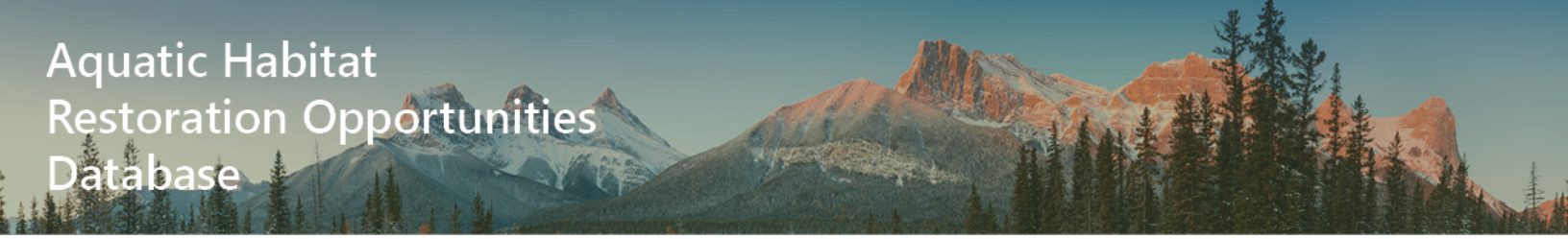
Aquatic Habitat Restoration Opportunities Database AHROD Report:

Exploring the feasibility of a national consolidated database of restoration opportunities

July 29, 2021



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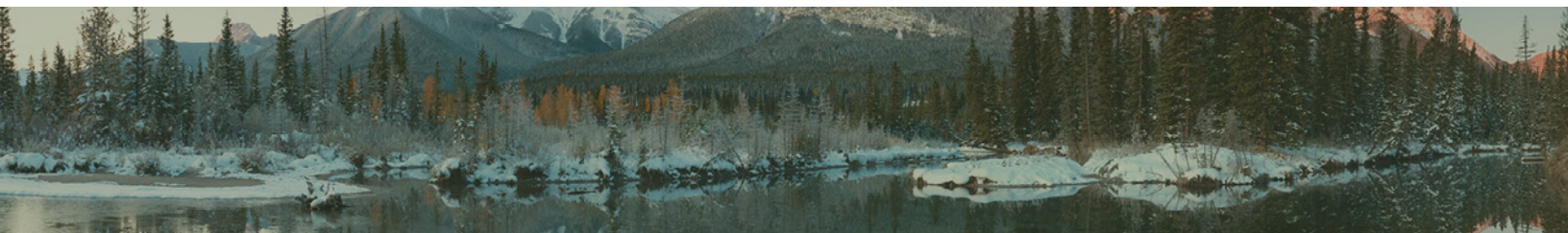

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Executive Summary

Aquatic Habitat Canada (AHC) is a national network supporting aquatic habitat protection and restoration. As an organization, AHC works to encourage and assist governments, local communities, Indigenous organizations, industry stakeholders, and conservation organizations to more effectively protect and restore aquatic ecosystems. In alignment with this goal, AHC has proposed an Aquatic Habitat Restoration Opportunities Database (AHROD). The potential database aims to present opportunities in an online database that would be accessible and convenient for the purpose of identifying where the restoration opportunities for aquatic habitat lie across Canada. This tool would have the potential to support regulatory agencies, interested stakeholders, and Indigenous groups to participate and collaborate in aquatic habitat conservation, protection and restoration initiatives.

AHC contracted H3M Environmental Ltd. to consult with interested stakeholders to determine whether there is a business case for investing in the development of an online spatial database, to identify opportunities for aquatic habitat restoration, and to assess stakeholder interests and objectives. Ultimately, the objectives of this report were to provide opportunity and access to a diversity of perspectives on the proposed aquatic habitat restoration database as it relates to:

- Interest;
- Value;
- Feasibility;
- Potential use; and
- Availability/ accessibility of reliable data.

The responses to the online survey and interview questions overwhelmingly indicated that the proposed national restoration opportunities database has the potential to provide considerable value across a variety of sectors. Use Cases were created to establish how end-users were anticipated to interact with the proposed database and to understand what their expectations were. The synthesis of this information has been used to further explore project feasibility, data requirements, functionality, and to develop the recommended next steps for AHC. Ultimately, the expectations of end-users and our assessment of feasibility can be summarized as follows:

- The first expectation is that the data is presented using a user friendly, geospatial mapping tool or interface.
    - We did not identify any major concerns or potential limitations regarding this item and believe that it is feasible.
- The second expectation is that data is consolidated and consistent across a variety of sources across a national, provincial, and regional scale.

    - We believe that insufficient fully formed restoration opportunity data is publicly available to create a functional restoration opportunities database at this time; however, respondents were interested in the development of a tool to support the identification of restoration opportunities based on ancillary data.
    - We believe that sufficient ancillary data is available that it would be feasible to create a minimum viable product version of this tool/ database.
    - Although a minimum viable product is expected to be feasible, the overall usefulness of the database is expected to increase by supplementing with additional regional/ localized partner data (*e.g.,* NGOs, Indigenous, etc.).
- The final expectation is that a prioritization criteria or decision-making framework should be incorporated into the database.
    - We believe that this component is not necessarily feasible at this stage but should be considered for future development.
    - The ability to support a meaningful Prioritization Criteria as part of this database will rely on the participation and buy-in from all sectors, with a focus on establishing clarity from government regulatory agencies.

Based on this, we believe that the development of a minimum viable product version of the AHROD project is feasible. We recommend the establishment of a series of small, regional Pilot Projects to further evaluate and address the feasibility and potential data gaps of the database at the regional level. These Pilot Projects should:

- Be strategically located in areas of British Columbia, Alberta, Ontario, and/ or Atlantic Canada that meet the following criteria:
    - A variety of interested and engaged stakeholders for collaboration;
    - Available data sources (at a provincial and regional scale);
    - A region with a relatively high number of aquatic habitat restoration opportunities;
    - A region with a relatively high number of groups interested in conducting aquatic habitat restoration.
- Focus on comparing themes and trends, identifying unique regional challenges, and establishing a level of consistency across geographies.
- Bridge the gap between organizations and across sectors.
- Create synergies and incentivize collaborative efforts.
- Identify additional detailed, accurate, consistent, and reputable data that would be trusted and approved by all sectors and stakeholders involved in aquatic habitat restoration.
- Evaluate the proof of concept, measured against standardized Key Performance Indicators (qualitative and quantitative milestones) to support the goals of comparability and scalability.
- Incorporate a structured Lessons Learned look-back process.

1 Background and Objectives

Aquatic Habitat Canada (AHC) is a national network supporting aquatic habitat protection and restoration. As an organization, AHC works to encourage and assist governments, local communities, Indigenous organizations, industry stakeholders, and conservation organizations to more effectively protect and restore aquatic ecosystems. In alignment with this goal, AHC has proposed an Aquatic Habitat Restoration Opportunities Database (AHROD). The potential database aims to present opportunities in an online database that would be accessible and convenient for the purpose of identifying where the restoration opportunities for aquatic habitat lie across Canada. This tool would have the potential to support regulatory agencies, interested stakeholders, and Indigenous groups to participate and collaborate in aquatic habitat conservation, protection and restoration initiatives.

AHC contracted H3M Environmental Ltd. (H3M) to consult with interested stakeholders to determine whether there is a business case for investing in the development of an online spatial database, to identify opportunities for aquatic habitat restoration, and to assess stakeholder interests and objectives. The idea was to explore if and how a database would be useful, and at what scale. AHC was also interested in exploring the spatial data that is currently available, inaccessible, or desired that could be used to build the potential database in the hopes of facilitating the identification and selection of aquatic habitat restoration opportunities.

Ultimately, the objectives of this report were to provide opportunity and access to a diversity of perspectives on the proposed aquatic habitat restoration database as it relates to:

- Interest;
- Value;
- Feasibility;
- Potential use; and
- Availability/ accessibility of reliable data.

2 Methodology

The process to define the interest and feasibility of a national aquatic habitat restoration opportunity database was conducted in two phases. The first phase included an online survey, the second phase consisted of an interview process.

2.1 Phase 1 (Online Survey)

2.1.1 Stakeholder list

Stakeholder lists were created by using a combination of AHC contacts from previous engagement through their organization, H3M contacts from existing client relationships, and by identifying organizations involved in aquatic habitat restoration or that have connections to potential stakeholders that may be involved in aquatic habitat restoration. Finally, to fill in the gaps on geographic representation as well as sector representation, organizations such as watershed and conservation groups from each province were included to ensure proper representation of perspectives were considered. Stakeholders were categorized into 5 sectors: academia, government, Indigenous, non-governmental organizations (NGO), and industry. An Other category was also created for organizations who felt they did not fall into the 5 previous categories. Stakeholders were identified across Canada including the territories; however, focus was placed on provinces and areas with higher population centers. 661 stakeholders were identified nationally.

2.1.2 Online Survey

The online survey included questions related to the following items:

- Organizational information;
- Geographic location;
- Scope and scale of aquatic habitat restoration (*i.e.,* local, regional, or national scale);
- Key factors and challenges;
- Geospatial data;
- Quality of data; and,
- Opinion of whether the database would be useful to their restoration efforts.

An Other section was included for people to describe challenges or limitations they felt were not captured in the questions provided. The survey also included a question to identify any further involvement that the participant was willing to undertake. This included options such as being available for a supplementary interview, providing data, providing additional suggestions, providing financial support, and an Other section to allow respondents to describe any other level of participation they were comfortable being involved in.

The stakeholders collected were initially sent an introductory email, describing the project, and informing them of the online survey. The survey was sent out the following week. The emails were all translated and sent in both French and English.

The survey was also made available in French and a link to the French and English versions were included in the invitation email sent to the entire list of stakeholders. The survey was also made available through social media platforms including AHC's Twitter, Facebook, and LinkedIn accounts and through H3M's LinkedIn.

2.2 Phase 2 (Interviews)

Thirty-five individual stakeholders were selected for the second phase of the project. Most participants were selected because they had indicated they would be available for an interview during the Online Survey component. Individuals were also selected based upon their geographic location and the sector they worked in to create appropriate representation. Several additional organizations were contacted for interviews to bolster geographic and sector representation. Invitation emails were sent describing the project and inviting them to participate in a one-hour interview. A set of pre-interview questions were attached to give context to the interview and to allow for the respondents to prepare (refer to Appendix B). The response rate from the initial selection triggered a supplementary set of email requests to be sent out to try to achieve a set of thirty-five respondents. Three interviews were held in French and thirty-two interviews were held in English.

The interview questions were created based on the questions answered in the previous online survey, with the intent of attaining a more in-depth understanding of the limitations that organizations face when identifying restoration opportunities. These questions were further tailored to gain further understanding of the data that they currently use, data they deem to be inaccessible, and data they feel would be useful for the proposed database and its function.

3 Results and Discussion

3.1 Phase 1: Online Survey

The online survey was designed to provide opportunity for easy access for a broad spectrum of participants to ensure inclusive and diverse perspectives, gain sector and demographic information, use response rate as a preliminary indicator by proxy of interest, and guide the direction and focus of the design of direct interviews for the follow-up phase. 661 survey requests were sent out to the identified stakeholder list and a public link was made available on social media.

The online survey received 129 total responses nationally or 19% which falls within the range of acceptable response rate considered statistically valid (*i.e.,* between 10% and 30%) for external surveys. Of the 129 respondents, there was an even distribution of representation across the identified sectors. The summary of respondents by sector is presented in Table 1 below.

Table 1: Summary of respondents by sector

Sector	Frequency
Academia	7
Government	29
Indigenous	17
Industry	21
NGO	37
Other	18

Non-Governmental Organizations (NGO's) were the most represented demographic (relative number of respondents by sector) by the respondents with Government closely following as the second most represented sector. Industry followed Government as the third most represented with Academia being the least represented sector by the respondents. The Other category, which was represented by multi-sector organizations, a retired individual with an interest in aquatic habitat restoration, a volunteer, and several consultants. Of the governmental agencies, the majority of respondents were federal, followed by provincial, and municipal level government.

Of the industry respondents, the majority of the responses were from the oil and gas sector. Mining, construction, fisheries, forestry, agriculture, hydroelectric, transportation and other utilities were also represented by respondents. The number of oil and gas sector participants may be a result of the high level of regulation on this industry and their interest in regulatory compliance and clarity.

The geographic representation spanned across Canada, with respondents occasionally representing more than one region. The summary of respondents by geography is presented in Table 2 below.

Table 2: Summary of respondent by geography

Province/ Territory	Frequency
BC	55
AB	39
SK	22
MB	15
ON	26
QC	27
NB	13
NS	16
PE	19
NL	8
YT	10
NT	14
NU	11

British Columbia was the most represented province (relative number of respondents by geography) followed by Alberta, Quebec, and Ontario. All provinces and territories were represented by the respondents in the online survey. British Columbia, Alberta, Quebec, and Ontario are provinces with identified large population centers and this may have influenced the representation in the online survey.

The majority of respondents identified that they were directly involved in restoration of aquatic habitats. Of these respondents, planning was identified as the primary area of practice in aquatic habitat restoration, followed by participation in physical works of restoration, environmental assessments, and policy. The Other category provided additional insights as to how individuals participate in the restoration of aquatic habitats. This included volunteer coordination, invasive species removal, creation of regulatory policy, modelling and mapping, training and education, stewardship, monitoring, and proposal development.

The majority of respondents indicated that they conducted their work at a regional/ watershed scale. This was followed by a specific location in a watershed, a specific watershed, and at a provincial scale. Several respondents identified scale to not be applicable in their works.

3.1.1 Topic 1 - Challenges and Limiting Factors

Results

The survey asked questions to explore the challenges that limit efforts in meeting aquatic habitat restoration objectives. These questions were answered by the respondents, identifying the level of limitation each topic presents. The scale included not applicable, not a limiting factor, slightly limiting, limiting, and highest limiting factor.

Six main challenges or limiting factors were addressed. These include:

- *Opportunity resources* – limited access to information, technology, or knowledge
- *Site information* – habitat data, land ownership, site history, species information
- *Funding resources* – monetary resources for completing restoration
- *Collaboration* – barriers to cooperation and coordination between organizations
- *Lack of expertise* – knowledge of proven and emerging restoration science or best practices
- *Regulatory hurdles* – regulatory requirements necessary to fulfill

The summary of responses by limiting factor is presented in Table 3 below.

Table 3: Summary of responses regarding challenges and limiting factors

	Frequency					
Response	**Opportunity Resources**	**Site Information**	**Funding Resources**	**Collaboration**	**Lack of Expertise**	**Regulatory Hurdles**
Highest limiting factor	10	7	51	9	4	16
Limiting factor	55	59	35	44	34	40
Slightly limiting factor	35	34	20	51	38	45
Not a limiting factor	21	23	12	18	46	16
Not applicable	8	6	11	7	7	12

Discussion

The intent of these questions was to identify the challenges and limitations that organizations face in the identification of restoration opportunities. These challenges and limitations were identified as key priorities for respondents and were further explored during the interviews conducted in the second phase of the study.

Funding resources was identified as a key challenge and limiting factor for respondents. The majority felt as though funding was their highest limiting factor, with the second most respondents identifying funding as a limiting factor. Several respondents identified this as being only a slightly limiting factor and the fewest respondents said this was not a limiting factor.

The next limiting factor explored was *site information*. Examples of site information include habitat data, land ownership, site history, and species information. The majority of respondents found site information presented itself as a limiting factor in achieving restoration objectives. Respondents second most frequent response was that site information is a slightly limiting factor, followed by it not presenting as limiting factor. The fewest number of respondents found this to be the highest limiting factor. Site information has also been described as a limiting factor and therefore a barrier to organizations reaching their restoration objectives.

Collaboration between agencies was identified as an additional challenge to achieving aquatic habitat restoration objectives. Most respondents found that this was a slightly limiting factor with the second most frequent response identifying that this was a limiting factor. The third most frequent responses found that collaboration not to be a limiting factor, and only several respondents identified it as their highest limiting factor.

A *lack of expertise* was found to be mainly a non-limiting factor across respondents, with slightly limiting as the second most frequent response. The third most frequent response was that lack of expertise in their organization was a limiting factor, and finally only a few respondents found a lack of expertise to be a highly limiting factor. The respondents identified lack of expertise to be mainly a non-limiting factor.

The next question addresses current *information resources on restoration opportunities* as being a limiting factor. Most respondents identified information resources to be a limiting factor, or a slightly limiting factor in meeting their restoration objectives. The third most frequent response was that information resources on restoration opportunities are not limiting and the least frequently mention response was that it was the highest limiting factor. Identifying that information resources on restoration opportunities is a limiting resource to respondents' efforts.

Regulatory requirements were shown to be only a slightly limiting factor to most respondent's restoration efforts, with regulatory requirements as a limiting factor for the second most frequent response. The third most frequent response was that regulatory requirements are the highest limiting factor with few responses indicating that they are not a limiting factor. Regulatory requirements were represented in this survey as only a slightly limiting factor.

Finally, an *Other* category captured challenges and limitations that respondents face in identifying restoration opportunities that were not captured in the above questions. The Other category was mainly respondents expanding on the ideas of the limiting factors found in the previous questions. This included regulatory clarity on offsetting, compensation, and other objectives, including a lack of political interest. Specific funding challenges were identified and included long term project funding, monitoring and planning-specific funding opportunities, and cost-benefit ratios of restoration activities. On the topic of land ownership, landowner willingness and the topic of multiple stakeholders involved in land management were also identified as a limiting factor.

Additionally, data silos, project monitoring, and agreement on land use and restoration objectives were all mentioned as challenges.

3.1.2 Topic 2 - Geospatial data

Results

The level of use, quality and availability, of geospatial data by respondents was explored in the second topic of the online survey. The summary of responses related to geospatial data quality and availability is presented in Table 4 below.

Table 4: Summary of responses regarding geospatial data quality and availability

Response	Frequency
Yes, I have all the good quality data I need	2
Yes, I have geospatial data, but it could be improved	14
No, the data is limited and/ or incomplete	30
No, the data is extremely limited and/ or incomplete	11
Not applicable	1

Discussion

Geospatial data was identified as an important tool for the majority of respondents. A follow-up question sought insight into what information and/or geospatial data provides the greatest value for identifying restoration opportunities respondents are engaged in. Most respondents indicated that the data is limited and not able to provide sufficient information. The second most frequent response indicated that respondents are generally provided with the geospatial information they require. The third most frequent response indicated that the data provided is extremely limited. Finally, few people indicated that they have everything that they require to identify restoration opportunities. The responses indicated that there is a broad range of data needs across sectors and geographies.

3.1.3 Topic 3 - Interest in a National Restoration Opportunity Database

Results

Lastly, the online survey asked if the proposed national online database of aquatic habitat restoration opportunities would be of interest to their organization's efforts in identifying restoration opportunities. The summary of responses is presented in Table 5 below.

Table 5: Summary of responses regarding interest in a national restoration opportunity database

Response	Frequency
Yes	106
Unsure	11
No	12

Discussion

Most respondents identified that yes, this database would be useful. Several respondents identified that it would not be useful to their organization, and several were also unsure if this would help their organizations efforts.

The results coming from the online survey presented overwhelming support for the idea of creating a national online database for aquatic habitat restoration. There were several hesitations identified in the survey results. The hesitations highlight the need for careful consideration for the quality, type, and scale of data to be presented in the database to consider the basic user needs and allow for quality data to be output.

3.2 Phase 2: Interviews

Thirty-five interviews were conducted across the sectors identified and discussed in the methodology section. The one-on-one interviews were conducted with the intent of attaining a more in-depth understanding of the limitations that organizations face when identifying restoration opportunities. The questions were tailored to gain further understanding of the data that they currently use, data they deem to be inaccessible, and data they feel would be useful for the proposed database and its function. The summary of respondents by sector is presented in Table 6 below.

Table 6: Summary of respondents by sector

	Frequency	
Sector	Primary Response	Secondary Response
Academia	-	1
Government	11	7
Indigenous	1	6
Industry	5	2
NGO	17	1
Other	1	-

Note: Primary Response – The main sector respondents indicated they worked in or associated with
Secondary Response – Additional sectors respondents indicated they worked in or associated with

Respondents were also distributed geographically throughout Canada. The summary of respondents by geography is presented in Table 7 below.

Table 7: Summary of respondents by geography

	Frequency	
Province/ Territory	**Primary Response**	**Secondary Response**
BC	10	4
AB	8	4
SK	4	3
MB	2	3
ON	6	4
QC	4	3
NB	2	1
NS	4	-
PE	3	-
NL	3	-
YT	2	1
NT	2	-
NU	2	1

Note: Primary Response – The main geographic area respondents indicated they worked in or associated with
Secondary Response – Additional geographic areas respondents indicated they worked in or associated with

Seven key questions were developed to understand the drivers, limitations, and opportunities for various stakeholders as it relates to aquatic habitat restoration. Upon completion of the interviews, the responses to each of the questions were divided into categories reflecting the value of the response.

The seven key questions included are:

- Q1 - What are the primary drivers for engaging in aquatic habitat restoration activities?
- Q2 - How are restoration opportunities identified?
- Q3 - What data sources are used to identify restoration opportunities?
- Q4 - What key challenges exist that impede the identification of restoration opportunities?
- Q5 - Are there data sources related to restoration opportunities that are inaccessible?
- Q6 - What outputs would provide the highest value from a restoration opportunity database?
- Q7 - Would a national restoration opportunity database provide value?

3.2.1 Q1 - What are the primary drivers for engaging in aquatic habitat restoration activities?

Results

Stakeholders were asked what their primary drivers were for engaging in aquatic habitat restoration activities. The summary of responses by sector is presented in Table 8 below.

Table 8: Summary of responses from Q1

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Ecosystem function	8	-	1	14	1	**24**
Species of concern	7	-	1	10	-	**18**
Regulatory requirements	6	-	4	4	1	**15**
Community driven	1	1	1	5	1	**9**
Other	3	2	2	3	-	**10**

Ecosystem function was the most frequently identified driver with 24 total responses. The majority of the responses were attributed to respondents from the NGO sector (14 responses; 82% of NGO respondents), followed by Government (8 responses; 73% of Government respondents). Respondents from these sectors indicated that their objective is often to restore ecosystems for their services which includes improving water quality, providing habitat, fostering biodiversity, and creating self-sustaining ecosystems among a suite of other metrics which lend to the functionality of the ecosystem. This response was also provided by Industry on one occasion and by the respondent from the Other sector which was represented by a consulting firm that works with Indigenous interests.

Species of concern was the second most frequently identified driver with 18 total responses. In similar fashion to ecosystem function, the majority of the responses were attributed to respondents from the NGO sector (10 responses; 59% of NGO respondents), followed by Government (7 responses; 64% of Government respondents). This result reflects the conservation goals and value of species that these sectors consider when engaging in aquatic habitat restoration activities. This response was provided on one occasion by Industry.

Regulatory requirements were the third most frequently identified driver with 15 total responses. 80% of Industry respondents (4 responses) identified this response as its primary driver, followed by Government (55% of Government respondents; 6 responses) and the NGO sector (24% of NGO respondents; 4 responses). This result primarily reflects Industry's requirement to engage in the restoration of aquatic habitat to meet regulatory requirements. This response was only provided by one respondent from the Other sector.

Community driven opportunities were the fourth most frequently identified driver with 9 total responses. The majority of the responses were attributed to respondents from the NGO sector (5

responses; 29% of NGO respondents), followed by Government (1 response; 9% of Government respondents), Indigenous (1 response; 100% of Indigenous respondents), Industry (1 response; 20% of Government respondents), and Other (1 response; 100% of Other respondents).

Other primary drivers that were identified include habitat offsetting, Indigenous rights, and intrinsic value.

In summary, ecosystem function and species of concern were identified as the primary drivers for the Government and NGO sectors, while Industry was primarily focused on regulatory requirements. All sectors also identified community driven opportunities as a key driver.

Discussion

The drivers identified above shed light on the question of "why" organizations restore aquatic habitats and inform which opportunities they choose to pursue. As noted above, Industry was primarily focused on complying with regulatory requirements and identifying opportunities that would provide their organization with the most "value". This specifically refers to maximizing positive impacts on habitat and meeting their business goals and regulatory requirements, relative to the level of investment. This was a key takeaway and was a consistent theme throughout the interview process. The other sectors differed from Industry in this respect. In general, they were interested in exploring and identifying opportunities that resulted in a positive effect on a component of the environment that their organization was focused on. In many cases this involved ecosystem function and species of concern.

Ecosystem function refers to the biophysical features (*i.e.,* physical, chemical, and biological) that support a healthy assemblage of biodiversity. This was the most commonly discussed driver for engaging in restoration activities and included items such as habitat connectivity, spawning habitat, and water quality. Motivation for considering this driver included economic, social, and environmental concerns. In many cases, restoration opportunities that are driven by ecosystem function are also based on the presence of species of concern.

Species of concern refers to species that have been prioritized by a group (*e.g.,* Government, NGOs, fisheries conservation groups, etc.). Many organizations are formed with the conservation of a specific species or a community assemblage of species as their key tenet. This motivates many of these groups to participate in the restoration of aquatic habitat. Many organizations were created with the mission to restore habitat for the success of a specific species or group of species (*e.g.,* salmon, waterfowl, etc.). Additionally, respondents spoke to the fact that the public often connects with specific species that have been identified by the *Species at Risk Act*, which has the potential to promote restoration projects with meaningful support and funding.

Although regulatory requirements were largely attributed to Industry, other sectors were also motivated by this driver. This includes specific departments of Government, who are responsible

for developing regulatory policy and whose work is to protect aquatic habitat and the species within them. An interesting example that blurs the lines between sectors was discussed by one of the respondents in Quebec. They discussed the presence of Government/ NGO hybrids, such as ABV des 7, that are mandated by the government to ensure aquatic ecosystems are maintained within the province. In Ontario, Conservation Authorities were also identified as a group that view regulatory requirements as a key driver to conducting restoration activities because of their duties under the *Conservation Authority Act*.

The value of Community driven restoration is a result of the knowledge and interest of community members, which is often realized through engagement, participation, and contributions to projects. Some community-based organizations are created based on the identification of the need for restoration in their local aquatic habitats. Although opportunities are often realized through NGOs, it is support at the community-level that increases the likelihood for project success. Other important drivers included intrinsic value, habitat offsetting, and Indigenous rights.

In summary, the primary motivating factors for engaging in restoration activities varied between sectors and organizations. However, there was substantial overlap in secondary drivers which suggests that all sectors would find value in their inclusion. The database should be designed with this overlap in mind to increase the potential for it to support the variety of end users and their goals across the variety of sectors identified. The main drivers to consider are as listed below:

- *Ecosystem Function* - environmental features (*i.e.,* physical, chemical, and biological) that support a healthy assemblage of biodiversity
- *Species of concern* - species that have been identified as a priority (*e.g.,* Salmon, SARA identified)
- *Regulatory Requirements* - Provincial and federal regulatory requirements
- *Community Driven* - Community defined restoration concerns, community support
- *Other* – Intrinsic values, Indigenous Rights

3.2.2 Q2 - How are restoration opportunities identified?

Results

Stakeholders were asked how aquatic habitat restoration opportunities are typically identified. The summary of responses by sector is presented in Table 9 below.

Table 9: Summary of responses from Q2

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Community identified	7	1	1	15	1	**25**
Government identified	8	1	4	9	1	**23**
Ecosystem function	5	1	3	8	-	**17**
NGO identified	4	-	2	7	-	**13**
Species of concern	4	-	2	6	-	**12**
Other	7	-	4	10	1	**22**

Community identified opportunities were the most frequently identified source with 25 total responses. The majority of the responses were attributed to respondents from the NGO sector (15 responses; 88% of NGO respondents), followed by Government (7 responses; 64% of Government respondents). Community identified opportunities was also noted by the respondent from the Indigenous sector, once by Industry, and by the respondent from the Other sector. Sources of these community identified opportunities include concerned citizens, citizen-science groups, landowners, and small community-based environmental groups.

Government identified opportunities were the second most frequently identified source with 23 total responses. The majority of the responses were attributed to respondents from the NGO sector (9 responses; 53% of NGO respondents), followed by Government (8 responses; 73% of Government respondents) and Industry (4 responses; 80% of Industry respondents). This response was provided by the respondent from the Indigenous sector and by the respondent from the Other sector. Government identified restoration opportunities were largely driven by stakeholder consultation processes (including regulatory requirements), watershed planning initiatives participated by governmental officials, and exploration of development impact offsetting projects.

Ecosystem function (17 total responses), NGO identified opportunities (13 total responses), and species of concern (12 total responses) were the third fourth and fifth most frequently identified sources. These three responses shared a very similar frequency and proportion by sector. The majority of the responses were attributed to respondents from the NGO sector (6-8 responses; 35-47% of NGO respondents), followed by Government (4-5 responses; 36-45% of Government respondents) and Industry (2-3 responses; 40-60% of Industry respondents). Ecosystem function was identified by the respondent from the Indigenous sector.

Other sources that were identified include Indigenous identified, historic projects, industry identified, infrastructure updates, organizational data, proponent identified, and watershed planning. The nature of these identified opportunities varies from an "as needed" informal basis or formal planning exercises based on specific goals.

In summary, each sector identified restoration opportunities through a variety of sources. Government and NGO respondents suggested that their organizations main informants of opportunities were community identified and government identified opportunities, while Industries opportunities were often informed by government identified opportunities. This difference is likely a result of Industry's legal and social license commitments to meet regulatory requirements. All sectors appear to equally use ecosystem function and species of concern as metrics to identify restoration opportunities.

Discussion

The identification of restoration opportunities varied greatly between different sectors and organizations. Industry tended to prefer opportunities that were identified by government. The other sectors were more likely to utilize all available information, regardless of its source to identify restoration opportunities. This may speak to the motivation of organizations to directly address their legal and social commitments while minimizing investment costs.

Community refers to citizens, which may include landowners, local special interest groups, and members of municipal government. The value that this group provides is a local, personally invested, and real-time perspective on the state of aquatic habitats. Many NGOs spoke to the importance of support from community in restoration activities. They indicated that community support was a key influencing factor regarding which projects are selected and completed. Support at this level can also impact funding and project resourcing through local volunteer initiatives. The nature of the opportunities identified by the community are often informal, which requires that the specific sites, issues, or concerns be brought to other organizations (*e.g.,* NGOs). The community is dependent on these organizations to determine if they are interested in pursuing these opportunities or capturing them for future use.

Government identified restoration opportunities refers to opportunities brought forward through planning exercises, research studies, or internal/ institutional knowledge. These are often made available to NGOs who hold capacity, expertise, and funding or to industry looking to identify projects to meet regulatory requirements. These opportunities, as stated, may originate from different sources but are often presented to organizations to be carried as part of a larger plan through government planning exercises to meet mandated requirements.

NGO identified opportunities include the opportunities that have been identified through consultation with communities, watershed planning exercises, or from on-the-ground efforts in a particular area. Government and industry often utilize NGOs to identify appropriate opportunities. This was a result of their regional knowledge, restoration and conservation goals, and community ties and support. There is a large variety in size and sophistication of different NGO's and this can be reflected in their methods of collecting, synthesizing and acting on restoration opportunities.

This can range from ad-hoc, for as-needed restoration such as bank sloughing, to sophisticated whole watershed plans to address larger picture habitat degradation and connectivity issues.

The identification of opportunities was typically a result of information passed on by individuals, formal observations, or organizational plans. Biophysical features including ecosystem function and species of concern were identified as a key item or trigger when selecting restoration projects. These types of restoration opportunities are typically identified as a result of historic or ongoing habitat degradation, species population declines, notable changes or issues, or modelling and planning exercises that formally evaluate the state of habitat and watersheds. Although this is not specifically how organizations identify opportunities, it does speak to the organizational motivation for conducting restoration and selecting opportunities.

In summary, the nature of whether an opportunity was identified ad-hoc or through planning exercises/ formal studies depended greatly on who identified the opportunity. Informal, ad-hoc community identification was the most common type, however identification through planning exercises/ formal studies were also well represented in the results. We believe that the proposed database has the potential to bridge the gap between identification types in the quality of data presented. This could be accomplished by establishing a basic framework of what information should be included for each potential opportunity through a standardized input format. This has the potential to ensure consistent information is collected and made available for each opportunity, regardless of its source, which will support meaningful comparisons during the opportunity selection and planning phase.

3.2.3 Q3 - What data sources are used to identify restoration opportunities?

Results

Stakeholders were asked which data sources were used to identify aquatic habitat restoration opportunities. The summary of responses by sector is presented in Table 10 below.

Table 10: Summary of responses from Q3

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Open government data	9	-	3	8	1	**21**
Personal communications	4	-	4	9	-	**17**
Organizational data	3	-	3	11	-	**17**
Publicly available data	7	-	-	6	-	**13**
Proprietary data	4	-	2	3	1	**10**
Other	9	2	3	13	1	**28**

Open government data was the most frequently identified source with 21 total responses. The majority of the responses were attributed to respondents from the Government sector (9 responses; 82% of Government respondents), followed by NGO (8 responses; 60% of NGO respondents) and Industry (3 responses; 60% of Industry respondents). This response was also provided by the respondent from the Other sector.

Personal communications and organizational data (17 total responses each) were tied for second as the most frequently identified sources. These responses shared a very similar frequency and proportion by sector. The majority of the responses were attributed to respondents from the NGO sector (9-11 responses; 53-65% of NGO respondents), followed by Industry (3-4 responses; 60-80% of Industry respondents), and Government (3-4 responses; 27-36% of Government respondents).

Publicly available data was the third most frequently identified source with 13 total responses. All responses were attributed to respondents from Government (7 responses; 64% of Government respondents) and NGO (6 responses; 35% of NGO respondents).

Proprietary data was the fourth most frequently identified source with 10 total responses. Responses were fairly evenly distributed between respondents from the Government sector (4 responses; 36% of Government respondents), NGO (3 responses; 18% of NGO respondents), and Industry (2 responses; 40% of Industry respondents).

Other sources that were identified include academic, citizen science, community knowledge, unpublished government data, historic project data, NGO data, opportunity prioritization, subscription-based data, traditional land use data, unknown data, and watershed planning.

In summary, each sector identified restoration opportunities through a variety of sources. Government respondents indicated that their organizations favored open government and publicly available data, while Industry and NGOs used a variety of data sources in addition to personal communications.

Discussion

The key takeaway from the responses to this question is that there are very few datasets with readymade opportunities for restoration. Opportunities that have been identified often exist in informal or undigitized formats from ideas written on napkins to full watershed plans. However, respondents from all sectors indicated that they use a wide variety of ancillary resources to inform their selection process. In many cases, personal communications are still seen as one of the most valuable resources in the creation and development of proprietary or institutional data to fill the gaps, create, and plan opportunities.

Open government data is the most common source that organizations use to identify restoration opportunities. The importance of open-source data cannot be under-stated given its availability to everyone in the aquatic habitat restoration community. This is exemplified by organizations across each sector identifying this as one of their most valuable sources of data.

Personal communications were the second most frequently identified data sources that were used to identify restoration opportunities. This refers to discussions with colleagues (external from their organization), technical experts, and other stakeholders. This casual discussion regarding potential projects, priorities, and objectives was a key method for gaining insight on data for a specific area. Although it provides valuable information, personal communication is time consuming, the results are not necessarily repeatable, and finding relevant organizations or individuals to speak with can be difficult. The organization Alternative Land Use Services (ALUS), a multi-provincial organization, is an example of one of these organizations created to facilitate this type of process and has been identified as a potential organization to include in the creation of this database.

Organizational data is almost as commonly used as open government data. This includes internal data sources collected through project planning initiatives or from internal expertise and knowledge of the areas their individuals work in. It was expressed that much of the data is not necessarily proprietary, but that it is not typically shared between organizations. The importance, quality and useful nature of these data was addressed by many of the respondents. As discussed in Section 4.2.5, this data is not regularly shared between organizations and at times perpetuates the duplication of data collection efforts.

Other publicly available data, which includes anything published and publicly available that is not government owned, such as reports from NGOs, academia, or other organizations that create these types of reports. This was the third most frequently identified data source. Several respondents identified that these datasets are not always consistently formatted or maintained regularly. Some organizations are also not aware of the sources that exist.

Proprietary data refers to data that is collected for specific projects and that cannot be shared because of ownership limitations. Although these are often high-quality data sets, they may only

be available to the stakeholders associated with a specific project and inaccessible to other organizations.

In summary, although a variety of data exists there were a number of issues and gaps that were identified by respondents that limit the use of this information. This reenforces the need for user friendly, maintained databases of available ancillary information that are well-connected, advertised, and reliable to bridge these gaps across the aquatic habitat restoration community. Exploring the availability of the data and forging strong partnerships and collaborative efforts will add value to the efforts in consolidating the information into the proposed database.

3.2.4 Q4 - What key challenges exist that impede the identification of restoration opportunities?

Results

Stakeholders were asked what key challenges exist that impede the identification of aquatic habitat restoration opportunities. The summary of responses by sector is presented in Table 11 below.

Table 11: Summary of responses from Q4

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Data deficiencies	8	-	3	7	1	**19**
Collaboration	1	-	3	7	-	**11**
Funding	1	1	-	7	1	**10**
Land ownership	3	-	1	6	-	**10**
Regulatory requirements	4	-	4	2	-	**10**
Other	4	1	3	13	2	**23**

Data deficiencies were the most frequently identified challenge with 19 total responses. The majority of the responses were attributed to respondents from the Government sector (8 responses; 73% of Government respondents), followed by the NGO sector (7 responses; 41% of NGO respondents) and Industry (3 responses; 60% of Industry respondents). This response was also provided by the respondent from the Other sector.

Collaboration was the second most frequently identified challenge with 11 total responses. The majority of the responses were attributed to respondents from the NGO sector (7 responses; 41% of NGO respondents), followed by Industry (3 responses; 60% of Industry respondents) and Government (2 responses; 9% of Government respondents).

Funding, land ownership, and regulatory requirements all received 10 responses. The majority of the responses for funding were attributed to respondents from the NGO sector (7 responses; 41% of NGO respondents), followed by Government (1 responses; 9% of Government respondents),

Indigenous (1 response; 100% of Indigenous respondents), and Other (1 response; 100% of Other respondents).

The majority of the responses for land ownership were attributed to respondents from the NGO sector (6 responses; 35% of NGO respondents), followed by Government (3 responses; 27% of Government respondents) and Industry (1 responses; 20% of Industry respondents).

The majority of the responses for regulatory requirements were attributed to respondents from Industry (4 responses; 80% of Industry respondents), followed by Government (4 responses; 36% of Government respondents) and the NGO sector (2 responses; 12% of NGO respondents).

Other sources that were identified include access, alignment of objectives, capacity/ expertise, Indigenous/ Indigenous participation, locating opportunities, opportunity prioritization, and timing.

In summary, a variety of data deficiencies were identified across all sectors that impeded the identification of aquatic habitat restoration opportunities. Funding issues posed the greatest challenge to the Indigenous and NGO sectors, while regulatory requirements and collaboration were notable challenges for Industry. All sectors experience some challenges associated with land ownership; however, it was less frequently identified than the other primary responses.

Discussion

In alignment with the responses to the previous question, the most identified challenge across sectors was data deficiencies. This specifically refers to the lack of data, incomplete data sets, inaccessibility, or lack of knowledge of existing sources. Although data exists and continues to be collected for restoration opportunities, the lack of connectivity between organizations, data collection protocol standardization, comparability, consistency, and open sharing of data can be improved.

Collaboration was identified as the second most common challenge, with the majority of responses coming from NGOs. Often the work that NGOs conduct are dependent on collaborations with other NGOs, industry, or community members. It was discussed many times that the stakeholder presence or interest in specific restoration opportunities are not always obvious and may be leading to missed opportunities.

Funding was a key challenge primarily identified by the NGO and Government sectors. As described in the survey, funding is often a limiting factor to conducting restoration. The decision to select a restoration opportunity can be greatly influenced by the presence of monetary support to conduct restoration as this is a known limitation. If organizations knew there were potential funders that had interest in specific projects, or that different project types would apply to specific funding opportunities (*e.g.,* salmon restoration initiatives*)*, they would be more likely to pursue

those opportunities. Conversely, agencies with funding expressed being able to use the map of opportunities to gain a better understanding of the bigger picture of restoration needs. By understanding the need for restoration in different areas, they would be able to better direct the nature of their funding to create a larger impact. Industry did not identify this as a challenge. Respondents overwhelmingly identified matching funders to projects as a potential benefit of this database that would significantly improve the selection and identification process.

Landownership was often a very heavily discussed topic. The challenges arise from landowner barriers being seen as the main concern that either leads to the success or collapse of projects. If organizations knew the boundaries of regulation or consent for works surrounding the land in question, they would be able to be more confident in the selection of priority restoration. Regulations around conducting restoration on public or private land, infrastructure (*e.g.,* roadways, railway lines, pipelines, etc.), and land use objectives are the main topics in regard to landownership. Support and clarity in regulation surrounding landownership and infrastructure was identified as a need especially in regard to offsetting. If the database were to provide the basic divisions of private and public lands (*e.g.,* national parks, provincial parks, and protected areas, etc.), it would provide proponents with enough information to start to navigate the regulatory standards around landownership. Landownership and landowner interest in collaborating was also identified as something that organizations would find helpful to understand prior to selecting restoration opportunities. Despite the challenges of attaining valuable up to date landowner data, there are organizations that are currently working with landowners to facilitate this process (*e.g.,* ALUS - Alternative Land Use Services). Understanding land ownership, from private to public and the regulations as they pertain to restoration works, is still seen as a major challenge, mainly for NGOs conducting restoration, but also by government and industry.

Regulatory requirements were identified as key challenges to identifying restoration opportunities. Industry respondents expressed concerns about selecting restoration opportunities that align with regulatory offsetting requirements and goals (*e.g.,* culvert restoration does not always apply). Other topics that respondents desired clarity on included remote developments, the inability for organizations to offset in high priority areas, clarity on habitat banking, and clarity around the quantification of habitat and restoration success, as defined by Government bodies. Respondents also mentioned the challenges of coordinating the variety of approvals that are required when working adjacent to or in a watercourse. The potential for applicable regulatory requirements to be incorporated into the proposed database would provide clarity and understanding of these requirements to ensure they have the appropriate internal knowledge and capacity prior to selecting the opportunity.

3.2.5 Q5 - Are there data sources related to restoration opportunities that are inaccessible?

Results

Stakeholders were asked what data sources related to aquatic habitat restoration opportunities are currently inaccessible. The summary of responses by sector is presented in Table 12 below.

Table 12: Summary of responses from Q5

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Proprietary data	4	-	3	8	1	**16**
Unknown/ unfamiliar data	6	1	3	2	-	**12**
Government data	-	-	2	6	1	**9**
Other	5	0	0	16	0	**21**

Proprietary data was the most frequently identified inaccessible source with 16 total responses. The majority of the responses were attributed to respondents from the NGO sector (8 responses; 47% of NGO respondents), followed by Government (4 responses; 36% of Government respondents) and Industry (3 responses; 60% of Industry respondents). This response was also provided by the respondent from the Other sector.

Unknown/ unfamiliar data was the second most frequently identified inaccessible source with 12 total responses. The majority of the responses were attributed to respondents from the Government (6 responses; 55% of Government respondents), followed by Industry (3 responses; 60% of Industry respondents) and the NGO sector (2 responses; 12% of NGO respondents). This response was also provided by the respondent from the Indigenous sector.

Government data was the third most frequently identified inaccessible source with 9 total responses. The majority of the responses were attributed to respondents from the NGO sector (6 responses; 35% of NGO respondents), followed by Industry (2 responses; 40% of Industry respondents). This response was also provided by the respondent from the Other sector.

Other sources that were identified include academic, aerial, data silos, incomplete data, Indigenous interest, landowner interest, non-digitized data, personal communications, satellite imagery, and subscription-based.

In summary, inaccessible proprietary and unknown data were identified as the greatest issue across all sectors. Inaccessible government data was also noted by Industry and the NGO sector.

Discussion

Respondents were asked to speak to the types of data that were inaccessible to their organizations and that they believed would be of use to them. The key takeaway from this is that data deficiencies and inaccessible data are limiting factors across sectors.

Proprietary data refers to data that is collected for specific projects and that cannot be shared because of ownership limitations. Although these are often high-quality data sets, they may only be available to the stakeholders associated with a specific project and inaccessible to other organizations. By creating stakeholder relationships and matching organizational capacity with the needs of those that hold this data, there is an opportunity to overcome this limitation. In addition, it may be possible to incorporate a data sharing component into regulatory processes to bolster data collection and sharing.

The second most frequent response was unknown data. This refers to data that is available, but the respondent is not aware of its existence. This speaks to the amount of data that is available but is not consolidated or advertised and provided to the correct audience. This is an opportunity for the proposed database as many respondents indicated their desire for information to be more centralized and consolidated.

Government data was also discussed as an inaccessible data source to some, as not all data is made publicly available. The exact source of this information varied from staff knowledge, data from reports that were not available in a usable format, data that government agencies have deemed "privileged", etc. Some respondents also mentioned government data that is accessible but spoke to the slow and tedious nature of acquiring data sets from government agencies (*e.g.,* manual data requests, access to information requests, etc.). The shared database is a platform for stronger data sharing and better communication, which could set a standard showing governments where and when data that already exists in internal silos is needed. By sharing this in a database, it would eliminate individual inquiries, which were discussed often as a long and tedious process, that individuals have to do separately. Although an opportunities database does not directly solve the problem of acquiring this data, it has the potential to promote relationships with government agencies that could facilitate the transfer of data.

In summary, although a variety of data exists there is a significant opportunity to fill in the gaps that were identified by the respondents. These results reenforce the need for a user friendly, maintained databases that is well-connected, advertised, and reliable.

3.2.6 Q6 - What outputs would provide the highest value from a restoration opportunity database?

Results

Stakeholders were asked what outputs would provide the highest value to their organization from an aquatic habitat restoration opportunity database. The summary of responses by sector is presented in Table 13 below.

Table 13: Summary of responses from Q6

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Localized data	9	1	3	12	1	**26**
Habitat connectivity	7	-	3	7	1	**18**
Prioritization Criteria	8	1	4	5	-	**18**
Stakeholder data	4	1	1	11	-	**17**
Species data	4	1	3	3	1	**12**
Regulatory requirements	2	-	1	5	-	**8**
Other	14	2	8	18	1	**43**

Localized data was the most frequently identified output with 26 total responses. The majority of the responses were attributed to respondents from the NGO sector (12 responses; 71% of NGO respondents), followed by Government (9 responses; 82% of Government respondents) and Industry (3 responses; 60% of Industry respondents). This response was also provided by the respondent from the Indigenous sector and the respondent from the Other sector.

Habitat connectivity (18 total responses) and prioritization criteria (18 total responses) were the second and third most frequently identified output. These responses shared a very similar frequency and proportion by sector. The majority of the responses were attributed to respondents from the Government (7-8 responses; 64-73% of Government respondents), followed by the NGO sector (5-7 responses; 29-41% of NGO respondents) and Industry (3-4 responses; 60-80% of Industry respondents). These responses were also provided by the respondent from the Other sector.

Stakeholder data (17 total responses) and species data (12 total responses) were the fourth and fifth most frequently identified outputs. These responses shared a very similar frequency and proportion by sector, with the exception of stakeholder data and NGOs. The majority of the responses were attributed to respondents from the Government (4 responses; 36% of Government respondents), followed by the NGO sector (3-11 responses; 18-65% of NGO respondents) and Industry (1-3 responses; 20-60% of Industry respondents). The species data response was also provided by the respondent from the Indigenous sector and the respondent from the Other sector.

Regulatory requirements were the sixth most frequently identified output with 8 total responses. The majority of the responses were attributed to respondents from the NGO sector (5 responses; 18% of NGO respondents), followed by Government (2 responses; 18% of Government respondents) and Industry (1 responses; 20% of Industry respondents).

Other outputs that were identified include access, collaboration, cumulative effects, cumulative impact, DFO information, ecosystem, funding requirements, habitat, historic project data, Indigenous information, Indigenous interest, land ownership, location of opportunities, offsetting/banking potential, organizational data, project cost, project scope, project type, restoration required, spatial component, type of degradation, water quality, and watershed planning.

In summary, localized data was identified as the most valuable output across all sectors. Habitat connectivity and opportunity prioritization were identified by Government and Industry as key outputs, while stakeholder data was identified by the NGO sector. Species data was also identified as a key output by Industry.

Discussion

The key takeaway from this line of inquiry is that all sectors identified their desire for flexibility from the outputs from the database. Although opportunities themselves do not seem to be widely available in a geospatial format, valuable ancillary data was identified. Ancillary data has the potential to support organizations in the identification and selection of opportunities based on their individual goals. There was a large number of outputs discussed and stakeholders indicated that they are looking for a solution that can effectively be used to assess these opportunities at both a fine and broad scale of resolution.

Localized data (or high-resolution data) was the most common response to this question. It is important to note that this term encompasses a very wide range of data types and primarily refers to the scale at which it is available. The high response rate for high-resolution data speaks to the needs of organizations at a watercourse or watershed level. It is at this resolution that organizations can make actionable decisions regarding opportunities. Further consultation will be required to further elucidate this topic and the specific data available will likely vary by local region.

Species specific data was also identified as a priority output. As discussed in several of the previous questions, many organizations are focused directly on the conservation of specific species or groups and would value information such as presence, diversity, population levels, etc., to direct their efforts. Sectors including Government, NGOs, and Industry value this information as a tool to foster support for their projects by discussing species that are of importance to communities.

The second most discussed output includes the topic of habitat connectivity. Connectivity refers to the interconnectedness of habitats as a way to understand the potential effects a habitat or

restoration project has upstream or downstream. The level of discussion surrounding this topic focused on understanding how habitat or species that are being targeted by restoration efforts are positively impacted and the influence of restoration works in recovering population, diversity, or habitat complexity. This can shed light on how we can create larger positive impacts when looking at watershed scale health and impacts of restoration efforts.

Prioritization criteria was a key topic discussed across sectors. Organizations spoke of the need to understand the greater picture of priority in the aquatic habitat restoration community. Including a standardized platform to convey their individual priorities allows organizations to engage in their priorities as they relate to different opportunities. By providing the information necessary to identify components of a project, the database could act as a prioritization tool. Creating standardized and comparable criteria that allows the opportunities identified to be organized by priority, based on repeatable and transparent evaluation of net benefit. Government organizations spoke of the need for standardized and clear prioritization criteria for aquatic habitat restoration opportunities and industry echoed this sentiment. If government is involved in the development of criteria, there is potential to improve clarity regarding regulatory requirements. Some NGOs were less interested about the inclusion of prioritization. However, this may be due to the fact that some organizations already have sophisticated prioritization tools or regional aquatic habitat/ watershed plans that already outline priorities in their areas. Other NGOs and even governmental organizations that have restoration opportunities identified that there are no shortages of opportunities, but the "shortfalls" lie in the ability to prioritize what efforts will provide the most benefit. Providing basic information that is standardized (*e.g.,* regulatory layers, species layers, cultural use layers, etc.) could establish a better understanding around comparable and important criteria that would allow organizations to prioritize projects in relation to opportunities. Prioritization would provide significant improvements to opportunity identification and planning efforts.

Regulatory requirements were also frequently discussed. Respondents described the inclusion of regulatory requirements in the proposed database as an opportunity to not only gain clarity and reduce wasted effort, but also as a resource for Government to focus the attention of proponents on their high priority outcomes. This could be applicable to all levels of Government including federal, provincial, and municipal.

Additional ancillary data includes stakeholder and rightsholder (*e.g.,* Indigenous groups) information. Given the importance of meaningful consultation with all interested and affected parties during the planning process, all sectors saw value in this output. Specific stakeholders and rightsholders discussed included landowners, government representatives, Indigenous, and other organizations that have identified themselves as working in the area. As each stakeholder provides different perspective, knowledge, skill and resources, the availability of this data has the potential to facilitate collaboration, funding, and more meaningful consultation. For example, if a group

were to understand the history of the site and provide input on what has worked in the past, what was present in the past, restoration efforts can already be more pointed towards what may work best. Or another local, lesser-known NGO could submit to the database that they may have already been thinking about the project and have a specific knowledge or desire to work on the site, and collaboration and workload can be shared amongst collaborating groups.

In summary, a large number of outputs were identified as having value across sectors. Key items include a geospatial mapping interface to visualize restoration opportunities and ancillary data to support project alignment, organizational decision making, and opportunity prioritization. These results reenforce the need for a user friendly, maintained database that is well-connected, advertised, and reliable.

3.2.7 Q7 - Would a national restoration opportunity database provide value?

Results

Stakeholders were asked if a national restoration opportunity database provide value to their organizations. The summary of responses by sector is presented in Table 14 below.

Table 14: Summary of responses from Q7

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Yes	9	-	4	12	1	**26**
Unsure	2	1	1	4	-	**8**
No	-	-	-	1	-	**1**

74% of respondents (26 total responses) from Government (82%), Industry (80%), NGO (71%), and the Other sector (100%) responded that yes, a national restoration opportunity database would provide value to their organizations. 23% of respondents (8 total responses) from Government (18%), Indigenous (100%), Industry (20%), and the NGO sector (24%) responded that they were unsure if a national restoration opportunity database provide value to their organizations. One respondent (3% of the total) from the NGO sector responded that no, a national restoration opportunity database would not provide value to their organization.

3.2.7.1 Yes

Results

The summary of responses by sector for respondents that answered "yes" is presented in Table 15 below.

Table 15: Summary of responses from Q7 of respondents who said "Yes"

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Collaboration	8	-	2	10	1	**21**
Improved planning	7	-	3	8	-	**18**
Funding opportunities	5	-	-	6	-	**11**
Other	2	-	2	6	1	**11**

Discussion

Of the respondents that said yes, the majority identified improving collaboration as the key benefit of the proposed database. This sentiment was evident across sectors and specific benefits mentioned include the ability to take on larger and more complex projects by combining available resources, capacity, sharing knowledge or data, and reducing duplicated efforts.

Improved planning was the second most identified potential benefit of this database. This would be accomplished through the consolidation and sharing of available data to facilitate the identification and selection of restoration projects. Organizations would not need to spend time and effort looking through multiple data sources to find the basic information that they need to move projects forward.

Funding opportunities were identified by NGOs and Government respondents as a key potential benefit of this database. One of the most frequently discussed ideas was that organizations could be able to "advertise" identified restoration opportunities that they were looking to complete. Potential funders, who are looking for projects to invest in, would be able to find opportunities that align with their goals.

The information provided in the proposed database must reflect the needs of the potential users. A consolidated list of currently available datasets identified by respondents is presented in Appendix A.

The potential value of the proposed database is examined in the use case in Section 4.

3.2.7.2 Unsure

Results

The summary of responses by sector for respondents that said they were "unsure" is presented in Table 16 below.

Table 16: Summary of responses from Q7 of respondents who were "Unsure"

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Improved planning	2	1	1	1	-	**5**
Funding opportunities	-	1	-	3	-	**4**
Collaboration	-	-	-	3	-	**3**
Regulatory clarity	2	-	1	-	-	**3**

Discussion

Some organizations were unsure about the ability of the proposed database to provide value in the identification of restoration opportunities. This response primarily came from organizations that have existing opportunities available (*e.g.,* a backlog) or that do not see the feasibility of having a national database for their purposes.

Despite the hesitations, many respondents noted that the database may be able to provide value to their restoration efforts through improved planning, funding opportunities, collaboration, opportunity prioritization, and regulatory clarity.

Hesitations were primarily related to the form, scale, and size of the database and the ability for it to be updated. Additional hesitations include the national scale being irrelevant in the type of work that they typically undertake and concerns that the types of restoration projects they typically do wouldn't be adequately reflected in such a database.

3.2.7.3 No

Results

The summary of responses by sector for respondents that answered "no" is presented in Table 17 below.

Table 17: Summary of responses from Q7 of respondents who said "No"

	Frequency					
Response	**Government**	**Indigenous**	**Industry**	**NGO**	**Other**	**Total**
Internal opportunities	-	-	-	1	-	**1**

Discussion

Only one respondent responded that the proposed database would not provide a benefit to their efforts in identifying restoration opportunities. This respondent is involved in restoration indirectly (*e.g.,* not actively conducting restoration activities), but does support individuals in this practice are by building databases and maps. They believe that the scale of such a database has the potential to be prohibitively large.

4 Use Cases

The information gathered from the online survey participants in Phase 1 and from the respondents in Phase 2 provided many valuable insights from a variety of individuals representing various organizations and sectors across Canada. After sorting, consolidating, and analyzing the data many common themes and trends were identified.

In an attempt to understand these trends and to describe how end-users were anticipated to interact with the proposed database, Use Cases were created to answer the following questions:

- Who is using the database?
- Why are they using the database?
- What data do they expect from the database?
- What scale is required for this database to be useful?
- Is this feasible based on available data?

These Use Cases were evaluated at two levels.

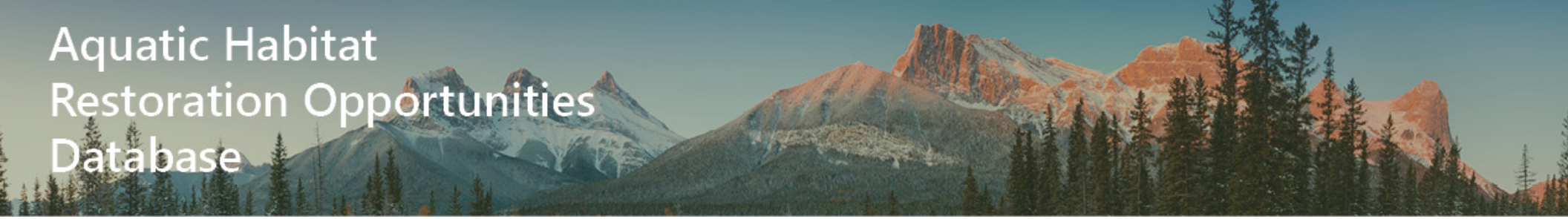
- **Simplified Use Cases** were intended to summarize each of the key uses that respondents identified as being crucial to the success of the proposed Project. These summaries are intentionally simple and are meant to generally evaluate what would be required to meet these needs.
- **Detailed Use Cases** discuss the two most highly anticipated uses that were identified by respondents. They are presented as hypothetical projects being undertaken by a proponent in an identified sector. These are intended to expand upon the selected Simplified Use Cases and discuss in more concrete terms how the database is expected to add value to the proponent, and other parties, by presenting these scenarios with and without the use of the Aquatic Habitat Restoration Opportunities Database.

4.1 Simplified Use Cases

Five simplified Use Cases were developed based upon the questions outlined above and the collective feedback from respondents to the survey and interview process. These Use Cases are presented in Table 18 below.

Table 18: Summary of simplified Use Cases

Use Case	Sector	Interaction/ Purpose	Required Data/ Key Attributes	Scale Required	
Regulatory-driven Offsetting (Detailed Use Case #1)	Industry	• This group is looking to identify opportunities to meet regulatory requirements	• Landowner information • Stakeholder/ rightsholder information • Site specific information (*e.g.,* Habitat surveys, species layer, waterflow/water quality) • Regulatory requirements layer and boundaries • Site history, document linked when possible • Prioritization criteria • Geospatial mapping interface • Connectivity, fragmentation, barriers	National Provincial: Regional:	Yes Yes Yes
Identification/ Prioritization of Restoration Opportunities (Detailed Use Case #2)	NGO	• This group is looking to input opportunities they have or find new ones and use the database to assign priority to the projects based on regulatory, degradation, habitat value, species etc.	• Landowner information linked • Stakeholder/ rightsholder information • Site specific information (*e.g.,* Habitat surveys, species layer, waterflow/water quality) • Regulatory requirements layer and boundaries • Site history, document linked when possible • Prioritization criteria • Potential funding opportunity • Geospatial mapping interface • Fragmentation/-barriers	National: Provincial: Regional:	No Yes Yes



Aquatic Habitat Restoration Opportunities Database

Use Case	Sector	Interaction/ Purpose	Required Data/ Key Attributes	Scale Required	
Restoration Opportunity Promotion and Collaboration	NGO	• This group is looking to provide opportunity data that they have already created or identified • Also includes groups looking to combine efforts to create larger more impactful restoration.	• Minimal, they would provide data in a standardized input form • Geospatial mapping interface • User friendly input form • Stakeholder Information linked • Regulatory requirements	National Provincial: Regional:	No Yes Yes
	Indigenous	• This group may have projects that they are looking to gain expertise, capacity, and/ or funding to complete. • They may have information or special use/ rights on land that needs to be considered	• Minimal, they would provide data in a standardized input form • Geospatial mapping interface • User friendly input form • Stakeholder Information linked • Regulatory requirements	National Provincial: Regional:	No No Yes
Opportunity for Government Agencies to Provide Regulatory Clarity	Government	• This group is looking to provide clarity or feedback on regulatory requirements for opportunity approval. • They may be able to support prioritization criteria development. • They may be able to support the identification of available funding resources. • They may be able to understand better what is happening in the different regions.	• Project data documentation linked • Regulatory boundaries • Site specific (*e.g.,* Habitat surveys, species layer, waterflow/water quality) • Site history, document linked when possible • Cumulative/element occurrence	National Provincial: Regional:	Yes Yes Yes
Provide Funding Opportunity to Complete Restoration	Funders	• This group has funds specifically available for restoration opportunities	• Project goals • Project scope and cost estimate • Stakeholder information • Habitat information	National Provincial: Regional:	Yes Yes Yes

4.2 Detailed Use Cases

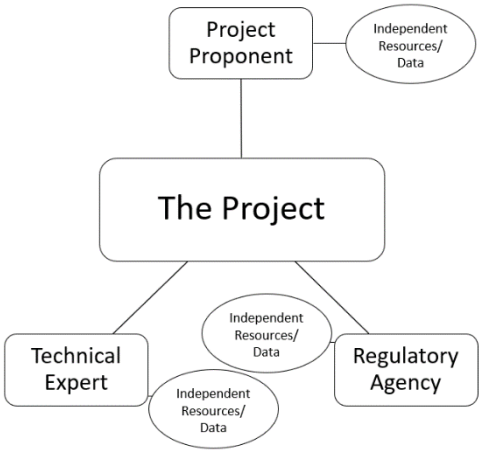
4.2.1 Use Case #1 - Regulatory-driven Offsetting (Industry)

A Project Proponent (Industry) has determined that their organization is responsible for undertaking aquatic habitat restoration work in a watercourse (the Project) to comply with regulatory requirements. The Proponent has identified that they will require the support of a Technical Expert (Consultant) and that they will require consultation and coordination with the appropriate Regulatory Agency (Government).

The following two sections are intended to expand upon the situation presented above for a scenario with and without the proposed Aquatic Habitat Restoration Opportunities Database.

Without the Aquatic Habitat Restoration Opportunities Database

In this scenario, the Proponent has engaged with each group independently and collaboration is exclusively occurring through the lens of the Project. As such, each group develops a siloed understanding of the Project according to their scope by assembling, evaluating, and incorporating available resources and data with limited interaction. A kick-off meeting was conducted with each group but given the lack of available information at this stage of the Project, only a high-level discussion was possible.



The Proponent tasked the Technical Expert with identifying restoration opportunities that are appropriate for the Project. The Technical Expert commenced a desktop and field-based study to assess conditions within a particular reach of the watercourse. Given the lack of available information and limited guidance from the Regulatory Agency, it was determined that a robust field program was required. Through this study, the Technical Expert identified several potential options and made a recommendation. These options were presented to the Proponent in a findings report and a single opportunity was selected by the Proponent based solely upon their understanding of the results. The remainder of the potential opportunities were rejected and lost because the Proponent did not have a tracking system for future opportunities in place.

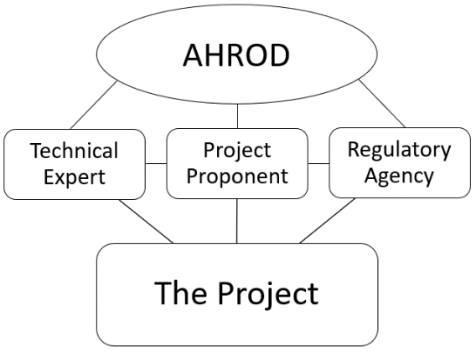
At this time, the Regulatory Agency and Indigenous Rightsholders was consulted and presented with the proposed concept. As neither group was meaningfully involved until this point in the Project, they are reliant upon the information presented to them and the limited other resources and data that they have available. Given the limited information available, they recommend several modifications to the concept which increased the time and budget requirements. If either group

had substantive issues with the proposed Project, the Proponent would have been required to start the restoration opportunity selection process over from the beginning.

In summary, by conducting this Project in the traditional manner presented above, several opportunities for proactive collaboration were missed. This ultimately resulted in additional time and budget being required and potential future opportunities being lost.

With the Aquatic Habitat Restoration Opportunities Database

In this scenario, the Proponent has engaged with each of the actors and discovered that there was an opportunity for proactive collaboration through the use of the Aquatic Habitat Restoration Opportunities Database. Each group started the Project with access to the same resources and data. This simplified process enabled the three groups to conduct a meaningful kick-off meeting that ensured that all stakeholders were in alignment at the start of the Project planning phase.



In a similar manner to the first scenario, the Proponent tasked the Technical Expert with identifying restoration opportunities that are appropriate for the Project. However, in this case a number of opportunities were identified during the desktop assessment using the Aquatic Habitat Restoration Opportunities Database that were in alignment with the regulatory guidance provided during the kick-off meeting. In addition, meaningful consultation with Indigenous Rightsholders was possible early in the process, which ensured that this perspective was incorporated into the selection of the final project location. A smaller field program was sufficient to ground truth the opportunities, which saved time and budget. The Proponent made an informed decision and selected a single option that they determined provided the most "value". The other opportunities that were identified, but not selected, were submitted to the Aquatic Habitat Restoration Opportunities Database for future reference.

The Regulatory Agency was presented with the proposed concept and was satisfied with the information presented, given the proactive collaboration that took place early in the planning process. The Project was able to proceed as planned and on schedule.

In summary, by conducting this Project with the use of the Aquatic Habitat Restoration Opportunities Database, the Project was able to move forward in a more efficient and predictable manner. Each group was able to access the same resources and data, which fostered effective communication and collaboration early in the Project planning phase. This ultimately resulted in time and budget efficiencies to be realized and potential future opportunities being preserved for future use and/or reference.

4.2.2 Use Case #2 - Identification/ Prioritization of Restoration Opportunities (NGO)

A Project Proponent (NGO) is in the process of selecting an aquatic habitat restoration opportunity to pursue in a specific region/ watershed (the Project). The Proponent is interested in identifying new opportunities, in addition to comparing them to opportunities that have been identified in-house. Ultimately, the Proponent is looking for the "best" opportunity that aligns with their organizational drivers/ goals, results in the most positive impact relative to investment, and is in line with the interests of relevant stakeholders and rightsholders. The Proponent has identified that they will require consultation and coordination with the appropriate Regulatory Agency (Government), stakeholders, and Indigenous rightsholders.

The following two sections are intended to expand upon the situation presented above for a scenario with and without the proposed Aquatic Habitat Restoration Opportunities Database.

Without the Aquatic Habitat Restoration Opportunities Database

In this scenario, the Proponent has undertaken a preliminary review of opportunities identified by their organization. As these opportunities were identified by different team members at different times, an inconsistent assortment of information is available for each site. The lack of consistency and varying level of detail available resulted in serious challenges to their decision-making process. In addition, the Proponent primarily relied on upon their internal expertise to evaluate these potential opportunities. Ultimately, the lack of comparable information, unintended bias in their decision-making processes, and a siloed understanding of priorities/ goals resulted in several quality opportunities being rejected. Although substantial effort was required to identify the rejected opportunities, they were set aside, poorly documented, and their associated data was ultimately lost because the Proponent did not have a tracking system for these types of opportunities in place.

Preliminary collaboration and engagement meetings were conducted but given the lack of available information at this stage of the Project, only a high-level discussion was possible. As such, the opportunities presented missed the mark for some potential partners and community support of the proposed Project was limited. The Proponent selected a final location; however, a partner was not identified for collaboration, as the opportunities were too focused on the goals of the Proponent and did not incorporate feedback from others early enough in the planning process. This limits the scale of the final Project, given the capacity and available funding through the Proponent.

At this time, the Regulatory Agency and Indigenous Rightsholders were consulted and presented with the final concept. As neither group was meaningfully involved, they are reliant upon the information presented to them and the limited other resources and data that they have available. Given the limited information available, they recommend several modifications to the concept

which increased the time and budget requirements. If either group had substantive issues with the proposed Project, the Proponent would have been required to start the restoration opportunity selection process over from the beginning.

In summary, by conducting this Project in the manner presented above, several opportunities for proactive collaboration were missed. This ultimately resulted in missed opportunities for collaboration, less effective opportunity selection, additional time and budget being required, and potential future opportunities being lost.

With the Aquatic Habitat Restoration Opportunities Database

In this scenario, the Proponent has undertaken a preliminary review of opportunities identified by their organization as well as opportunities identified through the Aquatic Habitat Restoration Opportunities Database. Given the structure of the database, a framework was present that allowed the Proponent to ensure adequate information was collected for each opportunity to allow meaningful comparison. In addition, the database was able to serve as a repository for all of the potential opportunities that were identified, so even those that were not in line with their organizational drivers/ goals could still be documented and made available to other groups that might be interested in pursuing or collaborating on them in the future.

The Proponent is then able to engage with each of the actors and discovers that there was an opportunity for proactive collaboration through the use of the Aquatic Habitat Restoration Opportunities Database. Each group started the Project with access to the same resources and data. This supported the selection of an opportunity that was justifiable in an ecosystem context. In addition, the established Prioritization Criteria supported decision making that considered regulatory considerations and priorities early. This simplified process enabled the groups to conduct meaningful collaboration and engagement meetings that ensured that all parties were in alignment at the start of the Project planning phase. These meetings resulted in several parties identifying an aligned interest in one particular opportunity. They decide to collaborate, and the result is successful funding applications, increased capacity, and improved community support.

The Regulatory Agency and Indigenous Rightsholders were presented with the proposed concept and were satisfied with the information presented, given the proactive collaboration that took place early in the planning process. The Project was able to proceed as planned and on schedule.

In summary, by pursuing this Project with the use of the Aquatic Habitat Restoration Opportunities Database, the Project was able to move forward in a more efficient, collaborative, and predictable manner. Each group was able to access the same resources and data, which fostered effective communication and collaboration early in the Project planning phase. This ultimately resulted in time and budget efficiencies to be realized and potential future opportunities being preserved for future use and/or reference.

5 Recommendations

The responses to the online survey and interview questions overwhelmingly indicated that the proposed national restoration opportunities database has the potential to provide considerable value across a variety of sectors. Upon review of the currently available resources, it was determined that insufficient restoration opportunity data is publicly available to populate the proposed database without additional effort to generate new data. However, respondents strongly indicated that a database consisting primarily of ancillary data would support their efforts in identifying new opportunities and that they would be interested in supporting and contributing to it. As such, Use Cases were created to establish how end-users were anticipated to interact with this newly proposed tool/ database and to understand what their expectations were. The synthesis of this information has been used to further explore the potential minimum viable product through project feasibility, functionality, data requirements, and the recommended next steps.

5.1 Feasibility and Functionality

Although the results of the survey and interviews found that insufficient restoration opportunity data is publicly available to create a fully functional restoration opportunities database at this time, respondents were interested in the development of a tool to support the identification of restoration opportunities based on ancillary data. To explore the feasibility of this, we considered the most simplified ways that end-users were expected to interact with it (see Use Cases in section 5). This provided clarity around the typical expectations that respondents had for the database. Ultimately, these expectations were summarized by the following items and should form the basis for the minimum viable product:

- Presented using a user-friendly, geospatial mapping tool/ interface;
- Consolidated and consistent data across a national, provincial, and regional scale; and
- Prioritization criteria/ decision-making framework.

The first expectation is that the data is presented using a user friendly, geospatial mapping tool or interface. This speaks to the geospatial nature of the majority of the data that was identified by respondents and the way in which they are looking to interact with the database. We did not identify any major concerns or potential limitations regarding this item and believe that it is feasible. There is a variety of existing geospatial mapping tools that have been created to support environmental screening processes that could support the development of this type of database. The ESRI geospatial platform is a particularly robust option for the development of this tool. In addition, there are a number of organizations that have expertise in the creation of these types of platforms, including several respondents to the study who indicated their potential interest in supporting the development of this project.

The second expectation is that data is consolidated and consistent across a variety of sources across a national, provincial, and regional scale. This item has been identified as a key component of the final success of the proposed project. Data sources typically fall into two main types: available, ready to use data and data that is reliant on the participation of organizations. Open-government data sources (federal and provincial) were identified as the primary, available source. This would include federal and provincial layers that provide hydrology, watershed, water quality, and species at risk information. We believe that the proposed database is feasible and that a minimum viable product can be created using exclusively this available, ready to use data. The potential minimum viable product is discussed and expanded upon throughout this recommendations section. Although a minimum viable product is expected to be feasible, the overall usefulness of the database is expected to increase by supplementing with more localized partner data (*e.g.,* NGOs, Indigenous, etc.). This item is discussed further in Section 6.2.

The final expectation is that a prioritization criteria or decision-making framework should be incorporated into the database. The intent of this component would be to support meaningful comparisons between opportunities with the goal of ordering and ranking them. Although this item was frequently discussed, it may not be feasible to include in the preliminary stages of project development. Respondents noted that the key to the successful implementation of this item would be to have buy-in across sectors, with a particular focus on government regulatory agencies. Respondents were clear that being able to rank and "pre-qualify" potential opportunities in terms that regulatory agencies and potential stakeholders including Indigenous groups agree with and accept would provide substantial value to their work. Although this item is not necessarily feasible at this stage of the process, it may be worth exploring for future development. This item is discussed further in Section 6.3.

Based on this, we believe that the development of an aquatic habitat restoration opportunity identification tool/ database is feasible at this time.

5.2 Data Requirements and Availability

As discussed above, we believe that insufficient restoration opportunity data is publicly available to create a fully functional restoration opportunities database at this time. However, respondents were interested in the development of a tool to support the identification of restoration opportunities based primarily on ancillary data. We believe that an aquatic habitat restoration opportunity identification tool/ database is feasible across a national, provincial, and regional scale. Upon review of the resources provided by respondents, a preliminary list of existing and available data sources and types of data were identified at each scale. As available data sources vary widely by region, it would be beyond the scope of this study to assemble a comprehensive list across each province and region. These resources are expected to form the basis for the development of a useful and feasible minimum-viable product.

National

A variety of data sets with national coverage were identified that should be included to meet the requirements of the Use Cases. The national scale should be included as the main component of the preliminary database development/ minimum viable product and we recommend that this list be expanded upon as part of the Pilot Project.

Key datasets that were identified include:

- Aboriginal Lands of Canada Legislative Boundaries (Government of Canada)
- Administrative Boundaries in Canada (Government of Canada – CanVec Series)
- Aquatic Species at Risk Critical Habitat (Fisheries and Oceans Canada)
- Elevation in Canada (Government of Canada – CanVec Series)
- Floods in Canada (Government of Canada)
- Lakes, Rivers and Glaciers in Canada (Government of Canada – CanVec Series)
- National Hydrographic Network (Government of Canada)
- Watershed Boundaries (Government of Canada – National Hydrographic Network Series)
- HydroSHEDS (World Wildlife Fund)

Provincial

Each province varies substantially with respect to the data that is available. Collaboration with local partners/ stakeholders would provide an excellent opportunity to identify relevant data that is available and applicable provincially. The provincial scale should be included as a component of the preliminary database development/ minimum viable product and we recommend that this list be expanded upon as part of the Pilot Project.

The types of data that should be included to meet the requirements of the Use Cases are presented below, using Alberta as an example:

- Atlas of Class A Watercourse Sites (Alberta Environment and Parks)
- Fish Stocking Data (Alberta Environment and Parks – My Wild Alberta)
- FWMIS Hydrology and Fish Species Data (Alberta Environment and Parks – Fisheries and Wildlife Management Information System)
- Natural Regions and Subregions (Alberta Environment and Parks)

Regional

Similar to the challenges of compiling data at the provincial level, each region varies substantially with respect to the data that is available. We suggest that this scale not be included as a component of the preliminary database development/ minimum viable product development. It should, however, be evaluated during the Pilot Project to identify gaps that data at this scale could address. Once again, collaboration with local partners/ stakeholders would provide an excellent

opportunity to identify relevant data that is available. The overall usefulness of the database is expected to increase by supplementing with more localized partner data (*e.g.,* NGOs, Indigenous, etc.).

Examples of the types of data that could be included are presented below:

- "Screening Maps" for streamlining permit process for TRCA regulations (Toronto and Region Conservation Authority)
- Flood Plain Mapping (Toronto and Region Conservation Authority (TRCA))
- Species data (*e.g.,* fish species presence/ absence data – AEP FWMIS; salmon smolt tracking -Atlantic Salmon Federation; Atlantic Salmon population, habitat, and Stakeholder information - Salmon Hub - Atlantic Salmon Conservation Foundation; etc.)
- Water quality metrics (Riverwatch/ Creekwatch Alberta)

5.3 Prioritization Criteria

The development and incorporation of Prioritization Criteria into the database was a frequently discussed topic by respondents. The intent of this component would be to support meaningful comparisons between opportunities by providing a framework for end-users to order and rank opportunities based on their organizational prioritizes. Although this item was frequently discussed, it may not be feasible to include in the preliminary stages of project development.

The Prioritization Framework is expected to incorporate some of the following criteria:

- Habitat connectivity
- Degree of change to a habitat (baseline historic vs current condition) (*e.g.,* water quality, erosion/ sedimentation, etc.)
- Potential for remediation improvement
- Species at risk
- Value of habitat (*e.g.,* ability to foster biodiversity, more ecosystem function)

Although this item is not necessarily feasible at this stage of the process, it should be considered for future development. The ability to incorporate a meaningful Prioritization Criteria as part of this database will rely on the participation and buy-in of government regulatory agencies and potential stakeholders including Indigenous groups. Respondents were very clear that being able to rank and "pre-qualify" potential opportunities in terms that regulatory agencies and potential stakeholders including Indigenous groups agree with and accept would provide substantial value to their work. We expect that the addition of prioritization criteria would be a valuable addition that would increase stakeholder use across sectors, particularly in the case of organizations that already have identified opportunities.

5.4 Pilot Project

Although the database is ultimately expected to function at a national scale, the majority of potential users conduct their work on much smaller scales, including watersheds or specific watercourses. Before formally scaling the database up to a national level, we recommend the establishment of a series of small, regional Pilot Projects to evaluate and address the feasibility and potential data gaps of the database at this working level. We expect that this will serve to evaluate the proof of concept, measured against standardized Key Performance Indicators (qualitative and quantitative milestones), and will involve a structured Lessons Learned look-back process.

The intent of establishing a series of Pilot Projects at a regional scale is to understand the ability of the database to provide foundational data that is sufficiently detailed, accurate, consistent, and reputable data that address shared interest for trustworthy and reliable information as the basis of planning and decision making. Establishing such a tool would bridge the gaps between organizations, across sectors, create synergies, and incentivize collaborative efforts. Multiple Pilots Projects in various geographic locations will allow for a series of comparisons to highlight common themes and trends, identify unique challenges, and establish a level of consistency across regions. These Pilot Projects should also be used to further expand upon the available data that should be included in the final database.

Based on the information collected throughout this study the top regions to establish these Pilot Projects would be British Columbia, Alberta, Ontario, and Atlantic Canada. The ideal locations for these Pilot Projects should meet the following criteria:

- A variety of interested and engaged stakeholders for collaboration;
- Available data sources (at a provincial and regional scale);
- A region with a relatively high number of aquatic habitat restoration opportunities; and
- A region with a relatively high number of groups interested in conducting aquatic habitat restoration.

It is recommended that a guiding framework for the development of Pilot Projects is created to support the goals of comparability and scalability. It will be important to identify that the organizational goals of participants are in alignment. The success of the Pilot Projects will be largely based on meaningful engagement and collaboration. Ensuring that all stakeholders are included in conversations regarding the classification and prioritization of opportunities will be critical to capturing the diverse regulatory, ecological, and cultural perspectives. Developing a centralized database has the potential to unify and reinforce these collaborative efforts and relationships across sectors.

The Use Cases discussed in Section 5 describe how the proposed database can function as a mechanism for collaboration and demonstrates how it would provide valuable outputs for various organizations and stakeholders in the process of identifying and planning restoration opportunities. Further, it has the potential to capture opportunities that would have otherwise been lost or not shared.

In summary, it will be important to define the required inputs to achieve the desired type, scale, and quality of outputs. The smaller scale of the Pilot Projects will allow AHC to focus on ensuring meaningful stakeholder relationships are formed. By starting with multiple smaller pilot projects, AHC can identify if this is truly feasible, and can decide if it is worth pursuing an expansion to the national level.

6 Conclusion

The intent of this study was to provide opportunity and access to a diversity of perspectives on the proposed aquatic habitat restoration database as it relates to:

- Interest;
- Value;
- Feasibility;
- Potential use; and
- Availability/ accessibility of reliable data.

The online survey and interview questions were designed to investigate the interest and potential value that the proposed aquatic habitat restoration opportunities database would provide to organizations across a variety of sectors. Ultimately, interest in this proposed project was overwhelmingly positive and respondents noted that it would have the potential to provide considerable value to their work. This was consistent across all sectors and respondents frequently discussed the potential for improved collaboration, the implementation of a prioritization framework (developed in collaboration with all stakeholders – emphasis on government regulatory agency buy-in), and a focus on ensuring usability at a national and regional scale as key components. Of note, the effectiveness and usability of the project across these scales was a primary concern and potential limitation identified by respondents to the study.

As noted above, ensuring that the database is designed to be effective across a national and regional scale was identified as a key component and potential concern associated with the proposed project. Put in other terms, this national database must function and provide focus on the regional scale in enough detail that users can obtain adequate information to inform their work. This was made clear by the majority of respondents who understand the need for national coverage, but whose work is largely or exclusively conducted at the regional, watershed, or watercourse scale. We believe that this is feasible and that available data at a national and provincial level is available to support the development of a minimum viable product.

To better understand the expectations of potential users at a regional scale, the study evaluated what spatial data is currently available, inaccessible, or desired. Deficiencies and data gaps in the available data was a major challenge identified across sectors and included inconsistencies between data sets, non-digitized data, unconsolidated data, unreliable or non-referenced data, and unknown or otherwise inaccessible data. There is a reliance amongst all sectors on open-source data, that is primarily made available through open government initiatives or public-facing organizations. The deficiencies and data gaps identified provide a tangible opportunity for the proposed project to solve some of these frequently identified issues. We believe that although challenges exist, they can be overcome and that the development of a minimum viable product is possible given the available data at a national and provincial level. Next steps for the project,

following the development of the minimum viable product could include the consolidation and centralization of this available open-source data, incorporation of inaccessible data sources through partnerships with stakeholders, and the creation of new data. These items should be explored further through the recommended Pilot Project.

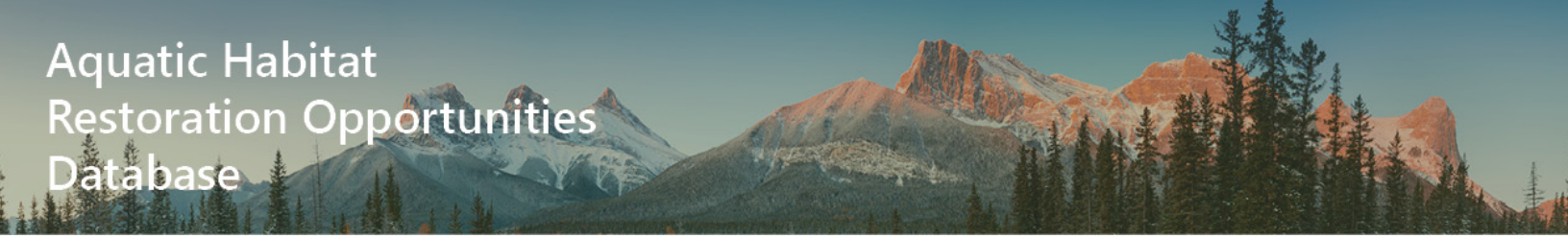
Although overall support for the proposed project was very high, several concerns and potential issues were identified by the study. The recommendation to undertake a series of small, regional Pilot Projects was informed by the need to evaluate and address these concerns at a regional/ local level before scaling the project up to a truly national scale (please refer to Section 6 for a discussion of the recommendations). Hesitancy among participants was largely driven by a lack of understanding of how something of this scale could be developed and deployed. We believe that given the available data, a minimum viable product can be developed. The Pilot Projects will be an important step towards further clarifying what level of detail is required at the regional level, but national and provincial data is available to support these first steps. A focus on the scope and scale of work being undertaken by proponents should not be overlooked and the incorporation of regional, sector-based needs will be key to the ultimate support and uptake by end-users. Despite the hesitancies identified, all respondents acknowledged and described potential examples of how the proposed database could support the identification and selection of restoration opportunities in their work.

In conclusion, the need for an aquatic habitat restoration opportunities database has been confirmed and validated based on the results of this study. Although the results of the survey and interviews found that insufficient restoration opportunity data is publicly available to create a fully functional restoration opportunities database at this time, respondents were interested in the development of a tool to support the identification of restoration opportunities based on ancillary data. We believe that sufficient ancillary data is available that it would be feasible to create a minimum viable product version of this tool/ database. The development of this database and the recommended Pilot Projects should focus on the key drivers, challenges, gaps in data, and desired outputs that were identified, to maximize support, uptake, and usability across sectors. The key elements that were requested by potential users include opportunities for collaboration, a prioritization criteria framework for restoration opportunities, and an effective scale to address the user requirements of a national database that must function on a regional scale. A series of small, regional Pilot Projects that are designed to engage with potential users and stakeholders, facilitate the development of the preliminary database, and define interactions across sectors is recommended. The lessons learned from these Pilot Projects are anticipated to provide invaluable insight that will inform and direct the growth of the project moving forward.

Appendix A

Consolidated List of

Identified Datasets



Consolidated List of Identified Datasets

- 1974 Rivers of Newfoundland document (Partially digitized)
- 3rd Party Reports (Proprietary)
- AbaData
- Academia/ Journal Articles
- AEP Fishes Database
- Aerial Photography (Historic and Current)
- Aquatic Resources
- Atlantic Salmon Conservation Foundation Past Project Data
- Atlantic Stream Data
- Community Mapping Network
- Compensation Partnerships
- Consultant Reports
- Cows and Fish Health Riparian Health Inventory
- CWF Canadian Aquatic Barrier Database
- Data from Aquatic Connectivity Project (DFO NL/LAB)
- Designated Trail Network Data (off road vehicle trails)
- DFO Offset Project Reports
- Environment Canada Water Chemistry Data
- GIS & Mapping Tools (ArcGIS, QGIS, etc.)
- GIS Data (elevation, landcover, etc.)
- Google Earth
- Government Best Management and Guidance Documents
- Groundwater/ Discharge Data
- Historical DFO Habitat Data (digitized)
- Hydro Quebec Data
- Land Management Objective Documents
- LiDAR
- Local Conservation Authority Data (well records, soils, planning)
- National Fish Habitat
- National Hydro Network Data
- NCC Aquatic Blueprint (incomplete ran out of time + resources)
- Netforce
- Open Government Data
- Personal Communication
- Provincial Datasets and Priorities
- Provincial Water Quality Data
- Provincial Wetland Inventories
- Quebec Open Data Portal
- Rules for Project Prioritization
- Salmon Explorer.ca
- Scheduled Salmon River Data
- Sensitive Ecosystem Database
- Sensitive Ecosystem Inventory Data
- Soil Inventory/ Sample Data
- Stewardship Project Registry
- Stream Crossing Assessments
- Sustainability Maps
- Temperature Data (Internal Organization Data)
- Tool for Coastal Restoration
- Traditional Land Use Data
- Watershed Atlas
- Watershed Database (water data)
- Watershed Specific Mapping Software (includes historic data)