Negotiating Restoration through Representation:

The role of visualization in the public process of Riverside Dam

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 my 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

As climate change intensifies ecological uncertainty and infrastructure risk, low-head dam removals have become sites where environmental, cultural, and political tensions converge. This thesis examines the case of Riverside Dam in Cambridge, Ontario (2008-2019), to explore how visualization acts as a tool of communication and an active agent in shaping negotiations over whether to remove, or rebuild a version of the dam. Visual materials from the Riverside Dam Municipal Class Environmental Assessment (EA), including consultant drawings, City reports, and community responses based on eight "preferred alternative" designs for the dam, play a decisive role in how potential futures are understood, aiding in understanding, participation, and decision-making. Drawings are political tools that can include or exclude voices, clarify or obscure impacts, and build or erode public trust. By closely studying the Municipal EA process for Riverside Dam, this thesis examines how values, trade-offs, and potential designs are communicated through visualizations and contested.

Drawing from literature on landscape architecture visualization studies, Indigenous knowledge systems, and environmental design, the thesis proposes a framework for negotiated design to better support engagement with the community. Negotiated design in this thesis is an approach to environmental planning and restoration that prioritizes structured dialogue and collaboration among diverse stakeholders with often competing interests. This framework is a call for transparency, accessibility, and legibility in architectural drawings in so that the public is aware of what is at stake with each "preferred alternative" within the Environmental Assessment process. The proposed framework lays out four visualization principles including: 1) contextual clarity, 2) embodied perspectives, 3) temporal layering, and 4) making conflict visible. Engagement principles also emphasize the use of physical space, co-creation, and writable, decision-oriented drawings.

Rather than producing an original design proposal, this thesis reinterprets three existing shortlisted design options (or "preferred alternatives") for the Riverside dam: rebuilding, removing and naturalizing, and building an offline dam. Through different forms of visualization, the framework developed in this thesis is applied to visualize trade-offs, reveal biases, and imagine the realities of each design to best engage and educate the public. These drawings are not final answers but rather invitations for further negotiation.

By centering legibility over resolution, this work positions visualizing ecological projects as a collaborative and evolving act. It contributes to broader conversations on climate resilience and adaptation, decolonial landscape practice, and the role of design in environmental governance.

Acknowledgments

I acknowledge that the research I conduct takes place on the traditional territory of the Haudenosaunee, Anishinaabe, and Neutral peoples. The land I study and work on exists within the Haldimand Tract, which is governed by the 1784 Haldimand Treaty.

I also recognize that the knowledge I have gathered about the watershed is only a small part of a much longer story. The histories of trauma, care, and relationship with this land and water span generations far beyond what any research can fully represent. It is with respect and humility that I undertake this work, aware of its place within these ongoing histories.

Dedication

To my supervisor, Jane Mah Hutton: thank you for always encouraging me, pushing this thesis further, helping me find direction, and being a constant source of positive support.

To my committee, Rick Andrighetti: thank you for your guidance and insightful comments throughout.

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To my friends: thank you for always giving me a reason to leave my desk, you made me want to be at school.

To my parents: thank you for a lifetime of support. I wouldn't be where I am today without you. You have always encouraged me and given me the confidence to pursue anything.

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"Reserva Botánica El Capiro - Landscape Architecture." Accessed November 21, 2025. https://landarch.org/portfolio-item/reserva-botanica-el-capiro/.

157 Fig. 4.1.6
"Use familiar reference points" diagram. *Made by author.*

158 Fig. 4.1.7
Illustration from Observations on the Theory and Practice of Landscape Gardening. This illustration anchors the viewer's understanding through recognizable landmarks and experiential perspectives. The viewer is able to physically lift the changes in the landscape off of the page (the base painting), keeping the familiar points accessible. *Paintings by Humphry Repton, 1805.*
Repton, Humphry, and J. Adey (John Adey) Repton. Observations on the Theory and Practice of Landscape Gardening : Including Some Remarks on Grecian and Gothic Architecture, Collected from Various Manuscripts, in the Possession of the Different Noblemen and Gentlemen, for Whose Use They Were Originally Written : The Whole Tending to Establish Fixed Principles in the Respective Arts. With Getty Research Institute. London : Printed by T. Bensley ... for J. Taylor ..., 1805. http://archive.org/details/observationsonth00rept.

159 Fig. 4.1.8
"Alternative idea of a navigational aid" diagram. *Made by author.*

160 Fig. 4.1.9
"Finding a New Commons: Rice Village and Timber Commons" illustrated site maps using playful legends, icons, and contextual labelling to orient the viewer. Labelling makes it extremely clear what is proposed versus what is existing. *Image courtesy of Julia Nakanishi.*
Julia Nakanishi. "Design Project 1: Rice Village." Accessed November 21, 2025. https://julianakanishi.com/three-design-projects.
Julia Nakanishi. "Design Project 2: Timber Commons." Accessed November 21, 2025. https://julianakanishi.com/new-page-4.

160 Fig. 4.1.10
"Finding a New Commons: Rice Village and Timber Commons" illustrated site maps using playful legends, icons, and contextual labelling to orient the viewer. Labelling makes it extremely clear what is proposed versus what is existing. *Image courtesy of Julia Nakanishi.*
Julia Nakanishi. "Design Project 1: Rice Village." Accessed November 21, 2025. https://julianakanishi.com/three-design-projects.
Julia Nakanishi. "Design Project 2: Timber Commons." Accessed November 21, 2025. https://julianakanishi.com/new-page-4.

161 Fig. 4.1.11
"Stakeholder Workshop Attendance Record" for 2017 SAC's. *Page from Riverside Dam Class EA.*
Riverside Dam Class EA. Wood., 2018.

162 Fig. 4.1.12
"The Social Landscape of Riverside Dam" Riverside Dam stakeholders spatialized, thumbnail. *Made by author.*
Riverside Dam Class EA. Wood., 2018.

164 Fig. 4.1.13
"The Social Landscape of Riverside Dam" Riverside Dam stakeholders spatialized. *Made by author.*
Riverside Dam Class EA. Wood., 2018.

167 Fig. 4.2.1
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168 Fig. 4.2.2
Perspective rendering showing community activity at eye level, illustrating how immersive viewpoints can communicate lived, sensory experiences of a space. This drawing foregrounds human scale, everyday interaction in an environmental context. *Image courtesy of © greenbox Landschaftsarchitekten, Hannes Banzhaf (Illustration).*
"Illustrations | TOPO*GRAFIK." Accessed November 21, 2025. https://www.topografik.fr/grafik?lightbox=dataItem-j0ib4q4o.

169 Fig. 4.2.3
"Laces, Ties and Knots" site plan paired with targeted perspective vignettes illustrating specific moments of community interaction and ecological intervention. This drawing demonstrates the combination of plants and illustrations, calling out specific points on the plan and how that looks for the community members. *Image accessed from ASLA, drawing by Xinyue (Hope) Shen.*
"Laces, Ties and Knots | ASLA 2021 Student Awards." Accessed November 21, 2025. https://www.asla.org/2021studentawards/3562.html.

170 Fig. 4.2.3
"Under the Canopy": A Shared Democratic Commons" Chenxi Wang: example of a hybrid drawing, an axonometric overlaid with multiple embedded viewpoints illustrating how small scale interactions exist within a larger system. *Accessed through LandArch, image courtesy of Chenxi Wang.*
"Under the Canopy: A Shared Democratic Commons - Landscape Architecture." Accessed November 21, 2025. https://landarch.org/portfolio-item/under-the-canopy-a-shared-democratic-commons/.

171 Fig. 4.2.5
"Who's Included in the Visual" diagram. *Made by author.*

172 Fig. 4.2.6
"Laces, Ties and Knots": centering real likeness of community members throughout the imagery describing the project. *Image accessed from ASLA, drawing by Lai Ching Tsui, andXinyue (Hope) Shen.*
"Laces, Ties and Knots | ASLA 2021 Student Awards." Accessed November 21, 2025. https://www.asla.org/2021studentawards/3562.html.

173 Fig. 4.2.7
"Above and Below Ground Relationships" diagram. *Made by author.*
"Laces, Ties and Knots | ASLA 2021 Student Awards." Accessed November 21, 2025. https://www.asla.org/2021studentawards/3562.html.

174 Fig. 4.2.8
"Urban Hedgerow" Coloco: Section diagram illustrating multi-scalar ecological relationships across water, soil, vegetation, and species. This layered visualizations shape the landscape. *Accessed through Coloco, project owned by City of Chantepie. Drawing done by Alexis Goncalves.*
"Laces, Ties and Knots | ASLA 2021 Student Awards." Accessed November 21, 2025. https://www.asla.org/2021studentawards/3562.html.

174 Fig. 4.2.9
"Chatahoochee Riverlands" SCAPE: Perspective rendered section foregrounding human interactions within the riverine landscape. The drawing situates more-than-human species as active agents rather than a backdrop. *Image courtesy of Scape studio.*
"Laces, Ties and Knots | ASLA 2021 Student Awards." Accessed November 21, 2025. https://www.asla.org/2021studentawards/3562.html.

175 Fig. 4.2.10
Cover of "Appendix F Natural Heritage System". *Page from Riverside Dam Class EA.*
Riverside Dam Class EA. Wood., 2018.

175 Fig. 4.2.11
Photo-realistic render of final "Rebuild the Dam" option. *Image from the council report presented December 3, 2024.*
Riverside Dam Class EA. Wood., 2018.

176 Fig. 4.2.12
"Systems in Relation" Rebuild the Dam thumbnail. *Made by author.*

178 Fig. 4.2.13
"Systems in Relation" Rebuild the Dam. *Made by author.*

180 Fig. 4.2.14
"Systems in Relation" Offline Dam. *Made by author.*

182 Fig. 4.2.15
"Systems in Relation" Remove the Dam. *Made by author.*

185 Fig. 4.3.1
"Seasonal Cycle" Diagram. *Made by author.*

186 Fig. 4.3.2
"The Life and Death of Ash" Sijia Zhong: Diagram showing ecological succession and maintenance cycles across multiple timeframes. They depict processes like forest regeneration, hydrological adaptation, and habitat shifts. Shows how landscapes require adaptive management rather than fixed maintenance. *Accessed from WorldLandscapeArchitect.com, drawn by Sijia Zhong.*
Holmes, Damian. "Student Project | The Death and Life of Ash: Landscape Tactics to Adapt to Invasive Species | Sijia Zhong." World Landscape Architecture, June 4, 2022. https://worldlandscapearchitect.com/student-project-the-death-and-life-of-ash-landscape-tactics-to-adapt-to-invasive-species-sijia-zhong/.

186 Fig. 4.3.3
"The Life and Death of Ash" Sijia Zhong: Seasonal vignettes illustrating the same landscape from the same view through the four seasons, helping viewers see how the site can be used cyclically. *Accessed from*

WorldLandscapeArchitect.com, drawn by Sijia Zhong.
Holmes, Damian. "Student Project | The Death and Life of Ash: Landscape Tactics to Adapt to Invasive Species | Sijia Zhong." World Landscape Architecture, June 4, 2022. https://worldlandscapearchitect.com/student-project-the-death-and-life-of-ash-landscape-tactics-to-adapt-to-invasive-species-sijia-zhong/.

187 Fig. 4.3.4
"Checklist for making climate change present" diagram. *Made by author.*

188 Fig. 4.3.5
"Learning from Animal Adaptations to Wildfire" Diana Nightingale and Andrea Binz: Temporal series illustrating landscape transformation over time under shifting climate conditions. It shows human response to increased fire risk due to climate change. *Accessed from Dezeen, drawn by Diana Nightingale and Andrea Binz.*
staff, Dezeen. "Ten Landscape Architecture Projects by the University of Southern California." School Shows. Dezeen, December 9, 2023. https://www.dezeen.com/2023/12/09/landscape-architecture-projects-university-of-southern-california-dezeen-shoolshows/.

188 Fig. 4.3.6
"Forest, Human, Fire": Fire 07: Side-by-side rendering comparing dry and wet season, showing fire risk exacerbated by climate change. *Accessed from ASLA, drawn by Zifan Wang.*
"Forest, Human, Fire | ASLA 2021 Student Awards." Accessed November 22, 2025. https://www.asla.org/2021studentawards/3660.html.

189 Fig. 4.3.7
"Future scenario alternatives" diagram. *Made by author.*

190 Fig. 4.3.8
"The Big U" Bjarke Ingels Group: Flood protection toolkit responding to social and economic amenities that enhance habitat, improve waterfront access, and create new recreational opportunities. Various segments become a catalog of adaptive strategies that can be applied at various scales. *Image courtesy of Bjarke Ingels Group.*
"Rebuild by Design, The Big U | 2016 ASLA Professional Awards." Accessed November 22, 2025. https://www.asla.org/2016awards/172453.html

191 Fig. 4.3.9
Page from Riverside Dam Class EA showing number of times the phrase "Climate Change" appears in the document. *Page from Riverside Dam Class EA.*
Riverside Dam Class EA. Wood., 2018.

192 Fig. 4.3.10
"Temporal Futures of the Riverside Dam Options" Rebuild the Dam, thumbnail. *Made by author.*

193 Fig. 4.3.11
"Temporal Futures of the Riverside Dam Options" Remove the Dam. *Made by author.*

195 Fig. 4.3.12
"Temporal Futures of the Riverside Dam Options" Offline Dam. *Made by author.*

197 Fig. 4.3.13
"Temporal Futures of the Riverside Dam Options" Offline Dam. *Made by author.*

199 Fig. 4.3.14
Graphic showing estimated cost of dam removal. *Slide from Public Information Centre #3, p.21*
City of Cambridge, *"Public Information Centre No.3,"* 2016.

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City of Cambridge, *"Public Information Centre No.3,"* 2016.

199 Fig. 4.3.16
News headline indicating the lack of clarity of the project's budget. *Waterloo Regional Record.*
Times, Bill Doucet Cambridge. "'I Don't See This Being a $20-Million Project, but It's Not Going to Be a Million-Dollar Project.'" The Record, March 1, 2020. https://www.therecord.com/news/i-dont-see-this-being-a-20-million-project-but-its-not-going-to-be/article_5bd2a948-70d1-50f4-b93c-4e43ce86f9fc.html.

199 Fig. 4.3.17
News headline indicating new budget and timeline for the project. *Kitchener City News.*
Staff, News. "Riverside Dam Rebuild Will Begin in 2025 with a Budget of $19 Million." CityNews Kitchener, February 19, 2023. https://kitchener.citynews.ca/2023/02/19/riverside-dam-rebuild-will-begin-in-2025-with-a-budget-of-19-million-6579907/.

200 Fig. 4.3.18
"When Construction Happens and What Seasons are Missed" timeline, thumbnail. *Made by author.*
Riverside Dam Replacement Construction Drawings, (2025).

200 Fig. 4.3.19
"When Construction Happens and What Seasons are Missed" timeline. *Made by author.*
Riverside Dam Replacement Construction Drawings, (2025).

208 Fig. 4.4.1
"Rijnvliet Food Forest Collage" Felixx Landscape Architects and Planners: Direct comparison showing added values of ecosystem services and added value human. *Accessed from © Felixx Landscape Architects and Planners.*
Landscape Architecture Platform | Landezine. "Rijnvliet Edible Neighborhood by Felixx." April 26, 2022. https://landezine.com/rijnvliet-edible-neighborhood-by-felixx/.

210 Fig. 4.4.2
"Laces, Ties and Knots": Visualization crediting multiple stakeholder perspectives through labeled quotes, images, and figures. This makes it transparent whose voices are represented, encouraging accountability, dialogue, and recognition of positionality in the design process. *Image accessed from ASLA, drawing by Shanni Jin.*
"Laces, Ties and Knots | ASLA 2021 Student Awards." Accessed November 21, 2025. https://www.asla.org/2021studentawards/3562.html.

211 Fig. 4.4.3
"Scale of Impact" diagram. *Made by author.*

212 Fig. 4.4.4
"Public Realm and Landscape" KLA: Visual showing the larger watershed scale in comparison to the scale of intervention. *Accessed from kland.co.uk.*
News « Kinnear Landscape Architects. n.d. Accessed November 22, 2025. https://kland.co.uk/news/.

214 Fig. 4.4.5
"The Camouflaged Vineyard" Vincent Kai Lok Wong: Perspective drawing taken from a non-human vantage point, illustrating the spatial experience beneath a human walkway. This visualization foregrounds ecological actors, showing how human infrastructure intersects with and impacts non-human pathways. *Image accessed from Bartlett Architecture, drawn by Vincent Kai Lok Wong.*
Vineyard, The Camouflaged. "The Camouflaged Vineyard." The Camouflaged Vineyard. Accessed November 22, 2025. https://autumn2021.bartlettarchucl.com/ds2-disruptions-in-the-terrain-vague/vincent-kai-lok-wong.

215 Fig. 4.4.6
"Study Area Context to Grand River". *Page from Riverside Dam Class EA.*
Riverside Dam Class EA. Wood., 2018.

216 Fig. 4.4.7
"The Larger Context" Grand River Watershed in relation to Riverside Dam, thumbnail. *Made by author.*
Grand River Conservation Authority (GRCA). *Watershed Boundary – Jurisdiction Polygon (Layer)*. GRCA Open Data Licence v2. Last updated March 30, 2023. https://data.grandriver.ca/downloads-geospatial.html
Grand River Conservation Authority (GRCA). *Waterbody (Layer)*. GRCA Open Data Licence v2. Last updated September 28, 2025.https://data.grandriver.ca/downloads-geospatial.html
Grand River Conservation Authority (GRCA). *Municipal Boundaries LS (Layer)*. GRCA Open Data Licence v2. Last updated October 1, 2025. https://data.grandriver.ca/downloads-geospatial.html
Grand River Conservation Authority (GRCA). *Dams (Layer)*. GRCA Open Data Licence v2. Last updated December 13, 2021.

218 Fig. 4.4.8
"The Larger Context" Grand River Watershed in relation to Riverside Dam. *Made by author.*
Grand River Conservation Authority (GRCA). *Watershed Boundary – Jurisdiction Polygon (Layer)*. GRCA Open Data Licence v2. Last updated March 30, 2023. https://data.grandriver.ca/downloads-geospatial.html
Grand River Conservation Authority (GRCA). *Waterbody (Layer)*. GRCA Open Data Licence v2. Last updated September 28, 2025.https://data.grandriver.ca/downloads-geospatial.html
Grand River Conservation Authority (GRCA). *Municipal Boundaries LS (Layer)*. GRCA Open Data Licence v2. Last updated October 1, 2025. https://data.grandriver.ca/downloads-geospatial.html
Grand River Conservation Authority (GRCA). *Dams (Layer)*. GRCA Open Data Licence v2. Last updated December 13, 2021.

224 Fig. 4.5.1
"Living Breakwaters" SCAPE: Participatory mapping session where community members actively annotate and manipulate a large site model. The process invites non-expert input, fostering shared ownership of the design and creating opportunities for iterative and collective decision-making. *Image courtesy of SCAPE studio.*
"Living Breakwaters." SCAPE, n.d. Accessed August 9, 2025. https://www.scapestudio.com/projects/living-breakwaters/.

226 Fig. 4.5.2
"Gene C. Reid Park Master Plan" Sasaki: this style of drawing can be used to showcase scenario planning in an accessible way to community members. *Image courtesy of Sasaki.*
"Gene C. Reid Park Master Plan." Sasaki, n.d. Accessed November 22, 2025. https://www.sasaki.com/projects/gene-c-reid-park-master-plan/.

228 Fig. 4.5.3
"Chatahoochee Riverlands" SCAPE: Workshop participants marking spatial priorities and concerns directly onto a physical base map using prompt-based flags. Close-up of flags indicates the colour-coded flags showing different themes. *Image courtesy of SCAPE studio.*
"Chattahoochee RiverLands." SCAPE, n.d. Accessed November 22, 2025. https://www.scapestudio.com/projects/chattahoochee-riverlands/.

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"Chattahoochee RiverLands." SCAPE, n.d. Accessed November 22, 2025. https://www.scapestudio.com/projects/chattahoochee-riverlands/.

230 Fig. 4.5.6
"Don Mouth Naturalization Project" table highlighting the realities of each option. *Table from Don Mouth Naturalization and Port Lands Flood Protection Portlands Environmental Assessment.*
"Don Mouth Naturalization and Port Lands Flood Protection Project - Environmental Assessment." Toronto and Region Conservation Authority (TRCA), n.d. Accessed November 22, 2025. https://trca.ca/conservation/infrastructure-projects/don-mouth-naturalization-port-lands-flood-protection-project/don-mouth-environmental-assessment/.

231 Fig. 4.5.7
Slide from PIC#4 comparing two shortlisted options. *Slide #29 from PIC#4.* City of Cambridge, *"Public Information Centre No.4,"* 2017.

232 Fig. 4.5.8
"Playing with the Options" physical model, thumbnail. *Made by author.*

233 Fig. 4.5.9
Photo of different dam options on the model. *Photo taken by author.*

234 Fig. 4.5.10
Photo of "Rebuild the Dam" option on the model. *Photo taken by author.*

234 Fig. 4.5.11
Photo of "Remove the Dam" option on the model. *Photo taken by author.*

236 Fig. 4.6.1
"Michigan State University Facilities and Land Use Plan" Sasaki: Community engagement session using large-scale site plans placed on the floor to encourage collaborative exploration, group discussion, and shared interpretation. These enable participants to physically navigate and annotate the map. *Image courtesy of Sasaki.*
"Michigan State University Facilities and Land Use Plan." Sasaki, n.d. Accessed November 22, 2025. https://www.sasaki.com/projects/michigan-state-university-facilities-and-land-use-plan/.

236 Fig. 4.6.2
"Michigan State University Facilities and Land Use Plan" Sasaki: Community engagement session using large-scale site plans placed on the floor to encourage collaborative exploration, group discussion, and shared interpretation. These enable participants to physically navigate and annotate the map. *Image courtesy of Sasaki.*
"Michigan State University Facilities and Land Use Plan." Sasaki, n.d. Accessed November 22, 2025. https://www.sasaki.com/projects/michigan-state-university-facilities-and-land-use-plan/.

238 Fig. 4.6.3
"Los Angeles River rover mobile visitor and education center". *Image from U.S. Fish & Wildlife Service.*
"The Los Angeles River Rover Mobile Visitor and Education Center | FWS.Gov." Accessed November 22, 2025. https://www.fws.gov/media/los-angeles-river-rover-mobile-visitor-and-education-center.

239 Fig. 4.6.4
City of Cambridge Public Information Centre Notice. *Accessed from City of Cambridge Website.*
"Riverside Dam." September 3, 2025. https://www.cambridge.ca/en/learn-about/riverside-dam.aspx.

239 Fig. 4.6.5
City of Cambridge Public Information Centre #4 comment form. Accessed from City of Cambridge Website.
"Riverside Dam." September 3, 2025. https://www.cambridge.ca/en/learn-about/riverside-dam.aspx.

240 Fig. 4.6.6
"Circulation of Knowledge: The "Zine", thumbnail. *Made by author.*

241 Fig. 4.6.7
"Circulation of Knowledge: The "Zine", coverpage. *Made by author.*

242 Fig. 4.6.8
"Circulation of Knowledge: The "Zine". Example of how zine could be displayed on community board. *Made by author.*

244 Fig. 4.6.9
"Circulation of Knowledge: The "Zine". Example of first page. *Made by author.*

245 Fig. 4.6.10
"Circulation of Knowledge: The "Zine". Back cover page. *Made by author.*

Statement of Positionality

This thesis comes from my own experience of uncertainty and curiosity. When I began my first year in architecture, I had absolutely no background or prior knowledge in the field. Entering this world was intimidating to say the least, and throughout this transformative time I was being taught to encounter the world through new ways of seeing and representing. The conventions of visual communication in this field can span from a simple parti to a beautiful but abstract and hard to understand diagram. This can feel like a barrier to communication that I wish to tackle.

My perspective is shaped by the Grand River, which has been a constant companion throughout my studies. As a settler living and learning on the traditional lands of the Haudenosaunee, Anishinaabe, and Neutral peoples, I am aware of how colonial histories influence what is considered legitimate knowledge and who feels welcome to speak. Learning from Indigenous knowledge systems has helped me appreciate that water, land, and community are interconnected, and that genuine communication about these places matters deeply.

This thesis is motivated by a desire to help make architectural knowledge and visual tools approachable to others who might feel the same sense of intimidation I once did and still do feel. I aim to support a culture of openness and understanding, where communication is clear, honest, and accessible. My hope is that this work not only represents water and land thoughtfully but also helps foster environments where all voices can contribute and learn together.

CHAPTER 1

Why Dam Removal Matters and Theoretical Framing

1.1 INTRODUCTION

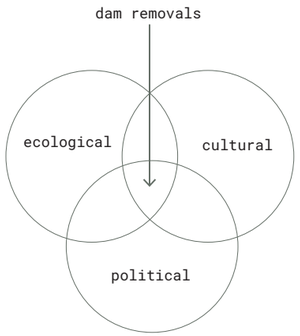


Fig. 1.1.1 Intersection of ecological, cultural, and political values in dam removal conversations. *Made by author.*

In public environmental processes, the tools used to communicate ideas – especially visualizations – wield significant power in shaping both understanding and participation for stakeholders and community members alike. This is especially evident in contested sites such as rivers and dams, where ecological, political, and cultural interests collide. In these settings, visual representations do more than just illustrate options: they mediate relationships between technical experts, government officials, and community members, actively influencing which voices are heard, which uncertainties are made visible, and which compromises become possible. In river landscapes, low-head dam removal is often especially controversial/contested. This thesis foregrounds visualization methods for their power to facilitate critique and nurture democratic engagement within contested processes of restoration.

Within this complex landscape of ecological infrastructure projects and decision-making, visual communication plays a critical role. Drawings, renderings, and visual tools are created specifically for contexts of public environmental governance – such as Environmental Assessments, municipal consultations, and multi-stakeholder negotiations – where diverse actors including government officials, Indigenous representatives, engineers, environmental advocates, and other local communities engage with contested proposals. These visualizations do more than just illustrate options; they actively shape public understanding, participation, and decision-making by mediating how values, conflicts, and uncertainties are made visible.[1] Visualizations can include or exclude perspectives, clarify or obscure risks, and build or erode public trust depending on their design and use within specific social and political contexts.[2]

As climate change intensifies ecological uncertainties and infrastructure risks, the question of managing low-head dams grows urgent. This challenge is not merely technical or scientific, but also deeply relational: it involves questions of who is recognized in restoration processes, whose histories are acknowledged and erased, and whose futures are represented.[3] These projects consequently become a negotiation between Indigenous and settler knowledges, past and future generations, and competing cultural and ecological values.[4]

This thesis pulls together concepts from co-design, participatory and deliberative planning, and design mediation to describe an approach summarized as "negotiated design". These concepts largely emphasize collaboration, dialogue, and negotiation among diverse stakeholders and can offer valuable strategies that can be adapted to environmental planning and restoration design projects.[5] Negotiated design in this sense is an approach to environmental planning and restoration that prioritizes structured dialogue and collaboration among diverse stakeholders with often competing interests. Drawing on scholarship in landscape architecture, Indigenous knowledge systems, and environmental governance, this thesis proposes a framework for negotiated design. Within the proposed framework, this thesis lays out four visualization principles including: 1) contextual clarity, 2) embodied perspectives, 3) temporal layering, and 4) making conflict visible. Engagement principles also emphasize the use of physical space, co-creation, and writable, decision-oriented drawings. These concepts make proposals clear and meaningful to all participants, value lived experiences and acknowledge multiple histories, present conditions and future uncertainties. It emphasizes treating disagreement as an essential element to deliberation rather than a barrier. Negotiated design recognizes that these types of projects require iterative, place-based processes where outcomes will emerge through continuous dialogue, reflection, and revision.

The Grand River, which forms Southwestern Ontario's largest watershed[6], includes the Speed River – which is home to the Riverside Dam. This thesis explores the Environmental Assessment (EA) process for Riverside Dam, initiated in 2008 and completed in 2021, proposing the removal of the existing dam and construction of a new one. Specifically, it deconstructs the methods of public engagement used, and how the City of Cambridge presented the available design options for community input. The EA, prompted by a call for action from the City of Cambridge

[1] Renae Walton and Karyn Bosomworth, "Innovative or Unrealistic: Reflections on the Use of Landscape Architecture Visualisations in Climate Change Planning," *Australian Journal of Maritime and Ocean Affairs* 9, no. 2 (2017): 96.

[2] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005. 645-647; Costa, "Ways of Engaging. Re-Assessing Effects of the Relationship between Landscape Architecture and Art in Community Involvement and Design Practice." 40-50.

[3] Abbott et al., "Incorporating Climate Change into Restoration Decisions"1; Parsons and Fisher, "Indigenous Peoples and Transformations in Freshwater Governance and Management." 124.

[4] Chris Sneddon et al., "Peopling the Environmental State: River Restoration and State Power," *Annals of the American Association of Geographers* 112, no. 1 (2022): 2-5.

[5] Henry Sanoff, *Community Participation Methods in Design and Planning*, in *Landscape and Urban Planning - LANDSCAPE URBAN PLAN* (2000), 50:31–32, 34–36, ; Judith E. Innes and David E. Booher, "Reframing Public Participation: Strategies for the 21st Century," *Planning Theory & Practice* 5, no. 4 (2004): 426–31.

[6] "Our Watershed," Grand River Conservation Authority, accessed September 18, 2025, https://www.grandriver.ca/our-watershed/.

for the crumbling dam, brought forward the complexity of engaging a broad public in decisions affecting both the river ecology and community identity. Learning from this process, the research develops a framework for negotiated design through visualizations, and illustrates its application through this case study at Riverside Dam.

This thesis contributes to broader conversations on climate resilience, decolonial land practice, and the politics of environmental governance. While restoration is primarily concerned with the recovery of ecological functions, this work highlights how participatory tools like visualizations facilitate co-creation, education, and collaborative decision-making about the future of the site. It frames restoration as a guiding theory through which to examine how representation, community engagement, and decision-making co-construct environmental outcomes.

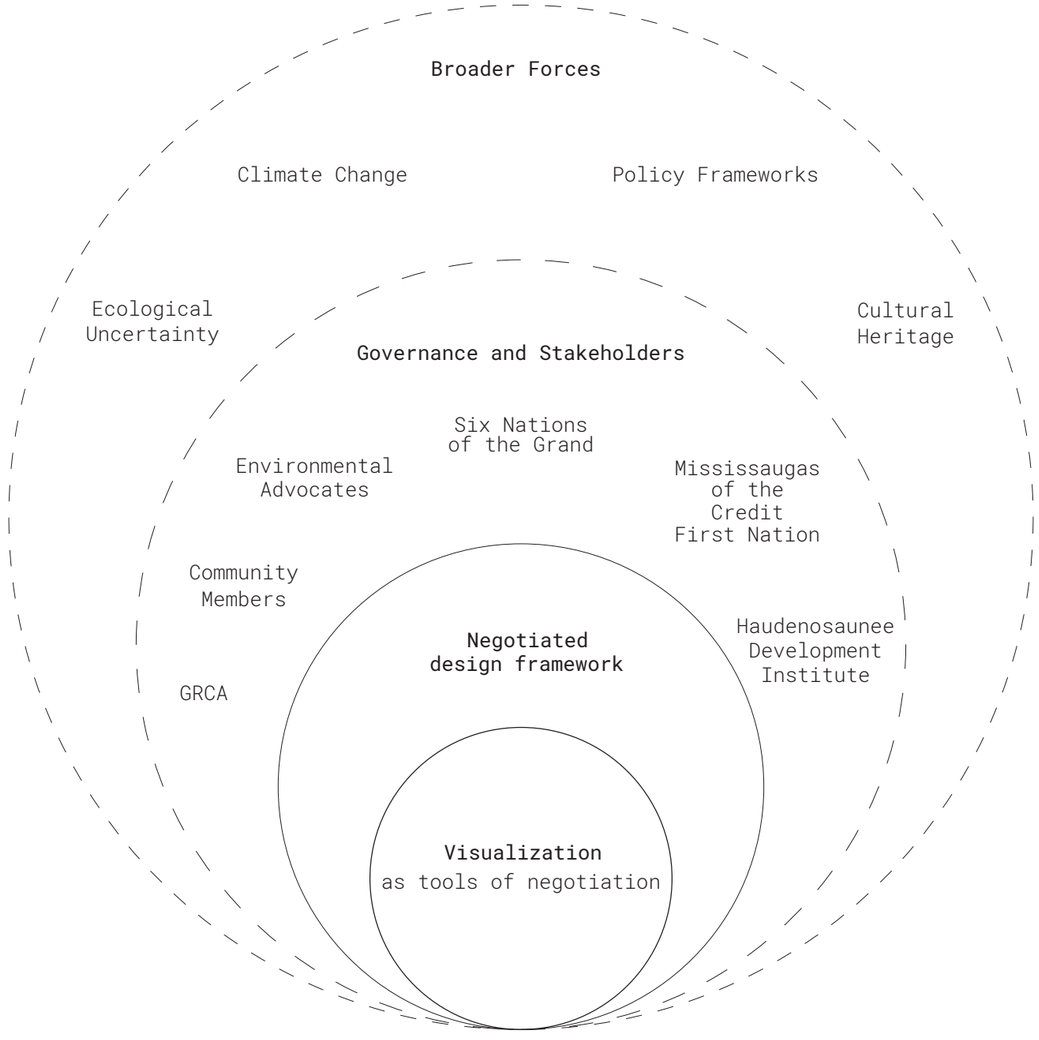


Fig. 1.1.2 Theoretical framework as it relates to Riverside Dam actors. *Made by author.*

1.2 THE URGENCY AND CONFLICT OF LOW-HEAD DAM REMOVALS

In rivers, natural processes intersect with cultural memory, policy, and local identities. This intersection often means that efforts to intervene, particularly through removal or reconfiguration of infrastructure, can become deeply contested. Riverside Dam on Ontario's Speed River exemplifies this complexity: a symbol of pride for the Preston community, reflecting the depth of political, ecological, and social differences. This complexity is extremely apparent in the case of low-head dams globally, where the question of whether to maintain or remove aging infrastructure carries overlapping ecological, cultural, and political implications.

Low-head dams, also referred to as 'weirs', exist worldwide and are built to span across a river to allow water to flow over them, typically less than 15 feet tall.[7] These structures, once symbols of industrial progress and local pride, have increasingly come under scrutiny for their ecological impacts, infrastructural risks, safety risks, and social meanings. As restoration initiatives gain momentum in response to shifting environmental priorities, aging infrastructure, and climate pressures, the debates surrounding low-head dam removals frequently reveal more than just ecological goals: they unearth layered conflicts over heritage, safety, future resilience, and the very definition of restoration and improvement.[8]



Fig. 1.2.1 Photo of a low-head dam, Nabao River, Tomar, Portugal. *Photo taken by author.*

The removal of this infrastructure is viewed as a common pathway towards restoration; removing the barrier allows a river to move in its natural, untamed state. River restoration in general has gathered substantial momentum in recent decades propelled by efforts to address the widespread degradation of freshwater ecosystems at a global scale.[9] The momentum comes from actions by a multitude of groups, some including Indigenous nations, municipal and watershed authorities, NGO's, academic/professional networks, philanthropic or public funders, and private owners, responding to climate adaptation, water quality issues, dam-safety liability, and reconciliation and environmental justice commitments. Despite the increasing prevalence and visibility of restoration projects since the late twentieth century, the meaning of restoration; what it's meant to achieve and for who, remains vigorously debated.[10]

The debate over the goals and beneficiaries of restoration becomes tangible when looking at low-head dam removals in places like Iowa, United States, where hundreds of these structures have been taken out in recent years as part of large-scale efforts to restore river health and address community concerns. The Iowa "Dam Mitigation Projects" has had a plan for dam mitigation since 2010, including strategies and action items for addressing the failing infrastructure before it fails.[11] The goal of this plan is to balance ecological benefits of fish passage with the need to block or slow the spread of invasive species at some of the largest dams. It also considers recreational benefits from new features, and to blend benefits to aquatic species, angler access, recreational safety, navigation improvements, economic development, and tourism.[12] The project stays connected with community members through surveys, which poll people based on how acceptable the condition of the dam is, how open they are to considering modification, and what they believe some of the ecological and social impacts are. It also does an exemplary job of keeping interested parties up to date by keeping a live map on their website showing the location of all the dams, and what dams have been modified or removed.

[7] *Low Head Dam Safety*, n.d., accessed September 18, 2025, https://www.americanrivers.org/low-head-dam-safety/.

[8] Coleen A. Fox et al., "'You Kill the Dam, You Are Killing a Part of Me': Dam Removal and the Environmental Politics of River Restoration," *Geoforum* 70 (2016): 94; Benjamin Smith et al., "The Changing Nature of River Restoration," *WIREs Water* 1, no. 3 (2014): 255–57

[9] Smith et al., "The Changing Nature of River Restoration." 250.

[10] Ellen Wohl et al., "The Science and Practice of River Restoration," *Water Resources Research 51*, no. 8 (2015): 5974–97. 5974-5976, 5980-5982.

[11] "Dam Mitigation Projects | Department of Natural Resources," accessed March 11, 2025, https://www.iowadnr.gov/places-go/water-trails/dam-mitigation-projects#iowa-plan-for-dam-mitigation.

[12] "Dam Mitigation Projects | Department of Natural Resources."

Dam Removal Europe is a vibrant, continent-wide movement that unites river enthusiasts, scientists, activists, practitioners, and agencies to restore free-flowing rivers by removing obsolete and harmful barriers. Established as a coalition of organizations such as WWF, The Rivers Trust, The Nature Conservancy, and Rewilding Europe, the group builds awareness, shares solutions, and drives policy changes to promote dam removal as a core river restoration strategy.[13] The momentum behind this movement is evident: a record 542 barriers (including dams, weirs, and culverts) were removed across 23 European countries in 2024 alone, reconnecting over 2,900 kilometers of rivers and enhancing both biodiversity and climate resilience.[14] Dam Removal Europe not only provides technical guidance and annual reports but also fosters international collaboration through events, workshops, and a continually updated database of removal projects, helping set the stage for Europe's ambitious target of restoring at least 25,000 kilometers of rivers to a free-flowing state by 2030.[15]

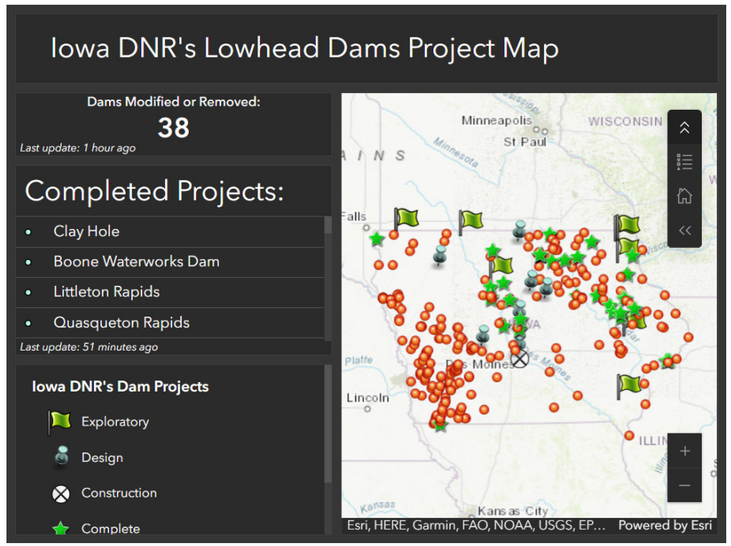
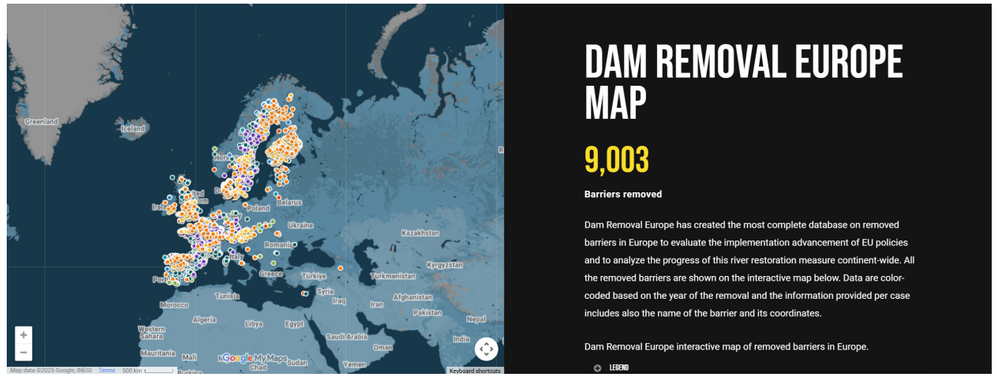
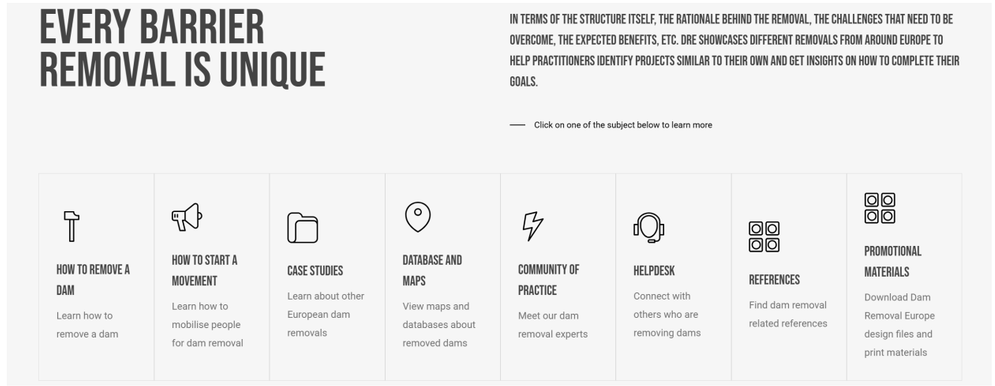


Fig. 1.2.2 Iowa DNR's Lowhead Dams Project Map. *image taken from Iowa Department of Natural Resources Website*





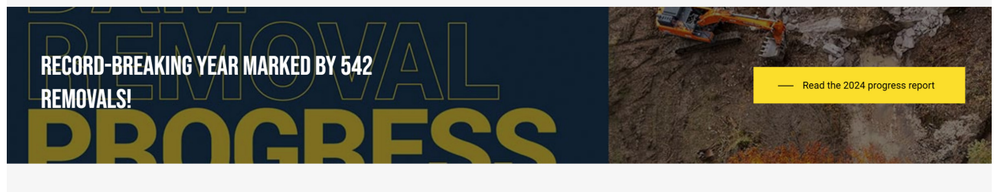


Fig. 1.2.3 (top) "Dam Removal Europe" Interactive map. *Image from Dam Removal Europe website.*

Fig. 1.2.4 (middle) "Toolbox" for dam removals. *Image from Dam Removal Europe website.*

Fig. 1.2.5 (bottom) Yearly progress reports put out by Dam Removal Europe. *Image from Dam Removal Europe website.*

[13] "About - Dam Removal Europe," accessed October 25, 2025, https://damremoval.eu/about/.

[14] "About - Dam Removal Europe."

[15] "About - Dam Removal Europe."

In North America, engineers and policymakers have shifted from building dams, channels, and levees, to removing them as they age, fail or damage ecosystems. Tens of thousands of small, low-head dams were originally built in the 1800's for industry, agriculture, or municipal purposes. These dams have been obstructing the natural movement of fish, disrupting sediment transport, and creating artificial reservoirs that alter habitat, enhance eutrophication, and jeopardize water quality.[16] Unlike more incremental ecological interventions, the removal of such infrastructure represents a fundamental reconfiguration of both landscape and community, often inciting conflict over goals, values, and anticipated outcomes.[17] These conflicts often center on competing values: preserving a sense of historical identity through the presence of the dam, or prioritizing ecological restoration through removal.

People shape rivers not only through infrastructure like dams, but also through cultural values, historical relationships, and ecological goals. As a result, decisions about dams cannot be reduced to a simple choice between 'maintaining the dam for history' and 'removing the dam for nature', they require an approach that acknowledges the multiple, overlapping interests and factors influencing river management. The contemporary river is shaped by accelerating impacts of climate change, evolving community values, multiple stakeholder interests, and land right conflicts. When the question is presented as "whether to remove the dam or not?", this can cause unrest in the community where people feel like they need to re-evaluate the role of the dam in both the landscape and the identity. Such positions, however, oversimplify a reality in which the contemporary river is shaped by.[18]

Urgency around dam removal is heightened by several converging pressures. First, the increasing risks associated with aging or failing dams; including potential hazards to public safety, property, and downstream communities, have become impossible to ignore, particularly in the face of more frequent weather events linked to climate change.[19] Second, changing environmental values and legislative frameworks have brought greater attention to the ecological and social harms of obsolete structures, including their impacts on Indigenous rights and watershed governance. Third, the economics of dam maintenance versus removal continue to

[16] Marie-Anne Germaine et al., "How to Better Involve Stakeholders in River Restoration Projects: The Case of Small Dam Removals," *River Restoration: Political, Social, and Economic Perspectives*, 2021, 147–68. 147.

[17] Fox et al., "'You Kill the Dam, You Are Killing a Part of Me': Dam Removal and the Environmental Politics of River Restoration." 94.

[18] David Havlick, "Infrastructure and the Environment," *Annual Review of Environment and Resources*, January 1, 2009, 350

[19] Seth H Lutter et al., "Social Considerations for the Removal of Dams and Other Aquatic Barriers," *BioScience* 74, no. 6 (2024): 393.

shift, with financial considerations frequently driving decision-making, even as the ecological benefits of removal are increasingly acknowledged.[20]

Despite sound ecological arguments for removal, proposals to decommission low-head dams almost invariably provoke strong reactions within affected communities. Many residents identify these structures as landmarks, symbols of collective history, and spaces for recreation, creating emotional and cultural attachments that are not easily dislodged. As a result, efforts to remove dams may be interpreted as threats to local identity or as acts of erasure, particularly when due process and transparent communication are lacking.[21]

The layered meanings of these infrastructures -whether as heritage icons or sources of ecological disruption- complicate what is already a complex decision-making process. In some cases, calls for dam removal are met with nearly immediate public resistance, driven by concerns about the loss of place, memory, and perceived value. Yet what is often overlooked in these debates are the long-term consequences of retaining or rebuilding obsolete dams, including increased risk of catastrophic failure, downstream flooding, and the perpetuation of ecological harm.

The urgency surrounding low-head dam removals is not simply a reflection of ecological need, but a mirror of broader social tensions around change, memory, and the negotiation of shared futures. Effective restoration, therefore, requires not just technical or ecological repair, but commitment inclusive dialogue transparency, and the balancing of diverse, sometimes conflicting, values.[22] This urgency, coupled with the contested nature of these projects, underscores why this thesis focuses on low-head dam removals in Ontario.

[20] Havlick, "Infrastructure and the Environment," 364–65.

[21] Fox et al., "'You Kill the Dam, You Are Killing a Part of Me': Dam Removal and the Environmental Politics of River Restoration." 98.

[22] Fox et al., "'You Kill the Dam, You Are Killing a Part of Me': Dam Removal and the Environmental Politics of River Restoration" 96-101.; Smith et al., "The Changing Nature of River Restoration" 251, 255-257; Wohl et al., "The Science and Practice of River Restoration." 5983-5985.

1.3 THEORETICAL FRAMEWORK: INTERSECTING LENSES FOR UNDERSTANDING AND VISUALIZING RESTORATION

To meaningfully address the complexities of low-head dam removals, this thesis draws on theoretical approaches that interrogate not only ecological or technical factors shaping river management, but also the deep-seated cultural assumptions underlying contemporary restoration efforts surrounding river restoration. Contemporary river restoration efforts share many similarities across the globe, though the motivations driving them vary by region. In the United States, the most cited objectives include improving water quality, managing riparian zones, enhancing in-stream habitat, facilitating fish passage, and stabilizing banks—goals that closely align with those of restoration initiatives in Victoria, Australia.[23] These goals can be seen in the *Upper Mississippi River Restoration Program* in the United States, and the *Goulburn River Restoration Project* in Victoria, Australia.[24] In contrast, the restoration of the Lower Havel River in Germany shows how European projects often place greater emphasis on social and economic benefits alongside ecological outcomes, reflecting different policy and cultural contexts.[25] In China, large-scale efforts focus on restoring floodplain forests and wetlands to reduce flooding along the Yangtze River, while smaller community-based projects aim to secure local water supplies.[26]

The scale and nature of river restoration practices are shaped by factors such as stakeholder priorities, the expertise of practitioners, the spatial scale of intervention, and local environmental conditions. Interventions can range from localized, short-term measures such as stabilizing banks, replanting riparian vegetation, or constructing fish habitats, to large-scale, long-term efforts aimed at reshaping ecosystem processes across entire river systems (see figure 1.3.1).[27] A key focus of many projects is re-establishing lateral

[23] Marcelo Ardon and Emily Bernhardt, *Restoring Rivers and Streams* (2009), 2.

[24] *The Gouldburn River Large Scale River Restoration Project* (n.d.); "Upper Mississippi River Restoration Program: Bank Stabilization Habitat Rehabilitation And," St. Paul District, accessed November 3, 2025,https://www.mvp.usace.army.mil/Home/Projects/Article/4295604/upper-mississippi-river-restoration-program-bank-stabilization-habitat-rehabili/.

[25] "Restoration project on the Lower Havel - NABU beyond borders," NABU - Naturschutzbund Deutschland e.V., accessed November 3, 2025, https://en.nabu.de/topics/ecosystems/havel/index.html; Ardon and Bernhardt, Restoring Rivers and Streams, 2.

[26] Ardon and Bernhardt, *Restoring Rivers and Streams*, 2.

[27] Ardon and Bernhardt, *Restoring Rivers and Streams*, 3.

and longitudinal connectivity, often accomplished through removal of dams and the restoration of more natural flow regimes.[28] The techniques used to restore rivers often need to be done alongside one another within a single restoration project. For example, channel reconfiguration is usually complimented with channel stabilization, which leads to floodplain reconnection and increase the amount of riparian vegetation.[29]

These interventions vary in scale and ambition, but many remain rooted in a technocratic approach to river management, emphasizing physical modifications to channels rather than the restoration of physical processes. The distinction can be seen in what is being repaired: form-based interventions target the visible geometry of the river (reshaping channels, armoring banks, or constructing riffles) whereas process-based restoration focuses on re-establishing the ecological and geomorphic functions that sustain river health over time (natural flow regimes, sediment transport, and floodplain connectivity). As Palmer et al. (2005) emphasize, restoring form without reactivating these underlying processes often leads to short-term improvements but fail to support long-term ecological resilience.[30] This orientation stems from the historic dominance of hydrology and engineering in shaping restoration practice, where controlling water and stabilizing landscapes were prioritized over ecological complexity, again turning to more localized solutions like hard bank stabilization over repairing long-term processes. Such structural interventions are often guided by the logic of "if we build it, they will come". This operating under the assumption that ecosystem and functions will be restored based on the physical restructuring alone.[31]

This legacy reflects more than just disciplinary influencing, it speaks to a broader Western paradigm that privileges control over nature, a legacy of settler-colonial land management that persists in the language, imagery, and priorities that shape environmental decision-making.[32] Western ecological science has often been framed through nature/culture dualism that positions ecological systems as objects to be measured, manipulated, and controlled.[33]

In William Cronan's study of colonial New England, he similarly demonstrates how the imposition of private property regimes and market economies reorganized plant and animal communities, embedding

[28] Ardon and Bernhardt, *Restoring Rivers and Streams*, 3.

[29] Ardon and Bernhardt, *Restoring Rivers and Streams*, 3.

[30] M.A Palmer et al., "Standards for Ecologically Successful River Restoration," *The Journal of Applied Ecology* 42, no. 2 (2005): 212–14.

[31] Ardon and Bernhardt, *Restoring Rivers and Streams*, 4.

[32] William Cronon, "The Trouble with Wilderness; Or, Getting Back to the Wrong Nature," *Environmental History* 1, no. 1 (1996): 15–17.

[33] Yrjö Haila, "Beyond the Nature-Culture Dualism," *Biology and Philosophy* 15, no. 2 (2000): 159.

ecological degradation within the very foundations of settler society.[34] As Domínguez and Luoma (2020) argue, these "fortress" and "colonial" conservation models are rooted in the belief that biodiversity protection is best achieved by separating nature from human presence. This ideology is derived from European land regimes that privilege ownership, cultivation, and control over relational stewardship.[35] Domínguez and Luoma (2020) also point out that while nature preservation is framed as a universal good, colonial conservation was historically structured to benefit the colonizing power. They say that today, similar extractive patterns persist as carbon offset markets and international conservation funding continue to channel benefits towards developed nations, while Indigenous and local communities receive only a fraction of the resources despite overlap between their territories and protected areas.[36] As an example, the authors note that global biodiversity targets, such as the Convention on Biological Diversity's 2010 goal to conserve ten percent of national territories, have disproportionately burdened former colonies with large Indigenous populations, pressuring them to designate more land for conservation often through displacement or restricted access, while developed countries lag behind in meeting their own targets. The persistence of fortress conservation illustrates how colonial logic remains embedded in contemporary environmental governance, operating through legal regimes that deny Indigenous title and authority. As Domínguez and Luoma (2020) observe, this type of conservation, especially the creation of protected areas and national parks that displace Indigenous communities, positions Indigenous peoples as objects of regulation rather than as rightful custodians of place.[37]

This critique can be extended to the field of visualization, where plans, maps, and static renderings can communicate single visions, even in the face of social and ecological complexity.[38]

[34] James Axtell, "Changes in the Land: Indians, Colonists, and the Ecology of New England by William Cronan," *The American Historical Review* 89, no. 3 (1984): 839–40.

[35] Lara Domínguez and Colin Luoma, "Decolonising Conservation Policy: How Colonial Land and Conservation Ideologies Persist and Perpetuate Indigenous Injustices at the Expense of the Environment," Land 9, no. 3 (2020): 2–6.

[36] Domínguez and Luoma, "Decolonising Conservation Policy: How Colonial Land and Conservation Ideologies Persist and Perpetuate Indigenous Injustices at the Expense of the Environment," 5-6.

[37] Domínguez and Luoma, "Decolonising Conservation Policy: How Colonial Land and Conservation Ideologies Persist and Perpetuate Indigenous Injustices at the Expense of the Environment," 6-8.

[38] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005. 647-649.

1.3.1 Understanding the Spectrum of Restoration Theory

The concept of ecological restoration is frequently understood, both in academic literature and in public discourse, as a process aimed at "assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed" according to the Society for Ecological Restoration(SER).[39] Research from the last decade or so from scholars such as Wohl et al. (2005, 2015), Ardon and Bernhardt (2009), Baker et al. (2014), Smith et al. (2014), Morandi et al. (2021), Sneddon et al. (2022), and Schneider (2022), highlights the inherent complexity of restoration, shaped by more than just ecological science, but also by a negotiation of social, political, and cultural values.[40]

As a response to these stresses, restoration theory has evolved to encompass far more than ecological processes alone. Many scholars now argue for integrating equity, justice, and plural approaches recognizing that restoration projects must address the expectations and priorities of diverse communities, including Indigenous governance and the remediation of social harms.[41] The *Political Science and Ecological Restoration* points out how especially in the context of the management of rivers and watersheds, restoration is also about political negotiation and the balancing of competing interests.[42]

Definitions of restoration vary across different disciplines and stakeholders, encompassing terms such as rehabilitation, renaturation, revitalization, enhancement, and improvement, each with nuanced meanings related to ecological goals and social contexts (see Figure 1.3.3).[43] As Morandi et al. (2021) describes, attempts to provide a definitive definition of restoration are difficult as restoration is best understood as an essentially contested concept that engages endless disputes about its purposes and proper use.[44] This contestation underscores the importance of recognizing restoration as a politically negotiated process involving multiple, and sometimes conflicting, visions of nature, justice, and future landscapes. To navigate

[39] "Restoration Resource Center What Is Ecological Restoration?," accessed March 16, 2025, https://ser-rrc.org/what-is-ecological-restoration/.

[40] Ellen Wohl et al., "River Restoration," *Water Resources Research* 41, no. 10 (2005); Ardon and Bernhardt, *Restoring Rivers and Streams*; Susan Baker et al., "Political Science and Ecological Restoration," *Environmental Politics* 23, no. 3 (2014): 509–24; Smith et al., "The Changing Nature of River Restoration"; Wohl et al., "The Science and Practice of River Restoration"; Bertrand Morandi et al., River Restoration: Political, Social, and Economic Perspectives, 1st ed., Advancing River Restoration and Management (John Wiley & Sons, Incorporated, 2021); Sneddon et al., "Peopling the Environmental State"; Lindsey Schneider, "'Land Back' beyond Repatriation: Restoring Indigenous Land Relationships," in The Routledge Companion to Gender and the American West (Routledge, 2022).

[41] Wohl et al., "The Science and Practice of River Restoration." 5983-5985.

[42] Baker et al., "Political Science and Ecological Restoration." 517-518.

[43] Ardon and Bernhardt, *Restoring Rivers and Streams*, 2; Smith et al., "The Changing Nature of River Restoration," 251; Morandi et al., *River Restoration: Political, Social, and Economic Perspectives*, 5.

[44] Morandi et al., *River Restoration: Political, Social, and Economic Perspectives*. 5.



Fig. 1.3.1 Academic to lay perspectives adapted from research by Naussauer (1995), Smith et al. (2014), Wohl (2005, 2015), Prior (2016), and Vos (2025). *Made by author.*

these complexities, scholars argue for moving beyond technical "fixes" to embrace collective design.

In contrast, lay perspectives on restoration tend to foreground tangible, visible benefits: making landscapes "look natural", enhancing recreational opportunities, or improving scenery. Frequently, these understandings privilege aesthetic and immediate outcomes, sometime obscuring, deeper ecological, historical, or cultural processes at stake. In the restoration of an urban area of River Skerne in Darlington, England, Prior (2016) documents how aesthetic value drove site selection, objectives, and the design vision. It also drove what techniques were implemented (meanders, willows, riffles, paths) to create a "natural-looking" scene and deliver amenity/recreation goals that publics prioritize.[45] Naussauer (1995) similarly shows that people often equate ecological quality with culturally familiar appearances; what looks good must be good.[46] Neat and orderly landscapes like trimmed edges, or mowed strips along paths act as "cues to care", signaling proper management and social acceptability, even when these aesthetic choices can hide underlying ecological processes.[47]

River restoration movements, for example, often mobilize around protecting scenic and ecological values of free-flowing rivers, framing restoration in terms of visible qualities and lived experience rather than technical definitions of ecological function.[48] Research on aesthetics and ecology further shows that lay audiences often evaluate environmental initiatives based on visual cues such as greenery, water clarity, or scenic beauty, that serve as proxies for ecological success.[49] While this emphasis on appearance is not in itself a negative and can actually build resonance, public support, and understanding, purely aesthetic visuals may also limit discussions of restoration by sidelining less visible but equally critical processes, such as sediment transport, ecological complexity, or cultural meaning. Given this, these visuals should be used alongside those that acknowledge the deeper implications.

Indigenous perspectives on restoration offer a profoundly different orientation than Western ecological frameworks, grounding restoration in reciprocal relationships between people, land, and more-than-human worlds. There is a consistent call from scholars and practitioners such

[45] Jonathan Prior, "Urban River Design and Aesthetics: A River Restoration Case Study from the UK," *Journal of Urban Design* 21, no. 4 (2016): 512, 517, 519–21.

[46] Joan Iverson Nassauer, "Messy Ecosystems, Orderly Frames," *Landscape Journal* 14, no. 2 (1995): 161–62.

[47] Nassauer, "Messy Ecosystems, Orderly Frames," 162–63.

[48] Jeroen Vos, "River Defence and Restoration Movements: A Literature Review," Water Alternatives 17, no. 2 (2024): 240-241.

[49] Zsuzsi Kovacs et al., "How Do Aesthetics Affect Our Ecology?," *Journal of Ecological Anthropology* 10, no. 1 (2006): 61–65,

as McGregor (2004), Kimmerer (2011), Robinson et al. (2021), for ecological restoration to recognize the vital role of Indigenous knowledge systems, often referred to as Traditional Ecological Knowledge (TEK), in guiding restoration practices that are culturally and ecologically meaningful.[50] TEK encompasses generations of empirical observations, adaptive management, and spiritual relationships between Indigenous peoples and their environments, providing rich, site-specific knowledge that complements Western scientific approaches.[51] Kimmerer (2011) draws on Haudenosaunee and other North American Indigenous worldviews to describe frameworks in which nature is understood as a living community of interrelated beings. These frameworks emphasize reciprocity, responsibility, and stewardship rather than human dominance, thereby expanding the goals of ecological restoration to include cultural revitalization, sustainable subsistence†, and kincentric† relationships with the land.[52] Kimmerer (2011) also argues that the traditional definition of restoration (as defined by SER) removes the human relationship from the conversation, and erases the fact that restoring people's relationship with the land is intertwined with ecological restoration.[53] Restoration from this perspective often involves restoring cultural keystone species, traditional diets, language, and spiritual practices alongside ecological functions, fostering a holistic renewal of both ecosystems and communities.[54]

Despite its importance, ethical challenges remain in integrating TEK into restoration, including protecting intellectual property rights and ensuring Indigenous leadership, requiring collaboration grounded in respect, reciprocity, and free, prior, and informed consent (FPIC).[55] FPIC means that the decisions must be made voluntarily, before any plans/activity begins, communities should have all the knowledge, and they should have the right to give or withhold consent to proposed actions, and not only as a one-time checkbox, but maintained consent throughout the whole

[50] Deborah McGregor, "Coming Full Circle: Indigenous Knowledge, Environment, and Our Future," American Indian Quarterly 28, no. 3/4 (2004): 385–410; Robin Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge," in *Human Dimensions of Ecological Restoration: Integrating Science, Nature, and Culture,* ed. Dave Egan et al. (2011); Jake M. Robinson et al., "Traditional Ecological Knowledge in Restoration Ecology: A Call to Listen Deeply, to Engage with, and Respect Indigenous Voices," *Restoration Ecology* 29, no. 4 (2021).

[51] Yadav Uprety et al., "Contribution of Traditional Knowledge to Ecological Restoration: Practices and Applications," *Écoscience* 19, no. 3 (2012): 226–37.

† "Sustainable substistence" refers to meeting the communities needs for food, material, and livelihood in a way that can be maintained indefinitely without harming the environment.

† "Kincentric" refers to how our moral responsibility extends to all of our non-human relatives..

[52] Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge," 257–79.

[53] Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge," 270; Robinson et al., "Traditional Ecological Knowledge in Restoration Ecology: A Call to Listen Deeply, to Engage with, and Respect Indigenous Voices," 2.

[54] Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge," 263–68.

[55] Robinson et al., "Traditional Ecological Knowledge in Restoration Ecology: A Call to Listen Deeply, to Engage with, and Respect Indigenous Voices," 2, 5.

process. The inclusion of Indigenous knowledge enhances restoration's social acceptability, ecological viability, and equity, supporting adaptive management in the face of environmental and cultural change.[56]

Understanding restoration as a set of theories, practices, and ongoing negotiations rather than a fixed endpoint is especially critical in contested contexts such as rivers and dam sites.[57] In these contexts, restoration serves as a lens to examine tensions between historical memory, current land and water use, cultural claims, ecological function, and adaptation to climate change. The narrative should recognize restoration as an evolving framework engaging diverse stakeholders in ongoing dialogue about what, how, and for whom landscapes are being "restored" for.[58] This approach is supported by scholars arguing for restoration to move beyond technical "fixes", instead engaging in "collective design", which is a collaborative process where diverse stakeholders, co-create restoration goals and strategies through shared decision-making and continuous negotiation. Collective design integrates ecological, cultural, and social knowledge to navigate the complexities of interconnected ecological and social futures, fostering adaptive and equitable restoration practices.[59]

In the case of dam removals in the Grand River Watershed, restoration becomes a space for values, knowledge systems, and future visions to both converge and collide. The local debates drawing in municipal governments, Indigenous communities, environmental advocates, and everyday park users illustrate how restoration is not simply a technical process, but a site for contestation and collaborative governance. This thesis frames restoration as a guiding theory that allows for inquiry into how representation, community engagement, and decision-making co-construct environmental outcomes.

[56] Uprety et al., "Contribution of Traditional Knowledge to Ecological Restoration: Practices and Applications," 228–32; Robinson et al., "Traditional Ecological Knowledge in Restoration Ecology: A Call to Listen Deeply, to Engage with, and Respect Indigenous Voices," 5–9.

[57] Smith et al., "The Changing Nature of River Restoration." 544-545.

[58] Andrea G. Nardini and Giulio Conte, "River Management & Restoration: What River Do We Wish For," Water 13, no. 10 (2021): 2

[59] Baker et al., "Political Science and Ecological Restoration." 510-512.

"Restoration is defined as the **return of an ecosystem** to a close approximation of its **condition prior to disturbance**. In restoration, ecological damage to the resource is repaired. Both the **structure and the functions** of the ecosystem are **recreated**."
- NRC 1992, p.18

"The goal of river restoration should be to **minimize human-mediated constraints**, thereby allowing natural re-expression of **productive capacity**. In some, if not most, intensely regulated rivers, **human-mediated constraints** may have progressed to the point that full re-expression of capacity is **neither desired nor possible**. Nonetheless, the implication is that **basic ecological principles** applied to rivers in a natural-cultural context can lead to **restoration of biodiversity and bioproduction** in space and time; but, the constraints must be removed, not mitigated."
- Stanford et al. 1996, p393

"It is now widely recognised that river restoration in the sense of Cairns (1991) - 'The **complete structural and functional return** to a pre-disturbance state' - is seldom feasible." "Practical 'river restoration' is, in fact, an **historically-influenced exercise** in **environmental enhancement** through **morphological modification**. It is probably more accurate to refer to the approach as river rehabilitation."
- Downs and Thorne 2000, pp. 249-250

"Ecological restoration can be defined as 'the process of **assisting the recovery and management** of ecological integrity,' including a 'critical range of variability in **biodiversity, ecological processes and structures**, **regional and historical context**, and **sustainable cultural practices**.'"
- McIver and Starr 2001, p. 15, citing SER website

"We define ecological river restoration as assisting the **recovery of ecological integrity** in a degraded watershed system by **reestablishing the processes necessary** to support the natural ecosystem within a watershed. Because both **technical and social constraints often preclude 'full' restoration** of ecosystem structure and function, **rehabilitation** is sometimes distinguished from restoration."
- Wohl et al. 2005, p.2

"River restoration means **repairing waterways** that can no longer perform essential **ecological and social functions** such as mitigating floods, providing clean drinking water, removing excessive levels of nutrients and wildlife. Healthy rivers and streams also enhance property values and are a hub for recreation."
- Palmer and Allan 2006, pp. 41-42

"[R]iver restoration means different things to different people. In terms of scale and scope, it can be a **complete structural and functional return** to the pre-disturbance state, a recovery of the **partly functional and/or structural conditions** of rivers (i.e., rehabilitation), a **recovery of the natural state** of a river ecosystem without really aiming at the pristine, pre-disturbance state (i.e., renaturalization), or an **improvement of the present state of rivers** and their surrounding areas with the intention of enhancing their ecological, social, economic or aesthetic features (i.e., enhancement)."
- Chou 2016, p. 2

- TECHNICAL/STRUCTURAL FUNCTIONS
- SOCIAL/CULTURAL/ETHICAL
- ECOLOGICAL/PROCESS-BASED
- PRAGMATIC/ HYBRID TECHNICAL-ECOLOGICAL

Fig. 1.3.2 Range of academic definitions of "restoration" in the context of rivers adapted from Morandi et al. (2021). *Made by author.*

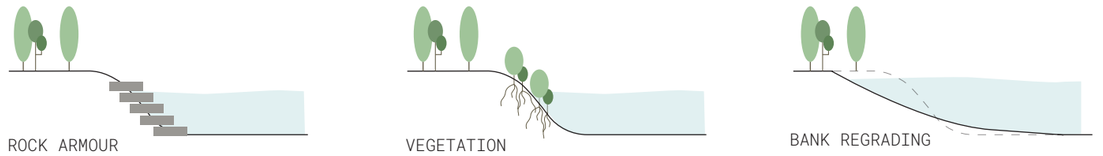
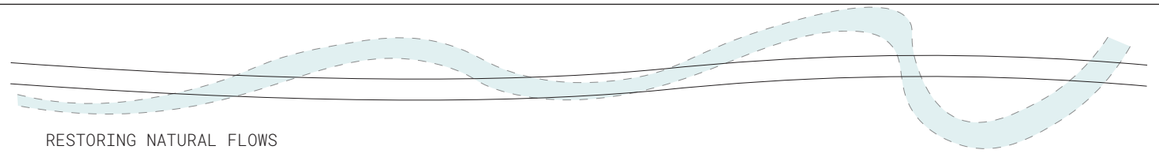
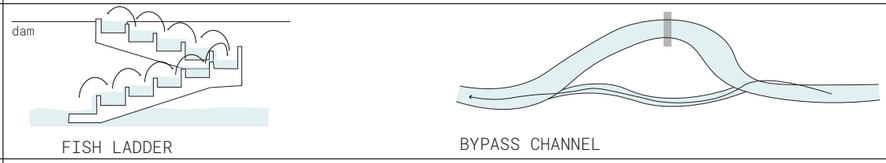
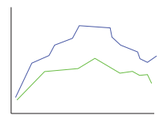
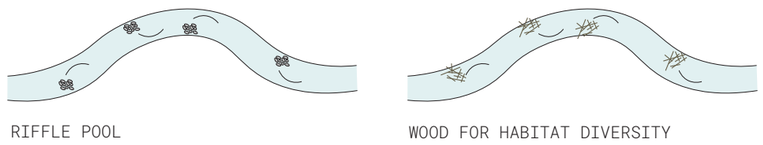
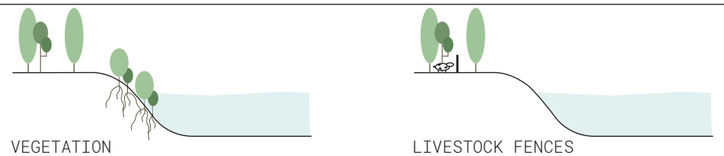
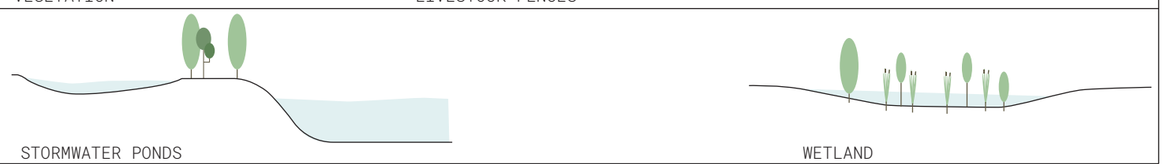
RESTORATION TYPE	DESCRIPTION	SCALE	EXAMPLE
BANK STABILIZATION	REDUCE/SLOWS BANK EROSION USING BIOENGINEERING OR ARMORING	SITE ~1 - 5km	
CHANNEL RECONFIGURATION	RESTORE PLANFORM/PROFILE (MEANDERS, DAYLIGHTING)	~1 - 5km	
DAM REMOVAL / RETROFIT	REMOVE OR MODIFY DAM TO REDUCE ECOLOGICAL IMPACTS	~1 - 5km WATERSHED	
FISH PASSAGE	RECONNECT MIGRATIONS VIA LADDERS, BYPASS CHANNELS, CULVERT FIXES.	INFRASTRUCTURE ~1 - 5km	
FLOODPLAIN RECONNECTION	LOWER BANKS/REGRADE TO LET FLOWS ACCESS FLOODPLAINS	~1 - 5km	
FLOW MODIFICATION	CHANGE TIMING/VOLUME OF RELEASES VIA GATES/REGULATORS	INFRASTRUCTURE WATERSHED	
IN-STREAM HABITAT IMPROVEMENT	ADD COMPLEXITY (WOOD, BOULDERS, RIFFLE-POOL SEQUENCES)	MICROHABITAT ~1 - 5km	
RIPARIAN MANAGEMENT	RE-VEGETATE BUFFERS, EXCLUDE LIVESTOCK, REMOVE EXOTIC SPECIES	~1 - 5km WATERSHED	
STORMWATER MANAGEMENT	CAPTURE/SLOW/FILTER URBAN RUNOFF (PONDS, WETLANDS, BIOSWALES)	URBAN WATERSHED	

Fig. 1.3.3 Different types and scales of river restoration. *Made by author.*

1.3.2 Visual Ethics and the Imperative for Good Visualization

Visualization is not simply a tool for environmental communication; as recent decolonial scholarship illustrates it is an epistemological lens through which landscapes are understood, challenged, and governed. Ethical visualization consequently requires an intentional commitment to transparency, plurality, and situated knowledge. Anania and Stiglitz (2023) show that the tools and methods used to visualize environmental data actively shape whose voices, histories, and relationships are made visible, confirming that visualization acts "as both drivers of knowledge and the objects of gatekeeping".[60] Drawing on landscape theory, critical mapping, and environmental ethics, visualization operates as an active mediator of knowledge, facilitating dialogue between competing worldviews, values, and ways of knowing. Corner (1999) has theorized mapping as a speculative and critical act – a "formative and creative process" that exposes the networks of agency and underlying landscape change rather than just recording fixed realities.[61]

The ethical imperative is crucial, it can be cautioned that dominant Western practices in data visualization amplify "imagined objectivity", often obscuring diversity and perpetuating settler-colonial hierarchies, while ethical visualizations can surface marginalized knowledge and foster more democratic modes of engagement.[62] Sheppard (2005) and Forester (1999) argue that ethical visualization must reveal conflict, highlight marginalized voices, and make explicit where decisions are contested, consequently transforming drawings and images into instruments of democratic practice.[63]

Beyond its theoretical richness, visualization is also practical – it has the potential to democratize environmental knowledge and expands access. Cognitive science and environmental psychology consistently demonstrate that imagery is processed more intuitively and more effectively than text, making complex ecological and planning issues accessible to broader and more diverse audiences. Sheppard (2005) points out that visual representations can foster emotional engagement and catalyze dialogue, enabling lay participants to grapple with uncertainty, values, and trade-offs that are often missed in technical documents.[64] Landscape architecture scholars such as Nadia Amoroso further recognize visualization as an essential tool for overcoming barriers in expert and lay knowledge, supporting inclusive participation, and empowering communities to shape collective futures.[65] This thesis foregrounds visualization methods for their power to facilitate critique, and nurture democratic engagement within contested processes of restoration.

As mentioned earlier, ethical visualization requires an intentional commitment to transparency, plurality, and situated knowledge, rejecting the myth of neutral representation. Rather than offering neutral depictions, responsible visualizations acknowledge the politics of representation, legibility, authorship, inviting critique over whose perspectives are made visible and whose are omitted. By grounding the research in these theoretical perspectives, this thesis uses visualizations as both methodology and ethics, an approach that foregrounds agency, dialogue, and contested meaning within environmental governance.

1.3.3 Decolonial Land Practice

A decolonial theoretical lens fundamentally challenges inherited logics of dominance, separation, and top-down control that underpin mainstream environmental governance. It calls for renewed attention to Indigenous knowledge systems, relationships to place, and political sovereignty that continue to be marginalized within settler-colonial frameworks.[66] Within this perspective, rivers and landscapes are viewed as living socio-ecological assemblages, shaped by intertwined histories of stewardship, dispossession, and resilience. Public infrastructure/restoration processes framed through a decolonial lens must therefore engage deeply with these complex legacies, resisting the imposition of external narratives or monolithic representations of "nature".[67] This approach foregrounds the need for restoration practice to be relational, context specific, and embedded within ongoing struggles for justice and self-determination.

Visualization plays a pivotal role in supporting decolonial restoration practices by influencing whose voices and values are made visible, and by shaping the accessibility of participation and power within environmental decision-making. As Sheppard (2005) states, the act of visualizing alternative futures is inherently entangled with questions of justice and representation.[68] Implementing ethical visualizations means facilitating a

[60] Katie Anania and Cooper Stiglitz, "Touching Variables: Decolonial Approaches and New Tools for Ecological Data Visualization," *Leonardo* 56, no. 6 (2023): 580

[61] James Corner, *The Agency of Mapping: Speculation, Critique and Invention* (1999), 214–19

[62] Anania and Stiglitz, "Touching Variables: Decolonial Approaches and New Tools for Ecological Data Visualization," 581–82.

[63] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005, 62-66; Corburn, "Bringing Local Knowledge into Environmental Decision Making: Improving Urban Planning for Communities at Risk." 429.

[64] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005, 646-647.

[65] Nadia Amoroso, *Representing Landscapes: Visualizing Climate Action* (Taylor & Francis Unlimited, 2024).

[66] Zoe Todd, "An Indigenous Feminist's Take On The Ontological Turn: 'Ontology' Is Just Another Word For Colonialism," *Journal of Historical Sociology* 29, no. 1 (2016): 7–9, 13–17

[67] Simpson, *As We Have Always Done : Indigenous Freedom through Radical Resistance*, 11-14.

[68] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005, 645-647.

shift from top-down communication – where visuals merely persuade or inform – to participatory and co-creative practices that invite meaningful dialogue and mutual learning. It is through these dialogic visual tools that restoration efforts can begin to unsettle long-standing colonial power dynamics encoded within maps, plans, and images.

Central to this theoretical framework is the concept of "two-eyed seeing", an integrative epistemology that recognizes the strengths and limits of both Indigenous and Western ways of knowing.[69] This dual vision fosters a respectful dialogue that honors the coexistence of epistemological difference without compromising Indigenous knowledge within settler paradigms. It reframes ecological restoration as fundamentally relational, necessitating processes that acknowledge diverse cultural memories, land-rights, and non-human agency alongside ecological function.

Throughout this thesis, this framework is relevant towards the critique of the processes and policies themselves that often lead to a lack of meaningful engagement or integration of Indigenous knowledge. Rather than positioning the work as an enactment of decolonial practice, the thesis exposes the performativity often embedded within restoration and planning rhetoric that claims such intent. The drawings respond directly to prior design and representational work produced with insufficient Indigenous consultation, tracing how these absences manifest spatially and visually. In this way, the visual component operates as a form of critical reflection rather than an alternative proposal; an interpretive practice that makes visible the disconnect between decolonial discourse and its implementation. Through this lens, the thesis underscores the need for deeper structural and procedural change before the ideals of relational and just restoration can be materially realized.

[69] Cheryl Bartlett et al., "Two-Eyed Seeing and Other Lessons Learned within a Co-Learning Journey of Bringing Together Indigenous and Mainstream Knowledges and Ways of Knowing," *Journal of Environmental Studies and Sciences* 2, no. 4 (2012): 334–35

1.4 METHODOLOGY AND STRUCTURE

This thesis employs a mixed-methods approach that combines literature review, spatial research, stakeholder mapping, case study analysis, and exploratory visualization. The intent of this methodology is not to propose a new design for Riverside Dam, but rather to reframe the City of Cambridge's shortlisted options for the dam's future through new forms of drawing and engagement. By focusing on representation, this work draws on models of visual communication and participatory formats to illustrate how such approaches have the potential to foster more meaningful public involvement in environmental decision-making, referencing strategies and outcomes documented in successful cases and literature.

The research began with a comprehensive literature review that explored three interconnected areas: understandings of ecological restoration, visual ethics and public engagement, and representational methods. This review highlighted the role of public perception, transparency, and participation in building legitimacy around environmental decision-making. The literature emphasized how visual communication techniques shape both the interpretation of projects and the inclusion of diverse voices in design and governance processes.

This theoretical foundation was complemented by research at multiple scales. At the watershed scale, mapping was used to trace the Grand River's history of settlement, industrial infrastructure, ecological management, and restoration efforts, situating Riverside Dam in a broader context of human-water relations. At the local scale, Riverside Park was studied to understand the ecological conditions, cultural attachments, and everyday uses that inform the community's strong responses to the dam. This multi-scalar perspective emphasized how large-scale histories, and small-scale attachments converge at the site of debate (Riverside Park, Cambridge, Ontario).

To ground this research in current practice, conversations were held with key actors involved in the Riverside Dam case. An engineer from the City of Cambridge provided key insight to the technicalities of the municipal

decision-making process, and the Chair of the Ontario Rivers Alliance (ORA) contributed perspectives on ecological priorities and advocacy, as well as where the ORA attempts to intervene in the decision-making process. These exchanges, combined with a stakeholder mapping exercise, clarified the range of interests and degrees of influence surrounding the dam. The mapping process identified alignments, tensions, and gaps in communication among groups such as the Grand River Conservation Authority (GRCA), municipal actors, recreational clubs, and residents.

Case studies of landscape architecture firms further informed the methodology. Firms such as SCAPE studio, Sasaki, and Michael Van Valkenburgh Associates Inc, were examined to understand how design professionals communicate complex ecological processes while engaging communities in decision-making. By analyzing and highlighting the strategies and representational methods being used in practice, these cases helped shape the author's "guidelines to inspire negotiated design". The "guidelines to inspire negotiated design" emphasize approaches that allow drawings to operate as iterative tools for dialogue rather than polished end-products, and that structure engagement formats to foreground multiple voices and perspectives.

The final stage of the methodology applies these guidelines directly to the Riverside Dam case. Rather than proposing new design alternatives, this thesis takes the shortlisted design options presented by the city and re-presents them through new sets of drawings and engagement formats. These materials are designed to better communicate the ecological, cultural, and social implications of each option, and to create a framework where residents can more actively participate in evaluating and imagining the future of the site. In doing so, this work explicitly contrasts with the Municipal Class Environmental Assessment process, which has relied on highly technical language and polished renderings that often reduce public engagement to one-way consultation. By reframing how the city's options are communicated, this methodology seeks to demonstrate how more accessible and dialogic forms of representation can open the decision-making process and help restore public trust.

The current chapter, *Why Dam Removal Matters and Theoretical Framing*, outlined the central themes of this thesis: restoration as a process of negotiation, the contested nature of low-head dam removals, and the importance of representation in shaping public engagement.

Chapter 2.0, *The Grand River and Riverside Dam: Histories, Powers, and Place*, provides historical and contextual grounding at two scales: the watershed

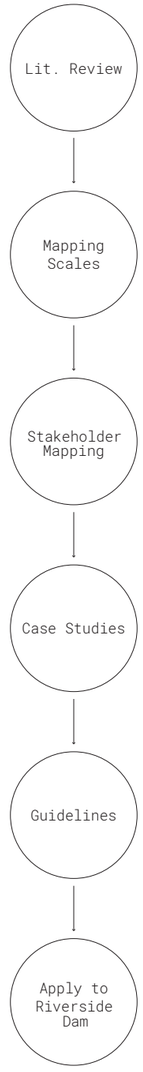


Fig. 1.4.1 Sequence of thesis methodology. *Made by author.*

and the site scale.

In Chapter 3.0, *Riverside Dam Visual Analysis and Exemplary Firms*, the role of drawings and visual communications in shaping public understanding of environmental projects is investigated. Beginning with a critique of conventional representations used in the Riverside Dam Class Environmental Assessment, a critique on the Municipal Class Environmental Framework itself, then followed by case studies of international firms. The projects examined demonstrate how representation can function as a tool for education, transparency, and negotiation.

Chapter 4.0, *Guidelines to Inspire Negotiated Design and what that Looks Like for Riverside Dam*, creates a set of guidelines for drawing and engagement practices that better support inclusive participation in restoration projects, and then applies these guidelines to the design projects at Riverside Dam as a direct contrast to the typical Municipal Environmental Assessment Process.

The final part, Chapter 5.0, *Conclusion*, reflects on the research and representational work of the thesis. I consider how reframing engagement through drawing can open space for more inclusive and transparent processes in environmental decision-making. The conclusion also identifies directions for future work, particularly the need to embed iterative, dialogic modes of communication into restoration practices more broadly as communities face the accelerating challenges of climate change.

CHAPTER 2

The Grand River and Riverside Dam: Histories, Power, and Place

2.1 HISTORY OF THE GRAND RIVER AND ITS DAMS

The watershed's long history of human intervention, from Indigenous stewardship through to colonial modifications and contemporary restoration efforts, offers a tangible landscape in which tensions, negotiations, and collaborative processes are enacted. The Grand River is what is considered a "working river", meaning that it provides irrigation, and agriculture, and for certain regions it provides drinking water, jobs, and transport. All of this requires collaboration between different industries and experts. Since the river does so much to support the region, the underlying goal of all authoritative bodies is to do what they can to maintain a healthy waterway. As debates surrounding dam removals, water governance, and climate adaptation play out along the Grand and its tributaries, the region is an example of how restoration efforts are shaped by overlapping values, contested histories, and the continual negotiation of ecological and cultural futures.

The Grand River watershed, stretching across approximately 300km of Southern Ontario, has been inhabited and shaped by human communities for millennia.[1] Indigenous stewardship laid the foundation for a deep, relational understanding of the river as a source of sustenance, identity, and governance. Before the existence of the Haldimand Tract, the Grand River has been central to the Haudenosaunee and other First Nations.

For the Haudenosaunee, whose governance and treaties long recognized the river as central to their sustenance and identity, dams were never neutral technologies. They symbolized both ecological disruption and the erosion of treaty promises. As Susan Hill notes in *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, the Grand River Navigation Company's dams of the 1830s and 1840s caused severe flooding of Haudenosaunee farmland, displacing families, spreading "ague and fever", and destroying crops without consent or adequate compensation.[2] These dams were not simply industrial projects built for sawmills and irrigation for agriculture, they were instruments of dispossession, restructuring both land and water used to serve settler economies while undermining

[1] "Grand River Source Protection Area," Drinking Water Source Protection, accessed September 23, 2025, https://www.sourcewater.ca/source-protection-areas/grand-river-source-protection-area/.

[2] Susan M. Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, 20:179.

Haudenosaunee governance.

This imposition was sharply at odds with the principles of the Tekeni Teiohatatie Kahswentha (Two Row Wampum belt) which outlines a relationship of coexistence between Indigenous and settler nations. As Monture states, the Two Row was repeatedly invoked by Haudenosaunee leaders as a framework for sovereignty:

> *It is said that the parallel lines represent two vessels travelling side by side down a river. The onkwehonwe are in their canoe with their language, culture, history, and traditions, while the Dutch are in their sailing vessels with all of their own customs that also make them distinct people. As these two vessels coexist, they are to be considered separate but equal in status, never interfering in each other's social or political affairs.*[3]

The very act of damming in the Grand River went against this principle, forcing interference not only in the flow of the river itself, but in Haudenosaunee land tenure and cultural continuity.

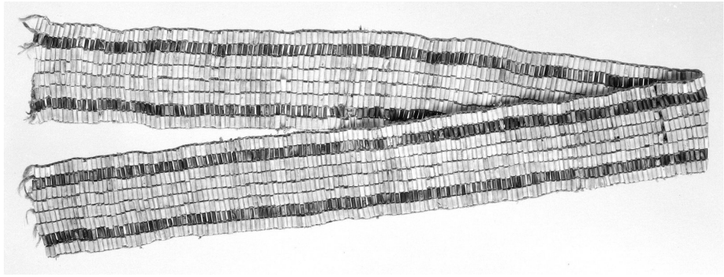


Fig. 2.1.1 Wampum belt given by Grand River Chiefs to John Brant, a version of the Guswhenta (Two Row Wampum Belt), c. 1820.

[3] Rick Monture, *We Share Our Matters: Two Centuries of Writing and Resistance at Six Nations of the Grand River*, 14.

Resistance to such incursions persisted across centuries. The Six Nations Confederacy lodged continuous petitions to the Crown, asserting their fishing rights, and demanding redress for damages caused by dams and flooding. In 1898, they again reminded Canada that the original treaty guarantees included:

> *Owing to the fact that was one of the conditions of the original Treaty between the Six Nations and the British Government, and was one of the conditions of the agreement entered by the Six Nations Council and the Grand River Navigation Company when the Dunnville and other Dams were built that they shall have all the privileges to fish along the River and at these dams without any restrictions whatsoever.*[4]

Meanwhile, Haudenosaunee intellectuals and leaders sought to strengthen the visibility of their governance systems. Seth Newhouse produced a 312-page English transcription of the Great Law of Peace in the 1880's – an effort to document sovereignty as settler governments increasingly sought to undermine it.[5] These acts of translation and assertion were themselves forms of resistance against the broader colonial project of control, of which dams were a physical manifestation.

While the early low-head dams built along the Grand River inflicted immediate and localized harm – flooding Indigenous farmland, disrupting traditional fishing practices, and symbolizing violations of treaty rights – these impacts were an early phase in a broader pattern of hydrological transformation.

As settler populations grew, towns like Kitchener, Waterloo, and Cambridge emerged along the river, accelerating the transformation of the landscape. The expansion of agriculture and industry in the 19th and early 20th centuries led to widespread deforestation and wetland drainage, severely degrading the water quality and aquatic habitats. Industrial pollutants and municipal sewage found their way into the river, compounding the ecological damage. This, in combination with catastrophic floods, underscored the urgent need for regional water management. These events prompted the establishment of the Grand River Commission in 1934, tasked with flood control, water quality improvement, and ecological restoration.[6]

The construction of large dams such as Shand (1942), Luther (1954), and Conestogo (1958) reflected attempts to engineer the river to serve human needs: controlling flooding, ensuring water supply, and supporting

[4] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, vol. 20, 209.

[5] Monture, *We Share Our Matters: Two Centuries of Writing and Resistance at Six Nations of the Grand River*, 70-76.

[6] "GRCA History," Grand River Conservation Authority, accessed November 24, 2024, https://www.grandriver.ca/who-we-are/grca-history/.

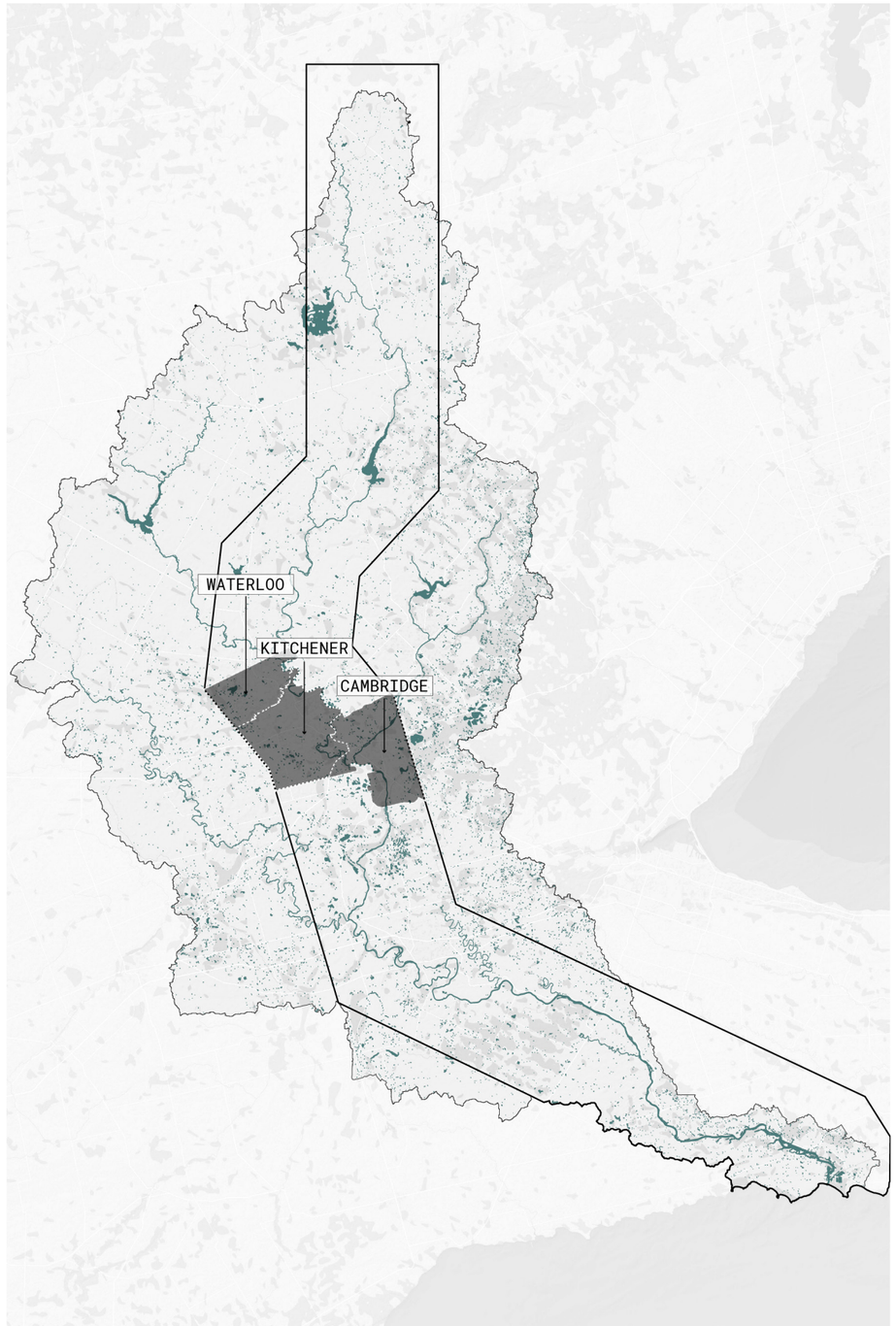


Fig. 2.1.2 Map of Kitchener, Cambridge, Waterloo in relation to the Grand River Watershed and Haldimand Tract.*Made by author.*

economic growth. The Shand Dam represented a particularly significant paradigm shift in Canadian water management, marking the first large-scale, multipurpose dam built in the country built solely for water conservation purposes.[7]

Rising 23 meters from the riverbed with a 640-meter earthen structure and concrete spillway, the dam created the 12-kilometer Belwood Lake reservoir, fundamentally transforming the Grand River's hydrology.[8] Recurring floods had long plagued the communities throughout the watershed, and while calls for flood control measures were common, it was the catastrophic floods of 1929, which devastated communities like Fergus, and Elora, demonstrating the urgent need for comprehensive flood control measures.[9]

Costing $2 million and employing 200 workers at its peak, the Shand Dam's construction required the displacement of half of Belwood's downtown area, including the purchase of 2,000 acres and numerous businesses ranging from banks to bakeries.[10] The dam's completion in

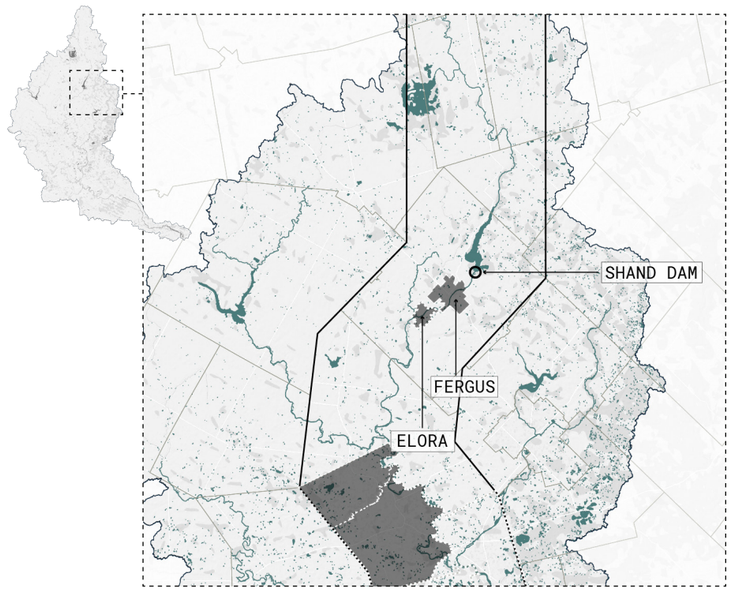


Fig. 2.1.3 Map of Fergus and Elora in relation to the Shand Dam, Grand River, and Haldimand Tract. *Made by author.*

[7] Beaumont, "The Shand Dam: Fifty Years on the Grand" 6.; Grand River Conservation Authority, "GRCA History."

[8] Beaumont, "The Shand Dam: Fifty Years on the Grand", 5; Grand River Conservation Authority, "GRCA Dams."

[9] "The Grand River of Southern Ontario 2: Riverview to Grand Valley via Luther Marsh," Holmström Ruddick, August 23, 2024, https://holmstromruddick.com/the-grand-river-of-southern-ontario-2-riverview-to-grand-valley-via-luther-marsh/.

[10] History of Belwood Lake - *Lake Belwood Real Estate*, April 29, 2024, https://lakebelwood.com/about-belwood-lake/history-of-belwood-lake/; Beaumont, "The Shand Dam: Fifty Years on the Grand," 30–36.



Fig. 2.1.4 Shand Dam, 2025. Fergus, Ontario. *Photo taken by author.*

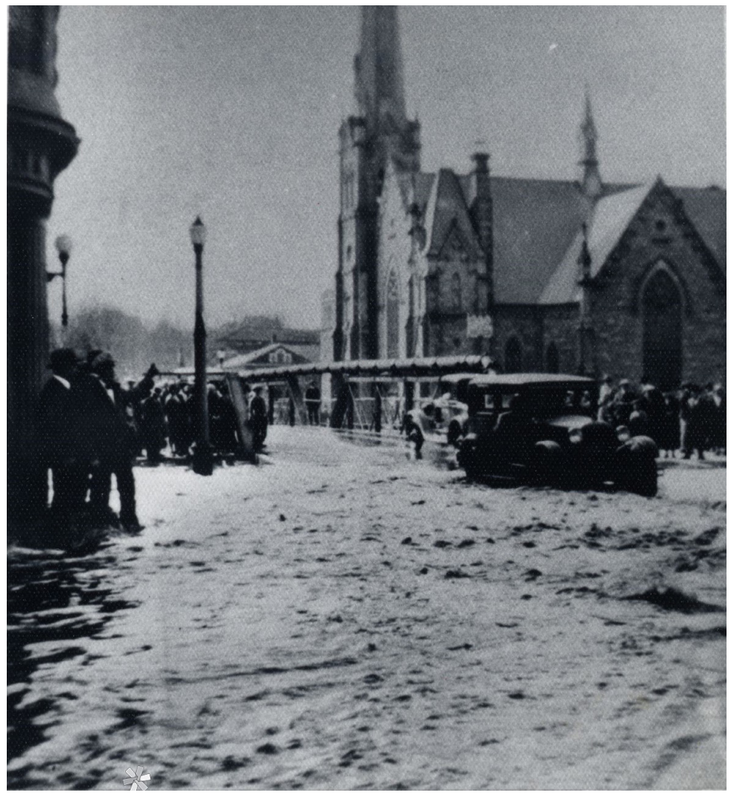


Fig. 2.1.5 Image of 1929 Flood, Galt (Cambridge), Ontario. *Image courtesy of Waterloo Historical Society.*



Fig. 2.1.6 Flood of 1948, Aerial View of Galt. *Photo: Grand River Conservation Authority.*



Fig. 2.1.7 Flood of 1974, View of Main Street Galt. *Photo: Grand River Conservation Authority.*

1942 called national and international attention, with the Financial Post saying "Grand Valley masters its river" and positioning such engineering projects as essential for post-war economic development.[11] However, these monumental interventions further reshaped the river's hydrology and ecology, continuing the legacy of imposed control over Indigenous lands and waterways while establishing a new era of engineered river management that prioritized human security and economic growth over ecological integrity.

This shift in approach exemplified a broader pattern in which human-caused problems – flooding, diminished water quality, ecological disruption – were routinely addressed by building more: more infrastructure, more engineering, ever-larger interventions. The construction of the Shand Dam set a precedent for a solutionist mindset that continues to shape responses to failing dams today. Rather than addressing the underlying causes, there is a persistent tendency to propose additional technological solutions, reinforcing a cycle where the answer to past interventions is simply to build new ones.

Despite these interventions, major floods have continued to shape the Grand River watershed in the following decades, with events such as the flood of 1974 inundating communities from Kitchener and Cambridge to Brantford, and more recent spring rain or snowmelt events often testing the region's infrastructure and resilience. Even after the Shand Dam's construction, persistent episodes of high water and widespread flooding have demonstrated both the limits of engineered control and the ongoing presence of natural forces in the landscape, leaving behind a legacy across the floodplain communities.

In recent decades, there has been a focus on ecological restoration efforts aimed at adapting to new environmental challenges and reversing some historic damage (such as tree replanting efforts).[12] Restoration initiatives target improving water quality, enhancing fish and wildlife habitat, restoring wildlife corridors, and stabilizing banks to reduce erosion. Grassland and tallgrass prairies were common in the central watershed but were mostly converted to farms in the 1800's, however the GRCA has been rehabilitating them at Apps' Mill Conservation Area (Brant), Brant Park (Brantford), Pinehurst Lake Park (Brant), F.W.R Dickson Wilderness Area (near Cambridge), Guelph Lake Conservation Area (Guelph), and Luther Marsh Wildlife Management Area.[13] These efforts also emphasize the

[11] Janet Baine, *Shand Dam a First for Canada*, n.d., 2.

[12] "Restoration," Grand River Conservation Authority, accessed August 25, 2025, https://www.grandriver.ca/our-watershed/natural-heritage/restoration/.

[13] Grand River Conservation Authority, "Restoration."

removal or adaptation of obsolete small dams such as Beattie Dam (Fergus), Chilligo Dam (Cambridge), Wilkes Dam (Brantford), and Taquanyah Dam (near Cayuga).[14] Given the complex cultural and ecological legacies of the watershed, restoration today should prioritize collaboration, integrating scientific research with Indigenous knowledge systems, and community values to foster resilient social-ecological relationships.

A range of organizations and community groups play critical roles in these restoration efforts. The Grand River Conservation Authority (GRCA) leads many watershed-scale projects, coordinating flood management, habitat rehabilitation, and public engagement initiatives.[15] Complementing this, groups such as Friends of the Grand River mobilize local volunteers for river clean-ups, tree plantings, and advocacy.[16] Indigenous organizations, notably the Six Nations Wildlife and Stewardship, and related Haudenosaunee stewardship councils, provide essential perspectives on restoring the river in ways that honor treaty rights, traditional ecological knowledge, and cultural renewal.[17] Additionally, regional chapters of national conservation organizations like Trout Unlimited and Wellington Water Watchers contribute scientific monitoring and educational outreach.[18] This network of partners exemplifies a multi-stakeholder approach that is critical for navigating the socio-ecological complexities of the Grand River's ongoing restoration and stewardship.



Fig. 2.1.8 Fish stocking at Soper Park, Cambridge, Ontario. *Photo: Grand River Conservation Authority.*



Fig. 2.1.9 Invasive species removal, Dickson Wilderness Area. *Photo: Grand River Conservation Authority.*

[14] Grand River Conservation Authority, "Restoration."

[15] Grand River Conservation Authority, "Restoration."

[16] "About Us," *Friends of the Grand River*, n.d., accessed August 25, 2025, https://friendsofthegrandriver.com/about-us/.

[17] "Six Nations Lands and Resources," accessed August 25, 2025, https://www.sixnations.ca/LandsResources/EcoCentre.htm.

[18] "Education," Water Watchers, accessed August 25, 2025, https://www.waterwatchers.ca/education; "OUR WORK," Freshwater Conservation Canada, accessed August 25, 2025, https://www.freshwaterconservationcanada.org/our-work.

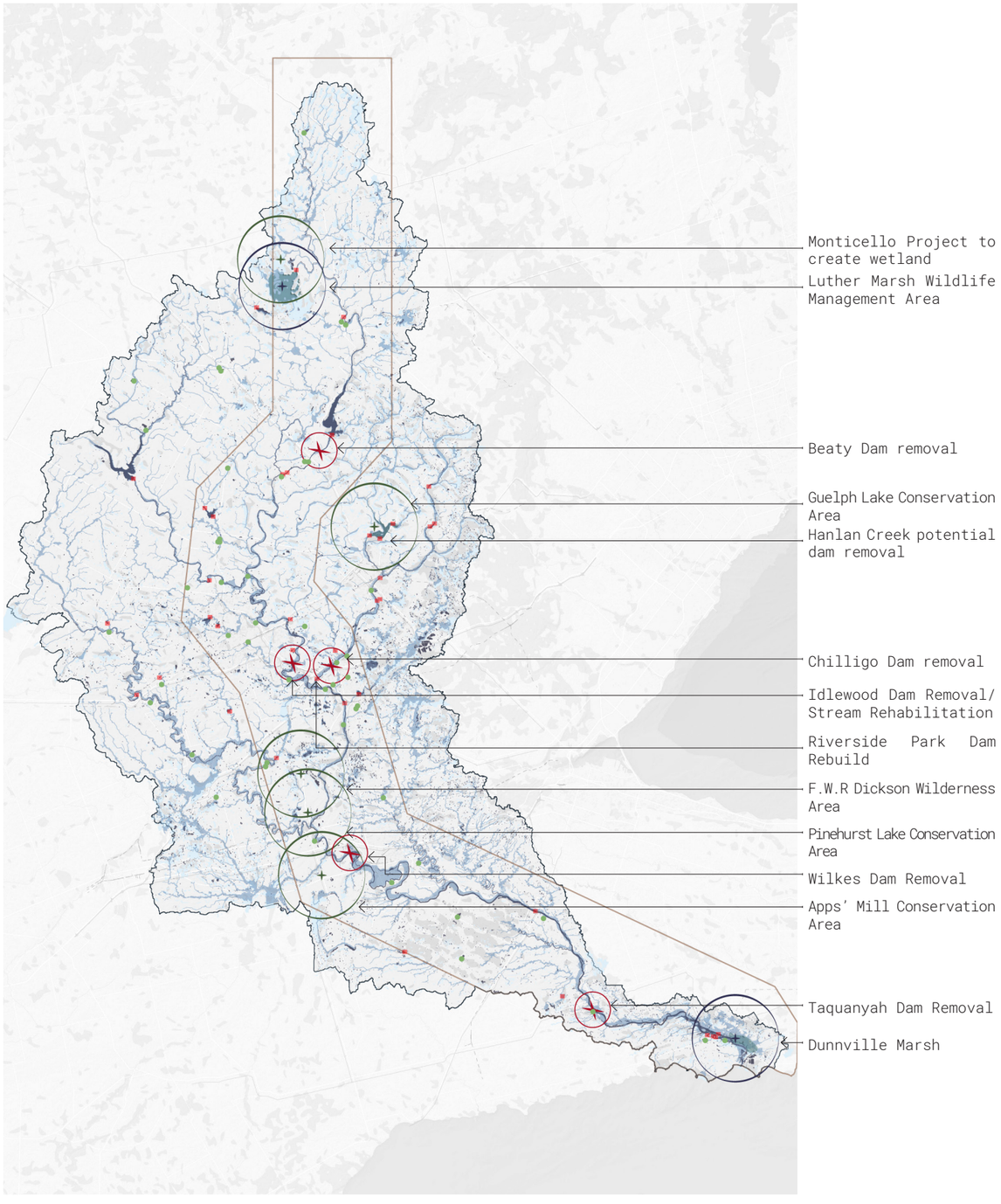
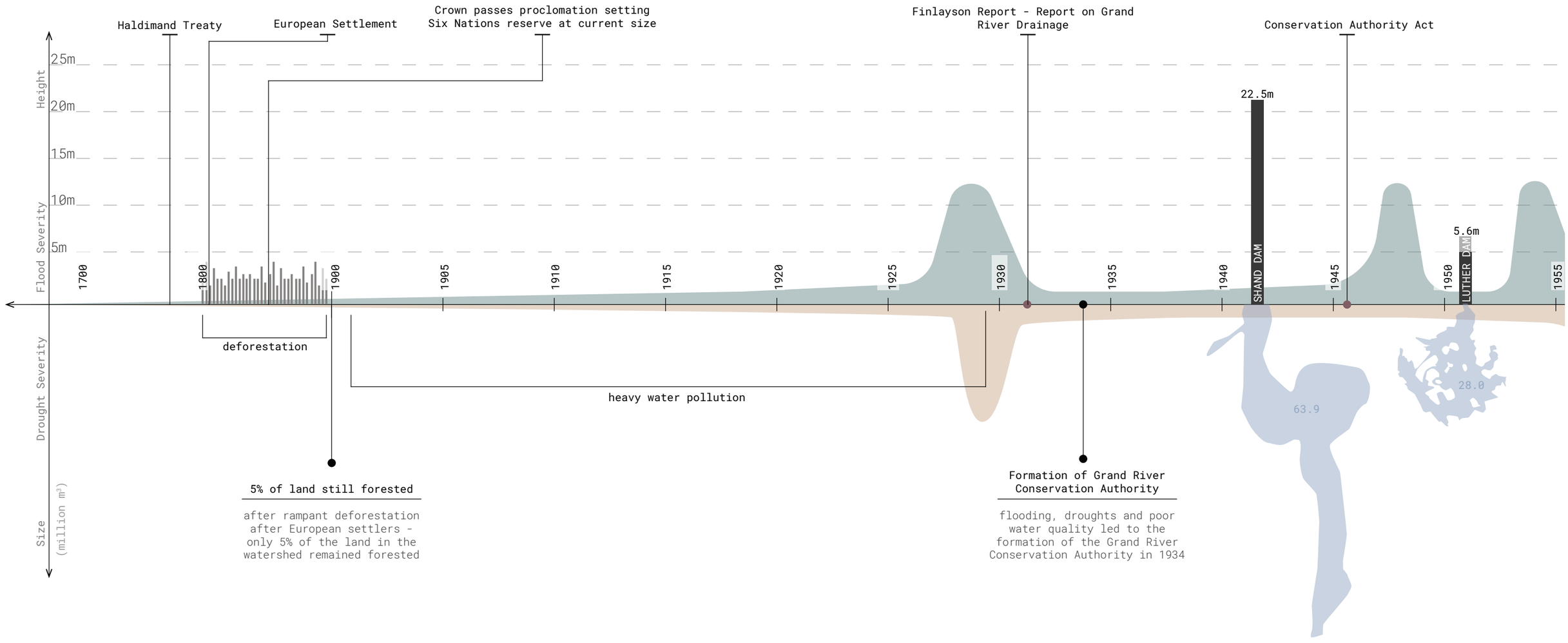


Fig. 2.1.10 Map of Restoration Efforts in the Grand River Watershed. *Made by author.*

Treaties, Water Management, and Restoration Efforts in the Grand River Watershed

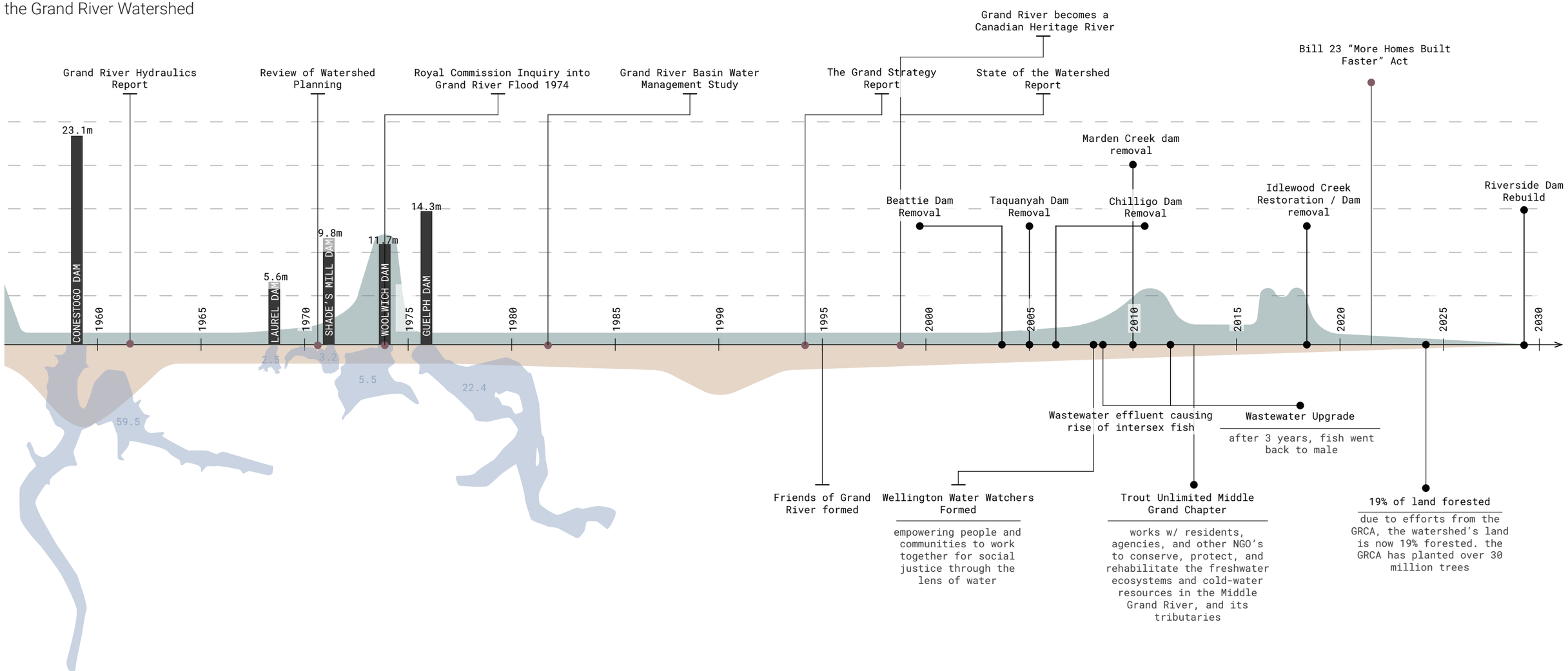


Legend

- Dam
- Flood severity
- Drought severity
- Reservoir size

Fig. 2.1.11 Timeline of Events Related to Water Management and Restoration on the Grand River. *Made by author.*

Treaties, Water Management, and Restoration Efforts in the Grand River Watershed



Legend

- Dam
- Flood severity
- Drought severity
- Reservoir size

Fig. 2.1.11 (cont.) Timeline of Events Related to Water Management and Restoration on the Grand River. *Made by author.*

2.2 RIVERSIDE DAM AND THE BIRTH OF PRESTON

The origins of the Riverside Dam are inseparable from the founding of Preston itself. The earliest European settlement along this reach of the Speed River dates to the early nineteenth century, when John Erb, a Mennonite from Pennsylvania, purchased roughly 500 acres of land from Richard Beasly. Richard Beasly, a Loyalist merchant and land speculator, had earlier purchased the land from the Six Nations (Haudenosaunee Confederacy).[19] It was part of territory granted to them under the Haldimand Tract (1784) in recognition of their alliance with the British during the American Revolution. Beasly's sales to settlers such as Erb were among the early transactions that dramatically reduced Haudenosaunee control over the Grand River corridor during the first decades of the nineteenth century.[20]

Recognizing the Speeds River's "powerful and constant current" as a dependable source of waterpower, Erb built a sawmill in 1806 and a gristmill in 1807, collectively known as Cambridge Mills. These two mills became the nucleus of a small settlement, and by the 1820s the area was known for its milling and agricultural production. After Erb's death in 1832, his son John S. Erb inherited the lands south of the Speed River and, in 1834, commissioned English surveyor William Scollick to formally lay out the village of Preston along what was then called the Great Road from Dundas (now King Street).[21]

Through the 1830s and 1840s, Preston grew rapidly. Immigration from Germany and Switzerland brought tradespeople, cabinet-makers, brewers, and merchants who relied on the river for waterpower and transport. By 1851, Preston was the largest village in Waterloo Township, with more than 1,100 residents and numerous mills, tanneries, and breweries clustered along the Speed River.[22]

The first dam at the site now known as Riverside Dam likely dates from this formative period. The Cultural Heritage Evaluation Report notes that "a

[19] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 2013, 2–3.

[20] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, vol. 20.

[21] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 2–4.

[22] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 6.

dam has been located at this general site since the early nineteenth century," associated with the original Erb mill complex.[23] Archival photographs and maps indicate that part of the existing dam may have been constructed as early as 1864 by A. A. Erb, with further reconstruction in the early 1890s by mill owner Samuel Cherry, who added the north and south stone-masonry control towers that define the structure's present form.[24]

By the mid-nineteenth century, Cambridge Mills had become a regional industrial hub. The Riverside Dam—also referred to as the Speed Dam or Cambridge Mills Dam—powered the millrace that diverted part of the Speed River beneath what is now the P & H Milling complex (formerly A. A. Erb & Bros. Flour Mill). The millrace crossed under King Street and re-joined the river downstream, providing mechanical power for grain-grinding, lumber production, and, later, hydroelectric generation.[25]

According to the Riverside Dam Class Environmental Assessment, the existing dam "was constructed between 1860 and 1880 to support the partial diversion of the Speed River and provide hydraulic power to the Erb saw and flour mills (now P & H Milling)".[26] When the millrace ceased operation in the early twentieth century, the dam's industrial role ended. Yet it remained a valued civic amenity: by the 1890s, the adjoining floodplain had been transformed into Riverside Park, and the dam's impoundment created a millpond that became central to the park's recreational landscape.[27]

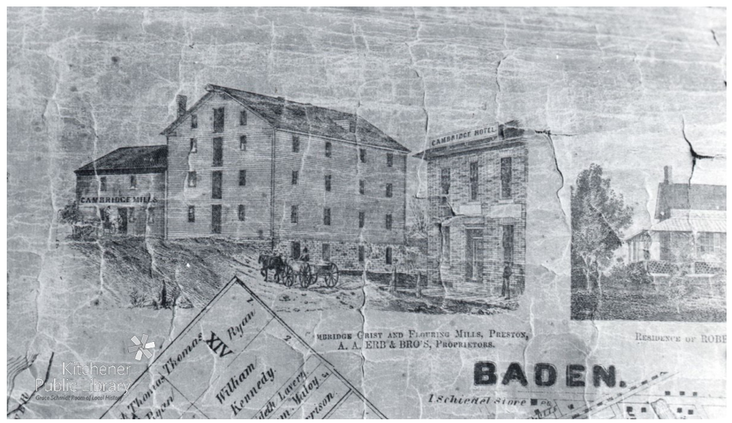


Fig. 2.2.1 Drawing of Cambridge Grist and Flour Mill in Preston, 1861. *Courtesy of Waterloo Historical Society.*

[23] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 2.

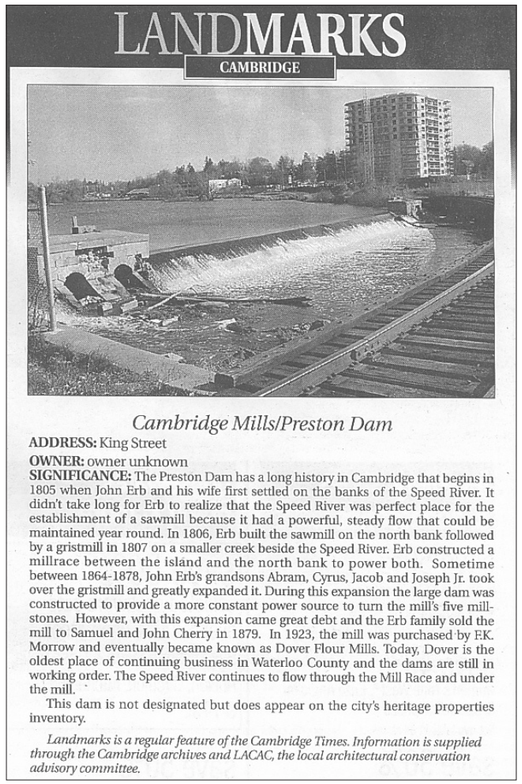
[24] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 1-2.

[25] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 12-15.

[26] *Riverside Dam Class EA* (Wood., 2018), 1.

[27] *Riverside Dam Class EA*, 1–2.

Throughout the twentieth century, the dam shaped Preston's physical and social identity. Together with the King Street Bridge, P & H Flour Mill, and Riverside Park, it formed a cohesive ensemble of civic and industrial landmarks that visually framed the town centre.[28] Historic postcards and photographs depict residents fishing and skating on the headpond, underscoring the dam's shift from an engine of production to a site of leisure and memory.



LANDMARKS

CAMBRIDGE

Cambridge Mills/Preston Dam

ADDRESS: King Street

OWNER: owner unknown

SIGNIFICANCE: The Preston Dam has a long history in Cambridge that begins in 1805 when John Erb and his wife first settled on the banks of the Speed River. It didn't take long for Erb to realize that the Speed River was perfect place for the establishment of a sawmill because it had a powerful, steady flow that could be maintained year round. In 1806, Erb built the sawmill on the north bank followed by a gristmill in 1807 on a smaller creek beside the Speed River. Erb constructed a millrace between the island and the north bank to power both. Sometime between 1864-1878, John Erb's grandsons Abram, Cyrus, Jacob and Joseph Jr. took over the gristmill and greatly expanded it. During this expansion the large dam was constructed to provide a more constant power source to turn the mill's five mill-stones. However, with this expansion came great debt and the Erb family sold the mill to Samuel and John Cherry in 1879. In 1923, the mill was purchased by EK. Morrow and eventually became known as Dover Flour Mills. Today, Dover is the oldest place of continuing business in Waterloo County and the dams are still in working order. The Speed River continues to flow through the Mill Race and under the mill.

This dam is not designated but does appear on the city's heritage properties inventory.

Landmarks is a regular feature of the Cambridge Times. Information is supplied through the Cambridge archives and LACAC, the local architectural conservation advisory committee.

Fig. 2.2.2 Clipping of Cambridge Mills/Preston (now known as Riverside Dam) in "Cambridge Landmarks" Section of Newspaper. *Image courtesy of Cambridge Archives.*

In 1928, the Waterloo Historical Society installed a commemorative plaque on the mill building, recognizing it as "the oldest place of continuous business in Waterloo County," thereby linking the living industry of P & H Milling to the region's earliest colonial enterprise along the Speed River.[29] This continuity reinforces the site's layered significance—economic, cultural, and environmental—within the broader Grand River watershed. When the municipalities of Galt, Preston, and Hespeler amalgamated in 1973 to form the City of Cambridge, the Riverside Dam remained a defining landmark of the Preston district. By the early twenty-first century, however, its structural condition had deteriorated. A 2008 inspection found "numerous cracks, spalling, and surface pitting," prompting emergency stabilization of the south control structure.[30] Subsequent inspections in 2014 and 2018 confirmed that the dam "remains in poor condition" and that the risk of partial failure within two to ten years was high.[31]

Despite its fragility, the dam continues to embody community identity. Public consultation during the 2018 Environmental Assessment revealed that many residents regard the dam and its millpond as integral to the sense of community and identity.[32] This enduring attachment reflects over two centuries of intertwined ecological and social history—beginning with the Six Nations' stewardship of the Grand River corridor, shaped through colonial industry, and now embedded in Cambridge's collective sense of place.

The Riverside Dam offers more than a record of nineteenth-century industrial ingenuity; it embodies the entanglement of environmental, cultural, and political histories that continue to shape the Grand River watershed. Its story begins with the alienation of Haudenosaunee lands along the Haldimand Tract and extends through the transformation of the Speed River into a mechanized landscape of mills, dams, and municipal infrastructure. Each phase of its life—from colonial acquisition to industrial expansion, from civic landmark to failing infrastructure—reflects a different set of values imposed upon the river. For this reason, Riverside Dam is an ideal site through which to study the tensions that emerge when ecological restoration collides with heritage preservation and public memory. It makes visible how questions of ownership, maintenance, and meaning are negotiated across scales of governance, and how visual communication including maps, diagrams, and renderings participate in those negotiations. Being a site that is beloved and contested, Riverside stands as a microcosm of the larger struggle to reconcile cultural attachment with environmental responsibility, making it a critical ground for re-imagining how design, and more critically the visual communication of those designs, can mediate between ecological processes and social histories in the context of climate adaptation and reconciliation.

[28] Unterman McPhail Associates, "Cultural Heritage Evaluation Report," 9–13.

[29] Unterman McPhail Associates, "Cultural Heritage Evaluation Report." 15.

[30] *Riverside Dam Class EA*, 2.

[31] *Riverside Dam Class EA*.

[32] *Riverside Dam Class EA*. A-44.

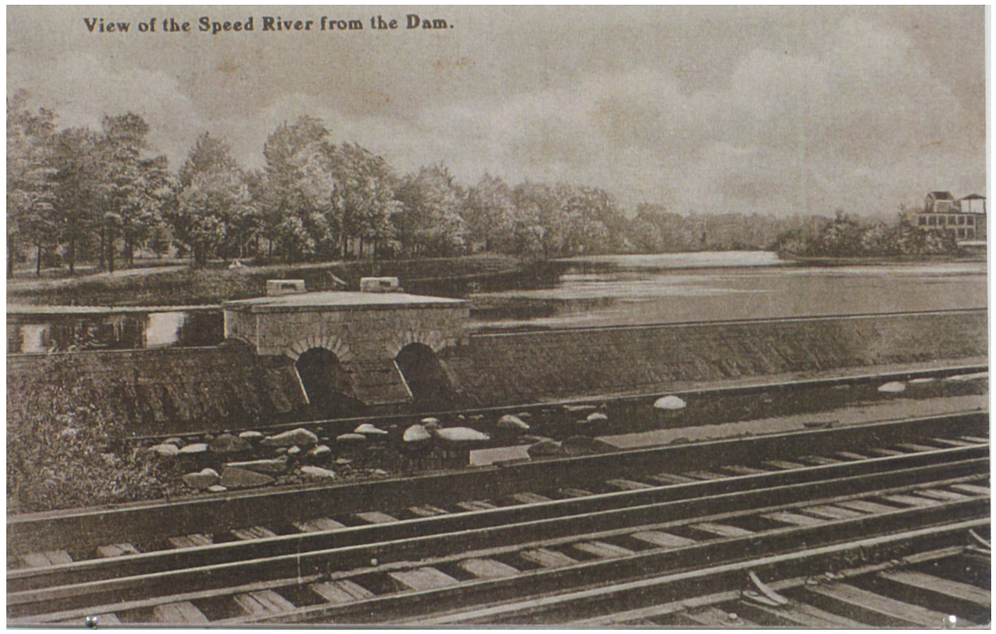


Fig. 2.2.3 Riverside Dam (formerly Speed Creek Dam), 1900. *Courtesy of Cambridge Archives. Photo Credit: Greg Pautler*



Fig. 2.2.4 Riverside Dam, 2025. *Photo taken by author.*

2.3 STAKEHOLDERS AND POWER STRUCTURES

2.3.1 Grand River Watershed Governance

The Grand River watershed is one of Ontario's largest and most complex hydrological systems, encompassing thirty-nine municipalities and two First Nations reserves within its management structures.[33] The governance of the Grand River watershed is born from its layered history of treaty-making between Indigenous peoples and colonial governments.

Among the most significant is the Haldimand Proclamation of 1784, which granted the Haudenosaunee a tract of land "six miles deep from each side of the river" in recognition of their alliance with the British during the American Revolutionary War.[34] This tract – known today as the Haldimand Tract – extends along the full length of the Grand River, forming the basis of the modern Six Nations reserve and the subject of ongoing land-rights claims.

> *I do hereby in His Majesty's name authorize and permit the said Mohawk Nation, and such other of the Six Nation Indians as wish to settle in that Quarter to take Possession of, & Settle upon the Banks of the River commonly called Ours [Ouse] or Grand River, running into Lake Erie, allotting to them for tat Purpose Six Miles deep from each Side of the River beginning at Lake Erie, & extending in that Proportion to the Head of the said River, which them & their Posterity are to enjoy for ever.* (Text of the Haldimand Deed of 1784 from Phil Monture's: *We share our matters*)[35]

Despite the existence of this treaty, the Crown soon undermined this agreement. In 1793, Lieutenant-Governor John Graves Simcoe issued a confirming patent that narrowed that tract, effectively reducing it by nearly one-third and imposing new restrictions.[36] *In The Clay we are Made of*, Hill notes that Crown officials questioned the validity of Haldimand's deed due to an "improper seal", using this technicality to justify new surveys

[33] Barbara Veale and Sandra Cooke, "Implementing Integrated Water Management: Illustrations from the Grand River Watershed," *International Journal of Water Resources Development*, September 20, 2016, 1–18,

[34] Monture, *We Share Our Matters: Two Centuries of Writing and Resistance at Six Nations of the Grand River*, xvi.

[35] Monture, *We Share Our Matters: Two Centuries of Writing and Resistance at Six Nations of the Grand River*, xvi.

[36] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, 20:148–50.

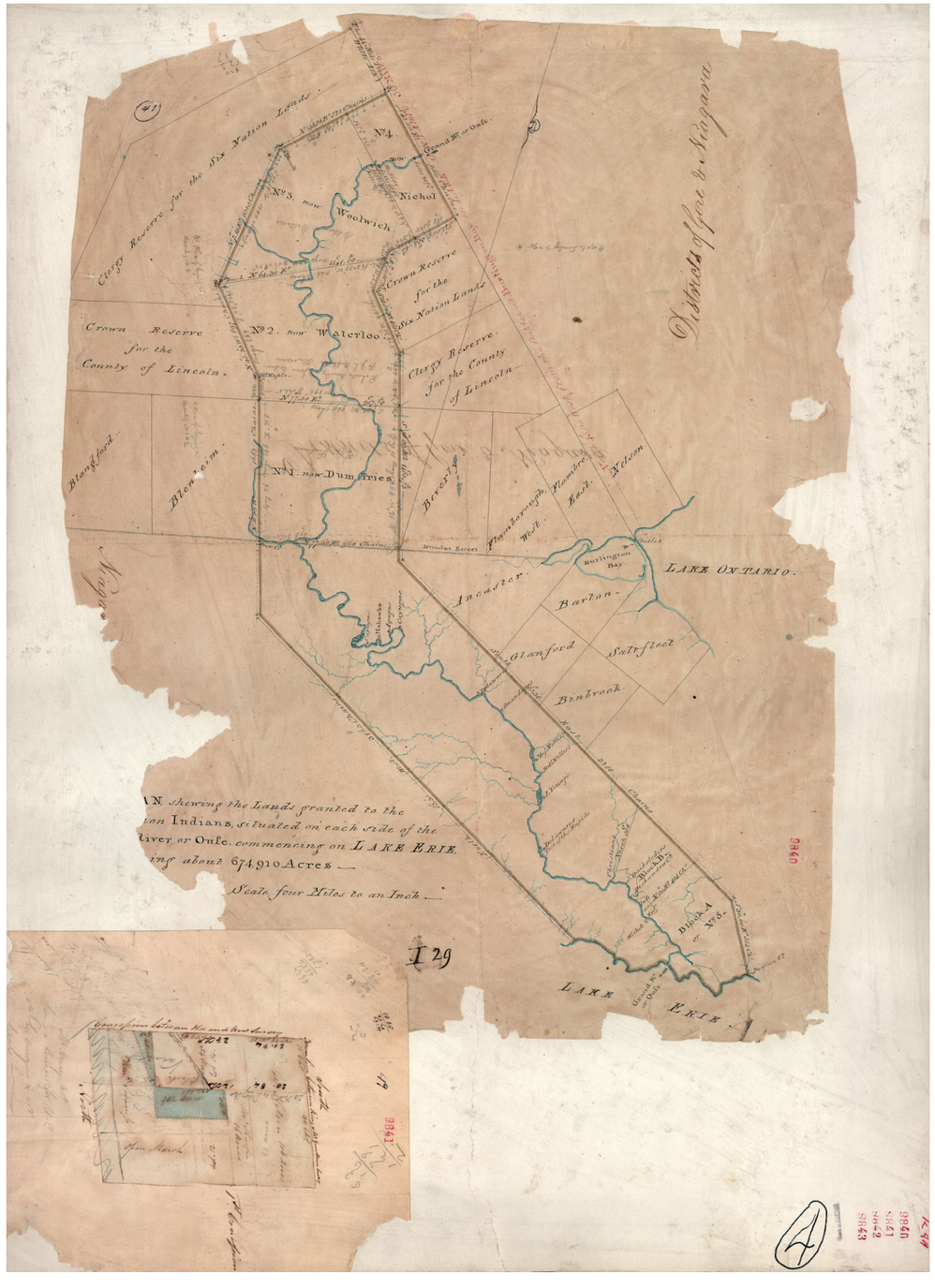


Fig. 2.3.1 Survey of Six Nations Land done in 1821 by Thomas Ridout. *Image from Public Archives of Canada*

that limited the Haudenosaunee's ability to lease or sell land without government oversight.[37] The resulting Simcoe Deed marked a major shift in control and laid the groundwork for two centuries of disputes over rightful jurisdiction of the Grand River corridor.[38]

Following these colonial reinterpretations, the Haudenosaunee established two Confederacy Councils, one along the Grand River (Ontario) and another at Onondaga (New York), to maintain the continuity of their governance system after relocation from New York State.[39] Despite this, federal intervention through the Indian Act increasingly eroded Haudenosaunee sovereignty. In 1924, the Department of Indian Affairs forcibly imposed an elected Band Council system, dissolving the traditional Confederacy through RCMP enforcement and establishing a new governance body under federal law.[40] Earlier amendments to the Indian Act, particularly the 1869 Gradual Enfranchisement Act and 1884 Indian Advancement Act, had already sought to replace hereditary forms of governance with state-controlled councils, a transition the Six Nations resisted for decades.[41]

Today, this dual governance structure persists: the Haudenosaunee Confederacy Chiefs Council (HCCC) continues to assert sovereignty and treaty rights based on the 1784 Proclamation, while Six Nations Elected Council (SNEC) operates under the Indian Act framework. Monture traces how Haudenosaunee writers and leaders have repeatedly invoked the Haldimand Treaty in letters, petitions, and political actions across the 19th and 20th centuries to reaffirm their independent jurisdiction.[42] These assertions frame how Six Nations engages with regional and watershed-level governance today.

Modern governance evolved through mid-20th-century conservation legislation. The Grand River Conservation Commission (1932) and the Grand Valley Conservation Authority (1948) were amalgamated in 1966 into the Grand River Conservation Authority (GRCA) under Ontario's Conservation Authority Act. The GRCA coordinates flood control, source-water protection, and land-management across municipalities, in partnership with provincial ministries, Environment and Climate Change Canada, and Indigenous communities.[43] These operations, however, occur on lands within the Haldimand Tract, territory still under active land-claim

[37] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, 20:148.

[38] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, 20: 151.

[39] Monture, *We Share Our Matters: Two Centuries of Writing and Resistance at Six Nations of the Grand River*, i.

[40] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, 20:236–37.

[41] Hill, *The Clay We Are Made of: Haudenosaunee Land Tenure on the Grand River*, 20:215–16.

[42] *Monture, We Share Our Matters: Two Centuries of Writing and Resistance at Six Nations of the Grand River*, 57–61, 145–48.

[43] Grand River Conservation Authority, "GRCA History."

litigation filed by Six Nations in 1995, meaning all governance actions remain embedded in a context of contested sovereignty.

Even within the settler governance framework, the GRCA's autonomy is being eroded. Recent provincial reforms have centralized key decisions and narrowed conservation authority roles. In 2020, Bill 229 (Schedule 6) amended the Conservation Authorities Act to let the Minister of Natural Resources and Forestry overrule a conservation authority on permits and even issue the permit directly, undermining local watershed expertise.[44] In 2022, Bill 23 (*More Homes Built Faster Act*) further restricted conservation authorities' ability to review or refuse development tied to Planning Act decisions, removing several environmental powers that safeguarded wetlands and floodplains.[45] Subsequent legislation (Bill 97, 2023, and Bill 185, 2024) largely retained with centralized structure, prioritizing

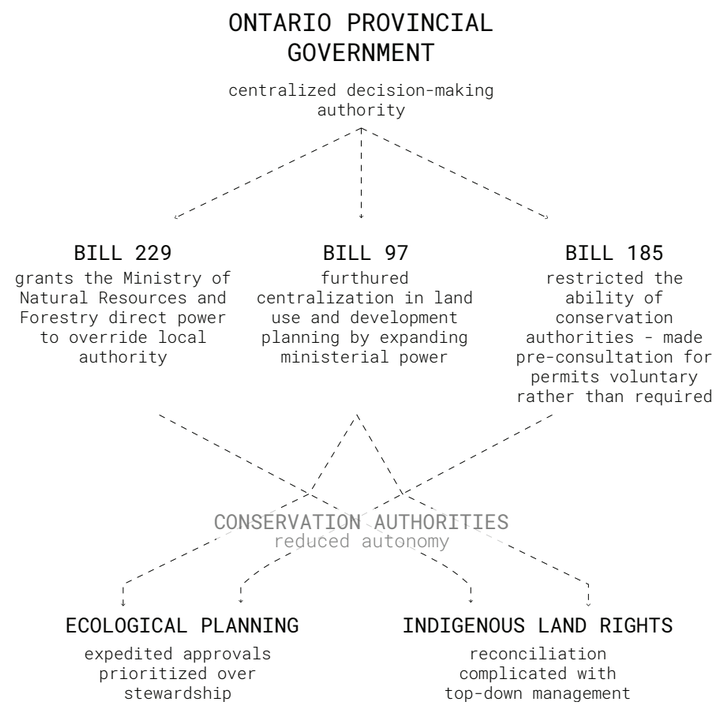


Fig. 2.3.2 Top-down power structure in the context of Conservation Authority. *Made by author.*

[44] "Bill 229, Protect, Support and Recover from COVID-19 Act (Budget Measures), 2020 - Legislative Assembly of Ontario," accessed October 11, 2025, https://www.ola.org/en/legislative-business/bills/parliament-42/session-1/bill-229.

[45] Phil Pothen, "Ontario's Housing Bill Is Actually a Trojan Horse for Environmentally Catastrophic Rural Sprawl," Environmental Defence, October 31, 2022, https://environmentaldefence.ca/2022/10/31/ontarios-housing-bill-is-actually-a-trojan-horse-for-environmentally-catastrophic-rural-sprawl/.

expedited approvals over ecological stewardship. Collectively, these policy changes marked a shift from watershed-based management toward top-down control, complication both ecological planning and reconciliation with Indigenous land rights.

Even as legislative changes have centralized control in the provincial government, Ontario's water-management framework continues to promote "collaborative" decision-making in name. The Lake Erie Region Source Protection Committee, established under the *Clean Water Act* (2006), exemplifies these efforts at multi-stakeholder engagement, bringing together municipalities, conservation authorities, and First Nations representatives to develop and implement source-water protection policies.[46] In practice, however, these operate within a governance landscape where real authority rests with the province. Provincial and federal agencies retain the power to approve, override, or withhold permits, leaving Indigenous nations and community groups to continually negotiate for genuine co-governance rather than one-way consultation.

The consequences of unbalanced governance are made visible in the lived realities of the Grand River watershed. Research from McMaster University's Ohneganos projects reports that 58 percent of households at Six Nations experience moderate to extreme water insecurity, stemming from inadequate infrastructure upstream contamination that flows directly into their section of the Grand River.[47] This disparity exposes the material outcomes of the jurisdictional inequities traced through the watershed's history of unresolved treaty obligations, uneven regulatory authority, and an enduring gap between responsibility and control.

2.3.2 Riverside Dam: Stakeholder and Power Dynamics

At the local municipal scale, Riverside Dam in Cambridge serves as a tangible case where power, responsibility, and public perceptions shape watershed decision-making. Building on the broader governance structures of the Grand River watershed – where the Conservation Authorities Act positions the GRCA as a technical advisor rather than a final arbiter – local decisions at Riverside expose how ecological expertise is often subordinated to political and symbolic pressures.

The Riverside Dam is an archetype of what the Ontario Ministry of Natural Resources terms an "orphaned" or legacy dam: a structure whose

[46] Drinking Water Source Protection, "Grand River Source Protection Area."

[47] leekinm, "How Indigenous and Western Knowledge Can Work Together to Improve Six Nations Water Security," *McMaster News*, April 19, 2023, https://news.mcmaster.ca/grand-river-six-nations-water-security/.

original industrial purpose has long disappeared and whose ownership and liability have become uncertain over time. The Crown is the owner of the bed and bank of the river, but the ownership of the structure itself is unknown.[48] The City, with concerns about public safety, prompted the initial study of the dam's structural integrity. Once the preferred solution is established, the City stated they are going to seek legal guidance on defining formal ownership of the dam.[49] Based on an article titled "Riverside Park dam in Cambridge now a project for 2029", the city is awaiting money to complete the project, implying the City as bearing all the responsibility.[50] This administrative ambiguity produced a governance vacuum in which no single agency held full jurisdiction – forcing the City of Cambridge to assume responsibility when the dam started to deteriorate. The question of "who owns the dam?" quickly became "who bears the political cost?" of what happens next.



Fig. 2.3.3 Comic strip related to ownership of Riverside Dam. *Posted to "Friends of Riverside Park Dam and Millpond".*

[48] *Municipal Class EA* (2024).

[49] *Riverside Dam Class EA*, 18.

[50] Bill Doucet, "Riverside Park Dam in Cambridge Now a Project for 2029," The Record, October 30, 2024, https://www.therecord.com/news/waterloo-region/riverside-park-dam-in-cambridge-now-a-project-for-2029/article_d8099f46-a7b6-5094-a5d9-ba4c75dfb399.html.

So, who becomes involved in projects like this? For a dam reconstruction or removal project, this typically includes the Ministry of Natural Resources and Forestry (MNRF) under the *Lakes and Rivers Improvement Act* and *Public Lands Act* which regulate dams, water crossings, and alterations to Crown lands. It also includes the Ministry of the Environment, Conservation and Parks (MECP) under the *Ontario Water Resources Act* and *Environmental Protection Act*.[51] In addition, the Endangered Species Act (Ontario) may apply where habitat or species at risk could be affected.[52]

At the federal level, the MCEA notes that the *Fisheries Act*, the *Canadian Navigable Waters Act*, and the *Species at Risk Act* may apply to municipal projects involving waterways.[53] Local and regional authorities, such as the Grand River Conservation Authority (GRCA), exercise jurisdiction under Ontario's Conservation Authorities Act and must issue permits for any works that alter a watercourse or affect regulated floodplains.[54] The coordination of these statutes ensures that projects like the Riverside Dam are evaluated not only for engineering feasibility but also for their ecological integrity, navigational safety, and compliance with heritage and habitat protections.

Within this system, the municipality becomes both an agent and a mediator—responsible for aligning community interests with regulatory mandates while managing risk, liability, and heritage preservation. Environmental assessments thus operate as more than technical studies but also instruments of negotiation between institutional jurisdictions and public values.

[51] *Municipal Class EA*, 67–74.

[52] *Municipal Class EA*, 69.

[53] *Municipal Class EA*, 69.

[54] *Municipal Class EA*, 70.

CHAPTER 3

Riverside Dam Visual Analysis and Exemplary Visualizations in Practice

For context:

The following sections of this thesis are going to be referencing a multitude of different drawings and images. The three different categories referenced are: 1) drawings/material put out by the City of Cambridge , 2) Drawings/ images being used as examples of good practice, and 3) drawings created by the author. Given this thesis draws on a wide range of visual materials that often depict similar content, this system of coloured borders helps prevent confusion by clearly distinguishing the origin, purpose, and authorship of each reference image.

These three different categories will be differentiated in the document through the use of different colours on the border of the spread as shown in the examples (Fig. 3.0.1, Fig. 3.0.2, and Fig. 3.0.3).

Pages with a beige border contain material put out by the City of Cambridge. These borders will be denoted with “City of Cambridge”.

Fig. 3.0.1 Sample spread 01. *Made by author.*



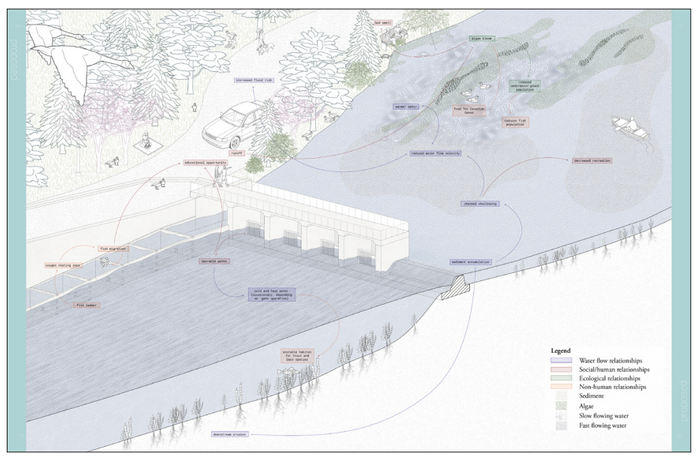
Pages with a light yellow border contain exemplary drawings/ images. These borders will be denoted with “Exemplary Visualization”.

Fig. 3.0.2 Sample spread 02. *Made by author.*



Pages with a light blue border contain proposed drawings/ images created by the author. These borders will be denoted with “Proposed”.

Fig. 3.0.3 Sample spread 03. *Made by author.*



3.1 INTRODUCING THE PROBLEM

The dynamics traced across the Grand River watershed, from early industrialization and settlement to the layered systems of governance that now regulate it, converge at Riverside Dam. The story of the dam distills the broader themes of the river's management into a single, tangible site. The debates that surrounded its potential removal or reconstruction show how policy, municipal decision-making, and public sentiment intersect in determining the fate of aging infrastructure.

The landscape in which the Riverside Dam conversations unfolded will be broken down in this chapter of the thesis, examining and critiquing the procedural umbrella that this process falls under and where visualization played its role.

3.1.1 Environmental Assessments and Public Consultation

Later in this chapter the drawings/visualizations used in the Riverside Dam Class Environmental Assessment (EA) are going to be examined, but it is important to first recognize that the drawings did not exist in isolation but rather as a part of a public consultation framework structured by Ontario's Municipal Class EA process. This framework, although designed to guide orderly infrastructure planning, is often criticized for emphasizing procedural compliance rather than fostering genuine, adaptive participation.[1] The class EA framework guides projects through five phases[2]:

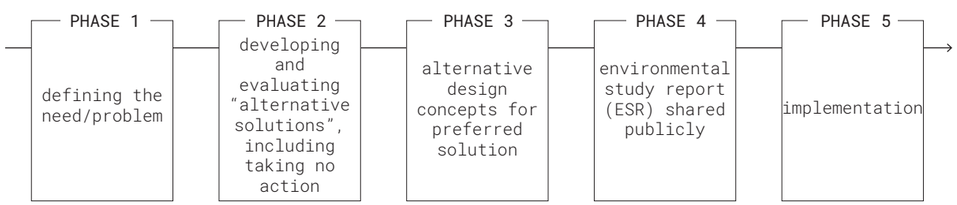


Fig. 3.1.1 The five general phases of Municipal Class Environmental Assessment. *Made by author.*

[1] A. John Sinclair et al., "Conceptualizing Learning for Sustainability through Environmental Assessment: Critical Reflections on 15 Years of Research," *Environmental Impact Assessment Review* 28, no. 7 (2008): 415–21.

[2] *Municipal Class EA*, 40–41.

Depending on the project's scale and complexity, it is classified into Schedule B, or C, requiring varying degrees of public consultation and environmental review.[3] As Riverside Dam was classified as a "Schedule B" project, that will be the focus of the discussion throughout the remainder of this chapter. The required "Phases" for a "Schedule B" project are then:

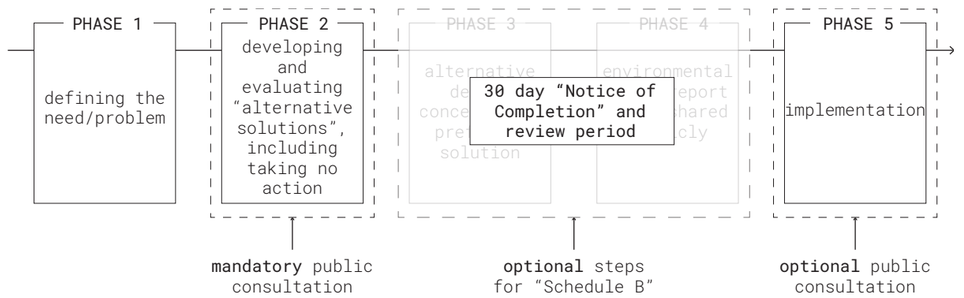


Fig. 3.1.2 The phases required for "Schedule B" projects. *Made by author.*

For such projects, public engagement is mandatory, and the Municipal Class EA emphasizes that what it lays out is a minimum requirement. There are two mandatory "points of contact" for consultation (including Indigenous communities): the first is by "Phase 2" of the planning process, after "the proponent" has identified and evaluated alternative solutions for a problem. Community members and stakeholders are consulted to assist in the selection of a "preferred solution".[4] The second "point of contact" is at the end of Phase 2, when providing "Notice of Completion" to Indigenous groups, community members, and stakeholders. This indicates a comment period of 30 calendar days. Any other community engagement is optional.[5]

Public consultation within Ontario's Environmental Assessment (EA) framework, has been a defining feature since the province enacted the *Environmental Assessment Act* (EAA) in the early 1970's as a response to widespread environmental concern across North America.[6] The legislation was initially celebrated for establishing a "traceable, rational and iterative" planning process that required "proponents" to consider reasonable alternatives, assess their environmental effects, and demonstrate that their preferred option was environmentally necessary.[7]

[3] *Municipal Class EA*, 39.

[4] *Municipal Class EA*, 76.

[5] *Municipal Class EA*, 76.

[6] *Annual Report 2007-2008* (ECO, 2008), 29.

[7] Richard D Lindgren and Burgandy Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," *Journal of Environmental Law and Practice* (Toronto) 21 (2010): 280.

Early environmental assessments were self-assessments conducted by federal departments on their own projects, with little formal public involvement outside of voluntary feedback. However, the establishment of the Federal Environmental Assessment and Review Process (FEARP) in 1973 marked a pivotal shift, formalizing assessment procedures and broadening their application to private projects with federal involvement, thereby opening the door to more meaningful public participation.[8]

By the late 1970's and early 1980's, public consultation had become a central feature of environmental assessments in Canada. In Parliament, Environmental Minister Jack Davis emphasized that "public disclosure is important… Public participation is also vital", signaling an institutional commitment to open review processes and community involvement in decision-making.[9] The Mackenzie Valley Pipeline Inquiry, led by Justice Thomas Berger, demonstrated how informal hearings in northern communities and a subsequent ten-year moratorium recommendation could elevate community voices and reshape environmental decision-making at the national level.[10]

This period saw the public acting as a "de facto watchdog", making it increasingly difficult to advance environmentally sensitive projects without a public review.[11] Federally, the Federal Environmental Assessment Review Office (FEARO) coordinated interdepartmental screening and organized public participation in independent review panels reviews.[12] Environmental Impact Statements (EIS) were made available for public and agency comments, and review panels issued formal recommendations to decision-makers.[13]

At the same time, several provinces formalized their assessment processes, further embedding participation. Quebec's 1980's regulations listed project classes subject to environmental assessment, while Ontario's Environmental Assessment Act and its "Class EA" system established structured screening and consultation mechanisms.[14] Together, these measures laid the institutional groundwork for the later federal legislation that would formalize public engagement requirements across Canada.

[8] Impact Assessment Agency of Canada, "Milestones in the History of Assessments," January 27, 2023,https://www.canada.ca/en/impact-assessment-agency/corporate/mandate/milestones-history-assessments.html.

[9] W. J. Couch et al., "Environmental Impact Assessment in Canada," in Environmental Impact Assessment (Springer Netherlands, 1983), 46.

[10] Couch et al., "Environmental Impact Assessment in Canada," 46.

[11] Couch et al., "Environmental Impact Assessment in Canada," 46.

[12] *The Federal Environmental Assessment and Review Process* (Federal Environmental Assessment Review Office, n.d.), 11.

[13] Couch et al., "Environmental Impact Assessment in Canada," 47.

[14] Couch et al., "Environmental Impact Assessment in Canada," 47.

Over the following decades, however, Lindgren and Dunn note that the promise of this early vision has steadily eroded through successive waves of reform, regulatory exemptions, and administrative streamlining that have prioritized efficiency over inclusivity.[15]

In the 1990's, Ontario's EA system had shifted toward what critics described as "EA in name only", a project approval mechanism dominated by political discretion and narrowly technical analyses.[16] The 1996 Bill 76 amendments introduced scoped assessments that allowed key planning questions such as the "need" for a project or its "alternatives" to be excluded from consideration altogether, fundamentally altering the public's capacity influence outcomes.[17] While consultation became a formal requirement under these amendments, its substance often remained superficial, with "proponents" treating engagement as a procedural check-box.[18]

Ontario's Class Environmental Assessment framework, under which Riverside Dam was evaluated, further exemplifies these limitations. Established to streamline routine or low-risk projects, Class EAs effectively "pre-approve" entire categories of municipal infrastructure undertakings. This allows them to proceed without Ministerial review so long as "proponents" adhere to prescribed documentation and notification steps.[19] Although the system includes a mechanism for the public to request a "Part II order" (commonly called a "bump-up", research shows that these requests are "rarely made or granted", leaving very little recourse for dissenting communities.[20]

Environmental Commissioners and advisory panels have already criticized these shortcomings. In the *Getting to Know Annual Report 2007-2008* put out by the Environmental Commissioner of Ontario, it states:

> *Environmental assessment (EA) is one of those grey, blurry areas of modern bureaucratic practice: often misunderstood, sometimes misused, but mostly ignored by the average citizen. Yet environmental assessment has a crucial role to play in our lives; it should be society's pre-eminent tool to carry out farsighted planning for public infrastructure in the name of public good. Unfortunately, Ontario has been long burdened with an EA system where the hard questions are not being asked, and the most important decisions aren't being made – or at least are not being made in a transparent, integrated way.*[21]

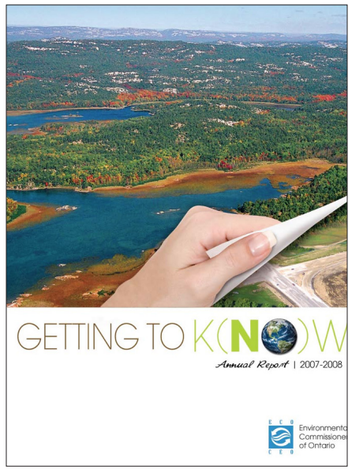


Fig. 3.1.3 Cover of the *Getting to Know Annual Report 2007-2008*, Environmental Commission of Ontario.

[15] *Annual Report 2007-2008*, 281–82.

[16] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 287–88.

[17] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 286, 294–95.

[18] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 298.

[19] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 284–85.

[20] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 296.

[21] *Annual Report 2007-2008*, 28.

Public consultation, though legally mandated, often remains inaccessible and resource-intensive for local participants. As Lindgren and Dunn summarize, participants including First Nations, aboriginal communities, and stakeholders, have long complained that consultation periods are too short, documents too technical or difficult to access, and engagement efforts "too superficial and with no real purpose other than to enable a proponent to report that it has fulfilled its statutory obligations to consult".[22] Such tokenistic approaches disproportionately disadvantage marginalized and under-resourced groups.

The persistence of these procedural and structural flaws has prompted repeated calls for reform. Ontario's EA Advisory Panel (2005) recommended clearer consultation standards, participant funding mechanisms, and improved integration of EA with land-use planning. However, most of these proposals remain unimplemented, leaving Ontario's municipalities operating within a framework that prioritizes expediency and risk management over deliberation and adaptive learning.[23]

3.1.2 Riverside Dam Environmental Assessment Process

The critiques surrounding the lack of adequate consultation can be seen at Riverside Dam. The amount of public consultation that is a minimum requirement seems disproportionate to the social complexity of the projects that fall under the scope of "Schedule B". In the case of Riverside Dam – a structure that shaped Preston's urban form and collective identity for over two centuries – the Class EA process requires only minimal engagement with the public. Proof of the shortcomings of this is the fact that the process at Riverside far extended the minimum requirements of the Class EA. The following section will break down the timeline of events at Riverside as well as public responses.

The City of Cambridge initiated a study on the dam out of safety concern in 2008.[24] When said structural assessments by Sanchez Engineering revealed significant safety and ecological risks, the City Council faced a polarizing choice of what to do with the failing structure, thus initiating a comprehensive Class Environmental Assessment (EA). Four "Public Information Centers" (PICs)" were held where invited stakeholder groups were invited to voice their opinions. The city's stakeholder engagement program included stakeholder specific workshops to provide direct input from advocacy groups and individuals into the alternative assessment process.[25] Alternatives including eight different "long-list screening" options spanning from removal to replacement were evaluated.[26]

The "PICs" were structured with drop-in hours, comment sheets, and brief presentations, typical mechanisms under the Municipal Class Environmental Assessment (MCEA) framework. While seemingly 'public', these formats position city staff and consultants as expert knowledge holders delivering information rather than as facilitators of co-creative dialogue, again fitting into the category of "tokenism" under Arnstein's (1969) "Ladder of Citizen Participation", and aligning with earlier critique of the Class EA.[27] Despite multiple opportunities for input, the process gave the impression of managing participation rather than adapting to it. This stagnancy in design is the opposite of Forester' (1999) view that true public engagement involves negotiation through revision; continuous dialogue and responsiveness to community concerns. Instead, the decision-making language, and crucially, the project visuals, remained largely fixed and closed.[28]

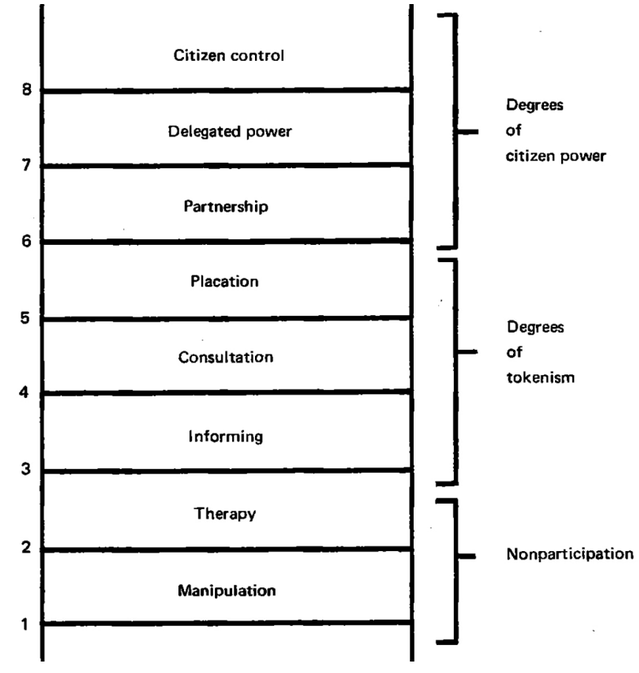


Fig. 3.1.4 "Ladder of Citizen Participation" Shelley Arnstein Arnstein, 1969.

[22] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 298.

[23] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 299–300.

[24] *McDonald, Riverside Dam Class EA*, 18.

[25] *McDonald, Riverside Dam Class EA*, 8.

[26] *McDonald, Riverside Dam Class EA*, 21.

[27] Sherry R. Arnstein, "A Ladder Of Citizen Participation," *Journal of the American Institute of Planners* 35, no. 4 (1969): 131.

[28] Pitch Pongsawat, "Book Review: The Deliberative Practitioner: Encouraging Participatory Planning Processes by John Forester," *Berkely Planning Journal* 15, no. 1 (2001): 90–92.

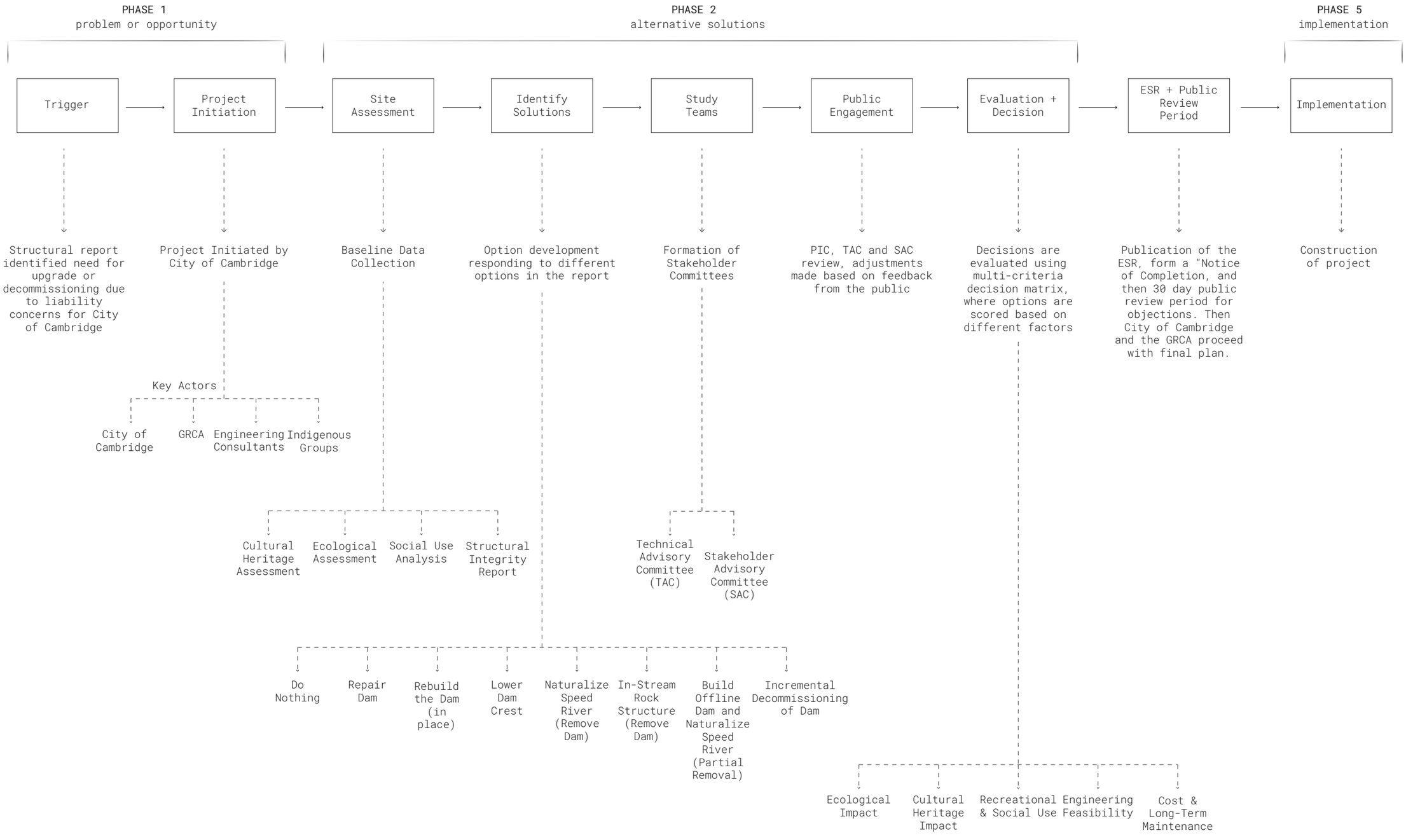


Fig. 3.1.5 Sequence of events for Riverside Dam Class EA in context with Municipal Class EA guidelines. *Made by author.*

From the outset, discussions of dam removals provoked intense responses from residents. Posts from a Facebook group titled "Friends of Riverside Park Dam and Mill Pond" created in 2012, have some large concerns over the erasure of Preston's heritage that people already feel has been diluted by the amalgamation of Preston into the City of Cambridge.[29] The general sentiment is that Preston "becoming a part of Cambridge" is at the expense of their cultural heritage.

> *"Preston Towne Centre is very passionate about their stand on the body of water being retained. The EA report indicated the Dam can't be repaired… therefore Preston Towne Centre wants the Dam to be replaced. This Dam has been the entrance to our community and business area for over 150 years." Preston Towne Centre Business Improvement Area (BIA) (PIC #4, p37)*[30]

These anxieties were only reinforced by the demolition of the Preston Springs Hotel in 2021, a landmark whose loss is still deeply felt in the community.[31]

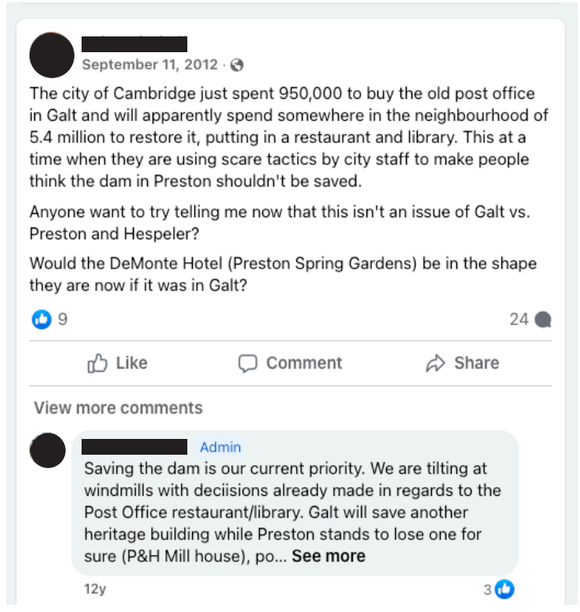


Fig. 3.1.6 Comment from "Friends of Riverside Dam and Millpond" Facebook Group critiquing the City for the loss of two heritage structures.



Fig. 3.1.7 Preston Springs Hotel Shortly Before Demolition, Cambridge Ontario. *Photo by David Bebee/Waterloo Regional Record*



Fig. 3.1.8 Preston Springs Hotel During Demolition, Cambridge, Ontario. *Photo: Metroland File Photo*

[29] "(20+) Friends of Riverside Park Dam and Mill Pond | Facebook," accessed October 26, 2025, https://www.facebook.com/groups/405127872839545/.

[30] City of Cambridge, "Public Information Centre No.4," 2017, 37.

[31] Joe Pavia, "Court Injunction Comes Too Late to Save Preston Springs Hotel," *CBC News*, December 31, 2020, https://www.cbc.ca/news/canada/kitchener-waterloo/cambridge-preston-springs-hotel-architecture-1.5858874.

Table ES-7.1 Alternative Evaluation

Environment	Evaluation Criteria	Weighting	Measure	Alternative				
				A: Do Nothing	C: Rebuild Riverside Dam	E: Naturalize Speed River	F: Construct In-Stream Rock Structures	G: Build Offline Dam & Naturalize Speed River
Functional (Physical)	Flooding	Low	Flood depth	No change	No change	Flooding is minimized	Flooding is reduced, some impact remains	Flooding is minimized
	Fluvial Stability / Sediment transport	Medium	Presence of barrier	No change	No change	Natural channel regime reinstated	Improved sediment transport	Natural channel regime reinstated
Natural	Fish Passage	High	Presence and nature of barrier	No change	Assumes fish ladder incorporated	Barrier eliminated	Barrier eliminated	Barrier eliminated
	Aquatic Habitat / Health	High	Unimpaired vs. impaired benthic community	No change	No change	Riverine conditions restored	Riverine conditions restored	Riverine conditions restored
	Water Quality and Temperature	Medium	Presence and extent of headpond	No change	No change	Headpond eliminated	Although minor backwater areas will exist, conditions will be improved relative to a dam	Offline headpond is considered an improvement relative to existing online headpond
	Natural Heritage	Low	Extent of riparian habitat	No change	Some opportunity for riparian rehabilitation	Significant opportunity for riparian rehabilitation	Some opportunity for riparian rehabilitation	Some opportunity for riparian rehabilitation
Social	Cultural Heritage	Very High	Extent of impact to built heritage	Dam will continue to deteriorate and ultimately be lost	Dam will be reconstructed to historic condition	Dam would no longer function. Elements of original structure would be retained / restored	Dam would no longer function. Elements of original structure would be retained / restored	New dam would have historical sympathetic design, but alternate dimensions
	Boating	Medium	Type of boating experience	No change	No change	Boating experience changes from flat water to riverine. Considered less desirable by majority of park users. Navigation barrier eliminated	Provides neither a consistent flat water nor riverine boating experience. Rocky ramps may continue to be barriers	Navigation barrier eliminated. Boating experience changes from flat water to riverine
	Fishing	Medium	Type of fishery	No change	No change	Changes in prevalent species to riverine community, considered negative by majority of park users and local business	Create mix of riverine and pond fish communities, considered negative by majority of park users and local business	Create mix of riverine and pond fish communities, considered negative by majority of park users and local business
	Park Vistas	Very High	The headpond vista is generally preferred by the public	No change	No change	Headpond eliminated	Ponded areas behind the rocky ramps would persist, however the vistas would change significantly	Headpond area reduced significantly
	Public Safety	High	Considers condition and presence of dam as well as water depth and velocity	Dam will continue to deteriorate and risk of failure increases	Dam would meet Provincial safety criteria, however its existence represents a hazard	Hazards related to the dam are eliminated	Steep slopes associated with rocky ramps will increase velocities locally	Dam would meet Provincial safety criteria, however its existence represents a hazard
Economic	Life Cycle Cost	Medium	Estimated Cost ($)	$4.9M +/- No capital cost. Dam would ultimately fail and resultant sediment release would require downstream clean-up	$8.5M +/- High capital cost. Perpetual Inspection, operation and maintenance required, including future sediment removal. Dam would need to be replaced at the end of design life (assumed 100 years)	$5.1M +/- High capital cost. Minor maintenance associated with bank erosion expected after implementation	$7.4M +/- High capital cost. Minor maintenance associated storm damage to rocky ramps	$8.2M +/- High capital cost. Perpetual Inspection, operation and maintenance required, including future sediment removal. Dam would need to be replaced at end of design life (assumed 100 years)
	Liability	Medium	Potential for damage to persons or property	High risk of failure and associated damages if dam stability not addressed	Low risk of failure, however presence of a dam introduces some liability	Liability minimized	Higher velocities and ponding considered to introduce marginally higher risk relative to Alternative E	Low risk of failure, however presence of a dam introduces some liability
Summary				**Screened.** Does not address structural / safety issues of the existing dam.	**Short-listed.** Preferred from a Social perspective, not preferred from Functional, Natural, or Economic perspective.	**Short-listed.** Preferred from a Functional perspective. Natural and economic perspective. Not preferred from a Social perspective.	**Short-listed.** Preferred from a Functional, Natural, and Economic perspective. Not preferred from a Social perspective.	**Screened.** Modifications to the dam geometry and reductions in headpond area, change in park vistas, and capital cost are less preferred.
Legend				Positive	Positive Neutral	Neutral	Neutral-Negative	Negative

Fig. 3.1.9 Alternative Evaluation Matrix from Riverside Class EA. The categories are broken down into four environments and given a rating from positive to negative. *Table from Riverside Dam Class EA.*

As the concerns were being raised by community members about heritage loss, the environmental and social complexities of the site brought a diverse set of stakeholders to the conversation. Some community groups and environmental organizations - such as Ontario Rivers Alliance, Six Nations of the Grand River, and Missisaugas of the New Credit First Nation, and local community members - advocated strongly for removing the dam and restoring a free-flowing river.[32]

In addition to "PICs", Indigenous consultation was undertaken as part of the Municipal Class EA process, involving three identified rights-holding communities: the Mississaugas of the New Credit First Nation (MNCFN), Six Nations of the Grand River (SNGR), and the Haudenosaunee Development Institute (HDI). Initial contact with MNCFN began in 2012, followed by a formal in-person meeting in September 2017. During this meeting, MNCFN affirmed that the Riverside Dam site lies within their traditional territory and outlined clear expectations for consultation, emphasizing that "notices are not consultation." They called for direct participation through Field Liaison Representatives in archaeological and environmental fieldwork, expressed concerns over cumulative impacts, and identified the importance of early involvement in planning and monitoring processes.[33]

Following the evaluation of the "preferred alternatives" in the "PIC's", the City of Cambridge's consultant initially determined that the "naturalize the river" option was slightly preferred over the "rebuild the dam" option based on the multi-criteria assessment.[34] However, after significant public pressure and Council's direction on March 6, 2018, the evaluation framework itself was altered to reflect revised political priorities. Specifically, the weighting for the "Life Cycle Cost" and "Liability" criteria was lowered from Medium to Low, while the "Flooding" criterion already weighted low remained unchanged.[35] This recalibration effectively neutralized the advantage held by the naturalization alternative and resulted in a "virtual tie" between the two options, after which the City selected "rebuild" as the Preliminary Preferred Alternative. This shift in weighting demonstrates how ostensibly technical evaluation frameworks can be reshaped by political decision-making, reframing what counts as "preferred" in the formal record of environmental assessments.

Further engagement with the MNCFN took place in 2018 after Cambridge

[32] Linda Heron, "Update: Riverside Dam on the Speed River," Ontario Rivers Alliance, September 8, 2020, https://www.ontarioriversalliance.ca/update-riverside-dam-on-the-speed-river/; *Riverside Dam Class EA*, A-42, A-48.

[33] *McDonald, Riverside Dam Class EA*, A-41-A-43.

[34] *McDonald, Riverside Dam Class EA*, A-44-A-45.

[35] *McDonald, Riverside Dam Class EA*, A-43-A-49.

LETTERS TO THE EDITOR

Opinion | Dam decision embarrassing

RE: Costs be damned: Riverside Park dam saved — March 8

March 28, 2018

RE: Costs be damned: Riverside Park dam saved — March 8

I really didn't think it would get this far, but after reviewing all of the available information, what logical person would?

When the removal of an archaic piece of infrastructure is supported by countless hours of biological study, numerous accounts from well-informed and good-natured stakeholder groups, and hundreds of thousands of dollars of unbiased environmental reporting, the decision should be easy.

Welcome to Cambridge, where council members abandon logic and ignore all recommendations in favour of a small group of passionate and vocal Prestonians.

As an aquatic biologist, an avid fisherman and environmentalist, and as a fellow taxpaying Preston resident — born and raised — the decision to rebuild the dam is not only mind-boggling, it's embarrassing.

I encourage those who fear change and cling to this piece of Preston heritage to look at other success stories featuring dam removals, including projects like the Crooks Hollow dam removal and the restoration of Spencer Creek. Perhaps this will lead to the realization that a healthy river is the best heritage we can leave for future generations.

Fig. 3.1.10 Opinion piece in response to "Cost be damned" article from Waterloo Region. *Headline from Waterloo Region Record.*

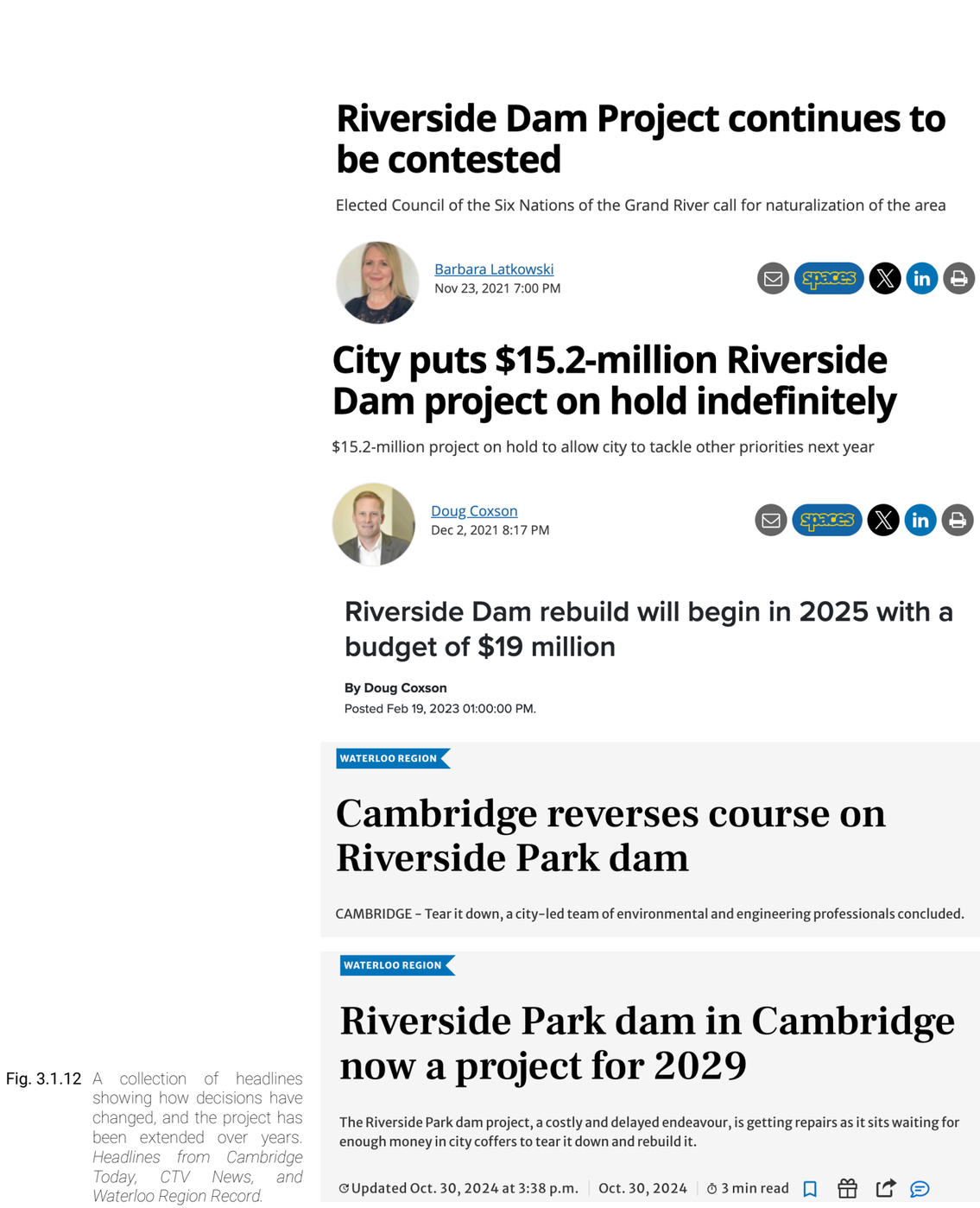
WATERLOO REGION

Six Nations representatives object to Riverside Dam reconstruction

CAMBRIDGE — Staff working on behalf of the Elected Council of the Six Nations of the Grand River want to see the brakes put on the Riverside Dam reconstruction.

Nov. 5, 2021 | 3 min read

Fig. 3.1.11 Headline indicating Six Nations of the Grand Opposition to City's decision to rebuild the dam. *Headline from Waterloo Region Record.*



Riverside Dam Project continues to be contested

Elected Council of the Six Nations of the Grand River call for naturalization of the area

Barbara Latkowski
Nov 23, 2021 7:00 PM

City puts $15.2-million Riverside Dam project on hold indefinitely

$15.2-million project on hold to allow city to tackle other priorities next year

Doug Coxson
Dec 2, 2021 8:17 PM

Riverside Dam rebuild will begin in 2025 with a budget of $19 million

By Doug Coxson
Posted Feb 19, 2023 01:00:00 PM.

WATERLOO REGION

Cambridge reverses course on Riverside Park dam

CAMBRIDGE – Tear it down, a city-led team of environmental and engineering professionals concluded.

WATERLOO REGION

Riverside Park dam in Cambridge now a project for 2029

The Riverside Park dam project, a costly and delayed endeavour, is getting repairs as it sits waiting for enough money in city coffers to tear it down and rebuild it.

Updated Oct. 30, 2024 at 3:38 p.m. | Oct. 30, 2024 | 3 min read

Fig. 3.1.12 A collection of headlines showing how decisions have changed, and the project has been extended over years. *Headlines from Cambridge Today, CTV News, and Waterloo Region Record.*

City Council voted to proceed with the rebuild option. At a meeting with SNGR on May 31, 2018, representatives stated that they understood Council's rationale but maintained their preference for naturalization over dam reconstruction, aligning with their broader ecological stewardship priorities. They also expressed interest in being involved in archaeological assessments and noted that the dam's location on Crown land would trigger the Crown's duty to consult under the *Public Lands Act*.[36] A parallel meeting with MNCFN on June 13, 2018 reinforced their desire to participate through their Water Committee in design, permitting, construction, and monitoring processes, with a focus on habitat and conservation concerns.[37] HDI was also engaged as part of the consultation process.[38] Despite there being clear evidence of their consultation through the mandatory "points of contact" as described in the Class EA framework, there is no evidence of participation in the actual design conversation. Based on the way it is documented in the Riverside Dam EA, it seems that consultation was only done by giving notice of changes, directly opposing what was requested by the MNCFN.[39]

The debate over the Dam's fate continued to unfold over more than a decade, shaped by technical assessments, shifting priorities, stakeholder engagement, and community activism. The complexity of the decision-making process cannot be overstated. Preceding the Council's decision to rebuild the dam, the ORA submitted a Part II Order request under the Municipal Class EA process. Their submission argued that the naturalization alternative had been identified as preferred in earlier evaluations, and that the subsequent reversal was influenced by political considerations rather than environmental or technical merit. ORA expressed concerns over the ecological consequences of dam reconstruction, the inadequacy of the consultation process, and the failure to prioritize climate adaptation goals.[40] In 2019, the Ministry of the Environment, Conservation and Parks (MECP) reviewed the request but denied issuing a Part II Order, allowing the project to proceed under the original Class EA, aligning with the critique mentioned earlier of the Part II orders rarely getting approved.[41] The Ministry's letter stated that the City had "fulfilled the requirements of the Class EA process" and that no potential for negative impacts had been identified that would warrant elevating the project to an individual EA.[42] This outcome effectively upheld the City's decision and illustrates

[36] *McDonald, Riverside Dam Class EA*, A-46.
[37] *McDonald, Riverside Dam Class EA*, A-49.
[38] *McDonald, Riverside Dam Class EA*, A-50.
[39] *McDonald, Riverside Dam Class EA*, A-41-A-50.
[40] Linda Heron, "Class Environmental Assessment - Riverside Dam Part II Order Request," personal communication, 2018.
[41] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 296.
[42] Rod Phillips, "MECP to ORA," personal communication, 2019.

how provincial oversight mechanisms often defer to municipal framing of environmental projects, even when contested by watershed-scale environmental advocates.

To clarify the intricate progression of events that brought the dam project to its current state, the following timeline maps the key milestones from the initial infrastructure failure warnings and the public consultations, through council presentations, heritage studies, stakeholder workshops, and the shifting "preferred alternatives". Tracking these turning points highlights the intersection of social, political and cultural pressures.

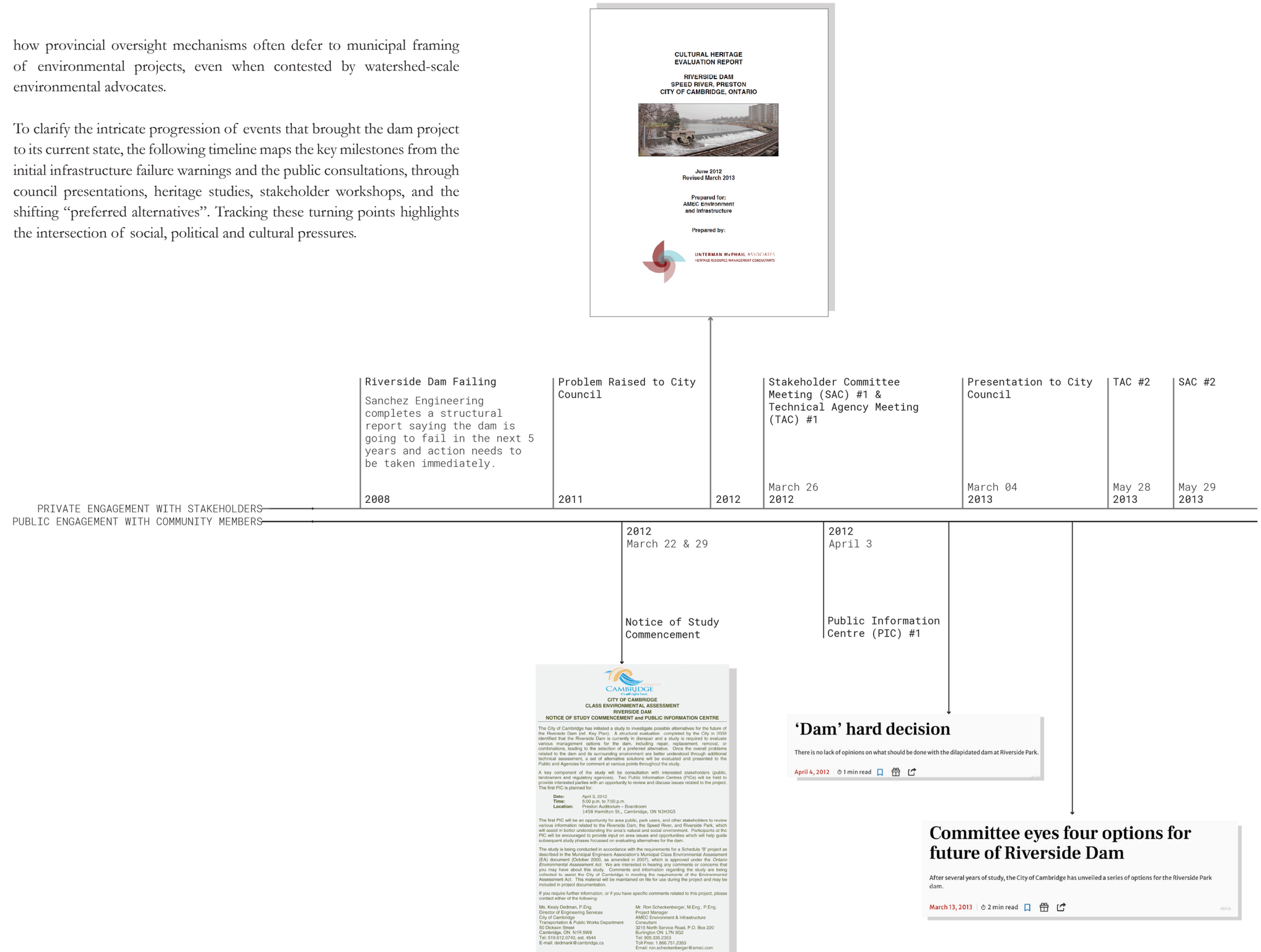


Fig. 3.1.13 Timeline of Riverside Dam Class EA process. *Made by author.*

Riverside Dam Class Enironmental Assessment

Organizations Invited to the 2017 Stakeholder Workshops

Organization
Waterloo Wellington Canoe Club
Ancient Mariners Canoe Club
Preston Heights Community Group
Preston Town Centre Business Improvement Association (BIA)
K-W Cambridge Bassmasters
P & H Milling
Save the Dam
Cambridge Municipal Heritage Advisory Committee (MHAC)
Cambridge Environmental Advisory Committee (CEAC)
Region of Waterloo
Grand River Conservation Association (GRCA)
Ministry of Natural Resources and Forestry (MNRF)
Amec Foster Wheeler (Consultant)
Mississauga's of New Credit First Nation
Six Nations
Haudenosaunee Development Institute (HDI)
Regional Councillor
Mayor of Cambridge
City of Cambridge Councillor Ward 1
City of Cambridge Councillor Ward 3
City of Cambridge, Community Services Department
City of Cambridge, Development & Infrastructure Department

Presentation to City Council	Meeting with Ministry of Natural Resources and Forestry (MNRF)	TAC #3	SAC #3	SAC #4	TAC #4	Meeting with Six Nations of the Grand River (SNGR)	Meeting with Mississaugus of the New Credit First Nation (MNCFN)	SAC #5	TAC #5
October 15 2013	February 26 2014	May 06 2016	June 09 2016	May 24 2017	June 27 2017	September 18 2017	September 28 2017	November 09 2017	November 14 2017

2013 June 6 & 13	2013 June 18	2013 June 18	2016 June 16, 21 & 23	2016 June 27		2017 November 16 & 23
Notice of PIC #2 Published in the Cambridge Times and Mailed to Affected Public	The four shortlisted options were presented in “more detail” PIC #2	Meeting with “Save the Dam” groud and Ministry of Natural Resources and Forestry (MNRF)	Notice of PIC #3 Published in the Cambridge Times and Mailed to Affected Public	PIC #3		PIC #4

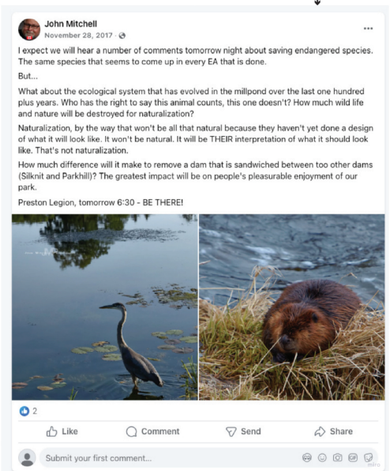


Fig. 3.1.13 (cont.) Timeline of Riverside Dam Class EA process. *Made by author.*

General Committee Meeting
Council deferred the proposed recommendation (remove the dam) and asked City to report bacl on how to proceed with rebuilding.

March 06
2018

Staff Report to City Council
City staff reported back outlining an approach to revisit "preliminary preferred alternative". This included reconsidering the weighting of criteria in the matrix. Specifically, this meant changing the significance of *economic, liability, and flooding* criteria.

April 17
2018

Staff Engagement
Staff re-engaged active members of the Technical and Stakeholder Communities. This included correspondence and one-on-one meetings.

April 17
2018

MNRF Correspondence
MNRF re-affirmed its support for the 'naturalize' alternative.

May 17
2018

GRCA Correspondence
Grand River Conservation Authority correspondence reiterated their support for the 'naturalize' alternative.

June 13
2018

Indigenous groups Correspondence
Described as "furthur dialogue" held with both SNGR and MNCFN to provide update on the Study

No clear date.
2018

2018
March 07



Cambridge reverses course on Riverside Park dam

CAMBRIDGE – Tear it down, a city-led team of environmental and engineering professionals concluded.

2018
April 18

ORA makes first contact with City Staff regarding their support for removing the dam.

Ontario River Alliance (ORA) First Correspondence

2018

A number of written commentaries were provided to City staff generally reflecting a split opinion amongst Rebuild vs. Naturalize option.

Other Written Correspondence

2018
June 26

ORA presented their case for removing the dam to City Staff

ORA Presentation

2018
July 27



CITY OF CAMBRIDGE
CLASS ENVIRONMENTAL ASSESSMENT
RIVERSIDE DAM
NOTICE OF STUDY COMPLETION

The Study
The City of Cambridge has completed a Municipal Class Environmental Assessment (Class EA) study to investigate possible alternatives for the future of the Riverside Dam. Significant feedback was received from the public regarding the evaluation of alternatives and the City elected to consider additional alternatives, revisit the evaluation and undertake additional consultation with key stakeholders, regulatory agencies and Indigenous Communities. The outcome of the Class EA study is that the Preferred Solution continues to be Rebuild the Riverside Dam.

The Process
The Study was carried out in accordance with the requirements for a Schedule 'B' project as described in the Municipal Engineers Association's Municipal Class Environmental Assessment (GA document (October 2000, as amended to 2015), which is approved under the *Ontario Environmental Assessment Act*. A key component of the study was consultation with interested stakeholders (public, landowners, regulatory agencies, and Indigenous Communities). Four Public Information Centres (PICs) were held between 2012 and 2017.

Public Review Period
An Environmental Study Report (ESR) has been prepared, which documents, the planning and design process, how public, regulatory agency and Indigenous Community input was addressed, the evaluation and selection of the preferred solution, along with associated mitigation measures to address impacts, and next steps towards project implementation. City of Cambridge Council approved the posting of the Notice of Study Completion on June 26, 2018.

The filing of this ESR completes the planning and conceptual design stage of the project. By way of this notice, the ESR is placed on record for a 45-day public review period starting July 27, 2018 and ending on September 28, 2018. The complete ESR will be posted on the City of Cambridge's website at www.cambridge.ca/RiversideDam. The complete ESR will be posted on the City of Cambridge's website at www.cambridge.ca/RiversideDam, and hardcopies will be available for review during regular business hours at the following locations:

Cambridge City Hall
50 Dickson Street
Cambridge, Ontario

Idea Exchange - Preston
436 King Street East
Cambridge, Ontario

Anyone with an interest in this Study is encouraged to review the ESR and provide comments to the City of Cambridge during the designated review period. If concerns arise during the 45-day Review Period that cannot be resolved through discussions with the City of Cambridge, a person may request that the Minister of the Ministry of the Environment, Conservation and Parks (MECP) make an order for a Part II Order (Section 16 of the Ontario Environmental Assessment Act) to Part II order). This request must be received by the Minister in writing within the above noted 45-day time line at the address listed below, and copied to the Director of the Environmental Assessments and Permissions Branch of the MECP, and Scott MacDonald, the City of Cambridge Project Manager. If no request is received, subject to comments, and the receipt of necessary approvals, the City intends to proceed with the project implementation phase.

All requests need to be made in writing to:

Minister
Ministry of the Environment, Conservation and Parks
Floor 11, 77 Wellesley Street West
Toronto ON M7A 2T5
Fax: 416-314-8452
MOECCpermissions@ontario.ca

Copy to:
Director,
Environmental Assessments and Permissions Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Ave West, 1st Floor
Toronto ON M4V 1P5

Contacts
If you have questions or comments related to this Study, please contact:

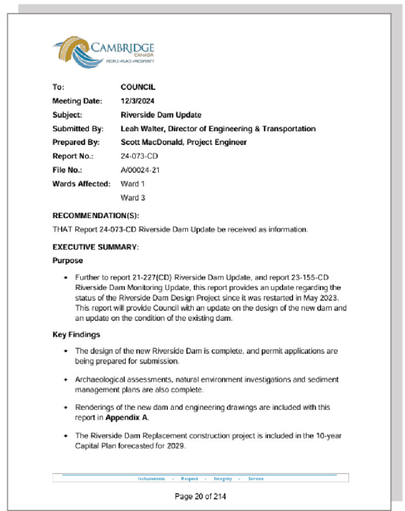
Scott MacDonald, P.Eng.
Project Engineer
City of Cambridge
Tel: 519-621-2340, ext. 4679
E-mail: macdonaldscott@cambridge.ca

Ms. Ros Schockenberger, M.Eng., P.Eng.
Project Manager
Wood, Environment & Infrastructure Solutions
Tel: 905.335.2353
Email: ros.schockenberger@woodplc.com

Information related to the study and consultation process is posted on the City of Cambridge's website, www.cambridge.ca/RiversideDam.

* Information collected will be used in accordance with the *Freedom of Information and Protection of Privacy Act*. With the exception of personal information, all comments will become part of the public record.

Fig. 3.1.13 (cont.) Timeline of Riverside Dam Class EA process. *Made by author.*



CAMBRIDGE

To: COUNCIL
Meeting Date: 12/3/2024
Subject: Riverside Dam Update
Submitted By: Leah Walter, Director of Engineering & Transportation
Prepared By: Scott MacDonald, Project Engineer
Report No.: 24-073-CD
File No.: AV00024-21
Wards Affected: Ward 1
Ward 3

RECOMMENDATION(S):

THAT Report 24-073-CD Riverside Dam Update be received as information.

EXECUTIVE SUMMARY:

Purpose

- Further to report 21-227(CD) Riverside Dam Update, and report 23-155-CD Riverside Dam Monitoring Update, this report provides an update regarding the status of the Riverside Dam Design Project since it was restarted in May 2023. This report will provide Council with an update on the design of the new dam and an update on the condition of the existing dam.

Key Findings

- The design of the new Riverside Dam is complete, and permit applications are being prepared for submission.
- Archaeological assessments, natural environment investigations and sediment management plans are also complete.
- Renderings of the new dam and engineering drawings are included with this report in **Appendix A**.
- The Riverside Dam Replacement construction project is included in the 10-year Capital Plan forecasted for 2029.

Inclusiveness ◦ Respect ◦ Integrity ◦ Service

Page 20 of 214

Project on Hold
Project put temporarily on hold due to pandemic.

March
2020

Project off Hold
Project taken off hold and preliminary design recommenced.

September
2020

New Structural Analysis of Dam
New strucural analysis showing dam will need $425,000 worth of repairs.

August
2024

2024

Design Drawings Complete
Detailed design drawings complete and posted.

2025

Construction
The removal and rebuild of the dam is budgeted for 2029.

2029

2018
September 28

In reponse to the 'Notice of Completion', ORA reached out to Ministry of Environment, Conservation, and Parks (MECP) to request Part II order of the Municipal Class EA.

ORA Request for Part II

**note* one of five (5) part II order requests received by MECP.*

2018
October 01

MECP response to ORA denying request for Part II order.

MECP Response

2021
May 17 - 31

30% design development completion presented to public virtually.

PIC #5

2021



Six Nations representatives object to Riverside Dam reconstruction

CAMBRIDGE — Staff working on behalf of the Elected Council of the Six Nations of the Grand River want to see the brakes put on the Riverside Dam reconstruction.

Nov. 5, 2021 | 3 min read

miro

Fig. 3.1.13 (cont.) Timeline of Riverside Dam Class EA process. *Made by author.*

These events raise pressing questions about how "preferred alternatives" are selected in public infrastructure projects, and whether these processes reflect genuine consultation or reproduce existing power structures. The Riverside Dam saga exposes the difficulties in balancing cultural heritage with environmental futures, and the tensions inherent in planning on Indigenous lands without deep, sustained engagement. When City Council can ultimately override stakeholder input, community input and their technical analysis, stakeholder trust is eroded, and the process itself becomes deeply political.

It also exposes perhaps one of the largest limitations under the Class EA "Schedule B" framework: no requirement for iteration throughout the consultation and engagement phases. The same set of fixed-perspective visuals repeated without any adaptation were presented at public meetings and council sessions from 2016 through 2021.[43] This lack of evolution in visual materials, despite ongoing community input, undermines the credibility of the engagement process and signals a disconnect between invited feedback and actual influence on project design, underscoring the idea that the public engagement is merely a formality to check a legal box.

The visual stagnancy represents what Forester (1999) identifies as a failure of democratic design: true participatory processes rely not just on the circulation of information, but ongoing negotiation through revision.[44] When the design outputs, in this case the key renderings and plans, remain unchanged, it becomes clear that public engagement may be more procedural than substantive, valuing appearances over adaptation. As the earlier mentioned "Ladder of Citizen Participation" suggests, this is characteristic of tokenistic consultation, where public voices are heard but rarely have impact on decisions or outcomes.[45] This lack of iterative revision erodes trust and engagement, as stakeholders see no reflection of their input, leading to diminished interest and confidence in the process.[46] Such static framing maintains a narrative that shuts down uncertainty or compromises inherent in complex environmental decisions. By making ongoing risks invisible, this stagnancy facilitates a consensus around a predetermined and unchallengeable vision.

Integrated, iterative visual tools which make room for revision, dialogue, and transparent documentation of change, are crucial for building legitimacy and trust in environmental projects.[47] Without this, the repetition of fixed imagery is an example of performance of public engagement rather than a genuine, adaptive process responsive to public input.

This closed-off procedure invites broader critiques on Ontario's Municipal Class EA framework, which authors have characterized as limiting meaningful public influence by privileging pre-set alternatives and technical evaluation metrics.[48] The prioritization of quantitative evaluation and narrow option framing constrains space for hybrid or locally rooted solutions that better reflect community values.

Participatory legitimacy depends on involving citizens not merely as respondents to a closed agenda, but as active contributors shaping how problems are framed and solutions co-designed.[49] The Riverside Dam consultation, bounded by procedural constraints and static visuals, is an example of how rigid institutional structures can lessen this kind of democratic environmental governance. The absence of iterative feedback, evolving representations, or community-generated content takes away from claims of public participation, and risks alienating the public, turning restoration into a bureaucratic formality rather than a collective endeavor for environmental or social renewal.[50]

The visualizations, and the way they were communicated, align with complaints earlier summarized from Lindgren and Dunn about documents being too technical or inaccessible.[51] The standard presentation for the "PIC's", "TAC's" and "SAC's" were a slideshow deck with lots of text, technical drawings, and the occasional render, and the report made available for the 30 day comment period being four parts and hundreds of pages.

This visual stagnancy brings a critique of the actual drawings presented throughout the process. The critique is not of quality, but rather quantity. The two drawings used to describe every design option were a construction drawing of the plan (meaning it is extremely technical in nature) and a photo-realistic render for each of the shortlisted options. While both drawings have a purpose and serve it well, they need additional visuals/ drawings to provide a whole explanation of the project being undertaken to community members and stakeholders.

[43] City of Cambridge, "Public Information Centre No.4"; City of Cambridge, "Public Information Centre No.3," 2016.

[44] Pongsawat, "Book Review: The Deliberative Practitioner: Encouraging Participatory Planning Processes by John Forester," 90–92.

[45] Arnstein, "A Ladder Of Citizen Participation."

[46] Anne Shepherd and Christi Bowler, "Beyond the Requirements: Improving Public Participation in EIA," *Journal of Environmental Planning and Management* (Abingdon) 40, no. 6 (1997): 726–33,

[47] Koichi Ito et al., "Understanding Urban Perception with Visual Data: A Systematic Review," *Cities* 152 (September 2024): 10–20.

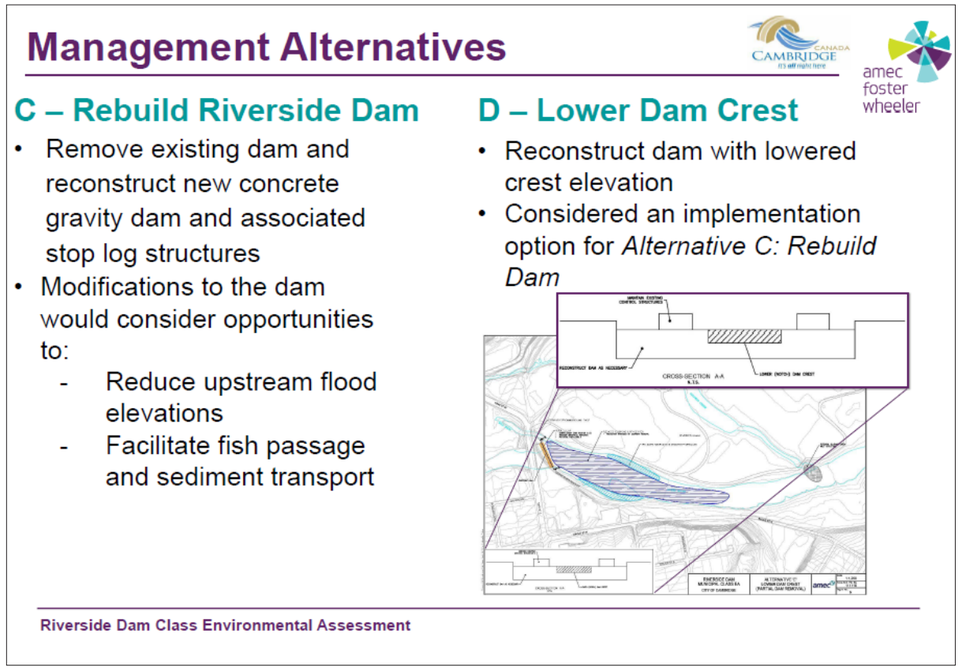
[48] Shepherd and Bowler, "Beyond the Requirements: Improving Public Participation in EIA"; Sinclair et al., "Conceptualizing Learning for Sustainability through Environmental Assessment: Critical Reflections on 15 Years of Research."

[49] Dave Renton, "Deepening Democracy: Institutional Innovations in Empowered Participatory Governance," *Capital & Class* 86, no. 86 (2005): 183.

[50] Judith E. Innes and David E. Booher, "Reframing Public Participation: Strategies for the 21st Century," *Planning Theory & Practice* 5, no. 4 (2004): 419-420,424-426,431.

[51] Lindgren and Dunn, "Environmental Assessment in Ontario: Rhetoric vs. Reality," 298.

Alternative C: Rebuild Riverside Dam





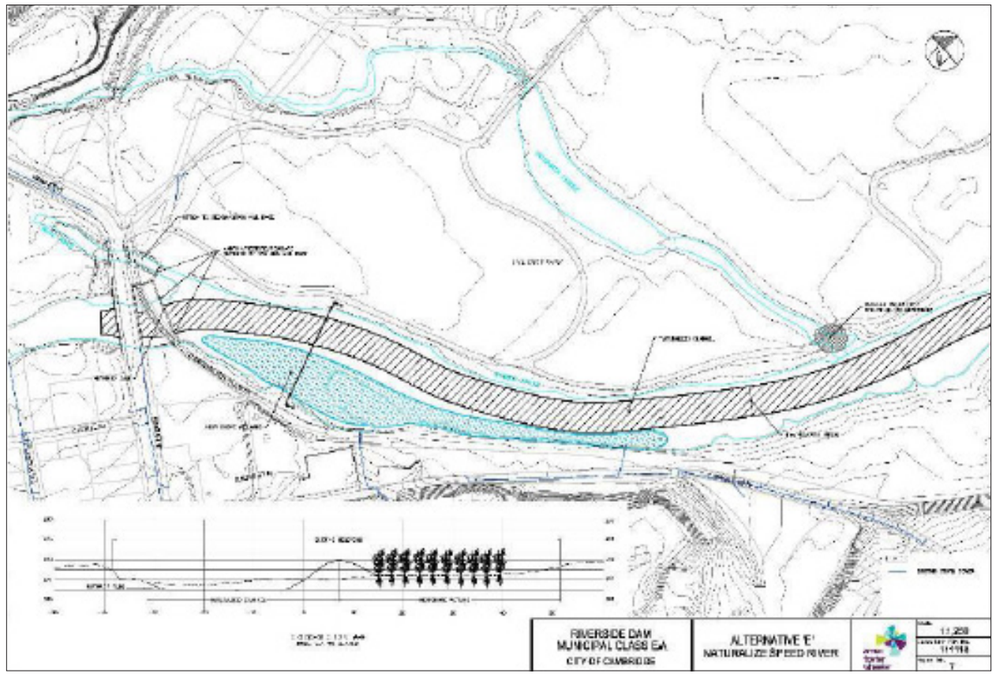
The following drawings are taken from the Riverside Dam Class Environmental Assessment. They are also the same drawings that appear in all of the "Public Information Center's" that were made public, and the material used for the "Stakeholder and Technical Committee" meetings.

These drawings were presented during the first four rounds of the Public Information Centers, Stakeholder and Technical Advisory meetings for the Riverside Dam Class EA. The "Alternative C - Rebuild Riverside Dam" option was introduced under the label "New Dam (in Place)", though the proposed structure is actually positioned 40 meters upstream of the original dam site. At this stage, this was the only option where no plans or sections were shown, only a single photo realistic rendering depicting a replica of the original dam. The absence of technical drawings and contextual drawings in this case reinforced a vision of permanence and perfection, shaping early understanding that this option would be bringing the dam back to its state as it was 100 years ago.

Fig. 3.1.14 (top) Slide presenting the **"Alternative C - Rebuild Riverside Dam".** *Image from the "Public Information Centre #3"*

Fig. 3.1.15 (bottom) Photo-realistic render of **"Alternative C - Rebuild the Dam"**. *Image from the Riverside Dam Class Environmental Assessment*

Alternative E: Naturalize Speed River



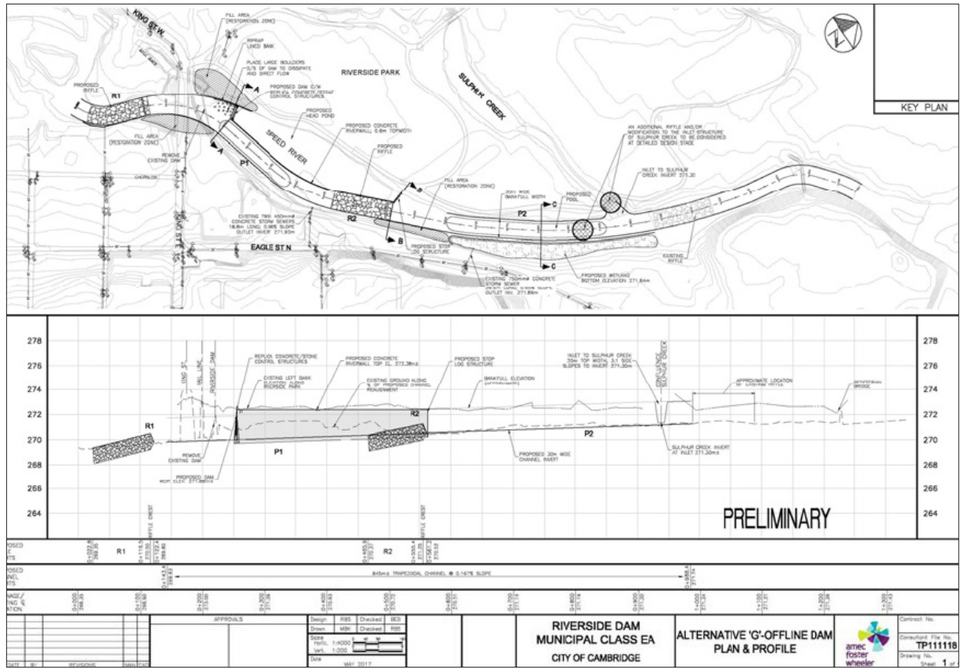
This technical plan and accompanying rendering of "Alternative E - Naturalize Speed River" option were again shown throughout the first four meetings amongst public and stakeholders. Although the plan and section is there, it presentation was limited to a low resolution, small frame on a powerpoint presentation, with no higher quality images available for download. Even if the public was able to glean anything from the technical drawings, the quality of dissemination constrained public understanding makes it illegible to anyone.



Fig. 3.1.16 (top) Technical plan and section of **"Alternative E - Naturalize Speed River"**. *Image from the Riverside Dam Class Environmental Assessment*

Fig. 3.1.17 (bottom) Photo-realistic render of **"Alternative E - Naturalize Speed River"**. *Image from the Riverside Dam Class Environmental Assessment*

Alternative G: Offline Dam



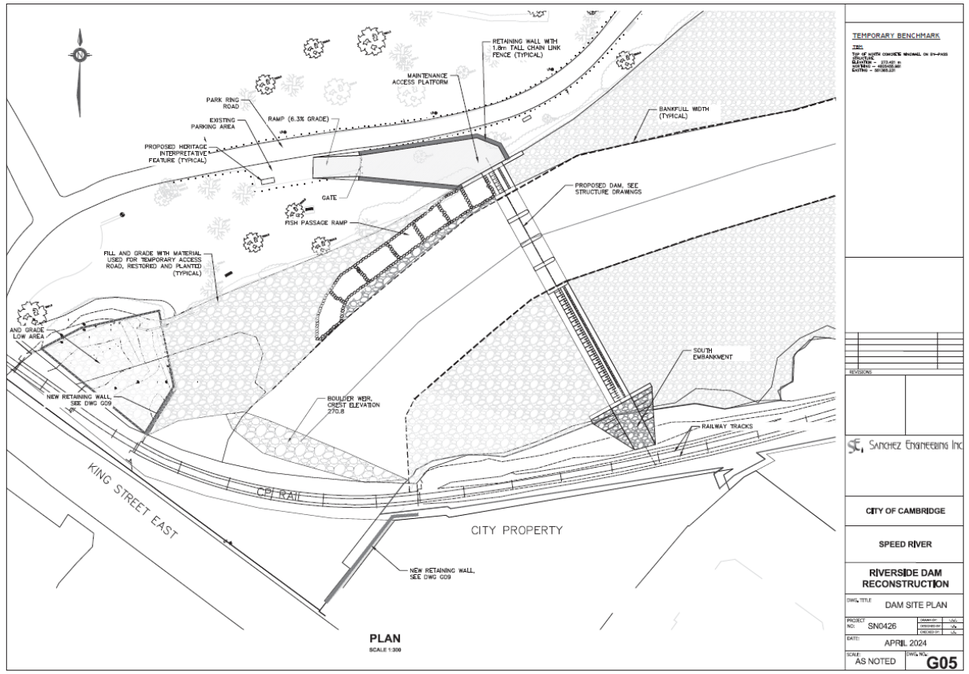
This plan, section, and rendering for "Alternative G - Offline Dam" was again presented in the first four meetings amongst the public and stakeholders. This appears to be the most detailed of all the "preferred alternatives", however it has the same issues of quality when you zoom in to try to see read the labels. The absence of any other explanatory drawings or diagrams leaves major gaps in understanding how an "offline dam" actually works. It is an unfamiliar concept for most members of the public. Despite its apparent technical depth, this presentation still leaves a lack of clarity for the viewer.



Fig. 3.1.18 (top) Technical plan and section of **"Alternative G - Offline Dam"**. *Image from the Riverside Dam Class Environmental Assessment.*

Fig. 3.1.19 (bottom) Photo-realistic render of **"Alternative G - Offline Dam"**. *Image from the Riverside Dam Class Environmental Assessment*

Final Design: Rebuild Dam



These drawings show what was actually designed for "Alternative C -Rebuild the Dam". This drawing set is obviously the most robust and technical as it is the final design (including more than what is shown on this spread), and parts of it were presented in the final PIC (#5) in May, 2018. These drawings are "construction drawings" meaning that they are meant for the contractors rather than for public communication.



Fig. 3.1.20 (top) Technical plan of final **"Rebuild the Dam"** option. *Image from the council report presented December 3, 2024.*

Fig. 3.1.21 (bottom) Photo-realistic render of final **"Rebuild the Dam"** option. *Image from the council report presented December 3, 2024.*

City of Cambridge

3.1.3 Breaking Down the Drawings

1. Photo-Realistic Renders

The renderings provide a clear and polished visualization of the potential future landscapes, serving as accessible entry points for public understanding. Their quality and clarity are commendable, making complex proposals more approachable by placing it in a realistic view that people may not have been able to imagine themselves. High-quality photo-realistic renders can translate and filter the technical jargon for the public, making them accessible concepts and tangible ideas. When these kinds of visualizations evoke a sense of place and emotional connection, they can overcome barriers of jargon and cognitive overload, making the envisioned future more relatable and comprehensible. This kind of engagement promotes ownership and supports more inclusive contextual data and narratives.

Despite the aesthetically pleasing nature and photo-realism of the renders that were put out by the city, there are still some critiques as follows:

Where are the People?

Across the renderings used in the Public Information Centers (PIC), Stakeholder workshops, and Technical Information Centers (TIC) –all realms of public discourse – there is close to a total absence of human figures or lived uses of the site. The park, river, and dam are shown in an abstraction, even though the park is noted to be "extremely well used".[52] Community voices advocating for recreational access, such as fishing, paddling, walking, or even ceremonies, are not visually present, people do not see themselves in the drawings.

This omission is not trivial, visual representations that erase people or reduce them to "generic users" do more than simply depict a site; they actively shape who is perceived as a legitimate stakeholder in its future.[53] Jorgenson (2017) also points out that conflicting values about nature and place infuse environmental controversies with complex social meanings. In the case of Riverside, the absence of everyday users from visual materials mirrors a marginalization of community knowledge and concerns, signaling exclusion from meaningful participation and reinforcing perceptions that decisions were made without genuine integration of local voices.

[52] City of Cambridge, "Public Information Centre No.3."

[53] Don Mitchell et al., "The Right to the City: Social Justice and the Right to Public Space," *Science and Society* 68, no. 4 (2005): 516, International Bibliography of the Social Sciences (IBSS); Emily Talen, "Bottom-Up GIS," *Journal of the American Planning Association* 66, no. 3 (2000): 1,

Removed from Ecological Reality

These kinds of photo-realistic visuals are most effective when paired with additional contextual materials that connect them to the real, underlying conditions of the site. For instance, the rendered landscapes often depict idealized, lush environments that do not explicitly represent technical constraints like sediment contamination, altered hydrology, or barriers to fish migration – all noted in the presentation through text on a slide, and documented in detail in reports and assessments. Including such baseline environmental conditions in complementary conditions can support transparency and ground public dialogue in ecological realities. Having the renders presented on their own as they are does not paint a full picture of the project that would ensue.[54]

This mismatch between visual presentation and documented risk contributes to a fantasy of smooth transformation and social consensus. These renderings offer imaginary futures that ignore underlying ecological precarity and the contested politics of restoration. For example, the sediment sampling identified zinc, copper, and lead levels exceeding provincial standards, yet none of the visualizations signal this environmental toxicity or how it would be managed.[55] This undermines both ecological accountability and public confidence.

One View, One Vision

A key flaw in the drawings presented throughout the process is the exclusive use of a single perspective across all the preferred alternatives. Despite technical and social differences between the options, the renderings share the same vantage points and stylistic treatment.

This visual uniformity is not a neutral choice. As Corner (1999) describes, "mapping is never neutral, passive, or without consequence; on the contrary, mapping is perhaps the most formative and creative act of any design process…".[56] Deploying a single viewpoint to communicate distinct scenarios effectively narrows the range of perceived possibilities, obscuring the underlying ecological, functional, and social distinctions among alternatives. Instead of inviting the public to imagine radically different futures or to grapple with uncertainty and trade-offs, this technique stabilizes a singular vision, paradoxically constraining public debate and reinforcing the authority of the design team.

[54] Meredith DeCock-Caspell and Liette Vasseur, "Visualizations as a Tool to Increase Community Engagement in Climate Change Adaptation Decision-Making," *FACETS* 6 (January 2021): 243–49.

[55] City of Cambridge, "Public Information Centre No.3."

[56] Corner, *The Agency of Mapping: Speculation*, Critique and Invention, 215.

Effective environmental and infrastructure visualization should strive to reveal the richness of alternatives – showing not just fixed endpoints but the range of spatial, temporal, and social outcomes possible. Approaches that instead maintain a controlled, unchanging perspective risk foreclosing dialogue and reducing contentious, lived processes into closed aesthetic displays.

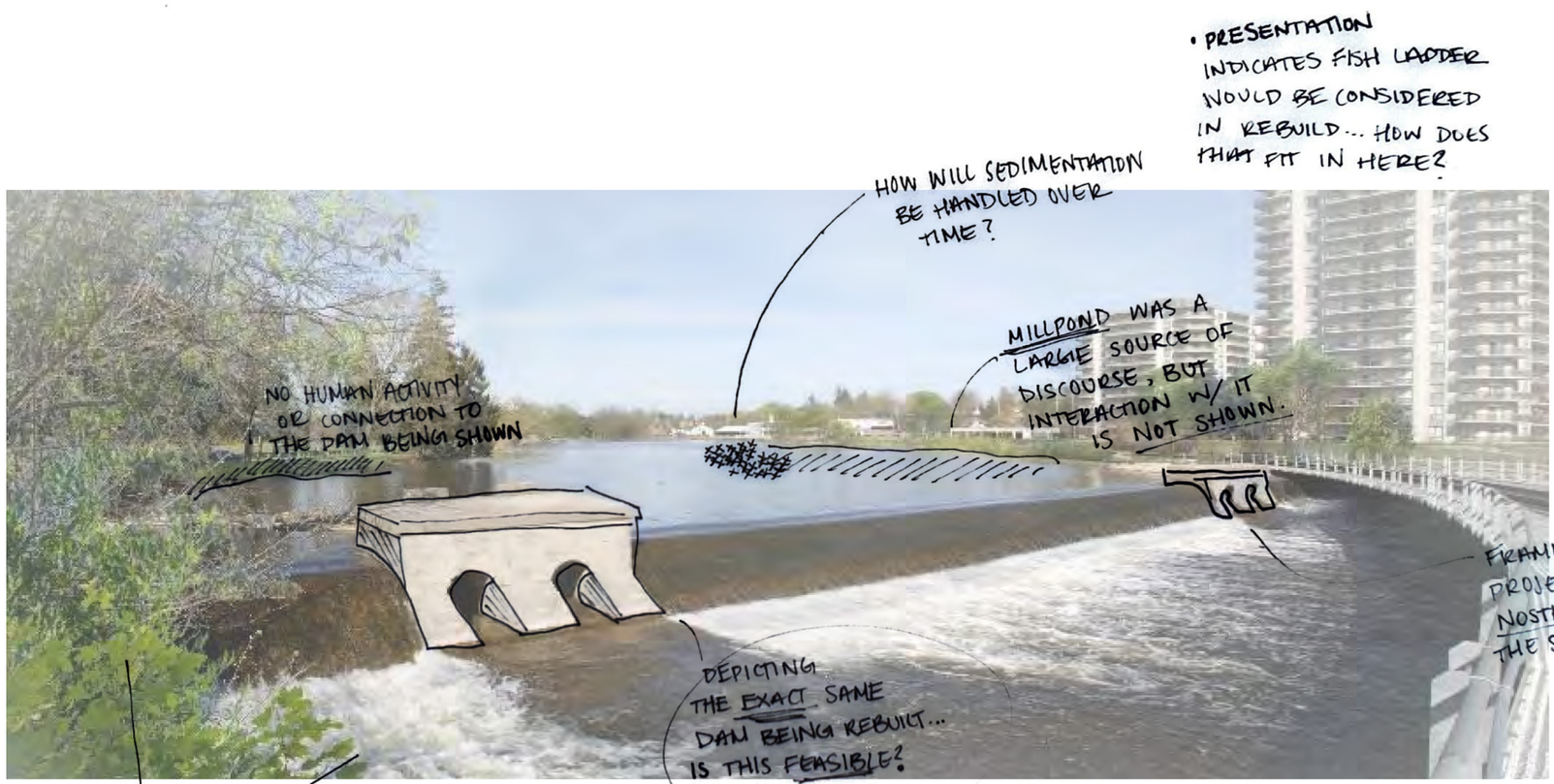


Fig. 3.1.22 "Alternative C - Rebuild the Dam", Photo-realistic render annotated. Base *image from the council report presented December 3, 2024, annotations by author.*

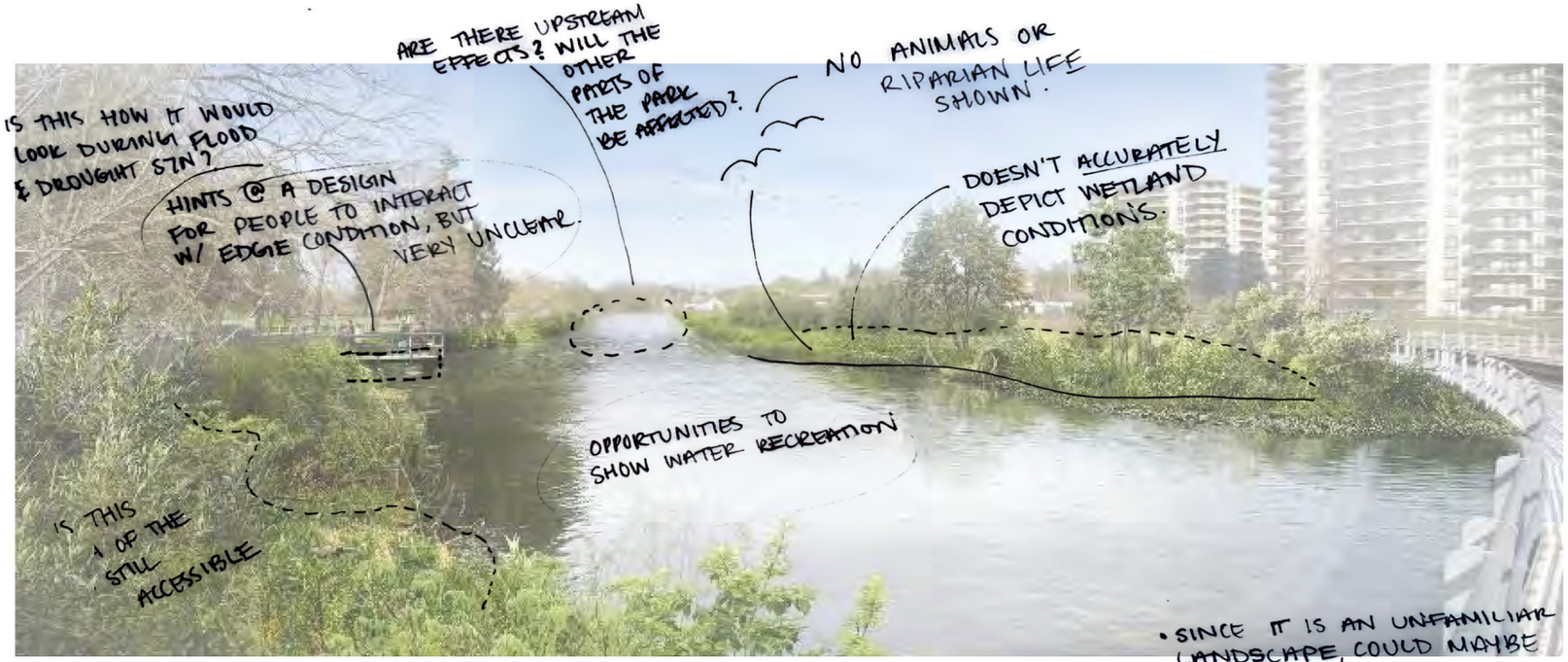


Fig. 3.1.23 “Alternative E - Remove the Dam”
Photo-realistic render annotated. *Base image from the council report presented December 3, 2024, annotations by author.*

City of Cambridge

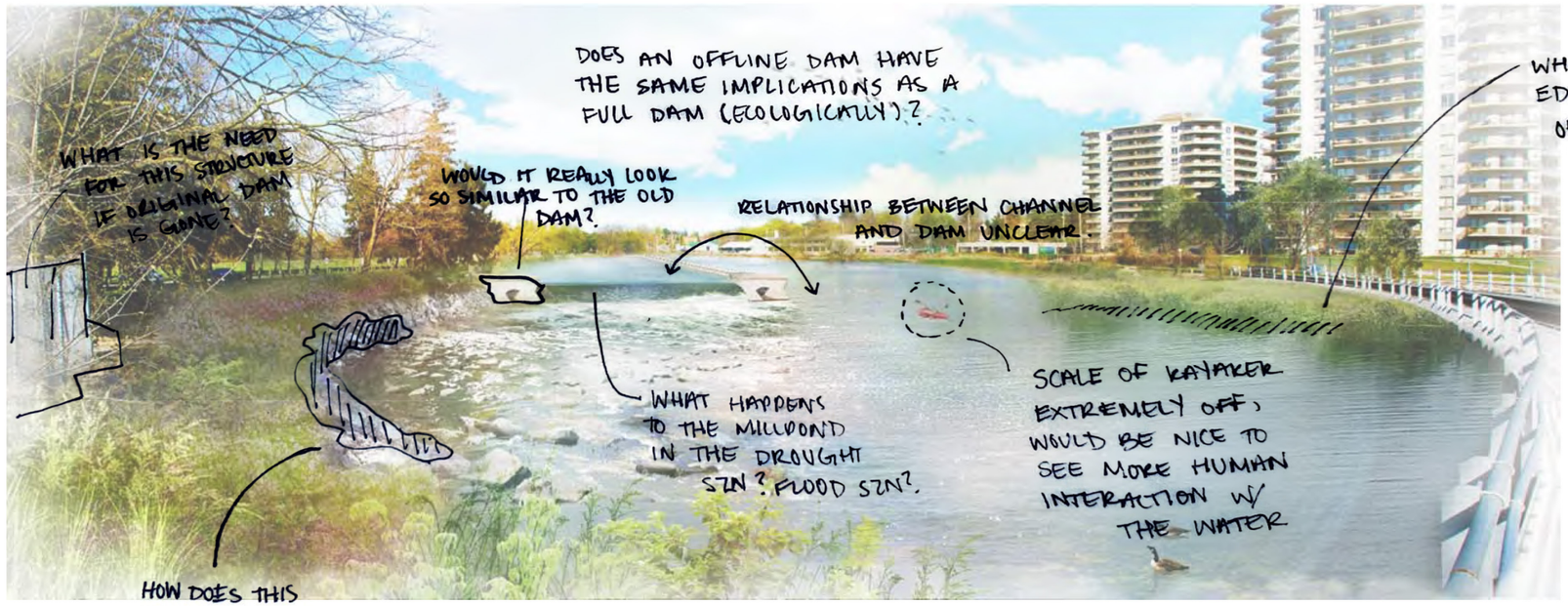


Fig. 3.1.24 “Alternative G - Offline Dam” photo-realistic render annotated. Base *image from the council report presented December 3, 2024, annotations by author*

City of Cambridge

3.1.4 Technical Plans and Sections

The construction plan is highly detailed and technical, containing specialized terminology and intricate procedural information primarily suited for city employees, engineers and technical experts involved in project implementation. While these drawings are essential for coordinating complex construction activities and regulatory compliance, this level of detail can be overwhelming or inaccessible for members of the public or diverse stakeholder groups during engagement sessions.

Drawings that Don't Speak

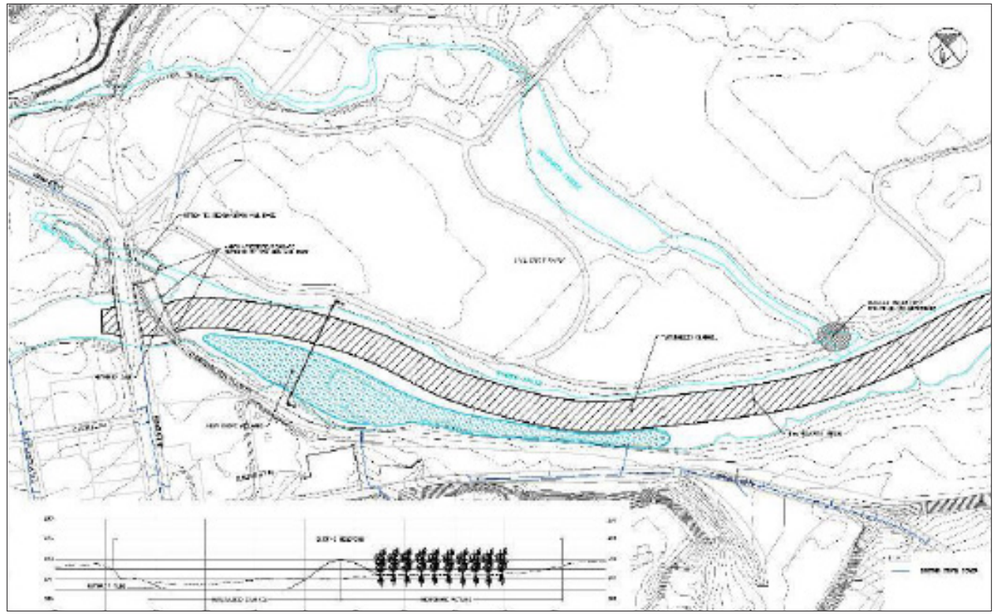
As mentioned before, in addition to the photo realistic renderings the only other visual materials presented during the Riverside Dam process were highly technical engineering seemingly designed for consultants and city officials rather than the general public. Notably absent were experiential section drawings, diagrams demonstrating water level changes pre- and post-removal, or spatial narratives illustrating how the park/river might change over time. These kinds of visual tools could have significantly enhanced public understanding and engagement by providing tangible, relatable depictions of complex ecological and social dynamics. For a project so embedded in public space and daily use, this lack of spatial clarity represents a critical omission.

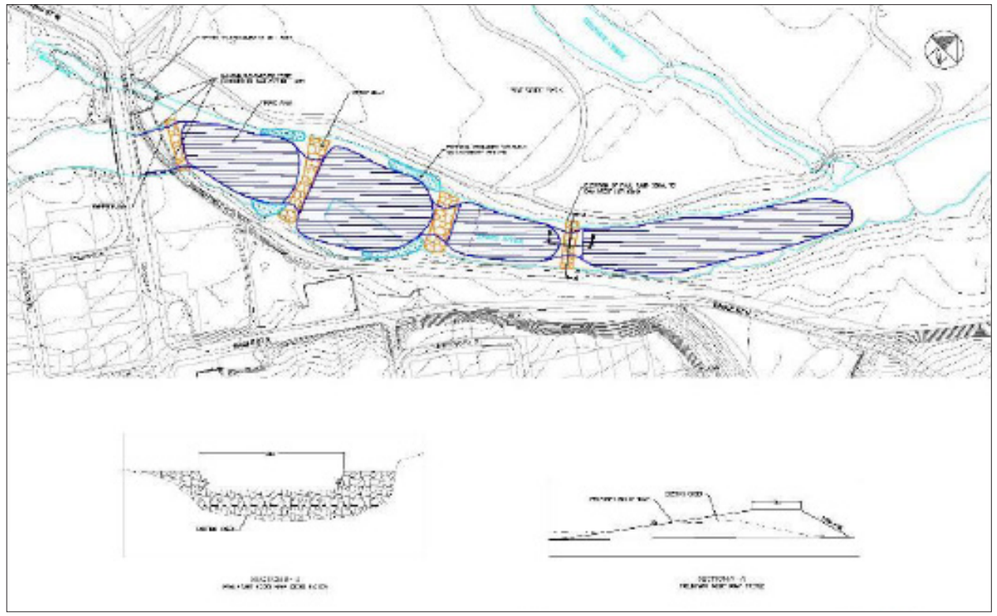
Without clear, comprehensible diagrams that show what will change, ecologically and socially, community members are left to speculate, heightening the risk of mistrust and misinformation – particularly among residents with emotional attachments to the site. Drawings are not mere records but propositions; their scale, framing, and positioning signal whose interests and perspectives they serve. This positions visual materials as active agents in shaping narratives and inclusivity, not neutral communications.[57]

This creates a dual failure: photo realistic renderings remain too abstract to foster substantive public feedback, while technical diagrams are too opaque to facilitate widespread understanding. What is missing is a crucial intermediary layer: clear, legible, and iterative visualizations. Ones that incorporate community questions and demonstrate design evolutions through time.[58] This kind of visual strategy would invite dialogue, acknowledge uncertainty, and build trust in both process and outcome.

[57] Corner, *The Agency of Mapping: Speculation, Critique and Invention*, 215–17.

[58] Corner, *The Agency of Mapping: Speculation, Critique and Invention*, 214–17, 229–33; Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005, 644–50.





*note - quality is the best that could be found online

Fig. 3.1.25 **"Alternative E - Naturalize River"** plan and section. *Image from council report presented December 3rd, 2024.*

Fig. 3.1.26 **"Alternative G - Offline Dam"** Plan and Section. *Image from council report presented December 3rd, 2024.*

The Riverside Dam case makes clear that Environmental Assessments are not neutral processes, but political arenas shaped by power, framing, and procedural limits. Council's intervention to alter the weighting of evaluation criteria, combined with the Ministry's refusal to elevate the project, illustrates how technical tools can be reoriented to serve political priorities. At the same time, engagement remained largely procedural, leaving limited room for deeper public or Indigenous involvement. These dynamics were reinforced by the visualizations used: a single technical plan and a photo-realistic render for each option, offering static and predetermined visions that obscured conflict rather than revealing it. This underscores that how options are shown is inseparable from how they are decided—a central concern of the next chapter, *Why Visualization Matters*.

3.2 WHY VISUALIZATION MATTERS

As climate adaptation and ecological restoration become more complex, the role of visual communication in public process becomes increasingly critical. In contested sites like rivers and dams where cultural, ecological and historical layers intersect, drawings do more than just illustrate proposals, they actively shape understanding, participation, and decision-making. No drawing is neutral, they are political and persuasive, they can include or exclude voices, clarify or obscure impacts, and build or erode public trust.[59]

Public infrastructure projects, particularly those focused on environmental restoration, are frequently presented to diverse audiences – municipal decision-makers, specialist consultants, and the general public – using highly technical documents, polished renderings, and top-down planning tools that can alienate rather than empower the public. These materials often rely on one-way dissemination rather than fostering genuine dialogue, reducing the public to observers rather than active participants in shaping their environment.[60] While idealized visuals such as those depicting lush green spaces or tranquil waterbodies are often popular and immediately graspable, they risk obscuring complexities, trade-offs, and long-term uncertainties inherent in restoration. Without complementary materials such as annotated diagrams, process sketches, or interactive models that explain assumptions, timelines, and potential impacts, these polished images can create an idea of completion that overlooks the realities of ongoing negotiation, maintenance, and diverse stakeholder concerns. On top of this, among communities with deep historical ties to a site, a singularly optimistic portrayal may feel disconnected from the lived experience, or worse, erase or tokenize specific relationships with the land.[61] Addressing these nuances requires pairing evocative, accessible imagery with more educational, participatory visuals that invite critique and surface trade-offs to foster genuine dialogue.

Despite their central role in aiming to shape public understanding, drawings in environmental projects often fall short of fostering genuine engagement.

[59] Innes and Booher, "Reframing Public Participation: Strategies for the 21st Century," 2004, 423.

[60] Innes and Booher, "Reframing Public Participation: Strategies for the 21st Century," 2004, 423–27.

[61] Karin Bäckstrand, "Civic Science for Sustainability: Reframing the Role of Experts, Policy-Makers and Citizens in Environmental Governance," Global Environmental Politics 3 (November 2003): 24–26.

As Ito et el. (2024) argue, planning and visuals tend to emphasize clarity, simplification, and resolution, frequently at the expense of complexity, ambiguity, and temporal change.[62] This visual grammar privileges finality over process, depicting landscapes as static outcomes rather than iterative negotiations. When drawings omit conflict, variability, or human presence, they reinforce top-down narratives of control, suggesting that decisions are already made, and the future is already drawn. In doing so, they risk alienating communities, foreclosing dialogue, and undermining trust in both the processes and outcomes.

This disconnect is evident in the drawings used to engage the public in the Riverside Dam conversation. Rather than reflecting the multiplicity of stakeholder concerns, or the uncertainty inherent in dam removal, the drawings emphasize a singular future state. In doing so, they (unintentionally?) gloss over the tensions and negotiations required to navigate competing values and priorities embedded in the site. These visualizations do not simply present outcomes—they shape how the public can, or cannot, participate in the negotiation of shared futures.

The concept of "negotiation" in environmental contexts extends far beyond simple bargaining or compromise. Environmental negotiation represents "structured dialogue among stakeholders with differing environmental interest to reach sustainable, mutually beneficial outcomes".[63] In the context of design and planning, negotiation becomes a process of exchanging promises and commitments through collaborative, problem-solving that acknowledges the inherent complexity of environmental challenges and the multiplicity of stakeholder perspectives. This thesis advances the concept of "negotiated design" – an approach that positions design processes, and particularly visualization, as active sites of structured dialogue rather than top-down communication tools.

In practice, negotiated design distinguishes itself from traditional approaches by emphasizing iterative visual and participatory processes that surface conflict, make trade-offs visible, and create space for meaningful engagement among diverse stakeholders. For Riverside Dam, this involves accommodating the competing values of municipal engineers focused on flood control, Indigenous communities asserting sovereignty over traditional territories, environmental advocates prioritizing ecological connectivity, and local residents attached to existing landscapes. Effective negotiated design actively facilitates mutual understanding and collaborative problem-solving, moving beyond consultation toward genuine co-creation

[62] Ito et al., "Understanding Urban Perception with Visual Data: A Systematic Review," 16–17.

[63] "Environmental Negotiation Term," *Sustainability Directory*, n.d., accessed September 14, 2025, https://sustainability-directory.com/term/environmental-negotiation/.

and context appropriate designs.

A key tension in environmental visualization lies between advocacy and transparency. According to Sheppard (2005), landscape visualizations can significantly influence public perceptions and behaviour towards climate change, particularly when they are immersive, emotionally engaging, and site-specific.[64] This raises a fundamental tension in environmental design: how can we use visualizations to advocate for necessary change without slipping into persuasion that feels manipulative? While some see evocative imagery as a political tool to catalyze climate action, others call for images that reveal complexity, acknowledge uncertainty, and resist narrative closure. Rather than attempt to resolve this tension, this thesis seeks to work within it – approaching visual communication as a space where affect, ethics, and accuracy must be constantly negotiated. By revealing the realities and consequences of all design options at both large and small scales, the approach taken in this thesis aims to reduce personal bias in favour of any one outcome and instead supports a more informed and transparent public dialogue about the preferred alternatives.

Mapping is one example of a tool that can be constructive and not only descriptive. According to James Corner (1999), it can act as a tool to speculate, critique and reframe relationships between land, people, and power. His notion of "the agency of mapping" reinforces the idea that drawings are active participants in shaping both the narrative and outcome. In climate adaptation work, this agency can be employed to reveal complexity, surface conflicts, and represent the layered values that are rooted in landscapes, particularly when decisions have both small and large-scale impact, such as dam removals or wetland configurations.[65]

Rose-Redwood et al. further document community-driven mapping as a transformative practice that supports the reclamation of Indigenous place-names and histories, "forging intergenerational connections between the wisdom of Indigenous elders and the curiosity of the next generation".[66] These techniques amplify the capacity for visual representation to foster an emotional investment, dialogue, and collective action, as noted by both Amoroso and Sheppard, and lay the groundwork for more just and transparent environmental governance. By actively engaging with place-based cultural knowledge, community-driven mapping, resists the erasure of Indigenous histories while expanding the interpretive and political possibilities of environmental design.

[64] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005, 637–49.

[65] Corner, The Agency of Mapping: Speculation, Critique and Invention, 213–30.

[66] Reuben Rose-Redwood et al., "Decolonizing the Map: Recentering Indigenous Mappings," *Cartographica* 55, no. 3 (2020): 157,

Amoroso (2020) similarly advocates for representational tools that move beyond photorealism or abstract diagrams. In *Representing Landscapes: Visualizing Climate Action*, she curates a diverse collection of projects by landscape architects, urban designers, and scholars that explore how climate-related transformations can be visualized in more inclusive, nuanced ways. The book assembles contributions from a wide range of authors and approaches: Gena Wirth from SCAPE Studio demonstrates how ecological systems can be made visible through immersive, community-engaged visualizations that reveals hidden hydrology and climate vulnerabilities; studios from Harvard GSD and the University of Guelph showcase analytical approaches that layer temporal data and ecological processes; while practitioners like Chris Reed and Michael Van Valkenburgh Associates explores how large-scale infrastructure projects can be communicated through multi-scalar, process-oriented drawings. These projects employ techniques such as mapping uncertainties, layering hydrological cycles, diagramming infrastructural systems, and combining aerial with immersive perspectives to communicate change over time.[67]

Visual representation in environmental design must be understood not simply as the production of static images or drawings, but as an active, ethical process imbued with the intentional agency of its creators. Michael Jenson argues that the value of architectural representation lies not only in the finished product, but fundamentally in the creative process itself – this is something he coins as "aesthetics of agency".[68] This process-oriented view highlights that drawings and visualizations serve as dynamic sites of negotiation, where multiple, often competing, social and political interests intersects interact rather than being passively communicated. Such representations must resist predetermined agendas and embrace flexibility, critical inquiry, and responsiveness to context and complexity. In this way, visualization becomes a powerful form of research and intervention that can mediate between diverse knowledge, stakeholder perspectives, fostering adaptive strategies in the face of environmental and cultural change. This approach resists the reduction of complex environmental realities into simplified or idealized images, acknowledging instead the fluid, contingent, and often conflicted nature of environmental decision-making and design. Thus, a responsible visual ethic must privilege openness, iterative collaboration, and cultural sensitivity, supporting designers as "process-architects" who facilitate transparent dialogue and co-creation through their visual work.

Power dynamics and accessibility are critical considerations in this

[67] Nadia Amoroso, *Representing Landscapes: Visualizing Climate Action*, 5–22, 31-45.

[68] Michael Jenson, "Process, Representation and Architectural Agency in an Age of Complexity and Change," *Journal of Architecture* 13, no. 2 (2008): 171–74.

negotiation. Complexity in visuals, jargon, or digital divides can exclude non-expert audiences, reinforcing existing inequalities. Thus, a responsible visual ethic must prioritize inclusivity, legibility, and cultural sensitivity to democratize environmental governance.[69] In community-based practices, it can be argued that visualization becomes the most effective when it is part of a co-creative process, not simply used to present outcomes, but to generate, test, and adapt ideas alongside those most affected.[70] Participatory visuals can democratize planning by allowing publics to critique, modify, or annotate evolving proposals. This invites ownership and trust, particularly in contexts with long-standing power imbalances or site-based attachment.

The reason that visualizations hold so much power to persuade and require so much ethical consideration is because they enhance human cognitive capacities. Visualizations amplify cognition by increasing memory resources, reducing search efforts, facilitating pattern detection, and enabling perceptual conclusion, allowing decision-makers to process complex information more efficiently.[71] Leveraging these cognitive benefits requires designs that align with users' mental models and cognitive load capacities, especially in contexts characterized by complexity and uncertainty.[72]

In architectural and environmental design, the transfer of knowledge through visualization is not merely about presenting data but about communicating insights across diverse stakeholders, each with distinct cognitive backgrounds and informational needs.[73] Architects utilize a complementary range of visualization types – including sketches, diagrams, images, physical models, and interactive visualizations – to manage information depth, maintain relevance, and overcome cognitive overload among recipients.[74] Combining traditional representational methods with novel digital tools enhances attention, motivation, and collaborative engagement, fostering shared understanding and more inclusive decision-making. Renderings, for example, serve not only to illustrate projects, but also to construct persuasive narratives that shape perceptions and social

[69] Costa, "Ways of Engaging. Re-Assessing Effects of the Relationship between Landscape Architecture and Art in Community Involvement and Design Practice," 10.

[70] Costa, "Ways of Engaging. Re-Assessing Effects of the Relationship between Landscape Architecture and Art in Community Involvement and Design Practice," 10–25; Nan Yang et al., "Landscape Architecture as Democratic Practice: Learning from Participatory Methods and Motivations in Community-Engaged Design," *Landscape Research* 50, no. 1 (2025): 57–69.

[71] M. Hamzah et al., "Supporting Decision Making Process with Information Visualisation: A Theoretical Framework," 2010 2nd *IEEE International Conference on Information Management and Engineering*, April 16, 2010, 12–15,

[72] Robert E. Patterson et al., "A Human Cognition Framework for Information Visualization," *Computers & Graphics* 42 (August 2014): 43–45.

[73] R. A. Burkhard, "Learning from Architects: The Difference between Knowledge Visualization and Information Visualization," Proceedings. Eighth International Conference on Information Visualisation, 2004. IV 2004., July 16, 2004, 4–6,

[74] R. A. Burkhard, "Learning from Architects: The Difference between Knowledge Visualization and Information Visualization," 10–14.

values toward architecture and environmental interventions. However, care must be taken to balance aesthetic and communicative power with accuracy and inclusivity to avoid marginalizing alternative perspectives or obscuring uncertainties inherent in environmental processes.

Recognizing the personal and cultural biases that influence visualizations and design processes is essential for fostering genuine negotiation and inclusiveness. As I engage in creating representations of complex environmental issues, I must confront my own assumptions, preferences, and potential blind spots that shape the images I produce. Like any author or designer, I carry a subjective lens – one that can inadvertently reinforce dominant narratives or marginalized alternative perspectives. Acknowledging the bias is not a sign of weakness but a critical step toward ethical practice, ensuring that visual communications do not just persuade but also authentically represent multiple voices, uncertainties and values. This self-awareness invites ongoing self-awareness, fostering a practice rooted in transparency, humility, and a commitment to collective, context-sensitive understanding.

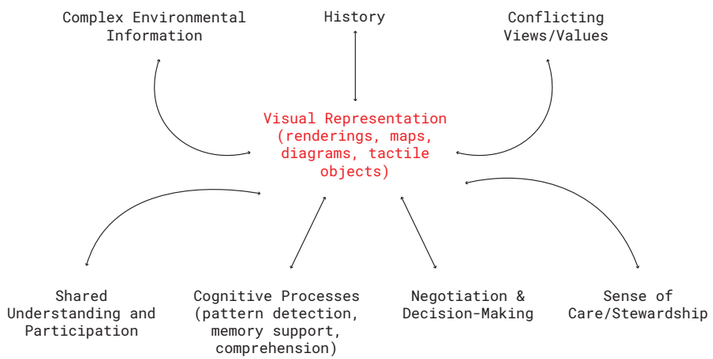


Fig. 3.2.1 Diagram showing visualization sitting at the middle of complex information and community understanding. *Made by author.*

3.3 WHO'S DOING THE WORK?

As public landscapes and climate change become increasingly complex – ecologically, socially, and politically – some design firms are stepping into roles that go far beyond conventional environmental remediation. These practices reframe the role of the designer as the facilitator, translator, and collaborator, actively engaging communities, visualizing layered futures, and negotiating contested terrain. Their work acknowledges the entanglement of ecological processes with cultural memory, economic pressures, and infrastructural legacies. They open space for adaptive, ongoing restoration. This section highlights three firms: SCAPE Studio, Sasaki, and Michael Van Valkenburgh Associates (MVVA). Their projects do not avoid conflict or uncertainty; instead, they visualize it, invite negotiation, and build public trust through clarity, access, and responsiveness.

3.3.1 SCAPE Studio

SCAPE is a landscape architecture and urban design firm driven by action, collaboration, and a belief in nature's capacity to heal when given the chance. Founded by Kate Orff in 2005, the practice works at the intersection of climate adaptation, biodiversity, and social equity, partnering with communities, cities, and organizations to co-design landscapes that thrive in the gradient between land and water. Grounded in deep site research and participatory dialogue, SCAPE transforms ecological and cultural narratives into actionable plans, fostering stewardship and resilience in the face of climate change.[75] This ethos aligns with Innes & Booher's (2004) collaborative, multi-way participation where stakeholders contribute their knowledge as co-experts in shaping outcomes,[76] and with van den Brink et al.'s (2019) framing of landscape architects as boundary spanners who connect actors, translate across disciplines, and help coordinate decisions.[77]

SCAPE's "Living Breakwaters" stands as an example for this thesis as a community-driven project in climate adaptation. The project was conceived after Superstorm Sandy in 2012, and the project not only responds to the physical vulnerability of Staten Island's South Shore but also addresses the social and ecological fragmentation that the disaster exposed. From the project's inception, SCAPE emphasized collaboration with residents, educators, scientists, and government agencies to ensure that local voices and ecological histories guided the design. Community workshops and educational programs, such as the Living Breakwaters Youth Ambassadors initiative, engaged students in monitoring wave dynamics, oyster growth, and shoreline change, turning the project into a living classroom for resilience and environmental stewardship.[78] Through this participatory approach, Living Breakwaters evolved from a coastal infrastructure project into a system that intertwines protection, habitat creation, and education.

The public engagement process with Living Breakwaters was deeply innovative and multifaceted, emphasizing hands-on, sensory, and educational approaches. SCAPE collaborated with eleven different groups from engineers and designers to groups dedicated to engagement.[79] Community engagement went beyond traditional town halls and focus groups. It included shore tours where locals experienced the current landscape firsthand, pop-up information booths, exhibitions, and virtual reality (VR) experiences that immersed participants in potential future scenarios, helping people translate complex scientific data into tangible experiences.[80]

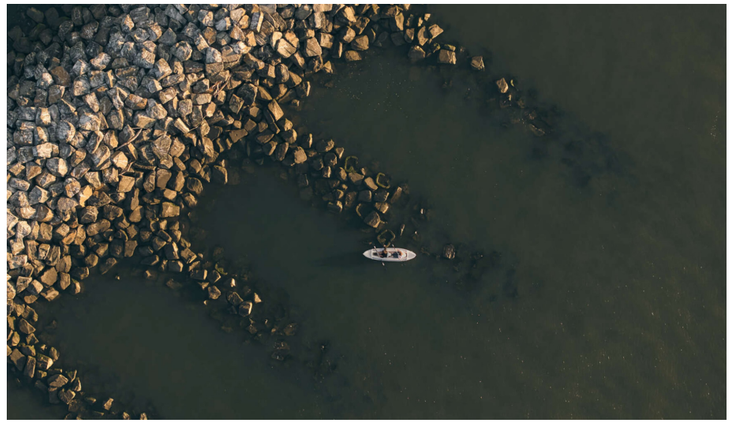


Fig. 3.3.1 SCAPE: "Living Breakwaters" aerial image, 2021. *Image courtesy of SCAPE studio.*

[75] "About Our Studio," *SCAPE*, n.d., accessed August 9, 2025, https://www.scapestudio.com/about/.

[76] Innes and Booher, "Reframing Public Participation: Strategies for the 21st Century," 2004, 428–30..

[77] Margo van den Brink et al., "To Draw or to Cross the Line? The Landscape Architect as Boundary Spanner in Dutch River Management," Landscape and Urban Planning 186 (June 2019): 21–22.

[78] "Living Breakwaters," SCAPE, n.d., accessed August 9, 2025, https://www.scapestudio.com/projects/living-breakwaters/.

[79] "Living Breakwaters."

[80] Office, "Best Practices for Community Engagement in Living Breakwaters," *SCAPE*, November 8, 2016, https://www.scapestudio.com/news/2016/11/best-practices-community-engagement-living-breakwaters/.

In Nadia Amoroso's *Representing Landscapes: Visualizing Climate Action*, Gena Wirth, Principal and Partner at SCAPE, lays out some principles that SCAPE follows.[81] These include:

1. Make dynamic landscape systems legible to the average viewer.
2. Inclusion of non-human species in the design proposal, not just in visualization.
3. Present things from the perspective of people, with images that convey the fabric and feel of their specific community.
4. Equitable and accessible communication.

These two drawings from SCAPE utilize their principles and make ecological and social processes visible in ways that directly contrast with the ones from Riverside Dam. The first drawing on the top (Fig. 3.3.2) situates the project into the larger context of the surrounding community by pointing out the surrounding schools involved in the education program affiliated with Living Breakwaters.[82] By pairing it with a simple diagram in the corner, it is clear that the intention of the project is to link risk reduction, culture, and ecology.

The second drawing (Fig. 3.3.3), the perspective section, is very helpful in simultaneously conveying the technical performance of a landscape proposal.[83] By putting in the oyster habitat, fish passage, and avian use into the operative section itself, the non-human world is a design client just as much as the human one is. Equally important, the graphics are easy to process and understand, making them accessible to a large audience, aligning with their goal for "equitable and accessible communication".[84]

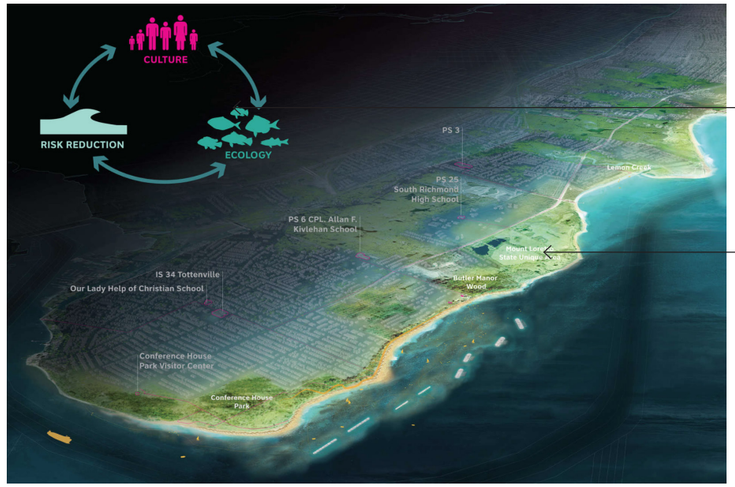


Fig. 3.3.2 SCAPE: "Living Breakwaters" aerial site map, 2021. *Image courtesy of SCAPE studio.*

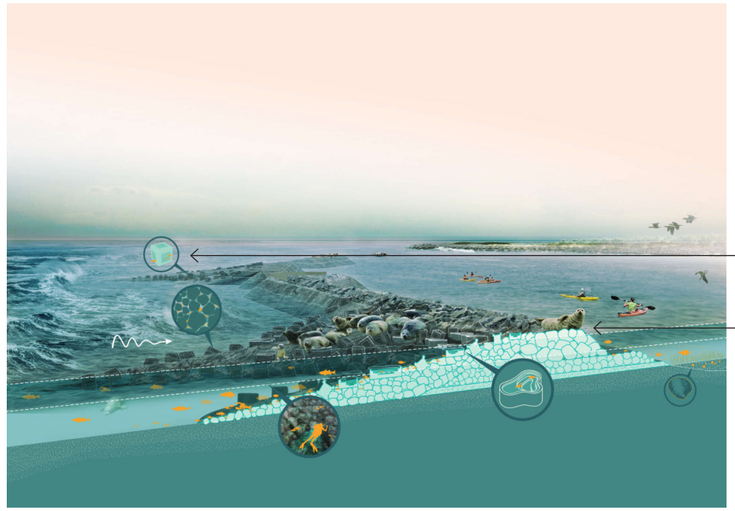


Fig. 3.3.3 SCAPE: "Living Breakwaters" perspective, 2021. *Image courtesy of SCAPE studio.*

[81] Nadia Amoroso, Representing Landscapes: Visualizing Climate Action, 5.
[82] "Living Breakwaters."..
[83] Nadia Amoroso, Representing Landscapes: Visualizing Climate Action, 6.
[84] Nadia Amoroso, Representing Landscapes: Visualizing Climate Action, 5..

These images of SCAPE's Living Breakwaters engagement process show a layer of climate adaptation design that extends beyond drawings themselves: the direct involvement of communities (particularly youth) in shaping how projects are communicated and understood.

In the first image (Fig. 3.3.4), the team set up a physical and highly visible engagement station, with tactile models and large-scale graphics. This aligns with the 12 Practices of Community Engagement that SCAPE referred to for this project.[85] It provides accessible, physical planning spaces where designers, residents, and children can meet on common ground.[86] Rather than situating participation in formal, exclusionary settings, this approach embeds the project in everyday public space, encouraging spontaneous conversation and broad participation.

In the second image (Fig. 3.3.5), young people are seen interacting with project materials. In conjunction with this project there was the Living Breakwaters Curriculum, which makes lifecycles and habitats visible, and invites students to consider what non-human presences exist in these habitats.[87] This follows the "community classroom" principle, where the site and tis representations become shared learning tools.[88] Engaging children and youth in this way does more than simply educate; it builds long-term stewardship and fosters a sense of belonging and agency in shaping environmental futures.

Importantly, these interactions also embody other best-practice principles: they make participation easy and intuitive, using clear, hands-on materials that don't rely on technical expertise; they visualize design to aid understanding, using models and diagrams as accessible interpretive tools, and they respond directly to community concerns, creating a feedback loop between local knowledge and design iteration.[89] In this sense, SCAPE's engagement strategy goes beyond consultation and it performs the same representational ethic present in their drawings: making dynamic systems legible, elevating lived experience, and distributing authorship of future landscapes. This community engagement framework stands in stark contrast to the top-down, one-directional communication practices evident in the Riverside Dam consultation process, where polished renderings foreclosed space for meaningful negotiation. SCAPE's method, by contrast, materializes negotiation in public space, allowing community members to see themselves as active participants in shaping ecological futures.

[85] Rebuild by Design, "Elements of Effective Engagement 12 Best Practices of Community Engagement," n.d.; Office, "Best Practices for Community Engagement in Living Breakwaters."

[86] Rebuild by Design, "Elements of Effective Engagement 12 Best Practices of Community Engagement."

[87] OUR WORK Oyster Reefs Education Harbor School Shell Recycling Science & Research Water Quality Collaborations et al., "Living Breakwaters Curriculum," Billion Oyster Project, accessed October 28, 2025, https://www.billionoysterproject.org/living-breakwaters-curriculum.

[88] Rebuild by Design, "Elements of Effective Engagement 12 Best Practices of Community Engagement."

[89] Rebuild by Design, "Elements of Effective Engagement 12 Best Practices of Community Engagement."



Fig. 3.3.4 SCAPE: "Living Breakwaters" community engagement. *Image courtesy of SCAPE studio.*



Fig. 3.3.5 SCAPE: "Living Breakwaters" youth engagement. *Image courtesy of SCAPE studio.*

3.3.2 Sasaki

Sasaki is another exemplary firm that this thesis looks towards for inspiration on collaborative approaches and community-driven design. The practice, characterized by its motto "Better design, together", aligns strongly with several core themes found across academic literature surrounding collaborative, interdisciplinary, and technologically enhanced participatory design and planning.[90] Sasaki explicitly embraces a working method that incorporates diverse perspectives, blends disciplines (including architecture, landscape architecture, and planning and urban design), promotes open exchange, and involves deep engagement with communities. Similarly to as described with SCAPE, this ethos resonates with the concept of the landscape architect being a "boundary spanner", a role that connects all disciplines and communities, as described by van den Brink et el.[91]

The firms approach to design innovation and community-driven visioning, exemplified by creating a shared future like the Santa Monica "Great Park", shows how advanced visualization tools can guide a democratic practice. Central to Sasaki's ethos is a belief that engaging stakeholders meaningfully, especially those from underrepresented communities, results in solutions uniquely tailored to distinct places and populations.[92] The firm's design process puts an emphasis on innovative forms of outreach, blending interactive activities with clear, accessible visuals, and documentation so that a wide variety of voices can help shape each projects trajectory.

At the inception of the firm 70 years ago by Hideo Sasaki, the employees were instilled with the concept of "integrated design", pushing the designers past the traditional solutional silo, that remains today.[93] The clarity of their work both facilitates collaboration between disciplines, but also empowers non-expert stakeholders to understand and participate in the decision-making process. This dual emphasis on engagement and clarity has distinguished Sasaki's projects globally, from expansive riverfront parks to complex urban revitalization, producing built environments that reflect both rigorous design thinking and the aspiration of their respective communities.

The effectiveness of their community engagement could not be achieved

[90] "Community Engagement," Sasaki, accessed October 17, 2025, https://www.sasaki.com/practice/expertise/community-engagement/.

[91] van den Brink et al., "To Draw or to Cross the Line? The Landscape Architect as Boundary Spanner in Dutch River Management," 21–22.

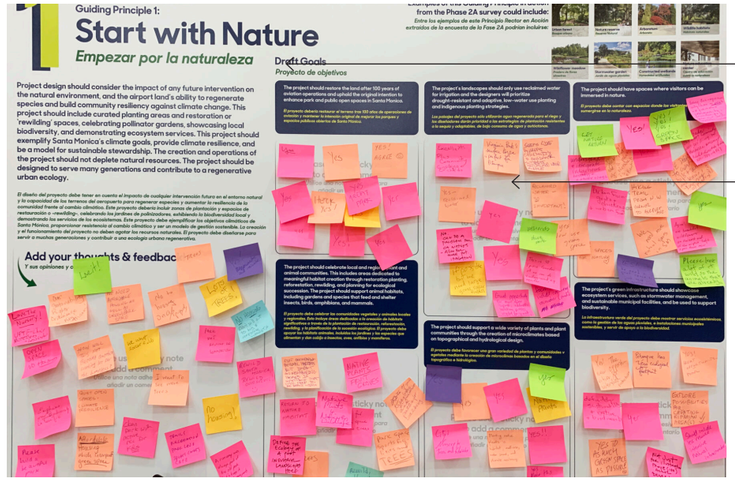
[92] "Community Engagement," Sasaki, accessed October 17, 2025, https://www.sasaki.com/practice/expertise/community-engagement/.

[93] "Community Engagement," Sasaki, accessed October 17, 2025, https://www.sasaki.com/practice/expertise/community-engagement/.



Outdoor, public-facing engagement.

Fig. 3.3.6 Santa Monica's Senior Park Planner, Tony Lopez, guides community members through a scale comparison activity at the project's kick-off open house, May 2025. *Image courtesy of Sasaki.*.



Multiple languages included when engaging with the community

Blank spaces for community members to put their opinions down

Fig. 3.3.7 Respondents provided input on all five of Sasaki's guiding principles to help the team refine them for the next stage of a project, May 2024. *Image courtesy of Sasaki.*.

without the clarity of the drawings/visualizations. Newell et al. describe the effectiveness of utilizing both realistic, immersive visualizations to convey complex scenarios to diverse audiences.[94] The Wuhan Yangzte Riverfront Park is an example of how design and drawings serve as indispensable precursors to realizing complex community outcomes. The project addresses the historical tension between the central Chinese city of Wuhan and the Yangzte, revered as the "mother river" but also a source of mounting flood damage.[95] This approach leverages the challenges of acknowledging the river's spontaneous and changing nature to nurture regional ecology and reinforce traditional wisdom, while also acknowledging that local community members still occupy the riverside parks even when it is flooded.

The reliance on visual engagement and the resulting drawings was critical for fostering the "inclusive collaboration" necessary for successful Community-Engagement Design (CED), a democratic practice strongly emphasized in contemporary landscape architecture.[96] Understanding that conveying such complex ecological and infrastructural concepts goes beyond abstract drawings and planning, Sasaki implemented an extensive web-based outreach effort supported by an interactive digital interface.[97] These kinds of approaches are recognized as highly effective planning by directly linking potential consequences and solutions to specific places.[98] By utilizing these visual and digital communication tools that serve to dissolve barriers between experts and laypeople and accelerate social learning, the final design of the park included features like decommissioned barges converted to floating parks and strategically graded streams that were built on a clear understanding of stakeholder values. Thus, ensuring a socially inclusive, ecologically robust, and culturally meaningful waterfront.[99]

[94] Robert Newell et al., "Communicating Complexity: Interactive Model Explorers and Immersive Visualizations as Tools for Local Planning and Community Engagement," *FACETS* 6 (January 2021): 295–96.

[95] "Wuhan Yangtze Riverfront Park," *Sasaki*, n.d., accessed October 17, 2025, https://www.sasaki.com/projects/wuhan-yangtze-riverfront-park/.

[96] Yang et al., "Landscape Architecture as Democratic Practice: Learning from Participatory Methods and Motivations in Community-Engaged Design," 59–60, 63–65.

[97] "Wuhan Yangtze Riverfront Park."

[98] Ellie Nasr-Azadani et al., "Is the Rapid Development of Visualization Techniques Enhancing the Quality of Public Participation in Natural Resource Policy and Management? A Systematic Review," Landscape and Urban Planning 228 (December 2022): 4–5,.

[99] "Wuhan Yangtze Riverfront Park."

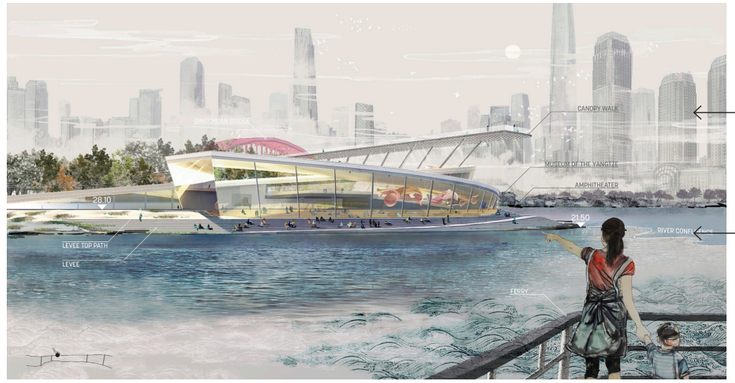


Fig. 3.3.8 Wuhan Yangzte Riverside Park, perspective view, 2018. *Image courtesy of Sasaki.*



Fig. 3.3.9 Wuhan Yangzte Riverside Park, aerial view, 2018. *Image courtesy of Sasaki.*

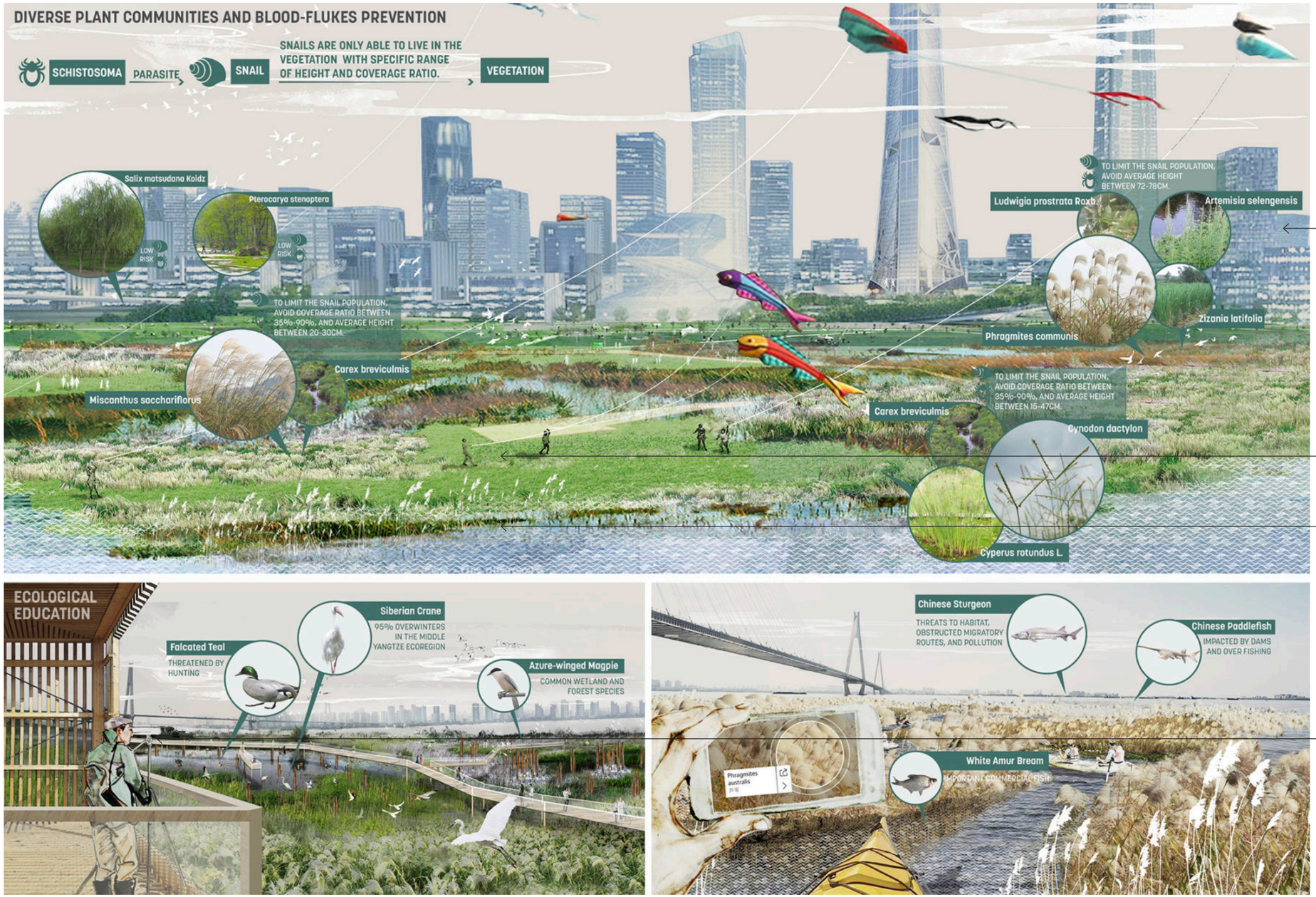


Clear labels

Hybrid drawings (sections, perspective, plan) clarifies elevation changes along the floodplain and where it falls on the tributary

Clear water-level markers visualize flood risk

Fig. 3.3.10 Wuhan Yangzte Riverside Park hybrid drawing, 2018. *Image courtesy of Sasaki.*



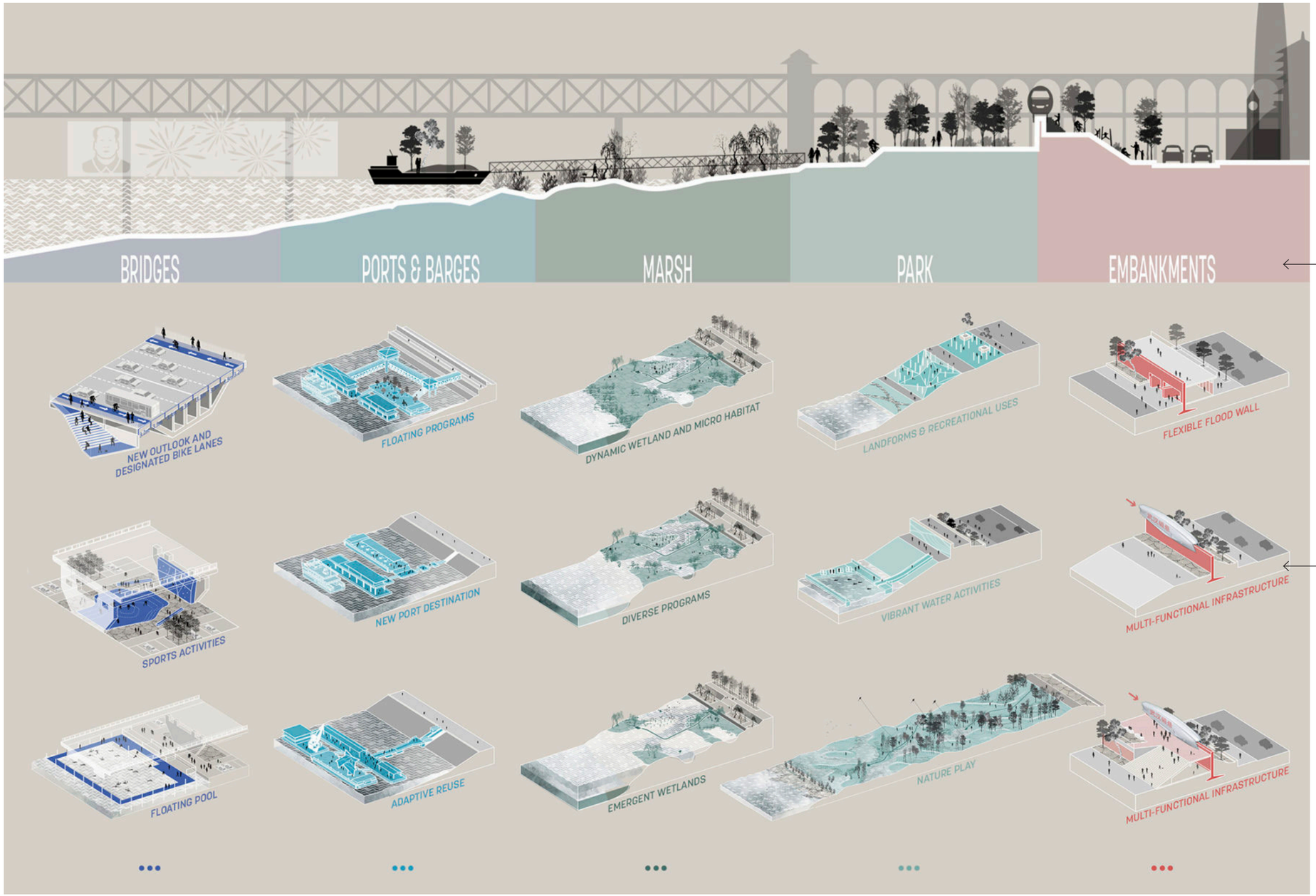
Hybrid ecological-educational diagram bridges science and design

Highlights community presence

Actually highlights where ecology is situated on the site

Highlights human and non-human co-existence

Fig. 3.3.11 Wuhan Yangzte Riverside Park perspectives, 2018. *Image courtesy of Sasaki.*



Uses colour to clarify programmatic zones and floodplain gradients

Sequential axonometric shows how site functions shift across typologies, following the same colour codes as the section

Fig. 3.3.12 Wuhan Yangzte Riverside Park sectional axonometrics, 2018. *Image courtesy of Sasaki.*

3.3.3 Michael Van Valkenburgh Associates Inc.

The third and final firm this thesis will discuss will be Michael Van Valkenburgh Associates Inc (MVVA), which was founded in 1982 by Michael Van Valkenburgh.[100] The firm structures its practice to be less hierarchal, operating as a collaborative team composed of professionals from diverse disciplinary backgrounds, including landscape architecture, architecture, art, ecology, anthropology, and engineering. This internal diversity is considered fundamental to the firm's capacity to lead intricate projects dynamically and openly.[101] MVVA is committed to ecological urbanism, which is an approach focused on continuous landscape elements and integrating ecology as a science into the process of city-making.[102] This methodology promotes the dynamic integration of natural and urban systems, moving beyond purely functional ecological objectives to incorporate positive ecological outcomes into the "felt experiences" of a place.[103]

The firm translates this commitment into practice through targeted visualizations and profound community engagement. A core goal is translating abstract data into tangible, emotional experience, emphasizing the sensory aspects of design. MVVA views public engagement as the "critical foundation for a park's success",[104] necessitating open dialogue and mutual understanding "at the beginning rather than after the design is finished".[105] Their process involves extensive, long-term collaboration, which takes effort and is difficult, but essential in a democratic society. The firm adheres to the principle that "nobody should be excluded" from the design process, with the ultimate purpose of making everyday lives of people richer and healthier.[106]

Their project the Poudre River Restoration Initiative (PRRI) in Greeley, Colorado, is a transformative, multi-phase initiative aimed at reestablishing the river's natural function, addressing severe impacts from historical urban development, channelization, mining, and diversion that have reduced the river's length within city limits by approximately 15% between 1950 and 2019.[107] This effort to restore ecological processes, support habitat connectivity, and prepare the corridor for future flood resilience and climatic uncertainty aligns directly with the goal of ecological restoration.

MVVA explicitly integrates three crucial components: technical data, community values, and landscape performance metrics into its design methodology.[108] This blending of science and social input aligns with concept of incorporating place-based values into restoration initiatives that is advocated by Wickham et al. Place-based values, derived from intimate connections to local environments, help ensure that restoration projects are not merely focused on ecological integrity but are also culturally and ecologically relevant and community-engaged.[109]



Fig. 3.3.13 Poudre River changes throughout time. *Image courtesy of Michael Van Valkenburgh Associates Inc.*

[100] "Michael Van Valkenburgh Associates Inc," accessed October 17, 2025, https://www.mvvainc.com.

[101] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org," accessed October 17, 2025, https://www.asla.org/ContentDetail.aspx?id=29648

[102] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."

[103] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."

[104] Martin C. Pedersen, "Michael Van Valkenburgh on the Making of Brooklyn Bridge Park," *Common Edge*, n.d., accessed October 17, 2025, https://commonedge.org/michael-van-valkenburgh-on-the-making-of-brooklyn-bridge-park/.

[105] Michael Van Valkenburgh Talks about Redesigning North Grant Park in Chicago, 2010, https://www.youtube.com/watch?v=LvgzCINi9Ks.

[106] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."

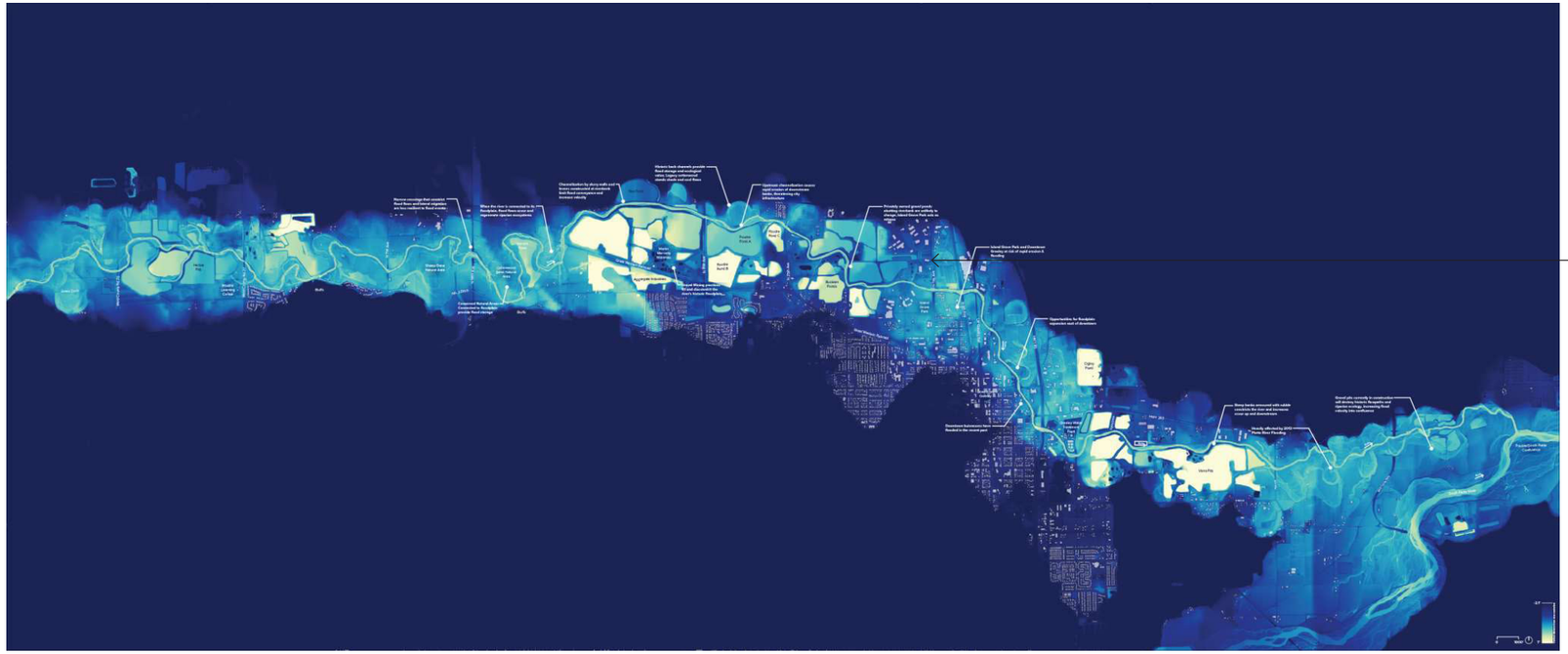
[107] "Michael Van Valkenburgh Associates Inc," accessed October 17, 2025, https://www.mvvainc.com.

[108] "Michael Van Valkenburgh Associates Inc."

[109] Sara B. Wickham et al., "Incorporating Place-Based Values into Ecological Restoration," *Ecology and Society* 27, no. 3 (2022): 2.

Michael Van Valkenburgh describes his practice's work as a form of ecological urbanism, one that "favors dynamic integration between natural and urban systems" rather than separating them into distinct categories.[110] In the aesthetic language of their drawings, this integration manifests through what has been called "hyper-nature" which is a deliberate exaggeration of topography, texture, and vegetation to make ecological performance visible and emotionally resonant. By heightening natural forms MVVA produces landscapes that feel both familiar and uncanny, inviting a sensory connection that links ecological process with human delight.

This strategy ensures that environmental function is not hidden in technical detail but made legible through visual drama, turning ecological systems into a source of wonder rather than abstraction. Their renderings, often densely layered with vegetation, people, and infrastructure, work as narrative tools that translate ecological processes into lived experience, reinforcing Van Valkenburgh's belief that "ecological urbanism should be felt as well as understood".[111]



Land use mapping situates the planning in the scale of the watershed

Fig. 3.3.14 Poudre River current land use. *Image courtesy of Michael Van Valkenburgh Associates Inc.*

[110] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."
[111] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."

Balances technical information with simple visual clarity for easy understanding

Compares typical and flood conditions to emphasize transformation

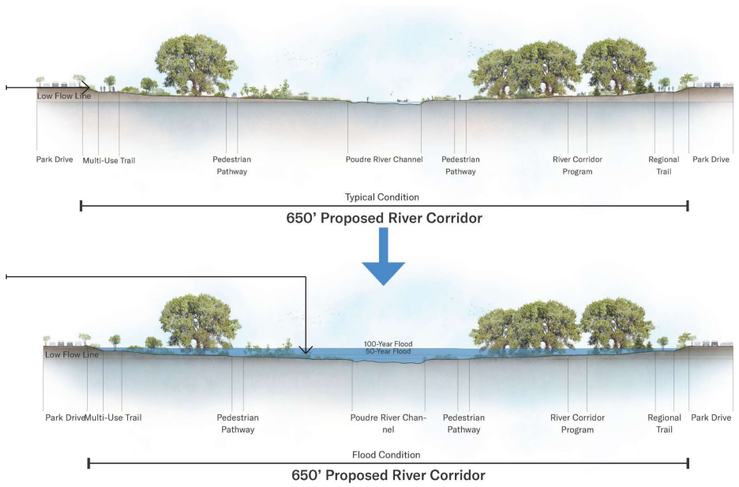


Fig. 3.3.15 Poudre River section showing riparian zones and flood lines. *Image courtesy of Michael Van Valkenburgh Associates Inc.*

Calls out key, site-specific, species

Illustrates the relationship of water and ecology through section

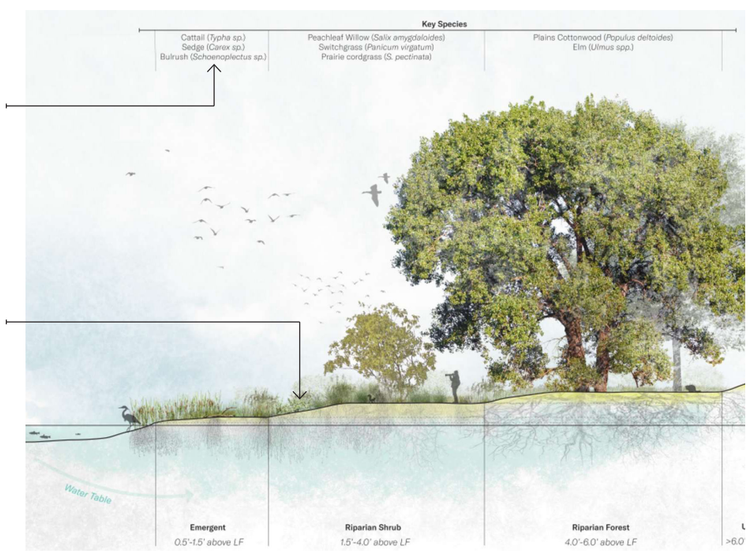


Fig. 3.3.16 Poudre River section showing different riparian zones. *Image courtesy of Michael Van Valkenburgh Associates Inc.*



Shows seasonality through fall colours

Foregrounds the lived experience

Situates community in the project

Fig. 3.3.17 Poudre River render. *Image courtesy of Michael Van Valkenburgh Associates Inc.*



Integrates daily recreation with restored ecological function

Shows recreation

Fig. 3.3.18 Poudre River render. *Image courtesy of Michael Van Valkenburgh Associates Inc.*

Michael Van Valkenburgh emphasizes that meaningful design for the public realm "can't happen without a public process that teaches you as much as you try to teach others".[112] In projects such as Brooklyn Bridge Park, MVVA and its collaborators led hundreds of open meetings over more than two decades, ensuring that the evolving design reflected both ecological priorities and community values. Van Valkenburgh describes this engagement as a form of design education through dialogue, in which residents learn about the complexities of waterfront ecology while the design team learns about patterns of use, memory, and meaning from those who inhabit the site.

This iterative process "on the order of 200 to 250 meetings," as he notes, produced a park that balances habitat restoration, recreation, and access in ways that could not have emerged from top-down design alone. Rather than treating engagement as consultation, MVVA treats it as co-production, a feedback system that shapes spatial and ecological decisions at every stage. This ethos aligns closely with the firm's visual strategy of hyper-nature: both their drawings and their outreach practices make ecological performance visible, legible, and emotionally resonant, turning public participation into a generative design tool rather than a procedural requirement.[113]

[112] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."

[113] "Interview with Michael Van Valkenburgh, FASLA | Asla.Org."



Fig. 3.3.19 Poudre River community youth engagement with large scale drawings. *Image courtesy of Michael Van Valkenburgh Associates Inc.*



Fig. 3.3.20 Poudre River community youth engagement with large scale drawings. *Image courtesy of Michael Van Valkenburgh Associates Inc.*

3.3.4 Conclusion

While SCAPE, Sasaki, and MVVA exemplify these principles through large-scale transformative projects, the methodologies they employ (participatory design, boundary spanning, clear visual communication, and long-term stakeholder engagement) are equally as applicable and essential to smaller-scale interventions such as the Riverside Dam removal. Low-head dams, while more modest in physical scope, are still key components of larger riverine systems and carry significant climate change implications through their effects on hydrology, sediment transport, habitat connectivity, and flood resilience. Low-head dam removals should not be understood as an isolated intervention but as opportunities to learn, establish community trust, and develop replicable engagement frameworks that can inform larger restoration efforts. The same principles of co-design, transparent visualization, and inclusive participation that guide urban waterfronts and regional parks can be applied to projects of smaller scales. By doing this, designers and city officials can ensure that even small-scale projects contribute meaningfully to systemic ecological recovery, climate adaptation, and the democratic shaping of resilient landscapes.

CHAPTER 4

Guidelines to Inspire Negotiated Design, and how that looks at Riverside Dam

The Guidelines:

1. Contextual Clarity
   - 1.1 Situated Ecology
   - 1.2 Acknowledge Contested Histories and Uncertain Futures
   - 1.3 Use Familiar Reference Points
   - 1.4 Use Clear Language and Include Navigational Aids

2. Embodied Perspective
   - 2.1 Use of Viewpoints, Not Just Plans
   - 2.2 Center Diverse Bodies and Cultural Memories
   - 2.3 Emphasize Relational Presence

3. Temporal Layering
   - 3.1 Reveal Ecological Succession and Seasonal Changes
   - 3.2 Make Climate Futures Viscerally Present
   - 3.3 Acknowledge Uncertainty and Cultivate Adaptive Capacity

4. Make Conflict Visible
   - 4.1 Side-by-side Views and Acknowledge Loss
   - 4.2 Credit the Source of Each View
   - 4.3 Situating Scale of Impact
   - 4.4 Centering Non-Human Perspectives

5. Engagement Principles
   - 5.1 Modifiability/Co-Creation
   - 5.2 Frame as Draft
   - 5.3 Writable Zones and Prompts
   - 5.4 Highlight Decision Points and Trade-Offs

6. Use of Physical Space
   - 6.1 Large-Scale Prints
   - 6.2 Place in Everyday Spaces

As highlighted throughout the entirety of this thesis, drawings and participatory methods play a critical role in how design proposals are communicated and negotiated in public. In contexts of ecological restoration, climate adaptation, or heritage change (especially where community memories and emotions are deeply rooted), these representational strategies must do more than illustrate a future outcome. They must help people see themselves in that future, understand what's at stake, and imagine alternatives.

The following representational practices are communicative frameworks, visual and spatial techniques that foster transparency, elicit input, and support more inclusive and situated decision-making. Together, they aim to build legibility, invite participation, inspire informed conversations, and make both opportunity and tension visible within the design process.

4.1 CONTEXTUAL CLARITY

Before drawings can foster meaningful public engagement, we must first interrogate what we mean by "context" itself. The settler-colonial discipline of landscape architecture has historically treated context as a bounded, mappable site. A parcel land to be surveyed, abstracted, and represented through Cartesian grids and property lines. As Tuck and Yang argue, "decolonization is not a metaphor", it requires fundamentally rethinking our relationship to land.[1] From Indigenous perspectives, context is not something that can be contained within cadastral boundaries and reduced to ecological inventories. Instead, it's a web of relationships that extend across time, scale, and species, connecting present communities to ancestors and future generations, to watershed systems and atmospheric processes, to more-than-human kin.[2]

"All My Relations" is a phrase common to many Indigenous nations across Turtle Island, reminding us that context encompasses not just spatial relationship but kinship obligations to all the animate and inanimate forms that can be seen or imagined.[3] Robin Wall Kimmerer, a Potawatomi botanist, writes that Indigenous ways of knowing require us to "engage with the world… with all the gifts of the human, not just our intellect, but with mind, body, emotion, and spirit".[4] This understanding of context as relational, reciprocal, and sacred stands in contrast to Western representational practices that have historically been used as "spatial discipline", tools to "exert control over geography, nature, and human inhabitants" who were "regularly seen as expendable or an obstacle to some Eurocentric notion of progress".

Donna Haraway's concept of situated knowledges offers a bridge between these perspectives: all representations emerge from particular, embodied positions, and claiming objectivity often masks the partiality and power

[1] Eve Tuck and K. Wayne Yang, "Decolonization Is Not a Metaphor," Decolonization: Indigeneity, Education & Society 1, no. 1 (2012): 2, 6.

[2] Robin Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge," in *Human Dimensions of Ecological Restoration: Integrating Science, Nature, and Culture*, ed. Dave Egan et al. (2011): 259-60, 268-69.

[3] "All My Relations," Government of Alberta, n.d.

[4] Robert Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*, 2013, 259.

embedded in how we see.[5] For landscape architects working in settler-colonial contexts, this means acknowledging that our drawings are never neutral descriptions of "what is there," but active constructions that privilege certain ways of knowing while marginalizing others. As Martin Dodge and Chris Perkins note, building on J.B. Harley's essay "*Deconstructing the Map*," maps "function as social texts" that do much more than store spatial data, they participate in systems of knowledge, power, and exclusion where certain voices are privileged and others silenced.[6] Indigenous cartographic practices, by contrast, function as "expressions of belonging, re-existence, and resistance", recording not just physical geography, but worldview, history, and spirituality.

So, what does this mean for representational practice? It means contextual clarity cannot be achieved simply by making drawings more legible or adding more ecological data. It requires asking deeper questions: Whose context? Whose knowledge systems are legitimated? What relationships are made visible, and which remain hidden? Which temporal scales are represented? Objectivity is never a view from nowhere; representations arise from partial, situated positions that carry power. In cartographic practice, what maps render legible also reflects social selection and exclusion.[7] A decolonizing approach to contextual clarity means that we recognize that:

- Colonial property boundaries do not reflect Indigenous territorial relationships, treaties, or traditional land use patterns.[8]
- Ecological "baselines" are often defined relative to post-colonial conditions, erasing millennia of Indigenous land stewardship and what the land was before dispossession.
- Site names carry colonial histories; official place names often erase Indigenous languages and the stories embedded in the land.

True contextual clarity, then, requires being explicit about positionality, acknowledging what and whom our drawings inevitably fail to represent, and creating space for multiple, sometimes contradictory, ways of knowing how to coexist.[9] The following guidelines aim to foster contextual clarity as a partial, situated, and relational practice that acknowledges diverse knowledge systems:

[5] Donna Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," Feminist Studies 14, no. 3 (1988): 581-83, 588-90.

[6] Martin Dodge and Chris Perkins, "Reflecting on J.B. Harley's Influence and What He Missed in 'Deconstructing the Map,'" Cartographica 50, no. 1 (2015): 37–38.

[7] Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," 581–83, 587–90; Dodge and Perkins, "Reflecting on J.B. Harley's Influence and What He Missed in 'Deconstructing the Map,'" 37–38.

[8] "Mapping Stories and Cultures | Global Policy Journal," May 8, 2025, https://www.globalpolicyjournal.com/blog/08/05/2025/mapping-stories-and-cultures.

[9] Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective."

4.1.1 Situated Ecology

The actual ecological details of the site need to be shown: the species, materials, and landforms. This is not limited to Latin nomenclature and conventional ecological surveys. Where possible and appropriate, drawings should include Indigenous names, uses, and relationships to plants, animals, and landforms. Generalized greenery, greenwashing, or abstract water features can flatten ecological richness and reduce local meaning. Amoroso (2020) highlights examples where multi-layered mapping is used to foreground site-specific ecologies, drawing attention to real organisms and materials rather than symbolic forms.[10]

Where possible, include Traditional Ecological Knowledge (TEK). This means not just representing what species exist, but their relationships, seasonal patterns, traditional harvesting practices, and cultural significance. As Kimmerer emphasizes, plants are not objects to be managed, but teachers and kin in reciprocal relationships.[11] Representational techniques might include: seasonal diagrams showing cycles, or deep sections showing subsurface relationships, between roots, hydrology, and soil horizons, making visible the "performative ground" beneath the visible surface.[12]

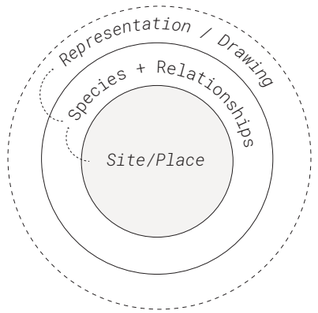


Fig. 4.1.1 "Situated Ecology" diagram. *Made by author.*

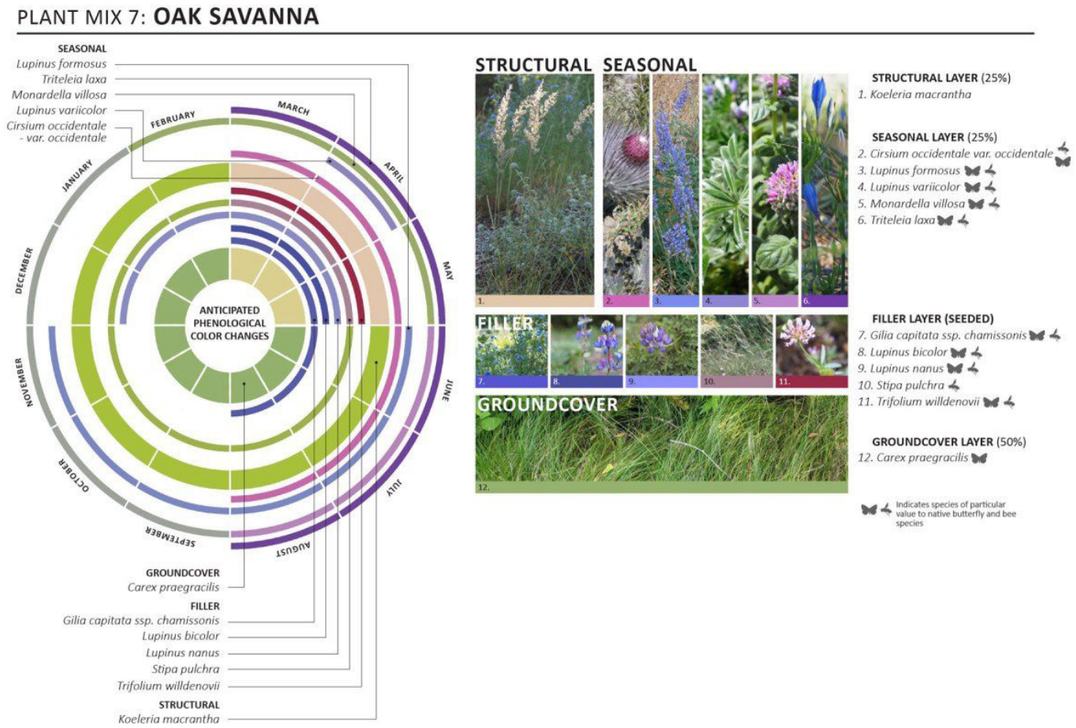


Fig. 4.1.2 "Eco-Patch Test Garden" Field Collective: Example of "situated ecology". The example shows flora/fauna and seasonal colour cycles, illustrating how drawings can foreground ecological relationships rather than symbolic greenery. *Image by Field Collective.*

[10] Nadia Amoroso, *Representing Landscapes: Visualizing Climate Action*, 2024.

[11] Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge." 259-60, 263-64, 268-69, 272.

[12] "The Performative Ground: Rediscovering The Deep Section," *Scenario Journal*, March 24, 2012, https://scenariojournal.com/article/the-performative-ground/.

4.1.2 Acknowledge Contested Histories and Uncertain Futures

Name the land's colonial history explicitly: Who's traditional territory? What treaties (if any)? Make visible to what the project would mean both to Indigenous reconciliation and ecological restoration/health.

Any uncertainties in the design proposal should be conveyed, whether they are still under study, contested, or dependent on public input. It is cautioned that visuals stripped of uncertainty risk alienating publics.[13] This can be done using faded lines, dashed elements, or labels to differentiate what is confirmed versus what is speculative. It is better to point out what is speculative rather than creating false promises over something that cannot be built.

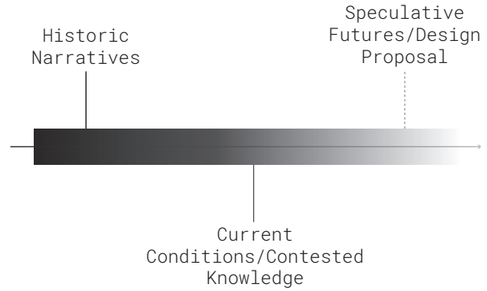


Fig. 4.1.3 "From documented histories to speculative futures" diagram. *Made by author.*



Fig. 4.1.4 "StoryMine" Layered visualization depicting the transformation of an industrial landscape over time. The drawing acknowledges contested histories by juxtaposing archival imagery with present and speculative future conditions, making visible both the colonial legacy of extraction and the ecological uncertainty of potential restoration. *Accessed from LandArch, image courtesy of Pelin Gezer, METU.*

[13] Renae Walton and Karyn Bosomworth, "Innovative or Unrealistic: Reflections on the Use of Landscape Architecture Visualisations in Climate Change Planning," *Australian Journal of Maritime and Ocean Affairs*, 2017: 102-3.



Fig. 4.1.5 "Reserva Botanica Layered visualization juxtaposing historical land-use to imagined land restoration. This visualization acknowledges colonial histories. *Accessed from LandArch, image by I.M.S Arquitectura.*

4.1.3 Use Familiar Reference Points

Ground the representation in landmarks, views, and experiential qualities that communities already know, not just the abstract geometries legible to professionals. This might include: views from specific gathering places; relationships to neighbouring sites of cultural significance; or connections to watershed-scale systems that communities experience through flooding, drought, or seasonal change. By doing this, it can help people orient themselves spatially and emotionally within the new design. As Sheppard (2005) notes, familiarity builds legibility, and emotional orientation is key to making visuals interpretable across audiences.[14]

Be cautious of who landmarks and views are familiar to. Different users may have different attachments/landmarks that would garner a different emotional connection to the design.

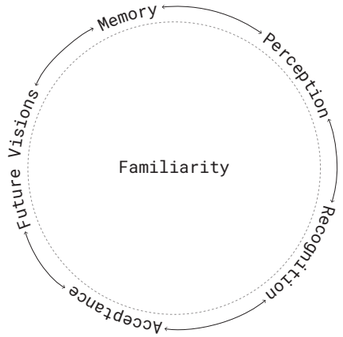


Fig. 4.1.6 "Use familiar reference points" diagram. *Made by author.*

[14] Stephen R.J. Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," Mitigation and Adaptation Strategies for Climate Change 8, no. 6 (2005): 640-48.



Fig. 4.1.7 Illustration from *Observations on the Theory and Practice of Landscape Gardening*. This illustration anchors the viewer's understanding through recognizable landmarks and experiential perspectives. The viewer is able to take physically lift the changes in the landscape off of the base painting, keeping all the familiar aspects accessible. *Paintings by Humphry Repton, 1805.*

4.1.4 Use Clear Language and Include Navigational Aids

Avoid unexplained technical terms and symbols. Add legends, north arrows, and scalar figures to help viewers interpret the image independently. It may also be helpful to question the usefulness of Western cartographic conventions: Is north-up orientation meaningful here, or could another orientation reflect how communities actually navigate and experience place? Consider multi-lingual labelling if/when appropriate.

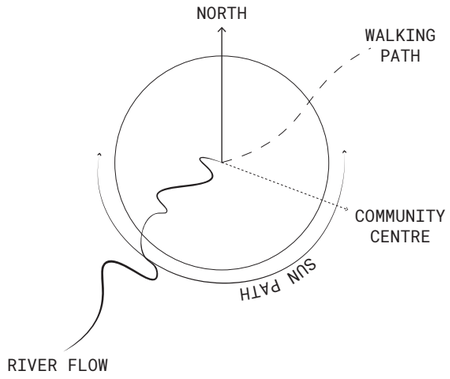


Fig. 4.1.8 "Alternative idea of a navigational aid" diagram. *Made by author.*

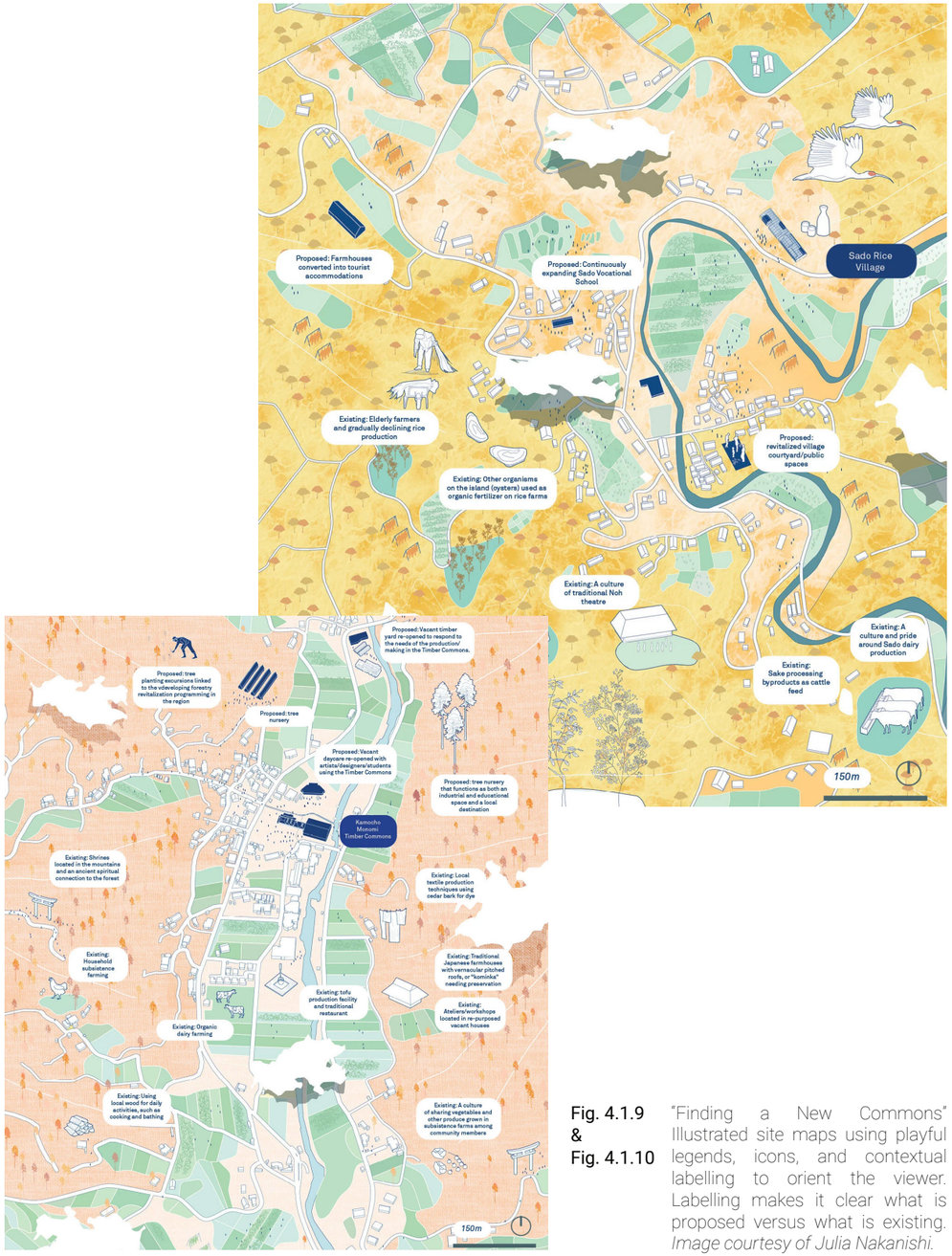


Fig. 4.1.9 & Fig. 4.1.10 "Finding a New Commons" Illustrated site maps using playful legends, icons, and contextual labelling to orient the viewer. Labelling makes it clear what is proposed versus what is existing. *Image courtesy of Julia Nakanishi.*

The Social Landscape of Riverside Dam

Current Publicly Accessible Information:

Riverside Dam Class Environmental Assessment
Environmental Study Report (ESR)
City of Cambridge
July 2018

amec foster wheeler

Table 1.1. Stakeholder Workshop Invitation and Attendance Record

Organization	Workshop No. 1 – May 24, 2017	Workshop No. 2 – June 27, 2017
Waterloo Wellington Canoe Club	×	×
Ancient Mariners Canoe Club	✓ two representatives attended	✓ one representative attended
Preston Heights Community Group	×	×
Preston Town Centre (BIA	✓ one representative attended	✓ one representative attended
K-W Cambridge Bassmasters	×	×
P&H Milling	✓ one representative attended	×
Save the Dam	✓ one representative attended	✓ one representative attended
MHAC	✓ three representatives attended	✓ one representative attended
CEAC	✓ one representative attended	✓ one representative attended
Mayor of Cambridge	×	×
City of Cambridge Councillor Ward 1	✓	✓
City of Cambridge Councillor Ward 3	✓	✓
City of Cambridge – Community Services Department	✓	✓
City of Cambridge – Development and Infrastructure Department	✓ two representatives attended	✓ three representatives attended
Regional Councillor – City of Cambridge	×	×
Region of Waterloo	✓ one representative attended	✓ one representative attended
GRCA	✓ two representatives attended	✓ one representative attended
MNRF	✓ one representative attended	×

Fig. 4.1.11 "Stakeholder Workshop Attendance Record" for 2017 SAC's. *Page from Riverside Dam Class EA.*

What's Missing from the Publicly Accessible Information:

While stakeholders are listed, they are not mapped. The City's material does not indicate where each group's activities occur, where their concerns are concentrated, or how their responsibilities overlap at the dam. Without showing these spatial relationships, it becomes difficult for the public to understand how decisions affect different users, which parts of the site matter to whom, or how local ecological and cultural practices align with governance boundaries. By presenting stakeholders only as names in a list, the City's material obscures the lived relationships between people, place, and river processes that could shape the decision.

Proposed Drawing:

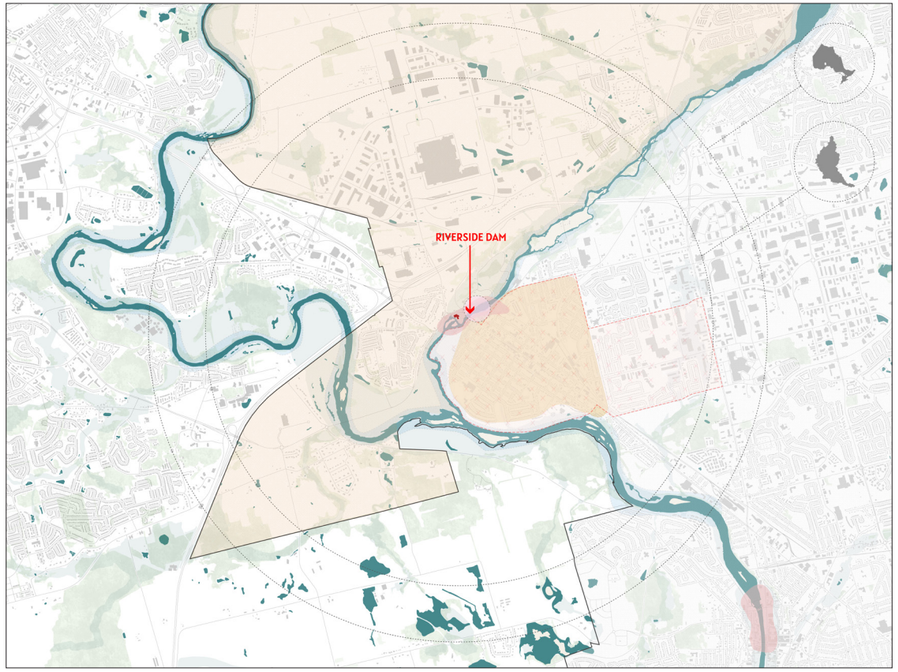


Fig. 4.1.12 "The Social Landscape of Riverside Dam" Riverside Park stakeholders spatialized, thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Situated Knowledge:

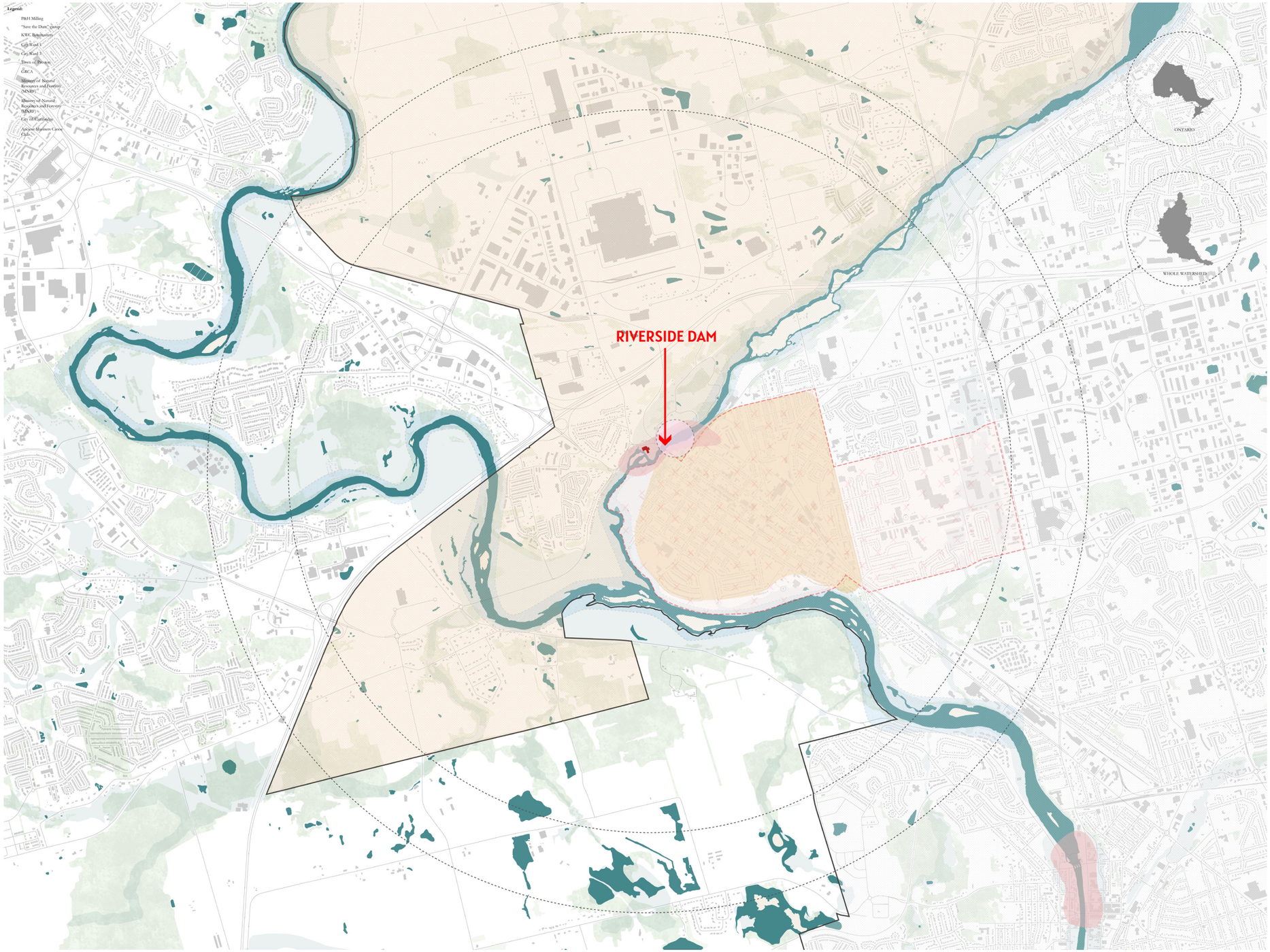
- expands the project's context beyond just the dam structure and millpond, highlighting surrounding neighbourhoods, river edges, and adjacent lands that shape how the site is lived and understood

Acknowledge Contested Histories and Uncertain Futures

- reveals how multiple groups, responsibilities, and interests converge at the dam, showing that the project is embedded in layered social, ecological, and cultural geographies

Intentions of Proposed Drawing:

The intention of the drawing is to show that even a seemingly small, site-specific intervention like the Riverside Dam has a much wider reach than the project footprint suggests. The drawing highlights the broader social, ecological, cultural, and recreational relationships that converge at this site. It makes visible how decisions made here ripple outward to affect different users, patterns of use, stewardship responsibilities, and everyday experiences along the river. By situating stakeholders spatially, the drawing helps viewers understand that the project is not isolated but embedded within a living network of people and places. Its goal is to support more informed engagement by showing that even small-scale infrastructure choices create far-reaching impacts across the community and landscape.



Legend

- P&H Milling
- "Save the Dam" group
- KWC Bassmasters
- City Ward 1
- City Ward 3
- Town of Preston
- GRCA
- Ministry of Natural Resources and Forestry (MNRF)
- City of Cambridge
- Ancient Mariners Canoe Club

Fig. 4.1.13 "The Social Landscape of Riverside Dam" Riverside Park stakeholders spatialized. *Made by author.*

4.2 EMBODIED PERSPECTIVE

Before drawings can engage publics in climate action and environmental stewardship, we must interrogate how perspective itself is constructed and who we are centering our visualizations around.

From Indigenous perspectives, knowledge is fundamentally embodied. It is inseparable from the sensory, emotional, and spiritual dimensions of being in relationship with place. As Liz Cameron, an Indigenous scholar working with Australian Aboriginal communities explains, embodied knowledge is "the sensory information built upon repeated observation through an immersion of self within a cultural place – that serves as a foundation to belonging".[15] Indigenous ways of knowing require engagement through all the senses: seeing, hearing, touching, smelling, tasting, intuiting, and imagining.[16] This multisensory knowing allows Indigenous people to "connect, analyze, predict, and measure changes in Country" through bodily experience rather than abstract data alone.[17]

This understanding resonates with the work of Maurice Merleau-Ponty, who argued that perception is not a passive reception of sensory data, but "an active, embodied engagement with the world."[18] The concept of the *lived body* (*le corps propre*) – the body not as object but as the means through which we perceive and make meaning – offers a bridge between Indigenous embodied knowing and Western phenomenology.[19] As phenomenologist/environmental David Seamon elaborates, environmental embodiment describes "the various lived ways, sensorily and motility-wise, that the body in its pre-reflective perceptual presence engages and synchronizes with the world at hand".[20] For architects/landscape architects alike, this means recognizing that our drawings do not simply represent space, but actively shape how bodies will move through, sense, and emotionally connect to designed environments.

[15] Liz Cameron, "Indigenous Ecological Knowledge Systems – Exploring Sensory Narratives," *Ecological Management & Restoration* 23, no. S1 (2022): 27–28.

[16] Cameron, "Indigenous Ecological Knowledge Systems – Exploring Sensory Narratives." 28-31.

[17] Cameron, "Indigenous Ecological Knowledge Systems – Exploring Sensory Narratives." 31.

[18] Maurice Merleau-Ponty et al., *Phenomenology of Perception*, 2013. x-xiv.

[19] Merleau-Ponty et al., *Phenomenology of Perception*. x-xiv.

[20] David Seamon, "Merleau-Ponty, Perception, and Environmental Embodiment: Implications for Architectural and Environmental Studies," Carnal Echoes: *Merleau-Ponty and the Flesh of Architecture*, 2010, 1-2.

The importance of embodied perspective becomes particularly acute in the context of climate change. Traditional climate communication often relies on abstract data, distant futures, and disembodied facts that feel far removed from the individual. Immersive reality technologies, in particular Virtual Reality (VR), have become powerful tools for climate education precisely because they create embodied experiences that situate learners within environmental scenarios. Markowitz et al. found in their studies of VR climate education that "participants will experience negative environmental events first-hand and the issues will be made psychologically closer," leading to significant knowledge gains and attitude changes toward the environment.[21]

The importance of embodied perspective is fundamentally about representation: whose bodies appear in our drawings, and whether community members can see themselves, meaning their daily lives, their cultural practices, their future possibilities, within the design proposal.

Embodied perspective is about creating representational practices that:

- Honour multiple ways of knowing, particularly Indigenous sensory and embodied epistemologies that have sustained healthy relationships with land for millennia.[22]
- Leveraging emerging technologies like immersive VR to overcome psychological distance and foster emotional connection to climate impacts.[23]
- Center diverse bodies and lived experiences in visualizations so that all community members can see themselved as agents within designed futures.
- Cultivate emotional engagement and empathy as necessary preconditions for environmental stewardship and climate action.[24]

True embodied perspective requires acknowledging that visualization is not neutral. Our choice of viewpoint, scale, figures, and representational medium, shapes not only what people see, but how they feel and connect, and whether they are moved to act. The following guidelines aim to foster embodied perspective as relational, multisensory, and emotionally engaged practice that centers lived experience and cultivates the conditions for meaningful climate action.

[21] David M. Markowitz et al., "Immersive Virtual Reality Field Trips Facilitate Learning about Climate Change," *Frontiers in Psychology* 9 (2018): 4.

[22] Fikret Berkes, *Sacred Ecology* (2017), 45-46, 55.

[23] Markowitz et al., "Immersive Virtual Reality Field Trips Facilitate Learning about Climate Change." 4-5.

[24] Cameron, "Indigenous Ecological Knowledge Systems – Exploring Sensory Narratives." 32-34.

4.2.1 Use of Viewpoints, Not Just Plans

Plans are helpful for technical coordination and understanding the spatial arrangement of elements, however, eye-level perspectives, vignettes, and immersive views center the lived, sensory experience of the communities that will be inhabiting these spaces. As Sheppard argues in his work on landscape visualization and climate change, realistic visualizations at human scale have the power to convey what it might be like to experience climate change, making the concept feel far less removed.[25] Plan views by their very nature remove viewers from this immersive reality, positioning them as external viewers.

So, in practice this means pairing plans with perspectives that show specific human vantage points. This can also mean using a plan to call out specific vignettes of lived everyday experiences (people waiting for a bus, children playing near stormwater infrastructure, elders resting in the shade) to make the design proposals legible at a human-scale.

This also means clearly labelling where viewpoints correspond to moments on a plan, creating a "cognitive bridge" between technical documentation and experiential understanding.

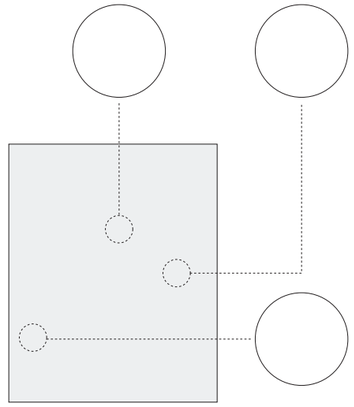


Fig. 4.2.1 "Use of viewpoints" diagram. *Made by author.*

[25] Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," 2005, 646, 652.



Fig. 4.2.2 Perspective rendering showing commmunity activity at eye level, illustrating how immersive viewpoints can communicate lived, sensory experiences of a space. This drawing foregrounds human scale, everyday interactions, and environmental context. *Image Courtesy of © greenbox Landschaftsarchitekten, Hannes Banzhaf (Illustration).*

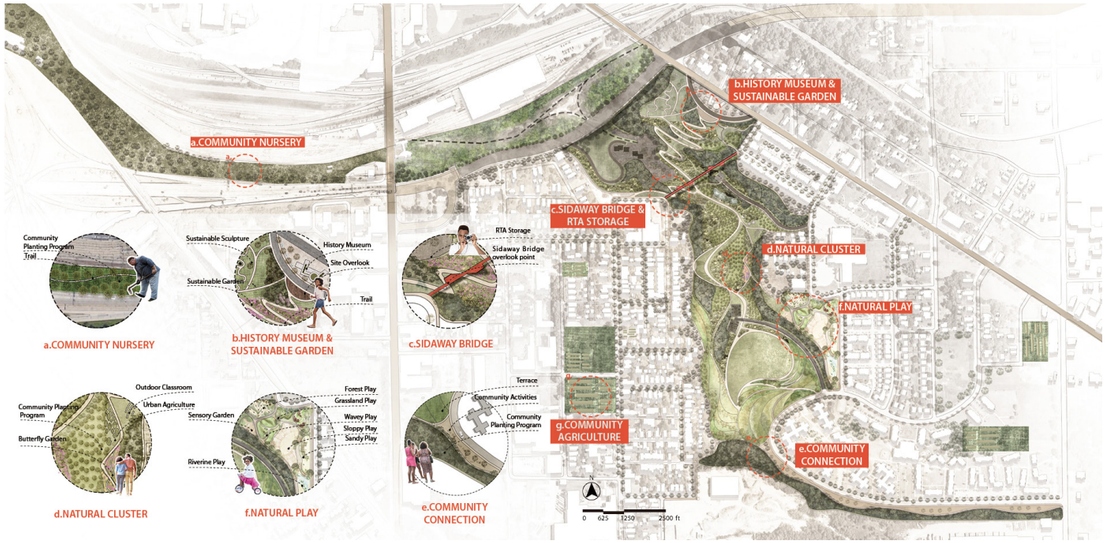


Fig. 4.2.3 "Laces, Ties and Knots": site plan paired with targeted perspective vignettes illustrating specific moments of community interaction and ecological intervention. This drawing demonstrates the combination of plants and illustrations, calling out specific points on the plan and how that looks for the community members. *Image accessed from ASLA, drawing by Xinyue (Hope) Shen.*



Fig. 4.2.4 "Under the Canopy": A Shared Democratic Commons" Chenxi Wang: example of a hybrid drawing, an axonometric overlaid with multiple embedded viewpoints illustrating how small scale interactions exist within a larger system. *Accessed through LandArch, image courtesy of Chenxi Wang.*

4.2.2 Center Diverse Bodies and Cultural Memories

Diverse figures in architectural and urban visualizations should reflect real community demographics, not generic or homogenized representations of humanity. Showcasing people of varied ages, abilities, cultures, and backgrounds engaged in everyday activities reinforces cultural memory and social inclusion.[26]

This is particularly important in the face of climate change, as vulnerable populations, including Indigenous communities, low-income neighbourhoods, and people with disabilities, are disproportionally impacted by climate risks, yet often excluded from climate planning processes and visual representations of climate futures.[27]

In practice, this means conducting demographic research, depicting everyday activity specific to the demographic/use of the site, showing intergenerational relationships, and especially being mindful of tokenism.

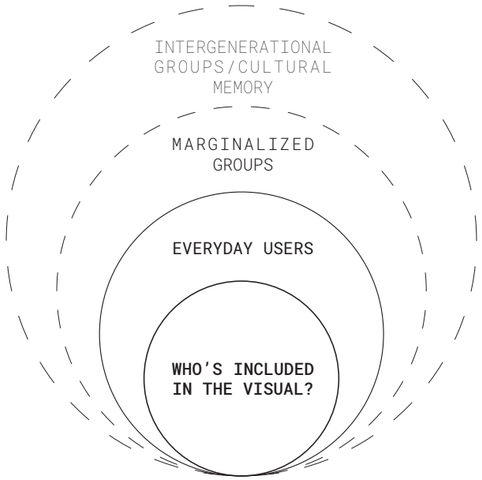


Fig. 4.2.5 "Who's Included in the Visual" diagram. *Made by author.*

[26] Emily Nonko, "Why the Tiny People in Architectural Renderings Need to Be Diverse," Curbed, February 22, 2017, https://archive.curbed.com/2017/2/22/14640048/scale-figures-architectural-images-diversity.

[27] H.A Bulkely et al., "Climate Justice and Global Cities: Mapping the Emerging Discourses," Global Environmental Change 23, no. 5 (2014): 916-18, 920-21.

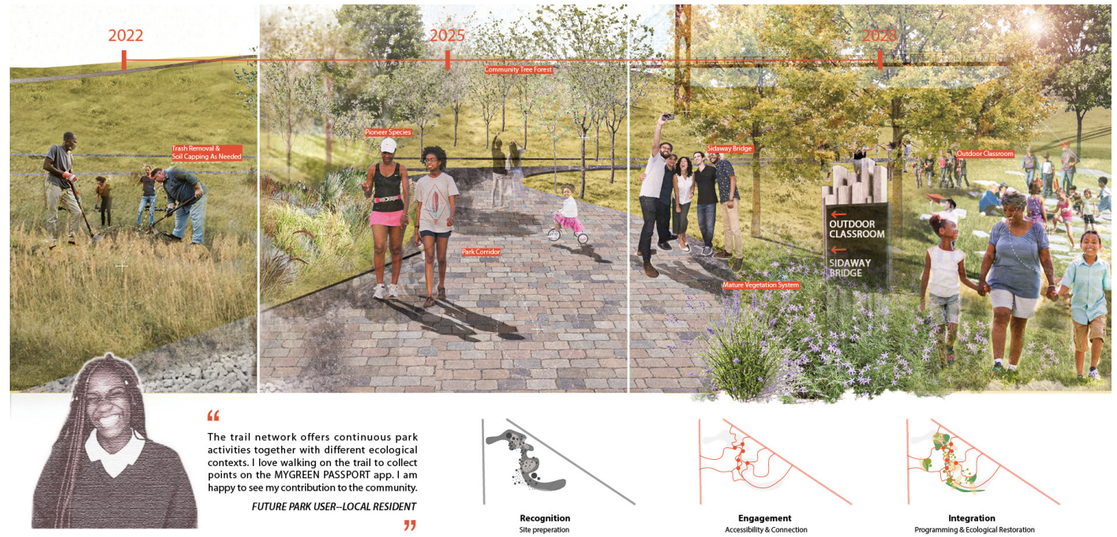


Fig. 4.2.6 "Laces, Ties and Knots": centering real likeness of community members throughout the imagery describing the project. *Image accessed from ASLA, drawing by Lai Ching Tsui, andXinyue (Hope) Shen.*

4.2.3 Emphasize Relational Presence

Drawings should use both human and more-than-human figures to illustrate the dynamic relationship among people, water, land, infrastructure, plants, animals, and atmospheric processes. This approach centers lived experience over abstraction, showing the land as an active field where human and environmental forces co-produce spatial and temporal change.[28]

Traditional landscape representation often treats landscapes as aesthetic objects, something beautiful to be admired rather than as relational assemblages constituted through ongoing interactions among diverse reactions.[29] Qviström's work on relational ontology in landscape architecture challenges this objectification, arguing that landscapes should be understood as "enacted and shaped in many different, conflated and sometimes conflicting ways" through the "unfolding of relations".[30]

Indigenous relational ontologies offer profound insights here. As articulated through concepts like "All My Relations", Indigenous ways of seeing emphasizes the relationship between things rather than the things themselves, recognizing that nothing exists in isolation.[31]

In practice this means depicting water, wind, sunlight, and seasonal changes as active presences. It also means including non-human species (pollinators, birds, fish, soil organisms) as visible actors within landscape, particularly in ecological restoration or climate adaptation projects.

Using arrows, flows, cycles, and other diagrammatic elements can help translate scientific or technical processes into smaller, digestible diagrams to reveal processes over time.

Lastly, this also means showing infrastructure in relation to ecological and social systems it supports or disrupts (ie. A seawall protects human development but alters shoreline ecology, or how a community garden connects food security to cultural practice).

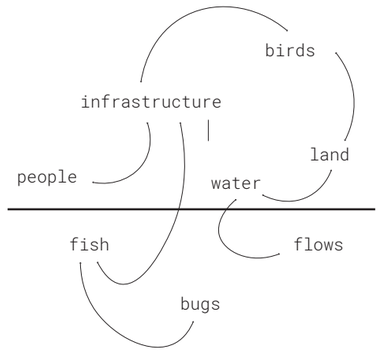


Fig. 4.2.7 "Above and Below Ground Relationships" diagram. *Made by author.*

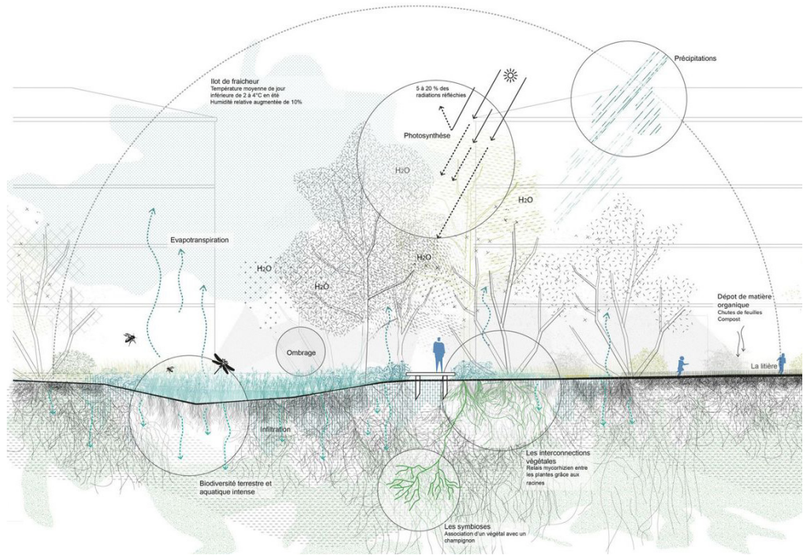




Fig. 4.2.8 "Urban Hedgerow" Coloco: Section diagram illustrating multi-scalar ecological relationships across water, soil, vegetation, and species. This layered visualizations shape the landscape. *Accessed through Coloco, project owned by City of Chantepie. Drawing done by Alexis Goncalves.*

Fig. 4.2.9 "Chatahoochee Riverlands" SCAPE: Perspective rendered section foregrounding human interactions within the riverine landscape. The drawing situates more-than-human species as active agents rather than a backdrop. *Image courtesy of Scape studio.*

[28] Cathryn Dwyre and Chris Perry, "Expanded Fields: Architecture/Landscape/Performance," PAJ (Baltimore, Md.) (1 Rogers Street, Cambridge, MA 02142-1209, USA) 37, no. 1 (2015): 2–6.

[29] Anna Jorgensen, "Beyond the View: Future Directions in Landscape Aesthetics Research," Landscape and Urban Planning at 100 100, no. 4 (2011): 353–55.

[30] Mattias Qviström, "Decentring Landscape: Rethinking Landscape Analysis with a Relational Ontology," *Landscape Research* 48, no. 8 (2023): 1110, 1116.

[31] Zoe Todd, "An Indigenous Feminist's Take On The Ontological Turn: 'Ontology' Is Just Another Word For Colonialism," Journal of Historical Sociology 29, no. 1 (2016): 32-33.

Systems in Relation

Current Publicly Accessible Information:

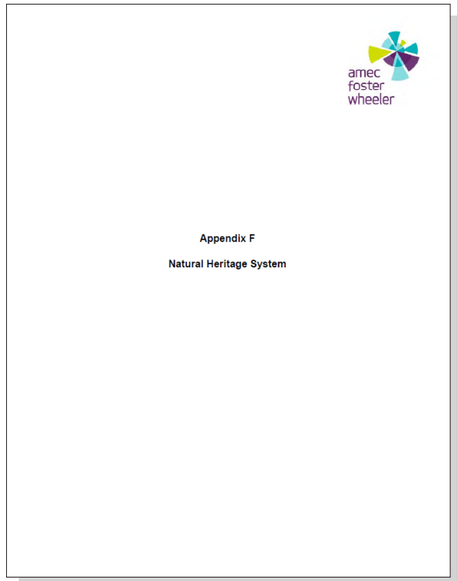




Fig. 4.2.10 (top) Cover of "Appendix F Natural Heritage System". *Page from Riverside Dam Class EA.*

Fig. 4.2.11 (bottom) Photo-realistic render of final "Rebuild the Dam" option. *Image from the council report presented December 3, 2024.*

What's Missing from the Publicly Accessible Information:

Although a Natural Heritage Appendix technically exists within the Environmental Assessment materials, it is buried deep inside the fourth PDF of the Natural Environment Report making it extremely difficult for the public to access. Finding it requires downloading multiple large files, scrolling through hundreds of pages, and knowing in advance what to look for. This placement effectively hides important ecological information from residents who may not have the time, bandwidth, or technical ability to navigate such unwieldy documents. As a result, the ecological relationships, species impacts, and non-human considerations associated with the Riverside Dam remain largely invisible to the public. The inaccessibility of this material reinforces a narrow understanding of the site and limits the community's ability to engage meaningfully with the full ecological context of the project.

Proposed Drawing:

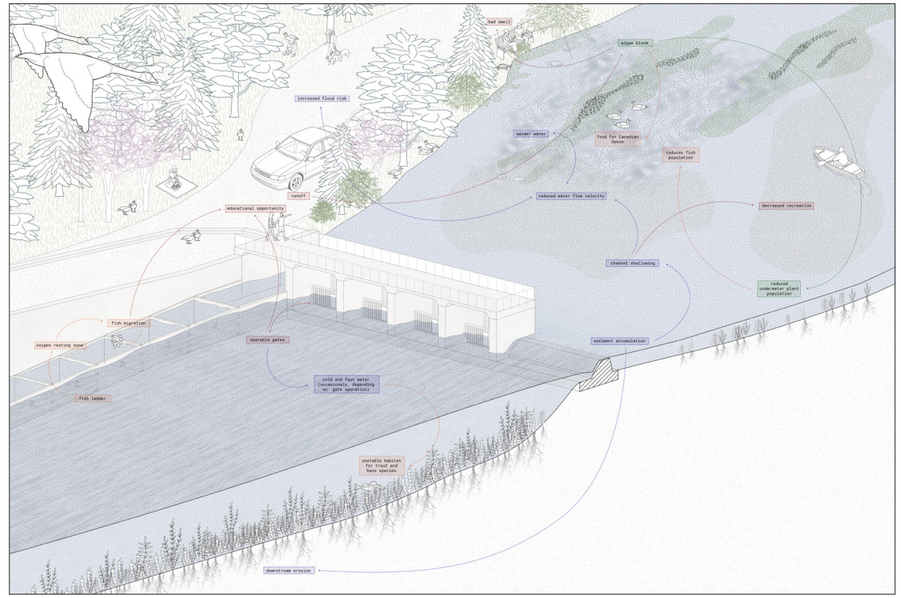


Fig. 4.2.12 "Systems in Relation" Rebuild the Dam thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Emphasize Relational Presence:

- using both human and non-human presence in the drawing
- has arrows depicting how everything has a a relationship/chain reaction to other existing things or people on the site

Use of Viewpoints, Not Just Plans:

- takes advantage of a section/perspective drawing to make relationships under water visible to the viewer

Intentions of Proposed Drawing:

The following drawings expand the City's technical representations by visualizing the ecological and social relationships that are invisible in typical plans, sections, or renders. They illustrate chain reactions such as changes in water temperature, sediment behaviour, flow velocity, fish habitat, recreation, vegetation, and community experience that move through both human and non-human systems. Using a section-perspective makes underwater conditions visible and allows direct comparison of how each option reshapes relationships on the site. This approach challenges static drawings by positioning the dam, or its removal, as a catalyst within a living system. The intention is to foreground how each option alters ecological functioning and everyday experience, and to highlight the cascading effects that should inform decision-making.

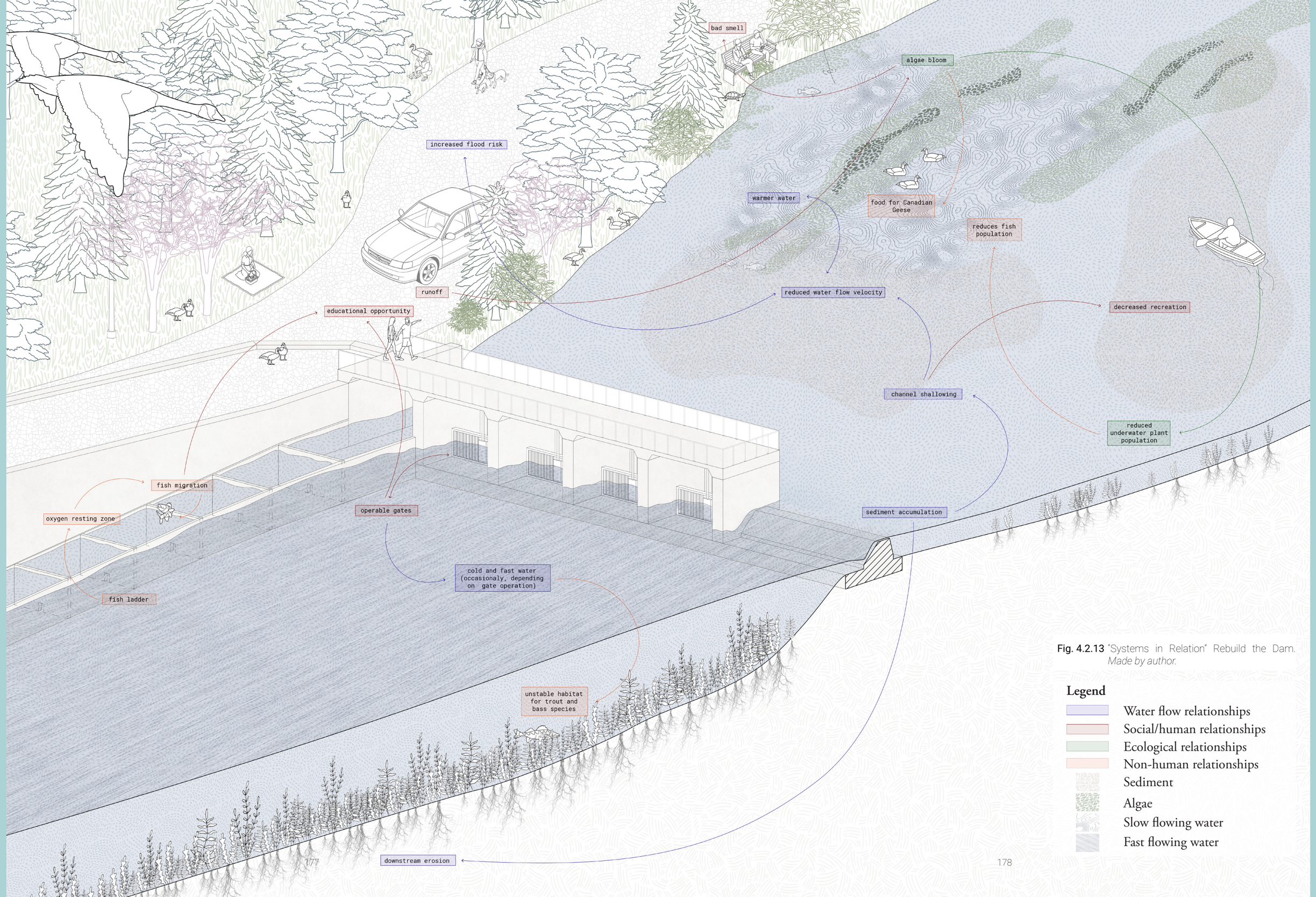


Fig. 4.2.13 "Systems in Relation" Rebuild the Dam. *Made by author.*

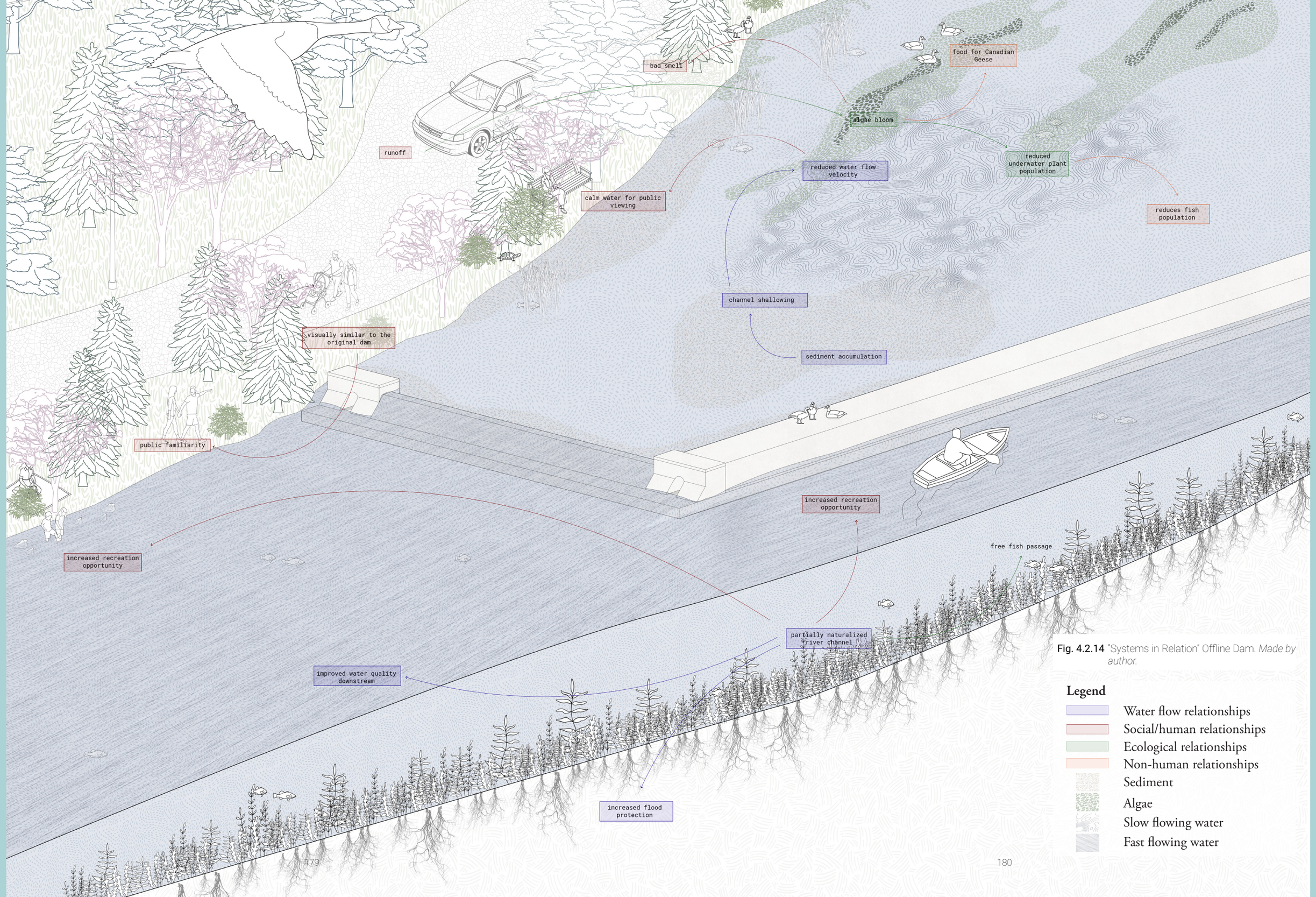


Fig. 4.2.14 "Systems in Relation" Offline Dam. *Made by author.*

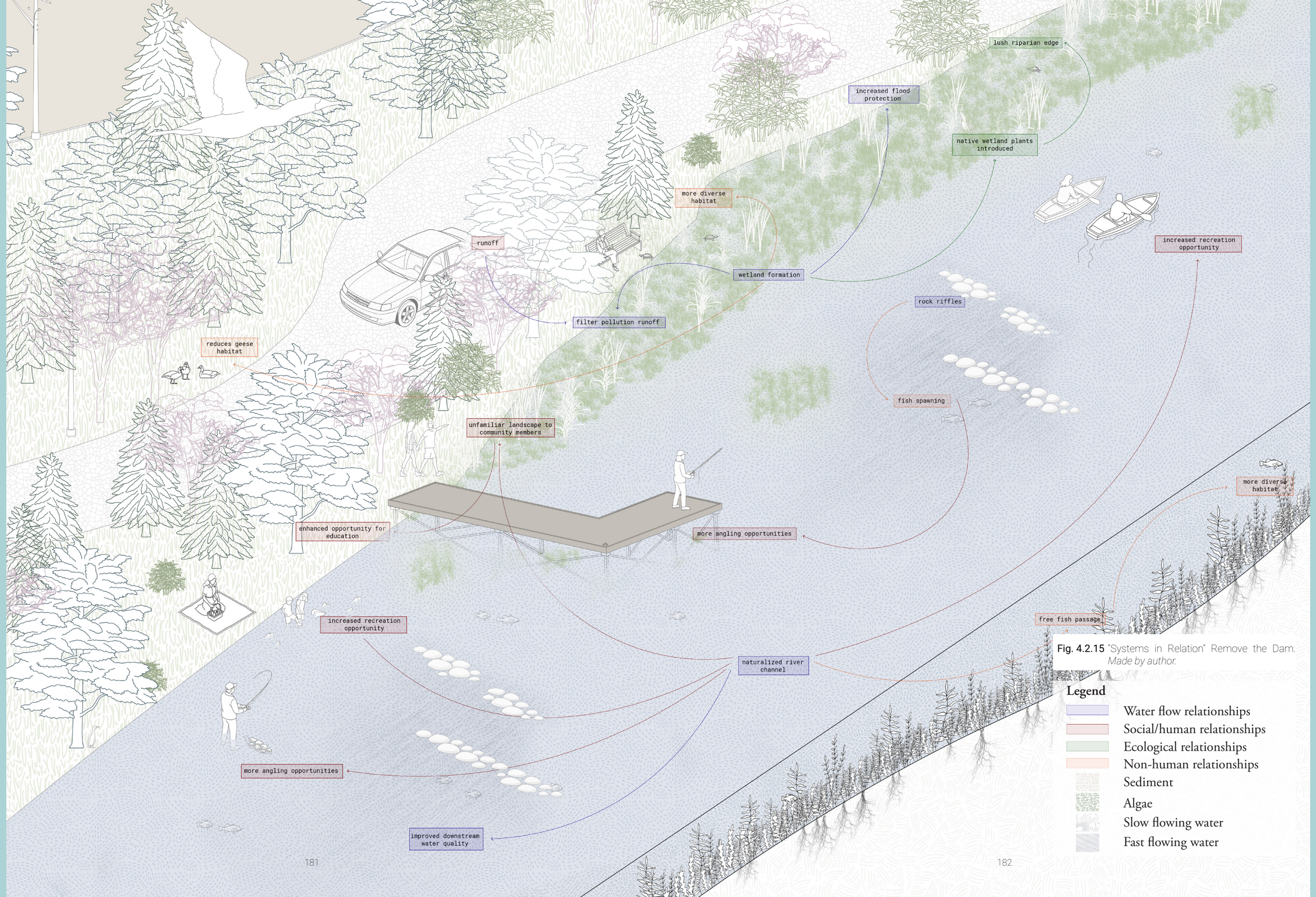


Fig. 4.2.15 "Systems in Relation" Remove the Dam. *Made by author.*

4.3 TEMPORAL LAYERING

Building on contextual clarity and embodied perspective, the role of the landscape architect extends to defining the spatial and cultural sensibilities at play while embracing the inherent paradox that landscapes are never permanent. Landscapes exist in constant flux, shaped by ecological succession, hydrological cycles, social transformations, and historical processes, all operating on vastly different timescales. This presents a fundamental challenge to conventional perspective views, which by their nature are singular, frozen moments. In this sense, they are limited in their capacity to fully represent such dynamic complexity.[32] As Corner argues, "the landscape medium is distinguished by its performative, self-evolving capacity… it is a process more than an object".[33] To represent landscapes wholly requires representational strategies that themselves embrace temporal multiplicity.

Composite visual techniques, which layer multiple temporal and spatial perspectives within a single representation or across coordinates series, thus become crucial for capturing the evolving narratives embedded in landscapes and for fostering richer engagement with contested environmental sites.[34] These techniques can spatialize time, making visible processes that typically remain abstract or invisible to human perception. Maldonado Rius emphasizes that "time drawing" is not simply about adding arrows to indicate future states, but rather developing graphic languages that convey rhythm, duration, simultaneity, and emergence. These are the qualities that distinguish living landscapes from static objects.[35] Like the other guidelines, this becomes especially important in the context of climate adaptation and ecological restoration, succession, infrastructural time and lived time all operate simultaneously but are rarely represented together. Heykoop's research demonstrates that conventional design representations tend to privilege infrastructural time while marginalizing the slower, more uncertain temporalities of ecological process and cultural meaning-making.[36]

From an Indigenous perspective, temporal representation takes on additional significance: linear Western notions of "past, present, and future" contrast with cyclical, relational understandings of time where ancestors, present generations, and those unborn exist in reciprocal relationship. As Vanessa Watts (Haudenosaunee and Anishinaabe scholar) articulates, Indigenous temporality recognizes that time is not chronological but relational.[37] This profound connection between past and future, the recognition that our actions today become the conditions our descendants inherit, stands in stark contrast to what Salvatori calls the "short cycles of entropy" that characterize Western development. In contrast, Western development tends to seek "unlimited growth that privileges the present over the forever".[38] In a climate-changed world where our present actions determine the cycles for centuries to come, Indigenous temporal frameworks offer essential guidance.

Landscape visualizations are only recently starting to show successional processes; however, it should be a staple especially in a climate-change era. Drawings tend to show "before" and "after", collapsing decades of growth, adaptation, and change into an impossible simultaneity. This temporal flattening obscured critical information: how long until planted trees provide shade and cooling? How will stormwater infrastructure perform as vegetation matures? What maintenance is necessary at different successional stages? For communities asked to support long-term restoration projects, understanding temporal trajectories is essential for building the patience, commitment, and adaptive management that ecological recovery requires.[39] How do we visualize processes that unfold over months, years, decades, or centuries within the constraints of static images or finite project timelines? How do we shift from design as the creation of finished objects to design as the staging of processes that will unfold in ways we cannot fully predict or control? Corner suggests that designers must learn to work with "uncertainty" and "latency", creating conditions (what he calls "dispositions") that exert very little restrain upon how things actually unfold.[40] Acknowledging that the approaching visualizations that include temporal layering is daunting, the following guidelines can be a start to how to approach them:

[32] Paul Cureton, Strategies for Landscape Representation : *Digital and Analogue Techniques*, 2017, 97-114.

[33] Dwyre and Perry, "Expanded Fields: Architecture/Landscape/Performance," 2–6; Luis Maldonado, "Time Drawing as a Key Practice for Beginners in Landscape Architecture," *SPOOL*, 9, no. 3 (2022): 26–29.

[34] Cureton, Strategies for Landscape Representation : *Digital and Analogue Techniques*, 114-28.

[35] Luis Maldonado, "Time Drawing as a Key Practice for Beginners in Landscape Architecture," *SPOOL* 9, no. 3 (2022): 26-29.

[36] Lee Heykoop, "Temporality in Designed Landscapes: The Theory and Its Practice in Works of Some Major Landscape Designers 1945-2005", 2015, 2, 4-6.

[37] Vanessa Watts, "Indigenous Place-Thought and Agency amongst Humans and Non Humans (First Woman and Sky Woman Go on a European World Tour!)," *Decolonization: Indigeneity, Education & Society* 2, no. 1 (2013): 23, 32.

[38] "Look to the Skies, Think like an Ancestor," Landscape Australia, accessed October 18, 2025, https://landscapeaustralia.com/articles/look-to-the-skies-think-like-an-ancestor/.

[39] Stephen R.J. Sheppard, "Making Climate Change Visible: A Critical Role for Landscape Professionals," *Special Issue: Critical Approaches to Landscape Visualization* 142 (October 2015): 99, 101-3.

[40] James Corner (March 17th, 1999), n.d., https://www.youtube.com/watch?v=vytaMZB_tsg.

4.3.1 Reveal Ecological Succession and Seasonal Changes

As emphasized earlier, landscapes exist in constant flux, yet conventional renderings present a single idealized moment. Typically, these moments depict mature landscapes at peak bloom. This flattening obscures a large range of ecological processes.

Indigenous seasonal calendars offer models for representing cyclical time. Many Indigenous cultures divide the year into seasons defined by ecological and cultural events rather than twelve abstract months.[41] This cyclical framework can be complimented with the design drawings to help community members understand the design beyond the static drawings.

In practice, these drawings could be seasonal vignettes showing the same view in the spring, fall, winter, and summer. It can also go beyond seasons and depict successional stages (Year 1, Year 5, Year 20, Year 50) to show how planted elements will evolve, or how hydrological systems will change. This can also mean showing maintenance regimes at different successional stages – what intervention is needed when – to reveal that ecological landscapes require adaptive management rather than perpetual maintenance of a fixed design. Arrows, flows, and diagrammatic overlays can be used to indicate processes happening over time: seed dispersal, pollinator movement, wetland adaptation, carbon sequestration, etc.

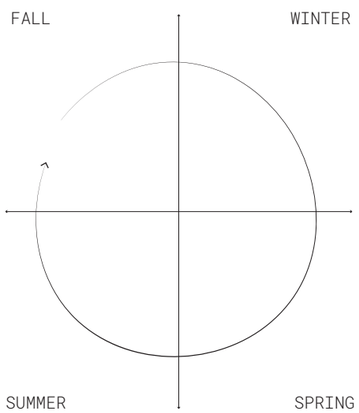


Fig. 4.3.1 "Seasonal cycle" diagram. *Made by author.*

[41] Landscape Australia, "Look to the Skies, Think like an Ancestor."

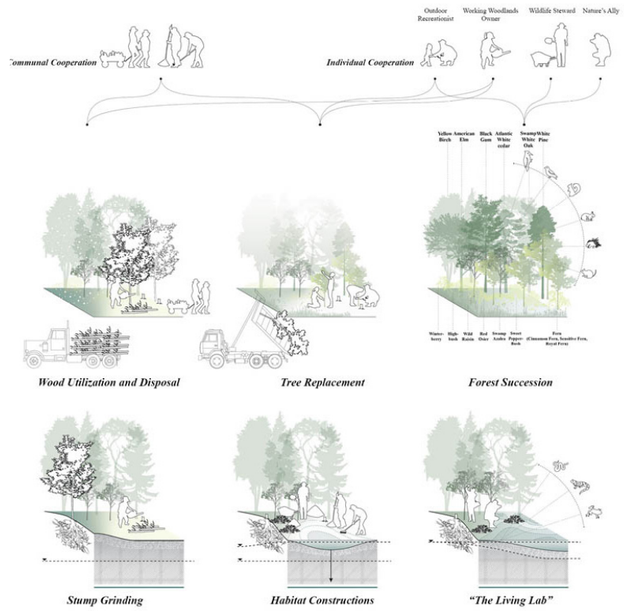


Fig. 4.3.2 "The Life and Death of Ash" Sijia Zhong: Diagram showing ecological succession and maintenance cycles across multiple timeframes. They depict processes like forest regeneration, hydrological adaptation, and habitat shifts. Shows how landscapes require adaptive management rather than fixed maintenance. *Accessed from WorldLandscapeArchitect.com, drawn by Sijia Zhong.*



Fig. 4.3.3 "The Life and Death of Ash" Sijia Zhong: Seasonal vignettes illustrating the same landscape from the same view through the four seasons, helping viewers see how the site can be used cyclically. *Accessed from WorldLandscapeArchitect.com, drawn by Sijia Zhong.*

4.3.2 Make Climate Futures Viscerally Present

Climate change creates what scholars call "temporal distance"; future impacts that feel psychologically remote, making them easy to discount or ignore.[42] Temporal layering can overcome this distance by visualizing how specific sites will transform under different climate conditions, making it suddenly emotionally compelling and actionable.

Research shows that when people see side-by-side comparisons of familiar landscapes under present and future climate conditions, they experience increased risk perception, greater emotional engagement, and stronger support for adaptation measures.[43] Immersive technologies like VR amplify these effects, but even simple temporal comparisons in static visualizations can effectively communicate climate trajectories.[44]

In practice this means potentially creating a temporal series showing the same scene under different climate conditions/scenarios and being clear about what the scenarios are. The climate conditions should be relative to the site, grounded in regional climate projections rather than generic imagery. Adaptive responses should also be shown alongside the impacts if they exist in the design. Importantly, temporal uncertainty indicators should be shown, communicating that futures are contingent on the choices communities make. Lastly, following ethical guidelines is important, being transparent about data sources, and clearly distinguishing between observed trends and imagined projections. Avoid cherry-picking worst-case "doomsday" scenarios, the goal is not to create anxiety about the future, but rather to empower community members to get involved and engaged.[45]

HOW TO MAKE CLIMATE CHANGE PRESENT:

- ☐ SHOW THE SAME SCENE OVER MULTIPLE CLIMATE CONDITIONS
- ☐ GROUND SCENARIOS IN REGIONAL CLIMATE DATA
- ☐ INCLUDE ANY UNCERTAINTY INDICATORS
- ☐ SHOW DATA SOURCES
- ☐ AVOID "DOOMSDAY" SCENES

Fig. 4.3.4 "Checklist for making climate change present" diagram. *Made by author.*

[42] Alexa Spence et al., "The Psychological Distance of Climate Change," *Risk Analysis* 32, no. 6 (2012): 957-76.

[43] Stephen R.J. Sheppard, "Landscape Visualisation and Climate Change: The Potential for Influencing Perceptions and Behaviour," *Mitigation and Adaptation Strategies for Climate Change* 8, no. 6 (2005): 640, 645-50.

[44] Markowitz et al., "Immersive Virtual Reality Field Trips Facilitate Learning about Climate Change." 4.

[45] Nadia Amoroso, *Representing Landscapes: Visualizing Climate Action*, 7.



Fig. 4.3.5 "Learning from Animal Adaptations to Wildfire" Diana Nightingale and Andrea Binz: Temporal series illustrating landscape transformation over time under shifting climate conditions. It shows human response to increased fire risk due to climate change. *Accessed from Dezeen, drawn by Diana Nightingale and Andrea Binz.*

Fig. 4.3.6 "Forest, Human, Fire": Fire 07: Side-by-side rendering comparing dry and wet season, showing fire risk exacerbated by climate change. *Accessed from ASLA, drawn by Zifan Wang.*



4.3.3 Acknowledge Uncertainty and Cultivate Adaptive Capacity

This guideline is especially applicable in community engagement where the public needs to vote or decide on a design alternative. Climate change, ecological dynamics, and social change all introduce fundamental uncertainties into landscape design. Rather than try to ignore/obscure this uncertainty, temporal layering should acknowledge multiple possible futures and show how each design option does so.

In practice this can mean creating visualizations for all scenarios considered, not just putting focus on one "preferred alternative", and showing different possible trajectories based on climate projections, management regimes, or community choices. Another option is to use conditional language and visual indicators: "if x, then y" graphics, showing how different interventions may affect the landscape. If the design involves infrastructure/designed objects that can be used/decommissioned seasonally, then it is essential to show this. This can be done through a series of diagrams or vignettes.

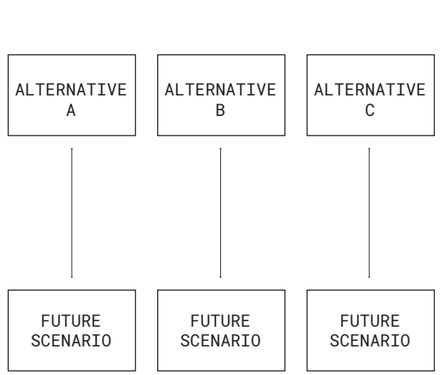


Fig. 4.3.7 "Future scenario alternatives" diagram. *Made by author.*

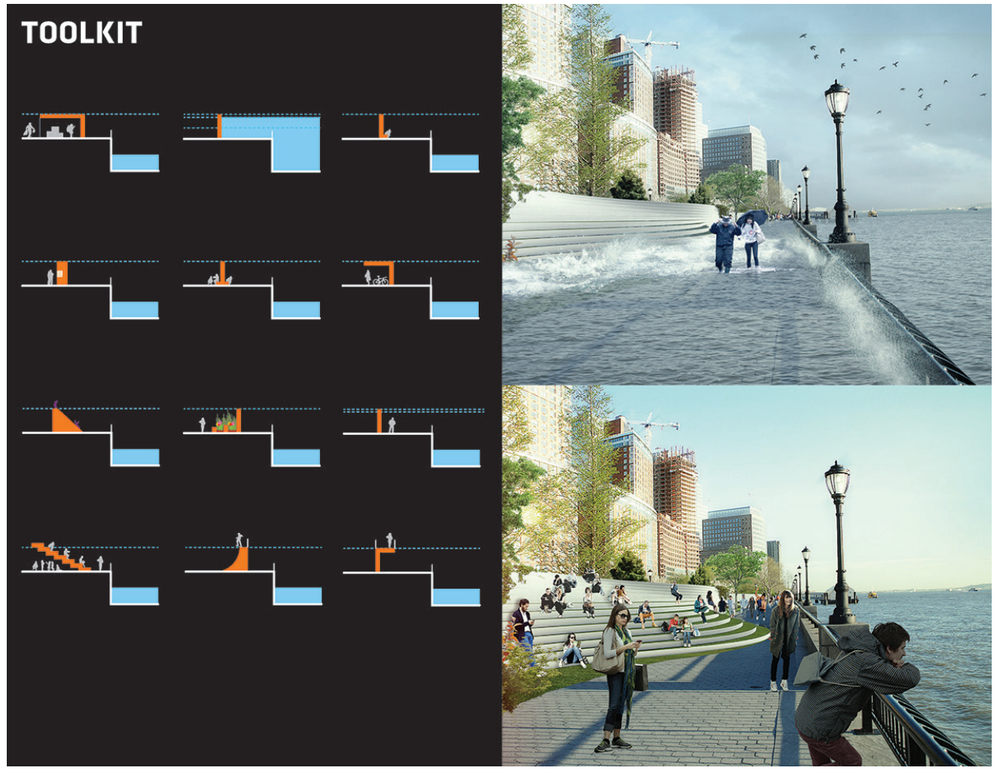


Fig. 4.3.8 "The Big U" Bjarke Ingels Group: Flood protection toolkit responding to social and economic amenities that enhance habitat, improve waterfront access, and create new recreational opportunities. Various segments become a catalog of adaptive strategies that can be applied at various scales. *Image courtesy of Bjarke Ingels Group.*

Temporal Futures of the Riverside Dam Options

Current Publicly Accessible Information:

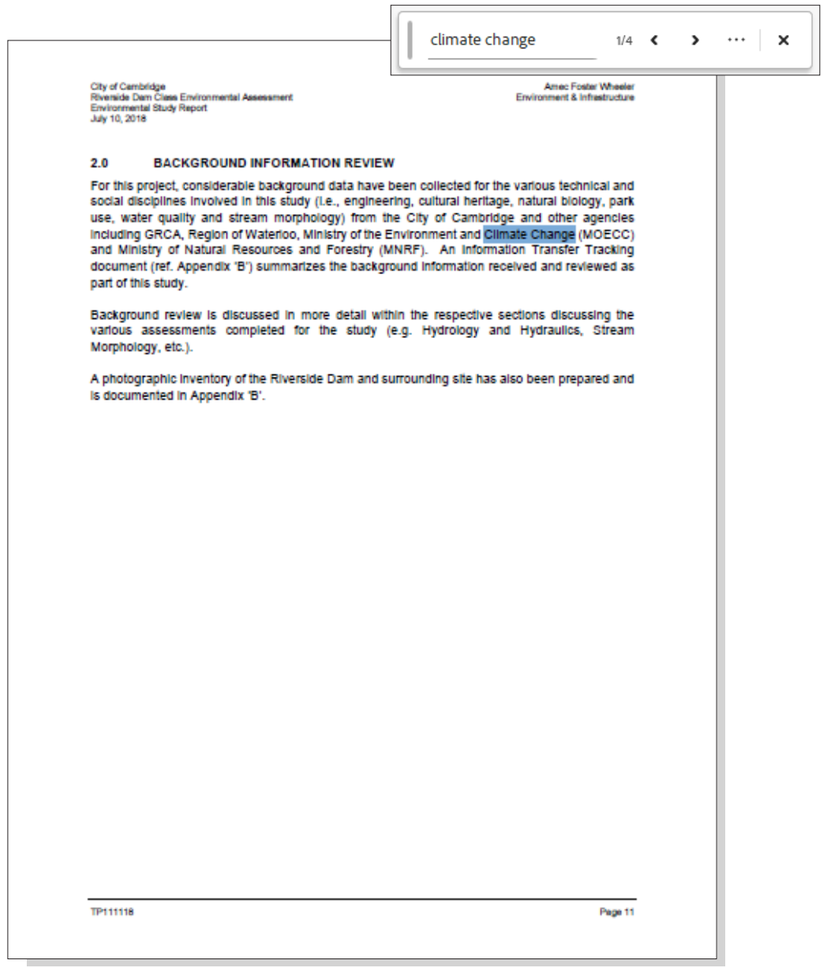


Fig. 4.3.9 Riverside Dam Class EA phrase search showing number of times the phrase "Climate Change" appears in the document. *Page from Riverside Dam Class EA.*

What's Missing from the Publicly Accessible Information:

Current public materials do not show how the river will change over time. They rely on single-moment renderings that hide long-term ecological and climate effects, including shifts in flow, habitat, vegetation, sediment, and maintenance needs. The Environmental Study Report contains 1,394 pages broken up into four parts, yet the phrase "climate change" appears only four times, and only in reference to consultation with the Ministry of the Environment and Climate Change. No temporal projections or climate-related impacts are shown. Without information about how each option performs under future conditions, residents cannot understand what the river may look like in coming decades or what future generations will inherit. This limits meaningful engagement and prevents people from fully evaluating the consequences of each choice.

Proposed Drawing:

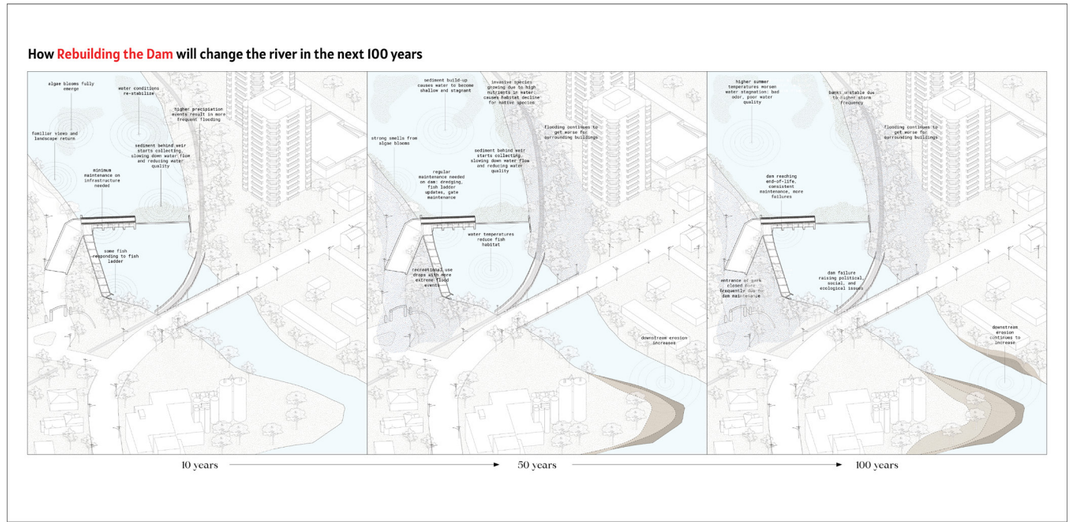


Fig. 4.3.10 "Temporal Futures of the Riverside Dam Options" Rebuild the Dam, thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Make Climate Futures Viscerally Present:

- uses three time steps (10, 50, 100 years) to show how each design option transforms the river over time
- presents a familiar location under future climate conditions to reduce "psychological distance" and help viewers imagine a long-term change
- includes indicators of ecological succession, sediment behaviour, flood patterns, and vegetation shifts

Reveal Temporal Uncertainties:

- shows aging infrastructure and adaptive management needs rather than a fixed, static design
- communicates that climate pressures intensify over decades and that outcomes depend on choices made now

Intentions of Proposed Drawing:

The intention of the following drawing is to expand the project's frame of reference beyond the immediate site and situate Riverside Dam within the larger hydrological, territorial, and political systems that shape it. While the City's material present only a narrow, local context, this drawing shows how the dam exists within a larger system. By visualizing these overlapping geographies together, the drawing aims to visualize and highlight how local interventions participate in regional water governance, Indigenous land rights, and cumulative ecological processes. Its purpose is to remind viewers that the dam is not an isolated piece of infrastructure but part of a much broader network of relationships, responsibilities and impacts.

How Rebuilding the Dam will change the river in the next 100 years

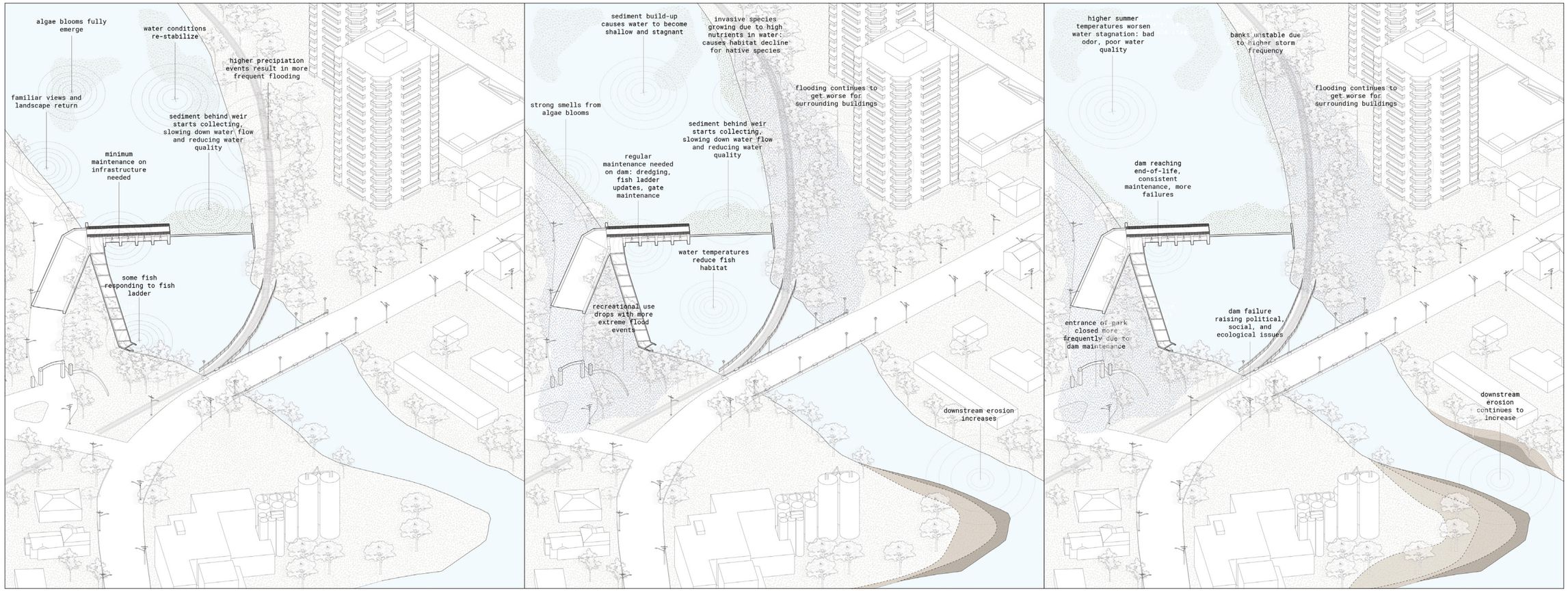


Fig. 4.3.11 "Temporal Futures of the Riverside Dam Options" Rebuild the Dam. *Made by author.*

How Removing the Dam will change the river in the next 100 years

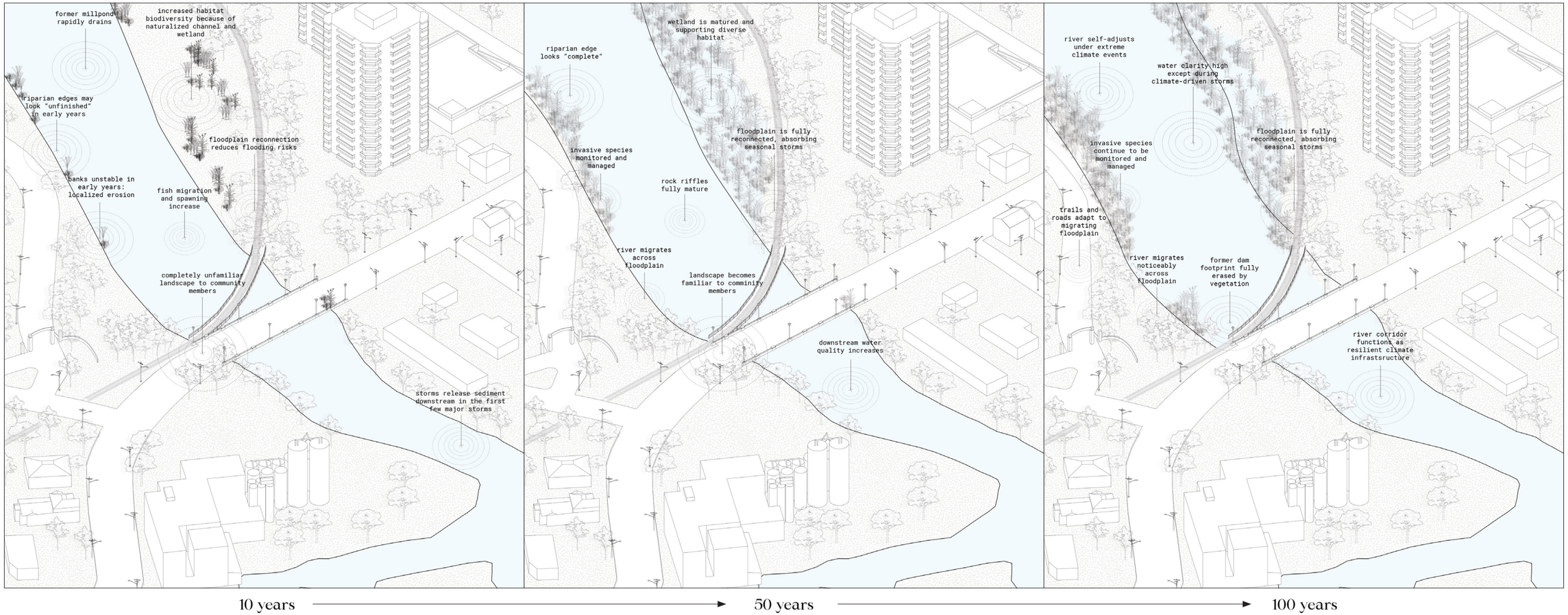


Fig. 4.3.12 "Temporal Futures of the Riverside Dam Options" Remove the Dam. *Made by author.*

How an Offline Dam will change the river in the next 100 years

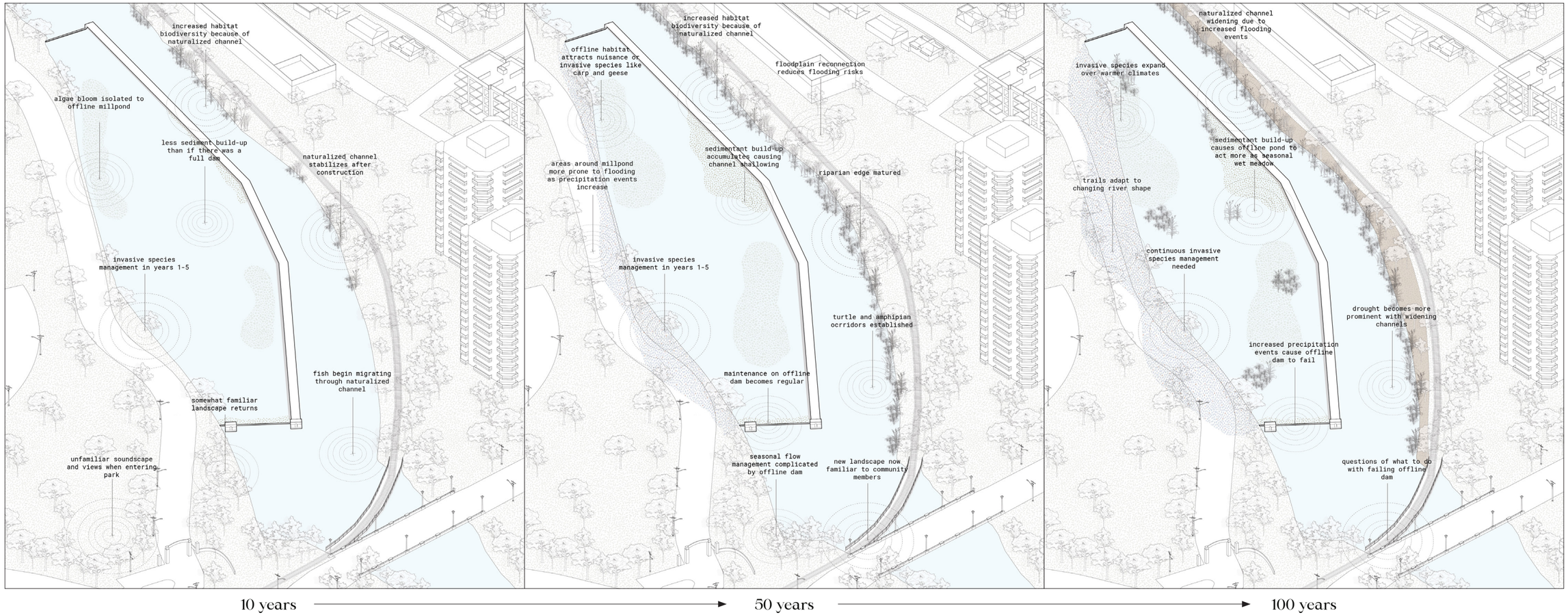


Fig. 4.3.13 "Temporal Futures of the Riverside Dam Options" Offline Dam. *Made by author.*

When Construction Happens and What Seasons Are Missed

Current Publicly Accessible Information:





‘I don’t see this being a $20-million project, but it’s not going to be a million-dollar project’

Riverside Dam rebuild will begin in 2025 with a budget of $19 million

Council votes to add project approved in 2018 back into city's 10-year capital schedule

Fig. 4.3.14 (top left) Slide from *Public Information Centre #3, p. 21*. Shows the estimated cost of removal.

Fig. 4.3.15 (top right) Slide from *Public Information Centre #3, p. 20*. Shows the estimated cost to rebuild (not current design).

Fig. 4.3.16 (middle) News headline indicating the lack of clarity of the project’s budget.

Fig. 4.3.17 (bottom) News headline indicating new budget for the project.

What’s Missing from the Publicly Accessible Information:

The City’s public material presents cost estimates and final renderings but does not show how construction timelines, seasonal constraints, or transitional stages will unfold for each option. Residents are given end-state images without information about the multi-year processes required to reach them. Key factors like winter shutdowns, flood risk windows, vegetation establishment periods, and staging requirements are not illustrated. Without clear information about when work happens, how long disruptions last, or how weather and site conditions shape construction, the public cannot fully understand the practical implications of each scenario. This limits meaningful engagement and prevents residents from evaluating how each option performs over time and what the community will experience during the transition.

Proposed Drawing:

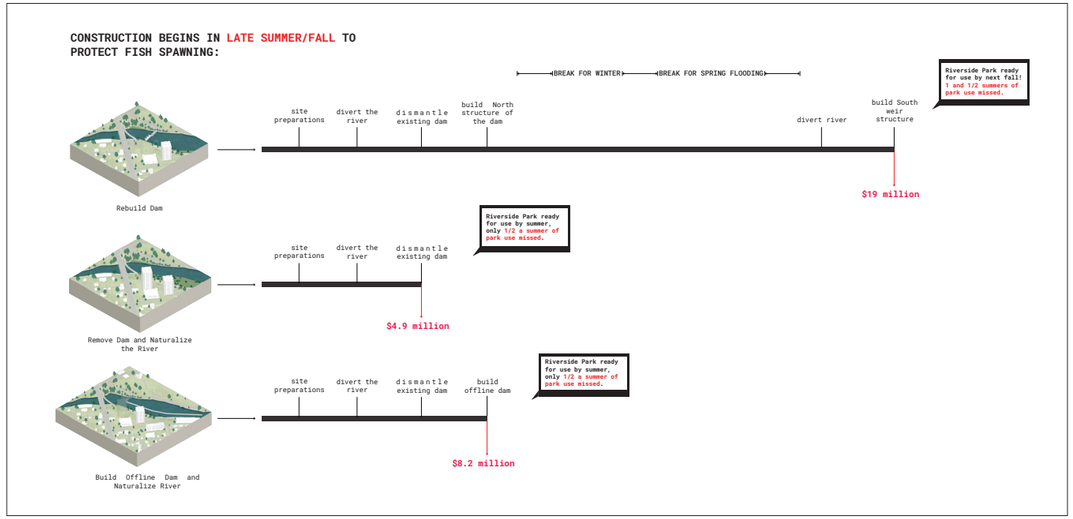


Fig. 4.3.18 “When Construction Happens and What Seasons are Missed” timeline, thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Reveal Ecological Succession and Seasonal Changes:
- shows how seasonal conditions directly shape the construction process, even though the drawing is not specifically about site use.
-reveals winter shutdowns, flood-risk windows, and planting periods as key temporal constraints.

Acknowledging Uncertainty and Adaptive Capacity:
- answers unanswered questions about time and construction, especially important since the project has been kicked down the road so much, it gives a clear idea of how things will happen once construction starts
- makes transitional stages visible
- acknowledges uncertainty by pointing out that decisions may have to adapt to site conditions or unforeseen events

Intentions of Proposed Drawing:

The following drawing responds to the City’s fragmented cost estimates and shifting public communications by making the construction timelines, transitional stages, and seasonal constraints of each dam option visible. By placing *Remove, Rebuild,* and *Offline Dam* on a shared temporal axis, the drawing makes it easily discernible how long each scenario takes, what disruptions occur, and when critical decisions or pauses arises. The intention is to address unanswered questions about sequencing and duration (issues that are not addressed through by the City or through media) and to highlight how uncertainty, weather, and adaptive decision-making shape the feasibility of each option. By foregrounding these transitional moments, it frames the project as a multi-year process with ecological, financial, and social implications.

CONSTRUCTION BEGINS IN LATE SUMMER/FALL TO PROTECT FISH SPAWNING:

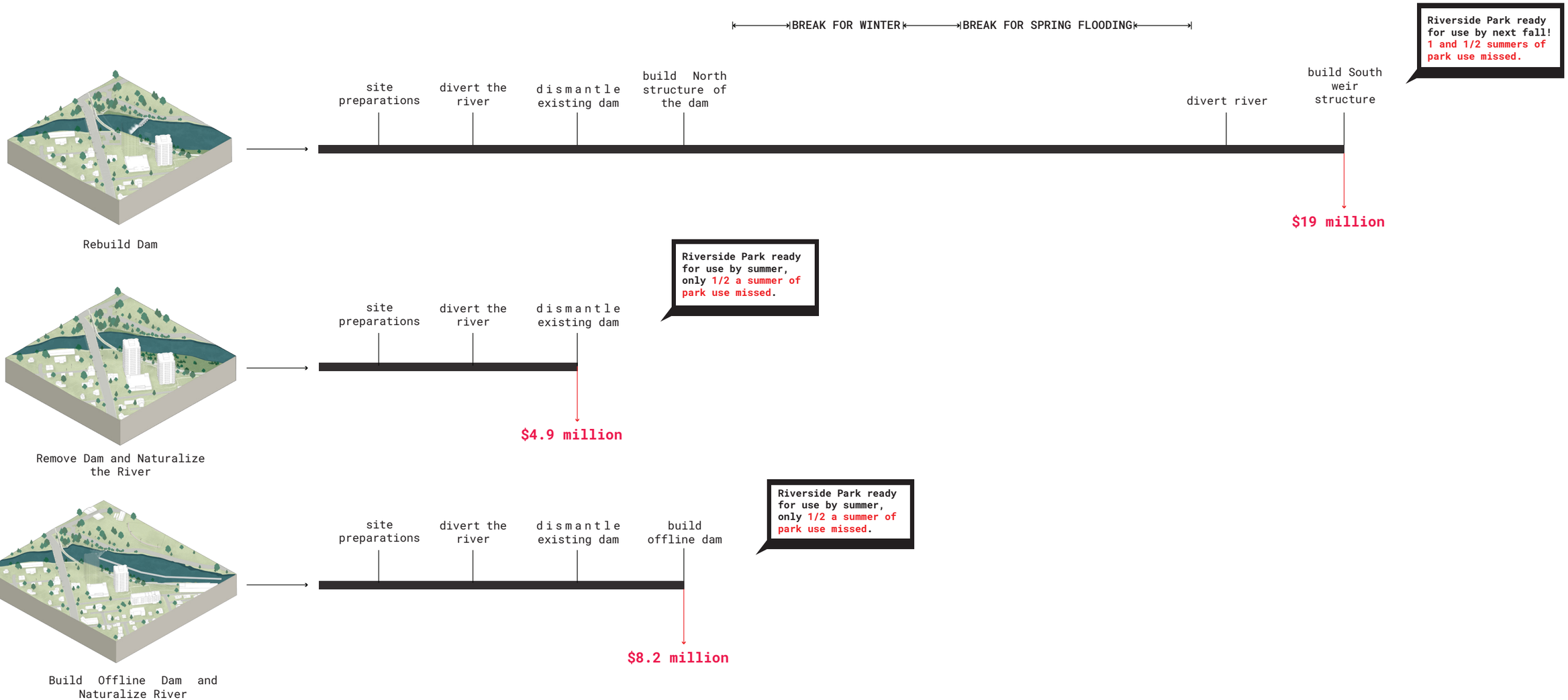


Fig. 4.3.19 "When Construction Happens and What Seasons are Missed" timeline. *Made by author.*

4.4 MAKE CONFLICT VISIBLE

Especially in the context of community planning and engagement when there are clear groups advocating for opposing designs (such is often the case in dam removals), there can be a feeling that the designer needs to sanitize conflict through the drawings, erasing tensions, smoothing over disagreements, and presenting "consensus" visions that obscure whose interests are served and whose are marginalized. We must fundamentally reconsider the role of conflict in landscape representation. The question is not how to remove conflict through visualization, but how to make it legible, productive, and transformative.

Western planning traditions have historically treated conflict as a problem to be solved, an inefficiency to be managed away through "consensus-building" that often functions as conflict suppression.[46] Public participation processes frequently aim to manufacture agreement, with facilitators steering discussions toward predetermined outcomes and dismissing disagreement as obstruction.[47] Visualizations in this tradition present polished renderings of "preferred alternatives", singular future visions that imply inevitability and foreclose debate.[48] When conflict arises, it is framed as a failure of communication rather than as a legitimate expression of incompatible values, unequal power relations, or irreconcilable visions of what landscapes should become.[49]

As political theorist Chantal Mouffe argues in her work on agonistic pluralism, conflict is not a defect of democracy but its very foundation. In Kuhn's terms, the aim of an agonistic planning model is to accept dissent between actors, to make them visible, and to cultivate 'strife', with planning's role to offer public arenas for disputes," while recognizing that the dominant regime will always be temporary and contested..[50] Mouffe distinguishes between antagonism, where opponents are enemies to be destroyed, and agonism, where adversaries contest vigorously but recognize each other's legitimacy within shared democratic institutions. The task of democratic practice, including landscape and infrastructure planning, is not to eliminate conflict but to transform it from antagonistic (violent, destructive) to agonistic (productive, generative).[51]

Agonistic approaches to planning recognize that diverse stakeholders often hold fundamentally different values, priorities, and visions for landscape futures.[52] These differences cannot always be reconciled through dialogue or "common ground" because they may stem from irreconcilable ontologies (what counts as valuable), epistemologies (what counts as knowledge), or ethical commitments (what counts as justice).[53]

For landscape visualization, procedural justice requires making it explicit whose visions are being represented, whose knowledge informs design proposals, what trade-offs are being made, and which alternatives were considered but rejected.[54] This contrasts sharply with conventional practice, where drawings present seamless, idealized futures while obscuring the conflicts, compromises, and power dynamics that shaped them.[55] As one study on procedural environmental justice argues, achieving meaningful involvement requires providing communities not just the formal right but the substantive ability to participate as equal partners at every level of environmental decision-making.[56] This includes access to technical expertise, resources for independent analysis, and visualization tools that represent community perspectives rather than only expert or developer visions.

Recent innovations in participatory mapping and scenario visualization demonstrate the power of making conflict visible. López-Rodríguez et al.'s work on "visualizing stakeholders' willingness for collective action" developed a visual tool that explicitly maps which stakeholders support, oppose, or are uncertain about specific strategies for managing a protected area in Spain.[57] Rather than presenting a singular "consensus plan," their visual tool created what they call a "boundary object" which is a shared representation that different stakeholders can interpret through their own values while seeing where others stand. The tool "fosters dialogue between stakeholders to redistribute tasks for working together on needed strategies...while promoting reflection on their willingness to collaborate as

[46] Manfred Kühn, "Agonistic Planning Theory Revisited: The Planner's Role in Dealing with Conflict," *Planning Theory* 20, no. 2 (2021): 144-50.

[47] Jonathan Skinner-Thompson, "Procedural Environmental Justice," *Wash. L. Rev.* 97 (2022): 413.

[48] Carl DiSalvo, *Design, Democracy and Agonistic Pluralism*, 2010, 1-4.

[49] Kühn, "Agonistic Planning Theory Revisited: The Planner's Role in Dealing with Conflict," 151, 146.

[50] Kühn, "Agonistic Planning Theory Revisited: The Planner's Role in Dealing with Conflict," 151, 154.

[51] Mouffe, *The Democratic Paradox*, 13.

[52] Kühn, "Agonistic Planning Theory Revisited: The Planner's Role in Dealing with Conflict.," 147, 151.

[53] Sophie Bond, "Negotiating a 'Democratic Ethos' Moving beyond the Agonistic–Communicative Divide," *Planning Theory* 10, no. 2 (2011): 161, 167.

[54] Skinner-Thompson, "Procedural Environmental Justice." 401-2.

[55] DiSalvo, *Design, Democracy and Agonistic Pluralism*, 1-2, 3-4.

[56] Skinner-Thompson, "Procedural Environmental Justice." 401-4.

[57] María D López-Rodríguez et al., "Visualizing Stakeholders' Willingness for Collective Action in Participatory Scenario Planning," *Ecology and Society* 28, no. 2 (2023): 2-3, 5.

a group to implement them".[58]

Critically, the López-Rodríguez study found that the visual tool enhanced four dimensions of participatory governance: inclusivity (representing diverse perspectives), integration (connecting social and ecological priorities), adaptation (allowing flexibility as conditions change), and pluralism (honoring value differences). By making visible not just what strategies were proposed but who supported each one, the tool transformed abstract conflict into concrete organizing opportunities.[59]

In addition to human conflict, more-than-human actors like fish, birds, forests, rivers, microorganisms, are systematically excluded from visualization processes not because they lack interests or agency but because conventional planning treats them as "resources" or "ecosystem services" rather than as subjects with their own rights and needs.[60] Indigenous scholars and multispecies justice advocates argue that genuine conflict visibility requires representing ecological actors' perspectives alongside human stakeholders.[61] This might mean visualizing salmon migration routes through proposed dam sites, depicting bird habitat fragmentation from wind energy projects, or showing how urban heat islands disproportionately affect street trees, outdoor workers, and unhoused communities simultaneously.

The challenge is representing conflict without furthering divisions or amplifying antagonism. Agonistic planning scholars caution that "extended participation processes" can become performative, where conflict is staged but never meaningfully addressed if power imbalances remain unchanged.[62] Simply showing "competing visions" side-by-side does not automatically transform antagonism into agonism; it can instead entrench positions, especially when some visions are backed by capital, legal authority, or technical expertise while others are dismissed as "emotional", "unscientific", or "impractical".[63] True agonistic practice requires not just making conflict visible but actively redistributing power, providing marginalized stakeholders with resources (technical support, legal aid, design expertise) to participate on more equal footing.

[58] López-Rodríguez et al., "Visualizing Stakeholders' Willingness for Collective Action in Participatory Scenario Planning." 5.

[59] López-Rodríguez et al., "Visualizing Stakeholders' Willingness for Collective Action in Participatory Scenario Planning." 5.

[60] Qviström, "Decentring Landscape: Rethinking Landscape Analysis with a Relational Ontology," 1115-16.

[61] Kimmerer, "Restoration and Reciprocity: The Contributions of Traditional Ecological Knowledge," 257–58, 261.

[62] Kühn, "Agonistic Planning Theory Revisited: The Planner's Role in Dealing with Conflict," 152-53.

[63] Kühn, "Agonistic Planning Theory Revisited: The Planner's Role in Dealing with Conflict," 153-54.

Moreover, some conflicts should not be visualized as symmetrical disagreements. When fossil fuel companies propose "green" infrastructure while continuing extraction, or when developers promise "affordable housing" in gentrifying neighborhoods, visualizing these as equivalent "stakeholder perspectives" obscures structural violence and legitimizes harm. Restorative justice frameworks remind us that some conflicts stem from past harms (colonization, slavery, environmental racism) that require redress, not negotiation between equal adversaries.[64] In these contexts, making conflict visible means acknowledging historical injustice, naming perpetrators and systems of harm, and centering the voices of those who have been systematically silenced.

True conflict visibility requires acknowledging that representation itself is never neutral. Every choice about what to visualize, whose perspectives to include, how to frame alternatives, and which conflicts to make explicit is a political and ethical commitment, a statement about whose struggles matter, whose knowledge counts, and what forms of contestation are legitimate.

The following guidelines translate the theoretical framework of agonistic pluralism, and procedural justice into practical approaches for representing conflict in landscape design. These are not merely graphic techniques but ethical commitments to democratizing visualization, honoring dissent, and transforming conflict from suppressed tension into generative democratic engagement.

[64] "Delivering Justice in Sustainability Transitions," February 28, 2024, https://www.eea.europa.eu/en/analysis/publications/delivering-justice-in-sustainability-transitions.

4.4.1 Side-by-Side Views and Acknowledge Loss

Comparing visuals that represent multiple stakeholder visions displayed side by side makes differences and shared priorities explicit. This strategy surfaces tensions and fosters transparent dialogue by allowing viewers to see competing futures in context.

Critically, acknowledging loss is essential for procedural justice. Every landscape decision involves trade-offs: land allocated for housing cannot simultaneously remain forest; water diverted for irrigation is unavailable for in-stream ecological needs; infrastructure that protects some neighborhoods from flooding may increase vulnerability elsewhere. Visualizations rarely depict what is lost, showing only gains while externalizing costs.[65]

Visualizing loss might mean showing "before and after" not as "degraded to restored" but instead making explicit the ecological and cultural values being displaced. It might mean depicting alternative timelines: "if we choose Option A, Species X will lose habitat; if we choose Option B, Community Y will face displacement; if we choose Option C, water quality will decline downstream".[66] The goal is not to paralyze decision-making through guilt but to cultivate what scholars call "response-ability"—the acknowledgment that our choices have consequences for others, creating obligations to address harms and redistribute benefits.[67]

In practice, this can look like creating side-by-side renderings showing different stakeholder visions for the same site. Using comparison matrices along with views of different strategies showing how each performs with different criteria, making trade-offs explicit, rather than obscuring them with aggregate "scores" could also be valuable to public understanding.

Documenting what is lost through outlining, different opacities, or other diagrammatic elements can be done as a way to honor and acknowledge that the designer is aware of what is going being sacrificed with the design option, for example trees getting removed, habitats getting disturbed, or cultural sites being displaced.

[65] Peter Schmitt and Sabine Weck, "Towards Just Planning: On the Relationship between Procedural and Distributive Justice in Local Development Actions," *Planning Practice & Research* 39, no. 5 (2024): 757–59.

[66] Sheppard, "Making Climate Change Visible: A Critical Role for Landscape Professionals," 101-3 .

[67] Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (2020), 28–29, 109–10.



Fig. 4.4.1 "Rijnvliet Food Forest Collage" Felixx Landscape Architects and Planners: Direct comparison showing added values of ecosystem services and added value human. *Accessed from © Felixx Landscape Architects and Planners.*

4.4.2 Credit the Source of Each View

Clearly labeling which community, institution, or ecological actor is being represented in each drawing is vital. This not only reveals whose vision is being put forward, but also leaves space for dialogue, negotiation, and recognition of gaps or overlaps.

Procedural justice research emphasizes that transparency increases legitimacy: when people know who proposed what and why, they can evaluate whether decision-making processes are fair and whether their own interests are being considered. As one study on procedural environmental justice argues, "explicit labeling increases procedural justice by making stakeholder perspectives transparent and traceable," allowing communities to "hold their representatives accountable" and identify whose voices remain unheard.[68]

Indigenous conflict resolution practices provide models for this transparency. In many Indigenous deliberation processes, speakers identify their clan, nation, or family lineage, situating their perspectives within specific relational networks and knowledge systems.[69] This is not just courtesy but an epistemological commitment: knowledge is always situated, emerging from particular relationships to land, ancestors, and more-than-human kin rather than from abstract universal reason.[70] Crediting sources in landscape visualization honors this relationality, acknowledging that every design proposal reflects specific standpoints shaped by culture, power, and positionality.[71]

This can be done in practice with clear labels, for example "Community Vision Co-Developed with Children from the Local School". Including images, quotes, or short narratives from stakeholders alongside visualizations can humanize perspectives and contextualize how their values have been shaped. When acknowledging non-human sources, recognizing what species and how the information was gathered places non-human species as knowledge-generators, not passive objects of human management.



Fig. 4.4.2 "Laces, Ties and Knots": Visualization crediting multiple stakeholder perspectives through labeled quotes, images, and figures. This makes it transparent whose voices are represented, encouraging accountability, dialogue, and recognition of positionality in the design process. *Image accessed from ASLA, drawing by Shanni Jin.*

[68] Skinner-Thompson, "Procedural Environmental Justice," 411, 413.

[69] Nisha Sikka et al., Indigenous Centered Conflict Resolution Processes in Canada, 2016, 12, 32.

[70] Cheryl Bartlett et al., "Two-Eyed Seeing and Other Lessons Learned within a Co-Learning Journey of Bringing Together Indigenous and Mainstream Knowledges and Ways of Knowing," *Journal of Environmental Studies and Sciences* 2, no. 4 (2012): 333, 335.

[71] Haraway, "Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective," 583.

4.4.3 Situating Scale of Impact

To counter perceptions of climate change as distant or abstract, drawings should situate site proposals within broader regional, watershed, or climate systems. Illustrating upstream and downstream connections or nested scales helps publics grasp how localized actions contribute to far-reaching impacts, enhancing comprehension and agency.

Scalar visualization also reveals environmental injustices that site-scale drawings obscure. Urban heat islands, for instance, are not evenly distributed but concentrated in historically redlined neighborhoods where tree canopy is sparse and impervious surfaces dominate.[72] Visualizing this at neighborhood scale shows local impacts, but situating those neighborhoods within regional heat patterns, historical disinvestment maps, and climate projection overlays reveals systemic injustice, how past racist policies shape present vulnerability and future climate risk.

Multi-scalar visualization is particularly critical for climate adaptation. A seawall may protect one neighborhood from sea level rise but redirect flooding to adjacent communities or disrupt tidal wetland ecology that provides regional storm buffering.[73] Green infrastructure may reduce urban heat locally but fail to address regional drivers like suburban sprawl and transportation emissions. Showing these connections—through nested maps, flow diagrams, or multi-scale comparisons—transforms site design from isolated intervention into systemic thinking about how local actions ripple through broader social-ecological systems.

In practice, this can look like creating nested scale diagrams showing the site within its watershed, bioregion, and climate context. Flow diagrams can be used to illustrate material, energy, or ecological connections: show where construction materials originate, where waste goes, how energy is sourced, how water cycles through the system.

Climate projections can also be shown at multiple scales: show site specific impacts, within regional patterns, within global trends. On a similar scale, showing how the proposal effects the immediate site, and if and how that affects other regions (for example, for a watershed, how upstream actions affect downstream communities and vice versa).

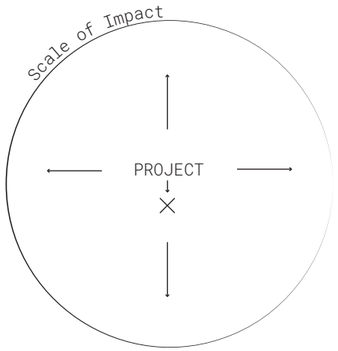


Fig. 4.4.3 "Scale of Impact" diagram. *Made by author.*

[72] Jeremy S. Hoffman et al., "The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas," *Climate* 8, no. 1 (2020): 1, 9-10.

[73] Sheppard, "Making Climate Change Visible: A Critical Role for Landscape Professionals," 100.

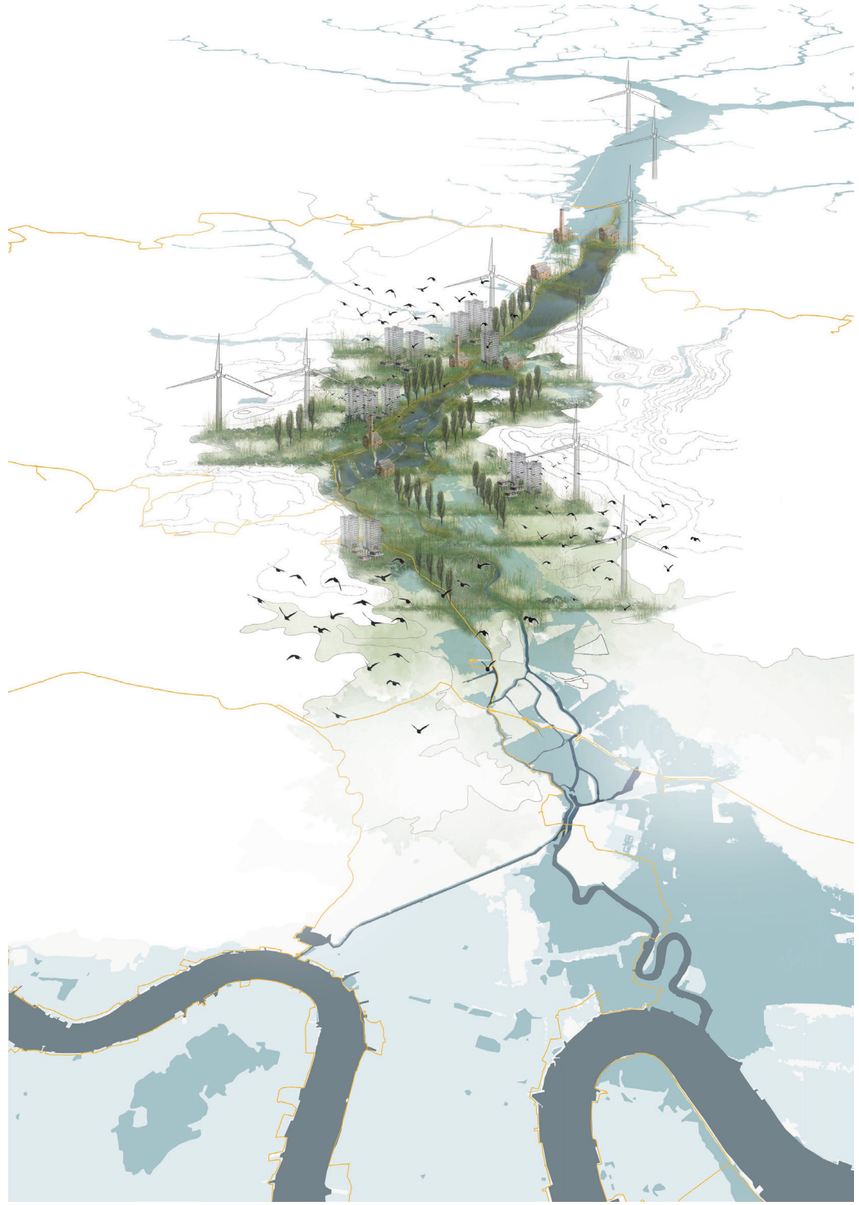


Fig. 4.4.4 "Public Realm and Landscape" KLA: Visual showing the larger watershed scale in comparison to the scale of intervention. *Accessed from kland.co.uk.*

4.4.4 Centering Non-Human Perspectives

Environmental drawings should also include the perspectives or pathways of non-human actors, such as fish migration routes, migratory bird stopovers, or habitat corridors, by visualizing their spatial needs and movement. Representing these ecological actors alongside human visions fosters awareness of more-than-human priorities and helps orient decisions toward ecological health, not just anthropocentric outcomes.

Multispecies justice scholars argue that representing ecological actors requires depicting not just their presence but their needs, movements, and vulnerabilities (migration routes, nesting habitat, collision risks, climate-driven range shifts).[74] As van Dooren and colleagues emphasize, cultivating "arts of attentiveness" requires following other species through their lifeways, tracing how they move, communicate, depend on others, and are affected by changing environments., so that their worlds and vulnerabilities can meaningfully shape environmental decision-making. [75] Centering non-human perspectives exposes conflicts between human development and ecological needs that anthropocentric planning obscures. A proposed highway expansion may serve human mobility but fragments habitat, creating barriers to wildlife movement and increasing roadkill mortality. Visualizing this conflict, showing animal pathways intersecting with proposed infrastructure, makes the trade-off explicit: human convenience versus ecological continuity. The goal is not to always prioritize non-human needs but to acknowledge that they exist, that they often conflict with human desires, and that ignoring these conflicts does not eliminate harm but merely externalizes it to beings without political voice.

In practice, this can mean mapping ecological pathways alongside human uses: overlaying wildlife corridors, bird migration routes, fish passage needs, pollinator networks onto site plans, revealing where human infrastructure disrupts ecological connectivity. Another technique is to create "species-eye view" renderings: visualize the landscape from the perspective of a fish swimming upstream, a bird sitting in the trees, a beetle navigating vegetation. Make it explicit that different beings perceive and navigate landscapes differently. Seasonal and daily temporal patterns of non-human use can also be useful to map, showing that non-human cycles may be different than those of people. Climate impacts can also be visualized on non-human actors. They can also be listed as stakeholders alongside human stakeholder groups.



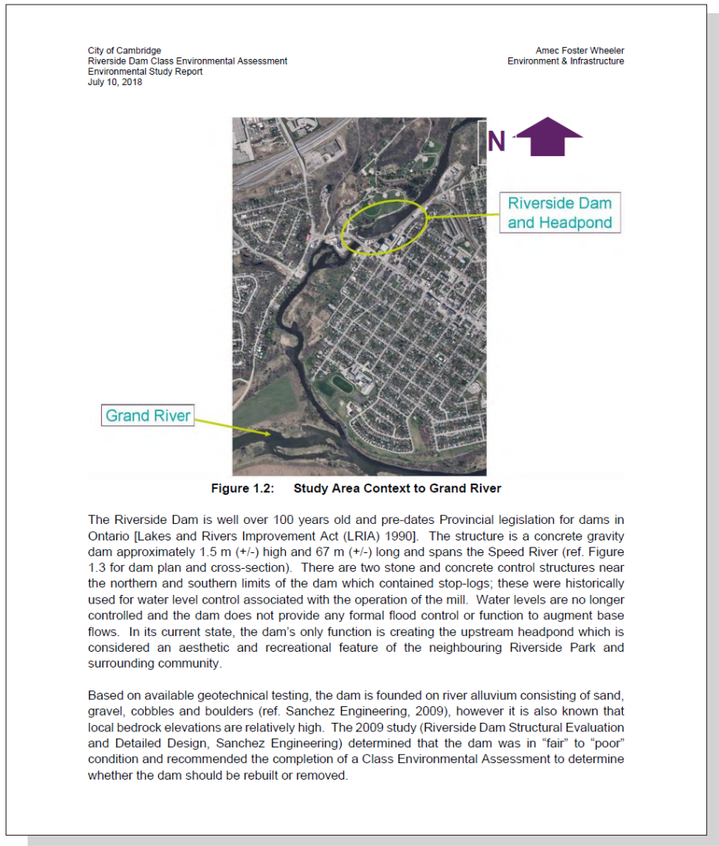
Fig. 4.4.5 "The Camouflaged Vineyard" Vincent Kai Lok Wong: Perspective drawing taken from a non-human vantage point, illustrating the spatial experience beneath a human walkway. This visualization foregrounds ecological actors, showing how human infrastructure intersects with and impacts non-human pathways. *Image accessed from Bartlett Architecture, drawn by Vincent Kai Lok Wong.*

[74] Thom Van Dooren et al., *Multispecies Studies: Cultivating Arts of Attentiveness*, 2016, 2-6.

[75] Van Dooren et al., *Multispecies Studies: Cultivating Arts of Attentiveness*, 2–6.

The Larger Context

Current Publicly Accessible Information:



City of Cambridge
Riverside Dam Class Environmental Assessment
Environmental Study Report
July 10, 2018

Amec Foster Wheeler
Environment & Infrastructure

Figure 1.2: Study Area Context to Grand River

The Riverside Dam is well over 100 years old and pre-dates Provincial legislation for dams in Ontario [Lakes and Rivers Improvement Act (LRIA) 1990]. The structure is a concrete gravity dam approximately 1.5 m (+/-) high and 67 m (+/-) long and spans the Speed River (ref. Figure 1.3 for dam plan and cross-section). There are two stone and concrete control structures near the northern and southern limits of the dam which contained stop-logs; these were historically used for water level control associated with the operation of the mill. Water levels are no longer controlled and the dam does not provide any formal flood control or function to augment base flows. In its current state, the dam's only function is creating the upstream headpond which is considered an aesthetic and recreational feature of the neighbouring Riverside Park and surrounding community.

Based on available geotechnical testing, the dam is founded on river alluvium consisting of sand, gravel, cobbles and boulders (ref. Sanchez Engineering, 2009), however it is also known that local bedrock elevations are relatively high. The 2009 study (Riverside Dam Structural Evaluation and Detailed Design, Sanchez Engineering) determined that the dam was in "fair" to "poor" condition and recommended the completion of a Class Environmental Assessment to determine whether the dam should be rebuilt or removed.

Fig. 4.4.6 "Study Area Context to Grand River". *Page from Riverside Dam Class EA.*

What's Missing from the Publicly Accessible Information:

The only "larger context" provided in the City's material is a small aerial map showing the immediate surroundings of the dam. This narrow framing limits public understanding of how Riverside Dam fits within the much broader Grand River watershed and the systems that shape it. Without showing upstream and downstream connections, watershed boundaries, Indigenous territories, or regional hydrological relationships, the existing material isolates the dam from the larger networks of water, governance, and land it participates in. As a result, residents are given an incomplete picture—one that makes the dam appear as a purely local object rather than part of a wider, interdependent system. This absence of regional context restricts meaningful engagement and prevents the public from seeing the full scale of impacts, responsibilities, and relationships at play.

Proposed Drawing:

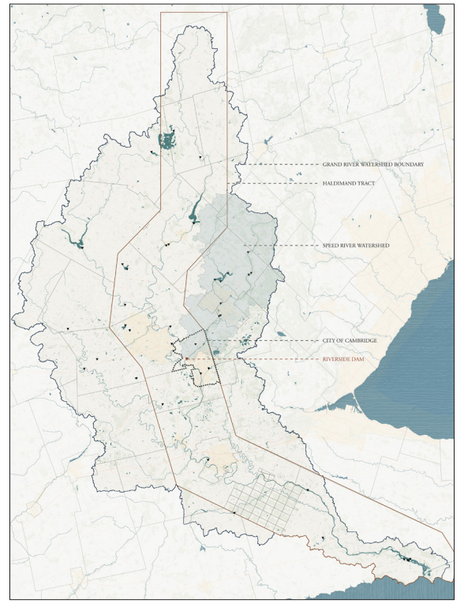


Fig. 4.4.7 "The Larger Context" Grand River Watershed in relation to Riverside Dam, thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Use Clear Language and Navigational Aids:

- labels are concise and placed directly beside features.
- the Grand River, Lake Ontario, and Lake Erie are clear geographical features.
- simple line conventions to differentiate layers without overwhelming detail.
- colour palette is meant to call attention to the water systems.

Situating Scale of Impact:

- by calling out Riverside Dam in the larger map of the watershed, it lets viewers know that it is just a small part of a larger system
- the same idea is applied to the watershed itself, the Speed River has its own watershed within the larger Grand River watershed

Intentions of Proposed Drawing:

The intention of the following drawing is to expand the project's frame of reference beyond the immediate site and situate Riverside Dam within the larger hydrological, territorial, and political systems that shape it. While the City's material present only a narrow, local context, this drawing shows how the dam exists within a larger system. By visualizing these overlapping geographies together, the drawing aims to visualize and highlight how local interventions participate in regional water governance, Indigenous land rights, and cumulative ecological processes. Its purpose is to remind viewers that the dam is not an isolated piece of infrastructure but part of a much broader network of relationships, responsibilities and impacts.

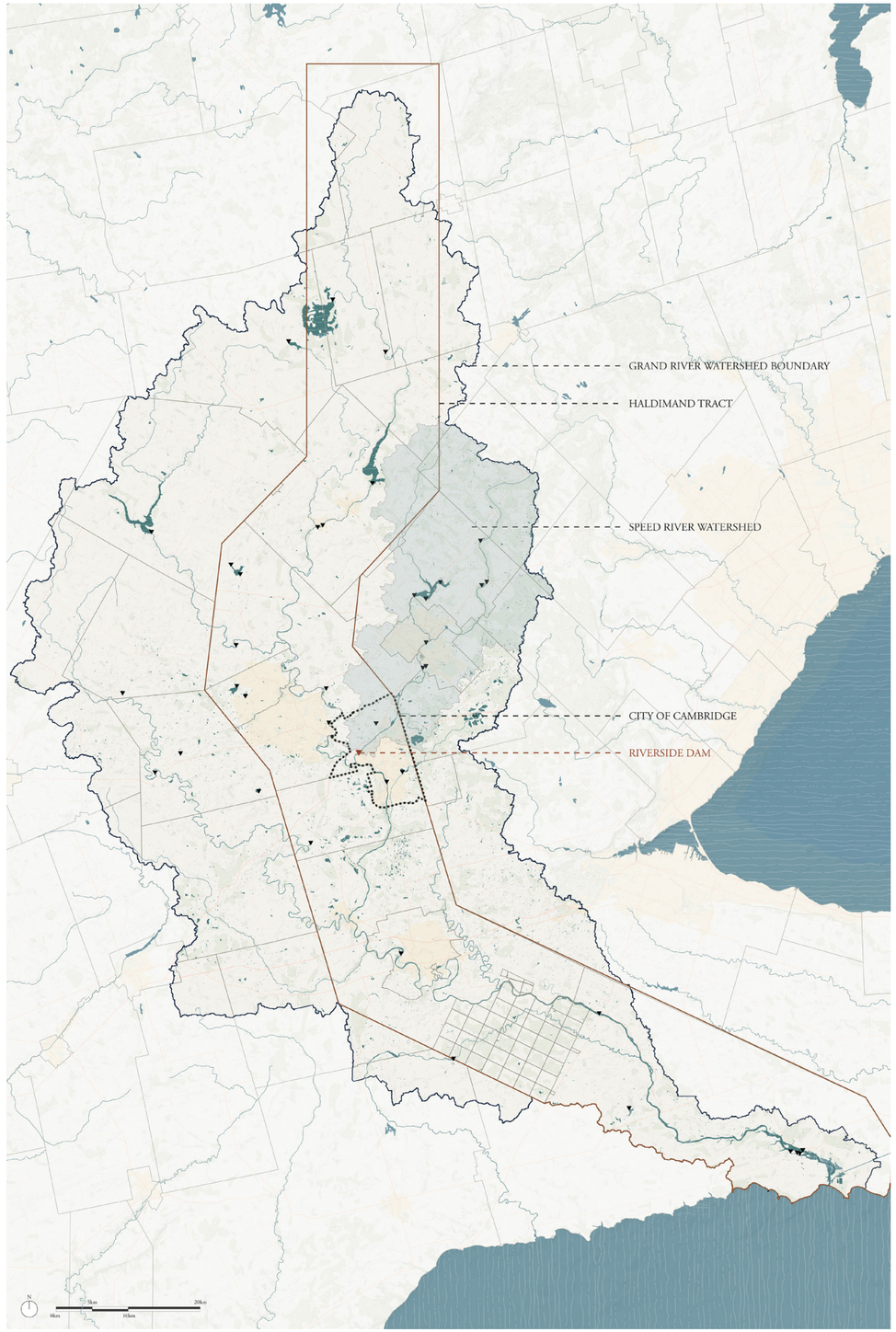


Fig. 4.4.8 "The Larger Context" Grand River Watershed in relation to Riverside Dam. *Made by author.*

4.5 ENGAGEMENT PRINCIPLES

The EA process, especially Schedule B, has reduced public engagement to polished renderings presented to passive audiences who are expected to admire, approve, or at most suggest minor modifications to predetermined designs. Before drawings can genuinely foster democratic participation and collective stewardship, we must fundamentally reconsider visualization not as a product to be consumed but as a process to be inhabited, not as expert pronouncement but as invitation to co-creation.

Western professional practice has historically maintained strict boundaries between "expert" designers and "lay" publics, with visualization functioning as a tool of authority rather than dialogue.[76] Architects and landscape architects produce technically sophisticated drawings that community members often cannot read, creating a pronounced asymmetry of knowledge that disempowers publics while centralizing design control in credentialed professionals.[77] Public engagement in this tradition typically occurs late in design processes, after major decisions have been made, and takes the form of formal presentations where polished renderings are displayed as near-final proposals, leaving little room for substantive community influence. When communities do offer feedback, it is often filtered through what planners deem "realistic" or "feasible," with dissenting voices dismissed as uninformed or obstructionist.[78]

As participatory design scholar Henry Sanoff has demonstrated through decades of practice and research, "the built and natural environments work better if citizens are active and involved in its creation and management instead of being treated as passive consumers".[79] Sanoff's work, emerging from democratic planning traditions of the 1960s-70s, established that participation is not merely an ethical obligation but produces better outcomes, designs that more accurately reflect community needs, generate stronger public support, and foster ongoing stewardship rather than passive use.[80] When people participate meaningfully in creating their environments, they develop a sense of ownership that translates into long-term care, adaptive management, and collective responsibility for landscape health.[81]

The concept of co-design, where stakeholders collaborate as equal partners throughout design processes rather than being consulted after experts have decided, represents a fundamental shift from participatory tokenism to genuine power-sharing.[82] Co-design recognizes that diverse stakeholders bring different forms of expertise: technical knowledge (designers, engineers), lived experience (community residents), traditional ecological knowledge (Indigenous peoples), and experiential wisdom (more-than-human actors represented through scientific observation or Indigenous relationality). As one recent report on co-design emphasizes, effective co-design "brings different stakeholders together to collaboratively design products, services and policies" where "each stakeholder brings unique knowledges" that are valued as equally legitimate.[83]

Critically, co-design is not a universal formula but must be adapted to specific contexts, power dynamics, and cultural protocols. Co-design with Indigenous communities, for instance, must centre Indigenous ways of knowing, being and doing and recognize historical and ongoing contexts of colonization and dispossession.[84] Key elements of culturally safe co-design include: acknowledging colonization and systemic racism; addressing individual biases; fostering self-determined decision-making; and creating culturally safe spaces.[85] The Australian government's recent review of Indigenous co-design processes found that failures often stem from treating co-design as consultation, tokenizing Indigenous participation, not addressing power imbalances, or appropriating Indigenous knowledge without consent or benefit-sharing.[86]

Critically, Forester emphasizes that deliberative practice is not about achieving false consensus but about structuring processes where decisions are understood by the people who made them, where people can openly express their opinions, make necessary compromises, and arrive at decisions that are acceptable even when interests conflict.[87] This connects directly

[76] Henry Sanoff, *Community Participation Methods in Design and Planning, in Landscape and Urban Planning - LANDSCAPE URBAN PLAN*, vol. 50 (2000): 14-15, 23-24.

[77] Sanoff, *Community Participation Methods in Design and Planning*, 15, 23-24.

[78] Pitch Pongsawat, "Book Review: The Deliberative Practitioner: Encouraging Participatory Planning Processes by John Forester," *Berkely Planning Journal* 15, no. 1 (2001): 90–92.

[79] Henry Sanoff, "Participatory Design," *DEPARCH Journal of Design Planning and Aesthetics Research* 1, no. 2 (2022): 1.

[80] Henry Sanoff, "Multiple Views of Participatory Design," *Focus* 8, no. 1 (2011): 12-16.

[81] Sanoff, *Community Participation Methods in Design and Planning, 103.*

[82] Kate Anderson et al., "Development of Key Principles and Best Practices for Co-Design in Health with First Nations Australians," *International Journal of Environmental Research and Public Health* 20, no. 1 (2022): 2-4.

[83] "Fact Sheets," *Transforming Indigenous Mental Health and Wellbeing*, n.d., accessed October 19, 2025, https://timhwb.org.au/fact-sheets/.

[84] "Fact Sheets."

[85] "Fact Sheets."

[86] National Indigenous Australians Agency (NIAA), *Co-Design Lessons Learned Report* (2023).

[87] Pongsawat, "Book Review: The Deliberative Practitioner: Encouraging Participatory Planning Processes by John Forester," 90–92.

to Mouffe's agonistic pluralism (discussed in "Make Conflict Visible"): the goal is not harmony but productive contestation where adversaries recognize each other's legitimacy within shared democratic institutions.[88]

The concept of claimed spaces versus invited spaces further illuminates limitations of conventional engagement.[89] Invited spaces are those created by authorities (public hearings, design charrettes, community workshops) where participation occurs on terms set by those in power. Claimed spaces are those created by communities themselves (neighborhood organizing, counterproposals, protest) where participation follows community-determined protocols. Research on transport planning found that residents who feel unheard in invited spaces often claim their own spaces to discuss issues, form counter-petitions, and organize resistance, yet these claimed spaces are typically not recognized as legitimate participation by planning authorities.[90] Genuine engagement frameworks must acknowledge and integrate claimed spaces, recognizing that participation is not only what happens in official forums but also what communities create for themselves. The challenge of engagement frameworks is both practical and ontological. Practically, how do we design processes that genuinely share power rather than manufacture consent? Ontologically, how do we shift from understanding landscapes as objects designed by experts to landscapes as commons co-created through ongoing negotiation among diverse human and more-than-human stakeholders?

True engagement frameworks require acknowledging that representation is power, every choice about how participation is structured, whose knowledge is solicited, which methods are used, and how input is incorporated (or ignored) is a political commitment about whose futures matter, whose knowledge counts, and what forms of democratic practice are possible.

The following guidelines translate the theoretical frameworks of participatory design, epistemic justice, deliberative practice, and Indigenous co-design into practical approaches for creating visualizations that invite genuine co-creation. These are not merely techniques for gathering feedback but ethical commitments to democratizing design authority and fostering collective stewardship.

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[88] Mouffe, The Democratic Paradox, 102–4.

[89] Anke Klaever and Ersilia Verlinghieri, "Who Is (Not) in the Room? An Epistemic Justice Perspective on Low-Carbon Transport Transitions," *Journal of Environmental Policy & Planning* 27, no. 2 (2025): 3–4.

[90] Klaever and Verlinghieri, "Who Is (Not) in the Room? An Epistemic Justice Perspective on Low-Carbon Transport Transitions," 2–3, 11.

4.5.1 Modifiability/Co-Creation

Drawings should actively invite stakeholders to mark up, annotate, or revise content, whether through live sketching, physical sticky notes, or digital tools, to foster a sense of ownership and deeper dialogue. We should shape visualizations that invite reshaping, creating iterative cycles where community input actively transforms proposals rather than merely commenting on them. As Sanoff argues, "the designer's job is no longer to produce finished and unalterable solutions but to extract solutions from a continuous confrontation with those who will use his/her work.[91]

Modifiability also addresses epistemic justice by materially disrupting the knowledge hierarchy where expert drawings are treated as authoritative truth. When anyone can pick up a marker and revise a rendering, the epistemic playing field shifts: lived experience, traditional knowledge, and community priorities become visible alongside technical expertise, creating opportunities for negotiation rather than expert imposition.[92]

In practice, this can be using large-format base maps as working surfaces for participants to draw on directly, using markers, colored pencils, or collage materials to express their visions. Providing physical manipulatives (model buildings, vegetation cutouts, water features) that participants can move around on site models can turn spatial decision-making tactile and accessible to non-experts.

Modified drawings should be returned to subsequent meetings, showing how previous input influenced current proposals and where disagreements remain unresolved. It also helps maintain continuity across engagement cycles rather than treating each session as isolated.



Fig. 4.5.1 "Living Breakwaters" SCAPE: Participatory mapping session where community members actively annotate and manipulate a large site model. The process invites non-expert input, fostering shared ownership of the design and creating opportunities for iterative and collective decision-making. *Image courtesy of SCAPE studio.*

[91] Sanoff, *Community Participation Methods in Design and Planning*, 13.

[92] Roisin Mooney et al., "Using Participatory Action Research Methods to Address Epistemic Injustice within Mental Health Research and the Mental Health System," *Frontiers in Public Health* 11 (2023): 2-4.

4.5.2 Frame as Draft

Labeling visuals as “working drawings,” “draft proposals,” or “scenario options” signals to the public that proposals remain open to input and change, supporting transparency and reducing resistance to adaptation or innovation.

The language and presentation of visualizations shape how communities perceive their own agency. When drawings are presented as polished, professionally rendered, and near-final, they communicate “this is what will happen; you may comment but fundamental elements are fixed”. This framing creates designed consensus; the illusion that design outcomes are inevitable rather than products of contested choices. Conversely, when visualizations are explicitly framed as drafts1: rough sketches, hand-drawn options, scenarios labeled “Option A,” “Option B,” “Option C”—they signal openness to revision.

In practice, that means for early engagement more “sketch” styles can be used, collaged visualizations, etc. Every visualization should be labeled with the process stage, ie. “Conceptual framework – not final”, or “Working scenario pending feedback”. Version numbers can also be included for clarity and proof of adaptation and iteration. Fixity levels can also be distinguished using visual codes (colour, line weights, annotations) to show what is relatively unchangeable, and what is still open to community influence.



Fig. 4.5.2 “Gene C. Reid Park Master Plan” Sasaki: this style of drawing can be used to showcase scenario planning in an accessible way to community members. *Image courtesy of Sasaki.*

4.5.3 Writable Zones and Prompts

Leaving graphic zones or integrated text prompts (e.g., "Where would you like to fish?") invites viewers to share ideas, raise concerns, or choose among options. This approach should be widely used in climate adaptation engagement, building ownership, acknowledging diverse perspectives, and fostering iterative solution development.

Recent innovations in participatory mapping for climate adaptation demonstrate the power of spatial prompts. Studies using PGIS (Participatory GIS) ask community members to mark on maps: Where do you experience flooding? Where are culturally important gathering sites? What routes do you use daily? Which trees provide essential shade? These prompts generate rich spatial data that technical experts cannot produce alone, revealing patterns of use, vulnerability, and value that inform more equitable and effective designs.[96] Moreover, when community members see their own contributions layered onto official plans "The route I marked became a priority pedestrian corridor!" they develop ownership and trust in planning processes.

Importantly, prompts must be carefully designed to avoid extracting knowledge without benefit. Indigenous communities have experienced repeated requests to "mark sacred sites" on maps that were then used by developers or agencies to avoid or exploit those sites rather than protect them.[93] Effective prompts therefore require clear agreements about data sovereignty: who owns the information generated, how it will be used, who can access it, and what protections ensure community priorities are honored rather than undermined.

In practice this means, creating prompt-based engagement posters: large format site plans with specific questions and spaces for written responses. Using colour-coded sticky notes for different types of input: green for "I value this", yellow for "I'm concerned about this", red for "this conflicts with my needs". Multi-scalar, temporal and open-ended prompts can also be created. For example, what's missing from this plan? What worries you about this proposal? Or how do you use this space in summer versus winter? How has the space changed over time? Multi-scalar prompts can be: where have you seen birds? Pollinators? Fish? How do you see animals move through this space?







Fig. 4.5.3 & Fig. 4.5.4 & Fig. 4.5.5 "Chatahoochee Riverlands" SCAPE:Workshop participants marking spatial priorities and concerns directly onto a physical base map using prompt-based flags. Close-up of flags indicates the colour-coded flags showing different themes. *Image courtesy of SCAPE studio.*

[93] National Indigenous Australians Agency (NIAA), *Co-Design Lessons Learned Report*.

4.5.4 Highlight Decision Points and Trade-Offs

Drawings can incorporate callouts, annotated bubbles, or highlighted questions to spotlight key trade-offs or pending choices, structuring more focused and productive public dialogue.

Highlighting trade-offs also cultivates what scholars call "response-ability", the recognition that choices have consequences for others, creating obligations to consider distributive justice.[94] Sanoff's participatory workshops often used "trade-off games" where families facing budget constraints chose between different housing features, making explicit that more space means fewer amenities, or vice versa.[95] Applied to landscape planning, trade-off visualization might show: "If we expand the parking lot, we lose these mature trees. If we preserve the trees, parking is reduced. Which matters more to you?" This honors that genuine participation involves difficult choices, not just expressing preferences without constraints.

In practice, this could mean using annotated call outs to flag key decisions, this can be done two-dimensionally or three-dimensionally where community members can engage with the visualization and learn simultaneously. Showing temporal timescales can also be relevant, showing how different trade-offs unfold over time based on the design decision.

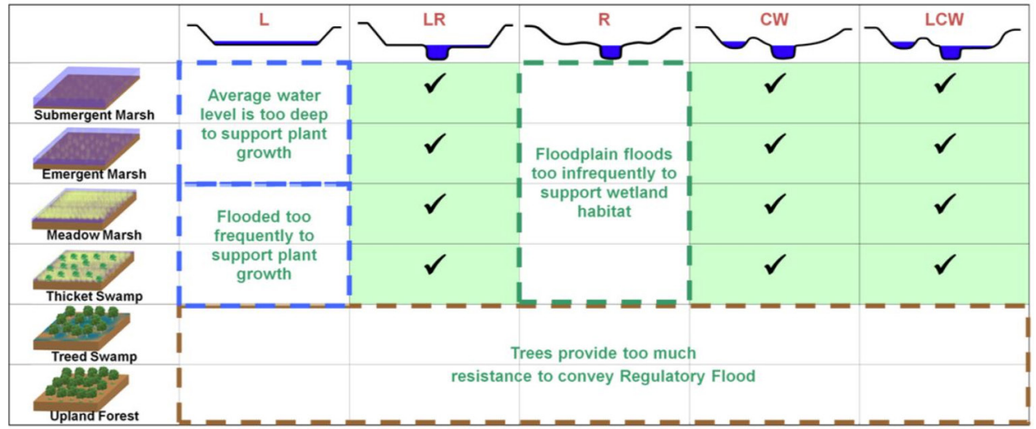


Figure 5-6 Screening of Cross-sections and Habitats for Discharge Points 2 and 3

Fig. 4.5.6 "Don Mouth Naturalization Project" table highlighting the realities of each option. *Table from Don Mouth Naturalization and Port Lands Flood Protection Portlands Environmental Assessment.*

[94] Haraway, *Staying with the Trouble: Making Kin in the Chthulucene, 10-12, 34.*

[95] Sanoff, *Community Participation Methods in Design and Planning*, 202-3.

Playing with the Different Options

Current Publicly Accessible Information:

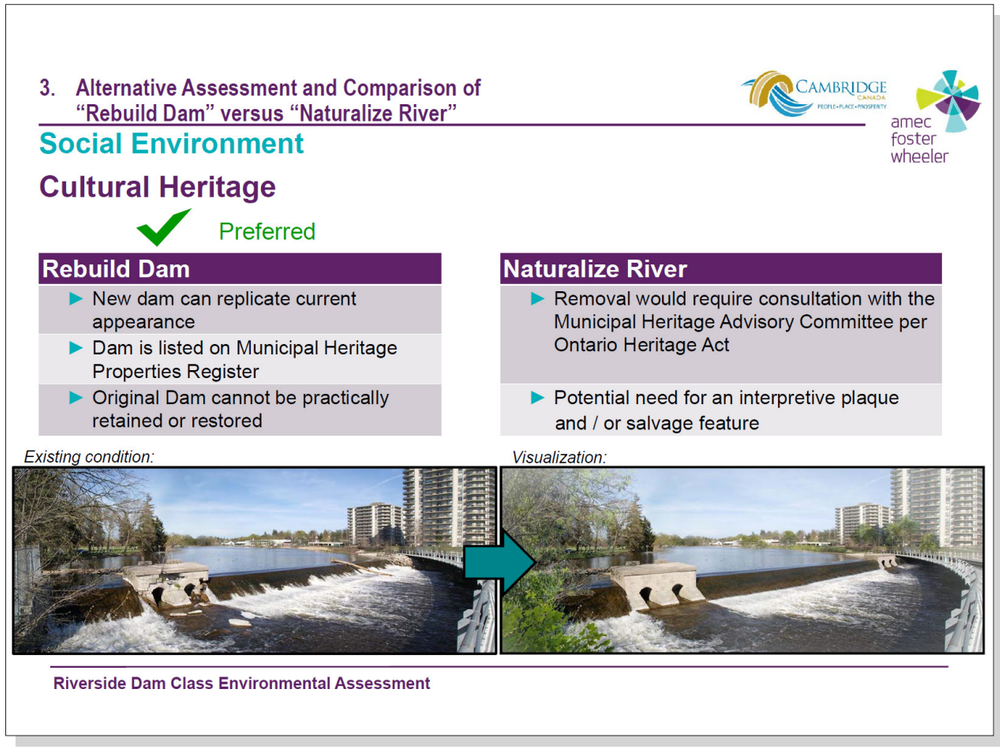


Fig. 4.5.7 Slide from PIC #4 comparing two shortlisted alternatives. *Slide #29 from PIC #4.*

What's Missing from the Publicly Accessible Information:

What is largely absent from the City's drawings is any indication that the design options for Riverside Dam remain open to interpretation, comparison, or modification. The visual materials presented through the Environmental Assessment process depict each alternative as a resolved and internally coherent proposal, offering limited opportunity for viewers to understand how elements might change, combine, or be negotiated over time. By presenting options as static endpoints rather than provisional scenarios, the drawings constrain public engagement to a process of preference selection rather than exploration or dialogue. This framing reinforces an expert-driven narrative in which decisions appear technically determined and minimizes the visibility of uncertainty, trade-offs, and competing values embedded within each alternative. As a result, the drawings limit the public's ability to engage with the project as an evolving process and instead position the future of the dam as something to be assessed visually, rather than actively questioned or shaped.

Proposed Drawing:



Fig. 4.5.8 "Playing with the Options" physical model, thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Modifiability / Co-creation

- components representing different shortlisted options can be added, removed, or rearranged during discussion
- supports active participation by allowing viewers to test scenarios
- enables a shared exploration of trade-offs

Frame as Draft

- the model is intentionally unfinished and reconfigurable, signaling that nothing is predetermined
- resists the sense of inevitability often produced by resolved drawings

Side-by-Side Views and Acknowledge Loss

- a consistent base allows different options to be compared directly within the same spatial framework
- allows the opportunity for questions to come up while simultaneously manipulating the different design options, supporting transparent discussion

Intentions of Proposed Model:

This physical model reframes how design options at Riverside Dam are understood by making them explicitly modifiable. Rather than presenting alternatives as fixed outcomes, the model allows elements to be moved, replaced, or combined, emphasizing that decisions remain negotiated and contingent. Through hands-on interaction, the model supports active engagement and makes trade-offs between ecological processes, cultural heritage, and public access more legible than static drawings allow. A consistent spatial framework and simplified material language clarify what is stable versus open to change, while resisting the sense of inevitability produced by finalized visualizations. In doing so, the model positions visualization as a tool for dialogue and comparison within a contested decision-making process.



Fig. 4.5.9 Photo of different dam options on the model. *Photo taken by author.*



Fig. 4.5.10 Photo of "Rebuild the Dam" option on the model. *Photo taken by author.*



Fig. 4.5.11 Photo of "Remove the Dam" option on the model. *Photo taken by author.*

4.6 USE OF PHYSICAL SPACE

Where and how visualizations are displayed profoundly shapes who can access them, whose bodies are centered in their viewing, what forms of interaction they enable, and ultimately whether they function as tools of democratic participation or instruments of exclusion. Before drawings can genuinely democratize landscape decision-making, we must reconsider the spatial politics of display itself.

Western architectural and planning practice has historically displayed visualizations in spaces that reinforce professional authority and exclude lay publics. Drawings are presented in formal settings, municipal hearing rooms, developer showrooms, architecture firm offices, that communicate institutional power through their very spatial grammar.[96] These spaces often require access credentials (knowing when and where meetings occur, having transportation, possessing literacy to navigate bureaucratic procedures), creating what geographer Don Mitchell calls "actually existing public space"—nominally open but materially inaccessible to many urban residents, particularly low-income communities, people with disabilities, immigrants, and youth.[97] As Mitchell argues in his influential book The Right to the City, "public space has never been a space of unmitigated freedom"; rather, it is "produced through ongoing struggles over who has a right to be in it, for what purposes, and under what circumstances".[98]

The display of landscape visualizations reproduces these exclusions. When drawings are shown only at 7:00pm municipal hearings, they exclude shift workers, caregivers without childcare, and those without evening transportation. When they are presented at eye level on walls, they exclude wheelchair users and children. When they are shown as small-format prints in distant offices, they exclude those without transportation, time, or confidence to enter formal institutional spaces.[99] Applied to landscape visualization, this means recognizing that display choices (scale, placement, interactivity, accessibility) are not secondary to content but constitute the

[96] Sanoff, *Community Participation Methods in Design and Planning, 68-69.*

[97] Don Mitchell, *The Right to the City: Social Justice and the Fight for Public Space* (2003): 2-6, 9-12, 14-16.

[98] Skinner-Thompson, "Procedural Environmental Justice." 399-400, 402.

very conditions of possibility for democratic engagement.[99]

Recent innovations in immersive cartography and large-scale participatory mapping demonstrate the power of scale and placement in fostering engagement. Aron Chang's "Big River Drawings" project created massive temporary maps (some exceeding 100 feet in length) of the Mississippi River watershed, displayed in public gathering spaces like science museums and community centers.[100] These large-format drawings did not just represent the river system; they transformed viewers' relationship to it by creating what Chang calls "spaces of learning, welcoming, and collaboration" where people could physically walk through the watershed, trace connections with their fingers, annotate specific locations, and discover how their own community fitted within broader hydrological systems. As Chang observes, the immersive scale "supports simultaneous viewing by multiple participants, encouraging group discussion and shared interpretation".[101]

The choice of display location is itself a political act with profound implications for who participates. Displaying drawings in everyday spaces like community centers, libraries, grocery stores, transit stations, parks, rather than only in formal institutional settings creates what Simon calls "places of low-threshold participation" where encountering visualizations requires no special commitment, credential, or courage.[102] Many participatory placemaking guides urge practitioners to "meet people where they are," bringing design tools into the lived spaces where communities already gather, rather than requiring attendance in unfamiliar institutions.[103]

The temporality of display also matters. Traditional engagement schedules (single public hearings announced with minimal notice) assume publics with flexible schedules, reliable transportation, and confidence navigating formal procedures. More democratic approaches involve sustained, iterative display where visualizations remain accessible over weeks or months, allowing people to encounter them multiple times, discuss with neighbors, return with questions, and see how input from previous sessions shaped revisions.[104] Chang's Big River Drawings exhibitions, for instance, remained on display for extended periods with regular facilitated sessions, "creating multiple entry points for participation and

[99] *Chapter 1: Principles of Participation – The Participatory Museum*, n.d., accessed October 19, 2025, https://participatorymuseum.org/chapter1/.

[100] Aron Chang, "Big River Drawings: In Support of Learning, Welcoming, and Community Engagement," *Open Rivers: Rethinking Water, Place & Community* no. 28 (2025).

[101] Chang, "Big River Drawings: In Support of Learning, Welcoming, and Community Engagement."

[102] *Chapter 1.*

[103] Montgomery Planning, *Equitable Engagement Guide* (n.d.).

[104] *Chapter 1.*

allowing understanding to accumulate over time rather than demanding instantaneous comprehension".[105]

The following guidelines translate the theoretical frameworks of spatial democracy, participatory exhibition design, and universal design into practical approaches for displaying visualizations in ways that enable rather than constrain democratic participation.

[105] Chang, "Big River Drawings: In Support of Learning, Welcoming, and Community Engagement."

4.6.1 Large-Scale Prints

Using large-format drawing at open houses or community events supports simultaneous viewing by multiple participants, encouraging group discussion and shared interpretation. Large-scale visualizations create a common spatial reference that fosters collaborative making. Aron Chang's research on "Big River Drawings" demonstrates how large, temporary drawings can transform public spaces, inviting participants to navigate, annotate, and collectively build understanding of complex systems like water infrastructure.[106] These immersive visualizations enhance learning, dialogue, and ownership by allowing people to physically engage with scale and spatial relationships rather than static, small-format prints that isolate the viewers.

In practice, this could mean creating walk-through experiences, using temporary installations, and providing physical aids for interacting with large-scale prints (sticky notes, pointers, transparent overlays). Displays can also go on horizontal surfaces (tables, floors) rather than just vertical walls.





Fig. 4.6.1 & Fig. 4.6.2 "Michigan State University Facilities and Land Use Plan" Sasaki: Community engagement session using large-scale site plans placed on the floor to encourage collaborative exploration, group discussion, and shared interpretation. *These enable participants to physically navigate and annotate the map. Image courtesy of Sasaki.*

[106] Chang, "Big River Drawings: In Support of Learning, Welcoming, and Community Engagement."

4.6.2 Place in Everyday Spaces

Installing drawings and visualizations in informal public settings such as libraries, parks, transit stops, and community centers, or even the site itself, extends engagement beyond formal consultation events and democratizes access to environmental planning processes. Yang et al. emphasize that embedding design materials in everyday landscapes creates ongoing opportunities for residents to interact with, learn from, and respond to project proposals on their own terms.[107]

Bringing visualizations to community spaces acknowledges that participation should meet people where they are; in places they already gather, at times that fit their lives, in environments where they feel safe and legitimate. Simon's participatory museum research demonstrates that when cultural institutions move beyond their buildings into community spaces, they reach dramatically different audiences: families who would never visit a museum, elders with mobility constraints, youth intimidated by formal settings.[108] The same principle applies to landscape planning: displaying drawings at a church social, library story hour, or farmers market reaches people who would never attend a 7:00pm planning commission hearing.



Fig. 4.6.3 "Los Angeles River rover mobile visitor and education center". *Image from U.S. Fish & Wildlife Service.*

[107] Nan Yang et al., "Landscape Architecture as Democratic Practice: Learning from Participatory Methods and Motivations in Community-Engaged Design," Landscape Research 50, no. 1 (2025): 63-64.

[108] *Chapter 1.*

Circulation of Knowledge: The "Zine":

Current Publicly Accessible Information:



CAMBRIDGE CANADA
PEOPLE • PLACE • PROSPERITY

CITY OF CAMBRIDGE
CLASS ENVIRONMENTAL ASSESSMENT
RIVERSIDE DAM
PUBLIC INFORMATION CENTRE (PIC) No. 4

This Notice is to advise interested parties that the City is planning a Public Information Centre (PIC) to provide an update on study progress, present the preliminary preferred alternative, and provide an opportunity to discuss the project with City staff and the Project Team.

The study is being conducted in accordance with the requirements for a Schedule 'B' project as described in the Municipal Engineers Association's Municipal Class Environmental Assessment (EA) document (October 2000, as amended in 2007, 2011 and 2015), which is approved under the *Ontario Environmental Assessment Act*. A key component of the study is consultation with interested stakeholders (public, landowners and regulatory agencies). The City has hosted three previous PIC's in 2012, 2013 and 2016 at which time background investigations, management alternatives and an evaluation of alternatives were presented. Significant feedback was received from the public and stakeholders during the study regarding the evaluation of alternatives. Over the most recent period the City has considered additional alternatives, revisited the evaluation and undertook additional consultation with key stakeholders and agency partners. This additional phase of the study is now complete and the City is looking for feedback from the public on the updated assessment, and the preliminary preferred management alternative for Riverside Dam.

The PIC is planned for:

Date: Wednesday November 29th, 2017
Time: 6:30 to 9:00 p.m. with a presentation at 7:00 p.m.
Location: Royal Canadian Legion Branch 126
334 Westminster Drive North, Cambridge

The PIC will consist of the following elements:

- 6:30 pm – Open storyboard period; an informal drop in period during which project details will be displayed on presentation boards.
- 7:00 pm - Presentation by City staff and the Project Team
- 7:30 pm – Open mic question period
- 8:00 pm – Storyboards & one-on-one discussion period; an opportunity for individuals to view the storyboards and discuss the project with City staff and the consulting team in an informal format

Anyone with an interest in this study is invited to attend the PIC and participate. If you cannot attend and would like to provide comments, please forward them by Monday **December 11, 2017** to one of the Project contacts provided below.

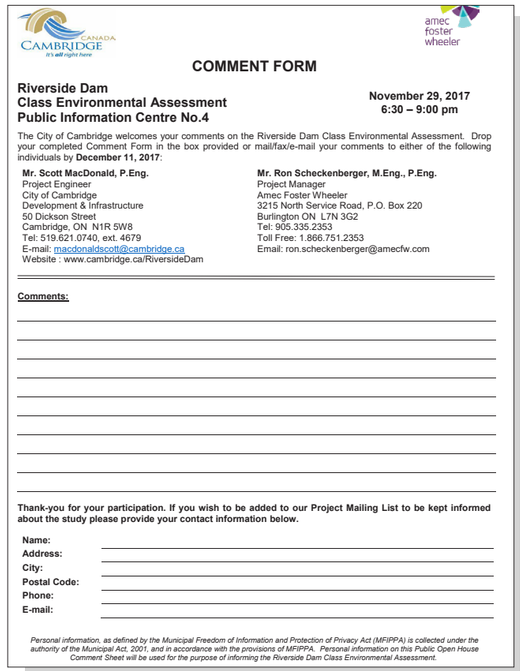
Comments and information regarding the study are being collected to assist the City of Cambridge in meeting the requirements of the Environmental Assessment Act. This material will be maintained on file for use during the project and may be included in project documentation.

All material presented at the PIC will be available to download from the City of Cambridge website at: www.cambridge.ca/RiversideDam

If you require further information, or if you have specific comments related to this project, please contact either of the following:

Mr. Scott MacDonald, P.Eng.
Project Engineer
City of Cambridge
Community Development
50 Dickson Street
Cambridge, ON N1R 5W8
Tel: 519.621.0740, ext. 4679
E-mail: macdonaldscott@cambridge.ca

Mr. Ron Scheckenberger, M.Eng., P.Eng.
Project Manager
Amec Foster Wheeler
3450 Harvester Road
Burlington ON L7N 3W5
Toll Free: 1.866.751.2353
Email: ron.scheckenberger@amecfw.com



CAMBRIDGE CANADA
It's all right here

amec foster wheeler

COMMENT FORM

Riverside Dam
Class Environmental Assessment
Public Information Centre No.4

November 29, 2017
6:30 – 9:00 pm

The City of Cambridge welcomes your comments on the Riverside Dam Class Environmental Assessment. Drop your completed Comment Form in the box provided or mail/fax/e-mail your comments to either of the following individuals by **December 11, 2017**:

Mr. Scott MacDonald, P.Eng.
Project Engineer
City of Cambridge
Development & Infrastructure
50 Dickson Street
Cambridge, ON N1R 5W8
Tel: 519.621.0740, ext. 4679
E-mail: macdonaldscott@cambridge.ca
Website : www.cambridge.ca/RiversideDam

Mr. Ron Scheckenberger, M.Eng., P.Eng.
Project Manager
Amec Foster Wheeler
3215 North Service Road, P.O. Box 220
Burlington ON L7N 3G2
Tel: 905.335.2353
Toll Free: 1.866.751.2353
Email: ron.scheckenberger@amecfw.com

Comments:

Thank-you for your participation. If you wish to be added to our Project Mailing List to be kept informed about the study please provide your contact information below.

Name:
Address:
City:
Postal Code:
Phone:
E-mail:

Personal information, as defined by the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA) is collected under the authority of the Municipal Act, 2001, and in accordance with the provisions of MFIPPA. Personal information on this Public Open House Comment Sheet will be used for the purpose of informing the Riverside Dam Class Environmental Assessment.

Fig. 4.6.4 (left) City of Cambridge Public Information Centre Notice. *Accessed from City of Cambridge Website.*

Fig. 4.6.5 (right) City of Cambridge Public Information Centre #4 comment form. *Accessed from City of Cambridge Website.*

What's Missing from the Publicly Accessible Information:

Limiting communication to mailed notices and formal meeting announcements excludes many residents who do not regularly check their mail, who move frequently, who rent, or who lack stable addresses. It assumes that everyone receives, reads, and understands printed notices, when in reality this method reaches only a narrow slice of the community. Mailbox-based communication also fails to meet people where they actually spend time (parks, cafés, libraries, transit stops, and other shared spaces) leaving out those whose schedules, mobility, language abilities, or daily routines make traditional notices inaccessible. As a result, key information about the Riverside Dam project circulates unevenly, reinforcing existing inequities in who is informed, who can participate, and whose voices shape the future of the site.

Proposed:

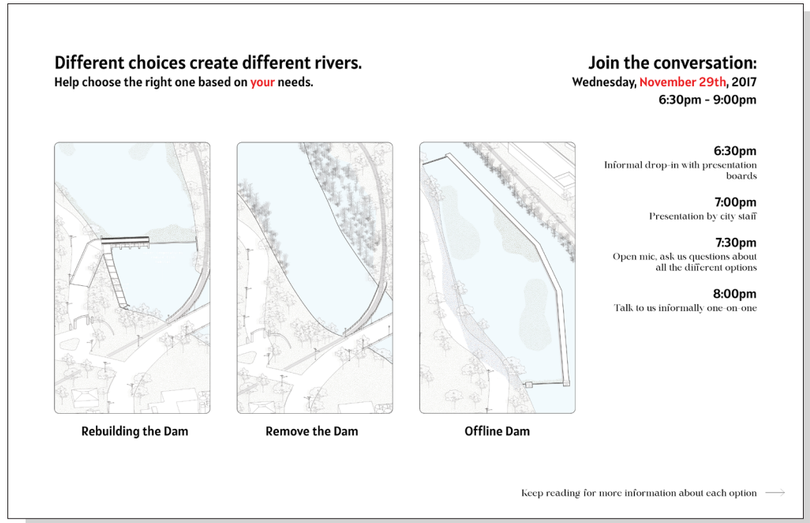


Fig. 4.6.6 "Circulation of Knowledge: The "Zine", thumbnail. *Made by author.*

Principles Followed by Proposed Drawing:

Place in Everyday Spaces:

- expands access beyond a mailbox, placing information in public, walkable, and commonly used spaces (cafe's, libraries, grocery stores, park boards, community centres)
- creates multiple entry points from children to seniors
- invites participation by clearly stating the problem and showing where and when the public can give their opinion
-treats public space as an information platform

Intentions of Proposed Drawing:

The idea behind this series of drawings is to be in a "zine" layout. Traditionally, "zine's" are very easy and cheap to produce, it can be printed on a standard 11"x17" of paper. It is also small enough that it can be left around local spaces, like libraries, grocery stores, coffee shops, pin boards, etc. This can help generate interest in the project and could attract audiences that may not have heard about it in the traditional way.

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Nibi Bimaadiziwin

Anishinaabemowin phrase for "water is life"





A barragem Riverside esta mudando.
Faca parta da decision.

La represa Riverside esta cambiando.
Sea parte de la decision.

Riverside Dam is Changing.

Be part of the decision.

Fig. 4.6.7 "Circulation of Knowledge: The "Zine", coverpage. *Made by author.*

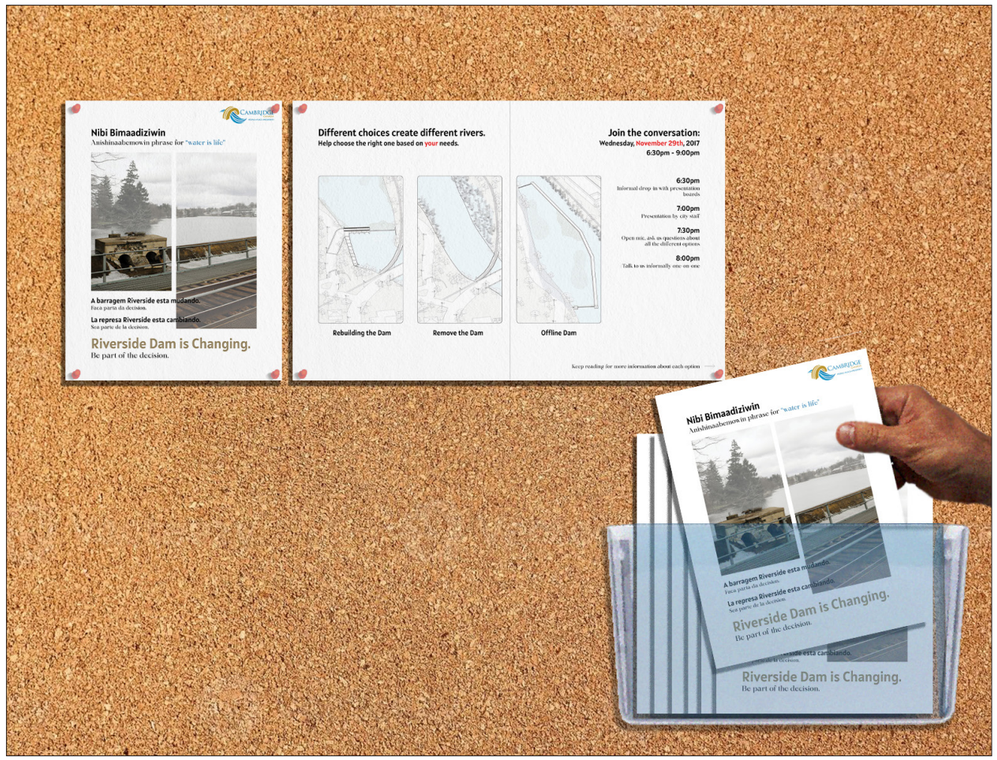
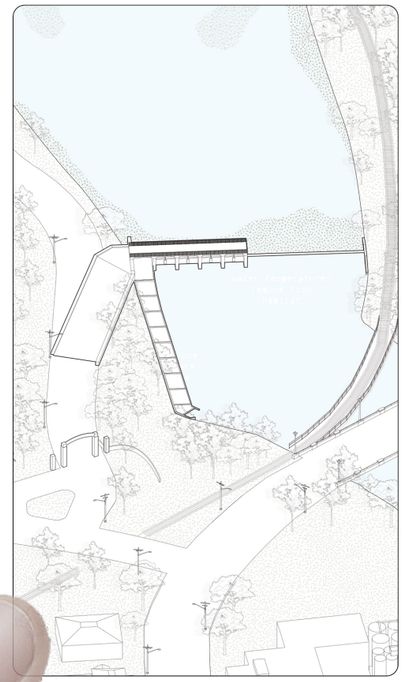


Fig. 4.6.8 "Circulation of Knowledge: The "Zine". Example of how zine could be displayed on community board. *Made by author.*

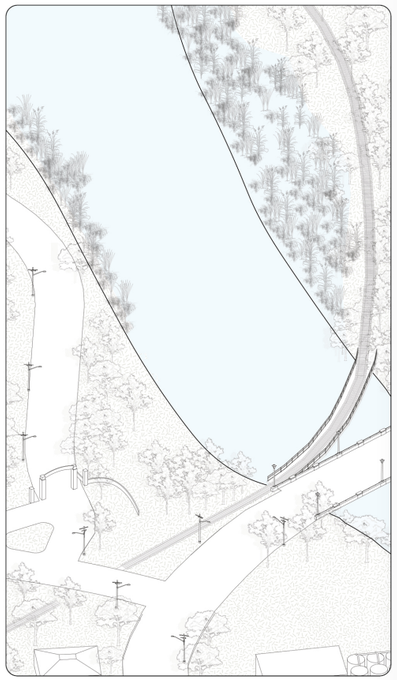
Fig. 4.6.9 "Circulation of Knowledge: The "Zine". Example of first page. *Made by author.*

Different choices create different rivers.

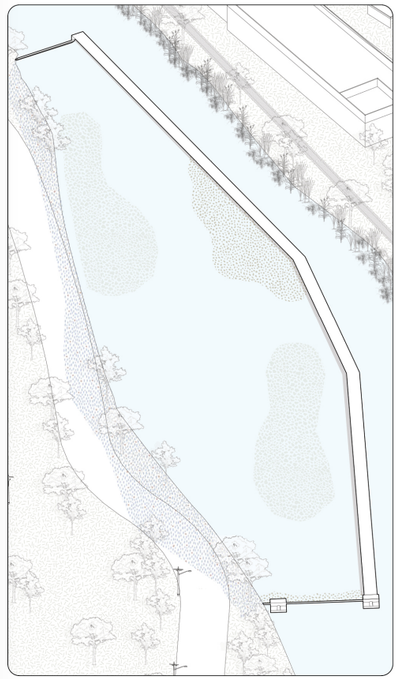
Help choose the right one based on your needs.



Rebuilding the Dam



Remove the Dam



Offline Dam

Join the conversation:

Wednesday, November 29th, 2017

6:30pm - 9:00pm

6:30pm
Informal drop-in with presentation boards

7:00pm
Presentation by city staff

7:30pm
Open mic, ask us questions about all the different options

8:00pm
Talk to us informally one-on-one

Keep reading for more information about each option

Miigwech
Thank you !

Stay up to date with the project:

https://www.cambridge.ca/en/learn-about/riverside-dam.aspx

Stay involved.
Mantenha-se envolvido.
Mantente involucrado.

Fig. 4.6.10 "Circulation of Knowledge: The "Zine". Back cover page. *Made by author.*

CHAPTER 5

Conclusion

5.1 LOOKING BACK ON THE PROCESS

This thesis examined how visualization influences environmental assessments and public engagement in the case of Riverside Dam. Throughout this process, it became clear to me that visualization is not a neutral tool: what is shown, how it is framed, and what remains unseen are deeply shaped by personal and cultural biases, including my own. Recognizing these biases was challenging but essential, as it underscored the need for ongoing reflection and transparency in representational work, particularly within settler colonial contexts where drawings have long been used to legitimize certain interests over others.

Currently, the baseline for public participation in Environmental Assessments is too low. Many processes treat consultation as a checkbox rather than an opportunity for genuine dialogue and influence, undermining trust and limiting the quality of decision making. In this context, it no longer feels sufficient for designers to claim neutrality, especially when climate change and ecological degradation make the consequences of inaction so visible; instead, I see a responsibility to advocate for more transparent, accessible, and ecologically responsible options, while still making trade offs and conflicts legible to the public. Personally, I believe the dam should be removed to restore ecological function and climate resilience, yet I deliberately did not reveal this preference in my visualizations—instead prioritizing a process that equitably presents all shortlisted alternatives (rebuild, offline, remove) so that communities can weigh the evidence themselves. This choice acknowledges that dam removal is not always the right path, given how deeply people resist change even when evidence points toward it, but a more transparent process could empower informed decisions and draw in voices who are typically sidelined. Raising expectations for participation, and insisting on participatory practices that are transparent, inclusive, and iterative, is necessary if environmental governance is to meaningfully serve the communities and more than human systems affected.

The Riverside Dam project exemplifies the challenges of trying to streamline Environmental Assessment processes. What was initially

intended to be a straightforward and relatively quick procedure stretched over nearly two decades, revealing the complexity of social, ecological, and political factors involved in even a small scale river infrastructure decision. This case illustrates that projects perceived as minor still require thorough due diligence, as their outcomes can trigger cascading effects on waterways, ecosystems, climate resilience, and community trust. Beyond technical considerations, the social dimensions of such projects demand equal attention; when community members feel unheard or marginalized, time and resources risk being spent inefficiently, prolonging conflict and increasing the amount of public money devoted to managing controversy rather than addressing root issues.

Clear and accessible forms of visualization are critical for meaningful community engagement. People care deeply about their local environments and often want to be involved in decisions that affect them, but engagement efforts frequently rely on technical imagery, buried appendices, and jargon that create barriers rather than bridges. Through this work, I explored how drawings could instead function as invitations to conversation, foregrounding relationships, trade offs, and uncertainties rather than only polished end states; however, I also recognize that my own visualizations remained largely within architectural conventions, such as vector linework, controlled compositions, and a physical model that was arguably too refined to encourage people to touch or modify it. These choices reflect my training and current skillset, but they also reveal limits: I did not fully test more atmospheric, "messy," or participatory media, nor did I empirically compare how different drawing styles might affect community understanding or comfort in speaking. With more time, I would experiment with a wider spectrum of formats—more realistic or narrative renderings, writable large scale prints, deliberately "imperfect" models, and drawings embedded with explicit questions—to more actively invite residents to mark, alter, and contest the materials.

Environmental Assessments are social processes as much as technical ones, and this thesis has underscored that drawings sit at the centre of those negotiations rather than outside them. The framework I developed (contextual clarity, embodied perspectives, temporal layering, and making conflict visible) was a way of articulating how visualization might better support negotiated design, where structured dialogue and collaboration among stakeholders with competing interests are prioritized. In practice, this meant re presenting the City of Cambridge's shortlisted options for Riverside Dam through new drawings and engagement formats rather than proposing an entirely new design, reframing the process so that residents could more clearly see what was at stake in each "preferred alternative."

These drawings are not intended as final answers, but as partial, situated representations that acknowledge their own limitations and aim to open space for further negotiation.

The guidelines I developed are intended as a practical scaffold within existing environmental governance structures, rather than as an abstract or stand alone toolkit. I have written them primarily for municipal staff, consultants, and designers working within the Municipal Class Environmental Assessment process, with the aim of setting a minimum standard for how drawings and engagement materials communicate trade offs, uncertainties, and conflicts to the public. In the same way that permit applications specify required drawing sets, I imagine these guidelines informing a list of minimum visualization and engagement requirements under the "public consultation" components of a Municipal Class EA, so that contextual clarity, embodied perspectives, temporal layering, and making conflict visible are treated as baseline expectations rather than optional enhancements. At the same time, I see this framework as adaptable enough for community organizations, Indigenous nations, and advocacy groups to develop their own counter visualizations and processes that more fully respect treaty relationships and Indigenous governance, and that extend beyond a single dam—or even beyond Ontario—to address the broader pattern of aging dams as both a problem and an opportunity for transformative change.

This research has been a valuable experience for me as a designer, allowing me to examine closely how people respond to Environmental Assessment processes, particularly in the context of the Riverside Dam project and similar undertakings. Conversations with engineers, municipal staff, activists, and community members offered insight into both the aspirations and frustrations that surround public engagement, visualization, and environmental governance. Engaging this topic has also deepened my own relationship to the land and water of the Grand River watershed; it has reinforced the importance of approaching design and representation not only with technical skill, but with sensitivity to social, cultural, and ecological contexts, and a willingness to question the comfort of neutrality when more just and ecologically responsible futures are possible. This thesis is a step toward more thoughtful, inclusive, and transparent environmental assessment practices, grounded in the belief that those who live in and with the land deserve to be meaningfully involved in shaping its future.

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