

Aquatic Invasive Species Risk Assessment and Prevention Program Development in Glacier National Park



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Glacier National Park



**4 native salmonids west
of the Continental Divide**



5 native salmonids east of the Continental Divide



Non-native species

- Lake trout*
- Lake whitefish*
- Rainbow trout
- Brook trout
- Arctic grayling
- Kokanee
- Yellowstone cutthroat trout

* native east of the Continental Divide



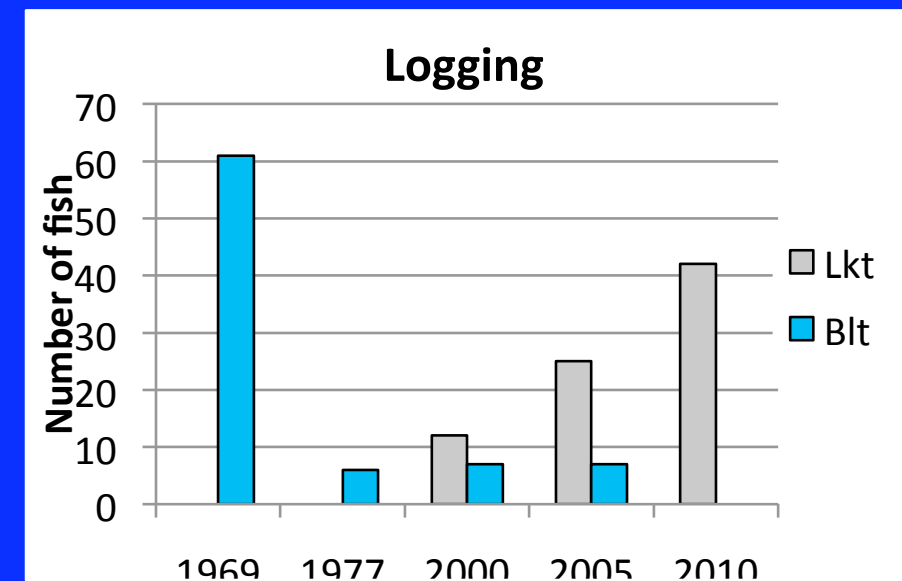
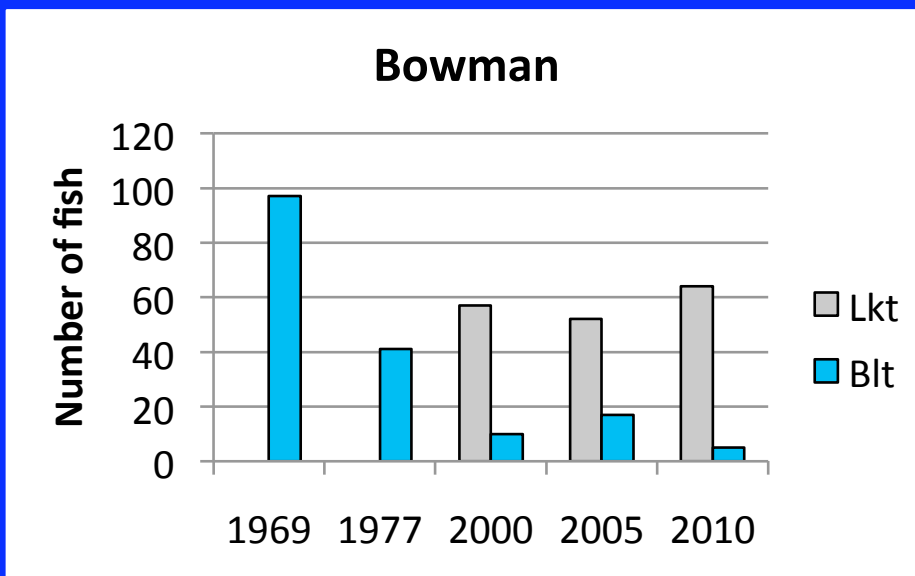
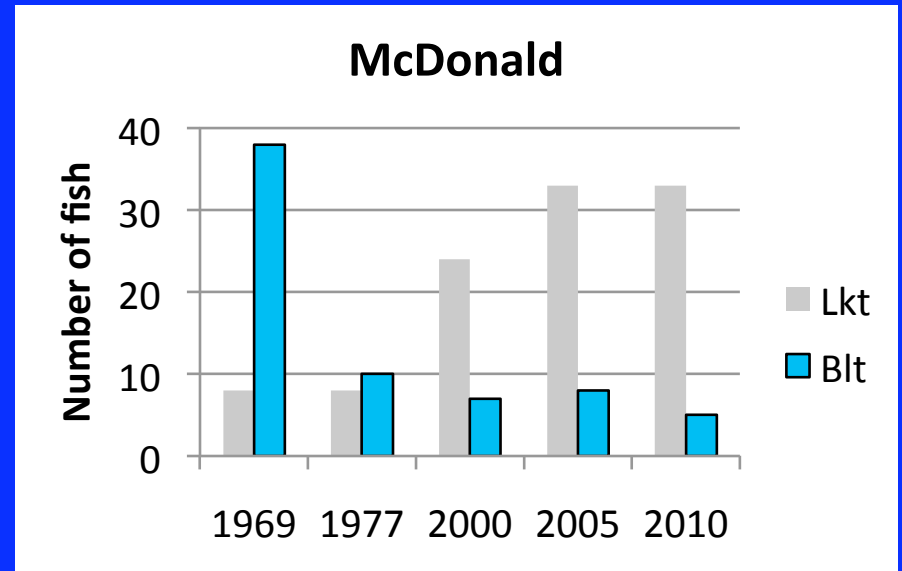
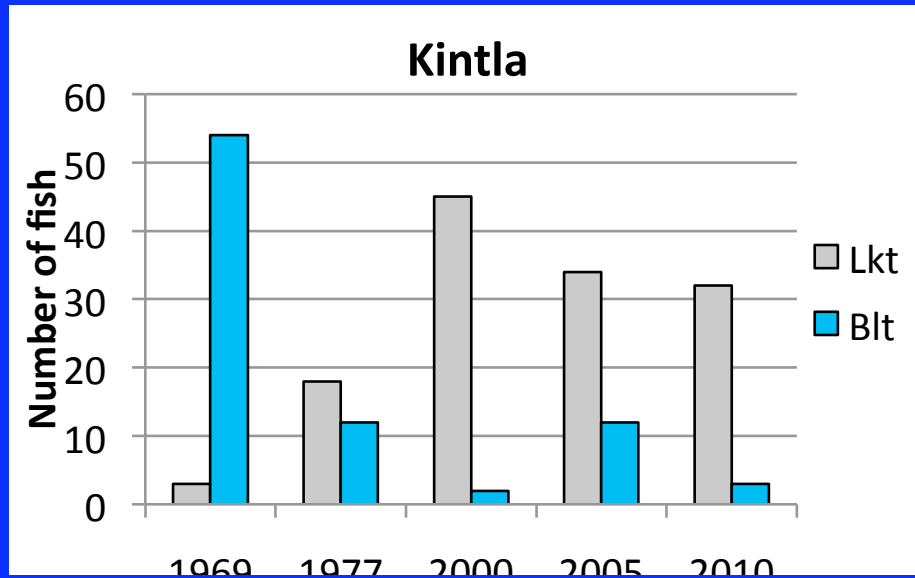


Glacier's Significance for Bull Trout

- About 100 lakes in the contiguous U.S. support native adfluvial bull trout populations, and only about half are natural undammed ecosystems¹.
- Glacier supports approximately 1/3 of the natural lacustrine bull trout habitat in the U.S.
- Glacier and the adjacent Blackfoot Reservation support the only bull trout populations found east of the Continental Divide in the U.S.

¹ Fredenberg et al. 2007

Bull and Lake Trout Gill Net Catch Comparison from Larger West-side Lakes



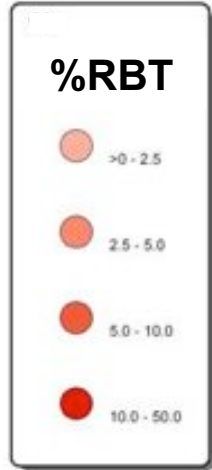
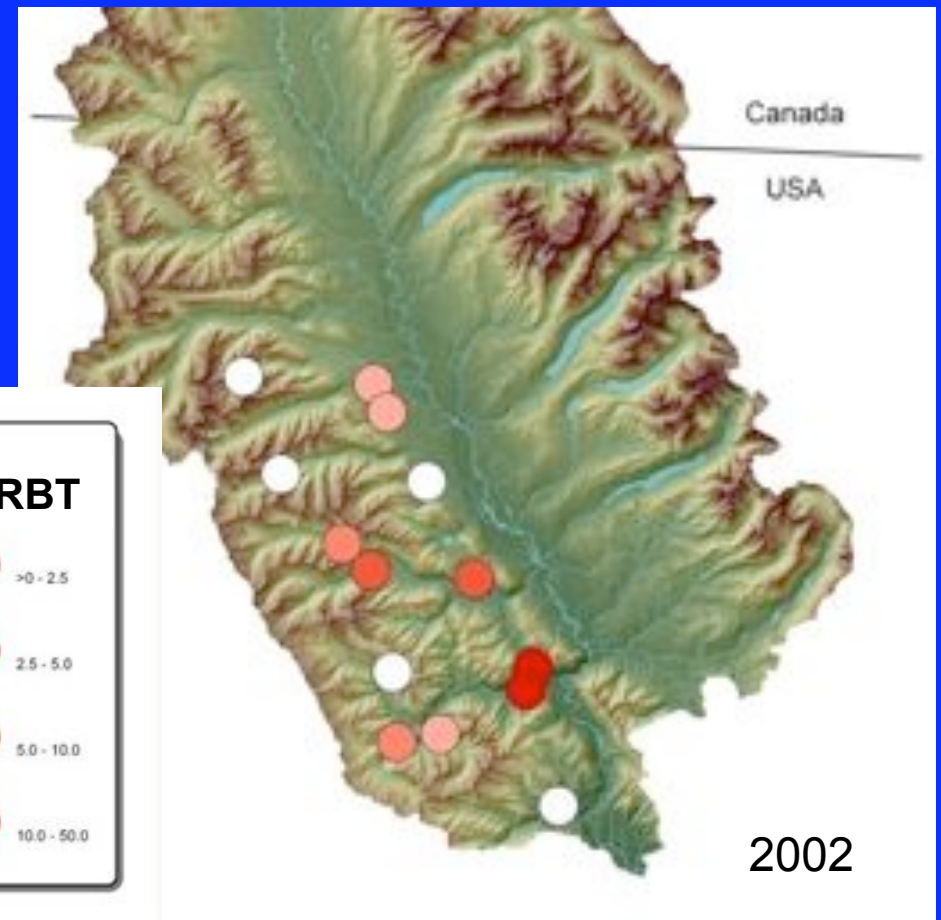
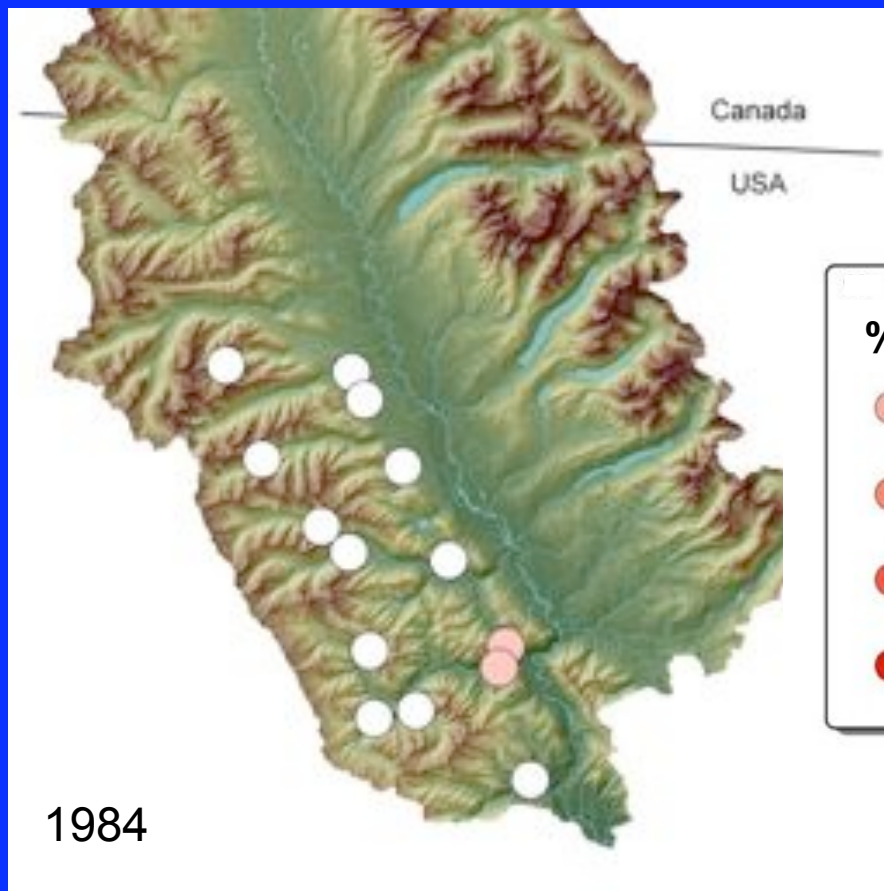
Quartz Lake Experimental Lake Trout Suppression Project



Collaborators: USGS, NPS, USFWS

Westslope cutthroat trout genetic status

N. Fk. Flathead River westslope -
rainbow hybridization



Rainbow trout suppression on Midvale Creek



NPS, Blackfeet Tribe, USFWS, MFWP, MTDNRC



Potential Invaders

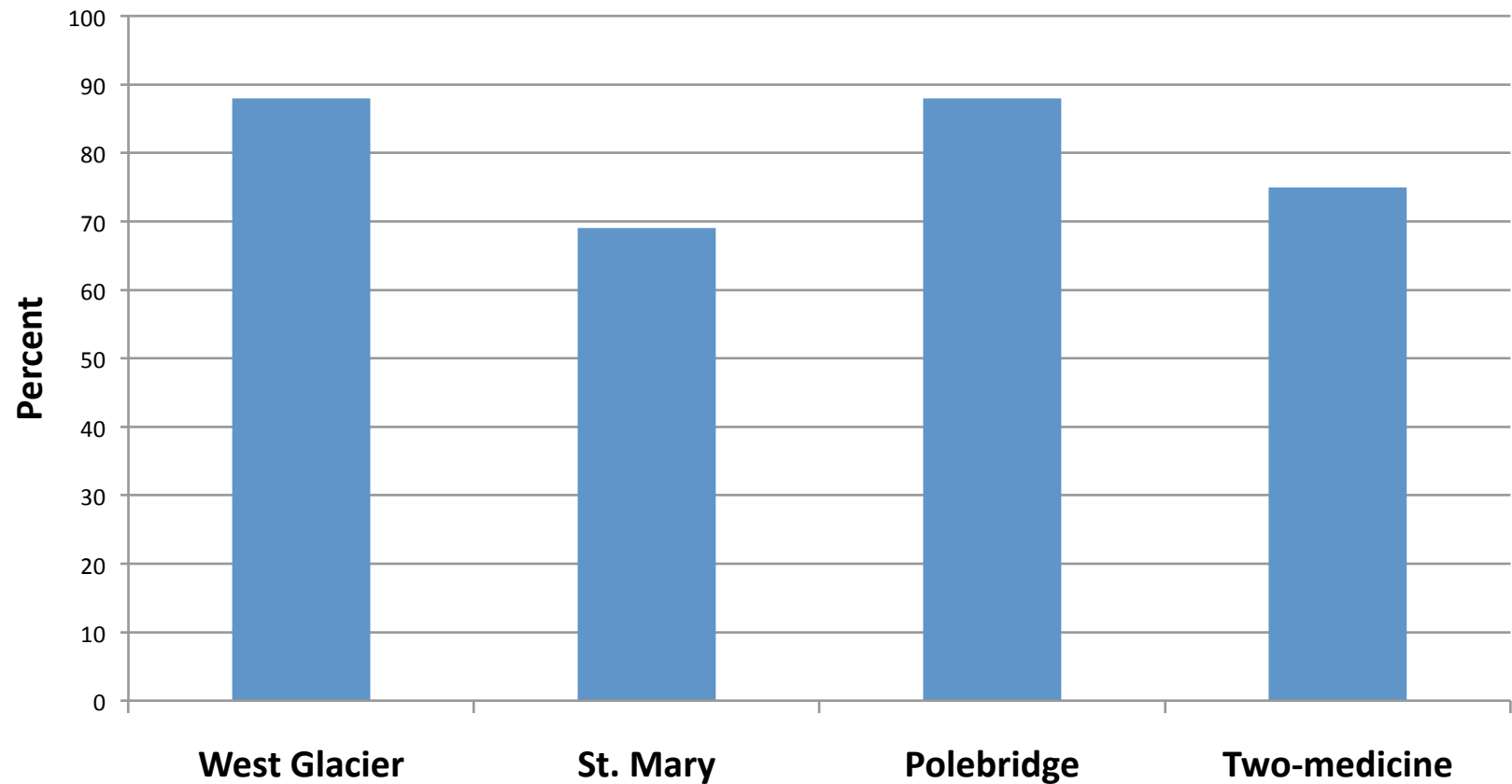


Entrance Interviews

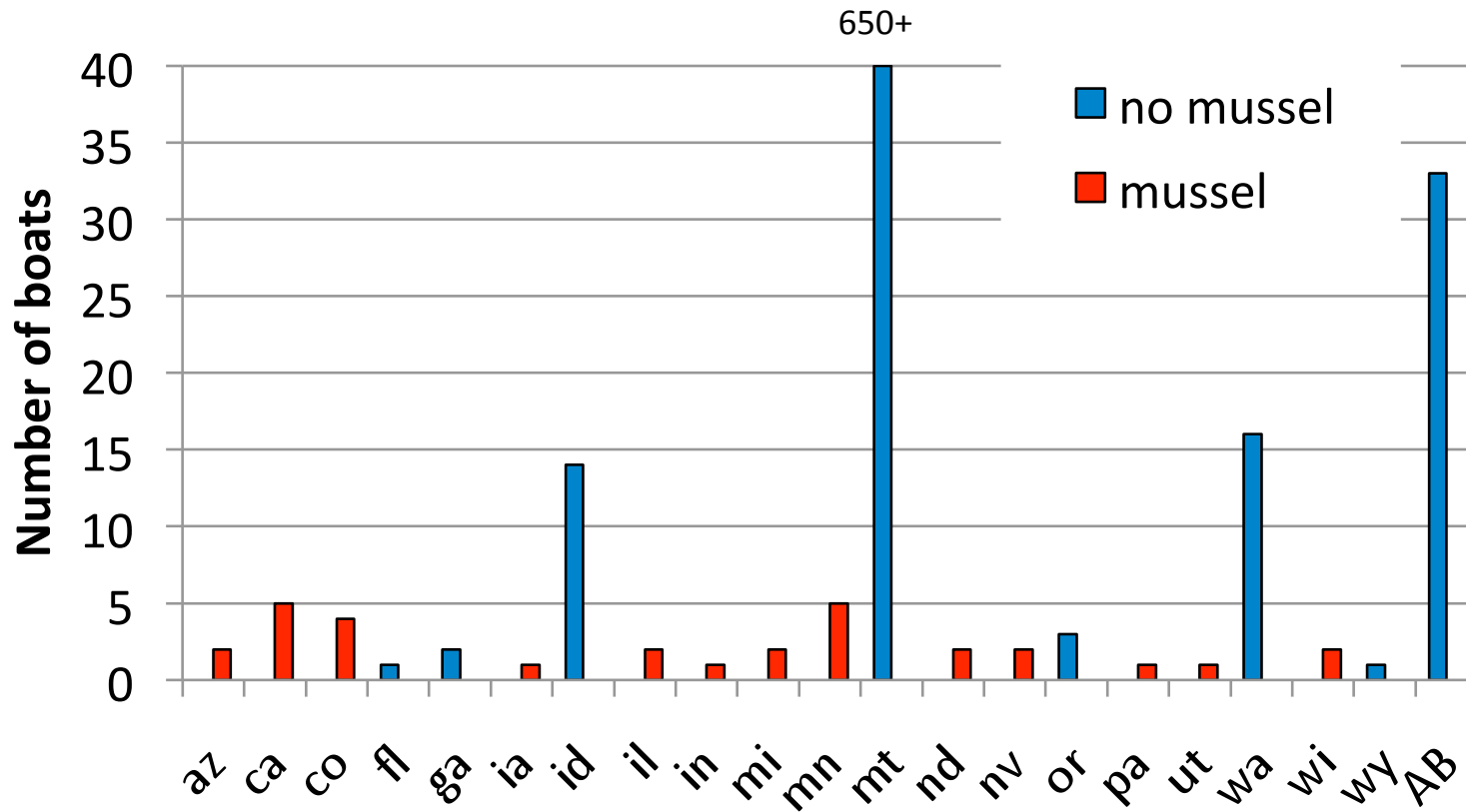


Boater Entrance Interviews

2009 Montana Registered Boats



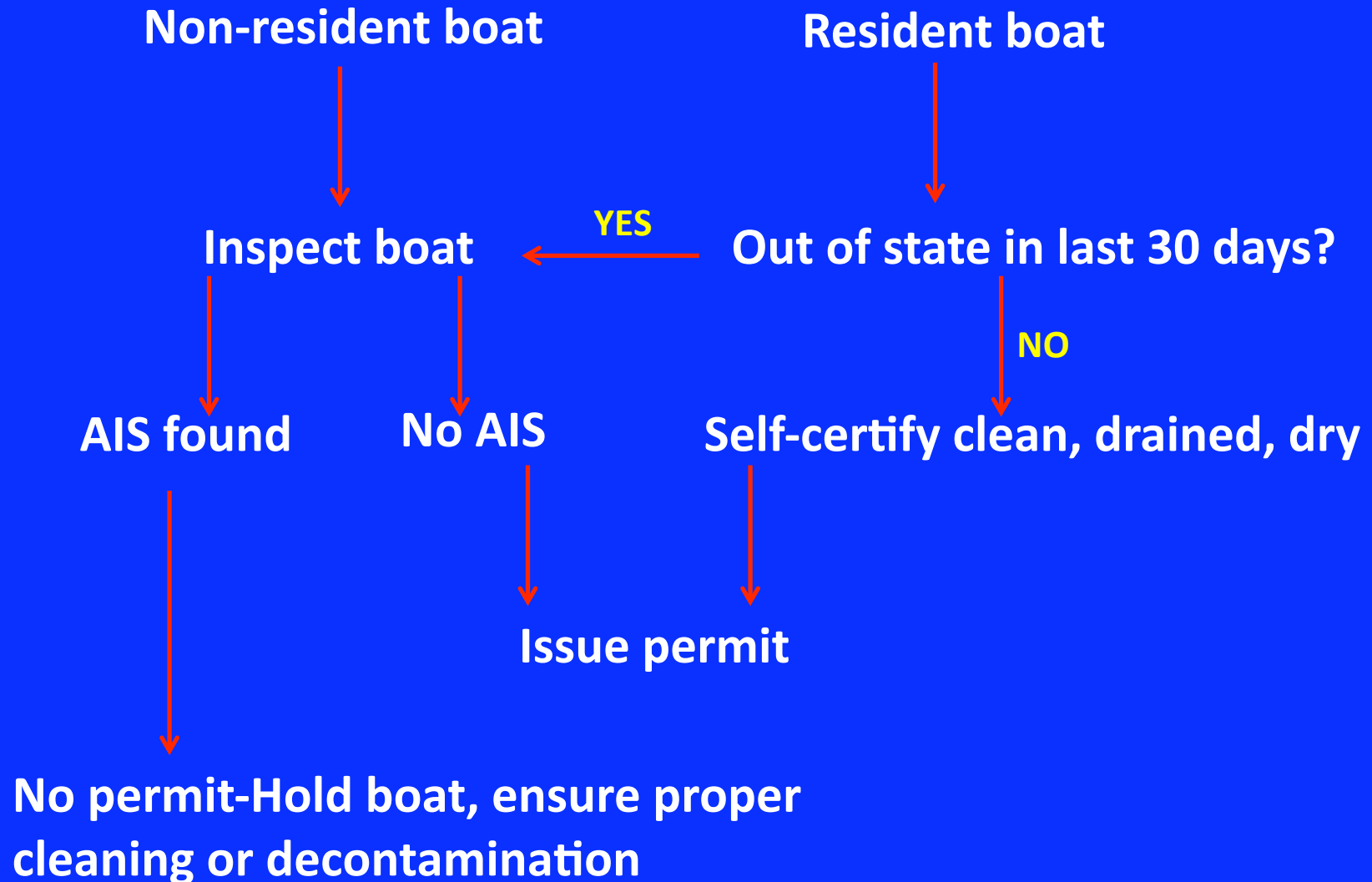
2010 Boater Registration Data



Inspection Training



2010 Inspection Flow Chart



Relative Risk of Zebra Mussel Introduction and Establishment

Bowman

Metric	Lower	Moderate	higher
Calcium (mg/l)	<12-15	15-20	>20
pH	<7.3 or > 9	7.3-7.5 or 8.7-9.0	7.5-8.7
Mean summer T (C)	<12	12-15	>15
DO (mg/l)	<4	4-8	>8
Motorized boat use	low	medium	high

McDonald

Metric	Lower	Moderate	higher
Calcium (mg/l)	<12-15	15-20	>20
pH	<7.3 or > 9	7.3-7.5 or 8.7-9.0	7.5-8.7
Mean summer T (C)	<12	12-15	>15
DO (mg/l)	<4	4-8	>8
Motorized boat use	low	medium	high

St. Mary Lake

Metric	Lower	Moderate	higher
Calcium (mg/l)	<12-15	15-20	>20
pH	<7.3 or > 9	7.3-7.5 or 8.7-9.0	7.5-8.7
Mean summer T (C)	<12	12-15	>15
DO (mg/l)	<4	4-8	>8
Motorized boat use	low	medium	high

Two-medicine

Metric	Lower	Moderate	higher
Calcium (mg/l)	<12-15	15-20	>20
pH	<7.3 or > 9	7.3-7.5 or 8.7-9.0	7.5-8.7
Mean summer T (C)	<12	12-15	>15
DO (mg/l)	<4	4-8	>8
Motorized boat use	low	medium	high

Waterton

Metric	Lower	Moderate	higher
Calcium (mg/l)	<12-15	15-20	>20
pH	<7.3 or > 9	7.3-7.5 or 8.7-9.0	7.5-8.7
Mean summer T (C)	<12	12-15	>15
DO (mg/l)	<4	4-8	>8
Motorized boat use	low	medium	high

2011 Glacier Boating Permit Program

- **Motorized/Trailer Boat Launch Permit system**
- **Permit is free**
- **Increase the number and frequency of inspections**
- **Requires face to face contact with NPS staff**
- **A series of questions to assess the “risk” level of the boat**
- **Clean, drained, and dry boats are permitted to launch**

Education and public outreach

Resource Bulletin

Aquatic Invasive Species

Threats to Oysters

Oysters are a keystone species in the coastal zone. They are a major part of the diet of many species of fish and birds. Oysters also provide habitat for many other species of fish and invertebrates.

The most significant threat to the health of the Central Coast oyster industry is the introduction of non-indigenous species. These species can be introduced to oyster farms through a variety of means, including the transport of oyster shells, the use of oyster rafts, and the use of oyster seed. The introduction of non-indigenous species can have a devastating impact on the oyster industry, as these species can outcompete oysters for space and resources, and can also damage oyster shells and reduce oyster survival.



The oyster industry is a major part of the Central Coast economy. Oysters are a keystone species in the coastal zone.

Why is it a threat?

There are many reasons why non-indigenous species are a threat to the oyster industry. One of the most common ways that non-indigenous species are introduced to oyster farms is through the transport of oyster shells. Oyster shells can carry non-indigenous species, and these species can be introduced to oyster farms when the shells are used to transport oyster seed. Another way that non-indigenous species are introduced to oyster farms is through the use of oyster rafts. Oyster rafts can carry non-indigenous species, and these species can be introduced to oyster farms when the rafts are used to transport oyster seed. Finally, non-indigenous species can be introduced to oyster farms through the use of oyster seed. Oyster seed can carry non-indigenous species, and these species can be introduced to oyster farms when the seed is used to grow oysters.

What are the risks?

The introduction of non-indigenous species to oyster farms can have a number of risks. One of the most significant risks is that non-indigenous species can outcompete oysters for space and resources. This can lead to a decline in oyster survival and growth. Another risk is that non-indigenous species can damage oyster shells and reduce oyster survival. Finally, non-indigenous species can also have a negative impact on the oyster industry's reputation. If consumers believe that oysters from a particular farm are contaminated with non-indigenous species, they may be less likely to buy oysters from that farm.

What's to be Done?

There are several things that can be done to reduce the risk of non-indigenous species being introduced to oyster farms. One of the most important things is to use oyster shells that have been thoroughly cleaned and disinfected. Another important thing is to use oyster rafts that have been thoroughly cleaned and disinfected. Finally, it is important to use oyster seed that has been thoroughly cleaned and disinfected. By following these guidelines, oyster farmers can reduce the risk of non-indigenous species being introduced to their farms.

Invasive Species	Reasons for Concern	How You Can Help
	<p>Increases of non-indigenous species can reduce biodiversity and ecosystem health. Non-indigenous species can also compete with native species for resources, leading to the decline or extinction of native species. Additionally, non-indigenous species can be harmful to humans, such as through the spread of disease.</p>	<ul style="list-style-type: none"> Remove oyster plants, animals, and materials from boat, gear, and oyster rafts. Inspect oyster rafts regularly and clean them as needed. Use oyster rafts that are made of non-toxic materials. Use oyster seed that is certified to be free of non-indigenous species.
	<p>Increases of non-indigenous species can reduce biodiversity and ecosystem health. Non-indigenous species can also compete with native species for resources, leading to the decline or extinction of native species. Additionally, non-indigenous species can be harmful to humans, such as through the spread of disease.</p>	<ul style="list-style-type: none"> Remove any plants, animals, and materials on boat or equipment. Check gear before the oyster farm, and clean it as needed. Use oyster seed that is certified to be free of non-indigenous species. Use oyster rafts that are made of non-toxic materials.
	<p>A non-indigenous species that is highly invasive and can cause significant damage to the oyster industry. Non-indigenous species can also compete with native species for resources, leading to the decline or extinction of native species. Additionally, non-indigenous species can be harmful to humans, such as through the spread of disease.</p>	<ul style="list-style-type: none"> Check for and remove any plants, animals, and materials on boat and equipment. Inspect all gear thoroughly before leaving the oyster farm.
	<p>A highly invasive species that can cause significant damage to the oyster industry. Non-indigenous species can also compete with native species for resources, leading to the decline or extinction of native species. Additionally, non-indigenous species can be harmful to humans, such as through the spread of disease.</p>	<ul style="list-style-type: none"> Report all sightings immediately. Check and clean gear regularly to prevent introduction.

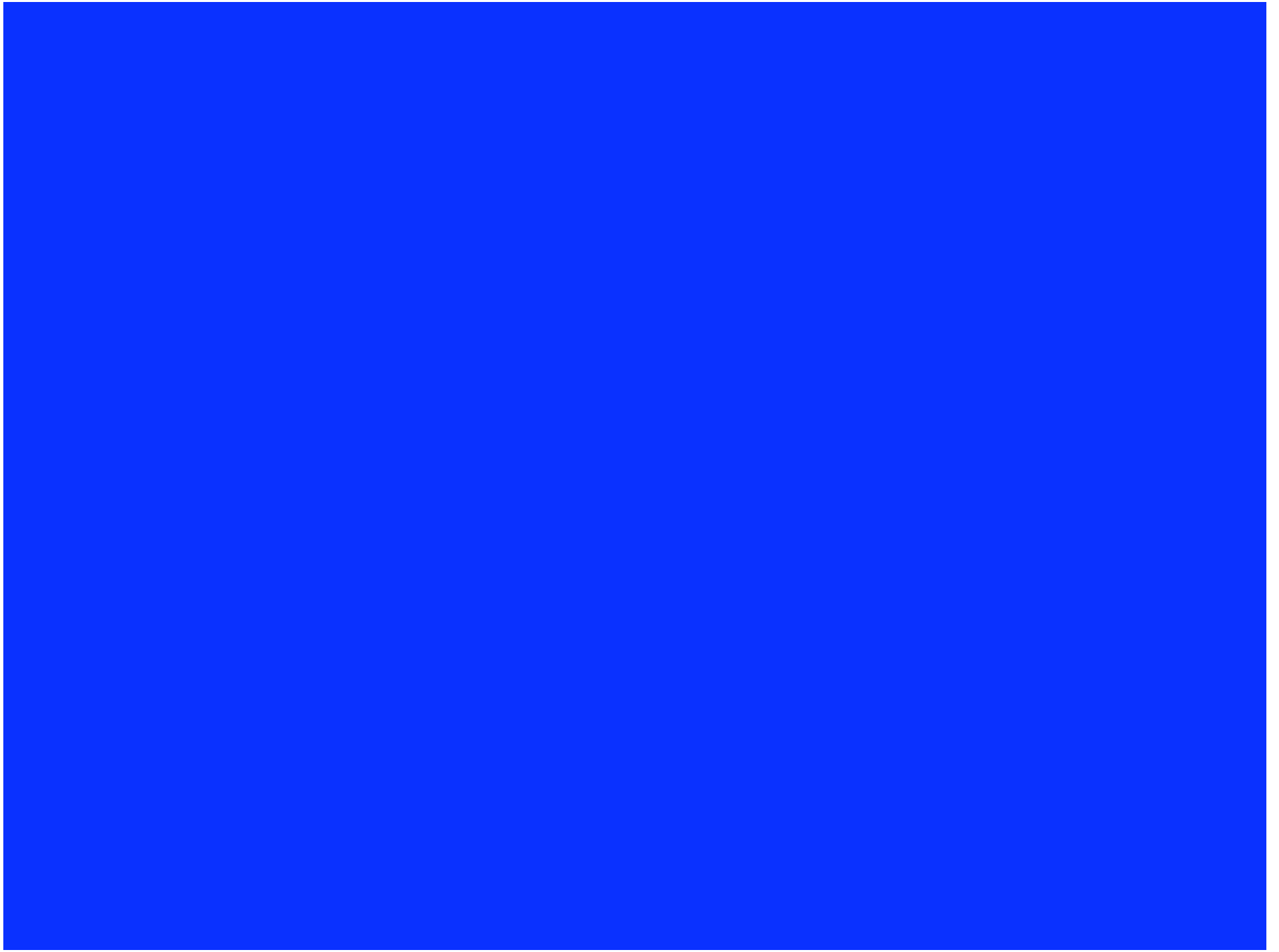


Monitoring





Logging Lake (W. Fredenberg)



2009 Boater Entrance Interviews cont.

Local County Boats

