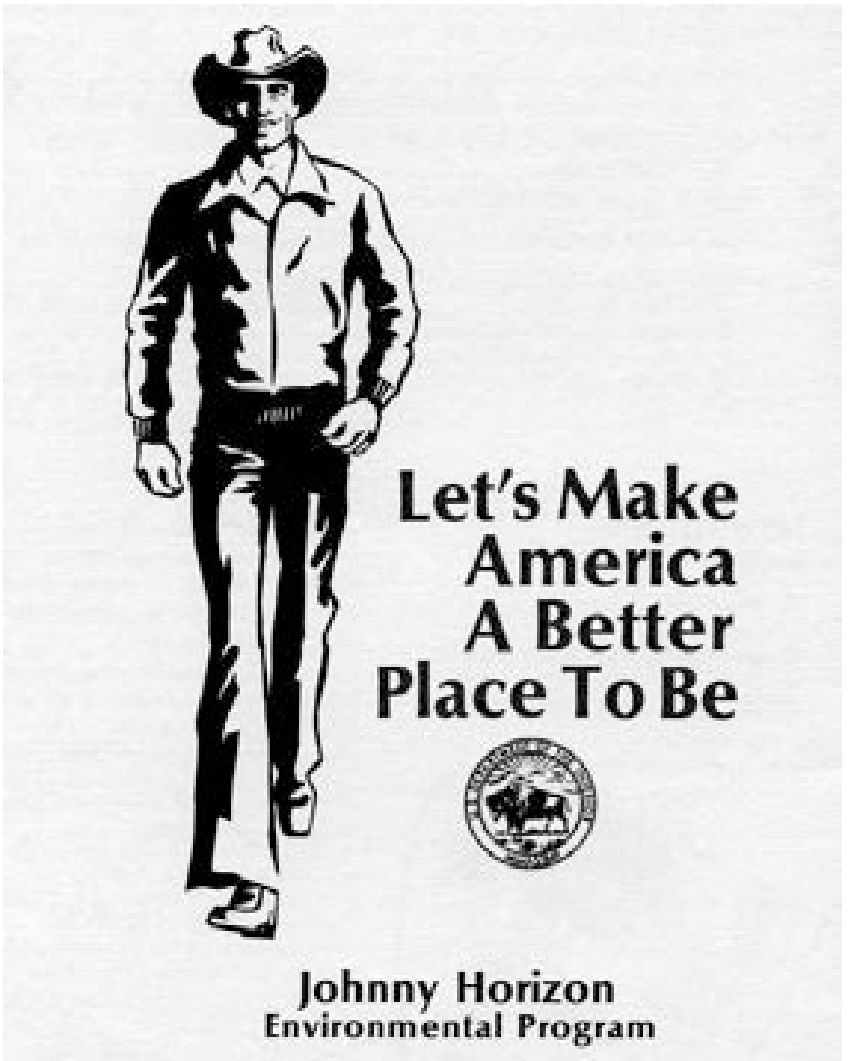
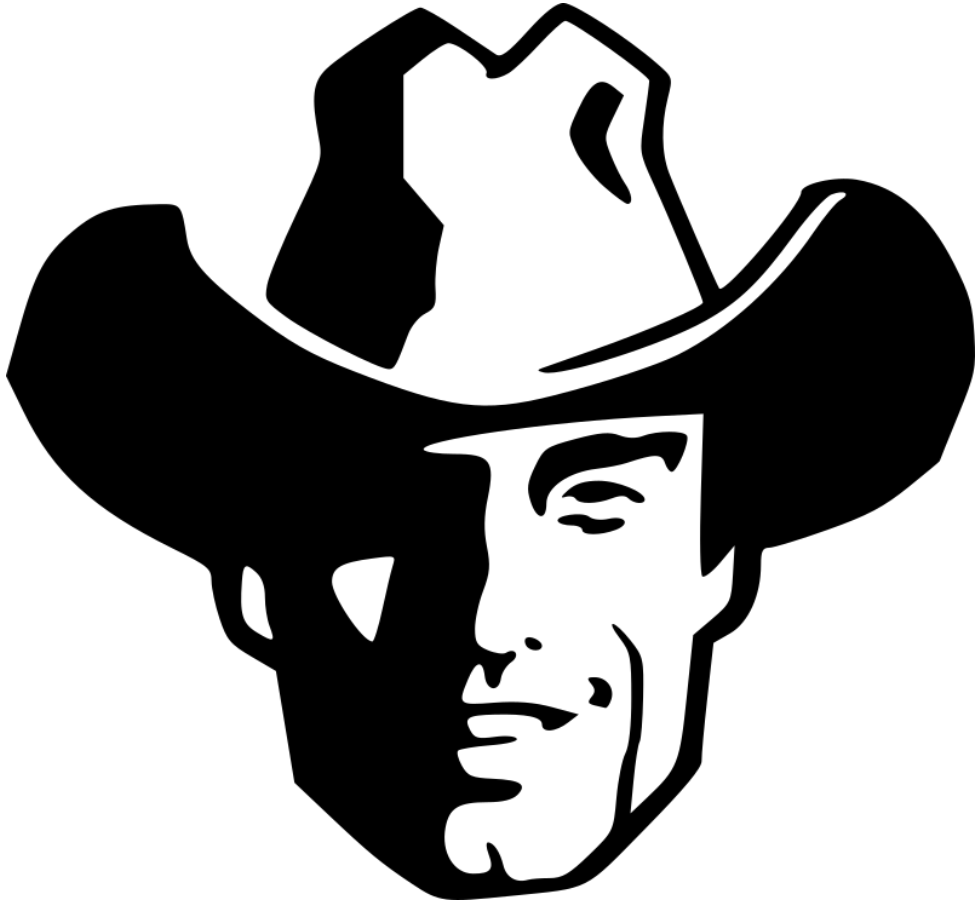
Prioritizing Invasive Dreissenid Mussel Monitoring

Photo from Science History Institute, Philadelphia, PA



https://en.wikipedia.org/wiki/Johnny_Horizon

Prioritizing Invasive Dreissenid Mussel Monitoring

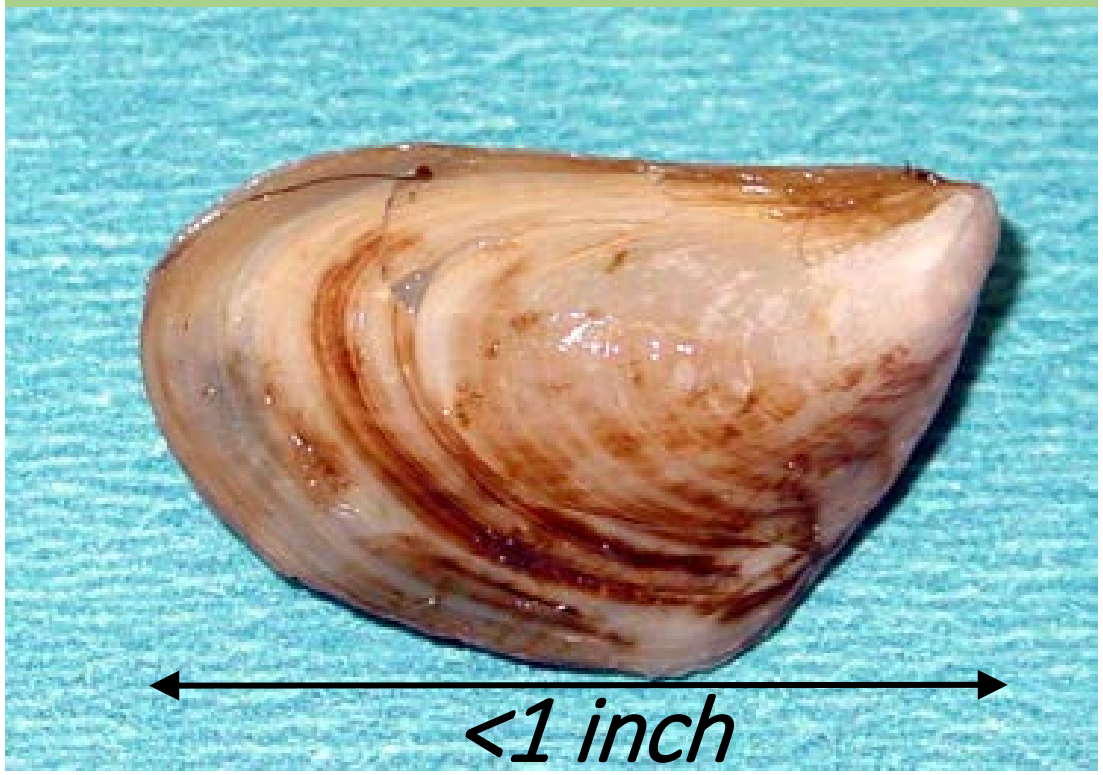


https://en.wikipedia.org/wiki/Johnny_Horizon

Prioritizing Invasive Dreissenid Mussel Monitoring

Zebra

Quagga



Alaska Center for Conservation Science
University of Alaska Anchorage

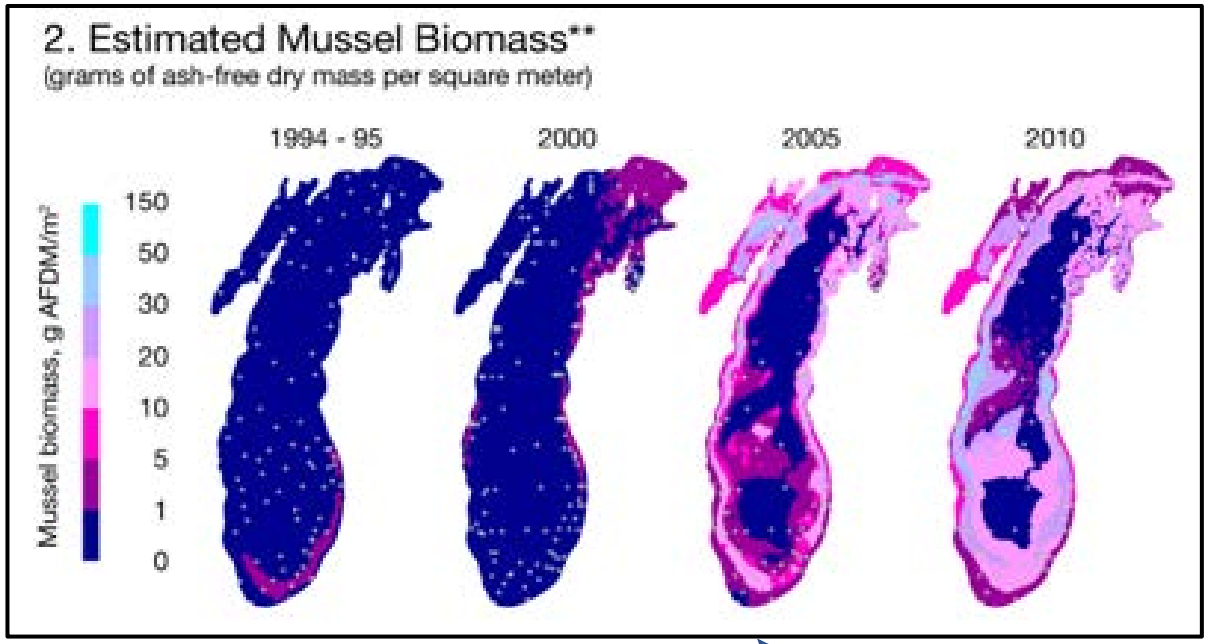
Marcus Geist – November 2025

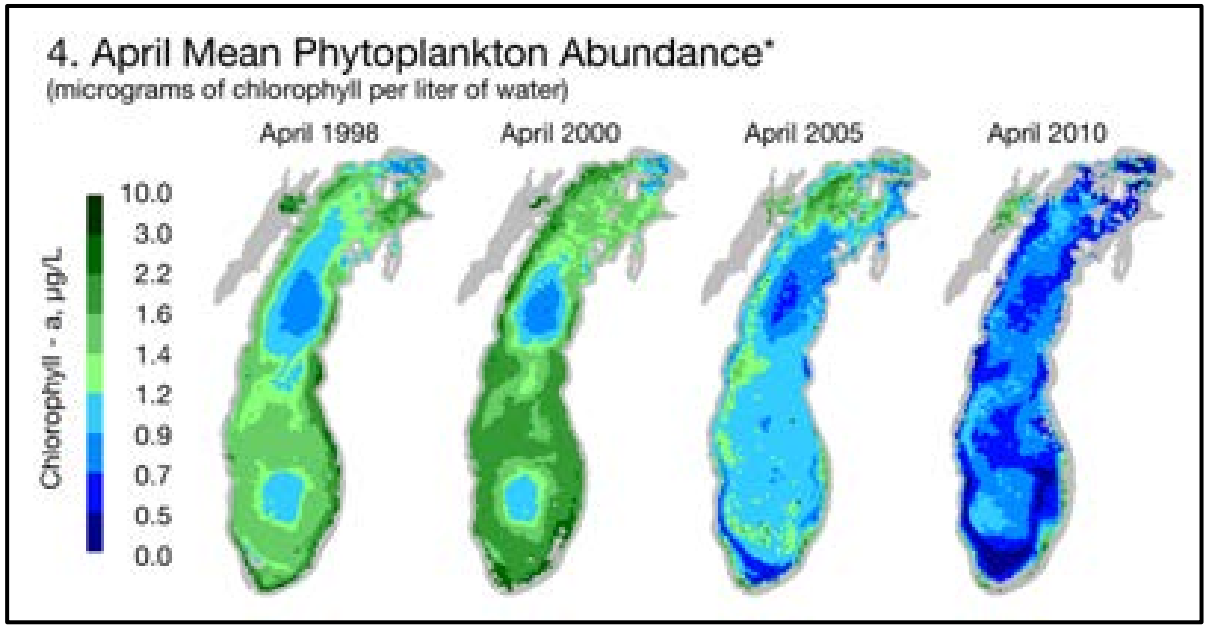
ENVIRONMENT, NATURE, NEWS

Quadrillions of invasive mussels are damaging the Great Lakes, documentary shows

https://www.wpr.org/environment/drebert-melnick-documentary-quagga-mussels-great-lakes

Invasive Mussels and the Productivity of Lake Michigan





Mussel Biomass

Phytoplankton

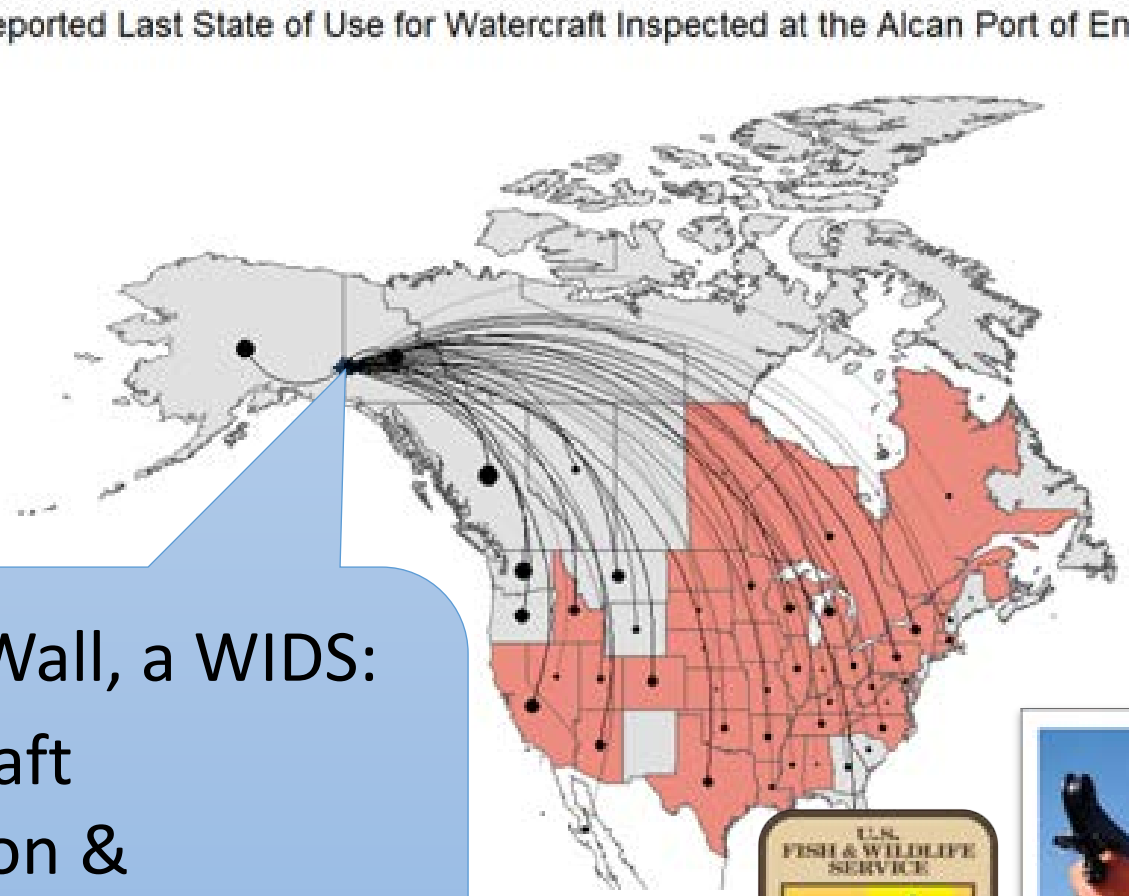
https://www.glerl.noaa.gov/pubs/brochures/infographics.html

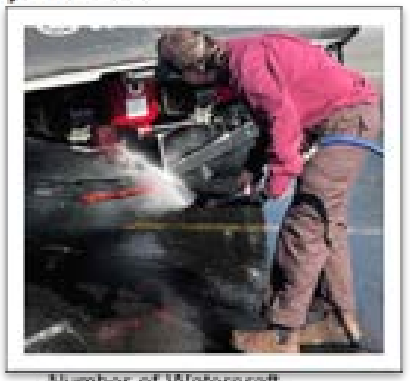
HOW: are we Responding?

ALCAN Station

Not a Wall, a WIDS:

Watercraft
Inspection &
Decontamination
Station





https://www.fws.gov/media/hot-wash-alcan-port-entry-watercraft-inspection-and-decontamination-station

Lake Vulnerability

n = ~ 1 million

STATE OF ALASKA PRESS RELEASE

For Immediate Release

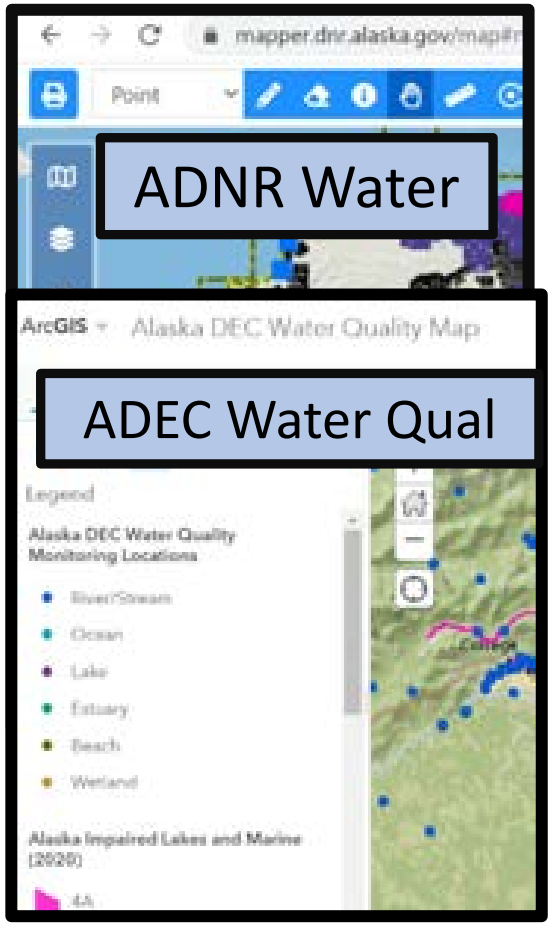
Invasive Zebra Mussels Hitchhike to AK on Aquarium Products

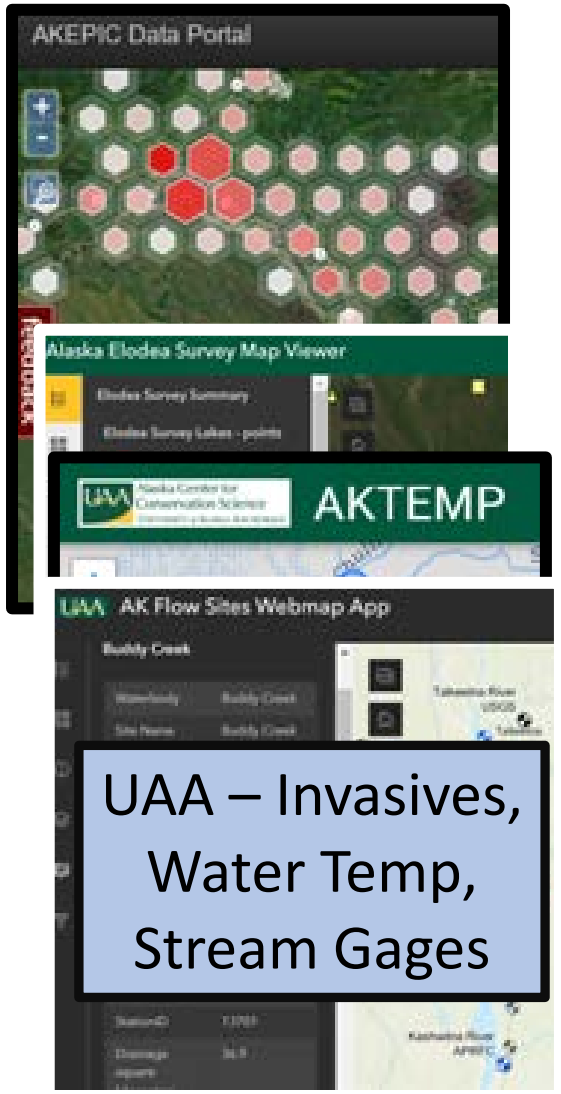
Alaskans who purchased marimo moss balls asked to call hotline

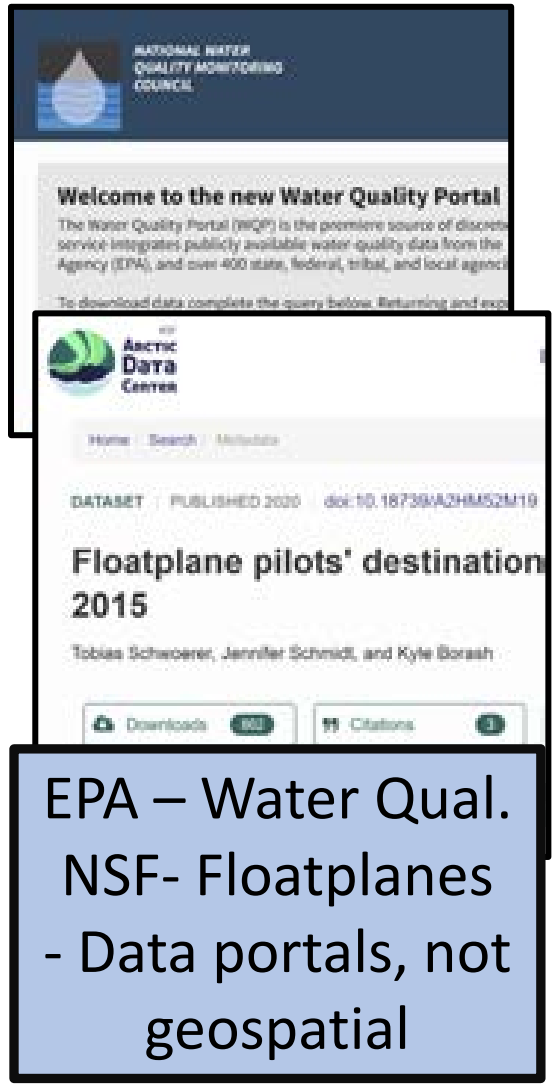
Zebra Mussel on a Marimo Moss Ball

Esri, GEBCO, Garmin, NaturalVue

Currently Many, Many Portals

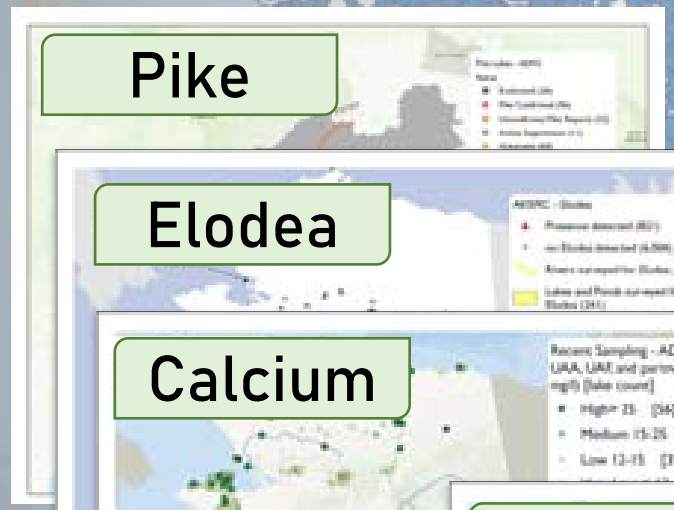


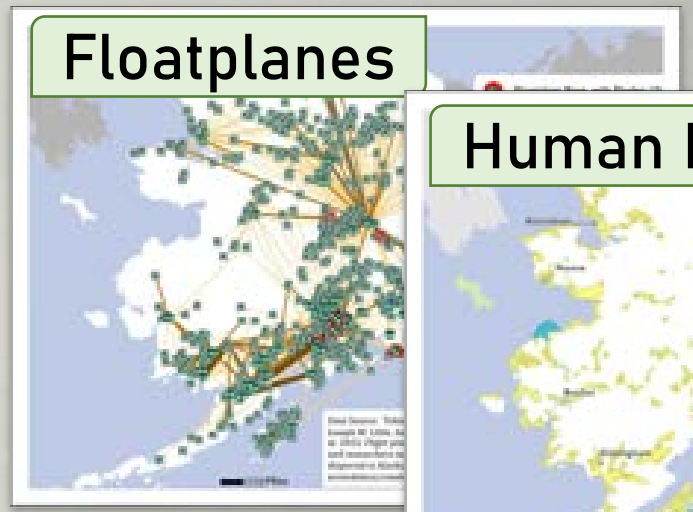


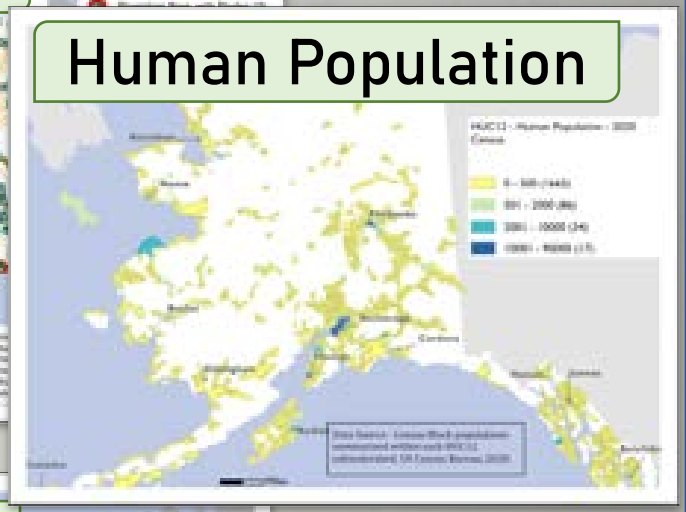


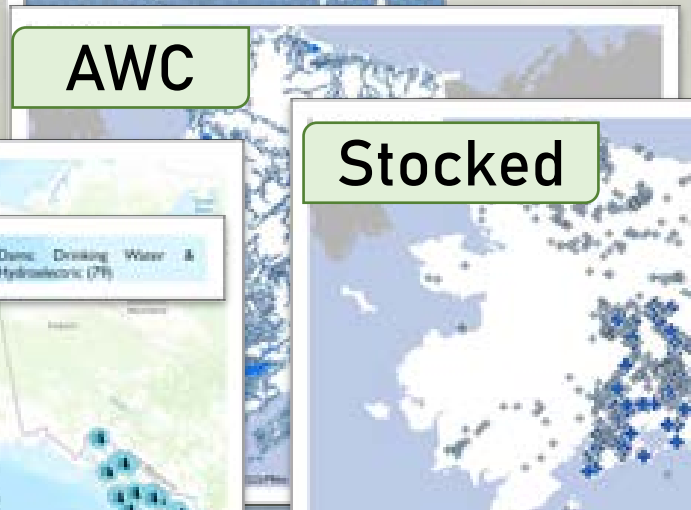
WHERE: Values at Risk, Infestation & Spread Threats?

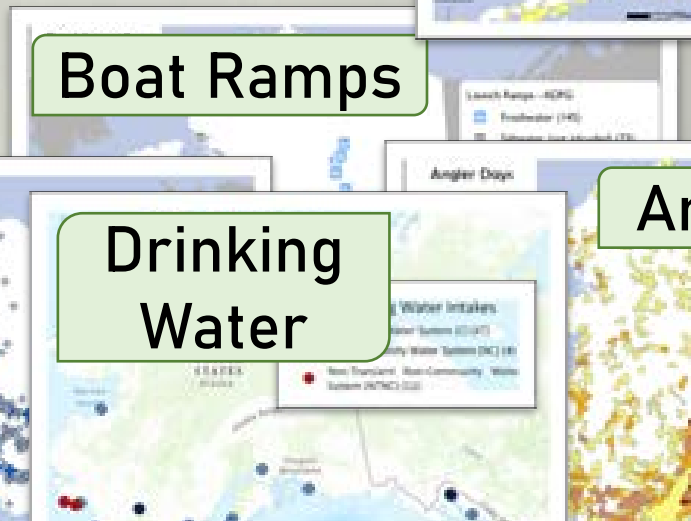
Waterbody Vulnerability

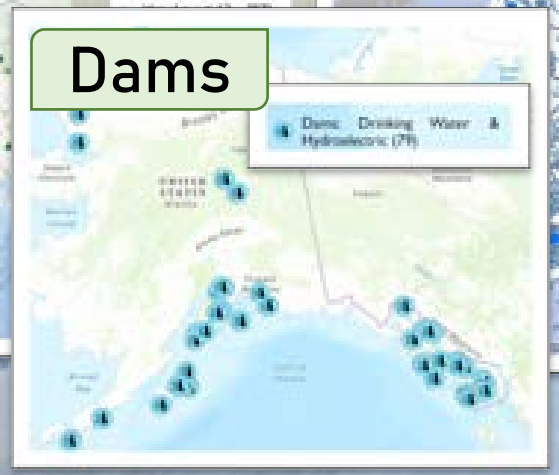


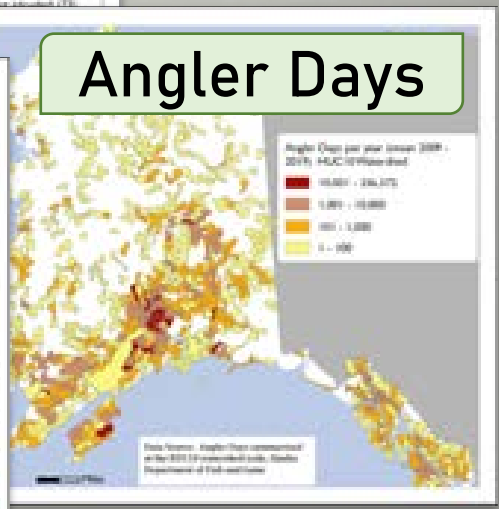




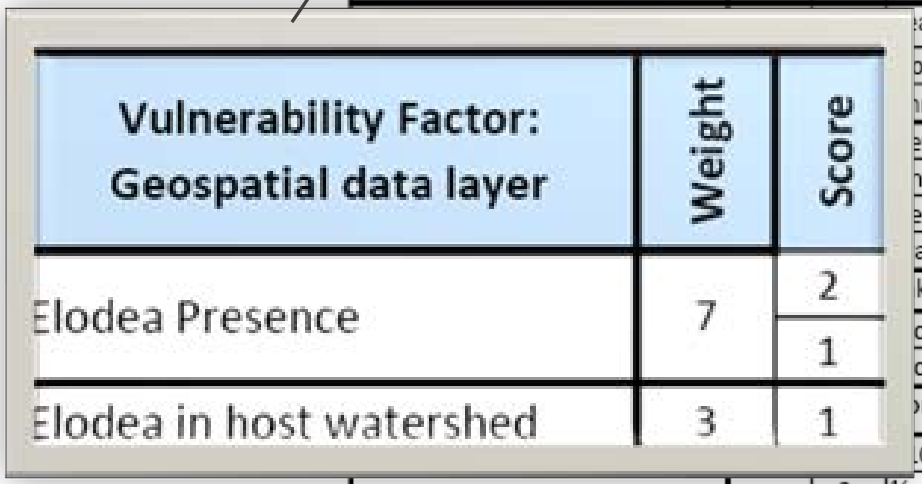


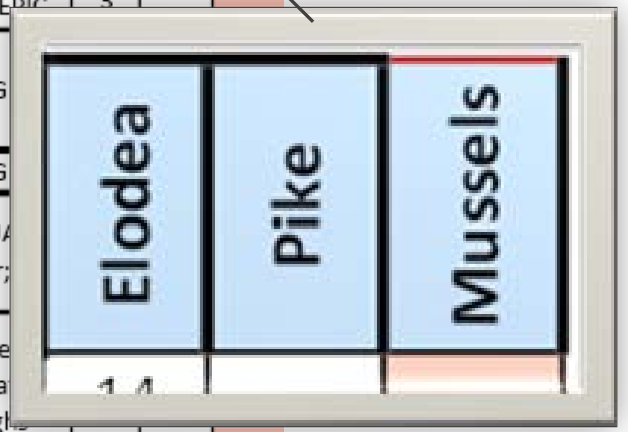


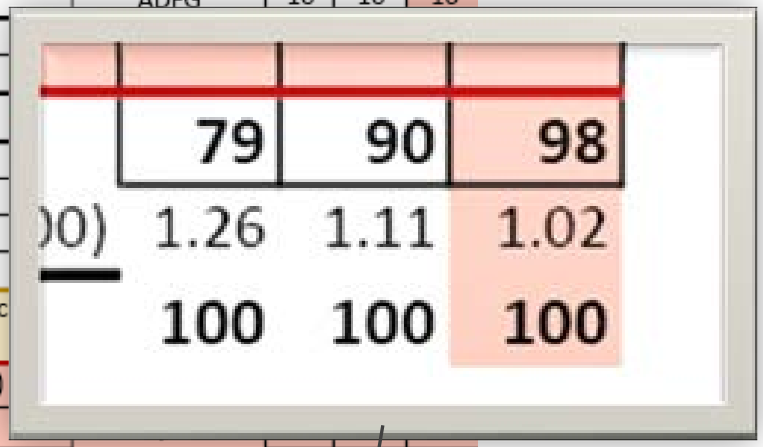




Vulnerability Scoring

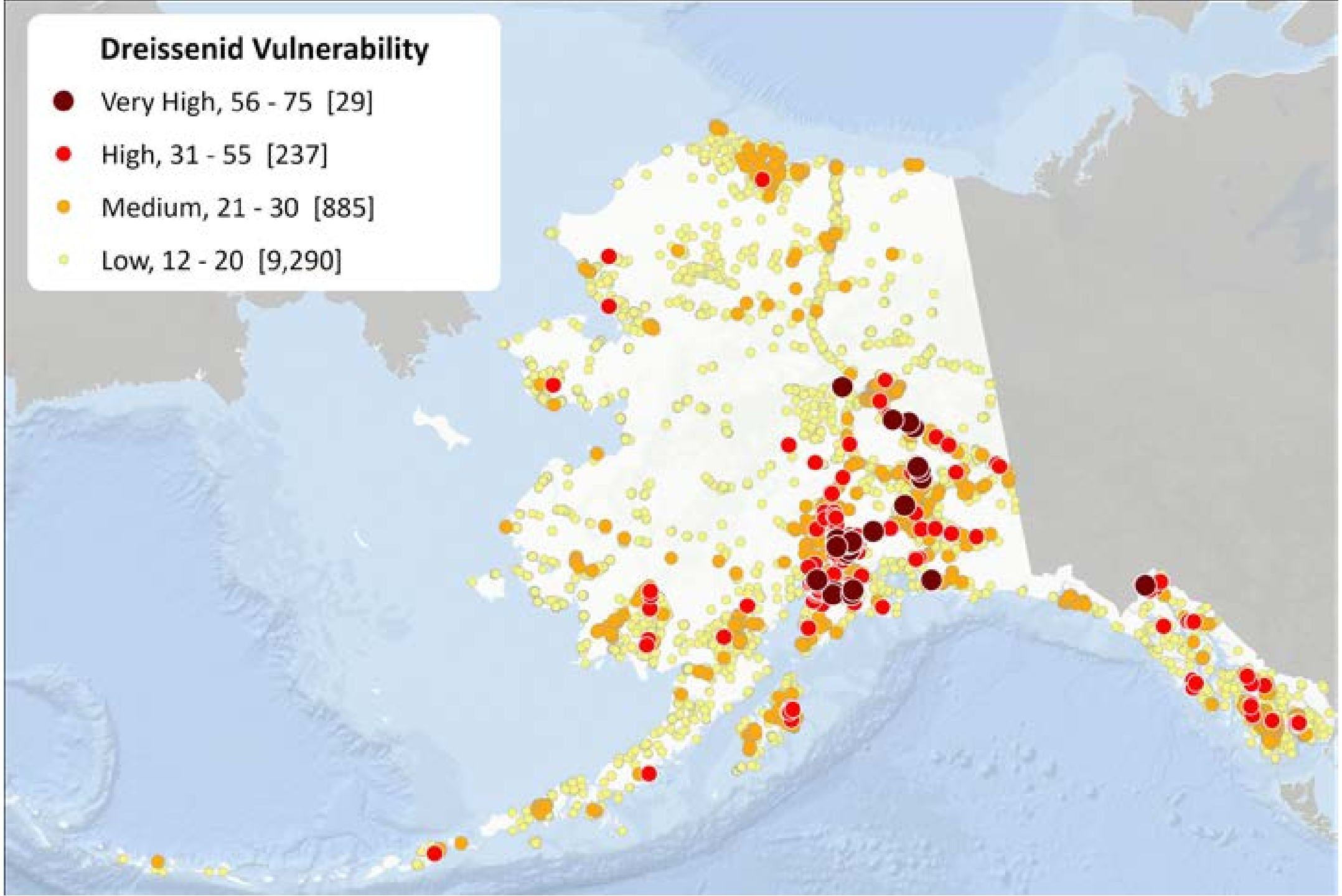






Lake Vulnerability Scoring - May 2025

Vulnerability Factor: Geospatial data layer	Weight	Score	Initial Scoring Method	Data Source	Elodea	Pike	Mussels
Elodea Presence	7	2	Present = 2	UAA - AKEPIC	14		
		1	Prior Co				
Elodea in host watershed	3	1	Has F	UAA, AKEPIC	3		
Pike Status	8	3	Pike	ADFG			
		2	Unco				
		1	Activ				
Pike in host watershed	4	1	Are t	ADFG			
			eap	FAA; UA Schwoerer;			
			bat				
			m				
			eve	ADFG, Ke Pen & Ma Borough			
			ndeve				
			eneral Public Access = 0.50				
			ail Access =0.25				
			ke is in the Catalog = 1	ADFG	10	10	10
			ocked by Regulation = 2				
			ocked (not by Regulation) = 1				
			nnected to NHD stream network, 1 =yes				
			00 meters to road = 1				
Distance to Road	3	3	¼ mile to road = 0.75				
		2	1 mile to road = 0.5				
		1	Less than 5 miles to road = 0.25				
Water Infrastructure	1	20	Is the lake a public drinking water supply or dammed for hydroelectric Yes, then lake has critical infrastructure. Yes=1				
Calcium Concentration Water Chemistry (Habitat Suitability)	4	4	Recent (year 2000-present) Calcium sample >20 mg/l (highly suitable)				
		3	Recent (year 2000-present) Calcium sample 12 - 20 mg/l (moderate)				
		2	Modeled Calcium concentration >20mg/l (highly suitable)	USGS / UAF - model)			
		1	Modeled Calcium concentration 12-20 mg/l (moderately suitable)				
			Maximum Possible Scores		**79**	**90**	**98**
				Normalization factor (to max at 100)	1.26	1.11	1.02
			Normalized Maximum Possible Scores		**100**	**100**	**100**


Dreissenid Vulnerability
Very High, 56 - 75 [29]
High, 31 - 55 [237]
Medium, 21 - 30 [885]
Low, 12 - 20 [9,290]

Lake Monitoring and Sampling Matrix

Calcium	Vulnerability: Very Low	Low	Medium	High	Very High	Critical
High >20 mg/l	0 No Priority	4 Monitor Low Priority	5 Monitor Medium Priority	6 Monitor High Priority	6 Monitor High Priority	7 Monitor Sample
Moderate 12 - 20 mg/l	0 No Priority	4 Monitor Low Priority	4 Monitor Low Priority	5 Monitor Medium Priority	5 Monitor Medium Priority	7 Monitor Sample
Low < 12 mg/l	0 No Priority	0 No Priority	4 Monitor Low Priority	4 Monitor Low Priority	4 - Monitor Low Priority	7 Monitor Sample
Old Data (pre 2000)	0 No Priority	1 Sample Low Priority	2 Sample Medium Priority	3 Sample High Priority	3 Sample High Priority	7 Monitor Sample
No Data	0 No Priority	1 Sample Low Priority	2 Sample Medium Priority	3 Sample High Priority	3 Sample High Priority	7 Monitor Sample
Predicted High > 20 mg/l	0 No Priority	2 Sample Medium Priority	2 Sample Medium Priority	3 Sample High Priority	3 Sample High Priority	7 Monitor Sample
Predicted Medium 12-20 mg/l	0 No Priority	1 Sample Low Priority	2 Sample Medium Priority	2 Sample Medium Priority	2 Sample Medium Priority	7 Monitor Sample

Vulnerability
(infrastructure, road access, boat launch, stocked, AWC, hydro connection)

0	1	2	3	**Sample** - Collect water sample for calcium concentration analysis
4	5	6	7	**Monitor** - Veliger plankton tow, shoreline survey, plates, benthic

Monitoring and Sampling Targets

- 6 Monitor - High Priority
- 5 Monitor - Medium Priority
- 4 Monitor - Low Priority
- 3 Sample - High Priority
- 2 Sample - Medium Priority
- 1 Sample - Low Priority

Monitoring / Sampling

- Monitor - High Priority (36)
- Monitor - Medium Priority (36)
- Monitor - Low Priority (67)
- Sample – High Priority (177)
- Sample – Medium Priority (982)
- Sample - Low Priority (9103)

Intermission

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Invasive Species Plants (AKEPIC) Aquatic Species Kachemak Bay Monitoring Resources

Non-Native Plants

Invasive and Harmful Species

erves as a repository for data on non-native plants and animals in Alaska, with a specific focus on invasive
Clearinghouse (AKEPIC) is a database and mapping application that provides spatial information and ecological
in Alaska and neighboring Canadian Territories. Similarly, the Alaska Aquatic Invasive Species Clearinghouse (AK
that provides temporal and spatial information for invasive aquatic species.

native species, habitats, and natural resources. Indeed, invasive species are considered to be one of the leading
"invasive species" means different things to different people. For ecologists, a species is "invasive" if it
. Often, the word "invasive" refers to non-native species that negatively affect the region to which they are
uced by humans (whether intentionally or accidentally).

Non-Native Plants

Aquatic Invasive Species

Kachemak Bay Community

https://accs.uaa.alaska.edu/invasive-species/

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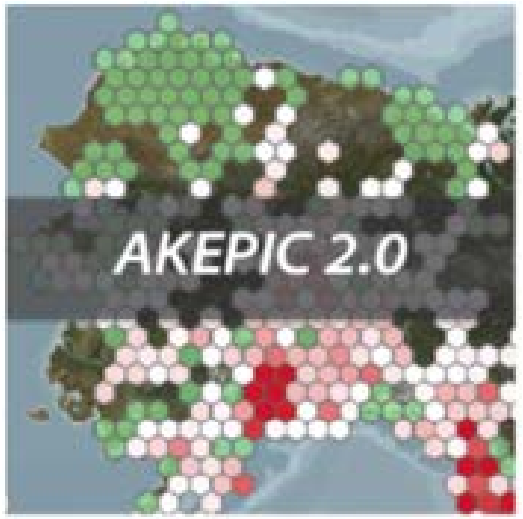
Invasive Species Plants (AKEPIC) Aquatic Species Kachemak Bay Monitoring Resources

Alaska Exotic Plants Information Clearinghouse (AKEPIC)

The Alaska Exotic Plants Informatio
non-native plant species in Al
the U.S. Forest Service, Nati
Plant Material Center, and
the Strategic Plan for Noxio
associated with the project
support the identification o
Additionally, the data are u

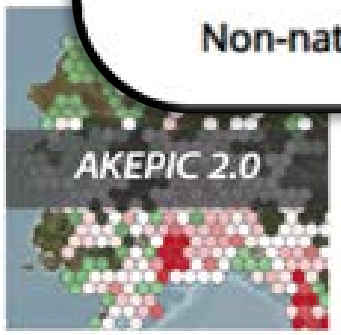
ACCS tracks all non-native
plant species that are know
state, ACCS has developed
to natural areas in Alaska (
Districts, and the University



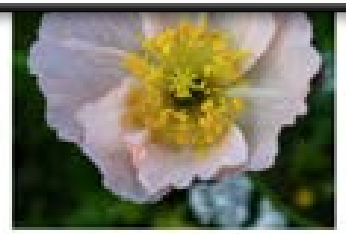
Non-native Plant Data 2.0

Non-native Plant List

Elodea Survey Web App



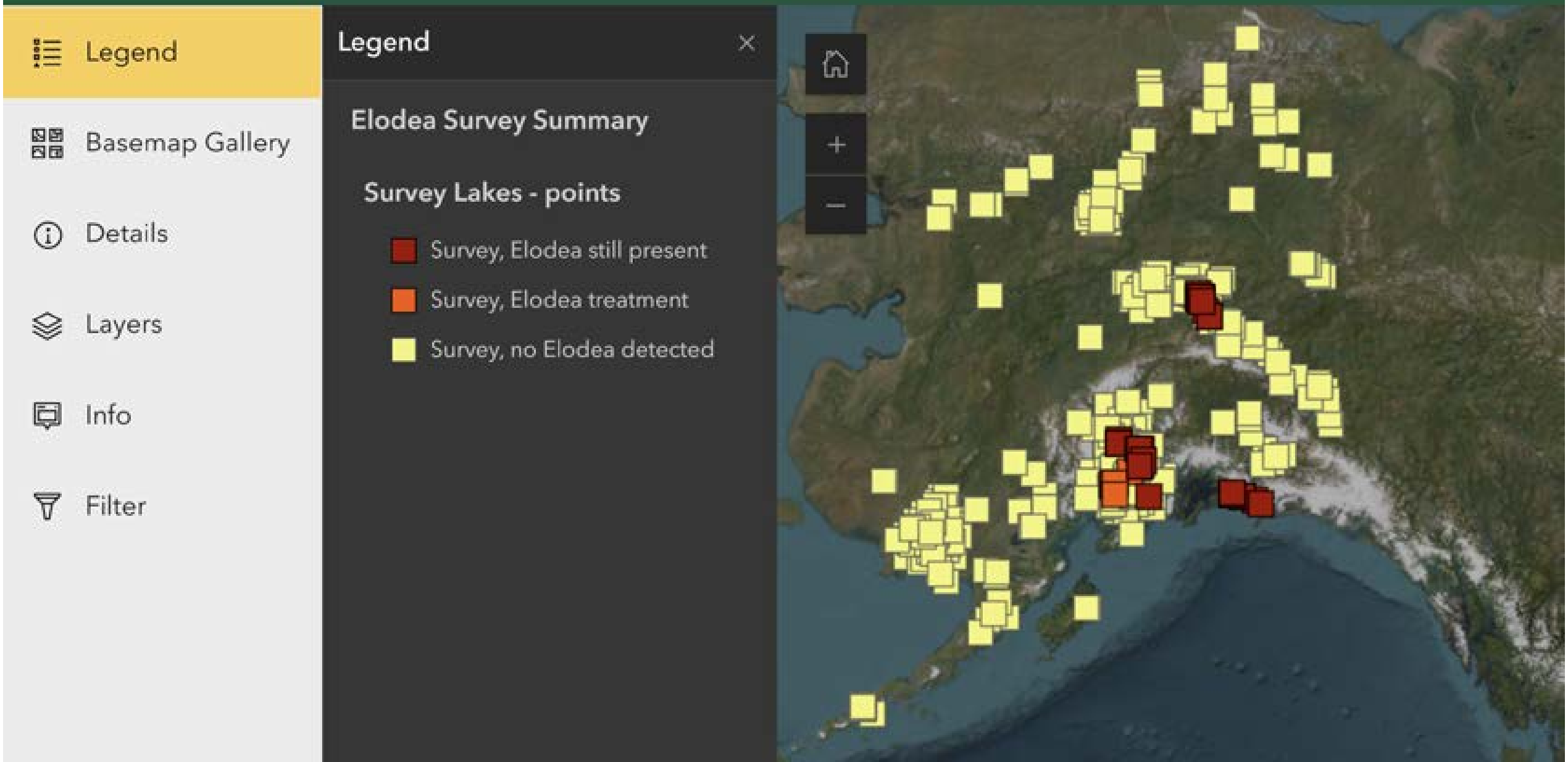
Non-native Plant Data 2.0



Non-native Plant List

Elodea Survey Web App

Alaska Elodea Survey Map Viewer



Alaska Center for Conservation Science
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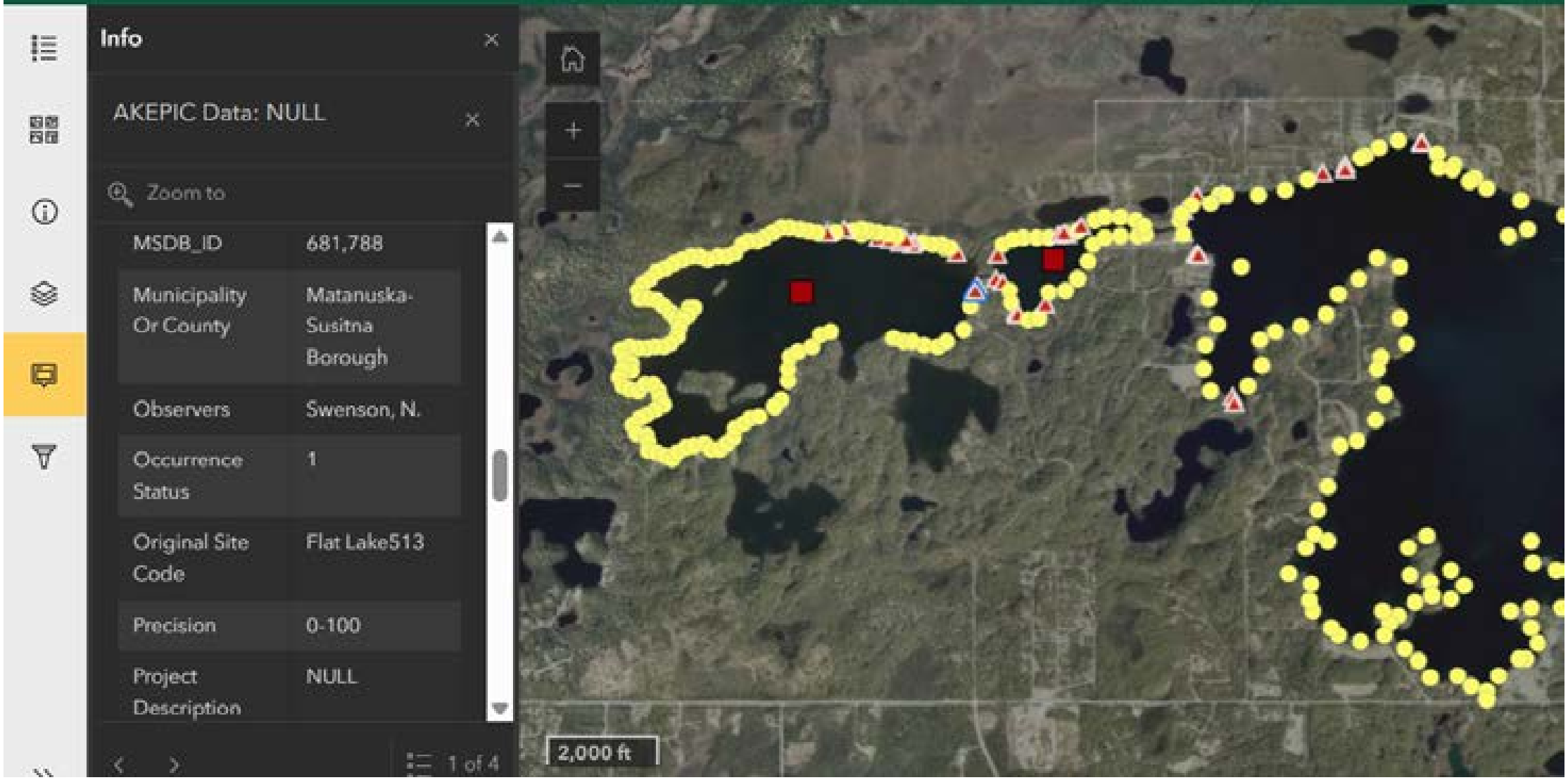
Alaska Elodea Survey Map Viewer



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Invasive Species Plants (AKEPIC) Aquatic Species Kachemak Bay Monitoring Resources

Invasive and Harmful Species

The Alaska Center for Conservation Science serves as a repository for data on non-native plants and animals in Alas
species. The Alaska Exotic Plants Information Clearinghouse (AKEPIC) is a database and mapping application that p
risk assessments for non-native plant species in Alaska and neighboring Canadian Territories. Similarly, the Alaska
Aqua) is a database and mapping application that provides temporal and spatial information for invasive aquatic sp

Invasive species can have strong impacts on native species, habitats, and natural resources. Indeed, invasive specie
threats to native species worldwide. The term "invasive species" means different things to different people. For eco
establishes and spreads rapidly to new areas. Often, the word "invasive" refers to non-native species that negativel
introduced and that have usually been introduced by humans (whether intentionally or accidentally).

Non-Native Plants

Aquatic Invasive Species

Kachemak Bay Community

Aquatic Invasive Species

Alaska Center for Conservation Science
University of Alaska Anchorage

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Home About Research Data and Services Publications

Alaska Aquatic Invasive Species Clearinghouse (AK Aqua)

The Alaska Aquatic Invasive Species Clearinghouse (AK Aqua) is a database and mapping application that provides temporal and geospatial information for invasive aquatic species in Alaska. Taxa p
primarily intended to support the iden
variety of research and modeling acti

The AK Aqua products are the result o
KBNERR, and ACCS, in support of the
administers the mapping application,

Alaska Aquatic Invasive Species Clearinghouse

Aquatic Invasive Species List

Dreissenid Mussel Web App

Alaska Aquatic Invasive Species Clearinghouse

Aquatic Invasive Species List

Dreissenid Mussel Web App

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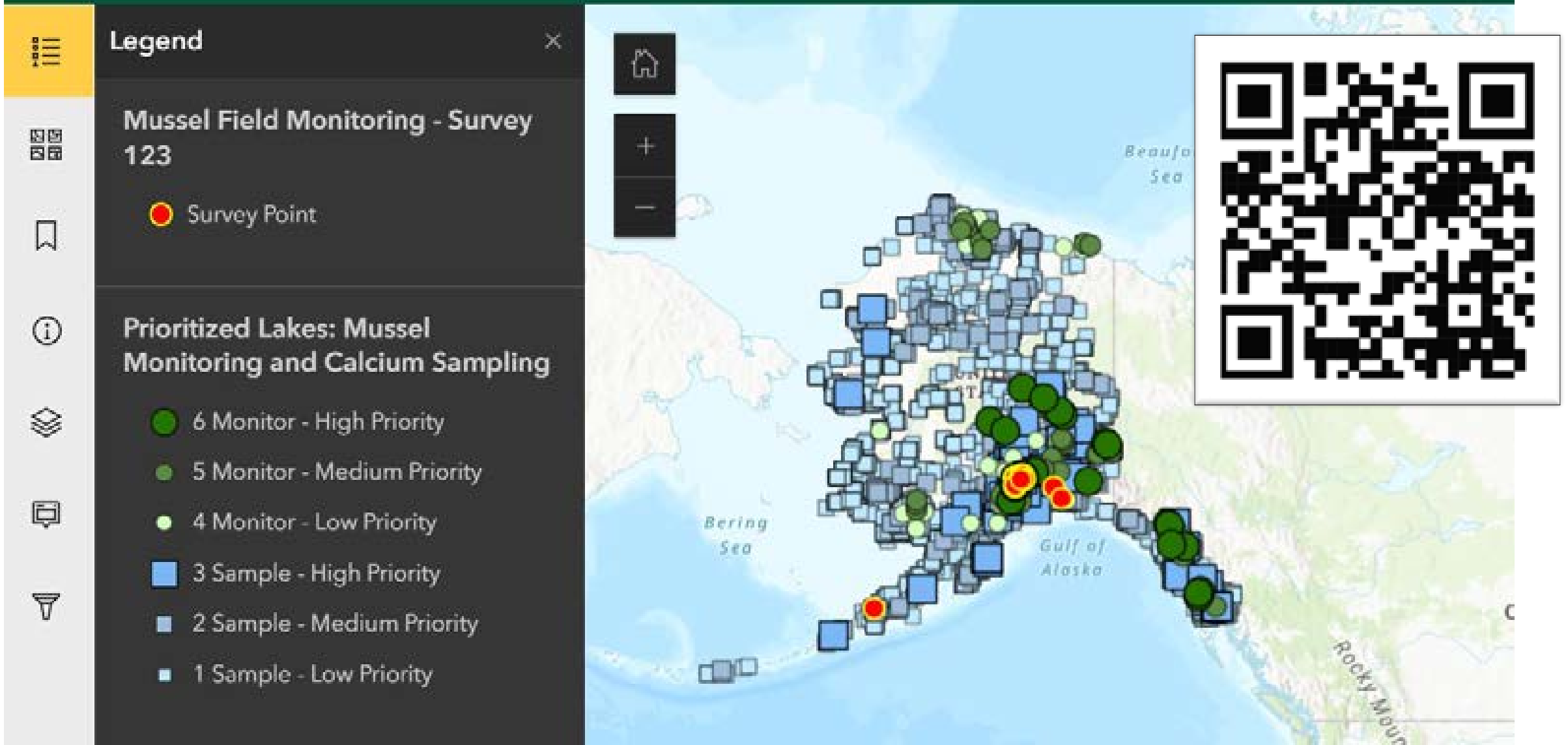
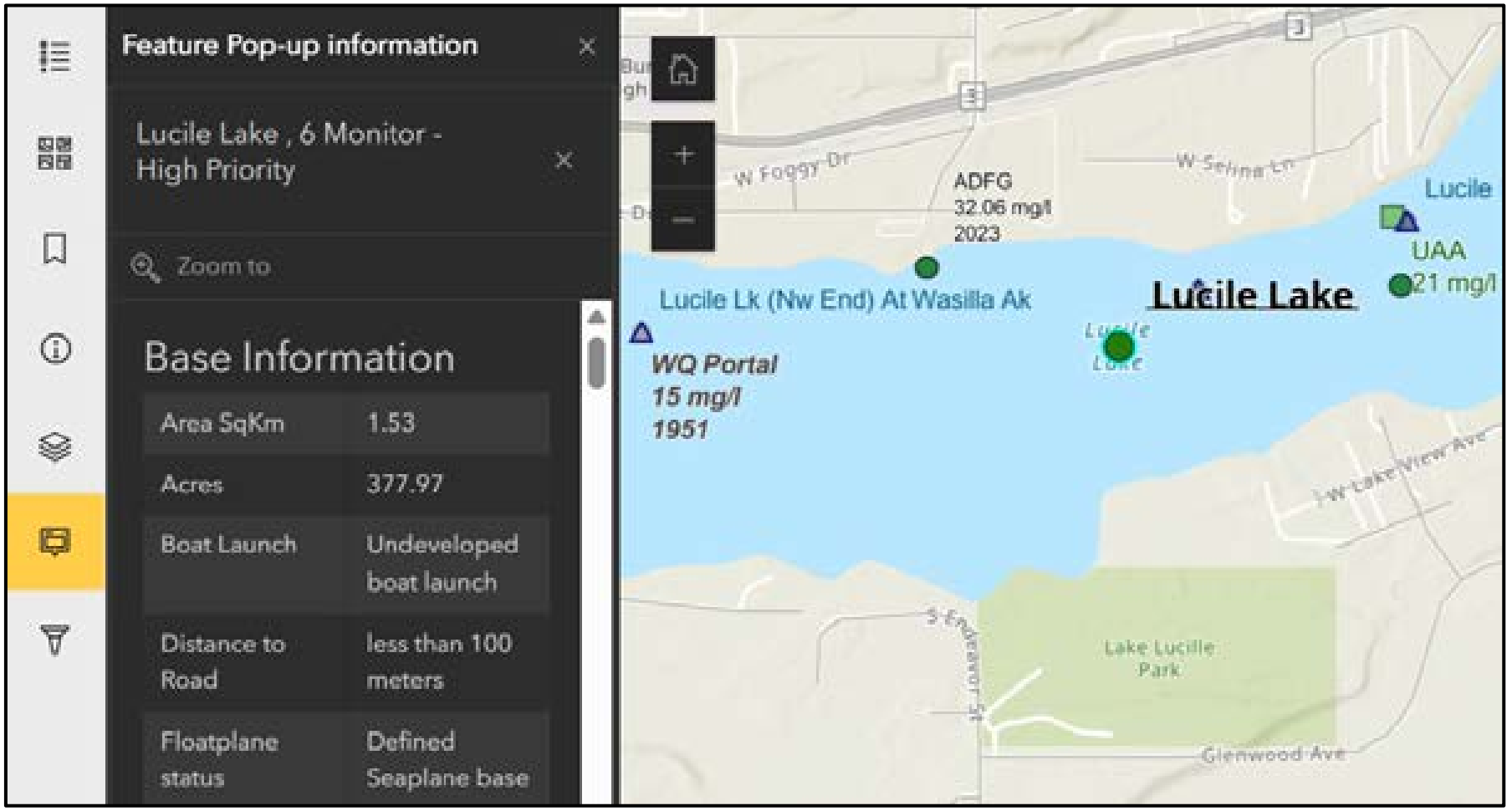
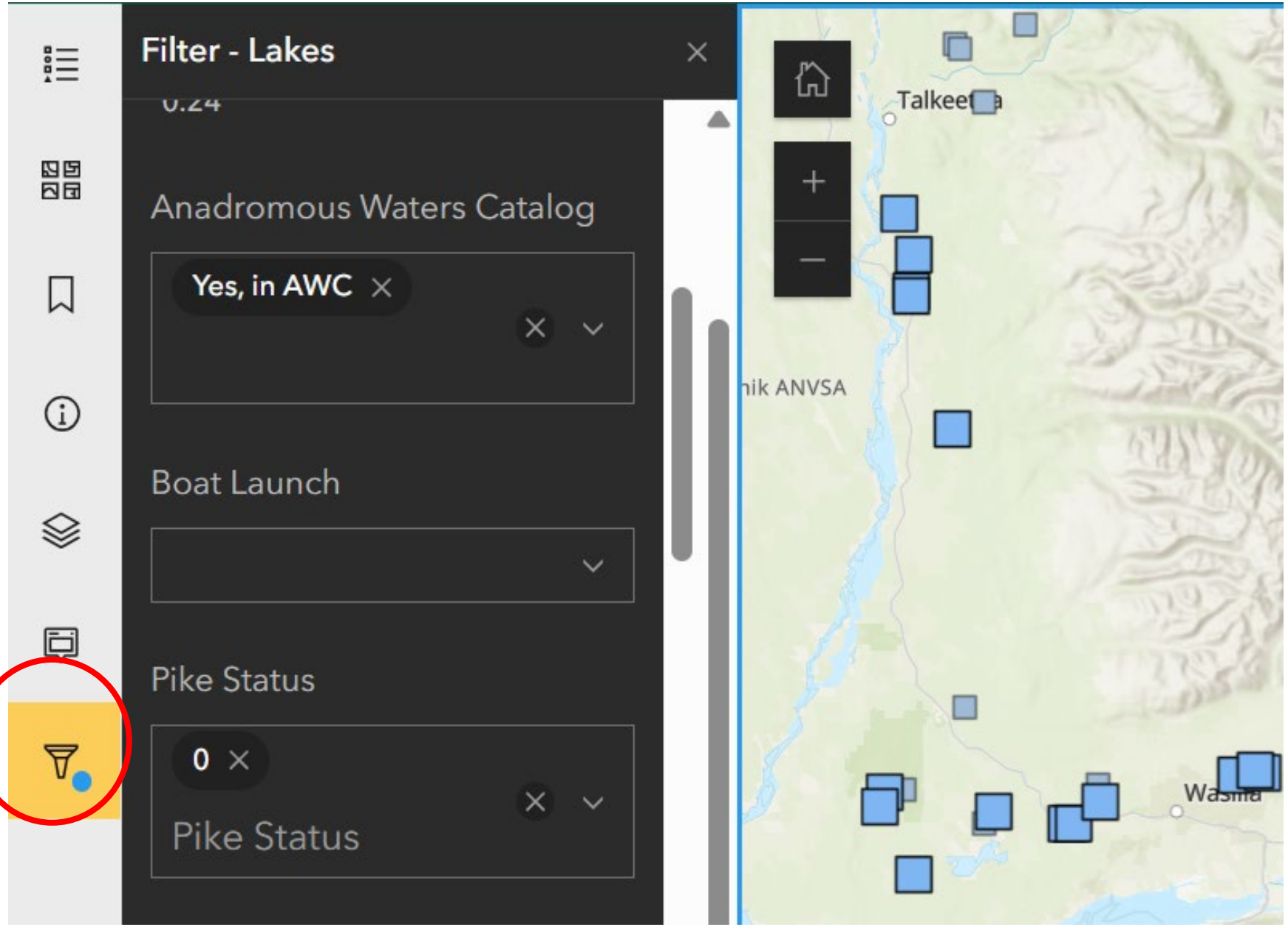
University of Alaska Anchorage

Invasive Dreissenid Mussel Monitoring and Calcium Sampling



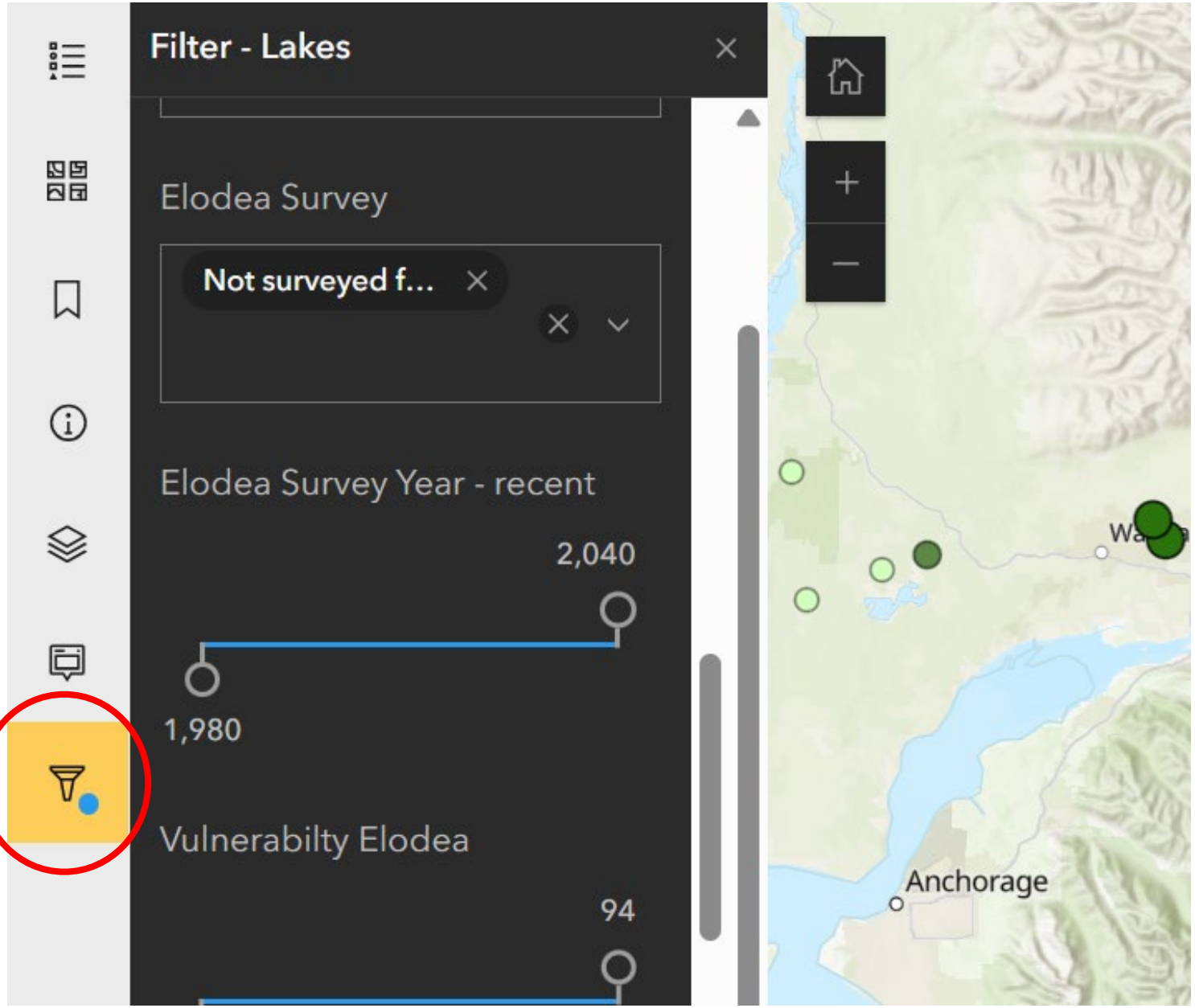


- > 50 Attributes
- Access
  - Boat Ramps
  - Floatplanes
- Suitability
  - Calcium
- Values
  - AWC
  - Stocked



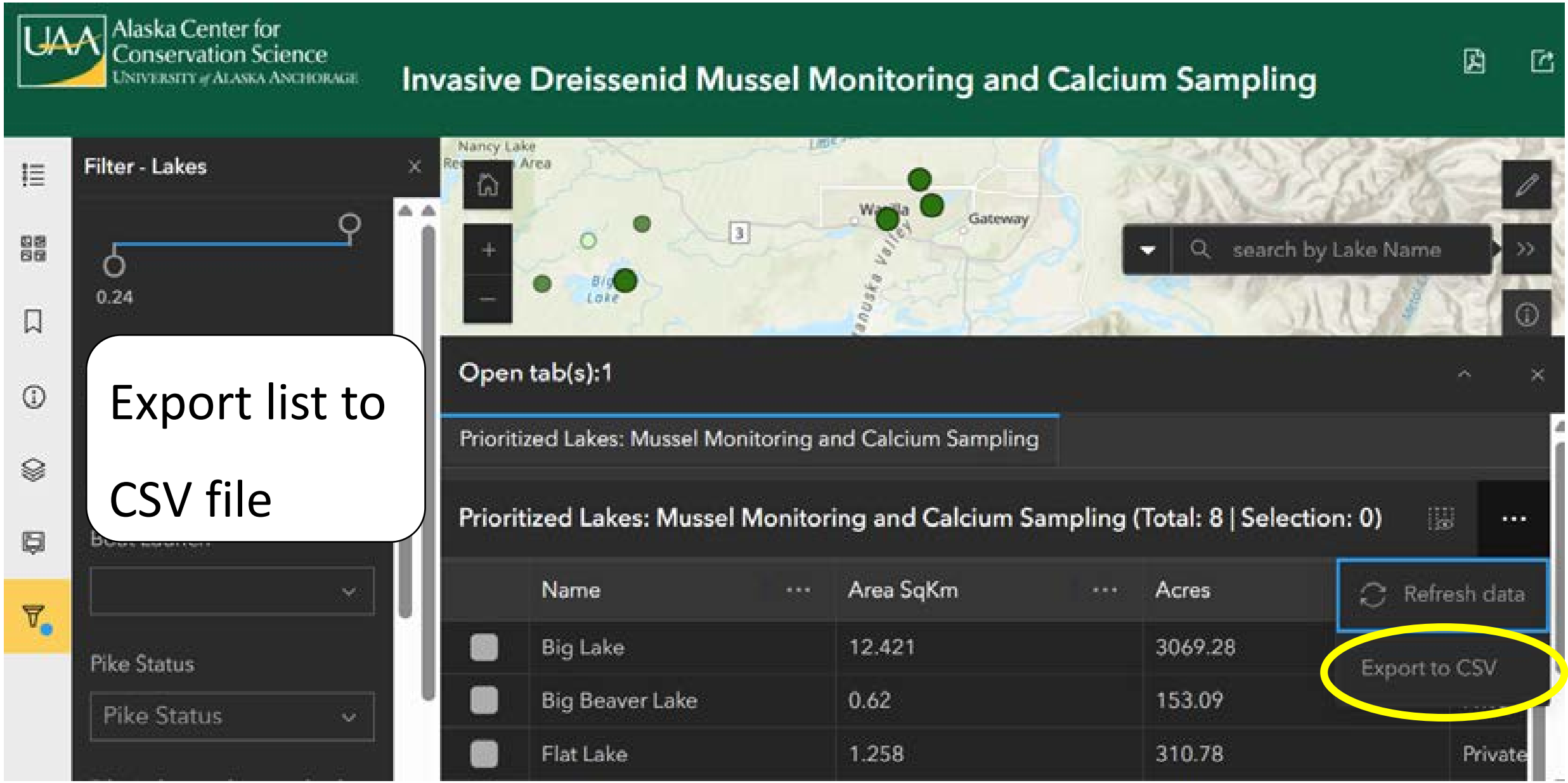
Filter Example:

- High / Medium Sampling Priority
- AWC
- No Pike



Filter Example:

- High / Medium Monitoring Priority
- Mat-Su Borough
- AWC
- No Elodea Survey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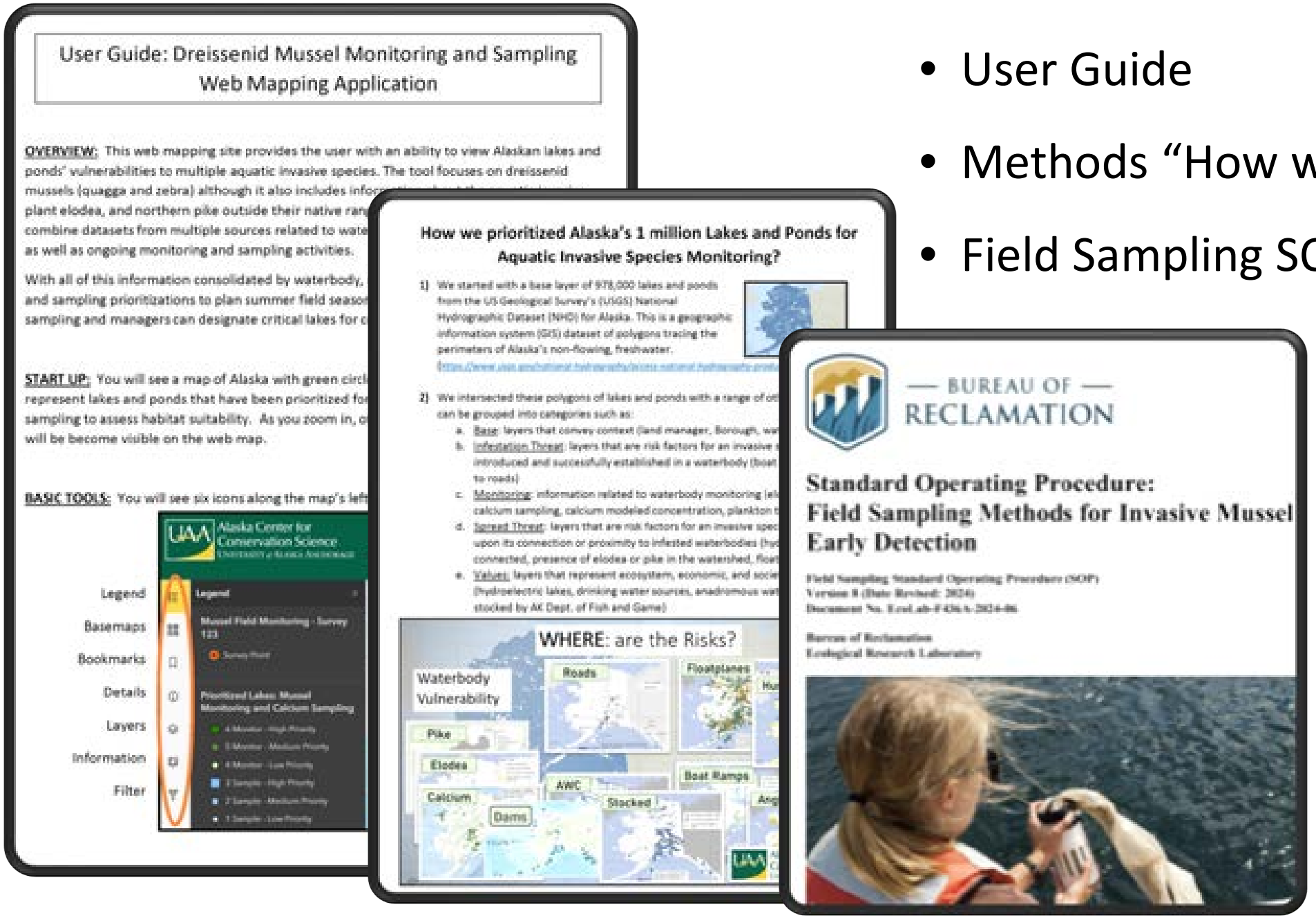
University of Alaska Anchorage
Invasive Dreissenid Mussel Monitoring and Calcium Sampling
Filter - Lakes
0.24
Pike Status
Pike Status
search by Lake Name
Gateway
Export list to CSV file
Open tab(s):1
Prioritized Lakes: Mussel Monitoring and Calcium Sampling
Prioritized Lakes: Mussel Monitoring and Calcium Sampling (Total: 8 | Selection: 0)
Name
Area SqKm
Acres
Refresh data
Export to CSV
Big Lake
12.421
3069.28
Big Beaver Lake
0.62
153.09
Flat Lake
1.258
310.78
Private



- User Guide
- Methods "How we Prioritized.."
- Field Sampling SOP

HOW: You can help?

Sampling - Collect Water for Calcium Analysis

- Use Map to determine greatest needs
- Confirm with Dreissenid working group: Tammy Davis – ADF&G, Kim Holzer - USFWS, Marcus Geist - UAA
- Obtain Sampling Kit Contact Deanna Strohm , UAF
- ddstrohm@alaska.edu

HOW: You can help?

Monitoring - Survey 123 app

- Shoreline (wrack line) walks for adult mussels
- Existing substrate (docks, pilings, etc.) for adult mussels
- Aquatic plant shake-down for adult mussels
- Plankton tow for larval mussels (veligers)
- Settlement plates or submerged bricks for adult mussels
- Ponar dredge (sediment grab sample) for adult mussels
- https://arcg.is/19H8SG2

123 link

Getty Images

Acknowledgements

- Funding: AK Dept. of Fish & Game & US Fish and Wildlife Service

Project Team:

- Tammy Davis, Krissy Dunker, Parker Bradley, Eric Wood – ADF&G
- Kim Holzer, Lisa Dlugolecki, Ben Wishnek - US Fish and Wildlife Service
- Toby Schwoerer, Erik Schoen, Deanna Strohm, Andy Baltensperger, and Dana Brown, UAF, International Arctic Research Center

https://accs.uaa.alaska.edu/invasive-species/

Marcus Geist
mageist@Alaska.edu

Alaska Center for Conservation Science
University of Alaska Anchorage

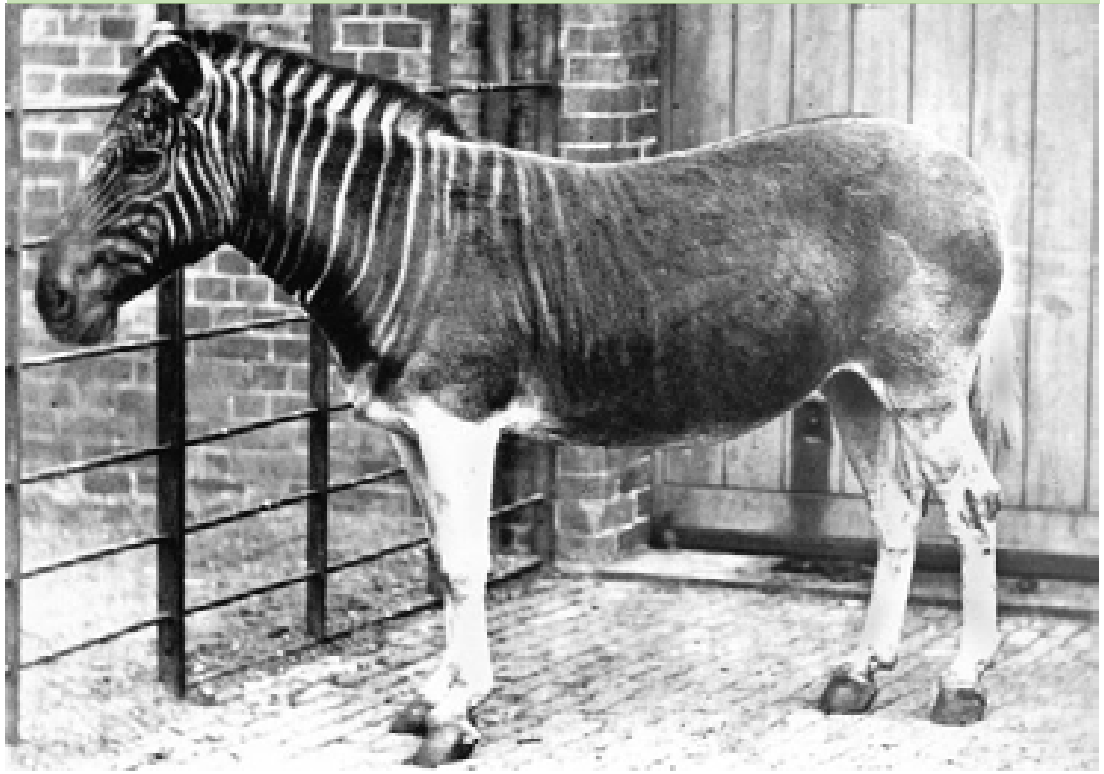
International Arctic Research Center

Prioritizing Invasive Dreissenid Mussel Monitoring

Zebra

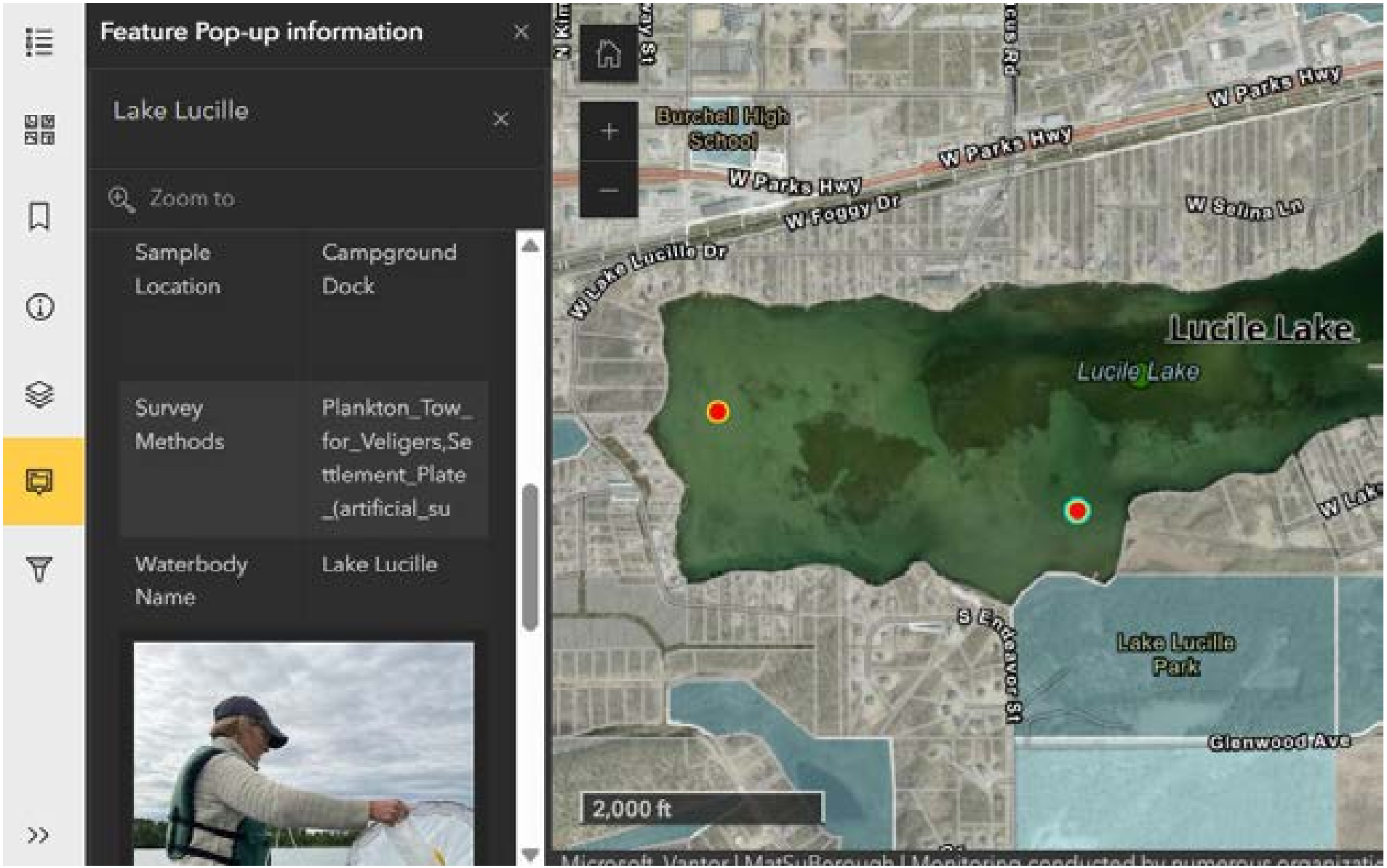
By Yathin S Krishnappa - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=31862629

Quagga



By Frederick York (d. 1903) - This file comes from the Biodiversity Heritage Library, and is available online at biodiversitylibrary.org/page/28201475/., Public Domain, https://commons.wikimedia.org/w/index.php?curid=108413

WHEN/WHERE: can we see results?



ArcGIS Survey 123

Standardized data fields

Uploads to web map

Includes site photos

Dreissenid Impacts (**why** you should care!)

- Infrastructure damage
  - Reproduce fast & often
  - Attach with glue-like byssal threads
  - & take up space – a lot of it!

- Outcompeting other species
  - Reduce phytoplankton biomass

- Eradication very difficult and expensive
  - Can prompt recreational closures
  - Lake quarantine can reduce property values

Dreissenid Impacts

- Alter energy pathways, nutrient availability
- Redirect biomass
    - water column → benthos
- Store a TON of carbon and nutrients
    - Reduce primary productivity
    - Potential “boom & bust” due to die-off events
    - May promote cyanobacteria blooms

(photo by: Jiying Li)