Establishing a scientific framework for Eurasian watermilfoil management in Wisconsin

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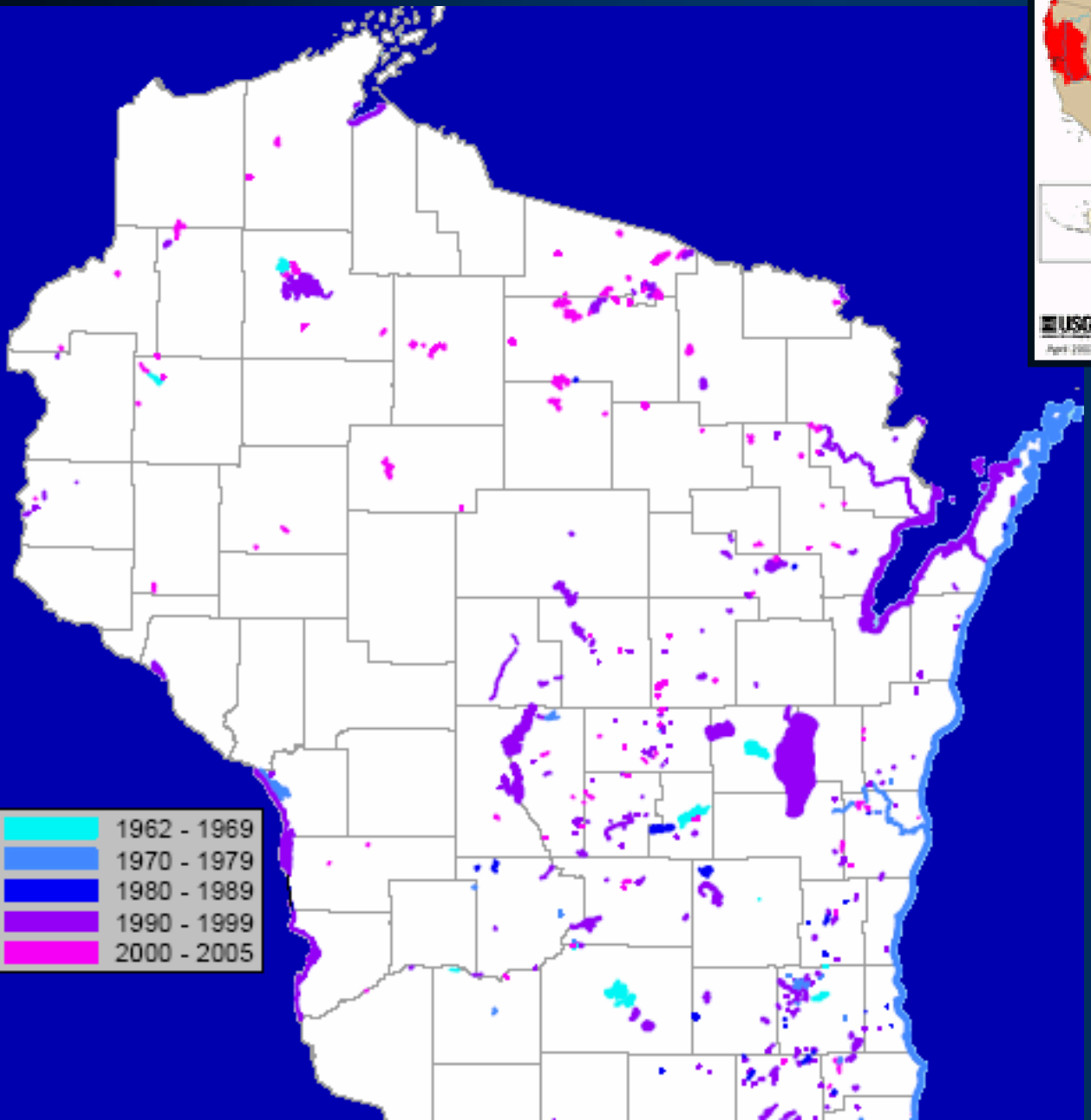
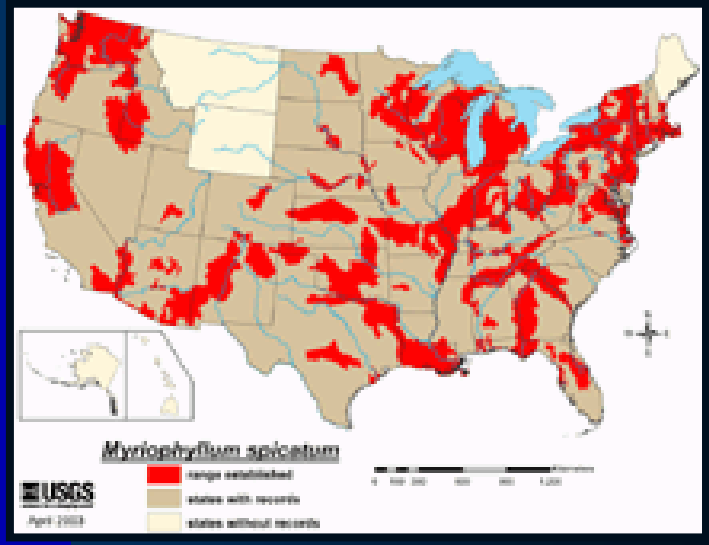
WISCONSIN
DEPT. OF NATURAL RESOURCES

Photo by John Madsen, Aquatic Plant Management Society

We know in general:





Present in 425 lakes in WI

Historically more problematic in SE WI

Despite good tracking of infestations in WI (✓yes or no):

- We have little information on where in lakes, how much of the littoral area is occupied, or what to expect in the future

-different lake types, different outcome?

-different location, different outcome?

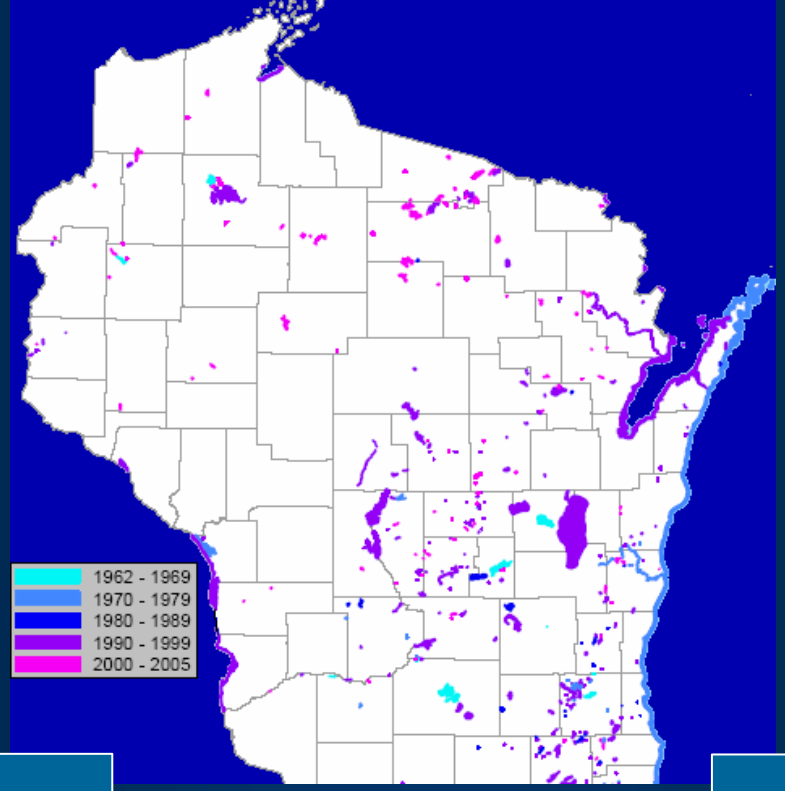
-different management, different outcome?

Translates to poor ability to educate the public on potential outcomes and management

A lake with EWM:

Photo by Ray Newman, Univ. MN

Another lake with EWM:


1962 - 1969
1970 - 1979
1980 - 1989
1990 - 1999
2000 - 2005

RMN lab

Is there a pattern to invasion events?

- Persistent low populations documented
  - Chesapeake Bay, MD (~60 years)
  - Acidic, oligotrophic Coventry Lake, CT
- Rapid expansion possible with favorable conditions/heavy disturbance
  - Nutrient-rich substrate
  - Hurricane, drought, flood, etc…
- Characteristic decline in EWM approximately 10-15 years after achieving dominance (Carpenter 1980; Creed and Sheldon 1995; Newman and Biesboer 2000; Simberloff and Gibbons 2004)

Questions about EWM

1) EWM status

-What is a “nuisance” level of EWM?

2) EWM ecology

-What are the possible outcomes when EWM invades a lake?

-What factors contribute to different outcomes?

-Interannual variation (with and without management)?

3) EWM management

-Past management (non strategic) outcomes = short term nuisance relief?

-Future management (strategic) outcomes = restoration?

Goals of statewide EWM Research in WI

1) Within a given lake - gain background data on infested lakes to manage today and track future changes

2) Across lakes statewide - understand the factors that control EWM abundance and time course in lakes (e.g., what lakes are susceptible to high nuisance levels?)

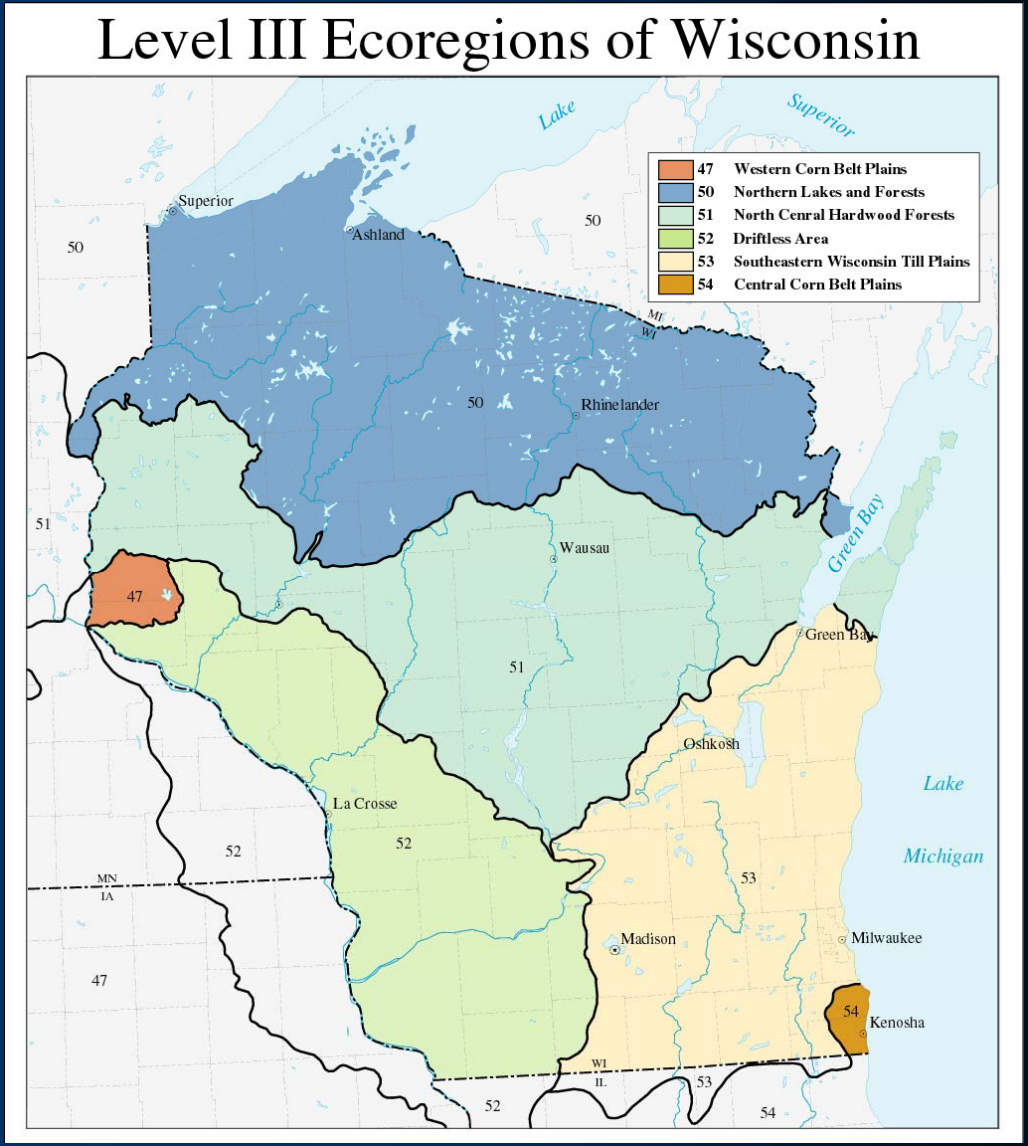
Approach – survey as many milfoil lakes as possible!!

Search for patterns across meaningful gradients…

Project Design

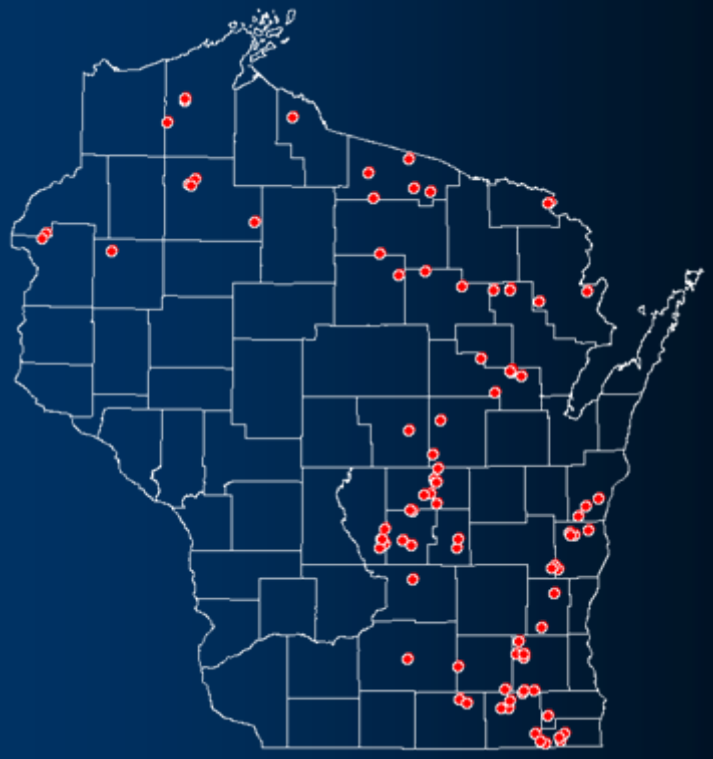
- Major factors:
  - –Ecoregion
  - –Lake Type

- Gradients of:
  - –Size (up to 500 acres)
  - –Depth
  - –Time since introduction
  - –Management histories

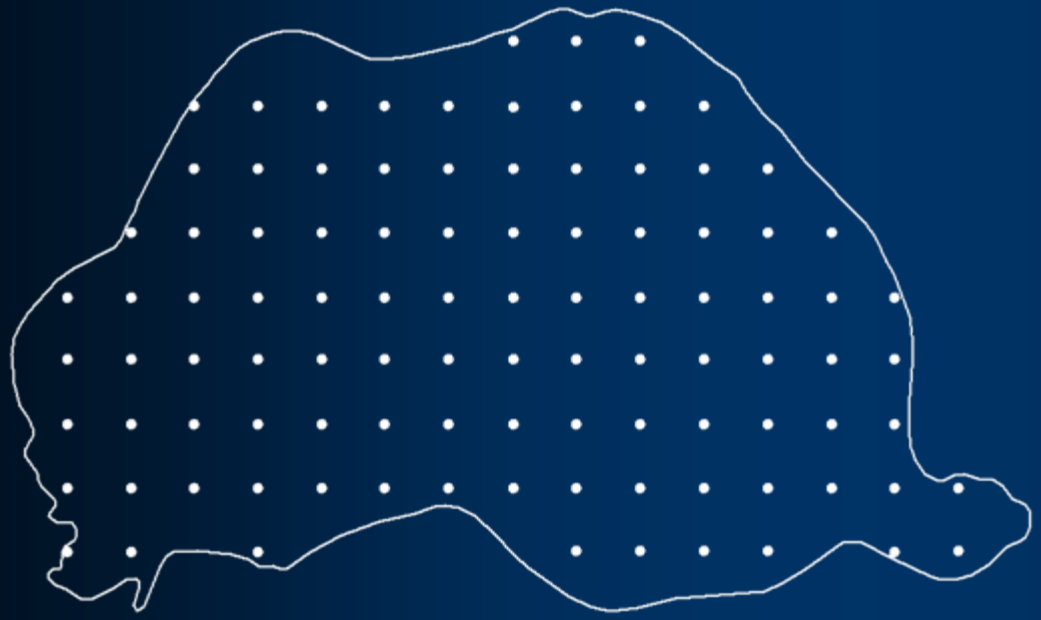


Omernick et al. 2000

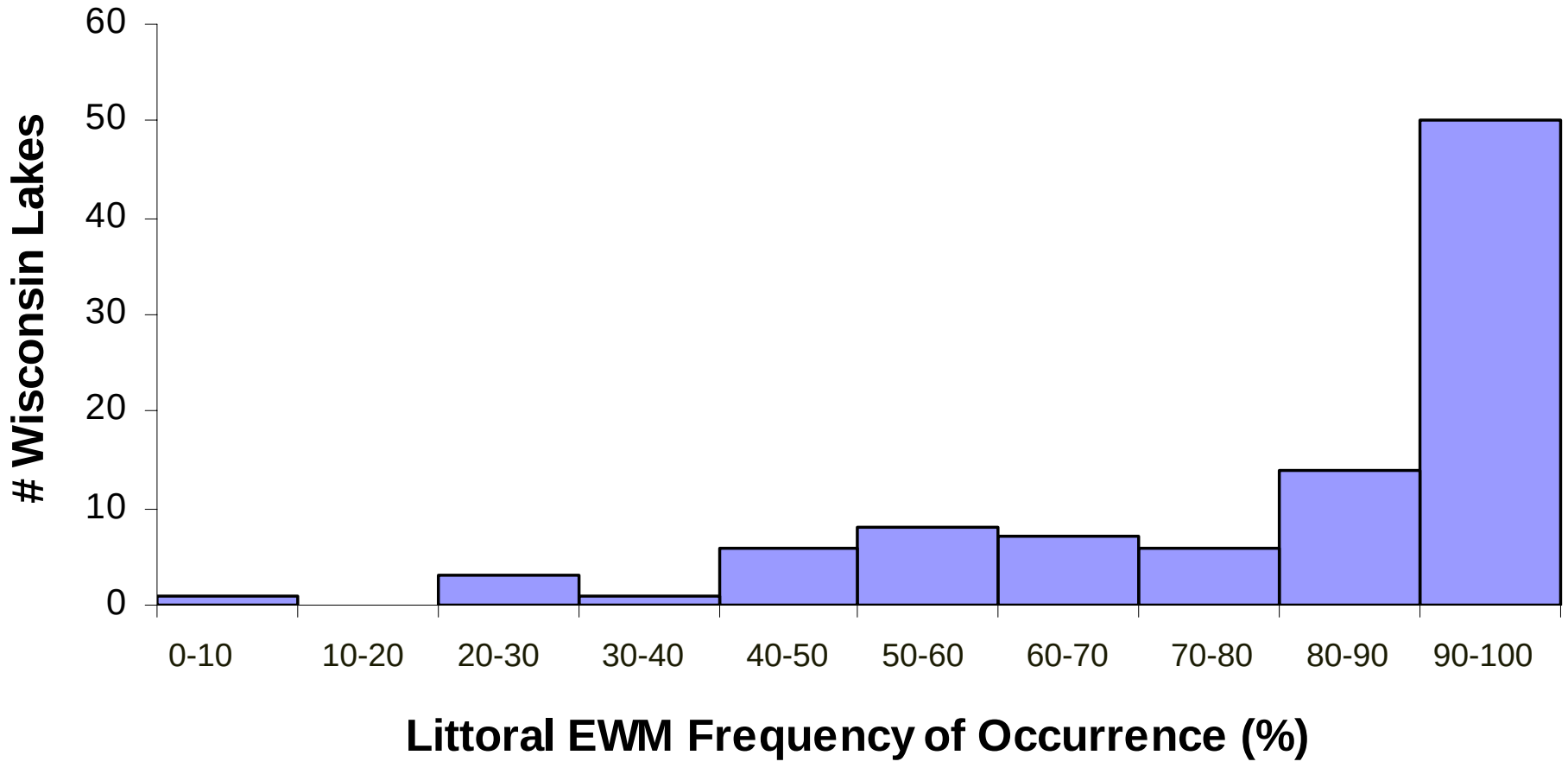
Data Collection



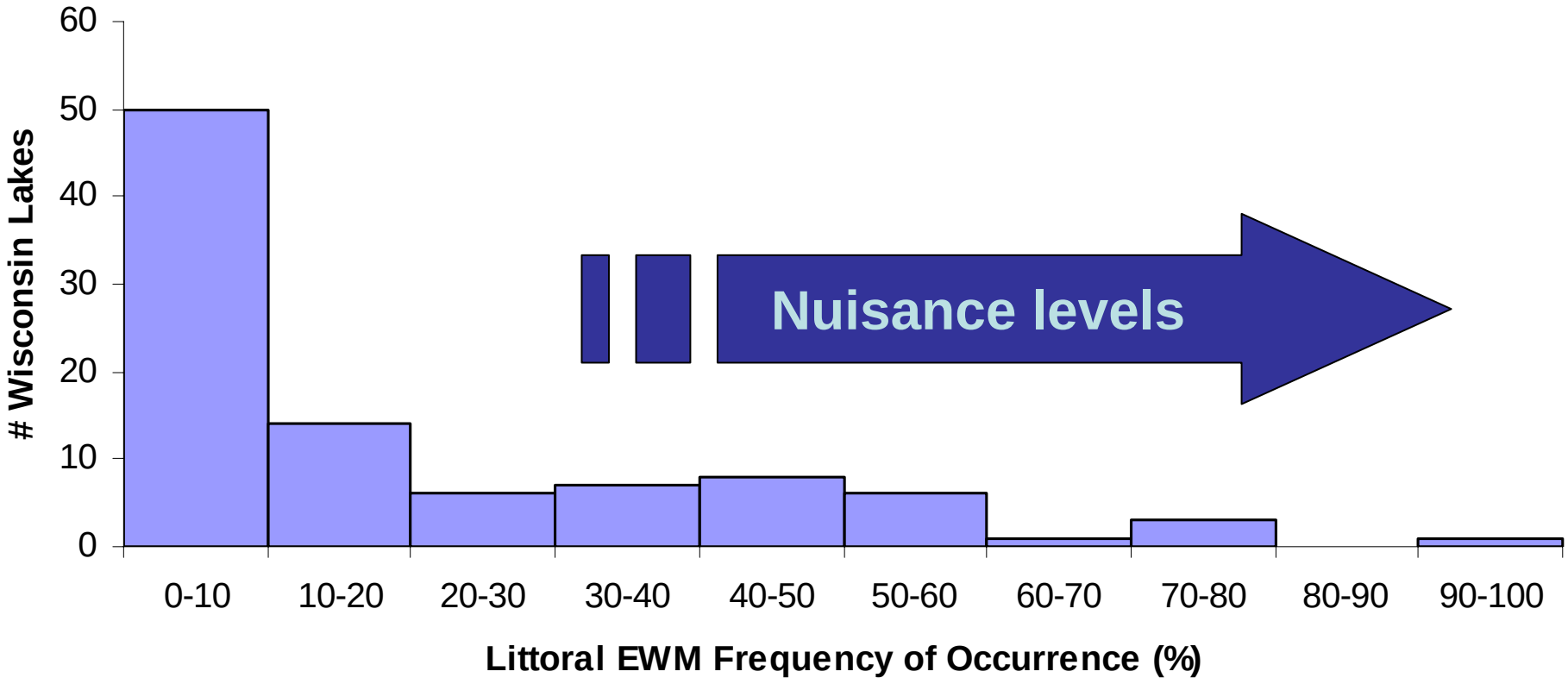
- Point-intercept method
- 100 EWM lakes (1/4 in state!)
- 30-70 m resolution
- Species list and distributions for each lake
- Density rating for exotics (1,2,3): EWM and Curly-leaf pondweed



EWM frequencies across state… PERCEPTIONS



EWM frequencies across state… REALITY!

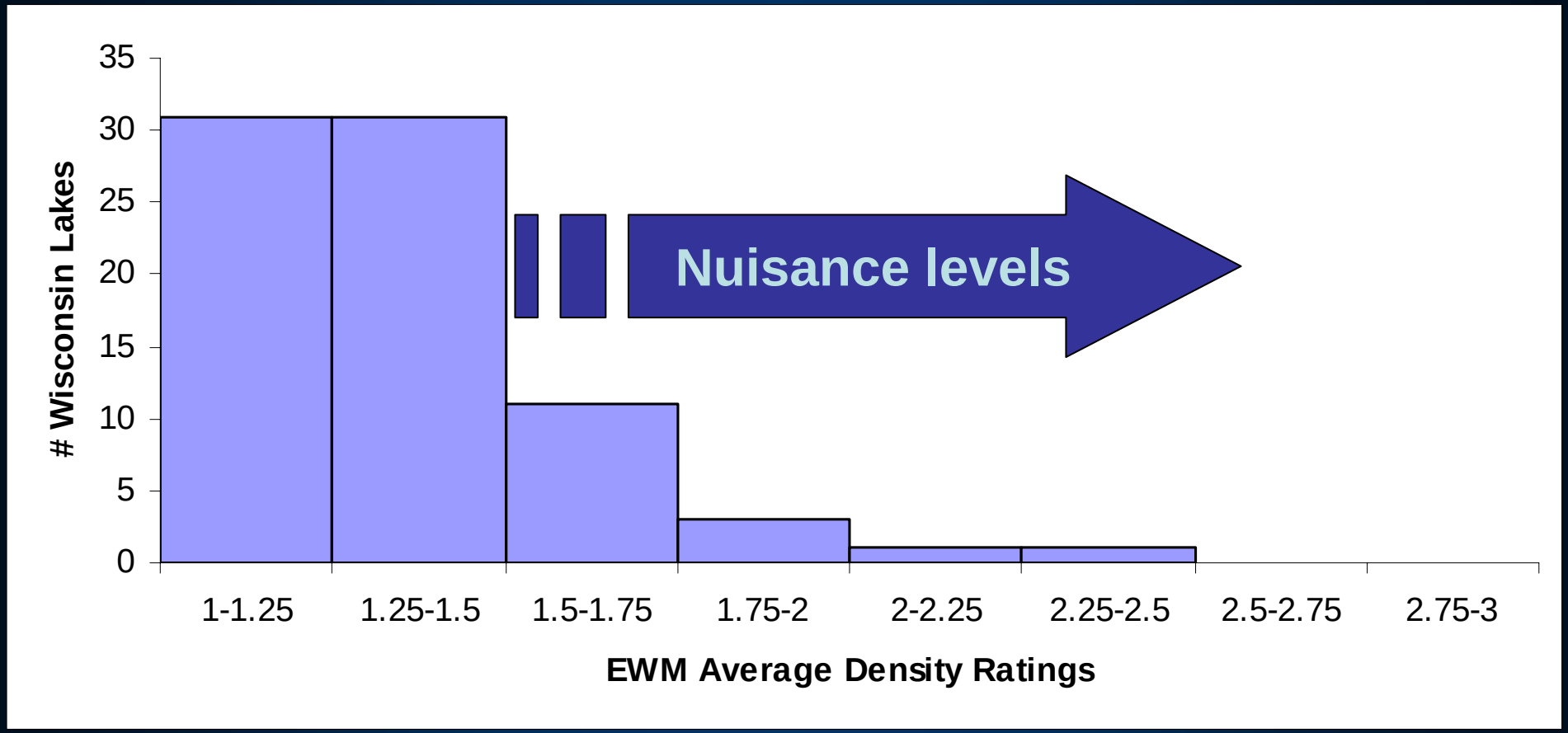


-Most EWM littoral frequencies are <10%

1=

2=

3=

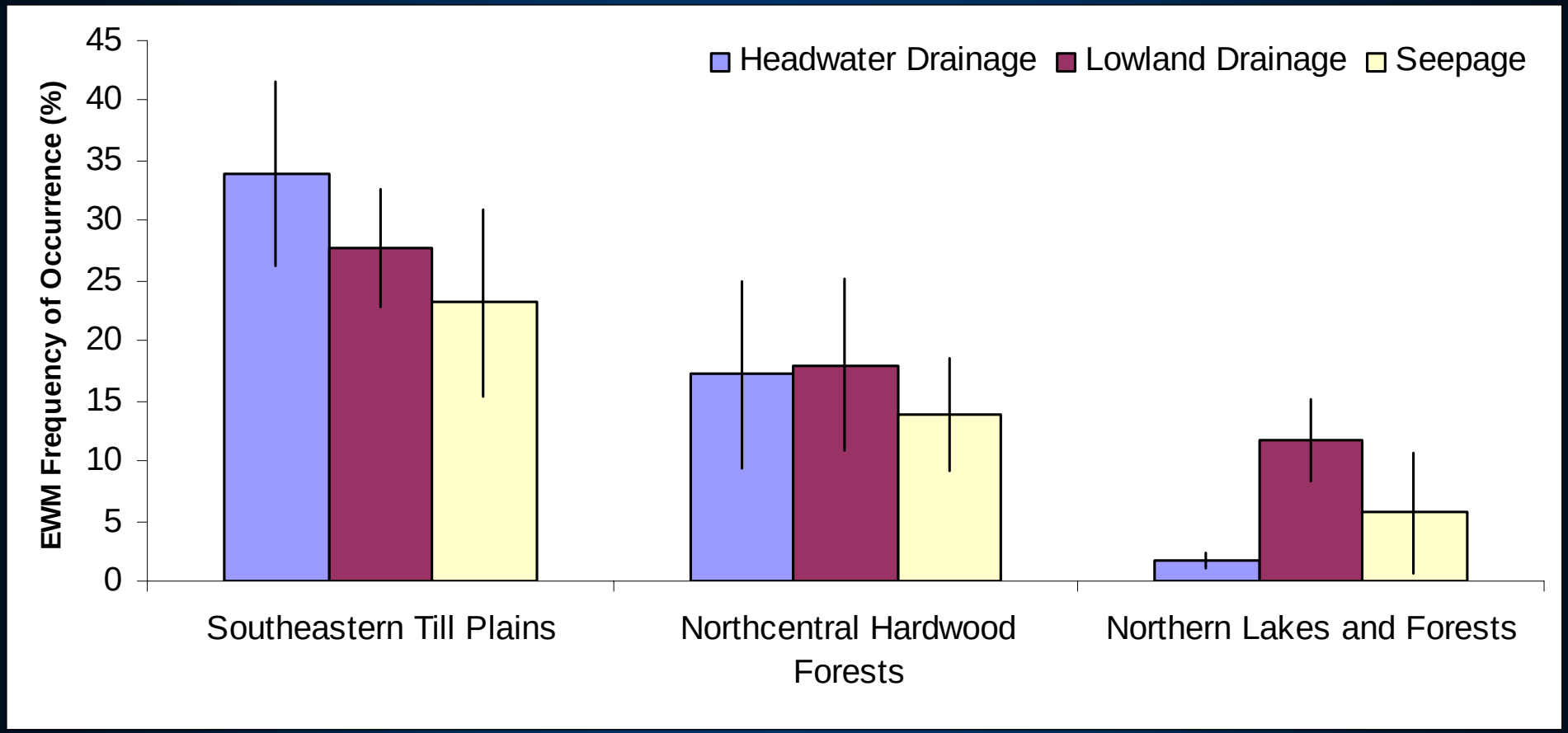


-EWM densities most commonly ranged between the 1-2 rake fullness rating categories.

What are “nuisance levels”?

- Observations from 2005 field crew
  - Navigational problems encountered when
    - Frequency of occurrence (littoral zone) >35%
    - Average density >1.4
  - “Nuisance” status depends on frequency, density & growth form
    - Canopy growth can be difficult to navigate at low frequencies of occurrence
    - Sub-surface growth can be frequent yet “non-nuisance”

Does current EWM frequency vary across regions or lake types?

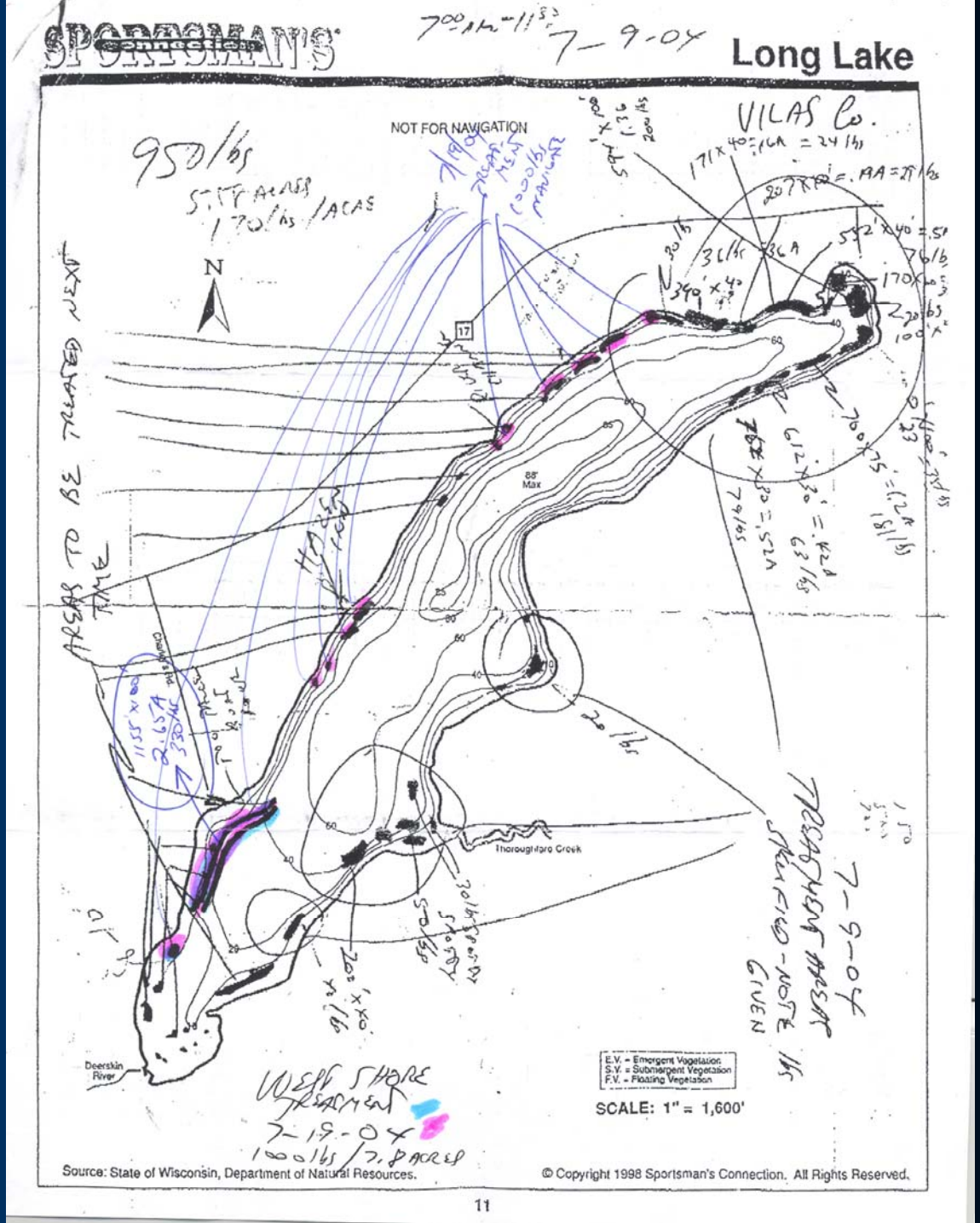


EWM frequency varies by ecoregion ($P<0.001$)

Lake type/overall no significant difference

Management history in WI

- Acreage of EWM
- Acreage of EWM treated
- Chemical/formula used
- Amount used
- When
- Where

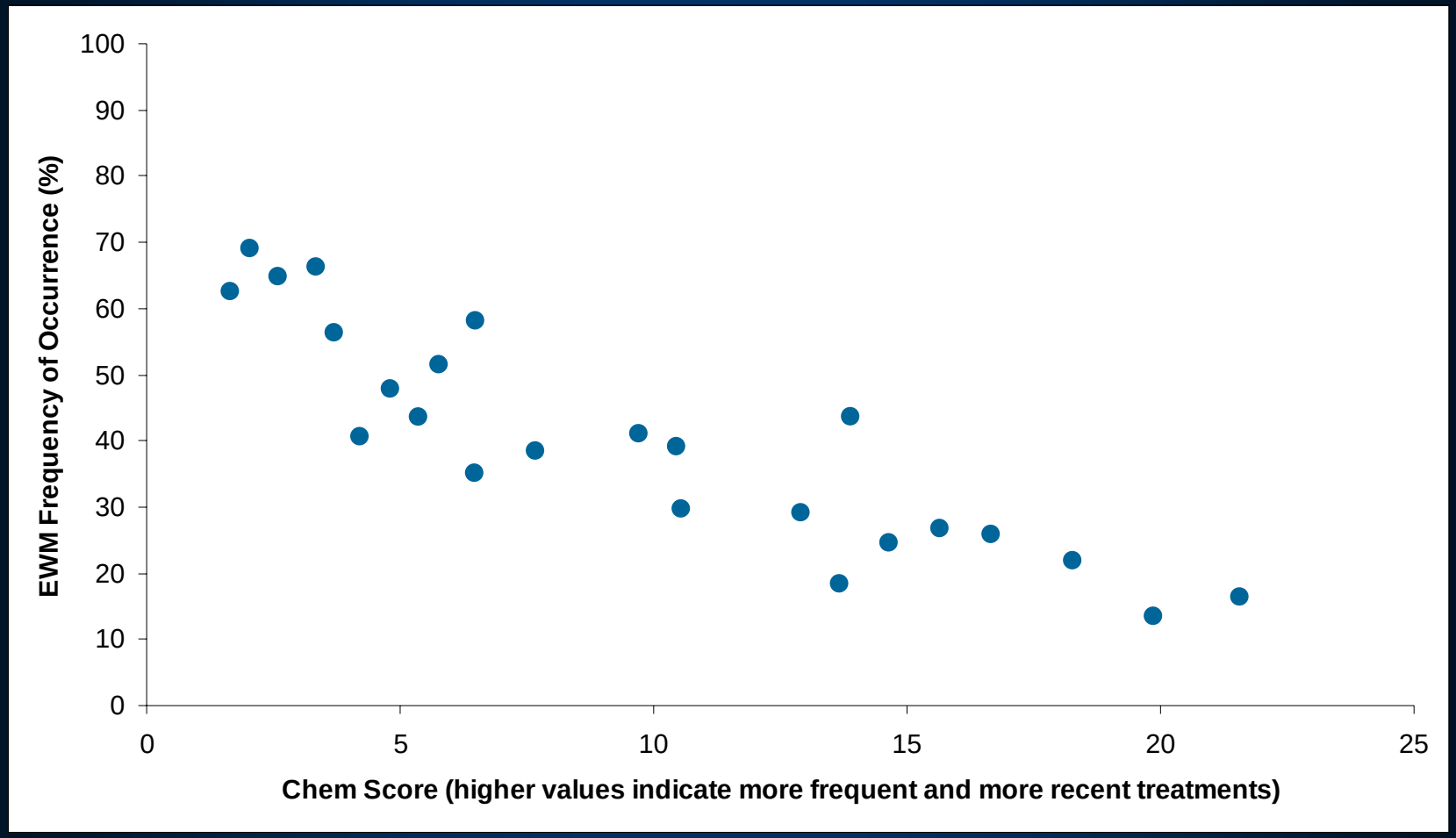


Has management history in WI affected current EWM status?

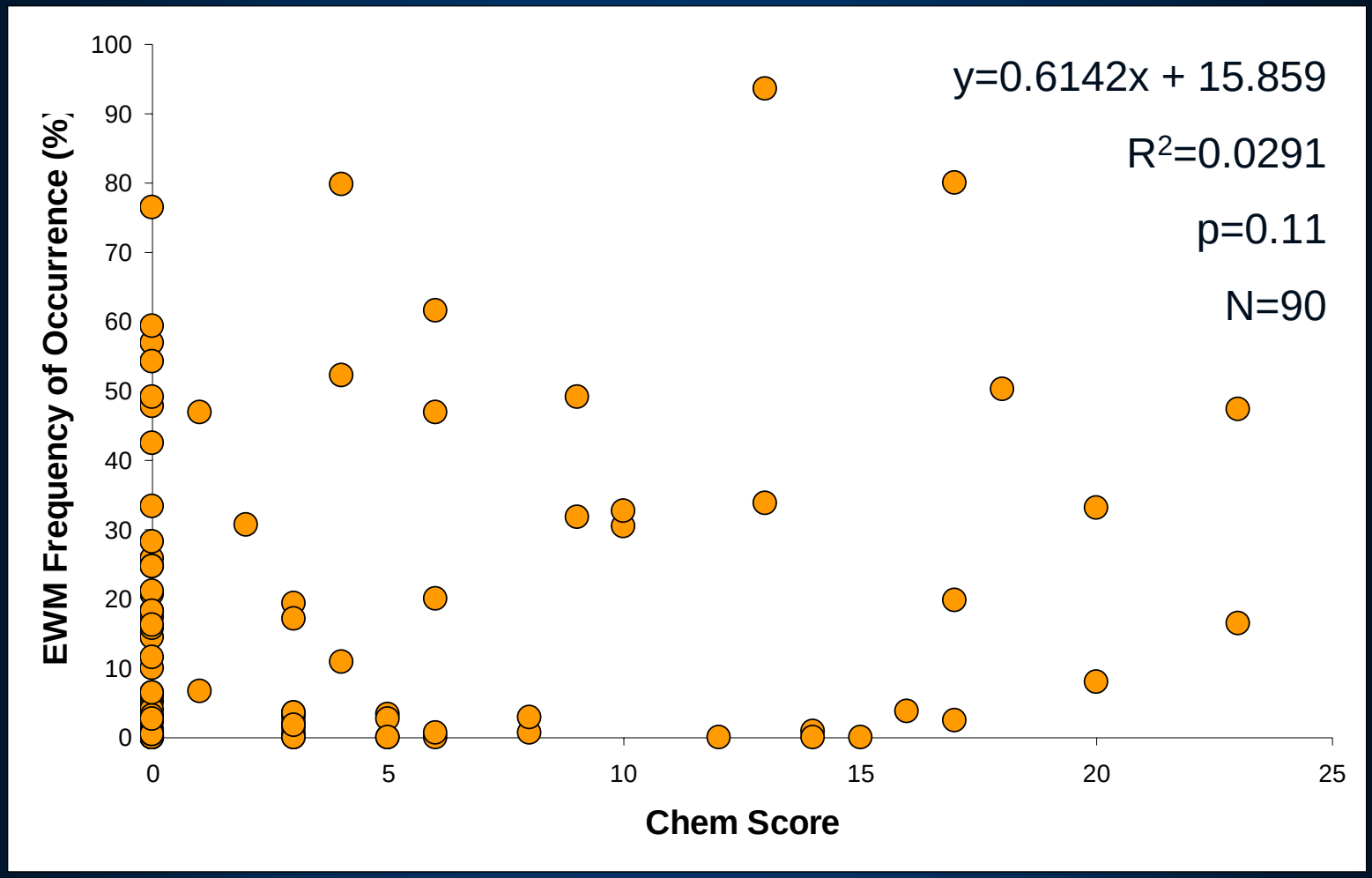
<u>Quantifying Chemical Management History</u>

- Point Assignment System used to reflect frequency and timing of management
  - 0 points: no control
  - 3 points each: control in 2004, 2005
  - 2 points each: control in years 2000-2003
  - 1 point each: control in years 1995-1999
  - +2 if continuous management from 2000-2004/5
  - +1 if management occurred *only* prior to 1995

In an ideal world…

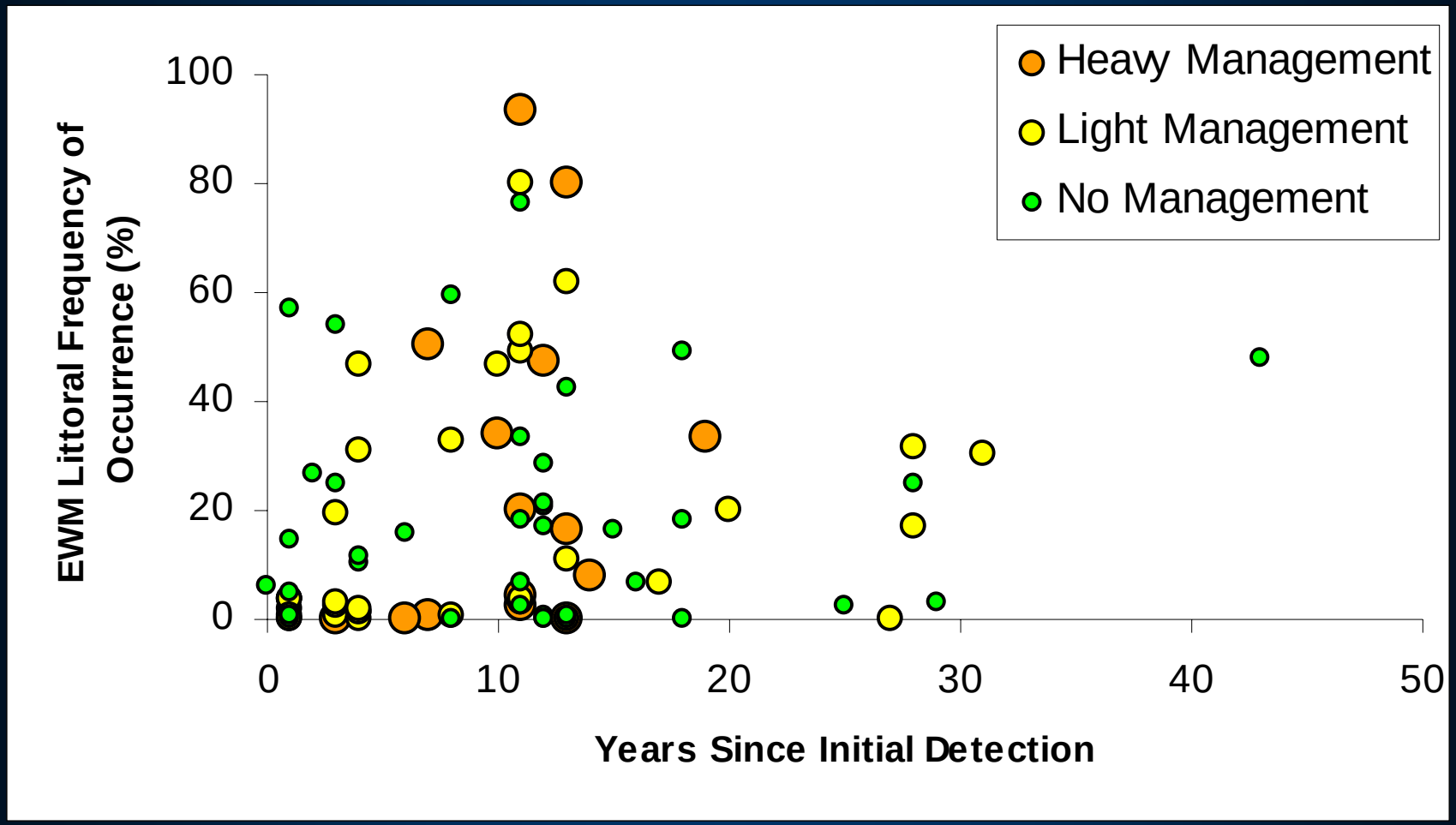


What we actually see…



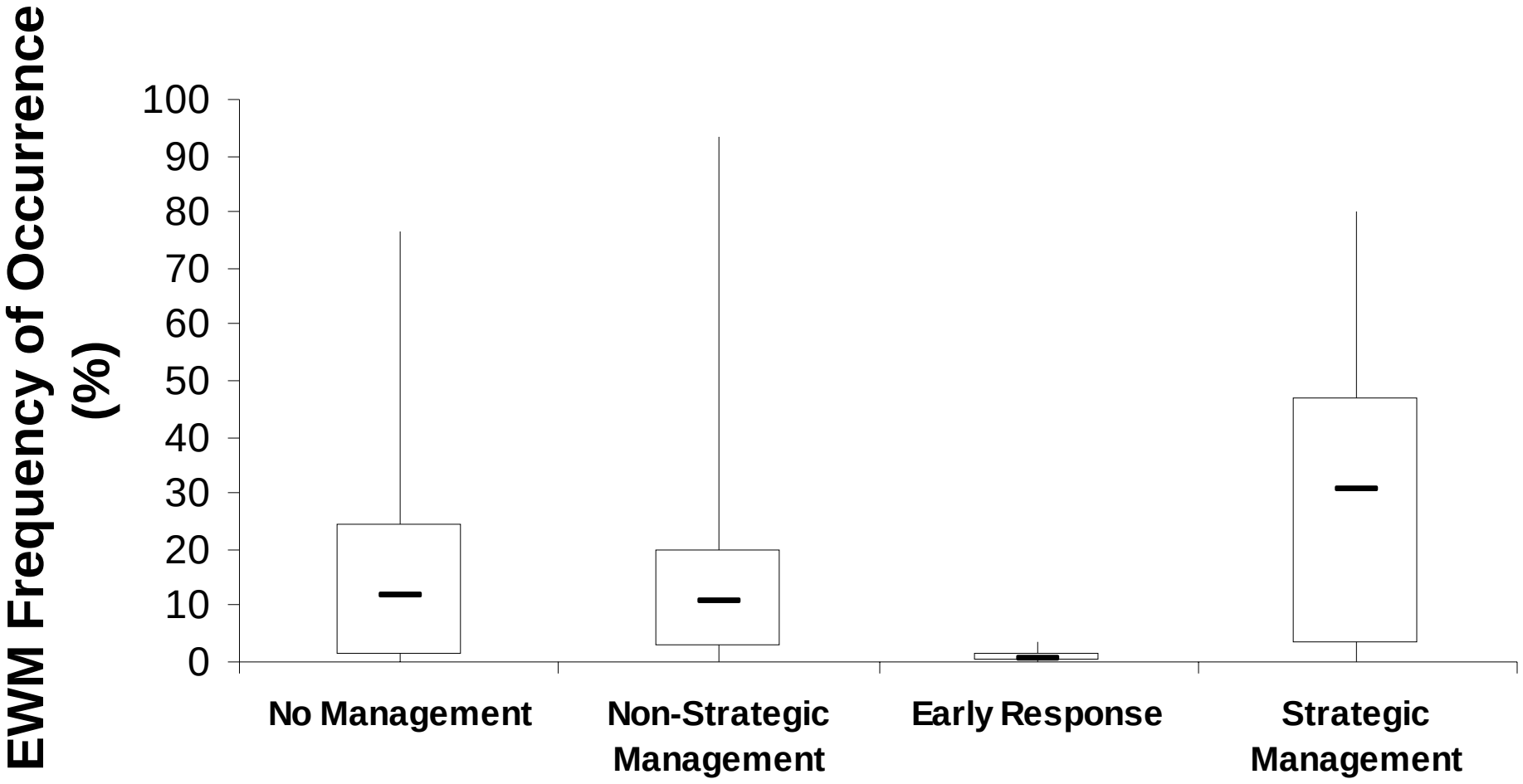
The intensity of past management in WI bears no relationship to EWM frequency.

Of 43 lakes with no management: 16% are >35% freq, 47% are <10%



Any management approach can result in wide variation in current EWM

Management Strategy



What factors affect EWM dominance/presence?

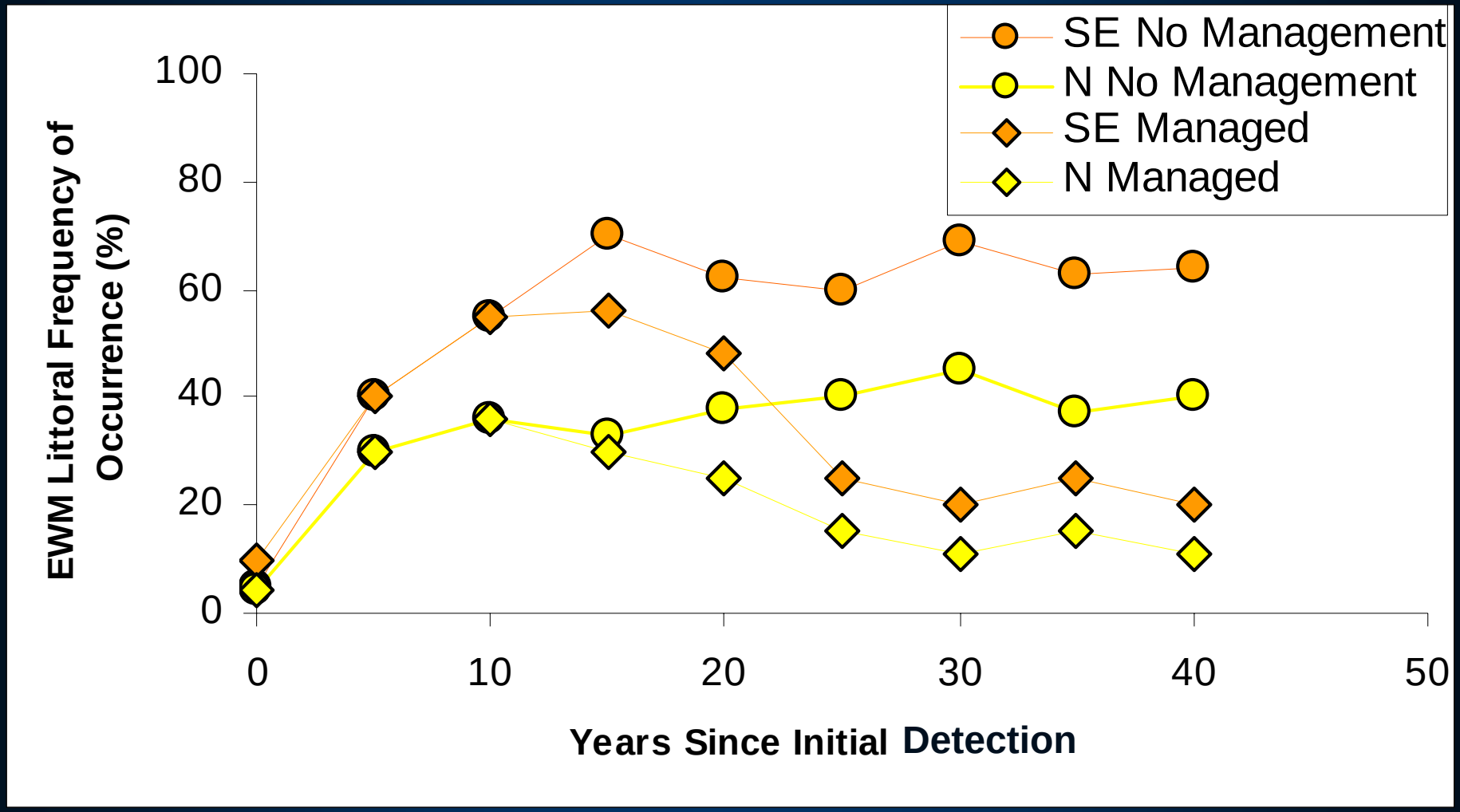
- Factors others have found:
  - Intermediate levels of total P (Madsen 1998)
  - Carlson's TSI - most abundant in mesotrophic and moderately eutrophic lakes (Madsen 1998)
  - Low % forest cover/High dissolved inorganic carbon (Buchan and Padilla 2000)
  - High alkalinity (Buchan and Padilla 2000)
- Our initial analysis:
  - Ecoregion
  - Total P
  - Alkalinity
  - Year of Introduction
  - Max depth

Hybrid Milfoil

- *Myriophyllum spicatum* X *sibericum*
- Known since 2001
- 26 lakes in state have hybrid; we surveyed 14
- Biology/ecology of hybrid unknown (management?)

Freq.	EWM	Hybrid
Mean	16.6	19.0
Max	93.6	48.2
Min	0.0	0.6

Future Research: Track Lakes Over Time



Summary

- Great “baseline” data on ¼ of EWM lakes
- May be able to determine factors for high nuisance conditions (stay tuned…)
- Plan to track new introductions with different management
- Be able to inform the public about reasonable expectations for EWM on individual lakes