

Re-storying Dammed Waters

Towards Kichissippi Pimisi (American Eel) Recovery
in Algonquin Provincial Park

by
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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis including any required final revisions as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Abstract

Since time immemorial, the migrations of Pimisi (American Eel, *Anguilla rostrata*) to the Kichissippi (Ottawa River) Watershed have woven together a vast web of interdependencies. Dam operations along these waters have driven Pimisi to endangerment, impacting ecological balances, cultural ties for the Algonquin Anishinaabeg, and relational understandings of the watershed.

Re-storying Dammed Waters considers the future of Pimisi recovery efforts by intervening in barriers to their habitat in what is now Algonquin Provincial Park in Ontario. Though celebrated for its vast offering of ‘wilderness’ experiences that foster human connection and care towards more-than-human beings, the park upholds colonial and resource-oriented legacies of land management and use. Successive and prolonged dam operations stemming from the park’s logging era to the rise of water management for recreation and hydropower development have resulted in aquatic ecosystem disruptions and biodiversity concerns that are challenging to negotiate. This thesis asks how the design of recovery interventions might reconcile human relationships with Pimisi and other more-than-human beings and systems.

A research process consisting of fieldwork documenting the park and its dams, conversations with allied voices in fisheries management, and case studies of dam intervention approaches reflect upon the planning and implementation of Pimisi recovery in conjunction with its ecological and cultural narratives. The synthesis of these studies imagines an alternative story for the park’s aging Cache Lake dam in support of recovery. Restorative and interpretive interventions within a phased design scheme reinstate the rights of Pimisi to access these waters, improve habitat conditions, and usher in human awareness and care.

By foregrounding more-than-human lives like Pimisi in a research process attuned to relationality, this thesis suggests that there is potential for an agential and ethical shift in how designers engage with the land. Amidst an ongoing global loss of biodiversity and entwined discourse on reconciliation in architecture, it offers actionable considerations for design that seek to bridge species, scales, and ways of knowing.

Acknowledgements

The development of this thesis took place between two watersheds, in places that bear settler given names of Cambridge and Ottawa. It began in the Grand River Watershed, where I am privileged and thankful to have spent many years of learning. The University of Waterloo School of Architecture is situated in Block One of the Haldimand Tract – land that includes six miles on either side of the Grand River, which was promised to the Six Nations of the Grand River with the Haldimand Treaty in 1784. The greater watershed, inclusive of the Haldimand Tract, belongs within the Traditional Territories of the Attawandaron (Neutral), Anishinaabeg, and Haudenosaunee peoples.

I completed this thesis in my family home in the Kichissippi (Ottawa River) Watershed, where we settled thirteen years ago. The watershed remains the unceded homeland of the Algonquin Anishinaabeg and important maturation grounds for migrating Kichissippi Pimisi. My research focuses on Algonquin Provincial Park, which was established within Algonquin Traditional Territory and defines a region that has long been shared with neighbouring Anishinaabeg, including the Nipissing, Ojibwe (Chippewa), and Mississauga. Dams and other divisions imposed on the Kichissippi Watershed were central to the construction of Canada; their futures present opportunities to consider how meaningful reconciliation with Pimisi, Indigenous peoples, and countless other beings might be pursued.

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Table of Contents

iii	Author's Declaration
v	Abstract
vi	Acknowledgements
x	List of Figures
xvi	PREFACE: CONFLUENCE
xx	Methodology and Structure
xxii	Addressing Research Limitations
xxiv	Notes and Terminology
1	CHAPTER I: SHARED WATERS
3	Between Two Worlds
11	Pimisi and the Algonquin Anishinaabeg
17	Managing a Slippery Decline
23	Recovery in Algonquin Provincial Park
27	CHAPTER II: BARRIERS TO LIFEWAYS
31	Infrastructures of Control
37	Damming Wilderness
46	Parallels of Watershed Colonization
49	Navigating Contradictions
51	CHAPTER III: CONVERSATIONS ABOUT PIMISI RECOVERY
53	In Conversation with Mark Ridgway
57	In Conversation with Krystal Mitchell
63	Recovery Objectives and Programming
67	CHAPTER IV: DAM INTERVENTION STUDIES
69	Introduction to the Cache Lake Dam
75	Improve or Remove?
81	Akikodjiwan (Chaudière Falls) Redevelopment
89	Undamming the Mill River
95	Phasing Dam Interventions
99	CHAPTER V: DESIGNING PIMISI RECOVERY
101	Phase I: Dam Retrofit
121	Phase II: Partial Dam Removal
137	CONCLUSION: REFLECTIONS
143	Bibliography
149	Appendix: Interview Transcripts

Fig. 1.12	<i>Florence Miller holding American Eel</i> . 1930. Photograph. Algonquin Provincial Park Archives & Collections, 2013.5.2.	24
Fig. 1.13	Author. <i>Upstream view of the Cache Lake dam</i> . 2023. Photograph.	24
Fig. 1.14	Author. <i>Wetlands on the floodplain of the Madawaska River</i> . 2023. Photograph.	26
Fig. 1.15	Lipman, Martin. <i>Pimisi in a holding tank</i> . 2017. Photograph. Ottawa Riverkeeper. Reproduced by permission from Ottawa Riverkeeper.	26

CHAPTER II: BARRIERS TO LIFEWAYS

Fig. 2.1	Author. <i>Yellow eel Pimisi takes shelter</i> . 2023. Pen and digital drawing.	27
Fig. 2.2	Author. <i>Timeline of environmental interventions, policies, and attitudes impacting Pimisi in Algonquin Provincial Park</i> . 2024. Timeline. Adapted from: A. S. Dyke and V. K. Prest, <i>Late Wisconsinan and Holocene Retreat of the Laurentide Ice Sheet</i> , 1987, "A" Series Map 1702A, 1 sheet, Geological Survey of Canada, https://doi.org/10.4095/122842 ; <i>Dam repair, Sasajewun, 1955-56</i> , photograph, Algonquin Park Archives & Collections, 2014.16.27; <i>Florence Miller holding American Eel</i> , 1930, photograph, Algonquin Provincial Park Archives & Collections, 2013.5.2; Gerald Killan, <i>Protected Places: A History of Ontario's Provincial Parks System</i> (Toronto: Dundurn Press in association with the Ontario Ministry of Natural Resources, 1993); <i>Logging dam</i> , 1938, photograph, Algonquin Park Archives & Collections, APM 3487; <i>Map of part of the Huron and Ottawa Territory, Ontario, showing the Districts of Parry Sound, Muskoka and Nipissing County of Haliburton</i> , 1913 (1914), map, Department of Lands Forests and Mines, Ontario, Library and Archives Canada, https://recherche-collection-search.bac-lac.gc.ca/eng/home/record?app=fonandcol&IdNumber=4129640 ; Vandyck Gravure, <i>Log cabins at "Nominigan Camp," Algonquin Provincial (Ontario) Park</i> , 1910, postcard, Baldwin Collection of Canadiana, Toronto Public Library Digital Archive, https://digitalarchive.tpl.ca/objects/269502/log-cabins-at-nominigan-camp-algonquin-provincial-onta ; and W. H. James, <i>Algonquin Park roadside scene</i> , 1959, photograph, Toronto Star Photographic Archive, Toronto Public Library Digital Archive, https://digitalarchive.tpl.ca/objects/275851/algonquin-park-roadside-scene?ctx=6d2eee4ddf5ee1f74f03ba42285ebbc2d436a103&idx=45 .	29
Fig. 2.3	<i>Log Drive on the Petawawa River above High Falls</i> . 1940. Photograph. Canadian National Railways. Toronto Public Library Digital Archive. https://digitalarchive.tpl.ca/objects/275871/log-drive-on-the-petawawa-river-above-high-falls--algonquin .	32
Fig. 2.4	Author. <i>Display wooden logging dam and chute at the Logging Museum</i> . 2023. Photograph.	32
Fig. 2.5	Author. <i>Portage over the Lake of Two Rivers dam</i> . 2023. Photograph.	33
Fig. 2.6	Author. <i>Eganville Chute hydropower dam</i> . 2023. Photograph.	33
Fig. 2.7	Author. <i>Index of dams along Kichissippi tributaries from Algonquin Park</i> . 2024. Digital drawing. Adapted from: M. Ridgway, T. Middel, and A. Bell, <i>Aquatic Ecology, History, and Diversity of Algonquin Provincial Park</i> (Peterborough, Ontario: Ontario Ministry of Natural Resources and Forestry, Science and Research Branch, Science and Research Information Report IR-10, 2017), 59-63, https://www.harkness.ca/publications/algonquin-aquatic-ecology/ ; and <i>Madawaska River Water Management Plan</i> (Toronto: Ontario Ministry of Natural Resources, 2009), 41-51.	35
Fig. 2.8	Author. <i>Map of dams along watercourses flowing from Algonquin Park to the Kichissippi</i> . 2024. Pen and digital drawing. Adapted from: "Ontario Dam Inventory," Ontario Ministry of Natural Resources and Forestry, GIS dataset, last modified November 24, 2023, https://geohub.lio.gov.on.ca/datasets/mnrf::ontario-dam-inventory/about ; and "Ontario Watershed Boundaries (OWB)," Ontario Ministry of Natural Resources and Forestry, GIS dataset, last modified January 25, 2023, https://geohub.lio.gov.on.ca/maps/mnrf::ontario-watershed-boundaries-owb/about .	36

Fig. 2.9	Bob McElroy and Diana McElroy. <i>Old logging dam remnants at Big Thompson Rapids</i> . 2011. Photograph. https://mcelroy.ca/bushlog/20110912.html . Reproduced by permission from Bob McElroy.	37
Fig. 2.10	Author. <i>Outlet of the Lake of Two Rivers dam</i> . 2023. Photograph.	37
Fig. 2.11	Valentine and Sons. <i>An ideal camping spot on Crown Lake, Algonquin National Park, Ontario</i> . 1910. Postcard. Baldwin Collection of Canadiana. Toronto Public Library Digital Archive. https://digitalarchive.tpl.ca/objects/293824/an-ideal-camping-spot-on-crown-lake-algonquin-national-park?ctx=f8ae0bdd9f6948ae23b758b0df1044678fa7dad3&idx=3 .	38
Fig. 2.12	Author. <i>Walking along the 'Big Pines' trail</i> . 2022. Photograph.	38
Fig. 2.13	Author. <i>Connecting hinterland parks to settler land use divisions</i> . 2023. Digital drawing.	39
Fig. 2.14	Author. <i>Algonquin Park management and zoning plan</i> . 2024. Pen and digital drawing. Adapted from: <i>Algonquin Provincial Park Management Plan</i> (Ontario, Canada: Queen's Printer for Ontario, 1998), https://www.ontario.ca/page/algonquin-provincial-park-management-plan .	41
Fig. 2.15	Author. <i>Human infrastructure and buildings along the Highway 60 corridor</i> . 2024. Collaged drawing.	42
Fig. 2.16	Author. <i>Author's adaptation of Jody Baker and Pierre Bourdieu's theories on capital applied to Algonquin Park</i> . 2023. Diagram.	42
Fig. 2.17	Author. <i>Canada Warbler near the Pog Lake Campground</i> . 2023. Photograph.	44
Fig. 2.18	Author. <i>Wolf diorama at the Visitor Centre</i> . 2023. Photograph.	44
Fig. 2.19	Author. <i>Display logging transportation mechanism at the Logging Museum</i> . 2023. Photograph.	45
Fig. 2.20	Author. <i>Omàmiwinini Wiigwas Chiiman (Algonquin birch bark canoe)</i> . 2023. Photograph.	47
Fig. 2.21	Author. <i>'Peace and Reconciliation' totem pole</i> . 2023. Photograph.	47
Fig. 2.22	Author. <i>View from 'Booth's Rock' trail</i> . 2023. Photograph.	50

CHAPTER III: CONVERSATIONS ABOUT PIMISI RECOVERY

Fig. 3.1	Author. <i>Yellow eel Pimisi feeds on bass</i> . 2023. Pen and digital drawing.	51
Fig. 3.2	Author. <i>Author's interpretation of Mark Ridgway's perspectives on Pimisi recovery</i> . 2024. Pen and digital drawing.	61
Fig. 3.3	Author. <i>Author's interpretation of Krystal Mitchell's perspectives on Pimisi recovery</i> . 2024. Pen and digital drawing.	62
Fig. 3.4	Author. <i>Pimisi recovery objectives</i> . 2024. Pen and digital drawing.	65

CHAPTER IV: DAM INTERVENTION STUDIES

Fig. 4.1	Author. <i>Yellow eel Pimisi burrows in the mud</i> . 2023. Pen and digital drawing.	67
Fig. 4.2	Author. <i>Key plan of the Cache Lake dam</i> . 2023. Digital drawing.	69
Fig. 4.3	<i>Historical stoplog dam and log chute at Cache Lake</i> . Drawing. In <i>Track and Tower Trail: A Look Into Algonquin's Past</i> . The Friends of Algonquin Park. Queen's Printer for Ontario, 2019.	70

Fig. 4.4	Author. <i>Cache Lake dam</i> . 2023. Photograph.	70
Fig. 4.5	Author. <i>Axonometric projection of the existing Cache Lake area</i> . 2024. Pen and digital drawing. Adapted from: <i>Big railway trestle between Cache Lake and Lake of Two Rivers</i> , 1940, photograph, Algonquin Park Archives & Collections, APM 1289; Bob McElroy and Diana McElroy, <i>Cache Lake dam</i> , 2008, photograph, https://mcelroy.ca/bushlog/20081105.html , reproduced by permission from Bob McElroy; <i>Fire warden's lookout tower, Cache Lake, Ont.</i> , photograph, Library and Archives Canada, PA-048122, https://recherche-collection-search.bac-lac.gc.ca/eng/home/record?app=fonandcol&IdNumber=3381938&q=fire%20warden%20cache%20lake ; <i>Highland Inn, Algonquin Park, Ont.</i> , photograph, Library and Archives Canada, https://recherche-collection-search.bac-lac.gc.ca/eng/home/record?app=fonandcol&IdNumber=4304145 ; and William James Topley, <i>Highland Inn & Railway Station from distance</i> , 1913, photograph, Algonquin Park (Ont), Library and Archives Canada, PA-010570, https://recherche-collection-search.bac-lac.gc.ca/eng/home/record?app=fonandcol&IdNumber=3309212 .	71
Fig. 4.6	Author. <i>Cache Lake upstream from the dam</i> . 2023. Photograph.	73
Fig. 4.7	Author. <i>Madawaska River downstream from the dam</i> . 2023. Photograph.	73
Fig. 4.8	Kensinger, Nathan. <i>Saw Mill River eel ladder</i> . 2016. Photograph. In "Daylighting the Sawmill River." https://ny.curbed.com/2016/12/15/13963898/yonkers-saw-mill-river-photo-essay . Reproduced by permission from Nathan Kensinger.	76
Fig. 4.9	<i>Glines Canyon Dam removal</i> . 2012. Photograph. Elwha River. National Park Service. https://www.nps.gov/olym/learn/nature/dam-removal.htm .	76
Fig. 4.10	Author. <i>Technical considerations for dam improvement</i> . 2024. Pen and digital drawing.	77
Fig. 4.11	Author. <i>Technical considerations for dam removal</i> . 2024. Pen and digital drawing.	79
Fig. 4.12	Author. <i>Key plan of Akikodjiwan (Chaudière Falls)</i> . 2023. Digital drawing.	81
Fig. 4.13	Author. <i>Plan of the Akikodjiwan (Chaudière Falls) redevelopment</i> . 2023. Digital drawing. Adapted from: CSW, <i>Chaudière hydro redevelopment</i> , landscape architecture drawings, 2017; Milieu Inc., <i>Chaudière Falls generating station upstream eel ladder</i> , eel ladder drawings, 2018; Philip John Bainbrigge, <i>Chaudiere Falls</i> , July 1838, watercolour, Library and Archives Canada, Acc. No. 1983-47-46, https://recherche-collection-search.bac-lac.gc.ca/eng/home/record?app=fonandcol&IdNumber=2833583 ; and William James Topley, <i>Chaudière dam</i> , photograph, Ottawa (Ont), Library and Archives Canada, PA-009122, https://recherche-collection-search.bac-lac.gc.ca/eng/home/record?app=fonandcol&IdNumber=3326127 .	82
Fig. 4.14	DCA (Douglas Cardinal Architect). <i>Proposed concept for Akikodjiwan (Chaudière Falls)</i> . 2014. Architectural rendering. Reproduced by permission from Douglas Cardinal Architect.	84
Fig. 4.15	<i>Aerial view of Akikodjiwan (Chaudière Falls)</i> . Photograph. Hydro Ottawa. https://hydroottawa.com/en/blog/discover-chaudiere-falls-where-ottawas-past-and-future-unite . Reproduced by permission from Franz Kropp (Portage Power).	84
Fig. 4.16	Author. <i>Eel ladder intake at Generating Station #5</i> . 2023. Photograph.	85
Fig. 4.17	Author. <i>Eel ladder running alongside a pedestrian pathway by Chaudière Park</i> . 2023. Photograph.	85
Fig. 4.18	Author. <i>Bypass solutions at Generating Station #5</i> . 2023. Collaged drawing. Adapted from: <i>Generating Station #5 trash rack screens</i> , photograph, Hydro Ottawa, in Brian Banks, "The charismatic eel," https://brian.eco/the-charismatic-eel/ , reproduced by permission from Franz Kropp (Portage Power).	87
Fig. 4.19	Author. <i>Author's observations of architectural storytelling at Chaudière Park</i> . 2023. Collaged drawing.	87

Fig. 4.20	Author. <i>Author's interpretation of a possible interpretive walk from Pimisi Station to Akikodjiwan (Chaudière Falls)</i> . 2023. Collaged drawing.	87
Fig. 4.21	Author. <i>Key plan of the Mill River</i> . 2023. Digital drawing.	89
Fig. 4.22	Author. <i>Plan of the Mill River restoration</i> . 2023. Digital drawing. Adapted from: <i>Hopewell Mills dam demolition</i> , 2012, photograph, Massachusetts Division of Ecological Restoration; <i>Inter-fluve, State Hospital Dam Removal</i> , engineering drawings, 2012; <i>Inter-fluve, Whittenton Dam Removal</i> , engineering drawings, 2013; <i>Inter-fluve, West Britannia Dam Removal</i> , engineering drawings, 2017; <i>Mill River channel construction</i> , 2012, photograph, Massachusetts Division of Ecological Restoration, https://millriver.blogspot.com/2012/11/what-do-neighbors-think.html ; and <i>West Britannia dam</i> , 2014, photograph, U.S Fish and Wildlife Service, https://www.flickr.com/photos/usfwsnortheast/16022971229/in/photostream/ .	90
Fig. 4.23	<i>Whittenton dam after its near failure</i> . 2010. Photograph. Massachusetts Division of Ecological Restoration.	92
Fig. 4.24	<i>Environmental Planning students from Northeastern University collecting measurements on the Mill River</i> . 2014. Photograph. Inter-fluve. https://interfluve.com/2020/mill-river-dam-removals/ . Reproduced by permission from Inter-fluve.	92
Fig. 4.25	Author. <i>Dam removal process at Hopewell Mills</i> . 2023. Collaged drawing. Adapted from: <i>Hopewell Mills dam demolition</i> , 2012, photograph, Massachusetts Division of Ecological Restoration, https://millriver.blogspot.com/2012/08/changing-habitat-in-former-impoundment.html ; and <i>Mill River dewatering</i> , 2012, photograph, Massachusetts Division of Ecological Restoration, https://millriver.blogspot.com/2012/08/the-first-riffle-in-200-years.html ;	93
Fig. 4.26	Author. <i>Mill River channel construction methods</i> . 2023. Collaged drawing. Adapted from: <i>FES bank construction</i> , 2013, Massachusetts Division of Ecological Restoration, https://millriver.blogspot.com/2013/08/channel-construction-and-return-of.html ; and <i>Floodplain planting</i> , 2013, Massachusetts Division of Ecological Restoration, https://millriver.blogspot.com/2013/10/dam-removal-done-planting-underway.html .	93
Fig. 4.27	Author. <i>Ecological changes to the Mill River</i> . 2023. Collaged drawing. Adapted from: <i>Former West Britannia dam floodplain</i> , 2011, Massachusetts Division of Ecological Restoration; and <i>Mill River after the completion of work</i> , 2012, Massachusetts Division of Ecological Restoration, https://millriver.blogspot.com/search?updated-max=2013-04-04T11:57:00-07:00&max-results=7 .	93
Fig. 4.28	Author. <i>Improvement study of the Cache Lake dam</i> . 2023. Digital drawing.	96
Fig. 4.29	Author. <i>Removal study of the Cache Lake dam</i> . 2023. Digital drawing.	96
Fig. 4.30	Author. <i>View of the Cache Lake dam from the 'Track and Tower' trail</i> . 2023. Photograph.	97

CHAPTER V: DESIGNING PIMISI RECOVERY

Fig. 5.1	Author. <i>Silver eel Pimisi crossing a riverbank</i> . 2023. Pen and digital drawing.	99
Fig. 5.2	Author. <i>Phase I masterplan</i> . 2024. Digital drawing.	102
Fig. 5.3	Author. <i>Axonometric projection of the landscape-scale changes in Phase I</i> . 2024. Pen and digital drawing.	103
Fig. 5.4	Author. <i>Phase I section of the dam site</i> . 2024. Pen and digital drawing.	105
Fig. 5.5	Author. <i>Phase I plan of the dam site</i> . 2024. Pen and digital drawing.	107

Fig. 5.6	Author. <i>Pimisi corral at the downstream intake of the planted eel ladder.</i> 2024. Pen and digital drawing.	109
Fig. 5.7	Author. <i>Pimisi movement through the eel ladder.</i> 2024. Pen and digital drawing.	110
Fig. 5.8	Author. <i>Pimisi ascend the eel ladder into the learning pavilion where a youth group are gathered.</i> 2024. Pen and digital drawing.	111
Fig. 5.9	Author. <i>Movement of water and bodies through the learning pavilion and adjoining eel ladder.</i> 2024. Pen and digital drawing.	112
Fig. 5.10	Author. <i>A canoe approaches the floating monitoring station where a human team is studying Pimisi.</i> 2024. Pen and digital drawing.	113
Fig. 5.11	Author. <i>Relationship of monitoring station to lake level changes and aquatic ecology.</i> 2024. Pen and digital drawing.	114
Fig. 5.12	Author. <i>Plan of the monitoring station.</i> 2024. Pen and digital drawing.	115
Fig. 5.13	Author. <i>Visitors learn about watershed connectivity at the trailhead water feature.</i> 2024. Pen and digital drawing.	117
Fig. 5.14	Author. <i>Movement of water through the trailhead.</i> 2024. Pen and digital drawing.	118
Fig. 5.15	Author. <i>Plan of the 'Track and Tower' trailhead.</i> 2024. Pen and digital drawing.	119
Fig. 5.16	Author. <i>Phase II masterplan.</i> 2024. Digital drawing.	122
Fig. 5.17	Author. <i>Axonometric projection of landscape-scale changes in Phase II.</i> 2024. Pen and digital drawing.	123
Fig. 5.18	Author. <i>Phase II section of the dam site.</i> 2024. Pen and digital drawing.	125
Fig. 5.19	Author. <i>Phase II plan of the dam site.</i> 2024. Pen and digital drawing.	127
Fig. 5.20	Author. <i>Remnants of the Cache Lake dam disrupt the trail.</i> 2024. Pen and digital drawing.	129
Fig. 5.21	Author. <i>Reuse of the removed sluice gate and dam debris.</i> 2024. Pen and digital drawing.	130
Fig. 5.22	Author. <i>Visitors learn about Pimisi spawning migrations at the dam lookout.</i> 2024. Pen and digital drawing.	131
Fig. 5.23	Author. <i>Material and visual connection to Pimisi migration.</i> 2024. Pen and digital drawing.	132
Fig. 5.24	Author. <i>Pimisi, other aquatic beings, and flowing sediments move around log structures in the Madawaska River channel.</i> 2024. Pen and digital drawing.	133
Fig. 5.25	Author. <i>Assembly of log habitat structures and seating.</i> 2024. Pen and digital drawing.	134
Fig. 5.26	Author. <i>Pimisi and human visitors cross shallow rapids at the reconstructed bridge.</i> 2024. Pen and digital drawing.	135
Fig. 5.27	Author. <i>Bridge form emulates Pimisi crossing between bodies of water.</i> 2024. Pen and digital drawing.	136

CONCLUSION: REFLECTIONS

Fig. 6.1	Author. <i>Migrating yellow and silver eel Pimisi.</i> 2024. Pen and digital drawing.	137
Fig. 6.2	Author. <i>Sunset over Lake Opeongo at the Harkness Laboratory of Fisheries Research.</i> 2023. Photograph.	142

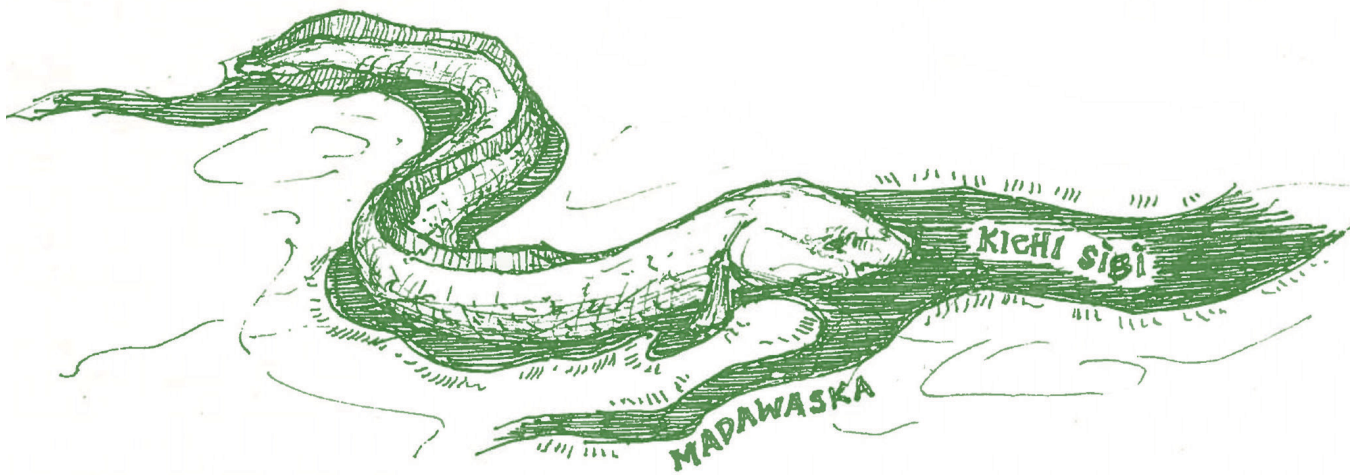


Fig. 0.1
Kichissippi Pimisi.

PREFACE

Confluence

At the shoreline of the Madawaska River in Algonquin Provincial Park, I watch the rippling water make blurry silhouettes out of young Rock Bass circling below the Lake of Two Rivers dam. Though deterred by the barrier, they approach its spew of frothing outflow anyways, compelled by a desire to move upstream. Prior to the construction of dams, establishment of park borders, and influx of annual tourists, the Madawaska and other tributaries of the Kichissippi (Ottawa River) in this region welcomed the arrival of another visitor, Pimisi (American Eel). Dams fragmenting the Kichissippi Watershed have rendered these migration routes unreachable and deadly, resulting in a concerning decline of Pimisi that is exacerbated by the inaction of government and industry to reconcile the impacts of these barriers.

The same dammed waters that historically carried migrating Pimisi merge with my own story of migration to the Kichissippi Watershed. I arrived to Turtle Island (Canada) from Malaysia at a young age with my immediate family in a move resulting from my parents' concerns of the nation's inequalities. We settled for several years in Oakville before relocating to a sprawling suburb in Ottawa that runs along the Kichissippi's Carp River tributary. As a new Canadian and racialized settler, my relationship to this home is ensnared in feelings of alienation and in the benefits of settler colonialism, which among many things, has afforded my family ownership of a parcel of land within unceded Algonquin Anishinaabeg Traditional Territory. As Algonquin scholar Lynn Gehl attests, the denial of Algonquin sovereignty and unity through dispossession and colonial divisions to their watershed territory paved Canada's path towards nation-building.¹ Facing ongoing settler colonialism, Algonquins continue to care for their land and relations, and are among the many prominent advocates for Pimisi today.

While growing up with many experiences outdoors cultivated my love and care for my home in the Kichissippi Watershed, I spent most of my life without

¹ Lynn Gehl, *The Truth That Wampum Tells: My Debwewin on the Algonquin Land Claims Process* (Black Point, Nova Scotia: Fernwood Publishing, 2014), 12.

coming to terms with the land-based impacts of settler colonialism, which Pimisi decline can be attributed to. Furthermore, as I began my education and work experiences in architecture, I seldom reflected on my position as a settler designer within the sites that I studied. It was only in the last two years of my undergraduate studies that courses taught by Elder Bill Woodworth, Mkomosé (Dr. Andrew Judge), and Jane Mah Hutton brought the stories of Indigenous peoples and more-than-human lives to the forefront of my understanding of land, challenging the often extractive and imposing design approaches that I had grown accustomed to.

Entering the Master of Architecture program, I had hoped to continue questioning the implications of foregrounding the land in design. Remembering my first visit to Algonquin Park the past summer, I began with an interest in the convergence of natural and human stories that had come to define this landscape. As my research led me to learn about the relationships of the Algonquin people to this area of their Traditional Territory (now a park that bears their name), I stumbled into the contemporary issue of Pimisi decline, realizing the park's long history of water management had contributed to their extirpation from this part of the watershed. Over discussions with my thesis supervisor, Métis architect and scholar, David Fortin, I started to question what I could offer as a settler designer to the current advocacy for Pimisi recovery.

The research enclosed in this book develops design considerations for Pimisi recovery in Algonquin Park that are situated in an awareness of relationality. As trawlulwuy scholar Lauren Tynan describes, relationality is a *lived* reality for Indigenous peoples that is rooted in the land and informs “how the world is known and how we, as Peoples, Country, entities, stories and more-than-human kin know ourselves and our responsibilities to one another.”² While not seeking to appropriate or deconstruct this way of understanding and being with the land, learning from it allowed me to build a richer ecological and cultural context surrounding recovery. Through my engagement with Algonquin Anishinaabe and Western scientific perspectives alike, I came to learn how the decline of Pimisi has produced reverberating impacts in Algonquin lifeways and aquatic ecosystem health. My research also confronted the erosion of relationality in the creation of Algonquin Park, which introduced colonial and resource-oriented management practices, including damming that have altered human relationships with the land.

2 Lauren Tynan, “What is relationality? Indigenous knowledges, practices and responsibilities with kin,” *Cultural Geographies* 28, no. 4 (2021): 600, <https://doi.org/10.1177/14744740211029287>.

Recognizing the relational impacts of recovery, my aim in this thesis is to explore how design can not only reconcile the impacts of park dams on migration, but additionally facilitate connections between Pimisi and other beings. The resulting design scheme responds to Pimisi's interactions with more-than-human beings and systems and situates their recovery within a broader ecological restoration plan. Drawing on Robin Wall Kimmerer's *Braiding Sweetgrass* and the work of *Cooking Sections*, *Feral Atlas*, and *Becoming Sensor*, which peer into and weave more-than-human worlds with human experiences, it furthermore relies on the narrative capacity of architecture as a bridge between Pimisi and the park's human community.

As this thesis studies Pimisi recovery through a design perspective, I believe that its outcomes address two distinct audiences. Adding to the existing field of recovery research, it introduces a relational way of thinking into the planning and implementation of recovery interventions. These considerations could serve as useful talking points for future discussions and studies among Indigenous communities, park staff, and other stakeholders in the park community.

This engagement with relationality furthermore raises questions about agency and ethics that are relevant to the design disciplines. Speaking to the practice of architecture from my experience, our work so often consists of manipulating sites with minimal or selective regard for their preexisting relationships with more-than-humans and Indigenous peoples. This reality is examined in Fortin's talk, "On Relationality in Housing and Design," which positions relationality as a prompt for contemplating who architecture is serving. Fortin considers how design responsiveness might extend towards the more-than-human relations and knowledge systems within a given site that are "deeply tied to place."³ I am led to wonder about the implications of this for settler designers like myself, as we respond to the increasing loss of biodiversity and environmental instabilities propelled by climate change, as well as calls to action for reconciliation with Indigenous peoples.⁴ In what capacity can design serve as advocacy for more-than-human beings like Pimisi? And how might centring relations serve as the grounds for allyship, directing our practices in support of Indigenous peoples' self-determination and the restoration of land amidst a global climate crisis?

3 David Fortin, "On Relationality in Housing and Design," lecture, University of Toronto, November 23, 2023, 24:32, https://www.youtube.com/watch?v=y5J4VXiRMHg&t=2499s&ab_channel=UofTDaniels.

4 Applicable to architects as our work is inextricably tied to the land, the Truth and Reconciliation Commission of Canada's *Calls to Action* calls for a reevaluation of settler relationships with the land through actions that support Indigenous self-determination. See *Truth and Reconciliation Commission of Canada: Calls to Action* (Winnipeg, Manitoba: Truth and Reconciliation Commission of Canada, 2015), 1-11, <https://nctr.ca/records/reports/#trc-reports>.

Methodology and Structure

The methods used in this thesis contextualize and envision the process of Pimisi recovery in Algonquin Provincial Park. Reviews of Traditional Ecological Knowledge and Western scientific literature, park visits, historical studies, mapping, interviews, and case studies provided me with an understanding of the opportunities and challenges of Pimisi recovery in the park. These insights were foundational for imagining design interventions supporting recovery at a single park dam site over time in the culminating section of this thesis.

Perhaps as a result of Pimisi's declining status and reclusive behaviour, I found that visual records of them in the park and greater Kichissippi Watershed ecosystems were limited. I relied on stories and studies to build an understanding of Pimisi, which were mostly recorded in a written form or transmitted to me directly through conversations. Faced with the challenge of visual representation, hand drawing, often in combination with digital media, served as a method of interpretation and storytelling throughout my research. The resulting body of drawings are more speculative than they are precise; however, they reflect a level of care in bringing to life the relationships between Pimisi and other beings that would have been overlooked in conventional architectural representations of the land.



Fig. 0.2
Author's hand drawings sitting atop a map of Algonquin Park, contrasting ways of seeing the land through relations and cartography.

In Chapter I ‘Shared Waters,’ I offer an overview of Pimisi decline in the Kichissippi Watershed due that situates this loss within relational understandings. Referencing studies and testimonies on ongoing efforts to recover Pimisi populations in this region, I identify the ecological and cultural relationships at stake and the strain on this process caused by a lack of widespread cooperation and interventions at dams. Algonquin Park is introduced as a management jurisdiction with the ability and interest to participate in Pimisi recovery moving forward.

Dams, while finite infrastructures, are embedded in Algonquin Park’s management practices. Chapter II ‘Barriers to Lifeways’ examines historical and current park dam operations to identify the challenges that they present to Pimisi recovery as infrastructures complicating relationships between humans and more-than-human inhabitants in the park landscape. Reflections on my visits to the park, analyses of historical documents, and the production of maps draw lines between the physical and ideological barriers to recovery supported by park dams.

Chapter III ‘Conversations About Pimisi Recovery’ establishes design objectives for Pimisi recovery in Algonquin Park, drawing from conversations with two individuals with experience in fisheries management in the park. Analysing the participant responses, I identify programming opportunities that support Pimisi and their relations under the objectives of aquatic connectivity, human engagement, and habitat restoration.

Using the park’s aging Cache Lake dam as a pilot site for a design proposal, Chapter IV ‘Dam Intervention Studies’ assesses existing dam intervention approaches that support Pimisi recovery. Dam improvement and dam removal are compared through case studies of the Akikodjiwan (Chaudière Falls) redevelopment and the Mill River restoration projects. Learning from their considerations and impacts, I argue for phasing these interventions at Cache Lake in response to the dam’s eventual deterioration.

The final part, Chapter V ‘Designing for Pimisi Recovery,’ presents a design speculation at landscape masterplan and building scales, which imagines Pimisi recovery over the lifespan of the Cache Lake dam. The proposal is divided into two phases of interventions that consider the structure’s immediate retrofit and its eventual removal. The design of eel passage, human occupancy, and landscape remediation knits the return of Pimisi into the vibrant ecology within the park.

Addressing Research Limitations

Arriving to Pimisi recovery as a settler architectural researcher, I did not have a preexisting exposure to Pimisi or relationship with the rich and complex epistemologies surrounding them. As I lack the formal expertise, embodied knowledge, and cultural ties to Pimisi, my role in this thesis is to act as an interpreter, translating storytelling and science into design. This required me to step outside of my architectural frame of reference and draw from other disciplines and knowledge systems.

While there is an existing wealth of Western scientific studies on Pimisi, I intended to ensure that Algonquin Anishinaabe perspectives were equally represented. Inspired by Jefa Greenaway and Brian Martin's guidelines for decolonizing research, particularly on "locating and positioning oneself," "building relationality," and "valuing Indigenous knowledge," I originally desired to conduct an engagement process with Algonquin communities throughout the entire Kichissippi Watershed.⁵ However, I found that limitations of resources and time within my scope of work proved insufficient for adequately building relationships at this scale that would be needed prior to initiating any formal conversations.

Instead, I was fortunate to connect with Krystal Mitchell, the Fisheries and Wildlife Management Advisor for the Algonquins of Ontario (AOO) Consultation Office, whose generous input on the AOO's involvement in Pimisi recovery advocacy provided much needed guidance for the research. Another engagement opportunity arose in May 2023, when I was invited to attend a set of fisheries planning meetings in Algonquin Park and was able to present and informally discuss the research with other invitees. In addition to these conversations specific to Pimisi recovery, hearing the perspectives of Indigenous rights holders and stakeholders during the meeting discussions was an invaluable learning experience on fisheries and fisheries management in the park.

Through settler colonialism, the dynamics of Algonquin nationhood today are complicated and remain unresolved. Acknowledging this, I have been careful to avoid generalizations of Algonquin experiences where appropriate and to attribute references to the individuals or communities who have shared that knowledge. As a result of the extent of my engagement, the

5 Jefa Greenaway and Brian Martin, "Guiding Decolonial Trajectories in Design: An Indigenous Position," in *Our Voices II, The Decolonial Project*, eds. Rebecca Kiddle, Luugigyoo Patrick Stewart, and Kevin O'Brien (New York: ORO Editions, 2021), 245-246.

phased scheme for Cache Lake presented in the design chapter of this thesis provides suggestions for potential cultural use programming. These spaces, however, have not been designed to be culturally specific and furthermore, do not reflect what Pimisi recovery means for all Algonquins. In my view, a design of that scope and level of detail would have warranted a thorough consultation with the Algonquin people throughout the design process, which was not achieved in this research. My hope is that the initial design response to cultural use could be built upon with increased Algonquin involvement in future studies.

Although the design proposal that emerges from my research learns from theoretical principles and case studies of dam improvement and removal approaches, it was not based upon a comprehensive environmental assessment. To determine an appropriate course for intervention at the Cache Lake dam, these ideas could be tested through a landscape ecology framework involving sampling and modelling procedures. Aside from its technical components, this scheme suggests that there is something to be gained by connecting the Pimisi recovery process to the network of relationships within the park. I respectfully offer this research as a resource that can help to further Pimisi recovery advocacy and action in the Kichissippi Watershed.

Notes and Terminology

On the Use of Algonquin Names

Where relevant, I have opted to use Algonquin names over common names, such as Kichissippi instead of Ottawa River, and Akikodjiwan instead of Chaudière Falls. In doing so, I challenge the renaming of sites by settler Canadians and the meaning that names carry in the context of the genocidal erasure of Indigenous peoples from their homelands. It is also my attempt to acknowledge the ongoing Algonquin presence in Algonquin Park and the broader Kichissippi Watershed where this research takes place.

On Capitalization

In her book *Braiding Sweetgrass*, Potawatomi botanist and writer, Robin Wall Kimmerer remarks on the privilege granted to human names by the norms of capitalization, saying, “[t]his seemingly trivial grammatical rulemaking in fact expresses deeply held assumptions about human exceptionalism, that we are somehow different and indeed better than the other species who surround us. Indigenous ways of understanding recognize the personhood of all beings as equally important, not in a hierarchy or a circle.”⁶ Following in Kimmerer’s footsteps, I have elected to capitalize Pimisi to emphasize their story as the primary focus of this thesis, not secondary to human existence.

6 Robin Wall Kimmerer, “Notes,” in *Braiding Sweetgrass* (Minneapolis, Minnesota: Milkweed Editions, 2013), 385.

Pimisi: I refer to American Eel (*Anguilla rostrata*) by their Algonquin name, Pimisi (also Pimizi) in acknowledgement of their immense cultural value for the Algonquin Anishinaabeg. Conversely, the common name ‘American Eel’ ascribes Pimisi geographically to the ‘Americas,’ but lacks the specificity of place, culture, and ecology that are the focus of this research. The word ‘eel’ is used when no reference is made to a particular species.

Kichissippi: Commonly known as the Ottawa River, Kichissippi (also Kitchissippi or Kìchì Sibi) translates to the ‘Big River’ in the Algonquin language. The Kichissippi is the central artery within the Kichissippi Watershed, which connects many inland tributaries and flows into the St. Lawrence River. British and French colonial powers divided the river and drainage area between the provinces of Ontario and Québec.

more-than-human: I use more-than-human when referring to living beings and systems, avoiding other terms that are reductive and use human intelligence as a benchmark for comparison, such as ‘non-human’ and ‘it.’

Traditional Ecological Knowledge: I use Traditional Ecological Knowledge (also TEK) in reference to Indigenous knowledge systems, which inform ways of living in recognition of a complex network of human and more-than-human relationships. The Algonquins of Ontario’s documents on Pimisi referenced in this thesis use the related term, Aboriginal Traditional Knowledge (or ATK) to describe this. My references to Algonquin Traditional Ecological Knowledge related to Pimisi are not intended to dissect these lived knowledges, which I am an outsider to; rather, they serve to indicate, as Kimmerer describes, the “cultural framework[s]” “incorporat[ing] human values” that compliment Western scientific research in supporting Pimisi recovery.⁷

reconciliation: In this thesis, reconciliation is understood as a process of mending one’s relationships with Indigenous peoples as well as with the land and more-than-human beings. Pimisi recovery in Algonquin Park can be seen as a call for humans to come together in repairing ecological and cultural relationships altered through damming and the loss of watershed connectivity. This connection between recovery and reconciliation leads me to critically examine my position as a settler designer and the responsibilities for care and advocacy for another being in peril.

7 Robin Wall Kimmerer, “Weaving Traditional Ecological Knowledge into Biological Education: A Call to Action,” *BioScience* 52, no.5 (May 2002): 433–434, [https://doi.org/10.1641/0006-3568\(2002\)052\[0432:WTEKIB\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2002)052[0432:WTEKIB]2.0.CO;2).

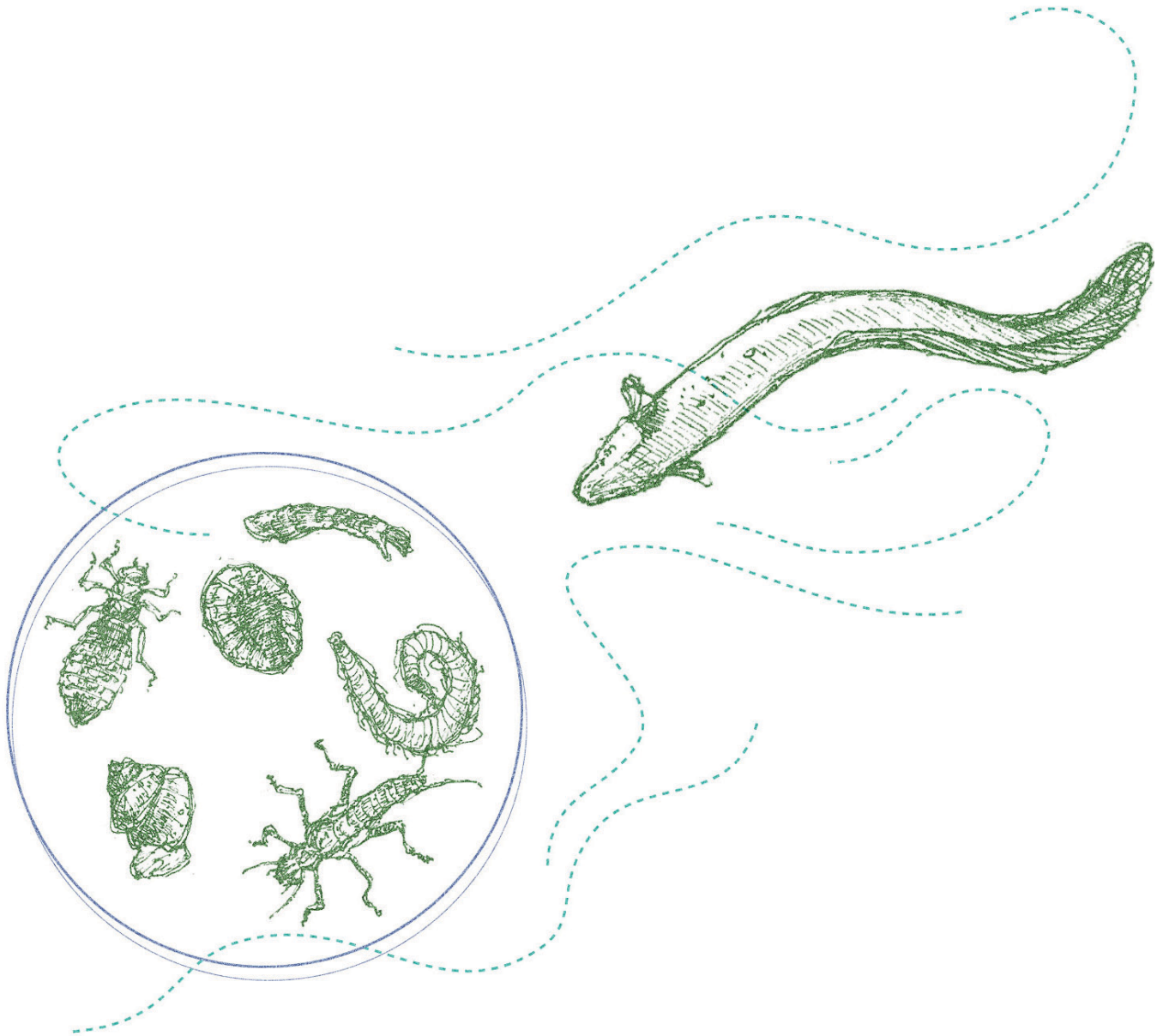


Fig. 1.1
Pimisi in their
elver stage
traverses the Gulf
of St. Lawrence,
feeding on benthic
invertebrates and
terrestrial insects
along the way.

CHAPTER I

Shared Waters

Storied by Algonquin Anishinaabeg since time immemorial, generations of Pimisi (American Eel) have made their way into the Kichissippi (Ottawa River) Watershed from the Sargasso Sea. They amassed to an unfathomable abundance and formed networks of interdependence rooted in ecological and cultural relationships. While many anthropic pressures today, including commercial fishing and climate change have contributed to their staggering 99 percent decline in the watershed, dams are largely to blame; Pimisi mortality and habitat fragmentation are the direct result of human domination through these infrastructures.¹ Concerning their plight, the late Algonquin Elder from Kitigan Zibi Anishinabeg, Grandfather William Commanda, delivered an urgent message:

I believe eel spirit is intrinsic to the sacred Seven Fire Prophecy Wampum Belt that I have carried for the people for over thirty six years. It is this prophecy that tells us that humanity is now at a cross roads, and that we need to regenerate our relationship with Mother Earth and each other.²

Commanda's message can be interpreted as a call to action for reconciliation with more-than-human beings and in the process, with our own humanity. It indicates that the loss of Pimisi is symptomatic of a larger disconnect of humans from their relations and responsibilities as caretakers. As the Kichissippi Watershed is awash with the rising tide of Pimisi endangerment, I offer a response to Commanda's message by contextualizing and speculating on design opportunities that advance recovery efforts in what is now Algonquin Provincial Park.

1 Steven M. Woods, Shannon D. Bower, and Nicholas W. R. Lapointe, "A contemporary estimate for the abundance of juvenile American Eel *Anguilla rostrata* attempting to migrate past a barrier in the Ottawa River," *River research and applications* 38, no. 10 (2022): 1689, <https://doi-org.proxy.lib.uwaterloo.ca/10.1002/rra.4034>.

2 William Commanda, *Manoshkadosh: The American Eel, A Circle of All Nations Note, Circle of All Nations*, https://www.circleofallnations.ca/http___circleofallnations_2014NEW_Welcome.html/Circle_Blog/Entries/2014/2/28_Grandfather_inspires_protection_of_the_Eel_files/AmEelManoshkadosh2007FinalWithOrigEmailandGWCLinkBiling.pdf.

Between Two Worlds

Pimisi migration is a story of relationships, developed through cyclical journeys between marine and freshwater worlds. In making this round-trip once in their lifetime, Pimisi have embraced an expansive network of relationships across multiple scales. The Sargasso Sea marks the emergence of life, as well as its terminus. After hatching, larvae called ‘leptocephali’ disperse within a territory encompassing the northern reaches of Greenland to the southern range of the Caribbean, and Central and South America [Fig. 1.2].³ A predominantly female sub-population ventures into the Kichissippi Watershed to mature and are among the most fecund (or fertile), effectively contributing to the future of the global population.⁴ The migratory nature of Pimisi has led to their vast extent of influence upon other beings, defined by multi-scalar ecological and cultural exchanges.

To go to and from the Kichissippi Watershed, Pimisi must traverse open waters and oceanic currents. Drifting leptocephali are trustingly carried by the Gulf Stream, transforming into swimming glass eels, then elvers as they arrive into the watershed.⁵ After developing into silver eels – a mark of maturity signaled by their skin turning silver – autumn beckons their return journey to their birthplace waters to breed.⁶ Humans have tried to comprehend how Pimisi are able to follow these long migration routes inland then back out to the Sargasso decades later. Scientists tracking spawning migrations allude to a navigation capability reliant on geomagnetic fields – their very own “magnetic compass.”⁷ Others observe that they swim deeper and deeper beyond the continental shelf, potentially testing the water’s salinity to support their orientation.⁸

In as much as Pimisi migration is a feat of extraordinary navigation, I imagine it as a corridor flowing with energy and matter. Algonquin Elder, William

3 José Benchetrit and James D. McCleave, “Current and historical distribution of the American eel *Anguilla rostrata* in the countries and territories of the Wider Caribbean,” *ICES Journal of Marine Science* 73, no. 1 (2016): 130, <https://doi.org/10.1093/icesjms/fsv064>.

4 R. MacGregor et al., *Recovery Strategy for the American Eel (Anguilla rostrata) in Ontario* (Peterborough, Ontario: Ontario Ministry of Natural Resources, 2013), <https://www.ontario.ca/page/american-eel-recovery-strategy>.

5 MacGregor et al., *Recovery Strategy for the American Eel*.

6 Catherine Schmitt, “American Eels on the Move in Autumn,” *Northern Woodlands*, October 18, 2021, https://northernwoodlands.org/outside_story/article/eels-autumn.

7 Mélanie Béguer-Pon et al., “Direct observations of American eels migrating across the continental shelf to the Sargasso Sea,” *Nature Communications* 6, no. 8705 (2015): 5, <https://doi.org/10.1038/ncomms9705>.

8 Béguer-Pon et al., “Direct observations of American eels migrating,” 6.

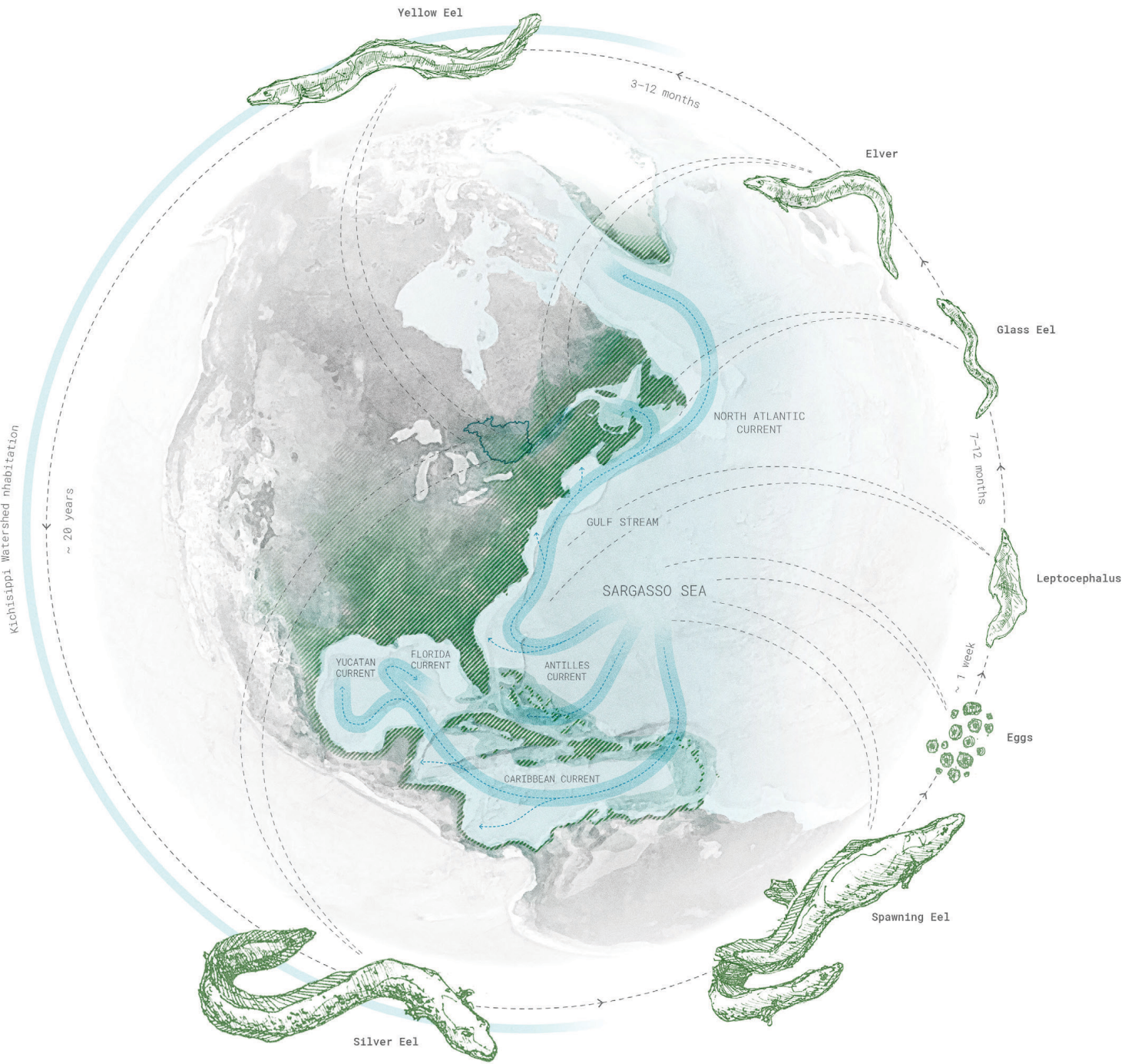
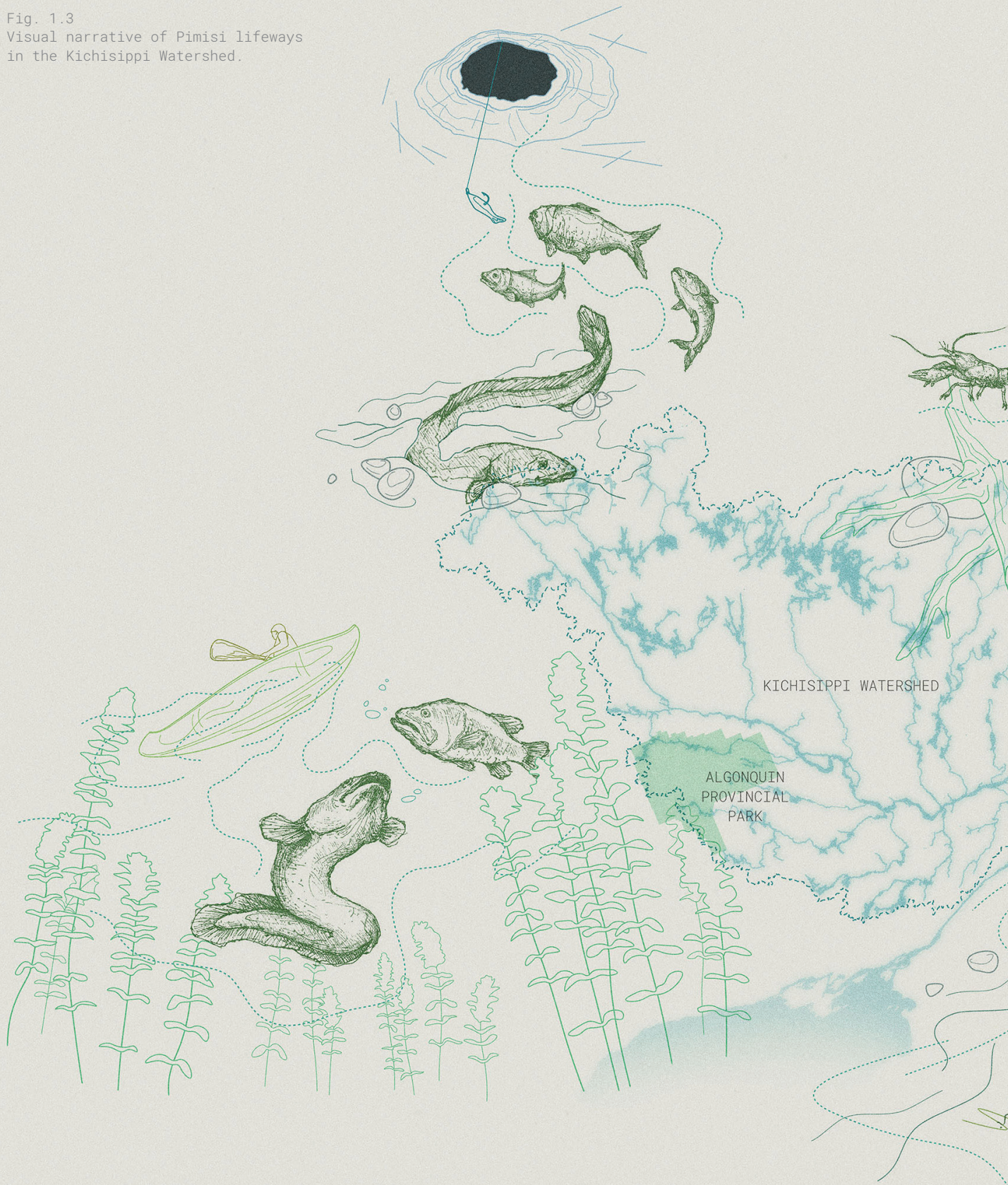


Fig. 1.2
Pimisi life cycle and
global distribution.

 inland distribution

Fig. 1.3
Visual narrative of Pimisi lifeways
in the Kichissippi Watershed.





20-YEAR
LIFE CYCLE

Upstream Feeding Migration
to the Kichissippi Watershed

Downstream Spawning Migration
to the Sargasso Sea

Commanda described Pimisi as a “cleaner and regulator of natural balances within rivers.”⁹ Commanda’s portrayal reflects how Pimisi are known to transport organic matter and nutrients between marine and freshwater worlds.¹⁰ Their bodies are effectively vessels that carry and redistribute what is in excess along their journey. Over generations, they would have ensured the stability of their homelands. Where significant numbers of Pimisi previously circulated organic carbon in Ontario, their recession has coincided with suffocating algal blooms fed by excessive nutrients.¹¹

Kichissippi Watershed ecology is vital to Pimisi maturation and “natural balances” as Commanda illustrated. These waters are known to have been swollen with large, fertile females who reside inland for upwards of twenty years [Fig. 1.3].¹² Throughout this period Pimisi burrow in the interstices of aquatic vegetation, mud, and rocks.¹³ When the need to cross between water bodies arises, they emerge, snaking their way across damp ground.¹⁴ As day turns to night, so begins their hunt for aquatic invertebrates, fish, and crustaceans – a menu that increases in size with their own growth [Fig. 1.4].¹⁵ Freshwater habitat diversity is thought to have contributed to their resilience and former role as a vigorous aquatic predator.¹⁶ Their dominance in these ecosystems has now been replaced by a proliferation of invasive fish, such as Round Goby and Rock Bass.¹⁷ The disappearance of Pimisi impacts watershed health, which both shapes and is shaped by their lifeways.

This ecological network is not without cultural relationships grounded in sharing waters with Indigenous peoples. While *Pimisi* is a name bestowed on the eels by the Algonquin people in the Kichissippi Watershed, the Mi’kmaq know them as *K’at* (or *G’at*), and the Seneca as *Goda:noh*.¹⁸ Mi’kmaq relations with *K’at* that continue in contemporary fishing are also embodied in the phrase, “*ga’tewe’g’tieg, ga’tewe’g’tieg,*” meaning “we go hunting for

9 Commanda, *Manoshkadosh: The American Eel*.

10 MacGregor et al., *Recovery Strategy for the American Eel*.

11 MacGregor et al., *Recovery Strategy for the American Eel*.

12 COSEWIC, *COSEWIC Assessment and Status Report on the American Eel *Anguilla rostrata* in Canada* (Ottawa: Committee on the Status of Endangered Wildlife in Canada, 2012), https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/american-eel-2012.html#_docInfo.

13 MacGregor et al., *Recovery Strategy for the American Eel*.

14 MacGregor et al., *Recovery Strategy for the American Eel*.

15 MacGregor et al., *Recovery Strategy for the American Eel*.

16 MacGregor et al., *Recovery Strategy for the American Eel*.

17 MacGregor et al., *Recovery Strategy for the American Eel*.

18 COSEWIC, *COSEWIC Assessment and Status Report on the American Eel*.

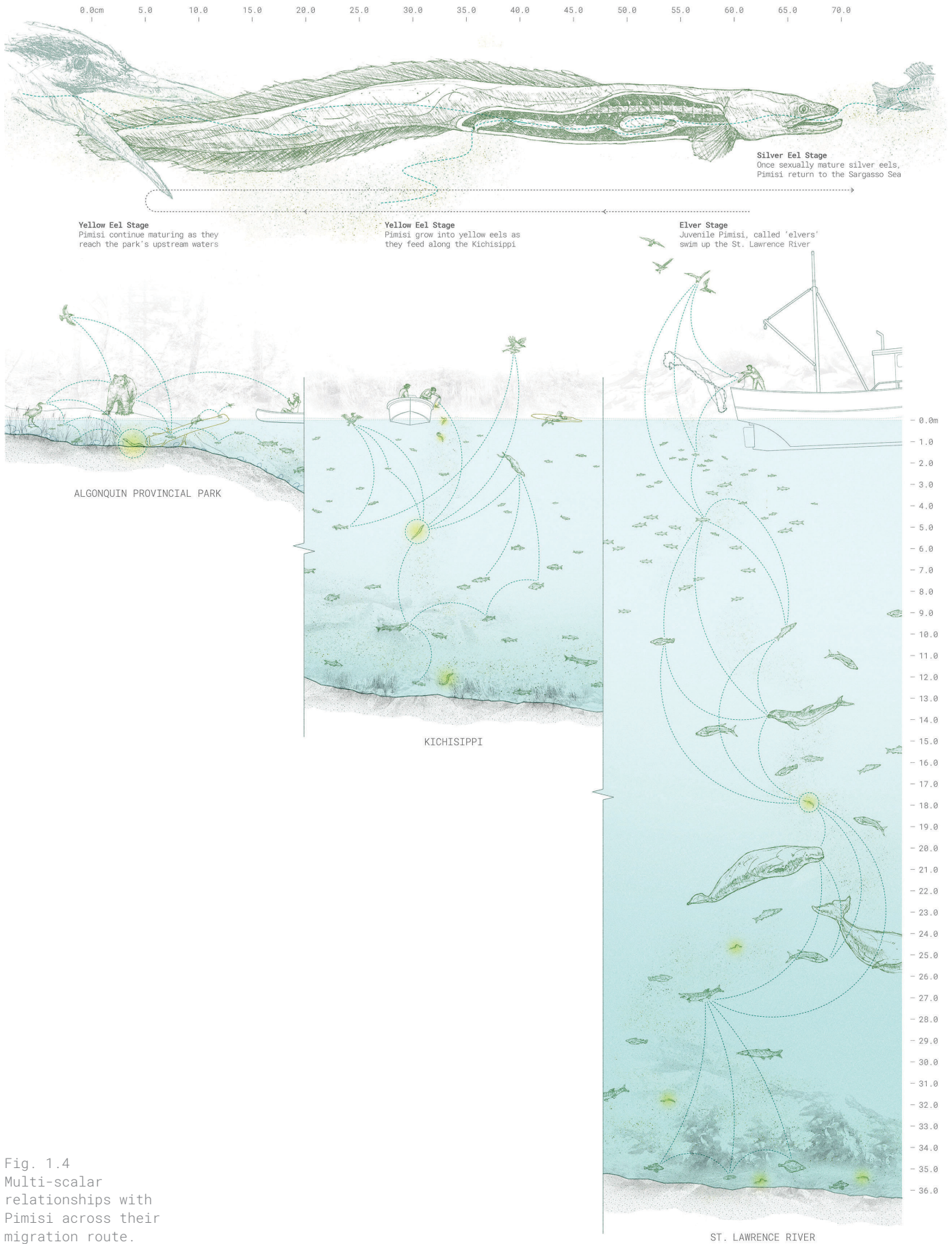


Fig. 1.4
Multi-scalar
relationships with
Pimisi across their
migration route.

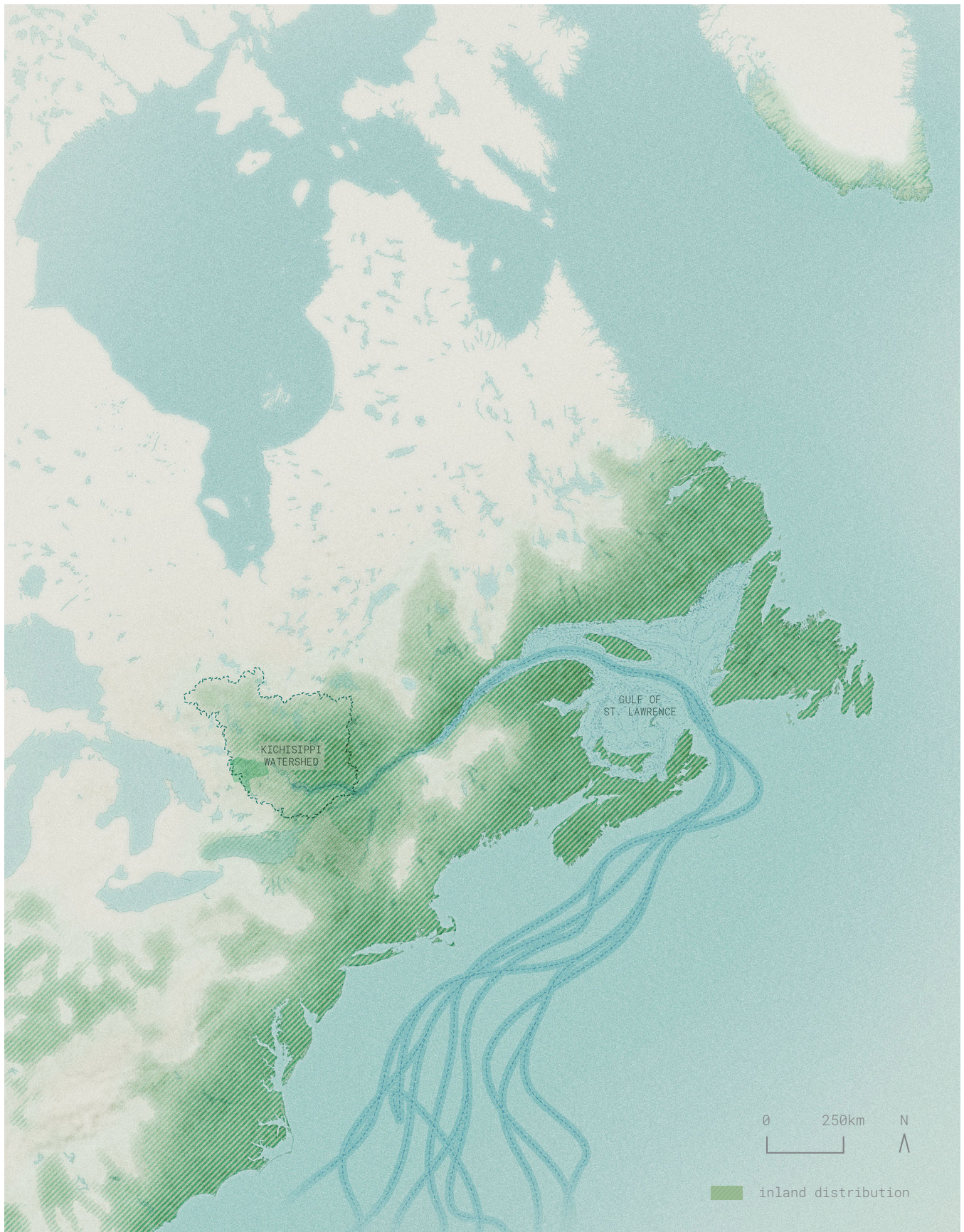


Fig. 1.5
Pimisi inland
distribution across
the Atlantic Coast.

eels.”¹⁹ Stories like Haudenosaunee retellings of the naming of the eel clan in ‘Deganawidah’ (or “The Great Peacemaker”) highlights a connection to community structures.²⁰ These varied appreciations place Pimisi in a network of intimate knowing extending well past the Kichissippi Watershed. Their influence on Indigenous peoples across their range contextualizes the cultural dimension at stake with their decline.

As I unravel Pimisi’s life cycle journey, I see tangled before me lines of interdependence that link them to places, people, and stories. Pimisi interactions with other beings between marine and freshwater worlds are integral to their lifeways. And yet, those very exchanges contribute to the health of the waters that they call home. Their complex relation to natural processes, more-than-human beings, and Indigenous peoples indicates the ecological and cultural balances that result from their migratory nature. Algal blooms, invasive aquatic species, and impacts to cultural connections lie in the wake of their decline. In this light, Pimisi endangerment destabilizes multiple scales of their habitat range, from the global network of relationships down to individual ecosystems and communities.

19 Cecilia Engler-Palma et al., “Sustaining American Eels: A Slippery Species for Science and Governance,” *Journal of International Wildlife Law and Policy* 16, no. 2-3 (2013): 131, <https://doi.org/10.1080/13880292.2013.805060>.

20 Engler-Palma et al., “Sustaining American Eels,” 133.

Pimisi and the Algonquin Anishinaabeg

During his lifetime of advocacy for the plight of Pimisi, Elder William Commanda recounted ancestral stories of their importance in the Kichissippi Watershed for the Algonquin Anishinaabeg. In his talk, *Manoshkadosh: The American Eel*, he presented vivid imagery of a time when “great silver pathways” were carved by silver eels swimming in the Kichissippi.²¹ This time of abundance as Commanda described is long gone, as Pimisi have plummeted to less than one percent of their historical population in the watershed.²² For the Algonquin people who have long shared these waters with Pimisi, the endangerment of this sacred relation threatens watershed health, biodiversity, and their lifeways.

Algonquin Traditional Ecological Knowledge, as an evolving way of knowing, recognizes Pimisi as multivalent and valued beings. For the Algonquins of Ontario (AOO), initiatives to gather Traditional Ecological Knowledge have been part of their recovery advocacy, resulting in the creation a set of documents titled, *Returning Kichissippi Pimisi, The American Eel, to the Ottawa River Basin* [Fig. 1.8]. They compile the experiences of Knowledge Keepers, whose intergenerational and personal encounters story Pimisi as nutritious and healing, as well as sacred beings. As I have learned from the accounts of Commanda and the AOO, Traditional Ecological Knowledge is integral to guiding Pimisi recovery alongside Western scientific research.

Like Pimisi, Algonquin Anishinaabe lifeways are based around the Kichissippi Watershed – waters that have been shared since time immemorial [Fig. 1.6]. In her essay on Algonquin heritage, Madaoueskarini Algonquin Christine Luckasavitch notes that the Algonquins are “the people of the rivers” and the Kichissippi (Ottawa River) is “our lifeblood, our main artery.”²³ Luckasavitch describes how tributary rivers outline traditional band territories, as with the Madaoueskarini who call the Madawaska River Watershed home.²⁴ Reflecting on Luckasavitch’s understanding, it is possible to grasp Pimisi ties to the larger Kichissippi Watershed in a similar way. The watershed is effectively a living body that defines ‘home’ for many beings and connects them through a vascular network.

21 Commanda, *Manoshkadosh: The American Eel*.

22 Brian Banks, “The Charismatic Eel,” Brian Banks. Last modified March 15, 2018, <https://brian.eco/the-charismatic-eel/>.

23 Christine Luckasavitch, “A brief history of the Madaoueskarini Algonquin People,” *Algonquin Life Magazine*, June 6, 2019, https://www.muskokaregion.com/life/a-brief-history-of-the-madaoueskarini-algonquin-people/article_3efeb715-ed51-563a-ab1a-6b06e9efedb3.html?

24 Luckasavitch, “A brief history of the Madaoueskarini Algonquin People.”

Though the heart of Algonquin Traditional Territory, the watershed has also been shared by other Anishinaabe,²⁵ Cree, Huron-Wendat, and Haudenosaunee neighbours. Michi Saagiig Nishnaabeg scholar, Leanne Betasamosake Simpson describes how in Indigenous contexts, relations between nations, even through conflict, are held by diplomatic traditions that recognize each nation's sovereignty, entwined spiritual and political systems, and responsibilities towards the land.²⁶ This understanding of territory and governance differs from colonial ideas of property that were later imposed on the watershed.

Relationships between the Algonquin people and Pimisi have long been maintained through harvest. The AOO's documents share that traditionally Pimisi were so abundant that it was possible to "spear over 1,000 eels in a night" from the vantage point of a birch bark canoe.²⁷ One of the Knowledge Keepers interviewed, Pikwàkanagàn First Nation Elder, Hector Vincent Amikons recalls his use of three-pronged spears fashioned from spruce or balsam wood with steel barbs to harvest Pimisi.²⁸ In addition to this harvesting method, archeologist William Allen observes indications of stone fishing weirs at the Rapides des Allumettes near sites along the Kichissippi where Pimisi bones had been unearthed [Fig. 1.7].²⁹

In contemporary accounts, however, there is a shared understanding of the scarcity of harvesting Pimisi in the Kichissippi Watershed. This is a stark contrast from their relationship with the Algonquins as a dependable food, medicine, and practical use material. Smoking harvested Pimisi produced a valuable source of nutrition that could be stored and eaten during the wintertime and long voyages.³⁰ Reinforcing their use as a travel food, Allen refers to archeological findings of Pimisi bones great distances away from

25 Algonquin, Nipissing, Ojibwe, Oji-Cree, Odawa, Potawatomi, and Mississauga people are Anishinaabeg. Their collective territories make up Anishinaabewaki.

26 Leanne Betasamosake Simpson, "Politics based on justice, diplomacy based on love," *Briarpatch*, May 1, 2013, <https://briarpatchmagazine.com/articles/view/politics-based-on-justice-diplomacy-based-on-love>.

27 *Returning Kichissippi Pimisi, the American Eel, to the Ottawa River Basin: Bridging the Gap Between Scientific and Aboriginal Traditional Knowledge* (Algonquins of Ontario, Traditional Knowledge Report: Volume 1, 2014): 2, <https://www.tanakiwin.com/current-initiatives/returning-kichissippi-pimisi-the-american-eel-to-the-ottawa-river/>; *Returning Kichissippi Pimisi, the American Eel, to the Ottawa River Basin: Bridging the Gap Between Scientific and Aboriginal Traditional Knowledge* (Algonquins of Ontario, Traditional Knowledge Report: Volume 2, 2014): 22-23, <https://www.tanakiwin.com/current-initiatives/returning-kichissippi-pimisi-the-american-eel-to-the-ottawa-river/>.

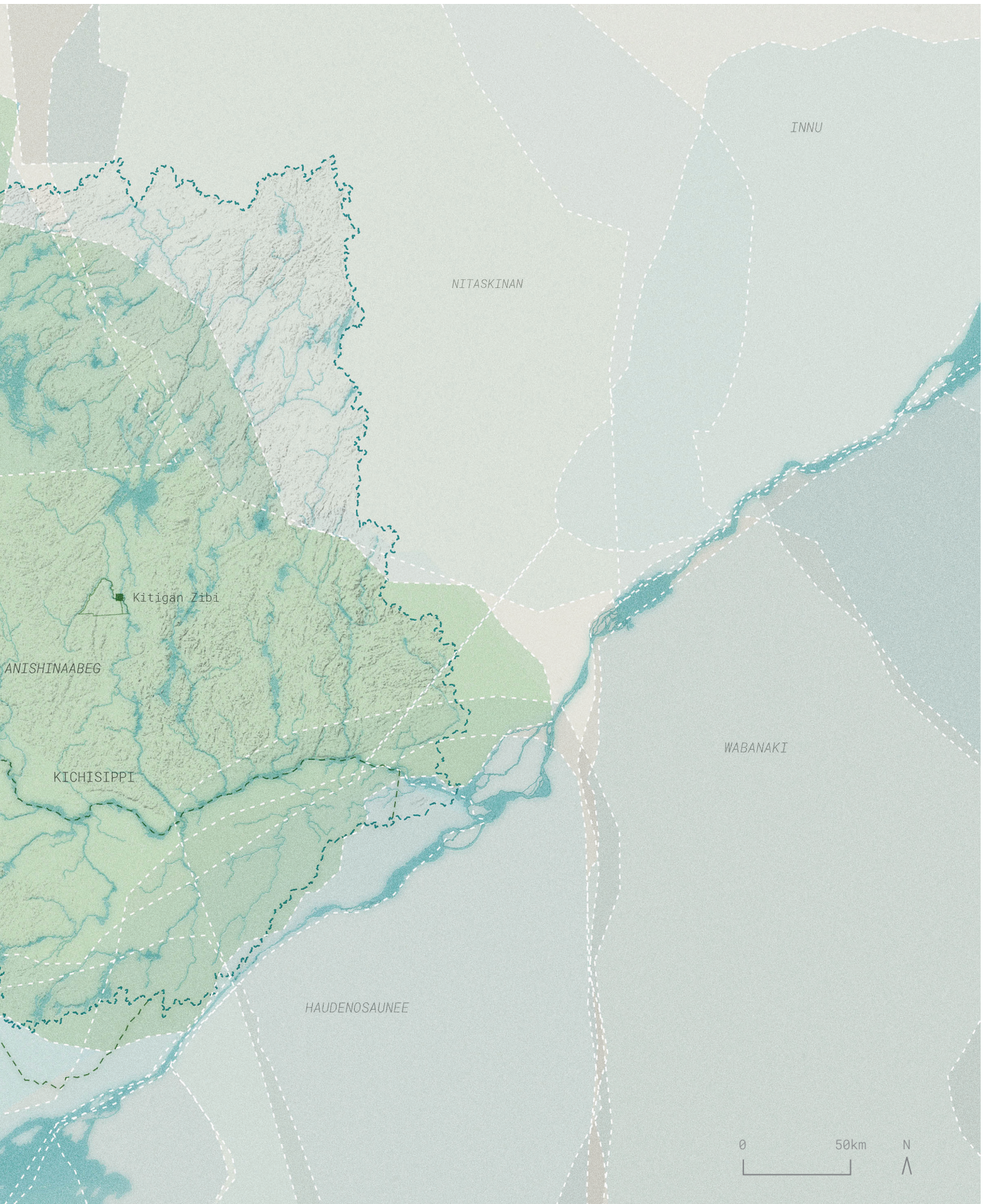
28 *Returning Kichissippi Pimisi* (Volume 1), 6.

29 William A. Allen, "Archeology Comes to the Rescue of Species at Risk," *Arch Notes* 15, no.6 (November/December 2010): 11, <https://ontarioarchaeology.wildapricot.org/Resources/ArchNotes/anns15-6.pdf>.

30 *Returning Kichissippi Pimisi* (Volume 2), 21.

Fig. 1.6
 Indigenous territories overlaid upon
 the Kichissippi Watershed. The watershed
 is the heart of Algonquin Traditional
 Territory.





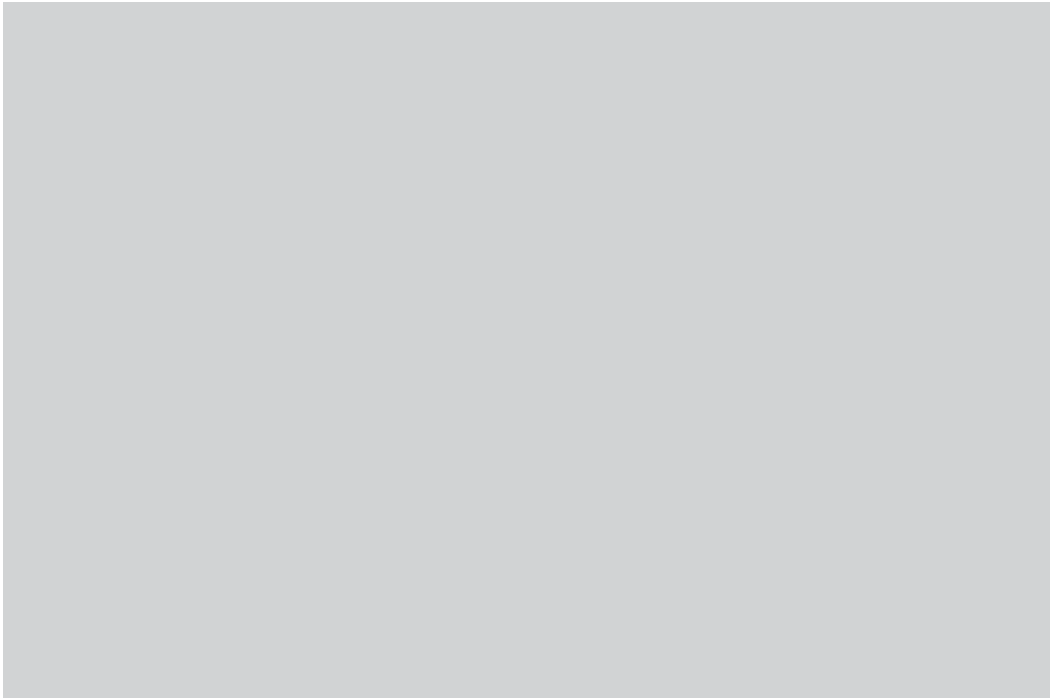


Fig. 1.7
Removed due to copyright restrictions. It was a photograph of archeologist William Allen standing by potential stone fishing weir remains along the Kichissippi.

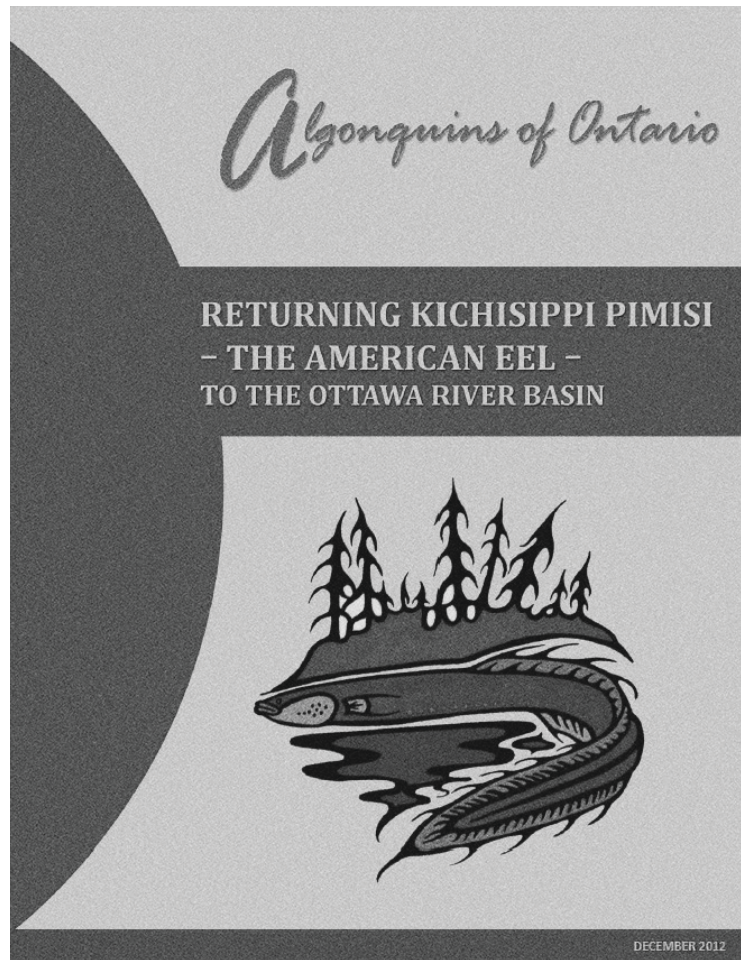


Fig. 1.8
Cover page of *Returning Kichissippi Pimisi - Traditional Ecological Knowledge* documents by the Algonquins of Ontario, featuring a depiction of Pimisi by Tony Amikons (Algonquins of Pikwàkanagàn First Nation).

water bodies.³¹ Other uses of Pimisi concern their healing properties. Chief Doreen Davis of Shabot Obaadjiwan First Nation describes knowledge that was passed down to her on the tightening of eel skin to brace injuries.³² The decline of Pimisi for the AOO threatens the disappearance of this wealth of uses and embodied skills.

In addition to being important to Algonquin sustenance and health, there is a spiritual reverence held for Pimisi. Their abundance led them to be regarded as “gifts of Mantiou,” the Anishinaabe “Good Spirit.”³³ According to the AOO, annual ceremonies were held to give thanks and honour Pimisi.³⁴ The AOO have attributed their significance to their behaviour as “a prayer-carrier of the waters because it travels farthest, through salt and fresh waters, and can travel in wetlands according to Aboriginal Traditional Knowledge (ATK).”³⁵ Adding to this sense of relationality, the AOO explain that Algonquin people identify with Pimisi’s characteristics of resilience and adaptability.³⁶

Recognizing the rich meaning of Pimisi, their imperiled status in the Kichissippi Watershed has reverberated in the ecology and culture of the Algonquin people. While Pimisi stories link Algonquins to their ancestral practices, Christine Luckasavitch’s perspective indicates that their endangerment has disrupted this connection. Luckasavitch observes that the direct impacts have fallen on youth, who are no longer growing up with those encounters.³⁷ What I understand from this is that endangerment is twofold: Pimisi populations are declining and because of this, related Traditional Ecological Knowledge is at risk of not being practiced by future generations. Decline goes beyond environmental disruptions to affect the ecological and cultural spheres of Algonquin communities.

31 Allen, “Archeology Comes to the Rescue,” 11.

32 *Returning Kichissippi Pimisi* (Volume 2), 8–9.

33 Rob MacGregor et al., “Natural Heritage, Anthropogenic Impacts, and Biopolitical Issues Related to the Status and Sustainable Management of American Eel: A Retrospective Analysis and Management Perspective at the Population Level,” *American Fisheries Society Symposium* 69, (2009): 716.

34 *Returning Kichissippi Pimisi* (Volume 2), 25.

35 *Returning Kichissippi Pimisi, the American Eel, to the Ottawa River Basin: Bridging the Gap Between Scientific and Aboriginal Traditional Knowledge* (Algonquins of Ontario, 2012): 1, <https://www.tanakiwin.com/current-initiatives/returning-kichissippi-pimisi-the-american-eel-to-the-ottawa-river/>.

36 *Returning Kichissippi Pimisi*, 1.

37 Christine Luckasavitch, “Kichissippi Pimisi: Restoration of endangered eel species ‘vital’ to the Algonquin People,” *Algonquin Life Magazine*, July 26, 2022, https://www.muskokaregion.com/life/kichissippi-pimisi-restoration-of-endangered-eel-species-vital-to-the-algonquin-people/article_185978f5-98e6-5391-8953-8b987b52107d.html.

Managing a Slippery Decline

Given the importance of Pimisi to the Algonquin Anishinaabeg, their voices are at the forefront of recovery advocacy in the Kichissippi Watershed. Together with conservation groups, they have been involved in efforts to raise awareness, policymaking, and action. While a pressing issue for those closely associated with recovery, Pimisi decline suffers from a lagging implementation of long-term strategies and remains unseen by many settler Canadians who inhabit the watershed. Rob MacGregor et al. posit that this reflects an “invisible collapse,” whereby their reduced physical presence has rendered them “invisible in scientific literature, public perception and management action.”³⁸ Despite Pimisi’s vast relational network, their catastrophic demise has escaped attention, particularly for people without ties to Indigenous or scientific communities.

Pimisi’s story is an elusive one. They occupy the depths of water bodies, physically concealed from the human gaze. Many people are simply unaware of their existence, let alone plight. A 2018 study by M. Aline Litt et al. found that among recreational anglers who fish in the Kichissippi there was misinformation, indifference, and even negative reactions towards Pimisi.³⁹ This lack of human awareness resonates with my own initial surprise upon discovering that Pimisi is no stranger to the waters that flow in and around my home in Ottawa.

The *invisibilization* of Pimisi began with their dismissal as unintended casualties in the settler colonial development of the Kichissippi Watershed. Recovery advocates identify watershed fragmentation and Pimisi mortality due to dams is chiefly to blame for their decline; restoring aquatic connectivity at these barriers is considered a top priority.⁴⁰ Dams are a clear example of anthropocentrism, privileging human use of water over connected habitats for other beings.

Yet, without human interference, Pimisi would not be able to bypass those artificial barriers. Regular human-assisted migration efforts by Algonquin Anishinaabeg and conservation groups, the Canadian Wildlife Federation

38 Rob MacGregor et al., “Declines of American Eel in North America: Complexities Associated with Bi-national Management,” *American Fisheries Society Symposium* 62, (2008): 17.

39 M. Aline Litt et al., “Angler interactions with American eel (*Anguilla Rostrata*): Exploring perspectives and behaviors toward an imperiled fish,” *Fisheries Research* 234 (2021): 6, <https://doi.org/10.1016/j.fishres.2020.105781>.

40 MacGregor et al., “Natural Heritage,” 725.

Fig. 1.9
Pimisi being
measured before
their release into
the Kichissippi near
Petrie Island by
Ottawa Riverkeeper.
Photograph by Martin
Lipman, Ottawa
Riverkeeper, 2017.



Fig. 1.10
Pimisi ascend an eel
ladder installed at
the Moses-Saunders
Power Dam along the
St. Lawrence River.
Photograph by New
York Power Authority.

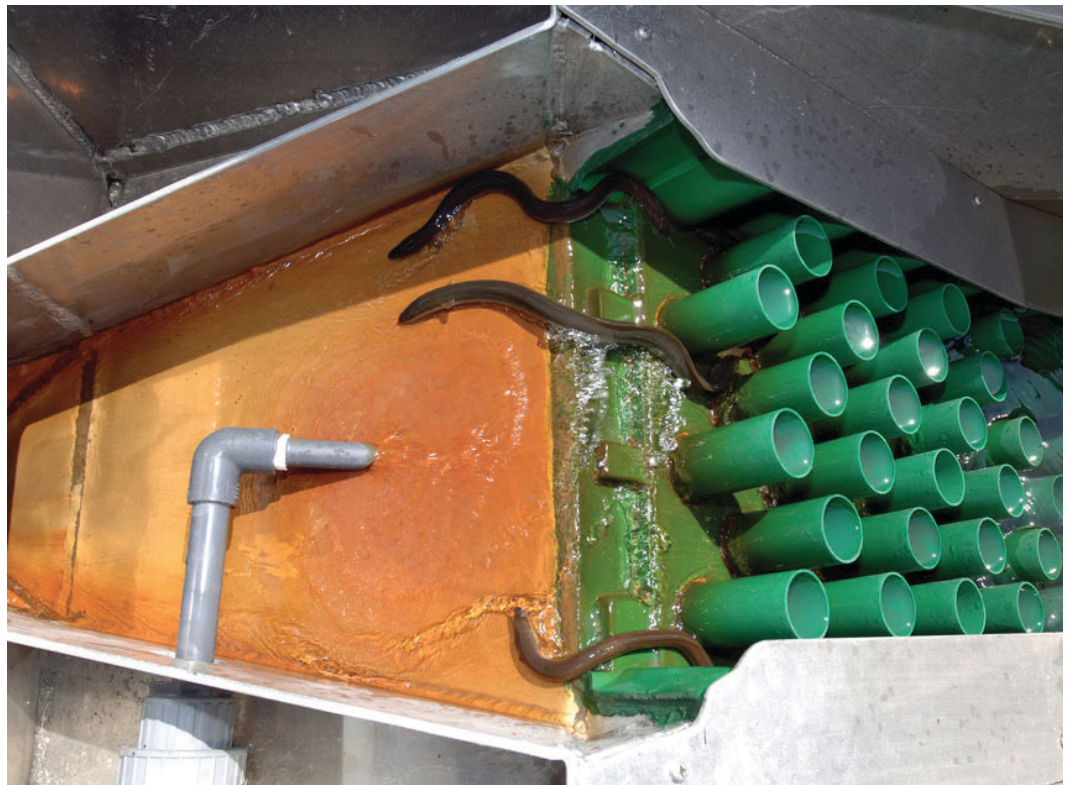
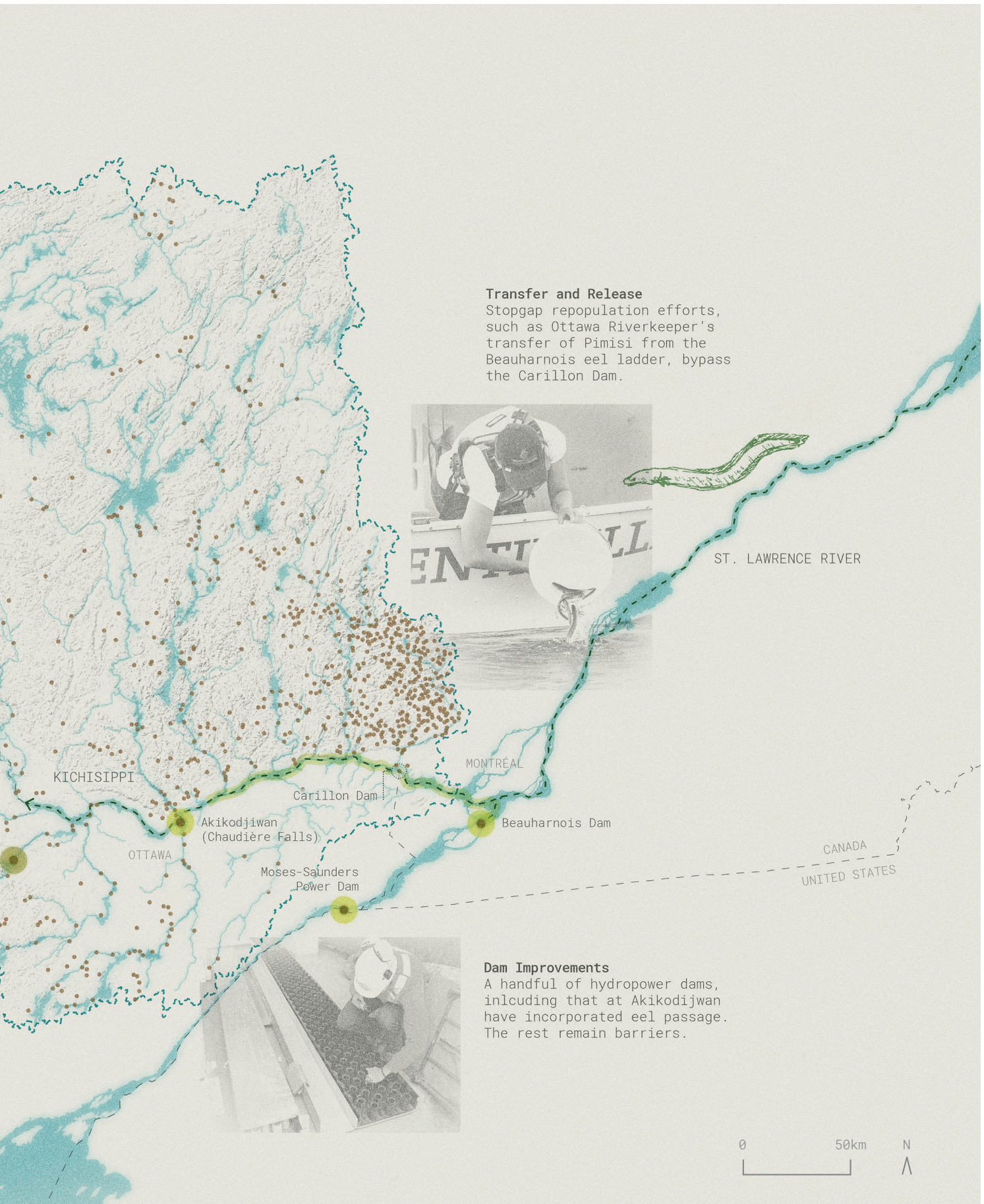


Fig. 1.11
Current short- and long-term recovery efforts in the Kichissippi Watershed.





Transfer and Release

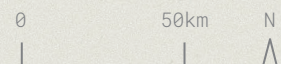
Stopgap repopulation efforts, such as Ottawa Riverkeeper's transfer of Pimisi from the Beauharnois eel ladder, bypass the Carillon Dam.



ST. LAWRENCE RIVER

Dam Improvements

A handful of hydropower dams, including that at Akikodjwan have incorporated eel passage. The rest remain barriers.



and Ottawa Riverkeeper have transferred hundreds of juvenile Pimisi from eel ladders at hydropower dams along the St. Lawrence River to repopulate the Kichissippi. A 2017 event organized by Ottawa Riverkeeper saw 400 Pimisi tagged for monitoring and released upstream near Petrie Island, sparing them from the deadly Carillion Dam impasse [Fig. 1.9].⁴¹ These actions, however, are limited in scope and capacity. Generating Station #5 at Akikodjiwan (Chaudière Falls) and Calabogie Generating Station on the Madawaska River are currently the only dams with eel passage interventions in the entire watershed, though the latter is not yet operational [Fig. 1.11].⁴² This “invisible collapse” will persist without similar provisions of long-term access at other dams in the watershed.

Coupled with the lack of intervention by dam owners, there has been insufficient government protection and enforcement.⁴³ Pimisi are on the “Endangered Species List” in Ontario; the publication of the *American Eel Recovery Strategy* in 2013, jointly authored by Indigenous and settler advisors provides recommendations to address endangerment. However, a follow up “Government Response Statement” detailing the actions that Ontario will be accountable for is nearly a decade overdue. More importantly, there is no listing beyond this jurisdiction that covers the entire watershed, including both sides of the Kichissippi, as well as the rest of Pimisi’s range in Canada. Pimisi are recognized as “Threatened” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but a similar case of inaction by the Canadian government has meant that they are yet to be listed under the *Species at Risk Act*, which would ensure a larger scope of federal protections.⁴⁴ In the current landscape of recovery, continued activism is needed to push those in power towards urgency.

Advocacy efforts today highlight the necessity of Indigenous involvement and settler allyship in Pimisi recovery. Algonquin Elder and Executive

41 “Ottawa Riverkeeper releases 400 American Eels into the Ottawa River as part of broader efforts to recover the species,” Ottawa Riverkeeper, last modified July 13, 2017, <https://ottawariverkeeper.ca/ottawa-riverkeeper-releases-400-american-eels-into-the-ottawa-river-as-part-of-broader-efforts-to-recover-the-species-2/#:~:text=The%20eel%20release%20was%20part,km%20of%20their%20historic%20range>.

42 Refer to the note on page 19 regarding the status of eel passage at Calabogie G.S.

43 Algera et al. provide further discussion on the shortcomings of the proponent-driven mitigation of Pimisi decline, which affect government and industry action in Ontario. See Dirk A. Algera et al., “Assessing a proponent-driven process for endangered species threat mitigation: Ontario’s *Endangered Species Act*, American eel, and hydropower,” *Facets* 7 (February 2022): 166–168, <https://doi.org/10.1139/facets-2021-0058>.

44 Banks, “The Charismatic Eel.”

Director of Plenty Canada,⁴⁵ Elder Larry McDermott, uses the phrase, “a shared responsibility and a shared response,” which he explains is an Anishinaabe guiding principle to grappling with biodiversity crises.⁴⁶ Christine Luckasavitch provides additional thoughts on sharing the watershed with Pimisi, saying, “[t]aking steps toward reconciliation with Indigenous peoples also means extending respect and support to other-than-human-beings – fish, rocks, trees, water and all others – who also call this place home.”⁴⁷ Moved by a cultural imperative, McDermott and Luckasavitch’s perspectives suggest that recovery is more than achieving a conservation target. It is about bridging of ways of knowing and care across species.

So, what does it mean to share waters with Pimisi as human allies for their recovery? To accept our responsibilities and act on them? To face the damages of settler colonialism by repairing our relationships with more-than-human beings in peril? I have observed that the current collaborative approach to Pimisi recovery is an invitation for all knowledge systems to work together. Advancing, and thus, expanding the scope of recovery asks for additional allyship, participation and implementation. It could mean drawing new lines of interdependence in considering the sites and people who might share in these responsibilities.

45 Plenty Canada is an organization offering environmental stewardship support led by Indigenous worldviews. See “About,” Plenty Canada, accessed March 8, 2023, <https://www.plentycanada.com/about-us.html>.

46 Larry McDermott, “Larry McDermott of Plenty Canada on Rights and Responsibilities,” interview by Lawrence Gunther, *The Blue Fish Radio Show*, January 2017, audio, 24:29, <https://www.spreaker.com/episode/larry-mcdermott-of-plenty-canada-on-rights-and-responsibilities--10333156>.

47 Luckasavitch, “Kichissippi Pimisi.”

Recovery in Algonquin Provincial Park

Alongside the ongoing cooperation between organizations to restore connectivity throughout the Kichissippi, recovery advocates have begun to identify Algonquin Provincial Park as a future site to extend their efforts. The park's boundaries are situated upon a rich, post-glacial aquatic landscape – most of which lies within the Kichissippi Watershed. Historical records indicate that these sub-watersheds formerly hosted maturing Pimisi.⁴⁸ They have also borne witness to human disruption through over a century of damming. Acknowledging this potential trajectory for recovery, this thesis looks to support Pimisi's return to the tributaries they historically inhabited in the park – an expansion of recovery efforts beyond the Kichissippi's hydropower dams.

Human encounters with Pimisi over the park's history have been documented in what limited records I could find. The last reported sighting occurred in 1993 when N. E. Jones, the Field and Wildlife Technologist at the time spotted them at Hogan Lake along the Petawawa River.⁴⁹ Reporting on Pimisi since then mentions that they are “no longer detected within the park boundary.”⁵⁰ This can be linked to habitat loss resulting from dams, as observed by AOO Knowledge Keeper, Beatrice Dumas who says, “on account of the dams, eels don't come up the Madawaska River anymore.”⁵¹

Though Pimisi have been long gone from these watersheds, there are renewed hopes for their return. During the summer of 2023, I was invited to attend a set of fisheries management planning discussions at the park, preceding the development of an updated “Fisheries and Aquatic Ecosystem Management Plan.” Representatives from the AOO, the Métis Nation of Ontario, conservation scientists, recreational groups, cottagers, and other local stakeholders weighed in on topics including Pimisi recovery and connectivity for species at risk at park dams. The willingness to introduce

48 MacGregor et al., *Recovery Strategy for the American Eel*.

49 N. E. Jones to Norm Quinn, “Report on American Eels in Hogan Lake,” July 18, 1993, letter, Ontario Ministry of Environment, Conservation and Parks.

50 Ridgway et al. provide the status and distribution of Pimisi in Algonquin Park based on historical data. M. Ridgway, T. Middel, and A. Bell, *Aquatic ecology, history, and diversity of Algonquin Provincial Park* (Peterborough, Ontario: Ontario Ministry of Natural Resources and Forestry, Science and Research Information Report IR-10, 2017), 101, <https://www.harkness.ca/publications/algonquin-aquatic-ecology/>. For documentation of localized Pimisi extirpations, see also, Nicholas E. Mandrak and E. J. Crossman, *Fishes of Algonquin Provincial Park* (The Friends of Algonquin Park, 2003), 7.

51 *Returning Kichissippi Pimisi* (Volume 1), 8.

Fig. 1.12
Visitor Florence
Miller holding
mature Pimisi in
the park's Galeairy
Lake, c.1930.
Photograph from the
Algonquin Provincial
Park Archives &
Collections.



Fig. 1.13
Upstream view of
the Cache Lake
dam, August 2023.
Non-powered dams
like this control
tributaries of the
Kichissippi that flow
through the park.



Pimisi as a topic of discussion tells me that the park is acknowledging their ties to this landscape and could participate in future recovery efforts.

Returning Pimisi into Algonquin Park is an opportunity to study how the park's non-powered dams, which too act as barriers, are negotiated to restore connectivity [Fig. 1.13]. Fifteen dams fragment the network of Kichissippi tributaries caught within the park boundary. From my understanding, the conditions and operations of park dams differ from the hydro facilities on the Kichissippi, as they are generally smaller in scale, have less water storage capacity, and are disassociated from energy stakeholders. As such, how might these infrastructures be reconsidered to facilitate Pimisi migrations?

In addition to reconciling the impact of dams, I would argue that recovery efforts would necessitate consideration for Pimisi's relationships with other beings. As they have been absent from the park for at least several decades, how might their reintroduction affect these ecosystems? Additionally, how might this process involve the diverse human community within the park, including Algonquins and other Indigenous peoples, tourists, researchers, and management staff? Recalling the study by Litt et al., the authors posit that if well informed, anglers could be important agents in recovery due to their direct and widespread influence on the watershed.⁵² In an effort to advance awareness and recovery advocacy, this observation could be aptly applied to the park's human community. Accompanying the restoration of safe access at dams there could be a *re-storying*, in other words, reorientation of human experiences in the park towards Pimisi. This could catalyze their shift from a predominantly transient consumer population to one that is informed and capable of being an agent of change outside their visit.

At the "cross roads" that Pimisi endangerment has led me to, I see the potential for Algonquin Park to be incorporated into long-term recovery efforts as significant. Learning from Algonquin advocates and scientific studies, positioning the park as a locus for facilitating connectivity and care could serve to not only return Pimisi at scale, but their ecological and cultural relationships as well. These implications provide a lens to view the design exploration of recovery interventions to come as a relational story weaving dams, beings, and park into an existing multi-scalar network.

52 Litt et al., "Angler interactions with American eel," 6.

Fig. 1.14 [right]
Wetlands formed on
the floodplain of
the Madawaska River
in Algonquin Park,
August 2023.



Fig. 1.15 [below]
Pimisi in a
holding tank at
the same transfer
and release event
shown earlier that
was organized by
Ottawa Riverkeeper.
Photograph by Martin
Lipman, Ottawa
Riverkeeper, 2017.



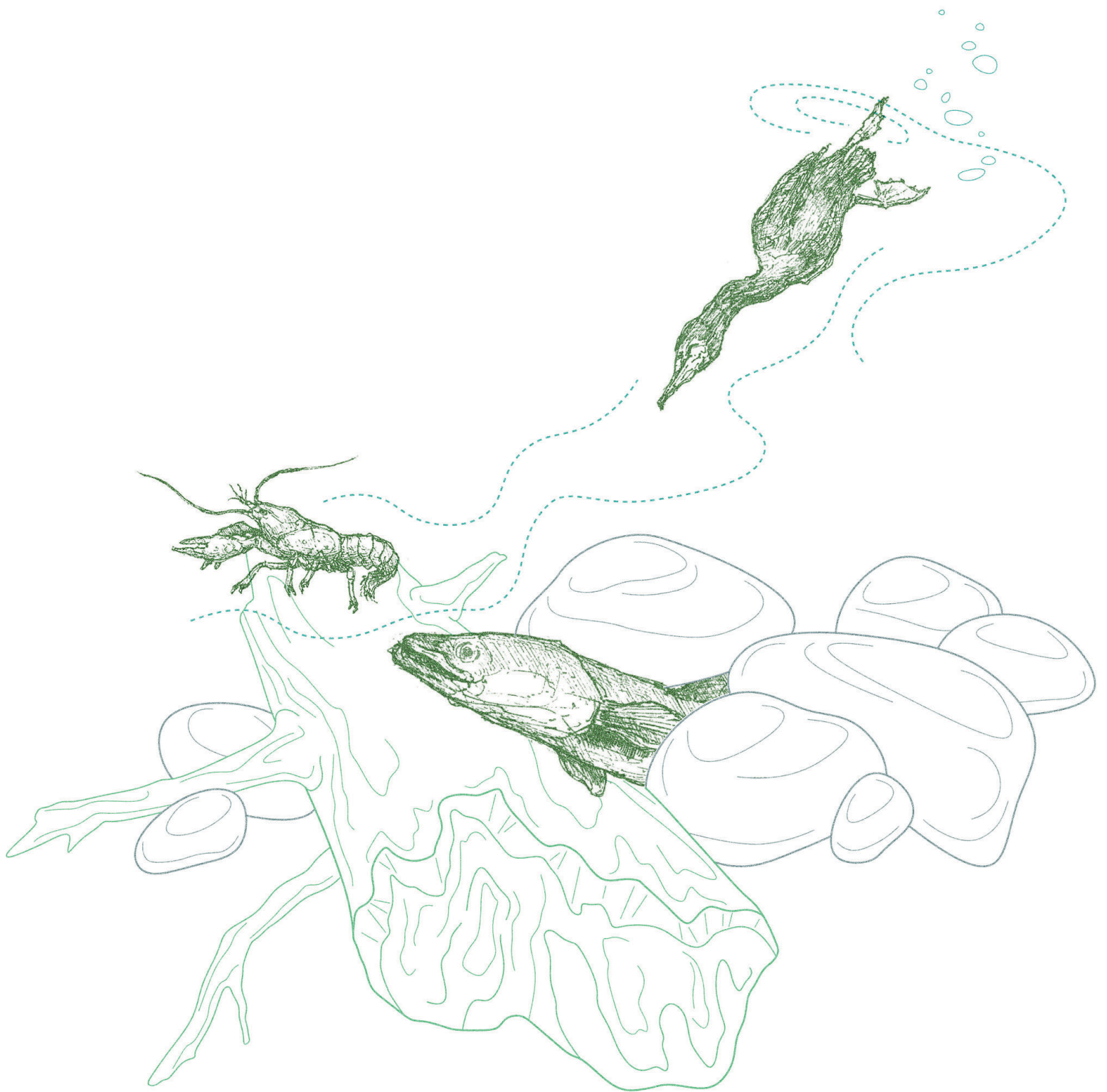


Fig. 2.1
Pimisi in their
yellow eel stage
relies on overgrown
embankments, rocks
and debris for shelter.

CHAPTER II

Barriers to Lifeways

Lakes and rivers and the trajectory of their use reveal the tensions between humans and more-than-humans in Algonquin Provincial Park. Water has shaped this landscape for millennia, originating as expansive glacial lakes formed by the melting Laurentide Ice Sheet.¹ Watersheds were later defined, producing migration routes for Pimisi connected to the Kichissippi coursing through the Kipawa, Dumoine, Petawawa, Bonnechere and Madawaska drainage systems. From the 19th century onwards, these waters have been harnessed and regulated by settlers for logging, recreation, and hydropower. While the motivations behind damming in the park have shifted, their operations and ecological and cultural impacts persist – maintained by repeated repairs and reconstructions.

This chapter reflects upon my experiences as a visitor to Algonquin Park over two summers. Through recollections and mapping, I attempt to make the impacts of park dams on Pimisi legible, leading to a discussion on human and more-than-human relationships in the park. The regime of water control imposes physical barriers to Pimisi migration, which I argue can be linked to the establishment of ‘wilderness’ and dual colonization of land and people. These ideological underpinnings have constructed a landscape of conflicting narratives. Coming to terms with them is critical for understanding the potential impacts of Pimisi recovery on the park.

1 M. Ridgway, T. Middel, and A. Bell, *Aquatic ecology, history, and diversity of Algonquin Provincial Park* (Peterborough, Ontario: Ontario Ministry of Natural Resources and Forestry, Science and Research Information Report IR-10, 2017), 4-6, <https://www.harkness.ca/publications/algonquin-aquatic-ecology/>.

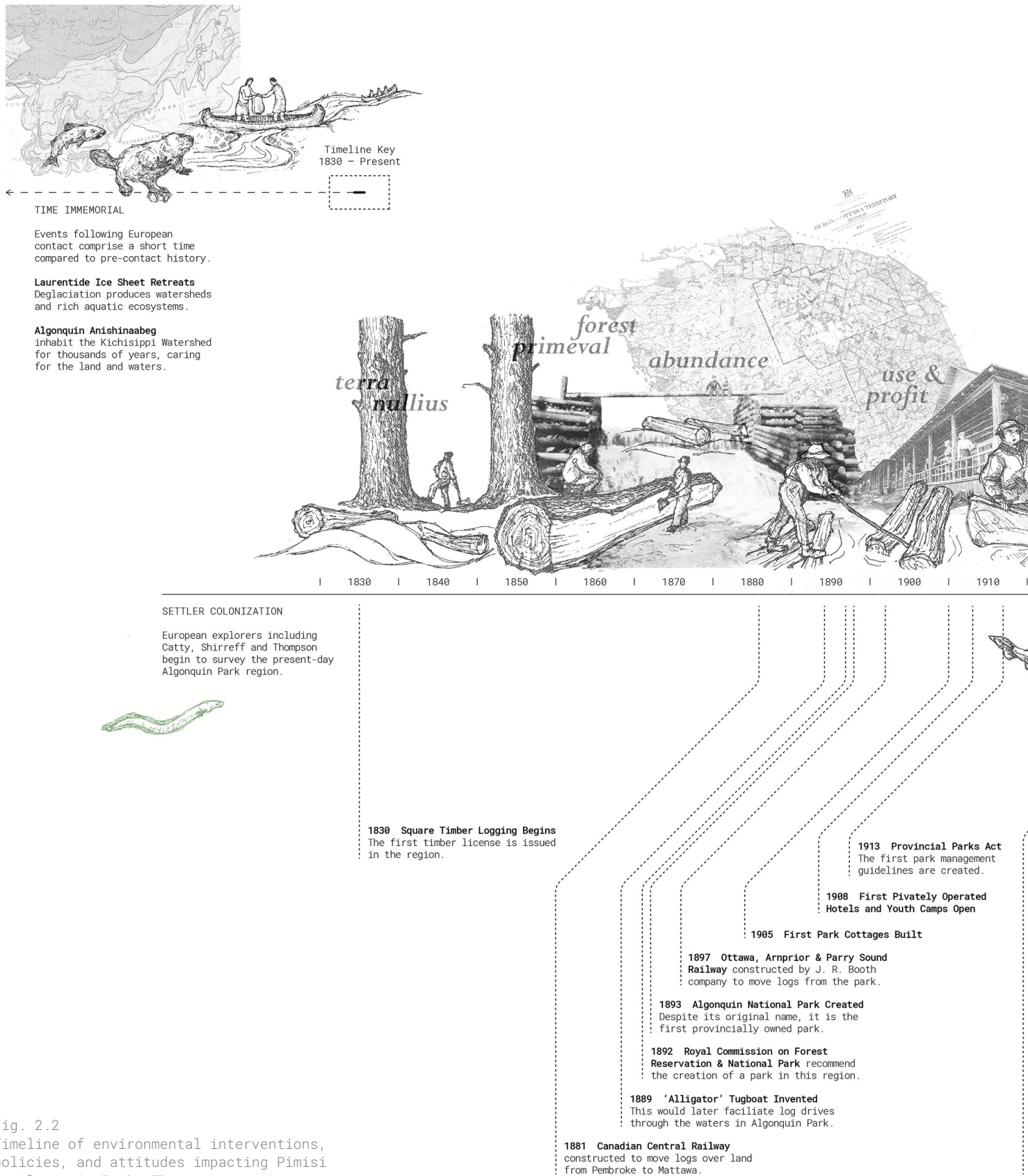
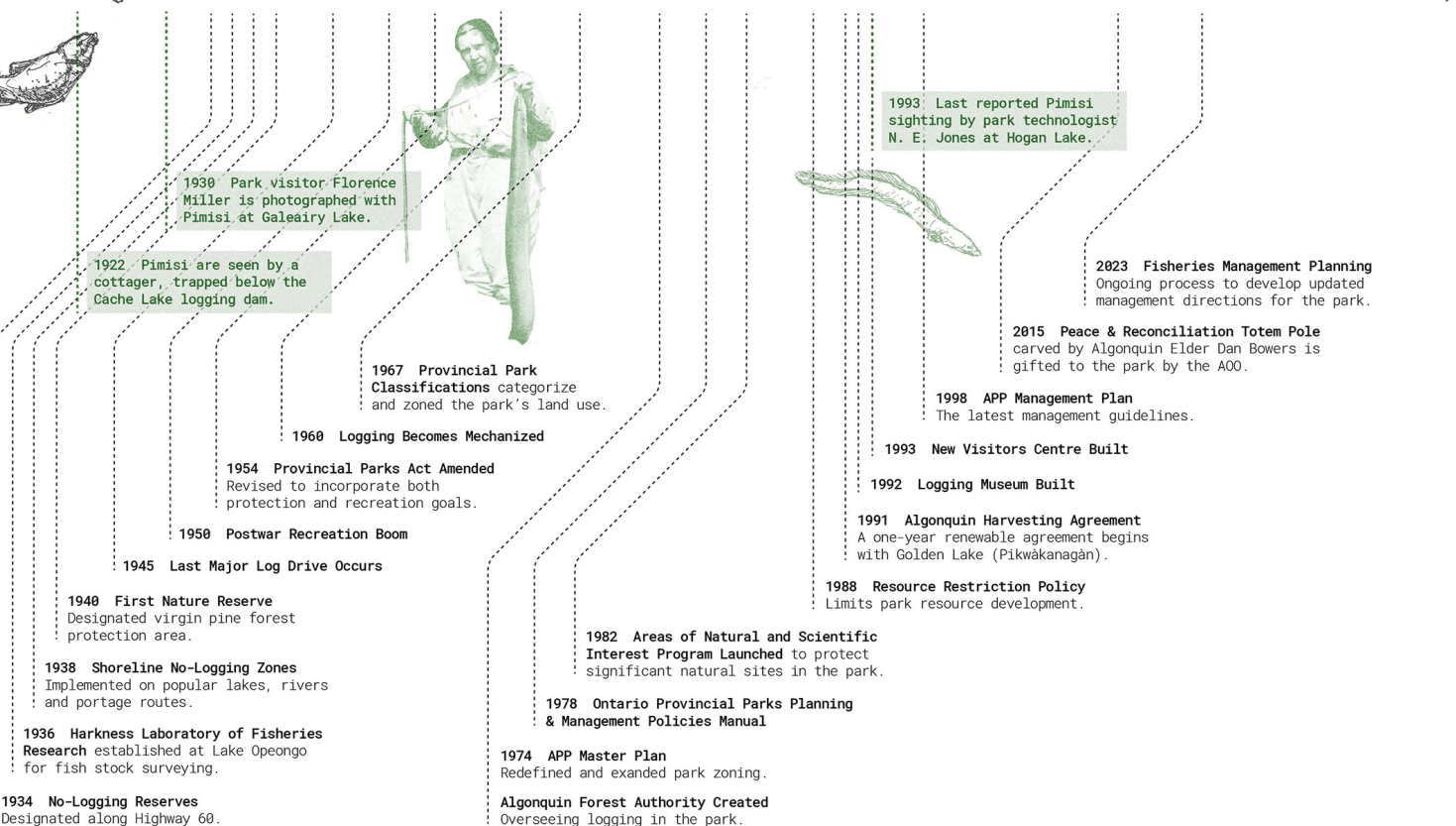
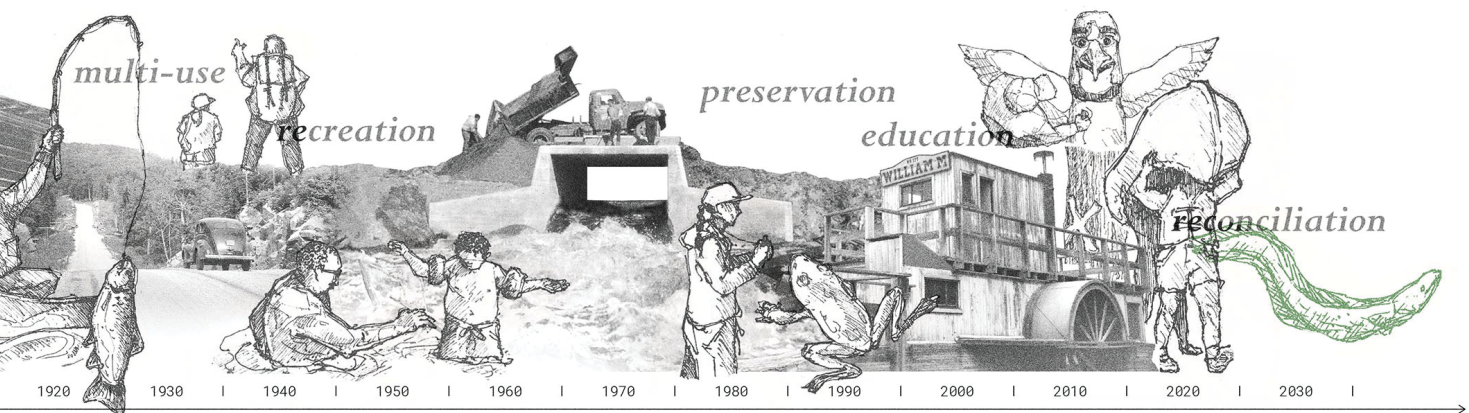


Fig. 2.2
Timeline of environmental interventions, policies, and attitudes impacting Pimisi in Algonquin Park. The green text indicates records of Pimisi in the park.



Infrastructures of Control

During my visit to Algonquin Park in August 2022, I witnessed traces of settler colonial history unfold on the landscape. The Visitor Centre displays the routes of European explorers as they embarked on their ‘discoveries,’ surveying viable land through what is now the park. An entire museum is dedicated to remembering the logging boom. Ruins of former logging camps and railroads that conquered the demanding terrain are marked as points of interest along hiking trails. But in addition to these relics of industrialization, there are park dams – both derelict and operating – severing nearly every river. While I initially presumed that human alterations to the landscape were storied in the past, learning about the enduring impacts of these dams proved otherwise.

Logging in this region was first to rely on damming for operations that flourished until they could no longer be sustained. In response to the diminishing availability of old-growth forest caused by intense logging activity in Ontario, Algonquin Park was established in 1893 not only as the inaugural Provincial Park for game preservation and leisure, but as a dedicated timber reserve for licensed logging companies.² At the park’s Logging Museum, I learned that these enterprises made their fortune leveling what was assumed to be an endless supply of prized white and red pine. Successive industries of squared timber, sawn lumber, and pulp and paper relied on Kichissippi tributaries to drive felled logs from the park to mills in Ottawa and beyond [Fig. 2.3].³ To facilitate this movement, naturally unpredictable rivers were tamed into reservoirs with wooden flash dams and rapids were bypassed using log chutes [Fig. 2.4]. Damming to sustain this boom-bust economy initiated the control of these waters, altering ecosystems dependent on connectivity and flux.

After hiking along the Oxtongue River, I picnicked above its Tea Lake dam. Once instrumental to log drives, this dam, as with many others in the park, now enhances visitor experiences of the river. Recreational development in Algonquin Park, which had steadily overtaken logging interests, accelerated mid-century following a tourism surge that resulted from the postwar economic boom and automobile revolution.⁴ Park dams responded

2 Gerald Killan, *Protected Places: A History of Ontario’s Provincial Parks System* (Toronto, Ontario: Dundurn Press in association with the Ontario Ministry of Natural Resources, 1993), 37.

3 David Lee, *Lumber Kings and Shantymen: Logging, Lumber and Timber in the Ottawa Valley* (Toronto, Ontario: James Lorimer & Co., 2006), 11.

4 Killan, *Protected Places*, 74.

Fig. 2.3
A log drive on the
Petawawa River in
Algonquin Park,
c.1940. Photograph
by the Canadian
National Railways.



Fig. 2.4
A display wooden
logging dam and
chute at the Logging
Museum's outdoor
exhibit, May 2023.





Fig. 2.5
A canoeist portaging
over the Lake of Two
Rivers dam, August
2023. This dam
doubles as a bridge
for pedestrians and
cyclists.



Fig. 2.6
The Eganville Chute
hydropower dam on
the Bonnechere
River, May 2023.

to modernization and this change in usage; logging dams were rebuilt in concrete and their operating regime shifted to optimize flows for recreation. Today, there are fifteen barriers of varying types and conditions dispersed along four of the tributary watersheds of the Kichissippi: the Kipawa, Petawawa, Bonnechere, and Madawaska [Fig. 2.7].

Beyond the park's borders, the decline of intensive logging was replaced by hydropower development throughout the Kichissippi Watershed. Though all park dams remain non-powered, they are not entirely divorced from the process of energy production. Gated dams in the park, notably along the Madawaska River, assist with water storage for most of the year; come winter, their gates are lowered to supply water to hydropower facilities downstream.⁵ This connection became apparent as I drove out of the park following Pimisi migration routes down the Bonnechere and Madawaska Rivers. The distant sound of churning water as my family car passed the towns of Eganville, Renfrew, and Arnprior was a reminder that neither river is free flowing nor has been for a long time [Fig. 2.6].

With the regime of water control for recreation and hydropower, park dams have adopted an unforeseen function of containing invasive species. Though now illegal, previous introductions of game and bait fish into park lakes for recreational fishing have disrupted native aquatic ecosystems.⁶ Ridgway et al. observe that while park dams have altered natural movements within watersheds, they are now protecting fragile native fish populations who are increasingly vulnerable under climate-change-induced lake warming.⁷ As such, Algonquin Park's reliance on dams has become difficult to disentangle from.

Waters that prior to colonial contact were shared by all beings, including Pimisi, have faced over a century of infrastructural disruption and are ensnared in further environmental issues by human design. Beyond the physical watershed fragmentation, it is important to recognize the ideologies perpetuated by settlers that disconnected the management of land from relationality and in turn, drove the construction of dams. In peeling back the layers of human-nature history, how might Algonquin Park navigate its complicated relationships with more-than-human beings including Pimisi moving forward?

5 Frank Hicks, "Algonquin Park Fishes and Aquatic Resources," in *Algonquin Park: The Human Impact*, eds. David Euler and Mike Wilton (Toronto, Ontario: Algonquin Eco Watch, 2009), 160.

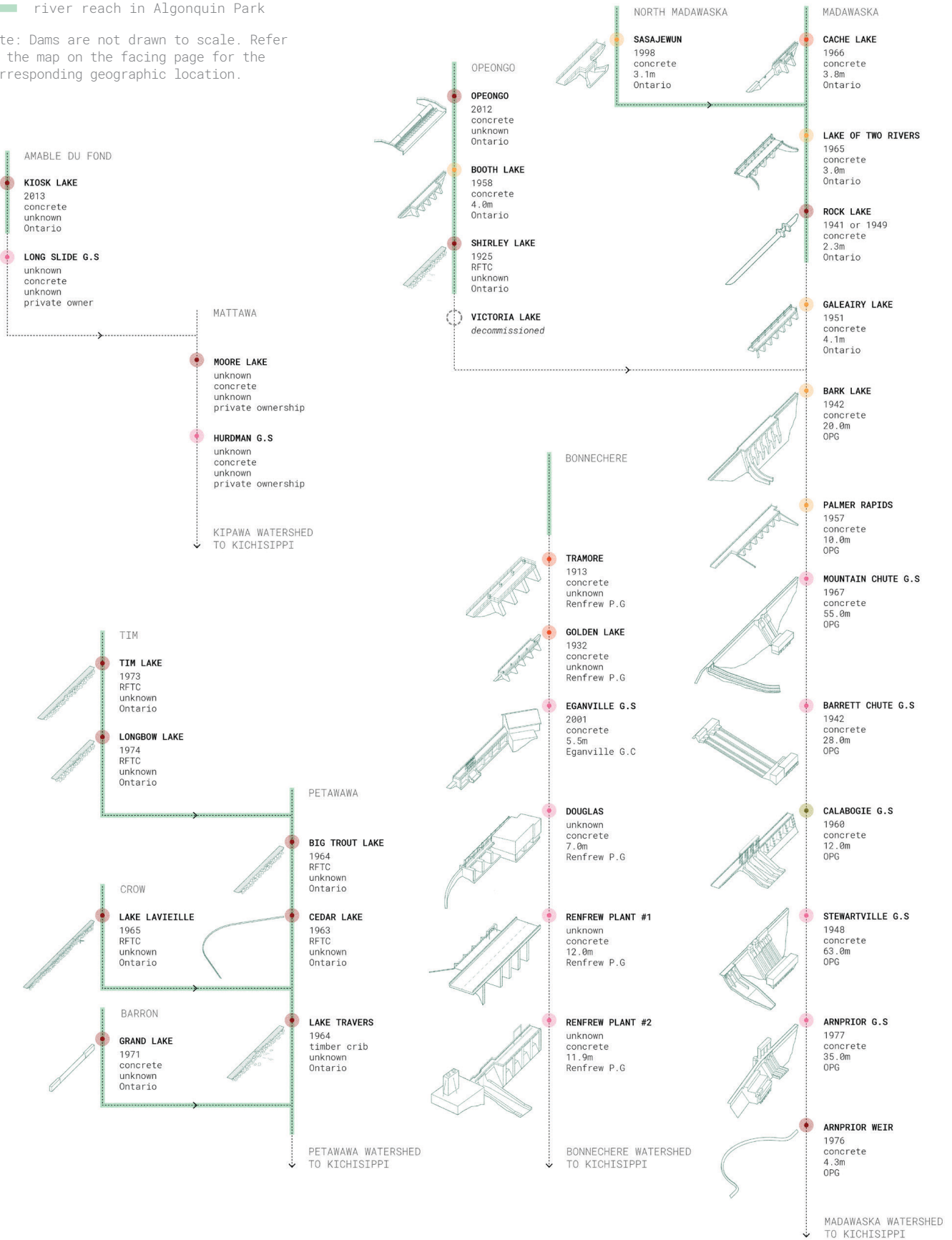
6 Ridgway, Middel, and Bell, *Aquatic ecology*, 96.

7 Ridgway, Middel, and Bell, *Aquatic ecology*, 59-95.

Re-storying Dammed Waters

river reach in Algonquin Park

Note: Dams are not drawn to scale. Refer to the map on the facing page for the corresponding geographic location.



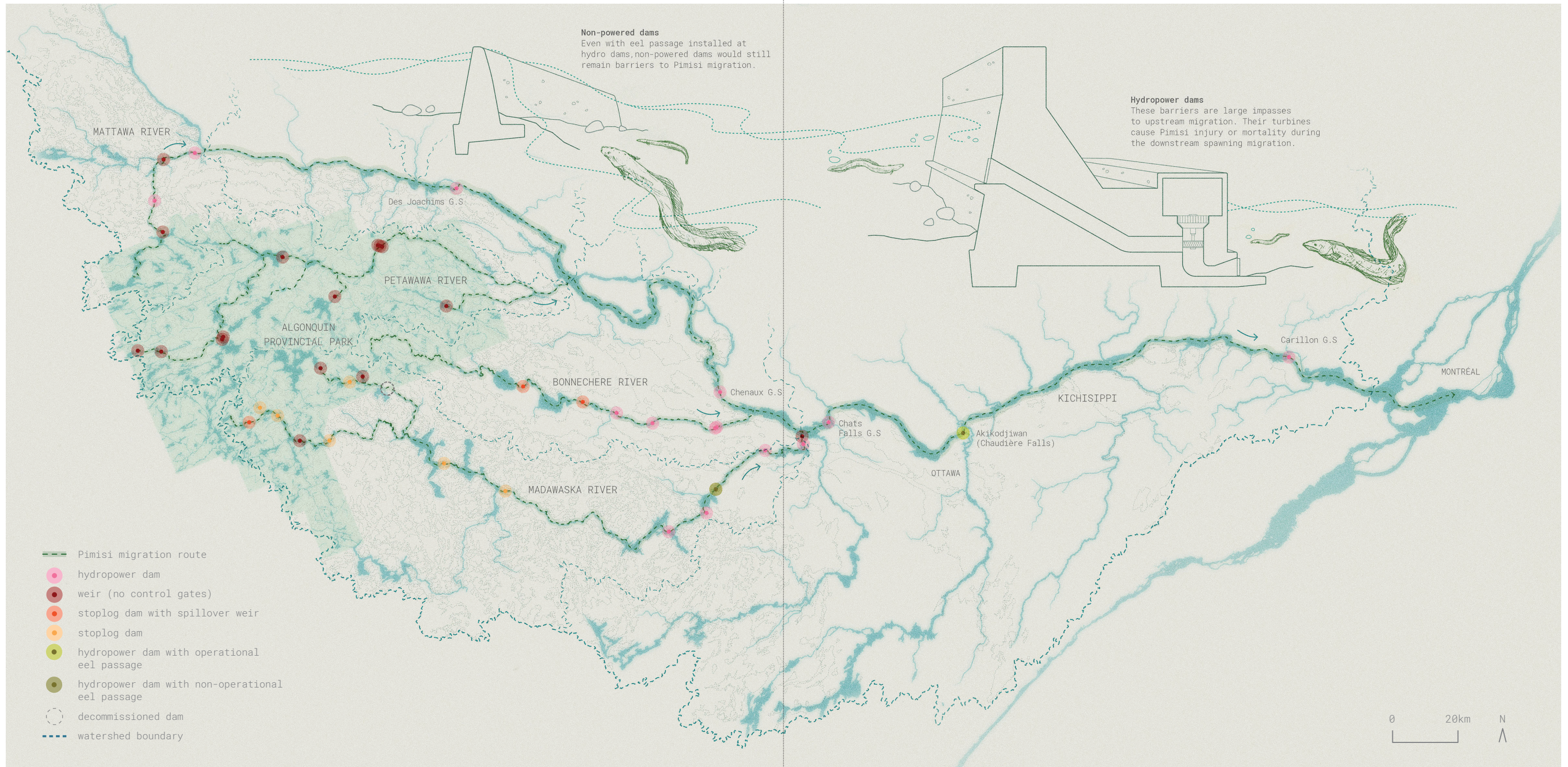


Fig. 2.7 [left]
Index of dams along Kichissippi tributaries flowing from Algonquin Park.

Fig. 2.8 [above]
Map of dams along Kichissippi tributaries flowing from Algonquin Park. Impacts on Pimisi are compounded by multiple barriers.

Fig. 2.9
Old logging dam
remnants at Big
Thompson Rapids near
Lake Travers, 2011.
Photograph by Bob
and Diana McElroy.



Fig. 2.10
Outlet of the Lake
of Two Rivers dam,
August 2023.



Damming Wilderness

Algonquin Park toes the line between being a space for people and for nature; however, its functions and appeal have long been supported by its misleading characterization as a wilderness. I thought of wilderness on an isolating four-hour hike where the forest enclosure was punctuated by panoramic lake views. I was reminded of it again when examining daily visitor sightings of moose and black bear at the Visitor Centre. The construct of wilderness saturates visitor experiences, yet there are several contradictions within this characterization. Relationships between humans and more-than-humans in the park are caught in tensions of othering and connection, and of consumption and care.

Unlike relationality, wilderness ascribes a distinction between humans and other beings. In *Wilderness and Territoriality*, Jean L. Manore introduces the “wilderness/urban dichotomy,” which attributes wilderness to the more-than-human due to a perceived “separateness” from civilization.⁸ Wilderness conjures the absence of human intervention in a natural setting; yet, while cities are for people, my analysis of dams indicates that Algonquin Park’s functions have not entirely supported other beings. The park is mired in a contradiction that at once strengthens the wilderness/urban dichotomy and blurs it, creating a human sphere within the landscape.

As part of a broader scheme of settler planning, Algonquin Park and cities are distanced and delineated; however, they participate in a system of exchange [Fig. 2.13]. Rather than preserving the land within city limits like Toronto’s High Park, the park draws the urban population into the wilderness of a vast and remote Canadian Shield landscape. Highway 60 stretches out from the park like two arms beckoning travelers from Ottawa, Toronto, and further afield. This relationship between parks and urban centres is explored by Tiffany Kaewen Dang who positions Canadian National Parks as extractive landscapes offering “spaces of leisure and relaxation for tired urbanites.”⁹ Connecting Dang’s assertion to Algonquin Park suggests that its use has been intensified by urbanization, which I imagine motivates visitors to plan wilderness getaways removed from their routine experiences.

8 Jean L. Manore, “Wilderness and Territoriality: Different Ways of Viewing the Land,” *Journal of Canadian Studies* 33, no. 2 (1998): 77, <https://doi.org/10.3138/jcs.33.2.77>.

9 Tiffany Kaewen Dang, “Grids and Parks: Two Sides of an Extractive Worldview,” *Scapegoat: Architecture / Landscape / Political Economy*, no. 12-13 (2020-21): 65.

Fig. 2.11
A 1910 postcard
marketing camping in
the park. Postcard by
Valentine and Sons.

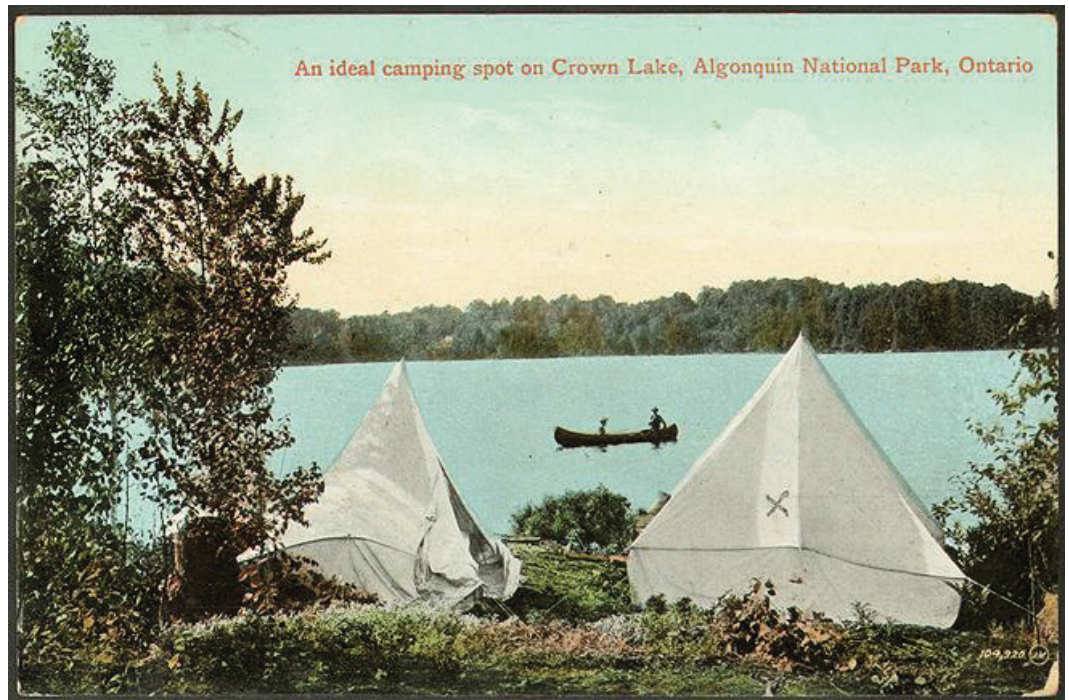


Fig. 2.12
Walking along the
'Big Pines' trail,
August 2022.



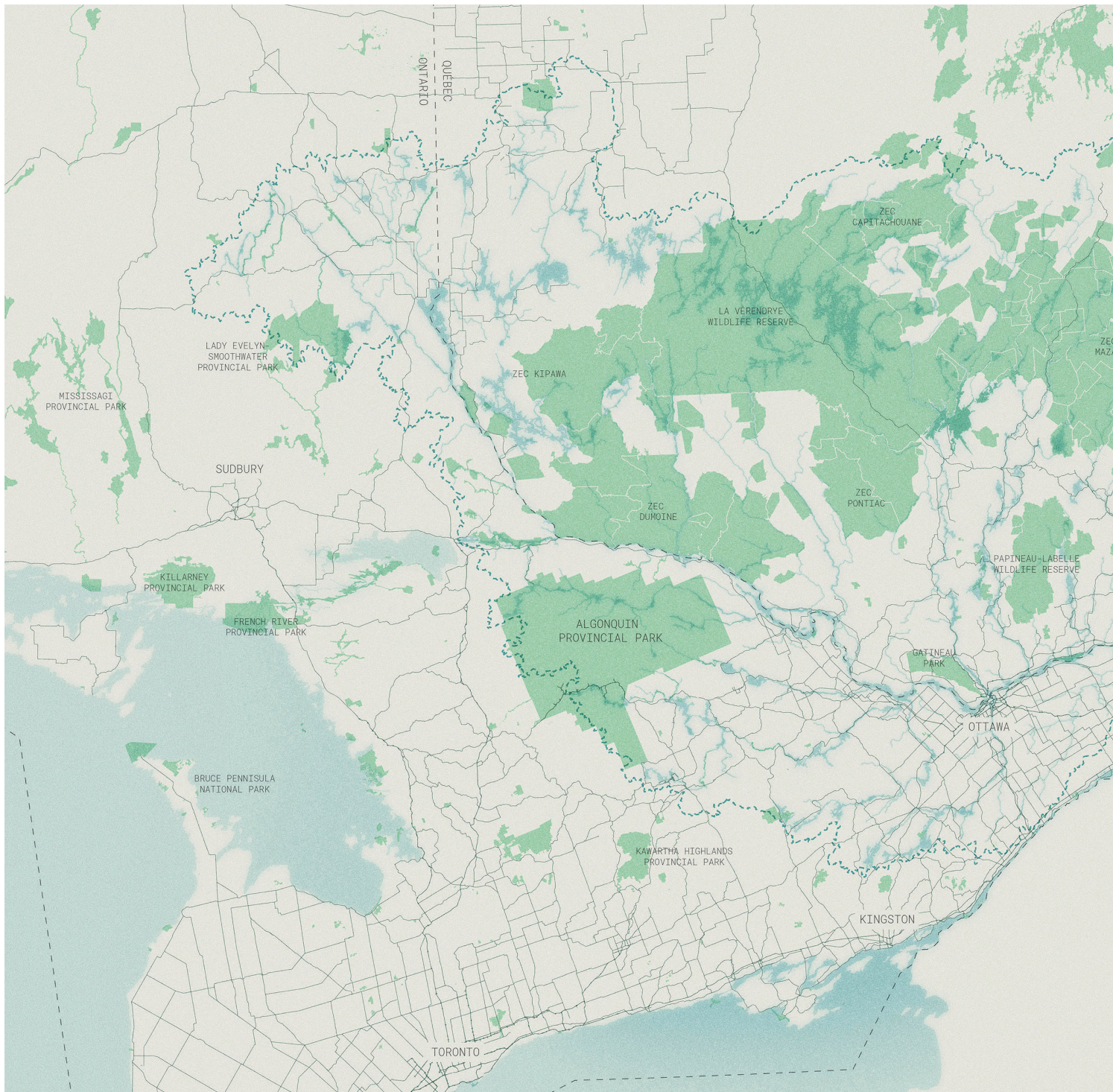
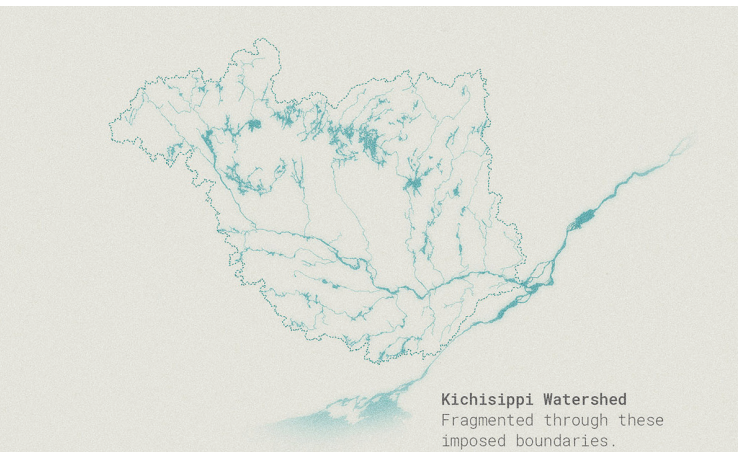
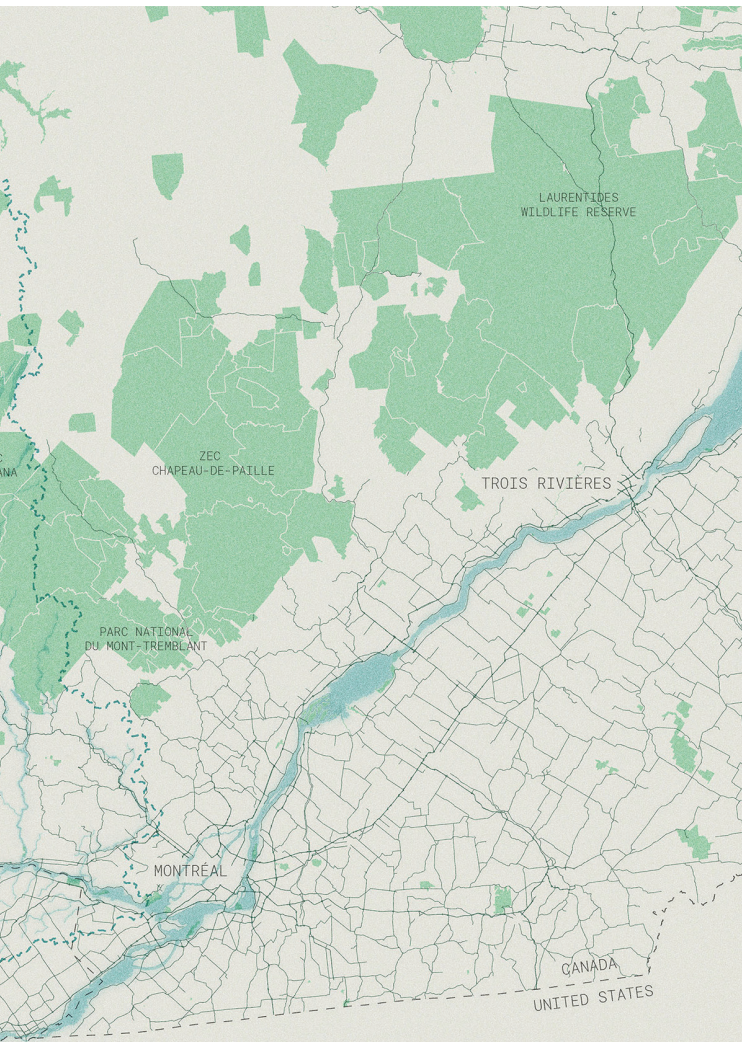


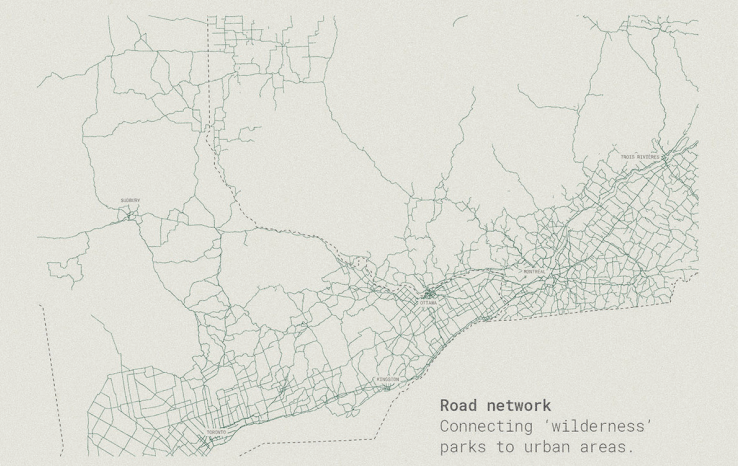
Fig. 2.13
Settler land use divisions produce hinterland parks, which are connected to urban areas through an extensive network of highways.



Kichissippi Watershed
Fragmented through these imposed boundaries.



'Wilderness' parks
Government-owned large parks delineating wilderness and civilization.



Road network
Connecting 'wilderness' parks to urban areas.

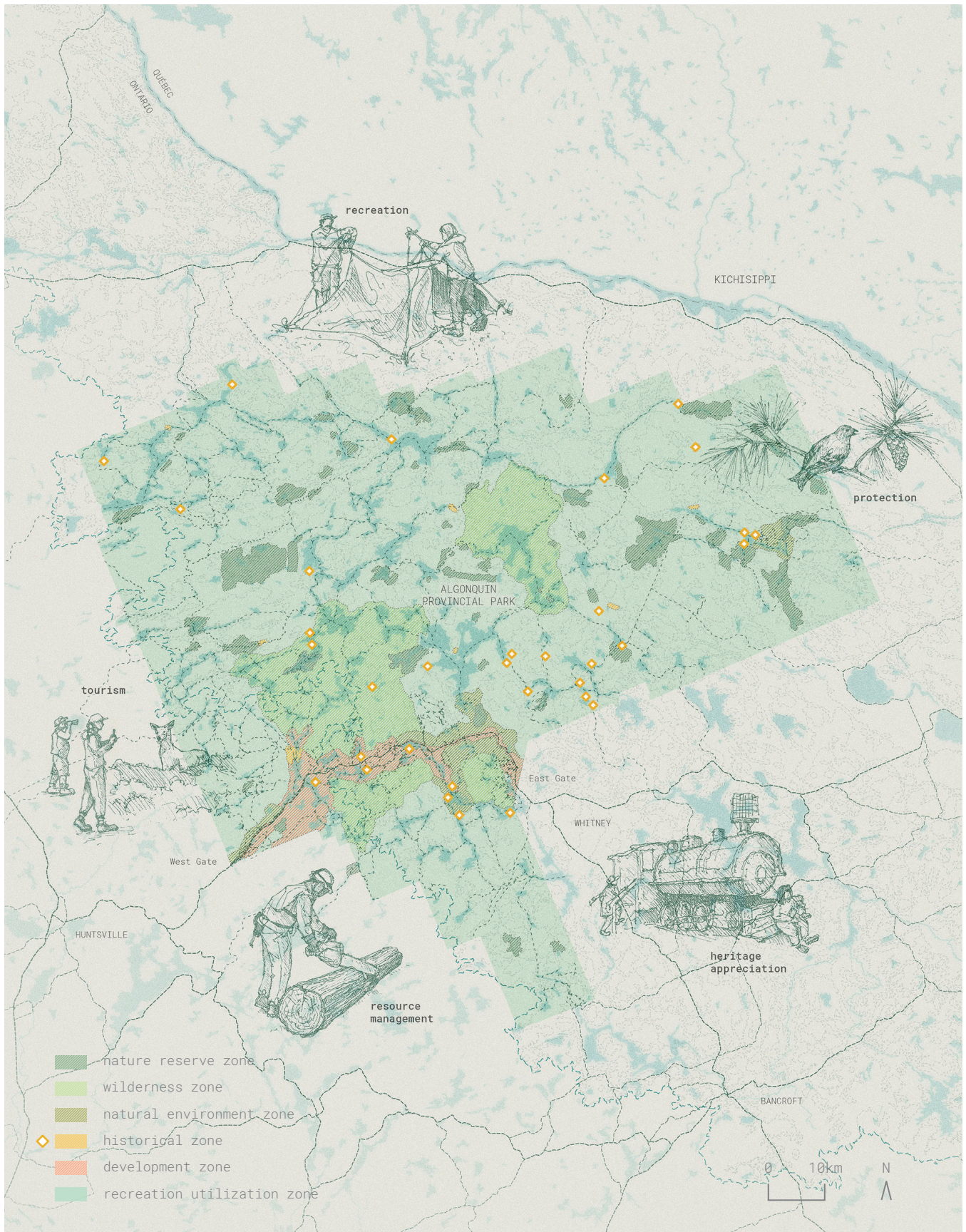


Fig. 2.14 [left] Algonquin Park plan, indicating its management objectives and zoning areas.

Fig. 2.15 [right] Human infrastructure and buildings along the Highway 60 corridor.

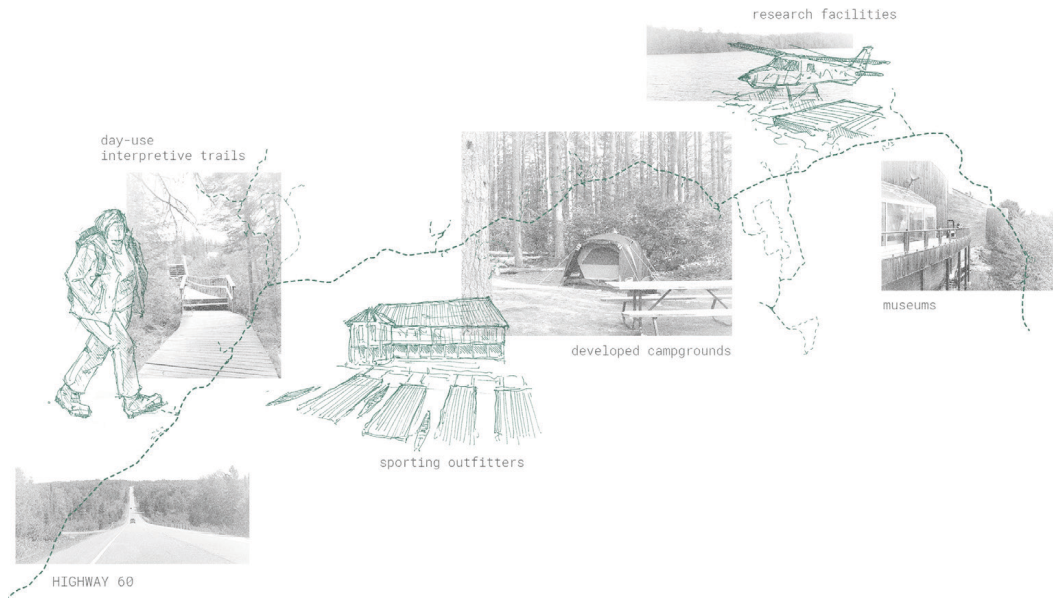
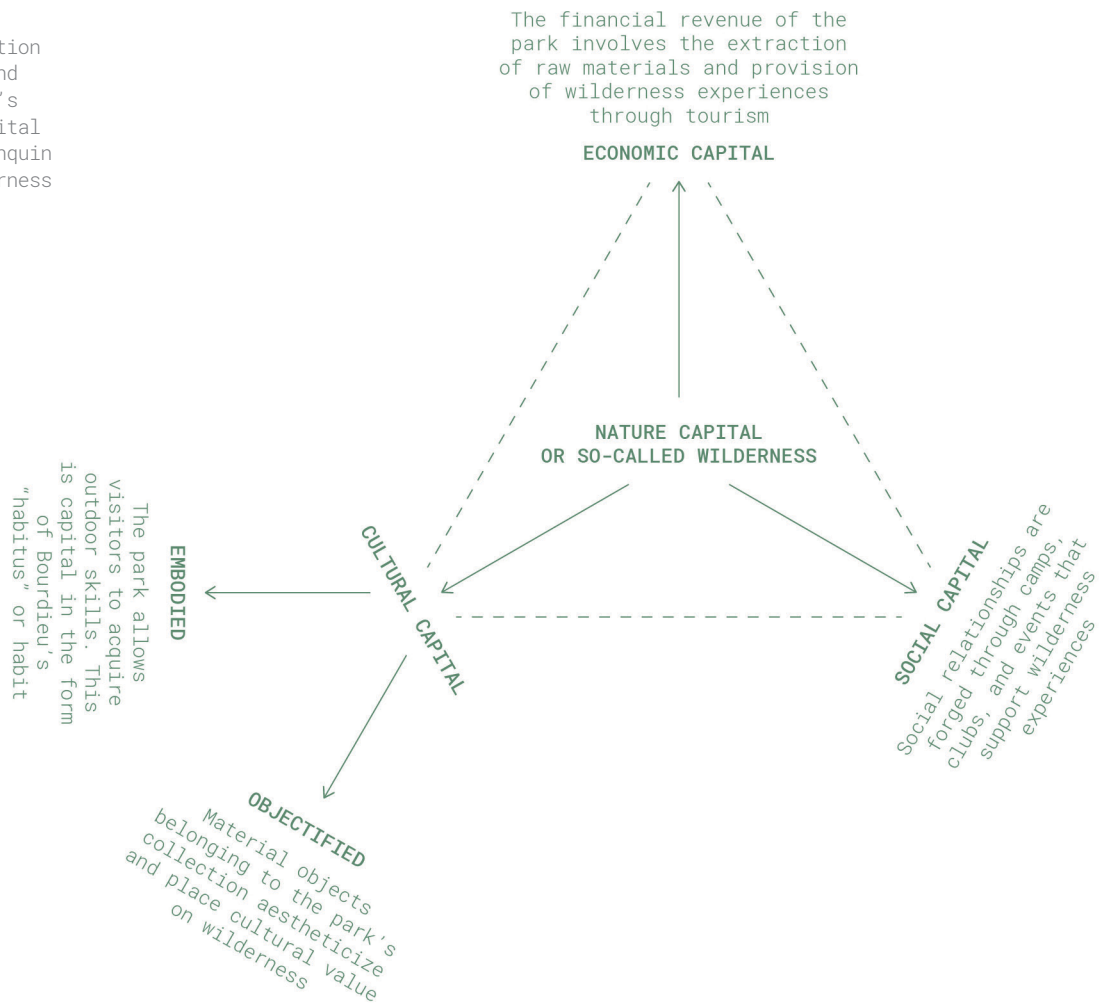


Fig. 2.16 Author's adaptation of Jody Baker and Pierre Bourdieu's theories on capital applied to Algonquin Park with wilderness at the centre.



Visiting the park, I experienced varying degrees of separateness from civilization corresponding to the planning, zoning, and management of land [Fig. 2.14]. The Highway 60 corridor hosts a concentration of human infrastructure and buildings, including developed campgrounds, museums, research facilities, sporting outfitters, and day-use trails. Conversely, withdrawing into the park's 'interior' via backcountry routes amplifies a sense of isolation, as if announcing the entrance into a more-than-human domain.

Although the perception of wilderness in Algonquin Park is beloved by many visitors, it enables resource-oriented perspectives of more-than human beings. Building on Pierre Bourdieu's triad of capital and Jody Baker's "woods lore," wilderness can be seen as a form of capital central to the park's economic development, social relationships, and cultural value [Fig. 2.16].¹⁰ Manore explains that this resource-oriented view enables consumption, whether through extraction, which fits the role of park dams historically, or a 'claiming' of land by visitors as a personal source of respite.¹¹ The friction between resource-oriented and relational perspectives of more-than-humans is apparent in contemporary management. Algonquin Park's management plan seeks to balance conservation through a "protection" objective, while meeting mandates for "recreation," "heritage appreciation," "tourism," and "resource management."¹² Though these objectives largely commercialize wilderness for human use and appreciation, they also provide experiences beyond consumption.

By embedding recreation and tourism activities within the landscape, the park facilitates direct contact between visitors and more-than-human beings, which have the capacity to promote curiosity and awareness. Learning is also guided through its offering of interpretive spaces, media, and educational events. Museum exhibits, ruins, and signposts I encountered along trails brought attention to the shared natural and human history on this landscape [Fig. 2.18, 2.19]. What was more compelling was that they did not attempt to gloss over the conflicts between settler interests and more-than-human processes, prompting critical thinking about the extent of human impact.

10 For further reading on capital, see Pierre Bourdieu, "The Forms of Capital," in *Handbook of Theory and Research for the Sociology of Education*, ed. J. G. Richardson (New York: Greenwood Press, 1986), 241–258; see also, Jody Baker, "Production and Consumption of Wilderness in Algonquin Park," *Space and Culture* 5, no. 3 (August 2002): 206, <https://doi.org/10.1177/1206331202005003001>.

11 Manore, "Wilderness and Territoriality," 78–81.

12 *Algonquin Provincial Park Management Plan* (Ontario, Canada: Queen's Printer for Ontario, 1998), <https://www.ontario.ca/page/algonquin-provincial-park-management-plan>.

Fig. 2.17
Canada Warbler
perched near my
campsite, August
2023. Their
migration South
would likely commence
a few weeks later.



Fig. 2.18
Wolf diorama at
the Visitor Centre,
August 2023.
Collectively, the
Visitor Centre's
dioramas and signage
panels describe the
natural and human
history of the park.

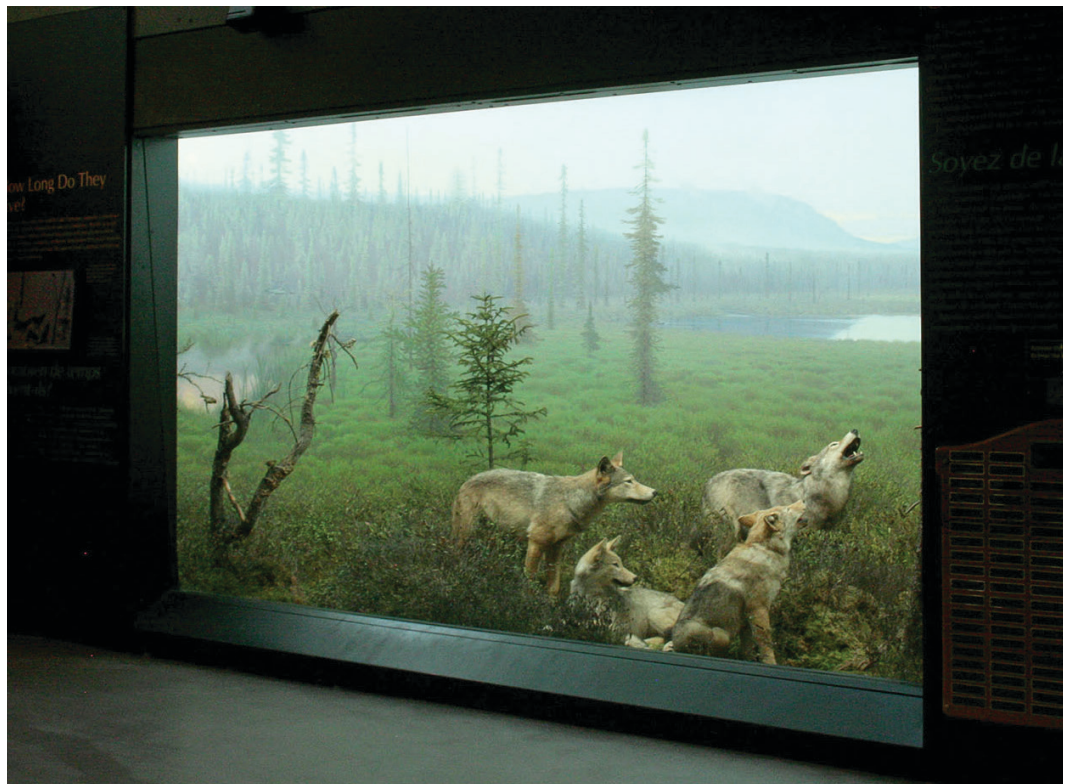




Fig. 2.19
Display of a logging
transportation
mechanism at the
Logging Museum's
outdoor exhibit,
May 2023. The cut
logs contrast the
historical old-
growth forest with
the current growth
of younger pines.

The neutrality of Algonquin Park's management is murky, and I struggle to make sense of its contradictory ambitions to serve both human and more-than-human interests. If one thing is certain, the park is dependent on a confluence of the two. Park dams tame the wild ways of water to largely benefit recreational opportunities. On the other hand, designated protection zones within the park remain off-limits. But in between the hierarchies of consumption and protection, the park facilitates a grey area of interactions. Despite coming to the park as a consumer partaking in recreation, I left more attuned to the myriad of beings with whom I shared the land. Encounters with more-than-humans, or so-called wilderness, have potential to transcend separateness and consumption and make space for meaningful connection and care.

Parallels of Watershed Colonization

There is another layer left to uncover: park dams are further entrenched in the unsettled reality of Algonquin Park. It is possible to draw parallels between Pimisi habitat fragmentation and Indigenous land dispossession, including the theft of unceded Algonquin territory, which both stem from the Kichissippi Watershed's colonization. This is a process that the park is complicit in. Christine Luckasavitch tells the story of her Madaoueskarini Algonquin ancestors during the creation of Algonquin Park, who faced encroachment from settlers, dismissals of their petitions with the Nipissing for land, and were eventually evicted as its borders were drawn up.¹³ Luckasavitch's account speaks to the system of settler colonial control and division of this territory that has left the Kichissippi Watershed fragmented by borders, management jurisdictions, and dams.

Historically, the management of Algonquin Park could be regarded as a type of fortress conservation, which Vaccaro et al. note is defined by exclusionary policies involving "evictions of local inhabitants" and "protecting and defending its borders" from those deemed 'outsiders.'¹⁴ Settler loggers and recreationalists were granted access and use of the park's natural 'resources,' while Indigenous peoples were actively hindered from practicing their traditional economies. As Luckasavitch describes, Madaoueskarini Algonquin lifeways were drastically altered as they were not only incongruous to settler interests in the park, but also viewed as a roadblock and threat to them.¹⁵ Algonquin Park's management effectively undermined Indigenous sovereignty and relationality, resonating with Chuck Commanda et al.'s reflection that in the history of Canadian parks, "colonial rules for conservation superseded Indigenous and natural laws."¹⁶

Rising from this legacy of denial are actions supporting Indigenous recognition in the park. A totem pole gifted by the AOO stands near the East Gate entrance [Fig. 2.21]. Its carver, Elder Dan Bowers of the Whitney and

13 Christine Luckasavitch, "A brief history of the Madaoueskarini Algonquin People," *Algonquin Life Magazine*, June 6, 2019, https://www.muskokaregion.com/life/a-brief-history-of-the-madaoueskarini-algonquin-people/article_3efeb715-ed51-563a-ab1a-6b06e9efedb3.html?

14 Ismael Vaccaro, Oriol Beltran, and Pierre Alexandre Paquet, "Political ecology and conservation policies: some theoretical genealogies," *Journal of Political Ecology* 20, no. 1 (2013): 256, <https://doi.org/10.2458/v20i1.21748>.

15 Luckasavitch, "A brief history of the Madaoueskarini Algonquin People."

16 Chuck Commanda, Larry McDermott, and Sarah Nelson, "Ginawaydaganuc: The Birchbark Canoe in Algonquin Community Resurgence and Reconciliation," in *The Politics of the Canoe*, eds. Bruce Erickson and Sarah Wylie Krotz (Winnipeg, Manitoba: University of Manitoba Press, 2021), 123.



Fig. 2.20
Omamiwinini
Wiigwas Chiiman
(Algonquin birch
bark canoe) built
by Chuck Commanda
on display at the
Visitor Centre,
August 2023. The
build was organized
by Christine
Luckasavitch's
company, Waaseyaa
Consulting, Algonquin
Outfitters, and other
partners in the park.



Fig. 2.21
'Peace and
Reconciliation'
totem pole carved by
Elder Dan Bowers,
August 2023.
Depicted in this
view are totems
of the Eagle, the
Anishinaabe, and
Turtle Island.

Area Algonquins selected this medium, originating in Pacific Northwest First Nation traditions, to commemorate stories representative of his people.¹⁷ At the Visitor Centre, I was welcomed by the presence of a 14-foot Algonquin birch bark canoe built in the park the previous summer [Fig. 2.20]. Led by Chuck Commanda, who is a master canoe builder from Kitigan Zibi, the canoe's construction brought together Indigenous and non-Indigenous partners and onlookers to share in the experience of “repatriat[ing] ancestral practices.”¹⁸ Contrary to the many objects representative of settler colonialism that I encountered during my visits, the canoe and totem pole tell a competing story. They sit among other contemporary actions that affirm the deep connections that the Algonquin people have to this region and the long road towards reconciliation.

From my brief experience joining Algonquin Park's fisheries management planning process, it seems that steps are being taken to include Indigenous perspectives in management. The erosion of relationality that has occurred through the park's colonization of Indigenous peoples and more-than-humans, even under the guise of conservation, contextualizes why repairing these relationships is a necessary concern. By seeing Pimisi recovery and Algonquin resurgence in parallel, intervening at park dams cannot be viewed as passive actions; rather, with Algonquin involvement, they could contribute to larger process of self-determination and reconciliation on unceded land.

17 “Peace and reconciliation totem pole at Algonquin,” Ontario Parks, Parks Blog, last modified June 21, 2017, <https://www.ontarioparks.ca/parksblog/peace-and-reconciliation-totem-pole-at-algonquin/>.

18 Mike Riley, “Second week of Algonquin Park birch bark canoe build went smoothly,” *Bancroft This Week*, August 30, 2022, <https://www.bancroftthisweek.com/second-week-of-algonquin-park-birch-bark-canoe-build-went-smoothly/>.

Navigating Contradictions

Algonquin Park is defined by a coexistence of contradictions in its management and use. Static control infrastructures remain in a landscape shaped by dynamic natural forces. Anthropocentric and consumptive practices occur alongside the development of connection and care towards more-than-humans. The park is a product of the denial of Indigenous peoples by settlers and a steppingstone for their resurgence. These evolving relationships with the land challenged my initial assumption about the park as a passive landscape. By visiting Algonquin Park, I participated in some ways in the continuum of its settler colonial legacies, which have influenced its purpose, perception, and use. At the same time, visitation can serve as a bridge towards relational engagements with the land.

In considering the future of Pimisi recovery in Algonquin Park, I believe that its contentious history and contemporary frictions should not go ignored. My study of park dams exposes the scale of spatial and ideological challenges coinciding with the park's management of water. The task of negotiating these barriers to support Pimisi recovery presents a shift towards relationality that calls into question the park's longstanding legacies.



Fig. 2.22
View from the
'Booth's Rock' trail
above Rock Lake,
August 2023.



Fig. 3.1
Pimisi in their
yellow eel stage
feeds on bass hiding
among aquatic plants.

CHAPTER III

Conversations About Pimisi Recovery

“All flourishing is mutual,” says Robin Wall Kimmerer of the reciprocal systems that allow a grove of trees to fruit in unison¹ – a connectedness that mirrors the ecologies and cultural practices dependent on the return of Pimisi. For the flourishing of these relationships to occur in the Algonquin Park landscape, human allyship is necessary. As I was conducting my research on Pimisi recovery, I was fortunate to encounter two such allies in Mark Ridgway, Director of the Harkness Laboratory, and Krystal Mitchell, Fisheries and Wildlife Management Advisor for the Algonquins of Ontario. Given their familiarity with Pimisi and experiences with fisheries management in Algonquin Provincial Park, I sat down with them to learn about their work and aspirations for Pimisi recovery in the park.

With Mark representing a government research team and Krystal, an Indigenous organization, I anticipated differences in their perspectives on recovery. While their responses placed emphasis on different priorities from conservation and aquatic ecosystem health to Algonquin culture and reconciliation, they shared a similar view that the reintroduction of Pimisi would enrich many relationships within the ecology of the park. After analysing and comparing their insights, I identified aquatic connectivity, human engagement, and habitat restoration as objectives for recovery. Each of these objectives offers initial ideas for space programming that will be incorporated in the design application presented in the final part of this research.

Please refer to the Appendix to read the full conversations.

¹ Robin Wall Kimmerer, “The Council of Pecans,” in *Braiding Sweetgrass* (Minneapolis, Minnesota: Milkweed Editions, 2013), 15.

In Conversation with Mark Ridgway

Mark Ridgway is the Director of the Harkness Laboratory for Fisheries Research, a facility based in Algonquin Park on Lake Opeongo, which operates under the Ontario Ministry of Natural Resources and Forestry. Throughout his extensive career at Harkness, he has been involved in multiple fisheries research and monitoring projects that have covered fish movement and the impacts of dams – relevant resources for my own study of Pimisi recovery. Beyond its contributions to the scientific community, Mark’s research has also supported the Algonquins of Ontario’s ongoing Land Claim Treaty negotiations process with the governments of Ontario and Canada. Our conversation relates Pimisi recovery to the aquatic ecology in Algonquin Park, as well as to the park’s research functions that sit alongside its cultural and educational values discussed in the previous chapter.

Despite having spent decades studying diverse aquatic ecosystems within the park, Mark has not seen Pimisi within its boundaries, reinforcing many other accounts about their disappearance. Upon asking him about his encounters with Pimisi in other contexts, he shared a story about seeing and handling them in a lake in Eastern Ontario:

You have to use these 5-gallon pails to hold them because they will stand on their nose and corkscrew out of the pail. You pick them up and you can hold as tight as you can, and that thing will move right between your hands, like it’s extraordinary. They’re incredible...

They’re very powerful, really strong. And when you see them in real life, they’re big. The diameter could be like this [Mark gestures a circumference the size of an orange]. I mean, they’re substantial.²

Based on his previous experiences, Mark postulates that Pimisi have had a long history of abundance in the Kichissippi tributary watersheds in Algonquin Park and would have been integral to the food webs and energy transfer within these ecosystems. He cites his observations of them in the Great Lakes as an example where they dominated other species like Smallmouth Bass – a fish that is considered invasive in the park. On the prospect of recovering Pimisi in the park, he is hopeful that they will find a place within its fish communities and begin to restore ecosystem functions and balances that may have been disrupted with their extirpation.

2 Mark Ridgway (Director, Harkness Laboratory of Fisheries Research), “Mark Ridgway Interview,” interview by author, November 24, 2023, transcript, 153.

From my understanding through working with them in other places and just catching them, they really do fit into a historical fish assemblage. They had an important role to play in the ecosystem in terms of consumption and predation and energy transfer – the functioning of an aquatic ecosystem. They are probably hugely important in the shallow areas of lakes. They are not a Lake Trout type predator – deep, dark, cold. They are more of a mid-range, shallow predator, and they would have had an enormous role in the park. So much has been lost that there’s not a lot of information currently on their role in these inland lake systems; but they were once incredibly abundant, and absolutely would have been a major factor in these aquatic food webs.³

As we moved on to discussing park dams, Mark established that their role within the park ultimately conflicts with the natural functions of ecosystems. He asserts that there is a broader “connectivity story” linked not only to the migratory nature of Pimisi, but to many other aquatic dwellers who would otherwise be moving through watersheds as well, albeit across much smaller distances.⁴ Referring to a tracking study conducted by Harkness, he observes natural occurrences of fish movements between three connected lakes in response to seasonal changes in their temperatures and food sources:

Tea Lake is the smallest and therefore warms in the summer, becoming inhospitable for Lake Trout as a cold water fish. Lake Trout are there in May and then largely get out. Some of our data may or may not show some winter occupancy, but it’s usually the seasonal nature of food availability in those systems that might drive it. Now, why do some Lake Trout say, “I’m a mover,” and the other one says, “I’m a stayer”? Who knows why some stay and some move? But there’s no question that without dams there, whole fauna can be moving.⁵

While park dams disrupt aquatic connectivity, resulting in habitat loss for migratory Pimisi and Namé (Lake Sturgeon), they have a contradictory role in protecting biodiversity. Echoing the Harkness study referenced earlier in this thesis, Mark notes that certain barriers have become “important biodiversity devices for conservation” by curbing the spread of invasive fish species who were originally illegally introduced beyond their natural range by anglers and tend to aggressively outcompete native feeders.⁶ He offers some examples of how park dams control drastically different fish assemblages:

3 Ridgway, “Mark Ridgway Interview,” 159.

4 Ridgway, “Mark Ridgway Interview,” 155.

5 Ridgway, “Mark Ridgway Interview,” 155.

6 Ridgway, “Mark Ridgway Interview,” 154.

What became apparent to us is that in several places – the Shirley Lake dam is a good example, the Annie Bay dam is a good example, and there's others – the species introductions that have occurred over the last ten to thirty years have put some real sea monsters into the aquatic food web. For example, the Shirley Lake dam might be the most dramatic. The food webs above the Shirley Lake dam are entirely native, you know, post-glacial. Below the Shirley Lake dam is a suite of these top predators that are just unbelievable – Smallmouth, Largemouth, Pike, Walleye, Rock Bass – all of them introduced. A dam like the Shirley Lake dam, is a real point of preservation and conservation of native fish assemblages.⁷

Mark is also concerned with the role of park dams in water management for hydropower. As mentioned previously, certain barriers are linked to a system of water storage for facilities downstream beyond the park. He cautioned that the removal of barriers like the Annie Bay dam controlling Lake Opeongo – the largest lake in the park – would release floods with the potential for severe environmental damage. It seems that adverse environmental changes due to the longstanding presence of park dams are difficult and, in some cases, too risky to reverse at certain sites by simply removing the barrier.

The preservation of other dams that do not bear these added responsibilities of conservation and water management remains a question. Mark points out that some park dams, including old logging dams are in various states of deterioration.⁸ He observes that they no longer function as barriers and furthermore, are outside the range of known invasive fish:

Some of the dams are in rather broken-down states. The dam at the outlet to Hogan is an old log crib dam, probably from logging days. There's water shooting out between the rocks and the dam, right? Over time it will wear down, but there aren't invasive species in that watershed at that point.⁹

Given the varying site conditions and functions of park dams within conservation and water management, this alludes to the possibility that interventions to these barriers to support recovery might vary on a case-by-case basis. Mark's recommendation is to look for dam improvement opportunities at sites with "minimal biodiversity effect" in Pimisi's historical range in the park, substantiated by photos and reports.¹⁰ Eel ladder infrastructure, as he describes, would minimize the possibility of invasive fish movement:

7 Ridgway, "Mark Ridgway Interview," 154.

8 Refer to page 35–36 for the locations and status of park dams in the Kichissippi Watershed.

9 Ridgway, "Mark Ridgway Interview," 154.

10 Ridgway, "Mark Ridgway Interview," 158.

It's just a question of picking the location where you're going to have the minimal biodiversity effect for an eel ladder that is just for eel – you know how the design that lets them snake up through the system? ...

It's a difficult trip from the Ottawa River into the park. So, whether it's one or two or three [ladders] in sequence to get them up there, I don't know. Maybe the Opeongo and Madawaska Rivers – they would probably pick sites like that, I would think, where they have clear evidence of this being the case ...

I think if you could successfully move eel up a ladder system that is exclusively used by eel, if you can do that, that would be an extraordinary story of recovery and conservation and the importance of this landscape. You would gain on the ecology side. You would improve on the cultural reconciliation side.¹¹

As Mark identifies, not only might future Pimisi recovery efforts reinforce Algonquin Park's primary responsibility towards biodiversity conservation, but they could additionally support the interests of Indigenous rights holders. Ultimately, recovery has the capacity to represent multiple interests and concerns among members of the park community. Aside from the human impacts, Mark's comments on aquatic connectivity, fish behaviour, and food webs help me to envision a wide array of multispecies encounters that could occur with this undertaking.

¹¹ Ridgway, "Mark Ridgway Interview," 158.

In Conversation with Krystal Mitchell

Krystal Mitchell leads Pimisi recovery advocacy as the Fisheries and Wildlife Management Advisor within the Algonquins of Ontario (AOO) Consultation Office. Prior to joining the AOO, Krystal began her career studying the fisheries in Algonquin Park as a staff member at the Harkness Laboratory of Fisheries Research. During this time, her contributions to fish population assessment supporting the AOO's Land Claim Treaty negotiation process facilitated relationship building with community members, which gradually developed her cultural awareness of this landscape. The significance of more-than-human beings in the park continues to be connected to her consultation role today, as she offers technical advice to AOO community leaders on fisheries and wildlife management within the Settlement Area outlined in their Land Claim.¹² Reflecting on her motivations to engage in this work, she said,

*I really wanted to pursue supporting Indigenous reconciliation and Indigenous initiatives on the landscape, especially the AOO's modern treaty with Ontario and Canada. I wanted to bring my experience to support the Algonquins in their journey towards treaty-making, and to ensure Algonquin rights are protected in their Traditional Territory.*¹³

Having spent a few years on Pimisi recovery advocacy with her colleague Ethan Huner, Krystal has been able to better her understanding about their value as a being, the magnitude of their decline for the AOO, and the pressures that inhibit their recovery. The AOO have led various advocacy initiatives, including the collection of Traditional Ecological Knowledge mentioned previously, calling on government organizations for nation-wide protections, and supporting eel passage improvements at the Calabogie Generating Station. Krystal conveys that future recovery efforts in the park would be significant in reviving the AOO connection to Pimisi in a landscape where they have deep ties and continue to harvest in. Though she agrees with Mark's perspective on the complicated role of park dams today, she notes that aside from the loss of Pimisi, these barriers have likely influenced harvesting activities:

From the AOO perspective, it stems back to the 'good and bad' conversation about dams. They serve an important purpose in protecting current ecological integrity, but they have also created connectivity issues. They've

12 For more information on the AOO Land Claim negotiations, see "Overview of Treaty Negotiations," Algonquins of Ontario, Our Treaty Negotiations, <https://www.tanakiwin.com/our-treaty-negotiations/overview-of-treaty-negotiations/>.

13 Krystal Mitchell (Fisheries and Wildlife Management Advisor, Algonquins of Ontario), "Krystal Mitchell Interview," interview by author, November 23, 2023, transcript, 161.

*been on the park landscape for such a long time through water management and the logging era – it’s a long history of impact. I don’t know how this has specifically affected the use of areas by Algonquin communities. The history of dams in Algonquin Park has certainly shaped where people are harvesting and how they harvest based on the movement of fish through watersheds and what type of barriers fish communities are encountering.*¹⁴

Recognizing these cultural impacts, our conversation highlights that Pimisi recovery is entwined with the rights and self-determination of the Algonquin people. Algonquin Park’s founding as a colonial project enabled through the denial of Indigenous peoples and resource-oriented views of the land is a difficult context to grapple with in considering how its management might move forward ‘in a good way.’ Krystal believes that furthering reconciliation entails increased AOO involvement in park planning and management – a collaborative approach that is currently being attempted in the Fisheries Management Planning process. As she explains,

*Algonquin Park is within unceded Algonquin Traditional Territory and the park is named after the people, so there must be opportunity for significantly more collaborative planning and management of the park to ensure that there is more input and incorporation of Algonquin perspectives, Traditional Knowledge and Algonquin cultural heritage in park planning, and to ensure that the AOO are consulted on Algonquin Park management decisions.*¹⁵

Given the significance of Pimisi for the Algonquin people, Krystal sees their recovery as relevant to the park’s long-term management planning, which is “looking forward to the next 25 to 50 years.”¹⁶ Using the phrase “eel-ready,” she encourages the proactive planning and implementation of regulations and interventions to facilitate Pimisi migration at park dams, though she stresses coordinating these measures with addressing hydropower facilities along the Kichissippi, which pose the most immediate threat.

Another insight raised in our conversation is the potential impact of Algonquin Park’s participation in recovery beyond the Kichissippi Watershed, contributing to what Krystal refers to as “a national level scope of people working for eel.”¹⁷ She shares that the AOO are part of a national coalition for Pimisi alongside organizations like the Canadian Wildlife Federation and the Mohawks of Akwesasne; together, local knowledge, monitoring and

14 Mitchell, “Krystal Mitchell Interview,” 166.

15 Mitchell, “Krystal Mitchell Interview,” 169.

16 Mitchell, “Krystal Mitchell Interview,” 165.

17 Mitchell, “Krystal Mitchell Interview,” 163.

advocacy are collectivized to apply pressure on government and industry. As she puts it, “the more people that can join that force and the stronger the voice, the more powerful the pressure is.”¹⁸

I proceeded to ask Krystal about the cultural impacts that Pimisi recovery in the park would have for the AOO. The most significant change that she envisions is a future restoration of harvest opportunities:

*Hopefully in the future there will be an abundance of eel that can support the Algonquin connection like it used to exist, and the Algonquin people can rebuild a strong physical connection to the eel. Hopefully, that will look like a meal of eel for Algonquin families down the road if eel populations increase to that point. There is no intention right now for harvest on that scale. Can you imagine if the Algonquins were able to again harvest eel in Algonquin Park? In their Traditional Territory of the Ottawa River Watershed? That would be incredible. The park will play an important role in recovering eel to that point through protections, potential dam removal or refurbishments, and through regulations and fisheries management throughout the park. The eel are battling threats like invasive species and climate change on top of all the barrier issues but what a beautiful future it would be if there was Pimisi returning to Algonquin Park!*¹⁹

Related to this hope, Krystal imagines the possibility of multi-generational skill sharing events in the park that could connect community members to traditional foodways and other practical skills. Reestablishing embodied connections with Pimisi through these practices, in her view, are critical for “building the relationship,” particularly for Algonquin youth.²⁰

*[T]he eel harvest could expand into traditional skill sharing. Things like that get lost too over time. Like how to prepare the eel for food, how to prepare it for medicinal uses. There was such a plethora of uses that the Algonquin people had for American Eel. In a future where Pimisi returns to the park, maybe there are workshops that could happen to teach those skills to the Algonquin people by those that may still remember.*²¹

[C]urrently there's whole generations of Algonquins that have never seen an eel and certainly have never held one or seen one in the wild or had a traditional meal of eel. It's that cultural connection that's significantly

18 Mitchell, “Krystal Mitchell Interview,” 163.

19 Mitchell, “Krystal Mitchell Interview,” 169.

20 Mitchell, “Krystal Mitchell Interview,” 170.

21 Mitchell, “Krystal Mitchell Interview,” 171.

*impacted by the absence of eel as well. Having opportunity in the future for physical handling, even if they are only here in small numbers to start, helps build the connection and build the motivation for further protection. By engaging Algonquin youth and showing them that there's hope for eel to come back and why that's important, you're building that awareness and by building an awareness, you're building the relationship.*²²

Krystal also acknowledges the potential for collaborative research and monitoring related to recovery efforts, thereby “connect[ing] Algonquin people with natural resource management and species of concern within the park.”²³ Based on her experience partnering with the AOO during her career at Harkness, she believes that similar opportunities for community members to assist with work like data collection could be integrated.

In addition to strengthening AOO relationships, Krystal identifies the need for addressing public awareness about Pimisi and their connection to the Kichissippi tributaries in Algonquin Park, and sees this complimenting increased education on park dams. Given its visitor outreach and educational programming, she believes that with input from the AOO, the park has “a responsibility to share [Pimisi’s] story and build that care and advocacy effort.”²⁴

*I think in terms of education for Pimisi, it's important that the story is told. I think there was somebody in that Fisheries Management Plan meeting that you attended that suggested that there be a whole park publication dedicated to the eel. It would be a great opportunity to tell the story of an important predator and an important part of the cultural and natural heritage of Algonquin Park. Thinking about your dam project, if there's storyboards or signage going up that can tell the story of watershed connectivity, I think Pimisi needs to be a part of that story because dams are such a significant barrier to their movement and their historic range.*²⁵

Bringing Pimisi’s story to the forefront, as Krystal suggested throughout our conversation, could prompt further consideration from the park community about the history of the land they are on and their place in it. Her insights left me with an impression of the potential impacts of recovery on human relationships by reviving cultural practices, inviting stewardship through monitoring, and promoting care and advocacy.

22 Mitchell, “Krystal Mitchell Interview,” 170.

23 Mitchell, “Krystal Mitchell Interview,” 170.

24 Mitchell, “Krystal Mitchell Interview,” 170.

25 Mitchell, “Krystal Mitchell Interview,” 168.

A broader "connectivity story"

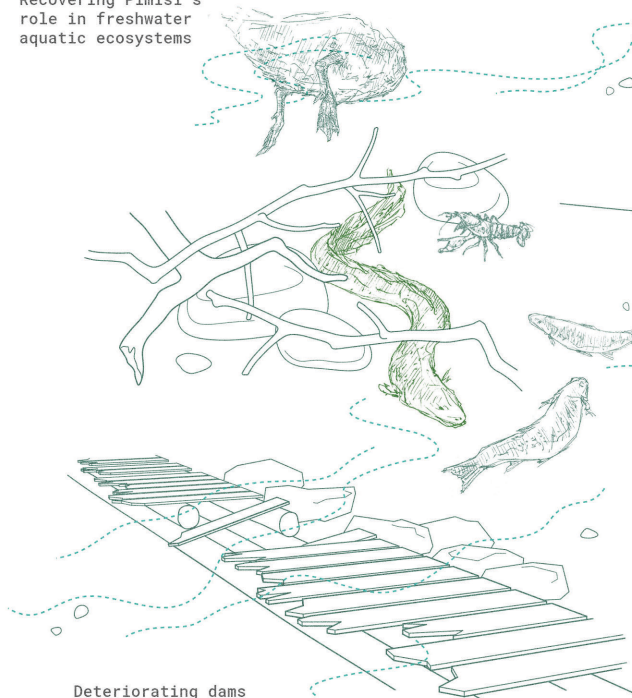
"The connectivity report, with Annie Bay dam as an example, demonstrates that natural movement between lakes for Whitefish, Lake Trout, Cisco and others are native species arriving at the dam. I interpret that to mean that their inter-lake movement under a natural system would be quite extensive. It's not just Pimisi." (155)

"The food webs above the Shirley Lake dam are entirely native, you know, post-glacial. Below the Shirley Lake dam is a suite of these top predators that are just unbelievable – Smallmouth, Largemouth, Pike, Walleye, Rock Bass – all of them introduced." (154)

"I get [the park dam] connection to water management downstream for hydroelectric power generation. If the Annie Bay dam were to fail, the hydroelectric facility downstream of Bark Lake could be crested and that's probably not a good thing." (154)

"They had an important role to play in the ecosystem in terms of consumption and predation and energy transfer – the functioning of an aquatic ecosystem. They are probably hugely important in the shallow areas of lakes." (159)

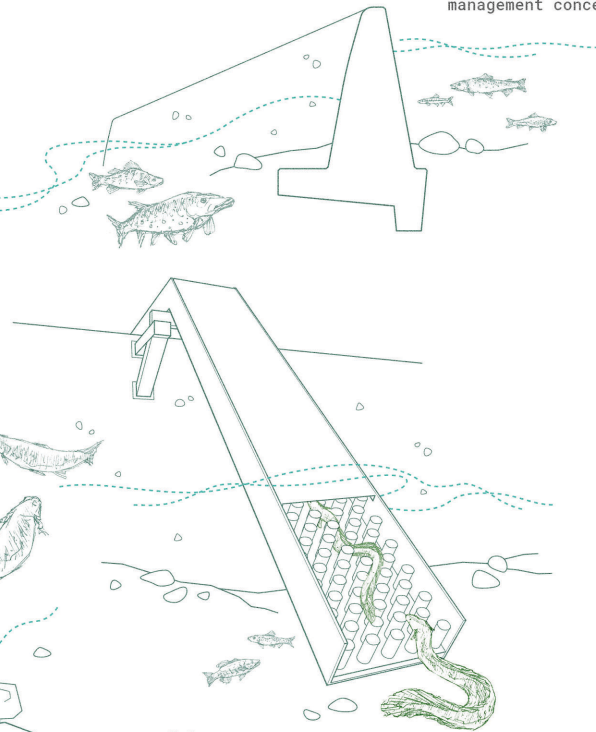
Recovering Pimisi's role in freshwater aquatic ecosystems



Deteriorating dams

"Some of the dams are in rather broken-down states. The dam at the outlet to Hogan is an old log crib dam, probably from logging days. There's water shooting out between the rocks and the dam, right? Over time it will wear down, but there aren't invasive species in that watershed at that point." (154)

Conservation and water management concerns



Eel passage

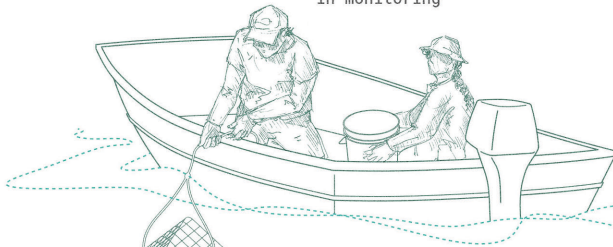
"I think if you could successfully move eel up a ladder system that is exclusively used by eel, if you can do that, that would be an extraordinary story of recovery and conservation and the importance of this landscape. You would gain on the ecology side. You would improve on the cultural reconciliation side." (158)

Fig. 3.2 [above]
Author's interpretation of Mark Ridgway's perspectives on Pimisi recovery.

Fig. 3.3 [right]
Author's interpretation of Krystal Mitchell's perspectives on Pimisi recovery.

"Being involved in monitoring and the on-the-ground work for fisheries and other species within Algonquin Park – this will be an important opportunity to connect Algonquin people with natural resource management and species of concern within the park." (170)

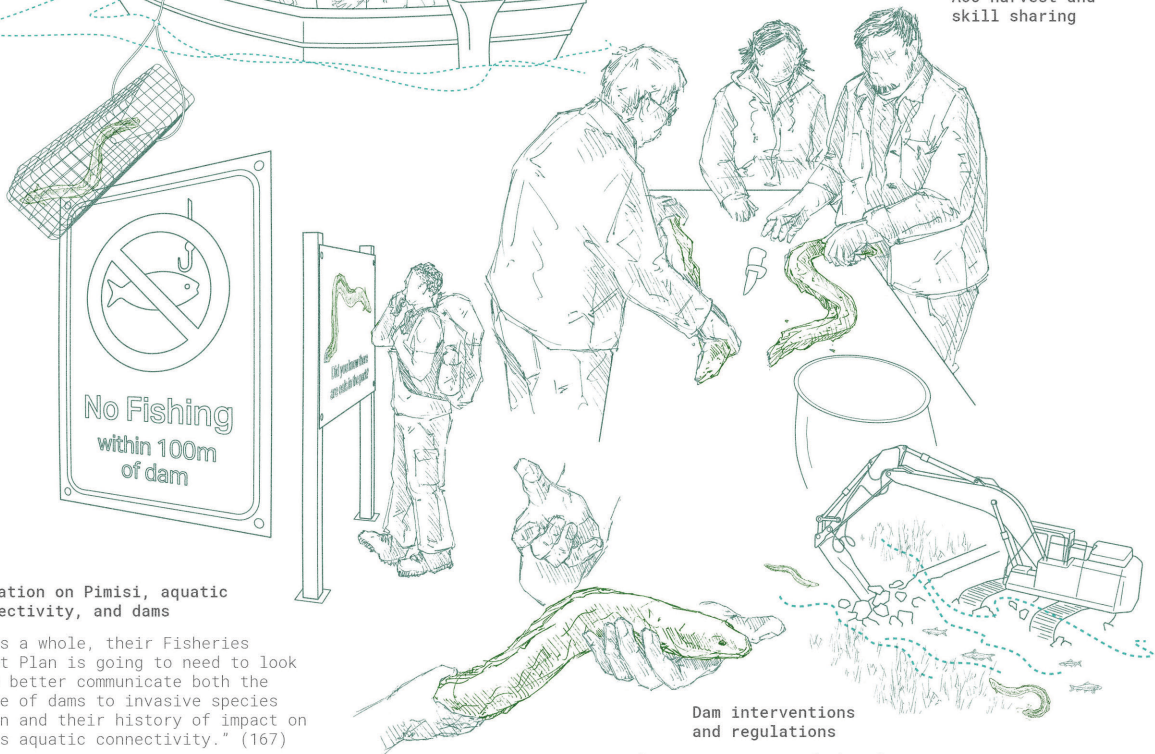
A00 involvement in monitoring



"Algonquin Park is within unceded Algonquin Traditional Territory and the park is named after the people, so there must be opportunity for significantly more collaborative planning and management of the park to ensure that there is more input and incorporation of Algonquin perspectives, Traditional Knowledge and Algonquin cultural heritage in park planning, and to ensure that the A00 are consulted on Algonquin Park management decisions." (169)

"There was such a plethora of uses that the Algonquin people had for American Eel. In a future where Pimisi returns to the park, maybe there are workshops that could happen to teach those skills to the Algonquin people by those that may still remember." (171)

A00 harvest and skill sharing



Education on Pimisi, aquatic connectivity, and dams

"I think as a whole, their Fisheries Management Plan is going to need to look at how to better communicate both the importance of dams to invasive species prevention and their history of impact on the park's aquatic connectivity." (167)

"I think in terms of education for Pimisi, it's important that the story is told... It would be a great opportunity to tell the story of an important predator and an important part of the cultural and natural heritage of Algonquin Park." (168)

Dam interventions and regulations

"Can you imagine if the Algonquins were able to again harvest eel in Algonquin Park? In their Traditional Territory of the Ottawa River Watershed? That would be incredible. The park will play an important role in recovering eel to that point through protections, potential dam removal or refurbishments, and through regulations and fisheries management throughout the park." (169)

Recovery Objectives and Programming

My conversations with Mark and Krystal generated qualitative information – descriptions about impact and use that I organized into a set of recovery objectives that would come to inform my design process [Fig. 3.4]. While they understood the focus of recovery to be Pimisi, their responses also captured its impact on the broader park ecology. Mark was concerned with the relationships of Pimisi to aquatic ecosystems and dams in the park. Krystal's perspective on recovery added insights on its human impact, particularly representing the Algonquins of Ontario experiences that she had come to know through her work. Another layer to their responses indicated that recovery is a process that is both *technical* and *interpretive*. In addition to technical requirements such as eel passage, they noted the importance of sharing stories about Pimisi.

After analysing and comparing their responses, I defined 'aquatic connectivity,' 'human engagement,' and 'habitat restoration' as three potential objectives for recovery. Each objective has the capacity to be both technical and interpretive. Collectively, they address the needs of Pimisi, while recognizing their relationships with humans and other beings. Within each objective, I began to explore the possibilities for space programming.

Aquatic Connectivity

As identified by Mark and Krystal, the primary aim will be restoring aquatic connectivity at park dams to enable Pimisi to safely migrate upstream and downstream and occupy previously inaccessible habitats. Park dams currently have no measures in place that would make them in Krystal words, "eel-ready." Recognizing the concerns surrounding the conservation of native fish assemblages and water management that Mark raised, the appropriate intervention approach would need to be evaluated based on site-specific considerations.

Human Engagement

The Algonquin Park community consists of a diverse range of human users with varying relationships to and knowledge of Pimisi. I envision three sub-categories within this objective that support a range of human connections to Pimisi:

- › Education: Combining Mark and Krystal's suggestions, furthering visitor awareness about Pimisi, aquatic connectivity, and park dams by communicating educational information and the stories of Algonquin people has the potential to engender care and advocacy. It is worth

referencing the park's existing typologies for educational spaces, whether that be within a dedicated building, or along a trail, or a combination of these two.

- › Culture: From my conversation with Krystal, I gathered that there is an opportunity to develop cultural use programming to support the Algonquin Anishinaabeg connection alongside the return of Pimisi. A space to accommodate large community gatherings near a harvesting site could be useful for hosting storytelling and skill sharing activities. For food related activities, an area to prepare and cook harvested Pimisi could also be incorporated.
- › Monitoring: Both Mark and Krystal found that monitoring work would be useful within the recovery process. As Krystal mentioned, this could create opportunities for Algonquin involvement in land management. Considerations such as access to monitoring sites and the types of facilities and equipment needed would be helpful for translating these activities into a design.

Habitat Restoration

The final objective addresses possible environmental improvements to recovery sites based on the behaviours and habitat requirements of Pimisi and other aquatic dwellers. The conversations with Mark and Krystal touched on some of the impacts of dams on aquatic ecosystems in the park. Sites with deteriorating dams where invasive species movement are less of a concern, as Mark pointed out, could be candidates for a larger scope of environmental remediation.

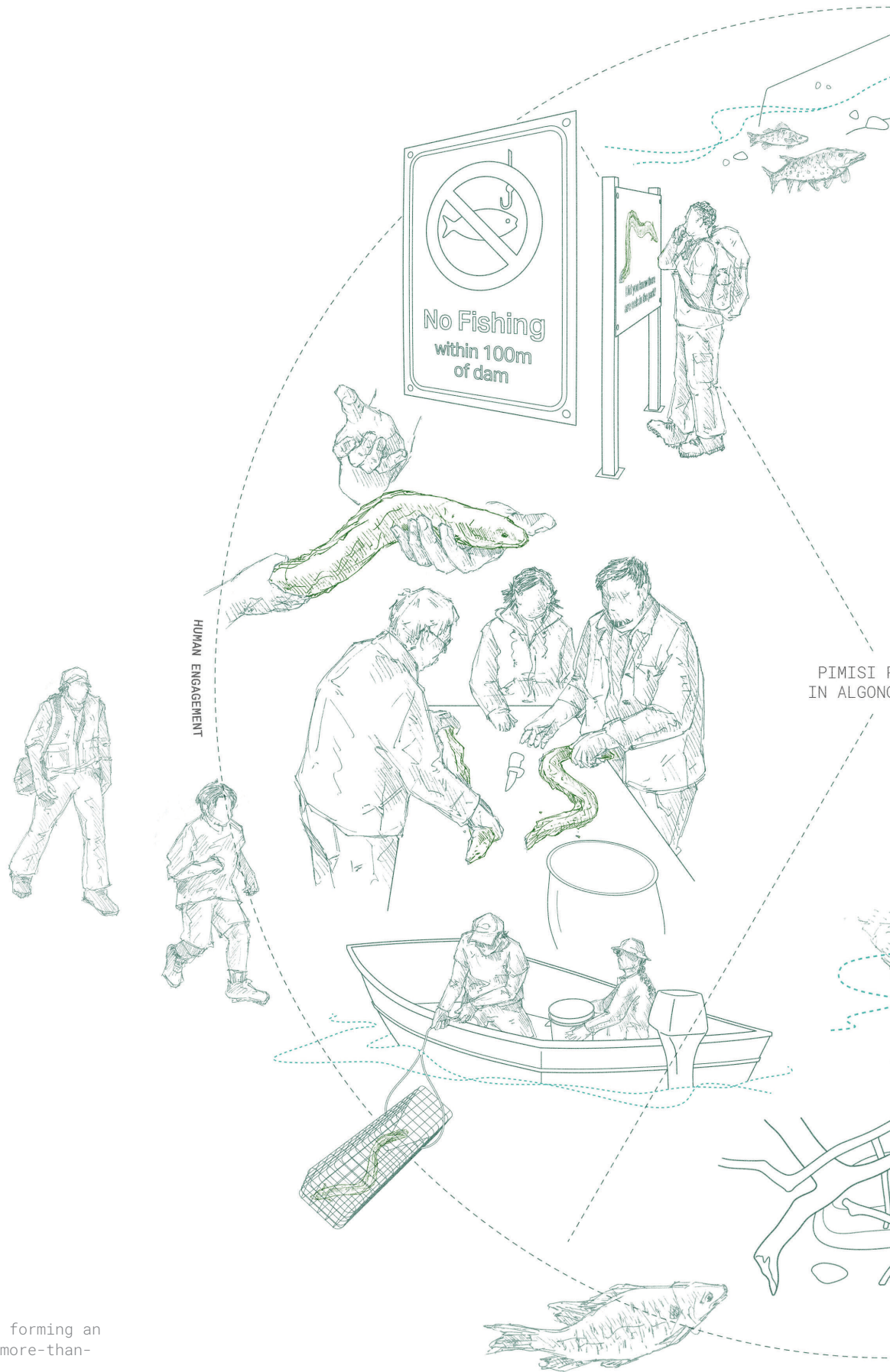
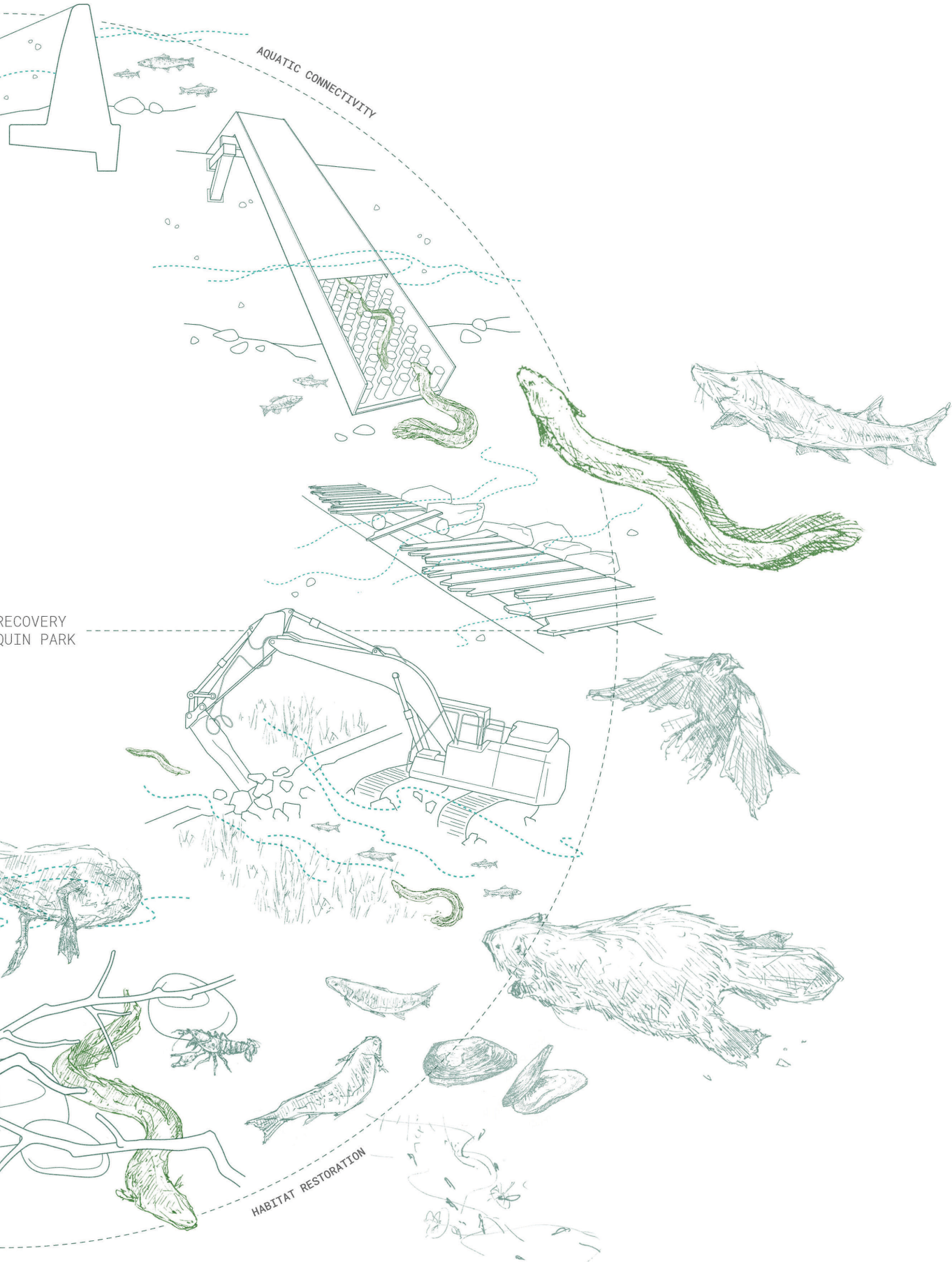


Fig. 3.4
Pimisi recovery objectives, forming an ecology of programming and more-than-human and human actors.



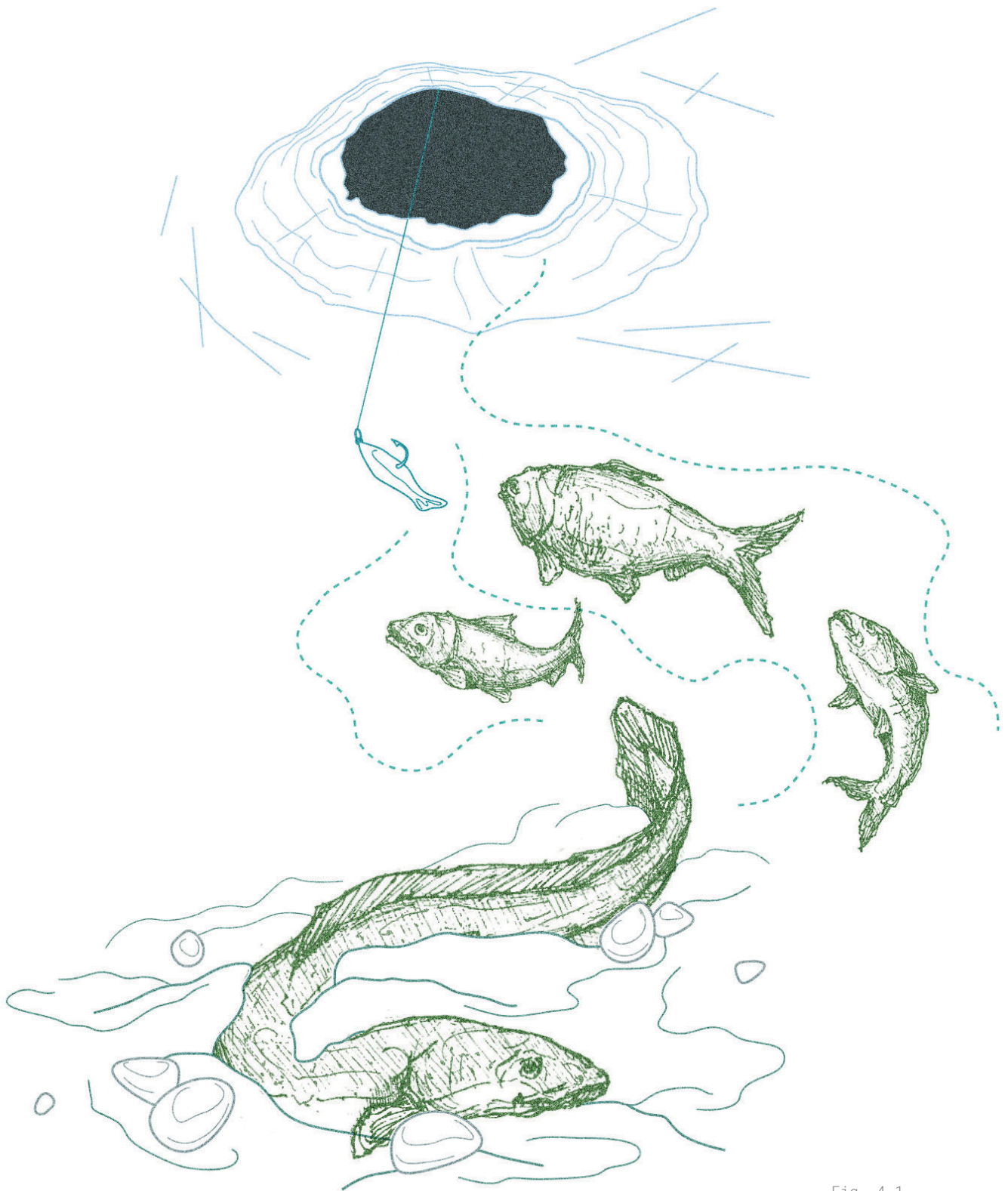


Fig. 4.1
Pimisi in their
yellow eel stage
burrows in the mud
for overwintering.

Dam Intervention Studies

A dam's stability and resistance to change is only true insofar as its ongoing maintenance. Many watercourses flowing through Algonquin Provincial Park have been dammed for over a century due to a series of dam reconstructions. As if by default, the reversion to infrastructural ownership and control of water has allowed these barriers to Pimisi migration to endure. This chapter seeks to define a dam intervention approach by examining the spatial and temporal relationship between park dams and the Pimisi recovery objectives derived from my interview study.

The perceived permanence of park dams due to their longstanding presence is refuted by Laura Wildman in "Dam Removal: A History of Decision Points" who identifies that all dams are engineered to perform within a limited operational lifespan.¹ Wildman's recognition that dams are finite destabilizes the regime and legacies of dam operations that I tackle in this research. This becomes a design prompt of how to translate Pimisi recovery objectives into spatial interventions that advance relational thinking while recognizing dam aging as a further constraint.

Within the Kichissippi Watershed, an aging dam at the park's Cache Lake is positioned as the site for a design proposal. I examine how Pimisi recovery could be implemented spatially at this dam, evaluating two existing intervention approaches: improvement and removal. The installation of eel bypass systems at Akikodjiwan (Chaudière Falls) and the demolition of dams along the Mill River serve as case studies of each approach that unpack their design considerations and relationships to the recovery objectives described previously. Learning from these projects, I speculate on phasing both approaches to support Pimisi recovery as the Cache Lake dam ages.

¹ Laura Wildman, "Dam removal: A history of decision points," in *The Challenges of Dam Removal and River Restoration*, eds. Jerome V. DeGraff, and James E. Evans (Boulder, Colorado: Geological Society of America, 2013), 1.

Introduction to the Cache Lake Dam

Near the headwaters of the Madawaska River, a concrete dam at the mouth of Algonquin Park's Cache Lake is the most upstream among a succession of barriers that have collectively extirpated Pimisi from this sub-watershed of the Kichissippi [Fig. 4.5]. Prolonged dam operations at this site have led to an onslaught of disruptions to their former habitat. Despite the habitat loss that has likely ensued as a result, the dam has become a fixture for Cache Lake visitors and cottage residents, supporting their paddling, cycling, and hiking activities. My encounter with the dam occurred two hours into a grueling hike along the 'Track and Tower' trail where it is one of many of interpretive markers describing the site's history. Even from a distance, I noticed that the dam had begun to tire, its concrete cracked and patched from repairs – worn from its slow battle with the river [Fig. 4.4].

Akin to other park dam sites, the dam at Cache Lake exhibits a continued return to infrastructural ownership and control of the Kichissippi Watershed. Opening the trail guidebook, I flipped to the corresponding section titled, "Dammed Three Times," which describes how this fissure inflicted on the river has persisted for over a century, having been remade several times. The formerly turbulent Madawaska was first subdued by a wooden logging dam in the 1880s and then by concrete reconstructions in 1930 and 1966 [Fig. 4.3].² The most recent of these reconstructions still operates, controlling the outflow of Cache Lake for recreational uses.³

The state of Cache Lake prior to dam operations remains unknown to me, but there are indicators of how it has altered its environment. From the trail upstream of the dam, I caught glimpses of the lake nearly touching the tree line [Fig. 4.6]. Pickerelweed, Canada goldenrod, and royal fern occupy what marginal space is left in between. With the dam in place, water has risen past natural proportions forming a slow-moving reservoir that is 289.8 hectares in area and 8.78 cubic metres in volume.⁴ By regulating what would otherwise be a varied natural flow regime, other more-than-human processes have been interrupted. Reinforcing Mark Ridgway's observations on connectivity from our interview, fish surveys of the park show that species like Longnose



Fig. 4.2
Key plan of the
Cache Lake dam in
the Kichissippi
Watershed.

2 The Friends of Algonquin Park, *Track and Tower Trail: A Look into Algonquin's Past* (Queen's Printer for Ontario, 2019).

3 *Madawaska River Water Management Plan*, (Toronto, Ontario: Ontario Ministry of Natural Resources, 2009), 41.

4 Trevor Middel, Mark Ridgway, Nick Lacombe, and Allan Bell, *Landscape Scale Lake Surveys of Algonquin Provincial Park*, Dryad, 2022, dataset, <https://doi.org/10.5061/dryad.4tmpg4fbz>.

Fig. 4.3
A drawing of the
historical stoplog
dam and log chute
at Cache Lake from the
'Track and Tower'
trail guidebook.

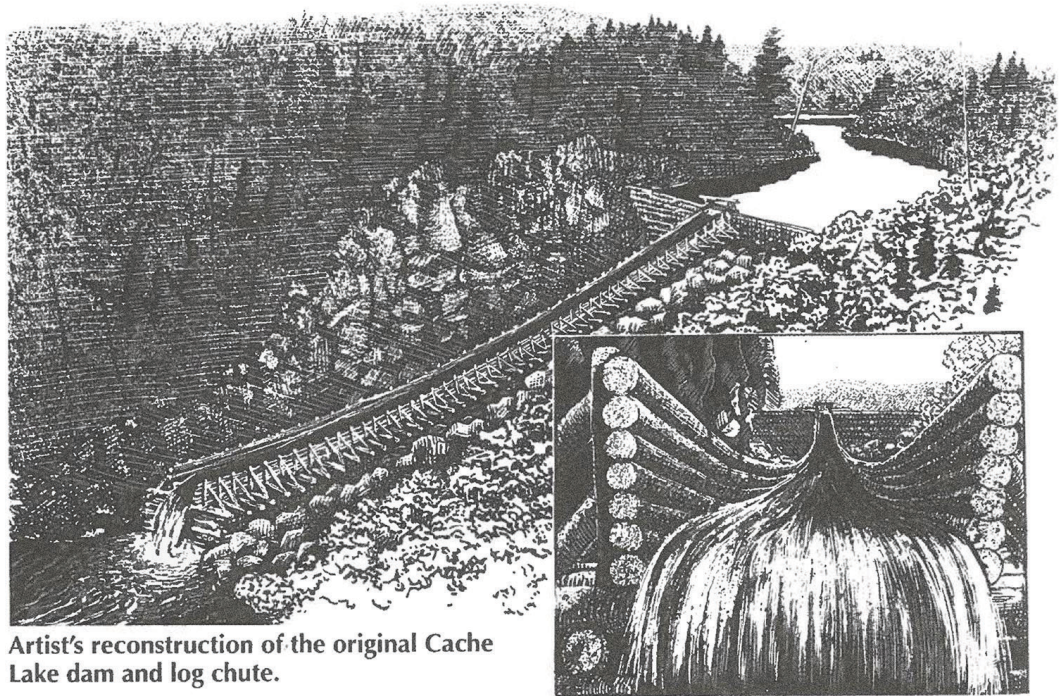


Fig. 4.4
The current concrete
stoplog dam at Cache
Lake, August 2023.
Repairs to the dam's
spillover weir are
visible to the left
of the view.



Fig. 4.5
 Axonometric projection of the existing
 Cache Lake area, indicating site
 connections and its location within the
 Madawaska River sub-watershed.

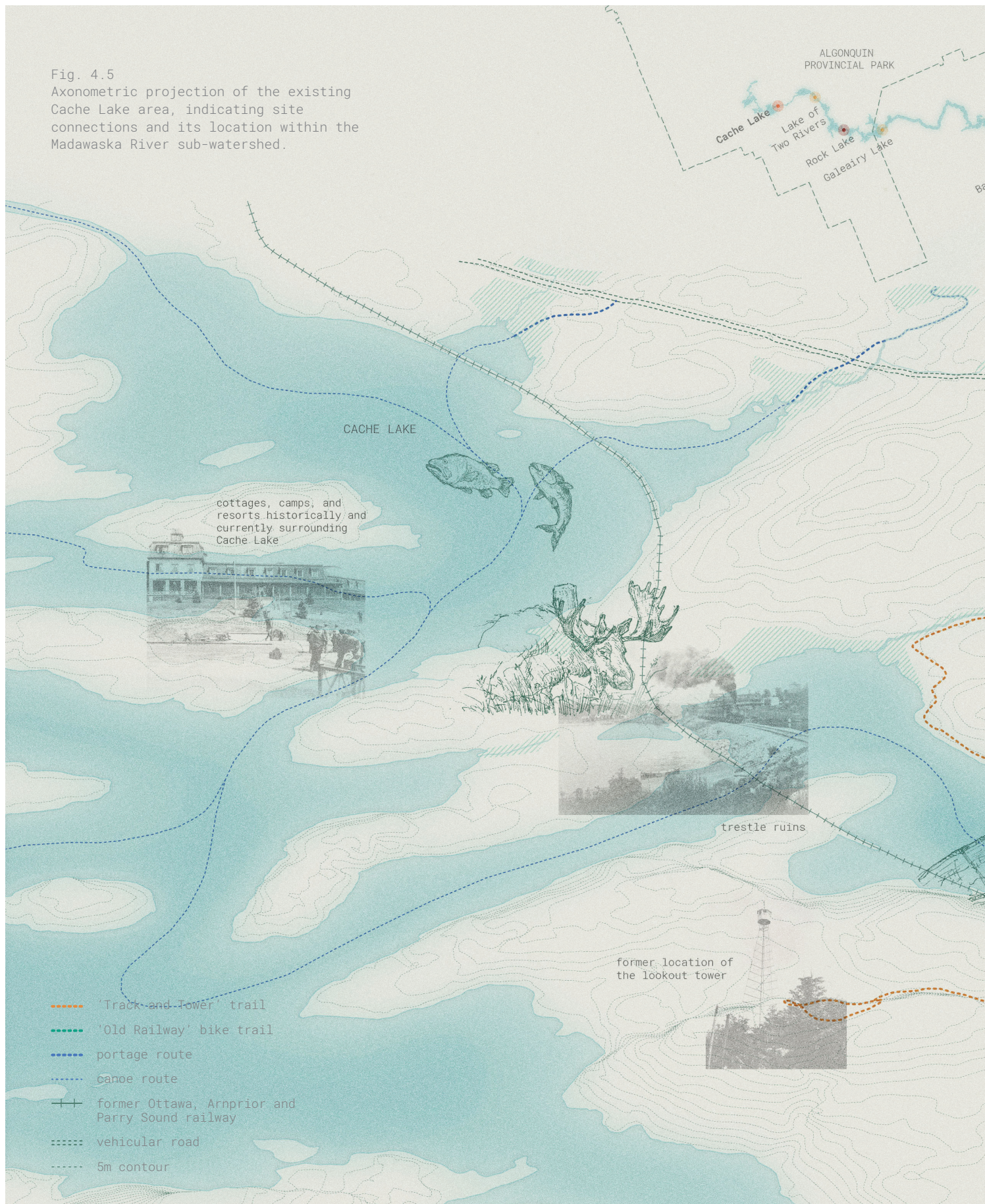






Fig. 4.6
Cache Lake upstream
from the dam where
the tree line nearly
meets the water,
August 2023.

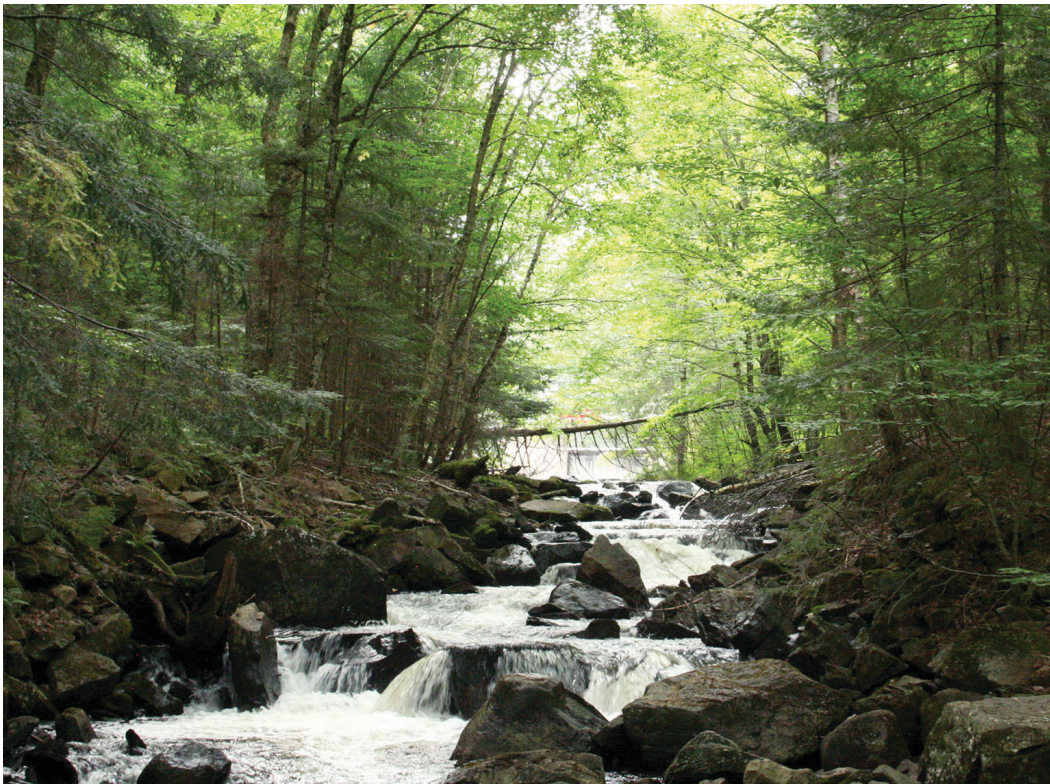


Fig. 4.7
The Madawaska River
downstream from
the dam, showing
the sediment-hungry
riverbed, August
2023.

Sucker and Lake Trout are prevented from moving downstream.⁵ In addition to this connectivity issue, it can be assumed that layers of sedimentary deposit have accumulated behind the barrier.

Downstream impacts have resulted from the river's recession and interrupted connectivity. In 1922, a cottager observed Pimisi trapped below the former logging dam on this site – an event foreshadowing their current absence.⁶ Damming Cache Lake has not only contributed to Pimisi decline as this historical account suggests, but it has also noticeably depleted their habitat. I followed the Madawaska River along the trail as it poured steadily over the dam's sluice gate and weir to find that the riverbed downstream was all exposed bedrock [Fig. 4.7]. Water moves around moss-covered rocks in a clumsy descent that is likely a ghost of its former vigour. Flanking banks rise steeply with a canopy of maple, birch, and spruce who have managed to root themselves in the rocky substrate. What biodiversity survives, has done so without nourishment from flowing sediment, whose movement and deposition has a multifaceted role in shaping healthy riparian ecosystems, including channel morphology, fish habitat, and plant growth.⁷

As I looked to define a site to generate an approach for Pimisi recovery, the conditions at the Cache Lake dam proved amenable. Its operating regime is a disruption to Pimisi lifeways and the riparian community they depend upon. Compounded with these ecological imbalances, there is a convergence of human and more-than-human beings through the site's recreational use. While these conditions are shared by other park dam sites, the initial deterioration of the Cache Lake dam situates Pimisi recovery within the reality of infrastructural limitations.

5 Ridgway et al. indicate fish distributions in the park. M. Ridgway, T. Middel, and A. Bell, *Aquatic ecology, history, and diversity of Algonquin Provincial Park* (Peterborough, Ontario: Ontario Ministry of Natural Resources and Forestry, Science and Research Information Report IR-10, 2017), <https://www.harkness.ca/publications/algonquin-aquatic-ecology/>. For information on park dams and connectivity, see also, M. Ridgway, T. Middel and L. Wensink, *Aquatic connectivity, fish introductions, and risk assessment in Algonquin Provincial Park* (Peterborough, Ontario: Ontario Ministry of Natural Resources and Forestry, Science and Research Information Report IR-13, 2018), <https://www.harkness.ca/publications/algonquin-aquatic-ecology/>.

6 Donald J. Beauprie, *Destination Algonquin Park: Tracks to Cache Lake and the Highland Inn* (Renfrew, Ontario: General Store Publishing House, 2011), 171.

7 Wohl et al.'s article provides further details about sediment regimes in riparian ecosystems. See Ellen Wohl, et al., "The Natural Sediment Regime in Rivers: Broadening the Foundation for Ecosystem Management," *BioScience* 65, no. 4 (April 2015), <https://doi.org/10.1093/biosci/biv002>.

Improve or Remove?

Improvement and removal are two existing pathways to intervening at dams that have been applied for Pimisi recovery efforts. Though they share the same end goal of recovery, the scope of their impacts differs significantly. Improvements to dams to assist with Pimisi's upstream and downstream migration is the conventional approach but implies a dam's continued maintenance. As a disruption to the status quo, dam removal prompts a wider breadth of impacts for Pimisi and their relations. To determine an appropriate response for the Cache Lake dam, I investigated these approaches, identifying their design considerations as it relates to Pimisi inhabitation of this site.

Dam Improvement

A widely used approach for several eel species, including Pimisi, entails improving dams with bypass infrastructures that are small in scope, cost effective, and non-invasive to their operations. An inclined ramp called an 'eel ladder' is typically used for upstream bypass of the barrier. In response to the swimming ability of Pimisi, they provide a textured climbing substrate moistened with running water throughout the ascent. The efficacy of dam improvement at Cache Lake hinges on an understanding of Pimisi physiology and site conditions, which lead to the following considerations [Fig. 4.10]:

- › Intake location: Successful eel ladder use is improved by locating intakes near a source of plunging water and the riverbank, which provide and the 'attraction flow' and 'edge effect' that support navigation.⁸ The Cache Lake dam outflow and the riverbank would be important navigation guides for Pimisi to site the ladder intake.
- › Substrate variation: Pimisi size and individual behaviours are shown to affect their use of ladders with uniform substrates.⁹ Based on their life cycle, Pimisi at Cache Lake would be in their yellow and silver (sexually mature) stages. Varying the size and spacing of climbing substrates could account for these life stage and behavioural differences.
- › Natural stream emulation: Bypass designs that emulate characteristics of natural streams, commonly referred to as 'nature-like fishways,'

8 Adam T. Piper, Rosalind M. Wright, and Paul S. Kemp, "The influence of attraction flow on upstream passage of European eel (*Anguilla anguilla*) at intertidal barriers," *Ecological Engineering* 44 (2012): 334, <https://doi.org/10.1016/j.ecoleng.2012.04.019>.

9 Matthew A. Mensinger et al., "American eel personality and body length influence passage success in an experimental fishway," *The Journal of Applied Ecology* 58, no. 12 (2021): 2766–2767. <https://doi.org/10.1111/1365-2664.14009>.

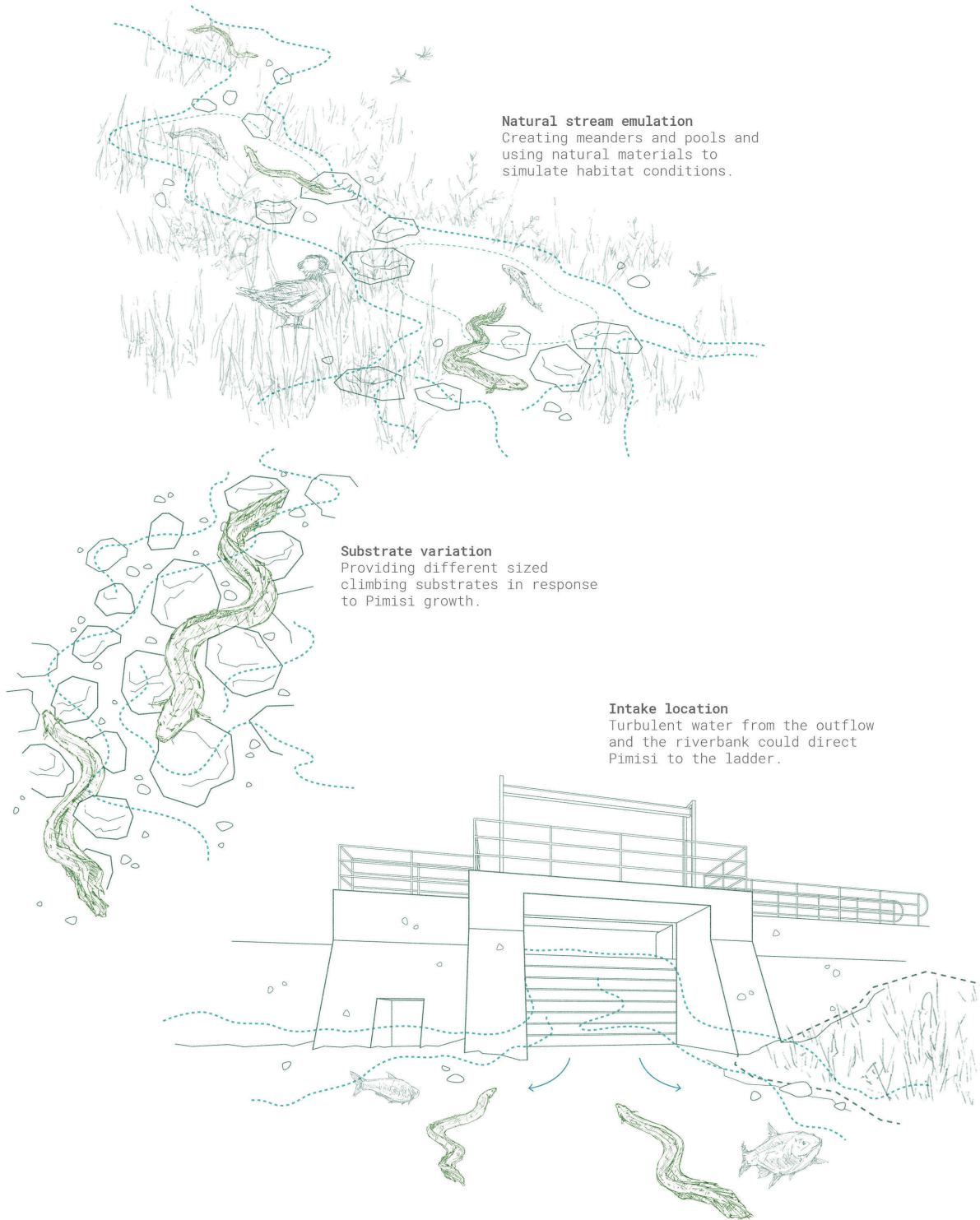
Fig. 4.8
An eel and fish ladder provides connectivity at a small weir along the Saw Mill River in Yonkers, New York. Photograph by Nathan Kensinger, 2016.



Fig. 4.9
Glines Canyon dam removal along the Elwha River in Washington. Photograph by the National Park Service, 2012.



Fig. 4.10
Technical
considerations for
dam improvement.



provide practical and architectural layers to the improvement approach. Though I have yet to find applications specific to eels, designs incorporating tiered rock pools generally support fish migrations by simulating habitat and attractive flow conditions.¹⁰ Integrating natural and ‘nature-like’ materials into climbing substrates could adapt this consideration to suit Pimisi swimming behaviour.

Dam Removal

The decommissioning and removal of dams has been implemented to a lesser extent in comparison to improvement interventions, but effectively supports Pimisi recovery within an environmental restoration agenda. Removal is often contentious given the perceptions and politics around dams and is complex due to the large and long-term scope of restoring their environmental disruptions to rivers and lakes. Removing the Cache Lake dam would entail considerations that mitigate short-term environmental changes and guide the long-term rehabilitation process [Fig. 4.11]:

- › Partial removal: Removing a dam to ensure that aquatic connectivity is uninhibited, while retaining a portion of the barrier is a strategy that has been used to account for a dam’s historical significance.¹¹ As the Cache Lake dam is already a part of the ‘Track and Tower’ trail interpretive experience, its remains could be leveraged for educational purposes to describe the history, role, impacts of park dams.
- › Sediment management: As a short-term result of dam removal, the release of sediment accumulated behind the Cache Lake dam would need to be managed. Depending on the site conditions and quality of sediment, this could be achieved through natural erosion timed with the dam’s removal during a period of moderate flows, manual dredging, or a combination of the two.¹²
- › Riverbank stabilization: Dam removal typically produces initial instabilities within a river system, resulting from a recession of the upstream reservoir an increase to the river volume downstream.¹³

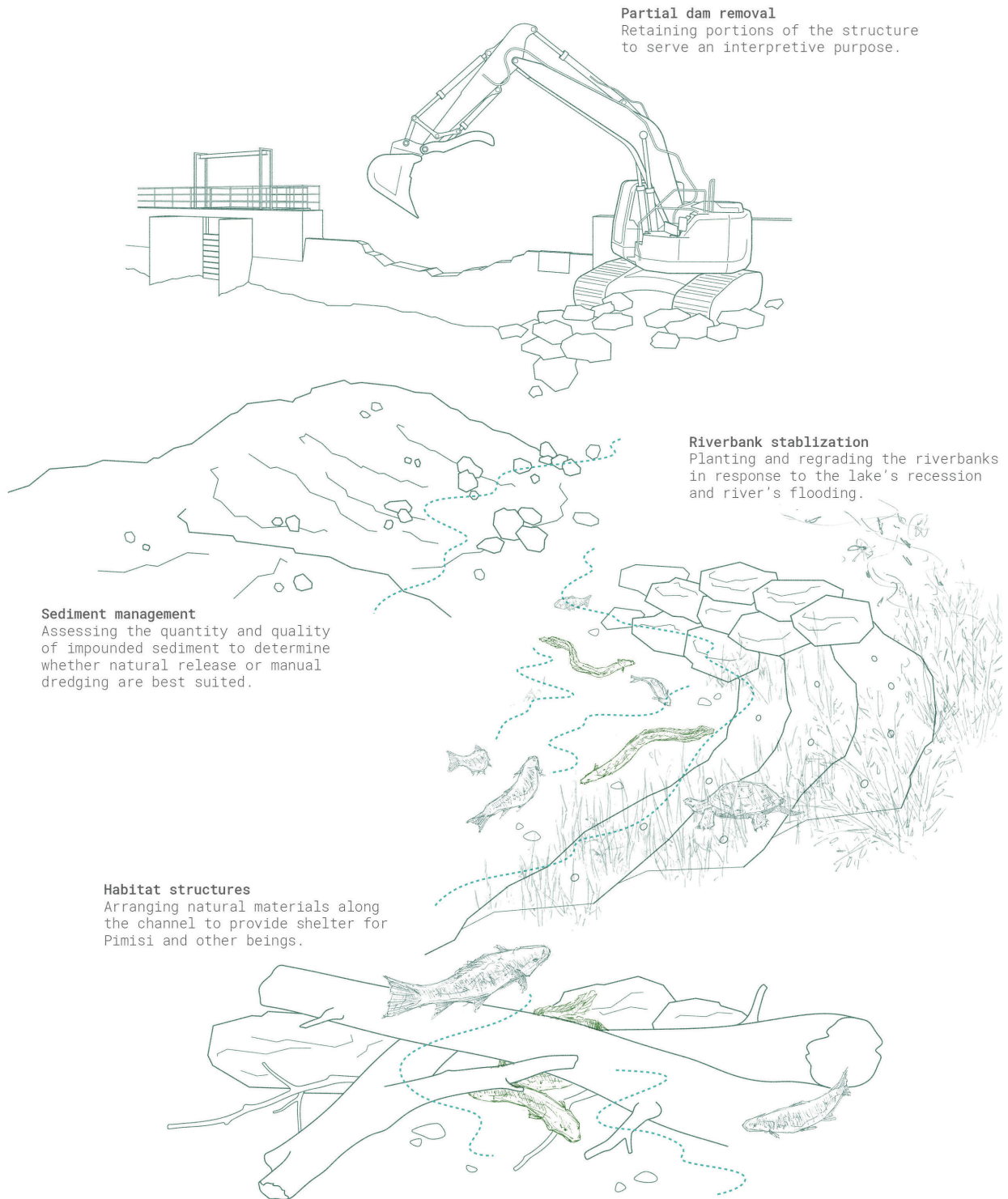
10 Abigail E. Franklin et al., “Evaluation of Nature Like and Technical Fishways for the Passage of Alewives at Two Coastal Streams in New England,” *Transactions of the American Fisheries Society* (1900) 141, no. 3 (2012): 625, <https://doi.org/10.1080/00028487.2012.683469>.

11 Jeffrey J. Duda and Ryan J. Bellmore, “Dam Removal and River Restoration,” in *Encyclopedia of Inland Waters, Second Edition*, eds. Thomas Mehner and Klement Tockner (Elsevier Inc., 2022), 579, <https://doi.org/10.1016/B978-0-12-819166-8.00101-8>.

12 Angela T. Bednarek, “Undamming Rivers: A Review of the Ecological Impacts of Dam Removal,” *Environmental Management* 27, no. 6 (2001): 808–810, <https://doi.org/10.1007/s002670010189>.

13 Duda and Bellmore, “Dam Removal and River Restoration,” 581–582.

Fig. 4.11
Technical
considerations for
dam removal.



Partial dam removal
Retaining portions of the structure
to serve an interpretive purpose.

Riverbank stabilization
Planting and regrading the riverbanks
in response to the lake's recession
and river's flooding.

Sediment management
Assessing the quantity and quality
of impounded sediment to determine
whether natural release or manual
dredging are best suited.

Habitat structures
Arranging natural materials along
the channel to provide shelter for
Pimisi and other beings.

Managing the drainage of Cache Lake could entail planting native wetland species, shrubs, and trees to protect its exposed shoreline from erosion. Downstream, regrading the riverbanks with natural materials could help to stabilize the new flow.

- › Habitat structures: Pimisi inhabitation of the bottom of river channels creates a need for shelter opportunities formed by natural structures such as rocky outcrops and sunken logs.¹⁴ The insertion of boulders and large woody debris to amend habitat conditions and store flowing sediment has been widely used in river restoration projects and can be applied downstream along the Madawaska River.

Dam improvement and removal cannot be measured by their technical design considerations alone. The next sections examine each intervention approach in further detail through case studies that offer transferable lessons for the Cache Lake dam. My analyses will discuss how these intervention approaches align with the three Pimisi recovery objectives of aquatic connectivity, human engagement, and habitat restoration.

¹⁴ R. MacGregor et al., *Recovery Strategy for the American Eel (Anguilla rostrata) in Ontario* (Peterborough, Ontario: Ontario Ministry of Natural Resources, 2013), <https://www.ontario.ca/page/american-eel-recovery-strategy>.

Akikodjiwan (Chaudière Falls) Redevelopment

Curtains of mist hang above churning waters where, not far from my home in Ottawa, interventions supporting Pimisi recovery have been introduced to the hydropower operations at Akikodjiwan (Chaudière Falls). The Kichissippi's plunge marks the junction of a sacred Anishinaabeg meeting place and a seeming impasse scaled along Pimisi journeys. In a familiar tale of infrastructural ownership and control, dams spanning the national capital and Gatineau, Québec previously rendered the industrialized site inaccessible to Pimisi and the public. The 2018 completion of the redeveloped facilities negotiates these barriers to acknowledge the site's storied relationships through interventions providing aquatic connectivity and human engagement opportunities [Fig. 4.13].

Hydropower generation at Akikodjiwan relies on a large ring dam and six generating stations, which have severed Pimisi migration routes winding between the islands and the mainland. To summarize the scale and deadly impacts of these barriers, a 1902 report described “hundreds of thousands” of Pimisi clogging a mill wheel in one of the dams.¹⁵ Settler exploitation of the falls for logging, and later hydropower, has not only been detrimental to Pimisi inhabitation of the Kichissippi Watershed, but to Algonquin culture and spirituality. As Lynn Gehl describes in reference to teachings by Elder William Commanda, the falls and islands occupy a revered place in Algonquin storytelling and ceremonies.¹⁶

With the redevelopment, Portage Power made the decision to not only upgrade their hydro facilities, but to provide access for Pimisi and an interpretive visitor experience – unprecedented moves for dams in the Kichissippi Watershed. Speaking with Franz Kropp, the company's Director of Generation, I learned that this was propelled by an engagement process with the Algonquins of Ontario (AOO), who saw opportunities in the redevelopment to address Pimisi decline, Algonquin culture, and public access.¹⁷ Portage Power consulted Douglas Cardinal Architect to develop a concept design translating these requests into an eel ladder and a culturally sensitive landscape that could facilitate ceremonial uses [Fig. 4.14].



Fig. 4.12 [above]
Key plan of
Akikodjiwan
(Chaudière Falls)
in the Kichissippi
Watershed.

Fig. 4.13 [right]
Plan of the
Akikodjiwan
(Chaudière Falls)
redevelopment.

15 S. J. Kerr, *Fisheries and Fish Management in Ontario: A Chronology of Events* (Peterborough, Ontario: Ontario Ministry of Natural Resources, Biodiversity Branch, 2010), 21.

16 Lynn Gehl, “Chaudière Falls: Creator’s Sacred Pipe: My teacher Grandfather William Commanda,” Lynn Gehl, last modified August 6, 2016, <https://www.lynngehl.com/gehl-blogging/chaudiere-falls-creators-sacred-pipe>.

17 Franz Kropp (Director of Generation, Portage Power), in discussion with the author, July 26, 2023.



I would be shortsighted to ignore that this project occurred against a backdrop of competing visions of reconciliation and commercialization for the site. Years before, Elder Commanda proposed returning the spirituality of Akikodjiwan through dam removal, and the additions of a ‘Historic Interpretive Centre and Park,’ ‘Peace Building Meeting Site,’ and ‘Aboriginal Centre.’¹⁸ With hydropower generation continuing in Portage Power’s project and the construction of the Zibi condominiums at the adjacent property, commercial interests in Akikodjiwan persist but are not unchallenged. Opponents from within the Algonquin Nation, the Traditional Grandmothers of Pikwàkanagàn, and Free the Falls desire the return of Algonquin stewardship of the sacred site and the realization of Elder Commanda’s vision.¹⁹ Despite this trajectory, I hesitate to dismiss the redevelopment’s Pimisi and Algonquin focused programming, which are attempts at progressive changes and dam owner accountability.

Aquatic connectivity is introduced through bypass solutions at Generating Station #5. Originally, the bypass design was envisioned by Cardinal as a sinuous concrete-formed channel beside the ring dam; however, constraints that arose during the project’s approvals process led Portage Power to implement standardized infrastructures instead [Fig. 4.18].²⁰ Upstream migration is facilitated through an aluminum ladder with intakes at the dam’s tailrace and at a small channel [Fig. 4.16]. Kropp explains that the ladder’s plastic substrate allows Pimisi to ascend into a holding tank to await tagging and release.²¹ Gridded screens installed over the entrances to the generators prevent downstream migrants from turbine mortality, directing them instead into passage pipes located at the top and the bottom of the water column.²² The two routes run through the dam and are monitored by staff in a dedicated ‘Eel Viewing Room.’

Since their installation, the efficacy of these bypass solutions has been mixed. Pimisi migration has been observed in the downstream passage pipes, but not the eel ladder. Kropp recognizes the scale of the falls and its multiple channels to be the challenge for responsive ladder design, and

18 William Commanda and Romola V. Thumbadoo, “The Legacy Vision of William Commanda for the Sacred Chaudière Site and the Indigenous Centre at Victoria Island,” Circle of All Nations, accessed July 10, 2023, <https://www.asinabka.com/geninfo.htm>.

19 For further perspective on the resistance to Akikodjiwan’s development, see Matt Cicero, “Saving Akikodjiwan,” *Briarpatch*, February 27, 2019, <https://briarpatchmagazine.com/articles/view/saving-akikodjiwan>.

20 Kropp, discussion.

21 Kropp, discussion.

22 Kropp, discussion.

Fig. 4.14 [right]
Axonometric view of
the concept design
for the ladder and
park by DCA (Douglas
Cardinal Architect),
2014.

Fig. 4.15 [below]
Aerial view of
the redevelopment,
showing Generating
Station #5 and the
ring dam. Photograph
by Hydro Ottawa.

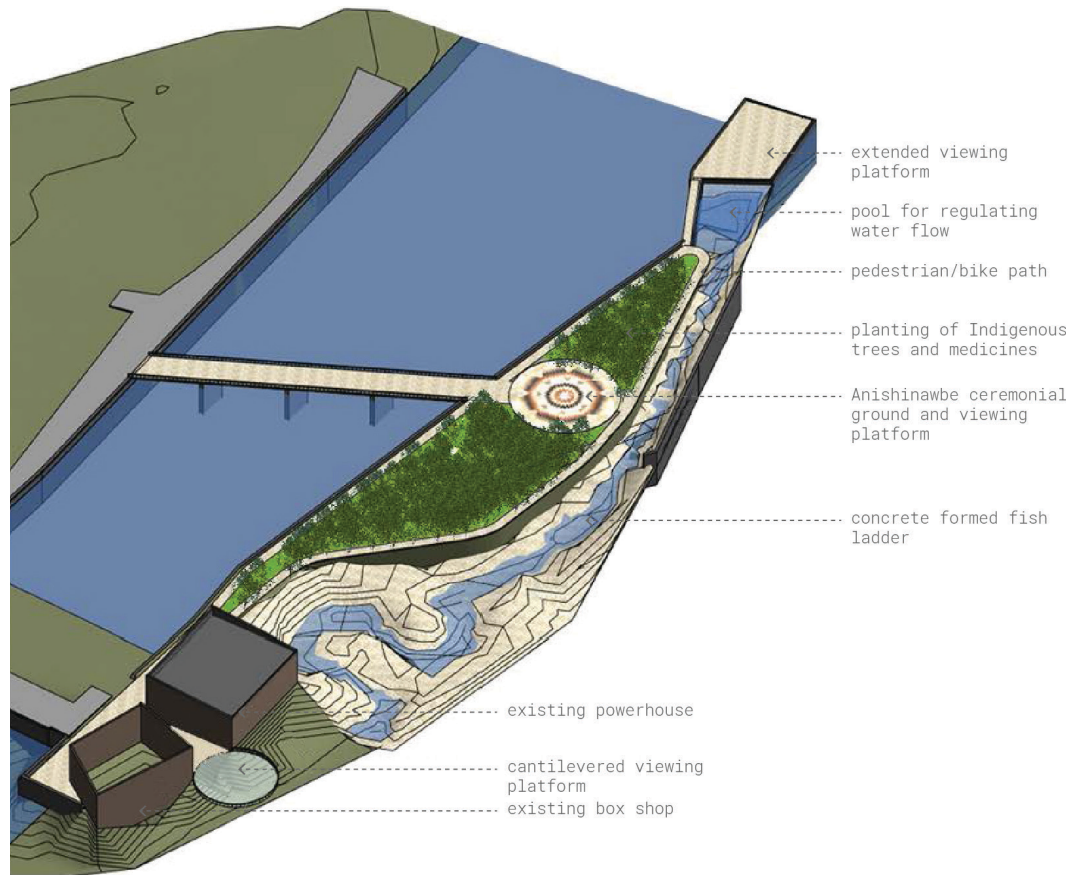




Fig. 4.16
One of the eel
ladder intakes
mounted to Generating
Station #5 with
steel supports,
August 2023.



Fig. 4.17
Eel ladder running
alongside a
pedestrian pathway
by Chaudière Park,
August 2023.
Concrete panels to
the right of this
view conceal the
ladder.

further speculates that the attraction flow at the intakes are insufficient.²³ I am inclined to think that the Cache Lake dam provides more definitive parameters for bypass location, as it is small scale and obstructs a single river channel. Though this was not brought up in our conversation, I wonder if the artificial and uniform ladder substrate also affects its efficacy. Cardinal's concept design adopted a 'nature-like' meandering profile, which though untested, feels like a promising emulation of flow conditions needed to entice Pimisi.

In addition to the bypass solutions, an interpretive experience for visitors attempts to engage with the cultural significance of Akikodjiwan. Cardinal's design honoured the sacred site with an Anishinaabe ceremonial space surrounded by native planting. These ideas were developed upon by CSW Landscape Architects into a built scheme bridging Algonquin and settler interpretations. The main feature, Chaudière Park, is publicly accessible and can accommodate cultural gatherings. Next to the park, the enclosures of two heritage industrial buildings have been preserved and frame lookout decks to the falls. Cache Lake shares a layered history, and I can imagine how the education on this site might be enriched by orchestrating similar cross-cultural learning opportunities around Pimisi recovery.

Facing the falls, storytelling occurs through spatial encounters at Chaudière Park [Fig. 4.19]. A gathering circle of four 'grandparent stones' address the cardinal axes valued by Algonquins. The four sacred medicines comprised of tobacco, sweetgrass, sage and cedar grow in a culturally significant planting scheme. Kropp notes that these medicines can be gathered during ceremonies, which tells me that they are not only symbolic, but practical.²⁴ Other elements, such as park benches formed by reclaimed floodgate stoplogs speak to the dam operations. This emphasis on the didactic and narrative capacity of the architecture is evocative and could be used to describe Pimisi to the public at Cache Lake.

Site adjacencies reinforce the presence of Akikodjiwan within this interpretive experience [Fig. 4.20]. Meanings and values attributed to the site are carried through informational signage and art dispersed along public pathways, akin to Algonquin Park's interpretive trails. A 2013 initiative by the AOO saw a nearby LRT station renamed 'Pimisi,' furthering their significance to the falls beyond the site:

²³ Portage Power is continuing to monitor the performance of their bypass solutions to address these issues. Kropp, verbal correspondence with author, July 26, 2023.

²⁴ Kropp, discussion.

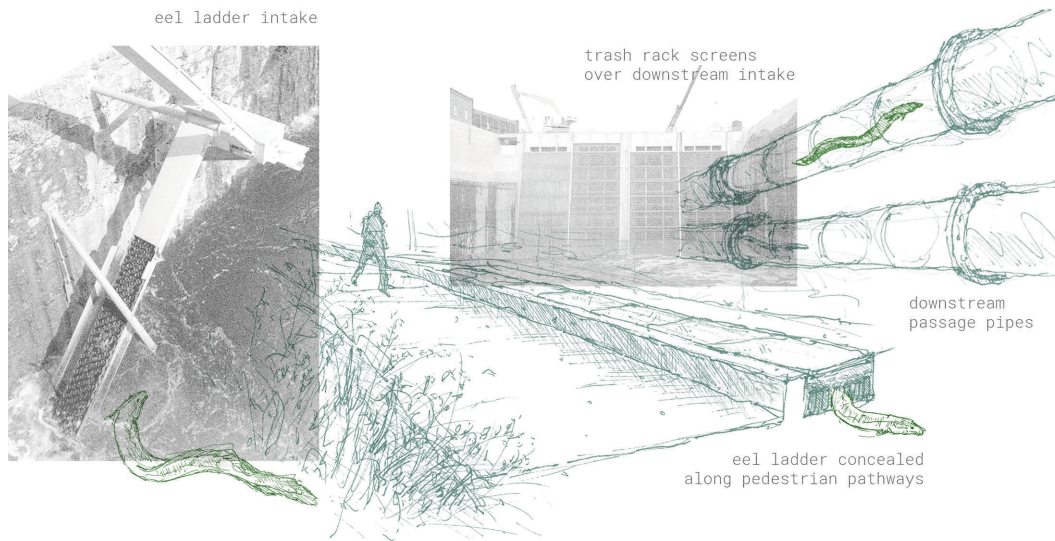


Fig. 4.18
Upstream and downstream bypass solutions for Pimisi at Generating Station #5.

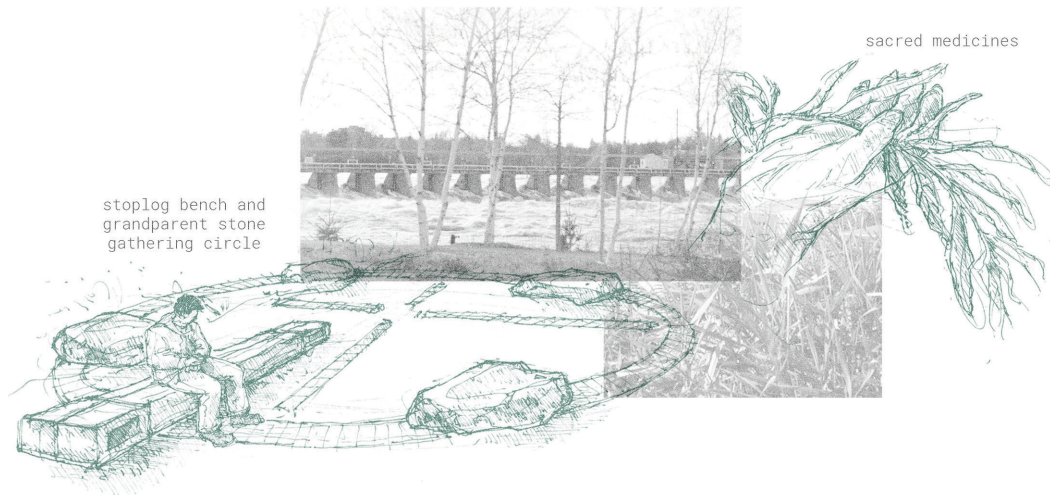


Fig. 4.19
Author's observations of architectural storytelling at Chaudière Park.

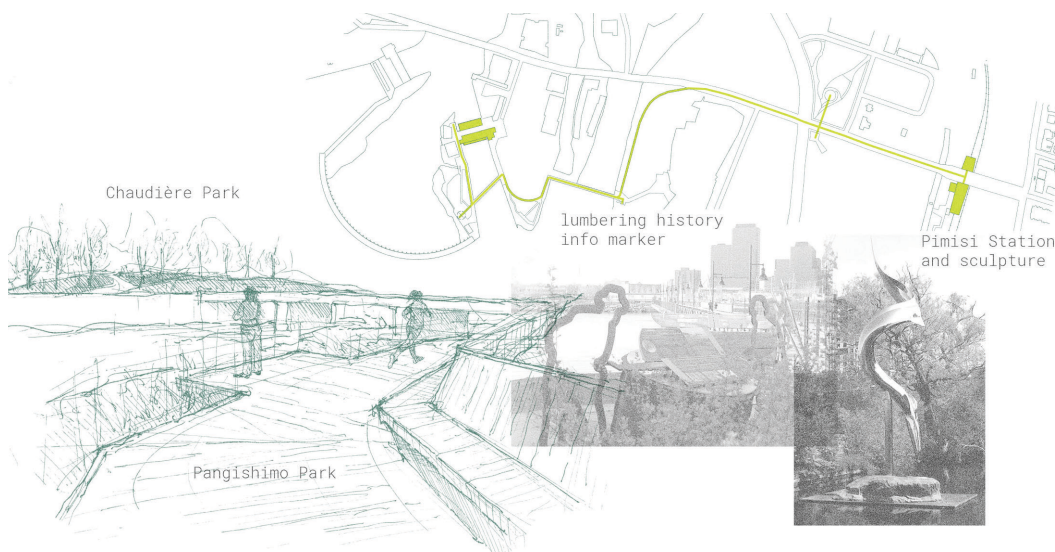


Fig. 4.20
Author's interpretation of a possible interpretive walk from Pimisi Station to Akikodjiwan (Chaudière Falls).

The renaming of LeBreton Transit Station to Pimisi Transit Station is much more than a symbolic gesture to honour its once plentiful presence within the Ottawa River or to serve as a footnote to its once extraordinary migration up and down Chaudière Falls. Rather the renaming to Pimisi Transit Station will draw public awareness and strengthen the call for action – to ensure the survival of the species. It is not lost on the Algonquin people that the survival of Pimisi is also an apt metaphor for the survival and rebuilding of the Algonquin Nation.²⁵

In a similar vein to the renaming, the design of bypass solutions and interpretive spaces are strides to broaden, and to an extent, return the meaning and purpose of Akikodjiwan. Despite their implementation, the obscured, and otherwise unidentified bypass solutions are missed opportunities to garner public awareness around Pimisi recovery. This is particularly true for the eel ladder, which is in a position to be part of the interpretive experience, allowing visitors to potentially witness migration due to its visibility from one of the observation decks and route below a public pathway [Fig. 4.17]. Bypass solutions have the potential to be more than mere infrastructures. If highlighted architecturally, they can enhance how recovery is registered and cultivate care in human relationships.

The Akikodjiwan redevelopment's investment in Pimisi recovery and reconciliatory efforts are important steps to incorporate relational understandings of the falls amidst ongoing dam operations. Yet, these moves can also be seen as an investment that ensures that Portage Power's dams endure. Based on the performance of the bypass solutions, Pimisi migration is still hindered by the barrier. The economic foothold of hydro dams like Portage Power's facilities suggests that improvements to the facilities are more suitable on this scale. However, the futurity of small, non-powered barriers like the Cache Lake dam remains a viable opportunity to consider another approach.

25 Algonquins of Ontario, "Algonquins of Ontario recommend LeBreton Transit Station be renamed Pimisi Transit Station," August 14, 2013, media release, http://www.tanakiwin.com/wp-system/uploads/2013/10/A00-Media-Release_Renaming-of-LeBreton-Station_20130814_Final.pdf.

Undamming the Mill River

In contrast to the attempt to address reconciliation and Pimisi recovery through improvements to dam operations, other conditions at dam sites have warranted the more ambitious endeavour of removing the barrier. As part of an extensive restoration project, the removal of three dams and the redesign of a fourth in Taunton, Massachusetts have released vast stretches of the Mill River for Pimisi and countless other fish migrants. Manufacturing waste and bygone mill operations had left this once vital tributary for migration within the Taunton River Watershed polluted and obstructed by centuries-old mill dams, which stood idle and derelict from neglect.²⁶ Their deterioration became the motivation for their removal and the pathway towards Pimisi recovery. This project advances relational thinking on a watershed scale through interventions to restore aquatic connectivity and riparian habitat and engage its human community.

In 2005, floodwaters threatened a catastrophic sudden failure of Taunton's Whittenton Mill dam [Fig. 4.23]. In a conversation with Beth Lambert, the Director of the Massachusetts Division of Ecological Restoration, I learned that this close call repositioned the city's dams as beyond saving due to safety issues and costly maintenance, which made restorative actions in support of exiled migratory fish viable.²⁷ The Mill River restoration partnership was formed to champion these issues, engaging in a lengthy process of feasibility studies, community outreach, and dam owner approvals to proceed with the work.²⁸ All four of the city's dams were incorporated one by one into the restoration. From 2012 to 2018, the dams at Hopewell Mills, West Britannia, and Whittenton Mill were removed. Based on its proximity to human development, only the Morey's Bridge dam was reconstructed with a fishway and a seasonal eel ladder [Fig. 4.22].²⁹

Different methods for breaching the dams to restore aquatic connectivity responded to site-specific sediment conditions. The Hopewell Mills dam contained high concentrations of contaminated sediment, which needed to be manually dredged before its demolition. A temporary cofferdam was constructed to divert the river and extract the sediment – some of which was



Fig. 4.21 [above]
Key plan of the Mill River in the Taunton River Watershed.

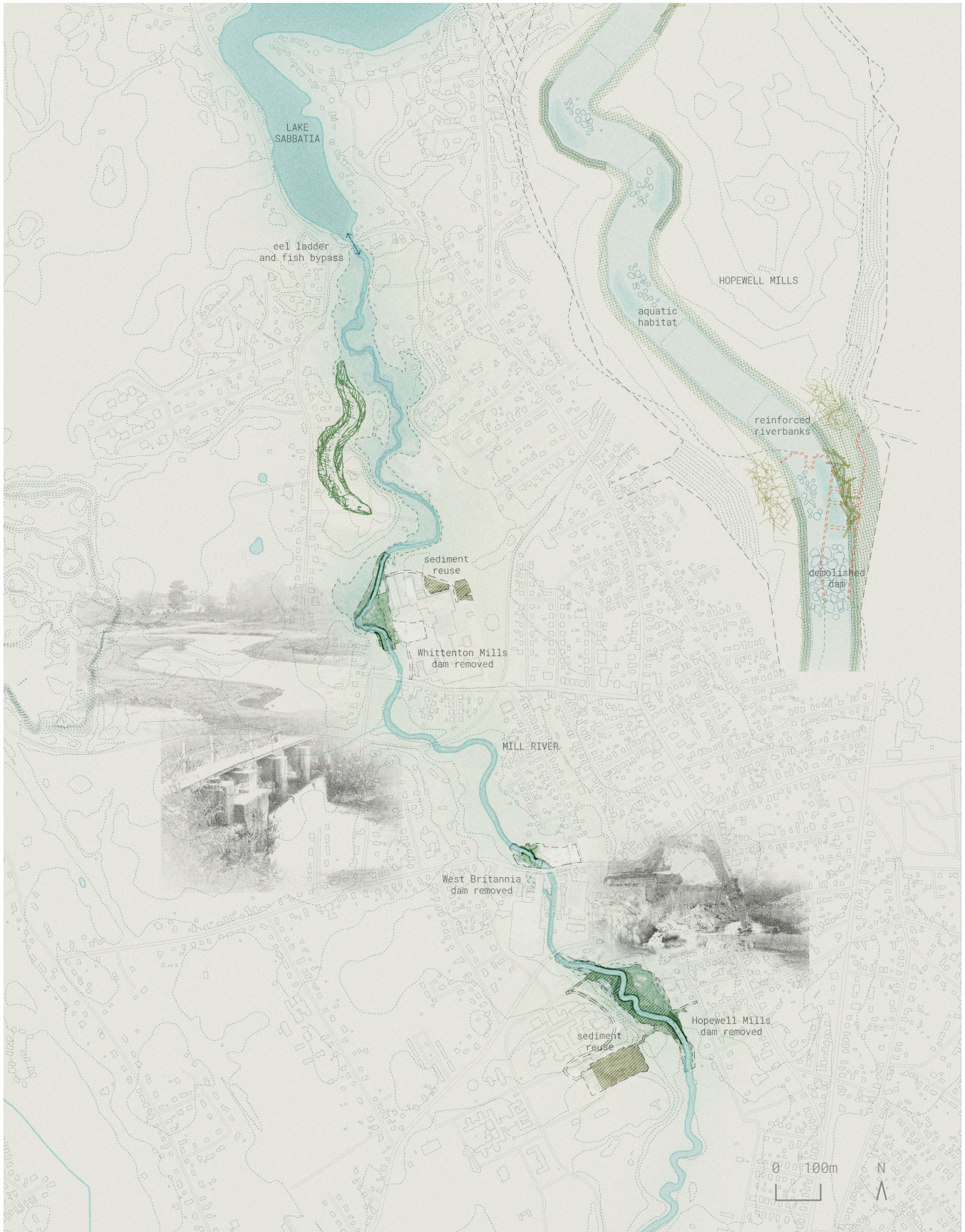
Fig. 4.22 [right]
Plan of the Mill River restoration.

26 "What a River Means," The Nature Conservancy, last modified March 31, 2023, <https://www.nature.org/en-us/about-us/where-we-work/united-states/massachusetts/stories-in-massachusetts/mill-river-restoration/>.

27 Beth Lambert (Director, Massachusetts Division of Ecological Restoration), in discussion with the author, August 7, 2023.

28 Lambert, discussion.

29 Lambert, discussion.



safe enough to be salvaged as the foundation of a wildflower meadow on the local State Hospital's grounds [Fig. 4.25]. Sediment behind the Whittenton Mill and West Britannia dams did not share these concerns and was allowed to release naturally without river diversion as the barriers were gradually removed. These methods provide an indication of how sediment release might be managed depending on the conditions at Cache Lake.

Beyond human intervention, this project recognized the Mill River as a dynamic agent in the restoration process. "The moment the dam comes out, the river starts acting like a river again," remarks Lambert as we discussed how it settled into a ribboned form of its own design.³⁰ Although the river was allowed to run freely, bank stabilization measures had to be implemented in locations that encroach on human development [Fig. 4.26].³¹ Riverbanks regraded with coconut fibre soil lifts and cobbles guide the meandering path. Planted reintroductions of native trees, shrubs, and groundcovers secure the floodplain from erosion. Woody debris dispersed along the channel shelters fish. These landscape efforts mitigated the short-term impacts of dam removal and improved habitat quality in the reconnected river.

In the aftermath of the removals, the Mill River has welcomed an influx of biodiversity. The river now runs unobstructed from its source of Lake Sabbatia before emptying into the marine estuary of Narragansett Bay. Pimisi are one of many previously exiled migrants, including Alewife and Sea Lamprey who have returned to this undammed corridor. While the river restoration was still ongoing with the West Britannia dam yet to fall, researchers had already begun observing an annual increase in juvenile 'yellow eel' Pimisi in Lake Sabbatia from 2013 to 2016, indicating a correlation between dam removal and successful upstream migration.³² The continued desire of Pimisi to reach the Mill River post-removal gives me hope for a similar recovery in Cache Lake and the Madawaska River system, where they too have been extirpated.

Like the Akikodjiwan redevelopment, the restoration process has not been architecturally highlighted within the city's public spaces. Downstream along the main branch of the Taunton River, the Weir Village Riverfront Park's trails, boat launches, and fishing piers provide opportunities to encounter the changes. Aside from recreation, there is untapped potential in

³⁰ Lambert, discussion.

³¹ Lambert, discussion.

³² Sara M. Turner, Bradford C. Chase, and Michael S. Bednarski, "Evaluating the Effect of Dam Removals on Yellow-Phase American Eel Abundance in a Northeastern U.S. Watershed," *North American Journal of Fisheries Management* 38, no. 2 (2018): 430, <https://doi.org/10.1002/nafm.10040>.

Fig. 4.23
Boulders piled
against the aged
Whittenton dam after
its near failure to
prevent collapse.
Photograph by the
Massachusetts
Division of
Ecological
Restoration, 2010.



Fig. 4.24
Environmental
Planning students
from Northeastern
University collecting
measurements on the
Mill River at the
former location of
the Whittenton Mills
dam. Photograph by
Inter-fluve, 2014.





Fig. 4.25
Dam removal process
at the Hopewell
Mills site.

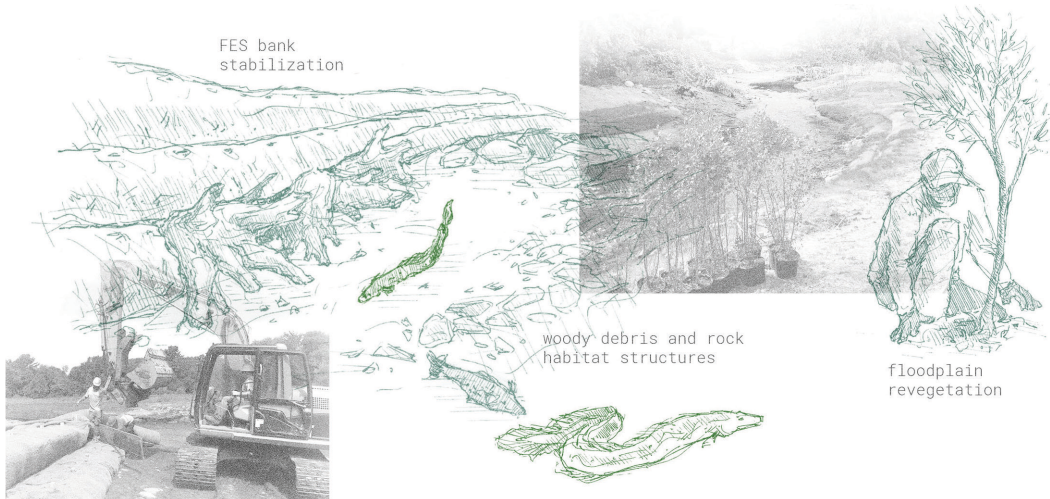


Fig. 4.26
Mill River channel
construction methods
used across all
removal sites.



Fig. 4.27
Ecological changes
to the Mill River in
the aftermath of the
dam removals.

imparting an educational dimension to human engagement. Coupled with this, the mostly leave-no-trace demolitions of the three mill dams removes public awareness on the history and ecological impacts of the city's mill operations. A portion of the West Britannia dam's wall remains, but without interpretative aids. Whether left as partially standing ruins or rubble, the demolished barriers would have important stories to tell about the path to restoration.

Despite the lack of architectural interventions, I am moved by how this project brought Taunton's human community together around a shared investment in the Mill River that transcends superficial appreciations. According to Lambert, residents who live alongside the river in particular have experienced the changes firsthand and gained a greater appreciation for its ecology and a personal sense of responsibility as caretakers in the long-term [Fig. 4.27].³³ Lambert's remarks tell me that environmental restoration efforts catalyze an additional restoration – one of human attitudes through embodied learning. As with Taunton's residents, perceptual shifts in park visitors are possible, but there is more to be gained through a deliberate integration of human engagement within Pimisi recovery efforts.

Liberated from the reliance on dams, Pimisi recovery in the Mill River supports a large breadth of restorative actions. By intervening beyond an individual site, the river is no longer property or resource, but a shared corridor traversed by Pimisi and their relations as they move uninhibited between marine and freshwaters, exchanging energetic flows. While the scope of my study concerns an individual site, I am reminded to see the Cache Lake dam in relation to Pimisi's migratory corridor within the Kichissippi Watershed – a network that can potentially be incorporated into long-term planning.

Perhaps the greatest takeaway from the Mill River is the pivotal role that the dam deteriorations had within the realization of the removal approach. Their status showed the Taunton community that dams are finite structures and can become liabilities in terms of safety and cost. This broke the cycle of dam repair and reconstruction, opening the door for ecological change and the renewal of human relationships to the river. The immense benefit of retiring these mill dams cumulatively impact and prioritize Pimisi recovery without the pressures of lingering barriers.

³³ Lambert, discussion.

Phasing Dam Interventions

Though supportive of recovery efforts, the Akikodjiwan and Mill River projects have shown that there may not be a single definitive approach to a dam intervention. Dam improvement is a more accessible intervention for recovery but limited in impact due to the persistence of the barrier. Removal, however, is challenging to justify if a dam is still operationally functioning. I would like to propose an alternative approach where improvement and removal are seen as a progression in response to the process of a dam's deterioration. Pimisi recovery can unfold over two phases, by first improving the Cache Lake dam through retrofit, and at the end of its operational lifespan, decommissioning and partially removing it. At the same time, this phasing accounts for long-term planning of recovery efforts throughout the Kichissippi Watershed, which will take time to resolve.

The severity of Pimisi decline necessitates an immediate solution that can be implemented while the Cache Lake dam continues to operate. In the first phase, an eel ladder can be installed to support Pimisi's initial reestablishment in headwaters of the Madawaska River [Fig. 4.28]. Alongside the retrofit, juvenile Pimisi will need to be stocked downstream of the Cache Lake dam through manual transfer and release, as they currently do not have access to these waters. As with the Akikodjiwan redevelopment, the integration of interpretive spaces relating to the ladder can further human visitor awareness and learning about Pimisi decline and the recovery process. What a profound experience it might be to witness Pimisi using the designated bypass in the same waters enjoyed for recreation.

While juvenile Pimisi mature in Cache Lake with the assumption of a twenty-year-long inland residency, the improvement or removal other dams along their migratory corridor can occur. Learning from the case studies, I recognize that garnering support from the public and dam owners to intervene will take time; however, improving the Cache Lake dam can set a vital precedent. Ideally, this would allow for Pimisi to safely migrate downstream to their spawning waters twenty years later. The advantage of phasing also addresses the environmental concern of managing invasive Smallmouth Bass. As they reside on both sides of the barrier, the long-term goal of its removal does not appear to affect their distribution.³⁴ Based on the speculations shared by Mark Ridgway and Krystal Mitchell, a degree of natural control could be

34 Ridgway, Middel, and Bell, *Aquatic ecology*, 157.

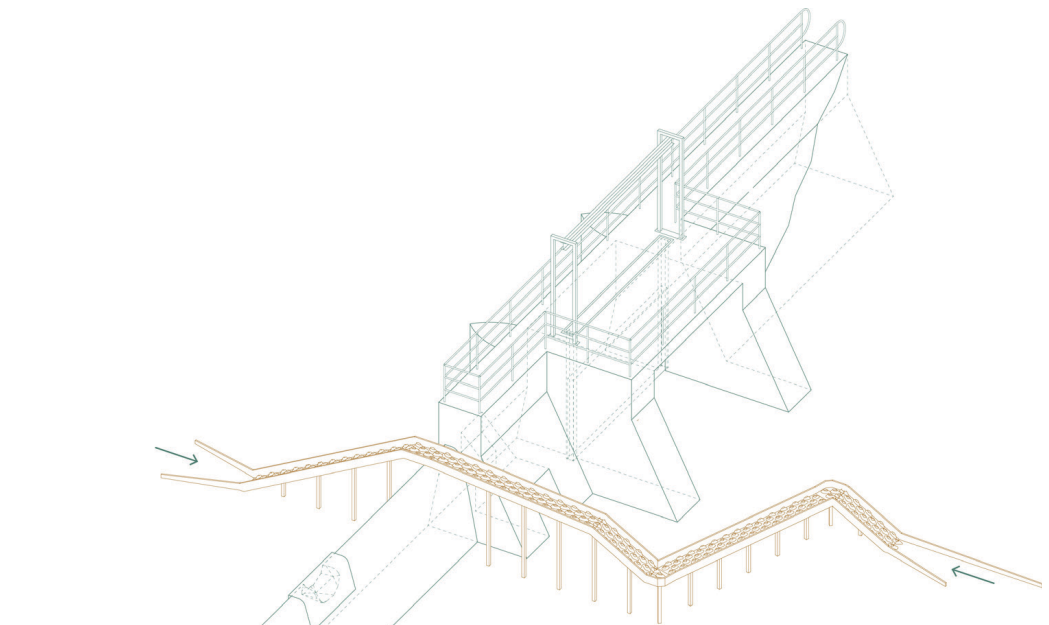


Fig. 4.28
Initial improvement
study of the Cache
Lake dam retrofitted
with a two-way eel
ladder.

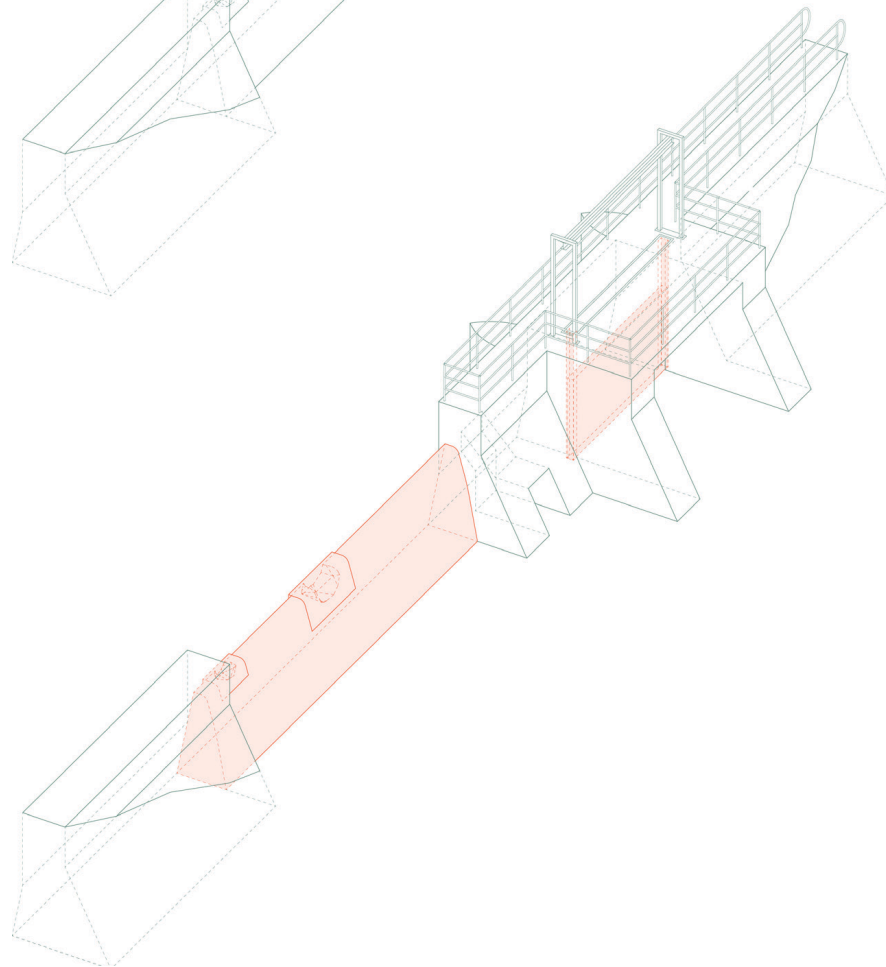


Fig. 4.29
Initial removal study
of the Cache Lake
dam's spillover weir
and sluice gate.



Fig. 4.30
View of the Cache
Lake dam from the
'Track and Tower'
trail, August 2023.

a possibility with the reintroduction of Pimisi who are known to predate on young invasive fish including bass species.³⁵

Several Pimisi generations later when the Cache Lake dam has neared the end of its operational lifespan, I propose further intervention through its partial removal [Fig. 4.29]. In this second phase, the partial removal of the barrier would restore aquatic connectivity for all beings who rely on the Madawaska River. It would also mean the return of natural processes and biodiversity in Pimisi's habitat. As with the Mill River restoration, a strategy for mitigating the short-term environmental impacts of removal is needed. Furthermore, the interpretive experience for human visitors can be expanded to include the dam removal and river restoration process.

The progression from improvement to removal would allow for an intensification of impacts on Pimisi abundance, ecosystem health, and human relationships in line with the Cache Lake dam's deterioration. While an eel ladder retrofit would be relatively straightforward to implement, the feasibility of partially removing the dam is bound to further studies and environmental assessments. However, this approach is still worth exploring within the phasing as a viable alternative to reconstruction.

35 MacGregor et al., *Recovery Strategy for the American Eel*; Krystal Mitchell (Fisheries and Wildlife Management Advisor, Algonquins of Ontario), "Krystal Mitchell Interview," interview by author, November 23, 2023, transcript, 175; and Mark Ridgway (Director, Harkness Laboratory of Fisheries Research), "Mark Ridgway Interview," interview by author, November 24, 2023, transcript, 165.



Fig. 5.1
Pimisi in their
silver eel stage
crossing a
riverbank.

CHAPTER V

Designing Pimisi Recovery

Learning from the insights shared by recovery advocates and the case studies on implementation, the following phased scheme imagines how architecture might bridge Pimisi recovery with the more-than-human and human lives that share the Cache Lake landscape. At a masterplan scale, the proposal forms a network of infrastructure, building, and landscape interventions that support Pimisi's return. Zooming in, I construct an interpretive journey through the interventions, visualizing multispecies encounters within the recovery process.

Addressing the primary goal of facilitating Pimisi migration to the headwaters of the Madawaska River, the Cache Lake dam is initially retrofitted with eel passage and later partially removed in time with its deterioration. Spaces for educational, cultural, and monitoring activities engage the diverse human community within the park, making visible a recovery process that is typically obscured. In reconnecting the lake and river, landscape interventions minimize the initial impacts of the barrier's removal while restoring the health of these ecosystems over time. Though not a comprehensive environmental restoration plan, the union of aquatic connectivity, human engagement, and habitat restoration objectives in this scheme highlights the value of applying relational thinking to the planning and implementation of Pimisi recovery interventions in Algonquin Park.

Phase I: Dam Retrofit

As an immediate action, upstream and downstream migration past the still operating Cache Lake dam is negotiated through a two-way eel ladder. Each year, juvenile Pimisi are transferred from the Kichissippi by a human team and released just below the dam. Pimisi ascend the ladder into Cache Lake, where they will spend their maturation period feeding on invasive Smallmouth Bass among countless prey. Many become a vital food source for other beings. Their return signals the incremental restoration of ecological balances within the headwaters of the Madawaska River. After residing in these waters for roughly twenty years, Pimisi descend the ladder en route to the Sargasso Sea. By this time, other dams along their migratory corridor are imagined to have incorporated measures of their own to ensure safe passage.

Interventions to three sites around Cache Lake work together to support the initial re-establishment of Pimisi and human attunement to their recovery [Fig. 5.2, 5.3]. At the dam, a planted eel ladder and learning pavilion connected to the ‘Track and Tower’ trail bridge Pimisi and human movement. Viewing opportunities and gathering spaces bring attention to Pimisi’s return. Upstream on the lake, a monitoring station connected to an existing portage route enables human teams to study the progress of recovery. Off Highway 60, the ‘Track and Tower’ trailhead introduces human visitors to Pimisi through an engagement with the waters they share beyond the confines of the park.

Fig. 5.2
Phase I masterplan,
indicating the
intervention sites.

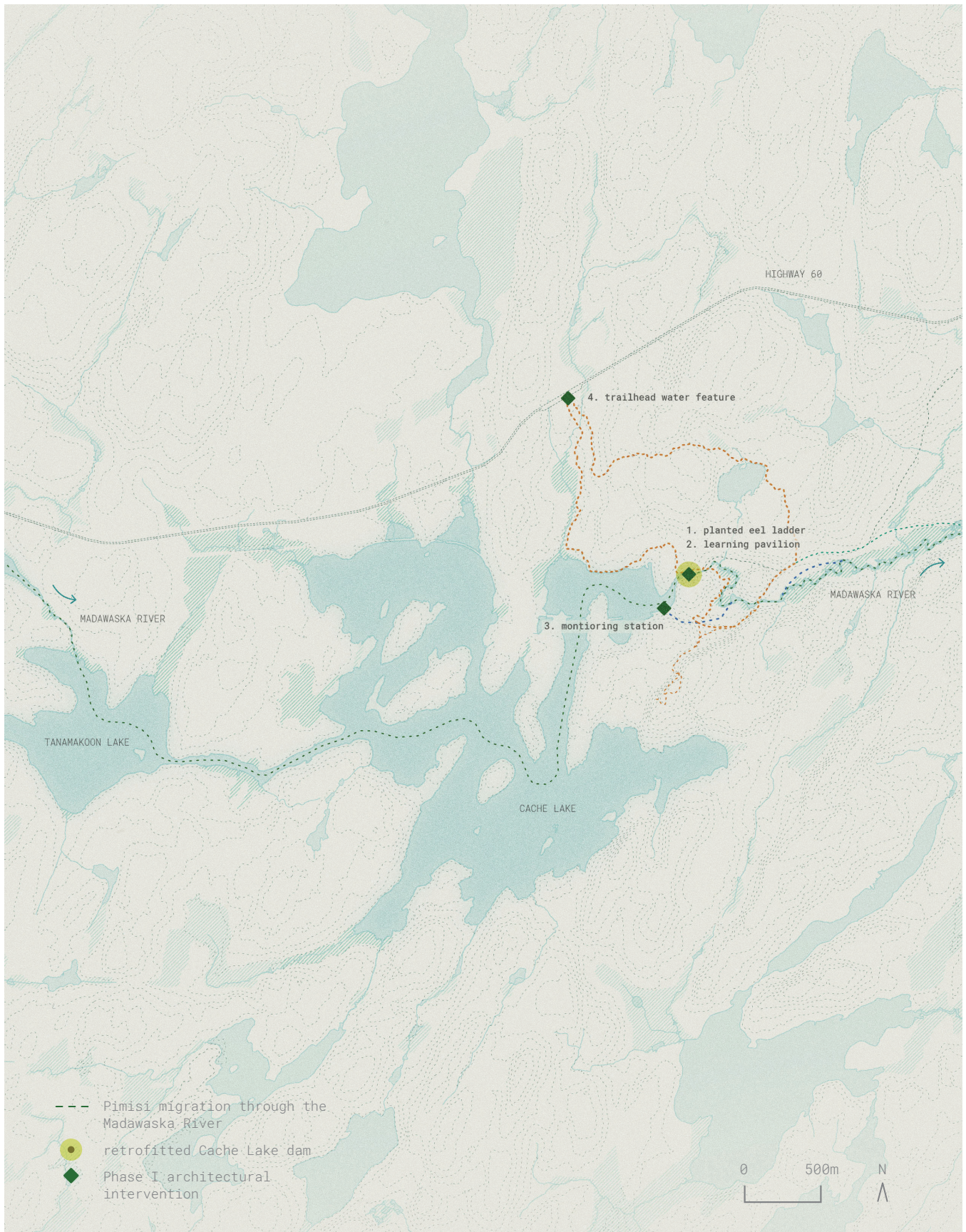
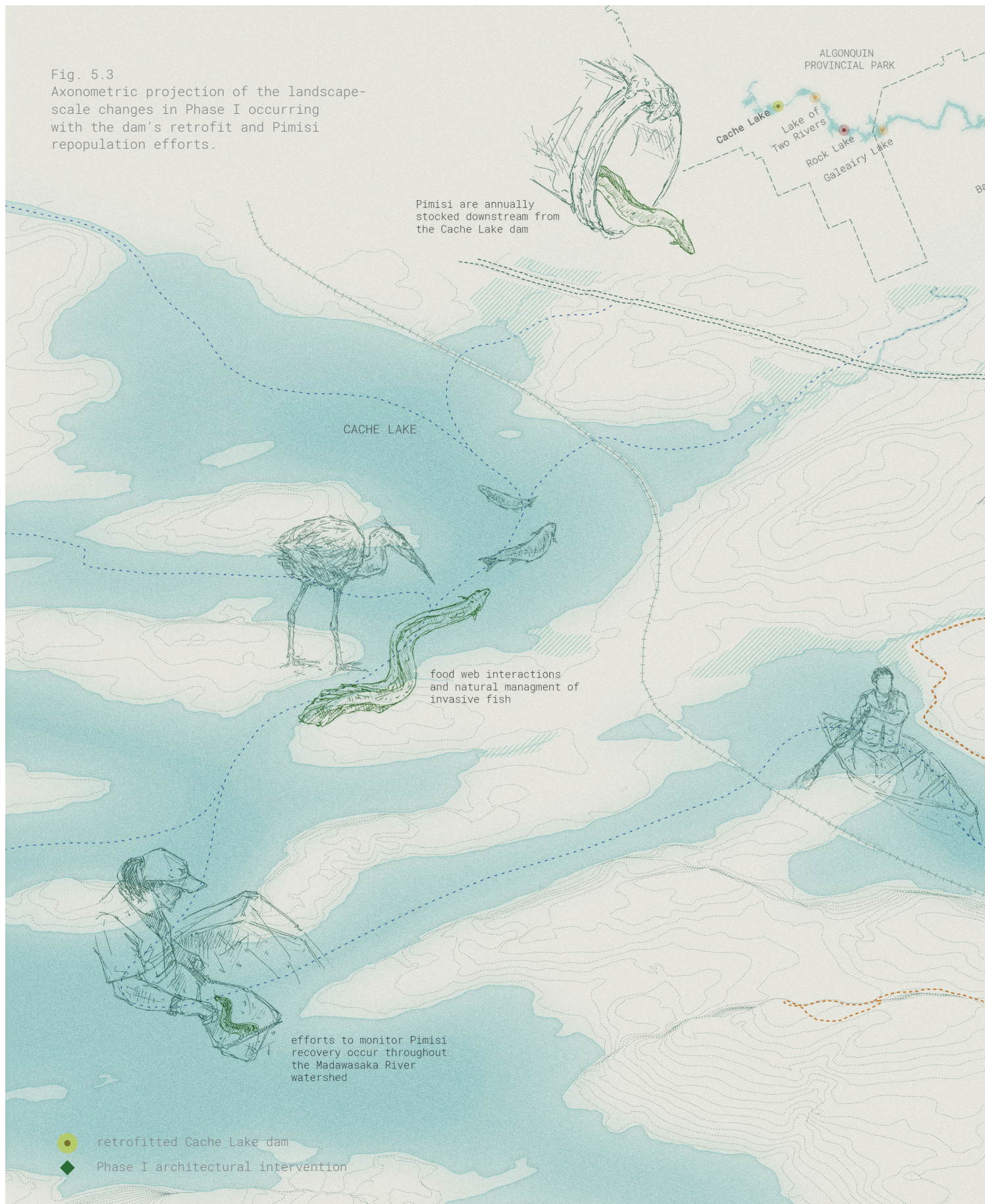
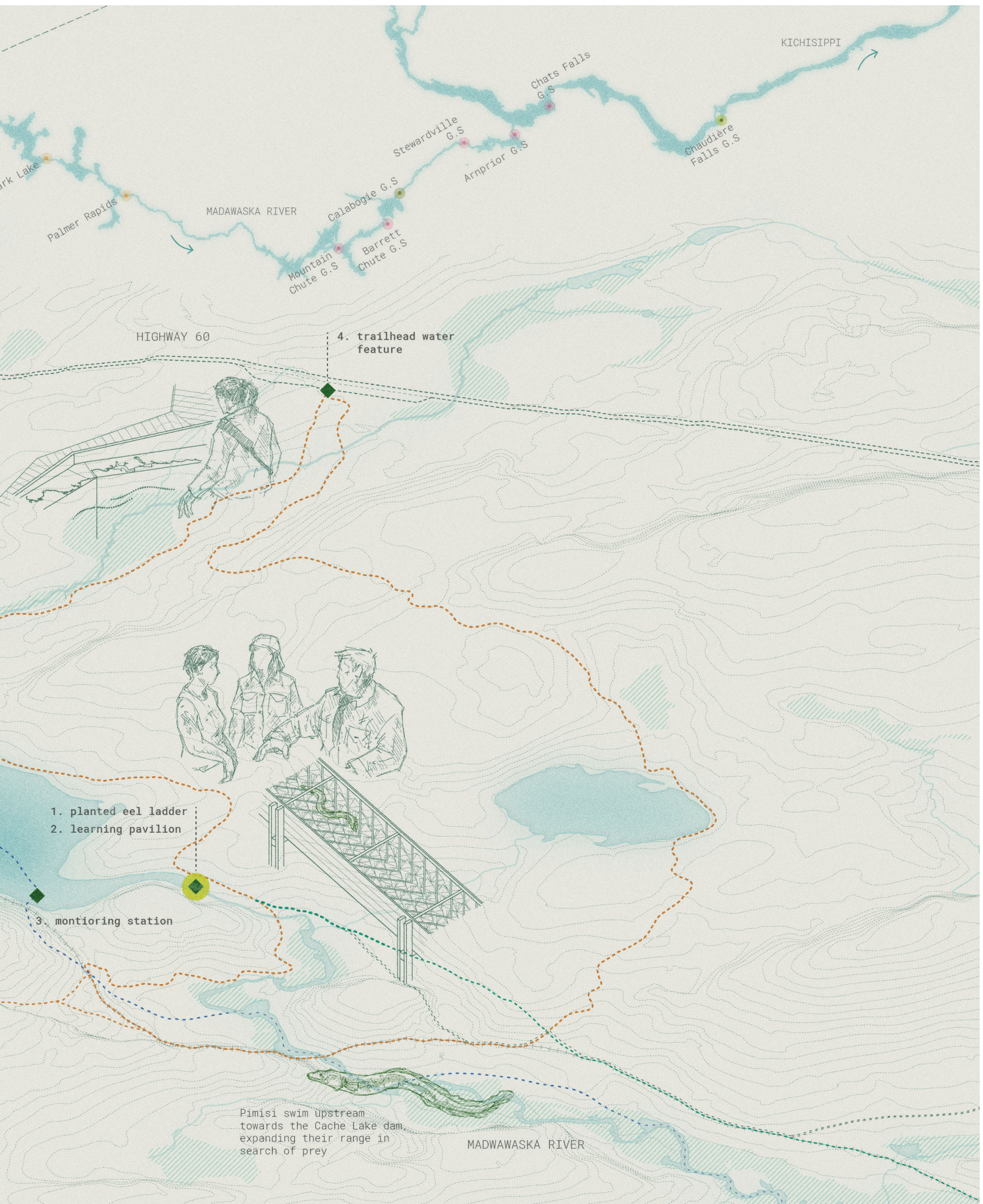


Fig. 5.3
Axonometric projection of the landscape-scale changes in Phase I occurring with the dam's retrofit and Pimisi repopulation efforts.





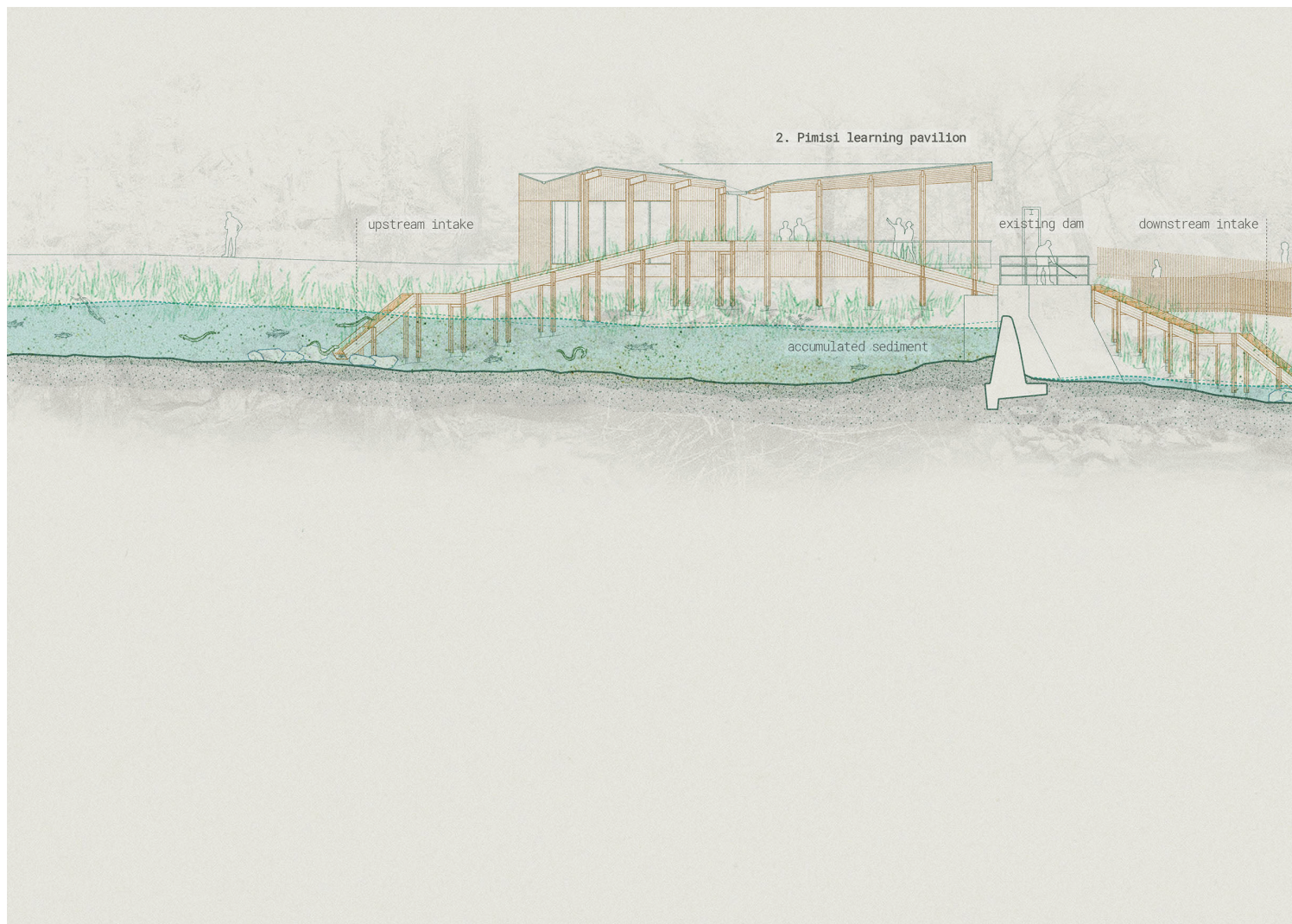


Fig. 5.4
Phase I section of the dam site.
Focusing on improving the existing dam,
an eel ladder and spaces for human
occupancy are added.



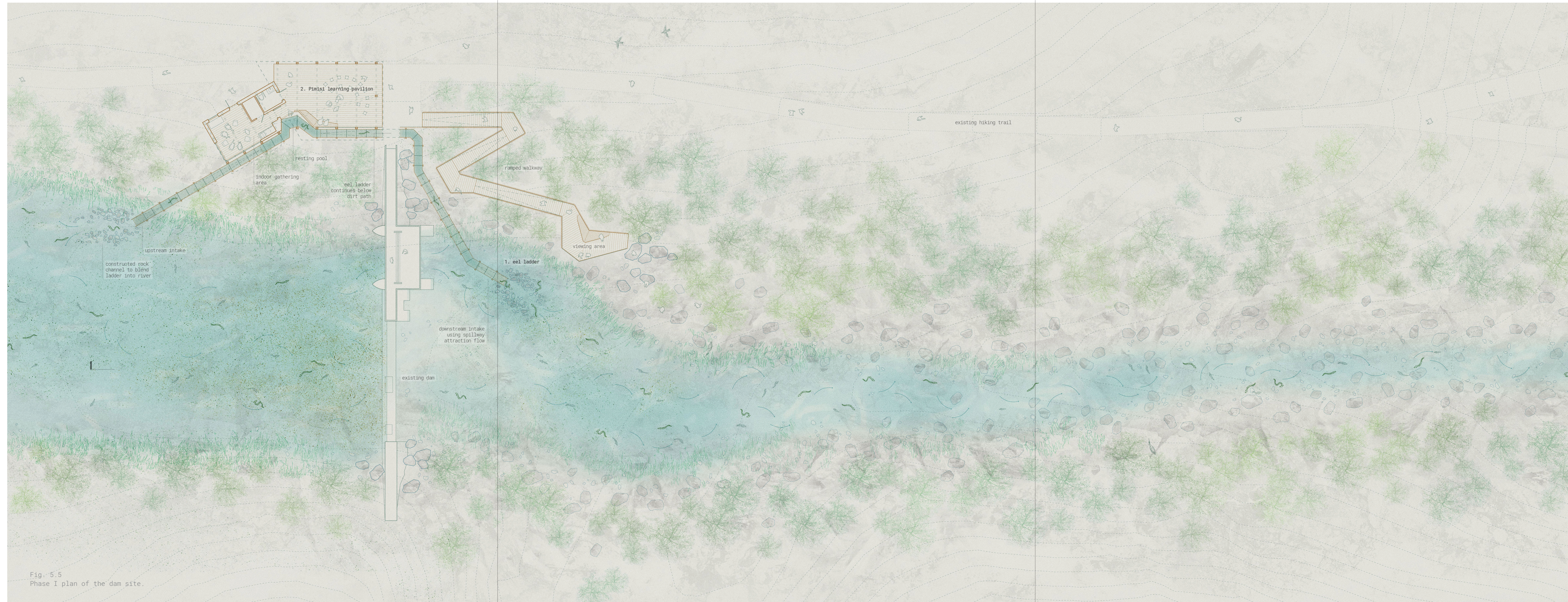
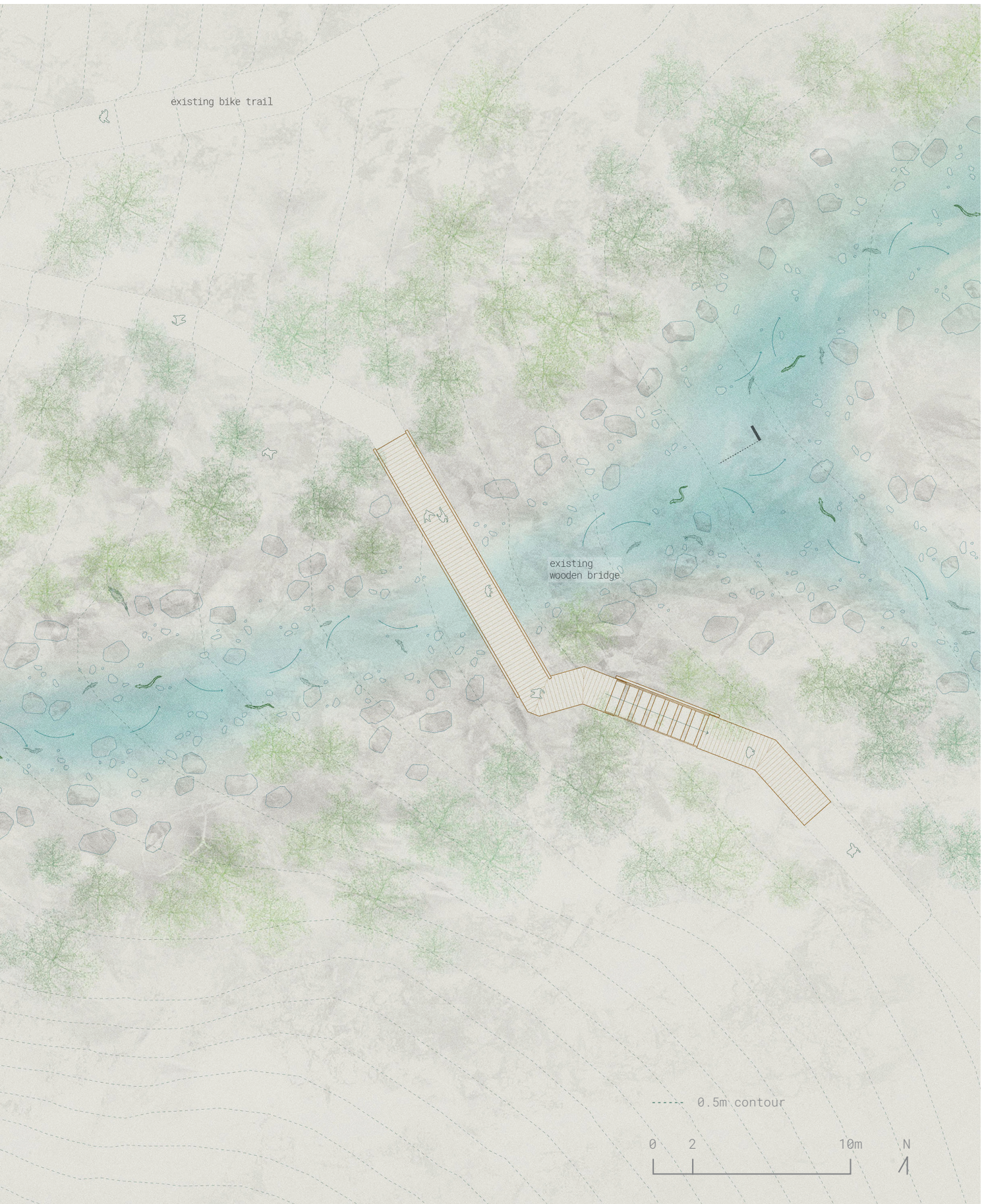
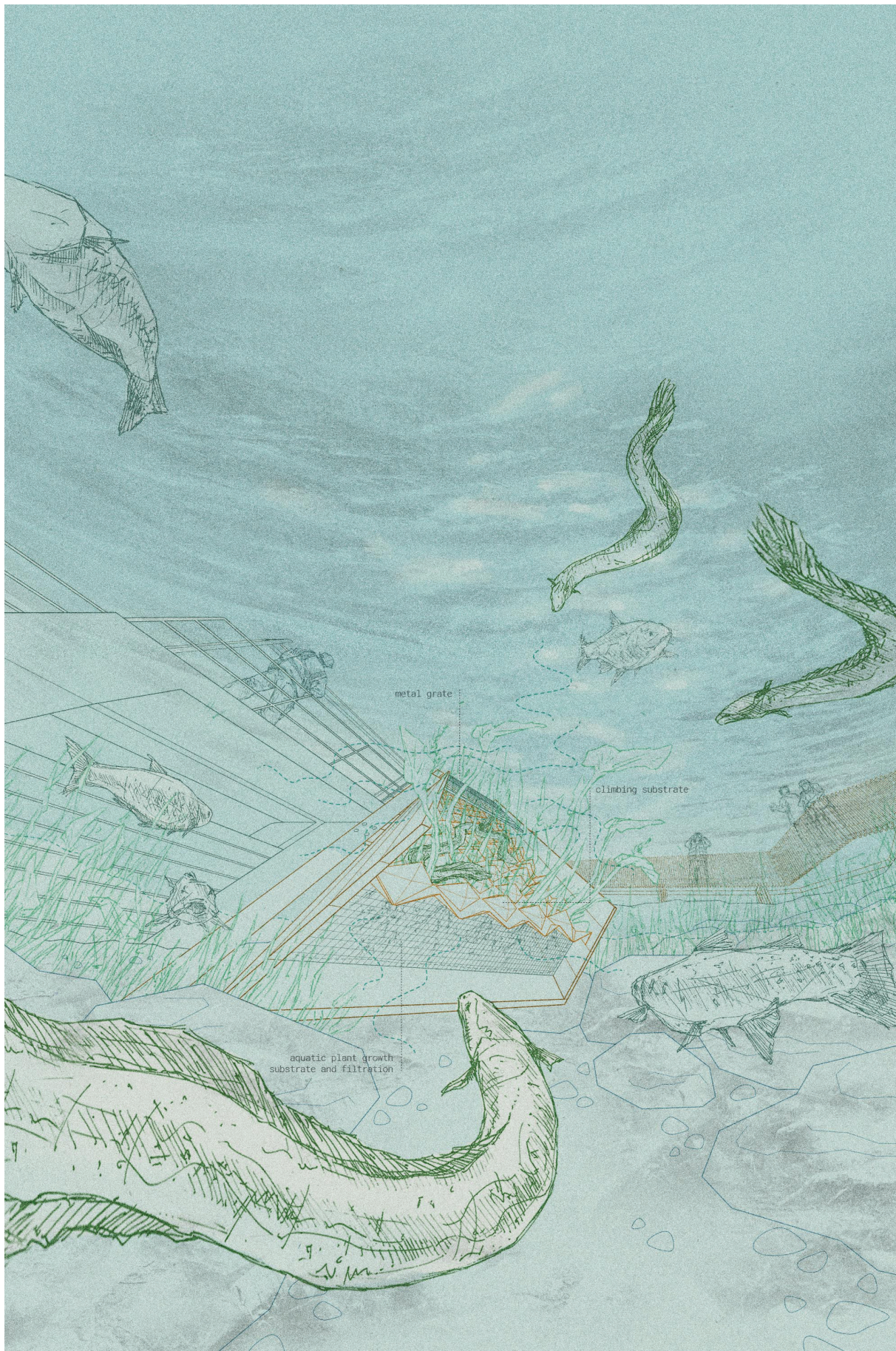


Fig. 5.5
Phase I plan of the dam site.





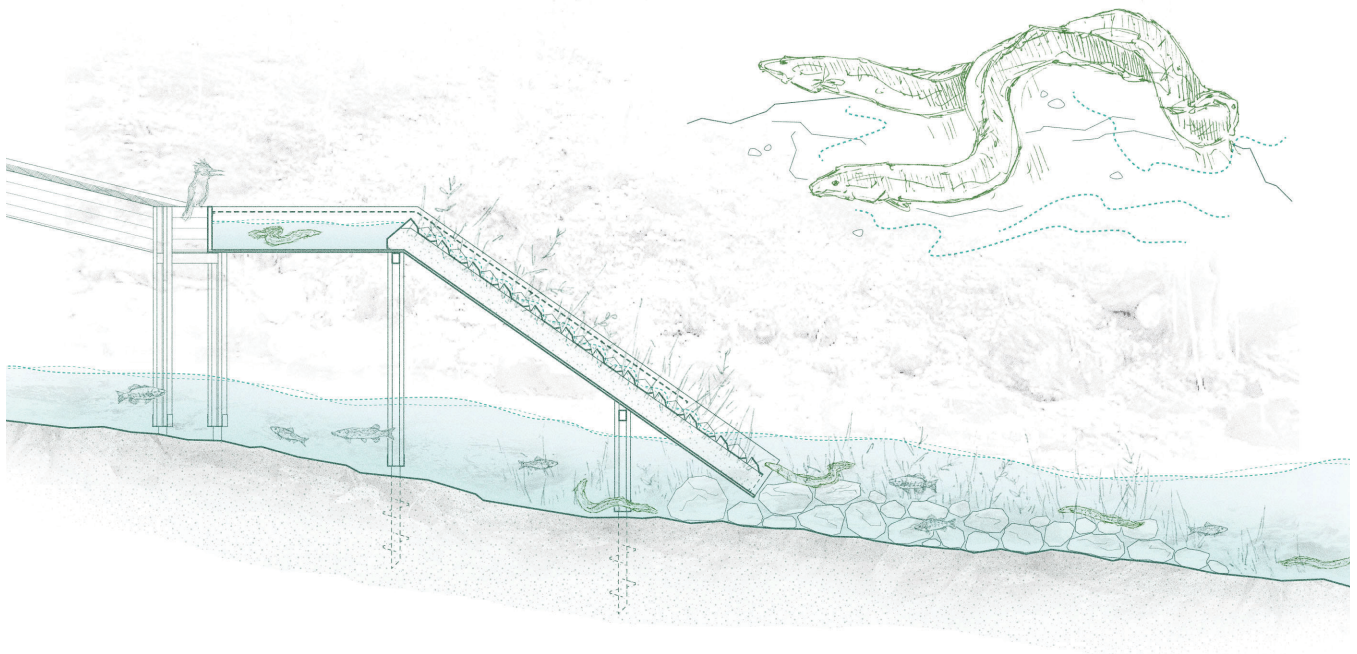
1. Planted Eel Ladder – ‘Pimisi Resilience’

Fig. 5.6 [left]
 Drawn to the dam's outflow, Pimisi corral at the downstream intake of the planted eel ladder.

Fig. 5.7 [below]
 Movement of Pimisi through the eel ladder.

In the face of barriers to their migration, Pimisi continue to be beckoned by a biological desire to return to their ancestral waters. Provided with an infrastructural aid, they can finally make their move past the Cache Lake dam. A two-way eel ladder circumvents the barrier on the northern riverbank. Its assembly draws from the former wooden log chute on this site, forming a light structure whose components can be easily disassembled and replaced. Instead of moving felled logs, the ladder allows Pimisi to pass safely up and down the Madawaska River.

Fast-moving outflow from the dam's sluice gate attracts Pimisi to the nearby downstream intake of the ladder. Privileging their climbing ability, both upstream and downstream intakes are steeply inclined to restrict the movement of invasive fish. Pimisi ascend a textured substrate hosting a tangle of rubbery leaves that conceal them from predation and blend this human-made infrastructure into its environment. Aquatic plant growth along the ladder is sustained by a regular flow of pumped water. A ramped walkway meanders alongside the ladder for human visitors to learn about the history of this dam and witness the display of resilience in Pimisi's return.





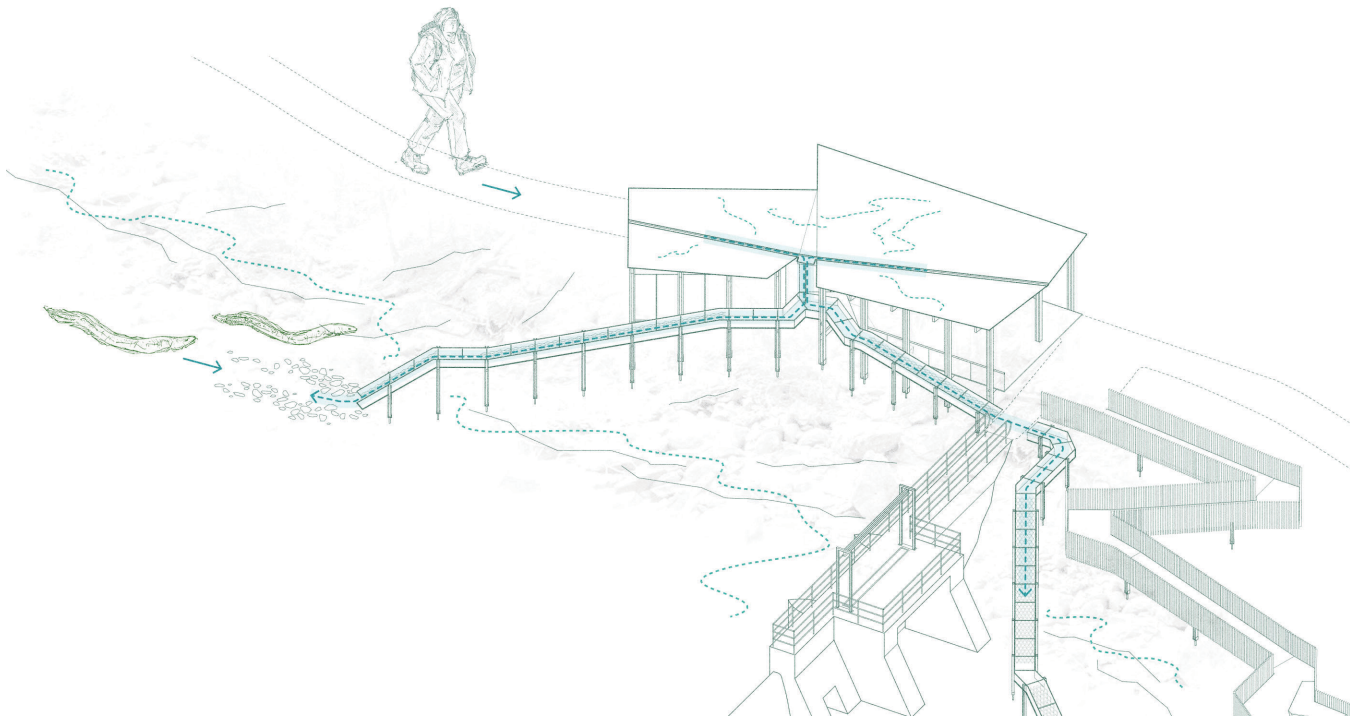
2. Pimisi Learning Pavilion – ‘Pimisi Brings People Together’

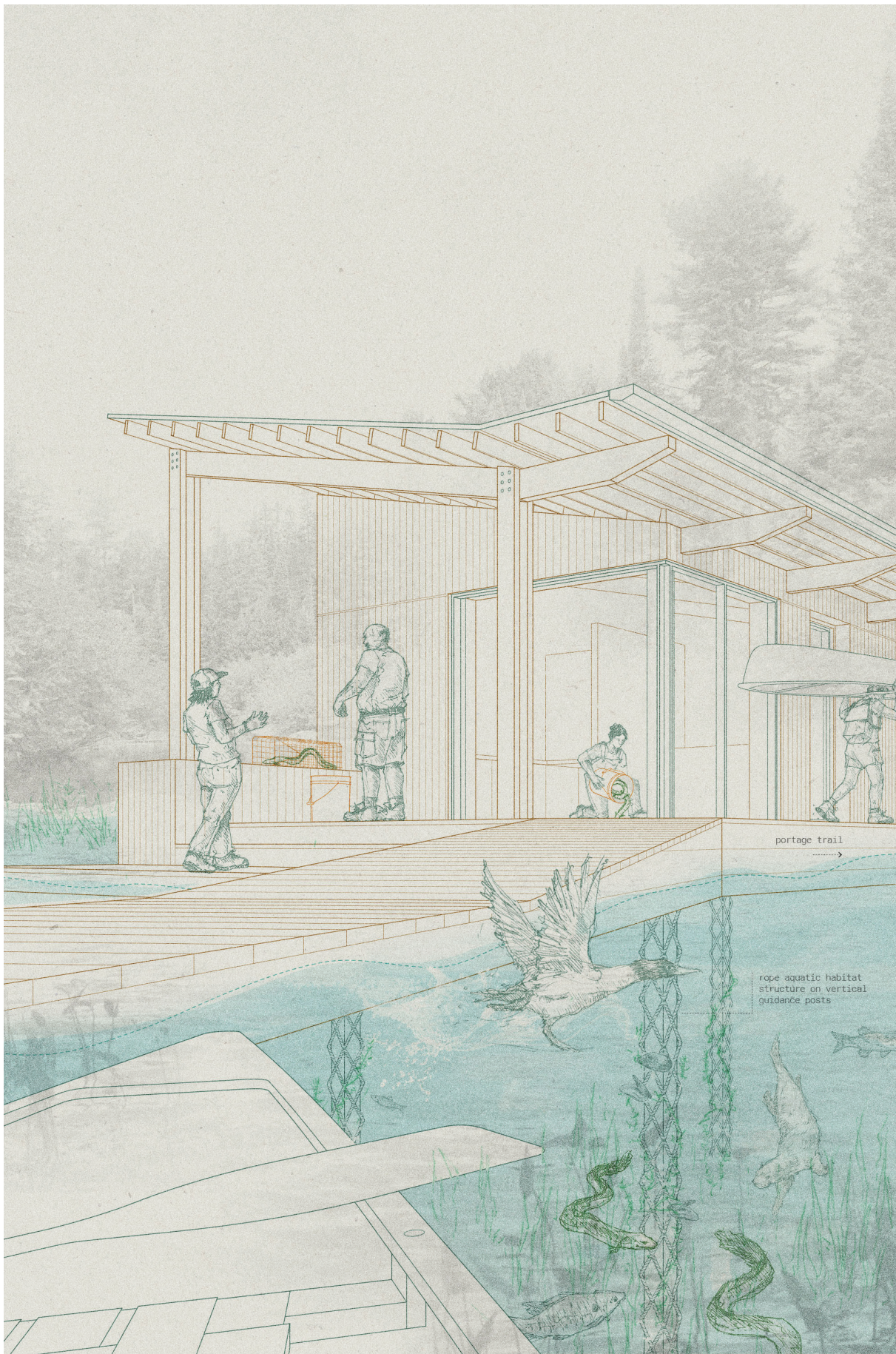
Fig. 5.8 [left]
Pimisi ascend the eel ladder into the learning pavilion where a youth group are gathered.

Fig. 5.9 [below]
Movement of water and bodies through the learning pavilion and adjoining eel ladder.

Pimisi have long been a unifying figure within Algonquin Anishinaabe culture, spirituality, and sustenance. From what I gathered through the interviews and case studies presented earlier in this thesis, the decline of Pimisi today has elicited a renewed convergence of communities and people around the shared responsibility of their recovery. Just upstream of the dam, a learning hub straddles the eel ladder and the trail to facilitate gatherings centred around Pimisi. The ladder enters the pavilion at the apex of its ascent to form a shallow resting pool for Pimisi. Here, at the intersection of the building’s roof planes, rainwater is directed into the pool and storage tank below to be circulated along the ladder.

While this building supports Pimisi migration past the dam, it also functions as the main public interface with recovery. The pavilion provides a sheltered rest stop where visitors and community groups can view the ladder up close and partake in events. An enclosed gathering space supplements the pavilion with a private meeting room and a small kitchen. The envisioned spaces are non-prescriptive to support various scales of educational and cultural gatherings.





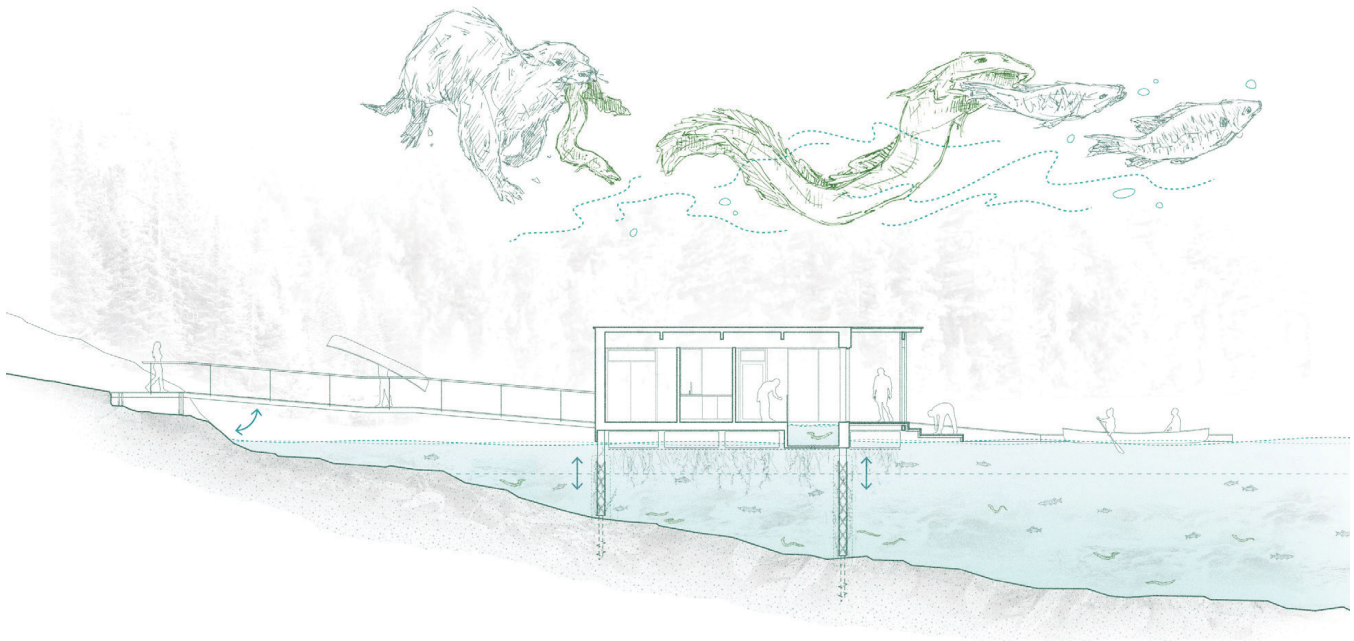
3. Monitoring Station – ‘Returning Natural Balances’

Fig. 5.10 [left]
A canoe approaches
the floating
monitoring station
where a human team
is studying Pimisi.

Fig. 5.11 [below]
Relationship of
monitoring station
to lake level
changes and aquatic
ecology.

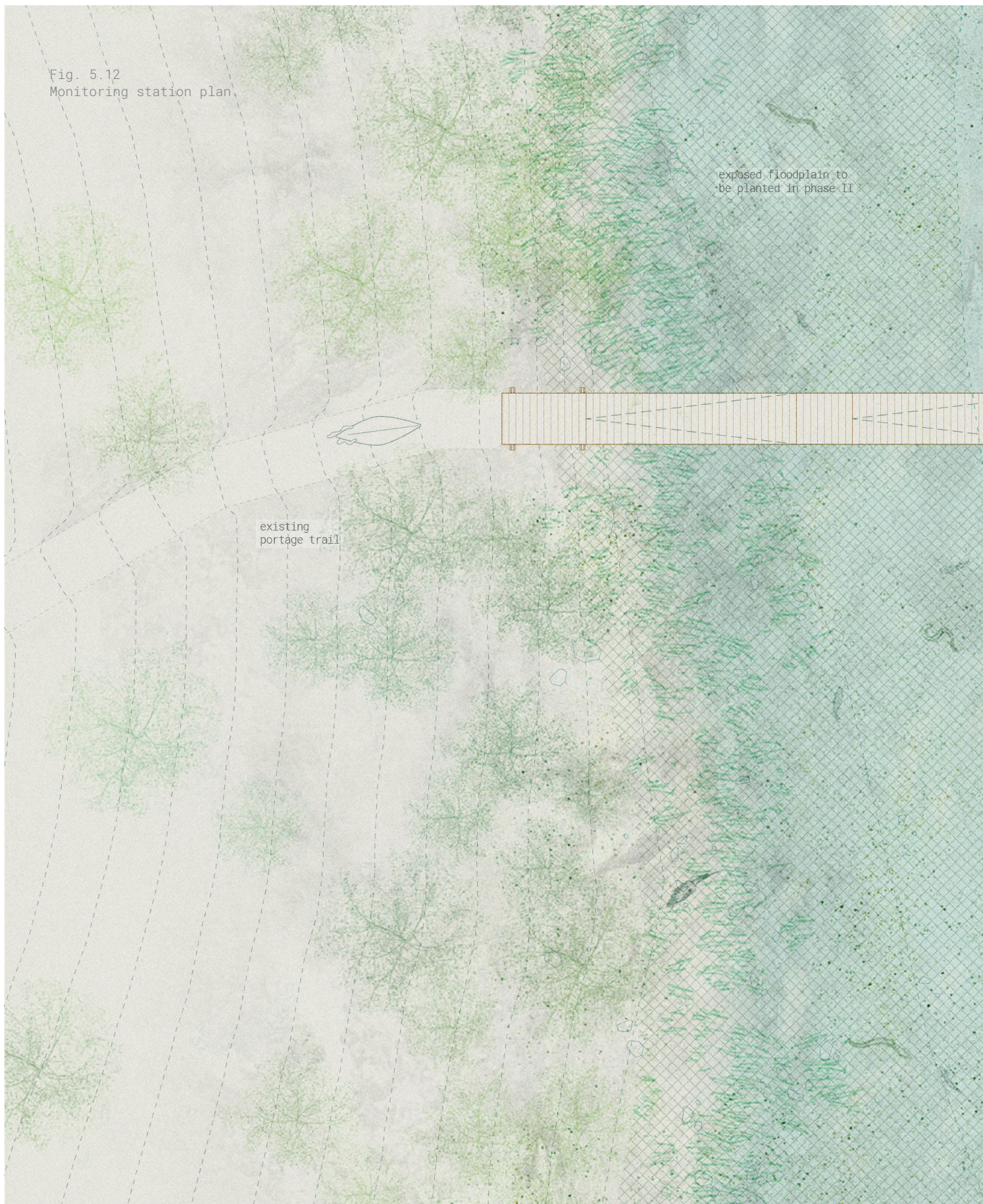
Given Pimisi’s role in ecosystem food webs and circulating nutrients, Algonquin Elder, William Commanda called them as a “cleaner and regulator of natural balances within rivers.”¹ In the recovery process there is an opportunity to track these changes within the headwaters of the Madawaska River. At the upstream entrance to a designated portage trail, a floating outpost marks the transition of human visitors moving from water to land. The building is dedicated to monitoring Pimisi populations in Cache Lake and the ensuing ecosystems changes prompted by their return.

Seasonal fieldwork is supported by a dedicated office space and lab for studying, measuring, and tagging Pimisi. This work continues in the sheltered outdoor work area where fishing traps and monitoring equipment can be unloaded and cleaned. Boats can be launched from the dock to conduct monitoring work around the lake and connected bodies of water. The dock is shared by canoeists portaging to the Madawaska River, creating a confluence of recreation and monitoring activities that enables public exposure to recovery research. Below the water’s surface, the underside of the building and its vertical guidance posts provide structures for aquatic plants and molluscs to latch onto.



1 William Commanda, *Manoshkadosh: The American Eel*, *A Circle of All Nations Note*, *Circle of All Nations*, https://www.circleofallnations.ca/http___circleofallnations_2014NEW_Welcome.html/Circle_Blog/Entries/2014/2/28_Grandfather_inspires_protection_of_the_Eel_files/AmEelManoshkadosh2007FinalWithOrigEmailandGWClinkBiling.pdf.

Fig. 5.12
Monitoring station plan.







4. Trailhead Water Feature – ‘Pimisi Navigation’

Fig. 5.13 [left]
Visitors learn about watershed connectivity at the trailhead water feature.

Fig. 5.14 [below]
Movement of water through the trailhead.

Between the Sargasso Sea and the Kichissippi Watershed, Pimisi must traverse a network of oceanic and riparian corridors. The trailhead is already an orientation point for human visitors, leading them from Highway 60 towards Cache Lake. This forested threshold is rethought to contextualize the trail as a journey alongside Pimisi, beginning with an opportunity to learn about the watershed connectivity necessary for their migrations. A water feature integrating a canopy and a bench presents their migration route at two scales: the Madawaska River and the Kichissippi Watershed. During rainfall, water is collected into a metal channel depicting Cache Lake and the Madawaska River. It subsequently flows into a shallow basin representing the greater Kichissippi Watershed.

The trailhead invites a connection between water and the human body. Visitors can study the maps and use the flowing water to wash themselves. These actions become almost ritualistic – repeated upon arrival and before departing through the proposed unification of the trail loop’s entry and exit. One’s passing through the threshold of the trailhead is an embodied land acknowledgement, centring the importance of water in supporting life in the Kichissippi Watershed.

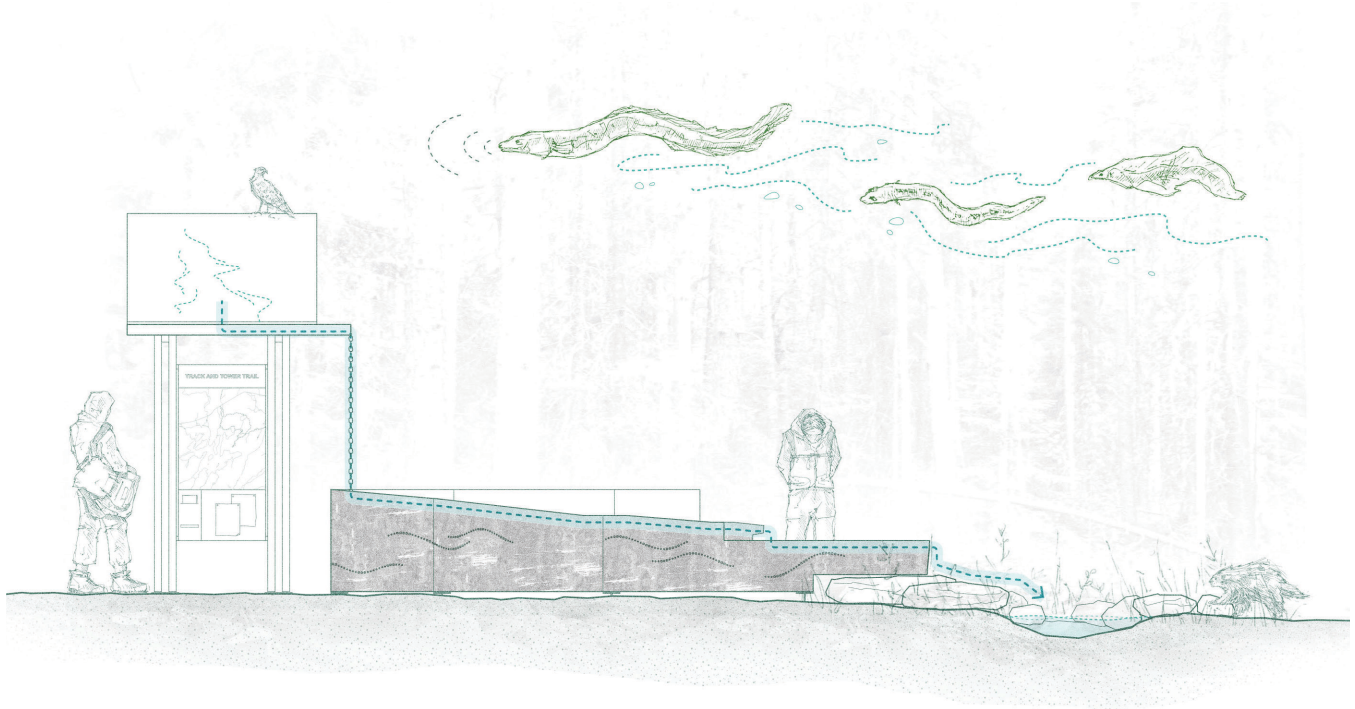
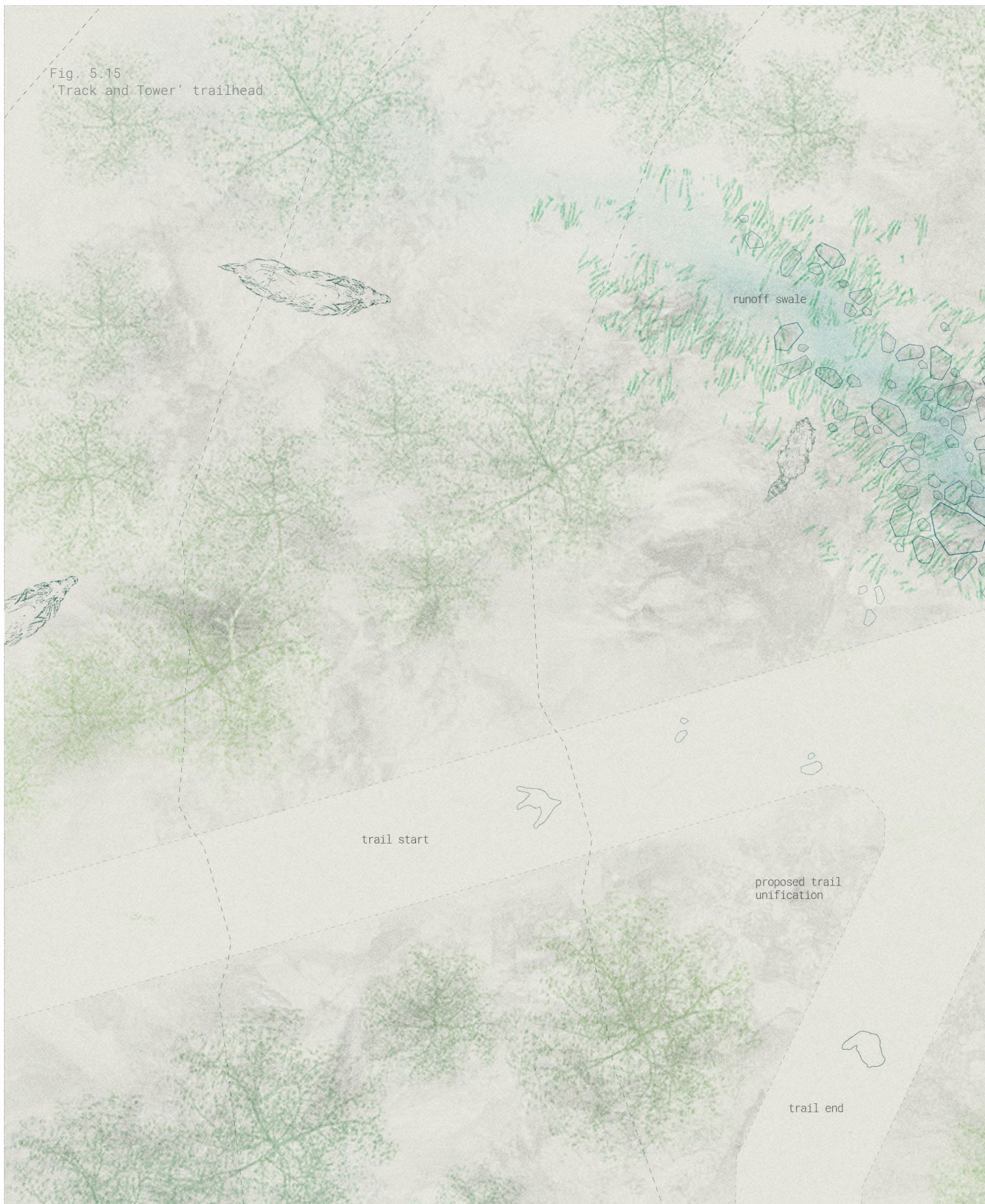
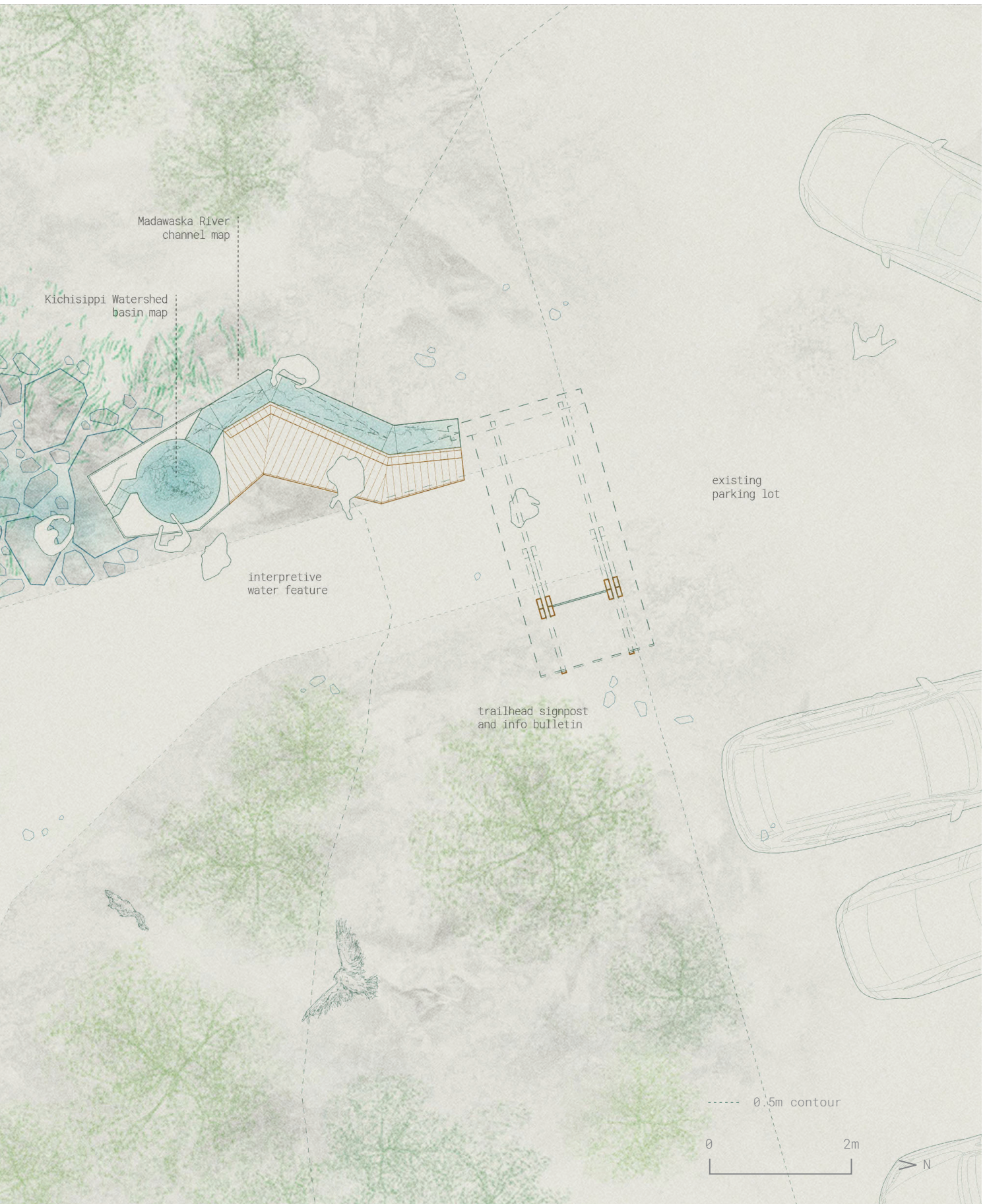


Fig. 5.15
'Track and Tower' trailhead





Phase II: Partial Dam Removal

After three Pimisi generations – a period of about 60 years following the completion of Phase I, the dam at Cache Lake is envisioned to have reached the end of its operational lifespan. It is decommissioned, and its concrete spillover weir and sluice gate are removed. Cache Lake drains, exposing a pre-dam floodplain lost for over a century. Native planting rooted into the new floodplain secures it from erosion and invasive plant occupants. Cottagers participate in these revegetation efforts on their own lakefront properties. The rapids downstream of the former dam regain their vigour, carrying sediment and other nutrients in their path. With the Madawaska River’s agency returned, Pimisi and other beings swim freely through an uninterrupted corridor.

At the site of the former dam and bridge, scattered dam remains are integrated into restorative and interpretive interventions [Fig. 5.16, 5.17]. A redefined riparian edge steadies the downstream channel and sediment release. The ‘Track and Tower’ trail is expanded to provide access to and interpretations of the dam removal and river restoration process, informing visitors about their impacts on recovery. Through these interventions, the delineation between Pimisi and human use of this stretch of the Madawaska is blurred even further.

Fig. 5.16
Phase II masterplan,
indicating the
intervention sites.

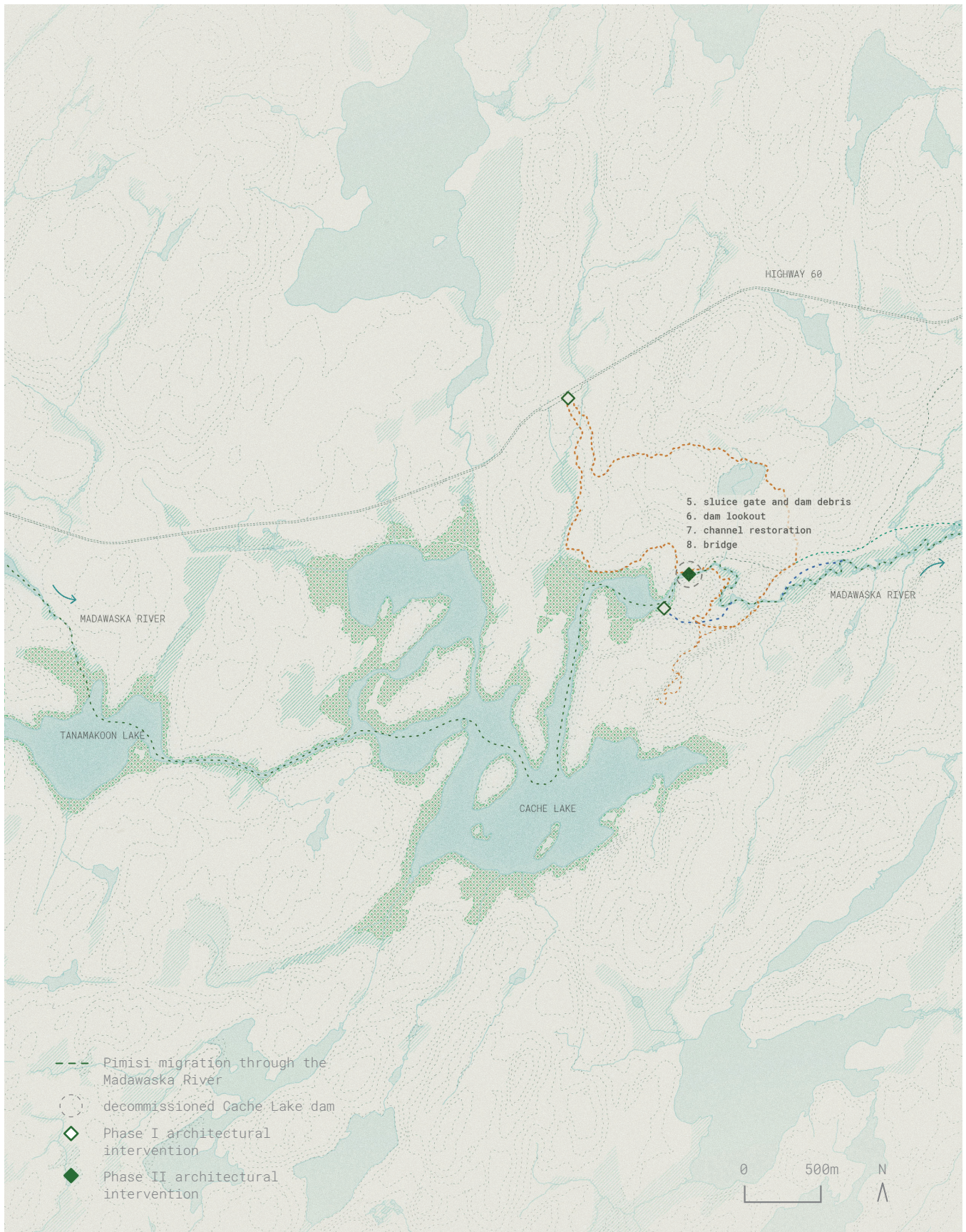
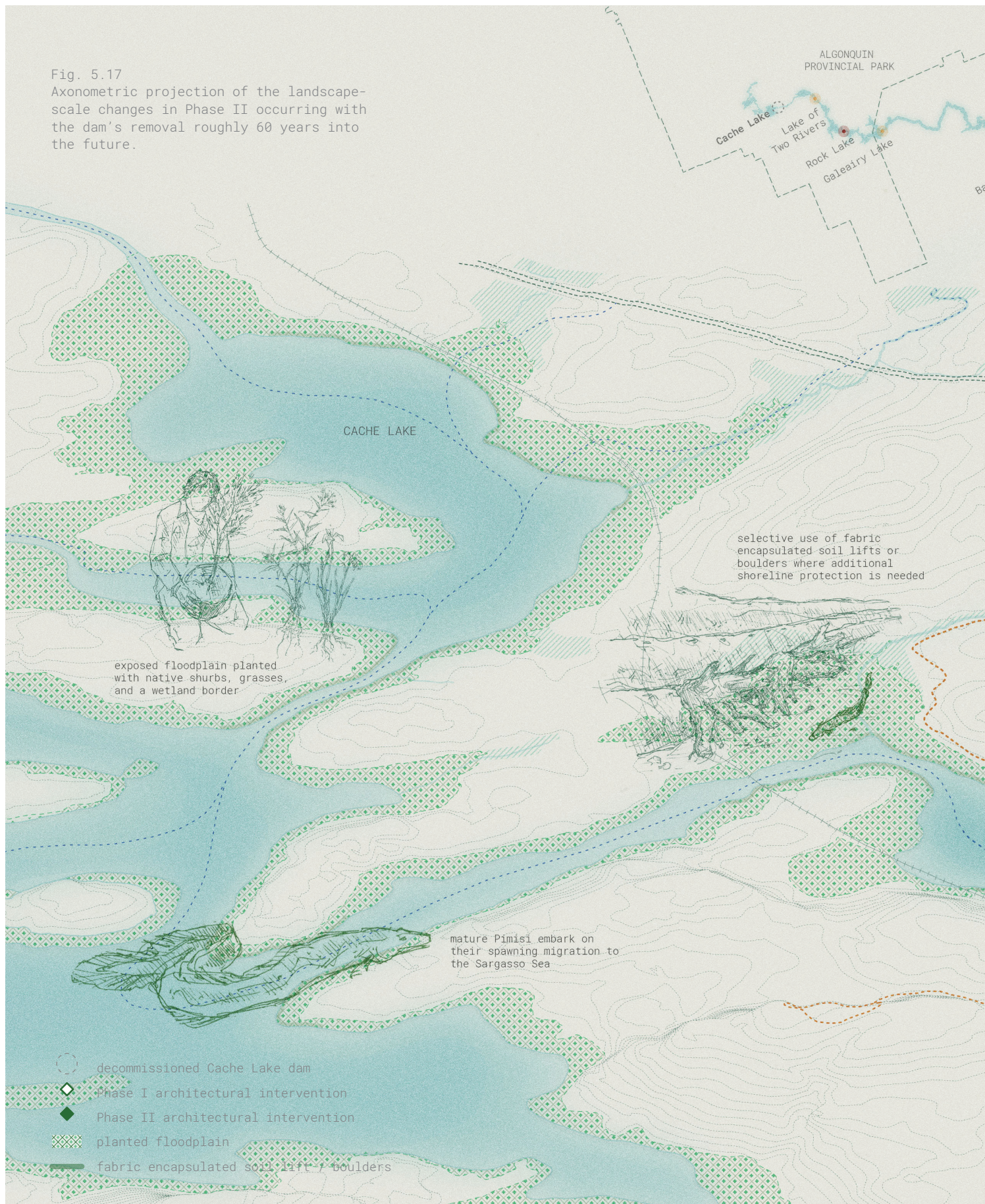
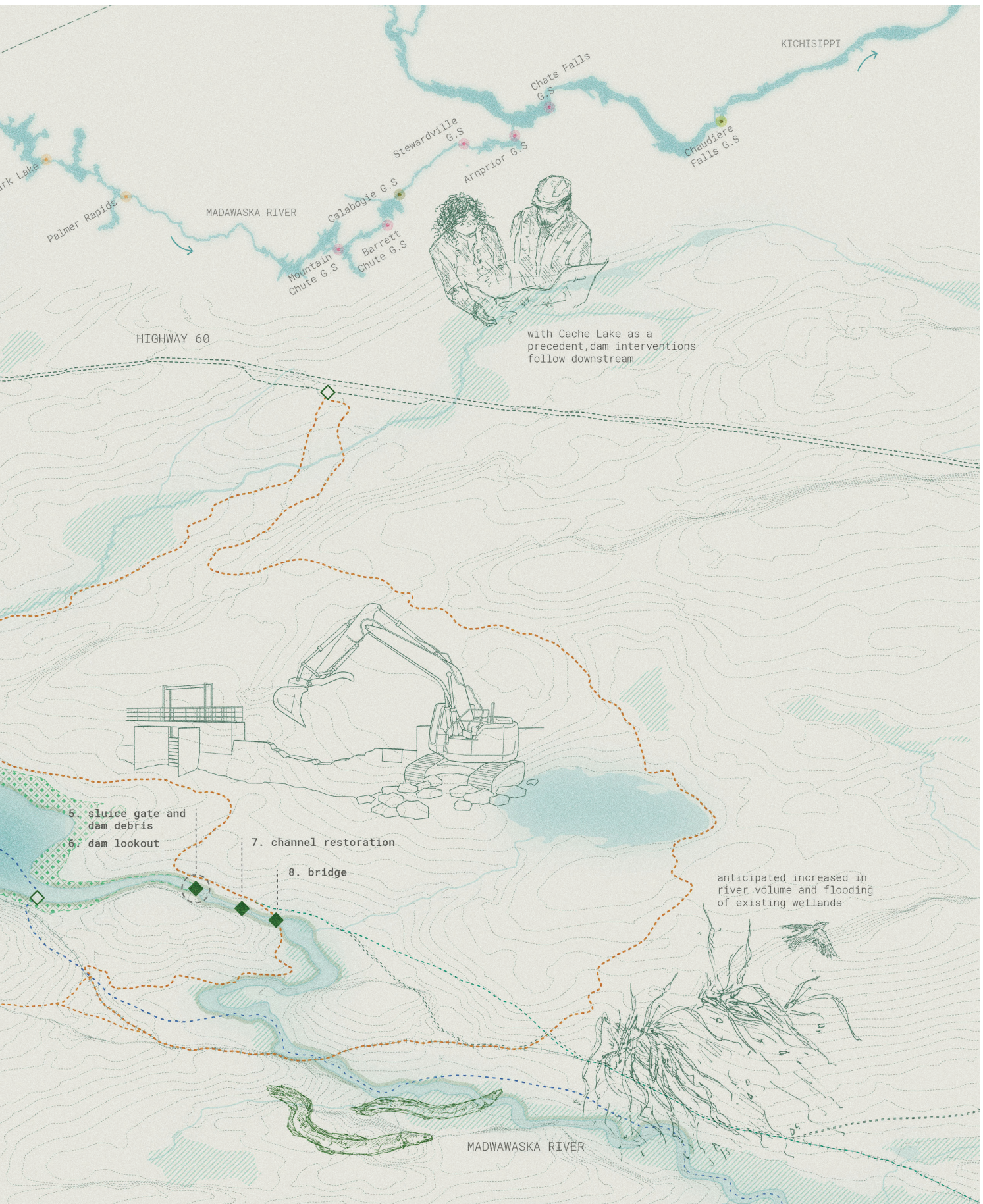


Fig. 5.17
Axonometric projection of the landscape-scale changes in Phase II occurring with the dam's removal roughly 60 years into the future.





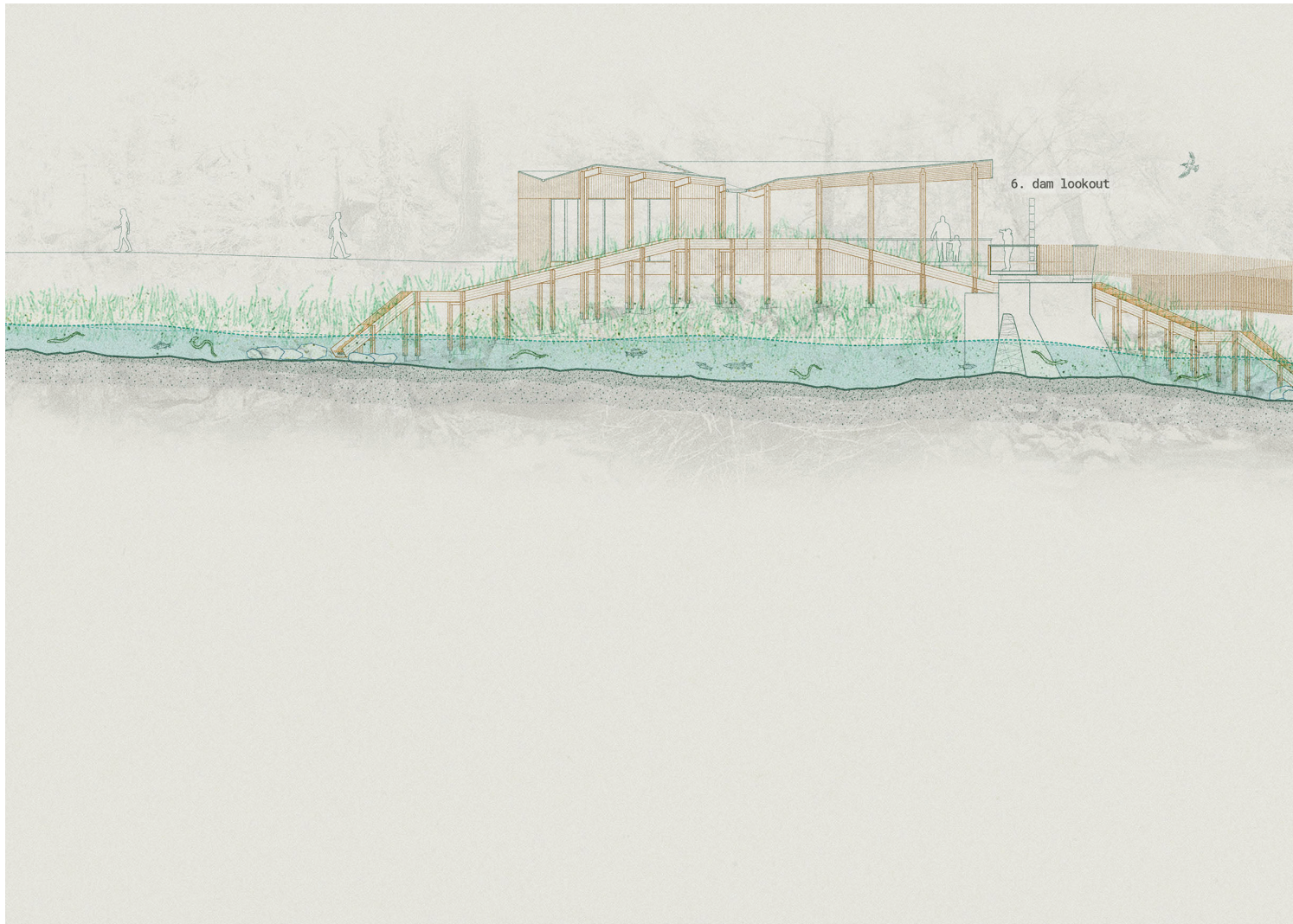
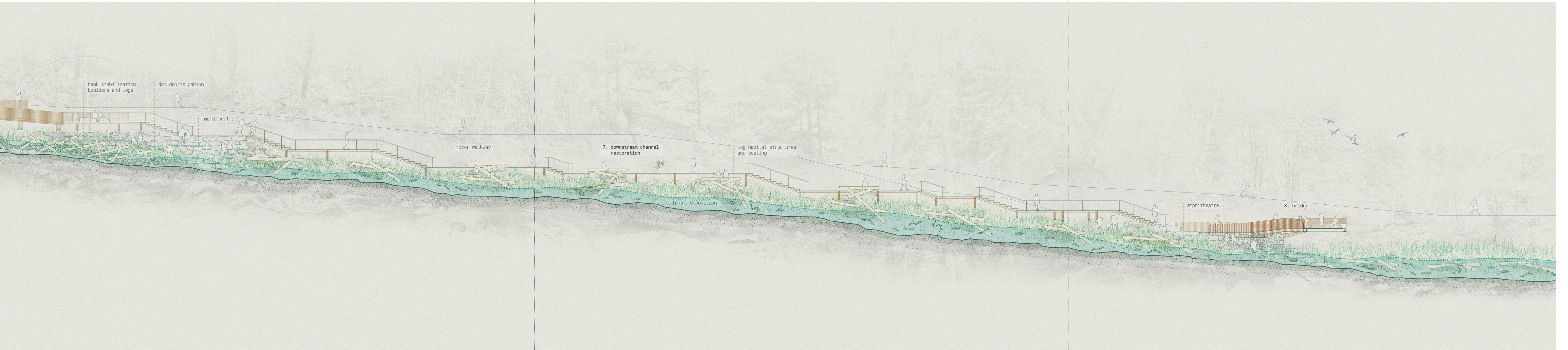


Fig. 5.18
Phase II section of the dam site.
With the decommissioning of the dam,
restoration and access are incorporated.



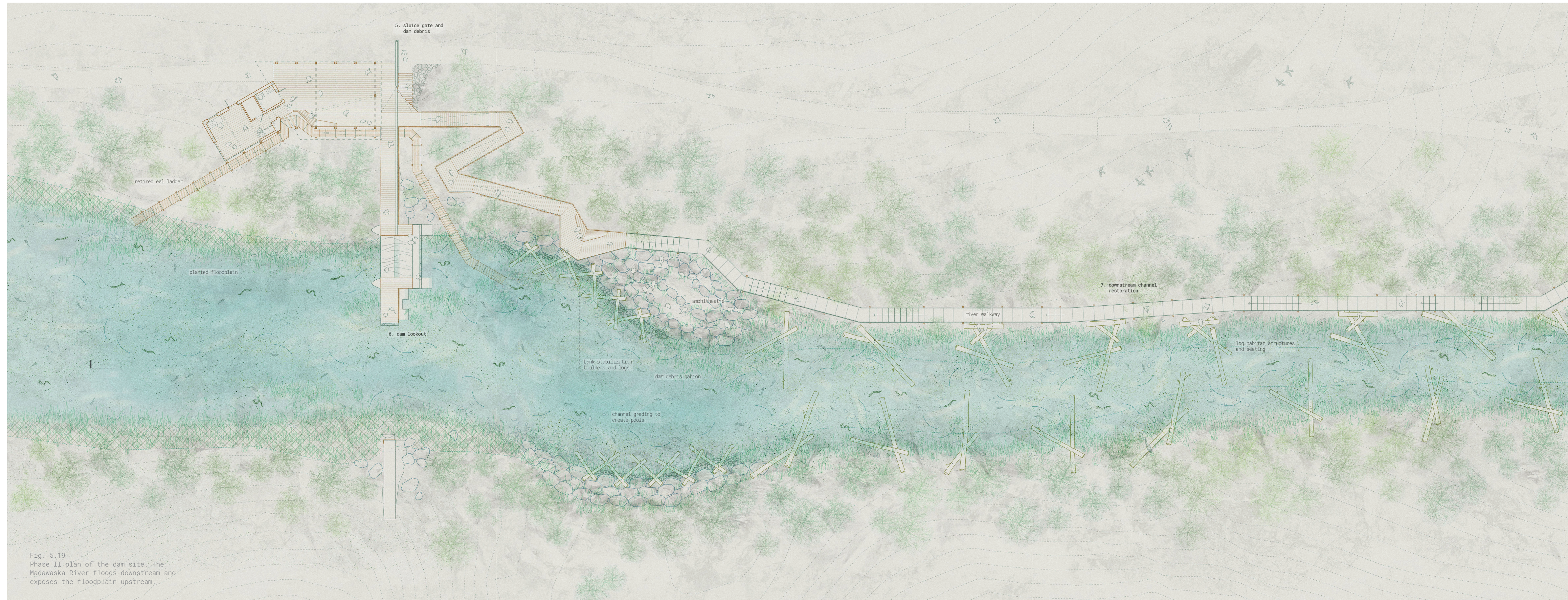
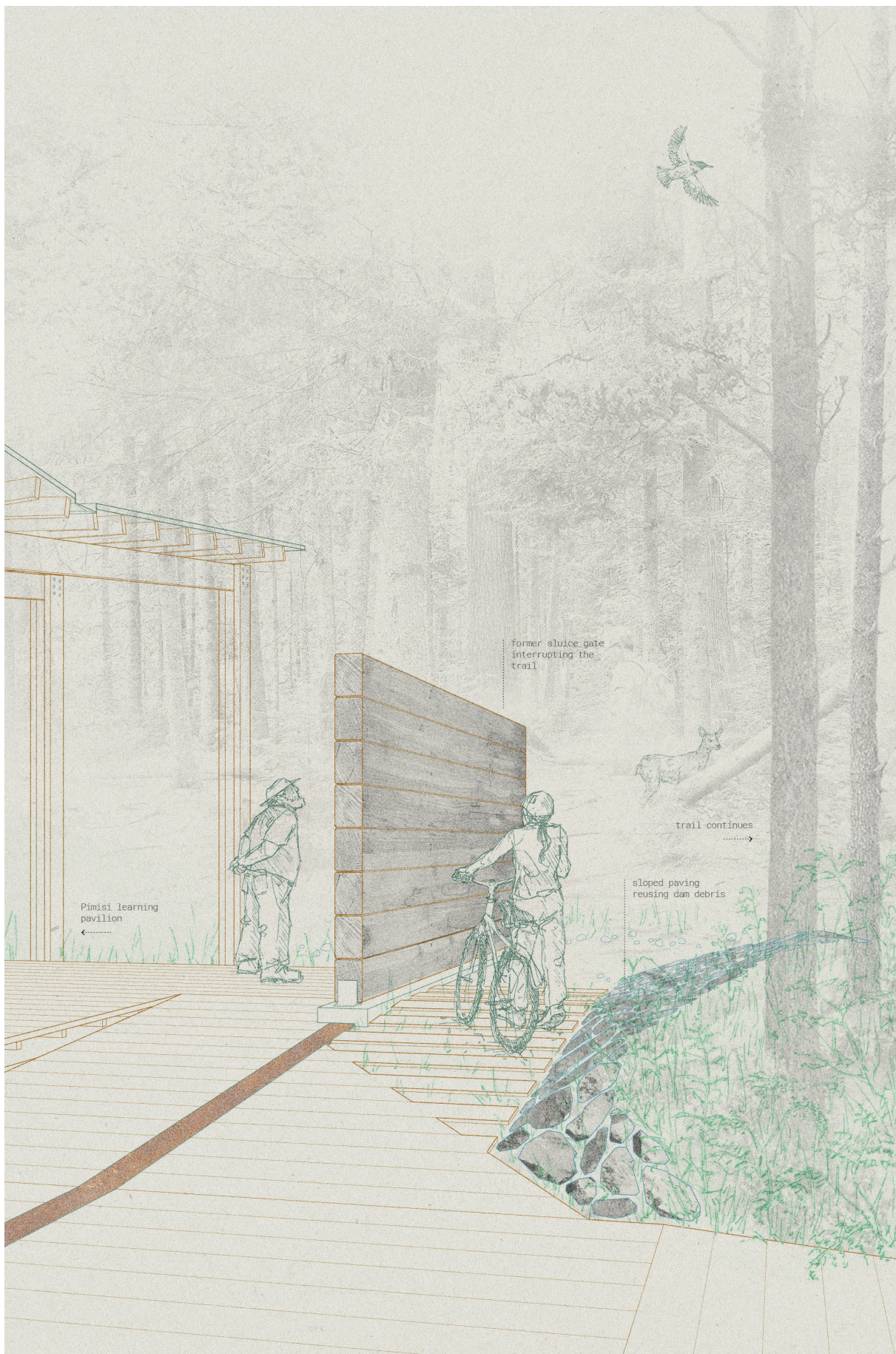


Fig. 5.19
Phase II plan of the dam site. The Madawaska River floods downstream and exposes the floodplain upstream.





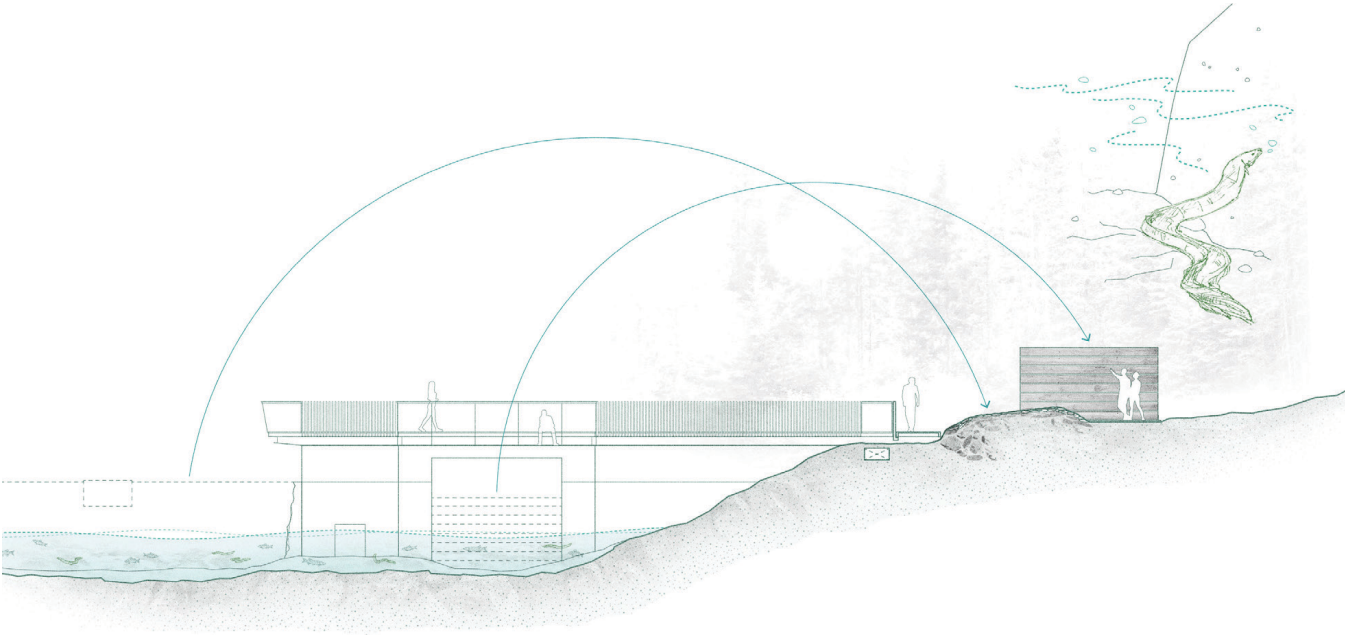
5. Sluice Gate and Dam Debris – ‘Barriers to Migration’

Fig. 5.20 [left]
Remnants of the
Cache Lake dam
disrupt the trail.

Fig. 5.21 [below]
Reuse of the removed
sluice gate and dam
debris.

Pimisi have disappeared from the Madawaska River, as with many of the Kichissippi’s tributaries as a consequence of pervasive damming. The impacts of the Cache Lake dam on Pimisi lifeways and the story of its undamming can be read through the reconstitution of its removed sluice gate and concrete debris from its weir. They perform as physical barriers for human visitors to maneuver around, re-enacting the barrier effect of dams on Pimisi migration.

The sluice gate comprised of wooden stoplogs is positioned on the trail just outside the pavilion. A line of weathering steel traces the path of the gate to its former position at the dam’s outlet. After passing around the barrier, the trail is edged with concrete debris paving from the dam’s spillover weir. These interventions prompt a pause in human movement along the trail to allow the scale of the former barriers and their demolition to come into focus.





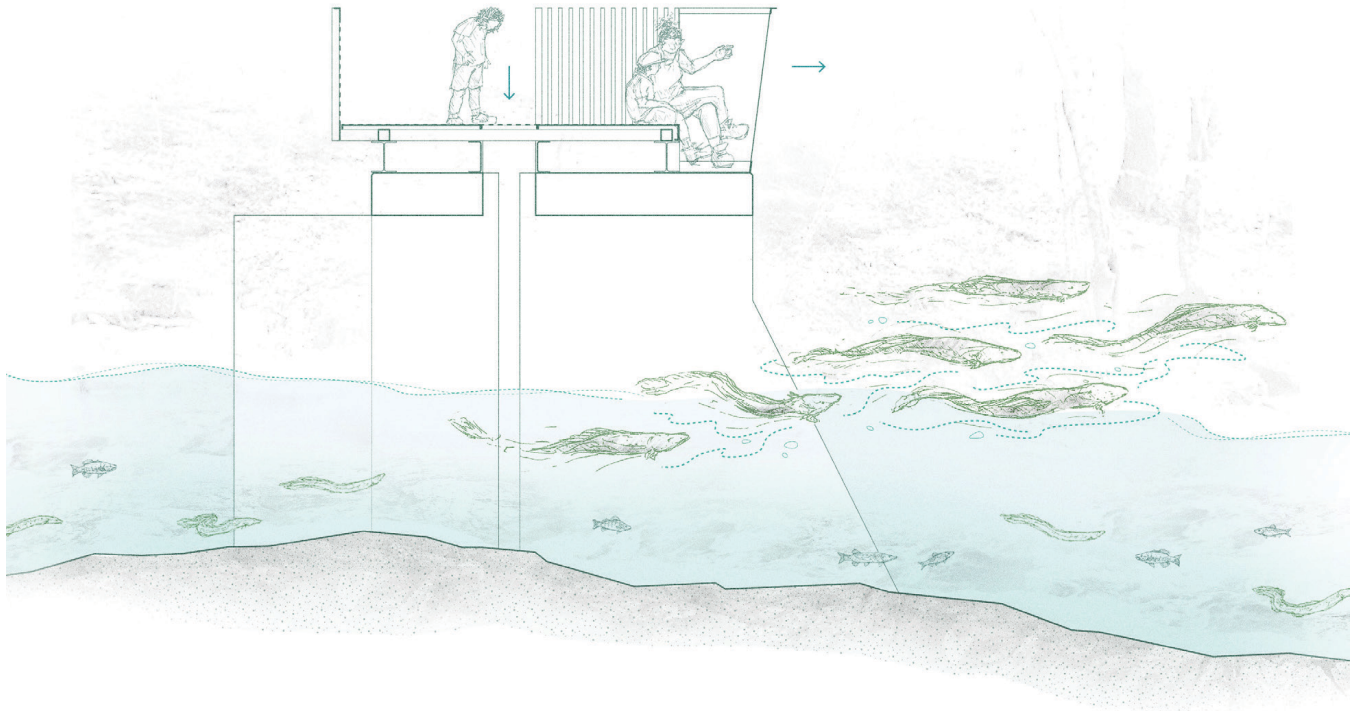
6. Dam Lookout – ‘Silver Pathways’

Fig. 5.22 [left]
Visitors learn about Pimisi spawning migrations at the dam lookout.

Fig. 5.23 [below]
Material and visual connection to Pimisi migration.

Algonquin Elder, William Commanda described Pimisi spawning migrations along the Kichissippi as “great silver pathways” formed by the sheer volume of glimmering skins reflecting in the water.² The remaining dam structure is transformed into a lookout to both architecturally emulate and provide a vantage for humans to witness Commanda’s story come to life. Come fall, Pimisi collectively journey to the Sargasso Sea uninhibited by the constraints of passage through the ladder.

The lookout is a material engagement with silver eel biology. A silver finish coats the metal floor and guardrail panels above the sluice gate outlet. Pimisi migration can be seen at several points along the lookout. Panel perforations above the former sluice gate opening invite human visitors to glance down in search of the elusive, silvery migrants. A seated area looks upon Pimisi passing downstream. Across the free-flowing Madawaska River, a panel attached to remnants of the dam wall on the opposite bank mark the pre-removal water levels.



2 Commanda, *Manoshkadosh: The American Eel*.



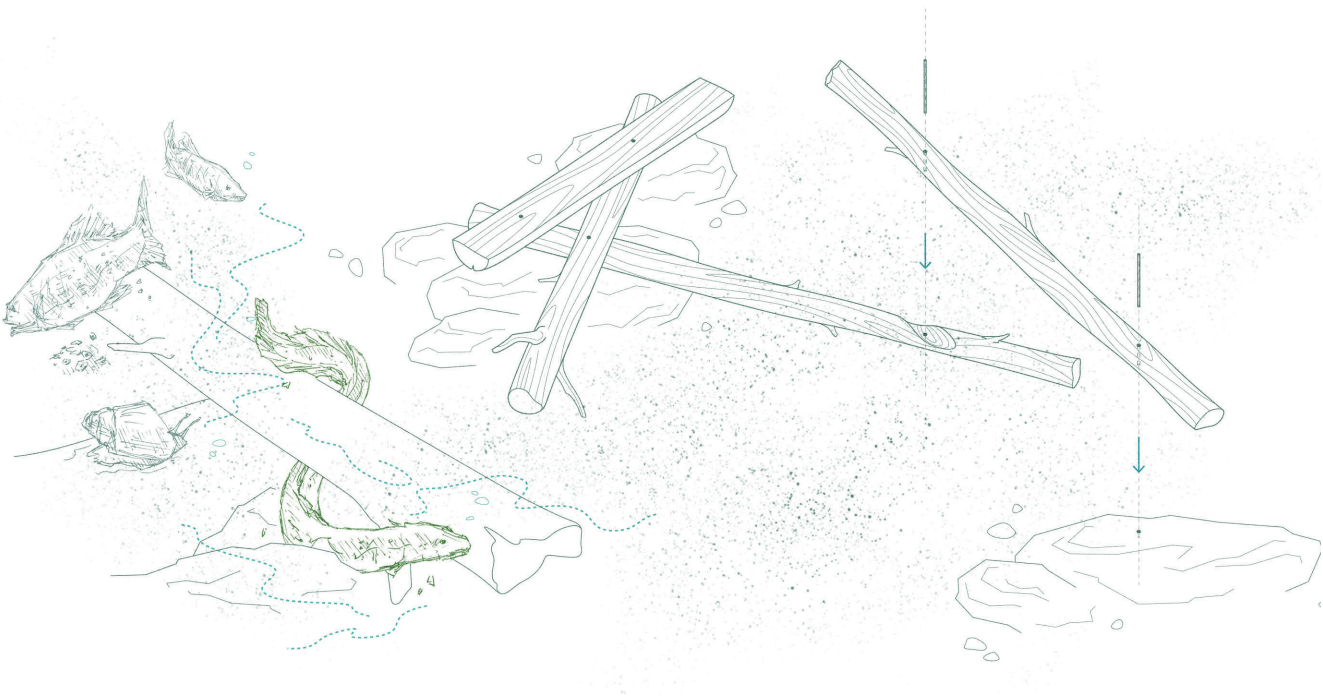
7. Downstream Channel Restoration – ‘Bottom Dweller’

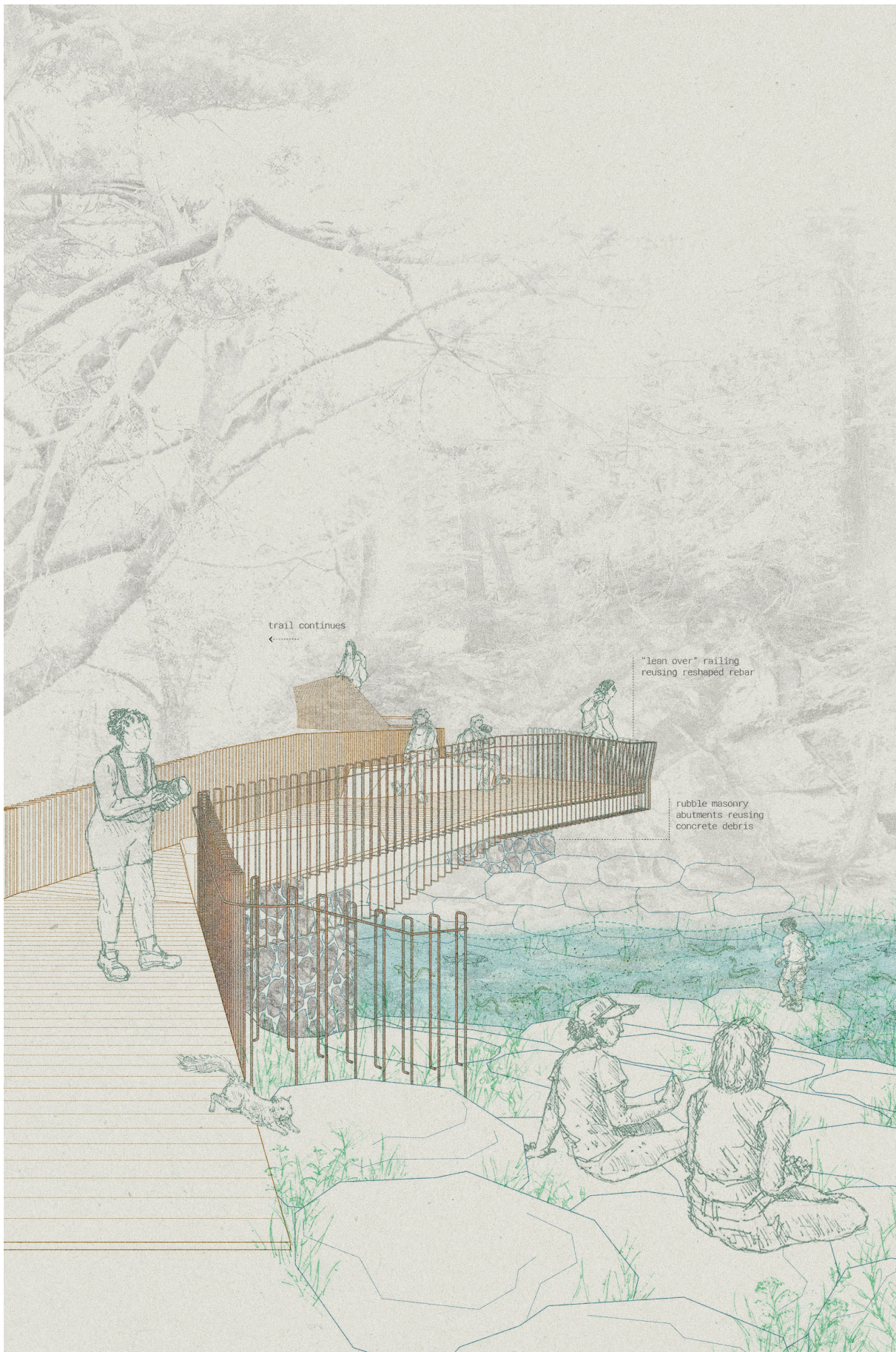
Fig. 5.24 [left] Pimisi, other aquatic beings, and flowing sediments move around log structures in the Madawaska River channel.

Fig. 5.25 [below] Assembly of log habitat structures and seating.

At the bottom of shallow water bodies, Pimisi spend their days hiding in anticipation of the feeding frenzy that nightfall conjures. The strategy for restoring the river channel downstream of the dam incorporates habitat structures for Pimisi, while accounting for sediment release and changes to the river’s path. Human access is provided through a riverwalk trail that continues from the ramp in Phase I. The steel mesh walkway treads gently on the northern riverbank and can be flooded depending on seasonal fluctuations in the river.

Pimisi and other aquatic beings find refuge in varied habitat conditions along the river’s edge. Large woody debris harvested locally through park forestry operations are bolted to the bedrock. These log structures connect human seating with shelter opportunities for more-than-human inhabitants. Over time, they accumulate sediment and support plant growth. Cascading boulder amphitheatres provide riverbank stabilization in locations with an increased density in human activity. Concrete debris from the dam encased in low gabion walls offer additional interstitial spaces for shelter.





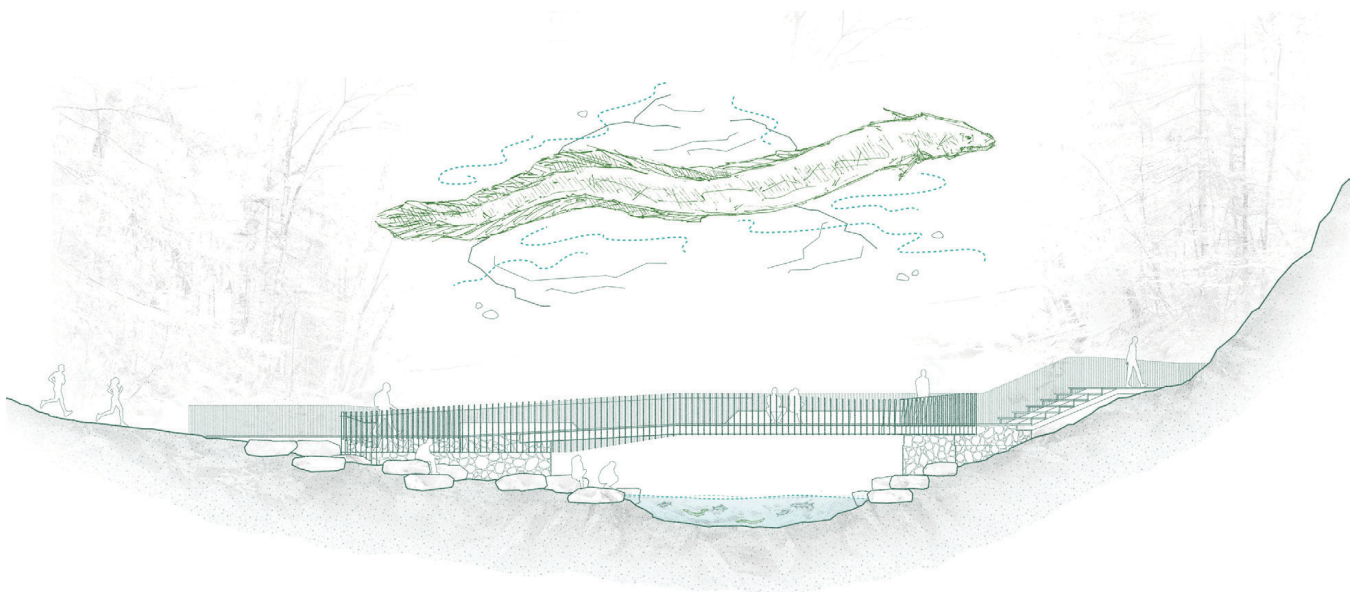
8. Bridge – ‘A Fish that Walks on Land’

Fig. 5.26 [left]
Pimisi and human
visitors cross
shallow rapids at
the reconstructed
bridge.

Fig. 5.27 [below]
Bridge form emulates
Pimisi crossing
between bodies of
water.

Pimisi are known to journey on land when necessary, moving across damp surfaces in search of the next body of water. The marvel of these crossings is conveyed through a sinuous bridge facilitating human passage over the Madawaska River. It replaces the former wooden bridge with a raised floor elevation in response to the increased downstream flooding. The new structure incorporates additional debris from the dam’s weir. Concrete rubble masonry abutments support both ends of the bridge while reshaped rebar forms a guardrail on its west-facing side.

As Pimisi make their way past the rocky crossing of the rapids, the bridge offers several viewing opportunities. Onlookers lean over the guardrails, lowered at select locations. On the northern riverbank, the bridge descends into a boulder amphitheatre. Steppingstones extend the reach of human interactions with the river, providing moments for play and discovery in waters now teeming with Pimisi.



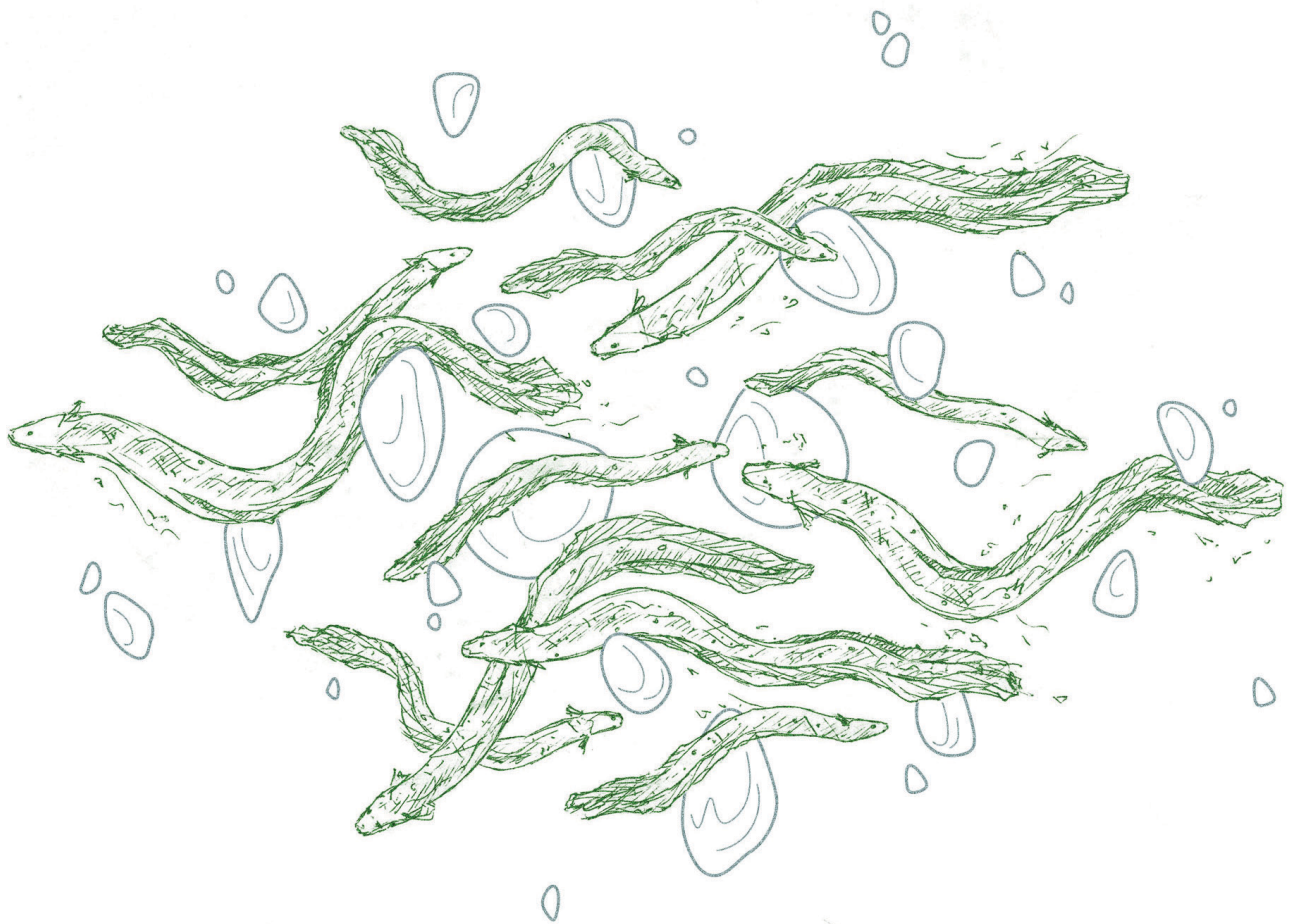


Fig. 6.1
Pimisi yellow
and silver eels
cross paths on
their respective
migrations.

CONCLUSION

Reflections

As Algonquin Provincial Park develops its new Fisheries Management Plan, this thesis imagines spatial forms of repair to park dam sites that could be incorporated to support the return of Pimisi to the Kichissippi tributaries they historically inhabited. The design narrative that unfolds over the lifespan of the Cache Lake dam understands the recovery process as an opportunity to revitalize and form new relationships centred around Pimisi. Within the long-term planning of recovery efforts in the Kichissippi Watershed, these moves hold immense potential to mend ecologically and culturally significant habitats and connections between species that have been fragmented for over a century by park dams.

Although this thesis offers a hopeful vision for a future recovery of Pimisi in Algonquin Park, it cannot be examined in isolation from the connectivity story within the greater watershed. Significant progress needs to be made to ensure safe migration through the Kichissippi. Without government protections at the federal and provincial levels and interventions to hydropower dams, their status in these waters remains threatened. Recovery advocates continue to call for the incorporation of eel passage in the \$750-million renovation planned by Hydro Québec for its Carillon Generating Station – the first impasse that juvenile Pimisi face entering the watershed.¹ This past summer, the Algonquin Anishinabeg Nation Tribal Council voiced their support for Ottawa Riverkeeper’s letter to the industry corporation, adding that prioritizing Pimisi is a chance “to make reparations” and commit to respectfully working together.² Retrofitting or redesigning

1 Blair Crawford, “Ottawa Riverkeeper wants Hydro Québec to give mysterious, endangered American eel a helping hand,” *Ottawa Citizen*, August 22, 2023, <https://ottawacitizen.com/news/local-news/ottawa-riverkeeper-wants-hydro-quebec-to-give-mysterious-endangered-american-eel-a-helping-hand>.

2 Savannah McGregor to Michael Sabia, “Ladders for the American eel at the Carillon Dam renovation,” August 31, 2023, letter, https://eadn-wc01-4092020.nxedge.io/cdn/wp-content/uploads/2023/10/AANTC_EelLadderLetter.pdf. See also, Laura Reinsborough to Manon Brouillette, August 15, 2023, letter, Ottawa Riverkeeper, <https://eadn-wc01-4092020.nxedge.io/cdn/wp-content/uploads/2023/08/Letter-to-Chair-Brouillette-August-15th-2023.pdf>.

major barriers with eel passage improvements, or alternatively, removing them where possible are urgent actions that dam owners ought to seriously consider.

Reflecting on the human responsibilities towards Pimisi and the weight of their meaning, I recall the insights that Krystal Mitchell shared with me in her interview on the collective power of recovery advocates to urge government and industry to act.³ While this research highlights existing advocacy efforts and interventions to dams, it also conveys my own capacity to bring attention to Pimisi decline and support their recovery as a settler designer. Learning from Algonquin Anishinaabe perspectives on Pimisi and Algonquin Park underscored the cultural motivations behind recovery and their entanglement with Algonquin people's rights and self-determination. These cultural narratives, coupled with my analysis of the park's settler colonial and resource-oriented legacies shaped my view of recovery beyond Western scientific understandings. This prompted me to align my design advocacy to additionally support the interests of Algonquins and non-Indigenous allies invested in Pimisi.

In a previous review of this research, I was asked to clarify how a designer's contributions to Pimisi recovery could be differentiated from that of an engineer or an ecologist. The response offered in this thesis suggests that designing interventions to support recovery is not limited to a technical exercise of assisting migration at park dams, nor is it constrained to a study of more-than-human systems. Instead, design input has the potential to address Pimisi's interface with both their more-than-human and human relations, facilitating multispecies encounters that diverge from Algonquin Park's current management and use.

Developing a relational understanding of Pimisi recovery led my design process to engage with more-than-human agency, which has historically been positioned to serve settler interests in the park landscape. It also encouraged moving between the scales of the Cache Lake dam site and the Kichissippi Watershed to grasp the possible impacts of the recovery interventions beyond park boundaries. Deviating from the control of water and invasive species management by dams, the reintroduction of Pimisi combined with phasing the partial removal of the Cache Lake dam could result in positive ecological impacts to the headwaters of the Madawaska River. The proposed scheme responds to the role of Pimisi in freshwater ecosystems by integrating shelter and feeding opportunities to support their maturation and interactions with

3 Krystal Mitchell (Fisheries and Wildlife Management Advisor, Algonquins of Ontario), "Krystal Mitchell Interview," interview by author, November 23, 2023, transcript, 173-174.

other beings and their environment. Accepting the limits of human control in river restoration demonstrated by the Mill River dam removals, the second phase works with the Madawaska River to rehabilitate habitats disconnected by damming.

Though the design perspective I adopted decentres human experiences, it proposes that their engagement is intrinsic to Pimisi recovery. Based on my interview conversations and analyses of the Akikodjiwan (Chaudière Falls) and Mill River projects, the interventions connect recovery to the existing educational, cultural, and research functions of Algonquin Park. Bringing together a diverse human community could produce multiple shifts towards relationality in the function and perception of the park: promoting care and advocacy among visitors, supporting Algonquin peoples' connections to Pimisi, and encouraging collaborative management – all of which could further the entwined processes of reconciliation and healing the land.

Recognizing the sovereignty of the Algonquin people throughout their Traditional Territory, as well as the experienced perspectives of management staff, researchers, and other members of the park community, the scheme for Cache Lake is not intended to be conclusive; rather, it aims to initiate further discussions within the park community surrounding the design of Pimisi recovery interventions with relations in mind. The decision-making behind the recovery objectives, programming, and phasing dam interventions provides relevant considerations for any non-powered dam within a future scope of recovery efforts. On the technical side, these theoretical ideas could be built upon in further studies to assess site conditions and determine a suitable scope of work. My attempt to include cultural use programming in the design of the learning pavilion highlights an opportunity for Algonquins working with the park to develop dedicated spaces related to future harvesting activities. Paired with this, the interpretive dimension to recovery interventions prompts additional consideration for how Pimisi's story might be told and who would be involved in the storytelling process.

Ultimately, Pimisi decline, while a significant loss in and of itself, speaks to the dismissal of more-than-humans on a global scale through human development led by colonial and capitalist systems. It is a trajectory that is fueling climate change and is on a path to render threadbare the vibrant tapestry of biodiversity. Fellow residents of the Kichissippi Watershed, Namé (Lake Sturgeon), Hickorynut Mussel, and Least Bittern are experiencing similar plights due to anthropic pressures, including habitat fragmentation

by dams, invasive species introductions, and wetland loss and degradation.⁴ This research emphasizes that these crises are intertwined with the practice of architecture. While the discourse on sustainability and offsetting environmental impacts continues to be prevalent, I recognize that there are perhaps deeper conversations needed regarding the participation of design in the restoration of land and relationships. Returning to Christine Luckasavitch's essay on Pimisi recovery reinforces that repairing relationships with more-than-humans is part of the process of reconciliation with Indigenous peoples.⁵ Yet, looking back on my efforts to support Pimisi, I have to also question the political nature, privilege, and responsibilities within building on unceded Algonquin Traditional Territory as a settler designer.

During the defense of this thesis, questions from my committee about the proposal's scope and implementation prompted reflection on its ecological restoration aims and reuse of dam materials contrasting with its reliance on more invasive processes of dam removal and extracting timber. Following these questions, I am left with a heightened consciousness about the impacts of construction and demolition on the land. At the same time, this research indicates how human intervention can do otherwise by 'giving back' to more-than-human relations.

When I consider how designers might respond to the environmental and reconciliatory concerns within the lands that they engage with, building a site-specific awareness of relationality is a promising first step. By working towards fuller understandings of the ecological and cultural relationships that define a place, they can better direct their agency to support more-than-human beings like Pimisi, while being mindful of the ethics of care, advocacy, and allyship related to these pursuits. This will continue to be an important consideration in my own practice, and one that could be useful

4 Golder Associates Ltd., *Recovery Strategy for Lake Sturgeon (Acipenser fulvescens) – Northwestern Ontario, Great Lakes–Upper St. Lawrence River and Southern Hudson Bay–James Bay populations in Ontario* (Peterborough, Ontario: Ontario Ministry of Natural Resources, 2011), <https://www.ontario.ca/page/lake-sturgeon-recovery-strategy>; Ontario Ministry of Natural Resources and Forestry, *Recovery Strategy for the Least Bittern (Ixobrychus exilis) in Ontario* (Peterborough, Ontario: Ontario Ministry of Natural Resources, 2016), <https://www.ontario.ca/page/recovery-strategy-least-bittern>; and "The Hickorynut: A Rarity Everywhere But Here," *Ottawa Riverkeeper*, accessed February 28, 2024, <https://ottawariverkeeper.ca/what-we-do-2/issues/endangered-species/the-hickorynut/>.

5 Christine Luckasavitch, "Kichissippi Pimisi: Restoration of endangered eel species 'vital' to the Algonquin People," *Algonquin Life Magazine*, July 26, 2022, https://www.muskokaregion.com/life/kichissippi-pimisi-restoration-of-endangered-eel-species-vital-to-the-algonquin-people/article_185978f5-98e6-5391-8953-8b987b52107d.html.

for other settler designers to critically examine the reproduction of colonial and resource-oriented relations with the land in architecture and the opportunities for change. If anything, relationality reveals that our design decisions are invariably bound to a fragile web of coexistence connecting all beings.



Fig. 6.2
Sunset over Lake
Opeongo at the
Harkness Laboratory
of Fisheries
Research, May 2023.

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APPENDIX

Interview Transcripts

Letter of Ethics Clearance

Notification of Ethics Clearance to Conduct Research with Human Participants

Principal Investigator: David Fortin (School of Architecture)

Student investigator: Elizabeth Yeoh

File #: 45161

Title: Conversations About Pimisi (American Eel) Recovery

The Human Research Ethics Board is pleased to inform you this study has been reviewed and given ethics clearance.

Initial Approval Date: 08/28/23 (m/d/y)

University of Waterloo Research Ethics Boards are composed in accordance with, and carry out their functions and operate in a manner consistent with, the institution's guidelines for research with human participants, the Tri-Council Policy Statement for the Ethical Conduct for Research Involving Humans (TCPS2 2022), the Ontario Personal Health Information Protection Act (PHIPA), and all laws and regulations of the province of Ontario (as applicable). Additionally, CREB operates in a manner consistent with the International Conference for Harmonization of Technical Requirements for Pharmaceuticals for Human Use (ICH) Guidance E6(R2): Good Clinical Practice, the International Organization for Standardization of Good Clinical Practices (GCP) as set out by ISO 14155 - Clinical investigation of medical devices for human subjects, Part C, Division 5 of the Food and Drug Regulations, Part 4 of the Natural Health Products Regulations, Part 3 of the Medical Devices Regulations. Both Boards are registered with the U.S. Department of Health and Human Services under the Federal Wide Assurance, FWA00021410, and IRB registration number IRB00002419 (HREB) and IRB00007409 (CREB).

Expiry Date: 08/29/24 (m/d/y)

Multi-year research must be renewed at least once every 12 months unless a more frequent review has otherwise been specified. Studies will only be renewed if the renewal report is received and approved before the expiry date. Failure to submit renewal reports will result in the investigators being notified ethics clearance has been suspended and Research Finance being notified the ethics clearance is no longer valid.

Level of review: Delegated Review

Signed on behalf of the Human Research Ethics Board



Joanna Eidse, Research Ethics Officer, jeidse@uwaterloo.ca, 519-888-4567, ext. 47163

This above named study is to be conducted in accordance with the submitted application and the most recently approved versions of all supporting materials.

Documents reviewed and received ethics clearance for use in the study and/or received for information:

file: Fortin_David_ResearchAuthorization_2023_Approved.pdf

file: Interview Guide_version1_20230719.pdf

file: Research Agreement_version2_20230821.docx

file: Recruitment Email_version2_20230821.docx

file: Consent Form_version3_20230827.docx

file: Information Letter_version2_20230821.docx

file: Appreciation Email_version2_20230821.docx

Approved Protocol Version 3 in Research Ethics System

This is an official document. Retain for your files.

You are responsible for obtaining any additional institutional approvals that might be required to complete this study.

Mark Ridgway Interview

Elizabeth Yeoh (EY): To begin, could you introduce your role and your work, as well as what drew you to it?

Mark Ridgway (MR): I'm the director of Harkness Laboratory of Fisheries Research for MNR. In that role and with the team of people from Harkness, we have conducted many monitoring and science elements in the park in support of the Algonquin Land Claim. They include multiple lake netting programs for relative population estimation, fish movement studies to improve those monitoring estimates as well as to learn new things about the species of interest. We've also used the registration database for park users, like you and I, to identify where people go in the park and park use. So, we've covered a lot of different subjects.

EY: What drew you to working in Algonquin Provincial Park? Did your park experiences begin at a young age?

MR: My first visit to the park – I was ten years old and accompanied my uncle's scout group on a canoe trip through Smoke and Ragged and Big Porcupine and occasional visits after that. When I returned in '83 to start my PhD field work is when I was really heavily involved. I have been in the park ever since except for two seasons.

EY: Given the focus of your work on the park's fisheries, have you always been interested in studying this field?

MR: Unrelenting interest.

EY: It seems to be a big passion for you!

MR: Lakes – they're islands of water in a sea of land. And occasionally they have ribbons that connect them. The park's glacial history is so interesting and diverse that there's a natural history element to the park lakes that drive a lot of great research questions.

EY: Can you touch on what is unique about the park's aquatic ecosystems?

MR: The park largely retains its post-glacial aquatic distribution. What I mean by that is that the Northern part of the park was, for a period of time, about a millennium, the main drainage of glacial Lake Algonquin – the precursor of Lakes Michigan and Huron. That drained through the top of

the park, so that brought in a fauna that was Great Lakes in nature from the plankton right through to some of the fish. Our species distributions in the park that are largely defined by that drainage system and that distribution is still evident. Introductions have been relatively limited so that the fauna doesn't get kind of homogenized from introductions. It retains its glacial fingerprint, and it does so very, very clearly.

EY: I think that is a really important feature to note. Algonquin Park has a very unique ecosystem.

MR: It does. So, if you think of other parts of Ontario – if you're over in the West near Lake Nipigon – it was also a main drainage system for a different glacial lake. But unlike that area, the park is accessible for us. We can go to different parts of the park and we're in this part of the drainage, and then we're in another part of the drainage. There are really important differences in food web stemming from that glacial story. At a park scale, it provides a huge background that can drive a lot of questions. In any one lake you can lose yourself in a ton of research questions regardless of the historical zoogeography.

EY: Can you talk about a bit of the work that you've done this past summer in the park?

MR: This past summer, we, and others – colleagues from universities – have been heavily involved in a detailed tracking study in three connected lakes: Tea, Canoe, and Smoke. Those lakes contain an acoustic network that's listening for fish that are implanted with ultrasonic tags. As they ping, the network of each lake is listening. When they're picked up by three or more receivers, you can triangulate their position in the lake. The tags themselves broadcast depth, so that's not a calculation, it's not an estimation question, it's just the depth. But the XY position in the lake, their planar position is horrendous trigonometry, and that's what the network does.

So, that was a big deal. We've done some netting in some of the lakes as part of what we've done for the past thirteen years, particularly with Lake Opeongo, which is the biggest lake in the park. That takes fully three weeks of work. We'll continue with that and hopefully continue on with that kind of work. Even when the Fisheries Management Plan and the Land Claim is settled, the idea is to, you know, keep going.

EY: That brings me to my next point. My thesis is focused on Pimisi recovery, and I am imagining that monitoring will be a huge component within that. I wanted to ask you how you came to learn about Pimisi, or as they are commonly known, American Eel?

MR: Regarding the park, there was a photo of, actually, I think it's Mrs. Harkness – “wife of-” – holding an eel – one of the last ones from Opeongo. Now, the people who would have more eel stories I'm sure are now long gone, but it showed that they were a common predator in the lake in my opinion. They would have been much more common throughout the park. So, that was my introduction to eels in the park. The park, I think, has an assemblage of those kinds of observations from the past. They can tell you where they were, but I just have that Opeongo reference point.

EY: Did you ever see any eels in the park during your time at Harkness?

MR: I have not seen an eel in the park. I have seen eel in other inland lakes down in Eastern Ontario, in lakes that are up on a hill, right? And these things literally get up into those systems. The first eel I ever handled was in a lake in Eastern Ontario.

EY: That must have been quite the experience.

MR: Well, it is! You have to use these 5-gallon pails to hold them because they will stand on their nose and corkscrew out of the pail. You pick them up and you can hold as tight as you can, and that thing will move right between your hands, like it's extraordinary. They're incredible.

EY: They're very powerful.

MR: They're very powerful, really strong. And when you see them in real life, they're big. The diameter could be like this [*Mark gestures a circumference the size of an orange*]. I mean, they're substantial.

EY: Yeah, the female eels can grow to one meter in length, which is incredible. I've never seen one or held one before so in hearing other people's experiences, it is just fascinating for me to imagine what that would be like.

MR: Yeah, they're super slippery, I'll say that!

EY: I understand that Harkness has done some extensive studies on aquatic ecosystems and connectivity in relation to park dams. Could you describe any experiences at park dams through your work? Do you have any observations to share on the impacts of these barriers?

MR: They're part of the connectivity story because they clearly *break* connectivity. What became apparent to us is that in several places – the Shirley Lake dam is a good example, the Annie Bay dam is a good example, and there's others – the species introductions that have occurred over the last ten to thirty years have put some real sea monsters into the aquatic food web. For example, the Shirley Lake dam might be the most dramatic. The food webs above the Shirley Lake dam are entirely native, you know, post-glacial. Below the Shirley Lake dam is a suite of these top predators that are just unbelievable – Smallmouth, Largemouth, Pike, Walleye, Rock Bass – all of them introduced. A dam like the Shirley Lake dam, is a real point of preservation and conservation of native fish assemblages.

Annie Bay dam is like that too. Below the Annie Bay dam are Rock Bass and Pike. As we discovered over a decade ago, the Rock Bass occupied the frothing water at the base of the dam in the bubbles. They're right up against it. So, in several important locations, they're very important biodiversity devices for conservation. In other places, maybe not so much. But who knows what the future holds.

Some of the dams are in rather broken-down states. The dam at the outlet to Hogan is an old log crib dam, probably from logging days. There's water shooting out between the rocks and the dam, right? Over time it will wear down, but there aren't invasive species in that watershed at that point. They must not be able to get up that far, because at Radiant Lake, where Hogan ultimately drains to, there's bass and Walleye and Rock Bass, Channel Catfish. But they don't get up upstream from there.

So, I guess my view is that park dams have an important role in conservation and water management. I get their connection to water management downstream for hydroelectric power generation. If the Annie Bay dam were to fail, the hydroelectric facility downstream of Bark Lake could be crested and that's probably not a good thing.

EY: It would cause flooding and that would exceed the dam's capacity, right?

MR: Opeongo is 58 square kilometers in area at about two meters deep. So that's the volume of water that absolutely would leave Opeongo. That's a lot of water.

EY: It sounds to me like dams occupy quite a tricky position in the park because they have an important role in watershed security because of invasive species, but at the same time, they inhibit connectivity for species that need to get into the park like Pimisi.

MR: That's right. The connectivity report, with Annie Bay dam as an example, demonstrates that natural movement between lakes for Whitefish, Lake Trout, Cisco and others are native species arriving at the dam. I interpret that to mean that their inter-lake movement under a natural system would be quite extensive. It's not just Pimisi. In that tracking study I referred to earlier on Smoke, Canoe and Tea – three connected lakes – we have Lake Trout and Smallmouth Bass just moving between them. Not all the tracked fish are moving between lakes, but there's certainly a contingent that is seasonally occupying one lake and then moving to another.

EY: Do you have any hypotheses on why they move between lakes?

MR: Yes. Tea Lake is the smallest and therefore warms in the summer, becoming inhospitable for Lake Trout as a cold water fish. Lake Trout are there in May and then largely get out. Some of our data may or may not show some winter occupancy, but it's usually the seasonal nature of food availability in those systems that might drive it. Now, why do some Lake Trout say, "I'm a mover," and the other one says, "I'm a stayer"? Who knows why some stay and some move? But there's no question that without dams there, whole fauna can be moving. The one fish that does not seem to do it is Burbot, also known as Ling. They seem to have been planted 12,000 years ago and they don't like going between lakes, but yeah, they just don't. "We've been here for twelve millennia. We're staying!"

EY: Hearing you talk about the fish communities in Algonquin Park is always so interesting. It's like a whole other world.

MR: It is. The connectivity story besides Pimisi is, I think, underappreciated at this point.

EY: For sure. I want to touch on the human aspect of this as well. Do you have any observations to share through your fieldwork on how park goers interact with dams?

MR: We did a lot of work at the Annie Bay dam for a year and saw relatively few people passing through because you portage up and around the dam in most cases where it occurs. So no, I don't have any direct park user contact, only stories that I or others accumulate based on others' observations. But

the fact that there is a fishing sanctuary at the Annie Bay dam, and that may occur in other dams in the park, is because there are individuals who will catch fish and throw them over the dam. And that's actually how Rock Bass and Pike got up into the Opeongo River. The receiving leg downstream of Opeongo is Booth Lake. At that dam, individuals caught fish and put them up over the dam.

EY: Do you think that there is a lack of awareness around the aquatic ecosystems that park goers interact with?

MR: Angler groups are very diverse. So, what motivates a trout or Brook Trout angler is different than what motivates a bass angler. There are sub-cultures within the angling culture. Awareness and interest in the environment probably also reflect that. There will be angler groups that are far more interested in the environment and climate change and all that kind of stuff versus others, which is probably a reflection of the public. But within angling groups, they do differ in their preferences and behavior and view of environmental influences.

EY: Right. So, you mentioned that you worked with the AOO for their ongoing Land Claim negotiations. How has your work engaged their harvesting needs within the park?

MR: The goal of our monitoring, like the appeal that we made at the beginning was based on a question by one of the lawyers who asked me in '09, "What do you know about trout, Lake Trout and Brook Trout in the park?" And I said, "Well, I know one population super well, I know a couple pretty well and beyond that, I don't know anything because we've never gone to other lakes to actually make consistent monitoring and assessment estimates or inferred relative abundance. But I have an idea on how we can do it." There's a bunch of technical details. What we choose to do is the one-hour net set done multiple times in a week or 8 days. So, the lake is actually surveyed three times or more. That information allows us analytically to get an estimate of the number of fish we expect at sites as distinct from the probability of catching fish at sites. It sounds techy, but that distinction is very important to infer defensible patterns of relative abundance.

So, our appeal was broad in the sense that look, Land Claim issues revolve around harvesting access: priority access points and constitutional priorities and then sustainability. Of all of those, sustainability also has, besides rights holders and stakeholders, another ranking above everybody, which is conservation. That's quite clear constitutionally and in Supreme Court decisions. It's conservation, rights holders, stakeholders. There's no debate.

It's settled law. So, we said, "To decide the outcomes of that ranking, you need to know the status of these lakes." Unlike the broad scale program for the province, which is a regional perspective of use knowing that anglers move among the region, in Algonquin Park families or communities tell you about what lakes they go to. You know, they may go to Lake A, B and C. They don't go to D, E and F over on the Southeast corner of the park. So, you can't go too high scale. You've got to make lake level inferences by the method.

The appeal was essentially we understand there are three priority levels in settled law. In any one of those, we have to make defensible decisions and we have to do so that is both accepted by rights holders and stakeholders and park staff, who have to implement these decisions. And so, we ought to start understanding what's out there on the landscape in terms of relative abundance. I think what we did has been successful in doing that and in communicating it, like making it understandable.

EY: Ultimately, all of those efforts are shifting the narrative and changing the intention of what, in my view, the park represents. It's not just a place that you go to visit, but it has a greater role within the AOO Land Claim, and within the access and use by Indigenous peoples and their involvement in management decisions, right?

MR: Well, you're right, that's a good point. Recovering the glacial history, digging it out, putting it together, all that kind of stuff, I have to say I think was deeply appreciated in the end, even whether you're Algonquin or not, you just may not know the history of Lake Algonquin. I came to appreciate that the park itself has a natural history, regardless of what humans are on the landscape. You can raise that natural history up, make it obvious, and explain why this is here and why it's not over here.

EY: That glacial story is so interesting, and I wonder if it also contextualizes the relationship with Pimisi, which has spanned a very, very long time. From reading the AOO's Traditional Ecological Knowledge documents that are publicly available, I get a sense that this relationship between the Algonquin and the eel is deeply entwined.

MR: Think of this: the occupancy of the landscape post-glacially by people also occurred with the occupancy of the landscape by eel. They kind of got there or developed where they were going to be at the same time. Then you had this extraordinary organism that would go away and then come back in great biomass. They're super reliable so long as the watershed connectivity continues to be the same. So, the natural history of people and eel moving into the landscape, I think, completely coincided.

EY: That's incredible to think about. Now that we're nearing the end of our conversation, I want to ask you, what forms of support do you think the park, as both a space and a community, could provide for Pimisi recovery efforts?

MR: My impression is that the park is interested in eel and sturgeon recovery. The park has never spoken to me about where they would want an eel ladder to help with that, but I know that they're interested in the topic. It's just a question of picking the location where you're going to have the minimal biodiversity effect for an eel ladder that is just for eel – you know how the design that lets them snake up through the system?

EY: For sure. Harkness would probably have a big role in recovery and monitoring efforts, right?

MR: Yes, if it was needed. It's a difficult trip from the Ottawa River into the park. So, whether it's one or two or three [ladders] in sequence to get them up there, I don't know. Maybe the Opeongo and Madawaska Rivers – they would probably pick sites like that, I would think, where they have clear evidence of this being the case.

EY: What kind of changes do you think the introduction of Pimisi recovery could have in the park's ecosystem and visitor experiences?

MR: I think if you could successfully move eel up a ladder system that is exclusively used by eel, if you can do that, that would be an extraordinary story of recovery and conservation and the importance of this landscape. You would gain on the ecology side. You would improve on the cultural reconciliation side. I think if you could isolate eel movement up these watersheds, that would be a big deal.

EY: Yeah, those technical considerations are important to contextualize.

MR: Throughout my time in the park for the last forty years, the eel and sturgeon conversation has always been around. We want to recover them, but how do we get them up the system?

EY: A gauntlet of problems.

MR: A gauntlet of problems. That's a good way to put it.

EY: To conclude, do you have any parting thoughts that you would like to share about Pimisi? Maybe something that you learned over the course of your time at Harkness?

MR: I have no experience on the park landscape with Pimisi. From my understanding through working with them in other places and just catching them, they really do fit into a historical fish assemblage. They had an important role to play in the ecosystem in terms of consumption and predation and energy transfer – the functioning of an aquatic ecosystem. They are probably hugely important in the shallow areas of lakes. They are not a Lake Trout type predator – deep, dark, cold. They are more of a mid-range, shallow predator, and they would have had an enormous role in the park. So much has been lost that there's not a lot of information currently on their role in these inland lake systems; but they were once incredibly abundant, and absolutely would have been a major factor in these aquatic food webs.

Now has that role been taken up by species like Smallmouth Bass? Maybe. There's a lot of technical questions about who might compete with each other, but in the Great Lakes, which contains the natural distribution of Smallmouth Bass, Pimisi really ruled the roost in-shore. So, Pimisi coincided with species that we think are invasive in the park, that were natural in the Great Lakes. They did well. I think if you can get them into lakes and get a run established, they'll find their niche.

Krystal Mitchell Interview

Elizabeth Yeoh (EY): I think a good place to start would be for you to introduce your role and your work, as well as what drew you to it.

Krystal Mitchell (KM): I have a background in fisheries biology, and I worked with Harkness Laboratory of Fisheries Research in Algonquin Park for most of my career. I joined the Algonquins of Ontario (AOO) Consultation Office in June 2022 as their Fisheries and Wildlife Management Advisor. I provide technical advice to the Algonquin community leadership on consultation and Treaty negotiations specific to fisheries and wildlife management in the AOO Settlement Area. I had a relationship with the AOO prior to coming to this role through my work with Harkness Lab, and I really wanted to pursue supporting Indigenous reconciliation and Indigenous initiatives on the landscape, especially the AOO's modern treaty with Ontario and Canada. I wanted to bring my experience to support the Algonquins in their journey towards treaty-making, and to ensure Algonquin rights are protected in their Traditional Territory.

I am currently the AOO staff lead on all files related to American Eel advocacy work that the Algonquins of Ontario Consultation Office is currently working on. Ethan Huner was the American Eel file lead before me, and we work closely together to support the restoration of American Eel populations in the Algonquin Traditional Territory.

EY: You mentioned that you and Ethan are engaged in this work. Can I ask what that entails, as well as what Pimisi recovery efforts mean for the AOO communities?

KM: Ethan had led a lot of work in the past to develop the series of reports that I know you're familiar with, *Returning Kichissippi Pimisi, The American Eel, to the Ottawa River Basin*. That work was intended to capture traditional Indigenous knowledge about Pimisi and to advocate for further protection and recovery action through government and industry. Specifically, the AOO have pushed Fisheries and Oceans Canada (DFO) on the federal listing of American Eel under the *Species at Risk Act* (SARA). As you're aware, the American Eel was assessed as threatened by the COSEWIC Committee in 2012, and it seems there's been very little momentum on a listing since then.

So, the AOO have also worked hard with non-profit conservation groups and other Indigenous communities on American Eel advocacy. The AOO sit as a part of a national coalition on American Eel conservation. Members

of the coalition work hard to push for the federal SARA listing, but also to stay engaged on American Eel conservation efforts throughout the Eastern provinces, Québec, and Ontario. For example, the Mohawks of Akwesasne are also part of the coalition and share updates on their great eel work in the Saint Lawrence River. It is a collective effort, but in recent weeks and months, that effort has really focused on pushing the federal government for the SARA listing and to do more at a national scale.

We've also worked with conservation organizations to push the province to respond. They released a *Recovery Strategy* in 2013 and we've not yet seen a final "Government Response Statement" (GRS). We have worked heavily with the Government of Ontario to try and ensure that their GRS is doing more in terms of provincial policy for American Eel recovery. Specifically, to require safe eel passage at hydropower facilities and other barriers in the Ottawa River Watershed.

That's where your work is very relevant. In recent years, there have been some opportunities to improve eel passage as part of hydropower facility refurbishment projects. For example, the AOO worked with Ontario Power Generation to ensure their Calabogie Generating Station (G.S) is 'eel-ready' as part of their recent facility refurbishment project. However, eels cannot currently make it to the Calabogie G.S because of the giant Arnprior dam downstream. While it's great to see eel passage improvement efforts happening in tributaries of the Ottawa River, they aren't currently as important as addressing major downstream barriers like the Carillon Generating Station and other dams in the Ottawa River. Improving eel passage in the Ottawa River is of great importance to the AOO.

EY: I read an article before talking with you, about environmental conservation organization, Ottawa Riverkeeper, who are lobbying for an eel ladder at the Carillon Generating Station. They wrote an open letter to Hydro Québec, who own the dam, but there have yet to be any actions. You mentioned the nature of collaboration in the AOO's Pimisi recovery efforts. What has working with other individuals and organizations in the watershed been like? And why are these cross-disciplinary and cross-cultural collaborations so important for recovery?

KM: Like I said, Ethan worked closely with Canadian Wildlife Federation (CWF) in the past on building some of the recommendations to government. Particularly with one of CWF's Biologists, Nicolas Lapointe. The AOO have supported a lot of CWF's eel advocacy initiatives, and they are still very much a strong partner in the AOO's eel work. CWF does a great job leading the national American Eel coalition and bringing conservation groups and

Indigenous communities together that are actively doing eel advocacy work. I think a united front and united voices are really helpful for pushing and creating the necessary pressure on government. So, it's not just one community, it's not just one non-profit, it's a national level scope of people working for eel. And I think the more people that can join that force and the stronger the voice, the more powerful the pressure is.

Indigenous communities on the Saint Lawrence River, like the Mohawks of Akwesasne are doing some really great research at the Moses-Saunders dam and eel habitat restoration work in that area. So again, it's the united voices that are really important to try and get a response from government and industry. Hopefully that comes soon because there was a lot of momentum in the early 2000s before the recovery strategies and COSEWIC assessments were released, and it feels like that momentum has really stagnated over the years.

And it is a complex issue, we understand that. There's still, harvest happening in Québec and harvest happening on the East Coast with the glass eels. So, it's a complex issue. The AOO respectfully recognize the potential impacts a federal listing may have on Indigenous eel fisheries in the Maritimes region where populations are currently deemed to be stable. But government must keep in mind that the population in Ontario has a disproportional contribution to the global population. The individuals and the females that are coming out of Ontario are much larger, and they're much more fecund. Removing those from the population before they can make it back to the Sargasso Sea to spawn is a significant issue.

I don't know if you ended up reading the report that Nicholas Lapointe and others had written about assessing the proponent driven nature of the hydropower industry and how that's lacking in terms of their mitigation plans because they're not being held to do more than the bare minimum by the government. That's a real issue as well. And so, by information sharing between CWF and all these other great groups that are doing this work, we can continue to address these issues with government and industry.

EY: Those are all great points. You mentioned that you'd spent most of your career working at Harkness. Can you delve into the history of your relationship to the park, and whether any of those experiences, the training that you got through that work, and the connections and partnerships that you formed have had any influence on your work with the AOO today?

KM: I was in undergrad when I started as a student at Harkness Lab, and I held different positions there over the years: technician, biologist level positions, and worked really closely with park staff on fish population assessment throughout the park. We focused on trout population assessment for the most part, and the funding that was coming into Harkness at the time for this assessment work was in support of the Algonquin Land Claim Treaty negotiation process.

So really, throughout my whole career with Harkness, we were intertwined with what was happening with the Algonquin Treaty. The Lab would also provide capacity building opportunities for Algonquin community members. There was a number of times over the years that Algonquin members came to the Lab or joined Harkness crews in the field, and we would put on workshops to do research skills training and provide information sharing opportunities – that is the sharing of Western science and Traditional Knowledge.

This work provided me with connections to local Algonquin community members and to the AOO Consultation Office staff – that's how I met Ethan. The work allowed Harkness to build relationship with the AOO over many years. And over that time, a better understanding of the cultural connections to the park and the cultural history and importance of fishing to the Algonquin people. Coming into my role with the AOO and learning about eel on the landscape, I had no idea eel existed in Algonquin Park! And really, it's been this role that's been the catalyst for me learning about American Eel and its historic range and sifting through files for species distribution in the park. Then, as part of the Algonquin Park fisheries management planning process, learning how dams and connectivity will be addressed into the future to support eel recovery efforts.

EY: It sounds like that role [at Harkness] was a good transition for you.

KM: Yeah, absolutely. And to have experience working from both lenses, right? Like from a government perspective – Harkness is a provincial government research facility – and then coming into an Indigenous

organization and working to protect Algonquin rights and interests. I'm very proud to have been a part of the fisheries work in Algonquin Park and to see the Algonquin Park Fisheries Management Plan to fruition because it's been part of my whole career. So being able to advocate for Algonquin Treaty rights protection and being able to bring my fisheries research experience into this role is really something I cherish a lot.

EY: That work is so important. Are you able to tell me when Algonquin Park's Fisheries Management Plan will be released?

KM: I can't confirm that. They're tracking for within the next couple of years, and there would be regulatory action coming out of the planning process. Timelines are confidential in terms of their planning process. You participated in that one Advisory Council meeting and so you know who's involved. They have a lot of great stakeholder and Indigenous representation. The AOO actively participate in the planning conversations and provide in-depth feedback to the park on the proposed planning components. The momentum has been really great, and the incorporation of feedback has been really great so far, so, hopefully the plan will be released in the next couple of years!

EY: That sounds great. Now, to turn to park dams as the central issue within my thesis. I'm wondering if you could help to frame the importance and urgency of Pimisi recovery in the context of these barriers, which are relatively smaller scale and also non-powered. Where does that issue sit in the larger Kichissippi Watershed with dams throughout Pimisi migration routes?

KM: Eventually, the hope is that the eel will return to Algonquin Park. But right now, the major barriers are further downstream. There are major barriers on the Ottawa River that are preventing the eel from making it all the way into the park. But in the future, the hope is that they will make it there. And so having barriers eel-ready, and to be thinking about eel passage within Algonquin Park is great. And this is part of the park's conversation because their current fisheries planning is looking forward to the next 25 to 50 years. They want to make sure that they're having those conversations now to ensure eel recovery in Algonquin Park is addressed going forward. In terms of dams as a whole, they are currently the number one threat right to Ontario eel populations. It's these barriers that are keeping the eel from entering their historic range.

I don't think we really understand what the eel population reduction within the Ottawa River Watershed has done to the ecosystem because they've been absent for so long and there has been such a breakdown of connectivity within their maturation grounds. It's an unknown what the lack of such a predator species has done to the ecosystems. On the park management perspective, maintaining ecological integrity means maintaining the natural ecosystem with its natural components and processes intact. And, with the absence of eel, that has not been in place for decades now.

EY: When we visited the park [as part of the fisheries planning meeting] in May at the Lake of Two Rivers dam there were – I think it was Largemouth Bass but correct me if I'm wrong – invasive species trapped behind the barrier. So, park dams have a role as a watershed security measure, right? As you've alluded to, the loss of Pimisi from that ecosystem has contributed perhaps to the prevalence of those fish. And so, there are a lot of factors that have shaped the ecosystem as we know it today. I'm wondering if you could touch on any of your experiences at park dams, perhaps through your work with the AOO, and the ecological disruptions that you may have noticed when visiting those sites?

KM: I haven't had too much experience with Algonquin Park dams in my role with the AOO. With Harkness, we encountered dams in the field during fish population assessments. Depending on where we were conducting field work, we would encounter dams and sometimes differences in fish populations upstream and downstream of these barriers. So, you mentioned invasive species and you're aware that Harkness did the connectivity and risk assessment associated with dams in Algonquin Park.

From the AOO perspective, it stems back to the 'good and bad' conversation about dams. They serve an important purpose in protecting current ecological integrity, but they have also created connectivity issues. They've been on the park landscape for such a long time through water management and the logging era – it's a long history of impact. I don't know how this has specifically affected the use of areas by Algonquin communities. The history of dams in Algonquin Park has certainly shaped where people are harvesting and how they harvest based on the movement of fish through watersheds and what type of barriers fish communities are encountering. But yeah, personally I can't necessarily speak to how Algonquin use and harvest activity has changed over time due to park dams.

EY: Yeah, they have been a really big part of the park's history. Like you mentioned, the wooden logging dams of the logging era, and now these concrete barriers that control water flow for recreational uses. Could you comment on the value of these barriers and how they fit into the park's story and visitor experiences?

KM: The Annie Bay dam is the dam I'm most familiar with, and that's been an area of concern over time because of the invasive species movements up to below that barrier. I'm not really sure how much the average visitor knows about park dam use and how water is managed in the park, but the Annie's Bay dam refurbishment project was a big one and was well known to local communities. And I know there was quite a lot of information that was shared about the refurbishment work there because it was such a specific design to prevent movement of Pike and Rock Bass into one of the most significant fisheries in the park.

EY: We're talking about the two-tiered structure, right?

KM: The weir, yeah. Harkness did an assessment there to ensure that there wasn't any movement of fish over the barrier. That's the other big piece. There needs to be a lot more education to the general public on the risk of fishing around dams and moving fish over dams. So that's a big part of the fisheries management planning process too – the education piece around watershed barriers and how they play that important role and how to prioritize different dams for removal or refurbishment. I think part of your project is looking at how we can retrofit but also how to use dams as an educational tool, which is really important because people need to know the context.

EY: And what better way to learn than through the park, right? It's already offering outdoor education. The dams have potential to be part of that.

KM: Yeah, the park has such a strong natural heritage education program. I'm not really sure how much they have done in terms of education on water management. They have the *Raven* article and many different educational outreach opportunities, but I don't know how much they've really addressed park dams. Maybe you've talked to others within the park and within the education program that have access to previous articles, but I think as a whole, their Fisheries Management Plan is going to need to look at how to better communicate both the importance of dams to invasive species prevention and their history of impact on the park's aquatic connectivity.

EY: Yeah, for sure. Transparency around the role of dams is important because when I visited the park two summers ago, I saw somebody fishing near a dam. So, perhaps it's still not communicated to the public clearly.

KM: That's an important point because the park is such a vulnerable environment when you think about its context on the landscape and the surrounding areas and how much invasive species movement has happened even in recent years. These species could significantly affect the ecological integrity of the park, should they get in naturally or should people be moving them across barriers. And I mean, moving live fish over land is illegal, but clearly people are still doing it! So there needs to be more education to emphasize how impactful this is. It's not just a fine, you're impacting the future of the park.

EY: And on the note of education at dams, what education do you think that people need about Pimisi? From my experience doing research on this topic, it seems that there is a lack of public awareness around their decline and endangerment in Ontario's jurisdiction of the watershed. Do you have any thoughts on that?

KM: I think there's a lack of knowledge that eel even existed here. The AOO are running an eel observation data collection project on a localized stretch of the Ottawa River, and we were recently putting up outreach signage, and happened to talk to people nearby while doing this work. They didn't even know that eel existed in this area of the world. You know, immediately they think of the big electric and moray eels in the ocean. They don't realize that there's a freshwater eel living in Ontario waters because it's been mostly absent from the landscape for so long. People have lost that connection. That's the piece that the AOO are so significantly concerned about because the people that have the memory of eel on the landscape, we're losing them from the population. So, the story of the eel is being lost as well.

I think in terms of education for Pimisi, it's important that the story is told. I think there was somebody in that Fisheries Management Plan meeting that you attended that suggested that there be a whole park publication dedicated to the eel. It would be a great opportunity to tell the story of an important predator and an important part of the cultural and natural heritage of Algonquin Park. Thinking about your dam project, if there's storyboards or signage going up that can tell the story of watershed connectivity, I think Pimisi needs to be a part of that story because dams are such a significant barrier to their movement and their historic range.

EY: You mentioned at the beginning of our conversation the word, 'reconciliation.' I want go back to that, and touch on the relationship between the AOO communities and the land that is now the park in the context of reconciliation. What does reconciliation look like for the AOO? And what is the potential for Algonquin Park's participation in recovery efforts to support that process?

KM: Yeah, that's a big question. Algonquin Park is within unceded Algonquin Traditional Territory and the park is named after the people, so there must be opportunity for significantly more collaborative planning and management of the park to ensure that there is more input and incorporation of Algonquin perspectives, Traditional Knowledge and Algonquin cultural heritage in park planning, and to ensure that the AOO are consulted on Algonquin Park management decisions.

The Fisheries Management Plan is a good example of that in good practice. The involvement that the AOO has had with the planning process so far is a really great example of what increased involvement can do – and that's respecting Indigenous input into how the park should be managed for the future to protect Algonquin rights and values, whether that be harvesting, or maintaining access to culturally important areas.

Specific to Pimisi recovery, there will be in-depth ecosystem management conversations if and when Pimisi return to the park. Hopefully in the future there will be an abundance of eel that can support the Algonquin connection like it used to exist, and the Algonquin people can rebuild a strong physical connection to the eel. Hopefully, that will look like a meal of eel for Algonquin families down the road if eel populations increase to that point. There is no intention right now for harvest on that scale. Can you imagine if the Algonquins were able to again harvest eel in Algonquin Park? In their Traditional Territory of the Ottawa River Watershed? That would be incredible. The park will play an important role in recovering eel to that point through protections, potential dam removal or refurbishments, and through regulations and fisheries management throughout the park. The eel are battling threats like invasive species and climate change on top of all the barrier issues but what a beautiful future it would be if there was Pimisi returning to Algonquin Park!

EY: It certainly would be! What a way to restore the relationship between Algonquins and Pimisi. You touched on a restoration of the cultural connection of being able to harvest Pimisi. What about the educational dimension of that too? Would there be a future where youth and other community members can come out to the park and be able to learn about Pimisi by participating in those hands-on activities related to recovery?

KM: Yeah, absolutely. You make a good point in terms of future reconciliation with the AOO. Being involved in monitoring and the on-the-ground work for fisheries and other species within Algonquin Park – this will be an important opportunity to connect Algonquin people with natural resource management and species of concern within the park. That’s what Harkness has supported in the past, to build those opportunities into their field research workplans, to have Algonquin community members come out and participate in the work and be part of the data collection process that feeds into fisheries management planning.

I think I mentioned that we’re starting to lose those people that have memory of eel, and currently there’s whole generations of Algonquins that have never seen an eel and certainly have never held one or seen one in the wild or had a traditional meal of eel. It’s that cultural connection that’s significantly impacted by the absence of eel as well. Having opportunity in the future for physical handling, even if they are only here in small numbers to start, helps build the connection and build the motivation for further protection. By engaging Algonquin youth and showing them that there’s hope for eel to come back and why that’s important, you’re building that awareness and by building an awareness, you’re building the relationship.

EY: This might be repeating a bit of what you had mentioned, but what forms of support do you see in the park, as both a space and a community, being able to offer towards Pimisi recovery efforts and collaborative work with the AOO?

KM: Yeah, I think back to their natural heritage education program. They have such a reach to the park visitor community. I think they have a responsibility to share the story of Pimisi and build that care and that advocacy effort. The AOO should play an important role in this story-telling. The on-the-ground funding for infrastructure work to address eel passage will have to come through MECP. The AOO will certainly want to be involved in terms of consultation on how this infrastructure work is implemented and plans for future management as well.

EY: What changes do you envision Pimisi recovery instilling within the park?

KM: It will be interesting to see how a return of a predator like the American Eel will impact the current fisheries and aquatic ecosystems in the park because they've been absent for so long. Like you said, maybe there will be positive impacts like predation on invasive species populations, and maybe American Eel will play a role in natural invasive species management.

Eel harvesting opportunity in Algonquin Park for the AOO, is an incredible dream that hopefully becomes reality. To be able to have Algonquins on the landscape having that connection to Pimisi in Algonquin Park would be amazing. And like you said, this would be a good way to bring youth into the park to strengthen cultural connection with eel and participate in eel recovery efforts.

EY: Yeah, that's already putting such great imagery in my mind, envisioning a future where those changes and connections could happen.

KM: And the eel harvest could expand into traditional skill sharing. Things like that get lost too over time. Like how to prepare the eel for food, how to prepare it for medicinal uses. There was such a plethora of uses that the Algonquin people had for American Eel. In a future where Pimisi returns to the park, maybe there are workshops that could happen to teach those skills to the Algonquin people by those that may still remember.

EY: Wouldn't that be so great? The park becomes a different kind of learning hub and that would be amazing. That about wraps up my questions, but I'm wondering if you have any final thoughts about Pimisi that you would like to share?

KM: I'm hoping there's going to be more momentum. It feels like things have really stagnated over the last few years and when I talk to people who have been involved in eel advocacy for over a decade, it's just really frustrating to hear their stories. People like Nicholas Lapointe and like Ethan, who have been on the eel file for so many years and just hearing what the momentum was like a decade ago compared to what it is now, it feels like so much has slowed down. We're really trying to work with some of the eel coalition partners to reinvigorate that momentum.

I'm not sure where work on eel protection and recovery stagnated. It feels like the government was more receptive in the past. We're not getting the same response and the same commitment to action that's really necessary for eel recovery in the Ottawa River Watershed. It's not going to happen

unless there is significant action taken in the immediate future, because every year we continue to lose eel that have miraculously made it into the Ottawa River, which is heartbreaking. I hear about a chopped-up eel that has been found that went through a turbine, and I'm just thinking to myself, *that eel is so incredibly special to have survived in the Ottawa River and now we've lost it*. American Eel is a designated species at risk in Ontario, and for them to be killed by these hydropower industry barriers with no consequences just feels so deeply wrong.

There needs to be some significant action and it's really disheartening to be falling on what feels like deaf ears. I've only been on this eel file for the last year and a half and just hearing what the momentum had been, and then being met with such inaction has been really frustrating. I'm hopeful that with all of these voices that are coming together and with the great work that has been done to build awareness, the message is going to continue to grow, and eel will become a bigger priority to government.

