Potential impacts of *Elodea canadensis* on freshwater ecosystems of Alaska

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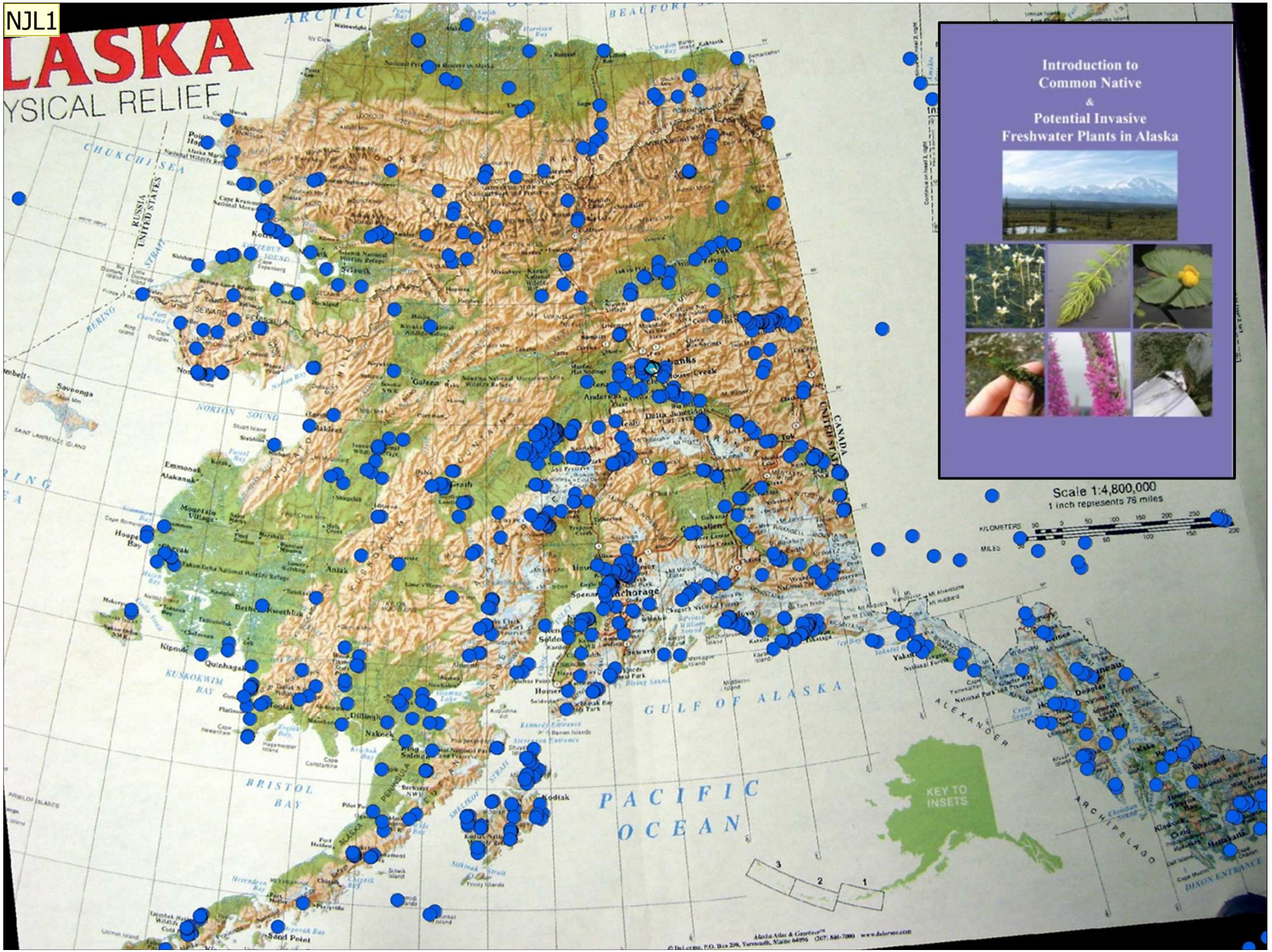
NJL1


LASKA
YSICAL RELIEF
Introduction to
Common Native
&
Potential Invasive
Freshwater Plants in Alaska
Scale 1:4,800,000
1 inch represents 76 miles
KILOMETERS
MILES
KEY TO INSETS
PACIFIC
OCEAN
GULF OF ALASKA
BERING SEA
CHUKCHI SEA
BEAUFORT SEA
BRISTOL BAY
NORTON SOUND
Anchorage
Fairbanks
Juneau
Kodiak
Nome
Barrow
Sand Point

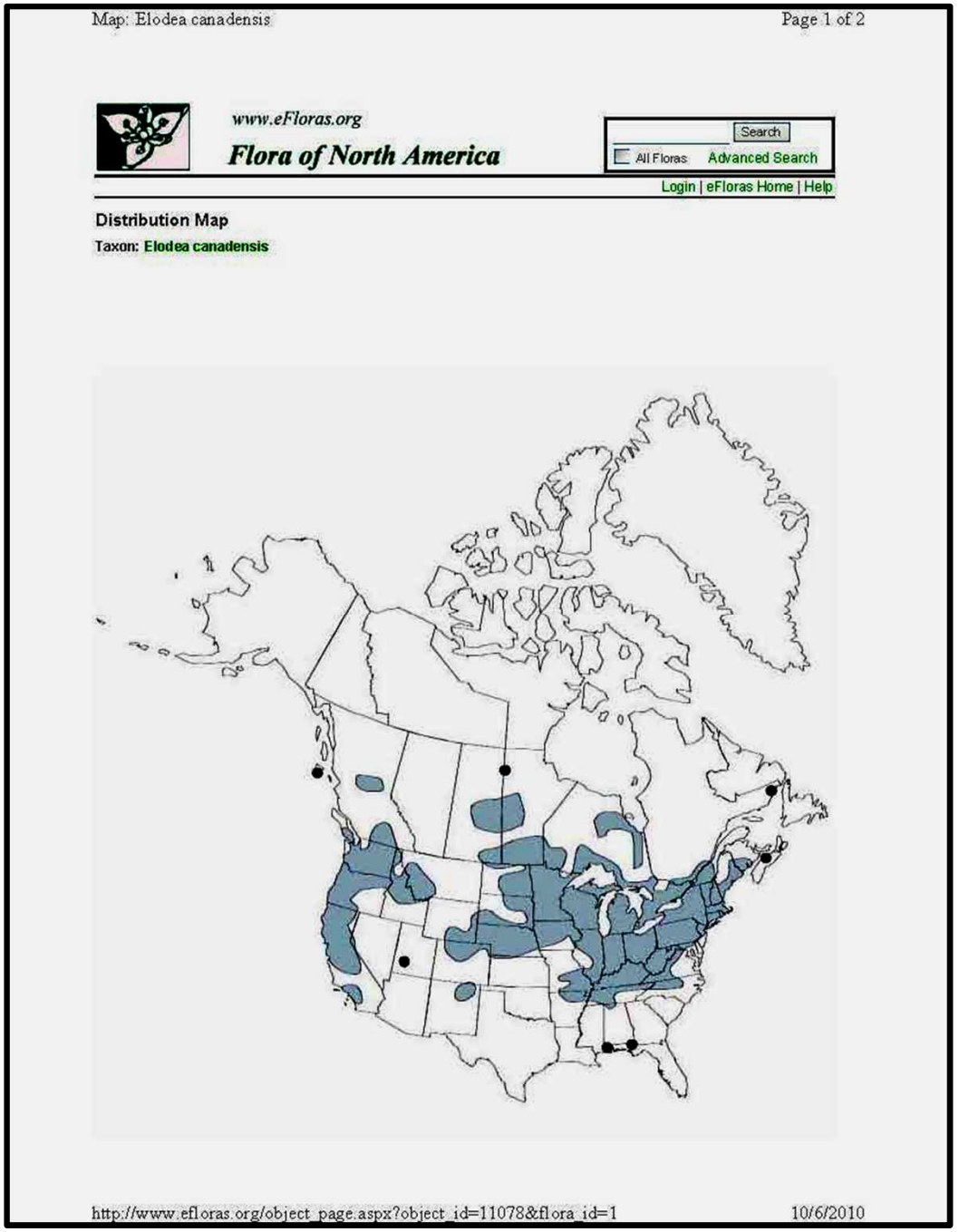
Slide 2

NJL1 I think this slide and the next one should be moved down to after what is currently slide 5.
Nicholas J. Lisuzzo, 2/24/2011

Known Distribution of *Elodea* in North America

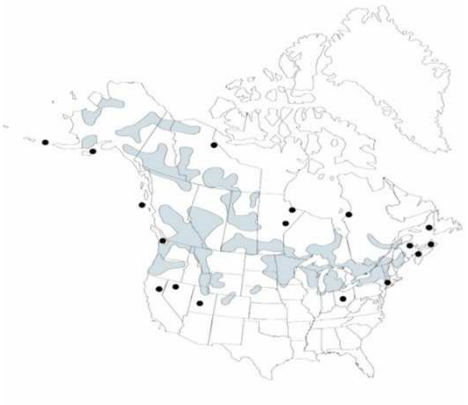
1000 mile to next nearest known native population

Invasive to Alaska (2010)



Distribution of native aquatic plants

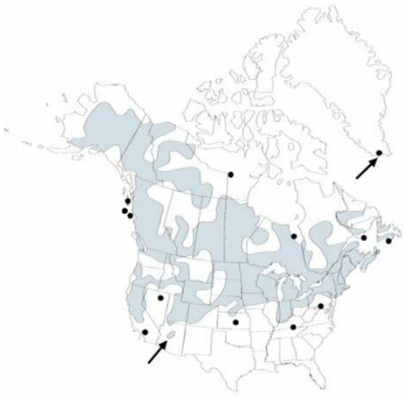
Ceratophyllum demersum



Potamogeton richarsonii

Potamogeton prealongus

Sparganium hyperboreum



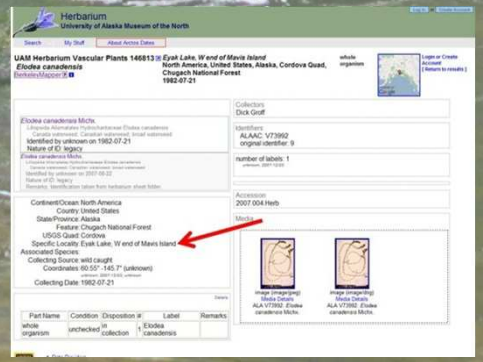
Potamogeton gramineus

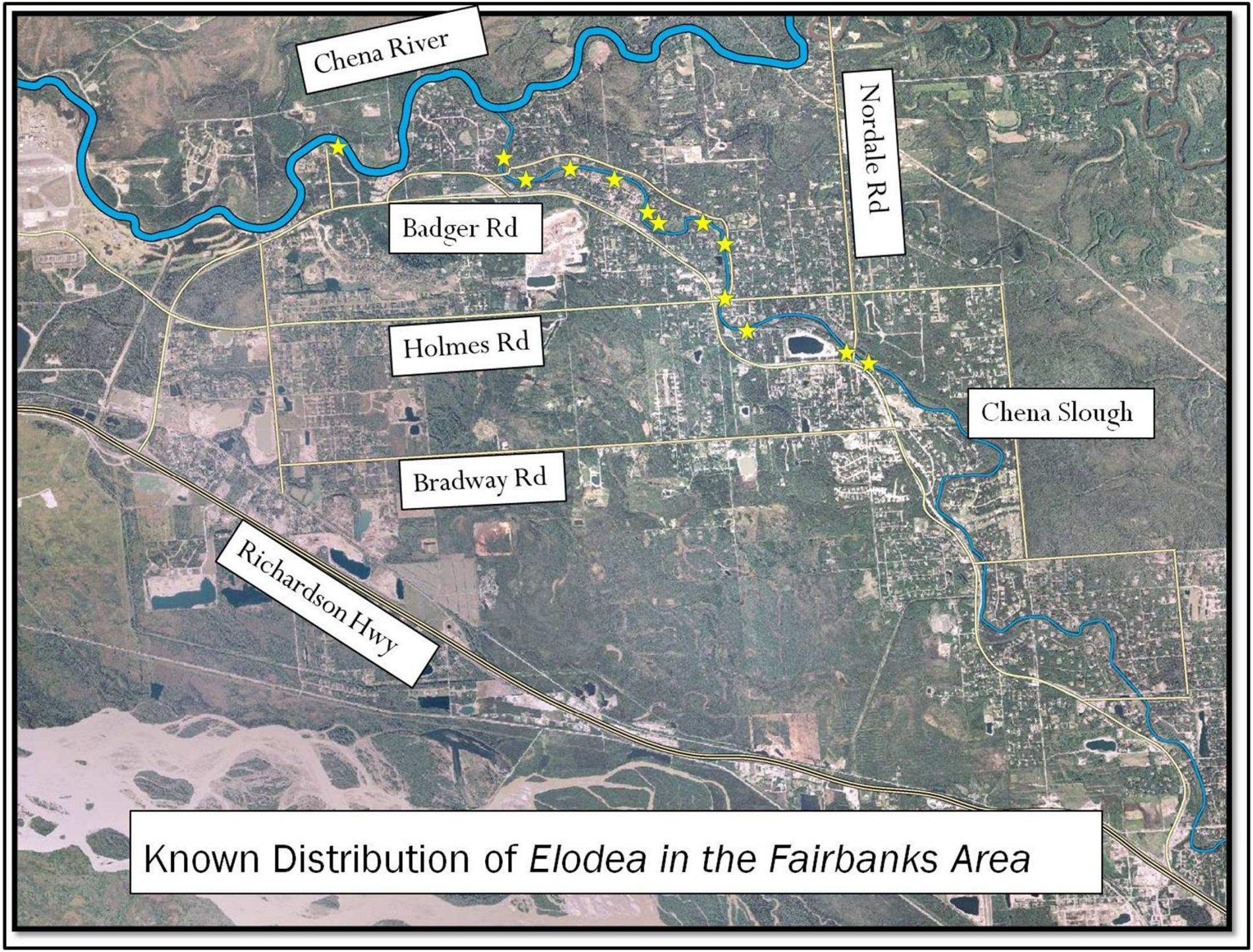
Sparganium angustifolium

Elodea Collections

- 2010 survey work by Wurtz and Lisuzzo revealed extensive populations along Chena Slough and isolated populations in Chena River

2009




Chena River
Nordale Rd
Badger Rd
Holmes Rd
Chena Slough
Bradway Rd
Richardson Hwy
Known Distribution of *Elodea in the Fairbanks Area*

Elodea canadensis

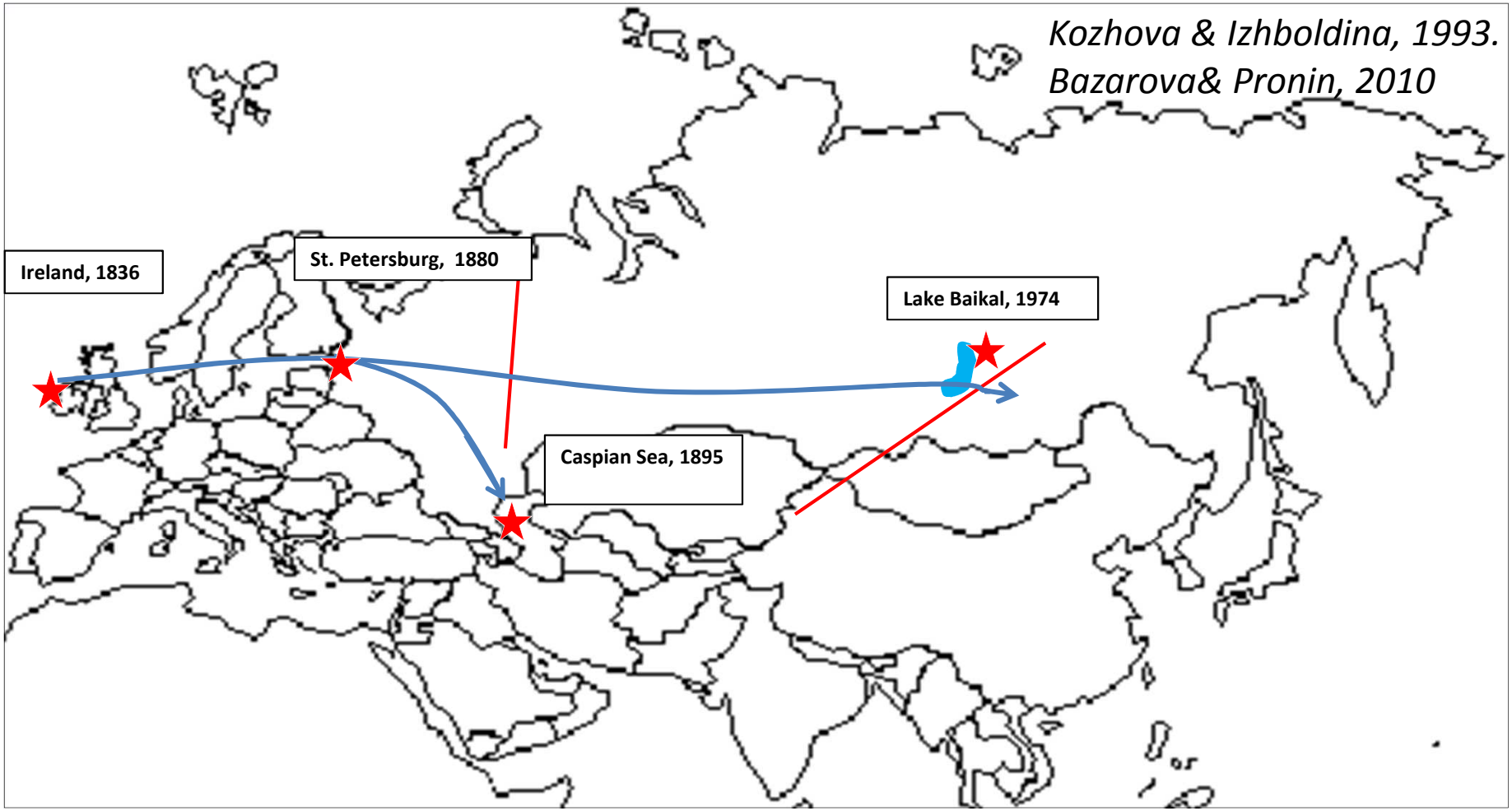
- Submersed aquatic plant
- Dioecious
- Reproduces primarily by vegetative growth
- It spreads easily via fragmentation
- Frequently grows in a tangled mass
- Can survive being frozen in ice
- Grows rapidly and can physically and chemically outcompete other aquatic plants

How dense are the populations

Fast flowing sites with gravel substrate

Slow flowing sites with thick sediment

The anthropogenic spread of *Elodea* across Eurasia



Ireland to Lake Baikal
5000 miles
Two continental divides
30 miles per year

St. Petersburg to the Caspian Sea
1000 miles
Upstream
70 miles per year

Fairbanks to Bethel
950 miles
Downstream
????

Where does *Elodea* grow well?

Good Habitat	Poor Habitat
• Still or slow moving water (< 1.0 m/s)	• Fast moving water (> 1.0 m/s)
• Cold Water (summer temperatures between 10 and 20 C)	• Very cold or warm water (summer temperatures below 10 or above 25 C)
• Silty or organic substrates	• Sandy substrates
• Clear water	• Turbid water

Bowmer et. al., 1995, Barrat-Segretain et. al. 2002.


CHENA HOT SPRINGS RD
STEESE HWY
NORDALE RD
COLLEGE RD
INTERMEDIATE
Chena River
Chena Slough
AIRPORT WAY
MITCHELL EXPY
GOOD
POOR
Tanana River
RICHARDSON HWY
Small streams, sloughs, lakes, and fens?

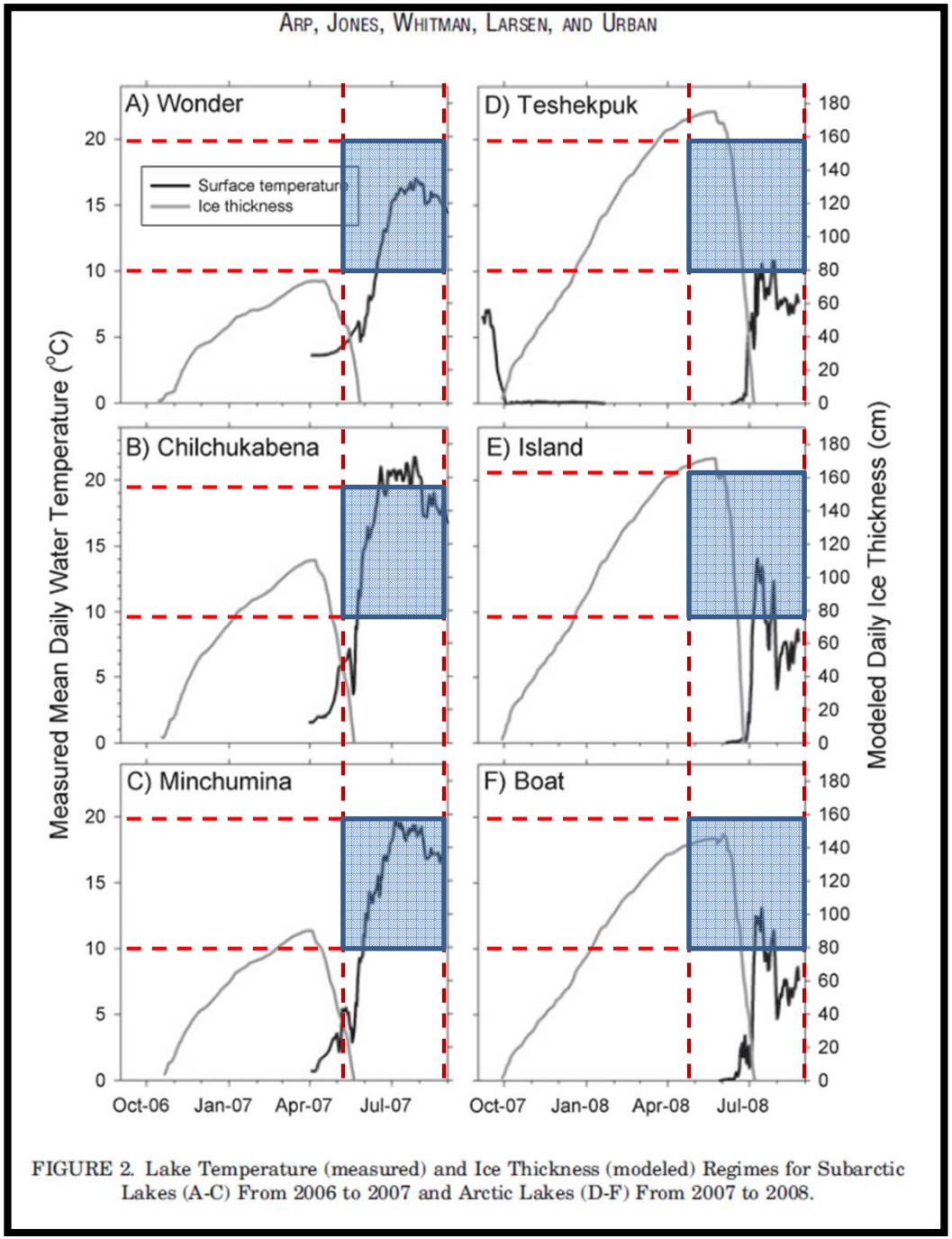


FIGURE 2. Lake Temperature (measured) and Ice Thickness (modeled) Regimes for Subarctic Lakes (A-C) From 2006 to 2007 and Arctic Lakes (D-F) From 2007 to 2008.

Will Alaskan lakes and streams be good habitat for *Elodea*?

What negative impacts could *Elodea* have in Alaska?

Dramatically changes freshwater habitats, altering DO, invertebrate communities, breeding and foraging habitat for fish and insects, decrease stream velocity, increase rates of sedimentation, decrease turbidity, alter nutrient availability (Buscemi, 1958, Pokorny et. al., 1984, Rorslett et. al., 1986).

Makes it difficult for boats to travel through infested waterways (Simpson, 1980, Bowmer et. al., 1995,).

Physically and chemically reduces native vegetation *(Erhard & Gross, 2006).*

Reduces aesthetics, and recreational opportunities (*Catlin & Wojtas, 1985, Josefsson & Andersson, 2001*).

Creates excellent habitat for Northern Pike.

Directly competes with Chinook salmon for breeding habitat in its native range (*Merz* et. al., *2008*).

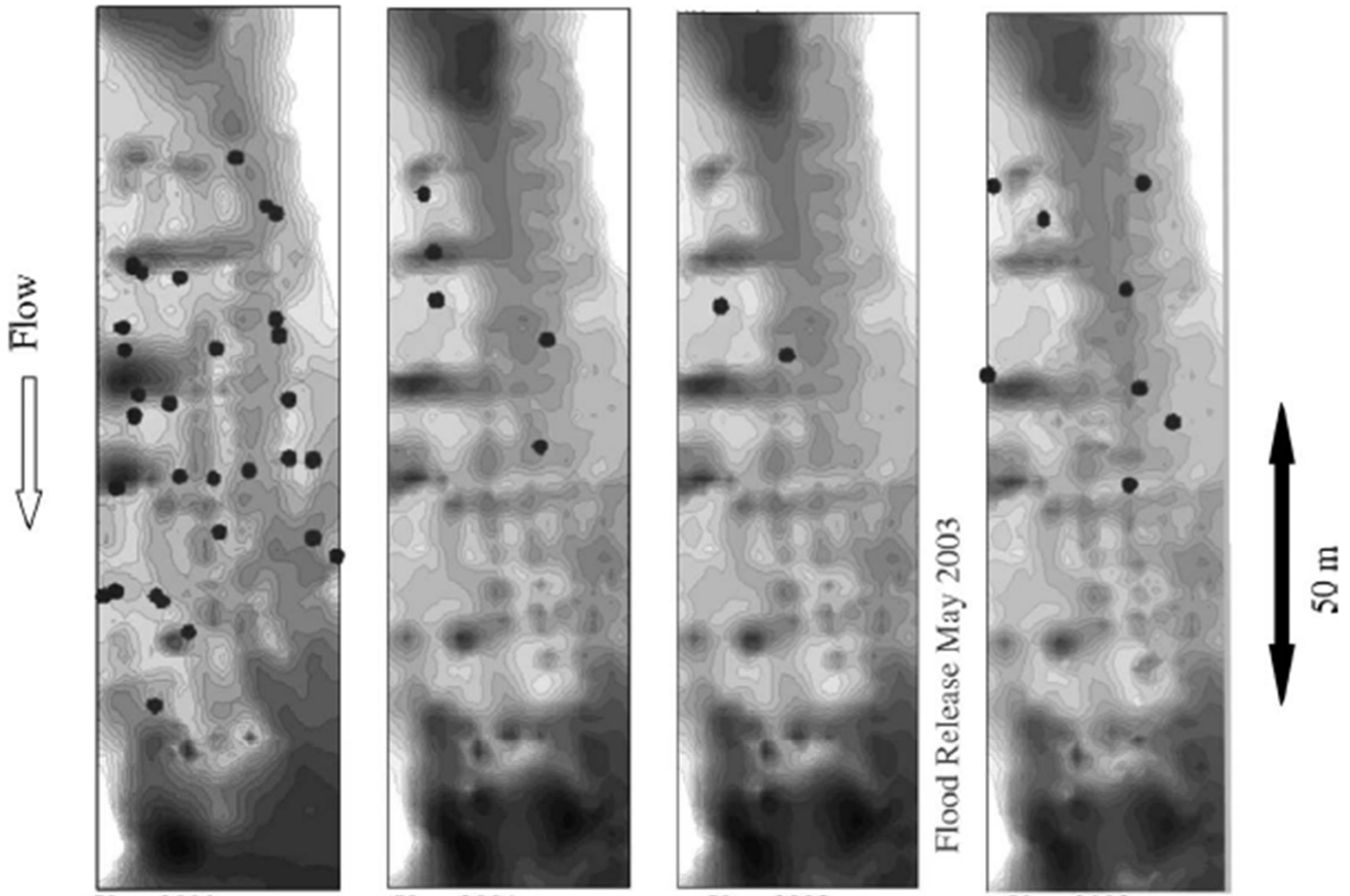


FIGURE 4.—Chinook salmon redds constructed at site 2 over four spawning seasons. The term "vegetation" refers to the percentage of the substrate covered by rooted vegetation, the term "redds" to the proportion of the redds in the Mokelumne River that were constructed at site 2.

The following assumptions are based on the evidence found in the peer reviewed scientific literature.

1. Without human intervention, *Elodea* will spread. Historically most of its spread outside its native range can be traced directly to human activities.

2. *Elodea* will impact the value of Alaskan freshwater ecosystems, aesthetics, recreational, subsistence and commercial opportunities.

3. *Elodea* will *most likely* not cause catastrophic damage to any particular resource.

4. The impacts of *Elodea* may be significant enough to outweigh the cost of containment or control.

The impact does not need to be catastrophic to justify action

Some examples:

The average value for the commercial salmon harvest in Alaska is greater than 230 million dollars per year (*AK DF&G, 2005*).

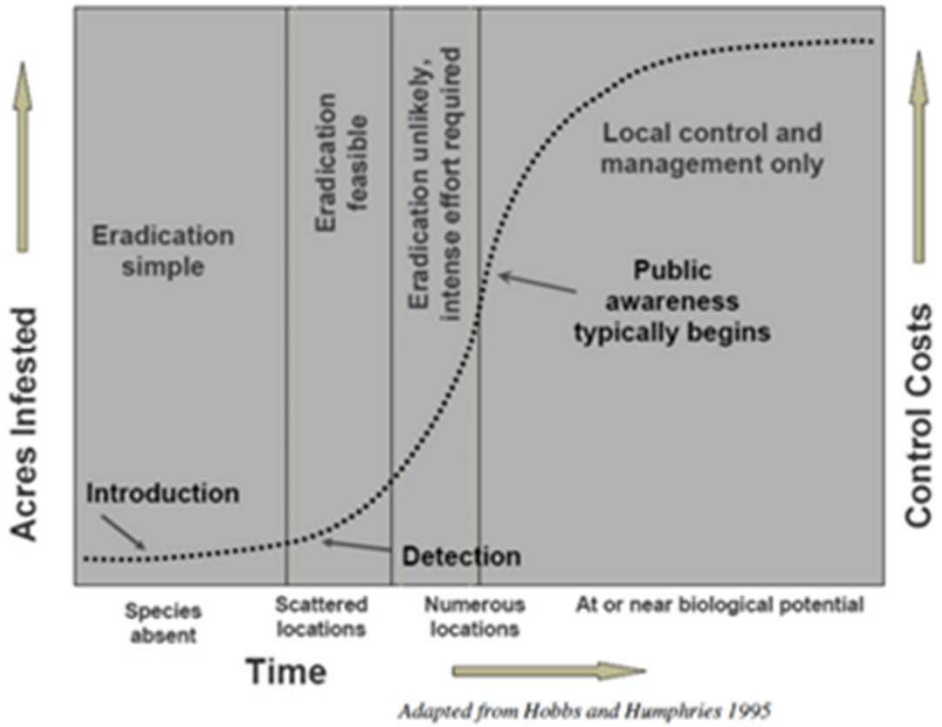
Degradation of habitat leading to the change of **1/10 of a single percent** of the total salmon population would be cost Alaska over **$230,000 per year**.

The sport-fishing industry in Alaska is valued at 1.4 billion dollars per year (*AK DF&G, 2007*).

A reduction of **1/10 of a single percent** in sport-fishing opportunities would cost Alaska **1.4 million dollars per year**.

A reduction of **1/10 of a single percent** in sport-fishing opportunities in the interior alone would cost interior Alaska **98,000 dollars per year**.

Can we control Elodea?



Hobbs, R.J. and S.E. Humphries. 1995. An integrated approach to the ecology and management of plant invasions. Conservation Biology. 9(4):761-770.

Aquatic Weed Control Methods

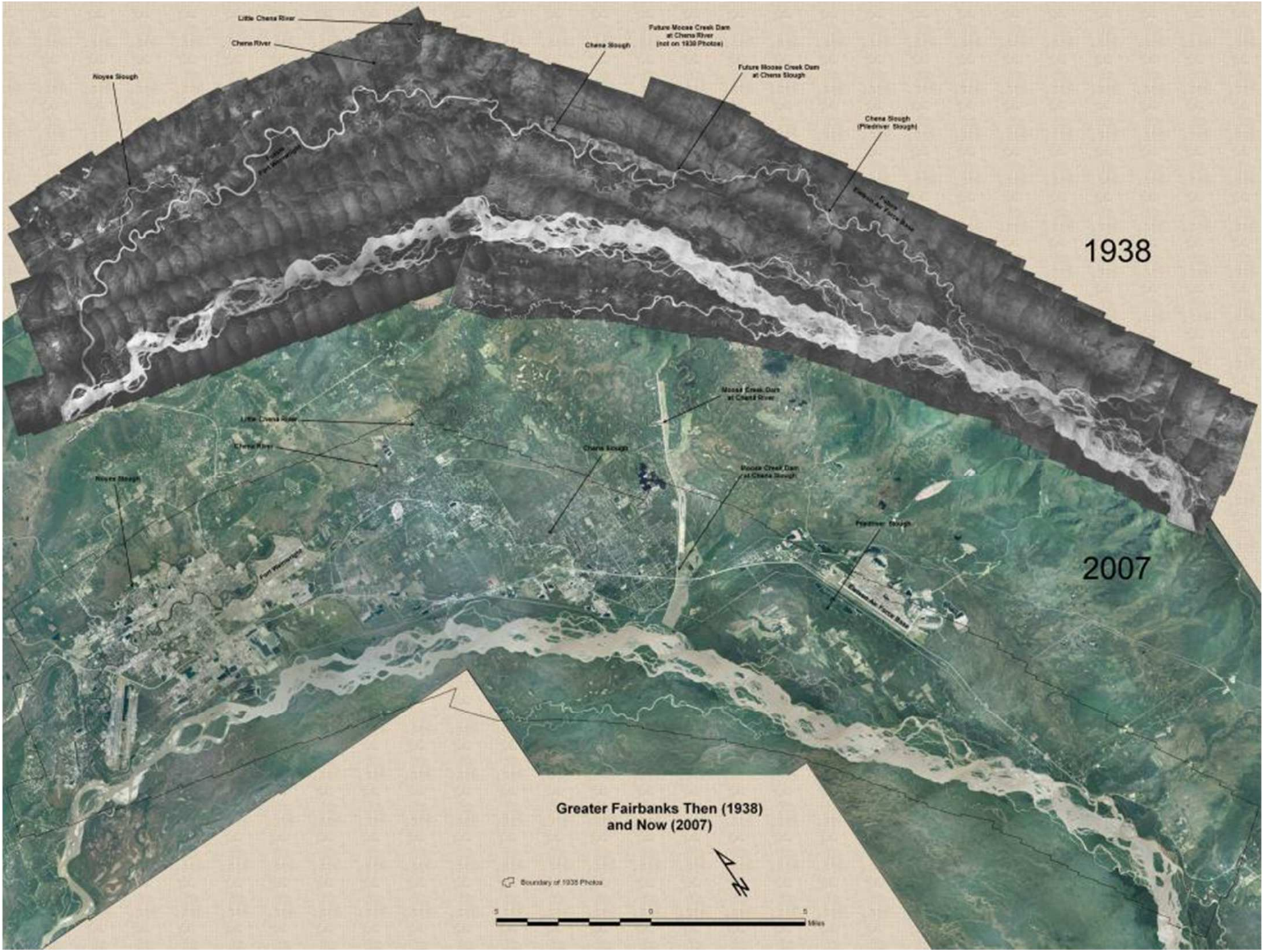
(info from Clemson University Cooperative Extension, Connecticut Dept. of Environmental Protection, State of Washington Department of Ecology, other sources)

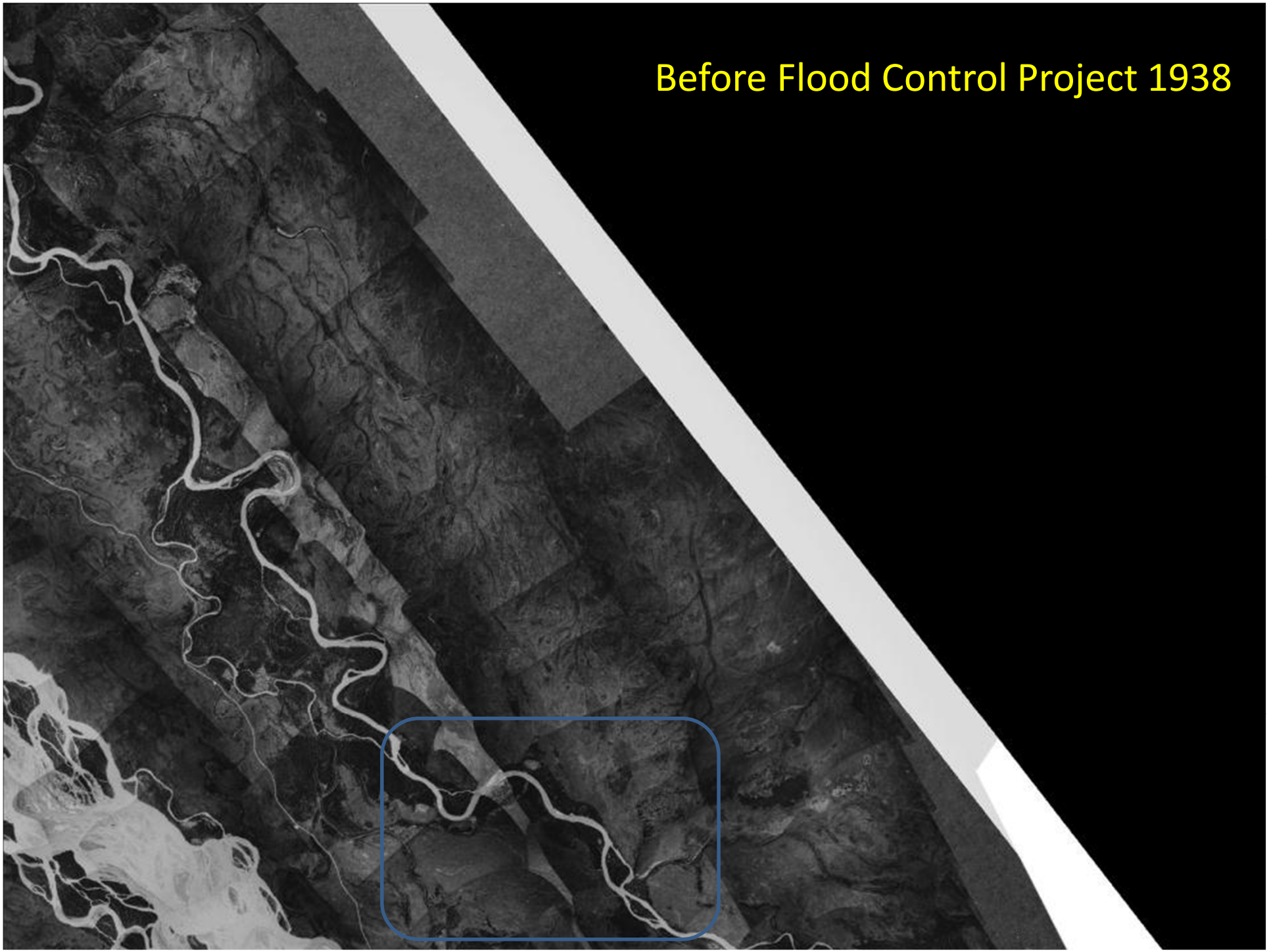
- **Prevention; Early Detection, Rapid Response (EDRR)**
- **Cultural Control Methods:** modify the environment to make conditions less suitable for weed growth.
  - *Fertilization*
  - *Pond Dyes*
  - *Benthic Barriers*
  - *Drawdowns*
- **Biological Control Methods**
  - *Triploid Grass Carp*
- **Chemical Control Methods**
  - Herbicides formulated for use in aquatic systems
- **Mechanical Removal**
  - Wide variety of equipment available
- **Integrated Aquatic Weed Management**
  - A combination of the above methods

Ways to get involved

www.fairbankssoilwater.org

- Inventory
  - FNSB
  - Encouraging statewide efforts
- Research
  - Habitat, fisheries, restoration, water quality…
- Control/engineering
- Permitting
- Funding
- Legislation
- Outreach
- Best management practices


Little Chena River
Chena River
Noyes Slough
Chena Slough
Future Moose Creek Dam at Chena River (not on 1938 Photos)
Future Moose Creek Dam at Chena Slough
Chena Slough (Piledriver Slough)
1938
Moose Creek Dam at Chena River
Little Chena River
Chena River
Chena Slough
Noyes Slough
Moose Creek Dam at Chena Slough
Piledriver Slough
2007
Greater Fairbanks Then (1938) and Now (2007)
Boundary of 1938 Photos
5
0
5
Miles


Before Flood Control Project 1938


With Flood Control Project 2002