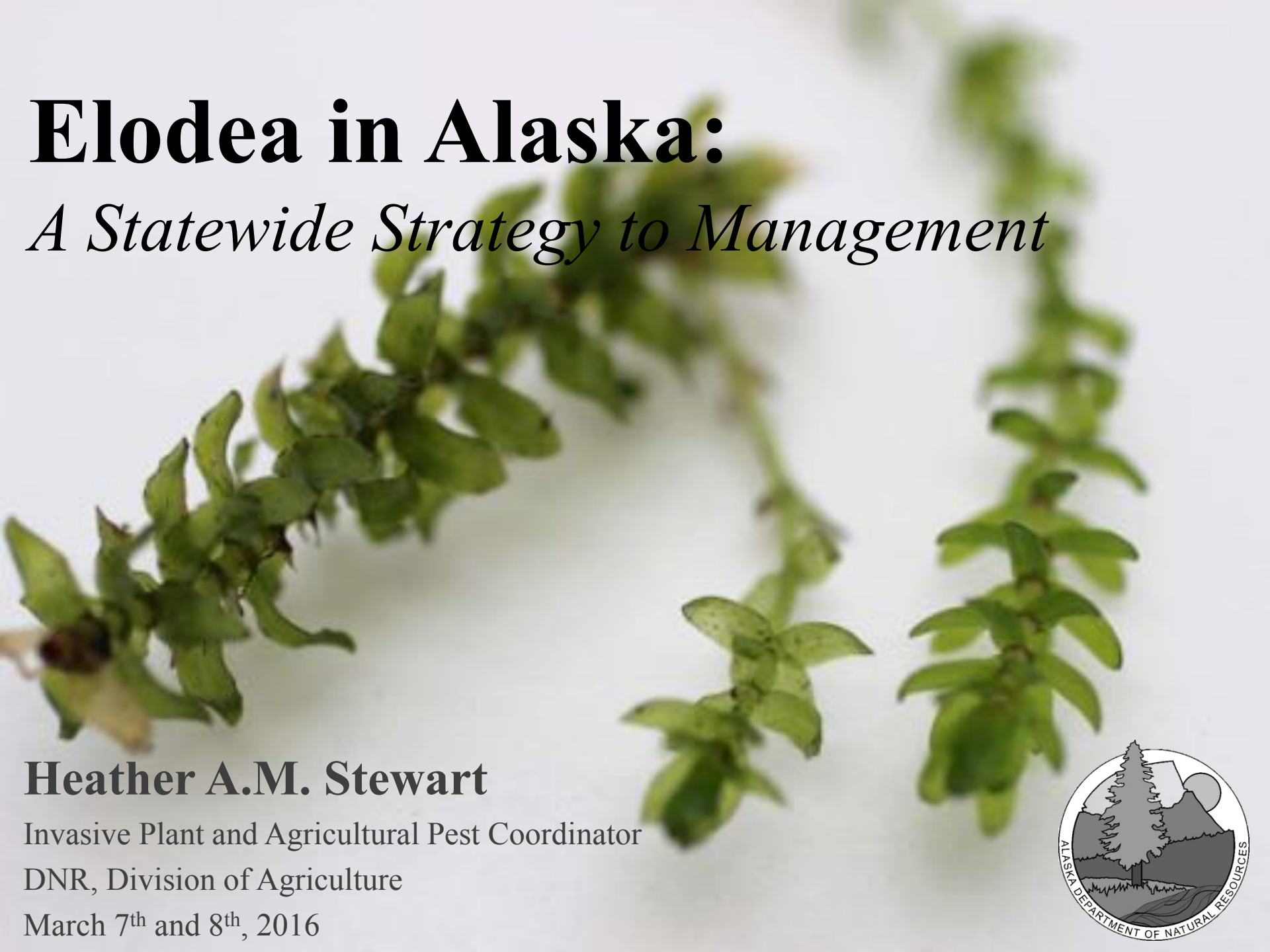


Elodea in Alaska:

A Statewide Strategy to Management



Heather A.M. Stewart

Invasive Plant and Agricultural Pest Coordinator

DNR, Division of Agriculture

March 7th and 8th, 2016



Elodea: Alaska's first submerged aquatic invasive plant



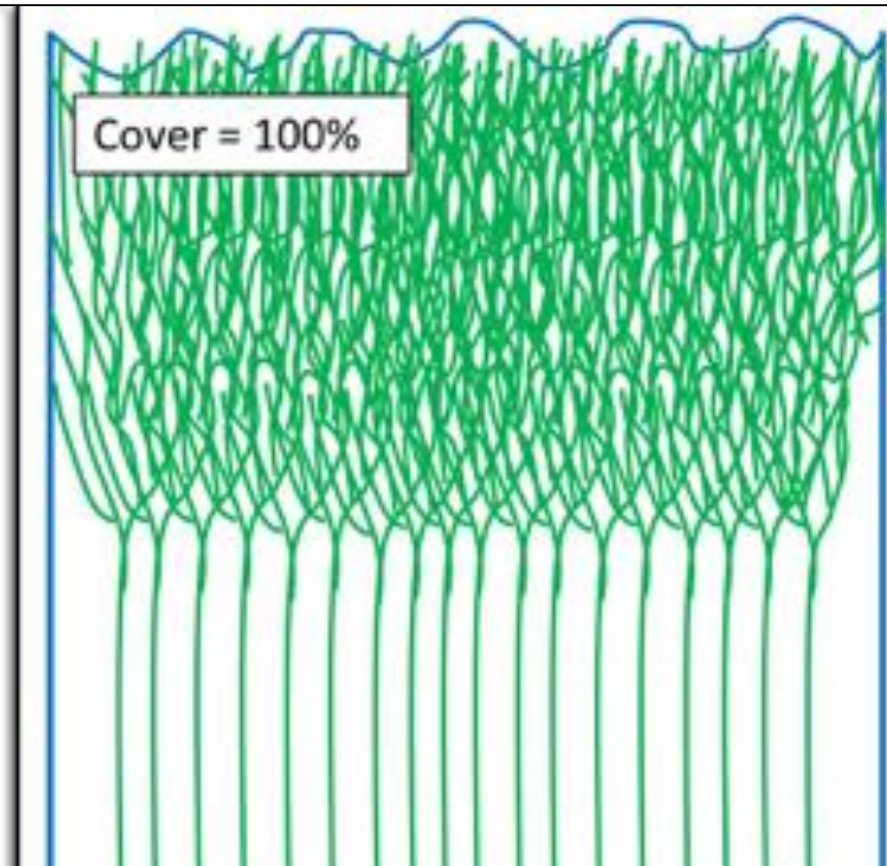
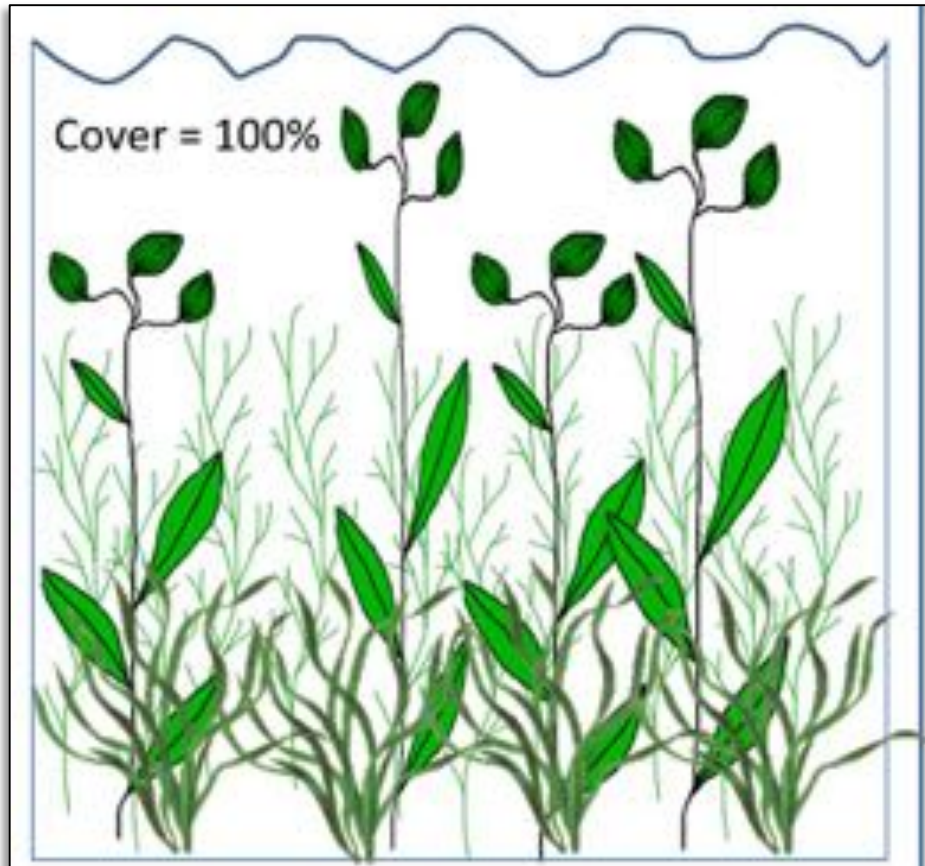
- Leaves in whorls of 3 or 4
- Leaves are $\frac{1}{4}$ - $\frac{1}{2}$ inch long
- Stems are lighter green than the leaves
- Roots look like silk string
- **Reproduces vegetatively:** every broken stem, leaf or root can create a new infestation
- All parts are underwater except flowers, which are rarely produced



Photo Credit: Dan Minchin

Why should we care?

- Degrades salmon spawning habitat
 - Slows stream velocities
 - Increases sedimentation rates
 - Increases dissolved oxygen
 - Prime invasive pike habitat
 - Lowers biodiversity



Why should we care?

- Lowers lakeshore property values
 - Eurasian Milfoil: 19%
 - Launch sites
 - Shore habitats
- Impedes recreation and impairs safety
 - Fouls boat propellers
 - Swimming
 - Affects floatplane launching

Anchorage Sand Lake



Fairbanks Chena Slough

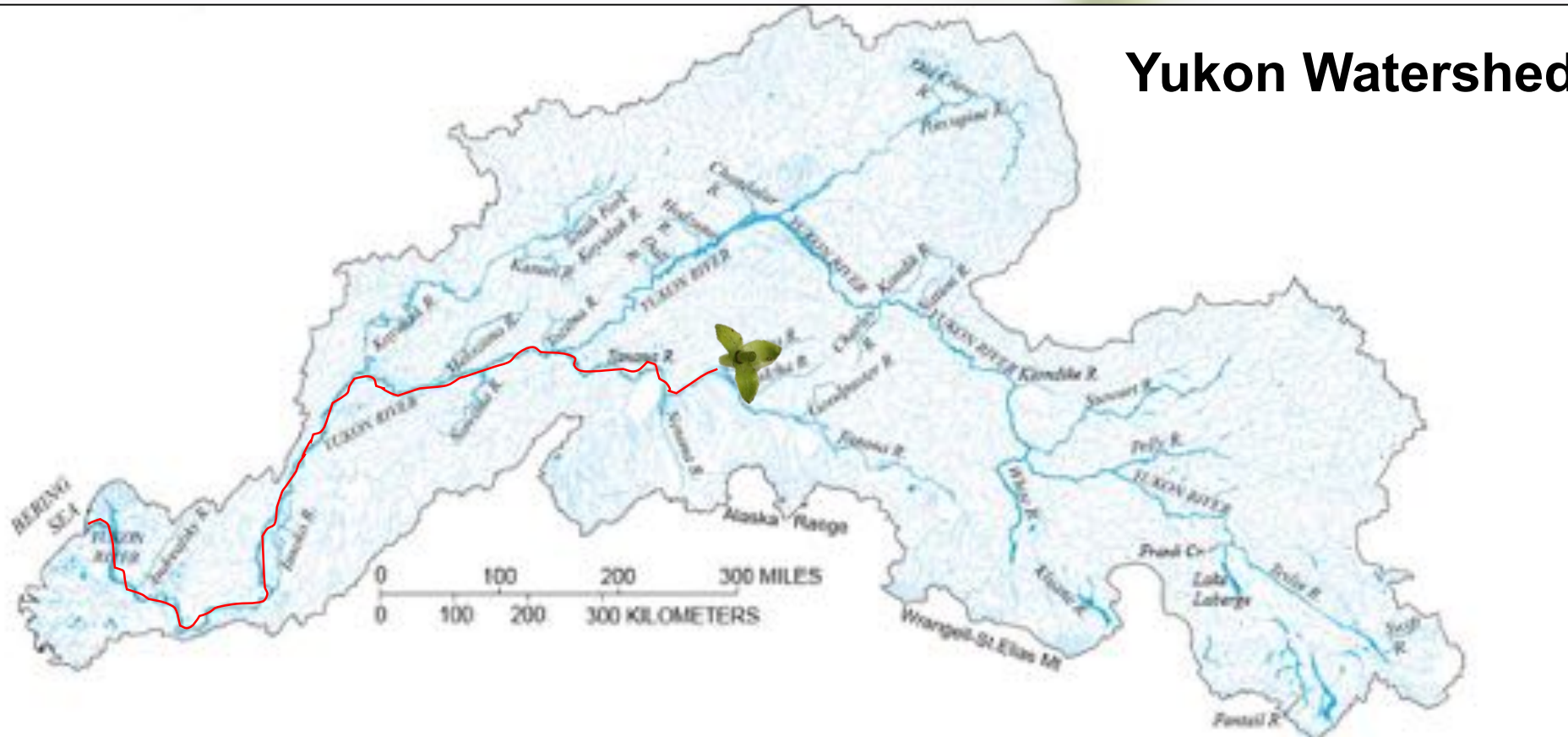


Anchorage Lake Hood



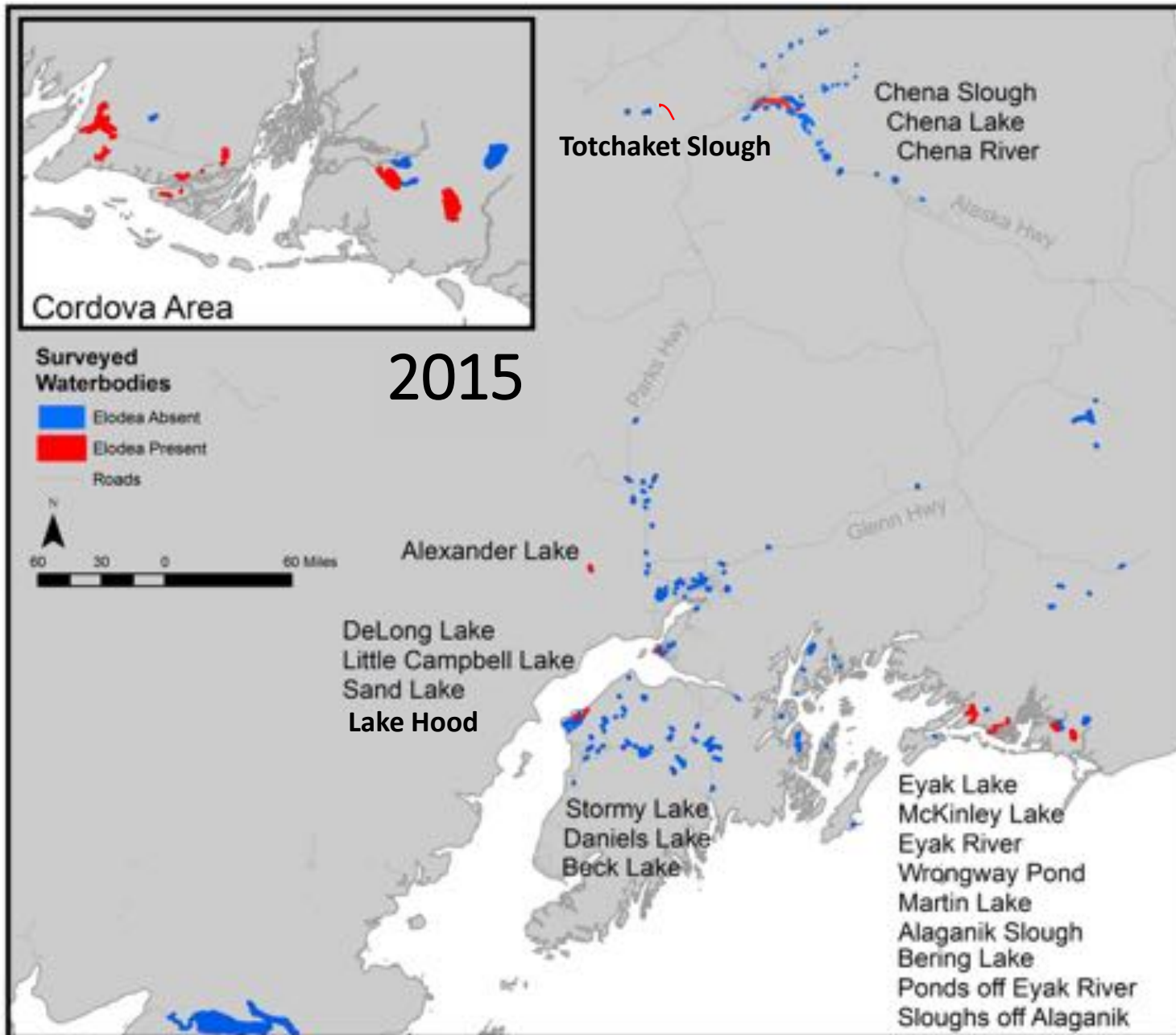
Mat-Su Alexander Lake

Yukon Watershed



- Hundreds of miles of potential suitable habitat for elodea to thrive in sloughs, oxbow channels, shallow ponds and lakes and vast expanses of wetlands.

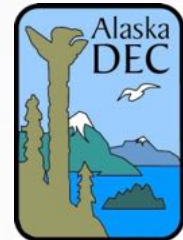
In Alaska



Memorandum of Understanding

January 15, 2013

- Recognizes DNR as lead agency for freshwater aquatic invasive plants
 - Assistance provided by other agencies
- Efficient permitting process for control methods
 - Statewide need to eradicate elodea
 - Expand public outreach and education
- Statewide plan and coordination for effective interagency response
 - Implement a plan for eradication



EXTERIOR QUARANTINE OF AQUATIC INVASIVE WEEDS	
PEST: Aquatic plants listed below.	
Canadian waterweed	(<i>Elodea Canadensis</i>)
Western nuttallii	(<i>Elodea nuttallii</i>)
Brazilian waterweed	(<i>Egeria densa</i>)
Hydrilla	(<i>Hydrilla verticillata</i>)
Eurasian watermilfoil	(<i>Myriophyllum spicatum</i>)

THE STATE of ALASKA
GOVERNOR SEAN PARNELL

Department of Natural Resources

DIVISION OF AGRICULTURE
Central Office
1800 Glenn Highway, Suite 12
Palmer, Alaska 99645-4756
Phone: 907.745.7200
Director's fax: 907.745.7117
Marketing & A&P fax: 907.745.7242
Inspection fax: 907.745.7254

EXTERIOR QUARANTINE OF AQUATIC INVASIVE WEEDS

Authority: AS 03.05.010
AS 03.05.027
AS 03.05.040
AS 44.37.030
AS 03.05.090

11 AAC 34.130
11 AAC 34.140
11 AAC 34.160
11 AAC 34.170
AAC 34.115

Establishment of Quarantine: The Director of the Division of Agriculture under the authority as the State Quarantine Officer hereby establishes a quarantine at the boundaries of Alaska to prevent the entry of the following aquatic invasive weeds.

PEST: Aquatic plants listed below.

Canadian waterweed	(<i>Elodea Canadensis</i>)
Western nuttallii	(<i>Elodea nuttallii</i>)
Brazilian waterweed	(<i>Egeria densa</i>)
Hydrilla	(<i>Hydrilla verticillata</i>)
Eurasian watermilfoil	(<i>Myriophyllum spicatum</i>)

This list is comprised of the most recent and accepted scientific and common names of the quarantine plant species. Regulated status also applies to all synonyms of these botanical names.

STATES REGULATED: ALL

MATERIALS REGULATED: All plants and plant parts of the regulated plants.

RESTRICTIONS: It is prohibited to import, transport, buy, sell, offer for sale, or distribute plants or plant parts of the regulated species within the state of Alaska. It is further prohibited to intentionally transplant wild plants and/or plant parts of these species within the state of Alaska.

DISPOSITION OF VIOLATIONS: All shipments of quarantined articles arriving in Alaska in violation of this quarantine shall be immediately shipped out of the state or destroyed by burning or other method approved by the Division of Agriculture. All costs for shipment out of state or destruction shall be performed at the expense of the owner, owners, or duty authorized agent.

Franci Havemeister
Franci Havemeister, Director

3/5/14
Date

Management Decisions and Coordination: *A Statewide Elodea Management Plan*

- Eradication is the goal.
 - Distribution
 - Feasibility of management
- An adaptive document utilized by federal, state, and local agencies and groups to manage elodea
 - Components include: Need for action, integrated management methods, permit requirements, continued monitoring goals, local efforts, and **implementation**



It is a Process

- Management of the site (not just the species)
- Actions considered and then determined
- Permitting
 - EPA: APDES
 - DEC: PUP
 - ADF&G: Fish Habitat
 - DNR MLW: Land Use
 - USFWS: PUP
- NEPA: Environmental Assessment
- Public commenting and scoping
- Action!



1st detection in
Alaska

Management Summary

1982

Eyak Lake

2010

Chena Slough

2011

Chena River /
Sand Lake

2012

Little Campbell/Delong
McKinley/Wrong Way /Wooded/Aloganik /Martin/Bering
Stormy /Daniels

2013

Beck Lake

2014

Alexander Lake

2015

Lake Hood
Totchaket Slough

2016

Lars Anderson at 12th CNIPM conference

1st/2nd manual treatment of Chena Slough
5 species quarantined by DNR
DEC/DNR/ADFG MOU

1st chemical treatment of Chena Slough
Statewide elodea strategy drafted

1st chemical treatment in Anchorage
3rd chemical treatment on Kenai
Elodea eradicated from Kenai?

*Discovery of Elodea in
Alaska*

What's next for the Interior of Alaska?

- Is eradication possible?
 - How is eradication possible?
- How can I stay informed and educate myself?
- How can I be an active participant in eradication efforts?
 - What is my role in the process?

Heather A.M. Stewart

Invasive Plant and Agricultural Pest Coordinator

heather.stewart@alaska.gov

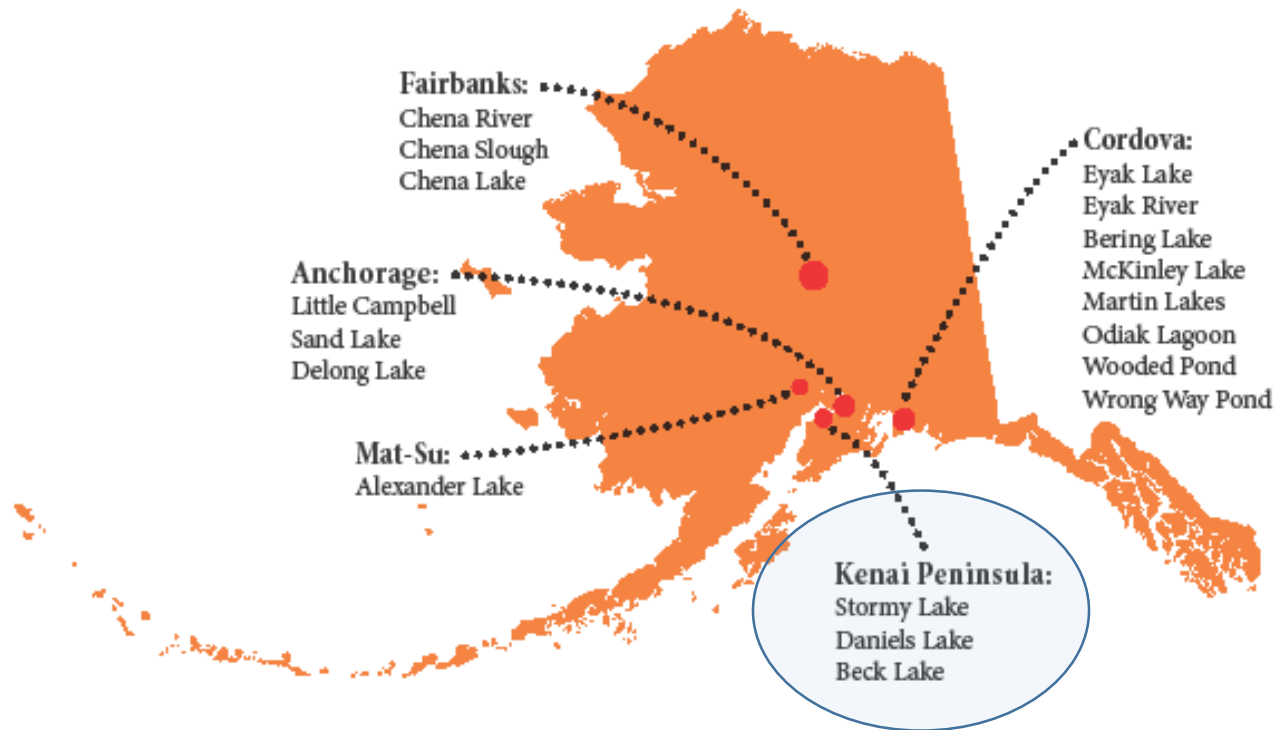
907-745-8721



Thank you

Eradicating Elodea from the Kenai Peninsula – success?

Known Locations of Elodea in Alaska



John Morton

Kenai National Wildlife Refuge



Community Elodea Information Meeting

Nikiski Community Recreation Center
Mile 23.4 Kenai Spur Highway

Tuesday February 19th, 2013
6 - 8:30PM

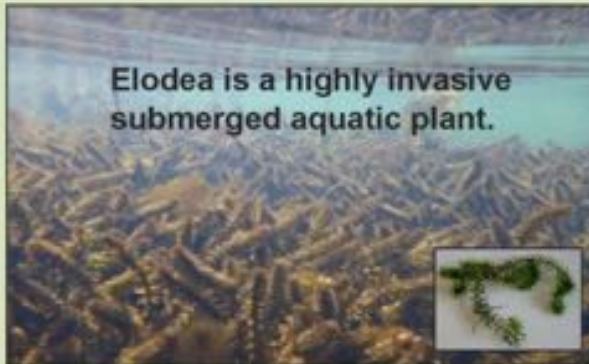


Please join us for a community meeting to discuss what to do about the discovery of Elodea in Stormy & Daniels Lakes.

Dr. Lars Anderson (USDA Agricultural Research Service and University of California-Davis), an aquatic invasive plant expert, will be at the meeting to provide information about Elodea, discuss options for management, and share his experiences in coping with aquatic infestations.

Elodea is not native to the Kenai Peninsula, and can cause serious, irreversible harm to fish and aquatic habitats if allowed to spread unchecked.

Elodea presence has recently been confirmed in Stormy and Daniels Lake on the Kenai Peninsula, and in some slow-moving waters in Anchorage, Fairbanks, and Cordova.



Elodea is a highly invasive submerged aquatic plant.



Why we don't want Elodea

Nuisance:
impedes boat and float plane launching, navigation, and fishing

Ecological:
degrades salmon spawning habitat

Safety: fouls float plane rudders and boat propellers

Economic:
reduces property values by fouling launch sites and shore habitats



Meeting Open to the Public
For more information, please contact Janice Chumley at UAF-Cooperative Extensive Service, 907-262-5824



INTEGRATED PEST MANAGEMENT PLAN FOR ERADICATING ELODEA FROM THE KENAI PENINSULA

April 2014

Prepared by

Elodea Subcommittee of the Kenai Peninsula Cooperative Weed Management Area

John M. Morton (USFWS Kenai National Wildlife Refuge, Soldotna)
Brienne N. Blackburn (AK Department of Natural Resources, Palmer)
Elizabeth Bella (USFWS Kenai National Wildlife Refuge, Soldotna)
Matt Steffy (Homer Soil & Water Conservation District, Homer)
Cheryl Anderson (USFWS Kenai Fish & Wildlife Field Office, Soldotna)
Rob Massengill (Alaska Department of Fish and Game, Soldotna)
Jack Blackwell (AK State Parks, Soldotna)
Lisa Ka'aihue (Cook Inlet Aquaculture Association, Kenai)
Rebecca Zulueta (Kenai Watershed Forum, Soldotna)
Janice Chumley (UAF Cooperative Extension Service, Soldotna)
Michelle Aranzuliz (Kenai Peninsula Borough Mayor's Office, Soldotna)
Cecil Rich (USFWS Regional Office, Anchorage)

In consultation with:

Lars Anderson (Waterweed Solutions, Davis)
Donald H. Lee (University of Connecticut, Storrs)
Scott Schuler (SePRO Corporation, Carmel, IN)
Andrew Skibo (SePRO Corporation, Fort Collins, CO)



Cooperative Weed
Management Area

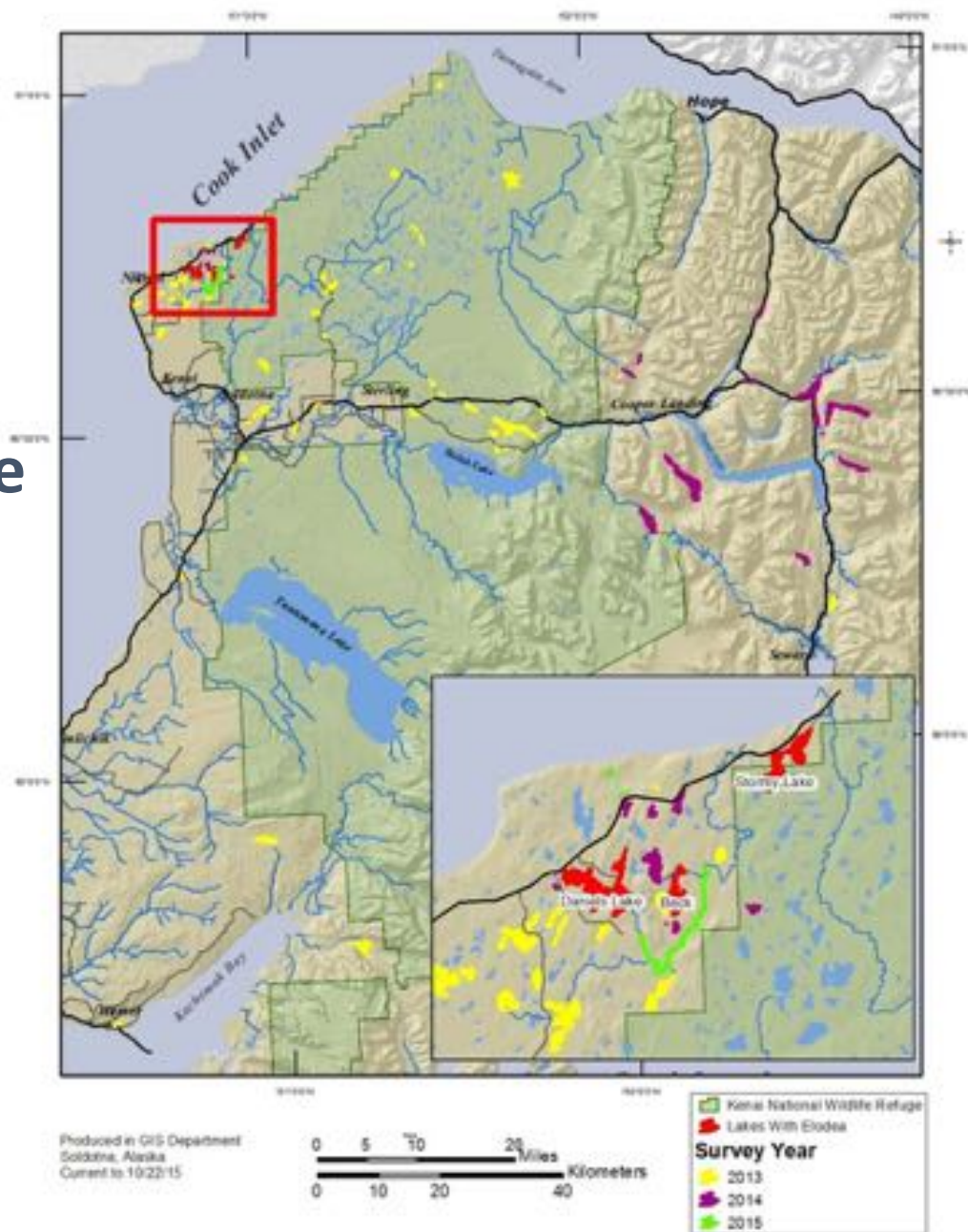


Kenai Watershed Forum

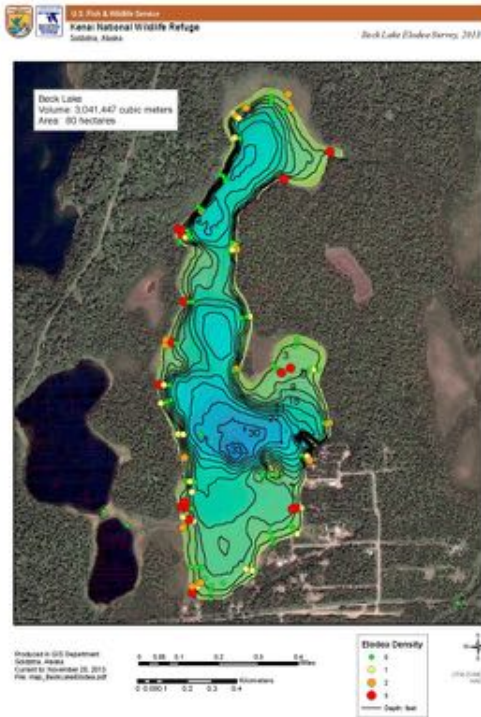




Surveyed 100+ at-risk lakes
before (and during)
treatment to assess
feasibility of peninsula-wide
eradication...

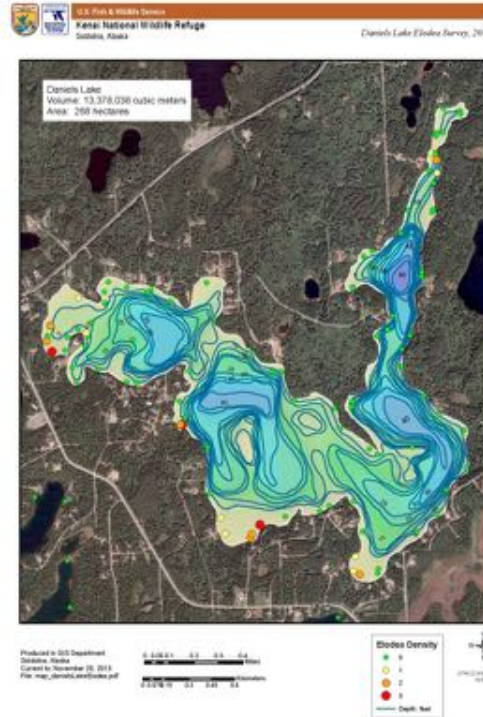


Beck Lake (200 ac) whole treatment



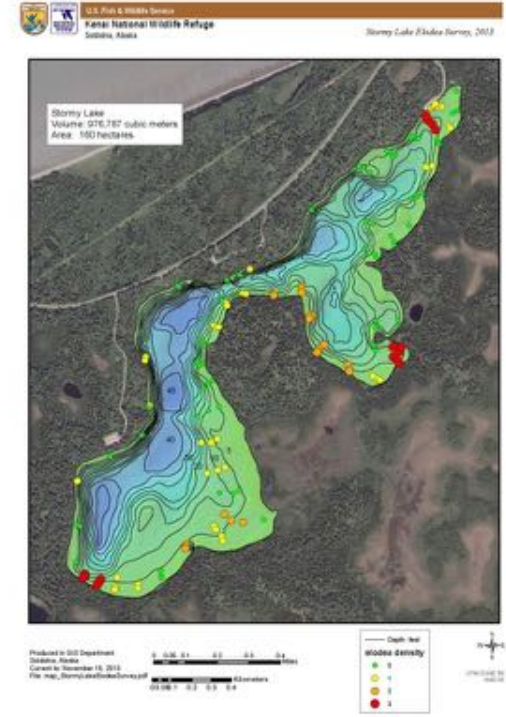
- Some private landowners
- Floatplanes
- NO public access
- Flows into Bishop Creek
- Rainbow trout

Daniels Lake (640 ac) partial treatment

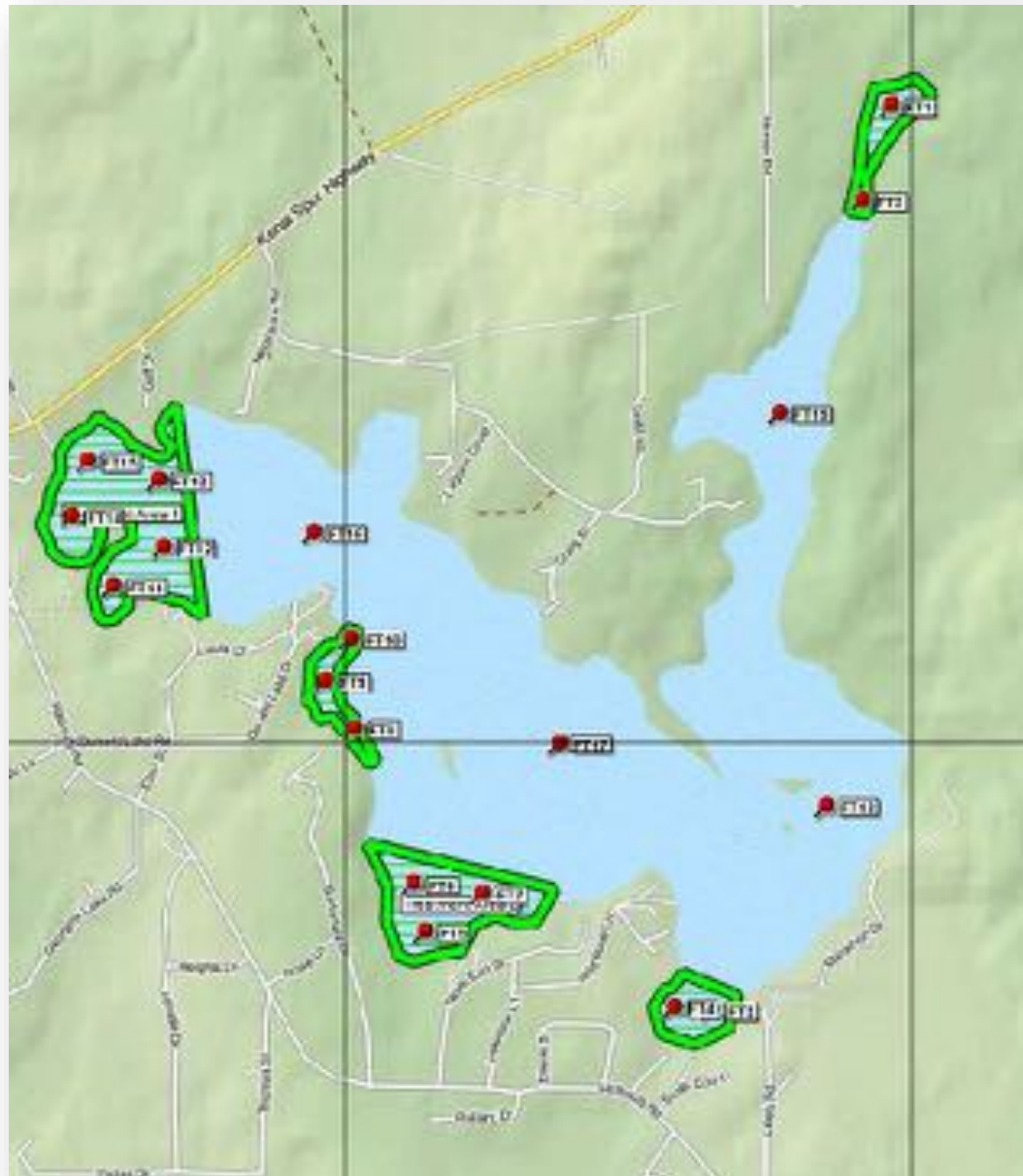


- All private landowners
- Floatplanes
- 1 community boat launch
- Flows into Bishop Creek
- Sockeye salmon

Stormy Lake (400 ac) whole treatment



- State Parks/KENWR
- 1 public boat launch
- Flows into Swanson River
- Arctic char



5 treatment sites on Daniels Lake

Red dots = 19 FasTEST sites

Fluridone kills elodea systemically and selectively with few nontarget effects

- ✓ Absorbed through roots and shoots (systemic)
- ✓ Inhibits carotenoid synthesis (photosynthesis) and elodea is particularly sensitive (selective)
- ✓ Applied as liquid or slow-release pellets
- ✓ Degrades by photolysis, adsorption, absorption
- ✓ No restrictions on swimming, drinking or fishing
- ✓ Minimal irrigation precautions
- ✓ Needs to be in water column for 45 – 90 days



Four herbicide treatments over three years (2014-16) to eradicate elodea

	Beck	Stormy	Daniels	Cost
acres	200	400	660 (100)	
approach	WHOLE	WHOLE	PARTIAL	
June 2014	liquid/pellet fluridone	liquid/pellet fluridone	diquat pellet	\$360k
Sept 2014	pellet	pellet	pellet	
June 2015	pellet	pellet	pellet	\$144k
June 2016	pellet	pellet	pellet	\$116k
cost	\$113K	\$320K	\$197K	\$620K







16' SPORTSMAN

AK 6821A

SOG

mph

5.0

N

MOB

ZOUT

ZIN

EXIT

ENTER

MENU

PAGE

WPT
FIND

LIGHT
POWER

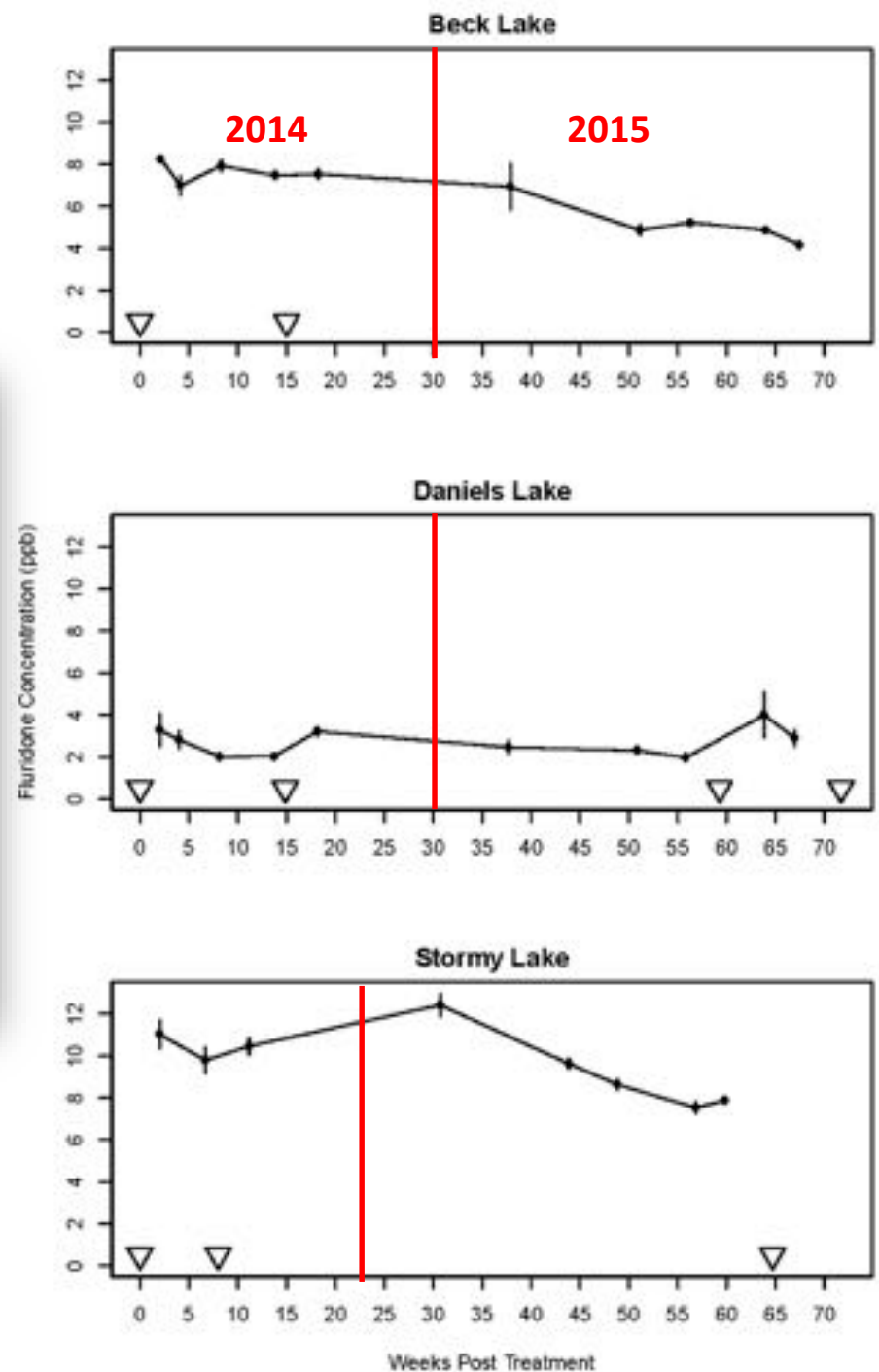
Sampling design to assess fluridone concentrations in water column

Lake	FastEST Site	15-Jun 2 WAT	1-Jul 4 WAT	1-Aug 8 WAT	1-Sep 12 WAT	1-Oct 16 WAT	Latitude	Longitude
Daniels Lake	1	X	X	X	X	X	60.7516372	-151.167864
Daniels Lake	2	X	X				60.7489173	-151.169602
Daniels Lake	3	X	X	X	X	X	60.7255421	-151.1783782
Daniels Lake	4	X	X				60.7256261	-151.1806742
Daniels Lake	5	X	X				60.727812	-151.1953083
Daniels Lake	6	X	X	X	X	X	60.7291887	-151.1959735
Daniels Lake	7	X	X				60.728905	-151.1919609
Daniels Lake	8	X	X				60.7336754	-151.1994711
Daniels Lake	9	X	X	X	X	X	60.7350518	-151.2011555
Daniels Lake	10	X	X				60.7362653	-151.199675
Daniels Lake	11	X	X				60.7377676	-151.2136654
Daniels Lake	12	X	X	X	X	X	60.7389127	-151.2107042
Daniels Lake	13	X	X				60.7408561	-151.2110261
Daniels Lake	14	X	X				60.7397951	-151.2160472
Daniels Lake	15	X	X	X	X	X	60.7413813	-151.2151459
Daniels Lake	16	X	X				60.733263	-151.1874602
Daniels Lake	17	X	X	X	X	X	60.7314558	-151.1717532
Daniels Lake	18	X	X				60.742802	-151.1744997
Daniels Lake	19	X	X				60.7393565	-151.2018797
Beck Lake	1	X	X	X	X	X	60.7408472	-151.1300189
Beck Lake	2	X	X				60.7378211	-151.1344396
Beck Lake	3	X	X	X	X	X	60.7336602	-151.1353409
Beck Lake	4	X	X				60.7325465	-151.128903
Beck Lake	5	X	X				60.7300037	-151.1332379
Beck Lake	6	X	X	X	X	X	60.7263682	-151.134783
Stormy Lake	1	X	X				60.7874167	-151.0327008
Stormy Lake	2	X	X	X	X	X	60.7840311	-151.0400868
Stormy Lake	3	X	X				60.7797427	-151.0402846
Stormy Lake	4	X	X	X	X	X	60.7794847	-151.0560459
Stormy Lake	5	X	X				60.7716495	-151.0532762
Stormy Lake	6	X	X	X	X	X	60.7696181	-151.0627725
Total Samples		31	31	13	13	13		
Grand Total		101						

Is it working?



- 1st application (Beck, Daniels) 3-4 Jun 14
- 1st application (Stormy) 23 Jul 14
- 2nd application (Beck, Daniels, Stormy) 16-17 Sep 14
- 3rd application (Daniels) 24 Jul 15
- 4th application (Daniels) 19 Oct 15



Is it working?



2 weeks (Stormy)

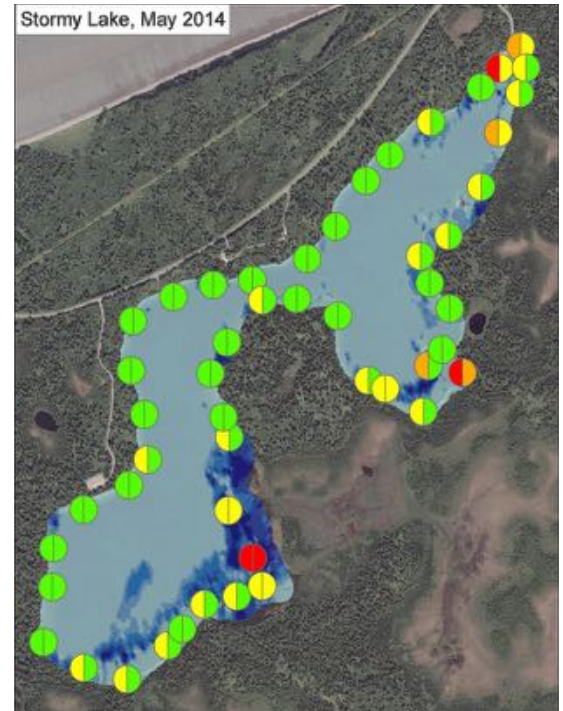
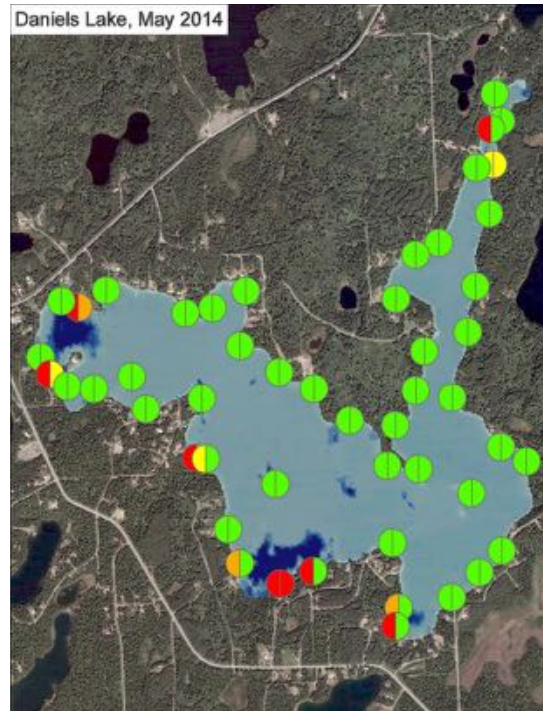
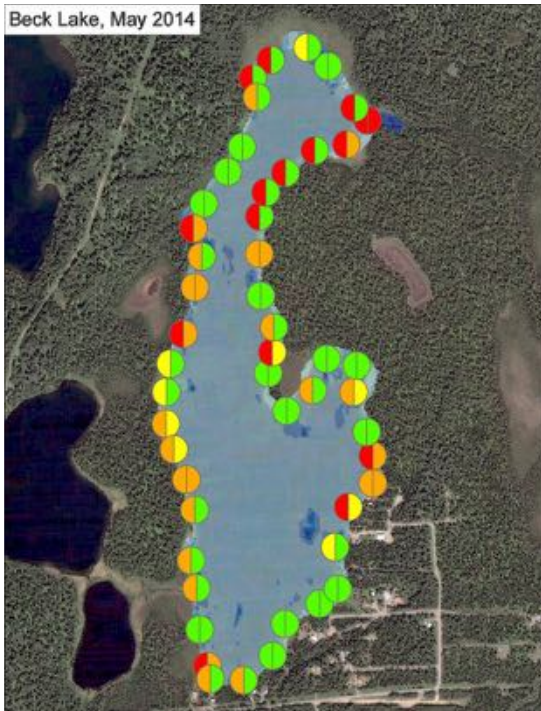


8 weeks (Beck)



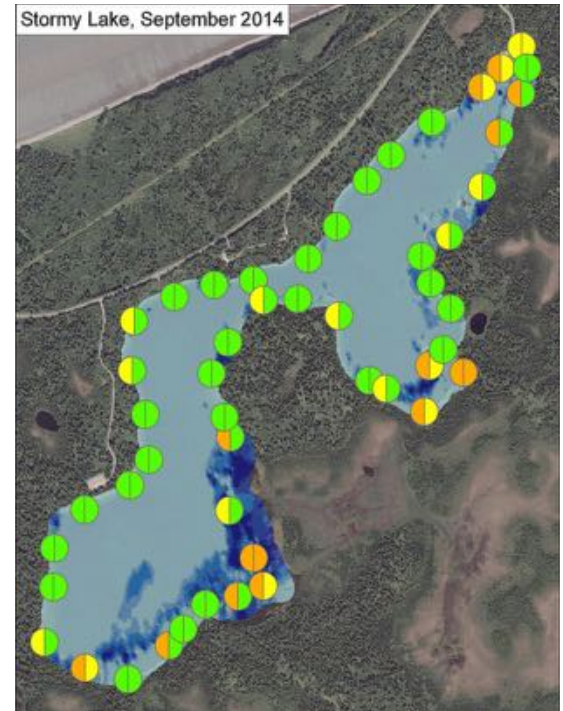
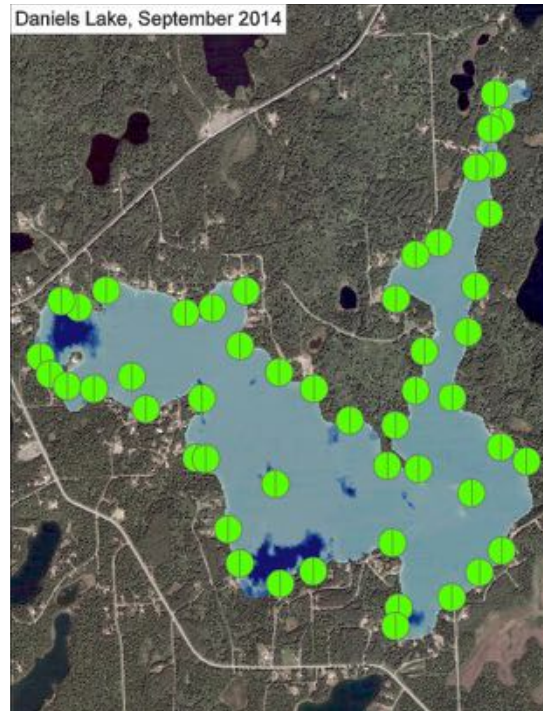
14 weeks (Beck)

Is it working?



SURVEY	LAKE		
	Beck	Daniels	Stormy
May 2014 (pre-trmt)	70	22	50

Is it working?



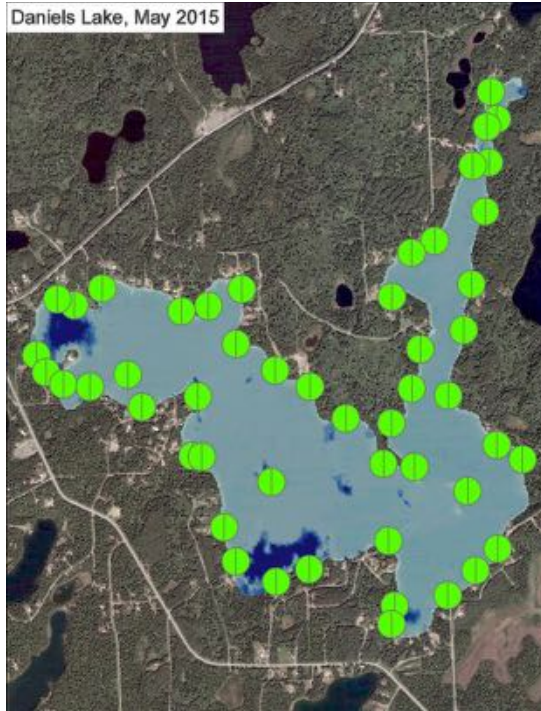
SURVEY	LAKE		
	Beck	Daniels	Stormy
May 2014 (pre-trmt)	70	22	50
Sept 2014 (post)	12	0	46

Is it working?

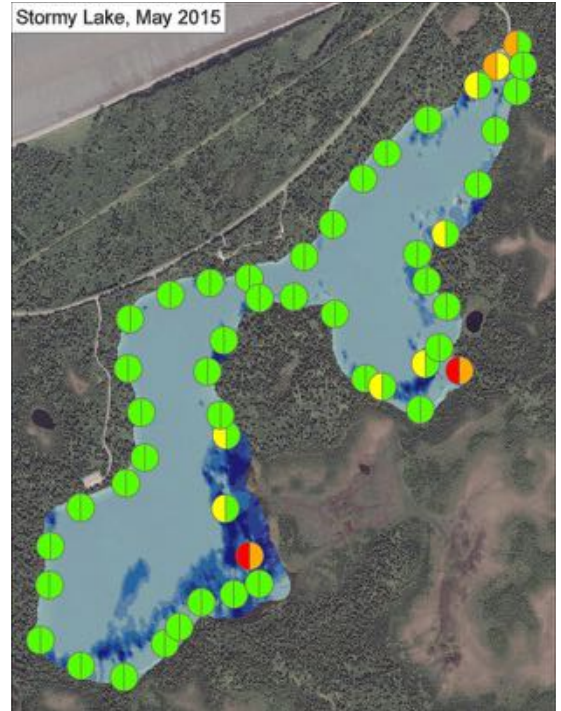
Beck Lake, May 2015



Daniels Lake, May 2015

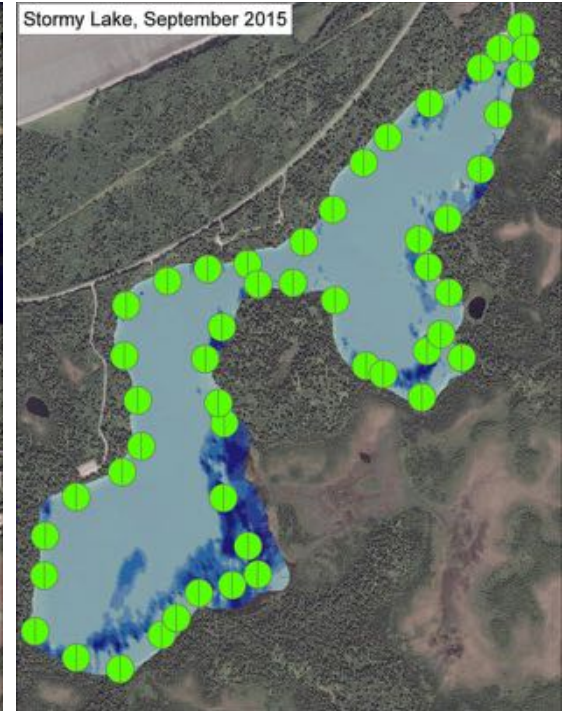
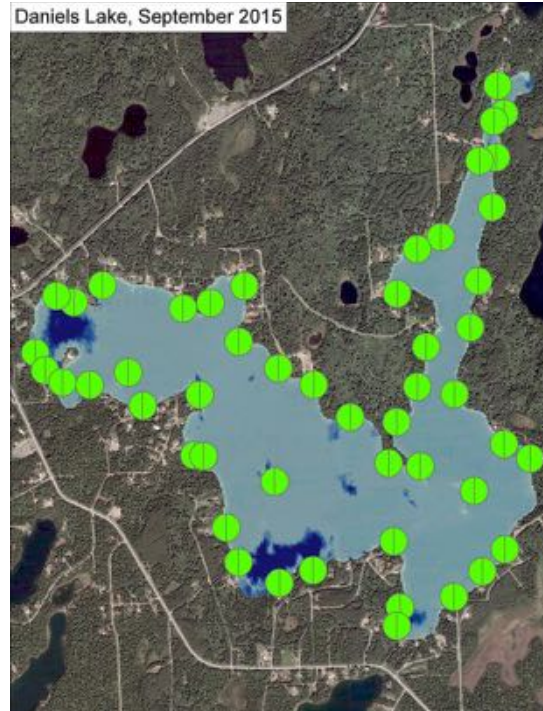


Stormy Lake, May 2015



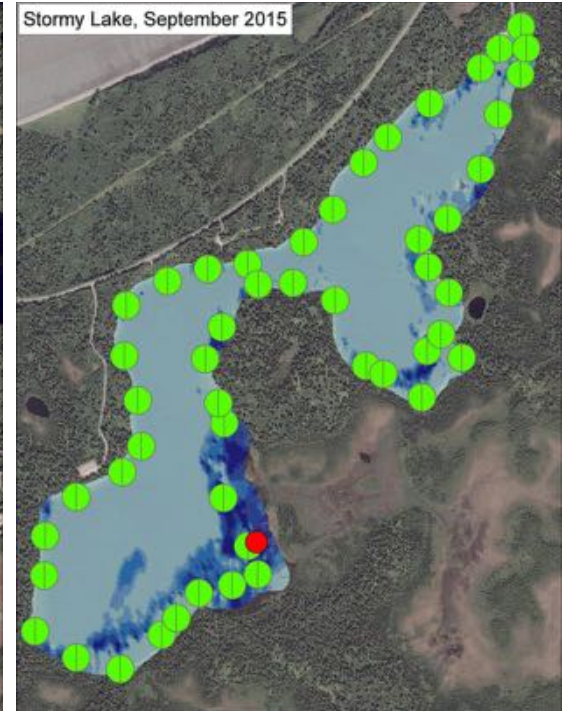
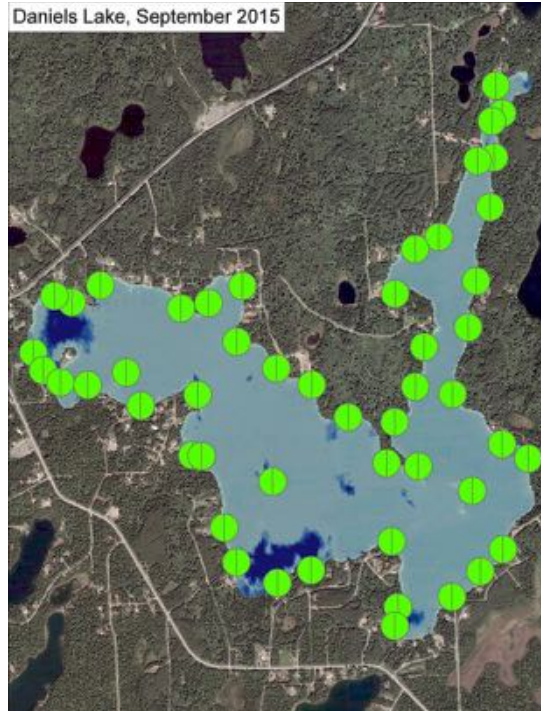
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Is it working?



SURVEY	LAKE		
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Is it working?

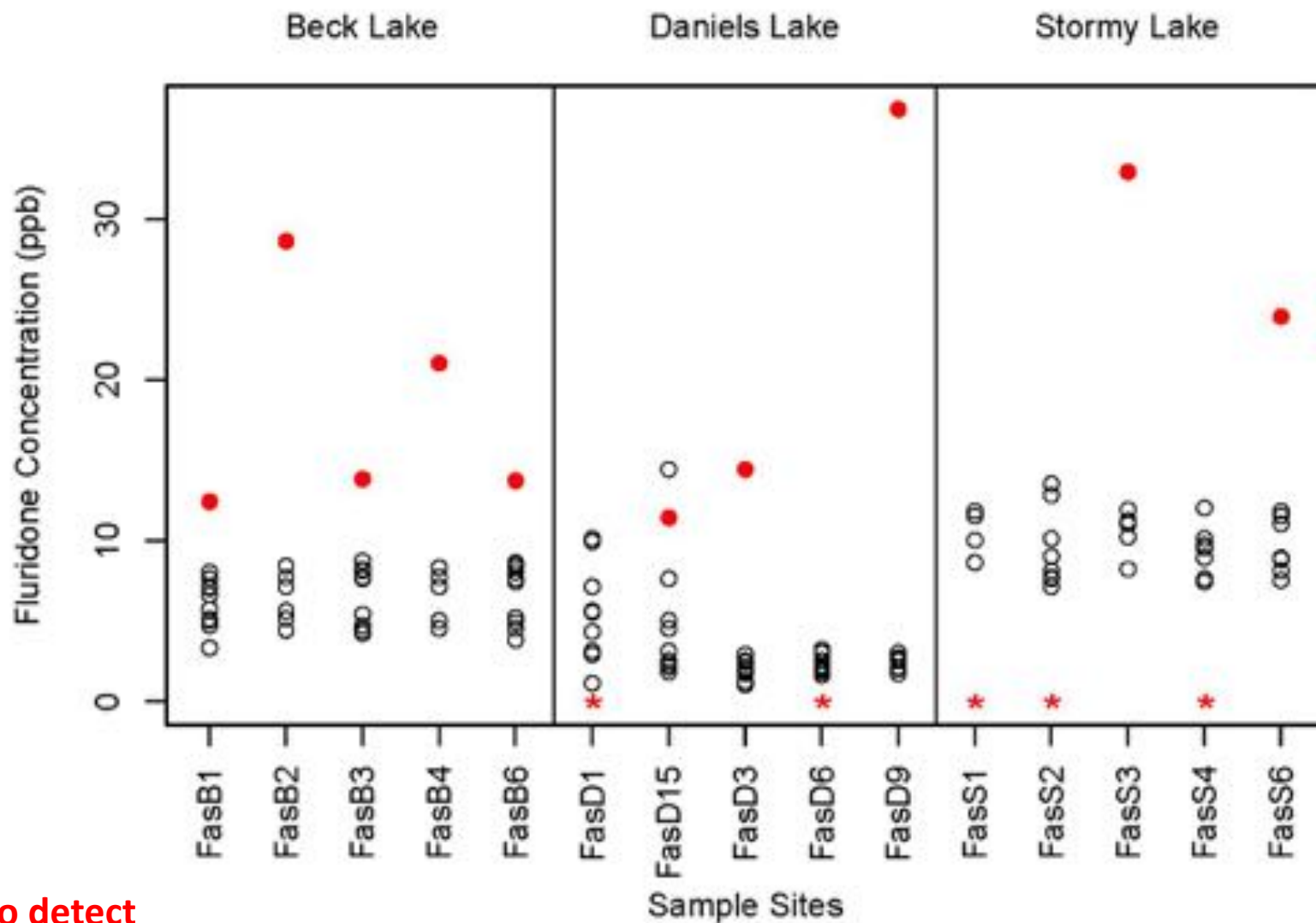


SURVEY	LAKE		
	Beck	Daniels	Stormy
May 2014 (pre-trmt)	70	22	50
Sept 2014 (post)	12	0	46
May 2015 (post)	0	0	20
Sept 2015 (post)	0	0	0*

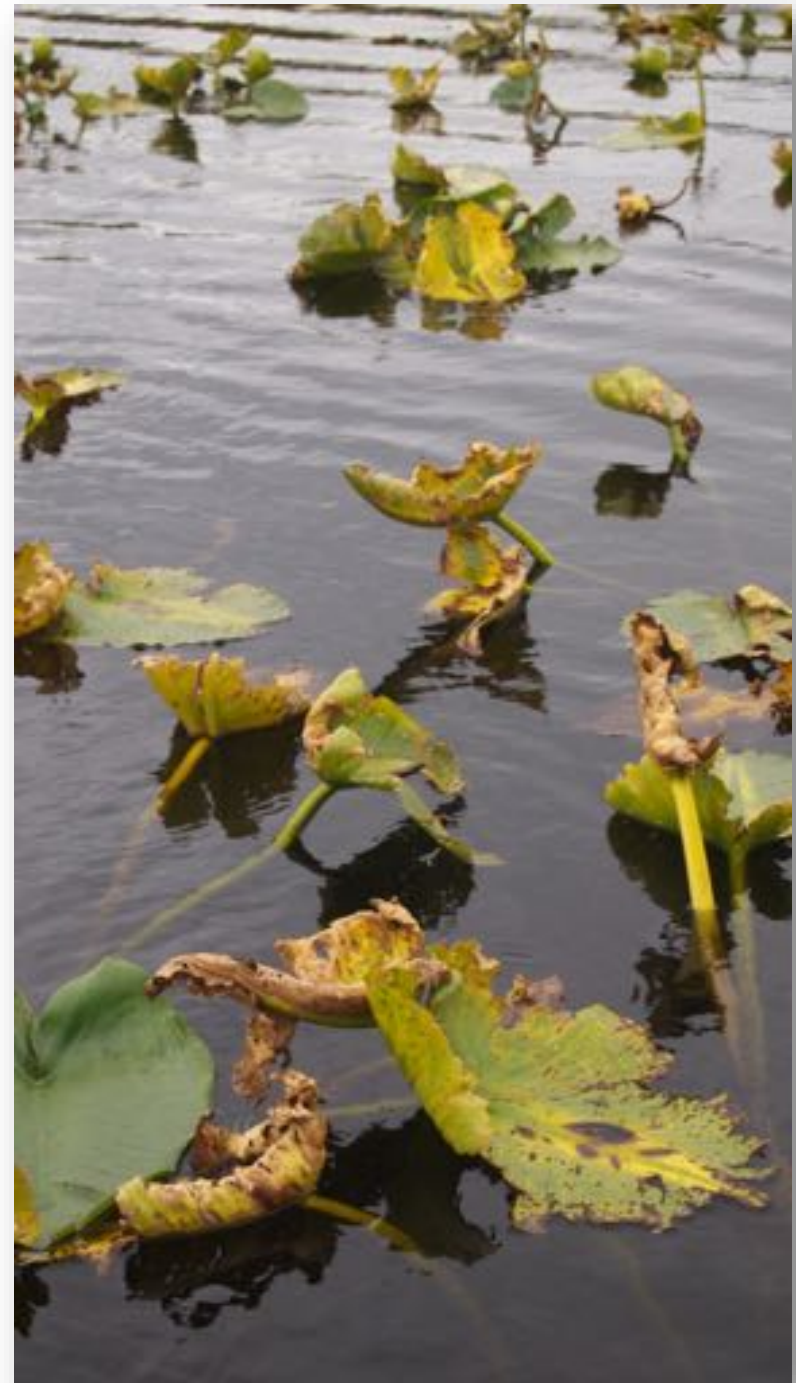
Does fluridone persist in sediment?



Does fluridone persist in sediment?



Some necrosis and loss of non-target plants



Why Kenai cares about Fairbanks.....



Next steps in 2016

- ✓ Continued monitoring to confirm success of eradication and assess post-treatment native flora response
- ✓ Herbicide residuals analysis with Wildlife International (Easton, MD)
- ✓ Continued fluridone sampling
- ✓ Re-open Stormy Lake boat launch
- ✓ Continued outreach
- ✓ Continue working with other areas in AK



A photograph of a lake with autumn foliage reflected in the water. The background shows a dense forest with trees in shades of green, yellow, and red. The water is calm, reflecting the trees and the sky. The foreground shows the water's surface with some ripples and reflections.

Daniels Lake post-treatment

QUESTIONS??

Prepared for:
The Fairbanks Soil & Water Conservation District
7-8 March 2016

Sonar[®] Aquatic Herbicide

Mode of action, efficacy, and toxicology

Andrew Skibo, Ph.D.

Aquatic Research & Development Lead, Western US

SePRO Corporation

Andrew.Skibo@Sepro.com | 303.229.9622

www.Sepro.com

Sonar[®] Aquatic Herbicide Family

Mode of action, efficacy, and toxicology

- **Sonar[®] Herbicide Family**
 - How it works
 - Water use precautions
 - “The art & science” of Sonar formulations
 - Efficacy on Alaskan acquisitions
 - Q&A

Sonar: How it Works

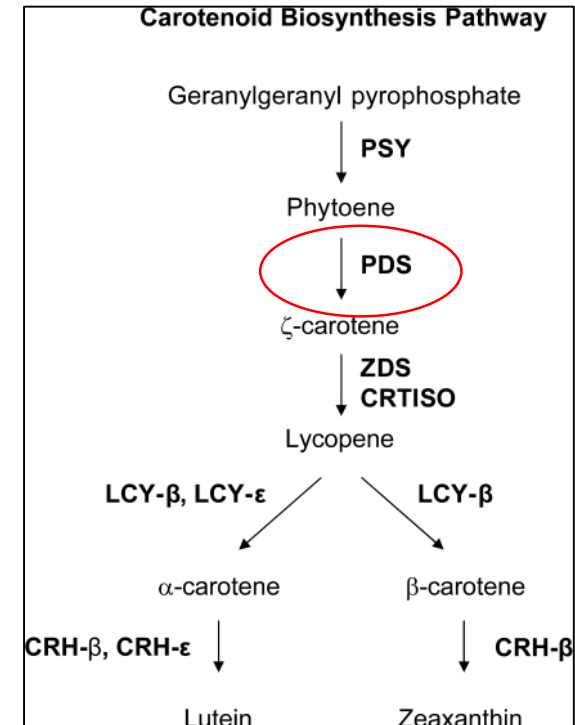
- Active Ingredient: Fluridone
- Sonar is a [systemic herbicide](#) for the control of *aquatic* plants and was registered by the Environmental Protection Agency for use in 1986.
- As a [systemic herbicide](#), Sonar is absorbed through the roots and shoots of plants and then translocates to the shoot tissues.
- Sonar inhibits the plant enzyme phytoene desaturase (PDS Inhibitor)

Sonar: How it Works



Typical plant response to Sonar Aquatic Herbicide
three weeks post-treatment.

- Sonar inhibits the synthesis of carotenoid pigments allowing ultraviolet light to destroy essential chlorophyll pigments.
- Without chlorophyll, the plant is unable to photosynthesize and the plant slowly starves and dies.



Sonar Aquatic Herbicide

- ***As determined by the U.S. EPA and the State of Alaska – Sonar Aquatic Herbicide poses a negligible risk to human health and the environment when used according to label instructions.***
- **No** Swimming Restrictions
- **No** Potable Water Restrictions (drinking)
 - 2000x Safety Margin
- **No** Fishing Restrictions
- **Minimum** Irrigation Precautions

Sonar Aquatic Herbicide

- ***As determined by the U.S. EPA and the State of Alaska – Sonar Aquatic Herbicide poses a negligible risk to human health and the environment when used according to label instructions.***
- **Minimum Irrigation Precautions**
 - ≤ 10 ppb no precautions other than sensitive crops (i.e. tomatoes, bell peppers, Solanaceae Family)
 - ≤ 5 ppb no precautions other than hydroponic and greenhouse production

Sonar Aquatic Herbicide

What about subsurface groundwater?

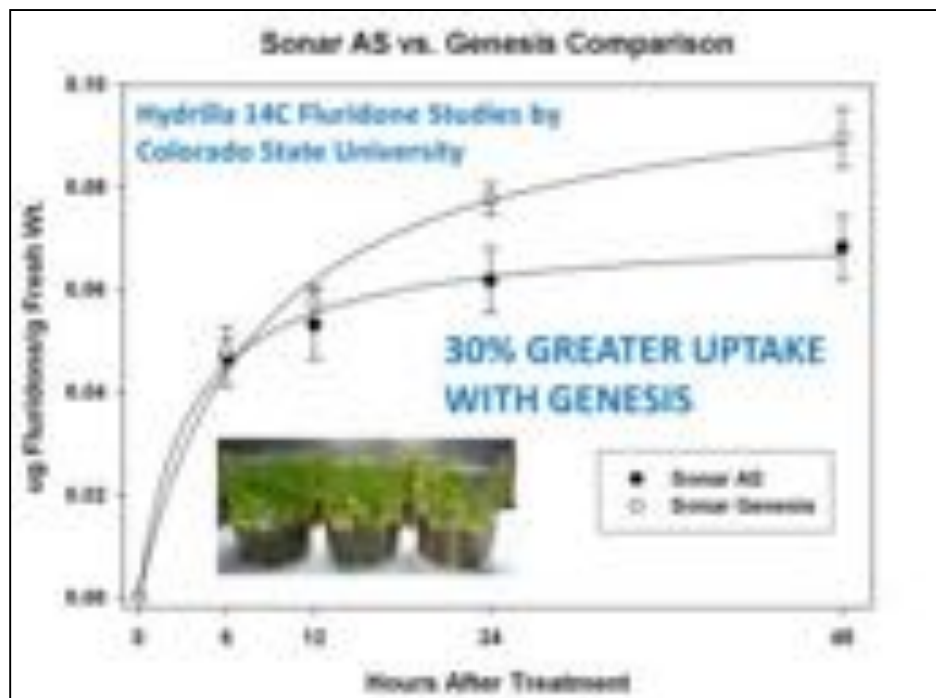
- Organic carbon partition coefficient (K_{OC})*: 350-1100

* Indicates a strong affinity to bind with soil particles and thus a decreased risk of soil leaching and offsite movement.

- DT_{50} aquatic environments (anaerobic): ± 9 months
- DT_{50} hydrosoil - ± 90 days
- Gradual desorption and breakdown through photolysis is primary degradation pathway in hydrosoil.

SonarGenesis*

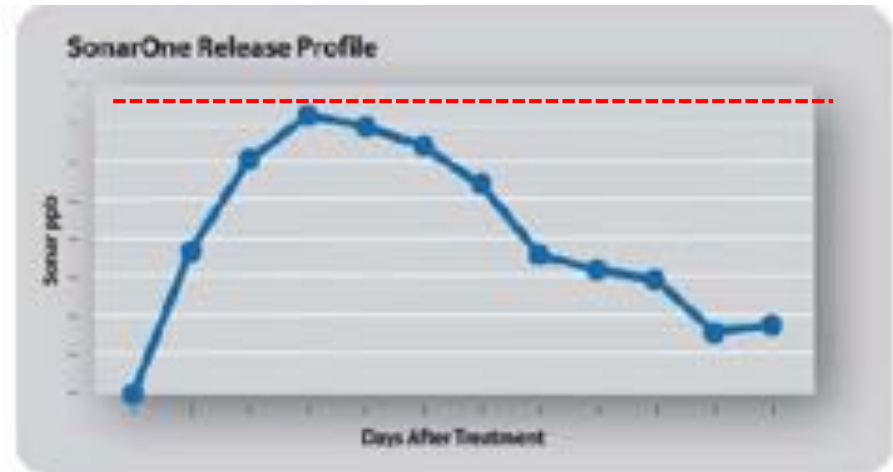
Aquatic Herbicide



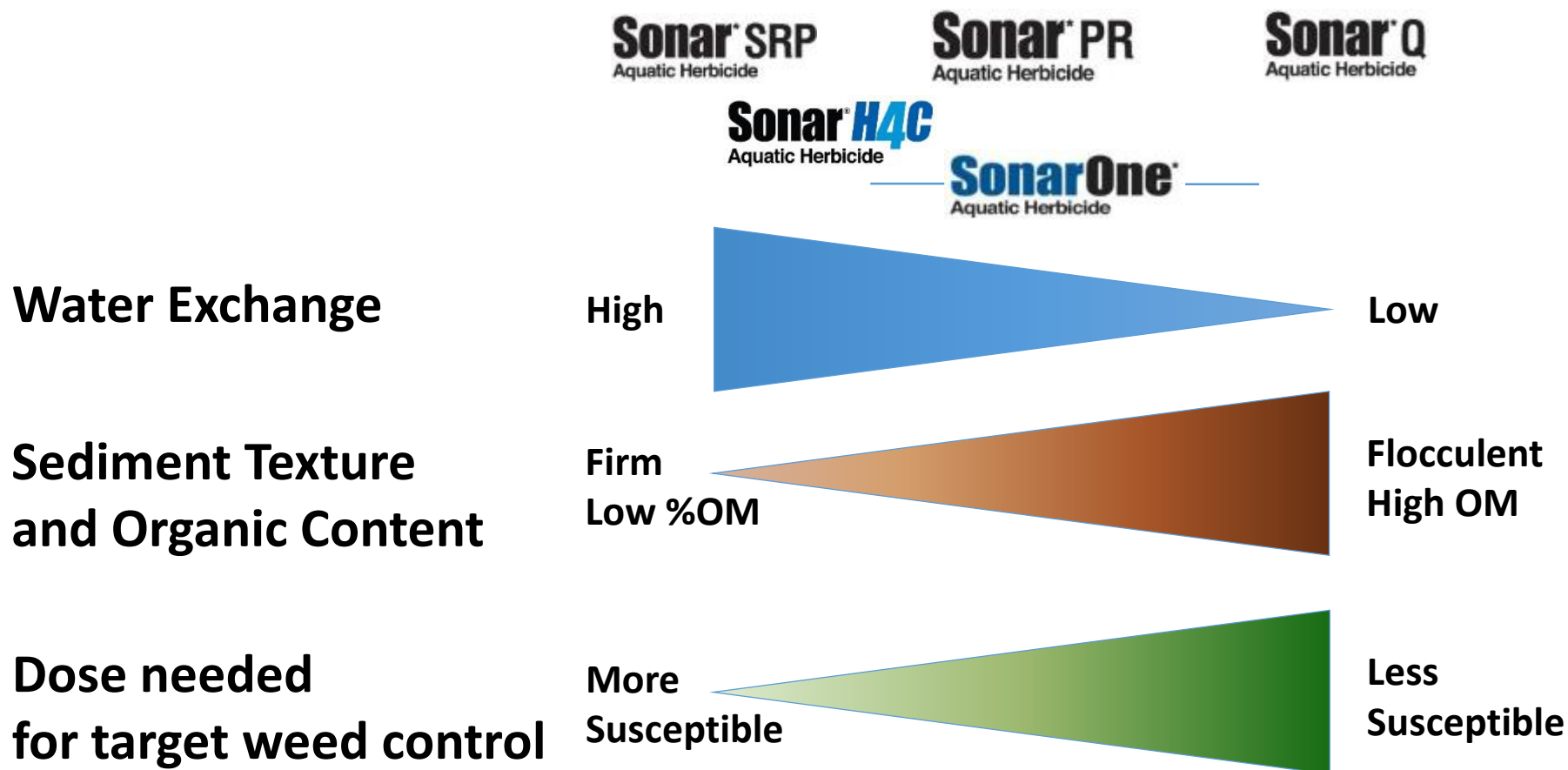
SonarOne*

Aquatic Herbicide

- A unique, *temporal* release profile that results in a quick initial target dose of Sonar followed by a sustained dose.
- Peak ppb's achieved faster
- Maximum concentrations sustained longer
- One-Step Sonar Solution

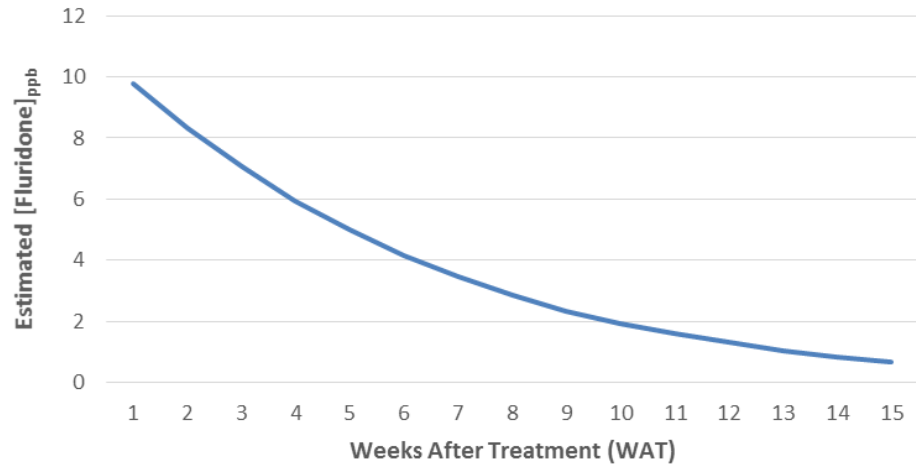


The Art and Science of Sonar Pellets

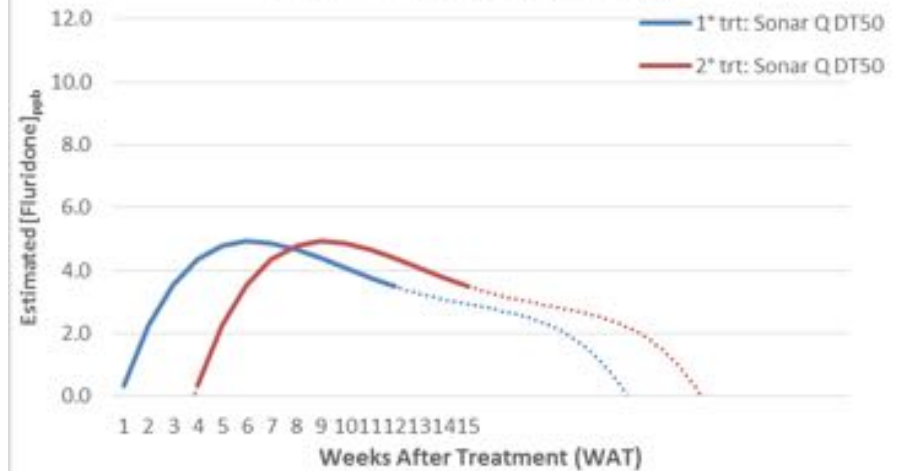


Why So Many Different Formulas?

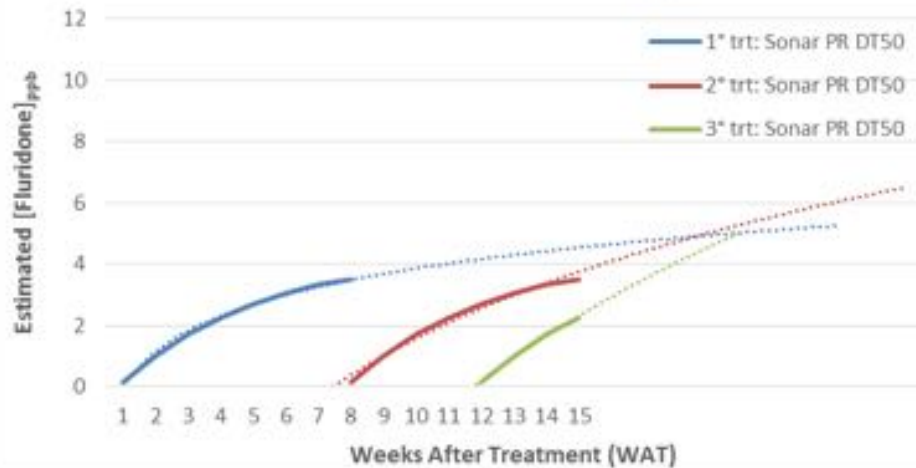
Sonar Liquid DT₅₀



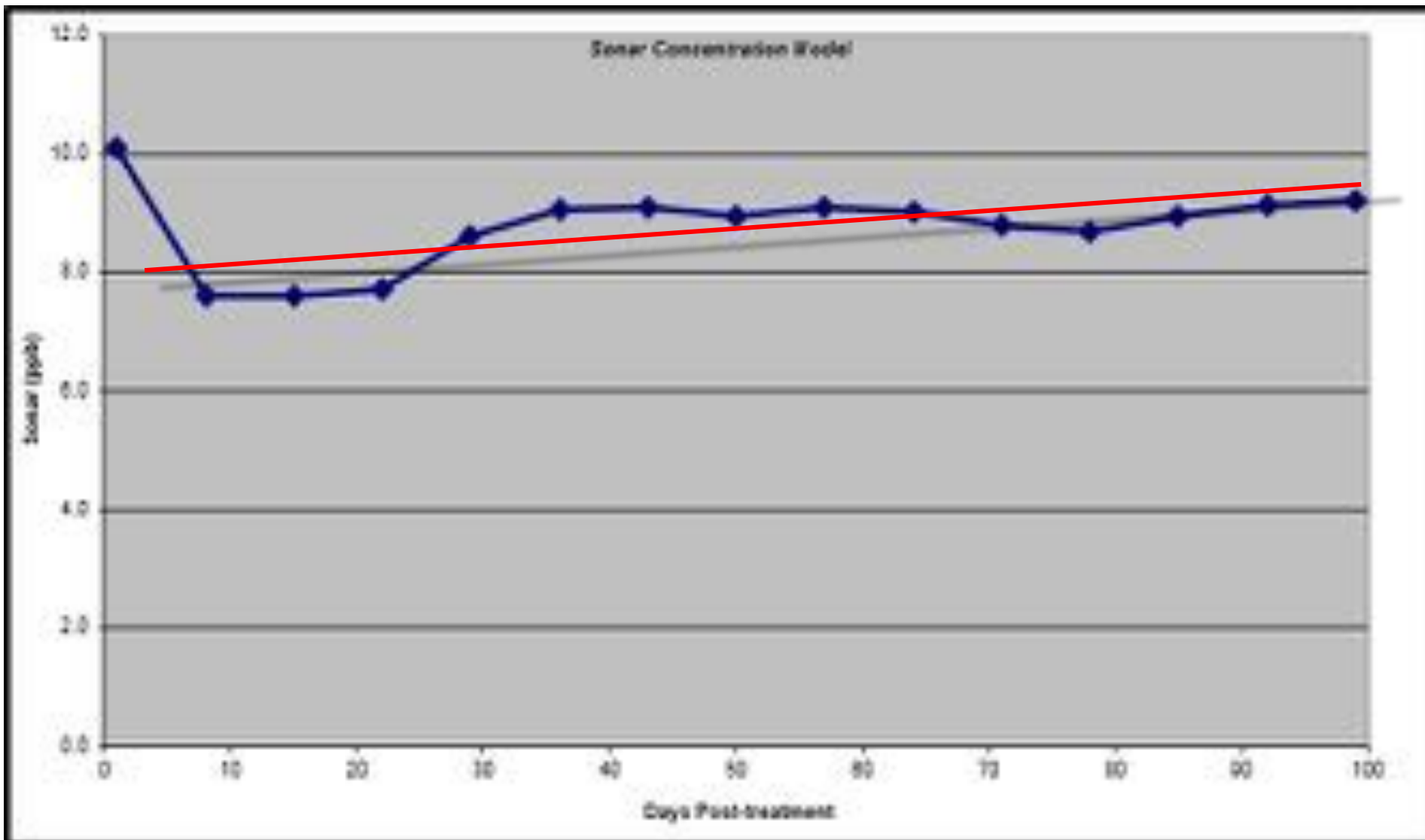
Sonar Q Release DT₅₀



Sonar Precision Release DT₅₀



Why So Many Different Formulas?



Consider the following:

What is this “Part-per-billion” (PPB)?



1 ppb = 1 5/8 inches



**On the equator
(24,901.55 miles)**

Perspective

<u>Unit</u>	<u>pounds per acre foot</u>	<u>1 second in</u>
1 ppm	2.7	~12 days
1 ppb	0.0027	~33 years

Toxicity: “The dose makes the poison”

<u>Compound</u>	<u>Acute LD₅₀ (rat)</u>	
VX	0.00082 mg/kg	
Honey Bee venom	2.8 mg/kg	
Nicotine	10 mg/kg	
Gasoline	50 mg/kg	
Caffeine	200 mg/kg	
Diquat dibromide +	230 mg/kg	
Paracetamol	1200 mg/kg	
Sodium chloride	3320 mg/kg	
Fluridone	5000-10,000 mg/kg	[USEPA Max] 0.15ppm
Ethanol	14,000 mg/kg	
Dihydrogen monoxide	>90,000 mg/kg	



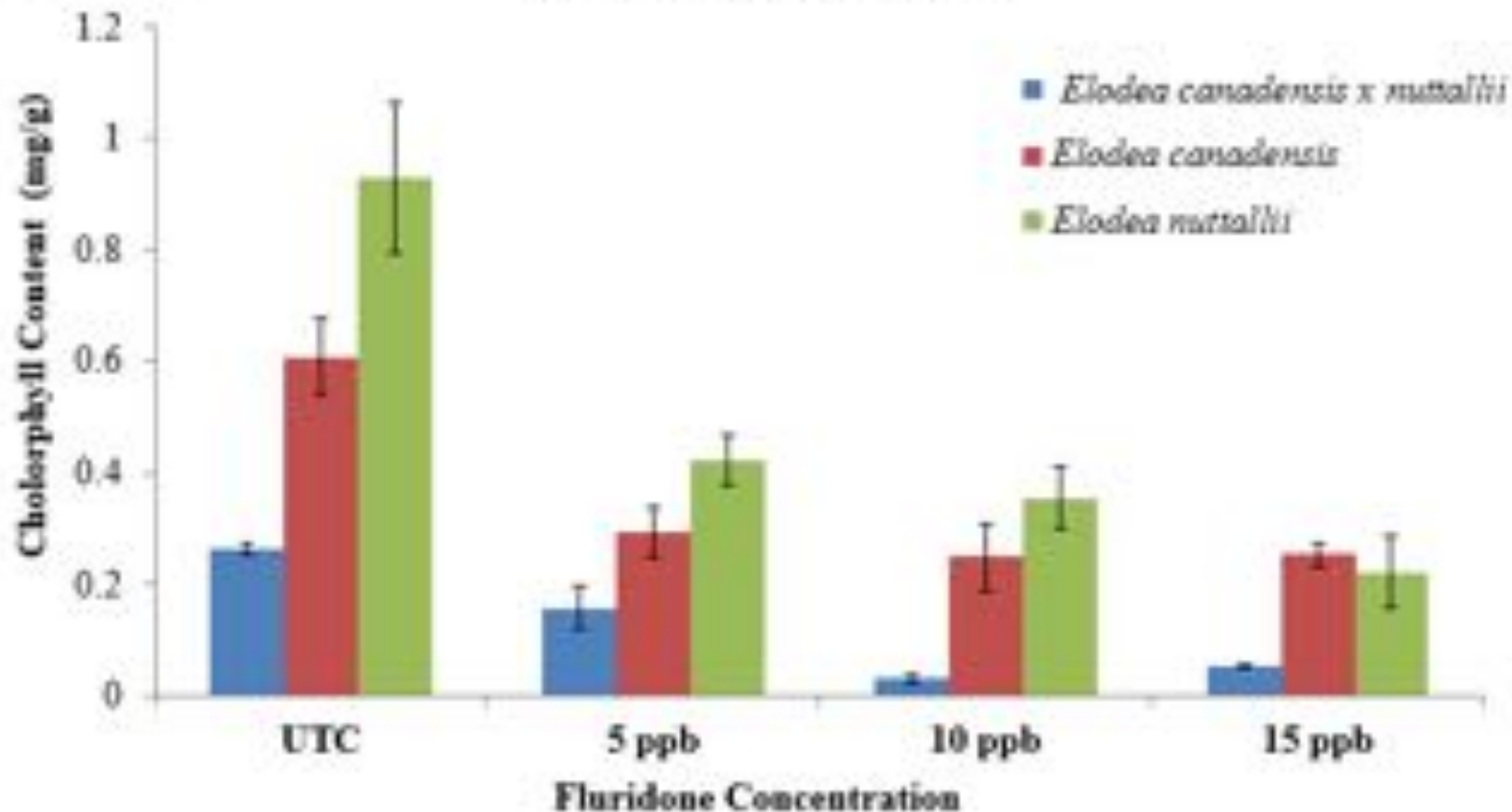
Aquatic Research

Sonar Efficacy

Biochemical Assay

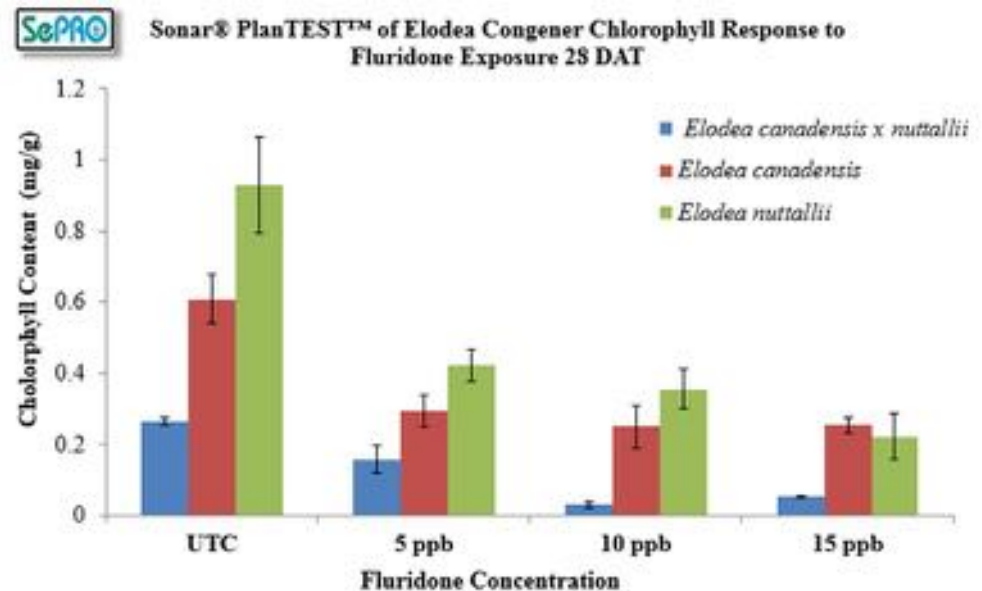


Sonar® PlanTEST™ of Elodea Congener Chlorophyll Response to Fluridone Exposure 28 DAT



Sonar Efficacy

- Sonar is very efficacious on *Elodea* spp.
- Sustained levels ≤ 5 ppb will control *Elodea* spp.
- Eradication is the goal and drives the plan to treat for 2-3 consecutive years



vs.

No Observable Effect Levels
(NOEL)

(NOEL)

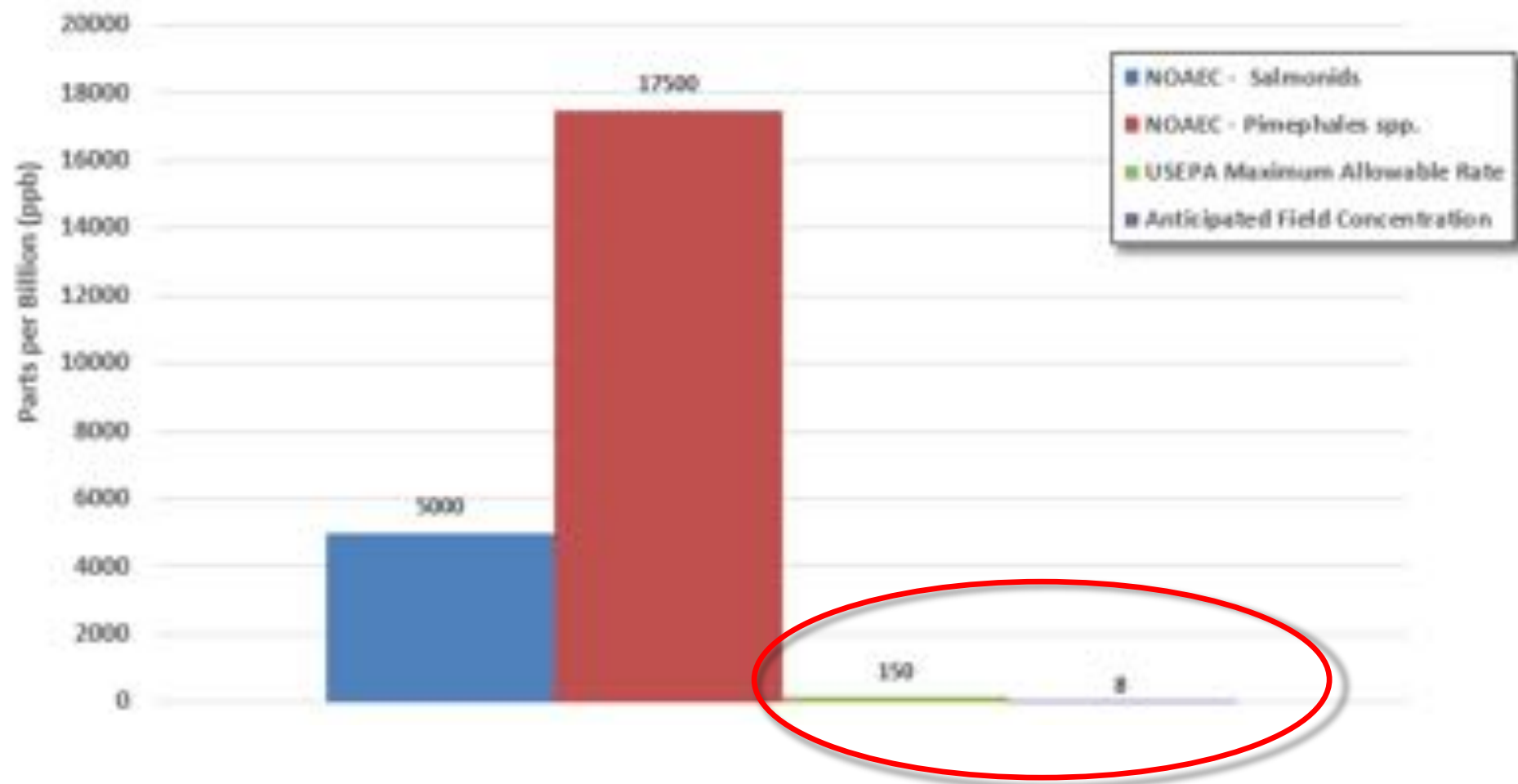
“Early Life Stage Toxicity of Fluridone to the Chinook Salmon, *Oncorhynchus tshawytscha*, Under Flow Through Conditions”

– Madsen, T.J. 2002-03', Study #47895, ABC Laboratories, Columbia MO.

- 61-Day post-hatch exposure, NOEC for egg hatchability and fry survival was 1.71 mg/L
- Noted absence of both significant mortality and sub-lethal effects.
- No significant effect on time-to-hatch or swim up
- No notable histo-/ pathology for brain, gills, liver from any fish in the treatment group
 - NOEC (liver) – 0.848mg ai/Kg
 - LOEC (liver) – 1.71mg ai/Kg

Alaskan *Elodea canadensis* x *nuttallii* Hybrid Control Project

Fluridone Information





Alaskan *Elodea canadensis* x *nuttallii* Hybrid Control Project
Fluridone Information



Summary / Questions

- Sonar poses negligible risk to human health & the environment
- Sonar is very effective on Elodea

Andrew Z. Skibo, Ph.D.

Research & Development Lead, Western US

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www.Sepro.com

Prepared for:
The Fairbanks Soil & Water Conservation District
7-8 March 2016

Sonar[®] Aquatic Herbicide

Mode of action, efficacy, and toxicology

Andrew Skibo, Ph.D.

Aquatic Research & Development Lead, Western US

SePRO Corporation

Andrew.Skibo@Sepro.com | 303.229.9622

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Sonar[®] Aquatic Herbicide Family

Mode of action, efficacy, and toxicology

- **Sonar[®] Herbicide Family**
 - How it works
 - Water use precautions
 - “The art & science” of Sonar formulations
 - Efficacy on Alaskan acquisitions
 - Q&A

Sonar: How it Works

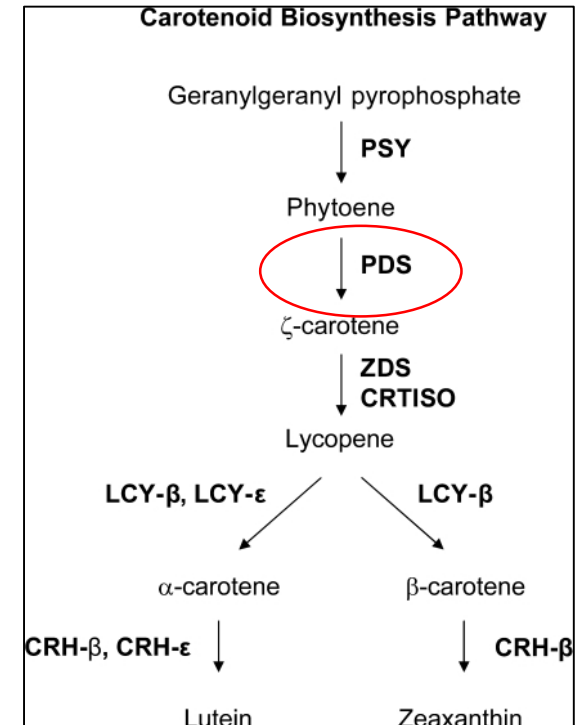
- Active Ingredient: Fluridone
- Sonar is a [systemic herbicide](#) for the control of *aquatic* plants and was registered by the Environmental Protection Agency for use in 1986.
- As a [systemic herbicide](#), Sonar is absorbed through the roots and shoots of plants and then translocates to the shoot tissues.
- Sonar inhibits the plant enzyme phytoene desaturase (PDS Inhibitor)

Sonar: How it Works



Typical plant response to Sonar Aquatic Herbicide
three weeks post-treatment.

- Sonar inhibits the synthesis of carotenoid pigments allowing ultraviolet light to destroy essential [*chlorophyll*](#) pigments.
- Without [*chlorophyll*](#), the plant is unable to photosynthesize and the plant slowly starves and dies.



Sonar Aquatic Herbicide

- ***As determined by the U.S. EPA and the State of Alaska – Sonar Aquatic Herbicide poses a negligible risk to human health and the environment when used according to label instructions.***
- **No** Swimming Restrictions
- **No** Potable Water Restrictions (drinking)
 - 2000x Safety Margin
- **No** Fishing Restrictions
- **Minimum** Irrigation Precautions

Sonar Aquatic Herbicide

- ***As determined by the U.S. EPA and the State of Alaska – Sonar Aquatic Herbicide poses a negligible risk to human health and the environment when used according to label instructions.***
- **Minimum Irrigation Precautions**
 - ≤ 10 ppb no precautions other than sensitive crops (i.e. tomatoes, bell peppers, Solanaceae Family)
 - ≤ 5 ppb no precautions other than hydroponic and greenhouse production

Sonar Aquatic Herbicide

What about subsurface groundwater?

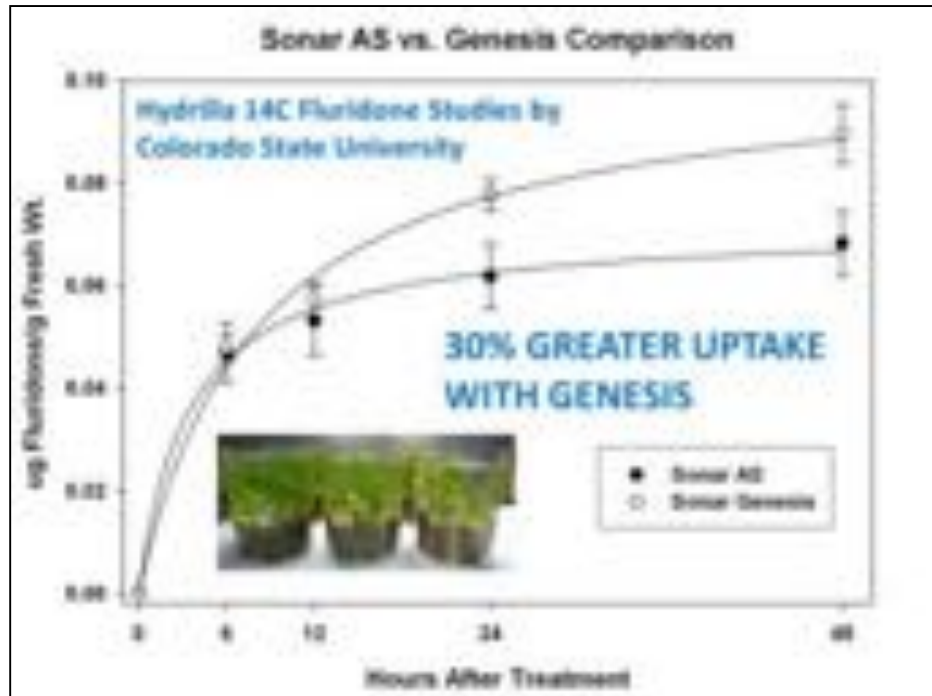
- Organic carbon partition coefficient (K_{OC})*: 350-1100

* Indicates a strong affinity to bind with soil particles and thus a decreased risk of soil leaching and offsite movement.

- DT_{50} aquatic environments (anaerobic): ± 9 months
- DT_{50} hydrosoil - ± 90 days
- Gradual desorption and breakdown through photolysis is primary degradation pathway in hydrosoil.

SonarGenesis*

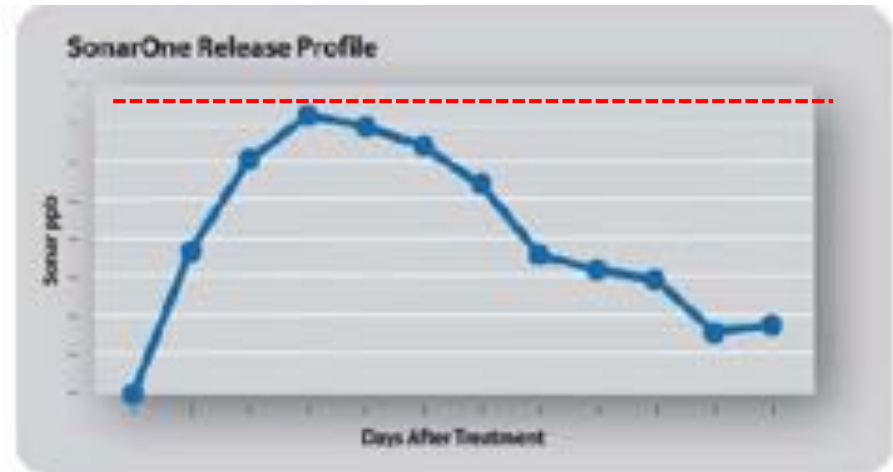
Aquatic Herbicide



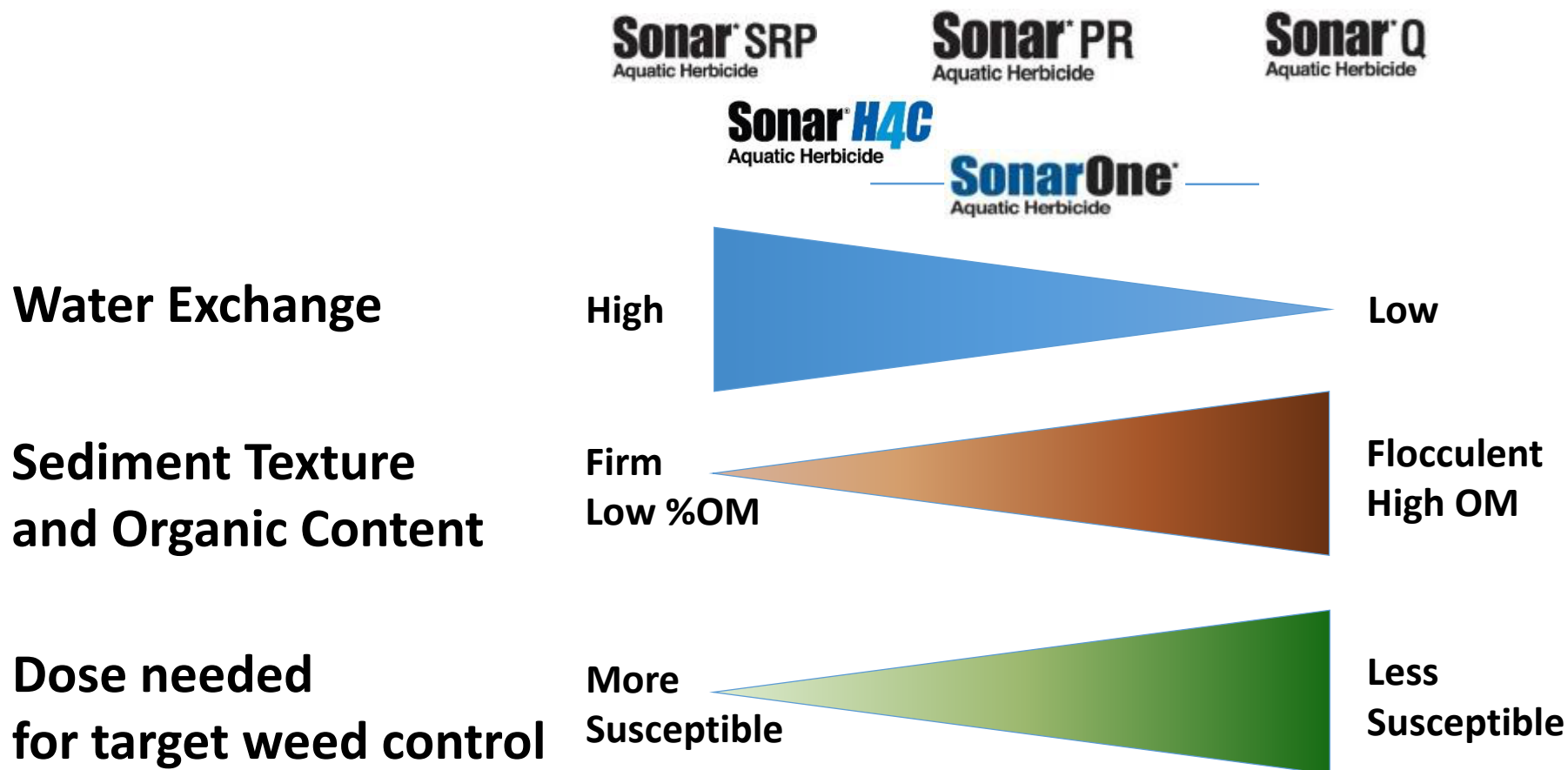
SonarOne*

Aquatic Herbicide

- A unique, *temporal* release profile that results in a quick initial target dose of Sonar followed by a sustained dose.
- Peak ppb's achieved faster
- Maximum concentrations sustained longer
- One-Step Sonar Solution

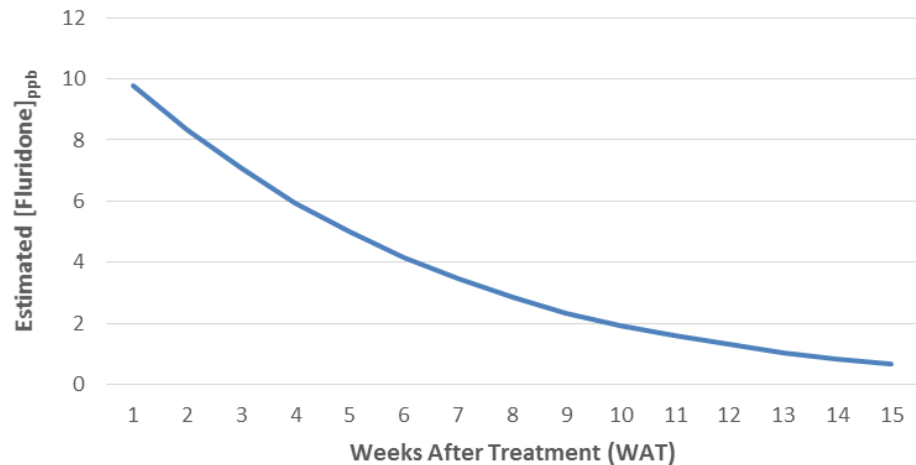


The Art and Science of Sonar Pellets

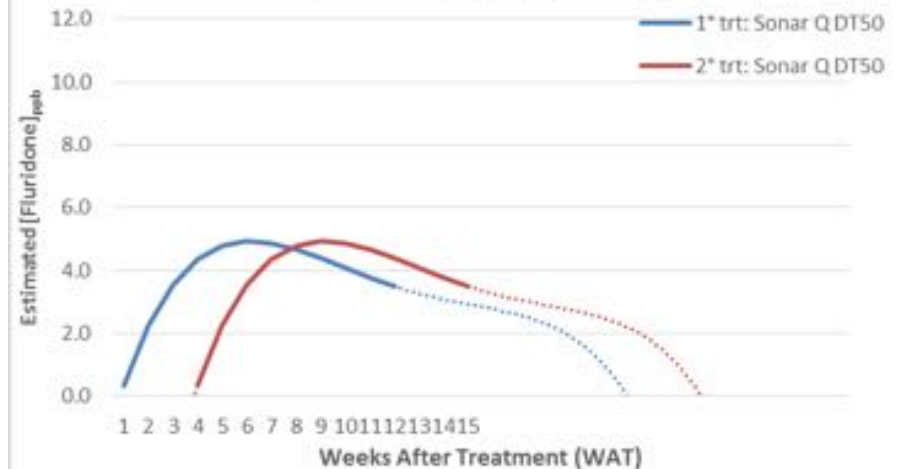


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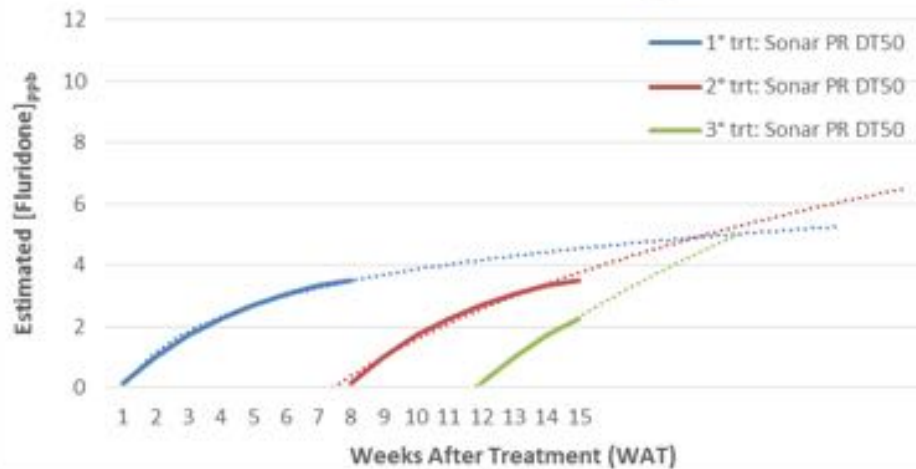
Sonar Liquid DT₅₀



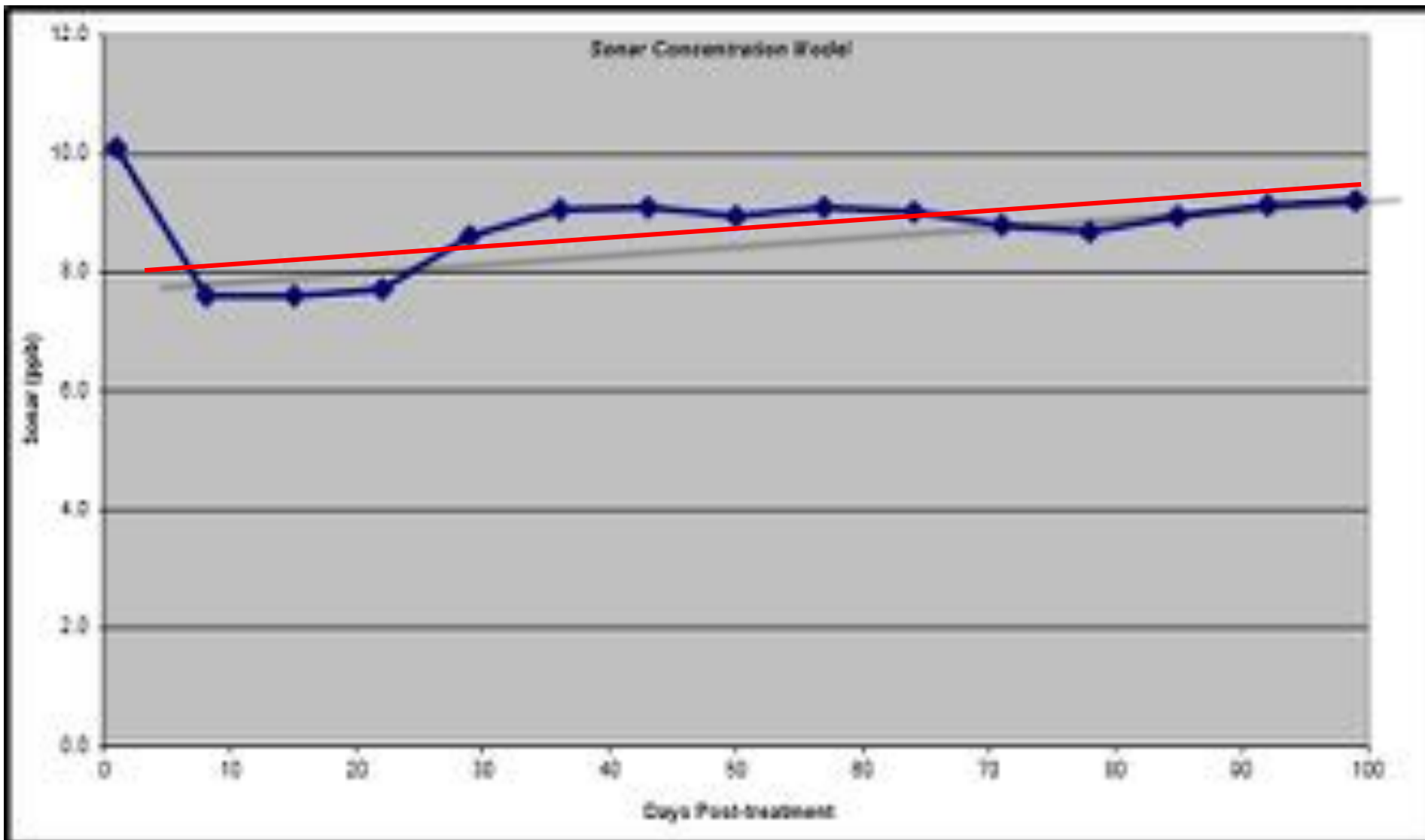
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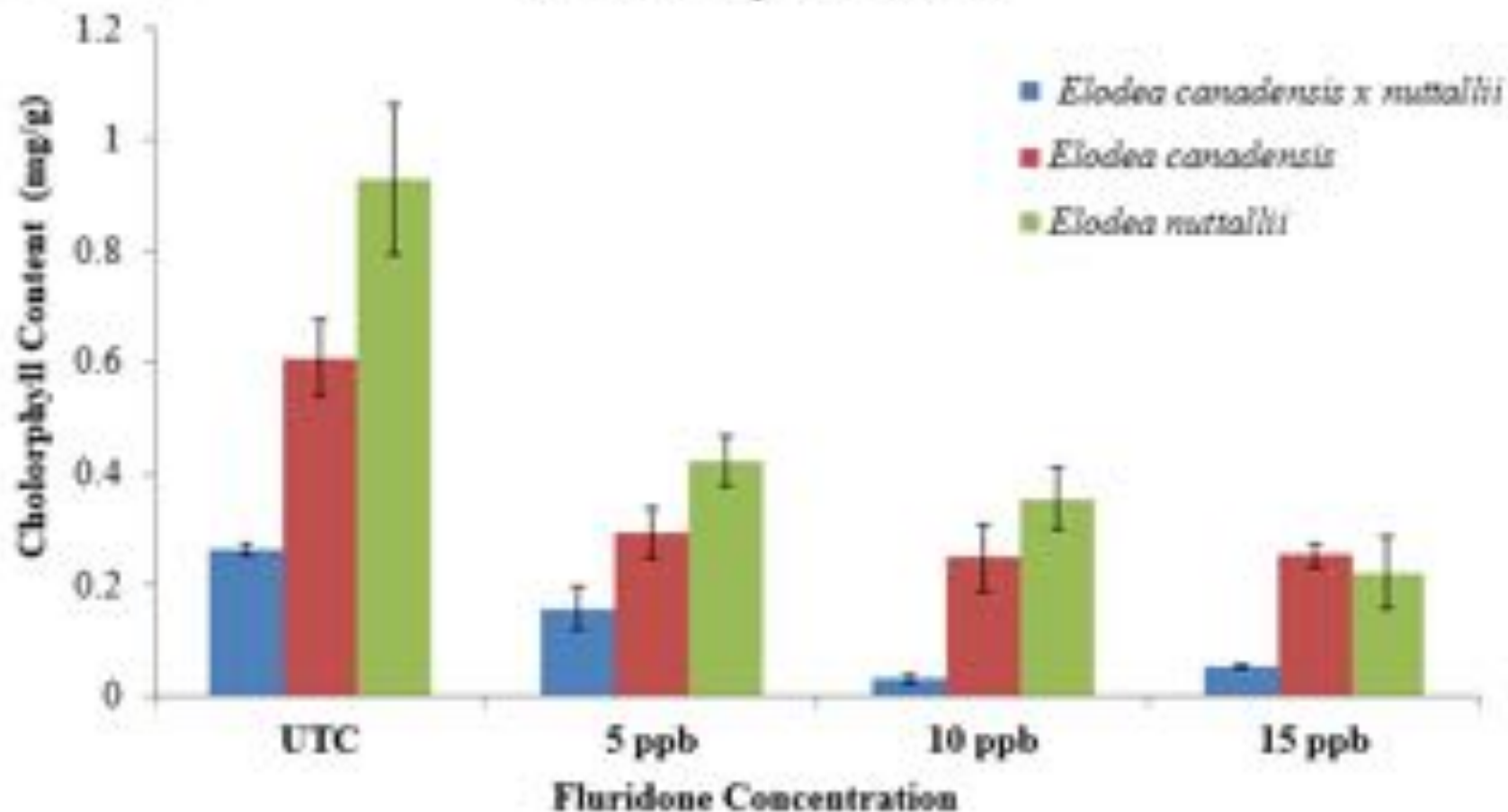
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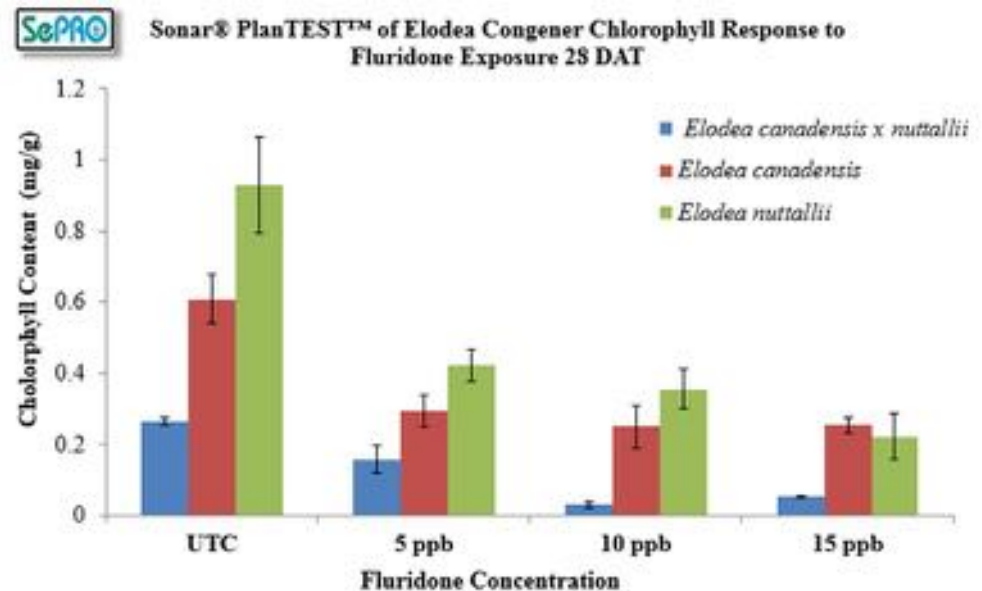


Sonar® PlanTEST™ of Elodea Congener Chlorophyll Response to Fluridone Exposure 28 DAT



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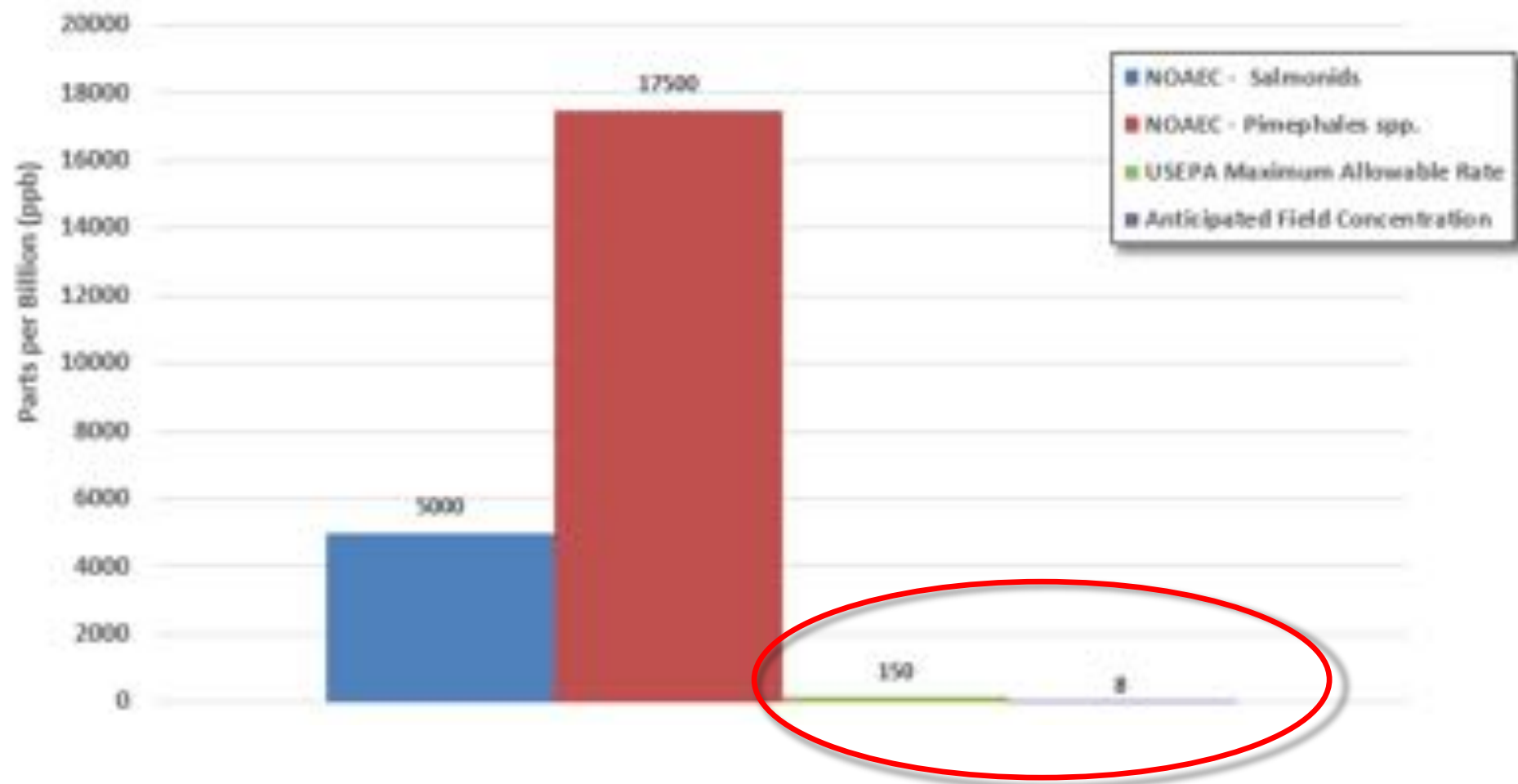
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Fluridone Information





Alaskan *Elodea canadensis* x *nuttallii* Hybrid Control Project
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Summary / Questions

- Sonar poses negligible risk to human health & the environment
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Elodea in interior Alaska

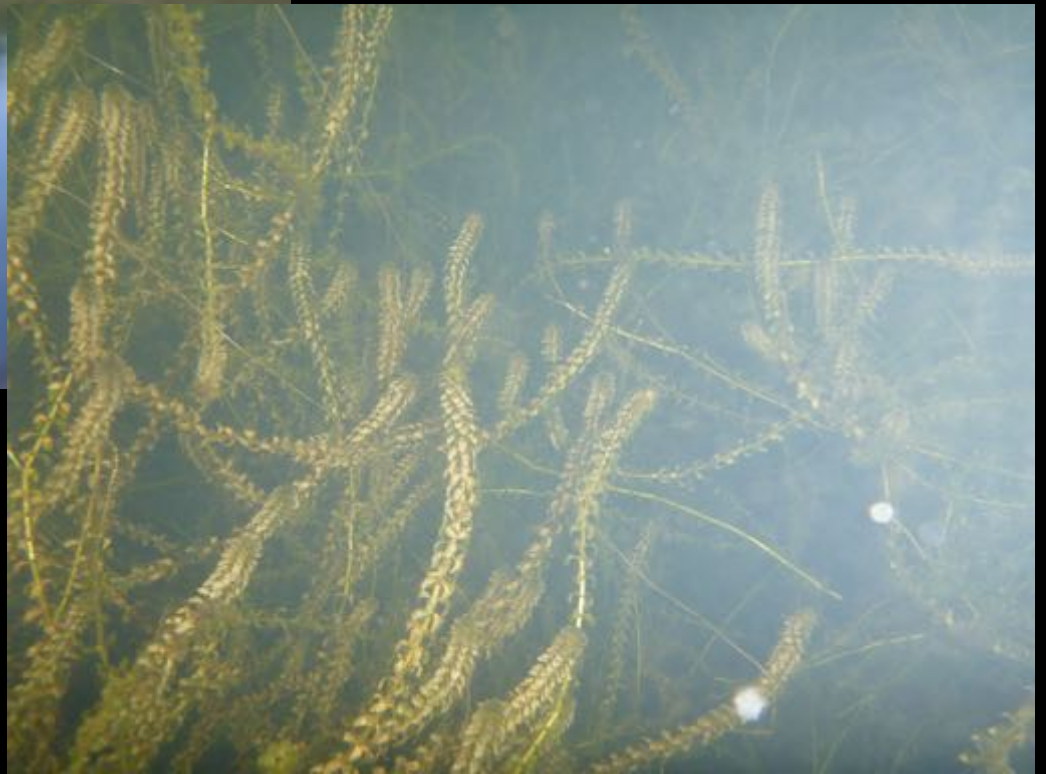


Public meeting
March 7th, 2016
Fairbanks City Hall

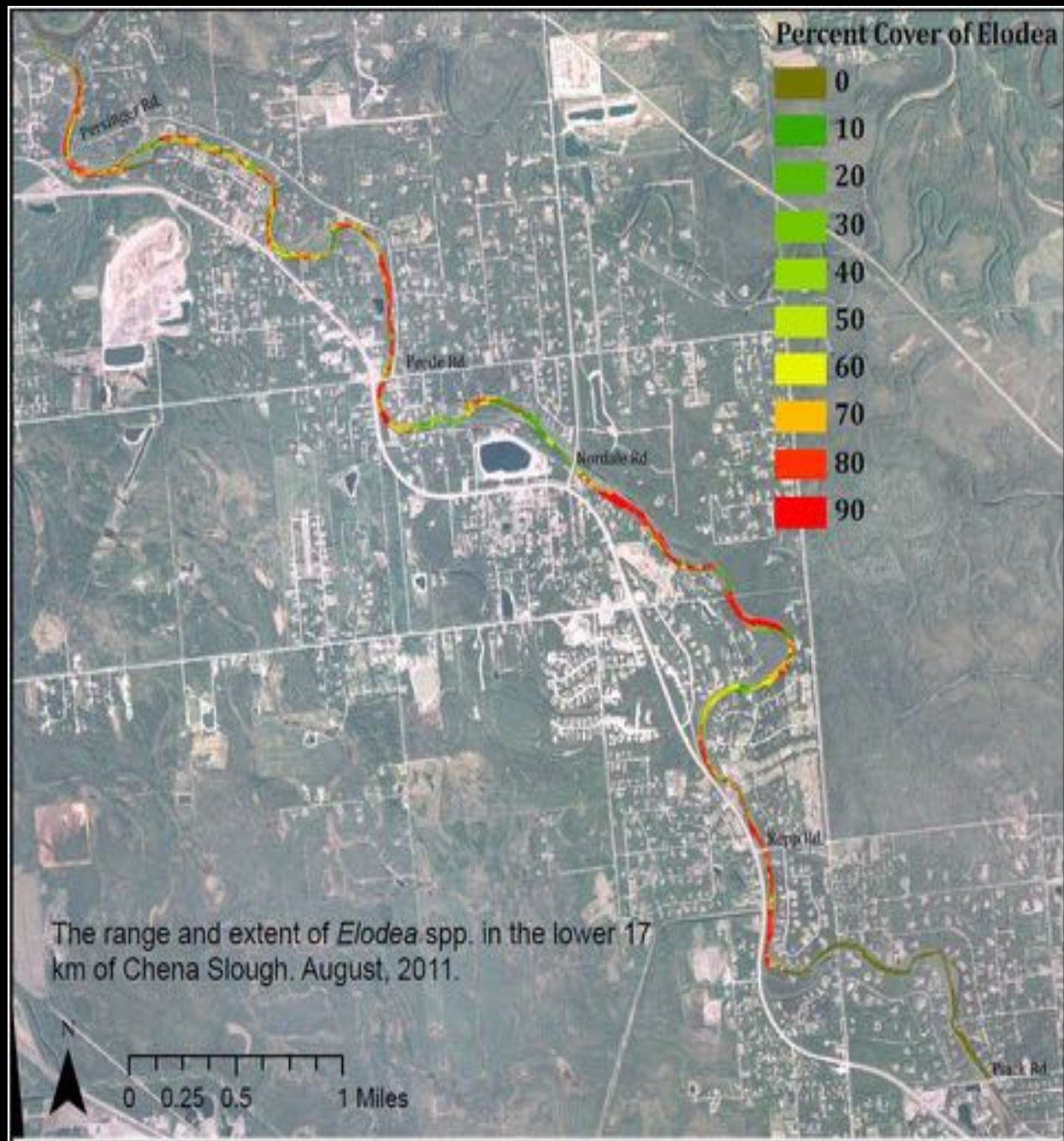




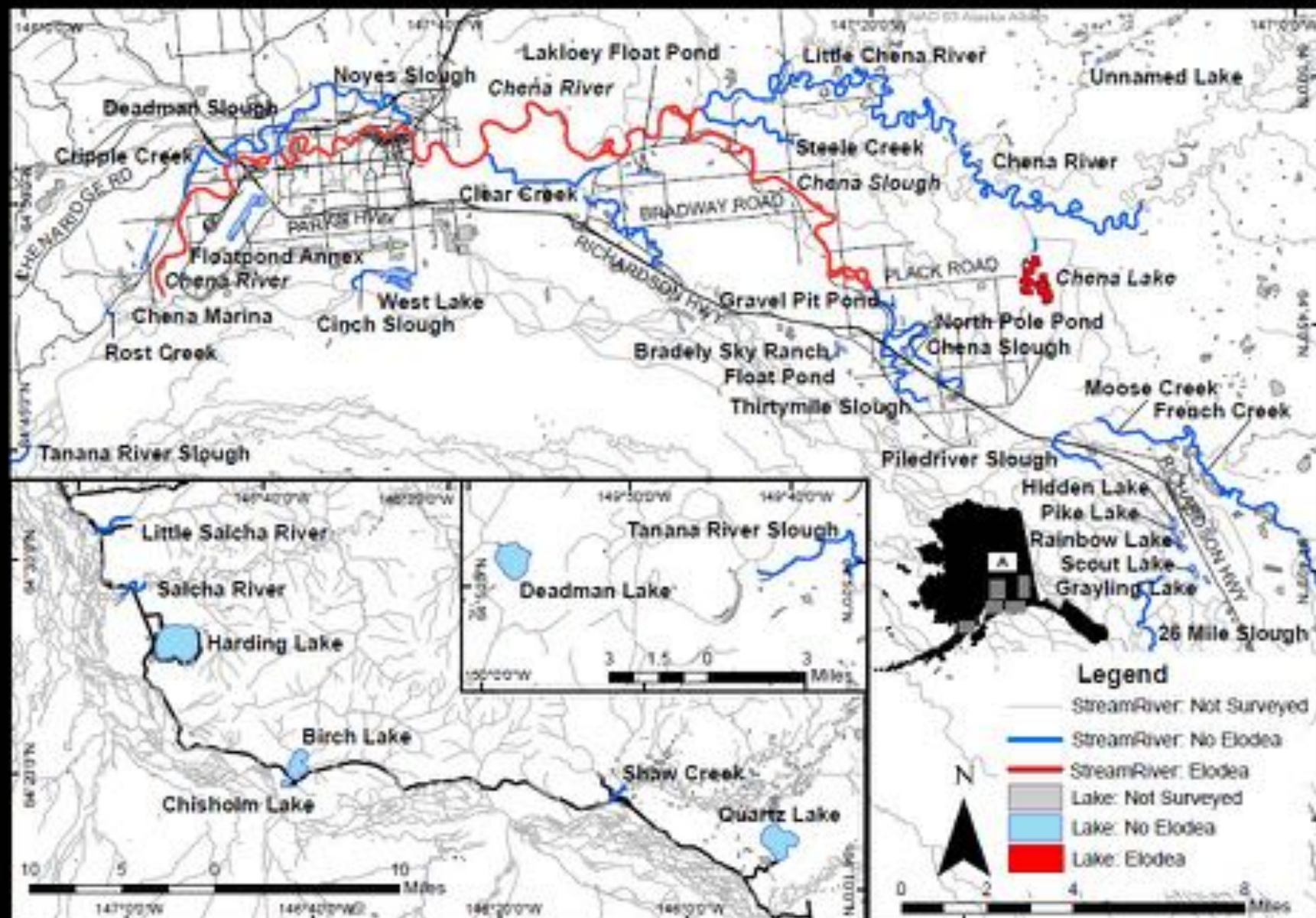
Chena Slough



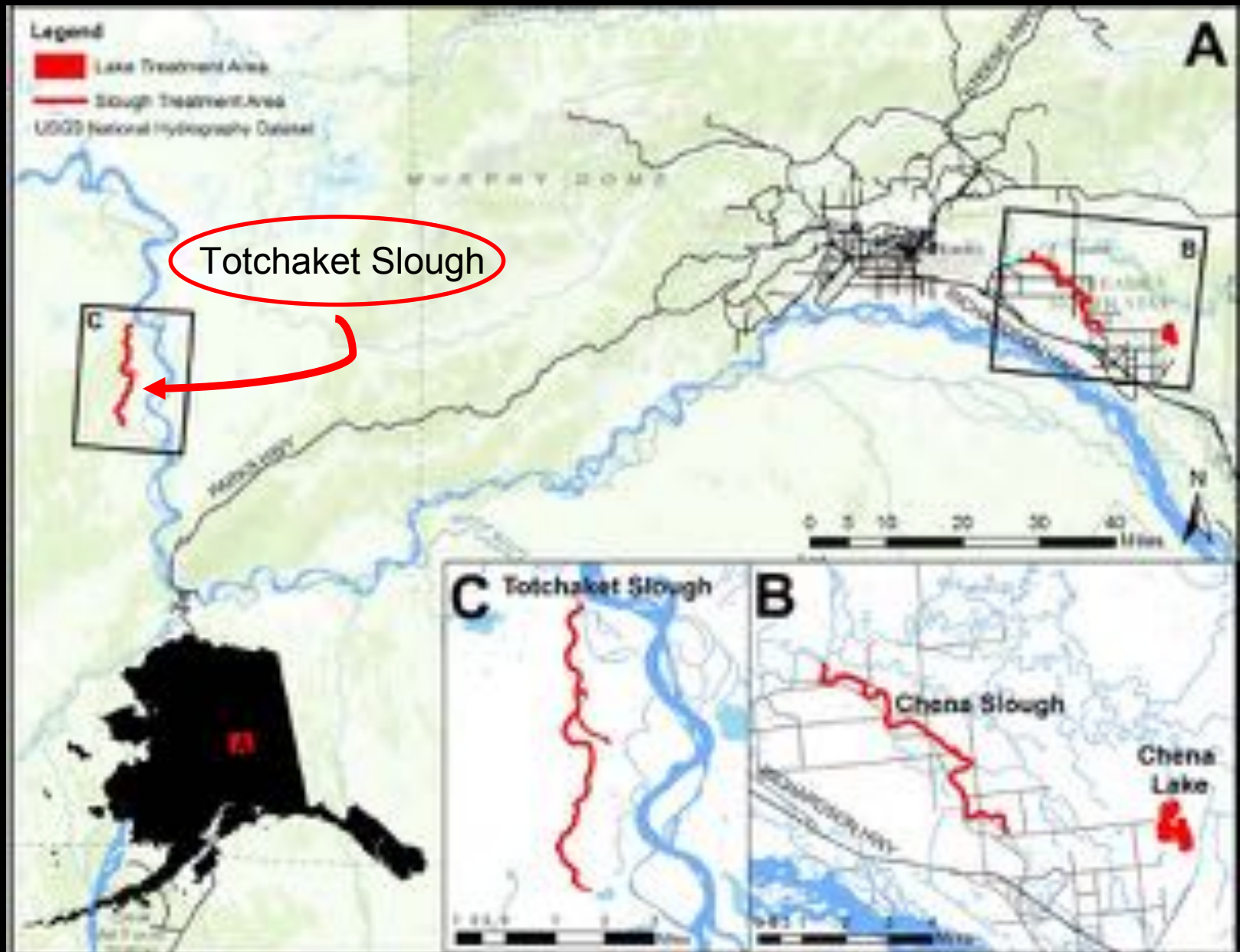
Fairbanks Elodea Steering Committee



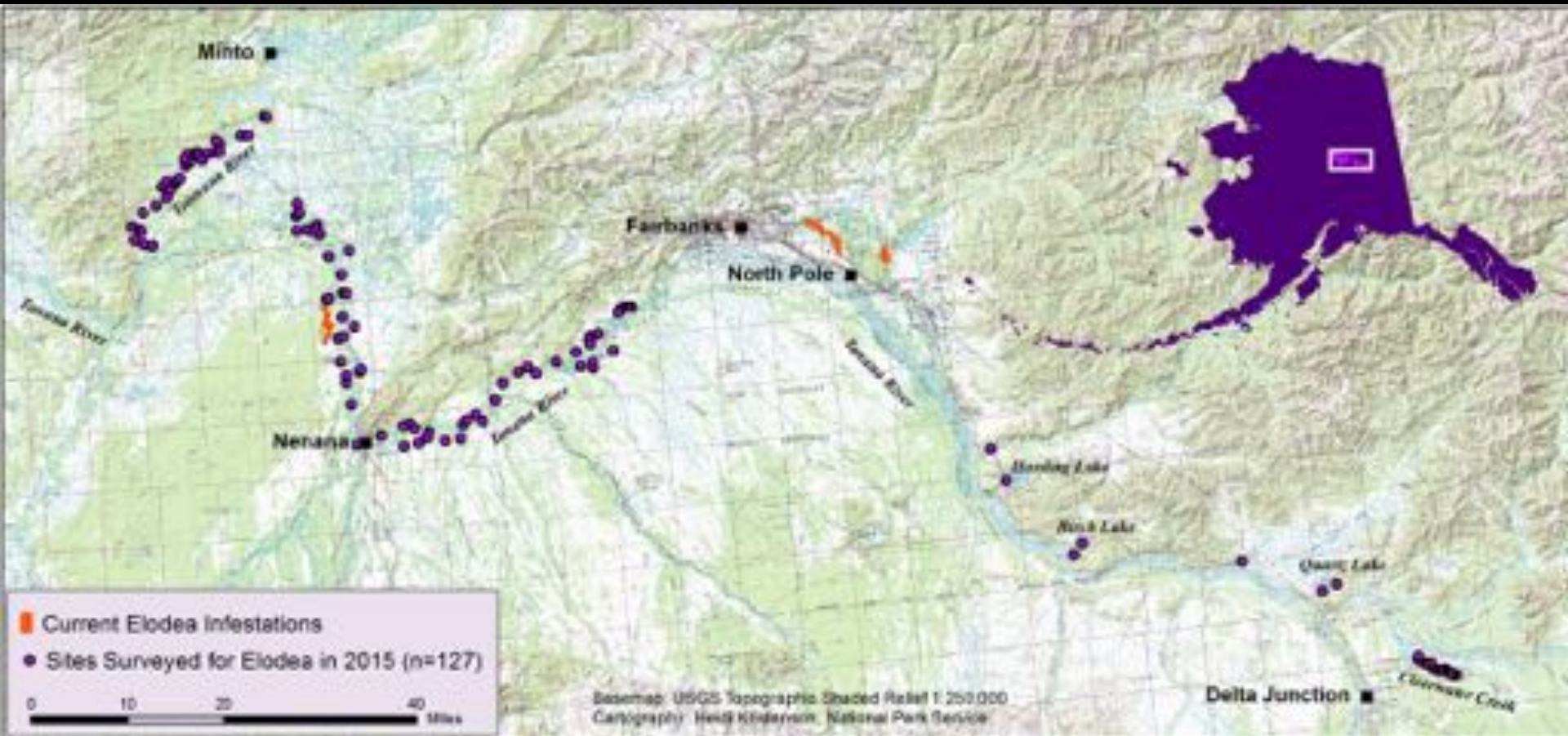
Fairbanks and North Pole Elodea Surveys



2015



2015 survey results



Known Elodea infestations in interior Alaska

Management Goal

To eradicate *Elodea* in interior Alaska and prevent spread of *Elodea* from existing infestations to uninfested water bodies



Integrated Pest Management (IPM) Strategy

...ecosystem-based strategy that focuses on long-term prevention of pests using a **combination of tools** such as biological, cultural, mechanical, physical, and chemical in way that **minimizes risks** to human health, beneficial and non target organisms, and the environment. IPM plans are based on science, and incorporate **adaptive management** approaches that allow for the most appropriate and effective treatment to prevent, eradicate, contain or control the pest (depending on the management goal).

5 principles of IPM

- Pest identification
- Monitoring and assessment
- Guidelines for when management action is needed
- Prevention
- Using a combination biological, cultural, physical, and chemical management tools

Alternatives

Control Options for *Elodea* spp.
in the Chena Slough near Fairbanks, Alaska

A compilation of potential treatments

April 28, 2011



In September 2010 the invasive plant *Elodea* spp. was documented growing in several miles of the Chena Slough and the Chena River. Photograph by: T12 Forest Service

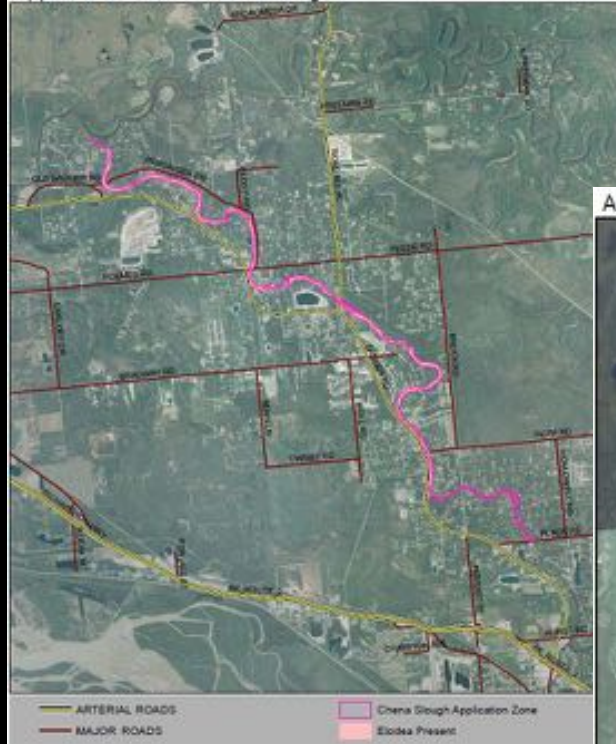
- No action
- Engineering methods
- Physical/ Mechanical control
- Chemical control

Mechanical control: Suction dredging and raking trials 2013-14



Proposed herbicide treatment areas

Application Zone - Chena Slough



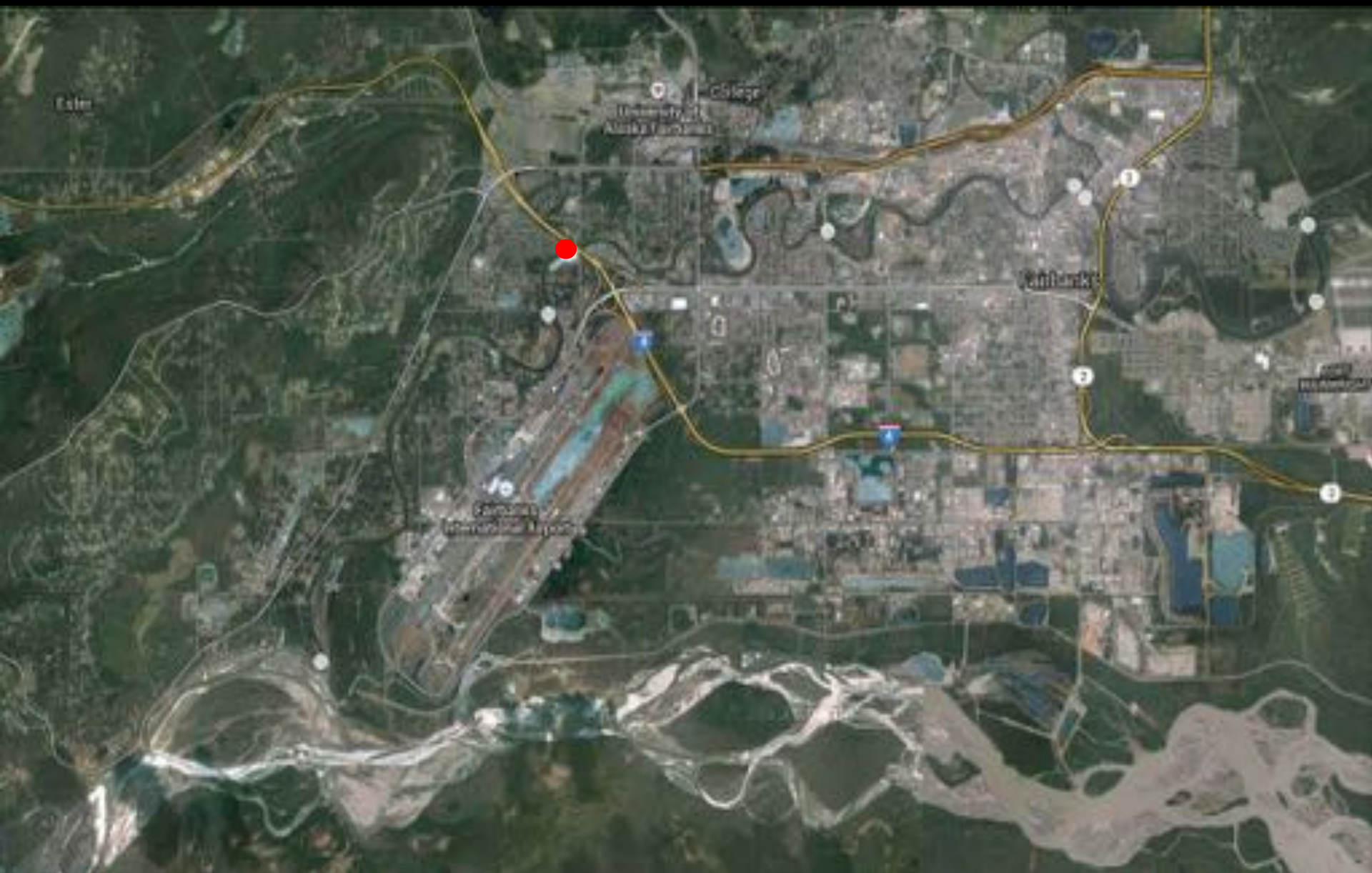
Application Zone - Totchaket Slough



Application Zone - Chena Lakes



Chena River – mechanical removal of Elodea



Preventing the spread of Elodea

- Public outreach and education
- Signage at boat launches and float ponds
- Survey and monitoring



Thank you!



Fairbanks Soil & Water Conservation District
7-8 March 2016

Plan of Operations 2016-19

Totchaket Slough, Chena Lake, Chena Slough

Andrew Skibo, Ph.D.

Aquatic Research & Development Lead, Western US

SePRO Corporation

Andrew.Skibo@Sepro.com | 303.229.9622

www.Sepro.com

Solar Treatment Plant.

Totchaket Slough



Totchaket Slough



- 232 acres
- Mean Depth – 3 ft.
- Volume – 696 acre-feet
- 3 FasTEST Sites
 - ▲ FasTEST Locations
- 5 Sample Events/year

Totchaket Slough

Treatment Plan Detail

- 2016
 - Budget: ~\$90,318.80, 132 Pails (2630.8#) Sonar ONE, 20 Gallons Sonar Genesis
 - Spring Treatment: Sonar Genesis (liquid) & Sonar ONE (pellets)
 - Summer Treatment: Sonar ONE
 - Fall Treatment: Sonar ONE
- 2017
 - Budget: ~\$90,318.80, 132 Pails (2630.8#) Sonar ONE, 20 Gallons Sonar Genesis
 - Spring Treatment: Sonar Genesis (liquid) & Sonar ONE (pellets)
 - Summer Treatment: Sonar ONE
 - Fall Treatment: Sonar ONE
- 2018
 - Budget: ~\$90,318.80, 132 Pails (2630.8#) Sonar ONE, 20 Gallons Sonar Genesis
 - Spring Treatment: Sonar Genesis (liquid) & Sonar ONE (pellets)
 - Summer Treatment: Sonar ONE
 - Fall Treatment: Sonar ONE

Totchaket Slough – SonarOne (pellet) Treatments

- Slough will be treated as a single Management Zone
 - 30 ppb will be applied during the spring treatment
 - 20 ppb will be applied during the summer treatment
 - 20 ppb will be applied during the fall treatment
 - The combination of Sonar pellet applications plus the injection of Sonar Genesis are designed to maintain an in-water concentration of Sonar of 4-8 ppb during the 12 Week treatment cycle.

Totchaket Slough – Sonar Genesis (liquid) Treatment

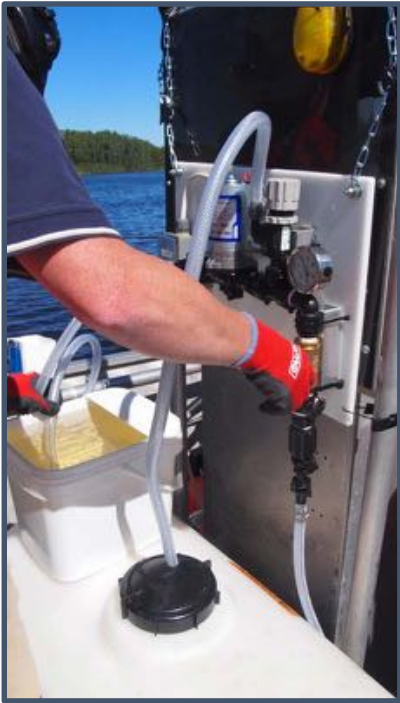
- Slough will be treated as a single Management Zone
 - 5 ppb will be applied during the spring treatment cycle, each year
 - The combination of Sonar pellet applications plus the application of Sonar Genesis are designed to maintain an in-water concentration of Sonar of 4-8 ppb during the 12 Week treatment cycle.

Application Equipment

Vortex™ Granular Spreader



Application Equipment: Sonar Genesis Liquid Application

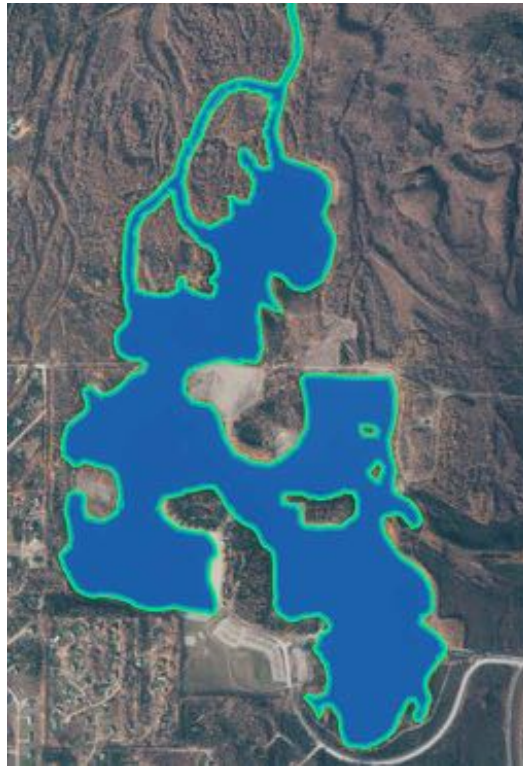


Totchaket Slough

Budget Summary

- Totchaket Slough (4 year program): ~\$270,956.40
- Equipment: ~\$12,000
- FasTEST : ~\$1,425/year
 - Schedule: 2, 4, 8, 12, 16WAT
 - 3 FasTEST sites per sample period
- *Note: estimated cost do not include shipping*

Sonar Treatment Plan: Chena Lake



Sonar Treatment Plan: Chena Lake



- 234.3 acres
- Mean Depth – 16 ft.
- Volume – 3748 acre-feet
- 4 FasTEST Sites
 - Locations TBD
- 4 Sample Events/year

Sonar Treatment Summary:

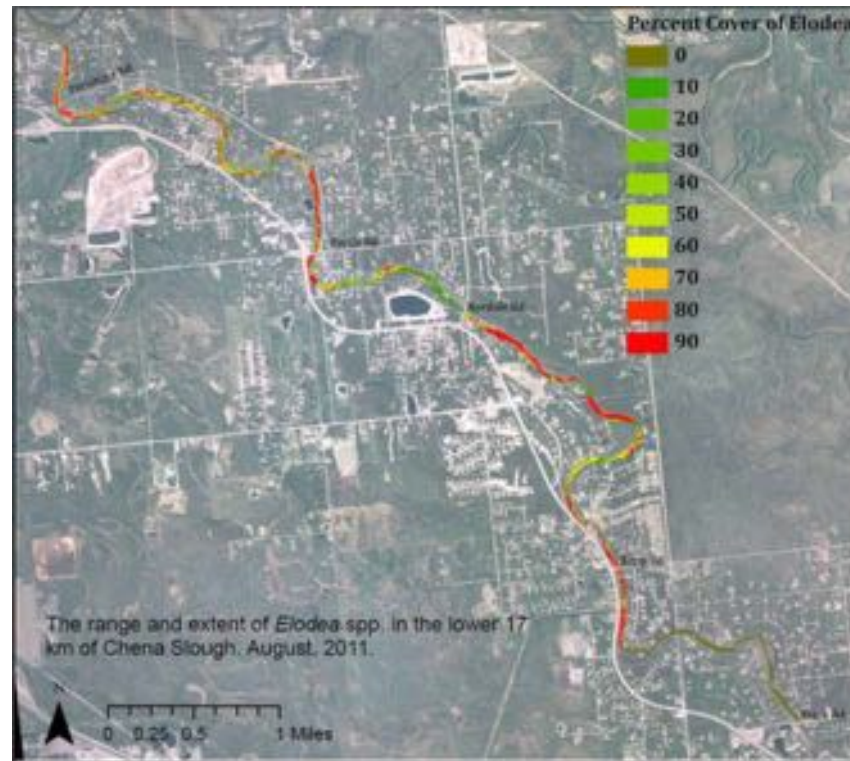
Chena Lake

- 2016
 - Budget: ~\$98,700
 - Spring Treatment: Sonar Genesis (liquid) & SonarOne (pellets)
 - Summer Treatment: SonarOne
- 2017
 - Budget ~\$47,000
 - Summer Treatment: SonarOne
- 2018
 - Budget ~\$47,000
 - Summer Treatment: SonarOne

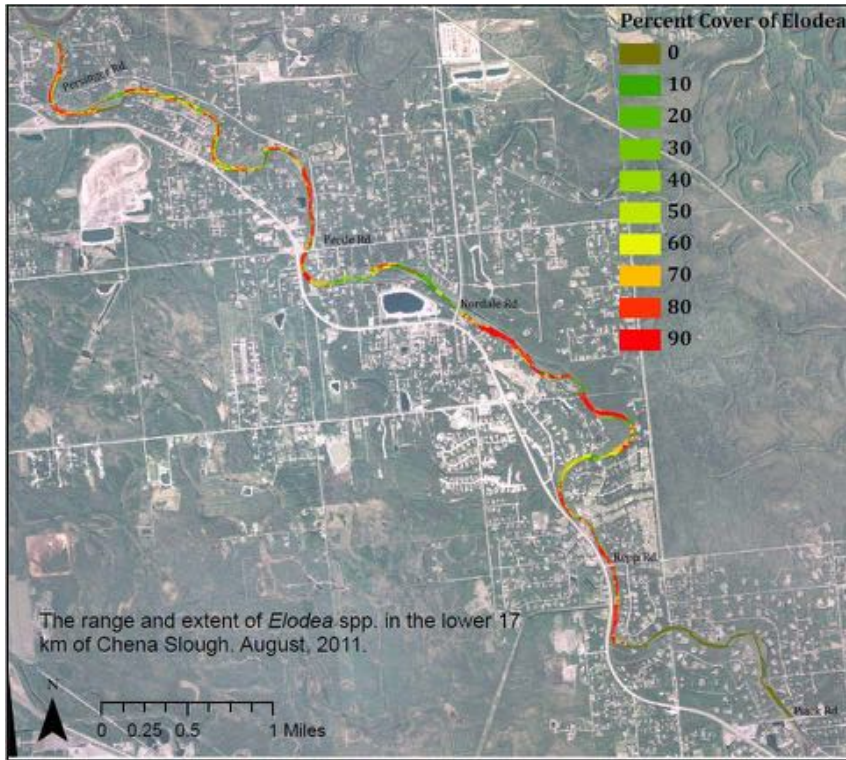
Sonar Treatment Summary: Chena Lake

Chena Lake										
2016			App 1		App 2					
Whole-lake Option		Sonar Formulation	Rate	Gallon/#	Rate	#		QTY	Cost	Cost/Acre
Size (acres)	234.3	Sonar Genesis (liquid)	7.0	141.7			Sonar Genesis (Gal)	142	\$ 38,563.50	\$ 414.59
Mean Depth (ft.)	16	SonarOne	6.0	1214.6	3.0	607.3	SonarOne (Pails)	91.1	\$ 58,574.63	
Volume (acre-feet)	3748.8								\$ 97,138.13	
2017			App 1		App 2					
Whole-lake Option		Sonar Formulation	Rate	Gallon/#	Rate	#		QTY	Cost	Cost/Acre
Size (acres)	234.3	Sonar Genesis (liquid)	0.0	0.0			Sonar Genesis (Gal)	0	\$ -	\$ 194.44
Mean Depth (ft.)	16	SonarOne	7.0	1417.0			SonarOne (Pails)	70.9	\$ 45,558.04	
Volume (acre-feet)	3748.8								\$ 45,558.04	
2018			App 1		App 2					
Whole-lake Option		Sonar Formulation	Rate	Gallon/#	Rate	#		QTY	Cost	Cost/Acre
Size (acres)	234.3	Sonar Genesis (liquid)	0.0	0.0			Sonar Genesis (Gal)	0	\$ -	\$ 194.44
Mean Depth (ft.)	16	SonarOne	7.0	1417.0			SonarOne (Pails)	70.9	\$ 45,558.04	
Volume (acre-feet)	3748.8								\$ 45,558.04	
Total Product	\$188,254.21									
Fastest (estimate 3 yr)	\$ 4,560.00	(4 sites, 4 sampling events/year, 3 years = 48 FasTEST)								
Grand Total	\$192,814.21									

Sonar Treatment Plan: Chena Slough



Sonar Treatment Plan: Chena Slough



- 118.78 acres
- Mean Depth – 3 ft.
- Mean Flow – 52 CFS
- Volume – 356 acre-feet
- 8 FasTEST Sites
 - Locations TBD
- 14 Sample Events/year
- Final acres, volume and treatments areas to be finalized (small adjustments TBD)

Sonar Treatment Summary: Chena Slough

- 2016
 - Budget: ~\$148,000
 - Spring Treatment: Sonar H4C
 - Summer Treatment: Sonar H4C
 - Sonar Genesis Drip Treatment (12 Week Program)
- 2017
 - Budget: ~\$137,000
 - Spring Treatment: Sonar H4C
 - Summer Treatment: Sonar H4C
 - Sonar Genesis Drip Treatment (12 Week Program)
- 2018
 - Budget: ~\$137,000
 - Spring Treatment: Sonar H4C
 - Summer Treatment: Sonar H4C
 - Sonar Genesis Drip Treatment (12 Week Program)
- 2019
 - Budget: ~\$108,000
 - Spring Treatment: Sonar H4C
 - Summer Treatment: Sonar H4C
 - Sonar Genesis Drip Treatment (12 Week Program)
- *Program and budget subject to change following year one (adjustments would likely lower budget)*

Chena Slough

Sonar Genesis – Injection Treatment

Week	Rate	Flow Rate	Acre-feet/day	Acre-feet/week	Gallon/day	Gallons/week
1	8	52.6	104.1	729.0	4.5	31.5
2	8	52.6	104.1	729.0	4.5	31.5
3	6	52.6	104.1	729.0	3.4	23.6
4	6	52.6	104.1	729.0	3.4	23.6
5	6	52.6	104.1	729.0	3.4	23.6
7	6	52.6	104.1	729.0	3.4	23.6
8	6	52.6	104.1	729.0	3.4	23.6
9	4	52.6	104.1	729.0	2.2	15.7
10	4	52.6	104.1	729.0	2.2	15.7
11	4	52.6	104.1	729.0	2.2	15.7
12	4	52.6	104.1	729.0	2.2	15.7
						244

Chena Slough

Sonar Genesis – Injection Treatment



Chena Slough

Sonar Genesis – Injection Treatment



Chena Slough

Sonar Genesis – Injection Treatment



Chena Slough – Sonar H4C (pellet) Treatments

- Slough will be divided into 5 Management Zones
 - 25-70 ppb will be applied during the spring treatment (depending upon site and year of treatment)
 - 25-50 ppb will be applied during the summer treatment (depending upon site and year of treatment)
 - The combination of Sonar pellet applications plus the injection of Sonar Genesis are designed to maintain an in-water concentration of Sonar of 4-8 ppb during the 12 Week treatment cycle.

Chena Slough – Sonar **ONE** (pellet) Treatments

- The slough contains back water areas that should be inspected during each application period. Some small areas may require the application of SonarOne or Sonar Genesis via a backpack sprayer or small pellet spreader (hand crank grass seed spreader). These inspections and treatments are to ensure coverage of all plants within the slough.

Chena Lake & Slough Budget Summary

- Chena Lake (3 year program): ~\$193,000
- Chena Slough (4 year program): ~\$530,000
- Equipment: ~\$28,000

• *Note: estimated cost do not include shipping*

Summary / Questions

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