

**DRAFT 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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MAY 2009

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 proposed rule under section 4(d) of the Federal Endangered Species Act (ESA) to protect the threatened Southern Distinct Population Segment of North American green sturgeon. This EA describes the proposed and alternative ESA 4(d) Rules under consideration by NMFS and provides an analysis of the potential environmental effects of each. This analysis will facilitate informed decision-making by NMFS and informed comments by the public in response to NMFS' decision.

This EA is organized as follows:

- 1.0 Introduction
- 2.0 Purpose of and need for action
- 3.0 Alternatives including the Proposed Action
- 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 of green sturgeon. The purpose and scope of this EA and the major environmental issues are summarized.

Chapter 3 profiles the proposed and alternative ESA 4(d) Rules 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 proposed and alternative ESA 4(d) Rules may affect the human environment.

Chapter 5 presents the environmental consequences of the proposed and alternative ESA 4(d) Rules. 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 draft 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 to 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; commercial and recreational fisheries harvest; and poor water quality conditions. Unless these threats are addressed, the Southern DPS may continue to decline in abundance and become at risk of extinction.

Section 4(d) of the ESA authorizes NMFS to issue protective measures via regulations, called a ESA 4(d) Rule, to govern the take of 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 protective regulations are necessary and advisable and proposes to establish an ESA 4(d) Rule for the Southern DPS.

NMFS considered and evaluated five alternative ESA 4(d) Rules for the Southern DPS:

No-action Alternative: The No-action Alternative represents the environmental baseline against which the other alternatives are compared to determine their environmental effects. If implemented, 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. Section 7 of the ESA would still apply to activities authorized, carried out, or funded by Federal agencies.

Full Action Alternative: All of the prohibitions under section 9 of the ESA would be adopted and applied to the Southern DPS. The take of Southern DPS fish would be prohibited in all activities, including those resulting in direct take (e.g., fisheries harvest, scientific research) and in indirect take (e.g., modifications to the Southern DPS’ habitat).

Alternative A: All of the prohibitions under section 9 of the ESA would be adopted and applied to the Southern DPS. However, the take of Southern DPS fish would be prohibited in the specific

categories of activities of most concern regarding the Southern DPS, rather than in all activities. 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; destruction or modification of spawning or rearing habitats; application of pesticides or discharge of pollutants beyond accepted levels into waterways used by Southern DPS fish; and activities that may entrain or impinge Southern DPS fish (e.g., operation of unscreened water diversions in spawning or rearing habitats, dredging, and power plant operations); and the release or introduction of non-native species.

Alternative B (Proposed Action): *Alternative B* is the same as the Full Action Alternative, but with exceptions and exemptions from the take prohibitions. The exceptions and exemptions would apply to activities conducted under NMFS-approved plans or criteria for: recreational and commercial fisheries; Tribal fisheries and resource management; habitat restoration activities; and Federal, state, and private research or monitoring; and emergency fish rescue.

Alternative C: *Alternative C* is the same as *Alternative A* and includes the same exceptions and exemptions as those under *Alternative B*. *Alternative C* differs from *Alternative B* in that the take of Southern DPS fish would be prohibited in specific categories of activities as specified in the ESA 4(d) Rule, rather than in all activities.

The alternatives would apply to areas where Southern DPS fish are known to occur, 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 (excluding the southern California Channel Islands) 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 of green sturgeon. *Alternative B* was selected as the preferred alternative,

however, because it was determined to provide a high degree of protection for Southern DPS green sturgeon 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 categories of activities that affect Southern DPS green sturgeon, 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 the development of alternative energy hydrokinetic projects. Given the lack of specific and detailed information to fully identify and assess all of the categories of activities affecting Southern DPS green sturgeon 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 Southern DPS fish. 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 Southern DPS green sturgeon, such as scientific research and monitoring and habitat restoration, by providing more stream-lined processes for these activities. 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.

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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).

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 to their survival, 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 known spawning populations are in the Klamath and Rogue Rivers.
- 2) A southern DPS consisting of populations from coastal and Central Valley watersheds south of the Eel River ("Southern DPS"). The only known spawning population is in the Sacramento River.

Northern DPS and Southern DPS green sturgeon 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 of green sturgeon 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, and causes of decline of 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, or destroy or adversely modify its critical habitat. The protections under section 7 of the ESA automatically apply 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 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 that they are necessary and advisable for the conservation of the threatened species. The 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.

The primary purpose of an ESA 4(d) Rule is the development of regulations that will provide for the conservation of the threatened species. The Secretary is given the discretion in how to achieve this purpose. The ESA 4(d) Rule may include a blanket take prohibition, or it 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 take to an acceptable level. The ESA 4(d) Rule would specify the criteria that must be satisfied to qualify for an exception or exemption. These ESA 4(d) Rule criteria or programs would assure entities that their activities are consistent with ESA requirements and with the protection of the species.

NMFS may also provide coverage for an otherwise prohibited take through section 7 or 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. No regulatory timeline exists for issuance of the ESA 4(d) Rule. 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 (excluding the Channel Islands) 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 and reduce the extinction risks to green sturgeon. 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 reduce the extinction risks faced by the species. Because the Southern DPS of green sturgeon is listed as threatened, the prohibitions under section 9 of the ESA to protect endangered species do not apply unless specified in an ESA 4(d) Rule. Although

listing the Southern DPS as a threatened species automatically provides protection under section 7 of the ESA, the restrictions associated with these protections apply only to Federal agency actions and do not explicitly prohibit take of the species. Take of Southern DPS green sturgeon as a result of a Federal agency action is not required to be authorized under an incidental take statement, which anticipates maximum take levels and requires that the action comply with reasonable and prudent measures established by NMFS to help minimize the effects from the take. In addition, without protective regulations governing take, NMFS does not have regulatory authority to review non-Federal actions that cause take of Southern DPS fish, nor does it have authority to require that conservation measures be taken to reduce or avoid that take. Without the establishment of protective regulations, NMFS cannot effectively address the threats faced by the Southern DPS and the species may continue to decline toward extinction. Thus, NMFS determined that restrictions on take in an ESA 4(d) Rule are necessary and advisable to protect and conserve the Southern DPS.

2.3 Scoping and Coordination and Consultation

NMFS held two public scoping workshops in Sacramento, CA, on May 31 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 has continued to consult and coordinate with state agencies, Tribal entities, and other organizations to gather information for the development and evaluation of the Proposed Action and 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 Proposed Action and alternatives.

2.4 Ongoing Actions

Ongoing actions that may affect, or be affected by, the Proposed Action 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 ongoing actions related to the proposed action include:

- State sturgeon recreational and commercial fishing regulations

Prior to 2006, fishing regulations in California, Oregon, and Washington did not differentiate between green sturgeon and white sturgeon (*Acipenser transmontanus*). In 2006, emergency regulations were adopted in California, Washington, and the Columbia River to prohibit the retention of green sturgeon in commercial and recreational fisheries. These regulations were permanently adopted in 2007. These changes may affect how the proposed ESA 4(d) Rule will address commercial and recreational fisheries activities in California, 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 INCLUDING THE PROPOSED ACTION

3.1 Introduction

This section describes the alternative ESA 4(d) Rules under consideration by NMFS. Each of the alternative ESA 4(d) Rules was evaluated based on their adherence to the following objectives:

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

Five alternative ESA 4(d) Rules were considered for the Southern DPS of green sturgeon. 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 Southern DPS fish.
- *Alternative B (Proposed Action)*: 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 activities that NMFS has determined to be adequately protective of the Southern DPS.
- *Alternative C*: Apply the prohibitions under section 9(a)(1) of the ESA as described in Alternative A, and include the exceptions and exemptions from the take prohibitions for activities that NMFS has determined to be adequately protective of the Southern DPS 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	Application of ESA section 9 prohibitions	Application of take prohibitions	Exceptions/Exemptions
No Action Alternative	No change from current management [no ESA 4(d) Rule]	Do not apply any ESA section 9 prohibitions	Do not apply any take prohibitions	NO
Full Action Alternative	Same as the protections applied to endangered species	Apply all ESA section 9 prohibitions	Prohibit all take of Southern DPS fish	NO
Alternative A	Same as the Full Action Alternative, but the take prohibitions apply only to specific activities	Apply all ESA section 9 prohibitions	Prohibit take in specific categories of activities	NO
Alternative B	Same as the Full Action Alternative, but with exceptions and exemptions	Apply all ESA section 9 prohibitions	Prohibit all take of Southern DPS fish	YES
Alternative C	Same as Alternative A, but with exceptions and exemptions	Apply all ESA section 9 prohibitions	Prohibit take in specific categories of activities	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 policies). The No-action Alternative represents the physical and biological status quo. Federal agency actions would still be subject to requirements under section 7 of the ESA for any actions that may jeopardize the continued existence of the Southern DPS. 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. Without additional regulations established in an ESA 4(d) Rule, the Southern DPS would remain vulnerable to a range of threats, including fisheries harvest, entrainment by water diversions, and habitat-modification. The No-action Alternative would avoid potential adverse effects to socio-economic components of the human environment, but the Southern DPS would continue to be at risk of further declines in abundance.

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 Southern DPS fish within the U.S., the U.S. territorial sea, 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 Southern DPS fish 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 Full Action Alternative would essentially provide the Southern DPS the same protections as an endangered species. The regulations would prohibit the take of Southern DPS fish, not the activities themselves. Activities that may cause take of Southern DPS fish include, but are not limited to:

- Commercial and recreational fisheries activities that target or incidentally catch green sturgeon in California, Oregon, Washington, and Alaska. Green sturgeon are primarily 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 Southern DPS green sturgeon.
- Illegal sturgeon poaching activities.
- Collecting or handling Southern DPS fish 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 result in the impingement or entrainment of Southern DPS fish. For the purposes of this EA, entrainment is defined as the incidental trapping of any life stage of Southern DPS fish within waterways or structures, whereas impingement is defined as the entrapment of any life stage of Southern DPS fish 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 without adequate fish screens,

dredging activities, once-through cooling water intake systems for power plants, and alternative energy hydrokinetic projects (e.g., tidal and wave energy).

- 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 biological requirements of 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 Southern DPS fish. Interested entities could apply for an ESA section 10 take permit for scientific research or enhancement activities or activities that result in incidental take. ESA section 7 consultations for Federal agency actions would need to include an evaluation of whether or not the action is likely to cause take of Southern DPS fish. Take prohibitions would not apply to take that is permitted under an ESA section 10 permit or authorized by 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, rather than to all activities, that have been identified to be of most concern to the Southern DPS. Alternative A would prohibit the take of Southern DPS fish in the following categories of activities:

- Commercial, recreational, and tribal fisheries activities within areas where Southern DPS fish occur (see Section 2.1 of this EA for a list of areas).
- Collecting or handling Southern DPS fish 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 Southern DPS fish, or otherwise result in the inability of Southern DPS fish to migrate; or (b) destroy, modify, or curtail spawning and rearing habitat of egg, larval, and juvenile stages of Southern DPS fish. The take prohibitions would apply to areas containing spawning, rearing, and migratory habitat for Southern DPS fish 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 Southern DPS fish. 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 and power plant operations would be prohibited in U.S. coastal waters within 110 m depth from Monterey, California (including Monterey Bay), to Yakutat Bay, Alaska, as well as in the Strait of Juan de Fuca, Puget Sound, Grays Harbor, Willapa Bay, the lower Columbia River estuary, Yaquina Bay, Winchester Bay, Coos Bay, Humboldt Bay, San Pablo Bay, Suisun Bay, San Francisco Bay, and the Delta.
- Application or discharge of pesticides, toxic chemicals, or other pollutants adjacent to or within waterways that contain any life stage of Southern DPS green sturgeon, 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 Southern DPS green sturgeon.

These activities were identified based on the best available data regarding take of Southern DPS fish. The take prohibitions would not apply to other activities not included in the categories listed above, even if take of Southern DPS fish occurs. Activities subject to the take prohibitions would need to be altered to avoid take of Southern DPS fish, or would need to be covered under the appropriate ESA section 10 permit or section 7 incidental take statement. All Federal agency actions, whether the take

prohibitions apply or not, would continue to be subject to section 7 of the ESA to ensure that they do not jeopardize the continued existence of the Southern DPS.

3.5 Alternative B – Proposed Action

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 activities determined to be adequately protective of the Southern DPS. 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 Southern DPS fish would be covered under a NMFS 4(d) program established and approved by NMFS through a formal process. Thus, there would be several options to address take of Southern DPS fish under Alternative B: section 10 or section 7 of the ESA, or under one of the exceptions or exemptions from the take prohibitions. Alternative B recognizes that: (1) a certain level of take may be allowable and necessary for activities that benefit the Southern DPS; and (2) activities may be modified to minimize take to a level that is adequately protective of the Southern DPS.

Alternative B specifies that the criteria that must be met to qualify for an exception from the take prohibitions or for an approved 4(d) program under the exemptions. The criteria include requirements for monitoring and evaluation and measures to minimize take of Southern DPS fish, as well as regular review by NMFS. The exceptions and exemptions would provide three major benefits: (1) coverage for take of Southern DPS fish that occurs in the course of activities conducted in compliance with the 4(d) exception criteria or NMFS-approved 4(d) programs; (2) a mechanism for NMFS to coordinate with entities to balance conservation with the use of natural resources; and (3) the establishment of programs and activities with measures to minimize take of Southern DPS fish and contribute to the conservation of the Southern DPS.

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

faced by green sturgeon, and for evaluating the effectiveness of management practices in promoting the recovery of the species. However, research activities constitute take of Southern DPS fish and must be monitored to ensure that the effects of take do not cause further declines in 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 and NMFS sturgeon research protocols (currently under development and scheduled to be finalized by the publication of the final ESA 4(d) Rule); (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 reduce the likelihood of interrupting 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; (6) take does not involve artificial spawning or enhancement activities; (7) information about the research activity is provided to NMFS at least 60 days prior to the start of the study, including the study objectives and justification, a summary of the study design and methods, estimates of the total non-lethal take of Southern DPS fish anticipated, estimates of incidental take of other ESA-listed species and proof that those takes have been authorized by NMFS or the USFWS, funding sources, and a point of contact; and (8) research reports are submitted to NMFS on a schedule to be determined by NMFS staff that include the total number of Southern DPS fish and any other ESA-listed species taken, information that supports that take was non-lethal, and a summary of the project results. Research activities that involve action, permitting, or funding by a Federal agency must comply with the requirements of section 7(a)(2) of the ESA to ensure that the action will not jeopardize the continued existence of the species.

- 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 CDFG, ODFW, WDFW, or 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 rescue and/or salvage 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 ESA section 7 or 10, or under another 4(d) program.

- 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. The take prohibitions would not apply to habitat restoration activities that meet the following criteria: (1) comply with required state and Federal reviews and permits; (2) submit a detailed description of the restoration activity to NMFS at least 60 days prior to the start of the project, including the geographic area affected, when the activities will occur and how they will be conducted, demonstration that all state and Federal regulatory requirements have been met, identification of funding sources, the severity of impacts (direct, indirect, and cumulative) on the Southern DPS, a description of methods to be used to ensure 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 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; and (3) progress reports are submitted on a schedule to be determined by NMFS staff, including the total number of Southern DPS fish taken, whether the take was lethal or not, a summary of the project status, and any changes in the methods employed. Habitat restoration activities carried

out, permitted, or funded by a Federal agency must comply with requirements under section 7(a)(2) of the ESA to ensure that the action will not jeopardize the continued existence of the Southern DPS.

- Enforcement Activities

An exception from the take prohibitions would be provided for enforcement activities. Take of Southern DPS fish (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 (TRMP) would not be subject to the take prohibitions. A TRMP 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 TRMP. A TRMP 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 TRMPs and the Secretary's determination on the TRMP would be published in the *Federal Register* for public comment (≥ 30 days) prior to approval.

- Scientific Research Program

For state-sponsored scientific research and enhancement activities that are not covered by the exception as described above, another exception would be provided. The take prohibitions would not apply to scientific research and monitoring activities conducted under a state-sponsored scientific research program established between NMFS and state fishery management agencies, that is, Alaska Department of Fish and Game (ADFG), Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), or California Department of Fish and Game (CDFG). The state 4(d) research programs would cover research and monitoring projects involving Southern DPS fish 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 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 ESA 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 would most likely be incorporated into these existing state ESA 4(d) research programs, or a separate program would need to be 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. Research and monitoring activities may fall into two categories: 1) ongoing state-supported research activities; and 2) future state-supported research activities.

Upon incorporation of green sturgeon into the state ESA 4(d) research program or development of such a program, ongoing state-supported research activities involving direct or incidental take of Southern DPS fish 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 Southern DPS fish; 2) a description of the study design and methodology; 3) a justification for take of Southern DPS fish 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 Southern DPS fish 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 Southern DPS fish 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 scientific research program would be provided by the NMFS Northwest or Southwest Regional Administrator.

Other scientific research or enhancement activities that are not covered under the exception or state 4(d) research programs as described above 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, provided 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 NMFS issues or denies a permit.

3.6 Alternative C

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

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 Proposed Action or 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 Proposed Action and alternatives is reviewed, followed by a description of the relevant resources. The major environmental issues were:

- 1) Southern DPS green sturgeon resource
- 2) Protected species resources
- 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 Proposed Action and alternatives would apply to freshwater river systems, coastal watersheds, bays, estuaries, and marine waters where Southern DPS green sturgeon are known to occur, including but not limited to:

- 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 Southern DPS fish. These are: the Sacramento-San Joaquin 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 (excluding the Channel Islands) to Alaska.

The affected environment would include both the water bodies where Southern DPS fish currently occur and the terrestrial areas bordering them, 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 Southern DPS green sturgeon occur and do not have a defined spatial boundary. Alternatives A and C, however, define geographic boundaries for the application of the take prohibitions for specific 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

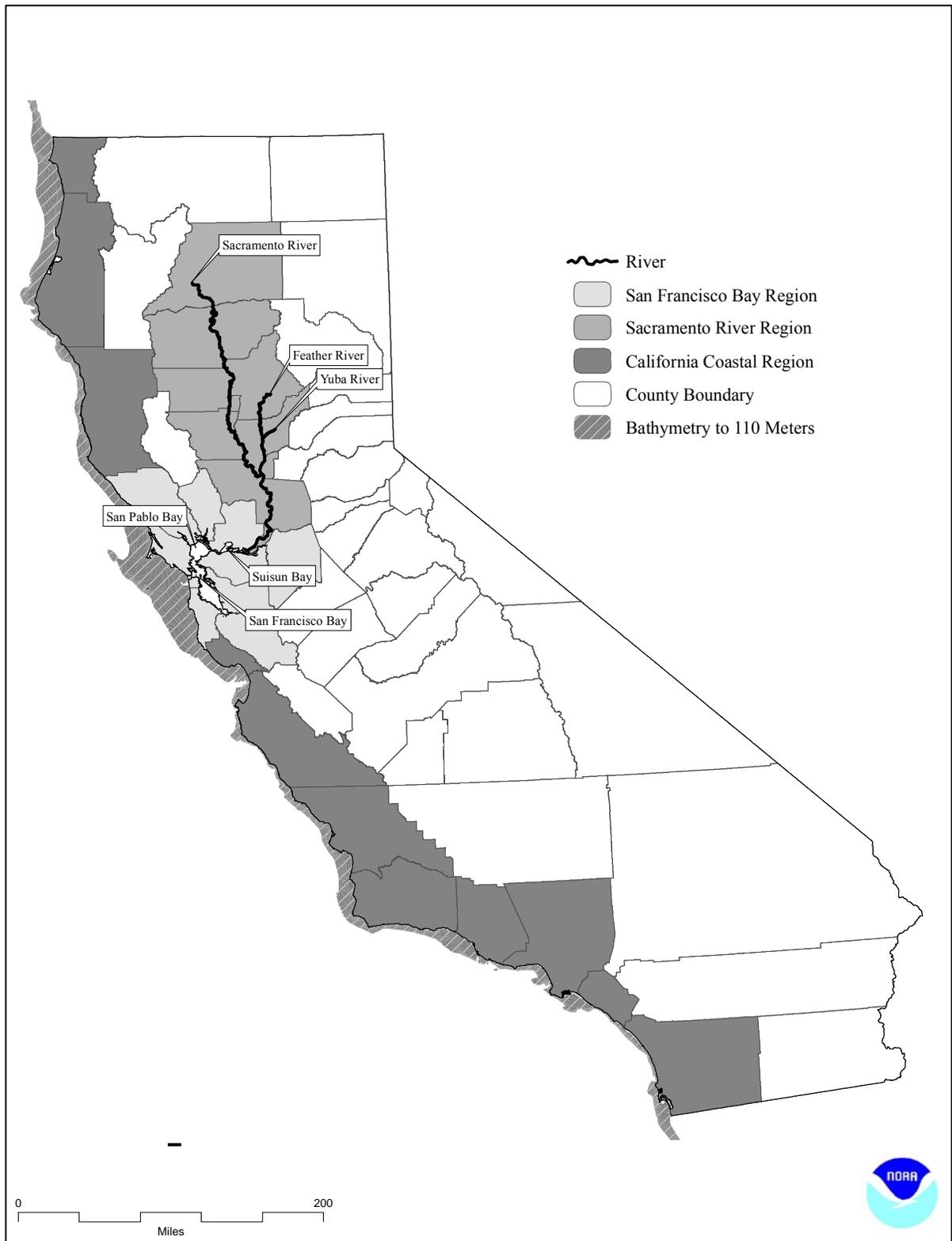


Figure 4.1-1 Potentially affected environment in California (by Charleen Gavette, NMFS).

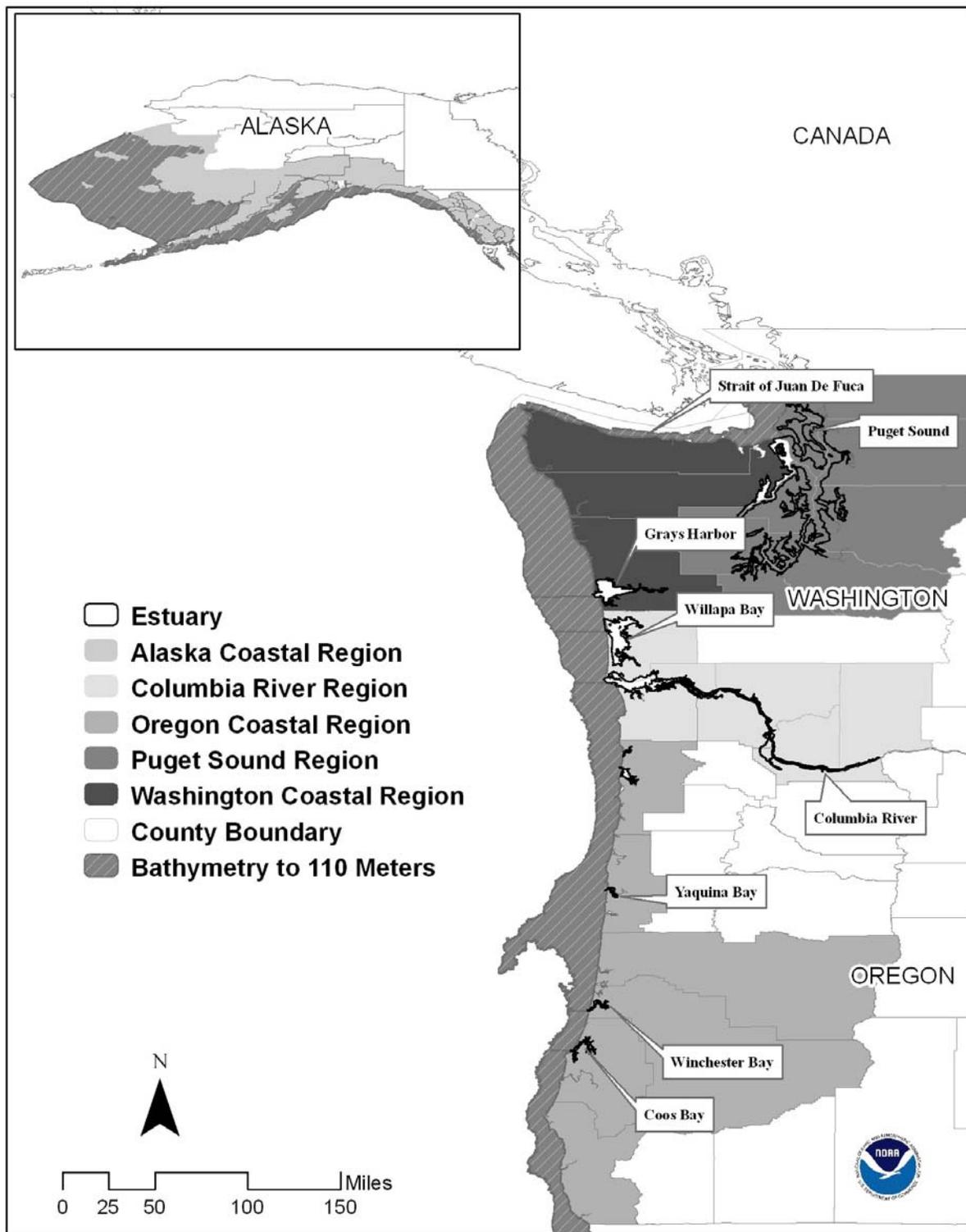


Figure 4.1-2 Potentially affected environment in Oregon, Washington, and Alaska (by Matt Dorsey, NMFS).

4.3 Southern DPS Green Sturgeon Resource

The Southern DPS of green sturgeon is the primary resource of concern for the Proposed Action and alternatives. The green sturgeon is a long-lived, anadromous fish species that is widely distributed along the U.S. West Coast and inhabits a range of habitats from fresh to estuarine and marine waters. Green sturgeon are primarily a benthic species, but use a variety of depths throughout their life stages and distribute widely within occupied bays and estuaries. Adult Southern DPS green sturgeon spawn in the Sacramento River and potentially in the lower Feather River, but confirmed evidence exists only for the Sacramento River (*Brown 2007*). Spawning occurs from March through July. 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 (*personal communication with Mike Thomas, UC Davis, and Richard Corwin, USBR, June 5, 2008*). Juvenile green sturgeon (≤ 3 years old) occur in the Delta and the Suisun, San Pablo, and San Francisco bays throughout the year (*CDFG 2002; BDAT 2005*). 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 of green sturgeon 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 to its survival, 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 of the ESA, which states that Federal agencies must ensure that activities they fund, permit, or carry out do not jeopardize the continued existence of the Southern DPS. However, as described in Chapter 2 of this EA, the protections under the ESA section 7 jeopardy provision are not sufficient to address the threats faced by the Southern DPS and to protect and conserve this species from further decline.

4.4 Protected Species Resources

A diversity of fish and wildlife species, including several other ESA-listed threatened and endangered species (e.g., salmonids) occur within the affected environment (Tables 4.4-1), as well as several ESA-listed plant species (Table 4.4-2). These species are protected by regulations under the ESA. In addition, numerous efforts have been made to aid in the protection and recovery of threatened and endangered 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	<i>Aplodontia rufa nigra</i>	Point Arena mountain beaver	E	CA
	<i>Dipodomys heermanni</i>	Morro Bay kangaroo rat	E	CA
	<i>Dipodomys ingens</i>	Giant kangaroo rat	E	CA
	<i>Odocoileus virginianus leucurus</i>	Deer, Columbian white-tailed	E	CA
	<i>Reithrodontomys raviventris</i>	Salt marsh harvest mouse	E	CA
	<i>Sylvilagus bachmani riparius</i>	Riparian brush rabbit	E	CA
	<i>Vulpes macrotis mutica</i>	San Joaquin kit fox	E	CA
	MARINE MAMMALS	<i>Arctocephalus townsendi</i>	Guadalupe fur seal	T
<i>Balaena mysticetus</i>		Bowhead whale	E	AK
<i>Balaenoptera borealis</i>		Sei whale	E	CA, OR, WA, AK
<i>Balaenoptera musculus</i>		Blue whale	E	CA, OR, WA, AK
<i>Balaenoptera physalus</i>		Fin whale	E	CA, OR, WA, AK
<i>Enhydra lutris kenyonii</i>		Northern sea otter	T	WA, AK
<i>Enhydra lutris nereis</i>		Southern sea otter	T	CA, OR, WA
<i>Eubalaena glacialis</i>		Northern right whale	E	AK
<i>Eumetopias jubatus</i>		Steller sea lion (Eastern)	T	AK
<i>Eumetopias jubatus</i>		Steller sea lion (Western)	E	CA, OR, WA, AK
<i>Megaptera novaeangliae</i>		Humpback whale	E	CA, OR, WA, AK
<i>Orcinus orca</i>		Killer whale (Southern resident)	E	WA
<i>Physeter macrocephalus</i>		Sperm whale	E	CA, OR, WA, AK
BIRDS		<i>Brachyramphus marmoratus marmoratus</i>	Marbled murrelet	T
	<i>Charadrius alexandrius nivosus</i>	Western snowy plover	T	CA, OR, WA
	<i>Gymnogyps californianus</i>	California condor	E	CA
	<i>Haliaeetus leucocephalus</i>	Bald eagle	T	CA, OR, WA
	<i>Pelecanus occidentalis</i>	Brown pelican	E	CA, OR, WA
	<i>Phoebastria (= Diomedea albatrus)</i>	Short-tailed albatross	E	CA, OR, WA, AK
	<i>Rallus longirostris obsoletus</i>	California clapper rail	E	CA
	<i>Sterna atnillarum brownii</i>	California least tern	E	CA
	<i>Strix occidentalis caurina</i>	Northern spotted owl	T	CA, OR, WA
	<i>Vireo bellii pusillus</i>	Least Bell's vireo	E	CA

Table 4.4-1 (continued)

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

Table 4.4-1 (continued)

Category	Scientific name	Common name	Status	Region
FISH (continued)	<i>Oncorhynchus kisutch</i>	Lower Columbia River/Southwest Washington Coho salmon	T	OR, WA
	<i>Oncorhynchus kisutch</i>	Northern California/Southern Oregon Coast Coho salmon	T	CA, OR
	<i>Oncorhynchus mykiss</i>	California Central Valley steelhead	T	CA
	<i>Oncorhynchus mykiss</i>	Central California Coast steelhead	T	CA
	<i>Oncorhynchus mykiss</i>	Lower Columbia River steelhead	T	OR, WA
	<i>Oncorhynchus mykiss</i>	Northern California steelhead	T	CA
	<i>Oncorhynchus mykiss</i>	Oregon Coast steelhead	SC	OR
	<i>Oncorhynchus mykiss</i>	South-Central California Coast steelhead	T	CA
	<i>Oncorhynchus mykiss</i>	Southern California steelhead	E	CA
	<i>Oncorhynchus tshawytscha</i>	California Coastal Chinook salmon	T	CA
	<i>Oncorhynchus tshawytscha</i>	Central Valley Fall and Late Fall-run Chinook salmon	SC	CA
	<i>Oncorhynchus tshawytscha</i>	Central Valley Spring-run Chinook salmon	T	CA
	<i>Oncorhynchus tshawytscha</i>	Lower Columbia River Chinook salmon	T	OR, WA
	<i>Oncorhynchus tshawytscha</i>	Puget Sound Chinook salmon	T	WA
	<i>Oncorhynchus tshawytscha</i>	Sacramento River Winter-run Chinook salmon	E	CA
	<i>Oregonichthys crameri</i>	Oregon chub	E	OR
	<i>Rhinichthys osculus</i> ssp.	Foskett speckled dace	T	CA
	<i>Salvelinus confluentus</i>	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
<i>Acanthomintha obovata</i> ssp. <i>Duttonii</i>	San Mateo thornmint	Lamiaceae	E	CA
<i>Alopecurus aequalis</i> var. <i>sonomensis</i>	Sonoma alopecurus	Poaceae	E	CA
<i>Amsinckia grandiflora</i>	Large-flowered fiddleneck	Boraginaceae	E	CA
<i>Arabis mcdonaldiana</i>	McDonald's rock-cress	Brassicaceae	E	CA
<i>Arctostaphylos hookeri</i> var. <i>ravenii</i>	Presidio manzanita	Ericaceae	E	CA
<i>Arctostaphylos morroensis</i>	Morro manzanita	Ericaceae	T	CA
<i>Arctostaphylos pallida</i>	Pallid manzanita	Ericaceae	T	CA
<i>Arenaria paludicola</i>	Marsh sandwort	Caryophyllaceae	E	CA, OR, WA
<i>Astragalus clarianus</i>	Clara Hunt's milk-vetch	Fabaceae	E	CA
<i>Baccharis vanessae</i>	Encinitas baccharis	Asteraceae	T	CA
<i>Blennosperma bakeri</i>	Sonoma sunshine	Asteraceae	E	CA
<i>Brodiaea pallida</i>	Chinese Camp brodiaea	Liliaceae	T	CA
<i>Camissonia benitensis</i>	San Benito evening-primrose	Onagraceae	T	CA
<i>Carex albida</i>	White sedge	Cyperaceae	E	CA
<i>Castilleja affinis</i> ssp. <i>Neglecta</i>	Tiburon paintbrush	Scrophulariaceae	E	CA
<i>Castilleja campestris</i> ssp. <i>Succulenta</i>	Fleshy owl's-clover	Scrophulariaceae	T	CA
<i>Castilleja levisecta</i>	Golden paintbrush	Scrophulariaceae	T	OR, WA
<i>Caulanthus californicus</i>	California jewelflower	Brassicaceae	E	CA
<i>Ceanothus ferrisae</i>	Coyote ceanothus	Rhamnaceae	E	CA
<i>Chamaesyce hooveri</i>	Hoover's spurge	Euphorbiaceae	T	CA
<i>Chorizanthe howellii</i>	Howell's spineflower	Polygonaceae	E	CA
<i>Chorizanthe pungens</i> var. <i>hartwegiana</i>	Ben Lomond spineflower	Polygonaceae	E	CA
<i>Chorizanthe pungens</i> var. <i>pungens</i>	Monterey spineflower	Polygonaceae-Buckwheat	T	CA
<i>Chorizanthe robusta</i> var. <i>hartwegii</i>	Scotts Valley spineflower	Polygonaceae-Buckwheat	E	CA
<i>Chorizanthe robusta</i> var. <i>robusta</i>	Robust spineflower	Polygonaceae-Buckwheat	E	CA
<i>Chorizanthe valida</i>	Sonoma spineflower	Polygonaceae	E	CA
<i>Cirsium fontinale</i> var. <i>fontinale</i>	Fountain thistle	Asteraceae	E	CA
<i>Cirsium fontinale</i> var. <i>obispoense</i>	Chorro Creek bog thistle	Asteraceae	E	CC
<i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	Suisun thistle	Asteraceae	E	CA
<i>Clarkia franciscana</i>	Presidio clarkia	Onagraceae	E	CA
<i>Clarkia imbricate</i>	Vine Hill clarkia	Onagraceae	E	CA
<i>Clarkia speciosa</i> ssp. <i>Immaculata</i>	Pismo clarkia	Onagraceae	E	CA
<i>Cordylanthus maritimus</i> ssp. <i>maritimus</i>	Salt marsh bird's-beak	Scrophulariaceae	E	CA
<i>Cordylanthus mollis</i> ssp. <i>mollis</i>	Soft bird's-beak	Scrophulariaceae	E	CA

Table 4.4-2 (continued)

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

Table 4.4-2 (continued)

Scientific name	Common name	Family	Federal status	Region
<i>Plagiobothrys hirtus</i>	Rough popcornflower	Boraginaceae	E	OR
<i>Plagiobothrys strictus</i>	Calistoga allocarya	Boraginaceae	E	CA
<i>Poa napensis</i>	Napa bluegrass	Poaceae	E	CA
<i>Potentilla hickmanii</i>	Hickman's potentilla	Rosaceae	E	CA
<i>Pseudobahia bahifolia</i>	Hartweg's golden sunburst	Asteraceae	E	CA
<i>Rorippa gambellii</i>	Gambel's watercress	Brassicaceae	E	CA
<i>Senecio layneae</i>	Layne's butterweed	Asteraceae	T	CA
<i>Sidalcea nelsoniana</i>	Nelson's checker-mallow	Malvaceae	T	CA, OR, WA
<i>Sidalcea oregana ssp. valida</i>	Kenwood Marsh checker-mallow	Malvaceae-Mallow	E	CA
<i>Streptanthus albidus ssp. albidus</i>	Metcalf Canyon jewelflower	Brassicaceae	E	CA
<i>Suaeda californica</i>	Seablite, California	Chenopodiaceae	E	CA
<i>Trifolium amoenum</i>	Showy Indian clover	Fabaceae	E	CA
<i>Trifolium trichocalyx</i>	Monterey clover	Fabaceae	E	CA
<i>Tuctoria greenei</i>	Greene's tuctoria	Poaceae	T	CA
<i>Tuctoria mucronata</i>	Solano grass	Poaceae	T	CA
<i>Verbena californica</i>	Red Hills vervain	Verbenaceae	T	CA

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

4.5 Habitat Resources

A proposed critical habitat designation under the ESA for the Southern DPS of green sturgeon was published on September 8, 2008 (73 FR 52084), with a technical correction published October 7, 2008 (73 FR 58527). NMFS proposed to designate 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 Southern DPS green sturgeon 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. The critical habitat designation is expected to be finalized in the fall of 2009. Once the critical habitat designation is finalized, Federal agencies must comply with section 7 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.

Designated critical habitat exists within the affected environment for: Southern Resident Killer Whale, bull trout, and listed salmon ESUs and steelhead DPSs. Table 4.5-1 summarizes the species and their designated critical habitat areas within the affected environment. These critical habitat areas are subject to the same protections under section 7 of the ESA as described above. The affected environment also includes essential habitats and wildlife refuges for fish and wildlife species. For example, 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, installing fish screens at diversions (Central Valley Project Improvement Act, Anadromous Fish Screen Program), and purchasing water to augment in-stream flows (Environmental Water Program) (*California Department of Water Resources (CDWR) 2005*).

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 are vital components of the Southern DPS' habitat, as well as of the economy and function of communities within the affected environment. For example, water diversions provide water supplies for irrigation and municipal use, but affect flow regimes and water quality in freshwater systems. Early life stages of green sturgeon require specific water temperatures for optimal survival and development (*Van Eenennaam et al. 2005*) and changes in water flow may affect the reproduction and annual recruitment of green sturgeon (*Van Eenennaam et al. 2006*). Physical structures associated with water diversion may have multiple effects on Southern DPS fish by posing impingement or entrainment risks to early life stages and blocking or delaying migration of all life stages of Southern DPS fish (*Moser and Ross 1995; Harrell and Sommer 2006*). In addition, runoff from land use activities such as agriculture and urban development may introduce contaminants into water ways, or result in increased stream bank erosion and sedimentation. 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 to be similarly affected by contaminants, although their exposure to in-bay or in-estuary contaminants may be reduced because of less time spent in these areas compared to white sturgeon.

4.6.1 Water Quality

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 coasts, 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
CALIFORNIA¹		
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
OREGON²		
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
WASHINGTON³		
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

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 Southern DPS fish. 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 Southern DPS fish within the Sacramento and lower Feather rivers, the Delta, or the Bays to successfully migrate to and from spawning areas. Other facilities exist within these waterways that may affect Southern DPS fish, 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. The majority 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. Most of the water used for agricultural irrigation and urban communities is supplied by groundwater sources, although 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 being applied to improve water supply quality and reliability (*CDWR 2005*).

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 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 2005). 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 greatest sources of water for the Delta (CDWR 2005).

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 $\geq 70\%$ 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 2005). 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 Proposed Action and alternatives. These activities include agricultural and urban use and development activities associated with water diversion that may alter water availability for Southern DPS green sturgeon, activities that affect water quality through runoff or increased shoreline erosion and sedimentation, and activities that result in direct take of Southern DPS fish (e.g., entrainment by water diversions structures or during dredging operations). Thus, these activities are closely tied to water quality and availability within the affected environment.

4.7.1 Agriculture

Agricultural activities in the regions surrounding water bodies occupied by the Southern DPS may affect water quality and availability for the species due to pesticide use and water diversion operations associated with agriculture. 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 coastal 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 consist 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 Southern DPS fish. Urban areas are often located near water bodies where Southern DPS fish occur. 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 is urbanized, as well as much of the area bordering San Pablo and Suisun Bay (*National Atlas 2006*). Urban areas also border Coos Bay, Grays Harbor, the lower Columbia River, and large portions of Puget Sound (*National Atlas 2006*). Much of these areas are also bordered by forestlands that are used for timber harvest, which may affect habitat for early life stages of Southern DPS green sturgeon through increased erosion and sediment input into water ways. In California, timber harvest activities primarily occur within 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. Timber harvest activities do not occur around the Delta or mainstem Sacramento River (*California Department of Forestry & Fire Protection, Timber Harvesting Plans map*). Timber harvest activities also occur along the Oregon and Washington coasts, where land cover is dominated by forests (*Oregon Department of Forestry 2002; Larsen and Nguyen 2004*).

In-water construction or alterations and shoreline development within rivers, bays, estuaries, and the Delta may alter habitat conditions within areas used by Southern DPS fish 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 within waters where Southern DPS fish occur, particularly the San Francisco, San Pablo, and Suisun bays. Operational and maintenance dredging activities occur within Federal navigation channels on a regular basis and cover about 12 square miles within this region (*ACOE 2008*). The projected dredging volume for the bays for a 50-year period from 1995-2045 is estimated to range from 3,470,000 cubic yards per year to 5,930,000 cubic yards per year (for a 50-year total of 173,500,000 to 296,500,000 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 within coastal estuaries such as Humboldt Bay, the lower Columbia River estuary, and Puget Sound. Dredging operations may cause increased turbidity, re-suspension of contaminants, entrainment of larval and juvenile fish, and other environmental effects (*LFR Levine-Fricke 2004*). For example, dredging operations in the lower Columbia River were found to entrain 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*).

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, Hoodspport, 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 Southern DPS fish. For example, mining activities may increase fine sediment input and introduce contaminants into streams used by Southern DPS fish. 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 Southern DPS fish, depending on the type of facility. Dams associated with hydropower plants alter flow regimes and may block the upstream and downstream migration of Southern DPS fish. Power plants that use once-through cooling systems (including nuclear and oil/gas plants) may entrain or impinge juvenile or adult green sturgeon, or produce elevated water temperatures by the discharge of warm water (*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 of the species. The types of 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 supply electricity to surrounding communities. The 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: ¹California Energy Commission (2006)

²Loy (2001)

Within the affected environment, there are 21 power plants in the Delta and Bays and along the California coast that use once-through cooling systems (Table 4.8-2) (York et al. 2005). These include two nuclear (regulated by the Nuclear Regulatory Commission under the Atomic Energy Act of 1954), one fossil fuel, and 18 oil/gas plants owned and operated by private companies and state government 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. Drawing water from the environment 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).

Although no LNG projects have yet been constructed within the affected environment, 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). 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 Type¹
Alamitos	South coast – south Palos Verdes Region; shore in bay/harbor	Los Angeles	1275	2083	Oil/gas
Contra Costa	San Francisco Bay-Delta	Contra Costa	341	680	Oil/gas
Diablo Canyon	Central Coast; shore in open coast rocky cove	San Luis Obispo	2540	2200	Nuclear
El Segundo	South coast - Santa Monica Bay; subtidal open coast sand bottom	Los Angeles	605	1020	Oil/gas
Encina	South coast; shore in bay/estuary	San Diego	857	965	Oil/gas
Haynes	South coast - south Palos Verdes Region; shore in bay/harbor	Los Angeles	1271	1570	Oil/gas
Humboldt	North coast; shore in estuary	Humboldt	78	135	Fossil Fuel
Hunters Point	South San Francisco Bay; shore of estuary	San Francisco	412	215	Oil/gas
Huntington Beach	South coast - south Palos Verdes Region; subtidal open coast sand bottom	Orange	507	880	Oil/gas
Long Beach	South coast - south Palos Verdes Region; shore in harbor	Los Angeles	261	577	Oil/gas
Los Angeles Harbor	South coast - south Palos Verdes Region; shore in harbor	Los Angeles	110	472	Oil/gas
Mandalay	South coast - Ventura Region; in harbor	Ventura	255	577	Oil/gas
Morro Bay	Central Coast; shore in estuary/harbor	San Luis Obispo	668	1002	Oil/gas
Moss Landing	Central Coast; shore in estuary/harbor	Monterey	1224	2538	Oil/gas
Ormond Beach	South coast - Ventura Region; 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	South coast - Santa Monica Bay/ harbor	Los Angeles	881	1310	Oil/gas
San Onofre	South coast - subtidal open coast sand bottom	San Diego	2580	2254	Nuclear
Scattergood	South coast - Santa Monica Bay; subtidal open coast sand bottom	Los Angeles	495	818	Oil/gas
South Bay	South Coast - Southern San Diego Bay; shore in estuary	San Diego	601	723	Oil/gas

¹ Sources: Ahern (2000); California Energy Commission (2006)

4.8.2 Mineral Resources

Mining operations may affect the habitat of Southern DPS fish through the removal of substrates important for spawning and rearing, or the introduction of excess sediments or contaminants into water through runoff. Operations located within or bordering water ways were primarily 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, as well as their tributaries (*National Atlas 2006*). Mining operations for sand and gravel, crushed stone, agricultural minerals, construction minerals, and miscellaneous industrial minerals exist within and along the border of the Delta and San Francisco, San Pablo, and Suisun bays (*National Atlas 2006*). Sand mining activities in the bays and the Delta occur within designated lease areas, a portion of which is 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*). State permits are required to conduct mining operations. Each state requires mining and reclamation plans to describe how adverse environmental impacts will be avoided or mitigated. The primary 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

Fisheries activities may result in direct take of Southern DPS fish. Within the affected environment, green sturgeon are taken 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 total green sturgeon bycatch that is made up of Southern DPS fish 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 white sturgeon fisheries throughout California, Oregon, and Washington and in the non-Tribal commercial and recreational salmon and steelhead fisheries in the lower Columbia River, Willapa Bay, and Grays Harbor. State-managed commercial white sturgeon fisheries occur in Washington and Oregon. 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 exist in the lower Columbia River (including select areas: Youngs Bay and Blind Slough), Willapa Bay, and Grays Harbor (*WDFW, 2006a; 2006b*). Bycatch of green sturgeon also occurs in state-managed commercial salmon and steelhead fisheries conducted within these estuaries, but retention of green sturgeon is prohibited (*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 in Oregon and Washington Columbia River commercial fisheries has been prohibited by emergency rule since July 2006 and is currently prohibited by a permanent rule effective as of February 2007. Washington state adopted a permanent rule on January 26, 2007, to prohibit the retention of green sturgeon in commercial fisheries statewide. Retention of green sturgeon is still allowed in Oregon commercial fisheries outside of the lower Columbia River.

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. Bycatch of green sturgeon also occurs in state-managed recreational salmon and steelhead fisheries conducted in the lower Columbia River, Willapa Bay, and Grays Harbor, but retention of green sturgeon is prohibited (*WDFW, 2006a; 2006b*). Oregon and Washington both require catch record cards to report the number of sturgeon caught. Prior to 2006, recreational fishing regulations did not differentiate between white

and green sturgeon. In 2006 and 2007, 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*). New regulations prohibiting the retention of green sturgeon in recreational fisheries are currently in effect for the Columbia river downstream of the Bonneville Dam (as of January 1, 2007), throughout California (as of March 1, 2007), and throughout Washington state (as of May 1, 2007). Retention of green sturgeon is still allowed in recreational fisheries in Oregon outside of the lower Columbia River. 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, recent data for 2007 show a total of 290 green sturgeon caught 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. Although these fisheries target white sturgeon and are prohibited from retaining green sturgeon, green sturgeon 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 of the catch occurring 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*). CDFG plans to continue the use of sturgeon fishing report cards to monitor catch and release of green sturgeon, as well as implement conservation measures to protect this species.

4.9.2 Commercial Coastal Groundfish Fisheries

Commercial groundfish bottom trawl fisheries occur off the coasts of California, Oregon, Washington, and Alaska and are managed by the Pacific Fishery Management Council (PFMC). 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). Green sturgeon are primarily caught in the West coast groundfish trawl fishery off the coast of California. From 2001 to 2007, about 465 out of 486 observed green sturgeon catches were from vessels in the California port groups, with the greatest catches 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 occurred on vessels within the Washington port groups (*personal communication with Janell Majewski, NMFS, January 29, 2007*). In addition, from 1990 to 2006, bycatch of 8 green sturgeon has been observed in the North Pacific groundfish bottom trawl fisheries off Alaska (*personal communication with Vanessa Tuttle, NMFS, November 20, 2006*) and At-sea Hake bottom trawl fisheries (*personal communication with Jennifer Ferdinand, NMFS, November 24, 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*). Recent tagging and genetics data confirmed that two green sturgeon detected in southeast Alaska near Graves Harbor were Southern DPS fish (*personal communication with Steve Lindley, NMFS, September 12, 2007*), indicating that the green sturgeon observed in the Bering Sea could belong to either 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. Several Federally-recognized Indian tribes have reported incidental catch of green sturgeon within their sturgeon and salmon and steelhead fisheries, including the Lummi, Makah, Quileute, Quinault, and Shoalwater Bay Indian

Tribes. The proportion of Northern DPS fish versus Southern DPS fish captured in these Tribal fisheries is not known. Some of these tribes have already implemented conservation measures for Southern DPS green sturgeon. For example, the Quinault Tribe conducts a commercial/ subsistence sturgeon fishery in Grays Harbor. White sturgeon are the primary target species, but green sturgeon are occasionally encountered, though usually not retained. After the Southern DPS was listed, the Quinault Indian Nation adopted a zero retention policy for green sturgeon (*personal communication with Joe Schumacker, Quinault Indian Tribe, November 2, 2006*). Low numbers of green sturgeon bycatch have also 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*). Tribal fisheries conducted in the Klamath/Trinity rivers target green sturgeon, but these are believed to be Northern DPS fish.

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 Southern DPS green sturgeon or make use of vital resources in such a way that take of Southern DPS fish may occur. Activities that may affect water quality or availability for Southern DPS fish, pose barriers to migration, or result in direct take of Southern DPS fish 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 draft Regulatory Impact Review/Initial Regulatory Flexibility Analysis (RIR/IRFA) (*Industrial Economics, Inc. (IEc) 2009a; 2009b*).

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

In this chapter, we describe the potential environmental consequences of the Proposed Action and alternatives on the environment. The Proposed Action and 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. Each of 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 Southern DPS green sturgeon. The Full Action Alternative would be the most restrictive alternative but may not be the most protective, because restrictions would apply equally to activities that potentially benefit Southern DPS fish (i.e., scientific research and monitoring, habitat restoration) and to those that potentially harm Southern DPS fish (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, because this alternative would prohibit all take of Southern DPS fish but provide more streamlined processes to promote activities that potentially benefit the conservation of Southern DPS fish. 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	Alternative C
Southern DPS Green Sturgeon	Potentially adverse effects on the Southern DPS because take of Southern DPS fish would continue to be allowed.	Prohibitions on take of Southern DPS fish would provide for protection and conservation of the species.	Prohibitions on take of Southern DPS fish would provide for protection and conservation of the species. Some take of Southern DPS fish would still be allowed and future activities would not be addressed.	Prohibitions on take of Southern DPS fish would provide for protection and conservation of the species. Would also facilitate scientific research to inform conservation and management.	Prohibitions on take of Southern DPS fish would provide for protection and conservation of the species. Some take of Southern DPS fish would still be allowed and future activities would not be addressed. Would facilitate scientific research to inform conservation and management.
Other Protected Species Resources	Would not provide benefits to other protected species resources.	Reinforce and add to protections for other protected species resources.	Reinforce and add to protections for other protected species resources. Most benefits limited to Central Valley, CA.	Reinforce and add to protections for other protected species resources.	Reinforce and add to protections for other protected species resources. Most benefits limited to Central Valley, CA.
Habitat Resources	Would not provide reinforce regulations for habitat protection and improvement.	Reinforce habitat protections. Habitat restoration activities must comply with ESA section 7 or 10.	Reinforce habitat protections (limited to 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 (limited to 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 Southern DPS fish. Potential reduction in water availability for non-environmental use.	Potential improvements in water quality and water availability for Southern DPS fish. Potential reduction in water availability for non-environmental use. Limited to Central Valley, CA.	Potential improvements in water quality and water availability for Southern DPS fish. Potential reduction in water availability for non-environmental use.	Potential improvements in water quality and water availability for Southern DPS fish. Potential reduction in water availability for non-environmental use. Limited to 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 Southern DPS fish.	Compliance with ESA section 7 or 10 required. Additional measures to reduce or avoid bycatch of Southern DPS fish.	Compliance with ESA section 7 or 10, or with a 4(d) exemption required. Additional measures to reduce or avoid bycatch of Southern DPS fish.	Compliance with ESA section 7 or 10, or with a 4(d) exemption required. Additional measures to reduce or avoid bycatch of Southern DPS fish.
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

The No-action Alternative would not apply any of the ESA section 9(a)(1) prohibitions, or any other protective regulations, to the Southern DPS of green sturgeon. The No-action Alternative would represent no change from current management policies for the Southern DPS. NMFS determined that the No-action Alternative is not a reasonable alternative, because it does not satisfy the objectives of the Proposed Action. However, the No-action Alternative represents the environmental baseline upon which to evaluate the environmental effects of the other alternatives and was considered in further analyses in this EA.

5.2.1 Southern DPS Green Sturgeon Resource

Over the long-term, the No-action Alternative may hinder the conservation of the Southern DPS, because no prohibitions on the take, import or export, possession, sale, delivery, carrying, transport, receipt, or shipping of Southern DPS green sturgeon would exist. Protective regulations and programs may still be adopted for the Southern DPS, but these would not be a result of an ESA 4(d) Rule implemented by NMFS. ESA section 7 consultations would still be required for Federal agency actions, but would be limited to an analysis of whether the action jeopardizes the continued existence of the species and would not involve an assessment of take. If an action is determined to result in jeopardy, then reasonable and prudent alternatives may be provided that may require extra time and costs for entities and agencies to implement. All reasonable and prudent alternatives must be economically and technically feasible and must be consistent with the intended purpose of the action. Activities conducted by non-Federal entities would not be subject to NMFS' review under section 10 of the ESA and take of Southern DPS green sturgeon in the course of these activities would continue to be allowed to occur.

5.2.2 Protected Species Resources

Implementation of the No-action Alternative would not result in a net benefit or cost to other protected species resources within the affected environment. Existing regulations under the ESA would continue to apply.

5.2.3 Habitat Resources

The No-action Alternative would not result in a net benefit or cost to habitats 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.

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

Existing regulations and management of fisheries activities would continue unchanged under the No-action Alternative. Although states and Tribes have considered or implemented changes to fisheries regulations to protect green sturgeon, these changes would not be a result of a 4(d) Rule. The commercial groundfish fishery is the only Federally-managed commercial fishery known to affect the Southern DPS at this time and would be required to comply with the ESA section 7 jeopardy standard.

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 Southern DPS green sturgeon. Existing state and Federal regulations would continue to apply.

5.3 Full Action Alternative

The Full Action Alternative would apply all of the ESA section 9(a)(1) prohibitions for the protection of the Southern DPS. The Full Action Alternative would prohibit take of Southern DPS fish within the U.S. and the U.S. territorial sea and upon the high seas, as well as prohibit the import, export, possession, sale, delivery, carrying, transport, or shipping of Southern DPS fish 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. Otherwise, any take must be authorized by an ESA section 7 incidental take statement or permitted under an ESA section 10 permit. Take resulting from Federal actions must be covered under an ESA section 7 incidental take statement. In addition to any reasonable and prudent alternatives, an incidental take statement would provide reasonable and prudent measures to minimize the effects of the take on the Southern DPS, which may result in extra time and costs to entities and agencies. However, these reasonable and prudent measures and their terms and conditions may only make minor changes to an action. Those involved in scientific research and enhancement activities that directly or incidentally take Southern DPS fish must apply for an ESA section 10(a)(1)(A) permit. Other activities conducted by non-Federal entities and involving incidental take of Southern DPS fish must be covered by an ESA section 10(a)(1)(B) permit. Obtaining this permit involves development of a Habitat Conservation Plan that includes an analysis of the potential impacts to the species and measures to monitor, minimize, and mitigate such impacts. A separate NEPA analysis is required to determine the effects of implementing an HCP.

5.3.1 Southern DPS Green Sturgeon Resource

Implementation of the Full Action Alternative would provide increased protections for Southern DPS green sturgeon and its habitat. In addition to existing protections for Southern DPS green sturgeon under section 7 of the ESA, the Full Action Alternative would prohibit the take of Southern DPS green sturgeon by Federal and non-Federal entities. Any activities that cause take of Southern DPS fish must be reviewed by NMFS and covered under an ESA section 10 permit or an ESA section 7 incidental take statement.

5.3.2 Protected Species Resources

The Full Action Alternative would likely benefit other protected species resources 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

Compliance with section 7 or section 10 of the ESA under the Full Action Alternative would likely result in conservation and mitigation measures that improve habitat quality for Southern DPS fish. These benefits and improvements would be consistent with Federal policies for the protection of designated critical habitat and the management of 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 ESA section 7 consultation requirements. These would be required to ensure that the projects do not jeopardize the Southern DPS fish. Other state and Federal laws already exist that regulate these activities to protect fish and wildlife habitat, and NMFS would work with the entity or agency throughout the ESA section 10 permit or section 7 consultation processes to develop the conservation and mitigation 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 Southern DPS green sturgeon, other fish and wildlife species, and other water users within the affected environment. This alternative would also potentially improve water availability for Southern DPS green sturgeon, 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 Southern DPS fish. Federal facilities would be required to obtain an incidental take statement under section 7 of the ESA, whereas non-Federal facilities would be required to obtain an ESA section 10 (a)(1)(B) permit to cover any take of Southern DPS fish. Mitigation measures, such as changes in operation

schedules and the installation of fish screens or fish passage structures, may be required to protect Southern DPS fish. Water users may need to diversify their water supply sources and expand water reuse and recycling programs. However, the effects of the Full Action Alternative on water availability for agricultural, municipal, and industrial use would not be significant 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. These fish screens are believed to be adequately protective of the Southern DPS. 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. The primary link between these activities and effects on the Southern DPS is through effects on water quality and availability, as well as through direct take of the species. Compliance with section 7 and section 10 of the ESA would be required to address effects on Southern DPS fish. Mitigation measures may include compliance with water quality standards, erosion control measures, changes to dredging and disposal locations and schedules, and shoreline restoration. These requirements would be similar to those imposed by existing state and Federal laws that regulate land use activities to minimize adverse environmental effects. For example, activities such as dredging operations are regulated by the ACOE and are subject to section 7 of the ESA whether or not a 4(d) rule exists. NMFS would work with the affected entities through the ESA section 7 or section 10 processes to develop mitigation 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 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 mitigated through 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 take of Southern DPS fish 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 conservation and mitigation measures to be implemented for in-river and in-bay sand and gravel mining activities or other mining activities conducted adjacent to water ways. These measures may include 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 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. 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 described and evaluated in the draft RIR/IRFA (*IEc 2009a; 2009b*). The Full Action Alternative would result in additional requirements and costs for activities to address the take of Southern DPS green sturgeon. As described above, activities would need to be altered to avoid take, or 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 on the activities 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 and mitigation measures.

5.4 Alternative A

Alternative A would result in similar effects as the Full Action Alternative. However, Alternative A would limit the application of the take prohibitions to specific categories of activities and, for some activities, to specific areas. 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 Resource

Alternative A would provide for the protection and conservation of the Southern DPS of green sturgeon by prohibiting take of Southern DPS green sturgeon in specific categories of activities known to cause take of Southern DPS fish or closely related species. Most benefits would occur in the Central Valley, California, to protect spawning adult populations and early life stages. However, Alternative A is not as protective as the Full Action Alternative. Some take of Southern DPS fish may continue to be allowed, because Alternative A would limit the application of the take prohibitions to certain areas and activities. In addition, Alternative A would not provide protection for Southern DPS fish from future activities or any activities for which we do not currently have information on take and that are not specifically identified in this alternative.

5.4.2 Protected Species Resources

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. However, these benefits would be limited to the specific activities and areas as described under Alternative A.

5.4.3 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 specifically lead to improved water quality, reduced 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 Southern DPS fish. The benefits to habitats would primarily occur in the Central Valley, California, however, because the application of the take prohibitions would be limited in to this area.

5.4.4 Water Quality and Availability

Alternative A would result in improved water quality and water availability for Southern DPS fish, 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 Southern DPS fish and lead to reduced water resources for agricultural, municipal, and industrial use in the Central Valley, California. However, the effects of Alternative A on water availability for agricultural, municipal, and industrial use would not be significant because many of the conservation and mitigation measures would already be required under section 7 of the ESA (to address jeopardy to the species or effects on critical habitat) 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 Southern DPS green sturgeon or that result in direct take of Southern DPS fish. 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 Southern DPS fish. Mitigation measures would include compliance with water quality standards, erosion control, habitat restoration, and changes to dredging and disposal locations and schedules. 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 Southern DPS fish. 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 take of Southern DPS fish 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 4(d) Rule as measures are being developed and implemented and alternate sources are explored.

5.4.7 Fisheries Opportunities

Alternative A may 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. 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 draft RIR/IRFA (*IEc 2009a; 2009b*). Like the Full Action Alternative, Alternative A would result in additional costs and regulatory burdens because activities that may cause take of Southern DPS fish 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 the application of the take prohibitions to certain areas and activities, the socioeconomic effects would be less than what would be expected under the Full Action Alternative. For example, Alternative A focuses on activities that affect in-stream passage or alter or destroy spawning and rearing habitat in the Sacramento River, the Delta, and the San Francisco, San Pablo, and Suisun bays. NMFS would work with affected entities to develop conservation and mitigation measures to avoid or reduce take of Southern DPS green sturgeon.

5.5 Alternative B (Proposed Action)

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 categories of activities for which conservation measures are adequately defined or for which the conservation benefits to the Southern DPS outweigh the potential impacts. 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 Southern DPS fish. The criteria and/or plans under the exceptions and exemptions would encourage coordination 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 or Alternative A and also result in improved water quality and habitat conditions for fish and wildlife. 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. 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 Resource

Alternative B would provide for the protection and conservation of the threatened Southern DPS of green sturgeon by prohibiting all take of Southern DPS fish. Alternative B would also provide a more stream-lined process to permit scientific research activities if they meet the criteria under the exceptions or under an established NMFS-approved state 4(d) research program. The exceptions and state 4(d) research program would benefit Southern DPS green sturgeon by facilitating scientific research activities that provide valuable information for green sturgeon management and conservation and by encouraging coordination with NMFS on such activities.

5.5.2 Protected Species Resources

Conservation measures implemented for the Southern DPS under Alternative B 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 result in improved water quality and availability, fish passage, and habitat conditions for Southern DPS fish that would benefit other fish and wildlife species co-occurring with the Southern DPS.

5.5.3 Habitat Resources

Alternative B would reinforce existing Federal policies to protect designated critical habitat as well as other important habitats such as wetlands, floodplains, and coastal areas. Conservation measures such as erosion control, reinforcement of water quality standards, and habitat restoration may be required under Alternative B to address take of Southern DPS fish. Additional regulatory burdens may be required for habitat restoration activities to comply with requirements under section 7 of the ESA or under 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 specified criteria. Some additional time and costs may be required to comply with the ESA 4(d) Rule criteria, but this exception would likely streamline the process for habitat restoration activities, removing the need to apply for an ESA section 10 permit or to obtain coverage under an incidental take statement for Federal actions. Federal actions would still need to comply with the jeopardy provision under section 7 of the ESA.

5.5.4 Water Quality and Availability

Alternative B would reinforce regulations and policies to protect water quality to the benefit of Southern DPS, other fish and wildlife species, and other water resource users. Alternative B would also improve water availability for Southern DPS fish, 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 Southern DPS fish and may affect water resource availability within the affected environment. Mitigation measures may be required to protect Southern DPS fish, such as changes in operation schedules and the installation of fish screens or fish passage structures. To make up for any reductions, water users may need to diversify their water supply sources and expand water reuse and recycling programs. 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. Many of the measures that would be required under Alternative B would be similar to those required under section 7 of the ESA to address jeopardy or critical habitat for the Southern DPS, or to those required to address effects on other protected species. Alternative B would ensure that the take of Southern DPS fish is specifically considered and addressed, in addition to the impact of the activity on the status or designated critical habitat of the Southern DPS or on other ESA-listed species.

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 Southern DPS fish, primarily from the effects of these activities on water quality and availability or from direct take of the species. Conservation and mitigation measures required under Alternative B may include compliance with water quality standards, erosion control measures, changes to dredging and disposal locations and schedules, and shoreline restoration. These measures under Alternative B would be similar to those required under existing state and Federal regulations governing land use activities, as well as existing protective regulations for other ESA-listed species, and would

not result in significant effects. NMFS would work with the affected entities through the ESA section 7 or section 10 processes to develop conservation and mitigation 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 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. Conservation and mitigation 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 protective regulations 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 take of Southern DPS fish in the analysis of environmental effects and in ESA section 7 consultations.

Alternative B would reinforce water quality standards for mineral production activities as well as apply conservation and mitigation measures to in-river and in-bay sand and gravel mining activities or other mining activities conducted adjacent to water ways. Potential conservation and mitigation measures may include 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 Southern DPS fish 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 bycatch of Southern DPS fish 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 Proposed Action. Protective measures for green sturgeon have already been adopted in state-managed fisheries in California, Washington, and the lower Columbia River to prohibit the retention of green sturgeon and to monitor bycatch. Federally-managed fisheries (i.e., coastal groundfish bottom trawl fishery) are already required under section 7 of the ESA to ensure that the fisheries do not jeopardize the continued existence of the species. The measures to avoid jeopardy would likely be similar to those required to avoid or minimize take. In addition, Alternative B would provide another option for covering take under a NMFS-approved FMEP for commercial and recreational fisheries or under a NMFS-approved TRMP for Tribal fisheries and other Tribal activities. These plans would provide a potentially more streamlined process for some entities by removing the need to obtain an ESA section 10(a)(1)(B) permit or coverage under an ESA section 7 incidental take statement. Development of FMEPs and TRMPs under Alternative B would benefit the Southern DPS of green sturgeon 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 draft RIR/IRFA (*IEc 2009a; 2009b*). Alternative B would require that any take of Southern DPS fish 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 conservation and mitigation measures. However, those regulatory burdens and costs may be reduced under Alternative B for certain activities, including scientific research and monitoring, habitat restoration, commercial and recreational fisheries, and Tribal resource use and management. For these activities, Alternative B would provide an exception or exemption as an alternative method to cover take of Southern DPS fish. These exceptions or exemptions would negate the requirement to obtain an ESA section 10 permit or an ESA section 7 incidental take statement to cover take. Federal agency actions would still be required to comply with the jeopardy standard under section 7 of the ESA. The potential socioeconomic effects of Alternative B would not be significant, because many of the regulatory burdens and costs expected under this alternative would overlap with those that would already be imposed on activities 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).

5.6 Alternative C

Alternative C would apply the ESA section 9(a)(1) prohibitions to specific categories of activities that affect the Southern DPS as in Alternative A and include the exceptions and exemptions listed under Alternative B. 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 Resource

Alternative C would provide for the protection and conservation of the Southern DPS and its habitats. Application of 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 is not as protective as the Full Action Alternative or Alternative B. By limiting application of the take prohibitions to specific categories of activities and geographic areas, some take of Southern DPS fish would be allowed to occur. In addition, Alternative C would not provide protections for Southern DPS in future activities or any activities not identified in this alternative due to a lack of sufficient information.

5.6.2 Protected Species Resources

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. Alternative C would specifically 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 would not cover other coastal estuaries where Southern DPS fish occur (i.e., Humboldt Bay, Coos Bay, Winchester Bay, Yaquina Bay, the lower Columbia River estuary, Willapa Bay, Grays Harbor, and Puget Sound).

5.6.3 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. Compliance with section 7 or section 10 of the ESA would be required for habitat-altering activities that may result in take of Southern DPS fish within the Sacramento River and its tributaries, the Delta, and the San Francisco, San Pablo, and Suisun bays. Like Alternative B, habitat restoration activities that qualify for the exception from the take prohibitions would not require coverage under an ESA section 10(a)(1)(B) permit or an ESA section 7 incidental take statement. This exception may provide a more stream-lined process for habitat restoration activities that benefit Southern DPS green sturgeon. Federal actions would still be required to comply with the jeopardy standard under section 7 of the ESA.

5.6.4 Water Quality and Availability

Alternative C would result in improved water quality and availability for Southern DPS fish, 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 Southern DPS fish. 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 significant because many of the measures required under Alternative C would be similar to those required under section 7 of the ESA (to address jeopardy to the species or effects on critical habitat) 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 Southern DPS fish or result in direct take of Southern DPS fish, focusing on those activities conducted in spawning and rearing habitats in the Central Valley, California. Alternative C may require conservation and mitigation measures similar to those required under existing regulations for land use

activities and for other ESA-listed species, including 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 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 Southern DPS fish. 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 potential take of Southern DPS fish 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. Under Alternative C, ESA section 10 (a)(1)(B) permits would be required in addition to state-issued permits. Following implementation of Alternative C, 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 bycatch of Southern DPS green sturgeon. The effects would not be significant, however, because the potential measures under Alternative C to address bycatch would be similar those already required. For most state-managed fisheries, protective measures have already been adopted for green sturgeon. For Federally-managed fisheries, the potential measures to address jeopardy to the species under section 7 of the ESA would likely be similar to those required to address take. In addition, Alternative C would provide another method to cover take of green sturgeon in commercial and recreational fisheries under

a NMFS-approved FMEP and in Tribal fisheries and other Tribal resource activities under a NMFS-approved TRMP. FMEPs and TRMPs may provide a more streamlined approach for some entities compared to the processes under ESA section 7 or 10, and also provide benefits to the Southern DPS by promoting the monitoring and minimization of green sturgeon bycatch. These NMFS-approved plans would also facilitate greater coordination with NMFS.

5.6.8 Socioeconomic Resources

The draft RIR/IRFA (*IEc 2009a; 2009b*) 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. The socioeconomic effects of Alternative C would be limited to certain categories of activities and certain geographic areas. In addition, Alternative C would provide exceptions and exemptions as additional methods to cover take of green sturgeon in scientific research and monitoring activities, habitat restoration, and commercial, recreational, and Tribal fisheries. 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 and alternatives would not be the only actions 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 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 Proposed Action and alternatives. The Proposed Action and alternatives would primarily provide for the protection and conservation of the Southern DPS and its habitats. The Proposed Action and alternatives would add to or complement existing protections and conservation efforts for the Southern DPS and its habitat and other fish and wildlife species within the affected environment. In addition, many of the potential effects of the

Proposed Action and alternatives overlap with those resulting from actions outside of the scope of the proposed action (e.g., application of the jeopardy standard under section 7 of the ESA; existing regulations for ESA-listed salmon and steelhead species).

5.7.1 Southern DPS Green Sturgeon Resource

Whether or not an ESA 4(d) Rule exists, all Federal actions must comply with section 7 of the ESA to ensure that the continued existence of the Southern DPS is not jeopardized. The Proposed Action (Alternative B) and alternatives (except for the No-action Alternative) would add to existing protections for the Southern DPS by prohibiting the take of Southern DPS fish. Existing protective regulations and critical habitat designations for other ESA-listed species, such as 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 Proposed Action and alternatives. The Proposed Action and alternatives (except for the No-action Alternative) would complement ongoing programs for the protection and restoration of important aquatic and marine habitats.

5.7.2 Protected Species Resources

ESA-listed species receive protection under section 7, 9, and 10 of the ESA. These sections prohibit take and other activities that may adversely affect ESA-listed species, as well as require coordination with NMFS and the USFWS for any activities resulting in a prohibited take or any Federal actions that may affect designated critical habitat. In addition, fish and wildlife conservation programs and efforts have been implemented within the affected environment. The Proposed Action and 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.

5.7.3 Habitat Resources

Section 7 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 Proposed Action and alternatives (except for the No-action Alternative) would add to existing regulations and efforts to protect designated critical habitat as well as other important habitats, such as wetlands, floodplains, and coastal areas.

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, including protective measures for other ESA-listed species. State, local, and regional programs have also been developed to monitor and improve water quality. The Proposed Action and alternatives would add to efforts to improve water quality throughout the affected environment.

Water availability and activities associated with water supplies may be affected by other regulations, including protective regulations for ESA-listed species (such as salmon and steelhead) and existing protections for Southern DPS fish under the ESA section 7 jeopardy standard. The restrictions on water use and availability under these regulations would be similar to those expected under the Proposed Action and alternatives. Thus, the effects of the Proposed Action and alternatives would not be significant because many restrictions would apply even without implementation of a 4(d) Rule for the Southern DPS. The Proposed Action and alternatives would specifically ensure that take of Southern DPS fish 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 requirements under section 7 of the ESA to protect Southern DPS fish, 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 have been established to address water quality issues and the effects of in-water and shoreline development. The effects of the Proposed Action and alternatives on land use activities and resource use would likely overlap with requirements that would be imposed under existing environmental regulations, programs, and efforts.

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 issues of concern 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 the reclamation of abandoned mines as well as of mining sites after mining operations have been completed. These efforts and regulations would benefit the Southern DPS and be consistent with the objectives of the proposed action. The effects of the Proposed Action and alternatives on access to energy and mineral resources would not be significant because many of the measures required to address take of Southern DPS fish 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 Proposed Action and alternatives (except for the No-action Alternative) would add to restrictions on fisheries, particularly for white sturgeon fisheries. However, most state-managed white sturgeon fisheries have already implemented measures to protect the Southern DPS of green sturgeon, including zero retention of green sturgeon and sturgeon report cards to monitor the catch and release of green sturgeon. Also, the coastal groundfish fishery is Federally-managed and already required to comply with section 7 of the ESA to ensure that the fishery does not jeopardize the Southern DPS of green sturgeon or adversely affect or destroy critical habitat. Management measures for Southern DPS green sturgeon to address jeopardy or critical habitat would likely be similar to those required under the Proposed Action and alternatives. The effect of the Proposed Action and alternatives would be to specifically ensure that take of Southern DPS green sturgeon is monitored and addressed.

5.7.8 Socioeconomic Resources

The socioeconomic effects of the Proposed Action and alternatives are more fully described and analyzed in the draft RIR/IRFA (*IEc 2009a; 2009b*). The Proposed Action and alternatives (except for the No-action Alternative) would impose additional regulatory restrictions and costs to activities that may cause take of Southern DPS fish. 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 conservation and mitigation measures required to address take of Southern DPS fish. These conservation and mitigation measures, and the time and costs to implement them, would be in addition to the measures, time, and costs that are already imposed on activities based on existing regulations or other social and economic factors. In many cases, however, the measures that would be required under the Proposed Action and alternatives would be expected to be similar to what would already be required under existing environmental regulations. For example, compliance with water quality standards is already required under the Federal CWA and would be reinforced by the Proposed Action and alternatives. Existing protections for ESA-listed salmonids would apply conservation and mitigation measures very similar to those that would be expected for Southern DPS green sturgeon. 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 specifically address the take of Southern DPS fish may differ slightly from those that would be required to address jeopardy or effects on critical habitat, but would not be expected to result in significant impacts on socioeconomic activities. In many cases, a separate NEPA review would be required prior to implementation of measures to address take of Southern DPS fish.

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 of an ESA 4(d) Rule for the Southern DPS (Executive Order 12898, 59 FR 7629; February 11, 1994). The Proposed Action and alternatives would apply to all entities that conduct activities resulting in take of Southern DPS green sturgeon and would not be based on racial, ethnic, socioeconomic, or any other status of groups of people. Thus, the Proposed Action and 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 greenhouse 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 that human GHG emissions, primarily carbon dioxide emissions (CO₂), 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 Proposed Action and alternatives would not be expected to affect climate change. The purpose of the Proposed Action and alternatives is to protect and conserve the Southern DPS of green by prohibiting take of the species. The Proposed Action and alternatives do not implement specific actions that would contribute to emissions of greenhouse gases into the atmosphere. However, climate change may affect Southern DPS fish through effects on the marine, estuarine, and freshwater habitats occupied by the Southern DPS.

5.10 Unavoidable Adverse Effects and Irreversible and Irretrievable Commitments of Resources

No unavoidable adverse effects or irreversible and irretrievable commitments of resources would be expected to result from implementation of the Proposed Action or any of the alternative ESA 4(d) Rules. The Proposed Action and alternatives are regulatory actions and do not implement specific actions that would involve the commitment of resources prior to evaluation of their effects. Through this action, NMFS hopes to avoid adverse effects on the Southern DPS.

6.0 CONSULTATION AND COORDINATION

Following the public scoping workshops held on May 31 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 Proposed Action and alternatives. Comments and technical information were discussed, addressed, and incorporated into this draft 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

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