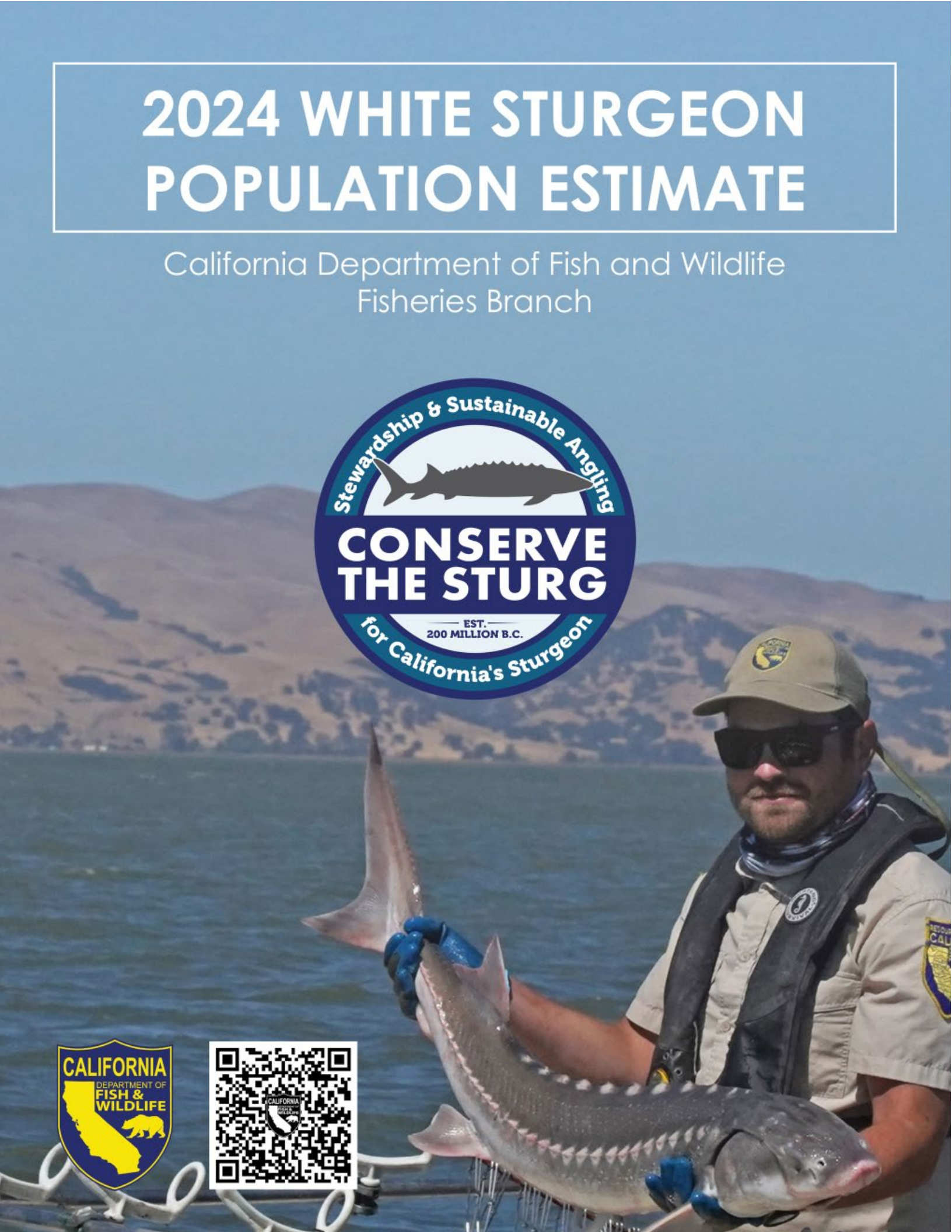
2024 WHITE STURGEON POPULATION ESTIMATE

California Department of Fish and Wildlife
Fisheries Branch

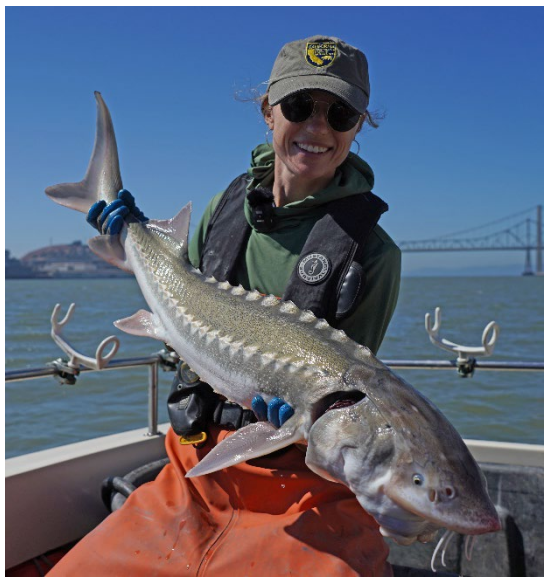


Introduction

In May 2024, CDFW began a new survey program to monitor the white sturgeon population in California. The survey design is based on methods that have been used by Washington and Oregon on the Columbia River since the 1990's, modified to suit the unique environment of the San Francisco Estuary and Delta. A feature of the new survey is that it will provide information across a broad range of fish sizes and ages to help inform management and conservation, whereas the survey methods used in past decades were designed to focus on the size range of sturgeon that could be kept by anglers. The new survey has been peer-reviewed by independent fisheries biologists and sturgeon experts to ensure that the Department is using the most rigorous, scientifically appropriate methods available.

Background

White sturgeon (*Acipenser transmontanus*) are an ancient and iconic fish species native to the San Francisco Estuary and California's Central Valley rivers. If left undisturbed, they can grow larger than 20 feet in length and live for more than 100 years. White sturgeon are an anadromous fish, moving easily between fresh and salt water and spending most of their time in the bays and Delta. Adults sometimes journey into the coastal ocean, but it is not common. Every year, some adults migrate into the largest Central Valley rivers to spawn. Most white sturgeon spawn for the first time after 14–19 years and then spawn again every 2–5 years. Successful spawning and survival of the young requires high springtime freshwater flows.



In June 2024, the California Fish and Game Commission (FGC) responded to a petition to list white sturgeon as threatened under the California Endangered Species Act (CESA). The FGC determined that listing "may be warranted," advancing white sturgeon as a candidate species, and starting the Status Review process. Candidate species receive full CESA protection from harm during the review. All projects that may impact white sturgeon now require CESA permitting and the sport fishery was closed. In August 2024, the FGC supported a CDFW-proposed emergency regulation under Section 2084 in Fish and Game Code Title 14 to allow catch-and-release only. The catch-and-release fishery for white sturgeon opened on October 1, 2024, with new protective seasons, fishing areas, and handling restrictions.

Population Status

The number of white sturgeon has been declining in California since the 1990's. Sturgeon face many challenges, including:

- loss of habitat due to dams
- changes to river flows in the highly altered and managed California water system
- mortality due to toxic Harmful Algal Blooms
- high levels of harvest in the past
- poaching

Estimates from the 1990's and earlier were around 150,000 or more white sturgeon within the range of the legal size to harvest. The exact harvest size limits varied slightly over the years but were most recently 40–60 inches Fork Length (2013–2023). **The most recent 5-year average of this size range of white sturgeon was approximately 30,000 fish**, but these data were collected before a major Harmful Algal Bloom (HAB) in the summer of 2022 that is believed to have killed thousands of sturgeon. Funding for previous studies ended in 2022 so no estimates have been made until 2024.

Historical Monitoring

CDFW started monitoring the white sturgeon population in the 1950's using mark-recapture surveys. Mark-recapture techniques were first developed in 1896 to study fish populations and are a standard fishery tool that is used around the world. In these studies, fish are caught in a marking period, marked with a unique identifier such as a numbered tag, and then released and given time to mix back into the population. Fish are then caught during a recapture period and checked for a mark or tag. The proportion of unmarked fish to marked (recaptured) fish in this second period is used to estimate the size of the overall population.

Until 2022, CDFW caught sturgeon using trammel nets designed to target harvest-sized fish. External reward tags, ranging from $20 to $150 per tag, were placed on fish as "marks" and returned tags were used as "recaptures" in the population models. In 2007, the Sturgeon Report Card program started, providing new data on angler catch and harvest rates that were not available before that time.

There are many different mark-recapture models and fisheries biologists select which models are the best fit for the species and area they are studying. CDFW used the *Lincoln-Peterson method* to estimate the size of the white sturgeon population until 2007 when Sturgeon Report Card data also permitted the use of the *Lincoln Harvest Estimator*. Both methods have been used since that time, but the *Lincoln Harvest Estimator* was considered the best fit for the data.

New White Sturgeon Monitoring

In 2024, CDFW began a new mark-recapture study that does not rely on reward tags and angler participation. To assist with field work and fishing expertise, CDFW contracted with Pacific States Marine Fisheries Commission (PSMFC) and partnered with fishing captains and guides from the white sturgeon sportfishing industry. The new survey is conducted from San Pablo Bay to Rio Vista and the areas in between. These locations were picked based on the Report Card fishing zones with the highest reported catch of white sturgeon. Each zone was then restricted to waters >4 feet deep where the setlines can be safely deployed and divided into 3.5 square mile sampling units (Fig. 1).

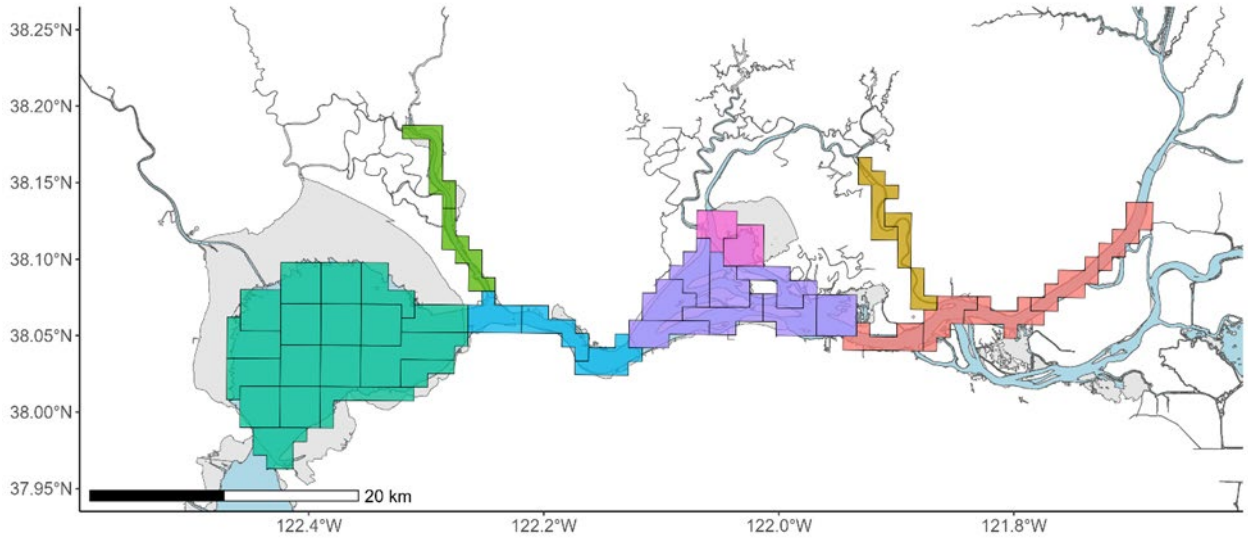


Figure 1. Map of the San Francisco Estuary and Delta indicating the survey region. Different colors indicate Sturgeon Report Card fishing zones (restricted to waters >4 feet depth), black lines show the boundaries of 3.5 square mile sampling units.

White sturgeon are captured using setlines that are anchored in sampling units overnight. Each setline is 600 feet long and has 40 baited circle hooks with three hook sizes to capture a wide size range of sturgeon. Setlines are deployed by two to three boats contracted from the sturgeon fishing guide fleet. The guide captains supply their expert local knowledge of where to find sturgeon while deckhands and CDFW and PSMFC scientists deploy and retrieve gear, measure and tag fish, and record data.

Tiny electronic tags called Passive Integrated Transponders (PIT), like those used to "microchip" pets, are inserted into captured fish as marks. The tags can last for the entire life of a sturgeon and provide a unique code that allows identification of a fish each time it is recaptured and scanned with a handheld electronic wand. Marking is conducted for 32 days in spring and the recapture phase occurs over 32 days in late summer. The survey timing is set when it is least likely to interfere with migration and spawning.

This study currently analyzes the collected mark-recapture data using the *Lincoln-Peterson method* to produce annual population estimates. When multiple years of data are available, the *Cormack-Jolly-Seber (CJS) method* will also be used. CJS will provide additional information on survival, mortality, and emigration and will refine previous population estimates by accounting for survival and mortality.

Preliminary Setline Survey Results from 2024

- Total number of longlines set: **1,009**
- Total number of hooks deployed: **40,243**
- Total number of white sturgeon landed in the first year: **1,449**
    - **961** white sturgeon were caught and marked in the marking period
    - **488** white sturgeon were caught in the recapture period. Of these, **24** were recaptures from this study.
- Mean Fork length: 43 inches (range 10–87 inches)
- Bycatch: primarily sharks and rays in San Pablo Bay and striped bass in inland areas; mortality was low. No federal Endangered Species Act protected green sturgeon or salmon were caught in 2024.

Preliminary White Sturgeon Population Estimate for 2024

Based on the first year of data, we estimate that there are **6,447 white sturgeon between 40–60 inch FL** (95% confidence interval 3,816–11,640) in the California population (Fig. 2). The setline method caught a wider size range of fish than the historical trammel net studies which allows us to estimate the size of a larger portion of the population than in the past. We estimate that there are **18,777 white sturgeon between 10–87 inch FL** (95% confidence interval 12,787–28,664) in the California population.

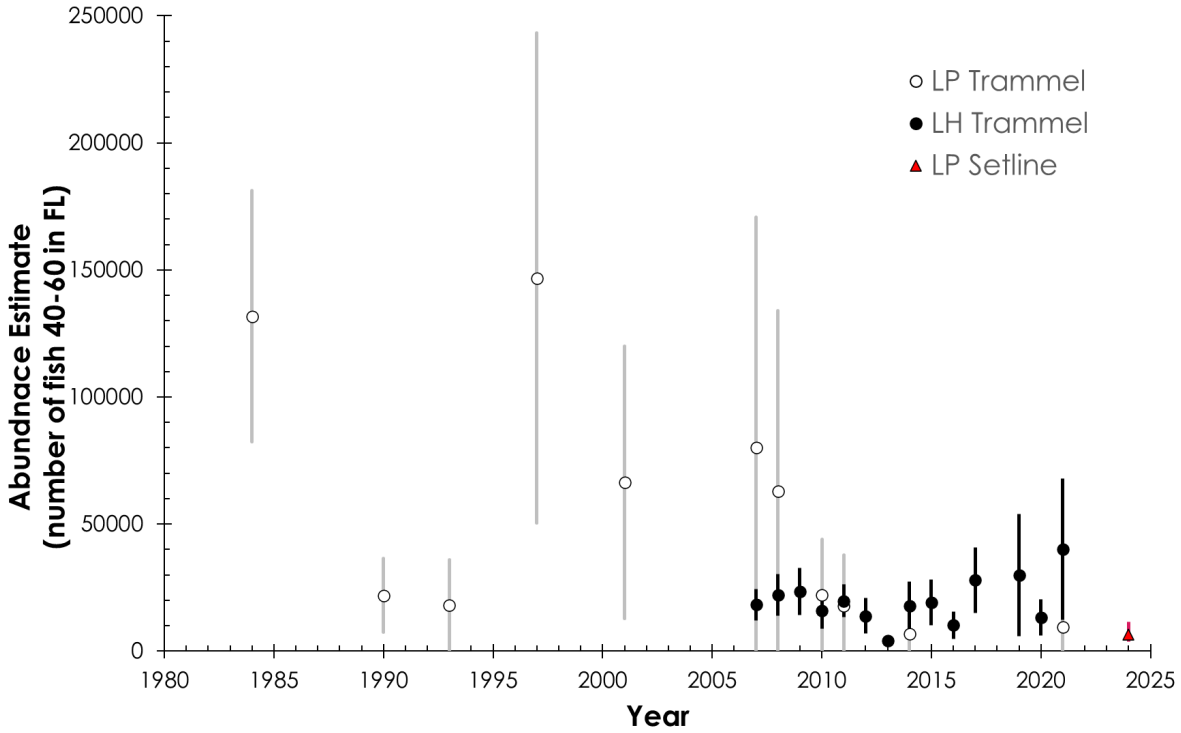


Figure 2. CDFW estimates of the population size of legal-size (40–60 cm FL) white sturgeon. Open circles = trammel net data, Lincoln-Petersen estimator (LP); black circles = trammel net data, Lincoln-Harvest estimator (LH); red triangle = setline data, Lincoln-Petersen estimator. Vertical lines indicate 95% confidence limits. Years with missing data were either not sampled or did not contain sufficient tag returns to generate an estimate.

Next Steps

- Starting this year, CDFW will be conducing sonar-based surveys of spawning white sturgeon in the Sacramento and San Joaquin rivers. This will provide additional information on spawning activity, timing, and location and allow CDFW to monitor this critical event.

- The best way to improve population estimates and reduce the range of possible errors is to tag as many fish as possible during the marking phase of the survey. To achieve this, the Department has added another boat to the marking phase for 2025. We are also working with charter guides to help tag the fish that they catch with clients.

- The numbers presented here are preliminary and are based on the first year of a pilot study. The 2024 season represents the most rigorous survey of white sturgeon conducted in California in many years; however, the survey methods are still being refined. Confidence in the accuracy and reliability of this study will improve as additional years of data are collected.

- A detailed, peer-reviewed description of the methods employed in this study is available on the Department's web page (scan the QR code below) or by request.

- The Department secured funding for three years (2024–2026) to implement and refine this pilot effort. Additional funding will be needed to establish a long-term monitoring program for white sturgeon in California.

Contact Us

This summary report was prepared by staff of CDFW Fisheries Branch. For more information about sturgeon in California, scan the QR code.

Please direct questions to: Sturgeon@wildlife.ca.gov