

# State of Colorado Zebra and Quagga Mussel Management Plan



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## Executive Summary

The Colorado Zebra/Quagga Mussel Management Plan (ZQM Plan) outlines a statewide collaborative effort to detect, contain, and substantially reduce the risk of the spread and further infestation by zebra/quagga mussels in Colorado. The Plan is coordinated by the Colorado Division of Wildlife (CDOW) as part of the State Aquatic Nuisance Species (ANS) Program. The Plan's primary components are early detection and rapid response, containment, prevention and education/outreach.

The backbone of the ZQM Plan is mandatory watercraft inspection and decontamination to prevent the spread of mussels overland on recreational watercraft. The watercraft inspection and decontamination component focuses primarily on the highest risk watercraft coming from out-of-state, regardless of residency, and those that have recently been in infested waters. According to State ANS Regulations, it is mandatory for all watercraft coming from out-of-state and those leaving an infested water to get an inspection and, if necessary, get decontaminated prior to launching in any waters of the state.

Standardized watercraft inspection and decontamination protocols have been implemented at a variety of inspection stations throughout the state to provide ample opportunity for watercraft owners to comply with the mandatory inspection regulations. Inspection and decontamination station locations will include, but are not limited to, (1) infested lakes and reservoirs, (2) state offices convenient for entry into Colorado, (3) private industry locations such as marine dealers, (4) high risk non-infested waters and (5) mobile roving watercraft inspection and decontamination units targeting random lakes and reservoirs. Each station placed at high risk waters will be multi-purpose, offering preventative or containment inspections to those entering or leaving that specific water body, and inspections and decontaminations for out-of-state watercraft.

Bodies of water, and water-based recreation, are often managed by multiple interests: federal, state, county and municipal agencies, marina operators and private entities. A goal of the ZQM Plan is to ensure watercraft inspection and decontamination stations placed at lakes and reservoirs are operated by the recreational manager with support from CDOW (law enforcement, training, certification, educational materials, signage, forms, etc). Due to the highly invasive nature of zebra and quagga mussels and their limited distribution in Colorado and the western United States, it is of critical importance that these entities cooperate to achieve the ZQM Plan's goals for waters of the state, regardless of jurisdiction.

ANS, especially zebra and quagga mussels, can result in severe impacts to water supply and distribution infrastructure for municipal, industrial and agricultural uses. These mussels negatively impact fisheries and all forms of water-based recreation (particularly boating and fishing interests). ANS can cause damage to watercrafts, motors and inhibit access opportunities. The economic impacts associated with mussel invasions can be devastating. In a survey of Eastern U.S. and Canada water users in 1995, Oneill found 339 facilities reported total zebra mussel related expenses of \$69,070,780 (Oneill, Jr., C.R. 1997).

The CDOW places a high importance on preventing and controlling zebra and quagga mussels in Colorado to protect not only our invaluable wildlife resources, but also our recreation and tourism industry, water storage and distribution systems, agricultural production and the state's overall economy. The CDOW encourages the larger water community to conduct facility assessments and implement preventative measures to reduce the risk of transportation through, and invasion of, water distribution systems. There are currently few, if any, proven control methods to mitigate the downstream movement of juvenile veliger mussels in natural environments. However, there are preventative and control measures that can be taken in water distribution systems. References outlining specific control measures are listed in the Appendices.

CDOW encourages all partners and citizens to take every precaution to stop the spread of zebra and quagga mussels and other aquatic nuisance species.

The ZQM Plan is a working document and will be updated regularly as implementation progresses and new information becomes available.

## **Partners**

Preventing the spread of zebra and quagga mussels and other aquatic nuisance species requires a high level of cooperation and coordination between federal, state, county and municipal agencies, marina operators, private entities and recreationists. Many of these entities have partnered together to form the Zebra and Quagga Mussel Task Force (ZQM Task Force) to develop and implement the ZQM Plan and to periodically review and update it. The ZQM Task Force is an ongoing collaborative work group that acts as a permanent zebra and quagga mussel management team and shares information and coordinates on field projects, educational efforts, protocol development, public relations, trainings and obtaining resources. Detailed information concerning the roles and jurisdiction of each entity is provided in Appendix A. Due to the multi-jurisdictional nature of Colorado waters, the ZQM Plan recommendations apply to all partners; for no single entity is responsible for, or capable of, implementing all of the necessary actions needed to protect Colorado waters from invasive mussels or other ANS.

### **State Government**

The Colorado Department of Natural Resources (CDNR) has authority to manage wildlife, recreation, and water resources in Colorado. The two CDNR divisions that manage for zebra and quagga mussels are the Colorado Division of Wildlife and Colorado State Parks. The Colorado Water Conservation Board and the Colorado Division of Water Resources are integral partners in the zebra and quagga mussel program. Additional state entities involved in the ZQM program include the Colorado Wildlife Commission, the Colorado Parks Board, the Colorado Fish Health Board, Colorado Department of Public Health and the Environment, Colorado Department of Agriculture, Colorado Department of Revenue, Colorado Office of Economic Development and International Trade, and the Colorado Tourism Office.

## **Federal Government**

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 problem, such as importation, interstate transport, exclusion, control, and eradication. Federal ANS management activities are coordinated through the ANS Task Force created by the National Aquatic Nuisance Prevention and Control Act of 1990 and amended in 1996 as the National Invasive Species Act. 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. Federal partners for the Colorado ZQM Program include the U.S. Army Corps of Engineers (ACOE), U.S. Bureau of Land Management (BLM), U.S. Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), National Park Service (NPS), and the Bureau of Indian Affairs (BIA).

## **Local Governments**

Cooperation from Colorado cities and counties is critical to the success of the ANS Program. Many waters in the state are owned and/or managed by local governments. Several Front Range municipalities have taken a pro-active approach to the zebra/quagga mussel problem by implementing watercraft inspection and decontamination at their reservoirs and lakes in 2008. Those governments are City of Aurora, City of Boulder, City of Denver, and City of Westminster. CDOW 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 ZQM Plan, we greatly increase the probability of preventing the spread of ANS in Colorado.

## **Recreational User Groups / Non-Governmental Organizations**

There are many non-governmental organizations (NGOs) that have an interest in preventing the spread of invasive species. In 2005, the Colorado Women Fly-Fishers located a new population of New Zealand mudsnail in the South Platte and was integral in rapid response. In 2007, The Nature Conservancy and Trout Unlimited played crucial roles in the development of the State ANS Management Plan and continue to serve on the State ANS Task Force. In 2008, private industries such as the two marinas at Lake Dillon, Red Mountain RV at Wolford Reservoir, and marine dealers, such as Tommy's Slalom, Inc. took an active role implementing watercraft inspection and decontamination at their locations. These entities are crucial to the success of the ZQM Plan and the CDOW 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 and early detection and rapid response. The CDOW will direct its messages to the following recreationists and special interest groups; marinas, marine dealers, boating 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, and many more.

## Early Detection

### *Statewide Sampling and Monitoring*

CDOW is the lead agency for statewide ANS Early Detection Sampling and Monitoring. Beginning in 2005, ANS sampling and monitoring was focused on collecting baseline data on all species present at survey locations, while specifically checking for over 35 plant and animal species. Following the discovery of zebra mussels at Lake Pueblo in 2007, the ANS early detection program was redesigned in 2008 to focus on an intense ZQM sampling program with temporary full-time technicians utilizing three sampling methods. First, plankton tows were performed to sample for veligers (the planktonic larval form of zebra and quagga mussels). Second, artificial substrates were deployed at set locations and were checked for attached adult mussels. Third, shoreline surveys were performed to look for adults and other ANS. Protocols for standard sampling methods can be found in Appendix B-C.

Waters are sampled based on a risk assessment conducted specifically for zebra and quagga mussels. The risk assessment was completed in June 2008 and identified 19 *very high* risk waters, 17 *high* risk waters, 58 *medium* risk waters, and 64 *low* risk waters (Appendix D). Technicians visited very high and high risk waters bi-weekly, medium-risk waters monthly and low-risk waters periodically (Appendix F). The sampling season and schedule was determined by surface water temperatures which influence plankton productivity. Research has shown that plankton productivity is positively correlated with veliger production. The sampling began as soon as the surface temperature reached 50° F, the temperature conducive to the highest plankton productivity and continued until the temperature dropped below that level. CDOW technicians conducted all three sampling methods and also performed the microscopy analysis on plankton tow samples.

In 2009, aggressive sampling will continue according to specifications determined in 2008 and revisions to protocol as recommended by the *Colorado Blue Ribbon Panel Report* (February 2009) and the 100<sup>th</sup> Meridian Initiative's *Interagency Dreissena Monitoring Plan for Western Waters* (May 2009). CDOW technicians will sample all 158 "at risk" waters specifically for zebra and quagga mussels. Technicians will also resume activities begun in 2005 to sample for all ANS while collecting baseline data. Identification of specimens will be conducted at the AAHL.

The State ANS Regulations require all persons conducting sampling for aquatic nuisance species, including zebra and quagga mussels, to be permitted by CDOW. Due to the prohibited nature of ANS, the CDOW Special Collections Permit for wildlife species collection does not apply. Any entity intending to conduct sampling for aquatic nuisance species must request a permit in writing to the CDOW ANS Program. Only the Director of the Division of Wildlife can approve the permit request. Entities requesting permits should attend the State ANS Sampling and Monitoring Training School taught annually by CDOW and Reclamation in April and August.

## ***Equipment Decontamination***

Every precaution is taken to ensure that efforts made to sample and monitor for ANS do not further endanger the state's waters. All persons, including DNR employees, conducting work activities in Colorado waters are required by the ANS Act to decontaminate their watercraft and all field equipment between water bodies. Work activities include sampling, scientific collection, infrastructure maintenance, filling water trucks, pumping equipment for wildfire fighting or mineral extraction, and all other water-based activities. Disinfection is especially important between sampling efforts in different reaches of the same stream, or between individual waters in order to minimize the chance of spreading zebra and quagga mussels and other ANS such as whirling disease, weeds and/or parasites to uninfected areas.

## ***Preserving and Shipping Samples***

Standard procedures to collect, preserve, and ship samples of adult and veliger larvae have been developed by AAHL (See Appendix B-C). These procedures ensure that the specimens can be positively identified and that accurate information can be conveyed between agencies. There are many entities performing water quality monitoring in Colorado. Those entities are encouraged to cooperate with CDOW to expand the reaches of the state sampling program to more waters.

## ***Identification of Samples***

The CDOW is able to provide identification services to partners for all ANS. ZQM identification relies on a three-stage process for positive confirmation of zebra or quagga mussel veligers in plankton tow samples. The first phase is a visual identification using a microscope or FlowCAM (digital video scanning/recording plankton identification instrument). Following the visual identification of a suspected veliger, the sample is then analyzed by a laboratory for DNA analysis. The lab first performs polymerase chain reaction (PCR) testing to determine if there is zebra/quagga mussel DNA in the sample. If the PCR test is positive, the laboratory performs gene sequencing to determine the specific mussel species. For veliger identification, a single positive ID with microscopy, PCR and gene sequencing is required to declare a body of water positive for zebra or quagga mussels.

Adults are identified visually by trained scientists. DNA verification may or may not be required to confirm the identification of an adult mussel.

## ***Notification of Infested Water***

The CDOW will declare a water positive for zebra or quagga mussels based on one set of positive test results on a single sample from the multi-tier 3-phase identification process (microscopy, PCR and gene sequencing - both ocular and molecular) or adult identification. If disparaging results are encountered, a body of water may be declared suspect for zebra or quagga mussels until confirmation can be obtained. Once a body of water is declared positive for mussels, genetic confirmation of future monitoring samples containing veligers is may no longer

be required. However, sampling will increase after detection to monitor growth rate and spread of the invasion.

Historically, CDOW communicates with the land and water managers throughout the mussel sampling and identification process. CDOW notifies both internal staff and critical partners (land owner, water owner, recreation manager, facilities manager, etc.) at the conclusion of the second testing phase, if there is a positive PCR result. Notification is prior to the third and final phase, speciation via gene sequencing. Early communication aids in preparing rapid response plans and drafting communication documents, such as a joint press releases, to speed up public notification. The public is notified directly after the final test results through a CDOW press release (see Appendix G).

## ***Reporting***

Any person who knows that an ANS is present or suspected at a specific location is required by the ANS Act to immediately report the sighting to the Division of Wildlife Invasive Species Program, 6060 Broadway, Denver, CO 80216. Within 10 days, the Division will notify the reporter of the identification results, or the status of the identification process.

All authorized agents and qualified peace officers performing watercraft inspection and decontamination are required to send suspect samples or known ANS taken from a watercraft or water body to AAHL immediately.

Any persons or agencies performing sampling or monitoring for ANS must first obtain an ANS sampling permit from CDOW. Permit holders are required to report according to rules set forth in the State ANS Regulations.

There are four options for reporting:

- a. Federal ANS Hotline: 1-877-STOP-ANS
- b. State ANS Hotline: 1-303-293-6531
- c. Email: ReportANS@state.co.us
- d. Website: [www.colorado.gov/wildlife](http://www.colorado.gov/wildlife)

Reports should be accompanied by standard CDOW forms, supplied on the website and by request. If they are not available, useful data to be included in a standard report is:

1. Date/Time that specimen was found
2. Exact location of sighting (water body and specific location on water body)
3. Suspected species
4. Name and contact information of the collector

## Containment and Prevention: Watercraft Inspection and Decontamination Program

The best method of protection against an invasive mussel introduction is through preventative measures. Prevention is much less expensive than containment or control efforts. Although containment at infested waters is the top priority, CDOW recommends that focus be placed on prevention through field watercraft inspection and decontamination, in conjunction with education and information efforts.

The goal of the State ANS Program in CDOW is to coordinate and implement seamless and consistent watercraft inspection and decontamination stations statewide. The priorities are based on the risk assessment conducted by CDOW in June 2008, which focuses on the risk of mussels being introduced by both the recreational and downstream vectors, in addition to placement in the watershed.

A revised risk assessment is recommended. The goal is to complete two risk assessments, with the first focused on risk of introduction due to recreational pressures or geographic approximation to infested waters, and the ability for the mussels to establish based on water chemistry parameters. The second should be focused on the risk of high negative impact if a sustainable mussel population were to be established. Currently, there is not enough data to complete these assessments. In order to accurately assess risk, water samples must be collected, analyzed and compiled to determine habitat suitability.

Assessment	Assessment Criteria	Criteria Description
Probability of ZQM being introduced and able to establish	Susceptibility	Probability of an introduction due to recreational pressures or geographic approximation to infested water.
	Habitat Suitability	The probability of ZQM being able to sustain a viable population if introduced based on water chemistry parameters.
Probability of high negative impact if mussels were to be established	Potential impact to water infrastructure	Risk of impacts to facilities, location in watershed and impact to municipal, industrial and agricultural water storage and supply.
	Potential impact to fisheries	Risk of impact to fisheries.

The goal of the watercraft inspection and decontamination program is to ensure a seamless program across jurisdictions, which enable out-of-state and resident boaters a convenient process to ensure ANS are not being transported on watercraft. These stations will be located at infested waters, high risk waters and convenient locations so that it is relatively easy for boaters to prevent the spread of ANS by complying with the inspection requirement. Watercraft inspection and decontamination stations that are not located at a specific water body will be operated by the owner (for example, CDOW will operate stations at CDOW offices; marine dealers may operate stations at their dealership, etc).

Site-specific plans will be written for each body of water on the risk assessment. These plans will be written in phases over many years beginning with the highest risk waters. The site specific watercraft inspection and decontamination stations will be founded on partnerships between CDOW and the land, water, recreation owners and managers at each specific body of water. The watercraft inspection and decontamination station will be operated by the recreational manager, owner or a private entity; with support from CDOW in the form of law enforcement support, training, certification, sampling/monitoring, educational materials, signage, standard forms and outreach. Although CDOW will be the coordinating agency for each site-specific effort, *it will require the collective efforts and resources from all direct partners to implement the field watercraft inspection and decontamination program.*

Watercraft inspection and decontamination stations will be multi-purpose, offering preventative or containment inspections to those entering or leaving that specific water body and inspections/decontaminations for watercrafts coming from outside of Colorado. The inspection and decontamination stations, regardless of management entity, will operate according to the Official State of Colorado Watercraft Inspection and Decontamination Procedures (adopted into regulation on February 20, 2009 and published in March 2009.).

The watercraft inspection and decontamination program will provide a large network of opportunities for boaters to minimize the risk of an introduction of zebra and quagga mussels, and other invasive species into state waters. The inspection and decontamination program has four components, listed below:

<b>Component</b>	<b>Definition</b>
Containment at Infested Waters	No trailered watercraft will leave infested water without an inspection. All persons with trailered motorized watercraft must submit to an inspection and if necessary decontamination prior to exiting an infested water. If an inspection station is inoperable or not available, the boat must get an inspection and if necessary decontamination at a state certified location prior to launching in any other water of the state.
Prevention Targeting Out-of-State Watercrafts	All trailered watercraft registered in a state other than Colorado, and all Colorado registered watercraft that have been in out of state waters within the last 30 days, are prohibited from launching on any water of the state without a prior inspection and if necessary, decontamination.
Prevention at Uninfested Waters	When required by the lake or reservoir, all trailered watercraft must submit to an inspection and if necessary decontamination prior to entering a high, medium or low risk water that is negative for ANS to prevent an introduction.
Roving Watercraft Inspection and Decontamination Patrols	CDOW roving inspection patrols will randomly set up watercraft inspection and decontamination stations at the waters without a permanent inspection program in place (typically medium and low risk waters). Boaters should expect to be inspected prior to launching on any water of the state.

## ***Containment at Infested Waters***

It is critical to prevent contaminated watercraft from spreading ZQM veliger or adults from infested waters to uninfested waters. There are currently no effective methods to control the downstream movement of veligers in the natural flow of water. We can, however, mitigate the potential overland spread from watercraft. It is essential that boats recreating on infested waters be inspected and, if necessary, decontaminated prior to launching in any other waters.

As of April 2008, there are seven positive waters and one suspect water in Colorado, summarized below. It is the highest priority that no watercraft leaves these waters without being inspected by a state authorized agent and decontaminated, if necessary. The majority of reservoirs in Colorado are owned and managed by federal, state, local and private entities. Typically, there are a minimum of three to five entities involved in creating and implementing a site-specific field response. *It is critical that all entities involved work together to contain infestations.*

<b>Positive Water</b>	<b>Owner</b>	<b>Recreation Manager</b>	<b>Date Tested Positive</b>
Pueblo	Bureau of Reclamation	State Parks, CDOW	January 17, 2008
Lake Granby	Bureau of Reclamation	U.S. Forest Service	July 10, 2008
Shadow Mountain	Bureau of Reclamation	U.S. Forest Service	September 26, 2008
Willow Creek	Bureau of Reclamation	U.S. Forest Service	September 26, 2008
Grand Lake	Town of Grand Lake	U.S. Forest Service	September 26, 2008
Tarryall Reservoir	CDOW	CDOW	October 8, 2008
Jumbo Reservoir	Julesburg Irrigation District	CDOW	October 8, 2008

<b>Suspect Water</b>	<b>Owner</b>	<b>Recreation Manager</b>	<b>Date Tested Positive</b>
Blue Mesa Reservoir	Bureau of Reclamation	National Park Service	February 19, 2009

1. **Pueblo Reservoir** – Positive for zebra mussels on January 17, 2008. Positive for both zebra and quagga mussels on September 26, 2008. This reservoir is owned and operated by the Bureau of Reclamation, with recreational management by State Parks and CDOW. State Parks is the lead agency on Pueblo watercraft inspection and decontamination station. In 2008, parks operated the watercraft inspection and decontamination program twenty-four hours per day, seven days per week, for approximately nine months each year. The program began in March 2008 utilizing a \$1M grant from the Colorado Water Conservation Board (CWCB). Since July 2008, the program has been funded by the ANS Act allocation. In 2009, parks is operating the watercraft inspection and decontamination station sixteen hours per day, seven days a week
2. **Lake Granby** – Positive for quagga mussels on July 10, 2008. Owned by the Bureau of Reclamation, managed by the U.S. Forest Service, water interests owned by Northern Colorado Water Conservancy District. CDOW was the lead agency on the watercraft inspection and decontamination program in 2008 and 2009. Beginning August 15, 2008, CDOW hired temporary FTE to perform watercraft inspection and decontamination at the

boat ramps, Friday through Sunday through October 15<sup>th</sup>. In 2009, the inspection stations were operated by CDOW beginning May 15<sup>th</sup> from 6:00 am – 8:00 pm at Sunset and Stillwater Ramps. Both ramps remain open at night and Arapahoe Bay remains open without inspection in 2009. Additional educational and watercraft inspection and decontamination opportunities are provided in September and October to private slip owners and marina operators to assist with boats leaving that have been in the water all season.

3. **Grand Lake** – Positive for quagga mussels on September 26, 2008. Owned and managed by the Town of Grand Lake. Connected to Lake Granby. CDOW hosted a watercraft inspection and decontamination day on September 27, 2008 to check watercrafts leaving for the season and to educate homeowners and marina slip renters. In 2009, the CDOW operated an inspection station on the public ramp beginning May 15<sup>th</sup> from 6:00 am – 8:00 pm. The public ramp remains open at night without inspections. Additional educational and watercraft inspection and decontamination opportunities are provided in September and October to private slip owners and marina operators to assist with boats leaving that have been in the water all season.

In August 2009, the Greater Grand Lake Shoreline Association (GGLSA) adopted the zebra/quagga mussel “drop a brick” program to voluntarily assist the CDOW effort to monitor for mussels. Homeowners deployed state provided bricks as substrate for mussel sampling and pledged to check the bricks and their infrastructure for mussels and send any suspects to the AAHL.

4. **Shadow Mountain Reservoir** – Positive for quagga mussels on September 26, 2008. Owned by the Bureau of Reclamation, managed by the U.S. Forest Service, water interests owned by Northern Colorado Water Conservancy District. Connected to Lake Granby and Grand Lake. In 2009, the CDOW operated inspection stations on the Green Ridge Ramp beginning May 15<sup>th</sup> from 6:00 am – 8:00 pm. Hilltop Ramp was closed by the USFS to assist with this effort. The ramps remain open at night without inspections. Additional educational and watercraft inspection and decontamination opportunities are provided in September and October to private slip owners and marina operators to assist with boats leaving that have been in the water all season.
5. **Willow Creek Reservoir** - Positive for quagga mussels on September 26, 2008. Owned by the Bureau of Reclamation, managed by the U.S. Forest Service, water interests owned by Northern Colorado Water Conservancy District. Connected through a pipeline to Shadow Mountain Lake. Willow Creek is closed to trailered watercraft use in 2009 by the USFS to assist with containment.
6. **Tarryall Reservoir** - Positive for quagga mussels on October 8, 2008. Owned and managed by CDOW. Beginning July 17, 2008, CDOW temporary FTE inspectors staffed the boat ramps from dawn until dusk Thursday through Monday. The reservoir was closed to boating for the season on October 31, 2008. In 2009, the reservoir opened when boat inspections began May 1<sup>st</sup> at the north boat ramp from 6:00 am – 10:00 pm, Thursdays through Mondays. Overnight beaching of boats is prohibited. The reservoir is

not accessible to trailered watercraft when inspectors are not present. The reservoir will once again close to boating on October 31, 2009.

7. **Jumbo Reservoir** - Positive for quagga mussels on October 8, 2008. Owned by the Julesburg Irrigation District and managed by CDOW. At the time of positive test results, Jumbo was closed to boating due to potential safety issues and conflicts between anglers and waterfowl hunters. Only permitted hunters were allowed to launch watercraft and they were given strict instructions to clean, drain, dry. In 2009, boat inspections began May 1<sup>st</sup> at the east boat ramp (near the outlet tower) from 6:00 am – 10:00 pm, seven days a week and will conclude October 1<sup>st</sup>. All other ramps will only be open to hand-launched boats. All boat ramps will be closed at night. The reservoir is not accessible to trailered watercraft when inspectors are not present. Overnight beaching of boats is prohibited. Boat inspections and the general boating season will end on October 1<sup>st</sup>. Boating is prohibited Oct. 1 through last day of regular goose season, except hand-propelled, non-motorized, craft used to set and pick up decoys and retrieve downed waterfowl.
8. **Blue Mesa Reservoir – Suspect for Quagga Mussels** – National Park Service collected plankton tow samples for analysis at Reclamation in 2008. On February 19, 2009, Reclamation reported inconclusive results which indicated there were positive microscopy results but negative DNA results from a single sample in March 2008. Subsequently, a single sample collected in May 2008 also showed inconclusive results which indicated there were negative microscopy results but positive DNA results. Sampling will increase in 2009 to determine if mussels are present in the reservoir or not.

NPS and CDOW have partnered to implement both containment and prevention protocols for the 2009 boating season. Boat inspections began May 8<sup>th</sup> at Elk Creek, Stevens Creek and Lake Fork Boat Ramps from 5:30 a.m. – 9 p.m., 7 days a week. All other boat ramps are closed to trailered watercraft. Ramps will be closed to nighttime use; however, overnight beaching will be allowed.

A multi-agency team coordinated by CDOW will determine the future management agreement for the above infested bodies of water to be implemented in 2010. This site-specific planning effort is scheduled to be concluded before March 2010. The implementation of site-specific plans are dependent on funding and available resources.

If waters are found to be positive for zebra or quagga mussels in the future, and a watercraft inspection and decontamination program is not already in place, CDOW will lead a response team consisting of the recreational managing agency, the infrastructure owner, the water owner, the land owner, local governments, concessioners and all interested parties to determine the containment strategy and necessary resources to implement the strategy. Each site-specific management plan will be a collaborative effort and outline the implementation strategy for that specific body of water. Implementation of those plans will be dependent on funding and resources.

Site-specific mussel management plans are strongly encouraged on all bodies of water with trailered motorized watercraft, especially those high in a watershed, as a preventative measure. CDOW coordinated 22 site specific management plans in 2009 and is willing to coordinate the site-specific management planning process for additional waters in 2010.

### ***Prevention Targeting Out of State Watercraft***

All trailered motorized watercraft coming into Colorado from outside of the state, regardless of residency, must be inspected and, if necessary, decontaminate prior to launching on waters of the state, according to state regulations. Watercraft inspection and decontamination stations will provide ample opportunity for compliance. This option puts the responsibility on the recreational user to minimize the potential for spread by their watercraft. Fixed watercraft inspection and decontamination stations will be located near Colorado's borders or in high population density locations. Watercraft inspection and decontamination stations located at high or medium risk waters will also provide inspections for out-of-state watercraft.

These watercraft inspection and decontamination stations form a network for the highest risk watercraft (out-of-state watercraft and Colorado-registered watercraft leaving and returning) to be inspected and if necessary, decontaminated, at locations throughout the state. The following prioritized list details the steps to implement this segment of the program. Items 1 through 4 will be implemented in 2009. Items 5 through 7 will be phased in over time and are expected to be fully implemented during the 2010 boating season.

1. Regulations requiring all out-of-state registered watercraft and in-state registered watercraft returning to Colorado to be inspected, decontaminated (if necessary) and tagged prior to launch in Colorado waters
  - *Completed February 20, 2009*
2. Establishing and enforcing penalties for violation of the regulations
  - *Completed February 20, 2009*
3. A notification campaign directed at local and out-of-state boaters
  - *Initiated April 2009*
4. A standardized watercraft tagging/seal system
  - *Implemented May 2009*
5. A method to identify individual watercrafts (e.g., providing barcodes for all Colorado registered watercrafts, utilizing a smart tag, or logging the registered Colorado license (CL) number)
6. Development of a real-time database to be shared by all entities supervising watercraft inspection and decontamination, including on-site computer capabilities for staff.

### **Possible watercraft inspection and decontamination Station Locations:**

- CDOW and other state offices
- Visitors Centers
- High, Medium and Low Risk Waters
- Marinas
- Marine Dealers
- Private Industry Locations

- Highway Rest Stops

### **Watercraft Inspection and Decontamination Stations managed by CDOW in 2009:**

- Denver CDOW Office
- Grand Junction CDOW Office
- Hot Sulphur Springs CDOW Office (established in 2008)
- Lamar CDOW Office

### **Proposed Watercraft Inspection and Decontamination Stations for future years:**

- Antonito Visitors Center
- Burlington Visitors Center
- Colorado Springs CDOW & State Parks Office
- Cortez Rest Stop
- Craig CDOW CWD Office
- Delta – Escalante SWA
- Dinosaur Visitors Center
- Fort Collins Visitors Center
- Limon Visitors Center
- Meeker CDOW Office
- Trinidad Visitors Center
- Trinidad – I25 Mile Marker 14 or 18 Rest Area
- Walden Highway Location

Out-of-state registered trailered watercraft owners will be notified prior to, or at, arrival in Colorado of inspection requirements through a variety of informational outlets listed on page 22-23. The watercraft will be inspected and decontaminated if necessary at a watercraft inspection and decontamination stations, by state authorized agents. Upon successful inspection, watercraft will be sealed to the trailer and the owners will be given a receipt authorizing launch in state waters.

### ***Prevention at High Risk Waters***

This component details a preventative measure using watercraft inspection and decontamination stations at high risk waters across the state. High risk waters are identified by the ongoing collaborative risk assessment (page 8-9).

At multi-jurisdictional reservoirs it will take a partnership of the owner and managing entities to plan and implement the site-specific programs. The majority of recreational water bodies in Colorado are not owned or operated by the Divisions of DNR. CDOW is willing to coordinate collaborative site-specific management plans for all high risk waters, however the implementation of these plans rely heavily on the recreational manager to supervise the program or contract with private industry for inspection services. These plans significantly reduce the risk of contamination of uninfected waters. Inspections and decontaminations will be conducted near boat ramp access. It is preferable that watercraft inspection and decontamination stations be multi-purpose *offering preventative inspections to those entering that specific water body*, and

*inspections/decontaminations for out-of-state watercraft.* This will provide a large network of opportunities for boaters to minimize the risk of an introduction of ZQM and other ANS into state waters.

*High Risk Waters Preventative Watercraft Inspection and Decontamination List  
(Based on June 2008 risk assessment and pending management agreements. Subject to change.)*

<b>High Risk Water</b>	<b>Owner</b>	<b>Recreation Manager</b>	<b>Inspection and Decontamination Paid for By</b>	<b>Inspection and Decontamination Supervised By</b>	<b>2008 Program</b>
25 State Parks	Various Owners	State Parks	State Parks	State Parks	Yes
Antero	Denver Water	Denver Water	Denver Water & CDOW	CDOW	Yes
Aurora Res	City of Aurora	City of Aurora	City of Aurora	City of Aurora	Yes
Boulder Res	City of Boulder	City of Boulder	City of Boulder	City of Boulder	Yes
Blue Mesa	Bureau of Reclamation	National Park Service (NPS)	NPS & CDOW	NPS	Yes
Carter Lake	Bureau of Reclamation	Larimer County	CDOW	Larimer County	No
Dillon Reservoir	Denver Water	U.S. Forest Service	Denver Water	Dillon and Frisco Marina Operators	Yes
Douglas Lake	North Poudre Irrigation	CDOW	CDOW	CDOW	No
Green Mountain	Bureau of Reclamation	U.S. Forest Service	U.S. Forest Service	Heeney Marina	No
Horsetooth	Bureau of Reclamation / NCWCD	Larimer County	CDOW	Larimer County	No
Lake Nighthorse	Bureau of Reclamation	Unknown	<i>Not Fully Built Yet</i>		No
McPhee	Bureau of Reclamation	U.S. Forest Service	CDOW	CDOW	No
Prewitt	North Sterling Irrigation	CDOW	CDOW	CDOW	No
Quincy	City of Aurora	City of Aurora	City of Aurora	City of Aurora	Yes
Rampart	Colorado Springs Utilities	U.S. Forest Service	Colorado Springs Utilities & CDOW	CDOW	Yes
Sanchez	Sanchez Ditch & Irrigation Co.	CDOW	CDOW	CDOW	No
Stanley Lake	City of Westminster	City of Westminster	City of Westminster	City of Westminster	Yes
Taylor Park	Bureau of Reclamation	U.S. Forest Service	CDOW	CDOW	No
Twin Lakes	Bureau of Reclamation	U.S. Forest Service	City of Aurora and Colorado Springs Utilities	Rocky Mountain Recreation Co.	No
Turquoise Lake	Bureau of Reclamation	U.S. Forest Service	City of Aurora and Colorado Springs Utilities	Rocky Mountain Recreation Co.	No
Vallecito	Pine River Irrig District	Pine River Irrig District	<i>Unknown</i>	<i>Unknown</i>	No

Williams Fork	Denver Water	Denver Water	Denver Water	CDOW	Yes
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Inspections will be coordinated by CDOW on high risk waters that have multiple responsible agencies and implemented as a partnership effort. Inspections will be conducted on high risk State Wildlife Area waters by CDOW and on State Park waters by State Parks. Inspections will be available seasonally based on the boating season and water temperature. Field operations will be site-specific and will use the state standard procedures for watercraft inspection, seals and decontamination. Inspection times and days of operations will be site-specific and will require collaboration to plan and implement. Decontamination equipment will be available on site. The implementation of collaborative site-specific zebra/quagga mussel management plans is dependent on funding and available resources.

### ***Roving Watercraft Inspection and Decontamination Patrol***

It is not possible to have watercraft inspection and decontamination stations on every boat ramp in the state. Therefore, Roving Watercraft Inspection and Decontamination Patrols will perform watercraft inspection and decontamination randomly for medium and low risk waters that do not have a permanent watercraft inspection and decontamination station.

A Roving Patrol will have a mobile watercraft inspection and decontamination unit that will set up at different waters each day or several waters in one day, depending on proximity. This field presence, personal education and random watercraft inspection effort will impress upon the boating public the importance of watercraft inspection and decontamination and drive home the “Expect to be Inspected” message. This will further strengthen the education campaign to encourage boaters to always clean, drain, and dry. Roving Patrols will be modeled after the fishing and hunting license programs and will impress upon boaters their responsibility for preventing the movement of mussels to new waters. There should be specific regulations establishing violations for trailered motorized watercraft that are not clean, drain and dry prior to launching in Colorado waters. It is proposed to attach a point system to boating registrations, similar to fishing, hunting and driving.

In 2009, there will be a total of 7 CDOW Roving Patrols. Three patrols will work in the SW Region, while one patrol will work in each of the NE, NW, and SE Regions. There will also be a single statewide patrol dedicated to quality assurance and field support. Every watercraft inspection and decontamination station is subject to field evaluation by the quality control roving patrol. Each patrol will consist of two temporary employees trained as stage II authorized agents.

These roving crews will operate seasonally and at varied times for 6 months (May-October). CDOW Area and District Wildlife Managers will provide law enforcement support for roving crews and stations located at water bodies. This roving component provides a moderate level of protection for waters or where such a station is not warranted based on the cost and an assessment of risk. It also allows an educational component to educate watercraft owners that it is their responsibility to keep their watercraft free of ANS, regardless of what water they are on.

## **Watercraft Inspection and Decontamination Standards, Training, Certification & Quality Control**

The overland spread of zebra and quagga mussels by recreational boaters must be controlled or minimized to protect the waters of the state. The ANS Act specifies that only authorized agents or qualified peace officers may conduct watercraft inspections and decontamination operations. Thus, the goal of the training aspect of the program is to increase the number of authorized agents at various locations around the state who are certified to conduct watercraft inspections and decontaminations. The State of Colorado standard protocols for watercraft inspection and decontamination should be implemented at all state waters, regardless of the managing entity or land/water owner. Proper training and the consistent use of standard methods and procedures ensures that watercraft inspections and decontamination effectively reduce the risk of spread. Because watercraft recreationists travel throughout the state and region, it is critical that all managers use the same protocols and watercraft owners have similar experiences at watercraft inspection and decontamination stations.

CDOW and Parks have partnered with several non-profits to conduct watercraft inspection and decontamination training annually since 2006. Colorado's protocols are based on the widely accepted Pacific Marine Fisheries Commission (PSMFC) standardized watercraft inspection and decontamination training taught at Lake Mead. *The Colorado ANS Watercraft Inspection Handbook* was published by CDOW in March 2009. The writing of this document was a collaborative effort between CDOW and Parks, along with many partners in Colorado and other states.

The program developed is a specific curriculum for water recreation managers that teach managers zebra/quagga mussel biology, vectors of spread, invasion history and Colorado specifics. It impresses upon managers the importance of watercraft inspection and decontamination programs. The course takes them through the intricacies of inspecting various types of watercrafts for mussels and procedures to decontaminate them. The program walks inspectors through setting up a watercraft inspection and decontamination program, including educational messages, tracking methods, tagging protocols, and so on.

Anyone conducting watercraft inspection and/or decontamination in Colorado is required by regulation to attend the state certification course. All partner agencies, water recreation managers, water providers, marina operators, marine dealers, angling and boating groups, etc. are highly encouraged to have staff in attendance. The PSMFC training at Lake Mead inspection and decontamination training is recommended, but does not replace or certify individuals to perform inspections or decontaminations for ANS in Colorado.

CDOW and State Parks (Divisions) will conduct trainings, certifications and quality control checks to administer and regulate watercraft inspection and decontamination procedures. Stage III trainers will be individuals designated and approved by both Divisions as experts in the biology, inspection and decontamination of ANS. Stage III trainers should be Level II certified by PSMFC, although it is not mandatory. Stage III trainers must teach Stage II trainings. Stage II trainings must be a minimum of 12 hours long, and must include:

1. Teaching and education methods;
2. Public education methods and messages;
3. Inspection procedures and hands on practice;
4. Decontamination procedures and hands on practice;
5. Procedures for tracking, reporting and collecting samples;
6. Proper application of watercraft inspection and decontamination seals;
7. Background biological information on listed ANS (impacts and identification);
8. Legal constraints; and
9. A written test.

Stage II trainers will be individuals who have been through Stage II training, have successfully passed the written test, and are in good standing with the quality control checks. Stage II trainers are permitted to conduct Stage I trainings. Stage II trainers are able to train Stage I inspectors in both inspection and decontamination. Stage I trainings must be a minimum of eight hours long for inspection with an additional 4 hours of coursework for optional decontamination certification. Stage I trainings must include:

1. Public education methods and messages;
2. Inspection procedures and hands on practice;
3. Decontamination methods and hands on practice (if additional 4 hours);
4. Procedures for tracking, reporting and collecting samples;
5. Proper application of watercraft inspection and decontamination seals;
6. Background biological information of listed ANS (impacts and identification);
7. Legal constraints; and
8. A written test.

Individuals who have attended Stage I training and have successfully passed the written test will be recognized by the Divisions as authorized agents. The CDOW roving quality control patrol will conduct quality assurance checks at watercraft inspection and decontamination locations to verify proper procedures are being utilized. If the patrol observes failures to use proper watercraft inspection and decontamination procedures, then either a written warning notice will be issued or they may decertify an authorized agent, a location or a level II trainer until they have attended and passed the appropriate training again. If the patrol observes multiple failures within a calendar year, then they may also decertify an agent, a location or a level II trainer for that calendar year. Recertification may occur in the next calendar year after such individuals attend and successfully pass the appropriate training.

Upon completion of the training, the student will be certified by the Divisions as a State Watercraft Inspection and Decontamination Operator (a.k.a. authorized agent). They will be assigned a unique identifying number. This will be logged in the shared database and will further partnerships, enabling the acceptance of watercraft inspection and decontamination programs across jurisdictional boundaries. This high level of certification and quality control should enable a passed and properly documented inspection or decontamination by one agency to be accepted by another agency.

## **Legal Authority**

While the ultimate success of the ZQM Plan requires the collaboration of all of the partners, the statutory and regulatory authority for Aquatic Nuisance Species lies under the DNR umbrella in both the Divisions of Wildlife and State Parks. The following chapter outlines the State of Colorado ANS Act and CDOW 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 (Appendix H). 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 1<sup>st</sup> violation is a class 2 petty offense with a fine of \$150. A 2<sup>nd</sup> offense is a misdemeanor with a \$1000 fine. For a 3<sup>rd</sup> 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 the CDOW and DPOR, designating a first year budget of \$3.9M for CDOW and \$3.2M for State Parks, and an annual budget of \$2.7M for State Parks and \$1.3M for CDOW. The Act allocated 7 Permanent FTE to State Parks. The Act delegates the promulgation of rules to the Parks Board. Rules will be presented to the Parks Board for adoption on February 20, 2009 (Appendix I). Rules presented take approximately 45 days to take effect.

### **State ANS Regulations:**

On February 20, 2009 the Parks Board adopted regulations regarding ANS, specifically watercraft inspection and decontamination. 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 and monitoring and reporting. They enable private industries to assist the state with inspection and decontamination services. The rules also created a new AIS list that targets species that can be transported on a boat overland. The animal species listed are New Zealand mudsnail, zebra mussels, quagga mussels, rusty crayfish, and three species of waterfleas. The plant species listed are African elodea, Brazilian egeria, Eurasian watermilfoil, giant salvinia, hydrilla, parrotfeather, yellow floating heart and water hyacinth.

### **CDOW Aquatic Health Regulations:**

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

- **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.

- **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 VHSV.

## **State Fish Hatchery Program**

### ***Preventing ANS Spread in Aquaculture Activities***

Annually, the Colorado State Fish Hatchery system, which consists of 17 production or rearing units, produces and stocks approximately 3,767,000 catchable and 16,531,000 subcatchable coldwater fish (of which 9,198,000 are from wild-spawn operations), and 76,007,000 warm-water fish. This represents a substantial contribution to the fisheries in the state, but also provides opportunities for dissemination of pathogens and aquatic nuisance species (ANS). With the detection of zebra and quagga mussels in several water bodies in Colorado, proactive and preventative methods have been instituted within the state hatchery system to prevent spread of ANS through aquaculture activities, especially fish stocking and taking of wild spawn. These methods are detailed in Appendix J.

### **ANS Technology/Tracking**

It is essential that the various agencies collaborating on the ANS program be able to communicate efficiently. There are several technological applications that can aid in this effort.

### ***Watercraft Inspection Seals***

In 2008, various entities implemented an inspection green seal system (locking tags with wire) at some reservoirs with watercraft inspection and decontamination programs. The seals are placed on watercrafts, locking the watercrafts to the trailer. The seals can only be cut off, so when a watercraft arrives at a reservoir with a seal, the inspector will know that it hasn't been on any other waters since it was inspected. This system is extremely useful for local boaters that use the same reservoirs repeatedly. A disadvantage of the uncoordinated seal system being used in 2008 was that some agencies using seals weren't accepting seals from other agencies, further frustrating watercraft owners.

A standard **GREEN** seal system, coupled with the watercraft inspection and decontamination certification and quality control program, should enable acceptance across jurisdictional boundaries. The goal is to engage entities to utilize state watercraft inspection and decontamination standards and participate in Colorado's certification training. This will make the process easier for watercraft inspection and decontamination staff from each entity and boaters alike.

When a watercraft leaves a reservoir, a certified inspection will be performed and if necessary, a decontamination, after which a seal can be placed on the watercraft certifying that the watercraft is cleared to launch in any state water. The state standard is a single seal system. The seal color is green and it will have a unique identifying number on it. (The number will be entered along with the watercraft's Colorado License (CL) number in the electronic database when that is available.) Seals will be given with a receipt that documents the date, location, authorized agent and procedure completed (inspection or decontamination) to warrant placing the seal.

The green seal attaching the watercraft to the trailer means that the watercraft has been inspected by a state authorized agent and is able to launch on any body of water in the state. To get a green seal, watercrafts must have no vegetation, no mud and no water, in addition to meeting the following criteria.

Watercrafts will get a green seal if...

- the watercraft is from out of state and has undergone and passed an inspection and if needed, decontamination, by a state authorized agent.
- the watercraft has left an infested body of water and has undergone and passed a high risk inspection and if needed, decontamination, by a state authorized agent.
- the watercraft has left an uninfested body of water and has undergone and passed an inspection and if needed, decontamination, by a state authorized agent.

No other colors of seals (only green) are endorsed by the state program and should be accepted across jurisdictions.

### ***Watercraft Inspection and Decontamination Tracking Database***

The 2008 seal system performed a critical function and notified the inspector that the watercraft had passed an inspection and what water it was last on. However, the 2008 watercraft inspection and decontamination protocol involved a lot of paperwork in the field and did not enable communication between watercraft inspection and decontamination inspectors and law

enforcement personnel. A high priority of the ZQM Plan is the development of an electronic database to be used by state authorized personnel at watercraft inspection and decontamination stations.

When a watercraft undergoes an inspection, the inspector will type in the CL number (or scan a barcode or smart tag) and see an up-to-date history of that watercraft's interactions with other watercraft inspection and decontamination stations. This database will contain information about watercraft inspection and decontamination efforts and will enable one agency to see when a watercraft was inspected or decontaminated at another agency's waters. This effort will compliment the current tagging system and will aid in acceptance of inspections across jurisdictional boundaries.

### ***Sampling and Monitoring Database***

Another necessary technological component of the ZQM Plan is a web-based sampling and monitoring database. The goal is to develop a database similar to the chronic wasting disease (CWD) database, which will enable the sampling technicians, microscopist, FlowCAM operator, laboratories and the program manager to save critical data from their step in the identification process in the same database. There will also be "read only" access given to key staff. This will enable CDOW to quickly respond to inquiries about sample status, promoting better communication both internally and externally. The database will be an effective way to engage partners to participate in the sampling program by providing them with the ability to track their samples through the CDOW identification process. The database is under development and scheduled for completion in spring 2011.

### **Communication and Information**

The CDOW public relations office is the lead on zebra and quagga mussel communication and information efforts. There has been an ongoing communications team established since January 2008, consisting of public information officers from DNR, CDOW, Parks, CWCB, Bureau of Reclamation, U.S. Forest Service, Water Distributors and local governments.

*The goals of the multi-agency communication team are to:*

- Communicate information about zebra and quagga mussels in Colorado
- Serve as main liaison between ANS Programs and media contacts
- Develop press releases in collaboration with other agencies
- Coordinate press contacts, interviews and media events
- Develop informational materials such as brochures, rack cards, signs and billboards
- Educate the public about what they can do to minimize the spread and about new regulations, laws, procedures

*Future activities will include but are not limited to the following:*

- Continue press release and media contacts responsibilities

- Continue presentations, educational media outlets, sportsmen’s tradeshow participation
- Parks will send a letter to all registered boaters in Colorado in 2009 and 2010
- Implement notification campaign to out of state boaters
- Send a letter regarding new out of state boating regulations to registered boaters other states, beginning with infested states and neighboring states.
- Create a Colorado specific brochure about zebra/quagga mussels
- Create a Colorado specific brochure about aquatic nuisance species
- Maintain inventory and distribution of brochures and rack cards
- Coordinate boat ramp sign orders and distribution for medium and low risk waters
- Coordinate posting of approximately 30 billboards
- Develop boilerplate letter to shoreline homeowners on infested waters
- Investigate utilizing truck wraps on hatchery trucks driving around the state
- Investigate utilizing truck wraps on semi trucks driving around the state
- Investigate AM radio stations repeated “clean, drain, dry” message and notice of out of state boater regulations, along with associated "tune to xxxx AM" signs on highways
- Pursue getting articles in mainstream publications (e.g. 5280 Magazine)
- Pursue information distribution through retail outlets
- Expand ANS information on websites
- Coordinate ALERT postcard to be included with water providers monthly bill to increase outreach effort to a majority of the population versus only boaters and anglers. The alert message will be included in mailing three times a year – May, July, September – to correspond with high recreation season.

## Education

Education truly is the most important aspect of the ANS Program. If every boater, angler and professional aquatic worker practices Clean, Drain and Dry, there will be little ANS moving into new waters. Not only is education critical for recreational user groups and the general public, but also for internal staff, partners, legislators and stakeholders. Opportunities for internal education are listed below:

1. The Annual ANS Workshop (5th year in 2009)
2. Various watercraft inspection and decontamination trainings statewide (16 in 2008)
3. ANS Newsletter to be sent out quarterly
4. A list serve for regular updates on program activities or news
5. Educational Program modeled after Bear Aware
6. SharePoint website

The Education Section of CDOW published the *State ANS Watercraft Inspection Handbook* in March 2009 (Appendix K). The writing of this document was a collaborative effort between CDOW and Parks, along with many partners in Colorado and other states. The target audience is

all recreational managers of waters in Colorado. Those include municipalities, counties, state agencies, federal agencies, marinas, private citizens and HOAs. It will read as a teaching manual, detailing the ZQM problem and the importance of implementing the watercraft inspection and decontamination programs. The manual will teach the standard protocols and the intricacies of managing a watercraft inspection and decontamination program. This standard for watercraft inspection and decontamination was adopted into regulation and is the state standard for inspection and decontamination. It serves as the curriculum for the trainings, certification and quality control program outlined earlier. It is posted online at [www.colorado.gov/wildlife](http://www.colorado.gov/wildlife).

Zebra and quagga mussels and other ANS present a multi-generational problem because there are currently no effective control methods for lakes and reservoirs. Therefore, it is critical that we take the message to the classroom and teach the next generation the importance of preventing invasive species from spreading to new habitats. The Education Section of CDOW is working to develop a curriculum for science, math and geography teachers on Invasive Species, utilizing zebra mussels as the “poster species”. CDOW presented the curriculum concept to Denver School District 6<sup>th</sup> grade Geography teachers on October 25, 2008 and to the Colorado Association of Science Teachers on November 21, 2008. K-12 educational materials will be developed over summer and tested in the fall of 2010. CDOW will conduct trainings in the spring for teachers. Once tested, the materials will be available in spring 2011.

A recommendation for the future is to develop a boater education program specific to ANS on the CDOW and State Parks websites. Parks registers all boats in Colorado and should consider incorporating this tool into the online registration process. A parallel online angler education program can be created specific to ANS within CDOW.

## **Research**

Although zebra and quagga mussels have been in the U.S. for over 20 years, and extensive research has been conducted in the Eastern U.S., there are still many questions left unanswered. It is apparent that the mussels are behaving much differently in the lower Colorado River than in the Eastern U.S. There is an ongoing and critical need for applied research to aid in the management of these highly adaptable invasive species in Colorado and the West.

An evolving list of potential research topics have been compiled for further analysis. It is the goal of CDOW to conduct some research in house, cost share other larger scale projects with partners and engage higher education involvement on others. The list below will continue to evolve as items are completed and new opportunities arise. Prioritization for research will be determined based upon resources, the expertise of the CDOW Aquatic Biology Staff and opportunity for partnerships. Not all projects listed below will be initiated or completed in 2009. Research will be ongoing over many years. Until we understand the mussels’ behavior in the West and have viable cost-efficient control methods, there will be a consistent need for scientific research.

## List of Priority Research Topics:

1. Economic analysis – detailed examination of costs associated with variety of management strategies and how those may affect local economies, private industries and state tourism revenue.
2. Veliger survivability in interior boat compartments, such as ballast tanks, live wells, bladders, etc.
3. Use of KCl, chlorine or other control methods in interior boat compartments, such as ballast tanks, live wells, bladders, etc., to kill veligers and adult mussels
4. Efficacy of currently used watercraft decontamination methods
5. Best Management Practices for fish management operations from infested waters or hatcheries (e.g. wild spawn, egg transport, etc)
6. Modeling risk of overland transport through Colorado on recreational watercraft.
7. Modeling risk of downstream dispersal via the natural flow of water, specifically from high altitude lakes and reservoirs (e.g. CB-T, Twin, Turquoise, etc)
8. Rate of spread from high elevation, high gradient, cold mountain rivers
9. Ability to survive and be transported through very large, high velocity water distribution structures such as the Adams tunnel
10. Reproductive capabilities in high altitude lakes
11. Effects on native plankton populations
12. Effects on native western mussels populations
13. Control methods in open water systems

## Volunteer Opportunities

There are numerous opportunities for volunteers to contribute. In 2005-2006, a volunteer work force was created to survey, map and kill Eurasian watermilfoil. This work force was small, but dedicated, and contributed a great deal about what we know to be the current status of Eurasian watermilfoil in Colorado. It is an example of how extremely dedicated and productive volunteers can be. Utilizing volunteers is an effective way to get a large volume of work done with limited resources. However, volunteers do need to be supervised and managed by permanent staff, which requires dedicated labor.

There are several opportunities for zebra/quagga mussel program volunteer involvement. Other states have utilized volunteer scuba dive teams for ANS sampling and monitoring, as well as control. Divers can conduct underwater surveys for adult mussels in infested waters and can perform hand removal of adults to slow the rapid growth rate.

The watercraft inspection and decontamination program can be staffed with certified volunteers. Volunteers would have to go through the Stage I training and maintain good status on quality control checks, as do other authorized agents. There is a possibility of having Stage II trained volunteers that can teach watercraft inspection and decontamination trainings and operate stations.

Sampling and monitoring is also an area that volunteers can prove efficient. Volunteers can expand the reaches and frequency of our sampling program by performing regular checks of

substrate samplers. They can also perform shoreline surveys and sample for other ANS. Opportunities also exist for volunteers to gather baseline data on native aquatic species.

Currently, there are several educational projects for volunteers to participate in. Projects include; development of informational materials (i.e. brochures); distribution of educational materials at lakes and reservoirs; staffing trade shows, expo booths and fishing tournaments; and classroom presentations or teacher trainings.

Lastly, there are programmatic administrative needs that volunteers could accomplish. Tasks would include basic office work such as compiling mailings, filing, data entry and meeting organization.

## **Staffing Requirements**

In order to effectively implement the ZQM Plan, at least 4 new permanent FTE are recommended for the DOW Invasive Species Program. Currently the personnel requirements are not in place to oversee the many facets of implementation. To accomplish the actions in the ZQM Plan, a range of 100-150 temporary FTE are needed to conduct sampling and monitoring, as well as operate watercraft inspection and decontamination stations. Those temporary employees and activities need to be managed by permanent personnel.

### Invasive Species Personnel:

- 4-8 New Permanent Full Time Invasive Species Biologists (WM III)
  - Implement the State ZQM Plan
  - Implement the State ANS Management Plan
  - Oversee watercraft inspection and decontamination operations
    - Containment at infested waters
    - Prevention targeting out of state boaters
    - Prevention at various lakes and reservoirs
    - Roving Patrols
  - Hire and supervise a minimum of 37 temporary FTE watercraft inspection and decontamination staff
  - Oversee watercraft inspection and decontamination training, certification and quality control
  - Coordinate sampling and monitoring staff
  - Coordinate with site-specific management planning teams
  - Coordinate volunteer projects
  - Rapidly respond in a timely fashion to reports of new ANS sightings
  - Responsible for distribution of ANS informational materials through Region
  - Coordinate with AWM and DWM staff
  - Consult and advise on terrestrial weed and exotic invasive insect issues
  - Serve as support services for field techs regarding invasive species.
- 15 temporary full-time early detection sampling and monitoring technicians (6 month temps to cover 10 month sampling window)

- 135 temporary full-time watercraft inspection and decontamination inspectors (6 month temps)

#### Law Enforcement:

- Utilize existing CDOW Area and District Wildlife Manager Staff
  - Provide law enforcement at watercraft inspection and decontamination stations
  - Conduct ANS inspections while performing other duties, such as checking fishing licenses and boating safety inspections
- Engage participation from qualified peace officers, such as municipal or county officers and federal partners
- Enforcement Responsibilities
  - Provide law enforcement support to watercraft inspection and decontamination Stations, including roving patrol
  - Conduct ANS Inspections and Decontaminations while performing routine enforcement duties, such as checking fishing licenses or boater safety
  - Provide ANS law enforcement procedural training and continuing education
  - Implement check stations at key locations that do not have watercraft inspection and decontamination stations
  - Coordinate with Invasive Species Program Staff and site-specific management planning teams.
  - Conduct investigations on ANS related matters

## **Summary of ZQM Plan Recommendations**

### ***Staffing Recommendations***

1. Fund, hire and train 4-8 new permanent full-time Invasive Species Biologists
2. Fund, hire and train 12 temporary full-time for sampling and monitoring
3. Fund, hire and train approximately 135 temporary full-time for watercraft inspection and decontamination

### ***Early Detection Sampling and Monitoring Recommendations***

1. Hire and train temporary full-time sampling and monitoring technicians.
  - a. Ten sampling and monitoring field technicians to conduct surveys and collect samples for ZQM and other ANS statewide.
  - b. Two technicians to work at AAHL (log samples, perform microscopy, operate FlowCAM, coordinate with labs, etc)
2. Purchase a FlowCAM identification tool for the AAHL.
  - a. Increase efficiency in processing by enabling AAHL staff to process more samples much faster.
  - b. Provide scientific documentation on sample analysis by logging prescribed data sets and photographing specimen.

- c. Aid with research efforts on effects of invasive mussels on plankton populations by logging and categorizing all plankton in the sample.
- 3. Perform PCR at AAHL
- 4. Purchase or utilize existing equipment, where available, for temporary FTE field staff
  - a. Each team of sampling technicians should have their own watercraft to eliminate need for aquatic staff to provide transportation to sampling sites on water.
    - i. Enable more efficient sampling by making technicians self sufficient.
  - b. Each sampling technician will need a vehicle that can trailer a watercraft.
  - c. They must have the ability to decontaminate the watercraft in between uses.
  - d. Five laptops
  - e. Five GPS units and Pathfinder Software
  - f. GIS capabilities
- 5. Implement a web-based real time database to track samples from the time they are taken to the final DNA results.
  - a. Model after CWD
  - b. Enable the program supervisor, sampling technician, microscopist and independent lab to all update data in the same system.
  - c. Provide up to the minute status reports on samples in various stages of the detection and identification process.
  - d. Document all steps in the process for scientific analysis.
- 6. Utilize partners to increase number of waters sampled for zebra and quagga mussels
  - a. Federal agencies (e.g. USFS, BLM, NPS), municipal and county parks, water providers and private reservoir managers are among the few entities that should partner with CDOW to increase overall sampling range.
  - b. CDOW can distribute and train entities on sampling protocols.
  - c. Samples should be sent to the AAHL for analysis.
- 7. Encourage reporting of potential sightings to CDOW.
  - a. Continue to utilize 1-877-STOP-ANS
  - b. Utilize 1-303-293-6531 for reporting and information distribution
  - c. Utilize [ReportANS@state.co.us](mailto:ReportANS@state.co.us) email address
  - d. Develop an internet based reporting system on CDOW website to easily allow recreationists, partners and the public to quickly report a suspected ANS sighting in CO.
- 8. Disinfect all equipment in between waters or between reaches of the same river.
  - a. Watercrafts, Trailers, Water Trucks, Barges and Large Equipment:
    - i. Removing all visible mud, plants, organisms and debris from watercrafts, trailers and equipment
    - ii. Wash with a high pressure (250psi) hot water wash (minimum 140°F); or intense scrubbing if high pressure is not available
    - iii. Drain all water and do not move water between waters, even from different stretches of the same river
    - iv. Thorough and complete drying
  - b. Waders and Gear:
    - i. Immerse waders and gear in a solution of Sparquat 256 and clean water (six ounces of Sparquat 256 per gallon of water) for fifteen minutes prior to, and after, sampling.

- ii. This will also protect against moving and transplanting whirling disease or New Zealand Mudsail
  - c. Plankton Tow Equipment and Substrates:
    - i. Plankton tow equipment and substrates used in an infested water body cannot be used in an uninfested water body.
    - ii. Soak plankton tow equipment and substrates in an approved disinfectant in between each and every use.
  - d. Questions about equipment disinfection can be directed to the CDOW Aquatic Animal Health Lab (122 E. Edison, Brush, CO 80723 - 970-842-6308).
- 9. Preserve samples properly
  - a. Preserve adults in 70% ethanol
  - b. Keep plankton tow samples alive, when possible, and store in refrigerator for max 3 days
  - c. If plankton tow samples must be preserved, store in 70% ethanol.
- 10. Ship samples properly
  - a. Ship samples to CDOW Aquatic Animal Health Lab (122 E. Edison, Brush, CO 80723 - 970-842-6308)
  - b. Samples must be accompanied by appropriate forms provided by CDOW and adequately labeled.
  - c. Live plankton tow samples must be shipped cold overnight in leak-proof plastic bottles.
  - d. Preserved adult specimen must be shipped in plastic containers preserved in ethanol.
- 11. Identification
  - a. Plankton Tow
    - ii. Phase I – ocular identification with a microscope or FlowCAM
    - iii. Phase II – molecular identification with PCR
    - iv. Phase III – molecular identification with gene sequencing
      - 1. One positive ID on all three phases is sufficient evidence to identify positive waters
      - 2. If only a single positive from any method is found, the water will be declared “suspect” until tests confirm or refute the infestation
      - 3. Once a water is identified positive, future DNA analysis may not be required following positive microscopy results.
  - b. Adults
    - v. Phase I – ocular identification by more than 1 trained scientist
    - vi. Phase II – molecular identification with PCR
      - 1. Molecular identification may or may not be required
- 12. Reporting
  - a. Telephone: 1-877-STOP-ANS or 1-303-293-6531
  - b. Email to ReportANS@state.co.us
  - c. Website: www.colorado.gov/wildlife.
  - d. Utilize appropriate forms from CDOW

## ***Prevention and Containment: Watercraft Inspection and Decontamination***

1. Containment of Infested Waters
2. Prevention targeting watercraft coming from out of state
3. Prevention at high or medium risk waters
4. Roving watercraft inspection and decontamination Patrols
5. Watercraft Inspection Handbook, Certification and Quality Control program
6. Green Seal System

## ***Technology***

1. Electronic Watercraft Inspection and Decontamination Tracking Database
2. Early Detection Sampling and Monitoring web-based database

## ***Communication and Information***

1. Continue press release and media contacts responsibilities
2. Continue presentations, educational media outlets, sportsmen's tradeshow's participation
3. Parks send another letter to all registered boaters in state in 2009
4. Send a letter regarding new out of state boating regulations to registered boaters other states, beginning with infested states and neighboring states.
5. Create a Colorado specific brochure about zebra/quagga mussels and all ANS
6. Maintain inventory and distribution of brochures and rack cards
7. Coordinate boat ramp sign orders and distribution for medium and low waters in 2009
8. Coordinate posting of approximately 30 billboards in 2009 with Marketing
9. Develop boilerplate letter to home owners on infested waters
10. Investigate utilizing truck wraps on hatchery trucks and semis driving around the state
11. Investigate AM radio stations repeated message, along with "tune to xx AM" signs
12. Pursue getting articles in mainstream publications (e.g. 5280 Magazine)
13. Pursue information distribution through retail outlets
14. Expand ANS information on websites
15. Coordinate ALERT postcard to be included with water providers monthly bill to increase outreach effort to a majority of the population versus only boaters and anglers.

## ***Education***

1. Annual ANS Workshop (5th year in 2009)
2. Watercraft Inspection and Decontamination Handbook
3. Watercraft Inspection and Decontamination Trainings
4. Colorado Reader for Classrooms
5. Classroom curriculum
6. Website boater education program
7. Website angler education program
8. Expand CDOW invasive species website

9. ANS Newsletter
10. A list serve for regular updates on program activities or news

### ***Volunteer Opportunities***

1. Scuba Divers
2. Watercraft Inspection and Decontamination Operators
3. Monitoring
4. Education
5. Administration
6. Sampling and Monitoring

### ***Research***

1. Economic analysis
2. Veliger survivability in interior boat compartments
3. Use of KCl, chlorine or other control methods in interior boat compartments to kill veligers and adult mussels
4. Efficacy of currently used watercraft decontamination methods
5. Best Management Practices for fish management operations from infested waters or hatcheries (e.g. wild spawn, egg transport, etc)
6. Modeling risk of overland transport through Colorado on recreational watercraft.
7. Modeling risk of downstream dispersal via the natural flow of water, specifically from high altitude lakes and reservoirs
8. Rate of spread from high elevation, high gradient, cold mountain rivers
9. Ability to survive and be transported through very large, high velocity water distribution structures such as the Adams tunnel
10. Reproductive capabilities in high altitude lakes
11. Effects on native plankton populations
12. Effects on native western mussel populations
13. Control methods in open water systems

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## Appendices

- A. Partners: Authorities and Responsibilities
- B. Plankton Tow Sampling Protocol
- C. Collection Protocol for watercraft inspection and decontamination Stations
- D. Protocol for Preserving and Shipping Samples
- E. Original Risk Assessment (June 23, 2008)
- F. Sampling List 2007 and 2008
- G. Notification of Positive Results Diagram
- H. State of Colorado ANS Act (SB08-226)
- I. State of Colorado ANS Regulations
- J. State Fish Hatchery Program Methods
- K. State ANS Watercraft Inspection Handbook
- L. Zebra and Quagga Mussel Overview
  - a. Biology, life cycle, habitat requirements and vectors of spread
  - b. Dreissena mussel Impacts
  - c. Dreissena invasion history in USA and Colorado
- M. State ANS Program Accomplishments (2004-2008)
- N. Statewide ZQM Planning Team Structure: DOW and Mussel Task Force
- O. Statewide ZQM Planning Team Concept, Goals and Objectives
- P. ACOE References: Zebra Mussel Control Manual and Zebra Mussel Information System