Staff Summary for June 19-20, 2024

15. White Sturgeon Petition to List

Today's Item **Information ☐** **Action ☒**

Consider and potentially act on the petition, Department's evaluation report, and comments received to determine whether listing white sturgeon (*Acipenser transmontanus*) as a threatened species under the California Endangered Species Act may be warranted.

Summary of Previous/Future Actions

• Received petition	November 29, 2023
• Transmitted petition to Department	December 7, 2023
• Public receipt of petition	December 13-14, 2023
• Published notice of receipt of petition	January 5, 2024
• Approved Department's request for a 30-day extension	February 14-15, 2024
• Received Department's 90-day evaluation report	April 17-18, 2024
• **Today, potentially determine if the petitioned action may be warranted, initiating the Department's one-year status review**	**June 19-20, 2024**

Background

San Francisco Bay Keeper, Restore the Delta, the Bay Institute, and California Sportfishing Protection Alliance submitted a petition in November 2023 to the Commission requesting the Commission list white sturgeon (*Acipenser transmontanus*) as threatened under the California Endangered Species Act (CESA; Exhibit 1). On December 7, 2023, the Commission referred the petition to the Department for an evaluation and recommendation.

California Fish and Game Code Section 2073.5 requires that the Department evaluate the petition and submit a written evaluation with a recommendation to the Commission; the Commission received the Department's evaluation report (exhibits 2 and 3) at its April 2024 meeting. The evaluation report delineates each of the categories of information required for a petition, evaluates the sufficiency of the available scientific information for each of the required components, and incorporates additional relevant information that the Department possessed or received during the review period. Based on the information contained in the petition and other relevant information, the Department concludes that there is sufficient information to indicate the petitioned action may be warranted.

At today's meeting, the Commission will receive a presentation on the Department's petition evaluation, receive a presentation from the petitioners, and hold a public hearing to receive oral testimony. If the Commission determines listing may be warranted, pursuant to Section 2074.2 of the Fish and Game Code the Department will undertake a one-year status review before the Commission can make a final decision on listing.

CESA and the Commission's listing regulation require that the petition contain specific scientific information related to the status of the species. CESA and case law interpreting it

make clear that the Commission must accept a petition when the petition contains sufficient information to lead a reasonable person to conclude there is a substantial possibility the requested listing could occur; the requested listing is tied to the species' status, that is, whether the species' continued existence is in serious danger or is threatened by a number of factors, and in no way relates to economic consequences that might result from listing.

If the Commission determines the petitioned action may be warranted, white sturgeon becomes a candidate for listing as threatened pursuant to Fish and Game Code Section 2074.2. Candidate species are protected during the remainder of the listing process pursuant to Fish and Game Code Section 2085. The Commission did receive a regulatory change petition from a member of the public to allow white sturgeon harvest during candidacy under the authority of Fish and Game Code Section 2084 (tracking number 2024-06), which is being received at this meeting under agenda item 18(A) and will be scheduled for initial action at the August 2024 meeting (see Item 18, Exhibit 2).

Significant Public Comments

1. The Plaza Aqua Farm writes to urge the Commission to be cognizant of private industry farm-raising of white sturgeon; it believes industry is exempt from take provisions under the California Fish and Game Code. (Exhibit 5)
2. The Coalition for a Sustainable Delta argues against listing white sturgeon under CESA. The coalition claims the petition to list the fish is flawed for several reasons, including insufficient data; incomplete graphical data that does not allow for reliable conclusions about population trends; misinterpretation of existing data on factors like recruitment and harvest rates; focus on historical threats like dam construction, not current ones; lack of details on the impact of current threats on the fish population; and the petition's assessment of existing management measures. The coalition believes the Commission's recent sturgeon regulations may effectively manage the white sturgeon population and prevent it from becoming endangered. (Exhibit 6)
3. The California Aquaculture Association (CAA) urges the Commission to consider the benefits of the white sturgeon industry when evaluating the petition to list white sturgeon as threatened. The CAA developed the largest farm-raised sturgeon caviar industry in the U.S. and supports regulations that promote domestic aquaculture to reduce reliance on imported seafood and to lessen pressure on wild fish populations. (Exhibit 7)
4. A co-written letter from State Water Contractors and San Luis & Delta-Mendota Water Authority urges the Commission to not list white sturgeon as a candidate under CESA, noting that the petition does not have the necessary requirements to meet the threshold for consideration, existing regulations already protect the fish, and the data provided is flawed. (Exhibit 8)
5. The Sierra Club urges listing white sturgeon as threatened under CESA due to population decline and threats from water diversions and habitat alterations. The club states that existing regulations are inadequate, and proposals for new water projects would further harm the species. Additionally, the Sierra Club collected 700 public comments from members and supporters urging the Commission to list white sturgeon. (Exhibit 9)

6. The owner of a sturgeon farm provides the history of sturgeon farming in California and notes the importance of the industry. The author also states that farmed sturgeon does not pose a threat to wild sturgeon and that any recovery plans for sturgeon should not impact the sturgeon farming industry. (Exhibit 10)

Recommendation

Commission staff: Determine that listing may be warranted; direct staff to issue a notice reflecting this finding and indicating that white sturgeon is a candidate for threatened species status.

Department: Accept the petition for further consideration under CESA.

Exhibits

1. Petition, received November 29, 2024
2. Department memo, received March 13, 2024
3. Department 90-day evaluation report, dated March 2024
4. Department presentation
5. Letter from Ali Bolourchi, President, Plaza Aqua Farm, received June 4, 2024
6. Letter from Paul S. Weiland, Nossaman LLP, received June 5, 2024
7. Letter from Tony Vaught, President, California Aquaculture Association, received June 6, 2024
8. Co-written letter from Jennifer Pierre, General Manager, State Water Contractors and Federico Barajas, Executive Director, San Luis & Delta-Mendota Water Authority, received May 6, 2024
9. Letters from Erin Woolley, Senior Policy Strategist, Seirra Club California, received May 6, 2024
10. Letter from Ken Beer, President, The Fishery, received May 6, 2024

Motion

Moved by _____ and seconded by _____ that the Commission, pursuant to Section 2074.2 of the California Fish and Game Code, finds that the petition to list white sturgeon (*Acipenser transmontanus*) as a threatened species does provide sufficient information to indicate that the petitioned action may be warranted based on the information in the record before the Commission, and directs staff to issue a notice reflecting this finding and indicating that white sturgeon is a candidate for threatened species status.

OR

Moved by _____ and seconded by _____ that the Commission, pursuant to Section 2074.2 of the California Fish and Game Code, finds that the petition to list white sturgeon (*Acipenser transmontanus*) as a threatened species does not provide sufficient information to indicate that the petitioned action may be warranted based on the information in the record before the Commission.

A PETITION TO THE STATE OF CALIFORNIA FISH AND GAME COMMISSION TO LIST

The California White Sturgeon (*Acipenser transmontanus*) as Threatened under the California Endangered Species Act (CESA)

Photo by Thomas Hasenberger, Adobe Stock

Submitted by Petitioners

SAN FRANCISCO BAYKEEPER®

The Bay Institute

RESTORE THE DELTA

CSPA

November 29, 2023

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1. Executive Summary

The White Sturgeon (*Acipenser transmontanus*) is the largest freshwater fish species in North America. The species as a whole is considered to be "endangered" by the American Fisheries Society (AFS 2008). Reproducing populations occur in the Columbia River and Fraser River Basins and in California, where the only such population occurs in the Central Valley (Sacramento River and San Joaquin River watersheds). The landlocked White Sturgeon population of the Kootenai River (a tributary of the Columbia River) is listed as endangered under the federal Endangered Species Act (ESA). White Sturgeon that spawn in the Central Valley and rear and/or migrate through the San Francisco Bay Estuary (SFE) are regarded as a species of "High" management concern by California Department of Fish and Wildlife (CDFW 2015); hereafter we refer to this population as the California White Sturgeon population.

Studies indicate that annual recruitment of California White Sturgeon has decreased since the early 1980s. Recent evidence indicates that this decline is continuing (Blackburn et al. 2019; Ulaski et al. 2022). Environmental conditions necessary to support population viability are deteriorating (SWRCB 2017; CDFW 2023). High levels of water diversion combined with adverse reservoir storage operations generate extremely altered hydrographs throughout the SFE watershed (TBI 2016; SWRCB 2016, 2017; Reis et al. 2019) – where California White Sturgeon spawn and rear – impairing successful reproduction. The population also suffers from overharvest in the recreational fishery (Blackburn et al. 2019; CDFW 2023; California Fish and Game Commission 2023). Furthermore, a massive harmful algal bloom in San Francisco Bay and San Pablo Bay in 2022 killed large numbers of adult California White Sturgeon, demonstrating the population's vulnerability to future algal blooms (CDFW 2023). A smaller harmful algal bloom in 2023 caused additional mortality to adult California White Sturgeon – 15 dead adults were detected on the shoreline by community scientists in the vicinity of the bloom soon after it occurred (California Fish and Game Commission 2023). California White Sturgeon population growth is most sensitive to survival of sexually mature adults (Blackburn et al. 2019), so these consecutive fish kills almost certainly have exacerbated the chronic declines in California White Sturgeon abundance. Persistent blooms in the Delta are likely to impede California White Sturgeon migration to and from their spawning grounds in the San Joaquin River watershed. Harmful algal blooms are fueled by chronically high nutrient levels in the SFE (Cloern et al. 2020); bloom formation in the Delta is also tied to high levels of water diversion and subsequent high residence time (low flow) in certain Delta channels (Berg and Sutula 2015).

Existing environmental regulations are inadequate to prevent further decline; without additional protections afforded to species listed under the Endangered Species Act (ESA), the California White Sturgeon is increasingly likely to become endangered in the near future.

Current regulation of river flow and water quality conditions in the SFE are inadequate to support native fish viability and fisheries (SWRCB 2010, 2017; CDFW 2010), including California White Sturgeon. The prospect of increasingly frequent and prolonged droughts related to global climate change (Diffenbaugh et al. 2015), combined with several planned water development projects in the SFE watershed are likely to increase the frequency and severity of inadequate

river flow conditions in the future. Similarly, current White Sturgeon fishing regulations are not sufficiently protective to prevent further decline of the population (Blackburn 2019; CDFW 2023; California Fish and Game Commission 2023) and future regulations under development now are inadequate to maintain population stability, much less reverse the decline of the California White Sturgeon population. Finally, harmful algal blooms in San Francisco Bay proper, which are facilitated by nutrient enrichment, threaten to cause repeated mass mortality events for California White Sturgeon in the future. Regulations to limit nutrient pollution to levels that will prevent harmful algal blooms have not yet been proposed and are not likely to be completely implemented for at least a decade. Meanwhile, water quality conditions in the Delta, particularly in the San Joaquin River near Stockton, likely impair migration of adult and juvenile California White Sturgeon to and from spawning grounds in the San Joaquin basin. More protective flow standards for the lower San Joaquin River have been adopted by the StateWater Resources Control Board (SWRCB 2018); however, five years later, the state has yet to implement these standards.

Each of these major impacts — inadequate river flow and water quality conditions, overharvest, and the loss of habitat and potential for catastrophic mortality due to harmful algal blooms — represent a grave threat to the California White Sturgeon population. These problems are independent of each other – addressing just one or two of these major problems will not eliminate the high risk that California White Sturgeon become endangered – that is, experience further declines in viability such that it is in danger of extinction – in the near future. Also, California White Sturgeon are impacted by numerous other environmental stressors that threaten the population. A coordinated response to these individual and collective threats is required in order to prevent endangerment and then extirpation of this unique population.

For these reasons, we petition the California Fish and Game Commission to list the California White Sturgeon population as threatened, meaning it is "likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by [CESA]." (Cal. Fish & Game Code § 2067; https://wildlife.ca.gov/Conservation/CESA/FESA).

2. Natural History

2.1. Description

The California Department of Fish and Wildlife (CDFW) describes White Sturgeon as follows:

> "… adults have wide, rounded snouts, with four barbels in a row on the underside, closer to the tip of the snout than to the mouth (Moyle 2002). They feed with a toothless, highly protrusible mouth and process food with a palatal organ in the pharynx. Their bodies have 5 widely separated rows of bony plates (scutes). Scute counts per row are: 11-14 (dorsal row), 38-48 (two lateral rows) and 9-12 (bottom

> rows). Four to eight scutes are also found between the pelvic and anal fin. Although they lack the large scutes behind the dorsal and anal fins found in green sturgeon (*A. medirostris*), small remnant scutes (fulcra) may be present. The dorsal fin has one spine followed by 44-48 rays. The anal fin has 28-31 rays. The first gill arch has 34-36 gill rakers. Body coloration is gray-brown on the dorsal surface above the lateral scutes, while the ventral surface is white and fins are gray. Their viscera are black. Dispersing juveniles tend to be darker than dispersing free embryos (Kynard and Parker 2005). Juveniles less than one year old have 42 dorsal fin rays, 35 lateral scutes, and 23 gill rakers on the first arch." (CDFW 2015 at p. 224.)

White Sturgeon may grow to 6 m fork length (FL), live more than 100 years, and weigh over 600 kg. In California, the largest individual on record – caught in Lake Shasta in 1963 – measured 2.9 m and 225 kg, and was at least 67 years old (CDFW 2015 at p. 225).

2.2. Taxonomy

All modern sturgeon are polyploid; White Sturgeon belong to ploidy group B with 240 chromosomes (Hildebrand et al. 2016). Phylogenetic relationships revealed by analysis of multiple mitochondrial gene sequences indicate that White Sturgeon's closest relatives are Asian species, including *A. schrenckii*, *A. sinensis*, and *A. dabryanus* (Krieger et al. 2008; Hildebrand et al. 2016). Analysis of multiple mtDNA sequences suggested that White Sturgeon shared a common ancestor with *A. schrenckii* (Amur Sturgeon) approximately 46 million years ago (Hildebrand et al. 2016 citing Peng et al. 2007).

2.3. Life History

Hildebrand et al. (2016) provided a rangewide overview of White Sturgeon life history stages. California White Sturgeon spawn and develop one to several months earlier than populations elsewhere in their range (see Hildebrand et al. 2016 at Table 1).

White Sturgeon are iteroparous. A small proportion of adults spawn in any given year. Successful reproduction occurs episodically, when spring-summer river flows are high enough to support incubation and early rearing success. In the SFE, females may mature reproductively as early as age 10, but more commonly between ages 12-16 (95-135 cm FL); 50% of females mature by age 14 and all mature by age 19 (CDFW 2015; Blackburn et al. 2019; CDFW 2023).

Males mature earlier, generally between 10-12 years of age (75-105 cm FL), and appear to spawn more frequently than females (Willis et al. 2022). Following maturation, males may spawn every 1-2 years. Females are physiologically capable of spawning every 2-3 years (Hildebrand et al. 2016 citing Paragamian et al. 2005); they typically wait at least 2-4 years between reproductive events, longer if spawning conditions are not favorable (Moyle 2002 at p. 108). Adult California White Sturgeon prepare to spawn by moving into the lower reaches of Central Valley rivers during the winter months and migrate upstream into spawning areas

between December and late May or early June (Israel et al. 2009; CDFW, 2015, pp. 225-226; Hildebrand et al. 2016; CDFW 2023).

Fecundity of female California White Sturgeon averages 5,648 eggs per kilogram of body weight, which translates to hundreds of thousands of eggs per female at maturity (CDFW 2015 citing Chapman et al. 1996; Klimley et al. 2015; Willis et al. 2022). Eggs are negatively buoyant and become adhesive upon fertilization (Moyle 2002; Israel et al. 2009; Hildebrand et al. 2016).

Embryonic development is rapid and temperature-dependent, ranging from 3-13 days in the California White Sturgeon population. Optimal egg incubation occurs between 14-17°C; mortality is nearly complete at temperatures <8°C and > 20°C (Wang 1985; CDFW 2023).

Hildebrand et al. (2016) suggest that populations may differ in their upper lethal temperature.

Among California White Sturgeon, yolk-sac larvae are 10-11mm total length (TL) at hatch; at temperatures between 14°C and 17°C, the yolk sac is completely absorbed approximately 20-23 days post-fertilization (Wang et al. 1985). Larvae are photonegative upon hatching and swim near the bottom of rivers (Kynard and Parker 2005). In a laboratory study, the presence of physical cover in well-lit mesocosms decreased predation on White Sturgeon larvae <17 mm TL; however, larger individuals did not benefit from the presence of cover and other studies have observed that White Sturgeon leave cover at the size where exogenous feeding begins (Gadmoski and Parsley 2005).

Recruitment of juvenile California White Sturgeon is positively correlated with high river flows and Delta Outflow during spring and early summer months (Israel et al. 2009; CDFW 2015, 2023; SWRCB 2017; *see also* Parsley and Beckman 1994; AFRP 2001; Moyle 2002; Willis 2022). CDFW's conceptual model for California White Sturgeon life history states:

> "The dispersal of larval white sturgeon is dependent on high spring river flows, which optimally consists of multiple large flow pulses and a relationship between the mean monthly outflow from April–July and white sturgeon [young-of-year] has been developed (Kohlhorst et al. 1991). Reduced seasonal flows or flows mismatched ecologically with sensitive early life stages may reduce dispersal of these life stages when they are most vulnerable to native and nonnative predation. Flow reductions may serve to reduce or eliminate [young-of-year] survival even if spawning was successful." (Israel et al. 2009 at p. 17).

The mechanism underlying the relationship between high river flows and California White Sturgeon recruitment has been attributed to improved survival and transport of larval sturgeon into suitable rearing areas, increases in the number of females spawning during high flow periods, or both (Fish 2010; CDFW 2015 at p. 226). It is also possible that high river flows improve spawning habitat by cleaning sand and silt out of gravel and cobble spawning substrates (Paragamian 2012; Hildebrand et al. 2016). Juvenile sturgeon actively swim downstream towards the estuary, suggesting that their capacity to osmoregulate in brackish environments develops as larvae mature into juvenile fish (Israel et al. 2009; CDFW 2015 citing McEnroe and Cech 1987). In the Central Valley, California White Sturgeon spawning has been

detected during wet and dry years in both the San Joaquin River and the Sacramento River, indicating that adults will attempt to spawn even when flows are low (Jackson et al. 2016). The fact that juvenile recruitment appears to be successful only in years when elevated river flows occur during larval dispersal and early juvenile rearing (i.e., between April and July) suggests that flows during the spring and early summer are essential (SWRCB 2017). CDFW (2015 at p. 227) states: "The first few months of life are considered to be critical for sustaining populations [of White Sturgeon]."

California White Sturgeon appear to grow more rapidly than conspecifics in more northerly populations. Young-of-year (YOY) White Sturgeon reach 18-30 cm TL by the end of their first year in the SFE, before growth rates slow such that they reach 102 cm TL by Age 7 or 8. California White Sturgeon grow faster than fish from any other populations through age 10 and growth remains fast relative to most populations throughout their life span (*see* Figure 2 of Hildebrand et al. 2016). California White Sturgeon are predicted to reach approximately 147 cm length by age 15, whereas fish of the same age in the lower Columbia River are predicted to be 116 cm (Blackburn et al. 2019, citing DeVore et al. 1995). California White Sturgeon in the SFE grow approximately 4.6 cm/year between ages 10-50, whereas those in the Kootenai River grow approximately 2.5 cm/year (Blackburn et al. 2019 at p. 907, citing Paragamian et al. 2005).

The relatively rapid growth of California White Sturgeon may reflect availability of water temperatures and/or high-quality habitats that support rapid growth, weak or absent density-dependence (i.e., low competition), or elevated marine-based prey availability. Alterations in hydrology resulting from dam operations are also suspected to produce differences in White Sturgeon growth (Blackburn et al. 2019 at p. 907, citing Beamesderfer et al. 1995 and Van Poorten and McAdam 2010). Whether this phenotypic difference in growth rates has any genetic basis is unknown.

In the SFE, California White Sturgeon larger than 2 m and older than 27 years are not common (CDFW 2015 at p. 225). Blackburn et al. (2019 at p. 906) reported a maximum age of 29 years, although they acknowledged uncertainty in estimation of age for fish older than 20 years old. They attributed truncated maximum age span in the SFE to harvest and sampling gear bias (the trammel net gear used by CDFW's Adult Sturgeon Study has a mesh size that targets legal-sized fish; oversized fish are captured less frequently).

2.4. Natural Mortality

Natural mortality of adult and sub-adult fish is expected to be low. Adult sturgeon are heavily armored and extremely large relative to most potential predators. White Sturgeon may be preyed upon by large sharks, sea lions, and other marine mammals (CDFW 2023, https://marinespecies.wildlife.ca.gov/white-sturgeon/the-species/), but mortality due to predation on adults is likely to be rare. Reliably high adult survival is essential to the success of the White Sturgeon life history strategy, which features late maturation, iteroparity, and multi-year intervals between spawning attempts.

On the other hand, larval and early juvenile White Sturgeon are susceptible to predation prior to ossification of their bony scutes (Gadomsky and Parsely 2015). Rates of predation on larval and juvenile White Sturgeon are unknown. In the SFE and its watershed, Sacramento Pikeminnow (*Ptychocheilus grandis*), Channel Catfish, (*Ictalurus punctatus*), Prickly Sculpin (*Cottus asper*), Common Carp (*Cyprinus carpio*), Largemouth Bass (*Micropterus salmoides*), and Striped Bass (*Morone saxatalis*) are likely to prey opportunistically on larval and juvenile White Sturgeon (CDFW 2015; see https://marinespecies.wildlife.ca.gov/white-sturgeon/the-species/). Predation would be expected to increase under low river flow conditions, which correspond to lower river stage and reductions in suspended sediment, both of which enable light penetration to the dark benthic environments that provide cover for larval and juvenile White Sturgeon.

2.5. Status

Twenty-two species in the order Acipenseriformes (sturgeon and paddlefishes) are categorized as "extinct in the wild", ''critically endangered',' or ''endangered'' by the International Union for Conservation of Nature

(IUCN: https://www.iucnredlist.org/search/list?query=sturgeon&searchType=species). The most recent IUCN list categorizes White Sturgeon as "vulnerable;" the change from the previous IUCN rating as "least concern" reflects this fish's declining status range-wide. White Sturgeon populations in the Columbia River above Grand Coulee Dam, Kootenai River, Fraser River and Nechako River are recognized as threatened or endangered by the United States and/or Canadian governments (Hildebrand et al. 2016; Ulaski et al. 2022 at p. 335). The American Fisheries Society considers White Sturgeon to be "endangered" (AFS 2008).

The SFE population of White Sturgeon – the only reproducing population in California – is a Species of Special Concern (CDFW 2015; Hildebrand et al. 2016). The 1992 Central Valley Project Improvement Act (CVPIA) established as federal policy that ''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." (CVPIA §3406(b)(1)). Under this "doubling policy", the Anadromous Fish Restoration Program (AFRP) established a production target of 11,000 White Sturgeon in the Central Valley, wherein "production" refers to the number of first-time spawners each spawning season (AFRP 2001 appendix A-2, *sensu* Ricker 1958). The AFRP Final Plan identifies as a "high priority" the need to "[s]upplement Delta outflow for migration and rearing of white sturgeon, green sturgeon, striped bass, and American shad by modifying [Central Valley Project] operations…" (AFRP 2001 at 97). Despite habitat and ecosystem restoration projects funded by the CVPIA and other governmental programs, there is no evidence that the AFRP White Sturgeon production target has ever been attained (Ulaski et al. 2022 at p. 335).

Like most sturgeon species, White Sturgeon life history allows them to capitalize on spawning, incubation, and juvenile rearing conditions that are available only infrequently. Historically, their long-life spans, variable and opportunistic reproduction, and high fecundity made it possible for California White Sturgeon to persist and maintain a relatively stable population through periods when riverine spawning and early rearing habitats were unsuitable (e.g., due to low river flows

associated with drought conditions). However, as the State Water Resources Contol Board (SWRCB) noted, the California White Sturgeon population currently "does not appear stable and exhibits progressively diminishing recruitment in recent wet years" (SWRCB 2017 at p. 3-63).

Although longevity and fecundity may buffer populations through periods of low recruitment, delayed maturation and the multi-year interval between egg clutches of individual females also make White Sturgeon vulnerable to sustained anthropogenic modification of river and estuarine flow regimes, overharvest, and sustained degradation of other habitat conditions (Blackburn et al. 2019). Willis et al. (2022 at p. 2) cautioned: "…long-term viability of white sturgeon depends on regularly favorable climate and flow conditions, as well as access to appropriate spawning and rearing habitat." See Hildebrand et al. 2016. The low intrinsic population growth rate of White Sturgeon means it is highly sensitive to overharvest (Blackburn et al. 2019; Ulaski et al. 2022 citing Boreman 1997) and catastrophic adult mortality events. Furthermore, because White Sturgeon recruitment is heavily influenced by survival at early life stages (Jackson et al. 2016 at p. 172 citing Kohlhorst et al. 1991, Hildebrand et al. 1999, Secor et al. 2002), persistent reduction in the frequency of high magnitude spring-summer river flows leads to increases in the interval between successful cohorts, reducing the population's resilience and viability during periods of poor recruitment or high levels of sub-adult/adult mortality.

3. Range and Distribution

3.1. Range

Reproducing populations of White Sturgeon have been documented in the Sacramento, San Joaquin, Columbia, and Fraser River drainages (Hildebrand et al. 2016). Land-locked populations exist in the Columbia River basin above major dams (Figure 1). White Sturgeon have also been introduced to watersheds outside of their native range (Figure 1) but none of these introduced populations appears to have persisted (USGS; https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=300). In California, White Sturgeon spawning is documented only in the Sacramento River (Moyle 2002; CDFW 2015) and in the San Joaquin River (Jackson et al. 2016). Spawning probably occurs, or occurred historically, in other reaches of major Central Valley Rivers (Moyle 2002). For instance, the National Marine Fisheries Service (NMFS) reports that "Green and white sturgeon adults have been observed periodically in small numbers in the Feather River" (17388 Federal Register/Vol. 70, No. 65 citing Beamesderfer et al. 2004). White Sturgeon have been detected in California river systems north of the SFE (Figure 2), but the origins and reproductive fates of these fish are unknown; CDFW (2015) reports:

> "Historically, small runs also occurred in the Russian, Klamath and Trinity rivers. White sturgeon have also been documented in the Eel River (M. Gilroy, CDFW, pers. comm. 2011). It is doubtful that any of these latter four rivers currently support populations of white sturgeon."

In salt water, White Sturgeon have occasionally been found far from likely natal rivers, including in the Aleutian Islands, and near Baja California, Mexico (Hildebrand et al. 2016 citing PSMFC 1992 and Ruiz-Campos et al. 2011, respectively). Individuals tagged in the SFE have been recaptured outside of their natal basin, including one in the Lower Fraser River (Welch et al. 2006) but it is generally thought that long-distance marine migrations of White Sturgeon are infrequent (Drauch Schreier et al. 2013). In the SFE, White Sturgeon may occasionally be found in tidal habitats of larger tributary streams such as Coyote Creek, the Guadalupe River, the NapaRiver, Sonoma Creek, and the Petaluma River (Leidy 2007 citing Stevenson et al. 1987 and CDFG2006).

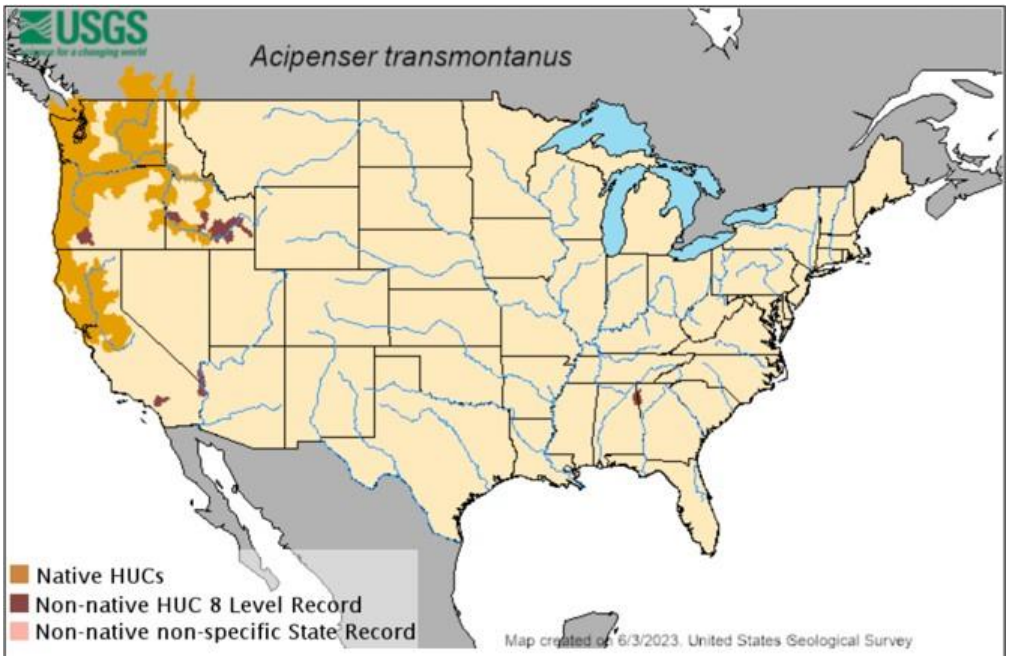


Figure 1: Native range of White Sturgeon (Acipenser transmontanus) in the lower 48 United States. Documented introductions outside of the native range are also depicted. USGS; https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=300

The small spawning range of California White Sturgeon relative to its large body size is characteristic of most endangered fish species in North America (Rosenfield 2002). The challenges of maintaining adequate population size and geographic insulation from localized catastrophic events are magnified for distinct populations of large-bodied fishes, like the California White Sturgeon, that are more geographically constrained than the species as a whole.

3.2. Distribution

Adequate distribution of spawning and rearing sites (population spatial structure) is a key factor determining the viability of anadromous fish species (McElhany et al. 2000). When key life stages are confined to a few small locations, the entire population is at risk from localized catastrophic mortality or destruction of habitat (Rosenfield 2002). The current distribution of

California White Sturgeon spawning is highly constrained relative to the population's historic range (Figure 2).

Impassable dams have blocked access to important spawning habitats throughout the Central Valley (CDFW 2015). Indeed, Sellheim et al. (2002 at p. 2) observed that "Much of historical California freshwater spawning and rearing habitat is now either inaccessible or severely degraded due to impassable barriers, insufficient freshwater flows, agricultural diversions, elevated water temperatures, invasive species, and environmental contaminants such as selenium." A relic population that persisted in Shasta Reservoir after construction of Shasta Dam indicates that California White Sturgeon likely migrated and spawned upstream of the current damsite historically, including in major tributaries to the upper Sacramento River such as the Pit River (Moyle 2002; CDFW 2015). Spawning in the Sacramento River is believed to occur only in the 140 km reach between Knights Landing and Colusa (Moyle 2002; CDFW 2015). In the San Joaquin River, spawning has been documented at sites between rkm 115.2 and rkm 139.8 (Jackson et al. 2016). NMFS reports "periodic" spawning of White Sturgeon in the Feather River (17388 Federal Register/Vol. 70, No. 65 citing Beamesderfer et al. 2004; see CDFW 2015). Heublein et al. (2017) report the presence of gravid White Sturgeon females near potential spawning habitat on the Feather River during spawning season. However, we are unaware of documented successful egg deposition or recruitment from the Feather River watershed.

The absence of evidence for consistent spawning activity in the Central Valley outside of the Sacramento River and San Joaquin River mainstems may reflect a lack of recent systematic sampling in other Central Valley rivers. Although Moyle (2002) correctly surmised that White Sturgeon spawned in the San Joaquin River, evidence of successful spawning was not documented until 2011. Extensice levels of water development limit the frequency and spatial extent of successful California White Sturgeon spawning in the San Joaquin River (Jackson et al. 2016). Furthermore, low flow levels, construction and maintenance of the Stockton Deepwater Ship Channel, and high nutrient inputs to the San Joaquin River from agriculture upstream foster low dissolved oxygen conditions and frequent harmful algal blooms (e.g., of the toxic cyanobacteria *Microcystis*) (Berg and Sutula 2015) in the lower San Joaquin River, both of which are likely to impair California White Sturgeon migrations to and from spawning grounds in the San Joaquin River and its tributaries (CBDA & CV RWQCB 2006; CDFW 2015). The frequency of flow and temperature conditions suitable for California White Sturgeon spawning and incubation in the Feather River are likely to be far lower now than occurred historically, due to construction and operations of Oroville Dam and the Thermalito water management infrastructure (Heublein et al. 2017).

The geographic range of sub-adult and adult California White Sturgeon rearing in the estuary is also at risk of being severely constrained. According to Leidy (2007), California White Sturgeon were most abundant in Suisun and San Pablo Bays, and the western Delta, although they are also found in Central and South San Francisco Bay. However, because adult and sub-adult White Sturgeon are relatively sedentary, heavy fishing harvest and repeated fish kills after harmful algal blooms in San Pablo Bay threaten to eliminate California White Sturgeon in this area. Similarly, intense fishing pressure in the western Delta, and increasingly sophisticated fishing

technology and communication among sport-anglers (CDFW 2023 at 55) may limit California White Sturgeon use of this area.

Figure 2: Current and historic distribution of White Sturgeon (Acipenser transmontanus) in California. The San Francisco Estuary (SFE) watershed is the only known spawning population in the state; detection of White Sturgeon in rivers north of the SFE is not believed to reflect presence of a current spawning population (CDFW 2015). California Fish and Game Commission (2023).

4. Abundance and Population Trends

4.1. Abundance

California White Sturgeon briefly supported a commercial fishery before the turn of the 20th Century. Skinner (1962) reports estimated landings of White Sturgeon, although he acknowledges high uncertainty in these estimates due to variable record keeping (Figure 3). High harvest led to a population crash and, as a result, the commercial fishery was closed from 1901-1910. Records indicate much smaller landings in 1916 and 1917. The commercial fishery was closed by the state legislature after 1917 and all possession of White Sturgeon was prohibited until 1953. A recreational White Sturgeon fishery was opened in 1954 and continues to this day.

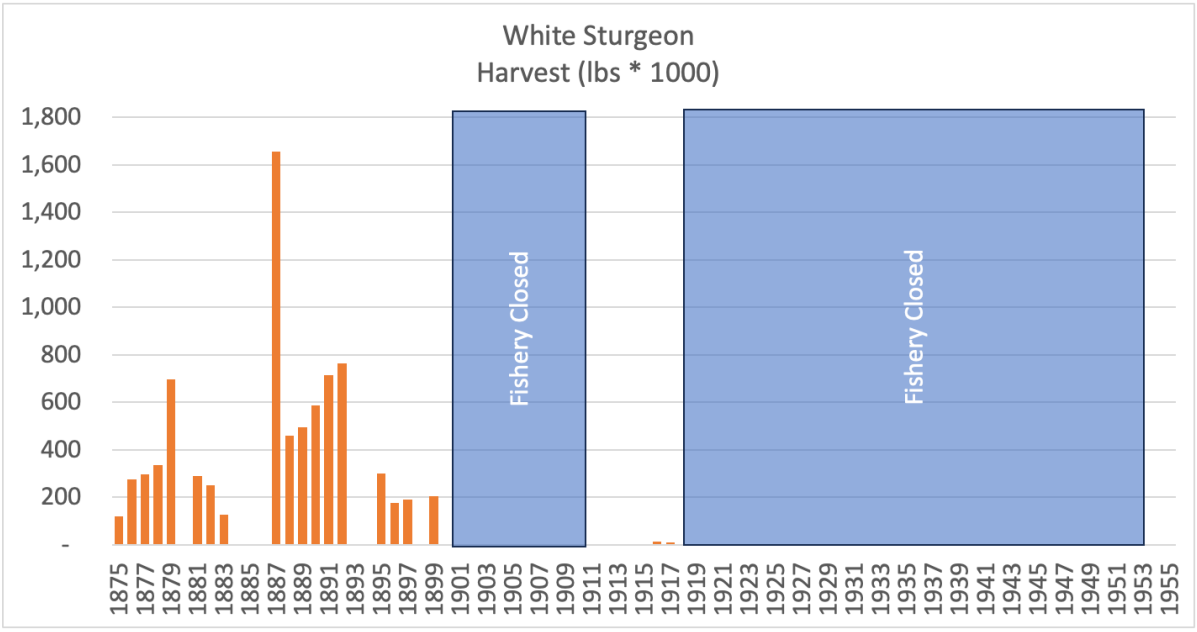


Figure 3 Commercial harvest of California White Sturgeon (in thousands of lbs). Data from Skinner 1962.

Several data sets reveal a decline in California White Sturgeon abundance over the past 25 years. For example, catches of Age 0 YOY White Sturgeon by the CDFW/Interagency Ecological Program's Bay Study reveal a decreasing trend in juvenile abundance over the past 40 years, punctuated by increases in years with high spring-summer freshwater flows out of the Delta and into San Francisco Bay (Figure 4; see Fish 2010).

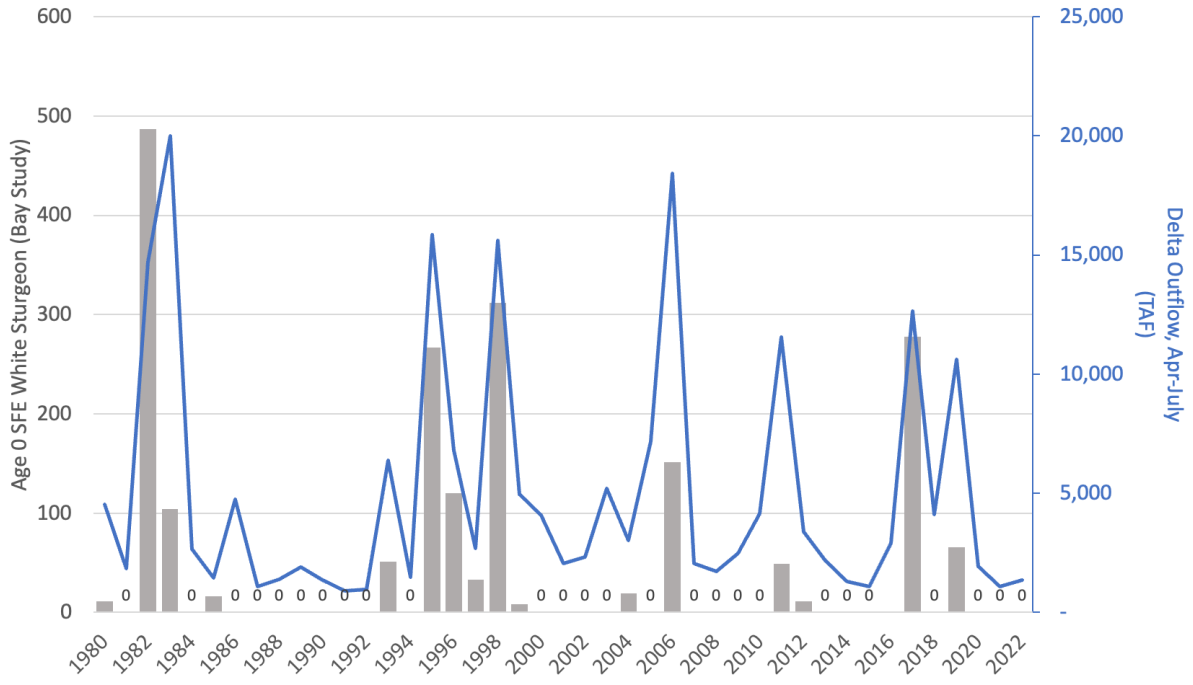


Figure 4: Relationship of spring-summer Delta ou[low and California White Sturgeon juvenile recruitment. Left axis: Abundance index of Age 0 White Sturgeon caught in pelagic waters of the San Francisco Bay estuary (source: CDFW/Interagency Ecological Program's San Francisco Bay Study otter trawl). Right axis: Average Delta Ou[low during April-July, in thousand acre-feet (source: Dayflow; https://data.cnra.ca.gov/dataset/dayflow). Abundance is strongly correlated with April-July Delta ou[low (r=0.762, n=42). No index was generated in 2016.

Similarly, over the past 25 years, CDFW's mark-recapture studies of sub-adult and adult California White Sturgeon reveals a decline of approximately 80% (Figure 4). For such a long-lived species, a decline of this magnitude in less than three decades is concerning. CDFW's most recent estimate of the 5-year average of the harvestable (slot-sized) population (33,000 fish) (CDFW 2023) does not account for potentially massive losses to the California White Sturgeon population resulting from harmful algal blooms in 2022 and 2023. CDFW's Adult Sturgeon Study confirms a substantial decline in California White Sturgeon density from levels commonly observed in the latter half of the 20th century to those observed over the last decade (Figure 5); CDFW reports that, "2022 represented the most survey days with zero catch since the onset of [CDFW's Adult Sturgeon Study]" (California Fish and Game Commission 2023 at PDF p. 49).

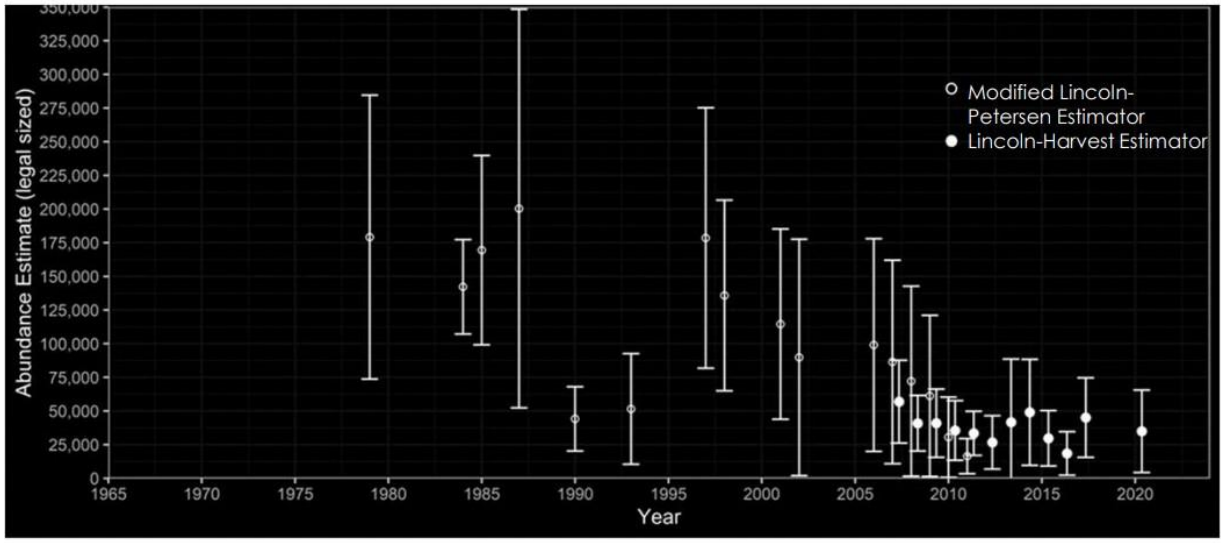


Figure 5: Estimated abundance of "slot-sized" California White Sturgeon based on CDFW mark-recapture studies. Whiskers represent error bounds. The latest year of data (2021) precedes fish kills related to harmful algal blooms in 2022 and 2023. CDFW 2023, slide 28.

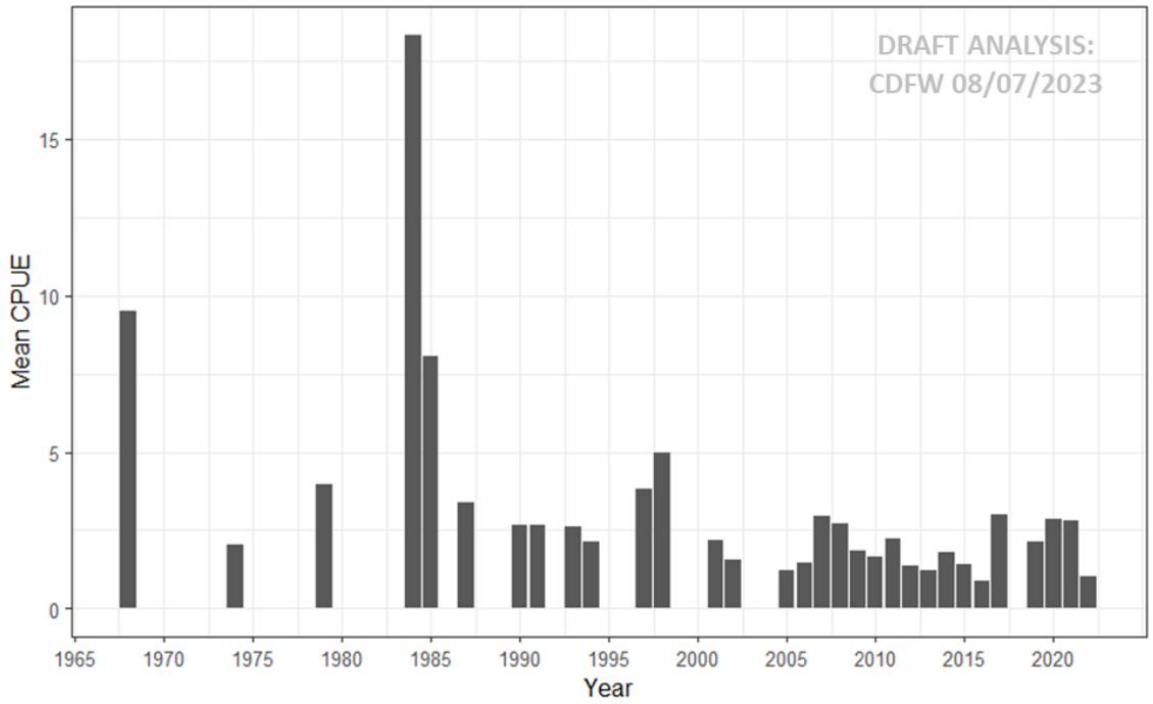


Figure 6: Catch-per-unit-effort (CPUE) of legal-sized White Sturgeon caught in the CDFW's Adult Sturgeon Study (trammel net gear) in the San Francisco Estuary, 1968 to 2022. Sampling was not conducted every year in the early decades of this sampling program; more recently, no sampling occurred in 2018 (Stompe and Hobbs 2023). A unit of effort is 100 net-fathom hours of fishing time. California Fish and Game Commission 2023 at Figure 9.

4.2. Population Trends

As described above, California White Sturgeon abundance is declining (Figures 4, 5, 6; CDFW 2015; SWRCB 2017; Blackburn et al. 2019; Schreier et al. 2022; Moyle and Rypel 2023; CDFW 2023; California Fish and Game Commission 2023). Blackburn et al. (2019 at p. 896) concluded that "Recent surveys suggest a declining population of White Sturgeon *Acipenser transmontanus* in the Sacramento–San Joaquin River basin (SSJ), California." Population trends are discussed below in the context of four factors for which data are available: the low frequency and declining magnitude of substantial juvenile recruitment related to Central Valley river flow conditions; high direct mortality related to entrainment and salvage at the massive water export facilities operated in the south Delta by the State Water Project (SWP) and the federal Central Valley Project (CVP); high rates of harvest in the recreational fishery; and catastrophic mortality in response to harmful algal blooms. Although these are not the only stressors on the California White Sturgeon population, they represent the largest negative anthropogenic effects on the population, and these are the impacts for which data are available to contextualize recent population trends.

4.2.1. River Flows and Delta Outflow

Recruitment of juvenile California White Sturgeon is flow-dependent. Chronically low river flows and reductions in freshwater inflow to San Francisco Bay (Delta outflow) resulting from water diversion and storage operations have been implicated in the decline of California White Sturgeon (CDFW 2015; Jackson et al. 2016; SWRCB 2017). As a result, successful cohort formation is infrequent for California White Sturgeon, corresponding to years of high spring-summer river flows into and out of the Delta (Figure 4; Moyle 2002; Fish 2010; CDFW 2015 citing Kohlhorst et al. 1991 and Schaffter and Kohlhorst 1999; SWRCB 2017). CDFW (2015 at p. 224) states "Annual recruitment of white sturgeon in California appears to have decreased since the early 1980s." Similarly, Blackburn et al. (2019 at pp. 897-898) observed that "Few age-0 and age-1 White Sturgeon have been sampled since 1998, and only two strong year-classes (2006 and 2011) have been documented in the last 19 years [through 2016]" and concluded that, "Continued poor recruitment has the potential to put the population at risk."

The SWRCB analyzed the relationship between average freshwater Delta outflow in March-July and recruitment of juvenile White Sturgeon (SWRCB 2017). The SWRCB found that recruitment of juvenile White Sturgeon did not occur when March-July average flows were below certain thresholds (see Figures 3.6-2 and 3.6-3 of SWRCB 2017 at pp. 3-65) and determined that monthly average Delta outflows > 37,000 cfs during this period were sufficiently protective of California White Sturgeon. From 1980-1999, average March-July Delta outflows >37,000 cfs occurred 30% of the time (6 out of 20 years). Since 1999, flows of this magnitude have occurred only 17.4% of the time (4 out of 23 years).

Using a similar analytical approach, we determined that recruitment of YOY White Sturgeon is very low or zero when Sacramento River flows ("SAC" + "YOLO" variables in Dayflow) average < 30,000 cfs between April and July (Figure 7).

Juvenile recruitment during optimal conditions may also be constrained by declines in the spawning stock of adults (SWRCB 2017 citing Gingras et al. 2014; Blackburn et al. 2019), adult fecundity, or both.

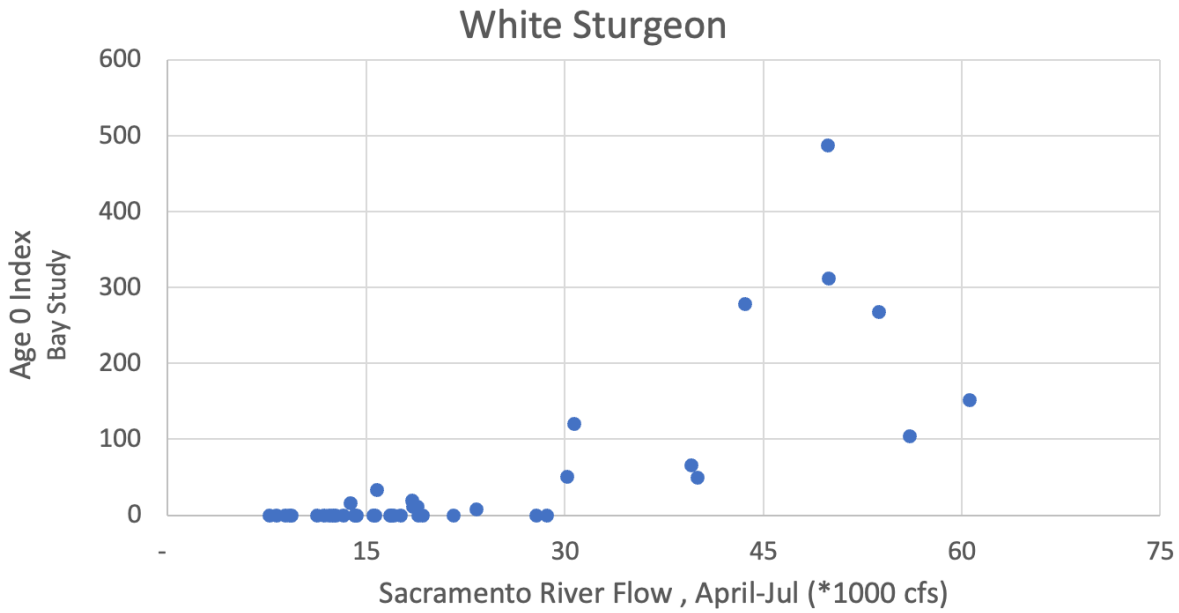


Figure 7: Relationship of spring-summer Sacramento River flow (= "SAC" + "YOLO" variables in Dayflow; https://data.cnra.ca.gov/dataset/dayflow) and an index of California White Sturgeon juvenile recruitment (source: Age 0 California White Sturgeon Index, CDFW//Interagency Ecological Program's Bay Study Otter Trawl). Age 0 abundance is strongly correlated with April-July Sacramento River flows (overall r=0.769, n=42, p<0.01).

4.2.2. Entrainment Mortality

Each year, fish "salvage" operations at the SWP and CVP South Delta water export facilities detect millions of fish that become entrained into the water export infrastructure (TBI 2012). Studies on survival of other fish species that become entrained show that orders of magnitude more fish are killed in the export facility infrastructure prior to salvage (e.g., by predation or unsuitable water quality conditions; Castillo et al. 2012). In other words, salvage is always much less than the total loss of fish attributable to exports, and failure to detect fish in salvage does not necessarily indicate that pre-screen mortality is zero.

Juvenile White Sturgeon are entrained episodically as a result of SWP and CVP water exports from the Delta. An unknown fraction of entrained White Sturgeon dies as a result of the entrainment and/or salvage process. Citing a study of entrainment mortality in the SFE's Green Sturgeon population, Jackson et al. (2016 at p. 172) indicate that "Water diversions in the main stem [of the San Joaquin River] and throughout the San Francisco Estuary may also entrain biologically significant portions of annual juvenile production." During 2023 through October 6th, 2023, a combined total of 947 juvenile California White Sturgeon were salvaged at the CVP and SWP facilities in the south Delta – a new annual record (Figure 8). Given the relationship between salvage (fish enumerated at the fish screening facilities) and entrainment mortality (which includes fish eaten in the CVP and SWP diversion infrastructure upstream of the salvage

facilities), total salvage of California White Sturgeon may underestimate mortality due to entrainment by 1-2 orders of magnitude.

Salvage may track annual recruitment of juveniles. To the extent this is true, trends in California White Sturgeon salvage data indicate a significant declining trend in abundance, including zero fish detected in 5 of the last ten years (Figure 8). High salvage mortality in 2023 likely reflects a relatively large cohort of YOY White Sturgeon produced following the record precipitation and runoff of that year. Results from 2023 illustrate how direct mortality related to entrainment may erode the capacity of the California White Sturgeon population to respond to environmental conditions that support successful reproduction.

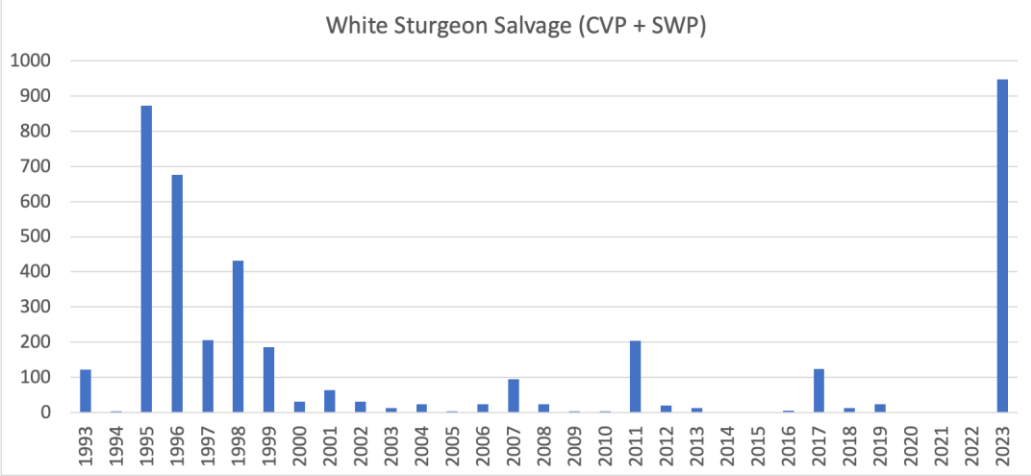


Figure 8 Annual combined salvage of White Sturgeon at Central Valley Project and State Water Project export operations (through 10/6/2023).

4.2.3. Fishing Harvest

California's sport fishery for California White Sturgeon has also been implicated in the decline of sub-adult and adult California White Sturgeon in the recent past. The SFE fishery targets White Sturgeon between 40 and 60 inches, which equates to fish between approximately 9 and 17 years of age. Anglers can catch 1 fish per day, and are limited to a harvest of three fish annually. Blackburn et al. (2019) estimated that the SFE sport fishery harvest rate between 2007 and 2015 averaged 13.6% (range: 8-29.6%). CDFW estimates that fishing exploitation rates from 2016 through 2021 averaged 8.1% (range: 3.5-14.2%; California Fish and Game Commission 2023 at PDF p. 22). These harvest levels are far above those that the best available science indicates can be sustained (CDFW 2023). Blackburn et al. state (2019 at p. 896):

> "Under current conditions, the population will likely continue to decrease (population growth rate $\lambda = 0.97$);..... The models also suggested that White Sturgeon in the [SFE] could reach the replacement rate (i.e., $\lambda \geq 1.00$) if total annual mortality for age-3 and older fish does not exceed 6%. Low levels of exploitation (i.e., <3%) would likely be required to maintain a stable population."

CDFW's mark-recapture abundance estimates of "slot sized" fish regularly exceeded 150,000 fish in the 1980s and returned to these levels in the late 1990s following an extended drought in 1987-1993 (Figure 5). By 2021, the estimated harvestable population had declined to a 5-year average of approximately 33,000 fish (CDFW 2023). This estimate does not account for the potential effect of massive fish kills in 2022 and additional mortality in 2023, related to red-tide blooms of the harmful algae, *Heterosigma akashiwo* (see below).

Population productivity is essential to fish population viability (McElhaney et al. 2000). Average population growth rates <1.0 clearly are not consistent with viability of California White Sturgeon. Moreover, Ulaski et al. (2022) found that existing harvest rates were inconsistent with population growth needed to attain federal targets for this species under the CVPIA.

4.2.4. Harmful Algal Blooms

In addition to the chronic drivers of declining abundance described above, the California White Sturgeon population is susceptible to widespread catastrophic loss from harmful algal blooms in the Bay and in the Delta. During July and August 2022, a red tide algal bloom, caused by the flagellated raphidophyte algae, *Heterosigma akashiwo*, spread across San Pablo, Central and South San Francisco Bays. *H. akashiwo* blooms have been linked to fish kills elsewhere in the world (CDFW 2023) and this bloom culminated in the rapid die-off of uncountable numbers of fish in the Bay (New York Times Aug. 30, 2022: https://www.nytimes.com/2022/08/30/us/fish-dead-algae-bloom-california.html) and at least one of its estuarine lagoons, (Lake Merritt, in Oakland California; Guardian Sept. 1, 2022; https://www.theguardian.com/us-news/2022/sep/01/dead-fish-oakland-lake-merritt-algae-bloom). White Sturgeon and Green Sturgeon suffered heavy mortality over a period of approximately one week. Based on reports and pictures submitted by volunteer naturalists and professional biologists, CDFW estimates 864 dead sturgeon were observed on the Bay shoreline, 195 of which were confirmed to be California White Sturgeon and 17 were confirmed as Green Sturgeon; the remaining carcasses were incomplete, poorly photographed, or were too badly decomposed to identify from pictures (CDFW 2023). Based on the ratio of confirmed carcasses (>90% of which were California White Sturgeon), it is clear that hundreds of California White Sturgeon carcasses were observed on the shoreline following the 2022 fish kill event. Another bloom of *H. akashiwo*, centered in San Pablo Bay (a sub-embayment in the larger San Francisco Bay complex), occurred in July of 2023. This bloom was shorter-lived and less extensive than the 2022 bloom. However, multiple observations of White Sturgeon carcasses were reported on the shoreline of San Pablo Bay in iNaturalist during the bloom and immediately after it receded (https://www.inaturalist.org/observations?nelat=38.86430003509466&nelng=-121.2081780273586&order_by=observed_on&place_id=any&subview=table&swlat=36.89297590683787&swlng=-123.6324969552935&taxon_id=49825). No official estimate of California White Sturgeon mortality in 2023 has been produced.

The number of California White Sturgeon carcasses observed on Bay Area beachlines during and immediately after the 2022 and 2023 red tide algal blooms likely represents a very small fraction

of total mortality during the blooms as: (a) ~80% of the Bay's shoreline was not systematically scanned for sturgeon carcasses due to access restrictions, and (b) most dead sturgeon probably drifted to the bottom, were swept out of the bay by tides, or degraded before detection (Schreier et al. 2022; CDFW 2023 at slides 52-54). Although the true extent of California White Sturgeon mortality will never be known, adult mortality is highly likely to be at least an order of magnitude higher than the confirmed carcass counts. Precise comparisons of bloom-related mortality to the standing stock of White Sturgeon are not possible because of high uncertainty in existing estimates of both mortality and total abundance of adult and sub-adult California White Sturgeon.

5. Habitat Necessary for Species Survival

5.1. Habitat Requirements

White Sturgeon populations with access to marine environments spawn in large rivers when flows are elevated and generally rear in their natal river estuaries and local marine environments until maturation and between spawning events (CDFW 2015; Hildebrand et al. 2016; Sellheim et al. 2022). Although they display wide diversity in their use of saline environments, California White sturgeon spawn exclusively in freshwater and spend most of their lives in saline habitats, returning to freshwater environments to spawn. Therefore, NMFS has jurisdiction over California White Sturgeon under the federal ESA. Indeed, the migratory behavior of non-landlocked White Sturgeon populations is roughly analogous to that of Shortnose Sturgeon (*Acipenser brevirostrum*) of the Atlantic Coast, a federally endangered species administered by NMFS.

White Sturgeon spawn in deep water (>4m; Parsley and Beckman 1994) with swift currents. Jackson et al. (2016) collected eggs in the San Joaquin River at depths >10 m. Spawning occurs at temperatures from 8-19□C, and peaks at ~14□C (CDFW 2015 citing McCabe and Tracy 1994). CDFW (2015) states that optimal incubation substrate is free of sand and silt that can smother embryos. Spawning substrates in the San Joaquin River and Kootenai Rivers may contain some gravel, but are dominated by sand, silt, or hard pan clay (Hildebrand et al. 1996 citing Jackson, Z., USFWS, Lodi, CA, pers. comm., and Kohlhorst, 1976); perhaps as a result, there is no White Sturgeon recruitment in the Kootenai River (Paragamian 2012) and successful recruitment in the San Joaquin River probably occurs only during years with high river flow (A. Schreier, UC Davis, pers. comm., Oct. 31, 2023).

In the SFE, recently hatched White Sturgeon employ a two-stage dispersal from spawning sites to estuarine rearing habitats. Partially developed White Sturgeon hatchlings are photonegative and briefly disperse along river bottoms; these embryonic fish then seek benthic cover until the initiation of exogenous feeding (Kynard and Parker 2005). Under optimal thermal conditions (14-17^{o}C), California White Sturgeon eggs hatch in approximately 5-7 days and yolk sack absorption is completed approximately 20-23 days post-fertilization (Wang et al. 1985). California White Sturgeon YOY are able to feed exogenously 20-30 days after hatching, at which

point they swim downstream actively, dispersing widely into rearing habitat throughout the lower rivers and Delta (Israel et al. 2009 citing McCabe and Tracey 1994; Kynard and Parker 2005). As YOY, California White Sturgeon become tolerant of brackish waters and tolerance or preference for salinity appears to increase continually with age (Sellheim et al. 2022).

In estuarine environments, White Sturgeon aggregate in deep water over soft bottom substrates. Movements may be in response to changes in salinity (CDFW 2015 at p. 224) and/or freshwater inflow to the estuary (Hildebrand et al. 2016 citing Kolhorst 1991). White Sturgeon feed on or near the bottom; they may feed in intertidal areas during high tides (Moyle 2002; CDFW 2015) but otherwise prefer deep water environments. Prey for juvenile sturgeon include chironomids, amphipods, aquatic insect larvae, and opossum shrimp (*Neomysis mercedis*; Scott and Crossman 1973; CDFW 2015). As White Sturgeon grow, their diet is dominated by benthic invertebrates including crabs and clams. An invasive non-native clam, *Corbula amurensis*, has become a major California White Sturgeon prey item since its invasion in the late 1980s, though its nutritional value to sturgeon is unknown (Zeug et al. 2014). Larger White Sturgeon prey on a range of fish including Pacific Herring (adults and eggs), Anchovy, Striped Bass, Starry Flounder, and Longfin Smelt (Skinner 1962; Scott and Crossman 1973; CDFW 2015 at p.225; Zeug et al. 2014).

Although capable of marine migrations (as evidenced by records of White Sturgeon along the Pacific Coast, far from natal habitats), California White Sturgeon typically remain in brackish estuarine environments through most or all of their adult lives (Miller et al. 2020). Until recently, it was believed that most White Sturgeon juveniles and adults remain in the SFE year-round (Klimley et al. 2015), but isotope microchemistry evidence reveals considerable individual variation in migrations to and from marine environments. Sellheim et al. (2022) found a wide range of amphidromous behavior among sub-adult California White Sturgeon (i.e., during the first 10 years of life), which they grouped into four basic patterns "ranging from those that primarily inhabited low salinity waters to those who resided in high salinity water following a few years in low or medium salinity" (at p. 11). Although some sub-adults remained in freshwater environments throughout their pre-maturation period, others never occupied freshwater during their sub-adult years. Short duration movements into high salinity habitats (> 10 psu) occurred among approximately half of the White Sturgeon studied by Sellheim et al. (2022) and the frequency of journeys into higher-salinity brackish habitats increased as individuals aged.

In addition to these periodic and short-term movements into marine waters, longer distance marine movements have been documented (Scott and Crossman 1973). Such migrations explain observations of juvenile and sub-adult White Sturgeon far from known spawning populations (Hildebrand et al. 2016). However, long-distance marine dispersal does not appear to be a significant component of the White Sturgeon life history strategy; gene flow appears to attenuate with geographic distance (Drauch Schreier et al. 2013; Willis et al. 2022), suggesting that extensive migrations are most often associated with feeding rather than spawning (CDFW 2015 at p. 225).

Critical habitat for California White Sturgeon should extend downstream of Central Valley "rim station" dams to the waters and fringing marshes of San Francisco Bay and its sub-embayments, and include the nearshore ocean off of San Francisco Bay (Gulf of the Farallones) and nearby coastal embayments (e.g., Bodega Bay, Tomales Bay). This would include recently documented spawning sites on the San Joaquin and Sacramento Rivers, as well as likely spawning and rearing areas on their major tributaries, including waterways used for migration to and from these spawning/rearing areas in and upstream of the Delta.

6. Factors Affecting Ability to Survive and Reproduce

Abundance of sub-adult and adult California White Sturgeon is at or near recorded lows (Figures 4, 5, 6). Successful cohort formation is rare (Jackson et al. 2016; Ulaski et al. 2022) and the size of successful cohorts appears to be decreasing (Figure 4; CDFW 2023), indicating declining population productivity. Both abundance and population productivity are likely to have declined further in response to massive fish kills caused by harmful algal blooms in 2022 and 2023; length data from confirmed California White Sturgeon killed in the 2022 event indicates that the majority of fish killed were of reproductive age (CDFW 2023). In addition, the population appears to have suffered significant range constriction caused by historic construction of impassable dams and their current operations; successful spawning in many rivers that likely supported spawning historically is unknown (e.g., the Stanislaus River, Tuolumne River) or extremely rare (Feather River, San Joaquin River). These low and/or declining levels of abundance, population productivity, and spatial distribution are not consistent with population viability (McElhany et al. 2000).

California White Sturgeon are imperiled primarily by:

- Central Valley water management infrastructure and operations, including:
  - the existence of several impassable Central Valley dams, which block access to former spawning and rearing grounds;
  - high levels of water diversion and the current operations of Central Valley dams, which collectively alter river hydrographs in ways that deprive California White Sturgeon of river and estuarine flows and water quality conditions necessary for successful recruitment;
  - direct mortality resulting from entrainment/salvage at CVP and SWP water export facilities in the south Delta;
- Overharvest in the recreational fishery; and
- Harmful algal blooms, some of which have resulted in direct mortality, and others (e.g., in the Delta) which routinely impair water quality conditions along the migration route for spawning White Sturgeon and their offspring.

Other threats include: low dissolved oxygen in the southern Delta; toxins, including selenium and mercury; and direct mortality from ship strikes and dredging. In addition to these existing threats, the risk of California White Sturgeon extirpation is exacerbated by imminent threats of

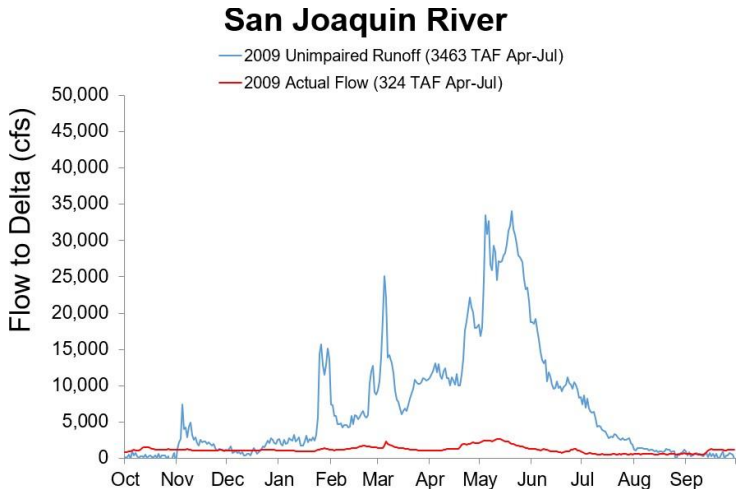
direct and indirect habitat modification driven by human activities. Major existing and reasonably foreseeable imminent threats to the California White Sturgeon population are described below.

6.1. Dams

Impassable dams on each of the nine largest Central Valley tributaries block access to historic California White Sturgeon spawning habitat. Smaller, semi-passable dams below these "rim" dams likely impair access to otherwise accessible spawning habitats. In addition, dams block river sediment transport which impairs sturgeon spawning habitat and denies migrating larval and juvenile sturgeon turbidity (suspended sediment) that they use to hide from predators (CDFW 2015). Among major anthropogenic factors limiting, or potentially limiting, viability of populations of White Sturgeon in California, CDFW rates dams as "high" (CDFW 2015 see Table 1 at PDF p. 109).

6.2. Water Diversions

Radical alteration of the SFE hydrograph as a result of the large-scale capture and diversion of Central Valley runoff is a major force constraining California White Sturgeon productivity and driving declines in abundance (Moyle 2002; CDFW 2015, 2023; Jackson et al. 2016; SWRCB 2017; Blackburn et al. 2019; Ulaski et al. 2022; SWRCB 2017). Diversions and reservoir storage operations during wet years truncate peak river flows (Figure 9) and constrain the frequency of wet conditions upon which White Sturgeon cohort success relies. For example, between 1990-2018, 7 out of 11 of the years that Reis et al. (2019) classified as "wet" or "above normal" in terms of unimpaired Central Valley runoff were actually "below normal" or drier in terms of water that flowed out of the Delta (Figure 10). Thus, water diversion and storage reduce the frequency and quality of conditions that favor California White Sturgeon recruitment.



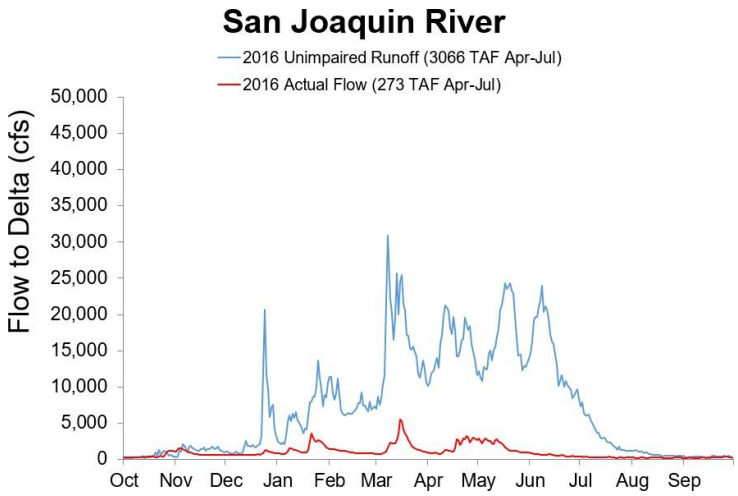


Figure 9: Unimpaired hydrograph (blue lines) vs. actual hydrograph (red lines) for the San Joaquin River in 2009 (top) and 2016 (bottom). Water diversions and reservoir operations eliminate high flow conditions that correspond with successful White Sturgeon recruitment on this and other Central Valley rivers.

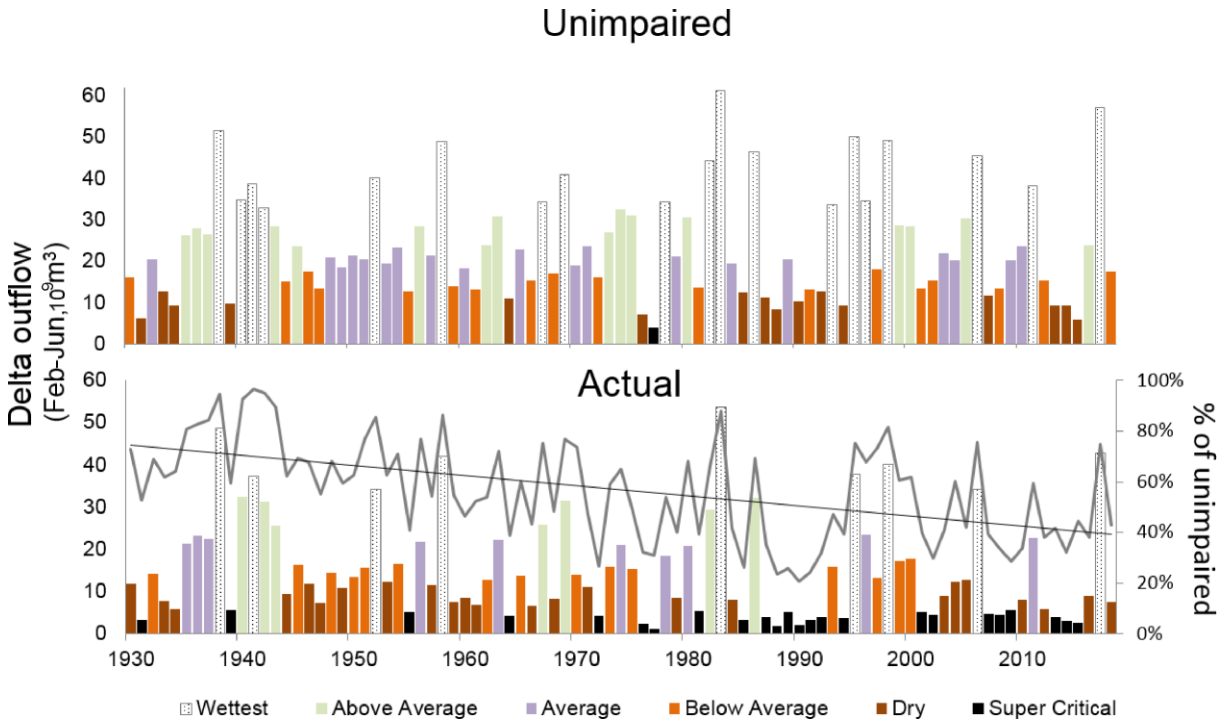


Figure 10: Trends in actual Delta ou[low (below) relative to Central Valley unimpaired runoff (above). Coloring of bars represent water year types based on quintiles of unimpaired flow from 1922-2016. In terms of actual Delta ou[low, the frequency of "wet" and "above normal" years is markedly reduced compared to unimpaired hydrology. The percentage of unimpaired flow reaching San Francisco Bay (line in lower panel; right y-axis) declined significantly during this

time-period (Kendall's tau = −0.36, p < 0.001), including since 1995 (Kendall's tau = −0.29, p < 0.05). Reis et al. 2019.

Despite the fact that current regulations are clearly inadequate to maintain freshwater flow or water quality conditions necessary to maintain viable populations of several fishes native to San Francisco Bay, the Delta, and their tributary rivers (SWRCB 2010, 2017; CDFW 2010, USFWS 2022), recent changes to state and federal ESA regulations nevertheless allow for increased water diversion, decreased river flows, and reduced Delta outflow as compared to earlier regulations (see, e.g., Figure 5.16-13, at p. 5-373 in Reclamation 2019; see, e.g., Tables 5.2.3-5.2.4 in CDWR 2020 at p. 5-12). Moreover, several recent proposals for new water managementinfrastructure described below seek to increase water diversions, particularly during wetter periods when high river flows and Delta outflows would otherwise benefit California White Sturgeon reproduction and recruitment.

6.2.1. Sites Reservoir

This proposed new off-channel reservoir would divert water from the Sacramento River during high flow periods from October-June, for later delivery to agricultural and urban users. If approved, Sites Reservoir diversion operations are expected to reduce April-June flows, especially under wet conditions, in the known spawning, rearing, and migration corridor of California White Sturgeon in the Sacramento River (e.g., Sites RDEIR/SDEIS Table 5c-9-1c). This is likely to have a negative effect on successful spawning and recruitment of juvenile California White Sturgeon.

6.2.2. Delta Conveyance

The California Department of Water Resources has proposed a new diversion from the Sacramento River that would route Sacramento River flow through an underground tunnel to existing export infrastructure in the southern Delta ("the Delta Conveyance Project"). Operation of the Delta Conveyance Project would substantially *reduce* flows in the lower Sacramento River, particularly during spring-summer months of wetter years (Delta Conveyance Project, Draft EIR (CDWR 2022) Appendix 05C Table 5C-42 at p. 5c-43); https://www.deltaconveyanceproject.com/planning-processes/california-environmental-quality-act/draft-eir/draft-eir-document) that would otherwise support California White Sturgeon reproduction and recruitment.

6.2.3. Bay-Delta Water Quality Control Plan Update and Proposed Voluntary Agreements

The SWRCB's existing Bay-Delta Water Quality Control Plan and related regulations are inadequate to protect native fishes, even when supplemented by flow and diversion constraints applied under the federal and state ESAs (SWRCB 2010, 2017; CDFW 2010; USFWS 2022). The

current water quality standards governing flow into the Delta from the Sacramento River watershed, through the Delta, and into San Francisco Bay, were adopted in 1995.

The SWRCB recently proposed new draft standards for flow from the Sacramento River watershed into the Delta, in-Delta hydrodynamics, and Delta outflow (SWRCB 2023). The "proposed project" would require a minimum of 55% of unimpaired flow from the Sacramento River and the Delta's eastern tributaries to reach the Delta year-round and for that volume to become Delta outflow. However, the "proposed project" will not achieve the frequency and magnitude of flow conditions that California White Sturgeon need to sustain their populations and fully recover. For example, the SWRCB has determined that average March-July Delta outflows ≥ 37,000 cfs are protective of California White Sturgeon (SWRCB 2017 at pp. 3-63 through 3-66). The SWRCB's modeling predicts that flows of this magnitude will occur with only marginally higher frequency than baseline (19% vs. 15%) under the SWRCB's proposed project (SWRCB 2023 Table 7.6.2-5 at p. 7.6.2-38). Moreover, this marginal difference in frequency of suitable flows is entirely due to flows that exceed *current* diversion and storage capacity (i.e., unregulated flows), but which would be available for capture and storage by new diversions (e.g., the proposed new Delta Conveyance Project) and/or new storage facilities, such as the proposed Sites Reservoir Project (see SWRCB 2017 at p. 5-31, showing that without "unregulated flows," Delta Outflow targets for White Sturgeon and Green Sturgeon would be achieved less frequently than baseline – 12% vs. 15%). Notably, the SWRCB's "high flow" alternative (65% of unimpaired Sacramento River and east side tributary inflow to the Delta) is projected to result in Delta outflows greater than or equal to the SWRCB's White Sturgeon minimum flow threshold in 24% of years (SWRCB 2023 Table 7.6.2-5 at p. 7.6.2-38), approximately the frequency needed to ensure spawning opportunities necessary to sustain and recover the California White Sturgeon population (1 in 4 years, see above).

The SWRCB also described proposed Voluntary Agreements (VAs) as an alternative to its "proposed project." These VAs would provide far less flow into San Francisco Bay, through the Delta, and in tributary rivers where California White Sturgeon spawn and rear, than the SWRCB's proposed project. In fact, during years with "wet" hydrology, modeling indicates that the Voluntary Agreements would result in *less flow* than under baseline conditions (see, e.g., SWRCB 2023 at Table 4-13; and Table G3a-10). Thus, the VA alternative threatens to significantly *diminish* the frequency and magnitude of river and Delta outflow conditions that White Sturgeon rely on for successful spawning and juvenile recruitment.

6.3. Entrainment Mortality

Direct and indirect mortality related to SWP and federal CVP operations in the southern Delta are a subset of overall water management impacts on the California White Sturgeon population. However, since these operations result in substantial direct mortality in years of high sturgeon recruitment, we consider this issue separately here. Although there is no known conversion for estimating total White Sturgeon entrainment mortality as a function of salvage of these fish (as there is for other species, e.g., Castillo et al. 2012), it is clear that: (a) there is no reason to expect high survival of salvaged fish, (b) total mortality will be greater than the number of fish

enumerated in salvage because of losses prior to the fish screens, and (c) salvage has been episodically high (Figure 8).

Whereas constraints on export operations contained in the 2008/2009 federal ESA biological opinions for Delta Smelt and anadromous fishes have been found to reduce salvage and related mortality of certain protected species (e.g., Delta Smelt; Smith et al. 2021), there is no reason to believe that those constraints are adequate to protect White Sturgeon, which are vulnerable in different seasons and under different hydrological conditions than other imperiled species. Furthermore, the export constraints detailed in the 2008/2009 biological opinion have been altered and may be altered again during the ongoing ESA reconsultation on CVP operations. Specifically, the most recent federal biological opinion and CESA Incidental Take Permit allow for much higher levels of export during "storm" conditions (CDFW 2020 at p. 92). If juvenile California White Sturgeon capitalize on high-flow storm events to disperse in the Delta, then implementation of this "storm-flex" provision would be expected to increase entrainment mortality.

6.4. Recreational Harvest

White Sturgeon life-history and behavior make the California White Sturgeon population susceptible to overharvest. White Sturgeon exhibit delayed maturation and do not spawn every year; thus, loss of older, more fecund, adult females represents a significant blow to overall California White Sturgeon population productivity (Blackburn et al. 2019). These same life history attributes can mask long-term declines in the population (Ulaski et al. 2022). Legal recreational fishing for California White Sturgeon has exacerbated recent population declines (Blackburn et al. 2019; CDFW 2023). CDFW's planned response – to set harvest levels to 4% of the harvestable population – will not eliminate the threat to the population posed by recreational fishing.

In addition, because adult and sub-adult White Sturgeon tend to aggregate in a small area for extended periods (Hildebrand et al. 2016), fishing boats can concentrate angling pressure on significant population pockets. This threat to the population from legal harvest is exacerbated by the expansion of tools for rapid communication in the field (cell phones; social media) that allow recreational anglers and boat captains to quickly learn about and move towards areas of high catches. In addition, White Sturgeon predictably return to favored spots seasonally (Hildebrand et al. 2016), making them easy for fishing boats to find and target.

In response to extremely high harvest rates in the recent past, CDFW has proposed to develop new fishing regulations intended to achieve a 4% harvest mortality rate (California Fish and Game Commission 2023). This target is significantly above the levels Blackburn et al. (2019) calculated would be necessary to maintain a *stable* population (<3%); harvest rates consistent with California White Sturgeon population growth would be lower still. And Blackburn's calculations did not account for the emerging threat of harmful algae blooms, which resulted in extreme California White Sturgeon mortality events in 2022 and 2023.

6.5. Poaching

Poaching California White Sturgeon, principally for their eggs (caviar), has been identified as a threat to the population (Israel et al. 2009). Organized poaching rings have been identified and participants arrested, but there are no data on the current magnitude of this problem.

6.6. Harmful Algal Blooms

As described above, harmful red tide (*H. akashiwo*) algal blooms in San Francisco Bay led to substantial die-off of California White Sturgeon in 2022 and 2023 (CDFW 2023; California Fish and Game Commission 2023). These widespread blooms, and more localized persistent blooms of cyanobacteria (*Microcystis*) in the San Joaquin River migration corridor, also threaten to constrain the geographic extent of California White Sturgeon spawning and rearing. Bloom formation corresponds to high light penetration, water temperatures, nitrogen (N) and phosphorus (P) (collectively, "nutrient") concentrations, and residence times. In the Bay, the one factor under human control is nutrient concentrations. In the Delta, because technologies to reduce N loads in treated wastewater effluent have been implemented at the Stockton and Sacramento wastewater treatment plants, reducing residence time with increased river flows (especially in the San Joaquin) represents the main viable strategy to mitigating or preventing harmful algal blooms.

Repeated red-tide algal blooms, in 2022 and again in 2023, indicate that sizeable California White Sturgeon mortality events may occur more frequently in the future. Indeed, future blooms may be worse. The SFE is highly susceptible to harmful algae blooms because it is chronically over-enriched in N and P compounds that fuel phytoplankton growth and reproduction (Cloern et al. 2020). *H. akashiwo* forms cysts that lay dormant in bottom sediments; the 2022 bloom may have deposited these cysts over a large portion of San Francisco Bay, setting the stage for rapid development of widespread blooms in the future. Moreover, *H. akashiwo* is not the only potentially harmful, bloom-forming phytoplankton in the Bay; the San Francisco Bay Regional Water Quality Board's (Regional Board) Nutrient Management Strategy identifies 17 harmful algal bloom-forming species in the SFE, and some of these are more toxic than *H. akashiwo* (SFEI 2016). Whereas, the Regional Board anticipates proposing regulations that would constrain nutrient loading of the Bay from wastewater treatment plants (Eileen White, Executive Director of the San Francisco Bay Regional Water Quality Board, pers. comm., Aug. 7, 2023), no reduction in nutrient loads has yet been required and such regulations (if adopted) are not likely to result in attainment of targeted nutrient load reductions for at least 10 years. Thus, the harmful algal blooms are an increasingly imminent threat to the California White Sturgeon.

In addition, harmful blooms of highly toxic cyanobacteria in the genus *Microcystis* are increasingly common on the lower San Joaquin River during the spring and summer (Kudela et al. 2023), including months when adult and juvenile California White Sturgeon would be migrating to and from the San Joaquin River and its tributaries. These blooms and related low

dissolved oxygen levels in the Stockton Deepwater Ship Channel likely form a barrier to migrating California White Sturgeon adults and juveniles (CBDA & CVRWQCB 2006; CDFW 2015 at p. 108).

6.7. Pollution

As Gunderson et al. (2017 at p. 334) note: "[t]he San Francisco Estuary is heavily influenced by anthropogenic activities, including historic and chronic contaminant inputs. These contaminants can adversely affect SFE fish populations, particularly white sturgeon, because they are a benthic dwelling, long-lived species." California White Sturgeon are sensitive to agricultural and industrial pollutants, many of which bioaccumulate, leading to deformities, slower growth, and reduced reproductive potential (CDFW 2015 at p. 230). Their exposure to organochlorine pesticides, mercury, and selenium is quite high in the SFE. Indeed, Gunderson et al. (2017) found elevated concentrations of several metals, as well as DDE, PCBs, PBDEs, galaxolide, and selenium in the tissues of California White Sturgeon. Given this fish's long lifespan, PCB's and other pollutants may represent a significant population-level concern (Moyle 2002; CDFW 2015 and sources cited therein).

The threat to California White Sturgeon posed by selenium accumulation may be underappreciated. Elevated levels of selenium (Se) lead to decreased swimming activity, slower growth, lower energy reserves, and decreased survival in California White Sturgeon (CDFW 2015 at p. 230). Se enters the SFE from agricultural runoff and stormwater discharge – particularly from naturally seleniferous soils on the west side of the San Joaquin Valley – and from petroleum refinery effluent in Suisun Bay and San Pablo Bay. Gunderson et al. (2017 at p. 335) report Se levels in California White Sturgeon consistent with those associated with impaired reproductive success. Stewart et al. (2020) reported Se in tissues of Sacramento Splittail taken from Pacheco Creek, which receives effluent from three nearby oil refineries, that were higher than those from Splittail sampled elsewhere in the SFE. These results suggested that "…the proposed EPA Se criteria for muscle tissue in Splittail may be under-protective." (Stewart et al. 2020 abstract). White Sturgeon also inhabit the receiving waters of Pacheco Creek and forageon some of the same prey as Sacramento Splittail (e.g., mollusks) as well as the Splittail themselves, suggesting that California White Sturgeon exposure to refinery-origin Se may be higher than previously understood.

6.8. Climate Change

The regional effects of global climate change are likely to exacerbate several stresses on the California White Sturgeon population. Potential effects include increases in water temperature that would impair reproductive success; increased developmental rates leading to potential mismatch between life-history transitions and prey availability; disease susceptibility; and increased duration, intensity, and extent of harmful algal blooms (CDFW 2015). Anthropogenic

impacts to climate have increased the risk of persistent droughts in California (Diffenbaugh 2015); alterations to annual and seasonal hydrology resulting from climate change are also likely to further impair California White Sturgeon recruitment.

6.9. Hatcheries

Hatchery supplementation of wild sturgeon is not currently a threat to the California White Sturgeon population, though it has been proposed. CDFW (2015 at p. 233) reports that artificially reared sturgeon were outplanted from 1980-1988. Hatchery supplementation could threaten California White Sturgeon discreteness. Conservation status assessments for Pacific salmon include thresholds for hatchery influence (Lindley et al. 2007). Indeed, Central Valley fall-run and late-fall run Chinook Salmon populations are listed as California Species of Special Concern, in part, because of high levels of hatchery influence (CDFW: https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon). Furthermore, hatchery-rearing of California White Sturgeon would not alleviate major threats to the population (e.g., overharvest, harmful algae blooms, selenium toxicity) as these threats affect mainly older fish; hatchery-rearing would not undo or mitigate several factors that imperil the population in the first place.

6.10. Ship Strikes

White Sturgeon are killed by strikes from boat and ship hulls or propellers (Hildebrand et al. 2016; Demetras et al. 2020). The population level impact of this effect is unknown. There is concern that narrow sections of the SFE (e.g., Carquinez Strait) may funnel high vessel traffic into the migratory path of California White Sturgeon on their way to and from spawning grounds, leading to deadly boat strikes (A. Schreier, UC Davis, pers. comm, Oct. 31, 2023). As the adult spawning stock becomes more limited, the potential for consistent loss of large females to ship strikes could become problematic (CDFW 2015).

6.11. Dredging

Dredging of the federal navigational channels, as well as smaller-scale dredging projects, poses a variety of direct and indirect impacts to California White Sturgeon. In 2009, the San Francisco Estuary Institute prepared a study for the U.S. Army Corps of Engineers regarding SFE dredging impacts on green sturgeon (Stanford et al. 2009). Direct impacts include entrainment from hydraulic dredging, exposure to contaminated sediments, water quality impacts via sediment resuspension and sedimentation, disturbance from underwater noise, and changes to habitat (e.g., bed leveling). Indirect impacts include modifications to prey base, increased occurrence of ship propeller strikes, and predation by invasive species. Impacts to Green Sturgeon are likely amplified for California White Sturgeon, because California White Sturgeon spend most of their lives in the SFE, whereas Green Sturgeon migrate through the estuary quickly.

7. Degree and Immediacy of Threat

The threats facing the California White Sturgeon described above vary by degree and immediacy. The most significant threats are harmful algal blooms, recreational fishing, and water diversions.

7.1. Water Diversions

Decreased freshwater flows through the watershed currently pose a severe, chronic threat to California White Sturgeon viability. Current management of river and estuarine flows (i.e., regulation of reservoir operations and diversions) constrains the productivity of the population and promotes gradual, but persistent decline in the population. Freshwater flow conditions are likely to be further degraded by multiple pending projects that would divert and store yet more runoff in the Sacramento Valley and the Delta.

7.2. Recreational Fishing

Recreational fishing is a grave threat to California White Sturgeon in the near-term. At current harvest levels, the threat from sportfishing is severe. It is possible that new proposed restrictions will reduce the near-term impacts from recreational fishing, but the best available science indicates that, unless harvest rates are restricted to <3% of the population, the population will continue to decline (Blackburn et al. 2019) and will certainly not recover.

7.3. Harmful Algal Blooms

Harmful algal blooms pose a potentially catastrophic, immediate threat to California White Sturgeon. Given the combination of excessive nutrient loading, increased water diversions, and climate change, it is likely harmful algal blooms will occur with increased frequency and severity, leading to future fish kills and impairment of migrations.

8. Impact of Existing Management Efforts

Existing regulatory mechanisms are clearly inadequate to protect California White Sturgeon from further decline and eventual extirpation.

8.1. Water Diversion Regulations

Despite the existence of regulations addressing water diversion under the state and federal Clean Water Acts (i.e., the Bay-Delta Water Quality Control Plan) and state and federal ESAs (i.e., state CESA Incidental Take Permit and federal Biological Opinions), the proportion of Central Valley-wide unimpaired runoff that makes it through the Delta to San Francisco Bay has declined dramatically over the past century and over the past 25 years (Figure 10; Hutton et al. 2017;

Reis et al. 2019). Moreover, existing river and estuarine flow requirements are minimum standards that do not address and will not prevent the further reduction of "surplus" (i.e., unregulated) flows by proposed projects in the near future. As SWRCB (2023, at 1-9) explains:

> "Total average annual unimpaired (without diversions and dams under current channel and infrastructure conditions) outflows from the Bay-Delta watershed are about 28.5 million acre-feet (MAF). Annual average outflows with diversions are a little more than half this amount at about 15.5 MAF, and outflows during the winter and spring from January through June are less than half. However, average regulatory minimum Delta outflows are only about 5 MAF, or about a third of current average outflows and less than 20 percent of average unimpaired outflows. Existing regulatory minimum Delta outflows would not be protective of the ecosystem, and without additional instream flow protections, existing flows may be reduced in the future, particularly with climate change and additional water development absent additional minimum instream flow requirements that ensure flows are preserved in stream when needed for the reasonable protection of fish and wildlife." (emphasis added).

Several other recent reviews have similarly concluded that minimum flow requirements and current flow levels in the SFE watershed are inadequate to protect endangered fishes or recreational and commercial fisheries (SWRCB 2010, 2017; CDFW 2010; USFWS 2022). The effect of water diversion and reservoir storage operations on the volume and timing of flows to San Francisco Bay can be seen in the reduced frequency of years with high spring-summer river flows, relative to the frequency of naturally occurring wet conditions (Figure 10). Thus, current water management practices reduce the frequency of conditions that California White Sturgeon depend on for successful spawning and larval rearing. Moreover, as described above, adoption of currently proposed updates to the Bay-Delta Water Quality Control Plan (SWRCB 2023), Sites Reservoir, and the Delta Conveyance Project would each reduce the frequency and magnitude of high spring-summer Delta inflows and outflows, and would therefore reduce the frequency and magnitude of successful California White Sturgeon recruitment.

8.2. Recreational Fishing Regulations

CDFW acknowledges that increased regulation of fishing harvest will be needed to stabilize the population (CDFW 2023; California Fish and Game Commission 2023). CDFW has convened agency and outside experts to review potential changes in fishing regulations aimed at attaining a new maximum exploitation rate target of 4% (California Fish and Game Commission 2023 at PDF p. 25). This target level of harvest is substantially higher than the maximum Blackburn et al. (2019) calculated would be necessary to maintain a stable population (<3%) – that calculation was made prior to the emergence of harmful algal blooms and associated fish kills in San Francisco Bay-proper. CDFW's revised harvest target would not be expected to halt declining abundance of California White Sturgeon, much less restore this population.

Separately, CDFW staff proposed emergency fishing regulations that would restrict the California White Sturgeon fishery to catch-and-release only for the 2024 fishing season. However, at its October 11, 2023, public meeting, the California Fish and Game Commission rejected this proposal in favor of a series of temporary modifications to fishing regulations aimed at achieving a harvest mortality target that was estimated, without supporting evidence, to be "4-5%." Thus, there are no current plans to reduce California White Sturgeon harvest to levels consistent with maintaining a stable, much less recovering, population.

8.3. Nutrient Enrichment Regulations

Nutrient enrichment of San Francisco Bay and its main tributaries supports increasingly common and widespread harmful algal blooms that kill California White Sturgeon and limit its geographic range. But current regulation of nutrient loads from agricultural runoff, treated municipal wastewater, and refinery effluent have not prevented the SFE from becoming one of the most nutrient-enriched estuaries in the world (Cloern et al. 2020). Until nutrient loading into the Bay (primarily by local wastewater treatment plants) is significantly reduced, widespread blooms are likely to recur in the pelagic waters of the Bay. Although the Regional Board anticipates requiring load reductions in an updated wastewater nutrient permit, changes in infrastructure and operations required to substantially reduce nutrient loads are likely to take many years to implement. Therefore, it is highly likely that California White Sturgeon will continue to suffer loss of habitat and potentially catastrophic fish kills for the foreseeable future as a result of harmful algal blooms.

In the Delta, river flows are chronically impaired (SWRCB 2017; Reis et al. 2019). Although the SWRCB has been reviewing water quality (flow) standards for the Bay-Delta since 2009, and adopted new standards for San Joaquin River flow in 2018, river and estuarine flows are still being managed to meet the requirements adopted nearly thirty years ago, in 1995. As a result, residence times in the southern Delta support widespread seasonal toxic algal blooms in all but the wettest years. Indeed, the state is contemplating replacing the unimplemented 2018 San Joaquin River basin flow standards (which would require that 40% of unimpaired flow from the lower San Joaquin River's three main tributaries reach the Delta) as part of a "voluntary agreement" with water diverters on the Tuolumne River (SWRCB 2023) – the proposed VA would provide significantly less flow in the Tuolumne River and San Joaquin River than the 2018 standards would provide. It is also not clear whether even the 2018 standards would result in flows needed to mitigate harmful algal blooms during the July-September period, when no new flow standard applies.

9. Recommendations for Future Management

Conserving, protecting, and restoring California White Sturgeon will require immediate action to simultaneously reduce key stressors, including: harmful reservoir operations and high levels of water diversion that inhibit successful spawning, rearing, and adult and juvenile migrations through the Delta; nutrient pollution that supports harmful algal blooms in San Francisco Bay-

proper; and overharvest. Full restoration of this population will also require elimination and mitigation of toxic substances that California White Sturgeon bio-accumulate (e.g., Selenium, methyl-mercury, PCB's, etc.). Population level impacts from ship strikes and dredging should be thoroughly investigated. And scientific research on, and long-term monitoring of, the California White Sturgeon population must be restored and expanded.

9.3. Restore Adequate Freshwater Flows to Increase Recruitment

Increased frequency of adequate river flow into, through, and out of the Delta are necessary to support successful recruitment of juveniles to the California White Sturgeon population. Based on the empirical relationship between Delta outflow and successful California White Sturgeon cohort formation, the SWRCB (2017) identified monthly average March-July Delta outflows > 37,000 cfs as necessary to protect White Sturgeon. In order to support population productivity consistent with a viable population, such flows need to occur at least once in every 4 years (~25% of years), given the reproductive interval of California White Sturgeon females (2-4 years). Restoring the population to its former abundance will require suitable river conditions to recur even more frequently.

Similarly, our analysis indicates that recruitment of Age 0 California White Sturgeon rarely occurs in years when average Sacramento River flows between April and July are < 30,000 cfs (Figure 7). New reservoir operation rules and constraints on diversions must be implemented to substantially increase the frequency and magnitude of average April-July Sacramento River flows >30,000 cfs.

Jackson et al. (2016) identified flow impairment as a likely constraint on California White Sturgeon reproductive success in the San Joaquin River Valley. Their study indicates that increases in streamflow during the March– May period are important drivers of spawning activity. However, they did not study the effect of flows in April-July on the successful transition of eggs into juveniles that reach the Delta. They called for increased research to refine estimates of streamflow and temperature needed to support successful spawning and larval survival in the San Joaquin and its main tributaries. Increased flows in the San Joaquin during the March-July time period will be necessary in order to study their effect on California White Sturgeon success. Restoration of the San Joaquin River as suitable spawning, incubation, and larval rearing habitat for California White Sturgeon would improve population viability through increased productivity and, eventually, abundance. Perhaps more importantly, increasing the frequency and success of spawning on the San Joaquin River and its tributaries would also be a major improvement to this fish's constrained geographic distribution, and would be a significant contribution to the population's overall viability, as a result.

In addition, flow and temperature conditions on the Feather River are unlikely to support successful California White Sturgeon reproduction, incubation, and dispersal in most years, due to the operations of Oroville Dam and the Thermalito infrastructure (Heublein et al. 2017). Restoration of the Feather River as suitable spawning, incubation, and early rearing habitat for California White Sturgeon would improve population viability through increased productivity

and, eventually, abundance; it would also create additional spawning opportunities off the mainstem Sacramento River that would be a significant incremental improvement to the population's constrained geographic distribution. Research into the flow needs of White Sturgeon on this river should be investigated; needed modifications to storage and diversion operations must be implemented to support successful reproduction on the Feather River.

9.2. Eliminate or Substantially Reduce Migratory Barriers Through the Delta

Two main barriers severely impair migration of California White Sturgeon through the Delta – low dissolved oxygen and harmful algal blooms in the lower San Joaquin River around Stockton. In part, both of these migration barriers result from inadequate San Joaquin River flows. Adequate river flows are necessary to alleviate chronically low levels of dissolved oxygen (Jassbyand Van Nieuwenhuyse 2005) and to prevent blooms of the toxic cyanobacteria (e.g., in the genus *Microcystis*; Berg and Sutula 2015; Lehman et al. 2013, 2020). Year round flows of ~1,000 cfs in the Stockton Deepwater Ship Channel correspond to near elimination of dissolved oxygenlevels < 5mg/L (the current regulatory standard (Figure 11; Jassby and Van Nieuwenhuyse 2005)and should be mandated, at least during the December-July period, when White Sturgeon are likely to migrate through this area on their way to or from spawning habitat in the San Joaquin watershed (Figure 12).

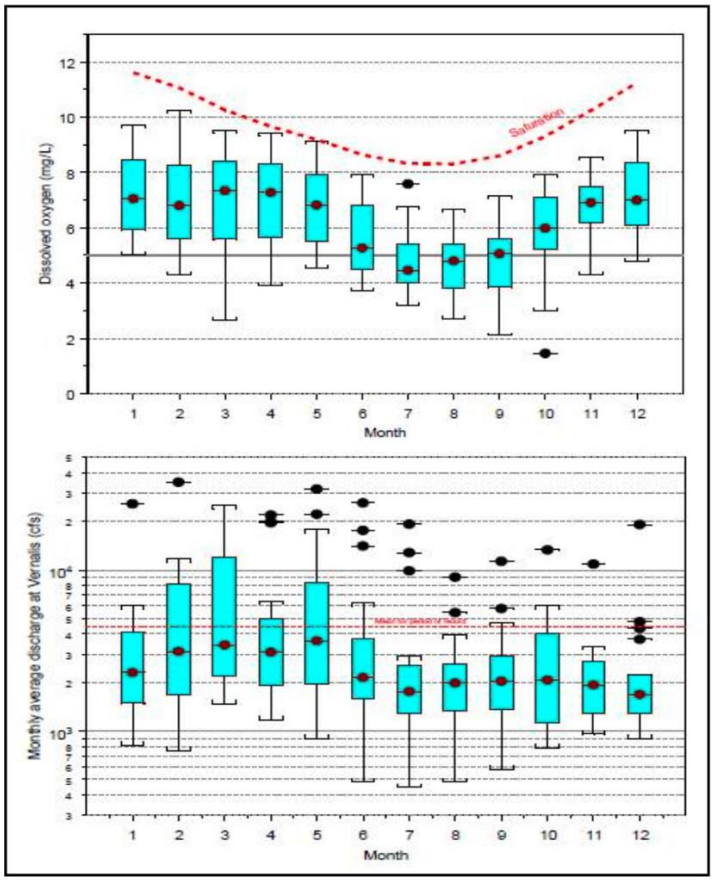


FIGURE 11

Top panel: Box plot of summary statistics for monthly average values of daily minimum DO in the ship channel at the Rough and Ready Island continuous monitoring station (DOmin), 1983-2001 (n=19/month).

Bottom panel: Figure 6 from Van Nieuwenhuyse, E. E. 2002. Box plot of summary statistics for monthly average discharge in the San Joaquin River near Vernalis (Qvern), 1983-2001.

Source: Figures 2 and 6 from Van Nieuwenhuyse, E. E. 2002.

Figure 11: Distribution of flows and dissolved oxygen levels by month in the Stockton Deepwater Ship Channel. TBI 2010. Original source Figures 2 and 6 from Van Nieuwenhuyse, E. E. 2002.

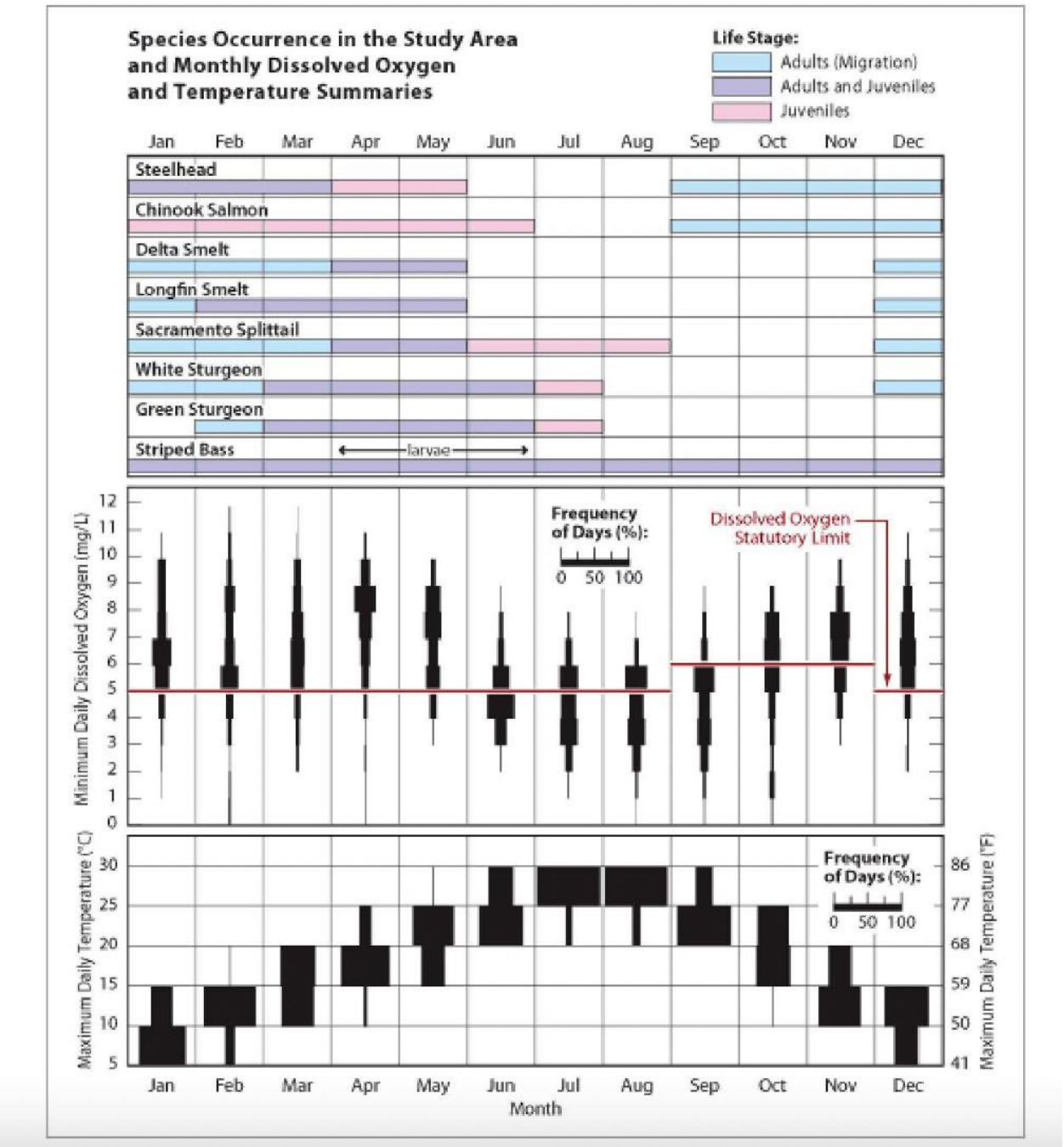


Figure 12: Timing of migration for different life stages of fish, including California White Sturgeon, that migrate through the Stockton Deepwater Ship Channel and the long-term distribution of temperature and dissolved oxygen levels in each month of the year. CBDA and CV RWQCB 2006.

The SWRCB adopted new standards for San Joaquin River inflow and flows on the San Joaquin's three lower tributaries in 2018 (SWRCB 2018). These updates, which have not been implemented and for which implementation is not imminent (SWRCB 2023), would require minimum flows of 1,000 cfs upstream of Stockton at Vernalis. However, about half the San Joaquin River's flow at Vernalis is distributed among other channels before it reaches Stockton, so this minimum Vernalis standard would not guarantee adequate flows to break up dissolved oxygen barriers in the lower San Joaquin River. A minimum flow standard of 1,000 cfs in the Stockton Deepwater Ship Channel (or ~ 2,000 cfs at Vernalis) should be implemented, at least during the months of December through July, when White Sturgeon migrate through this area.

At this time, it is unknown what specific flow levels are necessary to prevent toxic algal blooms in the lower San Joaquin River. Lehman (2020) found that summertime Delta outflows > ~10 Kcfs were associated with a reduction in toxic algal blooms magnitude, spatial extent, duration, and toxicity relative to drought years. In addition to the minimum flow at Vernalis (described above), the SWRCB's updates to San Joaquin River flow standards would require 40% of unimpaired flow from the Stanislaus, Tuolumne, and Merced rivers to reach the Delta between February-June. This standard has not been implemented; thus, it has had no effect on flow – and implementation of the 2018 standard is neither imminent nor certain, given the SWRCB's consideration of a "voluntary agreement" alternative. Adopted flow standards (i.e., SWRCB 2018) should be implemented while studies are conducted to determine flows necessary to prevent formation of harmful algal blooms in the lower San Joaquin watershed during the months of May-July (when blooms are likely to form and migrating sturgeon may be present).

9.3. Reduce Direct and Indirect Mortality Related to Water Export Operations

Episodic entrainment of juvenile sturgeon at CVP and SWP export facilities limits the California White Sturgeon population's ability to respond when environmental conditions would otherwise support juvenile recruitment. Most juvenile California White Sturgeon salvage (and by extension, most pre-screen mortality) occurs between June and November (Figure 13). It is likely that White Sturgeon mortality is higher in June than salvage data reveal, as most YOY entrained at this time are likely to be too small to screen efficiently and are vulnerable to pre-screen mortality. Current regulation of exports is least restrictive during these months.

Therefore, we recommend adoption of export-related hydrodynamic criteria (e.g., limits on negative flows in the Old and Middle River distributaries of the San Joaquin River) for June-November to limit the likelihood of entrainment for California White Sturgeon.

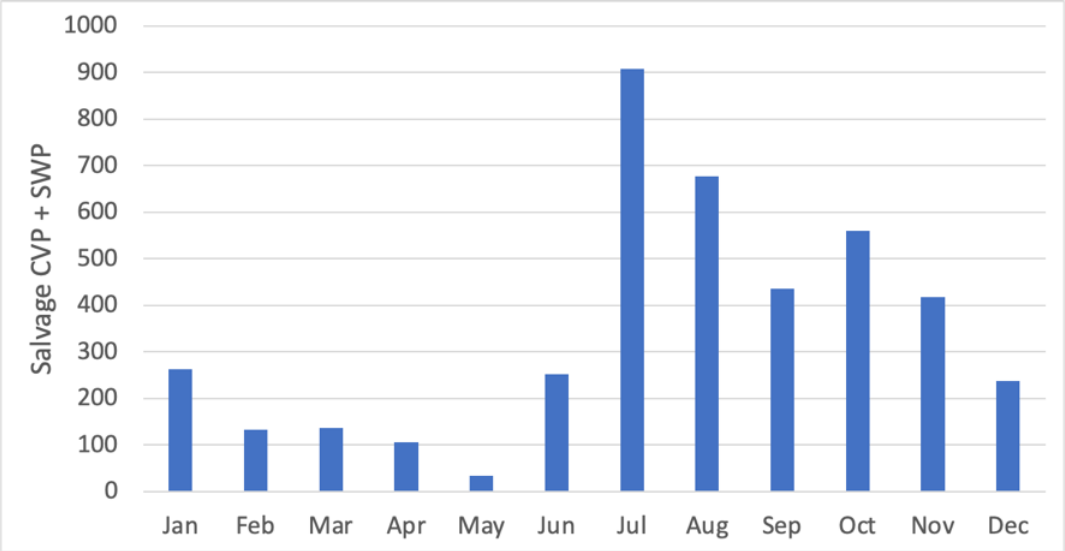


Figure 13: Combined CVP and SWP salvage of California White Sturgeon by month, 1993-2022.

9.4. Eliminate Harvest Impacts in the California White Sturgeon Fishery

Fishing harvest of California White Sturgeon has clearly been unsustainable. Until the population is determined to have recovered, fishing should be limited to catch-and-release only. A catch-and-release fishery for California White Sturgeon is consistent with conserving and restoring these fish as hooking mortality is extremely low. As CDFW reports:

> "Numerous studies on White Sturgeon indicate that the species is robust and tolerates the stress associated with catch and release angling well. … In a study conducted in the C.J. Strike reservoir catch and release fishery on the Snake River, ID, it was determined that adult White Sturgeon were hooked an average of 7.7 times, and landed 3.5 times, in a year (Kozfkay and Dillon 2010). This suggests that over the course of their long lives, these sturgeon experience a high level of catch and release without long term negative consequences. In studies of gear effects, it has been observed that metal tackle that has been ingested is processed and expelled quickly (Lamansky et al. 2018; Bowersox et al. 2016). Mortality as a result of angling was examined in the lower Fraser River, BC (Robichaud et al. 2006). Out of 25,219 angling events, no mortality was observed immediately upon capture and release. A subset of 96 angled fish were held in net pens for three days to evaluate delayed mortality. No mortality was observed in the first two days. Two fish died by the end of the third day (2.6% mortality); however, the authors indicated that the mortality was likely influenced by the high density of fish being held in the floating net pens (sturgeon are a benthic oriented species so captivity in a floating pen is itself a stressor) (Robichaud et al. 2006)." California Fish and Game Commission 2023 at PDF p. 56.

Although direct mortality from catch-and-release fishing appears to minimal, we recommend a prohibition on any fishing for California White Sturgeon over their spawning grounds between the months of December and May, inclusive. Hooking and capture generates sub-lethal stress responses (California Fish and Game Commission 2023); gravid females are likely to respond to hooking and associated handling by abandoning spawning for that year. Also, females that are already stressed by egg production and preparation for spawning may experience delayed mortality if they become further exhausted as a result of handling by anglers.

9.5. Reduce Nutrient Pollution in San Francisco Bay to Prevent Large Harmful Algal Blooms

Preventing future catastrophic algal blooms will require rapid and aggressive reductions in N and P loads for wastewater and oil refinery effluent disposed of in San Francisco Bay. The Regional Board anticipates drafting an update to its nutrient permit in 2024. However, adoption and implementation of the permit are uncertain, as are the permit's final terms; even under the best-case scenario, retrofitting existing infrastructure or building new infrastructure to substantially reduce nutrient loading and the risk of harmful algal blooms will require many years – perhaps a decade or more. Implementation of necessary load reductions (currently estimated to be on the order of a ~75-80% reduction in both N and P) will require significant investment by most or all of the Bay's 37 wastewater treatment plant operators and five refineries. Funding and technical assistance to facilitate rapid transition to lower N and P loadings should be provided.

9.6. Improve Monitoring and Research on California White Sturgeon Populations

Historic and current long-term monitoring programs that generate information about California White Sturgeon abundance, productivity, distribution, and life-history and genetic diversity should be maintained and expanded. Monitoring California White Sturgeon populations is challenging because they are relatively rare, large-bodied, long-lived, and migratory. Different life stages occupy very different habitats and require different gear to sample them efficiently. As described in this petition and elsewhere (California Fish and Game Commission 2023), CDFW has numerous monitoring programs to track California White Sturgeon abundance. Each of these programs has generated a valuable long-term data set, however, given the life-history of this fish and the large expanse and varied habitats of the San Francisco estuary and its watershed, each time series of estimated abundance is subject to high variability. Some of this variance is intrinsic to California White Sturgeon population dynamics, but some of it reflects the resource-intensive nature of adequately sampling California White Sturgeon. Recently, the US Bureau of Reclamation cut funding for CDFW's Adult Sturgeon Study. Dedicated funding to continue this program has not been secured. This study has provided critical, fishery-independent insight into long-term population trends for over 50 years. Funding must be replaced, and indeed, the Adult Sturgeon Study should be expanded, especially given the need to understand the population impacts of the 2022 and 2023 HAB-related fish kills. Similarly, the CDFW/Interagency Ecological Program's Bay Study provides critical data on California White

Sturgeon juvenile recruitment, but it is underfunded and future funding is not secure. Likewise, CDFW's White Sturgeon fishing tag program must be adequately funded to support increased participation from the fishing community. Finally, CDFW is currently unable to monitor White Sturgeon recreational fishing in the SFE beyond self-reported data. The Resources Agency should secure funds to maintain and increases each of the long-term sampling programs described above and fund additional CDFW staff to conduct frequent direct angler surveys, boat launch monitoring, and fishing regulation enforcement.

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State of California
Department of Fish and Wildlife

Signed original on file,
received March 13, 2024

M e m o r a n d u m

Date: March 15, 2024

To: Melissa Miller-Henson
Executive Director
Fish and Game Commission

From: Charlton H. Bonham
Director

Subject: Initial Evaluation of the Petition to List White Sturgeon (*Acipenser transmontanus*) as Threatened under the California Endangered Species Act

The California Department of Fish and Wildlife (Department) has completed its initial evaluation of the petition to list White Sturgeon (*Acipenser transmontanus*) as a threatened species under the California Endangered Species Act (CESA), Fish and Game Code section 2050 et seq. The Fish and Game Commission (Commission) received the petition from San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance on November 29, 2023. Pursuant to Fish and Game Code section 2073, the Commission referred the petition to the Department on December 6, 2023. On February 15, 2024, the Commission approved a Department request for a 30-day extension to further analyze the petition and complete its evaluation report in accordance with Fish and Game Code section 2073.5, subdivision (b).

The Department completed the attached petition evaluation report as required by Fish and Game Code section 2073.5. The Department's petition evaluation report delineates the categories of information required in a petition, evaluates the sufficiency of the available scientific information, and incorporates additional relevant information that the Department possessed or received during the review period. Based upon the information contained in the petition, and other relevant information in the Department's possession, the Department has determined that there is sufficient scientific information to indicate that the petitioned action may be warranted. The Department recommends that the Commission accept the petition for further consideration pursuant to CESA.

If you have any questions or need additional information, please contact Jay Rowan, Branch Chief, Fisheries Branch by email at Sturgeon@wildlife.ca.gov.

Attachment

ec: *California Department of Fish and Wildlife*

Chad Dibble, Deputy Director
Wildlife and Fisheries Division

Jay Rowan, Branch Chief
Fisheries Branch

Jonathan Nelson
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John Kelly
Senior Environmental Scientist (Specialist)
Fisheries Branch

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE

California Endangered Species Act

Petition Evaluation for White Sturgeon (*Acipenser Transmontanus*)

Report to the Fish and Game Commission

March 2024

Suggested citation:

California Department of Fish and Wildlife (CDFW). 2024. Report to the Fish and Game Commission. Evaluation of the petition from San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance to list White Sturgeon (*Acipenser transmontanus)* as threatened under the California Endangered Species Act. California Department of Fish and Wildlife, P.O. Box 944209, Sacramento CA 94244-2090. 19 pp.

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List of Abbreviations, Acronyms, and Terms

CDFW – California Department of Fish and Wildlife

CESA – California Endangered Species Act

cfs - cubic feet per second

Commission – California Fish and Game Commission

Department – California Department of Fish and Wildlife

e.g. – "for example" (*Latin: exempli gratia*)

ESA – Federal Endangered Species Act

et al. – "and others"

FL - fork length, the length of a fish measured from the tip of the snout to the fork in the tail

Id. – "the same"

i.e. – "that is" (*Latin: id est*)

mtDNA - mitochondrial deoxyribonucleic acid

Executive Summary

San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance submitted a petition (Petition) to the California Fish and Game Commission (Commission) to list White Sturgeon (*Acipenser transmontanus)* as threatened pursuant to the California Endangered Species Act (CESA). White Sturgeon are an anadromous fish native to California, where they primarily reside in San Francisco Bay and the Delta and spawn in the Sacramento and San Joaquin rivers and associated tributaries. They are slow-growing, late maturing, and long-lived, and are able to spawn multiple times during their lives. Historically, abundance estimates for the California population ranged between 175,000-200,000 legal-sized fish; the most recent five-year average abundance estimate indicates there are now approximately 33,000 legal-sized fish in the population.

On December 7, 2023, the Commission referred the Petition to the California Department of Fish and Wildlife (Department) in accordance with Fish and Game Code section 2073 (Cal. Reg. Notice Register 2024, No. 1-Z, p. 26). Pursuant to Fish and Game Code section 2073.5 and California Code of Regulations, title 14, section 670.1, the Department prepared this evaluation report (Petition Evaluation) within 120 days of receiving the Petition. The purpose of the Petition Evaluation is to evaluate the sufficiency of the scientific information contained in the Petition in relation to other relevant information possessed or received by the Department during the evaluation period, and to recommend to the Commission whether the Petition should be accepted and considered.

Summary of the information presented in the petition:

- **Life History, Range, Distribution (including map):** The Petition provides sufficient information regarding the life history, current range, and distribution of White Sturgeon, including a current distribution map.
- **Habitat necessary for survival:** The Petition provides sufficient information regarding the diverse spawning, rearing, holding, and foraging habitats used by White Sturgeon across fresh, estuarine, and ocean waters.
- **Abundance and population trends:** The Petition provides sufficient information regarding current White Sturgeon abundance estimates and population trends based on CDFW monitoring.
- **Factors affecting the ability to survive and reproduce:** The Petition provides sufficient information regarding factors threatening White Sturgeon survival and reproduction. It identifies Central Valley water

management infrastructure and operations, overharvest in the recreational fishery, and harmful algal blooms leading to both direct mortality and impaired water conditions as the three primary concerns. Climate change, vessel strikes, dredging, poaching, and water contaminants are also referenced.

- **Degree and immediacy of threat:** The Petition provides sufficient information to suggest that threats to long-term survival of White Sturgeon will continue or potentially worsen in the future. It identifies the most significant threats as harmful algal blooms, recreational fishing, and water diversions.
- **Impact of existing management efforts:** The Petition contains sufficient information explain concerns that existing and foreseeable regulatory mechanisms and management efforts will not adequately protect White Sturgeon from impacts that threaten their long-term survival. It states concerns that proposed voluntary agreements, updates to the Bay-Delta Water Quality Control Plan, and plans for Sites Reservoir and the Delta Conveyance Project would impair water timing and quality and species recruitment, and states concerns that the levels of harvest targeted in fishing regulations are not consistent with the goal of maintaining or restoring a stable population.
- **Suggestions for future management:** The Petition provides sufficient recommendations of management actions that would reduce key stressors, improving water flows and timing, water quality, reduce export and harvest mortality, and improve monitoring efforts.
- **Availability and sources of information.** The Petition references 68 peer-reviewed or public documents, including numerous documents authored by the Department. The references are current and appropriate.

After reviewing the Petition and other relevant information, the Department has determined that the Petition meets the requirements in Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1). In completing its Petition Evaluation, the Department has determined that there is sufficient scientific information to indicate that the petitioned action to list White Sturgeon as threatened under CESA may be warranted. Therefore, the Department recommends that the Commission accept the petition for further consideration pursuant to CESA.

Introduction

Candidacy Evaluation

The Commission has the authority to list certain species or subspecies as endangered or threatened under CESA (Fish & G. Code, §§ 2062, 2067, & 2070). The listing process is the same for species and subspecies (Fish & G. Code, §§ 2070-2079.1). CESA defines the "species" eligible for listing to include "species or subspecies" (Fish & G. Code, §§ 2062, 2067, & 2068), and courts have held that the term "species or subspecies" includes "evolutionarily significant units" (*Central Coast Forest Assn. v. Fish & Game Com.* (2018) 18 Cal.App.5th 1191, 1236, citing *Cal. Forestry Assn., supra*, 156 Cal.App.4th at pp. 1542 and 1549). The range of a species for the Department's petition evaluation and recommendation is the species' California range only (*Cal. Forestry Assn. v. Cal. Fish and Game Com.* (2007) 156 Cal.App.4th 1535, 1551).

CESA sets forth a two-step process for listing a species as threatened or endangered. First, the Commission determines whether to designate a species as a candidate for listing by evaluating whether the petition provides "sufficient information to indicate that the petitioned action may be warranted" (Fish & G. Code, § 2074.2, subd. (e)(2)). If the petition is accepted for consideration, the second step requires the Department to produce, within 12 months (18 months with extension) of the Commission's acceptance of the petition, a peer-reviewed report based upon the best scientific information available that advises the Commission on whether the petitioned action is warranted (Fish & G. Code, § 2074.6). Finally, the Commission, based on that report and other information in the administrative record, determines whether the petitioned action to list the species as threatened is warranted (Fish & G. Code, § 2075.5).

A petition to list a species under CESA must include "information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant" (Fish & G. Code, § 2072.3; see also Cal. Code Regs., tit. 14, § 670.1, subd. (d)(1)).

Within 10 days of receipt of a petition, the Commission must refer the petition to the Department for evaluation (Fish & G. Code, § 2073). The Commission must

also publish notice of receipt of the petition in the California Regulatory Notice Register (Fish & G. Code, § 2073.3). Within 90 days of receipt of the petition (or 120 days if the Commission grants an extension), the Department must evaluate the petition on its face and in relation to other relevant information the Department possesses and submit to the Commission a written evaluation report with one of the following recommendations (Fish & G. Code, § 2073.5, subds. (a)-(b)):

- Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected; or
- Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

The Department's candidacy recommendation to the Commission is based on an evaluation of whether the petition provides sufficient scientific information relevant to the petition components set forth in Fish and Game Code section 2072.3 and the California Code of Regulations, title 14, section 670.1, subdivision (d)(1) to indicate that the petitioned action to list White Sturgeon as threatened may be warranted.

In *Center for Biological Diversity v. California Fish and Game Commission* (2008) 166 Cal.App.4th 597, the California Court of Appeals addressed the parameters of the Commission's determination of whether a petitioned action should be accepted for consideration pursuant to Fish and Game Code section 2074.2, subdivision (e), resulting in the species being listed as a candidate species. The court began its discussion by describing the standard for accepting a petition for consideration previously set forth in *Natural Resources Defense Council v. California Fish and Game Commission* (1994) 28 Cal.App.4th 1104:

> As we explained in *Natural Resources Defense Council*, "the term 'sufficient information' in section 2074.2 means that amount of information, when considered with the Department's written report and the comments received, that would lead a reasonable person to conclude the petitioned action may be warranted." The phrase "may be warranted" "is appropriately characterized as a 'substantial possibility that listing could occur.'" "Substantial possibility," in turn, means something more than the one-sided "reasonable possibility" test for an environmental impact report but does not require that listing be more likely than not.

(*Center for Biological Diversity, supra*, 166 Cal.App.4th at pp. 609-10 [internal citations omitted]). The court acknowledged that "the Commission is the finder of fact in the first instance in evaluating the information in the record" (*Id*. at p. 611). However, the court clarified:

> [T]he standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable person. The Commission is not free to choose between conflicting inferences on subordinate issues and thereafter rely upon those choices in assessing how a reasonable person would view the listing decision. Its decision turns not on rationally based doubt about listing, but on the absence of any substantial possibility that the species could be listed after the requisite review of the status of the species by the Department under [Fish and Game Code] section 2074.6.

(*Ibid.*)

CESA Petition History

On November 29, 2023, the Commission received the Petition from San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance to list White Sturgeon (*Acipenser transmontanus*) as threatened under CESA. On December 6, 2023, the Commission referred the Petition to the Department for evaluation. At its meeting on December 14, 2023, the Commission officially received the Petition. At its meeting on February 15, 2024, the Commission granted the Department's request for a 30-day extension of the period to review the Petition and prepare this Petition Evaluation.

Federal ESA Petition History

On November 29, 2023, pursuant to Section 4(b) of the Endangered Species Act, 16. U.S.C. § 1533(b); Section 553(e) of the Administrative Procedure Act, 5. U.S.C. § 553(e); and 50 C.F.R. § 424.14(a), San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance provided notice in accordance with 50 C.F.R. § 424.14(b) and (c)(9) that they intended to petition the Secretary of Commerce, through the National Marine Fisheries Service, to protect the San Francisco Estuary White Sturgeon (*Acipenser transmontanus*) Distinct Population Segment as a threatened species.

Species Taxonomy

Analysis of multiple mitochondrial gene sequences indicates that the closest relatives of White Sturgeon are derived from Asia, including *A. schrenckii*, *A. sinensis*, and *A. dabryanus* (Krieger et al. 2008; Hildebrand et al. 2016). Analysis of multiple mtDNA sequences suggested that White Sturgeon last shared a common ancestor with *A. schrenckii* (Amur Sturgeon) approximately 46 million years ago (Hildebrand et al. 2016 citing Peng et al. 2007). There are multiple populations of White Sturgeon found on the west coast of North America with one genetically identifiable group found in California (Schreier et al. 2013).

Species Overview

White Sturgeon (*A. transmontanus*) are one of two sturgeon species native to California (along with Green Sturgeon, *A. medirostris,* which is listed as "threatened" on the federal ESA list, but not listed under CESA [Cal. Code Regs., tit 14, § 670.5]). There are listed populations (ESA or Canadian SARA) of White Sturgeon in the upper Columbia River (above Grand Coulee Dam), Kootenai River, lower, middle and, upper Fraser River, and Nechako River; unlisted populations are found in the Sacramento-San Joaquin rivers, Columbia River (below Grand Coulee Dam), and Snake River (Hildebrand et al. 2016). White Sturgeon can live in excess of 100 years, and historically grew to sizes of approximately 20 feet and 1300 pounds (Moyle 2002). The species is anadromous and is capable of coastal movements, although this appears to be uncommon and most adults in the Central Valley watershed population reside in San Francisco Bay and the Delta (Miller et al. 2020). Recent studies indicate that there are several different residence strategies in the population, with some fish remaining in the freshwater Delta for most of their lives and a larger proportion residing in the saline areas of the bay (Sellheim et al. 2022).

Adult White Sturgeon make seasonal migrations starting in November to spawn in the major rivers of the Central Valley (Miller et al. 2020). Historically, White Sturgeon likely spawned as far upstream in the Sacramento River watershed as the Pitt River and well into the San Joaquin River (Beamesderfer et al. 2004). Dams and anthropogenic water alterations have reduced access to spawning habitat (Hildebrand et al. 2016). Currently, the majority of spawning is thought to occur on the Sacramento River between river kilometers 127–248) (Schaffter 1997; CDFW 2021, 2022, 2023a), with a lesser amount of spawning on the lower San Joaquin River between river kilometers 115–138 (Jackson et al. 2016). Some additional spawning may occur on major tributaries such as the Feather, Bear,

Yuba, and Tuolumne rivers. White Sturgeon are observed in these rivers, but spawning has not been documented with captured eggs or larvae.

A small proportion of White Sturgeon start to mature at approximately 10 years with males maturing earlier than females; however, the majority of the population can take 14–19 years or more to mature to first reproduction (Chapman et al. 1996; Hildebrand et al. 2016; CDFW 2023b). Once mature, males are believed to spawn every 1–2 years and females every 2–4 years (Chapman et al. 1996). The species is a broadcast spawner, releasing large adhesive eggs into the water column, usually over coarse gravel and small cobble substrate (Moyle 2002). Eggs hatch in 4–12 days (Wang et al. 1985) and larvae rear in the river before moving down to the freshwater Delta where they are detected in the CDFW 20-mm tow-net survey[1]. Successful recruitment to the juvenile population is infrequent, occurring approximately every 6–7 years. Large year classes and successful recruitment are highly correlated with above normal water years as measured by high mean daily Delta outflow (Fish 2010; Gingras et al. 2013).

CDFW began monitoring the abundance of legal-sized sturgeon in the fishery in 1954 using mark-recapture tagging. Estimates were made of the abundance of fish that were "legal sized" based on the regulations at the time. Sampling effort was intermittent and then occurred annually after Green Sturgeon received federal ESA protection in 2006 (CDFW 2023b). Historically, the estimates of 40–60-inch FL White Sturgeon ranged around 125,000–150,000 fish. The most recent CDFW five-year average abundance estimate suggests there are approximately 33,000 40–60-inch FL fish in the population (CDFW 2023b).

There has been a recreational fishery for White Sturgeon in California since 1954. As of November 16, 2023, the fishery is operating under emergency regulations that permit anglers to take one sturgeon per year between 42–48-inch fork length (FL) and limit the total number of sturgeon taken per vessel per day to two. The fishery is open year-round in the San Francisco Bay and Delta. The Sacramento River and tributaries (upstream of the Highway 50 bridge) and the San Joaquin River and tributaries (upstream of the I-5 bridge) are closed to sturgeon fishing from January 1 through May 31 and open the remaining

[1] https://wildlife.ca.gov/Conservation/Delta/20mm-Survey

months. Revised long-term regulations have been under development for implementation in 2025.

Sufficiency of Scientific Information to Indicate the Petitioned Action May Be Warranted

Pursuant to Fish and Game Code section 2072.3 and California Code of Regulations, title 14, section 670.1, subdivision (d)(1), the Department verified that the petition contained information on each of the following petition components:

- Life History;
- Range;
- Distribution;
- Detailed Distribution Map
- Kind of habitat necessary for survival;
- Abundance;
- Population Trend
- Factors affecting the ability to survive and reproduce;
- Degree and immediacy of threat;
- Impact of existing management efforts;
- Suggestions for future management; and
- Availability and sources of information.

The Commission did not receive new information from the public during the Petition Evaluation period (Fish & G. Code, § 2073.4). Pursuant to Fish and Game Code section 2073.5, the Department evaluated based upon the information contained in the petition, whether there is, or is not, sufficient information to indicate that the petitioned action may be warranted. Below is a summary of relevant information from the petition for each of the petition components.

Natural History

Scientific Information in the Petition

The Petition discusses life history of White Sturgeon under "Section 2. Natural History" on pages 6-11 of the Petition, referencing current literature. The petitioners state that recruitment from the egg/larvae stages into the juvenile population is infrequent and correlated with high river flows and Delta Outflow

and discuss the mechanisms underlying this process, referencing Fish 2010, CDFW 2015, Israel et al. 2009 and other sources.

Range and Distribution[2]

Scientific Information in the Petition

Figure 1. Current distribution of White Sturgeon from CDFW (2023b, page 9). This map was included as Figure 2 in the Petition.

[2] Summaries of the information provided about range, distribution, and distribution map have all been included in the Range and Distribution Section

The Petition discusses range and distribution for White Sturgeon (including a map, Figure 1) in "Section 3. Range and Distribution" on pages 11–14 of the Petition. Discussion of the species' range (Section 3.1) addresses river, estuarine, and ocean habitation and includes populations from the Columbia and Fraser river drainages as well as the population in the Central Valley (Hildebrand et al. 2016; CDFW 2015). Distribution is addressed in Section 3.2, focusing on population spatial structure and discussing constraints related to upstream dams and possible threats White Sturgeon may experience in the estuaries.

Kind of Habitat Necessary for Survival

Scientific Information in the Petition

The Petition discusses the kind of habitat necessary for survival for White Sturgeon in California in "Section 5. Habitat Necessary for Species Survival" on pages 22–24 of the Petition. The petitioners address spawning habitat in major Central Valley rivers, dispersal and rearing habitat in the rivers and estuary, foraging and holding habitat in the estuary and Delta for subadults and adults, and infrequent long-distance marine migrations of adults. Critical habitat needs are discussed on page 24.

Abundance

Scientific Information in the Petition

The Petition discusses the abundance of White Sturgeon in California in "Section 4.1. Abundance" on pages 14–17 of the Petition. The references are up to date and rely on Department-authored documents including CDFW 2023b, Fish 2010, and documents presented at Fish and Game Commission meetings. The petitioners also discuss declining trends in both juvenile and adult abundance using data from Department monitoring.

Population Trend

Scientific Information in the Petition

The Petition discusses White Sturgeon population trends in California in "Section 4.2. Population Trends" on pages 17–22 of the Petition. "Subsection 4.2.1. River Flows and Delta Outflow" of the Petition addresses declining trends in juvenile recruitment correlated with low river flows and Delta Outflow (e.g. Fish 2010; CDFW 2015; SWRCB 2017). The petitioners state that monthly average Delta

outflows >37,000 cfs during March–July are sufficiently protective of White Sturgeon (SWRCB 2017), yet flows of this magnitude have only occurred in 4 out of the past 23 years. Subsequent sections discuss mortality due to entrainment of juveniles of water operations (4.2.2), fishing harvest (4.2.3), and recent harmful algal blooms (4.2.3).

Factors Affecting the Ability to Survive and Reproduce

Scientific Information in the Petition

The Petition discusses factors affecting ability to survive and reproduce in "Section 6. Factors Affecting Ability to Survive and Reproduce" on pages 24–32 of the Petition. The petitioners identify the three primary threats as:

1) Central Valley water management infrastructure and operations including dams, altered hydrograph due to water operations, and direct mortality from export operations. Potential impacts of planned projects (e.g. Sites Reservoir, Delta Conveyance Project, Bay-Delta Water Quality Control Plan and Voluntary Agreements) are also addressed.
2) Overharvest in the recreational fishery.
3) Harmful algal blooms leading to fish kills and impaired water quality.

The petitioners also discuss other factors that may influence the survival of the species including poaching, pollution, dredging, vessel strikes, and climate change.

Degree and Immediacy of Threat

Scientific Information in the Petition

The Petition discusses the degree and immediacy of the threat in "Section 7. Degree and Immediacy of Threat" on page 33 of the Petition with an emphasis on the three primary threats identified in Section 6 of the Petition. The petitioners discuss the role that current reservoir and river water management may have in persistent declines in the population and note that flow conditions may be further impacted by major projects currently in development. They also discuss the impacts of high levels of harvest from recreational fishing and the emerging threat of harmful algal blooms.

Impact of Existing Management Efforts

Scientific Information in the Petition

The Petition discusses the impact of existing management efforts in "Section 8. Impact of Existing Management Efforts" on pages 33–35 of the Petition with an emphasis on the three primary threats identified in Section 6 of the Petition. They discuss river and estuarine flow requirements as minimum standards that are not adequate to protect White Sturgeon and note that existing flows may be further reduced in the future. The petitioners discuss the sufficiency of recent efforts by the Department to review and update recreational fishing regulations in the emergency regulation and long-term regulation processes (e.g. CDFW 2023b) in light of recommendations in the literature (Blackburn et al. 2019). They also address concerns about the role anthropogenic sources of nutrient enrichment have in algal blooms in San Francisco Bay, the Delta, and San Joaquin River, noting that "the Regional Board anticipates requiring load reductions in an updated wastewater nutrient permit, [but] changes in infrastructure and operations required to substantially reduce nutrient loads are likely to take many years to implement." Additionally, the Petition states concerns with the status of the implementation of flow standards or voluntary agreements for the San Joaquin River, and their potential impacts on the White Sturgeon population.

Suggestions for Future Management

Scientific Information in the Petition

The Petition discusses the impact of existing management efforts in "Section 9. Recommendations for Future Management" on pages 35–42 of the Petition. Recommendations include: a) restoring freshwater flows between March and July to support juvenile recruitment, b) reducing or limiting migratory barriers caused by low water quality in the Delta, c) reducing mortality associated with entrainment in water operations, d) eliminating harvest in the recreational fishery by shifting to a sustainable catch-and-release fishery, e) reducing nutrient input into San Francisco Bay, and f) enhancing monitoring and research efforts on White Sturgeon.

Availability and Sources of Information

Scientific Information in the Petition

The Petition provides a list of 68 references in Section 10, "Availability and Sources of Information" on pages 42–49 of the Petition. The cited information sources range from peer-reviewed literature, reports and technical literature, and presentations and documents presented at public meetings. The information cited is current and is presented in accordance with standard scientific practice.

Summary of Petition Components

The above petition components were evaluated by the Department for sufficiency of information pursuant to Fish and Game Code section 2073.5. The Department finds that sufficient information was provided on the petition components. If the Commission accepts the petition for further consideration under CESA, the Department will commence a review of the status of the species at that time.

Recommendation to the Commission

Pursuant to Fish and Game Code section 2073.5, the Department evaluated the Petition on its face and in relation to other relevant information the Department possesses. In completing its Petition Evaluation, the Department has determined that the Petition and other relevant information provide sufficient scientific information to indicate that the petitioned action to list the White Sturgeon as threatened may be warranted. Therefore, the Department recommends the Commission accept the Petition for further consideration under CESA.

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Photo: CDFW

EVALUATION OF THE WHITE STURGEON CESA LISTING PETITION

PRESENTATION TO THE CALIFORNIA FISH AND GAME COMMISSION

June 19, 2024 | Dr. John Kelly

Fisheries Branch

Presentation Overview

Evaluation of the petition to list White Sturgeon (*Acipenser transmontanus*) as threatened under CESA.

I. Petition timeline

II. Petition summary and evaluation

III. CDFW recommendation

Photo: CDFW

Petition timeline

2023

November 29	Commission receives petition from *San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance*
	Petitioned Action: List White Sturgeon as **threatened** throughout its range in California
December 6	Petition referred to Department for evaluation

2024

February 15	Commission approves Department request for 30-day extension
March 15	Department transmits evaluation to the Commission
April 17	Public receipt of the petition evaluation https://fgc.ca.gov/CESA#ws

CESA Petition Evaluation Overview

Evaluate the scientific information presented in the Petition in the following categories:

1. Life history
2. Range
3. Distribution
4. Kind of habitat necessary for survival
5. Abundance
6. Population trend
7. Factors affecting ability to survive and reproduce
8. Degree and immediacy of threat
9. Impacts of existing management
10. Suggestions for future management
11. Availability and sources of information

1-3. Natural History, Range, Distribution

- Size: up to 20+ ft, 1800 lbs
- Lifespan: 100+ years
- Anadromous
  - Primarily estuary and freshwater
  - Infrequent ocean movements
- Late maturity: 50% at 14 yrs, 100% at 19 yrs
- Spawn every ~2-4 years

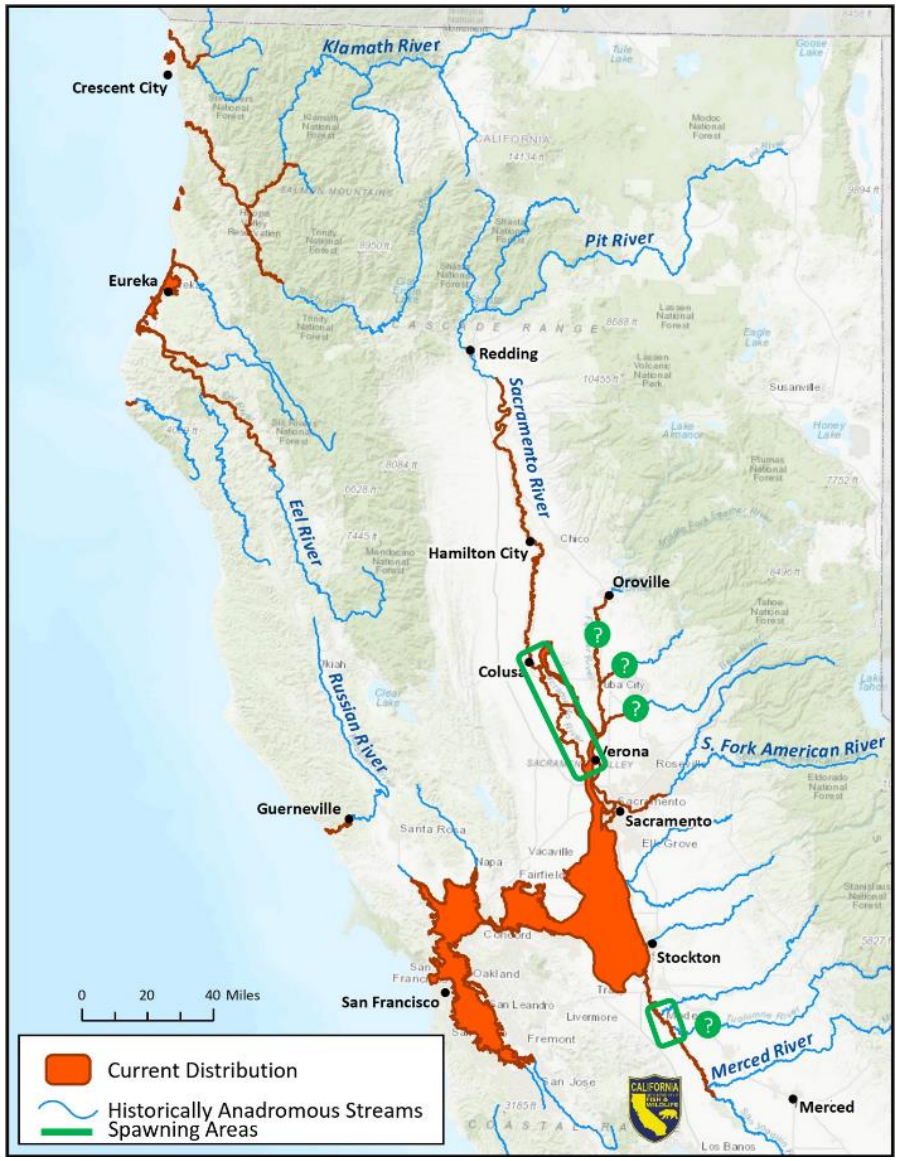
4. Kind of habitat necessary for survival

Rearing, foraging and holding:

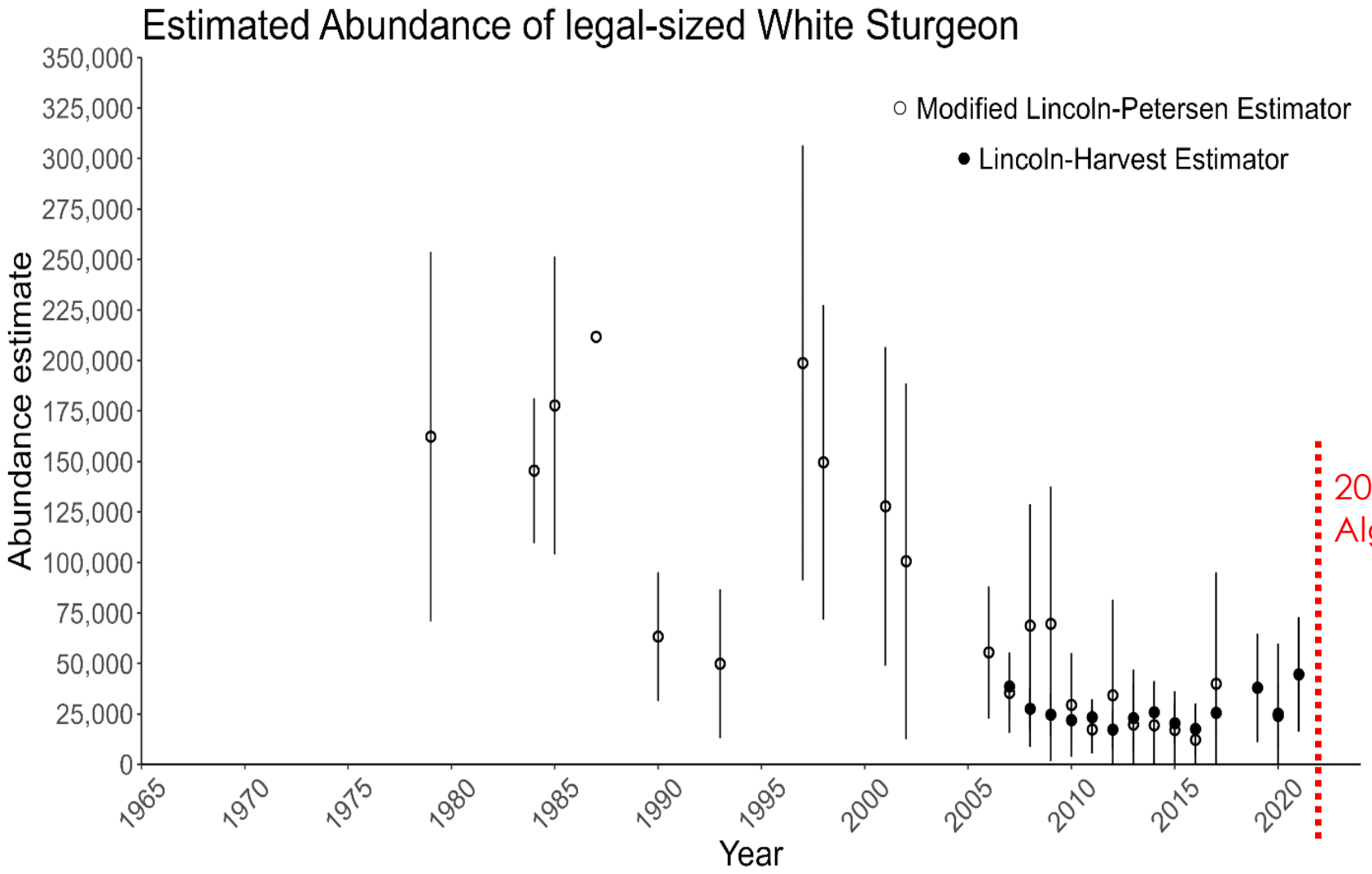
- San Francisco Bay, Estuary, and Delta
- Occasional marine movements

Migrating and Spawning:

- Major Central Valley rivers and tributaries below rim dams, including waterways used for migration
- December – May

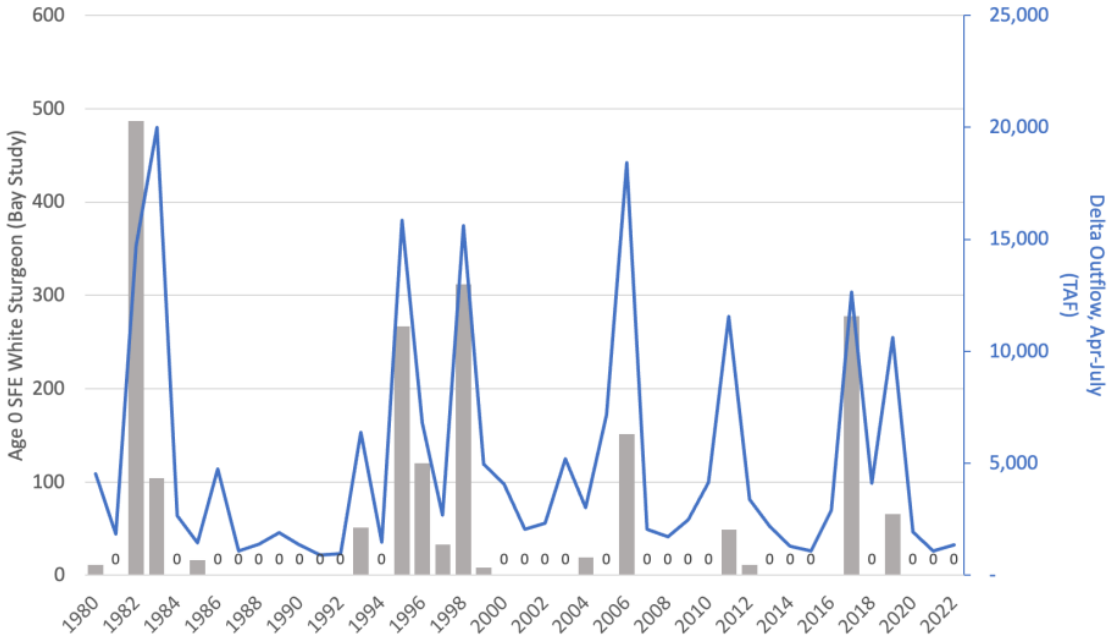


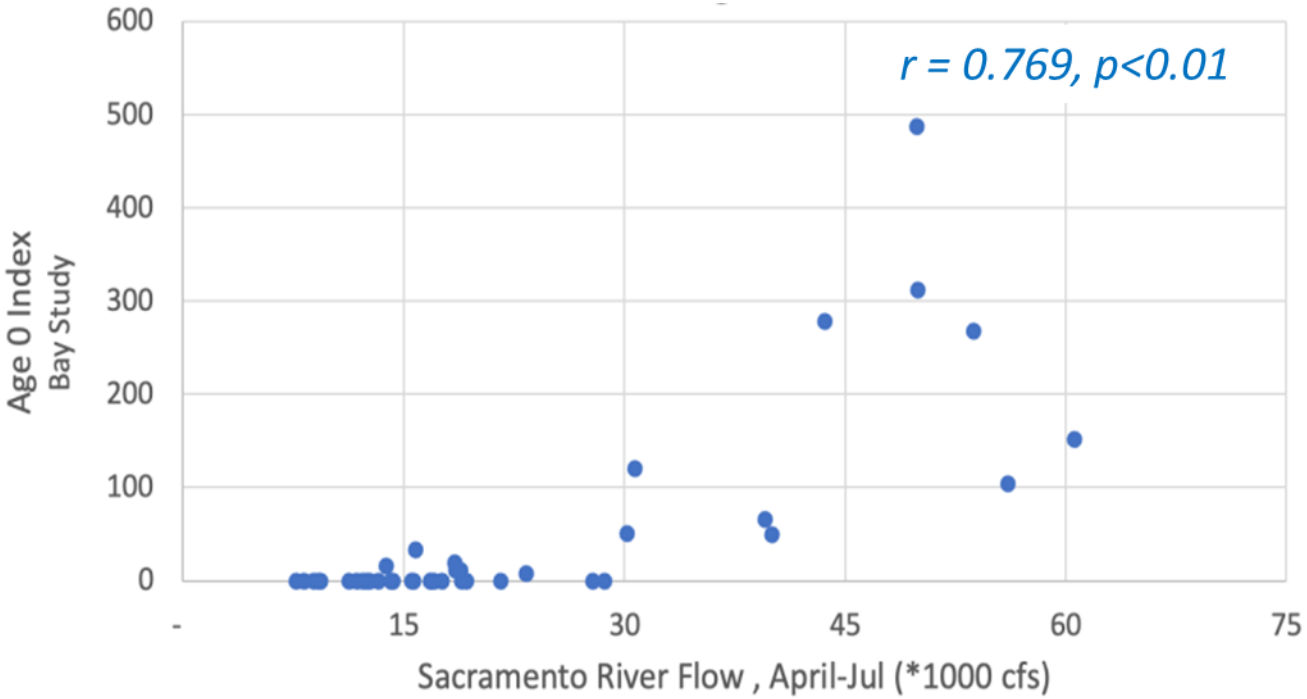
5. Abundance



Most recent 5-year average:
~33,000 legal-sized (40-60 inch FL) fish

6. Population trend: recruitment





- Survival through the first year is highly correlated with high flows in the river and delta
- Successful recruitment is infrequent

7. Factors affecting the ability to survive and reproduce

1) Central Valley water management infrastructure and operations:

- Dams
- Altered hydrograph
- Direct mortality from export
- Water management projects and agreements in development

2) Fishery overharvest

3) Harmful algal blooms

4) Other factors:

- Poaching, pollution, dredging, vessel strikes, climate change

8. Degree and immediacy of threat

- Population decline and low recruitment due to current reservoir and river management
- Flow conditions may be further impacted by major projects in development
- High levels of harvest from recreational fishing
- Threats of harmful algal blooms

Photo: CDFW

9. Impact of existing management efforts

- Minimum flow requirements are not adequate, existing flows may be further reduced in the future
- Concerns with the status of the implementation of flow standards or voluntary agreements for the San Joaquin River
- Emergency fishing regulations and proposed revisions to long-term regulations are insufficient
- Updated wastewater nutrient permits require changes in infrastructure and operations are will take many years to implement

10. Suggestions for future management

- Restore freshwater flows March–July to support juvenile recruitment
- Reduce mortality from entrainment in water operations
- Reduce/limit migratory barriers caused by low water quality in the Delta
- Reduce nutrient input into San Francisco Bay
- Eliminate harvest fishery, shift to catch-and-release
- Enhance monitoring and research efforts

Photo: Z. Medinas

Recommendation

The Department has determined that **the petition provides sufficient scientific information** to indicate that the petitioned action to list White Sturgeon as threatened under CESA **may be warranted**.

Credits | Questions | Contact

Photo: CDFW

Contributors:

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Sturgeon@wildlife.ca.gov

SUSTAINABLY GROWN
IN CALIFORNIA

PLAZA AQUA FARM

10822 GAY ROAD, WILTON, CA 95693 | WWW.PLAZAAQUAFARM.COM | 916.687.0350

June 4, 2024

California Fish and Game Commission

Dear Commissioners

We are writing to you today to provide background information for your consideration in the upcoming discussion on the petition to list White Sturgeon as threatened under the California Endangered Species Act at your upcoming June meeting.

White Sturgeon has been successfully raised in California by registered aquaculture companies since the early 1980's. We have done so in successful cooperation with both the University of California Davis as well as the Department. The Department issued wild broodstock collection permits allowing the initial collection of wild broodstock from state waters under very tightly controlled and monitored conditions. Those wild broodstock collection permits were explicit that the wild fish collected from the wild under those conditions of the permit never belonged to the collector and in fact were property of the people of the State of California. The collection permits, which had to be renewed yearly until such time that domestic broodstock were developed on the farms, had numerous conditions that had to be complied with to renew for another year. When those conditions were met, the collection permits explicitly stated and Fish and Game Code is cited (FGC 15001) that the resultant offspring from legally obtained wild broodstock became the sole property of the registered aquaculturist and was considered private property. It explicitly allowed for the sale of white sturgeon for both meat as well as caviar. These collections of white sturgeon from the wild were completed by the mid-1990s, by which time all reproduction shifted to on-farm, domestic broodstock resulting from these matured progeny. No further wild collections have occurred since. The distinction between wild-harvested vs farm-raised sturgeon is also recognized in FGC 7370. Also of note, Fish and Game Code devotes an entire Division (6.5) to the regulation of sturgeon egg processors, under which the Department issues a special license that the farms operate under in order to process, package and sell caviar (Sturgeon Egg Processors License, FGC 10000 et seq).

A similar situation occurred in 1998 when the USFWS became the co-sponsor of a proposal to list all sturgeon species of the world not already listed on the CITES appendixes onto Appendix II. CITES (Convention on International Trade of Endangered Species) whose best known function is the prohibition of elephant tusks in commerce in order to protect wild elephants, inadvertently drew us farms raising White Sturgeon into a regulatory no man's land. CITES does not make a distinction between wild animals and domestic stocks of those same species being considered for listing. The USFWS recognized that for the first time a grey regulatory area existed, and we worked with the Service for two years in the development of procedures that simplified the international trade of White Sturgeon products. The USFWS only allows products developed from Domesticated White Sturgeon, not originating from products derived from wild

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stock to fall under this regulatory exemption. To this day, international sales of caviar and sturgeon meat is allowed by the USFWS under this regulatory exemption and is tightly controlled via burdensome paperwork trails and product inspections upon export.

This proposed listing in California presents unique and unprecedented circumstances. For potentially the first time, a species has been petitioned to be listed under the State's Endangered Species Act while at the same time, a vibrant private industry farm-raising that same species exists. The Commission should be cognizant of that industry in their consideration of the listing.

CA Fish & Game Code Section 2082 does not prohibit the sale of any endangered or threatened species when the owner can demonstrate that the species, or part or product thereof, was in the person's possession before the date upon which the commission listed the species as an endangered or threatened species. The Commission should recognize that the industry falls under this code section and ensure that the Department recognizes that the White Sturgeon industry does fall under this code section. Likewise, Code Sections 2083 and 2085 provide support for the continued operation of the private aquaculture industry of White Sturgeon in California despite any listing of the wild stocks under the States ESA.

We urge the Commission to be cognizant of these issues in their consideration of the petition to list White Sturgeon as Threatened and utilize any discretionary authority they may have to make it clear that there is a distinction between wild stocks and domestic private stocks and their continued trade. As the listing process moves forward, we are very willing and open to working with the Department and the Commission to ensure that these private enterprises are not compromised inadvertently.

Thank you very much for your consideration.

Sincerely

Ali Bolourchi

President

A B 6/4/2024

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Refer To File # 300115-0001

VIA EMAIL

June 5, 2024

Samantha Murray, President
California Fish and Game Commission
715 P Street, 16th Floor
Sacramento, CA 95814
fgc@fgc.ca.gov

Charlton Bonham, Director
California Department of Fish and Wildlife
715 P Street
Sacramento, CA 95814
chuck.bonham@wildlife.ca.gov

Re: Petition to list the California white sturgeon as threatened under CESA and 90-day evaluation

Dear President Murray and Director Bonham:

This letter is prepared and submitted on behalf of the Coalition for a Sustainable Delta. We are writing to urge the Commission to make a "not warranted" finding in response to the petition submitted by the San Francisco Baykeeper, the Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance to list the California white sturgeon (*Acipenser transmontanus*) as a threatened species under the California Endangered Species Act (CESA), Fish & Game Code section 2050 et seq. We respectfully disagree with the California Department of Fish and Wildlife's (Department) evaluation opining that listing "may be warranted." The California Fish and Game Commission ("Commission") should reject the petition because: (1) is incomplete inasmuch as it fails to include the best scientific information available regarding the species, (2) the best scientific information available demonstrates that the abundance and range of the California white sturgeon have been stable for the past two decades or more and (3) the Commission took appropriate regulatory action in October 2023 and again in April 2024 to address over-exploitation of white sturgeon in the recreational fishery, which the best available scientific information indicates will contribute to the conservation of the species into the foreseeable future.

I. Legal Background

Section 2070 of the Fish and Game Code provides that "[t]he commission shall establish a list of endangered species and a list of threatened species." CESA defines an endangered species as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation,

competition, or disease." (Fish & G. Code, § 2062.) It defines a threatened species as a "native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter." (Fish & G. Code, § 2067.)

Any person can submit a petition to list a species under CESA. To be accepted, a petition must include sufficient scientific information that the petitioned action may be warranted. (Fish & G. Code, § 2072.3.) The Fish and Game Code provides that the petition must include information regarding "the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information," and "the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant." (*Id.*)

Caselaw clarifies that a species does not qualify for candidate status if there is not sufficient information that would lead a reasonable person to conclude that the petitioned action may be warranted. (*Natural Resources Defense Council v. Fish & Game Com.* (1994) 28 Cal.App.4th 1104, 1119; see also *Center for Biological Diversity v. Fish & Game Com.* (2008) 166 Cal.App.4th 597.) The Commission cannot blindly accept assertions regarding the status of the species in a listing petition. Rather, it has the legal obligation to evaluate the information in the petition and other available information and determine whether the petition's claims are accurate and credible. (*Id.* at pp. 1119, 1125.) The "may be warranted" finding in section 2074.2 requires a determination that there is a "substantial possibility" that the petitioned action is warranted. (*Id.*)

The petition in this instance proposes to list the California white sturgeon as threatened. In light of the definition of "threatened" in CESA -- "likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts" -- the Commission is required to determine that there is a substantial possibility that the California white sturgeon is likely to become an endangered species "in the foreseeable future" absent "special protection and management efforts." (Fish & Game Code, § 2062.)

II. The Trend and Abundance Data in the Petition Do No Support Candidacy

Petitioners contend that "[s]everal data sets reveal a decline in SFE White Sturgeon abundance over the past 25 years." Petition, p.18. The petition points to three data sets: (1) the Department's Bay Study, (2) the Department's Adult Sturgeon Study, and (3) two mark-recapture estimates from tags placed in legal-sized white sturgeon and recovered by anglers.

Petitioners fail to acknowledge that the three data sets in the petition are presented in graphical form only, hence do not and cannot provide reliable bases for inferential estimates of white sturgeon abundance. (See figures 4, 5, and 6 in the petition.) Presentation of data ***only*** in graphical form, without including the underlying raw data in some accessible form, precludes any quality-control assessment of those data or independent analysis of them. Incomplete presentation of

information is contrary to use of best available scientific information in support of regulatory decisions under endangered species laws (Murphy and Weiland 2016).

Furthermore, petitioners misinterpret those data sets.

A. The Bay Study

The first data set cited by petitioners in support of their argument regarding a decline in abundance is from the Interagency Ecological Program's Bay Study (figure 4 in the petition; Figure 1 below). The Bay Study, established in 1980, samples monthly fish and crustaceans in the open waters of San Francisco Bay and the Sacramento-San Joaquin Delta (with stations added in the lower Sacramento and San Joaquin rivers in the 1990s). While in a gross sense the Bay Study overlaps with a portion of the area occupied by white sturgeon in the Bay and Delta, it misses a material portion of the species' range within that area. Further, the sampling design and methods of the survey are not explicitly intended to target young-of-the-year (YOY) white sturgeon nor do they systematically or randomly sample known or likely YOY white sturgeon habitat.

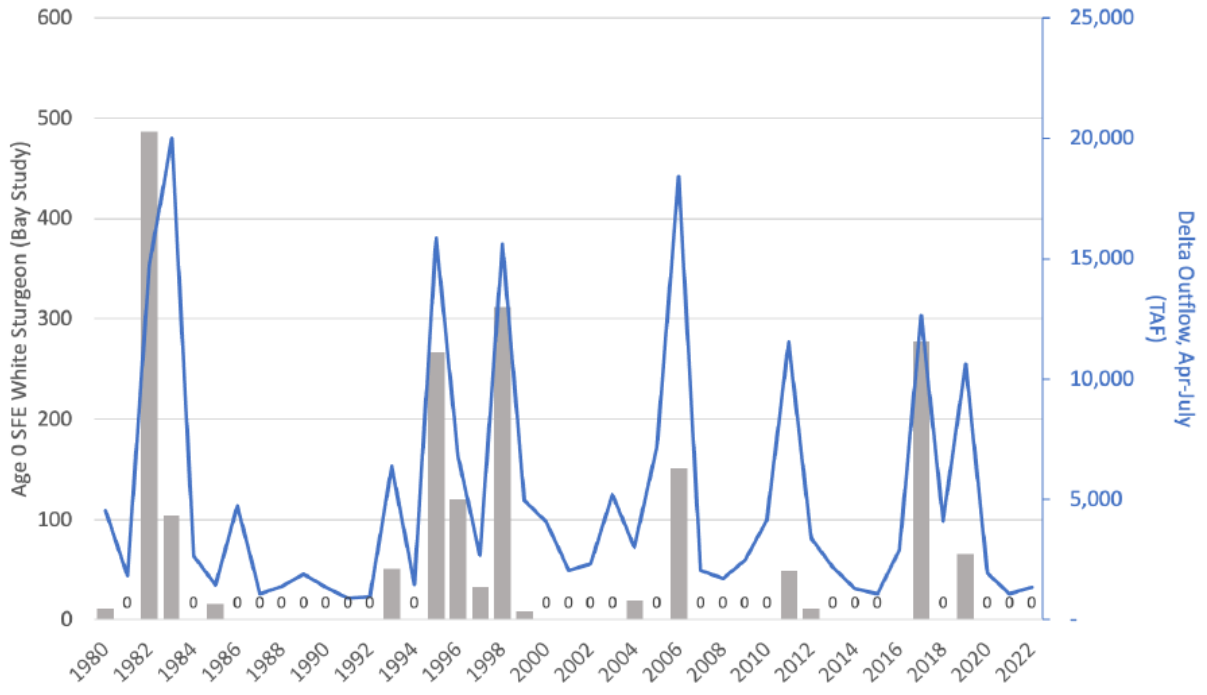


Figure 1. *This is Petition Figure 4, which reports on the left axis and in a bar graph the age 0 white sturgeon caught in the Bay Study and on the right axis and in a line graph the average Delta outflow from April through July for the period 1980-2022 (excluding 2016).*

Because the Bay Study does not sample a closed white sturgeon population, either employing randomly sited stations across the whole of the distribution of the species or stations distributed

across habitat strata occupied by the fish, it cannot yield census data from which reliable population estimates can be made.

While petitioners contend that the whipsaw recruitment data from the Bay Study presented in Petition figure 4 demonstrate a "decreasing trend in abundance," Petition, p.18, those data do not and cannot provide any information about the magnitude of a decreasing trend and, for that matter, any information regarding uncertainties attending the inter-year fluctuations in recruitment. Because the Bay Study samples YOY white sturgeon, and the species is long-lived (not reaching sexual maturity until 10-16 years and with a lifespan that can extend to 100 years) and reproduction is apparently episodic, substantial inter-year variation in recruitment should be expected. Data regarding early life stages of the species taken on their own are of limited informational value in generating population viability projections over time.

It is not possible to determine if YOY White Sturgeon abundance has decreased over the period of record based on the data presented in Figure 1. This is partly due to the sporadic nature of recruitment and partly due to the lack of tabular data and statistical testing. Visual examination of the graph could lead to the interpretation of declining recruitment. However, it could equally lead to the conclusion that recruitment is sporadic but stable, especially if 1982 is regarded as an outlier year. Absent any trend line or statistical test results, it is not possible to determine if any decreasing trend is statistically or biologically significant.

B. The Adult Sturgeon Study

The second data set presented by petitioners is from California Department of Fish and Wildlife mark-recapture studies of white sturgeon in the San Francisco Estuary. Whereas petitioners do not quantify the extent of decline of catch in the Bay Study over time, petitioners nonetheless contend that the mark-recapture studies "reveals [sic] a decline of approximately 80%." Petition, p.19, incorrectly referencing figure 4, rather than correctly figure 5. Petitioners make no attempt to characterize the uncertainty associated with the 80 percent "estimate," nor offer a confidence interval around that value, although doing so is standard practice.

The graphical representation of data in Petition figure 5 (Figure 2 below) includes two distinct data sets (paired on the same time axis) – one based on a modified Lincoln-Petersen estimator and a second based on a Lincoln-Harvest estimator. Petitioners do not explain whether the data derived using the two separate estimators are comparable or their limitations, biases, and assumptions.

The Lincoln-Petersen estimator is calculated using the number of white sturgeon tagged (M), the total number of white sturgeon harvested (C; with or without tags), and the number of white sturgeon harvested with a tag (R) (see CDFW 2023 for calculation details). This produces a statistically unbiased estimate of white sturgeon abundance. In contrast, the Lincoln-Harvest estimator is generated by dividing the total number of white sturgeon reported harvested (C) by exploitation rates calculated from reported tag returns (μ) (see CDFW 2023 for calculation details).

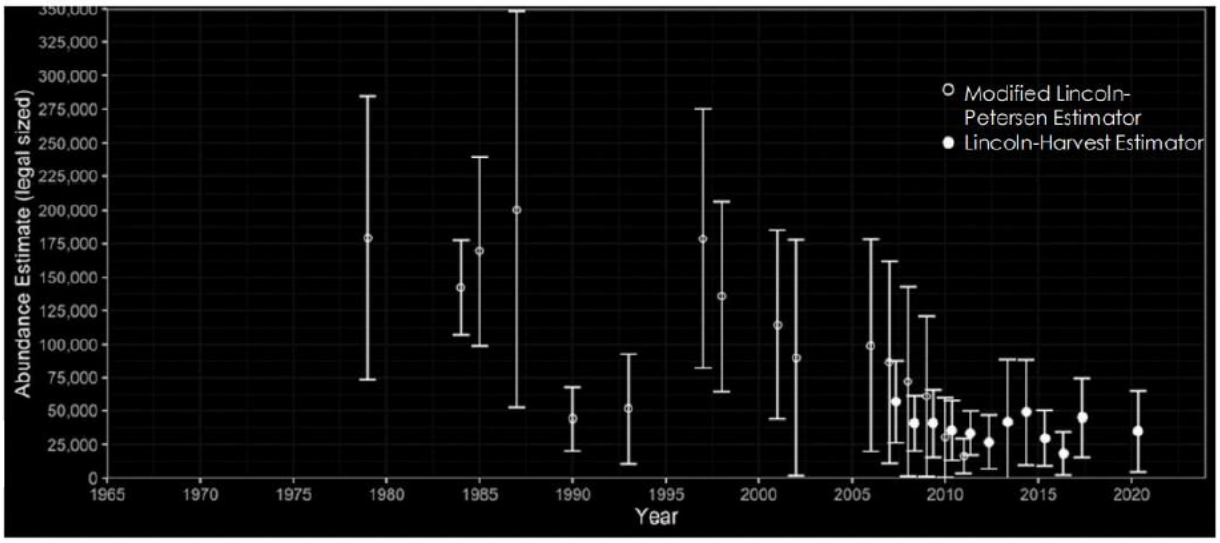
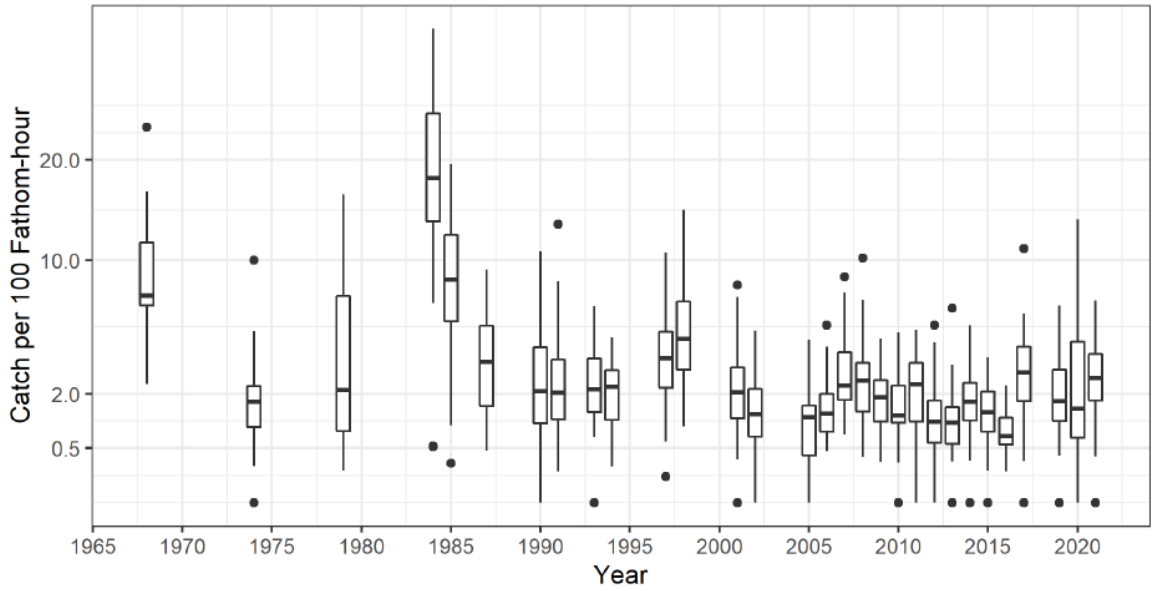


Figure 2. *This is Petition figure 5, which includes estimated abundance of slot-sized white sturgeon based on Department mark-recapture studies using two different estimators.*

However, the Department acknowledges that 70% of harvest cards are never returned. This means harvest values using the Lincoln Harvest estimator "represent a minimum harvest" (CDFW 2023). There is a known bias towards non-reporting in anglers who did not fish and/or did not capture a fish (CDFW 2019). Therefore, Figure 2 is comparing a statistically unbiased population estimate early in the time-series to an acknowledged minimum population estimate later in the time series.

Both estimators assume that the population is closed; that is, there are no births, deaths, or individuals entering or leaving the study area, therefore, the accuracy of the "estimates" is compromised. Understanding that the estimators are inappropriate in application by conservation planners, the graphed values point to separate concerns regarding the data. The Lincoln-Peterson estimator shows annual estimates wildly fluctuating between years, wholly unrealistic for a long-lived fish, suggesting an invalid sampling design. Data informing the Lincoln-Harvest estimator over the past decade and a half in contrast show the white sturgeon population to be stable, not declining as asserted by the petitioners.

The primary purpose of the Adult Sturgeon Study is to tag legal-sized white sturgeon for recapture and reporting in the recreational fishery (see mark-recapture estimate discussion below). It can also provide an index of legal-sized white sturgeon abundance, though the reliability of that index is questionable. Figure 3 below (CDFW 2022) provides a more complete picture of the adult white sturgeon index than Figure 2 also above (that is, Petition figure 5). This figure could be visually interpreted as showing a decline from the 1970s through present, especially when



Notes: Horizontal bar within box denotes median value, top of box the 75th percentile, bottom of box the 25th percentile outliers by points above and below whiskers, and whiskers extend to 1.5 times the interquartile range. Note y axis is on a square root scale.

Figure 3. *Box plot of daily catch per unit effort (catch per 100 net fathom hour, calculated per day) of white sturgeon captured during Department Adult Sturgeon Population Study tagging operations. Source: CDFW 2022 (Figure 8).*

considering two years with higher catches in the mid-1980s. However, the 95% confidence intervals from the large majority of years (even those with the highest captures) overlap, indicating no significant difference between individual years though there may still be a significant trend across years. Also, median values since the 1990s could be visually interpreted as low but stable through the present time.

C. Trammel net survey data

The third data set presented by petitioners is from the Department's Adult Sturgeon Study (figure 6 in the Petition; Figure 4 below). The survey employs trammel nets to capture white sturgeon so that they may be tagged to estimate the population and harvest rate of legal-size white sturgeon. As described previously, the use of the tagging data depends on recreational anglers, who return tags from legal-sized fish. Whereas petitioners argue that the tagging data reveal a decline in abundance over the past 25 years, the CPUE data provided by the trammel net survey presented from 1987 forward appear to indicate stability in white sturgeon numbers. Similar to the graphical presentations in the figures above and absent statistical testing, the contention that the data reveal a decline is unsupported by Figure 4. The data reports catch per unit effort rather than either a census of the species or an estimate of relative abundance derived from random sampling across the distribution of the species.

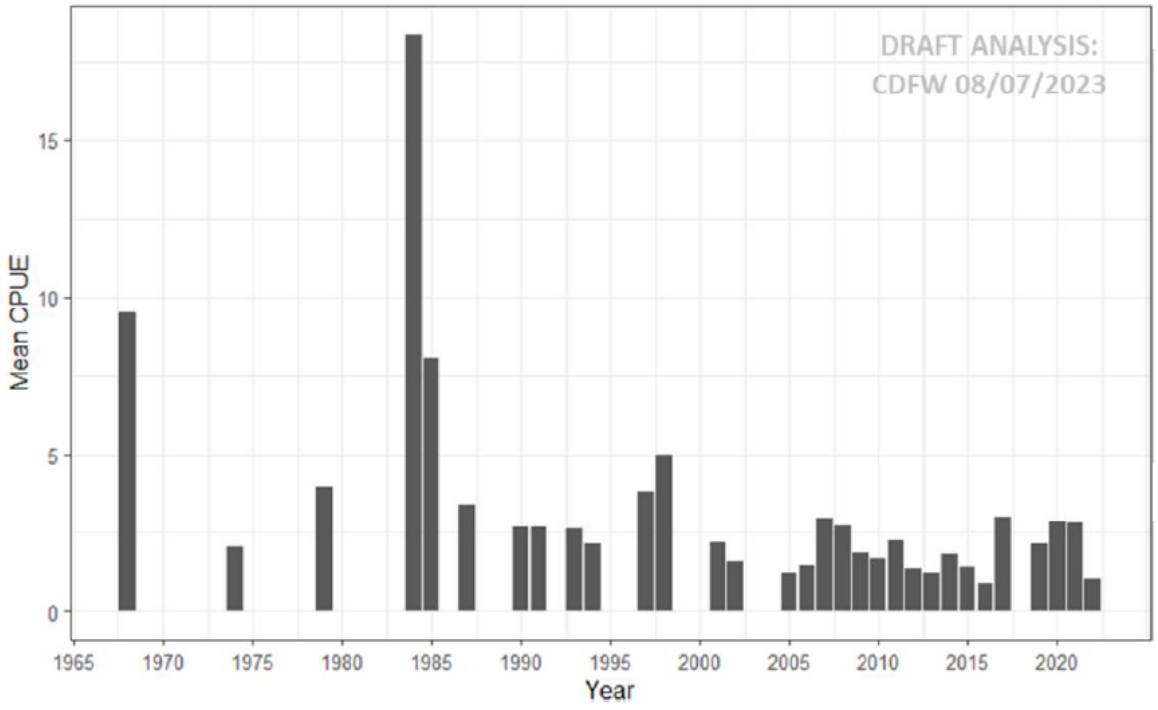


Figure 4. *Mean annual catch per unit effort (CPUE) of white sturgeon by the Department Adult Sturgeon trammel net survey.*

With regard to status and trend, ***the data presented graphically in Figures 1 through 4 above appear to indicate stability of the white sturgeon population over the past 20-25 years***. Petitioners neither disclose the population growth-rate trajectories that would be projected from the three data sets nor make any attempt to describe the relative reliability of the data sets nor synthesize legitimate conclusions that might be drawn from them. Here, too, the petition fails to present the best available scientific information. See Murphy and Weiland (2016) and National Research Council (2004).

III. The Distribution Data in the Petition Do Not Support Candidacy

Petitioners observe that "[i]mpassable dams have blocked access to important spawning habitats throughout the Central Valley." (Petition, page 16) It is true that a reduction in the distribution of white sturgeon in upper river tributaries has occurred as a consequence of dam construction, along with a reduction in white sturgeon carrying capacity in the system, but that construction occurred many decades ago. For examples, Shasta Dam was completed in 1945 and Oroville Dam was completed in 1968.

Figure 2 in the petition purports to display the current and historical distribution of white sturgeon, but rather the figure displays current distribution and "historically anadromous streams." Petitioners may be making the case by implication that mapped historically anadromous streams can be a proxy for the historical range of white sturgeon. But they do not make the case for this proposition. More importantly, ***the petition includes no data or analyses that indicate an actual constriction of the distribution of SFE white sturgeon over the past half century***, nor what the impact of tributary dams have had on white sturgeon spawning opportunities or performance, or on attributes of the white sturgeon's life cycle.

IV. The Petition Relies on Generic Information when Assessing Threats

The petition includes very limited analysis of threats that are specific to the California white sturgeon. Instead, the petition presents general factors that ***may*** impact the species, then devotes less than a page to the degree and immediacy of the potentially most significant of those threats. For examples, the petition states:

- With respect to water diversions, "[c]urrent management of river and estuarine flows (i.e., regulation of reservoir operations and diversions) constrains the productivity of the population and promotes gradual, but persistent decline in the population."

- With respect to harmful algal blooms, "[g]iven the combination of excessive nutrient loading, increased water diversions, and climate change, it is likely harmful algal blooms will occur with increased frequency and severity, leading to future fish kills and impairments of migrations."

(Petition, at p. 33.) The discussion includes no specificity or analysis of threats to the specific species covered by the petition. A generic assessment of threats to "fish" generally does not suffice to meet the requirement to identify the degree and immediacy of the threats to the specific species that petitioners are proposing to add to California's list of threatened and endangered species.

V. The Petition Fails to Establish or Support the Contention that Special Protection and Management Efforts are Needed

This Commission has broad authority under the Fish and Game Code to regulate the taking or possession of fish including white sturgeon. (Fish & G. Code, §§ 200, 205.) This authority includes the ability to establish temporal and spatial restrictions. (*Id.*) It also includes the ability to set bag, possession, and size limits. (*Id.*) And it includes the ability to prescribe both the manner and means of taking. (*Id.*) The Commission has for decades authorized a recreational white sturgeon fishery. Petition, p.18 ("A recreational White Sturgeon fishery was opened in 1954 and continues to this day.")

From 2007 to 2012, the recreational fishery harvest was limited to one fish per day, with no annual limit, and a "slot" restriction limiting harvest to fish 46 to 66 inches in total length. From 2013 to 2023, the recreational fishery harvest was limited to one fish per day, with an annual limit

of three fish, and a slot limit of 40 to 60 inches in total length. Beginning with the emergency regulation adopted in October 2023, the Commission imposed a regulation of one fish per year, two per boat in possession, and a slot limit of 42 to 48 inches fork length (FL) along with seasonal area closures. These actions very likely obviate the need for any further action by the Commission to protect white sturgeon.

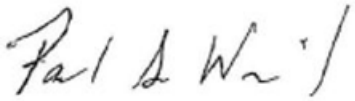
As the Department explained to the Commission when it recommended more restrictive fishing regulations for SFE white sturgeon, the species is subject to overexploitation and cannot absorb the historical fishing pressure. John Kelly, White Sturgeon Emergency Regulation Recommendation (Oct. 11-12, 2023). Historical exploitation rates of between 8 and 30 percent were reported by Blackburn et al. (2019) in the *North American Journal of Fisheries Management*. Those rates are greater than the 5 to 10 percent total mortality rate the authors reference as the maximum for sustainable sturgeon populations. Blackburn et al. conclude that the white sturgeon population in the San Francisco Estuary could be expected to decline if historical exploitation rates were maintained. The logical inference that can be drawn based on this conclusion is that reduction of white sturgeon exploitation rates could result in a positive population growth rate and obviate the danger of it becoming extinct in all or a significant portion of its range.

White sturgeon are long-lived, late maturing fish so there can be substantial lag time between regulation implementation and its intended effects. It is difficult to determine how long the recently adopted restrictions need to remain in effect before it is possible to assess their efficacy. Three years would likely be sufficient to calculate exploitation rates and determine if the regulation reduced those rates. However, determining if those reductions affected population abundance and trend would likely take 5 to 7 years, at minimum, and 10 years or more might be required given the generation times for white sturgeon. Given the action taken by the Commission in late 2023 and again earlier this year, the white sturgeon population is not likely to become an endangered species in the foreseeable future. This is the case because the Commission recently adopted special protection and management efforts that must be assessed over time, but that are expected to contribute to the long-term persistence of white sturgeon in all or a significant portion of its range.

VI. Conclusion

In light of the foregoing, we urge you to reject the petition.

Respectfully,



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Encl.: List of References

List of References

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CALIFORNIA AQUACULTURE ASSOCIATION

June 6, 2024

California Fish and Game Commission
715 P Street, 16th floor
Sacramento, 95814

Re: Petition to List White Sturgeon

Dear Commissioners:

The California Aquaculture Association (CAA)[i] has collaborated extensively over the years with the Commission, the Department, and various regulatory and research organizations to develop the United States' largest producer of farm-raised sturgeon caviar. Partnering with NGOs dedicated to preserving wild sturgeon stocks in the U.S. and worldwide, a regulatory framework was established to safely collect wild broodstock white sturgeon from spawning rivers as initial seed stock for the industry.

Collaborations with the University of California led to the creation of domesticated broodstock on farms, and no wild fish have been collected for over 30 years. Research conducted at the University has provided secondary benefits to resource managers at CDFW and other agencies, enhancing the understanding of white sturgeon biology and benefiting wild sturgeon population management both domestically and internationally.

Numerous NGOs have supported the development of the sturgeon farming industry, viewing it as a way to alleviate pressure on wild sturgeon stocks and reduce illegal fishing. The successful California program has been replicated globally, leading to significant commercial competition from farmed caviar imported and sold in the U.S. Today, nearly all caviar in international trade is farmed.

Given the substantial proportion of imported seafood consumed in the U.S., CAA works to maintain a regulatory environment that supports the farming of various seafood products, thus reducing reliance on imports. This regulated environment ensures a safer seafood supply for U.S. consumers.

CAA urges the Commission to consider the benefits and its historical role in developing the California white sturgeon industry when evaluating the petition to list white sturgeon as threatened. Numerous regulations in the Fish and Game code support and govern sturgeon farming in California. Please consider these regulations and the industry's role in meeting domestic caviar and sturgeon flesh demand. Support for this industry is vital, as it does not negatively impact wild sturgeon populations and contributes to the understanding of wild sturgeon biology.

As the petition to list white sturgeon as threatened progresses, it is crucial for the Commission to distinguish between wild populations and farmed sturgeon. CAA and the industry are ready to provide any necessary support during the listing process to ensure this distinction is clear. It is important that new regulations or limitations to protect the resource do not inadvertently constrain the industry.

Sincerely,

Tony Vaught
President, California Aquaculture Association

[i] The California Aquaculture Association (CAA) is a producer-supported association representing finfish, shellfish, and algae growers and seafood related businesses throughout California since 1983. The CAA promotes commercial production of plants and animals in aquatic systems to satisfy the needs of consumers for wholesome products that are produced by sustainable means conserving California's land and water resources.

June 6, 2024

Via Email: fgc@fgc.ca.gov

California Fish and Game Commission
P.O. Box 944209
Sacramento, CA 94244-2290

Re: Petition to list the California White Sturgeon (*Acipenser transmontanus*)

Dear Commissioners:

On November 29, 2023, several environmental organizations petitioned the Fish and Game Commission ("Commission") to have the California White Sturgeon ("White Sturgeon") listed as threatened under state law ("Petition"). This letter is in response to that Petition. In summary:

- The White Sturgeon population size has been stable for the last 14 years.
- The Petition ignores several state and federal regulations that are already in place to provide current and ongoing protection for White Sturgeon.
- The estimated White Sturgeon population size is nearly 7 times larger than the recovery criterion for Green Sturgeon identified in the NMFS 2018 Recovery Plan.
- The Petition is flawed and does not rely on the best available science.

The State Water Contractors (SWC)[1] and the San Luis & Delta Mendota Water Authority[2] (SLDMWA) are providing these comments on behalf of themselves and their member agencies

[1] SWC member agencies: Alameda County Flood Control & Water Conservation District, Zone 7, Alameda County Water District, Antelope Valley-East Kern Water Agency, Casitas Municipal Water District, Castaic Lake Water Agency, Central Coast Water Authority, City of Yuba City, Coachella Valley Water District, County of Kings, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, Dudley Ridge Water District, Empire, West Side Irrigation District, Kern County Water Agency, Littlerock Creek Irrigation District, Metropolitan Water District of Southern California, Mojave Water Agency, Napa County Flood Control and Water Conservation District, Oak Flat Water District, Palmdale Water District, San Bernardino Valley Municipal Water District. San Gabriel Valley Municipal Water District, San Gorgonio Pass Water Agency, San Luis Obispo County Flood Control and Water Conservation District, Santa Clara Valley Water District, Solano County Water Agency, and Tulare Lake Basin Water Storage District

[2] SLDMWA member agencies: Banta-Carbona Irrigation District, Broadview Water District, Byron Bethany Irrigation District, Central California Irrigation District, City of Tracy, Columbia Canal Company (a Friend), Del Puerto Water District, Eagle Field Water District, Firebaugh Canal Water District, Fresno Slough Water District, Grassland Water District, Henry Miller Reclamation District #2131, James Irrigation District, Laguna Water District, Mercy Springs Water District, Oro Loma Water District, Pacheco Water District, Panoche Water District, Patterson Irrigation District, Pleasant Valley Water District, Reclamation District 1606, San Benito County Water District, San Luis Water District, Santa Clara Valley Water District (Valley

who work together to provide water to more than 29 million California residents and 1.9 million acres of farmland throughout the state, as well as listed species and millions of waterfowl that depends upon nearly 200,000 acres of managed wetlands and other critical habitat within the largest contiguous wetland in the western United States.

For reasons provided in this letter, the Petition is incomplete, lacks evidence, and therefore does not meet minimum standards for acceptance. The Commission should reject the Petition and thereby not add White Sturgeon to the list of candidate species. If the Commission ignores the incompleteness of the Petition and accepts the Petition, the Commission should acknowledge that there is no evidence before it that would support a finding that the operation of the State Water Project (SWP) and Central Valley Project (CVP) is a primary threat to White Sturgeon based on the information presented in this letter. Should the Commission accept the Petition, it should not list the White Sturgeon after the candidacy period, for there is no rationale for supporting such a decision.

The Commission recently adopted emergency fishing regulations for White Sturgeon to bring commercial harvest down to sustainable levels, particularly in light of the recent red tide events. Commercial harvest far exceeded levels that are believed to be sustainable, being a recent historic harvest rate of 8-29.6% (2007-2015)[3] of the population when a harvest rate of 3-4% of the population is more in line with published literature and harvest practices of neighboring states. In doing so, the Commission has already taken the most reasonable action to protect the species, and it is an action that is already within the authority of the Commission. There are no actions beyond those already taken by the Commission that are necessary or appropriate for the protection of White Sturgeon. The Commission should allow time to determine if this recent action results in increased species abundance. Therefore, the Commission does not need to list White Sturgeon to continue to protect the species.

1. Petition Should Not be Accepted by the Commission

As explained in the March 2024 California Department of Fish and Wildlife (CDFW) Petition Evaluation Report (Evaluation Report), the California Endangered Species Act (CESA) sets forth a two-step process for listing a species. First, the Commission determines whether the California Fish and Game Code § 2074.2 factors have been met and, if so, accepts the Petition. If the Petition is accepted, CDFW has 12 to 18 months to produce a peer-reviewed report based on the best scientifically available information available to determine whether listing is warranted. The Commission will consider that report and other evidence in the record and make a final listing decision.

The Petition fails the first step in this process, and it should not be accepted. The appropriate test for determining whether the Section 2074.2 factors have been met was articulated in the Center for Biological Diversity, which explained that:

Water), Tranquillity Irrigation District, Turner Island Water District, West Stanislaus Irrigation District, and Westlands Water District.

[3] California Fish and Game Commission, Finding of Emergency and Statement of Proposed Emergency Action, October 27, 2023, p. 1.

> …the standard, at this threshold in the listing process, requires only that a substantial possibility of listing could be found by an objective, reasonable observer.

(*Center for Biological Diversity v. Fish and Game Commission* (2018) 166 Cal. App. 4th 597, 610-611). An objective and reasonable observer would certainly require that evidence be the foundation of the Petition. There are numerous examples of missing evidence. Some examples are as follows:

- The Petition states that "salvage has been episodically high" and cites salvage from 2023. (Petition, p. 20 ["while also recognizing that "high mortality in 2023 likely reflects relatively large cohort of YOY produced following record precipitation and runoff."]). The Petition provides no evidence of the relative effect of salvage on the population of White Sturgeon. Therefore, no evidence was provided as to the degree or immediacy of the effect.

- The Petition provides evidence of potential future changes in flow but makes no attempt to provide evidence that would link the potential change in flow to a large and imminent threat to the species. For example, the Petition states that the proposed Delta Conveyance Project and the Sites Reservoir Project, as well as the State Water Resources Control Board staff's Proposed Action (55% of the unimpaired hydrograph) and the proposed Healthy Rivers and Landscapes program that are alternatives in the Water Quality Control Plan update, are all threats to White Sturgeon. (Petition, pp. 27-28). In fact, the California Environmental Quality Act compliance document for each of the proposed projects or actions considered potential effects on White Sturgeon, applying the known flow to year class strength statistical relationship and found that each of these projects or actions would either have little to no negative effect, or a positive effect, on species abundance.[4] The Petition does not provide evidence that would link the flow changes proposed by Sites Reservoir and Delta Conveyance to project-related changes in species abundance, rather, it is assumed. (Petition, p. 27). As it relates to alternatives being considered in the Water Quality Control Plan update, the evidence provided in the Petition and the resulting concern is that these actions would not recover the species, and the cited studies are indicative of flows required for recovery. (Petition, p. 27). The Petition, of course, ignores evidence that the White Sturgeon adult population far exceeds the recovery standard for Green Sturgeon, a very similar species. (NMFS 2018).[5] Regardless, the test for whether the listing is warranted is whether there are imminent threats to the species and not whether proposed actions are providing enough benefit.

- The Petition describes the "red tide" algal blooms that occurred in 2023 in the Bay and then observed that both Microcystis and White Sturgeon exist in the San Joaquin River.

[4] Final Delta Conveyance EIR, pp. 12-213 to 12-214; Final Sites Reservoir EIR/S, p. 11-275; and SWRCB Draft Staff Report, p. 7.6.2-38.

[5] National Marine Fisheries Service. 2018. Recovery Plan for the Southern Distinct Population Segment of Northern American Green Sturgeon (*Acipenser medirostris*). West Coast region, California Central Valley Office, Sacramento. http://repository.library.noaa.gov/view/noaa/18695

(Petition, p. 30-31). The Petition, however, contains no evidence that would link Microcystis in the San Joaquin River to any change in White Sturgeon abundance or survival. Therefore as it relates to the Delta, there is no evidence of any actual impact to White Sturgeon from Microcystis.

- The Petition's data regarding historic abundance is incomplete. Representations of historic population data should not be accepted without the source data also being provided. For example, Petition Figure 3 illustrates data described as commercial harvest data from 1875-1889 but fails to provide the underlying raw data. It is impossible to assess the data on the basis of the graphs alone without simply assuming that the data are correctly presented. The cited source for Figure 3 is Skinner 1962, but neither the figure nor the source data is apparent in that publication, and the location of the reported harvest is unknown. In another example, Petition Figure 4 illustrates the CDFW data, but the age-1 data, in part of the original combined age-0 and age-1 dataset, was excluded. CDFW calculates the annual year-class index from catches of age-0 and age-1 sturgeon in systematic San Francisco Bay Study trawl surveys. The Petition lists annual year class indices based on catches of age-0 sturgeon, having removed the age-1 data for an unknown reason. There is a parallel Petition to list White Sturgeon filed by the same parties under federal law, but the corresponding figure showing age-0 sturgeon in that federal Petition does not match the corresponding Figure 4 in this state Petition. The reasons for the differences in the presentation of what appears to be the same dataset is not apparent. The data presented in the Petition cannot be verified, and the apparent inconsistencies are not understood.

The information presented in the Petition is insufficient, not meeting the minimum required for the "may be warranted" determination, and therefore, the Petition should not be accepted by the Commission. The failure to rely on evidence is important and has real-world implications. For example, the Department of Water Resources would have to obtain new permits for the operation of the SWP and likely adopt significant mitigation during the candidacy period to meet the California Endangered Species Act section 2081 standard for obtaining "take" authorization.

2. Listing the White Sturgeon is Not Warranted

The current regulatory framework is protective. The White Sturgeon is not appropriate for listing because the existing regulations that manage the Bay-Delta system are protective. The protectiveness of the existing regulations is evidenced by the stable population numbers over the last 14 years and because entrainment at the SWP and CVP water diversion facilities in the south Delta is low relative to species abundance. The Petition's description of alleged SWP and CVP caused changes in outflow is based on a flawed study; and in fact, the SWP and CVP have been supplementing summer outflows for decades compared to what occurred without the CVP and SWP. (Hutton et al. 2017, p. 2522).[6]

[6] Hutton, P.H., Rath, J.S., Sujoy, B. R. 2017. Freshwater flow to the San Francisco Bay-Delta estuary over nine decades (Part 2), change attribution. Hydrological Processes, 31: 2516-2529.

a. White Sturgeon abundance has been stable for the last 14 years.

As reported by CDFW, estimates of White Sturgeon abundance show that the population has been stable from approximately 2008 to 2022, with data for 2023 not yet available. This stable trend is consistent across surveys. However, the Petition makes conclusions related to species abundance trends, making a comparison to the highest abundance time-period in more than 100 years, which occurred in the 1980s, and then denoting a downward trend. The White Sturgeon population crashed around 1900 due to commercial overfishing and peaked in the 1980s (see Figures 1-3 below), which was an unusually wet time-period. (See Hutton et al. 2017, p. 2504, Fig. 4, denoting relative wetness of the 1980s). Therefore, any comparison of the White Sturgeon population to the highest abundance time-period would result in a downward trend. As far as determining whether current regulations are protective, it is the recent decade[7] that would inform the question of the immediacy of threats rather than the 30 years since historic peak abundance. The current population is stable. White Sturgeon abundance has been stable for at least 14 years.

- From 2007-2021, White Sturgeon abundance of 40-60 inch fish varied between 18,000 and 45,000 (See Fig. 1, below). The most recent CDFW five-year average abundance estimate (2017-2022) was approximately 33,000. (CDFW 2023, p. PDF 50).[8]

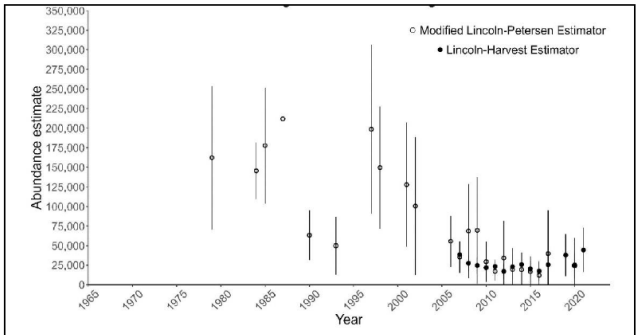

Figure 10. *Estimated abundance of legal-size White Sturgeon using the Modified Lincoln-Petersen (open circles) and Lincoln-Harvest (black points) estimators. Years with missing data were either not sampled or did not contain sufficient tag returns to provide an estimate.*

Figure 1. Mark-recapture estimates of 40-60-inch fork length White Sturgeon abundance based on tagging in annual net sampling from August-October and recaptures of external reward tags by recreational anglers (excerpt from CDFW 2023b).

- An index of relative abundance based on catch per unit effort in the trammel net survey follows a similar pattern to abundance estimates with relatively stable numbers since 2000. (Fig. 2, below).

[7] The 14-years mentioned in this letter represents the time-period of the 2008/09 and 2019 Biological Opinions and 2020 Incidental take Permit for SWP-CVP operations.

[8] CDFW (California Department of Fish and Wildlife). 2023. Exhibit 9. Supporting Material for CDFW "White Sturgeon Emergency Regulation Recommendation" Powerpoint. Pages 35–64 in Staff, editor. Fish and Game Commission Staff Summary, October 11-12, 2023 Meeting. California Fish and Game Commission. Available from: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=216457

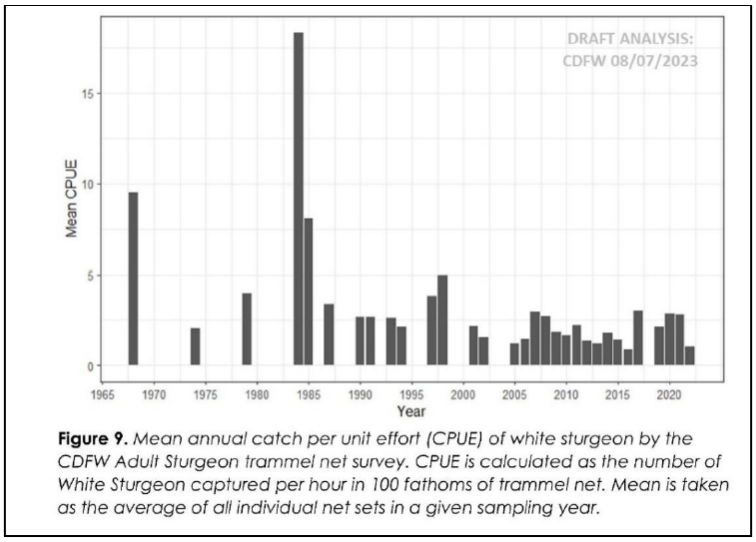

Figure 9. *Mean annual catch per unit effort (CPUE) of white sturgeon by the CDFW Adult Sturgeon trammel net survey. CPUE is calculated as the number of White Sturgeon captured per hour in 100 fathoms of trammel net. Mean is taken as the average of all individual net sets in a given sampling year.*

Figure 2. Index of White Sturgeon abundance based on annual catch per unit effort in August-October trammel net surveys where sturgeon are captured for tagging. (CDFW 2023)

- Annual fishery harvest data from commercial passenger fishing vessels generally follows similar patterns to abundance estimates and net survey catch per unit effort. (CDFW 2023). Catch per unit effort has been relatively stable or increasing from 2000-2020. (See Fig.3, below). However, CDFW 2023 discounted this catch data as a relative measure of abundance because the catch per unit effort was not included in the estimate.

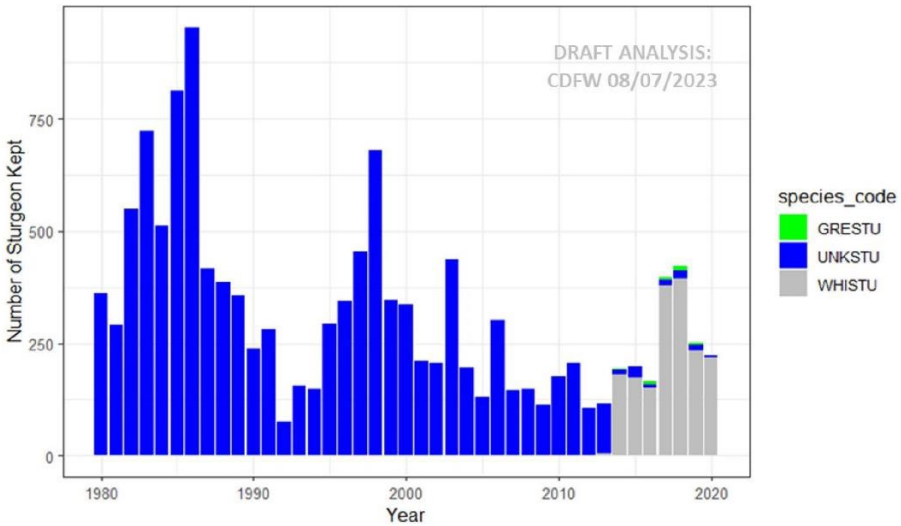

Figure 7. *Catch of White Sturgeon reported from commercial passenger fishing vessels (CPFVs) through the Marine Log System from 1980–2020. Recording species was not required until 2013.*

Figure 3. Annual catch of sturgeon by recreational anglers fishing on charter boats. CDFW 2023.

The adult numbers of White Sturgeon substantially exceed the recovery criteria of 3,000 adults identified in the Recovery Plan for the listed North American Green Sturgeon (NMFS 2018). The abundance of White Sturgeon adults was conservatively estimated to be an average of

20,000 between 2007-2011 based on age-specific population estimates in Gingras & DuBois (2013).[9] The Petition simply identified a reduction from historic highs in the population and concluded the species must be imperiled, without providing any evidence that the population is not self-sustaining. The Green Sturgeon recovery criteria was based on general principles of conservation biology[10] which would be appropriately applied to White Sturgeon as well, with the result being that the White Sturgeon already far exceeds the adult population recovery criteria.

b. Entrainment in the SWP and CVP export facilities is low.

The Petition identified direct mortality resulting from entrainment at SWP and CVP water export facilities in the south Delta in a list of primary factors imperiling White Sturgeon (San Francisco Baykeeper *et al.,* 2023). The Petition states, "it is clear that: (a) there is no reason to expect high survival of salvaged fish, (b) total mortality will be greater than the number of fish enumerated in salvage because of losses prior to the fish screens, and (c) salvage has been episodically high." (Petition, pp. 28-29).

It is difficult to reconcile the very small numbers of White Sturgeon salvaged at the SWP Skinner Delta Fish Protective Facility with the listing petition assertion that direct mortality resulting from entrainment/salvage has a significant impact on White Sturgeon. The only evidence of significant salvage presented in the Petition was one data point, last year, which was a very wet year. (*Id*). In most years, the impact is practically zero. (See Fig. 4, below). Years of higher numbers closely follow strong White Sturgeon year classes as abundant small juveniles are vulnerable to entrainment. Numbers decline as White Sturgeon from strong year classes grow out of the vulnerable size range.

The numbers of White Sturgeon in the salvage have declined substantially from historical levels in the 1980s, which is at least partially the result of the changes in regulations that manage the SWP and CVP export operations in the south Delta.

[9] Gingras, M., and J. Dubois. 2013. Monitoring progress toward a CVPIA recovery objective: estimating White Sturgeon abundance by age. IEP (Interagency Ecological Program for the San Francisco Estuary) Newsletter 26(4)6–9. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentId=74161.

[10] NMFS 2018, p. 39 ["we developed the adult abundance criteria using the best available information from general principles in conservation biology relating population viability to abundance."]

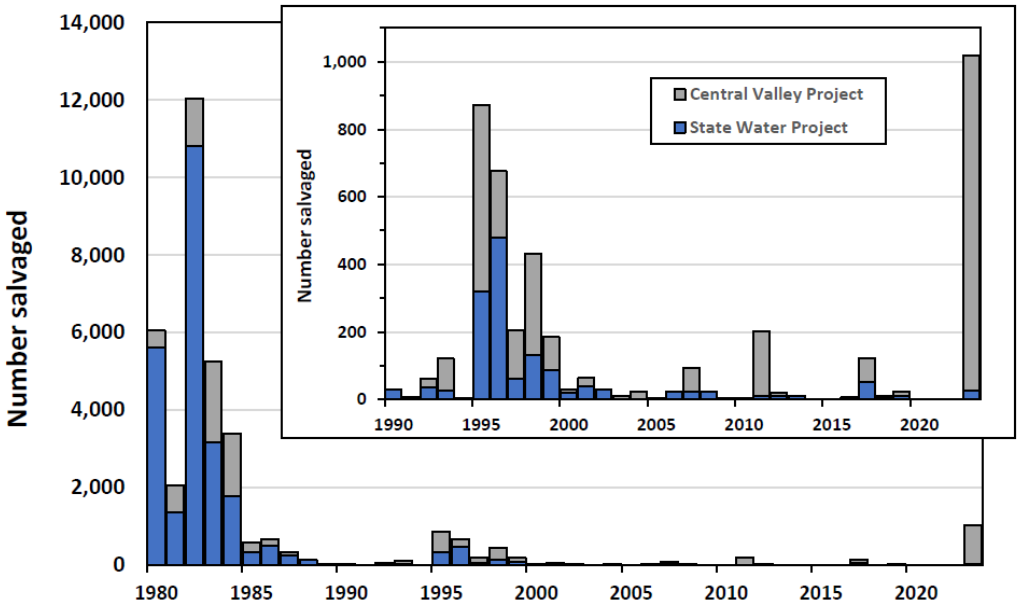

Figure 4. Annual salvage of White Sturgeon at SWP and CVP export facilities, 1980-2023. Insert graph shows expanded y-axis for 1990-2023. Data from Fish Salvage Monitoring (ca. gov)

The population-level impact of salvage is likely very low because the sturgeon salvaged are projected to comprise a very small percentage of the adult population. The recent 20-year average combined total salvage was 80 White Sturgeon. (Average of SWP- CVP salvage, 2003-2023, calendar year.) After salvage, these fish were trucked far away from the SWP and CVP facilities and released into the Delta. The rate of survival of these fish during the salvage process is very good, particularly for larger fish like sturgeon. As reported by Buchanan et al. 2021,[11] the rate of survival for larger fish like out-migrating steelhead was not statistically different between Old and Middle River where the SWP and CVP export facilities are located, and the San Joaquin River, indicating that salvaged White Sturgeon likely have very good survival in the salvage process.

The best estimates of the adult population of White Sturgeon are about 20,000 pre-algal bloom. Even if half of them died in the 2023 red tide bloom and all failed to survive the SWP and CVP salvage and release program, which is highly unlikely, a net 80-100 per generation loss would be a net 0.8-1.0% impact at the population level of 10,000, which is very low. For context, CDFW's recent emergency fishery regulation for White Sturgeon provided several options for appropriate harvest rate: <3% (Blackburn et al. 2019[12]); 5-10% (Beamesderfer and Farr 1997,[13] [when no other sources of significant loss]); and White Sturgeon maximum harvest rates in Washington and Oregon, which is 3.8%. (CDFW 2023, p. pdf 55.) CDFW further reported that the estimated

[11] Buchanan, R.A., Buttermore, E., Israel, J. 2021. Outmigration survival of a threatened steelhead population through a tidal estuary. *Can. J. Fish. Aquat*. Sci. 78: 1869-1886, p. 1883.
[12] Blackburn, S. E., M. L. Gingras, J. DuBois, Z. J. Jackson, and M. C. Quist. 2019. Population Dynamics and Evaluation of Management Scenarios for White Sturgeon in the Sacramento–San Joaquin River Basin. North American Journal of Fisheries Management 39(5):896–912. https://doi.org/10.1002/nafm.10316
[13] Beamesderfer, R., M. Simpson, G. Kopp, J. Inman, A. Fuller, D. Demko, and S. P. Cramer. 2004. Historical and current information on green sturgeon occurrence in the Sacramento and San Joaquin rivers and tributaries. State Water Contractors, Sacramento, CA. https://www.noaa.gov/sites/default/files/legacy/document/2020/Oct/07354626515.pdf

harvest rate from fishing from 2007-2015 ranged from 8-29% (mean 13.4%), and the average harvest rate from 2016-2021 was 8.1%.[14] (CDFW 2023, p. pdf. 54.) For comparison, the harvest rate for the Sturgeon Study from 2009-2021 was 3.5%.[15]

All of these harvest rates are higher than the worst case 0.8-1.0% rate at the SWP and CVP export facilities.

c. Trends in Species Survival are Driven by Wet Hydrology and Not SWP-CVP Operations.

The SWC and SLDMWA acknowledge that there is an April-July Delta outflow-to-year class strength statistical relationship for White Sturgeon. Based on the shape of the relationship, this relationship is really driven by wet-year hydrology and not project operations. The trends in year-class strength match wet-year hydrology very closely. (See Fig. 5, below). The SWP and CVP cannot create wet years using reservoir releases or curtailing exports. The Reis *et al*. study cited in the Petition is flawed and cannot be relied on for the proposition that the SWP and CVP have been creating more drought years. In fact, the SWP and CVP are heavily regulated in April-May under three different regulatory frameworks by four different state and federal agencies and will continue to be so regulated into the foreseeable future. (See Figure 5b below, comparing exports to outflow). During summer months, particularly July and August, the SWP and CVP have been augmenting flows for decades.

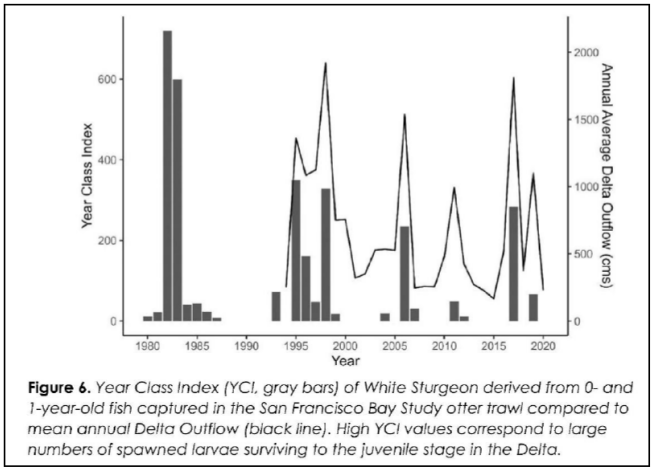

Figure 6. *Year Class Index (YCI, gray bars) of White Sturgeon derived from 0- and 1-year-old fish captured in the San Francisco Bay Study otter trawl compared to mean annual Delta Outflow (black line). High YCI values correspond to large numbers of spawned larvae surviving to the juvenile stage in the Delta.*

Figure 5. Index of annual reproductive success (age 0 and age 1). CDFW 2023.

[14] In reporting this estimate, CDFW acknowledged that low tag estimates in 2018 and 2022 precluded harvest rate estimates.
[15] From 2009 to 2021 the average harvest rate during the study was 353.38. Assuming a population of 10,000, the harvest rate is 3.5%. A population of 10,000 was assumed in this calculation to provide a comparison to the worst case mortality estimate for SWP-CVP exports. https://wildlife.ca.gov/Conservation/Delta/Sturgeon-Study.

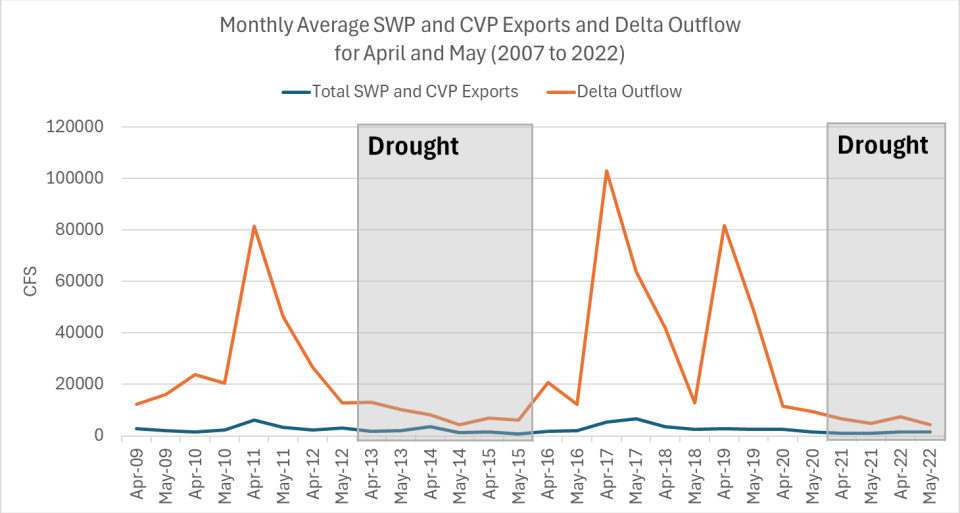

Figure 5b. Historical Total SWP and CVP Delta Exports and Delta Outflow for April and May from 2009 to 2022. Grey shaded years are drought years when the exports are at minimum levels for public health and safety.

i. The White Sturgeon year-class strength relationship is driven by the highest flow years.

There is a statistical relationship between White Sturgeon year-class strength and Delta outflow in the months of April-July in the Sacramento River. (Fish 2010.)[16] Since each month within the April-July time-period is also cross-correlated with the following and prior month, it is difficult to determine which months within that range are most important to the species; as the statistical relationship for the months between April-July, April-June, April-May, and May alone are all practically the same, with any minor differences not being statistically significant.

The ability of within-year water management strategies to affect year-class strength is unclear, given the large volumes of discharge associated with successful recruitment. This pattern appears to be driven by wet water years. This is because the flow-year-class strength relationship is not linear. Depending on how it is calculated, the threshold for significant recruitment is approximately 50,000 cfs, when measured by water-year average delta outflow, and 40,000 cfs when measured by April-July Sacramento River flow.[17] (See Figures 6 and 7).

[16] Fish, M. A. 2010. White Sturgeon Year-Class Index for the San Francisco Estuary and its Relation to Delta Outflow. IEP Newsletter 23(2):80–84. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentId=26542

[17] Sum of Sacramento River flow at Freeport and Yolo Bypass inflow to the Delta.

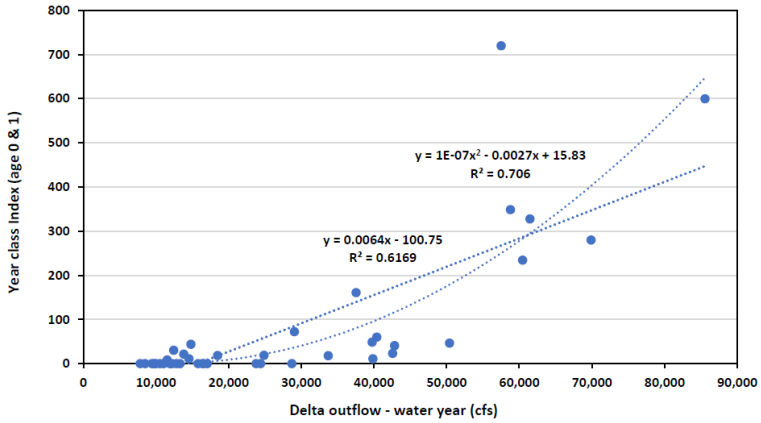

Figure 6. Relationship between year-class index and average Delta outflow by water-year, 1980-2020.

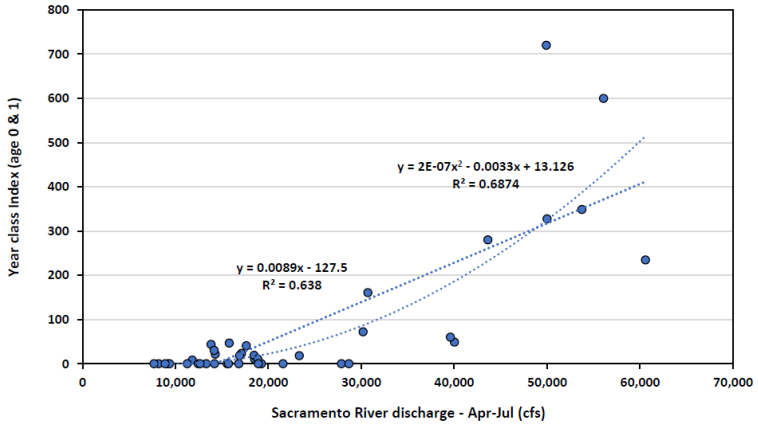

Figure 7. Relationship between year-class index and average Sacramento River discharge in April through June, 1980-2020.

The mechanisms for flow-related recruitment are not well understood, so the appropriate management action is unknown. The bottleneck occurs somewhere in the incubation, hatching, downstream dispersal, or early rearing stages between spring and late summer. Hypotheses for key factors have included the availability of suitable spawning habitat, which includes clean, rocky substrate and turbulence with resting areas nearby, higher predation during low flow conditions, dispersal into suboptimal habitats downstream, food availability during critical first feeding, or a combination thereof. (Coutant 2004[18]; Gadomski & Parsley 2005[19]; Hatten et al.

[18] Coutant, C. C. 2004. A riparian habitat hypothesis for successful reproduction of white sturgeon. Reviews in Fisheries Science. 12:23-73.

[19] Gadomski, D. M., and M. J. Parsley. 2005. Laboratory studies on the vulnerability of young white sturgeon to predation. North American Journal of Fisheries Management 25:667-674.

2018[20]; Hildebrand et al. 1999[21], 2016[22]; Kohlhorst 1980[23]; Kohlhorst et al. 1991[24]; McAdam 2012[25], McAdam et al. 2008[26]; McCabe & Tracy 1994[27]; Miller & Beckman 1996[28]; Paragamian et al. 2001[29]; Paragamian & Wakkinen 2002[30]; Parsley & Beckman 1994[31]; Parsley et al. 1993, 2002.[32]) Due to the shape of the flow-abundance relationship, it does not seem that additional flow in average or low water years can benefit these species.

Regardless of the month or season of important outflow from April-July, SWP and CVP export operations are not negatively impacting outflow in these months. Existing and foreseeable regulations already limit SWP and CVP diversions in April and May, including in wet years. In April and May, SWP and CVP exports were limited by an export-to-inflow ratio export restriction contained in State Water Resources Control Board water right Decision 1641 (D-1641). In the existing 2020 Incidental Take Permit that regulates SWP exports, there is an additional inflow-to-export restriction from April to May. See Figure 5b. The proposed Long-Term Operations Plan (LTO) for the SWP and CVP also includes significant pumping restrictions in March-May, and June in some water-year types. At the same time, in the July-August time-period, the SWP and CVP have been supporting outflow for decades. (Hutton et al. 2017, p. 2522).[33] The cause of changes in flow in spring and summer over nine decades was a mix of water project and non-water project diversions. (*Id.* at p. 2524). The existing and foreseeable regulations governing the CVP and SWP are protective in the spring, and CVP and SWP operations have been improving conditions in the summer.

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[20] Hatten, J. R., M. J. Parsley, T. R. Batt and R. L. Fosness. 2018. Substrate and flow characteristics associated with White Sturgeon recruitment in the Columbia River Basin. Heliyon. 2018 May 21;4(5):e00629. doi: 10.1016/j.heliyon.2018.e00629. PMID: 29872763; PMCID: PMC5986543.

[21] Hildebrand, L., C. McLeod and S. McKenzie. 1999. Status and management of white sturgeon in the Columbia River in British Columbia, Canada: an overview. Journal of Applied Ichthyology 15:164-172.

[22] Hildebrand, L. R., A. D. Schreier, S. O. McAdam, M. J. Parsley, V. L. Paragamian and S. P. Young. 2016. Status of White Sturgeon (Acipenser transmontanus Richardson, 1863) throughout the species range, threats to survival, and prognosis for the future. Journal of Applied Ichthyology 32:261-312. https://doi.org/10.1111/jai.13243

[23] Kohlhorst, D. W. 1980. Recent trends in White Sturgeon population in California's Sacramento-San Joaquin Estuary. California Fish and Game 66:210-219.

[24] Kohlhorst, D. W., L. W. Botsford, J. S. Brennan and G. M. Calliet. 1991. Aspects of the structure and dynamics of an exploited central Calironia population of White Sturgeon (Acipenser transmontanus). Pages 277 to 293 in P. Williot, editor. Acipenser – Actes du premier colloque international sur l'esturgeon. Bordeaux 3-6 octobre 1989. CEMAGREF.

[25] McAdam, D. S. O. 2012. Diagnosing causes of white sturgeon (Acipenser transmontanus) recruitment failure and the importance of substrate condition to yolksac larvae survival. Ph.D. Dissertation. Universty of British Columbia. Vancouver, B. C.

[26] McAdam, S., C. Williamson, and J. Vasquez. 2008. A conceptual model of white sturgeon recruitment failure in the Nechako River, Canada, based on hydraulic modeling and biological investigations. 7th International Symposium on Ecohydraulics, Jan 12-16, 2008, Concepcion, Chile.

[27] McCabe G. T., Jr., and C. A. Tracy. 1994. Spawning and early life history of white sturgeon, Acipenser transmontanus, in the lower Columbia River. Fishery Bulletin 92:760-772.

[28] Miller, A. I., and L. G. Beckman. 1996. First record of predation on white sturgeon eggs by sympatric fishes. Transactions of the American Fisheries Society 125:338-340.

[29] Paragamian, V. L., G. Kruse, and V. Wakkinen. 2001. Spawning habitat of Kootenai River white sturgeon, post-Libby Dam. North American Journal of Fisheries Management 21:22–33.

[30] Paragamian, V. L., and V. D. Wakkinen. 2002. The effects of flow and temperature on the spawning of Kootenai River white sturgeon. Journal of Applied Icthyology 18:608-61

[31] Parsley, M. J., and L. G. Beckman. 1994. White sturgeon spawning and rearing habitat in the lower Columbia River. North American Journal of Fisheries Management 14:812-827

[32] Parsley, M. J., L. G. Beckman, and G. T. McCabe, Jr. 1993. Spawning and rearing habitat use by white sturgeons in the Columbia River downstream from McNary Dam. Transactions of the American Fisheries Society 122:217-227.

[33] Hutton, P.H., Rath, J.S., Sujoy, B. R. 2017. Freshwater flow to the San Francisco Bay-Delta estuary over nine decades (Part 2), change attribution. Hydrological Processes, 31: 2516-2529.

ii. Petition incorrectly represents changes in flow and attribution.

The Petition makes several broad statements suggesting that large changes in outflow have occurred. (See, e.g., Petition section 6.2). Specifically, the Petition argues that the operation of the SWP and CVP have caused wet and above-normal water years to be reclassified as below-normal or drier. (Petition, p. 25). The Petition relies heavily on Reis et al. 2019 to support this conclusion and its conclusion that, "water diversion and storage reduce the frequency and quality of conditions that favor California White Sturgeon recruitment." (Petition, p. 25).

The Reis et al. paper cannot be relied on for these conclusions as it uses unimpaired flow as a representation of without project hydrology in the valley. This is a mistake, as the unimpaired flow is a theoretical calculation of flow that does not account for water consumption by native plants or the historic spreading of water across the floodplains without levees that would have occurred in pre-development conditions. In fact, when evapotranspiration from native vegetation is considered, the pre-development outflow is similar to contemporary outflow. (Fox et al. 2015,[34] as well as, Howes et al. 2015[35]). The Reis et al. paper also attributes all changes in outflow to SWP and CVP exports, which is incorrect. In fact, outflow is a result of all of the diversions throughout the entire watershed, of which SWP and CVP south of Delta diversions are a portion. And finally, the Reis et al. paper should not be relied on for a comparison of the recent and historic occurrence of so-called low outflow years (or drought years) because of how that paper recalculated water-year type using artificial thresholds binning ranges of historic water years, which obscures the trends. (See description of this recalculation by Reis et al. 2019, p. 6).

In short, the SWP and CVP cannot change the water-year type using project operations.

d. Sites Reservoir, Delta Conveyance Project, Water Quality Control Plan Update, and Voluntary Agreements will not impair species abundance.

The Petition objects to Sites Reservoir and the Delta Conveyance Project because of water diversions proposed during wet water years, particularly in April and May. (Petition, p. 27-28). The Petition objects to the update to the Water Quality Control Plan because it concludes based on the opinion that the Proposed Action of 55% of the unimpaired hydrograph is not enough outflow. (*Id*.) The Petition objects to the Voluntary Agreements (Healthy Rivers and Landscapes Program or HR&L Program), which is a proposed implementation alternative for the update to the Bay-Delta Water Quality Control Plan, because the Petition says that the HR&L Program would reduce outflow. (*Id*).

It should be noted that the Delta Conveyance Project and Sites Reservoir will be operating under the permit authority of the California Department of Fish and Wildlife and the United States Fish and Wildlife Service as those projects have sought and will continue to update, approvals for their respective operations plans and associated compliance with the California Environmental Quality Act and the National Environmental Policy Act, adopting mitigation when appropriate.

[34] Fox, P., Hutton, P. H., Howes, D. J., Draper, A. J., & Sears, L. (2015). Reconstructing the natural hydrology of the San Francisco Bay-Delta watershed. Hydrology and Earth System Sciences, 19, 4257–4274.
[35] Howes, D.J.; Fox, P.; Hutton, P.H. Evapotranspiration from Natural Vegetation in the Central Valley of California: Grass Reference-Based Vegetation Coefficients and the Dual Crop Coefficient Approach. J. Hydrol. Eng. **2015**, 20, 04015004.

These projects will also seek permit amendments and/or assignments from the State Water Resources Control Board, which already considers White Sturgeon to be part of its decision-making process. All of these state and federal agencies will be making decisions related to outflow for the protection of species and will be assessing the satisfaction of various legal requirements in the context of multiple species with species year-class strength-outflow relationships.

As it relates to the Delta Conveyance Project, it is proposed to divert new flows only under excess flow conditions in the Delta, and the diversion will be subject to new proposed restrictions, including in wet years.[36] Since the Delta Conveyance Project is a dual conveyance facility that will divert in coordination with existing SWP facilities, it is proposed to operate to any spring outflow requirements under the proposed update to the Long-Term Operations of SWP and CVP, including in above-normal water years. [37] The Sites Reservoir Project will have an Operational Agreement with the Department of Water Resources and the Bureau of Reclamation that will require that Sites Reservoir to not divert while the SWP and CVP are meeting Sacramento River inflow and outflow requirements, in addition to protective, operational criteria that are part of Sites Reservoir's operations plan. [38]

The Petition also objects to the Water Board's Proposed Action as described in the Water Board's Draft Staff Report. The Petition, however, ignores the regulatory framework within which the Water Board will make a decision under state and federal law when it approves the Water Quality Control Plan update, which requires that the Water Board balance the protection of beneficial uses that include urban, agricultural, and environmental uses. The Petition simply asserts that more flow would be better. (Petition, p. 28). This is not evidence of injury to White Sturgeon.

As part of the Water Board's consideration of the Water Quality Control Plan update, it will also be considering the HR&L Program This program includes approximately 700,000 acre-feet of additional outflow, which is to be primarily provided in April and May. The Petition's citation to SWRCB 2023, Table G3a-10, shows a small reduction in wet year outflow. This change in wet water years is a result of reservoir refill, which is needed because stored water is released during drier water year types. To put this in context, wet water year conditions are when flooding occurs and represent the conditions that were the subject of the Governor's new legislation approving new Water Code §1242.1, which encourages water diversions to manage flood risk in wet years to such an extent that water rights are not necessary. It is during these flood risk conditions that reservoir refill is most appropriate. Regardless, the estimated decrease in outflow is quite small relative to the flows that exist during wet conditions.

[36] Final DCP EIR, Section 3.16.1, pp. 3-142 to 3-144.
[37] Draft Long-Term Operations of the State Water Project Facilities EIR, Section 2.3.5, pp. 2-31 to 2-33.
[38] Final Sites Reservoir EIR, p. 2-80, Table 2-5.

e. White Sturgeon distribution is broad, and its productivity is stable.

The population is widely distributed in Sacramento-San Joaquin system habitats, including rivers, Delta, estuary, and marine waters. (CDFW 2024, Figure 1).[39] Spawning habitat is distributed over 70 miles of the Sacramento River mainstem, and spawning also occurs at a second site in the San Joaquin River. Spawning likely occurs in every year such that significant recruitment may be produced in years of suitable environmental conditions. The population is characterized by a broad distribution of size classes representing multiple cohorts. (Fig. 8, below).

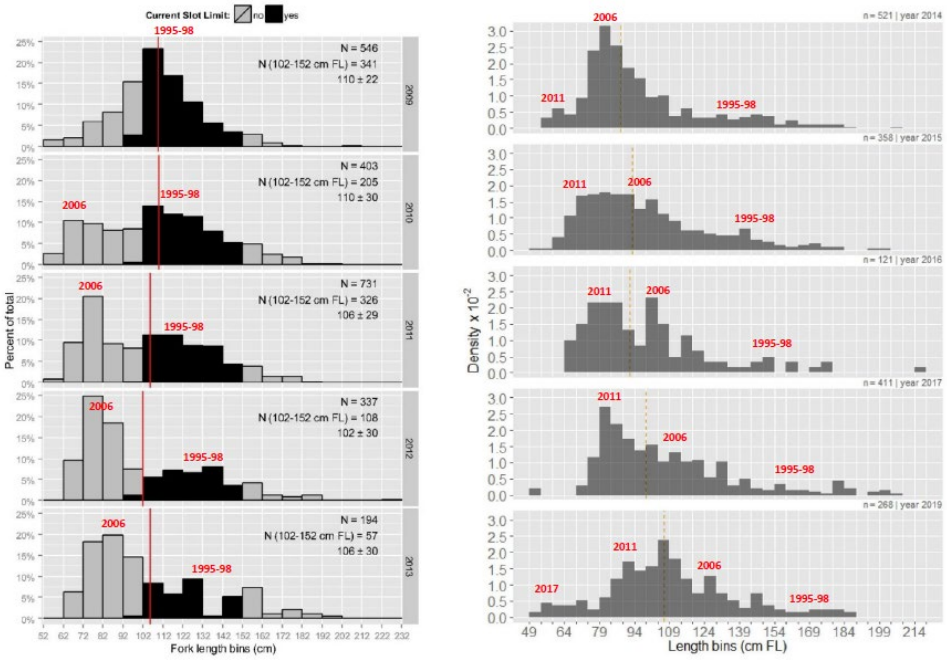

Figure 8. Annual length-frequency distribution showing continued progression of a strong year-class cohorts recruiting to the nets and moving through the population (Dubois and Harris 2013, Danos et al. 2020). Red lines indicate median fork length, Red text labels identify approximate year-class cohorts.

Productivity, in the form of periodic strong year classes has been sufficient to sustain the current population level and has limited harvest in the recreational fishery. The population exhibits high levels of genetic diversity in comparison with other White Sturgeon populations throughout their range (Drauch Schreier et al. 2013).

For all of these reasons, listing the White Sturgeon is not warranted.

[39] CDFW (California Department of Fish and Wildlife). 2024. Report to the Fish and Game Commission. Evaluation of the petition from San Francisco Baykeeper, The Bay Institute, Restore the Delta, and California Sportfishing Protection Alliance to list White Sturgeon (*Acipenser transmontanus*) as threatened under the California Endangered Species Act. California Department of Fish and Wildlife, P.O. Box 944209, Sacramento CA 94244-2090. 19 pp. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=221413&inline

The SWC and SLDMWA appreciate this opportunity to comment on the White Sturgeon Petition. If you have any questions, please contact Mr. Chandra Chilmakuri at cchilmakuri@swc.org or Mr. Scott Petersen at scott.petersen@sldmwa.org.

Sincerely,

Jennifer Pierre
General Manager
State Water Contractors

Federico Barajas
Executive Director
SLDMWA

June 6, 2024

California Fish and Game Commission
715 P Street, 16th Floor
Sacramento, CA 95814

Submitted via Email to: fgc@fgc.ca.gov

Re: Agenda Item 15 - White Sturgeon Petition to List

For the attention of California Fish and Game Commission Members and Staff:

Sierra Club California collected 700 public comments from our members and supporters throughout the state urging the California Fish and Game Commission to list the White Sturgeon as threatened under the California Endangered Species Act.

The names of the individuals submitting comments are listed in the rest of this document, along with any additional individual comments. Each of the individuals signed onto the following text:

> *Thank you for the opportunity to comment on the petition to list the White Sturgeon as threatened under the California Endangered Species Act (CESA). I urge the Commission to take the next step toward protecting this important species from further decline by accepting the petition for further review.*
>
> *White Sturgeon are declining due to chronic issues affecting the San Francisco Bay Delta. Unsustainable water diversions, reservoir operations, and adverse water quality conditions have plagued the Delta estuary for decades. This Commission has the ability to prevent the White Sturgeon from becoming another casualty in California's water mismanagement.*
>
> *Adequate flows during the spring and early summer are essential for White Sturgeon recruitment, but have been declining since the 1980s due to increased diversions. Current regulations are not sufficient to protect the species. The State Water Board is considering updated standards for the Bay Delta Water Quality Control Plan. However, the Board's proposed unimpaired flow objective for the Sacramento River is not sufficient for White Sturgeon recovery. The cumulative impacts of new proposed diversions, increased frequency of Harmful Algal Blooms, the effects of climate change and other threats must be addressed to prevent further decline of the species.*

Without additional actions by this Commission, the White Sturgeon is likely to become an endangered species within the foreseeable future. I respectfully request that the Commission take action to protect the White Sturgeon under CESA.

Thank you for considering this public input as you decide whether to take the next step toward fully protecting the White Sturgeon under the California Endangered Species Act.

Sincerely,

Erin Woolley
Senior Policy Strategist
Sierra Club California

Name	Address	Additional Individual Comment
Jason Chinn		These fish are important to our overall ecosystem down the line.
Dan Quast		It is important because it is. We need to have some common sense in the state government
Peter Reimer		One] To protect an endangered species. Two] I have friends and/or neighbors who fish.
Heinrich Albert		We all want to bring back salmon populations, and we should. But less known species like White Sturgeon are also very important and an essential part of California's river ecosystems.
Karen Guma		All species are linked in an ecosystem. We need you to protect them, especially when they are dealing with polluted waters.
Belinda Kein		Our planet is our home, the only habitable planet we have. We must protect it and the creature who inhabit land and water as well. It's time for such protections to be put in place for Wild Sturgeon to they too may thrive.
Susan Worden		We live in the Delta, and the well-being of its fish species are important to our family.
Anne Muraski		YES! List the white sturgeon as endangered, and at the same time help the beleaguered Delta which is a catastrophic environmental disaster. It is a ship that needs to be turned around to save so many species.
Perry Gx		Time Is Now For Swift Action In Regards To Sturgeon.
Sharma Gaponoff		We are screwing up everything. Lets at least protect the White Sturgeon by listing it as threatened under the California Endangered Species Act. Its the least we can do.
Pamela Morris		All declining species are important.
Michele Sanderson		thank you for working so hard to save the earth and humanity
Scott Jenkins		Dear CA Fish & Game Commission, You have the opportunity to protect White Sturgeon under CESA. We need you to take action now to protect these endanered fish Now!
Peggy Kennedy		Please protect White Sturgeon under CESA by listing the White Sturgeon species as threatened . They are a valuable part of the our ecosystem. Thanks you.
Diane Vornoli		I have been enjoying the Sacramento delta complex for over 40 years, and back then sturgeon were common. Now, I'm so worried about the species surviving! We must protect them! Please enable them to survive!
Mary Ann Ruiz		I am very concerned about the continuting loss of species here in California. The White Sturgeon is an important species for the health of the ecosystem of the Delta. Please move the status up to Threatened to protect this declining species.
Mark Rhomberg		White sturgeon need your help ASAP!
Natalie Blasco		The white sturgeon is a fish native to California’s Central Valley rivers and is experiencing significant population declines. Combating this decline will require addressing a number of threats, including insufficient in-stream flows and water temperature
Ken Ballinger		Decades (centuries?) of evidence show that if we don't actively protect nature, humans will eventually destroy it. Please protect this fish. Thanks.
Stephen Ferry		We need to protect native endangered species!
Elizabeth Hannah		The White Sturgeon is worthy of protected status as an endangered species. It’s a truly amazing and unique creature.
Christa Neuber		we can't lose more animals!
Michael Koterba		These magnificent fish should live longer than we do. Now they are likely to no longer live period. It is exceedingly frustrating to see the government agencies whose very existence is to ensure native species thrive are increasingly unable to ensure they
Tom Johnson		These long-lived fish are important to maintaining the ecological equilibrium.
Clint Freeland		The White Sturgeon is a fish native to California’s Central Valley rivers and is experiencing significant population declines. Combating this decline will require addressing a number of threats, including insufficient in-stream flows, water temperature, a

Name	Address	Additional Individual Comment
Vasu Murti		The Democratic Party platform should support: Animal Rights, Defending the Affordable Care Act, Ending Citizens United, Ending Marijuana Prohibition, Giving Greater Visibility to Pro-Life Democrats, Gun Control, Net Neutrality, Raising the Minimum Wage to
Pat Bryan		Sturgeon can live as long as humans - sometimes longer. As fellow earth creatures isn't it time we give respect?
John Goldsmith		The CA Fish & Game Commission should List White Sturgeon Under the CA Endangered Species Act (CESA)
Guillemette Epailly		Please list the white sturgeon under the CA Endangered Species Act to protect this beautiful and unique fish from extinction. Thank you.
M Robert Wilkerson		I believe passionately in saving our planet and our wildlife. I have also been fishing since I was a young kid growing up in California in the 1950's! Please help save this and ALL species.
Walter Erhorn		Please consider saving this ancient survivor favorably, Thanking you in advance for the voiceless.
Paulette Schindele		This important fish needs our help!
Katja Irvin		We need to take the current man-made mass extinction seriously and make it a priority to address this ominous trend.
Martha Booz		I support this petition most wholeheartedly! White Sturgeon ARE threatened already. Therefore they must be listed to prevent further decline.
Richard Devletian		Keeping our native wildlife populations intact and thriving is extremely important to the overall health of our ecosystem. Please list the White Sturgeon as Endangered under the CESA criteria to afford the delicate delta environment a legal foothold in pr
Christine Hoex		Personally I believe we need to recognize the rights of other species. And selfishly I (we), need them to keep the planet health and life sustaining. We can't do with out them, and who would want to!
Lee Hanger		The white sturgeon is endangered due to overfishing, a flourishing illegal caviar trade and habitat loss. Normal wildlife predators consist of Sculpins, Walleye, Smallmouth Bass and Chinook Salmon which are known to prey on eggs and juvenile White Sturge
Kathy Monteleone		Save the White Sturgeon and all wildlife!
Theresa Acerro		Itis your job to protect native species.White Sturgeon clearly need protection.
Verona Murray		I care about our environment and we must protect what's left of our California species!
Sam Butler		It is vital that we protect threatened and endangered species to preserve the web of life. Better still, let's take action not to stop species from getting into these critical situations in the first place. Let's take action for the white sturgeon that en
J B		The White Sturgeon is a fish native to California's Central Valley rivers and is experiencing significant population declines. Combating this decline will require addressing a number of threats, including insufficient in-stream flows, water temperature, a
Julie Smith		List White Sturgeon under the CA Endangered Species Act
Tina Bowman		Please protect the sturgeon by listing it as threatened! Thanks!
Evelyn Kirby		It is absolutely vital that all of us in California, and especially our own government, i.e. your agency, treat our native species as our highest priority as save each and every one, now especially the White Sturgeon!
Karen Schmidt		If it's native it needs to be protected!
Laura Manning		Please don't let the sturgeon in the delta die!
Dean Arrighi		Protecting the White Sturgeon will also protect many other delta species that are under threat for survival.
Ellen Gachesa		Save our wildlife!!
Pat Doherty		There is no reason to not put the white sturgeon on the CA endangered species list. All necessary steps need to be taken to save endangered wildlife , no matter what they may be
Saran Kirschbaum		I care about a healthy future for all, including my family.
Donald Weiden		We need to not only support and aid the survival of all native fish and game but provide the environments that they can flourish.

Name	Address	Additional Individual Comment
Scott Akemon		Can’t we do our part and let nature thrive.
Cheryl Kozanitas		Sturgeon are ancient and beautiful. Please save them from special interests.
Karen Jacques		White Sturgeon are in trouble. Unsustainable amounts of water have been diverted from the Delta year after year and its ecology is beginning to collapse. California and the world are facing an extinction/biodiversity crisis. Listing the White Sturgeon
Matt Richardson		I'm a native California. I've seen the demise of many fish populations and we now have 40 million people in the state! We need more protections to protect our amazing flora and fauna. Protect the White Sturgeon! And I like to fish!
john armstrong		it matters to me because I'd much rather have wildlife than illegal aliens from enemy countries.
Genette Foster		The loss it each and every species poses an additional threat to the Sacramento River and Bay ecosystem
Steve Bean		Must protect native species from humanity's destructive actions.
Lesley Shultz		Sturgeon is a very important species that deserves protection in the aquatic ecosystems!
Harry Knapp		I agree with the goal of this petition.
Rick Drain		The White Sturgeon are yet another native species that are already being threatened and harmed by excessive water diversion from the Sacramento/San Joaquin River valleys and Delta. We understand the desire to supply water to agriculture and housing. Ho
Karen Millet		It is critical to protect the White Sturgeon under the California Endangered Species Act. Please step up and protect the future of native fish and push back against threats to the Delta. You have the power to make a difference in the lives of White Sturge
Lindsay Sharp		This very ancient species are a wonder and desperately need protection now.
Alanna Russell		We have alerted so much of nature and I think it will be best and wisest if we can be hands off and NOT disrupt their ecosystem, and offer them the same resources they've enjoyed for eras.
Laurel Harris		Please help to save the threatened White Sturgeon!
Kathy Robinson		The white sturgeon is an important species in the Strait. These unique creatures must be protected.
Andre Tarverdians		I'm including this line to indicate that I'm a real person and that this issue is important to me.
Christine Hayes		The White Sturgeon is a fish native to California’s Central Valley rivers and is experiencing significant population declines. Combating this decline will require addressing a number of threats, including insufficient in-stream flows, water temperature, a
Abbie Bernstein		We are already losing too many species. Let's try not to lose any more.
Mary Lou Rosczyk		I remember when I was very young and had newly gotten a library card checking out a novel about a White Sturgeon thinking it was a book about a White Stallion. After initial confusion, I realized my mistake in the reading. However, since then White Sturg
Noah Armstrong		Please prevent the extinction of native California wildlife.
MaryBeth Rice		Let's slow the extinction crisis. We really can't afford to kill off every species.
William Wallin		By maintaining the complex entire ecosystem, we can aid our own healthy survival.
Shellie Krick		We don't want to lose any more species. Please include the white sturgeon on the CESA list.
Rachel Denny		Protecting the White Sturgeon will help to protect the ecosystem as a whole. Thank you for your consideration of this important matter.
R. Zierikzee		I care about the aquatic life in the Delta. Please protect our Delta. Don't take our water please.
V Joseph Klein		They are magnificent fish that can get very old but unfortunately their rate of reproduction does not match the rate at which they are caught and landed. To lose a species that has been around longer than we ave been is a shame. They need all the protecti

Name	Address	Additional Individual Comment
Kathleen Smith		As stewards of the Earth, we must protect our environment and the health and safety of all who live here, including fish species like the White Sturgeon who are threatened by unsustainable conditions in the San Francisco Bay Delta. We can and must do bett
Pam Abbott		These fish have been in our waterways forever! Please protect these fish NOW. We are the ones who have created an unhealthy environment for them, let's do all we can to help them thrive. We have only one planet and we need to acknowledge and protec
Alice Welchert		As a ship's captain once put it, a vessel will likely be seaworthy of it loses one rivet, or two or tens, hundreds? But too many rivets gone and the ship will sink and the sailors drown. Each species lost is another rivet that endangers all species, inclu
Jessica Koran		Please protect white sturgeon for the environment as a whole.
Linda Fitz Gibbon		We have to do our best to save the White Sturgeon before it's too late.
Patricia Gracian		We cannot continue to lose species of wildlife & sources of food in the food chain at the rate we are going, and expect to continue our safety and viability for our own species. It is imperative we stop decimating the web of life of our planet if we inten
Patrick Carr		White sturgeon once lived in abundance in California's larger rivers, but not anymore. It's vital that we seek to bring these amazing fish back from the brink of extinction.
Lorrel Hovland		We have lost and are losing many species of animals. This is not sustainable for a healthy environment. Please list the White Sturgeon as threatened under the CESA. Thank you.
Penelope Lepome		As a Californian, I am appalled at the decline of the Bay-delta estuary. Plans for further diversions under the Delta Conveyance Project will further adverse effects. That is why it is vitally important for the Commission to act.
Lynne Boyle		The health of this fish is important to all the surrounding environment.
Jerry Tobe		We must increase native species biodiversity in order to increase the likelihood of healthy ecosystems which, in turn, are required for an environment that is better for human health and well-being Thank you for reading my message
Sharon Byers		Please list White Sturgeon under The CA Endangered Species Act, CESA/
Brad Findlay		Now is California’s chance to take precautionary steps to protect this fascinating species from the threat of extinction. As a resident of California, it is my hope that the white sturgeon be listed as endangered in order to help protect this species now
Elizabeth Potter		I want the Delta to be a resilient resource for my grandchildren. Get a move on! Protect the White Sturgeon and address insufficient in-flows, algae blooms and no more dams.
Linda Riebel		You surely know about the web of life -- and how we're unraveling it. Please put White Sturgeon as protected under the CESA.
Jeffrey Gilman		The CA white sturgeon is related to the oldest known bony fish species, which dates back to the early Cretaceous period (ca. 120 million years ago). And unless strong protections are put in place, our human species will be responsible for wiping them out
Katharine Dreyfuss		Care of wildlife is essential for the thriving of human life. The support of wild creatures requires support for their habitats. White Sturgeons are threatened by insufficient instream flows, rising water temperature and algal blooms. Please help by incl
Wendy Krupnick		As someone born in CA a very long time ago, I am deeply concerned about the environmental degradation that has happened in my life time, especially to water ways.. The majestic and life sustaining Sacramento River has endured far too much abuse. Please pr
Bruce Coston		Stop all the insanity . Implement minimum Income . And use CSSD. 2x Condorcet Cloneproof voting to meet UDHR. 21.3 .
Harlan Lebo		Protection of the white sturgeon is vital.
Charming Evelyn		Ca keeps losing their biodiversity, which only leads to disaster. For us as a community to survive we require a flourishing bio-diverse environment. everything in nature depends on something else, so when we interrupt ature we are interrupting our food ch

Name	Address	Additional Individual Comment
Eva Lydick		I get it. I eat too and we need agriculture. But for too long and for too much, big ag has ruled. And the delta is severely over-taxed. We can have both fresh produce and a thriving ecosystem if we agree that is what we want. Big agriculture has tended
Katy Redmon		The natural beauty of California and its wildlife is important to me.
Ruth Stoner Muzzin		Please continue the work to list White Sturgeon
Barbara Ishida		This matters to me because I care about all native species and plants, that they be able to grow and thrive in their natural environments. We need natives.
Ginny Madsen		I am an elderly, 3rd generation Californian who believes rivers are the lifeblood of the state.
Lionel Mares		Please, protect fish and other endangered animals.
Ken Sanford		Many years ago, I lived in the bay area and my dad would take be fishing in the San Pablo Bay and Rodeo area. We mostly fished for Catfish and Striped Bass. Every once in awhile, budget permitting, he would take my brother and me on a party boat and we
Bonnie Macraith		This matters to me because this is a living creature that deserves our intervention and our compassion!
Denise Churchill		It is so important for all of us to be responsible to all that nature has to provide. What we as humans destroy we can never retrieve it again. We have to be so careful and a serious contributor to ensuring a future for all of our precious life.
Rebecca Smyth		Protecting native species must be prioritized and any steps that can be taken to bolster their survival are important.
Oscar Mace		It is important for the Commission consider the ethical dilemma of biodiversity or extinction. Should the Commission promote environmental action other than to prevent the decline of White Sturgeon would be an act of immoral environmental mismanagement.
Kristin Balmet		We need to protect fish now more than ever
Steve Tyler		With the critical population decline, this species should have been listed as endangered long ago. Please do not hesitate to do so. Thank you
Corey Jaseph		Once we lose these animals, we can never get them back.
Benjamin Billhardt		Please do the right thing,
Shirley Mercado		Such an amazing animal, Sturgeon is prehistoric in appearance and DNA. Please do all you can to ensure their existence going forward. Putting them on the Endangered Species list would help ensure their future
Michael Barnett		We need to do all we can stop species loss. Our future is their future. Let's do what's best for all of us.
Claire Chambers		Please do everything you can to protect White Sturgeon!
Mary Kuntz-Cote		I was a sturgeon fisherman in the Bay.
Ralph Penfield		Please helpt the White Sturgeon by protecting them under the CESA
Victor Kamendrowsky		The Delta is a national treasure. Protect it!
Jill Martin		Many fish will become endangered or extinct if we don't do a better job of water management.
Patricia Andrews		The California Sturgeon is a unique and special fish . I would hate to see it lost to our future generations.
Josef Lindner		Our natural heritage in California has already be so degraded and destroyed. Please, please take this action, to conserve for future generations the limited natural diversity that we as Californians still have and treasure. Do not assume that only cute an
Molly Culton		PROTECT WHITE STURGEON!!!!!
Paul Rauber		I'm writing to ask you to step up and protect the White Sturgeon under the CESA. This ancient species needs our help as we head into severe climate change. Evolution needs all its pieces!
Steve Bloom		Please do the right thing.
Aidan Patterson		I've loved sturgeons since I was a kid, and I have always revered them as one of our ancient creatures that deserve our love.
Erin Marcotte		prevent extinction

Name	Address	Additional Individual Comment
Jakob Evans		Thank you for considering this bold action in a time of ecological crisis.
Wesley Chuang		White sturgeons have been around for about 46 million years; I don't think we humans should be the cause of their extinction.
Varsha Madapoosi		Fish are incredibly important to the local ecosystems, often serving as keystone species. It's incredibly important that we add White Surgeon to the endangered species list to protect wildlife and also to improve the quality of local waterways and ecosyst
Amanda Blake		White sturgeon are one of the oldest and largest fish in existence, having originated in the late Triassic period. Please protect this remarkable and ancient species. We are living in a modern world that is failing in many ways to protect the earth we liv
Keiko Mertz		California's wildlife are essential to the culture and heritage of this great state! We MUST protect this iconic species for future generations!
William Martin		The delta smelt. Wild salmon. Longfin smelt. Steelhead. If not actually extinct, all of these fish have experienced significant declines in populations. Protect white sturgeon before they disappear as well.
John M. Shelton		White sturgeon are the legendary fish of the Central Valley, with stories from the colonization of our state replete with tall tales of this fish. Just imagine what kind of cultural significance that this species had for the Native Americans living in our
Dorette English		These are prehistoric fish that are indicator species - of our own threatened existence from over consumption. We need to ensure their recovery and survival well past our own due dates!
Molly Mcbride		Because we’re responsible for their decline and responsible that they prosper.
Jillian Chalfant		These prehistoric fish are such a value to our ecosystem and our state culture. Please protect them for future generations!
Margo Schueler		Please listen to the voices of those who know these ecosystems and want to preserve and restore the biodiversity that makes California one of the wonders of the world. We have lost much, lets not lose the White Sturgeon.
Irene Hilgers		By listing them U will protect them for our future & our kids future!!! Yippie-we are the best partners for Mother Nature!!!
Anne Zimmerman		Protect the web of life
Allen Bohnert		As a family, we all appreciate everything you are already doing. We also ask that you take 'another' action as noted below.
Leslie Klein		i am a physician
Joan Reynolds Griffin		We must protect our threatened species
Fred Herrera		Thank you for protecting White Sturgeon. God Bless all of you!I
Thomas Rogers		In honor of my deceased father, an ardent sport fisherman, do what can be done to protect and support our native fish stocks!

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Tim Maurer	
Leigh Slater	
Hildy Meyers	
Patti Fink	
Richard Tesdall	
Mary Mcauliffe	
Felena Puentes	
Bob Lentz	
Dorothy Davies	
Karen Espanol	
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Jill Davine	
Cynthia Crittenton	
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Herb Hwang	
Marjorie Xavier	
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Edward Landler	
Dennis Mcvey	
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Lequa Nwaohu	
Suzi Beaton	
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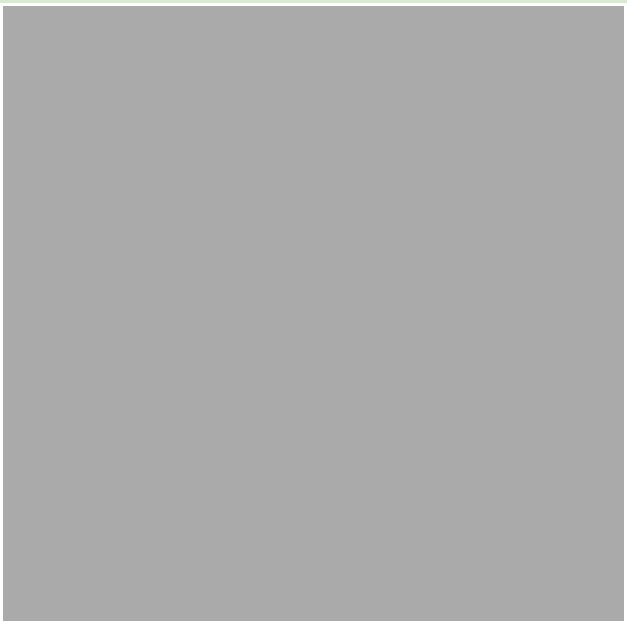
Shawn Saunders	
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Lisa Selby	
Katharine Ruthroff	
J Barry Gurdin	
Darrell Trombley	
Harry Silverdtein	
Kris Kelly	
Shannon Montoya	
Patrice Wallace	
Steven Yeager	
Richard Bejarano	
Sheryl Williams	
Annabelle Duval	

THE FISHERY

June 6, 2024

California Fish and Game Commission
715 P Street, 16th floor
Sacramento, Ca. 95814

Re: Petition to List White Sturgeon

Dear Commissioners:

I am a long-time owner (1981) of a sturgeon farm located near Sacramento, Ca. I would like to provide the Commission with a few bullet points of information that might be of some use when considering the proposed petition to list white sturgeon as threatened.

: White sturgeon were first spawned in a hatchery at UC Davis in 1980. UC Davis had secured a grant from USFWS to develop hatchery technology for white sturgeon.

: in 1981 the California Fish and Game Commission authorized private farms (ours) to collect a small number of mature wild sturgeon from the Sacramento River. We were able to spawn these fish, incubate the eggs, and rear the progeny. The wild adult sturgeon were returned to the Sacramento River after spawning, and a portion of the juveniles were provided to DFG for their use (some were stocked into the Sacramento River).

: Collection of wild sturgeon continued until around 1994, at which time several fish farms had sturgeon from the initial year classes mature, and were able to spawn these fish, rather than collect wild fish.

: From these humble beginnings, California sturgeon farms now provide approximately 80-90 percent of the farmed sturgeon meat and caviar produced in North America.

: Due to the success of commercial sturgeon farming, the industry has been able to secure numerous USDA funded research grants, including over 30 consecutive years of funding from Western Region Aquaculture Center. These funds supported many researchers from UC Davis and other California institutions, and developed valuable information of basic sturgeon physiology, maturation, genetics, pathology, and other disciplines that are useful for sturgeon farming and wild sturgeon management.

: The sturgeon farms in California, located in agricultural settings distant from natural waters, do not impact wild sturgeon populations. The farmed products provide a reliable, legal source of seafood items that discourages illegal poached sturgeon products from entering the marketplace.

11583 Valensin Road • Galt, California 95632
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Other thoughts:

: The petition expressed concern about degraded spawning habitat due to historic dam construction, and possible effects from pumping water to the proposed Sites Reservoir. My experience from collecting mature wild sturgeon in the Sacramento River from 1980-1994 was that white sturgeon mainly stage and spawn in the Sacramento River below Colusa. The spawning habitat for white sturgeon has not changed dramatically due to dam construction.

: Due to the demersal (sinking) adhesive eggs of white sturgeon, water flow during and immediately after spawning is probably not as critical a component as it is for fish species with pelagic (floating) eggs/larvae.

: There are many recorded instances where populations of sturgeon species have recovered from population declines simply by the imposition of effective limits on harvest (California white sturgeon in the early-mid 1900's being a prime example. White sturgeon in the Columbia River are another example). Sacramento River white sturgeon migrate, stage, and spawn at very specific times and place, and are very vulnerable to fishing pressure at that time. Protection of these fish at these times has not always been as thorough as desirable and is a logical step to boost annual recruitment.

:A remnant population of white sturgeon on the Kootenai River in Canada and Montana is landlocked by dams, and listed as endangered. Two restoration hatcheries (1 in Canada, and 1 in the US) now stock limited number of hatchery produced fingerlings each year to maintain and eventually boost this population. Prior to constructing and operating these hatcheries their personnel visited and were assisted by UC Davis and various commercial sturgeon farms. Numerous other sturgeon hatcheries/farms world-wide benefit from the white sturgeon hatchery manual and other research publications that are periodically produced due to California's commercial sturgeon production.

Final Thoughts

I cannot thoroughly evaluate the merits of the proposal to list SF bay white sturgeon as threatened. However, it is my firm belief that our farmed white sturgeon poses no threat to wild white sturgeon. Also, our industry provides benefits that provide knowledge about sturgeon and could ultimately help in the recovery of wild sturgeon.

I urge the commission to definitively indicate that any recovery plan for sturgeon should not adversely affect California sturgeon farms.

Sincerely,

Ken Beer
President, The Fishery