A FLOOD TOOLBOX

VISUALIZING FLOOD MITIGATION OPTIONS FOR FIRST NATIONS COMMUNITIES OF THE LOWER FRASER RIVER

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PREPARED FOR:
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ACKNOWLEDGEMENTS

Connor would like to acknowledge that, throughout the duration of this project, they have lived and worked on the ancestral and unceded territory of the xʷməθkʷəy əm (Musqueam), Sḵwxwú7mesh Úxwumixw (Squamish), səlilw ətaʔɬ (Tsleil-Waututh) Nations, and the shared territory of numerous Hul'qumi'num and the SENĆOŦEN speaking peoples.

As this project has examined flood mitigation, it also inherently considers the repercussions of colonial approaches to flood mitigation on First Peoples, their territories, their lifestyles and their culture. The majority of the development and subsequent flood mitigation infrastructure along the Fraser River has been detrimental to the Fraser's health, as well as that of the adjacent landscape, and thus significantly damaged many aspects of indigenous lifeways and/or exacerbated flood risk in indigenous communities.

Connor would like to thank:

Sts'ailes and Leq'á:mel First Nations (and many of their members), for responding to our requests for participant communities, and for their hospitality, kindness, and willingness to share their knowledge and experiences.

My mentors, Mariah Mund and Kees Lokman, for helping guide this project to its completion, and helping me learn so much along the way.

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This project was conducted under the mentorship of the Emergency Planning Secretariat (EPS). Any opinions or recommendations, and any errors, are those of the author, and do not necessarily reflect the views of the Emergency Planning Secretariat, or the University of British Columbia.

Included photos, unless otherwise credited, belong to the author.

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EXECUTIVE SUMMARY

The Fraser River is a significant and critical component of British Columbia's natural infrastructure, with a wide diversity of habitats and ecosystems along its course, and all manner of human development and activity occurring alongside it, providing food, shelter, agricultural land, and transportation routes (Fraser Basin Council, 2009).

The Fraser and its landscapes are inseparable from flooding. The First Peoples who have made the Valley home since time out of mind inhabited the river, its adjacent waterways, and its surrounding lands with little concern for flooding. Occupation of flood-prone areas was temporary, with groups relocating to settlements on higher ground during times of flood risk. With undamaged natural floodplains offering space the river could safely occupy during high flow events, flooding was seen as a seasonal event, around which life was structured (Gandolfo-Lucia, 2016).

European perception of the Fraser Valley was of a landscape ripe for cultivation. Agricultural development occured in rich, often flood-prone, soils. Following the flood of 1894, diking, draining and developing further destroyed and reducing the natural flood infrastructure that remained in the Fraser River (Gandolfo-Lucia, 2016).

Extreme weather (and a shift towards more pluvial flooding) and cycles of drought and deluge, coupled with a century of colonial development and flood mismanagement has put the Fraser River and the Valley's 2.5 million inhabitants at elevated risk, with a constant threat of logistical disconnection from the rest of Canada (Curry & Zwiers, 2018; Fraser Basin Council, 2016).

Throughout Canada, First Nations are among those most vulnerable to flooding (Chakraborty et al., 2021). In the Fraser Valley, many reservations are situated in remote areas, in some cases with whole communities at risk of flood impacts, including severing of travel routes and damage to critical infrastructure. Many reservations lack appropriate flood mitigation infrastructure, and funding and support for upgrades is poor. Mainland Coast Salish communities have limited capacity for proactive flood planning and management, and must compete for funding that is subject to outdated policies (Build Back Better Collaborative, 2022).

Visualizing specific flood mitigation options for First Nations communities can expedite flood management planning processes internally and externally, whether for deliberation within the community, or external discussions.

This project seeks to:

1. Collaborate with interested communities
2. Explore adaptation options specific to the communities and the regional context
3. Begin the development of a Coast Salish community flood toolbox
4. Inform proactive decision making and adaptation for flood risk reduction

FLOODING & THE FRASER

As the 7th largest annual discharge river in North America, the Fraser and its environs contain incredible biodiversity, both in and out of the water, enormous salmon runs, and the agriculture and other food production that occurs in the valley is integral to the food sovereignty of both First Nations and the province of British Columbia alike (Brice et al., 2021).

Flooding is inherent to the river, and historically these were characterized as nival, or snow melt derived. Human interactions with these floods are longstanding, with the earliest settler experiences coming from the 1830s, when a landslide-induced flood swept away the HBC's Fort Alexandria in the North Cariboo. Since then, the human impact on the Fraser River and Valley has been great and intense. European settlement and agriculture brought a completely different relationship to flooding than had been held by First Nations prior to contact. Immediately, wetlands were drained, fields and towns were diked, and side channels and flood plain network connections to the Fraser were severed to facilitate the expansion of settler agricultural territories (Gandolfo-Lucia, 2016). Agricultural development and subsequent pollutant runoff (in part influenced by flooding) has had adverse effects on the Fraser's water quality and suitability for aquatic flora and fauna (Hall & Schreier, 1996)

Events like the calamitous flooding of early May-June 1894 further cemented in the mind of settlers the perception of the Fraser and its flooding as an enemy to be combated. The flooding of May-June 1948 precipitated the most aggressive a campaign of mitigation efforts, constructing more and greater dams, ditches, and pumps. Settlers occupied increasingly flood prone land, in part due to these engineering efforts, which temporarily convinced them, at least temporarily, that previously sodden and damp land was safe from flooding. Today the Fraser River has little access to the network of channels and sloughs in its surrounding landscape that once provided space for its floodwaters (Finn et al., 2021).

The flooding that occurred in November 2021 exemplifies the fragility of human settlement in the Fraser valley, specifically the inadequacy of our preventative and responsive measures. Of course, climate change was another factor at play in November 2021, which will continue to affect flooding into the future. While the Fraser has always been subject to (at times, exceptional) flooding, climate change is altering the timing, severity and nature of flood events, with an increase in pluvial floods, and an earlier annual freshet (Gillet et al., 2022). Additionally, the Fraser's drought-flood cycles have become exaggerated, and repetitive intense droughts have caused changes to the surrounding landscape that reduce its capacity to absorb water, and exacerbate runoff of both water and debris (Brice et al., 2021).

FIRST NATIONS & THE FRASER

First Nations have made the Fraser River home since time immemorial. The Fraser River, valley, and environment are foundational to their identities, spiritualities, ceremonies and ancestral knowledge, and thus the Fraser's health has a direct effect on their health and well-being. Today, the Fraser and its landscapes remain a critical part of resident First Nations' lifestyles, as a source of identity, sustenance, and income (Stelkia et al., 2020).

First Nations knowledge reflects the fact that First Nations living alongside the river regarded its flooding as simply a seasonal occurrence, one which structured the year and everyday life. The river's movement and the regions its waters would occupy during floods and freshet were well understood, and settlement was sited appropriately to avoid these areas. Structures located near the river were used for activities that took place at times of the year where flooding or high water was unlikely. In some cases, structures were built to keep them elevated above even the highest water levels (Gandolfo-Lucia, 2016).

As mentioned previously, it was European development of the Fraser Valley, as well as their approach to flood mitigation, that robbed First Nations of much of the natural flood mitigation infrastructure that they had relied on. Reservations restricted First Nations movement and areas of occupation, and hindered their ability to engage with activities informed by the Fraser's flood cycles. Dramatic changes to the Fraser and its landscapes reduced the access to and availability of sources of food (particularly salmon) and materials, and left a disconnected and disjointed network of backwaters and stagnant sloughs (Finn et al., 2021).

With anthropogenic climate change intensifying flooding and altering its timing, First Nations are among the most vulnerable to its impacts. Reservations are often located in remote and under-serviced regions along the Fraser, with fragile connections to critical infrastructure and adjacent communities. If flood mitigation infrastructure exists, it is often insufficient for the challenge of climate-change exacerbated flooding, and communities must compete for provincial and federal funding for upgrades or new initiatives (Yumagulova, 2020; Resilient Waters, 2020)

First Nations are now pushing back against conventional, combative approaches to flood mitigation, instead seeking greater collaboration with their neighbouring communities, developing coordinated responses to elevated flood risks, placing emphasis on the ensured health of the Fraser's salmon and ecosystems, and sustainable economies alongside resilient communities (Build Back Better Collaborative, 2022).

PROJECT LIMITATIONS

Throughout its course, this project has gone through a number of alterations to its objectives. Originally, the intent was to focus entirely on the production of visualizations specifically to represent the possible interventions available to the engaged communities based on a review of relevant literature and precedents. While the primary focus has been addressing the flood mitigation needs of the engaged communities, a few additional priorities and constraints have emerged.

It quickly became apparent while engaging Sts'ailes and Leq'á:mel that the type of work being performed - actually VISUALIZING alternative flood mitigation approaches within a community and its landscape - was in higher demand, and the complexity of visualizations required far greater, than expected. Both of these communities were not in need of further risk assessments or lists of possible mitigation options; they were familiar with the direct and indirect flood risks facing their communities, and were already working on interventions to address them. Instead, what they needed were representations of these risks, as well as outcomes and co-benefits of mitigation, within the context of their lands to facilitate the types of discussion each community needs to advance their respective goals.

The process of engagement, visualization development, and feedback was longer than anticipated, and while more engagement prior to the completion of this project would have been desirable, the quality and amount of engagement achieved in a relatively short span of time was impressive.

This project has developed into something far greater than was originally intended. The work being done with Sts'ailes and Leq'á:mel, as well as the efforts to develop prototypical sites for the entirety of the Lower Fraser River, will continue beyond the end of my Sustainability Scholars appointment to ensure that the experiences of these nations, and their expectations for a new era of flood mitigation, are visualized to best suit those communities' uses for those visualizations. Ultimately, this report reflects the project as it is; a work in progress. The visualizations and related work discussed here are presented in the state they were available in at the time of publishing, and may not reflect their completed content or appearance.

The work carried out between May and August 2023, and the conversations facilitated by it, are nonetheless foundational to the flood toolbox as a long term project, and will help inform future engagement with new communities, and the development of a toolbox which will hopefully benefit all Coast Salish communities in the Fraser Valley.

THE TOOLBOX

Photo by Gillian Fuss

PURPOSE AND STRUCTURE

The intent of the Lower Fraser Flood Toolbox is to compile a collection of flood-related scenarios, informed by risk assessment and analysis, community engagement, First Nations knowledge, site visits, and specific, localized case studies. This toolbox will aide in proactive decision making and adaptation strategies to reduce the flood risks associated with land-use practices and climate change in the lower Fraser River. The toolbox is a diagnostic resource allowing communities to identify situations similar to their own, and get an understanding of what mitigation options are available in their particular situation. That being said, through case studies, the toolbox can adapt to meet the specific requirements of an individual community, becoming far more iterative and adaptive.

Though hard infrastructure still has a place in the toolbox, the general approach strives towards living with the water, not in opposition to it; where possible, seasonal fluctuations are accommodated rather than repelled, and solutions often provide not only flood mitigation, but ecological, cultural and social benefits.

Within the toolbox, there are broadly two categories of flooding-related issue scenarios:

Prototypical sites reflect the issues that might be found in a particular region of the river. These issue complexes are then visually illustrated, calling out each of the issues in question at a landscape scale. These problem areas can then be seen in a more detailed section which communicates the smaller impacts of the specific problem, and visualizes the same section in a state where flood mitigation interventions have been implemented.

Case studies develop from conversations and site visits conducted with specific engaged First Nations communities. These outline a specific set of issues and according responses based on direct engagement with the problem sites and members of the concerned communities. The suggested interventions might seek to address systematic flood-related issues, as opposed to isolated phenomena. Visualizations of these cases are created according to the requirements or needs of the community for their use in decision-making and planning.

The toolbox is meant to be ever evolving, with the specificity of mitigation situations increasing with the continued addition of case studies, making it a more effective planning and decision-making implement.

The objectives of the toolbox in the context of this Sustainability Scholar's project include:

1. Collaborate with interested communities
2. Explore adaptation options specific to the communities and the regional context
3. Inform proactive decision making and adaptation for flood risk reduction
4. Begin the development of a broader Mainland Coast Salish community flood toolbox

PROTOTYPICAL SITES

Prototypical sites are intended to broadly summarize the system of phenomena and resultant impacts that might be expected in a particular region. These regions are themselves generally defined by shared river or landscape factors, but have been more specifically determined by the Emergency Planning Secretariat's "Regional Hubs", which groups Mainland Coast Salish communities based on their geographic location and established connections with one another along the Fraser River. For the most part, the communities within each of these hubs share the same concerns and face similar challenges and risks when it comes to flooding.

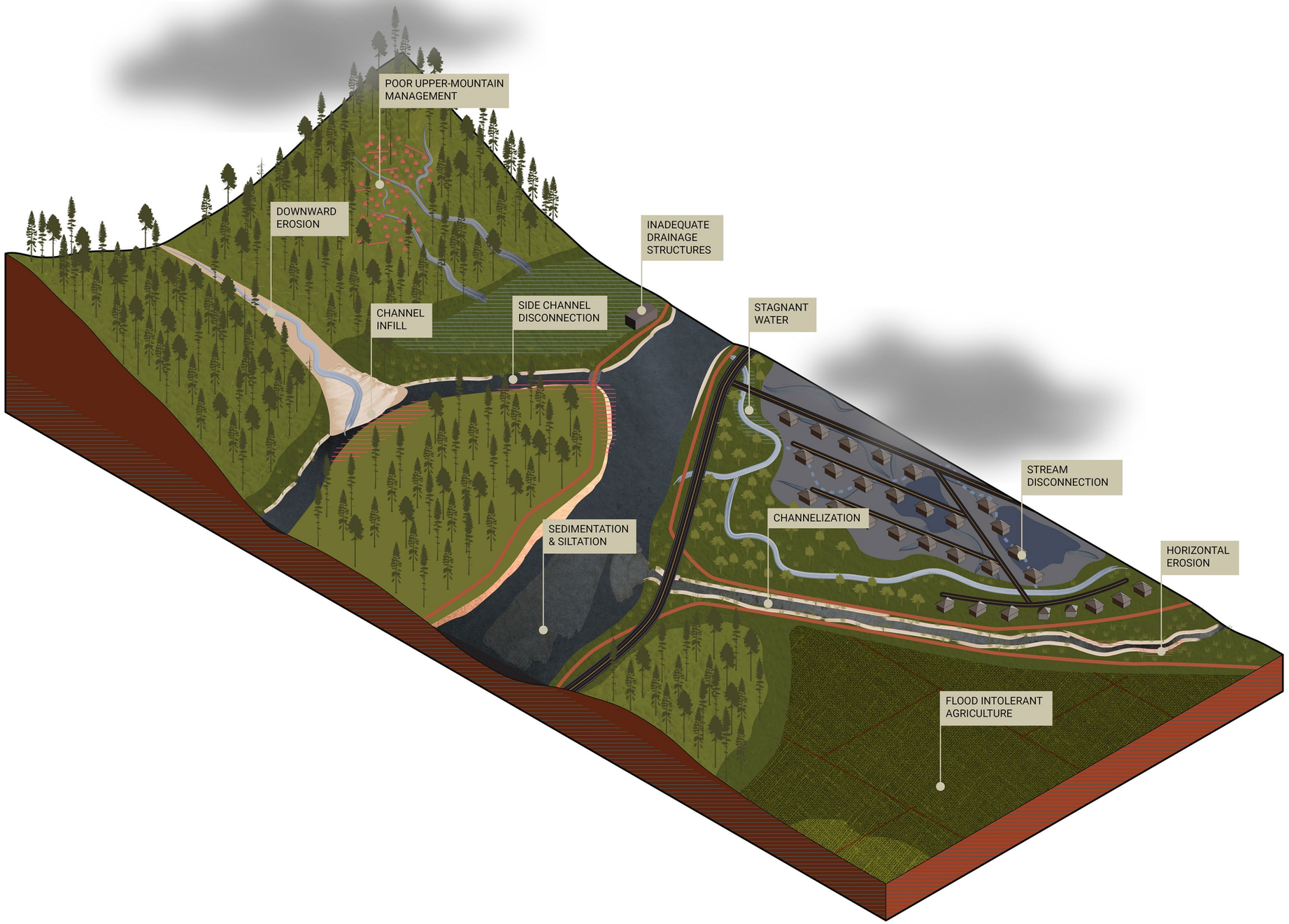
The Regional Hubs are:

1. **Coastal**
2. **River-Tidal**
3. **Mid-River**
4. **Up-River**

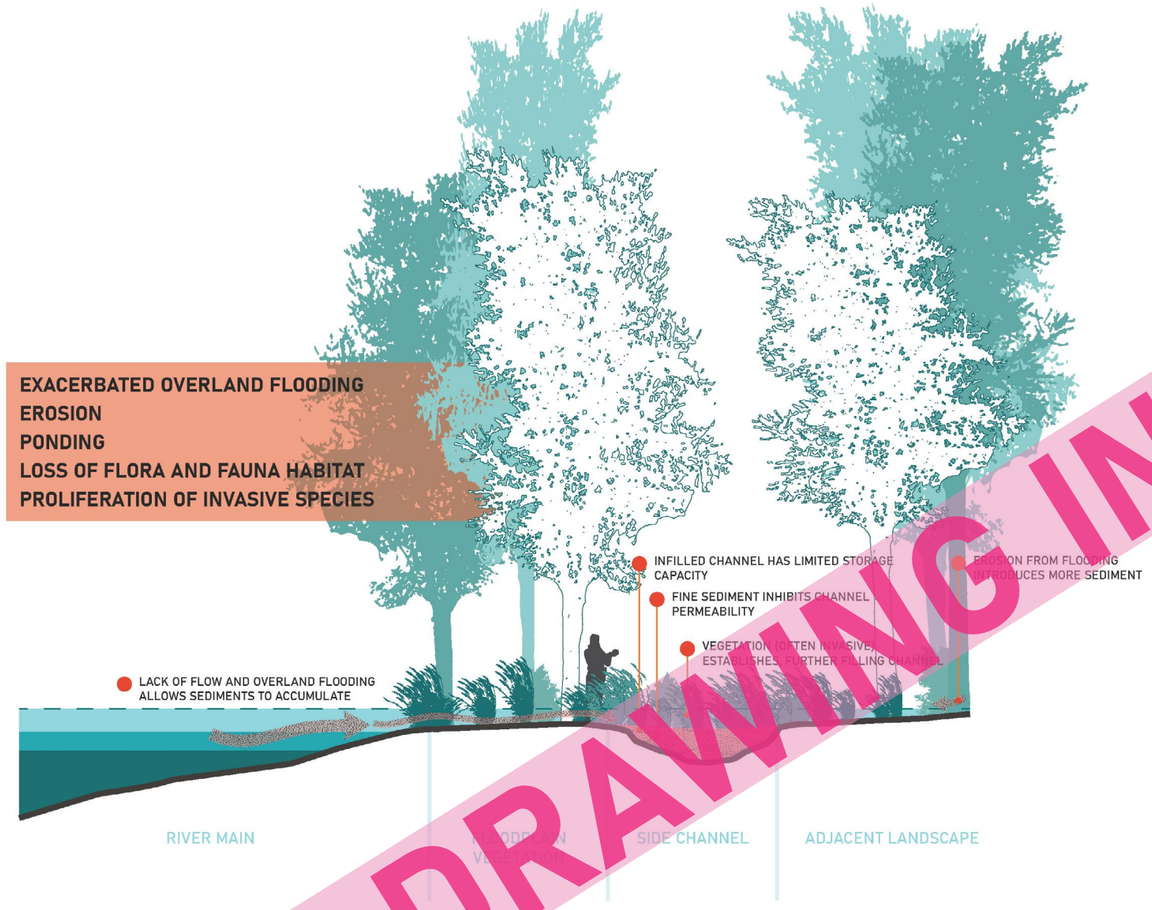
For each of these regions, the dominant flood-related impacts have been identified, and then laid out upon landscape level axonometrics that generalize the specific terrain and conditions found in each region, the objective being to make the representational hub identifiable to the communities within the hub, but not so specific as to limit their broader application.

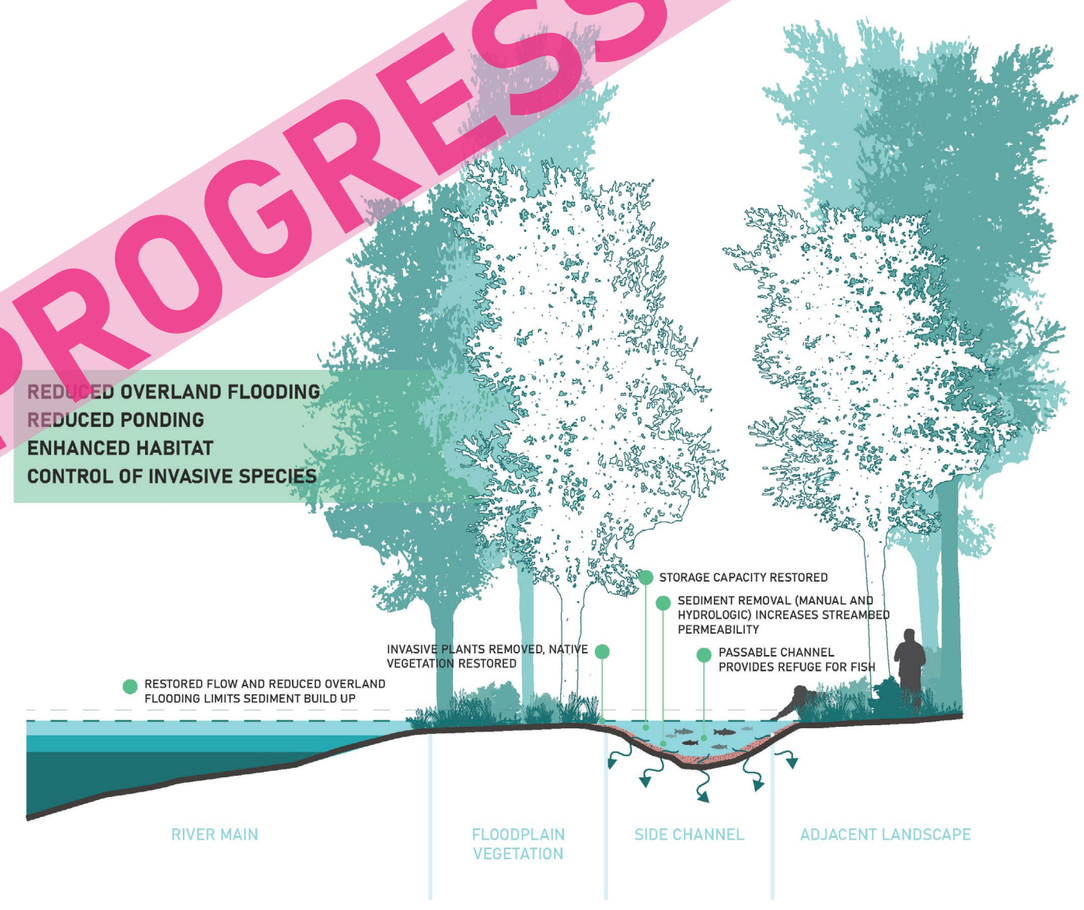
Each of the flood-related impacts are then illustrated in further detail in pairs of sections, one being the issue state, and the other an intervened state where possible risk-mitigation measures have been implemented. Possible co-benefits (cultural, environmental, or social) of the intervention are also detailed.

Prototypical sites, much like the rest of this project, have now evolved into something much larger, seeking to not only represent Regional Hub risks at a landscape scale, but also in subsequent detailed sections, while also providing information on the phenomenon that influence and exacerbate flood-related risks, and how they are linked together. Eventually, this may develop into an interactive website or animation, allowing viewers to quickly understand the relationships between flood-related risks and their hazards, as well as how they influence their community, the landscape, the river and flooding.



MID-RIVER HUB ISSUES AXONOMETRIC - DRAWN BY DANIKA OYSTREK





ISSUE/INTERVENED STATE SECTIONS FOR SIDE CHANNEL DISCONNECTION

CASE STUDY PROCESS

Case studies were based on and informed by continued engagement and conversations with participant communities, both in person and remotely, as well as site visits carried out on their territories, discussing what flood-related issues the community has faced, whether those were directly caused by flooding, or exacerbated by it.

Engagement began first online, where maps of the engaged communities territories were prepared, over which we then discussed the specific problems they were dealing with, highlighting areas of concern on the landscape, as well as the phenomena influencing them.

Following online engagement, site visits were conducted within the communities, Further discussions were had over territory maps, as well as conversations about what flood mitigation work was already underway, as well as what variety of visualizations would meet the community's needs the best. We then went out on the land to see some of the problematic areas in person, and continue observations and conversations on and about the land and the community's experience with flooding. Areas which were especially helpful for understanding the issues in question, or for potential use in later visualizations, were then photographed.

As mentioned previously, it became quickly apparent from these initial site visits that both Sts'ailes and Leq'á:mel were not necessarily in need of extensive research on what flood-mitigation options were available to them. Instead, the most beneficial visualizations would be those that took work they were already conducting, or would be conducting in the immediate future, and represented the outcomes, both direct and indirect, of that work. Visualizations of their territories in a pre-contact state, a current issue state, and a future intervened state were desired by both communities.

Later engagement was conducted in person and online, including larger meetings between myself, the Emergency Planning Secretariat team, and both Sts'ailes and Leq'á:mel simultaneously, which also introduced some collaborative discussion about flood-mitigation and visualizations between those communities. This type of engagement will continue until the visualizations are deemed satisfactory to the purposes the communities have for them.

NOTE: DUE TO CULTURALLY SENSITIVE INFORMATION OR SITES, SOME VISUALIZATIONS MAY BE EDITED OR REDACTED.

CASE STUDIES

AND COMMUNITY SPECIFIC VISUALIZATIONS

STS'AILES

CONTEXT, ISSUES & CONCERNS

Sts'ailes is located at the confluence of the Chehalis and Harrison Rivers. The Harrison is a short but large tributary to the Fraser, which hosts large numbers of salmon. Chehalis drains the 8.75 km long Chehalis Lake, and Statlu Lake, whose tributary creek to the Chehalis River has been heavily logged.

At Sts'ailes, flooding often runs far enough inland to threaten the southernmost residences on the reserve, and pluvial flooding and the freshet of both Harrison and Chehalis Rivers often threaten critical infrastructure, the community's cemetery, and a campsite adjacent to the Chehalis River. Groundwater flooding, especially during freshet, is a challenge for residences on Chehalis Road. Siltification and vegetative infilling of the slough networks that dominate the interface with the Harrison is a particularly significant flood-related issue.

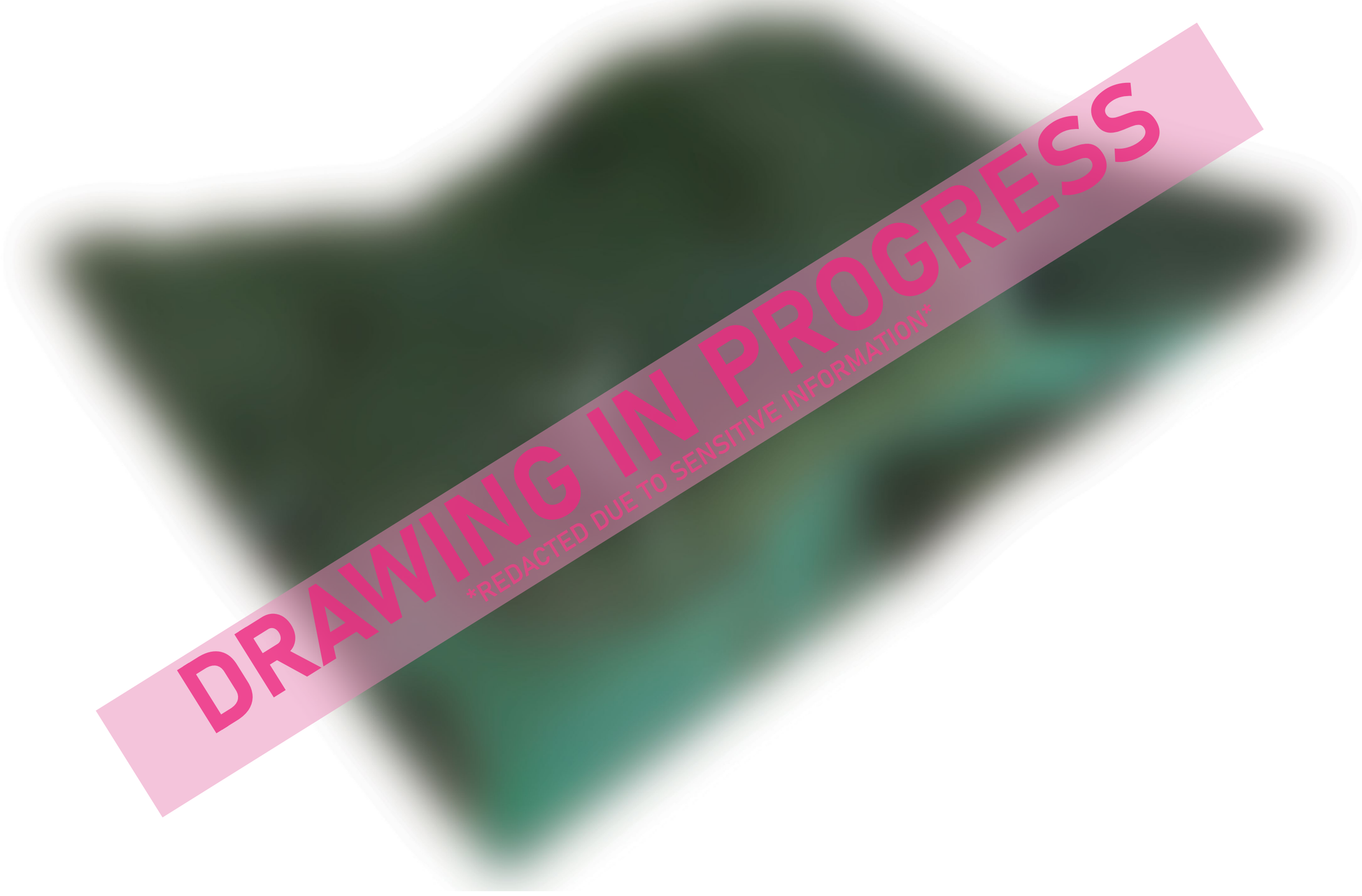
Historically, Sts'ailes stewarded and maintained the sloughs, with specific families accepting responsibility for their maintenance, ensuring navigability for human and animal alike, and full function as flood storage and dissipation. Seasonal occupation occurred alongside them, where fishing, food and medicine plant harvesting, and other production activities took place (Ritchie, 2010). Today, the community's connection with and access to sloughs and adjacent cultural sites, as well as the forest gardens that border them, is impeded by the overgrowth of vegetation, as is the sloughs' capacity to absorb flooding and freshet (Fischenich & Copeland, 2001).

Sts'ailes is already engaged in interventions to address some of these issues, namely the clearing and restoration of sloughs, which should continue into the future with an expanded scope. Other possible interventions include bypass channel networks constructed on the campsite near the Chehalis River.

Removal of sediment and vegetation from sloughs increases their holding capacity, thus somewhat reducing flooding impacts to cultural sites, facilities and residences further upland. Percolation of water from sloughs into the surrounding landscape is improved, as is permeation of cool oxygenated water back into the sloughs (Shrivastava, Stewardson, & Arora, 2020). Habitat, especially for salmonids, becomes more suitable, and biodiversity increases. The renewal of relationships with the sloughs occurs while sloughs are reactivated, with improved access to heritage sites, cultivation areas, and cultural activities and foods, and historic forest gardens as they are cleared of overgrowth.

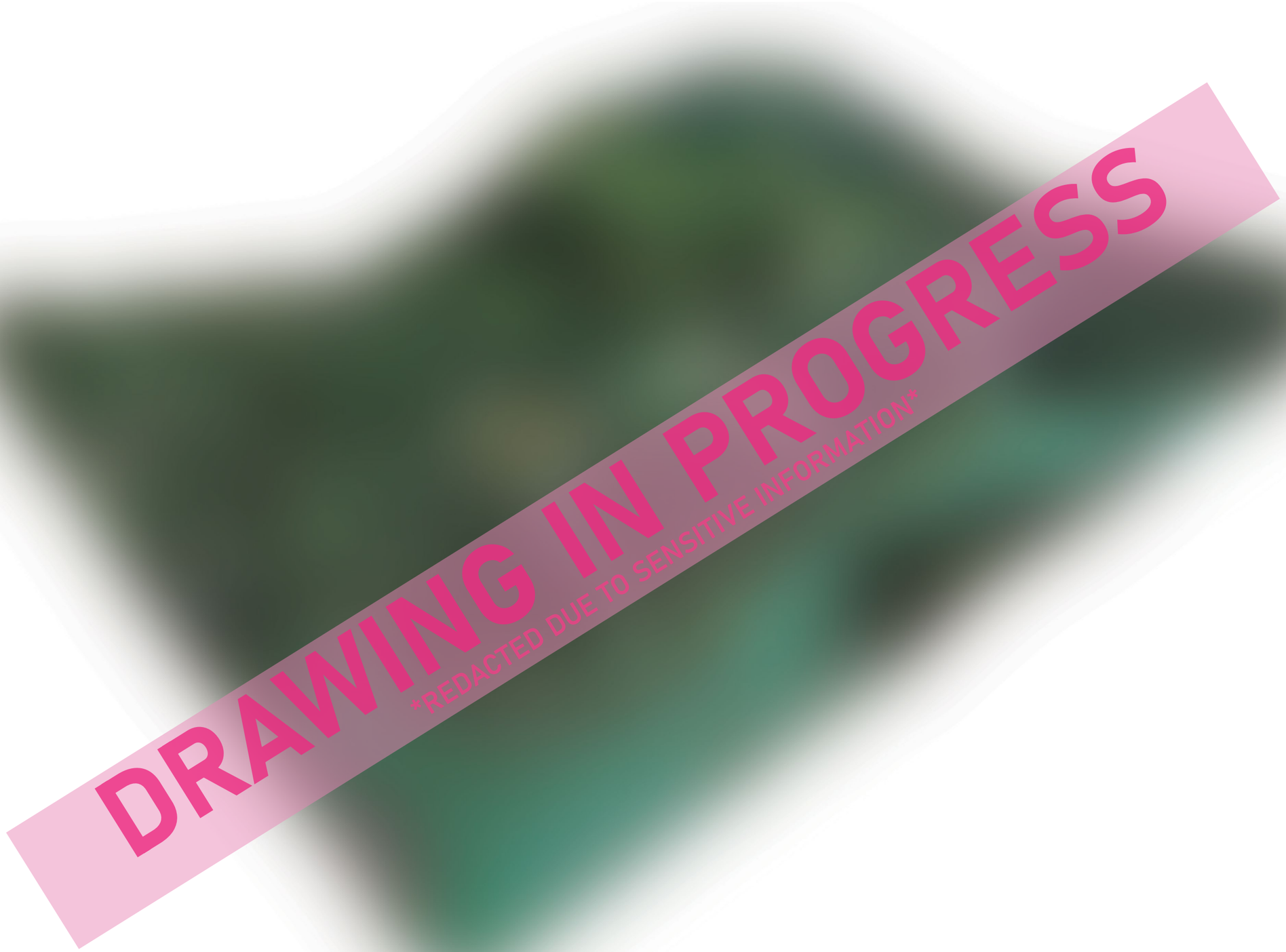
A network of bypass channels within the campsite adjacent to the Chehalis River could ensure high velocity flooding in the late fall is mitigated, protecting the site for a variety of future uses.

Visualizations for Sts'ailes focused on the potential co-benefits of slough reactivation, as well as past, present, and potential future condition of their landscape and flood dynamic.

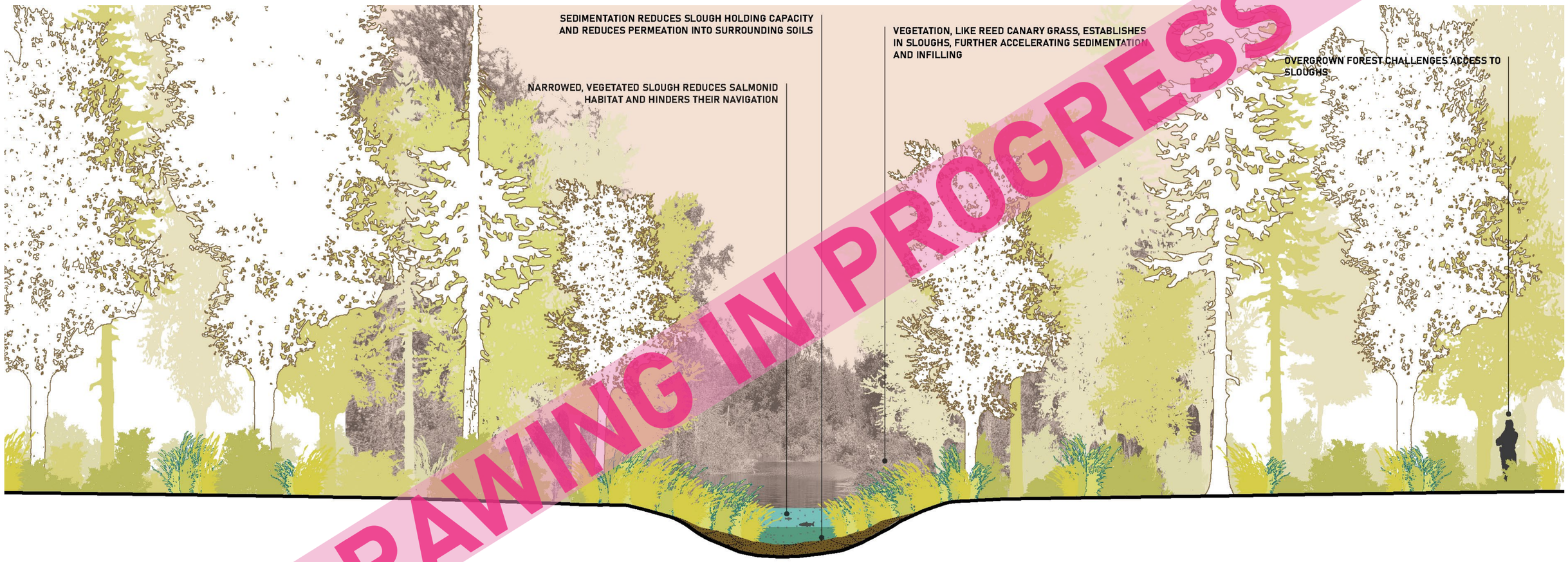


TERRITORY SCALE AXONOMETRIC - HISTORIC STATE OF LANDS AND WATERS, INTERACTIONS

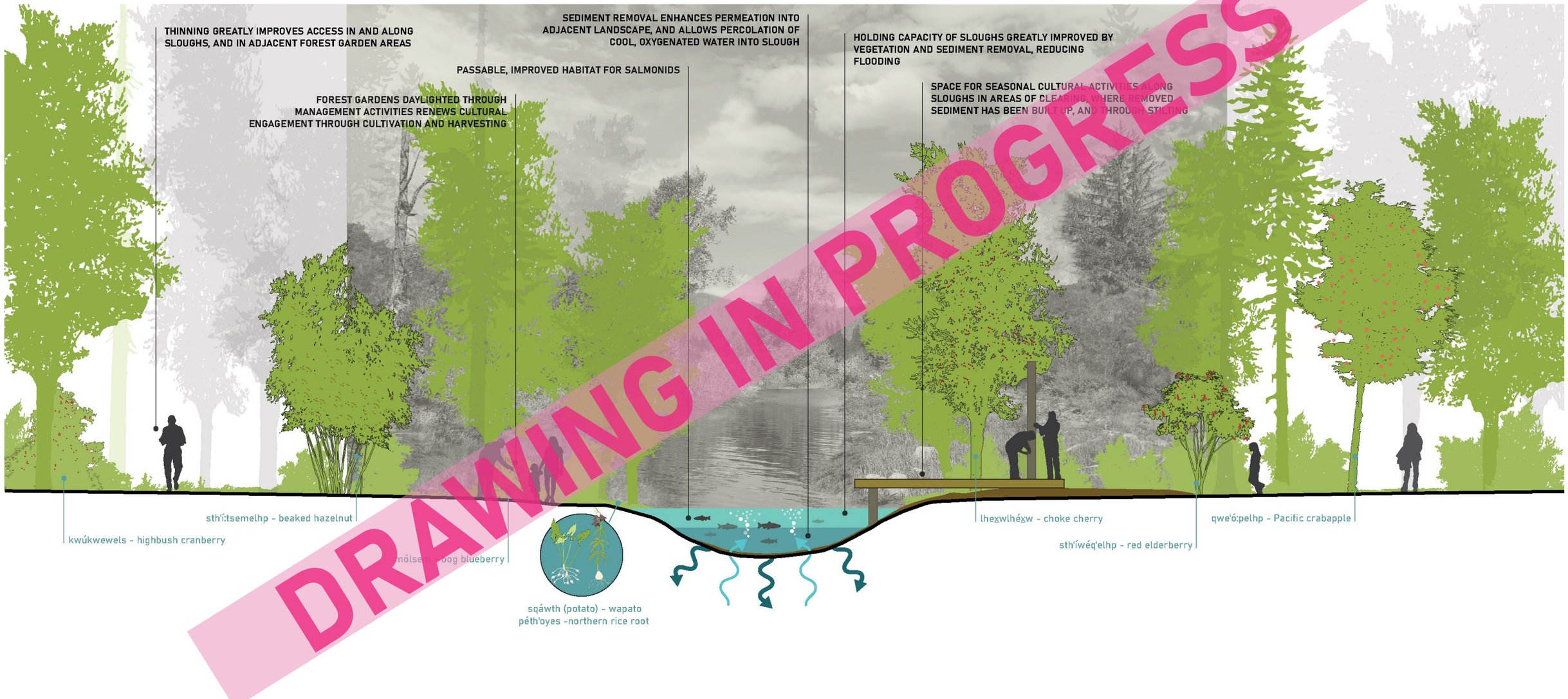
TERRITORY SCALE AXONOMETRIC - CURRENT STATE, INTERACTIONS



TERRITORY SCALE AXONOMETRIC - FUTURE STATE, INTERACTIONS



SLOUGH SECTION - CURRENT ISSUE STATE



SLOUGH SECTION - INTERVENED STATE

SLOUGH VISUALIZATION - INTERACTIONS AND ACTIVITIES AROUND A RESTORED SLOUGH

LEQ'Á:MEL

CONTEXT, ISSUES & CONCERNS

The territories of Leq'á:mel First Nation are located in and around Deroche, on both sides of Nicomen Slough, or "the level place where people meet". They hold 10 reserves, some of which are specifically for residential, burial, and agricultural use, and for future economic development.

Throughout Leq'á:mel's territory are a number of existing pieces of flood infrastructure, including dikes and flood boxes, as well as more naturalistic swale structures particularly in agricultural areas. Unfortunately, much of this infrastructure is in poor condition and inadequate to meet the challenge of climate exacerbated flooding (Resilient Waters, 2020). Floodboxes in the Taylor Road, Zaitscullachan and Skumalasph Sloughs are in need of immediate modification or replacement. Culverts that feed into Nicomen Slough are too small to accommodate elevated debris and water runoff, and their designs are an enormous obstacle to fish movement.

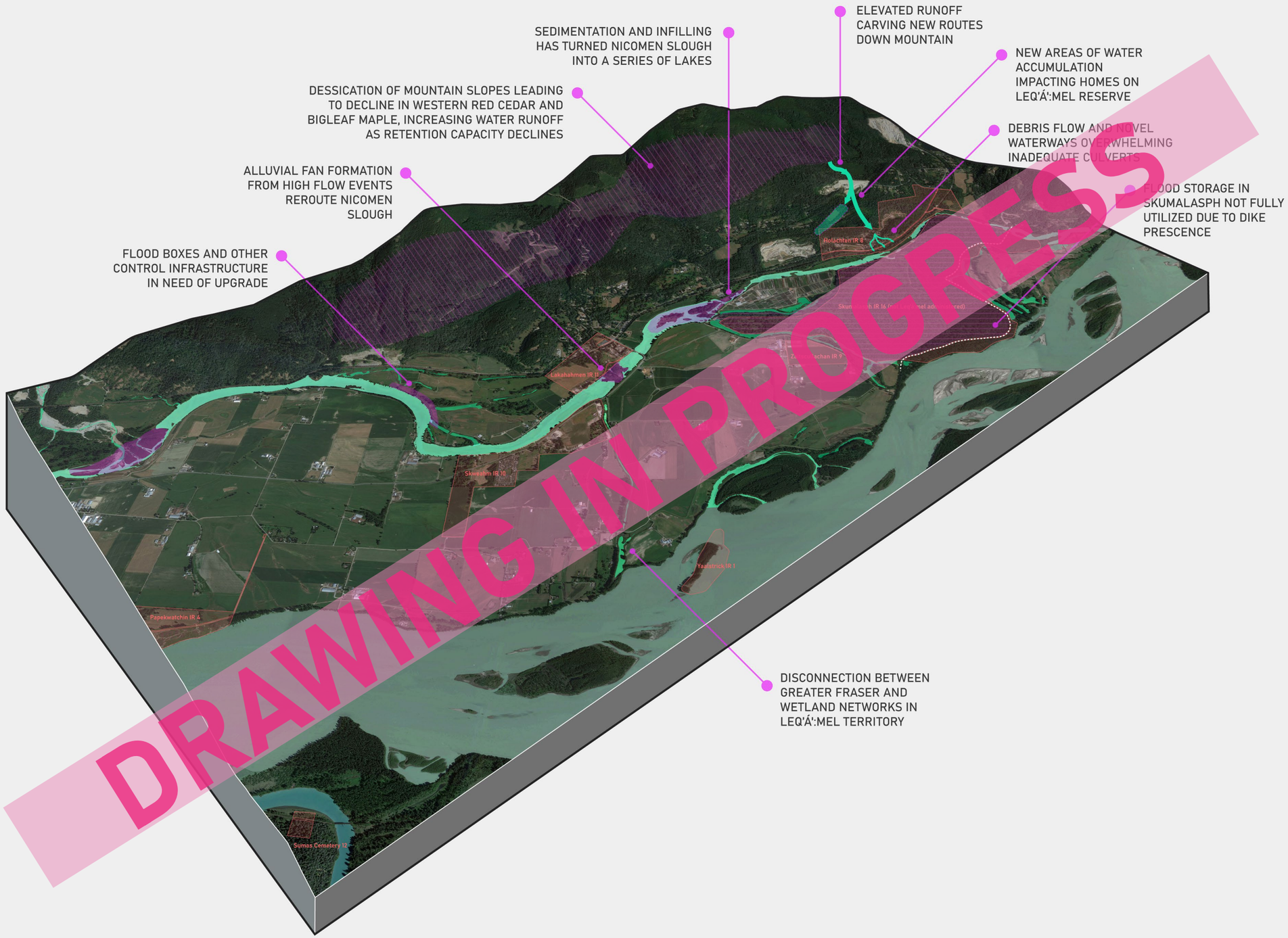
Much of Leq'á:mel's territory is affected by a compounding system of issues caused by historical approaches to flood management, as well novel or exacerbated hydrological phenomena. Extended summer droughts and a legacy of poor provincial forest practices have resulted in dessicated south-facing mountain slopes north of Nicomen Slough, leading to die-offs of Western red cedar (*Thuja plicata*) and bigleaf maple (*Acer macrophyllum*). In turn, the soils on these slopes have become unstable and hydrophobic, elevating water and debris runoff, especially during high rainfall events like atmospheric rivers (Vose, Clark, Luce, & Patel-Weynand, 2016). Coarse woody debris carried by this runoff has begun creating log jams around standing trees, causing avulsions. Runoff is no longer following historic stream channels towards large culverts, and is instead carving novel routes down the mountain. Rerouted water has saturated the hillside behind residential areas of Holachten 8, causing houses to sink, and debris and sediment blocks inadequate culverts, undermining them or exacerbating upstream flooding. Increased sediment deposition at the mouths of Deroche and Norris Creek has created alluvial fans which divert the flow of Nicomen Slough, eroding agricultural lands opposite them. Due to sedimentation and lack of flow, Nicomen itself has become less of a slough, and more a series of lakes. The flood storage offered by the network of channels in Skumalasph Reserve is unavailable to the Fraser due to disconnection by diking.

Like Sts'ailes, Leq'á:mel is already at work on the interventions required to address these issues. For runoff, these interventions include culvert enlargement, new water holding areas, and diversion/control streams, as well as gradual re-channeling of novel alluvial fans. Skumalasph would be reactivated as wetland for flood storage by the installation of fish-friendly flap gates, as well as upgraded culverts and channel reconnection.

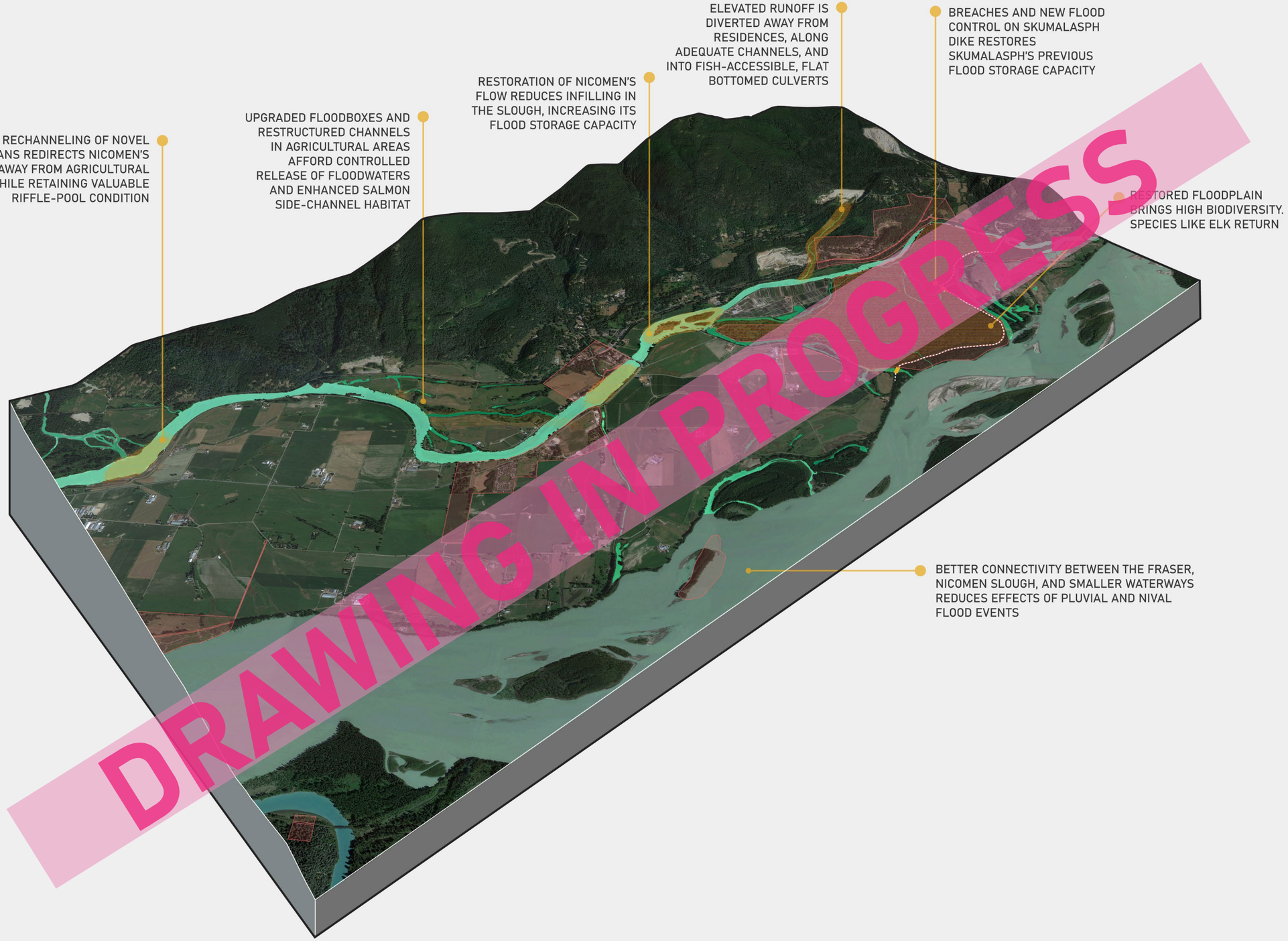
These interventions could ensure elevated water and debris runoff is accommodated and directed away from critical infrastructure and residences, and floodplain reconnection could increase flood storage capacity and reduce the likelihood of significant flood-related damage to waterways, habitat, farmland and infrastructure (Ahilan, Guan, Sleigh, Wright, & Chang, 2016). Additionally, these interventions bring new educational, cultural and harvesting opportunities, and increased access to cultural sites, activities and foods. Biodiversity of flora and fauna, habitat connectivity, and salmonid habitat would also be enhanced in all areas of intervention, especially in areas with previously inadequate and unfriendly culverts (Zwirn, 2002).

Of particular importance to Leq'á:mel was ensuring the visualizations could be used as complimentary graphics for funding applications, a wide variety of planning types, and assist in assertions of governance and jursidiction.

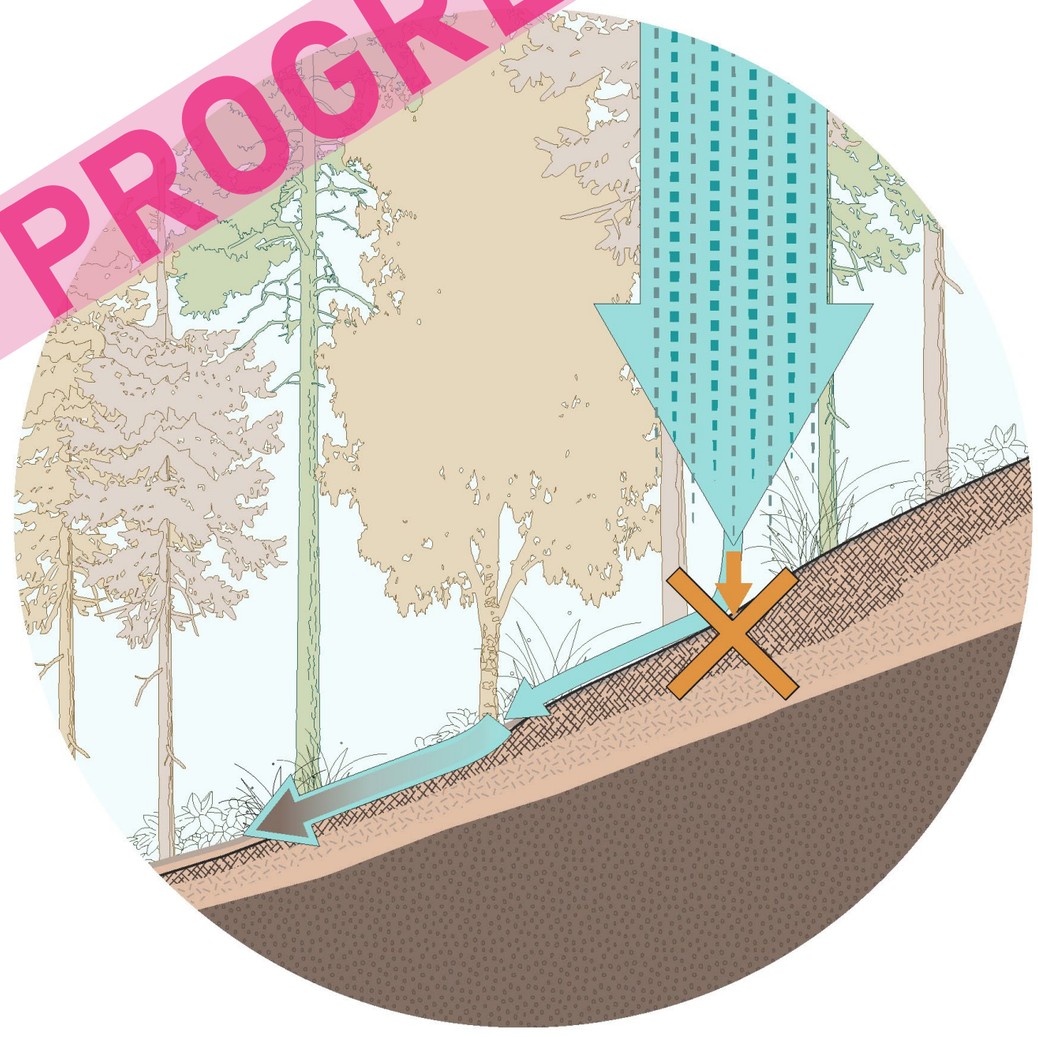
TERRITORY SCALE AXONOMETRIC - HISTORIC FLOW OF WATERS, STATE OF LANDS, & INTERACTIONS

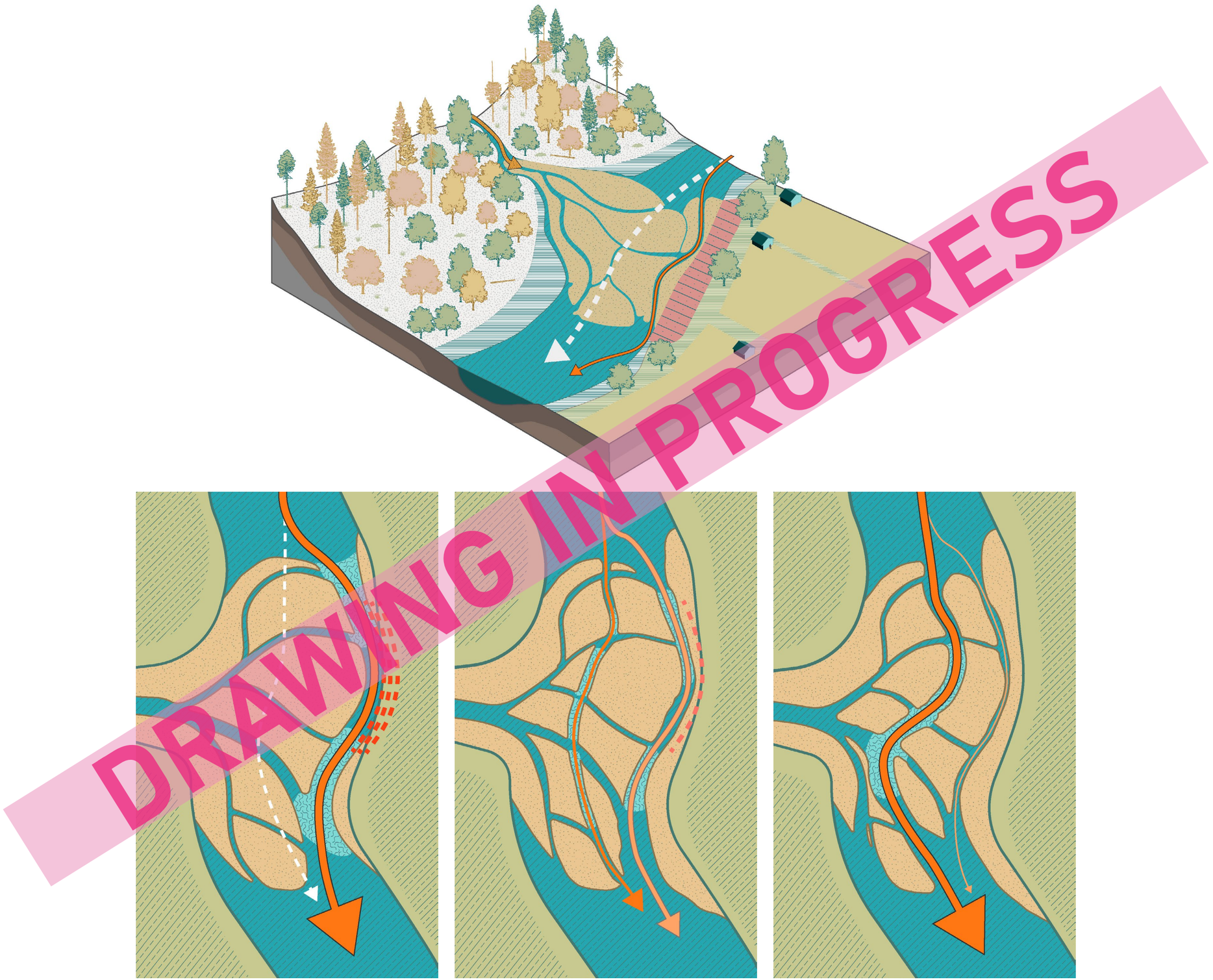


TERRITORY SCALE AXONOMETRIC - CURRENT FLOOD-RELATED ISSUES AND PHENOMENA

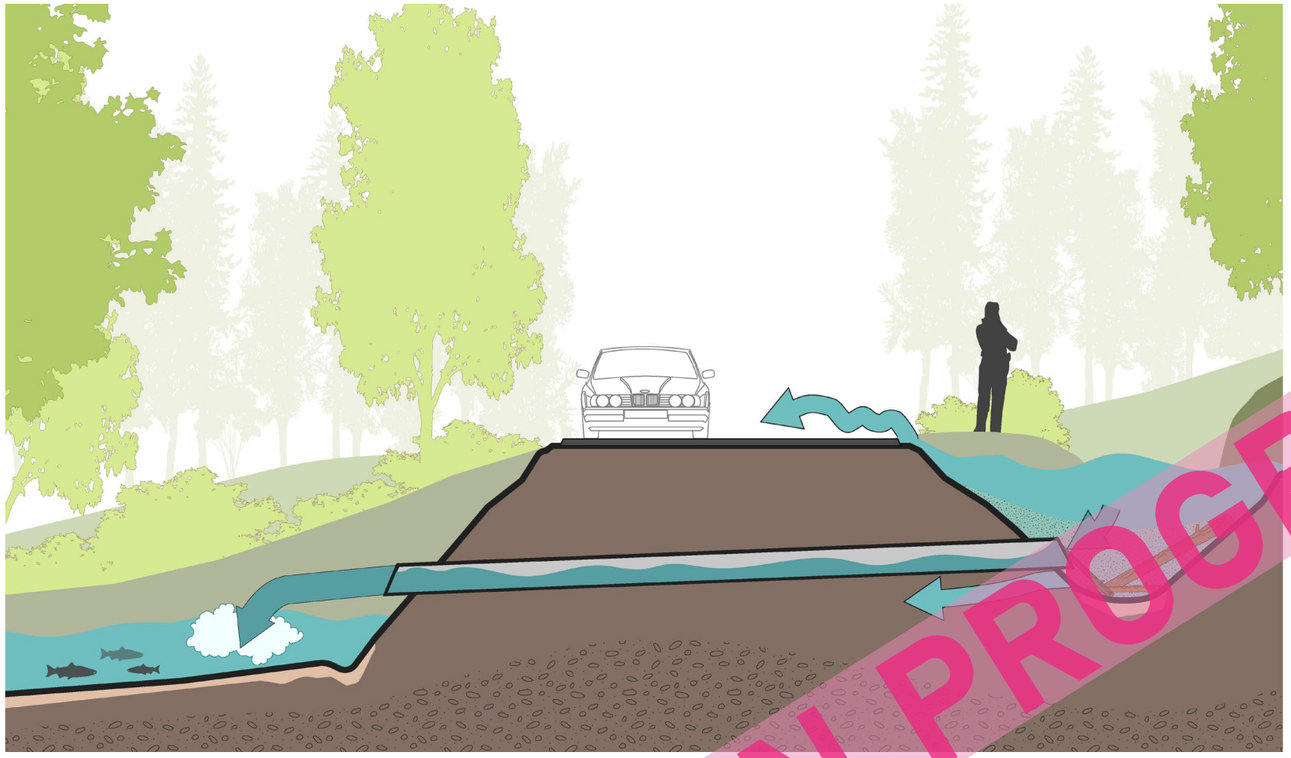


TERRITORY SCALE AXONOMETRIC - FUTURE STATE FOLLOWING MITIGATION INTERVENTIONS

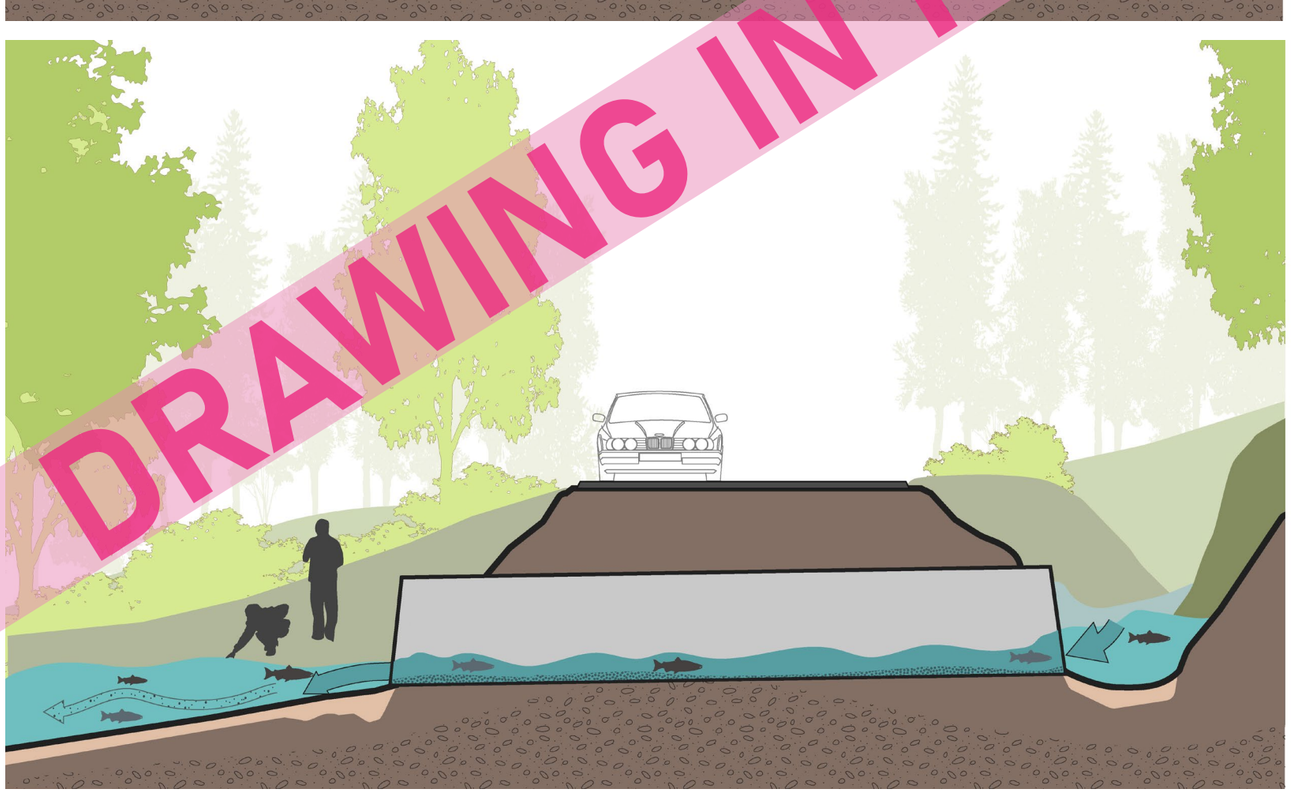




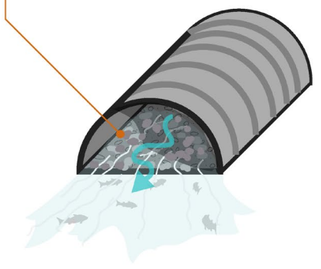
PHENOMENON DETAIL - NOVEL ALLUVIAL FAN FORMATION AND GRADUAL REROUTING



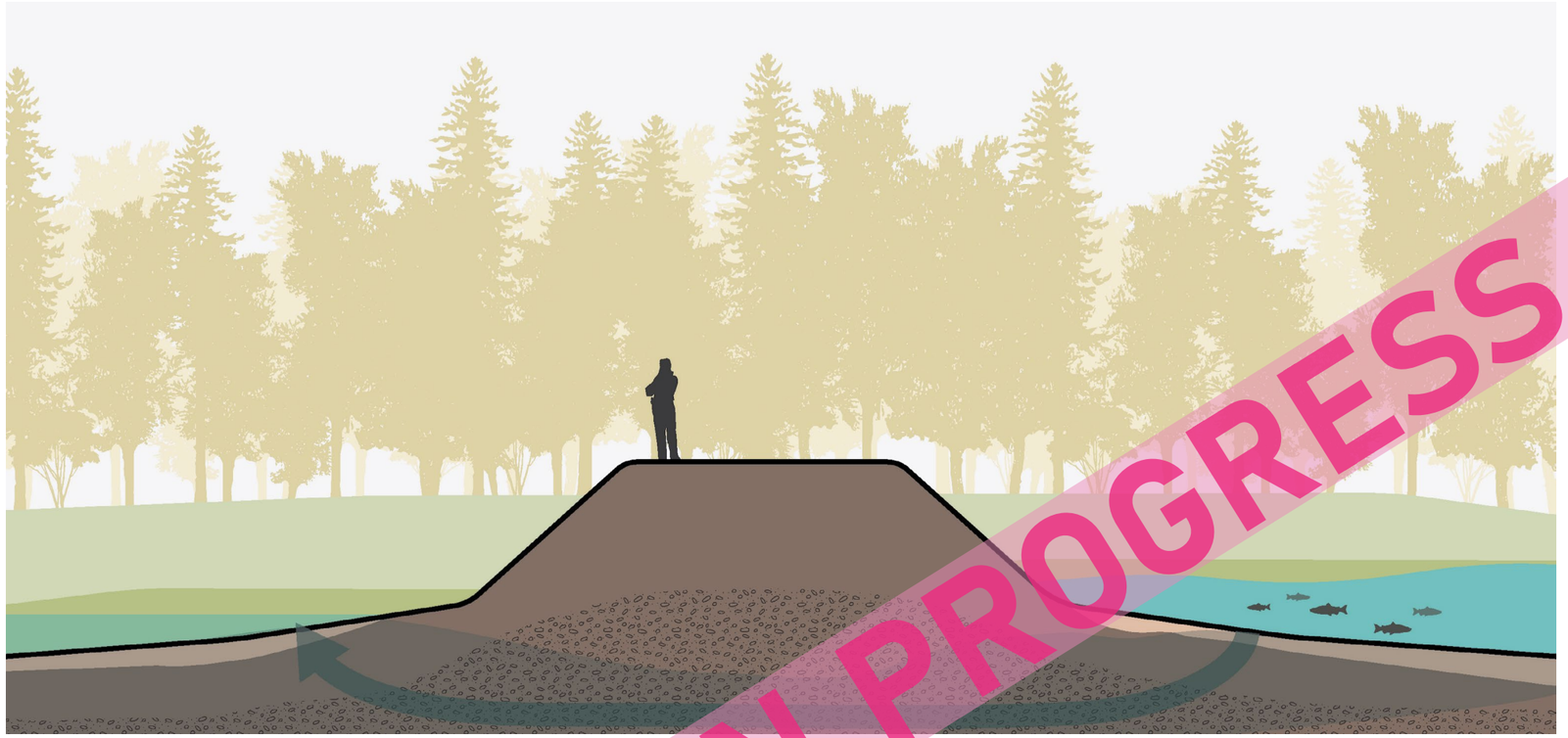
THE PROFILE OF CONVENTIONAL PIPE CULVERTS GENERATE HIGH WATER VELOCITIES, INHIBITING THE DEVELOPMENT OF A NATURAL SUBSTRATE

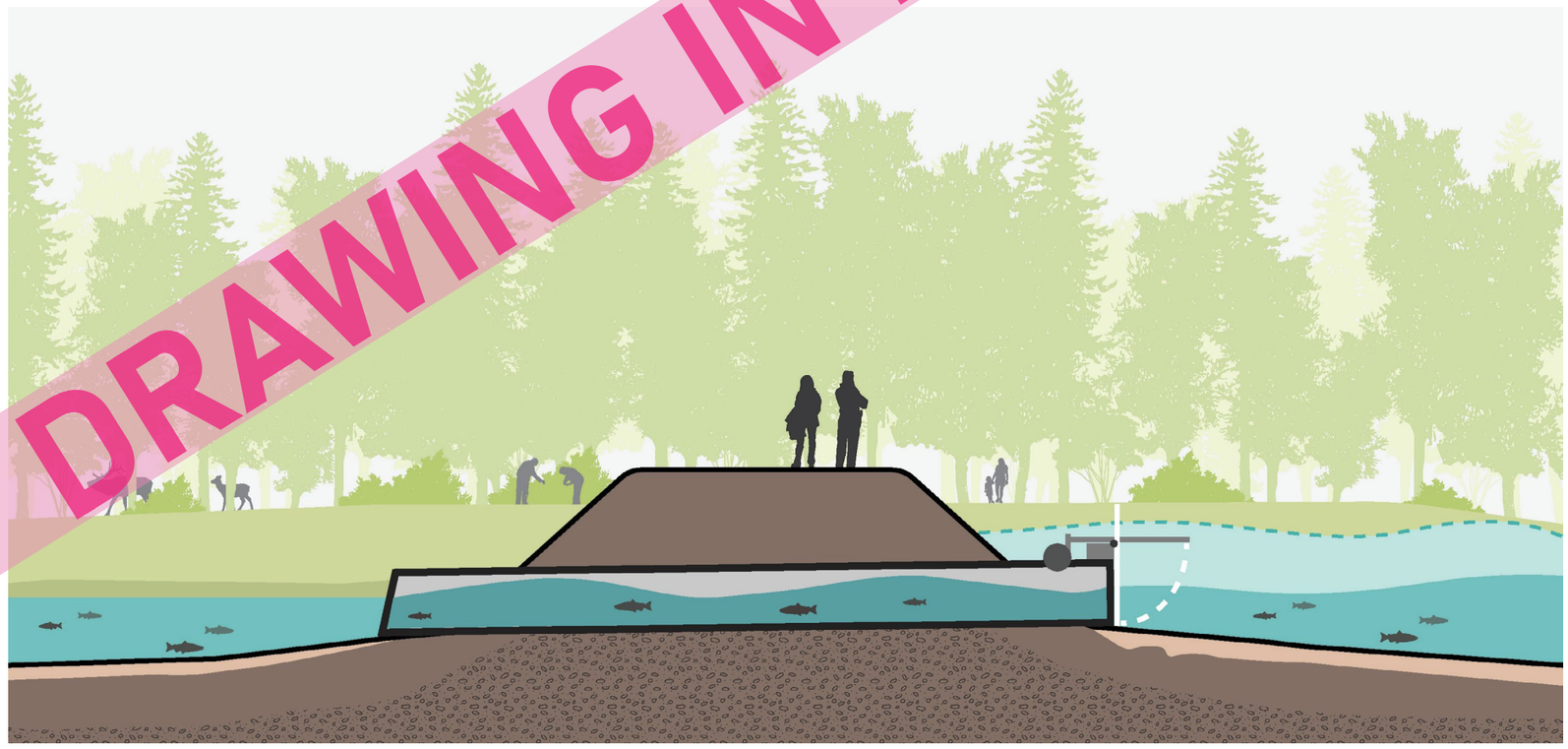


FLAT-BOTTOMED CULVERTS, OR D-VERTS, MORE CLOSELY MIMIC NATURAL STREAM VELOCITIES, ALLOWING A PASSABLE, GRANULAR SUBSTRATE TO DEVELOP



PHENOMENON DETAIL - INADEQUATE CULVERTS AND BENEFITS OF D-VERTS





PHENOMENON DETAIL - CURRENT STATE OF DIKES AND BENEFITS OF FLOODBOXES

NEXT STEPS

AND LESSONS LEARNED

TOWARDS RESILIENCE

The work performed over the past few months to collaborate with First Nations and develop visualizations reflecting the reality of their experience with flooding (and their vision for addressing it) has hopefully created something beneficial to those communities, communicating community knowledge, experience, and the urgency of these interventions. That being said, there is still much work to be done.

Sts'ailes and Leq'á:mel's visualizations will continue to be refined until they meet the specifications and requirements that were asked of them. But only once they are put to work, however the community sees fit, can their true success be determined. It may be that they need to be revisited and revised to address the shortcomings that became apparent in the real world, whether those refinements are done by me, another Sustainability Scholar, or someone else entirely.

This project has led to much greater, longer term objectives, far beyond what was originally intended. The reality is that the visualization of these issues are much needed in First Nations communities, but the timeline required to critically refine them until they do the work of a thousand words is longer than was anticipated.

Into the future, more communities will be engaged, leading to more case studies and more community and issue-specific visualizations. Eventually these will comprise a compendium of real-world applications of these visualizations. Prototypical sites will continue to be explored and expanded, culminating in something that expedites the planning and decision-making processes of First Nations communities. In turn, they may decide to engage someone in creating for them their own set of specific visualizations.

ADDITIONAL REFLECTIONS

The practice of landscape architecture is proud of its skill in taking land-based information and experiences, like those explored in this project, and turning them into visualizations that convey and convince of certain ideas or concepts in relation to the land. As an individual currently learning the practice, I think it is important to reflect on the way I approach landscape architecture following this flood visualization project, particularly the function and application of visualizations.

While images like the ones created for this project are produced regularly in the studio, the process of their creation is greatly altered when the actual purpose of the end result changes. Creating visualizations that can be interpreted by other landscape architects is easy, but it is a far greater (and far more rewarding) challenge to produce something which a non-landscape architect can then utilize and speak to, likely in discussions with other non-landscape architects.

There is a great need to foreground and implement First Nations knowledge and experience in all sorts of planning and management, and land management and stewardship is critical to First Nations sovereignty. Landscape architecture could assist in foregrounding this knowledge, and the implementation of systems of land management and stewardship.

Landscape architecture in the academic setting is still somewhat underpinned by a preoccupation with substantiated information that justifies certain decisions on the landscape. But the work conducted in this project offers an interesting alternative. In this case, there was limited need to seek out references and citations for the mitigation options, since the individuals engaged were already experts. They know their territories, lands, and waters, and the ways to manage them, better than anyone else. With future work like this, I would like to use those conversations with expert community members as the source of substantiation for the suggestions made.

My experience with this work has changed not only how I look at land and landscape, but also how I think about stewardship and its representation. I would like to further develop and explore these ideas, whether through continued work with Sts'ailes and Leq'á:mel, other First Nations, or in related projects.

One particular idea begging further research is how visualizations can be done in a way that doesn't rely on colonial representation methods. An attempt was made towards that goal here, but there is still more work to be done. This is likely a long process, but valuable for its broader applications, and potential implications for landscape architecture as a whole.

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