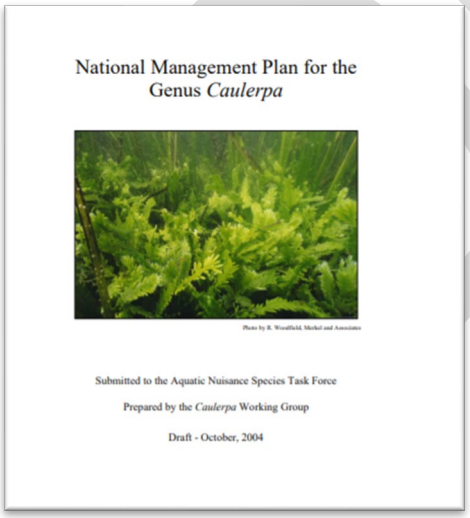
Assessment of the Species Control and Management Plans of the Aquatic Nuisance Species Task Force

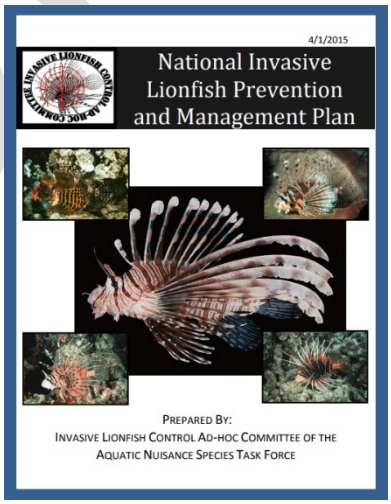
Recommendations from the Ad-hoc Control Subcommittee

June 2021

Control Subcommittee Membership

Kim Bogenschutz (Chair), Iowa Department of Natural Resources
Don MacLean (Coordinator), U.S. Fish and Wildlife Service
Karen McDowell, San Francisco Bay Estuary Partnership
Jolene Trujillo, U.S. Bureau of Reclamation
Dennis Zabaglo, Tahoe Regional Planning Agency
Paul Zajicek, National Aquaculture Association (USA)





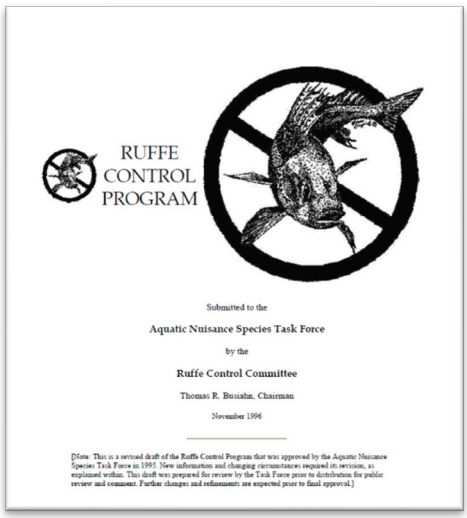


Table of Contents

Executive Summary

In 2019, the Control Subcommittee of the Aquatic Nuisance Species Task Force (ANSTF) took on the task of assessing the current status of each of the nine ANSTF-approved Species Control and Management Plans. The goal of the project was to determine the current status of each of the existing plans to determine whether a plan should remain active, be revised, or be archived.

To accomplish this task, the Subcommittee developed a list of potential contacts based on the original authors and working groups of each plan, appropriate contacts in the areas where the species is known to exist, and appropriate regional contacts. The contacts were then queried to determine whether they were aware of the plan, if they were doing work on said species and if so, whether their work was guided by the existing plan. The information gathered is summarized in a single-page entry for each species control plan, ending with a recommendation from the Subcommittee based on the responses received.

Based on its investigations, the Subcommittee makes the following recommendations.

- The following plans are **recommended to remain active**:
    - Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States
    - National Invasive Lionfish Prevention and Management Plan
    - Assessment of the National Control and Management Plan for Members of the Snakehead Family (Channidae)

- The following plans are **recommended to remain active but are in need of revisions**:
    - National Management Plan for the Genus Caulerpa
    - Management Plan for the European Green Crab
    - National Management and Control Plan for the New Zealand Mudsnail (NZMS)
    - The Ruffe Control Program

- The following plan is **recommended to be archived**:
    - National Management Plan for the Genus Eriocheir (Mitten Crabs)

- Plans with **special circumstances**:
    - The Quagga/Zebra Mussel Acton Plan is not technically considered a species control plan and is actively being revised by the Western Regional Panel.
    - The Brown Treesnake Control Plan is managed by the BTS Technical Working Group and is also under revision; the Working Group wishes to maintain the relationship it has historically had with the ANSTF.

The report then ends with three brief sections. The first section offers some recommendations for priorities on plan revisions. The second section discusses some observations regarding control plans and offers some options to consider. The final section briefly outlines the next steps the Control Subcommittee is planning for moving forward.

I. Background

Section 1202(e) of NISA (1996) authorizes the Aquatic Nuisance Species Task Force (ANSTF) to develop cooperative efforts to control aquatic nuisance species (ANS). Since that time, nine species control and management plans and the Quagga/Zebra Mussel Action Plan have been approved for implementation by the ANSTF. These plans have been implemented to varying degrees across the nation to control established aquatic invasive species, minimizing the risk of harm to the environment and the public health and welfare.

In 2018, the ANSTF began the development of its 2020-2025 Strategic Plan. The six broad goals of the draft plan included: Coordination, Prevention, Early Detection and Rapid Response (EDRR), Control and Restoration, Research, and Outreach and Education. At the December 2018 ANSTF meeting, Goal Teams were formed for each of the six goals and were tasked with refining the objectives and strategies identified for each goal.

At the Spring 2019 ANSTF Meeting, the work of each of the Goal Teams was reviewed and options were discussed for its committee structure under the new Strategic Plan and the process for development of work plans. It was determined that five standing subcommittees should be formed (Prevention, EDRR, Control and Restoration, Research, and Outreach and Education). The remaining goal, Coordination, focuses on internal operations and procedures and is currently managed by the ANSTF Executive Secretary. Self-nominations for the five subcommittees were then organized, and once formed, each subcommittee was tasked with developing a 2020 work plan for their goal by October 1, 2019.

Control and Restoration Goal

The following information is an excerpt from the Control goal of the 2020 – 2025 Strategic Plan and sets the stage for the work of the ANSTF Control subcommittee.

Goal 4: Facilitate capabilities to contain and control established ANS and restore native species and ecosystems

Control of established ANS populations is necessary to slow the rate of range expansion, lessen the impacts to public interests, and increase the likelihood of eradication. At this stage of invasion, multiple tools and significant resources are needed to remove and contain ANS populations as well as to guide management decisions. Risk analysis, benefit-cost analysis, and other tools can help identify and select high-priority ANS to be targeted for control as well as the most appropriate and cost-effective mitigation measures to be undertaken. Habitat restoration is also important to ensure that native and managed ecosystems recover once ANS are controlled. Adequate funding, public awareness, and management expertise are critical to success, particularly because ANS can span geographic and jurisdictional boundaries and do not recognize political boundaries or agency jurisdictions. Therefore, Federal and State agencies, local governments, non-profits, tribes, and private organizations should coordinate on an ecosystem-level approach to managing ANS.

The Act specifies that the ANS Task Force may develop cooperative efforts to control established ANS and minimize the risk of harm to the environment and society. When the ANS Task Force determines that control of an ANS is warranted, recommended actions are organized into a comprehensive management plan that focuses on essential tasks designed to minimize the impact to areas where ANS have already invaded and prevent spread into additional habitats. Species management plans

are developed through a cooperative process, with committee members from Federal and State agencies, non-governmental organizations, industry representatives, subject matter experts, and others. The plans also undergo review by the ANS Task Force members and regional panels, with opportunities for public review. Successful implementation of these plans requires the participation of Federal, State, tribe, and regional entities.

There are currently nine National ANS Management and Control Plans approved by the ANS Task Force:

- Brown tree snake (*Boiga irregularis*), approved June 1996.
- Eurasian ruffe (*Gymnocephalus cernuus*), approved November 1996.
- European green crab (*Carcinus maenas*), approved November 2002.
- Mitten crabs (Genus *Eriocheir*), approved November 2003.
- *Caulerpa* species (an invasive algae), approved October 2005.
- Snakehead (Family *Channidae*), approved November 2006, revision approved May 2015.
- New Zealand mudsnail (*Potamopyrgus antipodarum*), approved May 2007.
- [Invasive] carp (black carp (*Mylopharyngodon piceus*), bighead carp (*Hypophthalmichthys nobilis*), grass carp (*Ctenopharyngodon idella*), and silver carp (H. molitrix), approved November 2007.
- Lionfish (*Pterois volitans* and *P. miles*), approved May 2015.

Control programs, including those incorporated into National ANS Management and Control Plans, are necessary when populations of ANS become so well established that eradication is no longer logistically or economically feasible. Management objectives may include eradication within an area, suppressing a population, limiting spread, and reducing impacts. Control measures may include physical, mechanical, chemical, genetic, or biological tools that integrate into pest management strategies. Habitat and ecosystem restoration should be conducted whenever the control or eradication of ANS is planned since rehabilitation is often necessary to restore ecological processes. Restoration activities may include planting or stocking organisms or improving predator-prey relationships to attain food webs similar to pre-invasion conditions. ANS can be transported by materials, equipment, vehicles, or personnel used to conduct restoration activities; accordingly, all habitat restorations, even those not focused on ANS control, should call attention to actions (e.g., HACCP) that prevent establishment or reduce risk of ANS spread to an acceptable level not yet present within the project site.

The strategies under this goal seek to identify, execute, and improve control and habitat restoration tools. These strategies require inter-jurisdictional communication and regionally coordinated action through the continued development and implementation of ANS control and management plans. The Control and Restoration Goal also promotes mitigation measures and monitoring to ensure that any ANS introduced because of habitat restoration are treated in a rapid, effective and efficient manner.

Objective 4.1: Coordinate the development and implementation of ANS Management and Control Plans

Strategies:

a. Evaluate implementation of ANS Task Force approved ANS Management and Control plans
b. Refine process for the selection and development of new ANS Management and Control plans
c. Provide technical support and expertise for development of new ANS and implementation of existing Management and Control plans

Objective 4.2: Identify and communicate effective control and restoration techniques

Strategies:

a. Make ANS control and restoration protocols and Best Management Practices accessible to ANS Task Force members, regional panels, and partners
b. Encourage restoration of areas following ANS eradication or control efforts
c. Document successful control and restoration operations

Objective 4.3: Identify gaps in available control and restoration measures and encourage innovation

Strategies:

a. Identify circumstances where control or restoration options are not available
b. Identify and partner with entities that have the resources and expertise to advance control and restoration measures
c. Facilitate information sharing of newly developed control and restoration techniques

Outcome for Control and Restoration: Cooperative efforts between ANS Task Force members, regional panels, and their partners that suppress or eradicate ANS populations and restore native ecosystems

Brown Treesnake Control Plan

Although technically one of the nine control plans of the ANSTF, the Brown Treesnake Control Plan's management was transferred to the Brown Treesnake Technical Working Group as part of the Brown Treesnake Eradication and Control Act. The subcommittee included a brief history and recommendations, but did not actually assess the plan's status.

Quagga-Zebra Mussel Action Plan

In addition to the nine species control plans listed above, the ANSTF also facilitated the development of the Quagga-Zebra Mussel Action Plan for Western U.S. Waters (QZAP). Developed by the Western Regional Panel and approved for implementation by the ANSTF, QZAP is implemented by Federal, State, Regional and local entities throughout the west. However, since the internal coordination document did not undergo a formal public review, it is not considered an official ANSTF National Species Management and Control Plan. The Subcommittee included a brief history of the QZAP and its current revision status but did not assess the plan's status.

II. Control Subcommittee Process

To determine the current status of each of the existing ANSTF-approved plans, the Control Subcommittee developed a list of potential contacts based upon:

- Original authors of a plan
- Members of a plan's original development committee
- Regionally appropriate contacts based upon a species' current distribution (from USGS NAS database data), including:
    - USFWS Regional AIS Coordinators.
    - States where the species is currently established.
    - States adjacent to where a species is established.
    - Other organizations/contacts known to be or that may be working on the species.

The Subcommittee developed a series of five questions to help determine the status of each plan. The questions were:

1. Are you, or your organization, doing any work to control or manage < *species x* >?
    a) If yes, please continue on with all the questions.
    b) If no, please drop down to question 5.
2. Is the < *species x* > Plan being used to guide the work you are doing in any way?
    a) If so, what kind of work is being done (very short description)?
    b) Besides funding, does the plan have any pressing management needs?
3. Should the plan remain active?
    a) If yes, does the plan need a revision?
    b) If no, should the plan be archived (and why?)?
4. If the plan is recommended for revision, are you willing to be a potential contact to assist with the revision?
5. Do you know anyone else we should contact who may be working on < *species x* > or conducting work on behalf of the < *species x* > Plan?

The responses to these questions were compiled into a one-page summary for each plan.

The following definitions were agreed upon by the Subcommittee during its assessment of the plans:

- "Active Plan": A species control and management plan is considered "active" if it is still being used by some entity to guide invasive species management work, or if it is not currently being used, it still contains information current enough to be useful.
- "Archived Plan": An archived plan is a plan that is no longer being used to help guide the management of an invasive species, and/or contains information that is outdated, but the plan will still bestored on the ANSTF web site for historical purposes.

The Control Subcommittee decided to use the term "archive" instead of "retire' for plans that may no longer be relevant. The Subcommittee felt this designation was important as the term "retire" may imply that a plan no longer has any value. To avoid that assumption, the Subcommittee decided that instead of "retiring" older plans, they would be "archived" – the implication here being that while an archived plan may no longer be in use, it may still have historical value. In addition, if a plan is archived and then found to be needed again later, it can certainly be resurrected with the understanding that a revision would be required.

III. Control Plan Assessments

The following pages summarize the comments received by the Control Subcommittee during their assessment of each of the species control and management plans. A summary of the answers to the above questions is included along with a recommendation for each plan. It is important to note that in the following summaries, the section on work being conducted includes both work that is being guided by the respective plan, as well as work that is not.

The Brown Treesnake plan and the Quagga/Zebra Mussel Action Plan were not assessed due to their unusual status, but the Control Subcommittee felt it was important to include some summary information on the background and status of both plans.

Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States
Survey Results and Subcommittee Recommendations

- Plan prepared by the Asian Carp Working Group led by USFWS and approved in 2007.
- The national working group is no longer active, but several river basin groups are active (e.g., developing plans, conducting work).
- 27 entities queried; nine responses received.

Who is conducting Asian Carp Work?
The following entities are conducting Asian carp work: private aquaculture facility (PAF, x2), Tennessee Wildlife Resources Agency (TWRA), U.S. Fish and Wildlife Service (USFWS, x4), and Mississippi Department of Wildlife, Fish and Parks (MDWFP). The Subcommittee recognizes that additional Asian carp work is ongoing across the country and that this is not a complete summary; however, it is a snapshot based on the responses received.

Does the Asian Carp Plan Guide This Work?
Of the eight responders conducting Asian carp work, seven of them indicated that their work was guided by the Asian Carp Plan. Most of them also referred to regional or sub-basin plans developed to address specific priorities which used the national Asian Carp Plan for overall guidance (e.g., Asian Carp Regional Coordinating Committee, Upper Mississippi River Basin Asian Carp Control Strategy Framework, Ohio River Basin Asian Carp Control Strategy Framework).

What Kind of Work is Being Conducted?
- One **PAF** is producing and marketing only triploid Grass Carp and Black Carp.
- **TWRA** is doing population monitoring, removal/control efforts, movement studies, and outreach.
- **USFWS** is conducting a large variety of activities that can be broadly categorized as interagency coordination (e.g., grant coordination, strategy development, committee participation), field monitoring and early detection, active prevention/control (e.g., physical removal, implementation/operation/evaluation of barriers, rapid response), research and development, law enforcement/regulatory actions, and outreach with industry, stakeholders, and the public.
- **MDWFP** is utilizing radio telemetry to track Asian carp movement, funding research to document abundance and size structure in newly-invaded waters, and encouraging harvest of Asian carp in areas where they are abundant.

Should the Asian Carp Plan Remain Active or Be Revised?
Eight of the nine responders stated that the Asian Carp Plan should remain active. All of the responders agreed that, overall, the Asian Carp Plan does need to be revised. Six of the responders recommended updates for specific information in the Asian Carp Plan and/or suggested that the regional or basin plans be used for active revisions/updates.

Control Subcommittee Recommendation

Despite its age (13 years), the Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States should remain active. This is based on the fact that the plan is still being used as a high level guidance document that has led to the development and implementation of multiple river basin frameworks and action plans. For example, the USFWS budget was $25 million in FY20 in support of implementing the plan in the Mississippi River Basin. There is information in the appendices of the Asian carp Plan that needs to be updated, but these recommended updates can be resolved as part of active implementation of the plan.

Brown Tree Snake Control Plan
Committee Recommendations

In recognition of the need to control brown tree snake populations, the United States Congress incorporated a section into the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 authorizing such a program. Section 1209 specifically authorized the ANSTF to: "*undertake a comprehensive, environmentally sound program in coordination with regional, territorial, State and local entities to control the brown tree snake (Boiga irregularis) in Guam and other areas where the species is established outside of its historic range.*"

The Brown Tree Snake (BTS) Control Committee was established in 1993 by the ANSTF and the Memorandum of Agreement for Control and Eradication of the BTS. The BTS Control Committee produced the BTS Control Plan in 1996. Since that time, the Service's Fish and Aquatic Conservation Program's Branch of Aquatic Invasive Species has provided funding to continue coordinating the BTS program.

In 2004, the Brown Tree Snake Control and Eradication Act (BTSCE) of 2004, renamed the BTS Control Committee into the BTS Technical Working Group (hereafter TWG), clarified its purpose to ensure that "efforts concerning the brown treesnake are coordinated, effective, complementary, and cost-effective" and assigned it the responsibility for any revision of the Brown Tree Snake Control Plan. The BTS TWG is formally comprised of Federal, State, and territorial partner agencies, with periodic informal participation by non-governmental organizations.

In 2015, the BTS Control Plan was updated by the TWG and resulted in the Brown Treesnake Strategic Plan of 2015; a revision to this strategic plan currently underway is scheduled for completion in 2021. The TWG ensures the plan remains current, relevant and effective and facilitates the implementation of the BTS program.

While the 2004 BTSCE Act reassigned the update of the BTS Control Plan to the TWG, it is important to the TWG that there remain a connection between BTS prevention and control efforts and the ANSTF. The BTS is listed as an injurious species, it receives funding through Service's AIS program and there is no alternative invasive species body in the U.S. that can provide sufficient national-level technical, policy, and legislative support to those working on BTS at local and regional scales.

Control Subcommittee Recommendation

The Control Subcommittee did not assess the Brown Treesnake Control Plan due to existence of the TWG, which is responsible for the update and management of the plan, and is currently revising the plan. Instead, based on the history described above, and at the request of the TWG, the Control Subcommittee recommends that:

- The ANSTF continue to defer to the Brown Treesnake Working Group on all matters related to the Brown Treesnake and its management plan; and
- The ANSTF also maintain its relationship with and connection to the TWG, providing national-level technical, policy, and legislative support when needed.

National Management Plan for the Genus Caulerpa
Survey Results and Subcommittee Recommendations

- Plan approved in 2005.
- Prepared by the Caulerpa Working Group (working group no longer active).
- Seven entities queried; six responses received.

Who is conducting Caulerpa Work?
The California Department of Fish and Game, California State Lands Commission, Florida Fish and Wildlife Conservation Commission and NOAA Fisheries, Protected Resources Division Long Beach California.

Does the Caulerpa Plan Guide This Work?
Yes. The Plan currently informs and guides their public education efforts.

What Kind of Work is Being Conducted?
- The California Department of Fish and Game, California State Lands Commission, and NOAA Fisheries cooperatively conduct Caulerpa outreach and education.
- The Florida Fish and Wildlife Conservation Commission monitor for *Caulerpa taxifolia* and *Caulerpa brachypus* when in water operations are being conducted, and as part of their Florida Bay seagrass research efforts.

Should the Caulerpa Plan Remain Active or Be Updated?
The California agencies and NOAA Fisheries commented that the Plan should remain active because there continues to be the threat of new introductions. NOAA Fisheries cited a peer-reviewed, published 2012 California aquarium store survey reporting *Caulerpa spp*. continued to be sold in the aquarium trade despite a 2001 statewide ban. The Plan provides relevant information others may need to justify a response, and relevant information to initiate a response.

Control Subcommittee Recommendation

The **National Management Plan for the Genus Caulerpa** should be remain active and be updated. This recommendation is based on the fact that despite the age of the plan (15 years), Federal and California State agencies still utilize the Plan to inform their efforts. Updates on several sections of the Plan are necessary and new sections are recommended to be added. This recommendation is timely given the April 2021 discovery of *Caulerpa prolifera* – a species that was included in the original *Caulerpa* control plan - growing in the China Grove area of Newport Bay, California.

National Management Plan for the Genus Eriocheir (Mitten Crabs)
Survey Results and Subcommittee Recommendations

- Plan approved in 2003.
- Prepared by the Chinese Mitten Crab Working Group (no longer active).
- 25 entities queried on both the east and west coasts; only three responses received.

Who is conducting mitten crab work?
The New York State Department of Conservation, the California Department of Fish and Wildlife (CDFW), and the U.S. Fish and Wildlife Service.

Does the Mitten Crab Plan Guide This Work?
The Mitten Crab plan is not currently being used to guide work on either coast.

What Kind of Work is Being Conducted?
East Coast

- Mitten crabs were found in 2007 in the Hudson River and as far inland as Albany.
- The New York State Department of Conservation is working to track movement/distribution and as a result of their general aquatic invasive species education and regulatory efforts (6 NYCRR Parts 575 and 576) are working to contain and prevent spread.

West Coast

- The California population is thought to have significantly declined as they are rarely seen today. One Mitten Crab was collected in early October 2019, the first crab confirmed in San Francisco estuary since the fall of 2010. A report was received in late September 2019 of bait stealing by mitten crabs in Bethany Reservoir, which is on the California Aqueduct; but no crabs were observed.
- Within, CDFW, their AIS section is not currently doing any work to control or manage the mitten crabs: this is important since this is where the invasion took place. However outside the AIS section, CDFW indicated that they are looking for mitten crabs in San Francisco Bay Estuary, but it is part of baseline monitoring efforts and not something specific to any mitten crab management efforts.
- The USFWS noted that there is not currently any work to actively control or manage mitten crabs in the region (which includes CA). However, prevention activities and monitoring are also on-going as part of general invasive species monitoring.

Should the Mitten Crab Plan Remain Active or Be Updated?
Only two responders answered this question: one responded yes, but that the plan needs revision. The second did not feel that the plan needed to stay active.

Control Subcommittee Recommendation

The **National Management Plan for the Genus *Eriocheir* (Mitten Crabs)** should be archived. This is based on the 17-year age of the plan and the lack of current control or management activities. Much has changed over the years, a considerable amount of the Plan needs updating and new sections were identified that should be added. However, the lack of ongoing work does not seem to warrant a revision at this time. There are still cases of mitten crab smuggling that occur from time to time and the status of populations on both coasts is uncertain. The Subcommittee, however, is aware of recent sightings in the Housatonic River (CT), and acknowledges that the Mitten Crab plan may need to be resurrected and revised once more is known about east coast populations and range expansion.

Management Plan for the European Green Crab
Survey Results and Subcommittee Recommendations

- Plan approved in 2002.
- Prepared by the Green Crab Control Committee
    - Primary NOAA author now retired
    - Original plan editors are still active in the field of AIS and were surveyed
- 23 entities queried (including the West Coast European Green Crab Committee which may have reached up to 50 more); only four responses received.

Who is conducting European Green Crab Work?
The following three entities who responded to the survey are conducting European green crab work: University of California, Davis (UCD), National Oceanic and Atmospheric Administration (NOAA), and the Washington Department of Fish and Wildlife (WDFW).

Does the European Green Crab Plan Guide This Work?
Of the three responders conducting European green crab work, two of them indicated that their work was initially guided by the European Green Crab Plan. One of them now uses Salish Sea Transboundary Action Plan for European Green Crab, a regional plan developed to address specific priorities.

What Kind of Work is Being Conducted?

- **Work Being Guided by the National Plan:**
    - **UCD** is conducting a variety of green crab projects, including: 1) an ongoing population control program; 2) a coast wide study of population genetics comparing CA with WA, the Salish Sea and British Columbia among other locations; 3) a 37-year monitoring program on recruitment and impacts of green crabs on benthic infauna; and 4) monitoring the spread of green crabs annually along the west coast.
    - **WDFW** is actively managing European green crab in coordination with local, state and federal governments, tribes, shellfish aquaculture industry and many more.
- **Work Not Using the National Plan:** In 2020, **NOAA** supplied traps acquired by the AK Dept. of Fish and Game to their Little Port Walter facility and the Metlakatla Indian Community. They also funded a pilot project to investigate the use of eDNA techniques in concert with traditional trapping at the same locations.

Should the European Green Crab Plan Remain Active or Be Updated?
All of the responders agreed that the European Green Crab Plan needs to be revised. Two of the responders recommended updates for specific information in the Plan.

Control Subcommittee Recommendation

Despite the small number of responders, the European Green Crab (EGC) Plan should be remain active, but needs to be revised: several sections of the Plan were identified as requiring updates and new sections were identified that need to be added. This is based on the age of the plan (18 years), the Dec. 2020 WRP recommendation to the ANSTF to support actions to detect and control EGC, the work currently being conducted, and the crab's continued west coast expansion.

National Invasive Lionfish Prevention and Management Plan
Survey Results and Subcommittee Recommendations

- Plan approved in 2015.
- Prepared by the ANSTF Invasive Lionfish Control Ad-HOC Committee.
- Approximately 34 entities queried; 26 responses received.

Who is Conducting Lionfish Work?
Of the 26 responses we received, 18 responders indicated that they are doing some sort of lionfish work. These included:

- 3 Federal bureaus: NOAA (3 offices), USFWS, and NPS
- 6 States: AL, FL (x3), LA, MS, NC, and SC
- 4 Universities: NCSU, TX A&M, U of FL, and U of Miami
- Gulf States Marine Fisheries Commission

Does the Lionfish Plan Guide This Work?
Of the 18 responders conducting lionfish work, four of them indicated that their work was guided by the lionfish management plan. At least two responders did not even know of the National Plan's existence. Others are using more region-specific plans.

What Kind of Work is Being Conducted?

- **Work Being Guided by the National Plan:** Alabama and Mississippi are conducting educational events to increase awareness and harvest of lionfish. Louisiana has been monitoring populations and meta-barcoding stomach contents and using genetics to ID species. NOAA's Flower Banks Garden National Marine Sanctuary is controlling lionfish within its sanctuary. The Service supports lionfish work through its small grant program and the funding of State ANS Management Plans.
- **Work Not Using the National Plan: Other Work Being Conducted Outside the National plan**
    - Development of a Florida Lionfish Control Plan
    - Regulatory revisions designed to increase harvest pressure
    - Tournaments to incentivize removal and collect lionfish information
    - Research by numerous entities on a number of lionfish-related topics
    - Active management at sensitive areas (e.g. Biscayne National park)
    - Monitoring lionfish abundance from Cape Hatteras, NC to Port St. Lucie Inlet, FL
    - Promoting lionfish education at hundreds of public outreach and education events
    - Administering incentive programs, classroom programs, and the "Lionfish Challenge"
    - Marketing focused on lionfish as a recreational fishery and responsible seafood source

Should the Lionfish Plan Remain Active or Be Revised/Updated?
Of the ten responders that answered this specific question, all ten of them felt that the lionfish plan should remain active. Of those ten, three did not feel the plan needed to be updated yet; three indicated the plan needed to be updated, and four gave suggestions for updates but did not indicate that the suggested updates are needed immediately.

Control Subcommittee Recommendation:
The **National Invasive Lionfish Prevention and Management Plan** should remain active for at least another 5 years before a revision is considered. This is based on the young age of the Lionfish Plan (5 years), ongoing work not guided by but complementing components of the existing Plan, and the recommendations of some of the entities that are currently conducting lionfish work.

National Management and Control Plan for the New Zealand Mudsnail (NZMS)
Survey Results and Subcommittee Recommendations

- Plan approved in 2007.
- Original lead: New Zealand Mudsnail Management and Control Plan Working Group (primary USFWS author now retired).
- Approximately 23 entities queried; seven responses received.

Who is Conducting NZMS Work?
The following seven entities are conducting some type of NZMS work: Montana Fish, Wildlife and Parks, FWS Columbia Pacific Northwest**,** California Department of Fish and Wildlife, Colorado Parks and Wildlife, South Dakota Game, Fish and Parks, Washington Department of Fish and Wildlife, and Wyoming Game & Fish Department.

Does the New Zealand Mudsnail Plan Guide This Work?
Out of seven respondents, only two are using the NZMS Control and Management Plan (see below).

What Kind of Work is Being Conducted?
- **Work Being Guided by the National Plan:**
  - **FWS Columbia Pacific Northwest** – Work includes outreach to the public, including signage posted at known NZMS infested sites. Outreach to specific user groups such as anglers; Education and training to field staff and hatchery staff/managers about NZMS; implementing HACCP (Hazard Analysis Critical Control Point) planning to prevent unintentional movement of NZMS as part of field activities and monitoring for NZMS (eDNA, visual inspections).
  - **SD Game, Fish and Parks** – Monitoring for NZMS.
- **Work Not Using the National Plan:**
  - **MT- Fish, Wildlife and Parks** – Active monitoring and limited control by dewatering.
  - **CA Dept. of Fish and Wildlife** – Pathway prevention, outreach and education, monitoring
  - **WA- Department of Fish and Wildlife** – NZMS surveys are implemented into zebra/quagga mussel monitoring.
  - **CO Parks and Wildlife** – Monitoring existing NZMS populations and surveying for new populations. They are also performing watercraft inspection and decontamination to prevent and contain NZMS in select waters. They are doing a lot of education and outreach and installing new wader cleaning stations statewide in 2020-2022.
  - **WY Game & Fish Department** – Conducts public outreach and awareness and monitors current populations but has not attempted any control.

Should the New Zealand Mudsnail Plan Remain Active or Be Updated?
All respondents answered that the plan should remain active and be updated.

Control Subcommittee Recommendation

The **National Management and Control Plan for the New Zealand Mudsnail (NZMS)** should remain active but needs to be revised. This is based on the age of the plan (13 years) and the responses from the seven entities currently conducting NZMS work and the ongoing work that is not guided by, but complements components of the Plan.

Quagga/Zebra Mussel Action Plan for Western U.S. Waters

Background and Timeline

In 2007, invasive quagga mussels were detected in Lake Mead National Recreation Area and subsequently in the lower Colorado River Basin and associated waters. Senator Feinstein (CA) requested an action plan to detail management options to stop the spread of invasive mussels from the lower Colorado River into new western waters. The ANSTF discussed the concept at the fall 2008 ANSTF meeting and delegated to the Western Regional Panel (WRP). The WRP formed two committees, a steering committee, and a writing committee, to develop the document over the next year. The ANSTF approved the QZAP in February 2010.

The QZAP summarized strategies that addressed the zebra and quagga mussel invasion in the West and identified and prioritized specific and comprehensive actions needed to prevent further spread of these mussels, respond to new infestations, and manage existing infestations. QZAP was to serve as a common set of priorities for water or recreational management entities and their partners.

The WRP membership reviewed QZAP in 2013 and members indicated that the priorities specified in the original document continued to be the highest priorities for western waters, and that progress at that point had not been substantial. The WRP Chair presented the review to the ANSTF and collectively they decided that revising or updating the plan was not needed at that time.

As more partners engage in the fight against quagga and zebra mussels in the West, the QZAP is referenced as the "road map" to follow. However, with a decade of action, including successes and challenges, it is increasingly important to share past accomplishments in order to appropriately determine needs. As such, the WRP published the *Quagga and Zebra Mussel Action Plan for Western Waters: Status Update Report* in April 2019. The report compiled relevant information and accomplishments under each original action item and documented the status of western progress on each item.

Next Steps and Update

Following the publication of the *Quagga and Zebra Mussel Action Plan for Western Waters: Status Update Report* and *Building Consensus in the West Workgroup: Final Activity Report 2011-2019,* the WRP began working to develop the QZAP with updated recommendations to inform future management. The updated recommendations for the Quagga-Zebra Mussel Action Plan for Western Waters or QZAP 2.0 is being prepared to further the existing collaborative efforts on invasive mussels. They provide clear direction and a framework to guide WRP members and their partners in decision-making that empowers the implementation of a unified strategy for preventing the spread of quagga and zebra mussels in the West.

No Subcommittee Recommendation Needed

As of the drafting of this report, the QZAP 2.0 is in the last stages of finalization by the WRP. It was been approved by the WRP Executive Committee after some suggested edits and was presented at the December 2020 ANSTF meeting. Because the WRP is undertaking this effort, the Control Subcommittee did not feel it was necessary to make a recommendation for the QZAP plan.

Ruffe Control Program
Survey Results and Subcommittee Recommendations

- Approved in 1995; revised in 1996.
- Prepared by Ruffe Control Committee (no longer active).
- Approximately 12 entities queried; seven responses received.

Who is conducting Ruffe Work?
Of the seven responses we received, two responders - the U.S. Fish and Wildlife Service (USFWS) and the State of Michigan - indicated some work is being done on Ruffe.

Does the Ruffe Control Program Guide This Work?
- The USFWS still uses the Ruffe Control Program to guide its surveillance efforts.
- MI DNR indicated that the Ruffe Control Program is not being used to guide the State's efforts, but notes that it was used to inform many of the prevention strategies from the program which are included in the Michigan's Aquatic Invasive Species State Management Plan (MI Plan).

What Kind of Work is Being Conducted?
- The USFWS is conducting trawling surveillance at St Mary's River, Lake Huron and at western Lake Erie ports and tributaries. The Lower Great Lakes Fish and Wildlife Conservation Office (FWCO) is conducting trawling surveillance at eastern Lake Erie and Lake Ontario ports and tributaries. The Alpena FWCO is also trap netting and electroshocking for Ruffe in areas of past occurrence in the St Mary's River and northern Lake Huron areas. The Great Lakes Service efforts (Unified Regions 1 and 3) that support outreach and education for Ruffe remain a priority.
- The MI Plan includes pathway-based prevention strategies that address objectives in the Ruffe Control Program targeting the bait and shipping pathways. MI DNR also maintains a Ruffe information page on its invasive species website. Currently no active control efforts are ongoing in MI waters due to limited availability of effective control options, relatively low observed catch rates in MI waters, and limited resources due to other ongoing efforts to address statewide AIS priorities.

Should the Ruffe Control Program Remain Active or Be Revised/Updated?
The Service and MI DNR both agree that the Ruffe Control Program should remain active, but it is clear that the aging plan needs revision. It would benefit from an updated summary on documented impacts and spread in the last two decades. Additional information on novel control strategies may help inform future responses. If Ruffe spread to Southern Lake Michigan or inland they may spark a new sense of urgency for management and control (increased potential for spread into large rivers such as the Mississippi River like the round goby). In the Lower Lakes there is still significant concern over their spread to Lake Erie and inland waters such as the Finger Lakes. From a conservation viewpoint, the Service remains committed to addressing Ruffe as a high priority potential invasive species and ensuring detection efforts continue.

Control Subcommittee Recommendation

The **National Ruffe Control Program** (Plan) should remain active and should be revised and updated as soon as possible. This recommendation is based on the age of the plan (24 years), and the advice from both USFWS and the State of Michigan that the plan is still needed. The spread of Ruffe to Lake Erie and inland waters is still a conservation concern.

National Control and Management Plan for Members of the Snakehead Family (*Channidae*) Survey Results and Subcommittee Recommendations

- Plan originally approved in 2006; revised in 2015.
- Prepared by the ANSTF Snakehead Plan Development Committee (no longer active).
- Approximately 14 entities queried; eight responses received.

Who is conducting Snakehead Work?
The following entities are conducting some sort of snakehead work: Florida Fish and Wildlife Conservation Commission, Georgia Department of Natural Resources (GA DNR), Kansas Department of Wildlife, Parks and Tourism, Maryland Department of Natural Resources (MD DNR), Tennessee Department of Natural Resources, U.S. Fish and Wildlife Service (USFWS) (Southeast Legacy Region) and U.S. Geological Survey's Columbia Environmental Research Center.

Does the Snakehead Plan Guide This Work?
Five of the eight respondents stated that the Plan still guides their work (Control, Management or Research) or that they are planning on implementing appropriate parts of the Plan with newly hired staff.

What Kind of Work is Being Conducted?
- **FL Fish and Wildlife Conservation Commission** – Actively working to control and manage bullseye snakehead since their discovery in October 2000. Efforts include ecological research, range monitoring, eradication attempts, public round-ups, education/outreach, and eDNA development.
- **GA DNR** – Eradication/control attempts including rotenone treatments and physical removals; extensive surveys to assess populations; currently using a combination of active sampling and assessment of the feasibility of eDNA sampling to monitor potential latent population.
- **MD DNR** – Investigation of ecological impacts in Maryland's ecosystems and prioritization of management needs and strategies for control. Plan also used as a reference document for basic biology and history of snakeheads in the United States.
- **USFWS** – **Unified Region 2:** Has developed primers and probes for Northern and Bullseye snakehead species.

Should the Snakehead Plan Remain Active or Be Updated?
Seven of eight responders supported keeping the Plan active, but also indicted that the plan needs to be revised/updated immediately and would contribute to a revision/update.

Control Subcommittee Recommendation

The **National Control and Management Plan for Members of the Snakehead Family (Channidae)** should remain active. This recommendation is based on the age of the plan (revised 5 years ago), and the fact that it is highly valued and being actively used by state and federal agencies. Some responders indicated a revision/update is needed and they identified sections that should be updated or added.

IV. Control Plans Recommended for Revision

The ANSTF coordinated species management plans are valued by state and federal agencies and are informing some of the Federal, State and non-governmental actions to coordinate, prevent, detect, rapidly respond, control, restore, research, or educate people concerning invasive species. Plans range in age from 5 to 24 years. Plan users recommended updating and/or expanding four management plans:

- Caulerpa
- Green Crab
- New Zealand Mudsnail
- Ruffe

The Subcommittee recognizes undertaking plan revision imposes considerable resource demands for the ANSTF, Its members, and plan developers and recognizes that not all the plans may be able to be revised at once. Although it may seem logical to revise the plans on a schedule based on their age, the Subcommittee recommends the ANSTF also consider current use and recent events as factors in deciding which plan should first be revised.

V. Observations and Considerations

Throughout this assessment the Control Subcommittee observed several findings that can potentially impact how National Control Plans are utilized into the future.

First and foremost, National Control Plans lack supporting financial resources to implement. The committee acknowledges that this isn't likely to change; however, recognizing this limitation may impact how ANSTF wishes to pursue national control plan development in the future.

Secondly, the control committee observed that National Control Plans serve as guidance/reference for the development of more focused State, Regional, or other types of species-specific control plans. Additionally, there can be numerous types of plans for the same species, for example: for lionfish, the committee encountered at least 3 other plans (NPS – Lionfish Response Plan, NOAA National Marine Sanctuary plan and the FL FWC – State Control Plan). The large number of plans regarding invasive species control highlights that National Control Plans are not always what practitioners utilize for day-to-day control of an infestation.

The committee also observed that the National Control Plans may be regularly referenced but are rarely publicized and promoted. National Control Plans tend to be well known within the invasive species community but there is a learning curve for newcomers, and site or resource specific plans are where information regarding on the ground control efforts are obtained.

In order to address the absence of resources, national scope, and limited publicity when thinking about the creation of additional National Control Plans, the Control Subcommittee proposes several options for the ANSTF to consider:

National Scope:

- ANSTF can provide guidance on control efforts that is not a formal, national plan. Plans take a lot of work and time to get approved and are not necessarily utilized. An alternative

format that still provides the rigorous guidance may be a better output than the current plans.

Resources:

- ANSTF should thoroughly consider whether to approve of any new plans because they don't come with resources

Publicity:

- ANSTF should find ways to promote its current National Control Plans
- ANSTF should create a document library for practitioners to utilize

Potential Area for future exploration by the Control Subcommittee:

- Are we getting the return on investment for current National Control Plans?

National Control Plans are a beneficial tool for the aquatic nuisance species community and considering ways to make the plans more utilitarian and accessible will allow the ANSTF to ensure their success into the future.

VI. Next Steps

Concurrent with this report, the Control Subcommittee is also developing a document that outlines the steps for the development of control plans as well as guidance on plan contents. After completion of these two reports, the Subcommittee will move forward with the next logical steps identified by the original team which developed the initial control outputs for the 2020 ANSTF Strategic Plan. These include:

- Output 4.1.a(ii): Determine a Plan Liaison, if needed, for each ANS Management and Control Plan to monitor and report plan progress and implementation needs.

- Output 4.1.a(iii): Assist Plan Liaisons in finding Plan Managers and forming ad-hoc subcommittees to revise any ANS Management and Control Plan that is determined to be of high priority for a revision or update.

- Output 4.1.b(i): Develop a formal process to approve development of additional ANS Management and Control Plans; the process should include procedures for plan nomination and criteria to determine if the plan should be developed (e.g., level of impact, support for implementation, inclusion of an entity that is willing to lead implementation).