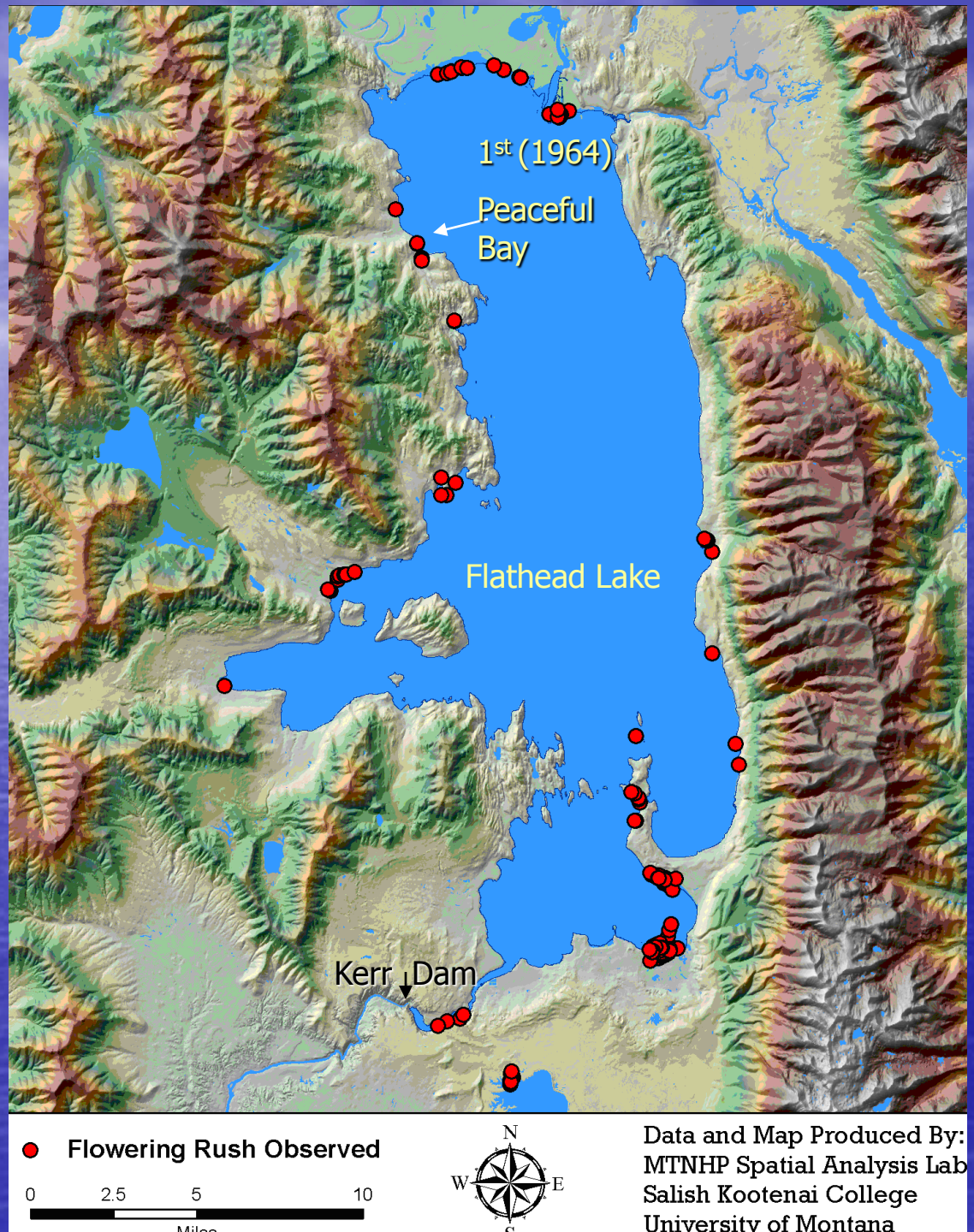
Flowering Rush
Flathead Lake to the Pend Oreille River

Dr. Peter Rice

University of Montana

Aquatic Weeds Workshop

7/09/14



Known Infestations

Flathead Lake

Partial Survey

Data Through

10/13/2008

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

Result 2009 Spatial Modeling	Current (2009)		Future Susceptible	
Habitat	Size Acres	Infested* Acres	Maximum Acres	% of Lake
0-10' Littoral	5,823	>1,039	4,364	3.5
10-20' Littoral	8,375	>1,000	6,546	5.3
	14,558	>2,039	10,910	8.8
% Current & Susceptible		>14	75	
Wetlands	1,536	100	? 1,536	

*dense infestations with high cover value

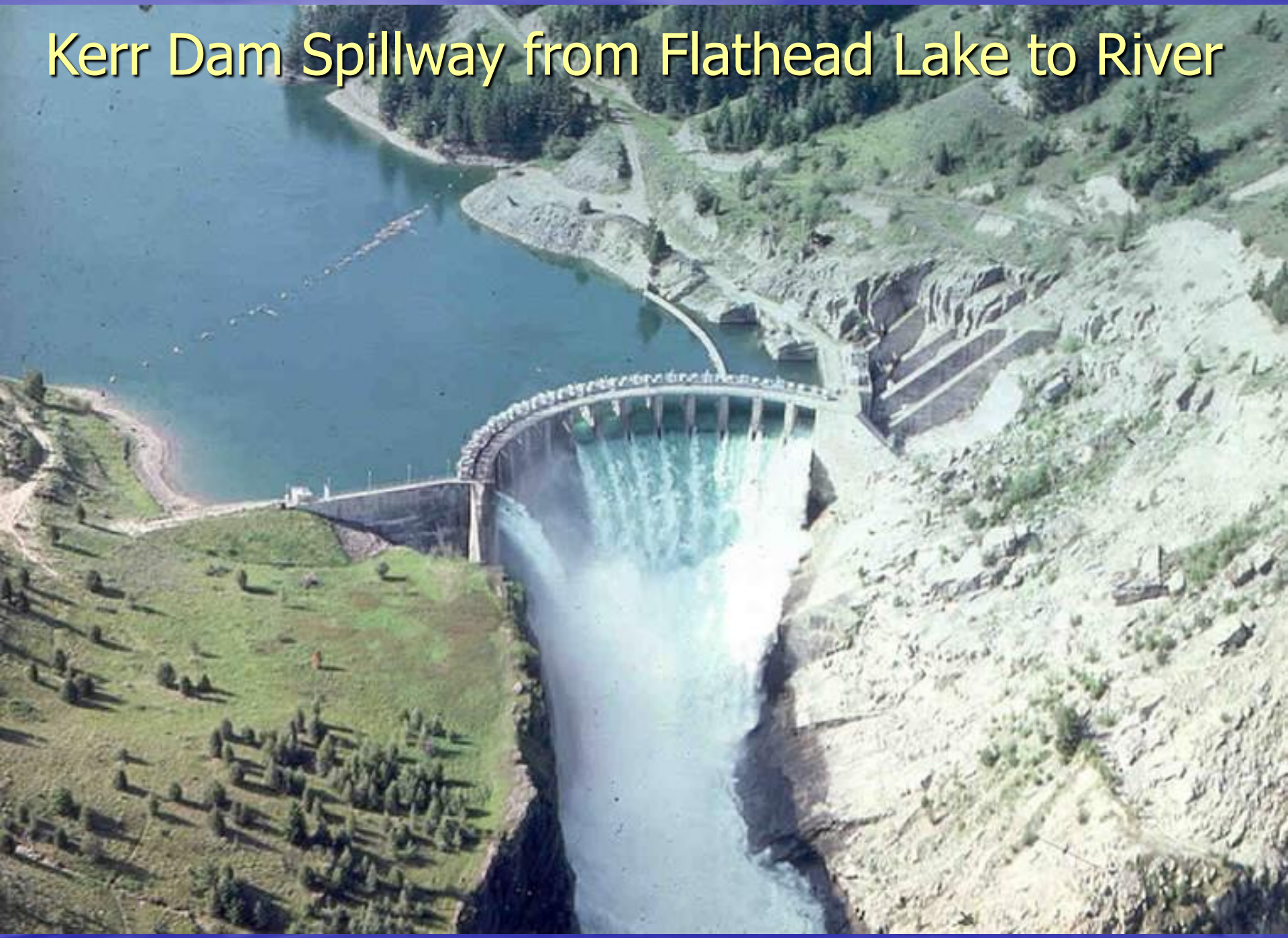
NAIP Spatial Model for East Bay

Buoyant Rhizome Fragments

Preformed Roots and Large Carbohydrate Reserve Quickly Anchor Fragments In Sediments

Rhizome Fragments on Unvegetated Littoral Zone Sediments

Kerr Dam Spillway from Flathead Lake to River

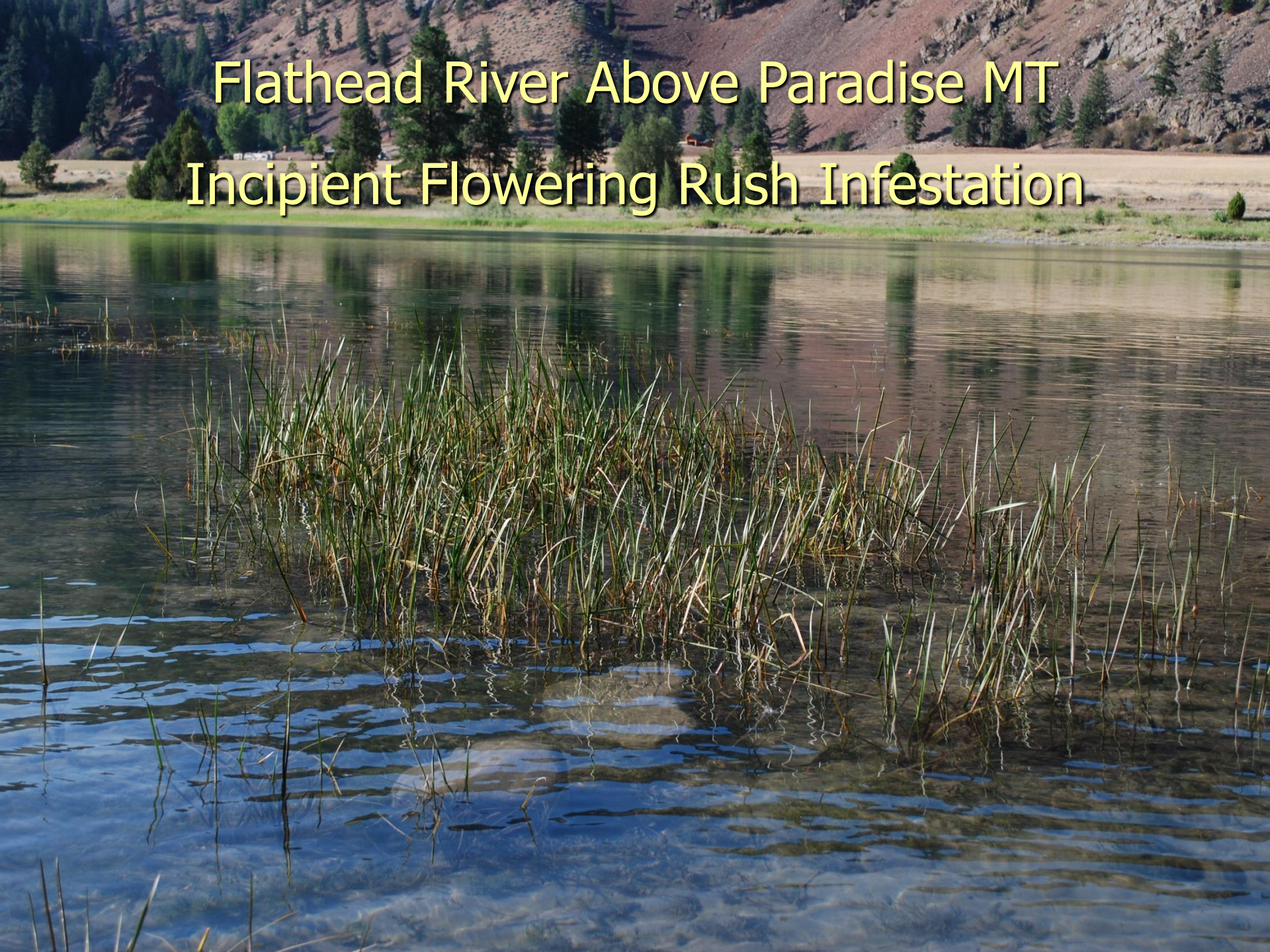


Dispersal Down the Flathead & Clark Fork Rivers

- Kerr Dam into Flathead and Clark Fork Rivers (MT)
- Thompson Falls, Noxon, Cabinet Reservoirs (MT)
- 165 Miles & Into Lake Pend Oreille (ID)
- Has Passed Thru Albeni Falls Dam into the Pend Oreille River (WA)

2007 7 26

< Perma Bridge
~ 2.5 Infestation per Mile on Flathead River


Flathead River Above Paradise MT
Incipient Flowering Rush Infestation

Lake Surveys as of 2008

- Flathead Lake
  ~2,000 ac
- Thompson Falls
  ~28 ac (12.5% FoO)
- Noxon
  ~46 ac (0.6% FoO)
- Cabinet
  Present (<<1% FoO)
- L. Pend Oreille
  ~8 to 200 acres (0.1% FoO)

FoO = Frequency of Occurrence

- These Data from:
  - Rice & Dupuis
  - Madsen & Cheshier 2008
  - Woolf 2007, Madsen & Wersal 2008

Still an Early Detection/Rapid Response Opportunity?

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Obvious Negative Impacts

- Formation of Monotypic Vegetation
- Displacement of Native Plant Communities
- Loss of Open Water Recreation
- Irrigation Impediment

Higher Level Impacts Likely

- Increases in Water Temperatures
- Nutrient Releases
- Sediment Transport & Deposition
- Food Chain Alterations
- Native Fisheries

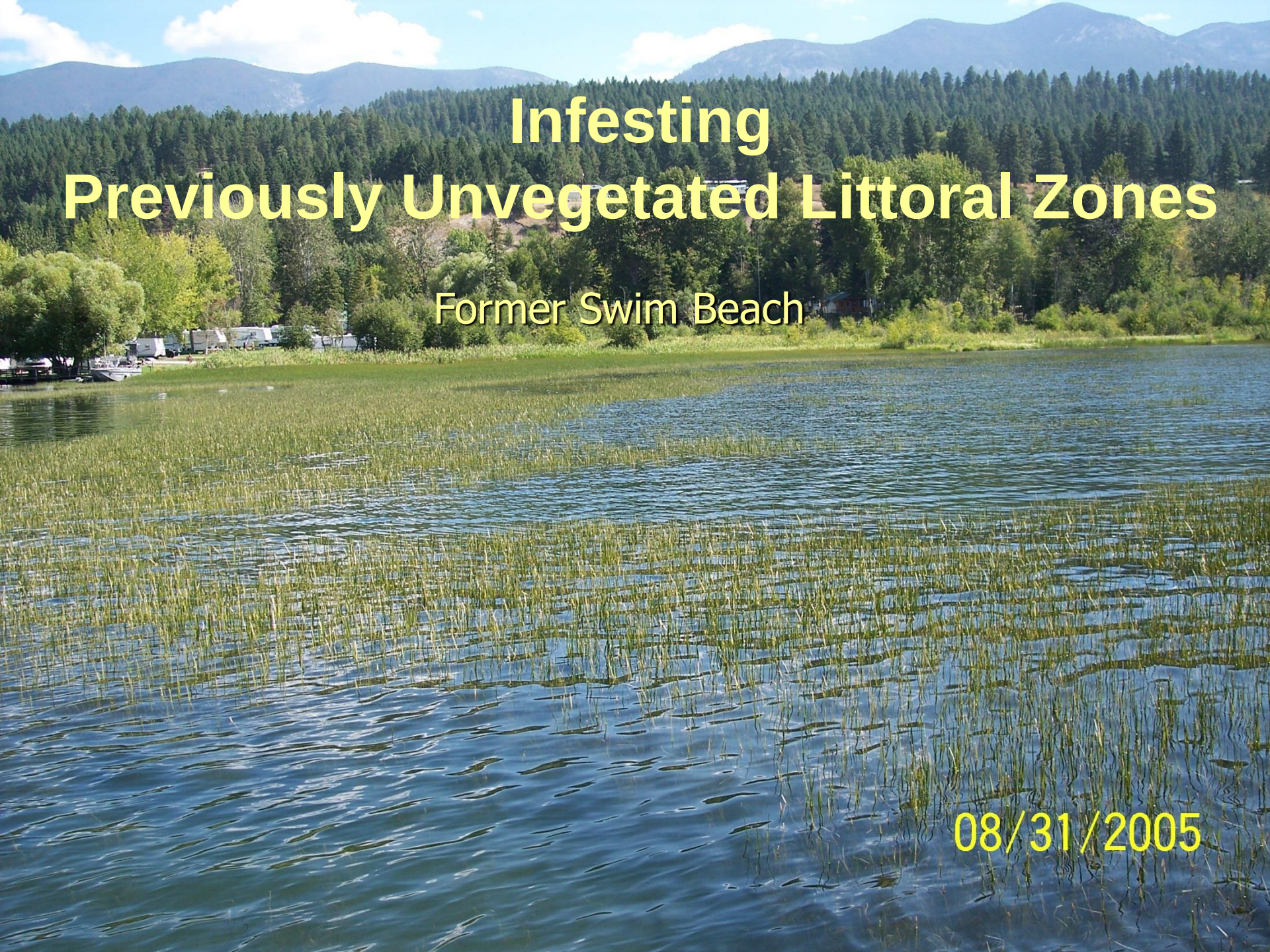
Creates
Vegetated vs. Open Water
Littoral Zone

Pablo Reservoir Irrigation Lift Station
Flathead Lake/River
Flowering Rush Colony
2007 7 26

Flowering Rush Fragments on Lift Station Trash Racks

Flathead Valley Pablo Reservoir Irrigation Canal

6.7 Million Acres Irrigated by Withdrawals From Columbia River System


Infesting
Previously Unvegetated Littoral Zones
Former Swim Beach
08/31/2005

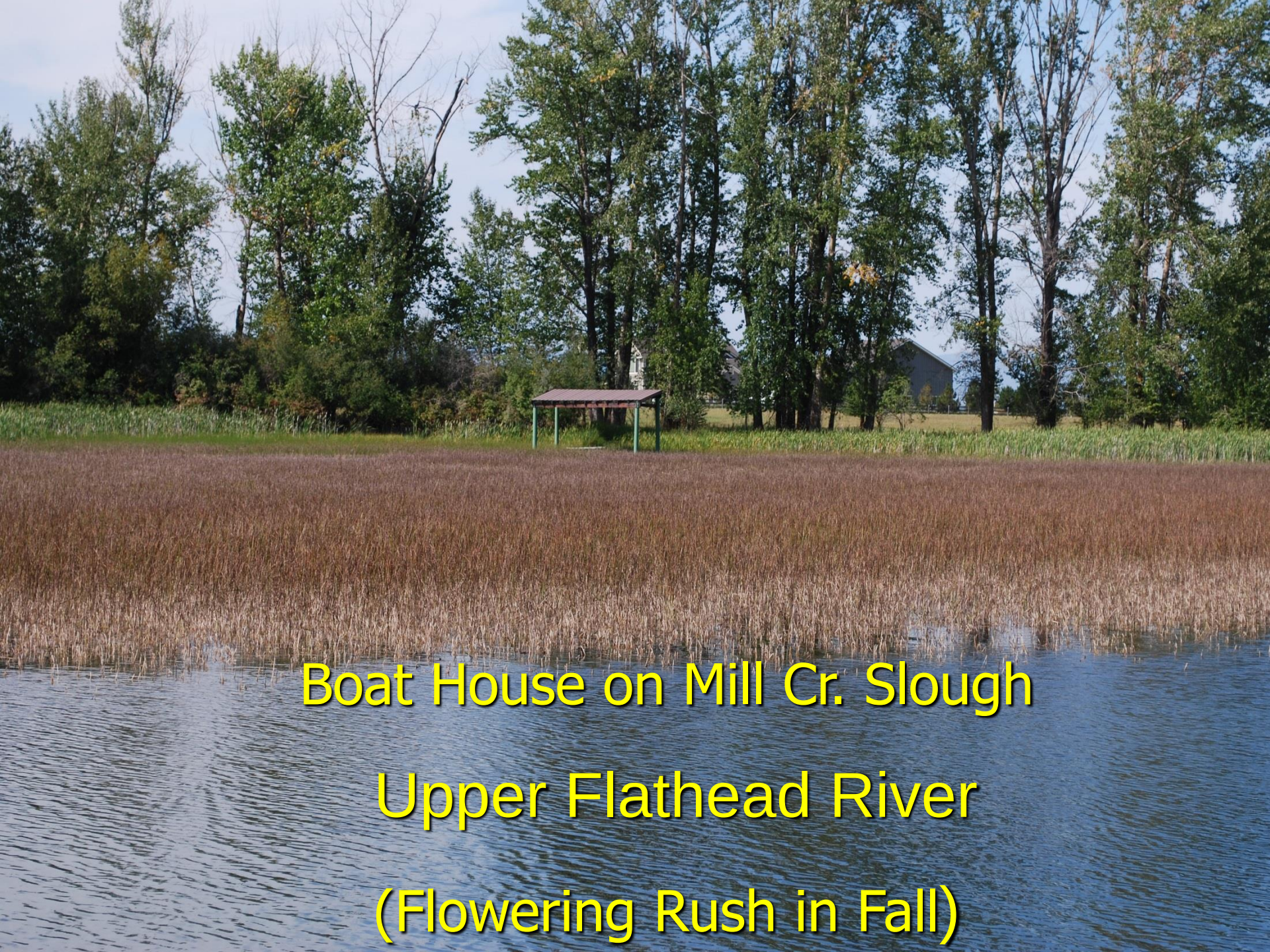
Ideal Habitat for Great Pond Snails
(*Lymnaea stagnalis*)
Host for Swimmer's Itch
(*schistosome cercarial dermatitis*)
Trematode Parasite (*Trichobilharzia ocellata*)

07/24/2008

Private Boat Docks Surrounded by Flowering Rush

Not Only A Nuisance But Also a Contributing Factor in Dispersal

Prop Fowling Stalls Motors & Facilitates Dispersal


Boat House on Mill Cr. Slough
Upper Flathead River
(Flowering Rush in Fall)

Invasive of Wetlands & Shoreline Displacing Native Plants

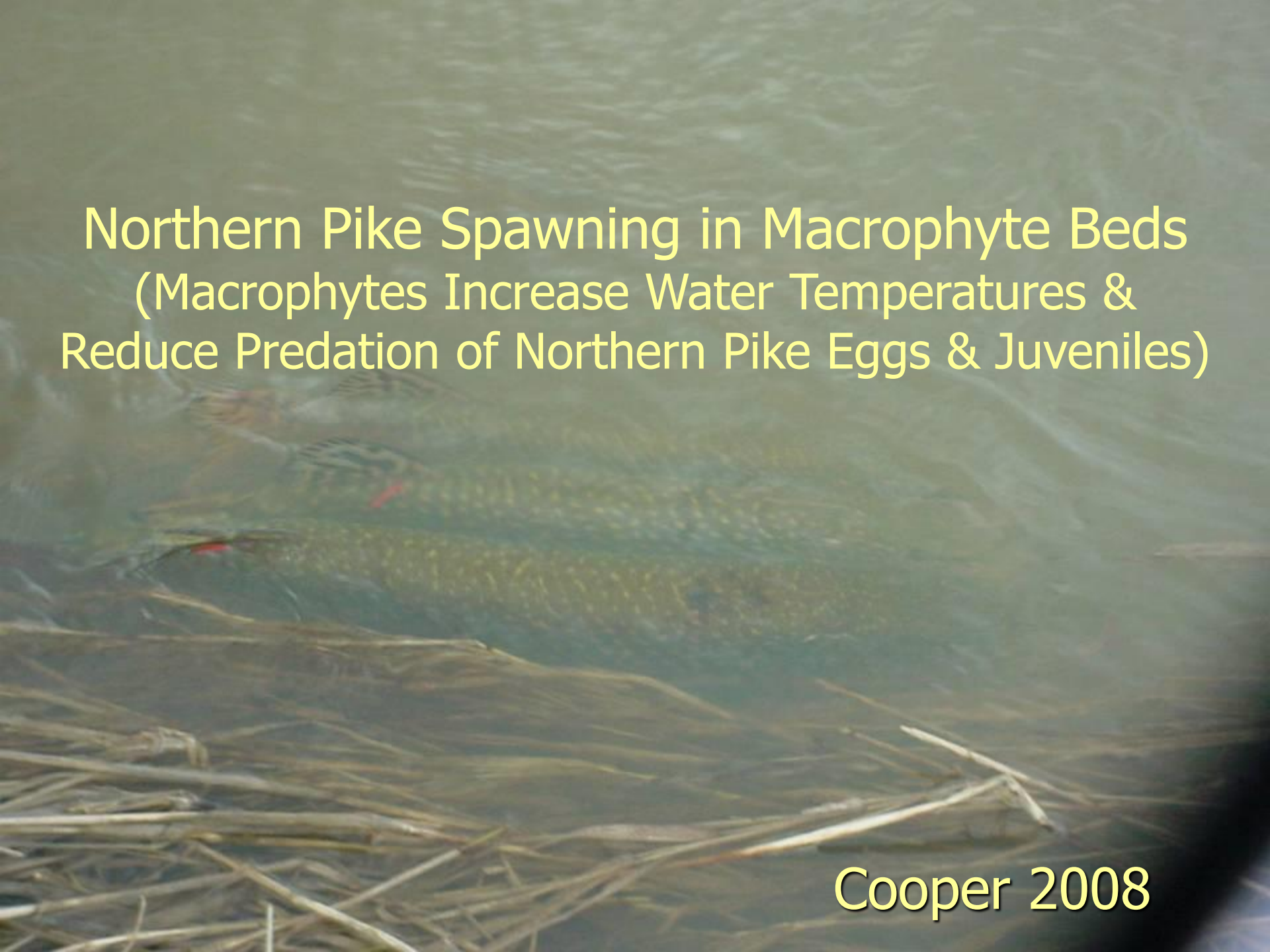
These Introduced Piscivorous Fish

Are Adapted to Vegetated Habitats

(Dibble et al 1997)

Native Salmonids Are Open Water Species

Northern Pike Predation of Salmonids



Northern Pike Spawning in Macrophyte Beds

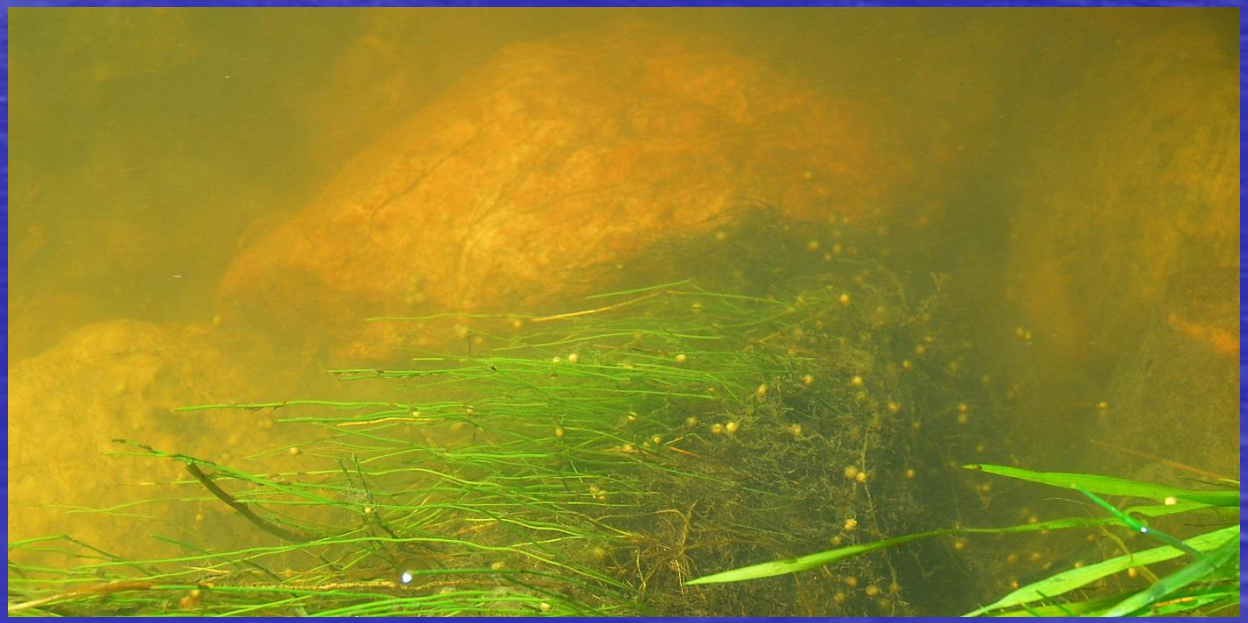
(Macrophytes Increase Water Temperatures & Reduce Predation of Northern Pike Eggs & Juveniles)

Cooper 2008

Northern Pike

Obligate Vegetation Spawners

- Eggs Attached
- Sac Fry Attached
- Fingerling Rearing



Hunt & Carbine 1951

Mann 1982

Grimm 1983

Quatrefoil Light Traps

Pierce et al 2007

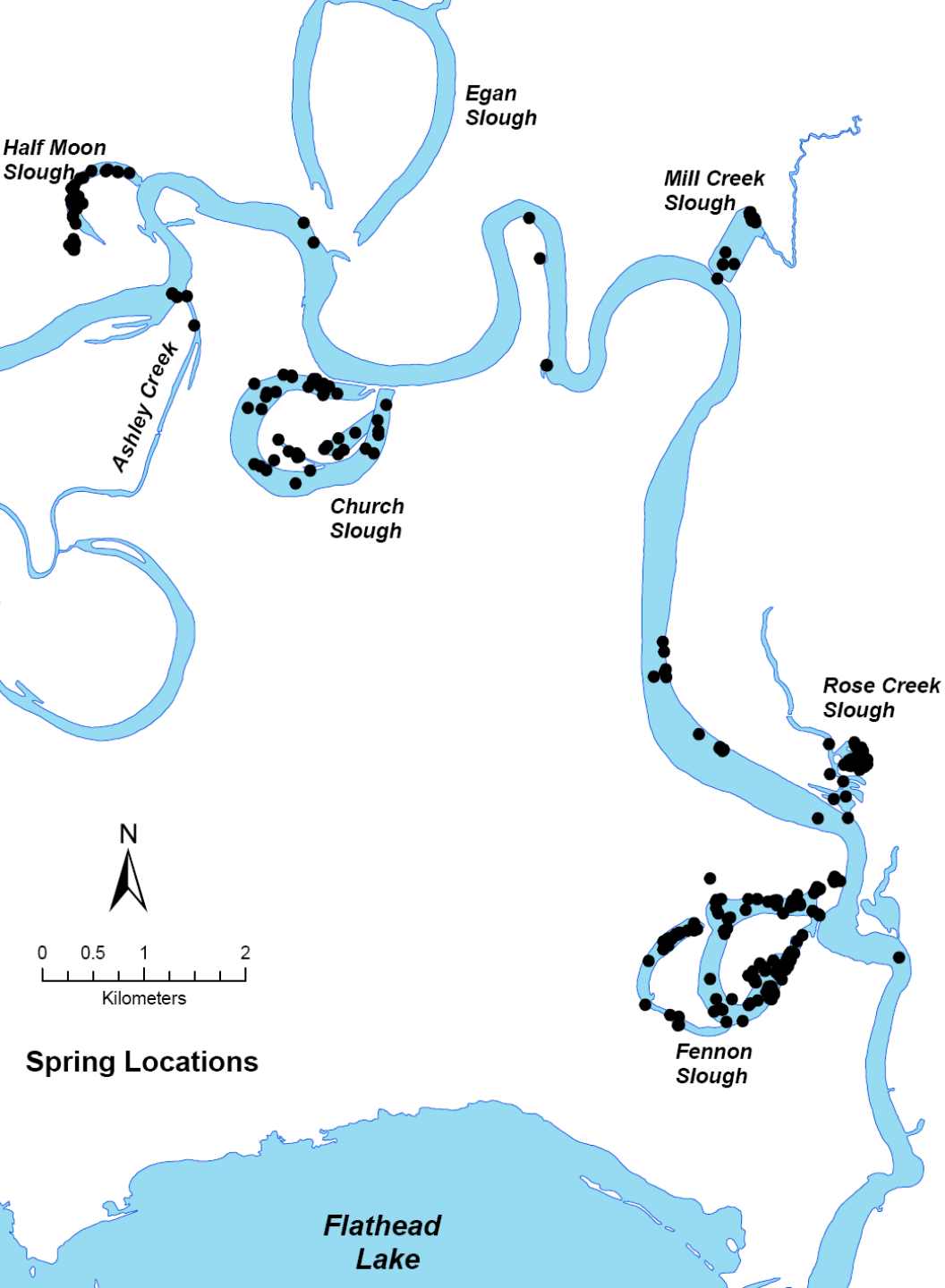
Floyd et al. 1984

Secor et al. (1992)

PAGES

% Positive Samples Fennon Slough 2013

	# light traps	Largemouth Bass	Yellow Perch	Pumpkin-seed	**Northern Pike**
100% BUTUMB	44	77	32	7	11
100% Native	36	56	2.8	0	0
Open Water	36	25	0	0	0



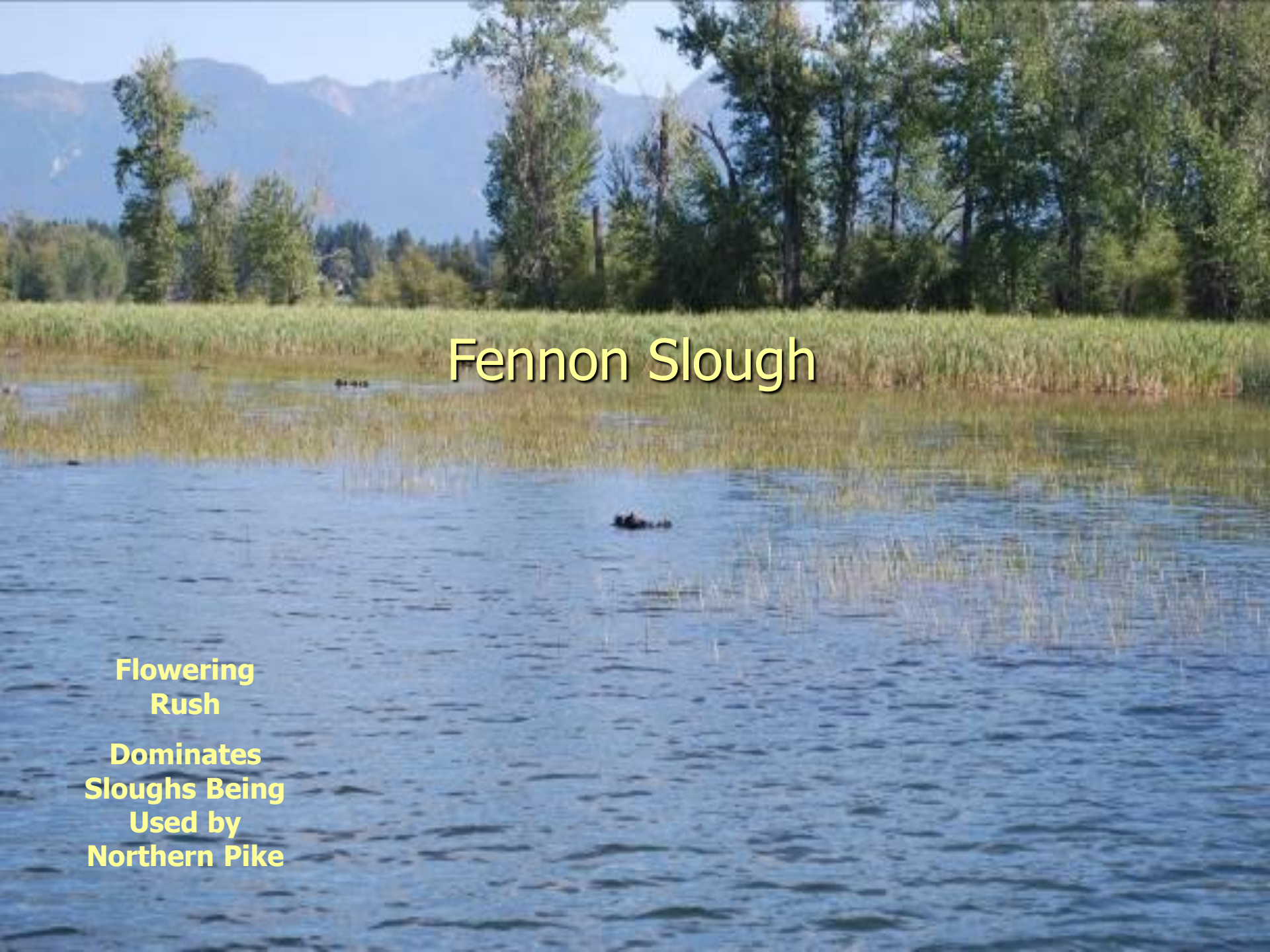
Montana Fish, Wildlife & Parks

Radio Tag Study

of

Northern Pike Distribution in the

Upper Flathead River


Fennon Slough
Flowering Rush
Dominates Sloughs Being Used by Northern Pike

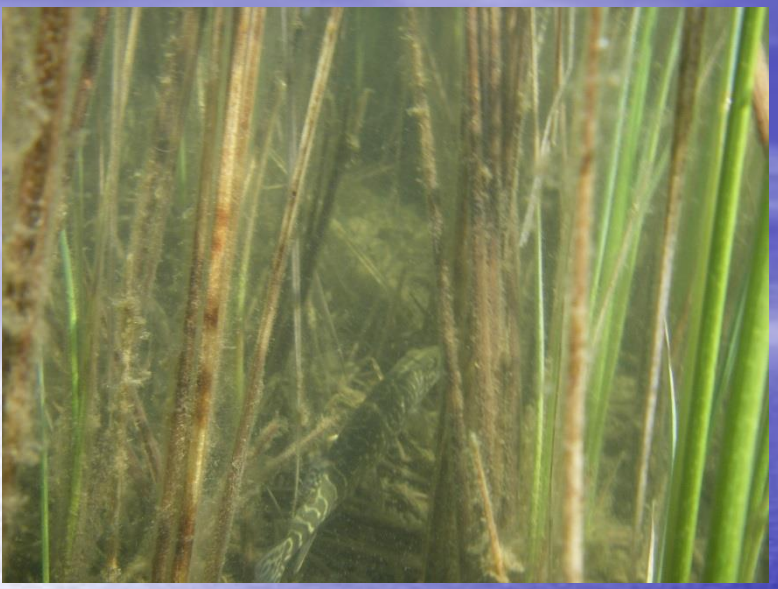
Northern Pike Location Points & Flowering Rush Infestation of Fennon Slough

Northern Pike Bioenergetics Study

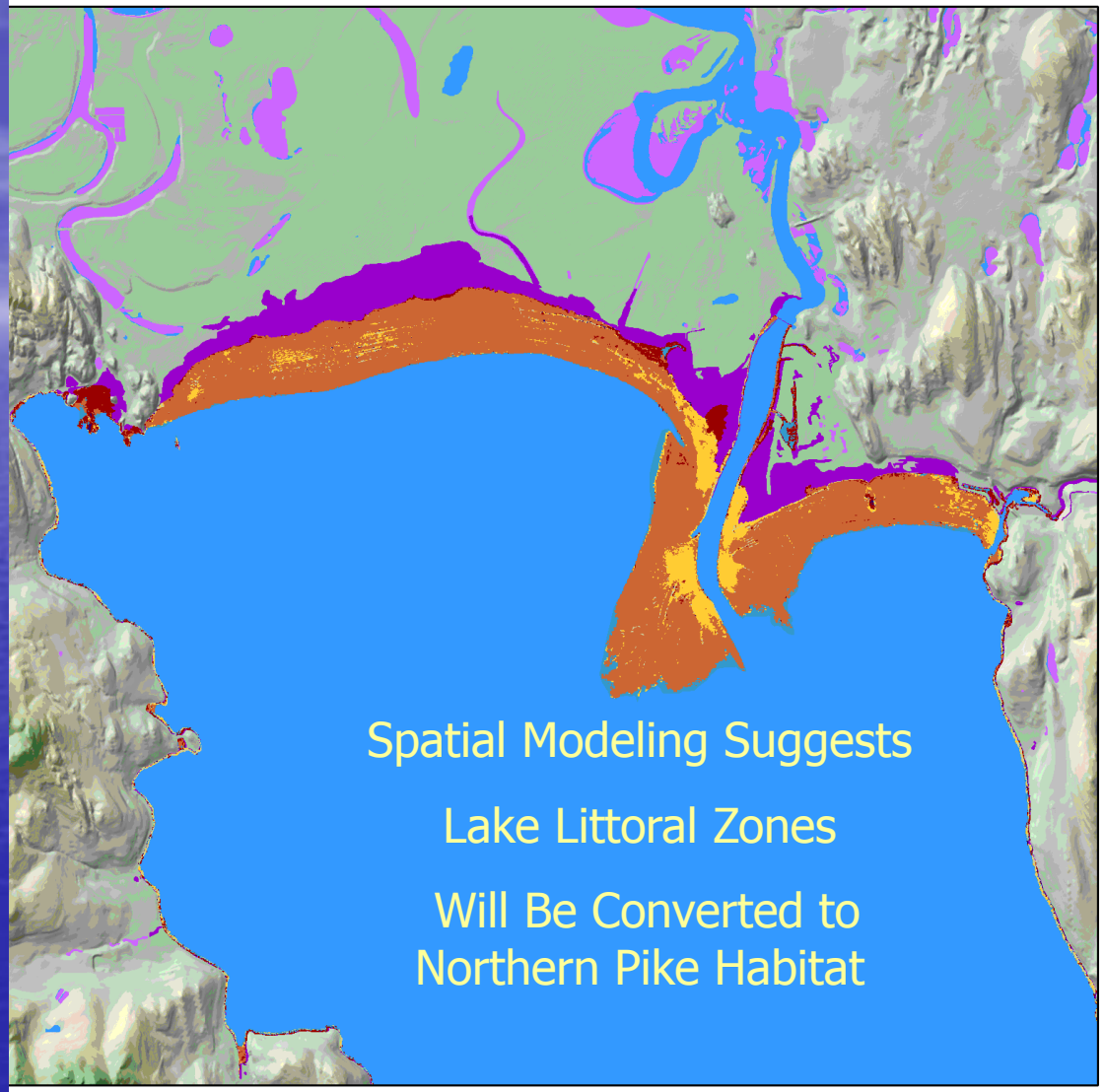
	Prey items	
Season	WCT*	BULL**
Winter	686	380
Spring	2,015	2,922
Summer	9,428	0
Fall	1,250	156
Totals	**13,379**	**3,457**

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

Muhlfeld et al. (2008)



Flowering Rush Invasion Susceptibility



class

Water
Vegetation
Low
Medium
High
Extreme

Adjacent Wetlands
Other Wetlands

N
W
E
S

0 0.5 1 2
Miles

Data and Map Produced By:
MTNHP Spatial Analysis Lab
Salish Kootenai College
University of Montana

Suppression of Flowering Rush

- Regrowth from Rhizomes
- Dispersal by Rhizome Fragments

Ideal Treatment Goal is to Maximize Rhizome Kill

Dam Induced Low Pool in Spring:

- Favors Expansion of Flowering Rush Infestations
- Provides Dry Ground/Foliar Treatment Window

May 27, 2008

Low Pool Foliar/Exposed Sediments Treatments

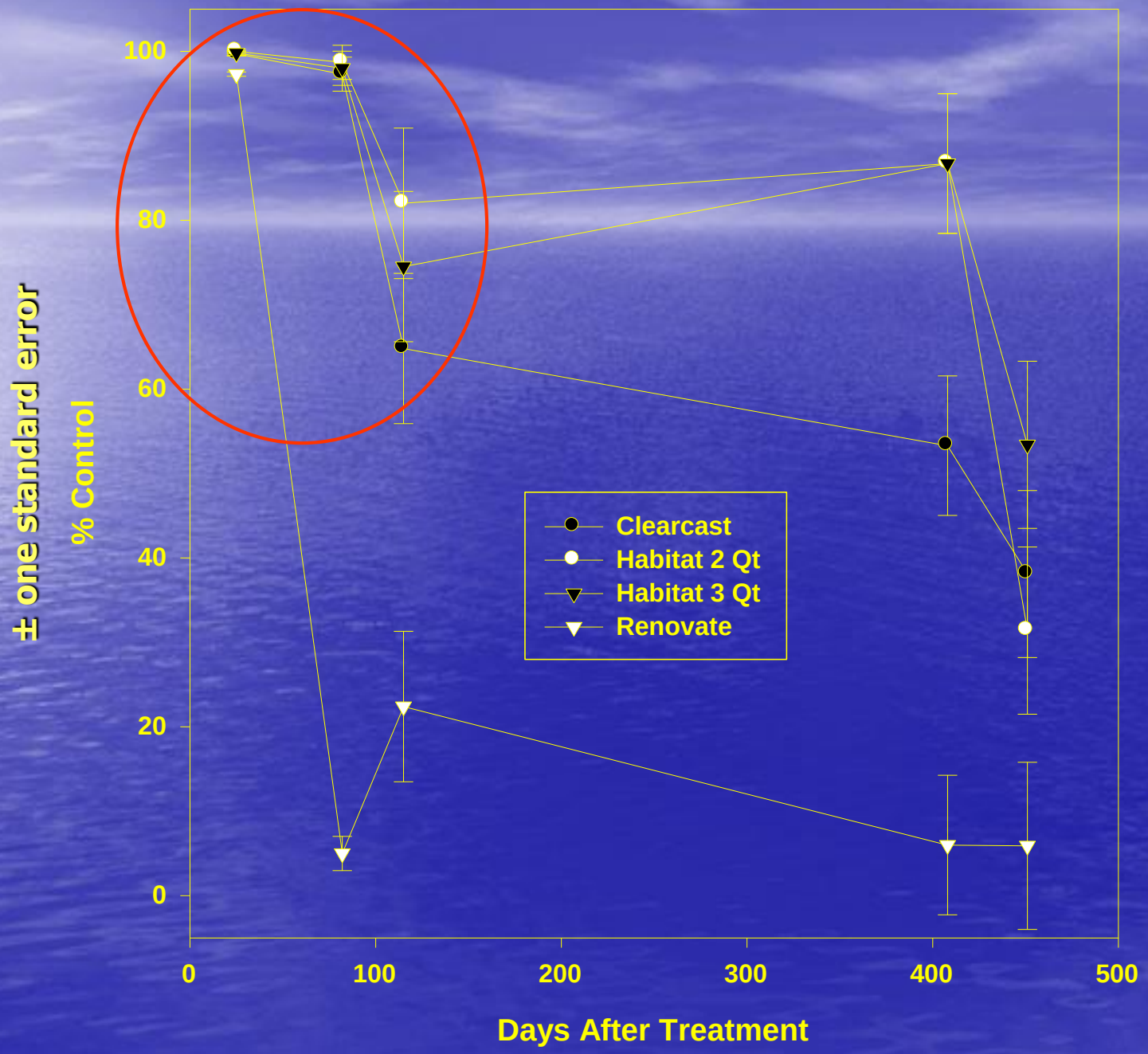
Leaves Are Often Well Emerged by at Least May While Flathead Lake is Still at Low Pool

5 to 7 Inch Average Leaf Length East Bay May 27, 2008

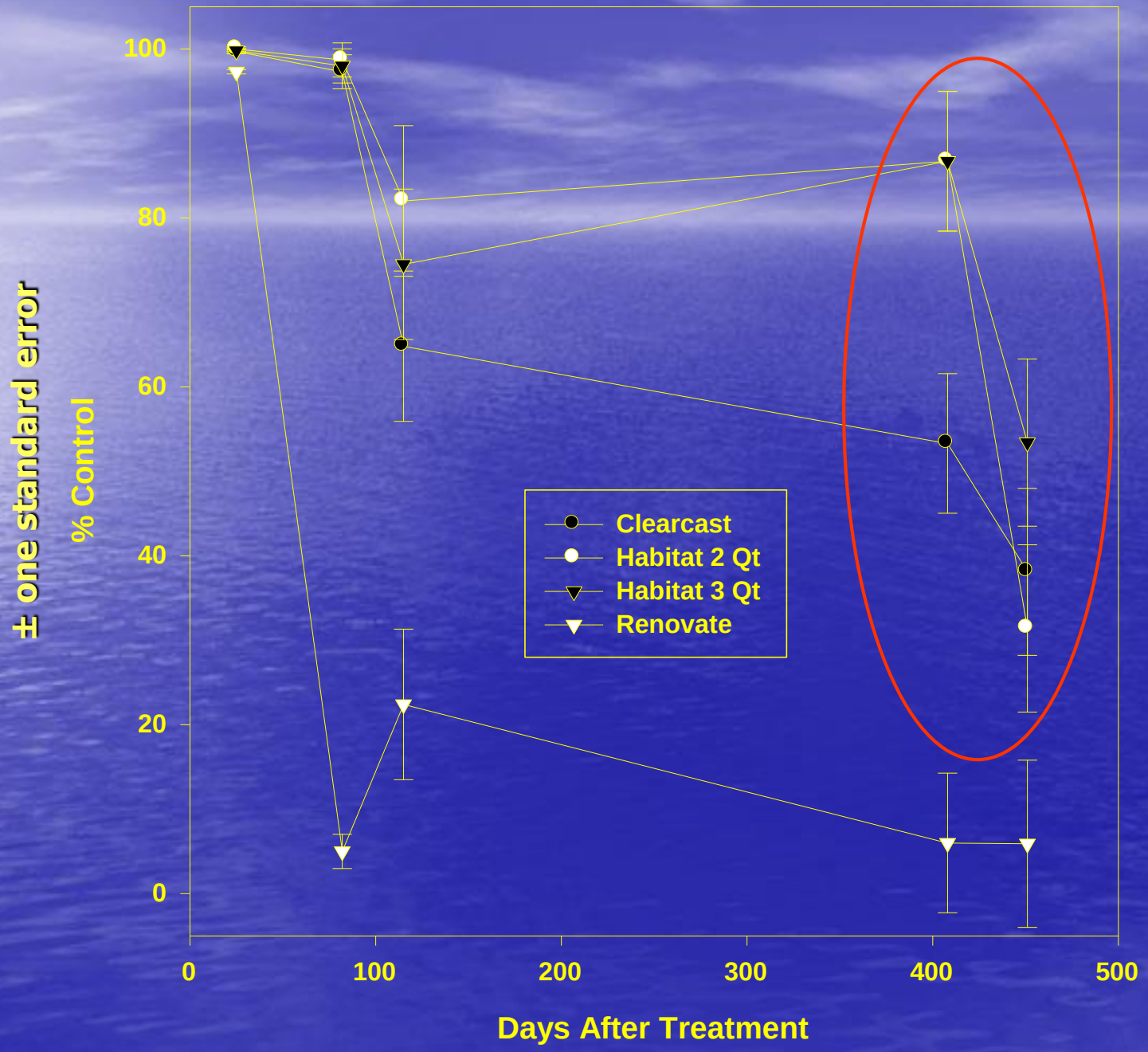
No-Spray Control Plot 82 Days After Treatment at Low Pool

Habitat (2 qt/ac) Plot
82 Day After Treatment

Response to Low Pool Foliar Treatments



Response to Low Pool Dry Ground/Foliar Treatments

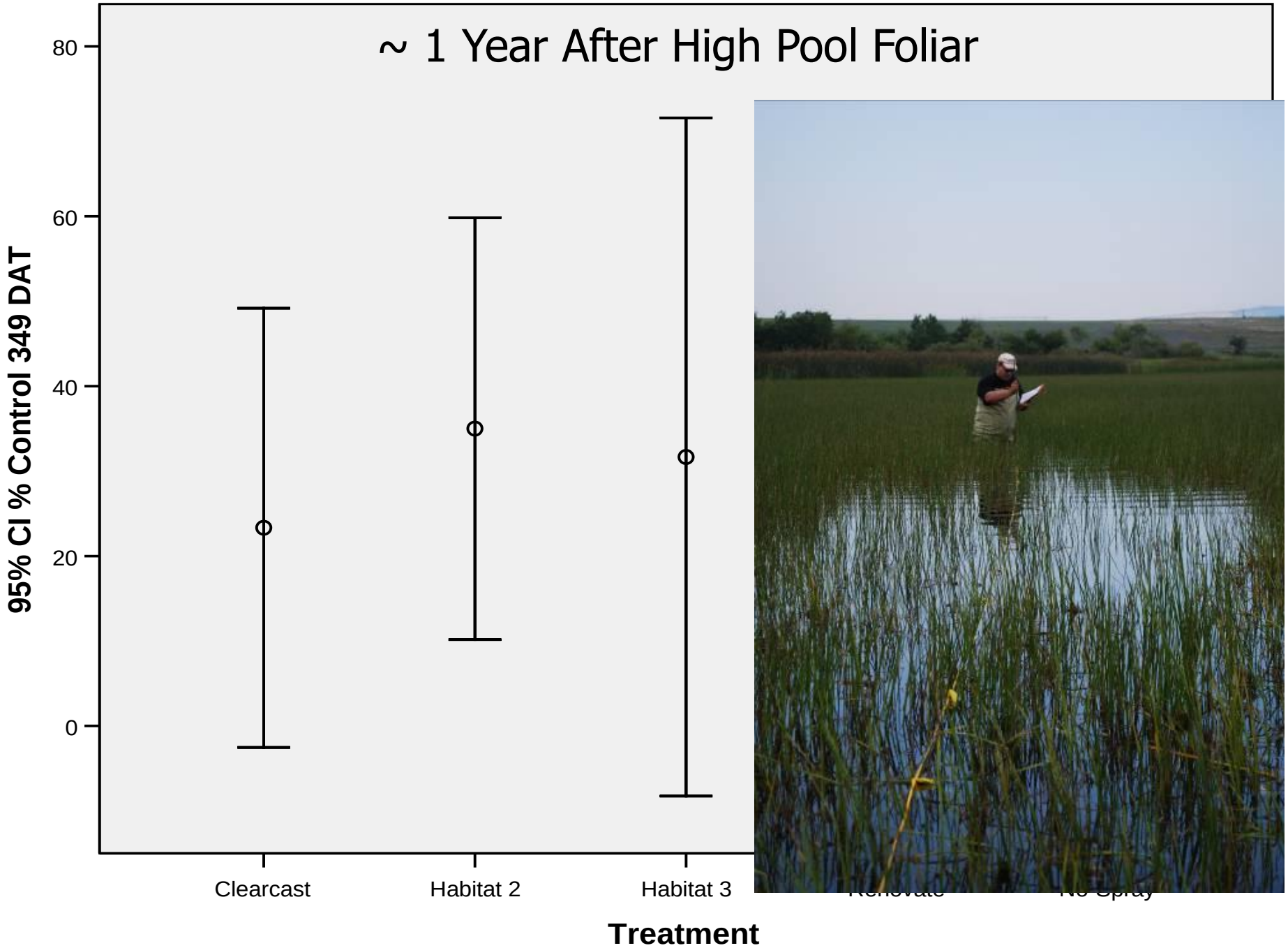


RHIZOMES!

High Pool Foliar Treatments

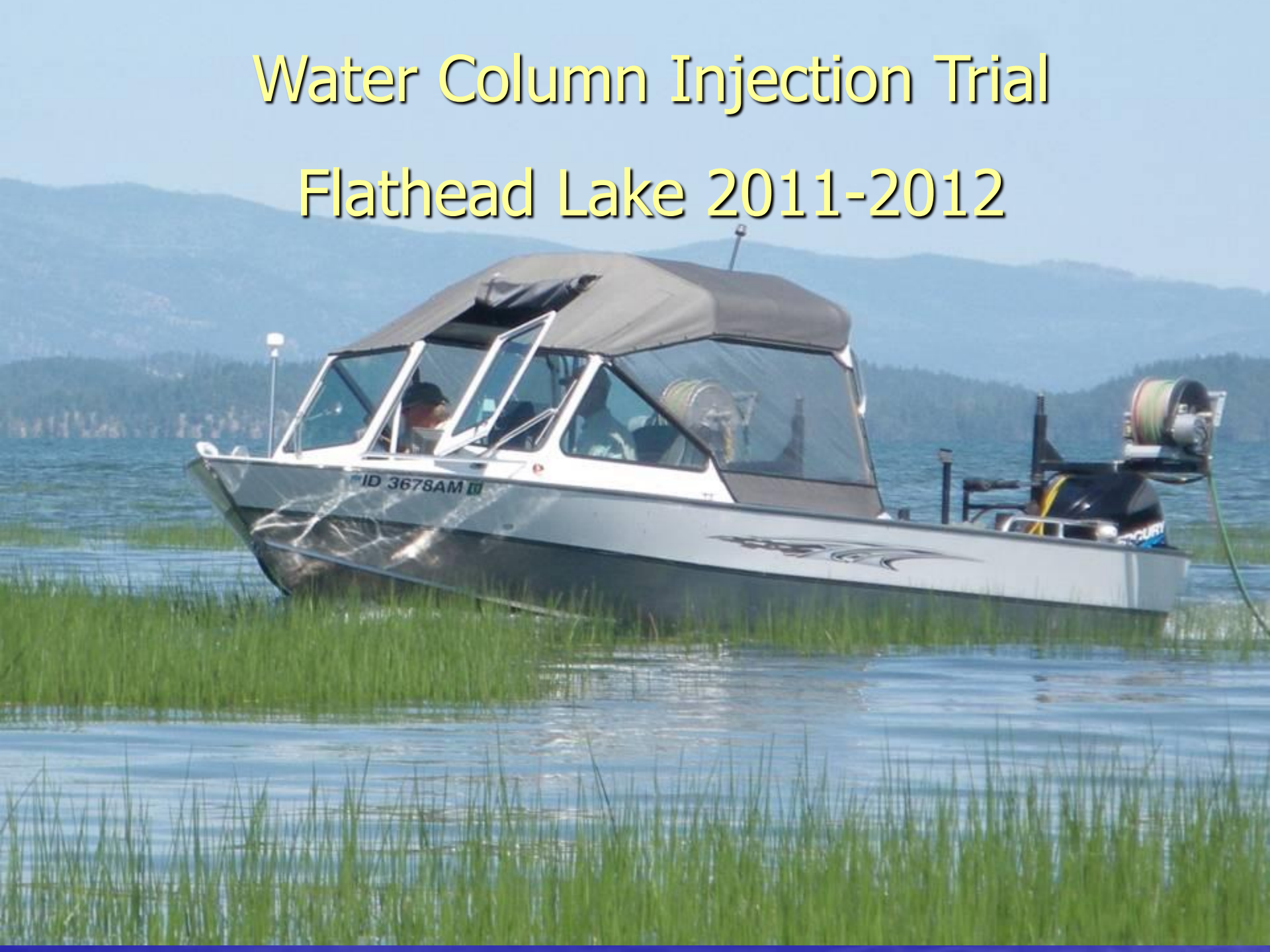
Boom Buster 125, height 48 in, 40 PSI, 31 GPA TV, effective swath 21 ft

~ 1 Year After High Pool Foliar



Water Column Injection Trial

Flathead Lake 2011-2012



Recovery From Submersed Treatments

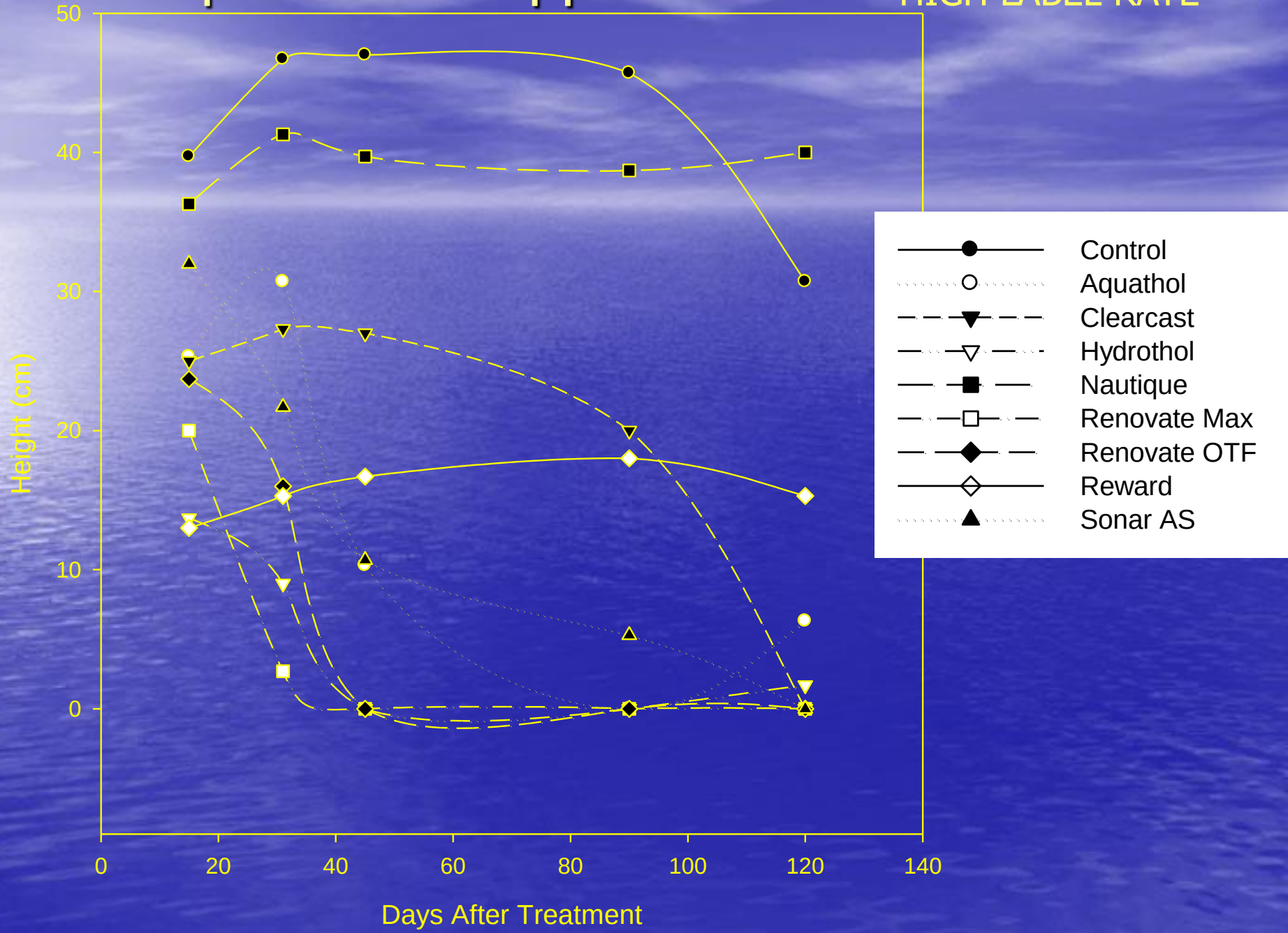
(Flathead Lake 2011-2012)

	6 WAT	1 YAT
Treatments	% Reduction	% Reduction
2,4-D + triclopyr	53%	25%
2,4-D + endothall	74%	30%
triclopyr + endothall	26%	11%
endothall alone	47%	21%
Untreated Control	0%	1%

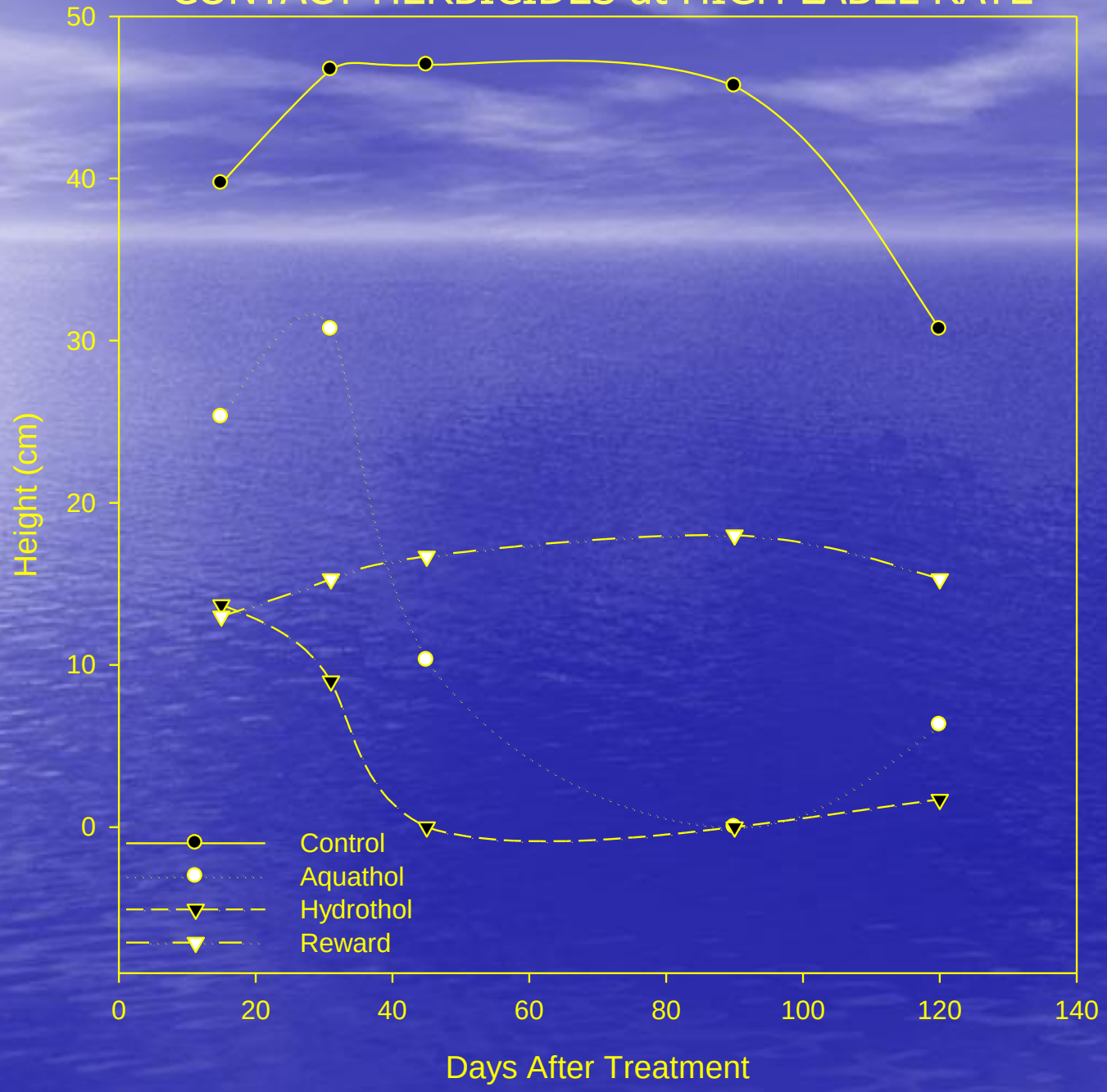
Greenhouse Trials Screening for Herbicide Activity

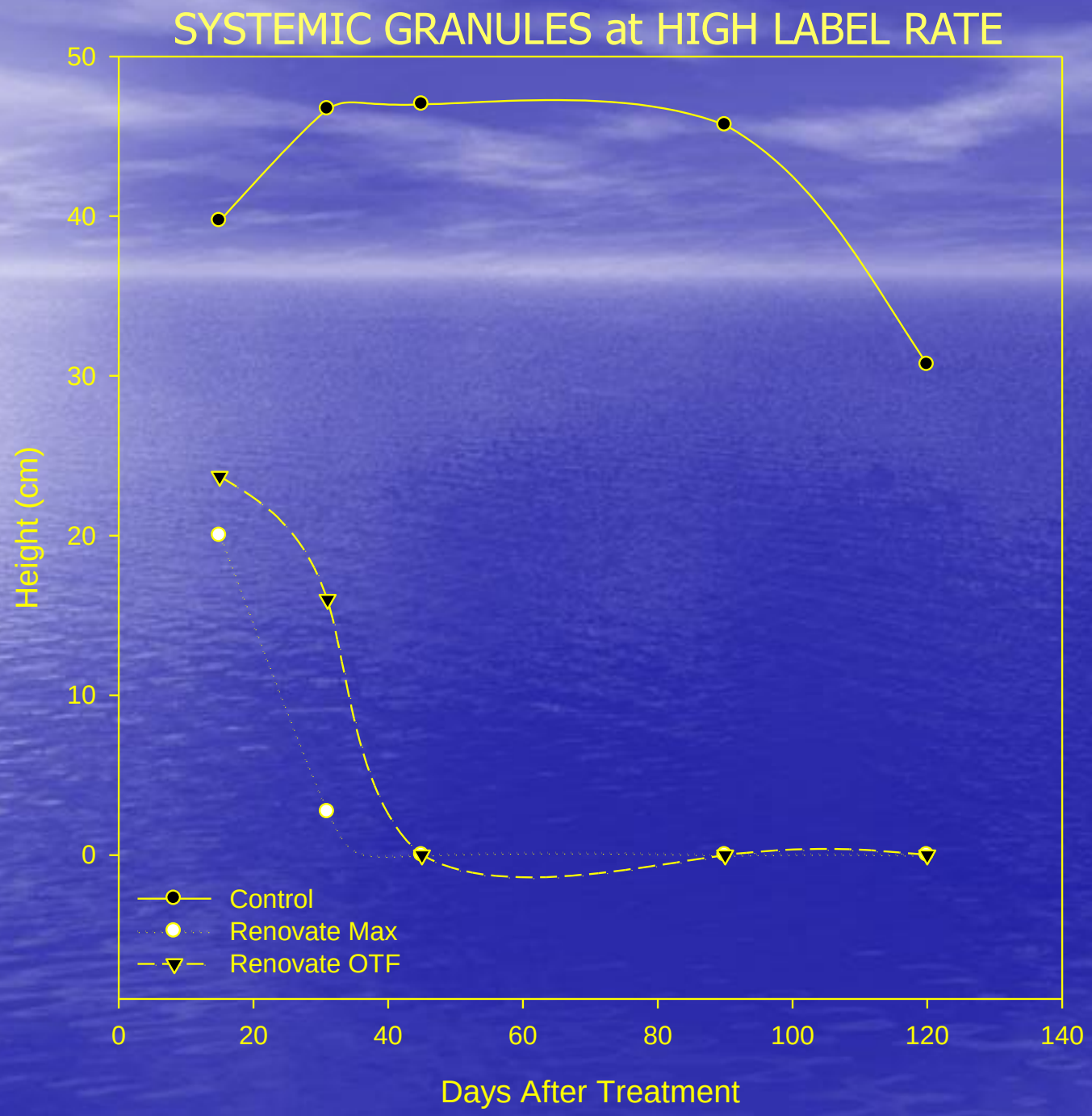
Top Growth Suppression

HIGH LABEL RATE



CONTACT HERBICIDES at HIGH LABEL RATE




SYSTEMIC GRANULES at HIGH LABEL RATE
Height (cm)
50
40
30
20
10
0
0
20
40
60
80
100
120
140
Days After Treatment
Control
Renovate Max
Renovate OTF

Herbicide Trials Summary

- Clearcast & Habitat as Low Pool Dry Ground/Foliar Treatments Provide Season Long Control
- Sequential Year Foliar Treatments Are Planned for 2013-2014
- High Pool Emerged Foliar Top Growth Was Not Effective
- A Number of Water Column Injection Herbicides Have High Submersed Treatment Activity
  - Aquathol K & Hydrothol 191, & high rates Renovate Max & OTF provided rapid "first season" suppression
  - contact herbicide treated plants recovered in second year
  - Clearcast & Renovate OTF maximized rhizome kill (>90%) but required long contact times
- Renovate Max G may be most effective submersed option?

07/24/2008

Flowering Rush Mining Weevil *Bagous nodulosus*

Custom Design Excavator

Maximized Water Management LLC

Bottom Barriers

Questions or Comments?