



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

FEB 15 2012

Michael G. Ensch
Chief, Operations and Regulatory
Directorate of Civil Works
U.S. Army Corps of Engineers
441 G. Street, NW
Washington, DC 20314-1000

Mr. Ensch:

Enclosed is the National Marine Fisheries Service's (NMFS) Biological Opinion on the effects of discharges of dredged and fill material into waters of the United States and other navigable waters and other activities the U.S. Army Corps of Engineers' proposes to authorize using Nationwide Permits on endangered and threatened species under NMFS' jurisdiction and critical habitat that has been designated for these species. We have prepared this biological opinion pursuant to section 7(a)(2) of the Endangered Species Act, as amended (ESA; 16 U.S.C. 1536(a)(2)).

To conduct a formal analysis of the effects of the activities that would be authorized by the proposed Nationwide Permits on endangered and threatened species under NMFS' jurisdiction and critical habitat that has been designated for those species at a national scale, we applied a programmatic assessment framework that is described in detail in Chapter 2.0 of our Biological Opinion. Using that framework, we first examine the direct, indirect, and cumulative effects of activities authorized by Nationwide Permits since those permits were established in 1977, then we examine whether or to what degree the U.S. Army Corps of Engineers (USACE) has structured the proposed Nationwide Permits to insure that those activities comply with the requirements of section 7(a)(2) of the ESA.

Based on our assessment, we concluded that the USACE has not structured the proposed Nationwide Permits in a manner that insures that the direct, indirect, or cumulative effects of the activities that would be authorized by the proposed Nationwide Permits are not likely to jeopardize the continued existence of endangered or threatened species under NMFS' jurisdiction or result in the destruction or adverse modification of critical habitat that has been designate for those species. We have worked with USACE staff to develop reasonable and prudent alternatives that would insure that those activities comply with the requirements of section 7(a)(2) of the ESA.

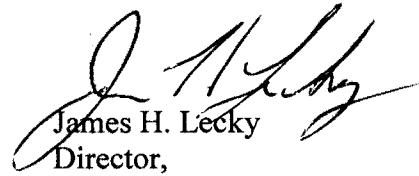


This Opinion concludes section 7 consultation on the proposed Nationwide Permits. Normally, the USACE is required to reinitiate formal consultation on the Nationwide Permits, where it retains discretionary involvement or control over the action and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, Action Agencies are normally required to reinitiate section 7 consultation immediately. However, because this Biological Opinion did not exempt the "take" of endangered or threatened species, any "take" of endangered or threatened species that might result from the proposed Nationwide Permits will be considered and exempted, as appropriate, in subsequent biological opinions that result from formal consultations that occur between NMFS and USACE Districts on district-level implementation of these Nationwide Permits.

If you have any questions regarding this Opinion, please contact me at (301) 427-8400.

Sincerely,

A handwritten signature in black ink, appearing to read "J. H. Lecky". The signature is fluid and cursive, with a large initial "J" and "L".

James H. Lecky
Director,
Office of Protected Resources

National Marine Fisheries Service
Endangered Species Consultation
Biological Opinion
on
**U.S. Army Corps of Engineers’
Nationwide Permit Program**

February 2012



U.S. Department of Commerce
National Oceanic and Atmospheric
Administration
National Marine Fisheries Service
Silver Spring, Maryland

Table of Contents

1.1 Description of the Proposed Action.....2

Nationwide Permit 1: Aids to Navigation.....3

Nationwide Permit 2: Structures in Artificial Canals.....3

Nationwide Permit 3: Maintenance3

Nationwide Permit 4. Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities.....4

Nationwide Permit 5. Scientific Measurement Devices.....4

Nationwide Permit 6. Survey Activities5

Nationwide Permit 7. Outfall Structures and Associated Intake Structures5

Nationwide Permit 8. Oil and Gas Structures on the Outer Continental Shelf5

Nationwide Permit 9. Structures in Fleeting and Anchorage Areas6

Nationwide Permit 10. Mooring Buoys.....6

Nationwide Permit 11. Temporary Recreational Structures.....6

Nationwide Permit 12. Utility Line Activities.....6

Nationwide Permit 13. Bank Stabilization8

Nationwide Permit 14. Linear Transportation Projects.....8

Nationwide Permit 15. U.S. Coast Guard Approved Bridges.....9

Nationwide Permit 16. Return Water From Upland Contained Disposal Areas9

Nationwide Permit 17. Hydropower Projects9

Nationwide Permit 18. Minor Discharges.....10

Nationwide Permit 20. Response Operations for Oil and Hazardous Substances.....10

Nationwide Permit 21. Surface Coal Mining Activities11

Nationwide Permit 22: Removal of Vessels.....11

Nationwide Permit 23. Approved Categorical Exclusions12

Nationwide Permit 24. Indian Tribe or State Administered Section 404 Programs.....13

Nationwide Permit 25. Structural Discharges.....13

Nationwide Permit 26. [Reserved]13

	Nationwide Permit 27. Aquatic Habitat Restoration, Establishment, and Enhancement Activities.	13
	Nationwide Permit 28. Modifications of Existing Marinas	15
	Nationwide Permit 29. Residential Developments	15
	Nationwide Permit 30: Moist Soil Management for Wildlife	16
	Nationwide Permit 31. Maintenance of Existing Flood Control Facilities	16
	Nationwide Permit 32. Completed Enforcement Actions	18
	Nationwide Permit 33. Temporary Construction, Access, and Dewatering.....	19
	Nationwide Permit 34. Cranberry Production Activities	19
	Nationwide Permit 35. Maintenance Dredging of Existing Basins	20
	Nationwide Permit 36. Boat Ramps.....	20
	Nationwide Permit 37. Emergency Watershed Protection and Rehabilitation	20
	Nationwide Permit 38. Cleanup of Hazardous and Toxic Waste	21
	Nationwide Permit 39. Commercial and Institutional Developments.....	21
	Nationwide Permit 41. Reshaping Existing Drainage Ditches	22
	Nationwide Permit 42. Recreational Facilities.....	23
	Nationwide Permit 43. Stormwater Management Facilities	23
	Nationwide Permit 44. Mining Activities.....	24
	Nationwide Permit 45. Repair of Uplands Damaged by Discrete Events.....	24
	Nationwide Permit 46. Discharges in Ditches.....	24
	Nationwide Permit 47. [Reserved]	25
	Nationwide Permit 48. Existing Commercial Shellfish Aquaculture Activities	25
	Nationwide Permit 49. Coal Remining Activities	26
	Nationwide Permit 50. Underground Coal Mining Activities.....	26
	Nationwide Permit A. Land-Based Renewable Energy Generation Facilities	27
	Nationwide Permit B. Water-Based Renewable Energy Generation Pilot Projects.....	27
1.2	Conditions of the Proposed Nationwide Permits.....	28
1.3	District Engineer's Decision-Making Process	36
2	Approach to the Assessment	39
2.1	Overview of NMFS' Assessment Framework	39
2.2	Application of this Approach in this Consultation	45
2.3	Evidence Available for the Consultation	50
2.4	Treatment of "Cumulative Impacts" (in the sense of NEPA)	53
2.5	Action Area.....	53

3	Status of Listed Resources.....	55
3.1	Species and Designated Critical Habitat Not Considered in this Opinion	57
3.3	Introduction to the Status Assessment	62
4	Environmental Baseline	139
4.1	Environmental Setting	139
4.2	Summary of the Status of the Watersheds in the Action Area	142
4.3	Summary of the Status of Wetlands in the Action Area	145
4.4	National Efforts to Conserve Aquatic Ecosystems.....	148
4.5	Integration and Synthesis of the Environmental Baseline.....	151
5	Effects of the Proposed Action	153
5.A.1	Effects of the Nationwide Permit Program	154
5.A.1.1	Number of Activities Authorized by Nationwide Permits.....	156
5.A.1.2	Acreage Impacted by Nationwide Permits.....	158
5.A.1.4	Geographic Distribution of Activities Authorized by Nationwide Permits	161
5.A.2	Activities Authorized by Specific Nationwide Permits	166
	Nationwide Permit 1	166
	Nationwide Permit 3	167
	Nationwide Permit 4	169
	Nationwide Permit 13	170
	Nationwide Permit 14	173
	Nationwide Permit 29	174
	Nationwide Permit 36	175
	Nationwide Permit 39	176
5.A.3	Cumulative Impacts of Nationwide Permits	177
5.A.3.1	Incremental Impacts of USACE Authorizations Generally.....	178
5.A.3.2	Incremental Impacts of Specific USACE Authorizations.....	183
5.A.4	Impacts of Nationwide Permits on Listed Resources.....	187
5.B.1.	Nationwide Permits and Compliance with Section 7(a)(2).....	189
5.B.1.1	USACE Estimates of the Effects of the Nationwide Permits.....	190
5.B.1.2	Ability to Prevent Nationwide Permits from Degrading Waters of the U.S.....	200
5.B.1.3	Ability to Protect Listed Resources.....	212
7.0	Cumulative Effects.....	219
9	Conclusion	221

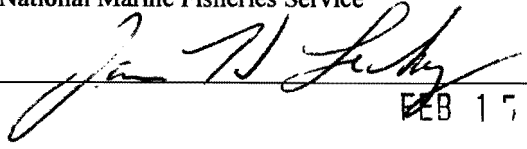
9	Reasonable and Prudent Alternative	223
9.1	Introduction to the Reasonable and Prudent Alternative	223
9.2	The Reasonable and Prudent Alternative	225
10	Incidental Take Statement.....	233
11	Conservation Recommendations	235
12	Reinitiation Notice	237
13	Literature Cited	239

**National Marine Fisheries Service
Endangered Species Act Section 7 Consultation
Biological Opinion**

Agency: United States Army Corps of Engineers

Activities Considered: Proposal to authorize the discharge of dredged and fill material or other structures or work in waters of the United States from 2012 through 2017

Consultation Conducted by: Interagency Consultation Division of the Office of Protected Resources,
National Marine Fisheries Service

Approved by: 
FEB 17 2012

Date: _____

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1539(a)(2)) requires federal agencies to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action "may affect" a protected species, that agency is required to consult formally with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service, depending on the particular endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR 402.14(a)). Federal agencies are exempt from this general requirement if they have concluded that an action "may affect, but is not likely to adversely affect" endangered species, threatened species, or designated critical habitat and NMFS or the U.S. Fish and Wildlife Service concur with that conclusion (50 CFR 402.14(b)).

The U.S. Army Corps of Engineers initiated formal consultation with NMFS and the U.S. Fish and Wildlife Service on the USACE's proposal to reauthorize 48 existing nationwide permits and establish two new nationwide permits that authorize the discharge of dredged or fill material into waters of the United States from 2012 through 2017. This document represents NMFS' programmatic biological opinion (Opinion) on the USACE's proposal to issue those permits at the national level. As an assessment of a national program of categories of activities, this Opinion does not assess the effects of individual discharges authorized by one or more of these permits to discharged dredged or fill materials into waters of the United States. Instead, this Opinion results from the national-level consultation on an action or series of actions affecting many species over all or a major portion of the United States and its territories as described in the Interagency Endangered Species Consultation Handbook (U.S. Fish and Wildlife Service and NMFS 1998). Specific uses of these proposed permits would be addressed in subsequent consultations by NMFS regions, such as in circumstances where an applicant notifies the Corps of a proposed activity that may affect listed species.

This Opinion is based on our review of the USACE's draft environmental assessments for the proposed nationwide permits, recovery plans for threatened and endangered sea turtles and shortnose sturgeon, status reviews for the

threatened and endangered Pacific salmon, the documents that were used to list green sturgeon and smalltooth sawfish as threatened and endangered species (respectively), reports on the status and trends of wetlands and deepwater habitats in the United States that have been prepared by the U.S. Fish and Wildlife Service's National Wetlands Inventory, past and current research and population dynamics modeling efforts, monitoring reports from prior research, and biological opinions on similar research, published and unpublished scientific information on the biology and ecology of threatened and endangered sea turtles, salmon, sturgeon, sawfish, and seagrasses in the action area, and other sources of information gathered and evaluated during the consultation on the proposed exercises. This Opinion has been prepared in accordance with section 7 of the ESA, associated implementing regulations, and agency policy and guidance (50 CFR 402; U.S. Fish and Wildlife Service and NMFS 1998).

Consultation History

On 30 March 2011, the U.S. Army Corps of Engineers provided the National Marine Fisheries Service with a copy of its 16 February 2011 Federal Register notice in which the USACE proposed to reissue and modify Nationwide Permits. On 1 April 2011, the U.S. Army Corps of Engineers provided the National Marine Fisheries Service with copies of the draft decision documents for the Nationwide Permits the USACE planned to issue.

In a series of telephone calls in May 2011, the National Marine Fisheries Services asked the U.S. Army Corps of Engineers for data on the number of activities that had been authorized by Nationwide Permits since 2007 (when they were last reissued), the acreage that was estimated to have been impacted by those authorizations, and the amount of mitigation the USACE had required. Those data were necessary to assess the potential effects of the proposed Nationwide Permits on endangered and threatened species under NMFS' jurisdiction and critical habitat that had been designated for those species.

Between 13 May and 7 June 2011, the USACE provided the data NMFS had requested. Formal consultation was initiated on 7 June 2011.

On 31 August 2011, the National Marine Fisheries Services provided the U.S. Army Corps of Engineers with a copy of its draft biological opinion on the proposed issuance, reissuance, and modification of the USACE's Nationwide Permits. The USACE provided comments on the draft opinion on 30 December 2011.

1.0 Biological Opinion

1.1 Description of the Proposed Action

The U.S. Army Corps of Engineers proposes to re-issue 48 pre-existing Nationwide Permits, re-issue two Nationwide Permits with possible modifications (NWP 21: Surface coal mining activities and NWP 48: Commercial shellfish aquaculture), issue two new Nationwide Permits, and reissue the pre-existing suite of General Conditions for a period of five years beginning in 2012 and ending in 2017. The purpose of the NWP program is to provide timely authorizations for the regulated public while protecting the Nation's aquatic resources. The U.S. Army Corps of Engineers proposes to issue these nationwide permits action pursuant to section 404(e) of the Clean Water Act

(33 U.S.C. 1344) and section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 *et seq.*).

The following narratives present each of the proposed Nationwide Permits, the scope of activities each permit would authorize, specific conditions attached to each permit, and the authorities for the permit (which are presented in parentheses at the end of each narrative):

Nationwide Permit 1: Aids to Navigation.

This Nationwide Permit authorizes the placement of aids to navigation and regulatory markers which are approved by and installed in accordance with the requirements of the U.S. Coast Guard (see 33 CFR, chapter I, subchapter C, part 66). (Section 10)

Nationwide Permit 2: Structures in Artificial Canals.

This Nationwide Permit authorizes structures constructed in artificial canals within principally residential developments where the connection of the canal to a navigable water of the United States has been previously authorized (see 33 CFR 322.5(g)). (Section 10)

Nationwide Permit 3: Maintenance

This Nationwide Permit authorizes:

- (a) The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure, or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement are authorized. Any stream channel modification is limited to the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill; such modifications must be immediately adjacent to the project.

This NWP also authorizes the repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. In cases of catastrophic events, such as hurricanes or tornadoes, this two-year limit may be waived by the district engineer, provided the permittee can demonstrate funding, contract, or other similar delays.

- (b) This NWP also authorizes the removal of accumulated sediments and debris in the vicinity of and within existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.) and/or the placement of new or additional riprap to protect the structure. The removal of sediment is limited to the minimum necessary to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend further than 200 feet in any direction from the structure. This 200 foot limit does not apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures.

All dredged or excavated materials must be deposited and retained in an upland area unless otherwise specifically approved by the district engineer under separate authorization. The placement of riprap must be the minimum necessary to protect the structure or to ensure the safety of the structure. Any bank stabilization measures not directly associated with the structure will require a separate authorization from the district engineer.

- (c) This NWP also authorizes temporary structures, fills, and work necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate.
- (d) This NWP does not authorize maintenance dredging for the primary purpose of navigation. This NWP does not authorize beach restoration. This NWP does not authorize new stream channelization or stream relocation projects.

Notification: For activities authorized by paragraph (b) of this NWP, the permittee must submit a preconstruction notification to the district engineer prior to commencing the activity (see general condition 30). The pre-construction notification must include information regarding the original design capacities and configurations of the outfalls, intakes, small impoundments, and canals. (Sections 10 and 404)

Note: This NWP authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill that does not qualify for the Clean Water Act Section 404(f) exemption for maintenance.

Nationwide Permit 4. Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities

This Nationwide Permit authorizes fish and wildlife harvesting devices and activities such as pound nets, crab traps, crab dredging, eel pots, lobster traps, duck blinds, and clam and oyster digging, and small fish attraction devices such as open water fish concentrators (sea kites, etc.). This NWP does not authorize artificial reefs or impoundments and semiimpoundments of waters of the United States for the culture or holding of motile species such as lobster, or the use of covered oyster trays or clam racks. (Sections 10 and 404)

Nationwide Permit 5. Scientific Measurement Devices

This Nationwide Permit authorizes devices whose purpose is to measure and record scientific data, such as staff gages, tide and current gages, meteorological stations, water recording and biological observation devices, water quality testing and improvement devices, and similar structures. Small weirs and flumes constructed primarily to record water quantity and velocity are also authorized provided the discharge is limited to 25 cubic yards. Upon completion of the study, the measuring device and any other structures or fills associated with that device (e.g., anchors, buoys, lines, etc.) must be removed and, to the maximum extent practicable, the site must be restored to pre-construction elevations. (Sections 10 and 404)

Nationwide Permit 6. Survey Activities

This Nationwide Permit authorizes survey activities, such as core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, and historic resources surveys. For the purposes of this NWP, the term “exploratory trenching” means mechanical land clearing of the upper soil profile to expose bedrock or substrate, for the purpose of mapping or sampling the exposed material. The area in which the exploratory trench is dug must be restored to its pre-construction elevation upon completion of the work and must not drain a water of the United States. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. This NWP authorizes the construction of temporary pads, provided the discharge does not exceed 1/10-acre in waters of the U.S. discharges and structures associated with the recovery of historic resources are not authorized by this NWP. Drilling and the discharge of excavated material from test wells for oil and gas exploration are not authorized by this NWP; the plugging of such wells is authorized.

Fill placed for roads and other similar activities is not authorized by this NWP. The NWP does not authorize any permanent structures. The discharge of drilling mud and cuttings may require a permit under Section 402 of the Clean Water Act. (Sections 10 and 404)

Nationwide Permit 7. Outfall Structures and Associated Intake Structures

This Nationwide Permit authorizes activities related to the construction or modification of outfall structures and associated intake structures, where the effluent from the outfall is authorized, conditionally authorized, or specifically exempted by, or that are otherwise in compliance with regulations issued under the National Pollutant Discharge Elimination System Program (Section 402 of the Clean Water Act). The construction of intake structures is not authorized by this NWP, unless they are directly associated with an authorized outfall structure.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit 8. Oil and Gas Structures on the Outer Continental Shelf

This Nationwide Permit authorizes structures for the exploration, production, and transportation of oil, gas, and minerals on the outer continental shelf within areas leased for such purposes by the Department of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement. Such structures shall not be placed within the limits of any designated shipping safety fairway or traffic separation scheme, except temporary anchors that comply with the fairway regulations in 33 CFR 322.5(l). The district engineer will review such proposals to ensure compliance with the provisions of the fairway regulations in 33 CFR 322.5(l). Any USACE review under this NWP will be limited to the effects on navigation and national security in accordance with 33 CFR 322.5(f). Such structures will not be placed in established danger zones or restricted areas as designated in 33 CFR part 334, nor will such structures be permitted in EPA or USACE designated dredged material disposal areas.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Section 10)

Nationwide Permit 9. Structures in Fleeting and Anchorage Areas

This Nationwide Permit authorizes structures, buoys, floats and other devices placed within anchorage or fleeting areas to facilitate moorage of vessels where the U.S. Coast Guard has established such areas for that purpose.

Nationwide Permit 10. Mooring Buoys

This Nationwide Permit authorizes non-commercial, single-boat, mooring buoys. (Section 10)

Nationwide Permit 11. Temporary Recreational Structures

This Nationwide Permit authorizes temporary buoys, markers, small floating docks, and similar structures placed for recreational use during specific events such as water skiing competitions and boat races or seasonal use, provided that such structures are removed within 30 days after use has been discontinued. At Corps of Engineers reservoirs, the reservoir manager must approve each buoy or marker individually. (Section 10)

Nationwide Permit 12. Utility Line Activities

This Nationwide Permit authorizes activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours.

A “utility line” is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and radio and television communication. The term “utility line” does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area. Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.

Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a power line or utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities. Foundations for overhead utility line towers, poles, and anchors: This NWP authorizes the construction or maintenance of foundations for overhead utility line towers, poles, and anchors in all waters of the United States, provided the

foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible. Access roads: This NWP authorizes the construction of access roads for the construction and maintenance of utility lines, including overhead power lines and utility line substations, in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows.

This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (See 33 CFR Part 322). Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials. (See general condition 30.) (Sections 10 and 404)

Note 1: Where the proposed utility line is constructed or installed in navigable waters of the United States (i.e., section 10 waters), copies of the pre-construction notification and NWP verification will be sent by the USACE to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

Note 2: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 3: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to Section 9 of the Rivers and Harbors Act of 1899. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

Nationwide Permit 13. Bank Stabilization

This Nationwide Permit authorizes bank stabilization activities necessary for erosion prevention, provided the activity meets all of the following criteria:

- (a) No material is placed in excess of the minimum needed for erosion protection;
- (b) The activity is no more than 500 feet in length along the bank, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in minimal adverse effects;
- (c) The activity will not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line, unless the permittee utilizes bioengineering techniques to accomplish the bank stabilization;
- (d) The activity does not involve discharges of dredged or fill material into special aquatic sites, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in minimal adverse effects;
- (e) No material is of the type, or is placed in any location, or in any manner, to impair surface water flow into or out of any water of the United States;
- (f) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas); and,
- (g) The activity is not a stream channelization activity.

This NWP also authorizes temporary structures, fills, and work necessary to construct the bank stabilization activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if the bank stabilization activity: (1) Involves discharges into special aquatic sites; or (2) is in excess of 500 feet in length. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit 14. Linear Transportation Projects

This Nationwide Permit authorizes activities required for the construction, expansion, modification, or improvement

of linear transportation projects (e.g., roads, highways, railways trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project.

This NWP also authorizes temporary structures, fills, and work necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to preconstruction elevations. The areas affected by temporary fills must be revegetated, as appropriate. This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) The loss of waters of the United States exceeds 1/10-acre; or (2) there is a discharge in a special aquatic site, including wetlands. (See general condition 30.) (Sections 10 and 404)

Note: Some discharges for the construction of farm roads or forest roads, or temporary roads for moving mining equipment, may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4).

Nationwide Permit 15. U.S. Coast Guard Approved Bridges

This Nationwide Permit authorizes discharges of dredged or fill material incidental to the construction of a bridge across navigable waters of the United States, including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills, provided the construction of the bridge structure has been authorized by the U.S. Coast Guard under Section 9 of the Rivers and Harbors Act of 1899 and other applicable laws. Causeways and approach fills are not included in this NWP and will require a separate section 404 permit. (Sections 10 and 404)

Nationwide Permit 16. Return Water From Upland Contained Disposal Areas

This Nationwide Permit authorizes return water from an upland contained dredged material disposal area. The return water from a contained disposal area is administratively defined as a discharge of dredged material by 33 CFR 323.2(d), even though the disposal itself occurs on the upland and does not require a section 404 permit. This NWP satisfies the technical requirement for a section 404 permit for the return water where the quality of the return water is controlled by the state through the section 401 certification procedures. The dredging activity may require a section 404 permit (33 CFR 323.2(d)), and will require a section 10 permit if located in navigable waters of the United States. (Section 404)

Nationwide Permit 17. Hydropower Projects

This Nationwide Permit authorizes discharges of dredged or fill material associated with hydropower projects

having: (a) Less than 5,000 kW of total generating capacity at existing reservoirs, where the project, including the fill, is licensed by the Federal Energy Regulatory Commission (FERC) under the Federal Power Act of 1920, as amended; or (b) a licensing exemption granted by the FERC pursuant to Section 408 of the Energy Security Act of 1980 (16 U.S.C. 2705 and 2708) and Section 30 of the Federal Power Act, as amended.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Section 404)

Nationwide Permit 18. Minor Discharges

This Nationwide Permit authorizes minor discharges of dredged or fill material into all waters of the United States, provided the activity meets all of the following criteria:

- (a) The quantity of discharged material and the volume of area excavated do not exceed 25 cubic yards below the plane of the ordinary high water mark or the high tide line;
- (b) The discharge will not cause the loss of more than 1/10-acre of waters of the United States; and (c) The discharge is not placed for the purpose of a stream diversion.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) The discharge or the volume of area excavated exceeds 10 cubic yards below the plane of the ordinary high water mark or the high tide line, or (2) the discharge is in a special aquatic site, including wetlands. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit 19. Minor Dredging

This Nationwide Permit authorizes dredging of no more than 25 cubic yards below the plane of the ordinary high water mark or the mean high water mark from navigable waters of the United States (i.e., section 10 waters). This NWP does not authorize the dredging or degradation through siltation of coral reefs, sites that support submerged aquatic vegetation (including sites where submerged aquatic vegetation is documented to exist but may not be present in a given year), anadromous fish spawning areas, or wetlands, or the connection of canals or other artificial waterways to navigable waters of the United States (see 33 CFR 322.5(g)). (Sections 10 and 404).

Nationwide Permit 20. Response Operations for Oil and Hazardous Substances

This Nationwide Permit authorizes activities conducted in response to a discharge or release of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR part 300) including containment, cleanup, and mitigation efforts, provided that the activities are done under either: (1) The Spill Control and Countermeasure Plan required by 40 CFR 112.3; (2) the direction or oversight of the Federal onscene coordinator designated by 40 CFR part 300; or (3) any approved existing state, regional or local contingency plan provided that the Regional Response Team (if one exists in the area) concurs with the proposed response efforts. This NWP also authorizes activities required for the cleanup of oil releases in waters of the United States from electrical equipment that are governed by EPA's polychlorinated biphenyl spill response regulations at 40 CFR part 761. This NWP also authorizes the use of temporary structures and fills in waters of the U.S. for spill response training exercises. (Sections 10 and 404)

Nationwide Permit 21. Surface Coal Mining Activities

In its proposed regulations, the USACE asked for comment on three options related to this Nationwide Permit:

Option 1: Do not reissue NWP 21.

Option 2 (Preferred Option) Discharges of dredged or fill material into waters of the United States associated with surface coal mining and reclamation operations provided the activities are already authorized, or are currently being processed by states with approved programs under Title V of the Surface Mining Control and Reclamation Act of 1977 or as part of an integrated permit processing procedure by the Department of Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE). The discharge must not cause the loss of greater than 0.5-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into tidal waters or non-tidal wetlands adjacent to tidal waters.

Under this option, NWP 21 would not authorize discharges of dredged or fill material into waters of the United States associated with the construction of valley fills.

The USACE would require the following notification with this option The permittee must submit a pre-construction notification to the district engineer and receive written authorization prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Option 3: 21. Surface Coal Mining Activities. Discharges of dredged or fill material into waters of the United States associated with surface coal mining and reclamation operations provided the activities are already authorized, or are currently being processed by states with approved programs under Title V of the Surface Mining Control and Reclamation Act of 1977 or as part of an integrated permit processing procedure by the Department of Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE). The discharge must not cause the loss of greater than 0.5-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into tidal waters or non-tidal wetlands adjacent to tidal waters.

The USACE would require the following notification with this option: The permittee must submit a pre-construction notification to the district engineer and receive written authorization prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit 22: Removal of Vessels

This Nationwide Permit authorizes temporary structures or minor discharges of dredged or fill material required for the removal of wrecked, abandoned, or disabled vessels, or the removal of manmade obstructions to navigation. This NWP does not authorize maintenance dredging, shoal removal, or riverbank snagging.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing

the activity if: (1) The vessel is listed or eligible for listing in the National Register of Historic Places; or (2) the activity is conducted in a special aquatic site, including coral reefs and wetlands. (See general condition 30.) If condition 1 above is triggered, the permittee cannot commence the activity until informed by the district engineer that compliance with the ‘‘Historic Properties’’ general condition is completed. (Sections 10 and 404)

Note 1: If a removed vessel is disposed of in waters of the United States, a permit from the U.S. EPA may be required (see 40 CFR 229.3). If a Department of the Army permit is required for vessel disposal in waters of the United States, separate authorization will be required.

Note 2: Compliance with general condition 19, Endangered Species, and general condition 20, Historic Properties, is required for all NWPs. The concern with historic properties is emphasized in the notification requirements for this NWP because of the likelihood that submerged vessels may be historic properties.

Nationwide Permit 23. Approved Categorical Exclusions

This Nationwide Permit authorizes activities undertaken, assisted, authorized, regulated, funded, or financed, in whole or in part, by another Federal agency or department where:

- a. That agency or department has determined, pursuant to the Council on Environmental Quality’s implementing regulations for the National Environmental Policy Act (40 CFR part 1500 et seq.), that the activity is categorically excluded from environmental documentation, because it is included within a category of actions, which neither individually nor cumulatively have a significant effect on the human environment; and
- b. The Office of the Chief of Engineers (Attn: CECW–CO) has concurred with that agency’s or department’s determination that the activity is categorically excluded and approved the activity for authorization under NWP 23.

The Office of the Chief of Engineers may require additional conditions, including pre-construction notification, for authorization of an agency’s categorical exclusions under this NWP.

Notification: Certain categorical exclusions approved for authorization under this NWP require the permittee to submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 30). The activities that require pre-construction notification are listed in the appropriate Regulatory Guidance Letters. (Sections 10 and 404)

Note: The agency or department may submit an application for an activity believed to be categorically excluded to the Office of the Chief of Engineers (Attn: CECW–CO). Prior to approval for authorization under this NWP of any agency’s activity, the Office of the Chief of Engineers will solicit public comment. As of the date of issuance of this NWP, agencies with approved categorical exclusions are the: Bureau of Reclamation, Federal Highway Administration, and U.S. Coast Guard. Activities approved for authorization under this NWP as of the date of this notice are found in USACE Regulatory Guidance Letter 05–07, which is available at: <http://www.usace.army.mil/CECW/Pages/rplsindx.aspx>.

Any future approved categorical exclusions will be announced in Regulatory Guidance Letters and posted on this same Web site.

Nationwide Permit 24. Indian Tribe or State Administered Section 404 Programs

This Nationwide Permit authorizes any activity permitted by a state or Indian Tribe administering its own section 404 permit program pursuant to 33 U.S.C. 1344(g)-(l) is permitted pursuant to Section 10 of the Rivers and Harbors Act of 1899. (Section 10)

Note 1: As of the date of the promulgation of this NWP, only New Jersey and Michigan administer their own section 404 permit programs.

Note 2: Those activities that do not involve an Indian Tribe or State section 404 permit are not included in this NWP, but certain structures will be exempted by Section 154 of Public Law 94-587, 90 Stat. 2917 (33 U.S.C. 591; see 33 CFR 322.4(b)).

Nationwide Permit 25. Structural Discharges

This Nationwide Permit authorizes discharges of material such as concrete, sand, rock, etc., into tightly sealed forms or cells where the material will be used as a structural member for standard pile supported structures, such as bridges, transmission line footings, and walkways, or for general navigation, such as mooring cells, including the excavation of bottom material from within the form prior to the discharge of concrete, sand, rock, etc. This NWP does not authorize filled structural members that would support buildings, building pads, homes, house pads, parking areas, storage areas and other such structures. The structure itself may require a section 10 permit if located in navigable waters of the United States. (Section 404)

Nationwide Permit 26. [Reserved]

Nationwide Permit 27. Aquatic Habitat Restoration, Establishment, and Enhancement Activities.

This Nationwide Permit authorizes activities in waters of the United States associated with the restoration, enhancement, and establishment of tidal and non-tidal wetlands and riparian areas and the restoration and enhancement of nontidal streams and other non-tidal open waters, provided those activities result in net increases in aquatic resource functions and services. To the extent that a USACE permit is required, activities authorized by this NWP include, but are not limited to:

The removal of accumulated sediments; the installation, removal, and maintenance of small water control structures, dikes, and berms; the installation of current deflectors; the enhancement, restoration, or establishment of riffle and pool stream structure; the placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or establish stream meanders; the backfilling of artificial channels and drainage ditches; the removal of existing drainage structures; the construction of small nesting islands; the construction of open water areas; the construction of oyster habitat over unvegetated bottom in tidal waters; shellfish seeding; activities needed to reestablish vegetation, including plowing or discing for seed bed preparation and the planting of appropriate wetland species; mechanized

land clearing to remove non-native invasive, exotic, or nuisance vegetation; the removal of small dams; and other related activities. Only native plant species should be planted at the site.

This NWP authorizes the relocation of non-tidal waters, including non-tidal wetlands and streams, on the project site provided there are net increases in aquatic resource functions and services. Except for the relocation of non-tidal waters on the project site, this NWP does not authorize the conversion of a stream or natural wetlands to another aquatic habitat type (e.g., stream to wetland or vice versa) or uplands. This NWP does not authorize stream channelization.

This NWP does not authorize the relocation of tidal waters or the conversion of tidal waters, including tidal wetlands, to other aquatic uses, such as the conversion of tidal wetlands into open water impoundments.

Reversion. For enhancement, restoration, and establishment activities conducted:

1. in accordance with the terms and conditions of a binding stream or wetland enhancement or restoration agreement, or a wetland establishment agreement, between the landowner and the U.S. Fish and Wildlife Service (FWS), the Natural Resources Conservation Service (NRCS), the Farm Service Agency (FSA), the National Marine Fisheries Service (NMFS), the National Ocean Service (NOS), U.S. Forest Service (USFS), or their designated state cooperating agencies;
2. as voluntary wetland restoration, enhancement, and establishment actions documented by the NRCS or USDA Technical Service Provider pursuant to NRCS Field Office Technical Guide standards; or
3. on reclaimed surface coal mine lands, in accordance with a Surface Mining Control and Reclamation Act permit issued by the Office of Surface Mining Reclamation and Enforcement (OSMRE) or the applicable state agency, this NWP also authorizes any future discharge of dredged or fill material associated with the reversion of the area to its documented prior condition and use (i.e., prior to the restoration, enhancement, or establishment activities).

The reversion must occur within five years after expiration of a limited term wetland restoration or establishment agreement or permit, and is authorized in these circumstances even if the discharge occurs after this NWP expires. The five-year reversion limit does not apply to agreements without time limits reached between the landowner and the FWS, NRCS, FSA, NMFS, NOS, USFS, or an appropriate state cooperating agency. This NWP also authorizes discharges of dredged or fill material in waters of the United States for the reversion of wetlands that were restored, enhanced, or established on prior-converted cropland or on uplands, in accordance with a binding agreement between the landowner and NRCS, FSA, FWS, or their designated state cooperating agencies (even though the restoration, enhancement, or establishment activity did not require a section 404 permit). The prior condition will be documented in the original agreement or permit, and the determination of return to prior conditions will be made by the Federal agency or appropriate state agency executing the agreement or permit. Before conducting any reversion activity the permittee or the appropriate Federal or state agency must notify the district engineer and include the documentation of the prior condition. Once an area has reverted to its prior physical condition, it will be subject to whatever the USACE Regulatory requirements are applicable to that type of land at the time. The requirement that the activity result in a net increase in aquatic resource functions and services does not apply to reversion activities meeting the above conditions. Except for the activities described above, this NWP does not authorize any future

discharge of dredged or fill material associated with the reversion of the area to its prior condition. In such cases a separate permit would be required for any reversion.

Reporting: For those activities that do not require pre-construction notification, the permittee must submit to the district engineer a copy of: (1) The binding stream enhancement or restoration agreement or wetland enhancement, restoration, or establishment agreement, or a project description, including project plans and location map; (2) the NRCS or USDA Technical Service Provider documentation for the voluntary stream enhancement or restoration action or wetland restoration, enhancement, or establishment action; or (3) the SMCRA permit issued by OSMRE or the applicable state agency. These documents must be submitted to the district engineer at least 30 days prior to commencing activities in waters of the United States authorized by this NWP.

Notification. The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 30), except for the following activities:

1. Activities conducted on non- Federal public lands and private lands, in accordance with the terms and conditions of a binding stream enhancement or restoration agreement or wetland enhancement, restoration, or establishment agreement between the landowner and the U.S. FWS, NRCS, FSA, NMFS, NOS, USFS or their designated state cooperating agencies;
2. Voluntary stream or wetland restoration or enhancement action, or wetland establishment action, documented by the NRCS or USDA Technical Service Provider pursuant to NRCS Field Office Technical Guide standards; or
3. The reclamation of surface coal mine lands, in accordance with an SMCRA permit issued by the OSMRE or the applicable state agency. However, the permittee must submit a copy of the appropriate documentation. (Sections 10 and 404)

Note: This NWP can be used to authorize compensatory mitigation projects, including mitigation banks and in-lieu fee projects. However, this NWP does not authorize the reversion of an area used for a compensatory mitigation project to its prior condition, since compensatory mitigation is generally intended to be permanent.

Nationwide Permit 28. Modifications of Existing Marinas

This Nationwide Permit authorizes reconfiguration of existing docking facilities within an authorized marina area. No dredging, additional slips, dock spaces, or expansion of any kind within waters of the United States is authorized by this NWP. (Section 10)

Nationwide Permit 29. Residential Developments

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States for the construction or expansion of a single residence, a multiple unit residential development, or a residential subdivision. This NWP authorizes the construction of building foundations and building pads and attendant features that are necessary for the use of the residence or residential development. Attendant features may include but are not limited to roads, parking lots, garages, yards, utility lines, storm water management facilities, septic fields, and recreation facilities such as playgrounds, playing fields, and golf courses (provided the golf course is an integral part

of the residential development). The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters. Subdivisions: For residential subdivisions, the aggregate total loss of waters of United States authorized by this NWP cannot exceed 1/2-acre. This includes any loss of waters of the United States associated with development of individual subdivision lots.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Sections 10 and 404) 30. Moist Soil Management for Wildlife. Discharges of dredged or fill material into non-tidal waters of the United States and maintenance activities that are associated with moist soil management for wildlife for the purpose of continuing ongoing, sitespecific, wildlife management activities where soil manipulation is used to manage habitat and feeding areas for wildlife. Such activities include, but are not limited to, plowing or discing to impede succession, preparing seed beds, or establishing fire breaks. Sufficient riparian areas must be maintained adjacent to all open water bodies, including streams to preclude water quality degradation due to erosion and sedimentation. This NWP does not authorize the construction of new dikes, roads, water control structures, or similar features associated with the management areas. The activity must not result in a net loss of aquatic resource functions and services. This NWP does not authorize the conversion of wetlands to uplands, impoundments, or other open water bodies. (Section 404)

Note: The repair, maintenance, or replacement of existing water control structures or the repair or maintenance of dikes may be authorized by NWP 3. Some such activities may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4).

Nationwide Permit **30:** Moist Soil Management for Wildlife.

Discharges of dredged or fill material into non-tidal waters of the United States and maintenance activities that are associated with moist soil management for wildlife for the purpose of continuing ongoing, site specific, wildlife management activities where soil manipulation is used to manage habitat and feeding areas for wildlife. Such activities include, but are not limited to, plowing or discing to impede succession, preparing seed beds, or establishing fire breaks. Sufficient riparian areas must be maintained adjacent to all open water bodies, including streams to preclude water quality degradation due to erosion and sedimentation. This NWP does not authorize the construction of new dikes, roads, water control structures, or similar features associated with the management areas. The activity must not result in a net loss of aquatic resource functions and services. This NWP does not authorize the conversion of wetlands to uplands, impoundments, or other open water bodies. (Section 404)

Note: The repair, maintenance, or replacement of existing water control structures or the repair or maintenance of dikes may be authorized by NWP 3. Some such activities may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4).

Natiowide Permit 31. Maintenance of Existing Flood Control Facilities

This Nationwide Permit authorizes discharges of dredged or fill material resulting from activities associated with the

maintenance of existing flood control facilities, including debris basins, retention/ detention basins, levees, and channels that: (i) Were previously authorized by the USACE by individual permit, general permit, or 33 CFR 330.3, or did not require a permit at the time they were constructed, or (ii) were constructed by the USACE and transferred to a non-Federal sponsor for operation and maintenance. Activities authorized by this NWP are limited to those resulting from maintenance activities that are conducted within the “maintenance baseline,” as described in the definition below. Discharges of dredged or fill materials associated with maintenance activities in flood control facilities in any watercourse that have previously been determined to be within the maintenance baseline are authorized under this NWP.

To the extent that a USACE permit is required, this NWP authorizes the removal of vegetation from levees associated with the flood control project. This NWP does not authorize the removal of sediment and associated vegetation from natural water courses except when these activities have been included in the maintenance baseline. All dredged material must be placed in an upland site or an authorized disposal site in waters of the United States, and proper siltation controls must be used.

Maintenance Baseline: The maintenance baseline is a description of the physical characteristics (e.g., depth, width, length, location, configuration, or design flood capacity, etc.) of a flood control project within which maintenance activities are normally authorized by NWP 31, subject to any case-specific conditions required by the district engineer. The district engineer will approve the maintenance baseline based on the approved or constructed capacity of the flood control facility, whichever is smaller, including any areas where there are no constructed channels but which are part of the facility.

The prospective permittee will provide documentation of the physical characteristics of the flood control facility (which will normally consist of as-built or approved drawings) and documentation of the approved and constructed design capacities of the flood control facility. If no evidence of the constructed capacity exists, the approved capacity will be used. The documentation will also include best management practices to ensure that the impacts to the aquatic environment are minimal, especially in maintenance areas where there are no constructed channels. (The USACE may request maintenance records in areas where there has not been recent maintenance.) Revocation or modification of the final determination of the maintenance baseline can only be done in accordance with 33 CFR 330.5. Except in emergencies as described below, this NWP cannot be used until the district engineer approves the maintenance baseline and determines the need for mitigation and any regional or activity-specific conditions. Once determined, the maintenance baseline will remain valid for any subsequent reissuance of this NWP. This NWP does not authorize maintenance of a flood control facility that has been abandoned. A flood control facility will be considered abandoned if it has operated at a significantly reduced capacity without needed maintenance being accomplished in a timely manner.

Mitigation: The district engineer will determine any required mitigation onetime only for impacts associated with maintenance work at the same time that the maintenance baseline is approved. Such one-time mitigation will be required when necessary to ensure that adverse environmental impacts are no more than minimal, both individually and cumulatively. Such mitigation will only be required once for any specific reach of a flood control project. However, if one-time mitigation is required for impacts associated with maintenance activities, the district engineer

will not delay needed maintenance, provided the district engineer and the permittee establish a schedule for identification, approval, development, construction and completion of any such required mitigation. Once the one-time mitigation described above has been completed, or a determination made that mitigation is not required, no further mitigation will be required for maintenance activities within the maintenance baseline. In determining appropriate mitigation, the district engineer will give special consideration to natural water courses that have been included in the maintenance baseline and require compensatory mitigation and/or best management practices as appropriate.

Emergency Situations: In emergency situations, this NWP may be used to authorize maintenance activities in flood control facilities for which no maintenance baseline has been approved. Emergency situations are those which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if action is not taken before a maintenance baseline can be approved. In such situations, the determination of mitigation requirements, if any, may be deferred until the emergency has been resolved. Once the emergency has ended, a maintenance baseline must be established expeditiously, and mitigation, including mitigation for maintenance conducted during the emergency, must be required as appropriate.

Notification: The permittee must submit a pre-construction notification to the district engineer before any maintenance work is conducted (see general condition 30). The preconstruction notification may be for activity-specific maintenance or for maintenance of the entire flood control facility by submitting a five-year (or less) maintenance plan. The preconstruction notification must include a description of the maintenance baseline and the dredged material disposal site. (Sections 10 and 404)

Nationwide Permit **32.** Completed Enforcement Actions

This Nationwide Permit authorizes any structure, work, or discharge of dredged or fill material remaining in place or undertaken for mitigation, restoration, or environmental benefit in compliance with either: (i) The terms of a final written USACE non-judicial settlement agreement resolving a violation of Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899; or the terms of an EPA 309(a) order on consent resolving a violation of Section 404 of the Clean Water Act, provided that:

- a. The unauthorized activity affected no more than 5 acres of non-tidal waters or 1 acre of tidal waters;
- b. The settlement agreement provides for environmental benefits, to an equal or greater degree, than the environmental detriments caused by the unauthorized activity that is authorized by this NWP; and
- c. The district engineer issues a verification letter authorizing the activity subject to the terms and conditions of this NWP and the settlement agreement, including a specified completion date; or
 - (ii) The terms of a final Federal court decision, consent decree, or settlement agreement resulting from an enforcement action brought by the United States under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899; or
 - (iii) The terms of a final court decision, consent decree, settlement agreement, or non-judicial settlement agreement resulting from a natural resource damage claim brought by a trustee or

trustees for natural resources (as defined by the National Contingency Plan at 40 CFR subpart G) under Section 311 of the Clean Water Act, Section 107 of the Comprehensive Environmental Response, Compensation and Liability Act, Section 312 of the National Marine Sanctuaries Act, Section 1002 of the Oil Pollution Act of 1990, or the Park System Resource Protection Act at 16 U.S.C. 19jj, to the extent that a USACE permit is required.

Compliance is a condition of the NWP itself. Any authorization under this NWP is automatically revoked if the permittee does not comply with the terms of this NWP or the terms of the court decision, consent decree, or judicial/non-judicial settlement agreement. This NWP does not apply to any activities occurring after the date of the decision, decree, or agreement that are not for the purpose of mitigation, restoration, or environmental benefit. Before reaching any settlement agreement, the USACE will ensure compliance with the provisions of 33 CFR part 326 and 33 CFR 330.6(d)(2) and (e). (Sections 10 and 404)

Nationwide Permit 33. Temporary Construction, Access, and Dewatering

This Nationwide Permit authorizes temporary structures, work, and discharges, including cofferdams, necessary for construction activities or access fills or dewatering of construction sites, provided that the associated primary activity is authorized by the Corps of Engineers or the U.S. Coast Guard. This NWP also authorizes temporary structures, work, and discharges, including cofferdams, necessary for construction activities not otherwise subject to the USACE or U.S.

Coast Guard permit requirements. Appropriate measures must be taken to maintain near normal downstream flows and to minimize flooding. Fill must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. The use of dredged material may be allowed if the district engineer determines that it will not cause more than minimal adverse effects on aquatic resources. Following completion of construction, temporary fill must be entirely removed to upland areas, dredged material must be returned to its original location, and the affected areas must be restored to preconstruction elevations. The affected areas must also be revegetated, as appropriate. This permit does not authorize the use of cofferdams to dewater wetlands or other aquatic areas to change their use. Structures left in place after construction is completed require a separate section 10 permit if located in navigable waters of the United States. (See 33 CFR part 322.)

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity (see general condition 30). The pre-construction notification must include a restoration plan showing how all temporary fills and structures will be removed and the area restored to pre-project conditions. (Sections 10 and 404)

Nationwide Permit 34. Cranberry Production Activities

This Nationwide Permit authorizes discharges of dredged or fill material for dikes, berms, pumps, water control structures or leveling of cranberry beds associated with expansion, enhancement, or modification activities at existing cranberry production operations. The cumulative total acreage of disturbance per cranberry production operation, including but not limited to, filling, flooding, ditching, or clearing, must not exceed 10 acres of waters of the United States, including wetlands. The activity must not result in a net loss of wetland acreage. This NWP does not authorize any discharge of dredged or fill material related to other cranberry production activities such as

warehouses, processing facilities, or parking areas. For the purposes of this NWP, the cumulative total of 10 acres will be measured over the period that this NWP is valid.

Notification: The permittee must submit a pre-construction notification to the district engineer once during the period that this NWP is valid, and the NWP will then authorize discharges of dredge or fill material at an existing operation for the permit term, provided the 10-acre limit is not exceeded. (See general condition 30.) (Section 404)

Nationwide Permit 35. Maintenance Dredging of Existing Basins

This Nationwide Permit authorizes excavation and removal of accumulated sediment for maintenance of existing marina basins, access channels to marinas or boat slips, and boat slips to previously authorized depths or controlling depths for ingress/ egress, whichever is less, provided the dredged material is deposited at an upland site and proper siltation controls are used. (Section 10)

Nationwide Permit **36. Boat Ramps.**

This Nationwide Permit authorizes activities required for the construction of boat ramps, provided the activity meets all of the following criteria:

- (a) The discharge into waters of the United States does not exceed 50 cubic yards of concrete, rock, crushed stone or gravel into forms, or in the form of precast concrete planks or slabs, unless the district engineer waives the 50 cubic yard limit by making a written determination concluding that the discharge will result in minimal adverse effects;
- (b) The boat ramp does not exceed 20 feet in width, unless the district engineer waives this criterion by making a written determination concluding that the discharge will result in minimal adverse effects;
- (c) The base material is crushed stone, gravel or other suitable material;
- (d) The excavation is limited to the area necessary for site preparation and all excavated material is removed to the upland; and,
- (e) No material is placed in special aquatic sites, including wetlands. The use of unsuitable material that is structurally unstable is not authorized. If dredging in navigable waters of the United States is necessary to provide access to the boat ramp, the dredging may be authorized by another NWP, a regional general permit, or an individual permit.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if: (1) The discharge into waters of the United States exceeds 50 cubic yards, or (2) the boat ramp exceeds 20 feet in width. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit 37. Emergency Watershed Protection and Rehabilitation

This Nationwide Permit authorizes work done by or funded by: (a) The Natural Resources Conservation Service for a situation requiring immediate action under its emergency Watershed Protection Program (7 CFR part 624);

- (b) The U.S. Forest Service under its Burned-Area Emergency Rehabilitation Handbook (FSH 2509.13);

- (c) The Department of the Interior for wildland fire management burned area emergency stabilization and rehabilitation (DOI Manual part 620, Ch. 3);
- (d) The Office of Surface Mining, or states with approved programs, for abandoned mine land reclamation activities under Title IV of the Surface Mining Control and Reclamation Act (30 CFR Subchapter R), where the activity does not involve coal extraction; or
- (e) The Farm Service Agency under its Emergency Conservation Program (7 CFR part 701).

In general, the prospective permittee should wait until the district engineer issues an NWP verification or 45 calendar days have passed before proceeding with the watershed protection and rehabilitation activity. However, in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur, the emergency watershed protection and rehabilitation activity may proceed immediately and the district engineer will consider the information in the pre-construction notification and any comments received as a result of agency coordination to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

Notification: Except in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur, the permittee must submit a preconstruction notification to the district engineer prior to commencing the activity (see general condition 30). (Sections 10 and 404)

Nationwide Permit 38. Cleanup of Hazardous and Toxic Waste

This Nationwide Permit authorizes specific activities required to effect the containment, stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority. Court ordered remedial action plans or related settlements are also authorized by this NWP. This NWP does not authorize the establishment of new disposal sites or the expansion of existing sites used for the disposal of hazardous or toxic waste.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Note: Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.

Nationwide Permit 39. Commercial and Institutional Developments

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States for the construction or expansion of commercial and institutional building foundations and building pads and attendant features that are necessary for the use and maintenance of the structures. Attendant features may include, but are not limited to, roads, parking lots, garages, yards, utility lines, storm water management facilities, and recreation facilities such as playgrounds and playing fields. Examples of commercial developments include retail stores, industrial facilities, restaurants, business parks, and shopping centers. Examples of institutional developments include schools, fire stations, government office buildings, judicial buildings, public works buildings, libraries,

hospitals, and places of worship. The construction of new golf courses, new ski areas, or oil and gas wells is not authorized by this NWP. The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Sections 10 and 404) 40. Agricultural Activities. Discharges of dredged or fill material into non-tidal waters of the United States for agricultural activities, including the construction of building pads for farm buildings. Authorized activities include the installation, placement, or construction of drainage tiles, ditches, or levees; mechanized land clearing; land leveling; the relocation of existing serviceable drainage ditches constructed in waters of the United States; and similar activities.

This NWP also authorizes the construction of farm ponds in non-tidal waters of the United States, excluding perennial streams, provided the farm pond is used solely for agricultural purposes. This NWP does not authorize the construction of aquaculture ponds. This NWP also authorizes discharges of dredged or fill material into non-tidal waters of the United States to relocate existing serviceable drainage ditches constructed in non-tidal streams. The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Section 404) **Note:** Some discharges for agricultural activities may qualify for an exemption under Section 404(f) of the Clean Water Act (see 33 CFR 323.4). This NWP authorizes the construction of farm ponds that do not qualify for the Clean Water Act Section 404(f)(1)(C) exemption because of the recapture provision at Section 404(f)(2).

Nationwide Permit 41. Reshaping Existing Drainage Ditches

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States, excluding non-tidal wetlands adjacent to tidal waters, to modify the cross-sectional configuration of currently serviceable drainage ditches constructed in waters of the United States, for the purpose of improving water quality by regrading the drainage ditch with gentler slopes, which can reduce erosion, increase growth of vegetation, and increase uptake of nutrients and other substances by vegetation. The reshaping of the ditch cannot increase drainage capacity beyond the original as-built capacity nor can it expand the area drained by the ditch as originally constructed (i.e., the capacity of the ditch must be the same as originally constructed and it cannot drain additional wetlands or other waters of the United States). Compensatory mitigation is not required because the work is designed to improve water quality.

This NWP does not authorize the relocation of drainage ditches constructed in waters of the United States; the location of the centerline of the reshaped drainage ditch must be approximately the same as the location of the

centerline of the original drainage ditch. This NWP does not authorize stream channelization or stream relocation projects.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity, if more than 500 linear feet of drainage ditch will be reshaped. (See general condition 30.) (Section 404)

Nationwide Permit 42. Recreational Facilities

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States for the construction or expansion of recreational facilities. Examples of recreational facilities that may be authorized by this NWP include playing fields (e.g., football fields, baseball fields), basketball courts, tennis courts, hiking trails, bike paths, golf courses, ski areas, horse paths, nature centers, and campgrounds (excluding recreational vehicle parks). This NWP also authorizes the construction or expansion of small support facilities, such as maintenance and storage buildings and stables that are directly related to the recreational activity, but it does not authorize the construction of hotels, restaurants, racetracks, stadiums, arenas, or similar facilities. The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Section 404)

Nationwide Permit 43. Stormwater Management Facilities

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States for the construction and maintenance of stormwater management facilities, including the excavation of stormwater ponds/facilities, detention basins, and retention basins; the installation and maintenance of water control structures, outfall structures and emergency spillways; low impact development stormwater features; and the maintenance dredging of existing stormwater management ponds/ facilities and detention and retention basins.

The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters. This NWP does not authorize discharges of dredged or fill material for the construction of new stormwater management facilities in perennial streams.

Notification: For the construction of new stormwater management facilities, or the expansion of existing stormwater management facilities, the permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) Maintenance activities do not require pre-construction notification if they are limited to restoring the original design capacities of the stormwater management facility. (Section 404)

Nationwide Permit 44. Mining Activities

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States for mining activities, except for coal mining activities. The discharge must not cause the loss of greater than 12 -acre of nontidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) If reclamation is required by other statutes, then a copy of the reclamation plan must be submitted with the pre-construction notification. (Sections 10 and 404)

Nationwide Permit 45. Repair of Uplands Damaged by Discrete Events

This NWP authorizes discharges of dredged or fill material, including dredging or excavation, into all waters of the United States for activities associated with the restoration of upland areas damaged by storms, floods, or other discrete events. This NWP authorizes bank stabilization to protect the restored uplands. The restoration of the damaged areas, including any bank stabilization, must not exceed the contours, or ordinary high water mark, that existed before the damage occurred. The district engineer retains the right to determine the extent of the pre-existing conditions and the extent of any restoration work authorized by this NWP. The work must commence, or be under contract to commence, within two years of the date of damage, unless this condition is waived in writing by the district engineer. This NWP cannot be used to reclaim lands lost to normal erosion processes over an extended period. This NWP does not authorize beach restoration.

Minor dredging is limited to the amount necessary to restore the damaged upland area and should not significantly alter the pre-existing bottom contours of the waterbody. **Notification:** The permittee must submit a pre-construction notification to the district engineer (see general condition 30) within 12-months of the date of the damage. The preconstruction notification should include documentation, such as a recent topographic survey or photographs, to justify the extent of the proposed restoration. (Sections 10 and 404)

Note: The uplands themselves that are lost as a result of a storm, flood, or other discrete event can be replaced without a section 404 permit, if the uplands are restored to the ordinary high water mark (in non-tidal waters) or high tide line (in tidal waters). (See also 33 CFR 328.5.) This NWP authorizes discharges of dredged or fill material into waters of the United States associated with the restoration of uplands.

Nationwide Permit 46. Discharges in Ditches

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal ditches that are: (1) Constructed in uplands, (2) receive water from an area determined to be a water of the United States prior to the construction of the ditch, (3) divert water to an area determined to be a water of the United States prior to the construction of the ditch, and (4) are determined to be waters of the United States. The discharge must not cause the loss of greater than one acre of waters of the United States.

This NWP does not authorize discharges of dredged or fill material into ditches constructed in streams or other

waters of the United States, or in streams that have been relocated in uplands. This NWP does not authorize discharges of dredged or fill material that increase the capacity of the ditch and drain those areas determined to be waters of the United States prior to construction of the ditch.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Section 404)

Nationwide Permit 47. [Reserved]

Nationwide Permit 48. Existing Commercial Shellfish Aquaculture Activities

This Nationwide Permit currently authorizes discharges of dredged or fill material in waters of the United States or structures or work in navigable waters of the United States necessary for the continued operation and/or expansion of existing commercial shellfish aquaculture operations, including the installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures. This NWP also authorizes discharges of dredged or fill material necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities. Rafts and other floating structures must be securely anchored and clearly marked.

This NWP does not authorize: (a) The cultivation of species not previously cultivated in the waterbody or of an aquatic nuisance species as defined in the Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990; or, (b) Attendant features such as docks, piers, boat ramps, stockpiles, staging areas, or the deposition of shell material back into waters of the United States as waste.

This NWP does not authorize new commercial shellfish aquaculture operations, except for expansions of existing operations. However, the USACE is considering whether to authorize new commercial shellfish aquaculture with this Nationwide Permit or to issue a new Nationwide Permit that authorizes activities associated with new commercial shellfish aquaculture.

Notification: The permittee must submit a pre-construction notification to the district engineer if: (1) The project area is greater than 100 acres; or (2) there is any reconfiguration of the aquaculture activity, such as relocating existing operations into portions of the project area not previously used for aquaculture activities; or (3) there is a change in culture methods (e.g., from bottom culture to off-bottom culture); or (4) dredge harvesting, tilling, or harrowing is conducted in areas inhabited by submerged aquatic vegetation; or, (5) there is an expansion to the project area. (See general condition 30.)

In addition to the information required by paragraph (b) of general condition 30, the pre-construction notification must also include the following information: (a) The size of the project area, plus any proposed expansion (in acres); (b) the corner latitude and longitude coordinates of the project area and the expansion area; (c) a brief description of the culture and harvest method(s), including plans for rotating production within a project area; (d) the name(s) of the cultivated species; (e) whether canopy predator nets are being used; and, (f) a description of the composition of the substrate material and vegetation. (Sections 10 and 404)

Note 1: The permittee should notify the applicable U.S. Coast Guard office regarding the project.

Note 2: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines “aquatic nuisance species” as “a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.”

Nationwide Permit 49. Coal Remining Activities

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States associated with the remining and reclamation of lands that were previously mined for coal. The activities must already be authorized, or they must currently be in process as part of an integrated permit processing procedure, by the Department of Interior (DOI) Office of Surface Mining Reclamation and Enforcement (OSMRE), or by states with approved programs under Title IV or Title V of the Surface Mining Control and Reclamation Act (SMCRA) of 1977. Areas previously mined include reclaimed mine sites, abandoned mine land areas, or lands under bond forfeiture contracts. As part of the project, the permittee may conduct new coal mining activities in conjunction with the remining activities when he or she clearly demonstrates to the district engineer that the overall mining plan will result in a net increase in aquatic resource functions. The USACE will consider the SMCRA agency’s decision regarding the amount of currently undisturbed adjacent lands needed to facilitate the remining and reclamation of the previously mined area. The total area disturbed by new mining must not exceed 40 percent of the total acreage covered by both the remined area and the additional area necessary to carry out the reclamation of the previously mined area.

Notification: The permittee must submit a pre-construction notification and a document describing how the overall mining plan will result in a net increase in aquatic resource functions to the district engineer and receive written authorization prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit 50. Underground Coal Mining Activities

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States associated with underground coal mining and reclamation operations provided the activities are authorized, or are currently being processed as part of an integrated permit processing procedure, by the Department of Interior (DOI), Office of Surface Mining Reclamation and Enforcement (OSMRE), or by states with approved programs under Title V of the Surface Mining Control and Reclamation Act of 1977.

The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This NWP does not authorize discharges into nontidal wetlands adjacent to tidal waters. This NWP does not authorize coal preparation and processing activities outside of the mine site.

Notification: The permittee must submit a pre-construction notification to the district engineer and receive written authorization prior to commencing the activity. (See general condition 30.) If reclamation is required by other statutes, then a copy of the reclamation plan must be submitted with the preconstruction notification. (Sections 10 and 404)

Note: Coal preparation and processing activities outside of the mine site may be authorized by NWP 21.

Nationwide Permit A. Land-Based Renewable Energy Generation Facilities

This Nationwide Permit authorizes discharges of dredged or fill material into non-tidal waters of the United States, excluding non-tidal wetlands adjacent to tidal waters, for the construction, expansion, or modification of land-based renewable energy production facilities. Such facilities include infrastructure to collect solar (concentrating solar power and photovoltaic), wind, biomass, or geothermal energy, as well as utility lines to transfer the energy to land-based distribution facilities. Attendant features may include, but are not limited to roads, parking lots, utility lines, and storm water management facilities.

The discharge must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects. This permit does not authorize discharges into nontidal wetlands adjacent to tidal waters.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Nationwide Permit B. Water-Based Renewable Energy Generation Pilot Projects

This Nationwide Permit authorizes structures and work in navigable waters of the United States and discharges of dredged or fill material into waters of the United States for the construction, expansion, or modification of water-based wind or hydrokinetic renewable energy generation pilot projects and their attendant features. Attendant features may include, but are not limited to, land-based distribution facilities, roads, parking lots, stormwater management facilities, utility lines, including utility lines to transfer the energy to land-based distribution facilities.

The discharge must not cause the loss of greater than 1/2-acre of waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless for intermittent and ephemeral stream beds the district engineer waives the 300 linear foot limit by making a written determination concluding that the discharge will result in minimal adverse effects.

For each single and complete project, no more than 10 generation units (e.g., wind turbines) are authorized. This NWP does not authorize activities in coral reefs.

Structures in an anchorage area established by the U.S. Coast Guard must comply with the requirements in 33 CFR part 322.5(1)(2).

Structures may not be placed in established danger zones or restricted areas as designated in 33 CFR part 334, shipping safety fairways or traffic separation schemes established by the U.S. Coast Guard (see 33 CFR part 322.5(1)(1)), or EPA or USACE designated open water dredged material disposal areas.

Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity. (See general condition 30.) (Sections 10 and 404)

Note 1: An activity that is located on an existing locally or federally maintained U.S. Army Corps of Engineers project requires separate approval from the Chief of Engineers under 33 U.S.C. 408.

Note 2: Copies of the NWP verification will be sent by the USACE to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the project and associated utility line(s) to protect navigation.

1.2 Conditions of the Proposed Nationwide Permits

Division and district engineers may modify the nationwide permits to help ensure that NWPs authorize only those activities that result in minimal individual and cumulative adverse effects on the aquatic environment and other public interest factors. Division engineers may add regional conditions to NWPs in cases where it is necessary to restrict or prohibit the use of an NWP in a specific geographic area or class of waters. For example, regional conditions may restrict or prohibit the use of NWPs in areas known to be inhabited by endangered or threatened species. As another example, regional conditions may require a prospective permittee to notify the district engineer before conducting an NWP activity, to provide the district engineer the opportunity to review the activity and determine whether section 7 consultation is required.

District engineers may add conditions to specific NWPs to ensure that a specific project results in minimal individual and cumulative adverse effects on the environment. These activity-specific conditions may include compensatory mitigation requirements, measures to protect endangered or threatened species, or other requirements.

To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as appropriate, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate USACE district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate USACE district office to determine the status of Clean Water Act Section 401 water quality certification and/ or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. *Navigation.* (a) No activity may cause more than a minimal adverse effect on navigation.
 - (b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.
 - (c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural

work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. *Aquatic Life Movements.* No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions. Bottomless culverts must be used where practicable. For an activity where it is not practicable to use a bottomless culvert, such as circumstances where sub-grade instability would make it unsafe to use a bottomless culvert, the bottom of the culvert must be below the grade of the stream bed unless the stream bed consists of bedrock or boulders.
3. *Spawning Areas.* Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.
4. *Migratory Bird Breeding Areas.* Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.
5. *Shellfish Beds.* No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWP 4 and 48.
6. *Suitable Material.* No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (*see* Section 307 of the Clean Water Act).
7. *Water Supply Intakes.* No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.
8. *Adverse Effects From Impoundments.* If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.
9. *Management of Water Flows.* To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows.

The activity may alter the preconstruction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).
10. *Fills Within 100-Year Floodplains.* The activity must comply with applicable FEMA-approved state or local floodplain management requirements.
11. *Equipment.* Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. *Soil Erosion and Sediment Controls.* Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.
13. *Removal of Temporary Fills.* Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.
14. *Discovery of Previously Unknown Remains and Artifacts.* If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found, and to the maximum extent practicable, stop activities that would adversely affect those remains and artifacts until the required coordination has been completed. We will initiate the Federal, Tribal and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.
15. *Proper Maintenance.* Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.
16. *Single and Complete Project.* The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.
17. *Wild and Scenic Rivers.* No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a “study river” for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).
18. *Tribal Rights.* No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.
19. *Endangered Species.* (a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which “may affect” a listed species or critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.
 - (b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

- (c) Non-Federal permittees shall notify the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. The district engineer will determine whether the proposed activity “may affect” or will have “no effect” to listed species and designated critical habitat and will notify the non- Federal applicant of the USACE’s determination within 45 days of receipt of a complete pre-construction notification. In cases where the non- Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the project, and has so notified the USACE, the applicant shall not begin work until the USACE has provided notification the proposed activities will have “no effect” on listed species or critical habitat, or until Section 7 consultation has been completed.
 - (d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species-specific regional endangered species conditions to the NWP.
 - (e) Authorization of an activity by a NWP does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (*e.g.*, an ESA Section 10 Permit, a Biological Opinion with “incidental take” provisions, etc.) from the U.S. FWS or the NMFS, The Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word “harm” in the definition of “take” means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.
 - (f) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the U.S. FWS and NMFS or their world wide Web pages at <http://www.fws.gov/> or <http://www.fws.gov/ipac> and <http://www.noaa.gov/fisheries.html> respectively.
20. *Historic Properties.* (a) In cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.
- (b) Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements.

- (c) Non-Federal permittees must submit a pre-construction notification to the district engineer if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the preconstruction notification must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)).

When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted and these efforts, the district engineer shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties on which the activity may have the potential to cause effects and so notified the USACE, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

- (d) The district engineer will notify the prospective permittee within 45 days of receipt of a complete preconstruction notification whether NHPA Section 106 consultation is required. Section 106 consultation is not required when the USACE determines that the activity does not have the potential to cause effects on historic properties (*see* 36 CFR 800.3(a)). If NHPA section 106 consultation is required and will occur, the district engineer will notify the non-Federal applicant that he or she cannot begin work until Section 106 consultation is completed.
- (e) Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the USACE is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/ THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and

other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. *Designated Critical Resource Waters.* Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, National Estuarine Research Reserves, and state designated outstanding national resource waters. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.
- (a) Discharges of dredged or fill material into waters of the United States are not authorized by NWP 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, A, and B for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.
 - (b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 30, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.
22. *Mitigation.* The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal: (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).
- (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.
 - (c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 0.1-acre and require preconstruction notification, unless the district engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project specific waiver of this requirement. For wetland losses of 0.1-acre or less that require pre-construction notification, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.
 - (d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment.

- (e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 0.5-acre, it cannot be used to authorize any project resulting in the loss of greater than 0.5-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.
 - (f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (*e.g.*, conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (*e.g.*, riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.
 - (g) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation, performance, and longterm management of the compensatory mitigation project.
 - (h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.
23. *Safety of Impoundment Structures.* To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.
24. *Water Quality.* Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional

water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

25. *Coastal Zone Management.* In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (*see* 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.
26. *Regional and Case-By-Case Conditions.* The activity must comply with any regional conditions that may have been added by the Division Engineer (*see* 33 CFR 330.4(e)) and with any case specific conditions added by the USACE or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.
27. *Use of Multiple Nationwide Permits.* The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed $\frac{1}{3}$ -acre.
28. *Transfer of Nationwide Permit Verifications.* If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate USACE district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature: "When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below."

_____ (Transferee)

_____ (Date)

29. *Compliance Certification.* Each permittee who receives an NWP verification letter from the USACE must provide a signed certification documenting completion of the authorized activity and any required compensatory mitigation. The USACE will provide the permittee the certification document with the NWP verification letter. The certification document will include:
- (a) A statement that the authorized work was done in accordance with the NWP authorization, including any general or specific conditions;
 - (b) A statement that any required compensatory mitigation was completed in accordance with the permit conditions; and
 - (c) The signature of the permittee certifying the completion of the work and mitigation.

30. *Pre-Construction Notification.* (a) *Timing.* Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, as a general rule, will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

- (1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or
- (2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division engineer. However, if the permittee was required to notify the USACE pursuant to general condition 19 that listed species or critical habitat might be affected or in the vicinity of the project, or to notify the USACE pursuant to general condition 20 that the activity may have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the USACE that there is "no effect" on listed species or "no potential to cause effects" on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (*see* 33 CFR 330.4(f)) and/or Section 106 of the National Historic Preservation (*see* 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the USACE. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee cannot begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

1.3 District Engineer's Decision-Making Process

The proposed rule for the NWPs identifies three primary categories of permits that are relevant to this assessment: one category in which District Engineers will decide whether to authorize an activity in specific circumstances (those permits that require PCN); another category of permits in which District Engineers might make such a decision (those permits that require PCN in specific circumstances); and a third category of permits in which the Corps of Engineers has already made that decision (those permits that do not require PCN).

When District Engineers review a PCN for a proposed activity, they will determine whether the activity proposed for authorization by a NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest.

If a proposed activity will result in a loss of greater than 0.1-acre of wetlands, a prospective permittee should submit a proposed mitigation plan with the PCN. Applicants may also propose compensatory mitigation for projects with

smaller impacts. District Engineers will consider any compensatory mitigation proposed by the applicant when they determine whether the proposed work results in minimal net adverse environmental effects to the aquatic environment.

The compensatory mitigation proposal may be either conceptual or detailed. If the district engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the District Engineer will notify the permittee and include any conditions the district engineer deems necessary. A District Engineer must approve any compensatory mitigation proposal before the permittee commences work.

If a prospective permittee elects to submit a compensatory mitigation plan with the PCN, District Engineers will expeditiously review the proposed compensatory mitigation plan. The district engineer must review the plan within 45 days of receiving a complete PCN and determine whether the proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after considering the compensatory mitigation proposal) are determined by the District Engineers to be minimal, the District Engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP.

If a District Engineer determines that the adverse effects of the proposed work are more than minimal, the District Engineer will notify the applicant either: (1) That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an individual permit; (2) that the project is authorized under the NWP subject to the applicant's submission of a mitigation proposal that would reduce the adverse effects on the aquatic environment to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions. Where the district engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant submit a mitigation proposal that would reduce the adverse effects on the aquatic environment to the minimal level. When mitigation is required, no work in waters of the United States may occur until the district engineer has approved a specific mitigation plan.

2 Approach to the Assessment

2.1 Overview of NMFS' Assessment Framework

Section 7(a)(2) of the Endangered Species Act of 1973, as amended, requires federal agencies, in consultation with and with the assistance of the Services, to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of endangered species, threatened species, or critical habitat that has been designated for these species (16 U.S.C. 1539). During consultations on specific actions, NMFS fulfills its obligations using an assessment framework that begins by identifying the physical, chemical, or biotic components of proposed actions that are likely to have individual, interactive, or cumulative direct and indirect effect on the environment (we use the term "potential stressors" for these components of an action); we then determine whether listed species or designated critical habitat are likely to be exposed to those potential stressors; we estimate how listed species or designated critical habitat are likely to respond to any exposure; then we conclude by estimating the risks those responses pose to the individuals, populations, and species or designated critical habitat that are likely to be exposed.

Federal agency programs apply to activities over large geographic areas over long periods of time, with substantial uncertainty about the number, location, timing, frequency, and intensity of specific activities those programs would authorize, fund, or carry out. Our traditional approaches to section 7 consultations, which focus on the specific effects of a specific proposal, are not designed to deal with the spatial and temporal scales and level of uncertainty that is typical of consultations on agency programs.

Instead of trying to adapt traditional consultation approaches to programmatic consultations, we have developed an assessment framework that specifically allows us to help Federal agencies insure that their programs comply with the requirements of section 7(a)(2) of the ESA as described in the Interagency Endangered Species Consultation Handbook (U.S. Fish and Wildlife Service and NMFS 1998; Chapter 5). Specifically, our programmatic consultations examine the decision-making processes that are integrated into Federal agency programs to determine whether those decision-making processes are likely to insure that specific actions the agency authorizes, funds, or carries out through the program comply with the requirements of section 7(a)(2). That is, during programmatic consultations we ask whether or to what degree the Federal action agency (in this case, the USACE) has structured its proposed program so that the agency (1) collects the information necessary to allow it to know or reliably estimate the probable individual and cumulative consequences of its program on the environment, generally, and listed resources specifically; (2) evaluates the information it collects to assess how its actions have affected the environment, generally, and endangered species, threatened species, and designated critical habitat specifically; and (3) when this information suggests that the activities authorized, funded, or carried out by its program no longer comply with the mandate and purposes of its program or of section 7(a)(2) of the ESA, does the Action Agency use

its authorities to bring those activities into compliance with program mandates and the requirements of section 7(a)(2) of the ESA. Here, “program structure” refers to the decision-making processes, applications of standards and criteria (including standards of information and treatment of uncertainty), feedback loops and internal audits, and controls (including permit conditions) that agencies employ to ensure that agency decisions to authorize fund, or carry out specific actions or a class of actions are likely to fulfill the mandates of the program before the agency authorizes, funds, or carries out those actions.

Figure 2.1 displays a normative model of a decision-making process that includes these program elements and feedback loops. The process trigger on the left-hand side of the figure (Box D1) might represent an application from a prospective permittee or licensee, a request for prospective funding, or a prospective proposal that would be undertaken by a federal agency. These process triggers are typically subjected to two screening processes (Box D2):

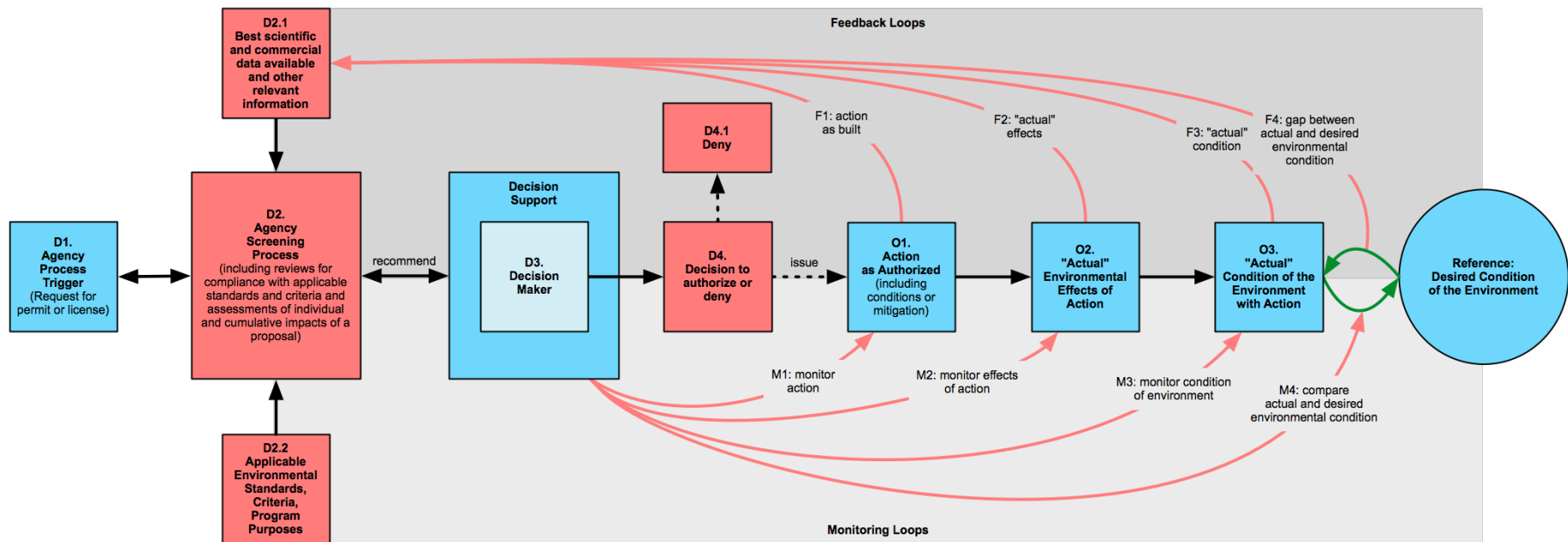
1. an initial screening process that are designed to insure that proposals minimally comply with statutory, regulatory, or policy requirements that are applicable to requests for permits, licenses, or funding and
2. secondary screening processes that are designed to insure that an agency satisfies the statutory, regulatory, or policy requirements or criteria that must be met before an agency can issue a permit, license, or funding.

For example, the screening process the Corps of Engineers applies to Standard Permits includes reviews for completeness; analyses for compliance with the section 404(b)(1) guidelines (which includes an evaluation of the availability of upland alternatives); compliance with state water quality standards; compliance with toxic effluent standards; compliance with the requirements of section 7(a)(2) of the ESA; public interest review; and mitigation sequencing.

Agency screening processes typically produce recommendations to agency decision-makers, who have the authority to make final decisions on Agency Actions (Figure 2.1, Box D3). Following those decisions, the Action Agency, permittee, licensee, or funding recipient undertakes the action, including any terms or conditions the Action Agency has attached (Figure 2.1, Box O1). The action produces a set of direct, indirect, and cumulative effects on the environment and any living organisms that occur in or rely on the environment that is affected by the action (Figure 2.1, Box O2) and the condition of the environment changes in response to those effects (Figure 2.1, Box O3). The significance of any changes in the condition of the environment should be determined by comparing the state of the environment with the action in place to some reference criterion, which is typically the desired condition of the environment (often established in statute).

Figure 2.1 also displays a program that contains an audit function represented by a monitoring component (Figure 2.1, Lines M1 to M4), a feedback component (Figure 2.1, Lines F1 to F4), and an information gathering and evaluation component that informs a screening process (Figure 2.1, Box D2.1). The monitoring component would collect empirical information on individual actions or a sample of individual actions to (a) identify what action actually occurred for comparison with the action that had been proposed and approved (implementation monitoring; Figure 2.1, Line M1); (b) identify which terms and conditions, if any, were satisfied, including any mitigation measures that were required (implementation monitoring; Figure 2.1, Line M1), (c) gather empirical information on

Figure 2.1. A normative model of a decision-making process that includes these program elements and feedback loops. See text for further explanation



the action's direct and indirect effects on the environment, including the effectiveness of any mitigation measures that had been required (validation and compliance monitoring; Figure 2.1, Line M2), (d) gather the empirical evidence to determine whether or to what degree the environment changed in response to those effects (Figure 2.1, Line M3); and (e) gather the empirical evidence sufficient to determine whether a proposal contributed to environmental conditions that fail to meet program purposes and standards (compliance monitoring; Figure 2.1, Line M4). The feedback component evaluates empirical data collected by monitoring and incorporates those data into agency decisions about prior or subsequent actions (Figure 2.1, Lines F1 through F4).

Regardless of whether an agency's decision-making processes corresponds to the model presented in Figure 2.1, five components of an agency's decision-making process are critical to our assessment of whether or to what degree an agency's program would be expected to insure that individual actions authorized, funded, or carried out by the program comply with the requirements of section 7(a)(2) of the ESA. The first critical component is the screening process an agency applies to specific actions authorized, funded, or carried out by a program. When we examine this component of an Agency's decision-making process, questions we ask include: What standards apply to the screening process? How rigorous are those standards? How rigorously does the Action Agency apply those standards? Are proposals assumed to comply with an Agency's statute barring evidence of non-compliance or vice versa? Which party (prospective permittees or the Action Agency) bears the responsibility for presenting the evidence that supports their position? Does an Agency's record of performance allow us to conclude that the screening process works as designed by filtering out proposals that do not satisfy applicable environmental mandates, standards, criteria, and program purposes?

The second critical component is the information that forms the foundation for the agency's screening process (Figure 2.1, Boxes D1.1, D2.1, and D2.2). When we examine this component of an agency's decision-making process, questions we ask include: Does the agency assess the individual and cumulative impacts of specific proposals? Does the agency's methodology consider all of the variables that would have to be considered to determine whether a specific proposal is likely to have adverse consequence for endangered or threatened species and designated critical habitat? Do assessments employ data acquisition procedures that are likely to identify, gather, and analyze all of the information that would be relevant to identify the presence or absence of consequence for endangered or threatened species and designated critical habitat? Does the assessment process incorporate quality assurance and quality control procedures? Are those procedures designed to prevent Type I decision error (falsely concluding that a proposal had an adverse impact), Type II decision error (falsely concluding that a proposal had no adverse impact), or both?

The third critical component is an Action Agency's decision-making process, which includes the information and variables that inform the Agency's decision on whether or not to authorize, fund, or implement an action, the decisions the Agency makes, and any conditions or terms the Agency attaches to its decision. When we examine this component of an agency's decision-making process, questions we examine patterns in prior decisions the Agency has made to determine whether or to what degree those decisions have insured that the subsequent action complies with the requirements of section 7(a)(2) of the ESA.

The fourth critical component is an audit function. Does the Action Agency regularly or continuously audit the

results of its actions? Are the monitoring and feedback loops (Figure 2.1, lines M1 to M4 and F1 to F4) designed to allow the Agency to (a) collect empirical information that allows them to insure that specific actions they authorize, fund, or carry out are undertaken as designed (including any terms, conditions, or mitigation measures associated with the proposal), (b) assess the actual effects of those actions, and (c) determine whether the program is fulfilling its mandate, purposes, and goals. Finally, we examine an Agency's record of performance over time to determine whether or to what degree its actual decisions show evidence of incorporating new information to improve subsequent decisions.

The final critical component is the agency's authority to modify its prior and subsequent decisions — and its willingness to use that authority — when new information (particularly information provided by the audit function) reveals that particular authorizations have not satisfied applicable environmental mandates, standards, criteria, and program purposes (the applicable environmental mandates includes compliance with section 7(a)(2) of the ESA).

We organize our programmatic consultations using a sequence of questions that focus on the agency's decision-making process, in general, and the five critical components we just described. Those questions focus on whether and to what degree an Agency has structured a program so that the Agency is in a position to know or reliably estimate whether endangered or threatened species or designated critical habitat are likely to be (a) exposed to stressors associated with specific actions a program would authorize, fund, or carry out; (b) respond to that exposure; and (c) experience individual-level, population-level, or species-level risks as a result of those responses. Further, we ask whether or to what degree an agency actively gathers that information, whether or to what degree an agency incorporates that information into its decision-making processes about specific actions, and whether or to what degree an agency changes the decisions it makes about specific actions based on that information.

It might be possible for NMFS to conclude that a Federal Action Agency had failed to insure that their actions comply with the requirements of section 7(a)(2) of the ESA without endangered or threatened species or designated critical habitat being adversely affected by that failure. To address this possibility, we preface our assessments of an agency's decision-making process with an assessment of the probable consequences of exposing endangered and threatened species and designated critical habitat to the physical, chemical, and biotic stressors that are known to be associated with actions the program would authorize, fund, or carry out. This component of our analyses establish the risks program pose to endangered and threatened species and designated critical habitat. Any risks we identify in this component of our analyses provide the context for our assessment of whether or to what degree an agency's program is likely to eliminate or avoid the risks the program poses.

RISK ANALYSES FOR ENDANGERED AND THREATENED SPECIES AND DESIGNATED CRITICAL HABITAT. As we described in the introduction to this Chapter, NMFS helps Action Agencies determine whether or to what degree they have complied with the requirements of section 7(a)(2) of the ESA by assessing whether and to what degree an Agency has structured a program so that the Agency is in a position to know or reliably estimate (a) whether endangered or threatened species are likely to be placed at increased risk of extinction, or (b) if those species avoid extinction, whether they are likely to experience increased risk of failing to recover from having been endangered or threatened because of the actions the program authorizes, funds, or carries out.

However, as we described in the preceding subsection of this Chapter, we preface our assessments of an agency's

decision-making process with an assessment of the probable consequences of exposing endangered and threatened species and designated critical habitat to the physical, chemical, and biotic stressors that are known to be associated with actions the program would authorize, fund, or carry out. This component of our analyses establish the risks program pose to endangered and threatened species and designated critical habitat¹. Any risks we identify in this component of our analyses provide the context for our assessment of whether or to what degree an agency's program is likely to manage those risks by eliminating or avoiding them.

Our consideration of how well an agency's program manages risks to endangered and threatened species reflects ecological relationships between listed species, the populations that comprise them, and the individuals that comprise those populations: the continued existence of species is determined by the fate of the populations that comprise them and the continued existence of a population is determined by the fate of the individuals that comprise them. Populations grow or decline as the individuals that comprise the population live, die, grow, mature, migrate, and reproduce, or fail to do so. When we assess whether or to what degree an agency's program is likely to eliminate or avoid risks to endangered or threatened species, we are mindful of the distinction between species, the populations that comprise the species, and the individuals that comprise those populations.

When we assess whether or to what degree an agency's program is likely to eliminate or avoid risks to individual members of endangered or threatened species, we think in terms of the individuals' fitness — its current or expected future reproductive success — which integrates an individuals' longevity with its current and future reproductive success. In particular, we examine the scientific and commercial data available to determine if an individual's probable response to stressors produced by an Action would reasonably be expected to reduce the individual's current or expected future reproductive success by increasing an individual's likelihood of dying prematurely, increasing the age at which it becomes reproductively mature, reducing the age at which it stops reproducing, reducing the number of live births it produces during any reproductive bout, reducing the number of reproductive bouts it engages in over its reproductive lifespan (in animals that reproduce multiple times), or causing the individual's progeny to experience any of these phenomena (Brommer 2000, Brommer *et al.* 1998, 2002; Clutton-Brock 1998, Coulson *et al.* 2006, Kotiaho *et al.* 2005, McGraw and Caswell 1996, Newton and Rothery 1997, Oli and Dobson 2003, Roff 2002, Stearns 1992, Turchin 2003).

When individual members of an endangered or threatened species can be expected to experience reductions in their current or expected future reproductive success or experience reductions in the rates at which they grow, mature, or become reproductively active, we would expect those reductions to also reduce the abundance, reproduction rates, and growth rates (or increase variance in one or more of these rates) of the populations those individuals represent (see Stearns 1992). Actions that are likely to reduce one or more of these variables (or one of the variables we derive from them) have fulfilled a *necessary* condition for reductions in viability of the population(s) those individuals

¹ We are aware that several courts have ruled that the definition of destruction or adverse modification that appears in the section 7 regulations at 50 CFR 402.02 is invalid and do not rely on that definition for the determinations we make in this Opinion. Instead, as we explain in the text, we use the "conservation value" of critical habitat for our determinations which focuses on the designated area's ability to contribute to the conservation of the species for which the area was designated.

represent, which would also satisfy a *necessary* condition for reductions in the viability of the species those populations comprise. Our programmatic assessments focus on whether or to what degree an agency's program is likely to insure that the direct or indirect effects of actions the program would authorize are not likely to reduce the fitness of listed individuals or are not likely to reduce that fitness to a degree that would be sufficient to reduce the viability of the population(s) those individuals represent.

Our consideration of how well an agency's program manages risks to designated critical habitat focuses on the value of the physical, chemical, or biotic phenomena of the critical habitat for the conservation of the endangered and threatened species for which the critical habitat was designated. In this step of our assessment, we consider information about the contribution of constituent elements of critical habitat (or of the physical, chemical, or biotic phenomena that give the designated area value for the conservation of listed species, particularly for older critical habitat designations that have no constituent elements) to the conservation value of those areas of critical habitat that occur in the action area. Then we consider the contribution of the conservation value of those areas to the conservation value of the entire critical habitat designation. Our programmatic assessments focus on whether or to what degree an agency's program is likely to insure that the direct or indirect effects of actions the program would authorize are not likely to reduce the conservation value of critical habitat that has been designated for endangered or threatened species or are not likely to reduce that conservation value to a degree that would be sufficient to reduce the species' likelihood of recovering from having been endangered or threatened.

2.2 Application of this Approach in this Consultation

As we have already discussed in section 2.1 of this chapter, we treat the suite of Nationwide Permits the U.S. Army Corps of Engineers proposes to issue as a "program" that would authorize a wide array of discharges of dredged or fill material over a five-year period. As we described in section 2.1, during programmatic consultations we ask whether or to what degree the USACE has structured this program so that the USACE (1) collects the information necessary to allow it to know how the actions it permits affect the environment, generally, and listed resources specifically; (2) evaluate that information to assess how its actions have affected the environment, generally, and endangered species, threatened species, and designated critical habitat specifically; and (3) when this information suggests that actions authorized by one or more of the proposed Nationwide Permits are not complying with the mandate and purposes of section 404 of the Clean Water Act, does the USACE use its authorities to bring those activities into compliance with that mandate and those program purposes. Specific additional questions we ask about the proposed Nationwide Permit program are:

1. Is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the general and particular effects of the discharges of dredged or fill material into waters of the United States that would be authorized by the proposed Nationwide Permits on the quality of the waters that would receive those discharges? That is, at the level of U.S. Army Corps of Engineers' Districts and hydrologic regions, sub-regions, basins, and sub-basins of the United States, its territories, and possessions:
 - 1.1 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the total number of discharges of dredged or fill material into waters of the United States resulting from the proposed Nationwide Permits, individually and collectively, over the five-year duration of the proposed permits?

- 1.2 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the total volume of dredged or fill material would be discharged into waters of the United States resulting from the proposed Nationwide Permits, individually and collectively, over the five-year duration of the proposed permits?
- 1.3 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the rate at which dredged or fill material is discharged into waters of the United States resulting from the proposed Nationwide Permits, individually and collectively, over the five-year duration of the proposed permits?
- 1.4 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the timing of discharges of dredged or fill material into waters of the United States resulting from the proposed Nationwide Permits, individually and collectively, over the five-year duration of the proposed permits?
- 1.5 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the location of discharges of dredged or fill material into waters of the United States resulting from the proposed Nationwide Permits, individually and collectively, over the five-year duration of the proposed permits?
- 1.6 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the baseline quality of the waters in the hydrologic basins that would receive dredged or fill material resulting from the proposed Nationwide Permits, individually and collectively, over the five-year duration of the proposed permits?
- 1.7 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate patterns of applicant compliance with the requirements of each of the proposed Nationwide Permits?
 - 1.7.1 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate geographic and temporal patterns of applicant compliance with the requirements of each of the proposed Nationwide Permits?
 - 1.7.2 in those instances in which applicants do not comply with the requirements of the proposed Nationwide Permits, is the Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate the magnitude of non-compliance with those requirements?
- 1.8 is the proposed Nationwide Permit Program structured so that the USACE is positioned to know or reliably estimate when specific waters of the United States have been or are being degraded as a result of the individual or cumulative effects of discharges resulting from each of the proposed Nationwide Permits or the suite of permits?

Here, we mean “cumulative impacts” as that term is defined pursuant to NEPA. That is, “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal

or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts include (NRC 1986):

- 1.8.1 time-crowded perturbations or perturbations that are so close in time that the effects of one perturbation do not dissipate before a subsequent perturbation occurs.
 - 1.8.2 space-crowded perturbations or perturbations that are so close in space that their effects overlap.
 - 1.8.3 interactions or perturbations that have qualitatively and quantitatively different consequences for the ecosystems, ecological communities, populations, or individuals exposed to them because of synergism (when stressors produce fundamentally different effects in combination than they do individually), additivity, magnification (when a combination of stressors have effects that are more than additive), or antagonism (when two or more stressors have less effect in combination than they do individually).
 - 1.8.4 nibbling or incremental and decremental effects are often, but not always, involved in each of the preceding three categories. The USACE has designed the Nationwide Permits so that they only authorize actions that have small or limited consequences when the actions are considered in isolation. However, that program limitation makes it more important to understand whether or to what degree the USACE has insured that the small effects of those individual actions do not accumulate to have ecological consequences that are substantially greater than any individual action.
2. is the proposed Nationwide Permit Program structured so that the USACE is positioned to take the actions that are sufficient to prevent waters of the United States from being further degraded by the individual or cumulative effects of the discharges of dredged or fill materials or other activities that would be authorized by the proposed Nationwide Permits on the quality of the waters that would receive those discharges? If the Nationwide Permit program positions the USACE to take these actions, is the USACE likely to take the these actions given its pattern of practice over time or any new commitments included in the proposed Nationwide Permits?
 3. has the USACE structured its proposed Nationwide Permit Program so that the USACE is positioned to insure that endangered or threatened species are not likely to be exposed to (a) the dredged or fill material that would be discharged into waters of the United States each year of the five-year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with such discharges?
 - 3.1 if the USACE cannot insure that endangered or threatened species are not likely to be exposed to dredged or fill material that would be discharged into waters of the United States each year of the five-year duration of the proposed permits, has the USACE structured its proposed Nationwide Permit Program so that the USACE can insure that endangered or threatened species are not likely

to be exposed to discharges that are likely to elicit responses that are potentially adverse for the listed individuals that are likely to be exposed to those discharges?

3.2 if the USACE cannot insure that endangered or threatened species are not likely to be exposed to reductions in water quality resulting from discharges of dredged or fill material into waters of the United States each year of the five-year duration of the proposed permits, has the USACE structured its proposed Nationwide Permit Program so that the USACE can insure that endangered or threatened species are not likely to be exposed to reductions in water quality that are likely to elicit responses that are potentially adverse for the listed individuals that are likely to be exposed to those reductions?

3.2.1 has the USACE structured the proposed Nationwide Permit Program so the USACE will know or be able to reliably estimate the physical, chemical, or biotic stressors that are likely to be produced as a direct or indirect result of the discharges of dredged or fill materials that would be authorized by the Nationwide Permit Program (that is, the stressors produced by the actual discharges of dredged or fill materials on, over, or near waters of the U.S.)?

Alternatively, has the USACE structured the Nationwide Permit Program so the USACE will know or be able to reliably determine whether or to what degree physical, chemical, or biotic stressors that are not authorized by the Nationwide Permit Program have been produced as a direct or indirect result of the discharges of dredged or fill materials that would be authorized by the proposed permits? Or, has the USACE structured the Nationwide Permit Program so the USACE will know or be able to reliably estimate that discharges of dredged or fill materials that would be authorized by the proposed permits have not occurred in concentrations, frequencies, or for durations that exceed the authorization of the proposed permit?

3.2.2 has the USACE structured the Nationwide Permit Program so the USACE will know or be able to reliably determine whether or to what degree applicants have complied with the conditions, restrictions, or mitigation measures the proposed permits require when they discharge dredged or fill material into waters of the United States?

3.2.3 has the USACE structured the Nationwide Permit Program so the USACE will know or be able to reliably estimate whether or what degree specific endangered or threatened species are likely to be exposed to (a) potentially harmful concentrations of dredged or fill materials the proposed permits would authorize to be discharged into waters of the United States? or (b) the ecological consequences of discharging dredged or fill materials into waters of the United States?

3.2.4 has the USACE structured the Nationwide Permit Program so the USACE will continuously identify, collect, and analyze information that suggests that the discharges of dredged or fill materials into waters of the United States may expose endangered or threatened species or designated critical habitat to dredged or fill material at

concentrations, intensities, durations, or frequencies that are known or suspected to produce physical, physiological, behavioral, or ecological responses that have potential individual or cumulative adverse consequences for individuals organisms or constituent elements of critical habitat?

3.2.5 has the USACE structured the Nationwide Permit Program so the USACE will employ an analytical methodology that considers (a) the status and trends of endangered or threatened species or designated critical habitat; (b) the demographic and ecological status of populations and individuals of those species given their exposure to pre-existing stressors in different drainages and watersheds; (c) the direct and indirect pathways by which endangered or threatened species or designated critical habitat might be exposed to discharges of dredged or fill materials into waters of the United States; and (d) the physical, physiological, behavior, sociobiological, and ecological consequences of exposing endangered or threatened species or designated critical habitat to dredged or fill materials at concentrations, intensities, durations, or frequencies that are known or suspected to produce physical, physiological, behavioral, or ecological responses, given their pre-existing demographic and ecological condition?

3.3 has the USACE structured the Nationwide Permit Program so the USACE will be able to prevent endangered or threatened species from being exposed to discharges of dredged or fill materials (a) at concentrations, rates, or frequencies that are potentially harmful to individual organisms, populations, or these species or (b) to ecological consequences that are potentially harmful to individual organisms, populations, or the species? How quickly would the USACE be able to implement preventive measures?

Our assessment focused on whether and to what degree the USACE structured the Nationwide Permit Program in ways that would prevent endangered or threatened species or critical habitat that has been designated for those species from being exposed to discharges of dredged or fill materials into waters of the United States and other activities because such exposures commonly trigger a cascade of events whose ultimate consequence is difficult to prevent. For example, once individual plants and animals are exposed to a discharge of dredged or fill materials in waters of the U.S., their responses to the exposure is controlled by the concentration, duration, and frequency associated with the exposure, their sensitivity to the discharged materials, other physical, chemical, or biotic stressors that are exposed to in the same time interval, their pre-existing physiological state, and their constitutional endowment. Because it is so difficult to prevent free-ranging organisms from responding to anthropogenic stressors once they have been exposed, the most effective management measures are designed to influence the exposure itself. For that reason, our assessment focuses on whether and to what degree the Nationwide Permit Program prevents endangered and threatened species and designated critical habitat from being exposed to discharges and other activities that would be authorized by the proposed Nationwide Permit Program.

As we also discussed in the introduction to this chapter, it might be possible for NMFS to conclude that a Federal agency had failed to insure that their actions comply with the requirements of section 7(a)(2) of the ESA without endangered or threatened species or designated critical habitat being adversely affected by that failure. To address this possibility, we preface our assessment of the USACE's decision-making process with an assessment of the

probable consequences of exposing endangered and threatened species and designated critical habitat to the discharges and other activities the USACE proposes to authorize over the next five years. Specifically, we

1. examine the activities that would be authorized by the Proposed Nationwide Permit Program.

These step of our analyses identify spatial and temporal patterns associated with each category of activity; specifically (a) the geographic distribution of the different activities; (b) the number or discharges; (c) the amounts of dredged or fill materials that are likely to be discharged; and (d) the rate of discharges.

2. we determine the degree of geographic and temporal overlap between the activities that would be authorized by the proposed Nationwide Permits and endangered and threatened species and designated critical habitat.

These analyses describe the spatial overlap and any specific evidence (reports or studies) that particular endangered or threatened species or designated critical habitat have been or are likely to be exposed to those use patterns. However, our exposure analyses are not conducted on a fine spatial scale because we they are only designed to establish whether or to what degree endangered or threatened species or designated critical habitat overlap, in space and time (some discharges of dredged or fill material may be occur when migratory species are not in an area, for example). Given spatial and temporal overlap, we then have reason to ask whether or to what degree the USACE's proposed Nationwide Permit Program can insure that these species or critical habitat are not likely to be exposed.

3. we conduct a detailed review of the literature available on the physical, physiological, behavioral, social, and ecological responses of endangered or threatened species or constituent elements of critical habitat given exposure to discharged of dredged or fill materials into waters of the United States or to the effects of those discharges and the activities associated with those activities on the ecology of the watersheds in which they occur (that is, effects resulting from changes in populations of prey, predators, competitors, symbionts, etc.). Rather than discuss the literature for each species, we organize the data using species groups (for example, Pacific Salmon; Sturgeon; Sea Turtles; etc.).
4. we *summarize* the probable consequences of the responses identified in the preceding section for populations of endangered and threatened species and designated critical habitat. Rather than discuss the literature for each species, it would be only be necessary to discuss the risks of exposing species groups (for example, Pacific Salmon; Sturgeon; Sea Turtles; etc.).

In this consultation, we present the results of these analyses before we present the results of our review and evaluate the USACE's proposed Nationwide Permits Program using the sequence of questions we identified previously. We use the results of these combined analyses to determine whether and to what degree the USACE structured the Nationwide Permit Program in ways that insure compliance with the requirements of section 7(a)(2) of the ESA.

2.3 Evidence Available for the Consultation

The evidence available for this consultation includes data the USACE has collected on nationwide permits the USACE has issued since 1977, when it created its first set of nationwide permits and stated its intention to "remain aware of potential cumulative impacts that may occur on a regional basis as a result of these nationwide permits. If adverse cumulative impacts are anticipated from any of the discharges subject to these nationwide permits, we

intend to take appropriate administrative action, including the exercise of authority express in 232.4-4 to require individual or general permits for these activities” (USACE 1977 page 37131). These data include the actual or estimated number of activities that were authorized using the different nationwide permits, the actual or estimated acreage impacted by those permits, and the actual or estimated acreage created or restored to mitigate the acreage impacted by activities authorized by the nationwide permits. Despite the USACE’s intention, actual counts of the number of discharges and other activities that have occurred are available for three of the 34-year duration of the nationwide permits — 1999, 2007, and 2010 — although the USACE has developed estimates for eleven of those 34 years.

In addition to the data available from the USACE, the organizations *Environmental Working Group* and *Public Employees for Environmental Responsibility* (PEER) distributed data they received from the USACE in response to Freedom of Information Act requests they submitted in the 1990s. As a result of one FOIA request the Environmental Working Group submitted in 1994 and two FOIA requests the Environmental Working Group submitted in 1995, the group received and published data on the total number of activities authorized in 27 USACE district by 18 of the Nationwide Permits that had been issued at the time. They also published data on the total number of activities authorized by Nationwide Permits and estimates of the acreage impacted by those between 1998 and 1996 with additional acreage estimates for 1997-2001. In 1999, PEER published data on the number of standard permits, letters of permission, Nationwide Permits, and Regional General Permits the USACE issued for the years 1982, 1987, 1992-1996, and 1998.

Data on the status and trends of wetlands and deepwater habitats have developed by the U.S. Fish and Wildlife Service’s National Wetlands Inventory for decades and cover the United States, generally (Dahl 1990, 2000, 2006, 2011; Dahl and Johnson 1991). The U.S. Geological Survey also published a national summary of wetland resources in 1996 (Fretwell et al. 1996) and Abernethy and Turner (1987) published national estimates of changes in the acreage of forested wetlands. In addition, the U.S. FWS’ National Wetlands Inventory and others have developed data on the status and trends of wetlands and deepwater habitats in the following states, regions, or localities: Alaska (Hall *et al.* 1994), Boston Islands Harbor Recreation Area (Tiner *et al.* 2003), Casco Bay Estuary in the Gulf of Maine (Foulis and Tiner 1994), Central Valley (California; Frayer et al. 1989), Chesapeake Bay (Tiner and Kenenski 1994), coastal Louisiana (Barras *et al.* 2004), coastal watersheds of the eastern United States (Stedman and Dahl 2008), Edisto River basin (South Carolina; Marshall *et al.* 1993), Florida (Frayer and Hefner 1991, Dahl 2005), the greater Buffalo area (New York; Tiner *et al.* 2008), Hackensack meadowlands (New Jersey; Tiner *et al.* 2002), Hackensack River watershed (New Jersey; Tiner and Berquist 2007), Maine (Tiner 2007), Maryland (Tiner and Burke 1995), Narragansett Bay estuary (Massachusetts and Rhode Island; Tiner *et al.* 2004), New Hampshire (Tiner 2007), New Jersey (Tiner 1985), northeastern States (Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia; Tiner 2010), Parker River watershed (Massachusetts; Tiner *et al.* 2002), Peconic River estuary (New York; Tiner *et al.* 2003), Rhode Island (Tiner 1989), Rhode Island Department of Environmental Management (1999, 2004, 2007; Murphy and Ely 2002), salt marshes in estuaries of southwestern Connecticut (Tiner *et al.* 2006), South Carolina (Dahl 1999), southeastern Virginia (Tiner *et al.* 2005), coastal Texas (Moulton *et al.* 1997), and Willamette River Valley (Oregon; Morlan *et al.* 2010). These data provide critical context for considering the potential consequences of impacts associated with activities permitted by the USACE on the ecological health of wetlands and other aquatic

ecosystems in the United States, its territories, and possessions.

In addition, over the past decade the Environmental Law Institute published several reports on off-site wetland mitigation banks (ELI 2002, 2009a), compensatory mitigation (ELI 2004a, 2004b, 2006), and wetland avoidance and minimization (ELI 2008, 2009b); these reports contain data on mitigation banks in the United States and their performance, the effectiveness of compensatory mitigation, and avoidance and minimization policies within USACE districts. Similarly, the City of Tacoma (Washington) distributed a draft report that reviews in-lieu fee mitigation program for shoreline habitat within the city boundaries (City of Tacoma 2010).

We supplemented this information by conducting electronic searches of literature published in English or with English abstracts using the Library of Congress' *First Search* and *Dissertation Abstracts* databases; SCOPUS, *Web of Science*; Cambridge Abstract's *Aquatic Sciences and Fisheries Abstracts* (ASFA); Google and Google Scholar; Yahoo! and Yahoo! Advanced Web Search; Microsoft *Bing*; *Mendeley*; *ScienceDirect*, and *Scribd* database services. The *First Search* databases provide access to literature in the biological, ecological, and agricultural sciences, master's theses, and doctoral dissertations published in professional journals between 1980 and today (although references for many scientific journals contained in the database only date to 1990 or 1992). In the *First Search* suite of databases, we specifically used the *ArticleFirst*, *BasicBiosis*, *Proceedings* and *ECO* databases, which index the major journals dealing with issues of ecological risk and water quality issues (for example, the journals *Environmental Toxicology and Chemistry*, *Human and Ecological Risk Assessment*), wetland ecology, conservation, and management (*Environmental Management*, *Estuaries*, *Journal of Wildlife Management*, *Restoration Ecology*, *Wetlands*, *Wildlife Society Bulletin*) and the ecology of threatened and endangered species (*Ambio*, *Biological Conservation*, *Bioscience*, *Canadian Journal of Fisheries and Aquatic Sciences*, *Conservation Biology*, *Ecology*, *Ecological Applications* *Journal of Animal Ecology*, *Journal of Applied Ecology*). In addition, we conducted electronic searches of journals published by Springer-Verlag and Elsevier using their respective web-sites and search engines.

For our electronic searches, we used paired combinations of the keywords: Clean Water Act, compensatory mitigation, Corps of Engineers, fill material, endangered species, Environmental Protection Agency (or EPA), estuarine wetland, Federal Water Pollution Control Act, in-lieu fee mitigation, mitigation, mitigation banking, Pacific salmon, palustrine wetland, riverine wetland, salmon, sea turtle, section 404, sturgeon, threatened species, U.S. Army Corps of Engineers, water quality, water pollution, wetland, wetland ecology, wetland regulation, and wetland restoration. We acquired all references that, based on a reading of their titles or abstracts, appeared to comply with these keywords. If a reference's title did not allow us to eliminate it as irrelevant to this inquiry, we acquired the reference. We supplemented our electronic searches by searching the literature cited sections of journal articles and other documents we acquired electronically. Because the geographic scope of the Nationwide Permits program is limited to the United States, its territories, and possessions, we limited the scope of our searches to that geographic area as well.

We organized the results of these searches using bibliographic software. We ranked the different papers based on the quality of their study design, sample sizes, level of scrutiny prior to and during publication, and study results. We rated carefully-designed field experiments (for example, experiments that control potentially confounding variables)

higher than field experiments that were not designed to control those variables. Carefully-designed field experiments were generally ranked higher than computer simulations or theoretical papers. Studies that relied on large sample sizes with small variances were generally ranked higher than studies that relied on small sample sizes or large variances.

2.4 Treatment of “Cumulative Impacts” (in the sense of NEPA)

To address the question of whether the activities that would be authorized by the proposed Nationwide Permits have direct and indirect effects on the environment that are small both individually and cumulatively, we explicitly consider the cumulative impacts of the proposed permits in a “cumulative impact” section of the Effects of the Action chapter of this Opinion. Here, we use the term “cumulative impact” in the NEPA sense of the term (the U.S. Council on Environmental Quality defines them under the term “cumulative effects” but we refer to them as “cumulative impacts” to distinguish between NEPA and ESA uses of “cumulative effects”). That is, we mean “cumulative impacts” as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). The effects analyses of biological opinions consider the “impacts” on listed species and designated critical habitat that result from the incremental impact of an action by identifying natural and anthropogenic stressors that affect endangered and threatened species throughout their range (the *Status of the Species*) and within an Action Area (the *Environmental Baseline*, which articulate the pre-existing *impacts* of activities that occur in an Action Area, including the past, contemporaneous, and future *impacts* of those activities). We assess the effects of a proposed action by adding their direct and indirect effects to the *impacts* of the activities we identify in an *Environmental Baseline* (50 CFR 402.02), in light of the impacts of the status of the listed species and designated critical habitat throughout their range; as a result, the results of our effects analyses are equivalent to those contained in the “cumulative impact” sections of NEPA documents.

This usage of “cumulative impacts” is distinct from the term “cumulative effects” which the section 7 regulations defines as “those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation” (50 CFR 402.02).

As we discussed previously, cumulative impacts includes (1) time-crowded perturbations or perturbations that are so close in time that the effects of one perturbation do not dissipate before a subsequent perturbation occurs; (2) space-crowded perturbations or perturbations that are so close in space that their effects overlap; (3) interactions or perturbations that have qualitatively and quantitatively different consequences for the ecosystems, ecological communities, populations, or individuals exposed to them because of synergism (when stressors produce fundamentally different effects in combination than they do individually), additivity, magnification (when a combination of stressors have effects that are more than additive), or antagonism (when two or more stressors have less effect in combination than they do individually); and (4) nibbling or incremental and decremental effects are often, but not always, involved in each of the preceding three categories (NRC 1986).

2.5 Action Area

The Action Area for this consultation on the U.S. Army Corps of Engineers’ proposed NWP program consists of the land and waters encompassed by 45 of the 50 states that constitute the United States, its territories, and its possessions (which includes American Samoa, Baker Island, Guam, Howland Island, Jarvis Island, Johnston Atoll,

Midway Islands, Navassa Island, the Commonwealth of the Northern Mariana Islands, Palmyra Atoll, Puerto Rico, the U.S. Virgin Islands, and Wake Island). This Action Area includes the coastal and estuarine water out to the limits of the territorial seas of the United States, its territories and its possessions.

Although the proposed Nationwide Permits have no specific geographic limitations within this Action Area, the New England District suspends Nationwide Permits within the District and replaces them with General Permits that are specific to the States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. The General Permit for activities in the State of Connecticut was finalized in July 2011 and expires in July 2016; the permit for the State of Maine expires in October 2015; the permit for the State of Massachusetts expires on January 2015 (the New England District proposed a modification to this permit on 2 August 2011, but that modification would not change the expiration date); the permit for the State of New Hampshire expires in January 2012; the permit for the State of Rhode Island expires in February 2012; and the Permit for the State of Vermont expires in December 2012. Because of these State-specific general permits, the lands and territorial waters of the five New England States are not included in the action area for this consultation.

Because NMFS only has jurisdiction over marine, coastal, estuarine, or anadromous endangered species, threatened species, and critical habitat that has been designated for those species in those ecosystems, this consultation addresses the potential effects of the proposed NWP in a portion of this Action Area. Specifically, we focus on the effects of the proposed NWPs in the boundaries of the following 19 Corps of Engineer's districts (moving from north to south along the Atlantic coast, east to west along the Gulf of Mexico, then south to north along the Pacific coast and excluding the New England District): New York, Philadelphia, Baltimore, Norfolk, Wilmington, Charleston, Savannah, Jacksonville, Mobile, New Orleans, Galveston, Los Angeles, Sacramento, San Francisco, Walla Walla, Portland, Seattle, Alaska, and Hawai'i (see Figure 2). These 19 districts encompass the geographic area in which endangered species, threatened species, and designated critical habitat under NMFS' jurisdiction occur.

In the background, we also consider the effects of the proposed NWPs within the boundaries of the Huntington, Kansas City, Little Rock, Louisville, Memphis, Nashville, Omaha, Rock Island, St. Louis, Tulsa, and Vicksburg districts. Endangered and threatened species under the jurisdiction of the NMFS and critical habitat that has been designated for these species would not be exposed to the discharges of fill material and other activities that would be authorized by Nationwide Permits in those district; however, the cumulative impact of those discharges and other activities would affect the river basins in the Arkansas, Atchafalaya, Illinois, Ohio, Mississippi, Missouri, Red, and Tennessee River drainages, which ultimately flow into the Gulf of Mexico. Because discharges of fill material and other activities in those districts affect the integrity of watersheds that produce the waters that flow in the Gulf of Mexico, activities that would be authorized by Nationwide Permits in those districts indirectly affect endangered and threatened species under the jurisdiction of the NMFS and critical habitat that has been designated for these species.

3 Status of Listed Resources

NMFS has determined that the following species² and critical habitat designations may be affected by the proposed Nationwide Permits:

Table 3.1. Species and critical habitat designations considered in this consultation

Common Name	Scientific Name	Listed As
Beluga whale, Cook Inlet (with critical habitat)	<i>Delphinapterus leucas</i>	Endangered
Fur seal, Guadalupe	<i>Arctocephalus townsendii</i>	Threatened
Killer whale, Southern Resident (with critical habitat)	<i>Orcinus orca</i>	Endangered
Monk seal, Hawai'ian	<i>Monachus schausinslandi</i>	Endangered
Sea Lion, Steller – eastern population (with critical habitat)	<i>Eumetopias jubatus</i>	Threatened
Sea Lion, Steller – western population (with critical habitat)		Endangered
Whale, blue	<i>Balaenoptera musculus</i>	Endangered
Whale, bowhead	<i>Balaena mysticetus</i>	Endangered
Whale, fin	<i>Balaenoptera physalus</i>	Endangered
Whale, humpback	<i>Megaptera novaeangliae</i>	Endangered
Whale, right (North Atlantic)	<i>Eubalaena glacialis</i>	Endangered
Whale, right (North Pacific)	<i>Eubalaena japonicus</i>	Endangered
Whale, sei	<i>Balaenoptera borealis</i>	Endangered
Whale, sperm	<i>Physeter macrocephalus</i>	Endangered
Sea turtle, Green (with critical habitat)	<i>Chelonia mydas</i>	Threatened
Sea turtle, Hawksbill (with critical habitat)	<i>Eretmochelys imbricata</i>	Endangered
Sea turtle, Kemp's	<i>Lepidochelys kempii</i>	Endangered
Sea turtle, Leatherback (with critical habitat)	<i>Dermochelys coriacea</i>	Endangered
Sea turtle, Loggerhead (North Pacific)	<i>Caretta caretta</i>	Endangered
Sea turtle, Loggerhead (Northwest Atlantic Ocean)		Threatened

² In this section of the Opinion, we use the word "species" as it has been defined in section 3 of the Endangered Species Act of 1973, which include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature" (16 U.S.C. 1532). Pacific salmon that have been listed as endangered or threatened were listed as "evolutionarily significant units" which NMFS uses to identify distinct population segments of Pacific salmon. Nevertheless, any taxa that have been listed as an ESU or DPS qualify as a "species" for the purposes of the ESA.

Table 3.1. Species and critical habitat designations considered in this consultation

Common Name	Scientific Name	Listed As
Sea turtle, Pacific ridley	<i>Lepidochelys olivacea</i>	Endangered Threatened
Bocaccio (Georgia Basin)	<i>Sebastes paucispinus</i>	Endangered
Eulachon, Pacific (Southern population)	<i>Thaleichthys pacificus</i>	Threatened
Rockfish, Canary (Georgia Basin)	<i>Sebastes pinniger</i>	Threatened
Rockfish, Yelloweye (Georgia Basin)	<i>Sebastes ruberrimus</i>	Threatened
Salmon, Chinook (California coastal) with critical habitat	<i>Oncorhynchus tshawytscha</i>	Threatened
Salmon, Chinook (Central Valley spring-run) with critical habitat		Threatened
Salmon, Chinook (Lower Columbia River) with critical habitat		Threatened
Salmon, Chinook (Puget Sound) with critical habitat		Threatened
Salmon, Chinook (Sacramento River winter-run) with critical habitat		Endangered
Salmon, Chinook (Snake River fall-run) with critical habitat		Threatened
Salmon, Chinook (Snake River spring/summer-run) with critical habitat		Threatened
Salmon, Chinook (Upper Columbia River spring-run) with critical habitat		Endangered
Salmon, Chinook (Upper Willamette River) with critical habitat		Threatened
Salmon, Chum (Columbia River) with critical habitat	<i>Oncorhynchus keta</i>	Threatened
Salmon, Chum (Hood Canal summer run) with critical habitat		Threatened
Salmon, Coho (Central California Coast) with critical habitat	<i>Oncorhynchus kisutch</i>	Endangered
Salmon, Coho (Lower Columbia River)		Threatened
Salmon, Coho (Oregon Coast)		Threatened
Salmon, Coho (Southern Oregon Northern Coastal California) with critical habitat		Threatened
Salmon, Sockeye (Ozette Lake) with critical habitat	<i>Oncorhynchus nerka</i>	Threatened
Salmon, Sockeye (Snake River) with critical habitat		Endangered
Smalltooth sawfish (U.S. portion of range) with critical habitat	<i>Pristis pectinata</i>	Endangered
Steelhead (California Central Valley) with critical habitat	<i>Oncorhynchus mykiss</i>	Threatened
Steelhead (Central California Coast) with critical habitat		Threatened
Steelhead (Lower Columbia River) with critical habitat		Threatened
Steelhead (Middle Columbia River) with critical habitat		Threatened
Steelhead (Northern California) with critical habitat		Threatened
Steelhead (Snake River Basin) with critical habitat		Threatened
Steelhead (South Central California coast) with critical habitat		Threatened
Steelhead (Southern California) with critical habitat		Endangered
Steelhead (Upper Columbia River) with critical habitat		Threatened
Steelhead (Upper Willamette River) with critical habitat		Threatened
Sturgeon, Green (southern population) with critical habitat	<i>Acipenser medirostris</i>	Threatened
Sturgeon, Gulf (with critical habitat)	<i>Acipenser oxyrinchus desotoi</i>	Threatened
Sturgeon, Shortnose	<i>Acipenser brevirostrum</i>	Endangered
Abalone, Black	<i>Haliotis cracherodii</i>	Endangered

Table 3.1. Species and critical habitat designations considered in this consultation

Common Name	Scientific Name	Listed As
Abalone, White	<i>Haliotis sorenseni</i>	Endangered
Coral, Elkhorn (with critical habitat)	<i>Acropora palmata</i>	Threatened
Coral, Staghorn (with critical habitat)	<i>Acropora cervicornis</i>	Threatened
Johnson's seagrass (with critical habitat)	<i>Halophila johnsoni</i>	Threatened

3.1 Species and Designated Critical Habitat Not Considered in this Opinion

As described in the *Approach to the Assessment*, NMFS uses two criteria to identify those endangered or threatened species or critical habitat that are not likely to be adversely affected by the various activities that would be authorized by Nationwide Permits from 2012 through 2017. The first criterion was *exposure* or some reasonable expectation of a co-occurrence between one or more potential stressor associated with the activities that would be authorized by the proposed permits and a particular listed species or designated critical habitat: if we conclude that a listed species or designated critical habitat is not likely to be exposed to those stressors, we must also conclude that the critical habitat is not likely to be adversely affected by those activities. The second criterion is the probability of a *response* given exposure, which considers *susceptibility*: species that may be exposed to sound transmissions from active sonar, for example, but are likely to be unaffected by the sonar (at sound pressure levels they are likely to be exposed to) are also not likely to be adversely affected by the sonar. We applied these criteria to the species listed at the beginning of this section; this subsection summarizes the results of those evaluations.

ATLANTIC SALMON (GULF OF MAINE). Atlantic salmon are an anadromous species: spawning and juvenile rearing occur in freshwater rivers followed by migration to the marine environment. This listing includes wild Atlantic salmon found in rivers and streams from the lower Kennebec River north to the border between the U.S. and Canada, including the Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot Rivers and Cove Brook. While at sea, Atlantic salmon undertake extensive migrations to waters off Canada and Greenland. Data from past commercial harvest indicate that post-smolts overwinter in the southern Labrador Sea and in the Bay of Fundy. Juvenile salmon in New England rivers typically migrate to sea in May after a two to three year period of development in freshwater streams, and remain at sea for two winters before returning to their U.S. natal rivers to spawn from mid October through early November.

The abundance of wild, Gulf of Maine Atlantic salmon is perilously small: the total run size of spawning adults in this species numbered approximately 150 animals in 1999 (NRC 2004). Since 1992, no wild Atlantic salmon have been caught in commercial fisheries or by research or survey vessels within the distribution of this species. Because of their current distribution, these Atlantic salmon might only co-occur with activities that would be authorized by the USACE's New England District. As we discussed in the preceding section (Action Area), the New England District suspends Nationwide Permits within the District and replaces them with General Permits that are specific to the States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. Because Atlantic salmon would be exposed to activities authorized by these General Permits (particularly activities authorized by the General Permit for the State of Maine) rather than the activities authorized by the Nationwide Permits. As a result,

we do not consider this species further in this consultation.

Climate Change³

There is general consensus within the scientific community that atmospheric temperatures on earth are increasing (warming) and that these increases will continue for at least the next several decades (IPCC 2001, Oreskes 2004). The Intergovernmental Panel on Climate Change (IPCC) estimated that average global land and sea surface temperature has increased by 0.6°C (\pm 0.2) since the mid-1800s, with most of the change occurring since 1976. This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley 2000). The IPCC reviewed computer simulations of the effect of greenhouse gas emissions on observed climate variations that have been recorded in the past and evaluated the influence of natural phenomena such as solar and volcanic activity. Based on their review, the IPCC concluded that natural phenomena are insufficient to explain the increasing trend in land and sea surface temperature, and that atmospheric warming observed over the last 50 years is probably attributable to human activities (IPCC 2001). Climatic models estimate that global temperatures would increase between 1.4 to 5.8°C from 1990 to 2100 if humans do nothing to reduce greenhouse gas emissions from current levels (IPCC 2001).

In the Northeast, annual average temperatures have increased by 2°F since 1970, with winter temperatures increasing by up to 4°F (Karl *et al.* 2009). Over the same time interval, the Northeast has experienced more days with temperatures greater than 90°F, a longer growing season, increased heavy precipitation, more winter precipitation falling as rain than as snow, reduced snowpack, earlier breakup of winter ice on lakes and rivers, earlier spring snowmelt resulting in earlier peak river flows, rising sea surface temperatures and sea level.

Over the next several decades, the Northeast is expected to experience temperatures increases of another 2.5 to 4°F during the winter season and 1.5 to 3.5°F during the summer season as a result of carbon emissions that have already occurred (Burakowski *et al.* 2008, Hayhoe *et al.* 2007, Karl *et al.* 2009). Forecasts beyond the middle of this century are sensitive to the level of carbon emissions produced today. If carbon emissions are not reduced, the length of the winter snow season would be cut in half across northern New York, Vermont, New Hampshire, and Maine, and reduced to a week or two in southern parts of the region; the Northeast would have fewer cold days during the winter and experience more precipitation (Hayhoe *et al.* 2007, Hayhoe *et al.* 2008, Huntington *et al.* 2004, Karl *et al.* 2009).

Cities in the Northeast that currently experience temperatures greater than 100°F for a few days each summer would experience an average of 20 days of such temperatures each summer; some cities in the Northeast -- Hartford, Connecticut, and Philadelphia, Pennsylvania, for example -- would experience an average of 30 days of such temperatures each summer (Karl *et al.* 2009). Hot summer conditions would arrive three weeks earlier and last three weeks longer into the fall. Droughts lasting from one- to three-months are projected to occur as frequently as once each summer in the Catskill and Adirondack Mountains, and across the New England states. Finally, sea levels in

³ The threats posed by the direct and indirect effects of global climatic change are or will be common to all of the species we discuss in this Opinion. Because of this commonality, we present this single narrative rather than in each of the species-specific narratives that appear later in this section of our Opinion.

this region are projected to rise more than the global average, which would increase coastal flooding and coastal erosion (Karl *et al.* 2009, Kirshen *et al.* 2008).

In the Pacific Northwest, annual average temperatures have increased by about 1.5°F over the past century with some areas experiencing increases of up to 4°F (Elsner and Hamlet 2010, Karl *et al.* 2009, Littell *et al.* 2009). Higher temperatures during the cool season (October through March) have caused more precipitation to fall as rain rather than snow and contribute to earlier snowmelt. The amount of snowpack remaining on April 1, which is a key indicator of natural water storage available for the warm season, has declined substantially throughout the Northwest region. In the Cascade Mountains, for example, the snowpack remaining on April 1 declined by an average of 25 percent over the past 40 to 70 years; most of this decline is attributed to the 2.5°F increase in temperatures during the winter season over the time interval (Christensen *et al.* 2007, Payne *et al.* 2004).

Over the next century, average temperatures in the Northwest Region are projected to increase by another 3 to 10°F, with higher emissions scenarios resulting in warming in the upper end of this range (Christensen *et al.* 2007, Karl *et al.* 2009). Increases in winter precipitation and decreases in summer precipitation are projected by many climate models, though these projections are less certain than those for temperature.

There is consensus within the scientific community that warming trends will continue to alter current weather pattern and patterns of natural phenomena that are influenced by climate, including the timing and intensity of extreme events such as heat-waves, floods, storms, and wet-dry cycles. Oceanographic models project a weakening of the thermohaline circulation resulting in a reduction of heat transport into high latitudes of Europe, an increase in the mass of the Antarctic ice sheet, and a decrease in the Greenland ice sheet, although the magnitude of these changes remain unknown (Levermann *et al.* 2007, Schmittner *et al.* 2005). As ice melts in the Earth's polar regions in response to increases in temperature, increases in the distribution and abundance of cold water are projected to influence oceanic currents, which would further alter weather patterns. In addition to influencing atmospheric temperatures and weather patterns, increases in greenhouse gases in the Earth's atmosphere have begun to increase rates of carbon capture and storage in the oceans: as carbon dioxide levels in the oceans increase, the waters will become more acidic, which would affect the physiology of large marine animals and cause structures made of calcium carbonate (for example, corals) to dissolve (IPCC 2001, Royal Society 2005).

Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Houghton *et al.* 2001, McCarthy *et al.* 2001, Parry *et al.* 2007; see Table 3.2). Climate-mediated changes in the global distribution and abundance are expected to reduce the productivity of the oceans by affecting keystone prey species in marine ecosystems such as phytoplankton, krill, cephalopods.

Increasing atmospheric temperatures have already contributed to changes in the quality of the freshwater, coastal, and marine ecosystems that are essential to the survival and recovery of salmon populations and have contributed to the decline of populations of endangered and threatened species (Karl *et al.* 2009, Littell *et al.* 2009). Since the late 1970s, sea surface temperatures have increased and coastal upwelling -- which is recognized as an important mechanism governing the production of both phytoplankton and zooplankton -- has decreased resulting in reduced

Table 3.2. Phenomena associated with projections of global climate change including levels of confidence associated with projections (adapted from IPCC 2001 and Campbell-Lendrum Woodruff 2007)

Phenomenon	Confidence in Observed Changes (observed in the latter 20 th Century)	Confidence in Projected Changes (during the 21 st Century)
Higher maximum temperatures and a greater number of hot days over almost all land areas	Likely	Very likely
Higher minimum temperatures with fewer cold days and frost days over almost all land areas	Very likely	Very likely
Reduced diurnal temperature range over most land areas	Very likely	Very likely
Increased heat index over most land areas	Likely over many areas	Very likely over most areas
More intense precipitation events	Likely over many mid- to high-latitude areas in Northern Hemisphere	Very likely over many areas
Increased summer continental drying and associated probability of drought	Likely in a few areas	Likely over most mid-latitude continental interiors (projections are inconsistent for other areas)
Increase in peak wind intensities in tropical cyclones	Not observed	Likely over some areas
Increase in mean and peak precipitation intensities in tropical cyclones	Insufficient data	Likely over some areas

prey availability and poorer marine survival of Pacific salmon. Changes in the number of Chinook salmon escaping into the Klamath River between 1978 and 2005 corresponded with changes in coastal upwelling and marine productivity and the survival of Snake River spring/summer Chinook salmon and Oregon Coho salmon has been predicted using indices of coastal ocean upwelling (Elsner and Hamlet 2010, Karl *et al.* 2009, Littell *et al.* 2009). The majority (90%) of year-to-year variability in marine survival of hatchery reared Coho salmon between 1985 and 1996 can be explained by coastal oceanographic conditions.

Changes in temperature and precipitation projected over the next few decades are projected to decrease snow pack, affect stream flow, and water quality throughout the Pacific Northwest region (Knowles *et al.* 2006, Mote *et al.* 2008, Mote and Salathé 2010, Rauscher *et al.* 2008). Warmer temperatures are expected to reduce snow accumulation and increase stream flows during the winter, cause spring snowmelt to occur earlier in the year causing spring stream flows to peak earlier in the year, and reduced summer stream flows in rivers that depend on snow melt (most rivers in the Pacific Northwest depend on snow melt). As a result, seasonal stream flow timing will likely shift significantly in sensitive watersheds. (Littell *et al.* 2009).

The States of Idaho, Oregon, and Washington, are likely to experience increased forest growth over the next few decades followed by decreased forest growth as temperature increases overwhelm the ability of trees to make use of higher winter precipitation and higher carbon dioxide. In coastal areas, climate change is forecast to increase coastal erosion and beach loss (caused by rising sea levels), increase the number of landslides caused by higher winter rainfall, inundate areas in southern Puget Sound around the city of Olympia, Washington (Littell *et al.* 2009).

Rising stream temperatures will likely reduce the quality and extent of freshwater salmon habitat. The duration of periods that cause thermal stress and migration barriers to salmon is projected to at least double by the 2080s for most analyzed streams and lakes (Littell *et al.* 2009). The greatest increases in thermal stress (including diseases and parasites which thrive in warmer waters) would occur in the Interior Columbia River Basin and the Lake Washington Ship Canal. The combined effects of warming stream temperatures and altered stream flows will very likely reduce the reproductive success of many salmon populations in Washington watersheds, but impacts will vary according to different life-history types and watershed-types. As more winter precipitation falls as rain rather than snow, higher winter stream flows scour streambeds, damaging spawning nests and washing away incubating eggs for Pacific Northwest salmon. Earlier peak stream flows flush young salmon from rivers to estuaries before they are physically mature enough for transition, increasing a variety of stressors including the risk of being eaten by predators.

As a result of these changes, about one third of the current habitat for either the endangered or threatened Northwest salmon species will no longer be suitable for them by the end of this century as key temperature thresholds are exceeded (Littell *et al.* 2009). As summer temperatures increase, juvenile salmon are expected to experience reduced growth rates, impaired smoltification, and greater vulnerability to predators.

Ocean acidification caused by increasing amounts of carbon dioxide (CO₂) in the Earth's atmosphere poses a more wide-spread threat because virtually every major biological function has been shown to respond to acidification changes in seawater, including photosynthesis, respiration rate, growth rates, calcification rates, reproduction, and recruitment (The Royal Society 2005).

At the same time as these changes in regional weather patterns and ocean productivity are expected to occur, the oceans are expected to be increasingly acidic. Over the past 200 years, the oceans have absorbed about half of the CO₂ produced by fossil fuel burning and other human activities. This increase in carbon dioxide has led to a reduction of the pH of surface seawater of 0.1 units, equivalent to a 30 percent increase in the concentration of hydrogen ions in the ocean. If global emissions of carbon dioxide from human activities continue to increase, the average pH of the oceans is projected to fall by 0.5 units by the year 2100 (The Royal Society 2005).

Although the scale of these changes are likely to vary regionally, pHs would be lower than the oceans have experienced about 420,000 years and the rate of change is probably one hundred times greater than the oceans have experienced at any time over that time interval. More importantly, it would take tens of thousands of years for ocean chemistry to return to a condition similar to that occurring at pre-industrial times (The Royal Society 2005).

Marine species such as fish, larger invertebrates, and some zooplankton take up oxygen and lose respired carbon dioxide through their gills. Increased carbon dioxide levels and decreased pH would have a major effect on this respiratory gas exchange system because oxygen is much harder to obtain from surface seawater than it is from air (primarily because concentrations of oxygen are lower in water). The processes involved in supplying oxygen to the gills means that more carbon dioxide is removed from these aquatic animals than is removed from air breathing animals of a similar size. This more ready removal of carbon dioxide from body fluids means that the level and range of CO₂ concentration in the bodies of water-breathing animals are much lower than is the case for air-breathing animals. As a result, large water breathing marine animals are more sensitive to changes in the carbon

dioxide concentration in the surrounding seawater than are large air-breathing animals.

This has important implications because higher ambient levels of carbon dioxide would acidify the body tissues and fluids of these species and affect the ability of their blood to carry oxygen. Experimental studies have demonstrated that acidosis of tissues decrease cellular energy use, lower respiratory activity, and lower rates of protein synthesis (Pörtner *et al* 2000, 2004). These changes would reduce the performance of almost every physiological process of larger animals including their growth and reproduction (Langenbuch and Pörtner 2002, 2003). By itself, this effect of climate change poses severe risks for endangered and threatened anadromous and marine species. In combination with changes in seasonal temperatures, formation of snow pack in terrestrial ecosystems, upwelling phenomena, and ocean productivity, ocean acidification would lead us to expect the status of endangered and threatened anadromous, coastal, and marine species to trend toward increasing decline over the next three or four decades.

3.3 Introduction to the Status Assessment

The rest of this section of our Opinion consists of narratives for each of the threatened and endangered species and designated critical habitat that are likely to occur in the action area and that may be adversely affected by activities that would be authorized by the Nationwide Permits between 2012 and 2017. Each narrative contains two components: (1) a summary of the global status of the species and any critical habitat that has been designated for those species and (2) background information that helps explain probable interactions between the listed species, designated critical habitat, and the activities that would be authorized by the proposed Nationwide Permits.

The summary of the global status of the species contains information on the distribution, population structure, and threat regime to support our assessment of the species' global status. This information also allows us to determine where the distribution of these species overlaps with the distribution of the activities that would be authorized by the proposed Nationwide Permits and to identify specific populations that might be exposed to those activities. The background information includes a section that discusses the species' dependence on waters of the United States' because all of the species we discuss are purely aquatic, these sections contain information on either the particular kinds of habitats the species occupy or particular Nationwide Permits that are likely to affect the species. We only discuss the kinds of habitat for those species that would be affected by a substantial number of the Nationwide Permits (as discussed in the *Effects of the Action* section of this Opinion, some species might be affected by the direct or indirect effects of up to 21 different Nationwide Permits). We only identify specific Nationwide Permits for marine mammals that have limited direct linkage to freshwater environments.

More complete reviews of the literature on the different species and critical habitat designations are available in five-year status reviews, listing documents, and recovery plans for the species we discuss or in the public literature.

3.3.1 Beluga whale, Cook Inlet

Distribution

Cook Inlet beluga are one of five populations (or "stocks") of beluga whales that are currently recognized in Alaska (Angliss and Outlaw, 2007). The range of this species is generally limited to Cook Inlet in southcentral Alaska, although they have been sighted in the Gulf of Alaska outside of Cook Inlet.

Status

On October 22, 2008, NMFS listed the Cook Inlet beluga whale as endangered (73 FR 62919). Historic numbers of beluga whales in Cook Inlet are unknown. Dedicated surveys began in earnest in the 1990s when NMFS began conducting aerial surveys for beluga whales in Cook Inlet. Prior to then, survey efforts were inconsistent, part of larger sea bird and marine mammal surveys, made by vessel, or estimated following interviews with fishermen (Klinkhart 1966). In many cases the survey methodology or confidence intervals were not described. For instance, (Klinkhart 1966) conducted aerial surveys in 1964 and 1965, where he describes having estimated the populations at 300-400 whales, but the methodology was not described nor did he report the variance around these estimates. Other estimates were incomplete due to the small area the survey focused upon (e.g. river mouth estimates; e.g., Hazard 1988). The most comprehensive survey effort prior to the 1990s occurred in 1979 and included transects from Anchorage to Homer, and covered the upper, middle and lower portions of Cook Inlet. From this effort, and using a correction factor of 2.7 to account for submerged whales Calkins (1989) estimated the 1979 abundance at about 1,293 whales.

Between 1979 and 1994, according to above noted population estimates, Cook Inlet beluga whales declined by 50%, with another 50% decline observed between 1994 and 1998. Using a growth fitted model Hobbs *et al.*, (2008) observed an average annual rate of decline of -2.91% (SE = 0.010) from 1994 to 2008, and a -15.1% (SE = 0.047) between 1994 and 1998. A comparison with the 1999-2008 data suggests the rate of decline at -1.45% (SE=0.014) per year (Hobbs et al. 2008). Given that harvest was curtailed significantly between 1999 and 2008, NMFS had expected the population would begin to recover at a rate of 2-6% per year. However, abundance estimates demonstrate that this is not the case (Hobbs and Sheldon 2008).

In conducting its status review, NMFS conducted a suite of population viability analyses to estimate the time to extinction for Cook Inlet beluga whales. The models were sensitive to a variety of parameters such as killer whale predation, Allee effects and unusual mortality events. The best approximation of the current population incorporated killer whale predation at only one beluga whale per year and allowed for an unusual mortality event occurring on average every 20 years. Based on this scenario, there is an 80% probability that the Cook Inlet beluga whale is declining, a 26% probability that this species will be extinct in 100 years (by 2108) and a 70% probability that this species will be extinct within 300 years (by 2308).

Dependence on Waters of the United States

Pacific salmon and eulachon are an important prey species for Cook Inlet beluga whales (Calkins 1989). Pacific salmon are an especially important prey item as these whales build their lipid body stores essential to their winter survival (Abookire and Piatt 2005, Litzow et al. 2006). To the degree that activities authorized by Nationwide Permits in southcentral Alaska (including the cities of Anchorage, Eagle River, Palmer, and Wasilla) and on Alaska's Kenai Peninsula affect salmon populations, those activities would also affect the forage base on Cook Inlet beluga.

In addition, activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), NWP 15 (Coast Guard approved bridges, such as the Knik Arm bridge proposed for construction in Cook Inlet), and NWP B (water-based energy generation pilot projects) overlap with

the distribution of Cook Inlet beluga whales.

Critical Habitat

On April 11, 2011 NMFS designated critical habitat for the Cook Inlet beluga whale 76 FR 20180. Two specific areas are designated comprising 7,800 square kilometers of marine habitat. Area one encompasses all marine waters of Cook Inlet north of a line from the mouth of Threemile Creek (61°08.5' N., 151°04.4' W.) connecting to Point Possession (61°02.1' N., 150°24.3' W.), including waters of the Susitna River south of 61°20.0' N., the Little Susitna River south of 61°18.0' N. and the Chickaloon River north of 60°53.0' N. (2) Area two encompasses all marine waters of Cook Inlet south of a line from the mouth of Threemile Creek (61°08.5' N., 151°04.4' W.) to Point Possession (61°02.1' N., 150°24.3' W.) and north of 60°15.0' N., including waters within two nautical miles seaward of the mean high water boundary along the western shoreline of Cook Inlet between 60°15.0' N. and the mouth of the Douglas River (59°04.0' N., 153°46.0' W.); all waters of Kachemak Bay east of 151°40.0' W.; and waters of the Kenai River below the Warren Ames bridge at Kenai, Alaska.

Area 1 has the highest concentration of beluga whales in the spring through fall as well as the greatest potential for adverse impact from anthropogenic threats. It contains many rivers with large eulachon and salmon runs, including two rivers in Turnagain Arm (Twenty-mile River and Placer River) which are visited by beluga whales in the early spring. Use declines in the summer and increases again in August through the fall, coinciding with Coho salmon returns. Also included in Area 1 are Knik Arm and the Susitna delta. Area 2 is located south of Area 1 and is used by Cook Inlet beluga whales for fall and winter feeding and as transit waters.

The primary constituent elements essential to the conservation of Cook Inlet beluga whales are: (1) intertidal and subtidal waters of Cook Inlet with depths <30 ft. (mean lower low water) and within 5 miles of high and medium flow accumulation anadromous fish streams; (2) primary prey species consisting of four species of Pacific salmon (Chinook, Coho, sockeye and chum salmon), Pacific eulachon, Pacific cod, walleye pollock, saffron cod and yellowfin sole; (3) waters free of toxins or other harmful agents; (4) Unrestricted passage within or between the critical habitat areas, and; (5) an absence of in-water noise levels that result in the abandonment of habitat by Cook Inlet beluga whales.

3.3.2 Fur seal, Guadalupe

Distribution

Guadalupe fur seals are found on Guadalupe Island (Mexico) in the eastern Pacific Ocean off Mexico; a few individuals have been known to range as far north as Sonoma County, California, south to Los Islotes Islands in Baja California, Mexico. A few Guadalupe fur seals occupy California sea lion rookeries in the Channel Islands of California (Stewart *et al.* 1987 in Reeves *et al.* 1992). Guadalupe fur seals exist as a single population from one breeding colony at Isla Guadalupe, Mexico.

Status

Guadalupe fur seals were listed as threatened under the Endangered Species Preservation Act of 1966 on March 11, 1967. This listing was extended in 1973 under the Endangered Species Act of 1973. In the U.S., Guadalupe fur seals (*Arctocephalus townsendi*) were listed as threatened under the ESA in 1985. The State of California lists the

Guadalupe fur seal as a fully protected mammal in the Fish and Game Code of California (Chapter 8, Section 4700, d), and it is also listed as a threatened species in the California Fish and Game Commission Code of Regulations (Title 14, Section 670.5, b, 6, H). The Guadalupe fur seal is also protected under CITES and is fully protected under Mexican law.

Guadalupe Island was declared a pinniped sanctuary by the Mexican government in 1975. Critical habitat has not been designated for this species in the U.S.

By 1897, the Guadalupe fur seal was believed to be extinct. None was seen until a fisherman found slightly more than two dozen at Guadalupe Island in 1926. Counts of Guadalupe fur seals have been made sporadically since 1954. A few of these counts were made during the breeding season, but the majority was made at other times of the year. Documented seal counts in the literature generally provide only the total of all Guadalupe fur seals counted (*i.e.*, the counts are not separated by age/sex class). The counts made during the breeding season, when the maximum number of animals occur on the rookery, were used to examine population growth. The natural logarithm of the counts was regressed against a year to calculate the growth rate of the population. These data indicate that the population of Guadalupe fur seals is increasing exponentially at an average annual growth rate of 13.7 percent. Sub-sampling of the rookery indicate that only 47-55 percent of the seals present (*i.e.*, hauled out) were counted during the census (Gallo 1994). The minimum size of the population in Mexico can be estimated as the actual count of 3,028 hauled out seals [The actual count data were not reported by Gallo (1994); this number was derived by multiplying the estimated number hauled out by 47 percent, the minimum estimate of the percent counted] (Carretta *et al.* 2006). In the United States, a few Guadalupe fur seals are known to inhabit California sea lion rookeries in the Channel Islands (Stewart *et al.* 1997).

Strandings of Guadalupe fur seals have occurred along the central and northern California coast, suggesting that the seal may be expanding its range (Hanni *et al.* 1997). The severe reduction of the Guadalupe fur seals has evidently had a less substantial effect on its gene pool, when compared to other similarly depleted pinniped species, as relatively high levels of genetic variability have been reported (Reeves *et al.* 2002).

Dependence on Waters of the United States

Guadalupe fur seals are found on Guadalupe Island (Mexico) in the eastern Pacific Ocean off Mexico; a few individuals have been known to range as far north as Sonoma County, California, south to Los Islotes Islands in Baja California, Mexico. A few Guadalupe fur seals occupy California sea lion rookeries in the Channel Islands of California (Stewart *et al.* 1987 in Reeves *et al.* 1992).

Guadalupe fur seals are shallow divers that forage in the upper 20 to 30 meters of the water column. They have mean dive depths of about 17 meters (for lactating females), with modal depths of 3.1 meters (Gallo-Reynoso 1994). Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), and NWP B (water-based energy generation pilot projects) overlap with the distribution of Guadalupe fur seals.

3.3.3 Killer whale, Southern Resident

Distribution

Southern Resident killer whales occur in the inland waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait during the spring, summer, and fall although they will seasonally migrate to coastal waters as far north as Queen Charlotte Islands and Vancouver Island in Canada and Washington, Oregon, and California.

Status

Southern resident killer whales were listed as endangered on November 18, 2005, because of the demographic consequences of whales that had been captured for aquarium display, killed to reduce their level of predation on fish species and because overfishing has depleted their prey base, the water quality of Puget Sound has been degraded, and individuals are killed in collisions with ships (70 *Federal Register* 69903). These whales also appear to be threatened by noise from industrial sources and military activities, entanglement in fishing gear, and disturbance associated with whale-watching vessels.

Critical habitat was designated for this species on November 29, 2006 (71 *Federal Register* 69054) and encompasses three specific areas in Puget Sound: (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca. The designated area encompasses about 2,560 square miles (6,630 sq km) of marine habitat.

Dependence on Waters of the United States

These fish-eating killer whales depend on populations of salmon as their primary prey. To the degree that activities authorized by Nationwide Permits in Puget Sound and Georgia Basin affect the distribution and abundance of salmon populations in the region, those activities would also affect the forage base on Southern resident killer whales.

In addition, activities that would be authorized by NWP 3 (maintenance), NWP 10 (mooring buoys), NWP 14 (linear transportation projects), NWP 15 (Coast Guard approved bridges), and NWP B (water-based energy generation pilot projects) overlap with the distribution of Southern resident killer whales.

Critical Habitat

Critical habitat that has been designated for southern resident killer whales includes the summer core area in Haro Strait and waters around the San Juan Islands, the Puget Sound area, and the Strait of Juan de Fuca, which together comprise about 2,560 square miles of marine and coastal habitat (71 FR 69054). The designated critical habitat includes three specific marine areas of Puget Sound in Clallam, Jefferson, King, Kitsap, Island, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom Counties in the State of Washington. The critical habitat designation includes all waters relative to a contiguous shoreline delimited by the line at a depth of 20 feet (6.1 m) relative to extreme high water in (see 50 CFR 226.206 for complete latitude and longitude references to all points contained in the following narratives):

1. the summer core areas, which includes all U.S. marine waters in Whatcom and San Juan counties; and all marine waters in Skagit County west and north of the Deception Pass Bridge (Highway 20);

2. Puget Sound, which includes (a) all marine waters in Island County east and south of the Deception Pass Bridge (Highway 20) and east of a line connecting the Point Wilson Lighthouse and a point on Whidbey Island located at 48°12'30"N. latitude and 122°44'26"W. longitude; (b) all marine waters in Skagit County east of the Deception Pass Bridge (Highway 20); (c) all marine waters of Jefferson County east of a line connecting the Point Wilson Lighthouse and a point on Whidbey Island located at latitude 48°12'33"N. latitude and 122°44'26"W. longitude, and north of the Hood Canal Bridge (Highway 104); (d) all marine waters in eastern Kitsap County east of the Hood Canal Bridge (Highway 104); (e) all marine waters (excluding Hood Canal) in Mason County; and (f) all marine waters in King, Pierce, Snohomish, and Thurston counties
3. Strait of Juan de Fuca Area: All U.S. marine waters in Clallam County east of a line connecting Cape Flattery, Washington, Tatoosh Island, Washington, and Bonilla Point, British Columbia; all marine waters in Jefferson and Island counties west of the Deception Pass Bridge (Highway 20), and west of a line connecting the Point Wilson Lighthouse and a point on Whidbey Island located at 48°12'30"N. latitude and 122°44'26"W. longitude.

Critical habitat that has been designated for southern resident killer whales does not include waters offshore of the Washington coast, Hood Canal or Dabob Bay, the Keyport Range Complex, Sinclair Inlet (near Bremerton), Ostrich Bay and Oyster Bay, portions of Whidbey Island and Navy Operating Area 3 (north and west of Whidbey Island).

3.3.4 Monk seal, Hawai'ian

Distribution

The Hawaiian monk seal is found primarily on the Leeward Chain of the Hawaiian Islands, especially Nihoa, Necker, French Frigate Shoals, Pearl and Hermes Reef, Kure Atoll, Laysan, and Lisianski. Sightings on the main Hawaiian Islands have become more common in the past 15 years and a birth was recorded on Kauai and Oahu in 1988 and 1991 respectively (Kenyon 1981, Riedmann 1990). Midway was an important breeding rookery, but is no longer used (Reeves *et al.* 1992). Hawaiian monk seals breed primarily at Laysan Island, Lisianski Island, and Pearl and Hermes Reefs (Tomich 1986). Monk seals are increasingly sighted in the main Hawaiian Islands. Monk seals have been reported on at least three occasions at Johnston Island over the past 30 years (not counting nine adult males that were translocated there from Laysan Island in 1984).

POPULATION STRUCTURE. Hawaiian monk seal appear to exist as a single population that occurs in the Northwest Hawai'ian Islands and Main Hawai'ian Islands. However, groups of individuals that occupy specific islands or atolls in the Hawai'ian Archipelago are treated as sub-populations for the purposes of research and management activity.

Pearl and Hermes Reef, the Midway Islands, and Kure Atoll form the three westernmost sub-populations of Hawaiian monk seals. There is a higher degree of migration among these sub-populations than among the sub-populations that occupy Laysan, Lisianski and French Frigate Shoals, which are more isolated. As a result, population growth in the westernmost sub-populations can be influenced more by immigration than by intrinsic growth. Several recent cohorts (groups of individuals born in the same year) at all three sites indicate that survival of juveniles has declined.

Status

Hawaiian monk seals were listed as endangered under the Endangered Species Act of 1973 on November 23, 1976 (41 FR 51611). A 5-year status review completed in 2007 recommended retaining monk seals as an endangered species (72 FR 46966, August 22, 2007). Critical habitat was originally designated for Hawai'ian monk seals on April 30, 1986 (51 FR 16047), and was extended on May 26, 1988 (53 FR 18988; CFR 226.201).

Monk seals are considered one of the most endangered groups of pinnipeds on the planet because all of their populations are either extinct (for example, the Caribbean monk seal) or near exist at numbers that are precariously close to extinction (Mediterranean and Hawai'ian monk seals).

Two periods of anthropogenic decline have been reported for Hawaiian monk seals. The first decline occurred in the 1800s when sealers, crews of wrecked vessels, and guano and feather hunters nearly hunted the population to extinction (Dill and Bryan 1912, Kenyon and Rice 1959). Following the collapse of this population, expeditions to the Northwest Hawai'ian Islands reported increasing numbers of seals (Bailey 1952). A survey in 1958 suggested that the population had partially recovered from its initial collapse. The population of Hawai'ian monk seals was believed to number slightly more than 1,000 seals at the end of this period (Rice 1960).

A second decline occurred from the late 1950s to the mid-1970s. Consistent declines in the monk seal population trends have been recorded since surveys commenced in the late 1950s. Counts of Hawaiian monk seals made since the late 1950s and 1980s at the atolls, islands, and reefs where they haul out on the northwest Hawaiian Islands showed a 50% population decline (NMFS 1991). The total population for the five major breeding locations plus Necker Island for 1987 was estimated to be 1,718 seals including 202 pups of the year (Gilmartin 1988). This compares with 1,488 animals estimated for 1983 (Gerrodette 1985). In 1992 the Hawaiian monk seal population was estimated to be 1580 (standard error = 147) (Ragen 1993). The best estimate of total abundance for 1993 was 1,406 (standard error = 131, assuming a constant coefficient of variation). Thus, between 1958 and 1993, mean beach counts declined by 60 percent. For the years 1985 to 1993 the mean beach counts declined by approximately 5 percent per year. This downward trend is expected to continue, mainly due to poor pup and juvenile survival in recent years. NMFS (2000) estimates the current monk seal population to be between 1,300 and 1,400 individuals. Data collected at five major haulouts recorded a 23 percent decline in the number of births in 1990 from the average annual levels recorded between 1983 and 1989 (NMFS 1991).

Regardless of which of these estimates, if any, most closely correspond to the actual size and trend of Hawai'ian monk seals, the evidence available suggest that these monk seals exist as a "small" population (that is, they experience phenomena such as demographic stochasticity, inbreeding depression, Allee effects, among others, that cause their population size to become a threat in and of itself). For example, Hawai'ian monk seals have very low survival of juveniles and sub-adults due to starvation (which is believed to be caused by limitations in the food base), low juvenile survival has lead to low juvenile recruitment into the adult population, and the adult population increasingly consists of ageing females who reproductive success is expected to decline (if it has not already declined) in the foreseeable future. A positive feedback loop between reduced reproductive success of adult females and reduced recruitment into the adult population (which reduces the number of adult females) is the kind of demographic pattern that is likely to increase the monk seal's decline toward extinction. As a result, we assume that

Hawai'ian monk seals have elevated extinction probabilities because of exogenous threats caused by anthropogenic activities (primarily whaling, entanglement, and ship strikes), natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to changing climate), and endogenous threats caused by the small size of their population.

Dependence on Waters of the United States

Hawai'ian monk seals occur on the beaches, coastal, and nearshore waters of the Hawai'ian archipelago. Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 3 (maintenance), NWP 10 (mooring buoys), NWP 14 (linear transportation projects), NWP 15 (Coast Guard approved bridges), and NWP B (water-based energy generation pilot projects) overlap with the distribution of Hawai'ian monk seals.

3.3.5 Sea Lion, Steller – eastern population

Distribution

Steller sea lions are distributed around the rim of the North Pacific Ocean from the Channel Islands off Southern California to northern Hokkaido, Japan. In the Bering Sea, the northernmost major rookery is on Walrus Island in the Pribilof Island group. The northernmost major haulout is on Hall Island off the northwestern tip of St. Matthew Island. Their distribution also extends northward from the western end of the Aleutian chain to sites along the eastern shore of the Kamchatka Peninsula. Their distribution is probably centered in the Gulf of Alaska and the Aleutian Islands (NMFS 1992).

Eastern Steller sea lions are distributed from California to Alaska and the population includes all rookeries east of Cape Suckling, Alaska south to Año Nuevo Island, which is the southernmost extant rookery. After the breeding season, adult male Steller sea lions disperse widely. Outside of the period from May through August, males that breed in California move north after the breeding season and are rarely seen in California or Oregon (Mate 1973).

Status

Steller sea lions were listed as threatened under the Endangered Species Act on November 26, 1990 (55 FR 49204). These sea lions were listed after the U.S. population declined by about 64 percent over three decades. In 1997, the species was split into two separate populations based on demographic and genetic differences (Bickham *et al.* 1996, Loughlin 1997), the western population was reclassified as endangered while the eastern population remained threatened (62 FR 30772). Critical habitat for both of these species was designated on August 27, 1993 (58 FR 45269).

Numbers of Steller sea lions declined dramatically throughout much of the species' range, beginning in the mid- to late 1970s (Braham *et al.* 1980, Merrick *et al.* 1987, NMFS 1992, NMFS 1995). For two decades prior to the decline, the estimated total population was 250,000 to 300,000 animals (Kenyon and Rice 1961, Loughlin *et al.* 1984). The population estimate declined by 50-60 percent to about 116,000 animals by 1989 (NMFS 1992), and by an additional 15 percent by 1994.

The decline has generally been restricted to the western population of Steller sea lions which had declined by about 5 percent per year during the 1990s. Counts for this population have fallen from 109,880 animals in the late 1970s to

22,167 animals in 1996, a decline of 80% (NMFS 1995). Over the same time interval, the eastern population has remained stable or increased by several percent per year, in Southeast Alaska (Sease and Loughlin 1999), in British Columbia, Canada (P. Olesiuk, Department of Fisheries and Oceans, unpublished data), and in Oregon (R. Brown, Oregon Department of Fish and Wildlife, unpublished data). Counts in Russian territories have also declined and are currently estimated to be about one-third of historic levels (NMFS 1992).

Dependence on Waters of the United States

Steller sea lions occur on the beaches, coastal, and nearshore waters of the eastern Pacific Ocean, from Alaska south to northern California. Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 3 (maintenance), NWP 10 (mooring buoys), NWP 14 (linear transportation projects), NWP 15 (Coast Guard approved bridges), and NWP B (water-based energy generation pilot projects) overlap with the distribution of this population of Steller sea lions.

Critical Habitat For The Eastern Population Of Steller Sea Lions

Critical habitat that has been designated for the eastern population of Steller sea lions includes an air zone that extends 3,000 feet (0.9 km) above areas historically occupied by sea lions at each major rookery in California and Oregon, measured vertically from sea level. Critical habitat includes an aquatic zone that extends 3,000 feet (0.9 km) seaward in State and Federally managed waters from the baseline or basepoint of each major rookery in California and Oregon.

In Oregon, the Steller sea lion rookeries included in the critical habitat designation are Pyramid Rock on Rogue Reef (42 26.4N latitude, 124 28.1W. longitude) and Long Brown Rock (42 47.3N. latitude, 124 36.2W. longitude) and Seal Rock (42 47.1N latitude 124 35.4W. longitude) on Orford Reef. In California, the Steller sea lion rookeries included in the critical habitat designation are Ano Nuevo Island (37 06.3N latitude, 122 20.3W. longitude), southeast Farallon Island (37 41.3N latitude, 123 00.1W. longitude), and Sugarloaf Island.- Cape Mendocino (40 26.0N latitude, 124 24.0W. longitude). Critical habitat for the eastern population of Steller sea lions has not been designated in the State of Washington.

3.3.5 Sea Lion, Steller – western population

Distribution

Steller sea lions are distributed around the rim of the North Pacific Ocean from the Channel Islands off Southern California to northern Hokkaido, Japan. In the Bering Sea, the northernmost major rookery is on Walrus Island in the Pribilof Island group. The northernmost major haulout is on Hall Island off the northwestern tip of St. Matthew Island. Their distribution also extends northward from the western end of the Aleutian chain to sites along the eastern shore of the Kamchatka Peninsula. Their distribution is probably centered in the Gulf of Alaska and the Aleutian Islands (NMFS 1992).

The Western population of Steller sea lions occurs in the central and western Gulf of Alaska, Aleutian Islands, as well as those that inhabit the coastal waters and breed in Asia (e.g., Japan and Russia).

Status

Steller sea lions were listed as threatened under the Endangered Species Act of 1973 on November 26, 1990 (55 FR 49204). The listing followed a decline in the U.S. population of about 64% over the three decades prior to the listing. In 1997, the species was split into two separate populations based on demographic and genetic differences (Bickham *et al.* 1996, Loughlin 1997), the western population was reclassified to endangered while the eastern population remained threatened (62 FR 30772). Critical habitat for this species was designated on August 27, 1993 (58 FR 45269).

Numbers of Steller sea lions declined dramatically throughout much of the species' range, beginning in the mid- to late 1970s (Braham *et al.* 1980, Merrick *et al.* 1987, NMFS 1992, NMFS 1995). For two decades prior to the decline, the estimated total population was 250,000 to 300,000 animals (Kenyon and Rice 1961, Loughlin *et al.* 1984). The population estimate declined by 50-60% to about 116,000 animals by 1989 (NMFS 1992), and by an additional 15% by 1994.

The decline has generally been restricted to the western population of Steller sea lions which had declined by about 5% per year during the 1990s. Counts for this population have fallen from 109,880 animals in the late 1970s to 22,167 animals in 1996, a decline of 80% (NMFS 1995). Over the same time interval, the eastern population has remained stable or increased by several percent per year, in Southeast Alaska (Sease and Loughlin 1999), in British Columbia, Canada (P. Olesiuk, Department of Fisheries and Oceans, unpublished data), and in Oregon (R. Brown, Oregon Department of Fish and Wildlife, unpublished data). Counts in Russian territories have also declined and are currently estimated to be about one-third of historic levels (NMFS 1992).

Population viability analyses have been conducted by Merrick and York (1994) and York *et al.* (1996). The results of these analyses indicate that the next 20 years may be crucial for the western population of Steller sea lions, if the rates of decline observed in 1985 to 1989 or 1994 continue. Within two decades, it is possible that the number of adult females in the Kenai-to-Kiska region could drop to less than 5,000. Once the western population of Steller sea lions crosses this threshold, the small population size, by itself, could accelerate the population's decline to extinction. Extinction rates for rookeries or clusters of rookeries could increase sharply in 40 to 50 years and Steller sea lions could become extinct throughout the entire Kenai-to-Kiska region in the next 100-120 years.

Holmes and York (2003) extended earlier analyses of central Gulf of Alaska sea lions through the late 1990s. They reported a shift in the demographic causes of this population's decline during the 1990s: adult survivorship had reached its lowest point (20 percent below 1976 levels) while juvenile survivorship and fecundity remained relatively high. By the mid to late 1990s, adult continued to remain depressed, but was accompanied by reduced fecundity and a slight decline in juvenile survivorship to within 5 to 10 percent of 1976 levels. This reduced fecundity continues to affect this population and Holmes and York (2003) suggested that even a small reductions in adult and juvenile survivorship might cause the population to decline further.

Dependence on Waters of the United States

Steller sea lions occur on the beaches, coastal, and nearshore waters of the eastern Pacific Ocean, from the southern Bering Sea, Pribilof Islands, Aleutian Islands, Kodiak Island, southcentral Alaska, and Prince William Sound. Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 3

(maintenance), NWP 10 (mooring buoys), NWP 14 (linear transportation projects), NWP 15 (Coast Guard approved bridges), and NWP B (water-based energy generation pilot projects) overlap with the distribution of this population of Steller sea lions.

Critical Habitat

Critical habitat that has been designated for the western population of Steller sea lions includes an air zone that extends 3,000 feet (0.9 km) above areas historically occupied by sea lions at each major rookery in California and Oregon, measured vertically from sea level. Critical habitat includes an aquatic zone that extends 20 nm (37 km) seaward in State and Federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska that is west of 144° W longitude.

Critical habitat includes Alaskan rookeries, haulouts, and associated areas. In Alaska, all major Steller sea lion rookeries and major haulouts and associated terrestrial, air, and aquatic zones have been included in the critical habitat designation. Three special aquatic foraging areas in Alaska. Three special aquatic foraging areas in Alaska, including the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area.

- (1) Critical habitat includes the Shelikof Strait area in the Gulf of Alaska which . . . consists of the area between the Alaska Peninsula and Tugidak, Sitkinak, Aiaktulik, Kodiak, Raspberry, Afognak and Shuyak Islands (connected by the shortest lines): bounded on the west by a line connecting Cape Kumlik (56°38'N/157°26'W) and the southwestern tip of Tugidak Island (56°24'N/154°41'W) and bounded in the east by a line connecting Cape Douglas (58°51'N/153°15'W) and the northernmost tip of Shuyak Island (58°37'N/152°22'W).
- (2) Critical habitat includes the Bogoslof area in the Bering Sea shelf which . . . consists of the area between 170°00'W and 164°00'W, south of straight lines connecting 55°00'N/170°00'W and 55°00'N/168°00'W; 55°30'N/168°00'W and 55°30'N/166°00'W; 56°00'N/166°00'W and 56°00'N/164°00'W and north of the Aleutian Islands and straight lines between the islands connecting the following coordinates in the order listed:

52°49.2'N/169°40.4'W; 52°49.8'N/169°06.3'W; 53°23.8'N/167°50.1'W; 53°18.7'N/167°51.4'W;
53°59.0'N/166°17.2'W; 54°02.9'N/163°03.0'W; 54°07.7'N/165°40.6'W; 54°08.9'N/165°38.8'W;
54°11.9'N/165°23.3'W; 54°23.9'N/164°44.0'W
- (3) Critical habitat includes the Seguam Pass area which . . . consists of the area between 52°00'N and 53°00'N and between 173°30'W and 172°30'W.

3.3.6 Whale, blue

Distribution

Blue whales are found along the coastal shelves of North America and South America (Rice 1974; Donovan 1984; Clarke 1980) in the North Pacific Ocean. In the North Pacific Ocean, blue whales occur in summer foraging areas in the Chukchi Sea, the Sea of Okhotsk, around the Aleutian Islands, and the Gulf of Alaska; in the eastern Pacific, they occur south to California; in the western Pacific, they occur south to Japan. Blue whales in the eastern Pacific winter from California south; in the western Pacific, they winter from the Sea of Japan, the East China and Yellow

Seas, and the Philippine Sea (Gambell 1985).

In the western north Atlantic Ocean, blue whales are found from the Arctic to at least the mid-latitude waters of the North Atlantic (CeTAP 1982, Wenzel *et al.* 1988, Yochem and Leatherwood 1985, Gagnon and Clark 1993). Blue whales have been observed frequently off eastern Canada, particularly in waters off Newfoundland, during the winter. In the summer month, they have been observed in Davis Strait (Mansfield 1985), the Gulf of St. Lawrence (from the north shore of the St. Lawrence River estuary to the Strait of Belle Isle), and off eastern Nova Scotia (Sears *et al.* 1987). In the eastern north Atlantic Ocean, blue whales have been observed off the Azores Islands, although Reiner *et al.* (1993) do not consider them common in that area.

At least three subspecies of blue whales have been identified based on body size and geographic distribution (*B. musculus intermedia*, which occurs in the higher latitudes of the Southern Oceans, *B. m. musculus*, which occurs in the Northern Hemisphere, and *B. m. breviceuda* which occurs in the mid-latitude waters of the southern Indian Ocean and north of the Antarctic convergence), but this consultation will treat them as a single entity. Readers who are interested in these subspecies will find more information in Gilpatrick *et al.* (1997), Kato *et al.* (1995), Omura *et al.* (1970) and Ichihara (1966).

In addition to these subspecies, the International Whaling Commission's Scientific Committee has formally recognized one blue whale population in the North Pacific (Donovan 1991), although there is increasing evidence that more than there may be more than one blue whale population in the Pacific Ocean (Gilpatrick *et al.* 1997, Barlow *et al.* 1995, Mizroch *et al.* 1984a, Ohsumi and Wada 1974). For example, studies of the blue whales that winter off Baja California and in the Gulf of California suggest that these whales are morphologically distinct from blue whales of the western and central North Pacific (Gilpatrick *et al.* 1997), although these differences might result from differences in the productivity of their foraging areas more than genetic differences (the southern whales forage off California; Sears *et al.* 1987; Barlow *et al.* 1997; Calambokidis *et al.* 1990).

A population or "stock" of endangered blue whales occurs in waters surrounding the Hawaiian archipelago (from the main Hawaiian Islands west to at least Midway Island), although blue whales are rarely reported from Hawaiian waters. The only reliable report of this species in the central North Pacific was a sighting made from a scientific research vessel about 400 km northeast of Hawaii in January 1964 (NMFS 1998). However, acoustic monitoring has recorded blue whales off Oahu and the Midway Islands much more recently (Barlow *et al.* 1994, McDonald and Fox 1999, Northrop *et al.* 1971; Thompson and Friedl 1982).

The recordings made off Oahu showed bimodal peaks throughout the year, suggesting that the animals were migrating into the area during summer and winter (Thompson and Friedl 1982; McDonald and Fox 1999). Twelve aerial surveys were flown within 25 nm² of the main Hawaiian Islands from 1993-1998 and no blue whales were sighted. Nevertheless, blue whale vocalizations that have been recorded in these waters suggest that the occurrence of blue whales in these waters may be higher than blue whale sightings. There are no reports of blue whales strandings in Hawaiian waters.

The International Whaling Commission also groups all of the blue whales in the North Atlantic Ocean into one "stock" and groups blue whales in the Southern Hemisphere into six "stocks" (Donovan 1991), which are presumed

to follow the feeding distribution of the whales.

Status

Blue whales were listed as endangered under the ESA in 1973. Blue whales are listed as endangered on the IUCN Red List of Threatened Animals (Baillie and Groombridge 1996). They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the MMPA. Critical habitat has not been designated for blue whales.

It is difficult to assess the current status of blue whales because (1) there is no general agreement on the size of the blue whale population prior to whaling and (2) estimates of the current size of the different blue whale populations vary widely. We may never know the size of the blue whale population prior to whaling, although some authors have concluded that their population consisted of about 200,000 animals before whaling. Similarly, estimates of the global abundance of blue whales are uncertain. Since the cessation of whaling, the global population of blue whales has been estimated to range from 11,200 to 13,000 animals (Maser *et al.* 1981; U. S. Department of Commerce 1983). These estimates, however, are more than 20 years old.

A lot of uncertainty surrounds estimates of blue whale abundance in the North Pacific Ocean. Barlow (1994) estimated the North Pacific population of blue whales at between 1,400 and 1,900. Barlow and Calambokidis (1995) estimated the abundance of blue whales off California at 2,200 individuals. Wade and Gerrodette (1993) and Barlow *et al.* (1997) estimated there were a minimum of 3,300 blue whales in the North Pacific Ocean in the 1990s.

The size of the blue whale population in the north Atlantic is also uncertain. The population has been estimated to number from a few hundred individuals (Allen 1970; Mitchell 1974) to 1,000 to 2,000 individuals (Sigurjónsson 1995). Gambell (1976) estimated there were between 1,100 and 1,500 blue whales in the North Atlantic before whaling began and Braham (1991) estimated there were between 100 and 555 blue whales in the North Atlantic during the late 1980s and early 1990s. Sears *et al.* (1987) identified over 300 individual blue whales in the Gulf of St. Lawrence, which provides a minimum estimate for their population in the North Atlantic. Sigurjónsson and Gunnlaugson (1990) concluded that the blue whale population had been increasing since the late 1950s and argued that the blue whale population had increased at an annual rate of about 5 percent between 1979 and 1988, although the level of confidence we can place in these estimates is low.

Estimates of the number of blue whales in the Southern Hemisphere range from 5,000 to 6,000 (review by Yochem and Leatherwood 1985) with an average rate of increase that has been estimated at between 4 and 5 percent per year. Butterworth *et al.* (1993), however, estimated the Antarctic population at 710 individuals. More recently, Stern (2001) estimated the blue whale population in the Southern Ocean at between 400 and 1,400 animals (c.v. 0.4). The pygmy blue whale population has been estimated at 6,000 individuals (Yochem and Leatherwood 1985)

The information available on the status and trend of blue whales do not allow us to reach any conclusions about the extinction risks facing blue whales as a species, or particular populations of blue whales. With the limited data available on blue whales, we do not know whether these whales exist at population sizes large enough to avoid demographic phenomena that are known to increase the extinction probability of species that exist as “small” populations (that is, “small” populations experience phenomena such as demographic stochasticity, inbreeding

depression, Allee effects, among others, that cause their population size to become a threat in and of itself) or if blue whales might be threatened more by exogenous threats such as anthropogenic activities (primarily whaling, entanglement, and ship strikes) or natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to changing climate).

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation) and NWP 8 (offshore oil and gas activities) overlap with the distribution of blue whales.

3.3.7 Whale, bowhead

Distribution

Bowhead whales were historically found in all arctic waters of the northern hemisphere. The Bering Sea population, which is also known as the western Arctic or Bering-Chukchi-Beaufort population, has been studied more than any other bowhead whale population. This population winters in the central and western Bering Sea (November to April) and migrates north and east through the eastern Chukchi Sea to the Beaufort Sea along the coast of Alaska and northwestern Canada (Brueggeman 1982, Braham *et al.* 1984). From June through September, these bowhead whales remain on foraging grounds in the eastern Beaufort Sea before migrating back to their wintering grounds in the Bering Sea (Hazard and Cabbage 1982; Richardson *et al.* 1987).

Bowhead whales in the western North Atlantic are currently segregated into two populations: the Davis Strait population occupies the Davis Strait, Baffin Bay, and the Canadian Arctic Archipelago while the Hudson Bay population occupies Hudson Strait, Hudson Bay, and Foxe Basin (Moore and Reeves 1993).

The Spitsbergen bowhead whale population, which is also known as the Greenland whale, bowhead whales in the eastern North Atlantic have been observed in the waters north of Iceland and as far east as the Laptev Sea. Shelden and Rugh (1995) reported sightings along the coastline of Greenland, in the waters near Spitsbergen Island, off North Cape in northern Norway, in the waters of Zemlya Frantsa-Iosifa (Franz Josef Land), near Novaya Zemlya, and near Severnaya Zemlya.

POPULATION STRUCTURE. Bowhead whales are known to exist as five separate populations: (1) Sea of Okhotsk, which occurs in the north Pacific Ocean off the western coast of Siberia near the Kamchatka Peninsula; (2) Bering Sea; (3) Hudson Bay; (4) Davis Strait, which is found in Davis Strait, Baffin Bay, and along the Canadian Arctic Archipelago; and (5) Spitsbergen, which is found in the North Atlantic Ocean east of Greenland in the Greenland, Kara, and Barents Seas (IWC 1992). A separate Bering Sea population may have become extinct as a result of whaling activities, except for the component that migrated to the Beaufort Sea.

Status

Bowhead whales were listed as endangered species on June 2, 1970 (35 FR 8495). Bowhead whales received further protection under the Convention on International Trade in Endangered Species of wild flora and fauna. Critical habitat has not been designated for bowhead whales.

Before exploitation, the Sea of Okhotsk population may have numbered between 3,000 and 6,500 animals (Shelden and Rugh 1995); it is now estimated to number between 300 and 400 animals (although these population estimates are not reliable). Individuals from this population may have mixed with individuals from the Bering Sea population, although the available evidence indicates the two stocks are essentially separate (Moore and Reeves 1993).

The Bering Sea population of bowhead whales declined from an estimated population of 10,400 to 23,000 animals (Woodby and Botkin 1993); by 1910, this population had been reduced to a few thousand individuals. From 1978 to 1983, this population was estimated to have numbered between 3,500 to 5,300 animals based on shore-based visual surveys (Zeh *et al.* 1993). The IWC Scientific Committee now recognizes the current population estimate to be 7,992 whales (95% C.I.: 6,900-9,200) (IWC 1995). A refined and larger sample of acoustic data from 1993 has resulted in an estimate of 8,200 animals, and is considered a better estimate for this population (IWC 1996).

The Spitsbergen population was reduced from 24,000 to a few “tens” of whales and has not recovered in the past 80 years. The Davis Strait and Hudson Bay populations declined from about 12,300 whales to less than 450, although significant whaling has not occurred in 80 years. There are no reliable estimates of the size of the Hudson Bay population of bowhead whales, although Mitchell (1977) conservatively estimates it at 100 or less. More recently, this population has been estimated to number from 256 to 284 whales within Foxe Basin (Cosens *et al.* 1997).

The Davis Strait population is separated from the Bering Sea population by the heavy ice found across the Northwest passage (Moore and Reeves 1993). The population was estimated to have originally numbered over 11,700 (Woodby and Botkin 1993) but was significantly reduced by commercial whaling between 1719 and 1915. The Davis Strait population is currently estimated to be 350 animals (Zeh *et al.* 1993) and recovery is described as “at best, exceedingly slow” (Davis and Koski 1980). Canadian Inuit have expressed an interest in resuming subsistence hunting of bowhead whales in Davis Strait, although the International Whaling Commission has not acted on this request.

The Spitsbergen population of bowhead whales was believed to have been the most numerous of the bowhead whale populations: before they were hunted by whalers, they are estimated to have numbered about 24,000 animals (Woodby and Botkin 1993). Between 1940 and September 1990, 37 bowhead whale sightings have been reported from this region (Moore and Reeves 1993). With a population size numbering in the tens of animals, the Spitsbergen population of bowhead whales is now critically endangered (Shelden and Rugh 1995).

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation) and NWP 8 (offshore oil and gas activities) overlap with the distribution of bowhead whales.

3.3.8 Whale, fin

Distribution

Fin whales are distributed widely in every ocean except the Arctic Ocean. In the North Pacific Ocean, fin whales occur in summer foraging areas in the Chukchi Sea, the Sea of Okhotsk, around the Aleutian Islands, and the Gulf of Alaska; in the eastern Pacific, they occur south to California; in the western Pacific, they occur south to Japan. Fin

whales in the eastern Pacific winter from California south; in the western Pacific, they winter from the Sea of Japan, the East China and Yellow Seas, and the Philippine Sea (Gambell 1985).

In the North Atlantic Ocean, fin whales occur in summer foraging areas from the coast of North America to the Arctic, around Greenland, Iceland, northern Norway, Jan Meyers, Spitzbergen, and the Barents Sea. In the western Atlantic, they winter from the edge of sea ice south to the Gulf of Mexico and the West Indies. In the eastern Atlantic, they winter from southern Norway, the Bay of Biscay, and Spain with some whales migrating into the Mediterranean Sea (Gambell 1985).

Fin whales are common off the Atlantic coast of the United States in waters immediately off the coast seaward to the continental shelf (about the 1,000-fathom contour). In this region, they tend to occur north of Cape Hatteras where they accounted for about 46 percent of the large whales observed in surveys conducted between 1978 and 1982. During the summer months, fin whales in this region tend to congregate in feeding areas between 41°20'N and 51°00'N, from shore seaward to the 1,000-fathom contour.

In the Atlantic Ocean, Clark (1995) reported a general southward pattern of fin whale migration in the fall from the Labrador and Newfoundland region, south past Bermuda, and into the West Indies. The overall distribution may be based on prey availability, and fin whales are found throughout the action area for this consultation in most months of the year. This species preys opportunistically on both invertebrates and fish (Watkins *et al.* 1984). They feed by filtering large volumes of water for the associated prey. Fin whales are larger and faster than humpback and right whales and are less concentrated in nearshore environments.

In the North Atlantic Ocean, the International Whaling Commission recognizes seven management units or “stocks” of fin whales: (1) Nova Scotia, (2) Newfoundland-Labrador, (3) West Greenland, (4) East Greenland-Iceland, (5) North Norway, (6) West Norway-Faroe Islands, and (7) British Isles-Spain-Portugal. In addition, the population of fin whales that resides in the Ligurian Sea, in the northwestern Mediterranean Sea is believed to be genetically distinct from other fin whales populations (as used in this Opinion, “populations” are isolated demographically, meaning, they are driven more by internal dynamics — birth and death processes — than by the geographic redistribution of individuals through immigration or emigration. Some usages of the term “stock” are synonymous with this definition of “population” while other usages of “stock” do not).

In the North Pacific Ocean, the International Whaling Commission recognizes two “stocks”: (1) East China Sea and (2) rest of the North Pacific (Donovan, 1991). However, Mizroch *et al.* (1984) concluded that there were five possible “stocks” of fin whales within the North Pacific based on histological analyses and tagging experiments: (1) East and West Pacific that intermingle around the Aleutian Islands; (2) East China Sea; (3) British Columbia; (4) Southern-Central California to Gulf of Alaska; and (5) Gulf of California. Based on genetic analyses, Berube *et al.* (1998) concluded that fin whales in the Sea of Cortez represent an isolated population that has very little genetic exchange with other populations in the North Pacific Ocean (although the geographic distribution of this population and other populations can overlap seasonally). They also concluded that fin whales in the Gulf of St. Lawrence and Gulf of Maine are distinct from fin whales found off Spain and in the Mediterranean Sea.

Regardless of how different authors structure the fin whale population, mark-recapture studies have demonstrate that

individual fin whales migrate between management units (Mitchell 1974; Gunnlaugsson and Sigurjónsson 1989), which suggests that these management units are not geographically isolated populations.

The recovery plan that has been drafted for fin whales treats the fin whales that occur off the Atlantic Coast of the U.S. as a single population that overlaps with the population the International Whaling Commission's Nova Scotia management unit (NMFS 2007). Individuals from this "population" of fin whales occur in the action area for this consultation.

Status

Fin whales were listed as endangered under the ESA in 1970. In 1976, the IWC protected fin whales from commercial whaling (Allen 1980). Fin whales are listed as endangered on the IUCN Red List of Threatened Animals (Baillie and Groombridge 1996). They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the MMPA. Critical habitat has not been designated for fin whales.

It is difficult to assess the current status of fin whales because (1) there is no general agreement on the size of the fin whale population prior to whaling and (2) estimates of the current size of the different fin whale populations vary widely. We may never know the size of the fin whale population prior to whaling. Chapman (1976) estimated the "original" population size of fin whales off Nova Scotia as 1,200 and 2,400 off Newfoundland, although he offered no explanation or reasoning to support that estimate. Sergeant (1977) suggested that between 30,000 and 50,000 fin whales once populated the North Atlantic Ocean based on assumptions about catch levels during the whaling period. Sigurjónsson (1995) estimated that between 50,000 and 100,000 fin whales once populated the North Atlantic, although he provided no data or evidence to support that estimate. More recently, Palumbi and Roman (2006) estimated that about 360,000 fin whales (95% confidence interval = 249,000 - 481,000) populated the North Atlantic Ocean before whaling based on mutation rates and estimates of genetic diversity.

Similarly, estimates of the current size of the different fin whale populations and estimates of their global abundance also vary widely. The draft recovery plan for fin whales accepts a minimum population estimate of 2,362 fin whales for the North Atlantic Ocean (NMFS 2007); however, the recovery plan also states that this estimate, which is based on on shipboard and aerial surveys conducted in the Georges Bank and Gulf of St. Lawrence in 1999 is the "best" estimate of the size of this fin whale population (NMFS 2006, 2007). However, based on data produced by surveys conducted between 1978-1982 and other data gathered between 1966 and 1989, Hain *et al.* (1992) estimated that the population of fin whales in the western North Atlantic Ocean (specifically, between Cape Hatteras, North Carolina, and Nova Scotia) numbered about 1,500 whales in the winter and 5,000 whales in the spring and summer. Because authors do not always reconcile "new" estimates with earlier estimates, it is not clear whether the current "best" estimate represents a refinement of the estimate that was based on older data or whether the fin whale population in the North Atlantic has declined by about 50% since the early 1980s.

The East Greenland-Iceland fin whale population was estimated at 10,000 animals (95 % confidence interval = 7,600 - 14,200), based on surveys conducted in 1987 and 1989 (Buckland *et al.* 1992). The number of eastern Atlantic fin whales, which includes the British Isles-Spain-Portugal population, has been estimated at 17,000 animals (95% confidence interval = 10,400 -28,900; Buckland *et al.* 1992). These estimates are both more than 15 years old and the data available do not allow us to determine if they remain valid.

Forcada *et al.* (1996) estimated the fin whale population in the western Mediterranean numbered 3,583 individuals (standard error = 967; 95% confidence interval = 2,130-6,027). This is similar to a more recent estimate published by Notarbartolo-di-Sciara *et al.* (2003). Within the Ligurian Sea, which includes the Pelagos Sanctuary for Marine Mammals and the Gulf of Lions, the fin whale population was estimated to number 901 (standard error = 196.1) whales. (Forcada *et al.* 1995).

Regardless of which of these estimates, if any, have the closest correspondence to the actual size and trend of the fin whale population, all of these estimates suggest that the global population of fin whales consists of tens of thousands of individuals and that the North Atlantic population consists of at least 2,000 individuals. Based on ecological theory and demographic patterns derived from several hundred imperiled species and populations, fin whales appear to exist at population sizes that are large enough to avoid demographic phenomena that are known to increase the extinction probability of species that exist as “small” populations (that is, “small” populations experience phenomena such as demographic stochasticity, inbreeding depression, Allee effects, among others, that cause their population size to become a threat in and of itself). As a result, we assume that fin whales are likely to be threatened more by exogenous threats such as anthropogenic activities (primarily whaling, entanglement, and ship strikes) or natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to changing climate) than endogenous threats caused by the small size of their population.

Nevertheless, based on the evidence available, the number of fin whales that are recorded to have been killed or injured in the past 20 years by human activities or natural phenomena, does not appear to be increasing the extinction probability of fin whales, although it may slow the rate at which they recover from population declines that were caused by commercial whaling.

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), and NWP B (water-based energy generation pilot projects) overlap with the coastal distribution of fin whales.

3.3.9 Whale, humpback

Distribution

Humpback whales are a cosmopolitan species that occur in the Atlantic, Indian, Pacific, and Southern Oceans. Humpback whales migrate seasonally between warmer, tropical or sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate or sub-Arctic waters in summer months (where they feed). In their summer foraging areas and winter calving areas, humpback whales tend to occupy shallower, coastal waters; during their seasonal migrations, however, humpback whales disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

In the North Pacific Ocean, the summer range of humpback whales includes coastal and inland waters from Point Conception, California, north to the Gulf of Alaska and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk (Tomlin 1967, Nemoto 1957, Johnson and Wolman 1984 as cited

in NMFS 1991b). These whales migrate to Hawai'i, southern Japan, the Mariana Islands, and Mexico during the winter.

In the Atlantic Ocean, humpback whales range from the mid-Atlantic bight, the Gulf of Maine, across the southern coast of Greenland and Iceland, and along coast of Norway in the Barents Sea. These humpback whales migrate to the western coast of Africa and the Caribbean Sea during the winter.

In the Southern Ocean, humpback whales occur in waters off Antarctica. These whales migrate to the waters off Venezuela, Brazil, southern Africa, western and eastern Australia, New Zealand, and islands in the southwest Pacific during the austral winter. A separate population of humpback whales appears to reside in the Arabian Sea in the Indian Ocean off the coasts of Oman, Pakistan, and India (Mikhalev 1997).

POPULATION STRUCTURE. Descriptions of the population structure of humpback whales differ depending on whether an author focuses on where humpback whales winter or where they feed. During winter months in northern or southern hemispheres, adult humpback whales migrate to specific areas in warmer, tropical waters to reproduce and give birth to calves. During summer months, humpback whales migrate to specific areas in northern temperate or sub-arctic waters to forage. In summer months, humpback whales from different "reproductive areas" will congregate to feed; in the winter months, whales will migrate from different foraging areas to a single wintering area. In either case, humpback whales appear to form "open" populations; that is, populations that are connected through the movement of individual animals.

NORTH PACIFIC OCEAN. NMFS' Stock Assessment Reports recognize four "stocks" of humpback whales in the North Pacific Ocean, based on genetic and photo-identification studies: two Eastern North Pacific stocks, one Central North Pacific stock, and one Western Pacific stock (Hill and DeMaster 1998). The first two of these "stocks" are based on where these humpback whales winter: the central North Pacific "stock" winters in the waters around Hawai'i while the eastern North Pacific "stock" (also called the California-Oregon-Washington-Mexico stock) winters along coasts of Central America and Mexico. However, Calambokidis *et al.* (1997) identified humpback whales from Southeast Alaska (central North Pacific), the California-Oregon-Washington (eastern North Pacific), and Ogasawara Islands (Japan, Western Pacific) groups in the Hawai'ian Islands during the winter; humpback whales from the Kodiak Island, Southeast Alaska, and British Columbia groups in the Ogasawara Islands; and whales from the British Columbia, Southeast Alaska, Prince William Sound, and Shumagin-Aleutian Islands groups in Mexico.

A "population" of humpback whales winters in an area extending from the South China Sea east through the Philippines, Ryukyu Retto, Ogasawara Gunto, Mariana Islands, and Marshall Islands (Rice 1998). Based on whaling records, humpback whales wintering in this area have also occurred in the southern Marianas through the month of May (Eldredge 1991). There are several recent records of humpback whales in the Mariana Islands, at Guam, Rota, and Saipan during January through March (Darling and Mori 1993; Eldredge 1991, 2003; Taitano 1991). During the summer, whales from this population migrate to the Kuril Islands, Bering Sea, Aleutian Islands, Kodiak, Southeast Alaska, and British Columbia to feed (Angliss and Outlaw 2007, Calambokidis 1997, 2001).

NORTH ATLANTIC OCEAN. In the Atlantic Ocean, humpback whales aggregate in four feeding areas in the summer

months: (1) Gulf of Maine, eastern Canada, (2) west Greenland, (3) Iceland and (4) Norway (Katona and Beard 1990, Smith *et al.* 1999). The principal breeding range for these whales lies from the Antilles and northern Venezuela to Cuba (Winn *et al.* 1975, Balcomb and Nichols 1982, Whitehead and Moore 1982). The largest contemporary breeding aggregations occur off the Greater Antilles where humpback whales from all of the North Atlantic feeding areas have been identified from photographs (Katona and Beard 1990, Clapham *et al.* 1993b, Mattila *et al.* 1994, Palsbøll *et al.* 1997, Smith *et al.* 1999, Stevick *et al.* 2003a). Historically, an important breeding aggregation was located in the eastern Caribbean based on the important humpback whale fisheries this region supported (Mitchell and Reeves 1983, Reeves *et al.* 2001, Smith and Reeves 2003). Although sightings persist in those areas, modern humpback whale abundance appears to be low (Winn *et al.* 1975, Levenson and Leapley 1978, Swartz *et al.* 2003). Winter aggregations also occur at the Cape Verde Islands in the Eastern North Atlantic (Reiner *et al.* 1996, Reeves *et al.* 2002, Moore *et al.* 2003). In another example of the “open” structure of humpback whale populations, an individual humpback whale migrated from the Indian Ocean to the South Atlantic Ocean and demonstrated that individual whales may migrate from one ocean basin to another (Pomilla and Rosenbaum 2005).

Status

Humpback whales were listed as endangered under the ESA in 1973. Humpback whales are listed as endangered on the IUCN Red List of Threatened Animals (Baillie and Groombridge 1996). They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the MMPA. Critical habitat has not been designated for humpback whales.

It is difficult to assess the current status of humpback whales for the same reasons that it is difficult to assess the status of other whales we have discussed thus far: (1) there is no general agreement on the size of the humpback whale population prior to whaling and (2) estimates of the current size of the different humpback whale populations vary widely and produce estimates that are not always comparable to one another, although robust estimates of humpback whale populations in the western North Atlantic have been published. We may never know the size of the humpback whale population prior to whaling.

Winn and Reichley (1985) argued that the global population of humpback whales consisted of at least 150,000 whales in the early 1900s, with the largest population historically occurring in the Southern Ocean. Based on analyses of mutation rates and estimates of genetic diversity, Palumbi and Roman (2006) concluded that there may have been as many as 240,000 (95% confidence interval = 156,000 – 401,000) humpback whales in the North Atlantic before whaling began. In the western North Atlantic between Davis Strait, Iceland and the West Indies, Mitchell and Reeves (1983) estimated there were at least 4,685 humpback whales in 1865 based on available whaling records (although the authors note that this does not represent a “pre-exploitation estimate” because whalers from Greenland, the Gulf of St. Lawrence, New England, and the Caribbean Sea had been hunting humpback whales before 1865).

Estimates of the number of humpback whales occurring in the different populations that inhabit the Northern Pacific population have risen over time. In the 1980s, estimates ranged from 1,407 to 2,100 (Baker 1985; Darling and Morowitz 1986; Baker and Herman 1987), while recent estimates place the population size at about 6,000 whales (standard error = 474) in the North Pacific (Calambokidis *et al.* 1997; Cerchio 1998; Mobley *et al.* 1999). Based on

data collected between 1980 and 1983, Baker and Herman (1987) used a capture-recapture methodology to produce a population estimate of 1,407 whales (95% confidence interval = 1,113 - 1,701). More recently, (Calambokidis *et al.* 1997) relied on resightings estimated from photographic records of individuals to produce an estimate of 6,010 humpback whales occurred in the North Pacific Ocean. Because the estimates produced by the different methodologies are not directly comparable, it is not clear which of these estimates is more accurate or if the change from 1,407 to 6,000 individuals results from a real increase in the size of the humpback whale population, sampling bias in one or both studies, or assumptions in the methods used to produce estimates from the individuals that were sampled. Since the last of these estimates was published almost 12 years ago, we do not know if the estimates represent current population sizes.

Stevick *et al.* (2003) estimated the size of the North Atlantic humpback whale population between 1979 and 1993 by applying statistical analyses that are commonly used in capture-recapture studies to individual humpback whales that were identified based on natural markings. Between 1979 and 1993, they estimated that the North Atlantic populations (what they call the “West Indies breeding population”) consisted of between 5,930 and 12,580 individual whales. The best estimate they produced (11,570; 95% confidence interval = 10,290 -13,390) was based on samples from 1992 and 1993. If we assume that this population has grown according to the instantaneous rate of increase Stevick *et al.* (2003) estimated for this population ($r = 0.0311$), this would lead us to estimate that this population might consist of about 18,400 individual whales in 2007-2008.

As discussed previously, between 2004 and 2006, an international group of whale researchers coordinated their surveys to conduct a comprehensive assessment of the population structure, levels of abundance, and status of humpback whales in the North Pacific (Calambokidis *et al.* 2008). That effort identified a total of 7,971 unique individuals from photographs taken during close approaches. Of this total,, 4,516 individuals were identified at wintering regions in at least one of the three seasons in which the study surveyed wintering area and 4,328 individuals were identified at least once at feeding areas in one of the two years in which the study surveyed feeding areas. Based on the results of that effort, Calambokidis *et al.* (2008) estimated that the current population of humpback whales in the North Pacific Ocean consisted of about 18,300 whales, not counting calves. Almost half of the humpback whales that were estimated to occur in wintering areas, or about 8,000 humpback whales, occupy the Hawai’ian Islands during the winter months.

Regardless of which of these estimates, if any, most closely correspond to the actual size and trend of the humpback whale population, all of these estimates suggest that the global population of humpback whales consists of tens of thousands of individuals, that the North Atlantic population consists of at least 2,000 individuals and the North Pacific population consists of about 18,000 individuals. Based on ecological theory and demographic patterns derived from several hundred imperiled species and populations, humpback whales appear to exist at population sizes that are large enough to avoid demographic phenomena that are known to increase the extinction probability of species that exist as “small” populations (that is, “small” populations experience phenomena such as demographic stochasticity, inbreeding depression, Allee effects, among others, that cause their population size to become a threat in and of itself). As a result, we assume that humpback whales will have elevated extinction probabilities because of exogenous threats caused by anthropogenic activities (primarily whaling, entanglement, and ship strikes) and natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to

changing climate) rather than endogenous threats caused by the small size of their population.

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), and NWP B (water-based energy generation pilot projects) overlap with the distribution of coastal distribution of humpback whales.

3.3.10 Whale, right (North Atlantic)

Distribution

North Atlantic right whales are distributed seasonally from the Gulf of Mexico north to waters off Newfoundland and Labrador (on the western Atlantic) and from northern Africa and Spain north to waters north of Scotland and Ireland (the Shetland and Orkney Islands; on the eastern Atlantic coast).

In the western Atlantic Ocean, right whales generally occur in northwest Atlantic waters west of the Gulf Stream and are most commonly associated with cooler waters (21°C). North Atlantic right whales are most abundant in Cape Cod Bay between February and April (Hamilton and Mayo 1990 Schevill *et al.* 1986, Watkins and Schevill 1982), in the Great South Channel in May and June (Kenney *et al.* 1986, Payne *et al.* 1990), and off Georgia and Florida from mid-November through March (Slay *et al.* 1996). Right whales also frequent the Bay of Fundy, Browns and Baccaro Banks (in Canadian waters), Stellwagen Bank and Jeffrey's Ledge in the spring and summer months, and use mid-Atlantic waters as a migratory pathway between the winter calving grounds and their spring and summer nursery-feeding areas in the Gulf of Maine. North Atlantic right whales are not found in the Caribbean Sea and have been recorded only rarely in the Gulf of Mexico.

POPULATION STRUCTURE. NMFS recognizes two extant groups of right whales in the North Atlantic Ocean (*E. glacialis*): an eastern population and a western population. A third population may have existed in the central Atlantic (migrating from east of Greenland to the Azores or Bermuda), but appears to be extinct, if it existed as a distinct population at all (Perry *et al.* 1999).

The degree to which the two extant populations of North Atlantic right whales are connected through immigration or emigration is unknown, but the two populations have historically been treated as if they are isolated populations. Nevertheless, on 5 January 2009, a North Atlantic right whale that had been observed in the Bay of Fundy on 24 September 2008 was observed in the Azore Islands (38 22.698 N and 28 30.341W) which demonstrates that at least one right whale migrated across the Atlantic (L. Steiner, post on MarMam, 7 January 2009).

Status

Right whales (both *E. glacialis* and *E. australis*) were listed as endangered under the ESA in 1970. In April, 2008, NMFS divided right whales into three separate listings: Northern right whales (*E. glacialis*), North Pacific right whales (*E. japonica*), and Southern right whales (*E. australis*), all of which were listed as endangered. Since 1949, the northern right whale has been protected from commercial whaling by the International Whaling Commission. They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the MMPA. NMFS designated critical habitat for the North Atlantic population of right whales on 3 June 1994 (59

FR 28793).

The legacy effects of whaling appear to have had and continue to have greatest effect on endangered Northern Atlantic right whales by reducing them to a population size that is sufficiently small to experience “small population dynamics” (Caughley 1994, Lande 1993, Lande *et al.* 2003, Melbourne and Hastings 2008). Kraus *et al.* (2005) estimated that about 350 individual right whales, including about 70 mature females, occur in the western North Atlantic. Waring *et al.* (2008) reviewed the data from the recapture database and estimated that the right whale population in the western North Atlantic Ocean numbers about 325 whales.

At these population sizes, we would expect North Atlantic right whales to have higher probabilities of becoming extinct because of demographic stochasticity, demographic heterogeneity (Coulson *et al.* 2006, Fox *et al.* 2006) — including stochastic sex determination (Lande *et al.* 2003) — and the effects of phenomena interacting with environmental variability. Demographic stochasticity refers to the randomness in the birth or death of an individual in a population, which results in random variation on how many young that individuals produce during their lifetime and when they die. Demographic heterogeneity refers to variation in lifetime reproductive success of individuals in a population (generally, the number of reproductive adults an individual produces over their reproductive lifespan), such that the deaths of different individuals have different effects on the growth or decline of a population (Coulson *et al.* 2006). Stochastic sex determination refers to the randomness in the sex of offspring such that sexual ratios in population fluctuate over time (Melbourne and Hastings 2008).

At small population sizes, populations experience higher extinction probabilities because of their population size, because stochastic sexual determination can leave them with all males or all females (which occurred to the heath hen and dusky seaside sparrow just before they became extinct), or because the loss of individuals with high reproductive success has a disproportionate effect on the rate at which the population declines (Coulson *et al.* 2006). In general, an individual’s contribution to the growth (or decline) of the population it represents depends, in part, on the number of individuals in the population: the smaller the population, the more the performance of a single individual is likely to affect the population’s growth or decline (Coulson *et al.* 2006). Given the small size of the northern right whale population, the performance (= “fitness” measured as the longevity of individuals and their reproductive success over their lifespan) of individual whales would be expected to have appreciable consequences for the growth or decline of the northern right whale population. Evidence of the small population dynamics of North Atlantic right whales appears in demographic models that suggest that the death or survival of one or two individual animals is sufficient to determine whether North Atlantic right whales are likely to accelerate or abate the rate at which their population continues to decline (Fujiwara and Caswell 2001).

These phenomena would increase the extinction probability of northern right whales and amplify the potential consequences of human-related activities on this species. Based on their population size and population ecology (that is, slow-growing mammals that give birth to single calves with several years between births), we assume that right whales would have elevated extinction probabilities because of exogenous threats caused by anthropogenic activities that result in the death or injury of individual whales (for example, ship strikes or entanglement) and natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to changing climate) *as well as* endogenous threats resulting from the small size of their population. Based

on the number of other species in similar circumstances that have become extinct (and the small number of species that have avoided extinction in similar circumstances), the longer North Atlantic right whales remain in these circumstances, the greater their extinction probability becomes.

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation) and NWP 8 (offshore oil and gas activities) overlap with the distribution of North Atlantic right whales.

Critical Habitat

Five areas have been reported to be critical to the survival and recovery of North Atlantic right whales: (1) coastal Florida and Georgia; (2) the Great South Channel, which lies east of Cape Cod; (3) Cape Cod and Massachusetts Bays; (4) the Bay of Fundy; and (5) Browns and Baccaro Banks off southern Nova Scotia. The first three areas occur in U.S. waters and have been designated by NMFS as critical habitat (59 FR 28793). North Atlantic right whales are most abundant in Cape Cod Bay between February and April (Hamilton and Mayo 1990; Schevill *et al.* 1986; Watkins and Schevill 1982), in the Great South Channel in May and June (Kenney *et al.* 1986, Payne *et al.* 1990), and off Georgia/Florida from mid-November through March (Slay *et al.* 1996). Right whales also frequent the Bay of Fundy, Browns and Baccaro Banks (in Canadian waters), Stellwagen Bank and Jeffrey's Ledge in spring and summer months and use mid-Atlantic waters as a migratory pathway between winter calving grounds and their spring and summer nursery/feeding areas in the Gulf of Maine. A recent review and comparison of sighting data suggests that Jeffrey's Ledge may also be regularly used by right whales in late fall (October through December; Weinrich *et al.* 2000).

The availability of dense concentrations of zooplankton blooms in Cape Cod Bay in late winter and the Great South Channel in spring is described as the key factor for right whale utilization of these areas. Kraus and Kenney (1991) provide an overview of data regarding right whale use of these areas. Important habitat components in Cape Cod Bay include seasonal availability of dense zooplankton patches and protection from weather afforded by land masses surrounding the bay. The spring current regime and bottom topography of the Great South Channel result in nutrient rich upwelling conditions. These conditions support the dense plankton and zooplankton blooms utilized by right whales. The combination of highly oxygenated water and dense zooplankton concentrations are optimal conditions for the small schooling fishes (sand lance, herring and mackerel) that prey upon some of the same zooplankton as right whales. Therefore, the abundance of these fishes, in turn, may affect and be affected by the distribution of several piscivorous marine mammal species such as humpback, fin, minke, and pilot whales, Atlantic whitesided dolphins, and harbor porpoise (CeTAP 1982).

Overfishing has severely reduced the stocks of several groundfish species such as cod, haddock, and yellowtail flounder. Recovery of commercially targeted finfish stocks from their current overfished condition may reduce the biomass of small schooling fish that feed directly on zooplankton resources throughout the region. It is unknown whether zooplankton densities that occur seasonally in Cape Cod Bay or the Great South Channel could be expected to increase significantly. However, increased predation by groundfish on small schooling fish in certain areas and at specific critical periods may allow the necessary high zooplankton densities to be maintained in these areas for longer periods, or accumulate in other areas at levels acceptable to right whales.

Fishing is allowed within the Cape Cod Bay and Great South Channel right whale critical habitat. Lobster trap gear and anchored gillnet gear are believed to pose the most serious risks of entanglement and serious injury to right whales frequenting these waters. As a result, regulations developed under the Atlantic Large Whale Take Reduction Plan restrict the use of lobster and anchored gillnet gear in Cape Cod Bay and Great South Channel critical habitat. The most restrictive measures apply during peak right whale abundance: January 1 to May 15 in Cape Cod Bay, and April 1 to June 30 in the Great South Channel critical habitat. Measures include prohibitions on the use of lobster trap gear and anchored gillnet gear in the Great South Channel critical habitat during periods of peak right whale abundance (with the exception of gillnet gear in the Great South Channel Sliver Area), and, for Cape Cod Bay critical habitat, anchored gillnet gear prohibitions and lobster trap restrictions during peak right whale abundance. During non-peak periods of right whale abundance, lobster trap and gillnet fishers must modify their gear by using weak links in net and/or buoy lines, follow gillnet anchoring requirements and meet mandatory breaking strengths for buoy line weak links, amongst others. Additional measures (i.e., gear marking requirements, and prohibitions on the use of floating line and the wet storage of gear) apply within as well as outside of critical habitat. All of these measures are intended to reduce the likelihood of whale entanglements or the severity of an entanglement should an animal encounter anchored gillnet or lobster gear.

The critical habitat identified in the Southeast U.S. is used primarily as a calving and nursery area. The nearshore waters of northeast Florida and southern Georgia were formally designated as critical habitat for right whales on June 3, 1994 (59 FR 28793); ten years after they were first identified as a likely calving and nursery area for right whales. Since that time, 74 percent of all known, mature female North Atlantic right whales have been documented in this area (Kraus *et al.* 1993). While sightings off Georgia and Florida include primarily adult females and calves, juveniles and adult males have also been observed.

3.3.11 Whale, right (North Pacific)

Distribution

Very little is known of the distribution of right whales in the North Pacific because so few of these animals have been seen in the past 20 years. In 1996, a group of 3 to 4 right whales (which may have included a calf) were observed in the middle shelf of the Bering Sea, west of Bristol Bay and east of the Pribilof Islands (Goddard and Rugh 1998). In June 1998, a lone whale was observed on historic whaling grounds near Albatross Bank off Kodiak Island, Alaska (Waite and Hobbs 1999). Surveys conducted in July of 1997 - 2000 in Bristol Bay reported observations of lone animals or small groups of right whales in the same area as the 1996 sighting (Hill and DeMaster 1998, Perryman *et al.* 1999).

Historical whaling records (Maury 1852, Townsend 1935, Scarff 1986) indicate the right whale ranged across the North Pacific above 35°N lat. They summered in the North Pacific Ocean and southern Bering Sea from April or May to September, with a peak in sightings in coastal waters of Alaska in June and July (Maury 1852, Townsend 1935, Omura 1958, Klumov 1962, Omura *et al.* 1969). Their summer range extended north of the Bering Strait (Omura *et al.* 1969). However, they were particularly abundant in the Gulf of Alaska from 145° to 151°W (Berzin and Rovnin 1966), and apparently concentrated in the Gulf of Alaska, especially south of Kodiak Islands and in the Eastern Aleutian Islands and southern Bering Sea shelf waters (Braham and Rice 1984).

The winter distribution patterns of right whales in the Pacific are virtually unknown, although some right whales have been sighted as far south as 27°N in the eastern North Pacific. They have also been sighted in Hawaii (Herman *et al.* 1980), California (Scarff 1986), Washington and British Columbia. Their migration patterns are unknown, but are believed to include north-south movements between summer and winter feeding areas. The scarcity of right whales is the result of an 800-year history of whaling that continued into the 1960s (Klumov 1962).

Status

Since 1949, the northern right whale has been protected from commercial whaling by the IWC. Right whales (both *E. glacialis* and *E. australis*) are listed as endangered under the ESA. They are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the MMPA. NMFS designated critical habitat for the North Atlantic population of right whales on June 3, 1994 (59 FR 28793). Critical habitat for right whales in the North Pacific Ocean was designated in 2006 and 2008.

The recovery plan for this species suggests that its population included more than 11,000 individuals before they were hunted, based on a known harvest of over 11,000 right whales by U.S. whalers with additional numbers struck and lost (Brownell *et al.* 1986). Current population estimates range from a low of 100-200 (Braham and Rice 1984) to a high of 220-500 (Berzin and Yablokov 1978 [in Berzin and Vladimirov 1981]), but Hill and DeMaster (1998) argue that it is not possible to reliably estimate the population size or trends of right whales in the North Pacific. As a result, no population projections are available for this species.

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), and NWP B (water-based energy generation pilot projects) overlap with the distribution of North Pacific right whales.

3.3.12 Whale, sei

Distribution

Sei whales occur in every ocean except the Arctic Ocean. The migratory pattern of this species is thought to encompass long distances from high-latitude feeding areas in summer to low-latitude breeding areas in winter; however, the location of winter areas remains largely unknown (Perry *et al.* 1999). Sei whales are often associated with deeper waters and areas along the continental shelf edge (Hain *et al.* 1985); however, this general offshore pattern of sei whale distribution is disrupted during occasional incursions into more shallow and inshore waters (Waring *et al.* 2004).

In the western Atlantic Ocean, sei whales occur from Labrador, Nova Scotia, and Labrador in the summer months and migrate south to Florida, the Gulf of Mexico, and the northern Caribbean (Gambell 1985, Mead 1977). In the eastern Atlantic Ocean, sei whales occur in the Norwegian Sea (as far north as Finnmark in northeastern Norway), occasionally occurring as far north as Spitsbergen Island, and migrate south to Spain, Portugal, and northwest Africa (Jonsgård and Darling 1974, Gambell 1985).

In the north Pacific Ocean, sei whales occur from the Bering Sea south to California (on the east) and the coasts of

Japan and Korea (on the west). During the winter, sei whales are found from 20°23'N (Masaki 1977; Gambell 1985). Horwood (1987) reported that 75 - 85% of the North Pacific population of sei whales resides east of 180° longitude.

POPULATION STRUCTURE. The population structure of sei whales is largely unknown because there are so few data on this species. The International Whaling Commission's Scientific Committee groups all of the sei whales in the entire North Pacific Ocean into one population (Donovan 1991). However, some mark-recapture, catch distribution, and morphological research suggest more than one "stock" of sei whales may exist in the Pacific: one between 175°W and 155°W longitude, and another east of 155°W longitude (Masaki 1977); however, the amount of movement between these "stocks" suggests that they probably do not represent demographically-isolated populations as we use this concept in this Opinion.

Mitchell and Chapman (1977) divided sei whales in the western North Atlantic in two populations, one that occupies the Nova Scotian Shelf and a second that occupies the Labrador Sea. Sei whales are most common on Georges Bank and into the Gulf of Maine and the Bay of Fundy during spring and summer, primarily in deeper waters. There are occasional influxes of sei whales further into Gulf of Maine waters, presumably in conjunction with years of high copepod abundance inshore. Sei whales are occasionally seen feeding in association with right whales in the southern Gulf of Maine and in the Bay of Fundy.

Status

Sei whales were listed as endangered under the ESA in 1973. In the North Pacific, the International Whaling Commission began management of commercial taking of sei whales in 1970, and fin whales were given full protection in 1976 (Allen 1980). Sei whales are also protected by the Convention on International Trade in Endangered Species of wild flora and fauna and the Marine Mammal Protection Act. They are listed as endangered under the IUCN Red List of Threatened Animals (Baillie and Groombridge 1996). Critical habitat has not been designated for sei whales.

Prior to commercial whaling, sei whales in the north Pacific are estimated to have numbered 42,000 individuals (Tillman 1977), although Ohsumi and Fukuda (1975) estimated that sei whales in the north Pacific numbered about 49,000 whales in 1963, had been reduced to 37,000 or 38,000 whales by 1967, and reduced again to 20,600 to 23,700 whales by 1973. Japanese and Soviet catches of sei whales in the North Pacific and Bering Sea increased from 260 whales in 1962 to over 4,500 in 1968 and 1969, after which the sei whale population declined rapidly (Mizroch *et al.* 1984). When commercial whaling for sei whales ended in 1974, the population of sei whales in the North Pacific had been reduced to between 7,260 and 12,620 animals (Tillman 1977). In the same year, the north Atlantic population of sei whales was estimated to number about 2,078 individuals, including 965 whales in the Labrador Sea group and 870 whales in the Nova Scotia group (IWC 1977, Mitchell and Chapman 1977).

About 50 sei whales are estimated to occur in the North Pacific "stock" with another 77 sei whales in the Hawaiian "stock" (Lowry *et al.* 2007). The abundance of sei whales in the Atlantic Ocean remains unknown (Lowry *et al.* 2007). In California waters, only one confirmed and five possible sei whale sightings were recorded during 1991, 1992, and 1993 aerial and ship surveys (Carretta and Forney 1993, Mangels and Gerrodette 1994). No sightings were confirmed off Washington and Oregon during recent aerial surveys. Several researchers have suggested that

the recovery of right whales in the northern hemisphere has been slowed by other whales that compete with right whales for food. Mitchell (1975) analyzed trophic interactions among baleen whales in the western north Atlantic and noted that the foraging grounds of right whales overlapped with the foraging grounds of sei whales and both preferentially feed on copepods.

Like blue whales, the information available on the status and trend of sei whales do not allow us to reach any conclusions about the extinction risks facing sei whales as a species, or particular populations of sei whales. With the limited data available on sei whales, we do not know whether these whales exist at population sizes large enough to avoid demographic phenomena that are known to increase the extinction probability of species that exist as “small” populations (that is, “small” populations experience phenomena such as demographic stochasticity, inbreeding depression, Allee effects, among others, that cause their population size to become a threat in and of itself) or if sei whales might be threatened more by exogenous threats such as anthropogenic activities (primarily whaling, entanglement, and ship strikes) or natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to changing climate). However, sei whales have historically exhibited sudden increases in abundance in particular areas followed by sudden decreases in number. Several authors have reported “invasion years” in which large numbers of sei whales appeared off areas like Norway and Scotland, followed the next year by sudden decreases in population numbers (Jonsgård and Darling 1974).

With the evidence available, we do not know if this year-to-year variation still occurs in sei whales. However, if sei whales exist as a fraction of their historic population sizes, large amounts of variation in their abundance would increase the extinction probabilities of individual populations (Fagan and Holmes 2006, Fagan *et al.* 1999, 2001).

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation) and NWP 8 (offshore oil and gas activities) overlap with the distribution of sperm whales, particularly in the northern portion of the Gulf of Mexico.

3.3.13 Whale, sperm

Distribution

Sperm whales occur in every ocean except the Arctic Ocean. Sperm whales are found throughout the North Pacific and are distributed broadly from tropical and temperate waters to the Bering Sea as far north as Cape Navarin. Mature, female, and immature sperm whales of both sexes are found in more temperate and tropical waters from the equator to around 45° N throughout the year. These groups of adult females and immature sperm whales are rarely found at latitudes higher than 50° N and 50° S (Reeves and Whitehead 1997). Sexually mature males join these groups throughout the winter. During the summer, mature male sperm whales are thought to move north into the Aleutian Islands, Gulf of Alaska, and the Bering Sea.

In the western Atlantic Ocean, sperm whales are distributed in a distinct seasonal cycle, concentrated east-northeast of Cape Hatteras in winter and shifting northward in spring when whales are found throughout the Mid-Atlantic Bight. Distribution extends further northward to areas north of Georges Bank and the Northeast Channel region in summer and then south of New England in fall, back to the Mid-Atlantic Bight.

Sperm whales are found throughout the North Pacific and are distributed broadly from tropical and temperate waters to the Bering Sea as far north as Cape Navarin. Mature female and immature sperm whales of both sexes are found in more temperate and tropical waters from the equator to around 45°N throughout the year. However, groups of adult females and immature sperm whales are rarely found at latitudes higher than 50°N and 50°S (Reeves and Whitehead 1997). Sexually mature males join these groups throughout the winter. During the summer, mature male sperm whales are thought to migrate into the Aleutian Islands, Gulf of Alaska, and the Bering Sea.

Sperm whales commonly concentrate around oceanic islands in areas of upwelling, and along the outer continental shelf and mid-ocean waters. Because they inhabit deeper pelagic waters, their distribution does not include the broad continental shelf of the Eastern Bering Sea and these whales generally remain offshore in the eastern Aleutian Islands, Gulf of Alaska, and the Bering Sea.

Sperm whales have a strong preference for the 3,280 feet (1,000 meters) depth contour and seaward. Berzin (1971) reported that they are restricted to waters deeper than 300 meters (984 feet), while Watkins (1977) and Reeves and Whitehead (1997) reported that they are usually not found in waters less than 1,000 meters (3,281 feet) deep. While deep water is their typical habitat, sperm whales have been observed near Long Island, New York, in water between 41-55 meters (135-180 feet; Scott and Sadove 1997). When they are found relatively close to shore, sperm whales are usually associated with sharp increases in bottom depth where upwelling occurs and biological production is high, implying the presence of a good food supply (Clarke 1956).

POPULATION STRUCTURE. The population structure of sperm whales is largely unknown. Lyrholm and Gyllenstein (1998) reported moderate, but statistically significant, differences in sperm whale mitochondrial (mtDNA) between ocean basins, although sperm whales throughout the world appear to be homogenous genetically (Whitehead 2003). Genetic studies also suggest that sperm whales of both genders commonly move across over ocean basins and that males, but not females, often breed in ocean basins that are different from the one in which they were born (Whitehead, 2003).

Sperm whales may not form “populations” as that term is normally conceived. Jaquet (1996) outlined a hierarchical social and spatial structure that includes temporary clusters of animals, family units of 10 or 12 females and their young, groups of about 20 animals that remain together for hours or days, “aggregations” and “super-aggregations” of 40 or more whales, and “concentrations” that include 1,000 or more animals (Peterson 1986, Whitehead and Wiegart 1990, Whitehead *et al.* 1991). The “family unit” forms the foundation for sperm whale society and most females probably spend their entire life in the same family unit (Whitehead 2002). The dynamic nature of these relationships and the large spatial areas they are believed to occupy might complicate or preclude attempts to apply traditional population concepts, which tend to rely on group fidelity to geographic distributions that are relatively static over time.

Status

Sperm whales were listed as endangered under the ESA in 1973. Sperm whales have been protected from commercial harvest by the International Whaling Commission since 1981, although the Japanese continued to harvest sperm whales in the North Pacific until 1988 (Reeves and Whitehead 1997). They are also protected by the Convention on International Trade in Endangered Species of Wild Flora and Fauna and the MMPA. Critical habitat

has not been designated for sperm whales.

The status and trend of sperm whales at the time of this summary is largely unknown. Hill and DeMaster (1999) and Angliss and Lodge (2004) reported that estimates for population abundance, status, and trends for sperm whales off the coast of Alaska were not available when they prepared the Stock Assessment Report for marine mammals off Alaska. Similarly, No information was available to support estimates of sperm whales status and trends in the western North Atlantic Ocean (Waring *et al.* 2004), the Indian Ocean (Perry *et al.* 1999), or the Mediterranean Sea.

Nevertheless, several authors and organizations have published “best estimates” of the global abundance of sperm whales or their abundance in different geographic areas. Based on historic whaling data, 190,000 sperm whales were estimated to have been in the entire North Atlantic, but the IWC considers data that produced this estimate unreliable (Perry *et al.* 1999). Whitehead (2002) estimated that prior to whaling sperm whales numbered around 1,110,000 and that the current global abundance of sperm whales is around 360,000 (coefficient of variation = 0.36) whales. Whitehead’s current population estimate (2002) is about 20% of past global abundance estimates which were based on historic whaling data.

Waring *et al.* (2007) concluded that the best estimate of the number of sperm whales along the Atlantic coast of the U.S. was 4,029 (coefficient of variation = 0.38) in 1998 and 4,804 (coefficient of variation = 0.38) in 2004, with a minimum estimate of 3,539 sperm whales in the western North Atlantic Ocean.

Barlow and Taylor (2005) derived two estimates of sperm whale abundance in a 7.8 million km² study area in the northeastern temperate Pacific: when they used acoustic detection methods they produced an estimate of 32,100 sperm whales (coefficient of variation = 0.36); when they used visual surveys, they produced an estimate of 26,300 sperm whales (coefficient of variation = 0.81). Caretta *et al.* (2005) concluded that the most precise estimate of sperm whale abundance off California, Oregon, and Washington was 1,233 (coefficient of variation = 0.41; based on ship surveys conducted in the summer and fall of 1996 and 2001). Their best estimate of the abundance of sperm whales in Hawai’i was 7,082 sperm whales (coefficient of variation = 0.30) based on ship-board surveys conducted in 2002.

Mark and recapture data from sperm whales led Whitehead and his co-workers to conclude that sperm whale numbers off the Galapagos Islands decreased by about 20% a year between 1985 and 1995 (Whitehead *et al.* 1997). In 1985 Whitehead *et al.* (1997) estimated there were about 4,000 female and immature sperm whales, whereas in 1995 they estimated that there were only a few hundred. They suggested that sperm whales migrated to waters off the Central and South American mainland to feed in productive waters of the Humboldt Current, which had been depopulated of sperm whales as a result of intensive whaling.

The information available on the status and trend of sperm whales do not allow us to make definitive statement about the extinction risks facing sperm whales as a species or particular populations of sperm whales. However, the evidence available suggests that sperm whale populations probably exhibit the dynamics of small populations, causing their population dynamics to become a threat in and of itself. The number of sperm whales killed by Soviet whaling fleets in the 1960s and 1970s would have substantial and adverse consequence for sperm whale populations and their ability to recover from the effects of whaling on their population. The number of adult female killed by

Soviet whaling fleets, including pregnant and lactating females whose death would also have resulted in the death of their calves, would have had a devastating effect on sperm whale populations. In addition to decimating their population size, whaling would have skewed sex ratios in their populations, created gaps in the age structure of their populations, and would have had lasting and adverse effect on the ability of these populations to recover (for example, see Whitehead 2003).

Populations of sperm whales could not have recovered from the overharvests of adult females and immature whales in the 30 to 40 years that have passed since the end of whaling, but the information available does not allow us to determine whether and to what degree those populations might have stabilized or whether they have begun the process of recovering from the effects of whaling. Absent information to the contrary, we assume that sperm whales will have elevated extinction probabilities because of both exogenous threats caused by anthropogenic activities (primarily whaling, entanglement, and ship strikes) and natural phenomena (such as disease, predation, or changes in the distribution and abundance of their prey in response to changing climate) as well as endogenous threats caused by the legacy of overharvests of adult females and immature whales on their populations (that is, a population with a disproportion of adult males and older animals coupled with a small percentage of juvenile whales that recruit into the adult population).

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation) and NWP 8 (offshore oil and gas activities) overlap with the distribution of sperm whales, particularly in the northern portion of the Gulf of Mexico.

3.3.14 Sea turtle, green

Distribution

The genus *Chelonia* is composed of two taxonomic units at the population level, the eastern Pacific green turtle (referred to by some as “black turtle,” *C. mydas agassizii*), which ranges from Baja California south to Peru and west to the Galapagos Islands, and the nominate *C. m. mydas* which occurs in tropical regions of the Atlantic, Indian, and Pacific Oceans and most seas associated with these oceans, except for the Bering and Beaufort Seas. They are most common along a north-south band from 15°N to 5°S along 90°W, and between the Galapagos Islands and Central American Coast (NMFS and USFWS 1998a).

In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Occasional nesting has been documented along the Gulf coast of Florida, at Southwest Florida beaches, as well as the beaches on the Florida Panhandle (Meylan *et al.* 1995).

Status

Green sea turtles were listed as threatened (except for breeding populations found in Florida and the Pacific coast of Mexico) on July 28, 1978. Breeding populations of green sea turtles found in Florida and the Pacific coast of Mexico are listed as endangered. Green sea turtles were listed as endangered because of population declines that resulted from their eggs were overharvested, hatchlings were disoriented by artificial lighting and experienced higher death rates as a result, adults were captured and killed for subsistence, immature and adult sea turtles were captured and died in large numbers in commercial fishing gear, they were captured and killed to satisfy extensive

commercial demand for turtle products in domestic markets and international trade, their nests were preyed upon by native and exotic species, human encroachment on coastal ecosystems destroyed or degraded their nesting beaches and foraging habitat, and (in the northwest Hawaiian Islands) they were afflicted with fibropapilloma, a tumor disease of an unknown etiology that can be fatal (Balazs *et al.* 1998).

Critical habitat has been designated for green sea turtles on Culebra Island, in Puerto Rico (63 *Federal Register* 46693)

Dependence on Waters of the United States

The majority portion of a green turtle's life is spent on the foraging areas. Green turtles are herbivores, and appear to prefer marine grasses and algae in shallow bays, lagoons and reefs (Rebel 1974). Some of the principal feeding pastures in the Gulf of Mexico include inshore south Texas waters, the upper west coast of Florida and the north-western coast of the Yucatan Peninsula. Additional important foraging areas in the western Atlantic include the Indian River Lagoon System in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito coast of Nicaragua, the Caribbean coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1971). The preferred food in these areas are *Cymodocea*, *Thalassia*, *Zostera*, *Sagittaria*, and *Vallisneria* (Babcock 1937, Underwood 1951, Carr 1952, 1954).

Ninety percent of the nesting and breeding activity of the Hawaiian green turtle occurs at the French Frigate Shoals, where 200-700 females are estimated to nest annually (NMFS and FWS 1998a). Important resident areas have been identified and are being monitored along the coastlines of Oahu, Molokai, Maui, Lanai, Hawaii, and at large nesting areas in the reefs surrounding the French Frigate Shoals, Lisianski Island, and Pearl and Hermes Reef (Balazs 1982; Balazs *et al.* 1987).

3.3.15 Sea turtle, hawks bill

Distribution

Hawksbill sea turtles are distributed in coastal areas with tropical and subtropical zones throughout the world. The largest populations of hawksbill sea turtles reside in the Caribbean Sea, the Seychelle Islands, Indonesia, and Australia. Small numbers of these turtles nest on Mona Island, Puerto Rico, St. Croix in the U.S. Virgin Islands, the Atlantic coast of Florida.(although only a few individuals), and the southern coast of the Island of Hawai'i.

Status

Hawksbill turtles were listed as endangered on June 2 1970, under the Endangered Species Conservation Act of 1969. Hawksbill sea turtles were listed as endangered because of population declines that resulted from their eggs were overharvested, hatchlings were disoriented by artificial lighting and experienced higher death rates as a result, adults were captured and killed for subsistence, immature and adult sea turtles were captured and died in large numbers in commercial fishing gear, they were captured and killed to satisfy extensive commercial demand for turtle products in domestic markets and international trade, their nests were preyed upon by native and exotic species, human encroachment on coastal ecosystems destroyed or degraded their nesting beaches and foraging habitat.

The coastal waters surrounding Mona and Monito Islands, off the west coast of Puerto Rico, have been designated critical habitat for hawksbill turtles.

Dependence on Waters of the United States

Hawksbill turtles mate in shallow water off their nesting beaches. Hawksbill turtles usually select nest sites under cover of woody vegetation, although they will build nests without such cover if it is not available.

3.3.16 Sea turtle, Kemp's ridley

Distribution

Kemp's ridley sea turtles are distributed in the western Atlantic Ocean from Nova Scotia and, possibly, Newfoundland, south to Bermuda, west through the Gulf of Mexico to Mexico. They have also been recorded in England, Ireland, the Scilly Islands, France, the Azores, and the Mediterranean Sea. Almost all nesting occurs in the southern coast of Tamaulipas, Mexico, near Rancho Nuevo.

Status

Kemp's ridley sea turtles were listed as endangered on July 28, 1978, because of population declines that resulted from their eggs were overharvested, hatchlings were disoriented by artificial lighting and experienced higher death rates as a result, adults were captured and killed for subsistence, immature and adult sea turtles were captured and died in large numbers in commercial fishing gear (northeast otter trawl fishery, pelagic longline fishery, and southeast shrimp and summer flounder bottom trawl fisheries, and shrimp fisheries in the northeast and southeast), they were captured and killed to satisfy extensive commercial demand for turtle products in domestic markets and international trade, their nests were preyed upon by native and exotic species, human encroachment on coastal ecosystems destroyed or degraded their nesting beaches and foraging habitat.

Critical habitat has not been designated for Kemp's ridley sea turtles.

Dependence on Waters of the United States

Juvenile Kemp's ridleys use northeastern and mid-Atlantic coastal waters of the U.S. Atlantic coastline as primary developmental habitat during summer months, with shallow coastal embayments serving as important foraging grounds. Juvenile ridleys migrate south as water temperatures cool in fall, and are predominantly found in shallow coastal embayments along the Gulf Coast during fall and winter months.

After loggerhead sea turtles, Kemp's ridley sea turtles are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June, and migrating to more southerly waters from September to November (Keinath *et al.* 1987; Musick and Limpus 1997). Kemp's ridley sea turtles frequently forage in shallow embayments, particularly in areas supporting submerged aquatic vegetation, such as ChESApeake Bay, Galveston Bay, Mobile Bay, and Pamlico Sound (Lutcavage and Musick 1985; Bellmund *et al.* 1987; Keinath *et al.* 1987; Musick and Limpus 1997).

3.3.17 Sea turtle, leatherback

Distribution

Leatherback sea turtles are widely distributed throughout the oceans of the world, and are found throughout waters of the Atlantic, Pacific, Caribbean, and the Gulf of Mexico (Ernst and Barbour 1972). In the Pacific Ocean, they range as far north as Alaska and the Bering Sea and as far south as Chile and New Zealand. In Alaska, leatherback turtles are found as far north as 60.34°N, 145.38°W and as far west as the Aleutian Islands (Hodge 1979, Stinson 1984). Leatherback turtles have been found in the Bering Sea along the coast of Russia (Bannikov *et al.* 1971).

Status

Leatherback sea turtles were listed as endangered on June 2, 1970, because of population declines that resulted from their eggs were overharvested, adults were captured and killed for subsistence, immature and adult sea turtles were captured and died in large numbers in commercial fishing gear (gillnets, longlines, lobster pots, weirs), adults are killed in collisions with boats and by ingesting marine debris, their nests were preyed upon by native and exotic species, and because human encroachment on coastal ecosystems destroyed or degraded their nesting beaches and foraging habitat. The Pacific population appears to be in a critical state of decline. The East Pacific leatherback population was estimated to be over 91,000 adults in 1980 (Spotila 1996), but is now estimated to number less than 3,000 total adult and subadult animals (Spotila 2000). Leatherback turtles have experienced major declines at all major rookeries in the Pacific basin. The status of the Atlantic population is less clear.

Critical habitat has been designated for leatherback sea turtles on St. Croix in the U.S. Virgin Islands (44 *Federal Register* 17710). On 26 January 2012, NMFS promulgated a final regulation to designated areas along the coast of Washington, Oregon, and California as critical habitat for leatherback sea turtles (Federal Register 77 FR 4170).

Dependence on Waters of the United States

Leatherback sea turtles are generally found in deeper waters offshore, but they are known to forage in bays and estuaries like Peconic Bay and Long Island Sound in New York, Chesapeake Bay, and Pamlico Bay where they have been captured in coastal fisheries (for example, see Mansfield *et al.* 2002a, 2002b)

3.3.18 Sea turtle, loggerhead (North Pacific)

Distribution

Loggerhead sea turtles are a cosmopolitan species, found in temperate and subtropical waters and inhabiting pelagic waters, continental shelves, bays, estuaries and lagoons. In the Pacific Ocean, loggerhead turtles are represented by a north Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea. Endangered North Pacific loggerhead sea turtles consist of the loggerhead sea turtles that nest along the coastline of southern Japanese, the Ryukyu Archipelago, and loggerhead sea turtles that nest outside of Japan in areas surrounding the South China Sea.

Despite this limited nesting distribution, these loggerhead sea turtles undertake extensive developmental migrations using the Kuroshio and North Pacific Currents, and some of them reach the vicinity of Baja California in the eastern

Pacific. After spending years foraging in the central and eastern Pacific, loggerheads return to their natal beaches for reproduction and remain in the western Pacific for the remainder of their life cycle.

POPULATION STRUCTURE. North Pacific Ocean loggerhead turtles nest in Japan and can be sub-divided into a series of

small sub-populations associated with specific nesting beaches in southern Japan, the Ryukyu Archipelago, and areas surrounding the South China Sea.

Status

North Pacific loggerhead turtles were listed as endangered on 22 September 2011 because of the human activities that were reported for the other sea turtles discussed previously. The major factors inhibiting their recovery include mortalities caused by fishery interactions and degradation of the beaches on which they nest. Loggerhead sea turtles face a number of threats in the marine environment, including oil and gas exploration, development, and transportation; marine pollution; trawl, purse seine, hook and line, gill net, pound net, longline, and trap fisheries; underwater explosions; dredging, offshore artificial lighting; power plant entrapment; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching.

Dependence on Waters of the United States

North Pacific loggerhead sea turtles occur in coastal waters of Hawai'i, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands.

3.3.19 Sea turtle, loggerhead (Northwest Atlantic)

Distribution

Loggerhead sea turtles are a cosmopolitan species, found in temperate and subtropical waters and inhabiting pelagic waters, continental shelves, bays, estuaries and lagoons. The species exists as five populations: one each in the Atlantic Ocean, Pacific Ocean, Indian Ocean, Caribbean Sea and Mediterranean Sea. Within these five populations, nesting aggregations are geographically discrete and function as sub-populations. In the western Atlantic Ocean, NMFS recognizes five major nesting aggregations: (1) a northern nesting aggregation that occurs from North Carolina to northeast Florida, about 29° N; (2) a south Florida nesting aggregation, occurring from 29° N on the east coast to Sarasota on the west coast; (3) a Florida panhandle nesting aggregation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting aggregation, occurring on the eastern Yucatán Peninsula, Mexico and (5). Loggerhead sea turtles also nest in the Bahamas, Colombia, Cuba, Greece, Honduras, Israel, Italy, Oman, Panama, and Turkey.

In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New Zealand, Indonesia, and Papua New Guinea.

POPULATION STRUCTURE. Loggerhead sea turtles, like other sea turtles, are divided into regional groupings that represent major oceans or seas: the Atlantic Ocean, Pacific Ocean, Indian Ocean, Caribbean Sea and Mediterranean

Sea. In these regions, the population structure of loggerhead turtles is usually based on the distribution of their nesting aggregations. In the Pacific Ocean, loggerhead turtles are represented by a northwestern Pacific nesting aggregation (located in Japan) which may be comprised of separate nesting groups (Hatase *et al.* 2002) and a smaller southwestern nesting aggregation that occurs in Australia (Great Barrier Reef and Queensland), New Caledonia, New

Zealand, Indonesia, and Papua New Guinea. One of the largest loggerhead nesting aggregations in the world is found in Oman, in the Indian Ocean.

Based on genetic analyses of loggerhead sea turtles captured in pelagic longline fisheries in the same general area as that of the proposed action, loggerhead sea turtles along the southeastern coast of the United States might originate from one of the five major nesting aggregations in the western North Atlantic: (1) a northern nesting aggregation that occurs from North Carolina to northeast Florida, about 29°N; (2) a south Florida nesting aggregation, occurring from 29°N on the east coast to Sarasota on the west coast; (3) a Florida panhandle nesting aggregation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting aggregation, occurring on the eastern Yucatán Peninsula, Mexico; and (5) a Dry Tortugas nesting aggregation that occurs in the islands of the Dry Tortugas near Key West, Florida (NMFS 2001).

Loggerhead sea turtles from the northern nesting aggregation, which represents about 9% of the loggerhead nests in the western North Atlantic, comprise more between 25 and 59% of the loggerhead sea turtles captured in foraging areas from Georgia to waters of the northeastern United States (Bass *et al.* 1998, Norrgard 1995, Rankin-Baransky 1997, Sears 1994, Sears *et al.* 1995). About 10% of the loggerhead sea turtles in foraging areas off the Atlantic coast of central Florida will have originated from the northern nesting aggregation (Witzell 1999). Loggerhead sea turtles associated with the South Florida nesting aggregation, in contrast, occur in higher frequencies in the Gulf of Mexico (where they represent about 10% of the loggerhead sea turtles captured) and the Mediterranean Sea (where they represent about 45-47% of the loggerhead sea turtles captured).

Status

Northwest Atlantic loggerhead turtles were listed as threatened on 22 September 2011 because of the same human activities that were reported for the other sea turtles discussed previously. The major factors inhibiting their recovery include mortalities caused by fishery interactions and degradation of the beaches on which they nest. Loggerhead sea turtles face a number of threats in the marine environment, including oil and gas exploration, development, and transportation; marine pollution; trawl, purse seine, hook and line, gill net, pound net, longline, and trap fisheries; underwater explosions; dredging, offshore artificial lighting; power plant entrapment; entanglement in debris; ingestion of marine debris; marina and dock construction and operation; boat collisions; and poaching.

Dependence on Waters of the United States

Four important nesting colonies of loggerhead turtles, including the largest nesting colony in the world, are located on the coasts of Florida, Georgia, South Carolina, and North Carolina where they are vulnerable to the direct and indirect effects of coastal development. Loggerhead sea turtles also forage in shallow bays, lagoons, and estuaries along the Atlantic and Gulf Coasts, from the Canadian Maritime Provinces to the Gulf of Mexico with important foraging areas in Chesapeake Bay, Pamlico Sound, Indian River Lagoon, Florida Bay, Mobile Bay, Galveston Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito coast of Nicaragua, the Caribbean coast of Panama, and areas along the coasts of Colombia and Brazil (Hirth 1971).

3.3.20 Sea turtle, Pacific ridley

Distribution

Olive ridley turtles occur in the tropical waters of the Pacific and Indian Oceans from Micronesia, Japan, India, and Arabia south to northern Australia and southern Africa. In the Atlantic Ocean off the western coast of Africa and the coasts of northern Brazil, French Guiana, Surinam, Guyana, and Venezuela in South America, and occasionally in the Caribbean Sea as far north as Puerto Rico. In the eastern Pacific Ocean, olive ridley turtles are found from the Galapagos Islands north to California. While olive ridley turtles have a generally tropical to subtropical range, individual turtles have been reported as far as the Gulf of Alaska (Hodge and Wing 2000).

Status

Olive ridley turtle populations on the Pacific coast of Mexico were listed as endangered on July 28, 1978; the same regulation listed all other populations were listed as threatened (43 *Federal Register* 32800).

Dependence on Waters of the United States

Olive ridley turtles nest along continental margins and oceanic islands. Most records of olive ridley turtles are from protected, relative shallow marine waters particularly between reefs and shore, larger bays, and lagoons (Deraniyagala 1939).

3.3.21 Bocaccio (Georgia Basin)

Distribution

The bocaccio that occur in the Georgia Basin are listed as an endangered “species,” which, in this case, refers to a distinct segment of a vertebrate population (75 *Federal Register* 22276). The listing includes bocaccio throughout Puget Sound, which encompasses all waters south of a line connecting Point Wilson on the Olympic Peninsula and Partridge on Whidbey Island; West Point on Whidbey Island, Deception Island, and Rosario Head on Fidalgo Island; and the southern end of Swinomish Channel between Fidalgo Island and McGlenn Island (U.S. Geological Survey 1979), and the Strait of Georgia, which encompasses the waters inland of Vancouver Island, the Gulf Islands, and the mainland coast of British Columbia.

Status

Georgia Basin bocaccio were listed as an endangered “species” on 28 April 2010 (75 *Federal Register* 22276). From 1975 through 1979, bocaccio were reported as representing an average of 4.63 percent of the total rockfish catch.

From 1980–1989, they represented about 0.24 percent of the rockfish identified, and from 1996 to 2007, bocaccio were not reported in a sample of 2,238 rockfish captured in recreational fisheries (in a sample of that size, there was a 99.5 percent probability of observing at least one bocaccio, assuming their relative frequency was the same as it had been in the 1980s). Bocaccio have always been rare in recreational fisheries that occur in North Puget Sound and the Strait of Georgia; however, there have been no confirmed reports of bocaccio in Georgia Basin for about seven years.

Although their abundance cannot be estimated directly, NMFS' Biological Review Team estimated that the populations of bocaccio, canary rockfish, and yelloweye rockfish are small in size, probably numbering fewer than 10,000 individuals in Georgia Basin and fewer than 1,000 in Puget Sound (74 Federal Register 18532).

Dependence on Waters of the United States

Georgia Basin bocaccio are most common at depths between 50 and 250 meters (160 and 820 feet). Larval rockfish occur over areas that extend several hundred miles offshore where they are passively dispersed by ocean currents and remain in larval form and as small juveniles for several months (Auth and Brodeur 2006, Moser and Boehlert 1991). They appear to concentrate over the continental shelf and slope, but have been captured more than 250 nautical miles offshore of the Oregon coast (Moser and Boehlert 1991, Richardson *et al.* 1980). Larval rockfish have been reported to be uniformly distributed at depths of 13, 37, and 117 meters below surface (Lenarz *et al.* 1991). Larval bocaccio had highest abundance at depths of 13 meters, but were also captured in the 117-meter samples.

At these depths, bocaccio are not likely to be exposed to the direct or indirect effects of most of the activities that would be authorized by the proposed Nationwide Permits. However, both adult or larval bocaccio might be exposed to water-based renewable energy generation pilot projects, such as one that is being considered for Admiralty Inlet in northern Puget Sound, which would be authorized by proposed Nationwide Permit B.

3.3.22 Eulachon, Pacific (Southern population)

Distribution

The southern population of Pacific eulachon consists of populations spawning in rivers south of the Nass River in British Columbia, Canada, to, and including, the Mad River in California (74 FR 10857).

Status

The southern population of eulachon was listed as threatened on 18 March 2010 (74 FR 10857). On 20 October 2011, NMFS published final regulations to designate 16 specific areas as critical habitat within the states of California, Oregon, and Washington as critical habitat for this species. The designated areas are a combination of freshwater creeks and rivers and their associated estuaries, comprising approximately 539 km (335 mi) of habitat. The Tribal lands of four Indian Tribes (Lower Elwha Tribe, Washington; Quinault Tribe, Washington; Yurok Tribe, California; and Resighini Rancheria, California) were excluded from designation after evaluating the impacts of designation and benefits of exclusion associated with Tribal land ownership and management by the Tribes.

Southern eulachon are primarily threatened by increasing temperatures in the marine, coastal, estuarine, and

freshwater environments of the Pacific Northwest that are at least causally related to climate change; dams and water diversions, water quality degradation, dredging operations in the Columbia and Fraser Rivers; commercial, recreational, and subsistence fisheries in Oregon and Washington that target eulachon; and bycatch in commercial fisheries.

Eulachon are particularly vulnerable to capture in shrimp fisheries in the United States and Canada as the marine areas occupied by shrimp and eulachon often overlap. In Oregon, the bycatch of various species of smelt (including eulachon) has been as high as 28 percent of the total catch of shrimp by weight (Hannah and Jones, 2007). In Canada, bycatch of eulachon in shrimp fisheries has been significant enough to cause the Canadian Department of Fisheries and Oceans to close the fishery in some years (DFO, 2008).

Dependence on Waters of the United States

Eulachon are an anadromous species that spawns in the lower portions of certain rivers draining into the northeastern Pacific Ocean ranging from Northern California to the southeastern Bering Sea in Bristol Bay, Alaska (Hubbs 1925, Schultz and DeLacy 1935, McAllister 1963, Scott and Crossman 1973, Willson *et al.* 2006). Eulachon have been described as “common” in Grays Harbor and Willapa Bay on the Washington coast, “abundant” in the Columbia River, “common” in Oregon’s Umpqua River, and “abundant” in the Klamath River in northern California. They have been described as “rare” in Puget Sound and Skagit Bay in Washington; Siuslaw River, Coos Bay, and Rogue River in Oregon; and Humboldt Bay in California (Emmett *et al.* 1991, Monaco *et al.* 1990). However, Hay and McCarter (2000) and Hay (2002) identified 33 eulachon spawning rivers in British Columbia and 14 of these were classified as supporting regular yearly spawning runs.

3.3.23 Rockfish, Canary (Georgia Basin)

Distribution

Georgia Basin canary rockfish occur throughout Puget Sound, which encompasses all waters south of a line connecting Point Wilson on the Olympic Peninsula and Partridge on Whidbey Island; West Point on Whidbey Island, Deception Island, and Rosario Head on Fidalgo Island; and the southern end of Swinomish Channel between Fidalgo Island and McGlenn Island and the Strait of Georgia, which encompasses the waters inland of Vancouver Island, the Gulf Islands, and the mainland coast of British Columbia.

Status

Georgia Basin canary rockfish were listed as a threatened “species” on 28 April 2010 (75 Federal Register 22276). The frequency of canary rockfish in Puget Sound appears to have been highly variable; frequencies were less than one percent in the 1960s and 1980s and about three percent in the 1970s and 1990s. In North Puget Sound, however, the frequency of canary rockfish has been estimated to have declined from a high of greater than two percent in the 1970s to about 0.76 percent by the late 1990s. This decline combined with their low intrinsic growth potential, threats from bycatch in commercial and recreational fisheries, loss of nearshore rearing habitat, chemical contamination, and the proportion of coastal areas with low dissolved oxygen levels led to this species’ listing as threatened.

Although their abundance cannot be estimated directly, NMFS’ Biological Review Team estimated that the

populations of bocaccio, canary rockfish, and yelloweye rockfish are small in size, probably numbering fewer than 10,000 individuals in Georgia Basin and fewer than 1,000 in Puget Sound (74 Federal Register 18532).

Dependence on Waters of the United States

Georgia Basin canary rockfish are most common at depths between 50 and 250 meters (160 and 820 feet) and may occur at depths of 425 meters (1,400 feet). Larval rockfish occur over areas that extend several hundred miles offshore where they are passively dispersed by ocean currents and remain in larval form and as small juveniles for several months (Auth and Brodeur 2006, Moser and Boehlert 1991). They appear to concentrate over the continental shelf and slope, but have been captured more than 250 nautical miles offshore of the Oregon coast (Moser and Boehlert 1991, Richardson *et al.* 1980). Larval rockfish have been reported to be uniformly distributed at depths of 13, 37, and 117 meters below surface (Lenarz *et al.* 1991). Larval canary rockfish were captured at all three depths, but their densities were highest at the 37- and 177-meter depths (Lenarz *et al.* 1991).

At these depths, canary rockfish are not likely to be exposed to the direct or indirect effects of most of the activities that would be authorized by the proposed Nationwide Permits. However, both adult or larval canary rockfish might be exposed to water-based renewable energy generation pilot projects, such as one that is being considered for Admiralty Inlet in northern Puget Sound, which would be authorized by proposed Nationwide Permit B.

3.3.24 Rockfish, Yelloweye (Georgia Basin)

Distribution

Georgia Basin yelloweye rockfish occur through Puget Sound, which encompasses all waters south of a line connecting Point Wilson on the Olympic Peninsula and Partridge on Whidbey Island; West Point on Whidbey Island, Deception Island, and Rosario Head on Fidalgo Island; and the southern end of Swinomish Channel between Fidalgo Island and McGlenn Island (U.S. Geological Survey 1979), and the Strait of Georgia, which encompasses the waters inland of Vancouver Island, the Gulf Islands, and the mainland coast of British Columbia.

Status

Georgia Basin yelloweye rockfish were listed as a threatened “species” on 28 April 2010 (75 Federal Register 22276). The frequency of yelloweye rockfish in collections from Puget Sound appears to have been highly variable; frequencies were less than one percent in the 1960s and 1980s and about three percent in the 1970s and 1990s. In North Puget Sound, however, the frequency of yelloweye rockfish has been estimated to have declined from a high of greater than three percent in the 1970s to about 0.65 percent in more recent samples. This decline combined with their low intrinsic growth potential, threats from bycatch in commercial and recreational fisheries, loss of nearshore rearing habitat, chemical contamination, and the proportion of coastal areas with low dissolved oxygen levels led to this species’ listing as threatened.

Although their abundance cannot be estimated directly, NMFS’ Biological Review Team estimated that the populations of bocaccio, yelloweye rockfish, and canary rockfish are small in size, probably numbering fewer than 10,000 individuals in Georgia Basin and fewer than 1,000 in Puget Sound (74 Federal Register 18532).

Dependence on Waters of the United States

Georgia Basin yelloweye rockfish are most common at depths between 91 and 180 meters (300 to 580 feet), although they may occur in waters 50 to 475 meters (160 and 1,400 feet) deep. Larval rockfish occur over areas that extend several hundred miles offshore where they are passively dispersed by ocean currents and remain in larval form and as small juveniles for several months (Auth and Brodeur 2006, Moser and Boehlert 1991). They appear to concentrate over the continental shelf and slope, but have been captured more than 250 nautical miles offshore of the Oregon coast (Moser and Boehlert 1991, Richardson *et al.* 1980). Larval rockfish have been reported to be uniformly distributed at depths of 13, 37, and 117 meters below surface (Lenarz *et al.* 1991). Like the other rockfish we have discussed, larval yelloweye rockfish were captured at all three depths, but their densities were highest at the 37- and 177-meter depths (Lenarz *et al.* 1991).

At these depths, yelloweye rockfish are not likely to be exposed to the direct or indirect effects of most of the activities that would be authorized by the proposed Nationwide Permits. However, both adult or larval yelloweye rockfish might be exposed to water-based renewable energy generation pilot projects, such as one that is being considered for Admiralty Inlet in northern Puget Sound, that might be authorized by proposed Nationwide Permit B.

Chinook Salmon

Chinook salmon are the largest of the Pacific salmon and historically ranged from the Ventura River in California to Point Hope, Alaska in North America, and in northeastern Asia from Hokkaido, Japan to the Anadyr River in Russia (Healey 1991). In addition, Chinook salmon have been reported in the Canadian Beaufort Sea (McPhail and Lindsey 1970). We discuss the distribution and status of the nine species of endangered and threatened Chinook salmon separately, then summarize their common dependence on waters of the United States.

Over the past few decades, the size and distribution of Chinook salmon populations have declined because of natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Natural variations in freshwater and marine environments have substantial effects on the abundance of salmon populations. Of the various natural phenomena that affect most populations of Pacific salmon, changes in ocean productivity are generally considered most important.

Chinook salmon are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation probably contributes to significant natural mortality, although the levels of predation are largely unknown. In general, Chinook are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the increasing size of tern, seal, and sea lion populations in the Pacific Northwest has dramatically reduced the survival of adult and juvenile salmon.

Dependence on Waters of the United States

As fish (exempting the few species of fish that can survive for short periods of time out of water), Chinook salmon survive only in aquatic ecosystems and, therefore, depend on the quantity and quality of those aquatic systems. Chinook salmon, like the other salmon NMFS has listed, have declined under the combined effects of overharvests in fisheries; competition from fish raised in hatcheries and native and non-native exotic species, dams that block their migrations and alter river hydrology; gravel mining that impedes their migration and alters the dynamics

(hydrogeomorphology) of the rivers and streams that support juveniles, water diversions that deplete water levels in rivers and streams, destruction or degradation of riparian habitat that increase water temperatures in rivers and streams sufficient to reduce the survival of juvenile Chinook salmon, and land use practices (logging, agriculture, urbanization) that destroy wetland and riparian ecosystems while introducing sediment, nutrients, biocides, metals, and other pollutants into surface and ground water and degrade water quality in the freshwater, estuarine, and coastal ecosystems throughout the Pacific Northwest.

3.3.25 Salmon, Chinook (California coastal)

Distribution

California Coastal Chinook salmon includes all naturally-spawned coastal Chinook salmon spawning from Redwood Creek south through the Russian River, inclusive.

Listing status

California Coastal Chinook salmon were listed as threatened in 1999, also because of the combined effect of dams that prevent them from reaching spawning habitat, logging, agricultural activities, urbanization, and water withdrawals in the river drainages that support them. The species exists as small populations with highly variable cohort sizes. The Russian River probably contains some natural production, but the origin of those fish is not clear because of a number of introductions of hatchery fish over the last century. The Eel River contains a substantial fraction of the remaining Chinook salmon spawning habitat for this species. Critical habitat was designated for this species on September 2, 2005 (70 *Federal Register* 52630).

Critical Habitat

NMFS designated critical habitat for California coastal chinook salmon on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following hydrological units: Redwood Creek, Trinidad, Mad River, Eureka Plain, Eel River, Cape Mendocino, Mendocino Coast, and the Russian River. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding.

The critical habitat designation for California coastal chinook salmon identifies primary constituent elements that include sites necessary to support one or more Chinook salmon life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation, and the areas that were excluded from designation.

In total, California Coastal Chinook salmon occupy 45 watersheds (freshwater and estuarine). The total area of habitat designated as critical includes about 1,500 miles of stream habitat and about 25 square miles of estuarine habitat, mostly within Humboldt Bay. This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bank-full elevation. In estuarine areas the lateral extent is

defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats, and while they are foraging. Of the 45 watershed reviewed in NMFS' assessment of critical habitat for California coastal chinook salmon, eight watersheds received a low rating of conservation value, 10 received a medium rating, and 27 received a high rating of conservation value for the species.

Critical habitat for California coastal chinook salmon consists of limited quantity and quality summer and winter rearing habitat, as well as marginal spawning habitat. Compared to historical conditions, there are fewer pools, limited cover, and reduced habitat complexity. The limited instream cover that does exist is provided mainly by large cobble and overhanging vegetation. Instream large woody debris, needed for foraging sites, cover, and velocity refuges is especially lacking in most of the streams throughout the basin. NMFS has determined that these degraded habitat conditions are, in part, the result of many human-induced factors affecting critical habitat including dam construction, agricultural and mining activities, urbanization, stream channelization, water diversion, and logging, among others.

3.3.26 Salmon, Chinook (Central Valley spring-run)

Distribution

The Central Valley Spring-run Chinook salmon includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California. This species includes Chinook salmon entering the Sacramento River from March to July and spawning from late August through early October, with a peak in September. Spring-run fish in the Sacramento River exhibit an ocean-type life history, emigrating as fry, sub-yearlings, and yearlings.

Status

Central Valley spring-run Chinook salmon were listed as threatened in 1999, a classification this species retained when the original listing was reviewed on June 28, 2005. This species was listed because dams isolate them from most of their historic spawning habitat and the habitat remaining to them is degraded. Central Valley spring-run Chinook historically occupied the upper reaches of all major tributaries to the Sacramento and San Joaquin rivers. Of the 21 populations identified by the California Department of Fish and Game in their status review, only 3 self-sustaining populations now exist in the upper Sacramento in Deer, Mill and Butte Creeks. Although these streams have not been affected by large impassable dams, diversions and small dams have degraded the spawning habitat.

Critical Habitat

NMFS designated critical habitat for Central Valley spring-run Chinook salmon on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following CALWATER hydrological units: Tehama, Whitmore, Redding, Eastern Tehama, Sacramento Delta, Valley-Putah-Cache, Marysville, Yuba, Valley-American, Colusa Basin, Butte Creek and Shasta Bally hydrological units. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species

identifies primary constituent elements that include sites necessary to support one or more Chinook salmon life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation and the areas that were excluded from designation.

In total, Central Valley spring-run Chinook salmon occupy 37 watersheds (freshwater and estuarine). The total area of habitat designated as critical includes about 1,100 miles of stream habitat and about 250 square miles of estuarine habitat in the San Francisco-San Pablo-Suisun Bay complex. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. In estuarine areas the lateral extent is defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats and while they are foraging. Of the 37 watersheds reviewed in NMFS' assessment of critical habitat for Central Valley spring-run Chinook salmon, seven watersheds received a low rating of conservation value, three received a medium rating and 27 received a high rating of conservation value for the species.

Factors contributing to the downward trends in this species include: reduced access to spawning/rearing habitat behind impassable dams, climatic variation, water management activities, hybridization with fall-run Chinook salmon, predation and harvest (CDFG, 1998). Several actions have been taken to improve and increase the primary constituent elements of critical habitat for spring-run Chinook salmon. These include improved management of Central Valley water, implementing new and improved screen and ladder designs at major water diversions along the mainstem Sacramento River and tributaries, removal of several small dams on important spring-run Chinook salmon spawning streams and changes in ocean and inland fishing regulations to minimize harvest. Although protective measures and critical habitat restoration likely have contributed to recent increases in spring-run Chinook salmon abundance, the species is still below levels observed from the 1960s through 1990. Many threats still exist.

3.3.27 Salmon, Chinook (Lower Columbia River)

Distribution

Lower Columbia River Chinook salmon includes all native populations from the mouth of the Columbia River to the crest of the Cascade Range, excluding populations above Willamette Falls. The Cowlitz, Kalama, Lewis, White Salmon, and Klickitat Rivers are the major river systems on the Washington side, and the lower Willamette and Sandy Rivers are foremost on the Oregon side. The eastern boundary for this species occurs at Celilo Falls, which corresponds to the edge of the drier Columbia Basin Ecosystem and historically may have been a barrier to salmon migration at certain times of the year.

Status

Lower Columbia River Chinook salmon were listed as threatened on June 28, 2005. Critical habitat was designated for this species on September 2, 2005 (70 *Federal Register* 52630).

Critical Habitat

NMFS designated critical habitat for Lower Columbia River Chinook salmon on September 2, 2005 (70 FR 52630). Designated critical habitat includes all Columbia River estuarine areas and river reaches proceeding upstream to the confluence with the Hood Rivers as well as specific stream reaches in a number of tributary subbasins. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more Chinook salmon life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity.

3.3.28 Salmon, Chinook (Puget Sound)

Distribution

Puget Sound Chinook salmon include all runs of Chinook salmon in the Puget Sound region from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula. Chinook salmon in this area generally have an "ocean-type" life history. Thirty-six hatchery populations were included as part of the ESU and five were considered essential for recovery and listed including spring Chinook from Kendall Creek, the North Fork Stillaguamish River, White River, and Dungeness River, and fall run fish from the Elwha River.

Status

Puget Sound Chinook salmon were listed as threatened in 1999; that status was re-affirmed on June 28, 2005.

Critical Habitat

NMFS designated critical habitat for Puget Sound Chinook salmon on September 2, 2005 (70 FR 52630). The specific geographic area includes portions of the Nooksack River, Skagit River, Sauk River, Stillaguamish River, Skykomish River, Snoqualmie River, Lake Washington, Green River, Puyallup River, White River, Nisqually River, Hamma Hamma River and other Hood Canal watersheds, the Dungeness/ Elwha Watersheds, and nearshore marine areas of the Strait of Georgia, Puget Sound, Hood Canal and the Strait of Juan de Fuca. This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation.

The designation for this species includes sites necessary to support one or more Chinook salmon life stages. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. Specific primary constituent elements include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat, and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and

floodplain connectivity.

3.3.29 Salmon, Chinook (Sacramento River winter-run)

Distribution

Sacramento River winter-run Chinook salmon consists of a single spawning population that enters the Sacramento River and its tributaries in California from November to June and spawns from late April to mid-August, with a peak from May to June.

Status

Sacramento River winter-run Chinook salmon were listed as endangered on January 4, 1994 because dams only allow them to access a small fraction of their historic spawning habitat and the habitat remaining to them is degraded. Sacramento River winter Chinook historically occupied cold, headwater streams, such as the upper reaches of the Little Sacramento, McCloud, and lower Pit Rivers. Sacramento River winter-run Chinook salmon consist of a single self-sustaining population which is entirely dependent upon the provision of suitably cool water from Shasta Reservoir during periods of spawning, incubation and rearing.

When NMFS listed Sacramento River winter-run Chinook salmon as endangered and designated critical habitat for the species, its final rules to list the species and designated its critical habitat identified section 404 permits the USACE issued in the Sacramento River, Sacramento River-San Joaquin Delta, and San Francisco Bay as one of the reasons for the listing (*57 Federal Register 36626, 59 Federal Register 440*).

Critical Habitat

NMFS designated critical habitat for Sacramento River winter-run Chinook salmon on June 16, 1993 (58 FR 33212). The following areas consisting of the water, waterway bottom and adjacent riparian zones: the Sacramento River from Keswick Dam, Shasta County (river mile 302) to Chipps Island (river mile 0) at the westward margin of the Sacramento-San Joaquin Delta and other specified estuarine waters. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. Factors contributing to the downward trends in this species include reduced access to spawning/rearing habitat, possible loss of genetic integrity through population bottlenecks, inadequately screened diversions, predation at artificial structures and by nonnative species, pollution from Iron Mountain Mine and other sources, adverse flow conditions, high summer water temperatures, unsustainable harvest rates, passage problems at various structures and vulnerability to drought (Good *et al.*, 2005).

3.3.30 Salmon, Chinook (Snake River fall-run)

Distribution

The present range of spawning and rearing habitat for naturally-spawned Snake River fall Chinook salmon is primarily limited to the Snake River below Hells Canyon Dam and the lower reaches of the Clearwater, Grand Ronde, Salmon, and Tucannon Rivers.

Status

Snowy River fall-run Chinook salmon were originally listed as endangered in 1992 but were reclassified as

threatened on June 28, 2005. Critical habitat for these salmon was designated on December 28, 1993. This critical habitat encompasses the waters, waterway bottoms, and adjacent riparian zones of specified lakes and river reaches in the Columbia River that are or were accessible to listed Snake River salmon (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams).

Critical Habitat

NMFS designated critical habitat for Snake River fall-run Chinook salmon on December 28, 1993 (58 FR 68543). This critical habitat encompasses the waters, waterway bottoms and adjacent riparian zones of specified lakes and river reaches in the Columbia River that are or were accessible to ESA listed Snake River salmon (except reaches above impassable natural falls and Dworshak and Hells Canyon Dams). These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. Adjacent riparian zones are defined as those areas within a horizontal distance of 300 feet from the normal line of high water of a stream channel or from the shoreline of a standing body of water. Designated critical habitat includes the Columbia River from a straight line connecting the west end of the Clatsop jetty (Oregon side) and the west end of the Peacock jetty (Washington side) and including all river reaches from the estuary upstream to the confluence of the Snake River and all Snake River reaches upstream to Hells Canyon Dam. Critical habitat also includes several river reaches presently or historically accessible to Snake River fall-run Chinook salmon. Limiting factors identified for Snake River fall-run Chinook salmon include: mainstem lower Snake and Columbia hydrosystem mortality, degraded water quality, reduced spawning and rearing habitat due to mainstem lower Snake River hydropower system, harvest impacts, impaired stream flows, barriers to fish passage in tributaries, excessive sediment and altered floodplain and channel morphology (NMFS 2005b).

3.3.31 Salmon, Chinook (Snake River spring/summer-run)

Distribution

Snake River spring/summer-run Chinook salmon are primarily limited to the Salmon, Grande Ronde, Imnaha, and Tucannon Rivers in the Snake River basin.

Status

Snake River spring/summer-run Chinook salmon were originally listed as endangered in 1992, but were reclassified as threatened on June 28, 2005. Critical habitat for these salmon was designated on October 25, 1999. This critical habitat encompasses the waters, waterway bottoms, and adjacent riparian zones of specified lakes and river reaches in the Columbia River that are or were accessible to listed Snake River salmon (except reaches above impassable natural falls, and Dworshak and Hells Canyon Dams) and is well beyond the area that is likely to be directly or indirectly affected by the proposed action.

Critical Habitat

NMFS designated critical habitat for Snake River spring/summer-run Chinook salmon on October 25, 1999 (64 FR 57399). This critical habitat encompasses the waters, waterway bottoms and adjacent riparian zones of specified lakes and river reaches in the Columbia River that are or were accessible to ESA listed Snake River salmon (except reaches above impassable natural falls and Dworshak and Hells Canyon Dams). Adjacent riparian zones are defined as those areas within a horizontal distance of 300 feet from the normal line of high water of a stream channel or

from the shoreline of a standing body of water. Designated critical habitat includes the Columbia River from a straight line connecting the west end of the Clatsop jetty (Oregon side) and the west end of the Peacock jetty (Washington side) and including all river reaches from the estuary upstream to the confluence of the Snake River and all Snake River reaches upstream to Hells Canyon Dam; the Palouse River from its confluence with the Snake River upstream to Palouse Falls, the Clearwater River from its confluence with the Snake River upstream to its confluence with Lolo Creek; the North Fork Clearwater River from its confluence with the Clearwater river upstream to Dworshak Dam. Critical habitat also includes several river reaches presently or historically accessible to Snake River spring/summer Chinook salmon. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. Limiting factors identified for this species include hydrosystem mortality, reduced stream flow, altered channel morphology and floodplain, excessive fine sediment and degraded water quality (NMFS 2006).

3.3.32 Salmon, Chinook (Upper Columbia River spring-run)

Distribution

Endangered Upper Columbia River spring-run Chinook salmon includes stream-type Chinook salmon that inhabit tributaries upstream from the Yakima River to Chief Joseph Dam. They currently spawn in only three river basins above Rock Island Dam: the Wenatchee, Entiat, and Methow Rivers. Several hatchery populations are also listed including those from the Chiwawa, Methow, Twisp, Chewuch, and White rivers, and Nason Creek.

Status

Upper Columbia River spring-run Chinook salmon were listed as endangered on June 28, 2005, because they had been reduced to small populations in three watersheds. Population viability analyses for this species (using the Dennis Model) suggest that these Chinook salmon face a significant risk of extinction: a 75 to 100 percent probability of extinction within 100 years (given return rates for 1980 to present).

Critical Habitat

NMFS designated critical habitat for Upper Columbia River spring-run Chinook salmon on September 2, 2005 (70 FR 52630). The designation includes all Columbia River estuaries and river reaches upstream to Chief Joseph Dam and several tributary subbasins. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more Chinook salmon life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The Upper Columbia River spring-run Chinook salmon species has 31 watersheds within its range. Five watersheds received a medium rating and 26 received a high rating of conservation value to the species. The Columbia River rearing/migration corridor downstream of the spawning range was rated as a high conservation value. Factors contributing to the downward trends in this species include mainstem Columbia River hydropower system mortality,

tributary riparian degradation and loss of in-river wood, altered tributary floodplain and channel morphology, reduced tributary stream flow and impaired passage and harvest impacts.

3.3.33 Salmon, Chinook (Upper Willamette River)

Distribution

Upper Willamette River Chinook salmon occupy the Willamette River and tributaries upstream of Willamette Falls. Historically, access above Willamette Falls was restricted to the spring when flows were high. In autumn, low flows prevented fish from ascending past the falls. The Upper Willamette spring-run Chinook are one of the most genetically distinct Chinook groups in the Columbia River Basin. Fall-run Chinook salmon spawn in the Upper Willamette but are not considered part of the species because they are not native. None of the hatchery populations in the Willamette River were listed although five spring-run hatchery stocks were included in the species' listing.

Status

Upper Willamette River Chinook salmon were listed as threatened in 1999.

Critical Habitat

NMFS designated critical habitat for Upper Willamette River Chinook salmon on September 2, 2005 (70 FR 52630). Critical habitat for upper Willamette River Chinook salmon includes defined areas within subbasins of the middle fork Willamette River, upper Willamette River, McKenzie River, Santiam River, Crabtree Creek, Molalla River and Clackamas River. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more Chinook salmon life stages. Specific sites include freshwater spawning and rearing sites, freshwater migration corridors. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. Of 65 subbasins reviewed in NMFS' assessment of critical habitat for the Upper Willamette River Chinook salmon species, 19 subbasins were rated as having a medium conservation value, 19 were rated as low, and the 27 remaining subbasins were rated as having a high conservation value to Upper Willamette River Chinook salmon. Federal lands were generally rated as having high conservation value to the species' spawning and rearing. Factors contributing to the downward trends in this species include reduced access to spawning/rearing habitat in tributaries, hatchery impacts, altered water quality and temperature in tributaries, altered stream flow in tributaries and lost or degraded floodplain connectivity and lowland stream habitat.

Chum Salmon

Historically, chum salmon were distributed throughout the coastal regions of western Canada and the United States, as far south as Monterey Bay, California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast. Chum salmon are semelparous, spawn primarily in freshwater and, apparently, exhibit obligatory anadromy (there are no recorded landlocked or naturalized freshwater populations) (Randall *et al.* 1987).

Chum salmon spend two to five years in feeding areas in the northeast Pacific Ocean, which is a greater proportion of their life history than other Pacific salmonids. Chum salmon distribute throughout the North Pacific Ocean and Bering Sea, although North American chum salmon (as opposed to chum salmon originating in Asia), rarely occur west of 175° E longitude (Johnson *et al.* 1997).

North American chum salmon migrate north along the coast in a narrow coastal band that broadens in southeastern Alaska, although some data suggest that Puget Sound chum, including Hood Canal summer run chum, may not make extended migrations into northern British Columbian and Alaskan waters, but instead may travel directly offshore into the north Pacific Ocean (Johnson *et al.* 1997).

Chum salmon, like pink salmon, usually spawn in the lower reaches of rivers, with redds usually dug in the mainstem or in side channels of rivers from just above tidal influence to nearly 100 km from the sea. Juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds (Salo 1991). This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus *Oncorhynchus* (e.g., coastal cutthroat trout, steelhead, Coho salmon, and most types of Chinook and sockeye salmon), which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions (unlike stream-type salmonids which depend heavily on freshwater habitats) than on favorable estuarine conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp predators (Miller and Brannon 1982).

Chum salmon have been threatened by overharvests in commercial and recreational fisheries, adult and juvenile mortalities associated with hydropower systems, habitat degradation from forestry and urban expansion, and shifts in climatic conditions that changed patterns and intensity of precipitation.

Dependence on Waters of the United States

As fish (exempting the few species of fish that can survive for short periods of time out of water), chum salmon survive only in aquatic ecosystems and, therefore, depend on the quantity and quality of those aquatic systems. Chum salmon, like the other salmon NMFS has listed, have declined under the combined effects of overharvests in fisheries; competition from fish raised in hatcheries and native and non-native exotic species, dams that block their migrations and alter river hydrology; gravel mining that impedes their migration and alters the dynamics (hydrogeomorphology) of the rivers and streams that support juveniles, water diversions that deplete water levels in rivers and streams, destruction or degradation of riparian habitat that increase water temperatures in rivers and streams sufficient to reduce the survival of juvenile chum salmon, and land use practices (logging, agriculture, urbanization) that destroy wetland and riparian ecosystems while introducing sediment, nutrients, biocides, metals, and other pollutants into surface and ground water and degrade water quality in the freshwater, estuarine, and coastal ecosystems throughout the Pacific Northwest.

3.3.34 Salmon, Chum (Columbia River)

Distribution

Columbia River chum salmon includes all natural-origin chum salmon in the Columbia River and its tributaries in Washington and Oregon. The species consists of three populations: Grays River, Hardy, and Hamilton Creek in Washington State

Status

Columbia River chum salmon were listed as threatened in 1999. Critical habitat was originally designated for this on February 16, 2000 (65 *Federal Register* 7764) and was re-designated on September 2, 2005 (70 *Federal Register* 52630).

Critical Habitat

NMFS designated critical habitat for Columbia River chum salmon on September 2, 2005 (70 FR 52630). The designated includes defined areas in the following subbasins: Middle Columbia/Hood, Lower Columbia/Sandy, Lewis, Lower Columbia/Clatskanie, Lower Cowlitz, Lower Columbia subbasin and river corridor. This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation.

The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more chum salmon life stages. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding and are rated as having high conservation value to the species. Columbia River chum salmon have primary constituent elements of freshwater spawning, freshwater rearing, freshwater migration, estuarine areas free of obstruction, nearshore marine areas free of obstructions, and offshore marine areas with good water quality. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity.

Of 21 subbasins reviewed in NMFS' assessment of critical habitat for the Columbia River chum salmon, three subbasins were rated as having a medium conservation value, no subbasins were rated as low, and the majority of subbasins (18), were rated as having a high conservation value to Columbia River chum salmon. The major factors limiting recovery for Columbia River chum salmon are altered channel form and stability in tributaries, excessive sediment in tributary spawning gravels, altered stream flow in tributaries and the mainstem Columbia River, loss of some tributary habitat types, and harassment of spawners in the tributaries and mainstem.

3.3.35 Salmon, Chum (Hood Canal summer run)

Distribution

Hood Canal summer-run chum salmon includes summer-run chum salmon populations in Hood Canal in Puget Sound and in Discovery and Sequim Bays on the Strait of Juan de Fuca. It may also include summer-run fish in the Dungeness River, but the existence of that run is uncertain. Of the sixteen populations of summer chum that are included in this species, seven are considered to be "functionally extinct" (Skokomish, Finch Creek, Anderson

Creek, Dewatto, Tahuya, Big Beef Creek, and Chemicum). The remaining nine populations are well distributed throughout the range of the species except for the eastern side of Hood Canal (Johnson et al. 1997).

Five hatchery populations are considered part of the species including those from the Quilcene National Fish Hatchery, Long Live the Kings Enhancement Project (Lilliwaup Creek), Hamma Hamma River Supplementation Project, Big Beef Creek reintroduction Project, and the Salmon Creek supplementation project in Discovery Bay. Although included as part of the species, none of the hatchery populations were listed.

Status

Hood Canal summer-run chum salmon were listed as endangered on March 25, 1999. Critical habitat for this species was designated on September 2, 2005 (70 Federal Register 52630).

Critical Habitat

NMFS designated critical habitat for Hood Canal summer-run chum salmon on September 2, 2005 (70 FR 52630). The specific geographic area includes the Skokomish River, Hood Canal subbasin, which includes the Hamma Hamma and Dosewallips rivers and others, the Puget Sound subbasin, Dungeness/Elwha subbasin, and nearshore marine areas of Hood Canal and the Strait of Juan de Fuca from the line of extreme high tide to a depth of 30 meters. This includes a narrow nearshore zone from the extreme high-tide to mean lower low tide within several Navy security/restricted zones. This also includes about 8 miles of habitat that was unoccupied at the time of the designation in Finch, Anderson and Chimacum creeks (69 FR 74572; 70 FR 52630), but has recently been re-seeded. Chimacum Creek, however, has been naturally recolonized since at least 2007. The designation for Hood Canal summer-run chum, like others made at this time, includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bank-full elevation.

The specific primary constituent elements identified for Hood Canal summer-run chum salmon are areas for spawning, freshwater rearing and migration, estuarine areas free of obstruction, nearshore marine areas free of obstructions, and offshore marine areas with good water quality. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity.

Of 17 subbasins reviewed in NMFS' assessment of critical habitat for the Hood Canal chum salmon, 14 subbasins were rated as having a high conservation value, while only three were rated as having a medium value to the conservation. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. Limiting factors identified for this species include degraded floodplain and mainstem river channel structure, degraded estuarine conditions and loss of estuarine habitat, riparian area degradation and loss of in-river wood in mainstem, excessive sediment in spawning gravels, and reduced stream flow in migration areas.

Coho Salmon

Coho salmon occur naturally in most major river basins around the North Pacific Ocean from central California to

northern Japan (Laufle *et al.* 1986). After entering the ocean, immature Coho salmon initially remain in near-shore waters close to the parent stream. Most Coho salmon adults are 3-year-olds, having spent approximately 18 months in freshwater and 18 months in salt water. Wild female Coho return to spawn almost exclusively at age 3. Spawning escapements of Coho salmon are dominated by a single year class. The abundance of year classes can fluctuate dramatically with combinations of natural and human-caused environmental variation.

North American Coho salmon will migrate north along the coast in a narrow coastal band that broadens in southeastern Alaska. During this migration, juvenile Coho salmon tend to occur in both coastal and offshore waters. During spring and summer, Coho salmon will forage in waters between 46° N, the Gulf of Alaska, and along Alaska's Aleutian Islands.

Dependence on Waters of the United States

As fish (exempting the few species of fish that can survive for short periods of time out of water), Coho salmon survive only in aquatic ecosystems and, therefore, depend on the quantity and quality of those aquatic systems. Coho salmon, like the other salmon NMFS has listed, have declined under the combined effects of overharvests in fisheries; competition from fish raised in hatcheries and native and non-native exotic species, dams that block their migrations and alter river hydrology; gravel mining that impedes their migration and alters the dynamics (hydrogeomorphology) of the rivers and streams that support juveniles, water diversions that deplete water levels in rivers and streams, destruction or degradation of riparian habitat that increase water temperatures in rivers and streams sufficient to reduce the survival of juvenile Coho salmon, and land use practices (logging, agriculture, urbanization) that destroy wetland and riparian ecosystems while introducing sediment, nutrients, biocides, metals, and other pollutants into surface and ground water and degrade water quality in the freshwater, estuarine, and coastal ecosystems throughout the Pacific Northwest.

When NMFS proposed Oregon coast, Southern Oregon Northern Coastal California, and Central California Coast Coho salmon as threatened, the proposal also identified the loss of wetland habitat, including the USACE's failure to consider the cumulative impact of its 404 permits, as one of several reasons for listing these salmon as threatened (60 *Federal Register* 38011, 61 *Federal Register* 56138).

3.3.36 Salmon, Coho (Central California Coast)

Distribution

Central California Coho salmon consist of all Coho salmon that reproduce in streams between Punta Gorda and the San Lorenzo River, including hatchery stocks (except for the Warm Springs Hatchery on the Russian River), although hatchery populations are not listed.

Status

Historically, central California Coho salmon were known to have occurred in 186 streams along the central coast of California. Spawning populations of these Coho salmon have been extirpated from 71 (53 percent) of the 133 streams for which recent data are available. Based on this evidence, we assume that spawning populations of this species have been extirpated from at least half of the species' historic distribution.

Although some of the spawning populations that remain are estimated to number in the hundreds, most of these populations have some Cohorts that number in the tens of individuals; their loss would create gaps in the number of Cohorts that represent a spawning population that are equivalent to the loss of year-classes of age-structured populations. The largest Cohorts of several other spawning populations — for example at Olema, Noyo, and Scott Creeks — are estimated to number less than 200 individuals while the smaller Cohorts are estimated to number about 23 (Olema Creek), 59 (Noyo Creek), 9 (Scott Creek) individuals with declining trends. These sizes are small enough to leave these Cohorts with high risks of declining to zero in the short term. None of the remaining spawning populations of central California coastal Coho salmon are large enough to “rescue” the spawning populations that have been extirpated or that are on the brink of being extirpated.

The combination of the threats facing this species of Coho salmon (habitat loss and landscape alteration associated with the urban, suburban, and exurban centers of the San Francisco Bay region; water pollution, competition and predation by exotic species) and the species’ status and trend, this species faces severe and imminent risks of extinction in the near future.

Critical Habitat For Coho Salmon (Central California Coast)

NMFS designated critical habitat for central California coast Coho salmon on May 5, 1999 (64 FR 24049). The designation encompasses accessible reaches of all rivers (including estuarine areas and riverine reaches) between Punta Gorda and the San Lorenzo River (inclusive) in California, including two streams entering San Francisco Bay: Arroyo Corte Madera Del Presidio and Corte Madera Creek. This critical habitat designation includes all waterways, substrate, and adjacent riparian zones of estuarine and riverine reaches (including off-channel habitats) below longstanding naturally impassable barriers (i.e. natural waterfalls in existence for at least several hundred years). These areas are important for the species’ overall conservation by protecting growth, reproduction, and feeding.

3.3.37 Salmon, Coho (Lower Columbia River)

Distribution

Lower Columbia River Coho salmon include all naturally spawned populations of Coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon, as well as twenty-five artificial propagation programs: the Grays River, Sea Resources Hatchery, Peterson Coho Project, Big Creek Hatchery, Astoria High School Coho Program, Warrenton High School Coho Program, Elochoman Type-S Coho Program, Elochoman Type-N Coho Program, Cathlamet High School FFA Type-N Coho Program, Cowlitz Type-N Coho Program in the Upper and Lower Cowlitz Rivers, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, North Fork Toutle River Hatchery, Kalama River Type-N Coho Program, Kalama River Type-S Coho Program, Washougal Hatchery Type-N Coho Program, Lewis River Type-N Coho Program, Lewis River Type-S Coho Program, Fish First Wild Coho Program, Fish First Type-N Coho Program, Syverson Project Type-N Coho Program, Eagle Creek National Fish Hatchery, Sandy Hatchery, and the Bonneville/Cascade/Oxbow complex Coho hatchery programs.

Status

Lower Columbia River Coho salmon were listed as endangered on June 28, 2005 (70 *Federal Register* 37160).

Critical habitat has not been designated for this species.

3.3.38 Salmon, Coho (Oregon Coast)

Distribution

The Oregon Coast Coho salmon species includes all naturally spawned populations of Coho salmon in Oregon coastal streams south of the Columbia River and north of Cape Blanco (63 FR 42587; August 1998). One hatchery population, the Cow Creek hatchery Coho salmon, is considered part of the species

Status

The Oregon coast Coho salmon species was listed as a threatened species under the ESA on February 11, 2008 (73 FR 7816). The most recent NMFS status review for the Oregon Coast Coho species was conducted by the biological review team in 2003, which assessed data through 2002. The abundance and productivity of Oregon Coast Coho since the previous status review represented some of the best and worst years on record (Sandercock, 1991). Yearly adult returns for the Oregon Coast Coho species were over 160,000 natural spawners in 2001 and over 260,000 in 2002, far exceeding the abundance observed for the past several decades (Good *et al.*, 2005). These increases in spawner abundance in 2000 to 2002 followed three consecutive brood years (the 1994 to 1996 brood years returning in 1997 to 1999, respectively) exhibiting recruitment failure (recruitment failure is when a given year class of natural spawners fails to replace itself when its offspring return to the spawning grounds 3 years later). These 3 years of recruitment failure were the only such instances observed thus far in the entire 55-year abundance time series for Oregon Coast Coho salmon (although comprehensive population-level survey data have only been available since 1980). The 2000 to 2002 increases in natural spawner abundance occurred in many populations in the northern portion of the species, which were the most depressed at the time of the last review (Sandercock, 1991). Although encouraged by the increase in spawner abundance in 2000 to 2002, the biological review team noted that the long-term trends in species productivity were still negative due to the low abundances observed during the 1990s

Critical Habitat

NMFS designated critical habitat for Oregon Coast Coho on February 11, 2008 (73 FR 7816). The designation includes 72 of 80 watersheds occupied by Oregon Coast Coho salmon, and totals about 6,600 stream miles including all or portions of the Nehalem, Nestucca/Trask, Yaguina, Alsea, Umpqua and Coquille basins. These areas are essential for feeding, migration, spawning and rearing. The specific primary constituent elements include: spawning sites with water and substrate quantity to support spawning, incubation and larval development; freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth, foraging, behavioral development (e.g., predator avoidance, competition) and mobility; freshwater migratory corridors free of obstruction with adequate water quantity and quality conditions; and estuarine, nearshore and offshore areas free of obstruction with adequate water quantity, quality and salinity conditions that support physiological transitions between fresh- and saltwater, predator avoidance, foraging and other life history behaviors.

3.3.39 Salmon, Coho (Southern Oregon Northern Coastal California)

Distribution

Southern Oregon/Northern California coast Coho salmon consists of all naturally spawning populations of Coho

salmon that reside below long-term, naturally impassible barriers in streams between Punta Gorda, California and Cape Blanco, Oregon. The geographic area of the listed species encompasses five of the seven hatchery stocks reared and released within the species' range of the species although none of the hatchery populations are listed. The three major river systems supporting Southern Oregon – Northern Coastal California coast Coho are the Rogue, Klamath (including the Trinity), and Eel rivers.

Status

Southern Oregon/Northern California coast Coho salmon were listed as threatened in 1997; they retained that classification when their status was reviewed on June 28, 2005 (70 *Federal Register* 37160). Critical habitat for this species encompasses accessible reaches of all rivers (including estuarine areas and tributaries) between the Mattole River in California and the Elk River in Oregon, inclusive (62 *Federal Register* 62741, November 25, 1997). That critical habitat was re-designated on May 5, 1999 (64 *Federal Register* 24049).

Critical Habitat

NMFS designated critical habitat for Southern Oregon/Northern California Coast Coho salmon on May 5, 1999 (64 FR 24049). Critical habitat for this species encompasses all accessible river reaches between Cape Blanco, Oregon, and Punta Gorda, California. Critical habitat consists of the water, substrate, and river reaches (including off-channel habitats) in specified areas. Accessible reaches are those within the historical range of the species that can still be occupied by any life stage of Coho salmon.

Of 155 historical streams for which data are available, 63% likely still support Coho salmon. These river habitats are important for a variety of reasons, such as supporting the feeding and growth of juveniles and serving as spawning habitat for adults. Limiting factors identified for this species include: loss of channel complexity, connectivity and sinuosity, loss of floodplain and estuarine habitats, loss of riparian habitats and large in-river wood, reduced stream flow, poor water quality, temperature and excessive sedimentation, and unscreened diversions and fish passage structures.

Sockeye Salmon

Sockeye salmon occur in the North Pacific and Arctic oceans and associated freshwater systems. This species ranges south as far as the Klamath River in California and northern Hokkaido in Japan, to as far north as Bathurst Inlet in the Canadian Arctic and the Anadyr River in Siberia. Sockeye salmon were an important food source for aboriginal people who either ate them fresh or dried them for winter use. Today sockeye salmon remain an important mainstay of many subsistence users and support one of the most important commercial and recreational fisheries on the Pacific coast of North America.

Sockeye salmon can be distinguished from Chinook, Coho, and pink salmon by the lack of large, black spots and from chum salmon by the number and shape of gill rakers on the first gill arch. Sockeye salmon have 28 to 40 long, slender, rough or serrated closely set rakers on the first arch.

Dependence on Waters of the United States

As fish (exempting the few species of fish that can survive for short periods of time out of water), Coho salmon

survive only in aquatic ecosystems and, therefore, depend on the quantity and quality of those aquatic systems. Coho salmon, like the other salmon NMFS has listed, have declined under the combined effects of overharvests in fisheries; competition from fish raised in hatcheries and native and non-native exotic species, dams that block their migrations and alter river hydrology; gravel mining that impedes their migration and alters the dynamics (hydrogeomorphology) of the rivers and streams that support juveniles, water diversions that deplete water levels in rivers and streams, destruction or degradation of riparian habitat that increase water temperatures in rivers and streams sufficient to reduce the survival of juvenile Coho salmon, and land use practices (logging, agriculture, urbanization) that destroy wetland and riparian ecosystems while introducing sediment, nutrients, biocides, metals, and other pollutants into surface and ground water and degrade water quality in the freshwater, estuarine, and coastal ecosystems throughout the Pacific Northwest.

3.3.40 Salmon, Sockeye (Ozette Lake)

Distribution

Ozette Lake sockeye salmon occur in Ozette Lake and its tributaries on the Olympic Peninsula of Washington, fish produced by two artificial propagation programs — the Umbrella Creek and Big River sockeye hatchery programs — have been included in the listing.

Status

Ozette Lake sockeye salmon were originally listed as endangered in 1991 and retained that classification when their status was reviewed on June 28, 2005 (70 *Federal Register* 37160).

Critical Habitat

On September 2, 2005, NMFS designated critical habitat for the Ozette Lake sockeye salmon species (70 FR 52630). The specific geographic areas designated as critical are the Hoh/Quillayute Subbasin, Ozette Lake and the Ozette Lake watershed, and include: the Ozette River upstream to endpoints in Big River, Coal Creek, East Branch Umbrella Creek, the North and South Fork of Crooked Creek and several other tributaries. The specific primary constituent elements identified for Lake Ozette sockeye salmon are areas for spawning, freshwater rearing and migration, estuarine areas free of obstruction, nearshore marine areas free of obstructions and offshore marine areas with good water quality. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage and adequate passage conditions. Only one watershed supports this species and it is rated as having a high conservation value. This watershed is essential to the species' overall conservation by protecting quality growth, reproduction and feeding..

3.3.41 Salmon, Sockeye (Snake River)

Distribution

Snake River sockeye salmon includes populations of sockeye salmon from the Snake River Basin, Idaho, although the only remaining populations of this species occur in the Stanley River Basin of Idaho.

Status

Snake River sockeye salmon were originally listed as endangered in 1991 and retained that classification when their status was reviewed on June 28, 2005 (70 *Federal Register* 37160).

Critical Habitat

Critical habitat for these salmon was designated on December 28, 1993 (58 FR 68543) and encompasses the waters, waterway bottoms and adjacent riparian zones of specified lakes and river reaches in the Columbia River that are or were accessible to ESA listed Snake River salmon (except reaches above impassable natural falls and Dworshak and Hells Canyon Dams). Adjacent riparian zones are defined as those areas within a horizontal distance of 300 feet from the normal line of high water of a stream channel or from the shoreline of a standing body of water. Designated critical habitat includes the Columbia River from a straight line connecting the west end of the Clatsop jetty (Oregon side) and the west end of the Peacock jetty (Washington side) and including all river reaches from the estuary upstream to the confluence of the Snake River and all Snake River reaches upstream to the confluence of the Salmon River; all Salmon River reaches to Alturas Lake Creek; Stanley, Redfish, yellow Belly, Pettit and Alturas Lakes (including their inlet and outlet creeks); Alturas Lake Creek and that portion of Valley Creek between Stanley Lake Creek and the Salmon River. Critical habitat also includes all river lakes and reaches presently or historically accessible to Snake River sockeye salmon. These habitats are critical for the conservation of the species because it provides spawning and juvenile rearing habitat, areas for juvenile growth and development and migration corridors for smolts to the ocean and adults to spawning habitat from the Pacific Ocean. Limiting factors identified for Snake River sockeye include: reduced tributary stream flow, impaired tributary passage and blocks to migration and mainstem Columbia River hydropower system mortality

3.3.42 Smalltooth sawfish (U.S. portion of range)

Distribution

The U.S. population of smalltooth sawfish is found only in the Atlantic Ocean and Gulf of Mexico. Historically, the U.S. population was common throughout the Gulf of Mexico from Texas to Florida, and along the east coast from Florida to Cape Hatteras. The range of this species has contracted to peninsular Florida, including the Everglades-Florida Bay region north to the Caloosahatchie River on Florida's western coast.

Status

The United State's population of smalltooth sawfish were listed as endangered on April 1, 2003, because of population declines caused by their incidental capture and death in commercial fisheries and the destruction and degradation of rearing habitat — mangrove forests and seagrass beds — for juvenile sawfish.

Dependence on Waters of the United States

Juvenile sawfish depend on habitats, such as mangrove forests and seagrass beds, as nursery habitat.

Critical Habitat

NMFS designated critical habitat for smallrooth sawfish on September 2, 2009 (74 FR 45353). The designation consists of two units: the Charlotte Harbor Estuary Unit and the Ten Thousand Islands/Everglades Unit, which are located along the southwestern coast of Florida between Charlotte Harbor and Florida Bay

The physical and biological features essential to the conservation of smalltooth sawfish, which provide nursery area functions are: red mangroves and shallow euryhaline habitats characterized by water depths between the Mean High Water line and 3 ft (0.9 m) measured at Mean Lower Low Water. These features are included in critical habitat within the boundaries of the specific areas in paragraph (b) of this section, except where the features were not physically accessible to sawfish at the time of this designation (September 2009); for example, areas where existing water control structures prevent sawfish passage to habitats beyond the structure.

Steelhead

Steelhead are distributed from Alaska south to southern California. They can be divided into two basic run-types: the stream-maturing type, or summer steelhead, enters fresh water in a sexually immature condition and requires several months in freshwater to mature and spawn and the ocean-maturing type, or winter steelhead, enters fresh water with well-developed gonads and spawns shortly after river entry (61 *Federal Register* 41542).

General life history information

Summer steelhead enter freshwater between May and October in the Pacific Northwest (Busby *et al.* 1996). Winter steelhead enter freshwater between November and April in the Pacific Northwest (Busby *et al.* 1996). Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity. Intermittent streams may also be used for spawning (Barnhart 1986, Everest 1973). Depending on water temperature, steelhead eggs may incubate for 1.5 to 4 months (61 *Federal Register* 41542) before hatching. Juveniles rear in fresh water from one to four years, then migrate to the ocean as smolts (61 *Federal Register* 41542). Winter steelhead populations generally smolt after two years in fresh water (Busby *et al.* 1996).

Dependence on Waters of the United States

Steelhead, like the other salmon discussed previously, survive only in aquatic ecosystems and, therefore, depend on the quantity and quality of those aquatic systems. Steelhead, like the other salmon NMFS has listed, have declined under the combined effects of overharvests in fisheries; competition from fish raised in hatcheries and native and non-native exotic species, dams that block their migrations and alter river hydrology; gravel mining that impedes their migration and alters the dynamics (hydrogeomorphology) of the rivers and streams that support juveniles, water diversions that deplete water levels in rivers and streams, destruction or degradation of riparian habitat that increase water temperatures in rivers and streams sufficient to reduce the survival of juvenile Coho salmon, and land use practices (logging, agriculture, urbanization) that destroy wetland and riparian ecosystems while introducing sediment, nutrients, biocides, metals, and other pollutants into surface and ground water and degrade water quality in the freshwater, estuarine, and coastal ecosystems throughout the Pacific Northwest and California.

When NMFS proposed and listed Central California Coast, South Central California Coast, Central Valley, Upper Columbia River, Snake River Basin, Lower Columbia River, and Northern California steelhead as threatened and Southern California steelhead as endangered, NMFS identified the loss of wetland habitat as one of the reasons these steelhead warranted protection under the ESA (61 *Federal Register* 41541, 62 *Federal Register* 43937).

3.3.43 Steelhead (California Central Valley)

Distribution

California central valley steelhead occupy the Sacramento and San Joaquin Rivers and their tributaries.

Status

California Central valley steelhead were listed as threatened in 1998, when their status was reviewed on January 5, 2006 they retained that classification (71 *Federal Register* 834).

Critical Habitat

NMFS designated critical habitat for California Central Valley steelhead on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following CALWATER hydrological units: Tehama, Whitmore, Redding, Eastern Tehama, Sacramento Delta, Valley-Putach-Cache, American River, Marysville, Yuba, Valley American, Colusa Basin, Butte Creek, Ball Mountain, Shata Bally, North Valley Floor, Upper Calaveras, Stanislaus River, San Joaquin Valley, Delta-Mendota Canal, North Diablo Range and the San Joaquin Delta. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation and the areas that were excluded from designation.

In total, California Central Valley steelhead occupy 67 watersheds (freshwater and estuarine). The total area of habitat designated as critical includes about 2,300 miles of stream habitat and about 250 square miles of estuarine habitat in the San Francisco-San Pablo-Suisan Bay estuarine complex. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. In estuarine areas the lateral extent is defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats and while they are foraging. Of the 67 watersheds reviewed in NMFS' assessment of critical habitat for California Central Valley steelhead, seven watersheds received a low rating of conservation value, three received a medium rating and 27 received a high rating of conservation value for the species.

3.3.44 Steelhead (Central California Coast)

Distribution

The Central California Coast steelhead includes steelhead in river basins from the Russian River to Soquel Creek, Santa Cruz County (inclusive) and the drainages of San Francisco and San Pablo bays; excluded is the Sacramento-San Joaquin River Basin of the Central Valley of California.

Status

Northern California steelhead were listed as threatened in 2000, when their status was reviewed on January 5, 2006 they retained that classification (71 *Federal Register* 834. Critical habitat was designated for this species on September 2, 2005 (70 *Federal Register* 52488).

Critical Habitat

NMFS designated critical habitat for the Central California Coast steelhead on September 2, 2005 (70 FR 52488), and includes areas within the following hydrologic units: Russian River, Bodega, Marin Coastal, San Mateo, Bay Bridge, Santa Clara, San Pablo, and Big Basin. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation, and the areas that were excluded from designation.

In total, Central California Coast steelhead occupy 46 watersheds (freshwater and estuarine). The total area of habitat designated as critical includes about 1,500 miles of stream habitat and about 400 square miles of estuarine habitat (principally Humboldt Bay). This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bank full elevation. In estuarine areas the lateral extent is defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats, and while they are foraging. Of the 46 occupied watersheds reviewed in NMFS' assessment of critical habitat for Central California Coast steelhead, 14 watersheds received a low rating of conservation value, 13 received a medium rating, and 19 received a high rating of conservation value for the species.

3.3.45 Steelhead (Lower Columbia River)

Distribution

Lower Columbia River steelhead include naturally-produced steelhead returning to Columbia River tributaries on the Washington side between the Cowlitz and Wind rivers in Washington and on the Oregon side between the Willamette and Hood rivers, inclusive. In the Willamette River, the upstream boundary of this species is at Willamette Falls. This species includes both winter and summer steelhead. Two hatchery populations are included in this species, the Cowlitz Trout Hatchery winter-run stock and the Clackamas River stock but neither was listed as threatened.

Status

Lower Columbia River steelhead were listed as threatened in 1998, after their status was reviewed, they were

reclassified to threatened on January 5, 2006 (71 *Federal Register* 834). Critical habitat was designated for this species on September 2, 2005 (70 *Federal Register* 52488).

Critical Habitat

NMFS designated critical habitat for Lower Columbia River steelhead on September 2, 2005 (70 FR 52630).

Designated critical habitat includes the following subbasins: Middle Columbia/Hood subbasin, Lower Columbia/Sandy subbasin, Lewis subbasin, Lower Columbia/Clatskanie subbasin, Upper Cowlitz subbasin, Cowlitz subbasin, Clackamas subbasin, Lower Willamette subbasin, and the Lower Columbia River corridor. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity. The critical habitat designation (70 FR 52630) contains additional description of the watersheds that are included as part of this designation, and any areas specifically excluded from the designation.

In total, Lower Columbia River steelhead occupy 32 watersheds. The total area of habitat designated as critical includes about 2,340 miles of stream habitat. This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bank full elevation. Of the 32 watersheds reviewed in NMFS' assessment of critical habitat for Lower Columbia River steelhead, two watersheds received a low rating of conservation value, 11 received a medium rating, and 26 received a high rating of conservation value for the species. Limiting factors identified for Lower Columbia River steelhead include: degraded floodplain and stream channel structure and function, reduced access to spawning or rearing habitat, altered stream flow in tributaries, excessive sediment and elevated water temperatures in tributaries, and hatchery impacts.

3.3.46 Steelhead (Middle Columbia River)

Distribution

Middle Columbia steelhead occupy the Columbia River Basin from Mosier Creek, Oregon, upstream to the Yakima River, Washington, inclusive (61 *Federal Register* 41541). Steelhead from the Snake River Basin (described elsewhere) are excluded. This species includes the only populations of inland winter steelhead in the United States, in the Klickitat River and Fifteenmile Creek (Busby *et al.* 1996). Two hatchery populations are considered part of this species, the Deschutes River stock and the Umatilla River stock; listing for neither of these stocks was considered warranted.

Status

Middle Columbia River steelhead were listed as endangered in 1999, after their status was reviewed, they were reclassified to threatened on January 5, 2006 (71 *Federal Register* 834). Critical habitat was designated for this species on September 2, 2005 (70 *Federal Register* 52488).

Middle Columbia River steelhead occupy the intermontane region which includes some of the driest areas of the

Pacific Northwest, generally receiving less than 40 cm of rainfall annually. Vegetation is of the shrub-steppe province, reflecting the dry climate and harsh temperature extremes. Because of this habitat, occupied by the species, factors contributing to the decline include agricultural practices, especially grazing, and water diversions and withdrawals. In addition, hydropower development has impacted the species by preventing these steelhead from migrating to habitat above dams, and by killing them in large numbers when they try to migrate through the Columbia River hydroelectric system.

Critical Habitat

NMFS designated critical habitat for Middle Columbia River steelhead on September 2, 2005 (70 FR 52630). Designated critical habitat includes the following subbasins: Upper Yakima, Naches, Lower Yakima, Middle Columbia/Lake Wallula, Walla Walla, Umatilla, Middle Columbia/Hood, Klickitat, Upper John Day, North Fork John Day, Middle Fork John Day, Lower John Day, Lower Deschutes, Trout, and the Upper Columbia/Priest Rapids subbasins and the Columbia River corridor. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The final rule (70 FR 52630) lists the watersheds that comprise the designated subbasins and any areas that are specifically excluded from the designation.

In total, there are 114 watersheds within the range of Middle Columbia River steelhead. The total area of habitat designated as critical includes about 5,800 miles of stream habitat. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. Of the 114 watersheds reviewed in NMFS' assessment of critical habitat for Middle Columbia River steelhead, nine watersheds received a low rating of conservation value, 24 received a medium rating and 81 received a high rating of conservation value for the species. Although pristine habitat conditions are still present in some wilderness, roadless and undeveloped areas, habitat complexity has been greatly reduced in many areas of designated critical habitat for Middle Columbia River steelhead. Limiting factors identified for Middle Columbia River steelhead include: hydropower system mortality, reduced stream flow, impaired passage, excessive sediment, degraded water quality and altered channel morphology and floodplain.

3.3.47 Steelhead (Northern California)

Distribution

Northern California steelhead includes steelhead in California coastal river basins from Redwood Creek south to the Gualala River, inclusive.

Status

Northern California steelhead were listed as threatened in 2000, when their status was reviewed on January 5, 2006

they retained that classification (71 *Federal Register* 834. Critical habitat was designated for this species on September 2, 2005 (70 *Federal Register* 52488).

Critical Habitat

NMFS designated critical habitat for Northern California steelhead on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following hydrological units: Redwood Creek, Trinidad, Mad River, Eureka Plain, Eel River, Cape Mendocino, and the Mendocino Coast. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding.

The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation, and the areas that were excluded from designation.

In total, Northern California steelhead occupy 50 watersheds (freshwater and estuarine). The total area of habitat designated as critical includes about 3,000 miles of stream habitat and about 25 square miles of estuarine habitat, mostly within Humboldt Bay. This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. In estuarine areas the lateral extent is defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats, and while they are foraging. Of the 50 watersheds reviewed in NMFS' assessment of critical habitat for Northern California steelhead, nine watersheds received a low rating of conservation value, 14 received a medium rating, and 27 received a high rating of conservation value for the species. Two estuarine areas used for rearing and migration (Humboldt Bay and the Eel River estuary) also received a rating of high conservation value.

3.3.48 Steelhead (Snake River Basin)

Distribution

Snake River basin steelhead are an inland species that occupy the Snake River basin of southeast Washington, northeast Oregon, and Idaho. The historic spawning range of this species included the Salmon, Pahsimeroi, Lemhi, Selway, Clearwater, Wallowa, Grande Ronde, Imnaha, and Tucannon Rivers.

Status

Snake River steelhead were listed as threatened in 1997, when their status was reviewed on January 5, 2006 they retained that classification (71 *Federal Register* 834).

Critical Habitat

NMFS designated critical habitat for Snake River steelhead on September 2, 2005 (70 FR 52630). Designated

critical habitat includes the following subbasins: Hells Canyon, Imnaha River, Lower Snake/Asotin, Upper Grand Ronde River, Wallowa River, Lower Grand Ronde, Lower Snake/Tucannon, Upper Salmon, Pahsimeroi, Middle Salmon-Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, Middle Salmon, South Fork Salmon, Lower Salmon, Little Salmon, Upper and Lower Selway, Lochsa, Middle and South Fork Clearwater, and the Clearwater subbasins and the Lower Snake/Columbia River corridor. These areas are important for the species' overall conservation by protecting quality growth, reproduction, and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions, and floodplain connectivity. The final rule (70 FR 52630) lists the watersheds that comprise the designated subbasins and any areas that are specifically excluded from the designation.

There are 289 watersheds within the range of Snake River steelhead. The total area of habitat designated as critical includes about 8,000 miles of stream habitat. This designation includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. Of the 289 fifth order streams reviewed in this species, 231 received a high conservation value rating, 44 received a medium rating and 14 received a rating of low conservation value for the species. The lower Snake/Columbia rearing/migration corridor downstream of the spawning range has a high conservation value. Limiting factors identified for Snake River Basin steelhead include: hydrosystem mortality, reduced stream flow, altered channel morphology and floodplain, excessive sediment, degraded water quality, harvest impacts, and hatchery impacts.

3.3.49 Steelhead (South Central California coast)

Distribution

The South-Central California steelhead ESU includes all naturally spawned populations of steelhead (and their progeny) in streams from the Pajaro River (inclusive) to, but not including the Santa Maria River, California.

Status

South-Central California Coast steelhead were listed as threatened in 1997, when their status was reviewed on January 5, 2006 they retained that classification (71 *Federal Register* 834).

Critical Habitat

NMFS designated critical habitat for South-Central California Coast steelhead on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following CALWATER hydrological units: Pajaro River, Carmel River, Santa Lucia, Salinas River and Estero Bay. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and

quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation and the areas that were excluded from designation.

In total, South-Central California Coast steelhead occupy 30 watersheds (fresh water and estuarine). The total area of habitat designated as critical includes about 1,250 miles of stream habitat and about 3 square miles of estuarine habitat (e.g., Morro Bay). This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. In estuarine areas the lateral extent is defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats and while they are foraging. Of the 30 watersheds reviewed in NMFS' assessment of critical habitat for South-Central California Coast steelhead, six watersheds received a low rating of conservation value, 11 received a medium rating and 13 received a high rating of conservation value for the species.

3.3.50 Steelhead (Southern California)

Distribution

Southern California steelhead occupy rivers from the Santa Maria River to the southern extent of the species range.

Status

Southern California steelhead were listed as endangered in 1997, when their status was reviewed on January 5, 2006 they retained that classification (71 *Federal Register* 834).

Critical Habitat

NMFS designated critical habitat for Southern California steelhead on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following CALWATER hydrological units: Santa Maria River, Santa Ynez, South Coast, Ventura River, Santa Clara Calleguas, Santa Monica Bay, Calleguas and San Juan hydrological units. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation and the areas that were excluded from designation.

In total, Southern California steelhead occupy 32 watersheds (fresh water and estuarine). The total area of habitat designated as critical includes about 700 miles of stream habitat and about 22 square miles of estuarine habitat, mostly within Humboldt Bay. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. In estuarine areas the lateral extent is defined by

the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats and while they are foraging. Of the 32 watersheds reviewed in NMFS' assessment of critical habitat for Southern California steelhead, five watersheds received a low rating of conservation value, six received a medium rating and 21 received a high rating of conservation value for the species.

Critical Habitat

NMFS designated critical habitat for Southern California steelhead on September 2, 2005 (70 FR 52488). Specific geographic areas designated include the following CALWATER hydrological units: Santa Maria River, Santa Ynez, South Coast, Ventura River, Santa Clara Calleguas, Santa Monica Bay, Calleguas and San Juan hydrological units. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The critical habitat designation (70 FR 52488) contains additional details on the sub-areas that are included as part of this designation and the areas that were excluded from designation.

In total, Southern California steelhead occupy 32 watersheds (fresh water and estuarine). The total area of habitat designated as critical includes about 700 miles of stream habitat and about 22 square miles of estuarine habitat, mostly within Humboldt Bay. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. In estuarine areas the lateral extent is defined by the extreme high water because extreme high tide areas encompass those areas typically inundated by water and regularly occupied by juvenile salmon during the spring and summer, when they are migrating in the nearshore zone and relying on cover and refuge qualities provided by these habitats and while they are foraging. Of the 32 watersheds reviewed in NMFS' assessment of critical habitat for Southern California steelhead, five watersheds received a low rating of conservation value, six received a medium rating and 21 received a high rating of conservation value for the species.

3.3.51 Steelhead (Upper Columbia River)

Distribution

Upper Columbia River steelhead occupy the Columbia River Basin upstream from the Yakima River, Washington, to the border between the United States and Canada. This area includes the Wenatchee, Entiat, and Okanogan Rivers. All upper Columbia River steelhead are summer steelhead. Steelhead primarily use streams of this region that drain the northern Cascade Mountains of Washington State. This species includes hatchery populations of summer steelhead from the Wells Hatchery because it probably retains the genetic resources of steelhead populations that once occurred above the Grand Coulee Dam. This species does not include the Skamania Hatchery stock because of its non-native genetic heritage.

Status

Upper Columbia River steelhead were originally listed as endangered in 1997, after their status was reviewed, they were reclassified to threatened on January 5, 2006 (71 *Federal Register* 834).

Critical Habitat

NMFS designated critical habitat for Upper Columbia River steelhead on September 2, 2005 (70 FR 52630). Designated critical habitat includes the following subbasins: Chief Joseph, Okanogan, Similkameen, Methow, Upper Columbia/Entiat, Wenatchee, Lower Crab, and the Upper Columbia/Priest Rapids subbasins and the Columbia River corridor. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The final rule (70 FR 52630) lists the watersheds that comprise the designated subbasins and any areas that are specifically excluded from the designation.

There are 42 watersheds within the range of Upper Columbia River steelhead. The total area of habitat designated as critical includes about 1,250 miles of stream habitat. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. Of the 42 watersheds reviewed in NMFS' assessment of critical habitat for Upper Columbia River steelhead, three watersheds received a low rating of conservation value, eight received a medium rating and 31 received a high rating of conservation value for the species. In addition, the Columbia River rearing/migration corridor downstream of the spawning range was rated as a high conservation value. Limiting factors identified for the Upper Columbia River steelhead include: mainstem Columbia River hydropower system mortality, reduced tributary stream flow, tributary riparian degradation and loss of in-river wood, altered tributary floodplain and channel morphology and excessive fine sediment and degraded tributary water quality.

3.3.52 Steelhead (Upper Willamette River)

Distribution

Upper Willamette River steelhead occupy the Willamette River and its tributaries upstream of Willamette Falls. This is a late-migrating winter group that enters fresh water in March and April (Howell *et al.* 1985). Only the late run was included is the listing of this species, which is the largest remaining population in the Santiam River system.

Status

Upper Willamette River steelhead were listed as threatened in 1999, when their status was reviewed on January 5, 2006 they retained that classification (71 *Federal Register* 834).

A major threat to Willamette River steelhead results from artificial production practices. Fish ways built at Willamette Falls in 1885 have allowed Skamania-stock summer steelhead and early-migrating winter steelhead of Big Creek stock to enter the range of Upper Willamette River steelhead. The population of summer steelhead is

almost entirely maintained by hatchery salmon, although natural-origin, Big Creek-stock winter steelhead occur in the basin (Howell *et al.* 1985). In recent years, releases of winter steelhead are primarily of native stock from the Santiam River system.

Critical Habitat

NMFS designated critical habitat for Upper Willamette River steelhead on September 2, 2005 (70 FR 52488). Designated critical habitat includes the following subbasins: Upper Willamette, North Santiam, South Santiam, Middle Willamette, Molalla/Pudding, Yamhill, Tualatin, and the Lower Willamette subbasins and the lower Willamette/Columbia River corridor. These areas are important for the species' overall conservation by protecting quality growth, reproduction and feeding. The critical habitat designation for this species identifies primary constituent elements that include sites necessary to support one or more steelhead life stages. Specific sites include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, nearshore marine habitat and estuarine areas. The physical or biological features that characterize these sites include water quality and quantity, natural cover, forage, adequate passage conditions and floodplain connectivity. The final rule (70 FR 52630) lists the watersheds that comprise the designated subbasins and any areas that are specifically excluded from the designation.

There are 38 watersheds within the range of Upper Willamette River steelhead. The total area of habitat designated as critical includes about 1,250 miles of stream habitat. This designation includes the stream channels within the designated stream reaches and includes a lateral extent as defined by the ordinary high water line. In areas where the ordinary high-water line is not defined the lateral extent is defined as the bankfull elevation. Of the 38 watersheds reviewed in NMFS' assessment of critical habitat for Upper Willamette River steelhead, 17 watersheds received a low rating of conservation value, six received a medium rating and 15 received a high rating of conservation value for the species. In addition, the lower Willamette/Columbia River rearing/migration corridor downstream of the spawning range was rated as a high conservation value.

3.3.53 Sturgeon, green (southern population)

Distribution

The southern population of green sturgeon occurs in the freshwater and estuarine waters of the Sacramento and Feather Rivers in central California .

Status

The southern population of Green sturgeon was listed as threatened on April 7, 2006, primarily because of population declines caused by dams the prevented them from reaching spawning areas located above the dams (FWS 1995). A substantial amount of habitat in the Feather River above Oroville Dam also was lost, and threats to green sturgeon on the Feather River are similar to those faced in the Sacramento River (NMFS 2004).

Dependence on Waters of the United States

The status reviews, proposed and final regulations to list green sturgeon as threatened did not identify water quality as a problem. Further, the published literature on green sturgeon provides limited information on the ecological relationship between green sturgeon and water quality. However, studies from other sturgeon demonstrates that sturgeon populations are limited by low levels of dissolved oxygen levels and high temperatures in the rivers,

streams, and estuaries they occupy; juvenile anadromous sturgeon also depend on the freshwater-brackish interface in the tidal portion of rivers for nursery areas. Siberian sturgeon (*Acipenser baeri*), for example, appear to have a preferred temperature range between 17.2 and 21.5° C and preferred dissolved oxygen levels between 5.9 and 13.2 mg/l (Khakimullin 1987). White sturgeon in the Bliss Reach of the Snake River (upstream of Brownlee Reservoir) were caught in water with temperatures between 10 and 22°C and dissolved oxygen levels between 8 and 16 mg/l (Lepla and Chandler 1995). Temperatures of 26°C and dissolved oxygen levels of 3 mg/l killed all juvenile Atlantic sturgeon (*Acipenser oxyrinchus*) in five out of six replicates (Secor and Gunderson 1997) and dissolved oxygen levels of 2.5 mg/l killed all 25-day old shortnose sturgeon (*Acipenser brevirostrum*), 96 percent of 32-day old shortnose sturgeon, 86 percent of all 64-day old sturgeon, and 12 percent of 104- to 310-day old shortnose sturgeon (Jenkins *et al.* 1993).

Critical Habitat For Green Sturgeon

On October 9, 2009, NMFS designated critical habitat for southern green sturgeon (74 FR 52300). The area identified as critical habitat is the entire range of the biological species, green sturgeon, from the Bering Sea, Alaska, to Ensenada, Mexico. Specific freshwater areas include the Sacramento River, Feather River, Yuba River, and the Sacramento-San Joaquin Delta.

Specific coastal bays and estuaries include estuaries from Elkhorn Slough, California, to Puget Sound, Washington. Coastal marine areas include waters along the entire biological species range within a depth of 60 fathoms. The principle biological or physical constituent elements essential for the conservation of southern green sturgeon in freshwater include: food resources; substrate of sufficient type and size to support viable egg and larval development; water flow, water quality such that the chemical characteristics support normal behavior, growth and viability; migratory corridors; water depth; and sediment quality. Primary constituent elements of estuarine habitat include food resources, water flow, water quality, migratory corridors, water depth, and sediment quality. The specific primary constituent elements of marine habitat include food resources, water quality, and migratory corridors.

Critical habitat of southern green sturgeon is threatened by several anthropogenic factors. Four dams and several other structures currently are impassible for green sturgeon to pass on the Sacramento, Feather, and San Joaquin rivers, preventing movement into spawning habitat. Threats to these riverine habitats also include increasing temperature, insufficient flow that may impair recruitment, the introduction of striped bass that may eat young sturgeon and compete for prey, and the presence of heavy metals and contaminants in the river.

3.3.54 Sturgeon, Gulf

Distribution

Gulf sturgeon are native to the Gulf of Mexico, from the Suwannee River in Florida to the Pearl River in Louisiana.

Status

Gulf sturgeon were listed as threatened on September 30, 1991, because of population declines caused by nearly a century of fishing pressure for meat and caviar, and habitat modifications caused by the disposal of dredged material, de-snagging (removal of trees and their roots), and other navigation maintenance activities; incidental take

by commercial fishermen; poor water quality associated with contamination by pesticides, heavy metals, and industrial contaminants; aquaculture and incidental or accidental introductions; and the Gulf sturgeon's slow growth and late maturation (56 *Federal Register* 49653).

Dependence on Waters of the United States

Gulf sturgeon are anadromous and spend the major part of a year in freshwater, migrating to saltwater in the fall. The best river habitat for gulf sturgeon are long, spring-fed free-flowing rivers. Steep banks and a hard bottom with an average water temperature of 60 to 72°F are also characteristic of rivers where sturgeon inhabit. Sturgeon occupy the river bottom downstream of springs where they seek thermal refuge during hot summer days.

Empirical studies of relationships between sturgeon and water quality have demonstrated that sturgeon populations are limited by low levels of dissolved oxygen levels and high temperatures in the rivers, streams, and estuaries they occupy; juvenile anadromous sturgeon also depend on the freshwater-brackish interface in the tidal portion of rivers for nursery areas. Siberian sturgeon (*Acipenser baeri*), for example, appear to have a preferred temperature range between 17.2 and 21.5° C and preferred dissolved oxygen levels between 5.9 and 13.2 mg/l (Khakimullin 1987). White sturgeon in the Bliss Reach of the Snake River (upstream of Brownlee Reservoir) were caught in water with temperatures between 10 and 22°C and dissolved oxygen levels between 8 and 16 mg/l (Lepla and Chandler 1995). Temperatures of 26°C and dissolved oxygen levels of 3 mg/l killed all juvenile Atlantic sturgeon (*Acipenser oxyrinchus*) in five out of six replicates (Secor and Gunderson 1997) and dissolved oxygen levels of 2.5 mg/l killed all 25-day old shortnose sturgeon (*Acipenser brevirostrum*), 96 percent of 32-day old shortnose sturgeon, 86 percent of all 64-day old sturgeon, and 12 percent of 104- to 310-day old shortnose sturgeon (Jenkins *et al.* 1993).

Critical Habitat

Critical habitat was designed for Gulf sturgeon in 2003 (68 *Federal Register* 13370). The designation encompasses 14 sites in Louisiana, Mississippi, Alabama, and Florida. The primary constituent elements essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, and sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes that support these habitat components. The primary constituent elements include:

1. Abundant prey items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats and substrates for juvenile, subadult, and adult life stages;
2. Riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone or hard clay;
3. Riverine aggregation areas, also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions;
4. A flow regime (*i.e.*, the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging;

and necessary for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larvae staging;

5. Water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages;
6. Sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and
7. Safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats (*e.g.* a river unobstructed by any permanent structure, or a dammed river that still allows for passage).

3.3.55 Sturgeon, shortnose

Distribution

Shortnose sturgeon occur along the Atlantic Coast of North America, from the St. John River in Canada to the St. John's River in Florida. Nineteen, geographically-distinct populations of shortnose sturgeon in the wild are distributed from New Brunswick, Canada; Maine; Massachusetts; Connecticut; New York; New Jersey and Delaware; Chesapeake Bay and Potomac River; North Carolina; South Carolina; Georgia; and Florida. Two additional, geographically distinct populations represent shortnose sturgeon that were isolated by dams occur in the Connecticut River (above the Holyoke Dam) and in Lake Marion on the Santee-Cooper River system in South Carolina (above the Wilson and Pinopolis Dams).

Status

Shortnose sturgeon were listed as endangered on March 11, 1967 (32 *Federal Register* 4001) and remained on the endangered species list with enactment of the Endangered Species Act of 1973, as amended. These sturgeon were listed as endangered because of population declines resulting from the construction of dams in the large river systems of the northeastern United States during the late-1800s and early-1900s, dredging, the effects of water pollution, bridge construction, and incidental capture in commercial fisheries. More recently, alteration of freshwater flows into the estuaries of rivers had reduced the nursery habitat of juvenile shortnose sturgeon and larval and juvenile shortnose sturgeon have been killed after being impinged on the intake screens or entrained in the intake structures of power plants on the Delaware, Hudson, Connecticut, Savannah and Santee rivers.

Critical habitat has not been designated for shortnose sturgeon.

Dependence on Waters of the United States

Shortnose sturgeon are anadromous fish that live primarily in slower-moving rivers or nearshore waters; they prefer nearshore marine, estuarine, and riverine habitats near large river systems. They are benthic omnivores that feed on crustaceans, insect larvae, worms and molluscs (NMFS 1998) but they have also been observed feeding off plant surfaces and on fish bait (Dadswell *et al.* 1984).

During the summer and winter, adult shortnose sturgeon occur in freshwater reaches of rivers or river reaches that are influenced by tides; as a result, they often occupy only a few short reaches of a river's entire length (Buckley and

Kynard 1985). During the summer, at the southern end of their range, shortnose sturgeon congregate in cool, deep, areas of rivers where adult and juvenile sturgeon can take refuge from high temperatures (Flournoy *et al.* 1992; Rogers and Weber 1994; Rogers and Weber 1995; Weber 1996). Juvenile shortnose sturgeon generally move upstream for the spring and summer seasons and downstream for fall and winter; however, these movements usually occur above the salt- and freshwater interface of the rivers they inhabit (Dadswell *et al.* 1984; Hall *et al.* 1991). Adult shortnose sturgeon prefer deep, downstream areas with soft substrate and vegetated bottoms, if present. While shortnose sturgeon are occasionally collected near the mouths of coastal rivers, they are not known to engage in coastal migrations (Dadswell *et al.* 1984).

3.3.56 Abalone, Black

Distribution

Historically, black abalone occurred from about Point Arena in northern California to Bahia Tortugas and Isla Guadalupe, Mexico. Black abalone are rare north of San Francisco and south of Punta Eugenia, and unconfirmed sightings have been reported as far north as Coos Bay, Oregon. The northernmost documented record of black abalone (based on museum specimens) is from Crescent City (Del Norte County, California, USA; Geiger 2004). Most experts agree that the current range of black abalone extends from Point Arena (Mendocino County, California, USA) south to Northern Baja California, Mexico. Black abalone may exist, but are considered extremely rare, north of San Francisco (Morris *et al.*, 1980) to Crescent City, California, USA and south of Punta Eugenia to Cabo San Lucas, Baja California, Mexico (P. Raimondi, personal communication). Within this broad geographic range, black abalone generally inhabit coastal and offshore island intertidal habitats on exposed rocky shores where bedrock provides deep, protective crevice shelter (Leighton 2005).

Status

Black abalone were listed as endangered under the ESA on January 14, 2009. Critical habitat was designated for black abalone on 27 October 2011 and includes about 360 square kilometers of rocky intertidal and subtidal habitat within five segments of the California coast between the Del Mar Landing Ecological Reserve to the Palos Verdes Peninsula, as well as on the Farallon Islands, Año Nuevo Island, San Miguel Island, Santa Rosa Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island, and Santa Catalina Island. This designation also includes rocky intertidal and subtidal habitats from the mean higher high water line to a depth of 6 meters (relative to the mean lower low water line), as well as the coastal marine waters encompassed by these areas (Federal Register 76: 66806-66844)..

Black abalone have experienced declines in abundance. It has gone locally extinct in most locations south of Point Conception, California.

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), and NWP B (water-based energy generation pilot projects) overlap with the distribution of black abalone.

3.3.57 Abalone, White

Distribution

Historically, white abalone occurred from Point Conception, California to Punta Abreojos, Baja California, Mexico. They are the deepest-living of the west coast abalone species (Hobday and Tegner 2000): they had been caught at depths of 20-60 m (66-197 ft) but had been reported as having had the highest abundance at depths of 25-30 m (80-100 ft; Cox 1960, Tutschulte 1976). At these depths, white abalone are found in open low relief rock or boulder habitat surrounded by sand (Tutschulte 1976, Davis *et al.* 1996).

Status

White abalone were listed as an endangered species on May 29, 2001. Over the past 30 years, the white abalone populations have declined precipitously in abundance primarily as a result of exploitation. Surveys conducted at Tanner and Cortez Banks have yielded numbers of white abalone in the low hundreds (Butler *et al.* 2006). Surveys conducted off the western side of San Clemente Island in August 2004 yielded only 6 animals at 37-50 m depth (Navy 2005 *in* Navy 2006a).

Dependence on Waters of the United States

Activities that would be authorized by NWP 1 (aids to navigation), NWP 8 (offshore oil and gas activities), NWP 10 (mooring buoys), and NWP B (water-based energy generation pilot projects) overlap with the distribution of white abalone.

3.3.58 Coral, Elkhorn

Distribution

Elkhorn coral is found on coral reefs in southern Florida, the Bahamas, and throughout the Caribbean. Its northern limit is Biscayne National Park in Florida and extends south to Venezuela. Once found in continuous stands that extended along the front side of most coral reefs, the characteristic “*Acropora palmata* zone” supported a diverse assemblage of other invertebrates and fish. These zones have been largely transformed into rubble fields with few, isolated living colonies.

Status

Elkhorn coral was listed as threatened on May 4, 2006. Elkhorn coral has declined by 90-95% within large areas of its range since 1980. Reductions of between 75 and 90% have been reported in areas such as the Florida Keys in 1998 due to bleaching and hurricane damage.

Elkhorn coral populations face high extinction risks because of the individual and cumulative effects of disease (particularly white-band disease and white pox; which has killed 85% of elkhorn coral colonies in the Florida Keys over an 8-year period); high seasonal temperatures that result in coral bleaching; overharvest by collectors; natural abrasion and breakage; anthropogenic abrasion and breakage (caused by recreational divers, vessel groundings, the impacts of anchors and anchor chains, fishing debris and damaging fishing practices); competition from macroalgae; predation (by the fireworm, *Hermodice corunculata*, and the murcid snail, *Coralliophila abbreviata*, among others), sedimentation and increases in water turbidity; increased carbon dioxide levels and ocean acidification; sea level

rise; and competition from bioeroding sponges of the genus *Cliona*.

These stressors not only increase the mortality rates of staghorn coral, they have reduced the reproductive success of staghorn coral, which reduces their ability to recover from mortalities. Staghorn coral reproduce through fragmentation (asexual) and broadcast spawning (sexual reproduction). Although fragmentation probably allowed staghorn coral to recover from physical disturbance in the past, the decline of the large, extant colonies that were the source of such fragments and the decline of suitable substrate on which those fragment could attach impairs this reproductive strategy for staghorn coral. At the same time, there is substantial evidence that sexual reproduction in staghorn coral is also compromised (reductions in successful fertilization and larval numbers and density). The combination of high mortality rates in a large number of colonies, extirpation of colonies, the continued action of multiple stressors, and reductions in the ability of colonies to recover from population reductions or withstand the effect of multiple stressors would suggest a species at substantial risk of extinction in the foreseeable future.

Dependence on Waters of the United States

Elkhorn coral was once the dominant species in shallow water (1 -5 m (3 ft-16 ft) deep) throughout the Caribbean and on the Florida Reef Tract, forming extensive, densely aggregated thickets (stands) in areas of heavy surf. Coral colonies prefer exposed reef crest and fore reef environments in depths of less than 20 feet (6 m), although isolated corals may occur to 65 feet (20 m).

Activities that would be authorized by NWP 1 (aids to navigation), NWP 3 (maintenance), NWP 10 (mooring buoys), NWP 18 (minor dredging), and NWP B (water-based energy generation pilot projects) overlap with the distribution of elkhorn coral.

Critical Habitat

Critical habitat for elkhorn coral was designated in November 2008 and includes reefs in southeastern Florida, Puerto Rico, St. John/ St. Thomas, and St. Croix.

3.3.59 Coral, Staghorn

Distribution

Staghorn coral colonies are known to occur in Anguilla; Antigua and Barbuda; Bahamas; Barbados; Belize; Cayman Islands; Colombia; Costa Rica; Cuba; Dominica; Dominican Republic; Grenada; Guadeloupe; Haiti; Honduras; Jamaica; Mexico; Montserrat; Netherlands Antilles; Nicaragua; Panama; Saint Barthélemy; Saint Kitts and Nevis; Saint Lucia; Saint Martin (French part); Saint Vincent and the Grenadines; Trinidad and Tobago; Turks and Caicos Islands; United States (Florida, Puerto Rico, U.S. Virgin Islands); Venezuela; and British Virgin Islands. The northern limit of staghorn coral is around Boca Raton, along the Atlantic Coast of Florida.

Status

Staghorn coral were listed as threatened throughout their range on 4 May 2006. Since 1980, the size and distribution of staghorn coral populations have collapsed because of disease outbreaks, such as white band disease; hurricanes; predation, bleaching, algal overgrowth, sedimentation, temperature and salinity variation, and low genetic diversity. Since the early 1970s, populations of this coral have declined by between 80 and 98% throughout their range and

some populations have become locally extinct, which led the International Union for the Conservation of Nature and Natural Resources to classify staghorn coral as critically endangered.

Staghorn coral populations face high extinction risks because of the individual and cumulative effects of disease (particularly white-band disease, which was reported to have affected 72% of tagged staghorn coral colonies in the Florida Keys in 2003, killing about 28% of those colonies and leaving others as fragments); high seasonal temperatures that result in coral bleaching; overharvest by collectors; natural abrasion and breakage; anthropogenic abrasion and breakage (caused by recreational divers, vessel groundings, the impacts of anchors and anchor chains, fishing debris and damaging fishing practices); competition from macroalgae; predation (by the fireworm, *Hermodice corunculata*, and the murcid snail, *Coralliophila abbreviata*, among others), sedimentation and increases in water turbidity; increased carbon dioxide levels and ocean acidification; sea level rise; and competition from bioeroding sponges of the genus *Cliona*.

These stressors not only increase the mortality rates of staghorn coral, they have reduced the reproductive success of staghorn coral, which reduces their ability to recover from mortalities. Like elkhorn coral, staghorn coral reproduce through fragmentation (asexual) and broadcast spawning (sexual reproduction). Although fragmentation probably allowed staghorn coral to recover from physical disturbance in the past, the decline of the large, extant colonies that were the source of such fragments and the decline of suitable substrate on which those fragment could attach impairs this reproductive strategy for staghorn coral. At the same time, there is substantial evidence that sexual reproduction in staghorn coral is also compromised (reductions in successful fertilization and larval numbers and density). The combination of high mortality rates in a large number of colonies, extirpation of colonies, the continued action of multiple stressors, and reductions in the ability of colonies to recover from population reductions or withstand the effect of multiple stressors would suggest a species at substantial risk of extinction in the foreseeable future.

Dependence on Waters of the United States

Staghorn coral occur in back reef and fore reef environments from 0-100 feet (0 to 30 m) deep. The upper limit is defined by wave forces, and the lower limit is controlled by suspended sediments and light availability. Fore reef zones at intermediate depths of 15-80 feet (5-25 m) were formerly dominated by extensive single species stands of staghorn coral until the mid 1980s.

Activities that would be authorized by NWP 1 (aids to navigation), NWP 3 (maintenance), NWP 10 (mooring buoys), NWP 18 (minor dredging), and NWP B (water-based energy generation pilot projects) overlap with the distribution of staghorn coral.

Critical Habitat

Critical habitat for staghorn coral was designated in November 2008 and includes reefs in southeastern Florida, Puerto Rico, St. John/ St. Thomas, and St. Croix.

3.3.60 Johnson's seagrass

Distribution

Johnson's seagrass is distributed along the east coast of Florida from central Biscayne Bay to Sebastian Inlet in

Indian River lagoon. The largest patches have been identified inside Lake Worth Inlet. The southernmost distribution is reported to be in the vicinity of Virginia Key in Biscayne Bay.

Status

Johnson's seagrass was listed as threatened on September 14, 1998, because of habitat destruction and modification resulting from propeller scarring (alteration and subsequent destruction of the benthic community from boating activities, propeller scarring of the substrate, anchoring, and mooring has been observed in Johnson's seagrass sites), dredging to provide boat access, erosion caused by storm action, increased suspended solids caused by human land uses, scour associated with storms, and nutrient enrichment of coastal lagoons in Florida caused by urban and agricultural land run-off that stimulates algal growth and smothers Johnson's seagrass (by shading rooted vegetation and diminishing the oxygen content of the water).

Dependence on Waters of the United States

Johnson's seagrass occurs in coastal lagoons in the intertidal zone or deeper. It does worse in the intermediate areas where other seagrasses thrive. Johnson's seagrass has been found in coarse sand and muddy substrates and in areas of turbid waters and high tidal currents.

Activities that would be authorized by NWP 1 (aids to navigation), NWP 3 (maintenance), NWP 10 (mooring buoys), NWP 15 (Coast Guard approved bridges), NWP 18 (minor dredging), and NWP B (water-based energy generation pilot projects) overlap with the distribution of Johnson's seagrass.

Critical Habitat

Critical habitat for Johnson's seagrass was designated on April 5, 2000. The designation encompasses 10 areas: a portion of the Indian River Lagoon, north of the Sebastian Inlet Channel; a portion of the Indian River Lagoon, south of the Sebastian Inlet Channel; a portion of the Indian River Lagoon near the Fort Pierce Inlet; a portion of the Indian River Lagoon, north of the St. Lucie Inlet; a portion of Hobe Sound; a site on the south side of Jupiter Inlet; a site in central Lake Worth Lagoon; a site in Lake Worth Lagoon, Boynton Beach; a site in Lake Wyman, Boca Raton; and a portion of Biscayne Bay.

4 Environmental Baseline

By regulation, environmental baselines for biological opinions include the past and present *impacts* of all state, Federal or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process (50 CFR 402.02, emphasis added). The “impact” of the activities we normally identify in the *Environmental Baselines* of Opinions allow us to assess the prior experience and state (or condition) of the endangered and threatened individuals and areas of designated critical habitat that occur in an action area. This is important because, as we noted in the *Approach to the Assessment* section of this Opinion, in some phenotypic states, listed individuals will commonly exhibit responses they would not exhibit in other phenotypic states. The same is true for populations of endangered and threatened species: the consequences of changes in the performance of individuals on a population depends on the prior state of the population. Designated critical habitat is not different: under some ecological conditions, the physical and biotic features of critical habitat will exhibit responses that they would not exhibit in other conditions.

When we “add” the effects of a new, continuing, or proposed action to the prior condition of endangered and threatened individuals and designated critical habitat, as our regulations require, our assessments are more likely to capture a proposed action’s probable consequences on endangered species, threatened species, and designated critical habitat. However, because this is a programmatic consultation on what is primarily a continuing action with a geographic scope that encompasses 45 of the 50 states that constitute the United States and includes all U.S. territories and possessions, this *Environmental Baseline* does not assess the consequences of the USACE’s proposed action for specific sites or listed resources that occur at those sites. Instead, this *Environmental Baseline* summarizes the status and trends of the aquatic ecosystems in the United States, including the natural phenomena and anthropogenic activities that appear to exert primary influence on that status and trend. We conclude with a summary of the consequences of those trends for endangered and threatened species and critical habitat that has been designated for them. As such, some of the information in this *Environmental Baseline* overlaps with some of the narratives we have already presented in our treatments of the *Status of Listed Resources*.

4.1 Environmental Setting

As we discussed in the *Approach to the Assessment* chapter of this Opinion, the Action Area for this consultation consists of the land and waters encompassed 45 of the 50 states that constitute the United States and include all U.S. territories and possessions. This Action Area includes the coastal and estuarine water out to the limits of the territorial seas of the United States, its territories and its possession. The discussion that follows provides a general

profile of the environmental setting of the Action Area, including some information from the five New England states that were not within the Action Area for this consultation).

The continental United States has a land area of about 2.3 billion acres. In 2002, about 20 percent of this area (442 million acres) was cropland in 2002, 26 percent (587 million acres) was permanent grassland pasture and range, 29 percent (651 million acres) was forest-use land, and urban areas represented about 3 percent (60 million acres) of this land area, while a variety of other land uses — parks and recreational areas, wildlife areas, rural highways, roads, railroads, airport rights-of-way — represented about 13 percent of the land area (Lubowski *et al.* 2006).

Since the 1940s, the acreage of land dedicated to forest-uses has declined since, although this acreage has increased by about 2 percent between 1997 and 2002. Between 1945 and 2002, the acreage of land dedicated to cropland uses declined by about 2 percent; between 1997 and 2002, total cropland decreased by 14 million acres (3 percent) to its lowest level since 1945 (Lubowski *et al.* 2006). The acreage of land dedicated to grassland pasture and range increased by almost 7 million acres (1 percent) from 1997 to 2002; however, the area dedicated to grazing has declined from the 1940s to 2002 (Lubowski *et al.* 2006). Between 1945 and 2002, the land area dedicated to special-uses and urban areas has increased continuously. Between 1990 and 2002, the acres in urban areas increased by about 13 percent to 60 million acres (Lubowski *et al.* 2006).

Since colonial times, the landscapes of the United States reflect the abundance, distribution, and economics of the human population. In 1790, the United States had a resident population that was slightly less than 4 million and a population density of 4.5 people per square mile. By 2000, that population had grown to slightly more than 281 million people and the population density had increased to 79.6 per square mile. In 2007, the population of the United States increased to more than 300 million people for the first time in its history.

Most of the population growth in the United States occurred in urban areas, first in central cities and later suburbs. Population sizes of cities in the eastern United States increased from the early 1800s until the 1950s; since then, the population size of western cities like Los Angeles and Phoenix increased while large eastern and Midwestern cities started to decline (Gibson 1998). At the same time, an increasing percentage of our nation's population was located in suburban areas. In 1910, three times more Americans lived in central cities than in suburban areas; by 1970, slightly more Americans lived in suburban areas than in either cities or rural areas. From 1950 to 1996, the urban population increased by 63 percent, the rural population decreased by 19 percent, and the greatest relative change occurred in the suburban population, an increase of 274 percent.

By 2000, half of the population in the United States lived in the suburbs (Hobbs and Stoops 2002). About 75 percent of all Americans now live in areas that are urban or suburban in character; that is, about 75 percent of the people in the lower 48 States live in less than 2 percent of the land area of the lower 48 states. Most of the urban or suburban areas occur in the South and Midwest, but cities and suburbs account for less than 2 percent of the land area in those regions. In comparison, urban and suburban lands in the Northeast made up over 5 percent of the landscape. The percentage of “undeveloped” land or natural areas in the South, Northeast, and West was almost the same as the percentage of urban and suburban area in those regions (about 22 percent). The Midwest had the lowest percentage of these lands (17 percent). In the Northeast and South, these lands are represented by forest cover; in the Midwest, these lands are represented by farmland, and in the West the lands are represented by grassland and shrub cover.

About half of all natural lands in urban and suburban areas consist of patches that are smaller than 10 acres. Nationally, less than 5 percent of all natural areas consist of patches at least 1,000 acres in size. The northeast States have a higher percentage of natural areas between 100 and 1,000 acres and 1,000 to 10,000 acres in size than the other regions. Only western States have natural areas greater than 10,000 acres; these natural areas, however, account for 0.3percent of all natural lands in urban and suburban areas.

The changes in land cover and land use that accompanied the first population shift from rural to urban areas followed by a subsequent shift from urban and rural to suburban areas was different from region to region (Stansfield 1998). In some cases suburbs developed along major highways and transportation systems to connect pre-existing, rural communities with nearby urban areas. In other cases, suburbs developed in areas that had previously been agricultural or had been dominated by natural communities because of favorable environmental conditions, zoning ordinances, or land costs (Abler *et al.* 1976, Matlack 1997). As a result, most modern metropolitan areas encompass a mosaic of different land covers and uses (Hart 1991). The mosaic of land uses associated with urban and suburban centers has been cited as the primary cause of declining environmental conditions in the United States (Flather *et al.* 1998) and other areas of the world (Houghton 1994).

Other human activities that have altered the landscapes of the United States include agricultural practices that include land conversion, sod busting, and applications of pesticides; forest practices that include timber harvests, silviculture, and the construction of logging roads; mining practices that include open-pit mining, mountain-top mining, placer mining, heap-leach mining, and removal of overburden materials; road construction practices that include alteration of land in the right of way, spraying herbicides to maintain the right of way, and construction of quarries for source materials; civil works projects that include canals, drainage ditches, projects to deliver water to arid lands in the western States, projects to drain wetlands in southeastern States, projects to control flooding in mid-western and eastern States, port construction, projects to maintain shipping channels, and the construction of more than 8,100 major dams on rivers and streams in the United States, Puerto Rico, and the U.S. Virgin Islands.

The direct and indirect effects of these changes in land-use and land-cover change have had a lasting effect on the quantity, quality, and distribution of every major terrestrial, aquatic, and coastal ecosystem in the United States, its territories, and possessions. By the mid-1990s, at least 27 types of ecosystem had declined by more than 98 percent (Noss *et al.* 1995). These include old growth and virgin forests in the eastern United States, pine barrens across Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island (Cryan 1985); more than 95 percent of the natural barrier island beaches in Maryland had been destroyed along with more than 50 percent of barrier island dunes. More than 99 percent of the native prairies of Kentucky and Texas and the wet and mesic coastal prairies of Louisiana have been destroyed (Smith 1993). By 1986, more than 98 percent of the pre-settlement longleaf pine (*Pinus palustris*) forests in the southeastern coastal plain had been destroyed (Noss 1989, Ware *et al.* 1993).

Many other native ecosystems have experienced substantial reductions in area. About 90 percent of the original 58 million hectares of tallgrass prairie had been destroyed; 99 percent of the tallgrass prairie east of the Missouri River and 85 percent of the tallgrass prairie west of the Missouri River has been destroyed (Klopatek *et al.* 1979, Chapman 1993). The remaining tallgrass prairie exists in small fragments (Madson 1990). About 85 percent of the coastal

redwood (*Sequoia sempervirens*) forests in California have been destroyed (Wilburn 1985) along with about 88.9 percent of the riparian forests of California's Central Valley (Barbour *et al.* 1991). Between 90 and 98 percent of the riparian and bottomland forests that once bordered the Sacramento River have been destroyed (The Nature Conservancy 1990, Jacobs 1992). Between 83 and 90 percent of the old-growth forests in the douglas-fir region of Oregon and Washington have been destroyed (Harris 1984, Spies and Franklin 1988; Norse 1990). Between the 1780s and 1980s (Dahl 1990); by the late 1980s, 85 percent of the virgin forest lands in the United States had been destroyed (Postel and Ryan 1991).

Aquatic and semi-aquatic ecosystems have not fared much better than these terrestrial ecosystems. Between the 1780s and 1980s, 30 percent of the nation's wetlands had been destroyed, including 74 percent of the wetlands in Connecticut, 73 percent of the wetlands in Maryland, 52 percent of the wetlands in Texas, 91 percent of all wetlands in California, including 94 percent of all inland wetlands (Barbour *et al.* 1991, Dahl 1990). From 1982 to 1987, the wetland area throughout the conterminous United States declined by 1.1 percent and the expansion of urban – suburban metropolitan areas accounted for 48 percent of this decline (Brady and Flather 1994). By the 1980s, 98 percent of about 5.2 million kilometers of streams had been sufficiently degraded to be unworthy of designation as wild or scenic rivers (Benke 1990). By the same time, about 81 percent of the native fish communities in the United States had been adversely affected by human activities (Judy *et al.* 1984).

In addition to the destruction and alteration of the lands and waters of the United States, the alteration of our nation's landscape has increased air pollution; re-directed or altered the flow of rivers and streams; depleted aquifers; increased levels of sediments, nutrients, metals, and pesticides in surface and ground water; increased the spread of invasive species and infectious diseases; increased rates of soil depletion and transport; and increased temperature of surface water and air Barnes *et al.* 2000, Binder *et al.* 1999, Daily 1997, Daily *et al.* 1997, Doyle *et al.* 2001, Harvell *et al.* 1999, 2002; Jones *et al.* 2001, Wilcove *et al.* 1998, Woodley *et al.* 1993).

Because of these changes in land use, many of the native plant and animal species that inhabited those native ecosystems over the past have become extinct or extinct in the wild over the past 200 years. The last passenger pigeon, a species that once numbered in the billions and covered most of the eastern and mid-western United States, became extinct in 1912. In the same year, the Louisiana parakeet (*Conuropsis carolinensis ludoviciana*) became extinct followed two years later by the extinction of its relative, the Carolina parakeet (*C. c. carolinensis*). The heath hen became extinct in the early-1930s, the June sucker (*Chasmistes liorus liorus*) in the mid-1930s, Tecopa pupfish (*Cyprinodon nevadensis calidae*) in the early 1940s, and Ash Meadows killifish (*Empetrichthys merriami*) and Thickettail chub (*Gila crassicauda*) in the 1950s. Over the past 200 years, a substantial portion of the bird fauna of the Hawaiian islands — including the Oahu akepa, Kona finch, Lanai creeper, black mamo, and Hawai'i o'o — became extinct combined with the extinction of substantial portions of the freshwater mussel fauna of the Mississippi, Ohio, and Tennessee Rivers and regional extirpations of the flora and fauna of California, Florida, Oregon, Puerto Rico, and the desert states.

4.2 Summary of the Status of the Watersheds in the Action Area

All of the anadromous, estuarine, coastal, and marine endangered species, threatened species, and designated critical habitat under the jurisdiction of NMFS depend on the health of aquatic ecosystems for their survival. All of these species were listed as endangered or threatened, at least in part, because of the consequences of human activities on

the aquatic ecosystems — the estuaries, rivers, lakes, streams, and associated wetlands, floodplains, and riparian ecosystems — of the United States, its territories, and possessions. The status and trends of those aquatic ecosystems determines the status and trends of these species and the critical habitat that has been designated for them.

Over the past 30 to 40 years, the nation's aquatic ecosystem have improved substantially. In particular, pollution from point sources have been significantly reduced over the past 35 years. Sewage and industrial discharges into aquatic ecosystems have been controlled, some agricultural pesticides have been restricted or banned. Programs like the Conservation Reserve Program have taken highly erodible lands out of production. Despite this progress, however, many aquatic ecosystems remain highly polluted. Assessments conducted by the water quality and natural resource agencies of the States suggests that 61 percent of river and stream miles, 54 percent of the lake area, 49 percent of estuarine area, and 22 percent of Great Lakes shoreline fully support the water quality standards they evaluated (EPA 2000). Of the waters bodies they assessed — 39 percent of the river and stream miles, 46 percent of the lake area, and 51 percent of the estuarine area, — one or more designated uses are impaired. Non-point pollution from urban and agricultural land — Siltation, nutrients, bacteria, metals (primarily mercury), and oxygen depleting substances — that is transported by precipitation and runoff was the primary cause of the impairment.

These water quality problems, particularly the problem of non-point sources of pollution, has resulted from the changes humans have imposed on the landscapes of the United States over the past 100 – 200 years. One way of relating these changes in water quality to land uses relies on the surface area of a watershed that is covered by porous versus impervious surfaces. Most land areas that are covered by natural vegetation are highly porous and have very little sheet flow; precipitation falling on these landscapes infiltrates the soil, is transpired by the vegetative cover, or evaporates. The increased transformation of the landscapes of the United States into a mosaic of urban and suburban land uses has increased the area of impervious surfaces — roads, rooftops, parking lots, driveways, and sidewalks — in those landscapes. As the area of impervious surfaces increases, that increase is accompanied by reductions in air quality, loss and fragmentation of habitat for native flora and fauna, and reductions in water quality (Arnold and Gibbons 1996, Barnes *et al.* 2000, Benfield *et al.* 1999, Schueler 1994).

The amount of impervious surface in a watershed is a reliable indicator of a suite of phenomena that influence a watershed's hydrology (Center for Watershed Protection 2003, Schueler 1994). Above certain thresholds, landscapes with impervious surfaces respond to precipitation differently than other land-uses: rain that would normally infiltrate in forest, grassland, and wetland soils falls on and flows over impervious surfaces. That runoff is then channeled into storm sewers and released directly into surface waters (rivers and streams), which changes the magnitude and variability of water velocity and volume in those receiving waters.

The area of impervious surfaces in watersheds has been correlated with the response of stream flow to precipitation (Anderson 1968, Jennings and Jarnagin 2002), stream hydraulics, stream bank stability (Booth 1990, Hammer 1972, Henshaw and Booth 2000, Leopold 1973), stream temperature, and one of the primary mechanism by which non-point sources of water pollution are transported to surface waters (Galli 1991, Jones and Clark 1987, Klein 1979). A study of 39 coldwater trout streams in Minnesota and Wisconsin concluded that the amount of impervious area in a watershed was negatively correlated with indices of biotic diversity. When impervious surfaces represented less than 6 percent of a watershed, biotic diversity in these streams remained high. When the area of impervious surface rose

to between 6 and 11 percent, minor changes in urban surface area could result in major changes in the diversity of the fish fauna in some streams; when the area of impervious surface rose above 11 percent, many species fell out of the fish fauna (Wang *et al.* 2003). Modeling estimates suggest that nutrient loads will increase above background levels once the impervious area of a watershed increases above 20 to 25 percent and concluded that increased solar radiation from pavement, removal of riparian vegetation, and deforestation related to urbanization would increase stream temperatures during summer months (Schueler 1995).

An assessment of the impacts of urbanization on water quality detected high concentrations of heavy metals (copper, lead, zinc, nickel, cadmium, arsenic, and beryllium), organic pollutants (fertilizers and pesticides), fecal coliform bacteria, nutrients, and total suspended solids in storm runoff that was being transported to rivers, streams, lakes, and other surface waters (EPA 1983). Many heavy metals exceeded Environmental Protection Agency's (EPA) water quality criteria and drinking water standards; copper, lead, and zinc were found in 91 percent of all samples and were detected in receiving waters at levels that would be harmful to aquatic life. Fecal coliform concentrations violated EPA water quality standards in many sample areas during every storm event.

In the 29 years that have passed since EPA's initial assessment of urban runoff, the pattern remains largely the same. Since 1995, States have listed more than 38,000 waters as impaired by pollutants that include mercury (13 percent), pathogens (13 percent), sediment (11 percent), other metals (10 percent), nutrient (9 percent), and oxygen depletion (7 percent), among other causes of impairment (EPA 2007). Pennsylvania reported the greatest number of impaired waters (6,957), followed by New Hampshire (5,192), Washington (1,714), Minnesota (1,500), Kansas, Indiana, and Idaho (each reporting slightly more than 1,300 impaired waters).

For example, between 1991 and 2001, the amount of impervious surface increased 10.4 percent throughout the Puget Sound region (Puget Sound Action Team 2007). By 2001, impervious surface covered 7.3 percent of the Puget Sound region below 1,000 feet elevation and was substantially higher in some counties and watersheds in the region. Over the same time period, about 190 square miles of forest (about 2.3 percent of the total forested area of the Puget Sound basin) was converted to other uses. In areas below 1,000 feet elevation, the change was more dramatic: 3.9 percent of total forest area was converted to other uses. By 2004, about 1,474 fresh and marine waters in Puget Sound were listed as "impaired waters" in Puget Sound. Fifty-nine percent of these waters tested were impaired because of toxic contamination, pathogens, low dissolved oxygen or high temperatures. Less than one-third of these impaired waters have cleanup plans in place. Chinook salmon from Puget Sound have 2-to-6 times the concentrations of PCBs in their bodies as other Chinook salmon populations on the Pacific Coast. Because of this contamination, the Washington State Department of Health has issued consumption advisories for Puget Sound Chinook (Puget Sound Action Team 2007). Nevertheless, between 2000 and 2006, counties in Puget Sound counties increased by 315,965 people or by more than 50,000 people per year, with associated increases in impervious surfaces and population density per square mile of impervious surface (Puget Sound Action Team 2007).

Pollutants found in Puget Sound Chinook salmon have found their way into the food chain of the Sound. Harbor seals in south Puget Sound, which feed on Chinook salmon, have PCB levels that are seven times greater than those found in harbor seals from the Georgia Basin. Concentrations of polybrominated diphenyl ether (also known as PBDE, a product of flame retardants that are used in household products like fabrics, furniture, and electronics) in

seals have increased from less than 50 parts per billion in fatty tissue to more than 1,000 ppb over the past 20 years (Puget Sound Action Team 2007).

Various pollutants from non-point sources have also resulted in over 2,000 fish consumption advisories and more than 2,500 beach closings and advisories being issued in 1996 alone. For example, toxic algae like *Pfiesteria piscicida*, which are associated with excessive amounts of nutrients (chemical elements such as nitrogen and phosphorus) in waters in Maryland, North Carolina, and Virginia, have resulted in millions of fish killed and have had adverse effects on human health.

4.3 Summary of the Status of Wetlands in the Action Area

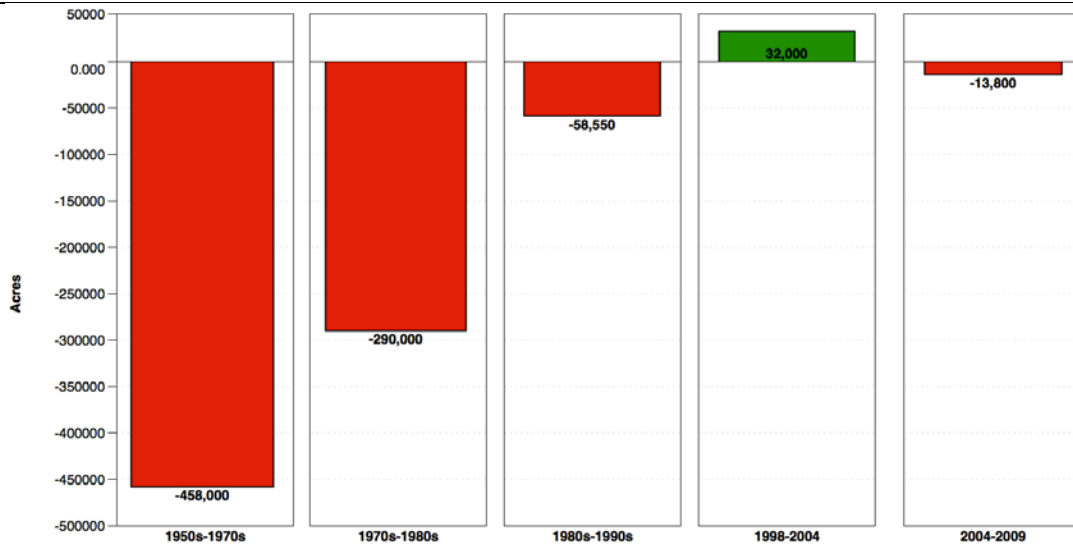
Wetlands are generally considered “waters of the United States” because of their hydrologic role (flood peak reduction, shoreline stabilization, ground water recharge), water quality function (sediment accretion and retention, nutrient retention, and retention of chemical contaminants), their support of aquatic food-chains, and because they provide habitat features that are necessary for at least one life history stage of most native species of plants, fish, and wildlife (Adamus and Stockwell 1983, Council on Environmental Quality 1989, Kadlec and Tilton 1979, Kusler 1983, Mitsch and Gosselink 1986, Mudroch and Capobianco 1979). Because of these functions, the status and trends of wetlands in watersheds is integral to the water quality and biotic diversity of watersheds in the United States.

The continental United States and Hawaii encompasses 2,313,617,280 acres of land and water. In the 1780s, about 391 million acres of these lands and waters would have been classified as wetlands using modern definitions (Dahl 1990). Between the mid-1970s and mid-1980s, about 300,000 acres of wetlands were being destroyed, modified, or degraded every year. From the mid-1970s to the mid-1980s, approximately 120,000 acres of non-tidal wetlands were converted to urban land uses (Dahl and Johnson 1991). By the 1980s, slightly more than 274 million acres of wetlands remained (11.9 percent); in 200 years, our nation’s wetland ecosystems had declined by 30 percent of their original acreage (Dahl 1990). By 2009, the date of the most recent estimate available, about 110.1 million acres (44.6 million hectares), or about 28.2 percent, of the original wetlands remained (Dahl 2011).

These losses have not been distributed evenly throughout the country. Twenty-two states lost at least 50 percent of their original wetlands. For example, California has lost about 91 percent of its original wetlands (the largest percentage lost) and Florida lost 9.3 million acres (the most acreage lost). Overall, 22 states have lost 50.0 percent or more of their original wetlands. Ten of these states — Arkansas, California, Connecticut, Illinois, Indiana, Iowa, Kentucky, Maryland, Missouri and Ohio — lost an estimated 70.0 percent or more of their original wetland acreage. From the mid-1970s to the mid-1980s, wetland losses in the southeastern U.S. accounted for 89 percent of wetland acreage destroyed or modified nationally (Boylan and MacLean 1997).

According to estimates developed by the Environmental Protection Agency, 2,080 of the 2,262 watersheds in the conterminous 48 states have experienced moderate to high levels of wetland loss. The watersheds that lost the largest number of wetlands are concentrated in California, Rio Grande drainage, the Ohio and Mississippi River drainages, the Puget Sound Region, and Florida. The only watersheds that had low levels of wetland losses were in north-central Montana and northern Maine.

Table 4.1. Average annual net change – loss or gain – of wetlands in the conterminous United States, 1954 to 2009 (after Dahl 2011 based on data from Frayer et al. 1983, Dahl and Johnson 1991; Dahl 2000, 2006, and 2011).



If we ignore the geographic distribution and ecological performance of wetlands and deepwater habitats and only consider their total acreage, the declining trend reversed between 1998 and 2004 when the area of wetlands in the conterminous United States increased by an average of 32,000 acres (12,900 hectares) each year for a total increase of 191,750 acres (77,630 hectares) over that time interval (Dahl 2011 and see Figure 4.1). The Natural Resources Conservation Service’s National Resources Inventory reported that the United States gained 263,000 acres of wetlands from 1997 to 2003, which represents an average annual increase of 44,000 acres. This net increase resulted from the area of wetlands created, enhanced, or restored by regulatory and non-regulatory activities, particularly efforts on active and inactive agricultural lands.

A more detailed examination of changes in the acreage of wetlands and deepwater habitats between 1998 and 2004 identifies important difference among types of wetlands and deepwater habitats and their geographic distribution. The wetland type that increased the most between 1998 and 2004 were freshwater ponds, many of which were created to mitigate for the destruction or modification of other wetland ecosystems. Between 1998 and 2004, the area covered by freshwater ponds increased by almost 700,000 acres (281,500 hectares), which is a 12.6 percent increase (Dahl 2006). This was the largest increase in area of any type of wetland or deepwater habitat; without this increase, the conterminous United States would have experienced a net loss of wetlands between 1998 and 2004. In the 1980s and early 1990s, ponds with a fringe of emergent vegetation represented the majority of the compensatory mitigation required to comply with section 404 of the Clean Water Act (Kentula 1993). Most of the ponds were created as artificial water detention basins, water hazards, for ornamental purposes, or for water management. These ponds do not replace the ecological functions of the vegetated wetlands they supposedly mitigate (Dahl 2000).

Pond construction projects were not evenly distributed throughout the United States. Most of these projects occurred east of the Rocky Mountains and were concentrated along coastal Texas, Louisiana, Florida, the central Mississippi River, and the lower Ohio River Valley. Open water ponds were created to mitigate for activities that occurred in a wide variety of wetland ecosystems in California, Oregon, and Washington (Gwin *et al.* 1999).

Table 4.1. Estimated average annual net loss of vegetated wetlands in the conterminous United States, 1974 to 2009 (after Dahl 2011 based on data from Dahl and Johnson 1991; Dahl 2000, 2006, and 2011).



These freshwater ponds were created to mitigate for a wide variety of other wetland types. From 1998 to 2004, about 82,500 acres of freshwater vegetated wetlands were lost each year (Dahl 2006). Freshwater emergent marshes, which are critically important to a large number of fish and wildlife species like juvenile sockeye and Chinook salmon, declined by about 142,570 acres (57,720 hectares; Dahl 2006). The area of marine intertidal beaches, which are critically important to threatened and endangered sea turtles and several threatened or endangered species protected by the U.S. Fish and Wildlife Service, declined by 1,900 acres (770 hectares) or 1.4 percent. This rate of decline was similar to the rate of decline for these beaches measured between 1986 and 1997.

Between 1998 and 2004, an estimated 88,960 acres (36,000 hectares) or 39 percent of the wetland losses were lost to urban development, 51,440 (20,800 hectares) or 22 percent were lost to rural development, and 18,000 acres (7,300 hectares) were lost to silviculture (Dahl 2006). An additional 70,100 acres (28,400 hectares) of wetlands lost between 1998 and 2004 were converted to deepwater habitats. Ninety-five percent of the area of wetlands and deepwater habitats that remained in 2004 were represented by freshwater wetlands while five percent were represented estuarine or marine wetlands (Dahl 2006). Forested wetlands represented most of the acreage of freshwater wetlands (51 percent), followed by emergent wetlands (25.5 percent), shrub wetlands (17 percent), and freshwater ponds (6.5 percent). By 2004, there were an estimated 728,540 acres (294,960 hectares) of intertidal non-vegetated wetlands in the conterminous United States.

The pattern of net increases that was detected between 1998 and 2004 was replaced by a pattern of decline between 2004 and 2009. In that time interval, the conterminous U.S. experienced a net loss of about 13,800 acres of wetlands (Figure 4.1). As before, these net losses mask important differences in patterns of loss and gain between types of wetlands and deepwater habitats. About 84,100 acres of intertidal wetlands were lost and 21,900 acres of freshwater wetlands were added, resulting in a total loss of about 62,300 acres of wetlands in the time interval (Dahl 2011). These acreage estimates mask substantial changes in the types of wetlands and their geographic distribution because some types of wetlands experienced substantial losses while other types of wetlands increased in acreage. The wetland types that experienced the greatest losses in acreage between 2004 and 2009 were forested wetlands (which decreased by about 633,100 acres) and estuarine intertidal vegetated wetlands (which decreased by about 110,900 acres). The wetland types that experienced the greatest increases in acreage between 2004 and 2009 were freshwater

emergent wetlands (which increased by about 267,800 acres), freshwater ponds (increased by about 207,200 acres), and freshwater scrub wetlands (which increased by about 180,100 acres).

In addition to reductions in the area of land represented by wetlands, the structure, biotic composition, and ecological processes of wetland ecosystems have often been degraded or damaged even when the ecosystem has not been destroyed. Wetland ecosystems can be degraded through physical, chemical, and biotic processes or through combinations of all three processes. Physical alterations, which are often the most destructive, include changes in the topography and hydrology of wetlands. Historically, the most significant physical alteration of wetland ecosystems has been caused by draining wetlands to support agriculture (Tiner 1984). Physical alterations to riverine ecosystems using dams, stream channelization, and dredging to stabilize water levels in rivers or lakes eliminates seasonal and episodic flooding that interrupts or eliminates the delivery of nutrients and sediments to wetland ecosystems, which commonly depend on nutrient and sediment pulses as part of their natural ecology (Loucks 1989).

The destruction of wetland acreage that has continued since the 1950s – with the exception of 1998 to 2004 -- would have been accompanied by reductions in the total population size of species that depended on those wetlands. Entire populations of some wetland-dependent species would have been extirpated as the acreage of their habitat effectively disappeared. Populations of other wetland-dependent species would have declined until their density was no longer constrained by the availability of wetland habitat.

4.4 National Efforts to Conserve Aquatic Ecosystems

Clean Water Act

The Federal Water Pollution Control Act, or Clean Water Act, is the principal law concerned with polluting activity in streams, lakes, and estuaries in the United States. This 1948 statute was totally re-written in 1972 (P. L. 92-500) to produce its current purpose: “to restore and maintain the chemical, physical, and biological integrity of the Nation's waters” (Federal Water Pollution Control Act, Public Law 92 –500). Congress made substantial amendment to the Clean Water Act in the Water Quality Act of 1987 (P. L. 100-4) in response to the significant and persistent water quality problems.

The Clean Water Act uses two primary approaches to achieve its goal. The first approach uses regulations to achieve a goal of zero discharge of pollutants into waters of the United States. The second approach provides federal technical assistance for municipal wastewater treatment construction. Both approaches are supported by research activities, permits, and provisions for enforcement. To achieve its objectives, the Clean Water Act prohibits all discharges into the nation’s waters, unless they are specifically authorized by a permit. For example, the National Pollutant Discharge Elimination System or NPDES program regulates discharges of pollutants like bacteria, oxygen-consuming materials, and toxic pollutants like heavy metals, pesticides, and other organic chemicals. On the other hand, Section 404 of the Clean Water Act prohibits discharges of dredged or fill material into waters of the United States without a permit.

Most of these federal programs are administered by the EPA, while state and local governments have the principal day-to-day responsibility for implementing the law. However, as discussed in the *Description of the Proposed Action* section of this Opinion, Section 404 of the Clean Water Act (33 U.S.C section 1344) authorizes the USACE,

or a state with a program approved by the EPA, to regulate placement of dredged or fill material in waters of the United States and other activities in navigable waters of the United States. We discuss the impacts of the USACE's program and its effects on endangered and threatened species in greater detail in the *Effects of the Action* chapter, which follows this *Environmental Baseline*.

Nonpoint sources of water pollution, which are believed to be responsible for the majority of modern water quality problems in the United States, are not subject to Clean Water Act permits or the regulatory requirements. Instead, non-point sources of pollution are regulated by States programs.

Wetland Protection Programs

Since the 1970s, numerous federal, state, local, and private programs have developed to protect and restore wetlands for their hydrological, ecological, and aesthetic value. In 1977, the Office of the President issued Executive Order No. 11990 which directed all federal agencies to minimize the destruction of wetlands and to preserve and enhance wetlands' benefits when carrying out responsibilities such as managing federal lands and facilities or funding construction activities. In 1989, the Executive Office of the President committed the executive branch of the United States to achieve a national goal of no net loss of wetlands.

About 13 percent of the wetland acreage in the United States is managed by Federal agencies. This includes 1.1 million acres of the U.S. Fish and Wildlife Service's National Wildlife Refuge System that were established to protect wetland ecosystems. Other Federal agencies managing wetlands include the National Park Service, USDA Forest Service, Bureau of Land Management, National Oceanic and Atmospheric Administration, Bureau of Reclamation, Bureau of Indian Affairs, and Department of Defense. Under Federal-Aid-Highway legislation, state transportation agencies may use National Highway System and Surface Transportation Program funds to finance wetland and natural habitat conservation planning and implementation, as well as compensatory mitigation and restoration projects that offset unavoidable losses from transportation projects. Under the Federal Aid Highway Program, the U.S. Department of Transportation has created, restored, or enhanced almost 42,000 acres of wetlands since 1996, which exceeds the acres adversely affected by transportation projects by almost 26,000 acres.

In addition, numerous programs implemented by Federal, state, and local governments, non-governmental organizations, and private institutions are designed to protect, restore, or enhance wetland ecosystems on the 74 percent of the land in the United States that is privately owned.

Conservation Reserve Program: Originally authorized in 1985 and re-authorized through 2007, the Conservation Reserve Program establishes permanent cover on eligible acreage of environmentally sensitive lands (including cropland and wetlands that had been previously converted for agriculture) through long-term rental agreements. Currently, about 2.3 million wetland acres, including upland buffers, have been restored and are maintained under 10- and 15-year contracts with annual rental payments.

Wetlands Reserve Program: Another voluntary program that helps restore and protect wetlands on private lands using conservation easements and cost-share agreements. Since 1992, more than 1 million acres of wetland and associated upland have been enrolled in this program. The 2002 Farm Bill authorizes up to an additional 250,000 acres to be enrolled in the program each year, for a total program enrollment of 2,275,000 acres by the end of 2007.

By the end of Fiscal Year 2005, the acreage of wetlands that were enrolled in this program exceeded 1.8 million acres of wetlands and associated uplands.

Aquatic Ecosystem Restoration: The USACE has numerous authorities that allow them to undertake projects to restore aquatic ecosystems on the 12 million acres of water and land the USACE's manages for purposes, such as flood damage reduction, navigation, and recreation. For example, the USACE is primarily responsible for the *Comprehensive Everglades Restoration Plan* (which was developed to restore the South Florida ecosystem, from Lake Okeechobee to the Florida Everglades and, once complete, will represent the largest ecosystem restoration undertaken), the *Louisiana Coastal Area, LA Ecosystem Restoration*, which was developed to restore and protect Louisiana's valuable coastal wetlands, and the *Upper Mississippi River Restoration*, which entails a suite of habitat projects to revitalize the side channels and to restore island, aquatic, and riparian habitat in the Upper Mississippi River.

FWS Coastal Program: The Coastal Program works in 18 specific coastal communities to improve the health of watersheds for fish, wildlife, and people by building partnerships; identifying, evaluating, and mapping important habitats; restoring habitats; and providing technical assistance and financial support to help protect important coastal habitats. Since 1994, the program has restored 112,000 acres of coastal wetlands, 26,000 acres of coastal uplands, and over 1,100 miles of coastal streamside habitat. It has also helped protect 1.33 million acres of coastal habitat.

North American Wetlands Conservation Act Program: This U.S. Fish and Wildlife Service program provides matching grants to public and private groups and agencies for wetlands restoration and protection in the United States, Canada, and Mexico. Since 1991, this program has protected, restored, or enhanced more than 14.6 million acres of wetland habitats and uplands associated with those habitats.

North American Waterfowl Management Plan— Joint Ventures: The U.S. Fish and Wildlife Service participates in a tri-national strategic plan that works to build partnerships between state and Federal governments, tribes, corporations, private organizations, and individuals that are designed to cooperatively plan, fund, and implement projects to conserve and enhance wetland habitat in high-priority "joint venture" regions. The plan calls for 16.1 million acres of wetlands and associated uplands to be protected and 12.1 million acres to be restored or enhanced.

FWS Partners for Fish and Wildlife Program: This program works with landowners to restore wetlands on private lands using cooperative agreements. Since the program began in 1987, the FWS has entered into over 37,000 agreements to restore more than 750,000 acres of wetlands, over 1.57 million acres of uplands, and over 5,900 miles of riparian and in-stream habitat.

Environmental Quality Incentives Program (EQIP): Through EQIP, farmers and ranchers receive financial and technical assistance on conservation practices that enhance soil, water, and related natural resources, including wetlands. Since the program was established in 1996, it has restored about 29,369 acres of wetlands and an additional 146,769 acres have been enhanced or improved.

Other federal programs that are protect, restore, or enhance wetlands in the United States include the Grassland Reserve Program and Wildlife Habitat Incentives Program. By Fiscal Year 2007, the latter of these two programs is

expected to have protected, restored, or enhanced about 11,100 acres of wetlands. The Federal Highway Administration uses its various authorities to achieve a net increase in wetland acreage associated with its projects. For example, Federal-aid highway projects provided 3.3 acres of compensatory wetland mitigation for each acre of impact and the FHWA estimates that Federal-aid highway programs have resulted in a net increase of 25,888 acres of wetlands between 1996 and 2005.

4.5 Integration and Synthesis of the Environmental Baseline

In 2007, the population of the United States increased to more than 300 million people for the first time in its history. That population growth and increase in population density was accompanied by dramatic changes in the landscapes of the United States. By 2000, half of the population in the United States lived in the suburbs (Hobbs and Stoops 2002). About 75 percent of all Americans now live in areas that are urban or suburban in character; that is, about 75 percent of the people in the lower 48 States live in less than 2 percent of the land area of the lower 48 states. Most modern metropolitan areas encompass a mosaic of different land covers and uses (Hart 1991). The mosaic of land uses associated with urban and suburban centers has been cited as the primary cause of declining environmental conditions in the United States (Flather *et al.* 1998) and other areas of the world (Houghton 1994).

The direct and indirect effects of these changes in land-use and land-cover have had lasting effect on the quantity, quality, and distribution of every major terrestrial, aquatic, and coastal ecosystem in the United States, its territories, and possessions. Many native ecosystems exist as small isolated fragments surrounded by expanses of urban and suburban landscapes or “natural” areas that are dominated by non-native species. As a result, many of the native plant and animal species that inhabited those native ecosystems over the past have become extinct, extinct in the wild, endangered, or threatened over the past 200 years.

Beginning in the 1960s, a wide variety of programs undertaken by federal, state, and local governments, non-governmental organizations, and private individuals have been established to protect or restore our nation’s forests, grasslands, wetlands, estuaries, rivers, lakes, and streams. Those programs have helped slow and, for many ecosystems, reverse declining trends that began in the past. However, those efforts have benefited some ecosystems and their associated flora and fauna more than other ecosystems. Despite the efforts of agencies at every level of government, non-governmental organizations, and private individuals, non-point sources of pollution still degraded our rivers, lakes, and streams; freshwater aquifers in coastal areas remain at risk from saltwater intrusion because of water withdrawals; nutrients transported down the Mississippi River remains sufficient to produce an hypoxic zone in the Gulf of Mexico that had more than doubled in size; and the acreage of wetland declined from slightly more than 274 million acres of wetlands to about 107.7 million acres between the 1980s and 2004 (Dahl 2006).

The status and trend of freshwater, estuarine, and coastal ecosystems of the United States and the effects of land use practices on those ecosystems has had substantial influence on patterns of extinction and endangerment. Our nation’s rivers and streams have been altered by dams, stream channelization, and dredging to stabilize water levels in rivers or lakes eliminates seasonal and episodic flooding that interrupts or eliminates the delivery of nutrients and sedi-ments to wetland ecosystems, which commonly depend on nutrient and sediment pulses as part of their natural ecology (Loucks 1989). Wetland ecosystems have been drained to make land available for agriculture; they have been filled to make land available for residential housing, commerce, and industry; they have been diked to control mosquitoes; and they have been flooded for water supply. Efforts to create and restore wetlands and other aquatic

ecosystems by agencies of federal, state, and local governments, non-governmental organizations, and private individuals have dramatically reduced the rate at which these ecosystems have been destroyed or degraded, but many aquatic ecosystems continue to be destroyed and degraded each year.

The impact of these land use changes on endangered and threatened species has been substantial. Over the past 20 years, at least 58 species have been presumed to have become extinct, including the longjaw cisco (*Coregonus alpense*; estimated year of extinction: 1983), Amistad gambusia (*Gambusia amistadensis*; estimated year of extinction: 1987), Maryland darter (*Etheostoma sellare*), Sampson's pearly mussel (*Epioblasma sampsoni*; estimated year of extinction: 1984). Numerous other species have not been seen in decades despite extensive efforts to collect them and are, therefore, assumed to be extinct, including the Thicketail chub (*Gila grassicauda*; last collected 1950s), Scioto madtom (*Noturus trautmani*; last collected 1957), Maryland darter (*Etheostoma sellare*; last collected 1988), Phantom shiner (*Notropis orca*; last seen 1975), Shortnose cisco (*Coregonus reighardi*; last collected 1985), Catahoula salamander (*Plethodon ainsworthi*; last collected 1964), Moloka'i damselfly (*Megalagrion molokaiense*; last seen 1940s), and the Oahu treesnail (*Achatinella abbreviata*; last seen 1963). Many more native species of plants and animals continue to decline toward extinction as a result of these land use changes.

5 Effects of the Proposed Action

The *Description of the Proposed Action* summarized the Nationwide Permits the U.S. Army Corps of Engineers either proposes to authorize or re-authorize and general permits whose direct and indirect consequences are considered in this Opinion. The *Status of the Listed Resources* identified the endangered species, threatened species, and designated critical habitat that may be affected and are likely to be adversely affected by the proposed Nationwide Permits. The *Status* also summarizes the status and trend of those species, their dependence on waters of the United States (including wetlands), and other ecological information that might be relevant to our effects' analyses. The *Environmental Baseline* summarized the consequences of a variety of human activities on endangered species, threatened species, and designated critical habitat.

The *Effects of the Action* is the primary focus of an Opinion. As we described in the *Approach to the Assessment* chapter of this Opinion, our analysis of the probable effects of the proposed Nationwide Permits on endangered and threatened species and designated critical habitat under the jurisdiction of NMFS has two components. The first component examines the consequences of exposing endangered and threatened species and designated critical habitat under the jurisdiction of NMFS to the various activities that would be authorized by the proposed Nationwide Permits. The second component examines the Nationwide Permit Program to determine whether or to what degree the USACE has structured the program to insure that specific discharges of dredged or fill material into waters of the United States and other activities authorized by the proposed Nationwide Permits are not likely to jeopardize the continued existence of endangered species or threatened species under the jurisdiction of NMFS or result in the destruction or adverse modification of critical habitat that has been designated for those species.

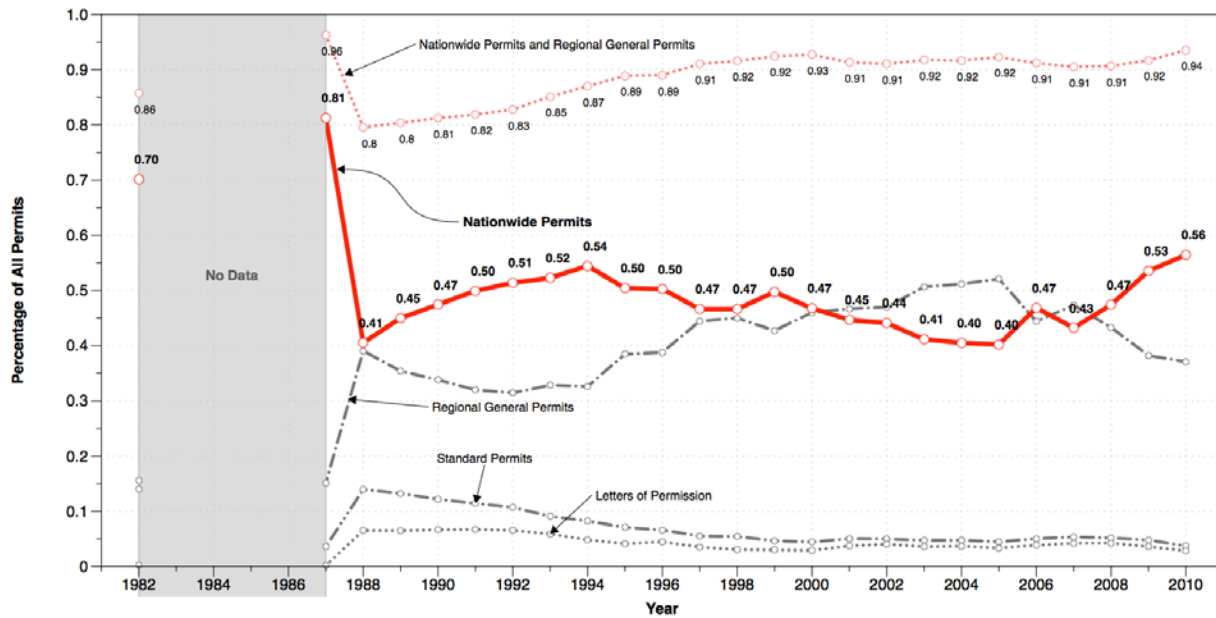
We begin the first component of our effects analyses by examining the categories of activities that would be authorized by the Proposed Nationwide Permit Program, particularly their spatial and temporal patterns and cumulative effects. Then we examine the degree of geographic and temporal overlap between those activities or their effects and endangered and threatened species under the jurisdiction of the NMFS and critical habitat that has been designated for these species. We follow this with a review of the literature available on the physical, physiological, behavioral, social, and ecological responses of endangered or threatened species or constituent elements of critical habitat given exposure to the activities that would be authorized by the proposed Nationwide Permits or to the effects of those activities on the watersheds and aquatic ecosystems. Finally, we summarize the probable consequences of those responses for populations of endangered and threatened species. Similarly, we summarize the probable consequences of site-specific alterations of designated critical habitat on the value of the critical habitat designations for the conservation of the endangered or threatened for which it was designated.

5.A.1 Effects of the Nationwide Permit Program

The Clean Water Act prohibits the discharge of any dredged or fill material into waters of the United States, which includes wetlands, without a permit. Discharges of these materials into jurisdictional wetlands and other waters of the United States are regulated by section 404 of the Clean Water Act, which is administered by the USACE with oversight by the U.S. Environmental Protection Agency. The USACE employs for primary kinds of permits to authorize discharges or fill materials into waters of the United States and other activities under the 404 program: (1) Standard or Individual Permits, (2) Letters of Permission, (3) General Permits (including Regional and State General Permits), and (4) Nationwide Permits.

1. *Standard or Individual Permits.* Standard or individual permits receive the highest level of scrutiny by the USACE. Before it can issue an individual permit, the USACE must establish that the discharge or other activity is in the public's interest. To help the USACE make that determination, it provides public notice to all known interested persons and evaluates comments and information it receives before it makes a final decision on an application. The USACE's review process is also intended to insure that proposed authorizations comply with the section 404(b)(1) guidelines, the National Environmental Policy Act, which can require the USACE to prepare environmental impact statements, consultations with NMFS and the U.S. Fish and Wildlife Service pursuant to section 7 of the ESA, and compliance with other sections of the Clean Water Act, among many of the federal, state, and local laws the USACE must consider. Depending on the data source, year, and USACE District, standard permits represent between 7 and 19% of the authorizations the USACE issues each year.
2. *Letters of Permission.* Letters of Permission are authorizations issued through abbreviated processing procedures that include coordination with Federal and State environmental agencies and a public interest evaluation, but do not require the USACE to publish a public notice. The USACE normally uses letters of permission for activities that occur in navigable waters when objections are not likely and when the activity does not qualify for a General Permit. Letters of Permission typically represent less than 1% of the authorizations the USACE issues.
3. *General Permits.* General permits are the most common mechanism for authorizing placement of dredged or fill material into waters of the United States, representing between 80 and 92% of all authorizations (USACE 1995, Martin *et al.* 2006; see also Figure 5.2). Nationwide permits, which are a type of general permit, are an essential part of the USACE's regulatory program, and are utilized to authorize approximately 40% of the activities regulated by this program. General permits are specifically authorized by Clean Water Act section 404(e) (33 U.S.C. section 1344(e)) which allows the Secretary of the Army to "issue general permits on a State, regional, or nationwide basis for any category of activities involving discharges of dredged or fill material if the Secretary of the Army determines that the activities in such category are similar in nature, will cause only minimal adverse environmental effects when performed separately and will have only minimal cumulative adverse effect on the environment."
4. *Nationwide Permits.* The USACE established Nationwide Permits to authorize discharges of dredged or fill material and other activities in 1977 (Federal Register 42 (138): 37122-37164). They were intended to allow the USACE to manage its Section 404 regulatory program and to allow it to focus its efforts on

Figure 5.1. Percentage of the total number of activities the USACE authorized using Nationwide Permits, Regional General Permits, Standard Permits, and Letters of Permissions between 1982 and 2010 (based on data from the USACE, Environmental Working Group, and Public Employees for Environmental Responsibility)



reviewing projects with greater potential for ecologically significant, adverse effects on waters of the United States.

5. *Stacking.* USACE regulations allow permittees to use combinations of General Permits and Nationwide Permits to authorize “single and complete” projects (defined as a project proposed or accomplished by one owner or developer) that do not exceed total impact limits (76 Federal Register 9203). This process is known as “stacking of permits.” This process allows projects that do not fit within one permit type to be permitted without going through the process associated with Standard Permits. USACE regulations also allow Nationwide Permits to be combined with Standard Permits if those portions of a project that qualify for a Nationwide Permit have “independent utility”; that is, they would satisfy their intended purpose regardless of their relationship to other parts of the proposal.

A basic premise of the USACE’s permitting program is that no discharge shall be permitted if (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the discharge would cause the nation’s waters to be significantly degraded. In order for a project to be permitted, it must be demonstrated that, to the extent practicable: steps have been taken to avoid impacts to wetlands and other aquatic resources, potential impacts have been minimized, and compensation will be provided for any remaining unavoidable impacts.

Since Nationwide Permits were established, they have been responsible for authorizing between 40 and slightly more than 80% of all of the activities the USACE has authorized (and for which data are available, see Figure 5.1). The combination of Nationwide and General Permits have accounted for more than 90% of the USACE’s authorizations since the early 1980s, although the proportion of activities authorized by the two permits has fluctuated. Until the late 1990s, Nationwide Permits accounted for the greatest proportion of authorizations, from the late 1990s

until about 2007, General Permits accounted for the greatest proportion of authorization; since then, the proportion of authorizations accounted for by Nationwide Permits has continually increased.

The narratives that follow discuss the number of activities that have been authorized by Nationwide Permits, the amount of acreage that has been impacted by those activities, any spatial and temporal patterns in those data, and cumulative effects. Then we examine the degree of geographic and temporal overlap between those activities or their effects and endangered and threatened species under the jurisdiction of the NMFS and critical habitat that has been designated for these species.

5.A.1.1 Number of Activities Authorized by Nationwide Permits

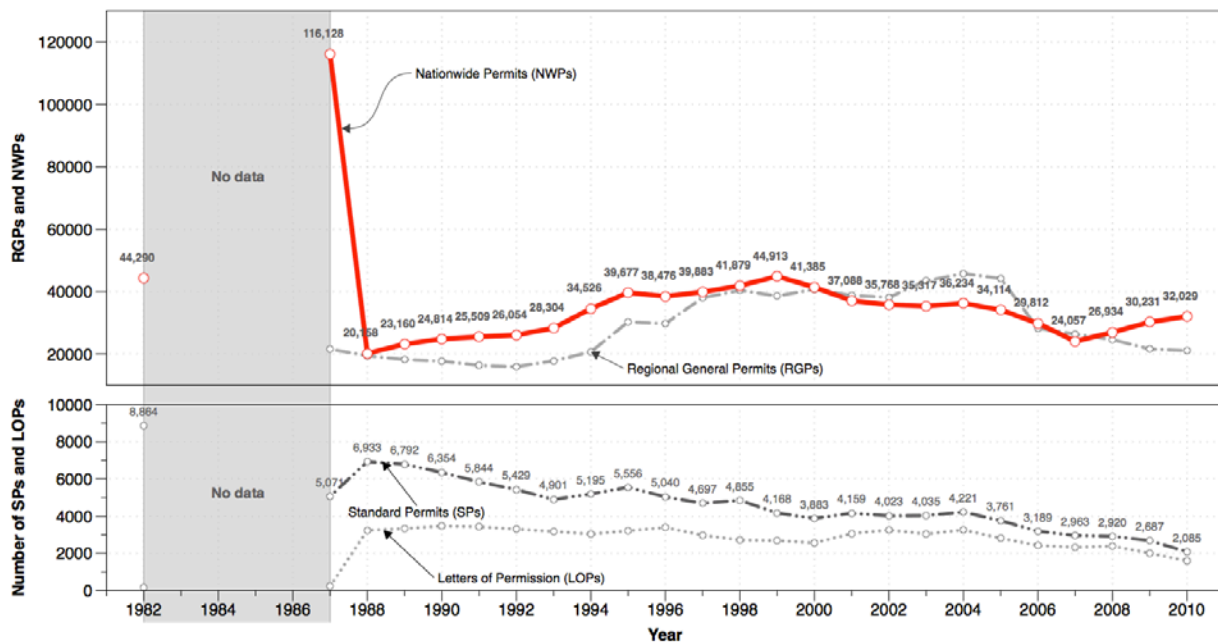
Since 1977, the USACE has made several attempts to collect data on the activities authorized by Nationwide Permits and has tried to continuously improve the information systems it uses to collect those data. Despite those efforts, there are still large gaps in the number of activities that have been authorized by Nationwide Permits. For example, the USACE has estimated the number of activities that Nationwide Permits have authorized each year since 1988, but the estimates for the first decade of the program are only available for 1982. Although we had data on number of activities available since 1988, the data available for the years 1999, 2007, and 2010 were the most detailed. We analyzed all of these data to gain insight into the number of activities that have been authorized by the Nationwide Permits, the permits that have been associated with the greatest number of activities, and to estimate the number of activities we would expect to be authorized by Nationwide Permits over the next five years.

Figure 5.2, presents estimates of the number of activities that have been authorized by Nationwide Permits between 1982 and 2010, based on data we received from the USACE, Environmental Working Group, and Public Employees for Environmental Responsibility (note the absence of data prior to 1982 and the data gap between 1982 and 1987). On average, about 36,613 (95% confidence interval = 29,259 - 43,967) discharges of dredged or fill material and other activities have been authorized in the United States, its territories, and possessions by Nationwide Permits each year since 1982. If we ignore the estimate for 1987, which is an outlier, the average number of discharges and other activities authorized by the Nationwide Permits drops to 33,109 (95% confidence interval = 30,250 – 35,968). The number of discharges and other activities that have been authorized over the past 8 years (between 2003 and 2010) have averaged 31,090 (95% confidence interval = 31,085 – 31,097), which is only slightly below the average for the longer time interval.

The number of activities authorized by Nationwide Permits declined consistently between 1999 and 2007 (Figure 5.2); in that time interval, the number of activities authorized by Nationwide Permits declined by 25,612 or 25.79%. Between 2007 and 2010, they declined by another 41,644 or 56.5%; and between 1999 and 2010, the number of activities authorized declined by 67,256 activities or 67.71%. Although these data suggest the number of activities authorized by Nationwide Permits are on a declining trend, these trends may be an artifact of the small sample size or, as the next paragraph suggests, the trend may result from deficiencies in the USACE's database.

Because many Nationwide Permits have authorized discharges and other activities without requiring permittees to provide any information to the USACE, we assume that the Nationwide Permits have authorized a substantial, but unknown number of activities. As a result, our estimates of the number of activities authorized by the Nationwide

Figure 5.2. Estimated or actual number of activities the USACE authorized using Nationwide Permits each year between 1982 and 2010 (based on data from the USACE, Environmental Working Group, and Public Employees for Environmental Responsibility)



Permits and the number of acres impacted by those activities almost certainly underestimate the actual number of activities that are likely to occur. Analyses of data presented in Ellis (2005) and that the Environmental Working Group and Public Employees for Environmental Responsibility received through Freedom of Information Act requests suggest that the USACE’s estimates underestimate the actual number of activities authorized by Nationwide Permits; in some cases, those underestimates are substantial.

Ellis (2005) evaluated the impacts of the USACE permits in the State of Montana from 1990 through 2002 and concluded that the USACE’s database contains no information about the size of project impacts for 29.1% of all 404 permits issued (1,819 of the 6,261 permits issued), with missing data for 27% of Standard Permits, 28% of Nationwide Permits, and 49% of General Permits. Based on the data they received from the USACE, the Environmental Working Group (1996) concluded that the USACE underestimated the number of activities it authorized using Nationwide Permits by 32 to 100%, depending on the permit number. Using data they also received from the USACE through a Freedom of Information Act request to determine that the USACE’s data, PEER estimated that the USACE issued about 36,000 to 39,000 Nationwide Permits each year, or a total of 112,804 Nationwide Permits in 1995, 1996, and 1998 (PEER 1999). The data available do not allow us to produce more reliable or robust estimates; nevertheless, for the purposes of this consultation, we assume that the estimates discussed in this subsection are minimum estimates.

Over the 24 years for which some data are available, a total of about 910,740 discharges of dredged or fill material and other activities have been authorized by Nationwide Permits. As we have already discussed, we assume these are minimum estimates and that the actual number of discharges are substantially higher because they do not

account for the number of authorizations that did not require permittees to notify the USACE. We also assume that some estimates contained in PCNs had some error associated with them.

The preceding estimates provide some insight into the total number of activities authorized by the USACE's Nationwide Permits. They do not, however, provide any insight into how different Nationwide Permits fit into those totals. To provide that insight, we conducted Pareto analyses using USACE's data from 1999, 2007, and 2010 to rank the different Nationwide Permits in terms of the number of activities they authorized. Based on those analyses activities authorized by four of the current Nationwide Permits –NWP 12 (utility line activities), NWP 3 (maintenance activities), NWP 14 (linear transportation projects), and NWP 13 (bank stabilization) accounted for almost 75% (74.05) of the activities authorized by Nationwide Permits since 1999. Adding two more Nationwide Permits – NWP 27 (aquatic habitat restoration, establishment, and enhancement activities) and NWP 18 (minor discharges) – accounted for more than 80% (82.17%) of the activities authorized by Nationwide Permits in the three years for which data on specific permits were available.

If we assume the averages we just discussed are representative of the number of activities the USACE will authorize each year over the five-year duration of the Nationwide Permits it currently proposes, we would expect the proposed Nationwide Permits to authorize at least 33,109 (95% confidence interval = 30,250 – 35,968) activities each year for the next five years. Using that assumption, we would expect the proposed Nationwide Permits to authorize at least 165,544 (95% confidence interval = 151,248 - 179,840) discharges of dredged or fill material or other activities into waters of the United states over the five-year duration of the proposed Nationwide Permits.

If we apply this same approach to the 21 existing Nationwide Permits that are likely to involve the kinds of activities that directly or indirectly affect endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species, we would expect these Nationwide Permits to authorize at least 30,083 (95% confidence interval = 27,485 – 32,681) activities each year for the next five years. Using that assumption, we would expect the proposed Nationwide Permits to authorize at least 150,413 (95% confidence interval = 137,424 – 163,403) activities over the five-year period.

5.A.1.2 Acreage Impacted by Nationwide Permits

The limitations in the data available on the number of activities authorized by Nationwide Permits since 1977 also affect the data available on the number of acres impacted by the Nationwide Permit. The data available for the years 1999, 2007, and 2010 were the most extensive and were supplemented by fragmentary data from other years. We analyzed all of those data to gain some insight into the acreage impacted by the Nationwide Permits, the permits that were associated with the most impacts, and to estimate the acreage we would expect to be impacted over the next five years.

Based on data the USACE provided for the years 1999, 2007, and 2010, at least 40,528.56 acres were impacted by the 204,498 activities the USACE authorized with Nationwide Permits in those three years (Table 5.2). The activities that were authorized in those three years impacted an average of 0.198 acres of jurisdictional wetlands and other waters of the United States. Activities authorized by Nationwide Permit 49 (coal remining activities) had the highest mean-acreage-impacted-per-activity values: on average, the 130 activities authorized by this Nationwide Permit impacted slightly more than 381.37 acres (acreage that had been verified by the USACE and acreage

estimated for activities that did not require reporting) resulting in an average of 2.93 acres impacted-per-activity. If we include the abnormally high number of acres that were impacted by Nationwide Permit 27 (aquatic habitat restoration, establishment, and enhancement) that occurred in 2010 (27,740.04 acres impacted in 2010, compared with 1,678 and 1,300 acres in 2007 and 1999, respectively), then activities authorized by NWP 27 had the highest mean-acreage-impacted-per-activity values: the 3,561 activities authorized by this Nationwide Permit impacted 30,725.8 acres of jurisdictional wetlands and other waters of the United States. If we treat the acreage estimate for 2010 as an outlier, then activities authorized by NWP 27 have the third highest mean-acreage-impacted-per-activity value.

In addition, between May 1997 and September 1998, 9,583 discharges authorized by Nationwide Permit 26 (which authorized discharges into headwaters and isolated waters. The permit has since been withdrawn), are reported to have impacted about 4,198 acres of wetlands. In the year 1999, the 33,800 discharges authorized by Nationwide Permit 26 are reported to have impacted about 8,400 acres of jurisdictional wetlands and other waters of the United States. This acreage would be added to the acreage estimates in the preceding paragraph.

With the data available, we could not reliably estimate the number of acres of jurisdictional wetlands and other waters of the United States that would have been impacted by activities authorized by Nationwide Permits since 1977. We could, however, estimate a minimal number of acreage that would have been impacted, although we could not estimate how much this minimal estimate would differ from an actual estimate. Nevertheless, at least 40,528.56 acres were impacted during 1999, 2007, and 2010. If we multiply our estimates of the number of activities that are reported to have been authorized by Nationwide Permits between 1982 and 2010 (910,740 permits, see Table A.1 in Appendix A) by our estimated mean-acreage-impacted-per-activity values (0.1982 or 0.2318, depending on whether we treat the acreage impacted by NWP 27 in 2010 as an outlier), then the Nationwide Permits would have directly impacted at least 180,508.67 to 211,109.53 acres of wetlands or other aquatic ecosystems between 1982 and 2010 (the former estimate does not treat the acreage impacted by NWP 27 as an outlier while the latter does).

Although the number of activities authorized by Nationwide Permits appears to have declined consistently from 1999 to 2010, the number of acres impacted by those activities appears to have increased consistently (see preceding discussion in Section 5.A.1.1). In 2007, the acreage impacted by activities authorized by Nationwide Permits was 1.62 times the acreage impacted in 1999; in 2010, the acreage impacted by those activities in 2010 was 4.763 times the acreage impacted in 2007. The acreage impacted by those activities in 2010 was 7.22 times the acreage impacted in 1999. On their face, these data suggest that the number of activities authorized by Nationwide Permits between 1999 and 2010 declined by 67.71% while the acreage impacted by those activities increased by more than 700%. As we stated in the preceding discussion, however, these trends may also be an artifact of the small sample size (we only have data for 3 of the past 12 years) or deficiencies in the USACE's database.

If we consider only the 21 existing Nationwide Permits that are likely to involve the kinds of activities that directly or indirectly affect endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species, we produce a slightly different picture (Table 5.3). Although these 21 Permits accounted for 79.09% of the activities authorized by Nationwide Permits in 1999, 2007, and 2010, they accounted for 90.86% of all of the acreage impacted by all of the activities authorized by Nationwide Permits in those three

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.2. Total acreage and mean-acreage-impacted-per activity based on data for the years 1999, 2007, and 2010. Adjusted mean acreage impacted per activity (column 5) treats the acreage estimated to have been impacted by Nationwide Permit 27 in 2010 as an outlier and replaces it with the mean value for 1999 and 2007

NWP #	Permit name (using naming conventions in 2011 proposed rule)	Revised Total Activities	Revised Total Acres	Mean Acre/Activity	Adjusted Mean Acre/Activity
1	Aids to navigation	2090	5.316	0.0025	0.0025
2	Structures in artificial canals	1541	0.602	0.0004	0.0004
3	Maintenance	29615	1067.782	0.0361	0.0361
4	Fish and wildlife harvesting, enhancement, and attraction devices	21449	50.183	0.0023	0.0023
5	Scientific measurement devices	1546	10.182	0.0066	0.0066
6	Survey activities	5515	136.803	0.0248	0.0248
7	Outfall structures and associated intake structures	2133	75.111	0.0352	0.0352
8	Oil and gas structures on the Outer Continental Shelf	106	0.7	0.0066	0.0066
9	Structures in fleeting and anchorage areas	658	0.09	0.0001	0.0001
10	Mooring buoys	3019	0.049	0.0000	0.0000
11	Temporary recreational structures	1573	0.09	0.0001	0.0001
12	Utility line activities	38263	1598.153	0.0418	0.0418
13	Bank stabilization	27805	599.57	0.0216	0.0216
14	Linear transportation projects	20505	884.613	0.0431	0.0431
15	U.S. Coast Guard approved bridges	220	28.392	0.1291	0.1291
16	Return water from upland contained disposal areas	528	42.486	0.0805	0.0805
17	Hydropower projects	21	1.29	0.0614	0.0614
18	Minor discharges	9830	208.268	0.0212	0.0212
19	Minor dredging	3706	36.774	0.0099	0.0099
20	Response operations for oil and hazardous substances	213	17.3	0.0812	0.0812
21	Surface coal mining activities	296	475.658	1.6070	1.6070
22	Removal of vessels	234	0.98	0.0042	0.0042
23	Approved categorical exclusions	5077	1064.651	0.2097	0.2097
24	Indian Tribe or State administered section 404 programs	2	0	0.0000	0.0000
25	Structural discharges	1859	21.777	0.0117	0.0117
27	Aquatic habitat restoration, establishment, and enhancement activities	3561	30725.807	8.6284	1.2837
28	Modifications of existing marinas	723	10.126	0.0140	0.0140
29	Residential developments	3454	403.024	0.1167	0.1167
30	Moist soil management for wildlife	508	37.869	0.0745	0.0745
31	Maintenance of existing flood control facilities	455	28.18	0.0619	0.0619
32	Completed enforcement actions	206	47.541	0.2308	0.2308
33	Temporary construction, access and dewatering	3702	230.489	0.0623	0.0623
34	Cranberry production activities	71	13.986	0.1970	0.1970
35	Maintenance dredging of existing basins	893	131.284	0.1470	0.1470
36	Boat ramps	2469	33.027	0.0134	0.0134
37	Emergency watershed protection and rehabilitation	1234	36.77	0.0298	0.0298
38	Cleanup of hazardous and toxic waste	487	184.058	0.3779	0.3779
39	Commercial and institutional developments	1756	190.424	0.1084	0.1084
40	Agricultural activities	1113	203.415	0.1828	0.1828
41	Reshaping existing drainage ditches	1003	305.311	0.3044	0.3044
42	Recreational facilities	974	164.796	0.1692	0.1692
43	Stormwater management facilities	492	39.492	0.0803	0.0803
44	Mining activities	653	203.626	0.3118	0.3118
45	Repair of uplands damaged by discrete events	1200	33.988	0.0283	0.0283
46	Discharges into ditches	1022	414.51	0.4056	0.4056
47	[Reserved]	382	218.47	0.5719	0.5719
48	Existing commercial shellfish aquaculture activities	103	130.07	1.2628	1.2628
49	Coal remining activities	130	381.37	2.9336	2.9336
50	Underground coal mining activities	103	34.11	0.3312	0.3312
Totals		204498	40528.56	0.1982	0.2318

years. The mean-acreage-impacted-per-activity value for these 21 Permits is 0.2277, which is about 1.15 times greater than the mean-acreage-impacted-per-activity value for all Nationwide Permits or 4.23 times the mean adjusted acreage (the acreage adjusted to account for the large acreage estimate for NWP 27 in 2010).

If we assume that the proportions represented by the data contained in Table 5.3 are representative of the activities that have been authorized by Nationwide Permits in the years 1982 and 1987 through 2010, we can estimate the potential effect of those Nationwide Permits over a longer time series. If we assume 79.09% of all of the 910,740 activities authorized by all Nationwide Permits over that time interval were authorized by these 21 Permits, about 827,498 of the activities authorized by Nationwide Permits in the years 1982 and 1987 through 2010 would have been authorized by those permits. If we apply the mean-acreage-impacted-per-activity value for these 21 Permits (0.2277) to those activities, those activities would have impacted about 188,421 acres.

If we estimate the number of activities the USACE has authorized with Nationwide Permits using the data presented in Figure 5.2 (and in Table A.1 in Appendix A), we would expect the proposed Nationwide Permits to authorize over the next five year (33,109; 95% confidence interval = 30,250 – 35,968) and would impact at least 6,562.17 to 7,674.63⁴ acres of wetlands and deepwater habitats (95% confidence interval = 5,995.49 – 8,337.38) each year for the next five years. Using these annual estimates, we would expect the proposed Nationwide Permits to impact at least 32,810.85 to 38,373.14 acres of wetlands and deepwater habitats (95% confidence interval = 29,977.43 – 41,686.89) over the next five years.

Applying these estimates to the 21 existing Nationwide Permits that are likely to involve the kinds of activities that directly or indirectly affect endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species, we would expect these Nationwide Permits to impact at least 6,849.83 acres of wetlands and deepwater habitats (95% confidence interval = 6,258.30 - 7,441.35) each year for the next five years or 34,249.14 (95% confidence interval = 31,291.51 - 37,206.76) over the five-year period.

5.A.1.4 Geographic Distribution of Activities Authorized by Nationwide Permits

The limitations in the data available on the number of activities authorized by Nationwide Permits since 1977 also affect the data available on the geographic distribution of those activities and the acres impacted by them. As before, we began with the district-specific data the USACE provided for the years 2007 and 2010 (we did not have similar data for 1999) and supplemented them with data from other sources. We focus our analyses on the 19 USACE

Districts that overlap the distribution of endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species.

Table 5.4 presents data on the number of activities and acreage impacted in 2007 and 2010 for the 19 USACE

⁴ These estimates treat the number of Nationwide Permits estimated in 1987 as an outlier (see Figure 5.1 and Table A.1 in Appendix A). The lower and upper estimates in this and the subsequent paragraph reflect differences in impact-per-acre estimates that reflect assumptions about the number of acres impacted by Nationwide Permit 27 in 2010. The higher impact-per-acre estimate assumes the 2010 estimate for Nationwide Permit 27 was an outlier, the lower estimate does not make that assumption.

Districts that overlap with the distribution of endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species. In 2007, 48.89% of all of the activities authorized using Nationwide Permits occurred in the 19 USACE Districts that overlap with the distribution of endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species. In 2010, that percentage had declined to 46.82%, although the 2.07% is not statistically significant. In 2007, 59.42% of all of the acreage impacted by activities authorized by Nationwide Permits occurred in the 19 USACE Districts that overlap with the distribution of endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species. In 2010, that percentage had increased to 87.15%. Unlike the change in number of activities, this difference in the number of acres impacted is both statistically and ecologically significant. The number of activities authorized by Nationwide Permits in all but one of the 19 Districts declined between 2007 and 2010 (Table 5.4); the single exemption was the Sacramento USACE District in which the number of activities increased by 1,395 between 2007 and 2010. The number of acres impacted by the activities authorized by Nationwide Permits increased in five of the 19 USACE Districts and the mean-acreage-impacted-per-activities increased in 9 of the 19 USACE Districts. Slightly more than half of the 51,051 activities authorized by all Nationwide Permits in 2007 and 2010 occurred within the USACE Districts that occur along the Atlantic Coast (Table 5.4). The second largest number of activities authorized by Nationwide Permits occurred in the Pacific Southwest, followed by the Pacific Northwest. The smallest number of activities authorized by the Nationwide Permits occurred in the Western Pacific.

About 82% of the 30,479 acres impacted by those activities also occurred along the Atlantic Coast and that region had the highest mean-acreage-impacted-per-activity value (0.9814) for the two years. The high percentage of activities and acres impacted along the Atlantic Coast in 2007 and 2010 resulted from the contribution of the Jacksonville USACE District, which has jurisdiction over the State of Florida, Puerto Rico, and the U.S. Virgin Islands. That District experienced the largest number of activities authorized by Nationwide Permits and the largest acreage impacted by those activities in 2007 and 2010: within the boundaries of Jacksonville USACE District: about 6,466 activities we authorized impacting about 22,953 acres. The pattern of activities and acreage impacted in that Corps District was inconsistent: the largest number of activities were authorized in 2007, but the largest acreage were impacted in 2010 (the mean-acreage-impacted-per-activity values for 2007 and 2010, respectively, were 0.1988 and 14.0706).

The Gulf Coast USACE Districts had the second highest mean-acreage-impacted-per-activity value for the two years (0.5589), followed by the Pacific Northwest (mean-acreage-impacted-per-activity 0.1386) and the Pacific Southwest (mean-acreage-impacted-per-activity 0.1241). Without the activities and acreage impacted in the Jacksonville USACE district, the other districts along the Atlantic Coast would have had mean-acreage-impacted-per-activity that are slightly lower than the Pacific Southwest (0.1159). Alaska had the smallest mean-acreage-impacted-per-activity value for the two years.

If we assume that the percentages presented in Table 5.4 are representative of what we might expect to occur in the future, we would expect 48.9% of all of the activities that would be authorized by Nationwide Permits each year for the next five years to occur within the 19 USACE Districts that overlap with the distribution of endangered or

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.3. Total number of activities, total acreage, and mean-acreage-impacted-per activity for the 21 existing Nationwide Permits that are likely to have the greatest influence on listed resources under NMFS' jurisdiction. Based on data for the years 1999, 2007, and 2010. Adjusted mean acreage impacted per activity (column 5) treats the acreage that was estimated to have been impacted by Nationwide Permit 27 in 2010 as an outlier and replaces it with the mean value for 1999 and 2007

NWP #	Permit name (using naming conventions in 2011 proposed rule)	Total Activities (reporting and non-reporting)	Total Acreage (reporting and non-reporting)	Mean Acre/Activity	Adjusted Mean Acre/Activity
1	Aids to navigation	2090	5.32	0.0025	0.0025
3	Maintenance	29615	1067.78	0.0361	0.0361
4	Fish and wildlife harvesting, enhancement, and attraction devices	21449	50.18	0.0023	0.0023
7	Outfall structures and associated intake structures	2133	75.11	0.0352	0.0352
8	Oil and gas structures on the outer continental shelf	106	0.70	0.0066	0.0066
12	Utility line activities	38263	1598.15	0.0418	0.0418
13	Bank stabilization	27805	599.57	0.0216	0.0216
14	Linear transportation projects	20505	884.61	0.0431	0.0431
17	Hydropower projects	21	1.29	0.0614	0.0614
27	Aquatic habitat restoration, establishment, and enhancement activities	3561	30725.81	8.6284	1.2837
28	Modifications of existing marinas	723	10.13	0.0140	0.0140
29	Residential developments	3454	403.02	0.1167	0.1167
31	Maintenance of existing flood control facilities	455	28.18	0.0619	0.0619
33	Temporary construction, access and dewatering	3702	230.49	0.0623	0.0623
35	Maintenance dredging of existing basins	893	131.28	0.1470	0.1470
36	Boat ramps	2469	33.03	0.0134	0.0134
39	Commercial and institutional developments	1756	190.42	0.1084	0.1084
40	Agricultural activities	1113	203.42	0.1828	0.1828
43	Stormwater management facilities	492	39.49	0.0803	0.0803
46	Discharges into ditches	1022	414.51	0.4056	0.4056
48	Existing commercial shellfish aquaculture activities	103	130.07	1.2628	1.2628
Total		159640	36817.25	0.2306	-

threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species. On that assumption, we would expect about 18,440 activities per year or 92,200 over five years to occur in these 19 USACE Districts. Those activities would impact about 4,050 acres per year or 20,280 acres over five years.

If we assume that the percentages presented in Table 5.4 are representative of what we might expect to occur in the future, we would also expect slightly more than half of the 18,440 activities (9,266 activities) that might occur each year over the next five years and slightly more than 80% of the 4,050 acres impacted each year (or about 3,345 acres) to occur in the USACE Districts that occur along the Atlantic Coast. Over five years, this would result in about 46,330 activities impacting about 16,730 acres of wetlands and other aquatic habitats in the USACE District in this region. Slightly more than 12% of these activities and about 75% of this acreage impacted, or 2,330 activities impacting about 3,050 acres per year, would occur in the Jacksonville USACE District. Districts in the Gulf Region would experience losses of about 365 acres of jurisdictional wetlands and other waters of the United States each year over the five-year duration of the proposed Nationwide Permits or about 1,930 acres of impact.

There is very little information on where activities authorized by Nationwide Permits occur at spatial scales that have higher resolution than USACE Districts. However, three studies examined the spatial distribution of Nationwide Permits within particular sub-basins (Brody *et al.* 2008, Highfield 2008) or counties (Ellis 2005). Those studies suggest an important pattern: activities authorized by Nationwide Permits tend to be concentrated in limited spatial areas and that concentration increases the probability of cumulative impacts in the form of space-crowded

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.4. Summary of the estimated annual number and percentage of activities the USACE expects to authorize using the proposed Nationwide Permits, the acreage affected by those activities from 2007 to 2010, for USACE Districts that have listed resources under NMFS jurisdiction (based on data provided by the USACE)

USACE District	Total Activities in subset	Total Acres Filled in subset	Mean Acreage Impacted Per Activity	Reported Mitigation
Alaska	2,889	252.029	0.0872	14.675
Baltimore	55	25.058	0.4556	14.552
Charleston	1,326	81.095	0.0612	33.75
Galveston	1,176	418.962	0.3563	409.94
Honolulu	390	52.567	0.1348	0
Jacksonville	4,904	974.73	0.1988	2,373.94
Los Angeles	1,806	336.047	0.1861	467.092
Mobile	1,108	145.782	0.1316	252.227
New Orleans	1,138	128.514	0.1129	112.799
New York	2,151	237.373	0.1104	153.904
Norfolk	3,018	134.875	0.0447	641.403
Philadelphia	585	48.839	0.0835	47.035
Portland	2,145	254.131	0.1185	1,243.95
Sacramento	1,974	176.444	0.0894	216.861
San Francisco	653	39.515	0.0605	590.191
Savannah	2,352	299.56	0.1274	445.711
Seattle	2,182	517.1	0.237	593.606
Walla Walla	1,521	141.36	0.0929	126.303
Wilmington	4,664	560.158	0.1201	1,213.25
Totals	36,037	4,824.14	0.1339	8,951.19
All Districts	73,713	8,118.75	0.1101	12,751.71
Percent of All Districts	0.4889	0.5942	-	0.7020

perturbations and “nibbling.” Brody *et al.* (2008) also produced data that demonstrates that a disproportionate number of activities authorized by Nationwide Permits occur in floodplains where those activities were more likely to affect water storage and hydrology while Highfield (2008) quantified the cumulative impact of Nationwide Permits on stream flows in the catchment areas he studied.

Brody *et al.* (2008) studied the spatial distribution of standard permits (individual), letters of permission, general permits, and Nationwide Permits the USACE issued in coastal areas of the states of Florida and Texas from 1991 to 2003. Based on their analyses, about 56% of the activities authorized in both states were authorized by Nationwide Permits (60.1% in Florida, 45.9% in Texas). In Florida, about 43% of permitted activities were located outside of urban areas and 51% of those activities were located outside of 100-year floodplains (49% were located within the 100-year floodplain in Florida). In Texas, about 78% of permitted activities were located outside of urban areas and 61% of those activities were located outside of 100-year floodplains. In Texas, about 47% of the activities affected estuarine wetlands; in Florida about 55% of the activities occurred in palustrine wetlands.

In Florida, 43.7% of the activities that affected estuarine wetland ecosystems, 60.2% of the activities that affected lacustrine wetland ecosystems, 47.8% of the activities that affected riverine wetland ecosystems, and 47.4% of the activities that affected marine wetland ecosystems were authorized by Nationwide Permits. In Texas, 39.2% of the activities that affected estuarine wetland ecosystems, 44.2% of the activities that affected lacustrine wetland

ecosystems, 41.6% of the activities that affected riverine wetland ecosystems, and 58% of the activities that affected marine wetland ecosystems were authorized by Nationwide Permits

Brody *et al.* (2008) concluded that the USACE increasingly used Nationwide Permits to authorize residential projects that occurred in palustrine wetlands in areas outside of urban areas over the study period. In particular, they highlighted the effects of these projects in coastal Texas around Galveston and Corpus Christi Bays where there were no large protected areas to buffer outward growth (as is the case in southern Florida), and there are no mandated growth management or comprehensive planning regulations that could help concentrate growth in urban areas. They concluded that palustrine wetlands will increasingly be altered by smaller-scale, residential projects authorized by Nationwide Permits, particularly in coastal Texas which is one of the fastest growing areas of the country.

Brody *et al.* (2008) also concluded that a large percentage of wetland alteration permits in both states were issued within the 100-year floodplain (an average of 48.4% and 38.7% in Florida and Texas, respectively). They argued that these results were ecologically significant because wetland alteration within floodplains increases impervious surface area and reduces or eliminates a wetland's ability to capture and store water runoff. Disrupting the natural hydrological system can exacerbate flooding or create flood problems in areas not originally considered vulnerable to flooding.

Highfield (2008) studied the impacts of section 404 permits issued by the Galveston USACE District in coastal counties in Texas from 1996 through 2003. Based on his study, activities authorized by permits tended to be concentrated in particular sub-basins. Specifically, activities in one sub-basin located north of the City of Houston and intersecting six counties — Leon, Houston, Polk, Trinity, Madison, and Walker Counties — accounted for about 74% of the permits he studied. Activities authorized by Nationwide Permits and General Permits accounted for 21.42% and 66.85% of those permits, respectively. This sub-basin was the largest in his study area and had a higher concentration of wetlands, which would explain the concentration of permits.

Although Ellis (2005) examined the cumulative impacts of activities authorized by USACE permits in Montana generally, she highlighted the impacts of bank stabilization activities (authorized using NWP 13) on 10 rivers in Montana, particularly the Yellowstone River (the longest free-flowing river in the lower 48 states). She noted that between 1990 and 2002, the USACE had authorized almost 82,000 linear feet (16.4 miles) of new bank stabilization structures on the Yellowstone River in 4 counties: Park, Stillwater, Sweet Grass, and Yellowstone. In the Billings area (in Yellowstone County, Montana), dikes and armoring had increased from approximately 21% of the channel's length in 1957 to 41% in 1999 (citing Aquaneering and Womack and Associates 2000). In Park Count, the Yellowstone River contained at least 9,134 feet of riprap, 108 rock barbs, 106 rock jetties, and 32 car bodies at the time of her study. One 8-mile section of the river, from Pine Creek to Carters Bridge, had been covered by rock riprap over 16% of its channel length and at least 62 rock barbs and jetties were added to this stretch between 1987 and 1998 (citing Natural Resources Conservation Service 1998). She reported that the USACE's program was having similar effects on the Big Hole, Bitterroot, Clark Fork, Flathead Rivers, Missouri, Musselshell, Ruby, and Sun Rivers.

5.A.2 Activities Authorized by Specific Nationwide Permits

A handful of the activities that have been authorized by Nationwide Permits have no known adverse direct or indirect, individual or cumulative impacts on endangered species, threatened species, or designated critical habitat under NMFS' jurisdiction or would not elicit responses that are likely to have adverse consequences for those listed resources. These Nationwide Permits include structures in fleeting and anchorage areas (NWP 9), mooring buoys (NWP 10) and, for species and designated critical habitat under NMFS' jurisdiction, NWP 34 (cranberry production). The activities authorized by the remainder of the existing and proposed Nationwide Permits are known to have direct, indirect, and cumulative impacts on endangered species, threatened species, and designated critical habitat that are exposed to them.

The following narratives focus on specific Nationwide Permits that are known to have potential adverse consequences for endangered and threatened species under the jurisdiction of NMFS or critical habitat that has been designated for those species. Each narrative summarizes the activities associated with the proposed Nationwide Permit, the number of activities the permit has been reported to authorize the impacts of those activities.

Nationwide Permit 1

Nationwide Permit 1 authorizes the placement of aids to navigation and regulatory markers that are approved by and installed in accordance with the requirements of the U.S. Coast Guard (*see* 33 CFR, chapter I, subchapter C, part 66).

The USACE estimated that NWP 1 will be used about 60 times per year over the next five years (totaling about 300 activities over the five-year period; they did not estimate the number of acres that might be impacted by these activities (Table 5.5). Data the USACE provided NMFS for the years 1999, 2007, and 2010, however, leads us to different estimates (see Table 5.3). In those three years alone, NWP 1 authorized 2,090 activities impacting 5.316 acres of jurisdictional wetlands and other waters of the United States. The USACE required 0.25 acres for these impacts. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 1 would be 0.0025 with 0.0470 acres of mitigation required for each acre impacted.

Extrapolating from the pattern of authorizations between 1988 and 2010, we would expect NWP 1 to authorize about 697 activities each year, impacting about 1.772 acres, and resulting in about 0.0833 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 3,483 activities, impact about 8.86 acres, and result in about 0.4167 acres of compensatory mitigation.

Aids to navigation have been important to prevent coral reefs from being damaged when ships ground on them. For example, in Bahia de Guayanilla, groundings that occurred in 1998, 2005, 2006, and 2009 damaged more than 20,000 square meters of coral. Large ship groundings off southeast Florida had injured about 53,400 acres of reef habitat between 1973 and 2004 (Boulon *et al.* 2005). At the same time, however, chains that anchor aids to navigation have been reported to scour coral reefs: for example, the anchor of a single navigation aid damaged about 83.1 square meters of coral in Bahia de Guayanilla (Karazsia 2011).

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.5. USACE estimates of the total number of activities and total acreage, and mean-acreage-impacted-per activity calculated from these data. Estimates are for the 21 existing Nationwide Permits that are likely to have the greatest influence on listed resources under NMFS' jurisdiction. Data on annual number of activities and annual acreage impacted provided by the USACE.

NWP #	Permit name (based on 2011 description)	Annual Number of Activities	Annual Number of Acres Impacted	Mean Acre/Activity	Compensatory Mitigation	Mitigation Ratio	5-Year Activities	5-Year Acres
1	Aids to navigation	60	-	-	-	-	300	-
3	Maintenance	5300	325	0.0613	150	0.4615	26500	1625
4	Fish and wildlife harvesting, enhancement, and attraction devices	55	5	0.0909	3	0.6000	275	25
7	Outfall structures and associated intake structures	410	15	0.0366	13	0.8667	2050	75
8	Oil and gas structures on the outer continental shelf	3	0	0.0000	0	0.0000	15	0
12	Utility line activities	7900	400	0.0506	480	1.2000	39500	2000
13	Bank stabilization	3500	55	0.0157	120	2.1818	17500	275
14	Linear transportation projects	4800	760	0.1583	850	1.1184	24000	3800
17	Hydropower projects	10	1	0.1000	3	3.0000	50	5
27	Aquatic habitat restoration, establishment, and enhancement activities	1650	880	0.5333	880	1.0000	8250	4400
28	Modifications of existing marinas	40	1	0.0250	0	0.0000	200	5
29	Residential developments	700	195	0.2786	325	1.6667	3500	975
31	Maintenance of existing flood control facilities	50	3	0.0600	2	0.6667	250	15
33	Temporary construction, access and dewatering	660	51	0.0773	48	0.9412	3300	255
35	Maintenance dredging of existing basins	120	0	0.0000	0	0.0000	600	0
36	Boat ramps	340	6	0.0176	6	1.0000	1700	30
39	Commercial and institutional developments	700	110	0.1571	350	3.1818	3500	550
40	Agricultural activities	60	5	0.0833	11	2.2000	300	25
43	Stormwater management facilities	220	31	0.1409	53	1.7097	1100	155
46	Discharges into ditches	25	8	0.3200	6	0.7500	125	40
48	Existing commercial shellfish aquaculture activities	3200	32	0.0100	0	0.0000	16000	160
Total		29743	2883	0.0969	3300	1.14	148715.00	14415.00

Nationwide Permit 3

Nationwide Permit 3 authorizes the repair, rehabilitation, or replacement of any previously authorized structure or fill (provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification). NWP 3 also authorizes the repair, rehabilitation, or replacement of structures or fills destroyed or damaged by storms, floods, fire or other discrete events, provided the repair, rehabilitation, or replacement begins, or is under contract to begin, within two years of the destruction or damage (this time limit can be waived by a district engineer). NWP 3 authorizes minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make the repair, rehabilitation, or replacement. NWP 3 also authorizes any stream channel modification associated with the structure, although the modification is limited to "the minimum necessary for the repair, rehabilitation, or replacement of the structure or fill" and must be immediately adjacent to the project (USACE 2011c).

Nationwide Permit 3 also authorizes removal of accumulated sediments and debris in the vicinity of and within existing structures (e.g., bridges, culverted road crossings, water intake structures, etc.) and the placement of new or additional riprap to protect the structure. Removal of sediment is limited to the minimum necessary to restore the waterway in the immediate vicinity of the structure to the approximate dimensions that existed when the structure was built, but cannot extend further than 200 feet in any direction from the structure (the 200-foot limit does not

apply to maintenance dredging to remove accumulated sediments blocking or restricting outfall and intake structures or to maintenance dredging to remove accumulated sediments from canals associated with outfall and intake structures). The permit requires prospective permittees to deposit or retain dredged or excavated materials in an upland area (unless a district engineer approves an alternative). Any riprap that is placed must be the minimum necessary to protect the structure or to ensure the safety of the structure; bank stabilization measures not directly associated with the structure would require a separate authorization from a district engineer (USACE 2011c).

Prospective permittees are required to submit a PCN to a district engineer only if they are removing accumulated sediment or debris in the vicinity of an existing structure. Prospective permittees are not required to notify a district engineer if their repair, rehabilitation, or replacement of a previously authorized structure or fill does not require them to remove accumulated sediment or debris in the vicinity of the structure (USACE 2011c).

Finally, NWP 3 authorizes temporary structures, fills, and work necessary to conduct the maintenance activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate (USACE 2011c).

Some uses of NWP 3, such as the routine cleaning of culverts or ditches, have minimal individual or cumulative environmental consequence. However, because there are no conditions that relate to the size of these activities, their timing of these activities (for example, adherence to construction windows to avoid exposing rearing juveniles to construction activities), or their location.⁵ As a result, a project to repair, rehabilitate, or replace a previously authorized structure can produce the same physical disturbance and have the same environmental effects as a project to construct a new one. For example, projects in one category of the activities this permit authorizes — the repair or replacement of bank stabilization structures damaged or destroyed by floods — have been known to involve construction activities that have the same direct and indirect impacts on jurisdictional wetlands and other waters of the United States as new projects.

The areas affected by these projects can be extensive. For example, between 1990 and 2002, 810 maintenance activities were authorized by NWP 3 in the State of Montana (Ellis 2005). About 395 of those activities impacted a minimum of 89,962 linear feet (about 17 miles) of streams and 13.7 acres of wetlands.

Based on PCNs associated with NWP 3 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 5,300 times per year over the next five years (totaling about 26,500 activities

⁵ The Nationwide Permits contain several conditions related to endangered or threatened species (for example, a statement that the permits do not authorize activities that are likely to jeopardize the continued existence of endangered or threatened species and a requirement to notify a district engineer if listed species occur on a site). However, these conditions presuppose that a prospective permittee is aware that listed species or designated critical habitat occur on their work site.

over the five-year period; Table 5.5) and impacting about 325 acres of waters of the United States each year (or about 1,625 acres over the five-year duration of the proposed Nationwide Permits). The USACE expected these activities to result in about 150 acres of compensatory mitigation each year or 750 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 3 would be 0.0613 and 0.4615 acres of mitigation would be required for each acre impacted. These projections do not estimate the linear footage impacted by the proposed activities.

These estimates conflict with what we would expect based on data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years alone, more than 29,615 activities were authorized by NWP 3 impacting at least 1,060 acres of jurisdictional wetlands and other waters of the United States. In those three years, 228.279 acres of compensatory wetlands were provided by permittees; in 2010, permittees used 13 mitigation bank credits and 8 in-lieu fee program credits (comparable data for mitigation bank and in-lieu fee program credits are not available for 1999 or 2007). Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 3 would be 0.0361 and 0.2138 acres of mitigation would be required for each acre impacted, both of which are lower than the USACE's projections. We could not estimate the linear footage impacted by the proposed activities from the data available.

Extrapolating from these data, we would expect NWP 3 to authorize about 9,872 activities each year, impacting about 356 acres, and resulting in about 76 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 49,358 activities, impact about 1,779 acres, and result in about 380 acres of compensatory mitigation.

Nationwide Permit 4

Nationwide Permit 4 authorizes placement of fish and wildlife harvesting devices and activities such as pound nets, crab traps, crab dredging, eel pots, lobster traps, duck blinds, clam and oyster digging, and small fish attraction devices such as open water fish concentrators (sea kites, etc.) into waters of the United States. This NWP does not authorize the construction of artificial reefs. The USACE does not plan to require prospective permittees to notify a district engineer before using this permit (USACE 2011d).

Based on PCNs associated with this NWP 4 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 55 times per year over the next five years (totaling about 275 activities over the five-year period) and would impact about 5 acres of waters of the United States each year (or about 25 acres over the five-year duration of the proposed Nationwide Permits; Table 5.5). The USACE expected these activities to result in about 3 acres of compensatory mitigation each year or 15 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 4 would be 0.0909 and 0.6000 acres of mitigation would be required for each acre impacted. These projections do not estimate the linear footage impacted by the proposed activities.

These estimates conflict with data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years alone, about 21,500 activities were authorized by NWP 4 impacting at least 50 acres of jurisdictional wetlands and other waters of the United States. In those three years, 25 acres of compensatory wetlands were provided by permittees; in 2010, permittees used one mitigation bank credits (comparable data for

mitigation bank credits are not available for 1999 or 2007). Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 4 would be 0.0023 and 0.4910 acres of mitigation would be required for each acre impacted, both of which are lower than the USACE's projections.

Extrapolating from these data, we would expect NWP 4 to authorize about 7,150 activities each year, impacting about 17 acres, and resulting in about 8 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 35,748 activities, impact about 84 acres, and result in about 41 acres of compensatory mitigation.

In addition to the direct loss of habitat, other direct impacts of the activities authorized by this Nationwide Permit have had more severe consequences for endangered and threatened species under NMFS' jurisdiction. Several of the harvesting devices whose placement has been authorized by this Nationwide Permit have been known to capture and kill endangered and threatened species. For example, green, Kemp's ridley, leatherback, and loggerhead sea turtles have been captured and killed in pound net fisheries in Peconic Bay, Long Island Sound, Chesapeake Bay, and Pamlico Sound when they became entangled in lead lines or "leaders" that are used to guide target species into the pocket of the pound net (Mansfield *et al.* 2002a, 2002b). One study identified 1,370 sea turtles that had been captured in pound net fisheries in Chesapeake Bay (Lutcavage and Musick 1985). Of these, 527 loggerhead sea turtles, 28 Kemp's ridley sea turtles, and 7 leatherback sea turtles died as a result of their capture.

Because of the number of sea turtles were being captured and killed in pound nets in portions of Chesapeake Bay, NMFS' promulgated regulations that constrain the configuration of pound nets set in portions of the Virginia side of the Bay (69 *Federal Register* 24997, 71 *Federal Register* 36024). Thus far, however, those regulations do not affect pound net fisheries elsewhere in Chesapeake Bay or along the Atlantic or Gulf Coasts; sea turtles continue to be captured in these fisheries. This Nationwide Permit will authorize the placement of an unknown number of pound nets, crab pots, lobster pods, and similar devices in navigable and other waters of the United States each year. The cumulative impacts of these activities on endangered and threatened sea turtles remain unknown because prospective permittees have not been and will not be required to notify the USACE before they begin their activities or report to the USACE when they have completed them.

Nationwide Permit 13

Nationwide Permit 13 authorizes bank stabilization activities for erosion prevention. The USACE does not require notification if a project (1) is less than 500 feet in length; (2) does not exceed an average of 1 cubic yard per linear foot of bank; and (3) does not place material in any special aquatic site, including wetlands. Projects greater than 500 feet in length or placing more than 1 cubic yard per linear foot can be approved under this permit if other conditions are met. Prospective permittees must submit a PCN to the district engineer prior to commencing their activity if the bank stabilization activity: (1) involves discharges into special aquatic sites; or (2) is in excess of 500 feet in length (USACE 2011i).

This NWP also authorizes temporary structures, fills, and work necessary to construct the bank stabilization activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be

placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

Based on PCNs associated with this NWP 13 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 3,500 times per year over the next five years (totaling about 17,500 activities over the five-year period) and would impact about 55 acres of waters of the United States each year (or about 275 acres over the five-year duration of the proposed Nationwide Permits; Table 5.5). The USACE expected these activities to result in about 120 acres of compensatory mitigation each year or 600 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 13 would be 0.0157 and 2.1818 acres of mitigation would be required for each acre impacted. These projections do not estimate the linear footage impacted by the bank stabilization projects authorized by this permit, which would be a better measure of their effect on river systems and streams. These projections do not include acreage or linear footage associated with projects that are shorter than 500 feet, because permittees are not required to notify the USACE of such projects.

As with the other permits we have discussed thus far, these estimates conflict with data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years, about 27,805 activities were authorized by NWP 13 impacting at least 600 acres of jurisdictional wetlands and other waters of the United States. In those three years, 1,320 acres of compensatory wetlands were provided by permittees; in 2010, permittees used four mitigation bank credits and 11 in-lieu fee program credits (comparable data are not available for 1999 or 2007). Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 13 would be 0.0216 and 0.2030 acres of mitigation would be required for each acre impacted, both of which are slightly higher than the USACE's projections.

Extrapolating from these data, we would expect NWP 13 to authorize about 9,268 activities each year, impacting about 200 acres, and resulting in about 440 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 46,342 activities, impact almost 1,000 acres, and result in about 2,200 acres of compensatory mitigation. Because our estimates are almost three times those of the USACE, we would expect the activities authorized by this Nationwide Permit to have greater impacts on jurisdictional wetlands and other waters of the United States, despite smaller mean-acreage-impacted-per-activity estimates.

Bank stabilization projects generally follow stream alignments, so it would be more important to know the linear distance impacted by these activities than acreage. For example, Ellis (2005) reported that between 1990 and 2002, the USACE authorized 1,101 activities with NWP 13 in Montana, impacting at least 338,217 linear feet (64.1 miles) of streams and 4.1 acres of wetlands. Nevertheless, the data we would need to estimate the linear impact of these projects are not available.

Bank stabilization is one of four widely used methods for modifying stream channels (the others are widening, deepening, and straightening; clearing and snagging; and diking). Bank stabilization typically involves combinations of shaping a slope, constructing berms or planting vegetations, and placing materials to reduce or prevent the modified bank from eroding. In addition to destroying aquatic habitat, the activities that would be authorized by the

proposed Nationwide and General Permits are likely to degrade or modify aquatic habitat. For example, in smaller streams, particularly those that seasonally become dry or nearly dry, this NWP would authorize bulldozing of stream bed gravel against the banks has been a common practice to retard erosion. In larger streams (and rivers) the dumping or placement of rock (riprap), broken concrete, and mixtures of materials (i.e., rocks, dirt, branches) along the banks is a common practice (Oregon Water Resources Research Institute 1995). Bulkheads and concrete walls have also been used to stabilize the banks of lakeshores and coastlines.

The consequences of bank stabilization projects depend on how well the projects are engineered and executed. When they are engineered and executed according to best practices, they produce minimal adverse consequence and substantial benefit to the aquatic ecosystems in which they occur (Fischenich 2001). Otherwise, these projects have been known to result in the loss of shallow edge water rearing habitat, changes to benthic vegetation, impacts to eelgrass and other vegetation important for herring spawning, loss of shoreline riparian vegetation and reduction in leaf fall, loss of wetland vegetation, alteration of groundwater flows, loss of large woody debris, changes in food resources, and loss of migratory corridors (Puget Sound Water Quality Action Team 1997, Thom and Shreffler 1994).

The effects of bank stabilization projects on streams and small rivers have been studied for decades (Stern and Stern 1980) and include increased down cutting erosion (streams with stabilized stream banks tend to be deeper than unaltered channels); reduced stream meandering, which constrains channel migration within floodplains; altered floodplain water regimes, increased flow velocities in stream reaches that have been stabilized; and reduced shallow slow current velocity conditions, which are important for juvenile salmon and can generally be a limiting factor for fish populations in rivers and streams (Auble *et al.* 2004, Bowen *et al.* 2003, Gurnell *et al.* 2002, Puget Sound Water Quality Action Team 1997, Stern and Stern 1980, Thom and Shreffler 1994, Zale and Rider 2003). Bank stabilization projects have been reported to temporarily increase suspended sediments during construction followed by long-term decreases in suspended sediments. When they involve removal of floodplain and riparian vegetation, they affect thermal and light regimes in streams. Reduced connectivity between river and floodplain, less side channel creation, and abandonment of side channels could lead to reduced or more erratic availability of the shallow and slow channel velocity habitat. Less bottomland disturbance and reduced connectivity between river and floodplain could also result in less input to the aquatic food chain and less recruitment of large woody debris, which is an important component of woodland river systems (Auble *et al.* 2004, Bowen *et al.* 2003, Gurnell *et al.* 2002, Stern and Stern 1980).

In a study of the cumulative impacts of activities authorized by USACE permits in Montana, Ellis (2005) highlighted the impacts of bank stabilization activities (authorized using NWP 13) on 10 rivers in Montana, particularly the Yellowstone River (the longest free-flowing river in the lower 48 states). She noted that between 1990 and 2002, the USACE had authorized almost 82,000 linear feet (16.4 miles) of new bank stabilization structures on the Yellowstone River in 4 counties: Park, Stillwater, Sweet Grass, and Yellowstone. In the Billings area (in Yellowstone County, Montana), dikes and armoring had increased from approximately 21% of the channel's length in 1957 to 41% in 1999 (citing Aquoneering and Womack and Associates 2000). In Park County, the Yellowstone River contained at least 9,134 feet of riprap, 108 rock barbs, 106 rock jetties, and 32 car bodies at the time of her study. One 8-mile section of the river, from Pine Creek to Carters Bridge, had been covered by rock

riprap over 16% of its channel length and at least 62 rock barbs and jetties were added to this stretch between 1987 and 1998 (citing Natural Resources Conservation Service 1998). She reported that the USACE's program was having similar effects on the Big Hole, Bitterroot, Clark Fork, Flathead Rivers, Missouri, Musselshell, Ruby, and Sun Rivers.

The effects of bank stabilization are not completely negative. Juvenile salmon will use interstitial spaces within riprap so flood and erosion control projects provide some rearing habitat (Dillon *et al.* 1998). However, the loss of pool habitat and off-channel habitats for overwintering greatly overrides the habitat gained along riprap (Dillon *et al.* 1998).

Nationwide Permit 14

Nationwide Permit 14 authorizes discharges of dredged or fill material into non-tidal waters of the United States associated with activities required for the construction, expansion, modification, or improvement of linear transportation projects (e.g., roads, highways, railways, trails, airport runways, and taxiways) in waters of the United States. For linear transportation projects in non-tidal waters, the discharge cannot cause the loss of greater than 1/2-acre of waters of the United States. For linear transportation projects in tidal waters, the discharge cannot cause the loss of greater than 1/3-acre of waters of the United States. Any stream channel modification, including bank stabilization, is limited to the minimum necessary to construct or protect the linear transportation project; such modifications must be in the immediate vicinity of the project (USACE 2011j).

Nationwide Permit 14 also authorizes temporary structures, fills, and work necessary to construct the linear transportation project. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be re-vegetated, as appropriate. This NWP cannot be used to authorize non-linear features commonly associated with transportation projects, such as vehicle maintenance or storage buildings, parking lots, train stations, or aircraft hangars. Prospective permittees must submit a PCN to the district engineer prior to commencing their activity if: (1) the loss of waters of the United States exceeds 1/10-acre; or (2) there is a discharge in a special aquatic site, including wetlands.

Based on PCNs associated with this NWP 14 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 4,800 times per year over the next five years (totaling about 24,000 activities over the five-year period) and would impact about 760 acres of waters of the United States each year (or about 3,800 acres over the five-year duration of the proposed Nationwide Permits; Table 5.5). The USACE expected these activities to result in about 850 acres of compensatory mitigation each year or 4,250 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 14 would be 0.1583 and 1.184 acres of mitigation would be required for each acre impacted.

As with the other permits we have discussed thus far, these estimates conflict with data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years, about 20,505 activities were authorized by

NWP 14 impacting at least 884 acres of jurisdictional wetlands and other waters of the United States. In those three years, 2,484 acres of compensatory wetlands were provided by permittees; in 2010, permittees used 232 mitigation bank credits and 165 in-lieu fee program credits (comparable data are not available for 1999 or 2007). Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 14 would be 0.0431 and 2.8082 acres of mitigation would be required for each acre impacted.

Extrapolating from these data, we would expect NWP 14 to authorize about 6,835 activities each year, impacting about 295 acres, and resulting in about 830 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 34,175 activities, impact almost 1,475 acres, and result in about 4,140 acres of compensatory mitigation.

As with other Nationwide Permits, these numbers almost certainly underestimate the number of activities that were authorized in those three years and their impacts. For example, Ellis (2005) reported that 742 activities were authorized by NWP 14 in the State of Montana between 1990 and 2002 impacting a minimum of 41,425 linear feet to streams and 39.3 acres to wetlands, but the USACE's database contained no information on the size of project impacts for 26.5% of all NWP 14 permits they had issued over the period of her study.

Nationwide Permit 29

Nationwide Permit 29 authorizes discharges of dredged or fill material into non-tidal waters of the United States for the construction or expansion of a single residence, a multiple unit residential development, or a residential subdivision. This NWP authorizes the construction of building foundations and building pads and attendant features that are necessary for the use of the residence or residential development. Attendant features may include but are not limited to roads, parking lots, garages, yards, utility lines, storm water management facilities, septic fields, and recreation facilities such as playgrounds, playing fields, and golf courses (provided the golf course is an integral part of the residential development; USACE 2011m).

Discharges authorized by this permit must not cause the loss of greater than 1/2-acre of non-tidal waters of the United States, including the loss of no more than 300 linear feet of stream bed, unless a district engineer waives the 300 linear foot limit for intermittent and ephemeral stream beds. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters. For residential subdivisions, the aggregate total loss of waters of United States authorized by this NWP cannot exceed 1/2-acre. This includes any loss of waters of the United States associated with development of individual subdivision lots. Prospective permittees must submit a PCN to the district engineer before commencing their activity.

Based on PCNs associated with this NWP 29 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 700 times per year over the next five years (totaling about 3,500 activities over the five-year period) and would impact about 195 acres of waters of the United States each year (or about 975 acres over the five-year duration of the proposed Nationwide Permits; Table 5.5). The USACE expected these activities to result in about 325 acres of compensatory mitigation each year or 1,625 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 29 would be 0.2786 and 1.6667 acres of mitigation would be required for each acre impacted.

As with the other permits we have discussed thus far, these estimates conflict with data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years, about 3,454 activities were authorized by NWP 29 impacting at least 403 acres of jurisdictional wetlands and other waters of the United States. In those three years, 803 acres of compensatory wetlands were provided by permittees; in 2010, permittees used 102 mitigation bank credits and 33 in-lieu fee program credits (comparable data are not available for 1999 or 2007). Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 29 would be 0.1167 and 1.9917 acres of mitigation would be required for each acre impacted.

Extrapolating from these data, we would expect NWP 29 to authorize about 1,150 activities each year, impacting about 134 acres, and resulting in about 268 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 5,757 activities, impact almost 672 acres, and result in about 1,338 acres of compensatory mitigation.

We discuss the impacts of this Nationwide Permit in section 5.A.3.2, Cumulative Impacts of Specific USACE Authorizations (see section 5.A.3.1, which follows).

Nationwide Permit 36

Nationwide Permit 36 authorizes activities required for the construction of boat ramps that do involve discharges of more than 50 cubic yards of fill material and do not exceed 20 feet in width (three other conditions apply; see Appendix A; both of these conditions can be waived by a District Engineer). If dredging in navigable waters of the United States is necessary to provide access to the boat ramp, the dredging may be authorized by another NWP, prospective permittees might be able to use a regional general permit or an individual permit to authorize that activity (USACE 2011q)

Based on PCNs associated with this NWP 36 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 340 times per year over the next five years (totaling about 1,700 activities over the five-year period) and would impact about 6 acres of waters of the United States each year (or about 30 acres over the five-year duration of the proposed Nationwide Permits; Table 5.5). The USACE expected these activities to result in about 6 acres of compensatory mitigation each year or 30 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 36 would be 0.0176 and 1.0 acres of mitigation would be required for each acre impacted.

As with the other permits we have discussed thus far, these estimates conflict with data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years, about 2,469 activities were authorized by NWP 36 impacting at least 33 acres of jurisdictional wetlands and other waters of the United States. In those three years, 15.53 acres of compensatory wetlands were provided by permittees (no mitigation bank credits or in-lieu fee program credits were used in 2010). Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 36 would be 0.0134 and 0.4703 acres of mitigation would be required for each acre impacted.

Extrapolating from these data, we would expect NWP 36 to authorize about 823 activities each year, impacting about 11 acres, and resulting in about 5 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 4,115 activities, impact

almost 55 acres, and result in about 26 acres of compensatory mitigation.

In addition to these direct impacts, the indirect impacts of the activities authorized by this Nationwide Permit have had more severe consequences for endangered and threatened species under NMFS' jurisdiction. For example, Haddad and Sargent (1994) estimated that over 64,200 acres of seagrasses, which provide important forage for the endangered West Indian manatee and which contain populations of the threatened Johnsons' seagrass, were moderately or severely damaged by boat propellers in Florida, partially as an indirect effect of boat ramps authorized by this Nationwide Permit. NWP 36 has also had ecologically significant indirect effects on endangered West Indian manatees in Florida: between 1986 and 1992, watercraft collisions accounted for 37.3% of manatee deaths, where the cause of death could be determined, by providing access to increased numbers of watercraft (Ackerman *et al.* 1995).

Nationwide Permit 39

Nationwide Permit 39 authorizes discharges of dredged or fill material into non-tidal waters of the United States to construct or expand commercial and institutional building foundations and building pads and attendant features that are necessary for the use and maintenance of the structures (these features may include, but are not limited to, roads, parking lots, garages, yards, utility lines, storm water management facilities, and recreation facilities such as playgrounds and playing fields). These developments include retail stores, industrial facilities, restaurants, business parks, and shopping centers. Examples of institutional developments include schools, fire stations, government office buildings, judicial buildings, public works buildings, libraries, hospitals, and places of worship.

Based on PCNs associated with this NWP 39 between 1 August 2009 and 31 July 2010, the USACE estimated that this Nationwide Permit will be used about 700 times per year over the next five years (totaling about 3,500 activities over the five-year period) and would impact about 110 acres of waters of the United States each year (or about 550 acres over the five-year duration of the proposed Nationwide Permits; Table 5.5). The USACE expected these activities to result in about 350 acres of compensatory mitigation each year or 1,750 acres over the next five years. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 39 would be 0.1571 and 3.1818 acres of mitigation would be required for each acre impacted.

As with the other permits we have discussed thus far, these estimates conflict with data the USACE provided NMFS for the years 1999, 2007, and 2010 (see Table 5.3). In those three years, about 1,756 activities were authorized by NWP 39 impacting at least 190 acres of jurisdictional wetlands and other waters of the United States. In those three years, 513.276 acres of compensatory wetlands were provided by permittees; in 2010, permittees use 135 mitigation bank credits and 51 in-lieu fee program credits. Based on these data, the mean-acreage-impacted-per-activity authorized by NWP 39 would be 0.1084 and 0.2.6954 acres of mitigation would be required for each acre impacted.

Extrapolating from these data, we would expect NWP 39 to authorize about 585 activities each year, impacting about 64 acres, and resulting in about 171 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 2,927 activities, impact almost 317 acres, and result in about 855 acres of compensatory mitigation.

We discuss the impacts of this Nationwide Permit in greater detail in section 5.A.3.2, Incremental Impacts of

Specific USACE Authorizations (below).

5.A.3 Cumulative Impacts of Nationwide Permits

As we discussed in the *Approach to the Assessment* chapter of this Opinion, we use the term “cumulative impacts” to mean “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts include (NRC 1986):

1. *Time-crowded perturbations*, which are perturbations that are sufficiently close in time that the effects of one perturbation do not dissipate before a subsequent perturbation occurs.
2. *Space-crowded perturbations*, which are perturbations that are sufficiently close in space that their effects overlap.
3. *Interactions*, which are perturbations that have qualitatively and quantitatively different consequences for the ecosystems, ecological communities, populations, or individuals exposed to them because of synergism (when stressors produce fundamentally different effects in combination than they do individually), additivity, magnification (when a combination of stressors have effects that are more than additive), or antagonism (when two or more stressors have less effect in combination than they do individually).
4. *Nibbling*, which are incremental and decremental effects are often, but not always, involved in each of the preceding three categories.

By law, “activities authorized by NWP’s must be similar in nature, cause only minimal adverse environmental effects when performed separately, and cause only minimal cumulative adverse effect on the aquatic environment” (USACE 2011 page 9174). In 1977, in response to concerns about the potential cumulative impacts of activities that would be authorized by Nationwide Permits that were raised by members of the public and the Environmental Protection Agency, the USACE stated its intention to “remain aware of potential cumulative impacts that may occur on a regional basis as a result of these nationwide permits. If adverse cumulative impacts are anticipated from any of the discharges subject to these nationwide permits, we intend to take appropriate administrative action, including the exercise of authority express in 232.4-4 to require individual or general permits for these activities” (USACE 1977 page 37131). The USACE has reiterated that commitment each time it has reauthorized Nationwide Permits.

Despite the Corp’s commitment, numerous studies have identified cumulative impacts resulting from activities authorized by Nationwide Permits on waters of the United States. Some of those studies have resulted in administrative changes to the Nationwide Permits program (for example, the suspension of Nationwide Permit 26), although it is not clear that those administrative changes eliminated or reduced the cumulative impact or whether the wetlands losses continued to occur at the same rate, but in smaller increments.

Because of the nature of the activities they authorize, the cumulative impacts of Nationwide Permits would include the time-crowded, space-crowded, interactive, and incremental impacts of activities authorized by USACE permits alone; impacts that result from those activities combined with activities authorized by standard, general permits, and letters of permission; and interactions between those activities and activities authorized by other Federal agencies, State and local governments, private action, or natural phenomena. To provide some insight into the potential

magnitude of the cumulative impacts of the Nationwide Permits, we assess the additive effects of the proposed Nationwide Permits over time.

5.A.3.1 Incremental Impacts of USACE Authorizations Generally

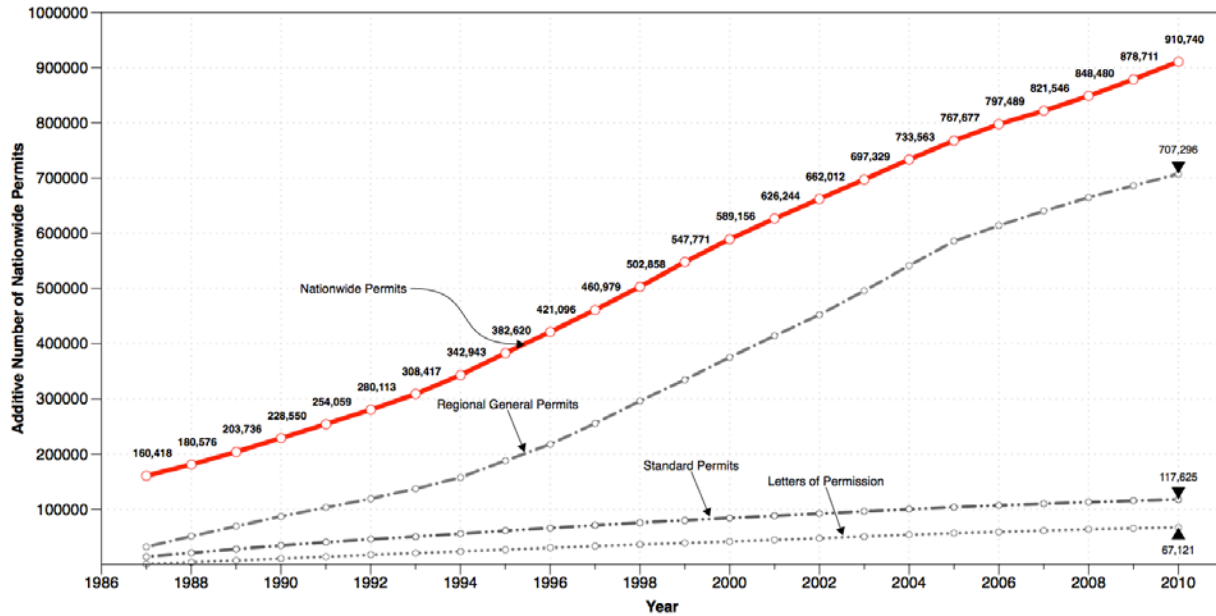
Figure 5.3, presents estimates of the cumulative number of activities that have been authorized by Nationwide Permits between 1987 and 2010, based on data we received from the USACE, Environmental Working Group, and Public Employees for Environmental Responsibility (because the absence of data prior to 1982 and the data gap between 1982 and 1987, we began this time series with 1987). Between 1987 and 2010, Nationwide Permits have authorized at least 910,740 activities and the trend has increased fairly consistently. Because many Nationwide Permits have authorized discharges and other activities without requiring permittees to provide any information to the USACE, we assume that the Nationwide Permits have authorized a substantial, but unknown number of activities. As a result, our estimates of the number of activities authorized by the Nationwide Permits and the number of acres impacted by those activities almost certainly underestimate the actual number of activities that are likely to occur.

Based on more detailed data the USACE provided for the years 1999, 2007, and 2010, we estimate that Nationwide Permits authorized at least 234,788 activities in jurisdictional wetlands and other waters of the United States in those years. Those activities impacted at least 42,467.49 acres of wetlands, jurisdictional wetlands, and other waters of the United States and resulted in about 37,578 acres of compensatory wetlands. At least 130,025 of these activities were associated with the 21 existing Nationwide Permits that are likely to have the greatest influence on endangered and threatened species under the jurisdiction of NMFS or critical habitat that has been designated for these species. The latter activities are reported to have impacted at least 35,749.47 acres of jurisdictional wetlands and other waters of the United States in those three years, resulting in about 20,426.56 acres of compensatory mitigation (an effective rate of 0.57 acres of mitigation for every acre impacted).

Focusing on those 21 existing Nationwide Permits and using the same approach to estimation, we can project the number of activities, acreage impacted, and acreage mitigated we would expect each year over the five-year duration of the proposed Nationwide Permits. Each year for the next five years, we would expect these Nationwide Permits to authorize about 43,341 activities or 216,708 activities over the five-year period. We would expect those activities to impact 11,916.49 acres of jurisdictional wetlands and other waters of the United States each year or 59,582.45 acres over the five-year period. We would expect these Nationwide Permits to result in 6,808.85 acres of compensatory mitigation each year or 34,044.26 acres over the five-year period. This would be a net loss of 5,107.64 acres per year or 25,539.20 acres of the five-year duration of the proposed Nationwide Permits.

When added to the acreage that we estimated had been impacted between 1982 and 2010 (138,838.53), the Nationwide Permits are likely to have incrementally impacted at least 198,420 acres of wetlands, jurisdictional wetlands, and other waters of the United States by the end of the five-year duration of the proposed Nationwide Permits. This acreage is sufficiently large to make cumulative impacts certain. The narratives that follow discuss the cumulative impacts different investigators have reported.

Figure 5.3. Cumulative number of activities the USACE authorized using Nationwide Permits each year between 1987 and 2010. Data on Standard Permits, Letters of Permission, and Regional General Permits are provided for context. Based on data from the USACE, Environmental Working Group, and Public Employees for Environmental Responsibility.



Several investigators have studied the cumulative impacts of the various permits the USACE uses to authorize activities that affect waters of the United States (standard permits, general permits, nationwide permits, and letters of permission). Allen and Feddema (1996) studied permits the USACE's Los Angeles District issued between 1987 and 1989 and concluded that the permits resulted in a 4% net loss of wetlands which tended to be replaced by riparian woodlands that were created to compensate for the destruction of a broad array of freshwater wetlands (Allen and Feddema 1996). Because this investigation only considered permits that required permittees to report to the USACE, the actual number of permits and their effects on wetlands and other waters of the United States would be greater. These investigators concluded that the USACE appears to evaluate section 404 permits on an individual basis without consideration of cumulative impacts at watershed or regional spatial scales, and that there have been "large losses in available habitat functionality due to a concentration of many projects" which may seriously affect species inhabiting the area. A similar evaluation of permits issued by the USACE's San Diego District reported an 8% net loss of wetlands (Fenner 1991).

Stein and Ambrose (1998) studied activities the USACE authorized in the Santa Margarita River watershed in San Diego and Riverside Counties, California from 1985 to 1993. They reported that about 74% of total riparian area was slightly to substantially adversely affected relative to pre-permit site conditions, and less than 1% was enhanced. Nationwide Permit's accounted for 55% of area subjected to substantial adverse impacts. At the time of their study, the watershed supported 30 listed species and 40 other regionally rare, special status species. Nearly half of the authorizations that were permitted in the watershed were followed by adverse to substantially adverse effects to listed species habitat, and no permits resulted in any enhancement of listed species habitat. About 40% of area affected by Nationwide Permits resulted in adverse to substantially adverse effects to the habitat of endangered or threatened species. Adverse impacts to listed species habitats occurred in all acreage categories these authors

studied. The authors reported projects also had substantial adverse indirect effects, due for example to development of adjacent non-jurisdictional floodplains, inhibiting exchange of water, flood energy, sediment, nutrients and organisms between active channels and floodplains; fragmentation of habitat corridors, including threat to a mountain lion population corridor in the watershed; and loss of habitat heterogeneity and structure. Stein and Ambrose concluded that the USACE' section 404 implementation has failed to minimize cumulative effects.

Despite the results of Allen and Feddema (1996) and Stein and Ambrose (1998), the southern California Districts actually compare favorably to the results of a few published studies elsewhere in the country. An examination of 46 permits requiring mitigation in Texas from 1982 to 1986 (ignoring the majority of permits that did not require mitigation and non-reporting permits; Fort Worth, Galveston, and Tulsa Districts), reported a net loss of 31% of wetlands even after considering mitigation requirements (Sifneos, Kentula, and Price 1992). About half of the wetlands (by number) impacted in Texas were about 5 acres or smaller in size. Sifneos, Price, and Kentula (1992) reviewed the effects of USACE permitting on freshwater wetlands in Louisiana, Alabama, and Mississippi. The USACE required compensatory mitigation for only 8% of the nearly 25,000 acres of wetlands impacted by USACE permits in Louisiana from 1982 to 1987, implying a net loss of at least 92% of the permitted fill area. Gosselink and Lee (1989) stressed the adverse effects of incremental, cumulative loss of bottomland hardwood forest wetlands in the South on ecosystem processes and plant and animal species. They attributed range restriction and fragmentation of swallow-tailed kite and threatened bald eagle populations and extirpation of the ivory billed woodpecker in part to bottomland hardwood forest loss and fragmentation, and cite indirect effects--of cultivation of filled wetlands and use of mobile, bioaccumulative pesticides there--in the decline of endangered brown pelican and osprey in downstream areas. Extensive contiguous habitat area is important to the survival of large, far-ranging mammals and raptors, such as the endangered red wolf and endangered Florida panther, and of forest interior specialist bird species, notably many neotropical migrants. These are species for which bottomland hardwood forest is a common or preferred habitat (Gosselink and Lee 1989).

As we discussed earlier (Section 5.A.1.4), three studies of activities authorized by Nationwide Permits reported that they tend to be concentrated in limited spatial areas and that concentration increases the probability of cumulative impacts in the form of time- and space-crowded perturbations and nibbling (Brody *et al.* 2008, Highfield 2008) or counties (Ellis 2005). Brody *et al.* (2008) also produced data that demonstrates that a disproportionate number of activities authorized by Nationwide Permits occur in the 100-year floodplain (an average of 48.4% and 38.7% of the authorizations issued in Florida and Texas, respectively) where those activities were more likely to affect water storage and hydrology.

Highfield (2008) quantified the cumulative impact of Nationwide Permits on stream flows in the catchment areas he studied. Although he did not report spatial or temporal patterns in the distribution of activities authorized using Standard and General Permits and Letters of Permission, he reported a statistically significant and positive relationship in the pattern of activities authorized by Nationwide Permits. He also concluded that Standard Permits, General Permits, Nationwide Permits, and Letters of Permission had a statistically significant effect on mean and peak annual flows. He concluded that the cumulative impacts of Standard Permits, General Permits, Nationwide Permits, and Letters of Permission had a statistically significant effect on peak annual flow and peak annual flow. Specifically,

1. each general permit increased mean annual flows by 0.07% and peak annual flows by 0.05%;
2. each nationwide permit increased mean annual flows by 0.28% and peak annual flows by 0.26%;
3. each letter of permission increased mean annual flows by 0.41% and peak annual flows by 0.26%; and
4. each standard permit increased mean annual flows by 2.1% and peak annual flows by 1.65%.

It is important to note that these are “cumulative impacts” that resulted from activities authorized by the USACE in combination with a variety of other activities that are not regulated by the USACE or the Clean Water Act. Nevertheless, based on regression equations he developed and using the average number of permits the USACE issued in the Galveston District from 1986 to 2000 and the average mean annual and peak flows, Highfield estimated the following cumulative impacts of USACE permits on flow regimes in his study area (see Table 5.6):

5. In a single year, activities authorized by the USACE’s Standard Permits would be expected to increase mean annual flows by about 27% and peak flows by about 21%. Over five years, these permits would be expected to increase mean annual flows by about 134% and peak flows by about 104%. Over 25 years, these permits would be expected to increase mean annual flows by about 669% and peak flows by about 520%;
6. In a single year, the activities authorized by the USACE’s Letters of Permission would be expected to increase mean annual flows by about 27% and peak flows by about 21%. Over five years, these permits would be expected to increase mean annual flows by about 134% and peak flows by about 104%. Over 25 years, these permits would be expected to increase mean annual flows by about 669% and peak flows by about 520%.
7. In a single year, the activities authorized by the USACE’s General Permits would be expected to increase mean annual flows by about 14% and peak flows by about 11%. Over five years, these permits would be expected to increase mean annual flows by about 75% and peak flows by about 53%. Over 25 years, these permits would be expected to increase mean annual flows by about 370% and peak flows by about 265%.
8. In a single year, the activities authorized by the USACE’s Nationwide Permits would be expected to increase mean annual flows by about 40% and peak flows by about 37%. Over five years, these permits would be expected to increase mean annual flows by almost 200% and peak flows by almost 184%. Over 25 years, these permits would be expected to increase mean annual flows by about 990% and peak flows by about 920%.

Twenty-eight of the proposed Nationwide Permits have been in place since 1990, including Nationwide Permits 3, 12, 13, 14, and 29, which authorize activities that convert permeable wetlands to impervious surfaces (we discuss this issue in greater detail in the next subsection of this Chapter). These Nationwide Permits have been in place long enough to have had the kinds of impacts on mean and peak annual flows that are represented in Table 5.6.

Highfield (2008) also reported that the percentage developed area in a catchment area was a significant predictor of peak annual flows and had greater effect on those flows than percentage area of palustrine scrub/shrub wetlands, which reduced peak flows. Specifically, a 1% increase in palustrine scrub/shrub led to a 17.68% decrease in peak

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.6. Estimates of the incremental impact of General Permits, Nationwide Permits, and Individual (Standard) Permits on mean annual and peak annual flows over 1, 2, 3, 4, 5, 10, 20, and 25 years (after Highfield 2008, his Table 17). See text for further explanation.

Years	Mean Annual Flow				Peak Annual Flow			
	General	Nationwide	Letter	Individual	General	Nationwide	Letter	Individual
1	254.2153	675.9207	218.1969	455.808	1828.512	6320.264	1393.356	3572.351
	14.93%	39.69%	12.81%	26.77%	10.66%	36.86%	8.13%	20.83%
2	508.4307	1351.841	436.3938	911.6159	3657.024	12640.53	2786.713	7144.702
	29.86%	79.38%	25.63%	53.53%	21.33%	73.71%	16.25%	41.66%
3	762.646	2027.762	654.5906	1367.424	5485.536	18960.79	4180.069	10717.05
	44.78%	119.07%	38.44%	80.30%	31.99%	110.57%	24.38%	62.49%
4	1016.861	2703.683	872.7875	1823.232	7314.049	25281.06	5573.425	14289.4
	59.71%	158.76%	51.25%	107.06%	42.65%	147.42%	32.50%	83.33%
5	1271.077	3379.604	1090.984	2279.04	9142.561	31601.32	6966.781	17861.76
	74.64%	198.45%	64.06%	133.83%	53.31%	184.28%	40.63%	104.16%
10	2542.153	6759.207	2181.969	4558.08	18285.12	63202.64	13933.56	35723.51
	149.28%	396.90%	128.13%	267.65%	106.63%	368.55%	81.25%	208.31%
15	3813.23	10138.81	3272.953	6837.119	27427.68	94803.96	20900.34	53585.27
	223.91%	595.35%	192.19%	401.48%	159.94%	552.83%	121.88%	312.47%
20	5084.307	13518.41	4363.938	9116.159	36570.24	126405.3	27867.13	71447.02
	298.55%	793.80%	256.25%	535.30%	213.25%	737.10%	162.50%	416.63%
25	6355.383	16898.02	5454.922	11395.2	45712.8	158006.6	34833.91	89308.78
	373.19%	992.25%	320.31%	669.13%	266.56%	921.38%	203.13%	520.78%

Increases based on the average annual number of permits issued from 1996 – 2003 and average mean annual flows and peak annual flows. Values represent estimated flow increases and percent increases over given number of years

annual flows, a 1% increase in developed area on average increased peak annual flows between 50 and 63%. From those data, Highfield concluded that the percentage of a sub-basin that was developed or had impervious surface greatly increased and offset any reductions in peak-flows associated with palustrine scrub/shrub wetlands.

Activities authorized by different Nationwide Permits are also likely to be connected through feedback mechanisms, that are a form of interaction that does not appear in our earlier list of cumulative impacts. For example, a study of Thompson Creek in Santa Clara Valley, California, reported that discharges in the creek before residential, commercial, and industrial development were typically at rates that would not cause bank erosion. Following that development, however, flows exceeded levels required to destabilize stream banks and regularly exceeded historic two-year storm events. In addition to resulting in flows that would significantly degrade the quality of the aquatic habitat, those flows increased demand for bank stabilization. This suggests a reinforcing feedback loop between construction of residential housing and commercial structures in floodplains and activities that are undertaken to respond to stream erosion to counter an indirect effect of that development or to prevent those structures from being affected by stream erosion, stream meandering, and channel migration within floodplains. This circumstance suggests a feedback mechanism connecting activities authorized by NWP 29 and 39 and NWP 13; there are

probably similar feedback mechanisms between other Nationwide Permits.

5.A.3.2 Incremental Impacts of Specific USACE Authorizations

In addition to discussing the incremental impacts associated with the suite of permits the USACE uses to authorize activities that affect waters of the United States, specific Nationwide Permits are likely to combine to produce time-crowded, space-crowded, and incremental impacts that have been reported to have ecologically significant adverse consequences on the hydrology of natural drainage systems, water quality, and the organisms they support. In particular, Nationwide Permits 3, 12, 14, 29, 39, and 40 authorize discharges of dredged or fill material into non-tidal waters of the United States for maintenance, road construction, residential housing, retail stores, industrial facilities, restaurants, business parks, and shopping centers. In 1999, 2007, and 2010, these Nationwide Permits authorized more than 93,700 activities impacting more than 4,300 acres of jurisdictional wetlands and other waters of the United States. However, because only portions of the kinds of projects associated with these activities might require an authorization from the USACE, the total area affected by the direct, indirect, and cumulative impacts of projects undertaken with complete or partial authorization by Nationwide Permits is likely to be substantially greater than these acreage estimates imply.

In addition to urbanizing watersheds by destroying or degrading wetlands, the activities authorized by these Nationwide Permits specifically replace existing wetlands and other waters of the United States — ecosystems with porous soils that capture and slow the movement of water across land surfaces, remove or slow the movement of sediment, capture nutrients like nitrogen and phosphorus, bind and tightly hold metal pollutants such as lead, zinc and cadmium, and remove some kinds of pesticides — with impervious surfaces. By “impervious surface” we mean any material of natural or anthropogenic source that prevents water from infiltrating into soil (Schueler 1994). The rooftops of buildings, sidewalks, parking lots, roads, gutters, storm drains, drainage ditches, parking lots, roads, driveways, urban and suburban malls and shopping centers, industrial and commercial areas, and construction sites all represent impervious surfaces.

We acknowledge that a host of other Federal, State, and local agencies and private institutions and individuals are responsible for activities that convert permeable to impervious surfaces. We also acknowledge that in some geographic areas and during some time intervals activities authorized by USACE permits are responsible for only a fraction of this conversion. Nevertheless, we can acknowledge the contribution of other entities and still assess the contribution of USACE permits to this larger problem.

When we considered the contribution of USACE permits to this larger problem, we considered and acknowledged the many changes the USACE has made to Nationwide Permits since their inception to eliminate or reduce their effects on the environment. For example, the USACE issued Nationwide Permit 26 in 1984, which authorized discharges into headwaters and isolated wetlands and had an acreage limit of 10 acres. The USACE re-issued NWP 26 in 1986 and 1991, and reduced the acreage limit for this permit to 3 acres and 500 linear feet of stream bed. Despite the reductions in acreage limits, NWP 26 authorized about 9,583 activities between May 1997 and September 1998 that are reported to have impacted about 4,198 acres of wetlands and about 33,800 activities that are reported to have impacted about 8,400 acres of wetlands in 1999. The USACE let NWP 26 expire in 2000, replacing it with six new and six modified Nationwide Permits that had acreage limits of 0.5 acres, which was a lower

acreage limit than some commentators (for example, Stein and Ambrose 1998) had recommended.

The transportation projects authorized by Nationwide Permit 14 result in impervious surfaces of about 100%. If we apply this percentages to the number of acres affected by this Nationwide Permit in the years 1999, 2007, and 2010, that permit would have resulted in about 884.613 acres of impervious surface in those three years. The residential housing and related activities that are authorized by Nationwide Permit 29 result in impervious cover percentages ranging from 10.6 to 27.8% (for 2.0 acre residential lots to 0.25 acre residential lots, respectively; see Table 5.7). If we apply these percentages to the number of acres affected by Nationwide Permit 29 in the years 1999, 2007, and 2010, the activities authorized by this permit would have increased the amount of total impervious surface by between 42.72 and at least 112 acres of impervious surface in those three years.

The commercial and industrial activities that are authorized by Nationwide Permit 39 have been found to result in impervious cover percentages ranging from 53 to 96% and the agricultural activities authorized by Nationwide Permit 40 have been found to result in impervious cover percentages of about 1.9%. If we apply these percentages to the number of acres affected by Nationwide Permit 39 in the years 1999, 2007, and 2010, the activities authorized by this permit would have increased the amount of total impervious surface by between 101 and at least 183 acres in those three years.

In combination, the direct effects of activities authorized by Nationwide Permits 14, 29, and 39 would have resulted in at least 1,028 to 1,180 acres of impervious surface in the three years for which data are available. If we assume that these results are representative and calculate the acreage of total impervious surface per year (342.75 to 393.15, which captures the upper and lower ranges of impervious surface associated with NWP 29 and 39), the activities authorized by these three permits would have increased the amount of total impervious surface by at least 1,710 to 1,900 acres of total impervious surface over the past five years (and an equal amount over the five year period of the proposed Nationwide Permits) or at least 8,500 to 11,795 acres over the past 30 years. With the data available, we cannot estimate the total acreage of impervious surface produced by activities authorized by Standard Permits, general permits, and Letters of Permission and activities that would not have required authorization from the USACE. However, those activities would substantially increase these acreage estimates.

The amount of impervious surface in a watershed is a reliable indicator of a suite of phenomena that influence a watershed's hydrology (Center for Watershed Protection 2003, National Research Council 1992, Schueler 1994). Numerous studies from throughout the United States have demonstrated that development on formerly undeveloped (or less developed) increases the area of impervious surface reduces the capacity of porous surfaces remaining in drainages to capture and infiltrate rainfall. As the percentage of these impervious surfaces increases, the fraction of annual rainfall or melt-water that becomes surface runoff (with corresponding reductions in the amount that infiltrates into the soil or recharges groundwater) and runoff reaches stream channels much more efficiently. (Bledsoe 2001, Booth 1990, 1991; Hammer 1972, Hollis 1975, MacRae 1992, 1993, 1996). The relative influence of the area of total impervious surface depends on the spatial scale. It has the strongest influence at the scale of catchment basins, a strong influence at the scale of sub-watersheds, moderate influence at the watershed scale, and weaker relative influence at the scale of sub-basins and basins (Coleman et al 2005).

Table 5.7. Estimates of the percent impervious cover associated with different land use cover (after Cappiella and Brown 2001 and Bannerman 2001)

Land Use	% Chesapeake Bay Impervious Cover (Cappiella and Brown 2001)	% Ultra-Urban Connected Impervious Cover (Bannerman 2001)
Agriculture	1.9	-
Open urban land	8.6	-
1/4 – 2.0-acre residential lot	27.8 - 10.6	-
High-density residential	33	31
Multi-family	43	49
High-rise residential	-	64
Schools	30	39
Industrial	53	69
Commercial	72	83
Downtown commercial	-	96

Because of these changes, peak discharge rates for floods in drainages with high levels of impervious surface area were higher with equivalent rainfall than they were before impervious surface area increased (Booth 1990, Hammer 1972, Henshaw and Booth 2000, Leopold 1973). In addition, these discharges transported sediment and pollutants more efficiently, which degraded the quality of receiving waters (Booth 1991, Booth and Jackson 1997, Booth and Reinelt 1993, Booth *et al.* 2002, Burges *et al.* 1998, Cappiella and Brown 2001, Jennings and Jarnagin 2002).

Klein (1979) reported a negative linear relationship between impervious area and base flow in the watersheds he studied in the Piedmont province of Maryland. He reported that the diversity of fish and invertebrates began to decline when impervious surface area reached between 10 and 12% and declined severely when that area reached 30%. May *et al.* (1997) studied the effects of urbanization on small streams in the Puget Sound region and reported that as the area of total impervious surface increased, stream corridor widths decreased and riparian encroachment and the number of interruptions along the length of the buffer both increased. Water quality criteria for chemicals in the water occurred after the area of total impervious surface exceeded about 45%, at which point habitat degradation became ecologically significant. As the area of total impervious surface increased, habitat attributes that are important for salmon, such as pools and the presence of woody debris, declined along with the benthic index of biotic integrity, and the ratio of Coho salmon to cutthroat trout. When the area of total impervious surface exceeded 5%, this latter ratio declined substantially suggesting that Coho salmon were being competitively excluded by the trout in these streams.

Roy *et al.* (2003) calculated indices of biotic integrity for fish communities and habitat at 267 sites in small watersheds in 30 small streams in the Etowah River basin in the State of Georgia and reported that indices of biotic diversity began to decline when the area of total impervious surface reached 15-20%. Wang *et al.* (2003) also calculated indices of biotic integrity for fish communities and habitat in 39 coldwater trout streams in Minnesota and Wisconsin. When impervious surfaces represented less than 6% of a watershed, biotic diversity in the streams they studied remained high. When the area of impervious surface rose to between 6 and 11%, minor changes in urban surface area could result in major changes in the diversity of the fish fauna in some streams; when the area of impervious surface rose above 11%, many species fell out of the fish fauna. When the total impervious area in a catchment basin exceeded 25%, the changes in runoff patterns seriously degraded aquatic ecosystems downstream of the affected area (Department of the Interior 2001, University of Wisconsin 2002, Wang *et al.* 2003). Miltner *et*

al. (2004) conducted similar studies at 267 sites in small watersheds in the major metropolitan areas in the State of Ohio. They reported that the indices were significantly affected in watersheds where the area of total impervious surface exceeded 13.8% and were severely degraded when that area exceeded 27.1%.

In most studies relating indices of biotic integrity to the total area of impervious surface, investigators reported measurable changes in the hydrology of rivers and streams when the area of total impervious was between 7 and 12%, with biotic degradation increasing when the percentage was between 11 and 25%, and substantial declines in biotic diversity occurring when the percentage exceeded 20 to 30% (Booth 1991, Booth and Jackson 1997, Booth and Reinelt 1993, Booth *et al.* 2002, Burges *et al.* 1998, Cappiella and Brown 2001, Jennings and Jarnagin 2002, Klein 1979, Schueler 1994). However, ephemeral and intermittent streams in the arid regions of southern California were reported to be more sensitive to increases in the area of total impervious surface. For example, Coleman *et al.* (2005) reported response thresholds of about 2 to 3% of the area of total impervious surface for ephemeral and intermittent streams in the arid regions of southern California.

Changes in runoff and flow have been shown to result in adversely affect aquatic habitat and species, including endangered and threatened species (Benke *et al.* 1981, Booth and Jackson 1997, Garie and McIntosh 1986, Jones and Clark 1987, and Pedersen and Perkins 1986). Coho salmon are particularly sensitive to the effects of urbanization and their abundance usually declines as watersheds become increasingly urbanized (Birtwell *et al.* 1988, Brown *et al.* 1994, Slaney *et al.* 1996, Mrakovcich 1998). For example, a study of the effects of impervious area on 22 small streams in the Puget Sound lowland ecosystem concluded that Coho salmon were the dominant salmonid in those streams that had a total impervious area less than 5% (May 1998). Above 5%, cutthroat trout dominated. A separate study concluded that when the total impervious area in a stream system exceeded 20% (May *et al.* 1996), the percentage of fine sediment (<0.85 mm) commonly exceeded 15%, a percentage that is harmful to salmon and aquatic insects (Barnard 1992, McHenry *et al.* 1994). These results are supported by the conclusions of other studies that demonstrated that fine sediment in salmon spawning gravels increased by 2.6 to 4.3 times in watersheds with more than 4.1 miles of roads per square mile of land area (Cedarholm *et al.* 1980, Matthews 1999) and that bull trout (*Salvelinus confluentus*) do not occur in watersheds with more than 1.7 miles of road per square mile in the Interior Columbia River basin (Haynes *et al.* 1996).

Previously, we presented the results of Ellis' (2005) study of the cumulative impacts of activities authorized by USACE permits in Montana. That study highlighted the cumulative impacts of bank stabilization activities authorized using NWP 13 on 10 rivers in Montana, particularly the Yellowstone River (the longest free-flowing river in the lower 48 states). In four Montana counties, the USACE had authorized almost 82,000 linear feet (16.4 miles) of new bank stabilization structures on the Yellowstone River between 1990 and 2002. In the Billings area (in Yellowstone County, Montana), dikes and armoring had increased from approximately 21% of the channel's length in 1957 to 41% in 1999 (citing Aquoneering and Womack and Associates 2000). In Park County, she reported that the Yellowstone River contained at least 9,134 feet of riprap, 108 rock barbs, 106 rock jetties, and 32 car bodies at the time of her study. One 8-mile section of the river, from Pine Creek to Carters Bridge, had been covered by rock riprap over 16% of its channel length and at least 62 rock barbs and jetties were added to this stretch between 1987 and 1998 (citing Natural Resources Conservation Service 1998). She also reported that the USACE's program had had similar effects on the Big Hole, Bitterroot, Clark Fork, Flathead Rivers, Missouri, Musselshell, Ruby, and Sun

Rivers.

The evidence available supports one conclusion: the Nationwide Permits have authorized activities that have had ecologically significant adverse effects on the physical structure and quality of waters of the United States through time-crowding, space-crowding, interactions, and “nibbling.” In addition to the direct loss of significant percentages of wetland acreage, the information available demonstrates that the cumulative impacts of the activities authorized by Nationwide Permits have been sufficiently large to change the flow regimes and physical structure of river systems, degrade water quality, and simplify or degrade aquatic ecosystems; these changes have resulted in declines in the abundance of endangered or threatened species (Beechie *et al.* 1994, Lichatowich 1989, Lucchetti and Fuerstenberg 1993, May *et al.* 1997, Moscrip and Montgomery 1997, Scott *et al.* 1986). These outcomes have occurred despite the USACE’s commitment to (a) remain aware of potential cumulative impacts resulting from activities authorized by Nationwide Permits and (b) take appropriate administrative action for those activities.

5.A.4 Impacts of Nationwide Permits on Listed Resources

As we have discussed, almost all of the endangered or threatened species under the jurisdiction of NMFS that occur in freshwater, coastal, or estuarine ecosystems within areas under the jurisdiction of the United States during all or portions of their life cycles are likely to be exposed to some of the direct or indirect effects of activities authorized by the proposed Nationwide Permits. In addition to the impacts we have discussed in this Opinion thus far, many of the species that have been listed as endangered or threatened were listed because of the consequences of activities in waters of the United States that were authorized by permits issued by the USACE (Table 5.8), although those permits have usually been contributing causes rather than the sole cause.

For example, when NMFS listed Sacramento River winter-run Chinook salmon as endangered and designated critical habitat for the species, its final rules to list the species and designated its critical habitat identified section 404 permits the USACE issued in the Sacramento River, Sacramento River-San Joaquin Delta, and San Francisco Bay as one of several reasons for the listing (57 *Federal Register* 36626, 59 *Federal Register* 440). When NMFS proposed Oregon coast, Southern Oregon Northern Coastal California, and Central California Coast Coho salmon as threatened, the proposal also identified the loss of wetland habitat, including the USACE’s failure to consider the cumulative impact of activities authorized by Nationwide and other permits and inadequate mitigation as reasons for the listing, as some of several reasons for listing these salmon as threatened (60 *Federal Register* 38011, 61 *Federal Register* 56138).

In the *Status of the Listed Resources* and *Environmental Baseline* section of this Opinion, we noted that the destruction or degradation of jurisdictional wetlands and other waters of the United States caused by activities the USACE’s authorized with section 404 permits were one of the reasons we listed Sacramento River winter-run Chinook salmon as endangered (57 *Federal Register* 36626, 59 *Federal Register* 440). Southern Oregon Northern Coastal California, and Central California Coast Coho salmon as threatened, Central California Coast, South Central California Coast, Central Valley, Upper Columbia River, Snake River Basin, Lower Columbia River, and Northern California steelhead as threatened and Southern California steelhead as endangered (61 *Federal Register* 41541, 62 *Federal Register* 43937). NMFS also designated or proposed critical habitat for the green and hawksbill sea turtles, several populations of steelhead, and Coho salmon to protect these species from the direct and indirect effects of

Table 5.8. Percentage of endangered and threatened species adversely affected by various forms of habitat destruction and degradation (after Wilcove *et al.* 2000)

Stressor	All Taxa (n = 1,207)	Vertebrate Taxa (n = 329)	Fish Taxa (n = 116)	Plant Taxa (n = 723)
Agriculture	38	40	45	33
Land conversion for commercial purposes	35	30	16	36
Water development	30	47	63	15
Outdoor recreation	27	16	25	33
Livestock grazing	22	17	19	33
Pollutants	20	27	25	7
Infrastructure development (including roads)	17	16	38	20
Disruption of fire regimes	14	5	6	20
Timber harvesting	12	16	19	7
Mining, oil and gas, geothermal	11	12	13	11
Military activities	4	2	0	5

activities that might otherwise be authorized by USACE permits (64 *Federal Register* 36274, July 6, 1999; 63 *Federal Register* 46693, September 2, 1998, 64 *Federal Register* 5740, February 5, 1999; 64 *Federal Register* 24049, May 5, 1999; and 64 *Federal Register* 24998, May 10, 1999).

Numerous species that are currently under the jurisdiction of the U.S. Fish and Wildlife Service have also been listed for similar reasons. For example, vernal pool tadpole shrimp (*Lepidurus packardii*); conservancy fairy shrimp (*Branchinecta conservatio*); longhorn fairy shrimp (*B. longiantenna*); and vernal pool fairy shrimp (*B. lynchi*) occupy basins and margins of vernal pools of the Central Valley of California and are endangered because of habitat loss and degradation due to urbanization, agricultural land conversion, livestock grazing, off-highway vehicle use, a flood control project, highway projects, altered hydrology, landfill projects, and competition from weedy nonnative plants. The regulations listing these species identified activities the USACE authorized using individual and nationwide permits as among the reasons why these species warranted their listing as endangered species (57 *Federal Register* 19856, 59 *Federal Register* 48136). The U.S. Fish and Wildlife Service also listed twenty- one plant species — including *Alopecurus aequalis* var. *sonomensis*, *Carex albida*, *Castilleja campestris* ssp. *succulenta*, *Chamaesyce hooveri*, *Cirsium hydrophilum* var. *hydrophilum*, *Cordylanthus mollis* ssp. *mollis*, *Lilium pardalinum* ssp. *pitkinense*, *Orcuttia pilosa*, *O. tenuis*, *O. viscida*, *Poa napensis*, *Plagiobothrys strictus*, *Sidalcea oregana* ssp. *valida*, *Thelypodium howellii* ssp. *spectabilis*, *Trifolium amoenum*, and *Tuctoria greenei* — as threatened or endangered because the aquatic habitats that supported them were destroyed or degraded activities the USACE authorized using one or more Nationwide Permits (62 *Federal Register* 14338, 62 *Federal Register* 54791, 62 *Federal Register* 61916, 64 *Federal Register* 28393). For several of these species, the listing documents identified the acreage limits attached to the USACE permits as being inadequate to protect the species. For example, the listing document for the Wenatchee Mountains checkermallow (*Sidalcea oregana* var. *calva*) established that three out of the five remaining populations of this species, which is native to hydric meadows or wetland and moist meadow complexes, occur on sites that are smaller than 5/100s of an acre (64 *Federal Register* 71684).

Other species the U.S. Fish and Wildlife Service listed because of activities authorized by Nationwide Permits include the Salt creek tiger beetle (*Cicindela nevadica lincolniiana*) which lost about half of the habitat for the largest population of this tiger beetle with the completion of a stream bank stabilization and channelization project that was permitted by the USACE along Little Salt Creek in 1992 (Spomer and Higley 1993, Farrar 2003). Since

then, stream channelization and bank stabilization projects conducted for flood control — many of them authorized by Nationwide Permit 13 — have caused channel incision and have necessitated additional bank stabilization projects further downstream or in feeder tributaries (70 *Federal Register* 58345).

5.B.1. Nationwide Permits and Compliance with Section 7(a)(2)

The information we have presented thus far establishes that the activities that would be authorized by the proposed Nationwide Permits have ecologically significant individual and cumulative effects on jurisdiction and non-jurisdictional wetlands and other waters of the United States, that endangered and threatened species under NMFS' jurisdiction and critical habitat that has been designated for those species are exposed to those activities, and that exposure is likely to have significant adverse consequences for those species and units of designated critical habitat. The USACE cannot use Nationwide Permits to authorize discharges of dredged or fill materials into waters of the United States or other activities unless the USACE can demonstrate that the activities will not result in more than minimal adverse effects on the aquatic environment, individually or cumulatively. However, the USACE does not normally review individual requests for authorization, except when preconstruction notification to the USACE is required or when a prospective permittee asks the USACE to verify that their activity complies with a Nationwide Permit. The USACE argues that the terms and conditions it attaches to each Nationwide Permit, regional and case-specific conditions, and the process the USACE uses to review PCNs avoids the potential adverse impacts of Nationwide Permits and insures compliance with applicable federal laws.

This is the central issue of this Opinion: whether or to what degree the USACE has structured its Nationwide Permit program so that the USACE can insure that the actions that would be authorized by those Nationwide Permits comply with the requirements of section 7(a)(2) of the ESA. That is, are the terms and conditions the USACE attaches to each Nationwide Permit, regional and case-specific conditions and the process the USACE uses to review PCNs likely to insure compliance with the requirements of section 7(a)(2) of the ESA? We organize our inquiry around the four primary questions we identified in the Approach to the Assessment section of this Opinion:

1. Has the USACE structured its proposed Nationwide Permit Program so that the USACE is positioned to know or reliably estimate the general and particular effects of the activities that would be authorized by the proposed Nationwide Permits on the quality of the waters that would receive those discharges?
2. Has the USACE structured its proposed Nationwide Permit Program so that the USACE is positioned to take actions that are necessary or sufficient to prevent waters of the United States from being degraded by the individual or cumulative effects of the activities that would be authorized by the proposed Nationwide Permits on the quality of the waters that would receive those discharges?
3. Has the USACE structured its proposed Nationwide Permit Program so that the USACE is positioned to *insure* that endangered or threatened species and designated critical habitat are not likely to be exposed to (a) the direct or indirect effects of the activities that would be authorized each year of the five-year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with those activities?
4. has the USACE structured its proposed Nationwide Permit Program so that the USACE is positioned to *insure* that endangered or threatened species and designated critical habitat do not suffer adverse conse-

quences if they are exposed (a) the direct or indirect effects of the activities that would be authorized each year of the five-year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with those activities?

In the narratives that follow, we present the evidence that will help answer each of these four questions and sub-questions that are related to them (which we have presented in the *Approach to the Assessment* section of this Opinion).

5.B.1.1 USACE Estimates of the Effects of the Nationwide Permits

The USACE asserts that the proposed Nationwide Permits will not result in more than minimal adverse effects on the aquatic environment, individually or cumulatively, because of the terms and conditions it attaches to each Nationwide Permit, regional and case-specific conditions, and the process the District Engineers use to review PCNs avoids the potential adverse impacts of Nationwide Permits and insures compliance with applicable federal laws (USACE 2011a – 2011v). The draft documents the USACE prepares to comply with NEPA assert that the USACE considers the reasonably foreseeable direct or indirect effects of the different Nationwide Permits (USACE 2011a – 2011v). Further the USACE asserts that its districts prepare supplemental decision documents that discuss local concerns related to the Section 404(b)(1) Guidelines, if a district considers it necessary address gaps in the National decision documents.

In the remainder of this sub-section, we examine these claims and assertions to determine whether the USACE is positioned to know or reliably estimate the general and particular effects of the discharges of dredged or fill material into waters of the United States or other activities that would be authorized by the proposed Nationwide Permits. As part of examining these claims, we distinguish between the two categories of Nationwide Permits the USACE has established: those that do not require PCN and those that do.

Nationwide that Do Not Require Pre-Construction Notification. Eighteen of the proposed Nationwide Permits would not require prospective permittees to provide PCNs, reporting, or either to the USACE. Other Nationwide Permits only require PCN for a portion of the activities the Nationwide Permits authorize. For example, Nationwide Permit 3 only requires prospective permittees to submit a PCN to a District Engineer if they are removing accumulated sediment or debris in the vicinity of an existing structure. Prospective permittees who do not plan to remove accumulated sediment or debris in the vicinity of a structure they are repairing, rehabilitating, or replacing are not required to notify a District Engineer (USACE 2011c), even if the direct and indirect effects of their activities are identical to the effects of constructing the original project.

Nevertheless, the USACE asserts that General Condition 19 of the Nationwide Permits prevent these activities from adversely affecting endangered or threatened species or designated critical habitat:

1. No activity is authorized under any Nationwide Permits which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act or which will destroy or adversely modify the critical habitat of such species. No activity is authorized under any Nationwide Permits which “may affect” a listed species or

critical habitat, unless Section 7 consultation addressing the effects of the proposed activity has been completed.

2. Non-federal permittees shall notify the District Engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat, and shall not begin work on the activity until notified by the District Engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that may affect Federally-listed endangered or threatened species or designated critical habitat, the PCN must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. The District Engineer will determine whether the proposed activity “may affect” or will have “no effect” to listed species and designated critical habitat and will notify the applicant of the USACE’s determination within 45 days of receipt of a complete PCN. Applicants shall not begin work until the USACE has provided notification the proposed activities will have “no effect” on listed species or critical habitat, or until Section 7 consultation has been completed.
3. As a result of formal or informal consultation with the FWS or NMFS the District Engineer may add species-specific regional endangered species conditions to the Nationwide Permits.
4. Authorization of an activity by a Nationwide Permits does not authorize the “take” of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with “incidental take” provisions, etc.) from the FWS or the NMFS, both lethal and non-lethal “takes” of protected species are in violation of the ESA.

The first element of General Condition 19 prohibits Nationwide Permits from authorizing activities that would either jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. The second element of General Condition 19 prohibits Nationwide Permits from authorizing activities that “may affect” endangered species, threatened species, or designated critical habitat unless a section 7 consultation with either NMFS, the U.S. Fish and Wildlife Service, or both has been completed. The second element of this condition also makes permit applicants primarily responsible for satisfying the requirements of the first provision: permit applicants would be responsible for determining if listed species and designated critical habitat is likely to occur in an area affected by their proposed activity and for notifying the relevant District Engineer if they determine that such exposure is likely. The fourth element of this general condition prohibits prospective permittees from “taking” endangered or threatened species without receiving an exemption or authorization from NMFS or the USFWS.

These conditions make an important first step toward insuring that the activities authorized by Nationwide Permits comply with the requirements of section 7(a)(2) of the ESA. However, they are only the first step; what matters is whether or to what degree permittees comply with the letter and spirit of these conditions and whether or to what degree those conditions are likely to produce outcomes that satisfy the requirements of section 7(a)(2). There are several reasons why these conditions do not fulfill their intended purpose.

First, the conditions the USACE imposes on these Nationwide Permits make prospective permittees solely responsible for compliance with the requirements of the ESA. The conditions assume that prospective permittees

would have sufficient knowledge of the presence or absence of endangered species, threatened species, and designated critical habitat on a project site and the requirements of the ESA, and have the technical knowledge necessary to determine if their activity might have direct or indirect effects on endangered species, threatened species, or designated critical habitat that occur in areas adjacent to or downstream of their project. Some prospective applicants certainly have sufficient knowledge to make these judgments; however, recent surveys of the depth of public knowledge of science, environmental information, and causal relationships suggest that it would be an error to make the same assumption about the general population (Miller *et al.* 1997, 2000; National Science Board 2006, National Science Foundation 2001, Tversky and Kahneman 1982).

Section 7(a)(2) of the ESA requires NMFS, Action Agencies, and prospective permittees (in their role as applicants for federal authorizations) to use the best scientific and commercial data available during consultations. The two general conditions the USACE proposes to attach to the Nationwide Permits make prospective permittees responsible for complying with this statutory requirement; however, only a fraction of prospective permittees (primarily those who can afford to contract to private consultancies) seem likely to be able to satisfy this requirement.

The scientific and commercial data would be considered 'available' if NMFS, the USACE, or a prospective permittee knows of the data or is in a position to know of the data given the institutional, electronic, and other resources available to them. The best scientific and commercial data includes data available in the form of reports and similar documents authored by federal, state, and local governments or under contract to those institutions. The best scientific and commercial data also includes data in peer-reviewed journal articles that are commonly inaccessible without subscription. If only 17 percent of the adults in the United States have sufficient scientific knowledge to understand the science section of the *New York Times* or similar scientific media (National Science Board 2006), it seems unreasonable to assume that most prospective applicants would have sufficient knowledge to satisfy their obligation to reach a conclusion based on the best scientific and commercial data available as the USACE's conditions require. The absence of specific guidance from the USACE to prospective permittees would exacerbate this problem.

Second, the absence of guidance from the USACE that specifies how prospective permittees can correctly satisfy the conditions of the Nationwide Permits increases permittees' probability of incorrect conclusions. Mason and Slocum (1987) and Lowe *et al.* (1989) concluded that when USACE's permits specified time limits for completing mitigation projects and provided sufficient detail or clarity to ensure the success of the created wetland or to facilitate enforcement of their conditions, compliance rates by permittees increased substantially and the outcomes of mitigation projects were more successful at replacing the functions of the original wetlands. Similarly, the absence of specific guidance from the USACE on (a) the specific questions prospective permittees should ask to determine if their activity might have direct or indirect effects on endangered species, threatened species, or designated critical habitat that occur in areas adjacent to or downstream of their project; (b) how prospective permittees should gather and evaluate the information relevant to answering these questions; and (c) some mechanism for verifying the results of these inquiries, even using based on a sub-sample of all permit applications makes it less likely that the two conditions will avoid exposing endangered species, threatened species, and designated critical habitat to activities authorized by the proposed Nationwide permits.

Third, the USACE does not routinely monitor compliance with these conditions. For example, Sifneos *et al.* (1992) reported that between 60 and 90% of the permits they examined in the States of Alabama, Louisiana, and Oregon had not been monitored by the USACE. Kentula (1986) reported that the USACE had not conducted site visits on 49% of the permits she studied in the State of Washington. Storm and Stellini (1994) reported that the USACE had monitored only one-third of the sites in Washington where monitoring was required and had no records of site visits for 55% of the sites in Oregon where monitoring had been required. The National Research Council (2001), General Accounting Office (2005), Mason and Slocum (1987), Morgan and Roberts (1999) and others all concluded that the virtual absence of compliance inspections by the USACE allows substantial numbers of permittees to ignore the conditions of their permits.

It is important to note that the values cited in the preceding paragraph are for standard permits, which supposedly receive greater scrutiny from the USACE. The point of Nationwide Permits is to authorize activities that would receive much less scrutiny; by design, Nationwide Permits that do not require PCN would receive almost no scrutiny of any kind. Without oversight or even the possibility of oversight, these Nationwide Permits are likely to produce the same compliance problems that have been reported with the compensatory mitigation the USACE requires of permittees.

Fourth, the evidence available establishes that at least some of these Nationwide Permits have had ecologically significant adverse consequences for endangered and threatened species. In the Section 5.A.2 of this Opinion, we discussed the effects of Nationwide Permit 4, which authorizes the placement of several harvesting devices that are known to capture or kill endangered and threatened species. For example, green, Kemp's ridley, leatherback, and loggerhead sea turtles have been captured and killed in pound net fisheries in Peconic Bay, Long Island Sound, Chesapeake Bay, and Pamlico Sound when they became entangled in lead lines or "leaders" that are used to guide target species into the pocket of the pound net (Mansfield *et al.* 2002a, 2002b). One study identified 1,370 sea turtles that had been captured in pound net fisheries in Chesapeake Bay (Lutcavage and Musick 1985). Of these, 527 loggerhead sea turtles, 28 Kemp's ridley sea turtles, and 7 leatherback sea turtles died as a result of their capture. These data alone suggest that the two permit conditions are insufficient to prevent these non-reporting Nationwide Permits from adversely affecting at least one group of endangered or threatened species.

Each year for the next five years, we would expect NWP 4 to authorize about 7,150 activities, impacting about 17 acres, and resulting in about 8 acres of compensatory mitigation. Over the five-year duration of the proposed Nationwide Permits, we would expect this Nationwide Permit to authorize about 35,748 activities, impact about 84 acres, and result in about 41 acres of compensatory mitigation. In addition to this loss in habitat, the number of endangered and threatened species that have been captured or killed in gear authorized by this permit have been much more than minimal. Although the actual cumulative impacts of this permit remains unknown (because prospective permittees have not been not and will not be required to notify or report to the USACE), our prior experience with the activities NWP 4 authorizes suggests that it has had significant, adverse impacts on endangered and threatened despite the two conditions the USACE applied.

We singled out Nationwide Permit 4 because we had data on the effects of the activities it authorizes on endangered and threatened species. However, activities authorized by other Nationwide Permits are likely to have individual or

cumulative impacts that are equally significant. Based on data the USACE provided us in 2007, Nationwide Permits that did not require pre-construction permittees to notify a District Engineer authorized a greater number of activities than Nationwide Permits that required notification, reporting, or both (an average of 4,660 activities per “non-reporting” permit versus an average of 2,412 activities per “reporting” permit). Based on USACE estimate, the non-reporting Nationwide Permits authorized an estimate 60,580 activities in 2007, impacting an estimate 3,878 acres of jurisdiction wetlands and other waters of the United States. If we assume that these estimates are representative and project them over the five-year duration of the last Nationwide Permit authorization, we would expect the non-reporting Nationwide Permits to have authorized about 302,905 activities, impacting 19,390 acres of jurisdictional wetlands, with no compensatory mitigation.

These estimates ignore other impacts that would have resulted from these activities, but would not have been reported. For example, between 1990 and 2002, Ellis (2005) reported that Nationwide Permit 3 authorized 810 maintenance activities in the State of Montana. About 395 of those activities impacted a minimum of 89,962 linear feet (about 17 miles) of streams and 13.7 acres of wetlands. Extrapolating from the data the USACE provided on NWP 13, we would expect that permit to authorize about 9,268 activities each year of the next five years or about 46,342 activities over the five-year period. We would also expect those activities to impact about 200 acres each year or almost 1,000 acres over five years. However, we cannot estimate the linear distance of rivers and streams that are likely to be impacted by these activities — or activities authorized by NWPs 3, 14, or 15 — because most of these activities do not require permittees to notify or report to the USACE; nevertheless, that linear distance is an important measure of the impact of these activities on waters of the United States.

Cumulative impacts are the final reason why the two conditions the USACE imposed are not likely to prevent endangered or threatened species from being adversely affected (directly and indirectly) by the activities authorized by these Nationwide Permits. The number of activities authorized by the non-reporting Nationwide Permits and the number of acres those activities impact are sufficiently large to make impacts resulting from time-crowding, space-crowding, interactions, or incremental effects (“nibbling”) almost certain. However, the USACE does not appear to be in a position to know or reliably estimate the cumulative impacts of these activities the Nationwide Permits authorize or to determine whether or to what degree the two conditions protect endangered and threatened species from those cumulative impacts.

Despite the USACE’s continued commitment to “remain aware of potential cumulative impacts that may occur on a regional basis as a result of these nationwide permits. If adverse cumulative impacts are anticipated from any of the discharges subject to these nationwide permits, we intend to take appropriate administrative action, including the exercise of authority express in 232.4-4 to require individual or general permits for these activities” (USACE 1977 page 37131), the evidence suggests that this does not occur. For the Nationwide Permits that do not require prospective permittees to notify or report to a District Engineer, the USACE is not in a position to know or reliably estimate the number activities Nationwide Permits authorize, where and when those activities occur, rates of compliance with the terms and conditions, or the individual and cumulative effects of those activities on the watersheds in which they occur.

As further evidence, consider the information contained in the USACE’s draft decision documents for the Nation-

wide Permits (USACE 2011b – 2011v). Given its commitment to monitor and act on potential cumulative impacts, it seems reasonable to expect the USACE to be able to present about 34 years of data on the individual and cumulative impacts of activities that have been authorized by the Nationwide Permits that have remained in place since 1977 (Nationwide Permits 1, 2, 3, 5 and 6), 25 years of data on the individual and cumulative impacts of the Nationwide Permits that have been in place since 1986 (NWPs 4, 7, 8, 9, 10, and 11), about 20 years of data on the Nationwide Permits established in 1990, etc.

Instead, the cumulative impact analyses in the USACE's draft decision documents only identify the number of times a Nationwide Permit is likely to be used each year, the acreage of jurisdictional wetlands those activities are expected to impact, the approximate acreage of compensatory wetlands that would be required to offset those impacts, and five-year projections of those annual estimates (USACE 2011b – 2011v). These estimates are followed by a general definition of compensatory mitigation, the statement that "wetland restoration, enhancement, and establishment projects can provide wetland functions and services, as long as the wetland compensatory mitigation project is placed in an appropriate landscape position, has appropriate hydrology for the desired wetland type, and watershed condition will support the desired wetland type"; the statement that "the required compensatory mitigation will attenuate cumulative impacts on the Nation's aquatic resources by providing aquatic resource functions and services, so that the net effects on the aquatic environment resulting from the activities authorized by this NWP will be minimal." The analyses conclude by asserting that "the convenience and time savings associated with the use of this NWP will encourage applicants to design their projects within the scope of the NWP rather than request Standard Permits for projects which could result in greater adverse impacts to the aquatic environment."

We examined 35 of the 50 decision documents we received from the USACE; with minor variations, this pattern is repeated in the Cumulative Effects analyses of each of those draft decision documents. With minor variations (different locations and a different reference period for the data), this pattern was also repeated in the Cumulative Effects analyses of each of the decision documents we received from the USACE in 2007 (USACE 2007a – 2007u). The cumulative effects analyses that appear in the 2011 documents:

1. do not add the acreage that are projected to be impacted over the next five years to the acreage that was estimated to have been impacted in the past five years (or since the program was established);
2. do not add the acreage that would be impacted by individual Nationwide Permits to the acreage impacted by the entire suite of Nationwide Permits;
3. do not add the acreage that would be impacted by Nationwide Permits to the acreage impacted by the USACE's other permits (standard and general permits and letters of permission);
4. do not consider how the impacts of this acreage might accumulate to degrade waters of the United States or adversely affect endangered or threatened species (including a failure to accumulate or consider the effects of differences between the acreage impacted by a Nationwide Permit and the acreage of compensatory wetlands when the former is greater than the latter);
5. do not present or discuss evidence contained in scholarly studies — articles published in peer-reviewed journals, gray papers, doctoral dissertations, and master's theses — of the spatial or temporal impacts of the Nationwide Permits on jurisdictional and non-jurisdictional wetlands and other waters of the United States,

watershed hydrology, water quality, or endangered and threatened species and designated critical habitat. For example, none of the decision documents we received in 2007 or 2010 reference any of the studies we cite or consider any of the information we discuss in Section 5.A.3 of this effects analysis. Those references were easily identified with electronic searches and were accessible without subscription or other payment;

6. do not provide evidence that establishes whether or to what degree permittees comply with the terms and conditions attached to non-reporting Nationwide Permits (or alternative measures of the effectiveness of those terms and conditions).

Without this information, the USACE is not in a position to know or reliably estimate the cumulative impacts of non-reporting Nationwide Permits on jurisdictional wetlands and other waters of the United States or determine whether or to what degree the two conditions the USACE asserts protect endangered or threatened species or designated critical habitat from being adversely affected by the individual or cumulative impacts of Nationwide Permits.

Several authors have reported that the USACE's assessments generally fail to consider the cumulative impacts of its authorizations on waters of the United States or endangered and threatened species and critical habitat that has been designated for those species. A review of the USACE's permitting program in southern California concluded that the USACE appears to evaluate section 404 permits on an individual basis without consideration of cumulative impacts at watershed or regional spatial scales (Allen and Feddema 1996). That review also concluded that the effects of several projects had accumulated to have substantial consequences for aquatic ecosystems without being detected by the USACE. Separate reviews of the USACE Nationwide Permit Program in southern California (Stein and Ambrose 1998), the Commonwealth of the Northern Mariana Islands (Gilman 1998), and the USACE's overall regulatory program (National Research Council 2001) reached similar conclusions: the USACE generally does not consider the cumulative effects of the activities it authorizes, particularly Nationwide Permits.

The USACE has been trying to address this problem for many years. Nationally, the USACE has tried to develop several databases – Regulatory Analysis & Management System (RAMS), RAMSII, and OMBIL Regulatory Module (ORM, the most recent of the series) -- that would provide better data to support USACE estimates of the number of activities authorized, their location and timing, impacts, compensatory mitigation, and cumulative impact assessments. Several USACE Districts have also developed methodologies that would allow them to assess and monitor the cumulative impacts of USACE authorizations. For example, the USACE's Savannah District has developed a watershed-based methodology that would allow them to assess and forecast the individual and cumulative impacts of standard and regional permits on such endpoints as percent impervious surface area in a watershed or catchment basin (Bernstein and King 2009, King and Bernstein 2009). Other USACE Districts are trying to develop methods for assessing and projecting the cumulative impacts of USACE authorizations. For example, on 29 July 2011, the USACE's Sacramento District sought sources that could conduct a comprehensive cumulative impact analysis in the planning area of the South Sacramento Habitat Conservation Planning Area.

The USACE clearly recognizes that it needs to improve its ability to assess the individual and cumulative impacts of the activities it authorizes through its various permits. At some point in the future, these efforts might respond to some or all of the concerns we have identified thus far. Even if the OMBIL Regulatory Module provides the

USACE with a comprehensive database that supports rigorous assessments of the individual or cumulative impact of activities authorized by USACE permits, the database cannot contain information about activities that do not require prospective permittees to provide information to the USACE. Even the most rigorous assessment methodologies are not likely to assess the impacts of activities whose number, location, timing, and individual impacts remain unknown.

Nationwide Permits that Require Pre-Construction Notification. The USACE proposes to require prospective permittees to notify the USACE before they undertake an activity for the 28 remaining Nationwide Permits. Once they are notified, USACE project managers evaluate PCNs to determine if the proposed activity “may affect” any endangered or threatened species or designated critical habitat. If a proposed activity “may affect” these listed resources, a District Engineer would initiate section 7 consultation with NMFS or the U.S. Fish and Wildlife Service, as appropriate; the consultation would occur while a Nationwide Permit is being authorized or the District Engineer could exercise discretionary authority and require an individual permit for the proposed activity. In the former case, the District Engineer would notify the applicant that he or she cannot proceed with the proposed activity until section 7 consultation is complete.

Although the information different USACE Districts require prospective permittees to provide in PCNs vary widely, the information contained in those notifications would generally leave the USACE in a position to know or reliably estimate how many activities these permits authorize, where and when those activities occur, and the individual and cumulative impacts of those activities, including impacts on endangered and threatened species and designated critical habitat. However, the evidence suggests that the USACE does not use the information contained in PCNs to filter our projects that are likely to have significant individual or cumulative impacts on waters of the United States, endangered or threatened species, or designated critical habitat.

First, the evidence suggests that the USACE does not review significant percentages of PCNs to insure they are complete and the information is correct. As we reported earlier, Ellis (2005) concluded that the USACE’s database contains no information about the size of project impacts for 29.1% of all 404 permits issued (1,819 of the 6,261 permits issued), with missing data for 27% of Standard Permits, 28% of Nationwide Permits, and 49% of General Permits. Brody *et al.* discarded 7,294 of 45,897 (15.892 percent) of the records they collected from the USACE’s database because those records either did not contain geographic information or the information was insufficient because of data entry errors.

These results are not surprising given the primary reason the USACE developed Nationwide Permits in the first place: to reduce the amount of personnel resources the USACE would otherwise dedicate to reviewing actions that it believes “result in minimal adverse effects on the aquatic environment” and to reduce the regulatory burden on applicants for activities that “result in minimal adverse effects on the aquatic environment, individually or cumulatively” (USACE 2007a-2007c, USACE 2011b-2011v). By design, the USACE intended activities authorized by Nationwide Permits to receive a lower level of review than activities authorized by standard permits.

For example, between 1992 and 1995, the USACE used general permits to reduce the evaluation time required for permits by 14%; USACE project managers reviewed and reached decisions about more than 90% of all PCNs within 14 to 21 days (USACE 1995). These abbreviated review schedules preclude or limit the level of scrutiny USACE

project managers can provide when they review PCNs from prospective permittees (GAO 1988, 2005; NRC 2001). Those limited review schedules would almost certainly preclude project managers from critically reviewing PCNs and verifying whether the basic information on project location, timing, and impacts contained in the notifications is correct or whether the conclusions about endangered and threatened species and designated critical habitat contained in the notifications were well-reasoned and had been based on the best scientific and commercial data available, as required by section 7(a)(2) of the ESA.

Second, the USACE does not appear to routinely conduct field inspections of PCNs to verify that the information contained in those notifications captures the activity and impacts that actually occurred. As we reported previously, Sifneos *et al.* (1992) reported that between 60 and 90% of the permits they examined in the States of Alabama, Louisiana, and Oregon had not been monitored by the USACE. Kentula (1986) reported that the USACE had not conducted site visits on 49% of the permits she studied in the State of Washington. Storm and Stellini (1994) reported that the USACE had monitored only one-third of the sites in Washington where monitoring was required and had no records of site visits for 55% of the sites in Oregon where monitoring had been required. The National Research Council (2001), General Accounting Office (2005), Mason and Slocum (1987), Morgan and Roberts (1999) and others all concluded that the virtual absence of compliance inspections by the USACE allows substantial numbers of permittees to ignore the conditions of their permits. These values are for standard permits, which supposedly receive greater scrutiny from the USACE. The point of Nationwide Permits is to authorize activities that would receive much less scrutiny than standard permits, so monitoring rates for PCNs are likely to be much lower than the data on standard permits suggests.

Third, assuming that USACE's project managers critically review PCNs for specific activities, those reviews appear to overlook the cumulative impacts of multiple activities on aquatic ecosystems. As we discussed previously, we examined 35 of the 50 decision documents we received from the USACE and compared the Cumulative Effects analyses in those Nationwide Permits that require PCN with those that do not. Ignoring minor variations (different estimates of number of activities and acreage impacted), the Cumulative Effects analyses for the two different kinds of Nationwide Permits were identical. This was also true for the USACE's decision documents in 2007.

Regardless of whether or not PCN had been required for a Nationwide Permit, the USACE's draft decision documents only identify the number of times a Nationwide Permit is likely to be used each year, the acreage of jurisdictional wetlands those activities are expected to impact, the approximate acreage of compensatory wetlands that would be required to offset those impacts, and five-year projections of those annual estimates (USACE 2011b – 2011v). These estimates are followed by a general definition of compensatory mitigation, the statement that “wetland restoration, enhancement, and establishment projects can provide wetland functions and services, as long as the wetland compensatory mitigation project is placed in an appropriate landscape position, has appropriate hydrology for the desired wetland type, and watershed condition will support the desired wetland type”; the statement that “the required compensatory mitigation will attenuate cumulative impacts on the Nation's aquatic resources by providing aquatic resource functions and services, so that the net effects on the aquatic environment resulting from the activities authorized by this NWP will be minimal.” The analyses conclude by asserting that “the convenience and time savings associated with the use of this NWP will encourage applicants to design their projects within the scope of the NWP rather than request Standard Permits for projects which could result in greater adverse

impacts to the aquatic environment.”

Like the draft decision documents for non-reporting Nationwide Permits, the documents for Nationwide Permits that require PCN:

1. do not add the acreage that are projected to be impacted over the next five years to the acreage that was estimated to have been impacted in the past five years (or since the program was established);
2. do not add the acreage that would be impacted by individual Nationwide Permits to the acreage impacted by the entire suite of Nationwide Permits;
3. do not add the acreage that would be impacted by Nationwide Permits to the acreage impacted by the USACE’s other permits (standard and general permits and letters of permission);
4. do not consider how the impacts of this acreage might accumulate to degrade waters of the United States or adversely affect endangered or threatened species (including a failure to accumulate or consider the effects of differences between the acreage impacted by a Nationwide Permit and the acreage of compensatory wetlands when the former is greater than the latter);
5. do not present or discuss evidence contained in scholarly studies — articles published in peer-reviewed journals, gray papers, doctoral dissertations, and master’s theses — of the spatial or temporal impacts of the Nationwide Permits on jurisdictional and non-jurisdictional wetlands and other waters of the United States, watershed hydrology, water quality, or endangered and threatened species and designated critical habitat. For example, none of the decision documents we received in 2007 or 2010 reference any of the studies we cite or consider any of the information we discuss in Section 5.A.3 of this effects analysis. Those references were easily identified with electronic searches and were accessible without subscription or other payment;
6. do not provide evidence that establishes whether or to what degree permittees comply with the terms and conditions attached to non-reporting Nationwide Permits (or alternative measures of the effectiveness of those terms and conditions).

Our comparisons of the draft decision documents from 2007 produced the same results. The evidence available suggests that the terms and conditions the USACE attaches to each Nationwide Permit, regional and case-specific conditions, and the process the District Engineers use to review PCNs do not place the USACE in a position to know or reliably estimate the individual or cumulative impacts of Nationwide Permits on jurisdictional wetlands and other waters of the United States. The evidence available also suggests that the USACE is not in a position to support its assertion that the Nationwide Permits will not result in more than minimal adverse effects on waters of the United States, individually or cumulatively.

An agency is not likely to be able to avoid impacts that it cannot or does not anticipate. In the previous section of this analysis, we discussed National efforts by the USACE to develop a uniform database and efforts by USACE Districts to develop and use more rigorous methodologies for assessing the cumulative impacts of activities authorized by the USACE. Those effort still focus on collecting more complete information on standard permits and some regional general permits; based on guidance on submitting PCNs available from several USACE Districts, those notifications appear to be submitted in writing and, therefore, would not be entered directly into a USACE

database. As a result, we conclude that the availability of PCNs do not currently place the USACE in a position to know or reliably estimate the cumulative impacts of Nationwide Permits on jurisdictional wetlands and other waters of the United States or determine whether or to protect endangered or threatened species or designated critical habitat from being adversely affected by the individual or cumulative impacts of the activities those Nationwide Permits authorize.

5.B.1.2 Ability to Prevent Nationwide Permits from Degrading Waters of the U.S.

On average, Nationwide Permits have authorized between 32,820 and 37,720 (95% confidence interval = 32,810 - 37,727) discharges of dredged or fill material and other activities in the United States, its territories, and possessions by Nationwide Permits each year since 1977 (Table 5.1). Based on the data available, we estimated that Nationwide Permits have authorized at least 767,590 discharges of dredged or fill material and other activities into waters of the United States since the early 1980s. The combination of the suite of permits the USACE issues — standard permits, general permits, nationwide permits, and letters of permission — has authorized at least one million discharges of dredged or fill material and other activities in waters of the United States since the early 1980s. We would expect the proposed Nationwide Permits to authorize at least 25,647 activities each year for the next five years or at least 128,235 activities over the five-year period.

Although the number of activities authorized by Nationwide Permits have declined consistently from 1999 to 2010, the number of acres impacted by those activities appears to have increased consistently. In 2007, the acreage impacted by activities authorized by Nationwide Permits was 1.62 times the acreage impacted in 1999; in 2010, the acreage impacted by those activities in 2010 was 4.763 times the acreage impacted in 2007. The acreage impacted by those activities in 2010 was 7.22 times the acreage impacted in 1999. Based on our analyses of the data available, we expect the proposed Nationwide Permits to impact at least 14,155.83 acres of jurisdictional wetlands and other waters of the United States each year or at least 70,779.15 acres over the five-year duration of the proposed permits.

The USACE has three mechanisms it can use to prevent these wetland losses from degrading waters of the United States:

1. it can modify, suspend, or revoke a Nationwide Permit. Modifications have commonly entailed PCN or a change in acreage limits. Suspensions or revocations have forced prospective permittees to seek authorizations using the standard permitting process, which receive more review;
2. it can require prospective permittees to comply with terms and conditions to its authorizations; and
3. it can require prospective permittees to mitigate the adverse effects of their actions on jurisdictional wetlands and other waters of the United States.

The USACE has used all three of these mechanisms since it established the Nationwide Permits in 1977. For example, the USACE revoked Nationwide Permit 26 (headwaters and isolated wetlands) in 1999 and replaced it with five new permits and, in its current proposal, plans to revoke Nationwide Permit 47 (pipeline safety program designated time sensitive inspections and repairs). However, eliminating these permits did not prevent the activities they authorized from impacting jurisdictional wetlands and other waters of the United States, the activities were either authorized by other Nationwide Permits, General Permits, or Standard Permits.

We discussed the terms and conditions the USACE attaches to its Nationwide Permits in the preceding section of these analyses, so the remainder of this section evaluates the mitigation measures the USACE requires to prevent the authorizations it issues from degrading waters of the United States. According to the Council on Environmental Quality, mitigation entails the following sequence (40 CFR 1508.20):

1. Avoiding an impact altogether by not taking a certain action or parts of an action;
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
5. Compensating for the impact by replacing or providing substitute resources or environments

With standard permits, the USACE first relies on the section 404(b)(1) guidelines to produce and permit the “least environmentally damaging practicable alternative” then relies on mitigation, particularly compensatory mitigation, to minimize the impacts of these alternatives on waters of the United States. As the USACE defines the term, compensatory mitigation means the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, or preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved (33 CFR 332.2). Specifically, the USACE argues that the compensatory mitigation it requires would “attenuate cumulative impacts on the Nation’s aquatic resources, so that the net effects” of activities those permits authorize will be minimal (USACE 2011a-2011v). The following subsection examines the performance record of compensatory mitigation.

Mitigation requirement. Section 314 of the National Defense Authorization Act of Fiscal Year 2004 required the Secretary of the Army, acting through the Chief of Engineers, to issue regulations that establish performance standard and criteria for the use of on-site, off-site, and in-lieu fee mitigation and mitigation banking to compensate for wetland functions lost as a result of activities authorized by the USACE’s permits. On 10 April 2008, the USACE and the Environmental Protection Agency responded to that mandate by finalizing regulations on compensatory mitigation for losses of aquatic resources (*Federal Register* 73(70): 19594-19705, 2008 and 33 CFR 332).

These regulations, which are commonly called the “Mitigation Rule” directs District Engineers to establish compensatory mitigation requirements based on the practicability and capacity to compensate aquatic resource functions that would be lost as a result of activities the USACE authorizes (40 CFR 332.3(a)). Specifically, when faced with options, the Mitigation Rule directs District Engineers to consider the option that would be environmentally preferable (40 CFR 332.3(a)).

The Mitigation Rule establishes a goal of achieving a minimum of 1:1 functional replacement (no net loss) of wetland functions with an adequate margin of safety to reflect anticipated success. In the absence of more definitive functional assessments, a minimum of 1:1 acreage replacement may be used as a reasonable surrogate for no net loss of wetland functions. Wetland compensation can be accomplished by project-specific compensation or by purchase

of credits from a USACE-approved mitigation bank. Three key factors determine the amount of wetland compensatory mitigation required: in advance vs. concurrent; in-kind vs. out-of-kind; and in-place vs. not in-place. Compensatory mitigation that is in-advance, in-kind and in-place has the greatest likelihood of replacing those wetland functions lost due to authorized projects; therefore, the compensation ratio is the lowest. Out-of-kind, not in-advance or not in-place compensation does not qualify for incentives to lower compensation ratios due to the difference between functions of the impact site and those of the compensation site.

When they evaluate compensatory mitigation options, the Mitigation Rule directs District Engineers to consider environmentally preferable alternatives. They are also directed to assess a proposal's probability of successfully replacing ecological functions, the location of the compensation site relative to the impact site and their significance within the watershed affected by a project, and the costs of the compensatory mitigation project. The Mitigation Rule also requires the EPA and the USACE to consider the consequences of allowing wetland losses to occur in urban and suburban areas with compensatory mitigation occurring in rural areas (called the "migration of wetland services" in the regulation).

General Condition 22 is the counterpart to the mitigation rule for Nationwide Permits. This General Condition requires District Engineers to consider the following factors when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal:

- (a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).
- (b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal. (c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 0.1-acre and require preconstruction notification, unless the district engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a projectspecific waiver of this requirement. For wetland losses of 0.1-acre or less that require PCN, the district engineer may determine on a case-by-case basis that compensatory mitigation is required to ensure that the activity results in minimal adverse effects on the aquatic environment. Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, wetland restoration should be the first compensatory mitigation option considered.
- (d) For losses of streams or other open waters that require PCN, the district engineer may require compensatory mitigation, such as stream restoration, to ensure that the activity results in minimal adverse effects on the aquatic environment.
- (e) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWP. For example, if an NWP has an acreage limit of 0.5-acre, it cannot be used to authorize any project resulting in the loss of greater than 0.5-acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation

can and should be used, as necessary, to ensure that a project already meeting the established acreage limits also satisfies the minimal impact requirement associated with the NWPs.

- (f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (*e.g.*, conservation easements) of riparian areas next to open waters. In some cases, riparian areas may be the only compensatory mitigation required. Riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (*e.g.*, riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.
- (g) Permittees may propose the use of mitigation banks, in-lieu fee programs, or separate permittee-responsible mitigation. For activities resulting in the loss of marine or estuarine resources, permittee-responsible compensatory mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee-responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation, performance, and longterm management of the compensatory mitigation project.
- (h) Where certain functions and services of waters of the United States are permanently adversely affected, such as the conversion of a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse effects of the project to the minimal level.

General Condition 22 is similar to the Mitigation Rule, but has important differences. Where the Mitigation Rule establishes a minimum of 1:1 functional replacement (no net loss) of wetland functions, with an adequate margin of safety to reflect anticipated success, as its goal, General Condition 22 does not specify functional replacement and only requires a minimum mitigation ratio of 1:1 for wetland losses that exceed 0.1 acre; compensatory mitigation is not required for wetland losses less than 0.1 acre. General Condition 22 also does not establish a preference for in-kind, on-site mitigation, mitigation that is based on considerations of wetland services, or mitigation that occurs before the impact.

This condition allows activities authorized by Nationwide Permits to result in net loss of wetland function, net loss of wetlands acreage in small increments, conversion of wetland types, and migration of wetland services between watersheds. Based on the evidence we presented earlier in this Opinion and evidence we present in subsequent analyses, General Condition 22 not only allows these outcomes, they have been occurring for perhaps decades and the USACE's current proposal does little to change that pattern in the future.

Performance of Compensatory Mitigation Efforts. Prospective permittees can compensate for their impacts through three primary mechanisms (General Accounting Office 2005, Martin *et al.* 2006):

1. **Permittee-Responsible Mitigation.** Permittee-responsible mitigation refers to aquatic resource restoration, establishment, enhancement, and/or preservation activity undertaken by a permittee (or an authorized agent or contractor of a permittee) to provide compensatory mitigation for which the permittee retains full responsibility (33 CFR 332.2).
2. **Mitigation Banks.** Mitigation banks refer to sites or suites of sites where resources (e.g., wetlands, streams, riparian areas) are restored, established, enhanced, or preserved for the purpose of providing compensatory mitigation for impacts caused by activities authorized by USACE permits. In general, mitigation banks sell compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor. The operation and use of mitigation banks are governed by legal documents called mitigation banking instruments (33 CFR 332.2).
3. **In-lieu Fee Mitigation.** In-lieu fee mitigation refers to a program involving the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or non-profit natural resources management entity to satisfy compensatory mitigation requirements for USACE permits. Similar to a mitigation bank, an in-lieu fee program sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the in-lieu program sponsor. However, the rules governing the operation and use of in-lieu fee programs are somewhat different from the rules governing the operation and use of mitigation banks. The operation and use of in-lieu fee programs are governed by legal documents that are called in-lieu fee program instruments (33 CFR 332.2).

Based on a review by the Environmental Law Institute (2006), 59.8% of *wetland mitigation* requirements were satisfied using permittee-responsible mitigation, 31.4% using a mitigation bank, 8.4% using in-lieu-fee mitigation, and 0.4% using other mechanisms. The same study reported that 81.5% of *stream mitigation* requirements were satisfied using permittee-responsible mitigation, 7.1% using a mitigation bank, 10.0% using in-lieu-fee mitigation, and 1.2% using other mechanisms. The narratives that follow examine the degree to which permittees who employ on these three different mechanisms can be expected to comply with the USACE's requirement to mitigate for their impacts, replace the acreage impacted by a particular proposal, or replace the hydrological and ecological functions of the wetlands and other waters of the United States that are impacted by an activity.

COMPLIANCE WITH REQUIREMENT FOR COMPENSATORY MITIGATION. A permit that requires compensatory mitigation has little benefit if permittees do not comply with the mitigation requirement. In addition to requiring mitigation projects, permittees must construct projects effectively before the project is likely to replace the physical, chemical, biotic, or ecological functions of the wetlands that have been destroyed as a result of a permit.

Although the evidence is limited, the USACE also appears less likely to require compensatory mitigation for activities that are authorized by Nationwide Permits. For example, Martin *et al.* (2006) estimated that the USACE required compensatory mitigation for about half of the activities they authorize with Standard Permits but about 21% of the activities they authorize with general permits (which included Nationwide Permits), although these values vary widely depending on geography (Table 5.9).

When the USACE requires compensatory mitigation, compliance rates are highly variable and have been very low when monitoring is limited or does not occur or when permits are not specific about mitigation requirements. For example, Mason and Slocum (1987) evaluated 32 wetlands in Virginia and concluded that permittees had complied with specific requirements to create wetlands on 86% of the time, while permits without such conditions had compliance rates of about 44%. When time limits for completion were specified in permits, all mitigation efforts complied with the permits while only half of the mitigation efforts associated with permits that did not specify deadlines or were compliant. Lowe *et al.* (1989) estimated that 86% of the 29 permits they surveyed did not contain sufficient detail or clarity to ensure the success of the created wetland or to facilitate enforcement of their conditions.

In southeast Florida, a study of 195 wetland mitigation projects concluded that only 40 (20.51%) of those projects had actually been constructed and those 40 projects mitigated about half of the 430 hectares of wetlands that had been required by permits had been constructed (Erwin 1991; see Table 5.10). A review of compliance rates in the State of Ohio provided the only study that reported 100% compliance (Fennessy and Roehrs 1997).

An evaluation of permit compliance and wetland mitigation in the State of Illinois, concluded that only two of 54 permits had complied with all of the conditions for which compliance could be determined (Gallihugh 1998). Rates of compliance with special conditions – requirement to provide monthly erosion control inspections during construction, to report conservation easements on all created and preserved wetlands, to report on vegetative sampling, to submit as-built plans following construction of mitigation sites, and to submit hydrological data – ranged from 16% to 49% (the highest compliance was with the requirement to submit as-built plans).

An evaluation of 40 mitigation sites in King County, Washington, identified 9 mitigation projects that had not been implemented (Mockler *et al.* 1998). Of those projects that had been implemented and had been in place for at least 3 years, 6 sites (21%) were considered to have successfully satisfied their performance standards while 23 (79%) had not. One site (3%) had replaced the hydrological and ecological functions of original wetlands while 28 (97%) did not. The investigators identified design flaws (hydrology inputs not as represented in design; plants inappropriately specified; and slopes steeper than 3:1), installation flaws (project not installed as designed; soil compacted, and soil not amended as designed) and maintenance flaws (mowed not weeded; and not mulched or irrigated during establishment year) as the cause of most failures.

Morgan and Roberts (1999) concluded that “some applicants apparently believe that they will not be held accountable for their projects.” The National Research Council (2001) concluded that the virtual absence of compliance inspections by the USACE made it possible for substantial numbers of permittees to ignore the conditions of their permits (citing an 8 April 1999 memorandum to all for USACE’s Commanders, Major Subordinate Commands, and District Commands from Major General Russell Furman that established compliance inspections as a low priority as a matter of standard operating procedure. In contrast, evaluating and issuing permits and self-reporting and self-certification for compliance were both considered high priorities). The Council concluded that if the USACE recognized mitigation compliance and increased compliance as a priority activity, mitigation would more likely be carried out as specified in Section 404 permits.

Johnson *et al.* (2000) evaluated compliance 45 compensatory wetland mitigation projects that had been required in western and eastern Washington State to determine whether the compensatory mitigation project had been

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.9. Estimated percentage of permits that required compensatory mitigation from October 2002 to September 2003 (from Martin *et al.* 2006)

USACE Division	No. Permits Issued	Percentage of Permits Requiring Compensatory Mitigation		
		Standard Permits	General Permits	All Permits
Lakes and Rivers	12,924	24	28	21
Mississippi Valley	14,576	86	25	31
North Atlantic	15,829	30	6	6
Northwestern	8,397	91	30	30
Pacific Ocean	1,267	14	8	9
South Atlantic	23,478	72	20	24
South Pacific	4,500	79	69	36
Southwestern	4,907	33	7	10
National Average		51	19	21

implemented, whether it had been implemented according to its plan, and whether it was meeting its performance standards (those assessable by the methods of this study). They concluded that 42 (93%) of the 45 projects evaluated had been implemented. However, there were spatial differences: on the west side (which corresponds to the boundaries of the Seattle District) 35 (92%) of 38 projects had been implemented, 3 (8%) had not. On the east side (which corresponds to the boundaries of the Walla Walla District) 7 (100%) of 7 projects had been implemented. Johnson *et al.* (2000) also reported that 23 of 42 (55%) projects had been implemented to plan, 3 could not be determined, and 16 (38%) had not been implemented to plan. They also reported that the level of compliance varied with USACE District: on the west side, 22 of 35 (63%) projects had been implemented to plan, 2 (6%) could not be determined, and 11 (31%) had not been implemented to plan; on the east side, 1 of 7 (14%) projects had been implemented to plan, 1 (14%) could not be determined, and 5 (71%) had not been implemented to plan. Overall, they reported that 12 of 34 (35%) projects with performance standards had met all standards that were assessed, 6 had met at least 1 of the standards that were assessed, and 16 (47%) had not met any of the standards that were assessed. On the west side, 11 of 28 (39%) projects with performance standards had met all standards that were assessed, 5 had met at least 1 of the standards that were assessed, and 12 (43%) had not met any of the standards that were assessed. On the east side, 1 (17%) of 6 projects with performance standards had met all standards that were assessed, 1 (17%) had met at least 1 of the standards that were assessed, and 5 (67%) had not met any of the standards that were assessed.

An evaluation of 345 wetland mitigation projects the Indiana Department of Environmental Management required for permit it issued through its Water Quality Certification program between 1986 and 1996 concluded that nearly 35 percent of the mitigation sites had not been constructed and permittees appeared to have ignored their mitigation requirement (Robb 2000). Permittees had constructed 214 (62.03%) of the sites although 70 of these sites (20.29%) were incomplete and permittees had not attempted to construct the mitigation on 49 (14.24%) of the sites.

A study of 391 projects that required compensatory mitigation to satisfy permit conditions imposed by the State of Massachusetts concluded that the majority of projects (54.4 percent) did not comply with the Massachusetts wetland regulations for reasons that included failure to construct the project, insufficient size or hydrology, and insufficient cover by wetland plants (Brown and Veneman 2001). A study of compensatory mitigation conducted by the National Research Council (2001) concluded that between 70 and 76 percent of the mitigation required in USACE's permits was implemented, and about 50 – 53 percent of the implemented mitigation projects did not meet permit requirements.

BIOLOGICAL OPINION ON U.S. ARMY CORPS OF ENGINEERS NATIONWIDE PERMIT PROGRAM 2011-2016

Table 5.10. Proportion of permits in compliance with mitigation requirements (after Turner et al. 2000, supplemented with additional data). See explanation in text)

Location	Number of Permits	Proportion Compliant	Proportion Not Compliant	Source
California				
Orange County	15	0.13	0.87	Sudol (1996)
Southern California	75	0.42	0.58	Allen and Feddema (1986)
Sacramento/Central Valley	30	0.50	0.50	DeWeese (1994)
Ventura/Los Angeles Counties	79	0.69	0.31	Ambrose and Lee (2004)
Florida				
Northeast	29	0.79	0.21	Lowe et al. (1989)
Northeast	201	0.86	0.14	Miracle et al. (1998)
South Florida	42	0.10	0.90	Erwin (1991)
Southwest Florida WMD	33	0.33	0.67	OPPAGA (2000)
Southwest Florida WMD	254	0.82	0.18	OPPAGA (2000)
St. Johns River WMD	nr	0.78	0.22	OPPAGA (2000)
Suwannee River WMD	nr	1.00	0.00	OPPAGA (2000)
Northeast District DEP	nr	0.67	0.33	OPPAGA (2000)
Southeast District DEP	nr	0.87	0.13	OPPAGA (2000)
Illinois	nr	0.04	0.96	Gallihugh (1998)
Indiana	345	0.62	0.38	Robb (2000)
Massachusetts	84	0.49	0.51	Brown and Veneman (1998)
Ohio	14	1.00	0.00	Fennesy and Roehr (1997)
Ohio	5	0.80	0.20	Wilson and Mitsch (1996)
Virginia	32	-		Mason and Slocum (1987)
with permit conditions	-	0.86	0.14	Mason and Slocum (1987)
w/o permit conditions	-	0.44	0.56	Mason and Slocum (1987)
with time limits	-	1.00	0.00	Mason and Slocum (1987)
without time limits	-	0.50	0.50	Mason and Slocum (1987)
Washington	17	0.53	0.47	Storm and Stellini (1994)
Washington (east-west combined)	45	0.93	0.07	Johnson et al. (2000)
East side	38	0.92	0.08	Johnson et al. (2000)
West-side	7	1.00	0.00	Johnson et al. (2000)
Implemented to plan (east-west combined)	42	0.55	0.45	Johnson et al. (2000)
Implemented to plan (east side)	7	0.14	0.86	Johnson et al. (2000)
Implemented to plan (west side)	35	0.63	0.37	Johnson et al. (2000)
Met performance standards	34	0.35	0.65	Johnson et al. (2000)
Met performance standards (east side)	6	0.17	0.83	Johnson et al. (2000)
Met performance standards (west side)	28	0.39	0.61	Johnson et al. (2000)
Washington	29	0.21	0.79	Mockler et al. (1998)

The GAO (2005) reviewed 152 permit files in which permittees were required to perform compensatory mitigation, but found little evidence that permittees had submitted monitoring reports to satisfy the conditions of their permits or that the USACE had inspected the mitigation projects for compliance with permit conditions. Of the 89 permits for which the USACE required permittees to submit monitoring reports, monitoring reports only appeared to have been submitted in 21 cases (24%) and the USACE only appeared to have conducted on-site inspections for 15% of the projects.

USACE Districts appeared to have provided more oversight of the 85 mitigation banks and 12 in-lieu-fee arrangements than of permittee-responsible mitigation projects, although the GAO (2005) concluded that, even in the

former cases, oversight by the USACE was limited. Out of 60 mitigation banks that were required to submit monitoring reports, 70% appeared to have submitted those reports. However, the USACE only appeared to have conducted on-site inspections of mitigation banks in 13% to 78% of the cases. Out of 6 in-lieu-fee arrangements that were required to submit monitoring reports to the USACE, all but one had submitted at least one report and USACE personnel had conducted on-site inspections for 5 of the 12 arrangements.

In contrast, a study of whether the 68 wetland mitigation banks in existence in the United States through 1 January 1996 had achieved no-net-loss of wetland acreage (nationally and regionally) concluded that 74% of the banks achieved no-net-loss of wetlands, based on acreage (Brown 1999). Overall, however, these mitigation banks were projected to result in net losses of about 21,000 acres nationally; in part because slightly more than half (52%) of the acreage in mitigations banks were later converted to other uses.

Like the National Research Council, the GAO concluded that the USACE' conflicting guidance, which notes that compliance inspections are crucial yet makes them a low priority, combined with limited resources to produce the low level of oversight compensatory mitigation projects receive from the USACE. As a result, the GAO also concluded that USACE's Districts cannot determine whether compensatory mitigation has been performed on thousands of acres and that the USACE could not assess the effectiveness of its mitigation program.

Of the 22 areas that had been studied, the proportion of compensatory mitigation projects that had been initiated as required ranged from 4 to 100%, with an average compliance rate of 58%. There was wide geographic and temporal variation (see Table 5.10). Two (8%) of the studies reported 100% compliance rates, 41.67% reported compliance rates between 50 and 92%, 29% reported compliance rates between 20 and 50%, and 12.5% reported compliance rates less than 20%. Nothing in the USACE's proposed regulations for Nationwide Permits would lead us to expect future compliance rates to be different than they have been in the past. Based on the USACE's current record of performance we expect compliance rates with the USACE's proposed terms and conditions, including requirements for compensatory mitigation, to be as variable in the future as they have been in the past. Based on the evidence available, we would expect about half of the activities that would be authorized by the proposed Nationwide Permits to comply with the requirement to mitigate at rates ranging from 50 to 100% and the other half at rates ranging from 0 to 50%.

During our consultation on the proposed Nationwide Permit program, the USACE reported that it has established eight performance standards to address, among other things, concerns identified by the Government Accountability Office during its review of compensatory mitigation compliance. Six of those performance standards address compliance and enforcement, with two standards focusing specifically on compensatory mitigation projects:

1. *Individual Permit Compliance.* The USACE shall complete an initial compliance inspection on 10% of the total number of all individual permits (including letters of permission) issued during the preceding fiscal year where authorized work is underway.
2. *General Permit Compliance.* The USACE shall complete an initial compliance inspection on 5% of the total number of all General Permits (including NWP) issued during the preceding fiscal year where authorized work is underway.

3. *Mitigation Site Compliance.* The USACE shall complete field compliance inspections of 5% of active mitigation sites each fiscal year. Active mitigation sites are those sites authorized through the permit process and are being monitored as part of the permit process but have not met final approval under the permit special conditions (success criteria).
4. *Mitigation Bank/In Lieu-Fee Compliance.* The USACE shall complete compliance inspections or audits on 20% of active mitigation banks and in lieu fee programs annually.
5. *Resolution of Non-compliance Issues.* The USACE will reach resolution on 20% of all pending non-compliance actions for permits with special conditions and/or mitigation requirements that are unresolved at the end of the previous fiscal year and have been received during the current fiscal year.
6. *Resolution of Enforcement Actions.* The USACE shall reach resolution on 20% of all pending enforcement actions (i.e., unauthorized activities) that are unresolved at the end of the previous fiscal year and have been received during the current fiscal year.

The USACE did not provide us with data that would have allowed us to determine whether or to what degree the USACE has complied with these performance standards.

REPLACEMENT OF LOST ACREAGE. In some cases, compensatory mitigation required by the USACE replaces the acreage impacted by a permittee's activity with an equal or greater amount of acreage. However, this does not appear to be true for a majority of the cases.

A review of 324 USACE permits issued in California from January 1971 through November 1987 identified 387 mitigation sites that entailed 1255.9 hectares compensatory wetlands that were required to mitigate for impacts to 368 mitigation sites that entailed 1176.3 hectares of wetlands Holland and Kentula (1992). Forest wetlands were the type of wetland most frequently destroyed or degraded (37.8% of impacted wetlands) and used to compensate for the loss of natural wetlands (38.2% of compensatory wetlands). Estuarine intertidal emergent wetlands had the highest area impacted (52.3%) and compensated (62.5%). About 90% of the time, the wetlands that were destroyed or degraded provided habitat for wildlife; about 83% of the time, wildlife was the objective of the compensatory mitigation. Endangered species were listed as affected in 20.4% and 21.0% of the wetlands that were impacted and that were provided to compensate for those impacts, respectively.

Sifneos *et al.* (1992) evaluated the effects of Section 404 permitting on freshwater wetlands in Louisiana, Alabama, and Mississippi. The USACE required compensatory mitigation for only 8% of the nearly 25,000 acres of wetlands impacted by activities authorized by USACE permits in Louisiana from 1982 to 1987, implying a net loss of at least 92% of the permitted fill area.

An evaluation of compensatory mitigation projects in six New England States conducted by Minkin and Ladd (2003) supported this general pattern. They identified 177.69 acres of forested wetlands and 6.81 acres of palustrine open water wetlands that had been destroyed or adversely affected by the activities authorized by the 60 projects they reviewed. Nevertheless, the mitigation projects they reviewed created, restored, or enhanced 47.41 acres of open water systems and only 24.74 acres of forested wetlands to compensate for these losses. Of the 24 acres of forested wetlands, they concluded that only about 17 acres approximated a natural forested wetland ecosystem. They

concluded that replacing forested wetlands with open water and emergent systems had caused a considerable loss of function, particularly for wildlife habitat and water quality.

Kettlewell *et al.* (2008) conducted a watershed-based assessment of the impacts of wetland permits and compensatory mitigation on the Cuyahoga River watershed in northeastern Ohio. Specifically, they examined the effectiveness of wetland mitigation regulations and any resulting cumulative changes to wetland and landscape structure. They reported that the majority of permittee-responsible mitigation projects (67%) were not successful at meeting permit requirements in terms of wetland area. Those projects that relied on mitigation banks and in-lieu fee mitigation resulted in a net increase in wetland area, but the Cuyahoga River watershed experienced a net loss of wetland acreage because wetland losses were compensated in mitigation banks located outside the watershed.

REPLACEMENT OF LOST FUNCTION. Harvey and Josselyn (1986) argued that the term “wetland restoration” should encompass sites on which human activities caused some kind of wetland to occur even if the “restoration” does not recreate the same kind of wetland that had been destroyed. However, a regulatory program that is supposedly designed to protect the physical, chemical, and biotic integrity of waters of the United States seems to require re-creation of the impacted wetland’s function, not just re-establishment of an aquatic ecosystem. Most reviews of wetlands that are actually created, restored, or enhanced to compensate for the loss of wetland ecosystems that are destroyed or degraded by activities authorized by permits issued by the USACE or a State agency generally have not replaced the ecological and hydrological functions of the original wetlands (Allen and Feddema 1996, Mager 1990, Race and Fonseca 1996, Roberts 1993, Sudol 1996).

Eliot (1985) reviewed wetland mitigation projects in the San Francisco Bay area and concluded that they frequently failed to achieve their purposes and almost half had not been built before the dates specified in permits. Quammen (1986) reviewed mitigation projects throughout the country, including Florida, New England, and Virginia, and concluded that few of them complied with permit requirements and their ability to compensate for the lost functions and values of the original wetlands was unknown. These results are similar to reviews published by Allen and Feddema (1996), Atkinson *et al.* (1993), Erwin *et al.* (1994), Kentula *et al.* (1992), Mager (1990), Reinartz and Warne (1993), Roberts (1993), Sifneos *et al.* (1992), Turner *et al.* (2001), Wilson and Mitsch (1996). The National Research Council (1992) also concluded that mitigation efforts could not claim to have duplicated the functions and values of wetlands that had been destroyed or modified through human action. Race (1996) cited studies by the Florida Department of Environmental Regulation that concluded that only 4.6 to 12% of the mitigation was ecologically successful and 28% were so unsuccessful that major remediation was recommended.

In the 1980s and early 1990s, ponds with a fringe of emergent vegetation represented the majority of the compensatory mitigation required to comply with section 404 of the Clean Water Act (Kentula 1993). Open water ponds, which appear to be the most common and successful form of “created wetland,” were created to mitigation activities that occurred in a wide variety of wetland ecosystems in California, Oregon, and Washington (Gwin *et al.* 1999). Between 1998 and 2004, the wetland type that increased the most were freshwater ponds, many of which were created to mitigate for the destruction or modification of other wetland ecosystems. In this time interval, the area covered by freshwater ponds increased by 12.6% or almost 700,000 acres (281,500 hectares), which was the largest increase of any type of wetland or deepwater habitat (Dahl 2006). Without the increase associated with

ponds, the conterminous United States would have experienced a net loss of wetlands between 1998 and 2004. Most of these ponds, however, were created as artificial water detention basins, water hazards, for ornamental purposes, or for water management and do not replace the ecological functions of the vegetated wetlands they supposedly mitigate (Dahl 2000).

A review of 61 permits for 128 projects in six counties around Chicago, Illinois concluded that 17% of the wetland vegetation proposed was established, and an additional 22% had established wetlands but with vegetation other than that proposed (Gallihugh 1998). Fifty-two% of the wetlands had excessive or unplanned open water, and 9% had insufficient hydrology. The wetland area lost was 117 hectares and the approved wetland mitigation amounted to 144 hectares.

In a review of the 68 wetland mitigation banks that were in existence in 1996, Brown and Lant (1999) concluded that the mitigation banks resulted in a net loss of more than 21,000 acres of wetlands, or 52% of the banked “mitigated” acreage, nationally. In a review of 11 compensatory wetland studies reported by Turner *et al.* (2001), the percentage of wetlands that met tests of functional equivalency ranged from 0 to 67%. Fennessy and Roehrs (1997), who reported that 100% of the permits they reviewed in the State of Ohio complied with the requirement to mitigate, also reported that none of the mitigation projects had successfully replaced the physical, chemical, biotic, or ecological functions of the original wetlands.

In their review of 40 mitigation sites in King County, Washington, Mockler *et al.* (1998) identified 31 mitigation projects that had been implemented; of these 6 sites (21%) were considered to have successfully satisfied their performance standards while 23 (79%) had not. One site (3%) had replaced the hydrological and ecological functions of original wetlands while 28 (97%) did not. The investigators identified design flaws (hydrology inputs not as represented in design; plants inappropriately specified; and slopes steeper than 3:1), installation flaws (project not installed as designed; soil compacted, and soil not amended as designed) and maintenance flaws (mowed not weeded; and not mulched or irrigated during establishment year) as the cause of most failures.

A study of 60 randomly selected compensatory mitigation projects in six New England states had higher compliance rates (67 percent), but 10 projects (17 percent) failed to approximate the wetlands they were intended to replace (Minkin and Ladd 2003). However, information on permit conditions was missing for seven projects (12 percent) and information on functions and values or types of impacted wetlands was missing for six projects (10 percent), making it impossible to determine success for those projects. These authors concluded that with projects that replaced specific wetland functions, the replacement had less ecological value than the wetland ecosystems that had been destroyed or degraded by the permitted activities.

Ambrose and Lee (2004) evaluated compensatory mitigation projects associated with permits issued in Los Angeles and Ventura Counties, California, from 1991 to 2003. They reported that 46% of the projects fully satisfied the acreage requirement, 24% failed to satisfy the acreage requirement, and 30% could not be determined. Only 2% of the projects they reviewed produced wetlands that were the functional equivalent of the original wetlands, 60% were partially successful, and 38% failed to replace the functions of the wetlands that had been lost. Specifically, 29% of the sites they evaluated provided marginal to poor wetland conditions (based on 15 attributes that measure landscape context, hydrology, abiotic structure, and biotic structure), 67% of the sites were sub-optimal, and only 4% of the

sites provided optimal conditions. With the exception of dissipation of flood energy, 66% of the mitigation sites failed to replace (46%) or only partially replaced (20%) the flood storage, biogeochemistry, sediment accumulation, wildlife habitat, and aquatic habitat functions of the wetlands that had been impacted.

Kettlewell *et al.* (2008) conducted a watershed-based assessment of the impacts of wetland permits and compensatory mitigation on the Cuyahoga River watershed in northeastern Ohio. Specifically, they examined the effectiveness of wetland mitigation regulations and any resulting cumulative changes to wetland and landscape structure. They reported that the majority of permittee-responsible mitigation projects (67%) were not successful at meeting permit requirements in terms of wetland area. Those projects that relied on mitigation banks and in-lieu fee mitigation resulted in a net increase in wetland area, but the Cuyahoga River watershed experienced a net loss of wetland acreage because wetland losses were compensated in mitigation banks located outside the watershed.

Kettlewell *et al.* (2008) also compared to kind of wetlands created by compensatory mitigation and concluded that these projects tended to replace scrub/shrub and forested wetlands with open-water/emergent wetland. In addition, compensatory mitigation tended to reduce the number of wetland sites in a watershed (from 134 impacted wetlands to 65 mitigation wetlands) and increased their size. Based on these data, we infer that compensatory mitigation concentrates wetlands in watersheds, which changes their physical, chemical, biotic, and ecological functioning in a watershed.

Micacchion *et al.* (2010) studied 26 randomly selected mitigation wetlands in the State of Ohio, including sites that had been constructed less than five years earlier; five to ten years earlier; and more than ten years earlier. On each site, they collected data on vegetative communities (using the Vegetation Index of Biotic Integrity), amphibious community (using the Amphibian Index of Biotic Integrity), and land uses in the areas around the mitigation sites (using the Landscape Development Intensity Index).

Two of the sites they studied did not meet their definition of a wetland because no significant plant communities of any kind had developed. Of the remaining 24 sites, 38.5% (10 sites) were in poor ecological condition, 42.3% (11 sites) were in fair ecological condition, and 19.2% (5 sites) were in good ecological condition based on vegetative communities the sites supported. Of these 24 sites, 87.5% (21 sites) were in poor ecological condition, 8.3% (2 sites) were in fair ecological condition and 4.2% (1 site) were in excellent ecological condition based on amphibious community. Overall, they concluded that 61.5% (16 sites) of the 26 sites failed to replace the wetlands that had been destroyed, 15.38% (4 sites) were potential successes and 23.08% (6 sites) were successes.

We discuss the inferences we reach from these data in the next section of this Opinion.

5.B.1.3 Ability to Protect Listed Resources

In its draft decision documents (USACE 2011a –v), the USACE argues that the proposed Nationwide Permits satisfy the requirements of section 7(a)(2) of the ESA because of the general conditions attached to the Nationwide Permits, particularly General Condition 19 (Endangered Species) among others. The USACE also states that it will condition permits to direct applicants to comply with the terms and conditions of incidental take statements contained in biological opinions NMFS issues on USACE permits in case an applicant “takes” a listed species. USACE permits also tell applicants that the USACE will not enforce the conditions of incidental take statements; instead they will

inform NMFS or the U.S. Fish and Wildlife Service of any violations of incidental take statements they discover.

Theoretically, these conditions should prevent listed resources from being adversely affected by activities that would be authorized by the proposed Nationwide Permits without undergoing a specific section 7 consultation. Those conditions should prevent activities authorized by Nationwide Permits from:

1. having more than minimal adverse environmental effects on the aquatic environment when performed separately or cumulatively.
2. substantially disrupting the movements of endangered marine mammals, sea turtles, and fish, unless the activity's primary purpose is to impound water (Condition 2. Aquatic Life Movements);
3. creating impoundments (Condition 8. Adverse Effects From Impoundments);
4. occurring in spawning areas during spawning seasons (Condition 3. Spawning Areas);
5. disruptions of water flow (Condition 9. Management of Water Flows);
6. occurring within 100-year floodplains without complying with Federal or State floodplain management requirements (Condition 10. Fills Within 100-Year Floodplains);
7. eroding soils and introducing sediment into waters of the United States (Condition 12. Soil Erosion and Sediment Controls);
8. leaving temporary fill associated with a project in place (Condition 13. Removal of Temporary Fills);
9. adversely affecting, "taking," or "jeopardizing the continued existence of" endangered or threatened or resulting in the destruction or adverse modification of critical habitat that has been designated for such species without subsequent formal section 7(a)(2) consultation or ESA permitting.
10. suffering the consequences of long-term loss or degradation of habitat because of the requirement for compensatory mitigation.

The question is whether and to what degree these terms and conditions achieve their intended outcomes. Although these terms and conditions have been in place since at least 2007 in some form or another, the evidence available establishes that at least some of these Nationwide Permits have had significant adverse consequences on the hydrology of watersheds in the United States, the distribution and abundance of jurisdictional wetlands and other waters of the United States, the quality of those waters, and the biology and ecology of endangered and threatened species that depend on those jurisdictional wetlands and other waters to complete their life cycles.

INCREMENTAL IMPACTS. Although the Clean Water Act limits activities that can be authorized by Nationwide Permits to those that "cause only minimal adverse environmental effects when performed separately, and cause only minimal cumulative adverse effect on the aquatic environment" and the USACE has continuously committed to "remain aware of potential cumulative impacts" that may result from its nationwide permits, the evidence available suggests that Nationwide Permits have had more than minimal adverse environmental effects on the aquatic environment when performed separately or cumulatively.

Based on data from the USACE, we estimate that Nationwide Permits authorized at least 234,788 activities in jurisdictional wetlands and other waters of the United States in 1999, 2007, and 2010. Those activities impacted at least 42,467.49 acres of wetlands, jurisdictional wetlands, and other waters of the United States and resulted in about 37,578 acres of compensatory wetlands. At least 130,025 of these activities were associated with the 21 existing Nationwide Permits that are likely to have the greatest influence on endangered and threatened species under the jurisdiction of NMFS or critical habitat that has been designated for these species. The latter activities are reported to have impacted at least 35,749.47 acres of jurisdictional wetlands and other waters of the United States in those three years, resulting in about 20,426.56 acres of compensatory mitigation (an effective rate of 0.57 acres of mitigation for every acre impacted).

Focusing on those 21 existing Nationwide Permits and using the same approach to estimation, each year for the next five years, we would expect these Nationwide Permits to authorize about 43,341 activities or 216,708 activities over the five-year period. We would expect those activities to impact 11,916.49 acres of jurisdictional wetlands and other waters of the United States each year or 59,582.45 acres over the five-year period. We would expect these Nationwide Permits to result in 6,808.85 acres of compensatory mitigation each year or 34,044.26 acres over the five-year period.

When added to the acreage that we estimated had been impacted between 1982 and 2010 (138,838.53), the Nationwide Permits are likely to impact at least 198,420 acres of wetlands, jurisdictional wetlands, and other waters of the United States by the end of the five-year duration of the proposed Nationwide Permits. This acreage is sufficiently large to make cumulative impacts certain. The narratives that follow discuss the cumulative impacts different investigators have reported.

Earlier, we discussed several studies of the cumulative impacts of the various permits the USACE uses to authorize activities that affect waters of the United States (standard permits, general permits, nationwide permits, and letters of permission). Allen and Feddema (1996) studied permits the USACE's Los Angeles District issued between 1987 and 1989 and concluded that the permits resulted in a 4% net loss of wetlands which tended to be replaced by riparian woodlands that were created to compensate for the destruction of a broad array of freshwater wetlands (Allen and Feddema 1996). Because this investigation only considered permits that required permittees to report to the USACE, the actual number of permits and their effects on wetlands and other waters of the United States would be greater. These investigators concluded that the USACE appears to evaluate section 404 permits on an individual basis without consideration of cumulative impacts at watershed or regional spatial scales, and that there have been "large losses in available habitat functionality due to a concentration of many projects" which may seriously affect species inhabiting the area. A similar evaluation of permits issued by the USACE's San Diego District reported an 8% net loss of wetlands (Fenner 1991).

Stein and Ambrose (1998) studied activities the USACE authorized from 1985 to 1993 in the Santa Margarita River watershed in San Diego and Riverside Counties, California (ignoring non-reporting permits). They reported that about 74% of total riparian area was slightly to substantially adversely affected relative to pre-permit site conditions, and less than 1% was enhanced. Nationwide Permit's accounted for 55% of area subjected to substantial adverse impacts. At the time of their study, the watershed supported 30 listed species and 40 other regionally rare, special

status species. Nearly half of the authorizations that were permitted in the watershed were followed by adverse to substantially adverse effects to listed species habitat, and no permits resulted in any enhancement of listed species habitat. About 40% of area affected by Nationwide Permits resulted in adverse to substantially adverse effects to the habitat of endangered or threatened species. Adverse impacts to listed species habitats occurred in all acreage categories these authors studied. The authors reported projects also had substantial adverse indirect effects, due for example to development of adjacent non-jurisdictional floodplains, inhibiting exchange of water, flood energy, sediment, nutrients and organisms between active channels and floodplains; fragmentation of habitat corridors, including threat to a mountain lion population corridor in the watershed; and loss of habitat heterogeneity and structure. Stein and Ambrose concluded that the USACE' section 404 implementation has failed to minimize cumulative effects.

Despite the results of Allen and Feddema (1996) and Stein and Ambrose (1998), the southern California Districts actually compare favorably to the results of a few published studies elsewhere in the country. An examination of 46 permits requiring mitigation in Texas from 1982 to 1986 (ignoring the majority of permits that did not require mitigation and non-reporting permits; Fort Worth, Galveston, and Tulsa Districts), reported a net loss of 31% of wetlands even after considering mitigation requirements (Sifneos, Kentula, and Price 1992). About half of the wetlands (by number) impacted in Texas were about 5 acres or smaller in size. Sifneos, Price, and Kentula (1992) reviewed the effects of USACE permitting on freshwater wetlands in Louisiana, Alabama, and Mississippi. The USACE required compensatory mitigation for only 8% of the nearly 25,000 acres of wetlands impacted by USACE permits in Louisiana from 1982 to 1987, implying a net loss of at least 92% of the permitted fill area. Gosselink and Lee (1989) stressed the adverse effects of incremental, cumulative loss of bottomland hardwood forest wetlands in the South on ecosystem processes and plant and animal species. They attribute range restriction and fragmentation of swallow-tailed kite and threatened bald eagle populations and extirpation of the endangered ivory billed woodpecker in part to bottomland hardwood forest loss and fragmentation, and cite indirect effects--of cultivation of filled wetlands and use of mobile, bioaccumulative pesticides there--in the decline of endangered brown pelican and osprey in downstream areas. Extensive contiguous habitat area is important to the survival of large, far-ranging mammals and raptors, such as the endangered red wolf and endangered Florida panther, and of forest interior specialist bird species, notably many neotropical migrants. These are species for which bottomland hardwood forest is a common or preferred habitat (Gosselink and Lee 1989).

As we discussed earlier (Section 5.A.1.4), Brody *et al.* (2008), Ellis (2005), and Highfield (2008) reported that activities authorized by Nationwide Permits tend to be concentrated in limited spatial areas and that concentration increases the probability of cumulative impacts in the form of time- and space-crowded perturbations and nibbling. Highfield (2008) quantified the cumulative impact of Nationwide Permits on stream flows in the catchment areas he studied. He concluded that Standard Permits, General Permits, Nationwide Permits, and Letters of Permission had a statistically significant effect on mean and peak annual flows. Specifically, he concluded that Standard Permits, General Permits, Nationwide Permits, and Letters of Permission had the following cumulative impacts of USACE permits on flow regimes in his study area (see Table 5.6):

1. In a single year, activities authorized by the USACE's Standard Permits would be expected to increase mean annual flows by about 27% and peak flows by about 21%. Over five years, these permits would be

expected to increase mean annual flows by about 134% and peak flows by about 104%. Over 25 years, these permits would be expected to increase mean annual flows by about 669% and peak flows by about 520%;

2. In a single year, the activities authorized by the USACE's Letters of Permission would be expected to increase mean annual flows by about 27% and peak flows by about 21%. Over five years, these permits would be expected to increase mean annual flows by about 134% and peak flows by about 104%. Over 25 years, these permits would be expected to increase mean annual flows by about 669% and peak flows by about 520%.
3. In a single year, the activities authorized by the USACE's General Permits would be expected to increase mean annual flows by about 14% and peak flows by about 11%. Over five years, these permits would be expected to increase mean annual flows by about 75% and peak flows by about 53%. Over 25 years, these permits would be expected to increase mean annual flows by about 370% and peak flows by about 265%.
4. In a single year, the activities authorized by the USACE's Nationwide Permits would be expected to increase mean annual flows by about 40% and peak flows by about 37%. Over five years, these permits would be expected to increase mean annual flows by almost 200% and peak flows by almost 184%. Over 25 years, these permits would be expected to increase mean annual flows by about 990% and peak flows by about 920%.

These changes in mean and peak annual flows are more than minimal. We also discussed the impact of activities authorized by Nationwide Permits 3, 12, 13, 14, and 29 on the hydrology of natural drainage systems, water quality, and the organisms they support. These Nationwide Permits authorize discharges of dredged or fill material into non-tidal waters of the United States for maintenance, road construction, residential housing, retail stores, industrial facilities, restaurants, business parks, and shopping centers. In 1999, 2007, and 2010, these Nationwide Permits authorized more than 93,700 activities impacting more than 4,300 acres of jurisdictional wetlands and other waters of the United States. However, because only portions of the kinds of projects associated with these activities would typically require an authorization from the USACE, the total area affected by the direct, indirect, and cumulative impacts of projects authorized by these Nationwide Permits is likely to be substantially greater than these acreage estimates imply.

In addition to urbanizing watersheds by destroying or degrading wetlands, the activities authorized by these Nationwide Permits specifically replace existing wetlands and other waters of the United States — ecosystems with porous soils that capture and slow the movement of water across land surfaces, remove or slow the movement of sediment, capture nutrients like nitrogen and phosphorus, bind and tightly hold metal pollutants such as lead, zinc and cadmium, and remove some kinds of pesticides — with impervious surfaces.

In combination, the direct effects of activities authorized by Nationwide Permits 14, 29, and 39 have resulted in at least 1,028 to 1,180 acres of impervious surface in the three years for which data are available. If we assume that these results are representative and calculate the acreage of total impervious surface per year (342.75 to 393.15, which captures the upper and lower ranges of impervious surface associated with NWP 29 and 39), the activities authorized by these three permits would have increased the amount of total impervious surface by at least 1,710 to

1,900 acres of total impervious surface over the past five years (and an equal amount over the five year period of the proposed Nationwide Permits) or at least 8,500 to 11,795 acres over the past 30 years. With the data available, we cannot estimate the total acreage of impervious surface produced by activities authorized by Standard Permits, general permits, and Letters of Permission and activities that would not have required authorization from the USACE. However, those activities would substantially increase these acreage estimates.

As we discussed earlier, the amount of impervious surface in a watershed is a reliable indicator of a suite of phenomena that influence a watershed's hydrology (Center for Watershed Protection 2003, National Research Council 1992, Schueler 1994). Numerous studies from throughout the United States have demonstrated that development on formerly undeveloped (or less developed) increases the area of impervious surface reduces the capacity of porous surfaces remaining in drainages to capture and infiltrate rainfall. As the percentage of these impervious surfaces increases, the fraction of annual rainfall or melt-water that becomes surface runoff (with corresponding reductions in the amount that infiltrates into the soil or recharges groundwater) and runoff reaches stream channels much more efficiently. (Bledsoe 2001, Booth 1990, 1991; Hammer 1972, Hollis 1975, MacRae 1992, 1993, 1996). The relative influence of the area of total impervious surface depends on the spatial scale. It has the strongest influence at the scale of catchment basins, a strong influence at the scale of sub-watersheds, moderate influence at the watershed scale, and weaker relative influence at the scale of sub-basins and basins (Coleman et al 2005).

Because of these changes, peak discharge rates for floods in drainages with high levels of impervious were higher for an equivalent rainfall than they were before the impervious surfaces increased (Booth 1990, Hammer 1972, Henshaw and Booth 2000, Leopold 1973). In addition, these discharges conveyed sediment and pollutants more efficiently, resulting in degraded water quality in receiving waters (Booth 1991, Booth and Jackson 1997, Booth and Reinelt 1993, Booth *et al.* 2002, Burges *et al.* 1998, Capiella and Brown 2001, Jennings and Jarnagin 2002, Klein 1979).

Changes in runoff and flow have been shown to result in adversely affect aquatic habitat and species, including endangered and threatened species (Benke *et al.* 1981, Booth and Jackson 1997, Garie and McIntosh 1986, Jones and Clark 1987, and Pedersen and Perkins 1986). Coho salmon are particularly sensitive to the effects of urbanization and their abundance usually declines as watersheds become increasingly urbanized (Birtwell *et al.* 1988, Brown *et al.* 1994, Slaney *et al.* 1996, Mrakovcich 1998). For example, a study of the effects of impervious area on 22 small streams in the Puget Sound lowland ecosystem concluded that Coho salmon were the dominant salmonid in those streams that had a total impervious area less than 5% (May 1998). Above 5%, cutthroat trout dominated. A separate study concluded that when the total impervious area in a stream system exceeded 20% (May *et al.* 1996), the percentage of fine sediment (<0.85 mm) commonly exceeded 15%, a percentage that is harmful to salmon and aquatic insects (Barnard 1992, McHenry *et al.* 1994). These results are supported by the conclusions of other studies that demonstrated that fine sediment in salmon spawning gravels increased by 2.6 to 4.3 times in watersheds with more than 4.1 miles of roads per square mile of land area (Cedarholm *et al.* 1980, Matthews 1999) and that bull trout (*Salvelinus confluentus*) do not occur in watersheds with more than 1.7 miles of road per square mile in the Interior Columbia River basin (Haynes *et al.* 1996).

FLOODPLAIN PROTECTION. although the effect of activities authorized by Nationwide Permits on floodplains has not been studied extensively, the few studies that have been conducted suggest that Condition 10 (Fills Within 100-Year Floodplains) does not prevent activities authorized by Nationwide Permits from having more than minimal individual or cumulative adverse environmental effects on 100-year floodplains or the contribution of those floodplains to the hydrology of watersheds.

As we discussed earlier, Brody *et al.* (2008) produced data that demonstrates that a disproportionate number of activities authorized by Nationwide Permits occur in floodplains where those activities were more likely to affect water storage and hydrology. In Florida, about 48.4% of activities authorized by standard permits (individual), letters of permission, general permits, and Nationwide Permits from 1991 to 2003 were located within the 100-year floodplain in Florida. In Texas, the percentage was 38.7%. They argued that these results were significant because wetland alteration within floodplains increases impervious surface area and reduces or eliminates a wetland's ability to capture and store water runoff. Disrupting the natural hydrological system can exacerbate flooding or create flood problems in areas not originally considered vulnerable to flooding.

REQUIREMENT FOR COMPENSATORY MITIGATION. Based on the data available, we must assume that the mitigation the USACE's requirement to compensate for the impacts of jurisdictional wetlands and other waters of the United States provides only partially replaces the hydrologic, chemical, and ecological functions of the wetlands they are designed to replace. This outcome results from the relatively low rates of compliance with the requirement to provide compensatory mitigation and the small percentage of compensatory mitigation projects that replace the hydrologic, chemical, and ecological functions of the wetlands they are designed to replace.

First, the requirement for compensatory mitigation (General Condition 22) does not establish functional replacement as the goal of wetland mitigation and only requires a minimum mitigation ratio of 1:1 for wetland losses that exceed 0.1 acre; compensatory mitigation is not required for wetland losses less than 0.1 acre. General Condition 22 allows activities authorized by Nationwide Permits to result in net loss of wetland function, net loss of wetlands acreage in small increments, conversion of wetland types, and migration of wetland services between watersheds.

Second, the proportion of compensatory mitigation projects that had been initiated as required ranged from 4 to 100% with overall compliance rates averaging 58% and varying widely geographically and over time. Nothing in the USACE's proposed regulations for Nationwide Permits would lead us to expect future compliance rates to be different than they have been in the past. Based on the USACE's current record of performance we expect compliance rates with the USACE's proposed terms and conditions, including requirements for compensatory mitigation, to be as variable in the future as they have been in the past. Based on the evidence available, we would expect about half of the activities that would be authorized by the proposed Nationwide Permits to comply with the requirement to mitigate at rates ranging from 50 to 100% and the other half at rates ranging from 0 to 50%.

Finally, even if the compensatory mitigation the USACE requires replaces the acreage that would be destroyed, only a small proportion of the compensatory mitigation project are likely to replace the hydrologic, geochemical, and ecological functions of the wetlands that would be destroyed or adversely modified by the activities the Nationwide Permits would authorize. As a result, the number of wetlands would decline in those watersheds, their

spatial distribution would be consolidated (or the acreage would be transferred out of the original watershed), and their functions would not be replaced.

ADVERSE EFFECTS TO LISTED SPECIES AND DESIGNNATED CRITICAL HABITAT. General Conditions 2 (Aquatic Life Movements), 3 (Spawning Areas), 8 (Adverse Effects From Impoundments), 9 (Management of Water Flows), 12 (Soil Erosion and Sediment Controls), 19 (Endangered Species), and 22 (Mitigation) should prevent the activities that would be authorized by the proposed Nationwide Permits from substantially disrupting the movements of listed species (unless the activity's primary purpose is to impound water); from occurring in spawning areas during spawning seasons; from creating impoundments or otherwise disrupting water flows; from occurring within 100-year floodplains; from adversely affecting, "taking," or "jeopardizing the continued existence of" endangered or threatened or resulting in the destruction or adverse modification of critical habitat that has been designated for such species without subsequent formal section 7(a)(2) consultation or ESA permitting; or from failing to compensate for long-term loss or degradation of habitat.

For the reasons and evidence we have already presented, we conclude that these conditions are not likely to produce their intended outcomes. Based on the evidence available, the USACE has not structured its proposed Nationwide Permit Program so that the USACE is positioned to know or reliably estimate the general and particular effects of the activities that would be authorized by the proposed Nationwide Permits on the quality of the waters that would receive those discharges. It also has not structured its proposed Nationwide Permit Program so that it is positioned to take actions that are necessary or sufficient to prevent the activities that would be authorized by the proposed Nationwide Permits from individually or cumulatively degrading the quality of the waters of the United States that would receive those discharges. It has not structured its proposed Nationwide Permit Program so that the USACE is positioned to *insure* that endangered or threatened species and designated critical habitat are not likely to be exposed to (a) the direct or indirect effects of the activities that would be authorized each year of the five-year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with those activities. And it has not structured its proposed Nationwide Permit Program so that the USACE is positioned to *insure* that endangered or threatened species and designated critical habitat do not suffer adverse consequences if they are exposed (a) the direct or indirect effects of the activities that would be authorized each year of the five-year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with those activities.

7.0 Cumulative Effects

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. During this consultation, NMFS searched for information on future State, tribal, local, or private actions that were reasonably certain to occur in the action area. NMFS conducted electronic searches of business journals, trade journals, and newspapers using *First Search*, Google, and other electronic search engines. Those searches produced no evidence of future private action in the action area that would not require federal authorization or funding and is reasonably certain to occur. As a result, at the spatial and temporal scale of this programmatic action, NMFS is not aware of any actions of this kind that are likely to occur in the action area during the foreseeable future

9 Conclusion

After reviewing the current status of Cook Inlet beluga whale, Guadalupe fur seal, southern resident killer whale, Hawai'ian monk seal, Steller sea lion (eastern population), Steller sea lion (western population), blue whale, bowhead whale, fin whale, humpback whale, North Atlantic right whale, North Pacific right whale, sei whale, sperm whale, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, North Pacific loggerhead sea turtle, Northwest Atlantic loggerhead sea turtle, Pacific ridley sea turtle, Georgia Basin bocaccio, Pacific eulachon (Southern population), Georgia Basin canary rockfish, Georgia Basin yelloweye rockfish, California coastal Chinook salmon, Central Valley spring-run Chinook salmon, Lower Columbia River Chinook salmon, Puget Sound Chinook salmon, Sacramento River winter-run Chinook salmon, Snake River fall-run Chinook salmon, Snake River spring/summer-run Chinook salmon, Upper Columbia River spring-run Chinook salmon, Upper Willamette River Chinook salmon, Columbia River chum salmon, Hood Canal summer run chum salmon, Central California Coast Coho salmon, Lower Columbia River Coho salmon, Oregon Coast Coho salmon, Southern Oregon Northern Coastal California Coho salmon, Ozette Lake sockeye salmon, Snake River sockeye salmon, smalltooth sawfish California Central Valley steelhead, Central California Coast steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Snake River Basin steelhead, South Central California coast steelhead, Southern California steelhead, Upper Columbia River steelhead, Upper Willamette River steelhead, green sturgeon (southern population), Gulf sturgeon, shortnose sturgeon, black abalone, white abalone, elkhorn coral, staghorn coral, Johnson's seagrass, the environmental baseline for the action area, the effects of the proposed Nationwide and General Permits, and the cumulative effects, it is the National Marine Fisheries Service's biological opinion that the U.S. Army Corps of Engineers has failed to insure that the activities that would be authorized by the proposed Nationwide Permits are not likely to jeopardize the continued existence of endangered or threatened species under the jurisdiction of NMFS.

After reviewing the status of critical habitat that has been designated for Cook Inlet beluga whale, southern resident killer whale, Hawai'ian monk seal, Steller sea lion (eastern population), Steller sea lion (western population), North Pacific right whale, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, California coastal Chinook salmon, Central Valley spring-run Chinook salmon, Lower Columbia River Chinook salmon, Puget Sound Chinook salmon, Sacramento River winter-run Chinook salmon, Snake River fall-run Chinook salmon, Snake River spring/summer-run Chinook salmon, Upper Columbia River spring-run Chinook salmon, Upper Willamette River Chinook salmon, Columbia River chum salmon, Hood Canal summer run chum salmon, Central California Coast Coho salmon, Oregon Coast Coho salmon, Southern Oregon Northern Coastal California Coho salmon, Ozette Lake sockeye salmon, Snake River sockeye salmon, smalltooth sawfish California Central Valley steelhead, Central California Coast steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Snake River Basin steelhead, South Central California coast steelhead, Southern California steelhead, Upper

Columbia River steelhead, Upper Willamette River steelhead, green sturgeon (southern population), Gulf sturgeon, elkhorn coral, staghorn coral, Johnson's seagrass, the environmental baseline for the action area, the effects of the proposed Nationwide and General Permits, and the cumulative effects, it is the National Marine Fisheries Service's biological opinion that the U.S. Army Corps of Engineers has failed to insure that the activities that would be authorized by the proposed Nationwide Permits are not likely to result in the destruction or adverse modification of critical habitat that has been designed for endangered or threatened species under the jurisdiction of NMFS.

9 Reasonable and Prudent Alternative

This Opinion has concluded that the U. S. Army Corps of Engineers has failed to insure that the Nationwide Permits it proposes to use to authorize activities in navigable and other waters of the United States are not likely to jeopardize the continued existence of endangered and threatened species under the jurisdiction of the National Marine Fisheries Service and are not likely to result in the destruction or adverse modification of critical habitat that has been designated for these species. The clause “jeopardize the continued existence of” means “to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species” (50 CFR §402.02).

Regulations implementing section 7 of the ESA (50 CFR §402.02) define reasonable and prudent alternatives as alternative actions, identified during formal consultation, that: (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the action agency's legal authority and jurisdiction; (3) are economically and technologically feasible; and (4) would, NMFS believes, avoid the likelihood of jeopardizing the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

9.1 Introduction to the Reasonable and Prudent Alternative

NMFS concluded that the U. S. Army Corps of Engineers has failed to insure that the Nationwide Permits it proposes to use to authorize activities in navigable and other waters of the United States because the evidence available suggests that the USACE has not structured its proposed Nationwide Permit Program so that the USACE is positioned to know or reliably estimate the general and particular effects of the activities that would be authorized by the proposed Nationwide Permits on the quality of the waters that would receive those discharges and, by extension, be positioned to know or reliably estimate the general and particular effects of those discharges on endangered and threatened species. The USACE also has not structured its proposed Nationwide Permit Program so that it is positioned to take actions that are necessary or sufficient to prevent the activities that would be authorized by the proposed Nationwide Permits from individually or cumulatively degrading the quality of the waters of the United States that would receive those discharges. It has not structured its proposed Nationwide Permit Program so that the USACE is positioned to *insure* that endangered or threatened species and designated critical habitat are not likely to be exposed to (a) the direct or indirect effects of the activities that would be authorized each year of the five-year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with those activities. And it has not structured its proposed Nationwide Permit Program so that the USACE is positioned to *insure* that endangered or threatened species and designated critical habitat do not suffer adverse consequences if they are exposed to (a) the direct or indirect effects of the activities that would be authorized each year of the five-

year duration of the proposed permits or (b) reductions in water quality that are caused by or are associated with those activities.

To satisfy its obligation pursuant to section 7(a)(2) of the Endangered Species Act of 1973, as amended, the USACE must place itself in a position to (a) monitor the direct, indirect, and cumulative impacts of the activities the proposed Nationwide or General permits would authorize, (b) monitor the condition of those effects on the sub-watersheds or watersheds in which those activities occur, (c) monitor the consequences of those effects for listed resources under NMFS' jurisdiction, and (d) take timely and effective corrective actions when the consequences of those actions exceed measurable standards and criteria.

The reasonable and prudent alternative that follows contains several elements that are designed to achieve these outcomes.

1. The first element of the reasonable and prudent alternative requires the USACE to systematically collect the basic information that would be necessary to know or reliably estimate how many activities may affect endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species, where and when the activities occurred, the impact of the activity, and whether a permittee complied with any general conditions of the Nationwide Permits that would apply to their activity (which can be used to verify compliance rates with those conditions and their effectiveness).
2. The second element of the reasonable and prudent alternative requires USACE Districts to formally consult with their counterparts in NMFS on procedures Districts impose to comply with the first element of this reasonable and prudent alternative and additional conditions those Districts might impose on Nationwide Permits and on measures to avoid or minimize the incremental, additive, and interactive impacts of activities that would be authorized by Nationwide Permits in those Districts on endangered and threatened species under NMFS' jurisdiction and critical habitat that has been designated for such species.
3. The third element of this alternative requires the USACE to analyze the information they receive as a result of the first element to assemble a picture of the individual and cumulative impacts of those individual actions on waters of the United States in those watersheds that overlap with the distribution of endangered or threatened species under NMFS' jurisdiction (and critical habitat that has been designated for those species).
4. The fourth, fifth, and sixth elements of this alternative set specific performance triggers for the Nationwide Permit program and requires the USACE to use its authorities to prevent waters of the United States from being degraded by activities that would be authorized by the Nationwide Permits.
5. The seventh element of this alternative directs the USACE to develop policy and guidance on assessing the cumulative impacts of Nationwide Permits for USACE project managers and directs the USACE to determine whether or to what degree project managers adhere to that policy and guidance.
6. The eighth element requires the USACE to provide annual reports of the cumulative impact of the actions it authorizes using the Nationwide Permits that overlap with the distribution of endangered or threatened species under NMFS' jurisdiction and critical habitat that has been designated for those species.

7. The final element of this alternative requires the USACE to develop and publish policy and guidance so that prospective permit applicants provide better information when they submit pre-discharge notifications to the USACE (to comply with Element 1). This reasonable and prudent alternative must be implemented in its entirety to insure that the activities the proposed Nationwide and General Permits authorize are not likely to jeopardize endangered or threatened species under the jurisdiction of the National Marine Fisheries Service or destroy or adversely modify critical habitat that has been designated for these species.

Requiring the USACE to systematically collect (Element 1) and systematically analyze (Element 2) the basic information about the activities that would be authorized by Nationwide Permits places the USACE in a position to know or reliably estimate how many activities may affect endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for those species, where and when the activities occurred, the impact of the activity, and whether a permittee complied with any general conditions of the Nationwide Permits that would apply to their activity. These elements also place the USACE in a position to know or reliably estimate compliance rates with the General Conditions of the Nationwide Permits and the effectiveness of those conditions. These elements require the USACE to monitor the direct, indirect, and cumulative impacts of the activities the proposed Nationwide or General permits authorize; monitor the condition of those effects on the sub-watersheds or watersheds in which those activities occur; and monitor the consequences of those effects for listed resources under NMFS' jurisdiction.

Establishing specific performance triggers for the Nationwide Permit program and requiring the USACE to use its authorities to prevent waters of the United States from being degraded by activities that would be authorized by the Nationwide Permits (Element 3) places the USACE in a position to take timely and effective corrective actions (Elements 4, 5, and 6) when the consequences of those actions exceed measurable standards and criteria. Requiring the USACE to provide that information to NMFS Regional Offices (Elements 2 and 7) allows NMFS to monitor compliance with these obligations and to intervene if a particular USACE District does not appear to comply with those obligations.

9.2 The Reasonable and Prudent Alternative

The U.S. Army Corps of Engineers shall issue a regulatory guidance letter (or regulatory guidance letters) that requires the District Engineers of the Alaska, Baltimore, Charleston, Galveston, Hawai'i, Jacksonville, Los Angeles, Mobile, New Orleans, New York, Norfolk, Philadelphia, Portland, Sacramento, San Francisco, Savannah, Seattle, Walla Walla, and Wilmington Districts to formally adopt Nationwide Permits within those Districts and to undertake the following actions if and when they adopt those Permits:

1. require all prospective permittees who plan to conduct activities under the authority of NWPs 1, 3, 4, 7, 8, 12, 13, 14, 17, 27, 28, 29, 31, 33, 35, 36, 39, 40, 43, 46, 48, and B in (a) navigable or other waters of the United States located within the boundaries of critical habitat that has been designated for endangered or threatened species under the jurisdiction of the National Marine Fisheries Service; (b) wetlands or riparian zones immediately adjacent to waters within those boundaries; or (c) the river systems, estuaries, and coastal areas identified in the following paragraphs to provide notify the relevant USACE District in which they plan to undertake activities (discharges of dredged or fill material into waters of the United States or

other activities in navigable waters of the United States) prior to undertaking these activities. This notification must, at a minimum, specify

- 1.1 the party or parties who plan to undertake the activity;
- 1.2 the location of the activity (using section, township, range locators; latitude and longitude, or Universal Transverse Mercator locators), including the watershed in which the activity would occur;
- 1.3 when the activity would occur (start date and end date);
- 1.4 an estimate of the area or linear distance (with Nationwide Permits 13 and 14) affected by the proposed activity,
- 1.5 a narrative explanation of how the prospective applicant satisfied the requirements of the USACE's conditions on endangered species, threatened species, and designated critical habitat.

The relevant critical habitat designations include those areas that have been designated for Cook Inlet beluga whale, southern resident killer whale, Hawai'ian monk seal, Steller sea lion (eastern population), Steller sea lion (western population), North Pacific right whale, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, California coastal Chinook salmon, Central Valley spring-run Chinook salmon, Lower Columbia River Chinook salmon, Puget Sound Chinook salmon, Sacramento River winter-run Chinook salmon, Snake River fall-run Chinook salmon, Snake River spring/summer-run Chinook salmon, Upper Columbia River spring-run Chinook salmon, Upper Willamette River Chinook salmon, Columbia River chum salmon, Hood Canal summer run chum salmon, Central California Coast Coho salmon, Oregon Coast Coho salmon, Southern Oregon Northern Coastal California Coho salmon, Ozette Lake sockeye salmon, Snake River sockeye salmon, smalltooth sawfish, California Central Valley steelhead, Central California Coast steelhead, Lower Columbia River steelhead, Middle Columbia River steelhead, Snake River Basin steelhead, South Central California coast steelhead, Southern California steelhead, Upper Columbia River steelhead, Upper Willamette River steelhead, green sturgeon (southern population), Gulf sturgeon, black abalone, elkhorn coral, staghorn coral, Johnson's seagrass

For shortnose sturgeon, the relevant river systems consist of the estuaries, mainstem portions, and major tributaries of the Kennebec and Penobscot Rivers, Maine; Connecticut (both above and below the Holyoke Dam) and Merrimack Rivers, Massachusetts; Hudson River, New York (up to the dam at Troy, New York); Delaware Bay and Delaware River, New Jersey and Delaware; Chesapeake Bay and Potomac River, Maryland, Virginia; Cape Fear River, North Carolina; Winyah Bay, North and South Carolina; Waccamaw - Pee Dee River, South Carolina; Santee River and Lake Marion, South Carolina; Cooper River, South Carolina; ACE Basin, South Carolina; Savannah River, South Carolina, Georgia; Ogeechee River, Georgia; and Altamaha River, Georgia

For loggerhead sea turtles, the relevant coastal areas consist of lands and waters on the shoreline of coastal lagoons, estuaries, and embayments, wetlands immediately adjacent to coastal lagoons, estuaries, and embayments, and lands and waters seaward of the base of the coastal dune systems on the Atlantic and Gulf Coasts from Cape Cod to Florida and Florida to Texas (in Florida, this area is generally seaward of the coastal construction control line), the main Hawai'ian Islands, Guam, and the Commonwealth of the Northern Mariiasna Islands.

2. engage in a formal section 7(a)(2) consultation with the NMFS Regional Office or Branch Office that is responsible for section 7 consultation within a District's boundaries as part of the process of adopting the Nationwide Permits identified in Element 1 of this Reasonable and Prudent Alternative. The actions considered in those consultations shall encompass
 - 2.1 any notification procedures USACE Districts develop as required by Element 1 of this Reasonable and Prudent Alternative;
 - 2.2 any regional or local procedures or conditions USACE Districts plan to impose on Nationwide Permits within their operating areas, particularly procedures that directly or indirectly affect endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for such species;
 - 2.3 on measures the Districts shall develop and impose to avoid or minimize the incremental, additive, and interactive impacts of activities that would be authorized by Nationwide Permits in those Districts on endangered and threatened species under NMFS' jurisdiction and critical habitat that has been designated for such species; and
 - 2.4 any "take" of endangered or threatened species under NMFS' jurisdiction that is likely to occur incidental to the individual or cumulative impacts of activities that would be authorized by Nationwide Permits in those Districts.
3. provide the NMFS Regional Office that is responsible for section 7 consultations within a District's boundaries a semi-annual report that identifies:
 - 3.1 the number of activities that were authorized by each of the different NWP's in the time interval covered by the report;
 - 3.2 the acreage or linear distance the permittees estimated would be impacted by activities that were authorized by each of the different NWP's in the time interval covered by the report;
 - 3.3 the acreage or linear distance that was actually affected by permitted activities that were authorized by each of the different NWP's in the time interval covered by the report;
 - 3.4 the watersheds that were impacted by permitted activities that were authorized by each of the different NWP's in the time interval covered by the report;
 - 3.5 the acreage of jurisdiction wetlands and other waters or the linear distance of streams or rivers that permittees were required to establish, restore, or enhance to mitigate for the impacts of activities that were authorized by each of the different NWP's in the time interval covered by the report;

- 3.6 the acreage of jurisdiction wetlands and other waters or the linear distance of streams or rivers that were actually established, restored, or enhanced to mitigate for the impacts of activities that were authorized by each of the different NWPs in the time interval covered by the report;
- 3.7 the kind and functional equivalence of the acreage of jurisdiction wetlands and other waters of the United States or the linear distance of streams or rivers that were actually created, restored, or enhanced to mitigate for the impacts of activities that were authorized by each of the different NWPs in the time interval covered by the report. Functional equivalence shall be estimated using the methods developed by Kettlewell *et al.* (2008), Micacchion *et al.* (2010) or comparable methodologies;
- 3.8 the percentage of prospective permittees who have complied with each of the following General Conditions of the NWPs: General Conditions 2 (Aquatic Life Movements), 3 (Spawning Areas), 8 (Adverse Effects From Impoundments), 9 (Management of Water Flows), 12 (Soil Erosion and Sediment Controls), 19 (Endangered Species), and 22 (Mitigation), during the time interval covered by the report;
- 3.9 how the USACE determined that prospective permittees complied with each of the following General Conditions of the NWPs: General Conditions 2 (Aquatic Life Movements), 3 (Spawning Areas), 8 (Adverse Effects From Impoundments), 9 (Management of Water Flows), 12 (Soil Erosion and Sediment Controls), 19 (Endangered Species), and 22 (Mitigation), during the time interval covered by the report. Specifically, the USACE shall identify whether their compliance estimates were based on field inspections of all relevant authorizations, field inspections of a random sample of those authorizations, or some other data-gathering method. The report shall identify sample sizes and sampling frequency;
- 3.10 the USACE District's' assessment of the cumulative impacts of the permitted activities on sub-watersheds and watersheds contained, in whole or in part, in the areas identified in Element 1. At a minimum, USACE Districts shall assess cumulative impacts by estimating total impervious surface area (using the methodology developed by the USACE's Savannah District or comparable method) or change in mean or peak flows (using the methodology developed by Highfield (2008) or a comparable method), or both;
- 3.11 the evidence the USACE used for that assessment; and
- 3.12 any actions the USACE took to insure that permittees complied with the General Conditions of the NWPs, particularly General Conditions 2 (Aquatic Life Movements), 3 (Spawning Areas), 8 (Adverse Effects From Impoundments), 9 (Management of Water Flows), 12 (Soil Erosion and Sediment Controls), 19 (Endangered Species), and 22 (Mitigation), in sub-watersheds and watersheds contained, in whole or in part, in the areas identified in Element 1.

If the number of activities that have occurred under the authority of a NWP is greater than 20, the USACE may estimate 3.1 through 3.8 based on a random sample of the notifications it receives in a time interval. A District that uses a random sample to produce these estimates must use a sample

that is sufficiently large to produce estimates that would be within 2 standard deviations of a complete count.

Any estimates produced to comply with Elements 3.3, 3.6, 3.7, and 3.8 shall be based on site visits of every site or a random sample of sites. A District that uses a random sample to produce these estimates must use a sample that is sufficiently large to produce estimates that would be within 2 standard deviations of a complete count.

4. for those sub-watersheds or watersheds contained, in whole or in part, in those areas identified in Element 1 of this Reasonable and Prudent Alternative, if and when a District's assessment identifies

- 4.1 individual or cumulative impacts of activities authorized by USACE permits that result in increasing the area of total impervious surface by more than 1 percent in watersheds contained, in whole or in part, in the areas identified in Element 1; or
- 4.2 rates of compliance with General Conditions 2 (Aquatic Life Movements), 3 (Spawning Areas), 8 (Adverse Effects From Impoundments), 9 (Management of Water Flows), 12 (Soil Erosion and Sediment Controls), or 22 (Mitigation) that fall below 95% (with a confidence interval of $\pm 5.0\%$); or
- 4.3 rates of compliance with General Condition 19 (Endangered Species) that fall below 95% (with a confidence interval of $\pm 5.0\%$); or
- 4.4 Nationwide Permits are identified as one of the sources of a physical, chemical, or biotic stressor that is identified in a Total Maximum Daily Load for an impaired water that is occupied by or is potentially occupiable by endangered or threatened species under NMFS' jurisdiction.

the District shall immediately employ all of the tools available to the USACE under the authority of the Clean Water Act and section 10 of the Rivers and Harbors Act of 1899 and any implementing regulations to prevent future uses of USACE permits (Standard Permits, Letters of Permission, General Permits, or Nationwide Permits) from having additional individual or cumulative adverse effects on endangered species or threatened species under NMFS' jurisdiction or designated critical habitat for those species that occur in the watershed.

These tools would include, but would not be limited to, Advanced Identification of Areas Unsuitable for disposal sites (40 CFR 230.80), Special Area Management Planning, or similar local planning process, revisions to District-level standard operating procedures to deny any subsequent permits for activities whose effects would exacerbate the cumulative impact, increased oversight of compensatory mitigation projects, increased enforcement actions, and restoration project planning.

5. until a USACE District institutes those measures that are necessary and sufficient to prevent future activities that would be authorized by USACE permits (Standard Permits, Letters of Permission, General Permits, or Nationwide Permits) from having additional individual or cumulative adverse effects on endangered species or threatened species under NMFS' jurisdiction or designated critical habitat for those species that occur in a watershed, the USACE shall suspend or revoke General or Nationwide Permits for

that watershed, except for those authorizations necessary to repair damaged or impaired infrastructure that place endangered or threatened species under NMFS' jurisdiction or critical habitat that has been designated for such species at additional harm or to respond imminent threats to human life or property during public emergencies or disaster situations.

6. the USACE shall establish and enforce a goal of achieving a minimum of 1:1 functional replacement (no net loss) of wetland functions for NWP 1, 3, 4, 7, 8, 12, 13, 14, 17, 27, 28, 29, 31, 33, 35, 36, 39, 40, 43, 46, 48, and B with an adequate margin of safety to reflect the anticipated success of wetland replacement projects. Each USACE District shall inspect or audit a sample of wetland mitigation projects on an annual basis to determine whether they have achieved that goal.

7. within 12 months of issuing the proposed Nationwide Permits, provide policy and guidance to insure that USACE's project managers assess the direct, indirect, and cumulative impacts (as the Council on Environmental Quality has defined those terms for the purposes of the National Environmental Policy Act of 1969) of activities that would be authorized by NWP 1, 3, 4, 7, 8, 12, 13, 14, 17, 27, 28, 29, 31, 33, 35, 36, 39, 40, 43, 46, 48, and B on endangered species, threatened species, and designated critical habitat under NMFS' jurisdiction when they review PCNs for those activities.

Once the USACE issues such policy and guidance, USACE Districts, Divisions, and Headquarters shall annually sample decisions made by USACE project project managers to insure determine whether or to what degree they have complied with the policy and guidance.

8. provide the NMFS Regional Office that is responsible for section 7 consultations within its boundaries with an annual report that assesses the cumulative impacts (as the Council on Environmental Quality has defined that term pursuant to the National Environmental Policy Act of 1969) of the activities authorized by the standard permits, general permits (which include the proposed NWPs), and letters of authorization on navigable or other waters of the United States in the sub-watersheds and watersheds contained, in whole or in part, in the areas identified in Element 1.

These reports must identify the direct and indirect impacts of the activities the USACE permits and the actual performance of any compensatory mitigation the USACE required. At a minimum, these cumulative impact assessments must assess the impact of the activities that occur under the authority of the Nationwide or General Permits on the percent of total impervious cover (at the level of sub-watershed) and the results of the USACE's reviews of the performance of project managers as required by Element 6. District Engineers may supplement this index with additional indices of the cumulative impacts of the activities that occur under the authority of the Nationwide or General Permits on sub-watersheds or watersheds.

9. provide prospective permittees with guidance on (1) where to find the information that is necessary to determine whether their activities are located within the boundaries described in Element 1 of this Reasonable and Prudent Alternative; (2) where to find the information that is necessary to identify the direct and indirect effects of their proposed activity on the environment; (3) where to find the information that is necessary to determine if endangered species, threatened species, or designated critical habitat under NMFS' jurisdiction are likely to be exposed to the direct or indirect effects of their activities and how, based on that information, to reach a conclusion that minimizes their chances of concluding that listed resources

will not be affected by their activity when effects are likely. Merely directing applicants to search the internet or referring them to a NMFS office would not satisfy this element of this Reasonable and Prudent Alternative.

Because this biological opinion has concluded that the U.S. Army Corps of Engineers failed to insure that the Nationwide Permits it proposes are not likely to jeopardize the continued existence of endangered species and threatened species under the jurisdiction of the National Marine Fisheries Service and are not likely to result in the destruction or adverse modification of critical habitat that has been designated for these species, the U.S. Army Corps of Engineers is required to notify the National Marine Fisheries Service's Office of Protected Resources of its final decision on implementation of the reasonable and prudent alternatives.

10 Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibits the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by NMFS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

None of the proposed NWP or Regional General Permits authorize the “take” of a threatened or endangered species unless that “take” has already been exempted from the prohibitions of section 9 of the Endangered Species Act of 1973, as amended, through a separate permit pursuant to section 10(a)(1)(A) of the Act (a permit for research or to enhance the survival or propagation of an endangered or threatened species), section 10(a)(1)(B) (a permit exempting incidental “take” of endangered species or threatened species), or through a biological opinion on a specific action that requires a NWP, Regional General Permit, or standard permit from the U.S. Army Corps of Engineers. In each of these instances, NMFS would normally conduct a separate section 7 consultation and issue a separate biological opinion before any endangered or threatened species might be “taken”; the amount or extent of “take” would be identified in those subsequent consultations on site-specific, area-specific, or permit-specific activities.

Further, the Reasonable and Prudent Alternative presented in the previous section of this Opinion requires USACE Districts to formally adopt Nationwide Permits before those Nationwide Permits can be used to authorize discharges into waters of the United States or other activities that may affect endangered or threatened species under NMFS’ jurisdiction. As part of that adoption process, the Reasonable and Prudent Alternative requires those Districts to engage in formal consultation with their counterparts in NMFS before any “take” incidental to activities authorized by Nationwide Permits can occur. Those formal consultations would identify and exempt any incidental “take” of endangered or threatened species under NMFS’ jurisdiction that is warranted. Therefore, no incidental take of listed fish or wildlife species is identified or exempted from the prohibitions of section 9 of the ESA in this programmatic opinion.

11 Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The following conservation recommendations would provide information for future consultations involving the issuance of marine mammal permits that may affect endangered whales as well as reduce harassment related to research activities:

1. the Chief of Engineers should establish a policy that directs District Engineers and project managers to consider the direct, indirect, and cumulative impacts of the activities the USACE authorizes on the “species of special concern” during the review of any PCNs; and
2. the Chief of Engineers should establish a policy that directs District Engineers and project managers to consider the direct, indirect, and cumulative impacts of the activities the USACE authorizes on goals set in recovery plans for endangered and threatened species within their geographic areas of responsibility.

In order to keep NMFS’ Endangered Species Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the U.S. Army Corps of Engineers should notify the Endangered Species Division of any conservation recommendations they implement in their final action.

12 Reinitiation Notice

This concludes formal consultation on the U.S. Army Corps of Engineers' proposal to re-issue 46 pre-existing Nationwide Permits, re-issue two Nationwide Permit with modifications, issue two new Nationwide Permits, and reissue the pre-existing suite of General Conditions for a period of five years beginning in 2011 and ending in 2016. As provided in 50 CFR 402.16, reinitiation of formal consultation is normally required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

In instances where the amount or extent of incidental take is exceeded, Action Agencies are normally required to reinitiate section 7 consultation immediately. However, because this Biological Opinion did not exempt the "take" of endangered or threatened species, any "take" of endangered or threatened species that might result from the proposed pesticide general permit will be considered and exempted, as appropriate, in subsequent biological opinions that result from formal consultations that occur between NMFS and USACE Districts on district-level implementation of these Nationwide Permits.

13 Literature Cited

- Abernethy, Y. and R.E. Turner. 1987. U.S. forested wetlands: 1940-1980. *BioScience* 37: 721-727
- Acevedo, W., J. L. Taylor, D. J. Hester, C. S. Mladinich, and S. Glavac. 2006. Rates, trends, causes, and consequences of urban land-use change in the United States. Professional Paper 1726, U.S. Department of the Interior, Geological Survey, Menlo Park, California.
- Achinstein, P. 2001. *The book of evidence*. Oxford University Press, New York, New York.
- Adler, R.W., J.C. Landman, and D.M. Cameron. 1993. *The Clean Water Act: 20 years later*. Natural Resources Defense Council. Island Press; Washington, D.C.
- Allen, A. O., and J. J. Feddema. 1996. Wetland loss and substitution by the Section 404 permit program in Southern California, USA. *Environmental Management* 20:263 - 274.
- Allen, M. A. and T. J. Hassler. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates. Chinook salmon (Pacific southwest). Biological Report 82 (11.49), U.S. Department of the Interior, U.S. Fish and Wildlife Service and U.S. Department of Defense, U.S. Army Corps of Engineers, Washington, D.C. and Vicksburg, Mississippi.
- Ambrose, R. F. and S. F. Lee. 2004. An evaluation of compensatory mitigation projects permitted under Clean Water Act section 401 by the Los Angeles Regional Quality Control Board, 1991 - 2002. University of California, Los Angeles, Environmental Science and Engineering Program, Los Angeles, California.
- Andrewartha and Birch. 1954. *The distribution and abundance of animals*. University of Chicago Press; Chicago, Illinois.
- Anisman, H. and Z. Merali. 1999. Understanding stress: characteristics and caveats. *Alcohol Research & Health* 23(4):241-249.
- Arauz, R. 2001. Impact of high seas longline fishery operations on sea turtle populations in the Exclusive Economic Zone (EEZ) of Costa Rica – A second look. In *Proceedings of the Twenty First annual symposium on sea turtle biology and conservation*, February 24-28, 2001, Philadelphia, Pennsylvania.
- Arauz, R., O. Rodriguez, R. Vargas, and A. Segura. 2000. Incidental capture of sea turtles by Costa Rica's longline fleet. In *Proceedings of the nineteenth annual sea turtle symposium*, March 2-6, 1999, South Padre Island, Texas.
- Arenas, P. and M. Hall. 1992. The association of sea turtles and other pelagic fauna with floating objects in the eastern tropical Pacific Ocean. In *Salmon, M., and J. Wyneken (compilers), Proc. Eleventh Annual*

- Workshop on Sea Turtle Biology and Conservation. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-SEFSC-302, p. 7-10.
- Arenas, P., L. Sarti, and P. Ulloa. 2000. Conservation and management of sea turtles in Mexico. Pg. 6-7 in Proceedings of the Eighteenth International Sea Turtle Symposium, 3-7 March, 1998, Mazatlán, Sinaloa Mexico.
- Atkins, N. and S. L. Swartz (eds.). 1989. Proceedings of the workshop to review and evaluate whale watching programs and management needs. November 14-16, 1988, Monterey, CA. Cent. Mar. Conserv., Wash., D.C., 53 p.
- Auble, G. T., Z. H. Bowen, K. D. Bovee, A. H. Farmer, N. Sexton, and T. J. Waddle. 2004. Summary of studies supporting cumulative effects analysis of Upper Yellowstone River channel modifications. Open File Report 2004-1442, U.S. Department of the Interior, Geological Survey, Washington, D.C.
- Auch R.F., Acevedo, W., and Taylor, J.L. 2006. The historical development of the Nation's urban areas. Pages 1 – 12, in W. Acevedo, J.L. Taylor, D.J. Hester, C.S. Mladinich, and S. Glavac (editors) Rates, trends, causes and consequences of urban land-use change in the United States. U.S. Department of the Interior Geological Survey Professional Paper 1726. Reston, Virginia.
- Aureggi, M., G. Gerosa, and S. Chantrapornsy. 1999. Marine turtle survey at Phra Thong Island, South Thailand. Marine Turtle Newsletter. No. 85:4-5.
- Balazs, G., H. Hirth, P. Kawamoto, E. Nitta, L. Ogren, R. Wass, J. Wetherall. 1992. Interim recovery plan for Hawaiian sea turtles. SWFSC Admin. Rep. H-92-01. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, Honolulu Laboratory ; Honolulu, Hawaii.
- Balazs, G.H. 1995. Status of sea turtles in the central Pacific Ocean. Pages. 243-252. In K.A. Bjorndal (editor) Biology and conservation of sea turtles (revised edition). Smithsonian Institution Press, Washington, D.C.
- Balazs, G.H. 1996. Behavioral changes within the recovering Hawaiian green turtle population. Page 16, 15th Annual Symposium, Sea Turtle Biology. and Conservation, Feb. 20-25, 1995, Hilton Head, South Carolina.
- Balazs, G.H. and J.A. Wetherall. 1991. Assessing impacts of North Pacific high-seas driftnet fisheries on marine turtles: progress and problems. Unpublished paper prepared for the North Pacific Driftnet Scientific Review Meeting, Sidney, British Columbia, Canada, 11-14 June 1991.
- Balazs, G.H. and S. Hau. 1986. Geographic distribution: *Lepidochelys olivacea* in Hawaii. Herpetological Review. 17(2):51.
- Balazs, G.H. and S.G. Pooley. 1994. Research plan to assess marine turtle hooking mortality: results of an expert workshop held in Honolulu, Hawaii, November 16-18, 1993. NOAA-TM-NMFS-SWFSC-201.
- Balazs, G.H., D.R. Kobayashi, D.M. Parker, J.J. Polovina, and P.H. Dutton. 2000. Evidence for counter-current movement of pelagic loggerhead turtles in the north Pacific Ocean based on real-time satellite tracking and satellite altimetry. Pg. 21 in Proceedings of the Nineteenth Annual Symposium on Sea Turtle Conservation and Biology, 2-6 March, 1999, South Padre Island, Texas.

- Balazs, G.H., P.Craig, B.R. Winton and R.K. Miya. 1994. Satellite telemetry of green turtles nesting at French Frigate Shoals, Hawaii and Rose Atoll, American Samoa. Pg.184, 14th Annual Symposium, Sea Turtle Biology. and Conservation, Mar. 1-5, 1994, Hilton Head, South Carolina.
- Balazs, G.H., P.Siu, and J. Landret. 1995. Ecological aspects of green turtles nesting at Scilli Atoll in French Polynesia. In Twelfth Annual Sea Turtle Symposium. NOAA Technical memorandum NMFS-SEFSC-361; p. 7-10
- Balazs, G.H., R. Forsyth, A. Kam. 1987. Preliminary assessment of habitat utilization by Hawaii green turtles in their resident foraging pastures. NOAA Technical memorandum. NOAA-TM-NMFS, SWFC-71.
- Balazs, G.H., S.G. Pooley, and S.K.K. Murakawa. 1995. Guidelines for handling marine turtles hooked or entangled in the Hawaii longline fishery: results of an expert workshop held in Honolulu, Hawaii, March 15-17, 1995. NOAA-TM-NMFS-SWFSC-222.
- Balazs, G.H., W. Puleloa, E. Medeiros, S.K.K. Murakawa, and D.M. Ellis. 1998. Growth rates and incidence of fibropapillomatosis in Hawaiian green turtles utilizing coastal foraging pastures at Palaau, Molokai. NOAA Tech. Memo. NMFS-SEFSC-415.
- Balcombe, C. K., J. T. Anderson, R. H. Fortney, and W. S. Kordek. 2005. Wildlife use of mitigation and reference wetlands in West Virginia. *Ecological Engineering* **25**:85-99.
- Ballesterro, J., R.M. Arauz, and R. Rojas. 2000. Management, conservation, and sustained use of olive ridley sea turtle eggs (*Lepidochelys olivacea*) in the Ostional Wildlife Refuge, Costa Rica: an 11 year review. Pp. 4-5 in Proceedings of the Eighteenth International Sea Turtle Symposium, 3-7 March, 1998, Mazatlán, Sinaloa, Mexico.
- Barbraud, C., and H. Weimerskirch. 2005. Environmental conditions and breeding experience affect costs of reproduction in Blue Petrels. *Ecology* **86**:11.
- Barnard, C.J. and J.L. Hurrst. 1996. Welfare by design: the natural selection of welfare criteria. *Animal Welfare* **5**:405-433.
- Barnhart, R. A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates. Steelhead (Pacific southwest). Biological Report 82 (11.60), U.S. Department of the Interior, U.S. Fish and Wildlife Service and U.S. Department of Defense, U.S. Army Corps of Engineers, Washington, D.C. and Vicksburg, Mississippi.
- Barton, K. 1986. Federal wetlands protection programs. Pages 373-411. In: A.S. Eno and R.L. Di Silvestro (editors) Audubon Wildlife Report 1986. National Audubon Society; New York, New York.
- Beauchamp, D. A., M. F. Shepard, and G. B. Pauley. 1983. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates. Chinook salmon (Pacific northwest). Biological Report 82 (11.6), U.S. Department of the Interior, U.S. Fish and Wildlife Service and U.S. Department of Defense, U.S. Army Corps of Engineers, Washington, D.C. and Vicksburg, Mississippi.

- Bendell-Young, L. I., K. E. Bennett, A. Crowe, C. J. Kennedy, A. R. Kermode, M. M. Moore, A. L. Plant, and A. Wood. 2000. Ecological characteristics of wetlands receiving an industrial effluent. *Ecological Applications* **10**:310.
- Benke, A. C. and C. E. Cushing, editors. 2005. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Bernstein, G. and R.L. Zepp, Jr. 1990. Evaluation of selected wetland creation projects authorized through the Corps of Engineers Section 404 Program. U.S. Fish and Wildlife Service. Permits/Licenses Branch. Annapolis Field Office; Annapolis, Maryland.
- Berryman, A. A. 2002. Population: A central concept for ecology? *Oikos* **97**:439-442.
- Berryman, A. A. 2003. On principles, laws and theory in population ecology. *Oikos* **103**:695-701.
- Berryman, A. A. 2004. Limiting factors and population regulation. *Oikos* **105**:667-670.
- Berryman, A. A. 2004. Mature population dynamics? *Trends in Ecology and Evolution* **19**:66-67.
- Berryman, A. A., M. L. Arce, and B. A. Hawkins. 2002. Population regulation, emergent properties, and a requiem for density dependence. *Oikos* **99**:600-606.
- Bethge, P., S. Nicol, B. M. Culik, and R. P. Wilson. 1997. Diving behavior and energetics in breeding little penguins (*Eudyptula minor*). *Journal of Zoology* **242**:483.
- Bevan, R. M., P. J. Butler, A. J. Woakes, and I. L. Boyd. 2002. The energetics of Gentoo Penguins, *Pygoscelis papua*, during the breeding season. *Functional Ecology* **16**:175-190.
- Bevelhimer, M. S. 2002. A bioenergetics model for white sturgeon *Acipenser transmontanus*: assessing differences in growth and reproduction among Snake River reaches. *Journal of Applied Ichthyology* **18**:550-556.
- Beyers, D., J. Rice, W. Clements, and C. Henry. 1999. Estimating physiological cost of chemical exposure: integrating energetics and stress to quantify toxic effects in fish. *Canadian Journal of Fisheries and Aquatic Sciences* **56**:9.
- Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. In *The biology of sea turtles*. Edited by P.L. Lutz and J.A. Musick. CRC Press, Boca Raton, Florida.
- Bjorndal, K.A. and A.B. Bolten. 1999. Observer program for the swordfish longline fisheries in the Azores, 20 March 1998 - 31 March 1999. Final report to NMFS, P.O. #40AANF804175.
- Bjorndal, K.A., A.B. Bolten, and B. Riewald. 1999. Development and use of satellite telemetry to estimate post-hooking mortality of marine turtles in the pelagic longline fisheries. SWFSC, Honolulu Laboratory. H-99-03C.
- Bledsoe, B. P. and C. C. Watson. 2001. Effects of urbanization on channel instability. *Journal of the American Water Resources Association* **37**:255-270.
- Blumstein, D.T. and A. Bouskila. 1996. Assessment and decision making in animals: a mechanistic model underlying behavioral flexibility can prevent ambiguity. *Oikos* **77**(3):569-576.

- Boisclair, D., and P. Sirois. 1993. Testing assumptions of fish bioenergetics models by direct estimation of growth, consumption, and activity rates. *Transactions of the American Fisheries Society* 122:784-796.
- Bolstad, W.M. 2007. *Introduction to Bayesian statistics*. Second Edition. Wiley Interscience; New York, New York.
- Bolten, A.B., J.A. Wetherall, G.H. Balazs, and S.G. Pooley (compilers). 1996. Status of marine turtles in the Pacific Ocean relevant to incidental take in the Hawaii-based pelagic longline fishery. U.S. Dept. of Commerce, NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-230.
- Bonfils, C., B.D. Santer, D.W. Pierce, H.G. Hidalgo, G. Bala, T. Das, T.P. Barnett, D.R. Cayan, C. Doutriaux, A.W. Wood, A. Mirin, and T. Nozawa, 2008: Detection and attribution of temperature changes in the mountainous western United States. *Journal of Climate* 21(23): 6404-6424.
- Bonnet, M. and W. G. Gilmartin. 1998. Evaluating the potential for shoreline fishing interactions with wildlife at Sand Island, Midway Islands, 1998. Contract report for Midway Atoll National Wildlife Refuge.
- Booth, D. B. 1991. Urbanization and the natural drainage system. Impacts, solutions, and prognoses. *The Northwest Environmental Journal* 7:93-118.
- Booth, D. B. and C. R. Jackson. 1997. Urbanization of aquatic systems: degradation thresholds, stormwater detection, and the limits of mitigation. *Journal of the American Water Resources Association* 33:1077-1090.
- Boulon, R.H., JR. 1994. Growth rates of wild juvenile hawksbill turtles, *Eretmochelys imbricata*, in St. Thomas, United States Virgin Islands. *Copeia* 1994:811-814.
- Bowen, B.W., F.A. Abreu-Grobois, G.H. Balazs, N. Kamezaki, C.J. Limpus, and R.J. Ferl. 1995. Trans-Pacific migration of the loggerhead turtle (*Caretta caretta*) demonstrated with mitochondrial DNA markers. *Proceedings of the National Academy of Sciences* 92: 3731-3734.
- Bozinovic, F. 1995. Nutritional energetics and digestive responses of an herbivorous rodent (*Octodon degus*) to different levels of dietary fiber. *Journal of Mammalogy* 76:11.
- Brady, S. J. and C. H. Flather. 1994. Changes in wetlands on nonfederal rural land of the conterminous United States from 1982 - 1987. *Environmental Management* 18:693 - 705.
- Brandt, S. B., and K. J. Hartman. 1993. Innovative approaches with bioenergetics models: future applications to fish ecology and management. *Transactions of the American Fisheries Society* 122:731-735.
- Breaux, A., S. Farber, and J. Day. 1995. Using natural coastal wetlands systems for wastewater treatment: an economic benefit analysis. *Journal of Environmental Management* 44:07.
- Broderick, D. 1997. Subsistence harvesting of marine turtles in the Solomon Islands. In *Proceedings of the Seventeenth annual sea turtle symposium*, 4-8 March, 1997, Orlando, Florida.
- Brody, S., S. Davis, W. Highfield, and S. Bernhardt. 2008. A spatial-temporal analysis of section 404 wetland permitting in Texas and Florida: Thirteen years of impact along the coast. *Wetlands* 28:107-116.
- Brommer, J. E. 2000. The evolution of fitness in life-history theory. *Biological Reviews of the Cambridge Philosophical Society* 75:28.

- Brommer, J. E., H. Pietäinen, and H. Kolunen. 1998. The effect of age at first breeding on Ural owl lifetime reproductive success and fitness under cyclic food conditions. *The Journal of Animal Ecology* 67:359-369.
- Brommer, J. E., J. Merilä, and H. Kokko. 2002. Reproductive timing and individual fitness. *Ecology Letters* 5:802-810.
- Brommer, J.E. 2000. The evolution of fitness in life-history theory. *Biological Reviews of the Cambridge Philosophical Society* 75(3):377-404.
- Brommer, J.E., H. Pietiäinen and H. Kolunen. 1998. The effect of age at first breeding on Ural owl lifetime reproductive success and fitness under cyclic food conditions. *The Journal of Animal Ecology* 67(3):359-369.
- Brommer, J.E., J. Merilä and H. Kokko. 2002. Reproductive timing and individual fitness. *Ecology Letters* 5(6):802-810.
- Brooks, R., D. Wardrop, and C. Cole. 2006. Inventorying and monitoring wetland condition and restoration potential on a watershed basis with examples from Spring Creek watershed, Pennsylvania, USA. *Environmental Management* 38:673-687.
- Brown, A. V., K. B. Brown, D. C. Jackson, and W. K. Pierson. 2005. Lower Mississippi River and its tributaries. Pages 231-282 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Brown, C.H. and W.M. Brown. 1982. Status of sea turtles in the Southeastern Pacific: Emphasis on Peru. In Bjorndal, K.A. (ed.) *Biology and conservation of sea turtles* (1st edition). Smithsonian Inst. Press, Wash., D.C. Pgs. 235-240.
- Brown, R. P., and V. Perez-Mellado. 1994. Ecological energetics and food acquisition in dense Menorcan islet populations of the lizard *Podarcis lilfordi*. *Functional Ecology* 8:427.
- Brown, R. P., V. Perez - Mellado, J. Diego - Rasilla, J. A. Garcia, and A. Naranjo. 1992. Individual and population energetics of a lizard on a Mediterranean islet. *Oecologia* 91:500.
- Brown, S. C. and P. L. M. Veneman. 2001. Effectiveness of compensatory wetland mitigation in Massachusetts, USA. *Wetlands* 21:508-518.
- Bryer, M. T., K. Maybury, J. S. Adams, and D. H. Grossman. 2000. More than the sum of the parts: diversity and status of ecological systems. Pages 201 - 238 in B. A. Stein, L. S. Kutner, and J. S. Adams, editors. *Precious heritage. The status of biodiversity in the United States*. Oxford University Press, Inc., New York, New York.
- Buckley, J. and B. Kynard. 1985. Yearly movements of shortnose sturgeons in the Connecticut River. *Transactions of the American Fisheries Society* 114:813-820.
- Burakowski, E.A., C.P. Wake, B. Braswell, and D.P. Brown, 2008. Trends in wintertime climate in the northeastern United States: 1965–2005. *Journal of Geophysical Research* 113: D20114.

- Burgman, M.A., S. Ferson, and H.R. Akçakaya. 1993. Risk assessment in conservation biology. Chapman and Hall, Publishers; New York, New York.
- Burnam, J. L. 2005. Impacts of low-water crossings on aquatic resources under the United States Army Corps of Engineers Nationwide Permit (NWP) Program. Dissertation Abstracts International **65**:125.
- Busby, P.J., T.C. Wainwright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of steelhead from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-27. U.S. Department of Commerce, National Marine Fisheries Service, Northwest Fisheries Science Center; Seattle, Washington.
- Bustnes, J., and K. Galaktionov. 2004. Evidence of a state-dependent trade-off between energy intake and parasite avoidance in Steller's eiders. *The Canadian Journal of Zoology* 82:6.
- Cam, E., E. G. Cooch, and J.-Y. Monnat. 2005. Earlier recruitment or earlier death? On the assumption of equal survival in recruitment studies. *Ecological Monographs* 75:419.
- Cam, E., J.-Y. Monnat, and J. E. Hines. 2003. Long-term fitness consequences of early conditions in the kittiwake. *The Journal of Animal Ecology* 72:411-424.
- Cam, E., W. A. Link, E. G. Cooch, J.-Y. Monnat, and E. Danchin. 2002. Individual covariation in life-history traits: seeing the trees despite the forest. *The American Naturalist* 159:10.
- Cappiella, K. and K. Brown. 2001. Impervious cover and land use in the Chesapeake Bay Watershed. Unpublished Report Prepared for the U.S. Environmental Protection Agency, Chesapeake Bay Program under grant No. CB-98321201-0, Center for Watershed Protection, Ellicott City, Maryland.
- Cargnelli, L. M., and M. R. Gross. 1997. Fish energetics: larger individuals emerge from winter in better condition. *Transactions of the American Fisheries Society* 126:4.
- Carter, J. L. and V. H. Resh. 2005. Pacific coast rivers of the coterminous United States. Pages 541-590 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Caswell, H. 2001. Matrix population models. Sinauer Publishers, Inc., Sunderland, Massachusetts.
- Caughley, G. 1994. Directions in conservation biology. *Journal of Animal Ecology* 63: 215-244.
- Center for Watershed Protection. 2003. Impacts of impervious cover on aquatic systems. Watershed Protection Research Monograph No. 1, Center for Watershed Protection, Ellicott City, Maryland.
- Chaloupka, M. 2001. Pacific loggerhead sea turtle simulation model development. A workbook prepared for NMFS, SWFSC, Honolulu, Hawaii. November 2001.
- Chaloupka, M. 2002. Stochastic simulation modeling of southern Great Barrier Reef green turtle population dynamics. *Ecological Modelling* 148:79-109.
- Chaloupka, M. and C. Limpus. 1997. Robust statistical modeling of hawksbill sea turtle growth rates (southern Great Barrier Reef). *Marine Ecology Progress Series* 146:1-8.

- Chaloupka, M. and C. Limpus. 2001. Trends in the abundance of sea turtles resident in southern Great Barrier Reef waters. *Biological Conservation* 102:235-249.
- Chaloupka, M. and C. Limpus. 2002. Survival probability estimates for the endangered loggerhead sea turtle resident in southern Great Barrier Reef waters. *Marine Biology* 140:267-277.
- Chaloupka, M.Y. and J.A. Musick. 1997. Age, growth, and population dynamics. In *The biology of sea turtles*. Edited by P.L. Lutz and J.A. Musick. CRC Press, Boca Raton, Florida.
- Chan, E.H., and Liew, H.C. 1996. Decline of the leatherback population in Terengganu, Malaysia, 1956-1995. *Chelonian Conservation and Biology* 2(2): 196-203.
- Chappell, M. A., V. H. Shoemaker, D. N. Janes, S. K. Maloney, and T. L. Bucher. 1993. Energetics of foraging in breeding Adelie Penguins. *Ecology* 74:2450-2461.
- Chaves, A., G. Serrano, G. Marin, E. Arguedas, A. Jimenez, and J.R. Spotilla. 1996. Biology and conservation of leatherback turtles, *Dermochelys coriacea*, at Playa Langosta, Costa Rica. *Chelonian Conservation and Biology* 2(2): 184-189.
- Cheng, I. and Chen, T. 1997. The incidental capture of five species of sea turtles of coastal setnet fisheries in the eastern waters of Taiwan. *Biological Conservation* 82: 235-239.
- Cheng, I. and T. Chen. 1996. Green turtle research in Taiwan. Pg.70, 15th Annual. Symposium, Sea Turtle Biology and Conservation, Feb. 20-25, 1995, Hilton Head, South Carolina.
- Christensen, I. 1990. A review of the distribution, migrations, food, reproduction, exploitation, and present distribution of humpback whales (*Megaptera novaeangliae*) in the northeast Atlantic. International Council for the Exploration of the Sea, Committee Meeting 1990/N:10.
- Christensen, J.H., B. Hewitson, A. Busuioac, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.-T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr, and P. Whetton, 2007: Regional climate projections. Pages 847-940. In: S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (editors). *Climate Change 2007: The Physical Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom, and New York, New York.
- Ciannelli, L., R. Brodeur, and T. Buckley. 1998. Development and application of a bioenergetics model for juvenile walleye pollock. *Journal of Fish Biology* 52:20.
- Clifton, K., D. Cornejo, R. Felger. 1982. Sea turtles of the Pacific coast of Mexico. In K. Bjorndal, ed. *Biology and Conservation of sea turtles*. Smithsonian Inst. Press: Washington, D.C. 199-209.
- Clutton-Brock, T. H., A. W. Illius, K. Wilson, B. T. Grenfell, A. D. C. MacColl, and S. D. Albon. 1997. Stability and instability in ungulate populations: An empirical analysis. *The American Naturalist* 149:25.
- Clutton-Brock, T. H., I. R. Stevenson, P. Marrow, A. D. MacColl, A. I. Houston, and J. M. McNamara. 1996. Population fluctuations, reproductive costs and life-history tactics in female Soay sheep. *The Journal of Animal Ecology* 65:15.

- Clutton-Brock, T. H., K. E. McComb, and J. C. Deutsch. 1996. Multiple factors affect the distribution of females in lek-breeding ungulates: a rejoinder to Carbone and Taborsky. *Behavioral Ecology* 7:373.
- Clutton-Brock, T. H., O. F. Price, S. D. Albon, and P. A. Jewell. 1991. Persistent instability and population regulation in Soay sheep. *The Journal of Animal Ecology* 60:593-608.
- Clutton-Brock, T.H. 1998. Reproductive success. Studies of individual variation in contrasting breeding systems. University of Chicago Press; Chicago, Illinois.
- Cole, L. 1954. The population consequences of life history phenomena. *The Quarterly Review of Biology* 29:103 - 137.
- Collins, N. C. 1980. Developmental responses to food limitation as indicators of environmental conditions for *Ephydra cinerea* Jones (Diptera). *Ecology* 61:650-661.
- Cooney, C. M. 2006. U S Army Corps of Engineers allows wetlands to go unprotected, GAO finds. *Environmental Science & Technology* 40:1.
- Cornelius, S. 1982. Status of sea turtles along the Pacific coast of middle America. In K. Bjorndal, ed. *Biology and Conservation of sea turtles*. Smithsonian Inst. Press: Washington, D.C. 211-220.
- Coulson, T., F. Guinness, J. Pemberton, and T. Clutton-Brock. 2004. The demographic consequences of releasing a population of red deer from culling. *Ecology* 85:12.
- Coulson, T., T. G. Benton, P. Lundberg, S. R. X. Dall, B. E. Kendall, and J. M. Gaillard. 2006. Estimating individual contributions to population growth: evolutionary fitness in ecological time. *Proceedings of the Royal Society of London, Series B: Biological Sciences* 273: 547 - 555.
- Council on Environmental Quality [CEQ]. 1989. *Environmental trends*. U.S. Government Printing Office; Washington, D.C.
- Council on Environmental Quality [CEQ]. 1997. *Considering cumulative effects under the National Environmental Policy Act*. Council on Environmental Quality; Washington, D.C.
- Crane, M. and G. Xian. 2006. Urban growth and seagrass distribution trends in Tampa Bay, Florida. Pages 185-188 in W. Acevedo, J. L. Taylor, D. J. Hester, C. S. Mladinich, and S. Glavac, editors. *Rates, trends, causes, and consequences of urban land-use change in the United States*. U.S. Department of the Interior, Geological Survey, Menlo Park, California.
- Cryan, J. F. 1985. Retreat in the Barrens. *Defenders* Jan/Feb: 18-29.
- Daan, S., C. Deerenberg, and C. Dijkstra. 1996. Increased daily work precipitates natural death in the kestrel. *The Journal of Animal Ecology* 65:6.
- Dadswell, M.J., B.D. Taubert, T.S. Squiers, D. Marchette, and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, *Acipenser brevirostrum* LeSueur 1818. National Oceanic and Atmospheric Administration Technical Report NMFS 14, Washington, D.C.
- Dahl, T.E. 1990. *Wetlands losses in the United States, 1780s to 1980s*. U.S. Department of the Interior, U.S. Fish and Wildlife Service; Washington, D.C.

- Dahl, T. E. 2000. Status and trends of wetlands in the conterminous United States, 1986 to 1997. U.S. Department of the Interior, U.S. Fish and Wildlife Service; Washington, D.C.
- Dahl, T. E. 2006. Status and trends of wetlands in the conterminous United States, 1998 to 2004. U.S. Department of the Interior, U.S. Fish and Wildlife Service; Washington, D.C.
- Dahl, T. E. 2011. Status and trends of wetlands in the conterminous United States, 2004 to 2009. U.S. Department of the Interior, U.S. Fish and Wildlife Service; Washington, D.C.
- Dahl, T.E. and C.E. Johnson. 1991. Status and trends of wetlands in the conterminous United States, mid-1970s to mid-1980s. U.S. Department of the Interior, U.S. Fish and Wildlife Service; Washington, D.C.
- Dahm, C. N., R. J. Edwards, and F. P. Gelwick. 2005. Gulf coast rivers of the southwestern United States. Pages 181-230 in A. C. Benke and C. E. Cushing, editors. Rivers of North America. Elsevier Academic Press, London, United Kingdom.
- Dam, R. and C. Diez. 1997a. Diving behavior on immature hawksbill turtle (*Eretmochelys imbricata*) in a Caribbean reef habitat. Coral Reefs 16:133-138.
- Dam, R. and C. Diez. 1997b. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. Proceedings of 8th International Coral Reef Symposium, 2:1412-1426.
- D'Amico, M. M. 2000. Be all that you can be, but nothing more: National Mining Association v U S Army Corps of Engineers and the Corps' critical loss of wetlands control. Pace environmental law review 17:325.
- Damsgard, B., A. Arnesen, B. Baardvik, and M. Jobling. 1997. State-dependent feed acquisition among two strains of hatchery-reared Arctic charr. Journal of Fish Biology 50:11.
- Davies, K. F., C. R. Margules, and J. F. Lawrence. 2000. Which traits of species predict population declines in experimental forest fragments? Ecology 81: 1450-1461.
- Dayton, PK, Thrush, SF, Agardy, MT and Hofman, RJ. 1995. Environmental effects of marine fishing. Aquatic Conservation: Marine and Freshwater Ecosystems 5:205-232.
- de Kloet, E.R., M. Joels and F. Holsboer. 2005. Stress and the brain: from adaptation to disease. Nature Reviews Neuroscience 6(6):463-475.
- Debora, G.M. and L. Sarti. 1998. Reproductive cycles of leatherback turtles. In Proceedings of the eighteenth international sea turtle symposium. March 3-7, 1998, Mazatlan, Sinaloa Mexico.
- DeLong, M. D. 2005. Upper Mississippi River basin. Pages 237-374 in A. C. Benke and C. E. Cushing, editors. Rivers of North America. Elsevier Academic Press, London, United Kingdom.
- Detenbeck, N. E., C. A. Johnston, and G. J. Niemi. 1993. Wetland effects on lake water quality in the Minneapolis/St. Paul metropolitan area. Landscape Ecology 8:39-61.
- Dill, L.M. 1987. Animal decision making and its ecological consequences: the future of aquatic ecology and behavior. Canadian Journal of Zoology 65:803-811.

- Dillon, J., T. Littleton, and J. Laufle. 1998. Appendix H. Literature review of revetment and channelization impacts on Pacific northwest aquatic resources with implications to Skagit River, Washington. Pages 1-30 in Skagit fisheries investigation, feasibility study. U.S. Department of the Army, U.S. Army Corps of Engineers, Seattle, Washington.
- Dobbs, K. 2001. Marine turtles in the Great Barrier Reef World Heritage Area. A compendium of information and basis for the development of policies and strategies for the conservation of marine turtles. First Edition. January, 2001.
- Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta*. (Linnaeus 1758). U.S. Department of the Interior, U.S. Fish Wildlife Service, Biological Report 88(14).
- Donoso, M., P.H. Dutton, R. Serra, and J.L. Brito-Montero. 2000. Sea turtles found in waters off Chile. Pp. 218-219 in Proceedings of the Nineteenth Annual Symposium on Sea Turtle Conservation and Biology, 2-6 March, 1999, South Padre Island, Texas.
- Dreitz, V. J. 2000. The influence of environmental variation on the snail kite population in Florida. Dissertation Abstracts International **61**:102.
- Dreitz, V. J., R. E. Bennetts, B. Toland, W. M. Kitchens, and M. W. Collopy. 2002. Snail kite nest success and water levels: A reply to Beissinger and Snyder. The Condor **104**:216-221.
- Duffy, W. 1998. Population dynamics, production, and prey consumption of fathead minnows (*Pimephales promelas*) in prairie wetlands: a bioenergetics approach. Canadian Journal of Fisheries and Aquatic Sciences **55**:13.
- Duke, S., P. Anders, G. Ennis, R. Hallock, J. Hammond, S. Ireland, J. Laufle, R. Lauzier, L. Lockhard, B. Marotz, V. L. Paragamian, and R. Westerhof. 1999. Recovery plan for Kootenai River white sturgeon (*Acipenser transmontanus*). Journal of Applied Ichthyology **15**:157-163.
- Dutton, P.H. G.H. Balazs, and A.E. Dizon. 1998. Genetic stock identification of sea turtles caught in the Hawaii-based pelagic longline fishery. Pp. 43-44 in Proceedings of the seventeenth annual sea turtle symposium. 4-8 March 1997. December 1998.
- Dutton, P.H., E. Bixby, R. LeRoux, and G. Balazs. 2000. Genetic stock origin of sea turtles caught in the Hawaii-based longline fishery. Pp. 120-21 in Proceedings of the Nineteenth Annual Symposium on Sea Turtle Conservation and Biology, 2-6 March, 1999, South Padre Island, Texas.
- Dutton, P.H., L. Sarti, R. Marquez, and D. Squires. 2002. Both sides of the border: Transboundary environmental management issues facing Mexico and the United States (eds Fernandez, L. and R.T. Carson). Kluwer Academic Publishers, Dordrecht. Pp. 429-453.
- Eckert, K. L. 1993. The biology and population status of marine turtles in the North Pacific Ocean. Final Report to U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Edmonds, C. P., D. M. Keating, and S. Stanwick. 1997. Wetland mitigation. The Appraisal Journal **65**:5.

- Edwards, D. J. 2003. Wetland mitigation banking: Is the current system beyond repair? *Tulane Environmental Law Journal* 16:445-470.
- Einum, S. 2003. Atlantic salmon growth in strongly food-limited environments: Effects of egg size and paternal phenotype? *Environmental Biology of Fishes* 67:263-268.
- Ellis, J. H. 2005. Impacts of the 404 permit program on wetlands and waterways in Montana and recommendations for program improvement. *Montana Audubon*, Helena, Montana.
- Elsner M.M., Hamlet A.F. 2010. Macro-scale hydrologic model implementation. Chapter 5 in Final Report for the Columbia Basin Climate Change Scenarios Project Seattle, Washington: Climate Impacts Group, Center for Science in the Earth System, Joint Institute for the Study of the Atmosphere and Ocean, University of Washington.
- Environmental Law Institute [ELI]. 2002. Banks and fees. The status of off-site wetland mitigation in the United States. Washington, D.C., The Environmental Law Institute.
- Environmental Law Institute [ELI]. 2004. National symposium on compensatory mitigation and the watershed approach. Washington, D.C., The Environmental Law Institute.
- Environmental Law Institute [ELI]. 2008. The federal wetland permitting program: avoidance and minimization requirements. Washington, D.C., The Environmental Law Institute.
- Environmental Law Institute [ELI]. 2009. Wetland avoidance and minimization in action: perspectives from experience. Washington, D.C., The Environmental Law Institute.
- Essington, T., J. Kitchell, and C. Walters. 2001. The von Bertalanffy growth function, bioenergetics, and the consumption rates of fish. *Canadian Journal of Fisheries and Aquatic Sciences* 58:10.
- Evans, M., N. Hastings and B. Peacock. 2000. *Statistical distributions*. Third Edition. Wiley Interscience; New York, New York.
- Fagan, W. F., E. Meir, and J. L. Moore. 1999. Variation thresholds for extinction and their implications for conservation strategies. *American Naturalist* 154: 510-520.
- Farrar, J. 2003. *Tigers of the Marsh*. Nebraska Game and Parks Commission, Lincoln, Nebraska.
- Fenner, T. 1991. Cumulative impacts to San Diego County wetlands under Federal and state regulatory programs 1985-1989. M.A. Thesis. San Diego State University, San Diego, California.
- Fennessy, S. and J. Roehrs. 1997. A functional assessment of mitigation wetlands in Ohio: comparisons with natural systems. Reported prepared by the State of Ohio, Environmental Protection Agency for the U.S. Environmental Protection Agency, Columbus, Ohio.
- Fischenich, C. 2001. Impact of stabilization measures. Technical Notes Collection ERDC TN-EMRRP-SR-32. U.S. Army Corps of Engineers, Research and Development Center, Environmental Laboratory; Vicksburg, Mississippi.

- Fisher, D. O., S. P. Blomberg, and I. P. F. Owens. 2003. Extrinsic versus intrinsic factors in the decline and extinction of Australian marsupials. *Proceedings of the Royal Society Biological Sciences Series B* 270:1801-1808.
- Flather, C. H., L. A. Joyce, and C. A. Bloomgarden. 1994. Species endangerment patterns in the United States. U.S. Department of Agriculture, U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.
- Flemminger, P. 2003. Wetland mitigation banking - banking credits for mitigating wetlands is seeing some success, although there are still obstacles. *Journal of Soil and Water Conservation* 58:118A.
- Flournoy, P.H., S.G. Rogers, and P.S. Crawford. 1992. Restoration of shortnose sturgeon in the Altamaha River, Georgia. Final Report to the U.S. Fish and Wildlife Service, Atlanta, Georgia.
- Forbes, B. C. and R. L. Jefferies. 1999. Revegetation of disturbed arctic sites: Constraints and applications. *Biological Conservation* 88:15-24.
- Frayser, W.E. and J.M. Hefner. 1991. Florida wetlands. Status and trends, 1970s to 1980s. U.S. Department of the Interior, Fish and Wildlife Service; Washington, D.C.
- Frayser, W.E., D.D. Peters, and H.R. Pywell. 1989. Wetlands of the California Central Valley: status and trends, 1939 to mid-1980s. U.S. Department of the Interior, Fish and Wildlife Service; Portland, Oregon.
- Frederick, P. C., K. L. Bildstein, B. Fleury, and J. Ogden. 1996. Conservation of large, nomadic populations of white ibises (*Eudocimus albus*) in the United States. *Conservation Biology* 10:203-216.
- Fretey, J. 2001. Biogeography and conservation of marine turtles of Atlantic coast of Africa. Convention of Migratory Species of Technical Series publications. UNEP/CMS Secretariat, Bonn, Germany. Vol. 6. 429 pp.
- Fretwell, J.D., J.S. Williams, and P.J. Redman (compilers). 1996. National water summary on wetland resources. U.S. Geological Survey Water Supply Paper 2425. U.S. Government Printing Office; Washington, D.C.
- Frid, A. and L.M. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. *Conservation Ecology* 6(1):11.
- Fritts, T. M. Stinson, R. Marquez. 1982. Status of sea turtle nesting in southern Baja California, Mexico. *Bull. South. Calif. Acad. Sci.* 81:51-60.
- Furness, R.W. 1982. Competition between fisheries and seabird communities. *Advances in Marine Biology* 20:225-307.
- Gales, R., B. Green, J. Libke, K. Newgrain, and D. Pemberton. 1993. Breeding energetics and food requirements of gentoo penguins (*Pygoscelis papua*) at Heard and Macquarie Islands. *Journal of Zoology* 231:125.
- Gallego-Fernández, J. B., M. R. Garcêla-Mora, and F. Garcêla-Novo. 1999. Small wetlands lost: a biological conservation hazard in Mediterranean landscapes. *Environmental Conservation* 26:10.
- Gallihugh, J. L. 1998. Wetland mitigation and 404 permit compliance study. U.S. Department of the Interior, U.S. Fish and Wildlife Service, Chicago Field Office, Barrington, Illinois.

- Gibbs, J. P. 2000. Wetland loss and biodiversity conservation. *Conservation Biology* **14**:314-317.
- Gill, and Hart. 1996. How feeding performance and energy intake change with a small increase in the body size of the three-spined stickleback. *Journal of Fish Biology* **48**:13.
- Gill, J., W. Sutherland, and K. Norris. 2001. Depletion models can predict shorebird distribution at different spatial scales. *Proceedings of the Royal Society of London, Series B: Biological Sciences* **268**:369-376.
- Gilman, E.L. 1998. Nationwide permit program: unknown adverse impacts on the Commonwealth of the Northern Marianas Islands' wetlands. *Coastal Management* **26**: 253-277.
- Golodetz, A. D. and D. R. Foster. 1997. History and importance of land use and protection in the North Quabbin Region of Massachusetts (USA). *Conservation Biology* **11**:227-235.
- Gotelli, N.J. 2004. *A primer of ecological statistics*. Sinauer Associates, Inc.; Sunderland, Massachusetts.
- Green, D. and F. Ortiz-Crespo. 1982. Status of sea turtle populations in the central eastern Pacific. In *Biology and conservation of sea turtles*. Edited by K.A. Bjorndal. Smithsonian Institution Press, Washington, D.C.
- Gremillet, D., G. Wright, A. Lauder, D. N. Carss, and S. Wanless. 2003. Modeling the daily food requirements of wintering great cormorants: a bioenergetics tool for wildlife management. *The Journal of Applied Ecology* **40**:266-277.
- Grimm, V. 1999. Ten years of individual-based modeling in ecology: what have we learned and what could we learn in the future? *Ecological modeling* **115**:20.
- Grimm, V., and C. Wissel. 2004. The intrinsic mean time to extinction: a unifying approach to analyzing persistence and viability of populations. *Oikos* **105**:501-511.
- Grimm, V., and J. Uchmanski. 2002. Individual variability and population regulation: A model of the significance of within-generation density dependence. *Oecologia* **131**:196-202.
- Grimm, V., T. Wyszomirski, D. Aikman, and J. Uchmanski. 1999. Individual-based modeling and ecological theory: synthesis of a workshop. *Ecological modeling* **115**:275.
- Grumbles, B. H. 1991. Wetlands, drainage ditches, and the Clean Water Act. *Journal of Soil and Water Conservation* **46**:174.
- Gutrich, J. J. and F. J. Hitzhusen. 2004. Assessing the substitutability of mitigation wetlands for natural sites: estimating restoration lag costs of wetland mitigation. *Ecological Economics* **48**:16.
- Gwin, S. E. and M. E. Kentula. 1990. Evaluating design and verifying compliance of wetlands created under Section 404 of the Clean Water Act in Oregon. U.S. Environmental Protection Agency, Ecological Research Service, Corvallis, Oregon.
- Gwin, S. E., and M. E. Kentula. 1990. Evaluating design and verifying compliance of wetlands created under Section 404 of the Clean Water Act in Oregon. U.S. Environmental Protection Agency, Ecological Research Service, Corvallis, Oregon.

- Hall, L.S. P.R. Krausman, and M.L. Morrison. 1997. The habitat concept and a plea for standard terminology. *Wildlife Society Bulletin* 25: 173 – 182.
- Hall, W.J., T.I.J. Smith, and S.D. Lamprecht. 1991. Movements and habitats of shortnose sturgeon *Acipenser brevirostrum* in the Savannah River. *Copeia* 3:695-702.
- Hamer, A. J., S. J. Lane, and M. J. Mahony. 2002. Management of freshwater wetlands for the endangered green and golden bell frog (*Litoria aurea*): Roles of habitat determinants and space. *Biological Conservation* **106**:413-424.
- Hamre, J. 1988. Some aspects of the interrelations between the herring in the Norwegian Sea and stocks of capelin and cod in the Barents Sea. International Council for the Exploration of the Sea, Committee meeting 1988/H:42.
- Hansen, M. J., D. Boisclair, S. B. Brandt, S. W. Hewett, J. F. Kitchell, M. C. Lucas, and J. J. Ney. 1993. Applications of bioenergetics models to fish ecology and management: where do we go from here? *Transactions of the American Fisheries Society* 122:1019-1030.
- Hartman, K. J., and S. B. Brandt. 1995. Comparative energetics and the development of bioenergetics models for sympatric estuarine piscivores. *Canadian Journal of Fisheries and Aquatic Sciences* 52:20.
- Harwood, J, and Croxall, J. 1988. The assessment of competition between seals and commercial fisheries in the North Sea and the Antarctic. *Marine Mammal Science* 4:13-33.
- Hassler, T. J. 1987. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates. Coho salmon (Pacific southwest). Biological Report 82 (11.70), U.S. Department of the Interior, U.S. Fish and Wildlife Service and U.S. Department of Defense, U.S. Army Corps of Engineers, Washington, D.C. and Vicksburg, Mississippi.
- Hatase, H, M. Kinoshita, T. Bando, N. Kamezaki, K. Sato, Y. Matsuzawa, K. Goto, K. Omuta, Y. Nakashima, H. Takeshita, and W. Sakamoto. 2002. Population structure of loggerhead turtles, *Caretta caretta*, nesting in Japan: bottlenecks on the Pacific population. *Marine Biology* 141:299-305.
- Haug, T, Kroyer, AB, Nilssen, KT, Ugland, KI and Aspholm, PE. 1991. Harp seal (*Phoca groenlandica*) invasions of Norwegian waters: age composition and feeding habitats. *ICES Journal of Marine Science* 48:365-371.
- Hayhoe K., Wake C., Anderson B., Liang X.-Z., Maurer E., Zhu J., Bradbury J., DeGaetano A., Stoner A. and Wuebbles D. 2008. Regional climate change projections for the Northeast USA. *Mitigation and Adaptation Strategies for Global Change* 13: 425-436.
- Hayhoe K., Wake C., Huntington T., Luo L., Schwartz M., Sheffield J., Wood E., Anderson B., Bradbury J., DeGaetano A., Troy T. and Wolfe D. 2007. Past and future changes in climate and hydrological indicators in the US Northeast. *Climate Dynamics* 28: 381-407.
- Hefner, J.M., B.O. Wilen, T.E. Dahl, and W.E. Frayer. 1994. Southeast wetlands: status and trends, mid-1970s to mid-1980s. U.S. Department of the Interior, Fish and Wildlife Service; Washington, D.C.

- Hemond, H. F. and J. Benoit. 1988. Cumulative impacts on water quality functions of wetlands. *Environmental Management* **12**:639-653.
- Hendrickson, J.R. 1980. The ecological strategies of sea turtles. *American Zoologist* **20**: 597-608.
- Henley, W. F., M. A. Patterson, R. J. Neves, and A. D. Lemly. 2000. Effects of sedimentation and turbidity on lotic food webs: a concise review for natural resource managers. *Reviews in Fishery Science* **8**:125-139.
- Heppell, S.S. 1998. Application of life-history theory and population model analysis to turtle conservation. *Copeia* **2**: 367-375.
- Heppell, S.S., L.B. Crowder, and T.R. Menzel. 1999. Life table analysis of long-lived marine species with implications for conservation and management. *American Fisheries Society Symposium* **23**: 137-148.
- Herman, J.P. and W.E. Cullinan. 1997. Neurocircuitry of stress: central control of hypothalamo-pituitary-adrenocortical axis. *Trends in Neuroscience* **20**:78-84.
- Hien, T.M. 2002. Brief on the status of marine turtles and the conservation activities in Vietnam. Presented at the Western Pacific Sea Turtle Cooperative Research & Management Workshop, Honolulu, Hawaii, February 5-8, 2002.
- Highfield W.E., Brody S.D. 2006. Price of permits: measuring the economic impacts of wetland developments on flood damages in Florida. *Natural Hazards Review* **7**: 123-130.
- Highfield, W. E. 2008. Section 404 permitting in coastal Texas from 1996-2003: patterns and effects on streamflow. Doctoral Dissertation. Texas A&M University, College Station, Texas.
- Highfield, W. E. 2008. Section 404 permitting in coastal Texas from 1996-2003: patterns and effects on streamflow. Texas A&M University.
- Highfield, W. E. and S. D. Brody. 2006. Price of permits: measuring the economic impacts of wetland developments on flood damages in Florida. *Natural Hazards Review* **7**:123-130.
- Hirth, H.F. and L.H. Ogren. 1987. Some aspects of the ecology of the leatherback turtle, *Dermochelys coriacea*, at Laguna Jalova, Costa Rica. NOAA Tech. Rept. NMFS 56.
- Hodge R. and B.L. Wing. 2000. Occurrence of marine turtles in Alaska Waters: 1960-1998. *Herpetological Review* **31**, 148-151.
- Hoeltje, S. and C. Cole. 2007. Losing function through wetland mitigation in central Pennsylvania, USA. *Environmental Management* **39**:385-402.
- Holland, C. C., and M. E. Kentula. 1992. Impacts of section 404 permits requiring compensatory mitigation on wetlands in California (USA). *Wetlands Ecology and Management* **2**: 157 - 169.
- Hollins, M. 1999. Addition by removal?: national mining limits section 404 control of construction in wetlands. *Journal of land use & environmental law* **14**:341.
- Holyoak, M., T. S. Talley, and S. E. Hogle. 2010. The effectiveness of U.S. mitigation and monitoring practices for the threatened Valley elderberry longhorn beetle. *Journal of Insect Conservation* **14**:43-52.

- Horikoshi, K., H. Suganuma, H. Tachikawa, F. Sato, and M. Yamaguchi. 1994. Decline of Ogasawara green turtle population in Japan. Page 235 in Proceedings of the fourteenth annual symposium on sea turtle biology and conservation, 1-5 March 1994, Hilton Head, South Carolina. August, 1994.
- Hornyak, M. M. and K. E. Halvorsen. 2003. Wetland mitigation compliance in the western upper peninsula of Michigan. *Environmental Management* **32**:535-540.
- Houck, O. A. and M. Rolland. 1995. Federalism in wetlands regulation: a consideration of delegation of Clean Water Act Section 404 and related programs to the states. *Maryland law review* **54**:1242.
- Houston, A.I. 1993. The importance of states. Pages: 10-31. In: *Diet selection. An interdisciplinary approach to foraging behavior*. Edited by R.N. Hughes. Blackwell Scientific Publications; London, United Kingdom.
- Howell, P., K. Jones, D. Scarmecchia, L. LaVoy, W. Kendra, and D. Ortmann. 1985. Stock assessment of Columbia River anadromous salmonids. Volume II: Steelhead stock summaries , stock transfer guidelines, and information needs. Final Report to the Bonneville Power Administration for Contract No. DE-A179-84BP12737, Bonneville Power Administration, Portland, Oregon.
- Hunt, P. G., K. C. Stone, F. J. Humenik, T. A. Matheny, and M. H. Johnson. 1999. Wetlands and aquatic processes: In-stream wetland mitigation of nitrogen contamination in a USA coastal plain stream. *Journal of Environmental Quality* **28**:8.
- Huntington T.G., G.A. Hodgkins, B.D. Keim, and R.W. Dudley. 2004. Changes in the proportion of precipitation occurring as snow in New England (1949 to 2000). *Journal of Climate* **17**(13): 2626-2636.
- Isaac, N. J. B., and G. Cowlshaw. 2004. How species respond to multiple extinction threats. *Proceedings of the Royal Society Biological Sciences Series B* **271**: 1135-1141.
- Jackson, J. K., A. D. Huryn, D. L. Strayer, D. L. Courtemanch, and B. W. Sweeney. 2005. Atlantic coast rivers of the northeastern United States. Pages 21-71 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Jacobson, R. B., S. R. Femmer, and R. A. McKenney. 2001. Land-use changes and the physical habitat of streams. A review with emphasis on studies within the U.S. Geological Survey Federal-State Cooperative Program. U.S. Geological Survey Circular 1175, U.S. Department of the Interior, Geological Survey, Denver, Colorado.
- Jarnagin, S. T. 2006. An overview of stressors and ecological impacts associated with regional and global patterns of population, land-use, and land-cover change. Pages 189 - 200 in W. Acevedo, J. L. Taylor, D. J. Hester, C. S. Mladinich, and S. Glavac, editors. *Rates, trends, causes, and consequences of urban land-use change in the United States*. U.S. Department of the Interior, U.S. Geological Survey, Menlo Park, California.
- Jenkins, W.E., T.I.J. Smith, I.D. Heyward, D.M Knott. 1993. Tolerance of shortnose sturgeon, *Acipenser brevirostrum*, juveniles to different salinity and dissolved oxygen concentrations. In: Proceedings of the 47th Annual Conference of the Southeastern Association of Fish and Wildlife Agencies **47**: 476-484.

- Jennings, D. and S. Taylor Jarnagin. 2002. Changes in anthropogenic impervious surfaces, precipitation and daily streamflow discharge: a historical perspective in a mid-atlantic subwatershed. *Landscape Ecology* **17**:471-489.
- Jennings, S, and Kaiser, MJ. 1998. The effects of fishing on marine ecosystems. *Advances in Marine Biology* **34**:201-352.
- Johnson, A., K. Macdonald, and P. Trotter. 2003. Programmatic biological effects analysis: King County (Washington) management program. Report prepared by Aquatic Resource Consultants for King County Department of Natural Resources and Parks, Seattle, Washington.
- Johnson, P. A., D. L. Mock, E. J. Teachout, and A. McMillan. 2000. Washington State wetland mitigation evaluation study. Phase 1: Compliance. Washington State Department of Ecology, Lacey, Washington.
- Johnson, T. B., and D. O. Evans. 1991. Behavior, energetics, and associated mortality of young-of-the-year white perch (*Morone americana*) and yellow perch (*Perca flavescens*) under simulated winter conditions. *Canadian Journal of Fisheries and Aquatic Sciences* **48**:672-680.
- Johnston, C. A. 1994. Cumulative impacts to wetlands. *Wetlands* **14**:49 - 55.
- Johnston, C. A., N. E. Detenbeck, and G. J. Niemi. 1990. The cumulative effect of wetlands on stream water quality and quantity. A landscape approach. *Biogeochemistry* **10**:105-141.
- Jones, K. E., A. Purvis, and J. L. Gittleman. 2003. Biological correlates of extinction risk in bats. *American Naturalist* **161**: 601-614.
- Juarez, R. and C. Muccio. 1997. Sea turtle conservation in Guatemala. *Marine Turtle Newsletter* **77**:15-17.
- Karas, P., and G. Thoreson. 1992. An application of a bioenergetics model to Eurasian perch (*Perca fluviatilis* L.). *Journal of Fish Biology* **41**:217.
- Karl T.R., Melillo J.M., Peterson T.C., eds. 2009. *Global climate change impacts in the United States* New York, New York: Cambridge University Press.
- Katahira, L., C. Fores, A. Kikuta, G. Balazs, M. Bingham. 1994. Recent findings and management of hawksbill turtle nesting beaches in Hawaii. In K. Bjorndal, A. Bolton, D. Johnson, P. Eliazar, eds. *Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation*. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, NOAA Technical Memorandum NMFS-SEFSC-351.
- Kelly, N. M. 2001. Changes to the landscape pattern of coastal North Carolina wetlands under the Clean Water Act, 1984–1992. *Landscape Ecology* **16**:3-16.
- Kentula, M. E., S. E. Gwin, and S. M. Pierson. 2004. Tracking changes in wetlands with urbanization: sixteen years of experience in Portland, Oregon, USA. *Wetlands* **24**: 734-743.
- Kentula, M.E., J.E. Sifneos, J.W. Good, M. Rylko, K. Kunz. 1992. Trends and patterns in Section 404 permitting requiring compensatory mitigation in Oregon and Washington, U.S.A. *Environmental Management* **16**: 109-119.

- Kettlewell, C., V. Bouchard, D. Porej, M. Micacchion, J. Mack, D. White, and L. Fay. 2008. An assessment of wetland impacts and compensatory mitigation in the Cuyahoga River Watershed, Ohio, USA. *Wetlands* **28**:57-67.
- Khakimullin, A.A., 1987. Oxygen preferendum (preferred oxygen regime) of hatchery young of the year Siberian sturgeon, *Acipenser baeri*. *Voprosy Ikhtiologii* 6: 978–983.
- Kikukawa, A., N. Kamezaki, and H. Ota. 1999. Current status of the sea turtles nesting on Okinawajima and adjacent islands of the central Ryukyus, Japan. *Biological Conservation* 87: 149-153.
- King, F.W. 1995. Historical review of the decline of the green turtle and the hawksbill. In Bjorndal, K.A. (ed.), *Biology and conservation of sea turtles* (2nd edition). Smithsonian Inst. Press, Wash., D.C.
- Kirshen P., Watson C., Douglas E., Gontz A., Lee J. and Tian Y. 2008. Coastal flooding in the Northeastern United States due to climate change. *Mitigation and Adaptation Strategies for Global Change* 13: 437-451.
- Klopatek, J. M., R. J. Olson, C. J. Emerson, and J. L. Joness. 1979. Land-use conflicts with natural vegetation in the United States. *Environmental Conservation* 6:191-199.
- Knight, R. L., R. Adams, C. O'Brien, and E. R. Davis. 1998. Beltway 8 Wetland Water Quality Project: constructed wetlands for storm water polishing and wetland mitigation banking. *Transportation Research Record*:10.
- Knowles, N., M.D. Dettinger, and D.R. Cayan. 2006: Trends in snowfall versus rainfall in the western United States. *Journal of Climate* 19(18): 4545-4559.
- Kolinski, S.P. 2001. Sea turtles and their marine habitats at Tinian and Aguijan, with projections on resident turtle demographics in the southern arc of the Commonwealth of the Northern Mariana Islands. A report prepared for NMFS, SWFSC, Honolulu, Hawaii. June, 2001.
- Kotiaho, J.S., V. Kaitala, A. Komonen and J. Paivinen. 2005. Predicting the risk of extinction from shared ecological characteristics. *Proceedings of the National Academy of Sciences of the United States of America* 102(6):1963-1967.
- La Peyre, M. K., M. A. Reams, and I. A. Mendelsohn. 2001. Linking actions to outcomes in wetland management: an overview of U S state wetland management. *Wetlands : the journal of the Society of the Wetlands Scientists* **21**:66-74.
- Landsberg, J.H., G.H. Balazs, K.A. Steidinger, D.G. Baden, T.M. Work, D.J. Russell. 1999. The potential role of natural tumor promoters in marine turtle fibropapillomatosis. *Journal of Aquatic Animal Health* 11:199-210.
- Langenbuch H, Pörtner H.O. 2003. Energy budget of hepatocytes from Antarctic fish (*Pachycara brachycephalum* and *Lepidonotothen kempi*) as a function of ambient CO₂: pH-dependent limitations of cellular protein biosynthesis? *Journal of Experimental Biology* 206: 3895-3903.
- Larsen, E. W. and S. E. Greco. 2002. Modeling channel management impacts on river migration: a case study of Woodson Bridge State Recreation Area, Sacramento River, California, USA. *Environmental Management* **30**:209-224.

- Lashley, D. 1995. Guidance on mitigation banking. National wetlands newsletter **17**:1.
- Lawton, J.H. 1995. Population dynamic principles. Pages 147-163. In: J.H. Lawton and R.M. May (eds.) Extinction rates. Oxford University Press, Inc.; New York, New York.
- Lee, L.C. and J.G. Gosselink. 1988. Cumulative impacts on wetlands: linking scientific assessments and regulatory alternatives. Environmental Management **12**: 591-602.
- Leppla, K.B. and J.A. Chandler. 1995. A survey of white sturgeon in the Bliss Reach of the middle Snake River, Idaho. In: New License Application for the C.J. Strike Hydroelectric Project, Volume 1. Technical Report E.3.1-E. Idaho Power; Boise, Idaho.
- Levermann, A. , Mignot, J. , Nawrath, S. , & Rahmstorf, S. 2007. The role of northern sea ice cover for the weakening of the thermohaline circulation under global warming. Journal of Climate **20**(16): 4160-4171
- Liebman, L. and D. M. Plott. 1996. Assessing private wetlands mitigation banking. Urban Land **55**:31.
- Liebman, L. R. and D. M. Plott. 1998. The emergence of private wetlands mitigation banking. Natural resources & environment **13**:341.
- Lima, S.L. and L.M. Dill. 1990. Behavioral decisions made under the risk of predation: a review and prospectus. Canadian Journal of Zoology **68**(4):619-640.
- Limpus, C. 1984. A benthic feeding record from neritic waters for the leathery turtle (*Dermochelys coriacea*). Copeia **1984**(2): 552-553.
- Limpus, C. 1992. The hawksbill turtle, *Eretmochelys imbricata*, in Queensland: population structure within a southern Great Barrier Reef feeding ground. Wildlife Research **19**: 489-506.
- Limpus, C., J. ,V. E. McLachlan. 1983. The hawksbill turtle, *Eretmochelys imbricata* (Linnaeus), in northeastern Australia: The Campbell Island Rookery. Australian Wildlife Research **10**:185-197.
- Limpus, C.J. 1982. The status of Australian sea turtle populations, p. 297-303. In Bjorndal, K.A. (ed.), Biology and conservation of sea turtles. Smithsonian Inst. Press, Wash., D.C.
- Limpus, C.J. and D. Reimer. 1994. The loggerhead turtle, *Caretta caretta*, in Queensland: a population in decline. Pp 39-59. In R. James (compiler). Proceedings of the Australian Marine Turtle Conservation Workshop: Sea World Nara Resort, Gold Coast, 14-17 November 1990. Australian Nature Conservation Agency, Australia.
- Littell J.S., Elsner M.M., Whitely Binder L.C, Snover AK (Editors). 2009. The Washington climate change impacts assessment: evaluating Washington's future in a changing climate. University of Washington, Climate Impacts Group. Seattle; Washington.
- Lubowski, R.N., M. Vesterby, S. Bucholtz, A. Baez, and M.J. Roberts. 2006. Major Uses of Land in the United States, 2002. U.S. Department of Agriculture, Economic Research Service, Economic Information Bulletin No. EIB-14, Washington, D.C.
- Lutcavage, M. and J. A. Musick. 1985. Aspects of the biology of sea turtles in Virginia. Copeia, May 3, 1985: 449-456.

- Madon, S. P., and D. A. Culver. 1993. Bioenergetics model for larval and juvenile walleyes: an in situ approach with experimental ponds. *Transactions of the American Fisheries Society* 122:797-813.
- Madson, J. 1990. On the Osage. *Nature Conservancy* 5/6 1990: 7-15.
- Mager, A. J. and R. Ruebsamen. 1988. National Marine Fisheries Service habitat conservation efforts in the coastal southeastern United States for 1987. *Marine Fisheries Review* 50:43-50.
- Majluf, P. 1989. Reproductive ecology of South American fur seals in Peru. *ICLARM Conference Proceedings* 18:332-343.
- Mangel, M. and C. Tier. 1994. Four facts every conservation biologist should know about persistence. *Ecology* 75: 607-614.
- Mansfield, K.L., E.E. Seney, and J.A. Musick. 2002a. An evaluation of sea turtle abundances, mortalities and fisheries interactions in the Chesapeake Bay, Virginia, 2001. Final Report submitted to the U.S. Department of Commerce, National Marine Fisheries Service, Northeast Region in fulfillment of Contract No. 43-EA-NF-110773; National Marine Fisheries Service; Gloucester, Massachusetts.
- Mansfield, K.L., E.E. Seney, M.A. Fagan, J.A. Musick, K.L. Frisch, and A.E. Knowles. 2002b. An evaluation of interactions between sea turtles and pound net leaders in the Chesapeake Bay, Virginia. Final Report submitted to the U.S. Department of Commerce, National Marine Fisheries Service, Northeast Region in fulfillment of Contract #EA1330-02-SE-0075; National Marine Fisheries Service; Gloucester, Massachusetts.
- Mantua N.J., Hare S.R., Zhang Y, Wallace J.M., Francis R.C. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. *Bulletin of the American Meteorological Society* 78: 1069-1079.
- Maragos, J.E. 1991. Assessment and recommendations for the conservation of hawksbill turtles in the Rock Islands of Palau. The Nature Conservancy, Pacific Region, Honolulu. In K.A. Eckert. 1993. The biology and population status of marine turtles in the North Pacific Ocean. Final Report to U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, Honolulu, Hawaii.
- Márquez, M.R. and A. Villanueva. 1993. First reports of leatherback turtles tagged in Mexico and recaptured in Chile. *Marine Turtle Newsletter* 61:9.
- Marrow, P., J. M. McNamara, A. I. Houston, I. R. Stevenson, and T. H. Clutton-Brock. 1996. State-dependent life history evolution in Soay sheep: Dynamic modeling of reproductive scheduling. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences* 351:16.
- Mason, D. M., A. Goyke, and S. B. Brandt. 1995. A spatially explicit bioenergetics measure of habitat quality for adult salmonines: Comparison between Lakes Michigan and Ontario. *Canadian Journal of Fisheries and Aquatic Sciences* 52:12.
- Matthews, W. J., C. C. Vaughn, K. B. Gido, and E. Marsh-Matthews. 2005. Southern plains rivers. Pages 283-326 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.

- May, C., R. Horner, J. R. Karr, B. Mar, and E. Welch. 1997. Effects of urbanization on small streams in the Puget Sound ecoregion. *Watershed Protection Techniques* 2:483-494.
- Mbobi, E. K. 2005. Section 404 of the Clean Water Act and resulting wetlands mitigation for selected counties of northern Ohio. *The Ohio Journal of Science* 105:35-42.
- McEwen, B.S. and J.C. Wingfield. 2003. The concept of allostasis in biology and biomedicine. *Hormones and Behavior* 43(1):2 - 15.
- McFarland, D. 1982. *Functional ethology*. Pitman Advanced Publishing Program; London, United Kingdom
- McFarland, D. 1982. Introduction to functional analysis of behavior. Pages: 3-23. In: *Functional ethology*. Edited by D. McFarland. Pitman Advanced Publishing Program; London, United Kingdom.
- McFarland, D.J. and R.M. Sibly. 1975. The behavioral final common path. *Philosophical Transactions of the Royal Society of London B Biological Sciences* 270:365-293.
- McGraw, J. B., and H. Caswell. 1996. Estimation of individual fitness from life-history data. *The American Naturalist* 147:47 - 64
- McKeown, A. 1977. *Marine Turtles of the Solomon Islands*. Ministry of Natural Resources, Fisheries Division: Honiara. 47p In National Marine Fisheries Service and United States Fish and Wildlife Service. 1998. *Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (Eretmochelys imbricata)*. National Marine Fisheries Service, Silver Spring, MD.
- McKinney, M. L. 1997. Extinction vulnerability and selectivity: combining ecological and paleontological views. *Annual Review of Ecology and Systematics* 28: 22.
- McNamara, J.M. 1993. State-dependent life history equations. *Acta Biotheoretica* 41(3):165 - 174.
- McNamara, J.M. and A.I. Houston. 1982. Short-term behavior and lifetime fitness. Pages: 60-87. In: *Functional ethology*. Edited by D. McFarland. Pitman Advanced Publishing Program; London, United Kingdom.
- McNamara, J.M. and A.I. Houston. 1986. The common currency for behavioral decisions. *The American Naturalist* 127(3):358-378.
- McNamara, J.M. and A.I. Houston. 1994. The effect of a change in foraging options on intake rate and predation rate. *The American Naturalist* 144:978-1000.
- McNamara, J.M. and A.I. Houston. 1996. State-dependent life histories. *Nature* 380(6571):6.
- McPhail, J.D. and C.C. Lindsey, 1970. *Freshwater Fishes of northwestern Canada and Alaska*. Fisheries Research Board of Canada Bulletin 173, Ottawa, Canada.
- Meffe, G.K. and C.R. Carroll and contributors. 1997. *Principles of conservation biology*. Sinauer Associates, Inc. Massachusetts. 729pp.
- Mehner, T., and W. Wieser. 1994. Energetics and metabolic correlates of starvation in juvenile perch (*Perca fluviatilis*). *Journal of Fish Biology* 45:325-333.

- Meylan, A. 1999. International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3:189-194.
- Meylan, A. B., and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered in the 1996 IUCN Red List of Threatened Animals. *Chelonian Conservation and Biology* 3:200-224.
- Micacchion, M., B. D. Gara, and J. J. Mack. 2010. Assessment of wetland mitigation projects in Ohio. Volume 1: an ecological assessment of Ohio individual wetland mitigation projects. Reported prepared by the State of Ohio, Environmental Protection Agency for the U.S. Environmental Protection Agency, Columbus, Ohio.
- Millán, R.M. 2000. The ridley sea turtle populations in Mexico. Page 19 in Proceedings of the Eighteenth International Sea Turtle Symposium, 3-7 March, 1998, Mazatlán, Sinaloa Mexico.
- Miller, J.D. 1995. Nesting biology of sea turtles. In *Biology and conservation of sea turtles*. Revised edition. Edited by K.A. Bjorndal. Smithsonian Institution Press. Washington and London.
- Miller, J.D., L. Kimmel, and M. Hess. 2000. 1999 Study of Public Attitudes Toward and Understanding of Science and Technology: Methodological Report. Chicago Academy of Sciences, Chicago, Illinois.
- Miller, J.D., R. Pardo, and F. Niwa. 1997. Public Perceptions of Science and Technology: A Comparative Study of the European Union, the United States, Japan, and Canada. Chicago Academy of Sciences, Chicago, Illinois.
- Miltner, R., D. White, and C. Yoder. 2004. The biotic integrity of streams in urban and suburbanizing landscapes. *Landscape and urban planning* 69:87-100.
- Minkin, P. and R. Ladd. 2003. Success of Corps-required wetland mitigation in New England. U.S. Army Corps of Engineers, New England District, Concord, Massachusetts.
- Moberg, G.P. 2000. Biological response to stress: implications for animal welfare. Pages: 1 - 21. In: *The biology of animal stress. Basic principles and implications for animal welfare*. Edited by G.P. Moberg and J.A. Mench. Oxford University Press; Oxford, United Kingdom.
- Moein, S.E., J.A. Musick and M.L. Lenhardt. 1994. Auditory behavior of the loggerhead sea turtle (*Caretta caretta*). In: K.A. Bjorndal, A.B. Bolten, D.A. Johnson, and P.J. Eliazar (compilers). Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-351.
- Morgan, K. L. and T. H. Roberts. 1999. An assessment of wetland mitigation in Tennessee. Tennessee Department of Environment and Conservation, Nashville, Tennessee.
- Morgan, K. L. and T. H. Roberts. 2003. Characterization of wetland mitigation projects in Tennessee, USA. *Wetlands* 23:65-69.
- Morgan, N. G. and M. Henrion. 1990. Uncertainty. A guide to dealing with uncertainty in quantitative risk and policy analysis. Cambridge University Press, New York, New York.

- Mortimer, M. J. 1998. Irregular regulation under section 404 of the Clean Water Act: is the Congress or the Army Corps of Engineers to blame? *Journal of environmental law and litigation* **13**:445.
- Moscrip, A. L. and D. R. Montgomery. 1997. Urbanization, flood frequency, and salmon abundance in Puget lowland streams. *Journal of the American Water Resources Association* **33**:1289-1297.
- Mote, P., A. Hamlet, and E. Salathé. 2008. Has spring snowpack declined in the Washington Cascades? *Hydrology and Earth System Sciences* **12**(1): 193-206.
- Mrosovsky, N.A., A. Bass, L.A. Corliss, and J.I. Richardson. 1995. Pivotal and beach temperatures for hawksbill turtles nesting in Antigua. P. 87 in K.A. Eckert. 1993. *The biology and population status of marine turtles in the north Pacific Ocean*. Final report to NOAA-NMFS, P.O. 40ABNF002067. 119p.
- Muccio, C. 1998. National sea turtle conservation report for Guatemala. August, 1998.
- Murray, B. G. 1992. The evolutionary significance of lifetime reproductive success. *The Auk* **109**: 167-172.
- National Marine Fisheries Service. 1997b. Environmental Assessment of final rule to implement the Pacific Offshore Cetacean Take Reduction Plan, under section 118 of the Marine Mammal Protection Act. September 1997.
- National Research Council 1992. Restoration of aquatic ecosystems. Science, technology, and public policy. National Academy Press, Washington, D.C.
- National Research Council. 1986. The special problem of cumulative effects. Pages 93-136 *In: Ecological knowledge and environmental problem-solving*. National Academy Press, Washington, D.C.
- National Research Council 2001. Compensating for wetland losses under the Clean Water Act. National Academy Press, Washington, D.C.
- National Research Council. 1990. Decline of the sea turtles. National Academy Press, Washington, D.C.
- National Science Foundation. 2001. Survey of public attitudes toward and understanding of science and technology, 2002. National Science Foundation; Arlington, Virginia.
- Neal, J. 1999. Paving the road to wetlands mitigation banking. *Boston College Environmental Affairs Law Review* **27**:161.
- Newton, I. and P. Rothery. 1997. Senescence and reproductive value in sparrowhawks. *Ecology* **78**:1000-1008.
- Nichols, W.J. 2002. Biology and conservation of sea turtles in Baja California, Mexico. Unpublished doctoral dissertation. School of renewable natural resources, the University of Arizona.
- Nichols, W.J., A. Resendiz, and C. Mayoral-Rousseau. 2000. Biology and conservation of loggerhead turtles (*Caretta caretta*) in Baja California, Mexico. Pp. 169-171, in *Proceedings of the Nineteenth Annual Symposium on Sea Turtle Conservation and Biology*, 2-6 March, 1999, South Padre Island, Texas.
- Nightingale, B. and C. A. Simenstad. 2001. Overwater structures: marine issues. Research Project T1803-Task 35, Report prepared by the Washington State Transportation Center for the Washington State Transportation Commission and the U.S. Department of Transportation, Washington, D.C.

- Nonacs, P. 2001. State dependent behavior and the Marginal Value Theorem. *Behavioral Ecology* 12(1):71-83.
- Noronha, F. 1999. Olive ridleys return to Orissa beaches. *Environmental News Service*, April 14, 1999.
- Noss, R. F. 1989. Longleaf pine and wiregrass: Keystone components of an endangered ecosystem. *Natural Areas Journal* 9:211-213.
- Noss, R.F., E.T. LaRoe III, and J.M. Scott. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. Biological Report 28. U.S. Department of the Interior, National Biological Service; Washington, D.C.
- O'Grady, J. J., D. H. Reed, B. W. Brook, and R. Frankham. 2004. What are the best correlates of predicted extinction risk? *Biological Conservation* 118: 513-520.
- Oli, M.K. and F.S. Dobson. 2003. The relative importance of life-history variables to population growth rate in mammals: Cole's prediction revisited. *The American Naturalist* 161(3):422-440.
- Olsson, O., J. S. Brown, and H. G. Smith. 2002. Long- and short-term state-dependent foraging under predation risk: An indication of habitat quality. *Animal Behavior* 63:981-989.
- Oregon Department of State Lands and U.S. Fish and Wildlife Service. 2010. Wetland and land use change in the Willamette Valley, Oregon: 1994 to 2005. Volume 1: Final Report. Oregon Department of State Lands, Salem, Oregon.
- Overli, O., T. G. Pottinger, T. R. Carrick, E. Overli, and S. Winberg. 2002. Differences in behaviour between rainbow trout selected for high- and low-stress responsiveness. *Journal of Experimental Biology* 205:391-395.
- Owen, C. R., and H. M. Jacobs. 1992. Wetland protection as land-use planning: the impact of section 404 in Wisconsin, USA. *Environmental Management* 16: 345 - 353.
- Palmqvist, E., and P. Lundberg. 1998. Population extinctions in correlated environments. *Oikos* 83: 359-367.
- Pandav, B. and B.C. Choudhury. 1999. An update on the mortality of olive ridley sea turtles in Orissa, India. *Marine Turtle Newsletter* 83:10-12.
- Pandav, B. and C.S. Kar. 2000. Reproductive span of olive ridley turtles at Gahirmatha rookery, Orissa, India. *Marine Turtle Newsletter* 87:8-9.
- Parametrix. 2010. City of Renton shoreline master program update. Shoreline cumulative effects analysis. Report prepared by Parametrix, Adolfson Associates, Inc., and Maney ARC for City of Renton, Renton, Washington.
- Parker, D.M., P.H. Dutton, K. Kopitsky, and R.L. Pitman. In press. Proceedings of the Twenty-second Annual Symposium on Sea Turtle Biology and Conservation, April 4-7, 2002, Miami, Florida.
- Parker, D.M., W. Cooke, and G.H. Balazs. In press. Dietary components of pelagic loggerhead turtles in the North Pacific Ocean. In Proceedings of the twentieth annual symposium on sea turtle biology and conservation, February 28 - March 4, 2000, Orlando, Florida.

- Parmenter, C.J. 1983. Reproductive migration in the hawksbill turtle, *Eretmochelys imbricata*. *Copeia* 1983:271-273 in K.A. Eckert. 1993. The biology and population status of marine turtles in the north Pacific Ocean. Final report to NOAA-NMFS, P.O. 40ABNF002067. 119p.
- Payne, J.T., A.W. Wood, A.F. Hamlet, R.N. Palmer, and D.P. Lettenmaier. 2004. Mitigating the effects of climate change on the water resources of the Columbia River basin. *Climatic Change* 62: 233-256.
- Pechmann, J. H. K., R. A. Estes, D. E. Scott, and J. W. Gibbons. 2001. Amphibian colonization and use of ponds created for trial mitigation of wetland loss. *Wetlands : the journal of the Society of the Wetlands Scientists* 21:93-111.
- Pellerin, B. A., W. M. Wollheim, C. S. Hopkinson, W. H. McDowell, M. R. Williams, C. J. Vorosmarty, and M. L. Daley. 2004. Role of wetlands and developed land use on dissolved organic nitrogen concentrations and DON/TDN in northeastern U S rivers and streams. *Limnology and Oceanography* 49:9.
- Perdion, J. 1997. Protecting wetlands through the Clean Water Act and the 1985 and 1990 Farm Bills: a winning trio. *University of Toledo Law Review* 28:867.
- Phillips, RA, Caldow, RWG and Furness, RW. 1996. The influence of food availability on the breeding effort and reproductive success of Arctic Skuas *Stercorarius parasiticus*. *The Ibis* 138:10.
- Pierce, D.W., T.P. Barnett, H.G. Hidalgo, T. Das, C. Bonfils, B.D. Santer, G. Bala, M.D. Dettinger, D.R. Cayan, A. Mirin, A.W. Wood, and T. Nozawa, 2008: Attribution of declining western U.S. snowpack to human effects. *Journal of Climate* 21(23): 6425-6444.
- Pillard, M. 2002. Taking wetland mitigation to the bank: an overview comparing types of mitigation banks used to prevent net wetlands loss. *Environmental protection* 13:37-41.
- Pimm, S. L., H. L. Jones, and J. Diamond. 1988. On the risk of extinction. *American Naturalist* 132: 757-785.
- Pitman, K.L. 1990. Pelagic distribution and biology of sea turtles in the eastern tropical Pacific. Pages 143-148 in E.H. Richardson, J.A. Richardson, and M. Donnell (compilers), Proc. Tenth Annual Workshop on Sea Turtles Biology and Conservation. U.S. Dep. Commerce, NOAA Technical Memo. NMFS-SEC-278.
- Plotkin, P.T., R.A. Bales, and D.C. Owens. 1993. Migratory and reproductive behavior of *Lepidochelys olivacea* in the eastern Pacific Ocean. Schroeder, B.A. and B.E. Witherington (Compilers). Proc. of the Thirteenth Annual Symp. on Sea Turtle Biology and Conservation. NOAA, Natl. Mar. Fish. Serv., Southeast Fish. Sci. Cent. NOAA Tech. Mem. NMFS-SEFSC-31.
- Plotkin, P.T., R.A. Byles and D.W. Owens. 1994. Post-breeding movements of male olive ridley sea turtles *Lepidochelys olivacea* from a nearshore breeding area. Pg.119, 14th Annual Symposium, Sea Turtle Biology and Conservation, Mar. 1-5, 1994, Hilton Head, South Carolina.
- Polovina, J.J., D.R. Kobayashi, D.M. Parker, M.P. Seki and G.H. Balazs. 2000. Turtles on the edge: movement of loggerhead turtles (*Caretta caretta*) along oceanic fronts, spanning longline fishing grounds in the central North Pacific, 1997-1998. *Fisheries Oceanography* 9: 71-82.
- Popper. K. R. 1959. The logic of scientific discovery. Harper and Row and Basic Books; New York, New York.

- Pörtner H.O., Bock C, Reipschläger A. 2000. Modulation of the cost of pH regulation during metabolic depression: a ³¹P-NMR study in invertebrate (*Sipunculus nudus*) isolated muscle. *Journal of Experimental Biology* 2003: 2417-2428.
- Pörtner H.O., Langenbuch M., Reipschläger A. 2004. Biological impact of elevated ocean CO₂ concentrations: lessons from animal physiology and Earth history. *Journal of Oceanography* 60: 705-718.
- Primack, R.B. 1993. *Essentials of conservation biology*. Sinauer Associates Sunderland, Massachusetts.
- Pritchard, P.C.H. 1982a. Marine turtles of the South Pacific. Pages 253-262 In K.A. Bjorndal (ed.), *Biology and Conservation of Sea Turtles*. Smithsonian Institution Press, Washington, DC. 583 pp.
- Pritchard, P.C.H. 1982b. Nesting of the leatherback turtle (*Dermochelys coriacea*) in Pacific Mexico, with a new estimate of the world population status. *Copeia* 1982:741-747.
- Pritchard, P.C.H. 1996. Are leatherbacks really threatened with extinction? *Chelonian Conservation and Biology*, Volume 2, Number 2, pp. 303-305.
- Pritchard, P.C.H. and P. Trebbau. 1984. *The Turtles of Venezuela*. Society for the Study of Amphibians and Reptiles in K.A. Eckert. 1993. *The biology and population status of marine turtles in the north Pacific Ocean*. Final report to NOAA-NMFS, P.O. 40ABNF002067. 119p.
- Public Employees for Environmental Responsibility. [PEER] 1999. Report card on U.S. Army Corps of Engineers' wetland protection program. Public Employees for Environmental Responsibility; Washington, D.C.
- Puget Sound Action Team. 2007. *State of the Sound 2007*. Office of the Governor, State of Washington. Olympia, Washington.
- Purvis, A., J. L. Gittleman, G. Cowlishaw, and G. M. Mace. 2000. Predicting extinction risk in declining species. *Proceedings of the Royal Society of London, Series B: Biological Sciences* 267: 1947-1952.
- Putrawidjaja, M. 2000. Marine turtles in Irian Jaya, Indonesia. *Marine Turtle Newsletter* 90:8-10.
- Race, M. S. 1985. Critique of present wetlands mitigation policies in the United States based on an analysis of past restoration projects in San Francisco Bay. *Environmental Management* 9:71 - 82.
- Race, M.S. 1986. Wetlands restoration and mitigation policies reply. *Environmental Management* 10: 571-572.
- Race, M.S. and M.S. Fonseca. 1995. Fixing compensatory mitigation: what will it take? *Ecological Applications* 6: 94-101.
- Railsback, S. F., and K. A. Rose. 1999. Bioenergetics modeling of stream trout growth: temperature and food consumption effects. *Transactions of the American Fisheries Society* 128:16.
- Rauscher, S.A., J.S. Pal, N.S. Diffenbaugh, and M.M. Benedetti, 2008: Future changes in snowmelt-driven runoff timing over the western United States. *Geophysical Research Letters* 35:
- Redmond, A. 1995. Florida's mitigation banking program. *National wetlands newsletter* 17:14.

- Redmond, A., T. Bates, F. Bernadino, and R.M. Rhodes. 1996. State mitigation banking programs: the Florida experience. Pages 54-75. In: L.L. Marsh, D.R. Porter, and D.A. Salvesen (eds.) Mitigation banking: theory and practice. Island Press; Washington, D.C.
- Reed, J. M. 1999. The role of behavior in recent avian extinctions and endangerments. *Conservation Biology* 13:232-241.
- Reed, J. M., L. S. Mills, J. B. Dunning, E. S. Menges, K. S. McKelvey, R. Frye, S. R. Beissinger, M.-C. Anstett, and P. Miller. 2002. Emerging issues in population viability analysis. *Conservation Biology* 16:7-19.
- Resendiz, A., B. Resendiz, J. Nichols, J. Seminoff, N. Kamezaki. 1998. First confirmed east-west transpacific movement of a loggerhead sea turtle, *Caretta caretta*, released in Baja California, Mexico. *Pacific Science* 52: 151-153.
- Resendiz, A., W. Nichols, J. Seminoff, N. Kamezaki. 1998. One-way transpacific migration of loggerhead sea turtles (*Caretta caretta*) as determined through flipper tag recovery and satellite tracking. Page 253 in Proceedings of the 17th annual sea turtle symposium, 4-8 March, 1997, Orlando, Florida..
- Rheinhardt, R. D., M. M. Brinson, and P. M. Farley. 1997. Applying wetland reference data to functional assessment, mitigation, and restoration. *Wetlands* 17:195.
- Riewald, R., A.B. Bolten, and K.A. Bjorndal. 2000. Use of satellite telemetry to estimate post-hooking behavior and mortality of loggerhead sea turtles in the pelagic longline fishery in the Azores. Final report to NMFS - Honolulu Laboratory, Order Number 40JJNF900114. December, 2000.
- Ripa, J., and P. Lundberg. 2000. The route to extinction in variable environments. *Oikos* 90:89-96.
- Robb, J. T. 2000. Indiana wetland compensatory mitigation inventory. Final Report. Indiana Department of Environmental Management, Indianapolis, Indiana.
- Robb, J. T. 2002. Assessing wetland compensatory mitigation sites to aid in establishing mitigation ratios. *Wetlands* 22:435-440.
- Robb, James T. 2000. Indiana Wetland Compensatory Mitigation: Inventory. Indiana Department of Environmental Management. May 2000. EPA Grant No. CD985482-010-0
- Roberts, C. M., and J. P. Hawkins. 1999. Extinction risk in the sea. *Trends in Ecology and Evolution* 14:241-246.
- Roff, D.A. 2002. Life history evolution. Sinauer Associates, Inc.; Sunderland, Massachusetts.
- Rogers, S.G. and W. Weber. 1994. Occurrence of shortnose sturgeon (*Acipenser brevirostrum*) in the Ogeechee-Canoochee river system, Georgia, during the summer of 1993. Final Report of the United States Army to the Nature Conservancy of Georgia.
- Rogers, S.G. and W. Weber. 1995. Status and restoration of Atlantic and shortnose sturgeons in Georgia. Final Report to the National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, Florida.
- Roise, J., K. Gainey, and T. Shear. 2004. An approach to optimal wetland mitigation using mathematical programming and geographic information system based wetland function estimation. *Wetlands Ecology and Management* 12:321-331.

- Romero, L.M. 2004. Physiological stress in ecology: lessons from biomedical research. *Trends in Ecology and Evolution* 19(5):249-255.
- Rose, K. A., E. S. Rutherford, D. S. McDermot, J. L. Forney, and E. L. Mills. 1999. Individual-based model of yellow perch and walleye populations in Oneida Lake. *Ecological Monographs* 69:127-154.
- Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. p.189-195. In K. Bjorndal (editor). *Biology and Conservation of Sea Turtles*. Smithsonian Inst. Press, Washington, D.C.
- Roy, A. H., A. D. Rosemond, M. J. Paul, D. S. Leigh, and J. B. Wallace. 2003. Stream macroinvertebrate response to catchment urbanization (Georgia, USA). *Freshwater Biology* 48:329-346.
- Royall, R. 2004. The likelihood paradigm for statistical evidence. Pages 119 - 152 in M. L. Taper, and S. R. Lele, editors. *The nature of scientific evidence. Statistical, philosophical, and empirical considerations*. University of Chicago Press, Chicago, Illinois.
- Rudstam, L. G., F. P. Binkowski, and M. A. Miller. 1994. A bioenergetics model for analysis of food consumption patterns of bloater in Lake Michigan. *Transactions of the American Fisheries Society* 123:344.
- Ruiz, G.A. 1994. Sea turtle nesting population at Playa la Flor, Nicaragua: An Olive Ridley "Arribada" Beach. Pg.129-130, 14th Annual Symposium, Sea Turtle Biology and Conservation, March 1-5, 1994, Hilton Head, South Carolina.
- Rupeni, E., S. Mangubhai, K. Tabunakawai and B. Blumel. 2002. Establishing replicable community-based turtle conservation reserves in Fiji. Presented at the Western Pacific Sea Turtle Cooperative Research & Management Workshop, Honolulu, Hawaii, February 5-8, 2002.
- Sapolsky, R.M. 1990. Stress in the wild. *Scientific American* 262(1):116-123.
- Sapolsky, R.M. 1997. Response: stress and glucocorticoid. *Science* 275(5306):5.
- Sapp, W. W. 1995. The supply-side and demand-side of wetlands mitigation banking. *Oregon law review* 74:951.
- Sargeant, S. L., M. C. Miller, C. W. May, and R. M. Thom. 2004. Shoreline armoring research program. Phase II: Conceptual model development for bank stabilization in freshwater systems. Reported prepared by Battelle Marine Sciences Laboratory, Pacific Northwest National Laboratory, for Washington State Department of Transportation, Olympia, Washington.
- Sarti, L. 2002. Current population status of *Dermochelys coriacea* in the Mexican Pacific Coast. Presented at the Western Pacific Sea Turtle Cooperative Research & Management Workshop, Honolulu, Hawaii, February 5-8, 2002.
- Sarti, L., S.A. Eckert, and N.T. Garcia. 1997. Results of the 1996-97 Mexican leatherback nesting beach census. NOAA/NMFS Final Report for Contract: 43AANF604301.
- Sarti, L., S.A. Eckert, and N.T. Garcia. 1998. Estimation of the nesting population size of the leatherback sea turtle, *Dermochelys coriacea*, in the Mexican Pacific during the 1997-98 nesting season. Final Contract Report to National Marine Fisheries Service; La Jolla, California.

- Sarti, L., S.Eckert, P. Dutton, A. Barragán, and N. García. 2000. The current situation of the leatherback population on the Pacific coast of Mexico and central America, abundance and distribution of the nestings: an update. Pp. 85-87 in Proceedings of the Nineteenth Annual Symposium on Sea Turtle Conservation and Biology, 2-6 March, 1999, South Padre Island, Texas.
- Sarti, L.M., S.A. Eckert, N.T. Garcia, and A.R. Barragan. 1996. Decline of the world's largest nesting assemblage of leatherback turtles. Marine Turtle Newsletter. Number 74. July 1996.
- Schmittner, A., M. Latif, and B. Schneider. 2005. Model projections of the North Atlantic thermohaline circulation for the 21st century assessed by observations. Geophysical Research Letters 32: L23710.
- Scholz, N. L., N. K. Truelove, B. L. French, B. A. Berejikian, T. P. Quinn, E. Casillas, and T. K. Collier. 2000. Diazinon disrupts antipredator and homing behaviors in chinook salmon (*Oncorhynchus tshawytscha*). Canadian Journal of Fisheries and Aquatic Sciences 57:1911-1918.
- Schueler, T. 1994. The Importance of imperviousness. Watershed Protection Techniques 2:100-111.
- Schwandt, A.J., K.L. Williams, A.C. Steyermark, J.R. Spotila, F.V. Paladino. 1996. Hatching success of the Leatherback turtle (*Dermodochelys coriacea*) in natural nests at Playa Grande, Costa Rica. Pg.290, 15th Ann. Symp. Sea Turtle Biol. and Conserv, Feb. 20-25, 1995, Hilton Head, South Carolina.
- Sea Turtle Association of Japan. 2002. Population trends and mortality of Japanese loggerhead turtles, *Caretta caretta* in Japan. Presented at the Western Pacific Sea Turtle Cooperative Research & Management Workshop, Honolulu, Hawaii, February 5-8, 2002.
- Secor, D.H., T.E. Gunderson. 1997. Effects of hypoxia and temperature on survival, growth, and respiration of juvenile Atlantic sturgeon, *Acipenser oxyrinchus*. Fishery Bulletin 96: 603-613.
- Seminoff, J.A. 2002. Global status of the green turtle (*Chelonia mydas*): a summary of the 2001 stock assessment for the IUCN Red List Programme. Presented at the Western Pacific Sea Turtle Cooperative Research & Management Workshop, Honolulu, Hawaii, February 5-8, 2002.
- Shabman, L. and W. Cox. 2004. Urban waters supply and the environment: extending the reach of section 404 of the Clean Water Act. Virginia Environmental Law Journal 23:75-109.
- Shafer, M.L. and F.B. Samson. 1985. Population size and extinction: a note on determining critical population sizes. The American Naturalist 125: 144-152.
- Sifneos, J. C., E. W. Cake, Jr., and M. E. Kentula. 1992. Effects of Section 404 permitting on freshwater wetlands in Louisiana, Alabama, and Mississippi. Wetlands 12:28 - 36.
- Sifneos, J. C., M. E. Kantula, and P. Price. 1992. Impacts of Section 404 permits requiring compensatory mitigation of freshwater wetlands in Texas and Arkansas. The Texas Journal of Science 44:475-486.
- Silva-Batiz, F.A., E. Godinez-Dominguez, J.A. Trejo-Robles. 1996. Status of the olive ridley nesting population in Playon de Mismaloya, Mexico: 13 years of data. Pg.302, 15th Annual Symposium, Sea Turtle Biology and Conservation, Feb. 20-25, 1995, Hilton Head, South Carolina.

- Smith, Ellen and Baker, Jason. August 2008. *Pacific Island Ecosystem Complex chapter, Climate Impacts on U.S. Living Marine Resources: National Marine Fisheries Service Concerns, Activities and Needs*. K.E. Osgood (editor). NOAA Technical Memorandum NMFS-F/SPO-89. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Pacific Fisheries Science Center; Honolulu, Hawaii.
- Smith, J.B. 1999. Western wetlands: the backwater of wetlands regulation. *Natural Resources Journal* 39: 357-413
- Smock, L. A., W. A. B., and A. C. Benke. 2005. Atlantic coast rivers of the southeastern United States. Pages 73-124 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Smoktonowicz, A. 2005. Federal conservation of wetlands runs amuck with wetland mitigation banking. *Ohio Northern University Law Review* 31:177-195.
- Southwood, A.L., R.D. Andrews, M.E. Lutcavage, F.V. Paladino, N.H. West, R.H. George, and D. R. Jones. 1999. Heart rates and diving behavior of leatherback sea turtles in the eastern Pacific Ocean. *The Journal of Experimental Biology* 202: 1115-1125.
- Spieles, D. J. 2005. Vegetation development in created, restored, and enhanced mitigation wetland banks of the United States. *Wetlands* 25:51-63.
- Spieles, D., M. Coneybeer, and J. Horn. 2006. Community structure and quality after 10 years in two central Ohio mitigation bank wetlands. *Environmental Management* 38:837-852.
- Spomer, S.M., and L.G. Higley. 1993. Population status and distribution of the Salt Creek tiger beetle, *Cicindela nevadica lincolniana* Casey (Coleoptera: Cicindelidae). *Journal of the Kansas Entomological Society* 66(4): 392-398.
- Spotila, J.R., A.E. Dunham, A.J. Leslie, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: Are leatherback turtles going extinct? *Chelonian Conservation and Biology* 2(2):209-222.
- Spotila, J.R., R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. *Nature* 45:##.
- Spotilla, J.R., A. Steyermark, and F. Paladino. 1998. Loss of leatherback turtles from the Las Baulas population, Costa Rica from 1993-1998: Causes and corrective actions. March 31, 1998.
- Springer, A. M., D. G. Roseneau, D. S. Lloyd, C. P. McRoy, and E. C. Murphy. 1986. Seabird responses to fluctuating prey availability in the eastern Bering Sea. *Marine Ecology* 32:1-12.
- Stanford, J. A., F. R. Hauer, S. V. Gregory, and E. B. Snyder. 2005. Columbia River basin. Pages 591-655 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.

- Starbird, C.H. and M.M. Suarez. 1994. Leatherback sea turtle nesting on the north Vogelkop coast of Irian Jaya and the discovery of a leatherback sea turtle fishery on Kei Kecil Island. Pg.143, 14th Annual Symposium on Sea Turtle Biology and Conservation Mar. 1-5, 1994, Hilton Head, South Carolina.
- Starbird, C.H., A. Baldrige, and J.T. Harvey. 1993. Seasonal occurrence of leatherback sea turtles (*Dermochelys coriacea*) in the Monterey Bay region, with notes on other sea turtles, 1986-1991. California Fish and Game 79(2): 54-62.
- Stearns, S. C. 1992, The evolution of life histories. New York, New York, Oxford University Press.
- Stedman, S. M. and T. E. Dahl. 2008. Status and trends of wetlands in the coastal watersheds of the eastern United States, 1998 to 2004. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service and U.S. Department of the Interior, U.S. Fish and Wildlife Service, Silver Spring, Maryland and Washington, D.C.
- Stein, B. A., L. S. Kutner, and J. S. Adams, editors. 2000. Precious heritage. The status of biodiversity in the United States. Oxford University Press, Inc., New York, New York.
- Stein, E. D. and R. F. Ambrose. 1998. Cumulative impacts of Section 404 Clean Water Act permitting on the riparian habitat of the Santa Margarita, California watershed. Wetlands 18:393-408.
- Stein, E. D., F. Tabatabai, and R. F. Ambrose. 2000. Wetland mitigation banking: a framework for crediting and debiting. Environmental Management 26:233.
- Stern, D. H. and M. S. Stern. 1980. Effects of bank stabilization on the physical and chemical characteristics of streams and small rivers: a synthesis. FWS/OBS-80/11, U.S. Department of the Interior, Fish and Wildlife Service, Eastern Energy and Land Use Team, Washington, D.C.
- Stewart, D. J., and F. P. Binkowski. 1986. Dynamics of consumption and food conversion by Lake Michigan alewives: an energetics-modeling synthesis. Transactions of the American Fisheries Society 115:643-661.
- Stewart, I.T., D.R. Cayan, and M.D. Dettinger, 2004: Changes in snowmelt runoff timing in western North America under a 'business as usual' climate change scenario. Climatic Change 62(1-3): 217-232.
- Steyermark, A.C., K. Williams, J.R. Spotila, F.V. Paladino, D.C. Rostal, S.J. Morreale, M.T. Koberg, and R. Arauz. 1996. Nesting leatherback turtles at Las Baulas National Park, Costa Rica. Chelonian Conservation and Biology. 2(2) 173-183.
- Stillman, R. A. 2003. Predicting wader mortality and body condition from optimal foraging behavior. Wader Study Group Bulletin 100:192 - 196.
- Stillman, R. A., A. E. Poole, J. D. Goss-Custard, R. W. G. Caldow, M. G. Yates, and P. Triplet. 2002. Predicting the strength of interference more quickly using behavior-based models. The Journal of Animal Ecology 71:532-541.
- Stillman, R. A., and J. D. Goss-Custard. 2002. Seasonal changes in the response of oystercatchers *Haematopus ostralegus* to human disturbance. Journal of Avian Biology 33:358-365.

- Stillman, R. A., J. D. Goss-Custard, A. D. West, S. D. Durell, S. McGrorty, R. W. G. Caldow, K. J. Norris, I. G. Johnstone, B. J. Ens, J. van der Meer, and P. Triplet. 2001. Predicting shorebird mortality and population size under different regimes of shellfishery management. *The Journal of Animal Ecology* 38:857-868.
- Stillman, R. A., J. D. Goss-Custard, and M. J. Alexander. 2000. Predator search pattern and the strength of interference through prey depression. *Behavioral Ecology* 11:9.
- Stillman, R. A., J. D. Goss-Custard, and R. W. G. Caldow. 1997. Modeling interference from basic foraging behaviour. *The Journal of Animal Ecology* 66:12.
- Stillman, R. A., L. M. Bautista, J. C. Alonso, and J. A. Alonso. 2002. Modeling state-dependent interference in common cranes. *The Journal of Animal Ecology* 71:874-882.
- Stillman, R. A., R. W. G. Caldow, J. D. Goss-Custard, and M. J. Alexander. 2000. Individual variation in intake rate: the relative importance of foraging efficiency and dominance. *The Journal of Animal Ecology* 69:484-493.
- Stinson, M. 1984. Biology of sea turtles in San Diego Bay, California and the Northeastern Pacific Ocean. Master's Thesis, San Diego State University.
- Stocker, M. 2002. Sounding the alarm on underwater noise. *Nature* 420:740.
- Stolt, M. H., M. H. Genthner, W. Lee Daniels, V. A. Groover, S. Nagle, and K. C. Haering. 2000. Comparison of soil and other environmental conditions in constructed and adjacent palustrine reference wetlands. *Wetlands* 20:671-683.
- Studt, J. and R. D. Sokolove. 1996. Federal wetland mitigation policies. Pages 37 - 53 in L. L. Marsh, D. R. Porter, and D. A. Salvesen, editors. *Mitigation banking: theory and practice*. Island Press and the Urban Land Institute, Washington, D.C.
- Suarez, A. 1999. Preliminary data on sea turtle harvest in the Kai Archipelago, Indonesia. Abstract appears in the 2nd ASEAN Symposium and Workshop on Sea Turtle Biology and Conservation, held from July 15-17, 1999, in Sabah, Malaysia.
- Suárez, A. and C.H. Starbird. 1996a. Subsistence hunting of leatherback turtles, *Dermochelys coriacea*, in the Kai Islands, Indonesia. *Chelonian Conservation and Biology* 2(2): 190-195.
- Suarez, M. and C.H. Starbird. 1996b. Subsistence hunting of leatherbacks in the Kei Islands, Indonesia. Pg.314, 15th Annual Symposium on Sea Turtle Biology and Conservation Feb. 20-25, 1995, Hilton Head, South Carolina.
- Sudol, M. F., and R. F. Ambrose. 2002. The US Clean Water Act and habitat replacement: evaluation of mitigation sites in Orange County, California, USA. *Environmental Management* 30:727 - 734.
- Suganuma, H., K. Horikoshi, H. Tachikawa, F. Sato, M. Yamaguchi. 1996. Reproductive characteristics of the Ogasawara green turtles. Pg. 318 in *Proceedings of the fifteenth annual symposium on sea turtle biology and conservation*, 20-25 February, 1995, Hilton Head, South Carolina, June, 1996.

- Sutherland, W. J. 1996a. From individual behavior to population ecology. Oxford University Press, Oxford, United Kingdom.
- Sutherland, W. J. 1996b. Predicting the consequences of habitat loss for migratory populations. Proceedings of the Royal Society of London. Series B, Containing papers of a Biological character 263:1325.
- Sutherland, W. J. 1998. The effect of local change in habitat quality on populations of migratory species. The Journal of Applied Ecology 35:418-421.
- Sutherland, W. J., and G. A. Allport. 1994. A spatial depletion model of the interaction between bean geese and widgeon with the consequences for habitat management. The Journal of Animal Ecology 63:51-59.
- Suwelo, I.S. 1999. Olive ridley turtle records from South Banyuwangi, East Java. Marine Turtle Newsletter 85:9.
- Sweka, J., and K. Hartman. 2001. Effects of turbidity on prey consumption and growth in brook trout and implications for bioenergetics modeling. Canadian Journal of Fisheries and Aquatic Sciences 58:8.
- Swords, D. C. 1992. The Comprehensive Wetlands Conservation and Management Act of 1991: a restructuring of section 404 that affords inadequate protection for critical wetlands. Louisiana Law Review 53:163.
- Taper, M. L., and S. R. Lele, editors. 2004. The nature of scientific evidence. Statistical, philosophical, and empirical considerations. University of Chicago Press, Chicago, Illinois.
- Teels, B. M., L. E. Mazanti, and C. A. Rewa. 2004. Using an IBI to assess effectiveness of mitigation measures to replace loss of a wetland-stream ecosystem. Wetlands 24:375-384.
- The Heinz Center. 2002. The state of the nation's ecosystems. Measuring the lands, waters, and living resources of the United States. The H. John Heinz III Center for Science, Economic, and the Environment, Washington, D.C. Published by the Cambridge University Press; New York, New York.
- The Heinz Center. 2003. 2003 Update to the state of the nation's ecosystems. Measuring the lands, waters, and living resources of the United States. The H. John Heinz III Center for Science, Economic, and the Environment, Washington, D.C. Available on-line at <http://www.heinzctr.org/ecosystems/report.html>.
- The Royal Society of London. 2005. Ocean acidification due to increasing atmospheric carbon dioxide. London, United Kingdom: The Royal Society of London.
- Thomas, R. and Z. Lamb. 2005. Compensatory wetland mitigation and the watershed approach: a review of selected literature. Wetland Science and Practice 22:61-70.
- Thomas, R. E., J. A. Gharrett, M. G. Carls, S. D. Rice, A. Moles, and S. Korn. 1986. Effects of fluctuating temperature on mortality, stress, and energy reserves of juvenile coho salmon. Transactions of the American Fisheries Society 115:52-59.
- Torok, L. S., S. Lockwood, and D. Fanz. 1996. Review and comparison of wetland impacts and mitigation requirements between New Jersey, USA, Freshwater Wetlands Protection Act and section 404 of the Clean Water Act. Environmental Management 20:12.
- Tuato'o-Bartley, N., T. Morrell, P. Craig. 1993. Status of sea turtles in American Samoa in 1991. Pacific Science 47(3): 215-221.

- Turchin, P. 2003. Complex population dynamics: a theoretical/empirical synthesis. Princeton University Press; Princeton, New Jersey.
- Turtle Expert Working Group. 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-444. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Science Center; Miami, Florida.
- Turtle Foundation. 2002. White paper summarizing a green turtle project on Sangalaki Island, East Kalimantan, Indoneisa, presented at the Western Pacific Sea Turtle Cooperative Research & Management Workshop, Honolulu, Hawaii, February 5-8, 2002.
- U.S. Army Corps of Engineers [USACE]. 1977. Regulatory program of the Corps of Engineers. Final Rule. Federal Register 42 (138): 37122-37164.
- U.S. Army Corps of Engineers [USACE]. 1986. Final rule for regulatory programs of the Corps of Engineers. Federal Register 51 (219): 41206 – 41260.
- U.S. Army Corps of Engineers [USACE]. 1991. Final rule for nationwide permit program regulations and issue, reissue, and modify nationwide permits. Federal Register 56 (226): 59110 –
- U.S. Army Corps of Engineers [USACE]. 1995. Section 404 of the Clean Water Act and wetlands. Special statistical report. Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 1996. Final rule for nationwide permit program regulations and issue, reissue, and modify nationwide permits. Federal Register 61 (241): 65874 – 65922.
- U.S. Army Corps of Engineers [USACE]. 2000. Final notice on issuance of nationwide permit program regulations. Federal Register 65 (47): 12818 – 12899.
- U.S. Army Corps of Engineers [USACE]. 2002. Final notice on issuance of nationwide permit program regulations. Federal Register 67 (10): 2020 – 2095.
- U.S. Army Corps of Engineers [USACE]. 2006. Proposed notice to reissue and modify nationwide permits. Federal
- U.S. Army Corps of Engineers [USACE]. 2007a. Draft decision document for nationwide permit 1. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007b. Draft decision document for nationwide permit 3. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007c. Draft decision document for nationwide permit 4. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007d. Draft decision document for nationwide permit 7. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007e. Draft decision document for nationwide permit 8. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.

- U.S. Army Corps of Engineers [USACE]. 2007f. Draft decision document for nationwide permit 11. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007g. Draft decision document for nationwide permit 12. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007h. Draft decision document for nationwide permit 13. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007i. Draft decision document for nationwide permit 14. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007j. Draft decision document for nationwide permit 17. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007k. Draft decision document for nationwide permit 27. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007l. Draft decision document for nationwide permit 29. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007m. Draft decision document for nationwide permit 31. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007n. Draft decision document for nationwide permit 33. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007o. Draft decision document for nationwide permit 35. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007p. Draft decision document for nationwide permit 36. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007q. Draft decision document for nationwide permit 39. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007r. Draft decision document for nationwide permit 40. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007s. Draft decision document for nationwide permit 43. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007t. Draft decision document for nationwide permit 46. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2007u. Draft decision document for nationwide permit 48. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011a. Proposal to reissue and modify nationwide permits. Federal Register 76 (32): 9174-9207.

- U.S. Army Corps of Engineers [USACE]. 2011b. Draft decision document for nationwide permit 1. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011c. Draft decision document for nationwide permit 3. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011d. Draft decision document for nationwide permit 4. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011e. Draft decision document for nationwide permit 7. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011f. Draft decision document for nationwide permit 8. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011g. Draft decision document for nationwide permit 11. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011h. Draft decision document for nationwide permit 12. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011i. Draft decision document for nationwide permit 13. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011j. Draft decision document for nationwide permit 14. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011k. Draft decision document for nationwide permit 17. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011l. Draft decision document for nationwide permit 27. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011m. Draft decision document for nationwide permit 29. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011n. Draft decision document for nationwide permit 31. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011o. Draft decision document for nationwide permit 33. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011p. Draft decision document for nationwide permit 35. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011q. Draft decision document for nationwide permit 36. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011r. Draft decision document for nationwide permit 39. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.

- U.S. Army Corps of Engineers [USACE]. 2011s. Draft decision document for nationwide permit 40. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011t. Draft decision document for nationwide permit 43. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011u. Draft decision document for nationwide permit 46. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers [USACE]. 2011v. Draft decision document for nationwide permit 48. U.S. Army Corps of Engineers, Regulatory Functions Branch; Washington, D.C.
- U.S. Army Corps of Engineers, O. D. 2008. Cumulative effects analysis: Upper Yellowstone River, Park County, Montana. Open File Report 2004-1442, U.S. Department of Defense, U.S. Army Corps of Engineers, Omaha District, Regulatory Branch, Omaha, Nebraska.
- U.S. Army Corps of Engineers, O. D. 2011. Special area management plan (SAMP): Upper Yellowstone River, Montana. U.S. Department of Defense, U.S. Army Corps of Engineers, Omaha District, Montana Regulatory Program, Helena, Montana.
- U.S. Council on Environmental Quality. 1997. Considering cumulative effects under the National Environmental Policy Act. Executive Office of the President of the United States, Council on Environmental Quality, Washington, D.C.
- U.S. Department of Agriculture. 1989. The second RCA appraisal: soil, water, and related resources on nonfederal land in the United States. Analysis of condition and trends. U.S. Department of Agriculture; Washington, D.C.
- U.S. Department of the Interior. 1988. The impact of federal programs on wetlands. Volume I. U.S. Department of the Interior; Washington, D.C.
- U.S. Department of the Interior. 1994. The impact of federal programs on wetlands. Volume II. U.S. Department of the Interior; Washington, D.C.
- U.S. General Accountability Office. 1988. Administration and enforcement of the Section 404 program. Testimony. U.S. General Accountability Office, Washington, D.C.
- U.S. General Accountability Office. 1993. Wetlands protection. The scope of the Section 404 program remains uncertain. U.S. General Accountability Office, Washington, D.C.
- U.S. General Accountability Office. 1993. Wetlands protection. The scope of the Section 404 program remains uncertain. U.S. General Accountability Office, Washington, D.C.
- U.S. General Accountability Office. 2005. Wetlands protection. Corps of Engineers does not have an effective oversight approach to ensure that compensatory mitigation is occurring. U.S. General Accountability Office, Washington, D.C.

- U.S. General Accountability Office. 2005. Wetlands protection. Corps of Engineers does not have an effective oversight approach to ensure that compensatory mitigation is occurring. U.S. General Accountability Office, Washington, D.C.
- U.S. General Accounting Office. 1988. Wetlands. The Corps of Engineers' administration of the section 404 program. U.S. General Accounting Office; Washington, D.C.
- U.S. Office of Technology Assessment. 1984. Wetlands: their use and regulation. OTA-0-206, U.S. Government Printing Office, Washington, D.C.
- Uchmanski, J. 1999. What promotes persistence of a single population: an individual-based model. *Ecological modelling* 115:16.
- Uchmanski, J. 2000. Individual variability and population regulation: an individual-based model. *Oikos* 90:539-548.
- Uchmanski, J. 2000. Resource partitioning among competing individuals and population persistence: an individual-based model. *Ecological Modeling* 131:12.
- Vinogradov, A. E. 2004. Genome size and extinction risk in vertebrates. *Proceedings: Biological Sciences* 271:5.
- Vucetich, J. A., T. A. Waite, L. Qvarnemark, and S. Ibarquen. 2000. Population variability and extinction risk. *Conservation Biology* 14:1704-1714.
- Ward, G. M., P. M. Harris, and A. K. Ward. 2005. Gulf coast rivers of the southeastern United States. Pages 125-180 in A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Ware, S., C. C. Frost, and P. Doerr. 1993. Southern mixed hardwood forest (the former longleaf pine forest). in W. H. Martin, editor. *Biotic communities of the southeastern United States. Volume 1: Terrestrial communities*. John Wiley and Sons, Publishers, New York, New York.
- Warrick, J. A. and K. M. Orzech. 2006. The effects of urbanization on discharge and suspended-sediment concentrations in a southern California river. Pages 163 - 170 in W. Acevedo, J. L. Taylor, D. J. Hester, C. S. Mladinich, and S. Glavac, editors. *Rates, trends, causes, and consequences of urban land-use change in the United States*. U.S. Department of the Interior, Geological Survey, Menlo Park, California.
- Weaver, L. A. and G. C. Garman. 1994. Urbanization of a watershed and historical changes in a stream fish assemblage. *Transactions of the American Fisheries Society* 123:162-172.
- Weber, W. 1996. Population size and habitat use of shortnose sturgeon, *Acipenser brevirostrum*, in the Ogeechee River system, Georgia. Unpublished Master Thesis, University of Georgia, Athens, Georgia.
- Weller, C., M. Watzin, and D. Wang. 1996. Role of wetlands in reducing phosphorus loading to surface water in eight watersheds in the Lake Champlain Basin. *Environmental Management* 20:731-739.
- Wenner, L. M. 1993. Wetlands preservation in the United States: a case of fragmented authority. *Northern Illinois University Law Review* 13:589.
- Whigham, D. F., C. Chitterling, and B. Palmer. 1988. Impacts of freshwater wetlands on water quality: A landscape perspective. *Environmental Management* 12:663-671.

- Whigham, D., M. Pittek, K. H. Hofmockel, T. Jordan, and A. L. Pepin. 2002. Biomass and nutrient dynamics in restored wetlands on the outer coastal plain of Maryland, USA. *Wetlands* **22**:562-574.
- White, D., K. Johnston, and M. Miller. 2005. Ohio River basin. Pages 375-426 *in* A. C. Benke and C. E. Cushing, editors. *Rivers of North America*. Elsevier Academic Press, London, United Kingdom.
- Whitman, M. S. 2002. A protocol for assessing the impacts of urbanization on coho salmon with application to Chester Creek, Anchorage, Alaska. Master of Science thesis. University of Alaska Fairbanks, Fairbanks, Alaska.
- Wilcove, D. S., D. Rothstein, J. Dubow, A. J. Phillips, and E. Losos. 1998. Quantifying threats to imperiled species in the United States. *Bioscience* **48**:697-615.
- Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, and E. Losos. 2000. Leading threats to biodiversity: what's imperiling U.S. species? Pages 239 - 254 *in* B. A. Stein, L. S. Kutner, and J. S. Adams, editors. *Precious heritage. The status of biodiversity in the United States*. Oxford University Press, Inc., New York, New York.
- Wilen, B. O. and W. E. Frayer. 1990. Status and trends of US wetlands and deepwater habitats. *Forest ecology and management* **33/34**:181-192.
- Wilkinson, J., and J. Thompson. 2006. 2005 status report on compensatory mitigation in the United States. Washington, D.C., The Environmental Law Institute.
- Wilson, R. F. and W. J. Mitsch. 1996. Functional assessment of five wetlands constructed to mitigate wetland loss in Ohio, USA. *Wetlands* **16**:436 - 451.
- Winter, T. C., D. O. Rosenberry, D. C. Buso, and D. A. Merk. 2001. Water source to four US wetlands: implications for wetland management. *Wetlands* **21**:462-473.
- Yates, K. E. 1998. Wetlands mitigation and mitigation banking in Louisiana. *Louisiana Law Review* **59**:32.
- Yocom, T. G., R. A. Leidy, and C. A. Morris. 1989. Wetlands protection through impact avoidance: a discussion of the 404(b)(1) alternatives analysis. *Wetlands* **9**:283 - 297.
- Zedler, J. B., G. D. Williams, and J. S. Desmond. 1997. Wetland mitigation: can fishes distinguish between natural and constructed wetlands? *Fisheries* **22**:4.
- Zedler, J.B. 1996. Ecological issues in wetland mitigation: an introduction to the forum. *Ecological Applications* **6**: 33-37
- Zens, M. S., and D. R. Peart. 2003. Dealing with death data: individual hazards, mortality and bias. *Trends in Ecology and Evolution* **18**:366-373.