

A.20 GREEN STURGEON (*ACIPENSER MEDIROSTRIS*)

A.20.1 Legal and Other Status

Green sturgeon are composed of two Distinct Population Segments (DPS): the northern DPS includes all populations in the Eel River and northward; the southern DPS includes all populations south of the Eel River. In this document, we discuss only the southern DPS.



After a status review was completed in 2002 (Adams et al. 2002), National Marine Fisheries Service (NMFS) determined that neither the southern or northern DPS warranted listing as threatened or endangered but should be added to the Species of Concern List. The “not warranted” determination was challenged on April 7, 2003. NMFS updated their status review on February 22, 2005, and determined that the southern DPS should be listed as threatened under the Endangered Species Act (Biological Review Team 2005). NMFS published a final rule on April 7, 2006, indicating that the southern DPS was threatened, which took effect on June 6, 2006 (71 FR 17757). On October 9, 2009, NMFS (74 FR 52300) designated critical habitat for the green sturgeon Southern DPS throughout most of its occupied range. The species is a Class 1 (qualifying as threatened under the California ESA) Species of Special Concern in California (DFG 2003).



A.20.2 Species Distribution and Status

A.20.2.1 Range and Status

Green sturgeon have been recorded from Ensenada, Mexico, to the Bering Sea in North America (Moyle 2002). Their current distribution, however, is in rivers from the Sacramento River to British Columbia. The only current spawning population of the southern DPS is in the Sacramento River, while spawning in the northern DPS occurs in the Klamath-Trinity River system and in the Rogue River, with infrequent spawning in the Umpqua River and possibly in the Eel River (Biological Review Team 2005). No indication of spawning (eggs, larvae, or juveniles) has been found in the Feather

River despite intensive sampling efforts (Niggemyer and Duster 2003), and no spawning is known to take place in the San Joaquin River above the Delta (Beamesderfer et al. 2004). Population size is unknown.

A.20.2.2 Distribution and Status in the Plan Area

Green sturgeon use the Sacramento River along the western boundary of Butte County and several have been recorded in the Feather River up to the Thermalito Afterbay (SWRI 2003, Beamesderfer et al. 2004) (see Figure A.20-1, *Green Sturgeon Modeled Habitat and Recorded Occurrences*). The California Natural Diversity Database has no records of green sturgeon within Butte County (CNDDDB 2006) (see Figure A.20-1).

A.20.3 Habitat Requirements and Special Considerations

Green sturgeon reside in both freshwater and saltwater habitat. Individuals spawn in deep pools or “holes” in large, turbulent, freshwater river mainstems (Adams et al. 2002). Although specific spawning habitat preferences are unknown, it is thought that eggs are broadcast preferably over large cobble substrates, but can range from clean sand to bedrock substrates (Moyle et al. 1995). It is likely that cold, clean water is important for proper embryonic development. Optimal temperatures for eggs and larvae are 15°C to 19°C, and temperatures above 20°C are lethal to embryos (Adams et al. 2002, Biological Review Team 2005). Non-spawning adults live in oceanic waters, bays, and estuaries.

A.20.4 Life History

Green sturgeon are anadromous with adults entering rivers to spawn in deep pools in large, turbulent rivers, probably over large cobbles, in March to July with the peak in mid-April to mid-June (Adams et al. 2002). Juveniles remain in fresh water for one to three years before migrating to the ocean where they remain near estuaries for a while but then move long distances (Moyle 2002). Males mature at approximately 15 years of age while females mature at about 17 years, and females can produce 60,000 to 140,000 eggs (Moyle et al. 1992, Adams et al. 2002). The maximum age is estimated to be 60 to 70 years or more (Moyle 2002). Juveniles and adults are benthic feeders, feeding primarily on invertebrates, although some small fish may also be eaten.

A.20.5 Threats

Green sturgeon are large in size, mature late, have a low productivity and long life span, and are anadromous. All these characteristics make them vulnerable to habitat degradation and overexploitation (NMFS 2006). The primary threat to the southern DPS is the reduction of the spawning area to one population in the Sacramento River. This reduction in range makes green sturgeon vulnerable to catastrophic events.

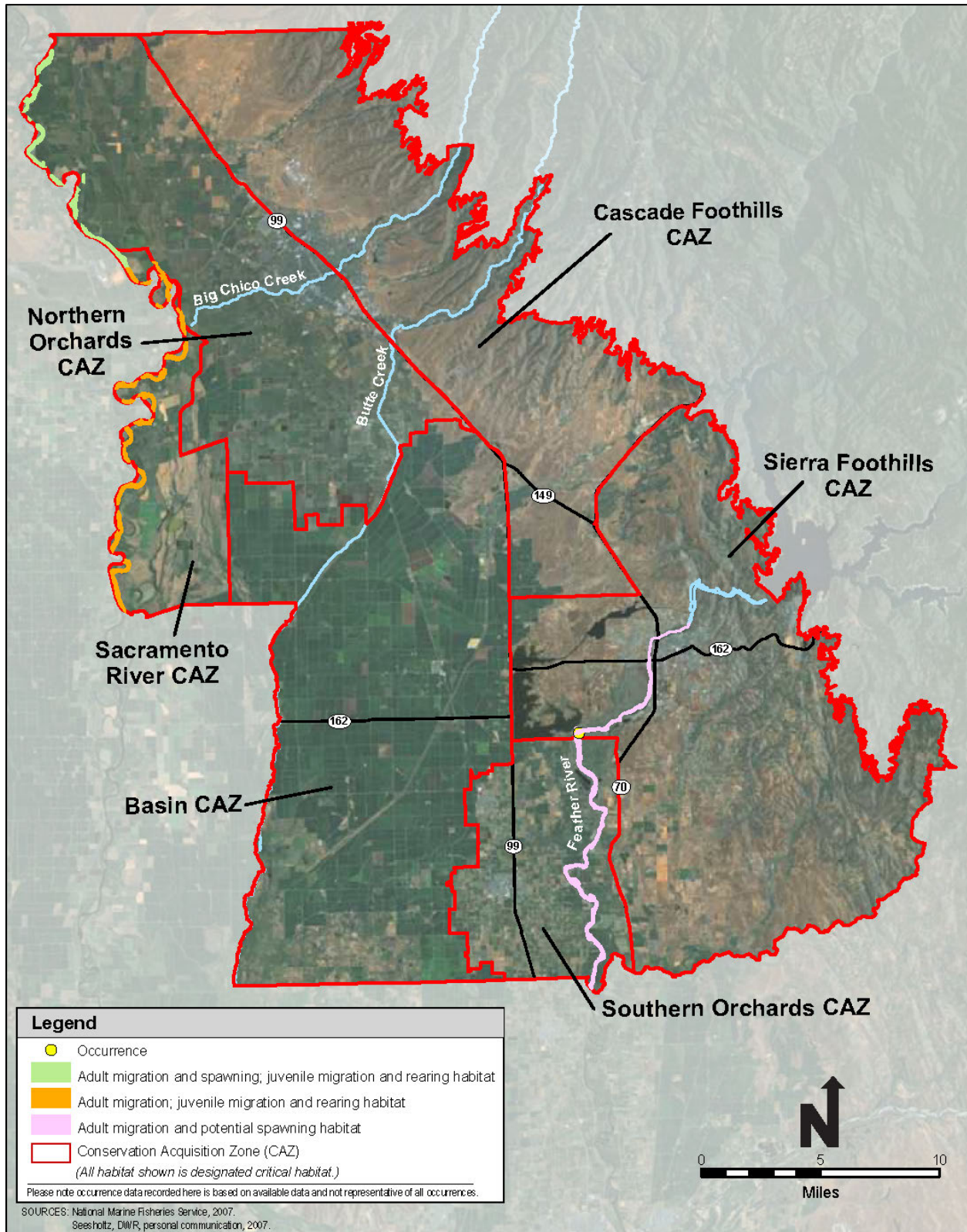


Figure A.20-1. Green Sturgeon Modeled Habitat and Recorded Occurrences

Loss of habitat due to dams (such as Keswick, Shasta, and Oroville) have already occurred, and continuing threats include migration barriers, insufficient flow, increased water temperatures, juvenile entrainment in water export facilities, nonnative forage species, competitors, and predators, poaching, pesticides and heavy metals, and local harvest (Biological Review Team 2005).

A.20.6 Relevant Conservation Efforts

The Central Valley Project Improvement Act's Anadromous Fish Restoration Program has the goal of supporting efforts that lead to doubling the natural production of anadromous fish in the Central Valley at a sustainable, long-term basis, at levels not less than twice the average levels attained during the period of 1967 to 1991. Although most efforts of the Anadromous Fish Restoration Program have focused on salmon as a result of their listing history and status, sturgeon may receive some unknown amount of incidental benefit from these restoration efforts. For example, the acquisition of water for flow enhancement on tributaries to the Sacramento River, fish screening for the protection of Chinook salmon and Central Valley steelhead, spawning gravel augmentation, or riparian revegetation and instream restoration projects would likely have some ancillary benefits to sturgeon. The Anadromous Fish Restoration Program has also invested in a green sturgeon research project that has helped improve our understanding of the life history requirements and temporal patterns of the southern DPS of North American green sturgeon.

Many beneficial actions have originated from and been funded by the CALFED program, including such projects as floodplain and instream restoration, riparian habitat protection, fish screening and passage projects, research on nonnative invasive species and contaminants, restoration methods, watershed stewardship, and education and outreach programs. Prior Federal Register notices have reviewed the details of the Central Valley Project Improvement Act (CVPIA) and CALFED programs and potential benefits for anadromous fish, particularly Chinook salmon and Central Valley steelhead (69 FR 33102). Projects potentially benefiting sturgeon primarily consist of fish screen evaluation and construction projects, restoration evaluation and enhancement activities, and contaminant studies.

In response to passage impediment concerns to green sturgeon and other migratory species, operations of the Red Bluff Diversion Dam (RBDD) have been modified since its construction in 1964 to reduce the "gates-in" period. In 2009, Reclamation received funding for the Fish Passage Improvement Project at the RBDD to build a pumping facility to provide reliable water supply for high-valued crops in Tehama, Glenn, Colusa, and northern Yolo counties while providing year-round unimpeded fish passage. This project, which is expected to be completed in late 2012, will eliminate passage issues for sturgeon and other migratory species.

The combination of increased law enforcement and new sport fishing regulations adopted over the past several years specifically to protect sturgeon and reduce their harvest is expected to further reduce illegal fishing practices as well as the effects of incidental harvest of green

sturgeon by recreational anglers throughout the range of the species. Mitigation under the Delta Fish Agreement has increased the number of wardens enforcing harvest regulations for steelhead and other fish in the Bay-Delta and upstream tributaries by creating the Delta Bay Enhanced Enforcement Program (DBEEP).

A.20.7 Species Habitat Suitability Model

A.20.7.1 Adult Upstream Migration/Potential Spawning/Rearing Habitat

Green sturgeon migration and potential spawning habitat is defined as migration, potential spawning, and rearing habitat delineated by NMFS (2007). Upstream migration and potential spawning habitat includes the Sacramento River along the western edge of the Plan Area and the Feather River up to the Thermalito Afterbay Outlet.

A.20.7.2 Assumptions

NMFS is the federal agency responsible for managing green sturgeon and as such is considered to be the authority on the distribution of the species and its habitat. Green sturgeon migrate up the Sacramento River to Keswick Dam through the western border of the Plan Area. They are known to spawn upstream of Hamilton City and below Keswick Dam in the Sacramento River. Preferred spawning habitats are thought to contain large cobble in deep and cool pools with turbulent water (DFG 2002, Moyle 2002, Adams et al. 2002). The scale of this habitat model limits the ability to distinguish between preferred spawning habitat and other habitat.

There are at least two confirmed observations that green sturgeon exist in the Feather River inside the Plan Area. In 1993, a University of California, Davis graduate student obtained descriptions of green sturgeon from anglers and saw pictures of green sturgeon in a local bait shop caught by anglers fishing in the Thermalito Afterbay Outlet (Beamesderfer et al. 2004). In 2006, A. Seesholtz (pers. comm.) observed 12 green sturgeon pulled out of the water by nearby salmon creel field crew. One of these fish was approximately 6.5 feet long and easily distinguishable as a green sturgeon.

Green sturgeon may spawn in the Feather River during high flow years (DFG 2002), although no indication of spawning has been documented despite intensive sampling efforts (Niggemyer and Duster 2003). Overall, it appears that green sturgeon use the Feather River almost exclusively in high flow years because of natural and manmade barriers, such as the bench at Shanghai Bend, that are harder to pass during drier years. Historical use of the Feather River (before construction of Oroville Dam) is unknown.

A.20.8 Recovery Plan Goals

A recovery plan has not been prepared for the green sturgeon, and recovery goals have not been established for the species.

A.20.9 References

Literature Cited

- Adams, P. B., C. B. Grimes, J. E. Hightower, S. T. Lindley, and M. L. Moser. 2002. Status Review for North American Green Sturgeon, *Acipenser medirostris*. National Marine Fisheries Service and North Carolina Cooperative Fish and Wildlife Research Unit.
- Beamesderfer, R., M. Simpson, G. Kopp, J. Inman, A. Fuller, D. Demko. 2004. *Historical and Current Information on Green Sturgeon Occurrence in the Sacramento and San Joaquin Rivers and Tributaries*. S. P. Cramer & Associates, Inc. for State Water Contractors. 44 pp. Revised August 10, 2004.
- Biological Review Team. 2005. Green Sturgeon (*Acipenser medirostris*) Status Review Update. NOAA Fisheries, Southwest Fisheries Science Center.
- CNDDDB (California Natural Diversity Database). 2006. Sacramento: California Department of Fish and Game.
- DFG (California Department of Fish and Game). 2002. California Department of Fish and Game comments to National Marine Fisheries Service regarding green sturgeon listing. 79 pp. plus appendices.
- DFG (California Department of Fish and Game). 2003. *Species of Special Concern*. Available: www.dfg.ca.gov/hcpb/species/ssc/sscfish/sscfish.shtml. Revised May 2, 2003.
- DWR (California Department of Water Resources). 2005. *Fish Passage Improvement, An Element of CALFED's Ecosystem Restoration Program* Available: <http://www.watershedrestoration.water.ca.gov/fishpassage/b250/content.html>. Accessed: March 2007.
- Moyle, P. B. 2002. *Inland Fishes of California*. Revised and expanded. Berkeley: University of California Press.
- Moyle, P. B., P. J. Foley, and R. M. Yoshiyama. 1992. *Status of Green Sturgeon, Acipenser medirostris, in California*. Final report submitted to National Marine Fisheries Service. University of California, Davis.
- Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. *Fish Species of Special Concern of California*, 2nd ed. Sacramento: California Department of Fish and Game.
- Niggemyer, A. and T. Duster. 2003. Final assessment of potential sturgeon passage impediments SP-F3.2 Task 3A. Oroville Facilities Relicensing FERC Project No. 2100. Surface Water Resources, Inc., Sacramento, CA. Available: orovillerelicensing.water.ca.gov/pdf_docs/12-17-03_env_att_11.pdf.

NMFS (National Marine Fisheries Service). 2006. Green Sturgeon (Northern and Southern DPS). Available: www.nmfs.noaa.gov/pr/pdfs/species/green_sturgeon.pdf.

NMFS. 2009. Stream waters designated as Critical Habitat for the Southern Distinct Population Segment of Green Sturgeon-GIS dataset. Available: <http://www.nmfs.noaa.gov/gis/data/critical.htm#sw>

SWRI (Southwest Research Institute). 2003. *Fish Distribution in the Feather River below Thermalito Diversion Dam to the Confluence with the Sacramento River*. Draft Report SP-F3.2, Task 1 and SP-F21, Task 2. Oroville FERC Relicensing (Project No. 2100).

Federal Register

69 FR 33102. 2004. Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids. Proposed Rule; Request for Comments. Federal Register 69:33102.

71 FR 17757. 2006. Endangered and Threatened Wildlife and Plants: Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. Federal Register 71: 17757.

74 FR 52300. 2009. Endangered and Threatened Wildlife and Plants: Final Rulemaking to Designate Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon. Final Rule. Federal Register 74:52300.

Personal Communications

Alicia Seesholtz, Environmental Scientist, DWR, Feather River project. Phone call with Rick Wilder on 09/20/07 regarding fish use of the Feather River.

This page is intentionally left blank.