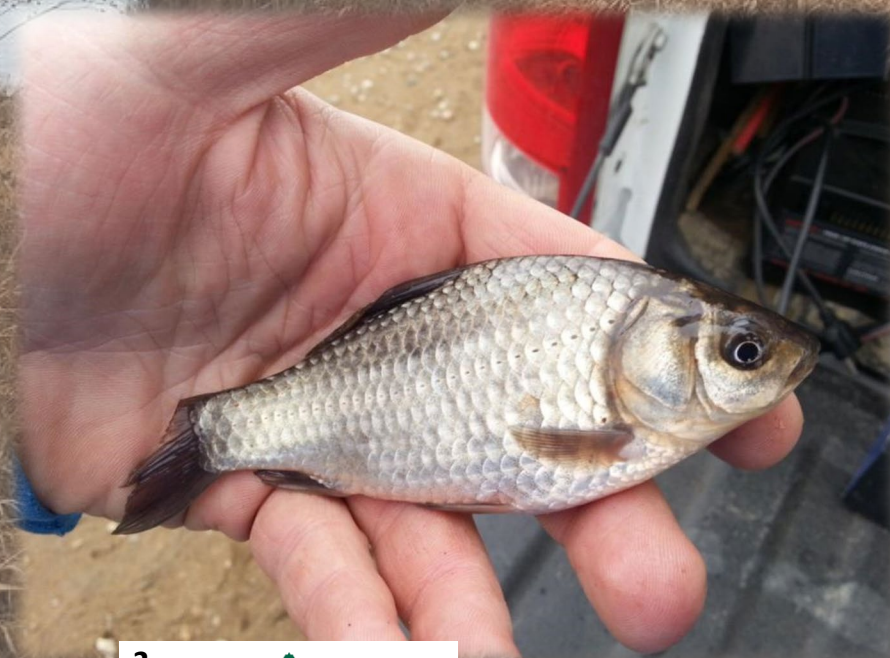


Native freshwater species get out of the way: Prussian Carp (*Carassius gibelio*) establishment, spread and impact in western North America

Poesch, M.S¹, Ruppert, J.L.W.¹, Docherty, C.¹, Donadt, C.¹, Card, J.¹, Schmidt, B.², & P. Aku².



UNIVERSITY OF ALBERTA
DEPARTMENT OF
RENEWABLE RESOURCES

2



Alberta Conservation
Association

Wildlife Fish Habitat



Outline

Background

Establishment
of Prussian
Carp

Impact
of Prussian
Carp on native
fauna

Spread
of Prussian
Carp

Summary &
Implications



Outline



Background

Prussian Carp

Cyprinid species native to Asia but introduced to Europe in the 17th century

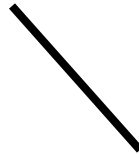
Assessed as the most harmful invasive fish in Eurasia (Kalous *et al.* 2004; Tarkan *et al.* 2014)

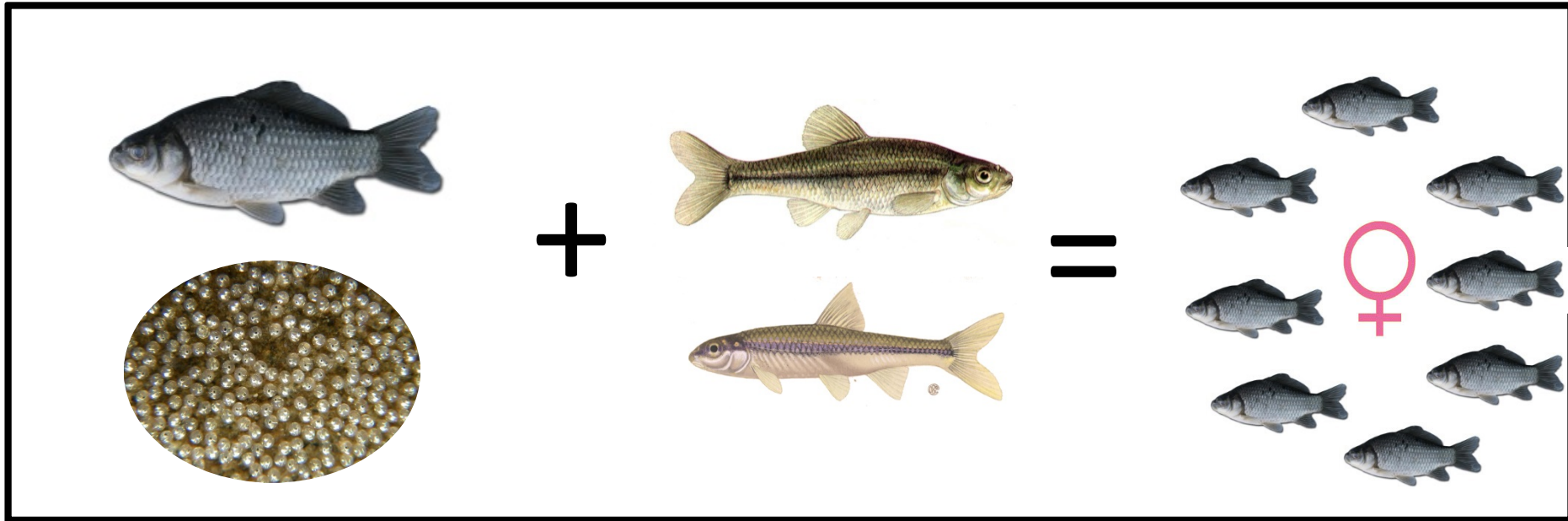
Morphologically similar to other carp species leading to delayed detection

First found in Alberta in 2000 but genetically confirmed in 2014 (Elgin *et al.* 2014)



1. Gynogenetic Reproduction

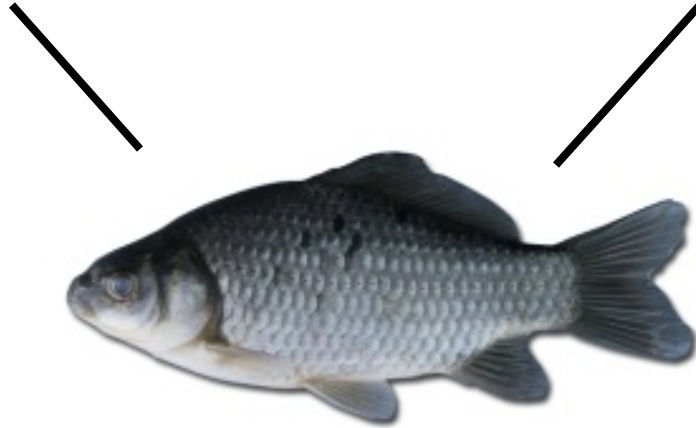




- Decline in native species from reproductive interference
- Most abundant species
- Competition with native and economically valuable species has resulted in population declines in Eurasia



1. Gynogenetic Reproduction



2. Habitat Preferences



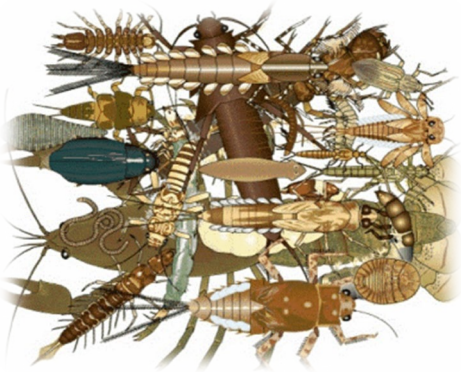
1. Gynogenetic Reproduction



2. Habitat Preferences



3. Broad Diet



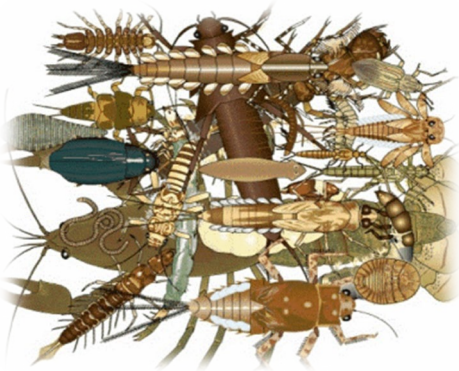
1. Gynogenetic Reproduction



2. Habitat Preferences



3. Broad Diet



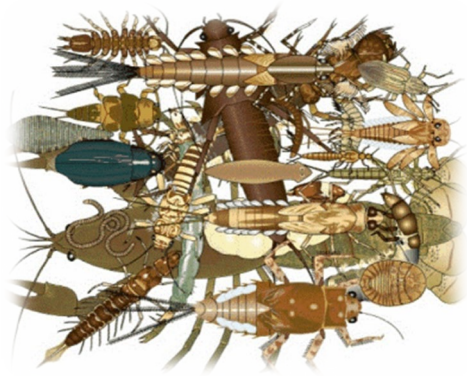
1. Gynogenetic Reproduction



2. Habitat Preferences



3. Broad Diet



4. Habitat Modification





Outline



Background

Establishment
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Carp

Study 1



BioInvasions Records (2017) Volume 6, Issue 3: 291–296

DOI: <https://doi.org/10.3391/bir.2017.6.3.15>

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Open Access

Research Article

Assessing the spread and potential impact of Prussian Carp *Carassius gibelio* (Bloch, 1782) to freshwater fishes in western North America

Cassandra Docherty[†], Jonathan Ruppert[†], Tyana Rudolfsen, Andreas Hamann and Mark S. Poesch*

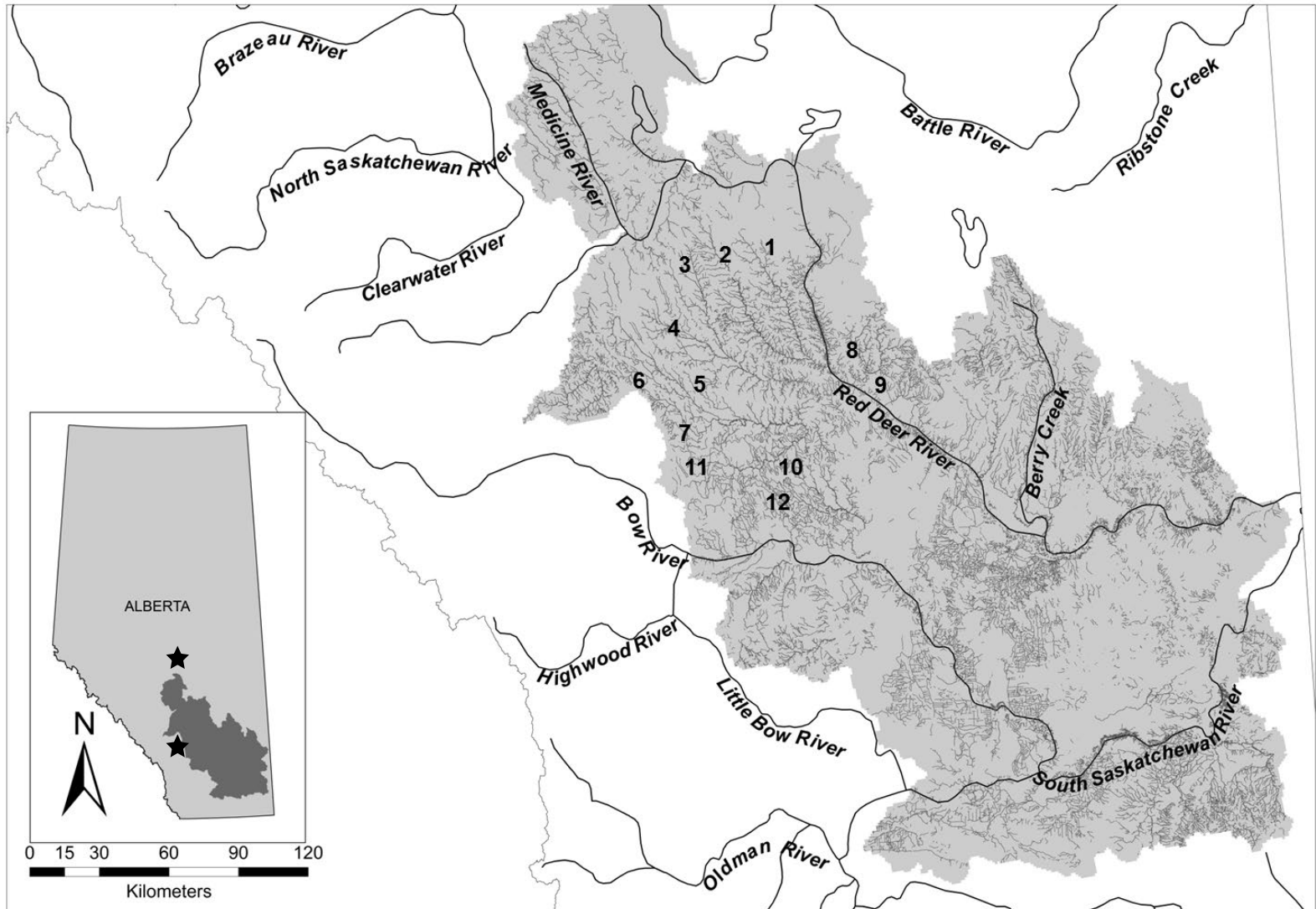
Objectives

1) Current distribution and rate of spread

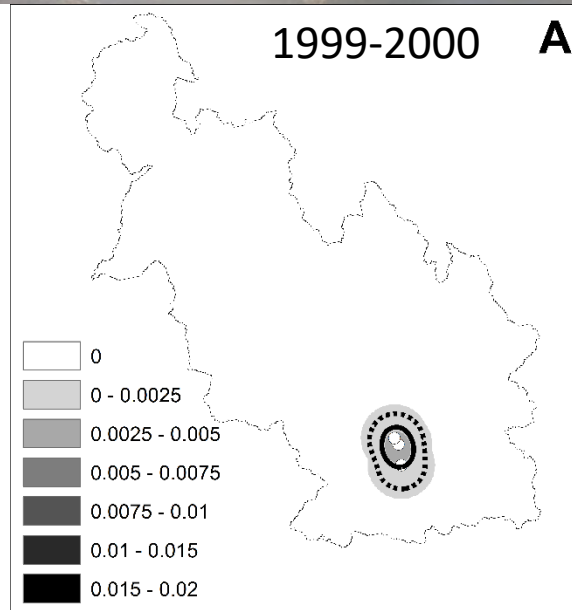
2) Overlap in life history with other fishes



Study Area



Prussian Carp Current Distribution





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Study 2

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Research



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<http://dx.doi.org/10.1098/rsos.170400>

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Native freshwater species
get out of the way: Prussian
carp (*Carassius gibelio*)
impacts both fish and
benthic invertebrate
communities in
North America

Jonathan L. W. Ruppert¹, Cassandra Docherty¹, Kenton Neufeld¹, Kyle Hamilton¹, Laura MacPherson² and Mark S. Poesch¹

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²Alberta Environment and Parks, Fish and Wildlife Division, 6909-116 Street, Edmonton, Alberta, Canada T6H 4P2

Objectives

1) Assess impacts of Prussian Carp on:

- - native fishes
- - invertebrates

2) Determine any Before/After differences



Field Study

41 sites, 12 streams

Collected fish community data

Sampled at sites previously sampled in 2005 (Before/After)

Sample sites across an invasion gradient (Recent, Early, None)

Collected habitat & water quality data



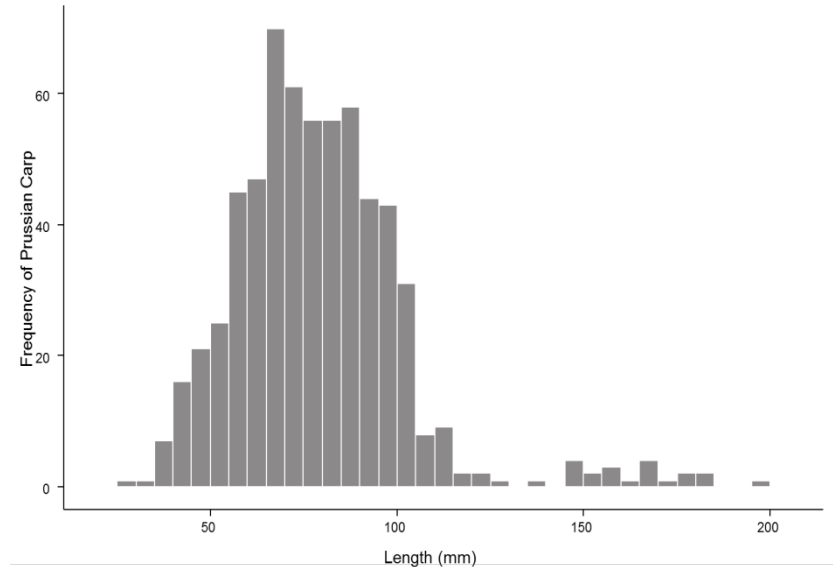
Analysis of Prussian Carp

Subsample of 625 specimens

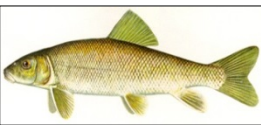
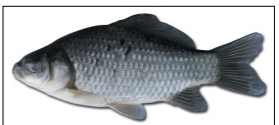
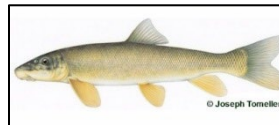
Multiple age classes (0-4)

Average total length was 78 mm; average weight 8.8 g

Gynogenesis



Fish Community



Brook
Stickleback
(BRST)

Fathead
Minnow
(FTMN)

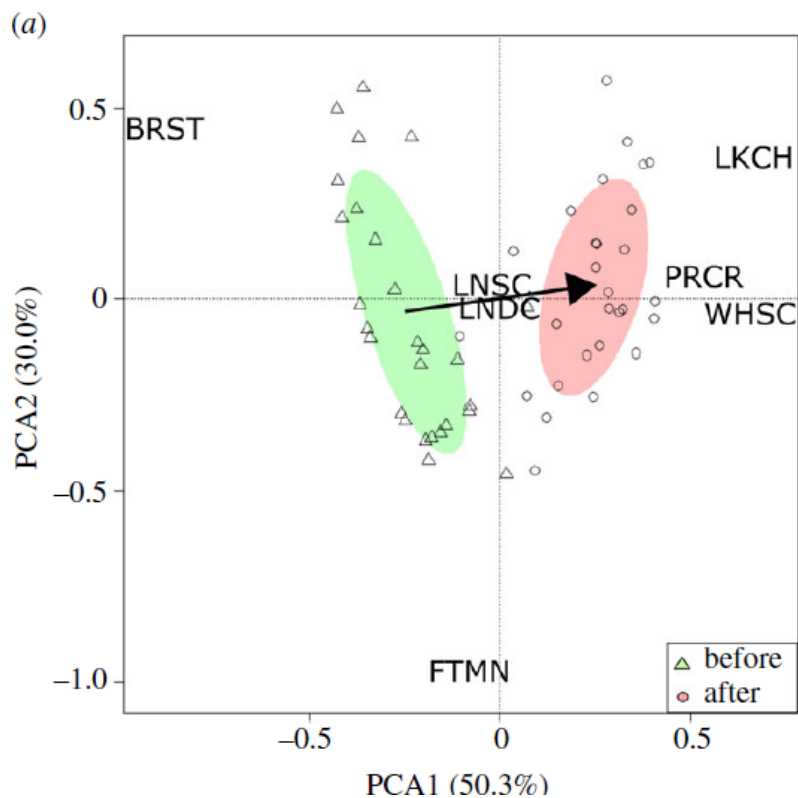
Lake Chub
(LKCH)

Longnose
Dace
(LNDC)

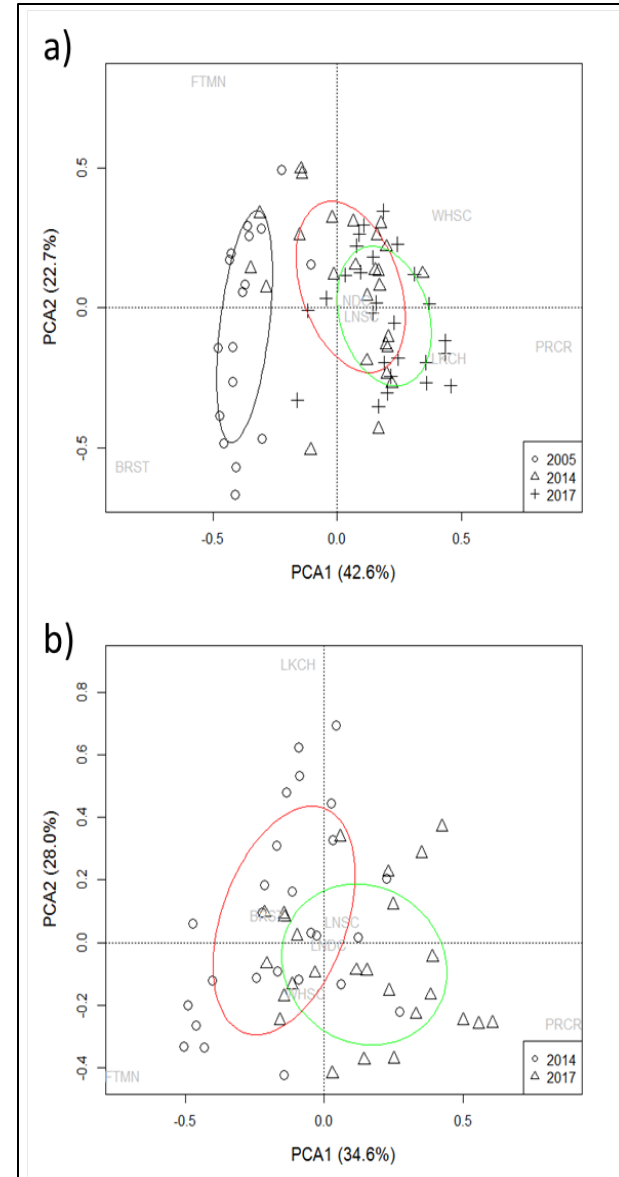
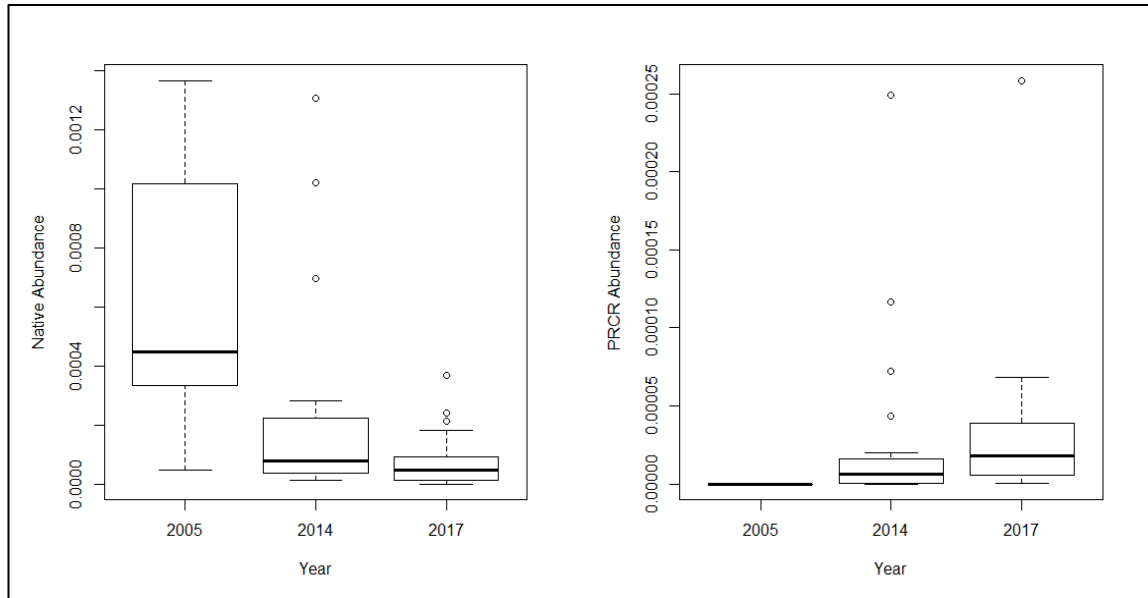
Longnose
Sucker
(LNSC)

Prussian
Carp
(PRCR)

White
Sucker
(WHSC)

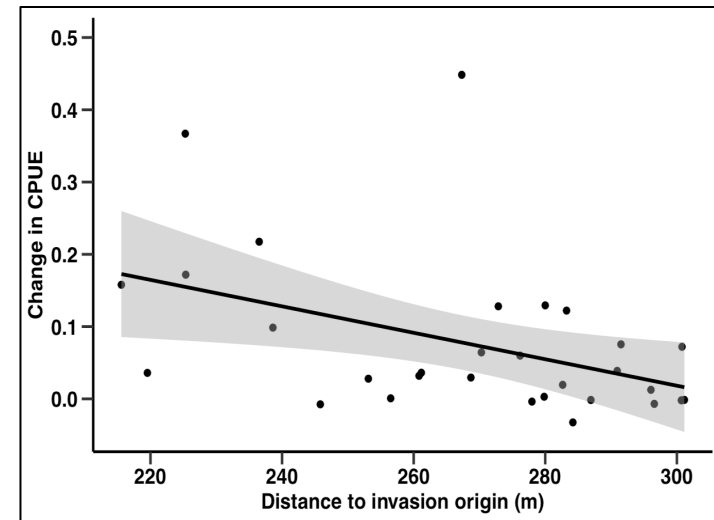
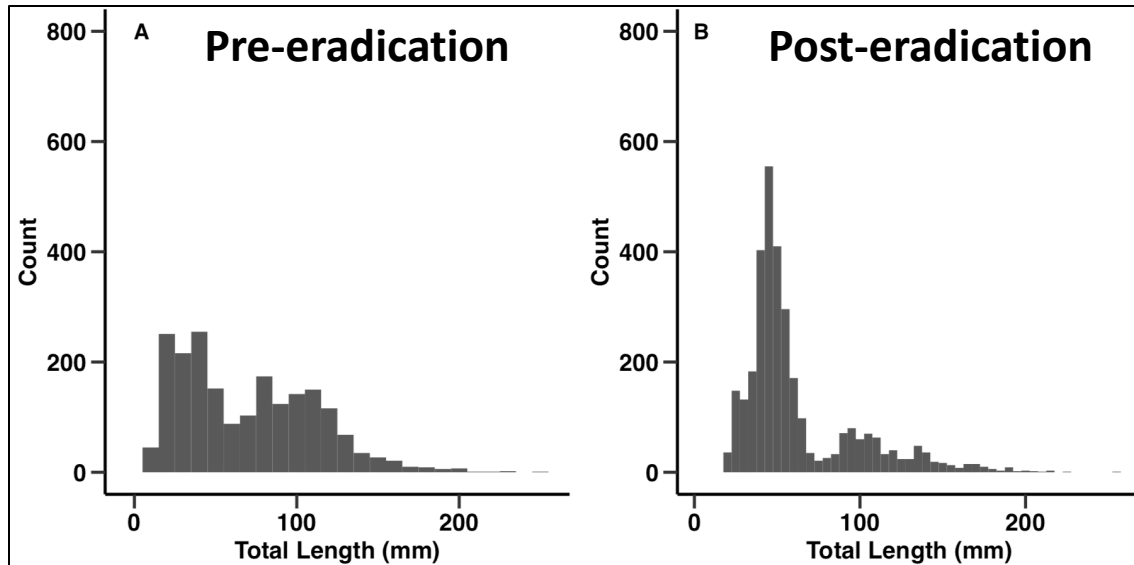


Update from 2017 sampling



(Shirton et al., in prep)

Eradication?





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eDNA



Genetic material shed from organisms (ex. skin cells, feces, saliva etc.) found in the environment

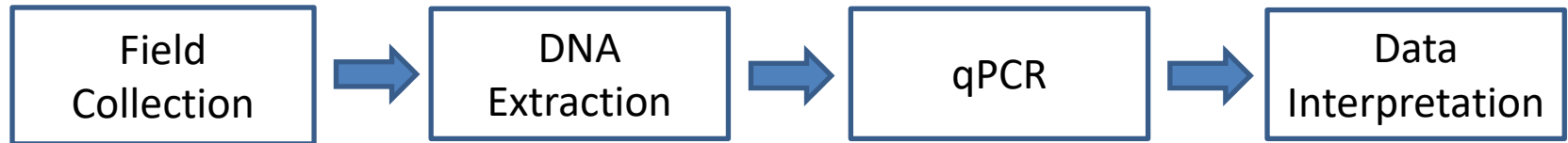
Used to detect organism presence

Collected through a water sample

Advantages – Non-invasive, sensitive, time and cost effective, differentiate between similar species

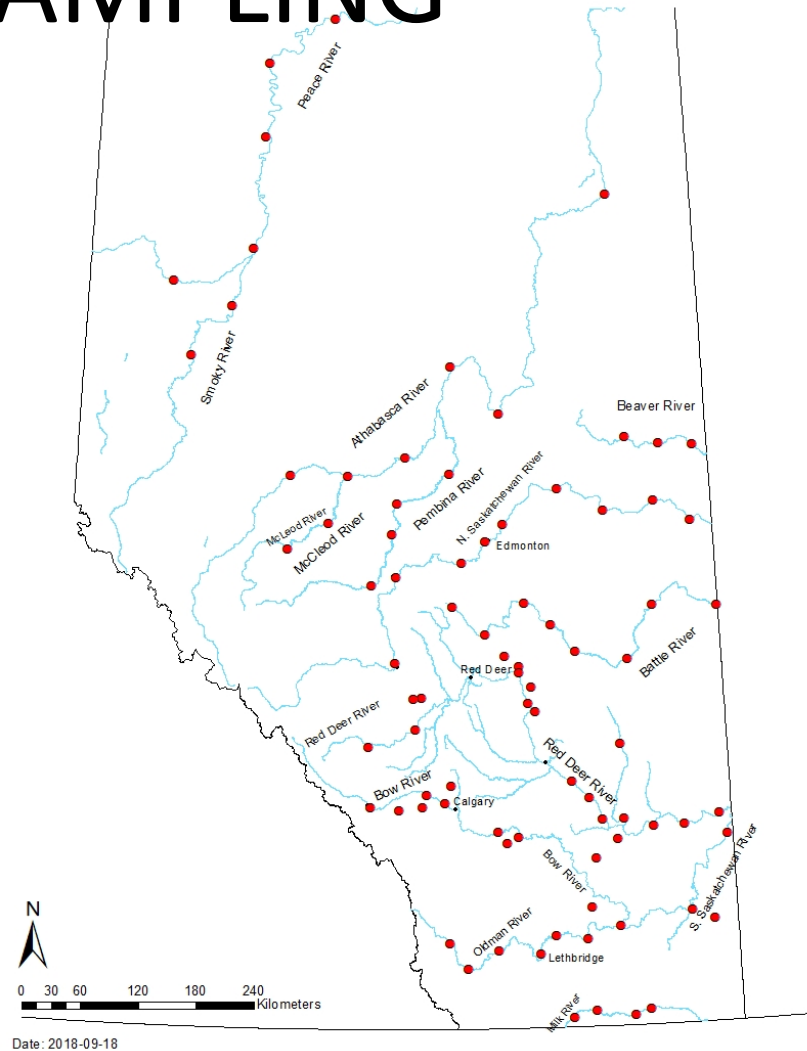
Disadvantages – limited to presence, sensitive sampling protocols

eDNA SAMPLING



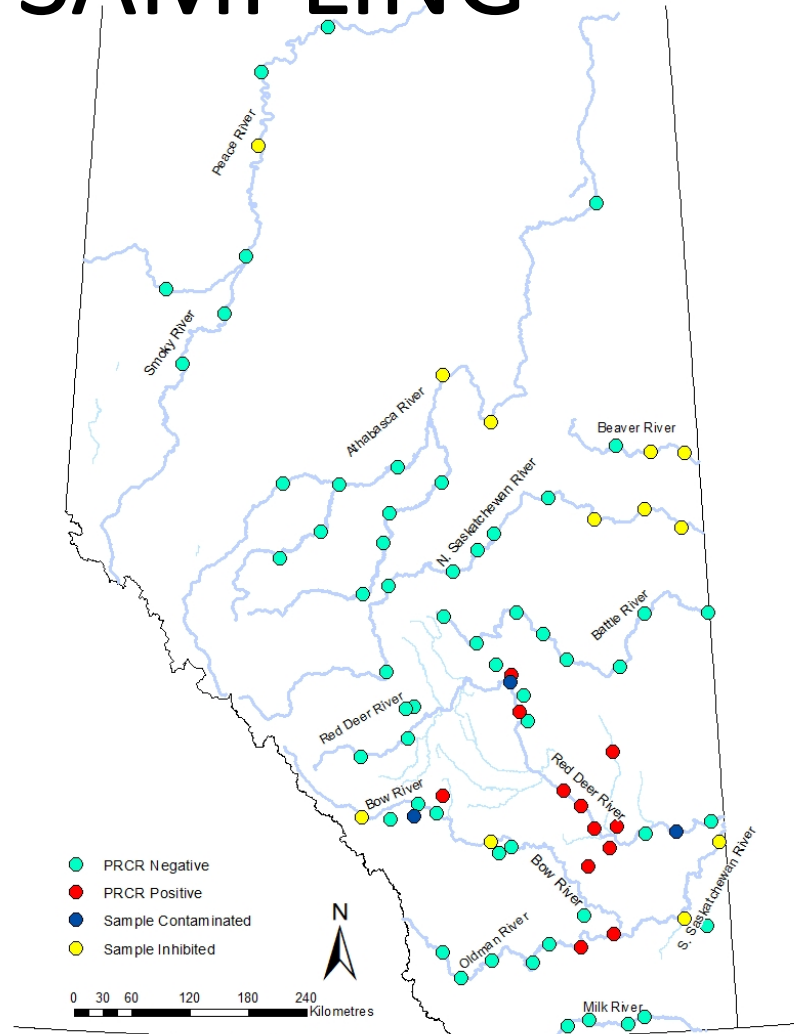
eDNA SAMPLING

- Sampled throughout province
- Areas where PRCR had previously not been identified
- Easy access sites
- Total of 83 sites

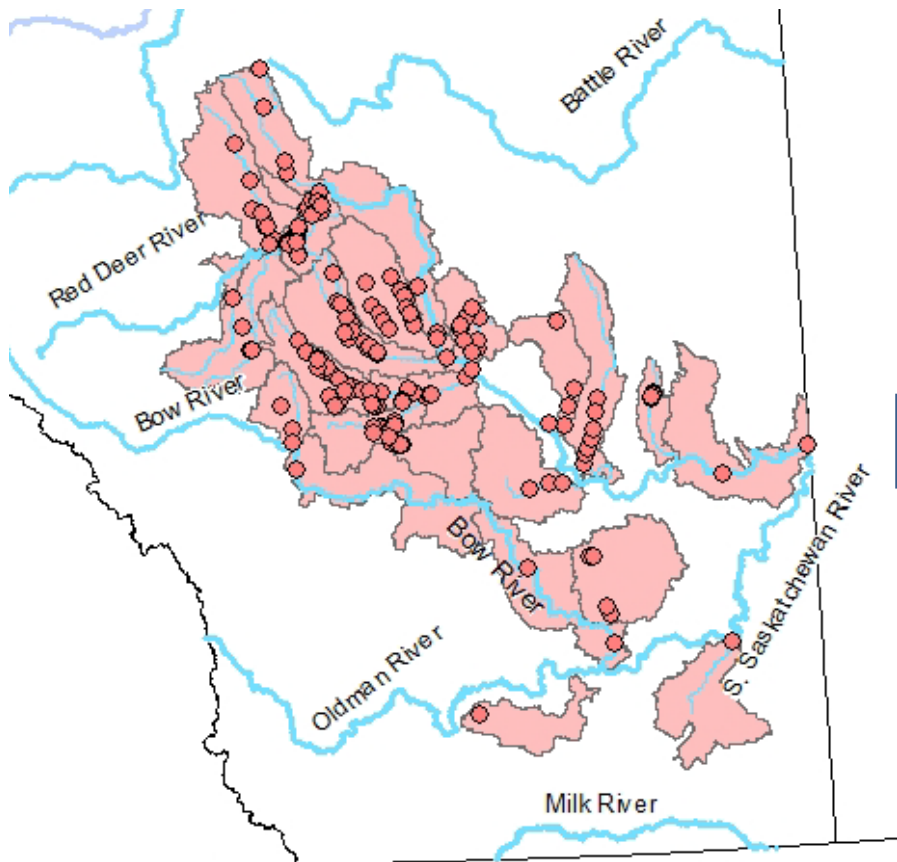


eDNA SAMPLING

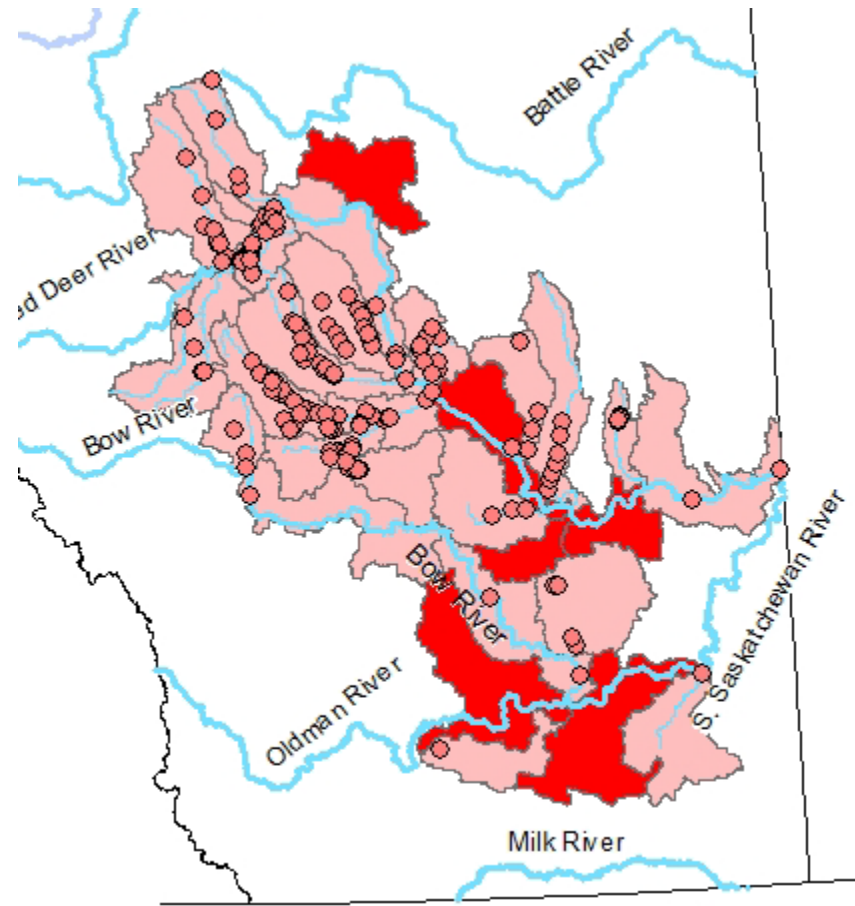
- 57 Sites No PRCR DNA
- 12 Sites PRCR DNA
- 3 Sites Contaminated
- 12 Sites Inhibited

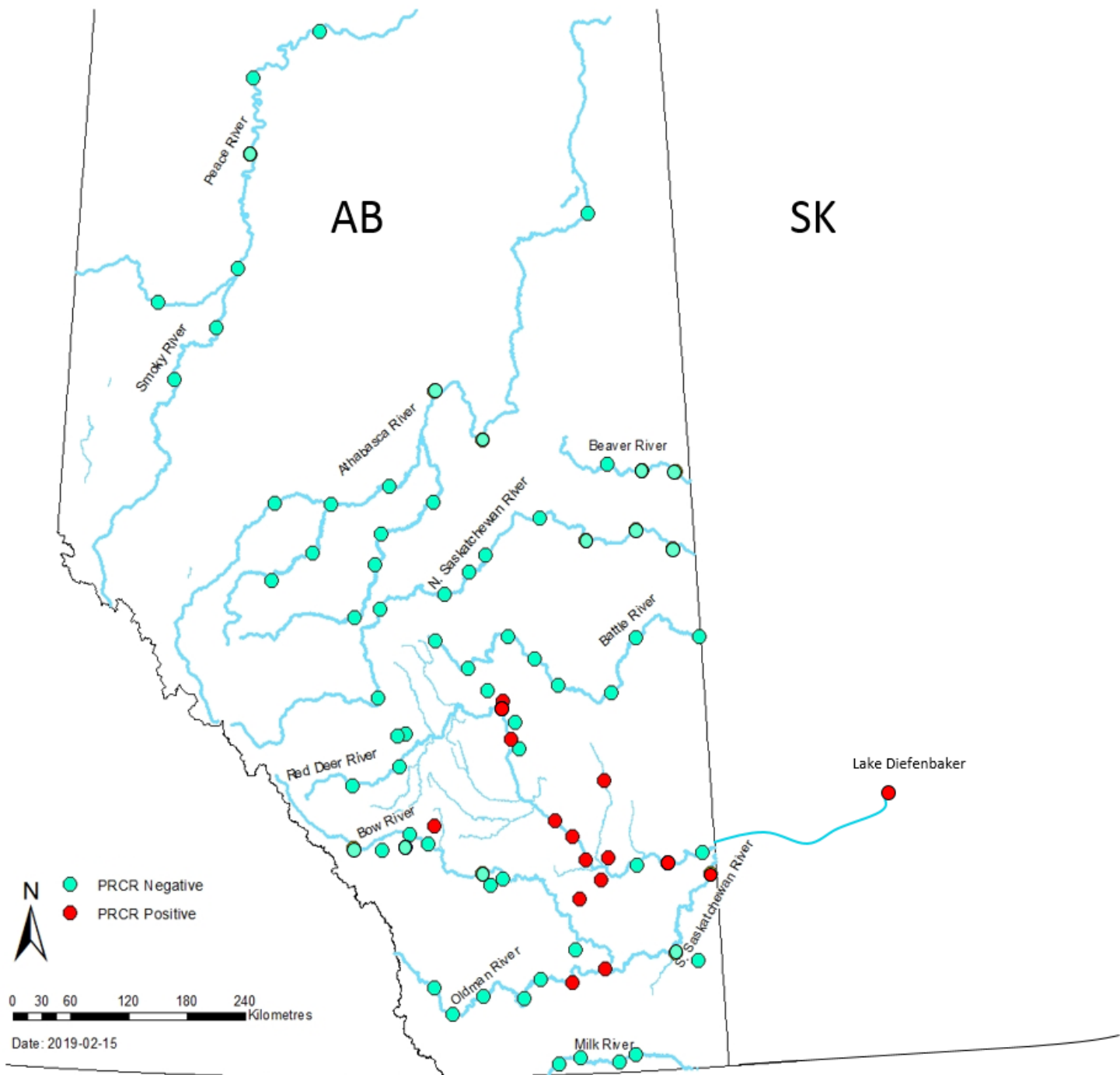


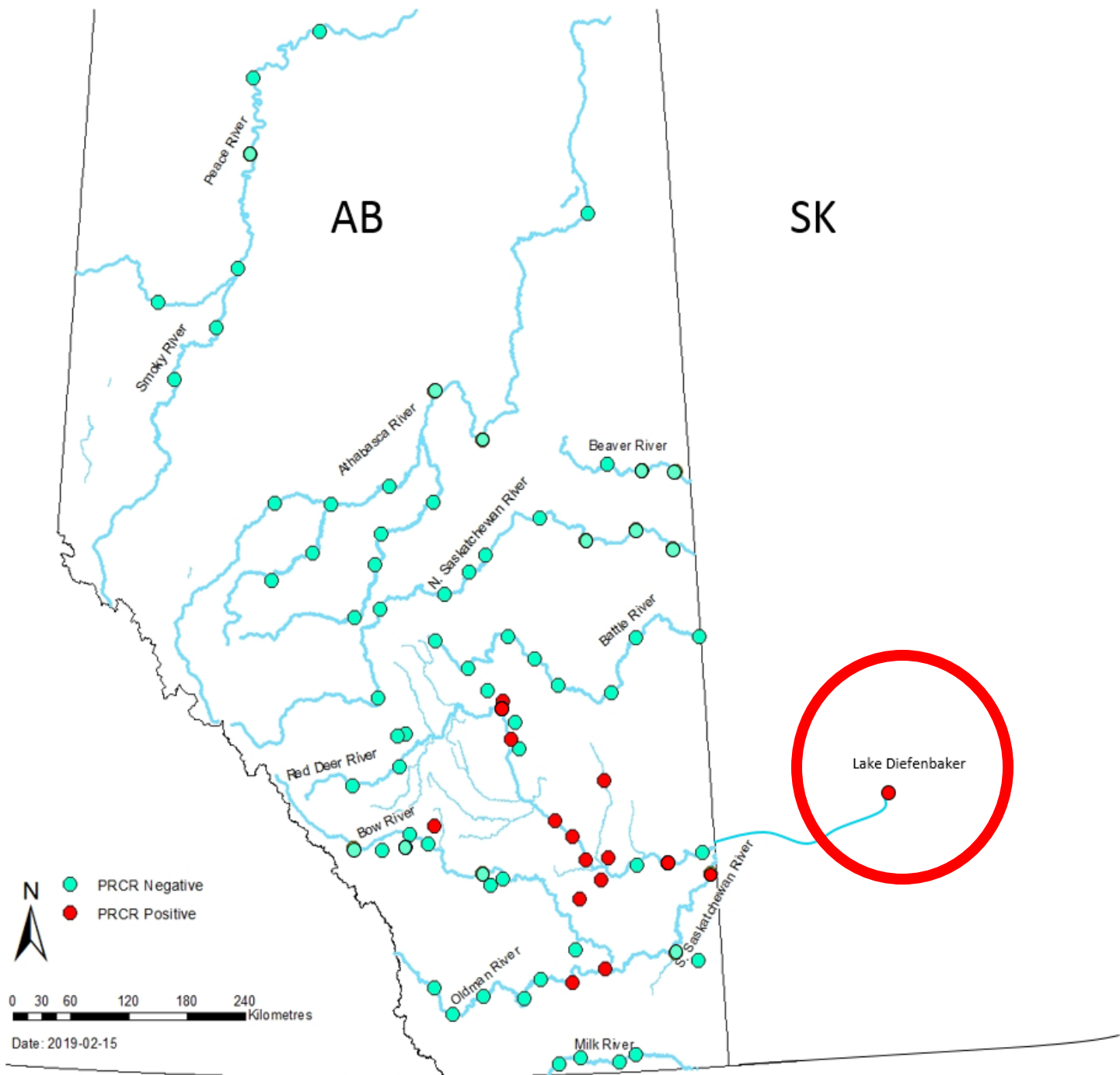
2017



2018









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Summary (1)

Range doubles every five years

Found beyond known barriers to movement
– suggesting human assisted dispersal

Found in both artificial and natural
waterways in Alberta and Saskatchewan

High overlap in life history traits with other
well known invasives

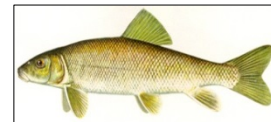
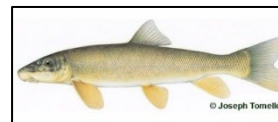
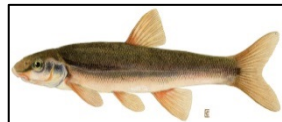


Summary (2)

Shift in both fish and invertebrate communities

Significant differences in native fish CPUE

No significant differences in environmental variables



Implications

Now present
throughout AB and
SK

By far the highest
biomass in our
catch data (~ 65%)

Potential
reproductive
interference with
cyprinids

Attack of the clones: Sperm-stealing Prussian carp threaten to overwhelm Alberta waterways

'They're here, they're having negative impacts, and they could actually overwhelm the system'

By Willis Snowdon, CBC News | Posted: Oct 05, 2017 12:12 PM MT | Last Updated: Oct 06, 2017 12:10 PM MT



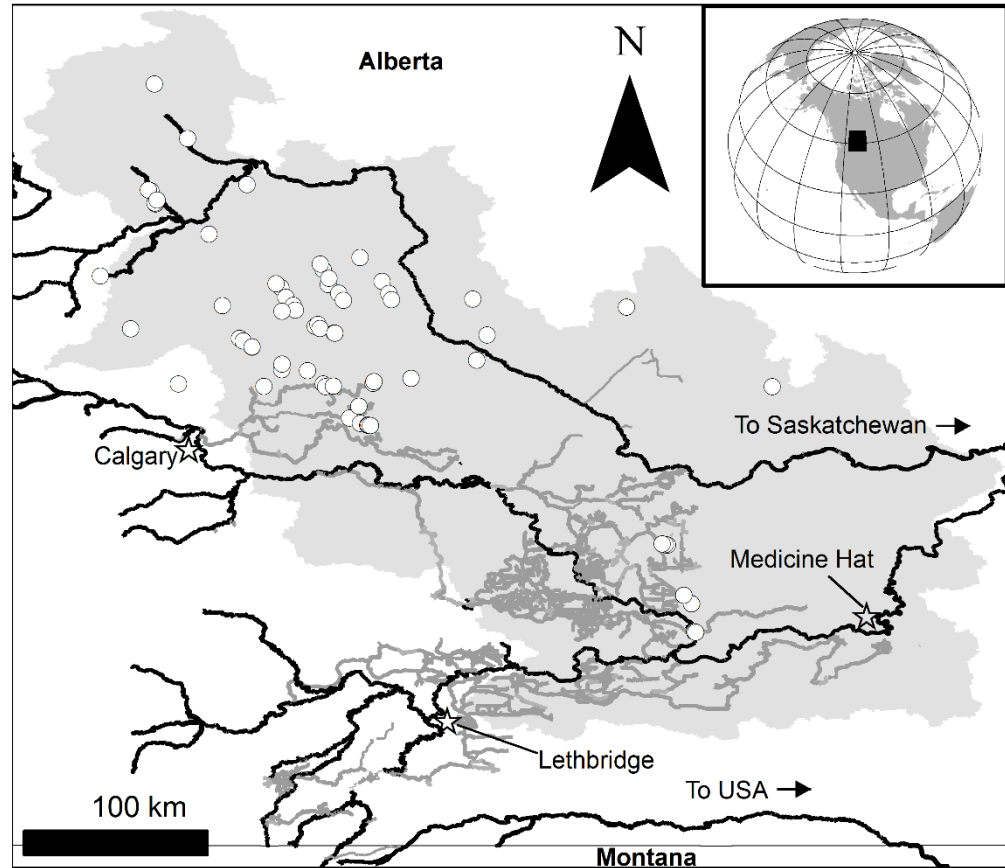
Prussian carp, native to Europe and Asia, were first detected in Alberta the early 2000s and have since spawned in waterways across the province. (George Chernilevsky)

Implications

Likely using canal systems to breach historical watershed boundaries (facilitating spread)

Invasion super highways

Human assisted dispersal



Implications

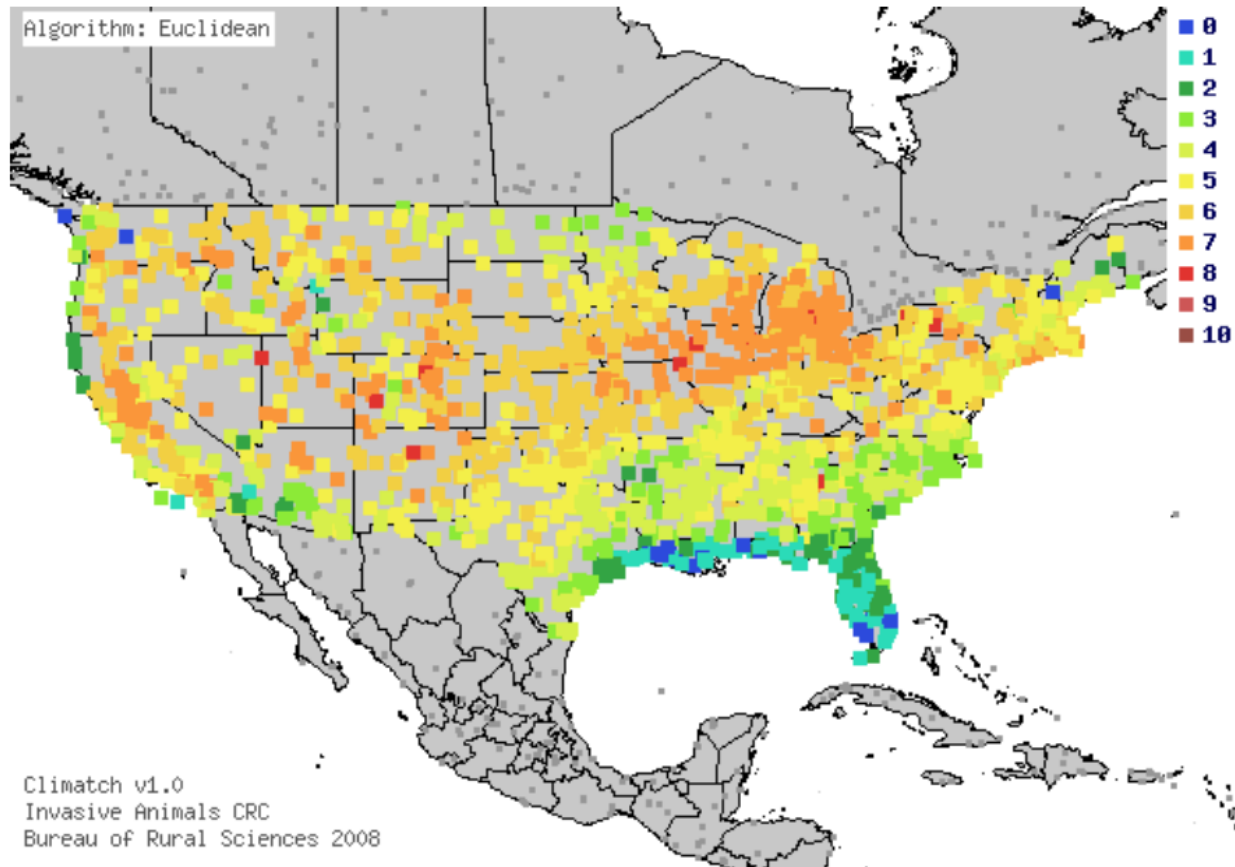


Figure 3. Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for *C. gibelio* in the continental United States based on source locations reported by Froese and Pauly (2010). 0= Lowest match, 10=Highest match.

Acknowledgements

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Warren Robb

Kenton Neufeld

Cassandra Docherty

Ed Bork

