Truckee River Watershed Invasive Species Project

Caldwell, T.J., Chandra, S., Rammer, G.

Dreissena polymorpha
(Zebra mussel)
(Actual size = 15 mm)

Dreissena rostriformis bugensis
(Quagga mussel)
(Actual size = 20 mm)

Sits flat on ventral side

Triangular in shape

Color patterns vary

Will not sit flat on ventral side, topples over

Rounder in shape

Dark concentric rings on shell

Paler in color near the hinge

U.S. Geological Survey

Chandra and Anderson

- Introduction to invasive species
  - Movement, transport, ecology, etc.
  - Objectives

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Outline

- Introduction to invasive species
  - Movement, transport, ecology, etc.
  - Objectives
- Methods
  - Invasive surveys, Calcium concentrations

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- **Summary**

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Invasive Species

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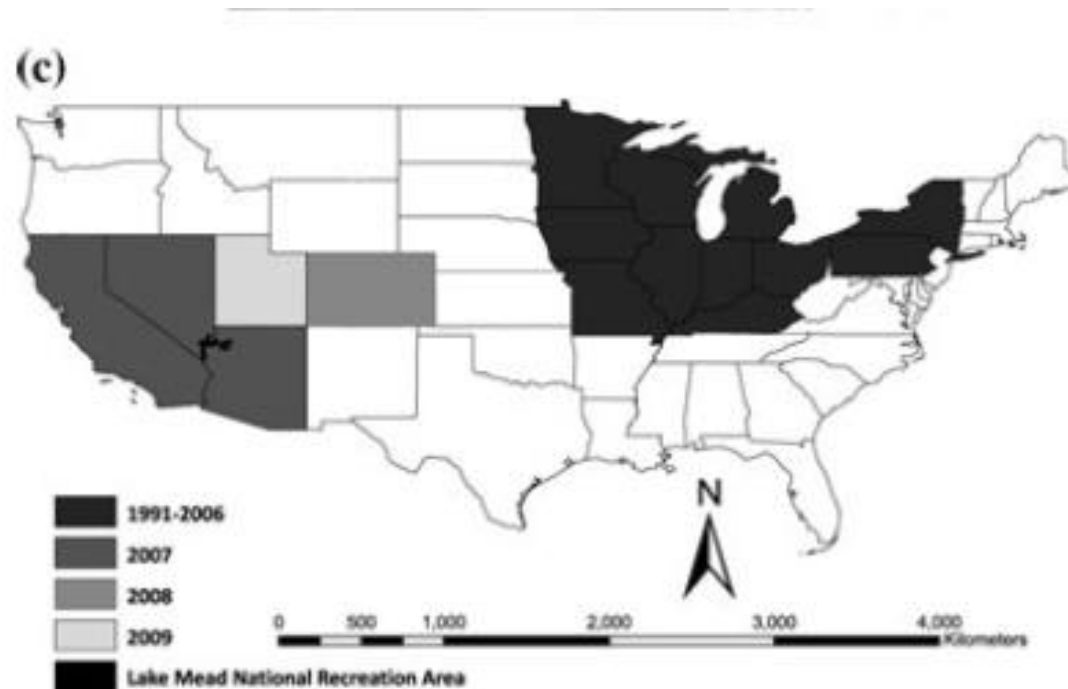- Deliberately – for sport, food source, or pleasing to the eye

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- The introduction of species can disrupt aquatic ecosystems
- Deliberately – for sport, food source, or pleasing to the eye
- Accidently - via ship ballast, hull fouling, aquaria, canals
- Examples – brook trout, zebra/quagga mussels, sea lamprey, Eurasian Water Milfoil

Movement

- Movement westward from the Great Lakes

Hickey 2010

Movement

- Boats (commercial and recreational)

BOATERS: FIGHT
Eurasian Water Milfoil
Remove all weeds from boating equipment

STOP AQUATIC HITCHHIKERS!

Movement

- Boats (commercial and recreational)

- Fishing Equipment (waders, boots, lures)

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- Fishing Equipment (waders, boots, lures)

- Water ways (canals, rivers/streams)

- Aquarium releases or ornamental use

Boat Movement

- 7757 Boater Interactions – Boats came from 16 States

  – 6431: from outside of watershed

  – 1057: from high use areas (i.e. Frenchmans, Sacramento River)

  – 65: from suspected/positive quagga and/or zebra mussel lakes (i.e. Lake Erie, Lake Mead)

STOP AQUATIC HITCHHIKERS!

M.E. Wittmann
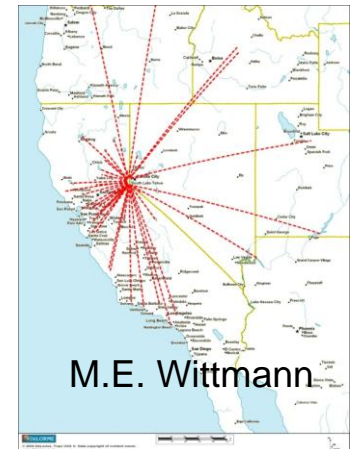
Calcium Concentrations

- Will dreissenid mussels survive in low calcium waters?

Table 1. Ecoregional risk classifications based on calcium concentration sample statistics in US streams and rivers (USEPA EMAP unpublished; USEPA WSA 2006)

Risk class	Distribution of calcium concentrations at sites
Very low	75th percentile < 12 mg L^{-1}
Low	12 mg L^{-1} ≤ 75th percentile < 20 mg L^{-1} or 75th percentile < 21 mg L^{-1} and maximum < 28 mg L^{-1}
High	mean ≥ 28 mg L^{-1} and 25th percentile > 12 mg L^{-1}
Highly variable	≥ 15% of sites with Ca < 12 mg L^{-1} AND ≥ 15% of sites with Ca ≥ 28 mg L^{-1}

Relative risk
- Very low
- Low
- High
- Highly variable
- Not assessed
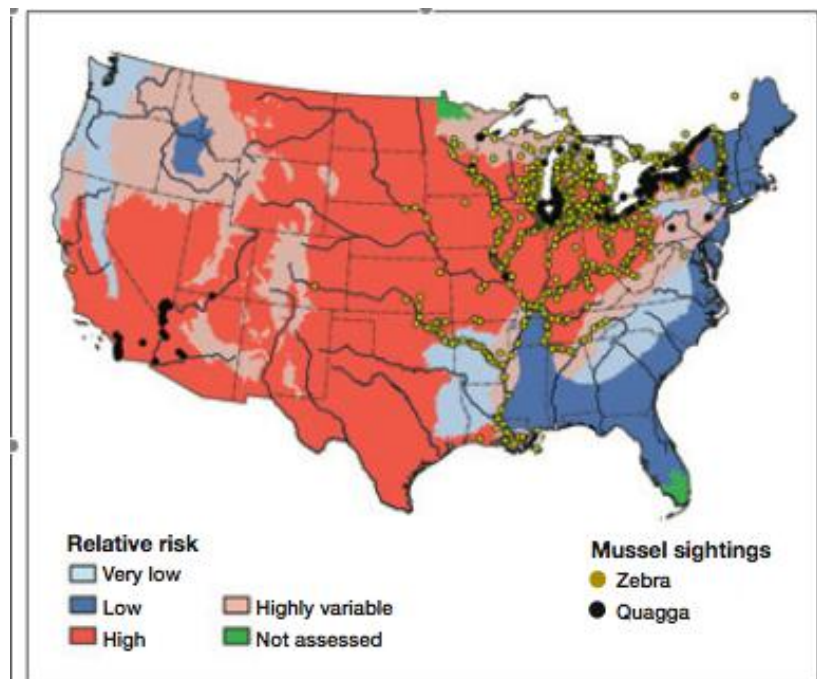
Mussel sightings
- Zebra
- Quagga

Figure 2. Dreissena invasion risk classes for ecoregions of the contiguous US based on calcium concentrations in streams and rivers. Depending on watershed characteristics, some portions of the highly variable ecoregions will be at high risk, while others will be at very low risk. Dots indicate zebra mussel and quagga mussel observations through March 2008. (Note in press: this figure has been updated from the version available on Frontiers' e-View; mussel sightings have been added to the map.)

Whittier et al. 2008

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- Establish baseline data set to detect changes in the ecosystem caused by new invasive species

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- Understand the potential for dreissenid invasion (i.e. water and sediment-pore calcium concentrations)

Truckee River Watershed

Lake
1. Donner
2. Stampede
3. Boca
4. Prosser
5. Martis Creek L.
6. Webber
7. Independence
8. Spooner
9. Marlette
10. Pyramid
11. Lahontan
12. Rye Patch
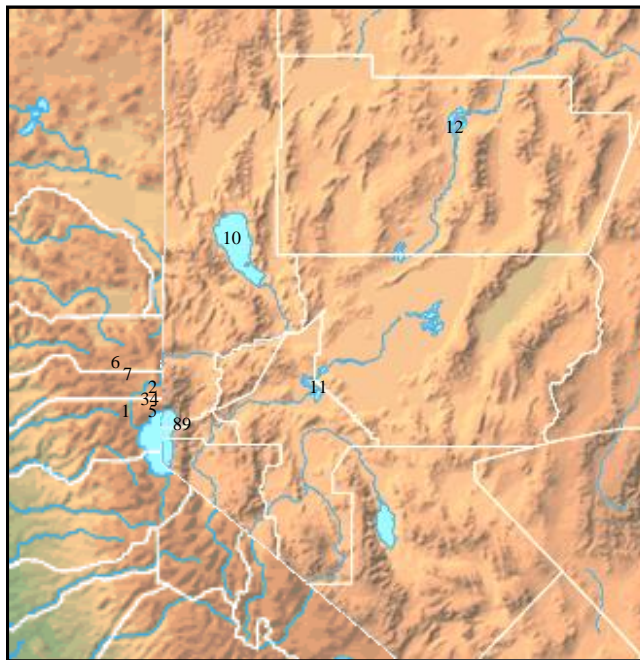
Study Sites

Table 1. Basic morphological characteristics of the 2010/2011 Truckee River region study lakes.

Lakes	Max Depth (m)	Surface Area (ha)	Shoreline (km)
Donner	70	390	12.07
Stampede	52	1351.7	40.2
Boca	24	396.6	24.14
Prosser	24	303.5	17.7
Martis Creek L.	6	23.4	Na
Webber	31	81	Na
Independence	44	252.9	9.3
Spooner	4	31.6	Na
Marlette	11	na	Na
Pyramid	130	50,000.00	160
Lahontan	26	4,409.90	96
Rye Patch	18.5	4,451.50	115.9

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- Invasive Species Survey
  - Survey lake shorelines for invasive species (hydrilla, Asian clams, EWM, Dreissenids, NZMS)

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Methods

- Invasive Species Survey
  - Survey lake shorelines for invasive species (hydrilla, Asian clams, EWM, Dreissenids, NZMS)

- Quagga/Zebra mussel veliger detection
  - 30cm, 64μm-mesh standard zooplankton net
  - Sampled boat launches, popular beaches, etc.
  - Samples shipped to CFG Bodega Bay Lab to detected veliger DNA

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- Calcium Water Analysis
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- Calcium sediment pore-water
  - Samples collected from Asian clam patch in Donner Lake and outside clam patch
  - Collected using a modified syringe-apparatus
  - Filtered and sent to UC-Davis for analysis

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- Crayfish
  - Crayfish were surveyed in 2010
  - Traps were placed in each lake overnight and collected and counted the following day
  - CPUE was calculated
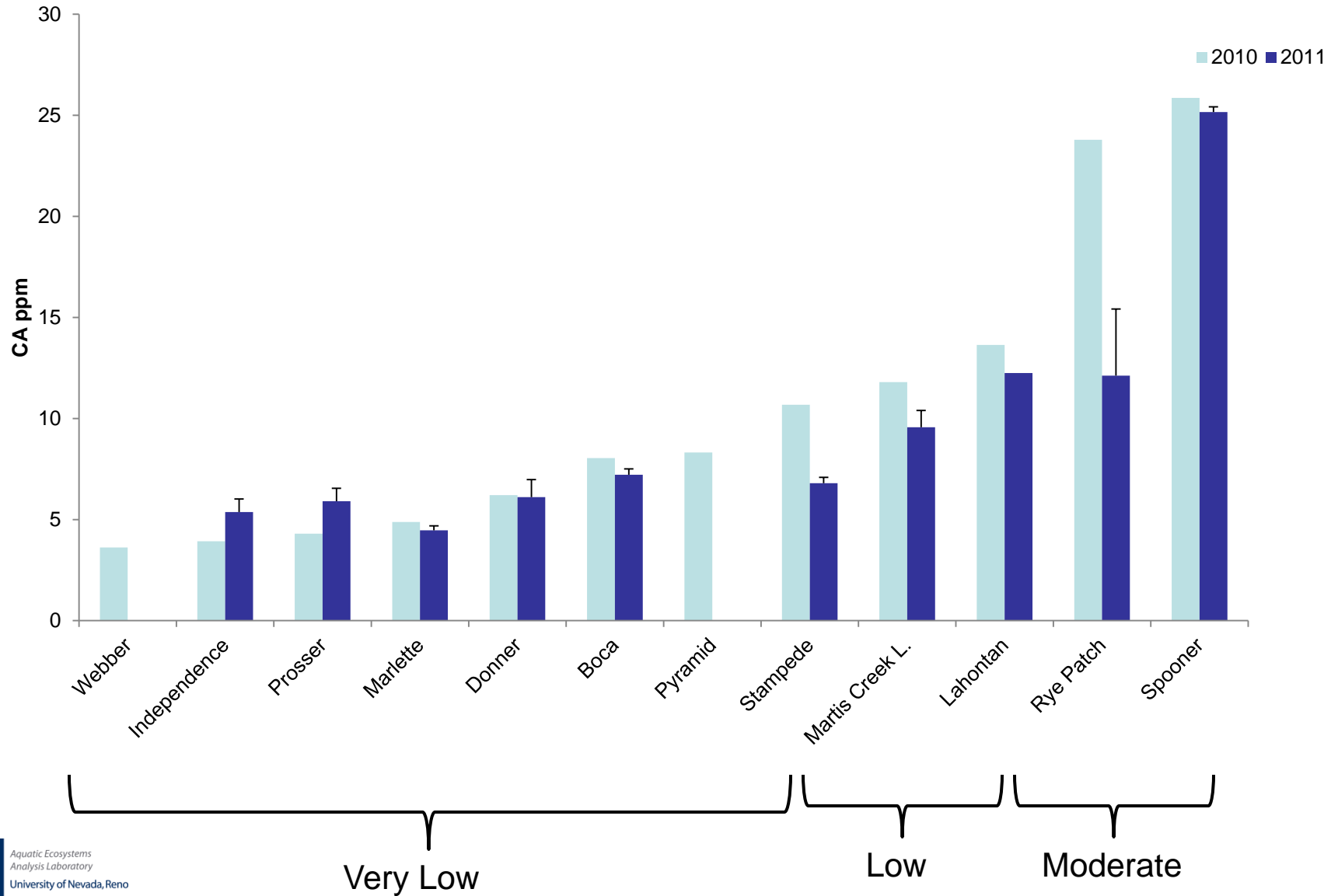
Results

- ## Invasive Species Surveys

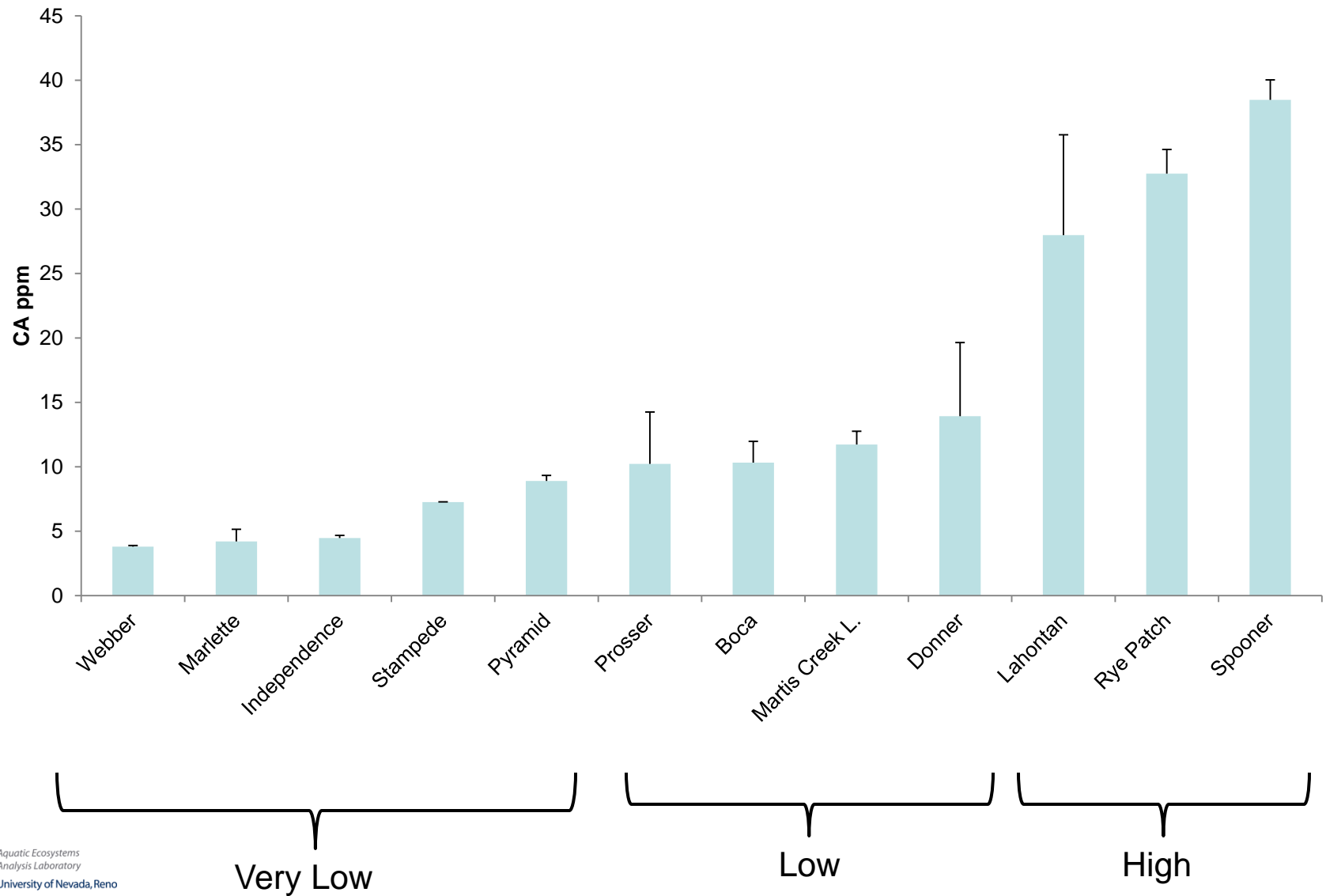| Lakes | Adult Invertebrates | | | | | Plants | |
	Quagga	Zebra	NZMS	Asian Clam	Crayfish	EWM	Hydrilla
Donner				X	X		
Stampede					X		
Boca					X		
Prosser					X		
Martis Creek L.				[1]X		X	
Webber					X		
Independence					X		
Spooner						X	
Marlette					X		

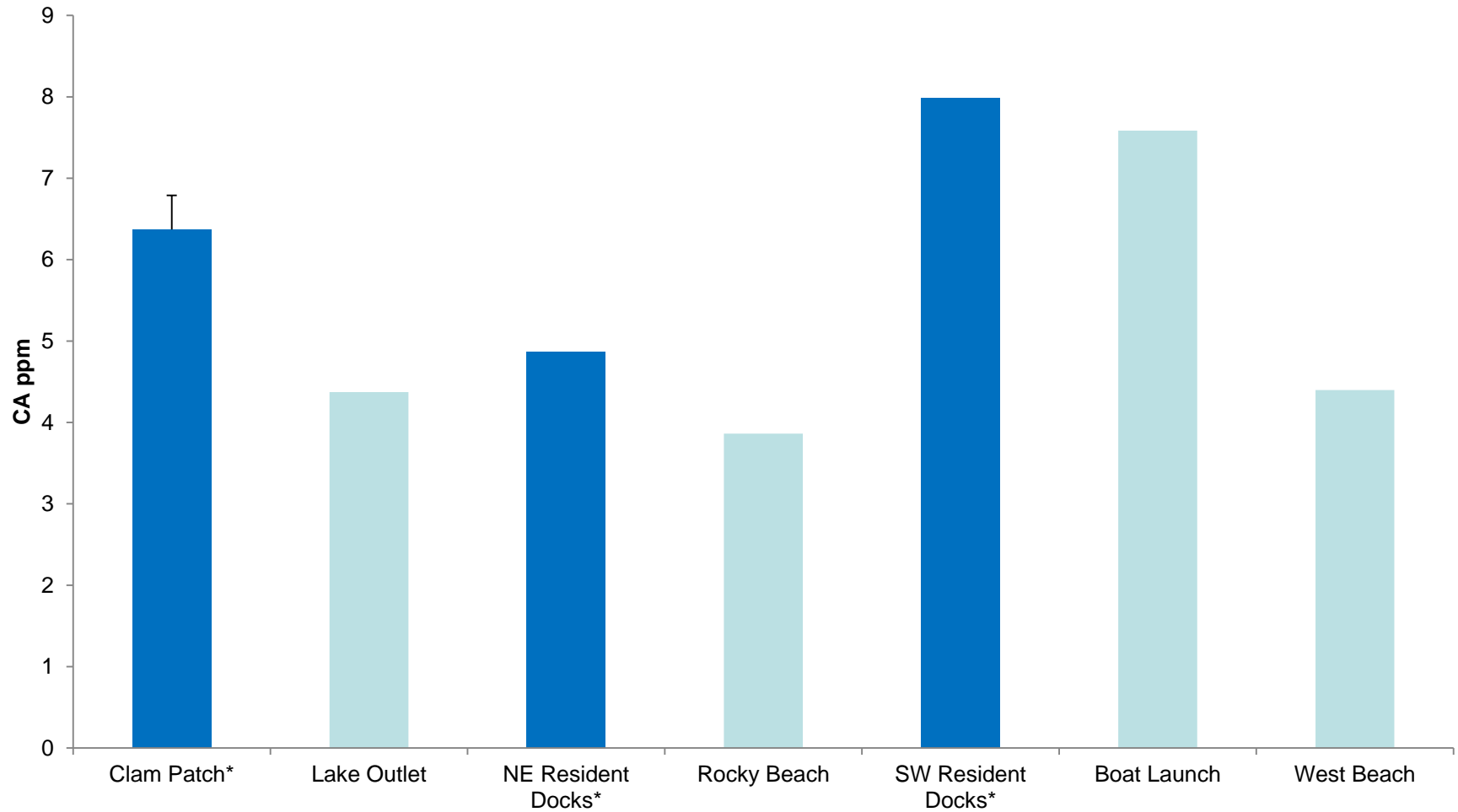*Negative on all veliger DNA analysis

Calcium Results
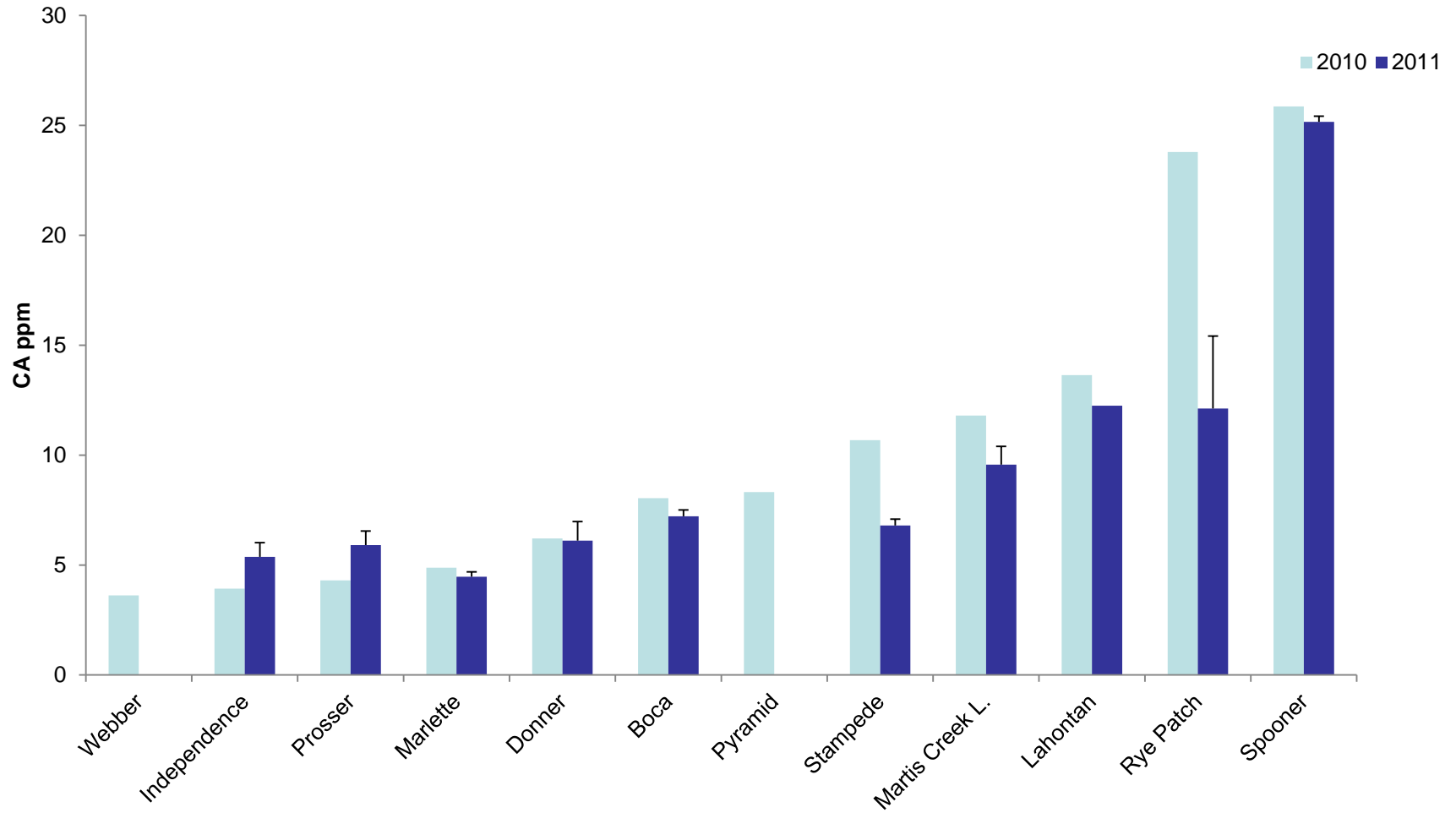
Calcium Results

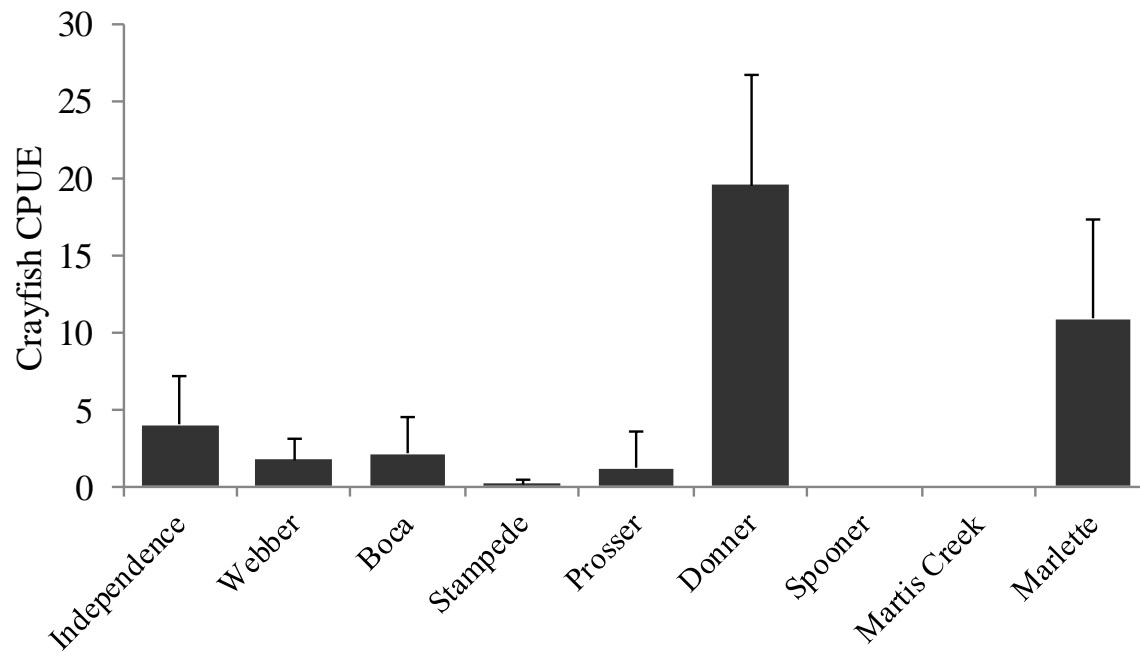# 2010 Calcium Sediment Pore-Water Results

Donner Lake sediment-pore water

Crayfish

- We have not seen any new invasions in recent years
  - Important to continue a baseline data set before new invasions

Summary

- We have not seen any new invasions in recent years
  - Important to continue a baseline data set before new invasions
- Majority of lakes are in the low risk according to water and sediment pore-water calcium levels
  - Continue to examine differences in Donner lake

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Summary

- Continue with boat checks and outreach/education to public