ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED APPLICATION OF PROTECTIVE REGULATIONS UNDER SECTION 4(D) OF THE ENDANGERED SPECIES ACT FOR THE THREATENED SOUTHERN DISTINCT POPULATION SEGMENT OF NORTH AMERICAN GREEN STURGEON

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How to read this Environmental Assessment

This environmental assessment (EA) was written to provide information to decision-makers at the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) and to the public about a final rule under section 4(d) of the Federal Endangered Species Act (ESA) to protect the threatened Southern Distinct Population Segment (Southern DPS) of North American green sturgeon. This EA describes the proposed and alternative ESA 4(d) Rules considered by NMFS and provides an analysis of the potential environmental effects of each. A draft EA was prepared for the proposed rule and alternatives to inform NMFS' decision-making and was made available for public comment. The public comments received are incorporated in this Final EA.

This EA is organized as follows:

1.0 Introduction
2.0 Purpose of and need for action
3.0 Alternatives
4.0 Affected environment
5.0 Environmental consequences
6.0 Consultation and coordination
7.0 Distribution list
8.0 Bibliography

Chapter 1 provides relevant background on green sturgeon biology and the ESA. Key points include: (1) the definition of Distinct Population Segments (DPS) for green sturgeon; and (2) the definition and purpose of ESA 4(d) Rules.

Chapter 2 presents the purpose of and need for an ESA 4(d) Rule for the threatened Southern DPS. The purpose and scope of this EA and the major environmental issues are summarized.

Chapter 3 profiles the alternatives to provide the decision-maker and the public with a clear and concise comparison. The process by which the alternatives were evaluated for consideration in further analyses is also summarized.

Chapter 4 provides a description of the baseline environment. The current status of relevant resources and regulations are summarized to better understand how the alternatives may affect the human environment.

Chapter 5 presents the environmental consequences of the alternatives. The potential direct, indirect, and cumulative effects relevant to the major environmental issues are described. Table 5.1-1 in Section 5.1 summarizes the environmental consequences of each alternative.

EXECUTIVE SUMMARY

This EA evaluates the potential environmental effects that may result from implementing protective regulations under the Federal Endangered Species Act (ESA) for the threatened Southern Distinct Population Segment of North American green sturgeon (*Acipenser medirostris*; hereafter, "Southern DPS"). The National Marine Fisheries Service (NMFS) listed the Southern DPS as a threatened species under the ESA on April 7, 2006. Several threats contributing to the risk of extinction of the Southern DPS were identified, including the loss of spawning habitat; concentration of spawning into a single spawning river (i.e., the Sacramento River, CA); entrainment or impingement by water project operations, dredging, power plant operations, or other in-water activities; bycatch of green sturgeon in fisheries; and poor water quality conditions.

Section 4(d) of the ESA authorizes NMFS to issue protective regulations, called an ESA 4(d) Rule, for threatened species. The ESA 4(d) Rule may apply any or all of the prohibitions listed under section 9 of the ESA to the Southern DPS. NMFS has determined that an ESA 4(d) Rule is necessary and advisable for the Southern DPS. In developing the ESA 4(d) Rule, NMFS considered and evaluated five alternatives:

No-action Alternative: The No-action Alternative represents the environmental baseline against which the other alternatives are compared to determine their environmental effects. The No-action Alternative would not apply any of the prohibitions under section 9 of the ESA, or any other protective regulations, to the Southern DPS. Federal agencies must continue to ensure that activities they authorize, fund, or carry out comply with section 7 of the ESA and do not jeopardize the continued existence of the Southern DPS or destroy or adversely modify its critical habitat.

Full Action Alternative: All of the ESA section 9 prohibitions would be applied to the Southern DPS. Take of the Southern DPS would be prohibited within the U.S. and the U.S. territorial seas and upon the high seas. The prohibitions would apply to direct take (e.g., from fisheries harvest or scientific research) and indirect take (e.g., take resulting from habitat modifications).

Alternative A: All of the ESA section 9 prohibitions would be applied to the Southern DPS. Prohibitions on the take of the Southern DPS would not apply to all activities, however, but only to the specific categories of activities that pose the greatest threat to the Southern DPS. These categories include: fisheries harvest; collection and handling for any purpose (e.g., scientific

research, emergency fish rescue, commercial sale, consumption); construction, maintenance, or operation of migration barriers in spawning or rearing habitats (i.e., the Sacramento River and tributaries, the Delta, and the San Francisco, San Pablo, and Suisun bays); destruction or modification of spawning or rearing habitats; application of pesticides or discharge of pollutants beyond accepted levels into waterways used by the Southern DPS; and activities that may entrain or impinge the Southern DPS (e.g., operation of unscreened water diversions in spawning or rearing habitats and dredging and power plant operations throughout the occupied range); and the release or introduction of non-native species.

Alternative B (Preferred Alternative): Alternative B would be the same as the Full Action Alternative, but would include exceptions and exemptions from the take prohibitions for the following activities when conducted in compliance with NMFS-approved plans or criteria: recreational and commercial fisheries; tribal fisheries and resource management; habitat restoration; research and monitoring; emergency fish rescue; and law enforcement activities.

Alternative C: Alternative C would be the same as Alternative A, but would include the same exceptions and exemptions as those under Alternative B. Alternative C differs from Alternative B in that the take prohibitions would apply to specific categories of activities (as described under Alternative A), rather than to all activities.

Unless otherwise specified (as in Alternatives A and C), the alternatives would apply wherever the Southern DPS occurs, including but not limited to:

- The Sacramento River, lower Feather River, lower Yuba River, the Sacramento-San Joaquin Delta, San Francisco Bay, San Pablo Bay, Suisun Bay, and Humboldt Bay in California;
- Coastal bays, estuaries, and freshwater rivers in Oregon and Washington including: Coos Bay, Winchester Bay, Yaquina Bay, the lower Columbia River estuary, Willapa Bay, Grays Harbor, and Puget Sound; and
- Coastal waters within 110 meters depth from southern California to Alaska, including the Strait of Juan de Fuca.

Except for the No-action Alternative, all of the alternatives would provide some degree of protection for the Southern DPS. Alternative B was selected as the preferred alternative, however, because it was

determined to provide a high degree of protection for the Southern DPS while avoiding significant adverse effects and promoting coordination between NMFS and some of the affected entities. The primary difference between Alternative B and Alternatives A and C is that Alternative B would apply the take prohibitions to all activities that affect the Southern DPS, whereas Alternatives A and C would apply the take prohibitions to specific categories of activities. Although NMFS can identify some of the activities that affect the Southern DPS, sufficient information is not available at this time to identify and address all activities that may affect the species. In addition, NMFS does not have sufficient information to assess the potential effects of activities that are currently in preliminary stages but likely to become increasingly important along the West coast, such as alternative energy hydrokinetic projects. Given the lack of specific and detailed information to fully identify and assess all of the activities affecting the Southern DPS both now and into the future, NMFS determined that Alternatives A and C would not provide sufficient protection for the species. The Full Action Alternative and Alternative B would address these uncertainties by prohibiting all take of the Southern DPS. Alternative B was preferred over the Full Action Alternative, however, because it would more effectively facilitate coordination between NMFS and some of the affected entities and promote activities that benefit the Southern DPS, such as scientific research and monitoring and habitat restoration, by providing more stream-lined processes for these activities under the exceptions and exemptions. Thus, Alternative B was determined to be the most protective of the species and selected as the preferred alternative.

The preferred alternative (Alternative B) would be expected to result in the following effects:

- Reinforcement of existing state and Federal environmental regulations.
- Additional regulations that may affect the availability and management of natural resources.
- Additional economic and administrative costs to comply with requirements under section 7 or section 10 of the ESA, or with NMFS 4(d) criteria or plans under the exceptions and exemptions.
- Improvements in water quality and availability, fish passage, and habitat conditions for fish and wildlife.
- Increased coordination with NMFS in resource management.

The draft EA was made available for public comment. One commenter submitted several comments requesting further clarification on the alternatives and specific points in the draft EA. Responses to the comments are incorporated in this final EA and summarized in Chapter 6 of this EA.

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GLOSSARY

ACOE	U.S. Army Corps of Engineers
ADFG	Alaska Department of Fish and Game
BRT	Biological Review Team
CDFG	California Department of Fish and Game
CDWR	California Department of Water Resources
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSWRCB	California State Water Resources Control Board
CVP	Central Valley Project
CWA	Federal Clean Water Act
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EPIC	Environmental Protection & Information Center
ESA	Federal Endangered Species Act
ESU	Evolutionary Significant Unit
FERC	Federal Energy Regulation Commission
FMEP	Fishery Management and Evaluation Plan
FR	Federal Register
mt	Metric tons
NASS	National Agricultural Statistics Service
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
ODFW	Oregon Department of Fish and Wildlife
Rkm	River kilometer
SWP	State Water Project
TMDL	Total Maximum Daily Load
TRMP	Tribal Resource Management Plan
U.S.C.	U.S. Code
USDA	U.S. Department of Agriculture
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife

Anadromous – fishes that migrate as juveniles from freshwater to saltwater and then return as adults to spawn in freshwater (NMFS Glossary).

Bycatch – fish other than the primary target species that are caught incidental to the harvest of the primary species. Bycatch may be retained or discarded. Discards may occur for regulatory or economic reasons (NMFS Glossary).

Conservation (conserve, conserving) – to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the ESA are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking [ESA Section 3(3)].

Contaminant – any physical, chemical, biological, or radiological substance causing an impurity in the environment (North Carolina Cooperative Extension Service, Water Quality & Waste Management Glossary)

Cumulative effects - 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 (CEQ Regulations, 40 CFR § 1508.7).

Distinct Population Segment – a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The ESA provides a process for listing species, subspecies, or distinct population segments of vertebrate species (NMFS, Office of Protected Resources Glossary).

Endangered species – any species which is in danger of extinction throughout all or a significant portion of its range [ESA section 3(6)].

Exclusive Economic Zone - the area that extends from the seaward boundaries of the coastal states (3 nautical miles [n.mi.] in most cases; the exceptions are Texas, Puerto Rico, and the Gulf coast of Florida at 9 n.mi.) to 200 n.mi. off the U.S. coast. Within this area the United States claims and exercises sovereign rights and exclusive fishery management authority over all fish and all continental shelf fishery resources. The EEZ was created in 1983 by Presidential Proclamation 5030 (NMFS Glossary).

Habitat restoration – an activity that has the sole objective of restoring natural aquatic or riparian habitat conditions or processes (50 CFR § 222.102).

Harass – an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3).

Harm – an act which actually kills or injures fish or wildlife, such as significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR § 222.102).

High seas – the waters beyond the territorial sea or exclusive economic zone (or the equivalent) of any Nation, to the extent that such territorial sea or exclusive economic zone (or the equivalent) is recognized by the United States (50 CFR § 300.11).

Human environment – includes the natural and physical environment and the relationship of people with that environment (40 CFR § 1508.14).

Incidental take – the take of protected species that results from, but is not the purpose of, carrying out an otherwise lawful activity (50 CFR § 402.02).

Indian lands – any lands title to which is either: 1) held in trust by the United States for the benefit of any Indian tribe or individual; or 2) held by any Indian tribe or individual subject to restrictions by the United States against alienation (Secretarial Order #3206).

Indian tribe – any Indian or Alaska Native tribe, band, nation, pueblo, community, or other organized group within the United States which the Secretary of the Interior has identified on the most current list of tribes maintained by the Bureau of Indian Affairs (Secretarial Order #3206).

Jeopardize the continued existence of – 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 the listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

Listed species - any species of fish, wildlife, or plant which has been determined to be endangered or threatened under section 4 of the federal ESA (50 CFR § 402.02).

Significant impacts or effects - substantial changes to the environmental component or a material bearing on the decision-making process that result from implementation of the Proposed Action. Includes beneficial, adverse, and cumulative effects (40 CFR § 1508.27).

Species – includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature [ESA section 3(16)].

Take – to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA section 3(19)].

Territorial seas – extends 12 n.mi. offshore of the United States. States exercise authority over marine fisheries in waters from the coastline to 3 n.mi. offshore, and out to 9 n.mi. for Texas, Puerto Rico, and the Gulf coast of Florida (NMFS Glossary).

Threatened species – any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range [ESA section 3(20)].

Wetlands - those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds (Executive Order 11990; May 24, 1977).

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1.0 INTRODUCTION

In this Environmental Assessment (EA), NMFS evaluated the potential environmental effects of implementing protective regulations under the Federal Endangered Species Act (ESA) for the conservation of the threatened Southern Distinct Population Segment (DPS) of North American green sturgeon (*Acipenser medirostris* Ayres, 1854). NMFS analyzed the potential environmental effects of the proposed protective regulations, or ESA 4(d) Rule, and four alternative rules. This EA was prepared according to the Council on Environmental Quality's (CEQ) regulations for implementation of the National Environmental Policy Act (NEPA) and NOAA'S NEPA implementing procedures.

1.1 Background

The North American green sturgeon (hereafter, "green sturgeon") is an anadromous fish species that is widely distributed, but not abundant, along the Eastern Pacific coast from the Bering Sea to Ensenada, Mexico (*Fry 1973; Moyle 2002*). Green sturgeon face several threats, including the loss of spawning habitat, the degradation of water quality in currently occupied areas, fisheries harvest, and poaching.

On June 12, 2001, the Environmental Protection and Information Center (EPIC), Center for Biological Diversity, and WaterKeepers Northern California filed a petition to list the green sturgeon as threatened or endangered under the ESA and to designate critical habitat. Section 4(a) of the ESA directs the Secretary of Commerce (the "Secretary") and the agency with jurisdiction over the species (here, NMFS) to determine if a species should be listed as endangered or threatened. NMFS convened a Biological Review Team (BRT) to complete a status review of green sturgeon populations. Based on genetic analyses and evidence of spawning site fidelity, NMFS determined that green sturgeon consist of at least two DPSs (*Adams et al. 2002; Israel et al. 2004*):

1) A northern DPS consisting of populations from coastal watersheds northward of and including the Eel River ("Northern DPS"). The Northern DPS is confirmed to spawn in two rivers, the Klamath River, California, and the Rogue River, Oregon.
2) A southern DPS consisting of populations from coastal and Central Valley watersheds south of the Eel River ("Southern DPS"). The only known spawning river is the Sacramento River.

The Northern DPS and Southern DPS are distinguished by their spawning locations, but their distributions outside of natal waters generally overlap with one another, an important factor to consider

in population management and conservation (*Chadwick 1959; Miller 1972; Adams et al. 2002; Erickson et al. 2002; Israel et al. 2004; Erickson and Hightower 2007*).

Based on a Status Review conducted by NMFS in 2002 (*Adams et al. 2002*), it was determined that neither DPS warranted listing as threatened or endangered [68 *Federal Register* (FR) 4433, January 23, 2003]. Both DPSs were added to the NMFS Species of Concern List. On April 7, 2003, EPIC and others challenged NMFS' "not warranted" finding for green sturgeon. On March 2, 2004, the U.S. District Court for the Northern District of California set aside NMFS' not warranted finding. The Court remanded the matter back to NMFS, because it was not satisfied with NMFS' examination of whether purported lost spawning habitat constituted a significant portion of either DPS' range.

NMFS solicited new information during a public comment period and reconvened the BRT to update the 2002 Status Review. New information in the Status Review Update (*BRT 2005*) led NMFS to revise its previous listing determination. NMFS issued a Proposed Rule to list the Southern DPS as threatened and to keep the Northern DPS on the NMFS Species of Concern list (70 FR 17386; April 6, 2005). Following a public comment period, NMFS issued a Final Rule to list the Southern DPS as threatened under the ESA (71 FR 17757; April 7, 2006). The Final Rule took effect on July 5, 2006. Detailed information on the biology, life history, status, and threats to green sturgeon are provided in the Status Reviews and Update (*Moyle et al. 1992; Adams et al. 2002; BRT 2005; Adams et al. 2007*) and previously published listing determinations and rules (68 FR 4433, January 23, 2003; 70 FR 17386, April 6, 2005; 71 FR 17757, April 7, 2006).

1.2 Application of ESA Section 4(d)

The ESA provides several means for the protection of threatened and endangered species. Section 7 of the ESA requires Federal agencies to consult with NMFS to ensure that any activity they authorize, fund, or carry out (called the "agency action") does not jeopardize the continued existence of an endangered or threatened species (the "jeopardy provision"), or destroy or adversely modify its critical habitat (the "critical habitat provision"). The jeopardy provision automatically applies when a species is listed as endangered or threatened. Section 9 of the ESA prohibits any person subject to the jurisdiction of the United States from the following activities, with respect to endangered species:

1) Import any such species into, or export any such species from the U.S.;
2) Take (see the Glossary) any such species within the U.S. or the U.S. territorial sea;

3) Take any such species upon the high seas;
4) Possess, sell, deliver, carry, transport, or ship, by any means whatsoever, any such species taken in violation of (2) and (3) above;
5) Deliver, receive, carry, transport, or ship in interstate or foreign commerce, by any means whatsoever and in the course of commercial activity, any such species;
6) Sell or offer for sale in interstate or foreign commerce any such species; or
7) Violate any regulation pertaining to such species or to any threatened species of fish or wildlife.

All of the prohibitions listed under section 9 of the ESA automatically apply when a species is listed as endangered but not when listed as threatened. For threatened species, section 4(d) of the ESA authorizes the Secretary to establish protective regulations if the Secretary, on the advice of NMFS, determines such regulations are necessary and advisable for the conservation of the species. This set of protective regulations is called an ESA 4(d) Rule and may include any of the prohibitions listed under section 9 of the ESA, or any other regulations. NMFS determines what is necessary and advisable based on the biological status, conservation needs, and potential threats to the threatened species.

An ESA 4(d) Rule may prohibit all take of the species, or may allow exceptions or exemptions from the take prohibitions for activities that may cause take, but that overall contribute to the conservation and protection of the threatened species. Exceptions or exemptions may also be included for activities in which measures have been adopted to minimize the effects of take. The ESA 4(d) Rule would specify the criteria that must be satisfied to qualify for an exception or exemption.

Take is also addressed under section 7 and section 10 of the ESA. Following completion of an ESA section 7 consultation, NMFS may issue an incidental take statement that anticipates a certain level of take incidental to the Federal agency action. Non-Federal entities may apply for two types of take permits under section 10 of the ESA: (1) a direct take permit for scientific research or enhancement purposes [section 10(a)(1)(A)], or (2) an incidental take permit for non-research activities [section 10(a)(1)(B)]. Federal entities may also apply for an ESA section 10(a)(1)(A) permit for scientific research and enhancement purposes. Take that results from activities conducted in compliance with an ESA section 7 incidental take statement, an ESA section 10 permit, or an ESA 4(d) Rule exception or exemption would not be in violation of the ESA prohibitions.

2.0 PURPOSE OF AND NEED FOR ACTION

2.1 The Proposed Action

NMFS proposes to establish an ESA section 4(d) Rule for the Southern DPS, to implement protective measures necessary and advisable to provide for the conservation of the Southern DPS by regulating the take of the species. The ESA 4(d) Rule would apply wherever the Southern DPS occurs, unless otherwise specified. The Southern DPS occurs in areas including, but not limited to:

- Freshwater rivers, bays, and estuaries in the Central Valley, California, including the Sacramento River [up to Keswick Dam, river kilometer (rkm) 483], the lower Feather River (up to Oroville Dam, rkm 116), the lower Yuba River (up to Daguerre Point Dam, rkm 19), the San Francisco, San Pablo, and Suisun Bays, and the Sacramento-San Joaquin Delta;
- Bays and estuaries along the California, Oregon, and Washington coasts: Monterey Bay, Humboldt Bay, Coos Bay, Winchester Bay, Yaquina Bay, the lower Columbia River estuary (up to Bonneville Dam, rkm 146), Willapa Bay, Grays Harbor, and Puget Sound; and
- Coastal waters within 110 meters depth from southern California to Alaska, including the Strait of Juan de Fuca. The 110 m depth contour occurs at varying distances, but within 100 miles, offshore.

2.2 Purpose and Need

The purpose and need of the Proposed Action is to protect the Southern DPS. The Southern DPS faces several threats including, but not limited to: the loss of spawning habitat in the upper Sacramento river, and potentially in the Feather and Yuba rivers, due to migration barriers and in-stream alterations; impingement and entrainment risks posed by water project operations, dredging operations, and power plants operations; bycatch in commercial and recreational fisheries; and a general lack of population data but suspected small population size. Past and ongoing Federal, state, and local protective efforts have contributed to the conservation of the Southern DPS, but we believe these efforts alone do not sufficiently address the threats faced by the species. In addition, we do not believe that existing protections under the ESA without an ESA 4(d) Rule are sufficient to protect the Southern DPS because the protections provided under section 7 of the ESA apply only to Federal agency actions and do not explicitly prohibit take of the species. Without an ESA 4(d) Rule, take of the Southern DPS as a

result of a Federal agency action is not subject to analysis in an incidental take statement, which would anticipate maximum take levels and require that the action comply with reasonable and prudent measures established by NMFS to help minimize the effects from the take. In addition, without an ESA 4(d) Rule, NMFS would not have regulatory authority to review non-Federal actions that cause take of the Southern DPS, nor would it have authority to require that conservation measures be taken to reduce or avoid that take. Thus, NMFS determined that an ESA 4(d) Rule is necessary and advisable to more effectively address activities causing take of the Southern DPS.

2.3 Scoping and Coordination and Consultation

NMFS held two public scoping workshops in Sacramento, CA, on May 31, 2006 and June 1, 2006, focused on recreational fishing and water resource issues concerning the Southern DPS. Workshop participants identified and discussed:

- Activities and programs that likely affect the Southern DPS;
- Potential effects of these activities and programs on the Southern DPS; and
- Ways to minimize adverse effects on the Southern DPS and its habitat.

Workshop participants presented information on green sturgeon biology and genetics, and on the effects of existing water use and fisheries activities on green sturgeon and how these activities may be affected by take prohibitions. The workshop resulted in the development of a list of activities related to habitat modification, water diversion, and conservation. NMFS used the list of activities to develop and evaluate the alternatives and the major environmental issues discussed in this EA, including: green sturgeon and other protected species, habitat resources, water quality and availability, land use resources, energy and mineral resources, fisheries opportunities, and socioeconomic resources. Workshop transcripts are available on the NMFS Southwest Region website (http://swr.nmfs.noaa.gov/, under "News Archive," July 2006), or upon request.

Since the public scoping workshops, NMFS continued to consult and coordinate with state agencies, Tribal entities, and other organizations to gather information to develop and evaluate the alternatives. Chapter 6 of this EA lists the State, local, Tribal, and non-governmental contacts that NMFS has consulted with throughout the development of the alternatives. In addition, the draft EA was released for public comment, concurrent with the proposed ESA 4(d) Rule (74 FR 23822, May 21, 2009). One

commenter provided several comments on the draft EA, requesting clarification on the alternatives and on specific issues. This final EA incorporates revisions in response to the comments. Chapter 6 of this EA provides a summary of the comments and responses to comments.

2.4 Ongoing Actions

Ongoing actions that may affect, or be affected by, the alternatives include: commercial and recreational fisheries, habitat-related activities (e.g., water diversion operations, dam operations, dredging for human use, and agricultural and municipal development), and scientific research activities within the areas identified in Section 2.1 of this EA. Specific actions include:

- State sturgeon recreational and commercial fishing regulations

  In 2007, revised state fishing regulations were adopted in California, Washington, and the Columbia River to prohibit the retention of green sturgeon in commercial and recreational fisheries. In Oregon, a state-wide prohibition on the retention of green sturgeon was adopted for commercial fisheries in 2009 and for recreational fisheries in 2010. These changes may affect how the ESA 4(d) Rule will address commercial and recreational fisheries activities in California, Oregon, Washington, and the Columbia River.

- Fish screening criteria for anadromous salmonids

  An ESA 4(d) Rule for threatened salmon and steelhead evolutionarily significant units (ESUs) (65 FR 42422, July 10, 2000; 70 FR 37160, June 28, 2005) established screening criteria for physical water diversions from a stream or lake. The criteria are described in NMFS' Southwest Region "Fish Screening Criteria for Anadromous Salmonids, January 1997." The screening criteria for salmonids may also protect juvenile green sturgeon from entrainment.

3.0 ALTERNATIVES

3.1 Introduction

This section describes the alternatives under consideration by NMFS. The alternatives were evaluated based on their adherence to the following objectives:

1) To conserve the Southern DPS.
2) To comply with the mandates of the ESA.
3) To regulate activities to avoid or minimize take of the Southern DPS.
4) To allow ongoing conservation efforts to continue or promote further conservation and protective efforts for the Southern DPS.

Five alternatives were considered for the Southern DPS. The main features of each alternative are summarized below and in Table 3.1-1:

- *No-action Alternative*: Do not apply the prohibitions under section 9(a)(1) of the ESA or any other protective regulations to the Southern DPS.
- *Full Action Alternative*: Apply all prohibitions under section 9(a)(1) of the ESA to the Southern DPS.
- *Alternative A*: Apply the prohibitions under section 9(a)(1)(A) and (a)(1)(D) through (a)(1)(G) of the ESA to the Southern DPS. Apply the take prohibitions under section 9 of the ESA [ESA section 9(a)(1)(B) and (a)(1)(C)] to specific categories of activities that cause take of the Southern DPS.
- *Alternative B* (Preferred Alternative): Apply all prohibitions under section 9(a)(1) of the ESA to the Southern DPS as in the Full Action Alternative, but with exceptions and exemptions from the take prohibitions [ESA section 9(a)(1)(B) and (a)(1)(C)] for certain activities that comply with NMFS criteria or NMFS-approved programs under the ESA 4(d) Rule.
- *Alternative C*: Apply the prohibitions under section 9(a)(1) of the ESA as described in Alternative A, and include the same exceptions and exemptions from the take prohibitions as described under Alternative B.

Table 3.1-1 Summary of the alternative ESA 4(d) Rules considered by NMFS. The primary features, similarities, and differences between the alternatives are highlighted.

Alternative	Description	Apply take prohibitions to all activities?	Apply take prohibitions to certain areas?	Include exceptions/ exemptions?
No Action Alternative	No change from current management [no ESA 4(d) Rule]	NO	NO	NO
Full Action Alternative	Apply all ESA section 9 prohibitions	YES	NO	NO
Alternative A	Apply all ESA section 9 prohibitions, but apply the take prohibitions to specific categories of activities	NO	YES	NO
Alternative B	Same as the Full Action Alternative, but with exceptions and exemptions	YES	NO	YES
Alternative C	Same as Alternative A, but with the same exceptions and exemptions as Alternative B	NO	YES	YES

3.2 No-action Alternative

Under the No-action Alternative, NMFS would not establish an ESA 4(d) Rule (i.e., no change from current management). The No-action Alternative represents the physical and biological status quo. Federal agency actions would still be subject to the jeopardy provision under section 7 of the ESA, but would not be required to conduct an assessment of take, because take would not be prohibited. Actions without a Federal nexus, however, would not be subject to additional regulations under the ESA.

NMFS does not consider the No-action Alternative to be a reasonable alternative because it would not satisfy the objectives listed in Section 3.1 of this EA. NMFS determined that ongoing local, state, and Federal efforts are not adequate for the conservation of the Southern DPS. The No-action Alternative would avoid potential socioeconomic effects, but, without additional regulations established in an ESA 4(d) Rule, activities resulting in take of the Southern DPS would not be subject to review by NMFS.

3.3 Full Action Alternative

The Full Action Alternative would apply all prohibitions under section 9(a)(1) of the ESA to the Southern DPS by: (1) prohibiting the take of the Southern DPS within the U.S., the U.S. territorial seas, or upon the high seas [“take prohibitions,” ESA section 9(a)(1)(B) and (a)(1)(C)]; and (2) prohibiting

the import, export, possession, sale, delivery, carrying, transport, or shipping of the Southern DPS in interstate or foreign commerce or for commercial activity, and the violation of any regulation pertaining to the species [ESA section 9(a)(1)(A) and (a)(1)(D) through (a)(1)(G)]. The regulations would prohibit the take of the Southern DPS, not the activities themselves. Activities that may cause take of the Southern DPS include, but are not limited to:

- Commercial and recreational fisheries activities that target or incidentally catch green sturgeon in California, Oregon, Washington, and Alaska. There are no directed fisheries for green sturgeon, but green sturgeon are caught as bycatch in white sturgeon fisheries and coastal groundfish bottom trawl fisheries (*Adams et al. 2002; Adams et al. 2007*).
- Tribal fisheries activities that target or incidentally catch the Southern DPS.
- Illegal sturgeon poaching activities.
- Collecting or handling the Southern DPS for any purpose (e.g., scientific research and monitoring, emergency fish rescue).
- Land-use activities that may disturb soil and increase sediment input into streams used by the Southern DPS, including road construction, gravel mining, logging, grazing, or farming.
- Activities that destroy or alter habitat used by the Southern DPS, including dredging, discharge of fill material, and draining, ditching, diverting, blocking, or altering stream channels or surface or ground water flow.
- Activities that may impinge or entrain the Southern DPS. For the purposes of this EA, entrainment is defined as the incidental trapping of any life stage of the Southern DPS within waterways or structures, whereas impingement is defined as the entrapment of any life stage of the Southern DPS on the outer part of any structure (e.g., intake structures and screening devices) that separates water traveling a natural course of passage from water that is being diverted for anthropogenic use. Impingement or entrainment may occur during activities such as the operation of water diversions, dredging activities, power plant intake systems, and alternative energy hydrokinetic projects (e.g., tidal and wave energy projects).
- Operating, constructing, or maintaining dams, cross-channels, or other physical structures such that they create migration barriers for the Southern DPS.
- Altering the hydrology (water flow, water temperature, etc.) of waterways used by the Southern DPS in ways that adversely affect the species.
- Applying pesticides at levels that adversely affect the Southern DPS.

- Discharge or dumping of toxic chemicals or other pollutants outside legally permitted levels into waters or areas supporting the Southern DPS.
- Introducing or releasing non-native species likely to alter the Southern DPS' habitat or to compete with the Southern DPS for space or food.

If the Full Action Alternative were implemented, proposed or ongoing activities would need to be modified to avoid take of the Southern DPS. Any take of the Southern DPS that does occur would need to be permitted under an ESA section 10 permit (for non-Federal actions and for scientific research or enhancement activities) or analyzed under an ESA section 7 incidental take statement.

3.4 Alternative A

Alternative A is the same as the Full Action Alternative, except that the take prohibitions [ESA section 9(a)(1)(B) and (a)(1)(C)] would apply to specific categories of activities that have been identified to pose the greatest threat to the Southern DPS, rather than to all activities that may cause take. Alternative A would prohibit the take of the Southern DPS in the following categories of activities:

- Commercial, recreational, and tribal fisheries activities within the areas where the Southern DPS occurs (see Section 2.1 of this EA for a list of areas).
- Collecting or handling the Southern DPS for any purpose including, but not limited to, scientific research and monitoring, emergency rescue, commercial sale, and consumption.
- Habitat-altering activities (e.g., construction, maintenance, or operation of dams and water diversion structures) that: (a) eliminate, obstruct, or delay passage of the Southern DPS, or otherwise result in the inability of the Southern DPS to migrate; or (b) destroy, modify, or curtail spawning and rearing habitat of egg, larval, and juvenile stages of the Southern DPS.
    - *Geographic limitations:* The take prohibitions would apply in areas that contain spawning, rearing, and migratory habitat for the Southern DPS in California (i.e., the lower Feather River, lower Yuba River, Sacramento River, Suisun Bay, San Pablo Bay, San Francisco Bay, and the Delta).
- Operation of water diversion, dredging, and power plant activities that result in the entrainment or impingement of any life stage of the Southern DPS.
    - *Geographic limitations:* Take resulting from entrainment or impingement at water diversions would be prohibited in the lower Feather River, lower Yuba River,

Sacramento River, Suisun Bay, San Pablo Bay, San Francisco Bay, and the Delta. Take resulting from entrainment or impingement during dredging or power plant operations would be prohibited in all areas occupied by the Southern DPS.

- Application or discharge of pesticides, toxic chemicals, or other pollutants adjacent to or within waterways that contain any life stage of the Southern DPS, at levels exceeding those established by the States and the Environmental Protection Agency (EPA) under the Federal Clean Water Act.
- Introduction or release of non-native species into waters adjacent to or within waterways that contain any life stage of the Southern DPS.

These activities were identified based on the best available data regarding take of the Southern DPS. The take prohibitions would not apply to activities not included in the categories listed above, even if take occurs. Activities subject to the take prohibitions would need to be modified to avoid take of the Southern DPS. Otherwise, take of the Southern DPS would need to be covered under the appropriate ESA section 10 permit or section 7 incidental take statement. All Federal agency actions would continue to be subject to the jeopardy and critical habitat provisions under section 7 of the ESA, but an assessment of take would not be required for activities that are not subject to the take prohibitions.

3.5 Alternative B – Preferred Alternative

Alternative B is the same as the Full Action Alternative (i.e., apply all prohibitions under section 9(a)(1) of the ESA), but would include exceptions and exemptions from the take prohibitions for certain activities. Under the exceptions, specific activities would be excluded from the take prohibitions for the Southern DPS through a relatively informal coordination process. Under the exemptions, take of the Southern DPS would be covered under a NMFS 4(d) program established and approved by NMFS through a formal process. Activities must meet specific criteria to qualify for the exceptions or exemptions. Thus, under Alternative B, take of the Southern DPS could be covered under an ESA section 10 permit, an ESA section 7 incidental take statement, or one of the exceptions or exemptions. Alternative B recognizes that: (1) a certain level of take may be allowable and necessary for activities that benefit the Southern DPS; and (2) certain activities may be modified to minimize take to a level that is adequately protective of the Southern DPS.

The exceptions and exemptions would provide three major benefits: (1) coverage for any take of the Southern DPS that occurs when the action is conducted in compliance with the 4(d) exception criteria or NMFS-approved 4(d) programs; (2) a mechanism for NMFS to coordinate with entities; and (3) the establishment of programs and activities with measures to protect the Southern DPS from take. Activities covered under the exceptions or exemptions but that are carried out, permitted, or funded by a Federal agency must continue to comply with the jeopardy and critical habitat provisions under section 7(a)(2) of the ESA. However, any resulting consultation would not involve an assessment of take.

Alternative B includes four exceptions to the take prohibitions:

- Federal, State, and Private Scientific Research Activities

  NMFS believes that the research and monitoring activities carried out or permitted by Federal agencies, state agencies, or private entities benefit the conservation of the Southern DPS. These studies provide valuable information necessary to assess the status of and threats to green sturgeon, and for evaluating the effectiveness of management practices in promoting the recovery of the species. However, research activities may result in take of the Southern DPS (e.g., capture and handling, tagging, collection of eggs) and must be monitored to ensure that the effects of this take do not negatively affect the population.

  Under Alternative B, the take prohibitions would not apply to Federal, state, or private-sponsored scientific research activities if those activities meet the following criteria: (1) the scientific research complies with all required state reviews and permits; (2) the research activity is directed at the Southern DPS and is not incidental to research or monitoring of another species; (3) take of live mature adults in the lower Feather River, lower Yuba River, Sacramento River, the Delta, or the Suisun, San Pablo, and San Francisco bays occurs from July 1 through March 1, to avoid disrupting the upstream spawning migrations of adults; (4) take is non-lethal; (5) take involving the removal of any life stage of the Southern DPS from the wild does not exceed 60 minutes; and (6) take does not involve artificial spawning or enhancement activities. At least 60 days prior to the start of the study or, if the study is ongoing, within 60 days after publication of the Final ESA 4(d) Rule in the *Federal Register*, the following information about the research activity must be provided to NMFS: the study objectives and justification; a summary of the study design and methods; estimates of the total non-lethal take of the Southern DPS anticipated; estimates of incidental take of other ESA-

listed species and proof that those takes have been covered by NMFS or the USFWS; identification of funding sources; and a point of contact. In addition, research reports must be submitted to NMFS on a schedule to be determined by NMFS staff and must include the total number of the Southern DPS and any other ESA-listed species taken, information that supports that the take was non-lethal, and a summary of the project results.

- Emergency Fish Rescue Activities

  NMFS believes that emergency fish rescue activities would contribute to the conservation of the Southern DPS. Emergency fish rescue activities include: aiding sick, injured, or stranded fish; disposing of dead fish; or salvaging dead fish for use in scientific studies. Collecting and handling fish should be conducted by trained personnel to protect fish from further injury and to ensure proper disposal of dead fish. Take prohibitions would not apply to emergency fish rescue activities conducted by, or in coordination with, NMFS, the U.S. Fish and Wildlife Service (USFWS), any Federal land management agency, or any of the following state fishery management agencies: California Department of Fish and Game (CDFG), Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), or the Alaska Department of Fish and Game (ADFG). The take prohibitions would not apply as long as the activity complies with required state or other Federal reviews or permits, benefits the Southern DPS, and occurs only because of emergency situations resulting from natural disasters, national defense, or security emergencies (see 50 CFR § 402.05). Within 30 days after conducting the emergency rescue, each agency would be required to submit a report to NMFS including, at a minimum, the number and status of green sturgeon handled and the location of the rescue operations. Project-related activities (e.g., salvaging fish trapped behind a man-made weir or dam) would not be considered an emergency fish rescue activity and would be subject to review under section 7 or section 10 of the ESA.

- Habitat restoration activities

  Habitat restoration activities conducted for the primary purpose of restoring natural aquatic or riparian habitat conditions or processes are likely to contribute to the conservation of the Southern DPS. These activities may include barrier removal or modification to restore water flow, riverine or estuarine bed restoration, natural bank stabilization, restoration of native vegetation, removal of non-native species, or removal of contaminated sediments. To qualify for this exception, the entity conducting the habitat restoration activity must show that the

activity complies with required state and Federal reviews and permits. At least 60 days prior to the start of the project, the entity must submit a detailed description of the restoration activity to NMFS including: the geographic area affected; when the activities will occur and how they will be conducted; evidence that all state and Federal regulatory requirements have been met; identification of funding sources; an analysis of the severity of impacts (direct, indirect, and cumulative) on the Southern DPS; a description of methods to be used to ensure that the likelihood of survival or recovery of the Southern DPS is not reduced; a plan for minimizing and mitigating any adverse impacts to spawning or rearing habitat; an estimate of the number of the Southern DPS that may be taken and how that estimate was made; a plan for effective monitoring and adaptive management; a pledge to use best available science and technology; and a point of contact. Progress reports must be submitted to NMFS on a schedule to be determined by NMFS staff and must include the total number of the Southern DPS taken, whether the take was lethal or not, a summary of the project status, and any changes in the methods employed.

- Enforcement Activities

  An exception from the take prohibitions would be provided for enforcement activities. Take of the Southern DPS (e.g., collection of tissue samples, holding of live or dead fish) would be allowed without a permit if conducted by a NMFS employee acting in the course of his or her official duties if such action is necessary for purposes of enforcing the ESA or its implementing regulations.

Alternative B would also include three exemptions from the take prohibitions for the following NMFS-approved 4(d) programs:

- Fishery Management and Evaluation Plans

  Commercial or recreational fisheries activities conducted under a NMFS-approved Fishery Management and Evaluation Plan (FMEP) would not be subject to the take prohibitions. State or Federal fisheries management agencies would develop the FMEPs for review and approval by NMFS. FMEPs would be required to address take of all green sturgeon in order to protect the listed entity, the Southern DPS. This is necessary because we currently cannot discriminate between the non-listed Northern DPS and the listed Southern DPS via fishing gear, visual indicators, or spatial or temporal distribution. An FMEP would be required to meet the

following criteria: 1) prohibit retention of green sturgeon (i.e., zero bag limit); 2) establish an incidental take management strategy that sets maximum incidental take levels and includes restrictions to minimize incidental take of green sturgeon; 3) provide biologically-based rationale demonstrating that the incidental take management strategy measures will not significantly reduce the likelihood of survival or recovery of the Southern DPS; 4) include effective monitoring and evaluation plans; 5) provide for the evaluation of monitoring data and revisions to the FMEP based on the data; 6) provide for effective enforcement and education; and 7) provide for biannual reports to NMFS, including the number of green sturgeon taken in the fishery and an evaluation and summary of the effectiveness of the FMEP. Upon approval of an FMEP, NMFS would issue a letter of concurrence that specifies the implementation and reporting requirements. NMFS would evaluate FMEPs on a regular basis and make recommendations to improve effectiveness. A public comment period of no less than 30 days would be provided prior to approval of any new or amended FMEP and prior to withdrawing approval of an FMEP.

- Tribal Resource Management Plans

  Tribal resource management activities (e.g., fishery harvest, artificial production, research, water or land management) conducted by a tribe, tribal member, tribal permittee, tribal employee, or tribal agent according to a NMFS-approved tribal resource management plan (Tribal Plan) would not be subject to the take prohibitions. A Tribal Plan may be developed by one tribe or jointly with other tribes and may vary in content. The Secretary would consult with the tribe(s) on a government-to-government basis to provide technical assistance during development of a Tribal Plan. A Tribal Plan would be eligible for approval only if the Secretary determines that implementation of the plan would not substantially reduce the likelihood of survival or recovery of the Southern DPS. NMFS would evaluate the effectiveness of the plan on a regular basis and provide recommendations on ways to alter or strengthen the plans. New or amended Tribal Plans and the Secretary's determination would be published in the *Federal Register* for public comment (≥ 30 days) prior to approval.

- State 4(d) Research Program

  Take occurring in state-sponsored scientific research and enhancement activities may be covered by the exception for research activities as described above or under an exemption for state 4(d) research programs. The take prohibitions would not apply to scientific research and

monitoring activities conducted under a state-sponsored scientific research program established between NMFS and the state fishery management agency (i.e., CDFG, ODFW, WDFW, and ADFG). State 4(d) research programs would cover research and monitoring projects involving the Southern DPS that are conducted or coordinated by one of these state fishery management agencies, or that are conducted by recipients of a permit issued by one of these state fishery management agencies. These state 4(d) research programs would help streamline the process for researchers, state agencies, and NMFS by allowing state fishery management agencies to maintain primary responsibility for coordination and oversight of research activities.

State 4(d) research programs have already been developed and implemented in California, Oregon, and Washington for threatened West coast salmon and steelhead ESUs. Green sturgeon could be incorporated into these existing state 4(d) research programs, or a separate program developed for green sturgeon. Each year, researchers would be required to submit research applications to the state fishery management agency. The state fishery management agency would evaluate and determine which projects are eligible for inclusion in the program and transmit approved applications to NMFS for review and approval. Researchers would not be required to apply for a separate permit from NMFS. The state 4(d) research programs may cover ongoing and future state-supported research and monitoring activities.

Upon incorporation of green sturgeon into the state 4(d) research program or development of such a program, ongoing state-supported research activities involving direct or incidental take of the Southern DPS could be considered for coverage under the program. Researchers would submit their applications to the state fishery management agency and the state agency would be required to provide to NMFS the following information for each ongoing project, within 120 days after publication of the Final ESA 4(d) Rule: 1) an estimate of the anticipated take (direct or incidental) of the Southern DPS; 2) a description of the study design and methodology; 3) a justification for take of the Southern DPS and the techniques to be employed; and 4) a point of contact. Take prohibitions would not apply to ongoing state-supported research activities specified in an application for inclusion in the state research program submitted within 120 days after publication of the Final ESA 4(d) Rule. Take prohibitions would apply if the application is determined to be insufficient or the activities are denied inclusion in the state 4(d) research program.

Future state-supported research activities involving direct or incidental take of the Southern DPS would be considered for incorporation into a state 4(d) research program when researchers submit an application to the state fishery management agency. The state agency would be required to submit for NMFS review and approval a list of all scientific research activities involving the Southern DPS for the coming year and information on each project as described above. For both ongoing and future state-supported research activities, the state agency would be required to provide an annual report to NMFS that, at a minimum, summarizes for each approved project the number of green sturgeon taken (direct and incidental) and the results. Written approval of the state 4(d) research program would be provided by the NMFS Northwest or Southwest Regional Administrator.

Scientific research or enhancement activities that are not covered under the exception or a state 4(d) research program would require an ESA section 10(a)(1)(A) permit. The take prohibitions would not apply to ongoing research activities for up to one year after publication of the Final ESA 4(d) Rule, if an application for an ESA section 10(a)(1)(A) permit is submitted to NMFS within 120 days after publication of the Final ESA 4(d) Rule. This one year grace period would allow time for NMFS to review the applications. The take prohibitions would apply if the application is declared insufficient or the permit is denied. If a complete permit application for ongoing research activities is submitted within 120 days after publication of the Final ESA 4(d) Rule, but NMFS is not able to issue a permit within one year after publication of the Final ESA 4(d) Rule, ongoing research activities may continue until a permit is issued or denied.

3.6 Alternative C

Alternative C is the same as Alternative A (i.e., apply the take prohibitions to specific categories of activities and, for some activities, to specific geographic areas), and would include the same exceptions and exemptions from the take prohibitions as described for Alternative B (see Section 3.5 of this EA). Alternatives B and C differ primarily in the application of the take prohibitions. Alternative B would prohibit all take of the Southern DPS, whereas Alternative C would prohibit the take of the Southern DPS in specific categories of activities (as described under Alternative A). Activities would need to be modified to avoid take of the Southern DPS. Otherwise, take would need to be covered under one of the exceptions or exemptions referred to above in Section 3.5 of this EA, permitted under an ESA section 10 permit, or analyzed under an ESA section 7 incidental take statement.

4.0 AFFECTED ENVIRONMENT

4.1 Introduction

This chapter describes the environmental baseline, or the current conditions of the environment that could potentially be affected if the Preferred Alternative or other alternatives were implemented. The description of the affected environment is organized by the major environmental issues identified through scoping. In each section, the relevance of the issue to the alternatives is reviewed, followed by a description of the relevant resources. The major environmental issues are:

1) Southern DPS green sturgeon
2) Other protected species
3) Habitat resources
4) Water quality and availability
5) Land use resources
6) Energy and mineral resources
7) Fisheries opportunities
8) Socioeconomic resources

4.2 Geographic Scope

The protections under the alternatives would apply to the Southern DPS wherever an individual occurs, unless application of the take prohibitions is limited geographically (as in Alternatives A and C for certain categories of activities). Based on the best available information, the Southern DPS is known to occur in the following areas:

- Estuaries, bays, and freshwater rivers and streams within the Central Valley of California that serve as spawning, rearing, feeding, and migratory habitat for all life stages of the Southern DPS. These are: the Sacramento-San Joaquin Delta (the Delta); the San Francisco, San Pablo, and Suisun Bays; the Sacramento River upstream to Keswick Dam (rkm 483); the lower Feather River upstream to Oroville Dam (rkm 116); and the lower Yuba River upstream to the Daguerre Point Dam (rkm 19);
- Coastal bays and estuaries off the Washington, Oregon, and California coasts, including the Strait of Juan de Fuca, Puget Sound, Grays Harbor, Willapa Bay, the lower Columbia River

estuary upstream to Bonneville Dam (rkm 146), Yaquina Bay, Winchester Bay, Coos Bay, and Humboldt Bay; and

- Coastal marine waters within 110 m depth from southern California to Alaska

The affected environment would include both the water bodies occupied by the Southern DPS and the surrounding lands, because activities occurring on land may affect the aquatic systems they border. For the purposes of this analysis, the affected environment was represented by the water bodies occupied by the Southern DPS and the counties bordering these water bodies, as described in Table 4.2-1 and depicted in Figures 4.2-1 and 4.2-2. The affected environment described may encompass an area larger than the actual affected environment. In addition, the affected environment under each alternative may differ. Under the Full Action Alternative and Alternative B, the prohibitions would apply wherever the Southern DPS occurs and do not have a defined spatial boundary. Alternatives A and C, however, define geographic boundaries for applying the take prohibitions to certain categories of activities.

Table 4.1-1 Summary of the states and counties representing the potentially affected environment.

State	Population in 2000	Area (sq mi)	Counties
California	15,188,771	51,169	Alameda, Butte, Colusa, Contra Costa, Del Norte, Glenn, Humboldt, Los Angeles, Marin, Mendocino, Monterey, Napa, Orange, Sacramento, San Diego, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Solano, Sonoma, Sutter, Tehama, Ventura, Yolo, Yuba
Oregon	1,315,691	16,819	Clatsop, Columbia, Coos, Curry, Douglas, Lane, Lincoln, Multnomah, Tillamook
Washington	4,351,759	20,187	Clallam, Clark, Cowlitz, Grays Harbor, Island, Jefferson, King, Kitsap, Mason, Pacific, Pierce, San Juan, Skagit, Skamania, Snohomish, Thurston, Wahkiakum
Alaska	514,804	256,405	Aleutians East, Aleutians West, Anchorage, Bethel, Bristol Bay, Dillingham, Haines, Juneau, Kenai Peninsula, Ketchikan Gateway, Kodiak Island, Lake and Peninsula, Matanuska-Susitna, Nome, Prince of Wales-Outer Ketchikan, Sitka, Skagway-Hoonah-Angoon, Valdez-Cordova, Wade Hampton, Wrangell-Petersburg, Yakutat

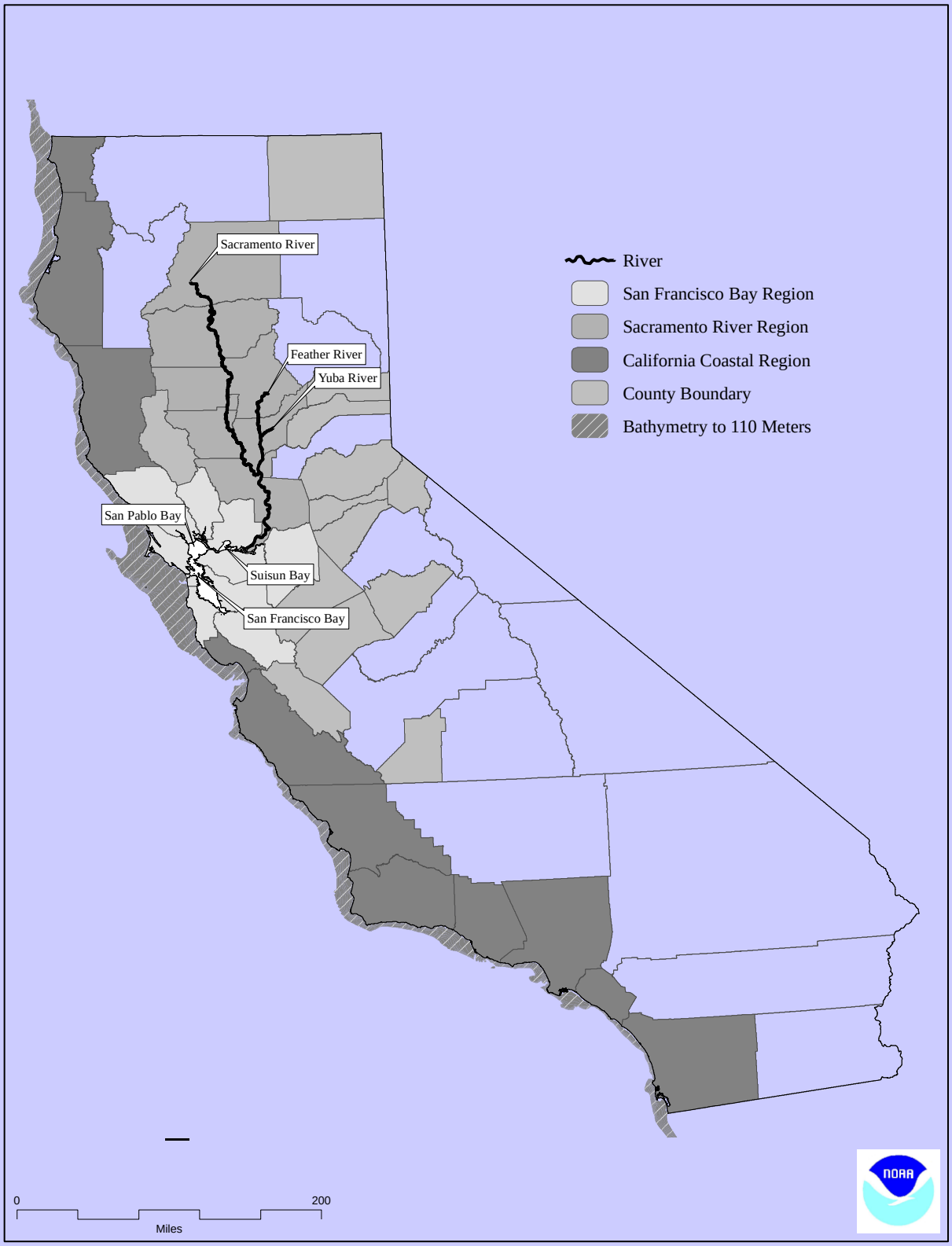

Figure 4.1-1 Potentially affected environment in California (by Charleen Gavette, NMFS).

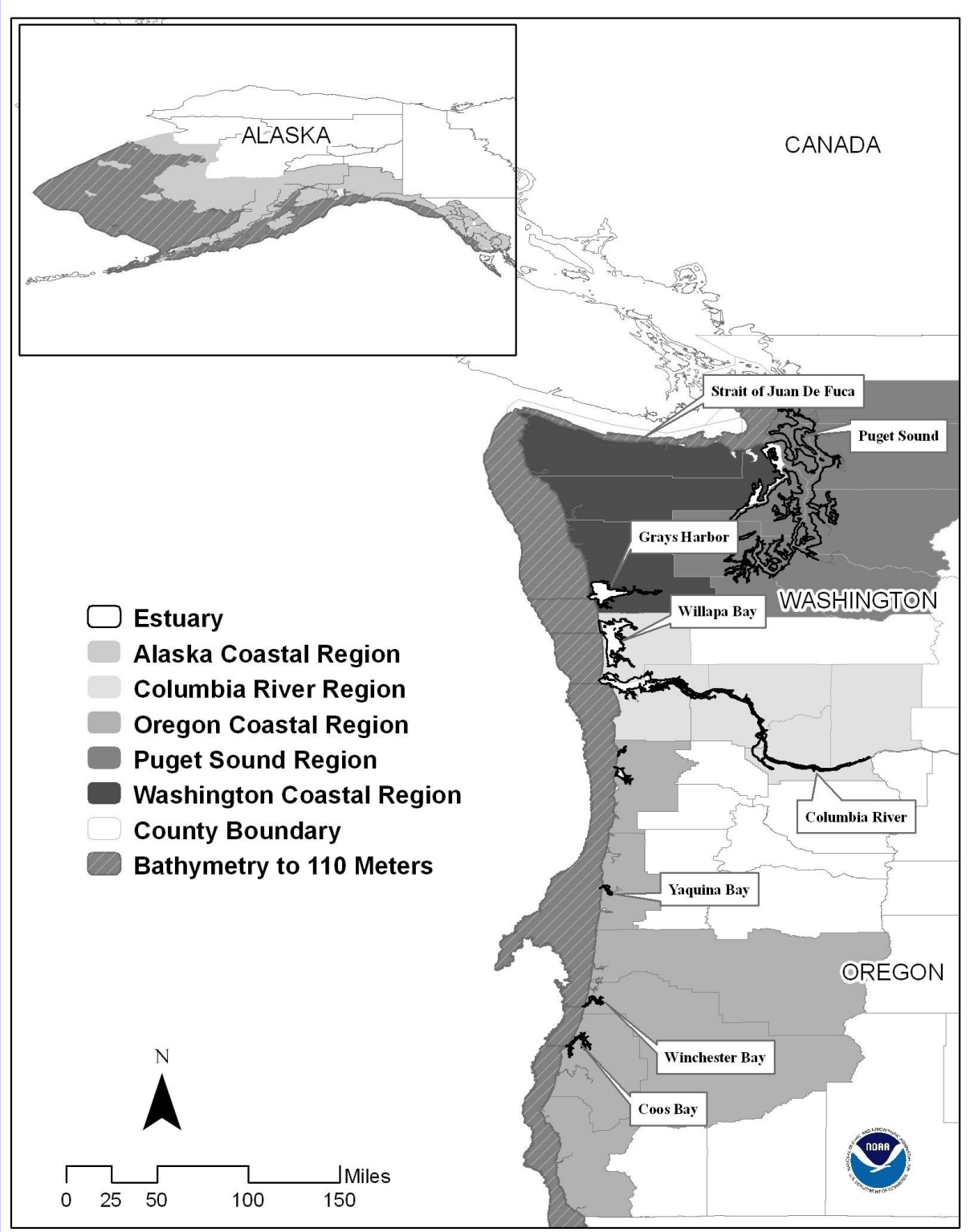

Figure 4.1-2 Potentially affected environment in Oregon, Washington, and Alaska (by Matt Dorsey, NMFS).

4.3 Southern DPS Green Sturgeon

The Southern DPS is the primary resource of concern for the alternatives. The green sturgeon is a long-lived, anadromous fish species that is widely distributed along the U.S. West Coast and inhabits riverine, estuarine, and marine habitats. Green sturgeon are a primarily benthic species, but use a variety of depths throughout their life stages and distribute widely within occupied bays and estuaries. The only confirmed spawning river for adult Southern DPS is the Sacramento River (*Brown 2007*). Adult Southern DPS may spawn in the Feather River, but evidence is lacking (*CDFG 2002; CDWR 2005b; Adams et al. 2007*). Spawning occurs from March through July in the mainstem Sacramento River as far upstream as Keswick Dam. The historical distribution of green sturgeon likely included areas further upstream, but the presence of dams currently blocks passage to upstream sites (*Adams et al. 2002; Adams et al. 2007*). Adult green sturgeon are found in the Delta and bays from March, or earlier, through October (*Kelly et al. 2006*), with some individuals outmigrating from the Sacramento River in December and February (*personal communication with Richard Corwin, USBR, June 5, 2008, and August 13, 2009, unpublished data with Mike Thomas, UC Davis*). Juvenile green sturgeon (≤ 3 years old) occur in the Delta and the Suisun, San Pablo, and San Francisco bays throughout the year (*CDFG 2002; Bay Delta and Tributaries Project 2009*). Green sturgeon juveniles rear in the Sacramento River and the Delta and bays for one to four years before migrating out to sea as subadults (*Emmett et al. 1991; Nakamoto et al. 1995*).

Subadult green sturgeon spend at least 6-10 years at sea before reaching reproductive maturity and returning to freshwater to spawn for the first time (*Nakamoto et al. 1995*). Adult green sturgeon spend as many as 2-4 years at sea between spawning events (*personal communication with Steve Lindley, NMFS SWFSC, and Mary Moser, NMFS NWFSC, cited in 70 FR 17386; Erickson and Webb 2007*). During their time at sea, subadult and adult green sturgeon inhabit coastal bays and estuaries and coastal marine waters from the Bering Sea to southern California, primarily occupying waters within 110 m depth (*Erickson and Hightower 2007*). Subadults and adults oversummer in coastal estuaries on the northern California, Oregon, and Washington coasts (i.e., Humboldt Bay, Coos Bay, Winchester Bay, lower Columbia River estuary, Willapa Bay, Grays Harbor) and overwinter in coastal marine waters along the central California coast and between Vancouver Island, British Columbia, and southeast Alaska (*Lindley et al. 2008*). Green sturgeon have not been observed in freshwater rivers or coastal bays and estuaries in Alaska.

The Southern DPS was listed as a threatened species under the Federal ESA in April 2006 (71 FR 17757), based on data indicating that the population has declined in numbers and faces several threats, including the loss of spawning habitats, low population numbers, injury or mortality risks from water projects and other in-water activities, and incidental catch in commercial, recreational, and Tribal fisheries. As a threatened species, the Southern DPS automatically receives protection under the jeopardy provision of section 7(a)(2) of the ESA. However, as described in Chapter 2 of this EA, the jeopardy protections under section 7 of the ESA are not sufficient to address the threats faced by the Southern DPS and to protect and conserve this species.

4.4 Other Protected Species

Several other ESA-listed threatened and endangered species occur within the affected environment, including a diversity of ESA-listed fish and wildlife species (Tables 4.4-1) and several ESA-listed plant species (Table 4.4-2). The ESA regulations and other existing environmental regulations and programs provide protections for these ESA-listed species. In addition, numerous efforts have been made to aid in the protection and recovery of these species within the affected environment.

Table 4.4-1 Other Federal ESA-listed threatened (T) and endangered (E) fish and wildlife species within the affected environment. CA = California, OR = Oregon, WA = Washington, and AK = Alaska; SC = species of concern.

Category	Scientific name	Common name	Status	Region
TERRESTRIAL MAMMALS	*Aplodontia rufa nigra*	Point Arena mountain beaver	E	CA
	Dipodomys heermanni	Morro Bay kangaroo rat	E	CA
	Dipodomys ingens	Giant kangaroo rat	E	CA
	Odocoileus virginianus leucurus	Deer, Columbian white-tailed	E	CA
	Reithrodontomys raviventris	Salt marsh harvest mouse	E	CA
	Sylvilagus bachmani riparius	Riparian brush rabbit	E	CA
	Vulpes macrotis mutica	San Joaquin kit fox	E	CA
MARINE MAMMALS	*Arctocephalus townsendi*	Guadalupe fur seal	T	CA
	Balaena mysticetus	Bowhead whale	E	AK
	Balaenoptera borealis	Sei whale	E	CA, OR, WA, AK
	Balaenoptera musculus	Blue whale	E	CA, OR, WA, AK
	Balaenoptera physalus	Fin whale	E	CA, OR, WA, AK
	Enhydra lutris kenyoni	Northern sea otter	T	WA, AK
	Enhydra lutris nereis	Southern sea otter	T	CA, OR, WA
	Eubalaena glacialis	Northern right whale	E	AK
	Eumetopias jubatus	Steller sea lion (Eastern)	T	AK
	Eumetopias jubatus	Steller sea lion (Western)	E	CA, OR, WA, AK
	Megaptera novaeangliae	Humpback whale	E	CA, OR, WA, AK
	Orcinus orca	Killer whale (Southern resident)	E	WA
	Physeter macrocephalus	Sperm whale	E	CA, OR, WA, AK
BIRDS	*Brachyramphus marmoratus marmoratus*	Marbled murrelet	T	CA, OR, WA
	Charadrius alexandrius nivosus	Western snowy plover	T	CA, OR, WA
	Gymnogyps californianus	California condor	E	CA
	Haliaeetus leucocephalus	Bald eagle	T	CA, OR, WA
	Pelecanus occidentalis	Brown pelican	E	CA, OR, WA
	Phoebastria (= Diomedea albatrus)	Short-tailed albatross	E	CA, OR, WA, AK
	Rallus longirostris obsoletus	California clapper rail	E	CA
	Sterna atnillarum browni	California least tern	E	CA
	Strix occidentalis caurina	Northern spotted owl	T	CA, OR, WA
	Vireo bellii pusillus	Least Bell's vireo	E	CA

Table 4.4-1 (continued)

Category	Scientific name	Common name	Status	Region
REPTILES	*Gambelia silus*	Blunt-nosed leopard lizard	E	CA
	Masticophis lateralis euryxanthus	Alameda (= striped racer) whipsnake	T	CA
	Thamnophis gigas	Giant garter snake	T	CA
	Thamnophis sirtalis tetrataenia	Snake, San Francisco garter	E	CA
	Caretta caretta	Loggerhead sea turtle	T	CA, OR, WA, AK
	Chelonia mydas	Green sea turtle	E/T	CA, OR, WA, AK
	Dermochelys coriacea	Leatherback sea turtle	E	CA, OR, WA, AK
	Lepidochelys olivacea	Olive ridley sea turtle	E/T	CA, OR, WA, AK
AMPHIBIANS	*Ambystoma macrodactylum croceum*	Santa Cruz long-toed salamander	E	CA
	Rana aurora draytonii	California red-legged frog	T	CA
INVERTEBRATES	*Apodemia mormo langei*	Lange's metalmark butterfly	E	CA
	Branchinecta conservatio	Conservancy fairy shrimp	E	CA
	Branchinecta longiantenna	Longhorn fairy shrimp	E	CA
	Branchinecta lynchi	Vernal pool fairy shrimp	E	CA
	Callophrys mossii bayensis	San Bruno elfin butterfly	E	CA
	Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	T	CA
	Elaphrus viridus	Delta green ground beetle	T	CA
	Euphilotes enoptes smithi	Smith's blue butterfly	E	CA
	Euphydryas editha bayensis	Bay checkerspot butterfly	T	CA
	Helminthoglypta walkeriana	Morro shoulderband (=Banded dune) snail	E	CA
	Icaricia icarioides fenderi	Fender's blue butterfly	E	OR
	Icaricia icarioides missionensis	Mission blue butterfly	E	CA
	Lepidurus packardi	Vernal pool tadpole shrimp	E	CA
	Lycaeides argyrognomon lotis	Lotis blue butterfly	E	CA
	Pacifastacus fortis	Shasta crayfish	E	CA
	Polyphylla barbata	Mount Hermon June beetle	E	CA
	Speyeria callippe callippe	Callippe silverspot butterfly	E	CA
	Speyeria zerene hippolyta	Oregon silverspot butterfly	T	OR, WA
	Syncaris pacifica	California freshwater shrimp	E	CA
FISH	*Eucyclogobius newberryi*	Tidewater goby	E	CA
	Hypomesus transpacificus	Delta smelt	T	CA
	Oncorhynchus clarki henshawi	Lahontan cutthroat trout	T	CA
	Oncorhynchus clarki seleniris	Paiute cutthroat trout	T	CA
	Oncorhynchus keta	Columbia River Chum salmon	T	OR, WA

Table 4.4-1 (continued)

Category	Scientific name	Common name	Status	Region
FISH (continued)	*Oncorhynchus kisutch*	Central California Coast Coho salmon	E	CA
	Oncorhynchus kisutch	Coho salmon	T	CA
	Oncorhynchus kisutch	Lower Columbia River/Southwest Washington Coho salmon	T	OR, WA
	Oncorhynchus kisutch	Northern California/Southern Oregon Coast Coho salmon	T	CA, OR
	Oncorhynchus mykiss	California Central Valley steelhead	T	CA
	Oncorhynchus mykiss	Central California Coast steelhead	T	CA
	Oncorhynchus mykiss	Lower Columbia River steelhead	T	OR, WA
	Oncorhynchus mykiss	Northern California steelhead	T	CA
	Oncorhynchus mykiss	Oregon Coast steelhead	SC	OR
	Oncorhynchus mykiss	South-Central California Coast steelhead	T	CA
	Oncorhynchus mykiss	Southern California steelhead	E	CA
	Oncorhynchus tshawytscha	California Coastal Chinook salmon	T	CA
	Oncorhynchus tshawytscha	Central Valley Fall and Late Fall-run Chinook salmon	SC	CA
	Oncorhynchus tshawytscha	Central Valley Spring-run Chinook salmon	T	CA
	Oncorhynchus tshawytscha	Lower Columbia River Chinook salmon	T	OR, WA
	Oncorhynchus tshawytscha	Puget Sound Chinook salmon	T	WA
	Oncorhynchus tshawytscha	Sacramento River Winter-run Chinook salmon	E	CA
	Oregonichthys crameri	Oregon chub	E	OR
	Rhinichthys osculus ssp.	Foskett speckled dace	T	CA
	Salvelinus confluentus	Bull trout	T	CA

Sources: 50 CFR §17.11 (USFWS ESA listed species list); NMFS ESA listed species list, http://www.nmfs.noaa.gov/pr/species/esa.htm; NMFS (2000)

Table 4.4-2 Federal ESA-listed threatened (T) and endangered (E) plant species within the affected environment. CA = California; OR = Oregon; WA = Washington. No species identified in the Alaska.

Scientific name	Common name	Family	Federal status	Region
Acanthomintha obovata ssp. *Duttonii*	San Mateo thornmint	Lamiaceae	E	CA
Alopecurus aequalis var. sonomensis	Sonoma alopecurus	Poaceae	E	CA
Amsinckia grandiflora	Large-flowered fiddleneck	Boraginaceae	E	CA
Arabis mcdonaldiana	McDonald's rock-cress	Brassicaceae	E	CA
Arctostaphylos hookeri var. ravenii	Presidio manzanita	Ericaceae	E	CA
Arctostaphylos morroensis	Morro manzanita	Ericaceae	T	CA
Arctostaphylos pallida	Pallid manzanita	Ericaceae	T	CA
Arenaria paludicola	Marsh sandwort	Caryophyllaceae	E	CA, OR, WA
Astragalus clarianus	Clara Hunt's milk-vetch	Fabaceae	E	CA
Baccharis vanessae	Encinitas baccharis	Asteraceae	T	CA
Blennosperma bakeri	Sonoma sunshine	Asteraceae	E	CA
Brodiaea pallida	Chinese Camp brodiaea	Liliaceae	T	CA
Camissonia benitensis	San Benito evening-primrose	Onagraceae	T	CA
Carex albida	White sedge	Cyperaceae	E	CA
Castilleja affinis ssp. Neglecta	Tiburon paintbrush	Scrophulariaceae	E	CA
Castilleja campestris ssp. Succulenta	Fleshy owl's-clover	Scrophulariaceae	T	CA
Castilleja levisecta	Golden paintbrush	Scrophulariaceae	T	OR, WA
Caulanthus californicus	California jewelflower	Brassicaceae	E	CA
Ceanothus ferrisae	Coyote ceanothus	Rhamnaceae	E	CA
Chamaesyce hooveri	Hoover's spurge	Euphorbiaceae	T	CA
Chorizanthe howellii	Howell's spineflower	Polygonaceae	E	CA
Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	Polygonaceae	E	CA
Chorizanthe pungens var. pungens	Monterey spineflower	Polygonaceae-Buckwheat	T	CA
Chorizanthe robusta var. hartwegii	Scotts Valley spineflower	Polygonaceae-Buckwheat	E	CA
Chorizanthe robusta var. robusta	Robust spineflower	Polygonaceae-Buckwheat	E	CA
Chorizanthe valida	Sonoma spineflower	Polygonaceae	E	CA
Cirsium fontinale var. fontinale	Fountain thistle	Asteraceae	E	CA
Cirsium fontinale var. obispoense	Chorro Creek bog thistle	Asteraceae	E	CC
Cirsium hydrophilum var. hydrophilum	Suisun thistle	Asteraceae	E	CA
Clarkia franciscana	Presidio clarkia	Onagraceae	E	CA
Clarkia imbricate	Vine Hill clarkia	Onagraceae	E	CA
Clarkia speciosa ssp. Immaculata	Pismo clarkia	Onagraceae	E	CA

Table 4.4-2 (continued)

Scientific name	Common name	Family	Federal status	Region
Cordylanthus maritimus ssp. maritimus	Salt marsh bird's-beak	Scrophulariaceae	E	CA
Cordylanthus mollis ssp. mollis	Soft bird's-beak	Scrophulariaceae	E	CA
Cordylanthus palmatus	Palmate-bracted bird's-beak	Scrophulariaceae	E	CA
Cordylanthus tenuis ssp. Capillaries	Pennell's bird's-beak	Scrophulariaceae	E	CA
Cupressus abramsiana	Santa Cruz cypress	Cupressaceae	E	CA
Cupressus goveniana ssp. Goveniana	Gowen cypress	Cupressaceae	T	CA
Delphinium bakeri	Baker's larkspur	Ranunculaceae	E	CA
Delphinium luteum	Yellow larkspur	Ranunculaceae	E	CA
Dudleya setchellii	Santa Clara Valley dudleya	Crassulaceae	E	CA
Erigeron decumbens var. decumbens	Willamette daisy	Asteraceae	E	OR
Eriophyllum latilobum	San Mateo woolly sunflower	Asteraceae	E	CA
Eryngium constancei	Loch Lomond coyote-thistle	Apiaceae	E	CA
Erysimum capitatum var. angustatum	Contra Costa wallflower	Brassicaceae	E	CA
Erysimum menziesii	Menzies' wallflower	Brassicaceae	E	CA
Erysimum teretifolium	Ben Lomond wallflower	Brassicaceae	E	CA
Gilia tenuiflora ssp. arenaria	Monterey gilia	Polemoniaceae	E	CA
Hesperolinon congestum	Marin dwarf-flax	Linaceae	T	CA
Howellia aquatilis	Water howellia	Campanulaceae	T	CA, OR, WA
Lasthenia burkei	Burke's goldfields	Asteraceae	E	CA
Lasthenia conjugens	Contra Costa goldfields	Asteraceae	E	CA
Layia carnosa	Beach layia	Asteraceae	E	CA
Lembertia congdonii	San Joaquin wooly-threads	Asteraceae	E	CA
Lessingia germanorum (=L. g. var. germanorum)	San Francisco lessingia	Asteraceae	E	CA
Lilium occidentale	Western lily	Liliaceae	E	CA, OR
Lilium pardalinum ssp. Pitkinense	Pitkin Marsh lily	Liliaceae	E	CA
Limnanthes floccosa ssp. Californica	Butte County meadowfoam	Limnanthaceae	E	CA
Limnanthes vinculans	Sebastopol meadowfoam	Limnanthaceae	E	CA
Lomatium bradshawii	Bradshaw's desert-parsley	Apiaceae	E	CA, OR
Lupinus sulphureus (=oreganus) ssp. kincaidii (=var. kincaidii)	Kincaid's lupine	Fabaceae	T	OR
Lupinus tidestromii	Clover lupine	Fabaceae	E	CA
Navarretia leucocephala ssp. pauciflora (=N. pauciflora)	Few-flowered navarretia	Polemoniaceae	E	CA
Navarretia leucocephala ssp. plieantha	Many-flowered navarretia	Polemoniaceae	E	CA
Neostapfia colusana	Colusa grass	Poaceae	T	CA
Oenothera deltoides ssp. howellii	Antioch Dunes evening-primrose	Onagraceae	E	CA
Orcuttia inaequalis	San Joaquin Valley Orcutt grass	Poaceae	T	CA

Table 4.4-2 (continued)

Scientific name	Common name	Family	Federal status	Region
Orcuttia pilosa	Hairy Orcutt grass	Poaceae	T	CA
Orcuttia tenuis	Slender Orcutt grass	Poaceae	T	CA
Orcuttia viscida	Sacramento Orcutt grass	Poaceae	T	CA
Pentachaeta bellidiflora	White-rayed pentachaeta	Asteraceae	E	CA
Piperia yadonii	Yadon's piperia	Orchidaceae	E	CA
Plagiobothrys hirtus	Rough popcornflower	Boraginaceae	E	OR
Plagiobothrys strictus	Calistoga allocarya	Boraginaceae	E	CA
Poa napensis	Napa bluegrass	Poaceae	E	CA
Potentilla hickmanii	Hickman's potentilla	Rosaceae	E	CA
Pseudobahia bahiifolia	Hartweg's golden sunburst	Asteraceae	E	CA
Rorippa gambellii	Gambel's watercress	Brassicaceae	E	CA
Senecio layneae	Layne's butterweed	Asteraceae	T	CA
Sidalcea nelsoniana	Nelson's checker-mallow	Malvaceae	T	CA, OR, WA
Sidalcea oregana ssp. valida	Kenwood Marsh checker-mallow	Malvaceae-Mallow	E	CA
Streptanthus albidus ssp. albidus	Metcalf Canyon jewelflower	Brassicaceae	E	CA
Suaeda californica	Seablite, California	Chenopodiaceae	E	CA
Trifolium amoenum	Showy Indian clover	Fabaceae	E	CA
Trifolium trichocalyx	Monterey clover	Fabaceae	E	CA
Tuctoria greenei	Greene's tuctoria	Poaceae	T	CA
Tuctoria mucronata	Solano grass	Poaceae	T	CA
Verbena californica	Red Hills vervain	Verbenaceae	T	CA

Source: 50 CFR §17.12 (USFWS 2005 ESA listed species list); NMFS (2000)

4.5 Habitat Resources

The affected environment contains designated critical habitat for the Southern DPS (74 FR 52300, October 9, 2009). NMFS designated critical habitat for the Southern DPS throughout most of its occupied range, including: coastal marine waters from Monterey Bay to the Washington/Canada border; coastal bays and estuaries in California, Oregon, and Washington; and fresh water rivers in the Central Valley, California. The essential physical and biological habitat features identified for the Southern DPS include: prey resources (including benthic invertebrates and small fish), water quality, water flow (particularly in freshwater rivers), water depth, substrate types (i.e., appropriate spawning substrates within freshwater rivers), sediment quality, and migratory corridors. Federal agencies must comply with section 7(a)(2) of the ESA to ensure that activities they fund, permit, or carry out do not result in the destruction or adverse modification of designated critical habitat. These protections apply

with or without an ESA 4(d) Rule for the Southern DPS. The affected environment also contains designated critical habitat for other ESA-listed species (Table 4.5-1).

In addition, the affected environment includes important habitats for a diversity of fish and wildlife species. For example, the Sacramento River and tributaries contain spawning and rearing habitats for many fish species, and part of the Pacific Flyway (an important breeding and resting ground for birds) occurs within the areas surrounding the Sacramento River, Delta, and bays. Many programs and activities have been conducted to improve habitat conditions for species within the affected environment. For example, the California Bay-Delta Authority Ecosystem Restoration Program focuses on restoring natural functions to creeks and rivers to provide habitat for threatened and endangered species. Other projects focus on restoring agricultural lands to riparian forest, reengineering or removing small dams, and installing fish screens at diversions (Central Valley Project Improvement Act, Anadromous Fish Screen Program) (*CDWR 2005a*).

Table 4.5-1 Summary of designated critical habitat within the affected environment.

Species	Designated critical habitat	Reference
Bull Trout	Grays Harbor, WA (nearshore) Puget Sound, WA (nearshore) Strait of Juan de Fuca, WA (nearshore) Washington coast (nearshore)	70 FR 56212, September 26, 2005
Southern Resident Killer Whale	Puget Sound, WA Strait of Juan de Fuca, WA	71 FR 69054, November 29, 2006
Chinook, Central Valley spring-run	Feather River, CA Sacramento River, CA Sacramento-San Joaquin Delta, CA Yuba River, CA	70 FR 52488, September 2, 2005
Chinook, Sacramento River winter-run	Sacramento River, CA Sacramento-San Joaquin Delta, CA San Francisco Bay, CA San Pablo Bay, CA Suisun Bay, CA	58 FR 33212, June 16, 1993
Chinook, Lower Columbia	Columbia River	70 FR 52630, September 2, 2005
Chinook, Upper Columbia spring-run	Columbia River	70 FR 52630, September 2, 2005
Chinook, Puget Sound	Puget Sound, WA (nearshore) Strait of Juan de Fuca, WA (nearshore)	70 FR 52630, September 2, 2005
Chum, Hood Canal summer-run	Puget Sound, WA (nearshore) Strait of Juan de Fuca, WA (nearshore)	70 FR 52630, September 2, 2005
Chum, Columbia River	Columbia River	70 FR 52630, September 2, 2005
Coho, Central California Coast	San Francisco Bay, CA San Pablo Bay, CA	64 FR 24049, May 5, 1999
Coho, Oregon Coast	Coos Bay, OR Winchester Bay, OR Yaquina Bay, OR	73 FR 7816, February 11, 2008
Steelhead, California Central Valley	Feather River, CA Sacramento River, CA Sacramento-San Joaquin Delta, CA Yuba River, CA	70 FR 52488, September 2, 2005
Steelhead, Central California Coast	San Francisco Bay, CA San Pablo Bay, CA	70 FR 52488, September 2, 2005
Steelhead, Lower Columbia	Columbia River	70 FR 52630, September 2, 2005
Steelhead, Middle Columbia	Columbia River	70 FR 52630, September 2, 2005
Steelhead, Upper Columbia	Columbia River	70 FR 52630, September 2, 2005
Steelhead, Upper Willamette	Columbia River	70 FR 52630, September 2, 2005

4.6 Water Quality and Availability

Water quality and availability influence the survival, growth, and development of the Southern DPS and may be affected by the alternatives. In this section, the current status of water quality in the affected environment and a description of activities that affect water quality and availability are provided, as a basis for evaluating how the alternatives may affect water quality and availability.

4.6.1 Water Quality

Water temperature and contaminant levels are important components of water quality for green sturgeon. Early life stages of green sturgeon require specific water temperatures for optimal survival and development (*Van Eenennaam et al. 2005*). In addition, green sturgeon may be particularly vulnerable to contaminant exposure and bioaccumulation because they are long-lived and benthic. The presence of 18 pesticides and 28 PCBs was detected within liver and gonad tissues of white sturgeon in the Columbia River and may adversely affect the reproductive success of sturgeon (*Feist et al. 2005*). Green sturgeon are likely similarly affected by, or may be even more sensitive to, certain contaminants in coastal estuaries, such as methylmercury and selenium (*Kaufman et al. 2008*).

The Federal Clean Water Act (CWA; amended in 1977) provides the foundation for the regulation of water quality in the United States. Under the CWA, state agencies develop water quality standards for the discharge of contaminants into surface waters. These water quality standards are reviewed and approved by the EPA. National Pollutant Discharge Elimination System (NPDES) permits must be obtained from the EPA for the discharge of contaminants. NPDES permits are not required, however, for irrigated agriculture and agricultural stormwater runoff. Instead, voluntary programs have been established to help agricultural producers meet environmental standards. Section 303(d) of the CWA requires that water bodies be listed as impaired if they fail to meet water quality standards. For each of these impaired water bodies, States must establish Total Maximum Daily Loads (TMDLs). TMDLs define acceptable concentration levels for specific pollutants. Causes for impairment include nutrients, pesticides, metals, fecal coliform, and high temperatures.

Impaired water bodies and the causes of impairment within each region are listed in Table 4.6-1. Although water quality is generally good throughout the regions, problems remain. Runoff from farms

and discharge from industrial activities introduce pesticides and heavy metals into waterways. Runoff from abandoned mines continues to contaminate the Sacramento River, the Delta, and the Bays with mercury. In addition, maintenance dredging, sediment disposal, and the discharge of ballast water and vessel wastes introduce contaminants and non-native species into coastal waters, bays, and estuaries. Unknown toxicity, mercury, and pesticides have been cited as major causes of impairment in the Sacramento and Feather rivers (Table 4.6-1). The highly urbanized areas surrounding the San Francisco Bay-estuary and the Delta result in the introduction of contaminants into waters from point and non-point sources. DDT and other pesticides remain large problems for water quality within the Delta and the bays. Several heavy metals have also been cited as causes for impairment within the San Francisco Bay (Table 4.6-1). Temperatures exceeding 20°C, DDT metabolites, and PCBs were the most commonly cited causes of impairment in the lower Columbia River (Table 4.6-1). Water quality is a major environmental issue in Puget Sound, given the highly urbanized areas bordering these waters. PCBs, dieldrin, and other pesticides have been cited as causes of impairment in Puget Sound, as well as pH, ammonia, and fecal coliform (Table 4.6-1). Along the coast, storm water and urban runoff wash contaminants into local creeks and rivers and eventually into the ocean. Shipping, harbors, marinas, and recreational boating also affect water quality. Fecal coliform was the primary water quality issue at sites along the California coast and within Coos Bay, Willapa Bay, and the Strait of Juan de Fuca (Table 4.6-1).

Table 4.6-1 Summary of impaired water bodies in California, Oregon, and Washington. Causes of impairment and total number of cases reported are provided.

Water Body	Causes of Impairment	Total cases reported
CALIFORNIA[1]		
Sacramento River	Unknown toxicity, mercury, diazinon	6
Feather River	Unknown toxicity, mercury, diazinon, group A pesticides	4
Sacramento-San Joaquin Delta	DDT, diazinon, mercury, chlordane, dieldrin, dioxin compounds, exotic species, furan compounds, PCBs, selenium, chlorpyrifos, group A pesticides, unknown toxicity, electrical conductivity, organic enrichment/low dissolved oxygen	31
Suisun Bay	DDT, diazinon, mercury, chlordane, dieldrin, dioxin compounds, exotic species, furan compounds, PCBs, selenium	11
San Pablo Bay	DDT, diazinon, mercury, chlordane, dieldrin, dioxin compounds, exotic species, furan compounds, PCBs, selenium	11
San Francisco Bay (in water)	DDT, diazinon, mercury, chlordane, dieldrin, dioxin compounds, exotic species, furan compounds, PCBs, selenium, zinc	75
San Francisco Bay (in sediments)	Mercury, PAHs, chlordane, lead, PCBs, chlorpyrifos, copper, DDT, dieldrin, mirex, pesticides, ppDDE, selenium, tributyltin	21
Pacific Ocean	High coliform count	5
OREGON[2]		
Umpqua River	Fecal coliform, temperature	5
Coos Bay	Fecal coliform	1
LOWER COLUMBIA RIVER[2, 3]	Arsenic, DDT metabolite (DDE), PCB, total PCBs, temperature, PAHs fecal coliform, dieldrin, 4,4'-DDE	36
WASHINGTON[3]		
Willapa Bay	Fecal coliform	1
Puget Sound	Ammonia, Bis(2-ethylhexyl)phthalate, dieldrin, fecal coliform, pH, total dioxins, total furans, total PCBs	23
Strait of Juan de Fuca	Fecal coliform	9

Sources: [1] California State Water Resources Control Board 2003

[2] Oregon Department of Environmental Quality 2003

[3] Washington State Department of Ecology 2005

4.6.2 Water Availability

The operation of facilities related to water availability for irrigation and municipal use, such as water diversions and dams, may be affected by the alternatives, because these activities may result in direct take of the Southern DPS or effects on the Southern DPS' habitat. For example, water diversions can alter flow regimes in freshwater systems, resulting in changes to spawning and rearing habitats as well as water temperature. Changes in water flow may also affect spawning and post-spawning migrations of the Southern DPS, which are believed to be triggered by increased flows (*Erickson et al. 2002; Benson et al. 2007; Brown 2007; Erickson and Webb 2007; Vogel 2008; Poytress et al. 2009*). Physical structures associated with water diversion may have multiple effects on the Southern DPS by posing impingement or entrainment risks to early life stages and blocking or delaying migration of all life stages (*Moser and Ross 1995; Harrell and Sommer 2006*).

Water supplies within the affected environment are derived from several sources including surface water, groundwater, recycled water, and imports. These sources supply water for agriculture, recreation, power generation, flood control, environmental benefits, and other uses. Facilities involved in the storage and distribution of water, including dams, reservoirs, water diversions, aqueducts and canals, bypasses, and weirs, may affect the Southern DPS. These facilities may block or delay passage, entrain larvae and juveniles, or alter water flow. In California, the Federal Central Valley Project (CVP) and the State Water Project (SWP) are two major water projects that operate in areas occupied by the Southern DPS. Facilities associated with the CVP and SWP (Table 4.6-2) may affect the ability of the Southern DPS within the Sacramento and lower Feather rivers, the Delta, and the Bays to successfully migrate to and from spawning areas. Other facilities exist within these waterways that may affect the Southern DPS, including the Anderson Cottonwood Dam, the Fremont Weir, and the hundreds to thousands of unscreened diversions within the Sacramento River and the Delta (*Herren and Kawasaki 2001; Harrell and Sommer 2006*).

In the area surrounding the Sacramento River, urban and rural communities rely on water from reservoirs and groundwater pumping. Most of the developed water supply is used for irrigated agriculture. A large portion is also designated for statutory required outflows to the Delta, to meet water quality requirements, and for in-stream flows, refuges, and wildlife areas. A small portion is applied to urban use and managed wetlands. Groundwater sources supply most of the water used for agricultural irrigation and urban communities. A few larger cities rely heavily on water diverted from

rivers. Much of the return flows from agricultural irrigation are also reused by downstream diverters, resulting in high water use efficiency, although water quality is a concern. Management measures, including conjunctive management, water-use efficiency measures, and groundwater planning and monitoring, are aplied to improve water supply quality and reliability (*CDWR 2005a*).

In the area surrounding the Delta and San Francisco, San Pablo, and Suisun bays, most of the water supplies are imported from other regions or are supplied by the Delta. Small reservoirs and groundwater sources make up the rest of the water supplies. More than 85% of the developed water supply is for urban uses in the area surrounding the San Francisco, San Pablo, and Suisun bays. Only about 10% of the developed water supply is used for agriculture, whereas more than 50% is used for residential and industrial water use (*CDWR 2005a*). In contrast, water use in the area surrounding the Delta is primarily for agriculture. The Delta itself supplies fresh water to San Francisco Bay and to much of the state. The Sacramento and San Joaquin Rivers are the primary sources of water for the Delta (*CDWR 2005a*).

Along the California coast, water availability and use varies from north to south. The north coast experiences heavy rainfall and produces a large proportion of the state's surface water runoff, resulting in large exports to other regions of the state. The central coast receives most of its water supply from groundwater sources, whereas the south coast relies on a variety of local and imported sources. From 1998 to 2001, the primary water use (making up ≥ 70% of the dedicated water supply) within the region was for: environmental use (statutory required outflow for wild and scenic rivers) in the north coast; irrigated agriculture in the central coast; and urban use in the south coast (*CDWR 2005a*). In Oregon and Washington, surface water sources are the primary source of water supplies. The major water use within these regions was for industrial, domestic, and irrigation purposes (*United States Geological Survey (USGS) 2000; Lane 2004*).

Table 4.6-2 Major facilities in the California Central Valley Project (CVP) and State Water Project (SWP).

Facility Name	Water body	Project
Tracy Pumping Plant	Sacramento-San Joaquin Delta	CVP
Keswick Dam	Sacramento River	CVP
Red Bluff Diversion Dam	Sacramento River	CVP
Corning Canal	Sacramento River	CVP
Tehama-Colusa Canal	Sacramento River	CVP
Contra Costa Canal/Pumping Plant	San Francisco Bay	CVP
South Bay Pumping Plant & Skinner Fish Facility	Sacramento-San Joaquin Delta	SWP
Clifton Court Dam & Forebay	Sacramento-San Joaquin Delta	SWP
Oroville Dam & Lake Oroville	Feather River	SWP
Hyatt Power Plant	Feather River	SWP
Thermalito Diversion Dam Power Plant	Feather River	SWP
Thermalito Diversion Dam & Pool	Feather River	SWP
Feather River Fish Barrier Dam & Pool	Feather River	SWP
Feather River Fish Hatchery	Feather River	SWP
Thermalito Forebay Dam & Forebay	Feather River	SWP
Thermalito Pumping-Generating Plant	Feather River	SWP
Thermalito Afterbay Dam & Afterbay	Feather River	SWP
Suisun Marsh Salinity Control Gates	Suisun Bay	SWP
California Aqueduct	Sacramento-San Joaquin Delta	
North Bay Aqueduct	Sacramento-San Joaquin Delta/ Suisun Bay	

Source: California Department of Water Resources, http://www.publicaffairs.water.ca.gov/swp/pdf/SWPmap.pdf)

4.7 Land Use Resources

Multiple land use planning and development activities occur within the affected environment that may be affected by the alternatives. These activities include agricultural and urban use and development activities associated with water diversion that may alter water availability for the Southern DPS, activities that affect water quality through runoff or increased shoreline erosion and sedimentation, and activities that result in direct take of the Southern DPS (e.g., entrainment by water diversions structures or during dredging operations). Thus, these activities are closely tied to water quality and availability.

4.7.1 Agriculture

Water quality and availability for the Southern DPS may be affected by pesticide use and water diversion operations associated with agricultural activities. Agriculture is a major land use activity in California. Harvested lands make up a large proportion of the area surrounding the Sacramento River

and the Delta and Bays in the Central Valley, California, and much of these harvested lands are irrigated (Table 4.7-1). Along the California coast, agricultural activities are concentrated within the northern and central coast counties. Harvested lands make up a smaller proportion of the affected environment in Oregon, Washington, and Alaska compared to California (Table 4.7-1). Much of the land bordering the lower Columbia River, Grays Harbor, Willapa Bay, Yaquina Bay, Coos Bay, and Winchester Bay consists of pasture and farmland (*National Atlas of the United States 2006*).

Table 4.7-1 Summary of the acreage and proportion of harvested lands and irrigated lands within the affected environment, by general regions.

Region of the affected environment	Harvested land (acres)	Harvested land (% of area)	Irrigated land (acres)	Irrigated land (% of harvested land)
Sacramento River, CA	4,040,281	44%	1,657,246	41%
Delta and San Francisco, San Pablo, and Suisun bays, CA	2,886,315	54%	843,959	29%
California coast	5,677,461	31%	718,106	13%
Oregon coast	911,800	10%	58,682	6%
Columbia River	299,159	7%	23,075	8%
Washington coast	88,240	2.5%	10,711	12%
Puget Sound, WA	425,766	6.6%	42,569	10%
Alaska coast	790,725	0.5%	1,558	0.2%

Source: USDA National Agricultural Statistics Service (NASS), 2002 Census of Agriculture database, www.nass.usda.gov.

4.7.2 Urban Use and Development

Activities associated with urban use and development may affect habitats occupied by the Southern DPS. Many water bodies occupied by the Southern DPS are surrounded by highly urbanized areas. For example, urban areas are concentrated around the city of Sacramento and at points along the Sacramento, lower Feather, and lower Yuba rivers (*National Atlas 2006*). Almost all of the land bordering San Francisco Bay and much of the area bordering San Pablo and Suisun Bay is urbanized (*National Atlas 2006*). Urban areas also border Coos Bay, Grays Harbor, the lower Columbia River, and large portions of Puget Sound (*National Atlas 2006*).

In-water construction or alterations and shoreline development within rivers, bays, estuaries, and the Delta may alter habitat conditions within areas used by the Southern DPS for spawning, rearing, and migration. Several major ports are located within the affected environment (Table 4.7-2). These ports serve as centers for recreation, transportation, and commerce. In addition, hundreds of dredging

operations are conducted in waters occupied by the Southern DPS, particularly the San Francisco, San Pablo, and Suisun bays. Operational and maintenance dredging activities occur in Federal navigation channels on a regular basis and cover about 12 square miles in this region (*ACOE 2008*). The projected dredging volume for the bays for a 50-year period from 1995-2045 is estimated to range from about 3.5 million to 5.9 million cubic yards per year, for a 50-year total of about 174 million to 297 million cubic yards of dredge material (*ACOE et al. 1998*). Dredged sediments are disposed of in designated sites, or applied to beneficial uses, such as flood control structures and wetland restoration. Three designated disposal sites are located in Carquinez Strait, San Pablo Bay, and near Alcatraz Island (*ACOE et al. 1998*). The most heavily used site is at Alcatraz Island, where an average of about 4 million cubic yards of sediment dredged from the Central and South Bay are disposed of per year. Two additional disposal sites are located in Suisun Bay and the San Francisco Bar Channel, but can only be used to dispose of clean sand from maintenance dredging projects conducted by the ACOE (*ACOE et al. 1998*). Operational and maintenance dredging is also a major activity in coastal estuaries such as Humboldt Bay, the lower Columbia River estuary, and Puget Sound. Dredging operations may increase turbidity, re-suspend contaminants, entrain larval and juvenile fish, and result in other environmental effects (*LFR Levine-Fricke 2004*). For example, dredging operations in the lower Columbia River entrained about 2,000 juvenile white sturgeon (*Buell 1992*).

Under the Rivers and Harbors Act, the ACOE is authorized to regulate the construction of any structure or any work conducted within navigable waters of the United States. In-water construction or alteration activities, including the installation of docks, bridge construction, and maintenance dredging operations, would need to be reviewed and permitted by the ACOE. In addition, the EPA and state and regional agencies oversee dredging and disposal activities conducted or permitted by the ACOE to ensure that they meet water quality objectives and other environmental criteria (*ACOE et al. 1996*).

Many of the water bodies occupied by the Southern DPS are bordered by forestlands used for timber harvest, which may affect habitat for early life stages of the Southern DPS by increasing erosion and sediment input into water ways. In California, timber harvest activities primarily occur along the northern portion of the coast, in areas bordering San Pablo and northern San Francisco Bay, and in areas to the east of the Central Valley, but not around the Delta or mainstem Sacramento River (*California Department of Forestry & Fire Protection, Timber Harvesting Plans map*). Timber harvest activities occur along the Oregon and Washington coasts, where land cover is dominated by forests (*Oregon Department of Forestry 2002; Larsen and Nguyen 2004*).

Table 4.7-2 List of major ports within the affected environment.

State	Major Ports
California[1]	Hueneme, Humboldt, Long Beach, Los Angeles, Oakland, Redwood City, Richmond, Sacramento, San Francisco, Stockton
Oregon[2]	Brookings, Coos Bay, Coquille, Depoe Bay, Florence, Gold Beach, Port Orford, Reedsport, Tillamook/Garibaldi, Warrenton, Yaquina Estuary
Washington[3]	Allyn, Anacortes, Bremerton, Brownsville, Camas-Washougal, Chinook, Coupeville, Dewatto, Edmonds, Everett, Friday Harbor, Grapeview, Hoodsport, Ilwaco, Indianola, Kalama, Keyport, Kingston, Longview, Lopez, Manchester, Olympia, Orcas, Peninsula, Port Angeles, Poulsbo, Ridgefield, Seattle, Shelton, Silverdale, Skagit County, Skamania County, South Whidbey Island, Tracyton, Vancouver, Wahkiakum County No. 1, Wahkiakum County No. 2, Willapa Harbor, Waterman, Woodland
Alaska[4]	Sitka, Yakutat

Source: [1] *Fassler-Katz (2006)*

[2] *NOAA Coastal Services Center (2006)*

[3] *Washington Public Ports Association (2006)*

[4] *World Port Source (2008)*

4.8 Energy and Mineral Resources

Activities associated with the extraction, production, or use of energy and mineral resources pose a risk of take to the Southern DPS. For example, mining activities may increase fine sediment input and introduce contaminants into streams used by the Southern DPS. Sand and gravel mining may be particularly harmful to stream habitats, because this type of mining disturbs sediments and depletes potential sources of spawning substrates for streams. Power plant operations may have different effects on the Southern DPS, depending on the type of facility. Dams associated with hydropower plants alter flow regimes and may block the upstream and downstream migration of the Southern DPS. Power plants using once-through cooling systems may entrain or impinge juvenile or adult green sturgeon, or elevate water temperatures by discharging warm-water effluent (*York et al. 2005*).

4.8.1 Energy Resources

The construction, installation, operation, and maintenance of energy production facilities within areas occupied by the Southern DPS may cause take. The facilities of concern include: hydropower plants; coastal power plants using once-through cooling systems; liquefied natural gas (LNG) projects; and alternative energy hydrokinetic projects. Hydropower plants and dams located within freshwater rivers

in the affected environment are listed in Table 4.8-1. Hydropower plants located within the affected environment account for a small proportion of electricity generation within each state. The Federal Power Act authorizes the Federal Energy Regulatory Commission (FERC) to regulate the licensing and re-licensing of non-Federal hydropower facilities in navigable waters of the United States. FERC oversees licensing, re-licensing, dam safety inspections, and environmental monitoring. Applicants for new licenses or license renewals must minimize any potentially adverse effects of the project on the environment. FERC ensures that applicants coordinate with NMFS to evaluate potential effects on ESA-listed species within the project area.

Table 4.8-1 Currently operational hydropower plants and dams within freshwater rivers within the affected environment. The generation capacity is reported in megawatts.

Power Plant	Stream	County	Capacity (MW)	Owner	Year Online
Edward Hyatt Power Plant [1]	Feather River	Butte	645	California Department of Water Resources	1968
Thermalito Pumping-Generating Power Plant [1]	Feather River	Butte	114	California Department of Water Resources	1968
Thermalito Diversion Dam Power Plant [1]	Feather River	Butte	3	California Department of Water Resources	1987
Keswick Power Plant [1]	Sacramento River	Shasta	117	United States Bureau of Reclamation	1949
Bonneville Lock and Dam [2]	Columbia River	Multnomah	1244	United States Army Corps of Engineers, Portland District	1938

Sources: [1]California Energy Commission (2006)
[2] Loy (2001)

Within the affected environment, there are 18 power plants in the Delta and Bays and along the California coast that use once-through cooling systems (Table 4.8-2) (*Foster 2005; Tetra Tech Inc. 2008*). These include two nuclear (regulated by the Nuclear Regulatory Commission under the Atomic Energy Act of 1954) and 16 oil/gas plants owned and operated by private companies and state agencies. Nearly 17 billion gallons of water per day are drawn into these plants to remove excess heat produced during power generation. The heated water is then discharged back into the environment and can affect species sensitive to elevated temperatures. The intake of water can also cause impingement of organisms on intake screens, or cause entrainment when smaller organisms pass through screens into the intake system. Thermal effects are regulated in part by Section 316(a) of the CWA. Impingement and entrainment effects are regulated in part by Section 316(b) of the CWA. State Regional Water

Quality Control Boards in California assess the thermal, impingement, and entrainment effects of these coastal and estuarine power plants (*York et al. 2005*). In recent and historical studies, green sturgeon entrainment has not been observed. However, one green sturgeon was impinged and died at the Contra Costa Power Plant Unit 1-5 in 1978-1979 and another was impinged and died at the Moss Landing Power Plant in 2006 (*personal communication with John Steinbeck, Tenera Environmental, September 7, 2006, and Carol Raifsnider, Tenera Environmental, September 12, 2006*).

No LNG projects have yet been constructed within the affected environment, but 12 LNG terminals have been proposed, including one in Coos Bay and one in the lower Columbia River. These proposed projects are in varying stages of development and are pending approval. Under the Energy Policy Act, FERC is authorized to approve LNG projects. LNG projects are also regulated by the U.S. Coast Guard, the ACOE, and the States and must comply with the CWA, CZMA, and Clean Air Act.

Several alternative energy hydrokinetic projects have been proposed along the West coast and in some coastal estuaries, including San Francisco Bay, Willapa Bay, Grays Harbor, and Puget Sound. These projects are in preliminary stages of permitting and development. Under the Federal Power Act and Energy Policy Act, FERC has the authority to issue licenses and exemptions from licensing for the construction and operation of alternative energy hydrokinetic projects along the coast in both state waters and offshore on the outer continental shelf. The Minerals Management Service (MMS), however, has the authority under the Outer Continental Shelf Lands Act to issue leases, easements, and rights-of-way for alternative energy hydrokinetic projects located on the outer continental shelf. MMS may work with FERC to assess potential environmental effects of such projects and to ensure compliance with the provisions of any lease, easement, and right-of-way issues.

Table 4.8-2 Power plants located along the coast of California and within the Delta and Bays that use once-through cooling systems (*Foster 2005; Tetra Tech Inc. 2008*). The permitted intake volume is reported in million gallons per day and the generation capacity in megawatts.

Power Plant	Intake Environment	County	Permitted Volume (MGD)	Generation Capacity (MW)	Facility Type
Alamitos	Los Cerritos Channel	Los Angeles	1275	1970	Oil/gas
Contra Costa	San Francisco Bay-Delta	Contra Costa	341	680	Oil/gas
Diablo Canyon	Pacific Ocean; shore in open coast rocky cove	San Luis Obispo	2540	2200	Nuclear
El Segundo	Santa Monica Bay; subtidal open coast sand bottom	Los Angeles	605	1020	Oil/gas
Encina	Aqua Hedionda Lagoon, Pacific Ocean; shore in bay/estuary	San Diego	857	965	Oil/gas
Harbor	Los Angeles Harbor	Los Angeles	108	462	Oil/gas
Haynes	Long Beach Marina	Los Angeles	1271	1570	Oil/gas
Huntington Beach	Pacific Ocean; subtidal open coast sand bottom	Orange	507	880	Oil/gas
Mandalay	Channel Islands Harbor	Ventura	255	577	Oil/gas
Morro Bay	Morro Bay Harbor	San Luis Obispo	668	1002	Oil/gas
Moss Landing	Elkhorn Slough/Moss Landing Harbor	Monterey	1224	2538	Oil/gas
Ormond Beach	Pacific Ocean; subtidal open coast sandy bottom	Ventura	688	1500	Oil/gas
Pittsburg	San Francisco Bay-Delta	Contra Costa	1070	2029	Oil/gas
Potrero	South San Francisco Bay; shore in estuary	San Francisco	226	362	Oil/gas
Redondo Beach	Santa Monica Bay/ harbor	Los Angeles	881	1310	Oil/gas
San Onofre	Pacific Ocean; subtidal open coast sand bottom	San Diego	2580	2254	Nuclear
Scattergood	Santa Monica Bay; subtidal open coast sand bottom	Los Angeles	495	818	Oil/gas
South Bay	Southern San Diego Bay; shore in estuary	San Diego	601	723	Oil/gas

4.8.2 Mineral Resources

Mining operations may affect the Southern DPS' habitat by removing spawning and rearing substrates, or introducing excess sediments or contaminants into water through runoff. Operations occurring adjacent to or within water ways occupied by the Southern DPS consist primarily of sand and gravel or crushed stone mines or plants. Recent surveys of active mining operations have identified operations for sand and gravel, crushed stone, and refractory, abrasive, and other industrial minerals on or near the Sacramento, lower Feather, and lower Yuba rivers, and their tributaries (*National Atlas 2006*). Mining

operations for sand and gravel, crushed stone, agricultural minerals, construction minerals, and miscellaneous industrial minerals occur within and along the border of the Delta and the San Francisco, San Pablo, and Suisun bays (*National Atlas 2006*). Sand mining occurs in the Delta and the Bays within designated lease areas, only a portion of which are mined (*Pillsbury Winthrop Shaw Pittman LLP 2008*). Much of the outer Oregon coast consists of forests and mined lands (quarries, strip mines, and gravel pits) (*National Atlas 2006*). Sand and gravel operations occur along the Umpqua River, which flows into Winchester Bay, and crushed stone operations occur near Coos Bay (*National Atlas 2006*). Numerous sand and gravel operations and crushed stone operations are also located along the lower Columbia River in both Washington and Oregon and in areas bordering Willapa Bay, Grays Harbor, and Puget Sound in Washington (*National Atlas 2006*). Each state requires mining operation permits and the development of mining and reclamation plans to describe how adverse environmental impacts will be avoided or mitigated. The major state mining regulations are: the California Surface Mining and Reclamation Act of 1975, the Oregon Mineral Land Regulation and Reclamation Program, and the Washington Surface Mine Reclamation Act of 1971 and Metal Mining and Milling Act. In addition, the CWA regulates the effects of mining operations on water quality.

4.9 Fisheries Opportunities

Green sturgeon are not targeted, but are caught as bycatch in commercial and recreational white sturgeon fisheries, salmon gill-net fisheries, and coastal groundfish trawl fisheries (*Adams et al. 2002; Adams et al. 2006*). The proportion of the Southern DPS versus Northern DPS in this bycatch is not known.

4.9.1 Commercial and Recreational Fisheries in Freshwater Rivers and Coastal Bays and Estuaries

Green sturgeon are caught as bycatch in the commercial and recreational white sturgeon fisheries in California, Oregon, and Washington. Commercial white sturgeon fisheries occur in Washington and Oregon and are managed by the States. The commercial sturgeon fishery in California has been closed since 1917, following a decline in sturgeon populations in the late 1800s due to heavy commercial fishing (*Pycha 1956*). Within Oregon waters, the commercial sturgeon fishery is open in the Columbia, Siuslaw, Coos, and Coquille Rivers and the Pacific Ocean (*ODFW 2006*). Green sturgeon landings ranged from 6,358 round pounds in 1995 to 1,702 round pounds in 2004, with a high of 23,315 round

pounds in 1998. White sturgeon landings ranged from 134,052 round pounds in 1995 to 194,779 round pounds in 2004, with a high of 311,830 round pounds in 1997 (*ODFW 2004*). In Washington, commercial sturgeon gillnet fisheries occur in the lower Columbia River, Willapa Bay, and Grays Harbor (*WDFW 2006a; 2006b*). Commercial catch in the lower Columbia River ranged from 6,200 white sturgeon and 400 green sturgeon in 1995 to 7,900 white sturgeon and 100 green sturgeon in 2004, with highs of 13,900 sturgeon in 1998 and 1,600 green sturgeon in 1997 (*WDFW and ODFW 2005)*. Retention of green sturgeon has been prohibited in commercial fisheries throughout Washington state and the Columbia River since 2007 and throughout Oregon state beginning in 2010.

Recreational sturgeon fisheries occur in California, Oregon, and Washington and are managed by the States. Similar to commercial fisheries, white sturgeon are the primary target species, whereas green sturgeon are considered inferior in quality and are less commonly encountered. Prior to 2006, recreational fishing regulations in Washington, Oregon, and California did not differentiate between white and green sturgeon. Recently, new sturgeon fishing regulations were adopted to increase restrictions on white sturgeon fisheries and prohibit retention of green sturgeon to protect both the Northern DPS and Southern DPS (*personal communication with Marty Gingras, CDFG, December 8, 2006; personal communication with John North, ODFW, March 6, 2007*). Beginning in 2007, a prohibition on the retention of green sturgeon was established for recreational fisheries in the Columbia river downstream of the Bonneville Dam and throughout California and Washington. In March 2010, a prohibition on the retention of green sturgeon was also adopted for recreational fisheries throughout Oregon. From April 2002 to March 2003, the total sturgeon catch in Washington state was 25,661 fish, consisting of 25,599 white sturgeon and 62 green sturgeon (*Kraig and Smith 2008*). Sturgeon fishing areas included the Columbia River, Snake River, Willapa Bay, Grays Harbor, Puget Sound, and unknown areas. Green sturgeon catch occurred in the Columbia River, Willapa Bay, and Grays Harbor (*Kraig and Smith 2008*). In Oregon, a total of 290 green sturgeon were caught in 2007 in the Columbia River, Nehalem Bay, Tillamook Bay, Yaquina Bay, and Winchester Bay (ODFW 2007 Sturgeon Sport Fishing Catch Data, available online at: http://www.dfw.state.or.us/resources/fishing/sportcatch.asp). In California, recreational sturgeon fisheries are conducted throughout the Sacramento and lower Feather rivers and the Delta and bays. Retention of green sturgeon is prohibited, but catch and release remains a problem (*Gleason et al. 2008*). Based on information provided by sturgeon catch cards in 2007, about 161 green sturgeon were caught and released in the Sacramento River and tributaries, with the majority caught from Red Bluff to Colusa and from Rio Vista to Chipps Island (*Gleason et al. 2008*). In addition, about 150 green

sturgeon were caught and released in the Delta and the Bays (*Gleason et al. 2008*). To reduce catch-and-release of green sturgeon, the California Fish and Game Commission adopted revised regulations to prohibit sturgeon fishing on the Sacramento River from Keswick Dam to the Highway 162 Bridge, effective March 1, 2010. CDFG plans to continue the use of sturgeon fishing report cards to monitor catch and release of green sturgeon.

Bycatch of green sturgeon also occurs in state-managed, non-Tribal commercial drift gill net salmon and steelhead fisheries in the lower Columbia River (downstream of Bonneville Dam), Willapa Bay, and Grays Harbor (*WDFW 2006a; 2006b*). The Columbia River salmon and steelhead fisheries harvest Chinook, coho, chum, and sockeye salmon and steelhead (*WDFW and ODFW 2002*). The non-Indian and Treaty Indian commercial harvest throughout the Columbia River decreased from about 31 million pounds in the 1940s to 1-2 million pounds in the 1990s, and totaled about 2.8 million pounds (approximately 246,700 fish) in 2000 (*WDFW and ODFW 2002*). The commercial fishery in Willapa Bay and Grays Harbor harvests Chinook, coho, and chum salmon. From 2006 to 2009, total landings for the non-Indian commercial salmon fishery in Willapa Bay consisted of 26,512 Chinook, 117,610 coho, and 16,289 chum salmon (*WDFW 2009*). Total landings for the non-Indian commercial salmon fishery in Grays Harbor from 2006 to 2009 consisted of 2,273 Chinook, 10,680 coho, and 373 chum salmon (*WDFW 2009*). Data on bycatch of green sturgeon in the commercial gillnet salmon and steelhead fisheries are available for the Columbia River in 2006. Sixteen green sturgeon were retained in the Columbia River commercial gillnet fishery (*WDFW 2006a*). After 2006, retention of green sturgeon was prohibited and catch-and-release numbers have not been recorded.

4.9.2 Commercial Coastal Groundfish Fisheries

Commercial groundfish bottom trawl fisheries occur off the coasts of California, Oregon, Washington, and Alaska. These fisheries are managed by the Pacific Fishery Management Council (PFMC), except for the California halibut bottom trawl fishery, which is managed by the State of California. These fisheries do not target green sturgeon, but have caught green sturgeon as bycatch (*personal communication with Duane Stevenson, NMFS, September 8, 2006; with Vanessa Tuttle, NMFS, November 20, 2006; with Jennifer Ferdinand, NMFS, November 24, 2006; and with Janell Majewski, NMFS, January 29, 2007; Adams et al. 2007*). Most green sturgeon caught as bycatch are observed in the commercial groundfish bottom trawl fishery conducted off the California coast, primarily on vessels targeting California halibut (*Bellman et al. 2010*). From 2001 to 2007, about 465 out of 486

observed green sturgeon catches were from vessels in the California port groups, with the greatest catch observed on vessels in the San Francisco (n = 325 green sturgeon) and Princeton/Half Moon Bay (n = 138 green sturgeon) port groups (*personal communication with Janell Majewski, NMFS, January 29, 2007*). From 2001 to 2007, about 17 out of 486 observed catches of green sturgeon were by vessels belonging to the Oregon port groups (*personal communication with Janell Majewski, NMFS, January 29, 2007*). Over the same time period, only 4 out of 486 observed catches of green sturgeon were on vessels in the Washington port groups (*personal communication with Janell Majewski, NMFS, January 29, 2007*). From 1990 to 2006, bycatch of 8 green sturgeon has been observed in the Alaska groundfish bottom trawl fisheries off Alaska (*personal communication with Jennifer Ferdinand, NMFS, November 24, 2006*) and At-sea Hake bottom trawl fisheries (*personal communication with Vanessa Tuttle, NMFS, November 20, 2006*). In 2006, 2 green sturgeon of unknown DPS were captured on observed Alaska groundfish bottom trawl vessels in the Bering Sea on the north side of Unimak Island (March 2006) and in the Gulf of Alaska on the southwest side of Kodiak Island (April 2006) (*personal communication with Duane Stevenson, NMFS, September 8, 2006*). Tagging and genetics data confirmed that two green sturgeon detected in southeast Alaska near Graves Harbor are part of the Southern DPS (*personal communication with Steve Lindley, NMFS, September 12, 2007*), indicating that the green sturgeon observed in the Bering Sea could be part of the Southern DPS or the Northern DPS.

Green sturgeon have also been captured in Monterey Bay and off San Pedro in the California commercial set net fishery for California halibut, using one-panel trammel nets (*personal communication with Rand Rasmussen, NMFS, July 18, 2006)*. In 2001, the use of set nets to fish for groundfish was prohibited north of 38°N. latitude (Point Reyes, CA) (*PFMC 2004*).

4.9.3 Tribal Resources

Several Federally recognized Indian tribes occupy areas within the affected environment (Table 4.9-1). Non-federally recognized tribes may also occur within the affected environment. The main Tribal resource activity that may affect the Southern DPS is Tribal fisheries. Low numbers of green sturgeon bycatch have been reported in Tribal fisheries conducted by the Lummi Tribe in the northern portion of Puget Sound and the Strait of Juan de Fuca (*personal communication with Alan Chapman, Lummi Indian Tribe, February 13, 2009*) and by the Makah Tribe in the Strait of Juan de Fuca (*personal communication with Colby Brady, Makah Tribe, February 9, 2009*). Several other tribes, including the

Quileute, Quinault, and Shoalwater Bay Indian Tribes, have also reported bycatch of green sturgeon in their sturgeon, salmon, and steelhead fisheries. Some tribes have implemented conservation measures for the Southern DPS. For example, the Quinault Tribe has adopted a zero retention policy for green sturgeon in its commercial/subsistence sturgeon fishery conducted in Grays Harbor. (*personal communication with Joe Schumacker, Quinault Indian Tribe, November 2, 2006)*. The proportion of Northern DPS versus Southern DPS fish captured is not known. Tribal fisheries conducted in the Klamath/Trinity rivers target green sturgeon, but these green sturgeon are part of the Northern DPS.

Federally recognized Indian tribes are domestic dependent nations with the right to self-government and self-determination. The relationship between the United States and Federally recognized Indian tribes is defined by treaties, statutes, Executive Orders, and court decisions. Executive Order 13175 (November 6, 2000) affirms the federal trust responsibility of the U.S. government to protect the welfare of Indian lands, tribal trust resources, and tribal rights. Federal agencies must consult with tribal officials to formulate and implement policies that have tribal implications. In addition, Secretarial Order #3206 provides guidance for the Department of the Interior and the Department of Commerce (the Departments) when actions under the ESA affect one or more Indian tribes. Secretarial Order #3206 specifically states that regulations under a 4(d) rule for threatened species should "avoid or minimize effects on tribal management or economic development, or the exercise of reserved Indian fishing, hunting, gathering, or other rights, to the maximum extent allowed by law." The Departments must provide sufficient notification to tribes before enacting policies that may affect them. Regulations for direct take must be addressed through government-to-government consultations. Regulations for incidental take must satisfy five standards to ensure that regulations are reasonable and that other alternatives cannot be used to achieve the same conservation objectives.

Table 4.9-1 Federally-recognized Indian tribes within the affected environment.

Region	Federally Recognized Tribes
Sacramento River, CA	Cachil DeHe Band of Wintun Indians of the Colusa Indian Community of the Colusa Rancheria; Mooretown Rancheria of Maidu Indians; Redding Rancheria
California Coast	Big Lagoon Rancheria; Cher-Ae Heights Indian Community of the Trinidad Rancheria; Elk Valley Rancheria; Smith River Rancheria; Wiyot Tribe
Oregon Coast	Confederated Tribes of the Coos, Lower Umpqua, & Siuslaw Indians; Coquille Tribe; and Cow Creek Band of Umpqua Indians
Columbia River	Cowlitz Indian Tribe
Washington Coast	Hoh Indian Tribe & Reservation; Jamestown S'Klallam Tribe; Lower Elwha Tribal Community of the Lower Elwha; Lummi Tribe; Makah Indian Tribe & Reservation; Quileute Tribe & Reservation; Quinault Tribe & Reservation; and Shoalwater Bay Tribe & Indian Reservation
Alaska Coast	Yakutat Tlingit Tribe

4.10 Socioeconomic Resources

Many activities occur in and around waters occupied by the Southern DPS or make use of vital resources in such a way that take of the Southern DPS may occur. Activities that may affect water quality or availability for the Southern DPS, pose barriers to migration, or result in direct take of the Southern DPS include, but are not limited to: land use activities (e.g., agriculture, mining, urban development, forestry), in-water construction or alterations (e.g., dredging and disposal, sand and gravel mining, shoreline development, bridge and dock construction), energy production activities (e.g., hydropower dams, LNG projects, alternative energy projects), water diversion activities, aquaculture, and commercial, recreational, and Tribal fisheries. Socioeconomic resources are described in detail in the Final Regulatory Impact Review/Final Regulatory Flexibility Analysis (RIR/FRFA) (*Industrial Economics (IEc) 2010a; 2010b*).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

This chapter describes the potential environmental consequences of the alternatives. The alternatives do not impose specific requirements on activities, but establish a framework for the evaluation of activities and invite entities to work with NMFS through the ESA section 10 or section 7 processes or under the exceptions and exemptions in the ESA 4(d) Rule (if applicable). The Full Action Alternative and Alternatives A, B, and C would each provide for some degree of protection and conservation of the Southern DPS. These alternatives would primarily result in socioeconomic effects associated with the regulatory changes and additional restrictions on activities. Under Alternatives A and C, the socioeconomic effects would be limited, but so would the protections and potential benefits to the Southern DPS. The Full Action Alternative would be the most restrictive but may not be the most protective, because restrictions would apply equally to activities that potentially benefit the Southern DPS (i.e., scientific research and monitoring, emergency fish rescue, habitat restoration, law enforcement) and to those that potentially harm the Southern DPS (e.g., operation of dams and water diversions, bycatch in fisheries, in-water construction and alterations). Alternative B was determined to be the most protective of the Southern DPS. This alternative would prohibit all take of the Southern DPS but provide more stream-lined processes to promote activities that potentially benefit the conservation of the Southern DPS. The No Action Alternative would have little effect on the biological or human environment, but would not provide for the protection of the Southern DPS from current threats. The potential environmental effects of each alternative are summarized in Table 5.1-1.

Table 5.1-1 Summary of the environmental consequences of each of the five alternative ESA 4(d) Rules.

Resource	No-action Alternative	Full Action Alternative	Alternative A	Alternative B (Preferred Alternative)	Alternative C
Southern DPS Green Sturgeon	Potentially adverse effects on the Southern DPS because take of the Southern DPS would continue to be allowed.	Prohibitions on take of the Southern DPS would provide for protection and conservation of the species.	Prohibitions on take of the Southern DPS would provide for protection and conservation of the species. Some take of the Southern DPS would still be allowed and future activities would not be addressed.	Prohibitions on take of the Southern DPS would provide for protection and conservation of the species. Would also facilitate scientific research to inform conservation and management.	Prohibitions on take of the Southern DPS would provide for protection and conservation of the species. Some take of the Southern DPS would still be allowed and future activities would not be addressed. Would facilitate scientific research to inform conservation and management.
Other Protected Species	Would not provide benefits to other protected species.	Reinforce and add to protections for other protected species.	Reinforce and add to protections for other protected species. Most benefits would be limited to the Central Valley, CA.	Reinforce and add to protections for other protected species.	Reinforce and add to protections for other protected species. Most benefits would be limited to the Central Valley, CA.
Habitat Resources	Would not reinforce regulations for habitat protection and improvement.	Reinforce habitat protections. Habitat restoration activities must comply with ESA section 7 or 10.	Reinforce habitat protections (effects limited to the Central Valley, CA). Habitat restoration activities must comply with ESA section 7 or 10.	Reinforce habitat protections. Habitat restoration activities must comply with ESA section 7 or 10, or more stream-lined exceptions process.	Reinforce habitat protections (effects limited to the Central Valley, CA). Habitat restoration activities must comply with ESA section 7 or 10, or more stream-lined exceptions process.
Water Quality and Availability	Would not provide for improved water quality. Would not affect water availability.	Potential improvements in water quality and water availability for the Southern DPS. Potential reduction in water availability for non-environmental use.	Potential improvements in water quality and water availability for the Southern DPS. Potential reduction in water availability for non-environmental use. Effects limited to the Central Valley, CA.	Potential improvements in water quality and water availability for the Southern DPS. Potential reduction in water availability for non-environmental use.	Potential improvements in water quality and water availability for the Southern DPS. Potential reduction in water availability for non-environmental use. Effects limited to the Central Valley, CA.

Table 5.1-1 (continued)

Resource	No-action Alternative	Full Action Alternative	Alternative A	Alternative B	Alternative C
Land Use Resources	No effects.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on land use activities and resources.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on land use activities and resources.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on land use activities and resources.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on land use activities and resources.
Energy and Mineral Resources	No effects.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on access to energy and mineral resources.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on access to energy and mineral resources.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on access to energy and mineral resources.	Compliance with ESA section 7 or 10 required. Additional measures may have non-significant effects on access to energy and mineral resources.
Fisheries Opportunities	No effects.	Compliance with ESA section 7 or 10 required. Additional measures to reduce or avoid bycatch of the Southern DPS.	Compliance with ESA section 7 or 10 required. Additional measures to reduce or avoid bycatch of the Southern DPS.	Compliance with ESA section 7 or 10, or with a 4(d) exemption required. Additional measures to reduce or avoid bycatch of the Southern DPS.	Compliance with ESA section 7 or 10, or with a 4(d) exemption required. Additional measures to reduce or avoid bycatch of the Southern DPS.
Socioeconomic Environment	No effects.	Additional measures, time, and costs required to comply with section 7 or section 10 of the ESA.	Additional measures, time, and costs required to comply with section 7 or section 10 of the ESA (but only for specific categories of activities).	Additional measures, time, and costs required to comply with section 7 or section 10 of the ESA. An exemption provided for fisheries and Tribal activities.	Additional measures, time, and costs required to comply with section 7 or section 10 of the ESA (but only for specific categories of activities). An exemption provided for fisheries and Tribal activities.

5.2 No-action Alternative

Under the No-action Alternative, no protective regulations would be established for the Southern DPS. The No-action Alternative would represent no change from current management policies.

5.2.1 Southern DPS Green Sturgeon

The No-action Alternative may hinder conservation of the Southern DPS, because no prohibitions on the take, import or export, possession, sale, delivery, carrying, transport, receipt, or shipping of the Southern DPS would exist. Other protections for the Southern DPS may still be adopted by, for example, state or local agencies, but would likely not be as comprehensive as an ESA 4(d) Rule. Federal agency actions would still require review under section 7 of the ESA, but the analysis would be limited to the jeopardy provision and would not involve an assessment of take. For actions determined to result in jeopardy, reasonable and prudent alternatives may be provided that must be economically and technically feasible and consistent with the intended purpose of the action, but may result in additional costs and time to implement. Take of the Southern DPS resulting from activities conducted by non-Federal entities would not be subject to NMFS review under section 10 of the ESA.

5.2.2 Other Protected Species

The No-action Alternative would not affect other protected species within the affected environment. Existing protections under the ESA and other environmental regulations would continue to apply.

5.2.3 Habitat Resources

The No-action Alternative would not affect habitat resources within the affected environment. Existing regulations to protect critical habitat for the Southern DPS and other protected species resources would continue to apply.

5.2.4 Water Quality and Availability

The No-action Alternative would not affect water quality or availability within the affected environment. Existing state and Federal regulations would continue to apply.

5.2.5 Land Use Resources

The No-action Alternative would not affect land use planning and development within the affected environment. Existing state and Federal regulations would continue to apply.

5.2.6 Energy and Mineral Resources

The No-action Alternative would not affect access to energy and mineral resources. Existing state and Federal regulations would continue to apply.

5.2.7 Fisheries Opportunities

The No-action Alternative would not affect existing fisheries regulations and management. The States and Tribes have already considered or adopted changes to fisheries regulations to protect green sturgeon. Review under section 7 of the ESA would be required for Federally-managed fisheries to address the jeopardy and critical habitat provisions, but would not involve an assessment of take.

5.2.8 Socioeconomic Resources

Implementation of the No-action Alternative would not be expected to result in additional regulatory burdens or costs for entities involved in activities that may cause the take of the Southern DPS.

5.3 Full Action Alternative

The Full Action Alternative would apply all of the ESA section 9(a)(1) prohibitions to prohibit take of the Southern DPS within the U.S. and the U.S. territorial seas and upon the high seas, as well as to prohibit the import, export, possession, sale, delivery, carrying, transport, or shipping of the Southern DPS in interstate or foreign commerce or for commercial activity. Activities that affect the Southern DPS or its habitat, either directly or indirectly, would need to be altered to avoid take. Any take must be analyzed in an ESA section 7 incidental take statement (for Federal actions), permitted under an ESA section 10(a)(1)(A) permit (for scientific research and enhancement activities), or permitted under an ESA section 10(a)(1)(B) permit (for incidental take in non-Federal actions). Additional time and costs may be required. For example, an incidental take statement provides reasonable and prudent

measures that must be complied with to minimize the effects of take on the species. These measures may only make minor changes to an action, but may result in extra time and costs to entities and agencies. To obtain an ESA section 10(a)(1)(B) permit for incidental take by non-Federal actions, a Habitat Conservation Plan (HCP) must be developed that analyzes the potential impacts to the species and measures to monitor, minimize, and mitigate such impacts. A separate NEPA analysis may be required to determine the effects of issuing section 10(a)(1)(A) and 10(a)(1)(B) permits.

5.3.1 Southern DPS Green Sturgeon

The Full Action Alternative would have beneficial impacts to the Southern DPS. Implementation of the Full Action Alternative would provide protection for the Southern DPS by prohibiting all take of the Southern DPS. Any activities that cause take of the Southern DPS must be reviewed by NMFS and covered under an ESA section 10 permit or an ESA section 7 incidental take statement.

5.3.2 Other Protected Species

The Full Action Alternative would likely benefit other protected species within the affected environment, particularly other fish and marine wildlife species. Conservation and mitigation measures implemented in compliance with section 7 or section 10 of the ESA under this alternative (such as improvements to fish passage, water quality improvements, and habitat protections) would benefit the Southern DPS as well as other fish and wildlife species that co-occur with the Southern DPS.

5.3.3 Habitat Resources

The Full Action Alternative would result in beneficial impacts to habitat resources. Compliance with section 7 or section 10 of the ESA under the Full Action Alternative would result in conservation and mitigation measures that improve habitat quality for the Southern DPS. These measures would be consistent with Federal policies to protect designated critical habitat and to manage water resources, wetlands, floodplains, and coastal resources. Federal agencies and non-Federal entities engaged in habitat restoration projects may experience increased regulatory burdens and costs due to the requirement to obtain an ESA section 10 permit or to comply with measures under an ESA section 7 incidental take statement, to address potential take of the Southern DPS. In some cases, the additional regulatory burdens and costs would likely be small because the measures required to address take of the

Southern DPS would be similar to what is already required under existing state and Federal laws that regulate these activities. NMFS would work with the entity or agency under the ESA section 10 permit or section 7 consultation processes to develop the conservation, mitigation, and minimization measures.

5.3.4 Water Quality and Availability

The Full Action Alternative would reinforce water quality standards and likely result in improved water quality for the Southern DPS, other fish and wildlife species, and other water users within the affected environment. This alternative would also potentially improve water availability for the Southern DPS, but may reduce the availability of surface water supplies for agricultural, municipal, and industrial use. The Full Action Alternative would impose additional restrictions on the construction and operation of dams and water diversion facilities that pose a risk of take to the Southern DPS. Any take of the Southern DPS at Federal facilities would need to be analyzed in an ESA section 7 incidental take statement. Any take of the Southern DPS at non-Federal facilities would need to be covered under an ESA section 10 (a)(1)(B) permit. Measures, such as changes in operation schedules and the installation of fish screens or fish passage structures, may be required to protect the Southern DPS. Water users may need to diversify their water supply sources and expand water reuse and recycling programs. The effects of the Full Action Alternative on water availability for agricultural, municipal, and industrial use would not be significant, however, because many of the measures that would be required under the Full Action Alternative would already be required to address jeopardy to the species or effects on critical habitat (under section 7 of the ESA), or would already be required to address effects on other protected species. For example, protective regulations for ESA-listed salmon and steelhead already require the installation of fish screens at water diversions in the Central Valley, California. Based on the best available data, these screens are believed to provide adequate protection for the Southern DPS. Rather than requiring additional measures, the Full Action Alternative would reinforce the existing requirement to install fish screens at water diversions.

5.3.5 Land Use Resources

The Full Action Alternative would result in additional regulations on land use activities, such as agriculture, shoreline development, dredging and disposal operations, and other shoreline and in-water construction and alteration activities, but would not be expected to result in significant effects. The primary link between these activities and effects on the Southern DPS is through effects on water

quality and availability, as well as direct take of the species. Compliance with section 7 and section 10 of the ESA would be required to address effects on the Southern DPS. Compliance with water quality standards, erosion control measures, changes to dredging and disposal locations and schedules, shoreline restoration, and other measures may be required. These measures would be similar to those imposed by existing state and Federal laws that regulate land use activities to minimize adverse environmental effects. For example, dredging operations are regulated by the ACOE and are subject to section 7 of the ESA whether or not an ESA 4(d) Rule exists. NMFS would work with the affected entities through the ESA section 7 or section 10 processes to develop the required measures.

5.3.6 Energy and Mineral Resources

The effects of the Full Action Alternative on access to energy and mineral resources within the affected environment would not be significant. Hydropower and nuclear power plant facilities are already subject to the jeopardy and critical habitat provisions under section 7 of the ESA, because both types of power plants are regulated by Federal agencies (FERC and the Nuclear Regulatory Commission). Non-nuclear power plants that use once-through cooling systems are regulated by state agencies and would be required to apply for an ESA section 10 (a)(1)(B) permit for any take that may occur. Fish impingement or entrainment in water intake structures would need to be avoided or minimized using measures such as the installation of fish screens or changes to operation schedules. The Full Action Alternative would result in restrictions similar to those imposed by other laws that regulate the impingement and entrainment of fish species at power plants, such as the Federal CWA and existing protective regulations for other ESA-listed species. Proposed LNG and alternative energy hydrokinetic projects would be subject to section 7 of the ESA and would need to consider the potential risk of take to the Southern DPS in the analysis of environmental effects.

The Full Action Alternative would reinforce water quality standards applicable to mineral resource production activities. The Full Action Alternative may require additional measures such as the use of alternate locations to avoid effects on spawning and rearing habitats, changes in the frequency of mining activities, and erosion control measures. ESA section 10 (a)(1)(B) permits would be required in addition to state issued permits. Mineral production may decrease for a short period following implementation of the ESA 4(d) Rule as measures are being developed and implemented and alternate sources are explored.

5.3.7 Fisheries Opportunities

Implementation of the Full Action Alternative would impose additional restrictions on commercial, recreational, and Tribal fisheries to avoid or reduce bycatch of green sturgeon, such as gear restrictions, depth restrictions, and monitoring and reporting of bycatch. However, these additional restrictions would not be expected to result in significant impacts. ESA section 10 (a)(1)(B) permits would be required for continued operation of state-managed fisheries, even if zero retention of green sturgeon has been implemented because take still occurs during catch and release fishing. Federally-managed commercial fisheries would continue to be subject to requirements under section 7 of the ESA.

5.3.8 Socioeconomic Resources

Socioeconomic effects are fully described and evaluated in the Final RIR/FRFA (*IEc 2010a; 2010b*). The Full Action Alternative would result in additional requirements and costs for activities to address the take of the Southern DPS, but these effects are not expected to be significant. As described above, activities would need to be altered to avoid take. Otherwise, that take would need to be covered under section 7 (Federal agencies) or section 10 (non-Federal agencies) of the ESA. Additional regulatory burdens and costs would result from the requirement to obtain an ESA section 10(a)(1)(B) permit or to consult with NMFS under section 7 of the ESA and to implement conservation and mitigation measures associated with ESA section 10 permits or with an ESA section 7 incidental take statement. Potential conservation and mitigation measures include erosion control, changes to dredging schedules and locations, installation of fish screens at water diversions, construction of fish passage structures, shoreline restoration, and implementation of green sturgeon bycatch reduction measures. NMFS would work with affected entities to develop conservation, mitigation, and minimization measures.

5.4 Alternative A

Alternative A would result in similar effects as the Full Action Alternative. However, Alternative A would limit application of the take prohibitions to specific categories of activities and, for some activities, to specific areas. Any activities that cause take of the Southern DPS and are subject to the take prohibitions must be reviewed by NMFS and covered under an ESA section 10 permit or an ESA section 7 incidental take statement. Non-federal activities that cause take of the Southern DPS but are not subject to the take prohibitions would not require review by NMFS. Federal agency actions that

cause take of the Southern DPS but are not subject to the take prohibitions would still be subject to review under section 7 of the ESA, but the analysis would not include an assessment of take. Thus, the environmental effects as well as the benefits to the Southern DPS under Alternative A would be limited compared to the Full Action Alternative.

5.4.1 Southern DPS Green Sturgeon

Alternative A would provide for the protection and conservation of the Southern DPS, but would limit application of the take prohibitions to specific categories of activities known to cause take of the Southern DPS or closely related species. In addition, application of the take prohibitions to some of the activities would be limited to the Central Valley, California, to protect spawning adult populations and early life stages. Alternative A would not apply the take prohibitions to future activities or any activities for which we do not currently have information on take and that are not specifically identified in this alternative. Thus, Alternative A would result in beneficial impacts to the Southern DPS, but would not be as protective as the Full Action Alternative.

5.4.2 Other Protected Species

Alternative A would also provide for the protection and conservation of other protected species within the affected environment by improving habitat conditions, water quality and availability, and fish passage. Alternative A would result in beneficial impacts, but these benefits would be limited to the specific activities and areas as described under Alternative A (see Section 3.4 of this EA).

5.4.3 Habitat Resources

Alternative A would result in beneficial impacts to habitat resources. Alternative A would provide for the protection and conservation of the Southern DPS' habitat as well as the habitat of other fish and wildlife species in the affected environment. Alternative A would reinforce Federal protections for critical habitat, wetlands, floodplains, and coastal zones. Alternative A would likely improve water quality, reduce sediment input and runoff, and minimize shoreline disturbance for the protection of the Southern DPS and other fish and wildlife species. Additional regulatory burdens and costs may be imposed on Federal agencies and non-Federal entities conducting habitat restoration projects, to ensure that the projects do not result in take of the Southern DPS. The benefits to habitats would primarily

occur in the Central Valley, California, however, because the application of the take prohibitions to some activities would be limited to this area.

5.4.4 Water Quality and Availability

Alternative A would result in improved water quality and water availability for the Southern DPS, particularly in the Sacramento River and tributaries, the Delta, and the San Francisco, Suisun, and San Pablo bays. Additional restrictions (such as changes to operation schedules, installation of fish screens or fish passage facilities) may be imposed on the construction and operation of dams and water diversion facilities that pose a risk of take to the Southern DPS and lead to reduced water resources for agricultural, municipal, and industrial use in the Central Valley, California. The effects of Alternative A would not be expected to be significant, however, because similar measures would already be required under section 7 of the ESA to address the jeopardy or critical habitat provisions, or under existing protective regulations for other ESA-listed species.

5.4.5 Land Use Resources

Alternative A would affect land use activities that may alter water quality or availability for the Southern DPS or that result in direct take of the Southern DPS, but would not be expected to result in significant effects. Alternative A would focus on land use activities that alter or destroy spawning and rearing habitat, introduce contaminants into water ways, or result in entrainment or impingement of the Southern DPS. Compliance with water quality standards, erosion control measures, habitat restoration, and changes to dredging and disposal locations and schedules may be required. Many of these measures would already be required under existing state and Federal regulations for land use activities and existing protections for other ESA-listed species.

5.4.6 Energy and Mineral Resources

Effects on access to energy and mineral resources under Alternative A would not be significant. Both hydropower and nuclear power plant facilities are regulated by Federal agencies and subject to section 7 of the ESA. Alternative A would require coverage under an ESA section 10(a)(1)(B) permit for non-nuclear power plants that use once-through cooling systems and that may impinge or entrain the Southern DPS. Alternative A would generally reinforce existing regulations under the Federal CWA

and existing protective regulations for other ESA-listed species concerning the impingement or entrainment of fish associated with the operation of cooling water intake structures. Proposed LNG and alternative energy hydrokinetic projects would be subject to section 7 of the ESA and would need to consider the potential risk of take to the Southern DPS in the analysis of environmental effects.

Alternative A would reinforce water quality standards applicable to mineral resource production activities, particularly within spawning and rearing habitats in the Central Valley, California. Alternative A may impose additional restrictions on in-river and in-bay sand and gravel mining activities or other mining activities conducted adjacent to water ways to avoid effects on important spawning and rearing habitats. ESA section 10 (a)(1)(B) permits would be required in addition to state issued permits. Mineral production may decrease for a short period following implementation of the ESA 4(d) Rule as measures are being developed and implemented and alternate sources are explored.

5.4.7 Fisheries Opportunities

Alternative A would impose additional restrictions on commercial, recreational, and Tribal fisheries to avoid or reduce bycatch of green sturgeon, such as gear restrictions, depth restrictions, and monitoring and reporting of bycatch, but would not be expected to result in significant effects. Although zero retention of green sturgeon has been implemented in several state-managed fisheries, ESA section 10 (a)(1)(B) permits would still be required for continued operation of these fisheries. Federally-managed commercial fisheries would continue to be subject to requirements under section 7 of the ESA.

5.4.8 Socioeconomic Resources

Socioeconomic effects of Alternative A are described and evaluated in detail in the Final RIR/FRFA (*IEc 2010a; 2010b*). Like the Full Action Alternative, Alternative A would result in additional costs and regulatory burdens, because activities that may cause take of the Southern DPS and that are subject to the take prohibitions under Alternative A would be required to comply with section 7 and section 10 of the ESA. Because Alternative A limits application of the take prohibitions to certain areas and activities (see Section 3.4 of this EA), the socioeconomic effects would be less than that expected under the Full Action Alternative and would not be expected to be significant. NMFS would work with affected entities to develop measures to avoid or reduce take of the Southern DPS.

5.5 Alternative B (Preferred Alternative)

Alternative B would apply the ESA section 9 prohibitions as described in the Full Action Alternative, but would include exceptions and exemptions from the take prohibitions for certain categories of activities. In addition to the processes under section 7 or 10 of the ESA, the exceptions and exemptions would provide an additional, and potentially more stream-lined, option for entities to obtain coverage for take of the Southern DPS. The criteria and plans under the exceptions and exemptions would encourage entities to coordinate with NMFS to incorporate conservation measures into their plans and programs for actions. Alternative B would be as protective of the Southern DPS as the Full Action Alternative. Alternative B would reinforce existing state and Federal environmental regulations, facilitate coordination with NMFS, and promote actions that would benefit the Southern DPS as well as other fish and wildlife species (e.g., improved water quality and habitat conditions). Over the long-term, the development and implementation of conservation measures under Alternative B would potentially improve resource management within the affected environment.

5.5.1 Southern DPS Green Sturgeon

Alternative B would provide for the protection and conservation of the threatened Southern DPS by prohibiting all take of the Southern DPS. Activities that result in take of the Southern DPS must be reviewed by NMFS and analyzed in a section 7 incidental take statement (for Federal actions), an ESA section 10(a)(1)(A) permit (for scientific research and enhancement activities), or an ESA section 10(a)(1)(B) permit (for incidental take in non-Federal actions). These requirements would result in a beneficial impact to the Southern DPS. Alternative B would also provide a more stream-lined and coordinated process under the exceptions and exemptions from the take prohibitions for certain activities that would benefit the Southern DPS (i.e., scientific research and monitoring, emergency fish rescue, habitat restoration, and law enforcement activities). These exceptions and exemptions would allow these activities to be carried out more expeditiously, thus more effectively aiding the conservation and recovery of the Southern DPS. Federal agency actions that qualify for the exceptions and exemptions would still be subject to section 7 of the ESA, but the analysis would be limited to the jeopardy provision and would not involve an assessment of take.

5.5.2 Other Protected Species

Alternative B would have beneficial impacts on other protected species. Conservation measures implemented for the Southern DPS would provide for the protection and conservation of other fish and wildlife species and their habitats within the affected environment. For example, Alternative B would likely improve water quality and availability, fish passage, and habitat conditions for the Southern DPS, benefiting other fish and wildlife species co-occurring with the Southern DPS.

5.5.3 Habitat Resources

Alternative B would result in beneficial impacts to habitat resources. Alternative B would reinforce existing Federal policies to protect designated critical habitat as well as other habitats such as wetlands, floodplains, and coastal areas. Erosion control measures, compliance with water quality standards, and habitat restoration may be required to protect the Southern DPS. Additional regulatory burdens may be imposed on habitat restoration activities to comply with an ESA section 7 incidental take statement or an ESA section 10(a)(1)(B) permit. However, Alternative B would provide an exception for habitat restoration activities that benefit the Southern DPS and meet the criteria specified under the alternative. Although additional time and costs may be needed to comply with the criteria, this exception would likely streamline the process. Non-Federal activities would not need an ESA section 10 permit. Federal actions qualifying for the exception would still need to comply with the ESA section 7 jeopardy and critical habitat provisions, but the analysis would not involve an assessment of take.

5.5.4 Water Quality and Availability

Alternative B would reinforce regulations and policies to protect and improve water quality, benefiting the Southern DPS, other fish and wildlife species, and other water resource users. Alternative B would also improve water availability for the Southern DPS, but may reduce water availability for agricultural, municipal, and industrial use. Like the Full Action Alternative, Alternative B would impose additional restrictions on the construction and operation of dams and water diversion facilities that pose a risk of take to the Southern DPS. Measures may be required to protect the Southern DPS, such as changes in operation schedules and installation of fish screens or fish passage structures. To make up for any reductions in water availability, water users may need to diversify their water supply sources and expand water reuse and recycling programs.

Overall, however, Alternative B would not be expected to have significant effects on water availability for agricultural, municipal, and industrial use in comparison to regulations that are already in place. Measures required under Alternative B would be similar to those already required under section 7 of the ESA to address the jeopardy and critical habitat provisions, or to address effects on other protected species. The main difference is that Alternative B would ensure that the take of the Southern DPS is specifically considered and addressed in the analysis of effects.

5.5.5 Land Use Resources

The effects of Alternative B on land use activities would be similar to those expected under the Full Action Alternative. Alternative B would affect land use activities such as agriculture, shoreline development, dredging and disposal operations, and other shoreline and in-water construction and alteration activities. Compliance with section 7 and section 10 of the ESA would be required to address take of the Southern DPS, including direct take of the species as well as indirect take resulting from the effects of these activities on water quality and availability. Measures required under Alternative B may include compliance with water quality standards, erosion control, changes to dredging and disposal locations and schedules, and shoreline restoration. Such measures would be similar to those required under existing state and Federal regulations governing land use activities, as well as existing protections for the Southern DPS and other ESA-listed species. Alternative B would primarily require that take of the Southern DPS be specifically addressed. Thus, Alternative B would not be expected to result in significant changes from existing requirements and would not be expected to result in significant effects. NMFS would work with the affected entities through the ESA section 7 or section 10 processes to develop conservation, mitigation, and minimization measures.

5.5.6 Energy and Mineral Resources

The effects of Alternative B on access to energy and mineral resources within the affected environment would be similar to those under the Full Action Alternative and would not be expected to be significant. Hydropower and nuclear power plant facilities are regulated by Federal agencies and are already required to comply with section 7 of the ESA. State-regulated non-nuclear power plants that use once-through cooling systems would be required to apply for an ESA section 10 (a)(1)(B) permit for any take that may occur. Measures such as the installation of fish screens or changes to operation

schedules may be required to avoid or reduce fish impingement or entrainment in water intake structures. Requirements under Alternative B would be similar to those under the Federal CWA and existing protections for the Southern DPS and for other ESA-listed species to address impingement and entrainment of fish species at power plants. Alternative B would require that proposed LNG and alternative energy hydrokinetic projects consider the potential risk of take of the Southern DPS in the analysis of environmental effects and in analyses under section 7 of the ESA.

Alternative B would reinforce water quality standards for mineral production activities as well as require measures to address effects on the Southern DPS and its habitat, such as the use of alternate locations to avoid effects on spawning and rearing habitats, changes in the frequency of mining activities, and erosion control measures. Alternative B would require that any take of the Southern DPS be covered under an ESA section 10 (a)(1)(B) permit. As measures are being developed and implemented and alternate sources explored, mineral production may decrease for a short period but such reductions would not be expected to be long-term or significant.

5.5.7 Fisheries Opportunities

Alternative B would require that take of the Southern DPS in commercial, recreational, or Tribal fisheries be covered under an ESA section 10(a)(1)(B) permit or under an ESA section 7 incidental take statement. The effects of Alternative B on fisheries opportunities would not be significant, however, because many of the measures required to avoid or reduce take have been or will be adopted independent of the ESA 4(d) Rule. Protective measures for green sturgeon have already been adopted in state-managed fisheries in California, Oregon, Washington, and the lower Columbia River to prohibit the retention of green sturgeon and to monitor bycatch. For Federally-managed fisheries (i.e., coastal groundfish bottom trawl fishery), measures to avoid or minimize take would likely be similar to those that would already be required to comply with the ESA section 7 jeopardy and critical habitat provisions. In addition, Alternative B would provide another option for covering take under a NMFS-approved FMEP for commercial and recreational fisheries or under NMFS-approved Tribal Plans for Tribal fisheries and other Tribal activities. These plans would provide a potentially more streamlined process by removing the need for analysis under an ESA section 10(a)(1)(B) permit or under an ESA section 7 incidental take statement. Development of FMEPs and Tribal Plans under Alternative B would benefit the Southern DPS by promoting measures to minimize and monitor bycatch of green sturgeon in fisheries and encouraging coordination with NMFS.

5.5.8 Socioeconomic Resources

The socioeconomic effects of Alternative B are analyzed and described in detail in the Final RIR/FRFA (*IEc 2010a; 2010b*). The potential socioeconomic effects of Alternative B would not be expected to be significant. Alternative B would require that any take of the Southern DPS be covered under section 7 or section 10 of the ESA, or under one of the ESA 4(d) Rule exceptions or exemptions. Like the Full Action Alternative and Alternative A, application of Alternative B would result in additional regulatory burdens and costs to implement required measures. Alternative B may reduce those regulatory burdens and costs for some activities (i.e., scientific research and monitoring, habitat restoration, law enforcement, emergency fish rescue, commercial and recreational fisheries, and Tribal resource use and management), however, by providing an exception or exemption as an alternative method to cover take of the Southern DPS. These exceptions or exemptions would negate the requirement that the take be reviewed in an ESA section 10 permit or an ESA section 7 incidental take statement. Federal agency actions qualifying for the exceptions or exemptions would still need to be reviewed under the ESA section 7 jeopardy and critical habitat provisions, but the analysis would not involve an assessment of take. The regulatory requirements under Alternative B would be similar to those already required under section 7 of the ESA (to address jeopardy to the species or critical habitat) and under existing protective regulations for other co-occurring ESA-listed species (e.g., salmon and steelhead) and would not be a significant change from these existing requirements.

5.6 Alternative C

Alternative C would apply the ESA section 9(a)(1) prohibitions to the same categories of activities as listed under Alternative A and include the exceptions and exemptions listed under Alternative B. Any activities that cause take of the Southern DPS and are subject to the take prohibitions must be reviewed by NMFS in an ESA section 10 permit, an ESA section 7 incidental take statement, or one of the 4(d) exceptions or exemptions. Non-Federal activities that cause take of the Southern DPS but are not subject to the take prohibitions would not require an ESA section 10 permit. Federal agency activities that cause take of the Southern DPS but are not subject to the take prohibitions would still be subject to the ESA section 7 jeopardy and critical habitat provisions, but the analysis would not involve an assessment of take. Thus, Alternative C would limit the application of the take prohibitions compared

to the other alternatives, but would also limit protections for the Southern DPS. The effects of Alternative C would be similar to the effects of Alternatives A and B.

5.6.1 Southern DPS Green Sturgeon

Alternative C would benefit the Southern DPS by providing exceptions and an exemption to streamline the permitting process for scientific research activities. However, Alternative C would limit application of the take prohibitions to specific categories of activities and geographic areas (see Sections 3.4 and 3.6 of this EA for the categories of activities and geographic limitations). In addition, Alternative C would not apply the take prohibitions to future activities or any activities not identified in this alternative due to a lack of sufficient information. Thus, Alternative C would benefit the Southern DPS, but would not be as protective as the Full Action Alternative or Alternative B.

5.6.2 Other Protected Species

Alternative C would result in beneficial impacts to other protected species. Alternative C would reinforce existing protective regulations for other ESA-listed species and provide for the protection and conservation of other fish and wildlife species. Like Alternative A, however, most of the benefits of Alternative C would be limited to the Central Valley, California, because for certain activities (i.e., habitat-altering activities and entrainment and impingement at water diversions) the take prohibitions would apply only in the Central Valley. Thus, Alternative C would likely improve water quality and availability, habitat conditions, and fish passage within the Sacramento River and its tributaries, the Delta, and the San Francisco, San Pablo, and Suisun bays, but may not provide for these benefits in other coastal estuaries where the Southern DPS occurs.

5.6.3 Habitat Resources

Alternative C would result in beneficial impacts to habitat resources. Alternative C would reinforce protections for critical habitat and other important habitats within the affected environment, such as wetlands, floodplains, and coastal areas. Like Alternative A, many of the benefits of Alternative C would be limited to areas in the Central Valley, California, because for habitat-altering activities, the take prohibitions would apply only in the Central Valley. Compliance with section 7 or section 10 of the ESA would be required for habitat-altering activities that may result in take of the Southern DPS

within the Sacramento River and its tributaries, the Delta, and the San Francisco, San Pablo, and Suisun bays. Like Alternative B, Alternative C may provide a more streamlined process for habitat restoration activities that qualify for the exception from the take prohibitions, because they would not require analysis under an ESA section 10(a)(1)(B) permit or an ESA section 7 incidental take statement. Federal actions qualifying for this exception would still be required to comply with the ESA section 7 jeopardy and critical habitat provisions, but the analysis would not involve an assessment of take.

5.6.4 Water Quality and Availability

Alternative C would improve water quality and availability for the Southern DPS, particularly in the Sacramento River and tributaries, the Delta, and the San Francisco, Suisun, and San Pablo bays. Alternative C may impose additional restrictions on the construction and operation of dams and water diversion facilities that cause take of the Southern DPS. For example, Alternative C may require changes to operation schedules, installation of fish screens, or construction of fish passage facilities. Alternative C may result in the reduced availability of water resources for agricultural, municipal, and industrial use in the Central Valley, California. However, the effects of Alternative C on water availability would not be expected to be significant because measures required under Alternative C would be similar to those required under section 7 of the ESA (to address the jeopardy and critical habitat provisions) or under existing protective regulations for other ESA-listed species.

5.6.5 Land Use Resources

Alternative C would primarily affect land use activities that alter water quality or availability for the Southern DPS or that directly take Southern DPS, focusing on activities conducted in spawning and rearing habitats in the Central Valley, California. The effects of Alternative C would not be expected to be significant. Measures may be required similar to those required under existing regulations for land use activities and for other ESA-listed species, such as compliance with water quality standards, erosion control, habitat restoration, and changes to dredging and disposal locations and schedules.

5.6.6 Energy and Mineral Resources

Alternative C would not be expected to result in significant effects on access to energy and mineral resources. Federally-regulated hydropower and nuclear power plant facilities are already subject to

section 7 of the ESA. Non-nuclear power plants would require coverage under an ESA section 10(a)(1)(B) permit if they use once-through cooling systems that may impinge or entrain the Southern DPS. The measures required under Alternative C would be similar to those required under the Federal CWA and under existing protective regulations for other ESA-listed species concerning the impingement or entrainment of fish associated with the operation of cooling water intake structures. Alternative C would require that the potential risk of take of the Southern DPS be considered in the analysis of the environmental effects of proposed LNG and alternative energy hydrokinetic projects.

Alternative C would reinforce water quality standards for mineral resource production activities, particularly within spawning and rearing habitats in the Central Valley, California. Additional restrictions may be required for in-river and in-bay sand and gravel mining activities or other mining activities conducted adjacent to water ways to avoid effects on spawning and rearing habitats. ESA section 10 (a)(1)(B) permits would be required in addition to state-issued permits. Mineral production may be reduced for a short period as measures are being developed and implemented and alternate sources are explored, but this reduction would not be long-term or significant.

5.6.7 Fisheries Opportunities

Alternative C would require compliance with section 7 or section 10 of the ESA to address take in bycatch of the Southern DPS. The effects would not be expected to be significant, however, because the potential measures under Alternative C to address bycatch would be similar to those already required under existing state fishery regulations (i.e., prohibiting the retention of green sturgeon) and under the ESA section 7 jeopardy provision for Federally-managed fisheries. In addition, Alternative C would provide an exemption from the take prohibitions for commercial and recreational fisheries under a NMFS-approved FMEP and for Tribal fisheries and other Tribal resource activities under a NMFS-approved Tribal Plan. FMEPs and Tribal Plans may provide a more streamlined approach for some entities compared to the ESA section 7 or 10 processes, and benefit the Southern DPS by promoting the monitoring and minimization of bycatch as well as greater coordination with NMFS.

5.6.8 Socioeconomic Resources

The Final RIR/FRFA (*IEc 2010a; 2010b*) provides a detailed analysis and description of the socioeconomic effects of Alternative C. Alternative C would result in additional regulatory burdens

and costs for activities in order to comply with section 7 or section 10 of the ESA, but would not be expected to result in significant effects. Because Alternative C would apply the take prohibitions only to specific categories of activities and, for some activities, certain areas, the socioeconomic effects of Alternative C would be limited compared to the Full Action Alternative and Alternative B. In addition, Alternative C would provide exceptions and exemptions from the take prohibitions for scientific research and monitoring, habitat restoration, emergency fish rescue, law enforcement, fisheries, and Tribal resource use and management activities. These exceptions and exemptions may provide a more streamlined approach for some entities compared to the processes under ESA section 7 or 10.

5.7 Cumulative Effects

The Proposed Action would not be the only action affecting the biological, physical, and socioeconomic environment as described in this EA. Other actions by Federal, state, local, and private entities are or would affect the Southern DPS and the surrounding biological and human environment. These include: (1) existing regulations and policies, as well as ongoing efforts to protect, conserve, and restore habitats and to monitor and mitigate the adverse environmental effects caused by human resource use activities; (2) past and current development and resource use activities (e.g., urban development, construction of dams and other migration barriers, recreational and commercial fisheries) that have altered stream and coastal habitats and the biological communities within them; and (3) economic and social factors outside of the scope of the alternatives. The alternatives would primarily provide for the protection and conservation of the Southern DPS and its habitats. The alternatives would add to or complement existing protections and conservation efforts for the Southern DPS and its habitats and other fish and wildlife species within the affected environment.

5.7.1 Southern DPS Green Sturgeon

Whether or not an ESA 4(d) Rule exists, all Federal actions must comply with the jeopardy and critical habitat provisions under section 7(a)(2) of the ESA. All of the action alternatives would add to existing protections for the Southern DPS by prohibiting the take of the Southern DPS. Existing protective regulations and critical habitat designations for other ESA-listed species, such as Pacific salmon and steelhead, would also provide protections for the Southern DPS by implementing conservation and mitigation measures similar to those that would be required under the alternatives. No significant cumulative impacts are expected.

5.7.2 Other Protected Species

ESA-listed species receive protection under section 7, section 9, and section 10 of the ESA. Other environmental regulations as well as past and ongoing conservation programs and efforts also provide protection for ESA-listed species and other fish and wildlife species. The alternatives (except for the No-action Alternative) would complement existing regulations, programs, and efforts for the protection and conservation of ESA-listed species and other fish and wildlife species. No significant cumulative impacts are expected.

5.7.3 Habitat Resources

Section 7(a)(2) of the ESA requires Federal agencies to ensure that their actions do not destroy or adversely modify designated critical habitat. Recent and ongoing efforts have also been made to incorporate habitat conservation and ESA objectives into land use planning and development. For example, watershed management efforts are being developed and implemented at the state level to provide guidance for activities that occur within, or that affect, watersheds, to ensure that effects on habitats and species are considered and addressed. The alternatives (except for the No-action Alternative) would complement ongoing programs and existing regulations and efforts to protect and conserve designated critical habitat as well as other important aquatic and marine habitats, such as wetlands, floodplains, and coastal areas. No significant cumulative impacts are expected.

5.7.4 Water Quality and Availability

Environmental regulations, programs, and efforts have been established to regulate, monitor, and improve water quality and availability within the affected environment. Water quality is regulated by the Federal CWA and other existing Federal and state regulations (e.g., protective measures for other ESA-listed species). State, local, and regional programs also focus on monitoring and improving water quality. The action alternatives would complement these existing regulations, programs, and efforts.

Water availability and activities associated with water supplies may be affected by other regulations, including protective regulations for other ESA-listed species (such as salmon and steelhead) and existing protections for the Southern DPS under section 7 of the ESA. Restrictions on water use and

availability under these regulations would be similar to those expected under the alternatives. Thus, the cumulative effects of the alternatives would not be expected to be significant because many restrictions would apply even without an ESA 4(d) Rule for the Southern DPS. The alternatives would specifically ensure that take of the Southern DPS is addressed in the implementation of these regulations.

5.7.5 Land Use Resources

Many land use activities are permitted, conducted, or funded by Federal agencies and subject to review under section 7 of the ESA, with or without an ESA 4(d) Rule. Land use activities are also regulated by other environmental regulations as well as existing state, regional, and local programs and efforts to monitor and mitigate adverse environmental effects resulting from human resource use. For example, watershed conservation and restoration activities address water quality issues and the effects of in-water and shoreline development. No significant cumulative impacts are expected.

5.7.6 Energy and Mineral Resources

The effects of hydropower facilities, proposed LNG projects, proposed alternative energy hydrokinetic projects, and power plants using once-through cooling systems on fish species are major concerns among states and local communities. Efforts have been initiated to improve fish passage in streams, remove dams, and reduce fish entrainment and impingement in once-through cooling systems. Efforts have also been made to ensure that effects on marine resources are adequately considered and addressed in the development of LNG projects and alternative energy hydrokinetic projects. Regulations also exist to minimize the effects of mining operations on habitats. State laws regulate mining operations and require reclamation of abandoned mines as well as of mining sites after mining operations have ceased. These efforts and regulations would benefit the Southern DPS and be consistent with the objectives of the ESA 4(d) Rule. The effects of the alternatives on access to energy and mineral resources would not be expected to be significant, because the measures required to address take of the Southern DPS would be similar to those required under existing regulations.

5.7.7 Fisheries Opportunities

Fisheries regulations are based on various factors, including the status of species and bycatch levels. Declines in groundfish, salmon, and white sturgeon populations in the past decades have led to

increased restrictions on these fisheries. Regulations have also been imposed to reduce bycatch of non-target species. The alternatives (except for the No-action Alternative) would add to restrictions on fisheries, particularly for white sturgeon fisheries. Most state-managed white sturgeon fisheries have already implemented protective measures for the Southern DPS, including zero retention of green sturgeon and sturgeon report cards to monitor catch and release of green sturgeon. Many of the coastal groundfish bottom trawl fisheries are Federally-managed and already required to comply with the jeopardy and critical habitat provisions under section 7 of the ESA. Measures to address take of the Southern DPS would likely be similar to those required to address jeopardy or effects on the Southern DPS' critical habitat. The effect of the action alternatives would be to specifically ensure that take of the Southern DPS is monitored and addressed. No significant cumulative impacts are expected.

5.7.8 Socioeconomic Resources

The socioeconomic effects of the alternatives are more fully described and analyzed in the Final RIR/FRFA (*IEc 2010a; 2010b*). The alternatives (except for the No-action Alternative) would impose additional regulatory restrictions and costs to activities that may cause take of the Southern DPS. The additional time and costs involved would result from the need to comply with section 7 or section 10 of the ESA, or with exceptions or exemptions under the ESA 4(d) Rule, and the implementation of any measures required to address take of the Southern DPS. These measures, and the time and costs to implement them, would be in addition to the measures, time, and costs already imposed on activities by existing regulations or other social and economic factors. In many cases, however, the measures that would be required under the action alternatives would be expected to be similar to what would already be required under existing ESA regulations and other environmental regulations. For example, compliance with water quality standards is already required under the Federal CWA and would be reinforced by the alternatives. Existing protections for ESA-listed salmonids would apply measures similar to those that would be expected for the Southern DPS. Also, some measures may already be required under section 7 of the ESA to ensure that Federal actions do not jeopardize the survival of the Southern DPS or destroy or adversely modify its critical habitat. Compliance with these standards under section 7 of the ESA is required whether or not an ESA 4(d) Rule is established for the species. Measures to address the take of the Southern DPS may differ slightly from those required to address jeopardy or effects on critical habitat, but would not be expected to result in significant socioeconomic impacts. In many cases, a separate NEPA review would be required prior to implementation of measures to address take of the Southern DPS. No significant cumulative impacts are expected.

5.8 Environmental Justice

Federal agencies are required to address environmental justice issues in NEPA documents. Environmental justice is defined as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA Office of Environmental Justice, EH-411-97/0001, February 1997). NMFS must ensure that the decision-making process for the development of the ESA 4(d) Rule is fair and that the impacts are evenly distributed. No single group of people, based on racial, ethnic, socioeconomic, or other status, should bear an unequal share of any negative environmental consequences that result from the application this ESA 4(d) Rule (Executive Order 12898, 59 FR 7629; February 11, 1994). The alternatives would apply to all entities that conduct activities resulting in take of the Southern DPS and would not be based on racial, ethnic, socioeconomic, or any other status of groups of people. The alternatives are not expected to impose disproportionately greater burdens on any single group of people based on characteristics of status.

5.9 Climate Change

Climate change is defined as any significant change in climate metrics, including temperature, precipitation, and wind patterns, over a period of time (U.S. EPA Glossary of Climate Change Terms, http://www.epa.gov/climatechange/glossary.html#C). The effects of climate change most people refer to today stems from "global warming," a relatively recent phenomenon of rising average temperatures across the globe. The temperature increase is thought to be due in large part to the human-induced increase in greenhouses gas emissions released into the atmosphere as a result of combustion. Common greenhouse gases (GHG) such as carbon dioxide, methane, and nitrous oxide trap radiant heat from the earth causing the average temperature to rise. Climate change research in reports from the United Nations Intergovernmental Panel on Climate Change (IPCC) (www.ipcc.ch), U.S. Climate Change Science Program's Science Synthesis and Assessment Products, and the U.S. Global Change Research Program, conclude that earth's climate is already changing. This change is expected to accelerate and human GHG emissions, primarily carbon dioxide emissions (CO_2), are the main source of accelerated climate change. This rise in temperature changes the climate worldwide and have already and will continue to cause or increase the severity of droughts, flooding, wildfires, and food and water shortages (USDA Forest Service guidance).

The alternatives would not be expected to affect climate change. The purpose of the Proposed Action is to protect and conserve the Southern DPS by prohibiting take of the species. The alternatives do not implement specific actions that would contribute to emissions of greenhouse gases into the atmosphere. However, climate change may affect the Southern DPS through effects on the marine, estuarine, and freshwater habitats occupied by the Southern DPS.

6.0 CONSULTATION AND COORDINATION

Following the public scoping workshops held on May 31, 2006, and June 1, 2006, NMFS consulted and coordinated with several green sturgeon experts and points of contact within state agencies, Tribes, and other organizations. These experts and contacts (including, but not limited to, those listed below) provided technical information used to develop the alternatives. Comments and technical information were discussed, addressed, and incorporated into this EA and other documents associated with the Proposed Action.

State Agencies

California Department of Fish and Game – Tom Barnes, Russ Bellmer, Marty Gingras

California Department of Water Resources – Alicia Seesholtz

Tribal Entities

Northwest Indian Fisheries Commission – William Beattie

Lummi Indian Tribe – Alan Chapman

Quinault Indian Tribe – Gary Morishima, Joe Schumacker

Other organizations

UC Davis – Josh Israel, Joel Van Eenennaam

The draft EA was announced in the proposed ESA 4(d) Rule (74 FR 23822, May 21, 2009) and made available to the public on the NMFS Southwest Region Web site (http://swr.nmfs.noaa.gov) and Federal eRulemaking Portal (http://www.regulations.gov). Public comments were accepted for 45 days from May 21, 2009, to July 6, 2009, and are posted on the Federal eRulemaking Portal. One commenter provided several comments on the draft EA, summarized (with responses) below.

Clarification of the alternatives: The commenter requested further clarification of the geographic limitations and distinctions between the alternatives. In addition, the commenter requested clarification on the specific categories of activities to which the take prohibitions would be applied in Alternative C.

> Response: The final EA was revised to more clearly describe the geographic limitations and distinctions between the alternatives considered (see Chapter 3). The final EA was also revised to clarify that under Alternative C, the take prohibitions would apply to the same specific categories of activities and in the same areas as described under Alternative A.

Emergency Fish Rescue Activities: The commenter requested clarification in the EA regarding the exception for emergency fish rescue activities under Alternative B. Specifically, the commenter asked what 4(d) programs were referred to in the sentence stating that "[p]roject-related activities … would not be considered an emergency fish rescue activity and would be subject to review under ESA section 7 or 10, or under another 4(d) program"(draft EA, page 15)

Response: A correction was made in this EA to clarify that, under Alternative B, project-related activities would not be eligible for the emergency fish rescue exception and would be subject to review under ESA section 7 or 10. Alternative B would not provide for 4(d) programs to cover such project-related activities.

Occupied Areas: The commenter asked why the draft EA specifically excluded the California Channel Islands from the list of areas (on page 21) known to be occupied by the Southern DPS, noting that the proposed critical habitat designation for the species (73 FR 52084, September 8, 2008) did not specifically state that green sturgeon do not occur around the Channel Islands.

Response: Based on the best available data, there is no evidence that green sturgeon occur in waters around the California Channel Islands. Thus, the waters around the Channel Islands were not included within the spatial scope of this EA. However, the final EA clarifies that protections under the alternatives would apply to the Southern DPS wherever they are found (unless geographic limitations have been specified, as in Alternatives A and C).

State Recreational Fisheries: The commenter requested clarification on which states' recreational fishing regulations did not differentiate between white sturgeon and green sturgeon prior to 2006.

Response: The final EA was revised to clarify that, prior to 2006, state recreational fishing regulations in Washington, Oregon, and California did not differentiate between white sturgeon and green sturgeon.

Update to References: The commenter suggested updating the 2005 reference for the Environmental Water Account because the program expired in 2007 and a revised program is currently in place with adjusted water amounts to augment instream flows.

Response: The final EA was updated to remove the outdated reference for the Environmental Water Account.

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