

1 **A.22 GREEN STURGEON (*ACIPENSER***
 2 ***MEDIROSTRIS*)**

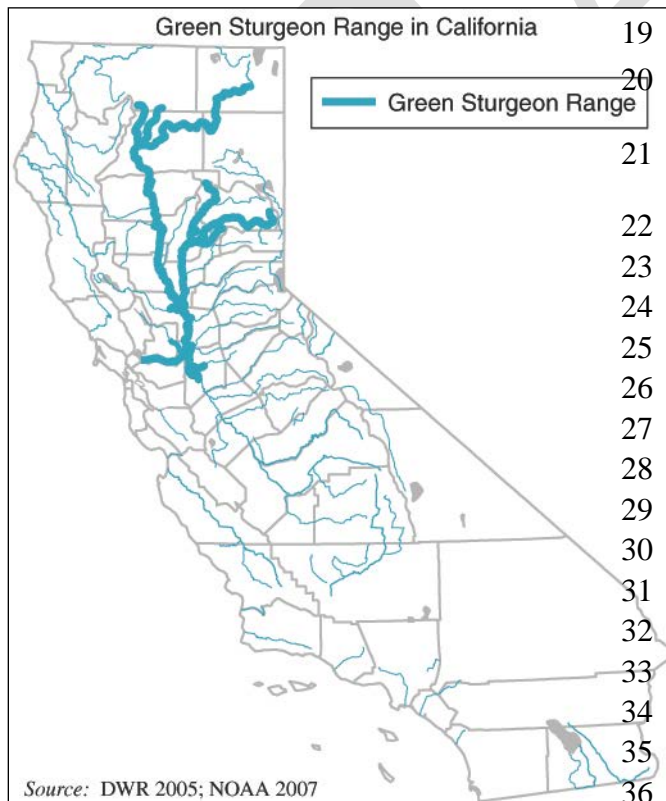
3 **A.22.1 Legal and Other Status**

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



Photo courtesy © Tox Soto, Karuk Tribe Fisheries Dept

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



19 **A.22.2 Species Distribution**
 20 **and Status**

21 **A.22.2.1 Range and Status**

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

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

4 **A.22.2 Distribution and Status in the Plan Area**

5 Green sturgeon use the Sacramento River along the western boundary of Butte County
6 (Information Center for the Environment, no date), and several have been recorded in the Feather
7 River up to the Thermalito Afterbay (SWRI 2003, Beamesderfer et al. 2004) (see Figure A-22).
8 The California Natural Diversity Database has no records of green sturgeon within Butte County
9 (CNDDDB 2006) (see Figure A-22).

10 **A.22.3 Habitat Requirements and Special Considerations**

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

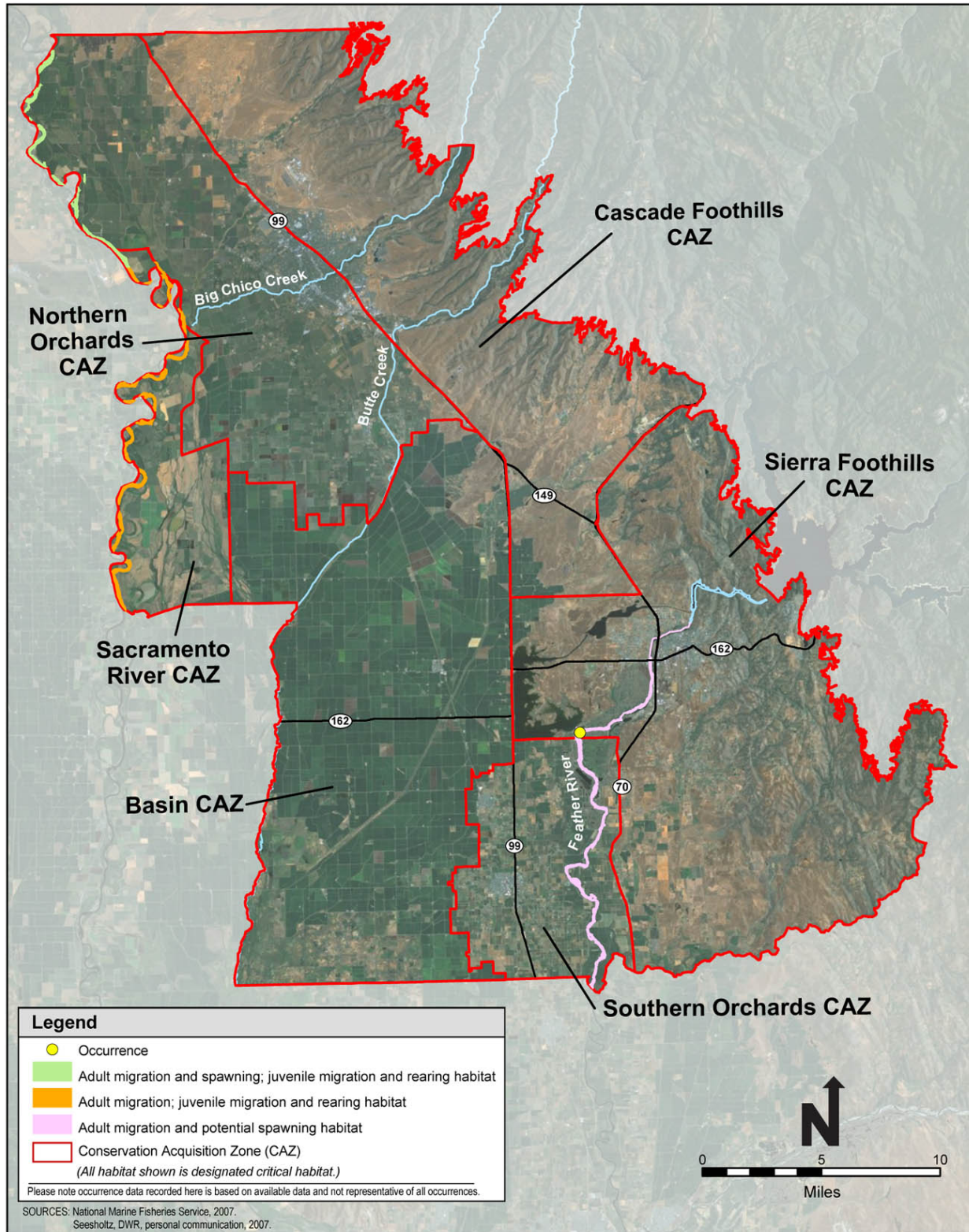
19 **A.22.4 Life History**

20 Green sturgeon are anadromous with adults entering rivers to spawn in deep pools in large,
21 turbulent rivers, probably over large cobbles, in March to July with the peak in mid-April to mid-
22 June (Adams et al. 2002). Juveniles remain in fresh water for one to three years before migrating
23 to the ocean where they remain near estuaries for a while but then move long distances (Moyle
24 2002). Males mature at approximately 15 years of age while females mature at about 17 years,
25 and females can produce 60,000 to 140,000 eggs (Moyle et al. 1992, Adams et al. 2002). The
26 maximum age is estimated to be 60 to 70 years or more (Moyle 2002). Juveniles and adults are
27 benthic feeders, feeding primarily on invertebrates, although some small fish may also be eaten.

28 **A.22.5 Threats**

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

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Figure A-22. Green Sturgeon Modeled Habitat and Recorded Occurrences

1 Loss of habitat due to dams (such as Keswick, Shasta, and Oroville) have already occurred, and
2 continuing threats include migration barriers, insufficient flow, increased water temperatures,
3 juvenile entrainment in water export facilities, nonnative forage species, competitors, and
4 predators, poaching, pesticides and heavy metals, and local harvest (Biological Review Team
5 2005).

6 **A.22.6 Relevant Conservation Efforts**

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

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

29 In response to passage impediment concerns to green sturgeon and other migratory species,
30 operations of the Red Bluff Diversion Dam (RBDD) have been modified since its construction in
31 1964 to reduce the “gates-in” period. In 2009, Reclamation received funding for the Fish
32 Passage Improvement Project at the RBDD to build a pumping facility to provide reliable water
33 supply for high-valued crops in Tehama, Glenn, Colusa, and northern Yolo counties while
34 providing year-round unimpeded fish passage. This project, which is expected to be completed
35 in late 2012, will eliminate passage issues for sturgeon and other migratory species.

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

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

5 **A.22.7 Species Habitat Suitability Model**

6 **Adult Upstream Migration/Potential Spawning/Rearing Habitat.** Green sturgeon migration
7 and potential spawning habitat is defined as migration, potential spawning, and rearing habitat
8 delineated by NMFS (2007). Upstream migration and potential spawning habitat includes the
9 Sacramento River along the western edge of the Plan Area and the Feather River up to the
10 Thermalito Afterbay Outlet.

11 **Assumptions.** NMFS is the federal agency responsible for managing green sturgeon and as such
12 is considered to be the authority on the distribution of the species and its habitat. Green sturgeon
13 migrate up the Sacramento River to Keswick Dam through the western border of the Plan Area.
14 They are known to spawn upstream of Hamilton City and below Keswick Dam in the
15 Sacramento River (J. Israel pers. comm.). Preferred spawning habitats are thought to contain
16 large cobble in deep and cool pools with turbulent water (DFG 2002, Moyle 2002, Adams et al.
17 2002). The scale of this habitat model limits the ability to distinguish between preferred
18 spawning habitat and other habitat.

19 There are at least two confirmed observations that green sturgeon exist in the Feather River
20 inside the Plan Area. In 1993, a University of California, Davis graduate student obtained
21 descriptions of green sturgeon from anglers and saw pictures of green sturgeon in a local bait
22 shop caught by anglers fishing in the Thermalito Afterbay Outlet (Beamesderfer et al. 2004). In
23 2006, A. Seesholtz (pers. comm.) observed 12 green sturgeon pulled out of the water by nearby
24 salmon creel field crew. One of these fish was approximately 6.5 feet long and easily
25 distinguishable as a green sturgeon.

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

32 **A.22.8 Recovery Plan Goals**

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

1 A.22.9 References

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