

Functional eradication as a framework for invasive species control

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What structures ecological communities?



Changing species composition



Removal
(e.g. exploitation)



Addition
(e.g. invasion)



Population control

ERADICATION



When is eradication successful?

Restricted geographic range



Small population size



Habitats readily accessible



Invader easily removed



Aquatic invasions



Aquatic invasions



How are AIS managers making decisions and what information do they need?



Bi-national survey of AIS managers and practitioners in United States and Canada

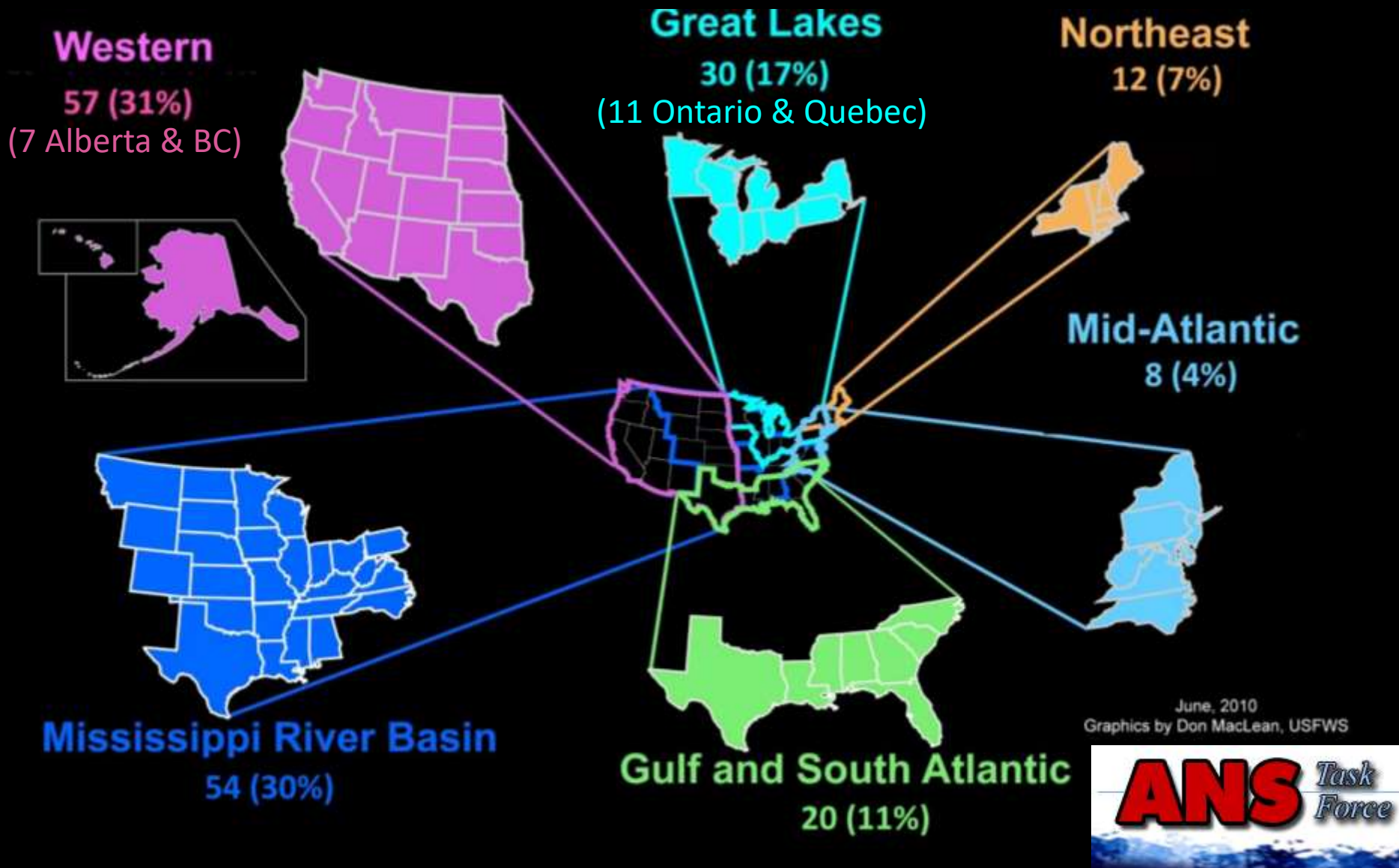
- What are the top aquatic invasion that concern managers?
- What is their status and impact?
- What are the goals of management and how are they being achieved?

Target audience

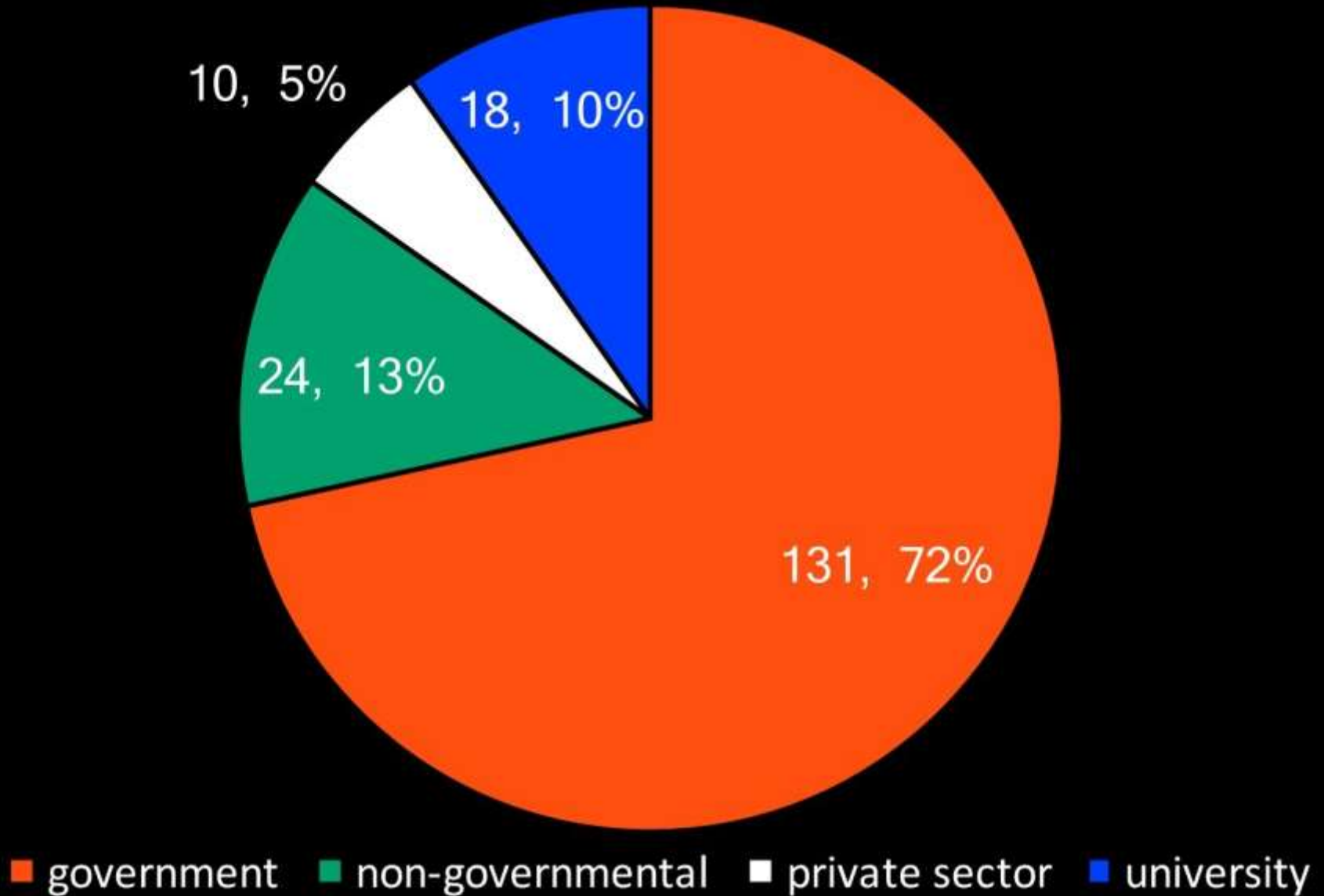
- Individuals in AIS management at federal, regional, or local levels
- Government, NGO, private sector, and public research institutions



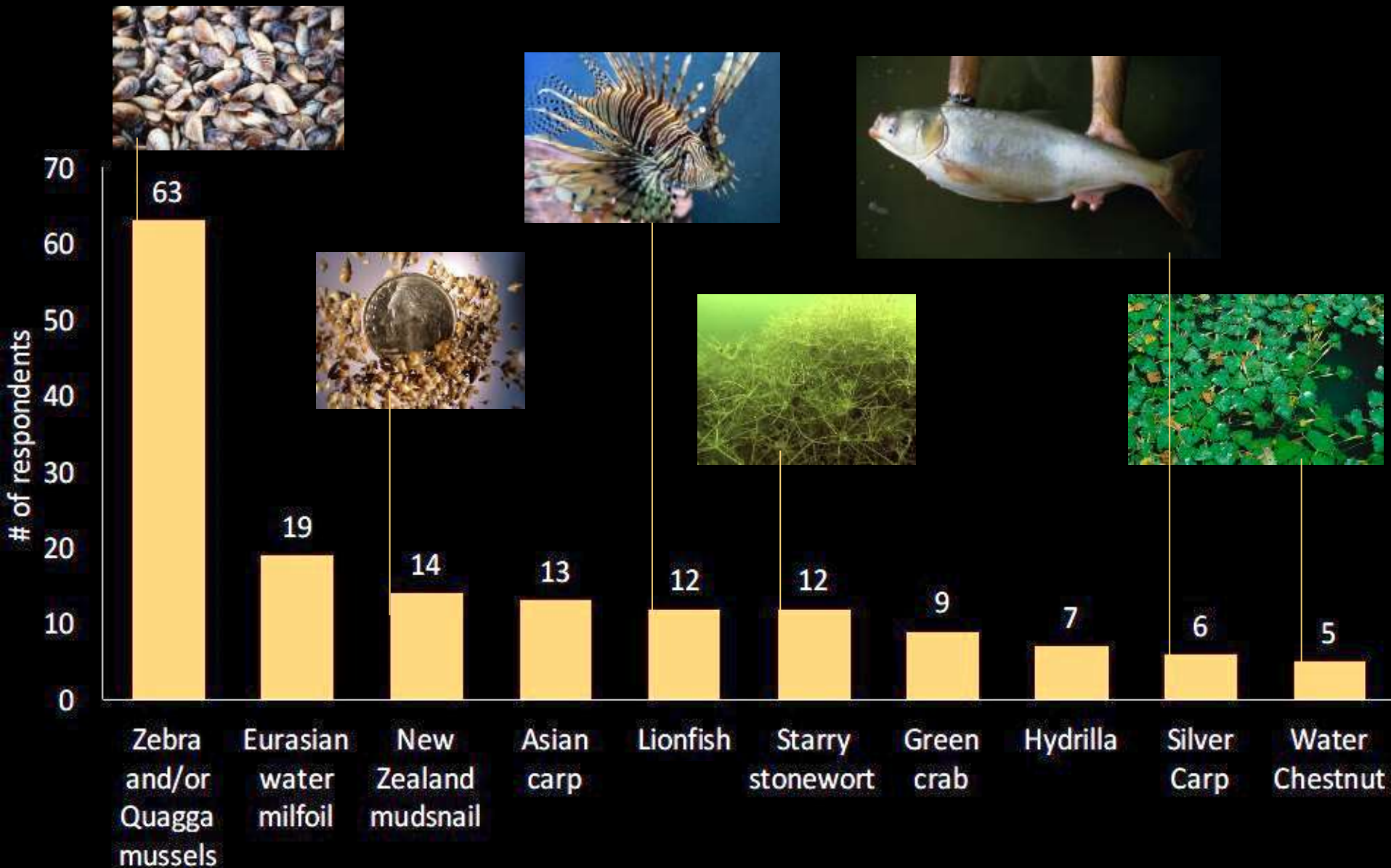
Reached 243 managers and practitioners through six regional panels

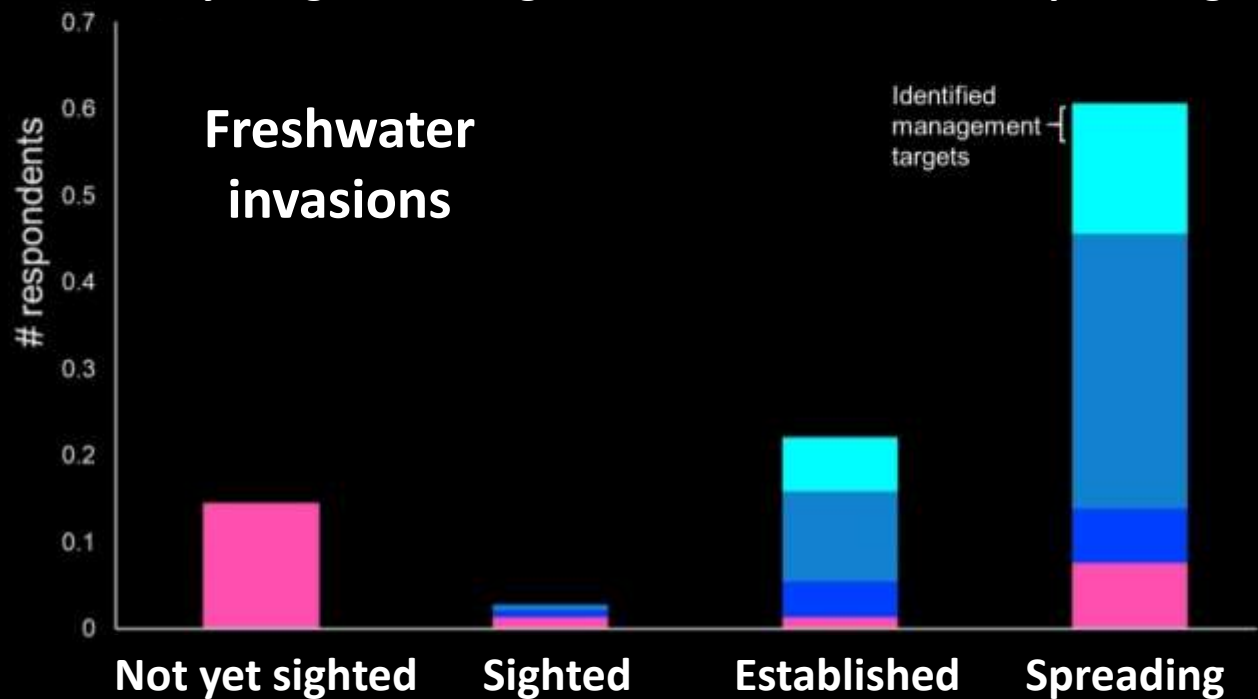
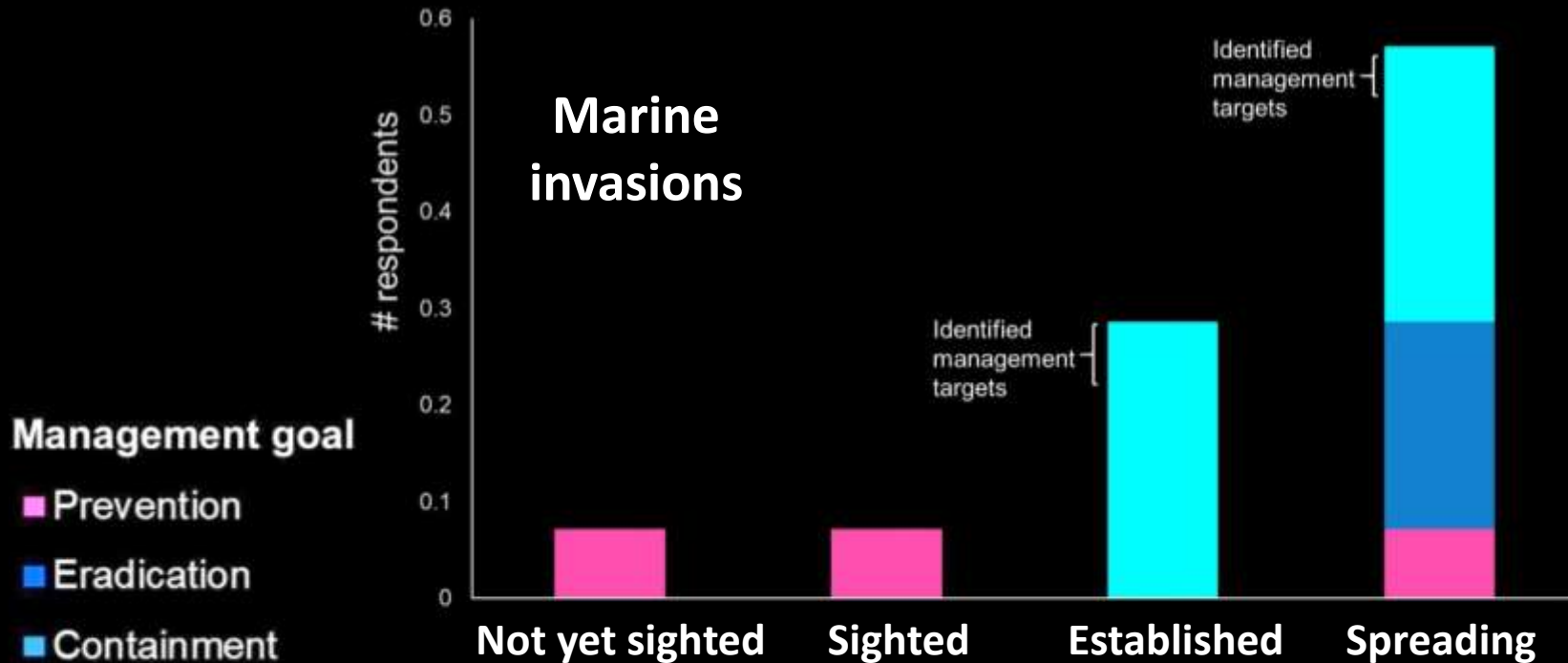


Respondent characteristics



Top priority aquatic invaders





Survey of North American AIS managers and practitioners

80%

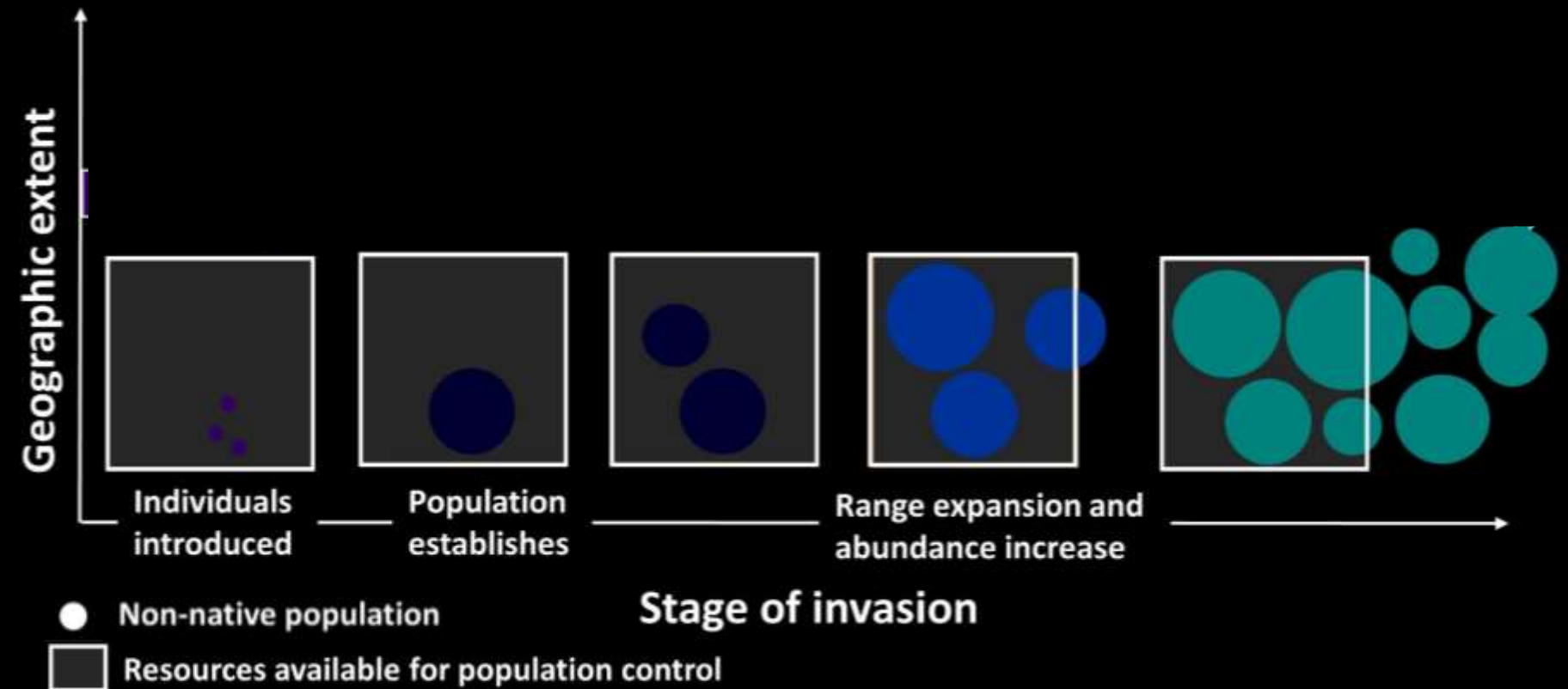
Invasion occurring at scale

beyond resources for eradication

95%

Lack targets for suppression
or ecological recovery

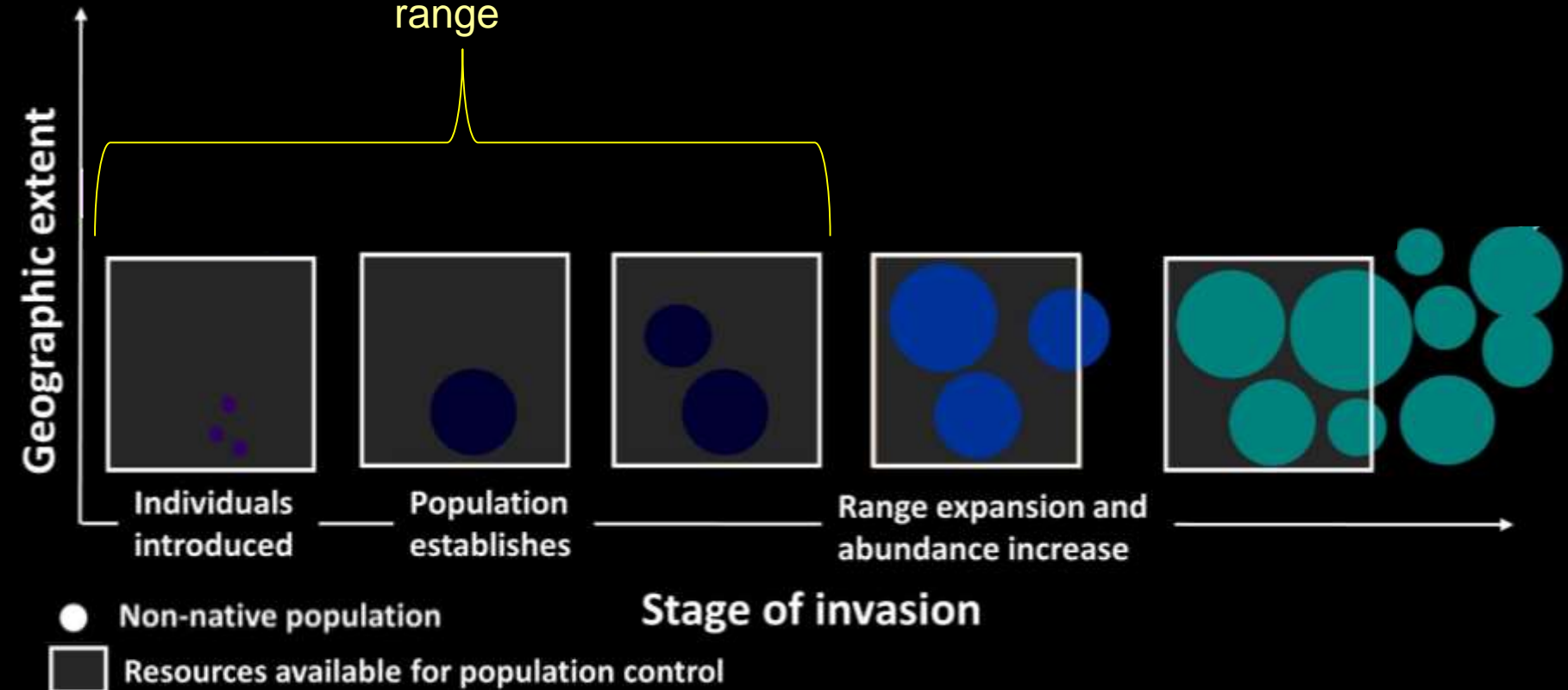
Management priorities and invasion stage



Management priorities and invasion stage

Numerical eradication

Removal until full extirpation from invaded range



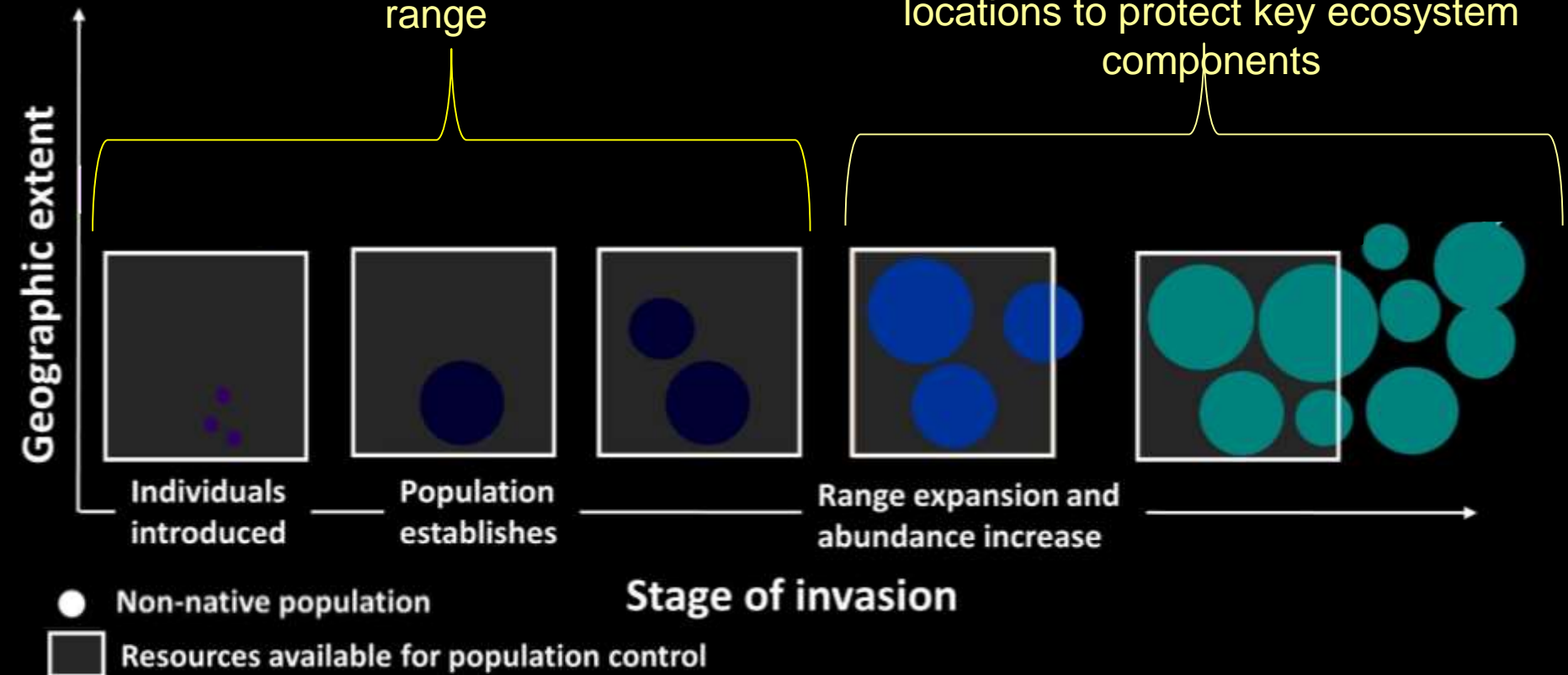
Management priorities and invasion stage

Numerical eradication

Removal until full extirpation from invaded range

Functional eradication

Ongoing suppression in high priority locations to protect key ecosystem components



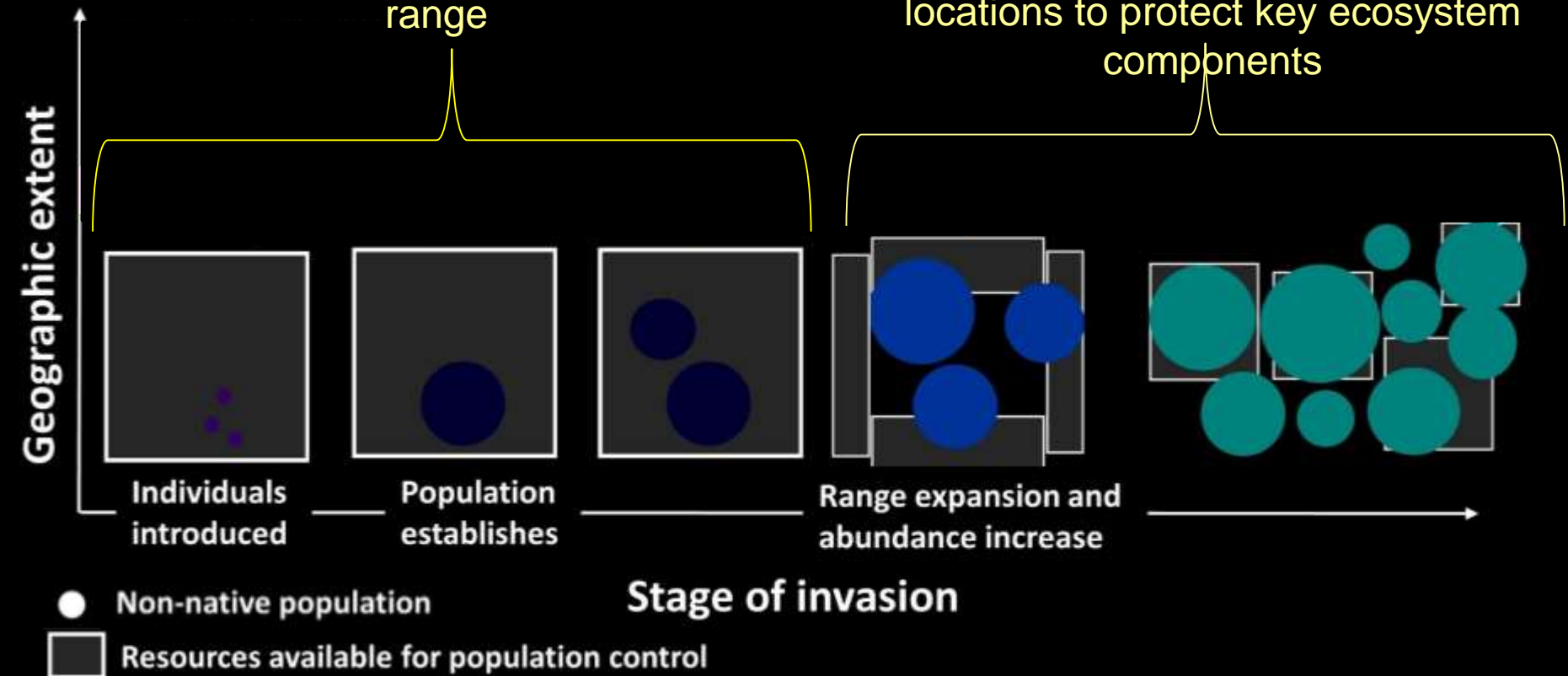
Management priorities and invasion stage

Numerical eradication

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Functional eradication

Ongoing suppression in high priority locations to protect key ecosystem components



Key questions for functional eradication

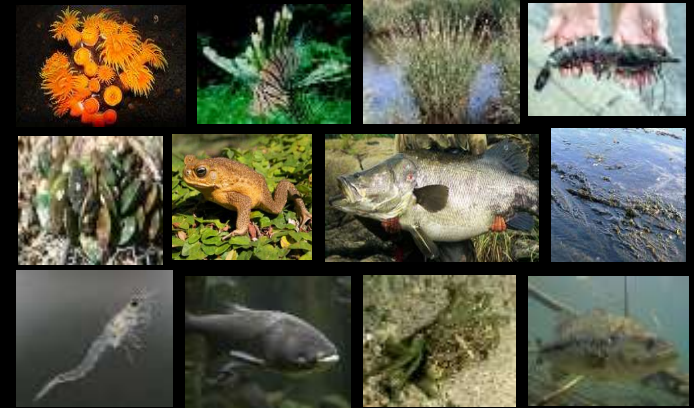
“Ongoing suppression in high priority locations to protect key ecosystem components”

- What level of removal is sufficient to alleviate impacts?
- Which areas should be prioritized?
- How can efforts be sustained?

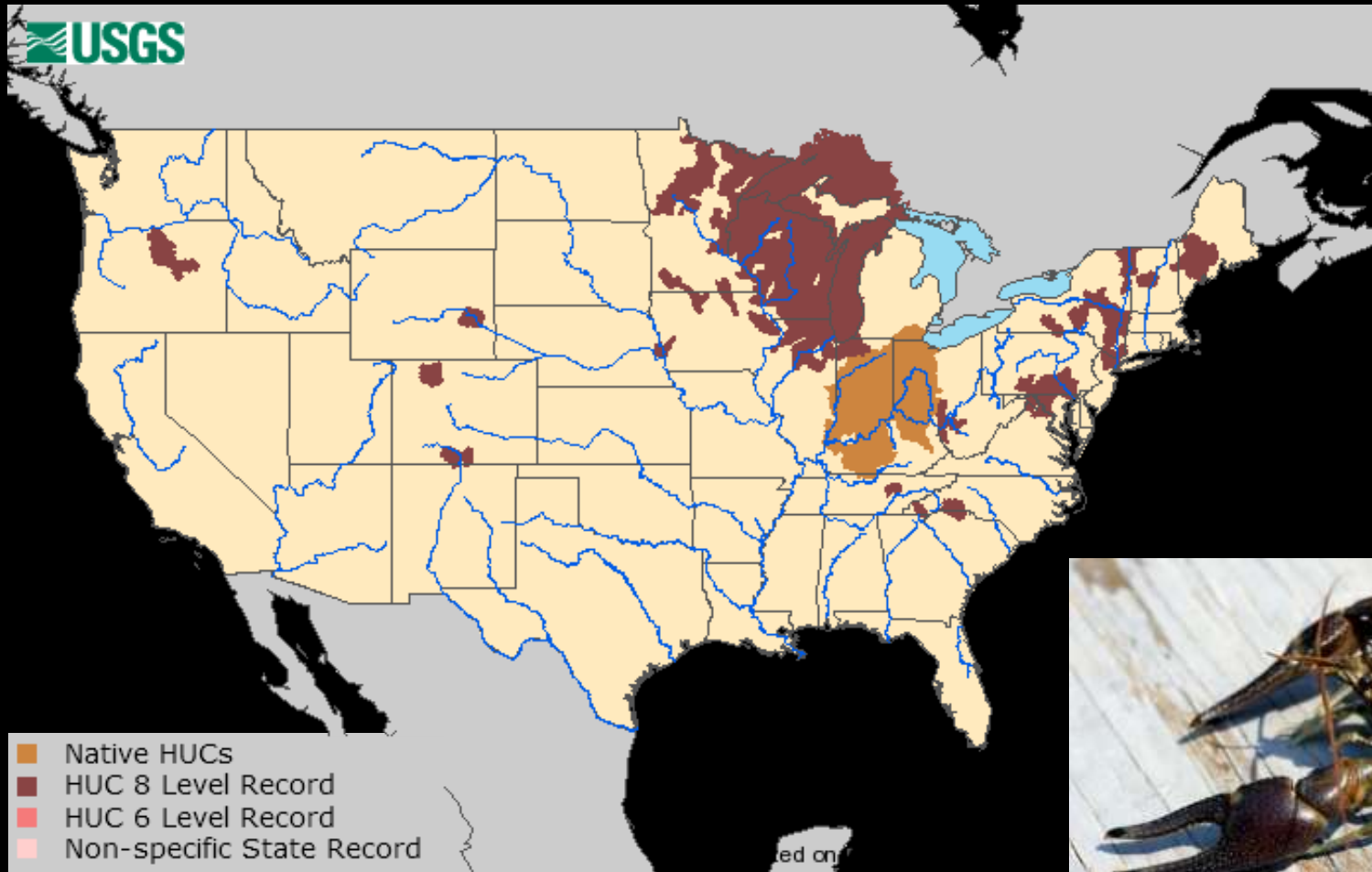


Targets for functional eradication

Three steps:

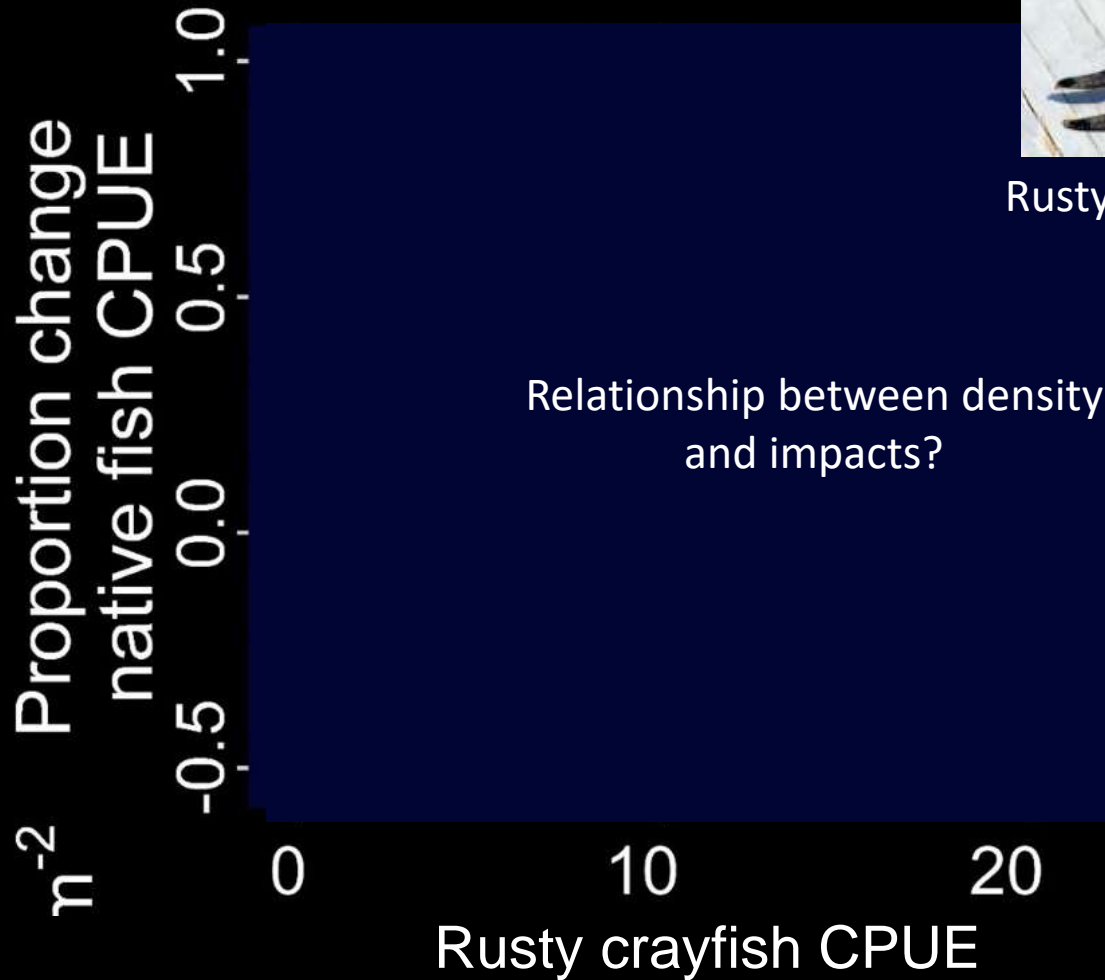


Rusty crayfish (*Faxonius rusticus*) distribution & impacts



- Compete with native invertebrates and fishes for food and space
- Damage vegetation that serves as key spawning and juvenile fish habitat

Impact thresholds can inform management targets

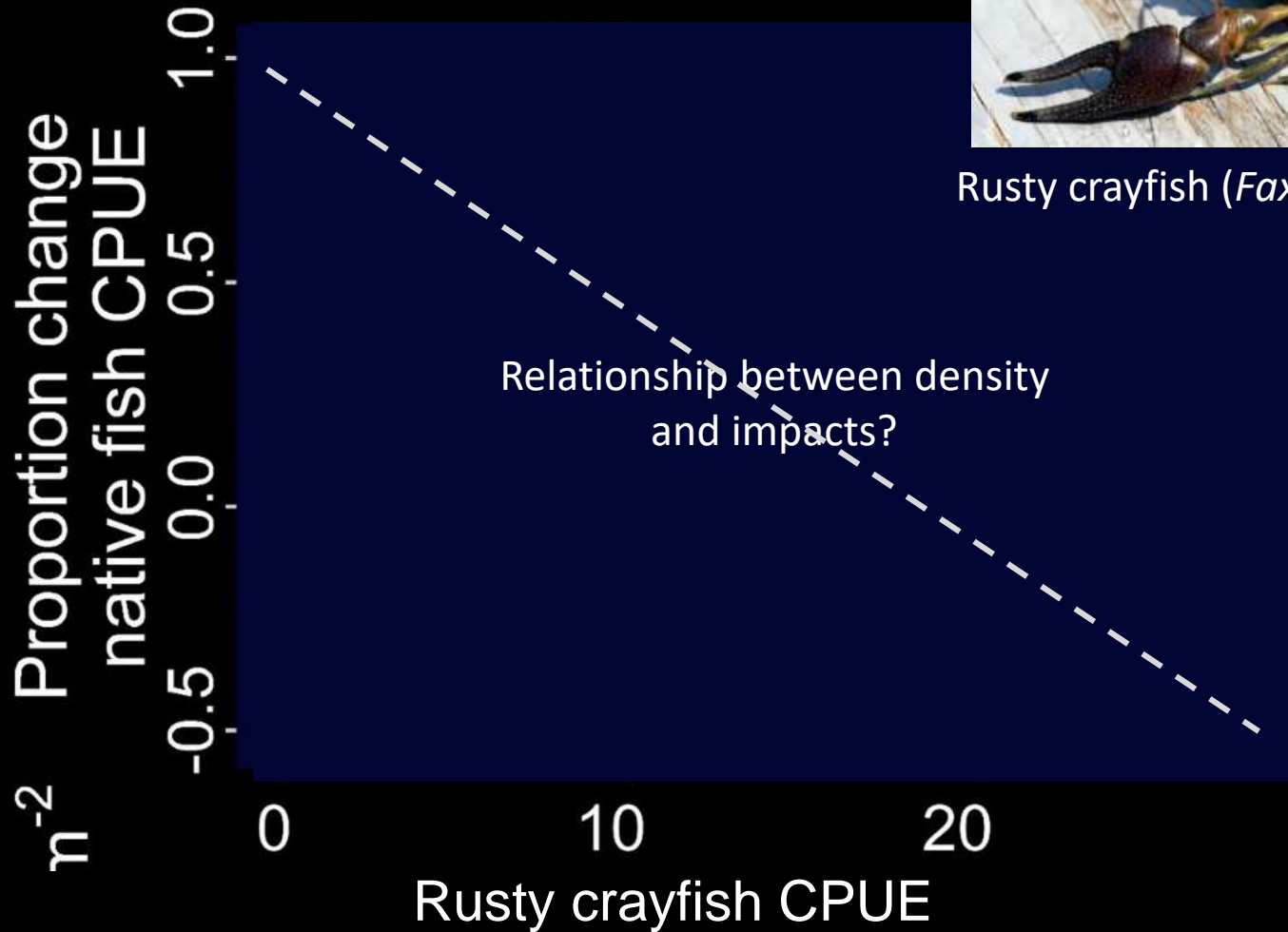


Rusty crayfish (*Faxonius rusticus*)

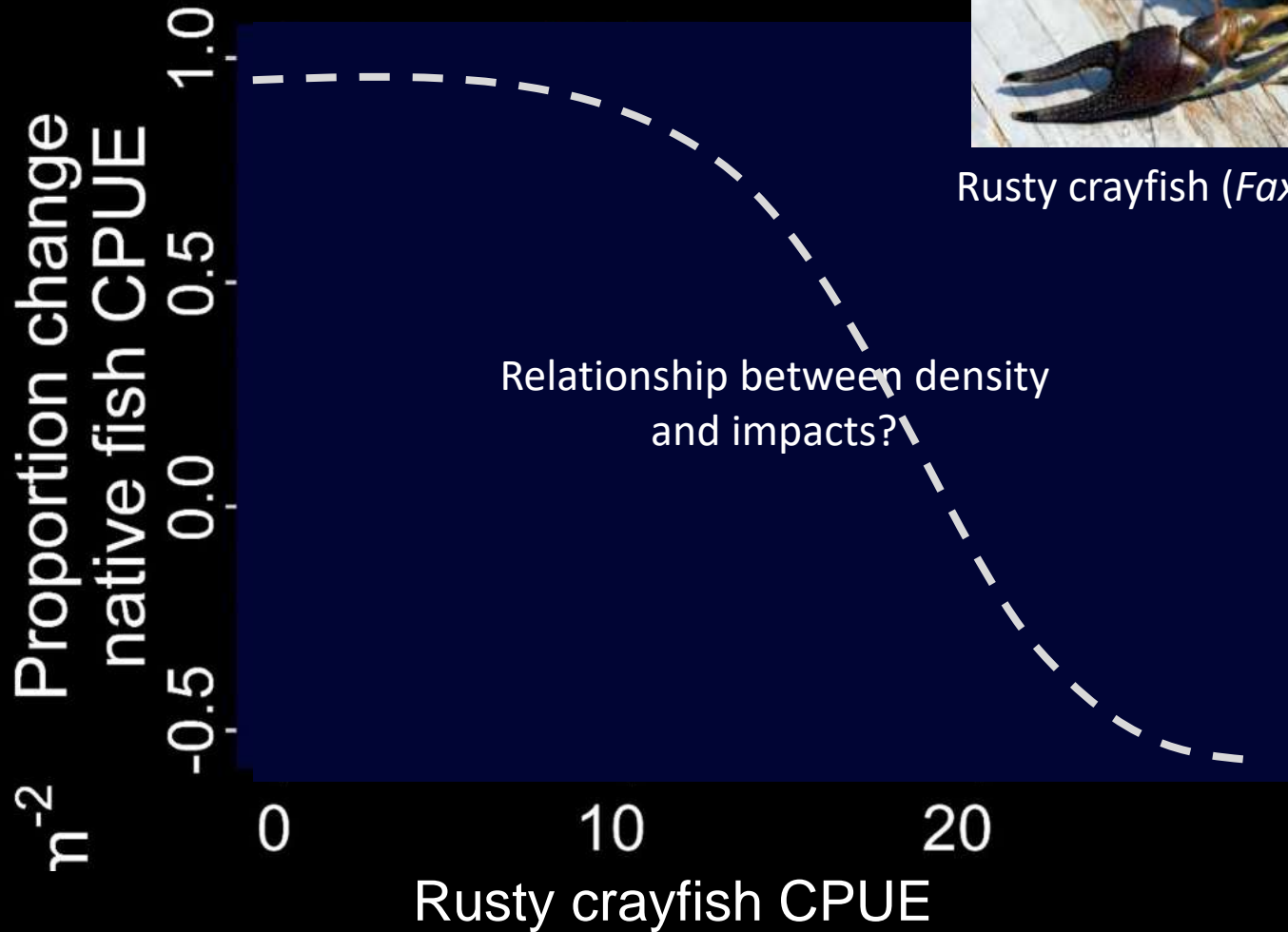
Impact thresholds can inform management targets



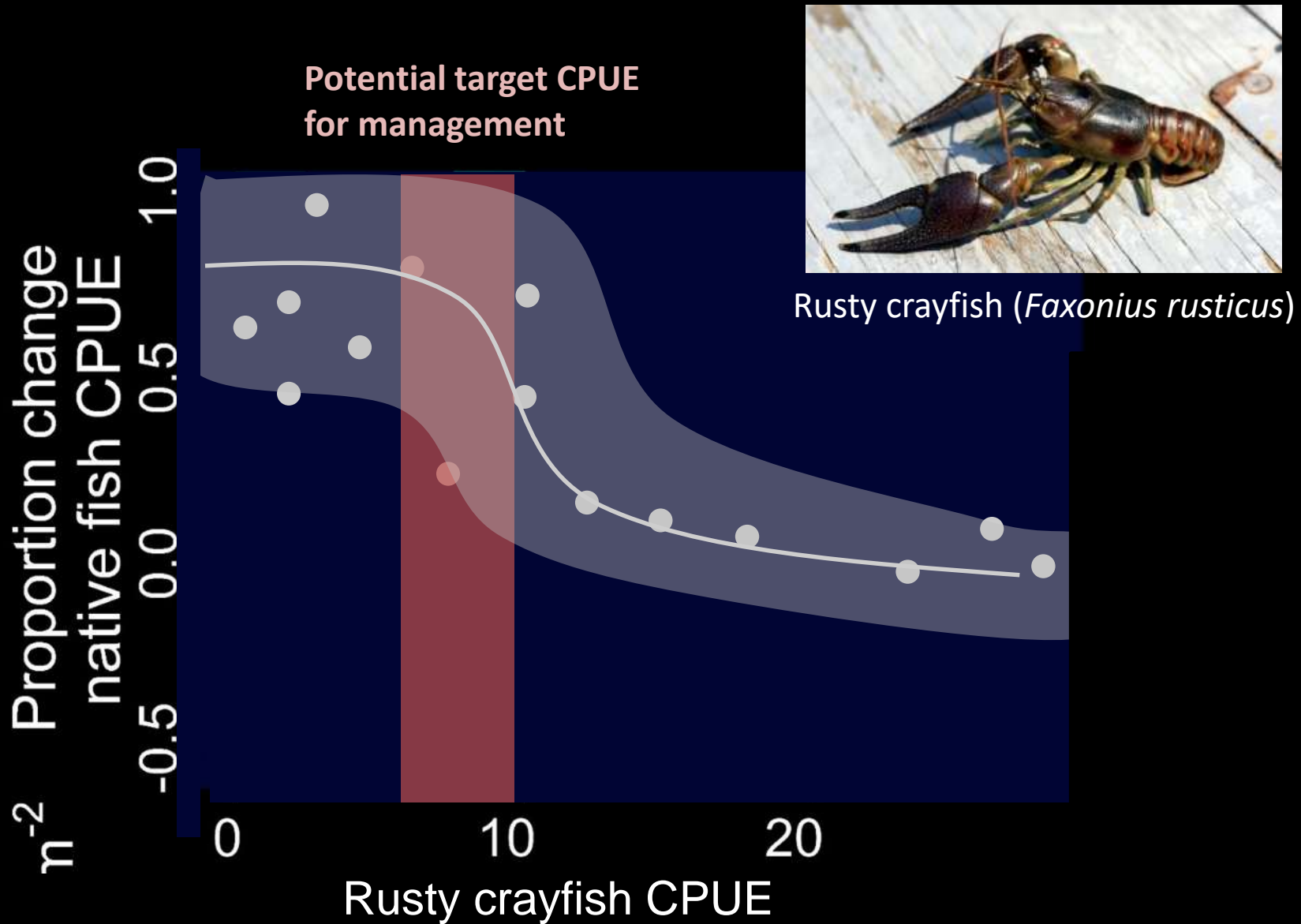
Rusty crayfish (*Faxonius rusticus*)



Impact thresholds can inform management targets



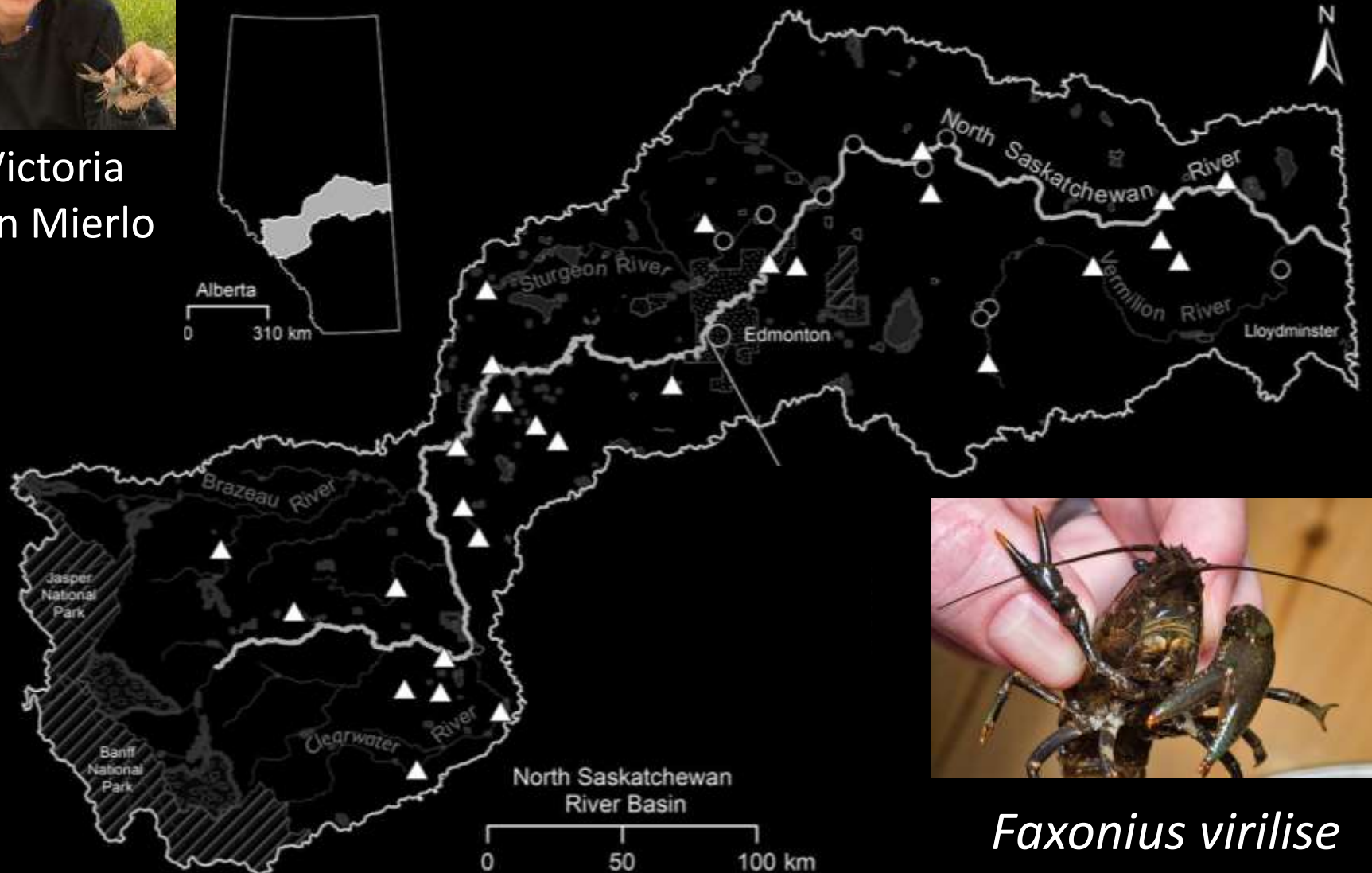
Impact thresholds can inform management targets



Expanding range of Northern crayfish in Alberta



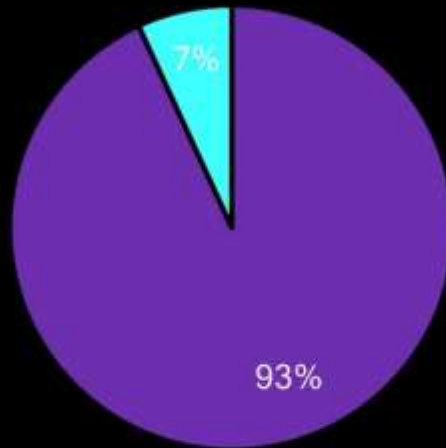
Victoria
Van Mierlo



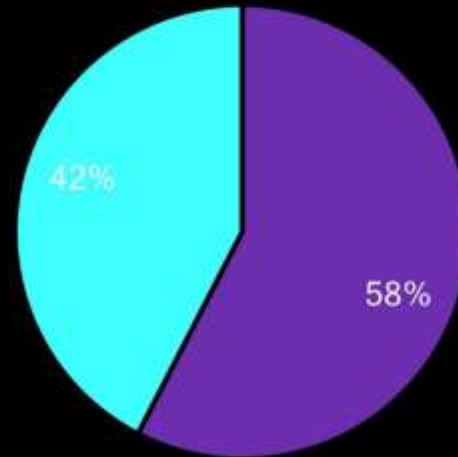
Faxonius virilise

In your jurisdiction, are you monitoring...

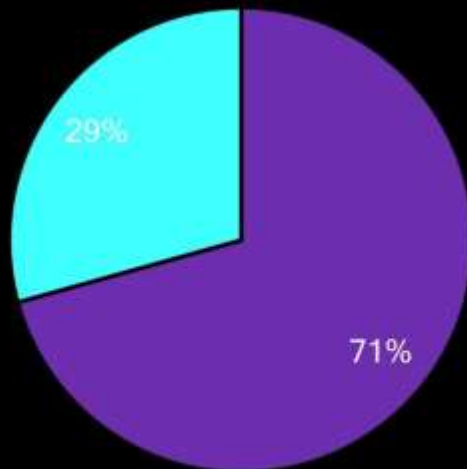
ANS populations



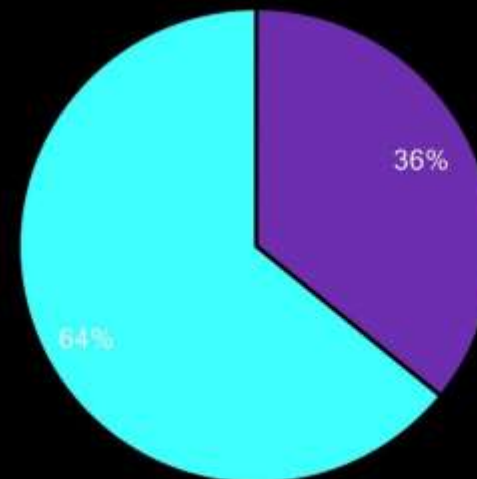
Ecological impacts



Impacts on native taxa



Socio-economic impacts



■ Yes ■ No

Key questions for functional eradication

“Ongoing suppression in high priority locations to protect key ecosystem components”

- What level of removal is sufficient to alleviate impacts?
- Which areas should be prioritized?
- How can efforts be sustained?



Prussian carp in Alberta

**HAVE YOU SEEN
THIS FISH?
CATCH IT. KILL IT.**



PRUSSIAN CARP A.K.A WILD GOLDFISH

Prussian Carp is a harmful invasive species that is known to devastate aquatic ecosystems and pose severe threats to native fish.

**If you catch a Prussian Carp,
DON'T LET IT LOOSE. Please kill it
and take it home to eat or properly
dispose of the carcass (away from
any water bodies).**

FOR MORE INFORMATION ON INVASIVE SPECIES, CALL:
1-855-336-BOAT (2628)

Global distribution of Prussian carp

Carassius gibelio

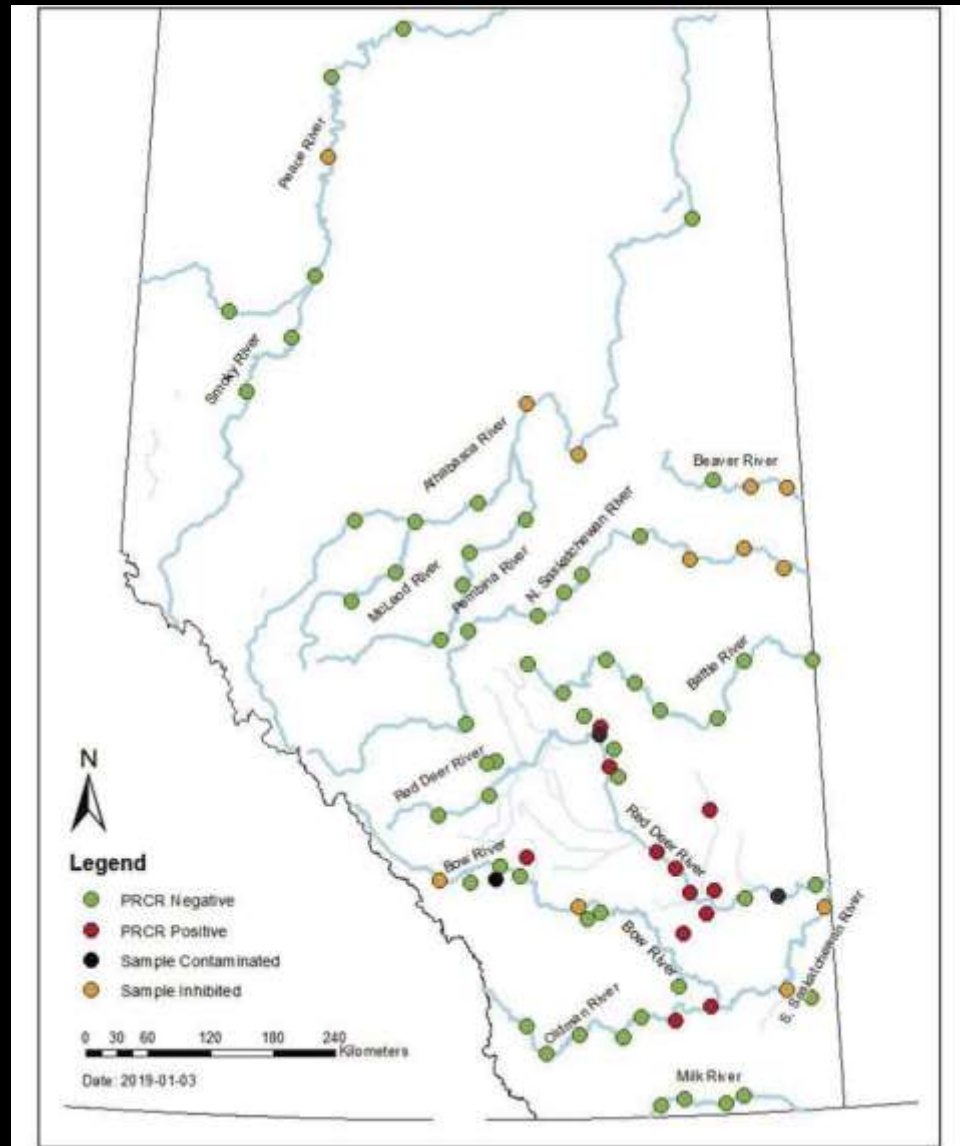


Prussian carp impacts

- Competition for food and space
- Reduce water quality
- Pathogens



Prussian carp distribution revealed by eDNA



What role can anglers play in supporting Prussian carp management?



What role can anglers play in supporting Prussian carp management?



Natasha Pentyliuk
(UAlberta)



Britt Schmidt
(ACA)



Howie Harshaw
(UAlberta)



Mark Poesch
(UAlberta)



Alberta Conservation
Association



UNIVERSITY OF
ALBERTA



Mitacs



Angler engagement in aquatic invasive species management



How well do reports by anglers predict known Prussian carp distribution in Alberta?



What characteristics affect an angler's willingness to report?



Natasha Pentyliuk



Angler Survey

With Prizes!



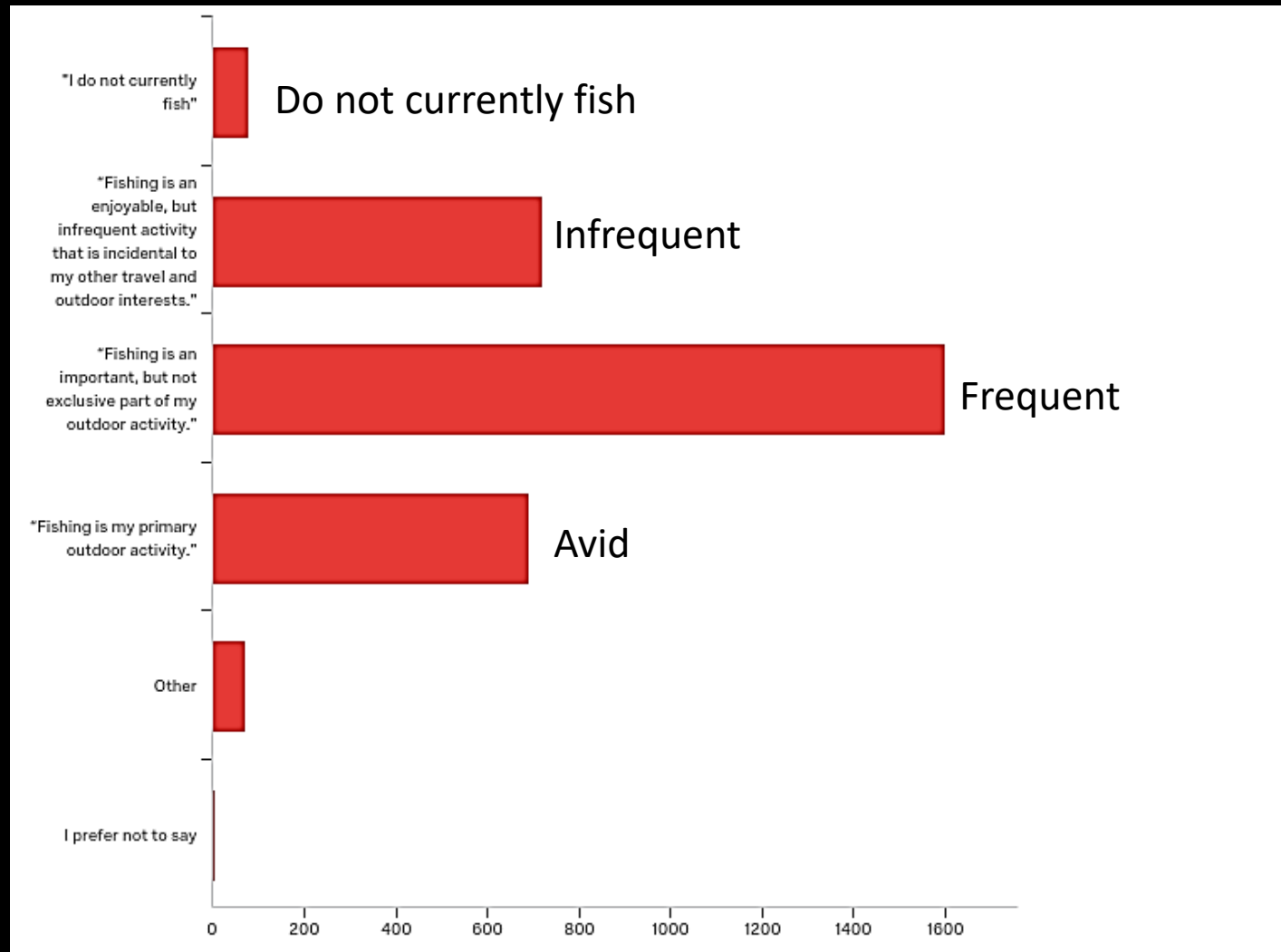
University of Alberta is working with Alberta Conservation Association to research the role anglers may play in addressing the spread of harmful aquatic invasive species (AIS) in Alberta. By surveying anglers from across Alberta, we hope to identify the factors that affect their engagement in AIS reporting and removal. Your participation in this study is indispensable.



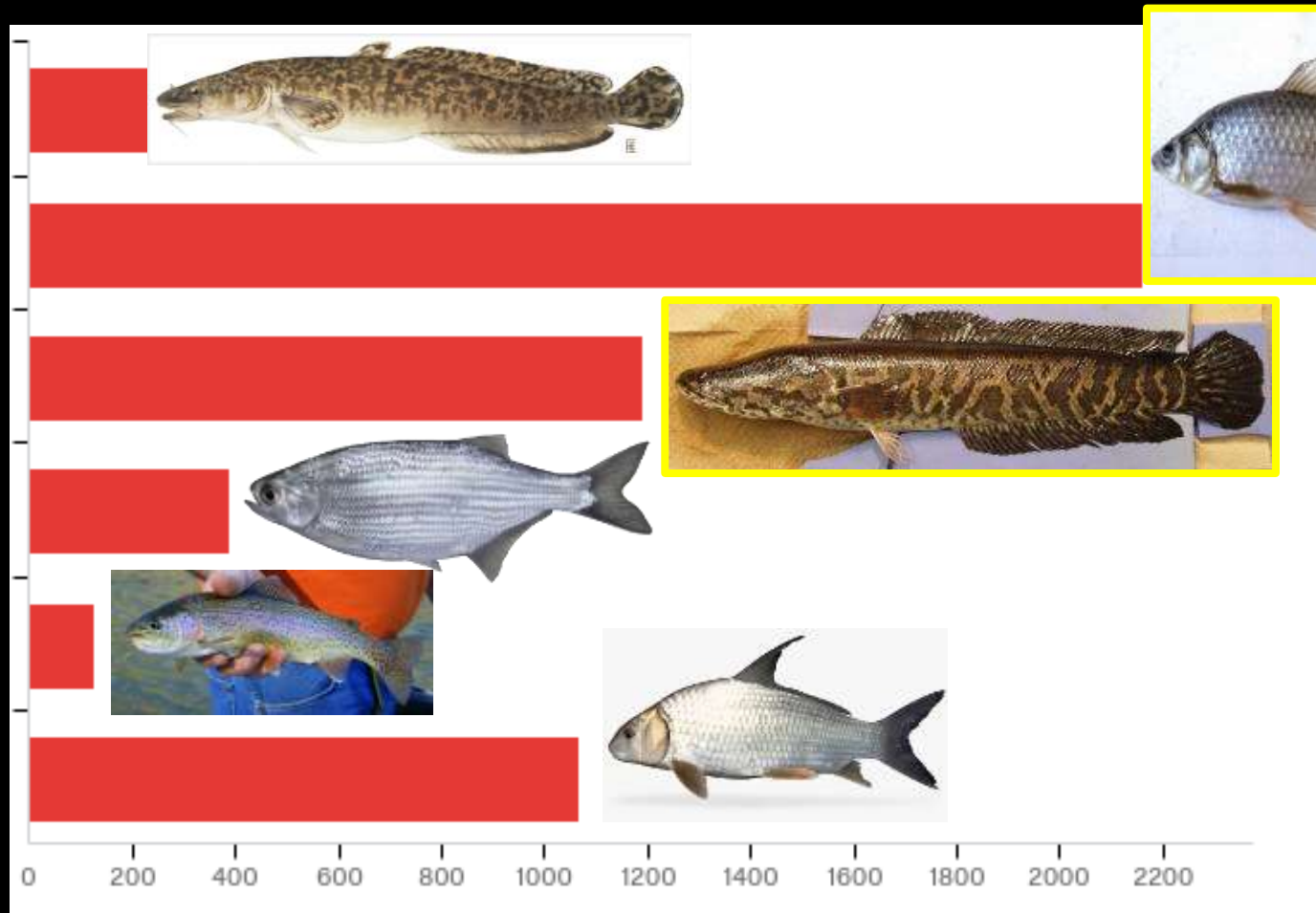
- ~ Online survey June-Aug 2019
- Distributed via email, events, and fishing locations
- Follow up with participants through 2020

How important is fishing to you?

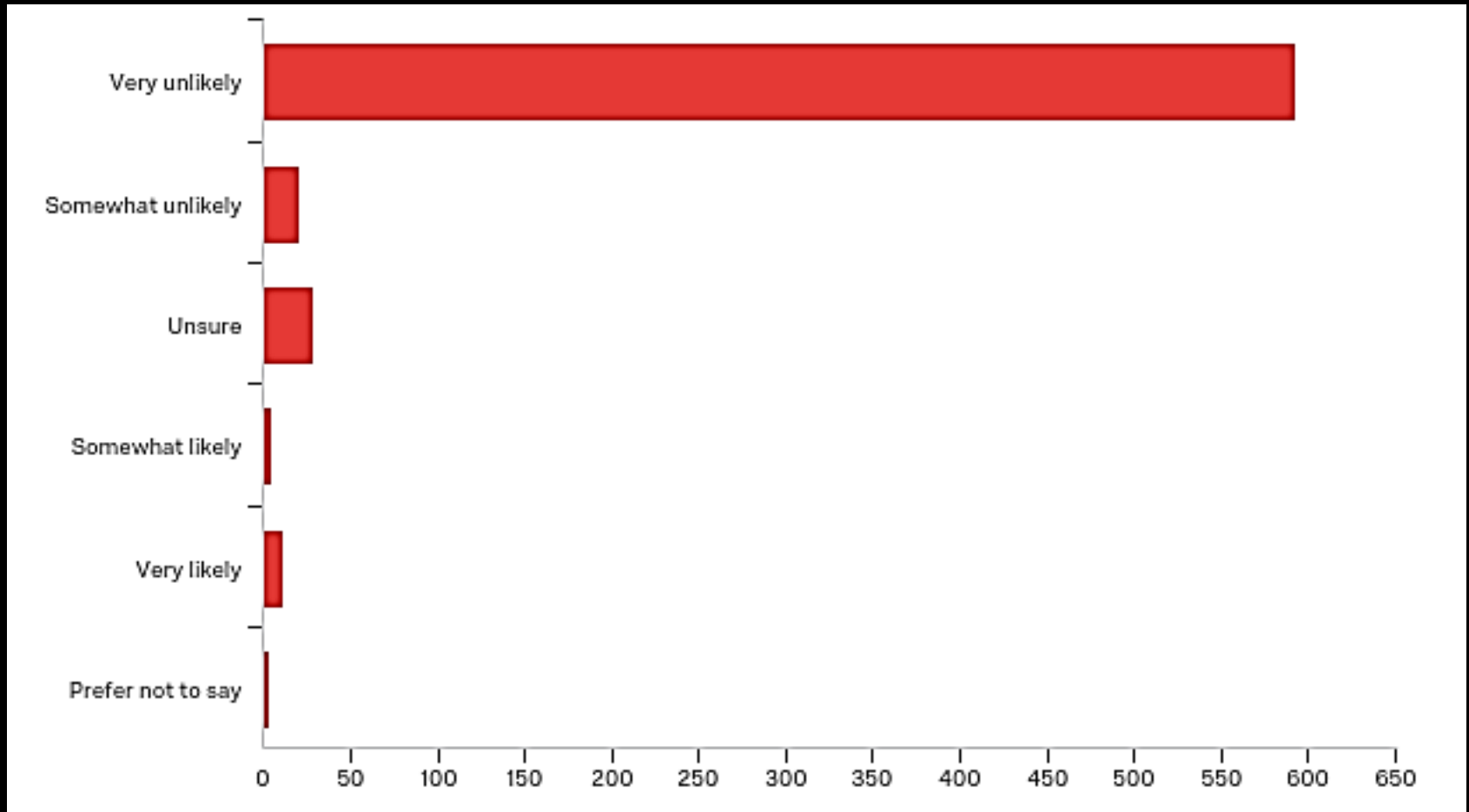
3,500 responses, fishing on average since 1992



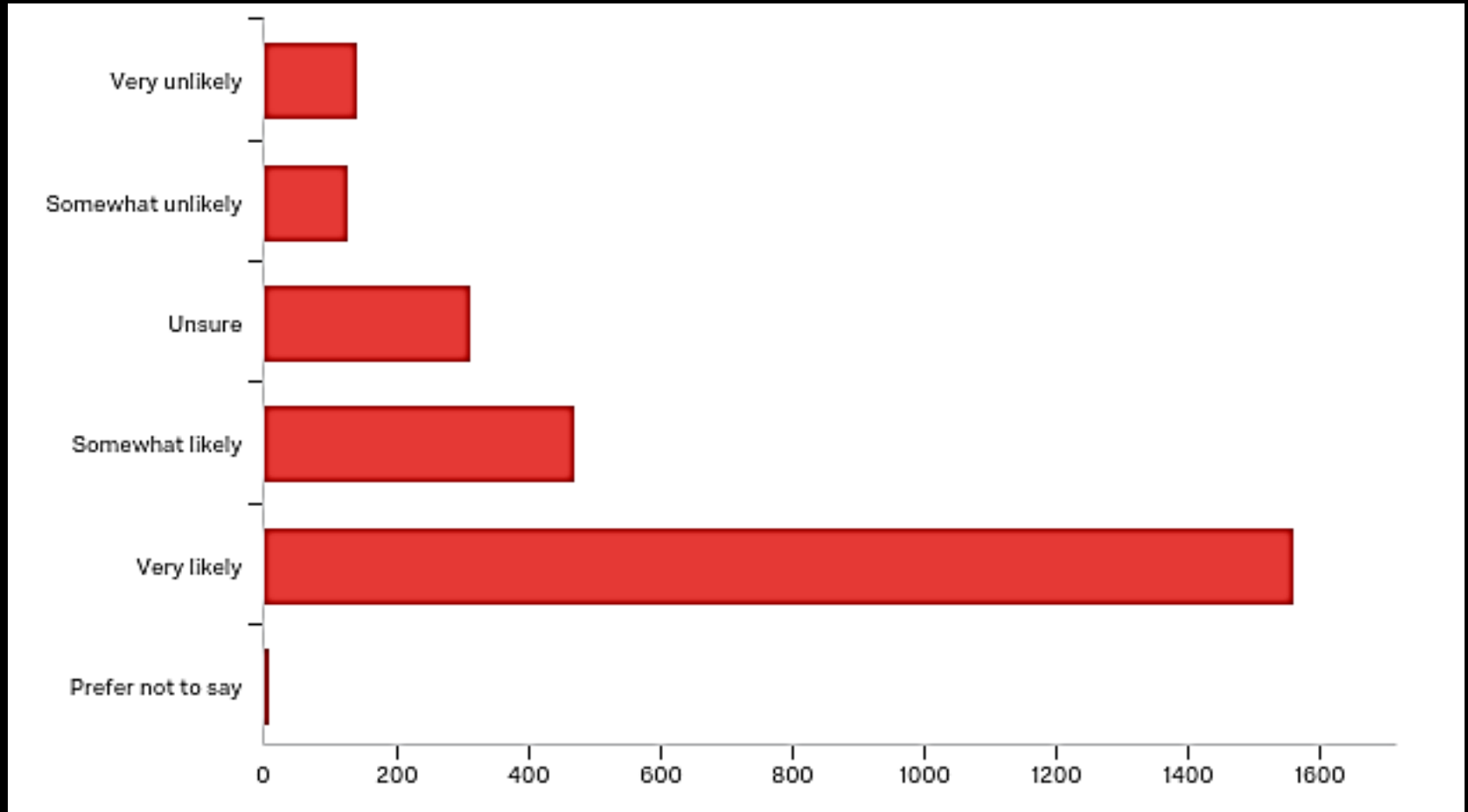
Which of these fish do you recognize as invasive in Alberta?



How likely are you to re-release Prussian carp if you caught it?



How likely are you to report sightings of Prussian carp?



Angler reporting & follow up

REPORT SIGHTINGS OF PRUSSIAN CARP AND GOLDFISH



Prussian Carp and Goldfish (both *Carassius* species), are harmful aquatic invasive species. You can help prevent their spread by never letting one loose once you catch them, and reporting any sightings in the manner described below:

REPORT OPTIONS

- FILL ONLINE FORM:**
INVASIVEREPORT.CA

QR CODE: 
- EMAIL:**
CONTACT@INVASIVEREPORT.CA
- SEND A FACEBOOK MESSAGE:**
INVASIVE REPORT

INCLUDE:

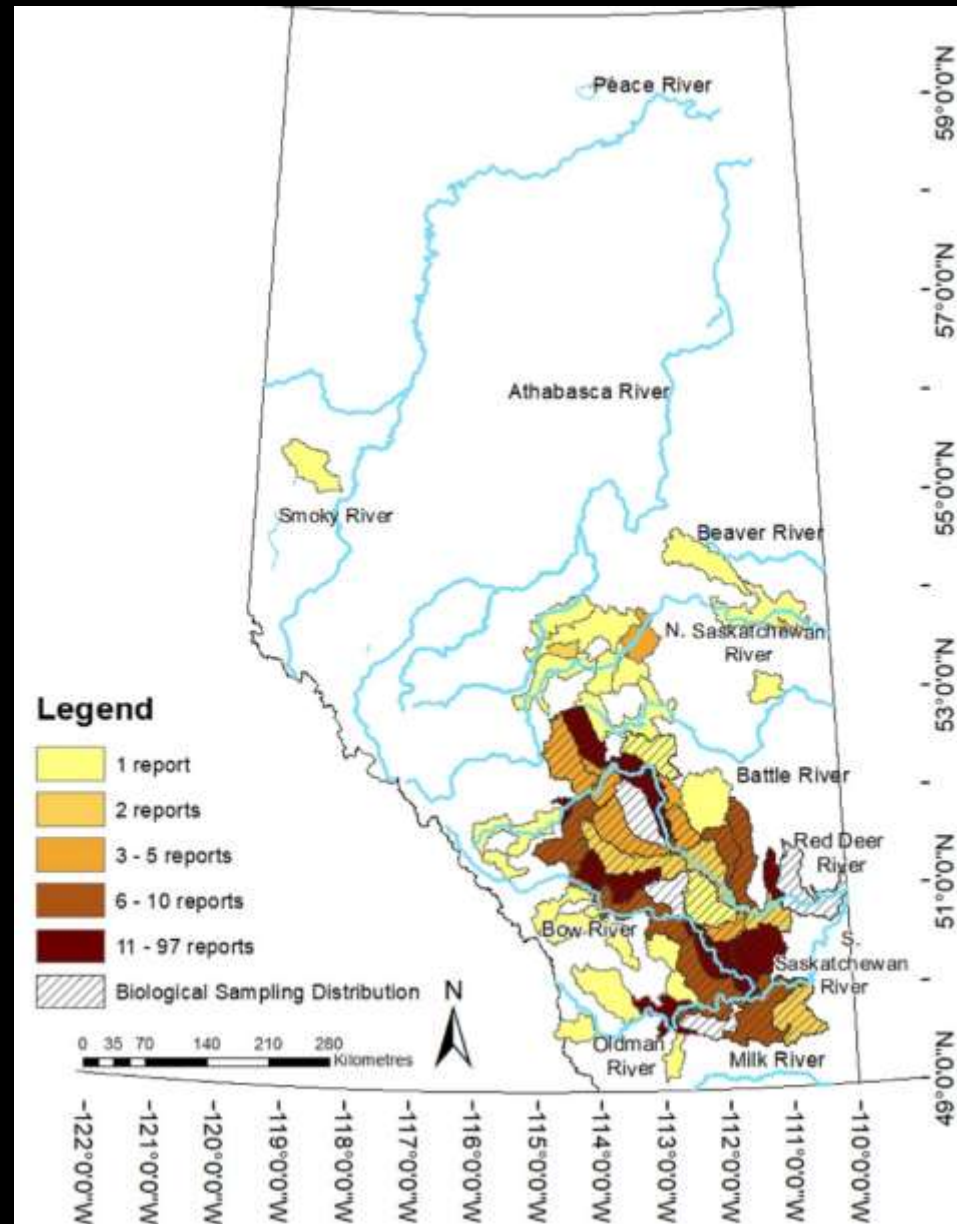
- YOUR NAME**
- YOUR EMAIL**
- CATCH LOCATION**
coordinates preferred, but general area is acceptable (e.g. "Red Deer River, ~5km south of Drumheller")
- CATCH DATE**
- #OF FISH IN SUBMISSION**
You can include multiple fish in a submission if they are caught on the same day in the same location
- PHOTO OF FISH**
Picture should be clear, perpendicular to camera, and filling up the frame



Invasivereport.ca

Prussian carp distribution revealed by angler reports

- 675 reports over the 2019-2020 fishing seasons
- 88% overlap between areas known to be invaded from biological sampling
- More reports = greater probability of invasion



Factors affecting probability of reporting and report accuracy



Days
fishing
per year



Ability to
identify
Prussian carp



Ability to
identify
look-a-likes

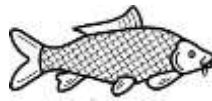


Proximity to
known
invaded area

Factors affecting **probability of reporting** and report accuracy



Days
fishing
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Factors affecting probability of reporting and **report accuracy**



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Proximity to
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Factors affecting anglers willingness to report Prussian carp



Higher willingness to report = higher rate of actual reporting

In summary

- Majority of AIS occurring at scales beyond resources for numerical eradication
- Ecological monitoring can guide ongoing, targeted suppression (functional eradication)
- Angler reporting can be a powerful tool for tracking AIS distribution
- Linking AIS threat to resource status and supporting species ID abilities promotes skillful engagement

Funders & partners



Canada
Research
Chairs

Alberta Environment
and Parks

ALBERTA
INNOVATES

Mitacs



NSERC
CRSNG



Thank you

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