



Fish and Shellfish Program NEWSLETTER

January 2022
EPA 823N22001

In This Issue

Recent Advisory News.....	1
EPA News.....	4
Other News.....	7
Recently Awarded Research....	9
Tech and Tools	12
Recent Publications	15
Upcoming Meetings and Conferences.....	16



This newsletter provides information only. This newsletter does not impose legally binding requirements on the U.S. Environmental Protection Agency (EPA), states, tribes, other regulatory authorities, or the regulated community. The Office of Science and Technology, Office of Water, U.S. Environmental Protection Agency has approved this newsletter for publication. Mention of trade names, products, or services does not convey and should not be interpreted as conveying official EPA approval, endorsement, or recommendation for use.

<https://www.epa.gov/fish-tech>

Recent Advisory News

Fish Advisory for Los Banos Reservoir Offers Safe Eating Advice for Four Fish Species

On December 7, 2021, the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) issued a state fish advisory for [Los Banos Reservoir](#) in Merced County. This state fish advisory provides safe eating advice for black bass species, Common Carp, sunfish species, and Threadfin Shad.

Los Banos Reservoir is located approximately 33 miles southwest of Merced. The California Environmental Protection Agency's OEHHA developed the recommendations based on the levels of mercury found in fish caught from the reservoir.

"Many fish have nutrients that may reduce the risk of heart disease and are excellent sources of protein," said Dr. Lauren Zeise, director of OEHHA. "By following our guidelines for fish caught in Los Banos Reservoir, people can safely eat fish low in chemical contaminants and enjoy the well-known health benefits of fish consumption."

When consuming fish from Los Banos Reservoir, the following advice is issued:

- Women ages 18 – 49 and children ages 1 – 17 should not eat black bass species. They may safely eat a maximum of one total serving per week of Common Carp, sunfish species or Threadfin Shad.
- Women ages 50 and older and men ages 18 and older may safely eat a maximum of three total servings per week of sunfish species or Threadfin Shad, or two total servings per week of Common Carp, or one total serving per week of black bass species.

OEHHA's fish advisory recommendations are based on the levels of contaminants, such as mercury, that persist in the environment and accumulate in fish. They are independent of any advisories to limit fish intake due to freshwater or estuarine harmful algal blooms (HABs). Before fishing, OEHHA recommends checking the [California HABs Portal](#) to see if there are HAB advisories and practicing [healthy water habits](#).

One serving is an eight-ounce fish fillet, measured prior to cooking, which is roughly the size and thickness of a hand. Children should eat smaller servings. For small fish species, several individual fish may make up a single serving.

A [poster](#) with the safe eating advice for Los Banos Reservoir is available on OEHHA's website in both English and Spanish. For fish species found in Los Banos Reservoir that are not included in this advisory, OEHHA recommends following the [statewide advisory for eating fish from California lakes and reservoirs without site-specific advice](#).

Mercury is released into the environment from mining and burning coal. It accumulates in fish in the form of methylmercury, which can damage the brain and nervous system, especially in developing children and fetuses. Because of this, OEHHA provides a separate set of recommendations specifically for children up to age 17 and women of childbearing age (18 – 49 years).

Eating fish in amounts slightly greater than the advisory's recommendations is not likely to cause health problems if it is done only occasionally, such as eating fish caught during an annual vacation.

The Los Banos Reservoir advisory joins more than 100 other OEHHA advisories that provide site-specific, health-based fish consumption advice for many of the places where people catch and eat fish in California, including lakes, rivers, bays, reservoirs, and the California coast. Advisories are available on OEHHA's [Fish Advisories web page](#).

For more information, contact Susan Klasing at susan.klasing@oehh.ca.gov.

Source: <https://oehha.ca.gov/fish/press-release/press-release-fish/fish-advisory-los-banos-reservoir-offers-safe-eating-advice>

Massachusetts Department of Public Health Issues Fish Consumption Advisories for Five Cape Cod Waterbodies

On November 2, 2021, the Massachusetts Department of Public Health (DPH) issued new fish consumption advisories to provide guidance on safe fish consumption to people who catch and consume freshwater game fish from five waterbodies on Cape Cod. Recent testing of fish from these locations found levels of per- and polyfluoroalkyl substances (PFAS) above DPH-recommended levels for regular consumption.

During recent testing on Cape Cod, DPH tested surface water in 16 waterbodies and fish in 5 waterbodies. Elevated levels of PFAS were detected in fish that were sampled from Johns Pond in Mashpee, Flax Pond (Picture Lake) in Bourne, Jenkins and Grews Ponds in Falmouth, and Mashpee-Wakeby Pond in Mashpee and Sandwich, prompting the five new fish consumption advisories. PFAS was not found at levels that would be unsafe for swimming or recreational activities in any of the 16 waterbodies tested. In addition to the waterbodies mentioned above, surface water was found to be safe in Shubael Pond (Barnstable); Hen Cove and Squeteague Harbor in Bourne; Crooked, Mares, Flax, and Round Ponds in Falmouth; Santuit Pond in Mashpee; and Peter's, Snake, and Triangle Ponds in Sandwich.

[PFAS](#) are a group of man-made chemicals manufactured and used in a variety of consumer products and industries throughout the world. Based on studies of laboratory animals and people, exposure to certain PFAS has been associated with changes in liver and kidney function, changes in thyroid hormone and cholesterol levels, and immune system effects. In addition, PFAS exposure has been shown to cause developmental effects to fetuses during pregnancy. Some studies also suggest an increased risk of developing cancer following long-term exposures to elevated levels of some PFAS.

DPH tested fish and surface water in these waterbodies because they are located on or near Joint Base Cape Cod where historical PFAS contamination has been found in the groundwater and surface water, and because they are popular locations for swimming and fishing. This contamination is being remediated by the United States Air Force, with oversight by the Massachusetts Department of Environmental Protection (MassDEP) and the United States Environmental Protection Agency (EPA) which have been investigating and overseeing the cleanup of contamination associated with Joint Base Cape Cod – a federal Superfund site – for several years.

These fish consumption advisories apply to the consumption of all native game fish but do not apply to stocked trout at a waterbody. Stocked fish are raised in fish hatcheries and then released. Therefore, they are unlikely to spend enough time in a lake or pond to become contaminated. As part of the Administration's commitment to investigating and eliminating sources of PFAS contamination and exposure to residents of the Commonwealth, both DPH and MassDEP have conducted testing for PFAS in drinking water, groundwater, and surface water. Drinking water results received from public water systems in the area do not indicate PFAS is a concern in the drinking water. Ongoing oversight by MassDEP requires testing of public drinking water for PFAS, and MassDEP works with public water systems to ensure delivered drinking water meets the Massachusetts drinking water regulatory standard. MassDEP is also assisting with sampling of private wells and has conducted sampling of lakes, ponds, and rivers for PFAS at selected locations across Massachusetts.

The [fish consumption advisories](#) for the five waterbodies include guidance on the amount of fish that can be safely consumed from each individual location, which varies depending on the levels of PFAS found in the fish, other contaminants that have been evaluated in the past, and who might consume the fish. The advisories were developed for sensitive populations (including children under 12, women who are or may become pregnant, and nursing mothers) and for all others in the general population. Because the new fish consumption advisories are different for each waterbody, recommendations range from consuming one meal per week to no fish consumption.

The Massachusetts DPH is working with local health departments in Bourne, Falmouth, Mashpee, and Sandwich as well as the Mashpee Wampanoag Tribe requesting that they post notices at the five waterbodies and publicize information for residents of the area.

Additional information about the fish consumption advisories and PFAS is available at [PFAS Fish Advisories – Supporting Information](#) and [PFAS \(Per- and Polyfluoroalkyl Substances\) in Recreationally Caught Fish](#).

More information about PFAS from Massachusetts: [Per- and Polyfluoroalkyl Substances \(PFAS\)](#).

For more information, contact Marc Nascarella at Marc.Nascarella@state.ma.us.

Source: <https://www.mass.gov/news/departments-of-public-health-issues-fish-consumption-advisories-for-five-cape-cod-waterbodies>

EPA News

EPA Announces \$34 Million in Puget Sound Funding

National Estuary Program provides funds for state, local, tribal, and federal projects

On December 16, 2021, the Northwest office of the United States Environmental Protection Agency (EPA) announced that it is providing over \$34 million in grant funds to state, local, tribal, and federal partners for Puget Sound recovery and conservation efforts.

“Puget Sound is a national treasure with profound economic and cultural significance,” said EPA Administrator Michael S. Regan. “These funds help build stronger partnerships and deliver results that are much-needed fuel for recovery of Puget Sound and the communities that depend on it. In addition to these grant funds, the \$89 million slated for Puget Sound in the Bipartisan Infrastructure Law will accelerate this progress to secure tangible, concrete protections that will benefit local communities for generations.”

These [National Estuary Program](#) funds support development and implementation of the [Puget Sound Action Agenda](#) - the five-year strategy for Puget Sound recovery - and work to meet tribal trust responsibilities and treaty obligations. These [grants](#) fund a diversity of work spanning from habitat protection, to finding and fixing sources of pollution, to cutting edge stormwater research, to tribal salmon restoration projects.

Recipients include three tribal consortia, 19 federally recognized tribes, the Northwest Indian Fisheries Commission, Washington’s Department of Ecology, Department of Health, Department of Fish and Wildlife, Department of Natural Resources, and Department of Commerce, the Puget Sound Partnership, Washington State University’s Stormwater Center, and the University of Washington’s Puget Sound Institute.

Since 2006, Congress has appropriated \$419 million in Clean Water Act and geographic program funds for Puget Sound that EPA has used to help restore more than 50,000 acres of habitat and protect in excess of 150,000 acres of harvestable shellfish beds. These federal funds have leveraged nearly \$2.1 billion of additional funds largely from the state of Washington.

In addition to providing grants, EPA experts partner with and provide their scientific and policy expertise to local, state, and tribal governments, industry, and non-governmental organizations (NGOs) and are involved in scientific

research and restoration projects throughout the Puget Sound basin. The EPA Puget Sound Program also co-leads the Puget Sound Federal Task Force that works to coordinate federal programs and resources to support Puget Sound Recovery. To learn more about this inter-agency effort, see the recently posted [November 2021 Progress Report](#).

Encompassing 8 million acres of rivers, bays, beaches and shorelines, the Puget Sound basin serves as an economic and cultural hub for the region's more than 4.7 million people, including 19 federally recognized tribes.

For more information, contact Bill Dunbar at dunbar.bill@epa.gov or Suzanne Skadowski at skadowski.suzanne@epa.gov.

Source: <https://www.epa.gov/newsreleases/epa-announces-34-million-puget-sound-funding>

EPA Grants Petition to Order Testing on Human Health Hazards of PFAS

On December 28, 2021, as a part of the United States Environmental Protection Agency (EPA)'s efforts to address the human health and ecological risks of per- and polyfluoroalkyl substances (PFAS), the Agency announced it was granting a petition from six North Carolina (NC) public health and environmental justice organizations to compel companies to conduct testing of certain PFAS.

This action advances the Biden-Harris Administration's commitment to improve understanding of, and to protect people from, the potential risks of PFAS. The petitioners' request that EPA leverage its authorities to compel development of much needed new information on PFAS underscored the need for robust testing on PFAS, and played a key role in advancing the Agency's plans for a [National PFAS Testing Strategy](#), a pillar of the agency's [PFAS Strategic Roadmap](#) that will lead to improved health protections for all communities.

"Communities in North Carolina and across the country deserve to know the potential risks that exposure to PFAS pose to families and children," said EPA Administrator Michael S. Regan. "By taking action on this petition, EPA will have a better understanding of the risks from PFAS pollution so we can do more to protect people. This data will also help us identify the sources of pollution so we can hold those accountable for endangering the public. EPA is fully committed to addressing this longstanding pollution challenge, and today we take another critical step forward to protect the water, air, and land we all depend on."

EPA plans to require PFAS manufacturers to provide the agency with toxicity data and information on categories of PFAS. EPA expects to exercise its Toxic Substances Control Act (TSCA) section 4 order authority to require recipients of test orders to conduct and fund the studies. The information gathered as a result of this testing will help EPA deepen its understanding of the impacts of PFAS, including potential hazards. As the agency learns more about the impacts of PFAS, EPA will continue to take action to protect human health and the environment.

In October 2020, the Center for Environmental Health, Cape Fear River Watch, Clean Cape Fear, Democracy Green, Toxic Free NC, and the NC Black Alliance submitted a petition asking EPA to require health and

environmental impact testing on 54 chemical substances that the petition identifies as PFAS manufactured by The Chemours Company in Fayetteville, North Carolina. The previous Administration denied this petition in January 2021, and the petitioners requested that the Agency reconsider its denial in March 2021, which EPA agreed to do in September 2021, in light of the change in administration and in policy priorities concerning PFAS.

In October 2021, EPA announced a National PFAS Testing Strategy which identifies priority substances for the first of several described phases of an iterative testing approach based on grouping of chemicals by chemistry features and available toxicity data. These substances include many of the chemicals identified in the petition, but also additional PFAS which will inform a wider universe of categories of PFAS where key data is lacking. For example, the first phase of testing on 24 PFAS is expected to provide data that can be extrapolated to 2,950 PFAS that belong to the same categories as the 24 individual substances.

EPA has granted the petition and will exercise its TSCA authorities to compel development of information on PFAS. In summary:

- **Near-Term Testing Covers 30 of 54 Petition Chemicals** – Under the Testing Strategy, EPA’s first test orders for 24 categories of PFAS about which the least is known will provide human health hazard data that cover 30 of the 54 petition chemicals.
- **Subsequent Testing May Cover Nine of 54 Petition Chemicals** – An additional nine PFAS identified in the petition belong to one other category included in the Testing Strategy. EPA is conducting more in-depth analyses of the sufficiency of the existing data, which will inform later phases of testing.
- **Remaining 15 of 54 Petition Chemicals** – 15 chemicals identified in the petition do not fit the definition of PFAS used in developing the Testing Strategy. EPA has determined that there is robust data on some of them available to the Agency. EPA is conducting more in-depth analyses of the existing data, which will inform later phases of testing.
- **Mixtures Studies** – EPA will address PFAS mixtures by using the toxicity of the individual substances to predict the toxicity of the mixture, an approach which is consistent with the current state-of-science on PFAS. EPA is proceeding with development and peer review of these methods as specifically applied to PFAS.
- **Human Studies** – EPA is contributing to and reviewing numerous existing ongoing human studies, including studies on potentially exposed workers and communities in North Carolina, and is evaluating how to further advance and expand on these efforts. These include studies of health outcomes for people in communities impacted by industrial PFAS releases, as well studies that explore the connection between chronic health outcomes and PFAS exposures in North Carolina.

- **Analytical Standards** – EPA does not believe it is appropriate to require the development or submission of analytical standards with the initial test orders that will be issued under the Testing Strategy and lacks the ability to order the submission of all analytical standards in the manner requested. Nonetheless, EPA has requested comment on whether to require the submission of existing analytical methods for PFAS under a separate rulemaking that the Agency expects to finalize next year.

EPA will also continue to work to address ongoing PFAS contamination through the actions outlined in the PFAS Strategic Roadmap.

For more information, contact press@epa.gov.

Source: <https://www.epa.gov/newsreleases/epa-grants-petition-order-testing-human-health-hazards-pfas>

Other News

Oregon Habitat Restoration Project Supports Millions of Dollars in Community and Economic Benefits

The Southern Flow Corridor project restored habitat for salmon while also supporting jobs, property values, and nearly \$15 million in economic output

On December 20, 2021, a [report](#) was released highlighting the socioeconomic benefits of a National Oceanic and Atmospheric Administration (NOAA)-supported effort to restore habitat for threatened salmon and reduce community flooding in Tillamook, Oregon. According to the report, the landscape-scale [Southern Flow Corridor project](#) has supported \$14.6 million in economic output, increased the value of nearby homes, improved local water quality, and more. The report was produced by researchers at Oregon State University.

Through the Southern Flow Corridor project, NOAA and partners restored tidal wetlands to provide habitat for salmon and reduce flooding in the town of Tillamook. The project created 443 acres of wetlands and opened 13 miles of tidal channels to migratory fish such as chum, Chinook, and threatened [Oregon Coast coho salmon](#). It also reduced flooding to 4,800 acres of the surrounding community.

The researchers found that, in addition to creating habitat and reducing flooding, the project provided a multitude of other benefits. These include:

- Supporting 108 jobs and \$14.6 million in total economic output in Oregon.



After growing in estuaries and migrating to the ocean, coho salmon return back to streams to spawn. (Photo courtesy of Bureau of Land Management)

- Increasing the value of homes in nearby residential areas by 10 percent, with an average benefit of \$19,000 per home.
- Reducing flooding on Highway 101, a major transportation corridor. Fewer highway closures would save approximately \$7,200 in travel costs per flooding event.
- Improving water quality by decreasing the amount of sediment that accumulates in Tillamook Bay. Less sediment would decrease the amount of dredging needed to maintain shipping lanes, saving approximately \$1,500 to \$8,000 per year.
- Storing 27,000 tons of [coastal blue carbon](#). The estimated value of this carbon storage ranges from \$530,000 to \$736,000.

By helping to increase the abundance of salmon in Tillamook Bay, the project is also expected to produce significant recreational fishing benefits. The publicly accessible project site also provides opportunities for activities such as hiking, kayaking, wildlife viewing, and a dog park.

The report was funded by the [Office of Habitat Conservation](#), with technical support from its [Restoration Center](#). NOAA's partners on the Southern Flow Corridor project included the Federal Emergency Management Agency (FEMA), Tillamook County, Tillamook Estuary Partnership, local landowners, and many others.

For more information, contact Office of Habitat Conservation at (301) 427-8600 or visit <https://www.fisheries.noaa.gov/about/office-habitat-conservation>.

Source: <https://www.fisheries.noaa.gov/feature-story/oregon-habitat-restoration-project-supports-millions-dollars-community-and-economic>

High Heat, Low Tide Likely Triggering Spike in Shellfish-Linked Infections

On July 16, 2021, the Washington Department of Health (DOH) reported an outbreak of vibriosis in Washington State that has already surpassed the highest number of cases ever recorded by the state for the month of July. Recent high temperatures and low tides in Washington State are likely to blame for the increased rate of illness, which is associated with eating raw or undercooked shellfish, especially oysters that are contaminated with *Vibrio*.

Found naturally in the environment, *Vibrio* bacteria thrive in warm temperatures. When midday low tides coincide with warm weather, *Vibrio* bacteria can grow quickly, increasing risk of illness among people who eat raw or undercooked oysters.

Vibriosis symptoms include diarrhea, abdominal cramps, nausea, vomiting, headache, fever, and chills. The illness usually occurs 4 hours to 4 days after eating contaminated shellfish, with mild or moderate symptoms that typically run its course in 2 to 3 days. Most people get sick within one day of consuming raw or undercooked shellfish.

People with weakened immune systems or liver disease are at higher risk for *Vibrio* infections. These people, and anyone who wants to avoid illness, should eat only thoroughly cooked shellfish.

“Another effect of the recent heat wave is the perfect storm of conditions for *Vibrio* infections. It’s important that when enjoying shellfish, we follow simple steps to stay healthy,” said Todd Phillips, Director of the Office of Environmental Health and Safety.

The Three Cs can prevent illness from *Vibrio*:

- **Cook** at 145° F for 15 seconds to destroy *Vibrio* bacteria.
- **Check** the [DOH Shellfish Safety Map](#) before heading to the beach to harvest shellfish recreationally. Shellfish gathered from open and approved areas should be harvested as the tide goes out.
- **Chill** quickly. Bring a cooler with ice with you when harvesting shellfish recreationally or purchasing for a store or seafood stand (or have them packed on ice). Oysters should be put on ice or refrigerated as soon as possible.

When preparing shellfish, people should wash hands frequently and not return cooked shellfish to the plate or cutting board where raw shellfish was prepared.

Visit the Washington DOH [Vibriosis web page](#) for more information.

For more information, contact Teresa McCallion at teresa.mccallion@doh.wa.gov.

Source: <https://www.doh.wa.gov/Newsroom/Articles/ID/2867/High-heat-low-tide-likely-triggering-spike-in-shellfish-linked-infections>

Recently Awarded Research

Sea Grant Announces \$2 Million in Support of 2021 American Lobster Initiative Efforts

On October 28, 2021, Sea Grant announced \$2 million in support of the Sea Grant American Lobster Initiative to address scientific and stakeholder needs associated with this important fishery.

This is Sea Grant’s third year of research and extension funding to address critical gaps in knowledge about how American lobster is being impacted by environmental change in the Gulf of Maine, Georges Bank, and southern New England. The focus of this work is based on specific wording in Sea Grant’s fiscal year 2021 appropriations language.

One of the most iconic modern American fisheries, the American lobster (*Homarus americanus*) also represents one of the largest and most valuable single-species fisheries along the Atlantic coast. The landing value of the

American lobster fishery was [estimated](#) at \$524.5 million in 2020. However, ecosystem shifts, food web changes and ocean acidification all present threats to the American lobster fishery in the Gulf of Maine, Georges Bank, and southern New England. While lobster landings continue to remain above historical averages, National Oceanic and Atmospheric Administration (NOAA) Fisheries data showed a 19 percent decline in pounds of American lobster landed in 2020 from data collected in 2018.

This year's funding will support Sea Grant's Northeast Regional Lobster Extension Program in Connecticut, Maine, Massachusetts, New Hampshire, New York, and Rhode Island in addition to supporting continuing efforts for three research projects initially funded in 2020 and six new research projects for 2021.

The six, new extramural research projects being funded at \$1.4 million in 2021 encourage research partnerships between state agencies, academia, and industry to examine impacts from environmental change on the American lobster and its fishery. Chosen through a competitive process that included review by subject matter experts, the projects will be conducted by researchers across the Northeast region, and they will address one or more of the following priorities:

1. Life history parameters, including but not limited to impacts of ocean acidification;
2. Distribution and abundance, including but not limited to ecosystem shifts; and
3. Species interactions.

In fiscal year 2019, the National Sea Grant Office launched the American Lobster Initiative to support two connected efforts, a national research competition and a Northeast Regional Lobster Extension Program. The extension program, designed to work with communities, is a four-year program that links lobster research with stakeholders who need and can use the results--the lobster fishing industry, resource managers, and others across the region. The American Lobster Initiative was informed by listening sessions with regional fishing industry stakeholders, state and federal fisheries managers, and university, state, and federal fisheries researchers. The American Lobster Research Program funded seven projects in fiscal year 2019 and nine projects in fiscal year 2020.

An ecosystem-based approach to American lobster habitat and trophic dynamics: Integrated modeling to evaluate climate-related impacts

University of Maine, Principal Investigator Brady - \$399,036

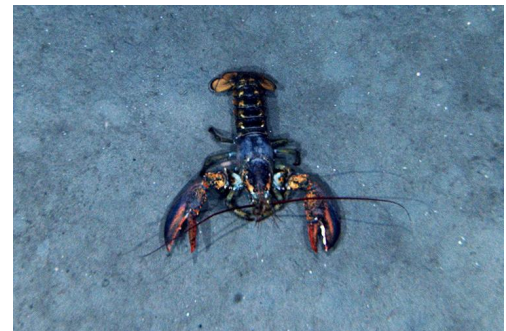
This study will expand the decades-long work of modeling larval American lobster transport to include dynamics associated with prey availability. The project will use an existing Larval Transport Model to project the spatio-temporal distribution of lobster larvae and link the output to trends in the boreal calanoid copepod's (*Calanus finmarchicus*) distribution and abundance and availability of recruitable habitats. Climate-induced changes in water masses that control the rate of warming in the Gulf of Maine, circulation patterns, spatial and temporal dynamics in spawning lobster distributions, and development time of larvae synergistically impact the timing of these species in the water column and may act to intensify the disconnect between larvae and their optimal food source. Through the team's work with the Maine Department of Marine Resources, Maine Lobsterman's Association, and the Lobster Institute, the study will build a flexible ecosystem-based early life history model capable of answering fundamental questions from industry members and stakeholders regarding changes in ocean conditions, larval distribution, and their relationships to their food supply.

Answering an industry question, "Who's eating juvenile lobsters?": An evaluation of lobster predation in the Gulf of Maine using stomach content analysis**Maine Department of Marine Resources, Principal Investigator Peters - \$128,880**

The Maine Department of Marine Resources and the Maine Center for Coastal Fisheries are partnering to understand what current and new predators of American lobsters exist in the Gulf of Maine, especially as it pertains to juvenile lobsters. To answer this question, they will use current surveys to collect stomachs from five species that have recently shown to be preying on lobster: Atlantic cod, white hake, red hake, Atlantic halibut, and Atlantic mackerel, and from two emerging species: black sea bass and striped bass. This team of researchers, state agency scientists, and industry members will share results with federal research partners, members of the lobster industry, and students across Maine. The research will provide data on potential lobster predators and allow managers to use these data to update current single-species American lobster assessments and work on ecosystem models for the Gulf of Maine.

Connecting the dots: Environmental drivers of egg production and stability in ovigerous American lobsters in the Gulf of Maine**Wells National Estuarine Research Reserve, Principal Investigator Goldstein - \$134,489**

A key goal of this work is to evaluate the overall health and quality of ovigerous American lobsters with respect to their egg production and examine how environmental drivers of climate change in the Gulf of Maine may be impacting this key life history phase. This work will address: 1) why ovigerous lobster egg clutch sizes have declined and to what extent this limits egg production; 2) what factors have contributed the most to declines in egg production; and 3) what impact temperature, maternal history, and size have on egg production and viability. The data obtained from this project will be used to inform future stock assessments and lay the groundwork for long-term monitoring programs that include the linkages between ovigerous lobster health and climate change. Stakeholder engagement and outreach will serve to connect these findings with the commercial lobster fishery, fisheries managers, students, and the public through data sharing, presentations, artistic visualization, and opportunities for student learning and experience.



American Lobster (Photo courtesy of NOAA Fisheries)

Evaluating impacts of changing life history parameters on the American lobster stock dynamics under different management regulations in a warming Northeastern US**Stony Brook University, Principal Investigator Chen - \$270,394**

The overarching objective of this project is to develop and conduct a simulation study to evaluate the impacts of possible climate-induced changes in American lobster life history parameters and alternative management regulations on the lobster population dynamics. The simulation framework will consist of the Individual-based Lobster Simulator, conditioned based on information derived in the latest stock assessments. The project will 1) develop a research collaborative team to help identify "what if" scenarios for simulating realistic ranges of changes in key life history parameters for Gulf of Maine and southern New England stocks; 2) develop a simulation framework for predicting the response of lobster stocks to changing life history parameters; 3) evaluate impacts of

increasing temperatures on lobster stocks given status quo management; and 4) compare the performance of different management regulations in a changing climate.

Investigating the ecological impacts of range-expanding species to the American lobster fishery using collaborative surveys, fisher observations, and predator-prey experiments

Northeastern University, Principal Investigator Grabowski - \$305,796

As a consequence of climate change, range-expanding species such as black sea bass and blue crabs are entering southern New England and the Gulf of Maine. Yet many questions about these species' distributions in their newly expanded ranges and their effects on the American lobster fishery remain unanswered. This study will answer questions about range-expanding species, such as, how prevalent they are in the Gulf of Maine, which coastal New England habitats and depths they prefer, and if they overlap with and consume critical life-history stages of the American lobster, such as early post-settlement and larger juveniles. Answering these critical questions will help evaluate the degree to which novel species range expansions are a potential threat to the American lobster fishery. The collaborative team that will collectively answer these questions includes university researchers, nonprofits, industry organizations, state resource agencies, and lobster fishers.

The influence of season and temperature on the distribution and abundance of juvenile lobsters assessed via traditional ventless and novel early benthic phase traps

New Hampshire Fish and Game, Principal Investigator Carloni - \$160,412

One of the major goals of this project will be to design and test a trap that effectively samples early benthic phase lobsters, an understudied segment of the American lobster population whose changes in abundance could give an early warning to potential changes in landings. Once this novel trap has been tested and calibrated it will be used in conjunction with SCUBA surveys and traditional ventless traps to explore the relationship between lobster density, temperature and catch. Further, the project seeks to better understand the degree to which ventless traps accurately reflect the size structure of the sublegal lobster population, and whether smaller lobsters may be excluded due to intraspecific competition. The data obtained from this project will be used to inform future stock assessments and lay the groundwork for a long-term monitoring program that includes early benthic phase lobsters and the linkages between each life history phase of the American lobster.

Source: <https://seagrant.noaa.gov/News/Article/ArtMID/1660/ArticleID/2885/Sea-Grant-announces-2-million-in-support-of-2021-American-Lobster-Initiative-efforts>

Tech and Tools

Citizen Science at EPA

Engaging the Public in Environmental Protection

Citizen science is an expansive field where the public contributes to scientific knowledge and understanding. A variety of terms are used to describe this valuable work including **community science**, **volunteer monitoring**, and **public participation in scientific research**.

[This StoryMap](#) is about EPA's involvement in citizen science. The projects highlighted here support environmental monitoring. Many feature collaborations with communities with environmental justice concerns, as well as initiatives with states and tribal sovereign nations.

Community leaders, scientists, educators, students, and others can use this StoryMap to learn more about the range of environmental citizen science projects across the country and the resources that EPA provides to help with these projects.

Where is citizen science happening?

Across the United States and around the world, people are collecting and using citizen science data that provides information on a wide range of environmental issues. Citizen science projects are **driven by rapid advancements in technology** and **growing awareness of issues** that are of personal interest to individuals, families, and communities.

What is the value of citizen science in environmental protection?

Citizen science offers new ways to gather information and build collaborations among government agencies, scientific organizations, and the public.

By increasing accountability, transparency, and public participation, citizen science can benefit the American public and society by:

- **Filling data gaps** and provide other means of identifying environmental problems.
- **Improving public understanding of environmental issues** and actions that address them.
- **Creating a stronger, more inclusive, and collaborative network** of individuals and organizations dedicated to solving environmental problems.
- **Yielding cost savings and efficiencies** in environmental monitoring and protection programs.

EPA is working towards a future where the public is increasingly involved in scientific data collection used in environmental protection. Over time, citizen science data are expected to be of higher quality, more accessible, and more useful in environmental decision making.

EPA-supported citizen science projects across the U.S.

EPA partners with states, tribes, schools, local governments, non-governmental organizations, community groups, and others to engage the public in expanding our knowledge and understanding of environmental science.

Most EPA citizen science activities are conducted by external organizations with EPA support such as funding, training, and technical advice on study design and data management. For many years, EPA has worked with partners on volunteer water monitoring. New citizen science activities are now emerging for other areas such as air pollution monitoring, communities with environmental justice concerns, and environmental education programs.

The following are examples of water quality and/or fish and shellfish EPA-funded citizen science projects.

Microplastics in Sitka Tribal Foods

The Sitka Tribe of Alaska investigated microplastic content in traditional subsistence foods. Through EPA Environmental Justice Small Grant funding, local scientists led students from Mt. Edgecumbe (mostly tribal youth) to test for microplastic presence in shellfish. Afterward, students helped present their findings to the community and raised awareness of causes of microplastics in food.

Mercury in Penobscot Traditional Food Systems

Within Oldtown, Maine, EPA researchers and partners sampled several species of fish and crayfish from Penobscot Indian Nation lakes and ponds. This baseline data is being used to guide tribal members about safely consuming fish from these waters and to better understand factors effecting mercury levels in the environment. This project used EPA Environmental Justice Small Grant funding to help design a long-term mercury monitoring program to inform community members and policymakers on the effectiveness of current regulations.



Citizen scientists collecting samples in Oldtown, Maine
(Photo courtesy of Penobscot Nation)

For more information, visit the [Penobscot Nation Department of Natural Resources web page](#).

Herring Monitoring

In Arlington, Massachusetts, the Mystic River Herring Monitoring program, funded by an EPA Environmental Education grant, involves citizen scientists in herring counting and assessing water quality of the Mystic River Watershed.

For more information, visit the [Mystic River Watershed Association web page](#).

Kuskokwim Water Quality

Several tribes along the Kuskokwim River in Southwest Alaska are concerned about climate change impacts to subsistence and the overall ecological health of the river. Through EPA funding, the Village of Aniak, Native Village of Georgetown, Native Village of Napaimute, and Telida Village each use tribal environmental program staff and trained tribal members to collect baseline water quality data and are collaborating to assess water temperature and turbidity impacts to subsistence fish species. Once the initial analysis is complete, they hope to develop a GIS story map, invite other tribes to join the effort, and develop a standardized methodology that can be used by others.

Learn more about EPA citizen science projects or check out citizen science across the federal government, visit citizenscience.gov.

For more information, contact innovation@epa.gov.

Source: <https://storymaps.arcgis.com/stories/57b2ee78221341a18bof7ebe8017340d>

Recent Publications

Journal Articles

The list below provides a selection of research articles.

- ▶ [Experimental evidence for recovery of mercury-contaminated fish populations](#)
Blanchfield, P.J., J.W.M. Rudd, L.E. Hrenchuk, M. Amyot, C.L. Babiarz, K.G. Beaty, R.A. Drew Bodaly, B.A. Branfireun, C.C. Gilmour, J.A. Graydon, B.D. Hall, R.C. Harris, A. Hayes, H. Hintelmann, J.P. Hurley, C.A. Kelly, D.P. Krabbenhoft, S.E. Lindberg, R.P. Mason, M.J. Paterson, C.L. Podemski, K.A. Sandilands, G.R. Southworth, V.L. St Louis, L.S. Tate, and M.T. Tate. 2022. Experimental evidence for recovery of mercury-contaminated fish populations. *Nature* 601:74-78.
- ▶ [Perfluoroalkyl substances in plasma of smallmouth bass from the Chesapeake Bay Watershed](#)
Blazer, V.S., S.E. Gordon, H.L. Walsh, and C.R. Smith. 2021. Perfluoroalkyl Substances in Plasma of Smallmouth Bass from the Chesapeake Bay Watershed. *International Journal of Environmental Research and Public Health* 18(11):5881.
- ▶ [Sedimentary records of microplastic pollution from coastal Louisiana and their environmental implications](#)
Culligan, N., K. Liu, K. Ribble, J. Ryu, and M. Dietz. 2022. Sedimentary records of microplastic pollution from coastal Louisiana and their environmental implications. *Journal of Coastal Conservation* 26(1).
- ▶ [Effect of heterotrophic bacteria on the growth of tilapia \(*Oreochromis niloticus*\) cultivated in brackish water](#)
Effendi, I., F. Feliatra, T. Emrinelson, I. Siregar, and A. Adelina. 2021. Effect of heterotrophic bacteria on the growth of tilapia (*Oreochromis niloticus*) cultivated in brackish water. *IOP Conference Series: Earth and Environmental Science* 744(1):012016.
- ▶ [Fishing in the city for food—a paradigmatic case of sustainability in urban blue space](#)
Joosse, S., L. Hensle, W.J. Boonstra, C. Ponzelar, and J. Olsen. 2021. Fishing in the city for food—a paradigmatic case of sustainability in urban blue space. *npj Urban Sustainability* 1:41.
- ▶ [Regional assessment of contaminant bioaccumulation in sport fish tissue in the Southern California Bight, USA](#)
McLaughlin, K., J. Davis, A. Bonnema, B. Du, G. Ichikawa, W. Jakl, W. Heim, and K. Schiff. 2021. Regional assessment of contaminant bioaccumulation in sport fish tissue in the Southern California Bight, USA. *Marine Pollution Bulletin* 172:112798.
- ▶ [Microplastic contamination in Great Lakes fish](#)
Munno, K., P.A. Helm, C. Rochman, T. George, and D.A. Jackson. 2021. Microplastic contamination in Great Lakes fish. *Conservation Biology* 1-11.
- ▶ [Environmental and anthropogenic drivers of contaminants in agricultural watersheds with implications for land management](#)
Smalling, K.L., O.H. Devereux, S.E. Gordon, P.J. Phillips, V.S. Blazer, M.L. Hladik, D.W. Kolpin, M.T. Meyer, A.J. Sperry, and T. Wagner. 2021. Environmental and anthropogenic drivers of contaminants in agricultural watersheds with implications for land management. *Science of The Total Environment* 774(1):145687.
- ▶ [Conserving shellfish reefs—a systematic review reveals the need to broaden research efforts](#)
Toone, T.A., R., Hunter, E.D. Benjamin, S. Handley, A. Jeffs, and J.R. Hillman. 2021. Conserving shellfish reefs—a systematic review reveals the need to broaden research efforts. *Restoration Ecology* 29:13375.
- ▶ [The abundance and characteristics of microplastics in commonly consumed shellfish in the Jiangsu coastal region of China](#)
Wang, T., B. Li, and D. Wang. 2021. The abundance and characteristics of microplastics in commonly consumed shellfish in the Jiangsu coastal region of China. *Environmental Science and Pollution Research* 28:60753–60764.

Upcoming Meetings and Conferences

Aquaculture 2022

February 28-March 4, 2022
San Diego, CA, USA

Gulf of Mexico Conference

April 25-28, 2022
Baton Rouge, LA

2022 Emerging Contaminants in the Environment Conference

April 27-28, 2022
Champaign, IL and Virtual

12th International Conference on Toxic Cyanobacteria

May 22-27, 2022
Toledo, OH

Small Pelagic Fish: New Frontiers in Science and Sustainable Management

November 7-11, 2022
Lisbon, Portugal

Additional Information

This monthly newsletter highlights current information about fish and shellfish.

For more information about specific advisories within the state, territory, or tribe, contact the appropriate state agency listed on EPA's National Listing of Fish Advisories website at <https://fishadvisoryonline.epa.gov/Contacts.aspx>.

For more information about this newsletter, contact Sharon Frey (Frey.Sharon@epa.gov, 202-566-1480).

Additional information about advisories and fish and shellfish consumption can be found at <https://www.epa.gov/fish-tech>.