

NON-NATIVE ERADICATION AND WESTSLOPE CUTTHROAT TROUT REINTRODUCTION IN THE CANADIAN ROCKIES

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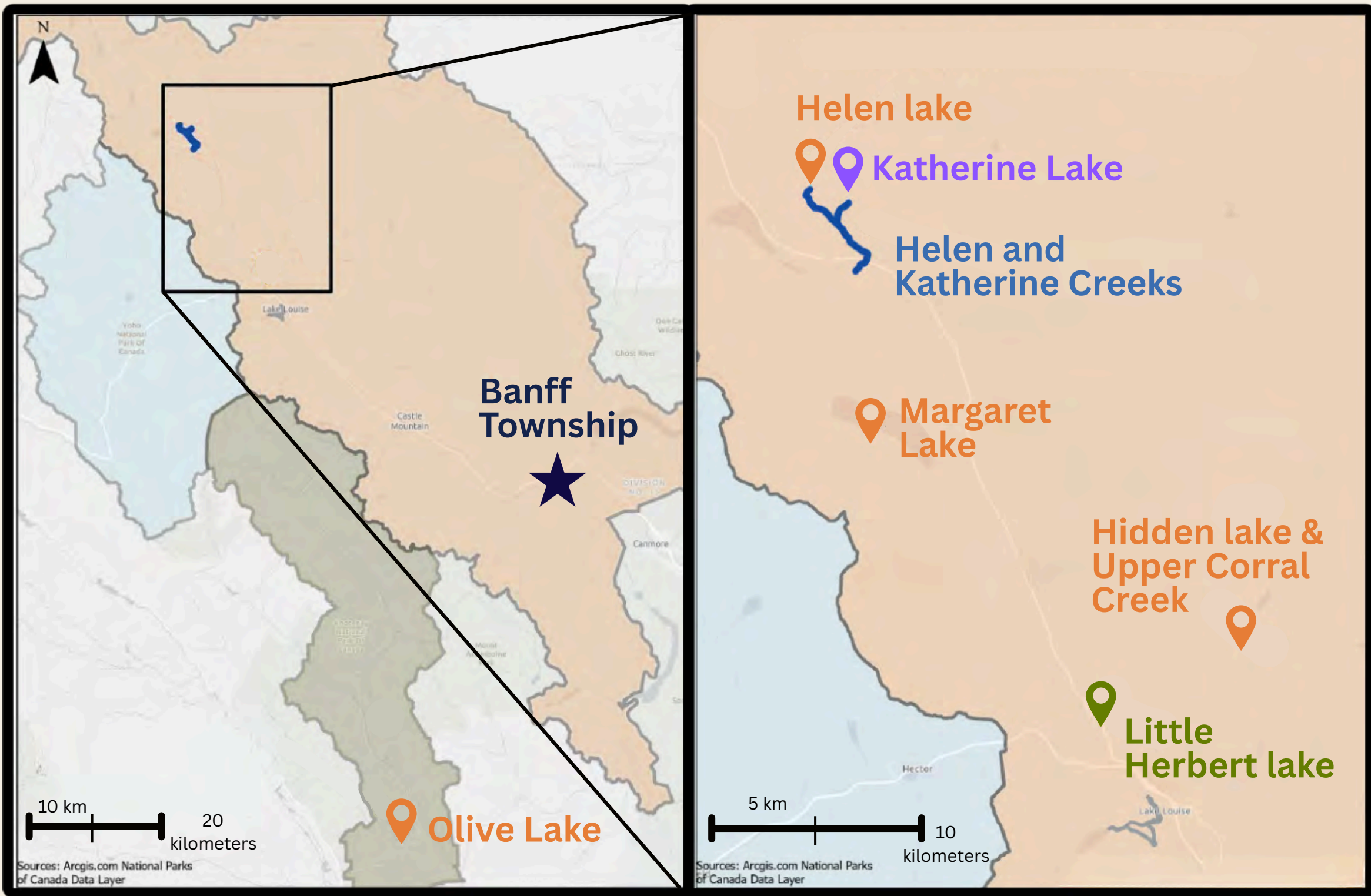
INTRODUCTION

- Non-native fish have been widely stocked throughout western North America⁵.
- Westslope cutthroat trout (WSCT) are at risk across their native range, largely due to competition and hybridization with non-native fish^{1,2,3}.
- Rotenone, a plant-derived piscicide, can effectively remove non-native fish but may also harm amphibians and aquatic invertebrates⁵.
- Conservation translocations can help re-establish WSCT populations where they have been extirpated⁴.

OBJECTIVES / PREDICTIONS

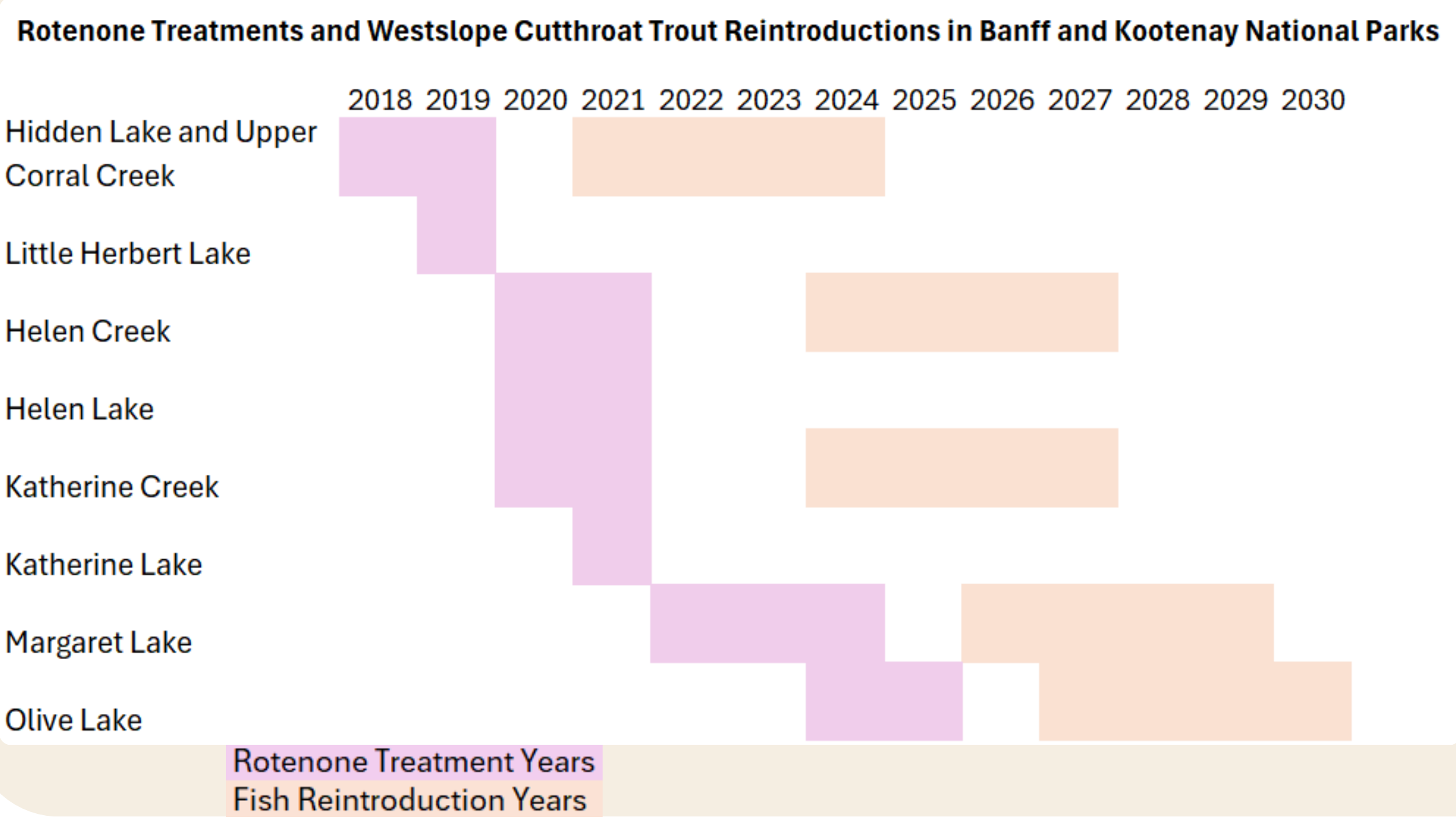
- Assess rotenone's effects on benthic macroinvertebrate communities in Banff and Kootenay National Parks.**
 - Benthic macroinvertebrate communities will return to pre-treatment metrics following rotenone exposure.
- Assess rotenone as a method for eradicating non-native salmonids.**
 - Rotenone will effectively eradicate non-native salmonids at Parks Canada study sites.
- Assess whether WSCT can establish populations following reintroduction to lakes and streams in Banff National Park.**
 - WSCT will establish populations in historical habitat.

STUDY AREA



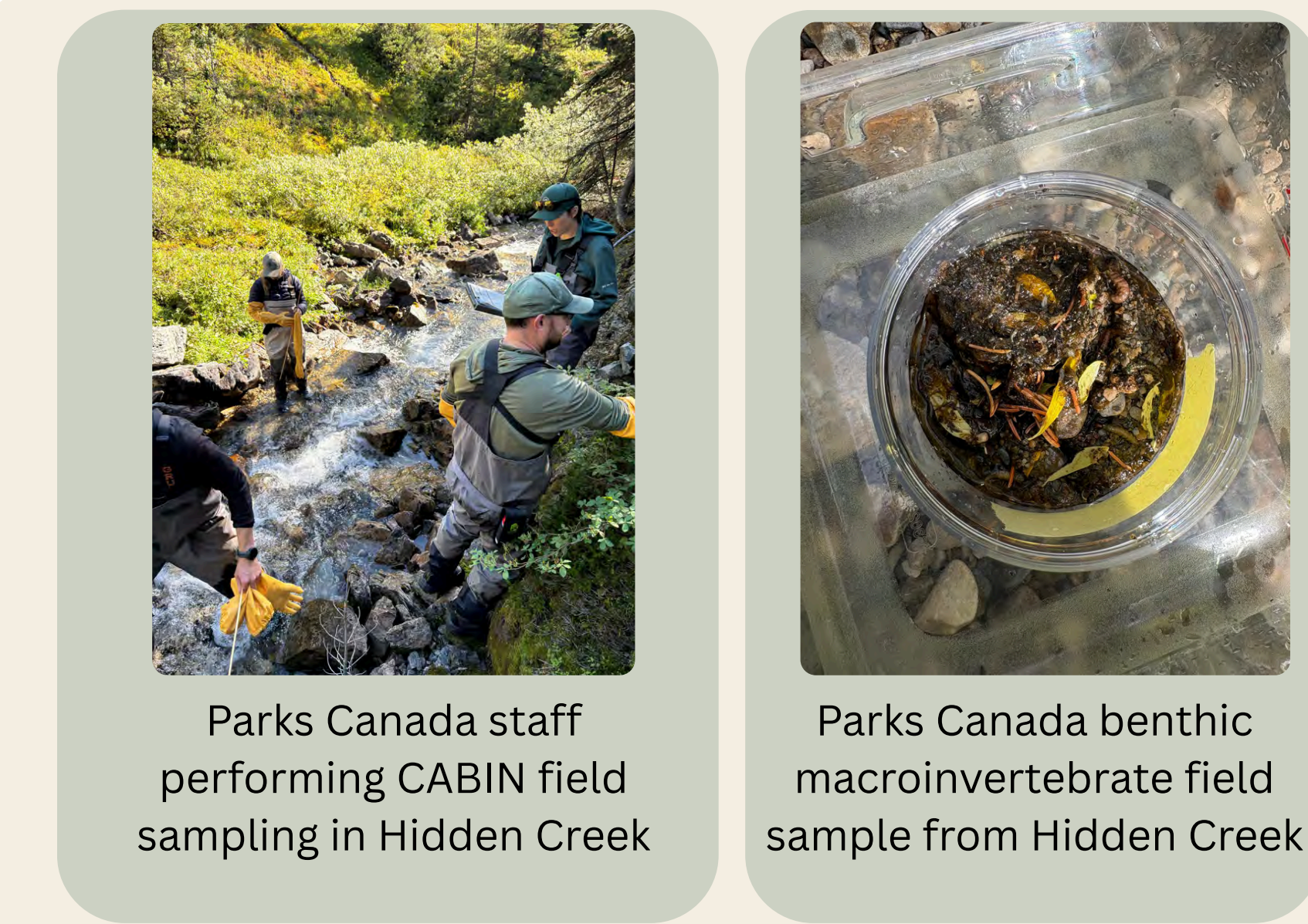
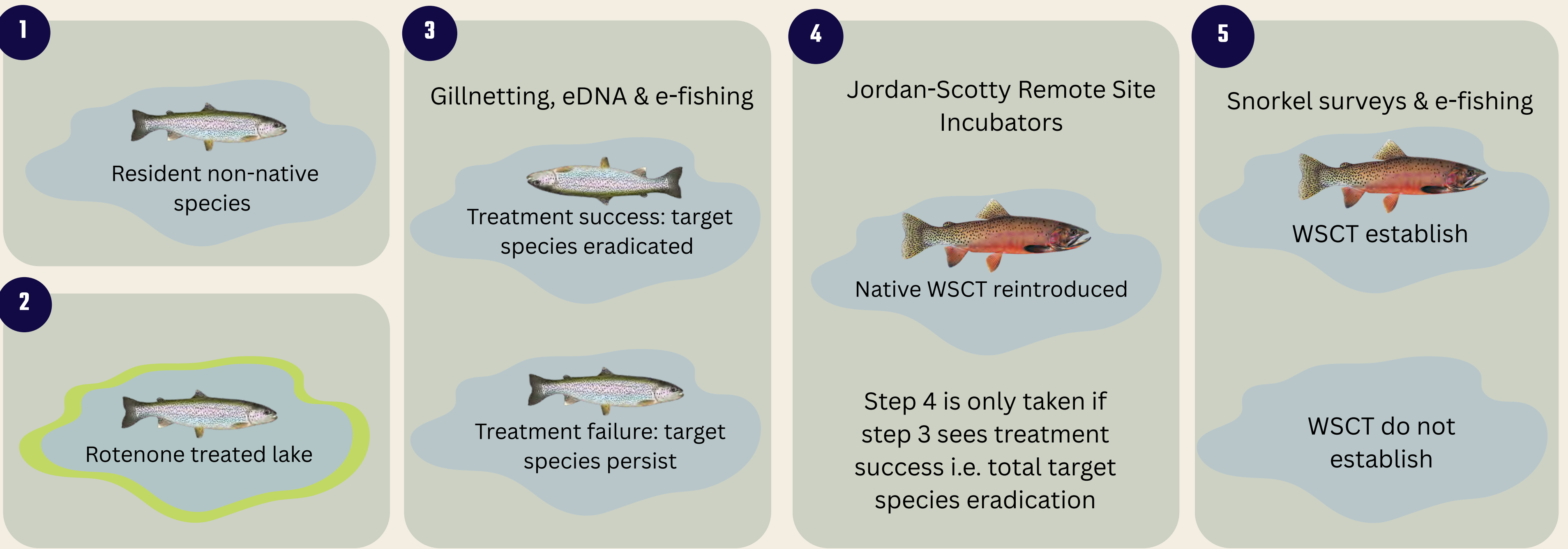
National Park boundaries:	Species removed:
Banff National Park	Eastern brook trout
Kootenay National Park	Yellowstone cutthroat trout
Yoho National Park	Rainbow trout
	Eastern brook trout & Yellowstone cutthroat trout

PROJECT TIMELINE



Saving Threatened Trout In Banff National Park Techniques

METHODS



Canadian Aquatic Biomonitoring Network (CABIN)
CABIN is a nationally shared Canadian aquatic macroinvertebrate database.

CABIN uses a reference condition model to analyze a test site's benthic macroinvertebrate population's degree of divergence from what it should be if the test site were in "reference condition" i.e., unaffected by humans.

The Mountain Parks CABIN reference condition model has over 120 reference sites available from which to analyze benthic macroinvertebrate population divergence on an annual basis in rotenone treated systems.



A WSCT eggs journey through the reintroduction timeline

PRELIMINARY RESULTS

- Benthic macroinvertebrates seem to recover**
 - Stream communities of benthic macroinvertebrates appear capable of recovering to reference condition following rotenone treatment and native fish reintroduction.
- Non-native fish were eradicated**
 - Rotenone effectively eradicated non-native fish populations across multiple aquatic ecosystems in Banff and Kootenay National Parks.
- Reintroduced WSCT appear to be establishing**
 - Reintroduced WSCT have grown in body size, remained in the systems within which they were hatched, and exhibited spawning behavior following remote site incubator deployment.

SIGNIFICANCE

- Understanding of the impact of rotenone and it's effectiveness is limited.**
- Variability of treatment success and treatment effects on benthic macroinvertebrates remain poorly understood.
 - Existing evidence is limited, and predominantly found in grey literature.
 - Better evidence can help predict treatment outcomes, reduce non-target harm, and build confidence in rotenone as a management tool.
- WSCT restoration needs more context.**
- Understanding what drives WSCT establishment can guide future translocations.
 - Help determine if, when, where, and how translocations are used for future management and conservation.

ACKNOWLEDGMENTS

Thank you to the University of Calgary and FRI Research for providing funding and supervision over this research.

Thank you to Shelley Humphries, Brad Stitt, Chloe Christenson, Calvin Kluge, Kellen Martel, Adam Peters, Jade Janzen, and countless other Parks Canada LLYK staff for:

- allowing my participation in applicable field work
- collecting years worth of hard earned, diligently collected data
- allowing me to work with their hard earned, diligently collected data

Works Cited

¹ Bell, D.A., Kovach, R.P., Muhlfeld, C.C., Al-Chokhachy, R., Cline, T.J., Whited, D.C., Schmetterling, D.A., Lukacs, P.M. & Whiteley, A.R., 2021. Climate change and expanding invasive species drive widespread declines of native trout in the northern Rocky Mountains, USA. *Science Advances*, 7(52), p.eabj5471.

² Cleator, H., Earle, J., Fitch, L., Humphries, S., Koops, M., Martin, K., Mayhood, D., Petry, S., Pacas, C., Stelfox, J., & Wig, D. 2009. Information relevant to a recovery potential assessment of pure native Westslope Cutthroat Trout, Alberta population. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/036. iv + 26 p.

³ COSEWIC 2006. COSEWIC assessment and update status report on the westslope cutthroat trout *Oncorhynchus clarkia lewisii* (British Columbia population and Alberta population) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 67pp.

⁴ Galloway, B.T., Muhlfeld, C.C., Guy, C.S., Downs, C.C., & Fredenberg, W.A. 2016. A Framework for Assessing the Feasibility of Native Fish Conservation Translocations: Applications to Threatened Bull Trout, North American Journal of Fisheries Management, Volume 36, Issue 4, August 2016, Pages 754–768

⁵ Rytwinski, T., Taylor, J.J., Donaldson, L.A., Britton, J.R., Browne, D.R., Gresswell, R.E., Lintermans, M., Prior, K.A., Pellatt, M.G., Vis, C., & Cooke, S. J. 2019. The effectiveness of non-native fish removal techniques in freshwater ecosystems: A systematic review. *Environmental Reviews* 27:71–94.