Northwest **Power** and **Conservation** Council

June 2, 2014

MEMORANDUM

TO: Council Members

FROM: Kerry Berg

SUBJECT: Presentation on invasives

Virgil Dupuis from Salish Kootenai College will give a presentation on flowering rush. This aquatic invasive plant is listed as a noxious weed by the states of Montana, Idaho, Washington and Oregon. Among its adverse ecological impacts is that it infests previously un-vegetated littoral zones and provides habitat for northern pike which are preying on our native trout and salmon. Here is a link to a 12 minute introductory video on flowering rush which was produced by Salish Kootenai College: http://www.weedcenter.org/research/Flowering_Rush_Video.html

Erik Hanson will give a presentation on invasives that are problematic in the Flathead as well as the entire Pacific Northwest. He has a masters and a PhD ABD in environmental science focused on invasive species management. He is the owner of Hanson Environmental, a consulting firm that specialized in aquatic invasive species. Hanson Environmental is engaged in all aspects of AIS management; from watercraft inspection station operation, rapid response preparation and exercises, contingency planning, development of integrated aquatic weed management plans, to

survey and control efforts. He currently is the coordinator for the Flathead Basin AIS management effort.

Thomas Woolf is the Aquatic Program Manager for the Idaho State Department of Agriculture. At the time this information was due it was still not confirmed whether he would be able to participate by phone or not.

Flowering Rush
An Invasive Aquatic Macrophyte Infesting the Columbia River Basin

Virgil Dupuis, Salish Kootenai College
Peter Rice, University of Montana

Northwest Power Planning Council, Missoula, MT June 11, 2014

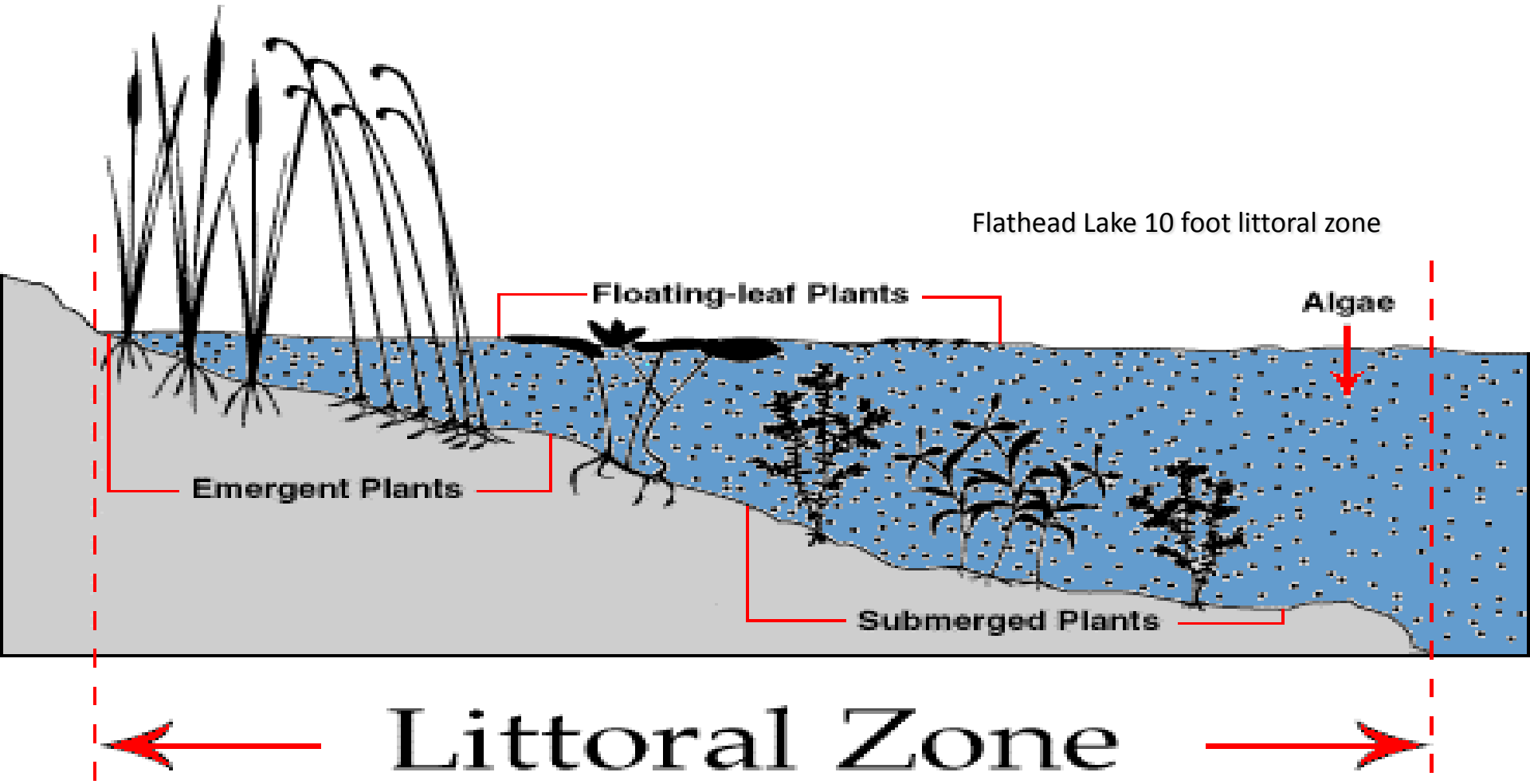

2005


2007 7 17

- Fully Submerged Form
- Emergent Form
- Shoreline Form

Literature: Rush found to 13 ft, In Flathead Lake found to 18 ft

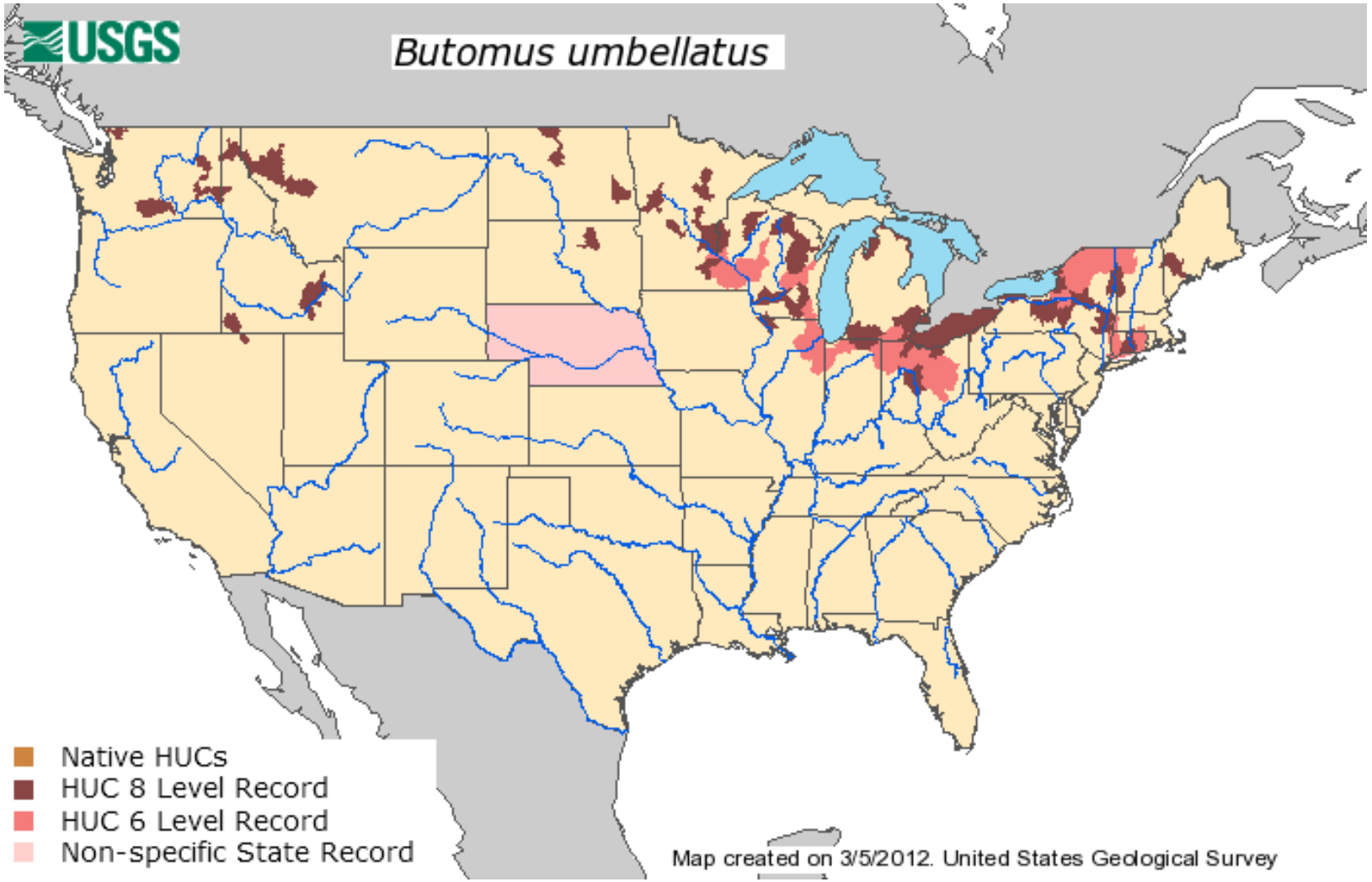
Flathead Lake 10 foot littoral zone



An Update on Flowering Rush Control Demonstration Projects for Infestations Spanning Watersheds Between the Pacific Northwest and a Great Lakes State

CLEAN LAKES INC.
Aquatic Ecosystem Restoration & Maintenance

US Geographic Distribution



Flowering Rush Listing as Noxious in the Columbia Basin

Montana: Category 1B; Containment and eradication

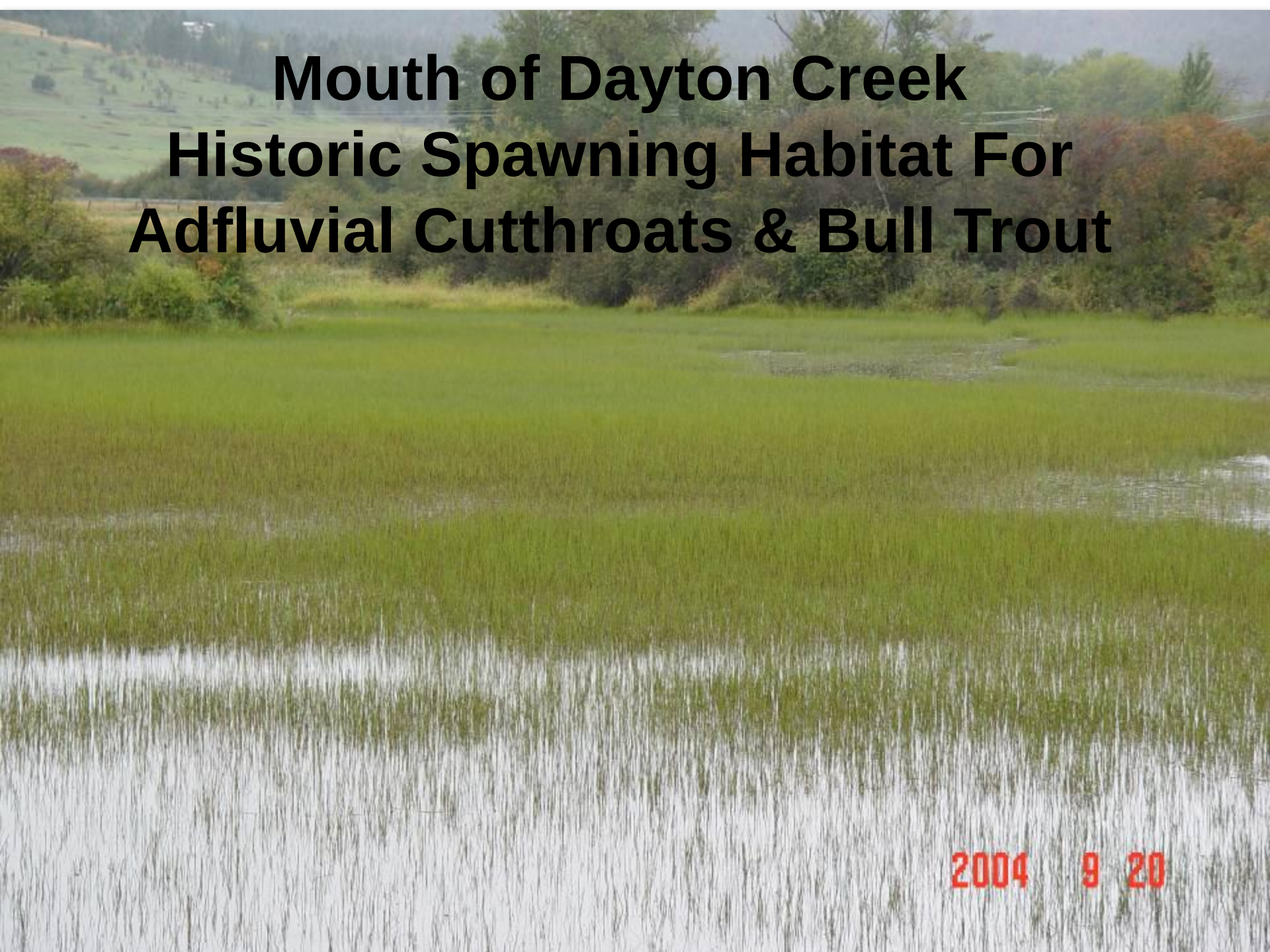
Washington: Category A; Limited distribution and eradication

Oregon: Category A; High threat, not known to exist

Idaho: Containment list


Low Pool in Spring
Favors Flowering Rush Over Native Emergent Macrophytes
Full Pool in Late Summer and Winter
Favors Flowering Rush Over Aquatic Macrophytes


Flowering Rush (*Butomus umbellatus*)
East Bay Flathead Lake MT

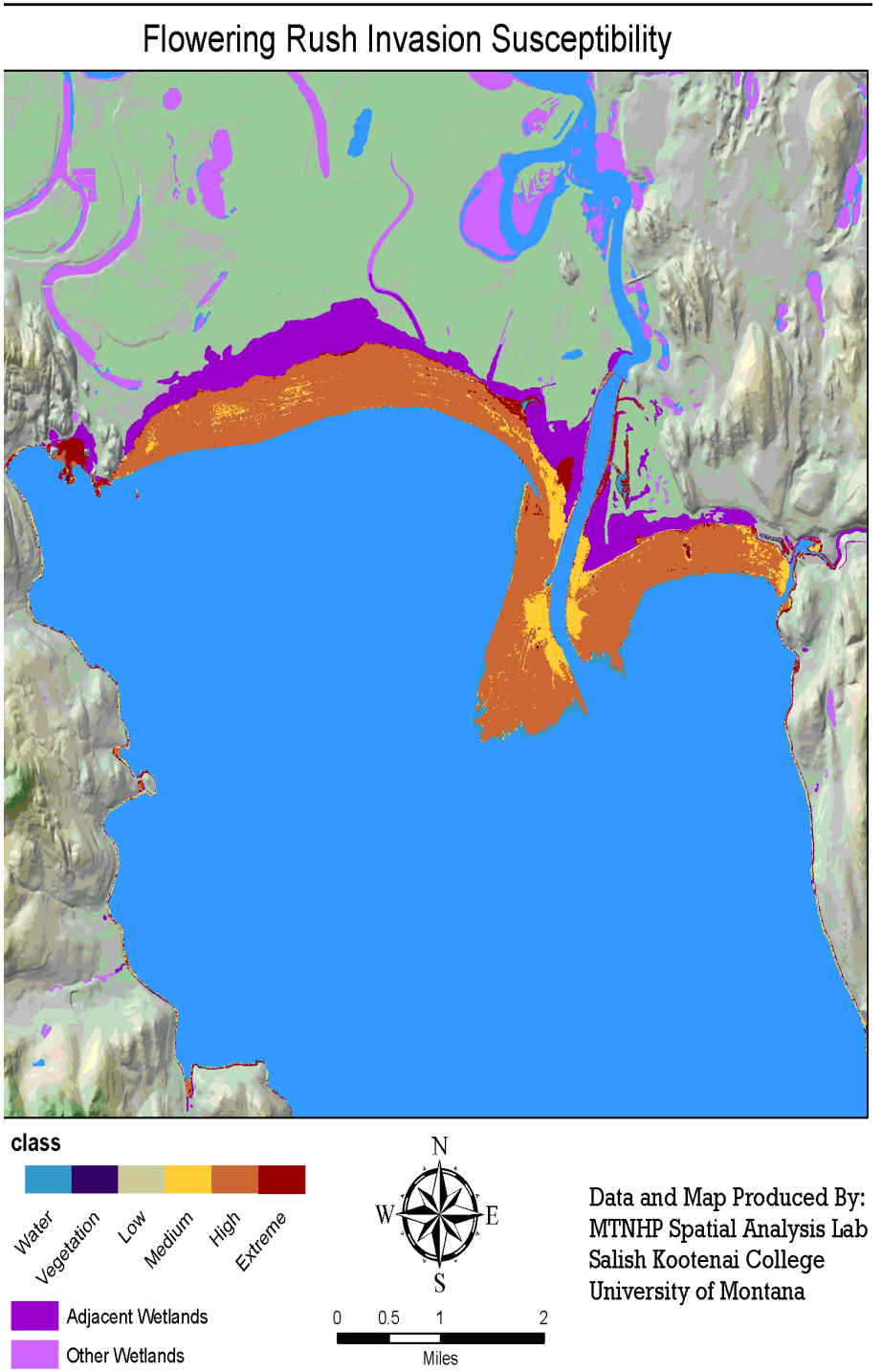

Mouth of Dayton Creek
Historic Spawning Habitat For
Adfluvial Cutthroats & Bull Trout
2004 9 20

Initial Spatial Modeling Predictions

Marcus Reddish, Peter Rice, Virgil Dupuis

	Size Acres	Infested Acres	Max Acres	% of Lake
0-10” Littoral	5,823	> 1000	4,364	3.5%
10-20’ Littoral	8,375	> 1000	6,546	5.3%
	14,558	> 2,000	10,910	8.8%

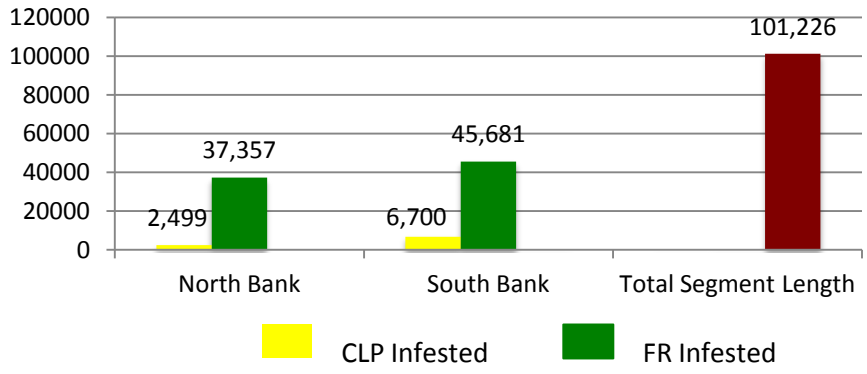
Spatial model suggests 75% of Flathead Lake littoral zone could be converted to flowering rush



Flathead Reservation line to Thompson Falls Inventory Summary

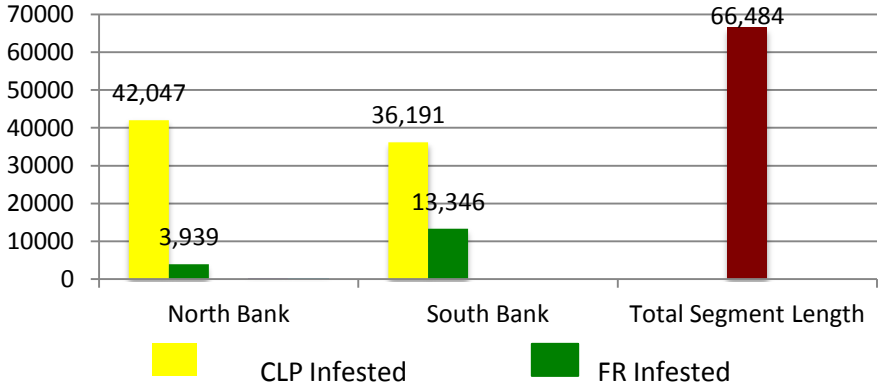
- Total river inventory length 31.5 miles
- Miles of river bank inventory, both sides 63.0 miles
- Miles of islands inventoried, both sides 30.4 miles
- Linear miles of flowering rush 24.8 miles
- Acres of flowering rush 88.3 acres
- Linear miles of curlyleaf pondweed 11.4 miles
- Acres of curlyleaf pondweed 61.1 acres

Plains to Reservation Line

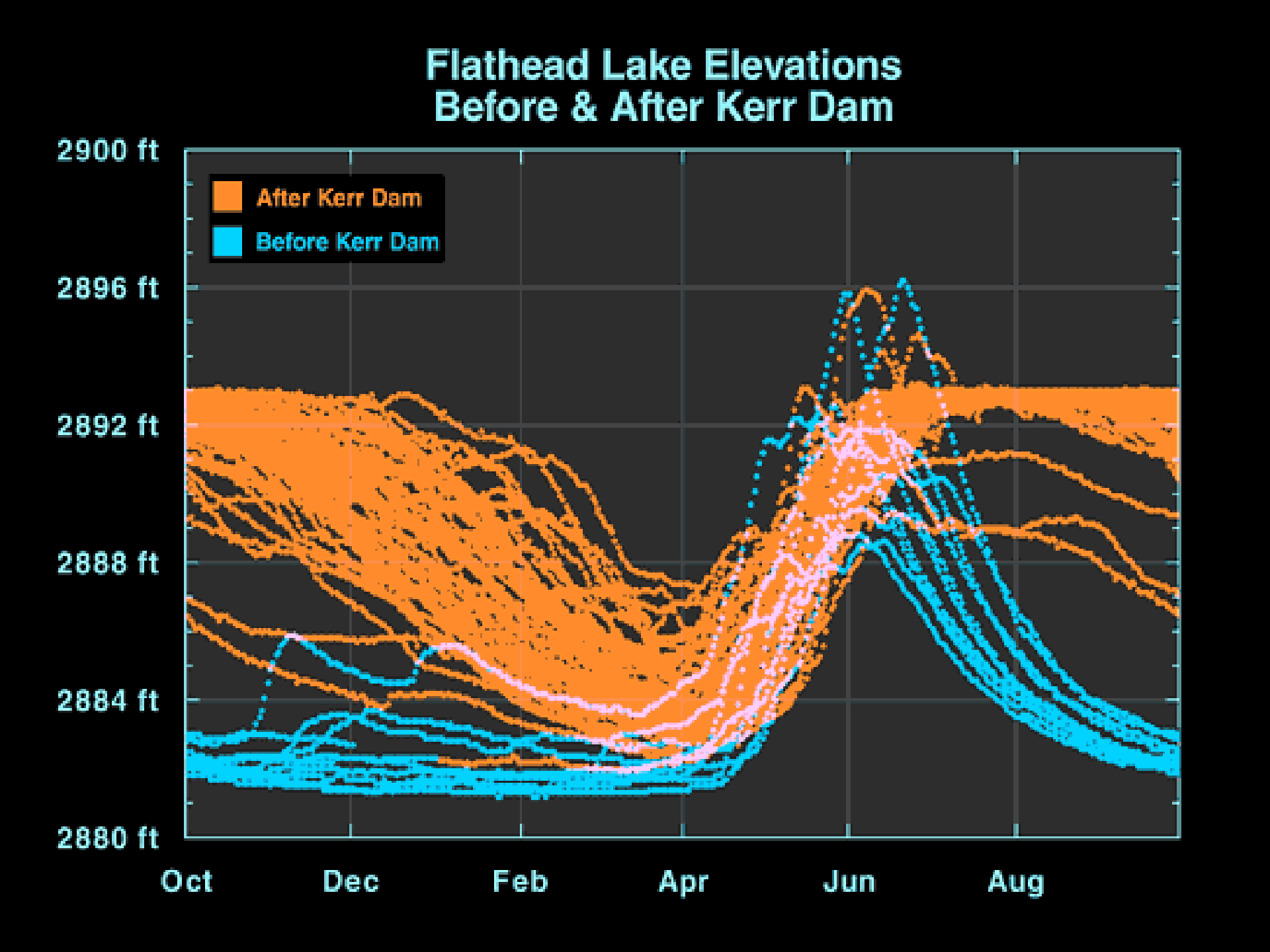


CLP 2% North Bank, 7% South Bank Infested
FR 37% North Bank, 45% South Bank Infested

T Falls to Plains



CLP 63% North Bank , 57% South Bank of segment infested
FR 6% North Bank , 20% South Bank of segment infested


Flathead Lake Elevations
Before & After Kerr Dam
2900 ft
2896 ft
2892 ft
2888 ft
2884 ft
2880 ft
After Kerr Dam
Before Kerr Dam
Oct
Dec
Feb
Apr
Jun
Aug


Mica
Revelstoke
Arrow Lakes
Duncan
Keenleyside
Kootenay Lake
Canada
U.S.
Grand Coulee
Chief Joseph
Wells
Albeni Falls
Libby
Hungry Horse
Noxon
Rocky Reach
Columbia R.
Pend Oreille Lake
Flathead Lake
Rock Island
Kerr
Seattle
Little Goose
Lower Monumental
Montana
Wanapum
Lower Granite
Priest Rapids
Washington
Dworshak
The Dalles
Ice Harbor
Portland
McNary
Hells Canyon
Bonneville
John Day
Oxbow
Idaho
Brownlee
Willamette R.
Oregon
Jackson Lake
Boise Projects
Snake R.
Corps of Engineers Dams
Dams owned by Others
American Falls

Dispersal Down the Columbia River System

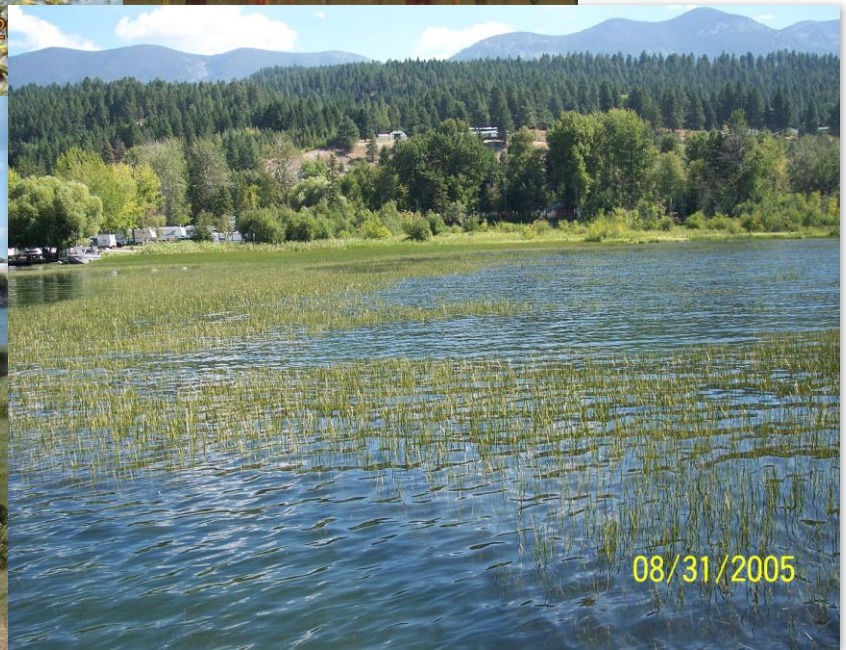
- Kerr Dam into Flathead and Clark Fork Rivers (MT)
- Thompson Falls, Noxon, Cabinet Reservoirs (MT)
- Lake Pend Oreille Clark Fork River delta (ID)
- Snake River Aberdeen-Springfield Canal Irrigation Systems (ID)
- Yakima River, Silver Lake Washington, Spokane River

Exposed flowering rush on Lower Flathead River: Perma Bridge


Flathead River Above Paradise MT
Incipient Flowering Rush Infestation

Property Values and Recreational Impacts

Swimmer's Itch (*schistosome cercarial dermatitis)* Trematode Parasite



Lake shore impacts: fouling swimming beaches

Private Boat Docks Surrounded by Flowering Rush

Flathead Valley Pablo Reservoir Irrigation Canal

Agricultural Water Delivery Impacts

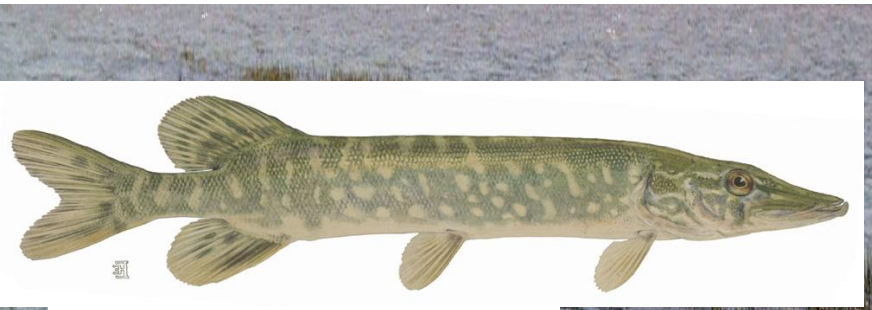
Flathead Indian Irrigation Project, MT

Spring Creek-Aberdeen Irrigation System, Idaho

Pablo Reservoir Lift Station Lower Flathead River
Moving Flowering Rush into Irrigation
Canals and Pablo Wildlife Refuge

Flowering rush and Native Plants and Sedimentation

Impacts to Native Fish

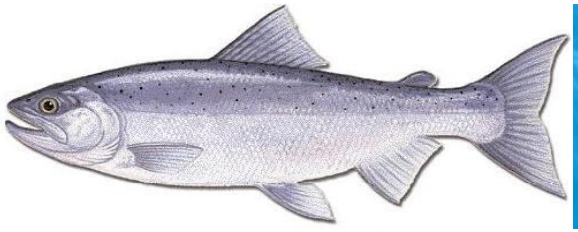


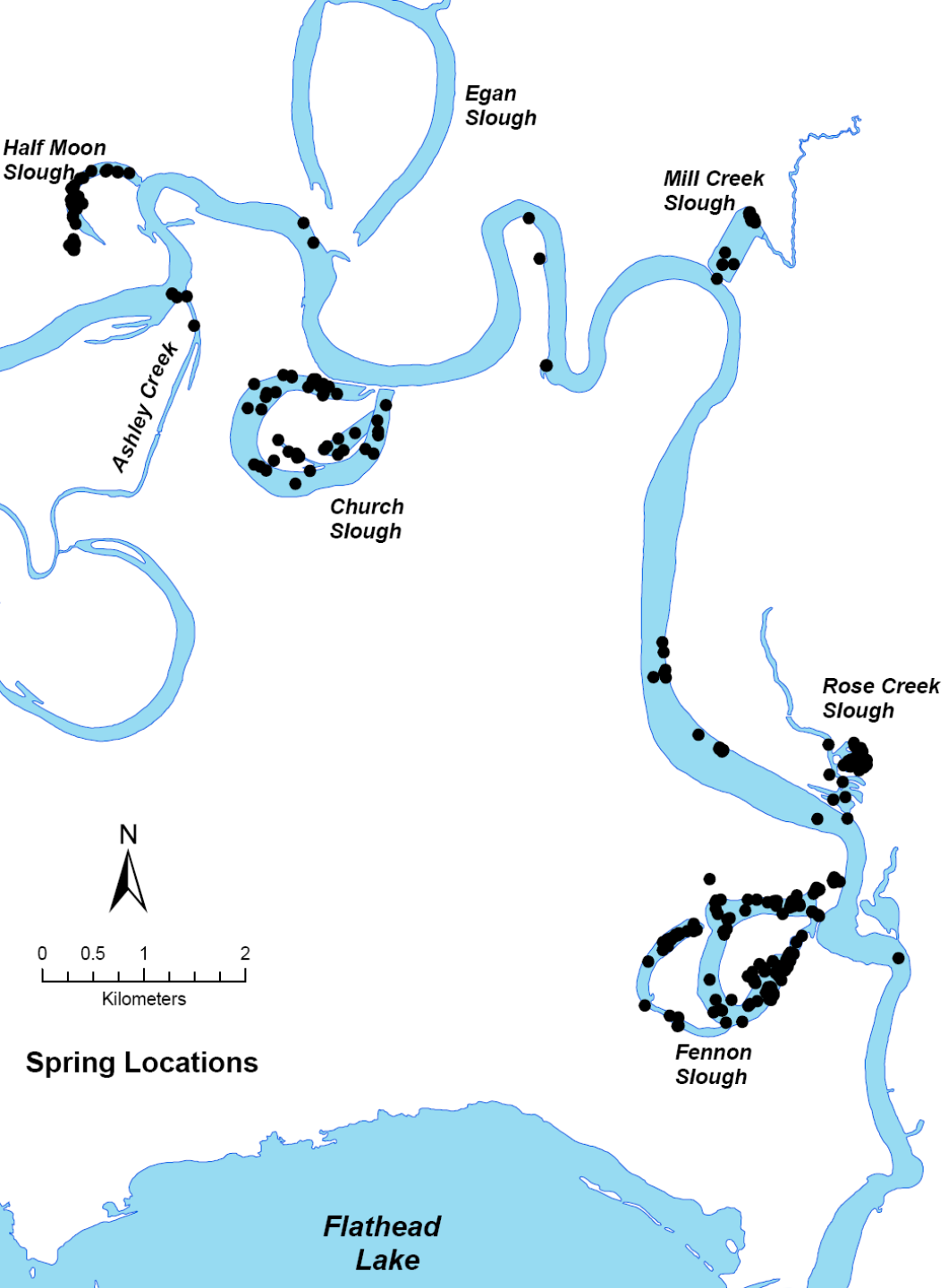
These Introduced Piscivorous Fish

Are Adapted to Vegetated Habitats

(Dibble et al 1997)

Native Salmonids Are Open Water Species





Montana Fish, Wildlife & Parks

Radio Tag Study

of

Northern Pike Distribution in the

Upper Flathead River

Northern Pike Bioenergetics Study

	Prey items	
Season	WCT*	BULL**
Winter	686	380
Spring	2,015	2,922
Summer	9,428	0
Fall	1,250	156
Totals	**13,379**	**3,457**

Bull Trout** & Cutthroats* Are Being Significantly Depredated by Northern Pike

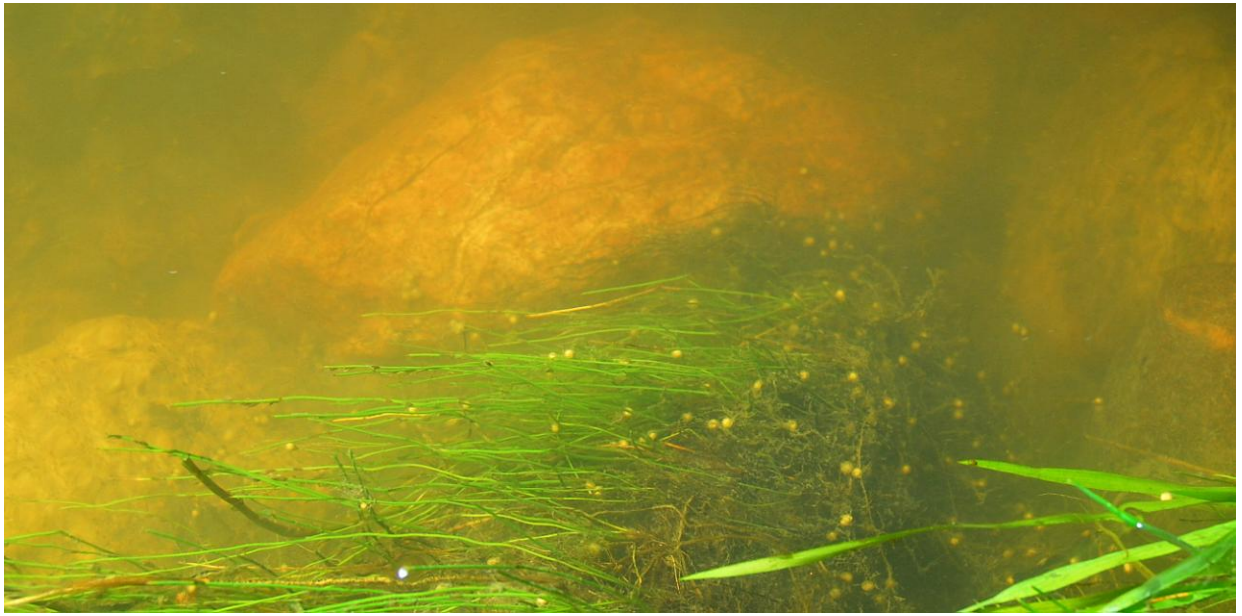
Muhlfeld et al. (2008)

Fennon Slough Map

Northern Pike

Obligate

Vegetation Spawners



- Eggs Attached
- Sac Fry Attached
- Fingerling Rearing


Northern Pike Spawning
in
Macrophyte Litter Beds
(Macrophytes Increase Water Temperatures &
Reduce Predation of Northern Pike Eggs & Juveniles)
Cooper 2008

Flowering Rush in April

(Fennon Slough, Upper Flathead River

Trials for Sampling Methods

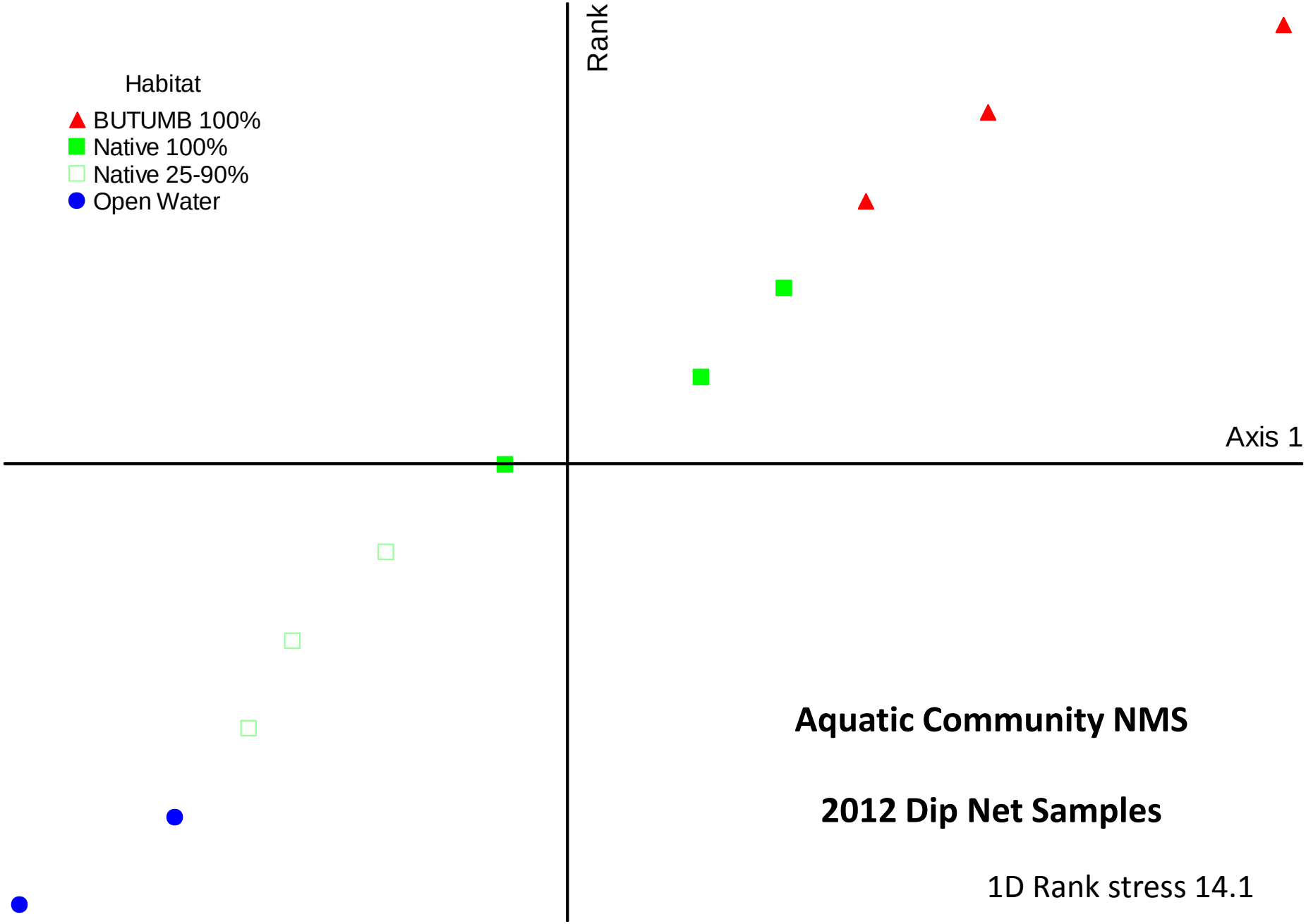

Habitat
BUTUMB 100%
Native 100%
Native 25-90%
Open Water
Rank
Axis 1
Aquatic Community NMS
2012 Dip Net Samples
1D Rank stress 14.1

Table 1. Proportional functional feeding groups summary (percent of total counts) for 2012 Faust Slough dip net samples.

Functional Feeding Group	Flowering Rush 100%	Native 100%	Native 50%	Open Water
Filterers	3.8	1.2	2.5	11.3
Gatherers	58.6	65.6	65.1	65.8
Omnivore†	0.0	0.0	0.3	0.0
Piercer-Herbivore	0.0	0.2	0.0	0.3
Predators	11.6	10.7	10.0	12.3
Predators/Gatherers¤	2.6	0.3	8.5	2.1
Scrapers	22.2	21.2	12.4	6.4
Shredders	1.2	0.8	1.2	1.7
	100.0	100.0	100.0	100.0

†crayfish, ¤water boatman

Aquatic Community NMS Relationship for 2012 Dip Net Samples

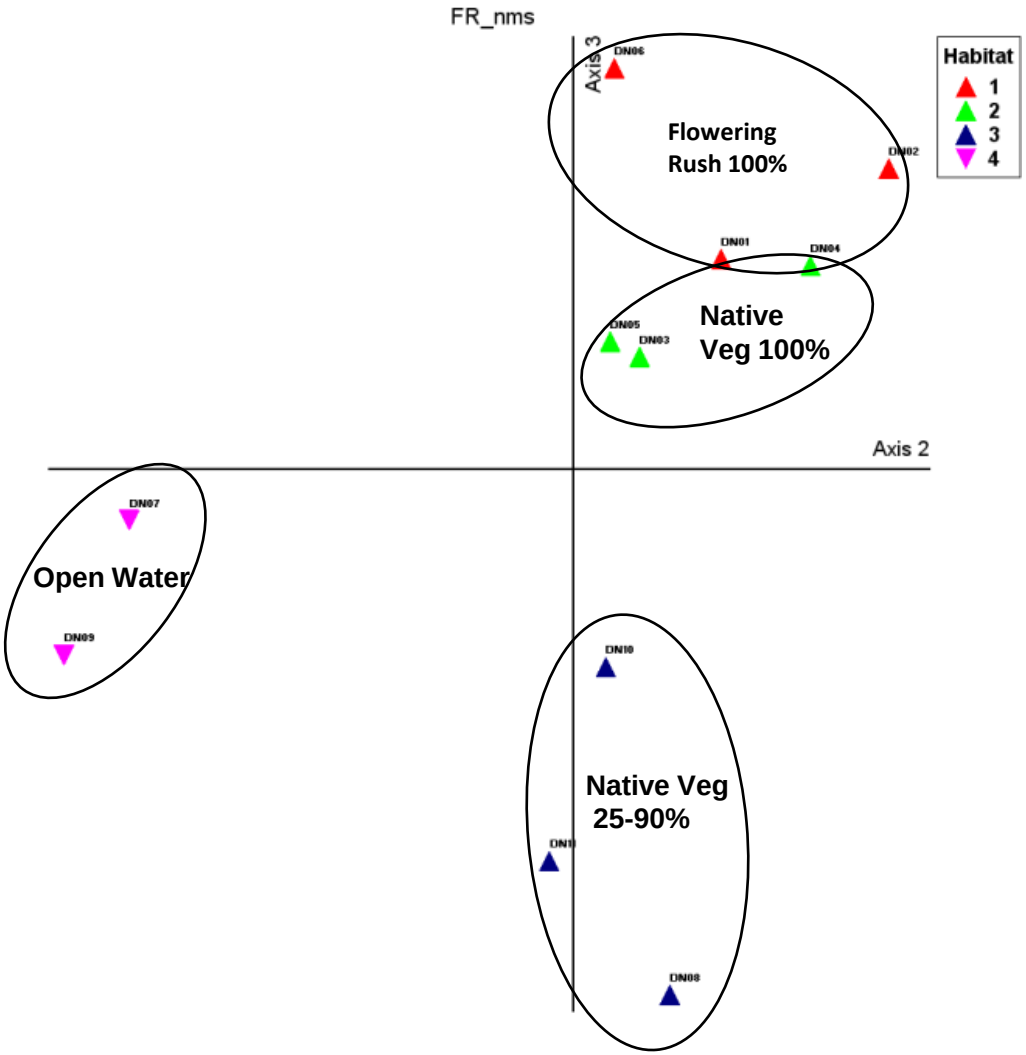


Table 1. Percent of positive light trap detects for fish in East Bay (2013).

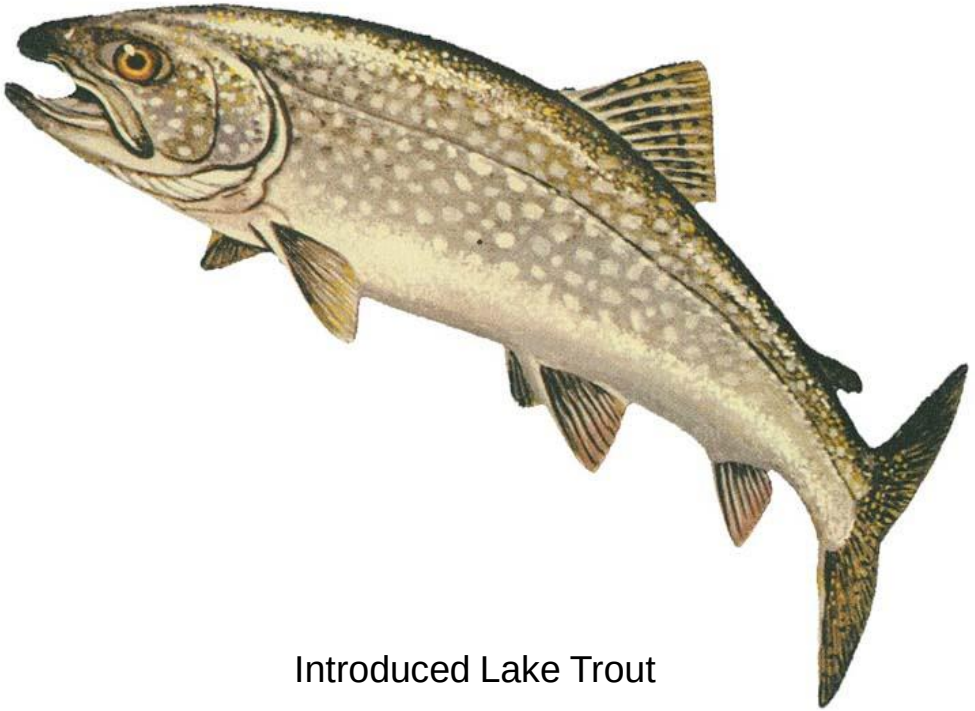
	# of light traps	Northern Pikeminnow	Yellow Perch
100% Flowering Rush	31	3	29

% Positive Samples Fennon Slough

2013Light Traps

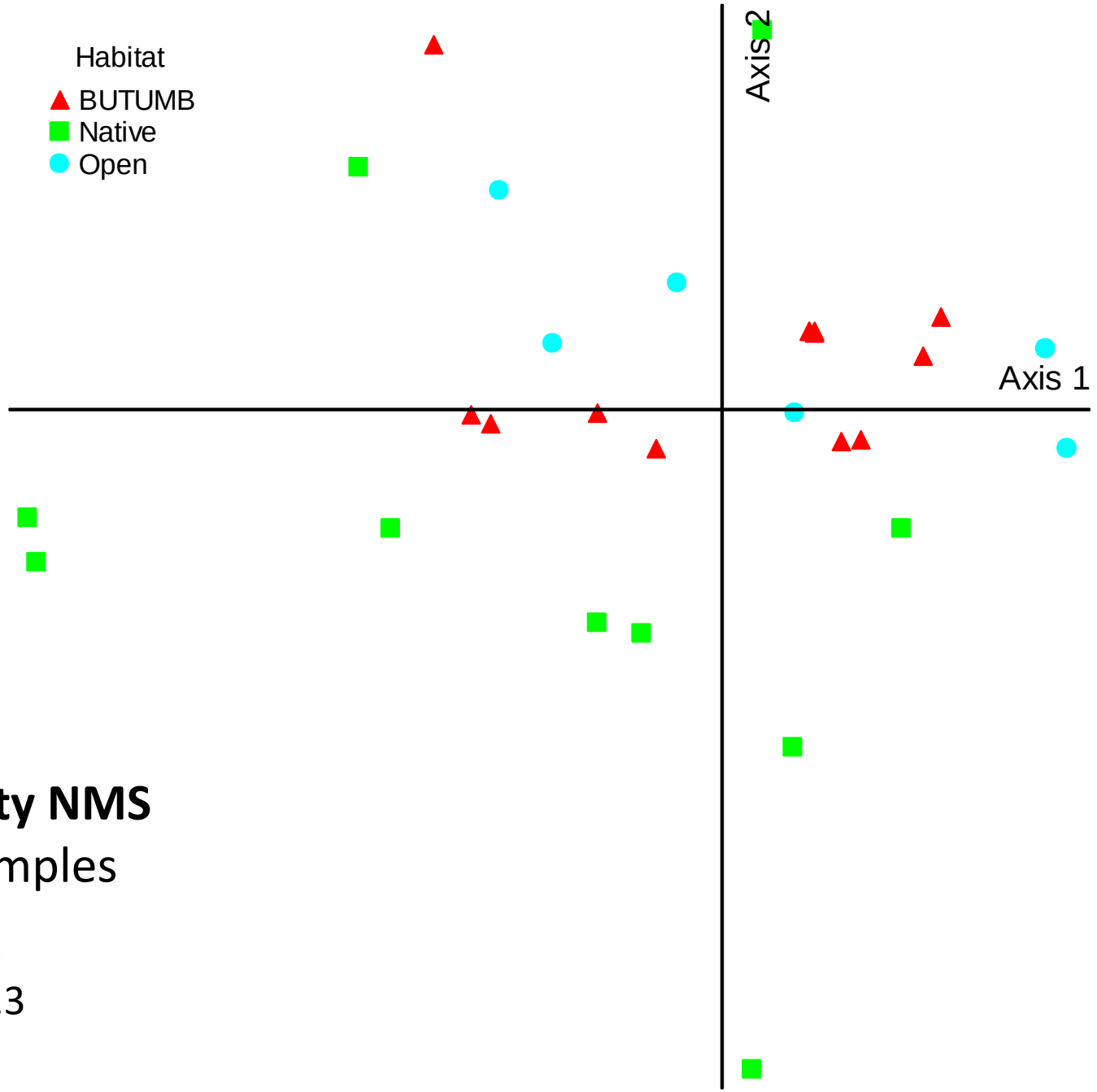
	# light traps	Largemouth Bass	Yellow Perch	Pumpkin-seed	**Northern Pike**
100% BUTUMB	44	77.3	31.8	6.8	11.4
100% Native	36	55.6	2.8	0	0
Open Water	36	25.0	0	0	0

Lake Trout Expand as Perch Prey Base Habitat Increases Magnifying Incidental Predation on Native Salmonids?



Introduced Lake Trout

Gregory & Powels



Aquatic Community NMS

2013 Light Trap Samples

2D NMS

Stress 16.3

Summary Points

- Flowering Rush Colonizes Previously Unvegetated Littoral Zones, and Alters Native Vegetation
- Flowering Rush Creates Northern Pike, Bass, and Perch Habitat
- Juvenile Northern Pike, Bass, and Perch Are Associated With Flowering Rush Infestations
- Northern Pike are Significantly Depredating Native Cutthrout & Bull Trout Populations
- Fish & Macroinvertebrate Community Composition is Being Altered from The Indigenous

An Update on Flowering Rush Control Demonstration Projects for Infestations Spanning Watersheds Between the Pacific Northwest and a Great Lakes State

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Aquatic Ecosystem Restoration & Maintenance

Montana

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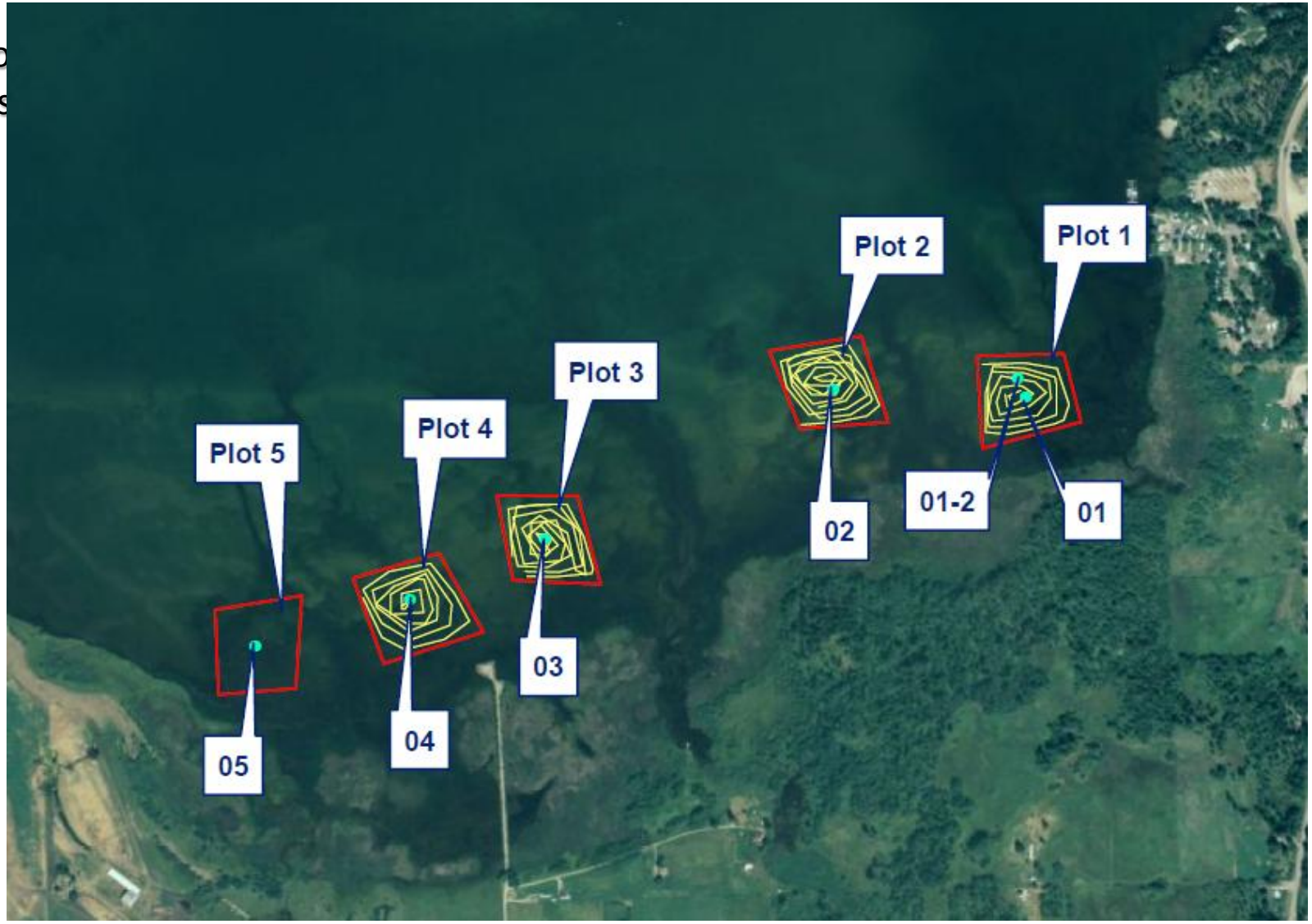
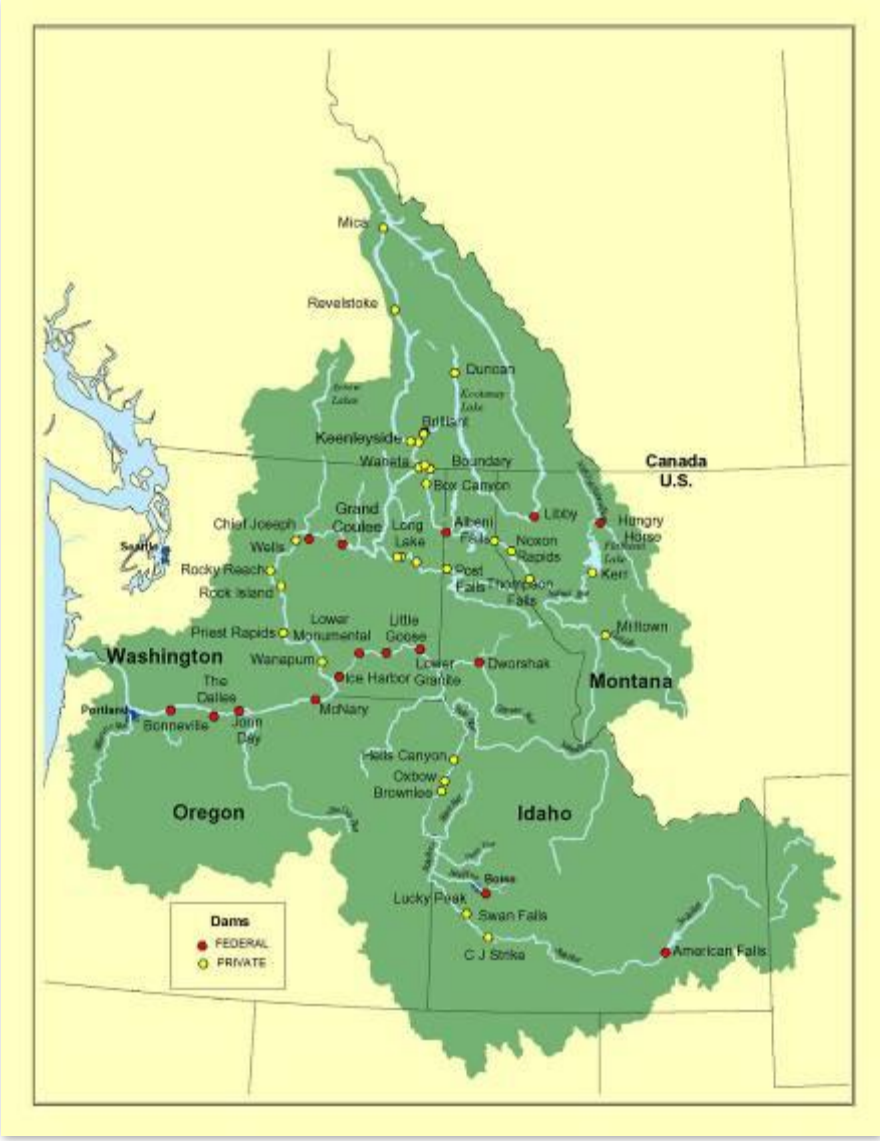


Low Pool Treatments

60 Day After Treatment

Habitat Low Pool Application: 21 DAT, will be treated again in spring 2015

Need for A System-Wide / Multi-Partner Comprehensive Scientific Assessment

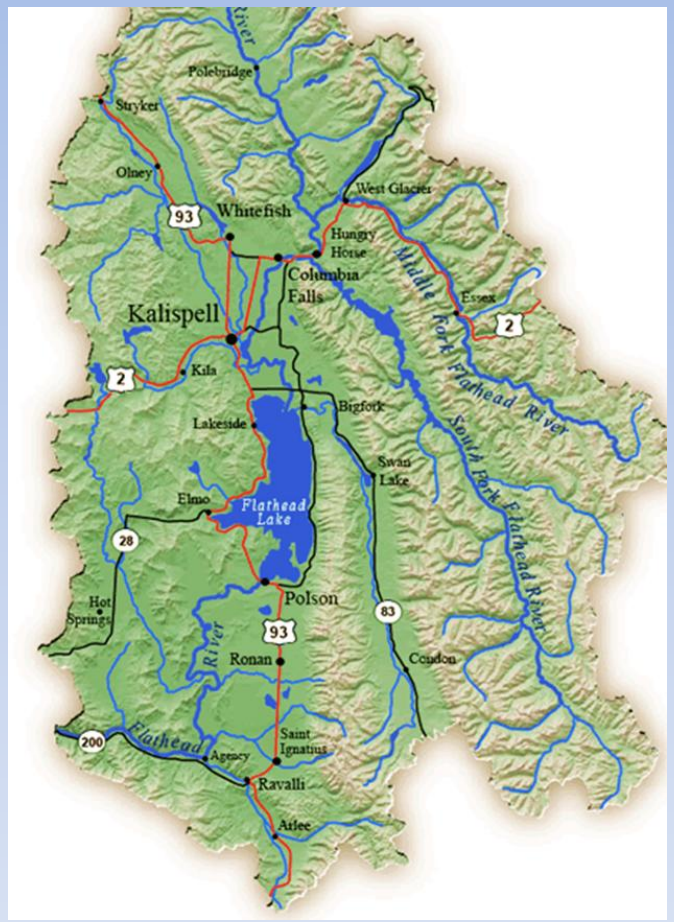


- Main Stem Survey
- Water Level Management & Invasion Success
- Reproductive Phenology & Rhizome/Seed Dispersal Determine Genotypes
- Higher Trophic Level Impacts, affects on native fish
- Sediment Deposition & Transport
- Control Methods
- Herbicide
- Mechanical Removal
- Biological Control
- Professional Awareness
- Strategic Plan for Columbia River Basin

Flowering Rush Cooperators

- USDA NIFA Tribal College Research
- University of Montana, Salish Kootenai College, Confederated Salish and Kootenai Tribes
- Montana Dept of Agriculture, Natural Resources, Fish, Wildlife & Parks
- Washington Department of Ecology, WSU Extension, CABI (United Nations)
- Idaho, Oregon, Minnesota
- Clean Lakes Inc.
- Mississippi, Army Corps, Wisconsin, Minnesota

Flathead Basin AIS Program



Erik Hanson Hanson Environmental 406.437.1440
hanson.environmental@gmail.com

Flathead Basin AIS Program

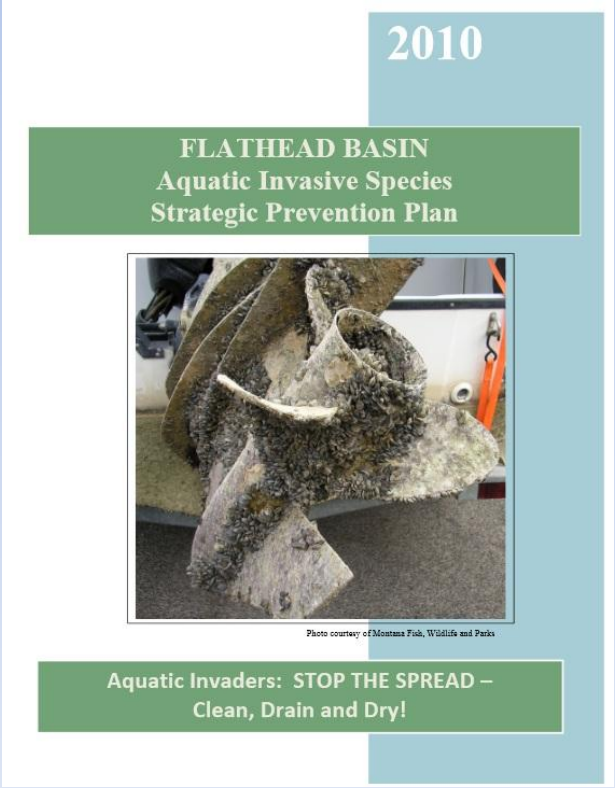
Flathead Basin

- Flathead Basin encompasses 8,587 sq miles
- Numerous pristine lakes, rivers and streams
- Flathead Lake
  - Largest freshwater lake West of Mississippi River
  - Surface area of 195 sq miles
  - 27 miles long and 15 miles wide
  - Headwaters of Columbia River
  - Heavily used by high risk boaters
  - 3000 individual water rights (50% season residents)
    - $500 per intake = $1.5 million

Flathead Basin AIS Program

Background:

- Workgroup formed in 2010
- Developed an AIS plan
  - Plan is amended to the state AIS plan
  - Strategies to protect the basin
  - Served as a guidance document
- Played a key role in state legislation
- Hired an AIS consultant in 2012
  - Implement plan
  - Coordinate
  - Secure Funding



Flathead Basin AIS Program

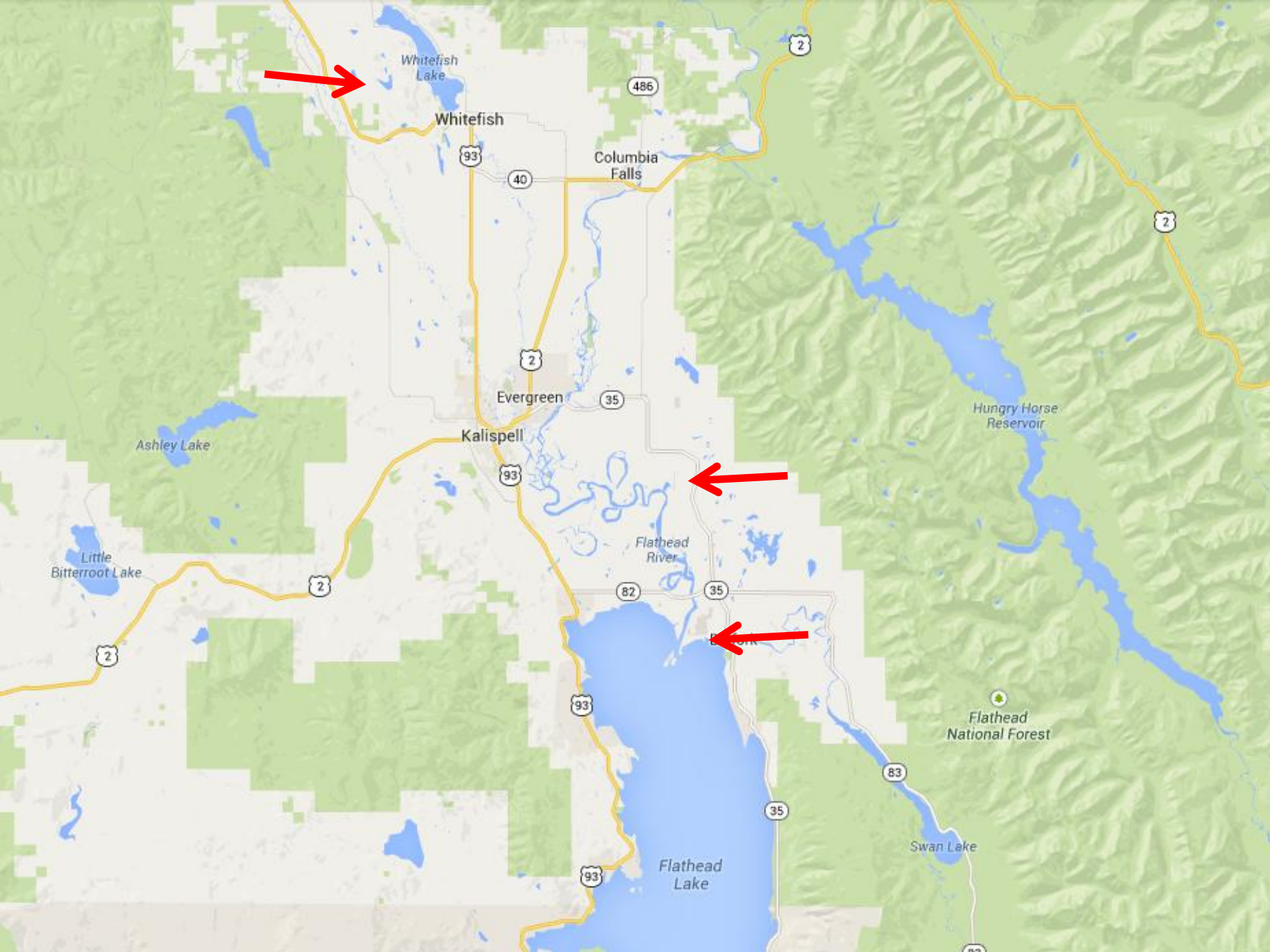
Funding

- Groups within the Basin
  - Lake County, Flathead Basin Commission, USFS, USCOE, USBR, City of Whitefish, Flathead Lakers
- Grants
- Consultant funded by donations from:
  - City of Whitefish
  - Lake County
  - Flathead Basin Commission
  - Flathead Conservation District
  - Flathead Lakers
  - Flathead Protection Agency
  - Swan Lakers
  - Whitefish County Water and Sewer District
  - Whitefish Lake Institute

Flathead Basin AIS Program

Address existing infestations

- Beaver Lake EWM
- Flathead Lake CLP


Whitefish Lake
Whitefish
Columbia Falls
Evergreen
Kalispell
Ashley Lake
Little Bitterroot Lake
Flathead River
Hungry Horse Reservoir
Flathead National Forest
Swan Lake
Flathead Lake
2
93
40
486
35
82
83

Beaver Lake EWM

Background:

2011 Eurasian watermilfoil discovered 2011

- Small patch next to boat ramp
- Bottom barriers deployed

2012

- Surveys: two more patches and isolated plants
- Dredging: Removed (25lbs)
- Bottom barriers removed
- Barrier placed on outflow

2013

- 5 lbs of plants removed

Flathead Lake CLP

Background:

- Discovered in 2011
- Occurs in isolated areas of lake and river
- 2013 and 2014 Dredge and survey
- DNRC Grant funded

Flathead Lake Flowering Rush

Background:

- Identified in 1964
- Over 2000 acres
- Interferes with recreation
- Changing the ecology of the lake

Invasive Aquatic Plant Issues

- Authority to quarantine
- Little regulation of pet/pond trade
- Limited “tools” for Flowering Rush
- Not enough research on impacts to salmonids
- Need a programmatic EA for treatment

Flathead Basin AIS Plan

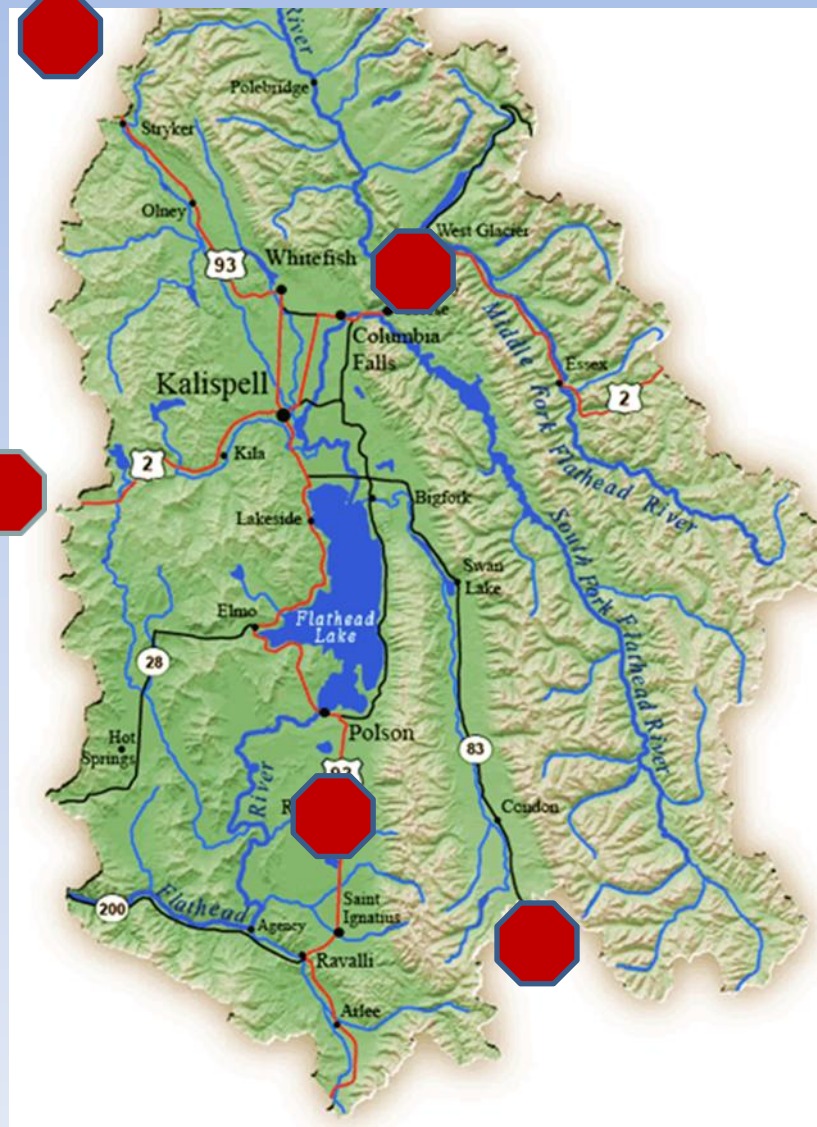
Implementation

- Watercraft inspections
- AIS surveys and control
- Education
- Contingency planning
- Legislation and authority
- Regional partnerships

Flathead Basin AIS Plan

Watercraft inspections

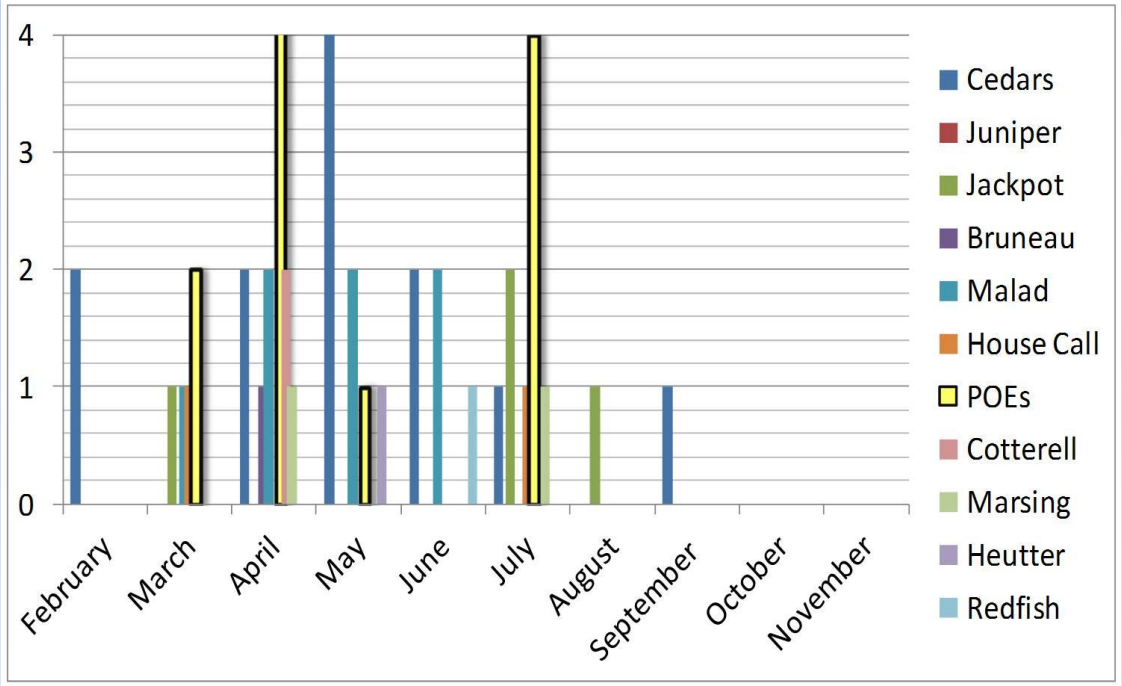
- Prioritize state inspection stations
- Provide funding for additional stations
- Glacier National Park
- Hwy 2 Glacier (BOR, FBC, City of Whitefish and Trout Unlimited funded)
- Eureka (COE funded)
- Clearwater (USFS Funded)
- Ronan (MT FWP)
- Libby (MT FWP)
- I-90 (MT FWP)
- Detection Dogs (AB,FBC DNRC)
- Volunteer inspections (Boat ramps)



Flathead Basin AIS Plan

Watercraft inspection issues

- Limited data on boater movement
- Limited hours
  - 10 to 12 hours a day
- Limited enforcement
  - 20 to 40% drive-bys
- No border inspections
- Limited season
  - Typically May to Sept



Flathead Basin AIS Plan

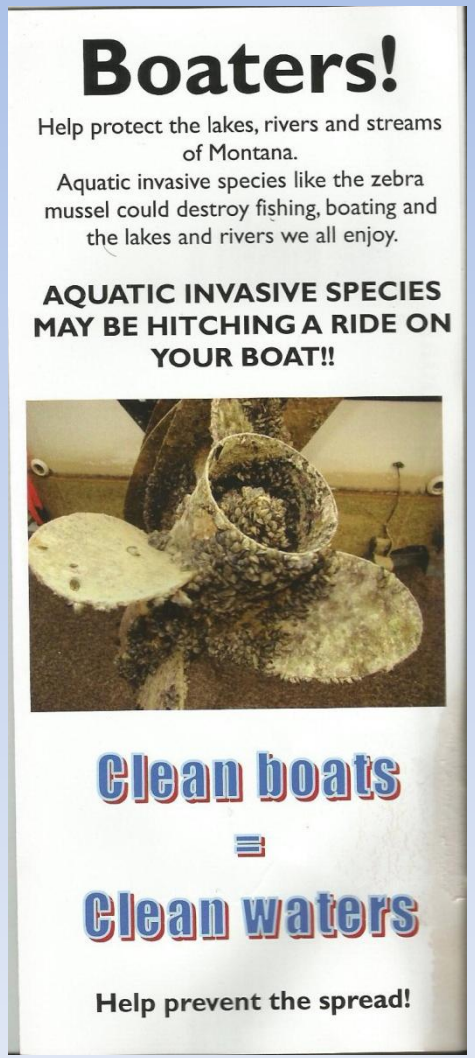
AIS Surveys

- All major waters surveyed for invasive aquatic plants
- Veliger monitoring through the Northwest Lakes Volunteer Lake Monitoring Network
- DRNC grant for additional sampling 2014
- eDNA research (EWM and Mussels)
  - Flathead Biological Station Dr. Gordon Luikart
  - Evaluation of New qPCR Tests for Early Detection of Invasive Dreissenid Mussels: Usefulness of eDNA and Plankton Tow Sampling
  - Detected less than 1 veligers worth of DNA
  - BPA Proposal for increased testing and field evaluation of accuracy

Flathead Basin AIS Plan

Education

- Presentations
- Camp host training
- AIS Kiosk, speakers trunk and educational trunk
- Law enforcement training
- Marina operators and boat shops
- Legislators and decision makers
- Educational Material
- Crown of the Continent AIS guide
- Focus Group Testing



Flathead Basin AIS Plan

Contingency Planning and response

- DNRC Renewable Resource Grant
- Provide education on Facility Risk Assessments
  - 40 facilities
- Develop a Rapid Response Framework and strikeforce
- Rapid Response capacity
  - Fouled Whitefish barges
  - Fouled sailboat
  - Citizen reports of invasive plants

Flathead Basin AIS Plan

Legislation and authority

- Input and drafting of MT AIS legislation
- Initiation of MT DOT commercially hauled boat program
- Local quarantine regulations (Lake County, Confederated Salish and Kootenai Tribe, City of Whitefish)
- Drafting of Water Resources and Reform Development Act language
- Development of MT AD HOC AIS advisory council and future MT invasive species council

Flathead Basin AIS Plan

Regional Partnerships

- Crown of the Continent AIS plan
  - AB, BC and MT
  - Pilot project for GNLCC
- Development and support of Alberta's AIS effort
- Future increased involvement with CRB and PNWER

Flathead Basin AIS Issues

Ongoing issues

- Uncertainty and variability of sampling for mussel veligers
- Need more and permanent funding (WRDA)
- Rapid response plan and funding for zebra/quagga mussels
- Programmatic EA for zebra/quagga treatment
- Authority to quarantine waterbodies
- Containment of Lake Mead, Powell, Havasu (Southwest)
- Need a coordinated outreach effort conducted by a firm that does advertising
- Comprehensive program for commercially hauled boats

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