



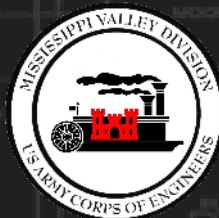
BUILDING RESILIENCY INTO ECOSYSTEM RESTORATION
PROJECTS: CASE STUDY OF MARSH LAKE

RESTORING AQUATIC CONNECTIVITY TO A HISTORIC REACH OF THE POMME DE TERRE RIVER AND RAPID COLONIZATION OF FRESHWATER MUSSELS AND FISH

Dan Kelner
Mussel Biologist
St. Paul District
April 18, 2024



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UPPER MINNESOTA RIVER
WATERSHED DISTRICT





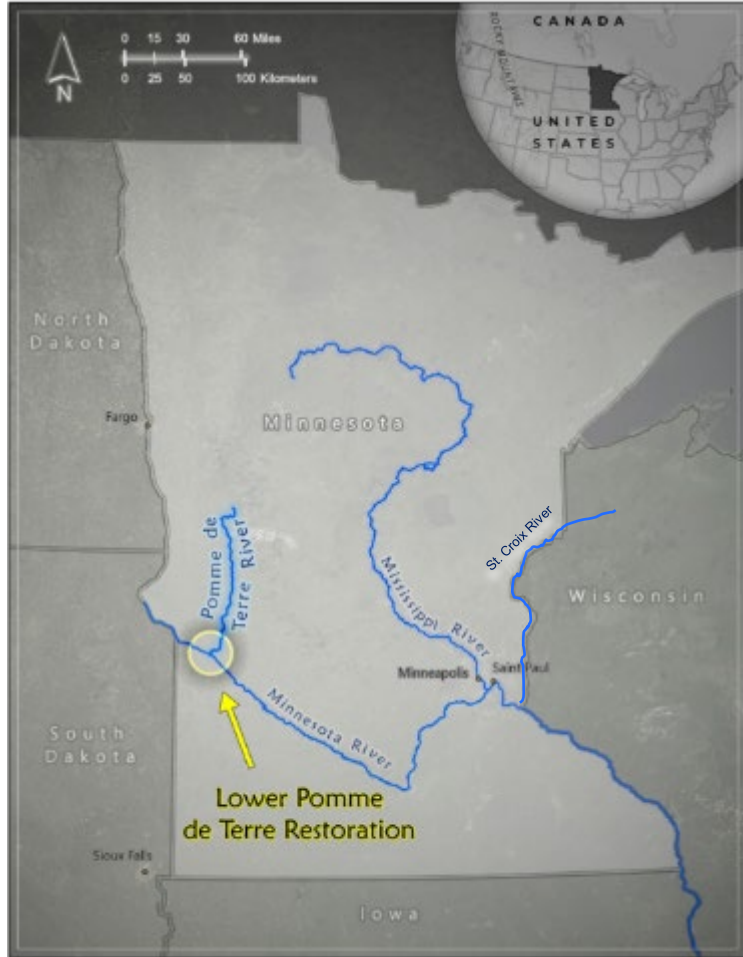
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LOWER POMME de TERRE RIVER RESTORATION





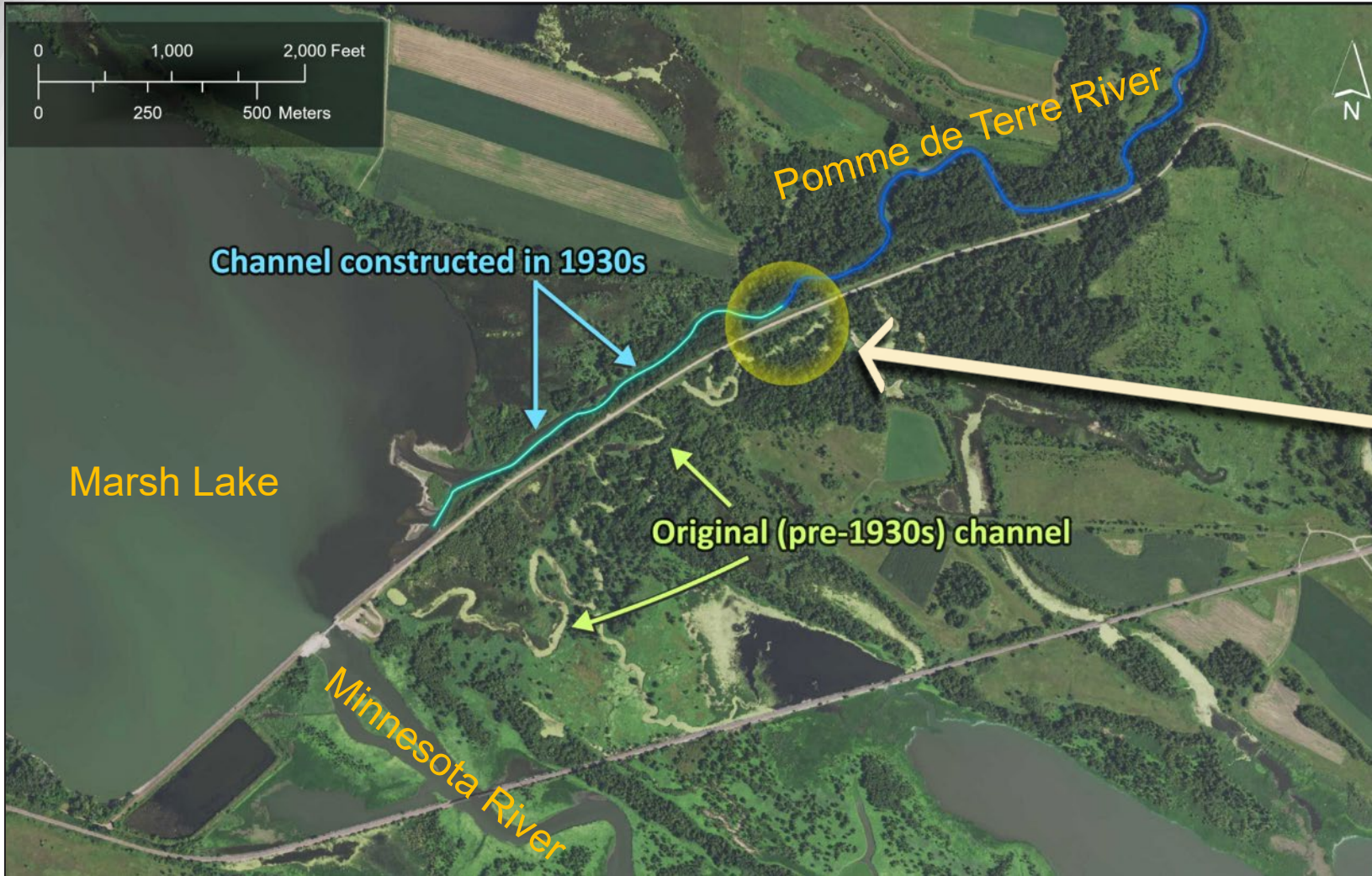
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PRE-RESTORATION (SUMMER 2015)





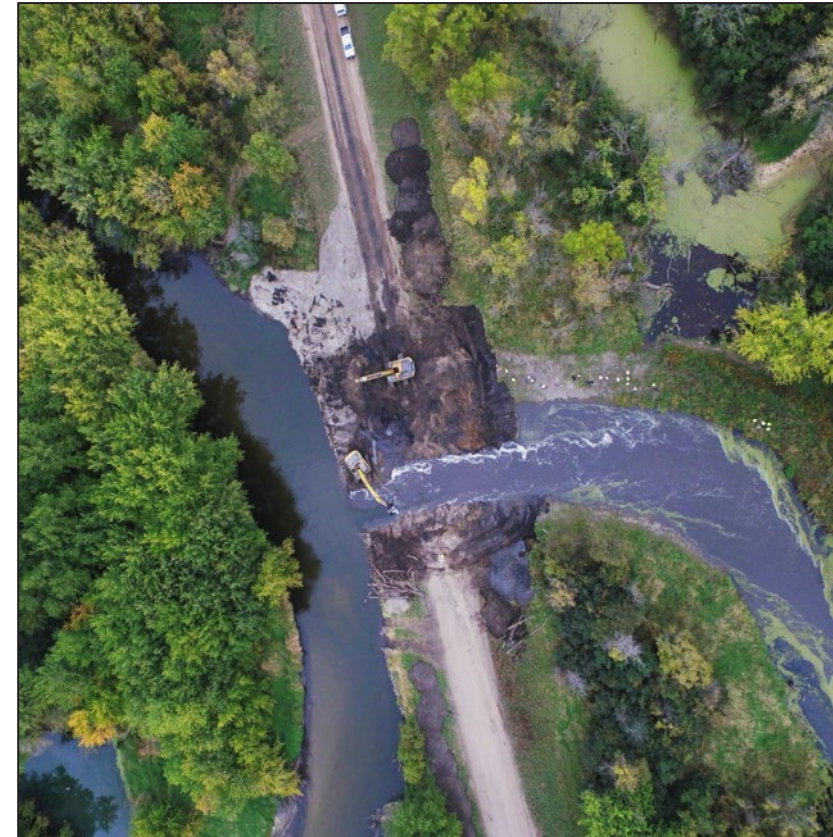
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EMBANKMENT BREACH (OCTOBER 2018)





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POST-RESTORATION (MARCH 2021)





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POST-RESTORATION (FALL 2023)





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PRE (2014) AND POST (2023) RESTORED CHANNEL

2014

2023





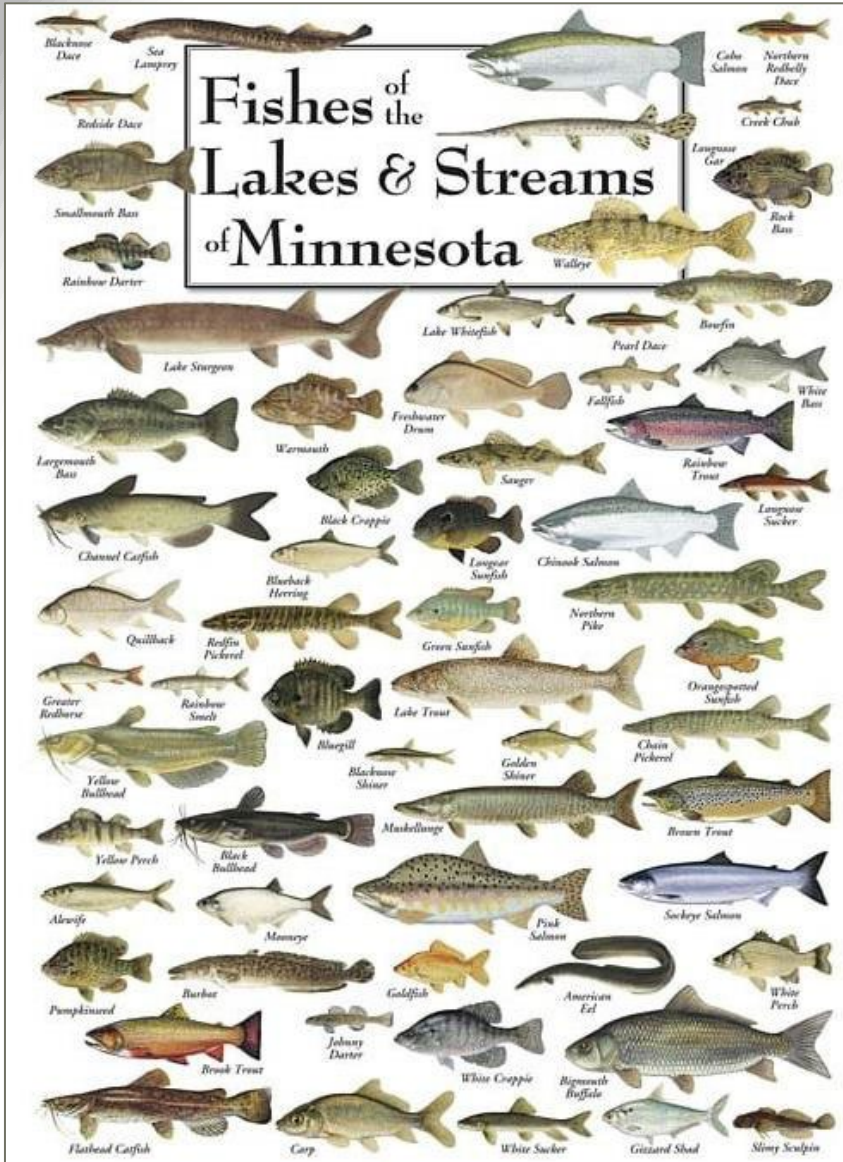
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LOWER POMME de TERRE RIVER RESTORATION



- 141 Native Species in Minnesota
- 87 Extant Species in Minnesota R. Watershed
- 18 Extirpated
- 47 Live Species in Pomme de Terre
- 51 Live Species in Connected Minnesota R. Reach



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2021 FISH SURVEY

9

- Standard Targeted Electrofishing
- 3 years post-reconnection
- 2 sites, 43 minutes, 334 meters
- 362 ind., 29 live species
- 55% species of upper PdT and connected Minn R. reach.
- Dominant – freshwater drum (15%), spotfin shiner (15%), bluegill (10%) bigmouth buffalo (7%), common carp (7%)
- Notable rare – johnny darter, blackside darter, emerald shiner, logperch, northern pike, golden redhorse, silver redhorse





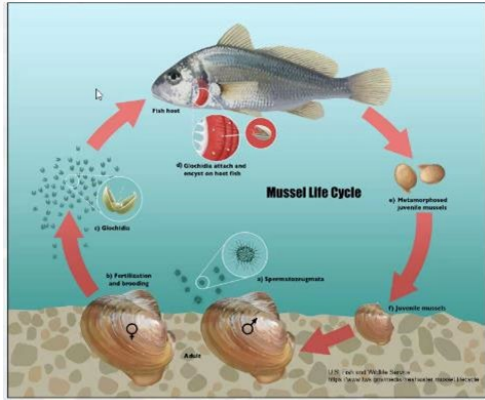
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LOWER POMME de TERRE RIVER RESTORATION



Threatened

- 51 Species in Minnesota
- ~1/2 State Listed T & E
- 5 Federally Listed T & E
- ~40 Species St. Croix and Mississippi R.
- 20 Extant Species Minnesota River
- 21 Species Extirpated
- 13 Species Pomme de Terre River
- 5 Species in Connected Minnesota R. Reach
- Tributaries Important Refugia

Species shown in the grid include: Westland (*Mygalella norvegia*), Round pigtoe (*Pleurobema carolinum*), Monkeyface (*Quadrula metformis*), Salamander mussel (*Simpsoniella ambigua*), Purple wateryback (*Cyclonaias tuberculata*), Butterfly (*Elliptica borealis*), Snuffbox (*Epichelonia triquetra*), Pistolet (*Trigoniza varreuxa*), Elipse (*Veneridacantha ellipticalis*), Spine (*Elliptica dilatata*), Creek humpshell (*Leptogona compressa*), Fluted shell (*Lasimona costata*), Black sandshell (*Ligumia recta*), Hickorynut (*Obovata albivitta*), Pimpleback (*Quadrula pustulosa*), Plain pocketback (*Lemnaea cardinalis*), Fatmucket (*Lemnaea siliquolata*), Eastern ellipse (*Elliptica complanata*), Cylindrical papershell (*Anodonta flexuosa*), Giant floater (*Pygostodon grandis*), Flat floater (*Anodonta suborbiculata*), Trencher (*Limnaea planorbis*), Webash pigtoe (*Fusconia fovea*), and White humpshell (*Lasimona complanata*).



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2022 MUSSEL SURVEY

- Timed visual/tactile searches
- 4 growing seasons post reconnection
- 19 person hours search
- 2.2 river kms (1.4 miles)
- Quantitative survey planned for 2024





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MUSSEL ASSEMBLAGE IN THE RESTORED CHANNEL

- 163 Live mussels
- 9 Species
- 8.6 Mussels per hour
- 69% of species found upstream (6km reach)

Species NOT Found In Restored Reach:



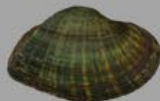
White Heelsplitter



Mapleleaf



Creeper



Elktoe

Opportunistic



Deertoe



Fragile Papershell

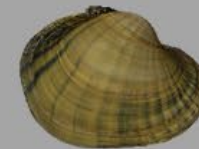


Pink Heelsplitter



Giant Floater

Periodic



Plain Pocketbook



Black Sandshell



Fatmucket

Equilibrium



Threeridge



Wabash Pigtoe

Life history strategies (Haag 2012)



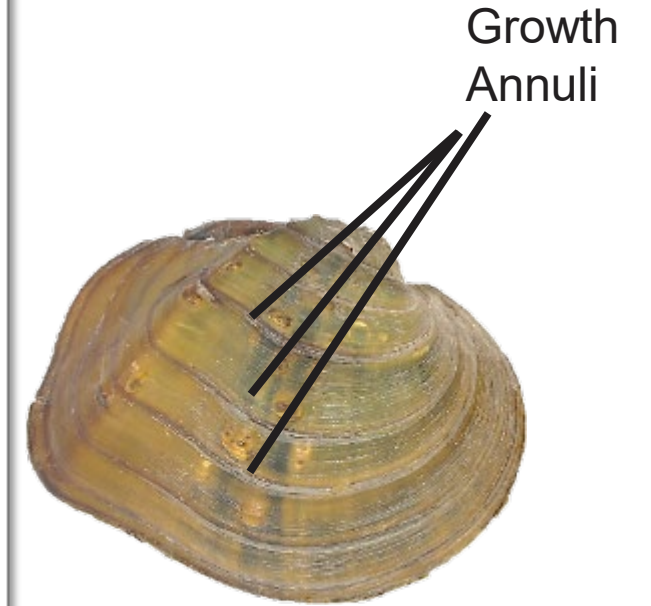
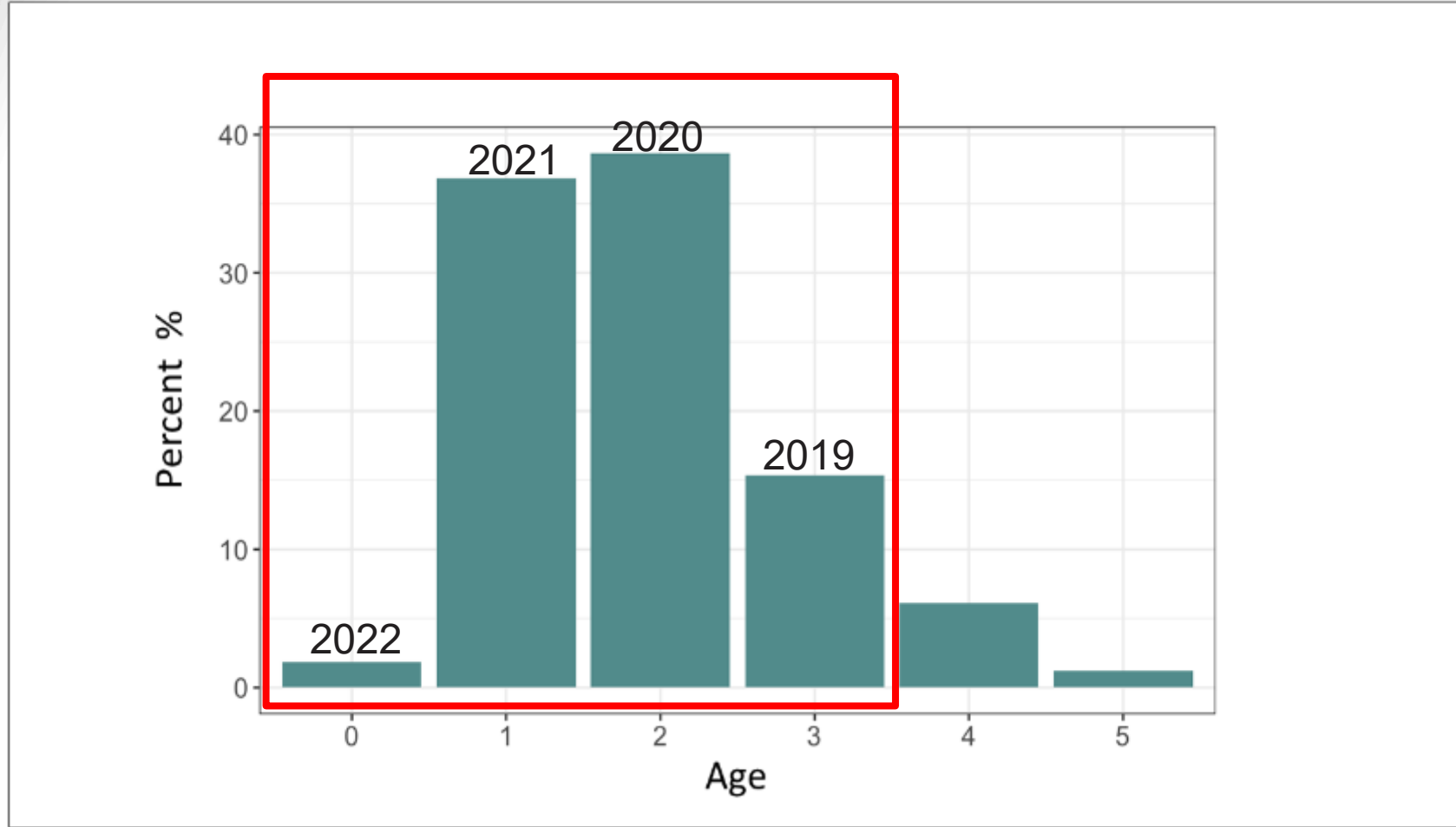
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AGE STRUCTURE OF COLONISTS





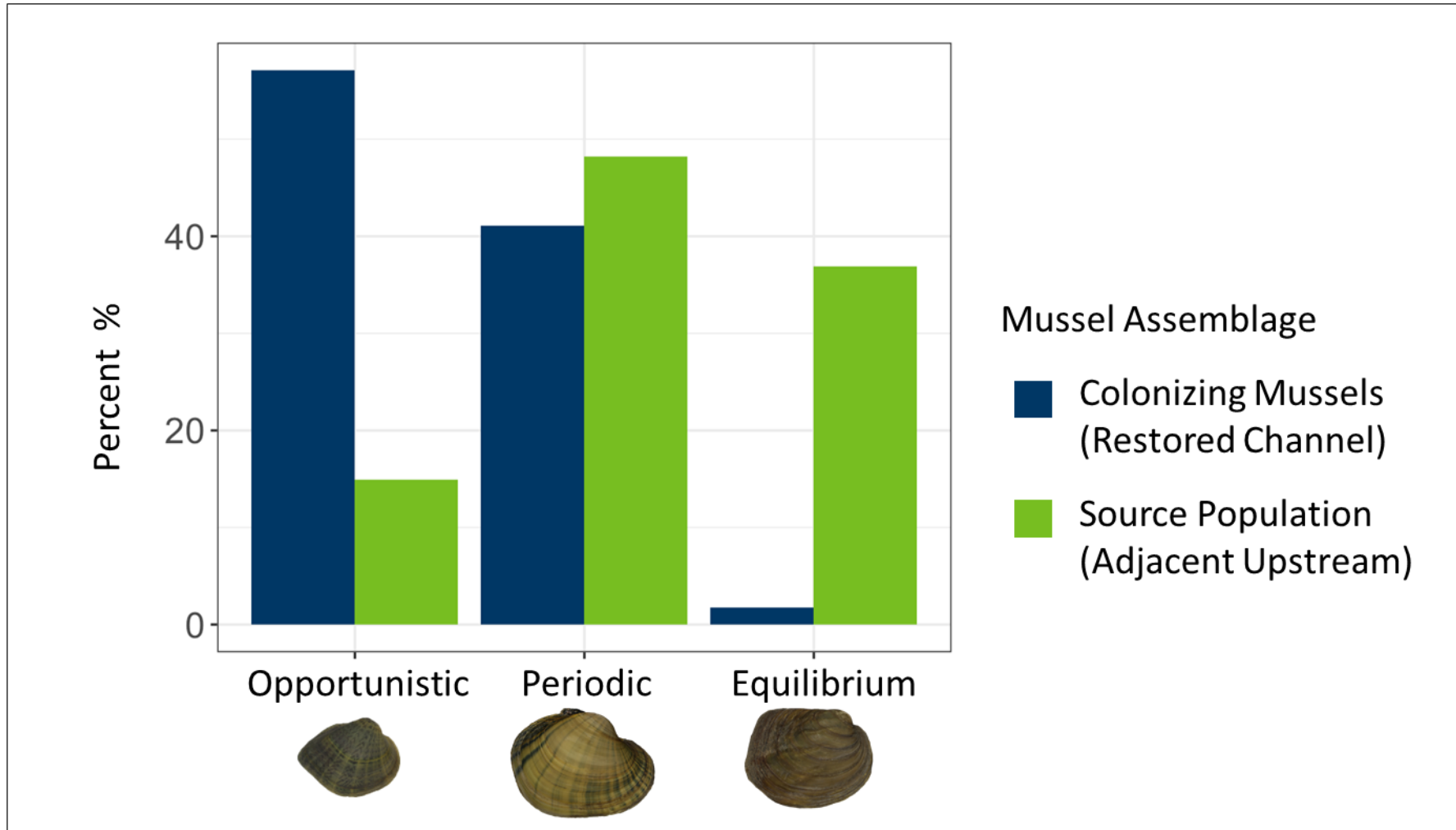
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RELATIVE ABUNDANCE: COLONISTS VS. SOURCE - LIFE HISTORY STRATEGY





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MARSH LAKE DAM ROCK RAMP FISHWAY



Marsh Lake

Minnesota River



Pomme de Terre River





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MARSH LAKE DAM ROCK RAMP FISHWAY





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CONCLUSION

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Ecological Resiliency - The capacity of an [ecosystem](#) to respond to a perturbation or [disturbance](#) by resisting damage and [subsequently recovering](#).

-Wikipedia



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QUESTIONS?



Marsh Lake Habitat Enhancement Project

Restore the aquatic and riparian ecosystems in the Marsh Lake project area on the Minnesota River in Western Minnesota.

By U.S. Army Corps of Engineers and Minnesota Department of Natural Resources

[About](#) [Location](#) [History](#) [Planning](#) [Objectives](#) [Project Features](#) [Compare Pre-Post](#) [Drawdowns](#) [Videos](#) [Monitoring](#) [2015-2023](#) [References](#) [Questions](#)

[Marsh Lake Habitat Enhancement Project \(arcgis.com\)](https://storymapx.arcgis.com/stories/fed86ac1de824c12afb6bbaaa4a59917)

<https://storymapx.arcgis.com/stories/fed86ac1de824c12afb6bbaaa4a59917>