Untangling the effects invasive species, natives and management

Alison Mikulyuk, Jake Vander Zanden, Martha Barton, Jennifer Hauxwell, Michelle Nault, Scott Van Egeren, Kelly Wagner

Is the cure worse than the disease?

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Some, not all invaders have large impacts

Table 2. Total number and percentage of alien species known to have an ecological or economic impact for different taxonomic groups in Europe*

Taxonomic group	*Total*	*Ecological impact (%)*	*Economic impact (%)*
Terrestrial plants	5789	326 (5.6)	315 (5.4)
Terrestrial invertebrates	2481	342 (13.8)	601 (24.2)
Terrestrial vertebrates	358	109 (30.4)	138 (38.5)
Freshwater flora and fauna	481	145 (30.1)	117 (24.3)
Marine flora and fauna	1071	172 (16.1)	176 (16.4)

*DAISIE database search at 12 Feb 2008

Vilà et al. 2011

An ecological principal:

Management priorities should be set by species according to the amount of harm they do, regardless of their origin.


BUYNI
NETWORK


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Prevention is important, control can help, care is key.

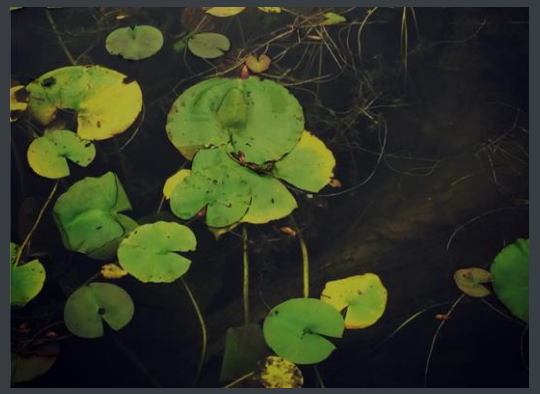
Treatments have a cost too.

Consider:

1. Effects of management
2. Effects of invader
3. Compare to natives

EWM case study

EWM effects



Native plant communities

- Diversity
- Abundance
- Physical structure

Blue-tailed damselfly (*Ischnura* elegans) nymph
CJ Sharp, CC BY-SA 3.0

Macroinvertebrates

- Trophic diversity
- ? Abundance

Fish

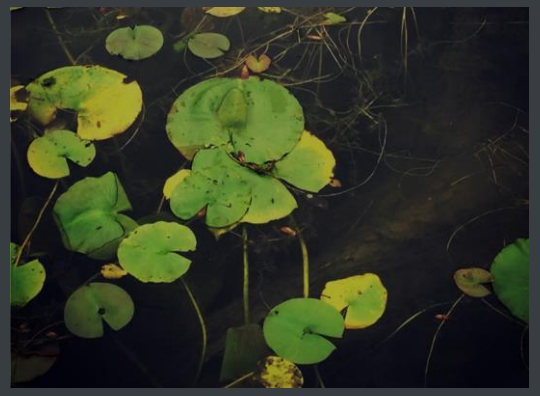
- Trophic diversity
- ? Species structure

Humans

- Property values
- Navigation
- Aesthetics

Cheruvelil et al. 2001; Duffy & Baltz 1998; Keast 1983; Madsen et al. 1991; Kovalenko & Dibble 2011;

EWM effects



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EWM Management

In Wisconsin:

~$2 million / year

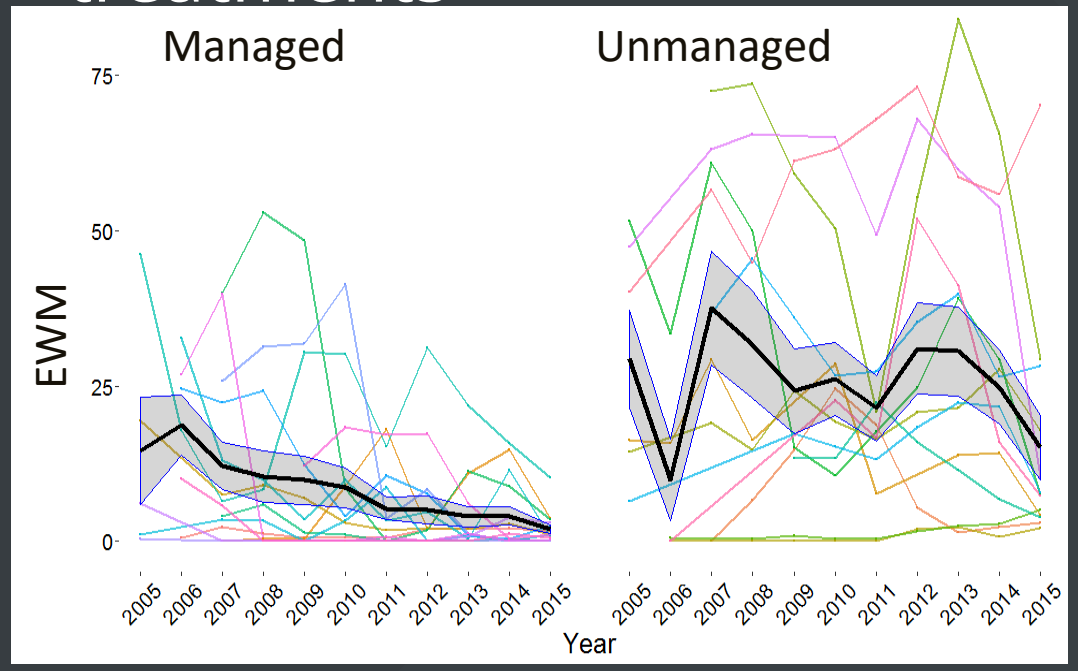
~20% EWM herbicide treatments (2015)

~mean of 16 acres per treatment (2015)

~1520 acres treated (2015)

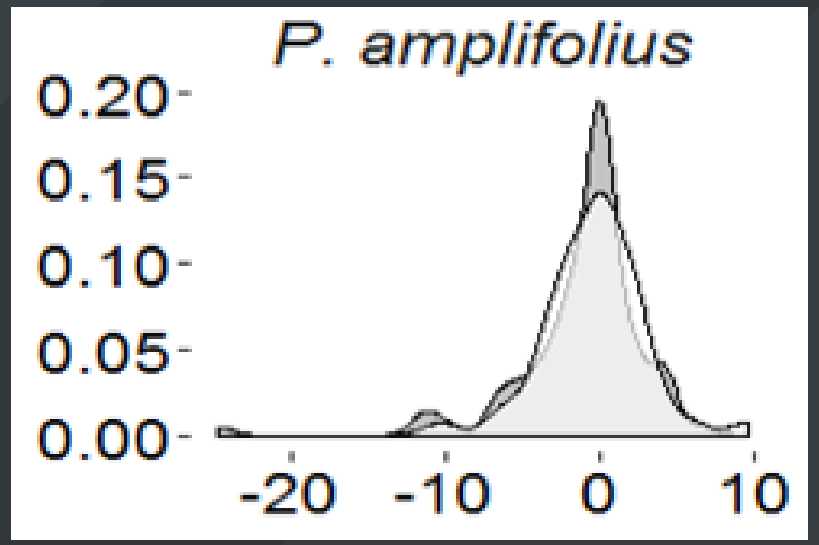
10 years of strategic management

- EWM decreased
- Most native species were not negatively impacted
- Some species were negatively affected by a few large-scale treatments



Distribution of year-to-year changes in abundance:

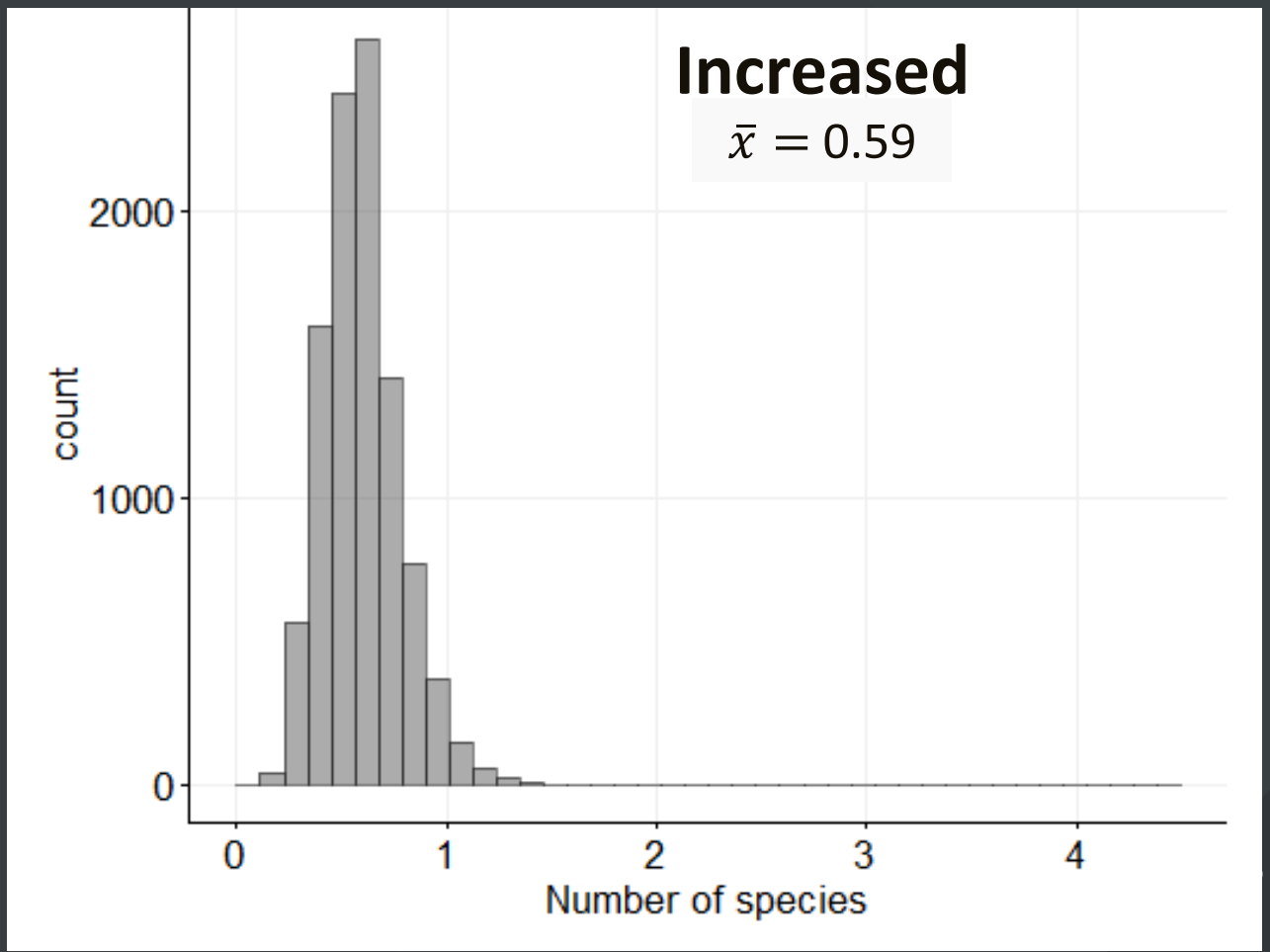
Managed (dark)
Unmanaged (light)



Results

- Treatment impacts generally low; Whole-scale impacts higher

What's typical?
$Year_1$ to $Year_2$ (46 unmanaged lakes)
How many species significantly Increased?

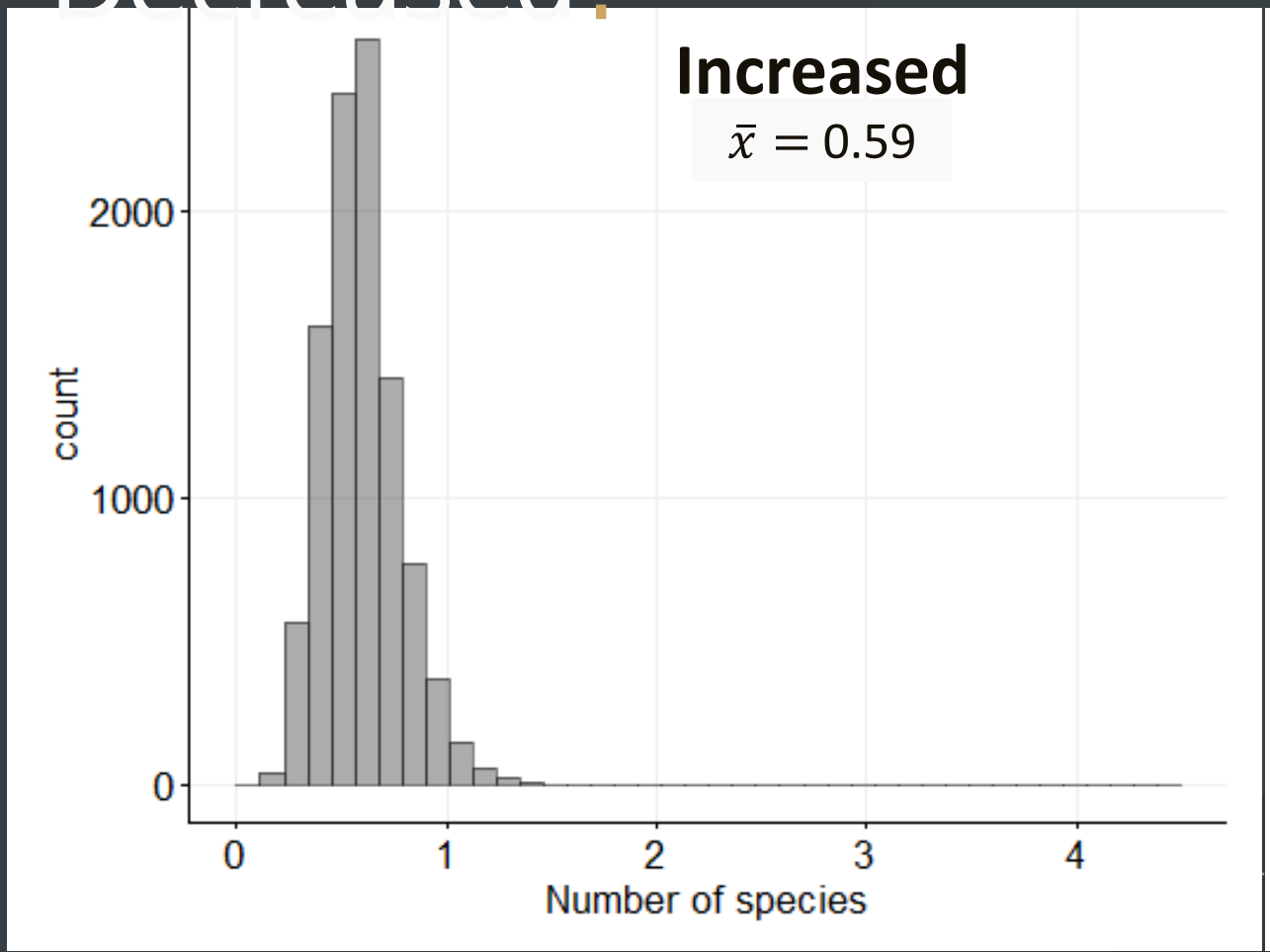


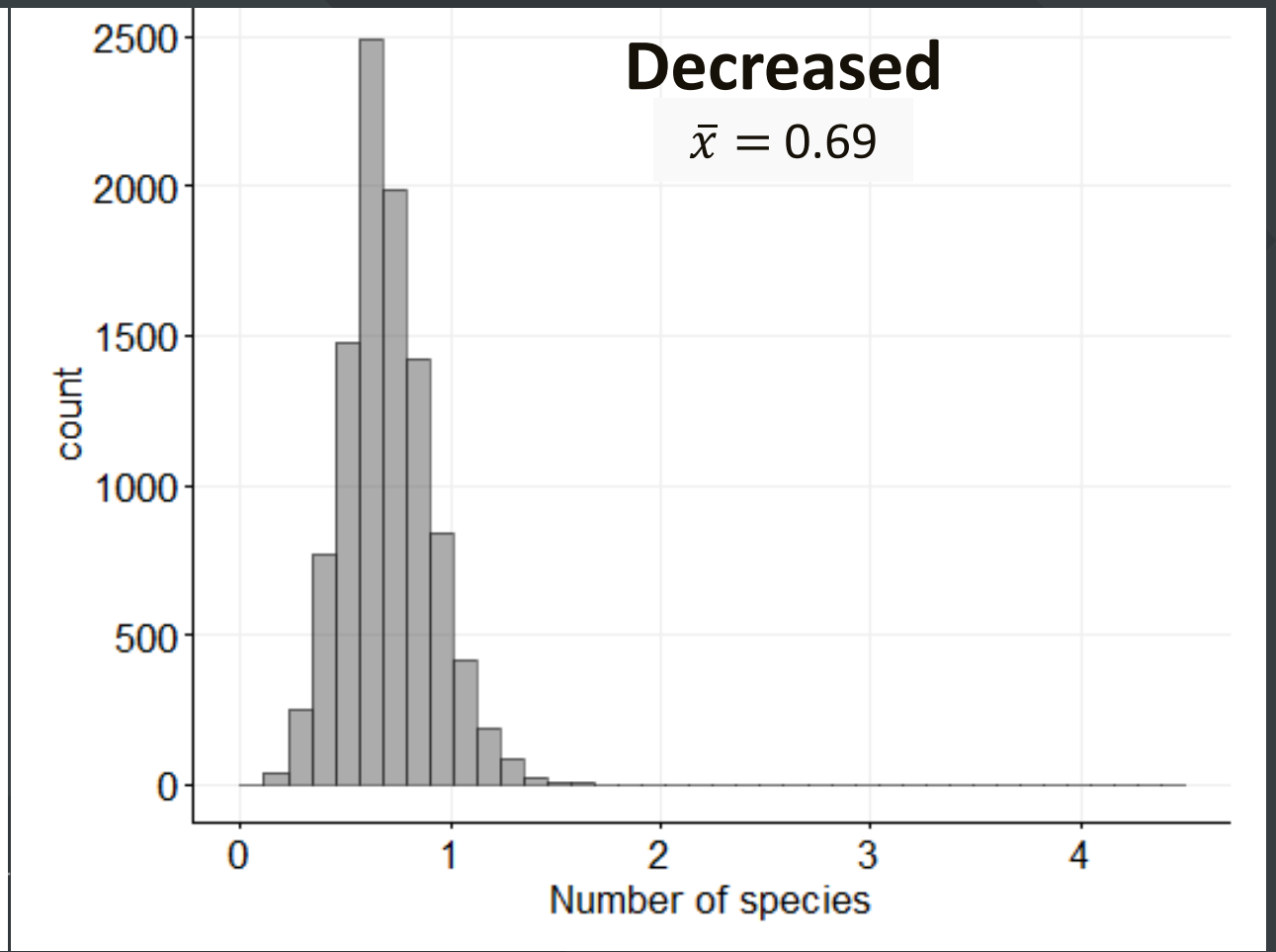
What's typical?

$Year_1$ to $Year_2$ (46 unmanaged lakes)

How many species significantly Increased?

Decreased?





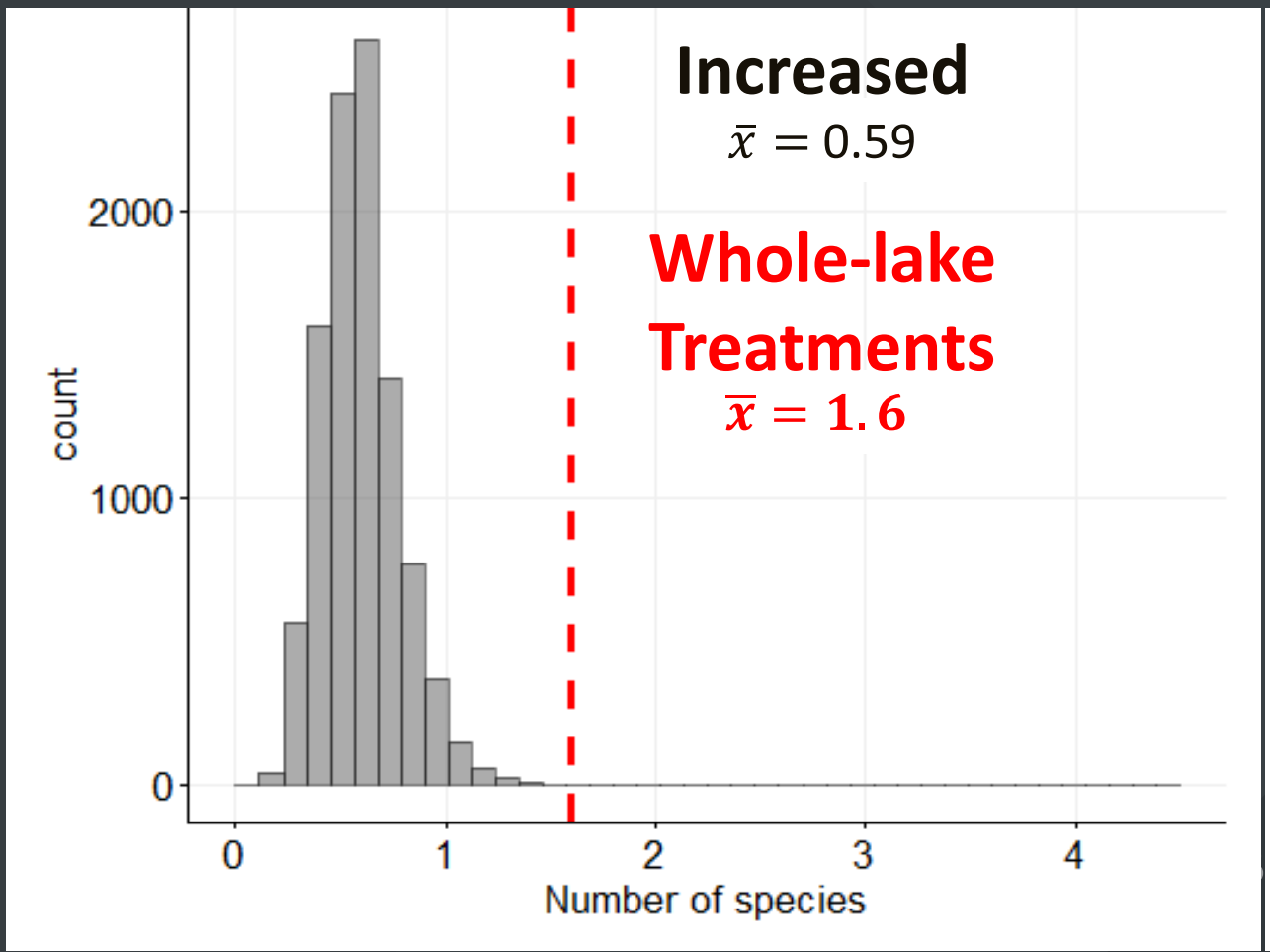
Are changes with TRT the same? N = 25 lakes, Pre/Post

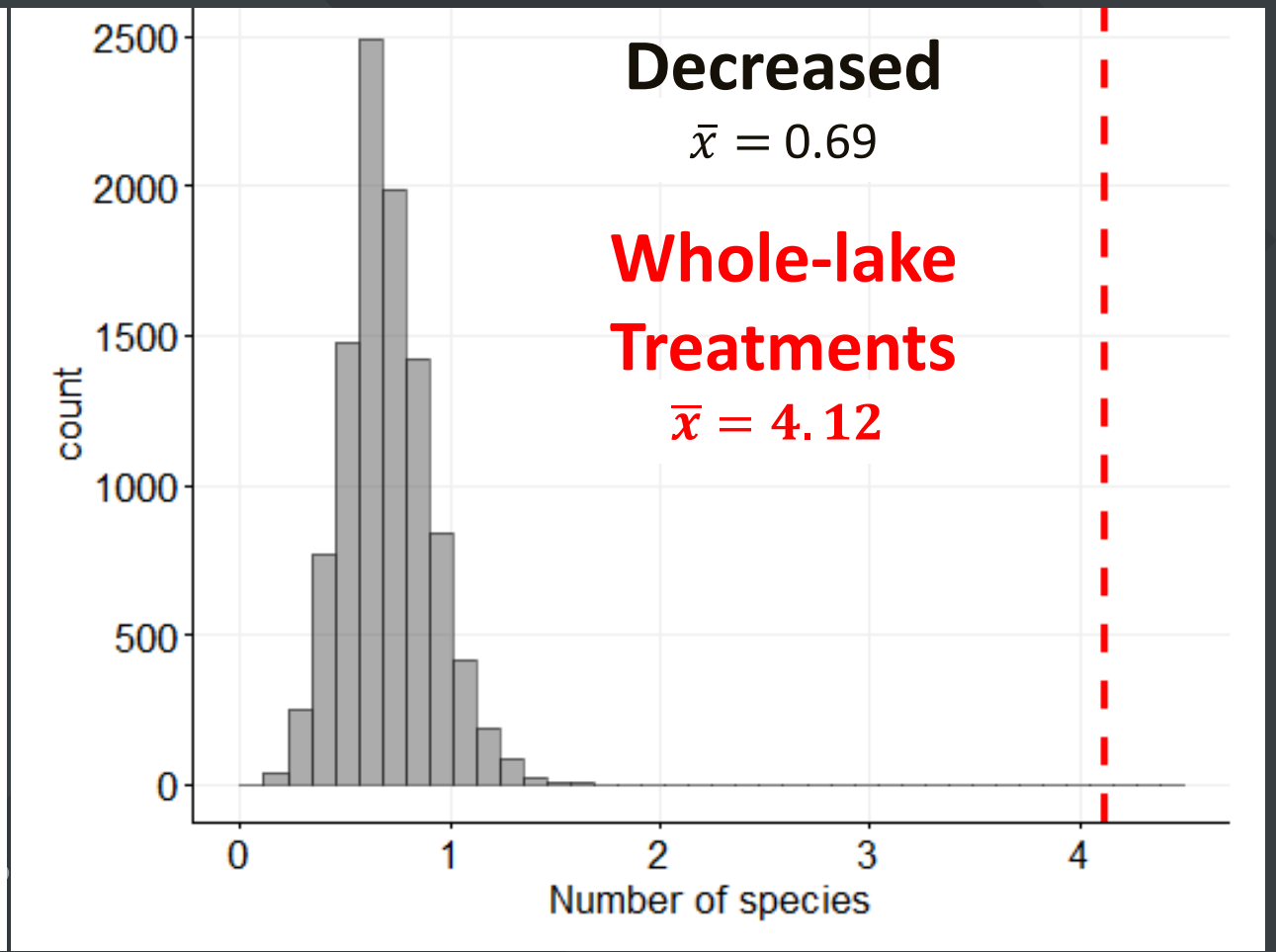
Kettle Moraine (2008)
Wolf (2014)
Deep (2013)
Jordan (2010)
Parker (2015)
Emily (2015)
Chalet (2015)
Helen (2014)
Grass (2012)
Washington (2014)
Spring (2007)
Pine Ridge (2014)
Chute Pond (2012)
Frog (2010)
George (2010)
Silver/Kenosha (2013)
Dutch Hollow (2013)
Fawn (2013)
Kathan (2010)
Silver/Vilas (2007)
South Twin (2009)
Halfmoon (2009)
Wilson (2012)
Sand Bar (2011)
Tomahawk (2008)

What's typical?

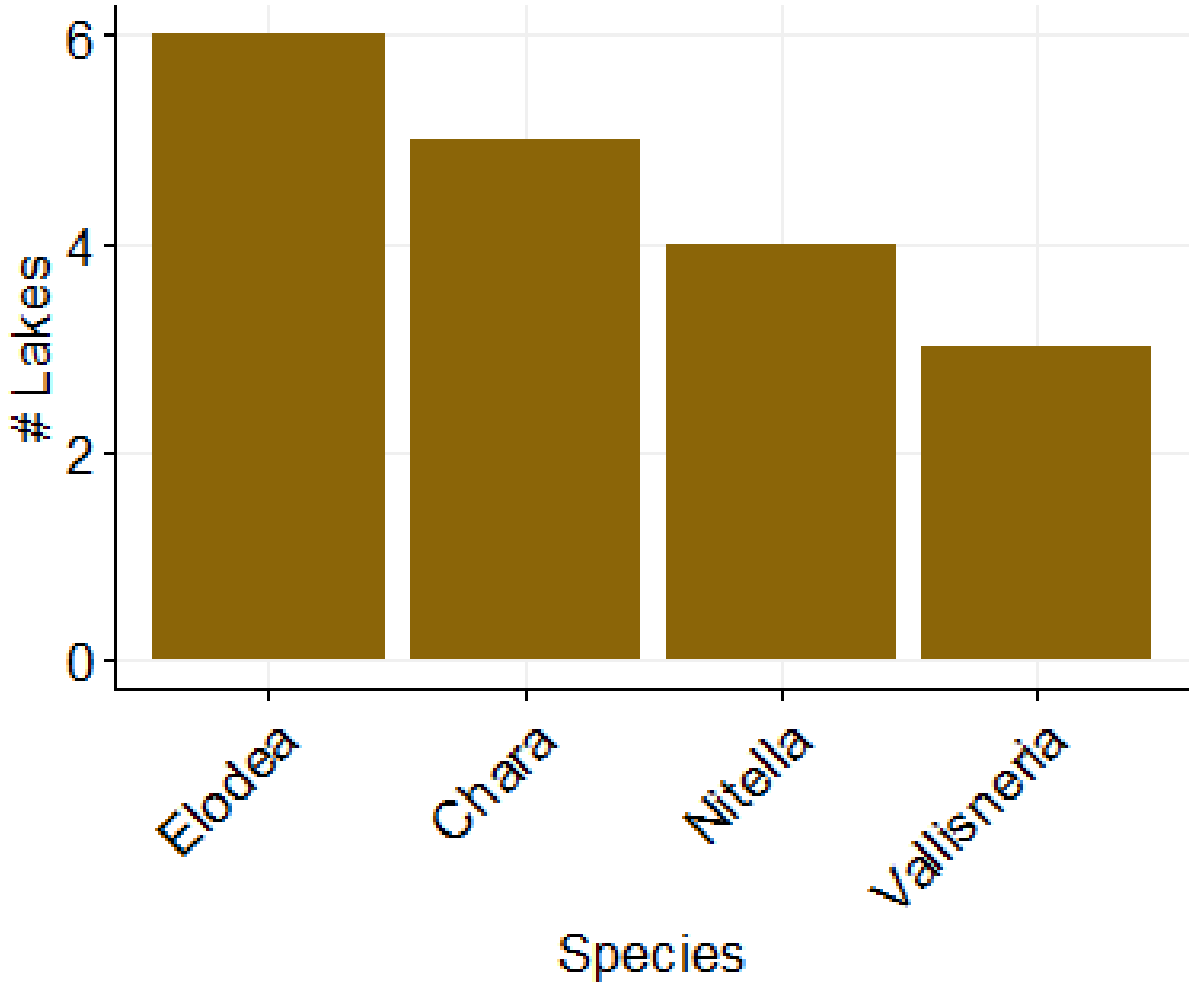
$Year_1$ to $Year_2$ (46 unmanaged lakes)

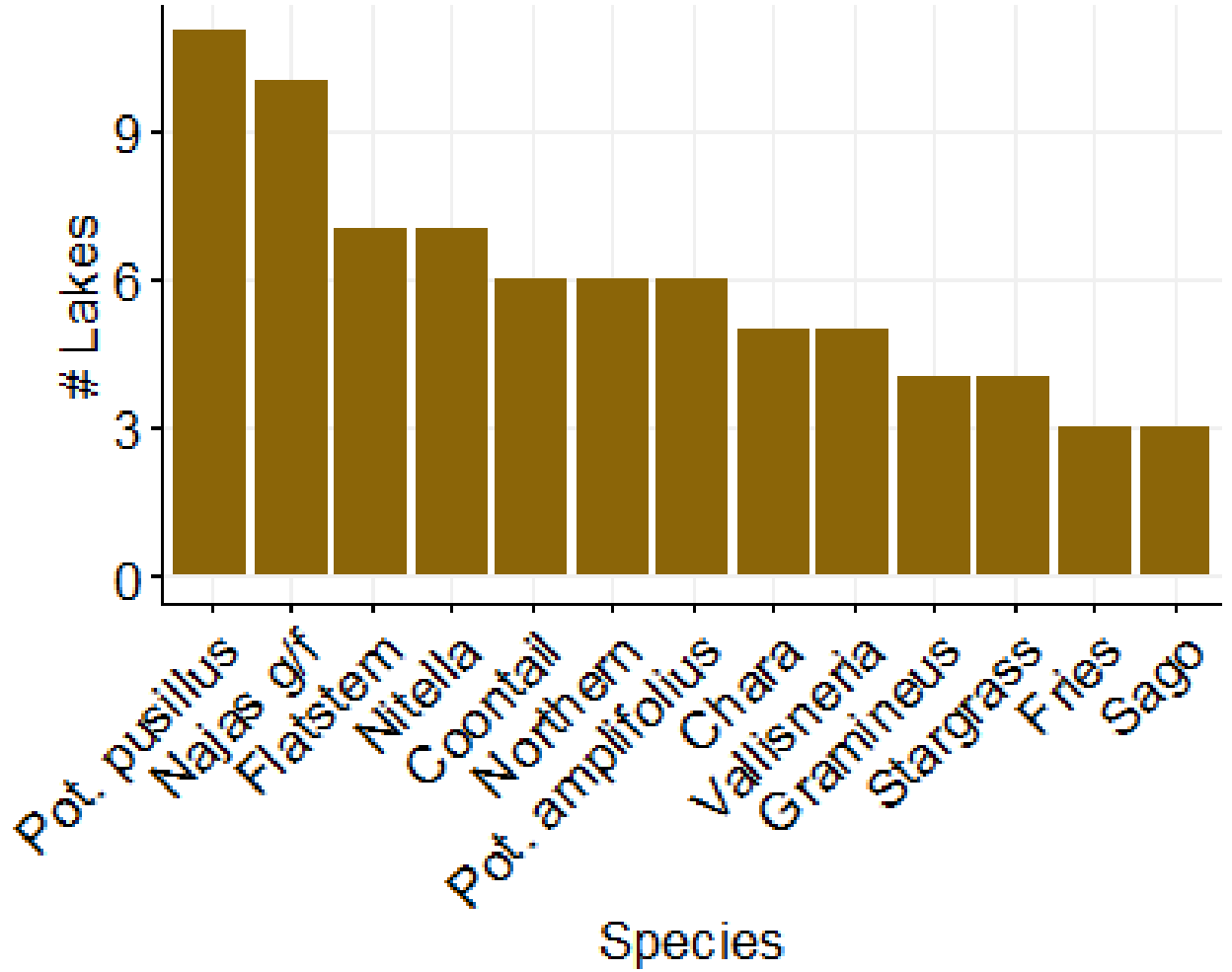
(Pre/Post)





Which species increased? Decreased?





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Is it worth it?
The ‘cure’ is bitter medicine
but may be better than being sick!

Next: Compare effects of EWM and TRT

Problem: NO PRE/POST EWM DATA!

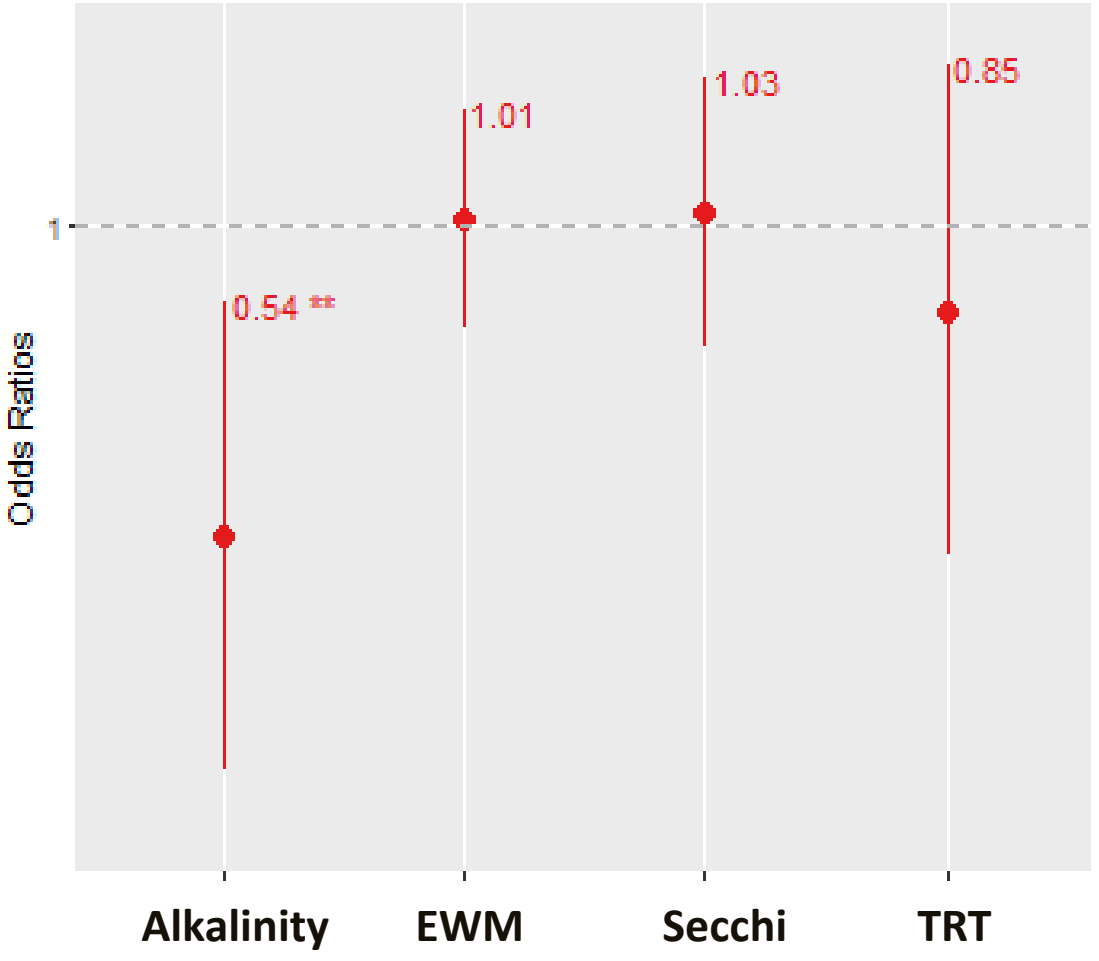
Solution:

Using observational data, account for environmental variation, compare:

- TRT (treated and untreated lakes)
- EWM (along an abundance gradient)

25 post-TRT & 125 (similar) untreated lakes

No evidence for effects on macrophyte abundance OVERALL:

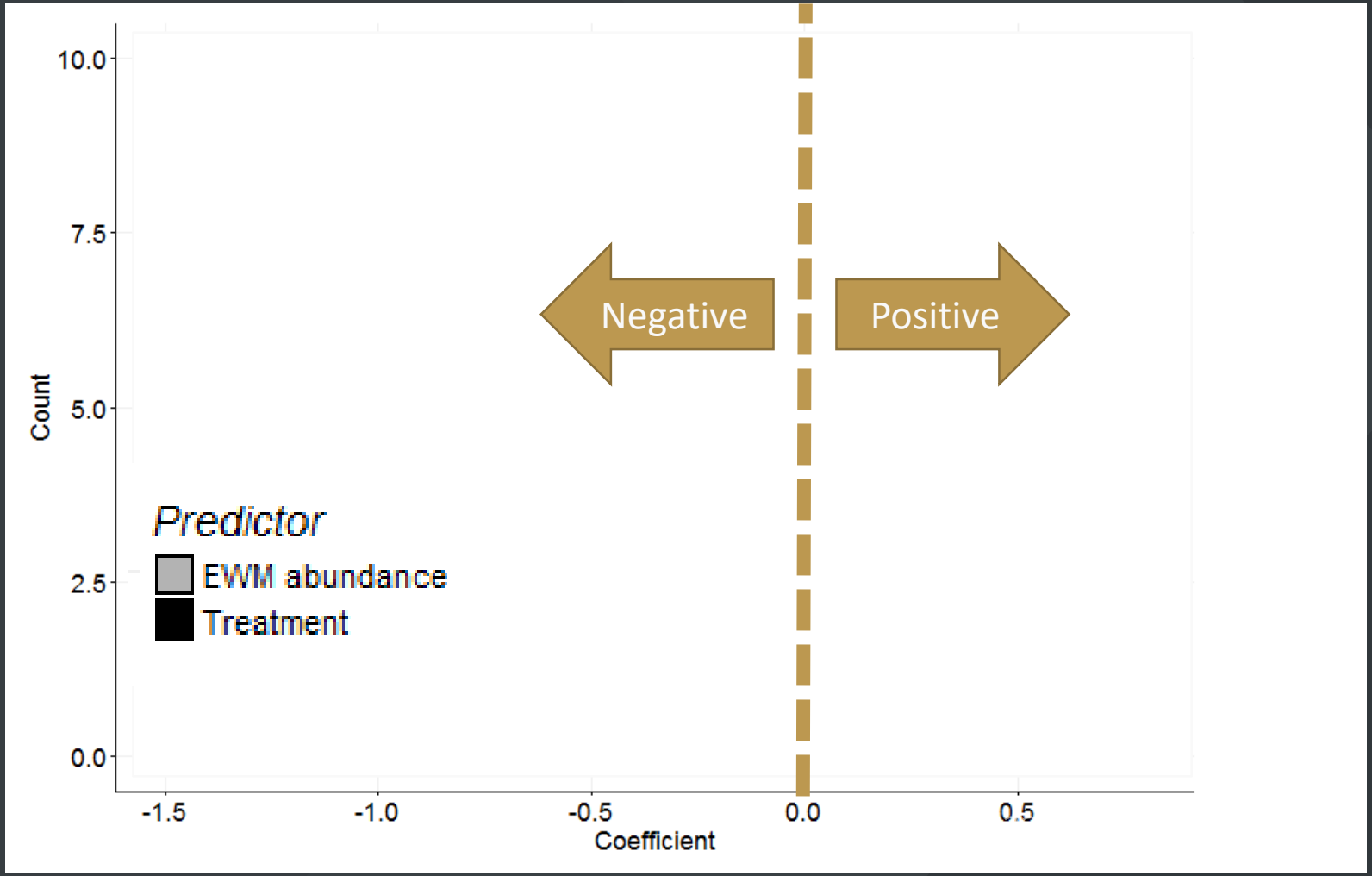


Significant effects on community composition:

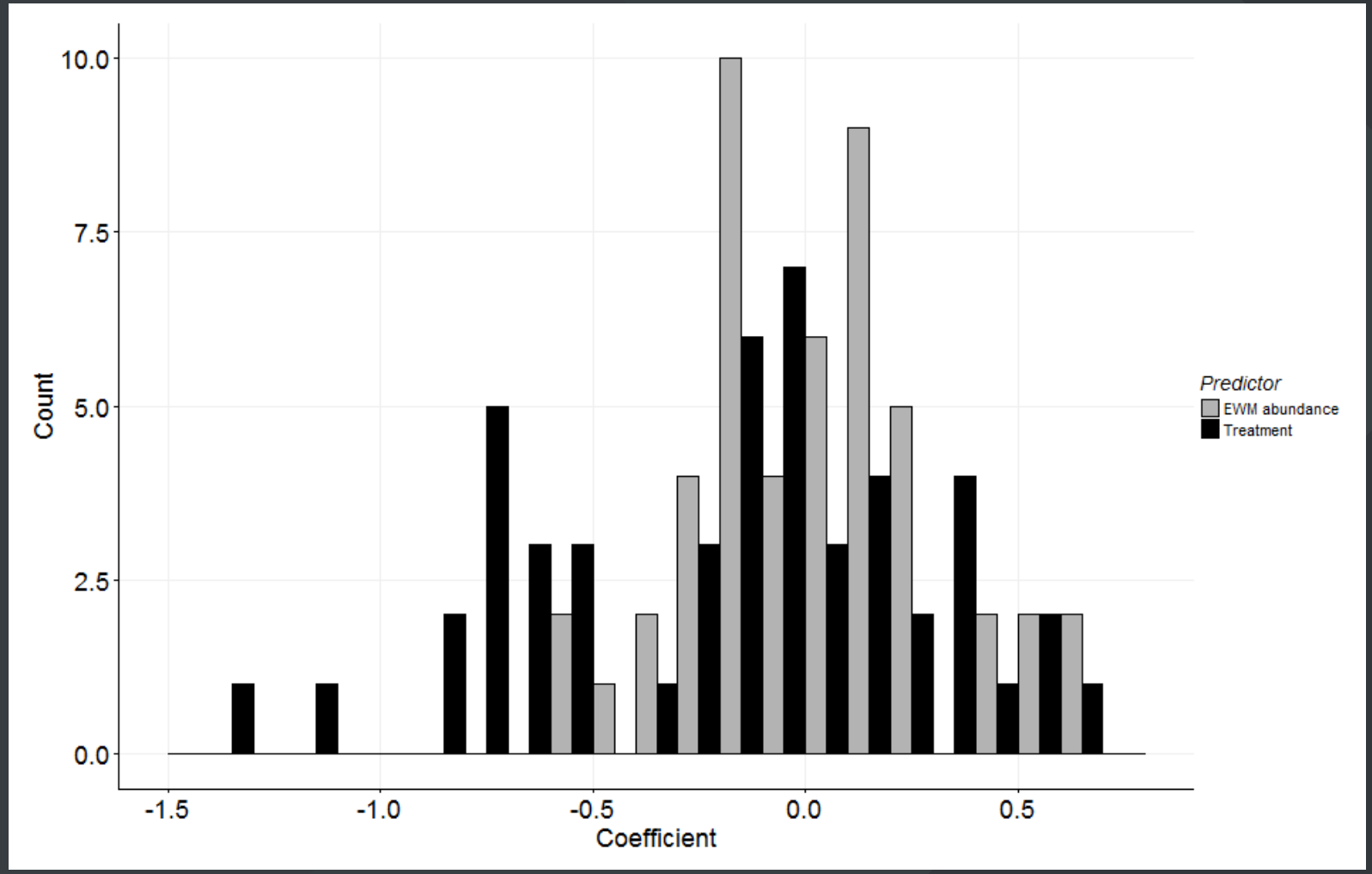
Alkalinity
Secchi
EWM
TRT

Also:
Lake
Species
Observation

Directly compare species-specific effects



TRT: effects are more variable and slightly more negative



Treatment & EWM:

- No evidence for overall effect on macrophyte occurrence

Treatment:

- More variable by species
- More negative effects

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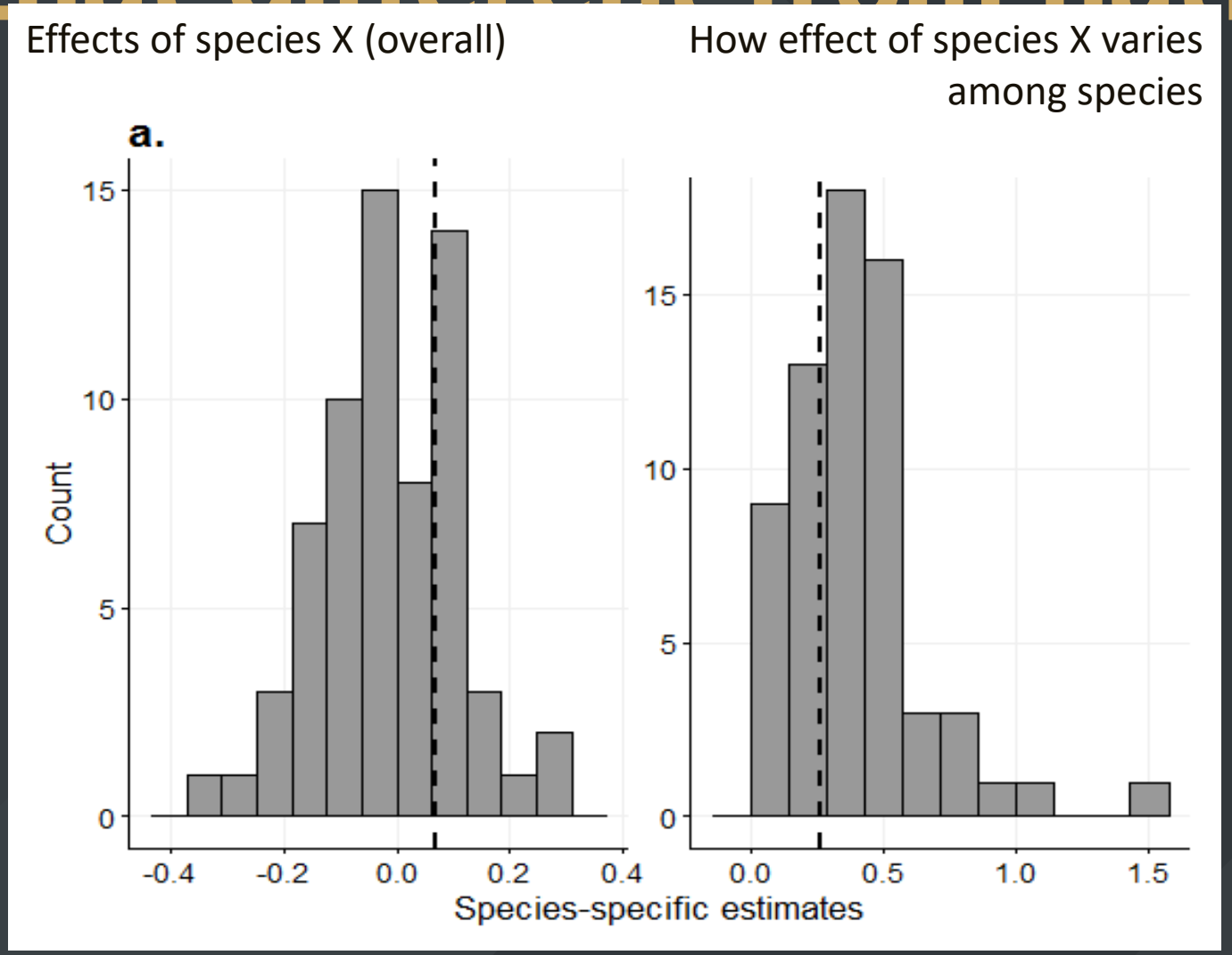
EWM affects community composition.
But is that different from natives?



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- Landscape-scape results (but management decisions often made locally)
- Risk assessment should consider multiple impacts

Acknowledgements

- WDNR lake managers
- WI lake consultants
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- Jojin Van Winkle, Eric Peterson
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- DNR colleagues