

State of Maine Action Plan for Managing Invasive Aquatic Species

2020 revision

January 1, 2020 draft

This is the first revision of Maine's *Action Plan for Managing Invasive Aquatic Species*. The original plan was adopted in 2002 by the Interagency Task Force on Invasive Aquatic Plants and Nuisance Species and the now-defunct Land and Water Resources Council. The 2002 plan recommended review, update and submission to the Land and Water Resources Council every four years, structured around two state biennial budget periods. This review schedule was not followed due to agency staff time constraints and lack of a clear need to revise the plan.

The Task Force periodically discussed revising the plan, particularly in 2008 and 2016. While revising the Action Plan isn't required per se, the Task Force directed state agency staff in 2016 to review and revise the strategies and tasks in the plan to ensure that invasive aquatic species threats are being addressed by state agencies and that the plan accurately represents the accomplishments and direction of the plan.

The original plan included the following sections: Introduction; Maine's Approach (general description of how the state is addressing invasive species); the Action Plan proper (with strategies and tasks); Implementation Plan; and Appendices. The Task Force determined that this revision would involve only the Action Plan portion of the larger plan and would not include the Introduction and Maine's Approach sections containing background and supporting information.

The Action Plan guides and coordinates the policies and programs of state agencies and action partners involved in managing invasive aquatic species. It also sets priorities for obtaining funds to support planned activities. "Action partners" is a term that describes the institutions and organizations committed to assisting the state in the endeavors specified in this plan.

Five key goals underpin Maine's Action Plan:

1. Educate the public and people involved in business, trade, research and government so well about invasive aquatic species that they do not facilitate the introduction or spread of species through activities over which they have control;
2. Prevent new introductions of invasive aquatic plant and animal species into the state;
3. Limit the spread of established populations to other waters of the state;
4. Detect and respond to incipient infestations with the objective of eradication;
5. Reduce the harmful effects resulting from infestations of invasive aquatic species by controlling and preventing further spread of those that cannot be eradicated.

Five objectives organize the work to be done:

1. Provide effective leadership, coordination and program monitoring,
2. Raise awareness and educate the public well,
3. Strengthen programs to prevent introduction and transport,
4. Be prepared to respond rapidly and control spreading,
5. Effectively inventory, research, and manage information.

Leading strategies stand out:

1. Freshwater Plants and Organisms That Travel With Them:
 - First line of defense: The watercraft inspection program (Courtesy Boat Inspection (CBI) Program) for invasive aquatic plants and other organisms will continue to function using volunteer and paid local staff. The number of inspections has increased from 2,848 in 2001 to more than 80,000 annually since 2012. The CBI Program has not expanded to tidal water because the funding source for the program continues to be limited to watercraft using inland waters. The content of inspector training has expanded beyond identifying invasive aquatic plants to include information about zebra mussels, crayfish and other organisms that may also be transported by boating and related activities. CBI inspectors are urged to search for and remove these

hitchhiking organisms and remind boaters of these threats in addition to invasive aquatic plants;

- **Second line of defense:** An early detection and rapid response system has been established to locate and eradicate new infestations. This system includes trained volunteer Invasive Plant Patrollers and the Department of Environmental Protection's rapid response capacity. Mandatory inspections required by the access owner have been temporary and limited to very few case-specific infestation sites. A mandatory inspection program for all infested inland waters was considered but not approved by the legislature. Discussions of mandatory inspections or other stringent controls will likely recur should the rate of new infestations increase significantly beyond the current \leq one/year rate.

2. **Non-native freshwater fish:**

- **First line of defense:** Stocking of any fish into any water of the state requires a permit from the Maine Department of Inland Fisheries and Wildlife (DIFW). DIFW will continue to regulate transfers in this manner. A high priority will be placed on developing a regular, ongoing public information and education effort to increase public awareness of the impacts of illegal fish introductions and the need for public support and assistance with the enforcement of laws designed to discourage unauthorized fish introductions. A very high priority will be placed on the enforcement of laws designed to prevent the illegal introduction of fish species.
- **Second line of defense:** DIFW will maintain their contingency program of staff, training, equipment, and financial resources necessary to provide a speedy and credible response to illegal introductions. DIFW will remove the fish if feasible to do so. DIFW will afford no specific regulatory protection to any fish species introduced illegally. Where a practical benefit can be reasonably expected, DIFW will adopt regulations designed to maximize the take of the illegally introduced species to the benefit of indigenous species.

DIFW's ability to achieve these goals may be hampered by limited staff and financial resources.

3. **Marine Species:**

Since Maine has limited defenses against species that are introduced into marine waters on the East Coast, the State will seek to understand the ecology and impacts of species that have the greatest potential to disrupt Maine's commercial fisheries and marine infrastructure.

4. **All Species:**

Maine will identify invasive aquatic organisms coming into the state, list and prohibit the most harmful as appropriate, and inform retailers, wholesalers, and the public about how to avoid introduction and spread, in collaboration with the Northeast Aquatic Species Panel (under the U.S. Fish and Wildlife Service) and other states and provinces.

Climate Change

While climate change may not substantively alter strategies and tasks in the Action Plan, Maine will continue to monitor climatic conditions to provide early warning of potential threats. Maine's cold climate and ocean temperatures have limited warmwater species but warming temperatures and fluctuating weather patterns may in time be more favorable to their introduction in freshwater and marine systems. At the same time, changing conditions may become less favorable for coldwater species, thus contributing to an overall shift toward warmwater assemblages. Climate changes may result in range expansions of invasive species currently to the south, exacerbate the impacts of invasive species and complicate Maine's prevention and control efforts.

GUIDE TO SYMBOLS:

◆ **High priority**

♣ **Funding needed before task can be undertaken or expanded**

Note: Existing funding sources may cover none or only a portion of these tasks, including some high priority ones.

Objective 1: Leadership, Coordination, & Program Monitoring

Overview 2019: Advocacy by concerned residents and organizations and adoption of legislation by the Maine Legislature, starting with base program components in 2000 and 2001 and continuing with periodic changes since, has laid the framework for strong leadership and coordination on this issue. The Interagency Task Force on Invasive Aquatic Plants and Nuisance Species, supported by staff within the Department of Environmental Protection (DEP), reviews and discusses state invasive aquatic species efforts, offers ongoing advice to state agency staff and provides a forum for public discussion of progress and direction of state agency invasive aquatic species research, control and eradication programs.

Biannual Task Force meetings provide a valuable forum for agency staff, affected interest groups and the general public to deliberate invasive aquatic species issues facing Maine. DEP staff records and maintains minutes of each meeting. Specific aspects of the Task Force's work that may need attention in the coming years include the following:

- A. Maintain an understanding of invasive species in marine waters and consider formal representation of the Department of Marine Resources (DMR) on the Task Force if warranted,
- B. Establish a process for periodic update of this action plan,
- C. Review the sticker funding mechanism for the program to ensure that it is fair, effective, and adequate to meet high priority needs.

Strategy 1A: Promote communication across marine and inland waters and facilitate management of unique organisms that transit both systems

Issue 2019: Marine interests and concerns in Maine seem largely separate from the freshwater invasive species program, although there has been crossover on specific topics, e.g., Chinese mitten crab. Aside from few isolated efforts on tidal rivers, e.g., posting warning signs at boat ramps, Maine's tidal rivers are not included in the freshwater plant inspection and education program.

The threat, however, remains: invasive aquatic plants and other organisms could be introduced in tidal rivers through recreational watercraft and gear.

Organisms such as Chinese mitten crab inhabit freshwater, brackish and marine systems at different stages of their life cycle. State and nationally significant resources such as Merrymeeting Bay on the Kennebec River could be affected.

In addition, invasive species also pose a threat in marine waters, especially to commercial fisheries, important habitats (e.g., eelgrass meadows, saltmarshes, etc.) and marine infrastructure. Addressing marine invasive species on a large scale remains hindered by authority and resources but also by the logistical challenges of preventing and managing species in the open marine system.

Because the threat to inland waters was the primary impetus for the legislation that established the formal invasive aquatic species program, marine interests were not included in the legislation and are therefore not represented on the Task Force or affected by the dedicated funding mechanism. Nevertheless, DMR participated in the development of the 2002 plan. Including marine issues was required for the plan to receive approval from the US Fish and Wildlife Service and make Maine eligible for federal funding to help implement the plan.

The 2002 plan recognized that, while there is an important role for DMR to play in managing invasive aquatic species, the department lacked the authority and resources to effectively participate. Adding DMR to the Task Force and expanding the sticker program were considerations in the 2002 plan; DMR has not advocated for membership on the Task Force. During a 2007 revision of the dedicated funding mechanism that supports DEP and Department of Inland Fisheries and Wildlife (DIFW) invasive species efforts, DMR chose not to participate in the sticker program.

Due to the dedicated funding mechanism from boats on fresh water, the nature of invasive species issues in marine vs. fresh waters, and the fact that DMR is not advocating for representation on the Task Force, there is no compelling reason to formally include marine representation on the Task Force.

The primary forum for addressing marine invasive species is the Maine Marine Invasive Species Collaborative, including DMR, DEP Marine Unit and NGOs, which meets periodically to coordinate projects on pressing topics such as impact of green crab (*Carcinus maenas*) on the soft-shell clam fishery. While not formally on the Task Force, DMR staff frequently attend Task Force meetings to update attendees on pressing marine issues.

Task 1A1: Marine Coordination ♦

State agencies including DMR and DEP Marine Unit staff will continue participation in the Maine Marine Invasive Species Collaborative. DMR staff will, as time allows, attend Task Force meetings to provide marine updates.

Task 1A2: Tidal Rivers

DEP will provide assistance as requested to tidal river watershed groups in developing an inspection and education program. DMR will seek opportunities to raise public awareness about the vulnerability of tidal waters to freshwater plant and animal infestations.

Strategy 1B: Ensure timely and ongoing communications

Issue 2019: The 2002 plan identified the Invasive Aquatic Species Program (IASP) Coordinator at DEP as responsible for ensuring ongoing coordination and communication among agencies and action partners but did not elucidate how that would be accomplished. Since 2002, the IASP Coordinator has engaged in frequent coordination and communication with DIFW, but only infrequently across a broader range of agencies. DEP maintains an email distribution list including fresh and marine waters interests and, as chair of the Task Force, includes marine invasive species issues on the Task Force agenda.

Task 1B: Technical Subcommittee & Interagency Coordination ♦

Participating agencies and organizations will report on their respective workplan at Task Force meetings, typically held bi-annually. The IASP Coordinator will convene the Technical Subcommittee on an as-needed basis for specific issues, e.g., reviewing functional roles, addressing gaps in authority, or revising the state action plan. The IASP Coordinator will continue to provide staff support to the Task Force and DEP staff will meet the statutory charge for a stateinvasive aquatic plant prevention, monitoring/early detection and control program. The Technical Subcommittee will continue to include representation from DEP, DIFW, Department of Agriculture, Conservation and Forestry (DACF) and DMR.

Strategy 1C: Establish action plan update process

Issue 2019: Legislation establishing the Task Force did not specify a process for updating the action plan nor how the public was to be involved

in its formulation. The USFWS Aquatic Nuisance Species Task Force recommends, but does not require, revision every 5 years. State plan revision is not required to continue to be eligible for USFWS to help implement the state plan.

Task 1C: Plan Update Process

The Task Force will review the Action Plan every five years and formally revise the plan as a result of the review only if deemed necessary. Public representation on the Task Force, public notice of meetings, and legislative consideration of relevant budgets and programs will ensure public involvement in the process.

Strategy 1D: Ensure strong regional and national coordination

Issue 2019: Some activities, especially those related to commerce, are best accomplished regionally or nationally. DEP and DMR represent Maine on the Northeast Aquatic Nuisance Species (NEANS) Panel, a regional committee under USFWS's Aquatic Nuisance Species Task Force with state freshwater and marine representation. Other regional and national opportunities for collaboration include the Northeast Aquatic Plant Management Society, the Gulf of Maine Council on the Marine Environment and the Invasive Species Advisory Committee to the National Invasive Species Council.

DIFW actively participates in the following statewide and northeast regional efforts which have a nexus with invasive aquatic species:

- The New England Fish Health Committee has worked to create a set of fish health inspection guidelines for all families of fishes moved within the northeast U.S. The guidelines are an attempt to prevent the introduction of illegal species and prevent the introduction and spread of exotic fish pathogens such as viral hemorrhagic septicemia, a deadly infectious fish disease.
- The Northeast Fish & Wildlife Diversity Technical Committee (a subcommittee of the Northeast Fisheries Administrators and Northeast Wildlife Administrators Associations) where invasive aquatic species are a well-recognized threat to many endangered, threatened, and regional species of greatest conservation need for regional conservation planning.
- The Eastern Brook Trout Joint Venture: Fish Habitat Partnership which identifies minimizing the effects of invasive aquatic species as a Key Conservation Action in their Conservation Strategy for Wild Eastern Brook Trout.

- Maine’s Wildlife Action Plan (updated 2015) identifies invasive aquatic species as a statewide stressor for all aquatic species of greatest conservation need and their habitats.

Maine should continue to be represented when opportunities arise and use these opportunities well.

Task 1D1: Regional Coordination ♦

Maine will continue to provide active representation in these organizations and advocate for regional initiatives or cost-sharing agreements on projects that are best undertaken at this level.

Task 1D2: National Coordination

Maine’s Task Force, through the Invasive Aquatic Species Program Coordinator, will provide periodic communications on Maine’s progress and emerging issues/needs to the USFWS Aquatic Nuisance Species Task Force via the NEANS Panel. Communication with congressional delegation and other national entities overseeing invasive species will be pursued as opportunities arise.

Strategy 1E: Review funding mechanism

Issue 2019: Many concerns were raised during public comment on the 2002 plan about the fairness, effectiveness, and adequacy of the sticker program. Also at that time, there was discussion as to how the sticker program could best support DMR’s participation in the program, e.g., prevention, detection, and response issues related to tidal rivers. Since 2002 there has been no initiative or desire expressed from DMR to participate in the sticker program and therefore no formal proposals have been made to the legislature.

Fairness questions have been raised periodically since initial plan adoption. The legislature required seaplanes to pay the out-of-state sticker fee annually starting in 2009. A recurring question from the public is why non-motorized watercraft are not required to support the program. The Maine legislature has considered proposals at the committee level to require canoes to pay a fee to support the State invasive aquatic species efforts, but no feasible mechanism has been identified for administering this fee. Short of such a mechanism, boaters with non-motorized watercraft may voluntarily purchase a sticker to support State invasive aquatic species efforts.

Annual compliance with the sticker program is high, above 90% according to boat inspection data, but the revenue stream is not sufficient to meet demand for grant requests from lake association-led boat inspection and plant removal initiatives after DEP’s base program costs are paid. The Legislature’s decision to combine the former stand-alone Lake and River Protection Sticker with the watercraft registration in 2007, which became effective in the 2008 calendar year, reduced administrative costs and modestly increased revenue to DEP and DIFW. A more significant change in distribution of revenue, but not in total annual revenue to the state program, came in 2014 when the Legislature changed the revenue distribution from 60% DEP/40% DIFW to 80% DEP/20% DIFW. The impetus for this change was to provide more grant funding (through DEP’s cost-share grant program) to lake associations conducting plant removal projects. (The bill as originally submitted included an increase on the in-state watercraft registration and out-of-state sticker fees. The fee increase was eliminated from the final adopted bill.)

Task 1Ea: Sticker Program ♦

DEP and DIFW will annually evaluate the revenue stream generated by the sticker program. DEP and DIFW will report to the Task Force annually on the adequacy of the revenue stream to meet high priority program needs.

Task 1Eb: Administrative Training

DEP and DIFW will provide program information, including any changes to the funding mechanism, to local officials via DIFW’s annual mailing to agents.

**Objective 2:
Education and Outreach**

Strategy 2A: Conduct Opportunistic Outreach Collaboration

Overview 2019: The 2002 plan indicated that education initiatives relating to invasive aquatic plant species lacked a unified coordinator, budget and approach to audience messages. The 2002 plan emphasized the need for consistent treatment of messages, logos and the like because Maine’s outreach efforts would encompass more than just plants, and recommended an interagency education committee.

While a laudable concept, speaking consistently with one statewide and cross-agency voice on invasive aquatic freshwater and marine species is not practical. Most of the education and outreach is initiated by a specific agency rather than a group of agencies. In addition, staff time has not allowed formation of an education subcommittee. A feasible approach is to inform sister agencies of education and outreach plans and seek collaboration where possible. The Task Force meetings present one forum for sharing this information. The Maine Invasive Species Network (MISN) is another opportunity to share knowledge and collaborate on all invasive species in Maine. Initially established by University of Maine Cooperative Extension in 2009, MISN annual meetings have been held all but one year since; another meeting is planned for 2019. The University hosts the MISN website but planning and organizing the annual meeting now falls to willing MISN members.

Examples of case-specific coordinated interagency outreach include the following: DEP/DIFW joint outreach on the invasive alga *Didymosphenia geminata*; DMR/DEP joint press release on Chinese mitten crab (*Eriocheir sinensis*); DEP/DIFW joint advertisements on invasive aquatic species spread prevention; and DEP placement of a plant-specific message in the DIFW boating law and fishing rule books.

Task 2A: Education Coordination

Agencies will assume responsibility for spearheading education efforts related to the species under their authority, with DEP taking the lead on plants, DIFW on inland fisheries and wildlife, and DMR on marine species, and report annually to the Task Force on their efforts. Agencies will pursue collaboration on outreach when appropriate, particularly on overarching matters such as general messages and unified logos. DEP will pursue opportunities to collaborate with DACF's Division of Plant Health.

Strategy 2B: Raise public consciousness in general about invasive aquatic species

Issue 2018: The press continues to show significant interest in invasive aquatic plant issues as evidenced by the multi-outlet coverage of the Annabessacook Lake variable water milfoil infestation confirmation, and DEP response to it, in 2014. The discoveries of two invasive aquatic plants in Cobbosseecontee Lake in 2018 also received considerable attention. The 2002 plan noted that Maine citizens recognized "milfoil" as *the* invasive aquatic species problem but were generally unaware that the issue is broader, encompassing other plants and freshwater animals and affecting

the marine environment as well. While "milfoil" likely remains the most recognized invasive aquatic species, other species have garnered significant attention in the public eye since the adoption of the 2002 plan. These include fish species such as northern pike and koi, the freshwater alga didymo, the invasive aquatic plant hydrilla and, in the marine environment, green crab. Many state and federal agencies around the country have developed fact sheets that can serve as models and sources of information.

Maine DIFW provides outreach on the dangers of invasive and non-native fish species through the fishing law book and other outlets. In 2013 alone, 350 signs were placed at public boat access sites describing the dangers of invasive fish to native ecosystems. DIFW also provides information and education materials on invasive species spread prevention to the baitfish industry.

When the stand-alone Lake and River Protection Sticker for Maine-registered watercraft was eliminated in 2007 to reduce administrative costs, the nationally-recognized "Stop Aquatic Hitchhikers" message was added to the watercraft registration for Maine boats.

Task 2B1: Messaging

Each agency will have fluid, adaptable approaches to education and press relations in anticipating issues and responding to new problems/challenges. Multiple agencies will collaborate on outreach where appropriate (e.g., Chinese mitten crab in tidal and fresh waters).

Beyond agency-specific outreach, agencies may consider collaborating to acquaint the public with the following messages:

- Prevention is the critical and most feasible, cost-effective way of dealing with invasive species, at least for most freshwater and wetland invasive aquatic species. Anticipation and understanding of harmful impacts are more realistic goals for marine species.
- Many non-native freshwater plants are a serious threat.
- Freshwater animals and marine species pose a threat, too.
- The scale and nature of impacts could be substantial. Doing nothing could be costly.
- Individuals can make a difference, e.g., preventing spread or finding an invader.
- Program results, i.e., where has the money been spent and how has it been making a difference?

Agencies will consider such tools as press releases, public service announcements and presentations, state agency websites, links with community and non-profit organization websites, and posters and brochures in town offices, marinas, retail stores, and other heavily trafficked places.

Task 2B2: Promote National Message: Check, Drain, Dry ♦

DEP will incorporate the *Clean, Drain, Dry* message now used in several states and will encourage DIFW to follow suit. Uniform regional and even national messaging, including the Stop Aquatic Hitchhikers campaign, may resonate with boaters and help prevent spread of invasive species.

Strategy 2C: Target and inform audiences that have the potential to make a big difference in preventing or spreading key species

Issue 2019: The primary agencies participating in spread prevention outreach have been DEP and DIFW (Fisheries, Recreational Safety and Warden Service). For several years DACF provided information on invasive aquatic plants to the nursery and pet store trade, but there has not been any outreach on prohibited plants to the general public. DIFW biologists target audiences, such as the Bass Working Group and the annual bass tournament draw, with nuisance fish information and coordinate with DEP and DACF where practical. Whenever possible, DEP has broadened its aquatic plant spread prevention message to include invasive aquatic animals. Outreach vehicles have included courtesy boat inspections, PSAs, public meetings such as the annual Milfoil Summit, advertisements in outdoor magazines, and an annual brochure showing infestation locations.

DEP received federal grant funds for zebra mussel outreach and DEP and DIFW have collaborated to reach anglers about the invasive alga didymo, but more could be done to promote decontamination techniques to reduce spread risk. In 2015-16 DEP staff revisited pet stores for invasive plants and found several prohibited aquatic plants and a freshwater clam that is not on DIFW's unrestricted list; these surveys should be repeated periodically, possibly with assistance from DACF. There is need for DEP and DMR collaboration for boat ramp signs and possibly inspections on rivers with tidal reaches. Past omnibus surveys indicate high general awareness of invasive species but an informal survey of boaters indicated that only 1 out of 5 performed a sufficient inspection. More work is needed on how to move from awareness to behavior change such that all users inspect all their gear before entering and after leaving a water body.

Task 2C1: Watercraft Transport ♦♣

DEP and DIFW, and DMR to a lesser extent, will continue mostly agency-specific messaging while pursuing interagency coordination when possible. DEP will pursue how to translate awareness into behavior change following social marketing methodologies. See also Tasks: 3B1b, 4A1, 4A2c, 4C1a, and 4C2b.

Task 2C2: Release into the Wild ♦♣

DEP and DACF will conduct periodic inspections of pet stores and nurseries for prohibited aquatic plants and will coordinate with the Warden Service for enforcement. DACF will continue to distribute information (including from DEP and DIFW) to nurseries and pet stores. DACF and DIFW, to the extent funding is available, will develop outreach materials for a specific spread pathway, e.g., proper disposal of unwanted plants and animals, as needed. See also Tasks: 3C1b/c, 3C2, 3C3a, 4A1, and 5C1b.

Task 2C3: Water Withdrawal

DEP will periodically conduct outreach to operations that withdraw water from inland waters and advise them to avoid waters with known invasive aquatic species infestations. DOT will require that subcontractors not withdraw water from known infested waterbodies.

**Objective 3:
Preventing Introduction and Transport**

Overview 2019: The freshwater invasive aquatic plant spread prevention program started with 2,848 inspections in 2001 and has topped 80,000 in the years of 2012-2018. DEP competitive grant funds are awarded annually to local inspection programs. In a few instances, access to or surface use of a waterbody has been temporarily limited to control spread of an invasive aquatic plant and ensure safety for individuals engaged in removal. DIFW continues to conduct outreach and enforce regulations on transporting fish. There has been limited outreach regarding preventing spread of invasive wetland plants and marine species.

A. Species Lists and Pathway Priorities

Strategy 3A1: Clarify authority for regulating invasive aquatic species

Issue 2019: Many sections within Title 12 give the Commissioner of DIFW discretion to require permits for the importation, transport, and release of species into the wild. The Department maintains a list of “Unrestricted Fish and Wildlife Species” that do not require such a permit. No list is currently promulgated to explicitly prohibit certain species but a 2007 statutory change gives the DIFW Commissioner broader authority to respond to nuisance fish infestations: “whenever an illegal introduction of invasive fish species occurs and the commissioner determines it necessary for resource protection and management, the commissioner may authorize licensed anglers to assist the commissioner in the taking and destruction of that invasive fish species.” The DIFW Commissioner has the authority to enact emergency rule-making that can assist with the removal of invasive fish species through angling. DIFW also has policy and management plan actions where length and bag limits do *not* apply to nuisance fish species.

Revisions to statutes have affected listing of invasive aquatic and terrestrial plants. Chapter 561 in 2005 (122nd Legislature) removed the requirement in Title 38 Section 410-N that invasive aquatic plants be identified through rulemaking, effectively allowing the DEP commissioner to add additional species to the list of invasive aquatic plants. Accordingly, DEP staff developed listing criteria that were reviewed and approved by the Task Force in 2008. For all plant species, a resolve passed by the 125th Legislature in 2011 directed the DACF (then-DAFRR) to establish criteria through rulemaking for identifying invasive plants. These criteria have been developed. In January 2017, DACF adopted a rule prohibiting the import or sale of 33 terrestrial plant species determined to meet the invasive plant criteria described in the rule. In addition to the regulatory list in rule, DACF maintains a non-regulatory advisory list of invasive plants including aquatic, wetland and terrestrial species. DACF convened in 2016 a Terrestrial Invasive Plant Scientific Advisory Committee to revise this advisory list of invasive plants.

DMR has authority under Title 12, Sections 6071 and 652, Chapter 24, to prohibit people from “landing on, bringing into, or depositing” non-indigenous marine organisms into marine waters including tidal estuaries such as the Penobscot and Kennebec Rivers. No provision explicitly names invasive aquatic species and states how invasive aquatic species are to be

managed. DMR does prohibit shellfish pathogens by rule explicitly. The state’s authority over ocean dumping is also not entirely clear relative to invasive aquatic species.

Task 3A1: Authority Clarification

Additional clarification will be addressed by specific agencies as needed. The respective agency will report to the Task Force on the need and proposed resolution.

Strategy 3A2: Maintain agency-specific species lists using defined process and standards

Issue 2019: A technical subcommittee, composed largely of state agency staff, was formed during development of the 2002 plan and compiled the Advisory List of Invasive Aquatic Species in Appendix D of that plan. After considerable subcommittee discussion of how to select species for the list, each agency determined which species within their respective jurisdiction would be included on the Advisory List. The Advisory List was intended for planning purposes and possibly a basis for creating an “official” list of invasive species.

Questions about the Advisory List in the 2002 plan intended to clarify the process for listing, criteria for evaluating species, and potential use of the Advisory List in regulatory matters, but these have not been deliberated by the Task Force. The 2002 plan charged the Task Force, assisted by its Technical Subcommittee, to develop a unified screening and risk assessment protocol for identifying which species should be listed on the Advisory List.

In practice, however, each agency has its own screening *and* listing process. The Advisory List has not been modified since the 2002 plan adoption, nor has the Advisory List been applied to invasive species prevention and control in a significant way. Given the agency-specific screening and listing protocols, committing staff resources to revise the plan’s Advisory List is not warranted.

Continuing the agency-specific approach to listing for regulatory, management or advisory purposes makes sense since individual agency staff have the biological expertise and job responsibility to inform listing and regulatory processes. Furthermore, Task Force members lack the time and resources needed to delve into listing processes.

DEP has developed a listing protocol for invasive aquatic plants. DACF - Maine Natural Areas Program has developed an evaluation process for their invasive plant advisory list.

Task 3A2a: Official Listing Process ♦

Decentralized screening and listing

State agencies will develop risk assessment protocol as needed to identify which species should be listed officially as invasive. Agencies will use existing protocols, e.g., those of DEP and DACF for invasive plants, as models for developing protocols for additional species.

Agencies will screen and evaluate candidate species for listing using an agency-specific protocol. DIFW will list freshwater fish and wildlife, DMR will list marine organisms, DACF will list wetland and terrestrial plants, and DEP will list aquatic plants with consideration of aquatic plants on DACF-Maine Natural Areas Program's invasive plant advisory list. Agencies will report new listing proposals to the Task Force but there will be no cross-taxa, comprehensive list, advisory or otherwise. Rather, agencies will maintain their lists and post them on their website. Citizens and organizations can propose candidates to the Task Force for referral to state agencies for evaluation.

Task 3A2b: Priority Pathways

Each agency will review pathways of introduction annually to ensure that existing threats are being addressed and with consideration of yet unconfirmed species that could threaten Maine's freshwater and marine systems. For example, DEP will periodically review the potential for transporting invasive aquatic plants and organisms by water withdrawal operations including hydroseeding, dust control and pool-filling.

B. Watercraft and Equipment Transport

Strategy 3B1: Further strengthen the watercraft inspection program for freshwater focusing on high priority locations and times

Issue 2019: Watercraft inspections for most boaters in Maine remain voluntary – not mandatory – and are done through the state's Courtesy Boat Inspection (CBI) Program. Roadside (ME Turnpike) inspections were

conducted in early years of the program but were determined to be cost prohibitive (~\$55/inspection) with questionable benefit since relatively few boaters were encountered and no plants were found. DEP determined that prevention funds were better used at boat access sites.

The number of inspections has expanded from 2,848 in 2001 to more than 80,000 in 2012 and each year since. DEP contractor Lakes Environmental Association in Bridgton administers the program including revising training protocol and training inspectors annually. Each year inspectors record "saves" when one of the aquatic plants on Maine's prohibited list is found on a boat entering or leaving an inland water.

Demand for annual inspection grants outstrips available funding. Barring additional revenue for the program, maintaining the 2012-2018 level of inspections, on the order of 80,000 annually, will be a significant challenge.

DIFW requires boat inspections by bass anglers participating in DIFW-permitted tournaments. Bass clubs are required to have two boat inspectors available to inspect boats before launching and after removal for tournaments on any water body. Bass club inspection data are entered in DEP's annual inspection database. Inspections were made mandatory in one other instance: the Messalonskee Lake Route 27 boat access in Belgrade. For several seasons, this trailer-accessible site was open only when an inspector was present by decree of the site owner, formerly Maine Department of Conservation (DOC). DEP paid for inspector time, typically 3 days/week from Memorial Day through Labor Day plus duck hunting season. This site was converted to a carry-in site after then-DOC constructed a new trailer-accessible site for Messalonskee Lake in Sidney.

Mandatory inspections for all waters in the state have been discussed but not pursued in any concerted manner. A bill introduced in 2003 (LD 1723) would have made inspections mandatory for all infested lakes but did not pass as originally drafted. After amendments, the adopted LD 1723 changed the surface use restriction statute (38 MRSA §1864) such that a restriction order from commissioners of DEP and DIFW may require inspections and cleaning of watercraft, watercraft trailers and equipment upon removal at sites that have been identified in the order. Such an order can be issued only where an invasive aquatic plant is documented and is intended to be in effect for limited duration.

In collaboration with DACF-Maine Natural Areas Program, DEP conducted a vulnerability analysis of Maine lakes in 2004 and used the

results to assess risk of spread in awarding grants to lake associations for boat inspection programs. DEP staff revised the analysis and added a predictive model in 2017, results of which are posted on DEP's website (<https://www.maine.gov/dep/water/invasives/vulnerability.html>). DIFW developed a list of Heritage Fish Waters that contain wild, self-sustaining populations of brook trout and Arctic charr. Waters which contain native species are not stocked unless they pass through a peer review process.

Task 3B1a: Revise Most Vulnerable Waters List ♦

DEP has updated the vulnerability analysis first completed in 2004 and will revise the analysis and model as more information becomes available. DIFW will review and update its Heritage Fish Waters list as needed. In addition to the criteria specified in the law, priority will also be given to such considerations as proximity to infested waters and exceptional streams, rivers and lakes (such as those with pristine conditions as defined by native aquatic assemblages, lack of previous stocking, and/or extent of watershed disturbance).

Task 3B1b: Boat Launching Facility Inspections ♦♣

DEP will continue to evaluate annually the methods, results, and cost-effectiveness of the Courtesy Boat Inspection Program and report to the Task Force and DEP's website. DEP will consider and recommend creative ways to the Task Force to increase boater self-inspection rates, reduce risks of spread, and ensure inspections continue as resources become limited.

Task 3B1c: Legal Clarification

The 2002 plan listed issues that needed legal clarification. The following issues have been addressed to some degree by statute and agency action:

- Under what circumstances, if any, can the state require mandatory inspections at entry points or boat launches?
A surface use restriction issued by DEP and DIFW commissioners (38 MRSA §1864) may require that watercraft on waters affected by the order be taken out of the water only at locations identified in the order. The order may also require inspections and cleaning of watercraft, watercraft trailers and equipment upon removal at sites that have been identified in the order.

- Does DACF have the authority for deployment and enforcement of buoys for the purposes of limiting surface use in infested areas?
- Can authority for deployment and enforcement of buoys for the purpose of limiting surface uses be delegated to DEP and/or DIFW?

For deploying buoys in the event of a surface use restriction order, DACF (includes former-DOC) has issued to DEP a state permit to place regulatory markers. DACF's Navigational Aids Program has also assisted DEP in placing these buoys.

The remaining questions address issues that are operationally, legally, or politically difficult but may be researched further in the future should legal clarification be needed. If needed, DEP and DIFW will request an opinion from the Attorney General's Office to clarify the following issues:

- Under what circumstances, if any, can the state require mandatory stops of a subset of traffic, i.e. only vehicles transporting watercraft and equipment?
- Does the state have the authority to close private, federally funded, or municipal boat launches?
- Under what circumstances, if any, can municipalities close private boat access facilities or require inspections?
- Under what circumstances, if any, can a Warden search a live well with an operating aerator while a boat is in transport?

Strategy 3B2: Consider stronger options on plant-infested waters if voluntary inspections do not succeed

Issue 2019: The 2002 plan noted that if voluntary inspections did not prevent the spread of invasive plants from infested lakes then it may be necessary to determine if limiting access to infested waters would be a viable option. Weighing whether limiting access is worth preventing the spread to other water bodies presents a difficult policy decision.

Such a dilemma faced the Maine Legislature in 2004 with LD 1723 which would have closed public access sites on lakes with known infestations when no inspector is present. Hours of operation for these sites would have been based on use patterns, time of year and budgetary constraints. The bill as originally presented was significantly amended in committee and the provision for access restriction on infested lakes was removed. However, the committee added flexibility to the pre-existing surface use restriction

statute (38 MRSA §1864) to allow access restriction on a case-specific basis (described above under Task 3B1c). There have been no further attempts to limit access on all infested lakes since the proposed 2004 bill. The Task Force and policy makers may again be faced with considering whether reducing likelihood of spread warrants limiting access.

DIFW and DACF each have an obligation to ensure public access to state waters and constructing boat launching facilities is part of this obligation. When reviewing applications for new or improved access sites, DEP licensing staff seeks recommendations from DEP Invasive Aquatic Species Program (IASP) to reduce invasive aquatic plants spread. In 2004, after receiving questions from concerned public about existing, new, or upgraded boat access as potential means of spreading invasive plants, DEP IASP staff wrote a staff guidance document with spread prevention recommendations for different development scenarios (e.g., new vs. existing sites, carry-in vs. trailer access). This guidance document was reviewed by the Task Force in 2004 and is used by DEP staff to advise DIFW and DACF.

DEP IASP staff has provided templates for lake associations developing infestation control plans and collaborated with now-inactive Maine Milfoil Initiative (St. Joseph's College) and Maine Volunteer Lake Monitoring Program (now Lake Stewards of Maine) to publish the Citizen's Guide to Invasive Aquatic Plant Management in Maine in 2014. IASP staff revised the plant removal grant application in 2015 to focus on longer term plant removal objectives and measuring progress. IASP staff annually provides technical assistance to local plant removal programs and is considering ways to provide more specific planning assistance to lake associations battling existing infestations.

The 2002 plan tasked the Task Force with establishing critical thresholds for the maximum extent of plant infestations that will be tolerated statewide, e.g., percent or number of Great Ponds and streams infested, without triggering stronger statewide action. Establishing such thresholds is not feasible since management actions are site specific. The Rapid Response Plan of 2006 includes a memorandum of agreement between DEP and DIFW describing the process for issuing a surface use restriction, which by statute must be signed by the commissioner of each agency.

Installation of a new boat ramp on a water body with a documented invasive aquatic plant infestation now requires a full DEP Natural Resources Protection Act permit; previously only the accelerated Permit-by-Rule was required. This change was made to allow site-specific design and operation

conditions to prevent plant establishment near the ramp, thereby reducing likelihood of spread to other waters.

Task 3B2a: Infestation Control Plans ♦ ♦

DEP will promote local development of management plans with IASP assistance and encourage municipalities and lake associations to undertake them for priority infested waters (see Early Detection, Rapid Response and Management, Strategy 4C1a/b).

Task 3B2b: Establish Critical Threshold ♦

When monitoring infestations, DEP may recommend one or more of the following strategies on a case-by-case basis:

- Make physical changes in the design of facilities, e.g. location of channel;
- Require inspection programs during high-traffic events such as open angling tournaments and regattas, or prohibit them altogether;
- Limit boat removal to specific locations/times;
- Require mandatory inspection of all boat removals, and/or
- Manage public and private access facilities, taking into account the state's obligation to balance the provision of public access with private opportunities and other resource and recreational values.

Any access limitations and inspection requirements would likely be in the context of a surface use restriction agreed to by the DEP and DIFW commissioners. The Task Force will continue to deliberate on stronger statewide spread prevention actions to curtail the spread of invasive aquatic species.

Task 3B2c: Boating Access Sites on Plant-Infested Waters ♦

Some progress (described above under Strategy 3B2) has been made on this task but more work is needed to complete the work initially laid out in the 2002 plan. DEP and the Land Use Planning Commission (LUPC) will review current permit requirements and consider changes in their rules that:

- Require consistent conditions related to invasive aquatic organisms for the development of all public and private facilities on infested waters,
- Issue permits only for those infested water bodies where a state-approved infestation control plan is in place (see Task 4C1b),

- Establish criteria for determining when impacts are unacceptable, and
- Establish construction standards with which any approved project must comply.

DEP and LUPC will also clarify which agency is responsible for enforcing conditions applied to any permitted projects.

C. Introduction Into the Wild

Strategy 3C1: Understand and manage what is coming into Maine through pet shops, garden centers, schools, scientific research and studies, and other sources

Issue 2019: The DEP has taken steps aimed at reducing the likelihood of introduction into the wild. For several years, up until approximately 2010, DEP trained DACF pet store and nursery inspectors on invasive aquatic plant identification. DEP contacted websites selling invasive aquatic plants that failed to identify those on Maine's prohibited list as illegal in Maine. In 2003 and 2004, DEP interns checked pet stores and nurseries for invasive aquatic plants and provided information to vendors on common and scientific plant names and identification. Similar surveys by DEP seasonal staff occurred sporadically in following years. On one occasion a DEP intern found the invasive aquatic plant hydrilla "hitchhiking" on a legal native plant. DACF Animal Welfare Program staff has significant responsibilities inspecting animals but may have little time to look for aquatic plants.

In fall 2015, DEP staff renewed their own surveys of pet stores selling aquatic plants, a subset of DACF's list of licensed pet stores. The 2015 pet store surveys yielded prohibited aquatic plants at four different establishments; three different prohibited species were identified. One of the species, parrot feather (*Myriophyllum aquaticum*), was labeled as *Myriophyllum simulans* but genetic identification showed it to be the prohibited species. After being informed of the discoveries, one regional distributor agreed to stop shipment of plants labeled *M. simulans* to Maine. DEP has shared this information with the Northeast Aquatic Nuisance Species (ANS) Panel. DEP will re-survey nurseries periodically, likely with assistance from DACF.

One known invasive animal (Asian clam, *Corbicula fluminea*) was also found by DEP staff. DIFW Warden Service responded immediately and confiscated the clams. Asian clam is not on DIFW's unrestricted species

list, i.e., the list of fish and wildlife species, including tropical fish and invertebrates, that do not require an importation permit or possession permit and may be traded by commercial pet shops.

Results of the recent DEP surveys highlight the need to maintain current lists of in-state retailers and out-of-state suppliers, continue periodic surveying of retail establishments in Maine and contact suppliers when prohibited species are found.

DIFW has revised its regulations on the importation of fish and wildlife. It has also implemented stronger regulations on the maintenance of fish and wildlife in captivity. These new rules should reduce the likelihood of accidental release of captive animals. DIFW's list of unrestricted fish includes only tropical fish and goldfish for aquarium use. No other fish species can be imported without an importation permit which must include a 3-year history of "clean" fish health.

DIFW's Division of Fisheries and Hatcheries maintains an Illegal Species Tracking File that follows non-native fish species occurrences from the first angler or anecdotal report to species occurrence confirmation. DIFW biologists periodically find aquarium fish that have been released into the wild. The problem of fish releases is likely larger than documented cases.

DIFW has a Bait Dealer Inspection Program in addition to enforcement procedures when necessary. DIFW, with DEP assistance, conducted a Hazard Analysis and Critical Control Point (HACCP) training in 2007. The HACCP training should be presented anew to bait dealers.

The internet trade of invasive flora and fauna continues to be a monumental concern for inadvertent introduction.

Task 3C1a: Wild Release Baseline Inventory ♦

DACF Horticulture and Animal Welfare Programs and DIFW will maintain a list of in-state retailers and out-of-state suppliers; and invasive aquatic species that are routinely ordered, permitted, or introduced as stowaways. DEP staff or interns will periodically survey pet stores and nurseries for invasive aquatic plants. The agencies will continue to participate in the Northeast ANS Panel to avoid overlap in outreach to likely vectors. DACF Animal Welfare Program will continue inspections for fauna that not on DIFW's unrestricted list.

Task 3C1b: Inspection Training ♦

DACF and DIFW will provide periodic training for Animal Welfare Program inspectors in the identification of invasive aquatic species; and educate retailers about which species are prohibited or ill-advised for sale. If inspectors have time to also inspect for plants, DEP will assist in plant identification training. Inspectors will educate retailers about the threats from invasive aquatic species, and how they can best help educate their customers as well.

Task 3C1c: Official List Updates & Information

DACF, DEP and DIFW staff will maintain updated legal lists of prohibited or permitted aquatic species, present them conspicuously on their websites, and inform Maine retailers, suppliers, and education and research institutions of the website address. DEP will work opportunistically with the Northeast ANS Panel to promote regional efforts to educate tradespersons through trade and professional journals, shows, and conferences; direct mailings; and other venues. They will also provide educational materials for distribution to the public, e.g., native plants for water gardens and invasive species to avoid.

Strategy 3C2: Strengthen bait-handling standards and educate bait handlers about this issue

Issue 2019: Freshwater invasive aquatic species can be transported with bait (e.g., spiny water flea) and sometimes as bait (e.g., crayfish). In addition, plant fragments and other invasive organisms may be attached to bait traps and nets. While the sale and possession of out-of-state baitfish is illegal, some anglers may still be importing baitfish or spreading already established in-state sources; they may also be using invertebrates. Fortunately, some of the invasive species of bait, such as crayfish, are no longer commonly used. It is nevertheless important to prevent new introductions and limit spread of existing populations. DIFW has such authority but may need to refine and strengthen it.

DIFW and DEP hosted a Hazard Analysis and Critical Control Point training for bait dealers in 2007. DIFW established in 2013 a Baitfish Working Group to address issues related to baitfish and invasive fish introductions. As part of their Baitfish Dealer Inspection Program, DIFW reminds dealers that it is illegal to release any live fish leftover from their sales season into public waters prior to their seasonal or business closure. Dealers are further instructed that a stocking permit from DIFW is required

if their intent is to release any unsold fish into a private pond. DIFW also prohibits use of seines on any water body with a documented invasive aquatic plant infestation.

Maine Statute (Title 12) lists legal baitfishes that can be used as live bait in Maine. Changes in legislation will be needed if research reveals that previously-declared legal baitfish are actually non-native to Maine.

Task 3C2: Bait Inventory and Information ♦

DIFW will maintain a list of licensed bait retailers and suppliers; and invasive bait species that are currently being supplied and sold. The department with DEP will organize and host a HACCP training for bait harvesters. The department will periodically distribute information about this issue to dealers, suppliers, sporting journals, and the public and will continue to convene the Baitfish Working Group.

Strategy 3C3: Strengthen the state's capacity to monitor and respond to invasive fish species, continue to educate the public about illegal stocking, and rigorously enforce the law

Issue 2019: Some illegally stocked fish, including bait species, have turned out to be very aggressive. Most notably bass, white perch, northern pike, muskellunge and black crappie have upset the balance in many waters, displacing native and stocked salmonids. Statutes explicitly prohibit illegal stocking but the incidence continues to increase. Reports of illegal stocking raises public awareness of the issue and, to some extent, concern about the potential conflict between state stocking programs and the need to reign in illegal introductions.

DIFW lacks capacity to monitor all new introductions and can only conduct one or two fish reclamation projects a year depending on waterbody size. Wardens are overextended and find identifying and proving the source of illegal introductions difficult. The maximum fine for illegal stocking is \$10,000. DIFW needs to continue to work with the judicial system to impose penalties that are commensurate with the impacts illegal introductions have on the native fish species.

Since the drafting of the 2002 plan, however, DIFW made significant changes to the reclamation program to address the threat of invasive species. A concerted effort was made to increase the number of staff that could legally apply rotenone in reclamation projects. The size of the reclamation team grew from two licensed staff to eleven. This has enabled

DIFW to perform more complex reclamations on a variety of waters throughout Maine. Additionally, staff members are routinely trained on new reclamation technology and methods, including nationally renowned training provided by the American Fisheries Society.

Since 2003 DIFW has completed several reclamation projects dealing with a variety of threats and management implications (see table at right). Most notable are projects dealing with the eradication of invasive species with the subsequent restoration of native brook trout and Arctic charr. These are unique and valuable resources to the State of Maine, and DIFW has been successful in restoring multiple populations since the inception of the 2002 plan. DIFW has reclaimed multiple waters to remove invasive fishes and restock with native species, including waters where spawning habitat may be limited and the waters require annual augmentation with hatchery fish. These waters provide valuable angling opportunities in areas such as southern Maine, where wild trout resources are not as plentiful as they are in northern Maine counties.

In addition to larger waters, DIFW reclaims numerous smaller, private ponds that are illegally stocked with invasive fishes. These invasive fishes include goldfish, koi, grass carp, and several other species. DIFW eradicates these smaller populations to prevent inadvertent or purposeful introductions to larger waters, and to prevent the spread of any potential pathogens. In addition to reclamation, DIFW pursues species suppression in certain cases. Spring 2018 marked the 13th year of netting and removing northern pike at one spawning area in Pushaw Stream in the effort to suppress pike in the Penobscot River system.

DIFW has received limited funding from the USFWS ANS Task Force (through the DEP grant agreement with USFWS) for equipment and supplies necessary for fishery reclamation projects. DIFW includes information on invasive fish, aquatic plants, and other invasive organisms in its fishing and boating rule books. Additional DIFW outreach efforts on the problems/impacts associated with illegal introductions include posting at boat ramps, providing information in sporting goods stores, television PSAs, and inclusion in fishing reports.

The department’s Operation Game Thief program can assist in identifying people involved in this activity. The department distributes cards offering \$2,000 rewards for information leading to a conviction of an illegal fish or wildlife introduction.

Fishery Reclamations by DIFW, 2003-2015

| Year | Water | Size of Water (acres) | Invasive Species Present | Species Restored |
|------|---------------------|-----------------------|---|---------------------------|
| 2003 | Mosquito Pond | 5 | Brown bullhead | Brook trout |
| 2007 | Nadeau Lake | 23 | Bullhead, smallmouth bass, white sucker | Brook trout |
| 2007 | Speck Pond | 14 | Chain pickerel, golden shiner | Brook trout |
| 2010 | Big Reed Pond | 96 | Rainbow smelt | Arctic charr, brook trout |
| 2011 | Little Concord Pond | 30 | Brown bullhead, chain pickerel, golden shiner, rainbow smelt. | Brook trout |
| 2012 | Wadleigh Pond | 150 | Rainbow smelt | Arctic charr, brook trout |
| 2013 | Abbotts Pond | 32 | Brown bullhead, golden shiner | Brook trout |
| 2013 | Thissell Pond | 132 | Rainbow smelt | Brook trout |
| 2014 | Broken Bridge Pond | 20 | Brown bullhead, chain pickerel, golden shiner | Brook trout |
| 2014 | Crocker Pond | 10 | Brown bullhead, chain pickerel, golden shiner | Brook trout |
| 2015 | Round Pond | 11 | Brown bullhead, golden shiner | Brook trout |

Task 3C3a: Further evaluate capacity to prevent, detect, and control invasive fish. ♦

DIFW will continue to evaluate the incidence and potential risk of invasive fish introductions, identify any related conflicts and needed changes regarding existing policies, rules, and programs better to protect native fish communities; identify staffing and resource needs, including opportunities for assistance from non-governmental organizations; and evaluate additional fish species

candidates for changes in fishery management. The Task Force and DIFW will provide opportunities for public involvement in deliberating the above.

Task 3C3b: Invasive Fish Information

DIFW will include information about the harmful effects and ways to avoid the introduction and spread of invasive freshwater fish, bait, and other relevant species in its fishing and boating rule books. The department will also consider other ways to educate the public.

Task 3C3c: Illegal Stocking Fines

DIFW will evaluate the adequacy of existing fines, knowledge of judges about the potential impacts of invasive species, and possible use of consent agreements or other tools and report its findings and recommendations to the Task Force as needed. The department will continue to promote the reporting of offenders through Operation Game Thief.

Strategy 3C4: Evaluate the impacts related to invasive aquatic species when permitting in-river projects

Issue 2019: As stated in the 2002 plan, some established invasive species may spread and cause significant harm if barriers, such as dams, are removed without adequate precautions.

DEP has the authority to consider invasive species when permitting in-river projects. DIFW is very concerned about upstream movement of invasive fish species resulting from dam removal, especially in attempts to restore diadromous fishes. DIFW's foremost concern is the threat that barrier removal poses to native brook trout. The 2002 Action Plan recommended identifying waters where a potential problem exists with barrier removal and fish movement; DMR does not plan to develop such a list a priori. Rather, barrier removal proposals will be reviewed case-by-case.

Task 3C4: Barrier Removal◆

Agencies involved with either proposing or permitting barrier removal projects (DEP, DIFW, LUPC, and DMR) will weigh the impacts from potential spread of invasive aquatic species against benefits gained from the removal of a specific dam or similar action. These same agencies may develop policy guidance, and rule-changes if needed, that consider the potential spread of invasive species from all barrier removal projects.

Strategy 3C5: Evaluate authority relating to marine dredging and processing waste disposal to ensure that adequate safeguards are in place

Issue 2019: DEP has the authority to regulate dredging. DMR comments and provides input on proposed dredging activities during the permitting process.

No action needed.

Strategy 3C6: Require good biosecurity protocols in field sampling.

Issue 2019: Many government agencies, non-profits, and private organizations conduct field sampling in Maine waters. Updating biosecurity protocols is ongoing due to emerging threats. DMR issues a special license for scientific research. Biosecurity procedure requirements are written into each license on a case-by-case basis. Anyone requesting a scientific collector's permit from DIFW needs to supply the department with a Biosecurity Plan and implement said plan when sampling. DEP updated in 2018 its decontamination protocol for field work by DEP staff.

Task 3C6: Sampling Permits

All agencies that issue sampling permits will update their permit or license conditions to require applicants to use relevant and effective biosecurity procedures to prevent the inadvertent spread of invasive aquatic species and infective pathogens.

D. Marine Vessels

Strategy 3D: Work with the US Coast Guard (USCG) and Northeast Aquatic Nuisance Species Panel to make sure that ballast water is effectively controlled

Issue 2019: The 2002 Action Plan included brief background on the threat of ballast exchange in Maine waters and the significance of USCG's salinity standard, which specifies how close to shore ballast water can be unloaded and has implications on potential for purged organisms to reach lower salinity estuaries where they can survive.

DMR was tasked with requesting that USCG review its salinity standard to ensure that it is effective in Maine's waters. DMR discussed this with USCG officials in 2003 and reported that Portland USCG officials are well-

versed in ballast water issues, including this one. Similarly, DMR was tasked with working with the USCG, port authorities, and Northeast ANS Panel to document the type and amount of shipping and ballast water activity. This task was not completed, is not a priority for DMR and is therefore removed from the 2018 Action Plan.

No action needed.

E. Marine Products Import and Export

Strategy 3E1: Identify alternatives to natural packing materials

Issue 2019: “Wormweed” (*Ascophyllum nodosum*, var. *scorpioides*)

is currently used to pack bait worms for shipping. It is difficult to remove all potential stowaways such as the green crab from this seaweed. Alternatives to use of wormweed have been identified, but none is deemed acceptable by the Maine baitworm industry. Efforts have been shifted to education that urges disposal on dry land of bait and bait-packing materials.

Task 3E1: Bait Worm Packing ♣

DMR will promote disposal on dry land of bait and bait-packing materials in education and outreach efforts to the bait exporting industry. DMR will consider alternative packing materials as they become known through the bait exporting industry, other states and the Northeast Panel.

Strategy 3E2: Understand how marine organisms are being introduced and spread in New England.

Issue 2019: During development of the 2002 Plan, the New England Transport Vector Study was underway to assess the risk of introduction through a variety of potential pathways including seafood companies, aquaculture facilities, bait shops, pet stores, public aquaria, marine research facilities, and wetland restoration efforts. DMR received the study results but has not found an opportunity to apply the findings in a comprehensive prevention program. Rather, DMR has worked with the Maine Marine Invasive Species Collaborative to address specific vectors, e.g., the wormweed issue. Furthermore, DMR licenses and/or maintains lists of seafood companies, aquaculture facilities, bait shops, and facilities with flow-thru seawater systems. DACF-Animal Health licenses land-based aquaculture. DACF’s Aquatic Animal Health Technical Committee considers invasive species potential releases from aquaculture operations.

DACF will inspect these operations and look for potential introductions of invasive fish or other aquatic organisms.

Task 3E2: Marine Pathways ♣

DMR will work opportunistically with the Maine Marine Invasive Species Collaborative to apply latest information on marine vectors.

Objective 4: Early Detection, Rapid Response and Management

Overview 2019. The need exists to make sure that all responses to possible infestations are grounded in the positive identification of reported organisms and undertaken with the public interest in mind. To that end, Maine’s *Rapid Response Plan for Invasive Aquatic Plants, Fish and Other Fauna* was signed by DEP and DIFW commissioners in 2006. Processes to ensure accurate identification and inform and solicit comment from the public are incorporated in the Rapid Response Plan (available here <http://www.maine.gov/dep/water/invasives/invplan.html>).

Rapid response to incipient infestations of invasive aquatic plants and fish is typically planned and conducted by state agency staff. Such response may require state agency involvement for several years. State agency response to an invasive aquatic plant infestation may transition into a long-term management effort with local entities becoming more involved over time. Management of an established and extensive invasive aquatic plant infestation, even if well-established when first detected, is typically conducted by local entities with DEP financial and technical support.

DEP rapid response projects to infestations include hydrilla in Pickerel Pond (started 2002) and Damariscotta Lake (started 2010), Eurasian water-milfoil in Salmon Lake (started 2008), European naiad in Northeast Pond on the Salmon Falls River (Started 2015) and Eurasian water-milfoil in Cobbosseecontee Lake (started 2018). DEP led the response to these infestations because of the incipient growth, the potential to significantly knock-back or eradicate the plant, and the high risk of spread to other state waters. If manual removal measures aren’t effective, DEP may seek permission to apply herbicide under the General Permit (Strategy 4B1 below).

Success of the DEP response to the above projects has been encouraging but each rapid response project requires considerable resources (funding

and staff) and a long-term commitment. DEP first visited Pickerel Pond with Maine Volunteer Lake Monitoring Program in 2002 and DEP continues annual dive surveys of the pond; hydrilla was last seen in Pickerel Pond in 2012 and hasn't been seen since.

A. Early Detection (see also 5A. Inventory)

Strategy 4A1: Establish simple reporting procedures.

Issue 2019: There is no cross-taxa state agency-coordinated approach for the public to report invasive aquatic species. The public notifies a specific agency of invasive aquatic species sightings. DMR updates its website with new species information as they appear and confirms and tracks new introductions when possible. DIFW refers citizens to department biologists for the identification of questionable organisms. DIFW has developed an internal tracking system and database focused on fish introductions.

DACF-MNAP hosts the *iMapInvasives* website for Maine, a web-based map and database showing distribution of invasive species in the state that allows reporting invasive species. *iMapInvasives* may be used for reporting any species but has mostly been used thus far for terrestrial plants.

DEP posts instructions for submitting suspicious plants for identification on its website and promotes use of a dedicated email address (milfoil@maine.gov) for reporting suspicious plants. Lake Stewards of Maine (LSM, formerly the Maine Volunteer Lake Monitoring Program) also has plant reporting information on its website. LSM and DEP coordinate to confirm identification of invasive aquatic plants using state experts, regional experts, and genetic testing if necessary. The state's Rapid Response Plan includes procedures state agency staff will follow to inform the public about new infestations of flora (DEP) and fauna (DIFW).

DACF created a state "clearinghouse" website on invasive species intended to direct interested individuals to agencies responsible for reporting sightings, confirming identification and possibly initiating rapid response for specific flora and fauna (see https://www.maine.gov/portal/about_me/invasives.html).

Task 4A1: Decentralized Reporting

Each agency will publicize information about its reporting procedures and how to identify invasive aquatic species. DEP and DIFW will track and confirm new sightings and notify local

officials and non-governmental organizations of new introductions of flora and fauna, respectively, as directed in the Rapid Response Plan; DIFW will also continue to use their in-house database for tracking fish introductions.

Strategy 4A2: Ensure that field staff and rapid response team personnel can easily identify species or access other resources for identification.

Issue 2019: A minimal level of training for field personnel is important to make them aware of the invasive flora and fauna already in Maine and on our doorstep. State park managers, field biologists, wardens, and similar staff are most likely to encounter infestations and they need to know what they are looking for. Definitive identification for some species, however, can be challenging without considerable experience or, in some cases, DNA analysis (e.g. certain species of water milfoil). Given job demands of state park managers, wardens and federal land managers, it is not reasonable to expect them to be experts on flora or fauna identification, but a minimal level of understanding should be attained.

Each agency is responsible for training staff in identification of respective taxa. Annual training is not necessarily required or possible due to competing demands on staff time. DIFW provides fish species identification training to wardens and others upon request. The focus is baitfish and commercial species and species likely encountered through angling. DEP has provided plant identification trainings to agencies including DIFW warden trainees, DACF inspectors, licensed pesticide applicators, land managers, and DIFW biologists. The level of detail in the training depends on the interest of the participants. The 2007 Maine Field Guide to Invasive Aquatic Plants, updated in 2018 and provided to some state agency field staff, may be more detailed than necessary for some. Some lake associations have printed shorter pictorial guides to meet their specific training objectives.

Clear procedures are needed for state agency staff to definitively confirm identifications of flora and fauna. As noted above, DEP and Lake Stewards of Maine (LSM, formerly Volunteer Lake Monitoring Program) have developed a process for identifying invasive aquatic plants using state and regional experts and a laboratory for DNA analysis of milfoils if need be.

LSM has trained over 4,500 Invasive Plant Patrollers (IPP) to conduct plant surveys. An ongoing challenge is to encourage and enable these trained volunteers to conduct regular plant surveys. LSM promotes IPP teams of at

least 4 individuals per lake to create local capacity for ongoing surveying. Trained IPPs have detected new infestations of invasive aquatic plants on several occasions, including hydrilla in Damariscotta Lake in 2009 and Eurasian water-milfoil on Cobbosseecontee Lake in 2018. LSM also has a rapid response team of trained, active and dedicated IPPs who travel far and wide in the state to assist in invasive plant screenings. The demand for workshops remains high but state funding challenges in the future may force adjustments in the training

Task 4A2a: Expert List for Confirming Identification ♦

If not already in place, DEP, DIFW and DMR will develop respective processes for confirming species identification using in-house agency, state partnering organization and national level personnel who have expertise in the identification of various taxa and species. DMR, in particular, will enlist an existing directory of national experts to identify the cryptic species encountered in marine waters.

Task 4A2b: Staff Training ♦ ♣

DEP will periodically offer plant identification training to field staff from DIFW (biologists and wardens), DACF (inspectors), Department of Transportation and other divisions within DEP. The Board of Pesticides Control will continue to train and certify persons to apply pesticides for control of aquatic invasive species. Training for staff involved in field sampling will include biosecurity measures to prevent inadvertent spread of invasive aquatic species and infective pathogens. In addition, DEP and DIFW education staff will provide training information and opportunities for Maine's enforcement community to stay abreast of laws and regulations pertaining to invasive aquatic species.

Task 4A2c: Invasive Plant Patroller Training ♦

The Volunteer Lake Monitoring Program will continue to train volunteers annually to identify freshwater plants and conduct invasive aquatic plant screenings surveys on lakes and ponds. Equivalent effort will be put toward stewardship, i.e., facilitating surveys by previously trained IPPs. Available funding may dictate altering the format of training.

B. Rapid Response

Strategy 4B1: Develop and maintain a flexible rapid response system

Issue 2019: Maine's Rapid Response Plan for Invasive Aquatic Plants, Fish and Other Fauna included contributions from DEP, DIFW, DACF-Maine Natural Areas Program (then-Department of Conservation) staff, regional and national aquatic plant monitoring and management experts, and local volunteers (see <http://www.maine.gov/dep/water/invasives/invplan.html> and follow link to the rapid response plan). The Rapid Response Plan expanded upon and codified existing agency protocol and was adopted by DEP and DIFW commissioners in 2006. The plan is guidance for state agency staff and details timelines, expectations and responsibilities for response.

The Rapid Response Plan does the following:

- Specifies the conditions/criteria under which a rapid response is to be commenced and the participants, procedures, and chain of command for various situations;
- Establishes a hierarchy of preferred/approved control and containment techniques;
- References licenses and permits necessary for specified control techniques and includes agreements detailing state interagency coordination in rapid response;
- Identifies procedures for keeping the plan current and any statutory or regulatory changes needed for implementation;
- Includes criteria for measuring response effectiveness; Standard Operating Procedures for the methods used for control; and procedure notifications (e.g., for drinking water suppliers).

Concerning invasive aquatic plants, the plan includes a memorandum of understanding between DEP and DIFW on considering requests for surface use restrictions, species specific control techniques, and provision for DEP deployment of advisory and regulatory buoys related to infestations. The IASP may apply herbicides to control invasive aquatic plants if permissions are received per the IASP's General Permit.

DIFW's tracking system standardizes the information collected from all reports of new illegal fish introductions and collects information specified in the Rapid Response Plan. A Threat Analysis datasheet was created as a planning tool when mitigation measures are being considered. DIFW's

Environmental Assessment was undertaken to get approval to use Federal Sportfish funding for reclamations.

While permitting under DIFW's General Permit from DEP (Piscicides for Control of Invasive Fishes) has facilitated reclamation projects using rotenone, changes in federal regulations during 2013-14 have further restricted purchase, storage and use of rotenone. These new federal regulations limit DIFW's ability to respond to nuisance fish infestations.

Task 4B1: Rapid Response to Plant Infestations ♦♣

DEP will follow the state Rapid Response Plan in responding to discoveries of invasive aquatic plant infestations. DEP IASP staff will renew their General Permit for herbicide treatment as needed to ensure they can apply herbicides in a timely manner if deemed necessary. IASP staff will obtain other permits (e.g., NRPA) as needed for manual removal. If appropriate for meeting objectives of Maine's rapid response, the IASP will incorporate new techniques or protocols into the Rapid Response Plan.

Task 4B2: Rapid Response to Fish & Aquatic Wildlife Introductions ♦♣

DIFW will follow the state Rapid Response Plan in responding to discoveries of invasive fish and wildlife introductions. DIFW will maintain a contingency program, including staff, training, equipment and financial resources necessary to provide a speedy and credible response to illegal introductions of invasive fish and other aquatic fauna. As part of this effort, DIFW will discuss with lake associations and other non-governmental organizations the feasibility of their helping to monitor and detect fish introductions and support fish reclamation projects if undertaken.

C. Management

Strategy 4C1: Develop plans and contingencies to contain and reduce existing freshwater plant infestations

Issue 2019: The number of documented invasive aquatic plant infestations in Maine has increased since 2002. Most of the increase is attributed to well-established infestations that had previously gone undetected but some incipient infestations (e.g., Damariscotta Lake, Cobbosseecontee Lake) were also added to the list.

In 2012 Maine DEP began to track and list invasive plant-infested waters within larger hydrologic systems (for example, the Sebago/Brandy Pond system includes Brandy Pond, Songo River, Sebago Cove, Panther Run, Sebago Lake and Sebago Basin). The result is a more precise list of infested waters, including named areas of larger water bodies, that features more meaningful information for boaters and others who make decisions based on whether a given water body is infested.

No matter how one organizes Maine's invasive aquatic plant infestations, a very low percentage – under one percent – of Maine lakes are infested. While spread prevention through boat inspections is more cost effective than plant removal, controlling existing infestations so they do not spread to other waters remains a high priority.

DEP staff leads the rapid response on incipient infestations and provides technical assistance to communities and lake associations to help control well-established infestations. DEP increased grant funding to lake groups conducting plant removal projects, an effort that was aided in 2014 by the legislated change in funding distribution which provided additional funding to DEP for "eradication activities." Still, DEP grant funding does not meet the plant removal needs of local groups.

Some lake-specific invasive aquatic plant management plans have been developed. In 2008 DEP developed a planning template for groups to use in developing management plans but no model plan has been established.

A one-time infusion of federal funding through the U.S. Fish and Wildlife Service in 2009 supported the Maine Milfoil Initiative (MMI) at St. Joseph's College in Standish. The objectives of MMI were to provide funding to lake groups battling established infestations, assist the groups with planning for removal and monitoring effectiveness, and research plant removal techniques appropriate to Maine waters and infestations. The seven "test bed" lakes selected for participation in MMI received grants up to \$40,000 and increased their capacity to control infestations. Recipients of MMI funding were required to develop management plans; DEP reviewed and commented on the MMI plans.

MMI concluded in 2014 with the release of the Maine Citizens' Guide to Invasive Aquatic Plant Management, a comprehensive guide to developing, implementing, and maintaining a successful management program (see <http://www.maineLakeStewards.org/citizensguide/>).

DEP is considering how to best assist lake groups in developing multi-year management plans. DEP's grant program to support local boat inspection and plant control efforts has not been made available for developing infestation control plans. Several lake associations have well-established and effective removal programs aided by limited state resources, but without a long-term plan per se. If DEP requires a multi-year plan for plant management, DEP will likely need to either write the plans or provide grant funding for plan development, the latter reducing funding available for actual plant removal until the plans are developed.

DEP purchases buoys through DACF's Navigational Aids Program. Advisory warning buoys may be provided to lake associations for judicious marking of infested areas. DEP stocks regulatory buoys in case of a regulatory marking needed under a surface use restriction. The Navigational Aids Program has assisted in deploying regulatory buoys indicating a surface use restriction. DEP, DIFW, and then-DOC developed in 2006 the Surface Use Restriction Memorandum of Understanding (MOU) as part of the Rapid Response Plan adopted by DEP and DIFW Commissioners. This MOU describes the process agencies will follow when a surface use restriction is proposed.

Task 4C1a: Invasive Aquatic Plant Management Plans ♦♣

DEP will assist lake associations in developing invasive aquatic plant management plans. For lake associations with well-established plant removal programs, plan development will essentially codify their existing program. DEP will use the Citizens' Guide to Invasive Aquatic Plant Management (2014) in this process. Lessons learned from developing plans inform updates to the Citizens' Guide on items including state approval process for plans, plan scope, eligibility for funding, and qualifications needed to conduct the work.

Task 4C1b: Invasive Aquatic Plant Grants ♣

DEP will continue to administer the existing grant program for local boat inspection and plant removal programs. DEP will consider expanding allowable grant costs to include management plan development if additional funding becomes available. Without increased revenue, awarding grants for management plan development will decrease funding available to active plant removal programs.

Task 4C1c: Surface Use Restrictions On Infested Waters ♦

Using the Surface Use Restriction Memorandum of Understanding (MOU) developed as part of the Rapid Response Plan and adopted by DEP and DIFW Commissioners in 2006, DEP and DIFW Commissioners will continue to consider requests for limited duration surface use restrictions on infested waters. The procedure outlined in the MOU considers the state's need to balance the provision of public access with other resource and recreational values.

Strategy 4C2: Ensure appropriate, effective, and practical control techniques

Issue 2019: Control techniques for plants and animals are different. Funding to allow monitoring and response to introductions is limited.

The predominant invasive aquatic plant control techniques used to date by DEP and lake associations include manual removal by hand, diver-assisted suction harvesting (DASH) and deployment of bottom barriers to smother plants and limit sunlight. SCUBA is almost always needed for effective use of these methods. DASH is an accelerated removal by hand method. Currently each technique can be conducted under a Permit-by-Rule under the Natural Resources Protection Act.

Changes to Maine statute in 2005 allow for "aquatic pesticide or chemical discharges for the purpose of restoring biological communities affected by an invasive species approved by the department and conducted by the department, the Department of Inland Fisheries and Wildlife, or an agent of either agency" in state waters; "department" refers to DEP.

Any use of an aquatic pesticide in state waters requires a National Pollutant Discharge Elimination System (NPDES) permit. Maine DEP's Division of Water Quality Management has delegated authority to issue NPDES, or MEPDES permits. The General Permit for Application of Herbicides for the Control of Invasive Aquatic Plants allows DEP's Invasive Aquatic Species Program to apply for coverage for use of herbicides. The General Permit for Application of Piscicides for the Control of Invasive Fishes allows DIFW to apply for coverage for use of piscicides. Each agency applies for coverage under the respective General Permit by submitting a notice of intent to treat that includes a statement of significant need, details of treatment and monitoring, and written consent to treat from a drinking water supply if applicable.

DIFW has licensed applicators on staff to use piscicides such as rotenone to control invasive fish, but deploys them only in limited circumstances,

particularly for small, isolated ponds. Options for controlling established invasive fish are few but, in the case of northern pike in the Penobscot River system, DIFW is annually trap-netting and removing spawning pike. Spring 2017 was the 12th year of this effort and results are encouraging: angler catch rates do not seem to be increasing and a recent environmental-DNA pike survey of an upstream reach of the Penobscot showed no positive pike ‘hits.’ DIFW has also considered using commercial fisheries as a potential removal tool for certain species.

In 2003 the Maine Board of Pesticides Control (BPC) adopted a regulation to control aquatic herbicides at the point of sale. This action was taken in response to concerns expressed by the DEP and private citizens that the general public—influenced by the threat of invasive plants like milfoil and advertised eradication claims of chemical products—were purchasing and applying aquatic herbicides illegally.

These restricted-use herbicides, listed on the BPC website, may be sold only by restricted-use pesticide dealers, and only to licensed applicators. A licensed applicator must apply the herbicide under a MEPDES permit. At-home applicators, therefore, no longer have legal access to aquatic herbicides through retail dealers or from the internet.

Given their respective responsibilities and work on state waters, clear communication is needed between DEP and DIFW so that both agencies are aware of invasive aquatic species removal projects. DIFW is concerned that widespread use of herbicides and/or manual removal or water level drawdown may harm existing native fish species.

DMR has required the destruction of cultured stocks to control pathogens in pen-reared facilities.

Task 4C2a: Plant Controls

DEP will continue to revise protocols for manual removal techniques and will provide updated protocols to lake groups conducting plant control projects. Innovative control methods will be reviewed by the DEP before allowing their use in Maine. Priority will be given to the use of integrated pest management techniques to the extent practical. DEP and DIFW will inform each other annually of planned invasive aquatic species projects. DEP will work to update permitting for invasive aquatic plant control techniques if needed.

Task 4C2b: Controls For Animals and Pathogens

DIFW will continue to use the general permit and licensed applicators on staff to control species within their authority on a case-specific basis. Priority will be given to the use of integrated pest management techniques to the extent practical. Environmentally appropriate pesticide applications will be considered only as a last resort, when applied by licensed state personnel, and for state waters that are isolated and small scale.

Task 4C2c: Restricted Chemicals

BPC and DEP will continue to educate the public about pesticides. The agencies will continue to investigate illegal sale and use of these products and to inform vendors of Maine’s list of restricted use chemicals. The BPC will also continue to provide continuing education for licensed applicators to make them aware of the impacts of inappropriate use of pesticide applications.

Objective 5: Inventory, Research, and Information Management

A. Inventory (see also 4A. Early Detection)

Strategy 5A: Develop baseline information

Overview 2019: DMR’s information about the movement of new invasive species into the state remains largely anecdotal and spotty but agencies and researchers have increased knowledge about a number of species. A new bryozoan species was identified in Casco Bay in 2018 by Tom Trott of DMR’s Maine Coastal Program. On-going monitoring occurs by the Maine Coastal Program and DEP’s Marine Unit (only via SCUBA in specific eelgrass beds) to describe this bryozoan’s distribution, water quality conditions supporting its presence, and substrate in Casco Bay. Also in 2018, DEP’s Marine Unit established an invasive species monitoring site in South Portland in collaboration with Wells Reserve’s participation in the regional Marine Invader Monitoring and Information Collaborative.

Most recently, there has been considerable public interest in and scientific research on the invasive green crab (*Carcinus maenas*) because of its predation on soft shell clams and disruption of eelgrass beds. Other flora and fauna that have garnered considerable attention in Maine and/or the

northeast U.S. and Atlantic Canada include the alga *Dasysiphonia japonica*, the tunicate *Didemnum* spp and Chinese mitten crab (*Eriocheir sinensis*), a species that inhabits tidal and fresh waters. Regional rapid assessments of marine invasive species, e.g., one coordinated by MIT SeaGrant in 2007 and again in 2018, include sites along the Maine coast and increase the knowledge base on invasive marine organisms. The 2007 rapid assessment was partially funded through the Cooperative Agreement between the DEP and the USFWS Aquatic Nuisance Species Task Force.

Maine clearly has more invasive aquatic plant infestations than in 2002, a combination of previously undetected established infestations and truly nascent populations. Still, Maine has relatively few infestations and a great deal to protect.

As of 2014, greater than 450 lakes had been surveyed by a combination of Lake Stewards of Maine (LSM, formerly Make Volunteer Lake Monitoring Program), state agencies, and academia, increasing our baseline knowledge of invasive aquatic plants in Maine. The majority of these were invasive plant screening surveys by LSM's Invasive Plant Patrollers, which also resulted in native plant lists for some waters. The Maine Natural Areas Program (MNAP) of then-DOC (now DACF) conducted rapid assessment surveys of about 100 lakes from 2002 through 2004. Grant funding from the US Fish and Wildlife Service supported DACF-MNAP aquatic plant assessments in 2016 and 2017. And DEP's monitoring program in the state's ecoreserves (legislatively-established protected areas on public lands) has added knowledge of plant populations in remote lakes. Much of the plant survey information is available at lakesofmaine.org.

DIFW biologists continue to perform new surveys on unsurveyed waters as well as resurveys of waters throughout the state. All information on fish species distribution is entered into existing DIFW Lake and Stream Inventory Databases. GIS coverages for invasive fish species, e.g., northern pike, black crappie, etc., have been created and are updated as information warrants. Additional information on fish species distribution was collected as part of a large-scale stream assessment study conducted in 2007, 2008 and 2010. Sections of >2800 individual streams have been surveyed since 2007. Sections of individual streams and approximately 180 remote ponds were surveyed between 2011 and 2017. There are still approximately 560 ponds throughout the state that have never been surveyed. Although DIFW maintains an annual effort toward assessing unsurveyed waters, staff and budget constraints severely limit the number of these waters that can be surveyed annually. DIFW has expanded the inventory effort through

partnerships with Maine Audubon and Trout Unlimited under the remote pond and coastal stream survey efforts.

Crayfish occurrence information has been gathered and tracked by Matt Scott and Will Reid; USM Professor Karen Wilson, who studied crayfish in Wisconsin, is collaborating with Scott and Reid to expand the knowledge of crayfish distribution in Maine. LSM tracks reports of non-native snails, e.g., Chinese mystery snail, from their volunteer monitors. Consultant Ken Hotopp (Appalachian Conservation Biology) is working to increase knowledge of snail distribution in Maine. DIFW fishery biologists archive samples for future identification.

Task 5A1: Marine Baseline Inventory (i.e., Rapid Assessment) ♦ ♣

DMR will, when possible, coordinate with the Maine Marine Invasive Species Collaborative, DEP, other state agencies, the Northeast ANS Panel and the regional Marine Invader Monitoring and Information Collaborative to sample the type, occurrence, and numbers of invasive marine species in various habitats and locations along the coast. DMR will maintain a list of invasive marine species known to exist in Maine and track their distribution with GIS mapping.

Task 5A2: Freshwater Plant Baseline Inventory (Rapid Assessment) ♦ ♣

DEP, in conjunction with the Maine Volunteer Monitoring Program's Invasive Plant Patrol, will continue to screen lakes for invasive macrophytes in Maine lakes and tidal rivers. DEP and DACF-Maine Natural Areas Program, along with Invasive Plant Patrollers, will also gather information on native plant distribution and add these data to the Lakes of Maine database.

Task 5A3: Freshwater Fish & Fauna Inventory Project ♦ ♣

As funding and staffing levels permit, DIFW will expand the lake and pond inventory of fish and other animal species by conducting both new surveys of unsurveyed waters and resurveys of waters that have not been visited in many years. These data will be entered in DIFW Lake and Stream Inventory Databases and the Knowledge Base database which is served to the public through lakesofmaine.org. DIFW may use these data to identify waters of highest natural biodiversity, establish a baseline of ecological conditions prior to invasive species infestation and track

distribution of freshwater invasive aquatic animal species in the state with GIS mapping. DIFW also uses these data to produce a GIS dataset of known and potential occurrence information of six invasive species that are concerning for fish passage decisions. This tool can be found here:

<https://www1.maine.gov/dacf/mcp/environment/streamviewer/>

Task 5A4: Crayfish and Snail Baseline Inventory ♣

No coordinated, one-time baseline inventory is proposed. Data on the type, occurrence, and numbers of invasive crayfish and snails in Maine may be collected by state agencies, LSM and outside researchers and consultants. DIFW will submit their data to Knowledge Base and urge other investigators to follow suit so that species distribution can be tracked with GIS mapping.

Task 5A5: East Coast Marine Species Information

DMR will gather species lists and management plans from states and Canadian provinces as needed and distribute them to others involved in marine invasive species management in Maine. While some of the information may require updating, DMR may benefit from collaboration with the NEANS Panel since NEANS has compiled species lists for its region.

B. Research

Strategy 5B1: Anticipate impacts and research & develop tools

Issue 2019: Maine has much to learn from ongoing research in other states and provinces. We may not discover from these sources, however, how species will affect Maine's ecology. Of particular interest are impacts on marine fisheries and genetic markers that can improve the identification of species that are easily confused with native species, e.g., Eurasian milfoil. While the spread of species that can survive Maine conditions is inevitable, Maine needs to know how best to protect existing fisheries when and if species become established.

Agencies pursue research as opportunities arise. DMR keeps abreast of research projects by other agencies and academicians. Considerable research is underway to understand the effects of green crab on soft shell clams and eelgrass. In the past DMR reviewed proposals and issued special licenses for Asian crab research projects. Additional research is needed to

understand vectors spreading invasive species in the marine environment and how to limit spread.

DIFW is interested in additional techniques for the detection and elimination of unwanted fish species, including use of environmental-DNA (e-DNA). DIFW has e-DNA calibrated and ready for use in Maine for detection of largemouth bass, smallmouth bass, black crappie, northern pike and muskellunge, and additional species are forthcoming. Alternative means of destroying unwanted nuisance fishes need to be researched: commercial harvest, more sophisticated trophic dynamics, triploidy of apex predators, etc.

Definitive identification of certain species of water milfoil is impossible without flower or fruit. A laboratory in Michigan, Project Aquagen, offered accurate genetically based identification of water milfoil but closed in 2018. Fortunately, a researcher at St. Joseph's College in Standish, Maine became interested in the issue and developed a laboratory procedure for identifying many milfoil species that started in 2018.

DEP began in 2018 discussions with a University of New Hampshire researcher regarding development of e-DNA for detecting presence of non-native mollusks such as zebra and quagga mussels in inland waters. Discussions and pooling of financial resources with partners in New England states and New York will occur in 2019 to move this project forward.

The Northeast Aquatic Nuisance Species Panel and the Northeast Aquatic Plant Management Society offer regular venues for information exchange and tracking research.

Research on the influence of climate change on the spread and management of invasive species is also needed.

Task 5B1: Research Needs ♦♣

Agencies will pursue individual grant and networking opportunities to better understand the ecology of invasive species relative to Maine and to develop invasive species detection and management techniques.

C. Information Management

Strategy 5C1:

Issue 2019: Besides the consolidation of the Department of Agriculture, Food and Rural Resources and the Department of Conservation into the Department of Agriculture, Conservation and Forestry in 2012, Maine's resource management agencies remain largely decentralized. This makes database development more complex, but facilitates targeted attention to all groups of organisms. Limited financial resources across the board means that Maine must be realistic about the development and maintenance of databases and websites, particularly their content.

Exceptions to the decentralized approach include *iMapInvasives* and Knowledge Base, each of which provides the opportunity to centralize data in one location providing that standardized protocols guide contributions. Each of these hosts records of some invasive species in Maine.

DEP lists waters known to be infested with invasive aquatic plants on its website. DMR relies on existing databases for invasive species location information. DACF facilitated the clearinghouse website for state invasive species that direct individuals to agencies responsible for specific flora and fauna for more information but also for reporting sightings.

Task 5C1a: Agency Databases

Agencies will develop and maintain individual databases, including lists of waters that are infested with invasive aquatic species. The Task Force encourages agencies to submit data to the Knowledge Base database to allow access by outside individuals and organizations.

Task 5C1b: Agency Websites

Agencies will develop and maintain individual web sites. DACF facilitated establishment of a state clearinghouse website with links to state agencies responsible for specific flora and fauna for more information and also for reporting sightings. In the future, the clearinghouse website may have links to other statewide or northeast U.S. regional organizations dealing with invasive aquatic species including Lake Stewards of Maine (formerly Maine Volunteer Lake Monitoring Program), the Northeast Aquatic Nuisance Species Panel and the Northeast Aquatic Plant Management Society.

Task 5C1c: Annotated Bibliography

The Task Force will encourage one of its partners to develop and disseminate an annotated bibliography of Maine-generated research on invasive aquatic species. This may be an interesting project for a student.