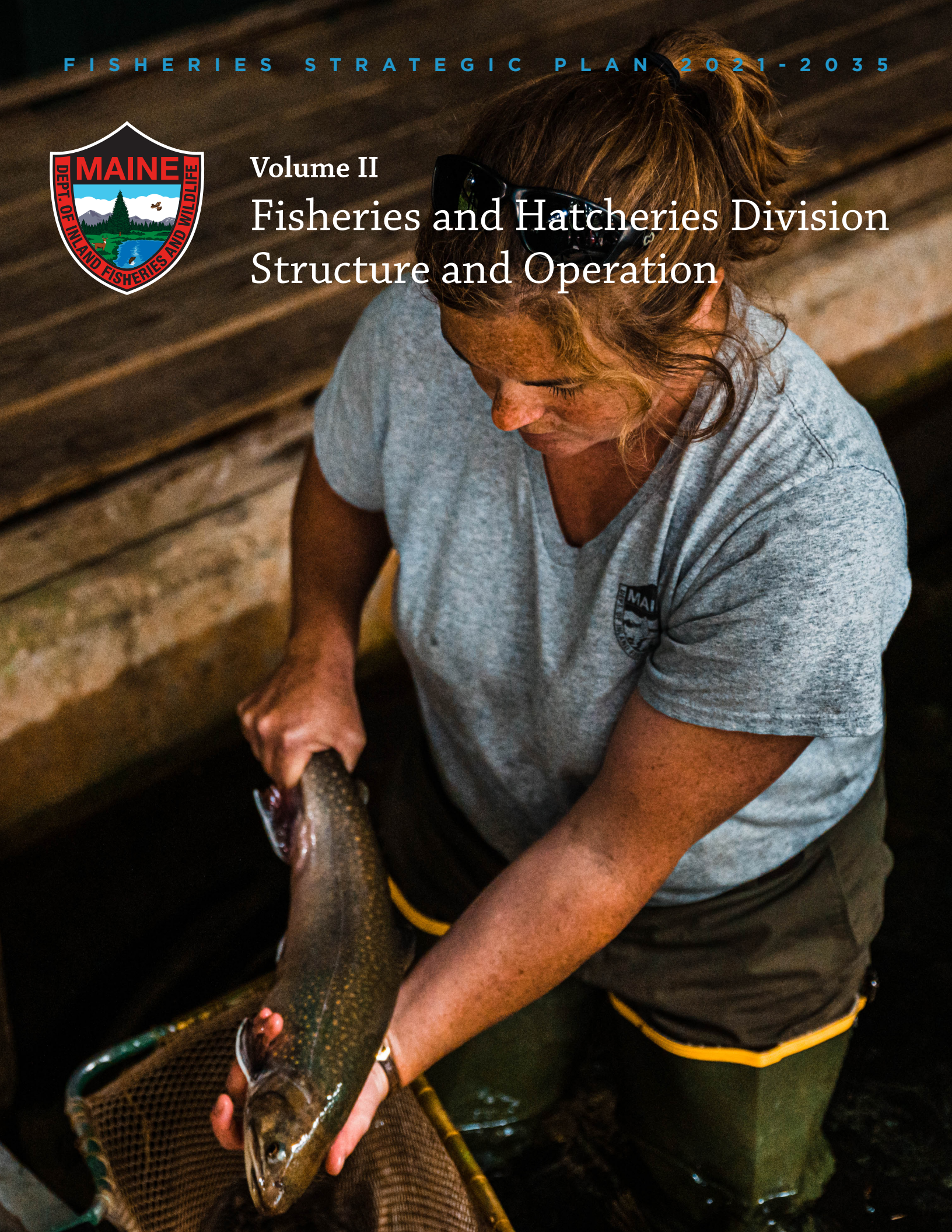
FISHERIES STRATEGIC PLAN 2021-2035

Volume II

Fisheries and Hatcheries Division Structure and Operation



Volume II

Fisheries and Hatcheries Division Structure and Operation

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Cover photo by Chris Bennett

I. MDIFW FISHERIES PROGRAM

The Maine Department of Inland Fisheries and Wildlife (hereafter, MDIFW) was formed in 1830 when the Governor appointed game wardens to enforce newly enacted moose and deer laws. Two Commissioners of Fisheries were appointed in 1867; and in 1880, the pair (who would be replaced by a single Commissioner of Inland Fisheries and Game in 1917) were given the responsibility of enforcing fish and game laws. In 1895, the state purchased land in Caribou and built the first state-owned fish hatchery.

In 1950, the Dingell-Johnson Act—also known as the Federal Aid in Sport Fish Restoration Act—provided a funding source for state agencies charged with managing fisheries resources. Funds from this program supported the creation, in 1951, of what we now know as the Division of Fisheries and Hatcheries (hereafter, the Division). Before the Division was formed, MDIFW's Commissioners authorized management activities with little apparent input from the scientific community, including stockings that were surprisingly widespread—thanks in large part to railroad transport—and poorly documented. Since then, however, Division research has greatly influenced management activities, as has as emerging information outside the agency, bringing a more scientific-centered approach to the conservation and use of Maine's fishery resources.

The Division is responsible for the preservation, protection, enhancement, and wise use of Maine's freshwater fishery resources, including native fish like brook trout, landlocked Atlantic salmon, and Arctic charr. These sustainable and renewable resources provide highly desirable recreational opportunities and associated economic benefits, particularly important in rural areas of Maine.

The Division's specific management needs and priorities allow for some flexibility as conditions change and new information emerges throughout the 2021-2035 planning period, but our overarching goals are to:

- Maintain healthy fish populations and habitats
- Weigh broad public interests when developing stocking and management programs
- Inform, collaborate with, and earn support from the public, stakeholders, and partners
- Encourage (and where possible, provide) fair, equitable, safe, and permanent recreational access to Maine's public waters
- Organize Division operations to meet current and future management challenges with efficiency, consistency, and accountability

The Division manages Maine's freshwater fishes at the population level using a variety of techniques, including research and assessment, stocking, regulations, habitat modification and restoration, education, angler satisfaction surveys, and enforcement.

In Maine, most coldwater and all warmwater fisheries are supported by natural reproduction, with only about 13% of lakes and ponds having received some form of MDIFW stocking since 2010. Hatchery-reared fish are most often stocked to support recreational angling in waters with little to no spawning and nursery habitat, or where predation and competition from introduced fish limits reproduction. Roughly 81% of those hatchery fish are brook trout, landlocked Atlantic salmon, and togue, all of which are all native to Maine. MDIFW does not produce any warmwater species in its hatchery system.

Maine's Fisheries Resources

Maine is a recreational angler's paradise, with 32,000+ miles of flowing water and 6,000+ lakes and ponds supporting a unique assemblage of wild and stocked coldwater species, including brook trout, landlocked Atlantic salmon, Arctic charr, and 20 other freshwater species for anglers to target. Maine is considered the last stronghold for native eastern brook trout, and MDIFW highly prioritizes the management of this important resource. We have the most extensive distribution and abundance of wild brook trout in its native U.S. range, with our 700+ wild brook trout ponds housing the vast majority of the country's remaining native lake and pond populations. Wild brook trout populations also occur in an estimated 22,248 miles of stream habitat.

With brook trout populations declining across their historic U.S. range (Maine to Georgia), a 2006 range-wide assessment by the Eastern Brook Trout Joint Venture concluded that:

> "Maine is the only state with extensive intact populations of wild, self-reproducing brook trout in lakes and ponds, including some lakes over 5,000 acres in size. Maine's lake and pond brook trout resources are the jewel of the eastern range: lake populations are intact in 185 subwatersheds (18% of the historical range), in comparison to only six intact subwatersheds among the 16 other states."

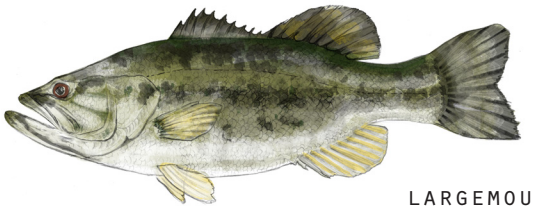
BROOK TROUT

Maine also supports the only endemic Arctic charr and landlocked Atlantic salmon populations in the contiguous U.S. We have 12 endemic Arctic charr populations (and two translocated ones) and the only endemic populations of landlocked Atlantic salmon in the U.S. Landlocked Atlantic salmon are thought to have evolved from anadromous Atlantic salmon thousands of years ago through a gradual voluntary landlocking process (i.e., not the result of stocking and/or barriers that prevented migration). Progeny from landlocked salmon within two of these drainages, West Grand Lake and Sebago Lake, have been stocked to create and restore fisheries around the U.S. and beyond.

MDIFW also manages native chain pickerel, lake whitefish, rainbow smelt, togue, and white perch fisheries, and we create additional recreational fishing opportunities through the annual production and stocking of 1 million+ coldwater fish (mostly native trout and salmon) in over 800 locations.

Maine is also home to several native species that are not regarded as sport fish, but which are integral to Maine's freshwater aquatic ecosystems. A few of these species, particularly those that are less-common, are listed in Maine's State Wildlife Action Plan because of their conservation status.

A variety of fishing opportunities occur across the state and throughout the year. Most warmwater fisheries are located within southern and coastal regions, whereas wild coldwater fisheries are most prominent in western and northern Maine.



LARGEMOUTH BASS

While brook trout remain the most popular sport fish in Maine, nonnative smallmouth and largemouth bass come in second and third, respectively. In the South Zone, bass are well established and are generally managed as a fishery resource. In the North Zone, however, bass compete with brook trout and other native fish, and are therefore generally managed as an invasive fish.

Fisheries across Maine experience a seasonality of angling use, mostly correlated with water temperature changes. In lakes and ponds, coldwater fisheries tend to be most productive for anglers in the spring, early summer, and winter, whereas warmwater fisheries generally remain productive year-round. In flowing waters, coldwater fisheries are generally most productive in the spring, early summer, and fall, whereas warmwater fisheries are steadily productive from spring through fall.

Many Maine waters, particularly in the South Zone, contain a mix of native and nonnative fish species. Where conditions are suitable, Division management and stocking programs generally emphasize native freshwater fish over non-native fish. Our Agency's commitment to the stewardship of native fish is strongly reflected in the species-specific goals, objectives, and action items in Volume I of this Plan, which balance recreational desires and conservation needs.

Many Maine waters support a variety of desirable sport fishes; and ideally, we could manage all of them to maximize their size, catch rates, etc. However, this is rarely possible. Biologists must consider multiple factors in their management approach, including interactions between species, habitat limitations, productivity, fishing pressure, and conservation needs.

II. STRUCTURE AND OPERATION OF MDIFW FISHERIES & HATCHERIES DIVISION

i. Division Structure

Fisheries and Hatcheries Administration

The Division Director, Fisheries Management Supervisor, and Superintendent of Hatcheries work out of MDIFW's headquarters in Augusta. The Director is responsible for administrative oversight and direction of the Fisheries Management and Hatcheries sections within the Division **(Figure 1)**. The Fisheries Management Supervisor oversees regional biological staff and regional work programs. The Superintendent of Hatcheries provides hatchery station managers with operational direction in the production and stocking of fish and also oversees the Fish Health Lab, which manages biosecurity and fish pathogen threats. Both the Fisheries Management Supervisor and Superintendent of Hatcheries will play key roles in integrating elements of this strategic plan into their respective work programs.

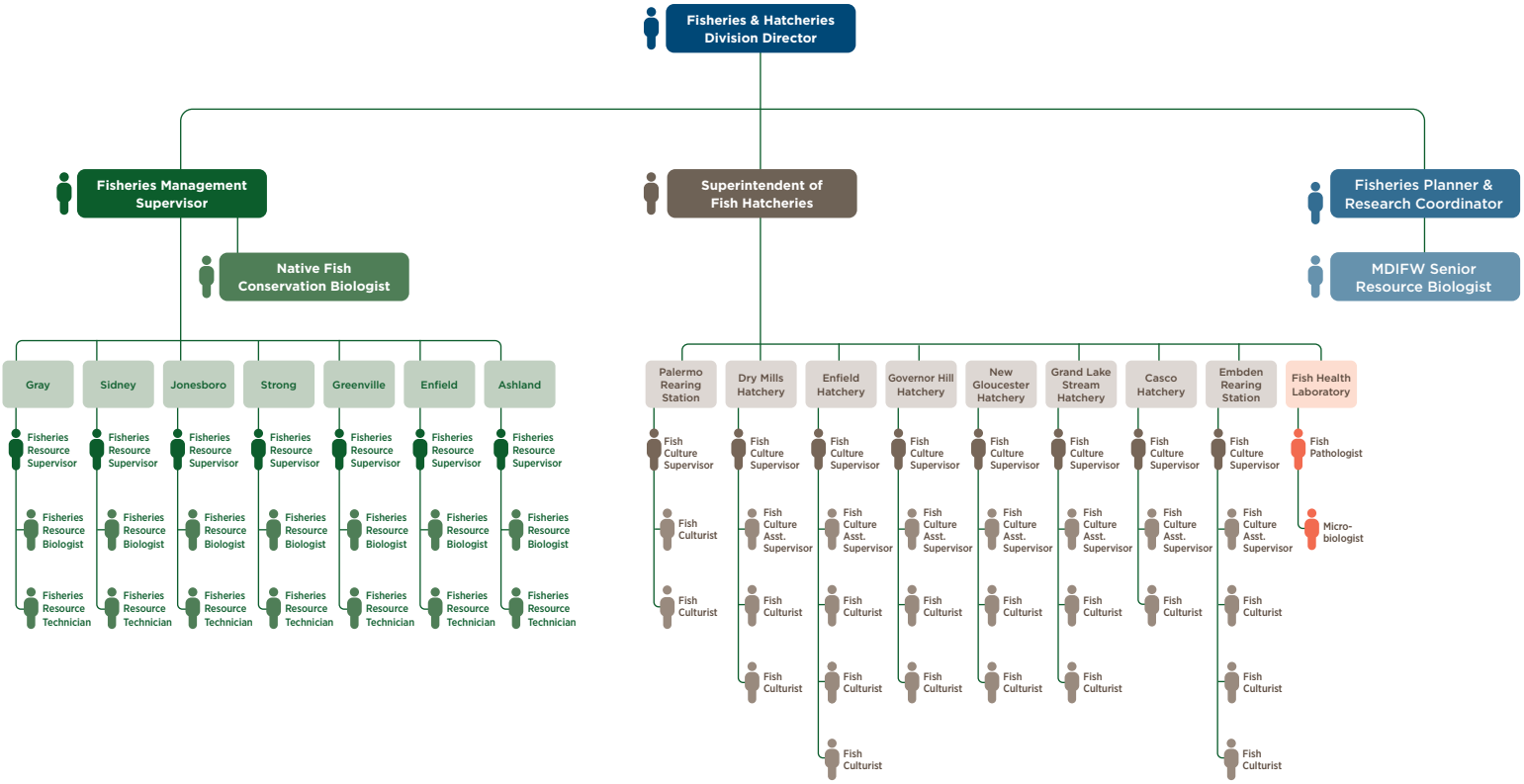


Figure 1. MDIFW Bureau of Resource Management – Fisheries & Hatcheries Division organizational chart including all permanent and seasonal full-time positions, 2021.

Fisheries Statewide Support Team

This three-person team, established in 2019, works out of MDIFW's Augusta and Bangor offices to support statewide planning, management, and conservation of freshwater fishery resources. Operating in close coordination with Division leadership, this team works collaboratively on a variety of projects and issues of statewide significance. Each position has a unique focus area including native fish conservation, planning and research coordination, data management, and commercial fisheries management. As we implement this 15-year strategic plan, these positions will play key roles including support of monitoring and investigations, tracking of accomplishments and progress toward implementation, and subsequent plan development.

Fisheries Management Regions

Maine is divided into seven spatially distinct regions (A–G) to facilitate routine assessment and management of the state's expansive fisheries resources. Each region is staffed with a Fisheries Resource Supervisor, Fisheries Resource Biologist, Fisheries Resource Technician, and temporary seasonal contractors as needed. Due to a variety of biotic and abiotic factors, many waterbodies within each region require customized management strategies to meet management objectives. Differences in waters are often even more pronounced between regions, making the regional structure the best way to achieve refined management of local resources.

The regional structure also allows members of the public to easily connect with the biologists managing their local resources. Regional boundaries reflect available resources based on river drainages, road access, and population density. But since town boundaries form the perimeter of each Region, the number and area of resources within each Region varies **(Figure 2, Table 1)**.

Each year, Fisheries Section staff and the Fisheries Management Supervisor collaboratively develop annual and quarterly regional work programs guided by the agency's mission and policies, and several planning documents such as this one. Throughout this planning process, Division leadership provide direction and ensure consistency with agency goals, objectives, and priorities. Regional staff are then charged with implementing on-the-ground actions.

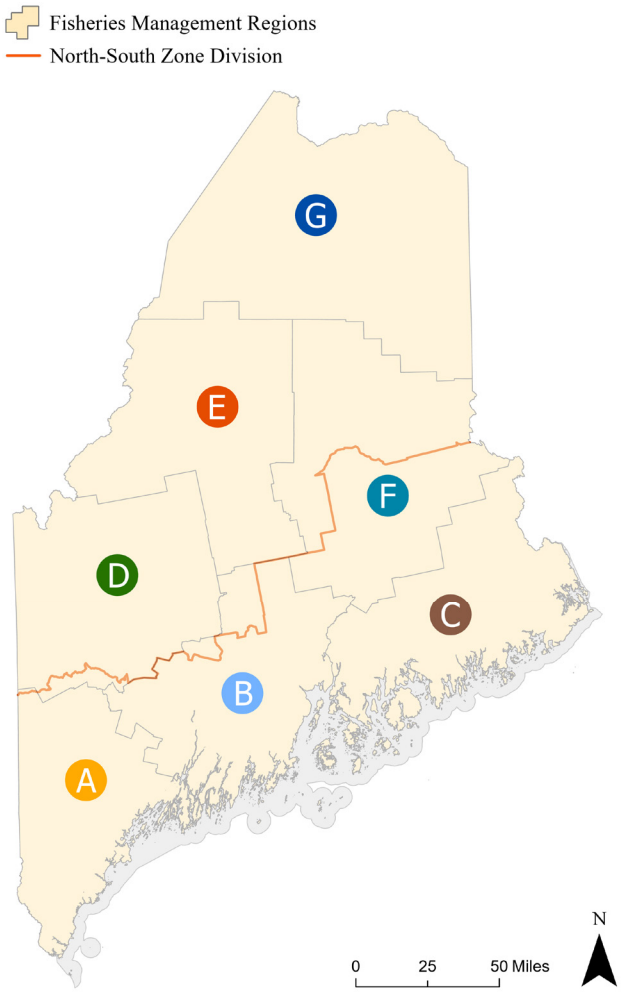


Figure 2. Fisheries Management Region map

Table 1. Fisheries Management Region resource summary

Region	Human Population*	Land Surface Area (mi²)	Miles of Rivers and Streams**	Total # of Great Ponds	Surface Area of Great Ponds (mi²)
A	599,457	3,252	4,273	358	156
B	367,242	3,950	4,115	387	175
C	120,975	3,995	3,949	402	240
D	80,759	4,337	4,334	315	169
E	14,850	4,612	4,653	499	361
F	58,329	5,166	5,142	374	284
G	66,351	7,136	6,496	366	152

**Population calculated based on 2010 Census results*
***Intermittent streams excluded from the calculation*

State Hatcheries

Maine's fish culture program can be traced back to the late 19th century when the state purchased its first hatchery in Caribou and leased another in East Auburn. Since then, dozens of fish culture facilities have been constructed to produce a variety of fish. Today, production occurs within eight facilities strategically located throughout the state. Combined, these facilities produce six species: brook trout, land-locked Atlantic salmon, togue, brown trout, rainbow trout, and splake. Each facility plays a unique role in the production, rearing, and stocking of these fish throughout the state. The Fish Health Lab also plays a key role by screening hatchery fish for pathogens and disease throughout the rearing process. This minimizes hatchery risks and ensures we release disease-free fish into the wild.

Wildlife Management Areas

MDIFW manages fish and wildlife resources in 65 Wildlife Management Areas (WMAs) statewide. These landholdings are managed for the protection and enhancement of important fish and wildlife habitats, but also allow for a variety of public recreation activities consistent with WMA goals. Many WMAs were established with a management focus on wildlife, not fish; but as management plans are updated, fishery resource information and management program needs are being incorporated to support a more comprehensive WMA management vision. This coordinated approach supports broader agency interests and increases opportunities for cost sharing, consistent with Wildlife and Sport Fish Restoration grant requirements.

FEDERAL FUNDING

EXCISE TAX ON FISHING GEAR & FUEL

LICENSE SALES

% FROM GENERAL FUND

ii. Funding Sources

The Fisheries and Hatcheries Division receives funds from several sources **(Figure 3)** to support Division operations. A brief summary of each funding source is provided below.

Federal Funds – Dingell-Johnson Act

Congress passed the Dingell-Johnson Act, also known as the Sport Fish Restoration Act, in 1950. The Act placed a federal excise tax on fishing gear, motorboat fuel, small engine fuel, and import duties to fund state-level fishery management. Funds are distributed through the U.S. Fish and Wildlife Service to state agencies based on land area and license sales. This funding source currently supports most of the staff biologists in the Division's Fisheries Section. Sport Fish Restoration funding requires a 25% match from the Department, which is mostly provided by a combination of license sales and state general fund revenues.

Federal Funds –State Wildlife Grant

The State Wildlife Grant program, administered by the U.S. Fish and Wildlife Service, was created in 2000 to provide additional funding to state agencies for the management of certain fish and wildlife that may not be eligible for Dingell-Johnson and Pittman Robertson (used for wildlife) funds. Funding is allocated to projects related to the recovery and conservation of declining fish and wildlife populations that have been identified as Species of Greatest Conservation Need in state wildlife action plans (SWAP). Maine's SWAP was most recently revised for the 2015–2025 planning period (see, MDIFW 2015). Only those projects that directly involve species listed in the SWAP are eligible for funding, and funds are distributed with a 25–35% (varies depending on planning vs. implementation grants) match requirement from the state. This funding source is shared to support both fisheries and wildlife programs managed within the Bureau of Resource Management. Recent research on lake whitefish was funded through our State Wildlife Grant.

FISHERIES AND HATCHERIES DIVISION ANNUAL OPERATING BUDGET (FY20)

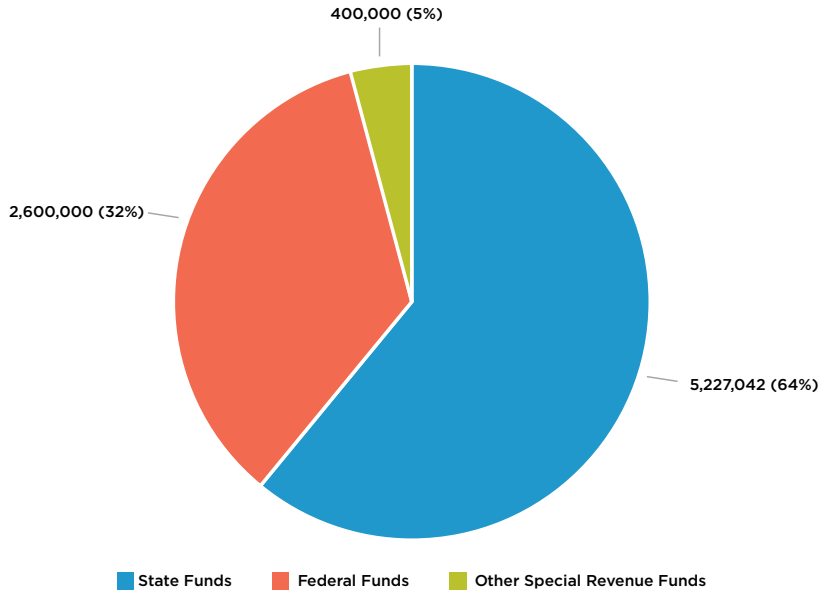


Figure 3. Division budget source summary for FY 20 (July 1, 2019 - June 30, 2020)

STATE FUNDING

LICENSE & PERMIT SALES

% FROM GENERAL FUND

SPORTSMAN'S LICENSE PLATES

State Funds

State funds include revenue generated from the sale of MDIFW licenses and permits, and contributions from the State's General Fund. Department revenues are constitutionally protected and are re-appropriated to MDIFW. While the percentage allocated to MDIFW from the General Fund can fluctuate slightly between budget cycles, the Department has typically received less than 1% (~$24 million) of Maine's General Fund dollars annually over the past decade, of which approximately $3.5 to 4.5 million/year has been allocated to the Fisheries and Hatcheries Division. An additional 0.5 million/year in state revenues was budgeted in fiscal year 2022 to address rising costs of personnel services. Agency revenues and General Fund appropriations provide essential match to leverage federal funds, particularly Dingell-Johnson funds. The Department's hatchery program is primarily funded with General Fund dollars.

Other Special Revenue Funds, Grants, and Donations

One important source of special revenue is derived from the sale and registration of sportsman's license plates. Sportsman plates ($20 annually) provide additional funds to support endangered species conservation, fish hatcheries, landowner relations, and water access. This is the only annual funding source available to maintain fish hatchery infrastructure, although other one-time funding contributions have supported more substantial infrastructure projects.

The Division also routinely applies for grants available from state and private sectors to fund special projects. This supplemental funding allows us to conduct additional work that might not otherwise be completed. The Maine Outdoor Heritage Fund is an example of one such non-federal grant source. This Fund awards profits from the sale of Maine Outdoor Heritage lottery tickets to conservation-related projects through a competitive proposal format and has helped fund important special projects such as a recent lake whitefish study and the Stream Temperature Monitoring and Modeling Network. Donations from lake associations, angling groups, and other organizations and individuals are often used to fund smaller local projects. These funds are typically reserved for the management region from which they were received and can be used on more of an ad-hoc basis for Division-supported projects that the donors are interested in or affiliated with. Donation-funded projects are great ways to get local partners involved in managing and protecting fisheries resources, and they have allowed the Division to pursue projects that wouldn't otherwise have been possible due to limited funding and/or staff time. A wonderful example is the "5 in 5" partnership with the Sebago Chapter of Trout Unlimited, where volunteers raised funds and provided support to eradicate invasive fish from five Southern Maine ponds and rebuild their native brook trout fisheries.

iii. Public Participation and Engagement

Maine's freshwater fisheries are a public resource, and the Division encourages public input.

Members of the public can bring new awareness and consideration of various interests to our decision-making process. The Division places a strong emphasis on public involvement and service, and regional staff regularly engage with the public while in the field, at meetings, and in the office.

The Importance of Public Engagement

The strong working relationships that Division staff have built with the public have earned them high approval ratings for their decision-making and the work they put in to managing Maine's freshwater fishery resources, with 85% of anglers agreeing in a 2016 survey that Maine's freshwater fishery resources are well managed (Duda 2016). This is a testament to the Division's commitment to customer service and science-based decision making backed by data collection and research.

Many initiatives advanced by the Division are direct results of local interactions with the public. These interactions build relationships and open up direct lines of communication between the public and those who manage their local fisheries. In addition to informal interactions, the Division also provides the public with more formal opportunities to weigh in on fisheries management actions, including during angler surveys, rulemaking, and various other planning- and committee-related projects.

Angler Surveys

The Division routinely uses angler opinion surveys to gauge angler satisfaction, focus management priorities, and better understand the factors that drive angler use patterns throughout Maine. Unlike in-person angler creel surveys, wherein biologists obtain biological and use information from anglers at specific waterbodies, angler opinion surveys help the Division evaluate angler attitudes on a statewide scale. Since population demographics and angler desires change over time, these surveys help us ensure that our management focus and direction align with the angling public's expectations.

The Division has historically surveyed a proportion of licensed resident and non-resident anglers once every 10 to 15 years to assess use patterns, opinions, and attitudes toward Maine's freshwater fishery resources. The first such survey published in 1981 and the most recent in 2016. Over the years, we have used various survey methods, including phone, mail, email, and in-person interviews. In 2015, we hired a professional public opinion research firm that specializes in natural resources (Responsive Management, Harrisonburg, VA).

The 2015-16 survey was survey was broad in scope, with questions on the open water and ice fishing seasons, angler satisfaction and participation, fishing regulations and access, specific species, and general attitudes towards fishing. Many of the questions replicated those of previous angler surveys, particularly our 1994 and 1999 surveys, allowing us to see how opinions have evolved. The recent survey was one of several sources used in the development of this Strategic Plan. The complete 2016 Responsive Management Angler Satisfaction Survey report can be accessed at maine.gov/ifw/docs/anglerreport_2016.pdf.

Rulemaking Participation

Several formal public participation opportunities exist within the Division's rulemaking process. The Maine Administrative Procedure Act (APA) ensures all state agencies follow the same set of procedures when adopting and implementing rules, outlining a process for public participation and transparency in agency decision-making, and this is the process the Division primarily follows when considering changes to fish- and fishing-related rules. All agency-initiated rule proposals, including the schedule of hearings and public comment periods, are advertised on MDIFW's website, and are subject to an internal peer review process wherein data and justifications are reviewed for merit.

MDIFW also utilizes the Commissioner's advisory council, made up of public appointees representing each of Maine's counties, as a channel for the public to weigh in on advertised rule proposals. The council uses a three-step process to review rule proposals and offer a final recommendation to the Commissioner. Council meetings are conducted publicly, with a portion of each meeting set aside for those in attendance to provide council members with input.

Most rule proposals are agency-initiated, but members of the public can also directly petition MDIFW for the adoption, repeal, or modification of agency rules using the formal petition process (maine.gov/sos/cec/rules/guide.html). Petitions with 150 or more validated signatures are advanced for consideration under the APA rulemaking process, with Division leadership providing direction to ensure that the rule's specific language and details are consistent with established rule and law.

Planning and Committee Work

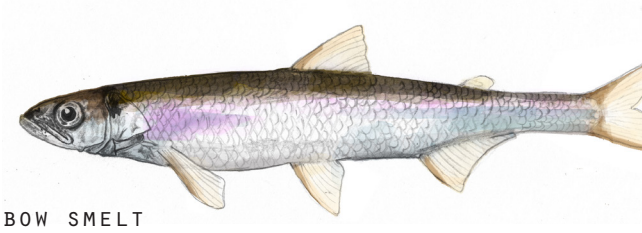
Outside of the APA rulemaking process, other opportunities for formal public engagement include review of stocking proposals and participation on stakeholder committees. Division proposals to create or terminate stocking programs are posted on MDIFW's website (maine.gov/ifw/news-events/proposed-stocking-program-changes.html) and emailed to anyone who has requested to be notified. The public has 30 days to submit comments, all of which are considered by Division leadership prior to preparing a written decision to approve, deny, modify, or condition the proposal.

Members of the public are also invited, as needed, to serve on special committees to help MDIFW navigate complex issues. These committees may include a mix of natural resource agency and non-governmental organization staff, as well as members of the public with vested interests in the topic. Examples include the technical committees formed to support elements of this plan and the stakeholder committees formed to support our water-specific management plans.

Public participation gives the Division a more complete understanding of management needs and concerns, allowing us to achieve more broadly supported outcomes than we likely would with agency input alone. With that in mind, the Division actively encouraged members of the public to participate in the 2021-2035 strategic planning process. Specific opportunities included sharing opinions and attitudes in the angler survey that informed many of the goals in Volume I, serving on the Steering Committee or one of eight Technical Workgroups, and reviewing and contributing comments during the 30-day public review period. All of these opportunities were designed to ensure that this plan appropriately captured Maine's fisheries management needs and will help to address them for the next 15 years.

III. COORDINATION & COOPERATION

The Fisheries Division does not employ trained engineers, law enforcement officers, environmental planners, or outreach specialists, but we rely on connections with all the above to successfully manage Maine's inland fisheries. We also coordinate and cooperate with numerous state, federal, and citizen-led organizations that have an interest or some other nexus with Division management programs. The Division places a strong emphasis on these internal and external partnerships, which bring needed skillsets and resources together, create efficiencies, and expand understanding and support of the work we do.



RAINBOW SMELT

i. External Partnerships

The Division coordinates with state and federal fisheries agencies to ensure that we are considering their needs and interests when advocating for our own programs. Within the state, strong working relationships between differing agencies help us all to further our missions and foster program support. And because Maine shares a border with New Hampshire, Quebec, and New Brunswick, we work closely with their state/provincial agencies to coordinate consistent management practices and fishing regulations that benefit our shared waters. Similarly, with over 3,400 miles of coastline, many of Maine's freshwater habitats are also occupied by diadromous species; and because of this overlap, MDIFW routinely coordinates with the Maine Department of Marine Resources on fishery management programs. We also regularly consult and collaborate with the U.S. Fish and Wildlife Service on shared fisheries of interest, the relicensing of hydroelectric projects, and public outreach.

MDIFW also coordinates with Maine's Native American tribes and the Maine Indian Tribal-State Commission, working with tribal biologists and representatives to ensure respective management interests are represented and outcomes are mutually supported. We also strive to align inland fishing laws on tribal trust lands with those applied throughout the rest of the state.

Other times, we align around specific species. Division staff participate on the three Atlantic salmon habitat recovery units' planning groups, and active participation by state, federal, tribal, and nongovernmental organizations on the Alewife Interaction Committee is a wonderful example of collaborative research to support restoration interests.

Many nongovernmental organizations, sporting clubs, and citizen-led groups with interests in Maine's freshwater fisheries resources are also strong supporters of Division programs. These groups often advocate for specific use opportunities, management strategies, or conservation-related concerns (though not always perfectly aligned with the broader agency perspective) and we routinely provide them opportunities to assist with special projects and represent broad public interests on committees. Their sometimes unique perspectives and resources create opportunities for meaningful partnerships on initiatives that might not otherwise be completed.

ii. Internal Partnerships

Fishing and Boating Access

The mission of MDIFW's Water Access Program is to provide fair, equitable, safe, and permanent access to Maine's public waters for fishing, boating, and associated recreational activities that will enhance the public's use and enjoyment of state waters.
Access to public waters is a fundamental part of Maine's history, identity, and culture, and was captured in the Great Ponds Act, which has existed in state statute since Maine's inception in 1820. The Great Ponds Act gives the public the right to access, by foot, all inland bodies of water greater than 10 acres in size (and dammed waterbodies over 30 acres). Great Ponds are held in trust by the state for the people of Maine. This includes the waters and submerged lands—Maine's blue parks.

The Water Access Program is a natural extension of this history and works to ensure legal, appropriate, adequate, and equitable public access to waters where recreational opportunities exist. Water Access Program priorities are strongly connected to MDIFW stocking and management programs. Waters actively managed by MDIFW for fishing and other public uses are generally a higher priority and a focus of Water Access Program acquisition and development. And since MDIFW stocks public waters to benefit the general fishing public, not just those who own shore frontage, we stock and actively manage where there are opportunities for reasonable and equitable public access and use.

The Water Access Program works closely with the regional fisheries staff and local communities to fulfill public access needs, and is staffed by two employees: a Chief Planner and a Maintenance Technician. The Planner is responsible for day-to-day operations including managing the program's budget, updating MDIFW's water access policies, selecting and prioritizing water access sites, acquiring properties, working with engineers to construct new or make significant repairs to sites, inspecting access sites, and ensuring all sites are properly maintained. The Maintenance Technician visits access sites to document their condition, perform minor repairs, and ensure the properties are functioning as intended. Major site construction is conducted by outside contractors hired through a competitive bidding process. MDIFW currently operates 154 water access sites throughout the state. The most recent angler survey (Duda 2016) indicated most anglers (91%) had no issues accessing the waters they fish. However, beyond the limitations of the Great Ponds Act, the vast majority of state waters lack permanent public access provisions that assure future access consistent with use opportunities. Of Maine's 2,309 named 10+ acre freshwater lakes and ponds, only 323 (14%) have public boating access. Currently, access to most state waters is provided by generous landowners at traditional access sites on private lands.

Funding for the Water Access Program comes from three primary sources: U.S. Fish and Wildlife Service's Sport Fish Restoration Program, the Boat Launch Facilities Fund (Maine Sportsman License Plate), and the Boating Facilities Fund (Maine Gas Tax). The program does not receive State General Fund dollars. The Water Access Program also utilizes existing competitive state funding programs to assist with land acquisition and site development. These programs include Land for Maine's Future, Maine Outdoor Heritage Fund, and the Shore and Harbor Management Fund.

MDIFW's water access sites range from large launches with parking for 50+ trailered vehicles and access for the most popular watercraft to small gravel parking areas with hand-carry access for car-top boats like canoes and kayaks. Their scale and infrastructure varies based on the size of the water, prevalence and type of watercraft used there, and fisheries present. The goal is always to provide the visiting public with equitable recreational access opportunities that are consistent with the water's characteristics.

Since the vast majority of access to Maine's waters is allowed by generous private landowners supporting traditional uses, there is considerable uncertainty around long-term public access to many waters of the state. This uncertainty creates an enormous program work list; therefore, the Water Access Program must strategically prioritize its work each year. To help focus and direct the work, the program maintains a list of priority waters for new public access and also considers the availability of suitable property, budgetary constraints, and programmatic goals.

The priority list is based on established guidelines and regularly reviewed and updated by regional fisheries staff. It focuses on waters without public access, and may not include those where some type of traditional privately owned public access exists now but may not in the future due to changing landowner needs and interests. While such sites provide critical access, they are not guaranteed to be open in perpetuity. The Water Access Program welcomes opportunities to work with landowners to ensure long-term public access to waters that provide recreational fishing, either by purchasing land or by acquiring easements.

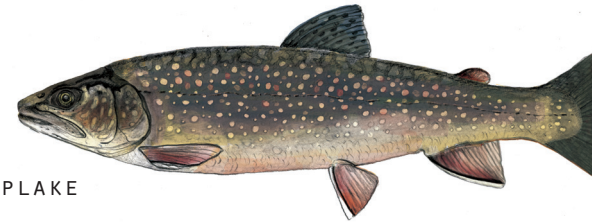
WHITE PERCH

Environmental Review

Maine's natural resources are afforded consideration and protection from various activities through several state and federal regulatory programs, including Maine's Natural Resources Protection Act, Site Location of Development Act, Maine's Endangered Species Act, 401 Water Quality Certification, Land Use Planning Commission, Shoreland Zoning, and the Federal Energy Regulatory Commission. MDIFW's Environmental Review Program coordinates with Division biologists to assess proposed development projects or activities' potential impacts on state fisheries resources and make subsequent recommendations to regulatory agencies. For perspective, in 2019 and 2020, Division staff were actively involved in varying stages of relicensing and post-licensing compliance reviews for approximately 40 hydroelectric facilities in Maine. The Environmental Review program also recently coordinated the development of a more collaborative Maine Department of Transportation road and bridge project review system, resulting in more timely planning and coordination between agencies and a stronger commitment to managing fish passage priorities.

Law Enforcement

The Maine Warden Service is responsible for enforcing Maine's fish and wildlife laws. Warden Service staff directly assist the Division by investigating potential fishing violations (with routine and special details), interpreting fishing laws, relaying resource use observations and public concerns, conducting season-long aerial angler counts, aircraft-stocking hatchery fish in remote waters, providing observations of annual smelt runs, and participating on Division committees and work groups. The Division and Warden Service also coordinate special enforcement initiatives around priority resource concerns consistent with statewide fishery management goals. Recent high-priority focus areas have included illegal fish introductions and importations and conservation of wild native salmonid populations.



SPLAKE

Public Outreach and Education

Effective communication is essential for MDIFW's Fisheries and Hatcheries Division to achieve its management goals. To cultivate awareness of and support for this Strategic Plan's goals and objectives, we will need to engage the public on the array of issues impacting the state's fisheries and waterways. The Division's public outreach and education efforts are developed to gain public recognition of, and support for, Maine's unique fisheries, their management opportunities and needs, and the variety of fishing experiences available statewide. While Division biologists regularly engage with anglers in the field and at venues including fish and game clubs, educational institutions, and natural resource focused events, MDIFW's Information and Education (I&E) Division plays an essential role in developing and implementing statewide Division outreach. I&E coordinates a strategic year-round communications schedule that reaches large audiences using a variety of traditional and emerging techniques and outlets.

Some common fishery themes supported by this work include:

- Increasing public awareness of threats posed by unauthorized/illegal fish introductions and the spread of invasive aquatic organisms and improving public compliance with laws that discourage these actions.
- Providing information on fishing opportunities and next steps to encourage angler recruitment, retention, and reactivation.
- Informing the public of the extent and value of the state's native and wild salmonid resources and other significant fisheries, and explaining the management techniques used to protect them.

The I&E Division, mindful that the tools we use to communicate are rapidly changing, and different demographic groups access information in different ways, uses the following traditional and innovative communication methods to reach anglers of varying demographics:

- **Press releases** distributed via email and posted on our website and on social media platforms.
- **Gov.Delivery emails,** sent to people who wish to receive specific information from MDIFW.
- **Blogs,** which are brief, informative articles featuring staff and their projects, posted biweekly on MDIFW's website and on Facebook and supplemented by focused press releases.
- **Facebook, Twitter, and Instagram posts,** which are short, informative posts supported by graphics that typically reach tens of thousands of users including many younger anglers.
- **How-to and next step videos, virtual public meetings, and panel discussions** where Department staff and outdoor enthusiasts share helpful tips to assist anglers of all skill levels.
- **Targeted digital media** using web data to target specific user groups.
- **Our recently redesigned website** is an essential repository for posting information and is used in conjunction with other tools.

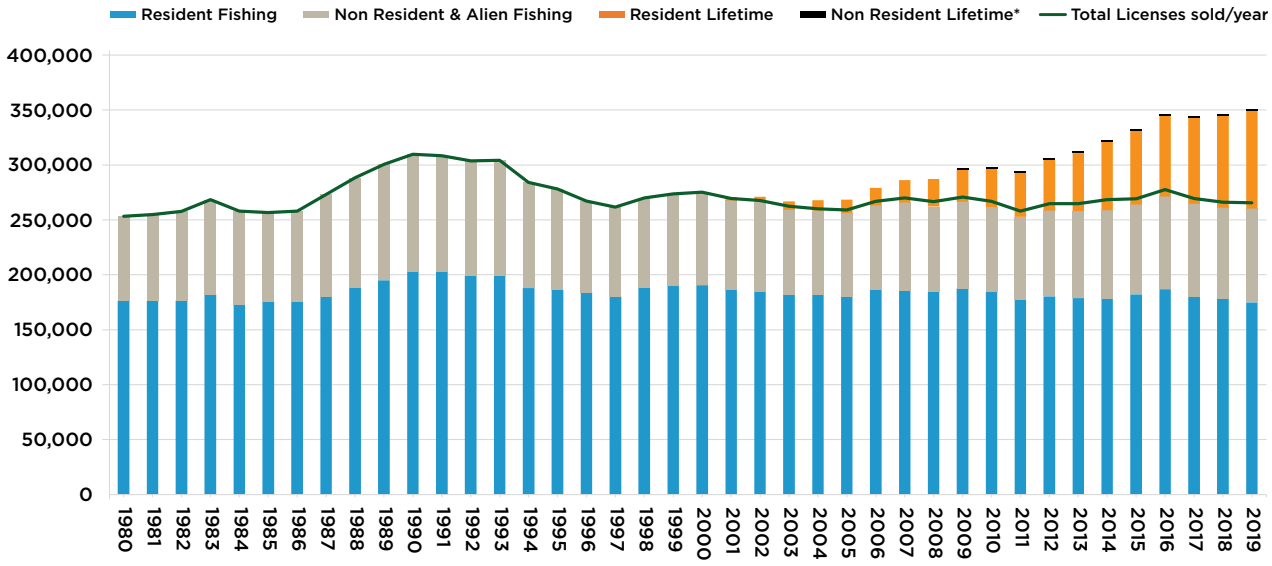
Visit mefishwildlife.com/fish to sign up for emails and find fishing resources.

The I&E Division also updates, redesigns, and reformats traditional printed publications (law book, Maine Fishing Guide, etc.) to increase ease of public use and to improve understanding. One recent effort (which will likely continue) has been the restructuring of our annual fishing law book, including creation of digital products and tools that make it easier for people to navigate and understand fishing regulations, ultimately improving compliance. Surveys indicate that most anglers now use digital media, and we only expect that proportion to increase over time.

Throughout this plan's implementation phase, we will be conducting surveys to measure changing public needs, wants, and satisfaction levels. We have strong baseline data from the public surveys conducted at the onset of the planning process; so if we see any significant changes, we will use those new insights to adapt. The methods we use to communicate have changed greatly since the last strategic plan, and we will continue to refine them as necessary to meet the changing needs of the Fisheries Division, the Department as a whole, and the public we serve.

iii. R3 Program

Following years of steady increases, Maine's annual recreational fishing license sales reached an all-time high of nearly 310,000 in 1990. After a slight decline in the 1990s, license sales been slightly increasing, with part of the increase attributable to lifetime license sales. **(Figure 4).**



**Non Resident Lifetime licenses were first available for purchase in 2009, and have accounted for <0.05% of all license sales 2009-2019.*

Figure 4. Maine Fishing License Sales 1980–2019

To further increase participation in outdoor recreation, MDIFW recently adopted a new, nationally recognized program called "Recruit, Retain, Reactivate" (hereafter R3). This program seeks to recruit new hunters and anglers, retain those that are already actively participating, and reactivate those that used to participate but no longer do so. The Maine R3 plan looks at all outdoor users as target audiences: shooters, hunters, anglers, hikers, paddlers, wildlife watchers, etc. It is MDIFW's goal to not only increase the number of outdoor participants, but also to increase public awareness of the work MDIFW does, so that people may better understand how and why the state's fish and wildlife populations are managed.

The R3 program works closely with the Bureau of Resource Management and Information and Education Division staff to develop planning and implementation goals. These goals primarily involve collaborating with partners to grow outdoor participation.

Some exploratory R3 efforts focused on fishing opportunities include:

- Placing a greater emphasis on family fishing (not just youth opportunities) by highlighting fishing opportunities within 30 miles of population centers. These efforts may also include creating new stocked fisheries near population centers where few opportunities currently exist.
- Registering and collecting contact information from individuals participating in special MDIFW and partner fishing events, such as free fishing weekend. This gives us a way to follow up with information on related events that may be of interest and keep them engaged.
- Developing how-to and where-to-go fishing tools and products for new anglers, while also supporting needs of more experienced anglers.

IV. FISH CULTURE AND HEALTH

i. Fish Culture Facilities

MDIFW currently owns and operates nine fish culture facilities located in Gray, Casco, New Gloucester, Palermo, Augusta, Embden, Enfield, Grand Lake Stream, and Phillips (Phillips facility currently serving as a back-up). All of these facilities opened between 1930 and 1959, and they represent the best of all the historically operated facilities (in 1959, MDIFW operated 15 fish culture facilities). While there have been several upgrades over the years, some components are antiquated and reaching the end of their useful life, and all the facilities would benefit from additional upgrades to increase efficiency and ensure continued production.

All of our hatcheries, whether fed by lake water, springs, or underground wells, have proven to support the production of coldwater sport fish. Today's facilities are fed by truly irreplaceable water resources, and therefore these locations warrant additional investments to maintain the quality and quantity of the water we use for fish production. This is especially true for the lake sources threatened by non-point source pollution from watershed development.

Other than the well water pumped seasonally in some hatch house operations, all facilities have simple gravity-fed systems that are economical to operate and have a low carbon footprint. Fish are grown at low to moderate densities for optimal health, quality, condition, and production. While each facility is physically independent, they are managed as an integrated, collective, interdependent system. Eggs and fish are transferred across facilities to achieve the most efficient growth and production **(Figure 5)**, and shutting down any one facility for any reason has program-wide implications.

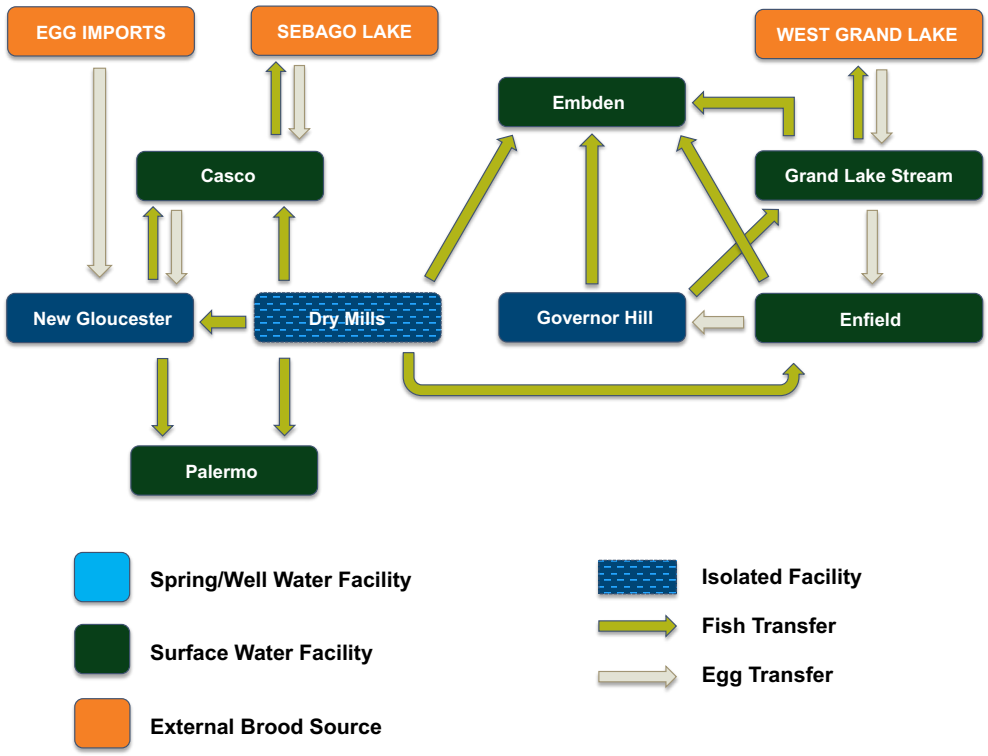


Figure 5. Illustration of the interconnected nature of MDIFW hatchery facilities

The Division's hatcheries produce and rear six fish species: brook trout, landlocked Atlantic salmon, togue, rainbow trout, brown trout, and splake. Each species serves a unique role in supplementing the state's wild fisheries resources, and as such some are stocked more frequently than others **(Table 2).** We use a variety of stocking approaches depending on the receiving water's existing fish community structure, status of the species, habitat suitability, angler use expectations, and overall management goals.

Table 2. Fish stocking summary by species (2016–2020)

SPECIES	AVERAGE # STOCKED/YEAR	% OF ALL SPECIES STOCKED
Brook Trout	614,489	70%
Brown Trout	112,550	13%
LL Atlantic Salmon	92,613	11%
Rainbow Trout	22,568	3%
Splake	28,733	3%
Togue	8,881	1%
TOTAL	**879,834**	**100%**

Note: Summary does not include fry (~300,000 fry stocked/year).

ii. Biosecurity

Biosecurity refers to all practical measures taken to prevent or reduce the risk of transmitting pathogens such as parasites, bacteria, or viruses from one group of fish to another. Maine's state-operated fish culture facilities have an excellent history of fish health testing and pathogen eradication, and consistently receive the highest possible rating (A) based on Northeast Fish Health Guidelines. This "disease-free" classification requires constant vigilance, continuous review for improvement, and continuing employee education. Most biosecurity threats cannot be seen with the naked eye. Fish (wild or cultured) may show no clinical signs of disease; but large numbers of pathogens may be present in sick or dead fish, inside or outside of eggs, in reproductive fluids, in water, on other aquatic life, and on equipment surfaces. Fish, birds, insects, and other aquatic organisms can also carry pathogens over long distances and create pathways for introductions into new waters. Division staff and visitors may also inadvertently introduce pathogens and parasites to aquaculture facilities or spread them between groups of fishes.

We have developed rigorous biosecurity practices to safeguard state fish culture facilities from these threats and to reduce the risk of pathogen introduction and spread among facilities and state waters. The specific safeguards differ by facility, taking into consideration factors like the disease susceptibility of fish, water quality, proximity to other aquaculture facilities, other fish stocks present in the facility, season, availability of quarantine facilities, and previous disease history. We reduce stress by mixing, filtering, and/or treating source water to bring it to an optimal temperature. We also manage fish densities to reduce stress while ensuring efficient use of fish feed.

iii. Fish Health Laboratory

The Department's Fish Health Lab works closely with the Superintendent of Hatcheries to develop appropriate fish health testing procedures, as well as practices and equipment to prevent pathogen introductions and transmission.

The lab was established in 1966; and in 1977, a full-time Fish Pathologist was hired to oversee it and its associated activities. A full-time lab technician position was added in 1987 to support fish health testing needs and responsibilities. By 1990, advances in technological equipment and techniques created a need for more space, prompting construction of a new laboratory near the Governor Hill Hatchery in Augusta.

A major focus of the Fish Health Laboratory is to help fisheries and hatcheries staff proactively, rather than reactively, manage our waters in a way that safeguards fish health. It is much easier and less costly to prevent disease than it is to manage it. Prevention is achieved in three ways: 1.) avoiding the introduction of new diseases, 2.) preventing the spread of existing diseases, and 3.) augmenting the ability of fish to naturally fight off disease. Stress is a known immune suppressor; and when disease is seen, it is usually associated with a stressful condition, whether it be environmental, nutritional, or physical. For that reason, within the hatchery system we are careful to create low-stress fish-rearing environments that naturally promote robust fish with disease-resistant immune systems.

The introduction of potentially harmful disease-causing pathogens into Maine's captive and wild fish populations is a recognized threat with potential long-lasting detrimental effects. The goal of MDIFW's fish health program is to prevent the introduction and spread of pathogens into and within the state, and to help better understand and reduce the impacts of

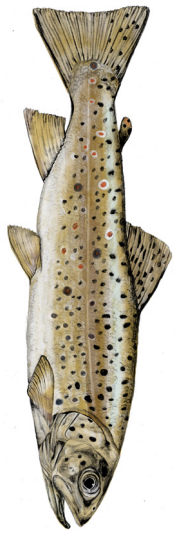
these diseases where they are present. We routinely screen hatchery and wild brood fish for certain pathogens to reduce the likelihood of their spread into new waters; and all state, federal, and private hatcheries in Maine conduct annual fish health inspections. MDIFW also oversees a permitting process through which we review all live fish or gamete imports into the state to reduce the risk of introducing pathogens. We also examine wild fish from within the state to determine and document the cause and extent of diseases.

iv. Fish Culture Operations

There is much more to operating a hatchery than simply rearing fish. Logistical demands placed on hatcheries include the need to produce fish that meet a variety of size and health requirements, and to ensure they are available for stocking at certain times of the year. Demands on the actual stocking events include the ability to use a variety of techniques (backpack, plane, stocking truck, boat, ATV, etc.) to maximize survival once released into the wild and to do so in a way that is considerate of program costs and efficiencies. To do this effectively takes a high level of coordination between facilities, staff biologists, Warden Service, and the Superintendent of Hatcheries.

Each fish culture station is managed by a Fish Culture Supervisor and one to four Fish Culturists depending upon the size and role of the facility. The Superintendent of Hatcheries provides overall direction to the Fish Culture Supervisors, including the number of fish to raise, orders for stocking, fish health programs, and operations and maintenance of the facility infrastructure. **The operation of these facilities includes:**

- Coordinating with MDIFW fisheries biologists regarding future production and stocking needs (e.g., number, size, species, strain, and stocking locations, etc.)
- Collecting eggs from wild fish
- Developing, managing, and caring for brood fish
- Incubating and hatching of eggs
- Husbandry of several coldwater fish species and strains, each with specific environmental requirements in different stages of development
- Distributing fish to waters statewide
- Cleaning, managing, and monitoring the water leaving each hatchery and maintaining the facilities that process it. Because fish produce waste, we have engineered facilities to reduce discharge of nutrients and organic material into receiving waters to levels that meet our Department of Environmental Protection license expectations



BROWN TROUT

We stock over 800 waters annually, some multiple times and at multiple locations, for a total of over 2,000 stocking events. Stocking efforts alone require over 700 workdays and over 100,000 vehicle miles each year, not including airplane stockings at over 170 locations throughout the state. We also coordinate with various sporting clubs, citizen-led groups, and private landowners for special events and access to the most suitable release sites.

Hatchery fish are raised for the purpose of stocking into the wild, so their health, condition, and behavioral characteristics are vital to the program's success. Fish culture staff provide 24-hour security to protect the interests of their facilities and prevent catastrophic fish loss. Fish must be disease-free and consistently meet very specific standards regarding their size, quality, and genetic integrity to maintain a fishery's post-stocking performance from year to year. For these reasons, the Department maintains its own captive and feral broodstock sources.

Captive brood lines are highly valued, and their development often requires a significant operational investment; but the returns on fishery management goals are worth it. Maintaining the genetic health of broodstock requires various spawning and rearing practices that promote genetic diversity. For example, striving for at least 150 paired matings of different age classes reduces genetic variability loss in captive populations. Also, secondary brood lines are held at separate facilities to breeding age, or as second-year fish where practical, to avoid a single point of failure leading to catastrophic loss of the primary brood.

The post-stocking survival and performance of hatchery fish is influenced by the health of the fish at the time of stocking. To ensure consistent performance in the wild, we make efforts in the hatchery to reduce stress, which can be caused by excessive handling, over-loading hatchery trucks (low oxygen), high rearing densities (overcrowding), low water velocities, temperature extremes, silt loads, gas supersaturation, physical disturbances such as tank cleaning, other human activities, predation (fear), and excessive light levels.

Vigilant hatchery management includes early observations of performance declines such as reduced growth rates, less favorable food conversions, or changes in behavior that may reflect reductions in general vitality and fish health or quality. We uniformly apply effective modern fish husbandry practices, including accurate record keeping, to all Division production facilities. This allows us to balance production potential and fish health in a way that supports conservation and recreational fishing opportunities with high quality fish. Further production increases within our existing hatchery infrastructure would compromise the health and stocking suitability of all the fish we produce.

Department hatcheries produce various age groups of fish, a practice that allows us to produce the least expensive product to support different management and stocking programs. Fall fingerlings, spring yearlings, and fall yearlings **(Figure 6)** compose most facilities' core age groups for stocking. We also produce other age groups for small specialty programs, and periodically stock retired brood stock when they are no longer suitable for egg production.

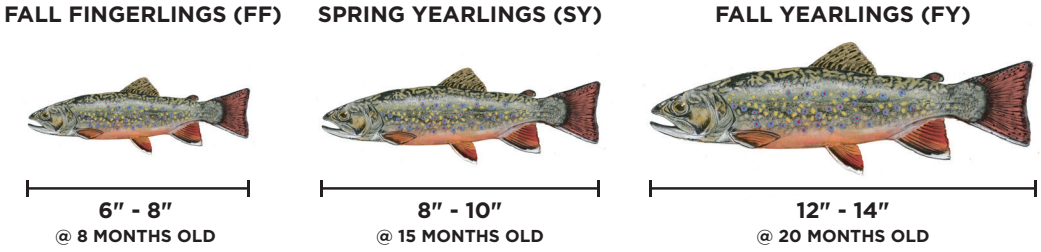


Figure 6. Standard age groups and sizes of fish stocked from Department fish culture facilities

Producing these core products at a consistent size from all facilities requires well-managed egg take operations and accelerated egg incubation using warmer water to accelerate growth. To optimize the use of space across the state's eight hatcheries and achieve the best growth for all fish, we have to make numerous egg and fish transfers between facilities. During this process, we utilize the Division's fish health testing program to ensure that all transfers meet rigorous biosecurity standards.

v. Stocking Programs

By stocking fish that meet Division size quality, health, transportation, and coordination requirements, we are able to create high-quality recreational salmonid (trout and salmon) fishing opportunities that the public wouldn't otherwise have access to. Such opportunities are important components of Maine's freshwater fisheries management program.

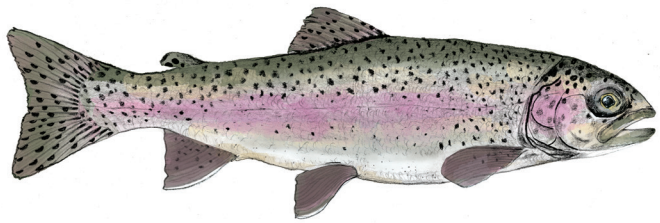
Each year, for production planning and allocation purposes, regional fisheries managers provide the Superintendent of Hatcheries with requested adjustments to ongoing programs' stocking rates. The Superintendent accounts for annual production deficits or surplus and then, based on the total requests statewide, makes the necessary adjustments to balance availability and requests. Stocking requests are managed through a database that was recently redesigned to make product requests and receipts more accessible and to improve the overall level of detail, efficiency, and user interface. The new database has also made it easier for the Division to notify the public of stocking events, with a 24-hour turnaround between when a water is stocked and when that information is published on the MDIFW website.

We stock hatchery-reared fish at different ages and sizes to support various types of management and conservation programs **(Table 3)**, generally in waters that lack the suitable spawning and nursery habitat for a wild salmonid fishery. Stocking also provides more diverse angling opportunities. Where conditions are suitable, we stock younger, less costly sub-legal-size hatchery fish and rely on the productivity of the water to grow them out to larger, more desirable sizes, ultimately creating multiage-class fisheries. Larger, more costly legal-size hatchery fish are generally reserved to provide fishing and harvest opportunity in less suitable waters that may only support cold water fish seasonally. These are waters where natural reproduction is typically nonexistent, growth and long-term survival is not expected, and the stocking provides easily accessible recreational fishing opportunities to the public.

In addition, some special propagation of wild fish to support reintroduction, restoration, and conservation of native coldwater fish has occurred within and outside of Department culture facilities. The need for wild fish propagation is expected to increase in the future, requiring not only additional capacity, but also isolation to protect domestic production from potential wild diseases and pathogens.

Table 3. Stocking approaches used to manage Maine's inland fisheries

APPROACH, INCLUDING ALTERNATIVE COMMON NAMES	GENERAL DESCRIPTION
Conservation	Stocking native fish species into waters where they may have been historically absent to preserve a population's genetic integrity. Conservation stocking creates source or "backup" populations in the event endemic populations are compromised or extirpated.
Experimental	Used to support research initiatives aimed at evaluating the success of stocking new strains, stocking different sizes, or new stocking rates. The program may then be changed, continued, or stopped, depending on results of the stocking.
Introductory	Stocking that is conducted to establish a fishery in a water in which the species was not originally present with the expectation that the species' presence will be maintained through natural reproduction. Stocking is discontinued once the species has become established or fails to establish.
Put-and-take/Catchable	Stocking legal-sized fish into waters with the expectation that they will be caught within a short amount of time. Little or no carryover from one year to the next is expected because of seasonally poor habitat.
Put-grow-and-take/ Biological/Maintenance/ Supplemental	A program of routine, continuous stocking (on various timetables) where suitable habitat for successful reproduction is limited or nonexistent, but habitat is suitable year-round for stocked fish to survive and grow. Hatchery fish are stocked at a size below the minimum length requirement with the expectation that they'll grow and eventually reach a size that meets or exceeds the minimum length requirement and be available for angler harvest.
Restoration	Stocking native fish species that were propagated in the hatchery but sourced from the wild (including game and nongame species) to repopulate and restore the ecology of waters that may have been reclaimed to remove invasive introductions.



RAINBOW TROUT

V. CONSERVATION AND MANAGEMENT OF NATIVE FISH

Freshwater fishes are among North America's most threatened taxonomic groups. Of the 65 fish species that can be found in Maine's inland waters, 47 (72%) are native and 18 (28%) are non-native **(see Tables 4 and 5).**

Most native fish in Maine need clean, clear water and unrestricted access to various aquatic habitats to survive, reproduce, move and disperse — capabilities that can be compromised by natural landscape features such as waterfalls or watershed divides, as well as man-made structures like dams, road/stream crossings, and developed shorelines. Maine's native freshwater fishes are also adapted to simple fish communities, and generally compete poorly with introduced fish, particularly non-native species whose presence can influence local distribution, abundance, and health of native fish.

As an outgrowth of the Maine Aquatic Biodiversity Project (2008), a list of Maine's native fish species that occur in freshwater was developed through professional opinion consensus. The list **(Table 4)** has continued to be refined through statewide fishery survey efforts, interagency collaboration, and the Northeast Fish and Wildlife Diversity Technical Committee. Some of these species only spend part of their life in freshwater; and although all 47 of them are native to Maine, they are not always native to the individual waters where they are present. In the case of an intentional introduction by biologists, the fish may enhance recreational and commercial use opportunities; but in the case of an unauthorized introduction, new fish often negatively impact other existing native species.

Table 3. List of Maine's native fishes found in freshwater

LIST OF MAINE'S NATIVE FISHES FOUND IN FRESHWATER		
SPECIES	SCIENTIFIC NAME	CONSERVATION STATUS
Alewife (sea-run)*	*Alosa pseudoharengus*	SGCN
American Brook Lamprey	*Lethenteron appendix*	SGCN
American Eel*	*Anguilla rostrata*	SGCN- Special Concern
American Shad*	*Alosa sapidissima*	SGCN
Arctic charr	*Salvelinus alpinus oquassa*	SGCN- Special Concern
Atlantic Salmon (landlocked and sea-run)**	*Salmo salar*	SGCN (sea-run); Endangered (Federal)
Atlantic Sturgeon*	*Acipenser oxyrhynchus*	SGCN, Threatened (Federal)
Banded Killifish	*Fundulus diaphanus*	
Blacknose Dace	*Rhinichthys atratulus*	
Blacknose Shiner	*Notropis heterolepis*	SGCN
Blueback Herring*	*Alosa aestivalis*	SGCN
Bridle Shiner	*Notropis bifrenatus*	SGCN – Special Concern
Brook Stickleback	*Culaea inconstans*	SGCN- Special Concern
Brook Trout (landlocked and sea-run)	*Salvelinus fontinalis*	SGCN (sea-run)- Special Concern
Brown Bullhead	*Ameiurus nebulosus*	
Cusk	*Lota lota*	SGCN
Chain Pickerel	*Esox niger*	
Common Shiner	*Luxilus cornutus*	
Creek Chub	*Semotilus atromaculatus*	
Creek Chubsucker	*Erimyzon oblongus*	SGCN - Special Concern
Eastern Silvery Minnow (?)	*Hybognathus regius*	SGCN
Fallfish	*Semotilus corporalis*	
Finescale Dace	*Chrosomus neogaeus*	
Fathead Minnow (?)	*Pimephales promelas*	
Fourspine Stickleback	*Apeltes quadracus*	
Golden Shiner	*Notemigonus crysoleucas*	
Lake Chub	*Couesius plumbeus*	

Continued on next page

Table 3. List of Maine's native fishes found in freshwater

LIST OF MAINE'S NATIVE FISHES FOUND IN FRESHWATER		
SPECIES	SCIENTIFIC NAME	CONSERVATION STATUS
Lake Whitefish	*Coregonus clupeaformis*	SGCN- Special Concern
Longnose Dace	*Rhinichthys cataractae*	SGCN- Special Concern
Longnose Sucker	*Catostomus catostomus*	SGCN
Mummichog	*Fundulus heteroclitus*	
Ninespine Stickleback	*Pungitius pungitius*	
Northern Redbelly Dace	*Chrosomus eos*	
Pearl Dace	*Margariscus nachtriebi*	SGCN
Pumpkinseed Sunfish	*Lepomis gibbosus*	
Rainbow Smelt (landlocked and sea-run)**	*Osmerus mordax*	SGCN (sea-run)
Redbreast Sunfish	*Lepomis auritus*	
Redfin Pickerel	*Esox americanus*	SGCN- Endangered (State)
Round Whitefish	*Prosopium cylindraceus*	SGCN
Sea Lamprey*	*Petromyzon marinus*	
Shortnose Sturgeon*	*Acipenser brevirostrum*	SGCN, Endangered (State and Federal)
Slimy Sculpin	*Cottus cognatus*	
Striped Bass*	*Morone saxatilis*	SGCN
Swamp Darter	*Etheostoma fusiforme*	SGCN- Threatened (State)
Threespine Stickleback	*Gasterosteus aculeatus*	
Togue	*Salvelinus namaycush*	SGCN
White Perch	*Morone americana*	
White Sucker	*Catostomus commersoni*	
Yellow Perch	*Perca flavescens*	

**Species managed by the Maine Department of Marine Resources (DMR)*

***Landlocked and sea-run life histories managed by MDIFW and DMR respectively*

(?) Current information is inconclusive as to whether or not this species is native to Maine

Additionally, Maine's northern latitude establishes a transition zone with some species at their upper- or lower-most range limit here. Native fishes that are found no further north than Maine include redfin pickerel, swamp darter, and American brook lamprey. Other natives that reach the southern edge of their natural range here include lake whitefish, togue, and a subspecies of landlocked Arctic charr.

The native species most often targeted by anglers — in order from most to least targeted — are brook trout, landlocked Atlantic salmon, togue, rainbow smelt, white perch, chain pickerel, yellow perch, and cusk. Maine is an angling destination because it supports some of the most abundant and highest-quality native coldwater fishery resources in the eastern U.S., including the most robust and intact populations of eastern brook trout within the species' native geographic range and the only endemic Arctic charr populations in the lower 48.

While some native fish (e.g., yellow perch, chain pickerel, white perch) are resilient and require little to no special conservation or management actions, others are more vulnerable. Coldwater species like brook trout, Arctic charr, and lake whitefish are less tolerant of ecological changes, with narrower habitat requirements and/or limited distribution. Factors that could disproportionately impact Maine's sensitive native species include climate changes influencing water temperature, new fish introductions, and barriers to fish passage. The Division places a concerted focus on the more vulnerable native coldwater fish, including employing a Native Fish Conservation Biologist to coordinate statewide conservation priorities for native resources. The Division's work programs monitor, assess, enhance, and protect native freshwater fish, while providing wise public use opportunities, like recreational fishing. These efforts ensure native fish continue to have a strong presence across the state and continue to be a part of Maine's culture, heritage, and recreation-based economy.

i. Threatened, Endangered, and Special Concern Fish Species

'Threatened' species are those at risk of becoming endangered, whereas 'Endangered' species are those at risk of becoming extinct. Maine's Threatened and Endangered species are afforded regulatory protection from the U.S. Endangered Species Act and/or the Maine Endangered Species Act. MDIFW also proactively manages at-risk fish populations identified in the State Wildlife Action Plan as Species of Greatest Conservation Need, as well as state listed Species of Special Concern, to prevent declines and the need for elevated listing.

Congress passed the U.S. Endangered Species Act (ESA) in 1973, in recognition that our rich natural heritage is of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people." It further expressed concern that many of our nation's native plants and animals were in danger of becoming extinct. Maine used the federal ESA as a model for the Maine Endangered Species Act (MESA), which was passed by the Maine Legislature in 1975 and gives the MDIFW Commissioner implementation authority. The purpose of the MESA is to provide meaningful protection to imperiled species in Maine and operate independently of the Federal ESA. Similar to the ESA, the MESA identifies species as Threatened or Endangered. Separately from the ESA and MESA, Maine has adopted a "Special Concern" designation for species that are at risk of becoming Threatened, Endangered, or even extirpated if not managed appropriately. Special concern species may be afforded special consideration associated with some in state environmental permitting. This listing criteria was pending formalization through the rulemaking process at the time of drafting this Plan.

Five of Maine's native fish species are listed under either the ESA or MESA, but only two of them (swamp darter and redfin pickerel) are obligate freshwater species, meaning that they remain in freshwater throughout their life cycle and thus are managed by MDIFW. Both of these species are listed under the MESA (not ESA), with the rationale for their state listing being their limited distribution in Maine (southern Maine is the northern extent of their natural range), historic loss of habitat, and degraded water quality. Active conservation includes specialized fishing regulations affording protections to redfin pickerel and review of proposed actions regulated by state environmental review and permitting agencies to ensure these species won't be negatively impacted.

ARCTIC CHARR

Maine's State Wildlife Action Plan (SWAP) identifies species-specific and habitat-based voluntary, non-regulatory actions (typically involving public awareness, research, stewardship, and partnerships) that can be taken to conserve priority species and help prevent further declines (MDIFW, 2015). Species listed in the SWAP are considered Species of Greatest Conservation Need (SGCN), and they include ESA and MESA Threatened and Endangered species like the aforementioned swamp darter and redfin pickerel as well as other more common species that, without continued or additional conservation, could become state/federally listed (i.e., identifies how to "keep the common species common"). Of the 40 native freshwater fishes MDIFW manages, 17 (43%) are listed as SCGN **(Table 4).** In general, these species are listed because of a lack of knowledge regarding their current abundance, population trends, and distribution.

ii. Heritage Waters

Maine has a greater distribution and abundance of lake and pond populations of native wild brook trout than any other state. In 2005, the Maine Legislature passed "An Act to Recognize and Protect the Native Eastern brook trout as Maine's Heritage Fish."

As part of this Act and its subsequent amendments, select lakes and ponds with native brook trout or Arctic charr populations that have never been stocked or have not been stocked in 25 years were compiled into a list of waters – the State Heritage Fish Waters List (SHFW) – that may not be stocked with other fishes without legislative approval. The use of live fish as bait is also prohibited in these waters to protect against new competing introductions. In 2019, MDIFW advanced broadened protections to SHFW tributaries and the vast majority of connected waters located in the North Zone by establishing a general law for the North Zone (effective Jan. 1, 2020) that prohibits the use of live fish as bait, with exceptions.

As of January 1, 2021, MDIFW has designated 583 waters as SHFW. Waters must meet the following criteria to be eligible for nomination:

- The water is a lake or pond.
- The water supports a self-sustaining population of brook trout or Arctic charr.
- The water has not been stocked with any species of fish within the past 25 years.

MDIFW reviews available stocking and resource assessment data, including newly surveyed waters and surveyed waters where the population status has changed since the last survey, on an annual basis using the following process:

1. Department fishery biologists survey waters eligible for SHFW. Based on the information collected during the survey, regional staff develop initial nomination recommendations.
2. Fisheries leadership review nomination recommendations, striving for statewide consistency in nomination advancement. Waters considered and reviewed are tracked in the Department's SHFW database, which includes justifications for waters not advanced.
3. Fisheries leadership, in consultation with the Commissioner's office, propose SHFW for advancement through the Maine Administrative Procedure Act's rulemaking process. Water names and watcodes (unique identifiers for Maine's waterbodies) are listed in the regulation packet; and waters proposed for listing are managed as discrete and separate rulemaking packets.
4. The Department prepares a required annual report to the MDIFW legislative committee, which includes the number of waters reviewed for SHFW consideration and a listing of those advanced through rulemaking.

VI. NON-NATIVE SPECIES

Non-native species are species that have moved to a new area, either of their own accord or through human intervention. **Introduced species** are non-native species that have been moved to a new area by human intervention. Not all non-native species are **invasive** or managed as invasive. For instance, typical hybrid garden roses are unlikely to spread and cause environmental harm, while the invasive Multiflora and Rugosa roses have caused ecological damage in Maine by rapidly spreading and displacing native species. Invasive species, therefore, are species that are non-native AND cause significant environmental or economic harm. In some places where habitat is no longer suitable for native fish, the Department stocks nonnative fish like brown trout and rainbow trout to enhance recreational values and fishing opportunities. These introductions are not invasive.

Aquatic invasive organisms, including non-native fish species, threaten Maine's ability to sustain thriving native fish populations (Maine's Wildlife Action Plan 2015), and are therefore of great concern. Many fish introductions took place in Maine's early colonization and settlement stocking history, before there was any awareness or understanding of the ecological consequences of introducing invasive fish species, including their tendency to compete with native species for resources or to prey directly on native fish. Such awareness was in its infancy upon the formation of the Fisheries and Hatcheries Division in the 1950s; but within the last 40 years, scientific observation and research within the Division and worldwide has raised the profile of past introductory stocking practices and increased awareness of interactions between different fish.

In response to emerging research, and with the goal of maintaining a balance between conservation and recreation, Division stocking and management practices have also evolved. Even though the presence of introduced fish species can compromise or displace native species, discussions on the topic are complicated by the popularity of sport fisheries created by such introductions.

The ecological effects of invasive fishes on Maine's native fish vary, but can be placed into two general categories: direct and indirect.

Direct effects include competing with native species for food or habitat resources or preying on native fish. Ecological competition among species, whether it involves a new invader/invasive fish or not, can be complex and outcomes certainly vary. Predation effects are often problematic when the invasive fish are large, fast growing, or have high reproductive potential relative to the native community. In Maine, we see these characteristics in muskellunge, northern pike, and smallmouth and largemouth bass. The predatory effects on native species are usually more pronounced according to the prey size preferences of the predator, so smaller-sized species or individuals tend to be disproportionally targeted or affected.

Indirect effects include facilitating the transport or establishment of pathogens, causing food web shifts, and contributing to behavioral changes that negatively affect native fish. Carp and rudd are two invasive species known to cause such indirect effects. The presence of invasive predators can also indirectly affect native fish. For highly mobile fish like brook trout, invasive predatory fish can trigger emigration from a water. Over time, this can result in range shifts or retraction of native fish species.

i. Origins of Notable Non-Native Fishes in Maine

MDIFW has documented 18 non-native freshwater fish species that are currently established in Maine **(Table 5).** There are also two species, fathead minnow and eastern silvery minnow, for which current information is inconclusive as to whether they are native to Maine. The geographic extent of aquatic habitats occupied by non-native fishes is wide. Non-native fishes are known and suspected to occur in all of Maine's large river drainages and approach a statewide distribution **(Figure 7)**. The origins of several notable non-native sport fish are outlined below.

Table 5. Non-native fish species found in freshwater habitats in Maine, current state status, and the year of first occurrence if known.

NON-NATIVE FISH SPECIES FOUND IN FRESHWATER HABITATS IN MAINE			
SPECIES	SCIENTIFIC NAME	STATE STATUS	COMMENTS; YEAR DOCUMENTED
Black Crappie	*Pomoxis nigromaculatus*	Non-Native	Introduced through stocking; 1921
Bluegill	*Lepomis macrochirus*	Non-Native	Unknown source; 2000
Brown Trout	*Salmo trutta*	Non-Native	Introduced through stocking; 1885
Common Carp	*Cyprinus carpio*	Non-Native	Introduced through stocking; 1879
Central Mudminnow	*Umbra limi*	Non-Native	Unauthorized introduction; 1999
Eastern Silvery Minnow	*Hybognathus regius*	Unknown	
Fathead Minnow	*Pimephales promelas*	Unknown	
Goldfish	*Carassius auratus*	Non-Native	Unauthorized introduction
Green Sunfish	*Lepomis cyanellus*	Non-Native	Unknown source; 2002
Largemouth Bass	*Micropterus salmoides*	Non-Native	First known stocking; 1897
Muskellunge	*Esox masquinongy*	Non-Native	Introduced through stocking (Canada); 1960s
Northern Pike	*Esox lucius*	Non-Native	Unauthorized introduction; early 1970s
Rainbow Trout	*Oncorhynchus mykiss*	Non-Native	Introduced through stocking; 1930s
Rock Bass	*Ambloplites rupestris*	Non-Native	Unknown, but likely natural migration from New Hampshire source; 2009
Rudd	*Scardinius erythrophthalmus*	Non-Native	Unknown source; 1973
Smallmouth Bass	*Micropterus dolomieu*	Non-Native	Introduced through stocking; 1868
Spottail Shiner	*Notropis hudsonius*	Non-Native	Unknown source; 1979
White Catfish	*Ameirus catus*	Non-Native	Unknown source; 1997

SMALLMOUTH BASS

Micropterus dolomieu

Smallmouth bass were initially stocked in 51 Maine waters from 1868 to 1881 through a series of authorized stockings with source fish from New York (Warner 2005). Some of these initial bass waters were managed as 'donor' waters for successive stocking and bass transfer efforts. Early in the introduction program, local officials, anglers, and game clubs were all recruited to facilitate the expansion effort and help reduce costs. An apparent lack of oversight regarding public participation in the expansion effort created considerable uncertainty regarding the number of smallmouth bass introductions that occurred. Smallmouth bass are now found in all seven fisheries management regions including 517 lakes/ponds encompassing approximately 59% of Maine's surveyed lake/pond acreage. They are most prevalent in the coastal to mid-interior portion of the state, and are actively managed (along with largemouth bass) as a sport fish in the South Zone. With a few exceptions, both species are managed as an invasive in the North Zone, where the state's native trout and salmon fisheries are most abundant.

LARGEMOUTH BASS

Micropterus salmoides

The history regarding the initial introduction of largemouth bass into Maine is not clear, but the species is believed to have entered the state incidentally in conjunction with the early importation of smallmouth bass (Jordan 2001). The first recorded introduction of largemouth bass was into Forbes Pond, Gouldsboro in 1897. Most introductions of largemouth bass early in the 1900s were conducted by Department Commissioners using bass reared at a federal hatchery, and the Department subsequently transferred bass from donor waters to additional waters as the authorized expansion effort continued. While the Department remained involved in some new largemouth introductions through the mid-1990s, increasing awareness regarding unintended consequences led the Division to exert more influence and place more restrictions on the stocking of non-native fish. Following the cessation of Department transfers, a marked expansion in range has occurred from unauthorized introductions. Like smallmouth bass, largemouth bass are now found in all seven fisheries management regions and are most prevalent in the southern and mid-coastal regions of the state. Largemouth bass are currently found in 475 lakes/ponds encompassing approximately 30% of Maine's surveyed lake/pond acreage. Both largemouth and smallmouth bass are actively managed as sport fish in the South Zone, and with a few exceptions, they are both managed as invasive in the North Zone, where the state's native trout and salmon fisheries are most abundant.

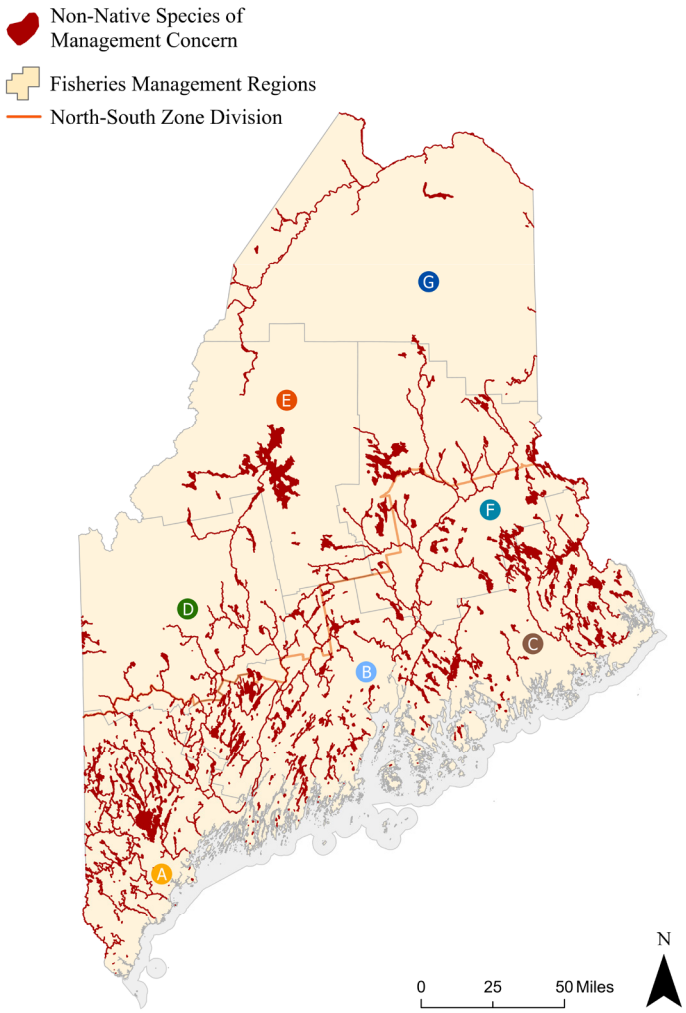


Figure 7. The extent of Maine's aquatic habitats with known and reported/unconfirmed occurrences of five non-native fish species: black crappie, largemouth bass, muskellunge, northern pike, and smallmouth bass.

NORTHERN PIKE

Esox lucius

Northern pike were first introduced through an unauthorized stocking in the early 1970s into the Belgrade Lakes Region (Brautigam and Lucas 2008). As a result of natural migration, dam removal, and unauthorized introductions, they have since spread throughout the lower Kennebec and Androscoggin drainages, among others. The most recent river drainage they colonized was the Penobscot, with pike detected in Pushaw Lake in 2003 due to an apparent unauthorized transfer. Current distribution is limited to the southern mid-coast region of the state, where they are found in 39 lakes/ponds encompassing approximately 7% of Maine's surveyed lake/pond acreage. Northern pike are managed by the Department as an invasive species statewide and are not afforded any special protections to enhance their sport fish value or their popularity, as that could encourage even more unauthorized introductions.

MUSKELLUNGE

Esox masquinongy

Muskellunge first appeared in Maine in the 1970s. These large, voracious predators were introduced into Lac Frontiere in the 1960s by the government of Quebec and soon thereafter emigrated down the St. John River into Maine. In the early 1980s, Baker Lake became the first waterbody in Maine to develop a muskellunge fishery. Additional populations have recently established in Fifth Saint John Pond, Fourth Saint John Pond, Third St John Pond, Beau Lake, and Glazier Lake. Musky are also commonly found in the St. John River, including the Northwest, Southwest, and Baker Branches, as well as the Allagash river downstream of Allagash Falls. The remote northern region of the state where musky reside also supports some of the most robust populations of wild brook trout and landlocked Atlantic salmon in the entire Northeast; but where they have established, populations of brook trout and salmon have been decimated. Muskellunge are managed by the Department as an invasive species due to their impacts on native fisheries, and are not afforded any special protections to enhance their sport fish value or their popularity, as that could encourage even more unauthorized introductions.

BLACK CRAPPIE

Pomoxis nigromaculatus

Historical accounts suggest black crappie were first stocked into a tributary of Virginia Lake (Sebago drainage) in 1921 by a camp owner. The species spread downstream to Sebago Lake, where they were first observed in 1952, and then to other waters in the drainage. In 1969 they were accidentally introduced into Sebasticook Lake and have since spread throughout the Sebasticook drainage. Their spread into the Little Ossipee drainage probably occurred in the 1960s from populations that dispersed from an introduced population in New Hampshire. Black crappie are expanding their range in Maine at an alarming rate, as a result of unauthorized deliberate transplantation. Lakes and ponds of both the Penobscot and Kennebec drainages now harbor large self-sustaining populations (Lucas 2002). Black crappie are not actively managed as a sport fish, though they are prevalent throughout the southern and mid-coast region of the state where they can be found in 101 waters encompassing approximately 10% of Maine's surveyed lake and pond acreage.

COMMON CARP

Cyprinus carpio

Common carp were first introduced into the Unites States in 1877 from Europe where they were raised in small ponds and harvested for food. Many immigrants were familiar with the cultivation of carp and were eager to bring them to the "New World," so the U.S. Fish Commission initiated a program to cultivate carp in the U.S. Private citizens applied to the Commission for these fish, which were then distributed to applicants throughout the Eastern States. The first carp introductions in Maine happened in 1879, with several dozen more stockings into privately owned ponds occurring between 1879 and 1896. Historical records indicate that between 1886 and 1887, 1,250 carp were distributed to 61 applicants in 15 of Maine's 16 counties. The carp populations in the tidal waters of the Scarborough and Kennebec Rivers probably resulted from escapes from these small private ponds. Little information is available on introductions of carp into the state's Great Ponds. It is known that Green Lake in Hancock County was stocked, and it is believed that Halfmoon Pond in Waldo County was also stocked, but these stockings failed to establish self-sustaining populations. In fact, most carp introductions in Maine appear to have been unsuccessful (Lucas 2002), but they are well established in the lower Androscoggin and Kennebec rivers and are managed as an invasive fish.

ii. Current Status and Trends of Non-native Fishes in Maine

The Division of Fisheries and Hatcheries started tracking the progression of non-native species occurrence reports in 2006. In the 15 years since this program was established, 173 new species occurrences have been confirmed, with largemouth bass, smallmouth bass, northern pike, and black crappie continuing to appear the most frequently in new waters **(Table 6)**. Reports of new species occurrences, whether confirmed or unconfirmed, appear to be declining **(Figure 8)**, but it is important to note that these are reports of occurrences, and since many are unconfirmed, they may not accurately reflect true species assemblage changes over time.

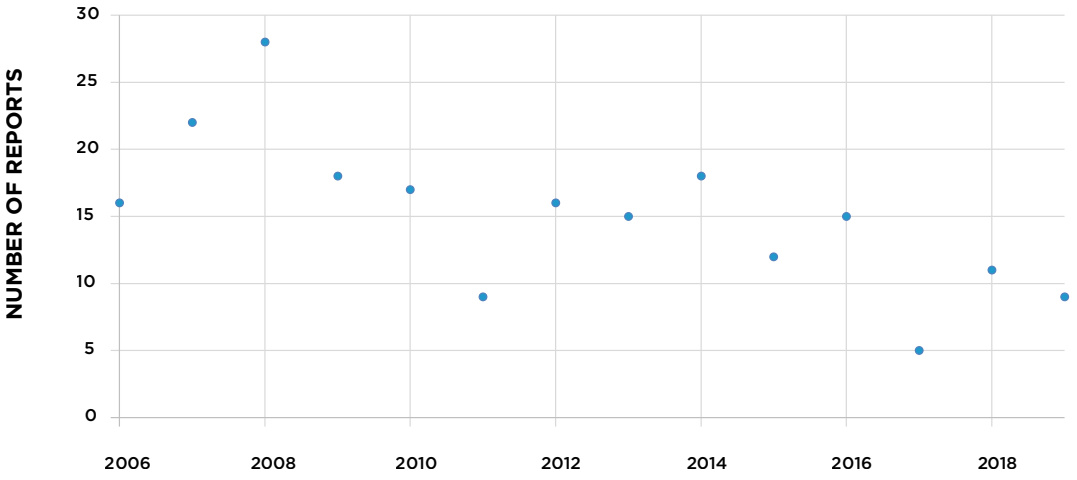


Figure 8. Reports of new species occurrences, both confirmed and unconfirmed, in Maine waterbodies by year (2006–2019).

Table 6. Species reported (confirmed or unconfirmed) and number of reports 2006–2019.

SPECIES	NO. REPORTS	SPECIES	NO. REPORTS
Alewife (landlocked)	6	Muskellunge	5
Banded Killifish	2	Northern Pike	24
Black Crappie	40	Northern Redbelly Dace	1
Bluegill	10	Pumpkinseed	5
Brown Bullhead	2	Rainbow Smelt	9
Carp/Koi	2	Rainbow Trout	1
Central Mudminnow	1	Rock Bass	2
Chain Pickerel	8	Smallmouth Bass	17
Creek Chub	1	Togue	1
Cusk	3	Walleye	3
Fathead Minnow	4	White Catfish	1
Golden Shiner	13	White Perch	2
Green Sunfish	1	White Sucker	3
Lake Chub	2	Yellow Perch	2
Largemouth Bass	52		

iii. Prevention Strategies

Many aspects of the Division's policies, programs, regulations, and outreach efforts are directed toward preventing unauthorized species introductions. Ultimately, nearly every piece of this multi-pronged approach relies heavily on public trust, as it only takes a single introduction event to significantly affect and potentially lead to permanent changes within freshwater ecosystems. Several examples of the Division's prevention strategies are outlined below.

Fish and Wildlife in Captivity

Maine's laws regarding the possession of fish and wildlife are in place to protect the interests of fish, wildlife, the public, and our natural resources; and they are some of the strictest such laws in the country.

Maine law allows MDIFW to maintain a list of fish and wildlife species (Unrestricted List) that do not require an importation, exhibition, or possession permit, and may be sold by commercial pet shops. Species listed on the Unrestricted List have been vetted by the Department to ensure they will not negatively impact native flora and fauna if released into the wild (it is still illegal to release any unrestricted species into the wild).

Fishing Regulations

Maine's fishing regulations strive to balance environmental conservation with responsible recreation, and they include:

- Up to a $10,000 fine for a conviction of illegal stocking
- No dumping unused baitfish into any waterway in the state
- No importation of baitfish into Maine
- No using live fish as bait as the General Law for all waters in the North Zone

Private Pond Stocking Permits

It is illegal to stock a private pond in Maine without a permit.

The permitting process includes a review of the site and species to ensure the stocking will not impact native fishery resources or expand the range of nonnative fish (see Private Pond Stocking Permit).

Fish Health Lab

Staff at the Division's Fish Health Lab sample hatchery fish prior to release to ensure they're disease-free, and also monitor wild fish populations for disease.

The Fish Pathologist and Hatchery Superintendent also review and issue fish importation permits (it is illegal to import live fish into Maine without a permit) to prevent introductions of new fish and pathogens into the state (see Fish Importation Permits).

Bass Tournament permits

Since 2020, all bass clubs have been required to participate in standardized training on aquatic plant and live-well inspection, and all tournament related inspections must be performed by individuals that have received this training.

Coordination with other agencies and programs

Some of the organizations we work closely with include the Maine Department of Environmental Protection's Invasive Aquatic Species Program; Maine Department of Agriculture, Conservation and Forestry's Pet/plant inspection and captive cervid programs; Maine Forest Service's Forest Health and Monitoring Program; and the U.S. Department of Agriculture's Animal and Plant Health Inspection Service.
MDIFW is also a member of the Northeast Wildlife Disease Cooperative, which helps to maintain regional awareness of and readiness for emerging diseases across the northeastern U.S.

Outreach

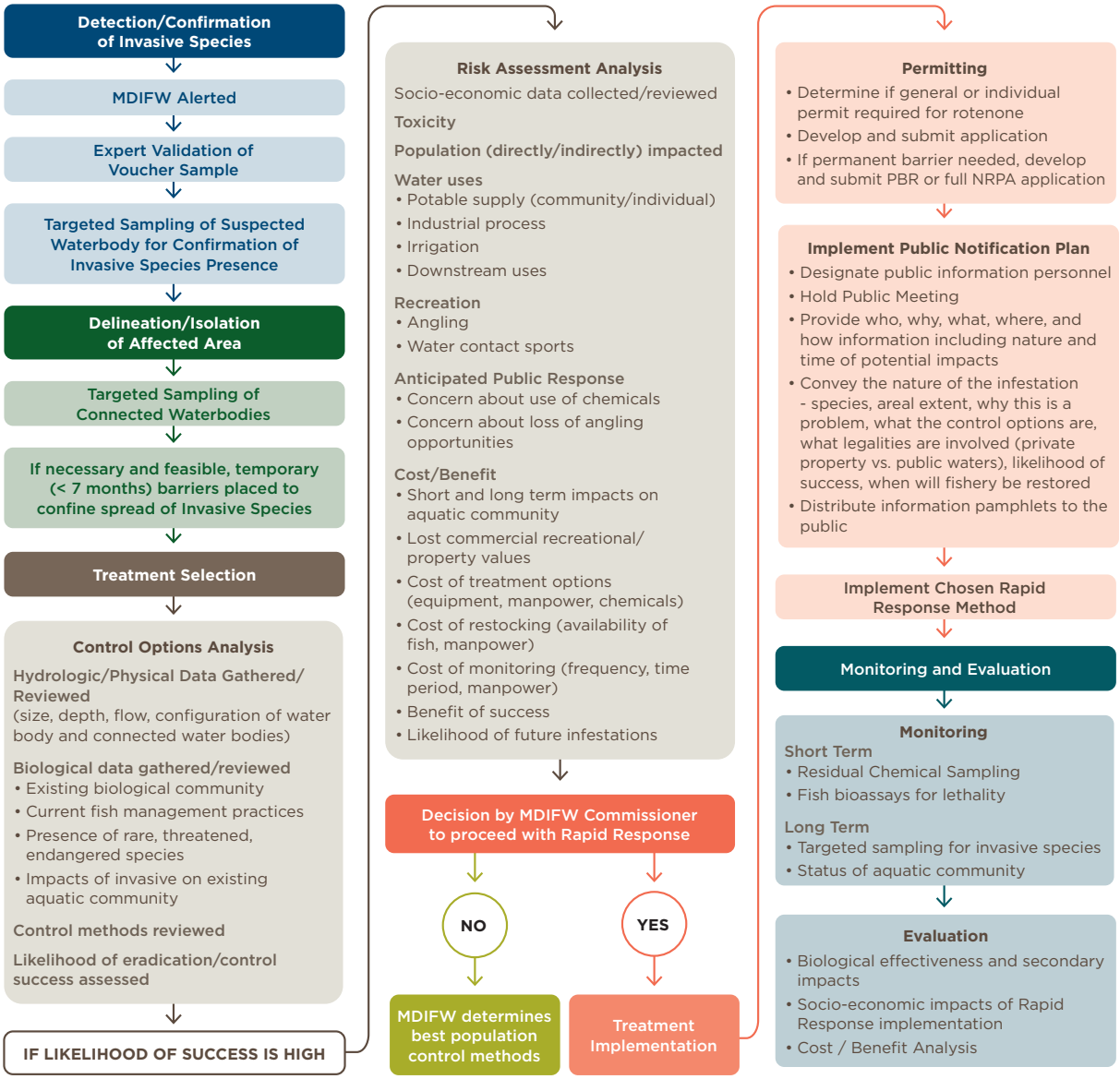
Trouble by the Bucketful signs displayed throughout the state to educate the public on the negative impacts of unauthorized fish stocking/dumping on the state's waterways.

- Emails, social media posts, and print materials created by the MDIFW's Information & Education Division to remind Maine's anglers of the consequences of unauthorized introductions.
- Staff presentations and opportunistic conversations with anglers.

iv. Response to Introduction or Invasion

Maine's Action Plan for Managing Invasive Aquatic Species (2002) outlines a process for state agency response to invasive or nuisance introductions. Per the plan, the Maine Department of Environmental Protection responds to new plant invasions and MDIFW's Division of Fisheries & Hatcheries responds to unauthorized fish introductions. Early detection and rapid response are the primary tools we use to combat new introductions (MDIFW 2006). Once we have confirmed the presence of a new species, we follow a set protocol to assess the invasion's species effects and probable extent, and to determine our agency response **(Figure 9)**. Response options include population monitoring, population suppression, and eradication by chemical treatment. When deciding on a response option, we generally consider the resource risks, costs, and possibility of success.

Figure 9. Rapid response protocol for invasive aquatic fish and other fauna



Population Monitoring

The ecological effects of non-native fish are not all equal; and in some cases our only response is to monitor the population to assess its long-term response and inform adaptive recovery options, which may include regulation changes, stocking needs/changes, and other measures based on risks and resource impacts.

We may take this approach when the effects of a new invader are minimal or negligible, or when more invasive or aggressive procedures are not viable. Population monitoring can take the form of routinely sampling fish communities in individual waterbodies, tracking recreational harvest and catch in sport fisheries, tracking population changes over time, mapping species distribution or expansion within river networks, or using emerging techniques like eDNA, which measures species-specific DNA shed into the environment. The Division monitors many of the most concerning non-native species occurrences as a part of scheduled field sampling.

Population Suppression

Fish populations can be suppressed by altering the suitability of their habitat and/or by reducing their reproductive success. While population suppression may involve a combination of actions, the overall goal is to minimize the geographic extent of the invasion and its ecological effects on resident and native species in a sustained manner over time. Actions to that effect may include actively removing the invasive fish with nets or traps; constructing barriers to limit range expansion; augmenting flow or manipulating the habitat to the detriment of the invasive species while improving conditions for native species; or controlling the species' biology by manipulating food web dynamics, disease response, or reproductive behavior or success. If such suppression techniques require a regular commitment of time and resources after their initial implementation, they may not be sustainable. Some suppression measures including flow augmentation (as conducted at Rapid River) and fish barriers (as constructed at Brown's Mills) require low investments after initial construction/implementation and provide long term, cost effective suppression.

NORTHERN PIKE

A rule of thumb for limiting the success of non-native introductions is, put simply, to make conditions more suitable for the desirable resource and less suitable for the invader. Hence, response strategies often involve habitat alterations that support containment or suppression. Examples include construction of fish passage barriers to contain an invasive species, removal of barriers to return an impounded system back to more natural or free-flowing riverine condition, flow alterations to optimize and minimize habitat suitability, and construction or removal of physical habitat features to favor the desired resource.

All of these habitat actions require a firm understanding, often gained through a comprehensive risk analysis, of the life history and habitat requirements of all species within the project area and the potential positive and negative impacts on them. This helps us to identify likely outcomes and respond with a course of action. For highly valued native species, especially highly mobile riverine species such as brook trout, a primary conservation strategy is to expand and reconnect river networks through fish passage enhancement or barrier removal; however, this action may expand the range (and, therefore, the potential threats) of introduced fish. Thus, these actions require thorough planning and consideration of unintended consequences.

While suppression does not result in eradication, has highly variable success rates, and is not usually cost-effective to maintain in perpetuity, it can reduce negative impacts and expansion potential while we work to develop more long-term or permanent eradication or control strategies. That said, in cases where invasive species control is a priority and chemical reclamation is not feasible, it may be the only option; and like weeding a garden, suppression may resemble a sustained management action.

Chemical Reclamation

When other removal or control methods are not viable or cost-effective, and when siting and logistical considerations are favorable, fisheries biologists can use a method called chemical reclamation to eliminate competitor species. In this process, a biodegradable product called Rotenone is applied to the waterbody to kill all fish that are present. MDIFW manages a team of specifically trained staff to perform this regulated and highly technical treatment process. Since the 1950s, this team has performed over 200 reclamations to eradicate a variety of invasive species.

Rotenone is a substance found in certain South American bean plants that indigenous tribes have used for centuries to harvest fish as food. Rotenone is highly toxic to fish and some other gill-breathing organisms because it enters the blood stream directly through the gills and acts by disrupting uptake of oxygen. It is relatively harmless to wildlife such as birds, furbearers, reptiles, and adult amphibians because when ingested (whether through drinking treated water or feeding on dead fish) the rotenone compound is readily broken down by stomach enzymes. Rotenone breaks down quickly in the environment and leaves no persistent toxic residues. The breakdown occurs so quickly that biologists must treat the entire water body and any connected tributaries within a 48-hour period. Failure to do so may result in "refuge areas" where the product has degraded to a level that is no longer toxic and some fish are able to survive.

Not all waters are candidates for chemical reclamation, and selected waters are chosen with careful consideration of several factors.
These include:

- Threat level in the water and drainage
- Threat level to native fish
- Threat level to managing a native sport fishery
- Physical characteristics of the water and headwaters to be treated (e.g., water size, presence of tributaries and other refuge, presence of wetlands and rooted aquatic vegetation, access for equipment and product)
- Cost of an effective treatment

We develop treatment projects through an internal review, planning, and a detailed public outreach process consistent with the American Fisheries Society's Planning and Standard Operating Procedures for the Use of Rotenone in Fish Management: Rotenone SOP Manual (Finlayson et al. 2018). After a need has been determined, the Division conducts an initial internal review of the project to determine logistical feasibility and the details of the treatment itself. Subsequent planning typically involves some level of modeling, monitoring plans, staff safety plans, contingency planning, and collaboration with landowners and other project partners. The Division conducts these treatments under a permit process issued by the Maine Department of Environmental Protection, which allows for and encourages public comment on the project, and all biologists involved are licensed through the Maine Board of Pesticides Control.

VII. DATA COLLECTION AND ANALYSIS

The duties of Fisheries Section staff are quite diverse, but collection and analysis of biological data remains one of the most important. These data advance a strong foundation of science-based recommendations needed to effectively manage fish populations and the fisheries they create, while also conserving Maine's diverse range of native species.

We collect data to:

- Evaluate the status of, and detect any changes in, fish populations including Species of Greatest Conservation Need
- Assess effectiveness of regulations and stocking programs
- Determine angler use, success, and changes in preferences and behaviors
- Investigate changes in the environment
- Understand public attitudes and desires

We use this information to guide MDIFW decisions around conservation and sport fishery enhancement, and we also share it with other agencies, conservation partners, and the public.

Data Collection Priorities

Maine has a wealth of water resources providing virtually unlimited fishing opportunities; but with a limited staff, we need to prioritize how frequently we collect data on each water body.

We survey many of the state's largest and most important waters on a routine basis. For decades, we have conducted annual studies on landlocked Atlantic salmon in Sebago Lake and West Grand Lake to monitor changes in growth. We typically survey other remote waters, like those in the Allagash Wilderness Waterway, less frequently, and sample other smaller waters more opportunistically, or when specific issues arise that warrant investigation.

Staff also heavily rely on emerging information provided by the public, either out in the field (such as while conducting creel surveys) or through other communications. Often, this is how we first hear about new fish introductions, changes in sport fisheries, and other things that may have emerged since we last sampled a particular waterbody.

Putting the Data to Work

In many cases, we collect data over time to monitor trends and evaluate the relative status of a fishery or population. After analyzing the data and comparing it to historical data (if available), regional staff develop management recommendations and work closely with the Management Section Supervisor to write well thought out annual and quarterly work plans that:

- Address local public concerns
- Strongly reflect Department planning priorities
- Can accommodate unanticipated urgent needs, like responding to a new infestation that threatens an important fishery

In most instances, waters that are routinely monitored or sampled are more actively managed to achieve some level of fish quality and angler success, and those supported by a formal management plan may have very specific fishery attribute objectives.

If a fishery is not meeting objectives, there are several options to consider. For example, if fish condition is unhealthy or declining in a stocked fishery, Division staff may elect to reduce the stocking rate. Or if we observed the same problem in a wild population, we may adopt a regulation change giving anglers the opportunity to harvest more fish.

Sharing the Data

Biologists routinely share data and provide updates to local angling groups and other interested parties. This helps increase public awareness and support for recommended management changes and allows us to solicit feedback. The Division also publishes special project reports on the MDIFW website.

i. Fish Data

Winter and open water angler surveys provide excellent opportunities to collect length and weight data, scales for aging, and stomach contents to assess prey availability. They are also our best source of data related to angler success. But to assess the overall health of fish populations, biologists also directly sample fish throughout the open-water season using nets, traps, and other sampling gear. These methods are often more efficient and require less effort than angler surveys; and because sampling equipment is standardized and not limited to legal-sized fish, direct sampling provides better, less biased information on fish health and population structure.

Biologists use different techniques depending on the time of year, conditions, water type (flowing water or lake/pond), and sampling objectives **(Table 7).** The toolbox of sampling methods is extensive and has been refined and built out over time.

Table 7. Gears frequently used to sample fish in Maine

GEARS FREQUENTLY USED TO SAMPLE FISH IN MAINE		
GEAR AND COMMON APPLICATION IN MAINE	PROS	CONS
Trap net – Passive gear used to sample fish when they're close to shore in the spring and fall. Trap nets are stationary nets that extend from the shore–nearshore and guide fish into a collection area where they are free to swim until removed for biological sampling.	• Non-lethal • Captures a variety of species and sizes of fish • Good sites tend to perform well between years • Efficient method to sample fish for mark & recapture • Gear is easy to maintain	• Only effective when fish are nearshore • Gear is heavy and takes a lot of effort to deploy • Poor site selection can significantly alter results • Otters can enter trap and harm or kill captured fish • Fish may develop trap avoidance behaviors after initial/repeated captures • May take 1-3 weeks to collect an adequate sample
Gillnet – Passive gear used to nhsample fish in the pelagic zone as they swim freely throughout the water column. Gillnets are long nets, closely resembling tennis nets, with a variety of mesh sizes. They are suspended at specific locations and depths where the targeted species are most likely to occur, and capture fish as they try to swim through nhthe net.	• Captures a variety of species and sizes of fish • Allows biologists to collect additional biological information (with lethal sampling) • Nets can be positioned throughout the water column • Efficient method to sample fish for mark & recapture • Gear is easy to maintain	• May be lethal to fish, though tending strategy can be modified to limit mortality when it is a concern • Can result in significant numbers of bycatch • Net mesh is prone to tears. If torn, it must be mended or replaced for effective use

GEARS FREQUENTLY USED TO SAMPLE FISH IN MAINE		
GEAR AND COMMON APPLICATION IN MAINE	PROS	CONS
Boat/raft electrofishing – Active gear used to sample fish in nearshore environments and flowing waters that are non-wadeable. Electrofishing boats/rafts use a generator to create an electric field in front of the boat which temporarily impairs fish so they can be netted by biologists.	• Non-lethal • Captures a variety of species and sizes of fish • Efficient at sampling a large area in a short amount of time • Highly mobile • Efficient method to sample fish for mark & recapture population estimates	• Not effective for sampling fish in deep or shallow water without additional modifications • High startup cost (~$35,000-$60,000 depending on options) • Capture requires netting impaired fish which can be challenging • Must plan collections to guard against bias towards sampling larger fish • Electrical energy created can cause bodily harm to operator(s) (use of safety equipment and protocols are essential)
Backpack electrofishing – Active gear used to sample fish in depths up to waist high, including flowing water and shallow areas of lakes and ponds. Backpack electrofishing units are carried like normal backpacks and include a wand (anode) and trailing cable (cathode) that create a narrow electric field in front of the operator which temporarily impairs fish so they can be netted by biologists.	• Non-lethal • Captures a variety of species and sizes of fish • Sampling can be repeated at a given site within the same day to develop an abundance estimate • Relatively easy to transport • High capture efficiency	• Only effective in shallower water • Biased toward sampling larger fish • Range is only several feet, so wide sampling areas require multiple backpack units • Each unit costs ~5-10k depending on options • Capture requires netting impaired fish which can be challenging • Electrical energy created can cause bodily harm, to operator(s) (use of safety equipment and protocols are essential) • Uses battery power (no battery = no sampling)
Experimental angling – Active gear used to sample fish in a variety of habitats. Often used to sample fish in remote waters that are difficult to get traditional gear types into and/or where other gear is less efficient (e.g., sampling bass when they're guarding nests). Fly/spinning rod and reels may be used depending on habitat and species targeted.	• Non-lethal • Minimal amount of gear needed for effective sampling • Can target specific species/individuals • Can generate catch rates that are analogous to those of anglers • Effective technique for assessing large river fisheries	• Catch can be biased toward larger individuals and/or specific sexes based on spawning behaviors • Requires a skilled angler to be successful • Fish are not always willing to bite

GEARS FREQUENTLY USED TO SAMPLE FISH IN MAINE		
GEAR AND COMMON APPLICATION IN MAINE	PROS	CONS
Picket weir - Passive gear used to capture fish in flowing waters, typically as they migrate upstream to spawn. A fence-like structure is assembled across the channel to stop fish from passing upstream and a trap box is placed along the fence, where there's sufficient attraction flow, so that fish naturally move into the trap box.	• Non-lethal • Captures a variety of species • High capture efficiency • Provides a near complete count of the number of spawning individuals	• Significant amount of time and staff required for installation, tending, maintenance, and removal • Prone to damage during high water events • Often hard to find an appropriate site for a weir to function properly • Does not capture small fish • Otters can enter trap and harm or kill captured fish
Beach seine – Active gear used to capture fish close to shore in flowing waters (where there's minimal flow) and lakes and ponds. Seines are long nets that hang vertically in the water and are pulled at each end to surround fish within a given area.	• Non-lethal • Captures a variety of species • High capture efficiency, particularly for small fishes • Easy to transport	• Large seins can be hard to drag through the water, especially when the substrate is soft (loose footing) • Large fish can avoid capture by swimming around net before it closes • Net mesh is prone to tears which must be mended for effective use • Vegetation, rocks, logs, etc. can get in the way and allow fish to easily escape before net is closed
Minnow Trap – Passive gear that is used to capture small fish in flowing waters (where there's minimal flow) and lakes and ponds. These galvanized steel traps are relatively small (< 20" long), consisting of two halves that can be disconnected and nested together for easy transport. Bait such as dog food is used to attract fish, which enter the trap through a ~1" funnel-like opening on either end of the trap.	• Non-lethal • Captures a variety of species • Samples small-bodied fish that are missed by other gears • Quick to deploy and tend • Easy to transport • Low-cost (< $20 per trap)	• Only samples small-bodied fish • Can only sample a small portion of available habitat • Difficult to associate catch rates with population abundance; data are most often used to confirm presence only

ii. Angler Data

Biologists use angler-sourced data in conjunction with other data to develop management recommendations. In fact, angler-sourced data is often the first cue to biologists that a fishery needs additional attention. Angler surveys are time consuming to conduct, so we can only survey anglers on a limited number of waters each year; but we also recruit anglers to voluntarily collect and submit their fishing data through citizen science programs. We manage these records collectively to track water-specific performance over time.

Direct Angler Surveys

Most of the data from angler interactions is collected during the ice fishing season when biologists interview anglers on the ice during creel surveys. Biologists use the information that anglers provide on number of fish caught and number of hours fished to calculate catch rates. By combining that information with total angler use estimates (from aerial or ground angler counts), we are able to develop season-long catch and harvest estimates. Anglers are also interviewed during the open water season, but on a more limited basis in part because of other competing field work and also because the open water fishing season is much longer, so surveys would carry a higher staff commitment.

Citizen Science Submissions

Personal Fishing Logbooks

Each regional office manages a Personal Fishing Logbook Program. Volunteer anglers record when and where they fished, and how many fish they landed and harvested. These data are used to assess potential changes in fisheries that the Department might not otherwise be focused on monitoring. This program effectively expands the Department's capacity to monitor more waters statewide.

Kiosk Boxes

To collect additional information from anglers, the Department installs angler kiosks or "boxes" at certain waters near parking areas and trailheads. Anglers can voluntarily fill out a survey card related to their fishing success and place it in the box to be collected by our biologists later.

iii. Water Quality Data

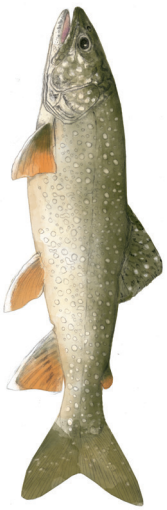
The chemical and physical properties of water often dictate what fish are present and where within a waterbody they are located. This is particularly true for coldwater fish during the summer months. To maximize our chances of collecting a target species, we will often sample the water first and use those data to inform the choice and placement of fish sampling equipment.

Biologists use specialized equipment to measure dissolved oxygen and temperature throughout the water column, which can help us assess habitat suitability for different species of fish. We also typically collect pH, conductivity, alkalinity, and Secchi depth readings to glean additional water quality information which can be tracked over time and indicate larger, landscape-level habitat suitability factors. For example, a trend of warmer summer water temperatures in a brook trout stream may indicate less coldwater input from groundwater. This shift in the face of climate change would suggest reduced future capacity to support wild brook trout year-round.

We also routinely measure water depth when sampling fish populations. By collecting depths throughout the waterbody, we can identify areas that certain fish species are most likely to inhabit, and where sampling gear will be most effective. This information also helps us assess the waterbody's carrying capacity and management potential.

iv. Habitat Surveys

Fish have evolved to occupy a wide variety of habitats, though each species requires specific habitat characteristics to successfully complete its life history requirements. A specialist species like Arctic charr requires the deep, well-oxygenated coldwater habitat provided by Maine's 14 Arctic charr waters; whereas a generalist species like golden shiner has broader tolerances and can be found in a variety of waters. Aquatic habitat surveys help fisheries biologists assess habitat suitability for species that may occur or be introduced within a waterbody as well as where and when those species are most likely to be encountered. The intensity of a habitat survey depends on its objective. For example, a survey of degraded habitat to inform a stream habitat restoration project would be much more involved than a survey to determine the average depth of a small pond.



TOGUE

MDIFW biologists conduct habitat surveys in actively managed waters, including sites that are part of long-term monitoring programs. Because most naturally formed aquatic habitats are relatively static, initial survey data can often be used for several decades before any updates are needed. A standard MDIFW lake or pond habitat survey involves measuring depths throughout the waterbody, characterizing the condition of the outlet and inlet(s), identifying potential spawning and nursery habitat, identifying springs and seeps, assessing shoreline development, and classifying substrates. Within flowing waters, habitat survey methods include measurements of flow, stream width, depth, and substrate, classification of spawning substrates, and a general assessment of the riparian zone.

v. Monitoring and Research

Larger lakes supporting popular coldwater fisheries are typically monitored on a set schedule. Monitoring may include collection of angler data, fish data, physical habitat data, and water quality data. These high-use sport fisheries require more intensive management, rigorous monitoring, timely management adjustments, and often, responsive stocking and regulation changes to correct unfavorable conditions.

After taking corrective management actions, we follow up with evaluations to assess effectiveness. Regulation changes may need to be in effect for many years before we can detect a change in the fishery, while stocking changes (for most species, excluding the long-lived togue) can yield improvements in less time. In either case, biologists must monitor the fishery to determine if the management change resulted in the desired effect.

Sometimes the changes occurring within fisheries cannot be explained through routine monitoring data and require additional targeted research and analysis. While the Division no longer has a research group (dissolved in 2010), fisheries staff do still periodically conduct general research to address information gaps on specific waters or among several populations of the same species. In some cases, we hire temporary staff to assist with the data collection. Formal research is typically facilitated thorough the University of Maine, including the US Geological Survey's Maine Cooperative Fish and Wildlife Research Unit ("Coop").

The Department maintains a cooperative agreement with the Coop and provides partial funding to support its research program, as well as additional project funding for MDIFW research, either conducted by the Coop or through other University programs. The Coop provides the Bureau of Resource Management with technical expertise, staff training, and at times, grant funding for research.

vi. Water-specific Planning

MDIFW is responsible for managing of over 6,000 lakes and ponds and more than 32,000 miles of flowing water. While many similarities may exist between these resources, each has unique characteristics that influence species composition, angling pressure and success, access, water quality, and management opportunities.

Fisheries biologists in each of Maine's seven fisheries management regions focus more of their resources on popular, higher-use recreational fisheries that require regular monitoring data to attain management objectives and meet angler expectations. These more intensively managed popular fisheries are also not surprisingly subject to more public scrutiny and are viewed as 'regional priority waters.' Maine's fisheries biologists spend a lot of time collecting data from priority waters so that we can develop data-driven management objectives for them.

For some priority waters, including Moosehead Lake, we have developed publicly supported comprehensive management plans that identify priorities and ground decision making, including requests from the public. This approach has proven extremely effective for decades. However, management objectives for other priority waters have been developed internally, with little organized public input, and are not well documented. In general, biologists strive to balance overall fish health (quality fish) with abundance (reasonable catch rates). While perhaps biologically sound, the lack of public input and awareness involved in this approach creates accountability concerns in places where there's a high level of public interest and/or where competing user groups exist.

Expanding Public Involvement

One component of this strategic planning process is to develop more robust, transparent, publicly supported management plans for priority waters statewide. By involving the public in the planning process, we can ensure that stakeholder opinions and interests are considered within the overall management approach, and we can improve the public's understanding of and investment in the outcome.

Water-specific management plans will contain measurable, realistic/attainable objectives based on recent and historical data (e.g., catch rates, size quality) that can be routinely assessed over time using standardized sampling approaches, considerate of logistical constraints. The Division will work to ensure any future management actions (including those proposed by the public) are consistent with these plans; and because the plans will outline management objectives and priorities, the public will be able to better understand the justification behind any such actions.

To facilitate public buy-in, the process for developing each water-specific plan will rely heavily on constructive public/stakeholder participation. Fisheries staff will convene a diverse public stakeholder user group composed of members that directly or indirectly benefit from the plan's actions; and where feasible and applicable, these user groups should include all of the following:

- Open water and ice anglers
- Registered Maine Guides who frequently use the water
- Anglers who own private and commercial property near/adjacent to the water
- Local bait/tackle shop owners and other local businesses
- Other angling and conservation groups that have a strong connection to the water

As new data and information are gathered, biologists will assess how well the fishery is meeting established objectives and adjust management if necessary. To ensure continued public support, vested stakeholders may have an opportunity to review and discuss any proposed management plan changes.

Prioritizing Plan Development

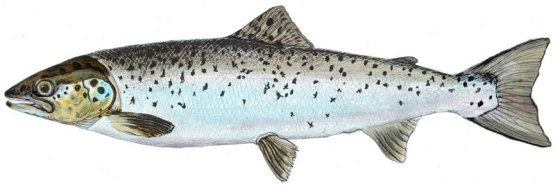
Ideally, every priority water in the state would have a water-specific management plan; but given the abundance of resources throughout the state, such an endeavor is not practical, particularly during this 15-year planning period. Therefore, Fisheries Resource Supervisors will prioritize waters within their management region and schedule the development of these plans over time. Since implementation of developed plans may require additional allocation of resources, the full burden of plan development and implementation will be considered in scheduling plan development. Where distinct waterbodies share similar characteristics with nearby waterbodies, they may be grouped together and managed under a single management plan for efficiency. For example, a single management plan may be developed for a cluster of relatively small remote trout ponds that have similar species composition, angling pressure, catch rates, etc.

VIII. FISHING REGULATIONS

MDIFW is responsible for the protection and enhancement of inland fisheries throughout the state and regularly works to update and refine the statutes, rules, policies, and standard operating procedures necessary to carry out this responsibility.

Statutes are laws enacted through bills proposed and passed in the Legislature that commonly set broad agency authorities and direction and may also grant rulemaking authority to state agencies. Agency rulemaking generally advances more specific requirements in accordance with the Maine Administrative Procedures Act. In addition to submitting agency bills for legislative approval, MDIFW also prepares testimony in response to bills submitted by legislators to inform the legislative decision-making committees. Many of the laws that apply to managing Maine's freshwater fisheries resources can be found in Title 12 (Conservation) of Maine's Revised Statutes. Rules have the same regulatory and enforcement power as laws, and as such the Division commonly refers to regulations and statutory provisions as "fishing laws."

Policies and standard operating procedures are internal guidelines that create consistency and direction on matters more connected with agency operations, helping to ensure that day-to-day operations are consistent, legal, and aligned with our broader overarching mission.



LANDLOCKED ATLANTIC SALMON

Conserving and enhancing native and wild fish populations, including the wise public use of this renewable resource, remains an important focus of the Division, and regulations are one of the tools we use to support that priority. We develop fishing regulations based upon fishery science principles, incorporating biological assessments, chemical and physical habitat characteristics, and public use, and they are commonly designed to protect spawning fish, encourage fish recruitment, manage harvest sustainably, improve fish health and size quality, provide a diversity of fishing opportunities, and manage invasive threats.

i. Regulation Setting Process

The Division develops, implements, reviews, and updates fishing regulations to achieve management objectives consistent with water-specific management plans, statewide strategic plans, and public interests. Regulatory needs are typically evaluated each year and draft regulation proposals, including statewide initiatives and special focus areas, are developed within each management region with direction from Division leadership. The process of Division regulation promulgation can be divided into four distinct sub-processes: drafting, internal review, external/public review, and implementation. In addition to the Division-initiated process, regulation proposals can also be developed via public petition.

Drafting

The Division typically formulates rule changes after evaluating data for a given fishery that suggest current regulations are not meeting management goals. It's not uncommon for data collection and evaluation to occur in response to public concerns expressed to regional staff. Other proposals are prompted by regulatory concerns including law book simplification and statewide language consistency. Prior to formal public review, all rule change proposals are documented as internal drafts for future vetting by MDIFW staff. Each of these preliminary/draft proposals contains several sections describing the rule change, including:

- Management goals and objectives for the waterbody
- Current and proposed regulations
- A statement of need
- A summary of any outreach conducted prior to drafting the official rule-making proposal
- A list of alternative management strategies that were explored in addition to the proposed rule change

Internal Review

When Fisheries Resource Supervisors submit a proposal, it is first reviewed by the Fisheries Division Director and Fisheries Management Section Supervisor to ensure it has merit, is consistent with established direction and initiatives, and aligns with the Division's policies and plans. Proposals are then presented to and reviewed by all other Fisheries Resource Supervisors and Division leadership at an annual in-house meeting. This review considers available data, alternative strategies, outreach and public involvement, potential unintended consequences, and the overall need and value of each regulation given the Division's goal to reduce law book complexity. During the meeting, staff commonly share their experiences with similar management challenges and regulations; and afterward, Resource Supervisors may modify proposals based on peer input or direction from the Management Section Supervisor before sending them to the Division Director for another round of review. The Director and Management Section Supervisor then meet with the Bureau Director and the Commissioner's office to give them an overview of all the proposals. Following that meeting, proposals are finalized and prepared for advertisement as a formal rule-making packet open to public comment. The rest of the rule-making process is dictated by the Maine Administrative Procedures Act, which ensures all state agencies follow a consistent and comprehensive procedure.

External/Public Review

Proposals, whether initiated by the Division or public petition, are brought forward to the MDIFW Advisory Council for an initial briefing. The council consists of 10 individuals appointed by the Governor to represent all of Maine's 16 counties (some represent multiple counties). This introduction of the proposed rule changes, referred to as **Step 1**, allows the council to become oriented to the rules packet and ask any initial questions. Staff may give presentations at this step to provide background on proposals that are more complex or more likely to generate public interest. By **Step 2** of the process, a Notice of Rulemaking Proposal is published in all major printed news sources in Maine and on the MDIFW website to notify the public of the proposed change and upcoming public hearings. Each rulemaking proposal is open to public comment for 30 days, with comments accepted via email, letter, or in person at one or more of the public hearings that are typically scheduled. At the Step 2 council meeting, the Department provides council members with a summary of all the public input. The council may discuss the public input and ask questions of the Department. At **Step 3** the Department gives the council an overview of the process and any considerations that may result in removal of rule proposals from the original packet. The council can then deliberate before voting on the rule packet. This vote constitutes a recommendation to the Commissioner to either approve or deny the entire rule packet.

Implementation

The approved rule packet is typically implemented on January 1 of the following year, with the council vote occurring in late summer or early fall. This gives MDIFW staff time to incorporate changes into the law book and the online regulation mapper (FLOAT). Aside from rare emergency changes, annual fishing regulations are effective January 1–December 31.

ii. North and South Zone Management

The Division created North and South Management Zones to accommodate generally disparate fishery resources that exist between northern and southern Maine. The North Zone contains an abundance of wild and native coldwater fish populations, whereas the South Zone contains more stocked and/or warmwater fisheries. The split-zone approach allows the Division to create two sets of General Laws for the state that reflect the different zones' management needs and public use goals. General Laws in the North offer increased protection to wild and native resources (e.g., use or possession of live fish as bait is prohibited, closed to fall and ice fishing), while those in the South are more focused on enhancing angling opportunity (e.g., fall or year-round fishing). The zones also play a role in the management of bass populations. While bass are not native to Maine, they are now widespread and well established throughout much of the South Zone, and relatively uncommon in the North Zone. The General Laws for bass reflect these differences and allow the Department to manage bass as an invasive species in the North with a "no size or bag limit" regulation and as a sport fish in the South with length and bag limits.

IX. LICENSES AND PERMITS

MDIFW administers several licenses and permits for recreational and commercial fisheries and other fisheries-related activities. License and permit sales are an important revenue source for agency operations. Each license or permit includes specific qualifying criteria, fees, and permissible activities that balance wise public use with protection of Maine's fisheries.

i. Recreational

- **Recreational Fishing License:** A valid Maine fishing license is required for anyone 16 years or older to fish in inland waters or to transport fish harvested from Maine's inland waters. Residents and nonresidents may obtain fishing licenses from licensing agents throughout the state, including many sporting goods and convenience stores and town offices. Licenses may also be purchased online through MDIFW's online hunting and fishing licensing system (MOSES) or at our Augusta headquarters. For more information on recreational fishing licenses, visit mefishwildlife.com/fish
- **Complimentary Fishing License:** Complimentary no-fee Maine fishing licenses may be issued to individuals who:
    - Are Maine residents age 70+
    - Belong to a federally recognized nation, band, or tribe
    - Are under the custody of the Maine Department of Health and Human Services
    - Are Gold Star family registration plate holders
    - Meet one of the eligibility criteria typically related to certain physical and mental disabilities
- **Fee Fishing Pond Permit:** This fee permit authorizes a person who owns a private pond to charge customers a fee for the opportunity to angle, harvest, and transport fish from that private pond. The permit allows those customers to fish by means specified by the permit holder and waives the requirement for anglers to possess a valid Maine fishing license. Fish harvested from private ponds under this permit must be killed prior to transport and labeled with the permit holder's name and address to clearly identify their source.
- **Group Home Fishing Permit:** This no-fee permit is issued to qualifying group homes licensed by the Maine Department of Health and Human Services to provide housing or care, and allows residents of the facility to angle in inland waters without possessing a valid Maine fishing license. Examples of qualifying facilities include children's homes, child placing agencies, adult day care programs, drug treatment centers, residential care facilities, and nursing homes.
- **Student Fishing Permit:** This no-fee permit is typically issued to schools and allows a group of students (age 16+) to angle without individually possessing a valid Maine fishing license for a period not to exceed three days.

ii. Commercial

Commercial licenses and permits allow for the legal harvest and sale of certain inland species. MDIFW administers and regulates three inland commercial fishery licenses and four such permits.

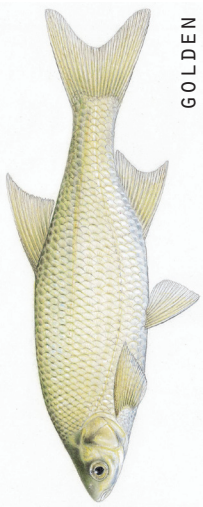
- **Licenses** - The licenses are Live Bait Retailer ($16), Baitfish Wholesaler ($26), and Smelt Wholesaler ($71). All three licenses allow the licensee to sell directly to consumers from a single retail location, but only wholesale licensees may harvest fish. Live Bait Retailers may sell approved baitfish species and smelt purchased from wholesalers, whereas Baitfish Wholesalers may only sell baitfish, and Smelt Wholesalers may only sell smelt (multiple license types can be purchased by a single individual).
- **Permits** - The four commercial permits administered by MDIFW are Lamprey, Sucker, Yellow Perch, and Eel. Fewer permits are sold than commercial licenses, and these resources commonly support lobster fishermen, striper anglers, and biological research. For more information on specific commercial licenses and permits, visit maine.gov/ifw/forms/index.html#fishing.

Commercial inland fishing opportunities are regulated by restrictions on seasons, gear types, waters where activities may occur, species approved for harvest, and inspections of retail locations to reduce the spread of unwanted species into new waters (more info in Commercial Fisheries section below).

iii. Other

MDIFW also issues several permits that allow for fish culture and production, including:

- **License to Cultivate or Sell Commercially Grown and Imported Fish:** This annual fee license, also referred to as "Land Based Aquaculture of Freshwater Species," is required to cultivate or sell fish that are commercially grown within the state or imported from outside the state, and gives MDIFW a way to track the import of restricted species. Atlantic salmon reared for restoration or commercial aquaculture are excluded and regulated by the Maine Department of Marine Resources. The license allows fish culture operations to grow fish for various uses including the food market, live sales, private pond stocking, and research. We have recently seen increased interest in aquaponics and more requests for new species. The license may require facilities connected to inland waters to conduct additional fish health tests to limit the spread of pathogens of regulatory concern.
- **Scientific Collectors Permit:** This no-fee permit is typically issued to academic institutions, consultants, and other state/federal agencies that sample freshwater fish populations for research, assessment, or monitoring. Often, sampling requires the use of collection devices and gear types not legal for recreational fishing, and also may involve collection beyond established length and bag limits. Permits address freshwater fishery resource concerns through established conditions, including a requirement for a disinfection and biosecurity plan, agency notification of fixed gear to address enforcement and public inquiries, reduction of bycatch, and requirements to coordinate with other entities of jurisdiction (including Maine's Native American Tribes and the Department of Marine Resources as applicable).



GOLDEN SHINER

- **Fish Importation Permit:** This no-fee permit is required for the importation of live fish or fish gametes (eggs/sperm) from out of state. Typically, imported fish are used for aquaculture and scientific research in labs. A risk assessment and review of fish health testing history is conducted to prevent introduction of injurious fish or pathogens into Maine. Permit conditions may include restrictions on propagation and requirements to euthanize and properly dispose of fish no longer needed.
- **Fishing Derby Permit:** This fee permit is issued for organized fishing events conducted on inland waters where contestants compete for cash awards or other prizes. These events are most commonly held as fundraisers during the winter ice fishing season. Permit conditions include limits on the number of events per water and on the value of cash and prizes, and require contestants to immediately kill the fish they catch for entry (to prevent unauthorized introductions to new waters). Derby harvest opportunities must also be consistent with Department management objectives, including the equitable distribution of fish to the general public.
- **Private Pond Stocking Permit:** This fee permit is required before any fish can be stocked into any private Maine water. A Private Pond Stocking Permit allows private waters to be stocked with fish purchased from licensed private commercial Maine hatcheries that meet fish health testing requirements. Occasionally, we will consider permits to transfer local wild-sourced fish into a private pond for the purpose of establishing that species. Prior to issuance, we review applications to ensure that the stocking will not impact sensitive native fisheries resources in the private pond's drainage and will not expand the range of nonnative fish.
- **Bass Tournaments:** We issue several fee permits to cover a variety of organized bass angling events. Conditions of these permits promote fish welfare, reduce potential transport of aquatic plants and other invasive aquatic organisms, and reduce competing public uses on waters and at public boat launches.
    - **One-Day Bass Tournament Permit (fee - catch/measure/release; fee - weigh-in):** This permit generally allows an organized bass club to hold a one-day tournament on specific waters that are 500 acres or larger in size. For a full list of requirements, see: maine.gov/ifw/docs/basstournament_oneday.pdf.
    - **Multi-Day Bass Tournament Permit (fee - maximum 3 days):** This permit is only available to nationally recognized bass fishing organizations and only permitted on waterbodies greater than 2000 acres. For a full list of requirements, see: maine.gov/ifw/docs/basstournament_multiday.pdf.
    - **One-Day Bass Tournament on Maine and New Hampshire Border Waters (fee - catch/measure/release; fee- weigh-in):** Since both Maine and New Hampshire issue permits on border waters, we coordinate to limit the number of events and event conflicts. The requirements of this permit are similar to the One-Day Bass Tournament Permit, with the main difference being that this permit is used only for tournaments on interstate waterbodies. For a full list of requirements, see: maine.gov/ifw/docs/basstournament_me_nh_borderwaters.pdf.

X. COMMERCIAL FISHERIES

Inland commercial fishing has a long history in Maine, with laws regulating the commercial take of rainbow smelt, cusk, suckers, minnows, American eel, hornpout, and yellow perch dating back to 1917. Today, the Division administers permits and licenses for the commercial harvest of inland species. Though cusk and hornpout are no longer regulated commercially in Maine, the other species still are, with sea lamprey added to the list in 2001. Maine's yellow perch and sea lamprey commercial fisheries see minimal participation, with very few permits sold for these species each year, mostly for scientific specimens (though yellow perch may also supplement the bait used in Maine commercial lobstering). Similarly, few American eel permits are sold annually, with most of the take being used as bait (particularly for striped bass) and a small portion used for human consumption. The most significant inland commercial fisheries in Maine are those targeting baitfish and smelt, which are also allowed to be harvested by recreational anglers for personal use (with a recreational fishing license).

Maine prohibits the importation of live baitfish and smelt from outside the state to protect against the introduction of new pathogens and non-native aquatic organisms into the state's waters. Currently, 17 fish species are legal to use as bait in inland waters **(Table 8)**. Most (11) of these fish are from the minnow family (Cyprinidae) and the others include two suckers (Catostomidae), two killifish (Fundulidae), the American eel (Anguillidae), and rainbow smelt (Osmeridae). Suckers are most often used by anglers fishing for large nonnative predatory fish such as northern pike and muskellunge. Yellow eel are most often used by anglers fishing for striped bass. Of Maine's cyprinids and killifish, collectively referred to by most anglers as "minnows," the most harvested species are golden and common shiners.

Ice fishing and spring trolling with smelt or minnows are long-held Maine traditions. There are roughly five times more Maine bait shops open in winter than in summer, and 90% of their sales occur during ice fishing season. While shiners are effective bait for many sport fish, many anglers prefer smelt — particularly when targeting landlocked Atlantic salmon. While smelt are a popular bait fish, they are also directly targeted and harvested by recreational anglers, making them the only bait fish that is also managed as a recreational species with specific bag and possession limits.

Managing commercial fisheries often requires a balance of conflicting interests. The smelt fishery is a great example: biologists and anglers want to maintain an adequate smelt population to grow and sustain healthy sport fish populations, recreational smelters want to continue the tradition of catching smelt for table fare or to use as baitfish, and commercial harvesters seek to maintain a viable livelihood collecting smelt for the retail baitfish market. While these interests may at times conflict, they all share a common need: a sustainable smelt population. Therefore, the Division, with input from a public working group, developed management objectives to ensure smelt populations can be sustained through time.

MDIFWs smelt management objectives, in order of priority, are:

1. Provide forage for salmonids.
2. Provide a recreational fishery for smelt where it will not adversely impact salmonid forage.
3. Provide an opportunity for commercial smelt fisheries where it will not conflict with salmonid forage or recreational smelt fishing.

This approach supports an allocation of a limited resources to different user groups based in the highest conservation and management priorities. All smelt populations have been prioritized under this management framework.

Maine has an economy associated with the commercial harvest and retail sale of bait fish, as well as a long tradition of anglers using live fish as bait. Numerous laws have been enacted to manage concerns associated with the spread of wild-caught bait fish species, including associated illegal bycatch, that may compete with native fish. However, continued due diligence on several fronts will be needed to effectively limit new introductions. Continued investments in monitoring commercially harvested bait, thoughtful review and refinement of commercial and recreational fishing laws, and development of best management practices, along with continued education and awareness will support continued, but limited angler use of locally sustainable and available baitfish. These efforts will reduce incentives for illegal importation of baitfish and associated threats, will conserve our native sport fisheries, and support Maine's baitfish economy.

Table 8. List of the legal species of fish that can be used as bait in Maine's inland waters.

COMMON NAME	FAMILY	LATIN NAME
American Eel	Anguillidae	*Anguilla rostrata*
Longnose Sucker	Catostomidae	*Catostomus catostomus*
White Sucker	Catostomidae	*Catostomus commersonii*
Blacknose Dace	Cyprinidae	*Rhinichthys atratulus*
Common Shiner	Cyprinidae	*Luxilus conutus*
Creek Chub	Cyprinidae	*Semotilus atromaculatus*
Eastern Silvery Minnow	Cyprinidae	*Hybognathus regius*
Fallfish	Cyprinidae	*Semotilus corporalis*
Fathead Minnow	Cyprinidae	*Pimephales promelas*
Finescale Dace	Cyprinidae	*Chrosomus neogaeus*
Golden Shiner	Cyprinidae	*Notemigonus crysoleucas*
Lake Chub	Cyprinidae	*Couesius plumbeus*
Northern Redbelly Dace	Cyprinidae	*Chrosomus eos*
Pearl Dace	Cyprinidae	*Margariscus margarita*
Banded Killifish	Fundulidae	*Fundulus diaphanus*
Mummichog	Fundulidae	*Fundulus heteroclitus*
Rainbow Smelt	Osmeridae	*Osmerus mordax*

See Acknowledgments, Glossary and References on pages 52-55 of Volume III