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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 223

[Docket No. 050323081-5081-01; I.D.031505C]

RIN 0648-AT02

Endangered and Threatened Wildlife and Plants: Proposed Threatened Status for Southern Distinct Population Segment of North American Green Sturgeon

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: We, the NMFS, have completed an update of an Endangered Species Act (ESA) status review for the North American green sturgeon (Acipenser medirostris; hereafter “green sturgeon”). After reviewing new and updated information on the status of green sturgeon and considering whether green sturgeon is in danger of extinction throughout all or a significant portion of its range, or is likely to become endangered within the foreseeable future throughout all or a significant portion of its range, we confirm our earlier determination that the species is comprised of two distinct population segments (DPSs) that qualify as species under the ESA, the Northern and Southern DPSs. We reaffirm our earlier determination that the Northern DPS does not warrant listing as threatened or endangered at this time, and we will maintain the DPS on the Species of Concern List due to remaining uncertainties about its status and threats. We revise our previous “not warranted” finding for the Southern DPS and propose to list it as threatened.

This revision is based on: (1) new information showing that the majority of spawning adults are concentrated into one spawning river (i.e., Sacramento River), thus increasing the risk of extirpation due to catastrophic events; (2) threats that have remained severe since the last status review and have not been adequately addressed by conservation measures currently in place; (3) fishery-independent data exhibiting a negative trend in juvenile green sturgeon abundance; and (4) new information showing evidence of lost spawning habitat in the upper Sacramento and Feather Rivers. We will reevaluate the status of the Northern DPS in 5 years. If the proposed listing is finalized, a recovery plan will be prepared and implemented for the Southern DPS. Protective regulations under ESA section 4(d) and critical habitat will be proposed in a subsequent Federal Register notice.

DATES: Comments on this proposal must be received by [insert date 90 days after date of publication in the FEDERAL REGISTER]. A public hearing will be held promptly if any person so requests by [insert date 45 days after date of publication in the FEDERAL REGISTER].

Notice of the location and time of any such hearing will be published in the Federal Register not less than 15 days before the hearing is held.

ADDRESSES: You may submit comments by any of the following methods:

- E-Mail: GreenSturgeon.Comments@noaa.gov
- Federal e-Rulemaking Portal: <http://www.regulations.gov>. Follow the instructions for submitting comments.
- Mail: Submit written comments to Chief, Protected Resources Division, Southwest Region, National Marine Fisheries Service, 501 West Ocean Blvd., Suite 4200, Long Beach, CA, 90802-4213.

The updated green sturgeon status review and other reference materials regarding this determination can be obtained via the Internet at: <http://www.nmfs.noaa.gov> or by submitting a request to the Assistant Regional Administrator, Protected Resources Division, Southwest Region, NMFS, 501 West Ocean Blvd., Suite 4200, Long Beach, CA 90802-4213, or the Assistant Regional Administrator, Protected Resources Division, Northwest Region, NMFS, 1201 NE Lloyd Avenue, Suite 1100, Portland, OR 97232.

FOR FURTHER INFORMATION CONTACT: Melissa Neuman, NMFS, Southwest Region (562) 980-4115; Scott Rumsey, NMFS, Northwest Region (503) 872-2791; or Lisa Manning, NMFS, Office of Protected Resources (301) 713-1401.

SUPPLEMENTARY INFORMATION:

Background

On June 12, 2001, we received a petition from the Environmental Protection Information Center, Center for Biological Diversity, and WaterKeepers Northern California requesting that we list the green sturgeon as threatened or endangered under the ESA and that critical habitat be designated for the species concurrently with any listing determination. On December 14, 2001, we provided notice of our determination that the petition presented substantial scientific information indicating that the petitioned action may be warranted and requested information to assist with a status review to determine if green sturgeon warranted listing under the ESA (66 FR 64793). To assist in the status review, we formed a Biological Review Team (BRT) comprised of scientists from our Northwest and Southwest Fisheries Science Centers and from the United States Geological Survey (USGS). We also requested technical information and comments from State and Tribal co-managers in California, Oregon, and Washington, as well as from scientists

and individuals having research or management expertise pertaining to green sturgeon from California and the Pacific Northwest. The BRT considered the best available scientific and commercial information, including information presented in the petition and in response to our request for information concerning the status of and efforts being made to protect the species (66 FR 64793; December 14, 2001). The BRT presented its findings in a final status review report for North American green sturgeon (Adams et al., 2002). Under the ESA, a listing determination may address a species, subspecies, or a DPS of any vertebrate species which interbreeds when mature (16 U.S.C. 1532(16)). On February 7, 1996, the U.S. Fish and Wildlife Service (FWS) and NMFS adopted a policy describing what constitutes a DPS of a taxonomic species (61 FR 4722). The joint DPS policy identified two elements that must be considered when making DPS determinations: (1) The discreteness of the population segment in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the significance of the population segment to the remainder of the species (or subspecies) to which it belongs. After conducting the status review, we determined that green sturgeon is comprised of two DPSs that qualify as species under the ESA: (1) a northern DPS consisting of populations in coastal watersheds northward of and including the Eel River (“Northern DPS”); and (2) a southern DPS consisting of coastal and Central Valley populations south of the Eel River, with the only known population in the Sacramento River (“Southern DPS”).

The BRT considered the following information in order to assess risk factors for each green sturgeon DPS: (1) abundance trends from fisheries data; (2) the effects of fishing bycatch; (3) the possible loss of spawning habitat in rivers where spawning is reported to have occurred historically, but apparently no longer does; (4) concentration of spawning in the Klamath and

Sacramento River systems; (5) lack of adequate population abundance data; (6) potentially lethal water temperatures and adverse effects of contaminants; (7) entrainment (defined here as loss of green sturgeon due to water diversion) by water projects; and (8) adverse effects of non-native species. Based on the 2002 risk assessment, we determined on January 23, 2003, that neither DPS warranted listing as threatened or endangered (68 FR 4433). Uncertainties in the structure and status of both DPSs led us to add them to the Species of Concern List (formerly the candidate species list; 69 FR 19975; April 15, 2004). Along with the finding, we announced that we would reevaluate the status of green sturgeon in 5 years.

On April 7, 2003, the Environmental Protection Information Center (and other Plaintiffs) challenged our “not warranted” finding for green sturgeon. The U.S. District Court for the Northern District of California issued an order on March 2, 2004, which set aside our “not warranted” finding and remanded the matter to us for redetermination of whether green sturgeon is in danger of extinction throughout all or a significant portion of its range, or is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. The U.S. District Court’s March 2004 remand was issued because the Court was not satisfied with our examination of whether purported lost spawning habitat constituted a significant portion of either DPS’ range. We reestablished the BRT in the early summer of 2004 and added a new member from USGS who possessed considerable knowledge of green sturgeon. The BRT was asked to consider recent scientific and commercial information available regarding the biological status of green sturgeon and to assist us in assessing the viability of the species throughout all or a significant portion of its range. We published a notice on June 18, 2004, soliciting information from the public to assist us in updating our status review and making a

new listing determination (69 FR 34135).

In addition to the information solicited during the first status review, we solicited any new information beyond that considered in the 2002 green sturgeon status review or the January 2003 1-year “not warranted” finding on the following topics for the Northern and Southern DPSs of green sturgeon: (1) new genetic, morphological, physiological, or ecological information relevant to DPS identification; (2) current or historic information documenting the geographic extent (e.g., area, river mile distance) and magnitude (e.g., abundance of spawning females, reproductive output) of spawning in particular river systems (e.g., Fraser River, Umpqua River, South Fork Trinity River, Eel River, Feather River, and San Joaquin River); (3) information documenting the current geographic extent and magnitude of spawning in areas other than where it is known to presently occur (i.e., areas other than the Sacramento River, Klamath River and Rogue River); (4) the legitimacy of references used to support information regarding current or historic spawning in the systems mentioned above in (2) and (3), particularly citations by Houston (1988) for the Fraser River; Lauman *et al.* (1972) and the Oregon Department of Fish and Wildlife (ODFW) (2002) for the Umpqua River; Moyle *et al.* (1992) and references therein for the South Fork Trinity River; Puckett (1976), Moyle *et al.* (1992) and references therein for the Eel River; Wang (1986) and FWS (1995) for the Feather River; and Moyle *et al.* (1992) and references therein for the San Joaquin River; (5) historic, current or future factors that may be responsible for the reported loss of spawning habitat and associated spawning populations; and (6) fishery-dependent and -independent abundance data for analysis of population trends. The public comment period closed on August 17, 2004. The BRT convened to draft an updated status review in November 2004.

On January 27, 2005, we distributed the updated status review to co-managers (i.e., States of Washington, Oregon and California, Yurok and Hoopa Tribes, FWS, and the California Bay-Delta Program) for review. The final updated status review for green sturgeon was completed by the BRT on February 22, 2005, and submitted to NMFS Regional Offices for further consideration prior to the publication of this notice.

Biology and Life History of Green Sturgeon

A thorough account of green sturgeon biology and life history may be found in the previous 1-year finding (68 FR 4433; January 23, 2003) and the updated status review (Adams et al., 2005), which are incorporated here by reference. The following is a summary of that information.

Adult Distribution and Feeding

The green sturgeon is the most widely distributed member of the sturgeon family Acipenseridae. Like all sturgeon species it is anadromous, but it is also the most marine-oriented of the sturgeon species. Green sturgeon are known to range in nearshore marine waters from Mexico to the Bering Sea and are commonly observed in bays and estuaries along the western coast of North America, with particularly large concentrations entering the Columbia River estuary, Willapa Bay, and Grays Harbor during the late summer (Moyle et al., 1992). The reasons for these concentrations are unclear, but do not appear to be related to spawning or feeding (Beamesderfer, 2000).

Little is known about adult green sturgeon feeding. Adults in the Sacramento-San Joaquin Delta are reported to feed on benthic invertebrates including shrimp, mollusks, amphipods, and even small fish (Moyle et al., 1992). One hundred and twenty-one green

sturgeon stomach samples from the Columbia River gillnet fishery were empty with the exception of one fish, while all white sturgeon stomachs contained digested material (ODFW 2002).

Spawning

Adult green sturgeon are thought to spawn every 3 to 5 years (Tracy, 1990), but new information suggests that spawning could occur as frequently as every 2 years (Lindley and Moser, pers. comm., 2004). Adults typically migrate into fresh water beginning in late February (Moyle et al., 1995); spawning occurs from March–July, with peak activity from April–June (Moyle et al., 1995). Confirmed spawning populations in North America are in the Rogue (Erickson et al., 2001, Rien et al., 2001), Klamath, and Sacramento Rivers (Moyle et al., 1992; CDFG, 2002). Green sturgeon females produce 60,000 - 140,000 eggs (Moyle et al., 1992), and they are the largest eggs (diameter 4.34mm) of any sturgeon species (Cech et al., 2000).

Spawning occurs in deep turbulent river mainstems. Klamath and Rogue River populations appear to spawn within 100 miles (161 km) of the ocean, while the Sacramento spawning run may travel over 200 miles (322 km). Specific spawning habitat preferences are unclear, but eggs likely are broadcast over large cobble where they settle into the cracks (Moyle et al., 1995).

Optimum flow and temperature requirements for spawning and incubation are unclear, but spawning success in most sturgeons is related to these factors (Dettlaff et al., 1993).

Temperatures above 68°F (20°C) were lethal to embryos in laboratory experiments (Cech et al., 2000).

Early Life History and Maturation

Green sturgeon larvae first feed at 10 days post hatch and grow quickly reaching a length

of 66mm and a weight of 1.8 g in 3 weeks of exogenous feeding. Metamorphosis to the juvenile stage is complete at 45 days. Juveniles continue to grow rapidly, reaching 300mm in 1 year and over 600mm within 2–3 years for the Klamath River (Nakamoto et al., 1995). Juveniles spend from 1–4 years in fresh and estuarine waters and disperse into salt water at lengths of 300–750mm. The little that is known regarding juvenile green sturgeon feeding habits comes from a study conducted in the Sacramento-San Joaquin Delta, where juveniles fed on opossum shrimp and amphipods (Radtke, 1966).

Green sturgeon disperse widely in the ocean after their out-migration from freshwater (Moyle et al., 1992). Tagged green sturgeon from the Sacramento and Columbia Rivers are primarily captured to the north in coastal and estuarine waters, with some fish tagged in the Columbia River being recaptured as far north as British Columbia (WDFW, 2002a). While there is some bias associated with recovery of tagged fish through commercial fishing, the pattern of a northern migration is supported by the large concentration of green sturgeon in the Columbia River estuary, Willapa Bay, and Grays Harbor, which peaks in August. These fish tend to be immature; however, mature fish and at least one ripe fish have been found in the lower Columbia River (WDFW, 2002a). Genetic evidence suggests that Columbia River green sturgeon are a mixture of fish from at least the Sacramento, Klamath, and Rogue Rivers (Israel et al., 2002). Mature males range from 139–199cm in fork length (FL) and 15 to 30 years of age (VanEennaam, 2002). Mature females range from 157–223cm FL and 17 to 40 years of age. Maximum ages of adult green sturgeon are likely to range from 60–70 years (Moyle, 2002).

Summary of New Information

Consideration as a “Species” Under the ESA

The ESA defines species as “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife that interbreeds when mature” 16 U.S.C. 1532(16). This definition allows for the recognition of DPSs at levels below taxonomically recognized species or subspecies. On February 7, 1996, the FWS and NMFS published a joint policy to clarify the phrase “distinct population segment” for the purposes of listing, delisting and reclassifying species under the ESA (61 FR 4722). This policy identifies two criteria that must be met for a population segment to be considered a DPS under the ESA: (1) The discreteness of the population segment in relation to the remainder of the species or subspecies to which it belongs; and (2) the significance of the population segment to the species or subspecies to which it belongs.

New genetic information in combination with the tendency of sturgeon to exhibit high spawning site fidelity confirms the conclusions drawn during the previous 1-year “not warranted” finding (68 FR 4433; January 29, 2003) that the northern and southern populations of green sturgeon are “discrete” and “significant” as defined in the DPS policy. (For a complete discussion of the discreteness and significance of the U.S. population of green sturgeon see 68 FR at 4437).

Genetic Information

Updated analyses of green sturgeon genetic structure were made available from University of California - Davis (J. Israel and B. May, pers. comm., 2004). These results incorporated a greater number of samples including new adult samples from the Umpqua River, new juvenile samples from the Sacramento River, and an increase in microsatellite DNA loci to nine over the six reported in the previous status review and discussed in Israel et. al. (2004).

Green sturgeon samples demonstrate a strong division between a grouping of the Rogue, Klamath, and Umpqua Rivers versus a grouping of the Sacramento and Columbia Rivers and San Pablo Bay samples. The northern group included mixed stock green sturgeon samples from the Umpqua River as well as single stock samples from the Rogue and Klamath Rivers and the southern group included mixed stock samples from the Columbia River, samples from San Pablo Bay that may be either mixed or single stock, and single stock samples from the Sacramento River.

Oceanic Distribution and Behavior

New oceanic distribution and behavior information came from pop-off archival tags (7 fish), Oregon trawl logbook analysis, and acoustic tags (168 fish). These data indicated that green sturgeon generally make northward migrations, to points as far north as northwest Vancouver Island, Canada, upon returning to the ocean. During oceanic migrations, archival tagged fish occupied depths of 40-70 m and remained exclusively inside the 110 m contour. These results are confirmed by Oregon trawl logbook records (Erickson and Hightower, 2004). Fish marked in spawning areas (Rogue and Klamath Rivers and San Pablo Bay) and in mixed stock areas (Columbia River and Willapa Bay) with acoustic tags in 2002, 2003, and 2004 sustained migrations of 100 km per day. Several fish tagged in 2002 returned to the Rogue River in 2004, suggesting a minimal spawning periodicity of 2 years if it is assumed that these fish were ripe and returning to the River to spawn (S. Lindley and M. Moser, pers. comm., 2004).

Freshwater Distribution Information

We requested new historic and/or current information for particular river systems where historic and current spawning status is uncertain (e.g., Fraser River, Umpqua River, South Fork

Trinity River, Eel River, Feather River, and San Joaquin River; 69 FR 34135). New information was received for the Chehalis, Umpqua, Rogue, and Eel Rivers within the Northern DPS and the Sacramento, Feather, and San Joaquin Rivers within the Southern DPS.

Northern DPS

Washington Department of Fish and Wildlife (WDFW) investigated the Chehalis River as potential green sturgeon habitat, and while it appears to possess suitable habitat features for green and white sturgeon spawning, there has not been evidence of spawning occurring in this basin (WDFW, 2004). Data summarized from catch record cards suggest that a few green sturgeon were caught in sport fisheries as far upriver as 60 kilometers during July 2002, March 2003, and December 2003, but these may be misidentifications of white sturgeon, which are much more common within the basin. Sport anglers have reported small green sturgeon in Grays Harbor; however, these fish were most likely of a post-migratory size and therefore were not fish rearing in the estuary. Green and white sturgeon eggs and larvae have not been observed in the Chehalis River or Grays Harbor.

There are two confirmed records of green sturgeon captured above tidal influence in the Umpqua River (T. Rien, pers. comm., 2004). In July 2000, two juvenile green sturgeon (each approximately 10-cm long) were regurgitated from two smallmouth bass caught at river kilometer (rkm) 134 on the Umpqua River. The ODFW interviewed the local angling guide, and the one available regurgitated fish was positively identified as a green sturgeon. The other regurgitated sturgeon was not available to examine. In April 1979, a 1.8 m green sturgeon was caught at rkm 164 on the Umpqua River. A picture of the fish was published in the Roseburg News Review (May 3, 1979) and it was visually identified as a green sturgeon by ODFW.

ODFW has sampled the Umpqua River in 2002, 2003, and 2004 using gill nets, beach seines, snorkeling, and underwater video, and their sampling efforts did not capture any green sturgeon above tidal influence in the Umpqua River.

A putative green juvenile sturgeon was captured at Big Butte Creek (rkm 254) near Lost Creek Dam on the Rogue River (R. Reisenbichler, pers. comm., 2004). This is unusual because it is very high in the system and above two major dams with fish ladders (Savage Rapids and Gold Ray) and several smaller dams.

Adult green sturgeon were sighted on the mainstem Eel River near Fort Seward, California (rkm 101) during snorkel surveys in 1995 and 1996 (S. Downie, pers. comm., 2004). Three sturgeon were sighted each year at a place locally known as “The Sturgeon Hole.” Two juvenile green sturgeon were captured in the Eel River estuary in 1994 by trawl (S. Cannata, pers. comm., 2004). The first one was 282mm FL and the second was 510mm. This is in addition to the previously reported capture of 26 juvenile green sturgeon near Fort Seward in 1967 and 1968 (Pluckett, 1976).

Southern DPS

Recent habitat evaluations conducted in the upper Sacramento and Feather Rivers for salmonid recovery planning suggest that significant potential green sturgeon spawning habitat was made inaccessible or altered by dams (historical habitat characteristics, temperature, and geology summarized in Lindley *et al.*, 2004). This spawning habitat may have extended up into the three major branches of the Sacramento River, the Little Sacramento River, the Pit River system, and the McCloud River.

Green and white sturgeon adults have been observed periodically in small numbers in the

Feather River (Beamesderfer et al., 2004). There are at least two confirmed records of adult green sturgeon in 2004. There are no records of larval or juvenile sturgeon of either species, even prior to the 1960's when Oroville Dam was built. There are reports that green sturgeon may reproduce in the Feather River during high flow years (CDFG, 2002), but these are not specific and are unconfirmed.

Small fisheries for sturgeon occur in spring on the San Joaquin River between Mossdale and the Merced River (Kohlhorst, 1976). Though sturgeon are known to migrate into the San Joaquin River, no efforts have been made to document sturgeon reproduction (FWS, 1995). In addition, data are not regularly collected at diversions on the San Joaquin River, and when sturgeon have been collected, species differentiation rarely occurred. Information exists through interviews with biologists, wardens, and anglers regarding the presence and potential spawning of white sturgeon on the San Joaquin River (FWS, 1995). Two juvenile white sturgeon caught at Woodbridge on the Mokelumne River (rkm 63) in 2003 are the first confirmation of white sturgeon reproduction in the San Joaquin River system (Beamesderfer et al., 2004). Though no green sturgeon have ever been documented in the San Joaquin River upstream of the Delta or in the Stanislaus, Tuolumne, and Merced Rivers (CDFG, 2002; Beamesderfer et al., 2004), the San Joaquin River and its tributaries have been heavily modified in ways that reduce suitability for sturgeon since the 1940s, so the lack of contemporary information cannot be considered evidence of historical green sturgeon absence. Moreover, species with a similar dependence on historic deep cool waters of the San Joaquin for spawning (i.e., spring-run Chinook salmon; Yoshiyama et al., 2001; and white sturgeon, FWS, 1995) are either extirpated or nearly so on the San Joaquin River, indicating that a once self-sustaining green sturgeon population on the San Joaquin River

may have been possible.

Catch Information

The coastwide bycatch of green sturgeon continues to be reduced over time as noted in the previous status review (Adams et al., 2002). Based on updated and corrected bycatch numbers, green sturgeon take has been reduced from a high of 9,065 in 1986 to 862 in 2001, the last year in the previous status review, to 512 in 2003. The greatest reductions in bycatch (direct and indirect) were for the commercial fisheries in the Northern DPS, specifically the Columbia River, Willapa Bay, and Grays Harbor. This reduction has occurred due to regulatory changes summarized in Adams et al. (2002), Appendix 1 Table 2. Yurok and Hoopa tribal green sturgeon fisheries have remained constant, with relatively constant effort, and together account for 59 percent of the coastwide green sturgeon catch in 2003.

Historic Spawning Status

Information presented in the first status review (Adams et al., 2002) and new information presented here regarding the historic and current spawning status of green sturgeon were analyzed.

Conclusions from New Information

In earlier technical memos and Federal Register publications (66 FR 64793, December 14, 2001; 68 FR 4433, January 23, 2003), we reported the loss of green sturgeon spawning habitat in the Umpqua, Fraser, South Fork Trinity, Eel (Northern DPS), Upper Sacramento, Feather, and possibly San Joaquin Rivers (Southern DPS) based on information presented in the petition. These claims prompted us to report that green sturgeon experienced a significant reduction in spawning area. New analysis of existing information and the submission of new

information to us in August 2004 (69 FR 34135) leads us to revise these earlier judgments in the following ways.

Northern DPS

There is no evidence of historic or current spawning in the Fraser or Chehalis Rivers (D. Lane, pers. comm., 2004; WDFW, 2004). Based on the lack of data, we cannot conclude that there has been a loss of spawning habitat over time in these systems.

Known historic and current spawning, based primarily on the presence of juvenile green sturgeon, occurs in the Umpqua, Rogue, Klamath and Trinity Rivers, and, therefore, we conclude that populations have not been extirpated from these systems (T. Rein, pers. comm., 2004; Erickson et al., 2002; Moyle, 2002; Sheiff et al., 2001). We are uncertain as to whether spawning habitat has been lost in the Umpqua River. A significant reduction in spawning habitat is not likely to have occurred in the Rogue River because there are no impassable barriers along green sturgeon migration routes. Although the Klamath River has undergone human alteration, data suggest that the geographic extent of spawning in the system has not been reduced over time. A paucity of data for the Trinity River limits our ability to comment on the magnitude of loss of spawning habitat in this system.

There is evidence to suggest that green sturgeon spawned in the South Fork Trinity River and continue to spawn there to some degree, based on the presence of adults in freshwater areas above tidal influence (CDFG, 1978; Moyle et al., 1992). We suspect that spawning habitat still exists in this system, but have no evidence to comment on whether spawning habitat has been reduced over time.

The Eel River is the only system in the Northern DPS where the status of spawning since

historic times is believed to have changed. Spawning is known to have occurred in the past based on the presence of juveniles (Plunkett, 1976), but recently, only adults have been present in the River (S. Downie, pers. comm., 2004) and one juvenile, whose natal stream origin is uncertain, was collected in the estuary. Despite Moyle et al.'s (2002) claim that green sturgeon have been extirpated from the Eel River, we determined that our ability to make a conclusion regarding extirpation is limited by: (1) low sampling effort in recent times (see Status of Green Sturgeon DPSs: Northern DPS); and (2) our inability to determine how much spawning habitat or reproductive potential may have been lost.

Southern DPS

Known historic and current spawning, based on the presence of juvenile green sturgeon, occurs in the Sacramento River (Adams et al., 2002). We have indirect evidence, based on habitat assessments of Chinook salmon, that the geographic extent of spawning has been reduced due to impassable barriers (the Keswick and Shasta dams) in the upper Sacramento River. We have not been able to quantify the reduction of habitat to date, and are uncertain how reduction in spawning habitat has affected the population's viability.

Spawning is suspected to have occurred in the Feather River due to the presence of adults in the system (CDFG, 2002). Although there is no evidence of spawning in the past or now, the continued presence of adults in the system suggests that green sturgeon are trying to migrate into presumed spawning areas now blocked by the Oroville Dam. Therefore, we conclude that spawning habitat may have been lost in the Feather River, but we were not able to determine how much habitat or reproductive potential was lost.

There is no evidence of historic or current spawning in the San Joaquin River

(Beamesderfer, 2004; Adams et al., 2002; CDFG, 2002). While we cannot make any conclusions regarding loss of spawning habitat over time in the San Joaquin River, indirect evidence from a variety of sources (Moyle, 2002; Lindley et al., 2004; L. Hess, pers. comm., 2004) suggests that both adult and juvenile green sturgeon may have been present in this system in the past. If spawning did occur in the San Joaquin River in the past, there may have been a reduction in spawning habitat again due to reasons mentioned above for the Sacramento and Feather Rivers.

Summary of Factors Affecting the Species

Section 4 of the ESA (16 U.S.C. 1533) and regulations promulgated to implement the listing provisions of the ESA (50 CFR part 424) set forth the procedures for adding species to the Federal list of threatened and endangered species. Section 4 requires that listing determinations be based solely on the best scientific and commercial data available, without consideration of possible economic or other impacts of such determinations. A species may be determined to be endangered or threatened due to one or more of the five factors described in section 4(a)(1) of the ESA. We must determine if either DPS of green sturgeon is endangered or threatened because of any one or a combination of the following factors: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

Species-wide Factors

Ocean and estuarine bycatch of green sturgeon in the white sturgeon and salmonid fisheries was considered a species-wide factor for decline since its impact could not be

apportioned to one DPS or the other. Current total catch of green sturgeon has been reduced to 6 percent of its 1986 high value of 9,065 fish; this does not, however, necessarily represent a reduction in green sturgeon abundance. The recent reduction is due to newly imposed fishing regulations in Oregon and Washington. Commercial fisheries targeting sturgeon have not been allowed in the Columbia River or Willapa Bay since 2001, and recreational fishing remains negligible (WDFW, 2004). Yurok and Hoopa tribal catch has remained relatively constant during the entire time series. The reduction in catch through protective management measures represents a reduction in risk to the Northern DPS. CDFG (2002) estimated an average fishing mortality of 2.2 percent for green sturgeon based on tag return data in the Sacramento-San Joaquin Estuary. The impact of this fishing mortality rate is unknown.

A summary of DPS-specific factors for decline is presented below (Tables 1 and 2). These factors were only considered for those river systems with known or suspected historical or current spawning activity.

Northern DPS Factors

The potential factors for decline in the Northern DPS are reduced flows, changed flow regimes, increased temperatures, and reduced oxygen concentrations, principally in the Klamath-Trinity and Eel River systems (Table 1). The impact of these factors is uncertain. This DPS also has the only major in-river fishery for green sturgeon (Yurok and Hoopa tribal fisheries in the Klamath-Trinity River system), the effects of which are uncertain, but catch data show no obvious signs of decline. As mentioned in the previous section, species-wide reduction in bycatch fishing mortality through protective management measures reduces the threat of overfishing in the Northern DPS. No risks due to disease, predation, or inadequacy of existing

regulatory mechanisms were identified. The Northern DPS has two known major spawning populations (e.g., the Klamath-Trinity River system and the Rogue River) that are not close to one another geographically, thus spreading risks of extinction over more than one spawning area. Spawning also appears to occur infrequently in the Umpqua River. This gives the Northern DPS some additional protection.

Southern DPS Factors

The principal factor for decline for this DPS comes from the reduction of green sturgeon spawning area to a limited area of the Sacramento River (Table 2). Keswick Dam provides an impassible barrier blocking green sturgeon access to what were likely historic spawning grounds upstream (FWS, 1995). A substantial amount of habitat in the Feather River above Oroville Dam also was lost, and threats to green sturgeon on the Feather River are similar to those faced in the Sacramento River (NMFS, 2004). The BRT concluded that a viable spawning population of green sturgeon no longer exists in the Feather River and was likely lost due to the habitat blockage as a result of Oroville Dam and from thermal barriers associated with the Thermalito Afterbay Facility (Table 2). Any observations of adult green sturgeon likely represent individuals that were stranded as a result of these barriers.

Potential adult migration barriers to green sturgeon include the Red Bluff Diversion Dam (RBDD), Sacramento Deep Water Ship Channel locks, Fremont Weir, Sutter Bypass, and the Delta Cross Channel Gates on the Sacramento River, and Shanghai Bench and Sunset Pumps on the Feather River. The threat of screened and unscreened agricultural, municipal, and industrial water diversions in the Sacramento River and Delta to green sturgeon are largely unknown as juvenile sturgeon are often not identified, and current California Department of Fish and Game

(CDFG) and NMFS screen criteria do not address sturgeon. Based on the temporal occurrence of juvenile green sturgeon and the high density of water diversion structures along rearing and migration routes, we find the potential threat of these diversions to be serious and in need of study (Table 2 NMFS, 2005).

CDFG (1992) and FWS (1995) found a strong correlation between mean daily freshwater outflow (April to July) and white sturgeon year class strength in the Sacramento-San Joaquin Estuary (these studies primarily involve the more abundant white sturgeon; however, the threats to green sturgeon are thought to be similar), indicating that insufficient flow rates are likely to pose a significant threat to green sturgeon (Table 2). This association of year class strength with outflow is also found in other anadromous fishes inhabiting the Estuary, such as striped bass, Chinook salmon, American shad, and longfin smelt (Stevens and Miller, 1983). Mean April-May flow rates of 566 cubic meters per second appear to be the minimum required for the production of good year class strength based on approximately 20 years of sturgeon salvage data at the Skinner Fish Facility (CDFG, 2002). According to this criterion, low flow rates occurred slightly more than 50 percent of the time during the years spanning 1968-1987 (CDFG, 2002). The FWS (1995) used water year types, based on an index developed for the Sacramento Basin (California Department of Water Resources, 2004), to suggest that low flow conditions occurred 53 percent of the time during the years spanning 1944-2004. It is postulated that low flow rates could dampen survival by hampering the dispersal of larvae to areas of greater food availability, hampering the dispersal of larvae to all available habitat, delaying the transportation of larvae downstream of water diversions in the Delta, or decreasing nutrient supply to the nursery, thus stifling productivity (CDFG, 1992). There are no current indications that flow rates will increase

over time.

High temperatures no longer seem to be the problem that they once were with the installation of the Shasta Dam temperature control device in 1997, although Shasta Dam has a limited storage capacity and cold water reserves could be depleted in long droughts (Table 2). Temperatures at RBDD have not been higher than 16⁰ C since 1995 (California Data Exchange Center) and are within the green sturgeon egg and larvae optimum for growth and survival of 15⁰ to 19⁰ C (Mayfield and Cech, 2004). However, green sturgeon reproduction before 1995 may well have been adversely affected by temperature and these earlier high temperatures may have caused population reductions that would still affect the overall population size and age-structure (Table 2). Water temperatures on Feather River downstream of the Thermalito Afterbay outlet are considerably higher than temperatures in the low-flow channel (FWS, 1995). It is likely that high water temperatures (greater than 17.2⁰ C) may deleteriously affect sturgeon egg and larval development, especially for late-spawning fish in drier water years (FWS, 1995). CDFG (2002) also indicated water temperatures may be inadequate for spawning and egg incubation in the Feather River during many years as the result of releases of warmed water from Thermalito Afterbay. CDFG believed this may be one reason neither green nor white sturgeon are found in the river in low-flow years. It is not expected that water temperatures will become more favorable in the near future (CDFG, 2002) and thus elevated water temperature continues to be a threat.

Sturgeon have high vulnerability to fisheries, and the trophy status of large white sturgeon makes these fishes a high priority for enforcement to protect against poaching (Table 2; CDFG, 2002). Green sturgeon are caught incidentally in these white sturgeon fisheries.

Non-native species are an ongoing problem in the Sacramento-San Joaquin River and Delta systems (Table 2; CDFG, 2002). One risk for green sturgeon associated with the introduction of non-native species involves the replacement of relatively uncontaminated food items with those that may be contaminated. For example, the non-native overbite clam, Potamocorbula amurensis, introduced in 1988, has become the most common food of white sturgeon and was found in the only green sturgeon examined thus far (CDFG, 2002). The overbite clam is known to bioaccumulate selenium, a toxic metal (CDFG, 2002; Linville et al., 2004). Green sturgeon may also experience predation by introduced species including striped bass.

Contamination of the Sacramento River increased substantially in the mid-1970s when application of rice pesticides increased (FWS, 1995). Estimated toxic concentrations for the Sacramento River during 1970-1988 may have deleteriously affected striped bass larvae (Bailey, 1994). White sturgeon may also accumulate PCBs and selenium (White et al., 1989). While green sturgeon spend more time in the marine environment than white sturgeon and, therefore, may have less exposure, the BRT concluded that some degree of risk from contaminants probably also occurs for green sturgeon (Table 2).

The previous status review (Adams et al., 2002) summarized juvenile entrainment and change in annual mean number over time. Juvenile entrainment is considered a type of threat imposed by water diversion (Table 2).

Table 1. Threats assessment by river system within the Northern DPS. No system-specific threats were identified in the Umpqua River. L=larvae; J=juvenile; and A=adult. All five listing factors were examined for each river system. Listing factors are: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

River System	Threats	Life Stage Affected				
		1	2	3	4	5
Rogue Klamath	Flow management and hydrological effects					✓
	Increased temperatures					✓
	Reduced O ₂ concentrations					✓
	Flow regime change					✓
-Trinity	In-river fishing					✓
	Reduced flows					✓
-South Fork Trinity	See Klamath threats					
	1955 and 1964 floods					✓
	See Klamath threats					
Eel	1955 and 1964 floods					✓
	Flow management and hydrological effects					✓
	Sedimentation and TMDL					✓

Table 2. Threats assessment by river system within the Southern DPS. L=larvae; J=juvenile; and A=adult. All five listing factors were examined for each river system. Listing factors are: (1) the present or threatened destruction, modification, or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; or (5) other natural or human-made factors affecting its continued existence.

River	Threats	Specific Effect	Timing of Exposure	Exposure	Life Stage	Listing Factors				
						1	2	3	4	5
Sacramento (Keswick and Shasta)	Impassible barriers	Block/prevent access to spawning habitat	Late-spring-early summer	Continuous	A					✓
	Adult migration barriers	Upstream migration barrier	Late spring-early fall	Continuous	A					✓
	Insufficient flow	Altered hydrology	Low flow years	Variable	L, J, A					✓
	Increased temperatures	Developmental abnormalities (reduced swimming performance)	Low flow years	Variable	L, J, A					✓
	Water diversion	Increased likelihood of stress, physical injury, harassment	All months	Continuous	L, J, A					✓
	Non-native species (e.g., striped bass)	Trophic alterations	All months	Continuous	L, J, A					✓
	Poaching	Removal of Fish	Unknown	Unknown	J, A					✓
	Pesticides and heavy metals	Contamination	All months	Continuous	L, J, A					✓
	Local fishing	Removal of Fish	January-May	Continuous	J, A					✓
	Impassible barriers (Oroville Dam)	Block/prevent access to spawning habitat	Late-spring-early summer	Continuous	A					✓
Feather	Extreme low flow rates	Altered hydrology	Low flow years	Variable	L, J, A					✓
	Increased temperatures	Developmental abnormalities (reduced swimming performance)	Low flow years	Variable	L, J, A					✓
	Non-native species (e.g., striped bass)	Trophic alterations	All months	Continuous	L, J, A					✓
	Poaching	Removal of Fish	Unknown	Unknown	J, A					✓
	Pesticides and heavy metals	Contamination	All months	Continuous	L, J, A					✓
	Local fishing	Removal of Fish	January-May	Continuous	J, A					✓

Status of Green Sturgeon DPSs

Northern DPS

The Fraser River in Canada currently has a catch and release fishery for sturgeon, but the number of green sturgeon captured is extremely small. A tagging study in 1992-1993 tagged 2300 sturgeon and only one was a green sturgeon (D. Lane, pers. comm., 2004). Green sturgeon occur off the West Coast of Vancouver Island where they are taken in the trawl fishery. These fish are thought to be from spawning areas in the United States, and this idea is supported by the recent acoustic and pop-off archival tagging. WDFW has investigated the possibility of green sturgeon spawning in the Chehalis River as it appears to provide suitable habitat features to support spawning. However, no evidence of spawning in this system has occurred to date. Currently, there is limited fishing in Grays Harbor, but no evidence of spawning has been found (WDFW, 2004).

Spawning does appear to take place in the Umpqua River, but is probably rare. Juvenile green sturgeon were identified in the system in 2000. Spawning in the Umpqua River apparently is not common since substantial sampling efforts in 2002, 2003, and 2004 failed to find any evidence of green sturgeon spawning.

The presence of green sturgeon spawning in the Rogue River has been only recently discovered. The river is less manipulated and habitat seems to be of better quality than in other green sturgeon spawning rivers. Blockages to migration of anadromous fish are likely to be upriver of the historical extent of green sturgeon spawning habitat and, therefore, do not seem to be limiting; habitat seems to be roughly what it was historically. Other anadromous salmonid fishes are generally doing well in the Rogue River (Weitkamp *et al.*, 1995; Busby *et al.*, 1996;

and Myers et al., 1998).

The Klamath River has the largest green sturgeon spawning population. Spawning still occurs upstream to the historical limit of its habitat range (Ishi Pishi Falls). Out-migrant juvenile green sturgeon are captured each year in screw traps at Big Bar (Schieff et al., 2001). The BRT expressed concerns over recent fish kills in the Klamath River, but reached no conclusions regarding whether or not the temperature regime in the system played a part in this mortality event. The Yurok tribal fishery comprises the majority of green sturgeon catch coastwide. There is no new information regarding abundance trends since the last status review (Adams et al., 2002). As discussed in the previous status review, the trends in numbers and size are difficult to interpret, but do not appear to indicate population decline.

There are few available data regarding the status of green sturgeon in the Trinity River system. The Hoopa Tribe has a small in-river fishery which takes fewer than 30 adult green sturgeon each year. Juvenile out-migrant green sturgeon are captured in most years in small numbers at Willow Creek (Schieff et al., 2001). Due to the continued presence of juveniles within the system, the BRT was not convinced that green sturgeon were extirpated from the South Fork Trinity River by the 1964 flood as suggested by Moyle (2002).

The Eel River is the southern-most known spawning area in the Northern DPS. Moyle et al. (1992) suggested that green sturgeon were extirpated from the Eel River following the 1964 flood. The 1955 and 1964 floods delivered large amounts of sediment into the Eel River. These historical flood events, combined with land use practices, have resulted in persisting high sediment levels. Some portion of the deep holes that green sturgeon use during spawning were filled in by the 1955 and 1964 flood events, but the extent of sturgeon habitat loss is unknown.

The BRT was not convinced that green sturgeon have been extirpated from the Eel River. Sightings of adults in both 1995 and 1996 and of juveniles in the estuary in 1994 suggest that a green sturgeon population persists in the Eel River, although severely reduced from historical levels. Sampling was limited with adult surveys conducted only in 1995 and 1996 and estuarine surveys conducted only in 1993 and 1994.

The evaluation of extinction risk over a “significant portion of its range” is difficult for this DPS because of the lack of historical data about green sturgeon spawning areas. As explained above, in earlier technical memos and Federal Register publications (66 FR 64793, December 14, 2001; 68 FR 4433, January 23, 2003) we had discussed the possibility that spawning habitat in the Fraser, Umqua, South Fork Trinity, and Eel Rivers had been severely reduced. However, after reviewing both existing and new information, we have revised those earlier judgments and now conclude that the Eel River is the only system in the Northern DPS where the status of spawning since historic times is believed to have changed. All BRT members felt that the historic spawning area of the DPS had been larger than the current spawning area, but with no historical data describing spawning areas, there was a range of thought about how much larger.

The BRT was unable to come to firm consensus on what should be considered “a significant portion” for this DPS, however, they generally agreed that “a significant portion” of the DPS's range would include either the Klamath or Rogue Rivers, and that the South Fork Trinity and Eel Rivers do not represent a significant portion of the DPS's range. The BRT's opinion regarding “significant portion of its range” is supported by drawing analogies from salmonid habitat use and estimated abundance in the Klamath, Rogue, South Fork Trinity and

Eel Rivers (Lindley *et al.*, 2004). Salmonid spawning habitat is more extensive and estimated population abundance is higher in the Klamath and Rogue Rivers than in the South Fork Trinity and Eel Rivers, and we expect that green sturgeon habitat requirements and population size are correlated with those of salmonids, both historically and today. Also, the geology of the Eel River, in particular, is more erosive and prone to sedimentation events, suggesting that spawning habitat in the Eel River is of poorer quality than that in the Klamath and Rogue Rivers. Finally, evidence suggests that the Klamath and Rogue Rivers played a more important role in historic Yurok and Hoopa tribal sturgeon fisheries than the Eel and South Fork Trinity Rivers (FWS, 1981), again supporting the BRT's conclusion that neither the Eel nor South Fork Trinity Rivers constitute a significant portion of the Northern DPS' range.

Conclusion-Northern DPS

Based on the input provided by the BRT, we conclude that the Northern DPS of green sturgeon is not in danger of extinction, nor likely to become endangered in the foreseeable future, in all or a significant portion of its range. While a significant portion of the DPS' range would include either the Klamath or the Rogue Rivers, neither of these populations is regarded as being at risk of extirpation now or in the foreseeable future. The BRT was not convinced that green sturgeon were extirpated from the South Fork Trinity or Eel Rivers, even though it is likely that the Eel River population, in particular, has suffered a severe reduction since historic times. Reference data from salmonid habitat assessments and tribal fisheries data suggest that even though green sturgeon populations in the Eel and South Fork Trinity Rivers are likely low, these rivers do not represent a significant portion of the DPS' range. The majority of the BRT felt that the presence of two well-separated and significant spawning populations in the Klamath and

Rogue Rivers, and the effective reduction in green sturgeon catch due to implemented regulatory mechanisms, confer a low level of risk to the DPS. A minority felt that overall paucity of data generates such uncertainty in green sturgeon status that the DPS' level of extinction risk may be higher than available data appear to indicate. The BRT expressed concern regarding the lack of data and monitoring efforts to adequately monitor the status of, and manage potential threats to, green sturgeon populations in this DPS. The BRT recommended that the Northern DPS be placed on the Species of Concern List, that their status be reviewed in at least 5 years, and that population status monitoring be implemented immediately.

Southern DPS

The BRT concluded that the Sacramento River contains the only known green sturgeon spawning population in this DPS. There are no updated population trends data since the last status review. The BRT concluded that there was almost certainly a substantial loss of spawning habitat behind Keswick and Shasta dams (FWS, 1995b, historical habitat data summarized in Lindley *et al.*, 2004 for salmonids). Green sturgeon currently occur up to the impassible barrier at Keswick Dam (FWS, 1995b). It is unlikely that green sturgeon reproduced in their current spawning area under the historical temperature regime that occurred before the construction of Shasta and Keswick dams. At present, water temperatures in the current spawning area are lower than they were historically due to releases from Shasta Dam. Prior to dam construction, green sturgeon would have had to migrate farther up the mainstem than they do now in order to encounter water temperatures cool enough to trigger spawning. The BRT considered it possible that the additional habitat behind Shasta Dam in the Pit, McCloud, and Little Sacramento systems would have supported separate populations or at least a single, larger Sacramento River

population less vulnerable to catastrophes than one confined to a single mainstem, but the BRT was unable to be specific due to the paucity of historical information. The BRT expressed concern about the habitat limitation and potential threats that green sturgeon faced in the Sacramento River and again expressed particular concern about the high numbers of juveniles entrained prior to 1986.

Juvenile entrainment data provide an indication of how abundance has changed over time (1968-present). For the State facility (John Skinner Fish Facility; 1968-2001), the estimated average number of green sturgeon taken per year prior to 1986 was 732; from 1986 on, the average number was 47. For the Federal facility (Tracy Fish Collection Facility; 1980-2001), the average number prior to 1986 was 889; from 1986 on, the average was 32. The significant reduction in numbers is consistent across the State and Federal facilities and is also consistent with significant reductions in estimated white sturgeon take within the same time periods (NMFS, 2005). In addition, evidence indicates export levels at both facilities have increased substantially, particularly at the State facility since the 1970s and 1980s (as exhibited by yearly acre-feet exported from Federal and State facilities, NMFS, 2005). Though there are many assumptions associated with fish salvage estimates at these facilities (i.e., estimates are expanded catches from brief sampling periods; CDFG, 2002), this information may be the best available data in determining the population trends of the Southern DPS.

The BRT concluded that an effective population of spawning green sturgeon does not exist in the Feather River. Although there is no evidence of spawning in the Feather River either in the past or now, the continued presence of adults in the system suggests that green sturgeon are trying to migrate to presumed spawning areas now blocked by Oroville Dam, suggesting in turn

that spawning habitat on the Fraser River may have been lost. A substantial amount of habitat in the Feather River was lost with the construction of Oroville Dam (constructed in 1961) and from thermal barriers at the Thermalito Afterbay facility (CDFG, 2002). FWS (1995b) stated that “Evidence also suggests that [white] sturgeon reproduction occurs in both the Feather and Bear rivers.” Again, the BRT assumed that a similar suggestion could be made for green sturgeon in the face of the paucity of data. Sturgeon (including some documented green sturgeon) still regularly occur in the Bear and Yuba Rivers (CDFG, 2002; Beamesderfer et al., 2004) and, therefore, must migrate through the Feather River. Threats to green sturgeon are similar to those faced in the Sacramento River.

Though the BRT concluded that there was not sufficient information to establish whether the San Joaquin River system once supported a viable green sturgeon population, we see no reason to exclude the San Joaquin River system as a possibly occupied watershed in the past based on similar conclusions reached for Chinook salmon habitat assessments in the Sacramento and Feather Rivers. While some authors indicate that there is no evidence of green sturgeon occurrence or spawning in the San Joaquin River (Beamesderfer et al., 2004; Adams et al., 2002; CDFG, 2002), sampling effort has been extremely limited. Thus, no evidence of presence does not necessarily mean that green sturgeon do not occur in this system. Moyle (2002) suggested that green sturgeon reproduction may have taken place in the San Joaquin River because numerous juvenile green sturgeon have been captured at Santa Clara Shoal and Brannan Island Recreational Area in the Delta. Both adult and juvenile green sturgeon salvage recoveries at the Federal facility, located closest to the San Joaquin River, also provide some evidence that the San Joaquin River system may at least be occupied by green sturgeon during parts of the year. The

potential threats faced by green sturgeon if they do occur or occurred in the past in the San Joaquin system would be similar in nature to those faced in the Sacramento River, but would likely be more extreme because there are a greater number of impassable barriers in this system, many of which lack fish passage structures, and flow rates are lower in the San Joaquin than those in the Sacramento.

Conclusion-Southern DPS

The majority of the BRT concluded that the Southern DPS is likely to become endangered in the foreseeable future throughout all of its range. The BRT felt that the blockage of green sturgeon spawning from what were historic spawning areas above Shasta Dam (although it is unclear whether these were separate populations) and the accompanying decrease in spawning area with the loss of a potential spawning area in the Feather River make green sturgeon in the Southern DPS likely to become endangered within the foreseeable future. We believe that the loss of potential spawning habitat in the San Joaquin River system also may have contributed to the overall decline of the Southern DPS. The majority of the BRT also felt that the concentration of spawning adults in the Sacramento River places this DPS at even greater risk of extinction. No BRT members felt that the DPS was at imminent risk of extinction.

Efforts Being Made to Protect Green Sturgeon

Section 4(b)(1)(A) of the ESA requires the Secretary of Commerce to make listing determinations solely on the basis of the best scientific and commercial data available after taking into account efforts being made to protect a species. Therefore, in making its listing determinations, we first assess a DPS's level of extinction risk and identify factors that have led to its decline. We then assess existing efforts being made to protect the species to determine if

those measures ameliorate the risks faced by the DPS.

In judging the efficacy of existing protective efforts, we rely on the joint NMFS-FWS "Policy for Evaluation of Conservation Efforts When Making Listing Decisions" ("PECE;" 68 FR 15100; March 28, 2003). PECE provides direction for the consideration of protective efforts identified in conservation agreements, conservation plans, management plans, or similar documents (developed by Federal agencies, state and local governments, Tribal governments, businesses, organizations, and individuals) that have not yet been implemented, or have been implemented but have not yet demonstrated effectiveness. The policy articulates several criteria for evaluating the certainty of implementation and effectiveness of protective efforts to aid in determining whether a species should be listed as threatened or endangered. Evaluations of the certainty an effort will be implemented include whether: the necessary resources (e.g., funding and staffing) are available; the requisite agreements have been formalized such that the necessary authority and regulatory mechanisms are in place; there is a schedule for completion and evaluation of the stated objectives; and (for voluntary efforts) the necessary incentives are in place to ensure adequate participation. The evaluation of the certainty of an effort's effectiveness is made on the basis of whether the effort or plan: establishes specific conservation objectives; identifies the necessary steps to reduce threats or factors for decline; includes quantifiable performance measures for the monitoring of compliance and effectiveness; incorporates the principles of adaptive management; and is likely to improve the species' viability at the time of the listing determination.

PECE also notes several important caveats. Satisfaction of the above mentioned criteria for implementation and effectiveness establishes a given protective effort as a candidate for

consideration, but does not mean that an effort will ultimately change the risk assessment. The policy stresses that just as listing determinations must be based on the viability of the species at the time of review, so they must be based on the state of protective efforts at the time of the listing determination. PECE does not provide explicit guidance on how protective efforts affecting only a portion of a species' range may affect a listing determination, other than to say that such efforts will be evaluated in the context of other efforts being made and the species' overall viability. There are circumstances where threats are so imminent, widespread, and/or complex that it may be impossible for any agreement or plan to include sufficient efforts to result in a determination that listing is not warranted.

Conservation measures that may apply to listed species include conservation measures implemented by tribes, states, foreign nations, local governments, and private organizations. Also, Federal, tribal, state, and foreign nations' recovery actions (16 U.S.C. 1533(f)), Federal consultation requirements (16 U.S.C. 1536), and prohibitions on taking (16 U.S.C. 1538) constitute conservation measures. In addition, recognition through Federal government or state listing promotes public awareness and conservation actions by Federal, state, tribal governments, foreign nations, private organizations, and individuals.

Fishing Regulations

Recent management strategies in Oregon and Washington have considerably reduced the catch of green sturgeon. There are no targeted commercial fisheries on green sturgeon, and recreational fishing remains negligible. Commercial by-catch of green sturgeon occurs predominantly during the early fall salmon and white sturgeon fisheries in the lower Columbia River, when the green sturgeon have migrated into the estuary and lower river mainstem.

Fisheries are timed to avoid coinciding with peak periods of green sturgeon presence. Since 2002, Oregon and Washington have adopted daily landing limits for sturgeon during fall Columbia River commercial salmon seasons. This management action has resulted in a significant decrease in green sturgeon catch due to the higher value (price per pound) of white sturgeon on the commercial market. Harvesters now typically release all green sturgeon (alive) to fill their weekly or daily landing limit with the more valuable white sturgeon. Additionally, this management approach has allowed the commercial fishery to access its allocation of white sturgeon prior to periods of peak green sturgeon presence and without any fisheries targeting sturgeon, further minimizing green sturgeon by-catch.

Protective efforts on the Klamath and Trinity Rivers began with take limits and maximum size ranges through the late 1970s, and between 1978 and 1993 seasonal limits were imposed to prohibit the take of sturgeon in the Klamath River upstream of and including the Trinity River. All sturgeon fishing has been prohibited in the Klamath-Trinity system since 1993. Sturgeon fishing also has been prohibited since 1993 in all waters of the Eel River from the mouth to rkm 153 including all waters of the South Fork Eel River downstream of Benbow Dam (CDFG, 2002). Sturgeon fishing in rivers and bays in Del Norte and Humboldt Counties, including the Smith River, Humboldt and Arcata Bays, and all tidal waters, has been prohibited since 1993. General angling regulations apply to sturgeon angling from Mendocino County south (one fish per day between 117 and 183cm TL).

Both white and green sturgeon are protected by the same fishing regulations in the Sacramento-San Joaquin system. No commercial take is permitted and angling take is restricted to one fish per day between 117 and 183cm TL. An additional closure in central San Francisco

Bay occurs between January 1 and March 15, coinciding with the herring spawning season to protect sturgeon feeding on herring eggs (CDFG, 2002). Active sturgeon enforcement is often employed in areas where sturgeon are concentrated and particularly vulnerable to the fishery.

There is no commercial fishery for green sturgeon in Canada, although the species is taken as by-catch in white sturgeon and salmon fisheries.

Habitat Protection Efforts

In the United States, the Central Valley Project Improvement Act (CVPIA) is a Federal act directing the Secretary of the Interior to amend previous authorizations of California's Central Valley Project to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic use, and fish and wildlife enhancement as a project purpose equal to power generation. As a result of the CVPIA enacted in 1992, the FWS and U.S. Bureau of Reclamation have led an effort to implement a significant number of activities across the Central Valley including projects such as: river restoration; land purchases; fish screen projects; water acquisitions for the environment; and special studies and investigations. The Anadromous Fish Restoration Program (AFRP), a component of the CVPIA, implements a doubling program in an attempt to "implement a program which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991." The AFRP specifically applies the doubling effort toward Chinook salmon, Central Valley steelhead, striped bass, and white and green sturgeon. Though most efforts of the AFRP have primarily focused on Chinook salmon as a result of their listing history and status, green sturgeon may receive some unknown

amount of 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, or riparian revegetation and instream restoration projects would likely have some ancillary benefits to sturgeon. The AFRP has also invested in one green sturgeon research project that has helped improve our understanding of the life history requirements and temporal patterns of green sturgeon within the Southern DPS.

The California Bay-Delta Program (CALFED) is a cooperative effort of more than 20 State and Federal agencies designed to improve water quality and reliability of California's water supply while recovering the Central Valley ecosystem. The CALFED program contains four key objectives which include water quality, ecosystem quality, water supply and levee system integrity. Many notable beneficial actions have originated and been funded by the CALFED program including such projects as floodplain and instream restoration, riparian habitat protection, fish screening and passage projects, research regarding non-native invasive species and contaminants, restoration methods, and watershed stewardship and education and outreach programs. Prior Federal Register notices have reviewed the details of CVPIA and CALFED programs and potential benefits towards anadromous fish, particularly Chinook salmon and Central Valley steelhead (50 FR 33102).

Information received from CALFED regarding potential projects that could be regarded as conservation measures for green sturgeon indicated a total of 118 projects of various types and levels of progress funded between 1995 and 2004. Projects primarily consisted of fish screen evaluation and construction projects, restoration evaluation and enhancement activities, contaminations studies, and dissolved oxygen investigations related to the San Joaquin River

Deep Water Ship Channel. Two evaluation projects specifically addressed green sturgeon while the remaining projects primarily address anadromous fish in general, particularly listed salmonids. The new green sturgeon information from research will be used to enhance our understanding of the risk factors affecting the species, thereby improving our ability to develop effective management measures. However, at present they do not directly help to alleviate threats that this species faces in the wild. All ongoing fish screen and passage studies are designed primarily to meet the minimum qualifications outlined by the NMFS and CDFG fish screen criteria. Though these improvements will likely benefit salmonids, there is no evidence showing that these measures will decrease the likelihood of green sturgeon mortality. While one of CALFED's goals is to recover a number of at-risk species (including green sturgeon) and the program has and continues to provide funding for a variety of laboratory-based research projects, there are no specific actions aimed at alleviating the primary risks that threaten the continued existence of green sturgeon in the wild.

Other potential conservation measures such as the opening of the RBDD gates have helped green sturgeon passage in the Sacramento River during the early part of their spawning season, but it is not known how effective this measure has been. In addition, fish ladders in place are probably too small for green sturgeon to negotiate during the latter part of the spawning season when the RBDD gates are closed (FWS, 1995b). The Glenn-Colusa Irrigation District plans to help reduce fish loss and enhance long-term fish passage, but these measures are not yet underway. Fish salvaging efforts at the Tracy Fish Collection Facility and the Skinner Delta Fish Protective Facility in the South Delta have been operating for decades, but it is unknown whether efforts to relocate adults have resulted in restoration of spawning potential and whether the

salvage of juveniles is effective.

As evaluated pursuant to PECE, the above described protective efforts do not as yet, individually or collectively, provide sufficient certainty of implementation and effectiveness to counter the extinction risk assessment conclusion that the Southern DPS is likely to become an endangered species in the foreseeable future throughout its range.

Green sturgeon are listed as Species of Special Concern under Canada's Species at Risk Act (SARA). Under SARA a Species of Special Concern is a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. There are no specific conservation measures directed at green sturgeon in Canada to alleviate the recognized threats of habitat degradation and alteration.

Proposed Determinations

Section 4(b)(1) of the ESA requires that the listing determination be based solely on the best scientific and commercial data available, after conducting a review of the status of the species and after taking into account those efforts, if any, being made by any state or foreign nation to protect and conserve the species. We have reviewed the petition, the reports of the BRT (NMFS, 2002, 2004), co-manager comments, and other available published and unpublished information, and we have consulted with species experts and other individuals familiar with green sturgeon. On the basis of the best available scientific and commercial information, the southern and northern populations of green sturgeon meet the discreteness and significance criteria for distinct DPSs.

Northern DPS

Informed by the BRT's risk assessment, we conclude that the Northern DPS is not

presently in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. Accordingly, the DPS does not warrant listing under the ESA at this time. Our review indicates that: (1) there is no evidence for reductions in spawning habitat in the South Fork Trinity River; and (2) the Eel River population may have experienced declines and loss of spawning habitat. Nevertheless, the BRT concluded that neither the South Fork Trinity nor the Eel River constitute a significant portion of the DPS' range because: (1) analogies drawn from salmonid research suggest that the South Fork Trinity and Eel Rivers do not support large salmonid populations; (2) habitat in the Eel River is of poorer quality compared to that of the Klamath and Rogue Rivers; and (3) tribal fisheries data do not suggest that the South Fork Trinity or Eel River supported significant numbers of green sturgeon in the past. Due to the poor availability of data and attendant uncertainties regarding the status of and threats facing the species, we will maintain the Northern DPS on the Species of Concern List. We will re-evaluate the status of the Northern DPS in 5 years provided sufficient new information becomes available indicating that a status review update is warranted.

Southern DPS

We propose to find that the Southern DPS is not presently in danger of extinction throughout all of its range. Fishing regulations in place in California, the implementation of studies aimed at increasing our understanding of the ecological requirements of green sturgeon in the wild, and efforts to ameliorate threats to salmonids in the wild, thus conferring some possible benefits to green sturgeon, indicate that the Southern DPS is not presently in danger of extinction throughout all of its range. We also propose to find that the Southern DPS is not in danger of extinction throughout a significant portion of its range. We feel that spawning habitat may have

been lost in the Sacramento and Feather Rivers, but due to a paucity of data, we are unable to determine the geographic extent and demographic consequences of this loss. We have no evidence of historic or current spawning in the San Joaquin River and therefore we have no evidence of lost spawning habitat.

Based on our evaluation of the best available scientific information and the ongoing state and Federal conservation efforts, we propose to find that the Southern DPS is likely to become endangered in the foreseeable future throughout all of its range and should therefore be listed as threatened. This proposal is based on the reduction of potential spawning habitat, the threats to the single remaining spawning population remaining severe and unlikely to be sufficiently alleviated by conservation measures currently in place, and the downward trend of sturgeon salvage estimates from State (1968-2003) and Federal (1980-2003) facilities.

Take Prohibitions and Protective Regulations

Section 9 of the ESA prohibits certain activities that directly or indirectly affect endangered species. In the case of threatened species, ESA section 4(d) authorizes the Secretary to issue regulations he considers necessary and appropriate for the conservation of the species. We have flexibility under section 4(d) to tailor protective regulations based on the contents of available conservation measures. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. These 9(a) prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. We will evaluate protective regulations pursuant to section 4(d) for the Southern green sturgeon DPS and propose any thought to be necessary and appropriate for conservation of the species in a forthcoming notice of proposed

rulemaking that will be published in the Federal Register.

Other Protective Regulations

Section 7(a)(2) of the ESA and NMFS/FWS regulations require Federal agencies to confer with us on actions likely to jeopardize the continued existence of species proposed for listing or result in the destruction or adverse modification of proposed critical habitat. If a proposed species is ultimately listed, Federal agencies must consult on any action they authorize, fund, or carry out if those actions may affect the listed species or its critical habitat. Examples of Federal actions that may affect the Southern green sturgeon DPS include: water diversion for human use; point and non-point source discharge of persistent contaminants; contaminated waste disposal; water quality standards; and fishery management practices.

Service Policy on the Role of Peer Review

On July 1, 1994, we and FWS published a series of policies regarding listings under the ESA, including a policy for peer review of scientific data (59 FR 34270). The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. Prior to a final listing, we will solicit the expert opinions of three qualified specialists, concurrent with the public comment period. Independent specialists will be selected from the academic and scientific community, Federal and state agencies, and the private sector.

Critical Habitat

Critical habitat is defined in section 3 of the ESA as: “(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management

considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species” (16 U.S.C. 1532(5)(A)). “Conservation” means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary (16 U.S.C. 1532(3)). Section 4(a)(3)(A) of the ESA requires that, to the maximum extent prudent and determinable, critical habitat be designated concurrently with the listing of a species (16 U.S.C. 1533(a)(3)(A)(i)). Designations of critical habitat must be based on the best scientific data available and must take into consideration the economic, national security, and other relevant impacts of specifying any particular area as critical habitat. Once critical habitat is designated, section 7 of the ESA requires Federal agencies to ensure that they do not fund, authorize or carry out any actions that are likely to destroy or adversely modify that habitat. This requirement is in addition to the section 7 requirement that Federal agencies ensure that their actions do not jeopardize the continued existence of listed species. We are currently compiling information to prepare a critical habitat proposal for the Southern DPS. In a previous Federal Register notice (66 FR 64793; December 14, 2001) we requested specific information on critical habitat and are again seeking public input and information to assist in gathering and analyzing the best available scientific data to support a critical habitat designation. We will continue to meet with co-managers and other stakeholders to review this information and the overall designation process. We will then initiate rulemaking with the publication of a proposed designation of critical habitat, opening a period for public comment and the opportunity for public hearings. Joint NMFS/FWS regulations for listing endangered and threatened species and designating critical

habitat at 50 CFR 424.12(b) state that the agency “shall consider those physical and biological features that are essential to the conservation of a given species and that may require special management considerations or protection” (hereafter also referred to as “essential features.” Pursuant to the regulations, such requirements include, but are not limited to the following: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and generally; (5) habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species. These regulations go on to emphasize that the agency shall focus on essential features within the specific areas considered for designation. These features “may include, but are not limited to, the following: spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, geological formation, vegetation type, tide, and specific soil types.”

Public Comments Solicited

We recognize that there are serious limits to the quality of information available, and, therefore, we exercised our best professional judgment in developing this proposal to list the Southern DPS. To ensure that the final action resulting from this proposal will be as accurate and effective as possible, we are soliciting comments and suggestions from the public, other governmental agencies, the Government of Canada, the scientific community, industry, environmental groups, and any other interested parties. Comments are encouraged on this proposal (See DATES and ADDRESSES). Specifically, we are interested in information regarding: (1) green sturgeon spawning habitat within the range of the Southern DPS that was

present in the past, but may have been lost over time (2) biological or other relevant data concerning any threats to the Southern green sturgeon DPS; (3) the range, distribution, and abundance of the Southern DPS; (4) current or planned activities within the range of the Southern DPS and their possible impact on the Southern DPS; and (5) efforts being made to protect the Southern DPS.

We are also requesting quantitative evaluations describing the quality and extent of freshwater and marine habitats for juvenile and adult green sturgeon as well as information on areas that may qualify as critical habitat in California for the proposed Southern DPS. Specific areas that include the physical and biological features essential to the recovery of the DPS should be identified. We recognize that there are areas within the proposed boundaries of the Southern DPS that historically constituted green sturgeon habitat, but may not be currently occupied by green sturgeon. We are requesting information about these currently unoccupied areas to help us determine whether these areas are essential to the recovery of the species or excluded from designation. For areas potentially qualifying as critical habitat, we are requesting information describing: (1) the activities that affect the area or could be affected by the designation, and (2) the economic costs and benefits of additional requirements of management measures likely to result from the designation. The economic cost to be considered in the critical habitat designation under the ESA is the probable economic impact "of the [critical habitat] designation upon proposed or ongoing activities" (50 CFR 424.19). Economic effects attributable to listing include actions resulting from section 7 consultations under the ESA to avoid jeopardy to the species. Comments concerning economic impacts should attempt to distinguish the costs of listing from the incremental costs that can be directly attributed to the designation of specific areas as critical

habitat.

We will review all public comments and any additional information regarding the status of, and critical habitat for, the Southern green sturgeon DPS in developing a final listing determination as well as proposed critical habitat and, potentially, section 4(d) regulations.

Public Hearings

Public hearings will be held in several locations within the range of the proposed Southern DPS; details regarding locations, dates, and times will be published in a forthcoming Federal Register notice.

References

A complete list of all references cited herein is available upon request (see ADDRESSES section).

Classification

National Environmental Policy Act

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in Pacific Legal Foundation v. Andrus, 675 F. 2d 825 (6th Cir. 1981), we have concluded that ESA listing actions are not subject to the environmental assessment requirements of the National Environmental Policy Act. (See NOAA Administrative Order 216-6.)

Executive Order 12866, Regulatory Flexibility Act and Paperwork Reduction Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic

analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process. In addition, this rule is exempt from review under Executive Order 12866. This proposed rule does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

Federalism

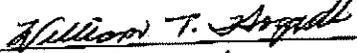
In keeping with the intent of the Administration and Congress to provide continuing and meaningful dialogue on issues of mutual State and Federal interest, this proposed rule will be given to the relevant state agencies in each state in which the species is believed to occur, who will be invited to comment. We have conferred with the States of Washington, Oregon and California in the course of assessing the status of the Southern DPS, and considered, among other things, Federal, state and local conservation measures. As we proceed, we intend to continue engaging in informal and formal contacts with the States, and other affected local or regional entities, giving careful consideration to all written and oral comments received. We also intend to consult with appropriate elected officials in the establishment of a final rule.

List of Subjects in 50 CFR Part 223

Endangered and threatened species, Exports, Imports, Transportation.

Dated:

MAR 28 2005



William T. Hogarth,
Assistant Administrator for Fisheries'
National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 223 is proposed to be amended as follows:

PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 223 continues to read as follows:

Authority: 16 U.S.C. 1531–1543; subpart B, § 223.12 also issued under 16 U.S.C. 1361 et seq.

2. In § 223.102, revise paragraph (a) by adding paragraph (25) to the end of the List of Threatened Marine and Anadromous Species:

§ 223.102 Enumeration of threatened marine and anadromous species.

(25) North American green sturgeon southern DPS (*Acipenser medirostris*). California. The southern DPS includes all spawning population of green sturgeon south of the Eel River (exclusive), principally including the Sacramento River green sturgeon spawning population.

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