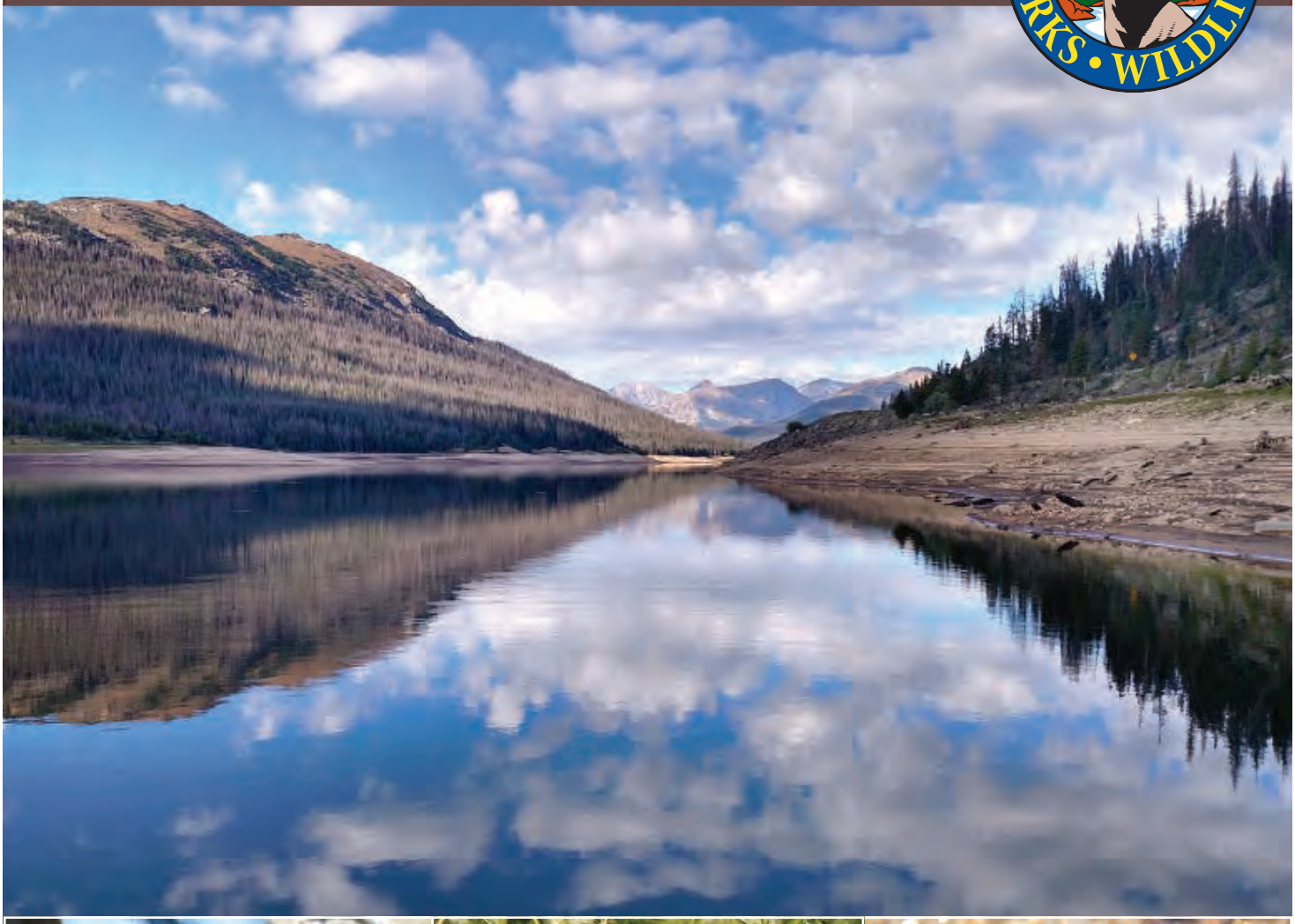
COLORADO PARKS & WILDLIFE

State of Colorado Aquatic Nuisance Species Management Plan

Invasive Species Program



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The Colorado Aquatic Nuisance Species Management Plan is part of a multi-jurisdictional collaborative effort to prevent and contain aquatic nuisance species to avoid or mitigate negative impacts to natural resources, outdoor recreation, and the water infrastructure of the state. Colorado Parks and Wildlife is providing coordination for the implementation of this plan, and together with their partners, are providing implementation guidance and oversight.

DESIGN SERVICES PROVIDED BY STATE OF COLORADO/INTEGRATED DOCUMENT SOLUTIONS

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Acronyms

ABYC—American Boat and Yacht Council

ACOE—Army Corps of Engineers

AFWA—Association of Fish and Wildlife Agencies

AG—Attorney General

AIS—Aquatic Invasive Species

ANS—Aquatic Nuisance Species

ANSTF—Aquatic Nuisance Species Task Force

BIA—Bureau of Indian Affairs

BLM—Bureau of Land Management

BOR—Bureau of Reclamation

CANS—Colorado Aquatic Nuisance Species Management Plan

CANSTF—Colorado Aquatic Nuisance Species Task Force

CDA—Colorado Department of Agriculture

CDNR—Colorado Department of Natural Resources

CDOT—Colorado Department of Transportation

CDOW—Colorado Division of Wildlife

CDPHE—Colorado Department of Public Health and the Environment

CDWR—Colorado Department of Water Resources

CMDA—Colorado Marine Dealers Association

CRB—Columbia River Basin

CRFWC—Colorado River Fish & Wildlife Council

CPW—Colorado Parks and Wildlife

CWA—Clean Water Act

CWCB—Colorado Water Conservation Board

DARCA—Ditch and Reservoir Company Alliance

DNA—Deoxyribonucleic Acid

DOI—Department of the Interior

Acronyms (continued)

eDNA—Environmental Deoxyribonucleic Acid

EDRR—Early Detection, Rapid Response

EO—Executive Order

EPA—Environmental Protection Agency

ESA—Endangered Species Act

EWM—Eurasian Watermilfoil

ISAC—Invasive Species Advisory Committee

ISAN—Invasive Species Action Network

ISSC—Invasive Species Subcommittee

ISP—Invasive Species Program

IT—Information Technology

MRBP —Mississippi River Basin Panel

MRBP—Missouri River Basin Panel

NAAG—National Association of Attorneys General

NAISMA—North American Invasive Species Management Association

NANPCA—Non-Indigenous Aquatic Nuisance Prevention and Control Act

NASBLA—The National Association of State Boating Law Administrators

NASL—National Association of State Legislators

NEPA—National Environmental Policy Act

NGO—Non-Government Organization

NISA—National Invasive Species Act

NISC—National Invasive Species Council

NMMA—National Marine Manufacturers Association

NOAA—National Ocean and Atmospheric Administration

NPDES—National Pollutant Discharge Elimination System

NPS—National Parks Service

NSGLC—National Sea Grant Law Center

NWCG—The National Wildfire Coordinating Group

NZMS—New Zealand Mudsnails

OIT—Colorado Governor's Office of Information Technology

PACFA—The Pet Animal Care Facilities Act

PCR—Polymerase Chain Reaction

PIJAC—Pet Industry Joint Advisory Council

PSMFC—Pacific States Marine Fisheries Commission

PWC—Parks & Wildlife Commission

SOBA—States Organization for Boating Access

SWA—State Wildlife Areas

USACE—US Army Corps of Engineers

USDA—US Department of Agriculture

USFS—US Forest Service

USDOT—US Department of Transportation

USFWS—US Fish and Wildlife Service

USGS—US Geological Survey

VHSV—Viral hemorrhagic septicemia

WAFWA—Western Association of Fish and Wildlife Agencies

WGA—Western Governors Association

WID—Watercraft Inspection and Decontamination

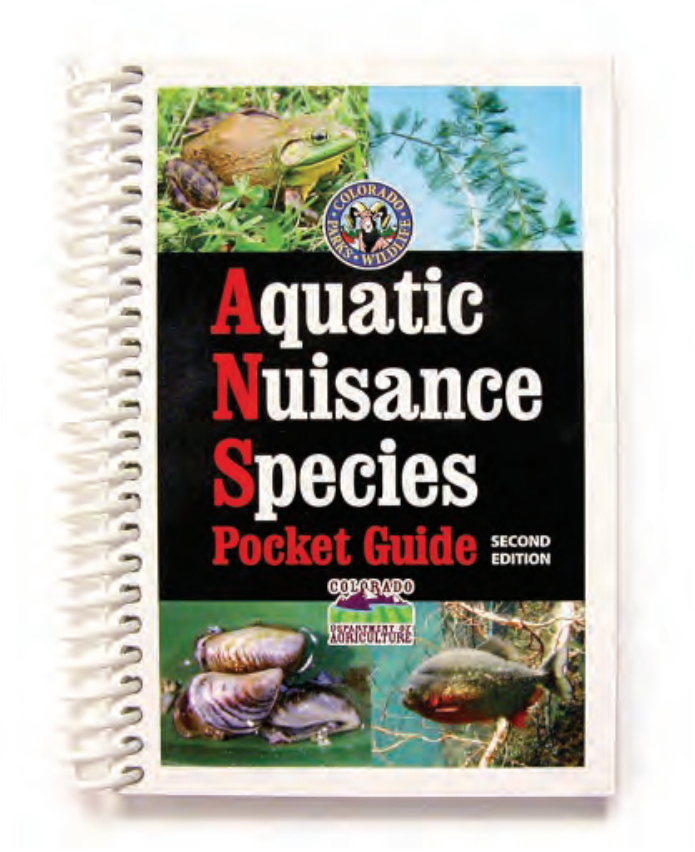
WISCE—Western Invasive Species Coordinating Effort (a.k.a. Western State ANS Coordinators)

WRP—Western Regional Panel on Aquatic Nuisance Species

WSIA—Water Sports Industry Association

ZQM—Zebra and Quagga Mussels

Executive Summary



Aquatic Nuisance Species (ANS) are invasive plants and animals that are transported and released, intentionally or unintentionally, outside of their historic range. ANS can completely alter aquatic systems by destroying native plant and animal habitats; threatening the diversity and abundance of native species; and damage industrial, agricultural, and recreational activities dependent on surface waters. ANS has spread beyond historic ranges and has adversely affected positive waters by threatening the integrity of the water resources. ANS are the cause of significant ecological and socio-economic problems for water users in North America. ANS, such as Eurasian watermilfoil (EWM), zebra/quagga mussels (ZQM), and Asian carp are being introduced or transported into new habitats at an alarming rate. Impacts from ANS are currently taking place in Colorado and are likely to increase if more non-indigenous species are introduced.

In 1990, the Non-Indigenous Aquatic Nuisance Prevention and Control Act (NANPCA) was passed to address ANS problems within the United States. This legislation provided an opportunity for federal cost-share support for the implementation of State ANS Plans. While programs created by this legislation were initially aimed at problems in the Great Lakes Region and Western U.S., the reauthorization of NANPCA in 1996 as the National Invasive Species Act (NISA) established a national goal of preventing new ANS introductions and limiting the dispersal of existing ANS in all 50 states. NISA specifies that State ANS Plans identify feasible, cost-effective management practices and measures that can be implemented by the state to prevent and control ANS infestations in a manner that is environmentally sound. Approval of a State ANS Management Plan by the Federal Aquatic Nuisance Species Task Force (ANSTF) is required for Colorado to be eligible for federal grants for ANS, as detailed in section 1204 of NISA which authorized the Director of the Fish and Wildlife Service to make grants to states with approved state or interstate ANS management plans (110 Stat. 4089,4091).

The significance of Colorado's aquatic resources requires a coordinated protection effort focused on prevention and coherent rapid response to the risk posed by ANS. For the last decade, Colorado's operations have been guided by multi-jurisdictional species-specific management plans, such as the Colorado Zebra and Quagga Mussel Management Plan. The implementation of a comprehensive overarching ANS Management Plan is necessary for guiding Colorado in future actions pertaining to ANS.

The purpose of Colorado's Aquatic Nuisance Species Management Plan is to recommend a statewide comprehensive approach to prevent and manage ANS through collaborative strategies. This management plan was developed collaboratively by Colorado Parks and Wildlife's Invasive Species Program (ISP) alongside the Colorado ANS Task Force members and stakeholders. This plan is the recommended programmatic strategy for preventing and managing ANS in the state. The Plan is designed to assist stakeholders with a proactive approach to prevention and rapid response.

The continued range expansion of zebra and quagga mussels throughout the Western US over the last decade has put Colorado at a much higher risk of devastating ecological and economic impacts from

the introduction of these destructive species than ever before. In an effort to enable Coloradoans to effectively respond to emerging and unanticipated ANS threats, this document will provide the necessary guidelines for management. The goal of the Plan is to minimize the harmful ecological, economic, and social effects of ANS through the prevention and management of ANS into, within, and from Colorado.

This Plan has been structured around prevention, internal and external coordination, monitoring and early detection, rapid response, education, outreach, and long term control. This is achieved through full implementation of the Plan with the continuation of the current CPW ANS Program that emphasizes the collaboration of agencies in order to prevent introductions, while effectively controlling or containing established ANS populations. Furthermore, to meet the objectives, strategies, and goals that are identified, respective actions will be routinely updated to illustrate program changes, accomplishments, and any emerging threats.

To accomplish the goal of the Plan, six objectives relating to ANS have been identified:

1. Ensure effective and consistent implementation of the Plan.
2. Prevent new introductions through managing human vectors and pathways of introduction and spread.
3. Improve the capacity to implement rapid response for new ANS.
4. Survey and monitor waters of the state for ANS.
5. Evaluate and improve upon the current statewide informational and educational campaigns.
6. Identify and support research including survey, monitoring, control, eradication, and education.

CPW's ANS expenditures total approximately $5.5M per year for temporary employees and operating budgets. Full-time employees in total account for roughly $500,000 in time charged to ANS each year. There are three full-time employees in the ANS Program Office and one full-time employee dedicated to ANS at Lake Pueblo State Park. CPW staff at State Parks and Wildlife Areas charge time to ANS when performing ANS related tasks (e.g. supervising or performing inspection and decontamination, or enforcement). CPW will request funding annually from the U.S. Fish and Wildlife Service for the implementation of this Plan.

The Governor of the State of Colorado and Colorado Parks and Wildlife, along with partner agencies involved in the management of ANS in Colorado, will submit this plan to the National Aquatic Nuisance Species Task Force, as allowed by section 1204 of the Federal Non-Indigenous Aquatic Nuisance Prevention and Control Act, on behalf of the State of Colorado, for the purpose of seeking federal grants to assist with the implementation of this plan.

Lake Pueblo

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Introduction

Colorado's rivers and water bodies support the economy, environment, and lifestyle in an arid and variable Western climate. Colorado's water also acts as headwater origins of seven major river basins or watersheds that supply water to 19 downstream states and Mexico (Cantwell, 2010). Aquatic Nuisance Species (ANS) pose a serious risk to Colorado and the people who rely on the water the state provides. ANS can completely alter aquatic ecosystems and threaten the integrity of water resources. In the last decade, Colorado has seen a number of non-native aquatic species out-compete native species disrupting ecological stability consequently impacting local and regional economies and recreation that depend on Colorado water. Many of Colorado's neighboring Western states have been overrun by invasive species creating a looming threat to Colorado's natural resources as people, animals, and other vectors travel between the states possibly intentionally or unintentionally transporting ANS. Moreover, as global climate change increases water temperatures, allowing for the rapid expansion of aquatic invasive species, new vectors of spread and specific species of concern are now on the horizon. Throughout the document, it will be clear that Colorado's action plan will be addressing prevention, detection, and management actions for ANS that have been found in the state, in addition to preventing ANS that has that potential to invade.

Program History

> ***Note:*** *Prior to July 1, 2011, the Colorado Division of Parks and Outdoor Recreation (CDPOR or DPOR) and the Colorado Division of Wildlife (CDOW or Wildlife) were separate agencies within the Colorado Department of Natural Resources. At that time, CDPOR was often referred to as "Colorado State Parks," "The Parks Division," "State Parks," or simply "Parks." The Colorado Division of Wildlife was often referred to as "The DOW," The Wildlife Division," or simply "Wildlife." On July 1, 2011, legislation was enacted to combine the Colorado State Parks and the Colorado Division of Wildlife into one agency—Colorado Parks and Wildlife (CPW). In order to reduce the number of acronyms and confusion, we will attempt to refer to past CDPOR operations, programs, and functions as "State Parks," and past Colorado Division of Wildlife operations, programs, and functions as "Wildlife." Any mention in this Plan of State Parks or Wildlife occurred before the merger. Any current or future actions mentioned in this plan will be executed by the single merged agency, CPW. Activities from 2012–present are attributed to CPW.*

Colorado has been involved in aquatic nuisance species identification and management for the last two decades. The discovery of Eurasian watermilfoil and New Zealand mudsnail in State waters led to the formation of an ANS partnership between Wildlife, State Parks and the U.S. Fish and Wildlife Service (USFWS) in 2004. The partnership centered on sampling and monitoring for aquatic noxious weeds and invasive animal species, while collecting baseline data on native species. The partnership also responded to reports of ANS and focused on statewide education, outreach, research and coordination with other western states.

In 2006, a group of caring individuals from numerous agencies started gathering regularly to discuss ANS. The group was co-led by Wildlife and State Parks. Agencies that participated included the Colorado Fish Health Board, the Colorado Department of Public Health and the Environment, the Colorado Watershed Network, the Colorado Department of Agriculture, The Nature Conservancy, Trout Unlimited, the City of Westminster, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S.D.A. Forest Service, U.S. Environmental Protection Agency, and the National Park Service. This group began to conceptualize what a statewide Invasive Species Program and/or ANS Program would look like and how it would function. They educated themselves to the legal authorities that existed through NANCPA and NISA and began to draft this State of Colorado ANS Plan.

This unofficial team was full of passion and concern for the resources of Colorado. They went out to field sites to learn more about NZMS and EWM impacts to their state. They teamed up and conducted field surveys on the weekends on their own time. They partnered with the Aquatic Ecosystem Restoration Foundation and hosted the ANS Symposia in

Brighton and Grand Junction to raise awareness. They also hosted smaller ANS workshops around the state to teach interested parties species of concern, identification, impacts, and reporting.

The team leaders pitched the Colorado ANS Management Plan to leadership in Spring 2007. The team felt that this was the best option to create the organizational infrastructure and capacity for an Invasive Species Program statewide. The concept was positively received and the group was formalized as the Colorado ANS Steering Committee (a.k.a. CANS Team) with leadership support in June 2007.

The first official meeting of the CANS Team was held on July 30, 2007. The team met monthly from that point forward with the intention of completing the Colorado ANS Management Plan by June 2008. Each member of the team drafted a different section and the group combined those sections and word-smithed the document until a complete draft was ready to be shared, reviewed, edited, and eventually submitted for federal approval. At this point, there was no Program, no Program Manager, no legal authority, and no budget for ANS in any state agency. It was the hope of the CANS Team that the State ANS Plan Grant would provide the minimal resources needed to get a State ANS Program up and running.

A meeting was organized with the various agency's Chief of Law Enforcement on December 6, 2007 to discuss the draft Plan. The group was aimed at specifically determining what legal authorities existed related to ANS, which agencies are the most appropriate for enforcement, and how enforcement implementation could exist.

A month later, the draft Colorado ANS Management Plan was presented to the DNR Executive Director and Division Directors on January 15, 2008. The Plan and management approach was positively received. The team gained additional feedback from leadership and was tasked with submitting a final draft for review and federal approval.

Unfortunately, two days later, a detection of zebra mussel veligers in Pueblo Reservoir State Park was reported by Reclamation. This completely halted the Colorado ANS Management Plan approval process, as the state and their partners transitioned into rapid response mode for mussels. The state quickly gained legal authority, $4M in funding, and both public and political support to create the largest, mandatory, multi-jurisdictional prevention and containment watercraft inspection and decontamination (WID) network in the nation. Colorado knew that utilizing education and information as a base was critical to stopping the spread, but only by adding mandatory inspection, decontamination, and enforcement, have they been able to truly stop the spread of mussels and other ANS in order to protect their great headwaters state from zebra and quagga mussels. The Colorado Invasive Species and ANS Program became operational on July 1, 2008.

Figure 1: Colorado's ANS Program Timeline

COLORADO PARKS & WILDLIFE

Colorado ANS Program

SIGNIFICANT MILESTONES IN COLORADO ANS HISTORY

2008

- **JANUARY** — *Zebra Mussel Veligers Detected at Lake Pueblo State Park*
- **MAY** — *State Legislature Passes the ANS Act*
- **JUNE** — *Water Providers Close Waters to Boating and Fishing*
- **JULY** — *Reservoirs Reopened by CDOW and State Parks WIDS*
- **JULY/OCTOBER** — *Quagga and Zebra Mussel Veligers Found at Several Reservoirs*

2009

- **FEBRUARY** — *The Parks Board Passes the ANS Regulations*; *DNR Published the* Colorado Watercraft Inspection and Education Handbook.
- **MARCH** — *Statewide Implementation of WIDS*; *March 30, 2009—First infested mussel boat intercepted coming into Colorado from out of state*

2010

- **JANUARY** — *State Zebra and Quagga Mussel Management Plan Finalized*

2011

- **JUNE** — *CDOW Published the* ANS Watercraft Decontamination Manual.
- **JULY** — *CDOW and State Parks Merge*

2012

- **JANUARY** — *CDOW Published the* Colorado Boat Compendium for ANS Inspectors.

2013

- **JANUARY** — *CPW Published the* Colorado ANS Curriculum for Watercraft Inspectors and Decontaminators.
- **SEPTEMBER** — *CPW Published the* Containment Manual for Watercraft Inspection and Decontamination Stations.

2014

- **JANUARY** — *Colorado de-lists seven reservoirs for zebra or quagga mussels following 5 years of negative testing.*; Colorado Trainers Manual for WID Courses *published*

2015

- **JANUARY** — *Western Regional Panel on ANS adopts Colorado training curriculum for 100th Meridian Regional Training Program*

2016

- **MAY** — *Supreme Court ruling in Case No. 13SC996 eliminated the entire source fund for the ANS Program (Tier II Severance Tax)*
- **JULY** — *Colorado deploys multi-state regional data sharing system for WID stations*
- **DECEMBER** — *CPW de-lists Pueblo Reservoir following 5 years of negative testing*

2017

- **JANUARY** — *Implementation funded by CPW with agency dollars, a motorboat Colorado grant and over $1M in partnership funds*
- **MARCH** — *State Legislature unanimously passes House Joint Resolution 17-1004 titled "Concerning Funding for the Prevention of ANS in Colorado".*
- **MAY** — *State Legislature approves the one time use of the general fund for the ANS program through SB17-259.*
- **AUGUST** — *Green Mountain listed as suspect for quagga mussels following US Bureau of Reclamation detection of veligers, which were confirmed to be quaggas by a private genetics lab for CPW*

2018

- **MAY** — *State Legislature approves the one time use of the general fund for the ANS program through HB18-1338.*; *State Legislature passes the Mussel Free Colorado Act to provide sustainable funds through the creation of an ANS Stamp*
- **OCTOBER** — *Congress passes WRDA-18 authorizing the Corps to fund WID monitoring and rapid response in the Upper Colorado, Columbia, South Platte, Upper Missouri and Arkansas River Basins*

2019

- **JANUARY** — *CPW implements the Mussel Free Colorado Act.*
- **MARCH** — *Infested boat interceptions skyrocket as the mussel populations at Lake Powell explode.*
- **AUGUST** — *As Chair of the Western Regional Panel, CPW facilitates the completion of the* Building Consensus in the West Summary Report 2010–2019 *and the* Quagga Zebra Action Plan Status Update Report.
- **DECEMBER** — *Senator Bennet introduces the* Stop the Spread of Invasive Mussels Act of 2019 *into Congress.*

The State Aquatic Nuisance Species Act (SB08-226) was passed by the General Assembly in May 2008 following a quagga mussel veliger detection in Lake Pueblo. The Act defines ANS as exotic or nonnative aquatic wildlife or plant species that have been determined to pose a significant threat to the aquatic resources or water infrastructure of the state. It makes it illegal to possess, import, export, ship, transport, release, plant, place, or cause an ANS to be released. The Act allocated funding to ANS programs in both Wildlife and State Parks. It provides authority to qualified peace officers to inspect, and if necessary, decontaminate or quarantine watercraft for ANS. It provides authority for CPW to certify individuals as authorized agents and for qualified peace officers to inspect, and if necessary, decontaminate or quarantine watercraft for ANS. It also provides authority for trained authorized agents to inspect and decontaminate watercraft for ANS. The Act also requires the state to report annually on program expenditures.

The CPW Invasive Species Coordinator position began on July 1, 2008. Wildlife internally reallocated resources to create a full-time position to coordinate invasive species activities statewide. The Invasive Species Coordinator oversees the implementation of the State Zebra and Quagga Mussel Management Plan (State ZQM Plan). The backbone of the State ZQM Plan strategy includes containment and prevention through watercraft inspection and decontamination, enforcement, sampling and monitoring, education/ outreach, communications, and information, and applied research.

SB 08-226 specifically authorizes and requires the Board of Parks and Outdoor Recreation to promulgate rules needed for the administration and enforcement of the Act. The State Parks Board passed regulations required by the Act on February 20, 2009. The rules require mandatory watercraft inspection, and if necessary, decontamination of all boats coming in from out of state, leaving a known positive water in Colorado, and those entering high-risk waters where inspections and decontaminations are required by the managing agency. The rules set the standard for watercraft inspection, decontamination, impoundment, sampling, monitoring, identification, and reporting. The regulations were updated in 2015 to exempt paddleboards from mandatory inspections, to reflect best management practices for decontamination, and to update organizational structure resulting from the merger of parks and wildlife.

In 2016, CPW updated the P-08 regulations to reflect the merger of Parks and Wildlife and to update regulations to meet current standards and protocols for watercraft inspection and decontamination (WID). The regulations were further updated due to citizen's petition that altered the exempt watercraft list to include only the ten hand-launched and hand-powered watercraft on the list.

On January 11, 2017, the Parks and Wildlife Commission updated the ANS regulations by de-listing *Daphnia lumholtzi* (waterflea) from the prohibited ANS and aquatic species lists, as well as to require boat operators to clean, drain and dry their watercraft in between launching. Additional changes include the requirement for boat operators to remove all plants and water drain plugs from watercraft, and to prohibit the overland transport of vessels and other floating devices (watercraft) with drain plugs in place and plants on board. These regulations are consistent with those of other states and are recommended by the Western Regional Panel's Building Consensus in the West Workgroup and a Western Association of Fish and Wildlife Agencies Resolution passed in July 2016.

In 2017, the Colorado General Assembly unanimously passed HJR 17-1004 which affirmed the State Legislature's commitment to ANS management in Colorado, and the priority that the legislature places on the ANS Program within the state's operations and encourages the federal government to assist the state with implementation of the ANS Program as outlined in the State ZQM Plan. Two additional bills were passed to provide general fund dollars to the ANS Program to sustain operations following a court decision that eliminated the program's main funding source.

At the same time, CPW in partnership with the Fish Health Board instituted regulatory changes to Chapter W-0 and Chapter W-1 of General Provisions. The prohibited species list in Chapter W-0 was replaced with an allowable species list. This new list improves clarification on which species are allowed to be possessed in the State of Colorado (CPW, 2019).

The allowable species list along with more details on CPW's aquatic health regulations is located in the Legal Authority Section of this document.

In 2018, the Colorado General Assembly passed the Mussel Free Colorado Act (HB18-1008) which created the ANS Stamp (a fee for motorized watercraft and sailboats using Colorado waters—residents and non-residents), increased fines for select ANS violations, and created a reimbursement process for CPW to get restitution for full decontaminations of quarantined or impounded watercraft.

Following the passage of HB18-1008, CPW formed an internal implementation team consisting of invasive species, public education, and information, marketing information technology, sales, licensing, registration, marketing, and financial services staff. The team achieved the implementation goals set forth to have the ANS stamp available for purchase for in-state boaters renewing registration in November and December of 2018, and continuing in 2019. The ANS stamp for out of state boaters was available beginning January 1, 2019, online and at CPW offices and at all 700+ sales locations. The team also updated the website, issued rack cards and posters to offices, WID stations, and sales locations, and participated in public education and media events. Similarly, the team also produced information to aid customer service and sales agents with the sale of the ANS stamp.

In addition, an internal CPW ANS Law Enforcement Team was established to update guidance documentation for officers relative to the new statute. The team consisted of fourteen officers representing the Law Enforcement Unit and the four CPW regions, alongside two invasive species staff members. Together they produced CPW LEOP 1140—Aquatic Nuisance Species Law Enforcement Procedures, which went into effect on March 1, 2019.

Since the ANS Program's inception, CPW has provided support to all waters of the state, and to all inspection stations, regardless of jurisdiction. Services provided include site-specific planning, training, certification, watercraft inspection and decontamination, quality control assessments, data collection development and support, law enforcement support, educational materials, workshops and conferences, sampling, monitoring, laboratory analysis, ANS identification, and cost-share opportunities.

ANS Management Actions

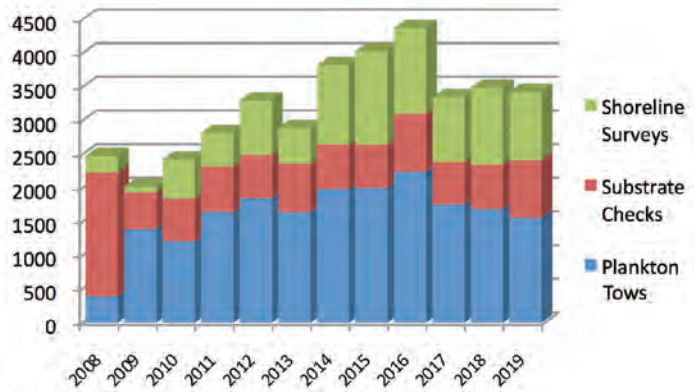
Sampling and Monitoring

CPW has sampled 584 "at-risk" waters for aquatic invasive species since before its inception. While CPW ANS staff has historically monitored the state's public waters for numerous invasive plants and animal species, and cataloguing native species along the way, the focus of sampling is on the early detection of zebra and quagga mussels.

The state follows a three-tier sampling protocol targeting the three life cycles of the zebra or quagga mussel:

1. Conducting plankton tows to find the veligers,
2. Deploy and check substrates to find the juvenile "settlers" or attached adult mussels, and
3. Conduct surveys along the shoreline and existing structures for settled juveniles or attached adults.

Figure 2: Summary of CPW's Mussel Monitoring Activities by Year



The state requires three steps to identify, verify and confirm a detection of zebra or quagga mussel veligers (1) visual analysis of plankton tows using a cross-polarized light microscope, (2) DNA verification utilizing polymerase chain reaction [PCR] and (3) DNA confirmation utilizing gene sequencing.

In 2019, crews sampled 179 standing, and approximately 4 flowing waters statewide. In addition to the sampling efforts performed by CPW, the National Park Service contributed 38 plankton samples. There were no detections of zebra or quagga mussels in Colorado.

The sampling teams conduct early detection sampling for zebra and quagga mussels on public lakes and reservoirs. CPW has met western regional minimum standards for zebra and quagga mussel monitoring. In past years, depending on funding, the program has been able to actively search for other ANS, sample flowing waters (rivers, streams, creeks), perform crayfish trapping, and conduct plant inventories.

Watercraft Inspection and Decontamination (WID)

CPW coordinates a vast network of WID stations operated by CPW, the National Park Service, Larimer County, several municipalities, and numerous private industry locations including businesses, concessioners, marinas, clubs, and private lakes. In total, the state has collectively performed over 4.9 million inspections and **119,814 decontaminations** since 2008.

Per the state ANS Regulations, trailered watercraft must submit to an inspection, and decontamination if needed, prior to entrance in Colorado's waters after boating out of state or boating on a positive or suspect water. Boaters are also required to submit to inspection prior to entering a water body where inspections are required by the managing agency. All persons performing inspections and/or decontaminations must be certified by CPW.

CPW taught 59 WID certification courses in 2019, in addition to maintaining an online re-certification program for experienced inspectors and decontaminators. There have been a total of 869 trainings since the program's inception.

In addition to the online course for experienced staff, the Invasive Species Program within CPW also provides two other specialized courses: (1) WID Trainer's certification, and (2) Advanced Decontamination. CPW certified 773 individuals this year, for a total of 7,631 people certified or re-certified to perform WID since the implementation of statewide training and certification program in 2009.

In 2019, CPW authorized 72 locations to perform watercraft inspection and decontamination. Of those, Green Mountain Reservoir was operated as a containment operation for quagga mussel veligers after their detection in August, and ten locations operated as containment for other ANS. The focus of the containment program is to inspect watercraft leaving the lakes/reservoirs to prevent boats from moving ANS overland into currently uninfested areas while maintaining prevention activities upon entrance to the reservoir.

Sixty-two locations operated as prevention locations. Prevention locations are those that are negative for all ANS or are not located at a waterbody (e.g. offices or marine dealers).

Colorado conducted a total of **481,543 inspections and 22,947 decontaminations** in 2019. There continues to be a large increase in the number of decontaminations performed as a direct result of CPW adapting to mitigate new threats. Increased invasions in the Colorado River Basin, from Lake Powell in Utah and Arizona downstream, continue to

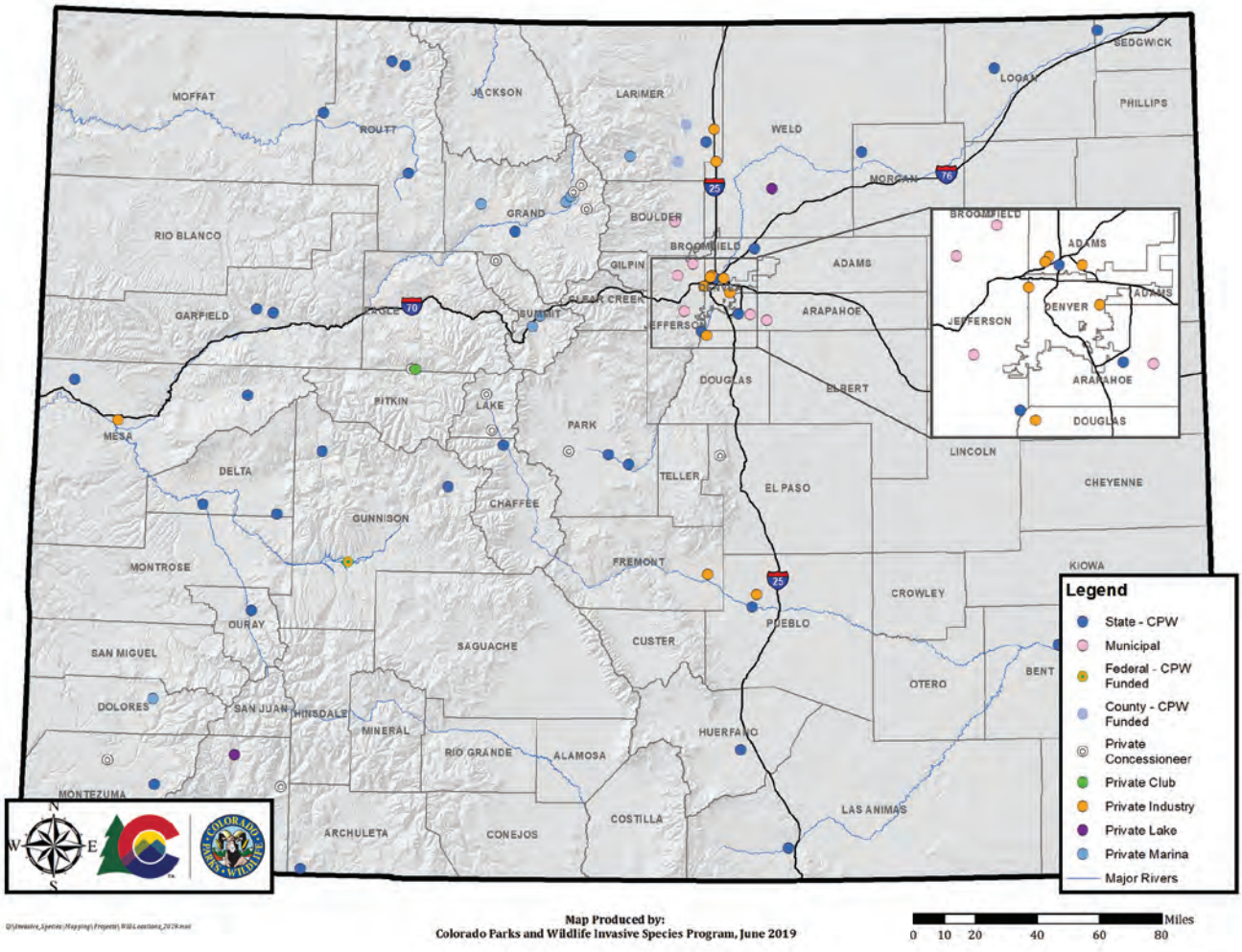
increase the need for diligent prevention at home in Colorado.

Similarly, there continues to be an increase in new infestations found in states that do not conduct preventative watercraft inspection and decontamination work. In the last year alone, North Dakota, South Dakota, Kansas, Oklahoma, Texas, and numerous eastern states detected new infestations of zebra or quagga mussels partly due to the lack of mandatory WID and early detection monitoring. These new infestations in other states illustrate the importance of Colorado's ANS Program to protecting our waters and infrastructure from invasion.

Research publications indicate zebra or quagga mussel veligers can survive up to 27 days in standing water on watercraft, which increases the need to decontaminate parts of watercraft that hold water and cannot be drained (e.g. ballast tanks). New information from Utah Division of Wildlife, Minnesota Department of Natural Resources, and the U.S. Bureau of Reclamation have demonstrated that juvenile and even small adult mussels can survive being moved through hoses and pumps into and out of ballast tanks, further increasing the risk to Colorado and the need for mandatory decontamination.

Lastly, waters in close proximity to, or positive for, other ANS such as New Zealand mudsnails or Eurasian watermilfoil, increase the need to perform more decontaminations to limit their spread within the state. CPW and their partners revised mandatory standing water decontamination triggers in 2012 to reduce the threat of invasion from viable zebra or quagga mussel veligers living in standing water, to protect against watercraft coming from other state's infested waters, and to reduce the spread of other invasive species.

Figure 3: Colorado Watercraft Inspection and Decontamination Stations for 2019



The Regional WID Data Sharing System

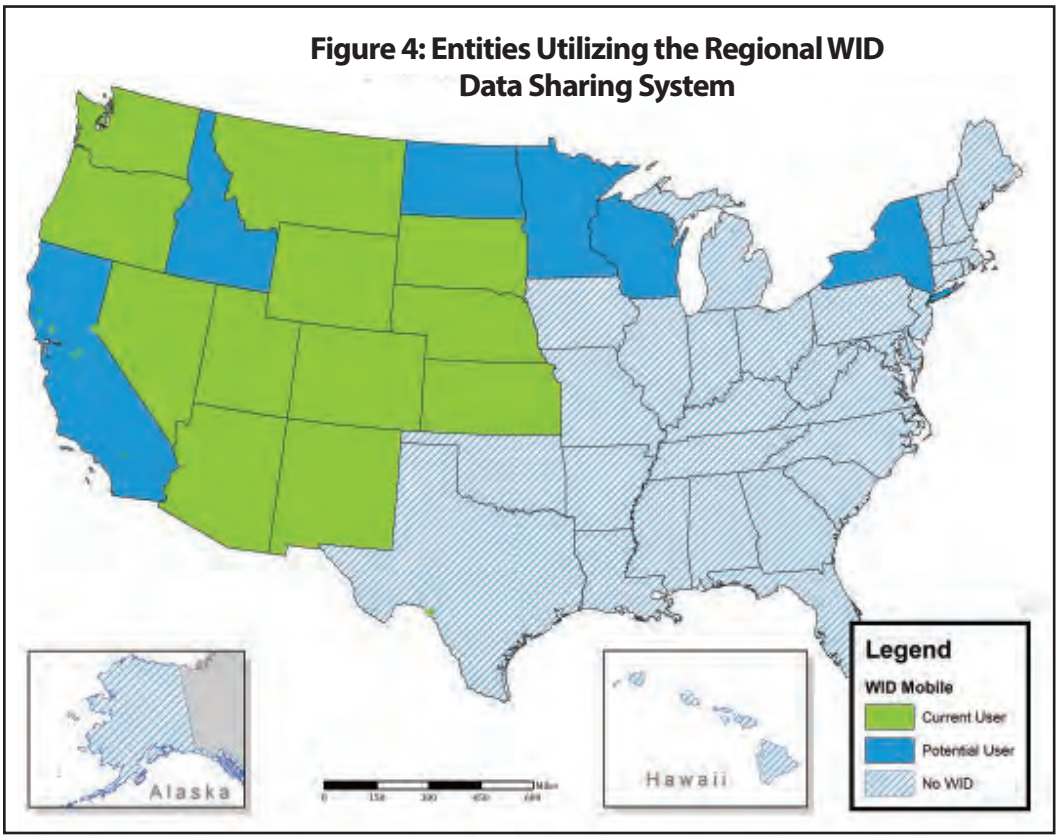
The Regional WID Data Sharing System (System) is in use at more than 200 locations across the west, including 50 in Colorado. CPW developed the System and maintains ownership and oversight. The states of Arizona, Kansas, Montana, Nebraska, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming, as well as select National Parks, the Lake Tahoe Regional Planning Agency, Solano County Water Agency, Mussel Dogs, and TiGE are now employing the System as their primary form of data collection and management.

The purpose of the System is to record information related to WID electronically and to share information in a timely manner across jurisdictions to aid collaborative efforts to prevent the spread of zebra and quagga mussels and other ANS. The System consists of a mobile application, website, and shared database hosted on a private server. The mobile application is compatible on all iOS and Android devices. This reduces the operating costs for mobile data collection and data entry while increasing accuracy. It provides for improved reliability in data collected in the field at WID stations, in addition to rapid query capacity for on-demand reporting. Lead agencies are able to customize the user interface of the mobile application in alignment with both western regional standards and state or local laws, regulations, and priorities.

The System is used for data entry, viewing, editing, querying, and reporting. An included risk assessment tool shows where boats are moving after launching in mussel infested waters and sends an alert to the next known destination. With the benefits of data sharing proving to be abundant, the states of Arizona, Nevada, and Utah have been using the System to send out timely electronic alerts of watercraft leaving infested waters. This increased timely communication has directly increased the number of infested watercraft being intercepted within the western region before launching in uninfested waters.

CPW manages and operates the System through a private industry contract utilizing federal grant dollars. The data itself is the property of the state agency that input the information. CPW leads a Governance Committee, consisting of user organizations that are charged with evaluating and prioritizing requests, changes, and enhancements. The Governance Committee works collaboratively to determine the viability and usefulness of new technologies. It is expected that this System will become an industry standard for entities performing WID. As users increase, this system will continue to improve communications among jurisdictions to enable field staff and managers to accurately focus resources towards effective risk mitigation related to the prevention and containment of zebra and quagga mussels and other harmful ANS.

Figure 4: Entities Utilizing the Regional WID Data Sharing System



Information and Outreach

CPW and partner agencies have implemented a comprehensive multi-faceted ANS public education campaign. The cooperative effort focuses on boaters and anglers primarily to prevent the spread of ANS utilizing a variety of mediums, including billboards, boat ramp signage, brochures, social media, and staffing tradeshow and expo booths to convey this message.

Along with ANS, the invasive species program within CPW has been conducting information, education and outreach efforts for terrestrial and aquatic plants (noxious weeds), animals, insects, and disease invasive species for a number of years. Accomplishments include distribution of tens of thousands of printed rack cards, brochures, handouts, DVDs, posters and signs at offices, boat ramps and water-access points. In addition, CPW has implemented an aggressive media relations campaign, using press releases and conducting web-based, radio, print and television interviews. CPW staff hosted numerous outreach seminars to boating and angling groups, marine dealers, home owners associations, clubs, watershed groups, basin roundtables, ditch companies, municipal water managers and providers, schools and youth educational opportunities.

CPW's focus has been on raising awareness of select user groups as to how they can take action to stop the spread of ANS into new waters. In the future, evaluation of campaigns and efforts is needed to determine the effectiveness of the historic efforts and if the behavior change is taking place. The strongest form of education CPW has is the one-on-one contact between the boater and inspector during every inspection where the boater is taught how to clean, drain, and dry their watercraft each time they use it. Evaluation is needed to determine if this practice is being implemented when boaters are using waters without WID stations. Similarly, education is ongoing in lesser forms for other user groups (e.g. anglers, hunters, gardeners) but there is a lack of focus in terms of knowing if awareness has been reached and if the users are taking action to help stop the spread.

Plan Purpose

Invasive species management, primarily ANS, must have centralized coordination within state government and this Plan aims to increase efficacy through the reduction of duplicating efforts and increased communication, enabling more efficient policy development and field operations. A central umbrella to oversee the Invasive Species Program (with ANS included) activities and provide consistency in implementation protocols is established within CPW. The Plan supports the existing framework for the facilitation of communication, providing standardization and consistency, offering a basis for future policy and legislative efforts, to develop the infrastructure for early detection and to respond rapidly to new ANS discoveries. The Plan is designed to assist stakeholders with a proactive approach to prevention and rapid response. **The goal of the Plan is to minimize the harmful ecological, economic, and social effects of ANS through the prevention and management of ANS into, within, and from Colorado.** This will be achieved through full implementation of the Plan with the continuation of the current Program that emphasizes the collaboration of agencies in order to prevent introductions, while effectively controlling or containing established ANS populations.

In an effort to enable Coloradoans to effectively respond to emerging and unanticipated ANS threats, this document will provide the necessary guidelines for management. The coordinated efforts contained within the Plan are designed to protect residents of Colorado and the State's aquatic resources from the multitude of potential losses associated with ANS. The Plan focuses on preventing the accidental introductions of new ANS, limiting the spread of existing ANS, and controlling or eradicating ANS where environmentally and economically feasible. The intentional introduction of non-indigenous species for aquaculture, commercial, or recreational purposes is addressed to ensure that these beneficial introductions do not result in accidental ANS introductions and to improve information sharing among those agencies responsible for the regulation of intentional introductions.

Plan Development

Both the planning process and the implementation of the Plan are intended to coordinate ANS activities for plants, fish, and animals with statutory authority over select areas of ANS, along with other state, federal and local agencies, private industry, non-governmental agencies, and land or water managers. The primary state agency responsible for ANS management is CPW. However, legal authority is shared with the Colorado Department of Agriculture (CDA) with respect to plants (noxious weeds, seeds, and nurseries), pets (Pet Care Facilities Act) and aquaculture (State Aquaculture Act). CDA regulates seed contaminants and seed purity to determine which terrestrial and aquatic plants are invasive enough to warrant listing as noxious and regulates those. CDA also inspects hay and mulch for prohibited plants and certifies forage and mulch as weed-free.

The following are five points to consider and issues addressed in the Plan and should provide guidance in the future development and refinement of the ANS Program. Plan implementation and future resource allocation must be prioritized with the following points in mind so decision-makers can take targeted actions to protect the state's waters from invasion in the most efficient and effective manner possible.

1. There are many pathways of introduction and spread for ANS, most of which are related to human activities. New species continue to be introduced and spread within North America through these pathways which must be a focus for management efforts. Colorado's program focuses on pathway prevention and prioritizes resources for human pathways. The system in place for watercraft inspection and decontamination should be considered for expansion to mitigate other vectors.
2. ANS have significant economic impacts once introduced. Those ANS with the highest economic impacts tend to have the highest priority for prevention and control. Some examples include the following:
    - Operational costs for water quality treatment, water supply, and distribution for municipal, industrial and agricultural use.
    - Loss of productivity for hydroelectric power plants or water distribution systems.
    - Costs associated with control, prevention, and monitoring measures.
    - Loss of habitat and other natural resource values that are challenging to price.
    - Costs associated with lost access to recreational facilities resulting from ANS.
    - Damage to agricultural irrigation infrastructure and water delivery.
3. ANS negatively impact our natural resources. Those impacts with broader natural resource impacts tend to have a higher priority for resources. A few examples include the following:
    - Loss of productive habitat.
    - Degradation of aquatic environments and impairment of functioning natural systems.
    - Alteration of aquatic biodiversity and abundance, including the loss of sensitive (threatened and endangered) plant and animal species.
    - Disruption of food webs and nutrient cycles, resulting in reduced biological productivity.
    - Loss of in-stream flow necessary to maintain fish habitat.
    - Non-target impacts to native species from ANS control measures.
4. Prevention is the best course of action because eradication may be impossible after establishment of ANS.
    - Management planning, educational efforts, and enforcement of statutes and regulations are strategies that can help in the prevention and spread of ANS.
    - Mandatory inspection and decontamination have been effective to stop the spread of mussels into Colorado and should be maintained and expanded in the future.
    - Effective systems should be put into place in all situations to impede the introduction of ANS through other vectors of human spread such as angler waders, pets, nursery, bait, emergency response, firefighting, and construction.

5. Research must develop new control strategies because there are few, if any, control methods available for use in water bodies once ANS establish.
    - The costs and impacts of ANS in Colorado are incurred in two main categories. First is the loss in potential economic output, such as reductions in recreation, aquaculture, fisheries, power, drinking water, industry, and agriculture. Second is the direct cost of combating and mitigating the impacts of invasion, including all forms of quarantine, control, and eradication (Mack et al. 2000).

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Public Involvement and Preliminary Comments

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The Colorado ANS Plan was conceptualized by a voluntary collaborative group of professionals concerned about the threat ANS is in Colorado in 2006. After gaining the attention of leadership and federal partners, a formal multi-jurisdictional Steering Committee was established to develop the Plan in 2007 co-chaired by Wildlife and State Parks. The draft Plan was presented to DNR leadership in January 2008 and was tabled a week later following the detection of zebra mussel veligers in Pueblo Reservoir. This original draft Plan has been continually updated over time by the the CPW Program with the Colorado ANS Task Force and serves as the basis for this document today.

The State ANS Law was passed shortly after the veliger detection at Pueblo Reservoir in May 2008, accompanied by the State Zebra and Quagga Mussel Management Plan and supporting regulations in 2009. An expansive statewide ANS program focused on stopping the spread of zebra and quagga mussels through watercraft inspection and decontamination was quickly developed and implemented through a multi-jurisdictional collaborative process.

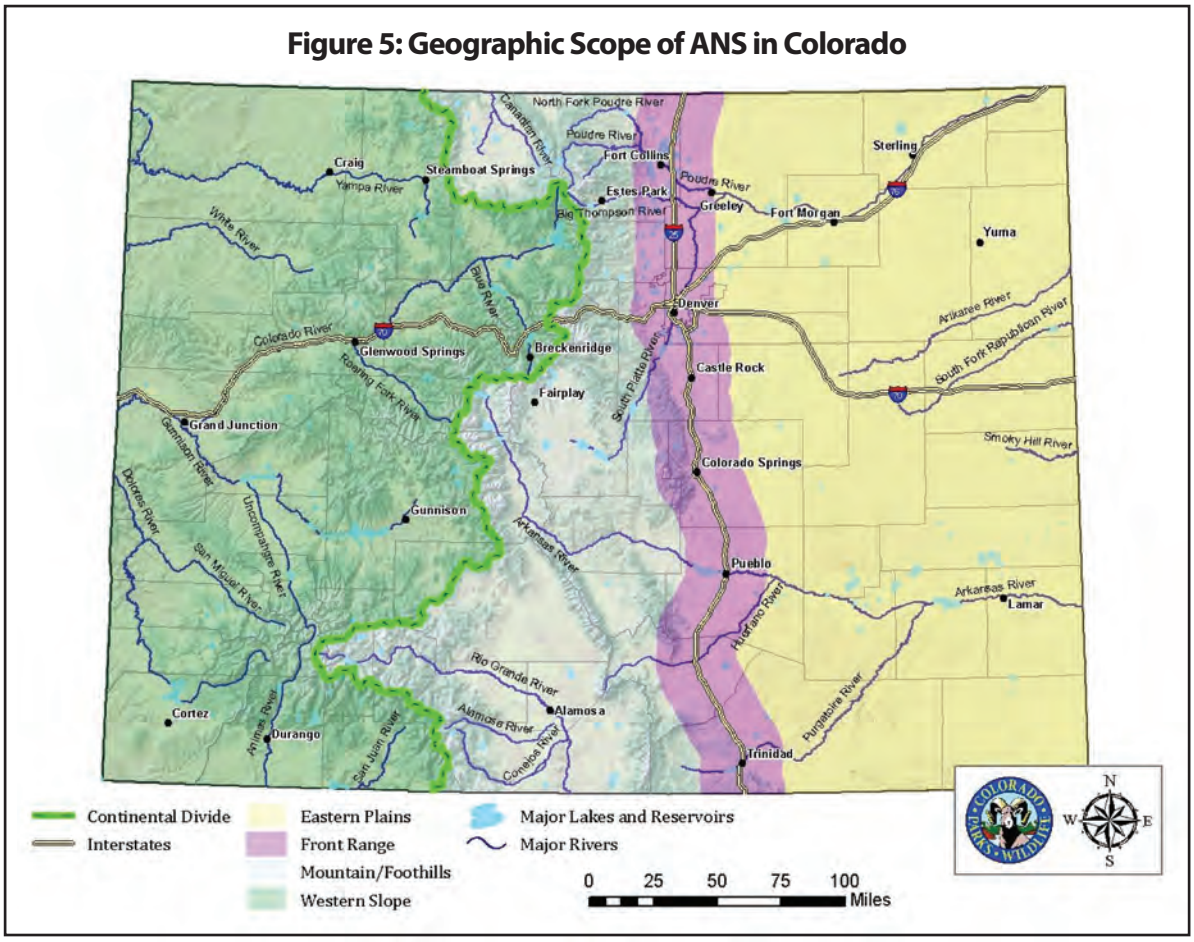
The Colorado ANS Plan was updated on a semi-annual basis and has been utilized by the Colorado ANS Task Force members in the years to follow. A revised draft of the Colorado ANS Plan was submitted to the ANS Task Force in 2013. The comments received about the draft helped to shape this document and are incorporated. Comments and recommendations made by the ANS Task Force and the responses to those are located in Appendix B. At that time, the agency had recently been merged and CPW did not prioritize the pursuit of final approval from the ANS Task Force.

Most recently, a draft of the Colorado ANS Management Plan was updated in 2018–2020 by CPW ANS Program staff, WID Supervisors, and CO ANS Task Force members. This current Plan was routed for internal CPW comments through the Aquatics section in the spring of 2019, followed by leadership and partner review. A public comment period was facilitated by CPW in March 2020.

The final Colorado ANS Plan is planned to be submitted to the ANS Task Force for approval on or before October 1, 2020. The Plan is scheduled for consideration and approval by the ANS Task Force at the fall meeting in November 2020. The Plan will then be signed by Governor Polis and will go into effect immediately thereafter.

The Colorado ANS Plan follows the guidelines set forth by the ANS Task Force and includes the required elements, figures, tables and sections necessary for approval. Once approved, Colorado will become eligible for State ANS Plan grant funding from USFWS per NISA.

Figure 5: Geographic Scope of ANS in Colorado



The State of Colorado contains the headwaters for several major river systems that make their way from the Continental Divide westward to the Pacific Ocean, and eastward toward the Atlantic Ocean. Waters draining to the west are of particular interest because many states heavily rely on the water that travels through these major watersheds as their primary source of water resources. In total, nineteen downstream states and Mexico rely on Colorado to provide them with water for the year; making Colorado a vital resource for millions of people.

Colorado is a headwaters state nicknamed the "Mother of Rivers" and is the origin of eight major river basins: Yampa/White, North Platte, Colorado, Gunnison, San Juan/Dolores, Rio Grande, South Platte, and the Arkansas. The state has over 105,344 river miles and more than 249,787 lake acres. Public boating is available at 153 reservoirs across the state.

The Arkansas basin is spatially the largest river basin in Colorado, covering 28,268 square miles in the southeast portion of the state. The river's headwaters are located near Leadville, Colorado, at an elevation of more than 14,000 feet. The North Platte flows into Wyoming, while the South Platte River emerges out of the mountains near the continental divide at an elevation of 11,500 feet; the basin covers 27,660 square miles in northeastern Colorado. Colorado's portion of the Rio Grande basin covers an area of 7,543 square miles; with the headwaters starting near the San Juan Mountains. The Gunnison basin covers an area of 8,000 square miles and is located in western Colorado extending west off of the continental divide. The Colorado basin encompasses an area of approximately 9,830 square miles, with the headwaters starting at an elevation of over 13,000 feet and located west of the continental divide. The White/Yampa basin covers 10,500 square miles in the northwest part of Colorado and the south-central portion of Wyoming. The San Juan-Dolores basin, which is part of the Upper Colorado Basin, covers an area of 10,169 square miles, with the headwaters starting at an elevation of greater than 14,000 feet (Colorado Water Conservation Board).

Figure 6: Colorado's Major Rivers and Waterbodies

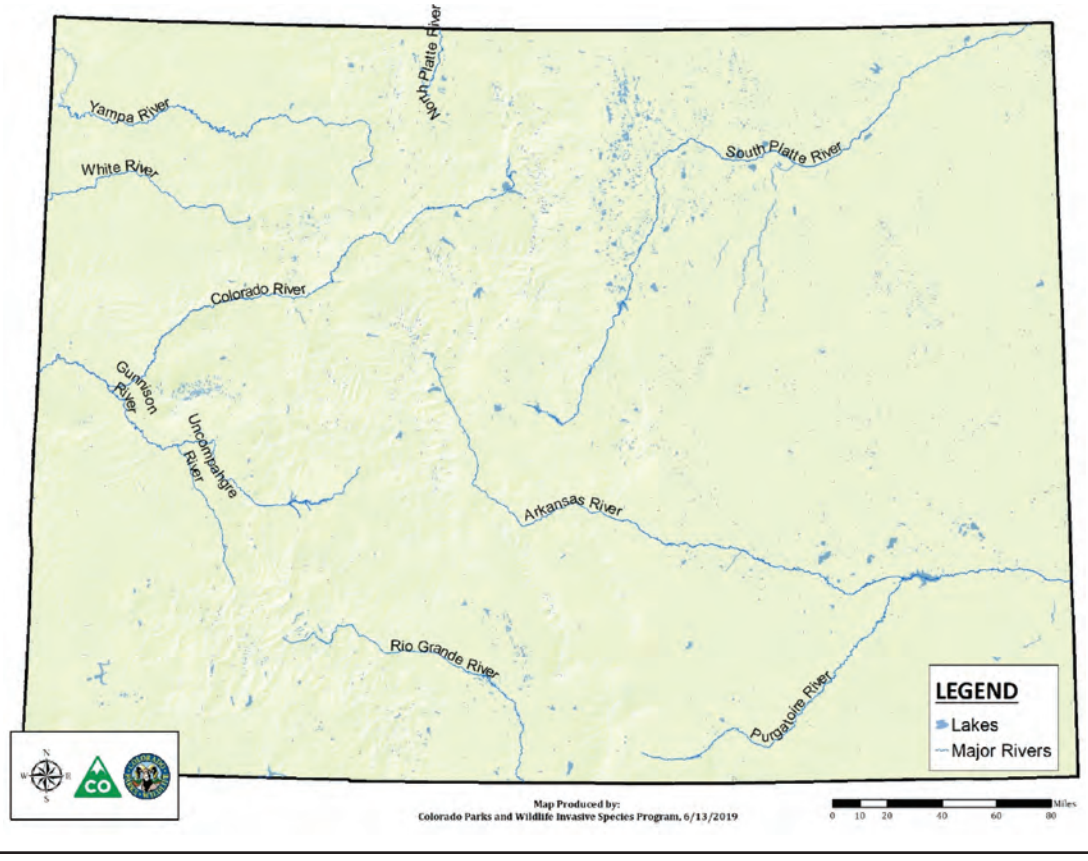
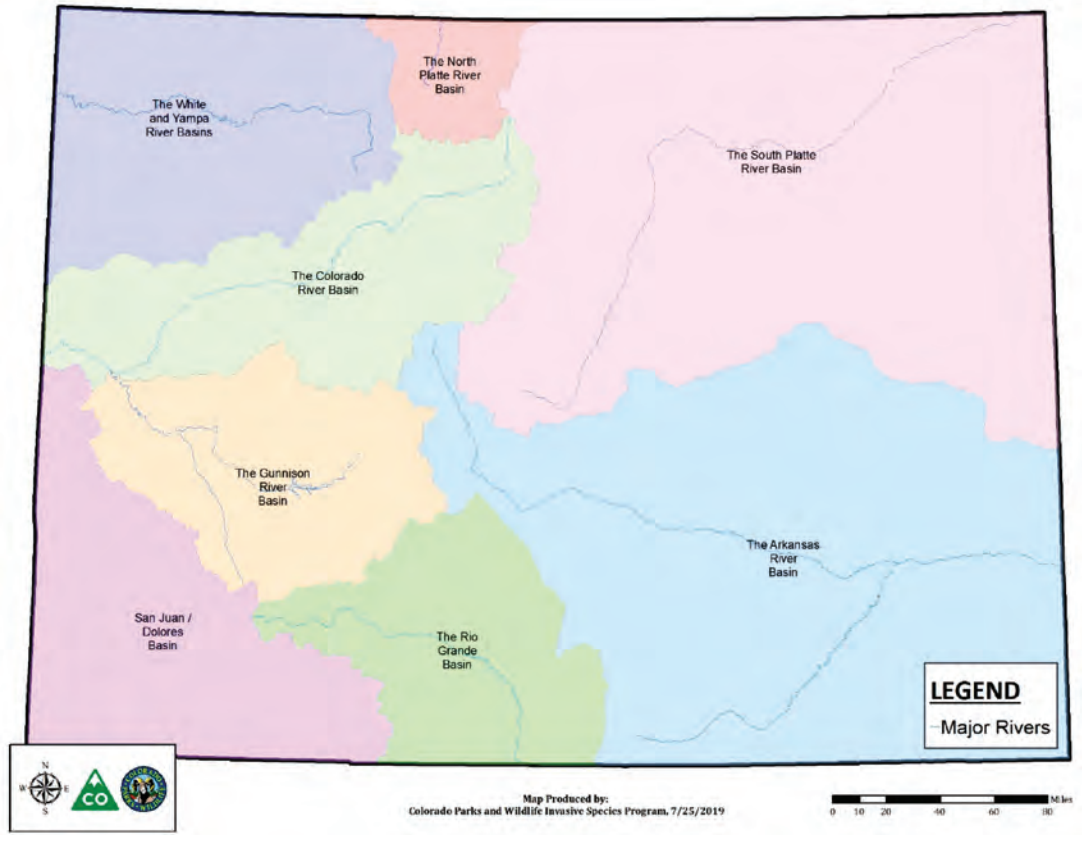


Figure 7: Colorado's River Basins



Prioritizing Management Actions—Science-Based Risk Analysis

Colorado has invested in utilizing data collected by sampling technicians and boat inspectors to perform detailed risk assessments to inform a data-driven, science-based approach to implementation of the ANS program, budget, and policy decisions.

The data collected by CPW's ANS sampling and monitoring team as well as inspectors and decontaminators is critical in providing accurate analysis and directing limited resources to the greatest needs. Below is a list of the risk assessments completed by CPW's ANS program, and a risk assessment by CDPHE, along with more details on CPW's ANS risk assessment titled *The Risk of Introduction by Recreational Watercraft*.

- CDOW ZQM Risk Assessment—2008
- CPW Risk of Introduction via Recreational Watercraft—2012
- CDPHE ZQM Habitat Suitability Assessment—2013
- CPW Listed ANS Habitat Suitability Assessment—2016
- CPW Risk of ZQM Introduction via Recreational Watercraft—2016
- CPW Risk of ZQM Establishment—Habitat Suitability Assessment—2016
- CPW Temperature Analysis for ZQM—2017
- CPW Risk of Introduction via Recreational Watercraft Update—2018

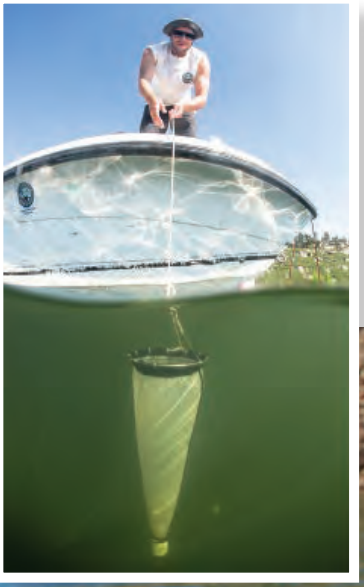
Risk of Introduction of Zebra or Quagga Mussels by Recreational Watercraft, 2018

This is the primary ranking analysis for determining high-risk waters. The analysis is based on boater demographics and includes more than one million data points collected at watercraft inspection and decontamination stations from 2012–2017. There are five data factors compared among waters with WID stations:

1. Total Incoming Inspections or Total Volume of Boats
2. Boat Origin
3. Watercraft Risk Type
4. Number of Boats That Have Been Out of State in the Last 30 Days
5. Last Launch in a Positive or Suspect Water

Risk of Establishment of Zebra or Quagga Mussels

This is the secondary ranking analysis for determining high-risk waters. The analysis is based on approximately 281,000 water quality data points collected by the CPW ANS Program's sampling and monitoring crews from 2013–2016. All waters examined are within the suitable habitat ranges for zebra and quagga mussels to establish, despite some being ranked lower than others.



Lake Mead National Recreation Area

This is a two-part analysis that examines the necessary water chemistry for survival following introduction and secondarily examines the variables necessary for maturity and reproduction and therefore long term invasion potential.

Part 1:

- Primary factors necessary for shell formation and animal viability.
- Represents what a zebra or quagga mussel would need to survive if introduced.
- CHALK variables = Calcium, Hardness, Alkalinity, pH

Part 2:

- Secondary factors necessary for long term population survival.
- Represents what a zebra or quagga mussel would need to survive, reproduce and establish an invasive population.
- Three variables = chlorophyll, total phosphorus, and total nitrogen

The approach to managing invasive species combines a focus on individual species and specific pathways of introduction or spread. There are a number of ANS already established within Colorado waters but not all represent a high management priority. Some of the established species that are a high priority include Eurasian watermilfoil (*Myriophyllum spicatum*), New Zealand mudsnails (*Potamopyrgus antipodarum*), and rusty crayfish (*Faxonius rusticus*).

There are additional ANS that pose a threat to Colorado's ecosystems and economy which have not yet been documented in Colorado (e.g. Silver, Bighead, and Black carp). Invasive species in neighboring states, as well as species suitable for establishment in Colorado, are all considerations for management priority.

Examining possible pathways for species introduction is an important aspect of prevention management. There are a variety of pathways identified as means to protect Colorado from the introduction and spread of ANS. Western regional ANS management programs have focused on recreational boating as a primary pathway and consequently, comprehensive boat inspection and decontamination protocols have been developed. Other pathways of interest for managers in Colorado include pet release, nursery sale and dumps, industrial construction, aquaculture, bait, internet sales, and other sectors of recreation such as hunting, fishing, and scuba diving. Exploration of species and pathways of concern have guided this management plan.

Granby Reservoir

Problem Definition and ANS of Concern

Previous ANS Detections and Management in Colorado

This section will outline the history of previous ANS detections in Colorado.

Asian clam (*Corbicula fluminea*)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The Asian Clam has experienced great success in North America and invaded Colorado rapidly. Asian clams were first detected in the South Platte River in Colorado in 1993 and have since expanded their range to include the Arkansas River, Gunnison River, San Juan River, and Colorado River basins.

Brazilian egeria (*Egeria densa*)


© VIRGINIA TECH WEED ID GUIDE

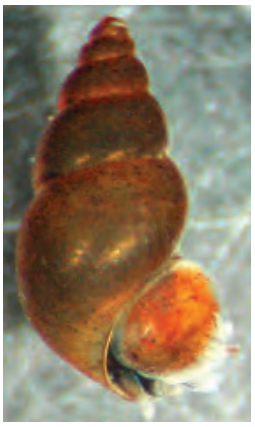
Brazilian egeria was first found in Colorado in 2017 and is confirmed in one location.

Eurasian watermilfoil (*Myriophyllum spicatum*)

CPW has provided services related to EWM management statewide since 2005. New locations of EWM are found annually. CPW has actively controlled EWM with herbicide treatments at Lathrop State Park, St. Vrain State Park, and Chatfield State Park in the past. EWM is a List B noxious weed and CDA administrative rules direct management requirements. CPW and CDA coordinated on reported observations, confirming identification, and rapid response. Per regulation, CPW utilizes both taxonomic and molecular methods to confirm species identification.


© PHOTO BY ELIZABETH BROWN

New Zealand Mudsnail (*Potamopyrgus antipodarum*)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First detected in Colorado in 2004 in the South Platte and Boulder Creek. These invasive snails continue to be found in new locations annually, including in the Gunnison River, Fourmile Canyon Creek, Monument Lake, Trinidad Lake, and Uncompahgre River. The most recent detections were made by the Denver Public Works Division at Johnson Habitat Park on the South Platte River in Denver, and by CDPHE in Trout Creek near Woodland Park in 2020. CPW relies heavily on partners to help detect NZMS and other ANS in flowing water systems.

These animals are accidentally transported and moved primarily by anglers. They hide in the mud on the bottom of boots and equipment. There is no viable method for control of these very small, asexual animals. CPW places a strong emphasis on angler education providing wader brushes and instructional rack cards to anglers. The only way to stop the spread of these tiny invaders is through educating anglers to clean their waders and gear in between each and every use. There is no viable method for control of these very small, asexual animals.

Rusty Crayfish (*Faxonius rusticus*)


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There were no new detections of Rusty Crayfish in several years. Rusty crayfish is an invasive species that was first discovered in 2009 in a main-stem impoundment of the Yampa River and at two river locations between Stagecoach Reservoir and Steamboat Springs. The ANS Program conducted extensive surveys statewide and detected a population in Sanchez Reservoir State Wildlife Area in 2010 and Stagecoach State Park in 2011. There are no current efforts ongoing to map crustaceans or control rusty crayfish in Colorado.

Populations were managed through manual removal of adult rusty crayfish from 2010–2015 to reduce the

reproducing population in the reservoirs and limit impacts to native communities and users. In 2016, CPW staff monitored the Yampa River's population and determined that manual removal was successful, as very few rusty crayfish were found in the river. Since they are still abundant in these reservoirs, trapping and monitoring efforts will be evaluated annually and potentially implemented in future years.

Wildlife implemented regulations passed by the Wildlife Commission in November 2010 in which all crayfish caught west of the Continental Divide must be immediately killed and taken into possession, or immediately returned to the water from which they were taken. There are no crayfish native to the Western Slope. The same restriction applies to Sanchez Reservoir in Costilla County due to the invasive rusty crayfish.

Rusty crayfish are native to the Ohio River Basin and have expanded their native range to include several U.S. states and Ontario, Canada. They colonize lakes, rivers, and streams throughout North America. They are more aggressive than native crayfish, better able to avoid fish predation, and can harm native fish populations by eating their eggs and young. They can displace native crayfish and hybridize with them. They graze on and eliminate aquatic plant populations that provide necessary habitat and food sources for native fish and waterfowl.

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Water flea
(*Daphnia lumholtzi*)
The invasive water flea was confirmed in Colorado in 2013 and was later found to be in 24 reservoirs across the state. The Parks and Wildlife Commission updated ANS regulations in 2017 by de-listing *Daphnia lumholtzi* (waterflea) from the ANS list and the prohibited aquatic species list in regulation. It appears to be ambiguous in western waters and has little to no impact on the fisheries or water infrastructure of the state.

Water hyacinth
(*Eichornia crassipes*)
CDA detected a population of water hyacinth in Centennial, CO in 2010. CPW confirmed the identification, removed all plants and monitored the site, which is now considered eradicated. It is suspected that this came from a nearby residential water garden dump. There are no known wild populations of water hyacinth in Colorado. There is one population of water hyacinth on a farm in Alamosa, CO since 2006.

© COURTESY WENDY VANDYK EVANS

Zebra Mussel (*Dreissena polymorpha*)
and **Quagga Mussel** (*Dreissena bugensis*)
Zebra mussels, and their close relative quagga mussels, are highly invasive aquatic species that negatively impact plankton communities, fisheries, and water-based recreation in addition to threatening water storage and distribution systems for municipal, industrial, and agricultural use.

The ANS Program has been successful in stopping the continued inoculation of zebra and quagga mussels, and other ANS, into Colorado's waters by watercraft. There has never been an adult zebra or quagga mussel found in a Colorado water body. However, the larval stage of the mussels, known as veligers, have been detected in several waters in the past.

Zebra

Quagga

© PHOTOS BY ELIZABETH BROWN

Colorado follows the western regional standards for listing and de-listing water bodies for zebra and quagga mussels, as documented in the *Western Regional Panel's Building Consensus in the West Workgroup*.

Per this standard, Green Mountain Reservoir is currently listed as a SUSPECT reservoir for quagga mussels. In August 2017, quagga mussel veligers were identified by the Bureau of Reclamation at Green Mountain Reservoir through microscopic analysis of water samples and subsequently positively identified using DNA testing. CPW confirmed the federal results through genetic testing at an independent laboratory. It is unknown if the veligers were dead or alive at the time of detection. Upon confirmation,

CPW increased monitoring at the reservoir, deployed a scuba dive team and worked with the local Marina to implement WID containment procedures. The established site team, which includes CPW, U.S. Forest Service (USFS), Reclamation, Northern Colorado Water Conservancy District (NCWCD), Heeney Marina and Summit County was gathered to further determine and implement actions necessary for containment. . Containment WID protocols continue to be implemented.

A suspect reservoir requires three years of negative testing to be de-listed to negative. There were no new detections in 2018 or 2019. CPW intends to delist Green Mountain in January 2021 pending there are no positive results in 2020.

- If another veliger or an adult is detected and confirmed through both microscopy and genetic analysis by two independent laboratories, the reservoir status will be upgraded to positive. A positive reservoir requires five years of negative testing to be de-listed to negative.
- If a reproducing adult population is found, the reservoir will be listed as infested. It is unlikely that an infested reservoir would ever be de-listed, but standards allow for this with five years of negative testing following a successful eradication event. There are currently no known treatments for eradication in an open water system, making de-listing impossible for infested waters at this time.

Previous Detections of Zebra and Quagga Mussels in Colorado:

- Pueblo Reservoir tested positive for zebra and quagga mussel larvae (veligers) in 2007 and for quagga mussel veligers in 2007, 2008, 2009 and 2011.
- Grand Lake tested positive for one zebra mussel and one quagga mussel veliger in 2008. There have been no verified detections at Grand Lake since 2008.
- Granby Reservoir, Shadow Mountain Reservoir, Willow Creek Reservoir, Tarryall Reservoir, and Jumbo Reservoir all tested positive for one quagga mussel veliger in 2008. There have been no verified detections at any of these waters since 2008.
- Blue Mesa Reservoir tested positive for quagga mussel eDNA in 2009, 2011 and 2012 by the Bureau of Reclamation.

De-Listing Positive Waters:

- Pueblo Reservoir was de-listed for quagga mussels in January 2017 after five years of negative results.
- Pueblo Reservoir was de-listed for zebra mussels in January 2014, along with the de-listing of Granby, Grand Lake, Shadow Mountain, Willow Creek, Tarryall, Jumbo and Blue Mesa.

Blue Mesa

Recent ANS Challenges

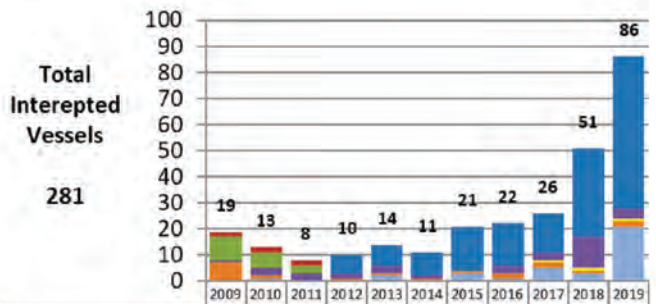
Watercraft is the number one vector of transportation for ZQM. As more waters across the nation continue to become infested, Colorado becomes more susceptible to an infestation. Each year, the number of infested watercraft coming into Colorado with zebra or quagga mussels increases. In the last few years it has spiked due to the expansive infestation at nearby Lake Powell. Colorado's ANS program continues to protect waters of the State by utilizing a multi-jurisdictional WID system as the most important prevention measure. Intercepted watercraft are fully decontaminated prior to being allowed into Colorado's waters and potentially quarantined or impounded. Since 2009, a total of 281 boats with attached adult zebra or quagga mussels were intercepted coming into Colorado.

Infested vessels were coming into Colorado from Arizona, California, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Michigan, Minnesota, Mississippi, Missouri, New York, Nevada, Oklahoma, Ohio, Pennsylvania, Texas, Utah, and Wisconsin. The majority of the intercepted vessels were coming from Arizona, Lake Powell, the Great Lakes, or Mississippi River states. All boats were fully decontaminated to ensure all mussels were dead, and no mussels were visibly attached to the vessel.

Plants, including Eurasian watermilfoil, continue to be of concern because they colonize a wide variety of habitats including rivers, creeks, ditches, lakes, and ponds and can grow in shallow or deep water. Eurasian watermilfoil reproduces most successfully by fragmentation. Small fragments break off and drift downstream or to another part of the water body and begin a new population. Humans help spread this plant by engaging in activities that help break apart and move the plant, such as boating.

Additionally, the invasive plant Brazilian egeria was first detected in Colorado in 2017 after being introduced into public waters as a contaminant in nursery stock. Brazilian egeria can aggressively invade aquatic ecosystems and create dense mats that crowd out native plants. Mats can impede boating, fishing, swimming, and other aquatic recreation activities. The mats are unsightly, restrict water movement, trap sediment, impair water quality, and degrade fish habitats. The fragmented pieces can clog water intake pipes and other water delivery infrastructure.

Figure 8: Infested Mussel Boats Intercepted by Entity by Year



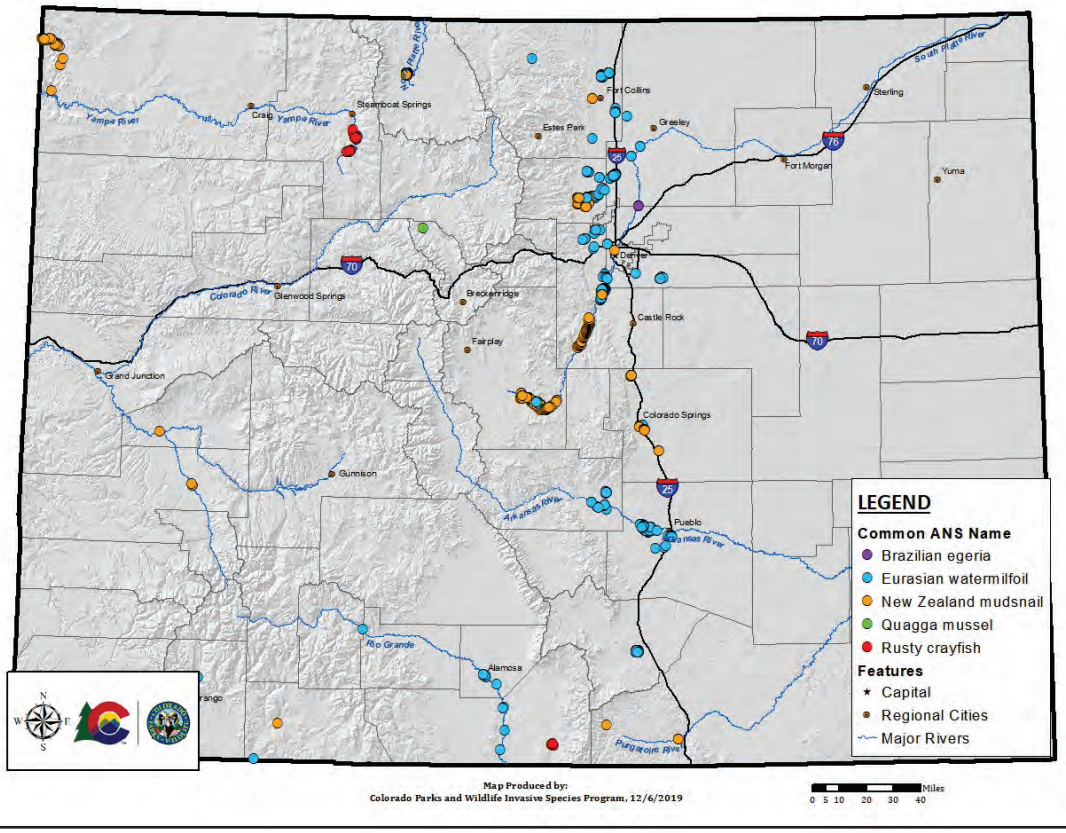
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Colorado Parks and Wildlife	0	0	0	7	8	9	17	16	15	34	58
Division of Wildlife	2	2	2	0	0	0	0	0	0	0	0
State Parks	9	6	3	0	0	0	0	0	0	0	0
Larimer County	1	3	3	2	3	1	0	3	3	12	4
Municipalities	0	0	0	0	0	0	0	0	1	1	1
National Park Service	7	1	0	1	1	1	1	2	2	1	2
Private Industry	0	1	0	0	2	0	3	1	5	3	21
Total	19	13	8	10	14	11	21	22	26	51	86

Impacts from Aquatic Nuisance Species

The introduction of harmful aquatic nuisance species into Colorado waters will cause severe ecological and economic impacts. One ecological impact is the ability of zebra mussels to filter up to 1 liter of water per day, removing the planktonic organisms from the ecosystem, which serves as the base of the food chain. This can have serious effects on fisheries and can lead to increased plant growth later resulting in toxic algae blooms. Economic impacts also occur with funding going to the perpetual control and maintenance of these species just to keep pipes open enough to let water flow through them to homes, farms and power plants. The potential decrease in water-based recreation following the invasion and negative impacts that could have on CPW revenue and state tourism is irrefutable. The Metropolitan Water District of Southern California (MWD) is a good example of economic impact. MWD is a consortium of 26 cities and water districts that provide drinking water to 18 million people. They currently deliver 1.7 billion gallons of water per day. Since their infestation of quagga mussels, it has been estimated to cost $10 million a year for control. They spend up to $10,000 a day on chlorine, which is used to prevent quaggas from settling (DeLeon 2008).

The problem of aquatic invasions poses unique challenges to the management of aquatic systems and the development of policy affecting aquatic environments. Since established populations of

Figure 9: ANS Distribution in Colorado for 2019



aquatic invaders are self-sustaining, resources must be devoted to both the prevention of new introductions and to the control and eradication of existing populations of invaders. The introduction of only a few organisms or, in the case of aquatic plants and algae, a piece or fragment of an organism, can result in the infestation of a water body, watershed, or an entire bio-geographic region. Further complicating preventative measures, these introductions can occur through any number of transport vectors. Since control methods are limited and costly and for most species eradication is unlikely, prevention is always the best course of action. The following sections identify priority pathways by which these species may have been introduced and identifies established and threatening species of greatest concern to Colorado water bodies. Located above is a map of Colorado with our current invasive species population distribution, a list of the water bodies can be found in Appendix C.

ANS of Concern to Colorado

For the purpose of this Plan, the terms "ANS" or "aquatic nuisance species" or "aquatic invasive species" are referring to those species listed in Parks Chapter 8 Regulations which are the primary species of concern.

Aquatic Nuisance Animals

Aquatic nuisance animals may include fish, bivalves, gastropods, amphibians, and macroinvertebrates.

Primary Aquatic Nuisance Animal Species of Concern:

Monitoring and management plans will be maintained for these species, and eradication and rapid response will be instituted with partners if they are found, pending available resources. National management plans will be utilized in the absence of a state plan. Colorado specific information on species of concern, pathways of introduction, and when possible the timing of introduction into the State are located in Appendix D.

**Refer to Chapter P-8 #800 for a list of aquatic nuisance species prohibited for possession in Colorado. https://cpw.state.co.us/Documents/RulesRegs/Regulations/ChP08.pdf*

PRIMARY AQUATIC NUISANCE ANIMAL SPECIES OF CONCERN			
Common Name	***Scientific Name***	**Status in Colorado**	**Management Plan**
Crayfish, Rusty	*Faxonius rusticus* (reclassified in 2017) formally known as *Orconectes rusticus*	Present	State of Colorado Rusty Crayfish Management Plan (Final 2010, Revised 2018)
Quagga Mussel	*Dreissena bugensis*	Suspect	State of Colorado Zebra and Quagga Management Mussel Plan (Final 2009, Revised 2018)
Zebra Mussel	*Dreissena polymorpha*	No verified presence	State of Colorado Zebra and Quagga Management Mussel Plan (Final 2009, Revised 2018)
New Zealand Mudsnail	*Potamopyrgus antipodarum*	Present	State of Colorado New Zealand Mudsnail Management Plan (Final 2005, Revised 2018)
Water Flea, fishhook	*Cercopagis pengoi*	No verified presence	None
Water Flea, spiny	*Bythotrephes longimanus* (also known as *Bythotrephes*)	No verified presence	None

Secondary Aquatic Nuisance Animal Species of Concern:

If detected in Colorado, CPW will work with partners to determine appropriate response and management actions for the following species.

**Refer to Chapter W-0 Article VII aquatic wildlife for a list of allowable aquatic species in Colorado. https://cpw.state.co.us/Documents/RulesRegs/Regulations/Ch00.pdf*

SECONDARY AQUATIC NUISANCE ANIMAL SPECIES OF CONCERN			
Common Name	***Scientific Name***	**Status in Colorado**	**Management Plan**
Alewife	*Alosa pseudoharengus*	Present	None
African Perch, Nile Perch	*Lates niloticu*	No verified presence	None
Amphipod, Ponto-Caspian echinogammarid amphipod	*Echinogammarus ischnus*	No verified presence	None
Apple Snail	*Pomacea*	No verified presence	None
Asian Carp: Bighead Carp Black Carp Silver Carp	 *Aristichthys/Hypophthalmichthys nobilis* *Mylopharyngodon piceus* *Hypophthalmichthys molitrix*	No verified presence	National Management Plan
Bitterling	*Rhodeus sericeus*	No verified presence	None
Bowfin	*Amia calva*	No verified presence	None
Burbot	*Lota lota*	No verified presence	None
Chain Pickerel	*Esox niger*	No verified presence	None
Eurasian Ruffe	*Gymnocephalus cernuus*	No verified presence	National Management Plan
European Valve Snail	*Valvata piscinalis*	No verified presence	None
Gars	*Lepisosteidae*	No verified presence	None
Giant Rams Horn Snail	*Marisa cornuarietis*	No verified presence	None

SECONDARY AQUATIC NUISANCE ANIMAL SPECIES OF CONCERN *(cont.)*			
Common Name	***Scientific Name***	**Status in Colorado**	**Management Plan**
Gobies	*Gobiidae*	No verified presence	National Management Plan
Ide	*Leuciscus idus*	No verified presence	None
Indian Carp	*Cirrhina mrigala, Catla catla and Labeo rohita*	No verified presence	None
Killer Shrimp	*Dikerogammarus*	No verified presence	None
Loaches	*Misgurnus*	No verified presence	None
Marine Toad, Cane Toad, Giant Toad, Giant, South American CaneToad, Dominican toad	*Bufo marinus Rhinella marina*	No verified presence	None
Northern Snakehead	*Channa argus*	No verified presence	National Management Plan
Mysterysnails Japanese, Chinese, Banded, Olive	*Cipangopaludina, Viviparus*	No verified presence	None
Rudd	*Scardinius erythrophthalmus*	Present	None
Walking Catfish	*Clarias batrachus*	No verified presence	None
Zander	*Sander lucioperca*	No verified presence	None

**Refer to Chapter W-0 Article VII Aquatic Wildlife for a list of allowable aquatic species in Colorado. https://cpw.state.co.us/Documents/RulesRegs/Regulations/Ch00.pdf*

Aquatic Nuisance Species—Plants

The spread of aquatic nuisance plants, invasive plants, or noxious weeds can cause significant ecological, economical, and recreational problems throughout Colorado. Ecological impacts from non-native aquatic plants include the reduction of native species and loss of native wildlife habitat, slowing or stopping of flowing water, and decline of water quality. Economic impacts include loss of income due to lack of recreation, impairment of agricultural water delivery systems, municipal drinking water delivery systems and the costs of control and maintenance. Dense mats of aquatic weeds impair all forms of water-based recreation. Recognition of the threat to western aquatic ecosystems and water delivery systems caused by invasive exotics has raised concerns with representatives from local, state and federal agencies as well as private water interests.

Invasive plants have invaded waters across Colorado due to intentional and/or unintentional actions. Primary pathways for introduction of aquatic plant species include boats and trailers, the aquarium trade, nursery and garden centers, mail order, and internet suppliers.

Since CPW shares statutory authority with CDA for managing aquatic noxious weeds, it is of the utmost importance that the two agencies work collaboratively to ensure that plants listed by either agency are not being sold in Colorado. A consistent approach to invasive plants from a regulatory standpoint between CDA and CPW, with clearly outlined roles and responsibilities, is necessary to become efficient and effective, reduce duplication, and improve education, enforcement, and management efforts.

Under CDA's Noxious Weed Act, there is an appointed Colorado State Noxious Weed Advisory Board to recommend the listing, delisting and classification of noxious weeds to the Commissioner of Agriculture. The Commissioner of Agriculture oversees and decides listing, delisting and classification and management plan development. CPW does not have a voting position on the Advisory

Board. DNR has a non-voting position on the Advisory Board. The Colorado State Noxious Weed Advisory Board has currently designated a total of 100 species on three lists within the CDA Weed Rules: (Refer to Appendix E—CDA's Noxious Weed List).

- 25 "List A" species are mandated for eradication on all lands in Colorado
- 40 "List B" species have statewide management plans (areas of the state designated for either eradication, suppression or containment)
- 16 "List C" species that have required suppression management plans

Annual changes to the weed rules, including List B species-specific management plans and changes to species on the weed list can be viewed by accessing the CDA website: http://www.colorado.gov/ag/weeds.

Primary Aquatic Nuisance Plant Species of Concern:

CPW is monitoring and will continue to monitor for the primary aquatic nuisance plant species of concern that are listed in Parks Chapter 8 regulations. Rapid response should be initiated for these species upon detection. Control or management actions will be instituted if the following species are found in accordance with governing regulations and available resources.

PHOTOS BY ROB ANDRESS, ALABAMA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

Yellow Floating Heart

PRIMARY AQUATIC NUISANCE PLANT SPECIES OF CONCERN

Common Name	*Scientific Name*	Status in Colorado	Management Plan
African waterweed (elodea)	*Lagarosiphon major*	No verified presence	None
Brazilian elodea, Egeria, leafy elodea, dense waterweed, anacharis, Brazilian waterweed	*Egeria densa*	Present	Site Management Plan
Eurasian watermilfoil	*Myriophyllum spicatum*	Present	CDA Weed Rule Management Plan
Giant salvinia	*Salvinia molesta*	No verified presence	National Plan and CDA Weed Rule Management Plan
Water Hyacinth	*Eichornia crassipes*	Present	None
Hydrilla	*Hydrilla verticillata*	No verified presence	CDA Weed Rule Management Plan
Parrotfeather	*Myriophyllum aquaticum*	No verified presence	None
Yellow floating heart	*Nymphoides peltata*	No verified presence	None

**Refer to Chapter P-8 #800 for a list of aquatic plants prohibited for possession in Colorado. https://cpw.state.co.us/Documents/RulesRegs/Regulations/ChP08.pdf*

Secondary Aquatic Nuisance Plant Species of Concern:

If detected in Colorado, CPW will work with partners to determine appropriate response and management actions for the following species.

SECONDARY AQUATIC NUISANCE PLANT SPECIES OF CONCERN			
Common Name	***Scientific Name***	**Status in Colorado**	**Management Plan**
Ambulia, Asian marshweed	*Limnophila sessiliflora*	No verified presence	None
Swollen Bladderwort	*Utricularia inflata*	No verified presence	None
Bur-reed, Exotic	*Sparganium erectum*	No verified presence	None
Curly leaf pondweed	*Potamogeton crispus*	Present	None
Didymo "rock snot"	*Didymosphenia geminata*	Present	None
Duck Lettuce	*Ottelia alismoides*	No verified presence	None
European water chestnut	*Trapa natans*	No verified presence	None
Fanwort	*Cabomba caroliniana*	Present	None
Flowering Rush	*Butomus umbellatus*	Present	None
Golden algae	*Prymnesium parvum*	Present	None
Heartshaped pickerel	*Monochoria vaginalis*	No verified presence	None
Miramar weed	*Hygrophila polysperma*	No verified presence	None
Mosquito fern	*Azolla pinnata*	No verified presence	None
Purple loosestrife	*Lythrum salicaria*	Present	List A Weed
Starry stonewort	*Nitellopsis obtusa*	No verified presence	None
Water creeping primrose, Floating Primrose Willow	*Ludwigia peploides*	Present	None
Water Lettuce	*Pistia Stratiotes*	Present—Eradicated	None
Yellow flag Iris	*Iris pseudacorus*	Present	None

Pathways of Introduction

Colorado's management approach is centered around managing human vectors of introduction and spread in a proactive approach to preventing invasive species establishment, early detection and rapid response. There are numerous vectors to consider. Some species have a single vector of non-natural spread, while others have many pathways by which to spread. Education and outreach, inspection and decontamination, along with regulation and enforcement, are primary tools to prevent further introduction and establishment.

Boating

Colorado is a popular destination for boating and outdoor recreational activities. For zebra and quagga mussels and some other ANS, boating is the primary mechanism for overland dispersal. Recreational watercraft can carry water inside engines, ballast tanks, and engine compartments across the land. Veligers are the larva form of adult zebra and quagga

Selected Examples of Aquatic Nuisance Species Impacts		
Environmental Effects	**Economic Impacts**	**Public Health**
Habitat Alterations	Industrial Water Supplies	Disease Epidemics
Water Quality	Municipal Water Supplies	Public Safety
Predation	Power Plants	Physical Injury
Competition	Commercial Fisheries	Bacterial Risks
Hybridization	Recreation	Harmful Algal Blooms
Parasitism	Navigation and Shipping	Parasites
Introduction of Pathogens	Aquaculture	Flooding

mussel, and are microscopic; therefore, the water that gets trapped inside ballast tanks and engine compartments on boats could hold veligers that are coming from an infested water body. A total of 281 boats with attached adult zebra or quagga mussels were intercepted coming into Colorado's waters from out of state at watercraft inspection and decontamination stations since 2009. Every year the number of mussel boats coming into Colorado increases. Invasive plants such as Eurasian watermilfoil have already established in some of Colorado's reservoirs. Plants can spread to other reservoirs by getting tangled up on a boat propeller or on the boat trailer. If not cleaned off, plants can reproduce in the next water body by just a fragment.

Boat Dealers, Marinas, and Marine Service Providers

Boat dealers, marinas, and other industry professionals may provide a pathway for ANS to be introduced into Colorado if they bring or receive boats from out of state that have invasive mussels or plants on the watercraft. Marine industry members are encouraged to be part of the solution by participating in the CPW ANS Program, get certified to perform WID, and share information through the Regional WID Data Sharing System, to reduce the risk of moving ANS and to provide the best possible customer experience.

Angling

ANS poses a significant threat to Colorado's fisheries. To help prevent the spread of ANS, anglers should keep their gear free of mud, plants and organic debris between each and every use. Moving a species from one body of water to another, even within different stretches of the same river, can start a domino effect of invasion causing irreversible ecological damage. Anglers need to make sure to examine all equipment including waders, footwear, ropes, anchors, bait traps, dip nets, downrigger cables, fishing lines, and field gear before leaving the water body. Also it is very important to thoroughly clean and remove any visible material, including plants, animals and mud on footwear and gear with a stiff brush and then disinfect using one of the following four methods:

1. Submerge in a quaternary ammonia based cleaner (6 oz. per gallon of water) for 20 minutes
2. Soak in 140° F water for 10 minutes
3. Freeze overnight
4. Dry for at least 10 days

Anglers should also make sure to completely drain water from their boat, motor, bilge, bladders, wells and bait containers away from the ramp, and also allow everything to dry completely between each use. Most ANS, such as New Zealand mudsnails, can survive several days out of water and can be transported on footwear or gear. Anglers are urged to wear non-felt soled boots or footwear to further reduce the risk of spreading ANS.

Fishing Tournaments

Fishing tournaments bring people into the state from all around the country and it is important that participants are made aware of the ANS rules in Colorado when they register for the event. Tournament staff should coordinate with CPW Aquatic Biologists, Area Wildlife Managers, or Park Managers to make inspection and decontamination available to participants.

Fish Bait Release

ANS fish, amphibians, and crustaceans can be spread by anglers who use them for bait and later release them into natural waters, or as contaminants in bait. Colorado's bait regulations are explained in more detail in the Legal Authority section of this document.

LIVE AQUATIC BAIT

Learn the bait rules for the waterbody you plan to fish before you go. There are different rules east and west of the continental divide, above 7,000 feet, and at specific waterbodies.

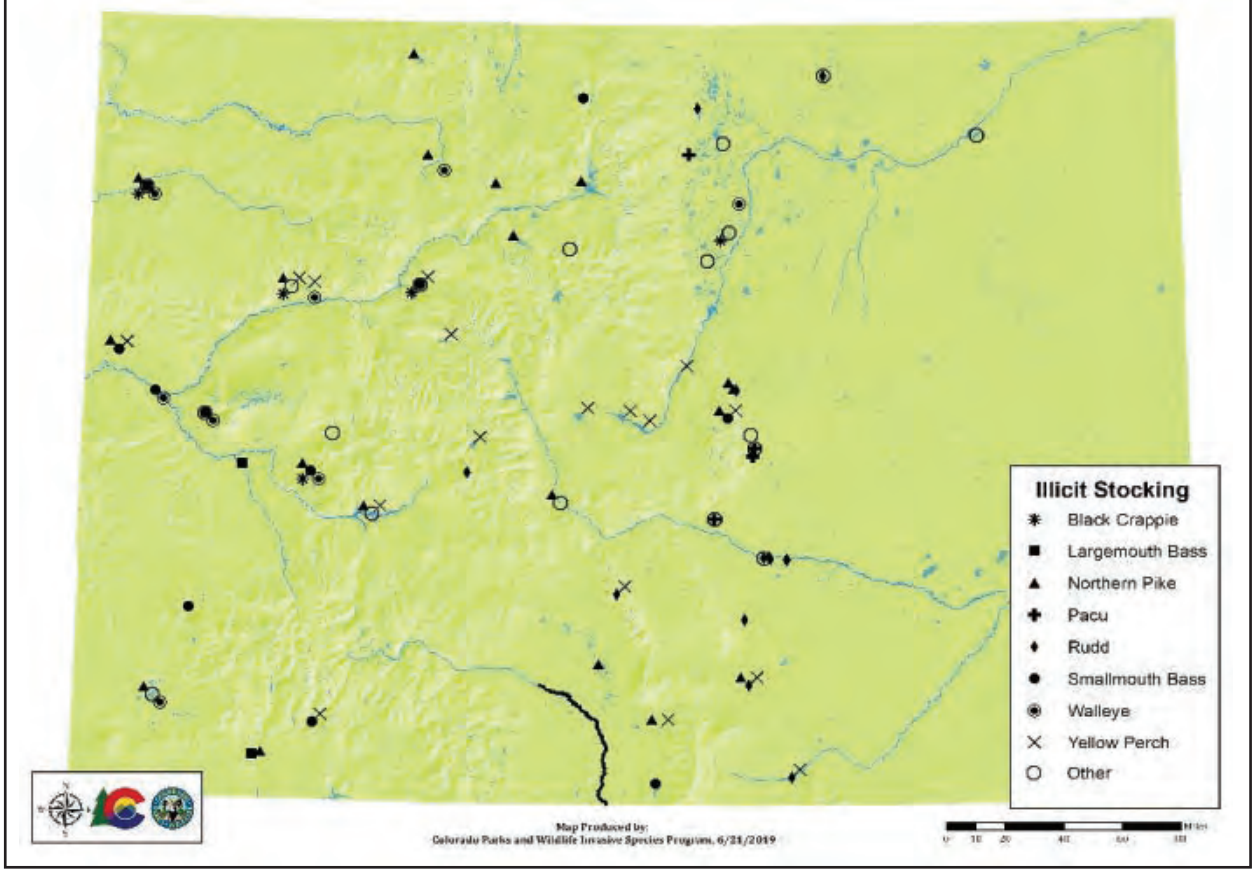
Purchase bait from a reputable Colorado bait dealer and keep your receipt with you as proof of purchase. It is illegal to bring live aquatic bait into Colorado from another state.

Dispose of unwanted bait, fish parts, worms, and packing materials in the trash; do not dump them in the water or on land.

Never dump live fish or other organisms from one waterbody into another. Fish caught for eating or taxidermy should be cleaned away from the water and placed on ice.

Don't transport natural water when keeping live aquatic bait. Drain bait container and replace it with spring or dechlorinated tap water.

Figure 10: Colorado's Illicit Stocking Events 1980–2015



Illicit Stocking

Illicit stocking refers to situations in which individuals intentionally and illegally introduce fish into a reservoir for sport fishing. There is no strategic plan to address illicit stocking in Colorado and it is not a function of the existing ANS Program. There is no dedicated staff, funding, or general consensus on optimal enforcement and/or management options among staff and partners. However, illegal stocking has impacts on recreational opportunities for anglers and natural resources conservation. In 2018, Pastorius Reservoir near Durango, Colorado was illegally stocked with the sport fish Northern Pike and subsequently was not open to anglers for the fishing season.

Aquaculture

Aquaculture is the cultivation of aquatic animals, fish and plants in a natural or controlled marine or freshwater setting. Aquaculture may be a pathway of ANS introduction if a species from the aquaculture system is put into the natural environment or if a non-native contaminant is present in the produce.

Aquarium and Pet Release

Aquarium release and pet release is a pathway of introduction for organisms in trade. People can buy invasive plant or animal species online or at nurseries or pet stores. One aquatic plant of concern is Brazilian egeria which is a prohibited ANS. It is not legal to possess this species within the State of Colorado and if this species is found, it must be reported to CPW immediately. Brazilian egeria was found in Colorado recently. It was originally introduced by the aquarium and water garden industry, and was sold for its oxygenating capabilities and its attractive flowers. Once the plant has been introduced into a new habitat it can spread further without human activity.

Crayfish, aquarium fish, or any other pets should not be released back into the wild or into any water body. If people release their pets or dump their fish tanks into state waters, this activity can result in a new species to the area. A gap in the current ANS Program is the capacity, resources and clear legal authority to appropriately address the aquarium and pet industries to prevent invasive species from being sold and released into Colorado's waters.

Schools and Classrooms

Teachers are pet owners and should be educated not to dump or release their classroom pets into natural settings. The ANS Program urges schools and classrooms to follow these rules when it comes to pets:

- Don't Let It Loose!—Do not release aquarium fish, plants or animals of any kind into the wild. They may prey on native species or spread disease. If you no longer want your pet or classroom animal, return it to a local pet shop or give it to an animal shelter, hobbyist, school, nursing home or veterinarian, and throw all aquarium plants into the trash.
- Don't Move It!—Never take plants or animals from one habitat to another. By moving a species even from one stretch of river to another, you may have inadvertently introduced an invasive species, upset the balance of the ecosystem, and spread disease.

Organisms in Trade—Nursery, Garden Centers, Pet Stores, and Aquaria

Nursery and garden centers act as a key pathway of introducing invasive both aquatic and terrestrial plant species. People often unknowingly buy invasive plants for their water features, gardens, or aquariums either online or at the store. This poses a major threat to native plant communities because introducing an invasive plant may spread to locations. Controlling invasive plants is costly and can pose other risks. One of the best lines of defense in helping stop the spread of invasive plants is to educate communities about invasive species. CPW's ANS Program encourages gardeners to:

- Plant Natives—Use plants native to your area in aquariums, water features and gardens.
- Avoid Seed Mixes—Stay away from seed mixtures, especially ones labeled "wildflowers."
- Be Careful—Use caution when buying plants or seeds on the internet or by mail order—you may unknowingly contribute to the spread of invasive species from one part of the country to another. Plants native to one region can be invasive in another region.
- Never Release—Do not dispose of aquarium water, water feature materials, plants, or animals into local water bodies. Some exotic plants and animals sold for water gardens and aquaria can be highly invasive.
- Dispose—Discard unwanted seeds, plants, or plant parts in the garbage far from any natural water source.
- Respond Aggressively—Act quickly to rid your waters or lands of noxious weeds and other invasive species.

Professional Activities and Construction

Invasive species prevention and containment should be a top priority for all natural resource professionals and construction workers. Those working in the field can accidentally spread ANS and other invasive species from one location to another. Following proper procedures when moving from site to site, always moving downstream, for instance, will protect the environment:

- Go to Field Sites Clean—Before leaving the shop or office, take time to inspect your vehicle and equipment, and remove plants, seeds, insects, animals, and mud.
- Plan Ahead—When moving from site to site, begin at a negative site (or the least infested site) and finish at the positive site (or most infested site). Between sites, use a brush or hand tool to remove accumulations of mud or plant debris, and disinfect gear per CPW guidelines. Use designated equipment for positive or infested sites.
- Leave the Field Clean—Before leaving the field site; inspect your vehicle, trailer, boots, nets and equipment. When available, use a power washer or air compressor to remove any plants, seeds, insects, animals, and mud. When these are not available, use a brush or other hand tool to knock off debris.
- Aquatic Equipment and Gear: Clean, Drain, Dry—Aquatic professionals must follow state watercraft inspection and decontamination procedures to inspect and decontaminate boats, trailers, equipment, and gear in between each and every launch.
- Minimize possible ANS introductions—Professionals can minimize possible ANS introductions during projects by using certified weed-free materials when bringing hay, mulch, gravel, or other materials onto a site. When the only available sources are not weed-free, scrape off the top 6 inches of soil or material and set aside. Use the newly exposed material for the project.

Scuba Divers

Divers can unintentionally spread ANS from one body of water to another on their gear. Some species are invisible to the naked eye and can survive hours to weeks on wet scuba gear, or water inside the equipment. By adhering to the following guidelines, divers can help prevent the spread of ANS:

- Inspect—Clean off visible plants, animals and mud from wetsuit, dry suit, booties, mask, snorkel, fins, buoyancy compensator (BC), regulator, cylinder, weight belt, boat, motor, and trailer before leaving the water body.
- Drain—Empty water from BC, regulators, boots, gloves, snorkel, mask and any other equipment that may hold water before leaving the water body.
- Rinse—Thoroughly rinse the inside of your BC with hot water (at least 104° F, but not more than 120° F) or salted water (1/2 cup salt dissolved per one-gallon water). Immediately follow a salted wash with a freshwater rinse. Lastly, submerge and wash your suit and other equipment using appropriate cleaning solutions.
- Dry—Completely dry your suit and all equipment completely before diving in a different water.

Hunters and Outdoor Enthusiasts

Equipment and vehicles traveling over water or land can transport harmful invasive species into and around Colorado. Cleaning gear and equipment before moving locations can help prevent harmful introductions. CPW's ANS program recommends that hunters and outdoor enthusiasts do the following to help protect the spread of invasive species:

- Come Clean—Before leaving home, take time to inspect your vehicles and belongings. Remove plants, seeds, insects, animals, and mud from vehicles, tires, boots, and equipment.
- Leave Clean—Before leaving the parking lot or campsite, inspect your vehicle and belongings. Remove plants, seeds, insects, animals, and mud. Brush dogs, pets, or other animals before leaving.
- Clean, Drain, Dry—Watercraft including trailers, motors/engines, and equipment and allow time to completely dry in between each and every use.

Firefighting Activities and Equipment

Firefighting equipment and activities can be a possible pathway of transporting ANS due to moving water and firefighting equipment to and from different lakes across the U.S. One of the action items listed in the pathways section of this document will be to implement the Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations, published in January 2017 by the National Wildfire Coordinating Group's Invasive Species Subcommittee (ISSC). They provide national leadership in the prevention of invasive species transport by wildland fire mobile equipment and related vehicles. The main goals of this subcommittee are listed below:

- To develop and disseminate standards, guidelines, best practices, and recommendations to control and prevent the spread of invasive species.
- Integrate new and evolving information from the natural resource management community into the invasive species control effort.
- Evaluate and recommend wildland fire and support vehicle utilization and/or decontamination techniques, equipment, or products to minimize invasive species transport.

Colorado participates on the Western Regional Panel on ANS which recently formed a fire protocols and standards workgroup. Colorado is engaged in this effort and will likely utilize the regional standards produced.

ANS Management Methods

Colorado recognizes that in order to protect the important aquatic resources for the state and others that depend on it, the ANS program must focus on the following management areas; Prevention, Early Detection, and Rapid Response. The State of Colorado aims to partner with federal agencies, other western states, and private industry in order to accomplish the protection of the aquatic resources.

Colorado has identified the species that pose the greatest threat and is working collaboratively to stop the further introduction and spread. Understanding the pathways of these species of concern is critical in directing management efforts that commonly have limited funding and resources. Participation and collaboration alongside other agencies can alleviate some of the burdens of trying to accomplish goals alone as well as minimizes any duplication.

Successful implementation of this Plan is dependent on the shared resources and adoption by all partners within the state, for while CPW is the main coordination body, the responsibility for preventing and controlling ANS falls to all land and water managers cooperatively.

This Plan will enable Colorado to uphold and expand upon its coordination endeavors between local and regional partners and stakeholders. Achieving this coordination requires recurring involvement in the Western Regional Panel, the Western Invasive Species Coordinating Effort, Western Governors Association, Western Association of Fish and Wildlife Agencies, Association of Fish and Wildlife Agencies, the Mississippi River Basin Panel, the Missouri River Basin Team, the Federal ANS Task Force, and other strategic groups or meetings. Recognition of regional cooperative efforts such as the *Quagga-Zebra Mussel Action Plan for Western US Waters* (WRP, 2010) and the *QZAP Status Update Report* (WRP, 2019), WRP's *Building Consensus in the West* (2010–2019), the *Updated Recommendations for the QZAP* (WRP, 2020), and the *National Management and Control Plan for the New Zealand Mudsnail* (Proctor et al. 2007) will guide Colorado's future ANS programmatic activities.

Colorado will deploy scientific-based protocols and standards for integrated pest management including survey, monitoring, prevention, containment, education, outreach, enforcement, and control tools such as physical, manual, cultural, social, and chemical options when appropriate.

Existing Authorities and Programs

Preventing the spread of aquatic nuisance species requires a high level of cooperation and coordination between federal, state, county and municipal agencies, private industry, non-governmental organizations and the public. Many of these entities have collaborated to form the Colorado Aquatic Nuisance Species Task Force (CANSTF or CANS Team) to develop and implement this Plan and to periodically review and update it. The CANSTF is the ongoing collaborative group that acts as a permanent ANS management team which shares information, coordinates on field projects, distributes educational resources, participates in protocol development, manages public relations, ensures staff from all agencies are properly trained and informed, directs policy, informs legislation and regulation, and strives to leverage resources to achieve shared statewide objectives.

Due to the multi-jurisdictional nature of Colorado waters and water infrastructure, the Plan's goals and objectives apply to all partners; for no single entity is responsible for, or capable of, implementing all of the necessary actions to protect Colorado from ANS.

State Government

Colorado's management approach is centered around managing human vectors of introduction and spread in a proactive approach to preventing invasive species establishment, early detection and rapid response. There are numerous vectors to consider. Some species have a single vector of non-natural spread, while others have many pathways by which to spread. Education and outreach, inspection and decontamination, along with regulation and enforcement, are primary tools to prevent further introduction and establishment.

Colorado Department of Natural Resources
https://cdnr.us

The Colorado Department of Natural Resources (CDNR) has the authority to manage wildlife, recreation, and water resources in Colorado. The CDNR division that manages ANS statewide is Colorado Parks and Wildlife (CPW). The state legislature merged the former Colorado Division of Wildlife (Wildlife) and Colorado State Parks (Parks) on July 1, 2011, creating the new CPW. The ANS Program began functioning as a fully merged statewide program in 2012.

Colorado Department of Natural Resources
www.cpw.state.co.us

Prior to the July 1, 2011 merger of the former Wildlife and Parks, the two ANS Programs operated independently per SB08-226. Since that time, the program has phased in integration including staff functions, program services, protocols and procedures, and field implementation. CPW operates a unified ANS Program today.

CPW has the authority to monitor, inspect, decontaminate, quarantine, impound, and enforce ANS laws and regulations in Colorado. CPW also has the ability to educate a large percentage of the user groups. If ANS were able to populate the Parks or State Wildlife Area reservoirs, it would have grave implications affecting recreation, fisheries, and the revenue of this agency. In addition, there would also be costly implications for the federal and local infrastructure, along with the state dams CPW owns or manages.

CPW's ANS Program annually participates in a variety of education and outreach events including; The Denver Boat Show, The Colorado Springs Boat Show, The International Sportsmen's Expo and The Denver Aquarium Endangered Species Event. Education is an important tool because it teaches the public about invasive species and the threat that they pose if introduced or further spread throughout Colorado's waters. The ANS program has also participated in the Denver Metro Water Festival and has given presentations to several elementary schools.

CPW Legal Authority for ANS

While the ultimate success of the Plan requires the collaboration of all of the partners, the statutory and legal authority for Aquatic Nuisance Species is granted to CPW within the DNR. The following chapter outlines the main statutes that provide legal authority directly to the ANS program: the State ANS Act (SB08-226), Resolution HJR17-1004, and the Mussel Free Colorado Act, in addition to CPW aquatic animal health regulations.

State of Colorado ANS Act (SB08-226)

The ANS Act was passed by the legislature and signed by Governor Ritter in May 2008. The Act defines ANS as exotic or nonnative aquatic wildlife or any plant species that have been determined to pose a significant threat to the aquatic resources or water infrastructure of the state. It makes it illegal to possess, import, export, ship, transport, release, plant, place, or cause an ANS to be released. It provides authority to qualified state commissioned peace officers to inspect, decontaminate, and quarantine watercraft for ANS. It also provides authority for authorized agents to inspect and decontaminate watercraft for ANS. The Act determines that the first violation is a class 2 petty offense with a fine of $150. A second offense is a misdemeanor with a $1000 fine. For third and subsequent offenses, the violator commits a class 2 misdemeanor and, upon conviction, shall be punished as provided in section 18-1.3-501 C.R.S. It created in the State Treasury an ANS Fund in both Wildlife and State Parks, designating a first year budget of $3.9M for Wildlife and $3.2M for State Parks, and an annual budget of $2.7M for State Parks and $1.3M for Wildlife. The Mussel Free Colorado Act (described later) merged the two funds into one within CPW. The Act delegates the promulgation of rules to the State Parks Board. Rules were approved by the State Parks Board for adoption on February 20, 2009.

CPW—Parks Chapter 8 Regulations

The State Parks Board adopted regulations regarding ANS in 2009, specifically watercraft inspection and decontamination; regulations were updated in 2016, 2017, and 2018 (see page 12). The regulations require all trailered watercraft to be inspected prior to leaving an infested water, or prior to entering any water of the state if coming from out of state waters. These rules set the standards for watercraft inspection and

decontamination, certification, sampling, monitoring and reporting. They enable private industries to assist the state with inspection and decontamination services. The rules also created a new ANS list that targets species that are transported on a boat overland. The animal species listed are New Zealand mudsnail, zebra mussels, quagga mussels, rusty crayfish, and waterfleas. The plant species listed are African elodea, Brazilian egeria, Eurasian watermilfoil, giant salvinia, hydrilla, parrotfeather, yellow floating heart, and water hyacinth.

Concerning the Funding for Aquatic Nuisance Species—House Joint Resolution 17-1004

In 2017, the Colorado General Assembly unanimously passed HJR 17-1004 which affirmed the State Legislature's commitment to ANS management in Colorado, and the priority that the legislature places on the ANS Program within the state's operations. The bill encourages the federal government, specifically Reclamation, ACOE, USFS and US Coast Guard, to assist the state with implementation of the ANS Program as outlined in the State ZQM Plan.

Mussel Free Colorado Act—House Bill 18-1008

In 2018, the Colorado General Assembly passed the Mussel Free Colorado Act which created the ANS Stamp. The stamp is a fee for motorized watercraft and sailboats using Colorado waters (both residents and non-residents), increased fines for select ANS violations, and created a reimbursement process for CPW to get restitution for full decontaminations of quarantined or impounded watercraft.

Following the passage of HB18-1008, CPW formed an internal implementation team consisting of invasive species, public education and information, marketing information technology, sales, licensing, registration, marketing, and financial services staff. The team achieved the implementation goals set forth to have the ANS stamp available for purchase for in-state boaters renewing registration in November and December of 2018, and continuing in 2019 and subsequent years. The ANS stamp for out of state boats became available on January 1, 2019 online, at CPW offices and at all 700+ sales locations. The team also updated the website, issued rack cards and posters to offices, WID stations and sales locations, and participated in public education and media events. Similarly, the team also produced information to aid customer service and sales agents with the sale of the ANS stamp.

CPW Aquatic Health Regulations

Possession of Aquatic Wildlife Regulation—CRS Title 33, Colorado Wildlife Regulations Chapter 0 General Provisions, Article VII, # 012

No live aquatic wildlife may be possessed except as authorized in CPW regulations. CPW has authority over all vertebrate, crustacean, and molluscan wildlife. Importation, transportation, possession, and release of species that are not listed on the allowable species list is illegal and enforceable. Colorado changed regulations from a prohibited species list to an allowable species list in 2018. Any person in the State of Colorado may possess the following aquatic wildlife. All other species are prohibited for possession.

- Amphibians
  - Bullfrogs
  - Aquatic Gilled forms of Tiger Salamanders
  - Any amphibians allowed under Chapter W-10, #1000.A.6
  - Any amphibian designated as unregulated wildlife under Chapter W-11, #1103.B


American Bullfrog

PHOTO BY CARL D. HOWE


Sanchez Reservoir

- Crustaceans—The following crustaceans may be possessed East of the Continental Divide. Crayfish are not allowed to be possessed live West of the Continental Divide and at Sanchez Reservoir.
    - Virile Crayfish
    - Waternymph Crayfish
    - Calico Crayfish
    - Ringed Crayfish
    - Southern Plains Crayfish
- Fish—Possession of these species is subject to the restrictions set forth in Chapter W-1.
    - Brown, brook, cutthroat, golden, lake and rainbow trout, and their hybrids
    - Arctic char
    - Grayling
    - Kokanee salmon
    - Whitefish
    - Sculpin
    - Smallmouth, largemouth, spotted, striped, and white bass
    - Wipers
    - Common Carp
    - Triploid grass carp
    - Bullhead, blue, channel, and flathead catfish
    - Black and white crappie
    - Drum
    - Northern pike
    - Tiger muskie
    - Sacramento and yellow perch, and their hybrids
    - Sauger and saugeye
    - Speckled dace
    - Rainbow smelt.
    - Tench
    - Walleye
    - Bluegill and bluegill hybrids
    - Green, redear and pumpkin-seed sunfish
    - Gizzard shad
    - Longnose and white suckers
    - Fathead minnow
    - Families of fish classified Cyprinidae except for bighead carp, black carp, and silver carp.
    - Any fish designated as unregulated wildlife under Chapter W-11, #1103.B of these regulations.
- Food Production Facility—In addition to those species identified in Chapter W-0, #012.C, any food production facility may possess the following aquatic wildlife in the State of Colorado:
    - Blue tilapia and their hybrids
    - Mozambique tilapia and their hybrids
    - Nile tilapia and their hybrids
    - Barramundi
    - Any other fish that the Division, after consultation with the Colorado Fish Health Board determines can securely be kept within a Food Production Facility and which does not present a risk to native species, their habitat, the aquatic environment, or other Food Production Facilities.
    - Crustacea—Red claw crayfish

Possession of Aquatic Wildlife Regulation (CRS Title 33, Colorado Wildlife Regulations Chapter 0 General Provisions, Article VII, # 013)

The release (stocking) of aquatic wildlife is carefully described by statute. Only certain species of fishes can be stocked and only in certain defined areas. Release of all other aquatic wildlife including vertebrates, crustaceans, and mollusks must be accompanied by written permission from CPW.

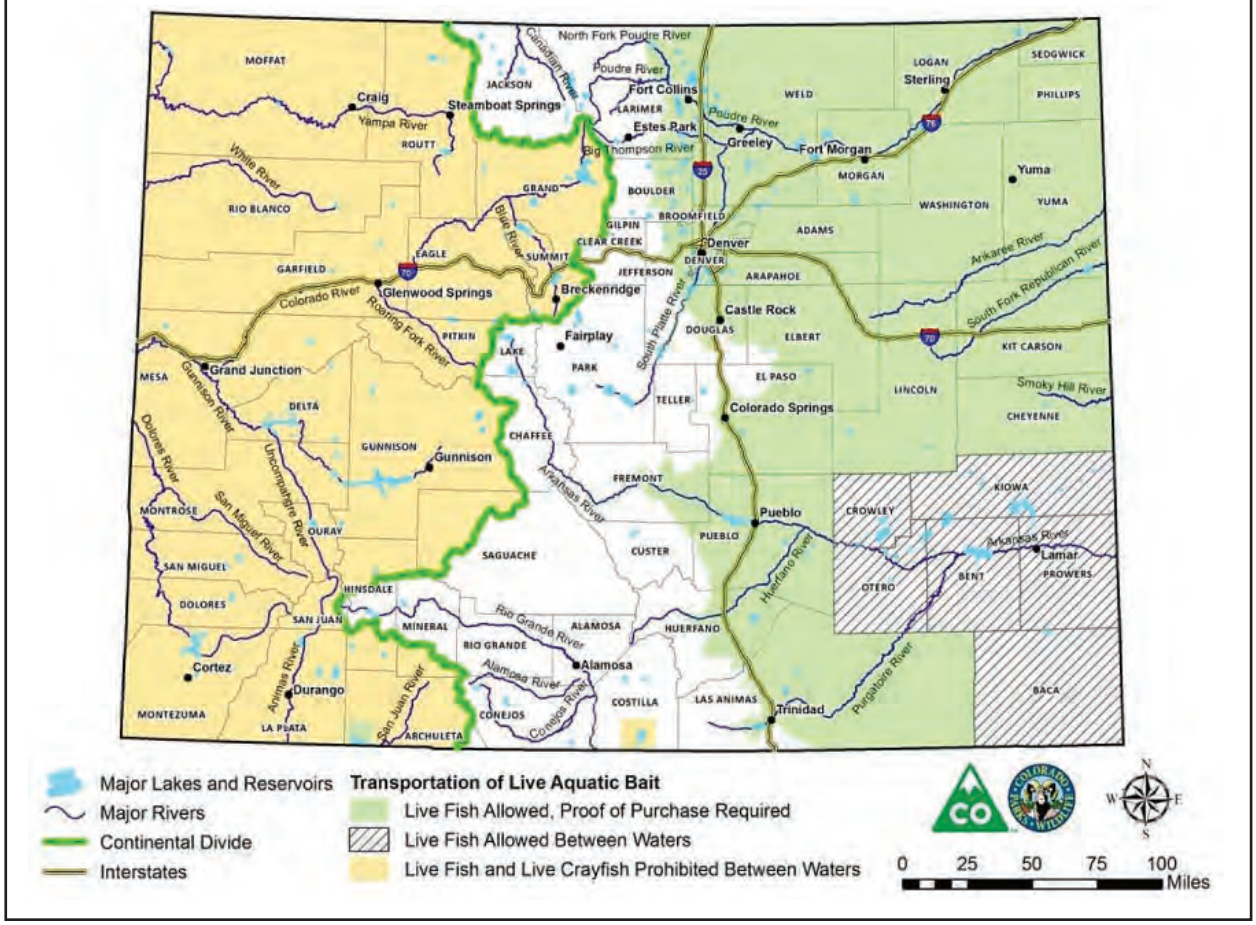
Possession of Aquatic Wildlife Regulation (CRS Title 33, Colorado Wildlife Regulations Chapter 0 General Provisions, Article VII, # 014)

No live aquatic animals may be imported into Colorado without an aquatic species importation license. No live fish may be imported, transported, transferred, or stocked in Colorado without a current fish health certificate. Salmonid fishes must be certified free of several regulated pathogens. Non-salmonid fishes are required to be inspected for Viral Hemorrhagic Septicemia Virus.

Colorado Parks and Wildlife regulations require that **all live fish as aquatic bait must be purchased from an authorized Colorado bait dealer** and must be accompanied by a **dated receipt**. The receipt is valid for ANS inspections for **seven days**.

- Live fish are only allowed for use as bait on the Eastern plains below 7,000 feet and at Navajo Reservoir.
- In those areas, the transportation of live fish as bait is prohibited between waters unless it was purchased from a Colorado bait dealer, as described above.
- Fish harvested in the wild for use as live bait can only be used in the water in which it was caught and can no longer be transported and stored for later use.
- The exception is fish harvested within Baca, Bent, Crowley, Kiowa, Otero, or Prowers counties, which can be transported and used only within those six counties.
- The transportation of live crayfish is prohibited on the western slope and from Sanchez Reservoir.
- It is unlawful to transport live fish as bait across state lines without an importation permit.

Figure 11: Live Aquatic Bait Fish Regulations in Colorado



Colorado Department of Agriculture
http://www.colorado.gov/ag

CDA provides financial assistance, technical support, reporting, on-the-ground control services, and statewide coordination for noxious weed management. In addition, the Department provides biological pest control agent, technical support for insect and plant pathogen management, and pesticide applicator licensing and training. CDA also has statutory authority over aquaculture, nursery, biological control, certified weed free hay and mulch, and seed industries (Colorado Department of Agriculture, 2020).

The Colorado Noxious Weed Act

The Act states that it is the duty of all persons to use integrated methods to manage both terrestrial and aquatic noxious weeds if they are likely to be materially damaging to the land of neighboring landowners. It directs CDA to provide the reporting infrastructure, list and classify noxious weeds, provide technical assistance and services on the management and control of noxious weeds. It also allows for the enforcement of noxious weed management programs at state, county, and municipal levels. All local governing bodies are required to report noxious weeds, have advisory weed boards, conduct enforcement, and have written management plans for the control of noxious weeds in their jurisdictions. The Colorado Noxious Weed Act was passed in 1990 and most recently revised in 2003 The Act provides legal mandates for eradication, containment, and suppression on specific species in various areas of the state.

The Colorado Noxious Weed List

The Colorado Noxious Weed List was created in 1990 and most recently revised in 2020 in order to coordinate noxious weed management efforts in Colorado and prioritize species for management. The List is divided into three parts (List A, B, and C) prescribing minimum statewide management standards (eradication, containment, and suppression). Criteria for designating a species as a noxious weed require that it be non-native to the State, aggressively invades, and it has a discernible impact on agriculture and/or the environment. Classification into one of the three parts of the list primarily reflects the known distribution of the designated species, the feasibility of current control technologies to achieve specified management objectives, and the costs of carrying out the prescribed state weed management plan (Colorado Department of Agriculture, 2020).

Counties and municipalities have enforcement authority over the weed list and the penalties are civil. The 2003 legislative amendments made the Act more enforceable. The majority of listed species are terrestrial invaders that infest range, pasture, cropland, and wildland habitats—but there are aquatic species scattered throughout the lists. There are gaps in existing capacities that challenge CDA or CPW's ability to fully address aquatic invasive plants at the current time. Adequate staff with funding for statewide surveys, facility/nursery inspections, and treatment across all waterbodies in the state to implement existing statutes is the single biggest issue. Secondarily is lack of statutory authority to inspect and regulate pet trade industry and aquatic plant industry. Most local governments (e.g. county weed programs) do not have the infrastructure or aquatic expertise to manage ANS.

List A—Twenty-five species mandated for eradication on all lands in Colorado. The state provides additional education and research.

- ANS on List A are Giant Salvinia, Hydrilla and Parrotfeather

List B—Thirty eight species; List B species are common in some parts of the State but rare in others. Species management plans mandate eradication, containment or suppression for each species depending on the distribution and abundance of the species in the State. The State provides additional education, research, and biocontrol resources.

- ANS on List B is Eurasian watermilfoil

List C—Sixteen species total; all species are found in Colorado and are fairly common in the state. The State mandates suppression on List C species; local governments can elevate control in their jurisdictions. For jurisdictions requiring management of List C species, the State provides additional education, and biocontrol resources.

- There are no ANS on List C

The Colorado Nursery Act

These regulations provide additional regulatory authority to prevent the introduction of identified invasive plants through the sale as nursery stock (organisms in trade) in Colorado. Eurasian watermilfoil, giant salvinia and hydrilla are listed in the Administrative Rules for the Nursery Act and are prohibited for sale in Colorado. Other aquatic plant species that are prohibited for possession in Parks Chapter 8 regulations or listed on the watch list are still being sold in Colorado and threatening natural resources, recreation and the water infrastructure of the state. Similar to the weed law, there are no clear roles and responsibilities with complementary authority for enforcement.

The Colorado Aquaculture Act

The Colorado Aquaculture Act created the Colorado Fish Health Board which promulgates, reviews, and approves regulations relating to fish health and importation or distribution of any exotic aquatic species.

The Pet Animal Care Facilities Act (PACFA)

Regulates pet aquatic animals including fish, amphibians and invertebrates including insects and/or coral species sold and distributed in the pet trade or that are not regulated by CPW. PACFA works in collaboration with CPW to identify invasive or prohibited species that are potentially being sold illegally in the pet trade as pets, with CPW having the authority for enforcement.

Colorado Department of Public Health and the Environment (CDPHE)

https://www.colorado.gov/cdphe

The Water Quality Control Division (WQCD) within CDPHE deals primarily with the Clean Water Act (CWA) and Safe Drinking Water Act. There appears to be no outright statement linking WQCD to an existing authority status regarding ANS. Water bodies are listed on the CWA 303(d) list for Colorado when an invasive species can clearly be defined as impairing the biological communities, such as benthic macroinvertebrates or fish, or if a species is considered a "biological pollutant," which would tie a pollutant to an impairment of a Designated Use. Designated Uses are human and ecological water uses that the WQCD and Environmental Protection Agency (EPA) officially recognize and protect. Designated Uses must include existing and desired uses that require good-to-excellent water quality. The WQCD must develop a set of water quality criteria (standards) that will protect each Designated Use. These assessments are very difficult to make in relation to ANS due to a lack of research and clear scientific support. This process of listing impaired waters through the CWA 303(d) list occurs every 2 years.

The CDPHE has been a member of the CANS Task Force since inception and has partnered with CPW on ANS projects. Most notably, the CDPHE obtained a five-year grant from EPA to provide water quality analytical services for the CPW ANS Program, which was essential to completing the risk analysis described on pages 22–23.

Colorado State Patrol (CSP)

http://cdpsweb.state.co.us

As post certified peace officers, they are authorized by the ANS Act to decontaminate, quarantine and impound watercraft for ANS per SB08-226. Other Western States have statutes that address ANS transport, inspection, and regulation of vehicles moving ANS on state or federal highways. The State of Washington passed legislation that allows their highway patrol to stop, inspect, and impound, if necessary, any motor vehicle or trailer carrying ANS into or through the state. In the future, similar statutes might be necessary in Colorado to protect our waterways from accidental introduction of ANS if highway stations for perimeter defense are necessary for protection.

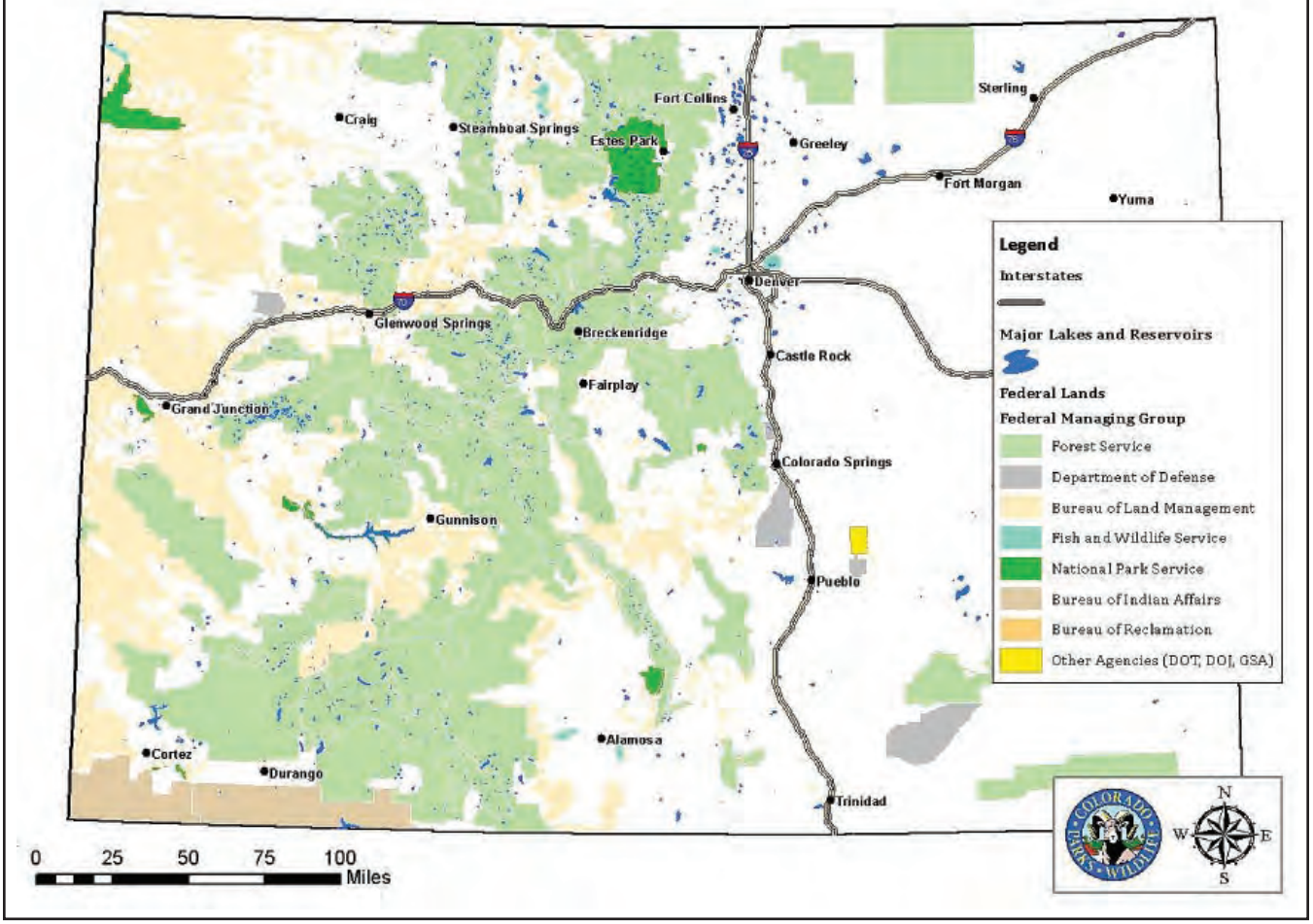
Federal Legal Authority

No single federal agency has clear authority over all aspects of ANS management, but many agencies have programs and responsibilities that address aspects of the issue, such as importation, interstate transport, exclusion, control, and eradication. Federal activities on ANS management are coordinated through the ANS Task Force created by the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 and amended as the National Invasive Species Act in 1996. In February 1999, President Clinton signed Executive Order (EO) 13112, which requires all federal agencies to collaborate in developing a national invasive species management plan to include terrestrial and aquatic species. Executive Order 13751 signed by President Barak Obama in December 2016, amends EO 13112. A brief description of NANPCA, NISA, EO 13112, EO 13751 and the Lacey Act follow.

Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA; Title I of P. No. 101-646, 16USC 4701 et seq.)

NANPCA established the first major federal program through ANS Task Force to prevent the introduction of, and to control the spread of, introduced aquatic nuisance species and the brown tree snake. The ten federal agency members of the ANS Task Force named in the Act are the USFWS, National Oceanic and Atmospheric Administration, NPS, Department of Transportation, U.S. Coast Guard, U.S. Army Corps of Engineers (USACE), Environmental Protection Agency (EPA), Department of State, U.S. Geological Survey, and Animal and Plant Health Inspection Service (APHIS). This list has expanded over time and current membership includes a broad array of federal agencies and non-governmental organizations. States are represented through the Regional Panels, which are sub-committees and not voting members of the ANS Task Force.

Figure 12: Colorado's Federal Lands and Waters



NANPCA provides an institutional framework that promotes and coordinates research, develops and applies prevention and control strategies, establishes national priorities, educates and informs citizens, and coordinates public programs. The Act also calls upon States to develop and implement comprehensive State ANS management plans. The ANSTF is required to report to Congress annually.

NANPCA also established two Regional Panels comprised of public and private entities to serve as advisory committees to the ANSTF—the WRP on ANS and the Great Lakes Panel. There have been four Panels added over time for a total of six regional panels. Colorado's Invasive Species Program Manager was the Chair of the WRP from September 2011 to June 2020. Colorado is a member of both the WRP and the MRBP.

Under NANPCA, state governors are authorized to submit comprehensive ANS management plans to the Task Force for approval which identify areas or activities for which technical and financial assistance is needed. Grants are authorized to states for implementing approved management plans, with a maximum federal share of 75 percent of the cost of each comprehensive management plan. The state matching contribution is 25 percent of total program costs.

Detailed information about the ANSTF and all current state ANS management plans can be found on the ANS Task Force website at https://www.anstaskforce.gov.

National Invasive Species Act (NISA; Pub. l. 104-322)
In 1996, NISA amended NANPCA to mandate regulations to prevent the introduction and spread of ANS into the Great Lakes through ballast water and other vessel operations. This Act required a U.S. Coast Guard study and report to Congress on the effectiveness of existing shoreside ballast water facilities used by crude oil tankers. It authorized funding for research on ANS prevention and control in the Chesapeake Bay, the Gulf of Mexico, the Pacific Coast, the Atlantic Coast, and the San Francisco Bay-Delta Estuary. In addition, NISA required a ballast water management program to demonstrate technologies and practices to prevent aquatic non-indigenous species from being introduced into and spread through ballast water in U.S. waters. It modified: (1) the composition and research priorities of the ANS Task Force; and (2) zebra mussel demonstration program requirements. Although Colorado is an inland state, it is clear that the regulation of ballast water has a profound impact on which ANS become established in the United States and can be moved into Colorado through many pathways.

Executive Order 13112 on Invasive Species
The Executive Order (EO) on Invasive Species signed by President William J. Clinton on February 3, 1999, expanded federal efforts to address ANS. The EO intended to build upon existing laws, such as the National Environmental Policy Act, NANPCA, the Lacey Act, the Plant Pest Act, the Federal Noxious Weed Act, and the Endangered Species Act. The EO directs all federal agencies to address invasive species concerns as well as refrain from actions likely to increase invasive species problems. The EO creates a National Invasive Species Council (NISC) charged with developing a comprehensive plan to minimize the economic, ecological and human health impacts of invasive species and determine the steps necessary to prevent the introduction and spread of additional invasive species. The National Invasive Species Management Plan was finalized on January 18, 2001. An update to The National Invasive Species Management Plan for 2016-2018 has been approved and is available on the Council website at https://www.doi.gov/invasivespecies/.

Executive Order 13751—Safeguarding the Nation from the Impacts of Invasive Species
Signed by President Barack Obama on December 5, 2016, EO 13751 amends EO 13112 and directs actions to continue coordinated Federal prevention and control efforts related to invasive species. This order maintains the NISC and the Invasive Species Advisory Committee (ISAC); expands the membership of NISC; clarifies the operations of NISC; incorporates considerations of human and environmental health, climate change, technological innovation, and other emerging priorities into Federal efforts to address invasive species; and strengthens coordinated, cost-efficient Federal action.

Lacey Act

The Lacey Act of 1900, amended in 1998 prohibits the importation of a list of designated species and other vertebrates, mollusks, and crustacea that are "injurious to human beings, to the interests of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States." The Act declares importation or transportation of any live wildlife as injurious and prohibited, except as provided for under the Act but allows import of almost all species for scientific, medical, education, exhibition, or propagation purposes.

Federal Government

Colorado's management approach is centered around a multi-jursidictional proactive approach to preventing invasive species establishment, early detection and rapid response. It is of the utmost importance that members of relevant federal agencies participate in and support the Colorado ANS Program because the highest risk waters and facilities are federally owned and/or managed. There is a shared responsibility among the state and federal partners, along with industry and local governments, to prevent the spread of ANS and protect our aquatic resources.

United States Department of Agriculture—
United States Forest Service
https://www.fs.fed.us/

The US Forest Service (USFS) was established in 1905 and is an agency of the U.S. Department of Agriculture. The USFS manages public lands in national forests and grasslands which encompasses 193 million acres across the USA. The USFS is the recreation manager of numerous very high risk waters in Colorado. As part of recreation management, they permit marinas, control boat ramp access and operations, and issue private slips on high priority waters, such as Granby and Shadow Mountain Reservoirs in the Arapahoe National Recreational Area, which is the headwaters to both the Colorado and Platte River Basins. The Regional Office and various forests have provided cost-share to CPW for ANS and are active in the CANS Task Force.

Department of Defense—
U.S. Army Corps of Engineers
https://www.usace.army.mil/

It is the policy of the Army Corps of Engineers (ACOE) to develop, control, maintain, and conserve the Nation's water resources in accordance with the laws and policies established by Congress and the Administration. The ACOE Zebra Mussel Research Program was authorized by NANPCA of 1990, Public Law 101-646, and is the only federally authorized research program for the development of technology to control zebra mussels. The ACOE ANS programs were integrated into the ANS Task Force to ensure total coordination and leveraging to address all ANS issues.

Water Resources Development Act

The reauthorization of the Water Resources Reform and Development Act (WRRDA, 2014) and Water Infrastructure Improvements for the Nation Act (WIIN, 2016) included funding for WID stations in four Columbia River Basin (CRB) states to prevent the spread of ANS, primarily zebra and quagga mussels, as well as provisions for monitoring and rapid response. The FY 2016 federal budget included a $4 million appropriation for WID stations. The Senate's FY 2017 Energy and Water Appropriations bill included $4 million for WID stations and $1 million for monitoring. The WRDA has successfully been used to provide much needed resources to states for the implementation of WID stations and monitoring in the CRB.

The 2018 Water Resources Reform and Development Act (S. 3021) was passed by the 115th Congress and signed into law October 2018. Section 1170 includes a provision which directs the ACOE to monitor and establish, operate, and maintain new or existing WID stations to prevent the spread of ANS in the Columbia, Upper Missouri, Upper Colorado, South Platte, and Arkansas River Basins. The provision also authorizes the ACOE to assist states with monitoring and rapid response efforts in the case of an infestation of quagga or zebra mussels.

United States Department of Commerce—
National Oceanic and Atmospheric Association
https://www.noaa.gov/

Tasked with the conservation and management of coastal and marine ecosystems and resources, the National Oceanic and Atmospheric Association

(NOAA) does not have any ANS authorities in Colorado. NOAA has a key role as a co-chair of the ANS Task Force but no exact directive or portfolio to work on ANS.

United States Environmental Protection Agency
https://www.epa.gov/

The Environmental Protection Agency's (EPA) mission is to protect human health and the environment. There are bio-assessments and wetland surveys conducted by the EPA in Colorado that may capture information on invasive species. Additionally, the EPA serves as a member on the ANS Task Force.

United States Department of the Interior (DOI)

There are numerous bureaus within the Department of Interior (DOI) that have responsibility or authority over some portions of ANS management. In 2017, Colorado participated in six focused state-federal committees which informed the DOI's *Safeguarding the West from Invasive Mussels* Initiative. *Safeguarding the West* enabled the Bureaus to engage with states on ANS management and provided resources through the Bureau of Reclamation to further specific needs and bolster the implementation of the *Quagga Zebra Action Plan for Western Waters (QZAP)*. Colorado benefited from this regional effort and encourages DOI to stay engaged and continue providing funds and coordination to western states for QZAP implementation.

DOI—Bureau of Indian Affairs
https://www.bia.gov/

The Bureau of Indian Affairs (BIA) mission is to: "… enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes, and Alaska Natives." Tribes in the southwest region of Colorado include The Southern Ute Tribe, and The Ute Mountain Ute Tribe.

DOI—Bureau of Land Management
https://www.blm.gov/

The Bureau of Land Management (BLM) manages 8.3 million acres of public lands and 27 million acres of federal mineral estate in Colorado. The BLM's strategy to prevent the introduction, spread, and establishment of aquatic invasive species is to use best management practices, such as boat inspections and equipment decontamination to develop and enhance the capacity to identify, report, and respond to newly discovered and localized invasive species. They work to restore native species to habitats impacted by invasive species by promoting collaboration, and the ability to respond when it comes to aquatic invasive species issues among federal, state, local and tribal governments, private organizations, and individuals. The agency supports public education and outreach efforts to promote the awareness and prevention of invasive species introductions. The BLM is an active participant in the CANS Task Force and has provided grants to CPW for a variety of ANS work.

DOI—U.S. Bureau of Reclamation
http://www.usbr.gov

The U.S. Bureau of Reclamation (Reclamation) is involved with ANS management on several levels. The Denver Technical Services Center (TSC), Hydraulic Investigations and Lab Services—Ecological Research Lab, the Research and Development Office, and the Office of Policy and Programs provide research, support, and assistance to the Regional and Area Offices in 17 Western States. There are three Integrated Pest Management (IPM) Coordinators for Colorado; the Western Colorado Area Office (Grand Junction), the Eastern Colorado Area Office (Loveland), and the Albuquerque Area Office (South Central Colorado). Reclamation staff from the Western Area Office and Eastern Area Office participate on site planning teams for high priority waters, and participates on the CANS Task Force. Reclamation has provided funding to CPW and partners for ANS work.


Martin Lake, Lathrop State Park

DOI—U.S. Fish and Wildlife Service
http:///www.fws.gov/

U.S. Fish and Wildlife Service (FWS) has multiple programs that address ANS management. FWS serves as co-chair of the Federal ANS Task Force, member of the WRP, and is the agency that provides federal funding for the implementation of ANS Task Force approved state ANS management plans. USFWS participates in the CANS Task Force and has provided grants to CPW for ANS work.

DOI—National Park Service
https://www.nps.gov/index.htm

The National Park Service (NPS) preserves the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The NPS cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world. There are 16 National Parks, Monuments or Historic sites in Colorado. Among those, Currecanti National Recreation Area, includes the largest body of water in Colorado, Blue Mesa; a popular destination for local and out of state boaters. NPS works closely with CPW to implement a comprehensive WID program at Blue Mesa Reservoir. Additionally, NPS staff performs plankton sampling at for analysis at CPW's ANS Lab. NPS participates in the CANS Task Force and has provided grants to CPW. The NPS manages the ANS program at Blue Mesa as a cost-share program with CPW.

DOI—United States Geological Survey (USGS)
https://www.usgs.gov/

The United States Geological Survey (USGS) gathers scientific data on the natural resources, climate change, land use changes, and environmental hazards. The USGS has developed the Non-Indigenous Aquatic Species (NAS) Database; it provides information on ANS distribution in the U.S. including maps of when and where the species was collected.

Regional and National Organizations

The Western Regional Panel on Aquatic Nuisance Species (WRP)
http://www.westernregionalpanel.org

The WRP was formed under a provision in NANCPA with the intention of coordinating ANS activities in the western 19 states. The WRP was not officially formed until after the passage of NISA in 1997. The WRP is an advisory (non-voting, non-member) subcommittee of the ANS Task Force and serves to coordinate state, federal, tribal, private industry, and non-governmental organizations to help limit the introduction, spread, and impacts of ANS in Western North America. The WRP authored the Quagga Zebra Action Plan for Western Waters and facilitated Building Consensus in the West. Colorado's Invasive Species Program Manager served as Chair of the WRP from September 2012 through June 2020.

The Western Invasive Species Coordinating Effort

The Western State ANS Programs formed the Western Invasive Species Coordinating Effort (WISCE) in 2011 out of a need to discuss and coordinate on zebra and quagga mussel management in the west. The purpose of WISCE is to provide an open dialogue among Western State ANS Coordinators with respect to ANS management and state program implementation. This group is coordinated among themselves and communication occurs via monthly conference calls and webinars. WISCE continues to be a positive and continuous group that solves common problems, supports and helps each other, and facilitates solutions between states and federal agencies. Colorado's Invasive Species Program Manager served as Chair of WISCE from

Figure 13: WRP Geographic Range

2012–2018 and CPW hosted the annual meeting in 2019 and 2020.

Western Governors Association
http://www.westgov.org/

The Western Governors' Association was established in 1984 to represent the Governors of 19 Western states and three U.S. territories in the Pacific. The association is an instrument of the Governors for bipartisan policy development, information exchange and collective action on issues of critical importance to the Western United States. In 2018, the WGA launched the Biosecurity and Invasive Species Initiative, the central policy initiative of WGA Chair Hawaii Governor David Ige, which focused on the impacts that nuisance species, pests and pathogens have on ecosystems, forests, rangelands, watersheds, and infrastructure in the West. The Initiative will examine the role that biosecurity plays in addressing the risks posed by invasive species. CPW participated in the Initiative and works collaboratively with WGA actively contributing to their efforts.

> ***WGA Policy Resolution 2016–05 Combating Invasive Species***
> Western Governors support coordinated invasive species management including early detection and rapid response programs to ensure that actions result in more on-the-ground prevention, management and eradication. Governors also call for increased accountability and oversight of federal invasive species programs and support the creation of a west-wide species inventory, including the development of data management standards, formats and protocols (Western Governors Association, 2016).

Western Association of Fish and Wildlife Agencies
https://www.wafwa.org/

The Western Association of Fish and Wildlife Agencies includes twenty-four states and Canadian provinces. WAFWA supports resource management and building partnerships at all levels to conserve wildlife for the use and benefit of all citizens. The Aquatic Invasive Species Working Group was established by the WAFWA directors in 2009. The working group's members consist of state and fish and wildlife agency personnel who have technical expertise and oversight of matters involving invasive species within their respective jurisdictions. The CPW Assistant Director currently serves as Chair of the Invasive Species Committee and the Invasive Species Program Manager participates as a member.

Common Carp

ILLUSTRATION BY DUANE RAVER, U.S. FISH AND WILDLIFE SERVICE

Association of Fish and Wildlife Agencies
https://www.fishwildlife.org/

The Association of Fish and Wildlife Agencies (AFWA) represents North America's fish and wildlife agencies to advance sound, science-based management and conservation of fish and wildlife and their habitats in the public interest. The CPW Director served as Chair of the Invasive Species Committee from 2009–2012 and the CPW Assistant Director and Invasive Species Program Manager participates as a member.

The Aquatic Nuisance Species Task Force
https://anstaskforce.gov/

The Federal Aquatic Nuisance Species Task Force was established by Congress with the passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA) in 1990 and reauthorized with the passage of the National Invasive Species Act (NISA) in 1996 (collectively, the Act). The ANS Task Force is composed of 13 Federal and 15 ex-officio members. The WRP and Great Lakes Panel were established in the authorizing legislation, and four additional panels have been created over time by USFWS. Colorado has participated on the ANS Task Force since 2011 as Chair of the WRP and as Co-Chair of the Communications, Education and Outreach Committee from 2014–2019.

Local Governments

Cooperation from Colorado local governments is critical to the success of the ANS Program. Many waters in the state are owned and/or managed by local governments. Larimer County operates an ANS inspection and decontamination program at two reservoirs that is a cost-share with CPW and Northern Water. Their program alone inspects over 55,000 boats and intercepts infested mussel boats annually. If there were no inspection program, those boats would get into the reservoirs and infest the entire northeastern half of the state's water supply and downstream impoundments.

Municipalities have taken a pro-active approach to the ANS problem by implementing watercraft inspection and decontamination at their reservoirs and lakes. Those governments are the City of Aspen, City of Aurora, City of Arvada, City of Basalt, City of Boulder, City and County of Denver, Town of Dillon, Town of Evergreen, Town of Grand Lake, City of Lakewood, City of Longmont, City of Loveland, City of Parker, Town of Snowmass, City of Westminster, and the Town of Windsor.

CPW will continue to work with local governments to mitigate the spread and impacts from ANS, including zebra and quagga mussels. By working together to implement the Plan, we greatly increase the probability of preventing the spread of ANS in Colorado.

Recreational User Groups and Industry Members

Private industries such as the Dillon and Frisco Marinas at Lake Dillon or marine dealers, such as Tommy's Slalom, Inc. and Great Lakes Marine took an active role implementing watercraft inspection and decontamination at their locations. These entities are crucial to the success of the Plan and CPW hopes that more partnerships can be formed to expand programs and reach a larger percentage of Colorado's residents and visitors for education, communication, volunteerism, early detection, and rapid response. CPW will direct its messages to the following recreationists and special interest groups; marinas, marine dealers, marine service centers, boating clubs, fishing clubs, fishing guides, anglers, waterfowl hunters, Trout Unlimited, Ducks Unlimited, BASS, CO Walleye Association, Muskies Inc, 5280 Bass Hunters, Federation of Fly Fishers, The Nature Conservancy, The American Boating and Yachting Council, and many more.

Non-Governmental Organizations

There are many non-governmental organizations (NGOs) that have an interest in preventing the spread of invasive species. The Colorado Women Fly-Fishers located a new population of New Zealand mudsnail in the South Platte and was integral in rapid response. The Nature Conservancy and Trout Unlimited played crucial roles in the development of this Plan and continue to serve on CANS Task Force.

Other Invasive Species Management Plans

Colorado Parks and Wildlife

- State of Colorado Zebra and Quagga Mussel Management Plan (Final 2009, Revised 2018)
    - i) Plan sets the foundation for how the ANS program functions in relation to mussels, including boat inspections, education, information, sampling and monitoring.
- State of Colorado Rusty Crayfish Management Plan (Final 2010, Revised 2018)
- State of Colorado New Zealand Mudsnails Management Plan: Current Status and Recommended Management Actions (Final 2005, Revised 2018)

Colorado Department of Agriculture

- Statewide noxious weed management plans (Updated biennially)
    - Written into Weed Rules by Agriculture Commission.
- Colorado's Strategic Plan to Stop the Spread of Noxious Weeds (2001)
    - Sets the framework for Weed Law and Rules.

Western Regional Panel on ANS

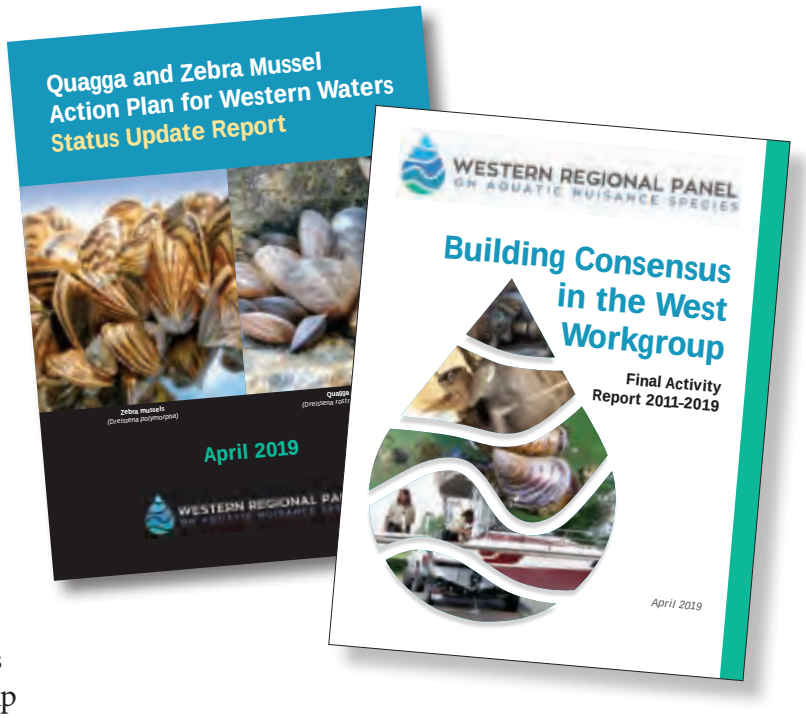
- Quagga Zebra Action Plan for Western Waters (QZAP, 2010)
- Quagga and Zebra Mussel Action Plan for Western Waters: Status Update Report (2019)
- Building Consensus in the West Workgroup: Final Activity Report 2011–2019 (2019)
- The Updated Recommendations for the Quagga Zebra Action Plan in Western Waters (2020).

Aquatic Nuisance Species Task Force

- ANS Task Force Strategic Plan 2020–2025
- National NZMS Plan (Final 2007)
- State and Interstate AIS Management Plans https://www.anstaskforce.gov/stateplans.php

National Invasive Species Council

- National Invasive Species Management Plan (2016–2018)



Management Plan Goal

The goal of the Colorado ANS Management Plan is to minimize the harmful ecological, economic and social impacts of ANS through prevention and management of ANS into, within, and from Colorado. The goal will be achieved through full implementation of the Plan objectives to prevent, control, contain, monitor, and whenever possible, eradicate aquatic invasive species from the waters of the State through the continuation of the current ANS program. The Plan emphasizes the collaboration of state agencies, alongside federal and local governments, private industry and the public, in order to prevent introductions, while effectively controlling or containing established ANS populations.

This will be achieved through the implementation of a plan and program that:

- Operates with funding and staffing levels adequate for effective implementation,
- Fosters agency collaboration and facilitates coordination with local, state, and federal entities,
- Seeks mutually beneficial collaborative solutions with the private sector and user groups,
- Emphasizes the prevention of new introductions,
- Enables early detection and monitoring of the waters of the state,
- Prioritizes rapid response to new infestations and containment of current infestations,
- Encourages and facilitates applied research and data-driven decision making,
- Inspire Coloradoans and visitors to take action and protect natural resources from invasive species through comprehensive statewide education, marketing and informational campaigns, and
- Contributes to the accomplishments of the goals that cross jurisdictional boundaries through state organizations (e.g. Colorado Fish Health Board) regional organizations (e.g. Western Regional Panel) and national organizations (e.g. North American Invasive Species Management Association).

This Plan will be adaptable, as it is not intended to address all potential invading species, their impacts, and the constraints and contingencies that may develop. CPW has developed statewide species management plans and site-specific ANS management plans to be used on a case-by-case basis.

Management Plan Objectives, Strategies, and Actions


WID Supervisors Meeting January 2020

Objective 1—Ensure the effective and consistent implementation of the Plan.

Strategy 1A:
Allocate adequate human resources within the CPW Invasive Species Program to implement the Plan and Program.

Action 1A1—
Maintain the Invasive Species Coordinator, Invasive Species Specialist, and Invasive Species Administrative Assistant positions.

Action 1A2—
Increase state capacity by adding full-time permanent staff to manage the ANS laboratory, field sampling operations, and watercraft inspection and decontamination.

Action 1A3—
Maintain temporary full-time employee levels to carry out the duties and functions of the Program.

Action 1A4—
Increase state capacity by adding full-time permanent staff to address gaps and inefficiencies related to aquatic invasive plant management and illicit fish stocking.

Strategy 1B:
Allocate adequate fiscal resources to successfully implement this Plan.

Action 1B1—
Maintain annual ANS Fund allocations within CPW consistent with FY21 and adjust for minimum wage and utility increases over time.

Action 1B2—
Collaborate with federal agencies to provide at least 50% cost share of watercraft inspection and decontamination stations, monitoring, and other invasive species program efforts statewide.

Action 1B3—
Collaborate with water providers, water districts, local governments, tribes, private industry, and other interested parties to ensure adequate funding and agency priority for ANS program implementation exists.

Strategy 1C:
Continue coordinating inter-agency and stakeholder involvement within Colorado.

Action 1C1—
Maintain at least one annual meeting of inter-jurisdictional teams including the Colorado ANS Task Force (established in 2006 and expanded to the Colorado ANS Stakeholders Group in 2016) and the Watercraft Inspection and Decontamination Supervisors Team (established in 2009).

Action 1C2—
Continue to seek mutually beneficial partnerships and opportunities between the public and private sector (e.g. Colorado Marine Dealers Association).

Strategy 1D:
Participate in regional and national AIS coordinating entities, including but not limited to the Western Regional Panel, the Mississippi River Basin Panel, the Missouri River Basin Team, Western Association of Fish and Wildlife Agencies, Association of Fish and Wildlife Agencies, Western Invasive Species Coordinating Effort, Western Governors' Association, ANS Task Force, American Boating and Yachting Council, National Marine Manufacturers Association, North American Invasive Species Management Association, and others as appropriate.

Action 1D1—
Contribute to coordinating agencies, provide program presentations, and participate in committees and working groups that further advance ANS prevention, detection, and control methodologies that impact Colorado and the western United States.

Strategy 1E:
Review and adapt the Colorado ANS Management Plan as needed including potential needs associated with climate change adaptation.

Action 1E1—
Evaluate ANS Plan strategies and actions to determine if adjustments need to be made, or as new needs arise.

Objective 2—Prevent new introductions through managing human vectors and pathways of introduction and spread.

Strategy 2A:
Provide sufficient watercraft inspection and decontamination stations to effectively protect the waters of the state from ANS introductions.

Action 2A1—
Maintain, and consider expanding, the current network of watercraft inspection and decontamination stations.

Action 2A2—
Consider implementing watercraft inspection and decontamination at fixed stations near the borders of the state.

Action 2A3—
Consider new technology to provide alerts when watercraft are traveling from infested areas into the state.

Action 2A4—
Maintain, manage, and continue improving upon the Regional WID Data Sharing System for the benefit of all participants. Chair the multi-jurisdictional Governance Team in perpetuity as the owner of the applications.

Strategy 2B:
Provide adequate training, resources and quality control to ensure watercraft inspection and decontamination personnel effectively and consistently implement standardized state and regional procedures.

Action 2B1—
Maintain the current certification and training program for watercraft inspectors and decontaminators.

Action 2B2—
Prioritize quality control evaluations of watercraft inspection stations throughout the state in order to maintain consistency with protocols and provide ongoing support and on the job training for boat inspectors.

Action 2B3—
Educate all recreational users to decontaminate and/or clean, drain, and dry to prevent ANS spread (i.e. waterfowl hunters).

Strategy 2C:
Encourage CPW and Partner agency staff working in aquatic settings to actively engage in best management practices to ensure ANS is not transferred while performing their work duties.

Action 2C1—
Ensure that CPW aquatic biologists and other agency personal utilizing watercraft to perform job duties are state certified in watercraft inspection and decontamination annually. Offer training opportunities to partner agencies.

Action 2C2—
Decontaminate CPW boats, waders and equipment between every launch according to the current Colorado ANS Watercraft Decontamination Manual and follow CPW equipment decontamination guidelines.

Action 2C3—
Limit the use of felt sole waders by CPW staff, and encourage other state, federal and local governments and private industry professionals to do the same.

Action 2C4—
Follow HACCP plans and disinfection protocols, and encourage other state, federal and local governments and private industry professionals to do the same.

Action 2C5—
Implement the standards and guidelines from the National Wildfire Coordinators Group to prevent AIS transport by wildland fire operations.

Strategy 2D:
Clarify agency roles and responsibilities related to the sale of invasive species in Colorado, and establish legal authority where gaps exist (i.e. nursery, pet, aquarium, or bait).

Action 2D1—
Evaluate existing legal authority related to the sale of invasive species or organisms in trade in Colorado and document state agency roles and responsibilities, where gaps exist that could result in a new introduction or further spread, and make recommendations to prohibit the sale of invaders in Colorado.

Action 2D2—
Develop an agreement between CPW and CDA to implement prevention, management, education, and enforcement in a uniform manner with clear roles, responsibilities and open lines of communication related to aquatic invasive plants.

Action 2D3—
Pursue statutory authority, if needed, to fill gaps and increase violations for the sale of invasive organisms in trade.

Strategy 2E:
Develop a statewide collaborative strategy with dedicated resources to address illicit fish stocking.

Action 2E1—
Develop a statewide collaborative strategy to address illegal fish introductions and limit future illicit stocking of non-native fish, considering reclamation of waters whenever possible.

Action 2E2—
Increase fines and enforcement for illegal fish stocking.

Action 2E3—
Provide incentives for reporting illegal stocking (similar to poaching) and utilize operation game thief for confidential reporting.

Strategy 2F:
Increase opportunities for anglers to clean their waders, boots, and gear to prevent the spread of New Zealand mudsnails and other ANS.

Action 2F1—
Develop partnerships with local businesses in popular fishing locations and provide wader or boot cleaning stations for use.

Action 2F2—
Provide wader or boot cleaning stations for use at State Parks, State Wildlife Areas or CPW offices frequented by anglers.

Action 2F3—
Provide instruction for anglers to clean gear and achieve behavior change.

Action 2F4—
Develop metrics to evaluate the effectiveness of wader or boot cleaning stations.

Objective 3—Improve the capacity to implement rapid response for new ANS.

Strategy 3A:
Ensure the capacity to implement the rapid response plan upon detection of ANS.

Action 3A1—
Maintain a CPW Rapid Response Fund for ANS that can be utilized quickly to initiate action upon the verified detection of ANS.

Action 3A2—
Establish proper species-specific containment, control and/or eradication techniques to be implemented for primary species of concern upon early detection, regardless of ownership, to prevent the spread of ANS within the species-specific management plan (if available). Consider the National Environmental Policy Act (NEPA) and Endangered Species Act (ESA) in relation to treating newly discovered infestations quickly.

Strategy 3B:
Implement agency directives and policy related to Invasive Species.

Action 3B1—
Implement the CPW Administrative Directive OG-7 titled Invasive Species Notification approved October 17, 2019.

Action 3B2—
Implement the CPW Administrative Directive OG-6 titled Invasive Species and Native Pests approved October 17, 2019.

Action 3B3—
Gain approval and implement the Parks and Wildlife Commission Policy titled Invasive Species and Native Pests.

Objective 4—Survey and monitor waters of the state for ANS.

Strategy 4A:
Maintain or increase existing field sampling and monitoring efforts for early detection, population monitoring, and baseline data collection of mollusks, crustaceans, and macrophytes.

Action 4A1—
Communicate with entities within Colorado, western states, and WRP members to consistently define, list, and de-list waters according to the regional standards.

Action 4A2—
Adapt and improve field sampling and monitoring protocols and procedures as science evolves and effective new tools are made available.

Strategy 4B:
Maintain the Colorado ANS Sampling and Monitoring Data Management System through allocation of IT time, support, and expertise.

Action 4B1—
Develop new monitoring reports and improve upon the existing features in the database.

Strategy 4C:
Provide for standardized laboratory testing protocols between CPW and their partners to ensure reliable test results and consistent interpretation of those results and corresponding management actions.

Action 4C1—
Communicate with entities within Colorado, western states, and WRP members to consistently implement regional lab standards.

Action 4C2—
Adapt and improve laboratory protocols and procedures as science evolves and effective new tools are made available.

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Objective 5—Evaluate and improve upon the current statewide informational and educational invasive species campaigns.

Strategy 5A:
Evaluate past educational efforts, in conjunction with western states, to determine if they are effective for achieving public awareness and behavior change (e.g. clean, drain, dry).

Action 5A1—
Contribute to regional or national analysis or evaluation of existing campaigns to determine effectiveness for behavior change.

Action 5A2—
Survey boaters, anglers, campers, and other recreational user groups to determine the awareness and voluntary compliance.

Strategy 5B:
Expand current invasive species informational and educational efforts.

Action 5B1—
Make educational materials available to the public through multi-media outlets such as newspapers, internet, social media, television and radio; water districts and utility companies; and specialty retailers.

Action 5B2—
Develop and implement a comprehensive statewide educational program focusing on organisms in trade.

Action 5B3—
Evaluate K-12 education criteria and coordinate with local organizations for opportunities to integrate ANS information, and develop new curricula as necessary.

Action 5B4—
Train speakers to give presentations on ANS issues at schools and public forums.

Action 5B5—
Develop ANS resource packets for distribution when presenting to different groups.

Strategy 5C:
Coordinate educational efforts with western region states.

Action 5C1—
Continue the use of National and Regional campaigns including, but not limited to: "Clean, Drain, Dry", "Don't Move a Mussel", "Stop Aquatic Hitchhikers", "Don't Let it Loose", "Habitattitude", "PlayCleanGo", and others.

Action 5C2—
Use standardized messaging for specific user group education such as "clean, drain, dry" for boaters.

Action 5C3—
Implement the ANS Task Force's national voluntary recreation guidelines for unregulated user groups.

Objective 6—Identify and support invasive species research including surveying, monitoring, control, eradication, and education.

Strategy 6A:
Collaborate with scientific researchers and other organizations to study biology, impacts, and control methods.

Action 6A1—
Place a high priority on invasive species related research within CPW.

Action 6A2—
Engage other governmental agencies, water users, educational institutions, private industry, and non-governmental organizations to conduct or support applied invasive species research.

Action 6A3—
Consider conducting research to determine how ANS in Colorado will be impacted in relation to the changing climate.

Priorities for Action

The priority for action is to maintain the existing Invasive Species Program within CPW including three permanent dedicated full time staff members and FY21 budget allocations. Given the current roles and functions of the ANS Program, increased capacity including new permanent full-time employees and financial resources for WID, monitoring, and educational operations may be essential due to the increased threat from neighboring states with mussel infestations and future invasive species on the horizon.

Mandatory watercraft inspection and decontamination stations are the foundation of the state's ANS strategy, coupled with early detection monitoring, education, enforcement, and coordination.

Securing long term funding agreements with federal partners for cost-share of WID and monitoring is a top programmatic priority. This includes the Regional WID Data Sharing System that is currently in use by numerous western states, local governments, NPS, private industry and regional entities.

In addition to current functions and duties, Colorado may elect to increase program resources and operations to manage pathways and vectors of spread, that are not currently being addressed, or to manage new introductions for species currently in the state and/or new to the state.

Organisms in trade is a threat that is not currently being addressed. Providing clarity for conflicting or unclear authority as it relates to aquatic plants is a priority to prevent the further sale and introduction of ANS into Colorado by nurseries and other stores. Colorado does not have a coordinated program or dedicated resources for aquatic invasive plant management.

Aquatic Section Fish Biologists manage non-native fish, and this is not currently a function of the State ANS Program. However, there is a need to develop a collaborative process to determine needs and provide recommendations to address illegal stocking and manage this human vector of introduction. Colorado does not have a coordinated program or dedicated resources for the illicit stocking of fish.

Acronyms for Implementation Table

ABYC—American Boat and Yacht Council

ACOE—Army Corps of Engineers

AFWA—Association of Fish and Wildlife Agencies

AG—Attorney General

BLM—Bureau of Land Management

BOR—Bureau of Reclamation

CANS Task Force—Colorado Aquatic Nuisance Species Task Force

CDA—Colorado Department of Agriculture

CDOT—Colorado Department of Transportation

CMDA—Colorado Marine Dealers Association

CPW—Colorado Parks and Wildlife

CRB—Columbia River Basin

CRFWC—Colorado River Fish and Wildlife Council

DARCA—Ditch and Reservoir Company Alliance

FWS—Fish and Wildlife Service

ISAN—Invasive Species Action Network

MRBP—Missouri River Basin Panel

NAISMA—North American Invasive Species Management Association

NASBLA—National Association of State Boating Law Administrators

NASL—National Association of State Legislatures

NMMA—National Marine Manufacturers Association

NPS—National Park Service

NSGLC—National Sea Grant Law Center

OIT—Colorado (Governor's Office of Information Technology)

PIJAC—Pet Industry Joint Advisory Council

Acronyms for Implementation Table (continued)

PSMFC—Pacific States Marine Fisheries Commissions

PWC—Parks and Wildlife Commission

SOBA—States Organization for Boating Access

USDOT—United States Department of Transportation

USFS—US Forest Service

USGS—US Geological Survey

WAFWA—Western Association of Fish and Wildlife Agencies

WGA—Western Governors Association

WID—Watercraft Inspection and Decontamination

WISCE—Western Invasive Species Coordinating Effort (a.k.a Western State ANS Coordinators)

WRP—Western Regional Panel on Aquatic Nuisance Species

WSIA—Water Sports Industry Association

CO ANS Management Plan Implementation Table							
Strategy	**Action**	**Action**	**Funding Source**	**Lead Organization**	**Cooperating Organizations**	**Status**	**Frequency**
Objective 1 - Ensure effective and consistent implementation of the plan.							
1A	**Allocate adequate human resources within the CPW Invasive Species Program to implement the Plan and Program**						
	1A1	**1A1** - Maintain the Invasive Species Coordinator, Invasive Species Specialist, and Invasive Species Administrative Assistant positions.	CPW	CPW	None	Existing	Ongoing
	1A2	**1A2** - Increase state capacity by adding full-time permanent staff to manage the ANS laboratory, field sampling operations, and watercraft inspection and decontamination.	CPW	CPW	None	For Consideration	TBD
	1A3	**1A3** - Maintain temporary full time employee levels to carry out the duties and functions of the Program.	CPW	CPW	None	Existing	Ongoing
	1A4	**1A4** - Increase state capacity by adding full-time permanent staff to address gaps and inefficiencies related to aquatic invasive plant management and illicit fish stocking.	CPW	CPW	None	For Consideration	TBD
1B	**Allocate adequate fiscal resources to successfully implement this Plan.**						
	1B1	**1B1** - Maintain annual ANS Fund allocations within CPW consistent with FY21 and adjust for minimum wage and utility increases over time.	CPW	CPW	Many partners	Existing	Ongoing
	1B2	**1B2** - Collaborate with federal agencies to provide at least 50% cost share of watercraft inspection and decontamination stations, monitoring, and other invasive species program efforts statewide.	Federal	CPW	BOR, ACOE, USFS, NPS, BLM	In Progress	Ongoing
	1B3	**1B3 -** Collaborate with water providers, water districts, local governments, tribes, private industry and other interested parties to ensure adequate funding and agency priority for ANS program implementation exists.	Local water districts, local governments, tribes, private industry	CPW	water providers, water districts, local governments, tribes, private industry, non-governmental organizations, interested parties	In Progress	Ongoing

CO ANS Management Plan Implementation Table							
Strategy	**Action**	**Action**	**Funding Source**	**Lead Organization**	**Cooperating Organizations**	**Status**	**Frequency**
1C	**Continue coordinating inter-agency and stakeholder involvement within Colorado.**						
	1C1	**1C1** - Maintain at least one annual meeting of inter-jurisdictional teams including the Colorado ANS Task Force (established in 2006 and expanded to the Colorado ANS Stakeholders Group in 2016) and the Watercraft Inspection and Decontamination Supervisors Team (established in 2009).	CPW	CPW	CANSTF, WID Supervisors	Existing	Ongoing
	1C2	**1C2** - Continue to seek mutually beneficial partnerships and opportunities between the public and private sector (e.g. Colorado Marine Dealers Association)	CPW	CPW	CMDA, NMMA, ABYC, WSIA, DARCA, and others	Existing	Ongoing
1D	**Participate in regional and national AIS coordinating entities, including but not limited to the Western Regional Panel, the Mississippi River Basin Panel, the Missouri River Basin Team, Western Association of Fish and Wildlife Agencies, Association of Fish and Wildlife Agencies, Western Invasive Species Coordinating Effort, Western Governors' Association, ANS Task Force, American Boating and Yachting Council, National Marine Manufacturers Association, North American Invasive Species Management Assocation, and others as appropriate.**						
	1D1	**1D1** - Contribute to coordinating agencies, provide program presentations, and participate in committees and working groups that further advance ANS prevention, detection and control methodologies that impact Colorado and the western United States.	CPW	CPW	WRP, WISCE, ANSTF, WAFWA, AFWA, NAISMA, SOBA, NASBLA, NSGLC, WGA, ABYC, NMMA, WSIA, NAAG, NASL, PSMFC, CRFWC, CRB, MRBP, MRBP, and others	Existing	Ongoing
1E	**Review and adapt the Colorado ANS Management Plan as needed including potential needs associated with climate change adaptation.**						
	1E1 -	**1E1** - Evaluate ANS Plan strategies and actions to determine if adjustments need to be made, or as new needs arise.	CPW	CPW	CANSTF	For Consideration	Ongoing
Objective 2 - Prevent new introductions through managing human vectors and pathways of introduction and spread.							
2A	**Provide sufficient watercraft inspection and decontamination stations to effectively protect the waters of the state from ANS introductions.**						
	2A1	**2A1 -** Maintain and consider expanding the current network of watercraft inspection and decontamination stations.	Various	CPW	Many partners	Existing, For Consideration	Ongoing
	2A2	**2A2** - Consider implementing watercraft inspection and decontamination at fixed stations near borders of the state.	Unknown	Uknown	CDOT, USDOT, State Patrol, Counties, Conservation Districts, Water Districts, etc.	For Consideration	TBD
	2A3	**2A3** - Consider new technology to provide alerts when watercraft are traveling from infested areas into the state.	Unknown	Uknown	CDOT, USDOT, State Patrol, Counties, Industry	For Consideration	TBD
	2A4	**2A4** - Maintain, manage, and continue improving upon the Regional WID Data Sharing System for the benefit of all participants. Chair the multi-jurisdictional Governance Team in perpetuity as the owner of the applications.	CPW, FWS, BOR, ACOE, Tahoe, Montana, Utah, and potentially others	CPW	WISCE, WRP, 10+ states, NPS, Cities, Counties, Industry Partners	Existing	Ongoing

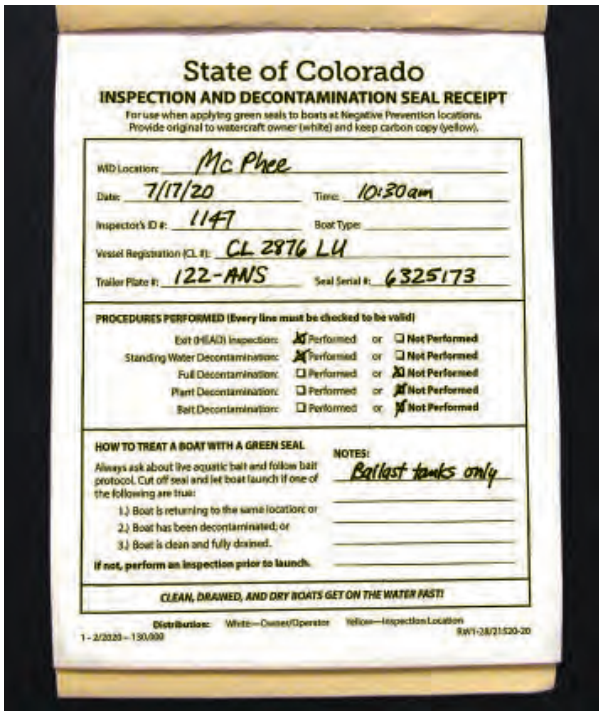
CO ANS Management Plan Implementation Table							
Strategy	**Action**	**Action**	**Funding Source**	**Lead Organization**	**Cooperating Organizations**	**Status**	**Frequency**
2B	**Provide adequate training, resources and quality control to ensure watercraft inspection and decontamination personnel effectively and consistently implement standardized state and regional procedures.**						
	2B1	**2B1** - Maintain the current state certification and training program for watercraft inspectors and decontaminators.	CPW	CPW	WID station partners	Existing	Ongoing
	2B2	**2B2** - Prioritize quality control evaluations of watercraft inspection and decontamination stations throughout the state in order to maintain consistency with protocols and provide ongoing support and on the job training for boat inspectors.	CPW	CPW	WID station partners	Existing	Ongoing
	2B3	**2B3** - Educate all recreational users to decontaminate and/or clean, drain and dry to prevent ANS spread (i.e waterfowl hunters).	CPW	CPW	Many partners	Existing	Ongoing
2C	**Encourage CPW and Partner agency staff working in aquatic settings to actively engage in best management practices to ensure ANS are not transferred while performing their work duties.**						
	2C1	**2C1** - Ensure that CPW aquatic biologists and other agency personal utilizing watercraft to perform job duties are certified in watercraft inspection and decontamination annually. Offer training opportunities to partner agencies.	CPW	CPW	All professionals working on waters of the state	Existing	Ongoing
	2C2	**2C2** - Decontaminate CPW boats, waders and equipment between every launch according to the current Colorado ANS Watercraft Decontamination Manual and follow CPW equipment decontamination guidelines.	CPW	CPW	All professionals working on waters of the state	Existing	Ongoing
	2C3	**2C3** - Limit the use of felt sole waders by CPW staff, and encourage other state, federal and local governments and private industry professionals to do the same.	CPW	CPW	All professionals working on waters of the state	Existing	Ongoing
	2C4	**2C4** - Follow HACCP plans and disinfection protocols, and encourage other state, federal and local governments and private industry professionals to do the same.	CPW	CPW	All professionals working on waters of the state	Existing	Ongoing
	2C5	**2C5** - Implement the standards and guidelines from the National Wildfire Coordinators Group (NWCG) to prevent AIS transport by wildland fire operations.	CPW	CPW	All professionals working on waters of the state	For Consideration	Ongoing
2D	**Clarify agency roles and responsibilities related to the sale of invasive species in Colorado, and establish legal authority where gaps exist (i.e. nursery, pet, aquarium, and bait).**						
	2D1	**2D1** - Evaluate existing legal authority related to the sale of invasive species or organisms in trade (i.e. aquatic invasive plants and animals) in Colorado and document state agency roles and responsibilities, where gaps exist that could result in a new introduction or further spread, and make recommendations to prohibit the sale of invaders in Colorado.	CPW	CPW	AG, CDA	For Consideration	One Time

CO ANS Management Plan Implementation Table							
Strategy	**Action**	**Action**	**Funding Source**	**Lead Organization**	**Cooperating Organizations**	**Status**	**Frequency**
	2D2	**2D2** - Develop an agreement between CPW and CDA to implement prevention, management, education and enforcement in a uniform manner with clear roles, responsibilities and open lines of communication related to aquatic invasive plants.	CPW	CPW	AG, CDA	For Consideration	One Time
	2D3	**2D3 -** Pursue statutory authority, if needed, to fill gaps and increase violations for the sale of invasive organisms in trade.	CPW	CPW	AG, CDA	For Consideration	One Time
2E	**Develop a statewide collaborative strategy with dedicated resources to address illicit fish stocking.**						
	2E1 -	**2E1** - Develop a statewide collaborative strategy to address illegal fish introductions and limit future illicit stocking of non-native fish, considering reclamation of waters whenever possible.	CPW	CPW	CANSTF	For Consideration	One Time
	2E3 -	**2E2** - Increase fines and enforcement for illegal fish stocking.	CPW	CPW	Law Enforcement Partner Agencies	For Consideration	Ongoing
	2E4 -	**2E3** - Provide incentives for reporting illegal stocking (similar to poaching) and utilize operation game thief for confidential reporting.	CPW	CPW	Various	Existing	Ongoing
2F	**Increase opportunities for anglers to clean their waders, boots, and gear to prevent the spread of New Zealand mudsnails and other ANS**						
	2F1	**2F1** - Develop partnerships with local businesses in popular fishing locations and provide wader or boot cleaning stations for use.	CPW	CPW	Industry, BLM	For Consideration	One Time
	2F2	**2F2** - Provide wader or boot cleaning stations for use at State Parks, State Wildlife Areas or CPW offices frequented by anglers.	CPW	CPW	BLM	For Consideration	One Time
	2F3	**2F3** - Provide instruction for anglers to clean gear and achieve behavior change.	CPW	CPW	CANSTF	For Consideration	Ongoing
	2F4	**2F4** - Develop metrics to evaluate the effectiveness of wader or boot cleaning stations.	CPW	CPW	CANSTF	For Consideration	Ongoing
Objective 3 - Improve the capacity to implement rapid response for new ANS.							
3A	**Ensure capacity to implement the rapid response plan upon detection of ANS**						
	3A1	**3A1** - Maintain a CPW Rapid Response Fund for ANS that can be utilized quickly to initiate action upon the verified detection of ANS.	CPW	CPW	CANSTF	For Consideration	Ongoing
	3A2	**3A2** - Establish proper species-specific containment, control and/or eradication techniques to be implemented for primary species of concern upon early detection, regardless of ownership, to prevent the spread of ANS within the species specific management plan (if available). Consider NEPA and ESA in relation to treating newly discovered infestations quickly.	CPW	CPW	CANSTF	For Consideration	Ongoing
3B	**Implement agency directives and policy related to Invasive Species.**						
	3B1	**3B1** - Implement the CPW Administrative Directive OG-7 titled Invasive Species Notification approved October 17, 2019.	CPW	CPW	PWC, FHB, CANSTF	Existing	Ongoing

CO ANS Management Plan Implementation Table							
Strategy	**Action**	**Action**	**Funding Source**	**Lead Organization**	**Cooperating Organizations**	**Status**	**Frequency**
	3B2	**3B2** - Implement the CPW Administrative Directive OG-6 titled Invasive Species and Native Pests approved October 17, 2019.	CPW	CPW	PWC, FHB, CANSTF	Existing	Ongoing
	3B3	**3B3** - Gain appproval and implement the Parks and Wildlife Commission Policy titled Invasive Species and Native Pests.	CPW	CPW	PWC, FHB, CANSTF	Existing	Ongoing
Objective 4 – Survey and monitor waters of the state for ANS.							
4A	**Maintain or increase existing field sampling and monitoring efforts for early detection, population monitoring, and baseline data collection of mollusks, crustaceans and macrophytes.**						
	4A1	**4A1** - Communicate with entities within Colorado, western states, and WRP members to consistently define, list and de-list waters according to regional standards.	CPW	WRP, WISCE	CANSTF, BOR, USGS, ACOE, NAISMA, WRP, WISCE, Industry	Existing	Ongoing
	4C2	**4A2** - Adapt and improve field sampling and monitoring protocols and procedures as science evolves and effective new tools are made available.	CPW	CPW	CANSTF, BOR, USGS, ACOE, NAISMA, WRP, WISCE, Industry	Existing	Ongoing
4B	**Maintain the Colorado ANS Sampling and Monitoring Data Management System through allocation of IT time, support, and expertise**						
	4B1	**4B1** - Develop new monitoring reports and improve upon the existing features in the database.	CPW	OIT	OIT	For Consideration	One Time
4C	**Provide for standardized laboratory testing protocols between CPW and their partners to ensure reliable test results and consistent interpretation of those results and corresponding management actions.**						
	4C1	**4C1** - Communicate with entities within Colorado, western states and WRP members to consistently implement reginal lab standards.	CPW	WRP	CANSTF, BOR, USGS, ACOE, NAISMA, WRP, WISCE, Industry	Existing	Ongoing
	4C2	**4C23** - Adapt and improve laboratory protocols and procedures as science evolves and effective new tools are made available.	CPW	CPW	CANSTF, BOR, USGS, ACOE, NAISMA, WRP, WISCE, Industry	Existing	Ongoing
Objective 5 – Evaluate and improve upon the current statewide informational and educational invasive species campaigns.							
5A	**Evaluate past educational efforts, in conjunction with western states, to determine if they are effective for achieving public awareness and behavior change (e.g. clean, drain, dry).**						
	5A1	**5A1** - Contribute to regional or national analysis and evaluation of existing campaigns to determine effectiveness for behavior change	USFWS	ANSTF	ANSTF, WISCE, WRP, NAISMA	For Consideration	One Time
	5A2	**5A2** - Suvey boaters, anglers, campers and other recreational user groups to determine the awareness and voluntary compliance of users.	CPW	CPW	ANSTF, WISCE, WRP, NAISMA	For Consideration	One Time
5B	**Expand current invasive species informational and educational efforts.**						
	5B1	**5B1** - Make educational materials available to the public through multi-media outlets such as newspapers, internet, television and radio; water districts and utility companies; and specialty retailers.	CPW	CPW	CANSTF	For Consideration	Ongoing
	5B2	**5B2** - Develop and implement a comprehensive statewide educational program focusing on organisms in trade.	CPW	CPW	ISAN, WRP, PIJAC, ANSTF, CDA, WISCE	For Consideration	Ongoing

CO ANS Management Plan Implementation Table							
Strategy	**Action**	**Action**	**Funding Source**	**Lead Organization**	**Cooperating Organizations**	**Status**	**Frequency**
	5B3	**5B3** - Evaluate K-12 education criteria and coordinate with local organizations for opportunities to integrate ANS information, and develop new curricula as necessary.	CPW	CPW	Butterfly Pavilion, Jefferson County, Sea Grant	For Consideration	Ongoing
	5B4	**5B4** - Train speakers to give presentations on ANS issues at schools and public forums.	CPW	CPW	ISAN	For Consideration	Ongoing
	5B5	**5B5** - Develop ANS resource packets for distribution when presenting to different groups.	CPW	CPW	ISAN, CANSTF	For Consideration	Ongoing
5C	**Coordinate educational efforts with western region states**						
	5C1	**5C1** - Continue the use of National and Regional campaigns including, but not limited to: Clean, Drain, Dry, Don't Move a Mussel, Stop Aquatic Hitchhikers, Don't Let it Loose, Habitattitude, Play Clean Go, and others.	CPW	CPW	WRP, WISCE, ANSTF, NAISMA	Existing	Ongoing
	5C2	**5C2** - Use standardized messaging for specific user group education such as "clean, drain, dry" for boaters.	CPW	CPW	WRP, WISCE, ANSTF, NAISMA, CANSTF	Existing	Ongoing
	5C3	**5C3** - Implement national voluntary recretion guidelines for unregulated user groups.	CPW	CPW	WRP, WISCE, ANSTF, CANSTF	Existing	Ongoing
Objective 6 – Identify and support invasive species research including surveying, monitoring, control, eradication, and education.							
6A	**Collaborate with scientific researchers and other organizations to study biology, impacts, and control methods.**						
	6A1	**6A1** - Place a high priority on invasive species related research within CPW.	CPW	CPW	Universities and research organizations	For Consideration	Ongoing
	6A2	**6A2** - Engage other governmental agencies, water users, educational institutions, private industry, and non-governmental organizations to conduct or support applied invasive species research.	CPW	CPW	Universities and research organizations	For Consideration	Ongoing
	6A3	**6A3** - Consider conducting research to determine how ANS in Colorado will be impacted with relation to the changing climate.	CPW	CPW	Universities and research organizations	For Consideration	One Time


Avery Lake



State of Colorado

INSPECTION AND DECONTAMINATION SEAL RECEIPT

For use when applying green seals to boats at Negative Prevention locations.
Provide original to watercraft owner (white) and keep carbon copy (yellow).

WID Location: Mc Phee
Date: 7/17/20 Time: 10:30am
Inspector's ID #: 1147 Boat Type:
Vessel Registration (CL #): CL 2876 LU
Trailer Plate #: 122-ANS Seal Serial #: 6325173

PROCEDURES PERFORMED (Every line must be checked to be valid)

Exit (HEAD) Inspection:	☒ Performed	or	☐ Not Performed
Standing Water Decontamination:	☒ Performed	or	☐ Not Performed
Full Decontamination:	☐ Performed	or	☒ Not Performed
Plant Decontamination:	☐ Performed	or	☒ Not Performed
Bait Decontamination:	☐ Performed	or	☒ Not Performed

HOW TO TREAT A BOAT WITH A GREEN SEAL

Always ask about live aquatic bait and follow bait protocol. Cut off seal and let boat launch if one of the following are true:

1.) Boat is returning to the same location; or
2.) Boat has been decontaminated; or
3.) Boat is clean and fully drained.

If not, perform an inspection prior to launch.

NOTES: Ballast tanks only

CLEAN, DRAINED, AND DRY BOATS GET ON THE WATER FAST!

Distribution: White—Owner/Operator Yellow—Inspection Location

1 - 2/2020 - 150,000 RW1-28/21520-20

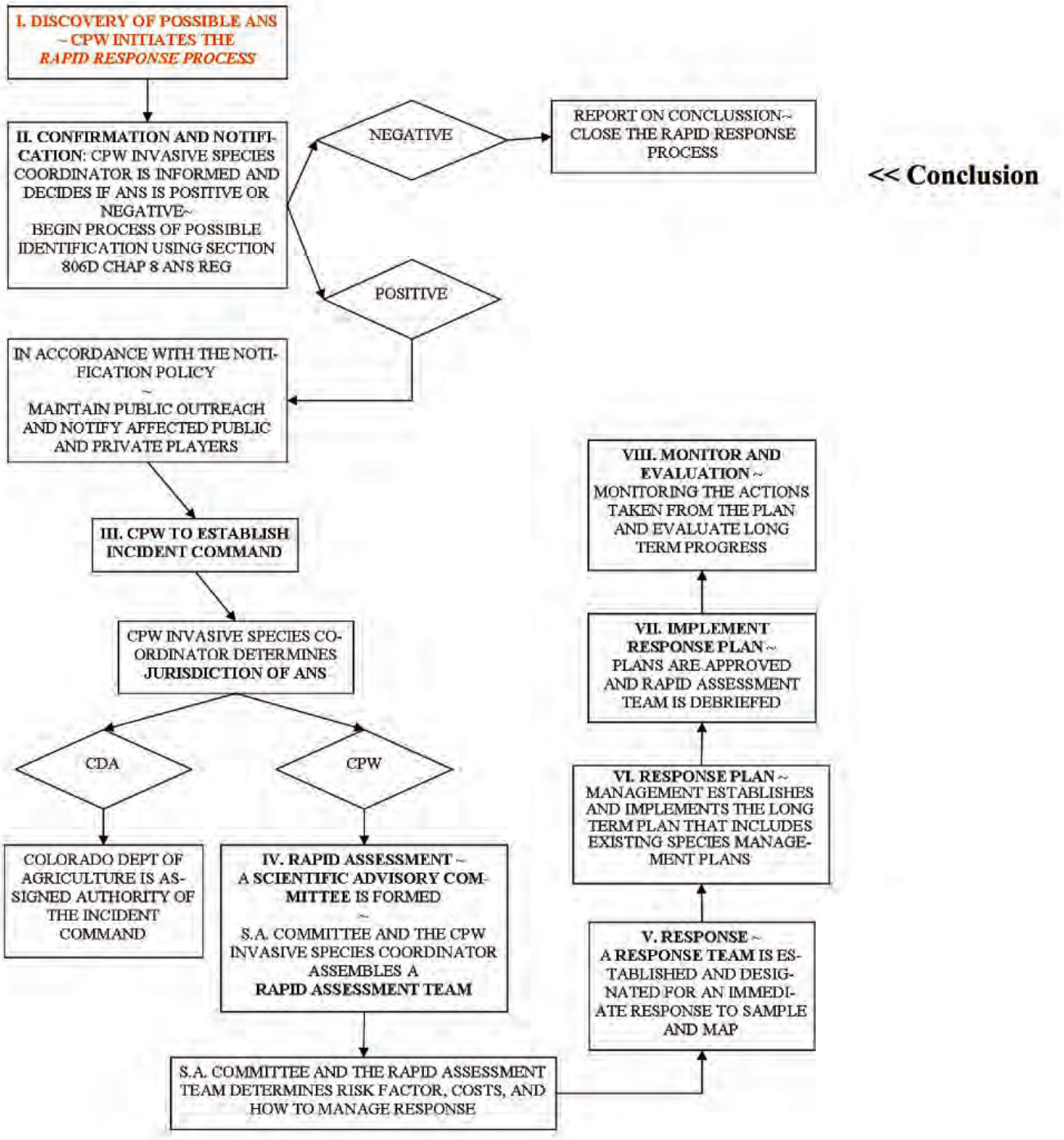
© PHOTO BY ELIZABETH BROWN

© PHOTO BY ROBERT WALTERS

Rapid Response Strategy

The following procedure outlines the protocol that should be adhered to by CPW staff in the event that an aquatic nuisance species listed in Parks Chapter 8 ANS Regulations is found in Colorado, triggering notification and potentially a rapid response process. The general process is charted in the figure below.

Figure 14: Rapid Response Strategy Protocol



I. Incident

The discovery of a possible ANS in the State of Colorado initiates the Rapid Response Process. This process must adhere to CPW Administrative Directive OG-7 titled Invasive Species Notification approved October 17, 2019.

II. Confirmation and Notification: ANS are Reported or Detected in Colorado

In the event that CPW staff, a member of the public, a partner agency or other entity finds a suspect or known ANS of plant, fish, or animal origin in Colorado, the following procedures must be adhered to for positive identification.

Upon the initial detection or suspicion of a newly discovered invasive species population, the CPW Invasive Species Program Manager must be informed in order to begin the process of positive identification and to activate the Invasive Species Notification Directive.

Subsequently, as per section #806D of the Parks Chapter 8 ANS Regulations, the following criteria must be met to positively confirm an invasive species.

Zebra and quagga mussel veligers—
A multi-phase testing process involving both visual and molecular identification methods on the same sample will be completed in accordance with the *State ANS Sampling and Monitoring Manual* available from CPW.

Colorado requires a positive microscopy, positive PCR and positive gene sequencing on the same sample to declare a water body positive for mussels. If only one test is positive, then the water body is declared suspect per WRP standards

Zebra and quagga mussel adults or New Zealand mudsnails—
Concurring identification by two or more taxonomic experts. DNA analysis may be performed.

Crayfish and other Crustaceans—
Concurring identification by two or more taxonomic identification experts.

Aquatic Invasive Plants —
Concurring identification by two or more aquatic botanical taxonomic experts. DNA analysis may also be performed.

After positive identification of an ANS, notification is given to the proper agencies and landowners as well as the public, in accordance with the Invasive Species Notification Directive. Public outreach should be maintained during the process to keep citizens informed of possible control methods to garner their support and cooperation. In some cases, success of rapid response control, containment or management processes depend upon public support. Existing outreach materials may be used in addition to any specific materials that may be added during the response planning process.

III. Establish Incident Command

It is important to establish command for a response process to clearly define roles and expectations. Given the multijurisdictional nature of many water bodies, it is important to have one leader whether it is one individual or a unified command.

CPW is the lead agency in the state for all ANS, invasive terrestrial animals, and pathogens, in addition to terrestrial weeds or forest pests located on CPW managed properties. The CDA has the authority and will be the lead agency for all other terrestrial weeds throughout the state along with the County. Incident command for rapid response protocols under the authority of CPW will become the responsibility of the Director or their designee. Incident command for terrestrial weeds or pests, not located on CPW lands, will be the responsibility of the CDA. CPW and CDA will coordinate closely on such matters regardless of jurisdiction and incident command.

Whirling Disease (WD)

PHOTO BY ERIC FETHERMAN

IV. Rapid Assessment

Following confirmation and notification of a newly discovered ANS, established species plans and procedures will be reviewed, as the ANS Program will lead notification and response coordination should management be warranted.

If it is a species new to the state, a team may gather or form in order to provide expertise on the ANS discovered and location, and determine future management actions if any are available to them. These individuals should be comprised of the ownership and management agencies, state experts, local agencies, academia, and the private sector.

The site team typically consists of CPW Program, Park or Wildlife Managers and Technicians, land managers, water owners, counties, and others that have responsibility or impacts from ANS invasions to evaluate the following considerations before proceeding with a response. This site team will be important for recommending the best management practices available for the species. Through this collaborative process, the site team will determine if the species has a low, medium, high risk or unknown level of risk for invasion by considering the following:

- Is it a primary priority species for response?
- Is there an existing management plan?
- Are treatment methods available?
- Are there regulatory obstacles that may hinder response?
- How quickly can the response be made?
- Is the invasion small and localized or widespread?
- Can the state afford to, or not to, respond?
- Who is skilled to perform the response treatment and are they available?
- What is the method of introduction at this new location and how can the further spread be stopped through pathway management within the state?

V. Response

After evaluating the above criteria and the recommendations from the site team, the collaborative will need to decide which response is necessary, if any. The site team can then develop objectives, establish incident command, and provide a briefing for the general staff.

A Response Team may be established and designated solely for the response effort. Decisions for rapid response actions should be based on strong, documented evidence. In the event that a new species or population is discovered, the CPW sampling crew would be immediately dispatched to the site in to sample and map the extent of the newly discovered population.

The CPW ANS staff is trained in sampling and monitoring techniques. It may be necessary to train them in eradication and control techniques for some species. However, there may be some instances where internal staffing resources or training may not be adequate. A private contractor with more expertise, Aquatic Biologists, County Weed Supervisors, or members of the CPW field operations branch may be the better option for implementing field treatment or control measures depending on the situation.

VI. Plan

In most cases, an existing species or site management plan already exists and should be used to guide communications, management and response.

If a plan does not already exist, one should be developed that includes:

- background and current status
- recommended actions
- measurable and flexible objectives
- current resources
- required resources

Objectives should be prioritized including:

- ecological health
- human health
- economic value
- change/rate of spread

Constraints need to be identified including:

- jurisdiction
- legislative authority
- regulatory compliance
- permitting
- funding
- control options
- personnel
- expertise
- access and ownership
- gaps in species biology
- ecological uncertainties

After the confirmation of the ANS, distribution and data acquisition, the team will be responsible for developing tactics for the response and begin planning the logistics. Measurable and flexible objectives should be developed. There are existing statewide high-priority species management plans that should be used for those species (ZQM, NZMS, Rusty crayfish, or EWM).

In the event that the species in question does not have a management plan, then a plan should be developed and containment should occur based on the best available data including but not limited to: eradication, quarantine, closure, restricted access, or mandatory inspection/equipment decontamination.

VII. Implement, Monitor, Evaluation

Implement

The plans should be implemented upon development.

Monitor

The Invasive Species Program should monitor the progress of the response to document changes so that results can be evaluated and management continued or changed as necessary. CPW sampling crews should monitor the ANS population.

Evaluation

Evaluation by the Invasive Species Program and the team of any rapid response actions taken will be reviewed to determine if the response was appropriate and achieved the desired results. In most cases, a long-term monitoring plan should be initiated to track progress and changes over time, such as the rate of spread, species composition, and change in endemic species. The objectives identified by the site team will help serve as measures of success. If no action was taken, environmental and economic impacts from the ANS in question will be evaluated to determine if response was appropriate and cost effective.

Gaps and Challenges

There are gaps and challenges that exist in the management of ANS. In some cases, there are practical steps that may be taken to address specific issues, but in others there are significant hurdles to overcome in order to address specific issues. The following gaps and challenges to managing ANS in Colorado have been identified. These gaps and challenges are by no means exhaustive and are not presented in any particular order of priority.

- CPW operates with a large variety of grants and donations each year. It would be most efficient to have longer term agreements in place with federal partners and donors for ongoing annual program operations (e.g. inspection staff at federal impoundments).
- The amount of infested watercraft being intercepted each year continues to rise as more states surrounding Colorado become more infested. It is in Colorado's best interest to support the development of new WID programs for prevention and containment in neighboring states, as well as bolstering existing containment programs in the West.
- New Zealand mudsnails continue to be found in new locations annually. The majority of locations are areas with clear angler access. While CPW has provided education to anglers specific to ANS and cleaning recommendations to stop the spread through voluntary compliance since 2004, it does not appear to have achieved the desired behavior change, as NZMS continue to spread to new locations focused on angler access points. Anglers need to be cleaning their gear and CPW may provide more opportunities for compliance.
- Eurasian watermilfoil continues to be found in new waters annually. There should be dedicated funding and coordination to implementing watershed based Cooperative Weed Management Areas to address this species at the population level versus the site level.
- There are overlapping and conflicting state authorities to manage aquatic invasive plants. In areas where specific invasive species exist, such as Eurasian watermilfoil, there can be conflict in which managing entity is most appropriate for monitoring, control or simply taking management action.

- Organisms in trade pose a huge threat to Colorado and are not being addressed. There are prohibited ANS being sold in Colorado due to conflicting authorities and a lack of capacity to perform inspections and enforcement in nurseries, bait stores, and pet stores.
- The sampling and monitoring program has been reduced over time and largely consists of monitoring for zebra or quagga mussels in large public waters with motorized boating. The capacity to survey smaller water bodies, and flowing waters such as rivers and streams, no longer exist. CPW also no longer performs monitoring for aquatic invasive plants, vertebrates and invertebrates, and also stopped performing population monitoring for existing infestations. Capacity should be restored so the sampling program can operate at full function. A dedicated permanent employee is recommended to manage the ANS Laboratory and field sampling operations.
- Climate change has been identified as highly influential to the water resources of Colorado. What is not clear at this time is the potential synergistic effects that can be anticipated with climate change and invasive species affecting waters. Working to anticipate possible climate change scenarios and impacts from invasive species will be important for future management of water and invasive species.

Climate Change and Invasive Species

Assessing the impacts that climate change will have on ANS in Colorado is difficult because there is little research on it thus far. The pathways of ANS introduction that could be altered because of climate change include warmer water temperatures, altered flow regimes, reduced ice cover, a change in thermal regimes, and increased water development activities. Because most aquatic species are ectothermic, their food consumption rate increases with water temperature until thermally stressful conditions are reached. Thus, climate warming could magnify the impacts of non-native predators on native prey species (Rahel, 2008). The magnitude, frequency, duration, and timing of floods, droughts, and intermittent flows (i.e., the flow regime) are primary drivers of ecological structure and function in aquatic ecosystems (Poff et al. 1997). There is a general consensus that climate change will modify patterns of precipitation, evapotranspiration, and runoff (Frederick and Gleick, 1999). Although the geography of these changes is uncertain, altered patterns of runoff will fundamentally modify many aquatic ecosystems (Poff et al. 2002).

Climate change will reduce the extent of ice cover on lakes in the northern hemisphere (Magnuson et al. 2000), which may influence the invasion process by increasing light levels for aquatic plants, reducing the occurrence of low oxygen conditions in winter, and exposing aquatic organisms to longer periods of predation from terrestrial predators (Rahel, 2008). As the climate warms, the geographic areas with suitable temperatures for warm water aquaculture, tropical fish culture, and outdoor water gardens will expand. For example, the aquaculture of other warm water species such as tilapia (Cichlidae) and some crayfishes would likely expand to areas currently too cold for outdoor propagation (Lodge et al. 2000; Peterson et al. 2005). Finally, the impacts of climate change could possibly increase water development activates such as re- building or maintaining dams and reservoirs in order to capture more water for human usage.

With a changing climate Colorado is experiencing lower snow pack, increased amount of wildfires, and an increase in population and water demand. Over the past 50 years, snow has been melting earlier in the year, and more late-winter precipitation has been falling as rain instead of snow. Thus, water drains from the mountains earlier in the year. In many cases, dams capture the meltwater and retain it for use later in the year. Nevertheless, upstream of these dams, less water is available during droughts for ecosystems, fish, water-based recreation, and landowners who draw water directly from a flowing river (EPA, 2016).

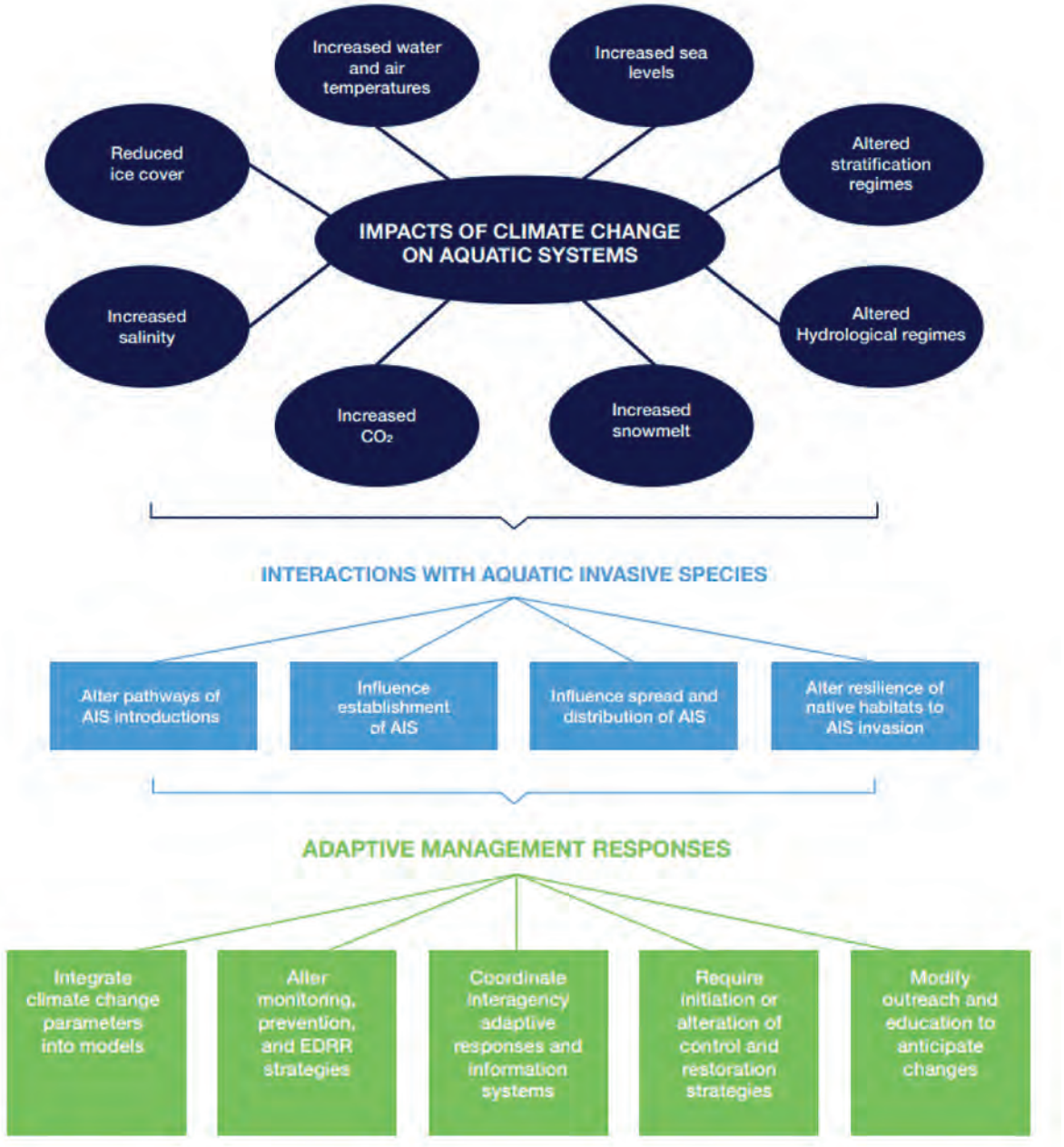
Changes in temperature and precipitation are affecting Colorado's snowpack and the amount of snow that accumulates on the ground. In most of the West, snowpack has decreased since the 1950s,

due to earlier melting and less precipitation falling as snow. The amount of snowpack measured in April of 2016 has declined by 20 to 60 percent at most monitoring sites in Colorado (EPA, 2016). Throughout the West, much of the water needed for agriculture, public supplies, and other uses comes from mountain snowpack, which melts in spring and summer, runs off into rivers, and fills reservoirs. Higher temperatures and drought are likely to increase the severity, frequency, and extent of wildfires in Colorado, which could harm property, livelihoods, and human health (EPA, 2016).

Finally, Colorado is one of the fastest growing states in the U.S. Colorado's estimated population is 5.68 million (*World Population Review, 2018*). Like most states across the US, the population of Colorado is growing, but the growth has been significant in past years. Increases between censuses of 30% are not uncommon, and if that trend continues, the numbers could comfortably exceed 6 million at the next census in 2020. Some estimates have placed the 2040 population as high as 7.8 million (*World Population Review, 2018*). This growth could put a strain on our water resources and set an increase on our water demand.

Figure 15: Model Showing Impacts of Climate Change on Invasive Species.

Adapted from U.S. Environmental Protection Agency, 2008.



Plan Review

The evaluation process of the Plan will provide a means of monitoring progress toward the achievement of the Plan goals, evaluating needs and problems, coordinating and standardizing efforts, and pursuing the goal of prevention and management of introductions, population growth, and dispersal of ANS into, within, and from Colorado.

Mid-course corrections will be made when, and if necessary, through recommendations made by the CPW Invasive Species Program. The process involves three main components: oversight, evaluation, and reporting. One of the roles should be to examine progress on management actions focused on the goal of the Plan. The Program may evaluate the success of each strategy by examining the level of achievement of the tasks clearly defined within each action.

The evaluation effort should not only examine progress, but also place special emphasis on funding and staffing needs to successfully accomplish the goals and associated tasks. This information will prove useful for future program planning purposes. While successful completion of all the objectives and tasks of the Plan will ultimately spell the success of the program, special emphasis during the monitoring and evaluation process will be placed on.

- Increased capacity that includes human and fiscal resources for program operations.
- Legislative statutory and regulatory guidance, authority, and support.
- Long term permanent funding that can be leveraged to supplement state program budgets through donations, grants, contracts, cost-share agreements, intergovernmental agreements, memorandums of understanding, and other partner agreements.
- Continued coordinated involvement and contributions by federal, state, local government partners and non-governmental entities.
- Continued and increased participation and contributions from private industry partners, (e.g., Colorado Marine Dealers' Association, marinas, concessionaires, aquaculture facilities, etc.).
- Management of established ANS (e.g. rate of spread, change in species composition, etc.).
- Continued and expanded ANS sampling and monitoring.
- Implementation of species management plans for ANS Species of Concern.
- Improved public awareness and behavior change as a result of education efforts.
- Improvement of statutory and regulatory consistency between CPW and CDA.
- Passage of legislation and regulations to support the Plan, as needed.

The State Invasive Species Program Manager at CPW will present a progress report to the CANS Task Force highlighting the program activities regarding ANS at the annual meeting each year. This presentation will include information on the success in achieving the goals and objectives outlined in respective sections above.

In addition, an annual report is required by the ANS Act and is provided to the State Legislature by January 15th each year. This report is distributed statewide and regionally to CPW staff and partners and provides detailed updates on the progress made by Colorado's ANS Program.

Conclusion

Going forward, the constant evolution of Colorado's ANS management plan will be essential in allowing the State and its partners to use the plan as a guidance tool for managing ANS issues. Management adaptations caused by greater understanding of species, fluctuating political climate, improved practices, and shifting climate are ultimately anticipated.

As a headwater state, the protection of Colorado's resources is beneficial for all downstream entities, and therefore providing leadership at the regional and national level must also remain a priority. As complex and interdisciplinary as natural resources management issues are, unwavering support and expansion of collaborative efforts are vital to protecting Colorado's tremendously important resources for future generations.

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Glossary

Accidental introduction—In aquatic systems, an accidental introduction of non-indigenous aquatic species that occurs as a result of activities other than the purposeful or intentional introduction of the species involved, such as the transport of non-indigenous species in ballast water or in water used to transport fish, mollusks, or crustaceans for aquaculture or other purposes.

Note: *Accidental introduction is the same as Unintentional Introduction.*

Aquatic nuisance species—Exotic or nonnative aquatic wildlife or any plant species that have been determined by the Parks and Wildlife Commission to pose a significant threat to the aquatic resources or water infrastructure of the state (Colorado ANS Act SB08-226)

Baitfish—Live aquatic wildlife for use as bait (CPW ANS Regulations)
Live fish or viable gametes

Ballast tank—A compartment within a boat, ship, or other floating structure that holds water. Adding ballast to a vessel lowers its center of gravity, and increases the draft of a vessel.

Control—Eradicating, suppressing, reducing, or managing invasive species populations, preventing spread of nuisance species from areas where they are present, and taking steps such as restoration of native species and habitats to reduce the effects of nuisance species and to prevent further invasions.

Decontamination—The use of hot water with high or low pressure to kill and remove ANS from boats, motors/engines, trailers, personal gear, and other equipment.

Ecological integrity—The extent to which an ecosystem has been altered by human behavior; an ecosystem with minimal impact from human activity has a high level of integrity; an ecosystem that has been substantially altered by human activity has a low level of integrity.

Ecosystem—The biological organisms in an ecological community and the non–living factors of the environment.

Environmentally sound—Methods, efforts, actions, or programs to prevent introductions or to control infestations of ANS that minimize adverse environmental impacts.

Eradicate—The act or process of permanently eliminating an invasive species in state waterbodies or infested areas

Established—An introduced organism with a permanent population(s) and rapid reproduction, i.e., one unlikely to be eliminated by man or natural causes (Shafland and Lewis 1984).

Exotic—(Same as non-indigenous) any species that enters an ecosystem beyond its historic range, including such organisms transferred from one country to another.

Indigenous—Occurring or found naturally in a particular area or ecosystem; historically occurring in geographic range previous to the arrival of the first European settlers; a species that is a member of the native natural community

Intentional introduction—All or part of the process by which a non-indigenous species is purposefully introduced into a new area.

Introduced—A plant or animal moved from one place to another by humans (i.e., an individual, group, or population of organisms that occur in a particular locale due to human actions).

Invasive—EO 13112 defines an "invasive species" as a species that is: non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Localized—A confined, reproducing population of an introduced organism that can be eliminated using standard methods (Shafland and Lewis 1984).

Native—A plant or animal species that naturally occurs in Colorado and has not been introduced from another state or continent.

Negative water—Any water body that is sampled where ANS is not known to occur.

Glossary (continued)

Non-indigenous species—Any species or other variable biological material that enters an ecosystem beyond its historic range, including such organisms transferred from one country to another.

Non-target—Plant or animal species not intended to be harmed by a control method.

Nonnative—Any species introduced into an ecosystem outside its native range.

Pathogen—A microbe or other organism that causes disease.

Population—A group of individual plant or animal species occupying a particular area at the same time.

Positive water—Any water body where an ANS presence has been confirmed.

Priority species—An ANS that is considered a significant threat to Colorado waters and is recommended for immediate or continued management action to minimize or eliminate their impact.

Reported—An introduced organism collected without evidence of reproduction. (Shafland and Lewis 1984).

Unintentional introduction—An introduction of non-indigenous aquatic species that occurs as the result of activities other than the purposeful or intentional introduction of the species involved, such as the transport of non-indigenous species in ballast or in water used to transport fish, mollusks or crustaceans for aquaculture or other purposes.

Note: *Unintentional introduction is the same as accidental introduction.*

Watershed—An entire drainage basin including all living and non-living components.

Appendix

Appendix A—Acknowledgments

Thank you to the following individuals, past and present, who contributed to the development and completion of the Plan. Listed in alphabetical order.

Colorado Parks and Wildlife Invasive Species Program Staff

- Elizabeth Brown, former Invasive Species Program Manager
- Brad Clements, Aquatic Nuisance Species and Watercraft Inspection and Decontamination Specialist
- Courtney Cooper, former Invasive Species Technician
- Jim Greffly, Aquatic Nuisance Species and Watercraft Inspection and Decontamination Specialist
- Melissa Petty, former Invasive Species Technician
- Erin Raney, former Invasive Species Technician
- Holly Straley, former Invasive Species Technician
- Jaclyn Taylor, former Administrative Assistant
- Robert Walters, Invasive Species Specialist

Colorado Aquatic Nuisance Species Task Force Members

- Ken Brink, Larimer County
- Bill Brueggeman, Currecanti National Recreation Area
- Greg Brujak, Retired: Mount Massive Lakes, Lake County Weed Board, and Fish Health Board
- Kelly Cline, City of Westminster
- Myron Chase, U.S. National Park Service (retired)
- Stacey Cole, City of Boulder
- Mark Coughlin, Larimer County
- Ken Curtis, Dolores Water Conservancy District
- Wayne East, Colorado Department of Agriculture
- Kellen Friedlander, Great Lakes Marine and Colorado Marine Dealers Association
- Joanne Grady, U.S. Fish and Wildlife Service
- Curtis Hartenstine, Northern Colorado Water Conservancy District

- Denise Hosler, U.S. Bureau of Reclamation (retired)
- Eric Howell, Colorado Springs Utilities
- Bill Janowsky, U.S. Forest Service
- Rick Kienitz, City of Aurora
- Scott Leach, formerly with Colorado Department of Agriculture
- April Long, Ruedi Water and Power Association
- Dave Nickum, Trout Unlimited
- Chris Pague, The Nature Conservancy
- Ed Perko, Pueblo Board of Water Works
- Michael Porter, U.S. Army Corps of Engineers
- Tina Proctor, U.S. Fish and Wildlife Service (retired)
- Brandon Ransom, Denver Water
- Traci Robb, U.S. Bureau of Reclamation Great Plains Region
- Steve Ryder, Colorado Department of Agriculture
- Ethan Scott, U.S. Bureau of Reclamation Upper Colorado Region
- Gene Seagle, U.S. National Park Service
- Amy Schwarzbach, City of Durango
- Sarah Spaulding, U.S. Environmental Protection Agency
- Chris Theel, Colorado Department of Public Health and the Environment
- Chris Treese, Colorado River Water Conservancy District
- Jay Thompson, U.S. Bureau of Land Management
- Jolene Trujillo, U.S. Bureau of Reclamation
- Holly Walters, City of Westminster
- John Wullschlegger, National Park Service
- Patty York, Colorado Department of Agriculture

Colorado Department of Natural Resources

- Dan Gibbs, Executive Director
- Tim Mauck, Deputy Director
- Douglas Vilsack, Assistant Director for Parks, Wildlife, and Lands

Colorado Parks and Wildlife Leadership Team

- Dan Prenzlow, Director
- Reid DeWalt, Assistant Director for Natural Resources
- Heather Dugan, Assistant Director for Law Enforcement and Public Safety
- Lauren Truitt, Assistant Director for Information and Education
- Justin Rutter, Assistant Director for Financial Services
- Jeff VerSteeg, Assistant Director for Research, Policy and Planning
- Brett Ackermann, SE Region Manager
- Cory Chick, SW Region Manager
- Mark Leslie, NE Region Manager
- JT Romatzke, NW Region Manager

Colorado Parks and Wildlife Senior Aquatic Staff

- Ken John Alves, SW Senior Aquatic Biologist
- Harry Crockett, Native Aquatic Species Coordinator
- Greg Gerlich, former Aquatic Section Manager
- April Kraft, Aquatic Animal Health Lab Manager
- Doug Krieger, Aquatic Section Manager (retired)
- Lori Martin, NW Senior Aquatic Biologist
- Vicki Milano, State Fish Pathologist (retired)
- William Morris, Hatchery Chief
- Josh Nehring, SE Senior Aquatic Biologist
- Matt Nicholl, Aquatic Section Manager
- George Schisler, Aquatic Research Chief
- Jeff Spohn, NE Senior Aquatic Biologist
- Pete Walker, State Fish Pathologist (retired)

Appendix B—Preliminary Comments from the ANSTF

Preliminary Comments from Members of the Aquatic Nuisance Species Task Force on the Draft State of Colorado ANS Management Plan, and the Colorado Parks and Wildlife State ANS Management Plan Invasive Species Rapid Response Plan:

From Susan Pasko, NOAA Office of Sustainable Fisheries, Chair of the ANSTF Research Committee

Thanks for the chance to review the Colorado State management plans. Overall, I found the plans to very well written and comprehensive. Just a few comments worth mentioning:

State Plan:

1. Someone will need to perform a through proofread of the final plan—there are a few incidents of grammatical errors/missing words.

   Response: *We have proofread the plan for grammatical errors/missing words.*

2. A statement regarding the priority order (or lack of) for the objectives may be needed. A common perception is that the first mentioned objectives are the highest priority, thus it may be questioned why prevention/research are near the end.

   Response: *The list of objectives has been reorganized and put into priority order.*

   Note: *After reorganizing the objectives so that they are listed in priority order the numbers that were previously assigned to those objectives and corresponding strategies and actions have changed.*

3. Problem 5B (Professionals introducing ANS through work activities). May want to include a Strategic Action to encourage use of HACCP and increase training opportunities.

   Response: *We have reorganized this section so that the Objectives are listed in priority order. Objective 5 in the previous draft has been moved and is now labeled as Objective 2 in the new draft. HACCP is listed as a strategic action in the 2nd Objective under Action 2C2*

   "Decontaminate CPW boats, waders and equipment between every launch according to the current Colorado ANS Watercraft Decontamination Manual and follow CPW equipment decontamination and/or HAACP guidelines."

   HACCP is also listed as a strategic action in Objective 2, Action 2C4

   "Follow HACCP plans and disinfection protocols, and encourage other state, federal and local governments and private industry professionals to do the same."

4. Priorities for Action—emphasizes the need for a white list, yet this recommendation is not included in the actions above. May go well under Objective 5.

   Response: *This section has been rewritten. CPW has revised there general provisions to chapter W-0 which got rid of the prohibited species list and replaced it with an allowable species list also referred to as a white list in the older draft of this document.*

5. The terms used pertaining the ANS watch list are not consistent. In text use "primary species," in table use "priority species."

   Response: *That typographical error has been corrected.*

Rapid Response Plan:

1. A flow chart diagramming the eight steps would be a valuable visual to include.

   Response: *A flow chart has been added to the rapid response plan.*

2. More detail is called for within the Incident Command section. For example, a description of the roles of the lead, additional roles necessary to carry out the response, and potential entities that may be used to carry out these roles.

   Response: *Additional details are included in this section.*

3. Suggest placing Rapid Assessment before Incident Command section. The decisions and recommendations from the Science Advisory Committee will determine the type of response necessary which may determine which agencies should lead the effort.

   Response: *We have reorganized this section of the document.*

From Kim Bogenschutz, Iowa Department of Natural Resources, ANSTF Representative for the Association of Fish and Wildlife Agencies


Inspection


Decontamination

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The plan really does seem like a draft to me as it appears to be missing some important contents as suggested in the checklist. Following are my brief comments:

Executive summary—It doesn't seem like a good, quick summary of the plan to me. It should contain more specific information about the plan rather than general intro material. Suggested content that is not included is

1. summary of each management plan section and major recommendations,
2. background on ANS problems, authorities, current programs,
3. summary of implementation table (there is no implementation table),
4. summary of program monitoring and evaluation plans.

Response: *The executive summary was rewritten to more closely follow the ANSTF guideline document.*

Introduction—This section should include more details on specific ANS problems in Colorado and the geographic scope/map. I liked the program history section.

Response: *A geographic map was added to the Introduction.*

Problem definition and ranking—There are no species specifically identified in this section and thus no known/suspected ANS concerns and problems identified and ranked. It seems to miss the point of defining the problem.

Response: *More information has been added to the section. We have categorized our species of concern into 'Primary' and 'Secondary' species of concern, which include animals and plants. Problems are identified in this section such as major pathways of ANS introduction.*

Plan Goal—Plan objectives are not given in this section but are references and can be found later in the plan. I think that's OK.

Response: *Thank you for your comment.*

Existing authorities and programs—Good

Response: *Thank you for your comment.*

Objectives, strategic actions, and cost estimates—No cost estimates are given. I think that's OK as long as they are included in the Implementation Table, but there is no Implementation Table with cost estimate info either.

Response: *In the final draft we have included an implementation table.*

Priorities for Action; status of ANS in Colorado—The lists are good, but there may be too many priority species that may need their own prioritization if funding is not available to address them all. It is not indicated which priority species will be addressed initially.

Response: *This section was rewritten and does not include the primary/secondary species of concern lists. They are now located in the Problem Definition section of the document. The primary species of concern animal and plant lists are from Colorado Parks and Wildlife's Chapter 8 ANS regulations; these are cited and put into the references section.*

Implementation Table—None included. There will need to be one in the final plan.

Response: *An implementation table will be created and put into the final plan.*

Program monitoring, evaluation, and implementation—OK

Rapid Response Plan—OK

Definitions—Good

Literature Cited—OK

Appendices—It lists appendices that will be included, so hopefully they will be in the final plan.

Response: *Appendices will be included in the Final Draft.*

From John Wullschleger, National Park Service; Federal ANSTF Member

In general the plan is well written and thorough. However, there is a lack of attention to the illegal and intentional introduction of fish into waters where they do not occur or are prohibited, by anglers seeking to provide themselves with additional angling opportunities. This activity has been occurring with regularity in Colorado and other states in the region, resulting in costly and difficult control and eradication efforts. Outreach efforts, penalties and problem/action statements all need to be updated to address this issue.

> ***Response:*** *Objective/Strategies/Actions have been added to address the issue of illegal fish stocking in Colorado, Refer to* Objective 2—Prevent and contain introductions through managing human vectors, pathways of introduction, and spread.:
>
> > **Strategy 2E**—Develop a new statewide collaborative strategy with dedicated resources to address illicit fish stocking. (and corresponding Actions)
>
> *We currently do not have an active education campaign within Colorado's Invasive Species Program that includes information about preventing the illegal and intentional introduction of fish species into waters where they do not occur or are prohibited. In our objectives section we have included information on the evaluation of our informational and educational ANS campaigns. Refer to* Objective 5—Evaluate, improve and expand upon the current statewide informational and educational ANS campaigns.

Specific comments are listed below.

- Page vii, 3rd bullet: Some of this seems to be beyond the scope of an aquatic nuisance species plan—insects in firewood and maybe weed seeds on ATV wheels.
- Page 9, 3rd paragraph, last sentence: suggest replacing "regional waters" with "waters outside the state" or "waters in the region."
- Page 10, Ecological Impacts: The 2nd and 3rd bullets, loss of native species and loss of biodiversity seem very similar.
- Page 10, #5: This seems to be redundant with the 3rd bullet under #2.
- Page 11, first sentence: Suggest deleting the acronym ANS here since it doesn't add to the meaning. Suggest replace "upon its" with "their."
- Page 11, 3rd paragraph, 3rd and 4th sentences: Are the figures correct and are they supposed to be the same? If cost the power industry alone was $3.1 billion from '93–99, it seems unlikely that cost wouldn't be considerably higher to "industry" as a whole over the longer (10 year) period following 1999.
- Page 18: Assume the table is monitoring all species because of the placement of the table in the text but a header would make this clearer.
- Page 20, Aquatic Nuisance Animals: "economical" should be "economic."

  > ***Response:*** *In the revision of our document the page numbers no longer correspond with the pages listed in the above comments. All typographical errors and suggested changes have been made.*

- **Interpretation and Outreach, page 19–20**. To support the concept of Prevention being an important way to avoid further invasions of nonnative fish, as well as Quagga/Zebra/etc , this section needs to include information about preventing the illegal and intentional introduction of fish species into waters where they do not occur or are prohibited. The outreach should include information about heavy fines such are suggested in the section on regulations below, particularly CRS title 33….#012 (page 21).

  > ***Response:*** *The tile of this section was changed to from 'Interpretation and Outreach' to 'Information and Outreach'. We currently do not have an active education campaign within the Invasive Species Program that includes information about preventing the illegal and intentional introduction of fish species into waters where they do not occur or are prohibited. In our objectives section we have included information on the evaluation of our informational and educational ANS campaigns. Refer to* Objective 5—Evaluate, improve and expand upon the current statewide informational and educational ANS campaigns.

- CPW—Aquatic Health Regulations. The penalty for Intentional violation of these CPW regulations should be increased from $50 to a truly punitive amount and points off licenses increased or result in loss of license outright. Only heavy penalties will be effective in preventing illegal introductions of fish species.

CDOW Aquatic Health Regulations:

The penalty for violation of CDOW regulations is a $50.00 fine and 1 point off fishing licenses.

- **Possession of Aquatic Wildlife Regulation (CRS Title 33, Colorado Wildlife Regulations Chapter 0 General Provisions, Article VII, # 012)**

No live aquatic wildlife may be possessed except as authorized in regulations. CDOW has authority over all vertebrate, crustacean, and molluscan wildlife. Importation, transportation, possession, and release of species on a prohibited list can result in particularly heavy fines. This does not apply to possession for aquarium use.

- **Possession of Aquatic Wildlife Regulation (CRS Title 33, Colorado Wildlife Regulations Chapter 0 General Provisions, Article VII, # 013)**

The release (stocking) of aquatic wildlife is carefully described by statute. Only certain species of fishes can be stocked and only in certain defined areas. Release of all other aquatic wildlife including vertebrates, crustaceans, and mollusks must be accompanied by written permission from the Director of the CDOW.

Response: *We have added more to the Objectives section of the document, this includes increasing fines for illegal fish stocking in Colorado. The Objective section has been put into priority order; Objective 5 in the old draft is now Objective 2 in the final document (Prevent and contain introductions through managing human vectors, pathways of introduction, and spread). We have added*

Strategy 2E—Develop a new statewide collaborative strategy with dedicated resources to address illicit fish stocking.

Action 2E1—Develop a statewide collaborative strategy to address illegal fish introductions and limit future illicit stocking of non-native fish and consider the reclamation of waters whenever possible.

Action 2E2—Dedicate additional or new human and fiscal resources to coordinate implementation of the strategy identified in 2E1 once developed.

Action 2E3—Increase fines and enforcement for illegal fish stocking.

Action 2E4—Provide incentives for reporting illegal stocking (similar to poaching) and utilize operation game thief for confidential reporting.

Would be worth identifying federal or regional plans that apply within Colorado. For example the QZAP.

Response: *Thank you for your comment, additional information concerning regional involvement has been added to the document under the Existing Authorities and Programs Section.*

- Page 31, Objective 2: Suggest inserting the phrase "to the extent possible" between "agencies" and "by."

  Response: *This objective has been rewritten.*

- Page 32, Problem 4A: Identifies that tests are unreliable, but no specifics about types of tests. Subsequent actions and components don't address unreliable tests. Perhaps include further discussion that details things that can assist in making tests more reliable and data valid.

  Response: *In the final draft the page numbers no longer correspond with the previous draft of the plan that was reviewed by the ANSTF. This Objective has been reworded as well as corresponding strategies and actions. Refer to* Objective 4—Survey and monitor waters of the state for ANS.

- **Objectives,**
  - Page 33–35, Objective 5—Prevention through Managing Human Vectors of Introduction and Spread.: The list of Problems 5A through 5E does not explicitly include the potential vector of intentional illegal introductions of fish, or other ANS. A new Problem 5F should be added to address this lack, and new Strategic Actions be formulated to address the problem.

    Response: *Page numbers referred to in the comments no longer correspond with the Final Draft. The Objective section has been put into priority order; Objective 5 in the old draft is now Objective 2 in the final document (Prevent and contain introductions through managing human vectors, pathways of introduction, and spread). We have added*

    Strategy 2E—Develop a new statewide collaborative strategy with dedicated resources to address illicit fish stocking.

    Action 2E1—Develop a statewide collaborative strategy to address illegal fish introductions and limit future illicit stocking of non-native fish and consider the reclamation of waters whenever possible.

Action 2E2—Dedicate additional or new human and fiscal resources to coordinate implementation of the strategy identified in 2E1 once developed.
Action 2E3—Increase fines and enforcement for illegal fish stocking.
Action 2E4—Provide incentives for reporting illegal stocking (similar to poaching) and utilize operation game thief for confidential reporting.

Objective 6 and problem 6A. This is a good approach. However, 'High Priority ANS' should be defined to include invasive fish species, and one action should be to develop a plan specifically for fish species that are commonly intentionally introduced such as northern pike, walleye, and smallmouth bass.

Response: *Invasive Fish have been added to our 'Species of Concern' list in the 'Problem Definition Section' of the document. We have added three species of Asian carp to our species list (Bighead Carp, Silver Carp, and Black Carp), as well the Northern Snakehead.*

- **Lists of Aquatic Nuisance Animals in the Problem Definition Section**
  - We were unable to find zebra or quagga mussel on this list—should they be?

    Response: *Zebra and quagga mussels have been added to the list of primary species of concern.*
  - Consider including a third list of species that are regulated and may be present in the state and not on the prohibited species list, but can cause damage to native species and ecosystems if introduced, and thus deserve monitoring and management plans, with associated eradication and control measures to be instituted if/when they are found. For example, the illegal introduction of smallmouth bass into Miramonte Reservoir resulted in CPW taking action to eradicate this species before it became established, despite this species not appearing on any of these lists.

    Response: *CPW has changed from a prohibited species list to an allowable species list in 2018. We have added to our objectives section to increase fines and penalties for illegal fish stocking in Colorado. Refer to Objective 2. At this time we have decided to not add any more species to our lists that would require management plans.*
  - Page 36: Should Utilizing Incident Command System (ICS) be part of addressing Objective 6?

    Response: *Objective 6 in the old draft is now Objective 3 in the Final Plan,* Objective 3—Improve the capacity to implement rapid response for new ANS.

From Meg Modely, Lake Champlain Basin Program, Aquatic Invasive Species Management Coordinator, ANSTF Member

- Consider adding parasites and pathogens to the first sentence in the Executive Summary

  Response: *In the final draft we have removed the parasites and pathogens from the document. These are managed by the Aquatic Animal Health Lab and are not in the Invasive Species portfolio.*
- I count 8 objectives in the Executive Summary, not 7.

  Response: *In the final draft there are 6 objectives.*
- Adjust wording in 5th bullet under Ecological Impacts on p10 to "Control measure impacts to…."
- The information on p11 about congressional estimates of ZM and QM impacts and the info cited from the US Commission on Ocean Policy may be redundant/conflicting.
- Lake George does not spend $1M annually on Eurasian water milfoil management. It is much less annually (closer to $200k) on p11.
- The 8th bullet on p23 "protects aquatic habitats and native species communities" ….through the development of laws and regulations?

  Response: *All suggested typographical/ grammatical errors have been fixed, in the update of this plan the pages no longer correspond with the page numbers in these comments.*

- Mention or add Stop Aquatic Hitchhikers Campaign, Habitattitude, and Play, Clean, Go to Objective #3

  Response: *Objective 3 in the old draft is now Objective 5 in the new draft. 5C1 has been updated to include campaigns in use in Colorado. This list is not limited.*

- Mention climate and its impacts to the plan

  Response: *We have added a section to the document that covers climate change and its probable impacts to invasive species.*

Preliminary Comments From Donald MacLean, U.S, Fish and Wildlife Service, Administrative Staff to the Aquatic Nuisance Species Task Force and State ANS Management Plan Coordinator

Besides the missing content (see below), the only major issue I found with the document are the problem statements (Problem 1A, 2a, etc.) listed in the Objectives/Strategies/Action section. These problems are actually really well done—they are something that are not usually included and are a nice addition to the section. My issue with them is that they are not addressed anywhere else in the document (some may be touched upon here or there, but not specifically addressed). These problems are exactly the type of information that should have been included in the Problem Definition and Ranking Section. Each of the Problems listed in The Objectives/Strategies/Action section should have at least a full paragraph describing that issue in The Problem Definition Section. Then, when the reader gets to The Objectives Section and sees what you are proposing to do with the CO Plan, and see the references to the problem, they are already intimately familiar with the problems in Colorado. My recommendation is that each of the problems be described in more detail in the Problem Definition Section.

Response: *Your suggestion has made. In the newest draft we have added more to the 'Problem Definition Section' that will cover the different problems that were addressed in the objectives section. Specifically we added an entire section to the 'The Problem Definition Section' that goes over in more detail the major pathways of ANS introduction.*

General Comments

- This draft plan was particularly difficult to review for a number of reasons, including: After scanning, the PDF was not subjected to OCR (optical character recognition) software. This made the document much harder to review as each page is a single full-page graphic and the text is not searchable (making it harder for the reviewer).

  Response: *The plan is a Word document now. CPW does not use OCR.*

- The appendices were not included. Though some appendices (such as those on comments) are difficult to include in a preliminary draft, many of the others are not. There were many times when I wanted to refer to an appendix and could not do so.

  Response: *The appendices have been added and updated to match the order in which they are discussed in the document.*

- The implementation table was also not included. Details that were not included in the various objectives, strategic actions and components of Section F might have been included in the implementation table.

  Response: *An implementation table will be in the final document.*

- Both US and U.S. are used to abbreviate United States. There are many places in the document where the word "was" is used incorrectly instead of "were."
- There are many places in the document where the acronym FTE is used when it should be plural (FTEs).
- There are two periods at the end of Strategic Action 5B3
- A bit more separation is needed between each of the Objectives in the Objective/Strategies/Actions section.

  Response: *The formatting and spelling inconsistencies have been updated.*

- At least one plan is referred to by numerous names. Besides its title in the table, the State Zebra and Quagga Mussel Management Plan is also referred to as the ZQM Plan, the Zebra and Quagga Mussel Plan, and I think at least one

other method as well. A consistent name should be used and should include the state reference so that it is not confused with the National plan (QZAP—the Quagga/Zebra Mussel Action Plan).

Response: *We have changed all references to The State of Colorado Zebra and Quagga Mussel Management Plan also known as the ZQM management plan for better consistency throughout the draft.*

Comments on Missing Content by Section

Executive summary—The executive summary is not an overall summary of the draft CO Plan but instead just a general introduction to invasive species, State plans, and an introduction to the 7 or 8 (see 4th bullet under Specific Comments below) objectives. According to the Guidance, the executive summary should give the reader an overview of the entire ANS Management Plan, and the existing text does not do so. The Guidance states:

- "The executive summary should briefly summarize each management plan section and its major recommendations. The purpose of the plan, the background on ANS problems, the authorities and current programs of involved organizations, and the central focus should be mentioned. In addition, present and proposed management actions to overcome problems along with program goals and objectives should be succinctly outlined. Finally, a summary of the implementation table (to include funding required for implementation in the initial and future years by objectives and major strategies) and program monitoring and evaluation plans should be provided."

  Note: *For the management actions, the whole implementation table does not need to be repeated. Perhaps just the objectives and strategic actions could be summarized.*

Response: *The Executive summary has been re-written to more closely match the example in the State Guidelines Document. We included a short summary of the objectives, the plan purpose, plan development, and plan review.*

Introduction—The introduction of the plan has a brief description of the AIS problem in general, but barely any information specific to Colorado. The addition of a description of the unique aspects of the AIS in Colorado would greatly enhance the draft Plan.

Response: *We have added more Colorado specific information such as program history, management actions/history along with statistics, and how Colorado prioritizes ANS management.*

Also, the following items, listed in the Guidance, are not included in the preliminary draft:

- The plan's purpose should be described here.
- Geographic scope of plan, including a map and discussion of the geographic area showing water bodies, drainage basins, and major structural features.

  Note: *We have already discussed this via e-mail, and the map I saw looks as if it would be sufficient, although it could perhaps use a few additions. Links could also be provided to existing maps, if possible.*

  Response: *This section has been re-written to closer match the example in the State Guidelines Document. We have created and added a few more maps that breakdown the geographic scope even further into basins and the major water bodies.*

- Discussion of any scientific review and/or public comment on the plan as well as a summary of specific comments and any indication of how those comments and reactions were addressed in the final plan.

  Note: *Since this is a preliminary review of a plan, I don't necessarily expect to see much information on specific comments yet, but the final plan should contain an appendix with highlights on the important comment periods and comments that helped shape the overall plan with a shorter summary in the main report and providing some information on how the comments may have shaped the development of the plan.*

  Response: *A Public Comment section has been added to the plans appendix as well as a paragraph in the (Introduction) highlighting how those comments have helped shaped the plans development.*

- An explanation of the connection of the ANS plan to other plans (ANS or otherwise) produced by adjacent states or entities with overlapping jurisdictions covering shared waters.

  Response: *More information about how Colorado works with the western states regarding ANS management is included in the 'Existing Authorities and Programs' under the section titled 'Regional and National Organizations'.*

Problem Definition and Ranking—The plan does have a specific section that covers this topic, but it lacks several of the crucial pieces of information that characterize the problem and its unique aspects particular to Colorado (See similar comment from Kim Bogenschutz). The following information from the Guidance is missing:

- Brief description of the overall history of AIS problems in Colorado (again, some of this can be gleaned from the Introduction, but it's in bits and pieces throughout those sections instead of in one cohesive section).

  Response: *We added a section to the 'Problem Definition' section of the document that covers the ANS history and introductions to the state.*

- An estimation of the number of species or other taxa in various classes, in the geographic area.

  Response: *Species tables have been added to this section. We also added a map that shows the invasive species distribution in Colorado.*

- Description of how connecting water bodies outside the plan boundaries may introduce new ANS into the affected area.

  Response: *Located in the introduction section under the geographic map is paragraph about Colorado's water, highlighting that Colorado is a headwaters state for seven water sheds, water flows into other states via downstream, water does not flow into Colorado.*

- Discussion of major problems and concerns, such as key introduced species and introduction pathways, lack of scientific knowledge, or limited public knowledge. If possible, problems should be grouped into 3-5 categories (e.g., high, medium, low or some other scheme).

  Note: *This would be an excellent place to expand upon the problems listed in The Objectives/Strategies/Action Section (see my earlier comment above).*

  Response: *Discussion of major problems, key species of concern (Priority Species), and information on the major pathways of introduction (Boating, Fishing Tournaments/Bait release, Aquarium/Pet Trade, Nursery/Gardens Center) have been added to this section. We have added more detail in the 'Problem Definition Section' on the problems that were listed in the Objectives/Strategies/Actions section.*

- Discussion of cryptogenic species (i.e., those which have not been determined as clearly native or nonindigenous), including, to the extent possible, probably pathway.

  Response: *CPW's authority is limited to non-native species as defined in statute for invasive species. Therefore, cryptogenic species are not included in this plan.*

Existing Authorities and Programs—This section of the Colorado Plan adequately describes the existing "players" in the world of AIS in Colorado, and also briefly describes the State of Colorado ANS Act, State ANS regulations, and CPW Aquatic Health Regulations, however, the following information from the Guidance is missing:

- A summary of relevant federal, tribal and regional authorities and activities that are or can be used to address the problems and concerns identified in the CO Plan.
- The Task Force recommends that any gaps in authorities or implementing regulations that impede or limit attainment of plan goals be identified.
- The plan should discuss current efforts to amend existing or enact legislation to address shortcomings in existing authorities and programs.

  Response: *Information was added and summarized to reflect the Federal, Regional, and Tribal involvement that can be used or is currently used to address ANS problems and concerns in Colorado. Additional partners were also added. We have also added to the document a section titled 'Gaps and Challenges'; this section covers any gaps in authorities that may limit the accomplishment of plan goals.*

Objectives, Strategies Actions, and Cost Estimates—The Colorado Plan outlines the basic objectives and strategies (strategic actions) of the plan, however, it fails to provide much detail at the action (component) level. While it does include short statements detailing the specific work or task that will be performed, it doesn't identify the organizations involved, their roles, and sometimes additional details would be helpful. It also fails to provide cost estimates for these actions. Some of this may have come out in the implementation table, but since that was also not provided, I cannot be sure. As per the Guidance, this section should include:

- **Actions** (called components in the Colorado Plan)—Describe the specific work or task that will be performed to implement a strategy. Short statements detailing the work required and organizations involved and their respective roles should be prepared for each action. The expected result should be described. Each action, along with associated strategies, objectives and goals should have a title and be listed in the implementation table. For each action, the names of the implementing and funding organizations and their roles should be specified.
- **Cost Estimates**—The basis for the cost estimates (i.e., salary of two field biologists 1/3 of the year, plus equipment and travel costs) should be presented here if that information is available. The estimated contribution of each organization and the total cost for each action should be shown in the implementation table.

  Response: *We have added more to this section.*

Implementation Table—The implementation table was not included in the preliminary review draft so it could not be reviewed.

Response: *An implementation table will be included in the final draft.*

- **Appendices**—The appendices, which are referred to in many places were not included in the preliminary review draft so they could not be reviewed.

  Response: *The appendices have been added to the document and the letters throughout the document have been updated to match the corresponding appendices.*

- **Table of Contents** (TOC)
- The **Introduction** starts on page 9 when it should start on page 1 after the roman numerals.

  Response: *We updated the page numbers in the final version of the document.*

- The **Appendices** should also be listed in the TOC.

  Response: *We have included the appendices to the Table of Contents in the Final version of the document.*

- **Executive Summary**—In addition to the earlier comments, the first two paragraphs of the Executive Summary, if kept as written, need some sort of transition. The first paragraph talks about invasive species and the second paragraph suddenly switches to aquatic nuisance species with no transition statement. The general reader could benefit with a statement that more clearly links the two subjects.

  Response: *We reworded the Executive Summary to make it easier to read for both the scientific community and the public.*

- **Executive Summary**—The statement just before the first bullet refers to "seven objectives," however there are eight bullets (objectives) listed. It would be less confusing if this was fixed, the 7 objectives were numbered, referred to more specifically in the Objectives Section, and the language matched the objectives as they are presented in Objective Section.

  Response: *In the final plan there are 6 objectives.*

- **Five Points to Consider**—I really like the "five points to consider" listed here and the fact that they are addressed in the plan—they are important points that are not often highlighted in this manner. While all of the points are addressed in the plan to some degree, it is not as clear how the points will guide future development. Please understand, I'm not asking you to add a huge amount of information here, but consider adding some additional thoughts regarding how these points guide future development. I suggest adding the point that eradication is often not possible after establishment as well.

  Response: *We have added more to this section to reflect how the 'Five Points to Consider' will guide future development of the Colorado ANS Plan.*

- **Education**, first line—The sentence mentions educational items that are provided to youth. Would it be possible to provide descriptions of

the various items, perhaps with images? This kind of information gives the reader a better idea of what is already being done. If they are familiar with the products at all, it gives them a stronger connection to the plan. These are also the kinds of things that are appropriate to include in the program portion of Section Existing Authorities and Programs.

Response: *More information has been added to the Existing Authorities and Programs section of the document to reflect the different education and outreach event that the ANS program participates in.*

> ***Note:*** *Educational materials that we use for our education/outreach events have not been put into the plan. We can provide that information if it is requested, or it can be found on the Colorado Parks and Wildlife Website: www.cpw.state.co.us> Programs > Invasive Species > Resources and Publications.*

- **Problem Definitions and Ranking**—The last sentence states: "The discussion and identification of the major problems and concerns outlined below, have served as the foundation for the development of Goals and Objectives found in Section D below." See earlier comment under missing content (and comment from Kim Bogenschutz). This section is so short and non-Colorado-centric that's it is not clear how this section shaped the Goals and Objectives..

  Response: *In reworking this section, that sentence was removed.*

- **Problem Definition Section**—Last Paragraph. This paragraph refers to recreational watercraft, water diversions, and aquaculture within Colorado, but has no real detail. Would it be possible to expand this section a bit with perhaps a paragraph on each of these pathways with some more Colorado-specific information and any relevant statistics (number of recreational watercraft, watercraft diversions, etc.)?

  Response: *Colorado specific information on the pathways of introduction including: Boating, fishing tournaments, aquarium trade/pet release, garden centers/nurseries were added to the document. Water diversions were removed because we have little or no data on that pathway.*

- **Problem Definition Section: Aquatic Nuisance Plants**—This section refers to aquatic nuisance plants in general, but has no Colorado-specific details. To what extent are the 3 priority plant species of concern were distributed throughout the state? Why are the other plants – the ones that are not yet in CO—listed as priority? Are they in adjacent states? Are they being imported into CO as part of the aquatic plant trade? Do you have any statistics on the major plant pathways (# of aquatic nurseries? # of water bodies infested with the 3 plants, etc?

  Response: *Thank you for your comment. Colorado specific information was added to this section regarding the priority plant species. Information on all of the priority species was added to the appendix, including species descriptions and when possible the timing of each introduction. Also added to the appendix is a positive waters list that has information on the geographic distribution of the ANS of concern to Colorado.*

- Page 23, last paragraph. This paragraph refers to "statewide species management plans," and although some of these reports were to be included in the missing appendices, their absence generates some questions: How are the statewide plans developed? Do they all receive funding from Colorado? A brief discussion of these statewide plans somewhere in the document would be beneficial.

  Response: *Thank you for your response. In the final document the page numbers no longer correspond with the page numbers listed in these comments. The State of Colorado species management plans for zebra and quagga mussels, NZMS and rusty crayfish were updated in 2018 and are available upon request.*

- Also, unless I missed it, I was surprised to find no reference to National ANSTF-approved plans such as the QZAP (Quagga-Zebra Mussel Action Plan, or the New Zealand Mudsnail Management Plan or others). Was this intentional? The suggested discussion above could also include, where applicable, how the statewide plans mesh with a National ANSTF species control plans. (These plans can be found on the ANSTF website.).

  Response: *Thank you for your response. Federal and regional management plan information has been added to the document.*

- **State Government**—In reference to the comment above under missing content, in existing authorities, the lack of program specific information is shown in this paragraph "zebra and quagga mussel program," which I am not sure is mentioned again in the draft plan anywhere. Although there is a small amount of detail in other parts of the document, this section is an appropriate place for a paragraph or two on Colorado's zebra and quagga mussel program and its current activities.

  Response: *Thank you for your response. This was a typo that has been corrected, it was meant to say Plan not Program. We have included in the multiple places Colorado's current activities with zebra and quagga mussels.*

- **Federal Government**—The end of this paragraph lists a number of "Federal partners" for the Colorado ANS Program, but it gives no details. How much land does each of the Federal partners have in Colorado? Do they acknowledge and support the ANS issue? Do they participate in the CANSTF? Did they participate or provide input in the draft CO Plan? What works well? What needs improvement? A paragraph on each of the Federal partners with some additional details could certainly enrich Existing Partners section.

  Response: *Thank you for your response, because so much of Colorado is owned and managed by federal agencies, a map showing the federal lands in Colorado has been added. As stated in the existing authorities section of the Colorado ANS Management Plan, efforts to manage ANS in Colorado are coordinated between private, local, state, and federal agencies along with CPW being the main agency on this effort. We have added more information to each federal and regional partner in the 'Existing Authorities and Partners Section' of the document.*

- Consider adding the term "Front Range" to the glossary and perhaps to the map of Colorado.

  Response: *Thank you for your comment. We have added a map that shows the geographic regions in Colorado. The map includes the area of Colorado covered by the 'Front Range'. This will clarify what is meant by the term 'Front Range'.*

- **State of Colorado ANS Act**—The third sentence, referring to the State of Colorado ANS Act, states: "It makes it illegal to possess, import, export, ship, transport, release, plant, place, or cause an ANS to be released." Does the Act include a specific list of prohibited species? Is this the list that would have been included in Appendix (Prohibited Aquatic Species)? Is this the same as the list under State ANS regulations?

  Response: *Thank you for your comment. CPW changed from a 'prohibited' species list to an allowable species list 'White List' in 2018. The list of allowable species is located in the 'CPW Aquatic Health Regulations' section of the document; it has also been cited in the references section – under CPW's General Provisions, 2019.*

State ANS Regulations:

- A sentence states: "The rules also created a new AIS list that targets species that can be transported on a boat overland." Despite the fact that you use the term target, the use of the term "can" is confusing. It sounds as if it is a list of species that are "allowed" to be transported as opposed to a list of species that are commonly transported.

  Response: *This section has been reworded. The 'list' that was mentioned was referring to the species listed in CPW's Chapter 8 ANS Regulations. Those regulations have be cited and put into the reference section of the document—under CPW's Chapter 8 ANS Regulations, 2009.*

- After the first bullet, the last sentence states: "This does not apply to possession for aquarium use." This is the perfect example of a gap that could be discussed in more detail.

- After 3rd bullet, last word. Suggest adding VHSV to your list of acronyms, if it is not already there.

  Response: *We have added a section to the document titled 'Gaps and Challenges' where we discuss the issue of ANS being sold by the pet and nursery industry in Colorado. We have added VHSV to the list of acronyms.*

- 3rd bullet from the bottom. Consider adding the term "East Slope" to the glossary and perhaps to the map of Colorado.

- 2nd bullet. Consider adding the term "West Slope" to the glossary and perhaps to the map of Colorado.

  Response: *Grammatical and typographical errors have been addressed. Also a map has been added to the Geographic Scope section of the document to show the 'East Slope' and 'West Slope' areas of Colorado.*

- Table, 5th row. The 3rd column refers to "List A species and List B species.

  Response: *The regulatory status column was taken out of the table. Information on List A and List B species are in the Existing Authorities and Programs section under The Colorado Noxious Weed List section. Also CDA's noxious weed list has been added to the appendix.*

  However, the web page in the next column just takes you to the index page for the Colorado Department of Agriculture and isn't really helpful to the reader.

  Response: *The website link has been updated.*

- What are List A and List B species? Is it important to give some more detail on their significance? As mentioned previously, a brief description of the statewide management plans would be helpful and List A and List B species could be briefly explained, if appropriate.

  Response: *Thank you for your comment. Information was added to the Final Plan on List A and List B species to the Existing Authorities and Programs section under The Colorado Noxious Weed List section.*

- Objective 1, 3rd line. The 3rd line of Objective 1, reading "…staffing and fiscal resources aquatic nuisance species …" is missing a word. I am guessing it should be "…staffing and fiscal resources for aquatic nuisance species …".

  Response: *In the Final plan we have re-written Objective 1, it now reads as: "Ensure effective and consistent implementation of the plan".*

- Section F, Problem 1A (and all the other Problems)—The problems are an interesting addition to this section, but need to be fully explained earlier in Section C (see my earlier comment on this—last paragraph before the General Comments heading).

  Response: *We have reworked the (Problem Definition Section) to include the pathways of concern discussed in the (Objectives/Strategies/Actions section).*

- **Component 1D2**—This section could use a small bit of clarification as it isn't entirely clear what the purpose is of the brief descriptions following the 4 acronyms for the Colorado agencies. I am assuming they are they brief descriptors of what each agency does, but it is unclear.

  Response: *We have decided to take out action item ID2 from Objective 1.*

- **Strategic Action 2A**—Is the acronym "ZQM Plan" in the list of acronyms or should it be spelled out?

  Response: *ZQM was added to the list of acronyms. The ZQM Plan is referring to the Zebra and Quagga Mussel Plan is spelled out in the section titled 'Other Invasive Species Management Plans'.*

- **Component 3A2**—Though certainly not mandatory, have you considered including the USFWS national public awareness campaign Habitattitude™ as part of this component?

  Response: *3A2 is now 5B2 in the final plan. It changed because we reorganized the Objectives/Strategies/Actions section so that it was in order of priority (1st objective being the highest priority). CPW does not want to limit opportunities by identifying any campaign specifically in this section.*

- **Component 3B1**—The "Don't Move a Mussel" campaign is not a Fish and Wildlife Service campaign. It was partially funded by USFWS funds, but is a campaign of the Pacific States Marine Fisheries Commission.

  Response: *Component 3B1 is now 5C1 in the final plan. It changed because we reorganized the Objectives/Strategies/Actions section so that it was in order of priority (1st objective being the highest priority). We have rewritten the action to say: "Continue the use of National and Regional campaigns including, but not limited to: Clean, Drain, Dry, Don't Move a Mussel, Stop Aquatic Hitchhikers, Don't Let it Loose, Habitattitude and others."*

- The "Stop Aquatic Hitchhikers" campaign has been in existence for approximately 11 years, not "over 20."

  Response: *Thank you for your comment, we have changed this sentence.*

- **Strategic Action 4B1**—This action doesn't match the wording of other actions in the plan (and doesn't seem like a strategic action). Perhaps it could be reworded to something like: Make monitoring information available to everyone by working with partners, citizens, and other parties permitted to sample to ensure reports follow a standardized protocol and format.

  Response: *This action item no longer exists in the current plan.*

- **Component 4B1a**—This component mentions the Colorado ANS Sampling and Monitoring Database System. Is this database mentioned elsewhere in the plan? This is the perfect type of information that could and should be briefly described in Section E (Existing Programs).

  Response: *The data base in not a program, rather a component used by our department to record sampling data.*

- **Strategic Action 5A1**—Is the acronym WID in the acronym list? Does it stand for "Watercraft Inspection and Decontamination?"

  Response: *The acronym WID stands for Watercraft Inspection and Decontamination; we have added it to the acronyms list.*

- **Strategic Action 4B2**—This action refers to the CPW Invasive Species Notification Directive, but it is unclear exactly what this is. This is an example of the kind of thing that could use a bit more detail in Section E, as either an existing program, a gap, or an impending piece of legislation or other state action (depending on the details).

  Response: *The original action item described in the comment has been accomplished (October 2019) and therefore the action item is not listed in the current plan.*

- Last sentence of **Component 5A1e**—The last part of the 2nd sentence—"and to speed up the process of previously inspected boats"—doesn't make sense to me. Is a word missing?

  Response: *This sentence has been changed.*

- **Strategic Action 5B1**—Does the Colorado Decontamination Manual refer to Appendix LL—Colorado ANS Watercraft Decontamination Manual?

  Response: *Yes, the Colorado Decontamination Manual is the same as the Colorado ANS Watercraft Decontamination Manual. We have taken appendix LL out of the final document. The Colorado ANS Watercraft Decontamination Manual is available upon request.*

- **Problem 5B**—For the problem of professionals spreading AIS through work activities, you have a component related to following HACCP Plans. Does this also include development of new HACCP plans where one does not exist and the development or HACCP training opportunities?

  Response: *In the final plan we have reorganized the objectives into priority order. The numbers and letters that were assigned to previous strategies and actions have been updated. Refer to* Objective 2—Prevent and contain introductions through managing human vectors, pathways of introduction, and spread.*;* Strategy 2C—Encourage CPW and Partner agency staff working in aquatic settings to actively engage in best management practices to ensure ANS are not transferred while performing their work duties. *HAACP is included in 2C2 and 2C4.*

- **Strategic Action 5B4**—Will CDPHE be in the list of acronyms?

  Response: *CDPHE (Colorado Department of Public Health) has been added to the acronym list.*

- **Strategic Action 5C2**—This strategic action has one or more words missing.
- **Strategic Action 5C3**—Part of this action—"… and enforce on those that are selling…" is awkward. Is there a better way to say this?
- **Strategic Action 5D4**—the term "leaches" is used incorrectly here. The correct term is spelled "leech." Leach refers to the process of permeating or penetrating gradually; leech refers to the carnivorous or bloodsucking aquatic or terrestrial worms typically having a sucker at each end.

  Response: *All typos have been corrected.*

Objective 6

- The wording of the first sentence is slightly confusing and may have a word missing.
- The sentence refers to section I.1. yet I do not see a Section I.1 (although there is a placeholder for section I.2 on page 51).

  Response: *Thank you for your comment, this information has been updated.*

- **Problem 6A**—For Problem 6A, the first strategic action is labeled 6B1. Should it not be 6A1 or is a strategic action missing instead?

  Response: *Thank you for your comment, this information has been updated.*

- **Component 7A1a**—This component refers to both aquatic and terrestrial research. Was the inclusion of terrestrial in an aquatic plan intentional?

  Response: *This action has been updated in the final plan .*

- After **Component 7B1d**—In the middle of the page after the last component the words "Cost Estimates" are sitting centered, all by themselves. Is this a placeholder for additional information?

  Response: *Thank you for your comment, this information has been updated.*

- Priority for action section—This section states that "a system to classify species was developed that recommends management activities for each classification." Would it be possible to add a little detail describing the classification system (who developed it, how it works, what is assessed, etc.). Was this going to be in one of the appendices?

  Response: *Thank you for your comment; this section was reworked to just include the top priorities of action, the top priorities were taken from the Objectives/Strategies/Actions section.*

- First paragraph—Are CANSC and CANS referring to the same thing?

  Response: *Thank you for your comment, CANSC was a typo referring to CANSSC (Colorado ANS Steering Committee), and CANS refers to The State of Colorado ANS Management Plan (This Plan).*

- Heading at bottom of page—The heading "Species of Concern" needs to be pushed to the next page to sit with its text.
- Primary Species of Concern and Secondary Species of Concern—In both cases the word directly after "concern" needs to be changed from "is" to "are."
- Species tables—Some of the species seem to be inconsistently names. In some cases they are named with a comma, such as: "loosestrife, purple." But in other cases they are named "yellow floating heart."
- The asterisk in the column heading "Regulatory Status" should be placed at the bottom of every table, and not just at the end of all the tables.
- The formatting in the tables needs to be cleaned up a bit—in many places some cells are centered justified and others are not.
- A blank row needs to be deleted on page 41.
- If more than one species is listed (see Knotweeds), the genus can be abbreviated after it is spelled out the first time.
- When a genus is used to indicate more than one species, the word "species" or the abbreviation "spp." should be included for clarity.
- In a couple of places, words are being cut off in mid-word due to tight column widths.
- Upper species table—On the plant table, you have the entry for pickerel weed listed as Monochoria vaginalis. Are you referring to the native pickerelweed (Pontedaria cordata), a plant native to eastern North America (also known to occur as a non-native in western N. America) or are you referring to heartshape pickerelweed (Monochoria vaginalis), a serious weed in rice fields in east and southern Asia which also supposedly occurs in California and Hawaii).
- Species table. The last 3 rows of species on page 43—chain pickerel, apple snails, and European valve snail—are repeated again on the top of page 44.

  Response: *In the final document the page numbers no longer correspond with the above comments. All typographical /grammatical errors have been made to the 'Primary Species of Concern' and 'Secondary Species of Concern' Tables in the Problem Definition and Ranking Section.*

- Aquatic Nuisance Animals, Priority and Secondary Species of Concern—After seeing numerous references to quagga and zebra mussels within the document, I was surprised to see that quagga and zebra mussels were not listed (either individually or as a genus) on your list of priority species. Was this intentional? If so, what is the reasoning for not including them?

  Response: *Quagga and Zebra Mussels are included in the species tables.*

- Plan Evaluation, 12 bulleted items—I really like the emphasis on these 12 items of 'special emphasis' during the monitoring and evaluation. Do each of these 12 items have a corresponding strategic action and component within the CO Plan? Can (or will?) performance measures be developed from the 12 emphasized items?

  Response: *The Plan Evaluation section has been changed and is now titled Plan Review. The 11 bulleted items in the Plan Review summarizes important topics already covered in the Objective/ Strategy/Action Section.*

- Reporting, 1st paragraph—The last words in that paragraph refer to "Chapter 9," but the chapters in the CO Plan are designated with letters. Did you mean Section I?

  Response: *In our new draft of the document we choose not to label by letter or chapter. We kept the headings and the paragraph titles.*

- Reporting, 2nd paragraph, first sentence—The word annual report does not need to be capitalized.

- Section 1—Page 51 is a placeholder for the Rapid Response plan but is labeled I.2. However, there is no section I.1. Is a section missing or is the placeholder mislabeled?

  Response: *In our new draft the sections are not labeled by numbers.*

- Section J, Definitions—(Note: if these definitions are products of State law or other state processes and cannot be changed, these comments do not need to be considered).

- Accidental Introductions—The definition of accidental introductions in the CO Plan only refers to aquatic pathways, yet in reality, accidental introductions occur in terrestrial pathways as well. One remedy for this could be to just start the sentence with: "In aquatic systems, an accidental introduction is …"

- Eradicate—Although I certainly know what you are referring to, it seems as if you should indicate from where the ANS is being eliminated (initial introduction site, State, region, water body, infested area, etc.).

- Established—The definition of establishment usually includes a reference to reproduction. Although I certainly understand that reproduction is included within the definition of a "permanent" population, it might be helpful to spell that out here more clearly.

- Exotic—It is unclear what is meant by "…or other variable biological material…" This comment can also be applied to the definition for non-indigenous.

- Invasive—This definition seems rather non-technical. Could the definition from Executive Order 13112 be used instead?

- EO 13112 defines an "invasive species" as a species that is:
  - 1) non-native (or alien) to the ecosystem under consideration and
  - 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

- Nonnative—The definition for nonnative is "Any species introduced by man into an ecosystem outside its native range." I think this is incorrect. I don't think that a species native status should have an anthropogenic component—it should solely be based on the species historical range and occurrence within various ecosystems. Recommend striking the words "introduced by man."

  Response: *All the suggested changes have been updated in the 'Definitions Section' of the document.*

- List of Appendices – Because I could not review the appendices I cannot be sure, but it looks as if Appendix Q and Appendix S may be the same thing. If not, what is the difference between the two appendices?

  Response: *We have updated our appendices and have included them in the final document.*

Comments on Draft #1 of the Colorado Parks and Wildlife State ANS Management Plan Invasive Species Rapid Response Plan

- The draft CO Plan has a placeholder (Section I.2) for a rapid response plan, but the draft rapid response plan does not say anything about being a section within the draft CO Plan. Is the intention to eventually include the draft rapid response plan as a section of the draft CO ANS Management Plan?

  Response: *We have included the Rapid Response Plan as its own section in the document.*

- 2nd Paragraph—The end of the paragraph refers to "site plans." This term, however, often has different definitions. Can the term be defined within the context of the rapid response plan?

  Response: *We have tried to clarify (in plan section of rapid response section) what we mean by existing site plans.*

- 1st sentence—The first sentence states: "This plan is a guidance tool for the State of Colorado to respond, eradicate, control and manage these invasive species as quickly as possible to minimize and possibly reverse damage to aquatic ecosystems." This statement is misleading as rapid response plans are used for rapid response to newly discovered introductions before the infestation becomes established; they are not used for long-term control and management.

  Response: *This information has been updated to better align with rapid response being used for newly discovered introductions.*

- 2nd paragraph from the bottom—The last sentence states: "Without early detection, eradication and containment efforts may not be feasible." Suggest altering the sentence to read: "Without early detection, eradication efforts may not be feasible and the response becomes a containment effort."

  Response: *This information has been updated.*

- Last paragraph—I am very pleased to see the mention of a rapid response fund.

- 3rd paragraph in Section II—Is there a reference for the #806D of the Parks Chapter 8 ANS Regulations in case the reader wants to see the regulations?

  Response: *CPW and Parks regulations are referenced and cited in the references portion of the document.*

- 1st bullet—The brackets are not needed in the sub-bullet.

- 1st bullet—Suggest changing the bolded text from "Aquatic nuisance species plants" to "Aquatic Invasive Plants."

  Response: *We used the title 'Aquatic Nuisance Plants' because we use the term ANS in Colorado.*

- 2nd bullet—Suggest changing the bolded text from "Exotic Invasive Fish" to "Invasive Fish" and change the "I" in ichthyologist to a lower case letter.

- There are differing spaces between the various sections.

  Response: *This information has been updated.*

- 1st paragraph after long list of bullets, 3rd line—This line refers to "high-priority species management plans." Please add the word "statewide" to distinguish these plans from existing National ANSTF species control plans.

  Response: *This information has been updated.*

Appendix C—ANS Positive Waters List

Definition from the ANS Act (SB08-226):

"AQUATIC NUISANCE SPECIES" MEANS EXOTIC OR NONNATIVE AQUATIC WILDLIFE OR ANY PLANT SPECIES THAT HAVE BEEN DETERMINED BY THE BOARD TO POSE A SIGNIFICANT THREAT TO THE AQUATIC RESOURCES OR WATER INFRASTRUCTURE OF THE STATE."

ANIMALS			
Common Name	***Scientific Name***	**Status in Colorado**	**Location in Colorado**
Crayfish, Rusty	*Orconectesrusticus*	Present in CO	Catamount Reservoir, Yampa River, Stagecoach Reservoir, and Sanchez Reservoir
Mussel, Quagga	*Dreissena rostriformis bugensis*	Present in CO	Green Mountain Reservoir (Suspect)
Mussel, Zebra	*Dreissena polymorpha*	Not Present in CO	No known
New Zealand Mudsnail	*Potamopyrgusantipodarum*	Present in CO	Bear Canyon Creek, City of Boulder—Boulder Creek, Dry Creek (2), Two Rivers Park, Chatfield Reservoir, Dinosaur NM—Green River, Gunnison River (East of Delta), Pike NF—South Platte River below Eleven Mile Dam, Eleven Mile Reservoir State Park, Jimmy Camp Creek Spinney Mountain Reservoir State Park, Charlie Meyer State Wildlife Area (Dream Stream), South Delaney Buttes Reservoir and East Delaney Buttes Reservoir in Delaney Buttes State Wildlife Area, College Lake at CSU Fort Collins, Fountain Creek in Colorado Springs, South Platte River in Denver, Uncompahgre River, 4Mile Canyon Creek, Monument Lake, Trinidad Lake, Lake Capote
Water Flea, spiny	*Bythotrephescederstroemi*	No verified presence	No Known
Water Flea, fishhook	*Cercopagispengoi*	No verified presence	No Known

Actual Size

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PLANTS			
Common Name	***Scientific Name***	**Status in Colorado**	**Management Plan**
African elodea	*Lagarosiphon major*	No verified presence	No Known
Brazilian elodea	*Egeria densa*	Present in CO	Jefferson Lake, NTP Ponds, Spinney Mountain Reservoir
Eurasian watermilfoil	*Myriophyllum spicatum*	Present in CO	Adobe Creek SWA, Arvada Reservoir, Bear Canyon Creek, Bessemer Ditch, Big Dry Creek, Blue Heron Ponds, Boulder Creek, Brush Hollow, Chatfield Reservoir, CU Ponds in Boulder, Bow Mar Lake, Bowles Reservoir, Brush Hollow Reservoir, Charlie Meyer SWA, Douglas Reservoir, Eleven Mile State Park, Gateway Reservoir (Private), Horseshoe and Martin Reservoirs in Lathrop SP, Lake Minnequa, Lowell Ponds, Marston Reservoir, Minnequa Canal (Fremont Canal), Monument Lake, Navajo Reservoir (NM Side), North Poudre Reservoir #4, Panama Reservoir #1, Pathfinder Park Pond, Pavlakis Open Space, Pella Crossing Ponds, Prospect Lake, Pueblo Reservoir, Pueblo Steel Mill, Rio Grande River, Saint Charles Reservoir#2, #3, Saint Vrain Creek, Saint Vrain State Ponds, Sawhill Ponds, Sheets Lake, Skaguay Reservoir, South Platte River, Standley Lake (Westminster), Swift Ponds, Tucker Lake, Tule Lakes, Walden Pond, Ward Road Ponds, Wellington Reservoir #4, West Lake, West Prospect Park Lake, Aurora Reservoir, Cherry Creek Reservoir, Lon Hagler Reservoir
Hybrid invasive watermilfoil	*Myriophyllum spicatum x Myriophyllumsibiricum*	Present in CO	Cigar Pond in Chatfield State Park, Cherry Creek Reservoir State Park (near swim beach), Golden Pond in Longmont, Saint Vrain State Park—Pelican
Giant salvinia	*Salvinia molesta*	No current verified presence	No Known
Hyacinth, water	*Eichhorniacrassipes*	Present in CO	Gator Farm, Alamosa (2006) Centennial (detected and eradicated in 2010)
Hydrilla	*Hydrillaverticillata*	No verified presence	No Known
Parrotfeather	*Myriophyllumaquaticum*	No verified presence	No Known
Yellow floating heart	*Nymphoidespeltata*	No verified presence	No Known

Appendix D—Species Descriptions

This list includes Colorado's primary species of concern. The species included in this list are ones that have been detected in Colorado and ones that have not yet been detected but are of top concern due to their possible economic and ecological impacts. For each species; information on the known distribution in Colorado, the pathway of introduction, and when possible the timing of each introduction is listed.

Rusty Crayfish (*Faxonius rusticus*)

Rusty crayfish (*Faxonius rusticus*) are native to the Ohio River Basin. They were first discovered outside of their native range in the 1960s.

Identification: Rusty crayfish grow up to five inches long. They have brown bodies and large grayish-green to reddish-brown claws with dark black bands on the tips. There are two rusty patches on either side of the crayfish's body. The claws, when closed, have an oval gap in the middle. The moveable claw is smooth and S- shaped. Males tend to be larger than females.

Habitat: Found in freshwater lakes, rivers, and streams. Prefer deep pools and fast currents with cover from predators.

Pathway of Introduction and Spread: Introduced by anglers who use the crayfish as bait and throw unused bait into the water or illegally stocked as a prey base for a fishery. Although they are often introduced as bait, they do not make good bait due to their aggressive nature.

Impacts: Rusty crayfish eat small fish, insects, and fish eggs. They also eat aquatic vegetation, damaging underwater habitat that is important for fish spawning, cover, and food. They are aggressive and displace native crayfish.

Current Status in Colorado: Rusty crayfish were first detected in Colorado in the Yampa River and Catamount Reservoir in 2009, in Sanchez State Wildlife Area in 2010 and in Stagecoach Reservoir State Park in 2011. Populations have been controlled through mechanical and physical harvesting.

Zebra Mussels (*Dreissena polymorpha*)

Quagga Mussels (*Dreissena bugensis*)

Zebra Mussels (*Dreissena polymorpha*) are native to the Black, Caspian and Azov Seas of Eastern Europe. They were discovered in the Great Lakes in Lake St. Clair in 1988 and have since spread to 33 states in the United States. Quagga Mussels (*Dreissena bugensis*) are native to the Dnieper River Drainage in the Ukraine. They were discovered first in the Great Lakes in the Erie Canal and Lake Ontario in 1989 and have since spread to 27 states in the United States.

Identification: Quagga mussels (*Dreissena bugensis*) and zebra mussels (*Dreissena polymorpha*) are small freshwater bivalve mollusk-animals with two shells. They are relatives of clams and oysters. It is very difficult for a non-expert to tell the two species apart. The shell color of both mussels alternates between a yellowish and darker brown, often forming stripes. Color patterns are highly variable and can be attributed to environmental factors. They range in size from microscopic up to about two inches long. Unlike native North American freshwater mussels, which burrow in soft sediment, adult zebra and quagga mussels can attach to most hard and semi- soft surfaces via tiny threads called byssal threads. Native species do NOT have byssal threads! These byssal threads are one of three main invasive characteristics that give zebra and quagga mussels an advantage over natives, along with rapid reproduction and their ability to filter feed at amazing rates.

Habitat: Both zebra and quagga mussels can survive cold waters, but cannot tolerate freezing. They can endure temperatures between 1°–30°C (33°–86°F). Zebra mussels need waters above 12°C (54°F) to reproduce, while quagga mussels can reproduce in waters as cold as 9°C (48°F). Adult mussels are light sensitive and prefer to live in water around 200 to 300+ feet deep. They are able to live in a wide range of conditions including oxygen-depleted water.

Pathway of Introduction and Spread: Many aquatic nuisance species, including zebra and quagga mussels, have been introduced into the Great Lakes in the discharged ballast water of ocean-going ships. Another method of dispersal from Europe to the United States is believed to be through transportation of attached mature adults on anchors stored internally in compartments on transoceanic vessels. Once in North American waters, aquatic nuisance species often hitch rides to other bodies of water on the boats, trailers, and equipment that people transport from place to place. Boaters and anglers can inadvertently transport ANS on waders and in bait buckets and live wells. Zebra and quagga mussels likely made their way to the Western USA on trailered watercraft. The first discovery west of the 100th Meridian was in Lake Mead in 2007. The invasive quagga mussels found in Lake Mead in 2007 were 1,000 miles farther west than any other known colony of quagga mussels at the time. The primary method of overland dispersal of these mussels is through human-related activities, especially trailered watercraft. Given their ability to attach to hard surfaces and survive out of water for extended periods (30 days!), many infestations have occurred by adult mussels hitching rides on watercraft. The microscopic larvae also can be transported in bilges, ballast water, live wells, or any other equipment that holds water.

Impacts: Zebra and quagga mussels pose a great ecological and financial threat to the state. The invasion of these mussels can affect every Coloradoan and visitors in some way and the impacts could be devastating. Potential impacts include.

- Prolific reproduction
- Clog water infrastructure
- Ecological impacts
- Recreational impacts
- Economic impacts
- Social impacts
- Difficult or impossible to eradicate
- Quick spread to new waters

Current Status in Colorado: There are no waters positive for zebra or quagga mussels in Colorado. All waters have been de-listed following five years of no detections per Western Regional Panel standards.

- Pueblo Reservoir State Park tested positive for zebra or quagga mussel larvae (veligers) in 2007, 2008, 2009 and 2011.
- Granby Reservoir, Grand Lake, Shadow Mountain Reservoir, Willow Creek Reservoir, Tarryall Reservoir and Jumbo Reservoir all tested positive for one zebra or quagga mussel veliger in 2008. There have been no verified detections at any of these waters since. They were all de-listed per regional standards in 2014 and are now considered negative.
- Blue Mesa Reservoir tested positive for quagga mussel eDNA in 2009, 2011 and 2012 by the U.S. Bureau of Reclamation. Blue Mesa was de-listed per regional standards in 2014 and is now negative.

In August 2017—The Bureau of Reclamation detected quagga mussel veligers in a sample taken from Green Mountain Reservoir. Green Mountain is listed as "Suspect" for the quagga mussel and is scheduled for de-listing in January 2021 pending there are no new verified detections.

New Zealand Mudsnails
(*Potamopyrgus antipodarum*)

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NZMS (*Potamopyrgus antipodarum*) are small aquatic snails native to fresh waters of New Zealand. They were first discovered in North America in the late 1980s in the Snake River, Idaho and Madison River, Montana. NZMS were first found in Colorado in 2004. They are spread across the South Platte River and various other locations across Colorado.

Identification: NZMS range in size from a grain of sand to 1/8 inch in length and are black or brown in color. The shell has about 5 ½ spirals. If the shell is held tip up with the opening toward you, the opening is on the right. There is an attached operculum (cover) which can close off the opening.

Habitat: Found in freshwater, brackish, or saline waters with almost any substrate. Populations in saline conditions produce fewer offspring and grow more slowly. Also tolerates a wide range of temperatures, ranging from near freezing to 82°F.

Pathway of Introduction and Spread: New Zealand mudsnails are spread into new river systems primarily by humans, although they can be carried on the feet of dogs and wildlife. Anglers, boaters, researchers and others can carry NZMS to uninfested locations on their boots and gear. They can survive up to 50 days on a damp surface, giving them ample time to be transferred from one body of water to another on fishing gear.

Impacts: NZMS compete with native invertebrates, including native mollusks, for space and food resources. NZMS may reduce the availability of native invertebrate prey for fish—particularly mayflies, caddis flies and chironomids. They are not a viable food source themselves—their hard shell allows them to pass through a fish gut unharmed.

Current Status in Colorado: Found in various parts of Colorado: Bear Canyon Creek, City of Boulder—Boulder Creek, Dry Creek (2), Chatfield Reservoir, Dinosaur NM—Green River, Gunnison River (East of Delta), Pike NF—South Platte River below Eleven Mile Dam, Eleven Mile Reservoir State Park, Jimmy Camp Creek Spinney Mountain Reservoir State Park, Charlie Meyer State Wildlife Area (Dream Stream), South Delaney Buttes Reservoir and East Delaney Buttes Reservoir in Delaney Buttes State Wildlife Area, College Lake at CSU Fort Collins, Fountain Creek in Colorado Springs, South Platte River in Denver, Uncompahgre River, 4Mile Canyon Creek, Monument Lake, Trinidad Lake, Lake Capote.

Fishhook Waterflea
(*Cercopagis pengoi*)

Spiny Waterflea
(*Bythotrephes longimanus*)

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Waterfleas are zooplankton aquatic crustaceans. Like invasive mussels, the Bythotrephes and Ceropagis were introduced into the Great Lakes from ships' ballast water coming from Eurasia. Unlike the fleas dogs are known to carry, waterfleas are very different. They do not live outside the water, and do not bite or harm people or pets.

Identification:

- Unique body shape: distinguished from other zooplankton by its long tail (70% of body is tail)
- Depending on age—the spine may contain 1–4 barbs (the older the water flea the more barbs)
- Head is mostly a single large black eye
- Swimming antennae propels flea through the water, allowing travel between shallow and deeper waters.
- Range in length from 0.4 to 1.6 mm, depending on sex (females are larger) and age

Habitat:

- Found mostly in temperate freshwater lakes, can tolerate brackish water
- Most abundant in the summer and fall
- Can tolerate temps between 4°–30°C (39°–86°F) and .04 to 8% salinity

Pathway of Introduction and Spread:

- Eggs and adults are easily transported in: ballast tanks, bilge water, bait buckets, live wells, and on fishing lines, anchor lines, and nets
- It only takes one adult or egg to start an infestation
- If female waterfleas die out of water, under certain conditions they produce eggs that resist drying and freezing, which can establish a new infestation later

Impacts:

- Outcompete native juvenile fish for food, causing low survival rates, and because barbs stick in the throat, are unpalatable to juvenile fish
- Avoid predation by larger fish by retreating to deeper waters during the day (10–20m) where they are less visible and ascending (0–10m) at night where food is abundant and temperatures higher, increasing metabolism and growth rates
- Their long spines can cause them to become entangled on fishing lines and can clog eyelets of fishing rods

Current Status in Colorado:
No known presence of either the Fishhook Waterflea (*Cercopagis pengoi*) or the Spiny Waterflea (*Bythotrephes longimanus*).

Aquatic Nuisance Plants—
Primary Species of Concern

African elodea (*Lagarosiphon major*)

Native to Southern Africa and South Tropical Africa, and has been found in the regions of Zambia, Zimbabwe, Botswana, Lesotho, and South Africa. Populations are established in New Zealand, Britain, Germany, and Ireland.

Identification: *L. major* is a dioecious, perennial submerged aquatic plant with adventitious roots and rhizomes that attach the plant to the substrate. The brittle, sparsely branched stem can grow up to 20 feet long, is 3–5mm in diameter and curves like a 'J' towards the base. The dark green leaves are alternately spiraled around the stem, though often crowded towards the stem tip. The leaves are minutely toothed, 5–20mm long, 2–3mm wide and generally have tapered tips that curve down towards the stem, though in low alkalinity waters the leaves can appear straight (Natural Heritage Trust, 2003).

Habitat: *L. major* prefers lakes, reservoirs, and slow moving rivers with silty or sandy bottoms. L. major is also known to occur in wetlands, water courses, and riparian zones.

Pathway of Spread: Probable pathways include aquarium release; intentional stocking for the plants oxygenation capabilities, and fragments stuck on boats got transported to other areas (Nault, 2009).

Impacts: *L. major* is a popular aquarium and water garden plant, and the ability to order this plant over the internet and through mail order gives it the ability to travel to all parts of the world (Natural Heritage Trust, 2003). It has escaped confinement and has been intentionally introduced on several occasions outside of its native range. In the locales to which it has been introduced, it has often become the dominant plant species, outcompeting both native and previously established exotic species, in addition to displacing other species that depend on the ecosystem. *L. major* has the potential to colonize large areas within a growing season by means of vegetative propagation, and is listed as a noxious weed in many parts of the world (Nault, 2009).

Current Status in Colorado: This species is not established in the U.S. No verified presence in Colorado.

PHOTO COURTESY ROBERT VIDEKI

PHOTO COURTESY LESLIE J. MEHRHOFF, UNIVERSITY OF CONNECTICUT, BUGWOOD.ORG

Brazilian elodea (*Egeria densa*)

Native to South America, regions of Brazil to coastal areas of Argentina and Uruguay. Brazilian egeria is a prohibited Aquatic Nuisance Species (ANS). It is not legal to possess this species within the State of Colorado. If found, this species must be reported to CPW immediately. This species was found in Colorado in 2017. Refer to the species distribution map (2019) in Problem Definition Section of this document.

Identification: The plant grows mostly underwater but grows to form dense mats along the surface. Leaves grow in whorls of three to six around the stem making a cylindrical shape, and the stems are very leafy compared to the native elodea. The leaf edges appear smooth to the naked eye but the margins are minutely toothed, visible with low magnification. A distinguishing characteristic is the smooth midvein on the underside of the leaf. Small white flowers appear from June through October. They have three glossy petals that appear wrinkled, and float on or rise above the water's surface on thread-like stems. The species is dioicous, although all USA populations appear male. Fruits and seed are not produced in the USA. It reproduces solely by stolons and stem fragments. Brazilian egeria is commonly mistaken for the native elodea (*Elodea canadensis*) or common waterweed, as well as the exotic hydrilla (*Hydrilla verticillata*). Use the following table to help tell the difference between the two species or contact your local herbarium for assistance with identification.

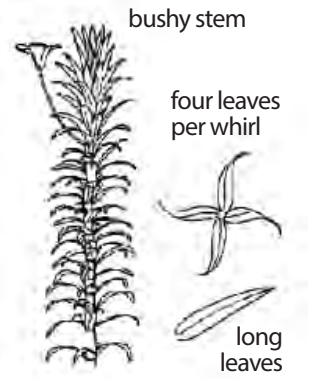

ILLUSTRATION COURTESY UNIVERSITY OF FLORIDA

Habitat: This noxious weed is a submersed, freshwater perennial plant found in both still and flowing waters including lakes, ponds and quiet streams. Brazilian elodea tends to form dense monospecific stands that can cover hundreds of acres. It prefers low light and tolerates variable water quality (turbidity, pollution, etc.). It can survive under ice for short periods but not prolonged freezing.

Pathway of Spread:

- Boats; Fragments of the plant could attach to the underside of a boat or boat trailer.
- It was originally introduced by the aquarium and water garden industry. It was sold for its oxygenating capabilities and for its attractive flowers. Once the plant's been introduced into a new habitat it can spread further without human activity.
- Can be bought online.

Impacts: A highly invasive aggressive species that colonizes a variety of habitats.

Current Status in Colorado: Found in Colorado in 2017 at the Metro Wastewater District's North Treatment Pond complex in Brighton.

Plant Characteristics	Brazilian elodea (exotic)	Common elodea (native)	Hydrilla (exotic)
Leave in whorl	3–6	3–5	5–8
Leaf margins toothed	Minutely, need magnification	No teeth	Coarse visible teeth
Midvein	Smooth	Smooth	1–4 conical bumps, midvein red
Flowers	Glossy White	White	Petals translucent, white to reddish
Reproductions	Stolons, fragments	Seeds, fragments, stolons	Turions, stolons, fragments

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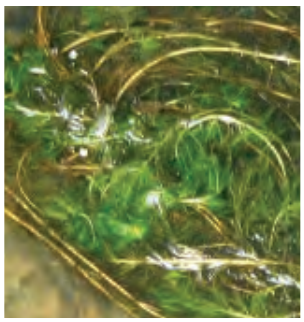

Eurasian watermilfoil (*Myriophyllum spicatum*)

The highest priority aquatic noxious weed in Colorado. This plant is native to Europe, Asia and Northern Africa. It was most likely introduced through the nursery trade in the 1940s, but possibly as early as the late 1880s. This is a highly aggressive species that can survive in a variety of habitats and grows an average of 1 foot per week.

Identification:

- Submerged, rooted, perennial
- Long branching underwater stems
- Feathery leaves in whorls of 4–5
- Leaves have 11–21 pairs of leaflets
- Closely spaced
- 1/2 inch in length
- Blunt or Flat Tip
- Collapses out of water

Habitat:

- Colonize a variety of systems
- Rivers, streams, creeks, ditches, canals
- Lakes, reservoirs, ponds
- Tolerates wide range of water conditions and depths
- Will grow long in 2 inches of water, and will grow tall in 40 feet of water.

Pathway of Spread:

- Reproduction
- Fragmentation
- Winter Buds
- When a water body is infested with EWM the long strands can get tangled and caught on the propeller or engines on boats. Boats can act as a pathway of spread because EWM can reproduce by just a fragment.

Impacts: These dense mats crowd out native species disrupt the food chain and displace native wildlife. It also impedes water recreation such as boating, swimming and fishing.

Current Status in Colorado: Present in Colorado, see (Appendix C) for the current list of waterbodies infested with EWM in 2019.

Giant salvinia (*Salvinia molesta*)

Native to Southeastern Brazil. It is a small free-floating fern that grows in clusters and develops into dense floating mats or colonies in quiet water, undisturbed by wave action.

Identification: The floating leaves of giant salvinia are oblong (0.5 to 1.5 inches long) with a distinct midrib along which the leaf may fold forming a compressed chain-like appearance. Leaves occur in whorls of three with two floating leaves and one submerged leaf. The entire plant is only about 1 to 2 inches in depth.

Habitat: Thrives in slow-moving, nutrient-rich, warm, freshwater.

Pathway of Spread: Boats, Trailers, recreational gear. New plants are known to form from fragments that break off existing plants and also as dormant buds break off nodes.

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Impacts: It is known to impact cultivated aquatic crops, clog irrigations canals and drinking water lines, and foul hydroelectric plants. This species impairs all forms of water-based recreation and has disastrous effects on the natural communities. Giant salvinia can completely cover waterways preventing the passage of sunlight and oxygen that native plants, fish, insects, and other species require, as well as covering open water that migrating waterfowl need to survive.

Current Status in Colorado: No verified presence in Colorado.

Water Hyacinth (*Eichornia crassipes*)

Native to Brazil and was introduced as an ornamental. It is still very commonly used for water gardening and home ponds. This species is notorious for clogging transportation systems and can colonize a wide variety of habitats.

Identification: Water hyacinth is a free-floating perennial plant that can grow to a height of 3 feet. Seedlings root in mud and then break free and float once mature. The mature plants are linked together by underwater stolons. The dark green succulent leave blades are circular to elliptical in shape attached to a spongy, inflated petiole. All leaves are smooth, basal, and emerged. Underneath the water is a thick, heavily branched, dark fibrous root system. Roots are feathery and typically more than 3 feet in length. The flowers are large (2 to 3 inches) and attractive. They can be pale blue, lilac, or white with a yellow spot located on a terminal spike. The flowers bloom from June through October.

Habitat: *Eichornia crassipes* inhabits slow-flowing freshwaters. Optimal growth occurs at water temperatures of 28°–30°C.

Pathway of Spread: Introduced as an ornamental plant, can be bought online.

Impacts: Water hyacinth is a very aggressive invader and can form thick mats. If these mats cover the entire surface of the pond they can cause oxygen depletions and fish kills.

Current Status in Colorado: Found in Alamosa, CO in (2006), and was found in Centennial, CO (detected and eradicated in 2010).

PHOTO COURTESY LESLIE J. MEHRHOFF, UNIVERSITY OF CONNECTICUT, BUGWOOD.ORG

Hydrilla (*Hydrilla verticillata*)

Native to Europe, Asia, and central Africa. It was first introduced in Florida in 1958 for use in the aquarium industry. It is currently considered by many to be the worst aquatic weed in the USA taking the title away from Eurasian watermilfoil.

PHOTO COURTESY LESLIE J. MEHRHOFF, UNIVERSITY OF CONNECTICUT, BUGWOOD.ORG

Identification: Hydrilla is a submerged, rooted, perennial plant that forms dense colonies and can grow to the surface in water over 20 feet deep. Hydrilla branches profusely and after reaching the surface it extends across it forming thick mats. Hydrilla can reproduce by fragmentation, from seeds, and it also produces 1/4-inch turions at the leaf axils and potato-like tubers attached to the roots in the mud. Leaves are blade-like about 1/8 inch and 3/8 inch long with small tooth margins. The underside of the leaf has a red midrib with one to four spines or conical bumps, making them feel rough. Leaves are usually four to eight in a whorl. Hydrilla produces tiny, translucent white to reddish flowers on long stalks. Plants flower from June through October.

Habitat: It has amazing reproductive capabilities that allow it to grow in almost any freshwater, in variable conditions with either low or high nutrient amounts, or a wide temperature tolerance (68°–86°F). It is able to first establish itself in low-light deep waters, similar to Brazilian egeria, and then move towards the shallow banks.

© PHOTO BY JEFF SCHARDT FLORIDA D.E.P.

Pathway of Spread: Boats; Fragments can get trapped on the propeller, engine, live wells, or any compartment on the boat.

Impacts: Hydrilla has an extremely rapid growth rate which quickly out competes and eliminates native species, forms surface mats that hinder recreation, navigation, and water intakes.

Current Status in Colorado: No verified presence in Colorado.

PHOTO COURTESY LESLIE J. MEHRHOFF, UNIVERSITY OF CONNECTICUT, BUGWOOD.ORG

Parrotfeather	Eurasian Watermilfoil
Leaflets in pairs of 20 to 30	Leaflets in pairs of 12 to 20
Submerged leaves 0.6 to 1.4 inches long	Submerged leaves 0.5 to 2.0 inches long
Submerged leaves 5 to 6 per whorl	Submerged leaves 3 to 5 per whorl
Emergent leaves 0.8 to 2 inches long with 16 to 18 leaflets per leaf	No emergent leaves
Flowers April through July	Flowers June through September
Fruits not known outside of native range	Fruits are hard, segmented capsule

Parrotfeather (*Myriophyllum aquaticum*)

Native to the Amazon River in South America. However, it can be found worldwide now. It is thought that this plant was introduced to North America around the 1800s as an ornamental species.

Identification: Parrotfeather has both submersed and emergent leaves, with the submersed form being easily mistaken for Eurasian waterfilfoil (*Myriophyllum spicatum*). Use the below chart to help distinguish between Eurasian watermilfoil and parrotfeather. Parrotfeather gets its name from its feather-like leaves which are arranged around the stem in whorls of four to six. Submersed leaves are 0.6 to 1.4 inches long and have 20 to 30 divisions per leaf. The emergent leaves are 0.8 to 2 inches long and have 6 to 18 divisions per leaf. The bright green emergent leaves can be very stiff and a darker green than the submersed leaves. The emergent stems and leaves are the most distinctive trait of parrotfeather, as they can grow up to a foot above the water surface and look almost like small fir trees.

Habitat: As it prefers a warmer climate, it is chiefly found in the southern parts of the United States. Parrotfeather is a freshwater plant which prefers shallow waters less than 5 feet; it can be found in lakes, ponds, and streams.

Pathway of Spread: Cultivated as an ornamental species for ponds.

Impacts: Parrotfeather seriously alters the physical and chemical characteristics of lakes and streams. Its infestations alter aquatic ecosystems by shading out algae and providing choice mosquito larvae habitat. Dense infestations also cause flooding and drainage problems, and its mats can restrict recreational activities.

Current Status in Colorado: No verified presence in Colorado.

Yellow floating heart (*Nymphoides peltata*)

Native to Asia and Europe.

Identification:

- Flowers are bright yellow with 5 petals, located above the surface of the water
- Leaves are circular or heart shaped
- Leaves are alternately arranged on the stem but oppositely on the flower stalk
- Seeds are flat and oval, many seeds per capsule

Habitat: This perennial aquatic plant is most commonly found in slow moving rivers, ponds, and lakes.

Pathway of Spread: Cultivated as an ornamental species for ponds.

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Impacts: Yellow floating heart can create dense mats that shade out native aquatic plants, decrease oxygen levels, increase mosquito breeding habitat, and impede boating activity, fishing, and swimming. Fragmented pieces of plants can establish new populations and seeds are engineered to disperse by attaching to the feathers of waterfowl.

Current Status in Colorado: No verified presence in Colorado.

Appendix E—CDA's Noxious Weed List

Colorado Noxious Weeds (Including Watch List), effective June, 2020:

List A Species (25)	
Common Name	***Scientific Name***
African rue	*Peganum harmala*
Bohemian knotweed	*Fallopia x bohemicum*
Camelthorn	*Alhagi maurorum*
Common crupina	*Crupina vulgaris*
Cypress spurge	*Euphorbia cyparissias*
Dyer's woad	*Isatis tinctoria*
Elongated mustard	*Brassica elongata*
Flowering rush	*Butomus umbellatus*
Giant knotweed	*Fallopia sachalinensis*
Giant reed	*Arundo donax*
Giant salvinia	*Salvinia molesta*
Hairy willow-herb	*Epilobium hirsutum*
Hydrilla	*Hydrilla verticillata*
Japanese knotweed	*Fallopia japonica*
Meadow knapweed	*Centaurea x moncktonii*
Mediterranean sage	*Salvia aethiopis*
Medusahead	*Taeniatherum coput-medusae*
Myrtle spurge	*Euphorbia myrsinites*
Orange hawkweed	*Hieracium aurantiacum*
Parrotfeather	*Myriophyllum aquaticum*
Purple loosestrife	*Lythrum salicaria*
Rush skeletonweed	*Chondrilla juncea*
Squarrose knapweed	*Centaurea virgata*
Tansy ragwort	*Senecio jacobaea*
Yellow starthistle	*Centaurea solsitialis*

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List B Species (38)	
Common Name	***Scientific Name***
Absinth wormwood	*Artemisia absinthium*
Black henbane	*Hyoscyamus niger*
Bouncingbet	*Saponaria officinalis*
Bull thistle	*Cirsium vulgare*
Canada thistle	*Cirsium arvense*
Chinese clematis	*Clematis orientalis*
Common tansy	*Tanacetum vulgare*
Common teasel	*Dipsacus fullonum*
Cutleaf teasel	*Dipsacus laciniatus*
Dalmatian toadflax, broad-leaved	*Linaria dalmatica*
Dalmatian toadflax, narrow-leaved	*Linaria genistifolia*
Dame's rocket	*Hesperis matronalis*
Diffuse knapweed	*Centaurea diffusa*
Eurasian watermilfoil	*Myriophyllum spicatum*
Hoary cress	*Cardaria draba*
Houndstongue	*Cynoglossum officinale*
Jointed goatgrass	*Aegilops cylindrica*
Leafy spurge	*Euphorbia esula*
Mayweed chamomile	*Anthemis cotula*
Moth mullein	*Verbascum blattaria*
Musk thistle	*Carduus nutans*
Oxeye daisy	*Leucanthemum vulgare*
Perennial pepperweed	*Lepidium latifolium*
Plumeless thistle	*Carduus acanthoides*
Russian knapweed	*Rhaponticum repens*
Russian-olive	*Elaeagnus angustifolia*
Salt cedar	*Tamarix. Ramosissima*
Salt cedar	*T. chinensis*
Scentless chamomile	*Tripleurospermum inodorum*
Scotch thisle	*Onopordum acanthium*
Scotch thisle	*O. tauricum*
Spotted knapweed	*Centaurea stoebe L. ssp. micranthos*
Spotted x diffuse knapweed hybrid	*Centaurea x psammogena*
Sulfur cinquefoil	*Potentilla recta*
Wild caraway	*Carum carvi*

List B Species (38) *continued*	
Common Name	***Scientific Name***
Yellow nutsedge	*Cyperus esculentus*
Yellow toadflax	*Linaria vulgaris*
Yellow x Dalmatian toadflax hybrid	*Linaria vulgaris x L. dalmatica*

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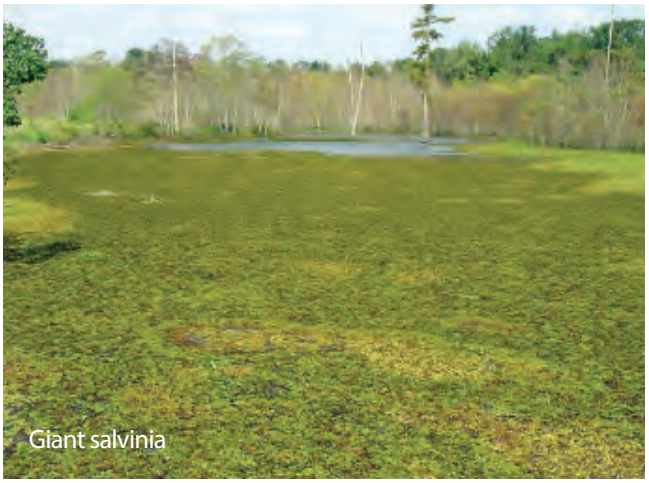
List C Species (16)	
Common Name	***Scientific Name***
Bulbous bluegrass	*Poa bulbosa*
Chicory	*Cichorium intybus*
Common burdock	*Arctium minus*
Common mullein	*Verbascum thapsus*
Common St. Johnswort	*Hypericum perforatum*
Downy brome, cheatgrass	*Bromus tectorum*
Field bindweed	*Convolvulus arvensis*
Halogeton	*Halogeton glomeratus*
Johnsongrass	*Sorghum halepense*
Perennial sowthistle	*Sonchus arvensis*
Poison hemlock	*Conium maculatum*
Puncturevine	*Tribulus terrestris*
Quackgrass	*Elymus repens*
Redstem filaree	*Erodium cicutarium*
Velvetlead	*Abutilon theophrasti*
Wild proso millet	*Salvia aethiopis*

Watch List Species (19)	
Common Name	***Scientific Name***
Baby's breath	*Gypsophila paniculata*
Caucasian bluestem	*Bothriochloa bladhii*
Common bugloss	*Anchusa officinalis*
Common reed	*Phragmites australis*
Garden loosetrife	*Lysimachia vulgaris*
Garlic mustard	*Alliaria petiolate*
Himalayan blackberry	*Rubus armeniacus*
Hoary alyssum	*Berteroa incana L.*
Meadow hawkweed	*Hieracium caespitosum*
Onionweed	*Asphodelus fistulosus*
Siberian elm	*Ulmus pumila*
Scotch broom	*Cytisus scoparius*
Swainsonpea	*Sphaerophysa salsula*
Syrian beancaper	*Zygophyllum fabago*
Tree of Heaven	*Ailanthus altissima*
Ventenata grass	*Ventenata dubia*
White bryony	*Bryonia alba*
Yellow bluestem	*Bothriochloa ischaemum*
Yellow flag iris	*Iris psuedacorus*



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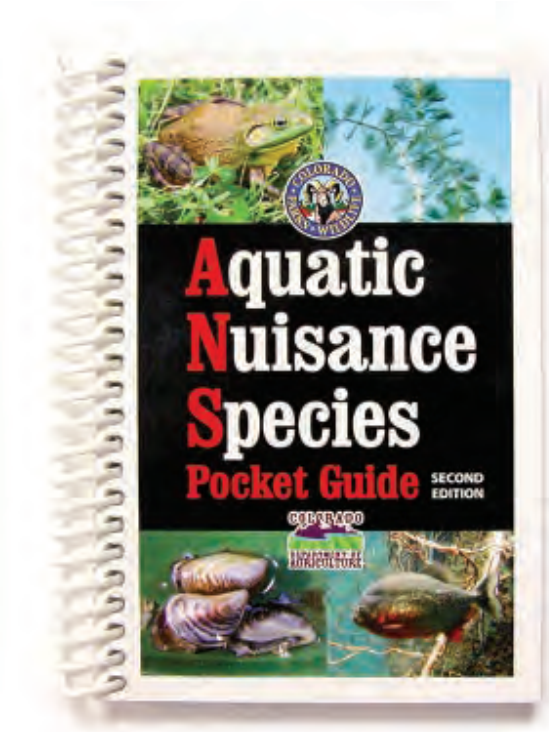

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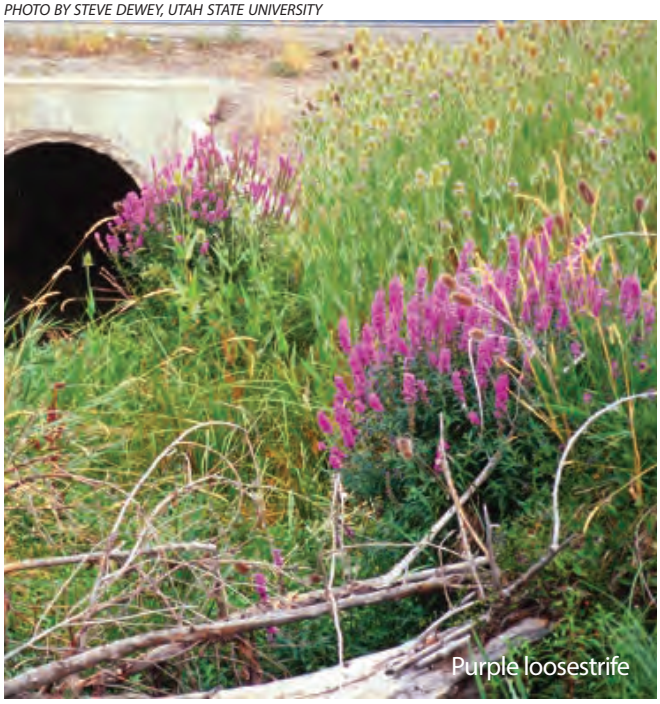

Purple loosestrife

Quagga Mussels

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