COUNTY OF SANTA CRUZ

FISH AND WILDLIFE ADVISORY COMMISSION

701 OCEAN STREET, ROOM 312, SANTA CRUZ, CA 95060
(831) 454-3154 FAX: (831) 454-3128

AGENDA
November 7, 2019
7:00 PM
Board of Supervisor's Chambers, Fifth Floor, 701 Ocean Street
PLEASE NOTE: Outside doors will be open 6:45-7:30 and then locked for security.
Please arrive during this time.
Staff can be contacted at 831-227-7404 but may not be available to answer the call during the meeting.

Agenda Item #		Start Time	End Time	Description
1		7:00	7:00	Call to Order
2		7:00	7:05	Roll Call; introduction of new commissioners
3		7:05	7:10	Approval of Minutes
4		7:10	7:15	Public Comments
5		7:15	8:05	Grant Proposal Presentations
	A1			Steven P. Kennedy: *The Cannonball Express (Student Version)*
	A2			Freeman Hydrologic Data Services, LLC: Understanding Scotts Creek Hydrology: Developing baseline knowledge to inform fish restoration in a highly-prioritized watershed
	A3			Raindancer Media: *Fresh Water in Peril: Blue-Green Algae on the Rise*
	A4			Monterey Bay Salmon & Trout Project: San Lorenzo River Adult Steelhead Population Monitoring
	A5			Sandra Baron: "A Vision for Santa Cruz Wildlife"
	A6			Santa Cruz Bird Club: Santa Cruz County Breeding Bird Atlas
	A7			Santa Cruz Predatory Bird Research Group, UC Santa Cruz Foundation: Raptor Pilot Study for Pajaro River Flood Protection
	A8			Salmonid Restoration Federation: 38th Annual Salmonid Restoration Conference
6		8:05	8:25	Commissioner Introductions, Reports and Announcements
7		8:25	8:35	Discuss December agenda, 2020 Workplan and 2020 Schedule
8		8:35	8:40	Updates on New Zealand Mudsnail
9		8:40	8:45	Update on Coho Salmon Recovery
10		8:45	8:55	Staff Reports and Announcements
11		8:55	9:00	Review Correspondence
12		9:00		Adjourn

11. CORRESPONDENCE

a. Cal Poly grant report dated October 2, 2019
b. Notice that Appendix R added to Pacific Herring Fishery Management Plan

The County of Santa Cruz does not discriminate on the basis of disability, and no person shall, by reason of a disability, be denied the benefits of its services, programs, or activities. The Planning Department Conference Room is located in an accessible facility. If you are a person with a disability and require special assistance in order to participate in the meeting, please contact Kristen Kittleson at (831)454-3154 or TDD number (454-2123) at least 72 hours in advance of the meeting in order to make arrangements. Persons with disabilities may request a copy of the agenda in an alternative format. As a courtesy to those affected, please attend the meeting smoke and scent free.

COUNTY OF SANTA CRUZ

FISH AND WILDLIFE ADVISORY COMMISSION

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Meeting Minutes
September 5, 2019

1. CALL TO ORDER – 7:00 pm
2. ROLL CALL
   Present: Commissioners Robin, Baron, Somerton, Lee, Hoffman, Gómez
   Excused: Berry, Freeman, Wise
   Absent: none

   Guests included presenters Mark Strudley, Brian Lockwood and Gary Kittleson; Marilyn Underwood, Environmental Health Director, and Nancy Easter
3. APPROVAL OF MINUTES – Commissioner Hoffman made a motion to approve the minutes; Commissioner Gómez seconded the motion. All aye; minutes approved.
4. PUBLIC COMMENTS
   None.
5. BUSINESS MATTERS
   A. Presentation: Mark Strudley, Flood Control Division Director: Multi-benefit Pajaro River Flood Risk Reduction. Dr. Strudley provided a brief history of the Pajaro River Flood Risk Reduction Project. The project was authorized by Congress in 1966 as a single objective project to reduce flood risk. Corps projects have 3 phases: feasibility, design and construction and this project is still in the feasibility phase. The current feasibility study recommends upgrades to sections of the levee system, including the addition of set-back levees that would add about 120 acres of habitat to the river corridor. As part of the existing flood control project, the County is obligated to manage vegetation within the levee system to maintain channel capacity. In 2017, high flows scoured through the bench excavation project area which has resulted in additional flood capacity and more habitat diversity within the river corridor. Mark explained that vegetation on the levee faces is managed so that rodent damage can be observed and addressed. Ground squirrel burrows weaken the levee and must be addressed by controlling ground squirrel populations and recompacting damaged areas. The County is currently managing rodent populations using carbon monoxide.
   B. Presentation: Brian Lockwood, General Manger, Pajaro Valley Water Management Agency: Proposed College Lake Integrated Resources Management Project. Mr. Lockwood provided information about the Pajaro Valley Water Management Agency (PV Water) and the state of the Pajaro Valley groundwater basin. PW Water has a long history (35 years) of managing the groundwater basin including monitoring, conducting studies, and developing water supply projects and programs. The College Lake Project would develop 1,800-2,300 acre-feet of water per year for agricultural irrigation in the coastal area to help eliminate overdraft and prevent seawater intrusion. The project would also develop an adaptive management plan to manage the land use within the lake basin to support water supply, fish and wildlife.
   C. Presentation: Gary Kittleson, consulting wildlife biologist: Wildlife Updates from Pajaro River, College Lake and Watsonville Sloughs. Mr Kittleson provided information about red-legged frog distribution and breeding within the Watsonville Sloughs, the western pond turtle population on the Pajaro River and bird observations at College Lake. Red-legged frogs are found in the Sloughs with breeding most successful away from deep water areas that support non-native fish. On the Pajaro River, red legged

frog breeding was observed for the first time in the off-channel scour holes that developed in 2017. The Pajaro River corridor supports a moderate number of western pond turtles. The population has more males than females. While males move greater distances than females, females may be at greater risk while searching for nesting areas. Bird surveys have been regularly conducted as part of the College Lake project development and are available on E-bird.

D. Questions and Discussion of Pajaro, College Lake and Watsonville Sloughs. The commissioners had time to ask questions about the presentations.

E. Audit of Fish and Game Propagation Fund. The California Department of Fish and Wildlife completed an audit of the Fish and Game Propagation Fund. The final report was included in the agenda packet. Environmental Health also provided a summary of findings related to the Fish and Game Propagation Fund

F. Finalize Funding Amount and Request for Proposals for Public Grants Program. The current balance of the Fish and Game Propagation Fund is $26, 085 and Environmental Health recommends going ahead with the public grants program. Commissioners Lee and Somerton expressed interest in discussing ways to leverage or increase revenue to the Fund. Based on previous comments about the scoring, staff adjusted the scoring to a scale of 0-20, instead of just 0-10. Commissioner Hoffman made a motion to have staff send out the Request for Proposals with a funding amount of $15,000; Commissioner Somerton seconded the motion. All aye, the motion passed. Staff will send out the Request for Proposals to email distribution lists and commissioners.

G. Letter to BOS re: Significant Tree Ordinance and discuss follow up. The letter from the commission went to the Board of Supervisors on August 6, 2019. Chair Coonerty responded to the letter, thanked the commission for the recommendations and provided the letter to the Planning Department. Supervisor McPherson plans to collect more information about the recommendation to expand the Significant Tree Ordinance outside the Coastal Zone. Commissioners agreed that there is no specific follow up needed at this time.

H. Letter to BOS re: rodenticides, low flow fishing closure criteria and discuss November agenda. The commission's letter regarding second generation rodenticides went to the Board of Supervisors on June 25, 2019. Commissioner Hoffman reported that AB1778, restricting the use of second- generation rodenticides, has been passed by the Assembly and is being reviewed and amended by the Senate. Supervisors McPherson and Friend brought a letter to the Board of Supervisors requesting a letter to the Fish and Game Commission in support of low flow fishing closure criteria for Santa Cruz County. After approval, the Board of Supervisors sent a letter to the Fish and Game Commission stating the County's support for the studies needed to create a low flow fishing closure criteria.

6. STAFF REPORTS/ANNOUNCEMENTS. Staff reported that construction of the Zayante Stream Wood Enhancement Project will start this month.

7. PRESENTATIONS AND ANNOUNCEMENTS BY COMMMISSIONERS. Commissioner Baron is interested in learning more about the Sensitive Habitat Protection Ordinance and protection for special forests; staff will be meeting next week with Planning staff and will ask about having someone come to the commission to provide information. For a future meeting, Commissioner Hoffman is interested in an update on the steelhead population. Chair Berry was interested in discussing hemp cultivation. Commissioner Gomez reported that road crews mowed native plants such as ferns and trillium along Lompico Road and was interested in learning more about options for more selective mowing by DPW.

8. ADJOURNMENT. Commissioner Gómez made a motion to adjourn; Commissioner Hoffman seconded the motion. All aye; motion passed. The meeting adjourned at 9:03 pm.

County of Santa Cruz Fish and Game Advisory Commission
GRANT APPLICATION – Version II

I. Application Date October 4th, 2019

II. Name of organization or individual submitting the proposal
Steven P. Kennedy

III. Project name. The Cannonball Express - Student Version

IV. Amount of funding requested. $2,000

VII. Project Description

The student version of "The Cannonball Express" is an education program for school age children, related to fish and wildlife, which fully complies with Fish and Game Code 13103(a). The STUDENT version of "The Cannonball Express" introduces students to at least six principles of fish and wildlife conservation in a subtle and memorable way. The unspoken lesson expounded in the video is that California was at one time, rich with wildlife, which was, alas, sacrificed in the name of nation building.

One of the first principles of fish and wildlife conservation taught in this video, is that some of this historic bounty of wildlife (biomass) is still around and can be counted in a measureable way. This is the purpose of the dialog between Ingrid and Carl about bears and the BioBlitz. Another principle of wildlife conservation is reflected in the dialog about healthy habitat, which is often degraded by air pollution, exotic invasive weeds and lethal plant pathogens like SODS. Unhealthy habitat and collateral damage occurring when wildlife makes suburbia its home can have a devastating impact on recovering fish and game populations and restrict opportunities for sportsmen doing recreational hunting and fishing.

A third principle of wildlife conservation brought up in the video is how changes in an environment can force changes in the morphology (size and shape) of wildlife through epigenetics, as reflected in the discussion of the spread of the deer antlers on the wall of the barn.

A fourth principle of wildlife conservation in the video is the need to keep top-of-the-food-chain predators like mountain lions in their niche, hunting and eating other wildlife and not domestic animals like sheep. This opportunistic feeding in suburbia and resulting conflict can result in a depradation permit and the shooting of the mountain lion.

A fifth principle of wildlife conservation brought up in dialog is in the recovery of good wildlife habitat after a wildfire, through the action of invertebrate life. i.e. Fungi, Bacteria and Insects. (The FBI) at the bottom of the food chain.

A sixth principle of wildlife conservation found here, is in the danger of diseases which can jump from one species to another. ie toxoplasmosis from cats to sea otters, causing problems all over the web of life.

On top of this education in the scientific principles of conservation, we are offering the County a step in the right direction for public safety. We consider a $2,000 investment in this youth education video to be a move towards the solution of a multi-billion dollar environmental problem.

This 28.5 minute, environmental education video will use vignettes of neighbors-helping-neighbors to inspire students in grades 4-8 to enter the training and education pipeline for the jobs of tomorrow, in the public and private sector, that will help citizens of Northern California prepare for, prevent and mitigate, the kind of deadly and environmentally destructive, suburban forest fires that have…

a) caused and threatened grid shut downs of up to five days,
b) temporarily closed forests to hunting and camping,
c) aggravated breathing difficulties for many thousand people,
d) needlessly created a huge demand for local forest products and
e) polluted water tables, streams and reservoirs, to the detriment of fish, wildlife and people.

VIII. Project objectives and goals

The objective of this project is to provide an educational tool to educators to use in the classroom and to promote a greater understanding of wildfire and its effects on us and to serve as part of the environmental community's video tool kit.

By shedding light on this amazing phenomena, providing an historical background, and by offering best practices for living with wildfire, this video will help people coexist with wildfire for years to come, as the target audience enters the workforce in their chosen professions.

Our goal is to cablecast this video on local cable television, to post it online, and most importantly, to offer the video to schools in the County, for educational use.

Without belaboring the point, our goal is to help create a critical mass of trained people who can find new solutions to the age old problem of the suburban forest fire. It follows, that more pragmatic wildlands management will also improve stream flows and enhance wildlife populations.

Our goal is to cablecast this video on local cable television, to post it online at

www.canonbal.org

www.YouTube.com

www.vimeo.com

and again, most importantly, to offer the video to schools in the County, for educational use.

IX. Background and history of the problem

The problem of neighborhood devouring, suburban forest fires had been dismissed as an "act of God" or as a "freak phenomena of nature" for over a hundred years. Beginning in 1910 and until recently, the United States Forest Service zealously pursued fire exclusion policies in an attempt to exclude wildfire from our Western forests. (CALFIRE has copied these policies.) This has resulted in forests thick with fuel. Meanwhile, suburbs have been expanding into those forests and many houses have been built in places beyond the reach of local fire departments. Of course, electrical power lines followed this expansion, creating a sprawling network that is now in dire need of upgrades and repairs. Drought, SODS, exotic invasive trees like eucalyptus and climate change, have made the problem worse.

While wildfire in a fire adapted ecosystem is generally beneficial, wildfire in suburbia can release a huge amount of toxic chemicals into the air and waters. This is generally bad for the environment, fish and wildlife.

Meanwhile, in the California schools, students wear bullet resistant backpacks, join gangs, enter schools past armed guards and through metal detectors, do drugs, lack career goals, fret over fires in the rain forests of the Amazon (while the fire adapted forests of Northern California desperately need regular burning) and get nearly useless college degrees in the liberal arts, with borrowed money. Many of them apparently suffer from nature deprivation syndrome, feel disconnected from society and must be bewildered by the educational challenges in front of them.

Responsible gun ownership is not being taught, as the number of kids engaged in recreational hunting continues to decline. A political counterweight to the excessive planting of wine grapes, heavy chemical use in agriculture and subsequent ground water pumping is disappearing, as fewer young people engage in recreational fishing in rivers and streams. No wonder these kids then pursue only occasionally useful college degrees in the liberal arts.

Some of those at-risk kids could be motivated to take a role in solving a multi-faceted environmental problem that will take a concerted effort by our entire society. There are 50 occupations that will have a say in how we deal with the issue of suburban forest fires. If I could name 25 of them, then I'd be a genius.

A few of these occupations are....

A) drone operator
B) vegetation manager, goat wrangler
C) fire fighter, fire marshal, home insurance inspector, fire insurance salesman, claims manager
D) prescribed burn planner, weather forecaster, smoke spread modeler, watershed manager
E) IBEW high voltage linesperson, solar panel installer, solar appointment canvasser, roofer
F) weed warrior, urban forester, tree trimmer, landscaper, botanist
G) wildlife biologist, trail cam operator, game warden
H) film maker

X. How will the project be accomplished (design specifications or plans, if applicable)

This video will be created by a team of consultants and experts in education, film making, web site creation and related occupations.

Production of the video will include the creation of rough drafts of the video (without titling and music) which will be evaluated and commented on, by stakeholders including fire professionals, foresters, PG&E linemen, drone pilots, insurance salespeople, urban planners, weather forecasters and real estate agents.

This critique may result in script changes and returning to the field for re-shoots of one or more scenes. We have budgeted for this.

Our efforts will be aided by students, volunteers and SAG listed talent.

We are open to script suggestions from the Fish & Game Commissioners.

XI. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

We will seek crowd sourced funding on line from www.GoFundMe.com and www.IndieGoGo.com for the Match Contribution.

Item	Funds Requested	Match Contribution	Total Amount
Pre-Production (including 10% of County grant and 10% of all Match Contributions for our fiscal agent's administrative fee)	$500	$700	$1,200
Equipment Rental	$300	$900	$1,200
Camera Operator (labor)	$600	$600	$1,200
Drone Operation (labor)	$100	$600	$700
Editing & Titling (labor)	$250	$600	$850
Music (scoring)	$50	$500	$550
Archival Rights	$100	$300	$400
Insurance	$100	$900	$1,000
TOTAL AMOUNTS	$2,000	$5,200	$7,200

XII. Timeline for completion

March 2020 - pre-production
June 2020 - production
August 2020 - titling, scoring and editing
September 2020 - delivery of final draft, DVD's and links to stakeholders.
October 2020 – submission of our final report to the Fish & Game Commission

XIII. Background or history of your organization

Steve Kennedy began work on the adult-homeowner version of "The Cannonball Express" in 1993, following the big fire in the Oakland-Berkeley hills in 1991. (His work on this video project is chronicled in the "Chronology" link on our web site at www.canonbal.org)

Discussions with the head of the San Mateo County Fire Safe Committee, Dave Soho, in Felton, that same year, were ended after creative differences. The Fire Safe Committee would eventually make a children's video that put Smokey in drag, call their main character "Bonnie the Bear" and release this video, "Bear Facts", just prior to the 1995 Mt Vision Fire in Point Reyes, which burned 45 homes.

After electing to work independently, an extensive web site (www.canonbal.org) was created around Steve's script, with the help of a cash contribution from ROMIC Corporation. The screenplay was adapted into a screenplay and then a storyboard was created for the Producer/Director, cast and crew.

The Botanist's Scene was filmed in October of 2000 and won a prize at Palo Alto's Greenlight Earth Film Festival.

The other 3 scenes were filmed in 2001 and the completed video was posted on line at www.canonbal.org where it has been viewed thousands of times by a global audience. Additional video clips of the Angora Fire were added in 2008

Over sixty people were involved in the creation of the supporting web site and the production of the adult/homeowner version of The Cannonball Express. The names of these paid staffers and volunteers have been listed on our web site www.canonbal.org in the link entitled, "About Us".

The adult/homeowner version of the video was cablecast from several community access cable TV stations in Santa Cruz, the Wine Country and the Bay Area and as far away as North Carolina.

This version was presented several times in private homes and community centers in the SF Bay Area.

The author went back to the drawing board after the devastating 2017 wildfires in the Wine Country. The result of that creative effort is the STUDENT version of “The Cannonball Express”. Many things, including story and character development, learned during the creation and promotion of the adult/homeowner version, were poured into the script of the Student version.

The STUDENT version of our video has received a beautiful letter of interest from a public school teacher, Allan Fisch, who has a background as an executive in Hollywood.
This letter is posted on line at www.canonbal.org and can be read by clicking on “Endorsements” and then opening the PDF on our chart. We are currently in search of additional letters of interest from teachers and Union leaders to ensure an interested audience, matching funds and the most bang for your buck.

Steve Kennedy is a voice and data electrician with IBEW Local 617. He will be retiring in March of 2019 from a career in construction. He plans an encore career in film making.
He holds a BA degree in English and Political Science from California State University Stanislaus.

Steve worked for CALFIRE/CDF in 1977 and 1978 in Mendocino County and saw major fires at St Helena, Mt Diablo, Grass Valley and Eagle Lake, in August of 1977.
For more information on Steve’s education, technical background and work experience, please see “Author’s Credentials” at www.canonbal.org

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

1. Project name

   "Understanding Scotts Creek Hydrology: Developing baseline knowledge to inform fish restoration in a highly-prioritized watershed."

2. Name of organization or individual submitting the proposal

   Freeman Hydrologic Data Services (affiliate to Cal Poly Swanton Pacific Ranch).

3. Amount of funding requested

   $2,500

For each of the following sections, give a brief description:

4. Project Description

   This project is essential to understanding streamflow dynamics, a major variable affecting the recovery of steelhead and Coho Salmon in Scotts Creek. As various agencies work together to restore fish populations and fish habitat in this stream, researchers are trying to understand the factors limiting recovery. To help with this effort, Swanton Pacific Ranch (SPR) installed, and has maintained a streamflow gage (Scotts Creek below Archibald Creek) in the lower watershed since 2010. A principal use of the data from this gage is to aid in the interpretation of fish population dynamics and changing physical habitat conditions. Further, the data adds to our understanding of how flow dynamics and stream discharge change over time and influence watershed management variables, such as residential and agricultural water use and stream restoration. The streamflow record is of particular importance given the availability of historic data from discontinued USGS streamflow gages known as "Scott Creek above Little Creek near Davenport, 11161900" (1958-1973), and "Scott Creek near Davenport, 11162000" (1936-1941). The location of the SPR gage provides record of streamflow for an equivalent drainage area as the discontinued USGS gage, 11162000.

   Swanton Pacific Ranch, collaborating with NOAA National Marine Fisheries Service is dedicated to ensuring the continued operation of the stream gage on Scotts Creek in order to provide an accurate, long-term streamflow record. In addition, there is a fish hatchery on Big Creek, an upstream tributary to Scotts Creek. The hatchery is operated by the Monterey Bay Salmon and Trout Project. Named the Kingfisher Flat Genetic Conservation Hatchery, it has been in operation since 1985, and is the only privately-run salmonid rearing facility on California's Central Coast. This facility is critical to the recovery of local, native salmonids, namely federally endangered Central California Coast Coho Salmon and threatened Steelhead. Accurate streamflow data in Scotts Creek provides an assessment of flow conditions in the watershed as compared to the rearing success of the hatchery. The Santa Cruz County Resource Conservation District has also expressed the value of the streamflow record to the efforts to restore the lagoon at the mouth of Scotts Creek. Letters of support for this project

from NOAA, MBSTP, and the RCD are attached to this grant application.

SPR has identified several tasks that are necessary to understanding long-term streamflow dynamics, recovery of salmonids in the watershed, changes in sediment transport, and other water quality changes. Three tasks of this long-term endeavor were completed under a 2017 grant awarded to SPR through the Public Grants Program of the Santa Cruz County Fish and Wildlife Advisory Commission: 1) evaluated the adequacy and accuracy of the stage data, SPR streamflow measurements, and the discharge record through the 2017 water year; 2) created three new ratings; and 3) provided a written report of findings and recommendations to SPR staff.

Additional tasks were identified by FHDS upon completion of the prior grant tasks. One task in particular is prioritized by Dr. Brian Dietterick, Director, Swanton Pacific Ranch. The stream discharge record needs to be re-calculated for several periods during 2010-2017 water years using the ratings developed under the 2017 grant.

The continuity of a long-term streamflow record is important to SPR and its other non-profit partners. Due to turnover of knowledgeable technical staff at SPR, Dr. Dietterick has asked FHDS to perform this next important task. Since SPR does not have funding for FHDS (an SPR Affiliate) to perform this task, FHDS is requesting, and would appreciate funding assistance from the Santa Cruz County Fish and Wildlife Advisory Commission Public Grants Program.

This long-term streamflow record supports two items listed in Fish and Game Code 13103:

(i) Scientific fish and wildlife research conducted by institutions of higher learning, qualified researchers, or governmental agencies.

(m) Other expenditures, for the purpose of protecting, conserving, propagating, and preserving fish and wildlife.

5. Project objectives and goals

<u>Objective: Recompute periods of Scotts Creek streamflow record previously identified during the period of 2010 through 2017 water years.</u>

The following tasks are proposed under this grant application:

- Recompute the periods that were identified during the previous grant study as described in section 4 above, and provide a written record analysis for these periods.
- Provide the revised data to SPR, Cal Poly, NOAA Fisheries, and other researchers as needed to support the continuing efforts in the watershed.
- Present a written summary and/or presentation of the revisions to stakeholders.

6. Background and history of the problem

For a more than a decade, personnel at Swanton Pacific Ranch have worked with numerous researchers and partners to restore, and better understand ecological challenges of endangered Steelhead and Coho Salmon within the Scotts Creek watershed. Scotts Creek has been designated as an area of high priority for salmonid restoration efforts South of San Francisco. A great deal of information has been obtained from monitoring efforts within the upper and lower reaches of the main stem of Scotts Creek, as well as two of the three main perennial tributaries (Mill Creek and Big Creek). NOAA Fisheries researchers have been investigating migration timing, physiology, abundance, survivorship, growth and age of juvenile and adult salmonids (Hayes et al. 2008). At the same time, many organizations have worked extensively to maintain and restore steelhead and Coho Salmon including the use of genetic conservation and rearing at the Big Creek Kingfisher Flat Hatchery, and habitat restoration along lower Scotts Creek. Much of the work restoring these fish populations would benefit from an improved understanding of the hydrologic processes in Scotts Creek.

Developing and maintaining an accurate, quality assured streamflow record is vital to the success of efforts to study and restore the salmonid population in the watershed. Scotts Creek is a natural channel. For natural channels, the rating is the relation between gage height and measured discharge. The rating can change for a variety of reasons. Storm events can cause long-term changes in channel morphology. During low flows, short-term rating changes can be caused by variable accumulation of leaves and small debris, or growth of algae on the section control of the gage pool. All of these occur in Scotts Creek and require continual effort to make streamflow measurements to define temporary rating shifts, or to develop new ratings. Streamflow records for natural channels are typically computed using the shifting control method, and specialized software designed for rating development and time series record computation. Lacking the specialized software, SPR has used an equation-based approach using a spreadsheet, to develop a single rating curve to compute discharge using stage and streamflow data collected through Water Year 2017. Available data collected by SPR show that the rating has changed substantially several times since the last computational effort completed in 2011. New Ratings were developed by FHDS, but the record has not been updated by SPR. SPR has asked Larry Freeman, FHDS to update the discharge record through the end of the 2017 Water Year using USGS methods (see attached reference list).

This work will allow SPR to translate flow stages and discharge to improve the understanding of limitations affecting use of refuge habitat found in off-channel alcoves or on the floodplain. It will also improve the understanding of performance of constructed large wood features as compared to design assumptions.

7a. How will the project be accomplished?

- Task a: Recompute the periods that were identified during the previous grant study as described in section 4 above.

- Task b: Provide the revised data to SPR, Cal Poly, NOAA Fisheries, and other researchers as needed to support the continuing efforts in the watershed.

- Task c: Summarize the findings for items above in a final report, with presentation to all partners working on projects in the Scotts Creek system.

7b. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Funds requested would cover consultant services provided by Larry Freeman, FHDS. The Matching Contributions from SPR are in the form of project oversight by the Director of SPR and supporting labor from SPR's Forestry and Watershed Apprentice, using already reserved funds. The Matching Contributions from FHDS reflect additional time needed beyond the amount requested for consulting services and are gladly provided to assist with this important work.

Item	Funds Requested	Match Contribution	Total Amount
Consultant Services: Larry Freeman, Freeman Hydrologic Data Services	$2,500	$2,500	$5,000
Project Oversight Brian Dietterick, Director, Swanton Pacific Ranch	$0	$500	$500
Watershed and Forrest Apprentice, CPC SPR	$0	$200	$200
TOTAL AMOUNTS	$2,500	$3,200	$5,700

8. Timeline for completion. Timeline assumes grant award date of February 1, 2020

   Task a completion: 6/01/2020
   Task b completion: 7/01/2020
   Task c completion: 8/01/2020

9. Background or history of your organization

Freeman Hydrologic Data Services, LLC (FHDS) was founded by Larry Freeman in May, 2015. Prior to this time, Mr. Freeman spent more than 35 years with the USGS performing numerous tasks, including his last 18 years as the Salinas/Marina/Santa Cruz Field office Chief (please refer to qualifications statement attached below). Mr. Freeman holds a Level 3 Hydrologic Technician Water Quality Certification from the American Institute of Hydrology.

Since its founding, FHDS has provided technical expertise to local agencies and other entities including:

- City of Watsonville Water Operations Division - Corralitos Creek EMP streamflow monitoring.
- Swanton Pacific Ranch – Scotts Creek streamflow data evaluation.
- Soquel Creek water District (volunteer) – Water Resources Management and Infrastructure Standing Committee.
- Santa Cruz Mid-County Ground Water Agency (volunteer) - Surface Water Advisory Committee.
- Illinois State Water Survey – Expert Witness services.
- In-Situ Instrument Company – Technical Advisory Board, training webinars, and water quality Instrument evaluations.

Selected references:

Measurement and Computation of Streamflow
Volume 1. Measurement of Stage and Discharge
Volume 2. Computation of Discharge
U.S. Geological Survey, Water Supply Paper 2175; By S. E. Rantz and others, 1982
(https://pubs.usgs.gov/wsp/wsp2175/)

Kennedy, E.J. 1984. Discharge ratings at gaging stations. Report prepared by U.S. Geological Survey. Series title: *Techniques of Water-Resources Investigations*. Washington, D.C.: U.S. Govt. Print. Office. Book 3, Chapter A10: Applications of Hydraulics. 65 pp.
https://pubs.usgs.gov/twri/twri3-a10/pdf/TWRI_3-A10.pdf

Sauer, V.B., and Turnipseed, D.P., 2010, Stage measurement at gaging stations: U.S. Geological Survey Techniques and Methods Book 3, Chapter A7, 45 p. (Also available at *http://pubs.usgs.gov/tm/tm3-a7/*.)

Turnipseed, D.P., and Sauer, V.B., 2010, Discharge measurements at gaging stations: U.S. Geological Survey Techniques and Methods Book 3, Chapter A8, 87 p. (Also available at *http://pubs.usgs.gov/tm/tm3-a8/*.)

Kenney, T.A., 2010, Levels at gaging stations: U.S. Geological Survey Techniques and Methods Book 3, Chapter A19, 60 p. https://pubs.usgs.gov/tm/tm3A19/

Hayes, S., Bond, M., Hanson, C., Freund, E., Smith, J., Anderson, E., Amman, A., MacFarlane, B. 2008. Steelhead Growth in a Small Central California Watershed: Upstream and Estuarine Rearing Patterns. Transaction of the American Fisheries Society. v. 137-1. Pp. 114-128.
https://www.waterboards.ca.gov/waterrights/water_issues/programs/hearings/caw_cdo/exhibits/sc_17.pdf

Freeman Hydrologic Data Services
Statement of Qualifications
Updated October 21, 2019

To Members of the County of Santa Cruz Fish and Wildlife Advisory Commission

Dear Commissioners

I am extremely pleased to have this opportunity to perform the tasks outlined in this proposal on behalf of the management, staff and partners of Swanton Pacific Ranch. The accuracy of the long-term streamflow record provided through operation of the Scotts Creek streamgage is vital to a variety of activities in the watershed. The tasks outlined in this Grant Proposal will continue to enhance efforts by SPR and others to maintain high-quality, long-term hydrologic monitoring records on Scotts Creek. I am pleased to submit the following Statement of Qualifications for your review.

Summary of Qualifications

Larry Freeman is the owner of **Freeman Hydrologic Data Services.** FHDS provides consulting services and technical training using USGS protocols specializing in stream gage, sediment and water quality network installation and operation and records computation. He brings to the table a unique set of technical and program management skills gained during his 35-year career with USGS, supplemented by over 4 years as a private consultant. He is regarded as an expert in streamflow and sediment monitoring, and records computation. He has decades of experience with monitoring site selection, station design and installation, and operation of long-term monitoring networks. As a USGS Field Office Chief, he collaborated with numerous Bay Area agencies and organizations to develop and implement long-term monitoring stations and programs, and is intimately familiar with the variety of hydrologic conditions present in Bay Area and Santa Cruz County watersheds.

Qualification Details

Prior to starting his consulting business in 2015, he had a notable 35-year career with the USGS. He was repeatedly recognized by the USGS and collaborative partners for providing high quality hydrologic information to the public, local, state and federal agencies, academia, and non-profit organizations. Throughout his USGS career he was actively engaged in streamflow and sediment monitoring, policy development, and testing of new monitoring methods and technologies. He continues to offer similar services through FHDS.

Over his career, Mr. Freeman has used his technical expertise to implement new methods and technologies for hydrologic monitoring. He frequently played key roles in testing new sensors and instrument technologies, and published criteria for field applications. His published articles, abstracts and reports include experience using suspended sediment surrogate technology such as turbidity and LASER backscatter to obtain continuous records of estimated sediment concentration and particle size.

During the final 18 years of his USGS career he managed the Salinas, Marina and Santa Cruz Field Offices. As one of only eight USGS California Field Office Chiefs, he was responsible for training and supervising his staff in surface water, sediment and water quality data collection and records computation. He also supervised the USGS California Sediment Lab. In addition, he was responsible for USGS water data program development and operations in nine counties in the Central Coast region of California, collaborating with approximately 30 local, State and Federal agencies and organizations. He routinely selected, designed and constructed monitoring sites, and along with his staff, operated them to support this region's long-term hydrologic monitoring network.

As Field Office Chief, Mr. Freeman necessarily became very familiar with the diverse hydrologic conditions and basin characteristics found in San Francisco Bay Area streams (large and small watersheds, urban and un-urbanized, with regulated and non-regulated flows). During his tenure as Field Office Chief, he worked with partner agencies and organizations to more than double the number of streamflow monitoring and flood warning stations in the Central Coast. **Table 1** is a list of the agencies and organizations he collaborated with. He also worked with peers in the U.S. Forest Service, U.S. Bureau of Reclamation, and private consultants to develop sediment-monitoring plans for the Trinity and San Joaquin River Restoration Programs where he was also responsible for verifying that USGS QA/QC protocols were used in streamflow and sediment data collection, records computation, and sediment lab analysis.

Table 1: List of past and present USGS and FHDS hydrologic monitoring programs in the Bay Area. Listed in order of program size.

Name	Program	Purpose of program	Watershed(s)
Santa Clara Valley Water District	Streamflow, daily sediment discharge, Bedload measurement	Flood warning, Contaminant load estimates (Hg, PCBs, VOCs), Salt pond restoration and sedimentation, South Bay sediment modeling	Coyote Creek, Guadalupe River, Llagas Creek, Pacheco Creek, San Mateo Creek, Saratoga Creek

San Francisco Public Utilities Commission	Streamflow, Continuous water temperature monitoring	Water rights, fish habitat, Daily Suspended Sediment discharge, Bedload discharge estimates, Flow diversion and reservoir inflow, stage and outflow.	Alameda Creek, Calaveras Creek, Pilarcitos Creek,
Alameda County Flood Control and Water Conservation District	Streamflow, daily sediment discharge, continuous water quality monitoring	Flood warning, Daily Suspended Sediment discharge, Bedload discharge estimates, Sedimentation rates in flood channels and reservoirs, South Bay sediment modeling, Fisheries, Tide gage	Alameda Creek, San Lorenzo Creek, Castro Valley Creek, San Francisco Bay
Alameda County Water Agency	Streamflow	Flow diversion management	Alameda Creek, Dry Creek
San Mateo County RCD	Streamflow	Coast-side streamflow, Watershed restoration efforts	Pilarcitos Creek, San Gregorio Creek
City of Watsonville	Streamflow	Flow diversion management, Flow diversion management.	Corralitos Creek and Browns Creek
City of Santa Cruz Water Department	Streamflow	Flow diversion management, Reservoir bathymetry and Sedimentation rate	San Lorenzo River
Santa Cruz County Department of Public Works	Streamflow	Flood warning	San Lorenzo River, Soquel Creek, Corralitos Creek

San Francisco District US Army Corps of Engineers	Streamflow	Flood warning, levee management	Pilarcitos Creek
San Francisco Estuary Institute	Daily sediment discharge	Contaminant load estimates (Hg, PCBs, VOCs)	Guadalupe River
City of San Jose, Environmental Services	Streamflow	Treatment plant operations	Coyote Creek
Midpeninsula Regional Open Space District	Streamflow	Flow diversion management	San Gregorio Creek
Soquel Creek Water District	Streamflow	Groundwater recharge monitoring, Surface water/Ground water interaction	Soquel Creek
San Mateo County Flood Control	Streamflow	Flood warning	San Francisquito Creek
City of Capitola and In-Situ Inc.	Continuous Water Quality record	Soquel Creek Lagoon 2016 seasonal monitoring	Soquel Creek

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center
Fisheries Ecology Division
110 Shaffer Road
Santa Cruz, California 95060

October 1, 2019

County of Santa Cruz –
Fish and Wildlife Advisory Commission
701 Ocean Street, Room 312
Santa Cruz, CA 95060

Re: Grant Applicant Cal Poly State University

To Whom It May Concern:

I am writing in support of the proposal being submitted to the Fish and Wildlife Advisory Commission by California Polytechnic State University's Swanton Pacific Ranch (SPR) titled, *Understanding Scotts Creek Hydrology: Developing baseline knowledge to inform fish restoration in a highly prioritized watershed.*

As you are doubtless aware, the Scott(s) Creek watershed supports sympatric populations of coho salmon (Central California Coast Evolutionarily Significant Unit) and steelhead trout (Central California Coast Distinct Population Segment), which are listed as endangered and threatened species, respectively, under the U.S. Endangered Species Act. The Scott Creek coho salmon population is of special management concern as it represents the southernmost extant population of this species in North America, and the only persistent population south of San Francisco Bay. Accordingly, NOAA Fisheries has been intensively monitoring the status and trends of salmonid populations and their habitats in the Scott Creek basin since 2003.

The streamgage maintained by SPR on mainstem Scott Creek below Archibald Creek is a critical data source that directly informs research and monitoring efforts conducted by NOAA Fisheries and our conservation partners. For more than eight years, the time series of discharge data generated at the Scott Creek streamgage has been used to examine how hydrologic variability effects the distribution, abundance and performance of salmonids at all life-stages. These data have been especially valuable in recent years, providing novel insight into the resiliency and viability of salmonid populations during extreme climatic events.

To improve the quality of the Scott Creek streamflow data, SPR recently completed a comprehensive and critical evaluation of their historical stage and discharge data sets (2010–2017). This effort identified multiple periods where new/revised rating curves and discharge calculations were warranted. Additionally, they generated the tools necessary to complete this task. The current proposal builds upon the previous work and seeks to apply new rating curves where necessary, and produce a revised time series of hourly discharge measurements. This is an extremely technical undertaking that will substantially enhance the robustness and utility of the Scott Creek streamflow data.

Given the overwhelming importance of the Scott Creek watershed to regional salmonid recovery efforts, NOAA Fisheries strongly supports projects that inform potential limiting factors in the basin. The proposal being submitted by SPR is unquestionably important work that will directly improve fisheries management and conservation in the Scott Creek watershed and elsewhere in the region. I highly recommend this project to the Commission for funding.

Respectfully,

Joseph D. Kiernan, PhD

Research Ecologist
NOAA Fisheries

October 7, 2019
County of Santa Cruz Fish & Wildlife Advisory Commission
701 Ocean St., Suite 312
Santa Cruz, CA 95060

Dear Commissioners,

On behalf of the Monterey Bay Salmon & Trout Project (MBSTP), I would like to express support for Swanton Pacific Ranch (SPR)'s ongoing research into the hydrology of the Scott Creek watershed. An accurate understanding of the discharge, flow dynamics and seasonal conditions on Scott Creek will be extremely beneficial to ongoing recovery efforts for endangered Central Coast coho salmon *Oncorhynchus kisutch.* Scott Creek represents a critical 'supporting' population of coho salmon on our part of the coast, and is unique in its importance in recovery efforts undertaken by MBSTP, NOAA and CDFW.

The MBSTP conservation hatchery at Kingfisher Flat is located within the Scott Creek watershed. Our work at Kingfisher Flat hatchery, including the transport and release of smolts (juvenile salmon) relies upon an accurate perception of conditions within the watershed. For this reason, MBSTP is supportive of SPR's ongoing efforts to engage in a thorough computation of streamflow data from the 2010-2017 Water Years Findings. Understanding the flow conditions of Scott Creek in recent years will offer helpful insight into future planning for coho salmon conservation within the watershed.

Future habitat recovery projects in the Scott Creek watershed- including the Highway 1 bridge replacement and lagoon restoration project, will also gain from having the most accurate computations of streamflow data possible. Species conservation and habitat projects in Scott Creek will benefit from the ongoing efforts of SPR to better understand the hydrologic profile of the watershed- please consider supporting their request.

Sincerely,

Ben J. Harris
Executive Director
Monterey Bay Salmon & Trout Project
(831) 531-2051

101 Cooper Street, Suite 246
Santa Cruz, CA 95060
https://mbstp.org
Non-Profit Tax ID #94-2401308

RESOURCE
CONSERVATION DISTRICT
OF SANTA CRUZ COUNTY

820 Bay Avenue, Suite 136
Capitola, California 95010
tel 831.464.2950
www.rcdsantacruz.org

County of Santa Cruz – Fish and Wildlife Advisory Commission
701 Ocean Street, 3rd Floor – Room 312
Santa Cruz, CA 95060

To whom it may concern:

I am writing to express the Resource Conservation District of Santa Cruz County's (RCD) support for Cal Poly State University's Swanton Pacific Ranch (SPR) grant application to use recently-developed ratings to re-compute the discharge record for the stream gage on Scott Creek below Archibald Creek and to revise several periods of data that were previously computed incorrectly.

Your grant review committee is well aware of the ecological significance of the Scott Creek Watershed. The stream gage maintained by SPR on mainstem Scott Creek is an indispensable data source that directly informs research and monitoring efforts conducted by Cal Poly professors and students, NOAA Fisheries, professional consultants, and other conservation partners. Continued investment in the operation and accuracy of the gage will ensure that conservation and monitoring goals are met.

In recent years, the RCD has helped lead an effort to restore the ecological condition and dynamism of the Scott Creek lagoon, marsh, and dune system, whose function has been compromised as a result of historic land use changes including a narrow bridge opening, extensive fill of the historic estuary and marshplain, and training levees along lower Scott Creek. By understanding and addressing ecological needs first, and designing transportation infrastructure improvements around those needs, this project models a new planning paradigm for major transportation projects - one in which the resiliency of ecosystems and infrastructure are integrated and planned for holistically from the very beginning. Due to the sensitive species present in the Scott Creek Watershed, a major effort such as this one must be informed by the best available science. Our consultants who are tasked with developing the scientific basis for restoration designs, rely on accurate, existing data to perform analyses and to identify data gaps. The corrections proposed in SPR's grant will inform our efforts of modelling the existing hydrologic conditions of the Scott Creek and therefore will enable us to make better decisions regarding the restoration of this dynamic system.

Sincerely,

Sharon Corkrean

Sharon Corkrean
Acting Executive Director

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

1. Project name
   " Fresh Water in Peril" blue-green algae on the rise

2. Name of organization or individual submitting the proposal
   Raindancer Media

3. Amount of funding requested
   $1.500.00

For each of the following sections, give a brief description:

4. Project Description
   7 years ago what seemed like a local problem, has turned into a nationwide problem. affecting freshwater lakes, ponds. reservoirs, and streams, around the country. Blue-green algae is killing pets, and making people sick. We will look at the spread of this deadly algae, and what can be done to stop it.

5. Project objectives and goals
   To educate the public about the dangers of this algae, and what we can do to stop it's spread.
   To start legislation on ag. run-off of fertilizers, and animal waste.

6. Background and history of the problem
   We will look at what has been done at Pinto lake in Watsonville, and see how we can use this knowledge nationwide. To keep this growing problem at bay.

7. How will the project be accomplished (design specifications or plans, if applicable)

We will but this video on You Tube, Vimeo, and distribute copies to Public Tv, and Water Departments County wide. Also make copies available to people who want to have meetings , and discussion groups.

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

7. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Item	Funds Requested	Match Contribution	Total Amount
shoot and edit interviews to tell our story	$1,200.00	$1,200.00	$2,400.00
dubs. on thumb drives and DVD's if needed	$300.00		3oo.oo
TOTAL AMOUNTS	$1,500.00		$2,700.00

8. Timeline for completion
   video complete and ready for distribution by June 2020

9. Background or history of your organization
   Raindancer Media has existed for 15 years. During that time, it has produced many
   . environmental films. *Downstream Peril* was previously provided with a grant from the Fish and Game Commission, but the most recent was *" The Dirt on Climate Change"* Ed Schehl has been a filmmaker for 40 years and has won multiple international awards for his films. He also was one of the originators of The Santa Cruz Environmental Film Festival.

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

1. Project name

   San Lorenzo River Adult Steelhead Population Monitoring

2. Name of organization or individual submitting the proposal

   Monterey Bay Salmon & Trout Project (MBSTP)

3. Amount of funding requested

   $1,554.71

For each of the following sections, give a brief description:

4. Project Description

   The Monterey Bay Salmon & Trout Project (MBSTP) will perform adult steelhead population monitoring in the San Lorenzo River by using the City of Santa Cruz's Felton Diversion fish trapping facility between the years 2020-2023. Adult steelhead will be captured at the Felton Diversion fish trap between January and May each season. Fish will be sampled for morphometric data (length, sex, etc.) as well as genetic materials (tissue samples) by trained volunteers. Genetic tissue analysis will be performed by the NOAA Southwest Fisheries Science Center genetics lab.

5. Project objectives and goals

   The objective of the MBSTP adult steelhead monitoring program is to provide accurate data on the run abundance, timing and other characteristics of adult steelhead in the San Lorenzo River watershed in support of recovery actions recommended by management agencies.

6. Background and history of the problem

   The San Lorenzo River watershed was historically home to an abundant and highly productive run of adult steelhead each winter season. This run once generated large-scale angler involvement, helping to stimulate a fishing tourism industry in Santa Cruz County. However, since the mid-1970's, adult steelhead numbers in the San Lorenzo have declined dramatically. Angler involvement in the fishery and the industry it supported have likewise been greatly reduced.

   Additionally, the latest recovery provisions by federal fisheries biologists (NOAA NMFS) indicate that steelhead in the San Lorenzo River are 'likely to become endangered in the foreseeable future'. The most recent biological status review by NMFS (2016) recommended that CCC steelhead remain listed as threatened. While the steelhead run earlier this year (2019) was estimated to be a relatively abundant one (through informal angler survey), it is likely that future conditions in the watershed (drought, continued development) will continue to play a constraining role on steelhead populations in the San Lorenzo. The unavailability of accurate data on annual adult steelhead returns to the watershed is a limiting factor for undertaking the recovery actions recommended by state (CDFW) and federal (NMFS) fisheries biologists.

   MBSTP is actively engaged in aiding the recovery of CCC steelhead within the San Lorenzo River, and carrying out the actions recommended by management agencies. To support that recovery, MBSTP volunteers will monitor and evaluate adult steelhead populations in the watershed each season. The San Lorenzo River currently lacks an accurate assessment of the abundance, run timing and general qualities of threatened Central California Coast (CCC) steelhead. MBSTP's monitoring effort at the Felton Diversion will help inform and assist the recovery of steelhead within the watershed.

7. How will the project be accomplished (design specifications or plans, if applicable)

   MBSTP will operate the Felton Diversion fish trapping facility each season (Jan-May) for the years 2020-2023. Sampling days will be randomized, and are dependent upon inflation of the City of Santa Cruz's diversion dam at the facility (typically at flows between 40-300cfs). While the dam is inflated and trap is operational, MBSTP trapping crews will engage in sampling for 24-hour windows (or as long as flow/site conditions allow). Randomizing trapping days will facilitate a representative sample of adult abundance, rather than biasing toward 'high' periods of the run.

   The trap will be checked at least once per hour while in operation by MBSTP. Fish will be measured, photographed and genetically sampled (see sampling team Task Sheet below).

Genetic tissue samples will be dried/preserved and transported to the NOAA SWFSC genetics lab for future analysis.

MBSTP will facilitate this sampling effort by using volunteer trapping teams, each led by a trained and qualified leader. Trap leads / Principal Investigators / Authorized Individuals will be in attendance at all times the trap is in operation for sampling. MBSTP is in possession of the required NMFS Section 10 Permits, and CDFW Scientific Collection Permits to engage in the described sampling effort. This project aligns with the SC County Fish & Game Code 13103 Section (i).

Acquiring accurate annual data on adult steelhead abundance and run characteristics in the San Lorenzo watershed will help inform recovery actions for this threatened species. The data collected by MBSTP's sampling effort will provide a large benefit to CCC steelhead management efforts at a relatively low cost, and will contribute to the recovery of native, local steelhead of Santa Cruz County.

MBSTP Felton Diversion steelhead sampling team Task Sheet

ROLE	TASK 1	TASK 2	Task 3	Task 4	Task 5
Team Lead	Prepare to collect fish from livewell, Read weight	Immobilize fish in livewell, verify sex	Measure fish by Standard Length (cm)	Hold fish for fin clip	Release fish upstream of trap
Netter	Transfer fish from trap→ livewell	Hold net in livewell for immobilization	Scan Fish for PIT tags	Collect fin clip + give to data collector	Assist with fish release
Data Collector	Prepare for data and fin clip collection (envelopes)	Take photo of fish	Record length and PIT tag data	Receive fin clip from netter (in prepared envelope)	Store fin clip, verify data
Time	**0 seconds (0:00)**	**8 seconds (0:08)**	**15 seconds (0:15)**	**25 seconds (0:25)**	**30 seconds (0:30)**

8. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Item	Funds Requested	Match Contribution	Total Amount
Inflatable PFD w/ hydrostatic release (Qty: 2)	$455.90	$0	$455.90
Waterproof First Aid Kit	$36.85	$0	$36.85
Headlamp (Qty: 3)	$89.97	$0	$89.97
Survival Ring Buoy	$98.75	$0	$98.75
20ft. retractable fall arrest cable	$301.98	$0	$301.98
Vest-style harness for fall arrest system	$385.95	$0	$385.95
Waterproof Bench Scale	$161.95	$0	$161.95
Tablet for electronic data recording	$0	$208.96	$208.96
Waterproof tablet case	$0	$89.95	$89.95
Tablet Pouch + sling	$0	$25.63	$25.63
Whatman Paper for genetic tissue collection	$0	$297.11	$297.11
Long Handled Scissors (Qty:2)	$0	$31.98	$31.98
Coin Envelope (Qty: 500)	$0	$12.98	$12.98
Long-handle dip net (Qty:2)	$0	$59.96	$59.96
Volunteer personnel hours (3 personnel @ $18.96/hr., 240 hours per season)	$0	$13,651.20	$13,651.20
TOTAL AMOUNTS	**$1,531.35**	**$14,377.77**	**$15,909.12**

9. Timeline for completion

Sampling will take place from January 1 through May 1 each year from 2020-2023. Data and summary reports will be made available to all management and municipal agencies after each sampling season. All materials will be purchased immediately upon grant award.

10. Background or history of your organization

The Monterey Bay Salmon and Trout Project (MBSTP) is a small 501c3 nonprofit organization dedicated to the recovery of native salmon and steelhead populations of the Monterey Bay area. Founded in 1977, for over forty years MBSTP has been working to prevent the extinction of local coho salmon, recover native steelhead populations, enhance ocean salmon fishing in Monterey Bay, and engage in education and outreach in local schools through the MBSTP Salmon & Trout Education Program (STEP). MBSTP operates the Kingfisher Flat conservation hatchery in northern Santa Cruz County to support ongoing recovery efforts for local salmonid populations. The adult steelhead monitoring project presented in this application is one of several efforts undertaken by MBSTP in support of native salmon and steelhead recovery.

MBSTP operates with the support and partnership of federal, state, and local natural resource agencies to accomplish goals in fisheries conservation. Qualified and proficient hatchery personnel are crucial to operation of the Kingfisher Flat conservation hatchery- in addition to a dedicated corps of MBSTP volunteers. This facility represents the 'backbone' of MBSTP's actions in local salmonid recovery.

MBSTP is engaging directly in conservation actions in local watersheds in both an immediate and long-term context- including steelhead stranding rescues, youth education and outreach, and recovery planning with management agencies. Steelhead conservation and recovery in the San Lorenzo River is a fundamental aspect of MBSTP's mission. Collecting accurate data on annual adult returns will help fulfill our organization's goals focused on the recovery of native steelhead within the watershed. With support from management agencies alongside a strong foundation of volunteers, MBSTP will continue to provide meaningful and lasting benefits for local salmon and steelhead populations for many years to come.

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

1. Project name

   A Vision for Santa Cruz Wildlife (title may change) Possible alternative names: Living with Wildlife, What Wildlife Needs, or Protecting our Wild Side.

2. Name of organization or individual submitting the proposal

   Sandra Baron

3. Amount of funding requested

   $865

For each of the following sections, give a brief description:

4. Project Description

Working with an experienced local graphic artist, we will create a beautiful and informative 8.5 by 11 brochure about local wildlife. We will provide this brochure (free of charge) to local groups to distribute at events and elsewhere.

5. Project objectives and goals

1) Educate the general public, including children, on what resources wildlife needs to survive in our county long term; and help people understand the challenges that wildlife species face and the extent of their vulnerability.

2) Provide a list of resources that the public can turn to for help dealing with problems related to wildlife.

3) Provide specific tips about woodrats. This is the number one problem that I hear about from people in our community, and helpful information is not readily available online.

6. Background and history of the problem

Our small county has a high level of biodiversity that is recognized worldwide. In recent history, natural resource protection was a community priority and many of our county ordinances and resource management plans reflect this shared value.

As our population grows, these important resources are under increasing pressure

from agriculture (especially in the mountains), housing, and new economic and recreational opportunities. Additional pressure stems from our close proximity to the heavily populated Bay Area, whose population comes here to live or to recreate, often in our open spaces.

Because of current trends it is clear that our open spaces and wildlife habitats will not be able to persist long term unless the community continues to care deeply about these issues.

Some recent public outreach campaigns have returned results that show wildlife protection as a low priority (among participants) compared to other important issues. This indicates that we need to do more to elevate conservation issues in our community.

The richness and magic that wildlife brings to our lives is an evocative story that many people can relate to. I don't think that the general public doesn't care about this issue, I think that the general public may not be aware of the extreme vulnerability of these species and how easily they could be lost.

Unfortunately, not all interactions between humans and local wildlife species are magical, problems with wildlife can be challenging. A number of local groups offer information and resources to help. This information has not been widely distributed.

7. How will the project be accomplished (design specifications or plans, if applicable)

I have been working on the content for the brochure and have received positive feedback from others. I will continue to craft the content with the goal of producing a brochure that is beautiful and informative. Accomplishing this will require professional layout and collaborative design, photo search and printing. I am working with Donna Webster, a highly experienced local graphic artist who has created brochures & materials for many local groups including: Santa Cruz County Tourism Bureau and Santa Cruz Ballet Theatre.

I will also work to distribute this brochure. It would be a suitable handout for yearly events such as: Earth Day, The Monterey Bay Youth Outdoor Festival, and others. And it will compliment materials offered from groups such as the Santa Cruz County Resource Conservation District who has already expressed interest. This is a county-wide issue, so

I believe it will have wide appeal and usefulness.

County of Santa Cruz Fish and Wildlife Advisory Commission

GRANT APPLICATION

7. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Item	Funds Requested	Match Contribution	Total Amount
Create content for wildlife brochure: research, writing & design. 25 hours.		500	
Professional layout and design of final product & overseeing printing (discounted price)	500		500
Wildlife photos		65	
Printing qty 500	365		365
Shipping Brochures		35	
TOTAL AMOUNTS	865	600	865

8. Timeline for completion - Completed by March 1st

9. Background or history of your organization

I have served on the Santa Cruz County Fish and Wildlife Commission since 2008. I have a background in biology, ecology, and resource protection in Santa Cruz County and elsewhere. My Master's degree research (published in Madrono) was on the relationship between a local endangered plant species and a previously undescribed native moth. I am passionate about the importance of preserving evolutionary relationships by preserving native plant habitat.

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

1. Project name

   Santa Cruz County Breeding Bird Atlas

2. Name of organization or individual submitting the proposal

   Alex Rinkert on behalf of the Santa Cruz Bird Club

3. Amount of funding requested

   $1,950

For each of the following sections, give a brief description:

4. Project Description

A breeding bird atlas is a published compendium of everything known about the breeding birds in a region. Unlike many other resources on breeding bird populations, a breeding bird atlas is truly comprehensive. An atlas contains synthesized information about the distribution, abundance, timing of breeding, and natural history of all breeding species in a region. The specificity to a region and comprehensive scope makes an atlas an indispensable resource for conservation practitioners and natural resource managers, as well as students and amateurs.

Breeding bird atlases typically require five years of field work to collect a sufficient amount of data followed by one or two years to write the publication. As a result of this long timeframe and the comprehensive nature of the content, the cost of collecting the data and publishing an atlas is prohibitively expensive for most agencies and organizations. Instead, the data for atlases are collected largely through volunteer efforts by both amateur birders and professional biologists. Many of the services needed to publish an atlas such as copy editing, illustrating, and GIS spatial analysis are also done by volunteers or by professionals pro bono. With the many volunteers and multiple components to producing an atlas there is a need for a parent organization and part-time staff to guide an atlas to publication.

In 2017 the Santa Cruz Bird Club, a local 501(c)(7) non-profit, sponsored the pilot year of the Santa Cruz County Breeding Bird Atlas. The five-year project aims to document breeding bird populations in Santa Cruz County and engage the birding community in the process. Now heading into its fourth year of field work, the atlas is on track to finish within the planned five year timeframe. We have partnered with the San Francisco Bay Bird Observatory, a 501(c)(3) non-profit, to strengthen our ability to see the atlas to publication.

The success of the atlas relies on the contributions of its volunteer observers. As such, the Santa Cruz Bird Club hired a project director to coordinate and train volunteers. Each year of field work begins with trainings that instruct volunteers on how to contribute observations to the

atlas. Observers are given a datasheet and educational resources to use during the breeding season, and many are given an assignment on specific places to visit or species to observe. Throughout the six month breeding season—March through August—observers watch for breeding behavior at parks, open spaces, and their backyards and record their observations on a datasheet. The project director regularly communicates with atlasers on what species and behaviors to be watching for and where to see them. At the end of the breeding season, observers submit their datasheet to the project director. A volunteer imports and manages these data, and performs analyses for the project director to use in reports and outreach materials. Our Year 2 annual report can be viewed here: https://santacruzbirdclub.org/wp-content/uploads/2019/09/AtlasYear2_AnnualReport.pdf

At the end of five years of field work, the project director will oversee the synthesis of atlas data and previous publications into a breeding bird atlas publication. Each breeding species in Santa Cruz County will have a two-page spread in the publication that includes a distribution and abundance map, a chart showing when a species is breeding, and a narrative describing patterns and trends. From this synthesis the author will identify threats to the species and write conservation recommendations in the two-page spread.

5. Project objectives and goals

The Santa Cruz County Breeding Bird Atlas has the following goals:

1. Create a current, comprehensive resource on local breeding bird populations that can be used by both amateurs and professionals.
2. Identify vulnerable breeding species and bird communities to facilitate informed conservation action.
3. Provide educational opportunities for the birding community that instills appreciation for breeding birds.

The atlas has the following objectives to reach its three goals:

1. Acquire sufficient funds to support field work and publication of the atlas.
2. Organize and train a large volunteer contingent to support field work.
3. Conduct five years of field work in Santa Cruz County from 2017-2021.
4. Organize a volunteer contingent to support publication of the atlas.
5. Coordinate the synthesis of atlas data with other resources in a publication.
6. Publish and disseminate results in an accessible format.

The specific objectives for 2020, the fourth year of field work, are as follows:

1. Offer twice as many trainings to increase the number and expertise of volunteers.
2. Increase public awareness of breeding birds by tabling at local events.
3. Hire and train four student interns to monitor colonial waterbirds and fill in gaps of field work coverage.

6. Background and history of the problem

Conservation practitioners and natural resource managers need current information on breeding bird populations for effective conservation and management. This information is heavily relied upon to prepare environmental impact reports, allocate resources for non-native species management, and perform maintenance activities with the least impact on breeding birds.

Some recent examples demonstrate the value of a breeding bird atlas to local agencies. In 2016 a draft environmental impact statement was prepared for the Santa Cruz Wharf Masterplan that omitted Pigeon Guillemot and Pelagic Cormorant as species that breed on the wharf. Over a dozen pairs of Pigeon Guillemots and Pelagic Cormorants are known to breed on the wharf, yet this information is not published in an accessible resource. A breeding bird atlas would describe these two species as breeding at the wharf and delineate date spans when various breeding activities occur so as to minimize the impact from construction activities on these species.

Another example of how a breeding bird atlas can be used in this capacity was illustrated in August 2019 when a large ponderosa pine at Quail Hollow Ranch County Park was slated to be removed due to apparent rot. The large tree was a granary for over 20 Acorn Woodpeckers and active nests of this species have been found in this specific tree. The tree removal was slated to happen in early August. Breeding bird atlas data collected between 2017-2019 shows that Acorn Woodpeckers can have active nests into early September in Santa Cruz County. In response to this information, maintenance postponed the tree removal until after the breeding season ended for Acorn Woodpeckers to reduce the impact on their breeding population.

Knowing the timing of when local breeding birds have active nests is critical in planning vegetation maintenance work. Extensive tree trimming and removal is ongoing throughout Santa Cruz County and California in response to massive wildfires across the state. Vegetation maintenance also regularly occurs throughout parks, urban, and suburban areas in the county. Having a resource that describes when is best for these activities to occur to minimize impact to breeding birds will promote informed maintenance that benefits breeding birds.

A breeding bird atlas is a resource that can be used for more than informing planning, management, maintenance activities. An atlas can serve as the foundation for scientific inquiry by students and researchers by providing background information and baseline data to evaluate changes in breeding bird populations. An atlas also serves as a general reference for citizens at large, increasing the awareness and thus appreciation, of the habitats that support breeding birds. Public support increases the likelihood of success for conservation measures.

7. How will the project be accomplished (design specifications or plans, if applicable)

   We will accomplish our 2020 objectives through the following actions:

   1. **Offer twice as many trainings in 2020 to increase the number and expertise of volunteers.**
      Trainings are an integral component of the atlas as they help develop the necessary skills and knowledge the observer needs for submitting high quality data to the atlas. Without high quality data, the atlas publication could not be used with confidence to guide conservation and management of breeding bird populations.

      The project director will schedule seven trainings that will occur throughout the breeding season. Trainings will be announced in the *Albatross*, the newsletter of the Santa Cruz Bird Club, and on the club's website. Five trainings occurring in the field will focus on training observers to interpret breeding behavior and two trainings will focus on using the datasheet where observations are recorded.

   2. **Increase public awareness of breeding birds by tabling at local events.**

      The project director in coordination with volunteers will represent the breeding bird atlas at public events to promote awareness of breeding bird populations and recruit more volunteers. Events that could be tabled at include the World Migratory Bird Day at Natural Bridges State Beach and the Monterey Bay Birding Festival.

   3. **Hire and train four student interns to increase the capacity of the atlas.**
      In 2019, three UCSC student interns were hired to help with fieldwork for the breeding bird atlas. Their contributions were impactful and the internship provided them with valuable experience they can use to further their careers in biology. The interns collected data on all breeding waterbird colonies in the county, documenting an increase in breeding Great Egrets and a catastrophic decrease in breeding Pelagic Cormorants. They also visited specific locations that helped fill in gaps of coverage in our field work.

      A job posting will be sent to the Biology and Environmental Studies departments at UCSC in February. Interns will be hired by April for the spring internship and June for the summer internship. The students will enroll in a 2-unit internship course at UCSC that requires 60 hours of fieldwork and an essay summarizing the internship experience. The project director will train and coordinate the students throughout the internship.

7. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Item	Funds Requested	Match Contribution	Total Amount
Trainings	$1050	$500	$1550
Outreach Events	$300	$300	$600
Student Internships	$600	$600	$1200
TOTAL AMOUNTS	$1950	$1400	$3350

We are requesting funding for seven trainings (5 hours/training x $30/hour), one outreach event (10 hours/event x $30/hour), and two student internships ($300 stipend/student). An anonymous donor that has supported the atlas since 2017 has pledged to match grants and donations to the atlas. The anonymous donor will match $500 of the funds requested for trainings that will cover preparation of needed educational materials, $300 to support presence at a second outreach event, and $600 for stipends that will support two additional student interns.

8. Timeline for completion

Date	**Objective 1—Volunteer Trainings**
Jan 31	Submit announcement of trainings to the *Albatross*.
March	Hold two field work trainings and one datasheet training.
April	Hold one field work training and one datasheet training.
May	Hold one field work training.
June	Hold one field work training.
Oct 31	Submit report to Fish and Wildlife Advisory Committee.

Date	**Objective 2—Community Outreach**
May 9	Table at the World Migratory Bird Day at Natural Bridges State Beach.
Sep 17-20	Table at the Monterey Bay Birding Festival in Watsonville.
Oct 31	Submit report to Fish and Wildlife Advisory Committee.

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

Date	Objective 3—Student Internships
Feb	Submit position announcement to UCSC.
Apr 1	Hire 2 students for the spring internship
May 1	Submit position announcement to UCSC.
June 15	Hire 2 students for the summer internship
Oct 31	Submit report to Fish and Wildlife Advisory Committee.

9. Background or history of your organization

The Santa Cruz Bird Club was organized in 1956 with the primary purpose of uniting those with a common interest in wild birds, so that they may better study and conserve them. The club boasts a membership of over 300 members of the community. We maintain an affordable membership dues of $20 per year.

The club is a voice for birds on conservation issues, representing their interests in local land use and development activities. Some of the issues the club has weighed in on recently are: Santa Cruz City and Santa Cruz County Parks Master Plans, bird-friendly building design standards, banning anticoagulant poisons, the impacts of the Live Oak School stadium lighting and San Lorenzo River project lighting, Santa Cruz Wharf Master Plan, San Lorenzo River Flood Control plan, UCSC Great Meadow Development Project, drone use at public parks, and College Lake Water and the College Lake impound water project

Historically, the Santa Cruz Bird Club actively campaigned to protect both Schwan Lagoon and Neary Lagoon as bird sanctuaries. The club began the incredibly successful Nest Box Program for Western Bluebirds and other cavity-nesters at Quail Hollow County Park, resulting in 149 bluebirds and 1080 birds of other species fledging since 2002! The effort at Quail Hollow Ranch helped the species recover from steep population declines in the county. Several other nest box projects have begun at UCSC, Soquel, and Asilomar that draw on the Quail Hollow program.

Each year the club offers dozens of free field trips and monthly talks related to birds, all open to the public. The annual Christmas Bird Count coordinated by the club contributes its results to a national database. Recent outreach activities have included co-sponsorship of the World Migratory Bird Day at Natural Bridges State Beach and the Monterey Bay Birding Festival. In 2017 the club launched the Santa Cruz Count Breeding Bird Atlas and partnered with San Francisco Bay Bird Observatory, a 501(c)(3) non-profit, to support the project.

County of Santa Cruz Fish and Wildlife Advisory Commission
GRANT APPLICATION

1. **Project name**
Raptor Pilot Study for Pajaro River Flood Protection

2. **Name of organization or individual submitting the proposal**
Zeka Glucs, Ph.D.
Santa Cruz Predatory Bird Research Group
University of California, Santa Cruz

3. **Amount of funding requested**
$3,771.20

For each of the following sections, give a brief description:

4. **Project Description**

The Santa Cruz Predatory Bird Research Group (SCPBRG) is seeking to implement a 1-year pilot program to investigate the effectiveness of recruiting predatory birds (hawks and owls) to supplement Zone 7 Flood Control Water Conservation and Flood Control District's (Zone 7) pest management activities.

5. **Project objectives and goals**

- Work towards the elimination or minimization of the use of ecologically harmful anticoagulant and fumigant rodenticides for pest management along the Pajaro River Levees
- Recruit native raptor species to the Pajaro River riparian corridor
- Work with local farmers and land owners to monitor rodenticide use and provide information on integrated pest management solutions such as wild raptor recruitment
- Coordinate with Watsonville Wetlands Watch to incorporate adult and school age stewards into the data collection process to teach them about research and conservation
- Collaborate with Ken Norris Center of Natural History to provide undergraduate students with research and museum cataloguing experience through raptor pellet diet analyses
- Collect and compare data on the extent of rodent burrow activity along a levee reach with owl boxes and raptor perches to a similar reach using traditional anticoagulant bait stations or fumitoxin tablets
- Generate publicly available report with findings from pilot study
- Determine criteria for expansion of a successful raptor program to additional sections of the levee

6. **Background and history of the problem**

<u>Flood Control on the Pajaro River:</u>
Currently, Zone 7 is the local superintendent that maintains roughly 15 miles of United States Army Corps of Engineers (USACE) constructed earthen levees along the Pajaro River and

Salsipuedes Creek near the city of Watsonville. The levees help protect the city of Watsonville and adjacent farm lands from periodic flooding.

Failure of the levees during a major storm event could result in fatalities and serious damage to downstream facilities. Earthen flood-control facilities are highly susceptible to damage from burrowing rodents such as California ground squirrels and pocket gophers. Burrowing rodents can weaken the compacted fill of levees, undermine access roads and cause erosion, sloughing and other maintenance problems. In some cases, a burrow can completely penetrate a levee, leading to piping, erosion of levee material, and potential levee failure.

Zone 7 maintenance crews are tasked with management of rodent communities along the river to ensure the integrity of the levees during high water events. Crews typically utilize 3 types of rodent control:

1. Moisture activated fumitoxin tablets
2. Live trapping
3. PERC Machine (Carbon Monoxide)

Zone 7 spends roughly $50k to $100k each year on pest management alone. Additional compaction and mowing are also associated with pest management and not included in those costs.

Additionally, farmers will deploy bait stations that use anti-coagulants to manage pests within agricultural parcels. The opposite bank of the river is maintained by Monterey County Water Resources Agency and they also use bait stations.

<u>Rodenticides and Raptors:</u>

Secondary poisoning from anticoagulant rodenticide has unfortunately become a common mortality factor for California's predators and scavengers from mountain lions to red-tailed hawks. Both diurnal and nocturnal birds of prey, referred to generally as raptors, have exhibited anti-coagulant rodenticide exposure rates that indicate potential population level effects from consumption of rodenticide-laced prey. Effects of repeated sub-lethal rodenticide poisonings in hawks and owls are still unknown. There are few examples of raptor mortality from primary or secondary exposures to fumigant rodenticides such as zinc-, aluminum-, and magnesium-phosphorus compounds, but there is evidence for sub-lethal health effects in raptors from consuming fumigant-exposed prey. Additionally, fumigant rodenticides used in burrows are considered to have a 100% mortality rate for all vertebrates and some invertebrate larvae present during treatment. There is, therefore, potential for these compounds to harm burrowing owls and many other non-target rodents and reptiles. When dissolved in water, these compounds may have toxic effects on aquatic wildlife as well. In general, reductions in rodenticide use are recommended where possible to avoid harmful effects to non-target organisms.

Notably, wild raptors have been shown to help control pest rodent populations in agricultural and urban settings. Raptors can be recruited to areas where rodent burrowing and foraging is occurring through the placement of barn owl boxes and raptor perches. A family of barn owls can consume as many as 800 rodents within a 1-4 km radius during a single breeding season. Diurnal raptors such as red-tailed hawks will readily hunt ground squirrels, larger rodents known to cause damage

to the Pajaro River Levee. By protecting raptors and harnessing their natural tendency to drive down rodent activity, land managers may be able to avoid or reduce eco-toxic rodenticide use and still prevent rodent damage to earthwork and crops.

7. How will the project be accomplished (design specifications or plans, if applicable)

Study Area

The project will be implemented on the Pajaro River between Murphys Crossing and the confluence with Salsipuedes Creek and on Cowards Creek between Highway 129 and the confluence with Pajaro River[1] (See Attachment A).

Six owl boxes will be installed every ~0.5 mile on the levee or adjacent bench through Reach A (2.5 miles between Murphys Crossing and the Coward Creek confluence). Reach B (2.5 miles from Coward Creek confluence to Salsipuedes Confluence) will be used as a control section as a basis for comparison with Reach A. Coward Creek will be split into an upper and lower reach where up to 2 raptor perches will be installed.

Monitoring Criteria

Monitoring will be focused on three different items:

- Owl Box Monitoring
  - Monitoring will be conducted 3 times per year: February, April and Jun/July
  - Occupancy: determined by presence of pellets and video surveillance of nest box
  - Productivity: determined by video surveillance of nest box
  - Diet: determined by pellet analysis
- Raptor Perches
  - 3 times per year
  - Perch usage: observations of raptor species diversity, pellet collection
- Rodent Activity
  - Monitoring will be conducted 2 times per year (following scheduled mowing and scraping of levee slopes)
  - Monitor for active burrows
  - Will include mapping
- Data on Adjoining Lands
  - Land use: urban/ag/, crop type, crop status (fruiting, fallow, etc)
  - Rodenticide trap locations within line of sight
  - Qualitative survey information from land renters and owners on average rodenticide use

Data Collection

- Nest occupation, adjoining land use, and rodent activity mapping using GIS Online
- Survey 123 forms for student and volunteer surveys

[1] The levees on this section of Coward Creek are not maintained by Zone 7 but it has been identified as an area with noticeable ground squirrel activity and a suitable location for a raptor perch.

- Pellet analysis to genera-level by UCSC students

Reporting

- Occupancy and usage statistics
- Burrow mapping over study area at sequential time points.
- Defining success criteria for raptor recruitment projects for county flood control
- Determine potential for expanding project to additional sites in Santa Cruz county

Education and Outreach Products

- Develop informational handouts on rodent control for schools and volunteers
- Develop informational handouts on rodent control for farmers and landowners
- Deliver Pajaro River raptor project presentations to local K-12 schools
- Undergraduate poster presentation at UC Santa Cruz

7. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Item	Funds Requested	Match Contribution	Total Amount
Supervising Biologist (3hr/wk over study period)		$4,541.16 SCPBRG	$4,541.16
2 Undergraduate Research Assistants ($12/hr, 10hr/wk x10 wks	$2,400		$2,400
Undergraduate Museum Tech (2 quarter stipend)		$3,000 Ken Norris Center for Natural History (KNCNH)	
6 Barn Owl Nest Boxes ($43 materials and $49 installation ea.)	$460	$92 Native Animal Rescue (NAR)	$552
Camera pole for barn owl nestbox monitoring	$50		$50
2 Raptor Perches ($80 materials $49 installation)	$258		$258
Vehicle transportation to site ($0.56/mi)	$403.20	$100 NAR	$503.20
County maintenance crews assistance		$1,500 Santa Cruz County Public Works	$1,500
Data input, mapping, and reporting assistance.		$2,000 Santa Cruz County Public Works	$2,000
Design and printing costs for educational materials		$3,000 Raptors are the Solution	$3,000
Supplies for sample collection and analysis	$200	$50 KNCNH	$250
Facilities costs for sample storage and lab space		$500 KNCNH	$500
TOTAL AMOUNTS	$3,771.20	$14,783.16	$18,554.36

**Native Animal Rescue is also donating raptor structure construction and installation time to this project.*
**Watsonville Wetlands Watch will contribute volunteer hours to site monitoring for this project*

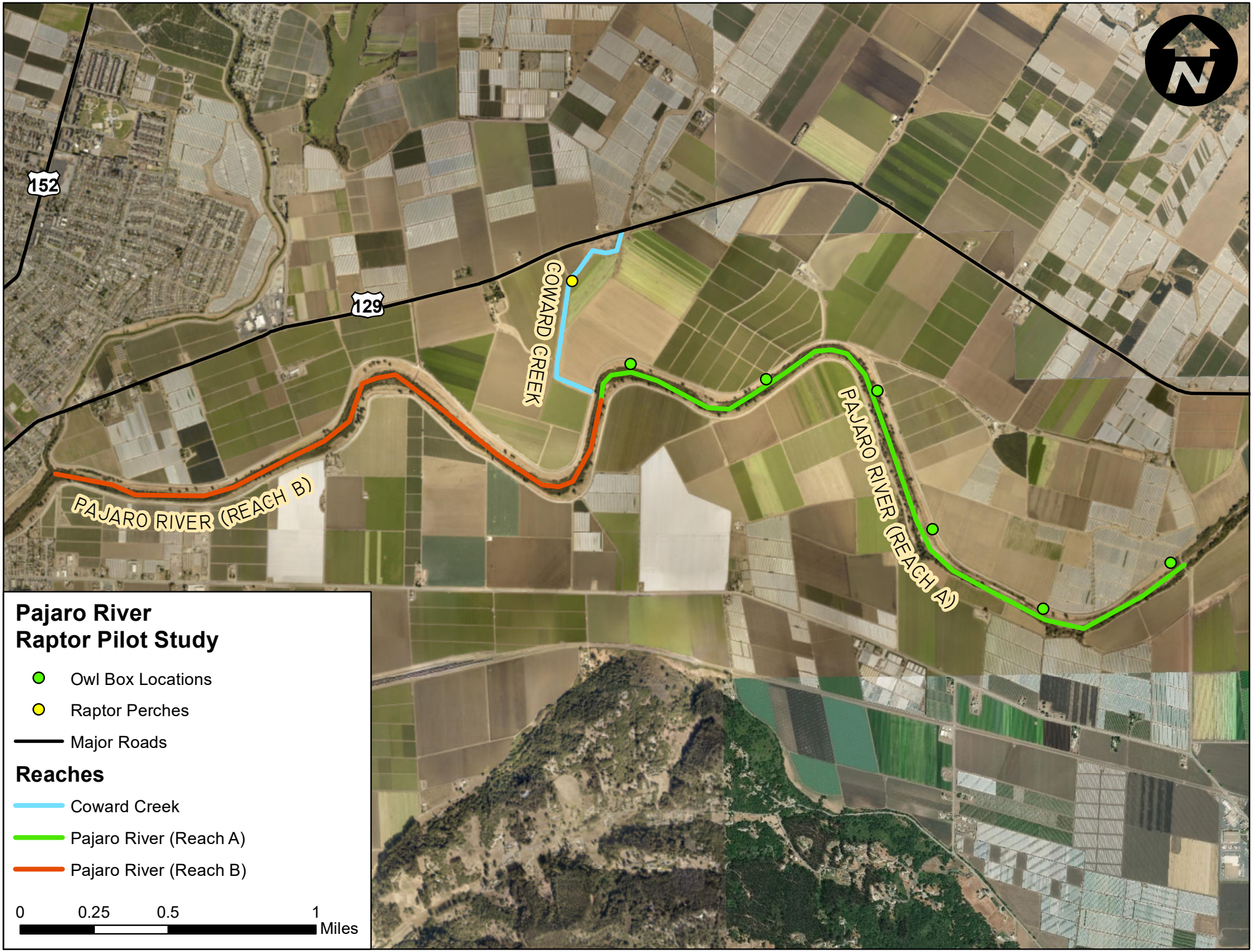
8. **Timeline for completion**

- January 2020: Owl Box Deployment, data collection on adjoining land use
- February 2020: Raptor Perch Deployment and 1st round of site monitoring
- April 2020: 2nd round of site monitoring
- June-July 2020: 3rd round of site monitoring
- July-November 2020: data analysis and report generation
- December 2020: publication of report and informational flyers.

9. **Background or history of your organization**

The Santa Cruz Predatory Bird Research Group (SCPBRG) is a 501c3 non-profit organization housed within UC Santa Cruz. Formed in 1975, PBRG worked under state and federal permits along with cooperation from the Pacific States Peregrine Falcon Recovery Team to save the peregrine falcon from the brink of a pesticide-mediated extinction. Our pioneering work led to the peregrine's removal from the federal list of endangered species in 1999 and from California's list of endangered species in 2009. PBRG also led or initiated successful breeding and release efforts for elf owls, aplomado falcons, Harris's hawks, and bald eagles.

SCPBRG's on-going peregrine falcon research in the San Francisco Bay Area, fueled by a dedicated group of student and volunteer falcon observers, is revealing novel nest location choices and dispersal patterns for hatch-year birds. Through our peregrine falcon nest cams and educational outreach program, we share or research and the peregrine falcon recovery story with K-12 students in the San Francisco and Monterey Bay areas. In response to a demand for opportunities to learn raptor field research techniques on-campus, SCPBRG established an internship program in 2018 to train undergraduates in raptor field research techniques on UC Santa Cruz lands. We continue to be a force for furthering our society's understanding of current threats to predatory bird populations and providing adaptive management solutions.


152
129
COWARD CREEK
PAJARO RIVER (REACH B)
PAJARO RIVER (REACH A)
Pajaro River
Raptor Pilot Study
Owl Box Locations
Raptor Perches
Major Roads
Reaches
Coward Creek
Pajaro River (Reach A)
Pajaro River (Reach B)
0
0.25
0.5
1
Miles

County of Santa Cruz Fish and Game Advisory Commission
GRANT APPLICATION 2019-2020

Grant Recipient and Contact Person:
Salmonid Restoration Federation
Contact: Dana Stolzman, SRF Executive Director and Conference Agenda Coordinator
425 Snug Alley, Unit D, Eureka, CA 95501
(707) 923-7501 / eMail Address: srf@calsalmon.org

1. **Project name:** 38th Annual Salmonid Restoration Conference
The Santa Cruz Fish and Game Commission has generously funded the Annual Salmonid Restoration Conference in previous years.

2. **Amount of funding requested:** $2,250

3. **Project Description**
The Annual Salmonid Restoration conference offers an unparalleled opportunity for stakeholders with a vested interest in the recovery of California's native salmonid populations to engage in technical education. The four-day conference, which will be held in Santa Cruz from March 31-April 3, 2020 will highlight regional and topical issues that affect salmonids and their diverse habitats by offering exemplary field tours, technical workshops, concurrent sessions, and a plenary session on the state of salmonid recovery in California. Field tours include all-day visits to dynamic, habitat restoration sites. Concurrent sessions focus on biological, physical, and policy-specific issues that affect habitat restoration and recovery of native populations of wild anadromous salmonids. The plenary session features distinguished keynote speakers including legislators, renowned academics, watershed visionaries, and scientists at the forefront of the restoration movement in California.

4. **Project goals and objectives**

Goals of the Annual Salmonid Restoration Conference:
- Improve salmonid habitat restoration efforts,
- Teach California Department of Fish and Wildlife (CDFW) and NOAA Fisheries protocols and methodologies to help recover salmon populations,
- Educate resource professionals about restoration techniques that address limiting factors to salmon,
- Engage the watershed community about the need and mechanisms to protect and restore wild salmon populations

Objectives of the Annual Salmonid Restoration Conference:
- Inform individuals and groups about restoration opportunities, technical and educational methodologies, and innovative developments,
- Provide hands-on training focused on salmonid restoration techniques,
- Acquaint conference participants with the NOAA Fisheries Salmon and Multi-species Recovery Plans, CDFW's Stream Habitat Manual, and the California Coastal Monitoring Program for Salmon and Steelhead,
- Facilitate communication and cooperation among restoration practitioners, contractors, resource managers, agency personnel and landowners, highlight specific regional and local

watershed problems, treatments and restoration opportunities, and
- Address recovery actions outlined in the various salmon Recovery Plans.

5. Background and history of the problem

Anadromous fisheries in California are in a steady state of decline. The once abundant runs of salmon, steelhead, and trout in California have dwindled to small populations. Chinook and Coho salmon are extinct in much of their historic range and are listed as threatened / endangered under the Endangered Species Act. The salmonid restoration field emerged to improve habitat conditions and enhance native salmonid recovery efforts. It is vital that restoration practitioners, landowners, and agencies that are entrusted to uphold public trust values have an opportunity to learn from each other's habitat restoration successes and failures so that together we can advance salmonid recovery efforts.

Current land uses in the Santa Cruz region of the Central Coast vary by watershed but primarily include irrigated croplands, small-scale timber production, rural-residential developments, and urban and suburban enclaves. The patchwork of private lands is interspersed with protected state and county parklands. In the next 10 years, it is likely that land use will include more cannabis operations as evidenced by the number of permit applications Santa Cruz County has received. Since virtually all of the watersheds in this region are designated as TMDL impaired and suffer from excessive sediment, the transition of forest, agricultural and ranching lands to cannabis production will likely contribute to water scarcity and lack of instream flows for threatened salmonids. Anticipated growth in housing and other population-related development will also have an adverse affect on salmonid spawning and rearing habitat.

The 2020 Annual Salmonid Restoration Conference will highlight restoration techniques to address water scarcity, sediment loading, fish passage, and other factors that limit salmonid recovery. The conference location varies year-to-year but the conference agenda focuses on statewide threats and opportunities for salmon restoration and recovery. Salmonid Restoration Federation is excited to be hosting the conference in Santa Cruz in 2020 since it has been over 10 years since we last had the conference in the Central Coast region.

The conference will highlight restoration techniques, flow enhancement, fish passage, and priority recovery strategies to address the root causes of salmonid decline and opportunities for watershed restoration.

6. How will the project be accomplished (design specifications or plans, if applicable)

SRF will host the 2020 conference in Santa Cruz, CA to emphasize the recovery strategies that are being implemented in the Central California region. The 38th Annual Salmonid Restoration Conference is a statewide conference that attracts presenters and participants throughout California and the greater Pacific Northwest. The Conference will address limiting factors affecting salmonids and recovery strategies identified in the NOAA Fisheries salmon and steelhead recovery plans, as well as the recent NOAA Fisheries Multi-species Recovery Plan. The Central Coast conference will highlight salmonid restoration efforts in several watersheds including the San Lorenzo River, Scott Creek, and San Gregorio Creek as well as the Carmel River and Butano and Pescadero watersheds. Field tours will visit the San Clemente Dam Removal on the Carmel River, flow enhancement projects in the Butano and Pescadero watersheds, fish passage efforts near Los Padres dam, community restoration projects in the San Lorenzo watershed,

sediment reduction efforts in San Gregorio watershed, and projects in Scott Creek and Swanton Ranch.

Technical workshops include Fish Passage at Road Crossings; Assessing Streamflow Diversions; Low-tech Process-based Restoration with Beaver and Wood: Jump-starting Structurally Starved Streams; and Making Recovery Plans More Actionable.

Concurrent Sessions include:

- Approaches for Management and Restoration of Central California Coastal Lagoons
- Central Valley Anadromous Salmonid Habitat Suitability Criteria
- Lessons Learned from 15 Years of the Integrated Watershed Restoration Program
- Understanding Historical Context to Inform Current Salmonid Recovery Planning
- Fostering Community Involvement To Address Common Urban Stream Management Issues
- Challenges and Innovations in Salmonid Lifecycle Monitoring in Coastal Streams
- Hydrologic Management Insights from Instrumented Watersheds
- The Science Informing Salmonid Reintroductions
- Salmon Seascape Ecology —Climate Change and Oceanic Conditions

The production and coordination of the conference is accomplished by identifying tour, workshop, and session coordinators, building a strong conference agenda, working with co-sponsors and restoration partners, conducting targeted outreach, and coordinating conference logistics. SRF also produces a Conference Proceedings, videotapes the Plenary and other sessions, and offers an educational poster session and restoration job fair as part of the conference.

7. Budget (include sufficient detail to explain use of grant monies). Specify if there are any sources of other funds committed to the proposed project.

Item	Funds Requested	Match Contribution	Total Amount
Conference Scholarships (5 @ $250 each)	$1,250	$1,000	$2,250
Personnel- SRF Staff		$50,000	$50,000
Conference Proceedings		$10,000	$10,000
Facility		$15,000	$15,000
Catering		$60,000	$60,000
Transportation		$10,000	$10,000
Sub-contractors	$1,000 videographer	$5,000	$6,000
AV Costs		$5,000	$5,000
Registration costs		$3,000	$3,000
Honorariums		$1,000	$1,000
Printing & Postage		$2,000	$2,000
TOTAL AMOUNTS	$2,250	$162,000	$164,250

8. Timeline for completion

The SRF Conference will be held March 31 - April 3, 2020. The Conference timeline to complete tasks associated with the conference begins approximately 12 months before the conference. SRF is currently circulating the 2nd Call for Abstracts, conducting co-sponsor outreach, coordinating logistics, and finalizing the agenda. In November, we will circulate the Final Call for Abstracts, select presentations, post the final agenda, and craft the conference agenda packet. SRF will open registration in December, distribute conference materials, and conduct logistics necessary for coordinating a conference with six field tours, four workshops, ten concurrent sessions, and a Plenary Session with renowned keynote presenters. In January we copy-edit, design, and produce the Conference Proceedings, as well as continue to process conference registration and conduct media outreach. In February and March, we focus on logistics, donations and co-sponsorships, and publicity. After the conference, we do extensive follow-up including making Powerpoint presentations available, synthesizing the conference evaluations, and making the Plenary session video and other conference highlights available online for broader dissemination.

9. Background or history of your organization

Salmonid Restoration Federation (SRF) is a non-profit organization that promotes stewardship, sustainable management, and restoration of California's salmon, steelhead, and trout populations and their habitat. SRF provides critical educational services for California's community-based salmonid restoration organizations and agencies by producing an annual conference, regional field schools, and technical symposia. SRF's statewide conference on salmonid restoration provides an opportunity for field tours, technical workshops, panels, and a plenary session on the state of salmonid recovery.

SRF was formed in 1986 to help stream restoration practitioners advance the art and science of watershed restoration. Our organization promotes restoration, stewardship, and recovery of California native salmon, steelhead, and trout populations through education, collaboration, and watershed capacity building. Our goals are to restore and recover California salmonids, improve water quality in California watersheds, and enhance watershed restoration efforts in California. To accomplish these goals SRF coordinates workshops and tours to highlight water conservation techniques, programs, and strategies to improve instream flows for both humans and fish.

SRF is uniquely qualified to perform the proposed work based on our long and successful history of providing technical education training in the fisheries restoration field. For over 30 years SRF has been producing the premier salmonid restoration conference that focuses on biological, environmental, and physical issues that affect salmonids. For over 20 years SRF has been producing intensive field schools on various habitat restoration techniques including water conservation, sediment reduction, and erosion control; bioengineering and stream bank stabilization; and fish passage design and implementation.

SRF also produces several regional restoration events including the Annual Coho Confab, the Spring-run Chinook Symposium, and the Steelhead Summit. The beneficiaries of our educational programs are restorationists, planners, watershed stewards, consultancies, agency personnel, landowners, and students. Our technical trainings are attended by hundreds of people in the watershed restoration field and the information that they receive is disseminated back to communities through universities, Resource Conservation Districts, water agencies, state, county, and federal agencies, tribal fisheries departments, and watershed councils.

In recent years, SRF has been engaged in water conservation and water rights education to build support for community-based water conservation pilot projects that can be transferred to other coastal watersheds. Since 2013, SRF has been conducting low-flow monitoring and community outreach in the 26 square-mile Redwood Creek watershed that is a tributary to the South Fork Eel River.

SRF currently has three Wildlife Conservation Board streamflow enhancement planning grants in the South Fork Eel River watershed.

Additionally, SRF's Executive Director, Dana Stolzman, has written a Collaborative Water Management guidebook in conjunction with Trout Unlimited and The Nature Conservancy to assist other coastal watersheds in flow enhancement planning efforts. This resource can be found at http://www.calsalmon.org/sites/default/files/files/CWM_Final_Report.pdf

SRF was also awarded the 2018 Water Quality Stewardship Award from the North Coast Regional Water Quality Control Board for "exemplary work in advancing the science and practice of stream restoration and salmonid protections on the North Coast."

NOAA FISHERIES

Recovering Threatened and Endangered Species

FY 2017 - 2018 Report to Congress

U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service

Recovering Threatened and Endangered Species

FY 2017-2018 Report to Congress

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Office of Protected Resources

NOAA FISHERIES

Recommended Citation:

National Marine Fisheries Service. 2019. Recovering Threatened and Endangered Species, FY 2017 - 2018 Report to Congress. National Marine Fisheries Service. Silver Spring, MD.

Copies of this report may be obtained from:

Office of Protected Resources – F/PR3
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

Or online at:
https://www.fisheries.noaa.gov/national/endangered-species-conservation/recovery-species-under-endangered-species-act#how-do-we-know-if-we're-making-progress

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CCC Coho: Ben White, Army Corps of Engineers

Photo Credit: Ben White Army Corps of Engineers

Contents

LIST OF ACRONYMS

ADF&G	Alaska Department of Fish & Game
AFR	Age at First Reproduction
ASF	Atlantic Salmon Federation
BOEM	Bureau of Ocean Energy Management
BOR	U.S. Bureau of Reclamation
CDFW	California Department of Fish and Wildlife
CDWR	California Department of Water Resources
COE	U.S. Army Corps of Engineers
DLNR	Hawaii Department of Land and Natural Resources
DPS	Distinct Population Segment
ESA	Endangered Species Act of 1973
ESU	Evolutionarily Significant Unit
FWS	U.S. Fish and Wildlife Service
HGMP	Hatchery Genetic Management Plan
IAC	Inter-American Convention for the Protection and Conservation of Sea Turtles
IATTC	InterAmerican Tropical Tuna Convention
NARWC	North Atlantic Right Whale Consortium
NASCO	North Atlantic Salmon Conservation Organization
NFWF	National Fish and Wildlife Foundation
NGO	Non-Governmental Organizations
NMFS	National Marine Fisheries Service

NOAA	National Oceanic and Atmospheric Administration
NOAA RC	NOAA Restoration Center
PCSRF	Pacific Coastal Salmon Recovery Fund
PIFSC	Pacific Islands Fisheries Science Center
ROV	Remotely Operated Vehicle
SCUBA	Self-Contained Underwater Breathing Apparatuses
SWFSC	NMFS Southwest Fisheries Science Center
TLC	Time-Lapse Cameras
TNC	The Nature Conservancy
WCPF	Western Central Pacific Fisheries Commission
WDFW	Washington Department of Fish and Wildlife
WWF	World Wildlife Fund for Nature

Photo Credit: Robert Frankevich

NOAA FISHERIES

Letter from the Assistant Administrator

Almost a half-century has passed since the enactment of the Endangered Species Act (ESA), which President Nixon signed into law on December 28, 1973. Congress passed the legislation recognizing that the natural heritage of the United States was of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people." They understood that, without protection from human actions, many of our nation's living resources would become extinct. In implementing the ESA, we continue to assess its regulatory framework and clarify procedures as appropriate. NOAA Fisheries and the US Fish and Wildlife Service recently revised joint ESA implementing regulations pertaining to the classification of species and the designation of critical habitat for listed species (Title 50 Part 424 of the Code of Federal Regulations). The revision was a part of our efforts to achieve the goals of Executive Order 13777, "Enforcing the Regulatory Reform Agenda," which directs federal agencies to review existing regulations, identify those that meet specific review criteria and make recommendations regarding leaving regulations as they are, or recommending their repeal, replacement or modification. These regulatory revisions are meant to clarify and interpret the procedures and criteria used for listing or removing species from the Lists of Endangered and Threatened Wildlife and Plants and designating critical habitat.

This biennial report to Congress highlights the important work of recovering marine species so that they no longer need the protections of the ESA and can be delisted. In this biennial report, we also continue to highlight the Species in the Spotlight initiative created in 2015. NOAA Fisheries launched the initiative to focus our resources on our most imperiled marine species and expand partnerships to help recover these species. Through an organized outreach strategy, we have expanded the support of the American public to address immediate needs to help stabilize the declining populations of eight endangered species identified as the most at risk of extinction in the near future. Since the initiative's inception, we have seen remarkable progress toward recovering these eight species through focused research initiatives and management actions. The Species in the Spotlight stories are contained in this report and capture noteworthy accomplishments over the past two years. For example, we highlight the successful production of viable white abalone broodstock that has increased by several orders of magnitude—from thousands to millions over the past two years—and the partners who have made it happen, including the University of California Davis Bodega Marine Laboratory and Amanda Bird from the Paua Marine Research Group.

In the last biennial report, I raised the question about considering the North Atlantic right whale as a Species in the Spotlight. The North Atlantic right whale is one of the world's most endangered large whale species, with only an estimated 411 individuals remaining at the end of 2017. In the late 1990s and early 2000s, there were positive signs that this species was recovering. Since 2010, however, the best scientific information indicates the species has been declining. Additionally, in 2017, nearly four percent of the species died, with most of the deaths observed in Canadian waters. The species faces the continued threat of human-caused mortality primarily due to lethal interactions with commercial fisheries and shipping traffic. We are still uncertain what the

long-term effect entanglements and other environmental stressors may have in limiting right whale calving and recovery. Because of these developments in the North Atlantic right whale status and threats, I am announcing its inclusion as the 9th Species in the Spotlight. We are developing a five-year priority actions plan with input from an expanded coast-wide U.S. Right Whale Recovery Plan Implementation Team. The Team will be convened in 2019 to focus on priority cross-regional recovery actions for this species. Key actions that build off the recovery plan for the North Atlantic Right Whale will be identified in the five-year priority actions plan, and we will report on progress on those actions in the next Biennial report. A story on the North Atlantic right whale is included in this biennial report.

The Species in the Spotlight initiative is an excellent example of how focused efforts around a common cause can advance recovery. However, we acknowledge and continue to advance the recovery of all the marine species under our purview. These species are of great interest to the public and represent a vital part of a healthy marine ecosystem. The ESA is designed to protect both species and their habitat and aspires to create a world of intact ecosystems. Many communities rely on marine ecosystems for their livelihoods, such as fishing and tourism. We are dedicated to all of the species and the ecosystems upon which they depend that Congress bestowed to us the honor of protecting and conserving.

Chris Oliver
Assistant Administrator for Fisheries

Photo Credit: NMFS

NOAA FISHERIES

Background

Primary purposes of the ESA, as amended (16 United States Code sections 1531–1544) are the conservation of endangered and threatened species and the ecosystems on which they depend. Conservation is defined as "…the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary." As one means of achieving recovery, the ESA requires the development of recovery plans for listed endangered or threatened species (except those species for which it is determined that such a plan will not promote the conservation of the species). Recovery plans organize and guide the recovery process.

We monitor recovery progress by conducting a review of the species status at least once every five years (five-year review) to determine, on the basis of such review, whether the species should be reclassified or removed from the list (ESA section 4(c)(2)).

The ESA amendments of 1988 added a requirement that the Secretaries of Commerce and the Interior report to Congress every two years on the status of efforts to develop and implement recovery plans, and on the status of all species for which recovery plans have been developed (ESA section 4(f)(3)). The Secretary of Commerce has delegated responsibility for endangered and threatened species recovery to the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA). This is the 15th Report to Congress on the status of the recovery program for these species.

Photo Credit: Autumn Sutherland

Overview

Photo Credit: Azores B.Skerry

Recovery is the process of restoring listed species to the point they no longer require the protections of the ESA. A recovery plan serves as a road map for species recovery—it lays out where to go and how to get there. Without a plan to organize, coordinate, and prioritize recovery actions, the efforts by so many agencies, non-profit organizations, tribal entities, stakeholders, and citizens may be inefficient, ineffective, or misdirected. Recovery plans are guidance documents, not regulatory, and the ESA clearly envisions recovery plans as the central organizing tool guiding each species' progress toward recovery.

This report summarizes efforts to recover all domestic and transnational species under NMFS' jurisdiction from October 1, 2016, through September 30, 2018. It includes a summary table (Table 1) outlining the status of each species, the status of the recovery plan, and the date the last five-year review was completed.

With this report, NMFS is updating progress made on the Species in the Spotlight initiative launched in 2015. The initiative is a strategic approach to endangered species recovery that focuses agency resources on species for which immediate, targeted efforts are needed to stabilize their populations and prevent extinction. This report highlights progress made on recovery efforts for the eight species originally identified in the Species in the Spotlight and the North Atlantic right whale, which was added to the initiative in 2019. These species are notable because the best available information points to their extinction in the near future because of rapid population decline or habitat destruction. They need focused human intervention to stabilize their population declines and prevent their extinction.

During the two years covered in this report (October 1, 2016 – September 30, 2018), the number of listed species under NMFS jurisdiction increased 10 percent. During that period, we managed 97 domestic (includes some transnational) species of salmon, sturgeon, sawfish, seagrass, mollusks, sea turtles, corals, and marine mammals, and 66 foreign species. In January 2017, NMFS delisted the distinct population segment (DPS) of the canary rockfish (*Sebastes pinniger*) due to new genetic analysis indicating the population did not meet the DPS criteria; thus, the listing was in error. In this report, we address the 90 species for which recovery plans have been or will be developed, including two newly listed transnational species[1]:

- Giant Manta Ray (*Manta birostris*) listed as threatened on January 22, 2018 (83 FR 2916)

- Oceanic Whitetip Shark (*Carcharhinus longimanus*) listed as threatened on January 30, 2018 (83 FR 4153).

Between October 1, 2016, and September 30, 2018, of the 90 domestic or transnational listed species for which a recovery plan would promote their conservation, 54 had final recovery plans, 2 had a draft recovery plan, 25 plans were in development, and 9 species recovery plans had not been started.

Between October 1, 2016, and September 30, 2018, the status of the 90 endangered or threatened species for which recovery plans have been or will be developed was:

- 27 (30%) were stabilized or increasing.
- 18 (20%) were declining.
- 9 (10%) were mixed, with their status varying by population location.
- 36 (40%) were unknown, because we lacked sufficient trend data to make a determination.

A list of the domestic and transnational species managed by NMFS for which recovery plans have been or will be developed (90 species) is provided in Table 1. For each species, subspecies, evolutionarily significant unit (ESU), or DPS, the table lists the population trend (unknown, decreasing, mixed, stable, or increasing), the status of the recovery plan, and the date the last five-year review was completed. Table 1 also includes the recovery priority number, which indicates NMFS' priorities for recovery plan preparation and implementation (April 30, 2019; 84 FR 18243). Additional information on these species is available online at http://www.fisheries.noaa.gov/ species-directory/threatened-endangered.

Recovery plans are available online at
https://www.fisheries.noaa.gov/resources/documents?title=&field_category_document_value%5Brecovery_plan%5D=recovery_plan&sort_by=created

Recovery plans may also be requested by writing to:

Endangered Species Division – Recovery Plans
Office of Protected Resources – F/PR3
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

This report is available online via the NMFS Office of Protected Resources website at
https://www.fisheries.noaa.gov/feature-story/endangered-species-biennial-report-2017-2018

[1] The ESA defines a species to include any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.

Table 1: ESA Listed Species Under NMFS Jurisdiction

ESA-listed species under NMFS jurisdiction through September 30, 2018, where recovery plans are either complete, in progress, or planned. Information includes the listing status, population trend, recovery priority number, recovery plan status, and 5-year review completion.

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[2]
SEA TURTLES						
Hawksbill Sea Turtle	06/1970	E	Mixed	3C	Completed 01/1998 (Pacific): 12/1993 (Atlantic)	06/2015
Kemp's Ridley Sea Turtle	12/1970	E	Unknown	1C	Completed 08/1992: Revision Completed 09/2011	07/2015
Leatherback Sea Turtle	06/1970	E	Mixed	3C	Completed 01/1998 (Pacific); 04/1992 (Atlantic)	11/2013; Full status review Initiated 12/2017
GREEN SEA TURTLE						
Central North Pacific DPS	07/1978: 04/2016	T	Unknown	3C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
Central West Pacific DPS	07/1978: 04/2016	E	Unknown	3C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
Central South Pacific DPS	07/1978: 04/2016	E	Unknown	3C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
South Atlantic DPS	07/1978: 04/2016	T	Mixed	5C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[2]
East Pacific DPS	07/1978: 04/2016	T	Mixed	5C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
North Atlantic DPS	07/1978: 04/2016	T	Increasing	5C	1978 Listing: Completed 01/1998 (Pacific); 10/1991 (Atlantic); 2016 Listing: Not Started	03/2015
LOGGERHEAD SEA TURTLE						
Northwest Atlantic Ocean DPS	07/1978; 09/2011	T	Stable	3C	Completed 12/1991; Revision Completed 01/2009	08/2009 (Full status review); 5-Year Review Initiated 10/2016
North Pacific Ocean DPS	07/1978; 09/2011	E	Stable	5C	Completed 01/1998; Revision Under Development	08/2009 (Full status review); 5-Year Review Initiated 10/2016
OLIVE RIDLEY SEA TURTLE						
Breeding colony populations of Pacific coast Mexico	07/1978	E	Stable	5C	Completed 01/1998	06/2014
Rangewide	07/1978	T	Mixed	5C	Completed 01/1998	06/2014

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
PACIFIC SALMON						
CHINOOK						
Chinook, Puget Sound ESU	03/1999; 06/2005[3]	T	Stable	3C	Completed 01/2007	05/2016
Chinook, Lower Columbia River ESU	06/2005[3]	T	Stable	3C	Completed 07/2013	05/2016
Chinook, Upper Columbia River, Spring-run ESU	03/1999; 06/2005[3]	E	Stable	1C	Completed 10/2007	05/2016
Chinook, Snake River Fall-run ESU	04/1992; 06/2005[3]	T	Increasing	5C	Completed 12/2017	05/2016
Chinook, Snake River Spring/ Summer-run ESU	04/1992; 06/2005[3]	T	Stable	3C	Completed 12/2017	05/2016
Chinook, Upper Willamette River ESU	03/1999; 06/2005[3]	T	Decreasing	3C	Completed 08/2011	05/2016
Chinook, California Coastal ESU	09/1999; 06/2005[3]	T	Unknown	3C	Completed 10/2016	05/2016
Chinook, Central Valley Spring-run ESU	09/1999; 06/2005[3]	T	Stable	3C	Completed 07/2014	05/2016
Chinook, Sacramento River Winter-run ESU	11/1990; 1/1994[4]; 06/2005[3]	E	Stable	1C	Completed 07/2014	12/2016
CHUM						
Chum, Hood Canal Summer-run ESU	03/1999; 06/2005[3]	T	Increasing	5C	Completed 05/2007	05/2016
Chum, Columbia River ESU	03/1999; 06/2005[3]	T	Stable	3C	Completed 07/2013	05/2016
COHO						
Coho, Lower Columbia River ESU	03/1999; 06/2005[3]	T	Stable	4C	Completed 07/2013	05/2016

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
Coho, Oregon Coast ESU	08/1998[3]; 02/2008	T	Increasing	5C	Completed 12/2016	05/2016
Coho, Southern Oregon/ Northern California Coast ESU	05/1997; 06/2005[3]	T	Unknown	3C	Completed 09/2014	05/2016
Coho, Central California Coast ESU	10/1996; 06/2005[3]	E	Unknown	1C	Completed 09/2012	05/2016
SOCKEYE						
Sockeye, Ozette Lake ESU	03/1999; 06/2005[3]	T	Stable	7C	Completed 05/2009	05/2016
Sockeye, Snake River ESU	11/1991; 06/2005[3]	E	Increasing	1C	Completed 06/2015	05/2016
STEELHEAD						
Steelhead, Puget Sound DPS	05/2007	T	Stable	7C	Draft Completed 12/2018	05/2016
Steelhead, Lower Columbia River DPS	03/1998; 01/2006[3]	T	Stable	3C	Completed 07/2013	05/2016
Steelhead, Upper Columbia River DPS	08/1997; 01/2006[3]	T	Increasing	3C	Completed 10/2007	05/2016
Steelhead, Middle Columbia River DPS	03/1999; 01/2006[3]	T	Stable	5C	Completed 09/2009	05/2016
Steelhead, Upper Willamette River DPS	03/1999; 01/2006[3]	T	Decreasing	3C	Completed 08/2011	05/2016

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
PACIFIC SALMON (CONTINUED)						
STEELHEAD						
Steelhead, Snake River Basin DPS	08/1997; 01/2006[3]	T	Stable	3C	Completed 12/2017	05/2016
Steelhead, Northern California DPS	06/2000; 01/2006[3]	T	Unknown	3C	Completed 10/2016	05/2016
Steelhead, Central California Coast DPS	08/1997; 01/2006[3]	T	Unknown	3C	Completed 10/2016	05/2016
Steelhead, South-Central California Coast DPS	08/1997; 01/2006[3]	T	Unknown	3C	Completed 12/2013	05/2016
Steelhead, Southern California Coast DPS	08/1997; 05/2002[6]; 01/2006[3]	E	Unknown	1C	Completed 01/2012	05/2016
Steelhead, California Central Valley DPS	03/1998; 01/2006[3]	T	Unknown	3C	Completed 07/2014	05/2016
ATLANTIC SALMON						
Gulf of Maine DPS	11/2000; 06/2009[7]	E	Decreasing	1C	Completed 02/2019	Review Initiated 06/2017
NON-SALMONID FISH						
Bocaccio - Puget Sound/Georgia Basin DPS	04/2010; 01/2017[5]	E	Decreasing	7C	Completed 10/2017	05/2016
Eulachon, Southern DPS	03/2010	T	Stable	9C	Completed 09/2017	05/2016
Giant Manta Ray	01/2018	T	Decreasing	6C	Under Development	N/A

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
Green Sturgeon, Southern DPS	04/2006	T	Unknown	6C	Completed 08/2018	08/2015
Gulf Sturgeon	09/1991	T	Mixed	7C	Completed 09/1995	Review Initiated 04/2019
Nassau Grouper	06/2016	T	Decreasing	3C	Under Development	N/A
Oceanic Whitetip Shark	01/2018	T	Decreasing	6C	Under Development	N/A
Shortnose Sturgeon	03/1967	E	Mixed	1C	Completed 12/1998	Not Started
Smalltooth Sawfish—U.S. DPS	04/2003	E	Increasing	1C	Completed 01/2009	09/2018
Yelloweye rockfish – Puget Sound/ Georgia Basin DPS	04/2010; 01/2017[5]	T	Decreasing	9C	Completed 10/2017	05/2016
ATLANTIC STURGEON						
Gulf of Maine DPS	02/2012	T	Unknown	3C	Under Development	Review Initiated 03/2018
New York Bight DPS	02/2012	E	Unknown	1C	Under Development	Review Initiated 03/2018
Chesapeake Bay DPS	02/2012	E	Unknown	1C	Under Development	Review Initiated 03/2018
Carolina DPS	02/2012	E	Increasing	1C	Under Development	Review Initiated 03/2018
South Atlantic DPS	02/2012	E	Mixed	1C	Under Development	Review Initiated 03/2018

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
PLANTS						
Johnson's Sea-grass	09/1998	T	Unknown	4C	Completed 09/2002	11/2007
INVERTEBRATES						
Black Abalone	01/2009	E	Unknown	5C	Under Development	07/2018
White Abalone	05/2001	E	Unknown	1C	Completed 10/2008	07/2018
Lobed Star Coral	09/2014	T	Decreasing	3C	Under Development	N/A
Mountainous Star Coral	09/2014	T	Decreasing	3C	Under Development	N/A
Boulder Star Coral	09/2014	T	Decreasing	3C	Under Development	N/A
Pillar Coral	09/2014	T	Decreasing	3C	Under Development	N/A
Rough Cactus Coral	09/2014	T	Decreasing	3C	Under Development	N/A
7 Indo-Pacific Corals	09/2014	T	Unknown	5C	Under Development	N/A
Elkhorn Coral	05/2006	T	Decreasing	3C	Completed 03/2015	08/2014
Staghorn Coral	05/2006	T	Decreasing	3C	Completed 03/2015	08/2014

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
SEALS AND SEA LIONS						
Bearded Seal — Beringia DPS	12/2012	T	Unknown	9C	Under Development	12/2010
Ringed Seal—Arctic Subspecies	12/2012	T	Unknown	9C	Under Development	12/2010
Hawaiian Monk Seal	11/1976	E	Increasing	1C	Completed 03/1983; Revision Completed 08/2007; Amended with Main Hawaiian Island Management Plan 01/2016	08/2007
Steller Sea Lion—Western DPS	04/1990; 11/1990; 5/1997	E	Mixed	5C	Completed 12/1992; Revision Completed 03/2008	Review Initiated 12/2017
WHALES						
Beluga Whale—Cook Inlet DPS	10/2008	E	Decreasing	2C	Completed 01/2017	02/2017
Blue Whale	06/1970	E	Stable	8C	Completed 07/1998; Draft Revision 10/2018	Review Initiated 10/2018
False Killer Whale—Main Hawaiian Islands Insular DPS	11/2012	E	Unknown	1C	Under Development	08/2010
Fin Whale	06/1970	E	Unknown	8C	Completed 07/2010	02/2019

Species Subspecies ESU/DPS	Date Listed Reclassified	ESA Status	Trend	Recovery Priority Number[1]	Status of Recovery Plan	Date 5-Year Status Review Completed[3]
WHALES						
Killer Whale—Southern Resident DPS	11/2005	E	Decreasing	1C	Completed 01/2008	12/2016
North Atlantic Right Whale	03/2008	E	Decreasing	1C	Completed 05/2005	10/2017
North Pacific Right Whale	03/2008	E	Unknown	4C	Completed 06/2013	12/2017
Sei Whale	06/1970	E	Unknown	6C	Completed 12/2011	Review Initiated 01/2018
Sperm Whale	06/1970	E	Unknown	7C	Completed 12/2010	06/2015
HUMPBACK WHALE						
Central America DPS	06/1970; 09/2016	E	Unknown	2C	1970 Listing Completed 11/1991; 2016 Listing Not Started	N/A
Mexico DPS	06/1970; 09/2016	T	Unknown	4C	1970 Listing Completed 11/1991; 2016 Listing Not Started	N/A
Western North Pacific DPS	06/1970; 09/2016	E	Unknown	7C	1970 Listing Completed 11/1991; 2016 Listing Not Started	N/A

[1] For explanation of the recovery priority numbers, see the Recovery Priority Guidelines (April 30, 2019; 84 FR 18243).

[2] For species listed within 5 years, a N/A (Not Applicable) is applied to the status of the 5-Year Review.

[3] In Alsea Valley Alliance v. Evans, 161 F. Supp. 2d 1154 (D. Or. 2001) (Alsea), the U.S. District Court for the District of Oregon ruled that NMFS could not exclude hatchery fish within the ESU when making a listing decision. Although the Alsea ruling affected only one ESU, subsequent to the ruling, NMFS initiated new status reviews for 27 ESUs and, in 2005, re-listed 15 ESUs of salmon with revised definitions of the populations to be included in the ESU, delisted one ESU (Oregon Coast coho) and listed one ESU (Lower Columbia River coho); and in 2006, re-listed 10 ESUs of steelhead (and identified them as DPSs).

[4] This ESU was first emergency-listed as threatened on 8/4/1989, then fully listed as threatened on 11/5/1990, then reclassified as endangered on 1/4/1994.

[5] The species listing was amended based on a geographic description and to include fish within specified boundaries (January 23, 2017; 82 FR 7711).

[6] This ESU was first listed on 8/18/1997; the southern range extension to the U.S.-Mexico border was added to the listing for this ESU on 5/1/2002 (57 FR 21586).

[7] The Gulf of Maine Atlantic Salmon DPS was originally listed on November 17, 2000 (65 FR 69469) and was revised to include the Androscoggin, Kennebec, and Penobscot River basins in 2009 (74 FR 29344, June 19, 2009).

Photo Credit: John Durbin NOAA

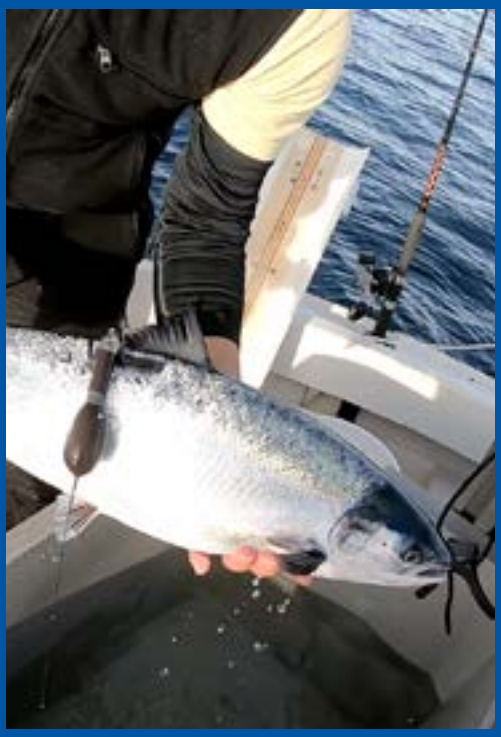
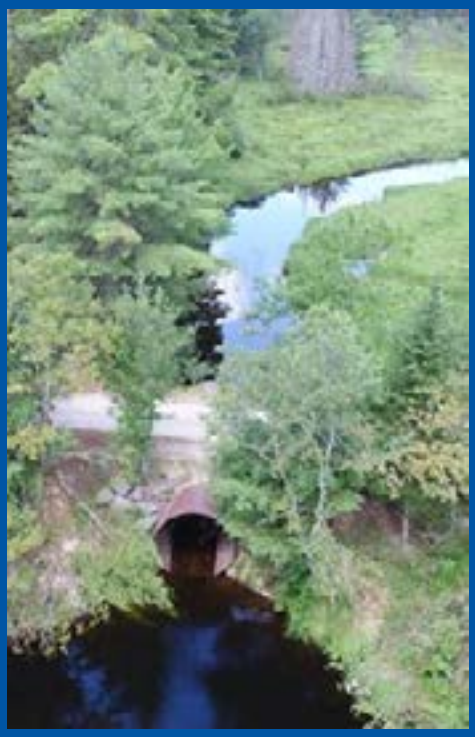




Photo Credit: NOAA (above left and section cover), Project SHARE (above middle), NOAA (above right)

SPECIES *in the* SPOTLIGHT

Atlantic Salmon Gulf of Maine
Distinct Population Segment

Photo Credit: NOAA

The Gulf of Maine DPS of Atlantic salmon *(Salmo salar)* is endangered and is one of three salmon Species in the Spotlight. They meet the criteria for being a spotlight species because of their dangerously low abundance and continuing declining population trend. Atlantic salmon are anadromous fish that spend the first half of their life in freshwater rivers and streams and then mature in the seas between Northeastern Canada and Greenland before returning to their natal rivers to spawn. In the United States, Atlantic salmon populations historically extended as far south as Long Island Sound. However, all southern populations have been extirpated. Today, the only remaining population of Atlantic salmon in U.S. waters exists in a few rivers and streams in central and eastern Maine.

Recovery Progress

Since the launch of the Species in the Spotlight initiative in May 2015, NMFS and its partners have been working to implement four key actions identified in the five-year (2016–2020) priority actions plan designed to contribute significantly to Atlantic salmon recovery: (1) reconnect the Gulf of Maine with headwater streams, (2) increase the number of fish successfully entering the marine environment, (3) reduce international fishery mortality in West Greenland, and (4) increase our understanding and ability to improve survival in the marine environment. These actions represent a critical subset of recovery actions identified in the new recovery plan for the species, which was published in February 2019 by the U.S. Fish and Wildlife Service (FWS)[2] and NMFS.

Reconnect the Gulf of Maine with Headwater Streams

In 2017 and 2018, 39 aquatic connectivity projects were completed within the freshwater range of endangered salmon in Maine, opening access to approximately 145 miles of streams and rivers. By helping to restore connectivity and ecological stream processes, these projects enhance adult access to spawning grounds and help to increase the number of fish that are successfully entering the marine environment. The major hydroelectric developer in Maine, Brookfield Renewable Energy, is continuing to work with us to implement structural and operational changes at their dams. These project changes are designed to minimize impacts on Atlantic salmon in compliance with the ESA, while still enabling the company to generate power. Brookfield Energy has also implemented operational changes at dams on the Kennebec,

Androscoggin, and Union Rivers with a goal of improving downstream passage survival for Atlantic salmon smolts.

Increase the Number of Fish Successfully Entering the Marine Environment

Critical to increasing the number of fish entering the marine environment is addressing downstream survival of smolts through hydroelectric dams. Our population modeling efforts have revealed that if we provide upstream passage without adequate downstream passage we may be doing more harm than good to the population. We have made substantial headway in our negotiations with Brookfield Renewable Energy such that they have nearly met their downstream performance standards for all Mainstem dams on the Penobscot River. These standards require that all smolts must pass over a dam within 24 hours of their first approach at a survival rate of 96 percent or greater. There are also a number of other threats that affect the number of smolts entering the marine environment. These include reduced habitat quality resulting from current and historic land use practices; climate change; and predator prey dynamics. We have made investments into each of these threats but over the last two years, we have paid particularly close attention to issues associated with climate change. A recent climate vulnerability assessment of 82 species of fish and invertebrates in the Northeast Continental Shelf concluded that Atlantic salmon are particularly vulnerable to climate change as a product of their life history in relationship to climate exposure. In 2017, NMFS implemented a climate scenario planning exercise to identify science and management actions that under a range of plausible, alternative future climate scenarios would provide a conservation benefit to Atlantic salmon. As a result of this exercise, a number of climate related actions were incorporated into the final Atlantic salmon recovery plan (2019). Efforts are currently underway to implement two priority actions that originated from the scenario planning exercise. These include conducting a range-wide habitat analysis to describe key habitat attributes that are important for Atlantic salmon persistence

Atlantic salmon Gulf of Maine *(Salmo salar)*

Status: Endangered
Highlight: Dangerously low abundance and continuing declining population trend.

Recovery Efforts

- Reconnect the Gulf of Maine with headwater streams — **Completed 39 aquatic connectivity projects, opening access to approx. 145 miles of streams and rivers**
- Increase the number of fish successfully entering the marine environment — **Smolt survival rate over Penobscot River dams near 96 percent or greater**
- Reduce international fishery mortality in West Greenland — **Reduced catch by 15 metric tons**
- Increase our understanding and ability to improve survival in the marine environment — **Deployed satellite tags on Atlantic salmon captured in Greenland to map migration patterns**

Photo Credit: Project SHARE culvert replacement

and productivity, and mapping climate resilient and climate vulnerable habitats to identify where Atlantic salmon populations are most likely to succeed under warming conditions.

Removing dams, installing fishways, and infrastructure improvements at road crossings are critical to the recovery of Atlantic salmon because they allow passage to headwaters and ensure passage to the marine environment. These recovery actions not only benefit Atlantic salmon, but are also essential for the conservation of commercially valuable species like river herring and American eel, and recreationally important species such as American shad. Boosting river herring populations in Maine may also benefit the American lobster industry, as river herring are an important source of bait, particularly in the spring. Additionally, river herring also serve as a source of food for cod, haddock, and other commercially valuable species in the Gulf of Maine. Lastly, infrastructure improvements at road crossings that ensure fish passage for Atlantic salmon and other fish also afford substantial societal and economic benefits by significantly increasing structural resilience to storm events.

Reduce International Fishery Mortality in West Greenland

The mixed stock fishery operating in West Greenland captures ESA-listed Atlantic salmon. At the 2018 annual meeting of the North Atlantic Salmon Conservation Organization (NASCO), the United States worked cooperatively with the other Parties of the West Greenland Commission (Canada, Denmark (in respect to the Faroe Islands and Greenland), and the European Union) to successfully negotiate new regulatory measures that reduce the catch of salmon by 15 metric tons in the mixed stock fishery at West Greenland for 2018, 2019, and 2020. The new regulatory measure caps the total catch of salmon for all components of the fishery at 30 metric tons, a substantial reduction from the 45 metric tons agreed upon in previous measures. The new regulatory measure also includes a number of elements that, if implemented, will significantly improve the management and control of the fishery. For example, licenses are now required for anyone who fishes for Atlantic salmon, including recreational and commercial fishermen. Accurate and detailed reports of fishing activities and landings, including no fishing effort and zero landings, are also required prior to receiving a license

to fish the following year. These requirements should improve the accuracy of the reported landings and support more informed fisheries management while also reducing the number of U.S. origin Atlantic salmon captured in this fishery.

Increase Our Understanding and Ability to Improve Survival in the Marine Environment
In 2018, NMFS partnered with the Atlantic Salmon Federation (ASF, Canada), Canada's Department of Fisheries and Oceans, and the Association of Fishers and Hunters (Greenland) to increase knowledge of habitat use by satellite tagging and releasing Atlantic salmon captured at Greenland. This study will increase our understanding of Atlantic salmon migrations by providing detailed migration maps of habitat preferences and predators of Atlantic salmon as they migrate from Greenland to natal rivers to spawn. NMFS is also working to increase the information received from these tags by collaborating with the U.S. Woods Hole Oceanographic Institute, ASF, and private tag manufacturing companies to develop ways to share information and improve approaches to monitoring the marine migration of a wide variety of animals.

Other Recovery Progress

2019 marks the focal year of the International Year of the Salmon, an initiative aimed at raising global awareness and enhancing knowledge about salmon conservation needs in a changing environment. Many of our species listed under the ESA are salmonids, including the Atlantic salmon. Along with partners across the northern hemisphere we are celebrating the International Year of the Salmon to share and develop knowledge, raise awareness, and take action for salmon conservation. While salmon conservation issues are tied closely to the West, Northeast, and Alaska coasts of the United States, these fish make epic migrations into international waters and the health of their populations raise concerns about environmental change and human factors affecting salmon distribution and abundance well beyond these regional borders. Throughout the International Year of the Salmon initiative, we are working collaboratively with our partners to enhance outreach efforts to protect salmon and their habitat against the backdrop of increasing environmental variability. We are also working to increase investments in research that will assist us in building resilience for these populations.

In February 2019, NMFS, in collaboration with the FWS, published a final recovery plan to guide the recovery of the Gulf of Maine Atlantic salmon DPS. Threats to survival are significant in both the marine environment and in Maine's river systems. The plan prioritizes international and local actions that can realistically make a difference as our environment changes. The recovery plan provides a roadmap with detailed, site-specific approaches to reduce threats to the species, identifies specific timetables for action, and estimates costs to achieve recovery goals. Other benefits of implementing recovery actions include improvements in water quality and flow in salmon rivers, enhanced understanding of sustainable management for numerous freshwater and marine resources that are part of the salmon's ecosystem, and reductions in environmental stressors affecting salmon and the ecosystem upon which they depend.

Summary

Access to freshwater spawning grounds has increased Atlantic salmon productivity. Downstream passage has been improved with achieving standards for smolt passage over dams. New regulatory measures were established that reduce the catch of Atlantic salmon by 15 metric tons (capped at 30 metric tons) in the mixed stock fishery in West Greenland for 2018, 2019, and 2020.

We have increased our knowledge of habitat use and Atlantic salmon migrations from Greenland to natal U.S. rivers. We are raising public awareness and increasing collaboration with our partners to enhance Atlantic salmon conservation through the International Year of the Salmon initiative. We, in collaboration with the FWS, recently finalized a recovery plan to efficiently and effectively guide recovery efforts.

All efforts this report highlights were made possible due to strong partnerships involving the U.S. Department of Agriculture Natural Resource Conservation Service, Penobscot Indian Nation, Project SHARE (https://salmonhabitat.org/), Maine Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources, Maine Department of Conservation, Maine Forest Service, NMFS, ASF, FWS, The Nature Conservancy (TNC), Downeast Lakes Land Trust, municipalities, lake associations, towns, and numerous private landowners.

Photo Credit: NOAA

PARTNER in the SPOTLIGHT: John Banks, Penobscot Indian Nation

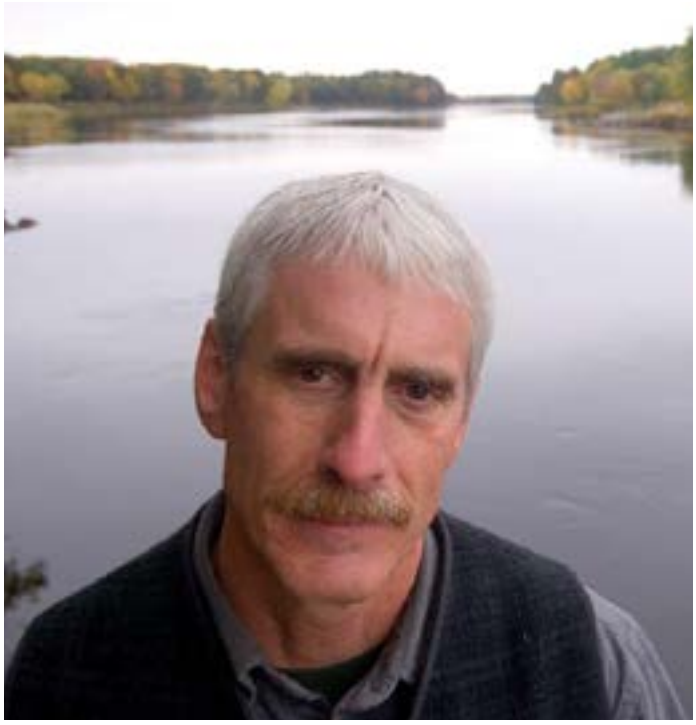


Photo Credit: Bridget Besaw

John Banks has served as the director of the Penobscot Indian Nation's Department of Natural Resources since 1980. John developed and administers a comprehensive natural resources management program for the Tribe. His program advances an integrated management approach that recognizes the inter-connectedness of all things in the natural world. He has served on numerous boards, commissions and delegations including the U.S. Delegation to the NASCO and the board of directors for the Penobscot River Restoration Trust. Thanks to John's tenacity, leadership, and support, the Penobscot River Restoration Trust (a consortium of non-governmental organizations (NGOs), the Penobscot Nation, state agencies, communities, and federal partners) led the successful removal of Veazie Dam and Great Works Dam and the de-commissioning of Howland Dam. This project referred to as the Penobscot River Restoration Project, improved access to thousands of kilometers of habitat in the Penobscot River and improves the chances that Atlantic salmon can recover in Maine.

As a member of the U.S. delegation to NASCO, John assisted the negotiation of the regulatory measure that substantially improved the monitoring and control of the fishery off Greenland from 2015 to 2017. Atlantic salmon are a culturally foundational species to the Penobscot Nation and are central to the tribe's history, ceremony, and sustenance. John carried the message of the importance of salmon to the Penobscot Nation, which was integral to the successful negotiation of that regulatory measure in 2015. John has been an influential voice in the salmon community for almost 40 years, and has been integral in the implementation of programs that have afforded significant conservation benefits to Atlantic salmon and sea run fish in the Penobscot River, one of the last strongholds for Atlantic salmon in the United States.



Photo Credit: mttamalpaisphotos.com (above left), Jennifer Carah, TNC (above middle), Eric Ettlinger (above right), Ben White, COE (section cover)

SPECIES *in the* SPOTLIGHT

Central California Coast Coho ESU

Photo Credit: Eric Ettlinger

Coho salmon (*Oncorhynchus kisutch*), commonly known as silver salmon, are an iconic part of California's natural heritage, and integral to the region's ecology. Recovering coho salmon will also provide social and economic benefits for future generations. Their recovery depends on many short and long-term actions, especially habitat restoration that is one of NMFS West Coast Region's highest priorities. Our work with partners is essential and is delivering on recovery goals, but there is much more to do and challenges remain. Recent and expected future droughts, for instance, underscore the importance of increasing the population throughout more of its historic range to improve the species' resilience.

Central California Coast (CCC) coho salmon were first listed under the ESA as a threatened species in 1996 and subsequently reclassified as endangered in 2005. CCC coho salmon became a state-listed endangered species under the California Endangered Species Act in 2002. The CCC coho salmon ESU represents the southern extent of the species' larger range, and recent assessments of the ESU status indicate that it remains at high risk of extinction. Since 2011, California Department of Fish and Wildlife (CDFW) and NMFS have been leading the implementation of the California Coastal Monitoring Program. The program has continued to monitor CCC coho salmon, and NMFS uses this data to inform the species' five-year reviews. Over time, these data will expand our knowledge on the status and trends of CCC coho salmon and improve our understanding of the species' viability.

Recovery Progress

Since the Species in the Spotlight initiative was launched, NMFS has made substantial progress on CCC coho salmon recovery efforts, advancing each of the four key actions in the five-year priority actions plan: (1) continue and expand conservation hatchery programs to prevent extinction, (2) continue and expand restoration and funding partnerships through implementation of

priority recovery actions in targeted locations, (3) restore key habitats for conservation hatchery outplanting and improve freshwater survival of coho salmon, and (4) ensure adaptive management for conservation hatchery programs and restoration is informed by monitoring and research.

Continue and Expand Conservation Hatchery Programs to Prevent Extinction

Conservation hatchery efforts are intended to prevent extinction and improve distribution, abundance, and genetic diversity of populations while other efforts build our capacity for long-term recovery. The two conservation hatchery programs are the Russian River Coho Salmon Conservation Program operated from the recently named Michael Dillabough Russian River Salmon Conservation Hatchery in Sonoma County, California, and the smaller Kingfisher Flat Hatchery on Scott Creek in Santa Cruz County, California. While differing in size and funding, both programs began in 2001 in response to abundance levels of coho salmon that were severely depressed. CCC coho salmon are collected from the wild, brought into the hatcheries, genetically tested, and spawned to maximize diversity and avoid inbreeding. The hatchery raises coho salmon to various ages, feeds them krill, and tags them. From April through May, biologists conduct phased releases of these fish into streams to coincide with offshore ocean conditions. This release strategy allows the fish to imprint on the creek so they will return to these streams as adults and spawn naturally.

The multiagency/stakeholder Russian River Coho Salmon Conservation Program is effectively increasing coho salmon in the Russian River population, rescuing and rearing coho salmon from Redwood Creek, and reintroducing coho salmon to Walker and Salmon Creeks. Through habitat restoration and advancements in conservation hatchery practices and monitoring, today we see the most adult coho salmon spawning in the Russian River in two decades. The approved CDFW and U.S. Army Corps of Engineers (COE) Hatchery Genetic Management Plan (HGMP) facilitates a regional expansion of the

Coho salmon *(Oncorhynchus kisutch)*

Status: Endangered
Highlight: Extreme Drought and Catastrophic Wilfires

Recovery Efforts

- Continue and expand conservation hatchery programs to prevent extinction— **Although well below the recovery target, spawning in the Russian River is the highest recorded over the last two decades**
- Continue and expand restoration and funding partnerships through implementation of priority actions in targeted locations—**Restoration completed or ongoing in key locations critical to recovery**
- Restore key habitats for conservation hatchery outplanting and improve freshwater survival of coho salmon— **Restored estuary and floodplain functions in several key watersheds**
- Ensure adaptive management for conservation hatchery programs and restoration is informed by monitoring and research—**Collaborated with California to ensure long-term monitoring**

coho salmon broodstock program to support reintroduction in streams within the northern portion of the CCC coho salmon ESU. The HGMP includes expanded geographic and production potential and identifies groundbreaking monitoring techniques, research, and tools, such as Remote Salmon Incubators, to increase program capacity.

In 2018, NMFS, the COE, CDFW, and North Coast Regional Water Quality Control Board partnered with TNC, The Conservation Fund, and the Mendocino Redwood Company to capture Mendocino Coast coho salmon following several years of drought. Despite extensive efforts to restore and improve aquatic habitat, coho salmon populations in the Navarro and Garcia River have not increased. Once tens of thousands of adults returned to spawn each year, but numbers now trend at about a few hundred. Researchers believe these northern ESU coho salmon populations are not responding to the restored habitat because of the ecological and genetic effects caused by critically small populations over the last decade. The decision to bring coho salmon into the hatchery was guided by ten years of coho salmon monitoring by the partnership. To keep these salmon populations from going extinct, the partnership captured approximately 200 juvenile coho salmon from the Navarro and Garcia Rivers, transported them to the hatchery, and then tagged and genotyped them for analysis. The TNC and The Conservation fund have provided funding to raise juvenile fish to adulthood. A Technical Advisory Committee comprised of federal, state, and NGO scientists will develop a strategy to guide this new program.

In the southern portion of the ESU, a team of NMFS and CDFW technical staff are developing plans for relocating the Southern Coho Salmon Captive Broodstock Program for endangered CCC coho salmon from the Kingfisher Flat Genetic Conservation Fish Hatchery to a new hatchery facility south of San Francisco. Although the Kingfisher Flat hatchery has been critical in saving the region's coho salmon from extinction, the size of the facility and available water cannot support expansion of the conservation program to a level needed for species recovery. The technical team has developed hatchery production goals needed for species recovery and identified the necessary water resources to achieve those production goals. The team is currently seeking funding for a feasibility study and meeting with local landowners and partners to review and evaluate alternative locations for the new facility. In the near future, the technical group will focus on securing funding for construction, equipment, and operations.

Continue and Expand Restoration and Funding Partnerships through Implementation of Priority Recovery Actions in Targeted Locations

Partnerships are essential for restoring coho salmon habitat throughout northern California. The state's Fisheries Restoration Grant Program, funded in part by the Pacific Coastal Salmon Recovery Fund (PCSRF) administered by NMFS, supports restoration projects that align with actions identified in the state and federal ESA recovery plans. In accordance with the PCSRF Federal Funding Opportunity, these funds are focused on projects and activities benefiting ESA-listed populations and addressing the limiting factors and priority actions specified in these recovery plans. Below are updates to three restoration projects named in the 5-year priority actions plan and three additional restoration projects that are large-scale and have multiple habitat benefits for coho salmon.

The Scott Creek Lagoon Restoration and Highway 1 Bridge Replacement project is moving forward with the South Embankment Study. About 60 percent of the replacement designs will be completed in 2019. This

Photo Credit: Derek Acomb

project will allow the river to return to its historical meander and restore the marsh/lagoon habitat for improved juvenile rearing. The Santa Cruz Resource Conservation District and California Department of Transportation continue to work on strategies for funding the new bridge and causeway. Replacement of the bridge, and included restoration of the marsh-lagoon complex of Scott Creek, is the highest recovery priority in the Santa Cruz area.

The Garcia River Estuary Enhancement Plan was completed in early 2018 and is under review. This high-priority recovery action will restore the estuarine and floodplain habitats. These habitats influence the survival and fitness of salmon at population-level scales. The NOAA Restoration Center (NOAA RC) staff have been working with TNC on permitting and funding strategies to implement restoration actions detailed in the plan.

TNC implemented phase 1 of a restoration project at five sites in the lower South Fork Ten Mile River including multiple engineered log jams and a sizeable wetland pond that will provide refuge and rearing habitat for coho salmon. Partial funding and permits have been secured for phase 2 of this project, which will implement similar projects on the South Fork Ten Mile River. The NOAA RC is currently working with TNC to advance the rest of the Ten Mile River watershed conceptual plans. TNC is submitting grant applications to CDFW's Fisheries Restoration Grant Program. If grant applications are successful, implementation will resume in 2020. NOAA RC staff are also working with Trout Unlimited on multiple large wood projects in upstream Ten Mile River's Core and Phase I priority tributaries as identified in the recovery plan.

In 2017 and 2018, 597 instream habitat structures consisting of over 1,464 pieces of large woody debris (including whole trees and rootwads) were added to coho salmon core habitat throughout the Albion River, Big River, Garcia River, Navarro River, Noyo River, and Ten Mile River systems. In 2018, the James Creek Fish Passage Project was completed. The improvement of fish passage in James

Creek, a tributary of the upper Big River in Mendocino County, opened more than four miles of high quality habitat, and coho salmon were documented upstream of the barrier the first winter after removal.

The Salmon Protection and Watershed Network (SPAWN) enhanced a 0.5-mile floodplain in Lagunitas Creek, Marin County. In 2016 and 2018, over 10,000 cubic yards of fill and numerous abandoned and dilapidated buildings were removed from the floodplain, creating side channels with refuge habitat for juvenile coho salmon and steelhead. SPAWN installed large woody debris, removed invasive plants, and reforested the riparian corridor with over 9,000 native plants from SPAWN's Native Plant Nursery. Phase two of the project is planned for 2019. Hundreds of volunteers assisted in transplanting and nurturing native plants to support the restoration project.

Restore Key Habitats for Conservation Hatchery Outplanting and Improve Freshwater Survival of Coho Salmon

Conservation hatchery broodstock outplanting requires strategically focused habitat restoration. Since many outplanting sites are located on private land (e.g., agriculture, timber operations, etc.), outreach to these landowners and assistance with project design and permitting has improved our ability to restore key habitats in strategic locations. The NOAA RC provided approximately $1.4 million in funding for the Butano Creek Channel Hydrologic Reconnection Project located in the Pescadero Creek watershed. This project aims to reconnect Butano Creek to the Pescadero Creek estuary by dredging approximately 1.5 miles of channel and providing fish access to over 10 miles of upstream spawning habitat that is currently impeded by sedimentation. This project will also alleviate the regular steelhead fish kills

Photo Credit: Jennifer Carah

Examples of restoration projects in the Russian River watershed to support hatchery coho salmon.

• NMFS has an ongoing partnership with Sonoma Water and the COE in the pilot implementation of the Forecast Informed Reservoir Operations concept, intended to improve water storage capability for municipal supplies and fisheries flows.

• Additionally, estuarine habitat modelling via Habitat Blueprint funding is ongoing with Sonoma Water, Bodega Bay Marine Laboratory, University of California and other partners to guide estuary management and restoration.

• Trout Unlimited constructed the Yellowjacket Creek Fish Passage Project in partnership with Jackson Family Wines (JFW). The passage project opens up 1.9 miles of spawning and rearing habitat on JFW property, a Core Recovery Area identified in the CCC Coho salmon Recovery Plan. An ESA Section 10 Safe Harbor Agreement with JFW ensures fish passage, fish flows, habitat improvements and, stocking of juvenile coho salmon.

• NMFS partnered with E. & J. Gallo Winery to enhance streamflows to Porter Creek from an off-stream reservoir.

• NMFS has been working with Sonoma County Open Space District (SCOSD) and Regional Parks Department, CDFW, and others to restore significant floodplain habitat in Mark West Creek for coho salmon. SCOSD purchased the property and transferred it to Sonoma County Regional Parks last year for future public access and protection. Park project proponents have plans and designs for future restoration via grant applications to numerous funding solicitations for 2019.

caused by poor water quality. Once this project is completed and fish kills cease, NMFS will consider reintroducing coho salmon in this watershed using fish from the Southern Coho Salmon Captive Broodstock Program.

The Lower Scott Creek Floodplain and Habitat Enhancement Project Phases 1-3 were completed between 2014 and 2017. This project included installation and enhancement of multiple instream wood complexes and reconnecting the stream channel with the adjacent floodplain. Overall, the project will increase habitat complexity and floodplain connectivity along 4,500 feet of the lower mainstem of Scott Creek, where Southern Coho Salmon Captive Broodstock Program monitoring and outplanting sites are located.

The San Vicente Creek Large Wood Habitat Enhancement Project was implemented in 2017. This project included felling 48 standing redwood trees into San Vicente Creek, located in Santa Cruz County. The addition of large wood to the channel and floodplain will increase instream habitat complexity and facilitate sediment sorting and trapping, which will improve overwinter survival of juvenile coho salmon and steelhead. Robust monitoring programs are evaluating the effectiveness of the project.

In the Russian River watershed many restoration projects have occurred in areas where Russian River Conservation Hatchery coho salmon are currently released or planned to be released (see inset box).

Ensure Adaptive Management for Conservation Hatchery Programs and Restoration is Informed by Monitoring and Research

Monitoring and research efforts by federal, state, and local agencies, NGOs, and private partners have provided critical information to adapt conservation hatchery practices, broodstock release strategies, and restoration

work. Population abundance and distribution monitoring also provides needed information on status and trends and guides conservation strategies for the recovery of coho salmon. However, there continues to be a funding shortfall for priority monitoring efforts. NMFS and CDFW continue to collaborate on ways to achieve a stable, long-term funding mechanism for monitoring CCC coho salmon populations.

Summary

The 2015 launch of the Species in the Spotlight initiative for CCC coho salmon came during the worst drought on record in California. California experienced well below average precipitation from 2012 through 2015, record high temperatures in 2014 and 2015, and record low snowpack in 2015. Some paleoclimate reconstructions suggest that this drought was the most extreme in the past 500 or perhaps more than 1,000 years. The drought was followed by catastrophic wildfires along the coast and northern interior, a series of unrelenting storms and extremely wet 2016–2018 winters. We will see the impact of the drought, fires, and flooding on CCC coho salmon populations for many generations.

Although there are still critically low numbers of CCC coho, they have persisted despite the challenges. That is due largely to the concerted and coordinated efforts of private landowners and volunteers; state and local agencies; hatchery managers, and non-profit organizations who are dedicated to coho salmon recovery and are partnering with NMFS to restore coho habitat and advance key recovery actions.

The Species in the Spotlight initiative has helped leverage funds for restoration and conservation, brought new partners to coho salmon recovery, and re-prioritized NMFS resources to energize state and federal collaborations. The initiative has affirmed the hard work of dedicated individuals who are involved every day in these conservation hatchery and habitat restoration programs.

Photo Credit: Dan Wilson

PARTNER in the SPOTLIGHT: Russian River Coho Salmon Hatchery Team

Photo Credit: Erin Seghesio, NMFS

The Russian River Coho Salmon Hatchery Team: (left to right) Brett Wilson, CDFW; Bradley Stokes, COE; Ben White, COE; Ellen McKenna, CDFW; Matt Wong, CDFW; Ken Leister, COE; Rory Taylor, COE; and Brian Freele, CDFW.

The Russian River Coho Salmon Hatchery Team, formed of the COE and CDFW hatchery employees, has played a critical role in CCC coho salmon recovery. The Coho Salmon Hatchery Team has been rearing endangered CCC coho salmon since 2001 when CDFW first collected broodstock from the Russian River. Coho salmon had been in decline since the 1960s on the central California coast and peaked in 2001, when drought and desiccated streams led CDFW to partner with the COE and NMFS on coho recovery in the Russian River. Following a complete and intensive habitat and fish survey of the basin, and documentation of the dire situation for coho salmon, CDFW led a rescue of the last coho salmon in the basin. The COE, who constructed and owned the steelhead mitigation hatchery, quickly funded and installed six additional round tanks solely dedicated to the rearing of coho salmon.

Since 2001, the Coho Salmon Hatchery Team has been committed to coho recovery by expanding operations and staffing the facility to meet the expanding scope and need of the recovery efforts. In 2006, Marin County coho salmon were integrated into the program to diversify broodstock genetics. In 2008, surplus hatchery juveniles and adults were reintroduced to Walker and Salmon Creeks along the Sonoma/Marin Coast where they were locally extinct. In 2011, the COE funded the hatchery expansion, staffing, and operations to accommodate and care for more adult and juvenile coho salmon. In 2014, when a record drought hit the region, CDFW partnered with the National Park Service to capture and rear rescued Marin County juvenile coho salmon, which were released as adults to supplement 2016 to 2018 spawning populations; and in 2017, the COE and CDFW together submitted a HGMP to NMFS, which formalized the plans for a Regional Coho Salmon Conservation Hatchery Program. In 2018, 17 years since the first Russian River rescue, the Team formed a new partnership with TNC, the Conservation Fund, and the Mendocino Redwood Company to capture and rear Mendocino Coast coho salmon from the Garcia and Navarro Rivers.

Since the inception of the Coho Salmon Conservation Program, hatchery releases have grown from 6,000 to 200,000 coho salmon annually. The Team has cooperatively built a separate facility, hired permanent staff, and dedicated additional funds, resources, and energy towards a partnership that now spans the entire CCC coho salmon ESU. As a result, the Russian River and Redwood Creek coho salmon populations were saved from local extinction and abundance has grown from a low in the teens to over 100 fish. In addition, coho salmon were successfully reintroduced to several watersheds where coho had been locally extinct – and natural reproduction is now occurring. The Coho Salmon Hatchery Team serves four counties (Sonoma, Marin, Mendocino, and Santa Cruz) and seven different CCC coho salmon populations. The Team also assists the Southern Coho Salmon Captive Broodstock Program at the southern end of the CCC range. The Russian River Coho Salmon Hatchery Team have been consistently dedicated to coho salmon recovery in the area for over 15 years.



Photo Credit: Robert Frankevich (above left), Verena Gill, NMFS (above middle and section cover), Autumn Sutherland (above right)

SPECIES *in the* SPOTLIGHT

Cook Inlet Beluga Whale DPS

Photo Credit: David Blazejewski

The endangered Cook Inlet beluga whale (*Delphinapterus leucas*) has been in decline since 1979. Where once there were an estimated 1,300 of these white whales adjacent to Alaska's most populous region, only an estimated 328 remain. The rapid decline and dire status of the Cook Inlet beluga whale population makes it a priority for NMFS and our partners to prevent extinction and promote recovery of this iconic species. The majority of the decline resulted from unregulated subsistence hunting, but almost 20 years after the hunting was greatly curtailed, the population has failed to increase in numbers. We lack the information to understand why this beluga whale population is not increasing.

Recovery Progress

Since the launch of the Species in the Spotlight initiative, partnerships have advanced implementation of the five-year priority actions plan for the Cook Inlet beluga whale. The plan focuses on five critical actions to improve conservation efforts: (1) reduce the threat of anthropogenic noise in Cook Inlet beluga whale habitat, (2) protect habitats that support foraging or reproduction of Cook Inlet beluga whales, (3) gain a better understanding of population characteristics of Cook Inlet beluga whales to ensure effective management actions result in recovery, (4) ensure healthy and plentiful prey are available, and (5) improve understanding of why Cook Inlet beluga whales are not recovering by enhancing the stranding response program.

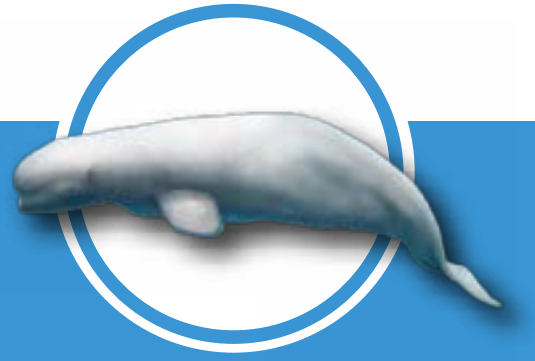
Reduce the Threat of Anthropogenic Noise in Cook Inlet Beluga Whale Habitat

Cook Inlet beluga whales are a very difficult species to study. The extraordinarily silty water they live in makes them invisible except for the portions of their bodies that break the surface of the water. Thirty-foot tides, the highest in the United States and miles-wide mudflats make boating extremely dangerous. For a third of the year, belugas dwell among large chunks of ice that swift tides wash back and forth. While the harsh conditions may help protect Cook Inlet belugas from killer whales, this dynamic environment severely hinders our ability to understand what may be limiting their recovery.

The turbid waters also limit the whales' ability to see their food and each other. They see their world through echolocation, which makes noise pollution in Cook Inlet a potentially serious problem. Cook Inlet is a naturally noisy environment at times, given the hiss of glacial silt in the water, the rushing tides moving rubble around on the bottom, and the cracks and rumbles of shifting ice during much of the year. Although belugas in Cook Inlet live in an area where vision is severely limited and the habitat is naturally noisy, they have managed to adapt to these conditions. What they have perhaps not adapted to as well is human-caused noise from activities such as pile driving, seismic exploration, oil and gas rigs, ship traffic, and military operations.

NMFS, other agencies, and industry partners are continually seeking ways to quiet the belugas' soundscape. Minimizing the presence of industrial noise in the waters within 10 miles of especially important habitat around the Susitna River Delta is one such measure. The Port of Anchorage has also gone to great effort to test technologies like confined bubble curtains and sonic resonators to reduce the amount of in-water noise from pile driving activities.

A partnership of scientists from NMFS and Alaska Department of Fish & Game (ADF&G) has been deploying passive acoustic monitors around key locations in Cook Inlet to identify beluga seasonal feeding grounds and then to better understand noise in these waters and its potential effects on belugas. In 2019, 14 different locations throughout Cook Inlet were acoustically monitored. NMFS is also deploying Cetacean and Porpoise Detectors, which detect the echolocation clicks of toothed whales, dolphins, and porpoises. These detectors classify groups of potential echolocation signals based on the intensity, duration, frequency content, and variation in inter-click intervals. This



Cook Inlet beluga whale (*Delphinapterus leucas*)

Status: Endangered
Highlight: An estimated 328 remain

Recovery Efforts

- Decrease the threat of anthropogenic noise in Cook Inlet beluga whale habitat — **Minimized the presence of industrial noise in the waters within 10 miles of important habitat in the Susitna River Delta**
- Protect Habitats that Support Foraging or Reproduction of Cook Inlet Beluga Whales — **Increased knowledge of winter habitats to avoid adverse impacts.**
- Gain a Better Understanding of Population Characteristics of Cook Inlet Beluga Whales to Ensure Effective Management Actions Result in Recovery — **Deployed 132 unmanned aircraft flights to identify individual whales, body condition, and health**
- Ensure healthy and plentiful prey are available— **Collected water and fish samples in four locations in upper Cook Inlet to test for contaminants**
- Improve understanding of why Cook Inlet beluga whales are not recovering by enhancing the stranding response program — **Increased public reports of stranded belugas and improved stranding response time**

provides temporal data on beluga activity such as presence, feeding behavior, or habitat usage. In 2020, NMFS is hoping to expand the detectors project to focus on beluga use of, and disturbance at, key foraging rivers in both the upper and lower Cook Inlet. These monitors provide information about the relative importance of different parts of Cook Inlet to belugas, and the degree to which humans acoustically affect these areas. This knowledge will better inform effective management and conservation actions.

Protect Habitats that Support Foraging or Reproduction of Cook Inlet Beluga Whales

Directly across Cook Inlet from Anchorage lies the Susitna River Delta, which appears to function as the very core of essential habitat for these whales. While it is important that these belugas have access to many runs of fish throughout the year at different locations, the Susitna's runs of salmon and eulachon are the belugas' main food source. The Susitna River Delta is an important calving area. As reported in the last Biennial report, in 2015, Dr. Tamara McGuire, LGL Alaska Research Associates, Inc., and her skipper, Brad Goetz observed a female beluga give birth to a healthy newborn. Information such as this, which highlights the importance of the Susitna River Delta region to Cook Inlet belugas for both foraging and reproduction, have led to this sensitive area receiving special consideration and protection during ESA section 7 consultations.

Although we have a good understanding of areas important to Cook Inlet belugas in the summer, we still know little about their winter habits. In an attempt to better document beluga distribution and habitat during non-summer months, NMFS is partnering with the Bureau of Ocean Energy Management (BOEM) to implement winter aerial surveys from 2018–2021.The early effort has already provided fruitful information suggesting important wintering areas. This information will also benefit BOEM as that agency prepares for upcoming oil and gas lease sales in lower Cook Inlet.

Photo Credit: Chris Garner, JBER

Gain a Better Understanding of Population Characteristics of Cook Inlet Beluga Whales to Ensure Effective Management Actions Result in Recovery

Our best range-wide population monitoring information for Cook Inlet belugas comes from aerial surveys conducted by the NMFS Marine Mammal Laboratory since 1993. These surveys help estimate the abundance of Cook Inlet belugas throughout their range. The next survey is scheduled to take place in June 2020.

In a partnership with local NGOs, NMFS is expanding a citizen science monitoring project for Cook Inlet belugas in 2019. Trained members of the public will collect observational data on seasonal beluga activity during standardized monitoring sessions. The citizen science monitoring, coupled with opportunistic sighting reports and systematic surveys, will be used to determine range-wide beluga presence and behavior. The data will be displayed in the Cook Inlet Beluga Whale Sightings Portal. This publically accessible portal is the result of a partnership between NMFS, Axiom, and the Alaska Ocean Observing System.

NMFS supported a partner-led research using non-invasive photograph identification of Cook Inlet belugas. Images collected by private contractors, Department of Defense Joint Base Elmendorf-Richardson biologists, and the public are compiled into the Cook Inlet Beluga Whale Photo-Identification Project's catalog. The data obtained from this long-term non-invasive study have provided vital individual-based information to managers, especially in regards to individual survival and reproductive history. It also provides information on group size, distribution, age-classes, habitat use, movements, feeding and calving grounds, calf-rearing areas, transit corridors, exposure to human activities, sexual distribution, and health.

An important indicator of population health and nutritional distress is female age at first reproduction (AFR). If AFR increases over time, it may be an indication of food limitation in the population. If AFR decreases with time, it can indicate a top-down factor such as predation or disease. Studies have shown that population AFR in mammals is quantifiable by measuring growth layer groups in the teeth. In 2018, NMFS partnered with the University of Alaska, Anchorage and the North Slope Borough in a graduate student project to assess the feasibility of using teeth from Cook Inlet beluga whales to estimate AFR.

To better understand why belugas are not recovering, NMFS collects data on physiology and body condition. NMFS collects this information by obtaining biopsy samples from Cook Inlet belugas. From 2016–2018, 39 samples have been collected. Sophisticated analysis of these tiny plugs of skin and blubber can provide insights into genetics, reproductive status, contaminant loads, and other important parameters. Cook Inlet beluga samples collected to date have identified pregnant females from reproductive hormone assays and estimated ages of whales.

Beginning in 2017, NMFS began using small unmanned aircraft to collect very detailed aerial imagery of beluga whales in the hopes that the images can be used to assess beluga whale body condition, health, and add to the existing photo-ID catalog. By the end of the 2018 season, NMFS made 132 flights on 26 groups of belugas. In 2019, we plan to expand sampling to use unmanned aircraft overhead photos for a future photo-ID mark-recapture abundance estimate.

In 2020, ADF&G will provide an individual-based population model that we anticipate will strengthen our estimate of Cook Inlet beluga whale vital rates. Data that feeds into the

Photo Credit: Georgia Aquarium

model include the Cook Inlet Beluga Whale Photo ID project, necropsies from beach-cast carcasses, satellite and aerial surveys, and genetics from the Bristol Bay population of beluga whales. This individual-based model will achieve two main goals; provide a preliminary assessment of whether vital rates can be estimated from the data being used, and evaluate the effectiveness of new sources of information to strengthen vital rate estimates.

Ensure Healthy and Plentiful Prey are Available

The Cook Inlet beluga population remains suppressed either because they are not reproducing fast enough or their survival rates are too low, or both. The availability of sufficient food could affect either of these factors.

In order to understand if there is sufficient prey for Cook Inlet belugas, we need to understand the whale's nutritional needs for healthy growth and reproduction. In 2018, NMFS partnered with the Georgia Aquarium and University of California Santa Cruz for a study to determine the energetic requirements and metabolic needs of belugas. Data on oxygen consumption of resting and diving whales at Georgia Aquarium will be correlated with their overall body condition and daily caloric food intake. This will allow metabolic demands of the whales to be matched to potential prey resource needs and applied to the wild Cook Inlet beluga population.

NMFS also initiated a study to assess the health of beluga prey in Cook Inlet, with emphasis on resident fish. Partnering with staff from Joint Base Elmendorf-Richardson and the NMFS Northwest Fisheries Science Center, we collected fish and water samples in 2017 from four locations in upper Cook Inlet to analyze for contaminants of emerging

concern such as pharmaceuticals and personal care products. The fish preliminarily tested positive for 21 of the 119 analytes tested and the water tested positive for four of the 126 analytes tested. Results are currently being analyzed to determine their significance.

In 2019-20, an Alaska Sea Grant fellow is scheduled to join NMFS to identify year-round distribution and abundance of beluga prey in rivers and streams throughout Cook Inlet. This project will highlight data gaps and greatly expand our understanding of what belugas may be eating in the winter months, which has not been well documented previously.

Improve Understanding of Why Cook Inlet Beluga Whales are not Recovering by Enhancing the Stranding Response Program

Scientists sample dead Cook Inlet beluga whales to find clues regarding their lack of recovery. In order to obtain the biological information we need from these dead whales, we need to find them before the process of decay has become advanced. To this end, NMFS is redoubling its efforts to inform area pilots and members of the public to quickly report sightings of dead (or live-stranded) animals so ground crews can respond rapidly.

We distributed stranding response kits to specially trained partners, giving them the tools to conduct good field examinations of beluga carcasses. We are pursuing arrangements to make aircraft available to us on short notice to allow access to stranded whales along those portions of Cook Inlet that are not road accessible. It is hoped with all the increased efforts in outreach and education (see Other Recovery Progress) that we will receive more reports on stranded belugas faster. Since 2018, public reports of stranded belugas have increased and our stranding response time has and continues to improve.

Other Recovery Progress

A main purpose of the overall Species in the Spotlight initiative is to gain public support for recovering highly endangered species. In the case of Cook Inlet beluga whales, NMFS relies heavily on its many partners to advance this effort. Our biggest partnership event is "Belugas Count!". This all-day citizen science celebration aims to bring together members of the public to focus on the endangered Cook Inlet beluga whale, fostering local pride, awareness, and stewardship. It is a collaboration among a variety of federal and state agencies, local and national organizations, industry, as well as individuals. The initial event was held on September 9, 2017, and was so successful, we decided to make this an annual event. Belugas Count! will be held September 21, 2019. The morning of Belugas Count! is dedicated to engaging the public in helping partners count belugas from staffed stations throughout Cook Inlet. Adult and juvenile Cook Inlet belugas were counted at multiple stations during the event in both 2017 and 2018. Activities on the afternoon are held at the Alaska Zoo where a free event includes talks and activities about Cook Inlet belugas. Around 600 people have been attending this portion of Belugas Count! The public and four beluga-focused aquariums also participate via social media posts and livestreams, which reached over 40,000 people during the 2018 event.

NMFS developed Cook Inlet beluga whale outreach materials to add to its expanding outreach kit. Materials include a tri-fold informational brochure; school-level curricula about Cook Inlet beluga whales; bookmarks with viewing guidelines for pilots and boaters with a slogan "Stay High and Fly By" and "Your Boating Action Can Cause an Adverse Reaction", and a sticker sheet highlighting the ecosystem of Cook Inlet focused around beluga whales. These materials are used in schools and at events like the Great Alaska Aviation Gathering

and the Great Alaska Sportsman Show. In addition, NMFS produced new metal signs for public roadways that access rivers and streams important to Cook Inlet belugas. The signs highlight both the plight of Cook Inlet belugas and suggest ways to mitigate impacts from boat disturbance and avoid beluga interactions. We are participating in stories in local and national print media, radio stations, and television to educate the public about how they can avoid potential harassment of belugas, report sightings of healthy whales and help us enhance our response to stranded whales.

Another example of successfully garnering support for Cook Inlet beluga recovery has been the formation in 2018 of the multi-partner Cook Inlet Beluga Whale Recovery Implementation Task Force jointly run by NMFS and ADF&G. The primary role of the task Force is to engage the expertise of researchers, managers, communicators, and various other stakeholders to advise NMFS and ADF&G on specific topics or issues relating to Cook Inlet beluga recovery. It will provide guidance and recommendations for most effective recovery action implementation and will help prioritize limited resources to make the most difference in achieving recovery. The focus will be on short-term actions that can be completed in the next 2-5 years without losing sight of the importance of long-term projects and research.

Summary

In collaboration with our partners, we continue to improve our knowledge of Cook Inlet beluga whales and their habitat needs. This information supports effective and efficient management programs to increase the likelihood that beluga whales will recover. We are also improving our communication with key groups in the region to help avoid beluga harassment. Additional research to identify critical factors limiting the Cook Inlet beluga population is vital to recovery. We must not lose this irreplaceable species that is so important to tourism and to local residents. Cook Inlet beluga whales also are culturally important to Native subsistence hunters that hope to resume sustainable harvest of this once abundant whale.

Photo Credit: Dan Wilson

PARTNER in the SPOTLIGHT: Sue Goodglick, ADF&G

Photo Credit: Sue Goodglick

Over the last two years Sue Goodglick, ADF&G, has become a crucial member of the multi-partner Cook Inlet beluga whale 'team'. Sue is a wildlife biologist for the State of Alaska's Marine Mammals Program and had been assisting with pinniped research and coordination until spring 2017 when a call went out for someone from the State to partner with NMFS for the inaugural Belugas Count! event. Sue jumped in with both feet forward and never looked back. Her commitment, passion, out of the box thinking, 'can-do' attitude, humility, humor, and uncanny attention to detail all greatly contributed to the success of Belugas Count! and helped make it a much-anticipated annual event for the public. Sue's ability to implement an approach with mutual gains has also aided in creating a cohesive Belugas Count! partnership of over 20 diverse groups from industry to NGOs. She never hesitates to go the extra mile and overcame her fear of live TV and very early mornings to take one for the team, twice! She is usually the first one to volunteer for outreach events to promote beluga conservation such as Potter Marsh Discovery Day. As well as being the lynchpin for the Belugas Count! Event, Sue co-chairs (with NMFS) the Outreach Committee of the Cook Inlet Beluga Whale Recovery Implementation Task Force. The purpose of the Task Force is to advise NMFS and ADF&G on issues related to Cook Inlet beluga whale recovery, including recommending practicable and effective ways to implement the 2016 recovery plan for the Cook Inlet Beluga Whale. In this role, she has also increased communication and coordination between agencies and stakeholders working to recover Cook Inlet beluga whales, promoted open and constructive discussion of ideas and information, and kept the Committee moving forward and making steady progress.



Photo Credit: NOAA (above left), Mark Sullivan (above middle), NOAA (above right and section cover)

SPECIES *in the* SPOTLIGHT

Hawaiian Monk Seal

Photo Credit: Mark Sullivan

The Hawaiian monk seal (*Neomonachus schauinslandi*) is the world's only surviving tropical seal species. Hawaiian monk seals are endemic to the Hawaiian Archipelago, which stretches 1,500 miles from Hawaii Island to Kure Atoll. There are only about 1,400 Hawaiian monk seals left in the world. While recent population assessments have yielded some encouraging results, the predominant trend has been a steep population decline since the 1950s.

The 2018 annual population assessment showed that Hawaiian monk seals have increased in numbers by about 2 percent annually since 2013, reversing at least six decades of steep population decline. The population is now estimated to be around 1,430 seals, with roughly 1,100 of those seals in the Northwestern Hawaiian Islands and 300 in the main Hawaiian Islands. This recent growth trend is primarily due to increased juvenile survival in the Northwestern Hawaiian Islands and stability or growth of the six subpopulations. Rapid growth trends observed in the main Hawaiian Islands subpopulation starting in the 1990s appear to have slowed or stopped, and the overall population numbers have remained stable since 2013, although 2018 was a record year with 31 pups born in the main Hawaiian Islands (excluding Niihau), a 30 percent increase over the previous record of 21 in 2013.

Recovery Progress

Since the launch of the Species in the Spotlight initiative, we have been working with our partners to implement the five key actions in the five-year priority actions plan for Hawaiian monk seals: (1) improve survival of juvenile and adult female seals in the Northwestern Hawaiian Islands, (2) manage and mitigate human-seal interactions to ensure natural population growth, minimize conflict, and foster coexistence, (3) detect and prevent catastrophic disease outbreak and disease-related mortality, (4) develop and implement strategic communications plan and social marketing strategy, and (5) encourage community-led monk seal stewardship and citizen science.

Improve Survival of Juvenile and Adult Female Seals in the Northwestern Hawaiian Islands

Despite the recent increase described above, numbers are still only about one-third of historic population levels. A slowed rate of decline leading up to the recent population increase is due in many ways to NMFS and partner recovery efforts. In fact, an estimated 30 percent of monk seals alive today are here because they directly benefited, or are the pup or grandpup of a female that benefited, from a lifesaving intervention performed by NMFS with the aid of our partners, such as disentanglement or dehooking. A total of 154 interventions to improve individual seals' survival prospects were performed in 2017–2018 in the Northwestern Hawaiian Islands. These included translocation of 45 pups from high shark predation risk areas to lower risk sites within French Frigate Shoals Atoll, releasing 14 seals entangled in marine debris and 18 seals trapped behind the Tern Island sea wall, and additional miscellaneous interventions including rescuing young pups from high waves and reuniting separated mothers and pups. Twenty-five malnourished seals were taken from the Northwestern Hawaiian Islands to The Marine Mammal Center's Ke Kai Ola facility on Hawaii Island, which opened in 2014 to rehabilitate monk seals.

Manage and Mitigate Human-Seal Interactions to Ensure Natural Population Growth, Minimize Conflict, and Foster Coexistence

Monk seals were essentially extirpated from the main Hawaiian Islands for many years, although in recent decades they successfully reestablished a small but thriving population. While this is a hopeful sign for recovery of the species, a human population unfamiliar with seals resulted in negative human-seal interactions such as harassment of seals hauled out on beaches, hookings, intentional killings, and more. There has been a noticeable shift in public attitude towards

Hawaiian monk seal (***Neomonachus schauinslandi***)

Status: Endangered
Highlight: 1,400 Hawaiian monk seals left in the world

Recovery Efforts

- Improve Survival of Juvenile and Adult Female Seals in the Northwestern Hawaiian Islands — **Intervened 154 times in 2017-2018 to improve individual seals' survival in the Northwestern Hawaiian Islands**
- Manage and Mitigate Human-Seal Interactions to Ensure Natural Population Growth, Minimize Conflict, and Foster Coexistence — **Launched "It's ok to call!" slogan to encourage reporting of seal-fishery interactions**
- Detect and Prevent Catastrophic Disease Outbreak and Disease-Related Mortality — **Vaccinated over 700 monk seals for morbillivirus**
- Develop and Implement Strategic Communications Plan and Social Marketing Strategy — **Developed communication strategy and increased public engagement in conservation of monk seals**
- Encourage Community-led Monk Seal Stewardship and Citizen Science — **Increased the number of public reports about monk seals from around 7,000 in 2016 to about 9,000 in 2018**

the positive in recent years, due partially to the fact that seals have now been in the MHI long enough that residents are getting used to their presence and younger generations on islands with larger seal populations are growing up seeing them on a regular basis. The shift is also due in part to the work of NMFS, our partners, and community members sharing information, educating the public, and engaging with local community encouraging coexistence.

A combination of approaches has been used to address this priority, including outreach directed at fishermen and other key stakeholder groups, improving our monitoring and data management, providing grants to the State of Hawaii Department of Land and Natural Resources (DLNR) and NGOs for community-based efforts, intervening directly with seals exhibiting concerning behavior, and rescuing hooked and entangled seals. A new set of graphics and messaging were developed for outreach purposes as part of our FAST program (Fishing Around Seals and Turtles). Two reflective decals—one decal for hook and line fishermen and one for spearfishermen—provide guidance on how to prevent negative interactions with monk seals and promoting our "It's ok to call!" slogan, designed to encourage reporting of incidents and interactions. The decals and messaging have proven to be popular with fishermen and have received positive local news media and social media exposure. Nevertheless, hookings and entanglements in state-managed nearshore fisheries continue to pose a significant recovery threat. DLNR was awarded a grant under Section 6 of the ESA to address these harmful fishery interactions

Photo Credit: NOAA

with monk seals (and sea turtles) via the development of a conservation plan and other activities. We will continue to support and encourage our state partner to reduce fishery impacts to monk seals and other protected species.

While attitudes are shifting and NMFS and partners have a strong presence in the community, there are still occasional interactions that are detrimental to individual seals, including three intentional killings in 2018 on the island of Molokai. Following the discovery of these killings, we engaged key individuals within the Molokai community to develop a collaborative strategy of community in-reach, which is discussed further in the Encourage Community-led Monk Seal Stewardship and Citizen Science section below.

Detect and Prevent Catastrophic Disease Outbreak and Disease-Related Mortality

Our program remains focused on morbillivirus and toxoplasmosis; two diseases that are very different, but both carry serious potential consequences for monk seals.

Morbillivirus is widespread and outbreaks of the disease have caused the deaths of thousands of dolphins and seals around the world, including the death of about 2,300 grey and harbor seals on the east coast of the United States since July 2018. This family of viruses includes measles, which human children are immunized against, and distemper, which is part of a core vaccination series for pet dogs. The disease has not yet been documented in monk seals in Hawaii, but could potentially be contracted from unvaccinated dogs or from other marine mammals such as whales and dolphins. Once introduced into the small population of monk seals, without an intervention like the vaccination program described below, an outbreak could set back recovery for decades, or eliminate hope for the species altogether.

In February 2016, after years of investigation and safety and effectiveness trials, NMFS began vaccinating wild monk seals. After an initial push that resulted in 84 vaccinated animals in the main Hawaiian Islands and 654 in the Northwestern Hawaiian Islands, this program is moving into a maintenance phase focusing primarily on weaned pups and animals we were unable to vaccinate in previous years. Samples are collected opportunistically from vaccinated seals to study antibody titers over time. As of the end of 2018, we are approaching herd immunity in 70 to 100 percent of simulated outbreak scenarios for the Northeastern Hawaiian Islands and Oahu and Kauai in the main Hawaiian Islands. Niihau remains a large gap in our efforts due to the fact that the majority of the main Hawaiian Islands population resides there, but we have limited access to perform these types of mitigation efforts. This is the first ever effort to vaccinate a wild marine mammal species, and NMFS hopes this will lay the foundation for future efforts to vaccinate marine wildlife against preventable diseases and safeguard populations against potentially devastating losses.

Feral cats and toxoplasmosis have long been known as threats to terrestrial species, but in recent years, it has become apparent that toxoplasmosis also poses a major threat to marine mammals, most notably the endangered Hawaiian monk seal. While all cats have the potential to carry the disease, indoor pet cats are much less likely to spread the disease as long as their litter is properly disposed of. Feral cats in particular are thought to be the primary vectors of the disease in Hawaii. Feral, abandoned, and other outdoor cats (also called “at-large” cats) have substantial, documented negative impacts on wildlife and are responsible for numerous mammal, reptile, and bird species extinctions. Cats function as vectors for several diseases, some of which have deleterious effects on human, wildlife, and domestic animal health.

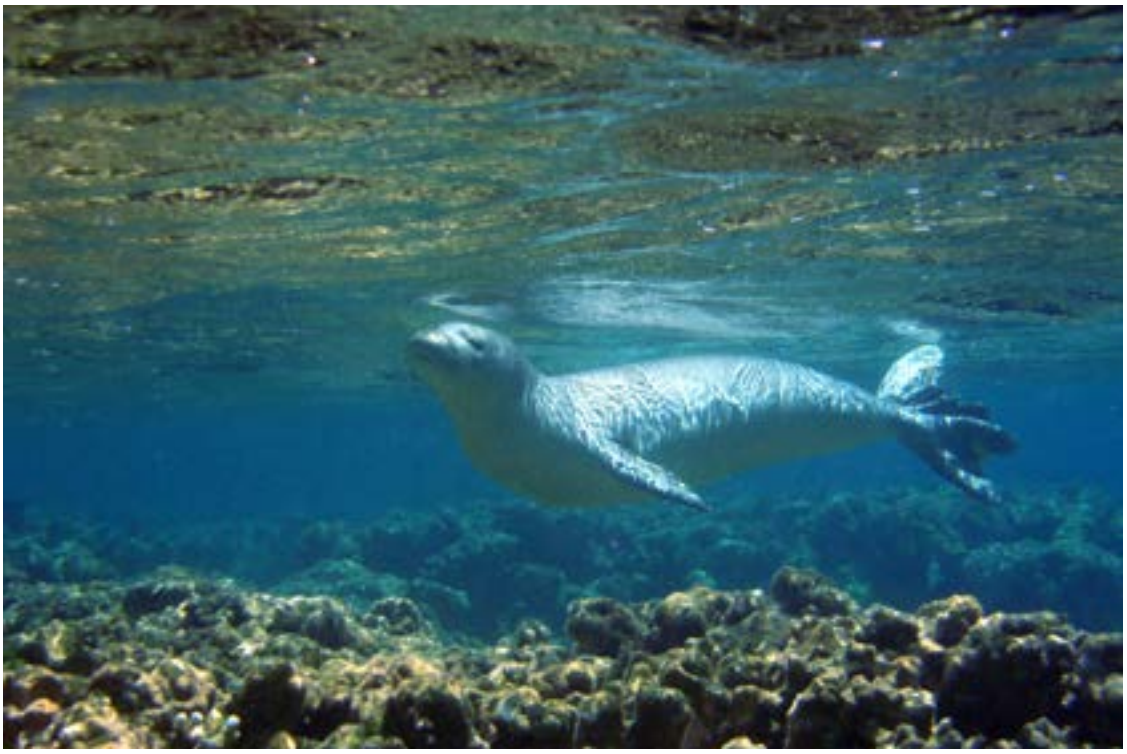


Photo Credit: Mark Sullivan

Cats are the sole definitive hosts of the protozoal parasite Toxoplasma gondii, which spreads when the cat sheds the oocysts (eggs) in their feces.

On the island of Oahu alone, there are an estimated 50,000–300,000 feral cats. Since 2001, there have been a minimum of eleven monk seal deaths attributable to toxoplasmosis in the Hawaiian Islands, including at least three in 2018. These numbers are likely a significant underestimate as NMFS is unable to recover every monk seal carcass, and, of those we do recover, some have decomposed beyond the point where identification of diseases like toxoplasmosis is possible. Additionally, mortalities seem to be disproportionately females, which means that not only are those animals lost, but their reproductive contribution to the population has been lost as well. Toxoplasmosis has become the number one disease threat to monk seals. Our ability to mitigate this threat is complicated by a paucity of preventative or curative measures, the fact that NMFS has no jurisdiction over cats or terrestrial ecosystems where they are found, and that policy and management actions enacted or proposed in an attempt to manage cats are consistently met with strong opposition from a vocal minority.

An interagency working group was created in May 2016 following a NMFS and DLNR co-sponsored workshop, consisting of federal, state, and county agencies committed to sharing information and resources to reduce the impacts of feral, abandoned, and outdoor cats. This working group, called the Toxoplasmosis and At-large Cat Technical Working Group continues to grow and develop, reaching out to potential partner agencies, engaging with stakeholders, discussing community outreach

messaging, initiating literature reviews to better understand proposed solutions to the problem, and organizing symposia at local conservation conferences among other actions. NMFS is in the early stages of developing a strategic plan, which will lay out a roadmap for NMFS and partners moving forward in the effort to reduce the threat of this deadly disease to Hawaiian monk seals and other native wildlife.

Develop and Implement Strategic Communications Plan and Social Marketing Strategy

We are working toward developing a proper strategy and conducting thorough research of major concerns and hurdles to engaging in desired behaviors for all stakeholder groups. While we do not have this expertise in-house, we have been able to leverage partnerships and other internal resources to help develop a strategic communications plan and social marketing strategy. Graduate and undergraduate students working on social science projects have contributed useful information. A group of volunteer interns has conducted extensive research and laid the groundwork for a plan. Staff have formed an internal Community Based Social Marketing group for knowledge sharing and discussing ideas, and some staff have received trainings on the principles and practices of social marketing and targeted communication, which has been incorporated into our education and outreach materials, web and social media presence, and community engagement.

In the summer of 2017, a monk seal gave birth on a crowded beach in the Waikiki area, one of the most populated areas in the state. Public attention was constant, public and seal safety concerns were high, and therefore NMFS was essentially obligated to deliver a steady stream of strategic messaging. This provided us with a unique opportunity to use non-traditional methods of public engagement such as "pupdates"— live-streamed question-and-answer segments with NMFS biologists produced by a local non-profit news group— in order to disseminate messaging in real time appropriate to the evolving situation on the beach and address the public's questions, concerns, and understanding of monk seals. This effort facilitated new and creative ways of communicating with the public, built new and strengthened existing partnership, and brought a new level of attention to Hawaii's native seal, not only from residents but from mainland U.S. and international visitors as well. A whole network of self-appointed monk seal stewards and ambassadors has emerged since the event and they contribute to our monitoring efforts by calling in sightings, and public outreach efforts by taking it upon themselves to educate other members of the public when they encounter monk seals on the beach.

Encourage Community-led Monk Seal Stewardship and Citizen Science

Community engagement and monk seal monitoring efforts are cornerstones of our recovery program and they dovetail in the form of a dedicated network of volunteers. Volunteers across the islands work with various partner agencies and organizations to report seal sightings and observe seals on local beaches. Volunteers also spend many hours answering questions and educating visitors and community members about the Hawaiian monk seal. NMFS and partners maintain a seal reporting "hotline" and coordinate a network of partners, staff, and volunteers throughout the main Hawaiian Islands. For many years, individual hotline numbers operated on each island, including two on Hawaii Island, which proved to be confusing for residents and visitors. Since consolidating the individual island hotlines into one statewide reporting number that also accepts calls for sea turtles and cetaceans, the number of monk seal sighting calls increased from about 7,000 in 2016 to around 9,000 in 2018.

We have focused our efforts on dialogue and partnership with a small group of influential community leaders who are interested in taking the lead on community-led monk seal stewardship and "inreach" to local community members, such as fishermen, most likely to interact with monk seals. Thus, this group of community leaders is helping NMFS communicate via an existing framework for natural resource management that has been used by Native Hawaiians for generations. This allows community members to dialogue in a manner that they are comfortable and familiar with, and NMFS is able to gain insight into their concerns and perceptions and then address those concerns and exchange information via trusted liaisons.

Summary

Although more work remains to recover the species, NMFS and our partners have made significant headway in reducing the extinction risk of Hawaiian monk seals. We celebrate the encouraging news of the recent population increase, which inspires us to continue to work diligently across the archipelago to combat threats to monk seals and more than six decades of population decline. Through the Species in the Spotlight program, we continue to build and leverage strategic partnerships that will contribute to and complement our recovery efforts as we work toward recovery of Hawaii's native seal. The five-year priority actions plan, along with increased collaboration with partners, will provide significant recovery benefit to monk seals.

Photo Credit: NOAA

PARTNER in the SPOTLIGHT: U.S. Coast Guard, District 14

How do you get a 400-pound Hawaiian monk seal from Point A to Point B? In a U.S. Coast Guard HC-130 aircraft, of course! Rescue and rehabilitation of malnourished, injured, or ill individuals is a critical component of recovery for monk seals, the most endangered pinnipeds in the United States. Monk seals from across the Hawaiian archipelago, including the remote and uninhabited Northwestern Hawaiian Islands, may need to be transported to or from NMFS facilities on the island of Oahu or The Marine Mammal Center's Ke Kai Ola facility on the island of Hawaii for actions such as surgical or medical interventions, long-term care, or rehabilitation. Options for moving large animals between islands are limited, especially when time is of the essence or the location is remote and difficult to access. The partnership between the U.S. Coast Guard and the Pacific Islands Marine Mammal Health and Stranding Response Program was formalized in 2008. Since 2008, the U.S. Coast Guard has been able to respond to more than 50 requests for transporting seals between islands, including a record-setting transport of seven female monk seals from Hawaii Island to Oahu in April 2016 following nearly 7 months of rehabilitation. These efforts translate into an excess of $450,000 in dedicated operational and staff support. The partnership is truly one of a kind, and is not just beneficial for the seals. U.S. Coast Guard pilots need to log a certain number of hours in the air per year, so transporting the seals means flight time not only contributes to the training requirement, but also potentially saves the life of the animal(s) on board, as well as provides an educational and rewarding encounter with monk seals for the U.S. Coast Guard members involved.

Photo Credit: NOAA Permit #15488, Florida Fish & Wildlife Conservation Commission (above and section cover)

SPECIES *in the* SPOTLIGHT

North Atlantic Right Whale

North Atlantic right whales (*Eubalaena glacialis*) range primarily from calving grounds in coastal waters of the southeastern U.S. to feeding grounds in New England waters and the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence. Right whales aggregate seasonally in seven known areas: the coastal waters of the southeastern United States; the Great South Channel; Jordan Basin; Georges Basin along the northeastern edge of Georges Bank; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the Roseway Basin on the Scotian Shelf. Since around 2010, fewer whales have been using some of these established habitats and have been staying within them for shorter periods. In addition, a newly recognized region south of the Massachusetts islands of Nantucket and Martha's Vineyard has been found to contain a large portion of the North Atlantic right whale population in winter through early spring. Surveys this summer and fall will be directed along the 50-fathom contour from the Hague Line to the mid-Atlantic to see if whales persist in this region year-round.

North Atlantic right whales are protected under both the ESA and the Marine Mammal Protection Act. They have been listed as endangered under the ESA since 1970. The North Atlantic right whale is one of the world's most endangered large whale species, currently numbering approximately 400 individuals. By the early 1890s, commercial whalers had hunted right whales in the Atlantic to the brink of extinction. After commercial whaling stopped, right whales experienced several decades of slow recovery and by 1990, the estimated minimum population reached 268 individuals. In the early 1990s, the population continued to grow to approximately 481 individuals in 2010. However, fluctuating mortality rates and decreased calving have led to a population decline that has continued for at least the last 8 years. Exacerbating the decline in total abundance is the continuous decreasing proportion of adult females in the population owing to lower survival rates compared to adult males. A large number of observed right whale mortalities in 2017 prompted a declaration of an Unusual Mortality Event throughout the species' range and continues to be investigated for causative factors as elevated mortalities continue to be documented into 2019.

North Atlantic right whales travel north to New England every year to feed off the dense concentrations of plankton (specifically copepods) that can be found in these productive waters. Thanks to the work of dedicated aerial survey teams, NMFS and its partners are able to monitor right whale locations, behavior, population shifts, and overall health within this critical habitat. These surveys and discoveries provide essential information that is necessary for reducing human impacts and helping NMFS take actions that support right whales recovery. (NOAA Permit #775-1660; Photographer: Cynthia Christman, NOAA)

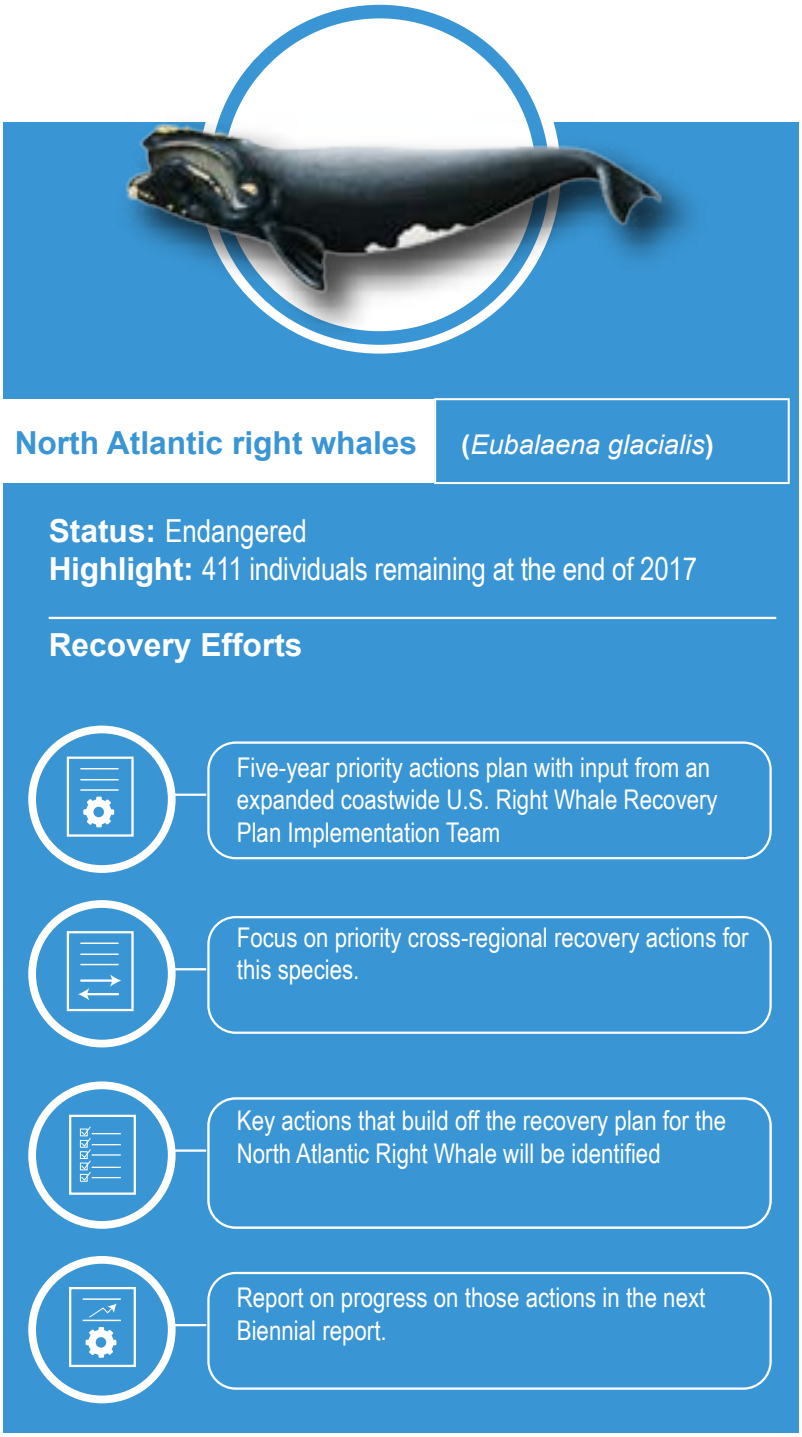
Because of the small population size and low annual reproductive rate of right whales, human-caused mortality affects their population growth rates more than other large whales. Also unlike other large whale species, right whales can occur very close to shore (< 1 mile). Vessel strikes and entanglement in fishing gear are the principal factors retarding growth and recovery of the population.

Recovery Progress

NMFS will develop a five-year priority actions plan with input from an expanded coastwide U.S. Right Whale Recovery Plan Implementation Team (composed of two region-specific implementation teams). The Team will be convened in 2019 to focus on priority cross-regional recovery actions for this species. Key actions that build off the recovery plan for the North Atlantic Right Whale will be identified in the five-year priority actions plan, and we will report on progress on those actions in the next Biennial report.

Other Recovery Progress

Extensive collaboration among stakeholders has been extremely important for right whale conservation efforts. NMFS has formed two regional (U.S. Northeast and U.S. Southeast) recovery implementation teams that assist and advise NMFS relative to regional right whale recovery tasks. NMFS funded the state of Massachusetts and Center for Coastal Studies to conduct aerial surveys for right whales and monitor abundance of copepods (*Calanus sp.*), the primary food source for right whales, in Cape Cod Bay. NMFS and the Center for Coastal Studies support and provide emergency response to entangled right and other large whales. NMFS supports the New England Aquarium to maintain a catalog of individual right whales, their identifying features and database of the resightings of those individuals— the fundamental building block of all of our population estimates and modeling exercises. The Aquarium is also involved in many other aspects of right whale recovery. The states of Florida and Georgia have been involved in monitoring right whale calf production, obtaining genetics samples of right whale calves and other unsampled individual right whales, and have rescued entangled right whales. The COE, U.S. Coast Guard, BOEM, and U.S. Navy have been instrumental in funding various aspects of monitoring and research and are involved in regional implementation team efforts. All of these entities— and many others— participate in the North Atlantic Right Whale Consortium (NARWC). The NARWC includes more than 200 individuals from various research and conservation organizations, shipping and fishing industries,



technical experts, U.S. and Canadian government agencies, and state and provincial authorities. The NARWC is dedicated to the conservation and recovery of the North Atlantic right whale.

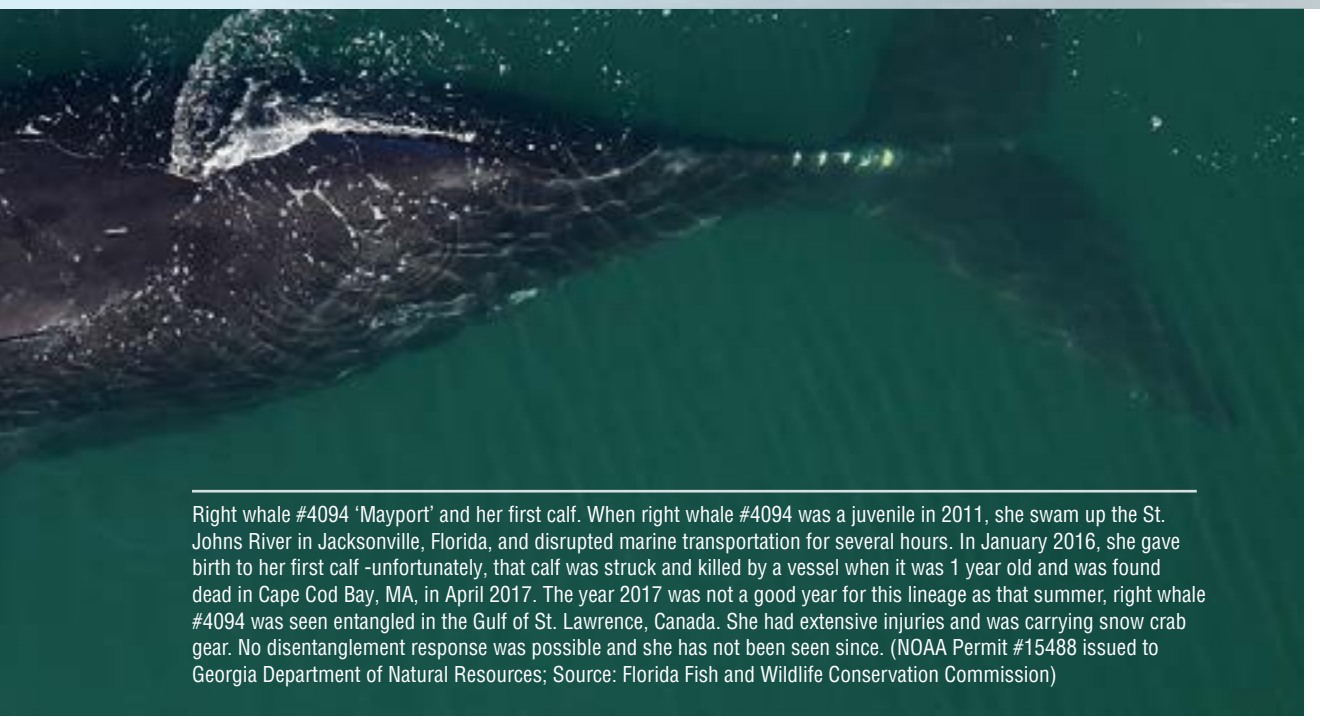
NMFS and our partners are committed to conserving and rebuilding the North Atlantic right whale population using a variety of innovative techniques to study, protect, and rescue these endangered whales.

NMFS is currently conducting a review of its vessel speed restriction rule (pursuant to 50 CFR 224.105). The review will culminate in a report that will assess economic impacts to the maritime community, vessel traffic compliance with the rule, impacts to navigational safety, conservation benefits to right whales, and outreach activities. NMFS is analyzing relevant data in collaboration with other organizations and scientists. The review is well underway, and we hope to circulate a draft for public comment by the end of the year. In addition, NMFS has taken several steps to reduce the threat of vessel collisions with North Atlantic right whales (see inset box).

For more than two decades, NMFS has implemented management measures to reduce whale entanglements in commercial fishing gear with the help of the Atlantic Large Whale Take Reduction Team—a group of stakeholders consisting of fishermen, scientists, conservationists, and state and

Examples of efforts to reduce vessel collisions with North Atlantic Right Whales.

- Since 2008, implementing mandatory speed restrictions of 10 knots or less for vessels 65 feet or greater in overall length in Seasonal Management Areas along the U.S. east coast at certain times of the year when whales may be present.
- Encouraging voluntary speed reductions in Dynamic Management Areas.
- Recommending alternative shipping routes and areas to be avoided and modifying international shipping lanes.
- Developing right whale alert systems and mandatory vessel reporting systems.
- Increasing outreach and education to recreational and commercial mariners.



Right whale #4094 'Mayport' and her first calf. When right whale #4094 was a juvenile in 2011, she swam up the St. Johns River in Jacksonville, Florida, and disrupted marine transportation for several hours. In January 2016, she gave birth to her first calf -unfortunately, that calf was struck and killed by a vessel when it was 1 year old and was found dead in Cape Cod Bay, MA, in April 2017. The year 2017 was not a good year for this lineage as that summer, right whale #4094 was seen entangled in the Gulf of St. Lawrence, Canada. She had extensive injuries and was carrying snow crab gear. No disentanglement response was possible and she has not been seen since. (NOAA Permit #15488 issued to Georgia Department of Natural Resources; Source: Florida Fish and Wildlife Conservation Commission)

federal officials. We require commercial fishermen to use certain gear modifications that are meant to reduce entanglement risk to North Atlantic right whales and have established areas where fishing cannot occur during certain times when North Atlantic right whales are present (see inset box).

However, entanglement in fishing gear continues to be a source of mortality and serious injury for this species; therefore, we are currently working with the Atlantic States Marine Fisheries Commission, the New England states, and the Take Reduction Team to develop additional management measures to further reduce the risk of entanglement in fishing gear. The Atlantic Large Whale Take Reduction Team met in April 2019 to develop recommended changes to the Take Reduction Plan that would reduce the effects of fixed gear fisheries on North Atlantic right whales. The Team was able to reach nearly unanimous consensus on a framework of measures that should achieve a 60 percent reduction in the risk of serious injury and mortality in trap/pot fisheries in the Gulf of Maine and southern New England. Two general risk reduction approaches emerged as the Team's preferred options: substantial buoy line reduction and gear modification to require buoy lines that can be broken by right whales.

Examples of efforts to reduce serious injury and mortality of North Atlantic Right Whales in commercial fisheries.

- Since 2007, and expanded in 2014, a number of areas of predictable aggregations of right whales have been seasonally closed to fixed gear commercial fisheries. Cumulatively, over 6,300 square miles are closed to trap/pot fishing during 3 month closures each year, and over 28,000 square miles are closed to gillnetting in closures of 3 to 6 months.
- Since 1997, expanded in 2007, weak links have been required in fixed gear fisheries fishing to increase the likelihood that right whales can break free of buoy lines and gillnet panels.
- In 2007, floating line between trap/pots on the bottom of the ocean was comprehensively replaced by sinking line, removing thousands of miles of entangling line from the water column.
- Buoy line marking has been required since 2000 on most fixed gear buoy lines to improve our understanding of where and how right whales become entangled.

There are many other efforts underway between NMFS and our partners to recover right whales. For example, NMFS is actively collaborating with Canada on science and management gaps that are impeding the recovery of North Atlantic right whales in both Canadian and U.S. waters. We are also convening expert working groups to solicit individual input on our management and monitoring efforts. This expert elicitation will help NMFS determine best methods for assessing the health of individual right whales and effectively direct management and science resources towards the most important recovery activities. Additionally, NMFS continues to conduct high-quality scientific research on North Atlantic right whales in collaboration with our partners including, but not limited to, aerial and shipboard surveys of right whale distribution, acoustic monitoring of whale presence, health assessments, photo-identification of individuals, and oceanographic and ecosystem assessments.

All efforts are important to help better understand the threats and needed actions to recover North Atlantic right whales.

Summary

NMFS is working to protect this species on multiple fronts, with the goal of increasing the population abundance. Partnerships are critical to North Atlantic right whale recovery and there are many important efforts underway. The major actions recommended in the recovery plan for the North Atlantic right whale include reducing or eliminating injury and mortality caused by vessel collisions and fishing gear, protecting habitats essential to the survival and recovery of the species, and minimizing the effects of vessel disturbance. Through the work of NMFS and our partners, we have made significant progress toward reducing the impacts of these threats to right whales. However, based on the status of the population, additional efforts are needed and underway.

Photo Credit: NOAA Permit #20556, Florida Fish & Wildlife Conservation Commission

PARTNER in the SPOTLIGHT: North Atlantic Right Whale Consortium

The NARWC includes over 200 partners dedicated to conserving and recovering North Atlantic right whales. The NARWC's website is an important source of information on right whales and includes information on annual meetings, NARWC databases, and annual report cards (https://www.narwc.org/).

As stated previously, the NARWC includes over 200 partners dedicated to conserving and recovering North Atlantic right whales. Partners include those from research and conservation organizations, industries (e.g., shipping and fishing), U.S. and Canadian government agencies, as well as state and provincial authorities. The NARWC fosters data sharing by providing access to various data contributed by investigators— this effort is critical to furthering information on North Atlantic right whales. Annual meetings of the NARWC provide a unique opportunity to bring partners together to share management and scientific information across the species' range. Partnerships represented by those in the NARWC are critical to North Atlantic right whale recovery; for this reason, we are happy to acknowledge the important long-term contributions of the NARWC.

Photo Credit: NOAA Permit #594-1759, Florida Fish & Wildlife Conservation Commission



Photo Credit: Scott Benson, NMFS (above left, middle, and section cover), Brian Skerry, National Geographic Magazine (above right)

SPECIES *in the* SPOTLIGHT

Pacific Leatherback Sea Turtles

Photo Credit: Scott, Benson, NMFS

Pacific leatherbacks (*Dermochelys coriacea*) are one of the most endangered sea turtle species in the world. Pacific leatherbacks are composed of two separate nesting populations—the Eastern Pacific and the Western Pacific. The Eastern Pacific population nests mainly in Mexico and Costa Rica, with additional nesting in Nicaragua, and forages in the Eastern Pacific Ocean. The Western Pacific population nest in tropical and subtropical latitudes primarily in Indonesia, Papua New Guinea, and Solomon Islands, and a lesser extent in Vanuatu. This population forages throughout the Western Pacific and Southeast Asian region, and migrates across the Pacific Ocean to forage in the Central and East Pacific. Nesting beaches that have been monitored consistently over time indicate nesting is declining by more than 5 percent annually. In the Eastern Pacific, nesting beach trends are mixed; however, the nesting beach in Costa Rica, Las Baulas, which hosts the largest majority of nesting females in recent decades has declined since the late 1980s as much as 15 percent each year. There may be fewer than 2,500 reproductive females in the entire Pacific Ocean.

Recovery Progress

Since the launch of the Species in the Spotlight initiative, partnerships have advanced implementation of the five-year priority actions plan for the Pacific leatherback. The plan focuses on five key actions to improve conservation efforts: (1) reduce interactions in fisheries, (2) improve nesting beach protection and increase reproductive output through outreach and community support, (3) cooperate with international partners to implement conservation measures and established agreements, (4) understand migratory habitats and pelagic threats to better implement mitigation measures, and (5) raise awareness and education of actions the public can take to support leatherback turtle conservation.

Reduce Interactions in Fisheries

The United States is a party to two Regional Fisheries Management Organizations in the

Pacific— the Western Central Pacific Fisheries Commission (WCPFC) and the InterAmerican Tropical Tuna Convention (IATTC). While both Regional Fisheries Management Organizations have had sea turtle measures in place for the last decade, sea turtle bycatch has continued to be a significant cause of mortality for Pacific leatherbacks. Further, the IATTC measure does not require bycatch reduction measures in the long-line fleet and the WCPFC measure only applied to the shallow-set swordfish portion of the longline fleet (approximately 1 percent of vessels operating in the convention area). Through the U.S. leadership, the IATTC Bycatch Working Group has been reconstituted and is evaluating how to address leatherback bycatch in the eastern Pacific Ocean, and the WCPFC sea turtle measures have been amended to include all shallow-set longline fleets regardless of target species (approximately 20 percent of vessels operating in the convention area). Additional work is needed to expand these measures to deep-set longline fisheries.

Improve Nesting Beach Protection and Increase Reproductive Output through Outreach and Community Support

In the Eastern Pacific, the FWS, which is responsible for sea turtle recovery in terrestrial habitats, continues to support our partners' efforts in Mexico and Costa Rica to protect critical leatherback nesting beaches. This ensures that beach surveys and anti-poaching efforts continue, as every hatchling and nesting female is vital for the survival of these populations. In the Western Pacific, NMFS and FWS have continued to support community-based projects in Papua Barat and Buru, Indonesia to protect leatherback nesting beaches and prevent poaching. In Buru this past year, the local community has passed anti-poaching ordinances to ban the direct killing of nesting females and collection of their eggs. Further, FWS is supporting a project in the Solomon Islands to improve leatherback nesting conservation and develop

Pacific leatherback (*Dermochelys coriacea*)

Status: Endangered
Highlight: Fewer than 2,500 reproductive females in the entire Pacific Ocean.

Recovery Efforts

- Reduce Interactions in Fisheries — **Western Central Pacific Fisheries Commission now requires sea turtle conservation measures in shallow-set longline fleets regardless of target species**
- Improve Nesting Beach Protection and Increase Reproductive Output through Outreach and Community Support — **Buru, Indonesia, passed anti-poaching ordinances to ban the direct killing of nesting females and collection of their eggs.**
- Cooperate With International Partners to Implement Conservation Measures and Established Agreements — **Promoted sea turtle conservation measures throughout the Pacific through several international treaties**
- Understand Migratory and Pelagic Threats to Better Implement Mitigation Measures — **Continued to satellite tag and collect tissue samples to understand migration patterns and exposure to threats**
- Raise Awareness and Education of Actions the Public Can Take to Support Leatherback Turtle Conservation — **Local partners in Buru, Indonesia, held workshop to develop a multi-year action plan for leatherback conservation on the island.**

a conservation action plan with the local community.

Cooperate With International Partners to Implement Conservation Measures and Established Agreements

Partnerships are the cornerstone of our Pacific leatherback conservation efforts. The United States continues to work on a Memorandum of Understanding with the Government of Indonesia on leatherback conservation. Further, we have been actively engaged with many environmental NGOs around the Pacific. In the Western Pacific, we have worked closely with World Wildlife Fund (WWF) for Nature to understand take of sub-adult and adult animals in local villages and identify ways to monitor and reduce that take. In the Eastern Pacific, we worked with Red Laúd del Océano Pacífico Oriental to support their on the ground efforts to continue to protect vital nesting beaches, as well as document and address bycatch of leatherbacks in coastal and pelagic fisheries. Finally, throughout the Pacific, we have been promoting leatherback conservation measures in several of the international treaties that we are a member of, such as the Inter-American Convention for the Protection of Sea Turtles (IAC), the IATTC, and the WCPFC.

Understand Migratory and Pelagic Threats to Better Implement Mitigation Measures

NMFS Southwest Fisheries Science Center (SWFSC) sampled and tagged three leatherbacks with satellite-linked transmitters at foraging grounds located off the coast of central California during 2017–2018. Genetic analyses confirmed the turtles belonged to the Western Pacific breeding populations. The telemetry data provided information about movements across the Pacific by Western Pacific leatherbacks. Two tags were deployed in September 2017. Both turtles traveled in a southwest direction and eventually crossed the International Date Line as they proceeded towards known western Pacific nesting areas before transmissions ceased. One tag was deployed in September 2018. This turtle also travelled in a southwest direction from the deployment site but turned back toward the California Current after overwintering in the

Photo Credit: Scott Benson, NMFS

northeast equatorial Pacific. Transmissions ended approximately 650 miles WSW of the California coast. The turtle was expected to arrive in nearshore California waters by June/July 2019.

Leatherback tagging efforts have been identified as a critical source of information to reduce entanglement risk of this endangered species in fixed-gear fisheries that operate within key foraging areas within the species' ESA designated critical habitat along the U.S. west coast. Thus, the tagging and sampling techniques developed by NMFS SWFSC are proving to be essential for mitigating threats to this leatherback population, and future support of such telemetry and stock identification efforts will be essential for continued mitigation of threats to this still-declining population.

Genetic analysis of samples from the eastern Pacific, collected by partners in Chile and Peru, determined that while most of the leatherbacks interacting with artisanal driftnet fisheries and commercial longline fisheries originated from nesting populations in the eastern Pacific (Mexico and Costa Rica), some (about 13 percent) originated from the western Pacific. New genetic analysis completed in 2018–19 now allows a more precise assignment of individual bycaught turtles to nesting populations in Papua New Guinea, Solomon Islands and Papua, Indonesia. This work is ongoing and will inform threats assessments. The NMFS SWFSC and Pacific Islands Fisheries Science Center (PIFSC) are developing partnerships in the western Pacific to build in-country technical capacity to conduct future genetic analysis with standardized markers developed by the SWFSC.

NMFS PIFSC researchers trained local Indonesian WWF staff members on best practices and protocols to tag nesting leatherback sea turtles. During October 2018, the WWF team tagged two female leatherbacks on Buru nesting beaches with satellite-linked transmitters. Telemetry data showed that the two nesting females generally stayed in offshore coastal waters before returning to nest in the same area. Several subsequent nesting events by these two females may have occurred outside of the monitored beaches, indicating a need to expand the monitoring program on Buru Island. After nesting, both females migrated across the Banda Sea to the coastal waters of East Nusa Tengara. Tagging nesting females continues through the 2019 summer nesting season. Additionally, monitoring of direct leatherback take in the Kei islands was continued by WWF in partnership with the NMFS PIFSC and Regional Office. During the period of July – December 2018, the team documented 24 leatherback turtles caught in Kei Islands. Work is in progress to strengthen the monitoring program and create collaborations with the local villages to reduce the direct take of foraging leatherbacks off the Kei islands.

Raise Awareness and Education of Actions the Public Can Take to Support Leatherback Turtle Conservation

To galvanize governmental and community support for leatherback conservation initiatives, local partners held a Workshop of Sea Turtle Conservation on the island of Buru, Indonesia in 2018. The partners invited provincial level government agencies, local village elders, and community members to discuss issues that threaten wildlife conservation efforts on Buru Island. The workshop culminated in a multi-year action plan for leatherback conservation on the island. This plan included local and village government roles in encouraging protection activities at the regency to village levels. This plan also provided outreach activities throughout the four villages to support the cessation of illegal take and to reduce predation of eggs through the formation of a Community Watch Group.

Other Recovery Progress

In addition to the substantial work NMFS and FWS have undertaken with our partners, we have also strengthened our internal multi-agency coordination on Pacific leatherback conservation. This included convening a planning meeting in May 2018 to discuss the highest priority projects to support the five key areas in the five-year priority actions plan for the Pacific leatherback.

Summary

Key accomplishments, to date, include strengthening sea turtle bycatch reduction measures through the WCPFC, working with NGO partners in Indonesia to monitor nesting activity, increasing hatchling production, reducing directed take of turtles and their eggs, and continuing to support long-term leatherback nesting beach conservation projects throughout the Western and Eastern Pacific. Efforts have also been continuing along the Central California Coast, where NMFS researchers have conducted aerial surveys to monitor density, distribution, and abundance, as well as satellite telemetry efforts to track at-sea movements of individual leatherbacks. These studies are important for understanding and mitigating risks, and assessing population trends.

Over the next few years, NMFS and FWS and their network of partners will continue to work together to address the five key areas in the five-year priority actions plan for the Pacific leatherback. By continuing to build strong partnership networks, we hope to reverse the decline of Pacific leatherbacks.

Photo Credit: Brian Skerry, National Geographic Magazine

PARTNER in the SPOTLIGHT: Red Laúd del Océano Pacifico Oriental

Eastern Pacific leatherback sea turtles range from the tip of Chile through the waters of the western United States and Canada. While principally nesting in Costa Rica and Mexico, they are found in the coastal and pelagic environments of all the countries of the Eastern Pacific. Given the precipitous decline in nesting over the past few decades, information collection, data sharing, and coordinated conservation action is critical to reverse this trend. Over the last decade, the Eastern Pacific Leatherback Network, or Red Laúd del Océano Pacífico Oriental (Laud OPO) in Spanish, has brought together scientists and conservation practitioners across the Eastern Pacific to compile and synthesize key nesting and fisheries bycatch data. The Laud OPO network initiated a regional bycatch assessment. Based on this information, Laud OPO has identified the most critical conservation actions to be taken. The actions that Laud OPO has identified have informed local and national governments. Further, representatives from the Laud OPO network have worked to educate international treaty organizations such as the IAC and the IATTC. Because of the perseverance of the members of Laud OPO, the IAC Parties have adopted a resolution on the Conservation of Eastern Pacific Leatherback turtle. From there, the IAC Secretariat and members of the Laud OPO network have worked together to provide critical information to the IATTC on the need for reducing Eastern Pacific leatherback fisheries bycatch.

Laud OPO has served as a critical link from local conservation groups to national and international organizations. Through the Laud OPO network, the tireless work of many scientists and conservationists to save Eastern Pacific leatherbacks is amplified to the larger international community.



Photo Credit: FWS (left, middle, right, and section cover)

SPECIES *in the* SPOTLIGHT

Sacramento River Winter-Run
Chinook Salmon ESU

Photo Credit: FWS

Chinook salmon (*Oncorhynchus tshawytscha*), commonly known as king salmon, are an iconic part of California's natural heritage and their recovery will help ensure the economic and recreational well-being of future generations. Endangered Sacramento River winter-run Chinook salmon are particularly important among California's salmon runs because they exhibit a life history strategy found nowhere else. These Chinook salmon are unique because they spawn during the summer months when air temperatures usually approach their warmest. As a result, winter-run Chinook salmon require stream reaches with cold-water sources to protect their incubating eggs from the warm ambient conditions.

Because of this need for cold water during the summer, winter-run Chinook salmon historically spawned only in rivers and creeks fed by cold water springs, such as the Little Sacramento, McCloud, and Pit Rivers, and Battle Creek.

The construction of Shasta and Keswick Dams eliminated access to the Little Sacramento, McCloud, and Pit Rivers, extirpating the winter-run Chinook salmon populations that spawned and reared there. The fish from these three different populations above Shasta Dam were forced to mix and spawn as one population downstream of Keswick Dam on the Sacramento River. Construction and operation of hydropower facilities in Battle Creek made the creek inhospitable to winter-run Chinook salmon, which resulted in extirpation of the population from that area.

Today, only the one population of winter-run Chinook salmon that spawns downstream of Keswick Dam exists. Over the last 10 years of available data (2009–2018), the population's abundance of spawning adults ranged from a low of 827 in 2011 to a high of 6,084 in 2013, with an average of 2,733. The earliest abundance data comes from the late 1960s when up to 117,000 winter-run Chinook salmon spawning adults were estimated. The population crashed in the 1970s and has persisted in large part due to managed cold-water releases from Shasta Reservoir from the spring through the fall, and artificial propagation from Livingston Stone National

Fish Hatchery's winter-run Chinook salmon conservation program. Thus, winter-run Chinook salmon are dependent on sufficient cold water storage in Shasta Reservoir, and it has long been recognized that a prolonged drought could have devastating impacts, possibly leading to the species' extinction.

Recovery Progress

Since the launch of the Species in the Spotlight initiative, there has been substantial progress on winter-run Chinook salmon recovery efforts, including advancement of each of the five key actions in the five-year priority actions plan: (1) improve management of Shasta Reservoir cold-water storage, (2) restore Battle Creek and reintroduce winter-run Chinook salmon, (3) reintroduce winter-run Chinook salmon into McCloud River, (4) improve Yolo Bypass fish habitat and passage, and (5) manage winter and early spring Sacramento-San Joaquin River Delta conditions to improve juvenile survival.

Improve Management of Shasta Reservoir Cold-water Storage

The NMFS SWFSC has made substantial progress on water temperature modeling and biological models over the past three years. This includes a physical model of Shasta Reservoir that has been coupled with a Sacramento River model. Together, these models can provide seasonal forecasts of water temperature in the Sacramento River and the associated impacts on cold-water storage in Shasta Reservoir.

The NMFS SWFSC also developed a novel egg mortality model to discern how water temperatures are expected to affect Chinook salmon egg survival. This model of temperature-dependent mortality for Chinook salmon embryos is different from previous models in that thermal tolerance parameters were estimated using observed field egg-to-fry survival data, rather than assuming thermal tolerance parameters measured

Chinook Salmon (*Oncorhynchus tshawytscha*)

Status: Endangered
Highlight: On average, 2,733 adults return to spawn annually

Recovery Efforts

- Improve Management of Shasta Reservoir Cold-water Storage — **Progressed substantially on water temperature and biological modeling to improve seasonal forecasts and cold-water storage management**
- Restore Battle Creek and Reintroduce Winter-Run Chinook Salmon — **Reintroduced approximately 380,000 salmon into Battle Creek**
- Reintroduce Winter-Run Chinook Salmon into McCloud River—**California has made considerable progress in designing and constructing various components of the juvenile salmon collection system for Shasta Reservoir.**
- Improve Yolo Bypass Fish Habitat and Passage — **The Wallace Weir Fish Rescue Project was completed, preventing adult salmon from straying into agricultural ditches and allowing them to be rescued from the Yolo Bypass so they can be returned to the Sacramento River**
- Manage Winter and Early Spring Delta Conditions to Improve Juvenile Survival — **Acoustically tagged winter-run Chinook salmon juveniles in winter and spring of 2016 and 2017, providing real-time fish distribution information to help managers make more protective water management decisions**

in laboratory studies. NMFS found strong evidence that significant thermal mortality occurred during the egg stage in some years due to a ~5°F reduction in thermal tolerance in the field compared to laboratory studies. Using the new egg mortality model coupled with the reservoir and river temperature models to guide management contributed to improved survival following the historic drought from 2012 through 2016.

Coming off that drought, in addition to using the new egg mortality model, the U.S. Bureau of Reclamation (BOR) implemented a pilot temperature project to target cooler water temperatures closer to where the winter-run spawned in 2016, 2017, and 2018, resulting in estimated egg-to-fry survival of 24 percent, 44 percent, and 26 percent, respectively. The long-term (2002–2018) average survival is 24 percent, with lows of approximately 6 percent and 4 percent egg-to-fry survival experienced in 2014 and 2015, respectively. The 44 percent egg-to-fry survival in 2017 was second highest since 2002 (the highest egg-to-fry survival since 2002 was 49 percent in 2011), resulting from an abundant water resource in one of the wettest water years on record.

Restore Battle Creek and Reintroduce Winter-Run Chinook Salmon

In March 2018, winter-run Chinook salmon were reintroduced into Battle Creek, initiating a long-term effort to establish another population of winter-run Chinook salmon. To jump start the reintroduction effort, approximately 200,000 hatchery-reared winter-run Chinook salmon were released into newly restored habitat in the North Fork of Battle Creek. The reestablishment of fish in this waterway occurred sooner than expected due the availability of fish from the Livingston Stone National Fish Hatchery winter-run captive broodstock program. Each year approximately 1,000 fish are retained in the hatchery and raised to adults for breeding. Fortunately, in 2017 there were enough spawning adults in the river so the captive broodstock at the hatchery was not required to sustain the population. Resource managers from the Battle Creek Salmon and Steelhead Restoration Program, composed of the CDFW, the FWS, BOR, NMFS, and the Pacific Gas and

Photo Credit: FWS

Photo Credit: FWS

Electric Company saw the extra broodstock as an exceptional opportunity to expand the current range of the fish and help in its recovery. All of the juvenile salmon are tagged and fin clipped prior to release, allowing resource managers to track their survival, owth and ocean distribution, as well as to detect them when they return to Battle Creek.

In March 2019, the reintroduction "jump-start" was repeated when approximately 180,000 more winter-run Chinook salmon from the hatchery were released into Battle Creek.

The successful release of these fish in 2018 and 2019 was the culmination of many years of planning and cooperation in rearing the fish and in restoring their habitat. This is a significant milestone toward the recovery of endangered Sacramento River winter-run Chinook salmon.

Reintroduce Winter-Run Chinook Salmon into McCloud River

In 2018, BOR awarded the California Department of Water Resources (CDWR) $2.7 million as the first installment of a 5-year contract totaling approximately $9 million for the design, construction, installation, and operation of two juvenile fish collection devices in the lower McCloud River and the McCloud arm of Shasta Reservoir. Under this contract, CDWR has made considerable progress in designing and constructing various components of the juvenile collection system—specifically guidance nets, debris booms, and a thermal curtain. The components are ready for deployment, pending completion on environmental compliance documents.

Improve Yolo Bypass Fish Habitat and Passage

Two more milestones for improving Yolo Bypass fish habitat and passage were reached in 2017 and 2018. The Wallace Weir Fish Rescue Project was completed in 2017 and is operational. The project was championed by Sacramento Valley farmers (BOR District 108) in partnership with The Sacramento River Salmon Recovery Program and state and federal support. The project prevents adult winter-run Chinook salmon from straying into Colusa Basin agricultural ditches and allows

Photo Credit: FWS

them to be rescued from the Yolo Bypass so they can be returned to the Sacramento River. The project includes replacing a seasonal earthen dam at Wallace Weir with a permanent, operable structure that would provide year-round operational control, and constructing a fish rescue facility.

In 2019, the Fremont Weir adult fish ladder was completed and became operational, providing a vital fish passage route for adult winter-run Chinook salmon migrating up the Yolo Bypass to return to the Sacramento River where they can reach their spawning habitat.

Manage Winter and Early Spring Delta Conditions to Improve Juvenile Survival

The Collaborative Adaptive Management Team Salmon Scoping Team Gap Analysis Report was completed in January 2017. This report provides research direction by identifying gaps in the current understanding of water project-linked effects on juvenile salmonid survival in the south Sacramento-Joaquin River Delta.

The Interagency Ecological Program comprised of seven agency directors requested a multi-agency technical team develop a focused framework for winter-run salmon monitoring. A report was completed in July 2016, and several of the recommendations for improved data generation and reporting have been implemented since 2017.

CDWR and BOR are designing a bio-acoustic fish fence at the Georgiana Slough-Sacramento River junction to guide juvenile winter-run away from relatively high mortality in the central Delta. The design is almost complete, and CDWR anticipates installation in early 2021.

The NMFS SWFSC completed a winter-run life cycle model that can evaluate how climate change and different water project operations

and management actions (harvest, habitat restoration), influence the long-term viability of winter-run Chinook salmon. It has been applied in the development of a biological opinion on California Water Fix, a science-driven upgrade to California's aging water system. Improvements to the enhanced particle-tracking model for the Delta component of the life cycle model were made in 2016 and continue to be refined. NMFS is also using the model in the biological opinion on the reinitiation of consultation on the long-term operation of the California State and Federal water projects.

Acoustically tagged winter-run Chinook salmon juveniles were tracked in winter and spring of 2016 and 2017. The tagged salmon provide real-time fish distribution information to help managers determine the survival of the juveniles from their release location in Redding through Chipps Island in the western Delta. This study has revealed that juvenile winter-run Chinook have much higher survival rates during high flow conditions that occur during wet winters.

Other Recovery Progress

The NMFS SWFSC in collaboration with the Metropolitan Water District of Southern California, the University of California at Davis, and the Lawrence Livermore National Laboratory found that 44–65 percent of surviving adult winter-run Chinook salmon reared in non-natal habitats as juveniles. Most of these non-natal habitats were not previously known to be important for winter-run Chinook salmon recovery.

The NMFS SWFSC has also developed a new model for forecasting the ocean abundance of winter-run Chinook salmon. The ocean abundance forecast is a function of adult returns to the river in previous years and river temperatures experienced by eggs, and is used by the Pacific Fishery Management Council to design commercial and recreational fishery seasons that maintain impacts on winter-run Chinook below limits specified in the Biological Opinion on those fisheries. Fishery management will now reduce impacts during droughts, whereas the older system did not provide protections until after reduced egg survival due to drought was apparent in adult population declines.

Summary

The 2015 launch of the Species in the Spotlight initiative for winter-run Chinook salmon came during the worst drought on record in California. California experienced well below average precipitation from 2012 through 2015, record high surface air temperatures in 2014 and 2015, and record low snowpack in 2015. The four-year period between fall 2011 and fall 2015 was the driest since record keeping began in 1895 and some paleoclimate reconstructions suggest that this recent drought was the most extreme in the past 500 or perhaps more than 1,000 years. Not surprisingly, for a species dependent on ample cold water, the 2014 and 2015 year classes were nearly wiped out due to high water temperatures and the overall viability of winter-run Chinook salmon decreased during the drought. However, the impact could have been worse if not for major efforts to protect winter-run Chinook salmon. In particular, water temperature management supported by strong science from the NMFS SWFSC greatly increased egg-to-fry survival in 2016. Additionally, hatchery production from Livingston Stone National Fish Hatchery was increased during the drought to buffer against low adult returns resulting from poor survival of the 2014 and 2015 year classes. This buffering was successful, and adult escapement through 2018 met the low extinction risk criterion for abundance. However, while winter-run Chinook salmon abundance was bolstered with increased hatchery production, the population's diversity was subsequently diminished by the additional influence of hatchery-origin fish spawning in the wild.

Substantial progress to protect winter-run Chinook salmon has been made over the last few years, and despite the historic drought's impacts on the population, there are reasons for hope. First, the adverse conditions for winter-run Chinook salmon caused by the drought ended with an extremely wet 2016/2017 winter, which contributed to improved spawning success and juvenile survival. The wet 2018/2019 winter also bodes well for winter-run Chinook salmon— a snow survey in April 2019 revealed a snowpack at 162 percent of the long-term average, thanks to more than 30 atmospheric river storms that swept across the state over the winter. This wet pattern continued into the spring and as of June 2019 the amount of snow blanketing the Sierra Nevada is 202 percent of average, even larger than the 2017 snowpack that pulled California out of a five-year drought. Second, a positive outcome of having just experienced the drought, is that science, modeling, and decision making improvements have better prepared Shasta Reservoir water temperature managers for protecting winter-run Chinook salmon through the next drought. Third, benefits of restoring Battle Creek and the Yolo Bypass will soon be realized, and both have the potential to greatly move the needle towards winter-run Chinook salmon recovery. Lastly, an accelerated pace of restoration in the Sacramento River continues due to significant partnerships among the Northern California Water Association, TNC, Cal-Trout, American Rivers, and state and federal agencies.

Photo Credit: FWS

PARTNER in the SPOTLIGHT: Randi Field, BOR

Photo Credit: Bureau of Reclamation

Randi Field with the BOR's MidPacific Region is responsible for operation of the largest reservoir in California— Shasta reservoir. Shasta reservoir stores up to 4.5 million acre feet of water that meets critical water supply needs for farms and cities, and must maintain key conditions for drinking water quality and fish protection throughout California. Winter-run Chinook salmon eggs and emergent fry are vulnerable to summer heat. They persist because of the careful operations of the limited cold-water pool deep in Shasta Reservoir. Improved management of Shasta Reservoir Coldwater Storage is a key action in the five-year priority actions plan. With Randi in the lead, BOR successfully completed two "operational study" years in 2017 and 2018, demonstrating management to a new temperature regime with positive results on egg and fry survival.

Furthermore, in an extraordinary commitment to survival of this endangered species, Randi took swift action as the uncontained Summer 2018 Carr fire swept towards and burned over the Sacramento River—in the location of vulnerable salmon redds. As BOR staff scrambled to protect Shasta Reservoir infrastructure and ensure safety of employees, Randi quickly and expertly gave instructions on temperature control operations that could be locked in place as the facilities were evacuated. Thanks to her expertise and quick action, suitable temperatures in the river for salmon were maintained, while the fire continued to advance in an uncontained state, before it was eventually controlled.



Photo Credit: NMFS Permit #19091 (above left and section cover), Soundwatch NMFS Permit #21114 (above middle), Lynne Barre, NMFS (above right)

SPECIES *in the* SPOTLIGHT

Southern Resident Killer Whale

A Southern Resident killer whale capturing a salmon in September 2018. Image collected by scientists from SeaLife Response, Rehabilitation and Research (SR3) and NMFS SWFSC, during research with an unmanned drone flying >100ft under NMFS research permit #19091.

Southern Resident killer whales (*Orcinus orca*) are one of the most endangered whales with only 74 whales in the population at the end of 2018, the fewest since the mid-1980s. The continued population decline highlight their challenges with survival and reproduction and the population's risk of extinction. The killer whales caught the world's attention in the summer of 2018, with the media and public following the story of J35, also known as Tahlequah, an adult female who gave birth to a calf that died immediately. The world watched with a heavy heart as J35 carried her dead calf for more than two weeks. Sharing the spotlight was J50, an ailing three-year-old calf also known as Scarlet. NMFS and partners initiated an emergency response to provide remote medical treatment to J50, but she eventually disappeared after declining dramatically in body condition. No other calves that were born in 2017 or 2018 survived and the population lost two individuals in each of 2017 and 2018.

Recovery Progress

Since the launch of the Species in the Spotlight initiative, there has been substantial progress on the five key actions in the five-year priority actions plan for the Southern Resident killer whale: (1) protect killer whales from harmful vessel impacts through enforcement, education, and evaluation, (2) target recovery of critical prey, (3) protect important habitat areas from anthropogenic threats, (4) improve our knowledge of Southern Resident killer whale health to advance recovery, and (5) raise awareness about the recovery needs of Southern Resident killer whales and inspire stewardship through outreach and education.

Protect Killer Whales from Harmful Vessel Impacts through Enforcement, Education, and Evaluation

The response to J50 and J35 helped get messages to boaters to give more space to the whales, particularly the most vulnerable

individuals. Ongoing efforts to protect the whales from harmful vessel impacts through enforcement, education, and evaluation incorporated new information and expanded actions. Research results from NMFS Northwest Fisheries Science Center digital acoustic tagging (Dtag) project provide a window into the underwater diving and foraging behavior of the whales and how they are impacted by vessels at different speeds and distances. In 2018, the Dtag project took on a new element, with eight successful tag deployments to explore the whales' behavior at night in collaboration with Canada Department of Fisheries and Oceans' study of Northern Resident killer whales.

In 2017, we completed a review of federal vessel regulations established in 2011 and have been working with partners to implement recommendations from the review to foster better compliance with the regulations and Be Whale Wise guidelines. New initiatives such as whale warning flags, expansion of the voluntary no-boat zone in partnership with Washington Department of Fish and Wildlife (WDFW), the Pacific Whale Watch Association, and San Juan County, and encouraging boaters to turn echosounders off when safe to do so went into effect in 2018. Increased capacity for vessel research and boater education through National Fish and Wildlife Foundation (NFWF) grants and support for additional enforcement through the Washington Task Force (see the following Partner in the Spotlight story), are also helping protect the whales during busy summer boating seasons. To address impacts from larger ships, NMFS serves on advisory and technical working groups for a transboundary, industry-led program, called ECHO (Enhancing Cetacean Habitat and Observations) working to understand and manage the impacts of shipping activities. In 2017 and 2018, ECHO spearheaded voluntary slow-down and displacement trials for ships to reduce noise near key foraging areas.

Southern Resident killer whales (*Orcinus orca*)

Status: Endangered
Highlight: 74 whales in the population at the end of 2018

Recovery Efforts

- Protect Killer Whales from Harmful Vessel Impacts through Enforcement, Education, and Evaluation — **Completed a review of federal vessel regulations and worked with partners to implement recommendations from the review**
- Target Recovery of Critical Prey — **Completed an assessment of Chinook salmon stocks that the whales depend on for growth and reproduction to inform salmon management**
- Protect Important Habitat Areas from Anthropogenic Threats — **Proposed expansion of designated critical habitat to include coastal waters.**
- Improve Our Knowledge of Southern Resident Killer Whale Health to Advance Recovery — **Developed metrics to assess trends in body condition, growth, and pregnancy and embarked on a new partnership to sequence the full genomes of 101 whales.**
- Raise Awareness About the Recovery Needs of Southern Resident Killer Whales and Inspire Stewardship through Outreach and education — **Worked with Killer Whale Tales and others to expand education program: in two years, Killer Whale Tales reached over 16,000 students at 263 schools and events**

Target Recovery of Critical Prey

Sufficient salmon prey is essential to recover the Southern Resident population. Knowing where and when the whales are most food-limited and which salmon stocks they eat and overlap with throughout their range helps target recovery of salmon stocks that will most benefit the whales. In 2018, NMFS and WDFW, with input from tribal organizations, NGOs, and Canada's Department of Fisheries and Oceans took a major step forward in understanding the whales' prey needs by completing an assessment of priority Chinook salmon stocks to inform salmon management and conservation actions. Information collected by NMFS on the whales' diet and distribution, as well as the distribution of salmon stocks, was essential for this analysis. A NFWF workshop advanced a final prey report, which is helping prioritize funding decisions and actions across a range of activities, such as hatchery adjustments and habitat restoration to support Chinook from high priority runs. NMFS works on these and other salmon regulatory and recovery actions related to hydropower passage, harvest management, and predation of ESA-listed salmon to support recovery and ensure sufficient prey for the Southern Residents (see inset box).

In 2017 and 2018, the NFWF Killer Whale Research and Conservation Program funded several Chinook salmon habitat improvement projects, while also investing in tools to advance our knowledge of the whales' diet, coastal occurrence, and nutritional status. The prey priority report informed selection of NFWF grants in 2018 and was highlighted in the PCSRF request for proposals to prioritize Species in the Spotlight (salmon and whales). In 2019, NMFS will coordinate with the Governor's Task Force on its recommendations and will continue to collaborate as new salmon initiatives are implemented through existing partnerships up and down the West Coast. We will also work with the Pacific Fishery Management Council as well as state and tribal co-managers to incorporate information on the whales' body condition, population status, distribution and diet to evaluate risks from coastal and inland

Photo Credit: Brad Hanson NMFS

Examples of conservation and management actions to support salmon recovery that have multi-species benefits and are increasing prey for the whales.

• Habitat: NMFS is working with partners in the Skagit Watershed to advance restoration actions that have the highest potential to increase Chinook smolt capacity of the system and provide flood risk reduction while minimizing impacts to agriculture. Monitoring results from 2017–2018 at the Fir Island Farm Estuary Restoration Project, which was completed in 2016 in partnership with WDFW, showed that the 131-acre project can now support an additional 64,400 Northern Puget Sound Chinook smolts. NMFS also worked with the COE to advance fish passage at Howard Hanson Dam east of Tacoma. The addition of downstream fish passage will allow the ESA-listed fish to access over 100 miles of additional habitat above the dam that will support spawning and rearing of Puget Sound Chinook salmon and steelhead prey for the whales and sustain tribal, recreational, and commercial fisheries.

• Hatcheries: NMFS is currently working to review Hatchery and Genetic Management Plans in Puget Sound that reflect increased hatchery production to serve as prey for Southern Resident Killer Whales. These efforts require coordination with Tribal and state co-managers to ensure plans will not interfere with recovery of ESA-listed salmon.

• Harvest: In 2018, Canada and the United States reached a new 10-year agreement under the terms of the Pacific Salmon Treaty. The agreement includes harvest reductions for Chinook fisheries in both countries that will help protect a variety of stocks that are important to the whales while providing sustainable harvest opportunities for First Nations, Indian Tribes, and commercial and recreational fishers.

• Hydropower: In the Columbia River basin NMFS approved "Flexible Spill" operations for eight lower Snake and lower Columbia River dams, which have the potential to reduce hypothesized latent mortality effects, improve juvenile survival, and increase adult abundance of multiple runs of Chinook salmon available to the whales.

salmon fisheries and inform development of management tools and conservation measures.

Protect Important Habitat Areas from Anthropogenic Threats

Currently, critical habitat for the whales is designated only in the core summer range in the Salish Sea. However, the whales spend most of the winter and a substantial portion of all seasons in outer coastal waters traveling, foraging, and socializing from Monterey, California, to Southeast Alaska. Over the last two years, NMFS pulled research results together from satellite tags, acoustic recorders, sightings, and sampling to inform a revision of critical habitat to protect coastal waters. A proposal for new critical habitat areas (in addition to the existing critical habitat in inland waters of Washington) is due out for public comment in 2019. Understanding how the whales are using their coastal range helps us understand patterns in response to changing environmental conditions and protect important habitat areas from anthropogenic threats.

Improve Our Knowledge of Southern Resident Killer Whale Health to Advance Recovery

Drone images collected by NMFS SWFSC, Sealife Response, Rehabilitation and Research, and Vancouver Aquarium are bringing new insights to our knowledge of Southern Resident killer whale nutritional health, which will advance recovery.

Photo Credit: NMFS

Successful field seasons in 2017 and 2018, with NFWF support, helped build a data set that now spans a decade. NMFS and our partners have analyzed new metrics, such as measurements of fat deposits around the head, to evaluate seasonal and annual trends in body condition, growth, and pregnancy. Declines in body condition for a number of individuals over time, particularly in J pod, have correlated with mortalities and abundance trends. Several pregnancies were detected through photogrammetry in 2017 and 2018, and while no new calves survived in 2018, there is hope that reproductive success will improve.

Researchers are currently developing models to formally relate body condition to population dynamics and examine trends in relation to environmental variables, such as Chinook salmon abundance, to inform salmon conservation and management. Non-invasive photogrammetric assessment of body condition has become a powerful tool to monitor the nutritional health of the whales and inform new risk assessment methods and adaptive management frameworks to evaluate the effects of actions that can change the prey available to the whales.

Ongoing research on the health of all the whales has provided baseline information for comparison with compromised individuals and other killer whale populations. NMFS researchers are investigating the medical condition of individual whales, including the presence of pathogens and parasites and unraveling the complex microbiomes (bacteria, fungi, and viruses) on the skin and in respiratory and digestive tracts to better understand the role disease may be playing in reproductive success and survivorship.

NMFS, TNC, and BGI, a leader in genomics research, embarked on a new partnership in 2018 to sequence the full genomes of 101 killer whales. Cutting-edge genetic technology will provide information on the degree to which inbreeding affects the health, growth and survival of individual whales. Samples from free-swimming whales and stranding investigations inform us about the natural threats the whales face in their environment and how human activities may contribute to the poor survival and reproduction seen for the Southern Residents in recent years.

Raise Awareness About the Recovery Needs of Southern Resident Killer Whales and Inspire Stewardship through Outreach and Education

Public awareness of the status of the whales and the threats they face is essential to the conservation of at-risk species. The Species in the Spotlight initiative has created a new campaign to spread messages about the whales through social media, videos, and web pages. Even more importantly, we are developing partnerships that raise awareness about the whales and support conservation with new audiences. Many partners inspire stewardship of the whales and their habitats by educating concerned citizens about actions they can take to help recover the whales.

NMFS has long-standing partnerships with education and outreach experts at institutions in the region, such as The Whale Museum and Seattle Aquarium. In 2017 and 2018, new opportunities and partnerships have helped expand the reach of several education programs. Reaching students and their families is an important way to ensure Southern Residents will have stewards into the future. NMFS worked with the Seattle Aquarium and Killer Whale Tales, a classroom program inspiring students and their families to take an active role in conservation, to update colorful and educational trading cards. Kids were especially interested in collecting the J35 and J50 cards, as well as their J pod families and other favorite whales in the population. Killer Whale Tales distributed trading cards full of whale facts and conservation messages, which were a powerful incentive to complete homework assignments, helping students and families reduce their environmental footprints. In 2017 and 2018, Killer Whale Tales reached over 16,000 students at 263 schools and events. In 2017, a NOAA Hollings Ocean Awareness grant supported land-based viewing at Whale Trail sites throughout the Southern Residents' range to engage the public and support broad conservation.

Other Recovery Progress

Local, state, federal, and international partners continued to support recovery in 2017 and 2018, implementing actions from NMFS 2008 Southern Resident killer whale recovery plan, our Species in the Spotlight five-year priority actions plan, the Washington Executive Order (see the following Partner in the Spotlight story), and Canada's Oceans Protection Plan. These plans are complementary, coordinated, and cover a broad suite of actions addressing the key known threats and increasing our scientific knowledge. The new Governor's Task Force drew on these existing plans for Southern Residents, NMFS ESA recovery plans for salmon, and Puget Sound clean-up efforts to guide development of recommendations to support recovery. In addition to planning for the future, over the last two years we have made progress on developing new partnerships, building external funding resources, and implementing a variety of ongoing research and conservation activities.

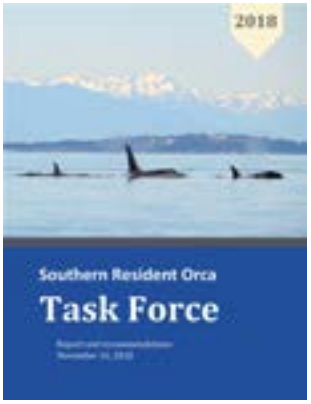
Summary

Over the past two years, we have continued to improve our understanding of and ability to protect this unique population. Despite the

work of our scientists and regional partners to make progress on the key actions identified in the Southern Resident killer whale five-year priority actions plan, the population has not grown and in fact has declined in abundance since it was first listed under the ESA. We clearly still have important work to do locally, with our federal capabilities, and working internationally to bring Southern Resident killer whales back from the brink of extinction. With new public awareness from last summer's events and through new efforts by the Governor's Task Force and in Canada, there is strong positive momentum to identify resources, make commitments, and follow through on strong actions that will benefit the whales and their prey and benefit the ecosystem.

Photo Credit: Lynne Barre, NMFS

PARTNER in the SPOTLIGHT: Washington State Southern Resident Killer Whale Task Force



In 2018, Governor Jay Inslee emerged as a leader bringing state authorities, significant investments, and new members of the community to the ongoing fight to recover the iconic Southern Resident killer whales. He signed an Executive Order directing state agencies to take immediate actions to benefit Southern Residents and setting up a Task Force that developed recommendations for additional short- and long-term actions. This Task Force process highlighted the urgency for action, raised awareness, brought diverse stakeholders together, and resulted in a new commitment from Washington State as a leading partner in recovery of the Southern Residents. This unprecedented step recognized the whales' endangered status, declining population trend, and risk of extinction from three primary threats— insufficient prey, high levels of contaminants, and disturbance from vessels and sound- which landed them as a Species in the Spotlight in 2015.

The Task Force brought together key partners in Washington, including co-chairs Stephanie Solien and Les Purce and nearly 50 members representing a wide range of sectors from state agencies; the state legislature; tribal, federal, and local governments; the whale watching industry; and non-profit organizations to provide expertise and variety of perspectives. Three technical working groups were appointed to focus on each of the main threats. The working groups reviewed existing scientific information and provided initial suggestions and evaluations of recommendations that then went to the Task Force for consideration and discussion. They drew on existing plans for Southern Residents, as well as plans for salmon recovery and Puget Sound restoration efforts, to guide development of recommended action steps to support recovery. NMFS participated on the Task Force and the working groups to provide our latest research, technical expertise, and experience from over a decade of implementation of our ESA Recovery Plan for Southern Residents. The Task Force also heard from many members of the public who attended the six Task Force meetings and provided thousands of comments.

The Task Force submitted a report to the Governor including 36 recommendations spanning regulatory, voluntary, enforcement, research, and outreach activities, many of which required specific legislation and funding to implement in Washington. The report acknowledged NMFS and other federal agencies actions to identify where the state can complement such actions. The Governor's office then moved forward in identifying specific actions to implement and asked for unprecedented state investment to support recovery efforts.His operating, capital, and transportation budgets requested for 2019–2021 included a combined $1.1 billion in investments to help Southern Residents and complement ongoing federal, state and local efforts to recover salmon. In 2019 the legislative and budget process, as well as the second year of the Task Force, will unfold providing new opportunities for partnerships and actions. Governor Inslee, the Task Force chairs and members, working groups, and public participants all deserve recognition for shining a brighter and bolder spotlight on Southern Resident killer whales, aggressively championing their cause, and engaging residents in opportunities to contribute to the whales' recovery.



Photo Credit: Kevin Stolzenbach (left), Kristin Aquilino, Bodega Marine Laboritory (above middle and right), David Witting, NOAA RC (section cover)

SPECIES *in the* SPOTLIGHT

White Abalone

Photo Credit: Cabrillo Marine Aquarium

White abalone (*Haliotis sorenseni*) are herbivorous marine snails that historically occupied subtidal rocky reef habitats from Point Conception, California to Central Baja California, Mexico, and the offshore islands and banks. White abalone are thought to help sustain the health and diversity of kelp forest ecosystems through competition for food and space with species like urchins and brittle stars that can decimate kelp forests when ecosystems are imbalanced. Sexes are separate, and gametes are released freely into the ambient sea water during reproduction. Males and females must be in close proximity for successful fertilization to occur and recruitment events are likely episodic. White abalone are estimated to live a minimum of 30 years.

White abalone supported a brief but intense and profitable commercial fishery in southern California during the 1970s. The state fishery historically was managed using size limits and seasons, which did not account for density-dependent reproduction and assumed regular successful recruitment. A combination of factors, most notably overfishing, reduced numbers of this bottom-dwelling species to very low levels, resulting in a fragmented population. Results from remotely operated vehicle (ROV) surveys and population viability analyses suggested that the remaining individuals were too far from potential mates to reproduce successfully in the wild. The fishery closure in 1997 has not reversed this status. In 2001, white abalone was the first marine invertebrate to be listed as endangered under the ESA, a protective step that managers hoped would help white abalone to recover.

Monitoring of wild white abalone has confirmed that populations continue to decline in some areas, and the wild population is at high risk of extinction. Even if limited natural recruitment of

white abalone is occurring, it is happening too slowly to give the species the foothold it needs to weather future threats and be viable over the long-term. The best way to safeguard white abalone against extinction is a captive breeding program aiming to produce young abalone that would be placed in kelp forests (outplanting) to increase abundance and reproductive success of white abalone in the wild. These animals reared in captivity can enhance wild populations to the point that densities are boosted enough to sustain healthy and prolific populations. As the captive breeding program proceeds, continued monitoring of white abalone and their habitat must occur in order to identify habitats best suited for future enhancement efforts and to track species' status over time.

Restoring white abalone to subtidal rocky reefs will help ensure a resilient kelp forest ecosystem (one of the most diverse marine ecosystems on earth), allow a culturally iconic species to persist, and hopefully revive a once-thriving commercial and recreational fishery.

Recovery Progress

Since the launch of the Species in the Spotlight initiative, we have worked with many partners to make substantial progress on the five key actions in the five-year priority actions plan for the white abalone: (1) expand existing captive propagation programs, (2) implement a successful outplanting program, (3) monitor and enhance white abalone populations in the wild, (4) identify, characterize, and prioritize existing and potential white abalone kelp forest habitat, and (5) develop a comprehensive, multi-institution outreach plan. Because each of these key actions is intricately linked, we report on progress across all actions in the following narrative.

NMFS recovery strategy for white abalone includes a captive breeding program to enhance wild populations in strategic locations in Southern California and Mexico (the historic range of the species). NMFS West Coast Region oversees the program in close coordination with the University

White abalone (***Haliotis sorenseni***)

Status: Endangered
Highlight: Dependent on Captive Breeding Program

Recovery Efforts

- Expand existing captive propagation programs — **Increased captive production by several orders of magnitude: from thousands to millions over the last two years**
- Implement a successful outplanting program — **Increased knowledge of where to outplant abalone in the wild and pilot outplanting program scheduled for late 2019**
- Monitor and enhance white abalone populations in the wild — **NMFS, with partners, are developing methods to track abalone populations over time**
- Identify, characterize, and prioritize existing and potential white abalone kelp forest habitat — **Identified key habitat features such as kelp resilience and algal composition**
- Develop a comprehensive, multi-institution outreach plan — **Established a NMFS Communications Team White Abalone Outreach Campaign, which has helped highlight our program**

of California Davis Bodega Marine Laboratory and in partnership with a growing list of partners including: the University of California Santa Barbara, The Cultured Abalone, the Santa Barbara Natural History Museum Sea Center, the Cabrillo Marine Aquarium, The Bay Foundation, the Long Beach Aquarium of the Pacific, the NMFS SWFSC, the CDFW, and the Moss Landing Marine Laboratory. The partners are making great strides in understanding factors that are important for successful reproduction of adults and survival of young abalone. For example, laboratory studies are determining optimal light cycles and diet for adults; determining optimal settlement and rearing conditions for young juveniles; examining factors that reduce disease risk; and determining whether genetic background influences survival. As a result of these important studies, and a 2016 ESA permit to identify and collect eligible new broodstock from the wild, production has increased by several orders of magnitude: from thousands to millions over the last two years. New genes from recently collected wild broodstock have boosted the genetic diversity of the captive population, which we hope will promote the overall health and resilience of captive-bred abalone upon their return to the wild during experimental outplanting efforts.

In addition to producing many healthy white abalone in captivity, a successful enhancement program depends on understanding the factors that influence the survival of outplanted animals in the wild. ROVs, divers using self-contained underwater breathing apparatuses (SCUBA), and closed-circuit rebreathers, time-lapse cameras (TLCs), and environmental data loggers are complimentary data gathering methods that help identify the best habitats for enhancement activities throughout the Southern California Bight, including Baja California, Mexico. NMFS oversees this program in close partnership with CDFW and several other partners including: the Aquarium of the Pacific; The Bay Foundation; Paua Marine Research Group; Subaqua Imaging/ Pisces Design; Centro de Investigación Científica

Photo Credit: Mike Ready NWFSC

y de Educación Superior de Ensenada; Baja California, and Comunidad y Biodiversidad. Partners are honing in on important habitat features to consider when selecting outplanting sites. These features include kelp resilience, algal composition, ocean temperature, sea floor substrate type and relief, the presence of remnant wild white abalone populations, and predator abundance. Several devices for delivering and acclimating captive abalone to their new homes in the wild (i.e., outplant modules) are being tested to see which confer a survival advantage. Experimental sites and promising module designs were selected for outplanting red and green abalone by NMFS, CDFW, Get Inspired, Paua Marine Research Group, and the Bay Foundation. In the meantime, an ESA permit that paves the way for white abalone outplanting will be issued in 2019.

In anticipation of the day when the outplanted white abalone grow and thrive, in some cases alongside the few remnant wild adults, NMFS and partners are developing methods to track the demographics of populations over time. TLCs can monitor the movements and behavior of outplanted abalone continuously over areas < 5m2 in the days and weeks following release. SCUBA surveys can monitor larger areas (100s of m2), in water depths up to ~ 90 ft. that have dense kelp. SCUBA surveys are effective for observing small, cryptic abalone in the days, weeks, months, and years following outplanting and can generate estimates of density on a per meter-squared basis. ROV surveys can cover large areas (hectares) in deeper waters (> 80 ft.) that do not contain thick kelp beds. ROVs are most effective for observing adults on open surfaces and can generate population estimates for large areas on annual or longer cycles. Genetic tools can monitor the survival, connectivity, and diversity of wild and enhanced populations. Non-invasive pathogen-detection methods are being developed to assess the health of wild and enhanced populations. Combining these monitoring tools maximizes the temporal and spatial coverage of rocky reefs, generates better population estimates, and helps determine whether enhancement efforts are building healthy, sustainable populations.

Our partner list continues to expand and now includes regular cooperation with several commercial aquaculture farms. Partnership with the U.S. Navy is ongoing. New partnerships with academic and government scientists in Baja California, Mexico, continue to develop. Within NOAA we are working together to carry out a variety of recovery activities. Our new relationships were forged and our current partnerships sustained by holding workshops, attending meetings, and developing interagency agreements. One such workshop developed the outline of a strategic plan for white abalone outplanting activities, schedules, cost estimations, and data sharing plans. This strategic plan will be final in time to inform our first experimental outplanting activities with white abalone. We continue to implement grant programs (e.g., ESA Section 6 Grants to States) and communicate a unified message for recovery. Outreach and education programs at our partner institutions and the Species in the Spotlight initiative, accompanied by the NMFS Communications Team White Abalone Outreach Campaign, have helped highlight our program to perspective partners and funding agencies.

Summary

Our captive propagation program has expanded such that millions of healthy animals, suitable for future outplanting, are currently in captivity. The methods for captive spawning and rearing have improved, factors that lead to higher rates of spawning and survival are being identified, health care protocols are being employed and improved when necessary, and additional partners with unique skill sets are contributing to the program. New genetic diversity has been incorporated into the captive breeding program through the collection of wild broodstock for the first time in years. As we approach the

issuance of an ESA permit allowing the first experimental outplanting of captive-raised white abalone in 2019, methods to meet this goal are being perfected by outplanting closely related species of abalone into habitats that possess characteristics thought to promote long-term survival of white abalone. We have identified monitoring tools useful for tracking outplant success, genetics, and health status of wild and restored white abalone populations. A NMFS strategic plan for outplanting is being developed to identify partner participation, activities, schedule, cost estimates, and methods for data sharing. This effort will form the basis for new partnerships, additional funding, and more effective and efficient implementation of recovery actions.

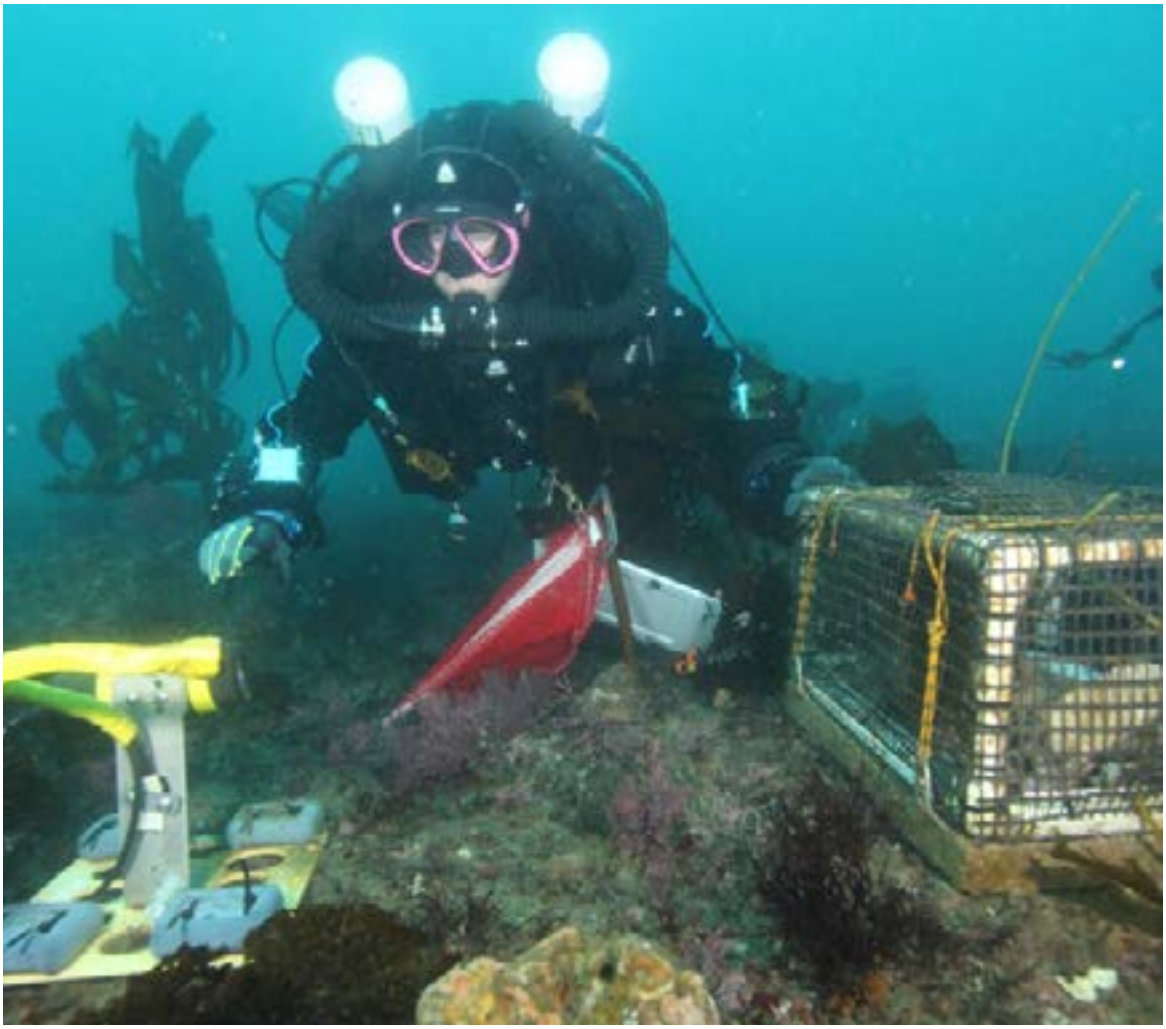


Photo Credit: David Witting, NOAA RC

PARTNER in the SPOTLIGHT: Amanda Bird, Paua Marine Research Group

Photo Credit: A. Obaza, PMRG

Amanda Bird (Paua Marine Research Group, PMRG) has played an instrumental role in advancing field-based methods to restore white abalone populations in the wild throughout the Southern California Bight. Amanda pursued a Master's program at California State University, Fullerton in the Fall of 2013, where she focused on assessing the population status of pinto abalone populations in southern California, which are closely related to white abalone. During her thesis research, Amanda worked closely with NMFS on white abalone recovery efforts. It was during that time that Amanda and a small group of dedicated underwater researchers identified a remnant wild population of white abalone in San Diego County, paving the way for future restoration work. In January 2016, Amanda founded PMRG— a marine and estuarine biological consulting firm—in San Diego, California. Amanda and PMRG provide expertise in biological sampling and habitat conservation to support the effective management of marine resources on the U.S. west coast. As a certified Small Women-owned Business Enterprise, Amanda has developed strong collaborations with federal and state governmental organizations, academic institutions, NGOs, and other consulting companies to provide comprehensive and effective marine resource management strategies to the larger white abalone conservation collaborative. Amanda has coupled excellent underwater skills with creative and innovative scientific technique to better understand the habitat needs of white abalone and develop a strategic approach to identifying and establishing restoration sites. Her kind and intellectual nature, alongside her commitment and passion, are responsible for forging and maintaining productive relationships that advance technological methods for monitoring white abalone (e.g., TLCs, SCUBA, and closed-circuit rebreathers) as well as data management and scientific interpretation of laboratory and field data. Amanda never hesitates to go beyond the call of duty to help out with all logistical aspects of making the white abalone program a success, from setting up rearing systems, to pouring concrete for outplant modules, to 12 hour plus workdays in the field. Because Amanda's skill set is so diverse, and because of her ability to think always about details, promote safety, and use creative approaches to solve problems, NMFS has selected Amanda as our Partner in the Spotlight.

ATLANTIC SALMON GULF OF MAINE DPS

CENTRAL CALIFORNIA COAST COHO ESU

COOK INLET BELUGA WHALE DPS

HAWAIIAN MONK SEAL

NORTH ATLANTIC RIGHT WHALE

PACIFIC LEATHERBACK SEA TURTLES

SACRAMENTO RIVER WINTER-RUN CHINOOK SALMON ESU

SOUTHERN RESIDENT KILLER WHALE

WHITE ABALONE

U.S. Secretary of Commerce
Wilber Ross

Assistant Secretary of Commerce for Oceans and Atmosphere and Acting Under Secretary of Commerce for Oceans and Atmosphere

Neil A. Jacobs, Ph.D.
Assistant Secretary of Commerce for Environmental Observation and Prediction Performing the Duties of Under Secretary of Commerce for Oceans and Atmosphere

Assistant Administrator for NOAA Fisheries
Chris Oliver

October 2019

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National Marine Fisheries Service
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Silver Spring, MD 20910

www.freemanhydro.com
Date: October 2, 2019

To: Kristen Kittleson
Fishery Resource Planner
County of Santa Cruz
701 Ocean Street, 3rd Floor – Room 312
Santa Cruz, CA 95060

From: Larry Freeman
Freeman Hydrologic Data Services, LLC (FHDS)
PO Box 952, Soquel CA 95073

Subject: Report from Swanton Pacific Ranch. Completion of tasks; Santa Cruz County Fish and Wildlife Commission 2017 Public Grant Program.

Dear Santa Cruz County Fish and Wildlife Advisory Commission members.

On behalf of Dr. Brian Dietterick, Director of Cal Poly Swanton Pacific Ranch (SPR), I am pleased to provide this grant task completion report to you. SPR wishes to express their appreciation for your support through the Public Grants Program. The information and data generated through this effort were provided to Dr. Dietterick and SPR by FHDS. The report and data are archived by SPR and are available upon request.

The following tasks were listed in the grant proposal, have been completed, and will support the long-term project entitled ***Understanding Scotts Creeks Hydrology: Developing baseline knowledge to inform fish restoration in a highly-prioritized watershed.***

1- **Grant objective 1:** Review stage record and streamflow measurements for the Scotts Creek below Archibald stream gage operated by SPR
    a. Review and correct stage record
    b. QA/QC discharge measurements
    c. Review each discharge measurement to ensure match with corrected stage record and their adequacy for use in rating curve development
2- **Grant objective 2**: Review historic ratings and develop new rating
    a. Review and evaluate historic rating curve design and upper-end rating extension(s)
    b. Define new ratings using all streamflow measurements made during the project period.
    c. Compute new ratings as needed.

SPR has received the final report from FHDS and includes:

- A complete list of streamflow measurements (including revisions) through September, 2017.
- A summary of periods where computational revisions should be made.
- A spreadsheet of the three new ratings that were developed using available measurements.
- A list of recommendations for continued operation of the streamgage.