



Well, anyone got anything they'd rather be doing than discussing Flowering rush?!



Solutions to Preserve our most
Precious Natural Resource...Water

The **SePRO**
Stewards
of Water



**Field and Mesocosm Evaluations of Granular Herbicide
and Preëmergent Use Patterns
for Control of Flowering Rush (*Butomus umbellatus*)**

Northern Rockies Invasive Plant Council Meeting

**13 February 2014
Airway Heights, Washington**

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Executive Summary

- Flowering Rush (*Butomus umbellatus*) Biology & Current Status
- Effective chemistries & BMP's: What do we know thus far?
- University of Montana – Missoula Mesocosm Trial 2013-14
- Lake Pend d'Oreille, Idaho Postemergent Field Trial 2013 – 14
- Current Management Tools and Future Work
- Conclusion and Q&A

Flowering Rush (*Butomus umbellatus*)

Status & Biology

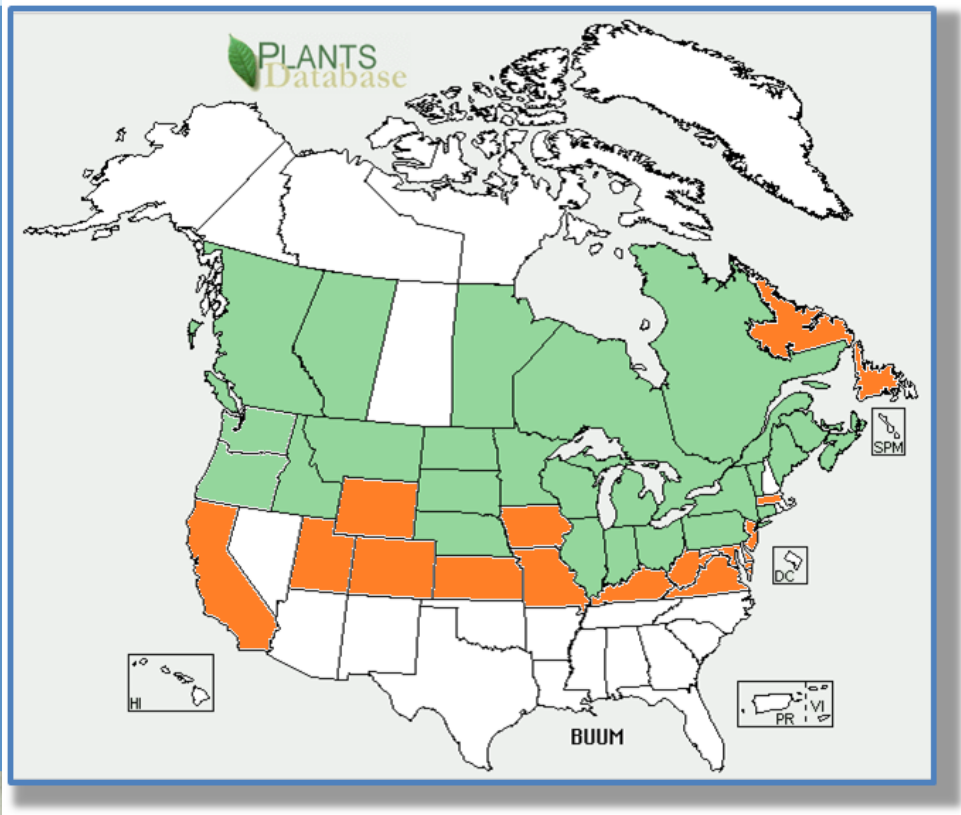


- Family *Butomaceae*, monogeneric
- Native of Eurasia
- Perennial Monocot
- Monoecious, rhizomatous, forb
- Abscission layer between bulbils facilitates fragmentation & subsequent dispersal
- Two known polyploid “races”
 - **Diploid** is fertile, flowers prolifically, reproduces via bulbil production, seed dispersal, rhizome fragmentation
 - **Triploid** is infertile, dispersal via rhizome fragmentation
- Frost sensitivity similar to *Typha* etc.



Flowering Rush (*Butomus umbellatus*)

Status & Biology



- Introductions
 - 1890's
 - St. Lawrence River
 - 1920's to present
 - Northeast
 - Upper Midwest
 - Canada
 - 1949
 - Snake River, Idaho
 - 1964
 - Flathead Lake, Montana
 - 1997
 - Silver Lake, Washington
 - 2003
 - Yakima River, Washington

Flowering Rush (*Butomus umbellatus*)

Status & Biology



- Emergence typically occurs late FEB to early MAR
- Exhibits Dimorphic Growth Pattern
 - Shallow submersed to emergent
 - Leaves triangular, twisted along axis
 - Foliage 0.5 to 1.5 meters, copious flowers
 - “Deep” submersed (found at depth to 20’)
 - Leaves “flattened”, no flowers



Flowering Rush (*Butomus umbellatus*)

Status & Biology



- Adapted to areas of seasonal fluctuation, abiotic/ anthropogenic disturbances: Littoral zones, flood plains, irrigation canals, wastewater areas, other areas of seasonal fluctuation/ disturbances -Hroudová et al. 1996
- Biodensity can exceed 50% and may become monotypic

Flowering Rush (*Butomus umbellatus*)

Ecological Impacts



- Displacement of Native Plant Communities
- Loss of Open Water Recreation, Navigation
- Irrigation Impediment
- Increases in Water Temperatures
- Sediment Flocculation & Deposition
- Food Chain Alterations / Native Fisheries
 - Increases habitat of predaceous species
 - Noted declines in diadromous spp.

Flowering Rush (*Butomus umbellatus*)

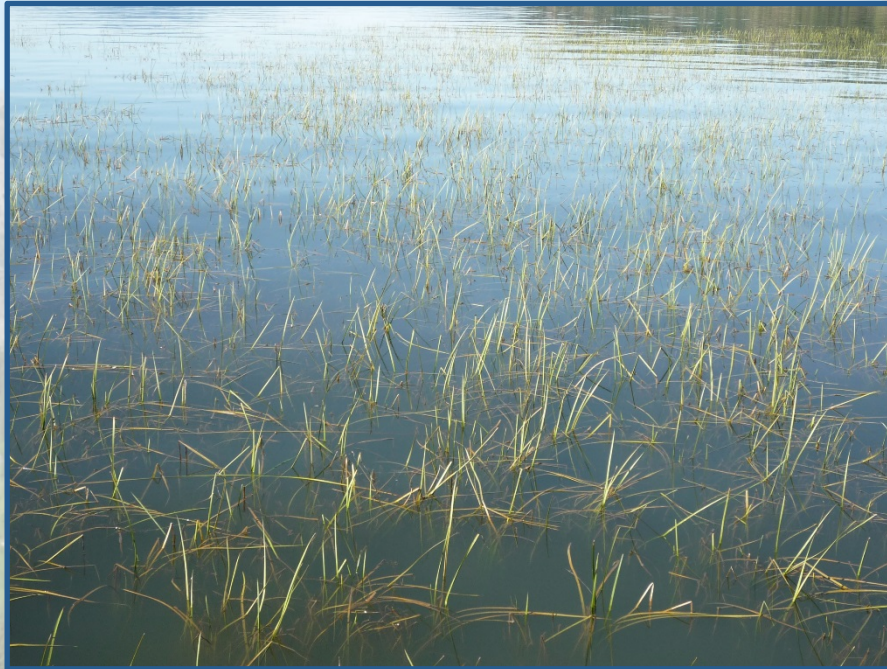
Treatment Options: Preemergents



- Habitat™ (Imazapyr)
- Clearcast™ (Imazamox)
- Sonar™ (Fluridone)
- Galleon™ (Penoxsulam) (TBD?)
- Oasis™ (Topramezone) (TBD?)

Flowering Rush (*Butomus umbellatus*)

Treatment Options: Submersed- Emergent



Systemics

- Renovate™ (Triclopyr)
- Renovate™ MAX G (Triclopyr + 2,4-D)
- Sonar™ (Fluridone)

Contacts

- Endothall (mono-salt)
- Diquat

?

Flowering Rush (*Butomus umbellatus*)

Treatment Options: Emerged Foliar



Systemics

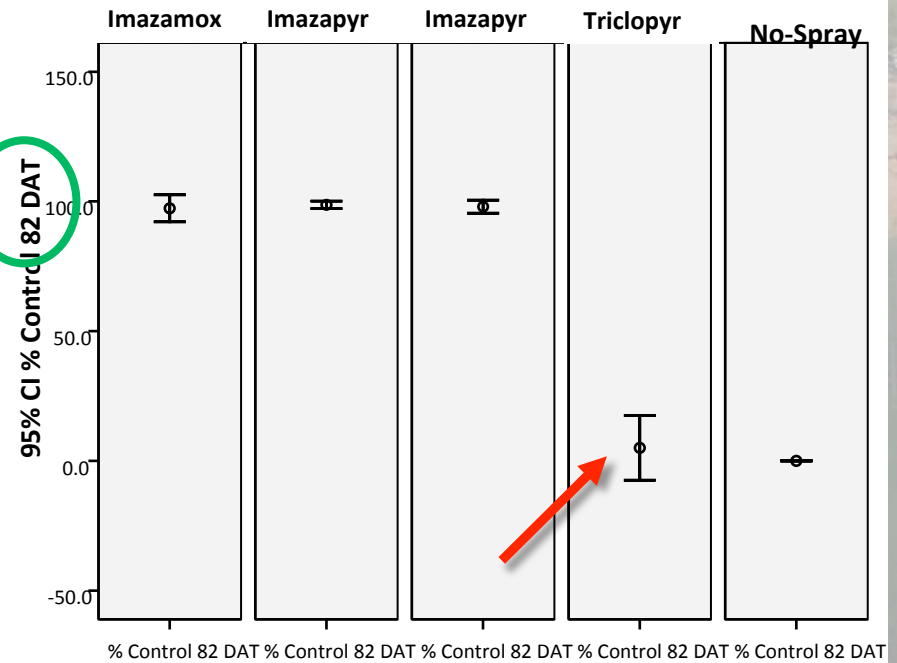
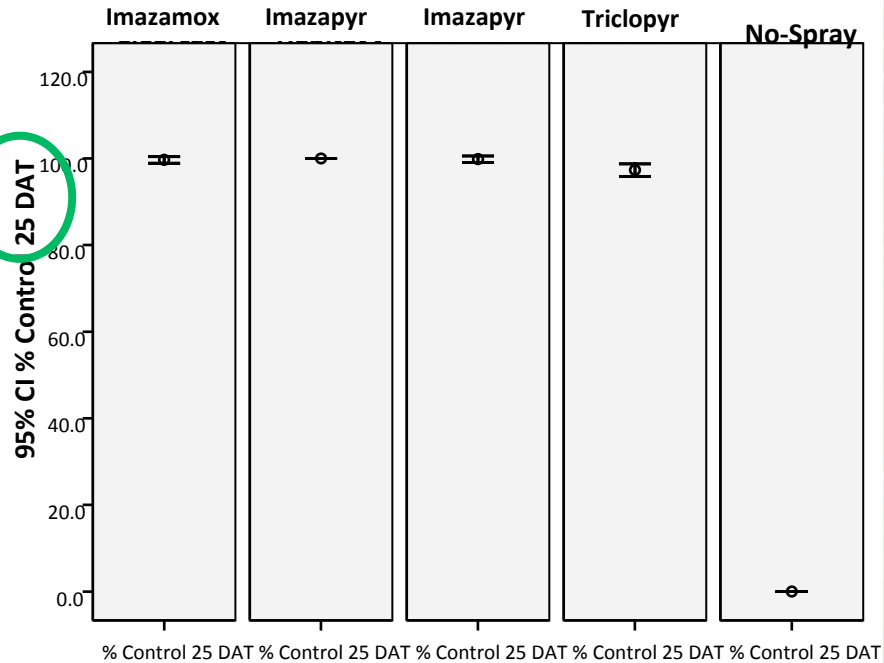
- Renovate™ (Triclopyr)
- Renovate™ MAX G (Triclopyr + 2,4-D)
- Sonar™ (Fluridone)
- Clearcast™ (Imazamox)
- Habitat™ (Imazapyr)
- Galleon™ (Topramezone)
- AquaPRO™ (Glyphosate)

Contacts

- Endothall (mono N,N, Di-K-salts)
- Diquat
- Stingray™ (Carfentrazone (TBD?))

Flowering Rush (*Butomus umbellatus*)

Effective chemistries



Flowering Rush (*Butomus umbellatus*)

Effective chemistries



Imazamox (0.56 kg a.i./HA) plot

82 DAT (18AUG08); Low pool foliar trial.

Summary of Foliar Applications

- “Low Pool” treatments provided greater control than “High Pool” treatments
 - Great exposure to plant tissue
 - Less variability
- Imazapyr= Best Control
 - Imazamox only evaluated at 2 quarts / acre
- Triclopyr should be evaluated at lower rates
 - 8 quarts / acre used in trial
 - Based upon past experience, this treatment likely burned plants before translocation could occur

Flowering Rush (*Butomus umbellatus*)

University of Montana- Missoula Mesocosm Trials 2013-14



- Flowering rush plugs (roots, rhizome, and sediment) extracted from the bed of Flathead Lake, May, 2013.
- 28cm X 15.25 cm plugs placed in 24.6 L buckets, transferred to University of Montana - Missoula greenhouse facilities.
- Emerging leaves $\pm$ 42cm in height (23cm below the water line, 19 cm above the water line) at trtmt.
- RCB Design of 4 reps per treatment
- The bucket water was 18°C during treatments
- Post-treatment period, buckets washed 6 times and refilled for monitoring.

Flowering Rush (*Butomus umbellatus*)

University of Montana- Missoula Mesocosm Trials 2013-14

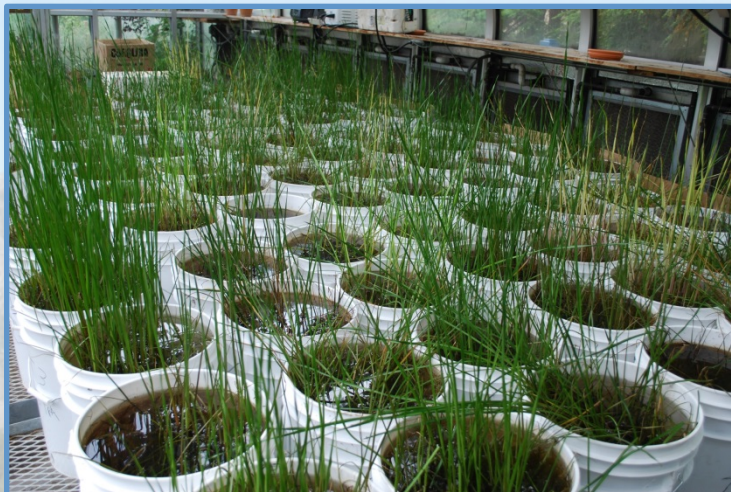
TREATMENT	Label Rate	Rate (ppm)	CET
Triclopyr	mid	1.5	14 DAT
Triclopyr	high	2.5	14 DAT
Triclopyr + 2,4-D	mid	2.5	14 DAT
Triclopyr + 2,4-D	high	5	14 DAT
Fluridone	mid	0.045	14 DAT
Fluridone	high	0.09	14 DAT
Endothall, mono-N,N-dimethylalkylamine salt	mid	2.75	24 HAT
Endothall, mono-N,N-dimethylalkylamine salt	high	5	24 HAT
Diquat + Triclopyr	mid	370 + 1.5	24HAT then 14DAT
Diquat + Triclopyr	high	370 + 2.5	24HAT then 14DAT
Diquat (fb) Triclopyr + 2,4-D	mid	370 + 2.5	24HAT then 14DAT
Diquat (fb) Triclopyr + 2,4-D	high	370 + 5	24HAT then 14DAT
Diquat (fb) Fluridone (granular)	mid	370 + 0.09	24HAT then 14DAT
Diquat (fb) Fluridone (granular)	high	370 + 0.15	24HAT then 14DAT
Topramezone	low	0.015	3 DAT
Topramezone	mid	0.03	3 DAT
Topramezone	high	0.05	3 DAT
Topramezone + MVO	low	90.72	Foliar
Topramezone + MVO	mid	152.02	Foliar
Topramezone + MVO	high	392.32	Foliar
UTC	UTC	UTC	UTC

"In-water"

Foliar

- Products used: Renovate® OTF, Renovate® MAX G, Sonar® ONE, Hydrothol-191®, Reward®, Oasis®, Competitor® (MVO)

Response Parameters:



These 4 MAT visual injury scorings and biomass dry weight determinations were done in early October (2013) when the untreated controls were undergoing normal fall senescence.

Percent (0-100%) Visual Injury

Biomass (Shoot) Dry weight (g)

Percent control (0-100%): $\Sigma_{d.w.}$ Reduction

$$\Delta [\text{Dry weight}_{\text{Treated}}] - [\text{Dry weight}_{\text{UTC}}]$$

Percent (%) Biomass control

$$\Sigma: [(\% \text{ Necrotic}) + (\% \text{ chlorotic}) + (\% \text{ bleached}) + (\% \text{ collapsed})] *$$

*can add to 200%

% Excess injury:

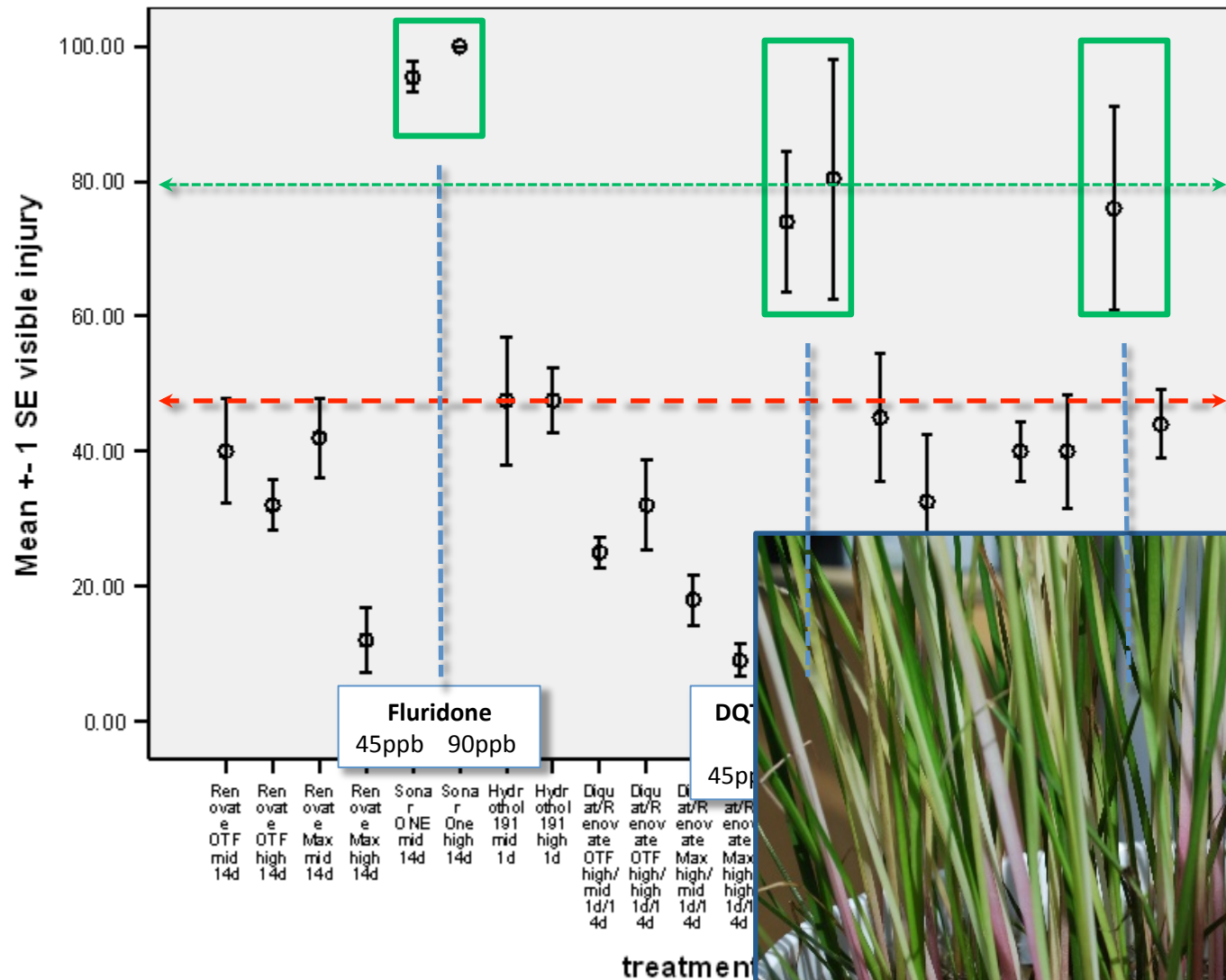
$$\Delta [\% \text{ Visible Injury}_{\text{TRT}} - \% \text{ Visible injury}_{\text{UTC}}]$$

% Thickened Biomass: Thicker cross section relative to normalized narrow linear leaf form*

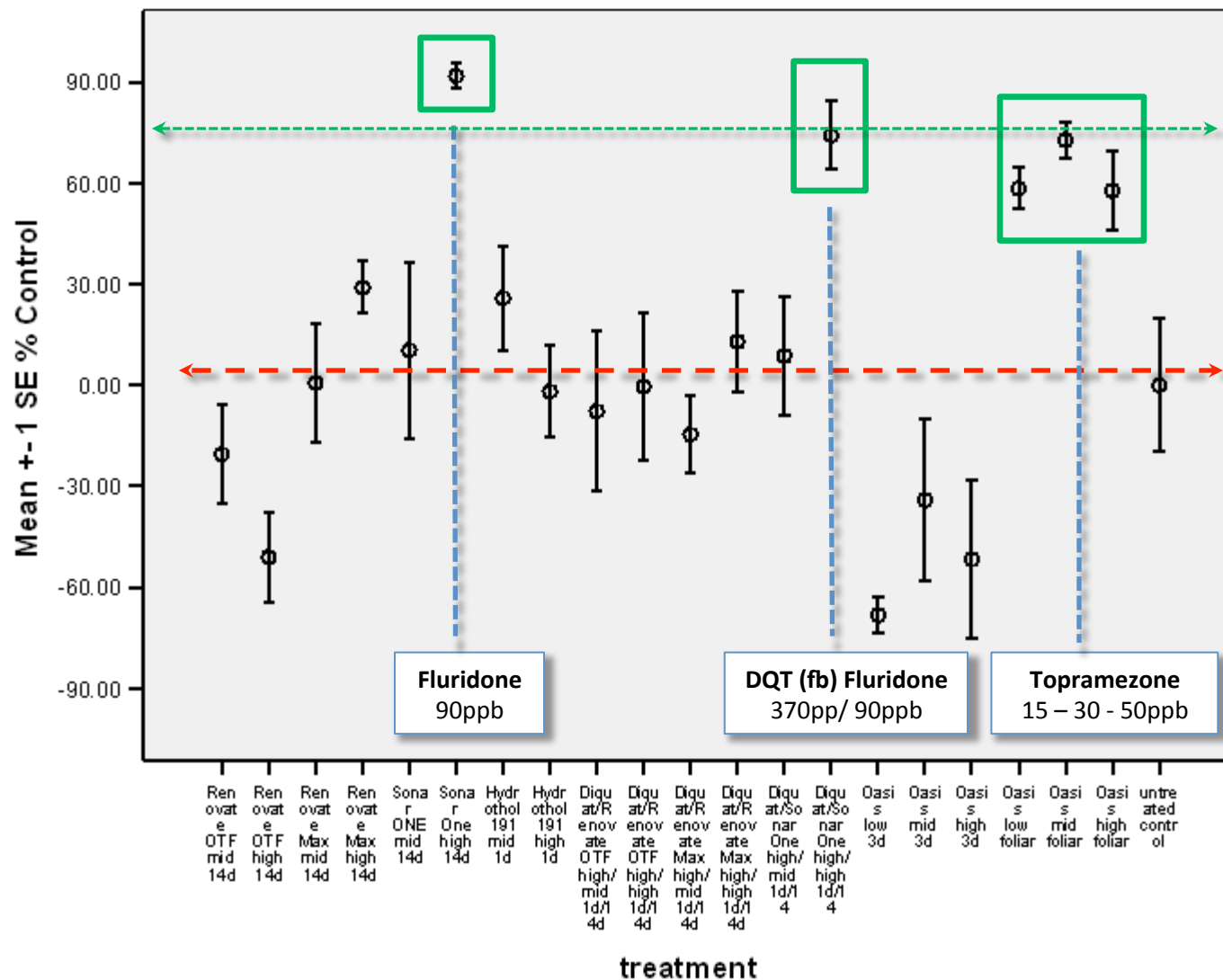
*This symptom has been observed in previous trials with Renovate Max

Percent (%) Regrowth: proportion of newly emerged biomass

Preliminary (4MAT) Results: Visible Injury



Preliminary (4MAT) Results: Percent Control



Flowering Rush (*Butomus umbellatus*)

University of Montana- Missoula Mesocosm Trials 2013-14

- Because of the resiliency of the rhizomes, the response parameter of most interest will be the dry weight of green leaf production at peak biomass in the second growing season (2014) after the herbicide treatments.
- This experiment is currently undergoing winter cold (freezing) treatment and will be returned to the heated greenhouse in early February to stimulate regrowth.



Flowering Rush (*Butomus umbellatus*)

Lake Pend d'Oreille Postemergent Trials 2013-14



Lake Pend d'Oreille, Idaho
Clark Fork Delta
Driftyard Complex



0800, 01AUG2013



Flowering Rush (*Butomus umbellatus*)

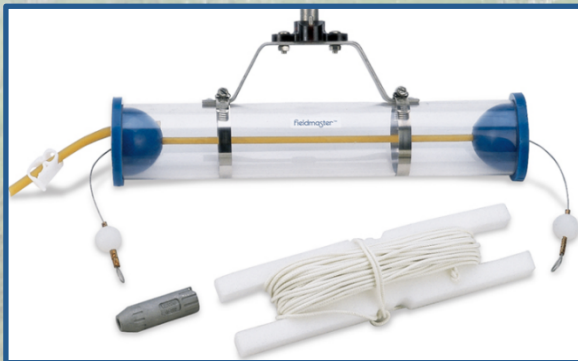
Lake Pend d'Oreille Postemergent Trials 2013-14

- Lake Pend d'Oreille, Bonner & Kootenai Co., ID
- 380 km², 350M depth (53.9Km³)
- 13th deepest US lake by volume

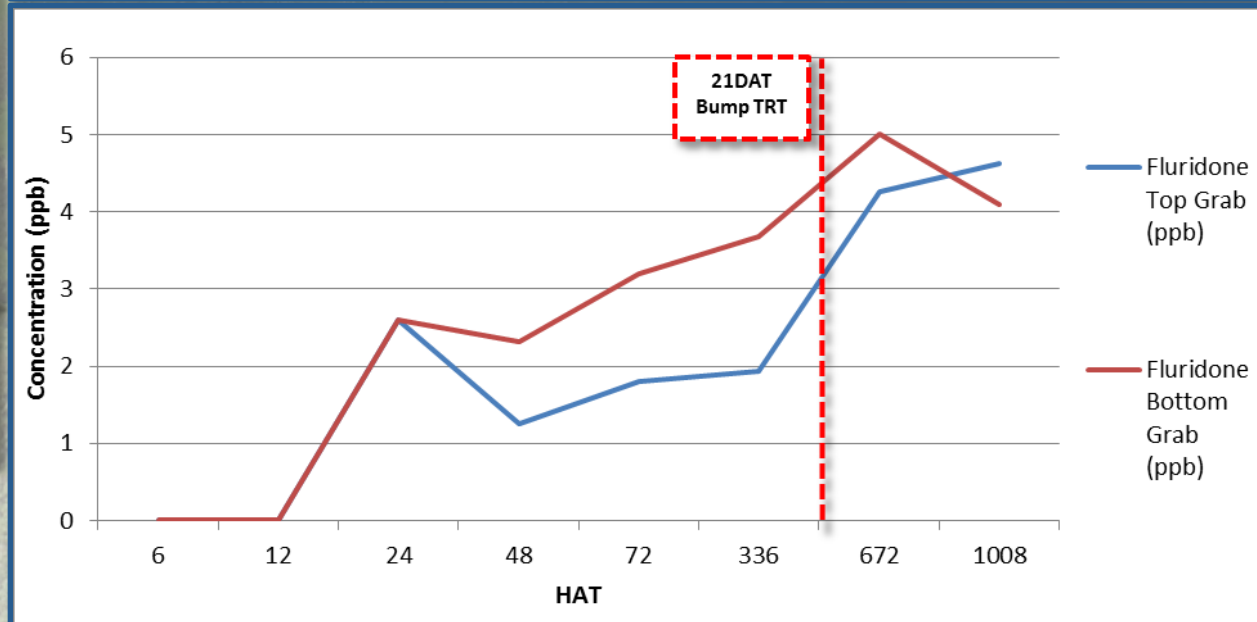
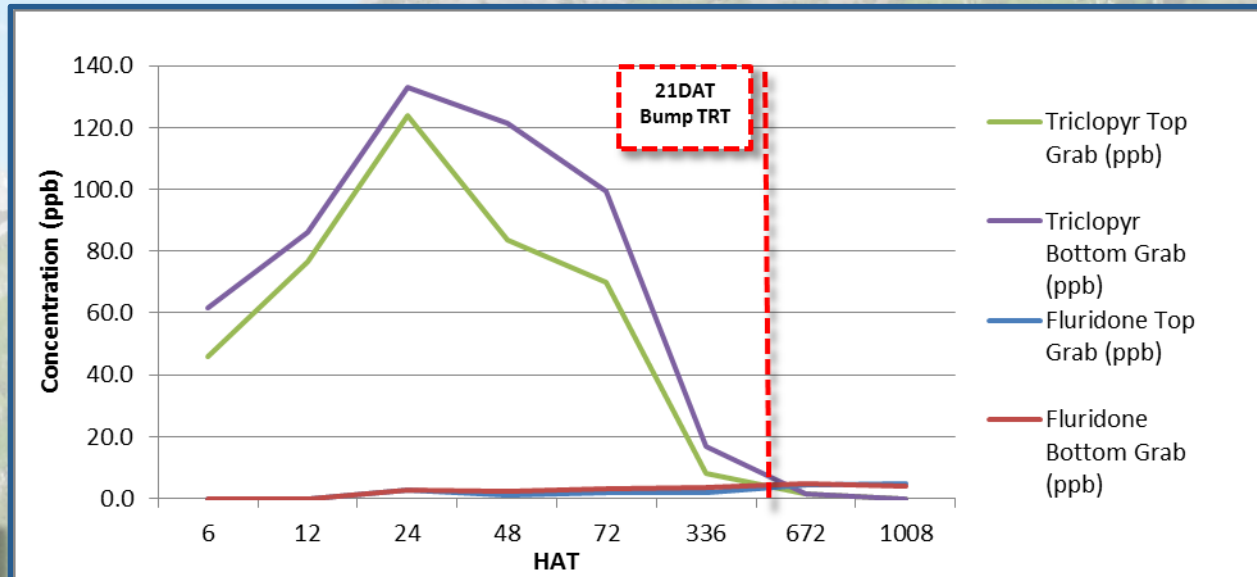


Flowering Rush (*Butomus umbellatus*)

Lake Pend d'Oreille Postemergent Trials 2013-14

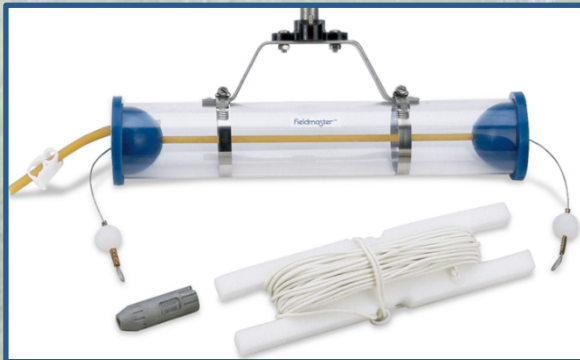


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Aquatic Research Instruments, Inc.

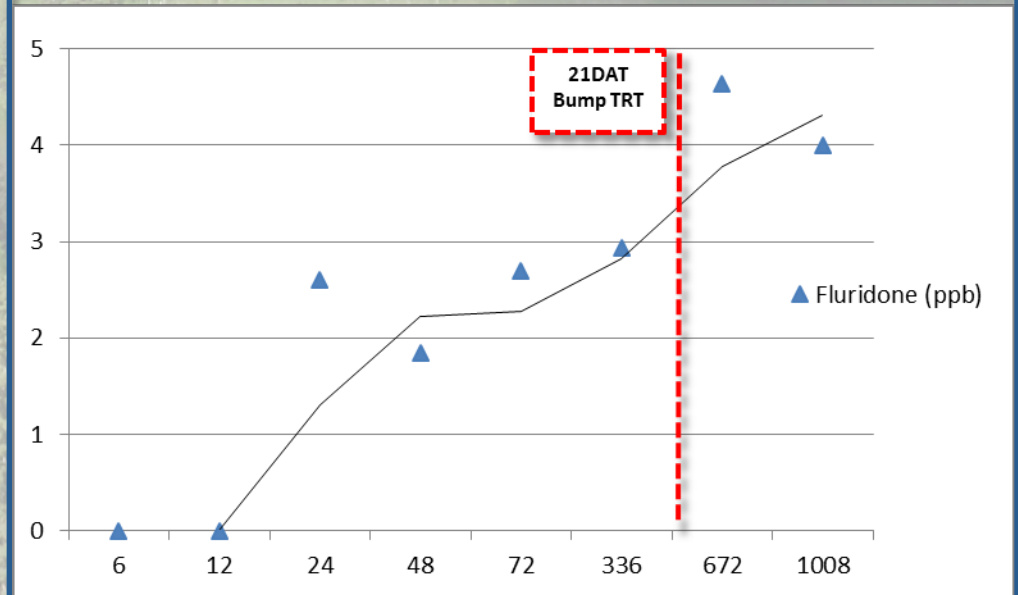
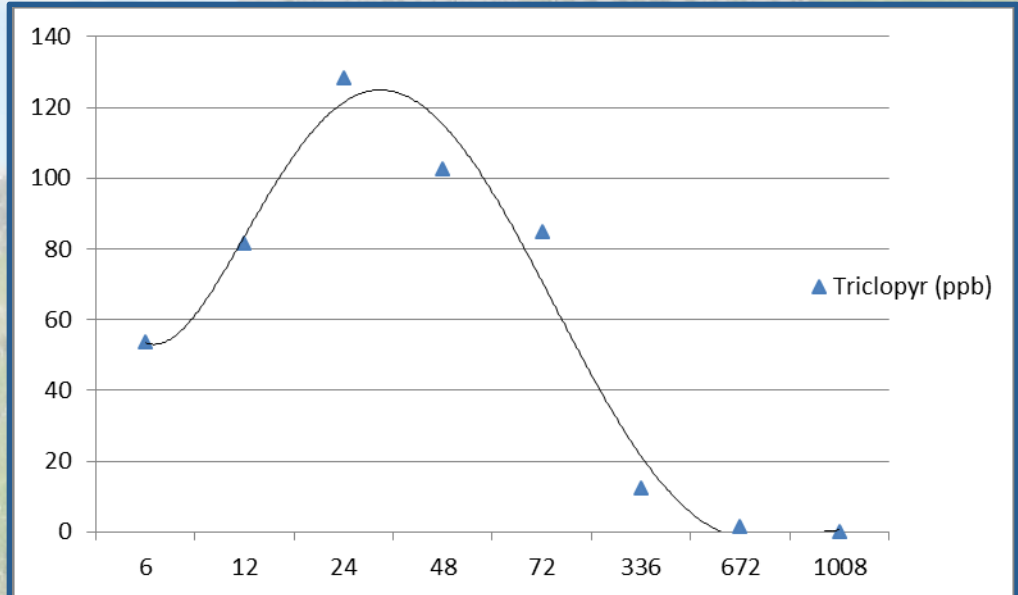


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Lake Pend d'Oreille Postemergent Trials 2013-14



**Student Vertical Point
Water Sampler®**
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Flowering Rush (*Butomus umbellatus*)

Lake Pend d'Oreille Postemergent Trials 2013-14

- Biovolume/ density survey work is planned mid-spring (± 60 DAE) the second growing season (2014)



Recognitions



Michael Shaner, Haywood Perry & Staff



Terry McNabb, Adam Kleven



**Dr. Kurt Getsinger CEERD-EP-P
Betsy Hull- Albeni Falls Dam, Seattle District**



Peter Rice, Virgil Dupuis & Staff



**Bonner County Noxious Weed Department
Brad Bluemer & Chase Youngdahl**



Solutions to Preserve our most
Precious Natural Resource...Water

The **SePRO**
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