



# Testing Message Frames and Metaphors on Social Media to Prevent the Spread of Aquatic Invasive Species

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# The Problem



- Aquatic Invasive Species (AIS) are non-native plants and animals that can harm native ecosystems
- Communicating AIS-prevention information to boaters and anglers important to reduce the spread
- The challenge
  - Encourage behavior change through strategic communication



# Message Frames and Metaphors



## ■ Message framing

- Composition of message influences how individuals process and respond to it by making parts of an idea more salient
- Different messages frames may appeal to different audiences

## ■ Metaphor

- Comparison of two previously unrelated objects
  - Apply aspects of one object to another
  - Meaning itself is passed from one object to another
- Metaphors can help construct knowledge, evoke emotions and influence evaluations

# Metaphors and Persuasion



- Metaphors common in persuasion and AIS outreach specifically
- Metaphors convey system of connected knowledge highlighting some attribute
- Metaphorical language can lead to more elaboration than literal language
- Superior organization strongest explanation for metaphor's persuasive impact
  - Structures info better than literal language
- Metaphors allow humans to see AIS as:
  - Invader, unwelcome alien or a hitchhiker
- Metaphor one type of message frame

# Using metaphors to describe invasive species



# Militaristic Metaphors



## Concerns raised:

- May create incorrect assumptions about relationships between humans and environment
- Institutes a fear-based ideology and reduces scientific credibility (Larson 2005)



**Learn how to become a  
Weed Warrior!**



# Militaristic Metaphors



THE LATEST NEWS FOR ALL LAKE LOVERS

**SPORTS**  
Linné's girls roll in 5 straight!  
N-2 ON ROAD

**Healthy Lakes Journal**

**LIFE**  
Deck Days  
Concert Line-Up

No. 31,087 Madison, Wisconsin Friday, May 27, 2016

## SPINY WATER FLEAS PLAN FURTHER INVASION OF INLAND LAKES!

### Spiny Water Flea General promises less fish & green water; scientists say they can be stopped!



The maniacal Spiny Water Flea General!



The spiny water flea invasion horde.

After years of having their invasion front stunted in the Great Lakes, the Spiny Water Flea General has decreed his forces inland to the region's numerous inland lakes. Citing his species' "manly destiny" and "their need to thrive," the Spiny Water Flea General encouraged his peers to use boaters to reach these new lakes and to eat all of the native zooplankton they can upon arrival. Recent takeovers of lakes in Wisconsin, including inside Lake Mendota, demonstrates that the spiny water fleas intend to make good on the General's promise. In these invaded lakes, the General has claimed victory once his species has turned the water green with algae and reduced the number of fish that humans like to catch.

The editorial team at the *Healthy Lakes Journal* has repeatedly asserted that the spiny water fleas are not welcome in the region and that everyone should take action to prevent their invasions into local lakes. Luckily, limnologists from across the country all agree that this determined invasion workforce can be stopped with a few simple actions. Boaters should always drain all their water from their live wells, bilge pumps, and coolers. They should also be sure to clean all the mud and debris from boats and gear, including anchors, which is reportedly a favorite location for spiny water fleas to be transported.

Continued on B3

**INSIDE: Warden - Don't Pick up Hitchhikers!; Local Lake - Spiny Water Flea Cost Us Millions!**

## NOXIOUS WEEDS PUBLIC ENEMIES

PURSUE. CAPTURE. DESTROY.

Noxious weeds spread quickly, invading entire ecosystems. Property owners are required to control them on their property.



THE CITY OF  
**Edmonton**

# Nativist metaphors



Concerns raised:

- Unethical comparisons to unwanted immigrants or foreigners
- Example from an urban gardening project: participants resisted using only 'native' plants and wanted to include diverse and exotic plants because of their neighborhood's diverse community.

(Keulartz and van der Weele 2008)





# Hitchhiker Metaphor



**STOP AQUATIC  
HITCHHIKERS!**<sup>™</sup>

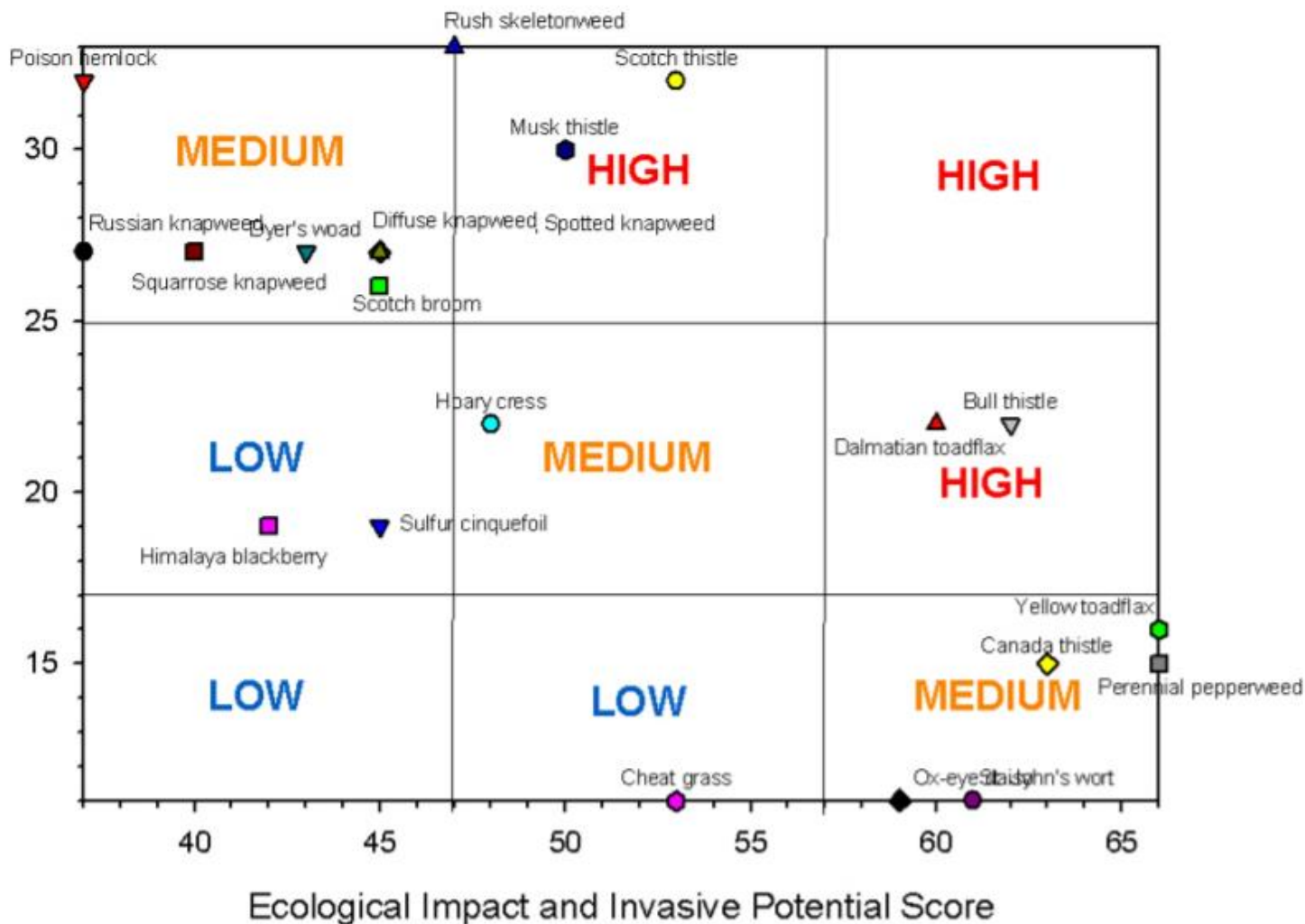
Be A Good Steward.  
Clean. Drain. Dry.

[StopAquaticHitchhikers.org](http://StopAquaticHitchhikers.org)

# Scientific/"Impact-Based" Comms



Potential for Effective Management and Control Score



# Limited research exists on invasive species message frames



- One finding:  
Describing invasive species as the **driving** force of environmental change rather than as the **passengers** that spread in response to disturbance increased perception of risk and willingness to take action against invasive species.



(Hart and Larson 2014)

# Limited research exists on invasive species message frames



- Wallen & Kyle 2018
  - Message frame impacts intention to take action
- Olden *in progress*
  - Any language referencing nonnative makes readers assume negative impacts
- Janovsky & Larson 2019
  - When present, invasive species literature uses more militaristic language than other ecological topics



# Research Question

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- How does the invasive species message frame used impact communication outcomes?
  - Cost effectiveness
  - Conversation
  - Sharing
  - Desire to receive similar content

# Project Goals

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- Test which metaphors/messages are most effective in generating:
  - Lowest cost per click
  - Engagement
- Compare metrics by gender

# Methods



- Five different message frames
  - Militaristic, nativist, hitchhiker, protective & science
- Five, four-day tests consisting of \$250 (\$50 per message frame, 5 message frames) for each sex (for a total of \$5,000 spent)
- Judged success based on cost-per-click and engagement
- Reached >270,000 people

# Message frames: Protective

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- Female reviewers thought nativist and militaristic metaphors were too male-centric and suggested a more nurturing message frame focused on protecting lakes



# Message Frames: Science



- Focus on scientific impacts of AIS
  - Fisheries, recreation, property values, water quality
- No metaphor
  - Straight-forward message about impacts of AIS
  - Hard to find real-world examples that don't use some metaphoric language
  - The word 'invasive' itself has some metaphorical meaning

# Selection Criteria



- Targeting:
  - All adults 18+ in Wisconsin
  - Interest in boating/fishing
- Action:
  - Learn more about preventing spread of zebra mussels
- FB Sponsor
  - Wisconsin Lakes Partnership

# Background & Acknowledgements

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- Team members
  - Barry Radler with data analysis
  - Brooke Weiland for art
- FB Partner
  - Wisconsin Lakes Partnership
- Funded by UW Sea Grant & WDNR
- Use results to inform communications of Wisconsin AIS Partnership

# Strategies for the Art

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- Very clear on what message frame
  - Perhaps over the top
  - Tested at WI Fishing Expo
- Similar design attributes
  - Consistency so that people weren't acting just on design differences

# Militaristic: Stop the Invasion



**Wisconsin Lakes Partnership**

Sponsored · 🌐

👍 Like Page

Help fight the battle against zebra mussels.



## Stop the Zebra Mussel Invasion

Stop invasive species in your wake. The Stop Aquatic Hitchhikers campaign empowers recreational users to stop the transport and spread of these harmful aquatic invasive species.

[STOPAQUATICHITCHHIKERS.ORG](http://STOPAQUATICHITCHHIKERS.ORG)

[Learn More](#)

# Science: Just the Facts



**Wisconsin Lakes Partnership**

Sponsored · 🌐

👍 Like Page

Zebra mussels are present in Wisconsin's lakes and can impact fisheries and recreation.



Prevent the spread of invasive species

Stop invasive species in your wake. The Stop Aquatic Hitchhikers campaign empowers recreational users to stop the transport and spread of these harmful aquatic invasive species.

[STOPAQUATICHITCHHIKERS.ORG](http://STOPAQUATICHITCHHIKERS.ORG)

[Learn More](#)

# Nativist: Keep 'em out



**Wisconsin Lakes Partnership**

Sponsored · 🌐

👍 Like Page

Keep them out of Wisconsin's lakes.



**Not Native. Not Welcome.**

Stop invasive species in your wake. The Stop Aquatic Hitchhikers campaign empowers recreational users to stop the transport and spread of these harmful aquatic invasive species.

[STOPAQUATICHITCHHIKERS.ORG](http://STOPAQUATICHITCHHIKERS.ORG)

[Learn More](#)

# Protective: Take care of your lake



**Wisconsin Lakes Partnership**

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Zebra mussels harm our waters.



## Help protect Wisconsin's lakes

Stop invasive species in your wake. The Stop Aquatic Hitchhikers campaign empowers recreational users to stop the transport and spread of these harmful aquatic invasive species.

[STOPAQUATICHITCHHIKERS.ORG](http://STOPAQUATICHITCHHIKERS.ORG)

[Learn More](#)



# Hitchhikers: Stop aquatic hitchhikers

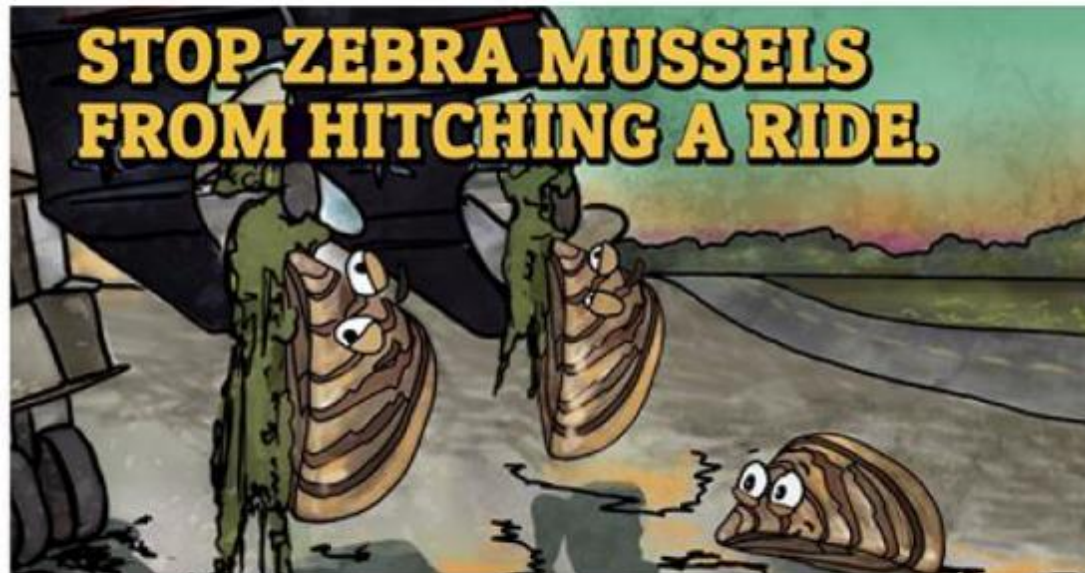


Wisconsin Lakes Partnership

Sponsored · 🌐

👍 Like Page

Zebra mussels can hitch a ride on your boat and hurt our lakes.



## Stop Aquatic Hitchhikers!

Stop invasive species in your wake. The Stop Aquatic Hitchhikers campaign empowers recreational users to stop the transport and spread of these harmful aquatic invasive species.

[STOPAQUATICHITCHHIKERS.ORG](http://STOPAQUATICHITCHHIKERS.ORG)

Learn More

# Results



<b>Men</b>	<b>CPC</b>
Militaristic	\$0.54
Science	\$0.56
Nativist	\$0.68
Protective	\$0.91
Hitchhikers	\$0.91

<b>Women</b>	<b>CPC</b>
Science	\$0.79
Nativist	\$0.88
Militaristic	\$0.91
Protective	\$1.00
Hitchhikers	\$1.10

# Results



	Cost per click (CPC) groupings for each message frame		
	<u>Least Cost Effective</u>	<u>Average Cost Effectiveness</u>	<u>Most Cost Effective</u>
Men	Hitchhikers Protective	Nativist	Science Militaristic
Women	Hitchhikers	Science Militaristic Nativist Protective	

# Results



Men	FB Reactions
Nativist	32.8
Militaristic	31
Hitchhikers	28.8
Protective	28.4
Science	12.8

Men	Shares
Hitchhikers	9.2
Protective	6.2
Militaristic	5.6
Science	5.2
Nativist	4.4

Men	Likes
Militaristic	7
Nativist	6.2
Protective	4.8
Hitchhikers	3.6
Science	3.4

Data on  
engagement

Men	Comments
Nativist	4.8
Militaristic	4.6
Science	2.8
Protective	1.4
Hitchhikers	1

# Results



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Men	Shares
Hitchhikers	9.2
Protective	6.2
Militaristic	5.6
Science	5.2
Nativist	4.4

Men	Likes
Nativist	6.2
Militaristic	6.2
Protective	3.8
Hitchhikers	3.6
Science	2.8



Anything but the facts generates a reaction

Something with some feeling

Men	Comments
Nativist	4.8
Militaristic	4.6
Science	2.8
Protective	1.4
Hitchhikers	1

# Results



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Nativist	32.8
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Nativist	4.8
Militaristic	4.6
Science	2.8
Protective	1.4
Hitchhikers	1

More shares for the socially desirable frames

Wants to be seen supporting this message



# Results



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Militaristic	31
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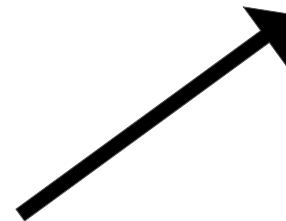
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Hitchhikers	9.2
Protective	6.2
Militaristic	5.6
Science	5.2
Nativist	4.4

Men	Likes
Militaristic	7
Nativist	6.2
Protective	4.8
Hitchhikers	3.6
Science	3.4

More page likes for the more controversial frames

Done in private

I want to see more content like this



Men	Comments
Nativist	4.8
Militaristic	4.6
Science	2.8
Protective	1.4
Hitchhikers	1

# Results



Men	FB Reactions
Nativist	32.8
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Hitchhikers	28.8
Protective	28.4
Science	12.8

Men	Shares
Hitchhikers	9.2
Protective	6.2
Militaristic	5.6
Science	5.2
Nativist	4.4

Men	Likes
Militaristic	7
Nativist	6.2
Protective	4.8
Hitchhikers	3.6
Science	3.4

The more controversial frames elicited more conversation



Men	Comments
Nativist	4.8
Militaristic	4.6
Science	2.8
Protective	1.4
Hitchhikers	1



# Results



Women	Reactions
Nativist	26.6
Hitchhikers	18.8
Militaristic	18.6
Protective	17.6
Science	11.4

Women	Shares
Hitchhikers	12
Protective	7.6
Nativist	6.8
Science	5.4
Militaristic	5.2

Women	Page Likes
Science	4.2
Nativist	2.8
Protective	2.8
Hitchhikers	2.6
Militaristic	2.2



Three groups, but similar pattern

Women	Comments
Nativist	1
Militaristic	0.6
Science	0.4
Protective	0.4
Hitchhikers	0

# Results



Women	Reactions
Nativist	26.6
Hitchhikers	18.8
Militaristic	18.6
Protective	17.6
Science	11.4

Women	Shares
Hitchhikers	12
Protective	7.6
Nativist	6.8
Science	5.4
Militaristic	5.2

Women	Page Likes
Science	4.2
Nativist	2.8
Protective	2.8
Hitchhikers	2.6
Militaristic	2.2



Similar pattern of sharing socially desirable things

Women	Comments
Nativist	1
Militaristic	0.6
Science	0.4
Protective	0.4
Hitchhikers	0

# Results



Women	Reactions
Nativist	26.6
Hitchhikers	18.8
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Women	Shares
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Women	Page Likes
Science	4.2
Nativist	2.8
Protective	2.8
Hitchhikers	2.6
Militaristic	2.2

Women	Comments
Nativist	1
Militaristic	0.6
Science	0.4
Protective	0.4
Hitchhikers	0

Less variability,  
but almost  
opposite of men

# Results



Women	Reactions
Nativist	26.6
Hitchhikers	18.8
Militaristic	18.6
Protective	17.6
Science	11.4

Women	Shares
Hitchhikers	12
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Nativist	6.8
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Militaristic	5.2

Women	Page Likes
Science	4.2
Nativist	2.8
Protective	2.8
Hitchhikers	2.6
Militaristic	2.2

Little discussion  
was generated



Women	Comments
Nativist	1
Militaristic	0.6
Science	0.4
Protective	0.4
Hitchhikers	0

# But not always the conversation we wanted



Most Relevant ▾

7 Shares · 8 Comments

Write a comment...

Wonder how many are registered to vote?  
Like · Reply · Message · 2d

Damn, even the shell fish are victims of hate speech!  
Like · Reply · Message · 11h

They probably separate mussel families too.  
Like · Reply · Message · 2d

Build the wall 🤪  
Like · Reply · Message · 2d

Wtf... This is why Americans are so hated amongst the mussel community.. We don't need this intolerance... Not here.. Not in my country.. These people.. No matter what religion they belong to should not be oystercized for how they vote or what type of shell they have... Lol.. Oystercized...  
Like · Reply · Message · 1d

Where the only species aloud to spread like aids  
Like · Reply · Message · 2d

Racist!  
Like · Reply · Message · 1d

That sounds inhumane!  
Like · Reply · Message · 2d

It's better on some frames



Wisconsin Lakes Partnership shared a link.

Written by Tim Campbell [?] · July 6 at 6:03 AM



STOPAQUATICHITCHHIKERS.ORG

Prevent the spread of invasive species

Learn More

Stop invasive species in your wake. The Stop Aquatic...

4,935 people reached



Like



Comment



Share



Jordan Heck, Alex Young and 6 others

Most Relevant

4 Shares

2 Comments



Write a comment...



Wisconsin Conservation Warden Association



Like · Reply · Message · 1d



Like · Reply · Message · 2h



Most Relevant

14 Shares

2 Comments



Write a comment...



The mussels clog intakes for water, at the cost of millions-billions of \$s. They've cleaned lakes so well that it has totally upset the natural balance. Seaweeds thrive deeper than usual because the water is clearer. Thus we have more green yuk on the ... See More

Like · Reply · Message · 5w

4 Replies

Yeah, whatever. Zebra mussels have cleaned up lakes that were so polluted now are clean almost good to drink.

Like · Reply · Message · 5w



# Limitations



- Tested what is most cost effective at gaining people's attention rather than what to do once you have it
- While efforts were made to equivalently capture the visual 'essence' of a message frame, art is inherently subjective
  - Different visual executions could provide different results
  - Would have been impossible to do with photos

# Conclusions



- Conceptually informed message test to promote awareness about AIS
- Using targeted Facebook advertising message tests rare within Extension research
  - Combining visual/textual elements of a message frame is rare even though people process much info visually
- Science and militaristic frames generally lowest cost
- Less expensive to initiate clicks for men
  - Likely because of greater interest in the topic among men
  - Or there could be more competition for ad space among women
- Men/women have differences in their most appealing/engaging frames
- Cost effective not same as most engaging



# Application

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- We might be able to achieve the same communication goals without needing to use potentially controversial metaphors
- Use of some metaphors because “they engage people” may also be the reason for some tough-to-manage public attitudes
- Training for more deliberate use of metaphors in communications

# How you can use this



- “Invasive species can impact your property – volunteer today!” vs “Join the war on invasive species – volunteer today!”
  - Essentially the same outcome, but without the same ethical concerns
- Messaging to be “engaging” vs messaging to take desired action
  - We want people to be sharing messages about preventing the spread of AIS, so nurturing and hitchhikers are best

# Thank You!



## Questions?

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