



October 28, 2013

Subject: Truckee Regional AIS Vulnerability Assessment

Interested Parties:

In 2010, the Truckee River Fund provided funding to launch an Aquatic Invasive Species (AIS) watercraft inspection program in the Truckee region (Donner Lake and Stampede, Prosser and Boca Reservoirs). Elements of the Truckee AIS prevention program are based on the successful AIS prevention program at Lake Tahoe, which has also received funding support from the Truckee River Fund. The Lake Tahoe AIS program is implemented in partnership between the Tahoe Resource Conservation District (Tahoe RCD) and the Tahoe Regional Planning Agency.

For the Truckee regional program, the Tahoe RCD partnered with the Truckee River Watershed Council and various water body managers and cooperators to implement an AIS inspection program. Voluntary inspections have been conducted at Truckee regional water bodies since 2010.

The Truckee program also included the development of an AIS Vulnerability Assessment (<http://tahoercd.org/tahoe-aquatic-invasive-species-resources/>). The assessment includes data on nearby infestations, recreational uses, access to the water bodies, impact to water quality, and a review of AIS science and research across the nation.

**Recommendation:** Based on the Truckee Regional AIS Vulnerability Assessment, we recommend shifting from a program of voluntary inspections to a program of mandatory inspections at Truckee regional water bodies. There are a number of ways mandatory programs can be implemented.

We hope to continue to work with water body managers and other agency partners to implement AIS prevention for Truckee regional water bodies.

Sincerely,

A handwritten signature in blue ink that reads "Lisa Wallace".

Lisa Wallace, Executive Director  
Truckee River Watershed Council

A handwritten signature in blue ink that reads "Kim Boyd".

Kim Boyd, District Manager  
Tahoe Resource Conservation District

# **Truckee Regional Aquatic Invasive Species Prevention Program**

## **AIS Vulnerability Assessment For 2011, 2012, 2013**

**October 28, 2013**



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  - *Examination of Calcium and pH as predictors of Dreissenid mussel survival in the California State Water Project*, Claudi & Prescott, RNT Consulting, March 2011
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  - *Mid-Pacific Region Dreissenid mussel infestation susceptibility assessment*, US Bureau of Reclamation, July 2012
  - *A calcium-based invasion risk-assessment for zebra and Quagga mussels*, Whittier et al, 2008
  - *Short term survival and potential grazing effects of New Zealand mudsnail on an uninvaded Western Great Basin watershed*, Kolosovich et al, 2012
  - *Hydrilla verticillata – the perfect aquatic weed*, Langeland, 2007
  - *Aquatic invasive species transport via trailered boats: What is being moved, Who is moving it and What can be done*, Rothlisberger et al, March 2010
  - *History of Dreissena research and the ICAIS gateway to aquatic invasions science*, Karatayev et al, 2012
  - *Determining factors for Eurasian watermilfoil spread in and around Lake Tahoe, CA-NV*, Kendall and MacIntyre, 2008
  - University of California Riverside, Center for Invasive Species Research webpage on "propagule pressure", [http://civr.ucr.edu/invasive\\_species\\_faqs.html](http://civr.ucr.edu/invasive_species_faqs.html)
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## **AIS VULNERABILITY ASSESSMENT**

This assessment summarizes the vulnerability of the lakes and reservoirs in the Truckee region to aquatic invasive species (AIS). Invasive species are those known to cause harm to ecology, economy and/or human health.

It discusses four parameters of risk: nearby infestations, recreational use, access, and water quality (Table 1).

The assessment was conducted by the Tahoe Resource Conservation District (Tahoe RCD) and Truckee River Watershed Council (TRWC) through the Truckee Regional Aquatic Invasive Species Prevention Program (TRAISPP). TRAISPP is managed by the Tahoe RCD in partnership with the TRWC. The risk assessment is updated as AIS research, policy, and best practices become available. The risk assessment is part of the over-arching AIS vulnerability assessment in which TRAISPP continually re-evaluates vulnerability to AIS based on the latest available data.

## **TRUCKEE REGIONAL WATER BODIES**

Water bodies included are Boca Reservoir, Donner Lake, Glenshire Pond, Independence Lake, Lake of the Woods, Martis Creek Reservoir, Prosser Reservoir, Stampede Reservoir, the Truckee River and Webber Lake.

## **BACKGROUND**

California Department of Fish and Wildlife Code 2302 requires waterbody managers/owners to assess the vulnerability to Dreissenid mussels (i.e. quagga and zebra mussels) in their water bodies and to develop a prevention program.

Though assessing vulnerability is a requirement of the California Department of Fish and Wildlife (CDFW) regulation, CDFW does not require a format or topics. Rather, CDFW recommends examining four parameters:

1. Nearby infestations;
2. Recreational use;
3. Access;
4. Water quality.

Using these parameters, TRAISPP assessed the risks posed to the Truckee region by a suite of aquatic invasive species (AIS) including, but not limited to, Dreissenid mussels, Eurasian watermilfoil, New Zealand mudsnail and Asian clam. Eight known AIS were considered (Table 2).

Some existing studies suggest that the Truckee regional water bodies are not highly susceptible to Dreissenid mussels; however zebra and quagga mussels are included in the vulnerability assessment, because 1) inclusion is required by CDFW code, 2) research on quagga mussel survivability is inconclusive at this time and 3) inclusion of a species is not based on one parameter alone – boater use patterns, water body access and nearby infestations present sufficient threat to warrant inclusion of Dreissenid ssp. in the vulnerability assessment.

Eurasian watermilfoil is included in this assessment because of its establishment in nearby waters (Lake Tahoe, Truckee River, Martis Creek Reservoir, Spooner Lake) and its potential to significantly impact not only nutrient cycling, but also recreation and property values. In their study, “The effects of AIS on property values: evidence from a quasi-random experiment”, Horsch & Lewis state that, “lakes invaded with milfoil experienced an average 13% decrease in land values *after* invasion”. Locally, control of Eurasian watermilfoil in the Tahoe Keys costs hundreds of thousands of dollars per year. In, “Determining factors for Eurasian watermilfoil spread in and around Lake Tahoe, CA-NV” Kendall and MacIntyre classify Donner Lake and Stampede Reservoir at high risk for Eurasian watermilfoil establishment<sup>1</sup>.

New Zealand mudsnails are known to negatively impact native mollusk communities and reduce food supply for trout species. According to the California Department of Fish and Wildlife, New Zealand mudsnail infestations have significantly disrupted trout fisheries and stocking operations. New Zealand mudsnails have recently been identified in the Truckee River in significant numbers just east of the CA/NV state line<sup>2</sup>. The Truckee River has not been surveyed for NZ mudsnail in California, but the species are known to be capable of moving upstream of their own power and in the gut of fishes.

Asian clams are present in Lake Tahoe and Donner Lake. Due to their ability to concentrate calcium, Asian clams may facilitate the establishment of zebra and quagga mussels by creating micro-habitats that are attractive to

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<sup>1</sup> See Appendix B, “Determining factors for Eurasian watermilfoil spread in and around Lake Tahoe, CA-NV”, pg. 21-22.

<sup>2</sup> Chris Crookshanks, Nevada Department of Wildlife. Personal communication, August 7,2013

mussels. Early detection monitoring for 2010 – 2012 documents that Asian clams are able to persist in Donner Lake. The extent and speed of spread of an invasive species is partly a function of the number of repeated introductions (called ‘invasion pressure’, or ‘propagule pressure’)<sup>3</sup>. Invasives that are present in relatively low concentrations, such as Asian clams in Donner Lake, benefit from the increased propagule pressure of repeated introductions that accelerate their spread in a new ecosystem. Although not present in great numbers at this time, Asian clams may establish more rapidly with increased propagule pressure if unrestricted introductions continue.

The remaining species are included in the assessment because of their pest ratings, proximity of infestations and because none of the known water quality data for Truckee regional waters precludes their survival. The ecological systems of water bodies are complex and dynamic; therefore assessing the likelihood of infestation of any species with certainty is extremely difficult. The following section examines four risk parameters for the likelihood of AIS impact based on current data. As species adapt and conditions change, and new invasive species are identified, the risk of AIS will change. Guidance from state and federal agencies as well as local resource managers throughout the country advocate for establishment of AIS prevention efforts because the cost of prevention is so small compared to the costs of control, maintenance and management. Once AIS have established it is usually impossible (in the case of most species) to eradicate them.

### **RISK PARAMETERS**

Consistent with the CDFW code, TRAISPP examined the following risk parameters in order to assess vulnerability of AIS to Truckee regional water bodies.

**Table 1 – Summary of Risk**

<b>Parameter</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>
1. Nearby infestations	X		
2. Recreational use		X	
3. Access	X		
4. Water quality		X	

<sup>3</sup> See Appendix B, University of California Riverside Center for Invasive Species Research webpage on “propagule pressure”,

## **1. Nearby Infestations: Risk level High**

The combination of species presence (see page 8) and stakeholder feedback give this parameter a high risk rating.

Each of the species in Table 2 is a known aquatic invasive species; together, they are collectively targeted for prevention by TRAISPP. The majority of the species have a state or federal pest rating. Those that do not are included due to their presence within the watershed (curly leaf pondweed and Asian clam) or region (rock snot).

**Table 2 – AIS considered in Risk Assessment**

<b>Group</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Pest Rating<sup>4</sup></b>
<b>Aquatic Plants</b>	curly leaf pondweed	<i>Potamogeton crispus</i>	
	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>	CDFA "A"
	Hydrilla	<i>Hydrilla verticillata</i>	CDFA "A" Federal
<b>Invertebrates</b>	quagga mussel	<i>Dreissena bugensis</i>	CDFW
	zebra mussel	<i>Dreissena polymorpha</i>	CDFW
	New Zealand mudsnail	<i>Potamopyrgus antipodarum</i>	CDFW
	Asian clam	<i>Corbicula fluminea</i>	
<b>Other</b>	rock snot	<i>Didymosphenia geminate</i>	

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<sup>4</sup> Pest Ratings

CDFA = California Department of Food and Agriculture (Policy Letter #89-2; April 28, 1989)

"A" = An organism of known economic importance subject to state (or commissioner when acting as a state agent) enforced action involving: eradication, quarantine, containment, rejection, or other holding action

CDFW = California Department of Fish and Wildlife, Restricted Species, California Code of Regulations Title 14 §671

Federal = US Fish and Wildlife Service, Lacey Act CFR 16.11 – 16.15

- Nearby Infestations:
  - Curly leaf pondweed in Lake Tahoe
  - Eurasian watermilfoil in Lake Tahoe, Truckee River, and Martis Creek Reservoir, Spooner Lake and Lake Berryessa
  - Hydrilla in Clear Lake and the Sacramento Delta
  - Quagga mussels in Lake Mead, Lower Colorado River system and various waterbodies in Southern California
  - Zebra mussel in San Justo Reservoir
  - New Zealand mudsnail in Truckee River
  - Asian clam in Donner Lake and Lake Tahoe
  - Rock snot in American River/Sacramento Area
  
- Stakeholder View of Infestation Risk:

In 2011, through a stakeholder facilitated process, TRAISPP presented data<sup>5</sup> on nearby infestations, recreational use, access, and water quality. Additionally, Dr. Sudeep Chandra (University of Reno, NV) and Dr. Lars Anderson (USDA Agricultural Research Station) presented summary information on AIS of concern.

Based on this information, stakeholders assessed risk of introduction, establishment, economic impact, and environmental impact for several different aquatic invasive species.

The group included representatives from local government, resource management agencies, academia, and the general public.

Participants rated each type of risk for all species using the following scale:

- 1 = No risk/impact
- 2 = Low risk/impact
- 3 = Medium risk/impact
- 4 = High risk/impact
- 5 = Unacceptable risk/impact

The stakeholders assigned medium to high risk for introduction, establishment, economic impact, and environmental impact for all species<sup>6</sup>.

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<sup>5</sup> See Appendix A, 2011 Risk Assessment Power Point Presentations

<sup>6</sup> See Appendix C, 2011 Risk Assessment Summary

## **2. Recreational Use Risk Level Medium**

From 2010 – 2012, TRAISPP inspectors recorded launches of nearly 9,000 unique vessels in Truckee regional waters:

- 2010: In Truckee regional waters, 31 vessels were identified as high risk and offered free bleach decontamination. 15 boaters obtained decontamination, leaving 16 high-risk boats that launched.
- 2011: In Truckee regional waters, 85 vessels identified as high risk and offered free bleach decontamination. Data on how many vessels were decontaminated is unavailable.
- 2012: In Truckee regional waters, 216 vessels were identified as high risk and offered free hot-water decontamination. Only 12 boaters obtained decontamination, leaving 204 high-risk boats that launched.

Since inspectors were not present at the ramps at all times, these figures represent a sub-set of boaters that launched in Truckee regional waters. In other words, in 2012, for example, at least 204 high-risk boats launched without obtaining decontamination.

## **3. Water Quality Risk Level Medium**

- AIS present:
  - Asian clams at Donner Lake;
  - Eurasian watermilfoil in Martis Creek Reservoir;
  - Eurasian watermilfoil Truckee River below Tahoe Dam;
  - New Zealand mudsnail in Truckee River in Nevada near state line.
- Water quality data<sup>7</sup>
  - In, “Determining factors for Eurasian watermilfoil spread in and around Lake Tahoe, CA-NV” Kendall and MacIntyre classify Donner Lake and Stampede Reservoir at high risk for Eurasian watermilfoil establishment<sup>8</sup>.

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<sup>7</sup> See Appendix D, 2010 – 2012 Inventories of AIS & Water Quality in Lakes in the Lower Truckee River Region

<sup>8</sup> See Appendix B, “Determining factors for Eurasian watermilfoil spread in and around Lake Tahoe”, pg 21 – 22.

- In “History of Dreissena research and the ICAIS gateway to aquatic invasions science” Karatayev et al<sup>9</sup>. state the following in reference to what we know about survivability requirements for zebra and quagga mussels:

*Although both species [of zebra and quagga mussels] have similar life history characteristics, they differ in the timing and rates of spread, habitat requirements, growth and population dynamics (Karatayev et al., 2012). While the zebra mussel is among the best studied freshwater invertebrates, we do not always have comparable information for the quagga mussel. This limits our ability to predict the spread and ecological impacts of this important freshwater invader. There is very little information on the lower pH and calcium limits of quagga mussels to establish sustained populations, making accurate prediction of their potential for spread uncertain.*

Water quality data collected in the Truckee region does not preclude establishment of the species examined here, and indicates high suitability for some species.

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<sup>9</sup> See Appendix B, “History of Dreissena research and the ICAIS gateway to aquatic invasions science”, pg 2

#### 4. Boater Access Risk Level High

Water body	Restricted Boat Launches	Semi-Restricted Boat Launches	No Restrictions on Boat Launches
Boca Reservoir – public boat ramp			X
Boca Reservoir – dispersed launching			X
Donner Lake – public boat ramp		X	
Donner Lake - 2 private boat ramps	X		
Glenshire Pond – non-motorized only			X
Independence Lake	X		
Lake of the Woods			X
Martis Creek Reservoir – non-motorized only			X
Prosser Reservoir - public boat ramp			X
Prosser Reservoir - dispersed shoreline launches			X
Stampede Reservoir - public boat ramp			X
Stampede Reservoir - dispersed shoreline launches			X
Truckee River – non-motorized only			X
Webber Lake	X		

- Boca Reservoir:
  - No vessel access restrictions at boat launch
  - Dispersed shoreline launching common on east shore
- Donner Lake:
  - Semi-Restricted public boat launch
  - Restricted private boat launches – 2 staffed ramps with locking gates
- Glenshire Pond:
  - Non-motorized vessels only
- Independence Lake:
  - No outside vessels allowed
- Lake of the Woods:
  - Very small lake with difficult access and low level of boater use

- Martis Creek Reservoir:
  - Non-motorized vessels only
- Prosser Reservoir:
  - No Restriction public boat launch
  - Some dispersed shoreline launching
- Stampede Reservoir:
  - No vessel access restrictions at boat launch
  - Minimal dispersed shoreline launching
- Truckee River:
  - Non-motorized vessels only
- Webber Lake:
  - Privately operated lake
  - Boat inspections required upon arrival
  - Very few vessels leave the premises during boating season

### **Prevention Approach**

TRAISPP was formed to prevent AIS introduction in Truckee regional water bodies that drain to the Truckee River and to educate the public about AIS. To meet those purposes, TRAISPP has implemented the following since 2010:

- 2010
  - Stakeholder group formed
  - Monthly stakeholder meetings held
  - 2 public forums held (June and September)
  - Voluntary inspections at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Boater surveys at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Early detection monitoring & water quality data collection
- 2011
  - 3 public forums held (5/18, 7/28, 9/29)
  - Stakeholder facilitated risk assessment conducted
  - Voluntary inspections at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Boater surveys at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Early detection monitoring & water quality data collection

- 2012
  - Donner Lake steering committee and working group formed
  - Voluntary inspections at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Boater surveys at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Early detection monitoring & water quality data collection
  - Ordinances requiring mandatory boat inspections in Truckee regional waters passed in the Town of Truckee and Sierra County based on presentations of boater use, water quality, access, and regional infestations
  
- 2013
  - Regular Donner Lake steering committee and working group meetings
  - Boater surveys at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Voluntary inspections at Donner Lake, and Boca, Prosser and Stampede Reservoirs
  - Ordinance requiring mandatory boat inspections in Truckee regional waters passed in Nevada County
  - Early detection monitoring & water quality data collection
  - Prevention planning for new infestation of New Zealand mudsnail in the Truckee River

### **Determination of Prevention Management**

Since 2010 stakeholders, facilitated by TRAISPP, have reviewed the four parameters of AIS risk (nearby infestations, recreational use, access, and water quality) and selected management alternatives:

- In 2010, AIS prevention was managed through boater education and voluntary inspections;
  
- In 2011, AIS prevention was managed through boater education and voluntary inspections; stakeholders participated in a Risk Assessment,

considered a suite of management alternatives<sup>10</sup> that ranged from education only to lake closure, and concluded that a mandatory program was the most appropriate course of action considering the risk posed by AIS to water bodies in the region;

- In 2012, AIS prevention was managed through boater education and voluntary inspections; mandatory watercraft inspection ordinances passed in the Town of Truckee and Sierra County;
- 2013, AIS prevention was managed through boater education and voluntary inspections; mandatory watercraft inspection ordinance passed in Nevada County.

Motorized vessels pose the largest risk of transporting AIS due to the retention of water on board, propellers and trailers. Therefore, motorized watercraft are often the highest priority target for prevention programs. Boat inspections provide many barriers to invasive species: 1) They prevent invasions by new alien species such as New Zealand mudsnails and Eurasian watermilfoil, 2) They retard the spread of existing invasive species such as the Asian clam by preventing multiple introductions, and 3) Retarding Asian clam spread reduces Donner Lake's potential future vulnerability to quagga and/or zebra mussel invasions. Additionally, the cost of a prevention program is small in comparison to the potential costs of control, maintenance and losses to local economy and property values if AIS establish in local waters.

Regional resource managers have a low capacity to inspect non-motorized vessels and fishing equipment. These users come into contact with the water at a myriad of locations with gear that can be obscured inside vehicles. The recognized low capacity to inspect is particularly troubling to resource managers considering the recent discovery of New Zealand mudsnails in the Truckee River, which are most often transported on fishing equipment. One possible strategy is to provide non-motorized users such as paddlers and anglers with AIS education and encouragement to self-inspect and decontaminate their gear as necessary.

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<sup>10</sup> See Appendix E, Management Alternatives

## **Annual Evaluation**

TRAI SPP staff attends regional and statewide conferences on AIS prevention and management. Staff regularly reviews AIS research (national and local), AIS prevention and management policies, and best practices for prevention and management.

Additionally, annual reports on early detection monitoring in the Truckee regional waters are reviewed.

Updates as of August 2013 include:

1. Nearby infestations;
  - New Zealand mudsnail confirmed in the Truckee River in Nevada
2. Recreational use;
  - More high risk boats are coming to Truckee regional waters
  - The majority of boaters with high risk vessels are declining decontamination
  - If the economy continues its apparent recovery, we expect to see a corresponding increase in boater use
3. Access;
  - More water bodies in California and Nevada are requiring inspections and/or restricting access
  - If Truckee water bodies have no or voluntary inspections, these water bodies become more susceptible to high risk boats
4. Water quality;
  - Water quality data is inconclusive on mussel survivability, but water quality is not limiting New Zealand mudsnail, Asian clam, Eurasian watermilfoil, curly leaf pondweed, hydrilla, or rock snot