

Institutional impact on environmental research partnerships between Indigenous communities
and mainstream scientists

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Individuals who are situated within both mainstream scientific institutions and Indigenous communities are key to the success of environmental research partnerships that span those boundaries. However, the currencies of mainstream scientific career progression may present challenges for scientists seeking to boundary span. In interviews with twenty-four environmental scholars across North America, we examine how scientists navigate their employer institutions while they also seek to promote Indigenous community priorities. We found that many boundary spanners develop expertise in navigating administrative policy with which they aim to shift power and resources towards Indigenous communities. Major barriers to boundary spanners include career progression incentives, project administration, and capacity. Indigenous scholars, who we identify as key boundary spanners, face these barriers in addition to others. Finally, we offer recommendations for institutions to better support boundary spanning researchers.

Positionality statement and land acknowledgement

I am a white settler whose family came to what is now known as the east coast of the United States mostly within the twentieth century, although one thread of my ancestral line traces back two hundred years in the United States' Southeast. On my father's side my ancestors mostly originated in the British Isles. My mother's side, which is also my major connection to ancestral culture, are Ashkenazi jews from Eastern Europe. I performed this work while living in the ancestral homelands of the Lenni Lenape, Lenapehoking or Philadelphia. Many Lenape have been forcibly displaced to Oklahoma, Wisconsin, an Ontario but some have remained in Lenapehoking and continue to steward their ancestral lands. I completed this work as a student at the University of Washington Seattle, which is located on complicated and overlapping Indigenous homelands. As I do not feel qualified to assess a proper acknowledgement of those Indigenous groups, I will borrow the land acknowledgement drafted by the Tribal Relations Office at the University of Washington: The University of Washington acknowledges the Coast Salish peoples of this land, the land which touches the shared waters of all tribes and bands within the Suquamish, Tulalip and Muckleshoot nations. This project was developed in consultation with both Indigenous and non-Indigenous boundary spanners whose contributions to the work are invaluable.

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Methods

Data Collection

Research participant selection and criteria

I used a stratified chain referral approach (Bernard 2017) to identify individuals who self-identified as an environmental scholar, a boundary spanner as per Hatch et al (2023) and are employed by a mainstream scientific institution or Tribal college. I identified 25 participants who met these criteria, and they were asked to participate in a semi-structured interview and brief survey (described below). 92% of participants (n=23) completed both the survey and interview. One participant completed the survey, but did not complete an interview, and one participant completed an interview, but did not complete a survey. This resulted in a total of 24 surveys and 24 interviews being included in the analysis. IRB exemption was obtained for this project from the University of Washington (STUDY00017065) and all participants reviewed and signed a consent form before participation (appendix 1)

Survey data collection

Prior to being interviewed, each participant completed a short survey (appendix 2) that included basic demographic information and two sets of questions (Table 1). The first question set asked participants to use a Likert scale to score their agreement (from 1 to 6) with nine characteristics of boundary spanners as defined by Hatch et al (2023) (Table 1). The second question set asked participants to score their agreement (from 1 to 6) with institutional support

for boundary-spanning relationships and boundary-spanning projects. One respondent left three of the Likert scores blank, another left two Likert scores blank, and three declined to provide their age.

Table 1. Likert scale questions from the pre-interview survey. In the first set, respondents self-ranked themselves on a scale from 1 (“This characteristic never applies to me”) to 6 (“This characteristic always applies to me”). In the second set, respondents ranked their institutions’ support for themselves or their projects achieving a successful partnership from 1 (“The institution I work for does not support me in achieving this attribute”) to 6 (“The institution I work for provides generous support for me to achieve this attribute”). Adapted from Hatch et al. (2023)

Shorthand	In-depth Question
<i>Set 1. For each of the nine boundary-spanning characteristics and abilities listed below, please rank how much this characteristic or ability applies to you in your role as a collaborator with Indigenous community(ies). Adapted from Hatch et al 2023 “Boundary spanners, a critical role for enduring collaborations between Indigenous communities and mainstream scientists” Ecology and Society 28(1):41</i>	
Braided Identity	Situated in the Indigenous community and in the mainstream science community.
Approachable	Respects and invites conversation and interaction from all parties.
Available	On call both formally (nine-to-five) and informally (24-7). Emotionally intelligent. Empathetic, sympathetic, self-aware, and community-aware.
Knowledgeable	A dual knowledge holder: deep knowledge of the customs, practices, systems of power, and communication pathways of their (partner) Indigenous community; a trusted source of disciplinary knowledge to their community.
Resourceful networker	A connector and networker; knows where to go to find answers on both sides of the boundary.
Hears	Hears the unspoken message; understands beyond the words to the intent; knows how words will be interpreted.
Committed	Long-term dedication to their (partner) Indigenous community; building trust on both sides of the boundary.
Balance power	Seeks to alter power dynamics across the boundary to ensure equity and respect for the Indigenous community.
Community knowledge	Helps frame communication and interactions across the boundary to respect, balance, and hold space for all knowledge systems to be recognized and valued, particularly Indigenous community knowledge.
<i>Set 2. For each attribute of a successful partnership listed below, please rank how much your home institution (that is, the institution at which you are employed, rather than the individual external grants or contracts that you have obtained, if applicable) supports you in achieving a successful partnership in your role as a collaborator with Indigenous community(ies). Adapted from Hatch et al 2023 “Boundary spanners, a critical role for enduring collaborations between Indigenous communities and mainstream scientists” Ecology and Society 28(1):41</i>	
Elevates	Researcher elevates and celebrates other voices, particularly non-dominant group members; keen to listen and learn. Researcher is flexible, open-minded, willing to modify research plan to meet objectives of the community; willingness to change direction mid-project with community input.
Knowledgeable	Researcher is knowledgeable about tribal sovereignty and data and knowledge ownership. Researcher goes through formal process of securing permissions, signed partnership agreements, formal agreements, and related norms and adhering to cultural protocols. Recognizes when data or knowledge is/is not appropriate to make public.
Collaborative	Researcher is collaborative in all aspects of the project. Researcher writes grants collaboratively with Indigenous community members and/or content experts. Researcher is willing to cede expertise.
Navigates	Researcher is willing to navigate the university, government agency and/or grantor systems with community interests centered.
Gives power	Researcher gives power and/or authority to tribal members. Researcher recognizes the experience and teachings of local knowledge holders as akin to university training.
Useful	Researcher brings desired skills and knowledge to the community. Questions are driven by a community group, centered on community interest or need.

Compensation	In the research project community members, and boundary spanner, are compensated for time, expertise, and project implementation.
Long term	The research project is part of a long-term relationship maintained over a series of projects and fueled by personal relationships and mutual respect. The research project is supported by constant shifts in power and authority between team members and across the boundary.
Place based	The research project is place-based and geographically centered within traditional community boundaries
Brings together	The research project brings together tribal members, whether they are local or not
Time	Project logistics include pre-project time devoted to develop/deepen relationships, cocreate the project, and apply for needed permits and formal agreements. Project includes time for community interaction and listening sessions.
Flexibility	Project logistics include project flexibility built in to allow for unexpected opportunities and connections.
Youth and capacity	Project logistics includes elements centered on tribal youth and community capacity building.
Brings together	Project logistics bring elder, students, teachers, and mainstream scientists/ academic together (e.g., science and culture camp).
Relationships	Project logistics foster long term relationships between teachers and scientists.

Interview data collection

I conducted semi-structured interviews (Barriball and While 1994) virtually via the Zoom platform (Zoom Video Communications, Inc). I first reviewed the consent form, and once verbal consent was obtained, I asked participants questions using an interview guide (appendix 3), following a standard semi-structured interviewing approach (Galletta 2013). Interviews averaged 58 minutes, ranging from 45 minutes to 90 minutes. I recorded and transcribed interviews; transcripts were provided to interviewees for review before coding and analysis. A total of 24.2 hours of transcript data was analyzed.

Survey analysis

To explore the degree to which there was structure in the way participants perceived their own boundary-spanning characteristics or the support of their institutions, I used Likert-scale responses as the basis for a hierarchical cluster analysis. Hierarchical cluster analysis is used to identify groups of similar data by merging data points into clusters using distance measures, and then merging clusters into larger clusters using linkages. This process continues until all data has been aggregated into one cluster and results in a dendrogram showing distinct clusters of data points at each level of aggregation. Mice and lattice packages (Sarkar 2008, Buuren and Groothuis-Oudshoorn 2011) were used in RStudio Version 2023.06.1.524 (Posit Studio 2023) to impute missing values using predictive mean matching. Clusters and heatmaps were plotted using the pheatmap package (Kolde 2019) using a color palette from the viridis package (Garnier et al. 2024). Euclidian distances were used to determine similarity between data points and complete linkages were used to determine distance between clusters. The best number of clusters

was determined using the NbClust package using the complete linkage method (Charrad et al. 2014).

Qualitative analysis

Transcripts were coded in MAXQDA 2022 Analytics Pro (VERBI Software 2021) using both inductive and deductive approaches. This dual approach involved coding for an *a priori* list of codes adapted from the survey questions regarding boundary spanning while concurrently creating emergent codes which were grouped into concepts and themes as described by (Saldana 2021). Memos were recorded throughout the coding and analysis process to capture thoughts on emerging themes, highlight connections or differences between interviews, and to refine code, category, and theme definitions. First cycle coding was performed on the transcribed interviews using an eclectic coding approach as per Saldana (2021) which included descriptive codes, subcoding, *in vivo* coding, evaluative comments, and tags. Initial coding was conducted in two passes to ensure all relevant data were captured in the analysis and to refine code definitions.

Second cycle coding was performed using the smart coding tool and creative coding tool in MAXQDA (VERBI Software, 2021) and included three iterations (Table 2). In the first iteration, codes were sorted into subcodes, merged, or split as necessary to clarify meaning and new codes were created to highlight connections among codes that had emerged from the initial coding process. In the second iteration, codes were combined into categories, which were further recategorized into concepts, and in the third iteration categories were recategorized into major themes. The codebook is provided in the appendix 4. All survey data and excerpts from interview transcripts have been anonymized in order to respect the privacy of interviewees.

Table 2. Number of codes at each coding step. Steps include first cycle coding in which codes were created, and three iterations of second cycle coding in which codes were refined and grouped into categories, concepts, and themes.

Stage	Number of codes
First cycle coding	471
First iteration second cycle coding	106
Second iteration second cycle coding	14
Third iteration second cycle coding	3

Code segments were grouped as they related to “Impediments,” or discussion of barriers to boundary spanning work, “Recommendations,” or discussion of how institutions could better support boundary spanning work, and “Desired Outcomes” or discussion of support for boundary spanning work and the potential benefits of that support. The intersection of codes within a coded segment was calculated between the “Impediments” code group and the “Recommendations” code group and the “Recommendations” code group and the “Desired Outcomes” code group using the Code Relations Browser tool in MAXQDA (VERBI Software, 2021). These data were visualized in a Sankey diagram (Otto et al. 2022) connecting “Impediments” to “Recommendations” to “Desired Outcomes,” with links weighted by the frequency of co-occurrence of codes. The diagram was generated in RStudio Version 2023.06.1.524 (Posit Studio, 2023) using the tidyverse (Wickham et al. 2019), dplyr (Wickham et al. 2023), ggplot2 (Wickham 2016), and ggsankey (Sjoberg 2021) packages.

Results

Description of survey respondents

Demographics

The average age of participants was 47 years (range 35-62; n = 21). About 45.8% (n = 11) respondents identify as women, 45.8% identify as men, and the remaining ca. 8% (n=2) identify their gender in other categories. About 29% of respondents (n=7) identify as Indigenous, Native American, Michif, Native Hawaiian, or American Indian and the remaining 71% of participants do not identify as Indigenous. About 67% of respondents (n=16) identify as white and/or white settler as at least one of their ethnic or racial identities.

Institutional and Professional Characteristics

Nineteen respondents (79%) work for academic institutions and their job titles range from one late-stage trainee to emeritus positions, with the majority in mid- to late-career positions such as associate or full professor or director. Three (13%) work for the U.S. government. Two respondents (8%) work at Tribal colleges on sovereign lands, six respondents (25%) work at Canadian institutions, and sixteen (67%) work at U.S. institutions. Out of interviewees working at institutions located within the boundaries of the United States, five (21%) work at minority serving institutions. Institutions are geographically diverse and include locations on the East Coast, West Coast, and Midwest of North America and the Mountain West and Southwest of the United States. Ten (42%) respondents work in a department related to environmental science; five (21%) work in interdisciplinary departments that include environmental and social sciences; four (16%) work in Indigenous studies departments; four (16%) work in social science departments; and one (4%) works in a humanities department.

All survey respondents consider themselves to be boundary spanners to some degree; ten (42%) consider themselves to somewhat fit the description and fourteen (58%) consider

themselves to fit the description. Respondents all have worked in partnership with Indigenous communities or governments in an environmental research project for some period of time (mean = 17 years, range from 4-47 years), although in some cases they were no longer working in partnership with a community. Respondents have established research partnerships with Indigenous communities around the world, but the vast majority are located in North America, particularly in the United States and Canada.

Research Question 1. Relationship to boundary spanning

Self-perception of boundary spanning characteristics and abilities

Hierarchical cluster analysis revealed two groups based on self-scoring of boundary spanning characteristics by respondents (Figure 1). One group consists of six (25%) respondents who scored themselves mid to high in most characteristics except those related to their integration into both the Indigenous community they partner with and the scientific community (i.e., Braided Identity and Knowledgeable). The second group consists of 18 respondents (75%) that generally scored themselves highly across all boundary spanning characteristics. Standing out in this group are respondents 20, 23, 13, and 21 who scored Braided Identity as never applying to them but scored themselves as mid to high in the characteristic Knowledgeable. While, as may be expected, the group where respondents scored themselves low in relation to metrics of identity and position in community, particularly “Braided Identity” and “Knowledgeable” consists of non-Indigenous respondents.

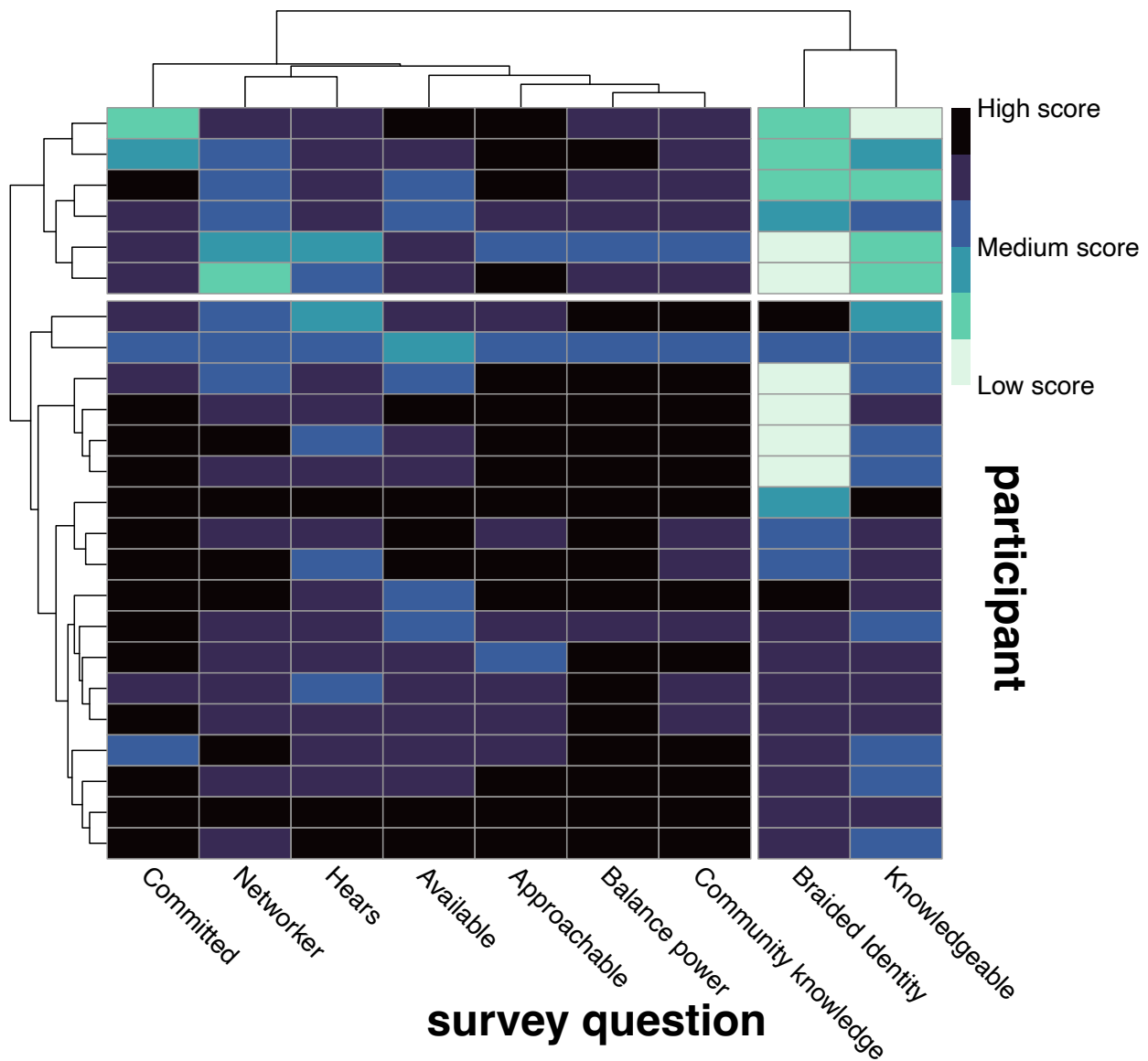


Figure 1. Results of hierarchical cluster analysis on participant responses regarding how boundary spanning characteristics and abilities apply to themselves in their role as a collaborator with their Indigenous community partners. In the central heatmap, darker colors represent higher scores, and light colors represent lower scores with survey respondents on the y axis and boundary spanning characteristics and abilities on the x-axis. See table 1 for a more detailed description of those characteristics and abilities. The two clustered groups are distinguished by a space between rows and columns. Dendrograms showing clusters at each level are on the top and left-hand side of the figure.

Relationship to boundary spanning in interviews

When discussing the importance of different boundary spanning characteristics and abilities described by Hatch (2023) interviewees most often highlighted the importance of centering research questions on community needs (mentioned in 67% of interviews), projects that include youth and capacity building (54%), long-term commitment (54%), and creating space for community knowledge (50%). Other frequently discussed concepts include being knowledgeable about Indigenous sovereignty (37%), seeking to balance power in the research relationship (33%), and the importance of the researcher's knowledge and skills being useful to the community (33%). Braided identity was also often discussed (45%), but in part because several interviewees asked for clarification on the meaning of the term or discussed how they felt they ranked low on that metric.

Some interviewees posited additional characteristics and abilities that might be added to the list—in particular humility (discussed in 50% of interviews) and the role of mentorship in relationship building (discussed in 41% of interviews). However, the characteristic of availability was more controversial, as some researchers pointed to that characteristic as embodying their approach to partnership and two objected to the concept of 24/7 availability. Those interviewees found that characteristic to typify a toxic approach in which researchers claim they must overextend their capacity in order to do community-engaged work. One interviewee stated:

This idea that you need ... to be able to sacrifice yourself and your mental health and your time and your family, in order to do Indigenous partnerships, is extremely unhealthy, it's part of the righteousness problem of non-Indigenous people when they do Indigenous partnerships. That's the value accruing to the non-Indigenous partner through the assumed morality of these partnerships (Interview 17)

Outside of the *a priori* topic of boundary spanning characteristics and abilities, recurring concepts include motivations, identity, and balancing the need for collaboration with the researcher's and community's capacity and skillset. The most discussed motivation to do boundary spanning work were personal values (mentioned in 63% of interviews). Values cited include a belief in social justice; responsibility to community, ancestors, and land; participation in reconciliation; equity; and reciprocity. Many interviewees see boundary spanning as part of their identities; they see themselves as people who have always valued such relationships or who have always worked to communicate across boundaries.

A related motivator for interviewees is the type of impact that results from their work, in particular direct benefit for the communities with which they work. In addition, interviewees cite the importance of accessing the best available knowledge, including Indigenous knowledges, to address pressing issues such as climate change, and that research be just, applied, and solution oriented. One interviewee discusses their concept of career success in the context of boundary spanning work:

I might have a different definition of success than other people, and I'm feeling pretty happy with where I'm at because a lot of the work that I get to do does have some of these outreach components. When I think about [career progression I think] where can I make the most impact. (Interview 21)

Another interviewee points out that the metrics they value in their career progression are relationship based and contrast this to common scholarly impact factors: I'm so proud that I have the relationship I do with [Indigenous Knowledge Holder] ... he continues to want to exchange ideas and spend time with me. To me, that's worth several h-index points. I hold that up as a career achievement. And yet, who cares? I care about that. (Interview 3)

Another discusses choosing to work at a Tribal college, and in a non-tenure track position, in part to avoid constraints related to tenure track career progression in mainstream scientific institutions:

I have chosen to not chase a tenure track position to not feel like I have to write a bunch of proposals and get grants. I want to have a certain quality of life where I choose who I work with and the work that I do, and my perception is you don't always have that freedom at a non-Tribal institution, or if you're seeking tenure. (Interview 7)

Further discussion of impact includes directly benefiting communities through the transfer of resources from large colonial institutions (e.g., universities) to Indigenous communities to use as they need—including for political activism such as defending land rights or to assist in a crisis, as is the case with a professional society that funds a rapid assistance program. Some interviewees did this by completely relinquishing control data to the community, preferring not to even know what is done with the data to avoid influencing community decisions about how to use them. This approach requires an abundance of resources, especially when combined with the time required to build meaningful research relationships, as one interviewee states: “it takes resources, a lot of money and time to be a boundary spanner. You can't do it on the cheap, either with your time or money. I don't see how it's possible without investing a lot of time and a lot of money to do it.” (Interview 12)

Another topic emergent in interviews is variation in the geographical distribution of support for boundary spanning work, often related to proximity to large Indigenous communities, those communities' influence on institutional culture, and institutional access to resources. Several researchers commented that boundary spanning work may be better facilitated in Canada due to cultural norms formed by Indigenous activism and experience with co-management. One interviewee said, “Just what would be really radical in the United States, I feel like is more

mainstream in Canada.” (Interview 11) Similarly, interviewees commented that some areas of the western U.S. have cultural advantages over some areas of the East Coast, although this varied by proximity to Indigenous communities. Furthermore, researchers noted differences between funding structures in Canada and the U.S., in particular citing positively the flexibility and stability of base grant funding available from the Social Science and Humanities Research Council (SSHRC).

Research Question 2. Relationship to institution

Perceptions of institutional support for boundary spanning researchers

Hierarchical cluster analysis of institutional support for boundary spanning researchers revealed three clusters of participants (Figure 2). The first group consists of five respondents (21%) who generally perceive the institutional support they receive as mid to low. The second group consists of thirteen respondents (54%) who generally rank the institutional support they receive as high. Group three consists of six respondents (25%) who generally feel the institutional support they receive in the midrange.

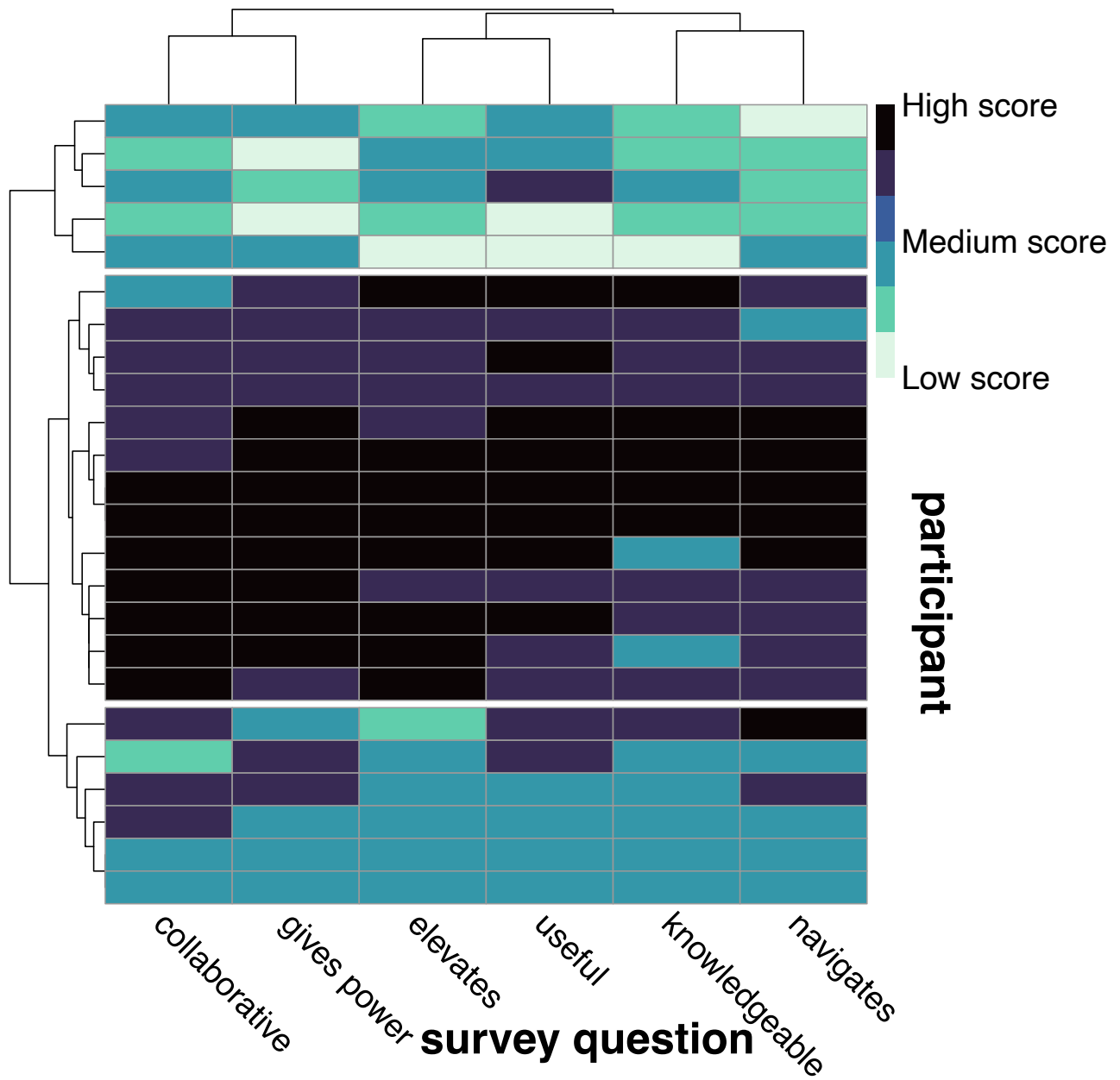


Figure 2. Results of hierarchical cluster analysis on participant responses regarding how their employer institution supports them to achieve a successful partnership in their role as a collaborator with Indigenous community(ies). In the central heatmap, darker colors represent higher rankings and light colors represent lower rankings with survey respondents on the y axis and attributes of successful boundary spanning researchers are on the x-axis. See table 1 for a more detailed description of those attributes. The two clustered groups are distinguished by a space between rows and columns. Dendrograms showing clusters at each level are on the top and left-hand side of the figure.

Perceptions of institutional support for boundary spanning projects

Survey respondents were best split into three groups when ranking support from their institutions for boundary spanning projects (Figure 3). One group consists of ten respondents (42%) who generally perceived institutional support for projects as high. A second group consists of three respondents (12%) who ranked institutional support for projects as low. A third group consists of eleven respondents (46%) who felt institutional support for boundary spanning projects as mid-range.

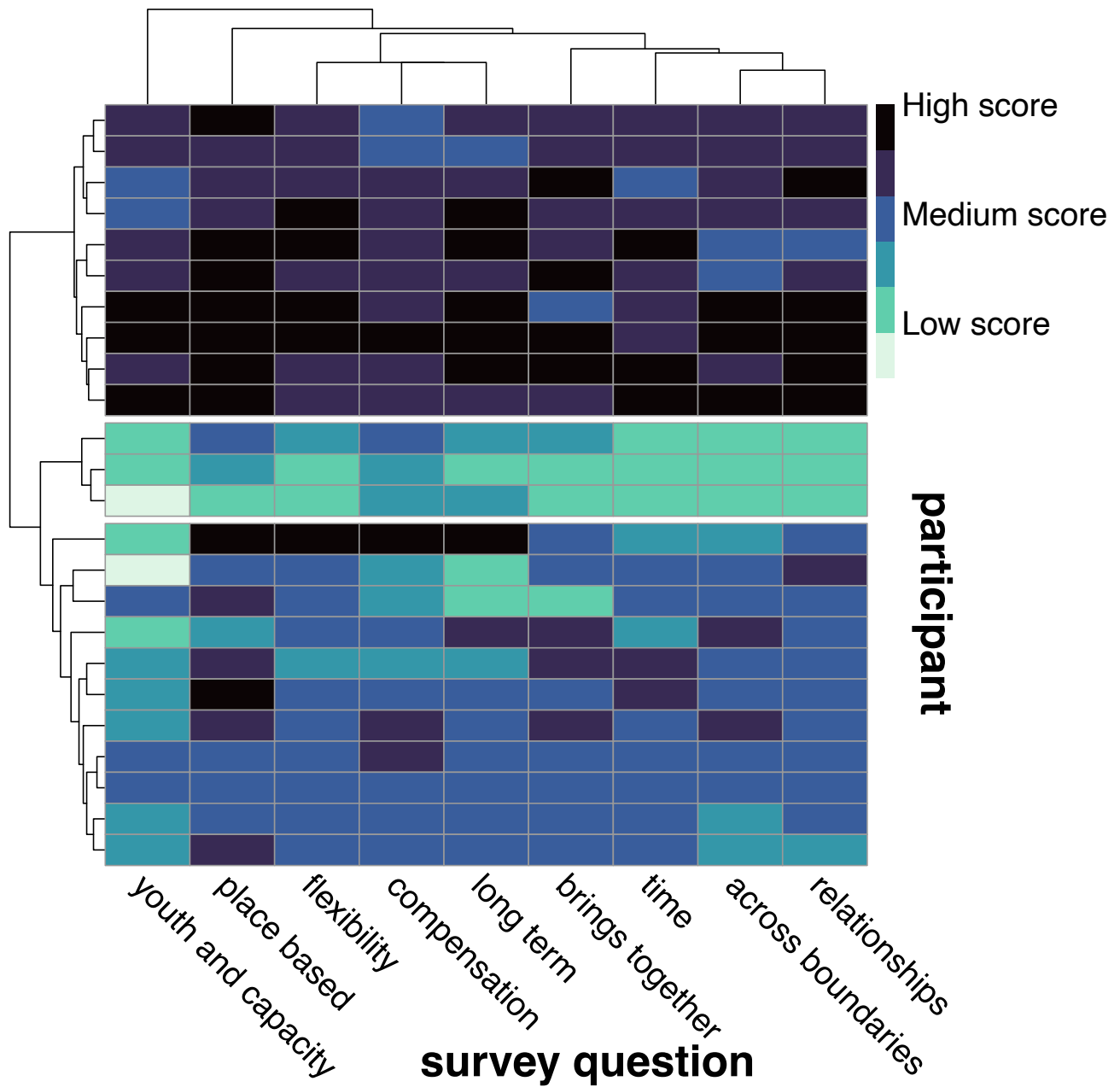


Figure 3. Results of hierarchical cluster analysis on participant responses regarding how their employer institution supports their research project to benefit their Indigenous community partners. In the central heatmap, darker colors represent higher scores and light colors represent lower scores with survey respondents on the y axis and attributes of successful boundary spanning research projects are on the x-axis. See table 1 for a more detailed description of those attributes. The three clustered groups are distinguished by a space between rows and columns. Dendrograms showing clusters at each level are on the top and left-hand side of the figure.

Relationship to institution in interviews

Boundary spanning and relationships with institutions

When discussing institutional relationships to boundary spanning work, interviewees related the mission of the institution to metrics of support, including support from leadership and relationships to the populations the institution serves. For example, four interviewees employed at the same institution all pointed to that institution's tagline as evidence that boundary spanning work is valued by their institution. Furthermore, interviewees employed at Tribal colleges and other Minority Serving Institutions cited their institutions' mission to serve those communities as evidence of institutional support for their work. In general, in the absence of an explicit mission statement, support from leadership, or other clear institutional imperative to serve community and/or Indigenous interests, interviewees felt a disconnect between the priorities of their institutions and with those of communities. Some interviewees connected this lack of alignment to evidence of lack of institutional support. However, one interviewee pointed out that they were unsure how to evaluate project support in the survey since they had been able to obtain sufficient grants to facilitate boundary spanning, and their institution does not directly support research (e.g., funding for research). Regarding the level of institutional support that interviewee felt that the "institution could care less. They don't have an office that is helping me do that." (Interview 2)

Lack of alignment between institutional and community priorities can create issues for boundary spanning researchers who may not be incentivized by the structure of their institution to do community engaged research. One interviewee discusses incentives at a large research university versus a smaller, Minority Serving Institution that is more mission-driven to serve the community:

I think there's pockets of people who kinda get it. But in general, if you look at things like our promotion and tenure criteria [at the research institution] yes, there's lip service around working with communities. And yeah, community-engaged research. But it doesn't translate into the actual way that people are evaluated for promotion. Whereas at [the Minority-Serving Institution] it was recognized that if you're doing work with communities, then that's part of your scholarship, and the bar was much more reasonable for how many papers you have to publish every year. I got tenure there without ever getting an NSF grant. (Interview 5)

Another interviewee expands on how, as an academic at a mainstream scientific institution, they find incentive structures can limit the ability of researchers to serve community priorities and enact boundary spanning characteristics:

That category of first priority is almost necessarily decoupled from the kind of things that we are incentivized to do. And so, there's the community-oriented folks that are members, that are working for the Tribe or working for the First Nation, they're the true boundary spanners, that is it is almost their sole priority to have the research be directed and co-produced in that space. And then there's another category which is we do some of that. But we are not rewarded for doing that in that way, and so necessarily have to be one step outside of that. (Interview 4)

Other interviewees expressed that while their institution may not prioritize or explicitly support boundary spanning work, the institution also generally does not impede the work and lack of interference is enough to get things done. For example, when discussing their perception of university support for boundary spanning, an interviewee said, "rarely is my institution involved in my work to the extent that they would have an impact on most of these activities." (Interview 11)

Many interviews (79%) included a discussion of institutional values. This was often expressed in the contexts of 1) research priorities (46% of interviews), 2) who is considered expert (38%), and what is considered knowledge (21%). Some participants perceive their community work as less valued in their institution than work that focuses on novelty, innovation, global impact, or invention. Consequently, incentives in those institutions work against those

boundary spanners and encourage scholars to “jump around to different communities to try and skim off the cream of what the most novel, exciting, cool thing about a culture is, do that research and then move on” (Interview 8).

Other participants noted that they feel their work is valued in their institution and point to organizational culture, distribution of resources, and support from leadership to illustrate that support. Furthermore, some interviewees suggested that an institution placing value on the necessity and importance of boundary spanning research reflects institutional understanding of what is considered knowledge. In particular, they discussed the role of Indigenous science and Indigenous knowledge systems in their departmental and institutional culture, and how qualification and evaluation standards reflect what knowledges the institution values and who is considered expert. For instance, participants pointed to the expertise of their community partners who might not have the academic degrees necessary for them to qualify for employment within the university. One interviewee describes a shift in power relation in their own work where Indigenous knowledge holders hold equal rank as faculty on graduate committees:

We have a lot of Indigenous knowledge holders that now serve officially as committee members, which means they sign the documents and without their signature a student will not be granted a PhD or Masters. And that's awesome, because that brings Indigenous governance of knowledge into the university, so that it's not just the university adjudicating the work, through our protocols and the disciplinary protocols, but also the Nation's protocols. (Interview 3)

Change in institutional attitudes towards research with Indigenous communities

Most interviewees (88%) have witnessed increasing interest in their fields, institutions, funders, and peers in performing or supporting boundary spanning work and in partnering with Indigenous communities on environmental and climate research. Some interviewees stated that they have benefited from this rise in interest, both in material support and in the social capital of

their scholarship. However, several researchers (38%) expressed concern about the authenticity of this boom in interest and 29% of interviewees said they were concerned about potential or observed harms that result from inexperienced, ill-intentioned, or non-Indigenous researchers pursuing partnerships with Indigenous communities. One interviewee is concerned that harm to communities could result from inexperienced researchers rushing into research partnerships due to the recent rise in interest:

I think there's a danger ... of appropriation, of people who are well intentioned, moving into spaces that they're not yet equipped to be in and doing a lot of damage. In either, in not understanding the value of relationships or not understanding current dynamics. (Interview 21)

Another interviewee discusses harm they anticipate, and have seen enacted, to communities due to a scramble to engage in boundary spanning work without proper alignment to community priorities and time spent in preparation:

One of the changes I've seen in the last especially 5 years is this huge glut in non-Indigenous researchers doing Indigenous-centered research. And I would say easily, 85 to 90% of it is quite harmful...[and] takes resources and directs them away from Indigenous folks. A lot of it is for educating white folks so the benefits go to white people again. I'll go into community, and I'll watch students show up [with] no training. First of all, you might die. This is the Arctic, trying to go for a walk... Do you have a bear guard? No, you cannot go for a walk, what are you doing? But also they're coming to communities and getting super drunk and these sorts of stuff. And I'm like, you actually can't do that. You can't do that, differently, then you can't do it in other field work. (Interview 17)

When asked why they think these changes have come about, interviewees cite cultural change associated with larger social movements such as Land Back, Idle No More, and Black Lives Matter which have slowly translated into changes in policy and funding priorities. Furthermore, interviewees discuss the growing power of Tribal governments, increasing numbers of Indigenous scholars who are becoming more influential in their fields, and initiatives such as the Truth and Reconciliation Commission and the Biden Administration's guidance on

Indigenous Traditional Ecological Knowledge. Here, one interviewee identifies a growing societal acknowledgement that it is vital to include Indigenous peoples in global and local conversations around land and the environment, especially in the context of a changing climate:

I think what's happening in our world with issues like climate change and the need and role for Indigenous people, finally, for the first time, there's a recognition of that. So, I think for me to see advancement, where I'm getting these opportunities to be part of major research institutions, major research projects, major research centers around science and data, but also the importance of inclusion, of Indigenous people and our knowledge. (Interview 6)

However, while most interviewees (83%) discussed seeing dramatic change in their fields in recent years, some (42%) found that changes in institutional policy and processes are yet to catch up with the intentions for equity that are often expressed by institutions. One interviewee states that “notwithstanding the fact that institutions say they're committed to working with Indigenous peoples. We have not really developed the policies and programs to facilitate that in an equitable manner.” (Interview 15). However, interviewees expressed hope that current shifts in societal and institutional values can ultimately result in benefit to the communities they partner with if institutions “actions still ... catch up to the words” (Interview 5). Furthermore, it may be possible to subvert the structures of mainstream institutions to better meet the needs of Indigenous communities and the boundary spanning researchers that work with them, or as one interviewee states, to “make change through the infrastructures that make things flow certain ways.” (Interview 17)

The nuts and bolts of boundary spanning work within mainstream scientific institutions

If institutions are yet to establish the infrastructure necessary to facilitate boundary spanning work, how do boundary spanning researchers navigate within those institutions to advance the interests of Indigenous communities? Many interviewees (63%) discussed considerable expertise needed to negotiate institutional administrative structures and regulations as a boundary spanner,

because “there are structures that the university has that are often quite rigid. And so it is important to understand those structures, those limitations and constraints” (Interview 4)

Interviewees repeatedly stressed the importance of having good relationships with institutional administrators, and further discuss negotiating the details of administration themselves:

This is sort of the unspoken, unsung, heroic work of community-based research where you're just learning the worst administrative stuff and just how to get things done despite it. ... So, it's partly learning the rules of your institution and having good relationships with staff. I got to know people in my institution who could help me get the work done, and knew I wasn't trying to cut corners, but also understood that this is not... some more standard kind of research. (Interview 5)

One interviewee gained knowledge and influence over the distribution of resources from their institution by taking on the role as an administrator themselves for some years:

It did mean that ... I know the rules much better than your average faculty member. Some of that I knew before I was administrator, but almost all of it I know from being an administrator. The best academic training I've ever had was being an administrator. And so, I know. So, when they say, “Oh you can't do that,” I'm like, “yes, we can” ... Intervention doesn't usually help, like showing up to talk to the people who transfer money. It's not a persuasive argument. It has to be a jurisdictional legal infrastructure, which means being an expert in the university's infrastructures (Interview 17)

Furthermore, the interviewee expands on how administrative expertise can be used to forward community priorities within settler colonial structures:

I think a lot of us need much more nuanced theories of change and our places in them are not very central places. Or, your central place is as an administrator or finance administrator, which I think a lot of academics would really balk at, that the best place for you is in an office. If you're in an office and you're controlling the flow of money, you can actually do Land Back. There are ways to do Land Back, if you control the budget (Interview 17)

Another interviewee emphasizes the need for boundary spanners to conduct, and be acknowledged for doing, infrastructural work within mainstream institutions: “It's pointing out issues and systems that can be improved. And I think that that's just as important.” (Interview 21)

In addition to understanding administrative constraints and opportunities, many interviewees (46%) discussed “how there are many ... tips of the trades and workarounds to navigate that disjunct between community interests and institutional interests.” (Interview 8). Furthermore, these workarounds take time and capacity, and interviewees felt that in addition to navigating these structures themselves, one of their key roles in partnership is to reduce the burden that navigating colonial systems placed onto Indigenous communities. As one interviewee stated when discussing a project in which they had to assign travel expenses and paying participants to different funding sources in order to avoid making community members go through an extensive and invasive process to register as vendors with the funder:

We tried to be very strategic ... so it was the Federal Government, a state university, and a private university. And so we just kind of figured out how to attach different research tasks or project tasks to each thing so that we could get it all done with the least amount of impact to the community we were working with. And I ended up absorbing most of that impact as the PI. But that's part of what you have to do. (Interview 5)

To mediate the administrative burden placed on researchers, there may be a need “to do creative things... policies and barriers that are being gently tested” (Interview 3). Negotiating these workarounds might limit some researcher’s ability to do boundary spanning work: “I've learned how to do this in efficient ways that I can imagine other people getting caught up in and not knowing how to solve.” (Interview 12)

Discussion of tricks and workarounds to negotiate between community interests and funding administration is a common theme in interviews, particularly when it comes to paying community members for research participation or goods and services. In order to meet both

communities' and funders' priorities some interviewees “find what the angle that the funder will like, and then shove in all the stuff that the community wants to do” (Interview 8). For example, one interviewee’s community partner was hosting the interviewee’s field class in their community. Due to university protocols, the interviewee was only able to pay them as a teaching assistant, even though the community member’s role was equal or greater than the interviewee’s. So, the interviewee opted to use discretionary research funds to top up the community member’s compensation:

We're gonna consider it research [time], which it is, in my view, because I'm learning from her how to be a community engaged researcher every time I do this with [them] again. And I can get these invoices paid quickly and people are happy, and they feel respected, and they feel valued. And they'll want to do it again next year because we had a great time and they got paid a good amount of money, a professor-level money. (Interview 12)

Interviewees also figured out workarounds as a way to leverage their position within settler colonial institutions to move resources from those institutions into Indigenous communities. As one interviewee states:

Once you get the money doesn't matter where it goes right? So if I said, Oh, I'm gonna do [example of research project] and then, you know, [Indigenous research partner] says, ‘Hey, we've got 10 days to [do some research] it's like, ‘Yup. here we go, here's the money, [let's] point that money cannon.’ (Interview 18)

One interviewee acts as a conduit to move money from funding agencies to their research partners by leveraging their role at a university, and meeting funder’s needs, while maintaining Indigenous data sovereignty as a top priority:

Because I'm at a university, a lot of the groups or Nations that I hold money for can't hold money from [funding agency]. But my university can and so I sort of hold the purse. The money's all theirs. I never keep any of the money unless there's an agreement that I keep the money. The money flows through me... I do all the administration. I get the money to flow. I do the funding transfers... There has to be a proposal and so mostly what I do is... I sort of beard for it, to use queer terms. So, I talk about the relationships we develop in order to get the money moving as like a genre of relationship... So the infrastructure, through an

infrastructural theory of change, becomes the focus of the reporting. And just be really clear, I am very, very, very good at grantsmanship and reporting. And so, I can weave these beautiful narratives and problem statements. And we've solved the problems without ever giving away any of the details, any of the data (Interview 17)

Interviewees found the imperative to publish for career advancement can also create potential conflict with community priorities or sometimes “results in perverse outcomes where young scholars have an interest in working with Indigenous peoples as long as it results in a scholarly output, right? Because that has to be the outcome. Otherwise, it's of no ‘value’ to them in terms of their career development, but that motivation will undermine a true equitable relationship with the community.” (Interview 15). Another interviewee discusses lack of alignment in priorities:

Being an Indigenous scholar, working both at a non-Tribal institution, but also just in general and being in academia there's a responsibility to do the best by my community in this field. And so that doesn't always fit well with what currently exists in academia, which includes the way we do dissemination and the language we use in publications (Interview 7)

Some interviewees broaden the scope of what they publish about in order to continue to produce enough papers for professional evaluation metrics while also prioritizing Indigenous data sovereignty:

Some of it is trying to be smart about the publications. So publishing on process. That's maybe not mainstream science... We've published on just different ways of disseminating, and what works, kind of lessons learned, that type of thing. So, being just thoughtful about a broad number of publications. Oftentimes not always, but oftentimes they're just counting. And then it does get the information out which you know we've talked to people that are like, Oh, this is really helpful. (Interview 16)

Other interviewees leverage research that doesn't include community engagement in order to produce enough academic publications to meet career requirements. For example, one interviewee states:

It's always a balancing act for a lot of scholars where their promotion criteria, their tenure, depends on publications and grants and such. And community interests, I would say, don't

always align with publication, publishing Traditional Knowledge for example, and maybe even usually don't. The way I've kind of addressed it, and I'm not perfectly satisfied with, is that I have some projects that I think of as kind of paper mills which are not so community oriented and are more just in the basic [science], or things like that. Those pay the bills, so to speak, with publications. Then those subsidize my other [boundary spanning] projects. (Interview 8)

Another interviewee touches on a possible cost of this approach, the need to split time and research capacity between multiple research priorities:

I have done quite a bit of work that is not published, in part because it's innovating in space that is more for internal use than it's for external viewership. Even though some of this work is generalizable, it's not my place to dictate when and how that gets published. So, that means I have to have, kind of, multiple careers that are spanning... that space that I find useful and interesting. That [my community partners] find useful and relevant but also a second set of research priorities that are more- focused on the on the basic and academic. (Interview 4)

Some interviewees deal with these capacity issues, and with the need to spend time in community, by reducing teaching loads. Strategies discussed to reduce teaching load include: 1) completing all their instruction in one semester and spending the rest of the year in or near community 2) leveraging research chairs or other senior positions to reduce the time they spend on finance administration and grant writing and 3) opting to work in research professor positions or other roles that don't require teaching.

Half of interviewees mention some measure of luck, privilege, or exception that allows them the capacity or resources to do boundary spanning work. Examples include unusually generous access to discretionary funds, luck that they landed in a unit or with supervisors that support them, or having a certain exceptional talent, such as the ability to publish at an unusually fast pace. Many acknowledge that this work may not be possible if their time, circumstances, or resources were more limited. Two interviewees lost at least some capacity to do boundary spanning work as their family obligations increased after having children. One interviewee posits

why depending on privilege or exceptionalism could limit who can perform boundary work within mainstream institutions:

I've been lucky enough to... turn some work into publications... but I know some colleagues that haven't had the time or energy. I don't have kids. That's just a fact that gives me so much time to write and publish, if people want families and do this work, they are not gonna have the same ... research output. So, I acknowledge that's a huge thing, especially with moving around ... well, if you have a 2-year-old forget about it...I think I found a workaround that works for me and that in itself is problematic. Right? Because if you do want strong community-based work to be recognized, then what can we do at an institutional level? Like, it's great. A few of us got through the cracks. But it's not a solution. (Interview 18)

Research question 3. Desired outcomes, impediments, and recommendations to inform infrastructural change

From discussion of institutional support in interviews emerged three major categories: desired outcomes, impediments, and recommendations. Desired outcomes include support or desired support or needs expressed by interviewees. In contrast, impediments are barriers, difficulties, or causes of bad outcomes described by interviewees. And finally, recommendations include either suggestions made directly by interviewees on how to better support boundary spanning work or emergent ideas from repeated or otherwise significant discussions of the support and impediments faced by boundary spanning researchers.

Desired Outcomes

Table 3 describes the general themes that emerged from interviews with regards to desired outcomes from institutional support and describes specific examples of outcomes that interviewees either described or expressed that they would like to see occur.

Table 3. Desired outcomes. Support, needs, and desired support to facilitate boundary spanning research that benefits Indigenous communities listed in order of frequency of code segments

General	Specific
Sufficient resources to build long-term, meaningful relationships	Research partnerships can access stable, long-term funding that allows for sufficient time to build trust, learn protocols, and develop mutual understanding of community research interests
	Leadership supports boundary spanning researchers, takes an interest in their projects, and supports researchers through funding and assistance with institutional administration issues
	Funds can be accessed without preconception of research project and/or specifically to develop relationships and develop grant proposals pre-submission
	Researchers are completely self-sufficient resource wise when in community, and additionally bring resources into community both through research infrastructure and by supporting local goods and services
	Institution maintains long-term research programs with Indigenous communities where students and early career researchers can access resources and plug into existing projects
	Research partnerships can access flexible or discretionary funds where research questions and projects can shift to meet community needs or evolving situations
	Boundary spanners have robust support from leadership, particularly during times of administrative transition, to maintain funding between large grants and to support scholars to problem solve legal or administrative issues
	Indigenous community partners are co-PIs on grants and funds are applied to directly benefit community and/or are directly accessed and controlled by community partner
	Research partnerships can access enough funding to be generous with resources to community partners and trainees
Sufficient time to build and maintain research relationships	There is sufficient time from call for proposals to grant submission to allow for community-engaged or co-productive project development and Indigenous permission protocols.
	Researchers are able to devote significant time to research relationship, in community and in the field, which may mean reducing or eliminating other duties such as teaching, administration, or grant writing
	Researchers are supported to maintain relationships throughout life stages, including time-intensive periods such as caregiving for elders or children
	Career timelines and milestones are flexible and account for special considerations of boundary spanning and community engaged work, such as expectation that research products or progress towards a degree, will be produced at a slower rate
	Researchers feel trusted by leadership and are allowed space and academic freedom for them to manage research relationships, pursue funding, and pursue projects without undo interference or institutional bureaucracy
	Research partners are provided enough time and resources to dream together about potential projects, thus speeding up proposal development when appropriate funding becomes available
	Access to boundary spanning community, mentors, and training
Researchers can access training, peer-learning, and mentorship specific to boundary spanning work and/or from other boundary spanners either formally or informally as well as a robust community and professional network of boundary spanning researchers at the local, national, and international level	
Access to formal training on working with Indigenous peoples, data sovereignty, community-engaged research and knowledge co-production	

	<p>Research partnerships are developed with guidance from Indigenous research protocols, Indigenous ontologies, and work on Indigenous histories and impacts of settler-colonial process</p> <p>Institutional research teams are multidisciplinary, have skills that are complimentary to Indigenous community partners and are useful to community, and are able to add team members when new community research needs are identified</p> <p>There are pathways for mainstream researchers to work with boundary spanners who are primarily located within Indigenous communities and to support communication in partnership in Indigenous languages</p> <p>Institutional and departmental culture values, facilitates and rewards boundary spanning work including interdisciplinary departments and degree programs</p>
Increased administrative capacity for research relationship for both boundary spanning researcher and Indigenous community partners	<p>Streamlined administrative and permissions pathways so researchers can balance community engagement with community capacity for projects</p> <p>Supportive administrators that are experienced with the particulars of boundary spanning work and can access guidance and training when needed</p> <p>Ability to pay community members quickly and easily for goods and services immediately, in cash or electronic payment, and without making community members register with the institution or provide sensitive information such as Social Security numbers</p> <p>Administrators that are accessible either in person or over the phone</p> <p>Administrators that specialize in working with Indigenous communities and/or boundary spanners such as Tribal relations office, diversity officers, and Tribal liaisons</p> <p>Processes to qualify people as co-instructors or committee members based on lived experience, Indigenous ontology, and other non-degree related qualifications</p> <p>Access to petty cash accounts and definitions of honorariums, and professional services to include knowledge holders</p> <p>Streamlined processes for Indigenous communities to show support for grant applications</p> <p>Fast reimbursement and per diem processes</p> <p>Easy access to institutional infrastructure to Indigenous communities, including treating Indigenous Nations similarly to Federal or State partners when accessing laboratory equipment, offices and so on</p>
A critical mass of Indigenous researchers	<p>More Indigenous scholars</p> <p>Hiring criteria that:</p> <ul style="list-style-type: none"> - Emphasize importance of life experience, Indigenous ontology and Traditional Knowledge in hiring criteria - Recruit from Tribal colleges and universities - Deemphasize importance of publishing, academic degrees, and scholarly outputs <p>Well-resourced partnerships with Tribal Colleges and Universities</p> <p>Indigenous language revitalization, classes and research initiatives</p> <p>Scholarships, free tuition, and fellowships for Indigenous scholars</p> <p>Flexible training programs such as virtual access to classes and internships with hybrid format</p> <p>Oral traditions and non-academic products are valued and accounted for in hiring and promotion</p> <p>Increased access to publishing, conferences, and professional societies</p> <p>Institutions are physically located near Indigenous communities</p> <p>Indigenous culture is forefront in the workplace</p> <p>Close connection to Indigenous Studies departments</p> <p>Indigenous scholarship and Indigenous peoples are included in all aspects of curriculum and publishing</p>

	Support for Indigenous scholarship and students is discussed in hiring processes
Research forefronts community priorities and provides direct benefits to community	Research products that are accessible and beneficial to communities such as curricula for local schools, local media, websites, story maps, art, and plain-language summary reports
	Grants and funding sources that community can access independently of the boundary spanning researcher
	Investment in community capacity, such as building infrastructure and providing training community members
	Paired investigation of environmental metrics with cultural and/or community well-being metrics
	Significant time is spent developing project goals and proposals with community members or governments
	Understanding of what may or may not be representative of larger Indigenous community needs
	Indirect costs are paid to Indigenous community partner
	Research methods and processes account for cultural sensitivity of data, for example seeking high confidence or confidentiality when testing traditional food sources
	Sufficient knowledge and trust is built previous to submitting proposals for funding for boundary spanning researcher to understand community priorities and what issues may be sensitive
	Resources are provided directly to community such as funds or research equipment
	New expertise or resources are accessed when community expresses interest in new research topics
	Research funding or collaborations begin with no preconceived agenda for research topics, project goals, or research products
	Indigenous language use and revitalization is important aspect of research project
Enact and support Indigenous data sovereignty and Indigenous research protocols	Permissions processes that equally value Indigenous protocols
	More standardized approaches across government agencies
	Protocols informed by UNDRIP
	Indigenous group legally owns the data
	Streamlined legal departments that understand and respect Indigenous sovereignty
	Indigenous ethic review committees for university-side permissions and for special cases where it may not be possible to receive permissions from a particular Indigenous community (for instance asking for Indigenous identity in a national survey)
	Engagement with community protocols before funding is applied for
	Continuous report back to Indigenous community
	Robust Indigenous ethics review structures
	Research products reviewed and approved by community
	Ethics review structures that are specific to this work rather than biomedical
Greater in-person availability to partners	Researchers are able to live or spend significant time physically in or near community, more than few weeks of field time
	Researchers and students use remote access to complete institutional obligations
	Tribal colleges and universities with increased capacity for research
	Labs and other institutional structures are located near community
	Events and meeting happen on Indigenous territories
	Resources to support students to live in or near community for years during degree programs
	Institutions are more open to other knowledge systems and non-academic work
	Internships and training projects that assume trainees have obligations at home in community

Better representation in the literature	Publication format is flexible to allow for best expression of Indigenous ontologies and boundary spanning work and publications are written using Indigenous methods such as storytelling
	Robust community review of publications and other research products
	Editors and reviewers are familiar with basic concepts of Indigenous studies, Indigenous scholarship and boundary spanning research
	Publishing and review processes are more accessible to authors with non-academic backgrounds

Desired outcomes discussed frequently across interviews are related to administration, funding, time, incentives, benefit to community partners, support from leadership, and support for Indigenous scholars. Some interviewees recommend using guidance from Social Science and Humanities Resource Council (SSHRC) as guidelines for developing equitable and meaningful pathways for support for Indigenous scholars and boundary spanning researchers (Government of Canada, 2012). However, some researchers are concerned that efforts at support from institutions would be more of a burden than a help:

Very often they think that they need to hire somebody who will help you manage your research relationships. But to me that sounds threatening to be honest, it's like someone is going to get in the way of the relationship I already have, and I don't know that I want to have to educate this other person or help this other person understand what it means to have a relationship with people in Indigenous communities where I work. It's so unlikely that they're gonna hire somebody who's so good at that right? Who's able to do this across all these different contexts. And so that's part of what's in my mind is what are we looking for in terms of institutional support? (Interview 11)

Another interviewee states that “support for me is trust and getting out of my way.” (Interview 24)

Many interviewees suggest that institutional support would de-emphasize the importance of academic publications and impact factors as criteria in professional evaluation and hiring. One interviewee who works at an institution where evaluation criteria has already been revised to account for community-engaged work states:

They've realized that they gotta be a little more flexible. For example, understanding younger faculty members may not be publishing at super-fast rates, because community engaged work takes a long time. So that's a major thing, to understand that the work will operate at a different pace or look a little different than your standard science work. (Interview 12)

Impediments

Table 4 describes the general themes that emerged from interviews in regard to impediments faced by boundary spanning researchers within their institutions and describes specific examples of impediments encountered by researchers in their work.

Table 4. Impediments. Barriers to performing boundary spanning research that benefits Indigenous communities as discussed by interviewees listed in order of frequency of code segments

General	Specific
Capacity	Pressure to work with multiple communities and locales when it is not feasible to maintain meaningful relationships beyond a certain number of projects
	Teaching load detracts from time and energy spent on research relationship, particularly in social science departments
	Committees and other institutional obligations require for career advancement limit time and reduce capacity for research relationship
	Personal circumstances, such as having children or other caregiving responsibilities, limits capacity for research relationship and time spent on special administrative needs
	Scholars of color and Indigenous scholars are capacity burdened by requests for unpaid labor such as extra time mentoring Indigenous students and student of color, consulting on diversity initiatives, teaching other faculty about community engaged work, and large numbers of requests to develop/write grants or join projects.
	Community-engaged work is considered an extra responsibility on top of, not instead of, standardized professional requirements and metrics of career progression
	Indigenous community partners are inundated with research requests and administrative requirements that exceed their capacity. Boundary spanners also spend time attempting to mediate this capacity burden on their community partner
Bureaucracy	Issues getting permits to work from agencies that don't have context for boundary spanning work
	Requirements to collect identification numbers or other personal or invasive information in order to pay community partners
	Legal barriers or issues with administrative burden from institutional legal departments
	Transitions between administrations and subsequent change in values or loss of relationships with expert administrators
	Excessive time spent dealing with bureaucracy and negotiating bureaucratic structures, both for researcher and for community partner
	Funding structures mandate that community partners are paid inadequately, especially compared to compensation for researchers working for the institution
	Reimbursements or payments to independent contractors taking excessive amounts of time and requiring researchers to front large amounts of money
Funding	University takes a significant amount in indirect costs that should be split/go to community partner
	University and granting agencies funding policies can be restrictive and time consuming to negotiate
	Grant reviewers are not familiar with Indigenous protocols and community engaged work and request infeasible or inappropriate research methods such as collecting human blood samples
	Transdisciplinary grants from NSF are competitive and relatively small, making them impractical to spend time and energy on applying for
	Grant proposal timelines are too short to build proper relationships, understand community need before submission, and do not account for time to complete Indigenous community protocols around research development and permissions
	Grant funding timelines are short relative to community priorities for research, creating pressure to meet objectives quickly, which is counter to best practices
	No-cost extensions are not guaranteed and require more time spent on administration
	Grant funding and funded research positions require preconception or mandate of project goals

	Funding structures do not allow for flexibility in research objectives and products as community priorities evolve or become more clear to researchers
	Funding priorities do not align with boundary spanning work, or resources and grants specifically targeted at boundary spanners is underfunded
Professional advancement	Leadership primarily values Western knowledge systems and does not consider Indigenous science as valid or rigorous science
	Evaluation standards are primarily based on academic publication metrics such as number of publications, high impact journals and h-index, and publishing rates are often slower in boundary spanning work
	Community engaged work is a collateral, or extra, duty that is not accounted for in promotion, for example academic service is considered service to the institution or field, not to community
	Early career researchers need to move to find positions or are require to do non-community-engaged work as stepping stones to permanent positions which makes doing place-based work and maintaining relationships difficult
	Promotion guidance and standards do not account for specific considerations around community engaged work with Indigenous Peoples. Researchers are required to individually justify their research outputs to evaluators.
	Researchers are unable to access evaluators who are knowledgeable about boundary spanning work
	Community-facing research products and social impact are not accounted for in evaluation processes, or are accounted for less than academic publication
	Institutional timelines for grants, projects, deliverables, and publication are misaligned with community interests
	Meeting professional advancement milestones while facing additional capacity barriers such as delays from Covid or caring for young children can reduce capacity for research relationship
Covid	Loss of elders, knowledge, and research partners
	Inability to maintain relationships in person, loss of communications, and gaps in relationship maintenance and data collection
	Longer timelines that interfere with career progression, grant extensions, and other deadlines
Distance from communities	Inability to maintain community responsibilities, build and maintain relationships, and deeply understand community needs while physically distant most of the year
	Difficulty communicating, either because in person communication is easier or because community partners do not have/use electronic communications
	Pressure to work on campus, as if “real” work can’t be done in community
	Expense to travel long distances and stay in remote areas with limited lodging
Bad practices in the past	Due to ongoing and past bad practices by scientific institutions and researchers, Western science and scientists trained in that tradition are often viewed as suspicious or as harmful
	Due to exploitation of Indigenous and institutional resources by researchers there are heavier administrative burdens on both sides of the research relationship
	Researchers who do not understand ongoing legacies of colonialism reproduce those harms and send unprepared students into the field, which further perpetrates harm
Access to peers and training	Difficulty accessing networks of peers both within and between institutions, an subsequent difficulty accessing peer learning and collaboration
	Difficulty finding mentors who are knowledgeable and/or experienced in boundary spanning work
	Lack of formal training in Indigenous studies or community-engaged research
	Community oriented research products are less valued than research products considered universal, innovative, novel, or tech-based

Institutional values	Pressure to jump around to different communities and locales, especially to work internationally, rather than maintaining long term relationships in one or a few communities
	Institutional values are misaligned with community interests, particularly around data sovereignty or research goals
Publishing	Publishers value generalizable or scalable findings that often don't apply to Indigenous protocols and community-engaged research products
	Review processes are inaccessible and alienating to community-based scholars
	Reviewers are not knowledgeable about Indigenous studies, settler colonialism, and community-engaged research and sometimes are aggressive or racist in their reviews
	Field is small enough that knowledgeable reviewers and subject matter experts are often also collaborators on other work and therefore disqualified from those roles
Barriers to Indigenous scholars	Institutions physical distance from communities can discourage Indigenous scholars who also have community roles and obligations
	Emphasis on academic publication as a metric for hiring and promotion and lack of account for non-academic products, training, lived experience, Indigenous ontologies, role as knowledge holder, social impact, or other metrics of success outside of publication
	Lack of ability to bring whole selves into position, including culture and religious practice
	Power to hire and evaluate is grounded in settler-colonial structures rather than in partnership with Indigenous communities

Impediments discussed frequently in interviews are related to capacity, funding, professional advancement, Covid, and bureaucracy. A common theme is conflicts between career incentives and community priorities, particularly when it comes to publishing:

One of the challenges is that our system of incentives is set up in a way that in some ways is at odds with the primary priorities associated with a research objective to serve a community. Oftentimes, the non-generalizable objectives make it more difficult for the currency of our trade, which is peer reviewed publications that are more broadly relevant outside of that space. (Interview 4)

Another interviewee expands on the lack of alignment between boundary spanning research products and institutional professional evaluation criteria:

Faculty that are most involved in working with Indigenous communities, we are community engaged scholars where the outputs of our research are not necessarily scholarly. Typically outputs are much more oriented towards what is going to be of greatest interest and value to the community itself. So that's a challenge, especially for young scholars...There are these barriers to scholars getting involved in this sort of research, in part, because institutions have not aligned their tenure and promotion processes with facilitating this approach to scholarship. (Interview 15)

Without criteria that accounts for slower rates of scholarly output, scholars can struggle to meet professional milestones when compared with peers that are not doing community-engaged work:

In the promotion process, I certainly wrote in my description and justification, that things like the pandemic had an incredibly strong impact on my ability to work with communities. And just reiterating that the timelines getting work done are going to be a lot different. Because a lot of people, if they're working with big data sets, they're not doing field work, they're not building relationships. (Interview 21)

Another major barrier is the amount of time and capacity that researchers spend negotiating bureaucratic structures. One interviewee, whose institution recently lost a large number of administrative staff, expands on how issues with administration can strain or destroy research relationships:

One of the things that's happened is that I can't move money out of the university anymore. I can't even pay bills. And so that's definitely straining relationships. Ending research projects. I can't pay a hotel that we stayed in in August. It's the only hotel in this remote, Indigenous community. We can't do research there because they won't serve us anymore. And rightfully so, but that's the end of that project. And it's because something happened in financial services where they just can't pay an invoice that we gave them months ago. So, that's very frustrating. (Interview 17)

One interviewee discusses how the paperwork required to rent a car in a remote area created a prohibitive amount of work for them, and also required asking a local person to do additional work by providing their institution with documentation. The interviewee explained the impact, saying, "...it's stuff like that that adds up, every little, tiny thing like that. Suddenly you realize you spent 20 hours of your work week, just trying to do a thing. You're not trying to do anything illegal. You're just trying to use the only option you have to work in a small town." (Interview 5)

Several interviewees are affected by bureaucratic burdens resulting from reimbursement systems, wherein they do not want to make community partners have to wait for payment, fill out prohibitive paperwork, or provide personal or bank account information. Consequently, those researchers end up spending large amounts of money themselves and then waiting for long periods of time to get reimbursed. One interviewee points out that this system severely limits who can do boundary spanning work:

Sometimes I can do things like pay out of pocket, and I do that with [some Indigenous community partners]. I'll pay out for it and then get reimbursed. And I was out thousands and thousands of dollars for six months waiting to get reimbursed. I can only do that so many times before I have no money to eat, right? And that's a common problem. And graduate students couldn't do that. And junior faculty couldn't do that. So, that's been a really serious problem. (Interview 17)

Recommendations

Recommendations discussed in more than half of interviews include revision of promotional processes and evaluation criteria; increasing access to stable, flexible resources;

providing support for Indigenous scholars and Indigenous scholarship; increasing administrative capacity for boundary spanning projects; and supporting boundary spanners' physical presence in community (Table 5).

Table 5. Recommendations. Suggestions to improve structural support for boundary spanning researchers as discussed by interviewees listed in order of frequency of code segments

General	Specific
Revise professional evaluation processes and criteria	Equally weight metrics specific to Indigenous science, community-engaged research, and boundary spanning to more traditional metrics such as rate of academic publication
	Hire progressive leadership who are boundary spanners and/or Indigenous so that boundary spanners are likely to have support from leadership
	Issue quality guidance on Indigenous and community-engaged research for evaluators and that boundary spanners can reference when justifying their research agenda
	Grant generous academic freedom on research agendas and avoid interfering in research relationships
	Reward scholars with long-term research relationships, promote long-term research as valuable, and provide support for researchers to do boundary spanning work throughout as their lives change. For example early career researchers or parents of young children may be experiencing greater capacity barriers to publishing
	Evaluate boundary spanning work as core responsibilities of boundary spanners' professional role, and include that work in job description
	Include Indigenous and community-engaged metrics in promotional criteria: <ul style="list-style-type: none"> - Count time spent building and maintaining research relationships - Count social impact and community benefit - Count non-academic products and community presentations - Count Indigenous cosmology for Indigenous scholars working with Indigenous communities - Count service to community as academic service - Count knowledge mobilization, i.e. public or community facing research products - Account for greater administrative burden when considering publishing and other time-sensitive metrics - Value publications on process, interdisciplinary research, and work that may seem mundane i.e. not focused on novelty or innovation
	Provide flexible and extended timelines for career milestones and assume that research projects and deliverables will be produced at a slower pace than some other kinds of research
	Understand that research products may look different than in other projects, for example newspaper articles, blogs, podcasts, art projects, non-academic books, plain language summaries, grade school curricula, story maps, or community handbooks
	Assume that research may never be published, and that data may need to be excluded from reports due to Indigenous data sovereignty protocols
	De-emphasize importance of academic publications in hiring and account for experience, non-academic training, worldview, relationships, and social location in Indigenous community
	Weave in boundary spanning metrics throughout promotional criteria and processes, rather than creating additional categories, in order to avoid adding an extra administrative burden on boundary spanners
	Include evaluators on panels who are knowledgeable about Indigenous research protocols and community engaged research
	Make evaluation criteria and required career benchmarks clear, accessible, and transparent
Provide rewards and fellowships specific to boundary spanning work	

Make access to resources easy, stable, and more flexible	Waive or reduce indirect costs or split indirect costs with community partner. In particular, remove cost sharing for Indigenous governments and Indigenous non-profits
	Provide generous and flexible travel funds, especially for partners working in remote areas with limited accommodations
	Extend funding cycles beyond the common length of three to five years and make no-cost funding extensions easy to apply for, quick, and automatically approved
	Provide access to multidisciplinary resources and networks
	Provide consistent access to non-competitive or low competition small grants that are discretionary or target areas that are hard to fund through other agencies
	Hire and maintain leadership who are Indigenous and/or are boundary spanners
	Establish funds that can be provided directly to community with minimal effort, for example a rapid assistance fund that can be used to address crises in community
	Establish funds for making connections with Indigenous communities, developing relationships, and developing project goals pre-grant application
	Create more funding opportunities targeted at Indigenous scholarship, boundary spanning and community engaged work, particularly targeting quantitative science
	Create endowed positions that provide generous, discretionary funds for boundary spanning work
	Revise funding criteria to account for Indigenous protocols, such as establishing data sovereignty contracts, research agreements, and not requiring invasive or exploitative research practices
	Allow for flexibility in how research funds are used, research objectives, deliverables, and timelines
	Allow for community partners to be paid without invasive administrative protocols, quickly, and at equal rates as scholars working for mainstream institutions, even if they don't hold academic degrees. Allow for cash payments with simple receipts
	Provide base grants, career awards, or other funding not tied to specific research objectives or projects, in particular to support research relationships in between grants for specific projects
	Increase number of grants and funding amount of grants specific to transdisciplinary, community engaged, and boundary spanning work, particularly in funding agencies focused on quantitative work and in the U.S.
Provide grants specifically for making relationships, developing proposals, or for community engagement	
Make resources easy to access from both sides of the research relationship i.e. reducing administrative burden of using funds or paying people but also making it easy for Indigenous community partners to access institutional labs, equipment, and other resources	
Support Indigenous scholars and Indigenous scholarship	Revise qualification standards and promotion criteria to include social impact, lived experience, non-academic training, Indigenous ontologies, relationships, location in community as knowledge holder or other distinguished role, and de-emphasize importance of academic degree and academic publications
	Support and partner with Tribal colleges and universities, particularly to develop capacity, create degree programs that provide more official qualifications in Indigenous environmental science and governance, and provide administrative or infrastructural support, for instance acting as a partner when institutions seek accreditation to become a university
	Confer honorary degrees to Indigenous knowledge holders and elders and/or remove degree requirements to serve on committees, as consultants, and as instructors
	Build infrastructure and develop policy specifically aimed at supporting Indigenous faculty and students
	Support Indigenous language revitalization, for example by developing Indigenous language classes and offering resources to communities seeking to reconstruct lost language

	Offer fellowships and/or free tuition to all Indigenous students
	Hire more Indigenous scholars and develop cohorts of Indigenous scholars so they have peer support, easy access to collaborators, and can develop scholarship with shared experiences and knowledges
	Waive membership fees, publishing fees, and conference registration fees for Indigenous scholars. Provide travel funds for conference attendance.
	Create structure that allow Indigenous scholars to remain physically present in or near their home communities. Provide remote access to teach or attend classes, locate research institutions, research stations, and labs in or near Indigenous communities, make internships and other training programs hybrid remote/in-person so trainees can maintain jobs, families, or other obligations while participating.
	Develop guidelines for merit review of Indigenous research that specifically accounts for Indigenous research protocols and Indigenous knowledge systems. Interviewees point to the SSHRC “Guidelines for the Merit Review of Indigenous Research” as a model (Government of Canada, 2012)
	Create space for Indigenous scholars to bring their whole selves into the institution, particularly including culture and spiritual practice
	Structure publications and other forms of knowledge dissemination to better accommodate different ways of knowing and oral traditions, for example journals specializing in perspectives articles or other less conventional formats
	Move power to evaluate away from institutions and into Indigenous communities. For example, holding thesis defenses in Indigenous community or including community review processes for research protocols and publication
	Support, collaborate, and connect to Indigenous Studies departments
	Indigenize curriculum and publication across all disciplines, not just siloed into particular classes or academic spaces
	Create more permanent positions primarily focused on Indigenous science and Indigenous community partnerships
	Discuss support for Indigenous scholarship in hiring interviews and onboarding processes
Increase administrative capacity for boundary spanning projects	Develop policies, protocols, an agreement on research done with Indigenous Peoples that enshrine Indigenous rights and insure Indigenous data sovereignty, especially complete ownership of data by Indigenous community and clear guidelines on the need for discretion around culturally sensitive information. Interviewees suggest the “United Nations Declaration on the Rights of Indigenous Peoples” as a model (United Nations, 2007)
	Require proof of meaningful collaboration and permission from the community before grant proposals are approved for submission, for example a co-PI from the partner community. Make sure those permission processes are not an administrative burden on Indigenous communities. Use Tribal research review protocols as models for institutional permissions and review processes
	Standardize consultation and permissions forms across large institutions, such as governments, to streamline processes for Indigenous communities
	Require approval from Indigenous communities before data is published or presented publicly
	Establish Indigenous ethics review boards to generally review proposals but also specifically to provide guidance when Indigenous communities cannot be asked for or provide permission- for instance when Indigenous communities does not exist anymore
	Build administrative staff that specializes in boundary spanning work. Establish Tribal liaisons, Tribal affairs, and Tribal relations offices an hire administrative staff that are trained and experienced in working with Indigenous communities and boundary spanning researchers
	Reduce administrative burden on researchers and community partners, for example expand allowable categories of travel expenses to include special considerations of working in remote communities
	Encourage close, long-term working relationships between administrators and researchers. Make administrators accessible in person or over the phone, rather than only by email, and encourage long term continuity with those individuals who become familiar with the logistics of doing boundary spanning work.

	Provide guidance and training to administrators on best practices for working with Indigenous communities and how to administrate community-engaged projects.
Reduce or remove pre-conception of grants/projects	Provide support and funding for relationship building and project development in community before proposal submission, for example engagement grants for relationship building and planning grants targeting at building the capacity to write proposals
	Provide ample time from call for proposals to submission deadline for relationship building, proposal development, Indigenous community permission and review protocols, and collaborative writing processes with community partners that may have limited capacity. And/or establish rolling deadlines for funding proposals
	Create funding opportunities that have flexible goals and deliverables, don't require pre-determined project goals, research priorities or agendas and/or doesn't specify research questions or deliverables
	Support researchers to maintain long term relationships that have built the trust and understanding of community priorities required to move more quickly on project development and funding proposals
	Expect relationship building to take years, not months, and build this time into structures to support project development. Require these longer terms relationships for some funding opportunities to reduce pressure on Indigenous communities from many scientists seeking to collaborate on grants.
Build an institutional culture that supports boundary spanning work	Clearly articulate, and support with resources, the equal validity of Western and Indigenous knowledge systems, particularly in science
	Establish educational and training requirements that mandate researchers and trainees to understand the histories of Indigenous peoples, colonialism, and the harms caused in communities by research.
	Establish initiatives to actively address and reconcile past and current harms perpetrated on communities by scientific institutions and researchers, for instance Indigenous ethics review boards
	Provide training to researchers and trainees on best practices for working with Indigenous communities
	Understand that often the Masters and PhD students' timelines are often too short to do boundary spanning work, and either avoid involving students or develop research programs that are possible for students to plug into for a relatively short time
	Focus on communities as centers of knowledge, training, and power, rather than mainstream scientific institutions. For instance, do not assume Indigenous youth are better trained at a university than in their home community
	Encourage and support interdisciplinary, transdisciplinary, or multidisciplinary research and large, diverse research teams that include arts, education, and humanities scholars in addition to the sciences
Value boundary spanning work and acknowledge that it too can be highly rigorous and robust. Acknowledge and accept community expertise when reviewing analyses and collecting data.	
Support boundary spanning researchers to be physically present in community	Schedule teaching of in person activities such as required instruction or training, so they occur in the same semester/quarter/time period an allow boundary spanning researcher to work remotely the rest of the year
	Locate research institutions, labs, and research stations in or near Indigenous communities
	Provide sufficient time and resources to be out of the university and in community, often in remote places. Expect that researchers will spend months in community each year, rather than weeks and may visit community outside of time allocated for field work
	Hold events and meetings on Indigenous territories, rather than making community members travel to mainstream institutions
	Reduce teaching loads or hire boundary spanners in well-supported research positions without teaching obligations

	Support students to spend large amounts of time in community, for example to live in or near community for 2-3 years
Bring together boundary spanning researchers	Establish highly interdisciplinary departments or departments focused on boundary spanning research
	Establish research institutes, initiatives, and research centers around Indigenous science and boundary spanning research. Interviewees cited the Center for Braiding Indigenous Knowledges and Science at the University of Massachusetts Amherst as an example
	Encourage networking between boundary spanning researchers at local, regional, national, an international levels
	Acknowledge work put into formal and informal mentorships, especially by Indigenous scholars an scholars of color
Build time for boundary spanning work into positions	Include boundary spanning work as a primary duty in job descriptions
	Create reward structures for diversity, equity, and inclusion work within institutions, service on committees specific to Indigenous inclusion and research, and for social impact outside of institutions
	Reduce or remove non-research obligations such as teaching loads and administrative burdens
	Provide long grant timelines and easy to obtain, or indefinite, no-cost extensions
	Provide support for researchers through life stages, for example interviewees cited difficulty maintaining capacity for boundary spanning work after having children and suggest providing childcare or support to include families in research trips
	Expect that research products will be produced at a slower rate
	Provide support for long term relationships so the background knowledge and trust is there to allow research processes to go more quickly
	Create endowed chairs focused on boundary spanning work so researchers spend less time teaching and pursuing funding
	Allow for flexibility in career timelines and milestones
Facilitate access to training and mentors	Expect that timelines, such as trainees progress towards a degree, will be longer than in other types of research
	Establish structures to bring together scholars within and between institutions who are working with Indigenous peoples, to encourage peer mentoring an collaboration
	Provide quality training on best practices for working with Indigenous communities, Indigenous sovereignty, community-engaged research, and special considerations around supporting people particularly impacted by systemic injustice and trauma
Revise publishing processes	Waive publishing, society membership fees, and conference fees for Indigenous scholars
	Encourage articles written in other formats than traditional research papers, for example offer perspectives article format in journals
	Require that publications at acknowledge the contributions of Indigenous Peoples to their work. For instance, at minimum acknowledge the traditional territory on which the work was done.

	Develop quality criteria to evaluate the level of collaboration, the benefit to the Indigenous community, and the strength of relationship between researchers and Indigenous community partners. Use these criteria when reviewing papers regarding Indigenous knowledges or collaboration
	Develop kinder and more collaborative review processes that are more accessible to authors from diverse backgrounds
	Encourage co-analysis and review by Indigenous community partners
	Use reviewers who are knowledgeable about Indigenous studies, Indigenous science, colonialism, and community-engaged research. Provide guidance for reviewers who are not expert in these fields about basic and foundational concepts
	Remove comments from reviewers that are prejudiced, rude, or aggressive

Sankey diagrams linking desired outcomes, impediments and recommendations weighted by frequency of co-occurrence reveal significant opportunities to improve institutional support for boundary spanners (Figure 4). The recommendation to revise processes for professional evaluation stands out as being linked heavily to both the impediments and desired outcomes described by interviewees. Much of the weight of these linkages results from the perspective that an emphasis on academic publications as a primary metric for promotion and thus is a significant impediment to career progression. Furthermore, the linkage between a recommendation to revise evaluation processes and several outcomes results from the desire of interviewees to have their professional evaluations reflect the slower rates of academic production associated with boundary-spanning research.

Interviewees recommend that for externally oriented knowledge mobilization and social impact, such as non-academic products and deliverables produced for Indigenous community partners, to be weighted equally to metrics of impact that are internal to academia (e.g., the h-index). For example, here an interviewee describes having to individually justify their research production during promotional evaluation and recommends that guidance be created to account for boundary spanning work in professional evaluation:

And it's like bam bam bam. And now you're at this level. You're supposed to have X many publications and it's just a really different system. So sometimes you get people who understand that and sometimes you get people who don't. But there's nothing yet in our guidance for that promotional package that talks specifically about working with Indigenous communities. The burden is on the person who's going up for promotion to justify that. So it would be nice if there was a little more understanding. And that is an institutional piece that could change. (Interview 21)

What this guidance might look like was another recommendation that emerged from interviews. One interviewee identified a need for a “suite of criteria and indicators that journals could use to evaluate the strength of the relationship that scientists have had with Indigenous peoples when

they say they worked with Indigenous peoples to produce this research” (Interview 15). Some suggested the boundary spanning characteristics used in the study, and adapted from Hatch et al. (2023), may serve this purpose, and others recommended adapting existing research guidance from the Social Science and Humanities Resource Council (CITE) or from the United Nations Declaration on the Rights of Indigenous Peoples.

Impediments due to administrative burdens and lack of capacity also stand out as important contributors to recommendations—particularly to support recommendations to make the day-to-day functioning of boundary spanning work easier and less time consuming both for boundary spanning researchers and their Indigenous community partners. The need for more Indigenous scholars and Indigenous scholarship is another heavily weighted category. While only a third of the scholars I spoke with were Indigenous, all scholars emphasized the central importance of boundary spanning work being done by Indigenous scholars for Indigenous communities, whether or not those scholars originated from their partner community. There was general agreement that Indigenous scholars are most qualified to do boundary spanning work, and that Indigenous communities are most likely to benefit when Indigenous scholars are the ones spanning the boundary between mainstream environmental science and Indigenous community priorities.

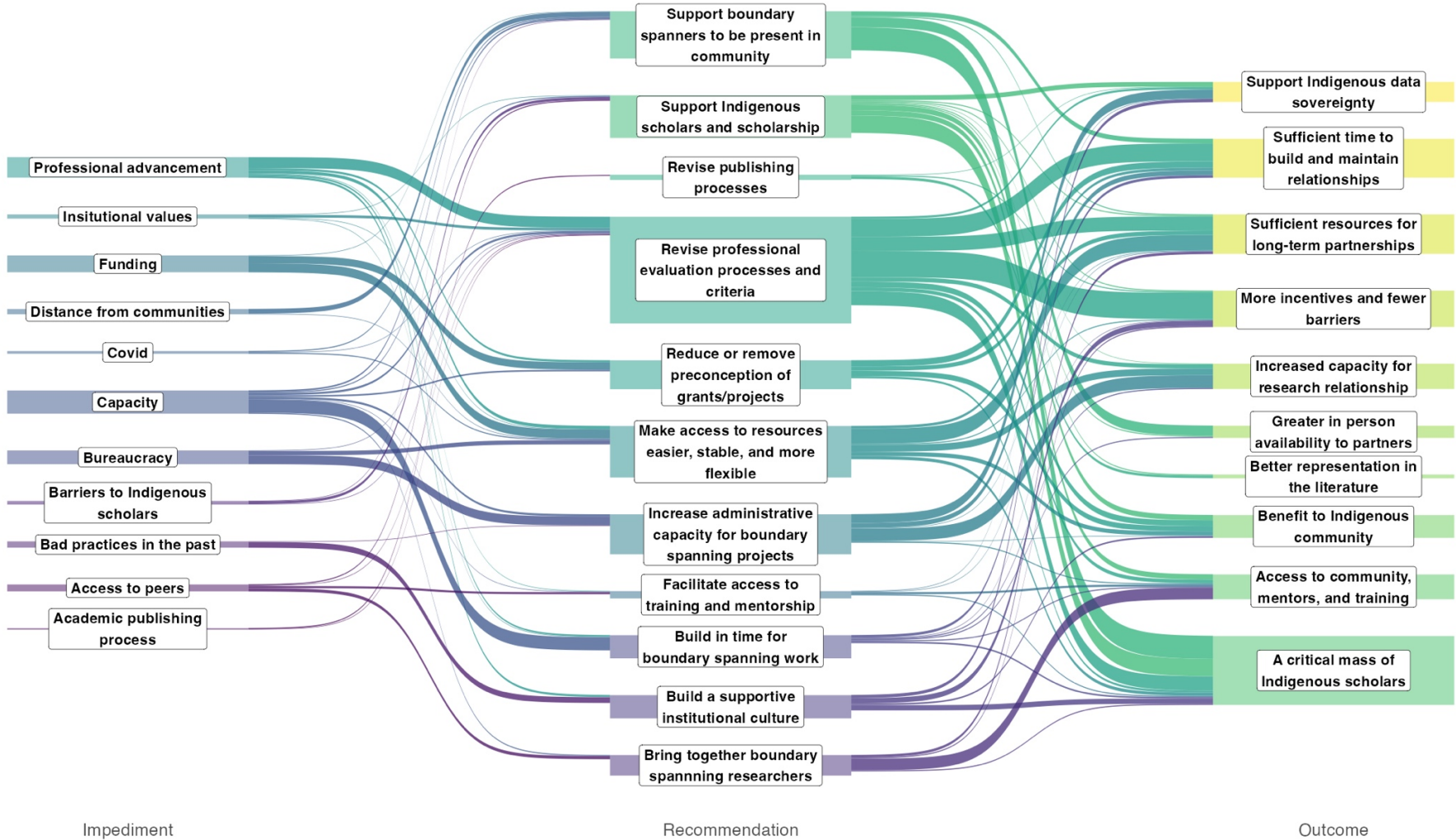


Figure 4. Connections between impediments, recommendations, and desired outcomes that emerged from interviews. Connections are weighted by the co-occurrence of codes in each category

Discussion

There is an increasing recognition within mainstream scientific institutions of the importance of working in partnership with Indigenous communities on environmental research, as well as ensuring that community engaged work produces just and equitable outcomes. However, David-Chavez and Gavin (2018) indicate that many research partnerships between Indigenous communities and mainstream environmental scientists are not reciprocally beneficial. Rather, it is possible that many of these relationships are primarily benefitting mainstream researchers and the institutions where they work, as institutional incentive structures may inhibit truly co-productive research (Lhoest et al. 2024). Boundary spanning scientists offer a possible pathway for Indigenous community priorities to be fore fronted in research (Hatch et al., 2023), and thus could facilitate more equitable research outcomes (e.g., Huff-Davis et al. 2018, Wilson et al. 2020, Dawson et al. 2021, Reid et al. 2024). In addition to possible ethical reasons to account for equity in research partnerships, international agencies mandate researchers to consider the impact of their research on Indigenous Peoples. The United Nations Declaration on the Rights of Indigenous Peoples (United Nations 2007) establishes Indigenous Peoples rights to data sovereignty and self-determination in research involving Indigenous knowledges.

This study points to the potential conflict in interests faced by boundary spanning researchers who work within institutions whose values may not always align with their own. Whyte (2018) called for mainstream scientists working with Indigenous peoples to honestly consider that they are representing, in least in some part, the interests of settler colonial institutions, even if they don't agree with the fundamental ideologies of those structures. Simpson (2004) points to mainstream environmental scientists' primary interest in the ecological aspects of Indigenous Knowledges as an indication that scientists relate to Indigenous

Knowledges as a tool to enhance Western Knowledge systems- rather than as equally rigorous and complex ways of understanding the world. Both Simpson (2004) and Whyte (2018) point to conflicts in understanding of what Indigenous Knowledges are for- i.e. as a way to enhance Western environmental management or as tools for Indigenous governance and self-determination- as continuance of scientific histories of settler-colonial extraction of resources and the oppression of Indigenous peoples. Similarly, interviewees in this study acknowledge that their role working within mainstream scientific institutions can limit their ability to fully prioritize the interests of their Indigenous community partners. Furthermore, they express concern that the current rise in interest in Indigenous Knowledges could harm Indigenous communities. This conflict in what knowledges do for Indigenous communities and what they do for mainstream scientific intuitions is likely impacting the level of benefit-sharing resulting from research partnerships between mainstream scientists and Indigenous communities- even in the case of those boundary spanning scientists who seek to balance power in their relationships.

To address this issue, some interviewees point to the possibilities to subvert, repurpose, or rebuild institutional structures in order to shift power in the research relationship away from themselves, and therefor away from the institutions where they work. These findings build on concepts from Indigenous studies scholar La Paperson (2017) who theorizes that it is possible to subvert settler-colonial structures in universities as a way to build a “decolonizing university.” La Paperson (2017) further suggests that it might be possible to create a machine that “assembles decolonizing machines out of scrap parts from colonial technology.” This echoes the infrastructural theory of change discussed by some interviewees. These sorts of strategies could move power and resources away from settler-colonial institutions and towards Indigenous

communities. However, changing institutions from within is likely only one tactic in transformation of academic institutions to better support Indigenous communities.

A key finding from this analysis is that performing boundary spanning work well requires abundance—specifically an abundance of time and resources. Boundary spanners who participated in this study emphasized that they struggle to attain such abundance or have special circumstances that have allowed them to gain needed resources and time. Furthermore, obtaining access to time and resources requires financial and administrative structures that address the special considerations of doing boundary spanning work with Indigenous communities, such as systems to pay people without burdensome paperwork or long waiting times to be reimbursed. Negotiating these structures requires trained, knowledgeable administrators and necessitates that institutions value boundary spanning work enough to provide that support. This intensity of resource needs by boundary spanners in environmental sciences parallels similar needs in other disciplines. For instance, Cooper (2019) identified that Indigenous Studies research that engages with Indigenous communities is particularly time- and resource-intensive, and researchers require substantial and sustainable support from institutions in order to effectively address Indigenous community priorities and enact solutions that benefit communities. Similarly in the field of ethnobiology, McAlvay et al. (2021) discuss the need for extra time and resources in order to build the relationships and trust that is necessary to avoid harmful, extractive approaches to data collection.

Obtaining access to time and resources requires financial and administrative structures that address the special considerations of doing boundary spanning work with Indigenous communities, such as systems to pay people without burdensome paperwork or long waiting times to be reimbursed. Negotiating these structures requires trained, knowledgeable

administrators and necessitates that institutions value boundary spanning work enough to provide that support. Access to knowledgeable administrative staff can also be a major barrier for access the resources needed to do community engaged research. Huff-Davis and colleagues (2018) argue that researchers who wish to engage appropriately and successfully with communities need to work closely with administrators trained in the special considerations of community-based research with Indigenous Peoples. They also identify the reimbursement system, which is ubiquitously used across research institutions, as a major barrier to community partnerships with Indigenous communities, as paying for research expenses up front and long timelines to receive subcontract payments or reimbursements burdens both community partners and researchers. Irby et al. (2021) identified a need for institutions to explicitly show their value for community engaged research not just to ensure access to resources but also to influence leadership and shape a supportive institutional culture for community engaged researchers in public health.

Furthermore, there is a need to build institutional administrative structures that respect and elevate Indigenous data sovereignty. In this research some interviewees discussed data ownership as a potential point of conflict between their institution and the communities they partner with. Others mentioned that Indigenous review boards and data sovereignty contracts were routine in any research done at their institution involving Indigenous peoples. This finding aligns with recommendations derived from Indigenous research governance and policy as per the "CARE (collective benefit, authority to control, responsibility, and ethics) Principles for Indigenous Data Governance" (Carroll et al. 2020) a set of guidelines developed by an international network of Indigenous data sovereignty networks and Indigenous scholars to ensure equitable benefit in the use of data related to Indigenous Knowledge. Garba et al. (2023) applied these principles apply to research legislation and policy in the U.S. and, similarly to this study,

conclude that institutions should develop administrative structures specific to Indigenous data sovereignty, such as requiring Indigenous experts review of research proposals and routine data sovereignty contracts.

This study also highlights a need to align incentive structures in institutions with the values and realities of boundary spanning research. In particular, this may require revising evaluation criteria for career progression and the currencies of that progression, such as funding and publication processes. The most common impediment identified by interviewees is the use of academic publication as the primary criteria for hiring and promotion. Most interviewees identified this metric as a major barrier to their own work, and to the recruitment, inclusion, and retention of Indigenous scholars in environmental scholarship. Previous research on incentives in boundary spanning research have had similar findings about lack of alignment in incentive structures and academic publishing (Lhoest et al. 2024) and the need to change expectations for research outcomes used in professional evaluation, such as including community-oriented research products in promotion packages (McAlvay et al. 2021, Trisos et al. 2021). Furthermore, while universities encourage researchers to do community-engaged work, the institutional metrics of academic success do not account for the extra time required to collaborate on research with communities (Styres et al. 2010). Trisos et al. (2021) also recommend fundamental changes in how authorship is viewed in professional evaluation, suggesting a shift towards a more collectivist vision of knowledge production by counting publications in professional evaluation based on substantial contribution to the work, rather than by emphasizing lead or corresponding authorship. Furthermore, I recommend that field specific criteria be applied to boundary spanning scholars working with Indigenous communities. Academic field is already routinely taken into account in professional evaluation criteria- for example ecologists are not expected to

publish as much as computer scientists and are not as highly cited as medical doctors. Boundary spanning scholars should also be expected to meet criteria that is realistic for their field.

The results of this study emphasize a need to review processes for funding, and publication in the scientific literature. Cooper (2019) found that Indigenous studies scholars regularly face reviewers who are inadequately trained in the methodologies and terminologies of Indigenous studies, a finding also noted by interviewees in this project. In addition to ensuring that evaluators and reviewers have basic foundational knowledge in Indigenous and community engaged methodologies, interviewees identified a need for specific criteria to evaluate researchers who work in partnerships with Indigenous communities. David-Chavez and Gavin (2018) recommend standards of research engagement with Indigenous communities and offer a series of questions that address Indigenous sovereignty at each stage of the research process to guide reviewers through evaluation processes. They found that studies with high levels of quality engagement with Indigenous communities often included a wide variety of research-related activity outside of simply doing data collection. They particularly emphasize the importance of community forums and community data review processes, as well as culturally informed local capacity building, training and activities for community members, youth engagement, and community-oriented knowledge dissemination including the use of Indigenous languages. The Canadian agency the Social Science and Humanities Research Council evaluates the level of community engagement in research proposals involving research with Indigenous Peoples. They present detailed guidance (Government of Canada 2012) on how to evaluate these proposals that include taking into account Indigenous ontologies and pedagogies; accounting for reciprocal benefit in research; and, similar to the findings of this study, including metrics such as life experience and community-oriented responsibilities when evaluating the capability of

Indigenous scholars. The boundary spanning characteristics and abilities developed by Hatch et al. (2023) and built on in this paper may also serve as additional criteria for evaluation, as was suggested by an interviewee.

Finally, a major finding from this work is, as Kimmerer and Artelle (2024) argue, it's "time to support Indigenous science" and particularly it's time to support Indigenous scientists. A major theme identified in this study is that boundary spanning environmental scholarship needs more Indigenous scientists, and that those scientists need support that is tailored to their experiences and research priorities. Both Indigenous and non-Indigenous interviewees emphasized this point multiple times in interviews. Indigenous scientists often sought to build cohorts within their fields and institutions in order to shift the balance of power towards Indigenous scholarship. Non-Indigenous scientists often felt that the people best qualified to do boundary spanning work are Indigenous scientists, whether they originate from the community they partner with or from elsewhere. Whyte (2018a) argues that Indigenous Knowledges "are associated with Indigenous capacities for resurgence and collective continuance. Therefore, their primary value is tied to the well-being of current and future Indigenous persons, families, communities, and nations" (pg. 75). In order to make sure Indigenous knowledges, as well as non-Indigenous knowledges, are used in service of Indigenous futures, Indigenous scientists doing boundary spanning work is needed.

In this study, most of the researchers I interviewed worked for mainstream scientific institutions with ontological and pedagogical foundations in settler colonial traditions. Consequently, the perspectives expressed in my interviews were shaped, at least in some part, by those settler-colonial traditions and the structures of power and incentives within them. Additionally, I did not speak with partners from Indigenous communities who partnered with the

interviewees. Consequently, I have no way to evaluate how much the researchers I interviewed are successful in bringing benefit to the communities with which they work. I have to trust the recommendations of the researchers that suggested them, the interviewees' own self-perception, and the fact that many have maintained long term research relationships with communities, which may suggest that their community partners are benefiting in some way from the research partnership. In addition, while this analysis was mainly deductive, I was unable to use a true grounded theory approach to this work due to a limited amount of time to conduct interviews. Consequently, I did not achieve theoretical saturation. It is possible if further interviews were conducted, other themes may have emerged or gained importance in the analysis.

Conclusion

Future work on institutional support for boundary spanning researchers working with Indigenous communities could look more closely at the funding policies and procedures from large funding agencies in order to offer specific suggestions for infrastructural change within funding structures. Comparing funding policies from agencies in the U.S. and Canada, and across field such as social science and environmental science, could elucidate why some funding structures work better for boundary spanning research than others. Several interviewees pointed to the need for guidelines and trainings both to prepare administrators and leadership to support boundary spanning work and for boundary spanners themselves to become better partners to Indigenous communities. Further investigation into what curricula could best meet these needs would be a useful next step.

While boundary spanners may feel more or less supported by their institutions, generally they face barriers related to professional evaluation metrics, in particular the use of academic

publishing as a primary metric of success. Administrative burdens faced by boundary spanning researchers are high, which can limit the resources and capacity those researchers have to invest into their research relationships with Indigenous community partners. Consequently, in order to do their work well, boundary spanning researchers must become experts in the administrative structures of their institutions and/or find workarounds to avoid administrative barriers. This work can amount to extra duties for boundary spanning researchers which are not necessarily included in their job descriptions or accounted for in promotion processes. This can compound career progression barriers that boundary spanners already face due to longer research and publication timelines and greater emphasis on community-oriented research products.

Furthermore, Indigenous scholars, who are key to making boundary spanning work meaningful and beneficial to Indigenous communities, face additional barriers to participating in mainstream scientific institutions. Consequently, in order to facilitate boundary spanning environmental research that benefits Indigenous communities, it is necessary to provide support for Indigenous scholars.

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**UNIVERSITY OF WASHINGTON
CONSENT FORM**

Interviews on Partnerships Between Indigenous Communities and Mainstream Scientists

We are asking you to participate in a research study as an interviewee. This form gives you information to help you decide whether to be in the study. Being in the study is voluntary. Please read this carefully. You may ask any questions about the study. Then you can decide whether you want to be in the study.

CONTACT INFORMATION

PI and Faculty Advisor: Dr. Phil Levin, Professor, School of Environmental & Forest Sciences, School of Marine & Environmental Affairs, pslevin@uw.edu, 425-777-6656

Graduate student and contact for interviewees: Sofi Courtney, School of Environmental & Forest Sciences and American Indian Studies, scourt2@uw.edu, 267-994-5304

KEY INFORMATION ABOUT THIS STUDY

- This research is designed to gather information about how research partnerships between Indigenous communities and environmental scientists function within mainstream scientific institutions, how researchers working for those institutions are supported or not supported by their employers to make reciprocally beneficial research relationships, and how career progression of researchers is influenced by doing collaborative work with Indigenous communities.
- Information obtained from interviews will be analyzed in order to identify common themes from interviewees perspectives and to identify how demographics and career stage are related to the type of support or challenges researchers encounter while working in partnership with Indigenous communities. These data will be used in Sofi Courtney's master's thesis and one anticipated academic publication.
- You will be one of approximately 20 people interviewed for this research.
- The interviews will take place remotely via an online platform such as Zoom. If you prefer, it is possible to conduct the interview over the phone instead of Zoom.
- Participation involves being interviewed by a researcher from the University of Washington. The interview will last approximately 60 or more minutes.
- An audio and video recording of the interview, as well as an automatic transcription, will be made during the interview using Zoom's automated functions. A notification will pop up when recording begins. In addition, an audio recording will be made by the researcher using a secondary device. Notes will be written during the interview by the researcher. If

you do not want to be recorded, you can submit a written reponse. If neither of these options work for you, you will not be able to participate in the study.

- You will have the opportunity to review and approve the transcript of the interview before analysis begins.
- If you feel uncomfortable in any way during the interview session, you have the right to decline to answer any question or to end the interview.

CONFIDENTIALITY OF RESEARCH INFORMATION

- Your name and identifying information will remain anonymous in any materials that result from this research including Sofi Courtney’s thesis or any other potential reports, publications, or presentations.
- The researcher will not identify you by name in any reports using information obtained from this interview. Your confidentiality as a participant in this study will remain secure. This will be done by changing your name and disguising any details of your interview which may reveal your identity or the identity of the people you speak about. Disguised extracts from your interview may be quoted in published papers, reports, conference presentations, website pages, a thesis, and/or a published book.

This study has been explained to me. I volunteer to take part in this research. I have had a chance to ask questions. I will receive a copy of this consent form.

Printed name of subject

Signature of subject

Date

Appendix 2. Pre-interview survey

Please fill out the questions below. This three-part survey is expected to take less than 10 minutes to complete. If you are signed in to a google account, your response will be automatically saved, and you can return to complete the survey at any time. If you do not wish to answer a question, or it does not apply to you, please respond with "na" for not applicable. Thank you very much for your response.

1.Email

2.Name:

3. In *Boundary spanners: a critical role for enduring collaborations between Indigenous communities and mainstream scientists*, Hatch et al. (2023) define a boundary spanner as “a trusted individual, or close team of individuals, who simultaneously engages with and/or is a member of the mainstream scientific community while serving their (partner) Indigenous community as their highest priority” (pg. 4). In your own opinion, does this definition apply to you?

Mark only one oval.

Yes

Somewhat

No

4. Age:

5.Race/Ethnicity:

6.Gender:

7.Tribal affiliation, if applicable:

8.Indigenous community(ies) that you partner with:

9.How long have you partnered with each community (roughly)?

10.Professional title:

11. Career stage:

Mark only one oval.

Less than 5 years in field

5-10 years in field

10-20 years in field

More than 20 years in field

12. What professional or academic fields do you identify as?

Boundary spanning characteristics

For each of the nine boundary-spanning characteristics and abilities listed below, please rank how much this characteristic or ability applies to you in your role as a collaborator with Indigenous community(ies). *Adapted from Hatch et al. 2023. Boundary spanners, a critical role for enduring collaborations between Indigenous communities and mainstream scientists. Ecology and Society 28(1):41*

13. **Braided identity**- Situated in the Indigenous community and in the mainstream science community.

Mark only one oval.

This characteristic never applies to me

1

2

3

4

5

6

This characteristic always applies to me

14. **Approachable**- Respects and invites conversation and interaction from all parties.

Mark only one oval.

This characteristic never applies to me

1

2

- 3
- 4
- 5
- 6

This characteristic always applies to me

15. **Available**- On call both formally (nine-to-five) and informally (24-7). Emotionally intelligent. Empathetic, sympathetic, self-aware, and community-aware.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

16. **Knowledgeable**- A dual knowledge holder: deep knowledge of the customs, practices, systems of power, and communication pathways of their (partner) Indigenous community; a trusted source of disciplinary knowledge to their community.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

17. **Resourceful networker**- A connector and networker; knows where to go to find answers on both sides of the boundary.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

18. Hears what others can not- Hears the unspoken message; understands beyond the words to the intent; knows how words will be interpreted.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

19. Committed- Long-term dedication to their (partner) Indigenous community; building trust on both sides of the boundary.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

20. **Balance power**- Seeks to alter power dynamics across the boundary to ensure equity and respect for the Indigenous community.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

21. **Create space for community knowledge**- Helps frame communication and interactions across the boundary to respect, balance, and hold space for all knowledge systems to be recognized and valued, particularly Indigenous community knowledge.

Mark only one oval.

This characteristic never applies to me

- 1
- 2
- 3
- 4
- 5
- 6

This characteristic always applies to me

Institutional Support

For each attribute of a successful partnership listed below, please rank how much your home institution (that is, the institution at which you are employed, rather than the individual external grants or contracts that you have obtained, if applicable) supports you in achieving a successful partnership in your role as a collaborator with Indigenous community(ies). *Adapted from Hatch et al. 2023. Boundary spanners, a critical role for enduring collaborations between Indigenous communities and mainstream scientists. Ecology and Society 28(1):41*

22. Researcher elevates and celebrates other voices, particularly non-dominant group members; keen to listen and learn. Researcher is flexible, open-minded, willing to modify research plan to

meet objectives of the community; willingness to change direction mid-project with community input.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

23. Researcher is knowledgeable about tribal sovereignty and data and knowledge ownership. Researcher goes through formal process of securing permissions, signed partnership agreements, formal agreements, and related norms and adhering to cultural protocols. Recognizes when data or knowledge is/is not appropriate to make public.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

24. Researcher is collaborative in all aspects of the project. Researcher writes grants collaboratively with Indigenous community members and/or content experts. Researcher is willing to cede expertise.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3

- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

25. Researcher is willing to navigate the university, government agency and/or grantor systems with community interests centered.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

26. Researcher gives power and/or authority to tribal members. Researcher recognizes the experience and teachings of local knowledge holders as akin to university training.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

27. Researcher brings desired skills and knowledge to the community. Questions are driven by a community group, centered on community interest or need.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

28. In the research project community members, and boundary spanner, are compensated for time, expertise, and project implementation.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

29. The research project is part of a long-term relationship maintained over a series of projects and fueled by personal relationships and mutual respect. The research project is supported by constant shifts in power and authority between team members and across the boundary.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

30. The research project is Place-based and geographically centered within traditional community boundaries

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

31. The research project brings together tribal members, whether they are local or not

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5
- 6

The institution I work for provides generous support for me to achieve this attribute

32. Project logistics include pre-project time devoted to develop/deepen relationships, cocreate the project, and apply for needed permits and formal agreements. Project includes time for community interaction and listening sessions.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

- 1
- 2
- 3
- 4
- 5

6

The institution I work for provides generous support for me to achieve this attribute

33. Project logistics include project flexibility built in to allow for unexpected opportunities and connections.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

1

2

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The institution I work for provides generous support for me to achieve this attribute

34. Project logistics includes elements centered on tribal youth and community capacity building.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

1

2

3

4

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The institution I work for provides generous support for me to achieve this attribute

35. Project logistics bring elders, students, teachers, and mainstream scientists/academics together (e.g., science and culture camp).

Mark only one oval.

The institution I work for does not support me in achieving this attribute

1

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The institution I work for provides generous support for me to achieve this attribute

36. Project logistics foster long term relationships between teachers and scientists.

Mark only one oval.

The institution I work for does not support me in achieving this attribute

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The institution I work for provides generous support for me to achieve this attribute

Appendix 3. Interview guide

1. Introductory materials

- a. Hello, thank you so much for taking the time to meet with me. It's an honor that you chose to participate, and I am really excited to hear your thoughts.
- b. I'm going to be recording this and will be using the zoom transcription function, is that okay with you? Great, thanks (start recording/transcribing)
- c. I saw that you reviewed and signed the consent form, thank you for that. OR Could you please review and sign the consent form? Here's a link to it.
 - i. Do you have any questions for me about the form?
 - ii. Just to reiterate, you are able to revoke your consent for me to use the information you are providing me at any time, before, during, or after this chat. I will be anonymizing these interviews and will offer you a chance to review the transcribed interview before I code it. Does that all sound good?
- d. Also, I saw that you filled out the survey, thank you so much for doing that OR Are you able to fill out this short survey for me before we start? I'd like to collect this information before we talk so that everyone is doing it in the same order.
 - i. <https://forms.gle/ecnXRrx4nkyK7v2w7>
 - ii. Do you have any questions for me about the survey?

2. Interview questions

- a. Partnership questions
 - i. Can you tell me a little about the communities you partner with and the projects you partner on?
 - ii. In the survey you completed, did any characteristics or abilities stand out to you as particularly important in your own work? Can you discuss how you enact those characteristics within your partnership? (if you need a reminder, see table of boundary spanning characteristics and abilities at the end of this document)
- b. Institutional questions
 - i. What institutional structures support you in your work?
 - ii. What institutional structures are a hindrance to your work?
 - iii. Can you talk a bit about how you negotiate within your institution to make your work happen given the institutional opportunities or barriers you discussed above?
- c. Career questions
 - i. How has your career progression, i.e. external impacts (for instance from colleagues, institution, funders etc.) been impacted by doing this kind of work?
 - ii. Have your own career goals, i.e. personal relation to work and your institution, been changed by doing boundary spanning work? If so, how?
- d. Supplementary question

- i. How do you engage your students or other mentees in this kind of work?
- ii. How do you make change in your university?

3. Wrap up

- a. Thank you so much for taking the time to meet with me. I learned a lot and this will be super helpful for the project. Is there any one else you think I should talk to?
- b. I will send you a copy of the transcript of this interview within the next couple weeks, if you'd like to review it before I start coding. And I'll keep you informed about any publications or other products that come out of this work.
- c. Please do get in touch if you have any questions at all, or any further thoughts on our discussion.
- d. This was so great, thanks!

Boundary spanner: “a trusted individual, or close team of individuals, who simultaneously engages with and/or is a member of the mainstream scientific community while serving their (partner) Indigenous community as their highest priority”

Appendix 4. Code book

1 Boundary spanning, relationships with institutions, and change

1.1 theory of change

1.1.1 US v Canada

1.1.1.1 west coast vs east coast

1.1.1.2 values: US vs Canada

1.1.1.3 grants: US vs Canada

1.1.2 funding access becoming easier

1.1.3 more boundary spanners

1.1.4 communities demand it

1.1.5 capitalism

1.1.6 faculty pushing

1.1.7 growth of Indigenous research methodologies

1.1.8 prayers

1.1.9 small group of committed people

1.1.10 land grab publication

1.1.11 more positions

1.1.12 shift in societal values

1.1.13 policy

1.1.13.1 Biden administration

1.1.14 tribes have more power

1.1.15 Tribes have research protocols

1.1.16 funders values

1.1.16.1 decolonization

1.1.17 professional societies

1.1.18 publishing

1.1.19 more Indigenous scholars

1.1.20 make change in science

1.1.21 "the jury is still out"

1.1.22 tolerated to celebrated

1.1.23 changes in policy/protocols

1.2 trend

- 1.2.1 rise in interest
 - 1.2.1.1 cool, trendy
- 1.2.2 authenticity, benefit
- 1.2.3 incentives
- 1.2.4 harm
- 1.3 perception of institution
 - 1.3.1 agencies
 - 1.3.2 social science vs quant science
 - 1.3.3 mission
 - 1.3.3.1 engaged university
 - 1.3.3.2 who does the institution serve?
 - 1.3.4 relationship to policy
 - 1.3.5 promotion, showcase
 - 1.3.6 what is the institution?
 - 1.3.7 Institutional relationships with Tribes
 - 1.3.7.1 Institutions rep in Indian country
 - 1.3.8 disconnect between researcher/community and institution
 - 1.3.9 not there yet
 - 1.3.9.1 persistence
 - 1.3.9.2 inertia
 - 1.3.10 size of institution
 - 1.3.11 institutional values
 - 1.3.11.1 neither support or impediments
 - 1.3.11.2 supportive
 - 1.3.11.3 institutional/departmental culture
 - 1.3.11.4 local vs larger scale
 - 1.3.11.5 box ticking
 - 1.3.11.6 value
 - 1.3.11.6.1 change in values
 - 1.3.11.6.2 who gets considered expert
 - 1.3.11.6.3 what is valued as knowledge
 - 1.3.11.6.4 what is valued

- 1.3.12 incentives
- 1.3.13 job search, hiring
- 1.4 A priori codes
 - 1.4.1 Attributes of successful partnerships
 - 1.4.1.1 Research project
 - 1.4.1.1.1 Place-based
 - 1.4.1.1.2 Shifts in power
 - 1.4.1.1.3 Long term relationship
 - 1.4.1.1.4 fair compensation
 - 1.4.1.1.5 Questions centered on community
 - 1.4.1.2 Project logistics
 - 1.4.1.2.1 Fosters long term relationships
 - 1.4.1.2.2 Brings people together
 - 1.4.1.2.3 Youth and capacity building
 - 1.4.1.2.4 project flexibility
 - 1.4.1.2.5 In project time
 - 1.4.1.2.6 Pre-project time
 - 1.4.1.2.7 Brings together tribal members
 - 1.4.1.3 Mainstream scientific researcher
 - 1.4.1.3.1 Flexible and openminded
 - 1.4.1.3.2 is useful
 - 1.4.1.3.3 Values local knowledge
 - 1.4.1.3.4 Shift power to community
 - 1.4.1.3.5 Elevates and celebrates other voices
 - 1.4.1.3.6 Navigate colonial systems
 - 1.4.1.3.7 Writes grants collaboratively
 - 1.4.1.3.8 Collaborative
 - 1.4.1.3.9 Knows what to keep private
 - 1.4.1.3.10 Seeks permission
 - 1.4.1.3.11 Knowledgeable about sovereignty
 - 1.4.2 characteristics and abilities of a boundary spanner
 - 1.4.2.1 Create space for community knowledge

- 1.4.2.2 Balance power
- 1.4.2.3 Committed
- 1.4.2.4 Hears what others cannot
- 1.4.2.5 Resourceful networker
- 1.4.2.6 Knowledgeable
- 1.4.2.7 Available
- 1.4.2.8 Approachable
- 1.4.2.9 Braided identity
- 1.5 Power
 - 1.5.1 take role of learner
 - 1.5.2 power of ideas coming from community
 - 1.5.3 uneven power relations
 - 1.5.4 not everything has to be done in direct collaboration
- 1.6 tribal values
- 1.7 motivations
 - 1.7.1 impact
 - 1.7.2 move resources to community
 - 1.7.3 personal values
 - 1.7.4 responsibilities
 - 1.7.5 to solve problems
- 1.8 humility
 - 1.8.1 what is participation
 - 1.8.2 should we do this?
 - 1.8.3 admitting fallibility
- 1.9 trauma
- 1.10 spectrum of boundary spanning
 - 1.10.1 generalizing to local communities
 - 1.10.2 knowledge integration vs two row wampum
 - 1.10.3 heuristic
 - 1.10.4 aspirational
- 1.11 personality, identity
 - 1.11.1 self-identify

- 1.11.1.1 home tribe versus others
 - 1.11.2 skills in context
 - 1.12 key skill is relationship
 - 1.12.1 seek guidance from partners
 - 1.12.2 cups of tea
 - 1.13 mentoring
- 2 The nuts and bolts of boundary spanning work within mainstream
 - 2.1 creative finagling to fit into existing structure
 - 2.1.1 "stress"
 - 2.1.2 clout
 - 2.1.3 understand institutional structure
 - 2.1.4 policies and barriers that are being gently broken
 - 2.1.5 tricks and workarounds
 - 2.1.5.1 turning bureaucracy to advantage
 - 2.1.5.2 leverage basic science to supplement
 - 2.1.5.3 legal implications
 - 2.1.5.4 money
 - 2.1.5.5 career requirements
 - 2.2 Project and career functioning
 - 2.2.1 administration
 - 2.2.1.1 reimbursement
 - 2.2.1.2 paying people
 - 2.2.1.3 grant management
 - 2.2.1.4 admin are also figuring it out
 - 2.2.1.5 good relationship
 - 2.2.1.6 continuity of individual relationships
 - 2.2.1.7 in person vs remote
 - 2.2.1.8 IRB vs tribal permissions
 - 2.2.1.9 admin: us vs Canada
 - 2.2.1.10 Indigenous data contract
 - 2.2.2 career progression
 - 2.2.2.1 Qualifications

- 2.2.2.1.1 who does a researcher represent
- 2.2.2.1.2 who are representatives of communities or Tribes
- 2.2.2.1.3 brought in preexisting relationship
- 2.2.2.1.4 experience versus education
- 2.2.2.2 maintain productivity
- 2.2.2.3 ambition
- 2.2.2.4 accountability
- 2.2.2.5 consider alternate career
- 2.2.2.6 implicit exploitation
- 2.2.2.7 But actually, it's been hard for me to keep it up
- 2.2.2.8 prestige
- 2.2.2.9 benefit
- 2.2.2.10 "science lives in an ivory tower"
- 2.2.2.11 early career vs later career
- 2.2.2.12 got me this job
- 2.2.2.13 Publishing
 - 2.2.2.13.1 publishing and career advancement
 - 2.2.2.13.2 publishing on process
 - 2.2.2.13.3 review structure
 - 2.2.2.13.4 partners as co-authors
 - 2.2.2.13.5 unpublished work
 - 2.2.2.13.6 publishing vs community priorities
 - 2.2.2.13.7 nonacademic products
 - 2.2.2.13.7.1 knowledge mobilization
 - 2.2.2.13.8 publishing to support change
 - 2.2.2.13.9 changing access publishing
 - 2.2.2.13.10 Publishing less
- 2.2.2.14 professional evaluation
 - 2.2.2.14.1 evaluation standards
 - 2.2.2.14.1.1 knowledge mobilization
 - 2.2.2.14.2 lip service but not included in rewards structure
 - 2.2.2.14.3 people doing evaluation

- 2.2.2.14.4 promotion structure
- 2.2.2.14.5 pubs and grants
- 2.2.2.15 promotion criteria
- 2.2.3 funding
 - 2.2.3.1 seed/pilot funding
 - 2.2.3.2 permissions
 - 2.2.3.3 data sovereignty
 - 2.2.3.4 incentives to partner
 - 2.2.3.5 pi finds funds, not university
 - 2.2.3.6 private donor
 - 2.2.3.7 interdisciplinary funding
 - 2.2.3.8 educate funders
 - 2.2.3.9 cooperative agreement vs grant
 - 2.2.3.10 no cost extension
 - 2.2.3.11 not enough to be worth it
 - 2.2.3.12 multiple funding streams
 - 2.2.3.13 intentions of funders
 - 2.2.3.14 discretionary funding
 - 2.2.3.15 grants: collaboration with partner
 - 2.2.3.16 more competition
 - 2.2.3.17 small grants
 - 2.2.3.18 funders values
 - 2.2.3.19 "just throwing money around"
 - 2.2.3.20 "we don't tick boxes"
 - 2.2.3.21 self-determined
 - 2.2.3.22 funding initiatives
 - 2.2.3.23 flexibility
 - 2.2.3.24 base grant
 - 2.2.3.25 overhead
 - 2.2.3.26 comments on specific funding agencies
 - 2.2.3.26.1 State funding
 - 2.2.3.26.2 nsf

- 2.2.3.26.3 noaa
- 2.2.3.26.4 NSERC
- 2.2.3.26.5 SSHRC
- 2.2.3.26.6 national endowment for the humanities
- 2.2.3.26.7 Foundations
- 2.2.3.26.8 National Cancer Institute
- 2.2.3.27 advantage submitting with partners
- 2.2.4 tribal college
 - 2.2.4.1 Complimentary strength of TCUs vs non-Native univer
- 2.2.5 mentees
 - 2.2.5.1 funding
 - 2.2.5.2 peer mentoring
 - 2.2.5.3 keep Indigenous youth away from academic culture
 - 2.2.5.4 informal mentees
 - 2.2.5.5 have own relationship
 - 2.2.5.6 bring into existing relationship
 - 2.2.5.7 permissions
 - 2.2.5.8 mentees and career
 - 2.2.5.9 reduce risk
 - 2.2.5.10 graduate student: increased risk
 - 2.2.5.11 timeline
 - 2.2.5.12 previous experience
 - 2.2.5.13 trust
 - 2.2.5.14 varying levels of risk
- 2.2.6 risks
 - 2.2.6.1 potential for harm
- 2.3 luck, luxury. exceptions
 - 2.3.1 on their own capacity
 - 2.3.2 career advancement
 - 2.3.3 resources
 - 2.3.4 academic skill
 - 2.3.5 interest in field

2.3.6 luxury of time, low pressure

3 support and impediments to inform infrastructural change

3.1 Desired outcomes

3.1.1 Sufficient resources to build long term, meaningful relations

3.1.1.1 long term efforts

3.1.1.2 support from leadership

3.1.1.3 different support for quant and qual

3.1.1.4 institution acknowledge long term commitment

3.1.1.5 funding

3.1.1.5.1 funding to make relationship

3.1.1.5.2 dedicated funding

3.1.1.6 resources

3.1.1.7 sustainable funding

3.1.2 Structures that incentivize boundary spa, esp. professional e

3.1.2.1 emphasis on rigorous science

3.1.2.2 recognition

3.1.2.3 highlight work

3.1.2.4 knowledgeable evaluators

3.1.2.5 quality over quantity

3.1.2.6 reviewers and evaluators with background

3.1.2.7 space to hold those relationships throughout life

3.1.2.8 title

3.1.2.9 evaluation

3.1.2.9.1 know evaluation criteria

3.1.2.9.2 evaluation standards

3.1.3 Sufficient time to build and maintain research relationships,

3.1.3.1 lack of interference

3.1.3.2 not being rushed

3.1.3.3 balance engagement with time capacity

3.1.3.4 extended timeline

3.1.3.5 spend time in community

3.1.3.6 take time to learn protocols

- 3.1.3.7 time for relationship building
- 3.1.3.8 time to dream about future projects
- 3.1.4 Institutional structures that bring together boundary spanning
 - 3.1.4.1 Training and mentorship specific to boundary spanning
 - 3.1.4.1.1 trainings
 - 3.1.4.1.2 curriculum
 - 3.1.4.2 research centers/institutes/communities
 - 3.1.4.3 existing knowledge base
 - 3.1.4.4 multidisciplinary team
 - 3.1.4.5 working with other boundary spanners
 - 3.1.4.6 interdisciplinary department
 - 3.1.4.7 culture (+)
 - 3.1.4.8 academic community
- 3.1.5 Administrative protocols, administrative roles, and administrative
 - 3.1.5.1 infrastructure
 - 3.1.5.2 Less time dealing with admin, researchers, and Tribal people
 - 3.1.5.2.1 hiring community members
 - 3.1.5.2.2 mediate Tribal capacity
 - 3.1.5.2.3 way to show partnership with tribe without letters
 - 3.1.5.3 action, not just words
 - 3.1.5.4 guidance from Tribal relations
 - 3.1.5.5 diversity officer
 - 3.1.5.6 tribal liaison
- 3.1.6 A critical mass of Indigenous researchers
 - 3.1.6.1 support for Indigenous students
 - 3.1.6.2 Support for Indigenous scholars
 - 3.1.6.2.1 cohorts
 - 3.1.6.3 more Indigenous scholars
 - 3.1.6.3.1 Indigenous studies dept
 - 3.1.6.3.2 prayer
 - 3.1.6.3.3 bring in whole selves
- 3.1.7 Project goals and research processes are led by community researchers

- 3.1.7.1 no preconceived agenda
- 3.1.7.2 Language
- 3.1.8 Standard for qualifications, and permissions that facilitate b
 - 3.1.8.1 quality standards for permissions
 - 3.1.8.2 Structures to protect and enact Tribal sovereignty
 - 3.1.8.3 Tribal permissions
 - 3.1.8.4 standard of what qualifies someone to act as representa
- 3.1.9 ability to be physically present in community
 - 3.1.9.1 out of the ivory tower
 - 3.1.9.2 remote access
 - 3.1.9.3 located where community is
 - 3.1.9.4 get out of the university more
- 3.1.10 Publication policies benefit Indigenous scholars and comm
 - 3.1.10.1 Reviewers and editors that have background
 - 3.1.10.2 costs
- 3.2 Impediments
 - 3.2.1 capacity
 - 3.2.1.1 too many community projects
 - 3.2.1.2 teaching load
 - 3.2.1.3 time capacity
 - 3.2.1.4 collaborative grant writing: capacity
 - 3.2.1.5 Tribes inundated with request
 - 3.2.1.6 extra burden on Black Indigenous and POC scholars
 - 3.2.2 funding
 - 3.2.2.1 overhead/indirect costs
 - 3.2.2.2 granting agency policy
 - 3.2.2.3 NSF access
 - 3.2.2.4 funding timeline
 - 3.2.2.5 preconception of grant
 - 3.2.2.6 funding priorities
 - 3.2.2.7 access to funding
 - 3.2.2.8 funding procedure

- 3.2.3 bureaucracy
 - 3.2.3.1 permitting
 - 3.2.3.2 IRB
 - 3.2.3.3 institution legal office
 - 3.2.3.4 transition to new administration
 - 3.2.3.5 local agency policy
 - 3.2.3.6 time spent dealing with
 - 3.2.3.7 travel logistics
 - 3.2.3.8 paying people
 - 3.2.3.9 prevents good work from happening
 - 3.2.3.10 impacts relationships
 - 3.2.4 professional advancement
 - 3.2.4.1 leadership
 - 3.2.4.2 evaluation standards
 - 3.2.4.3 professional constraints
 - 3.2.4.4 difficulty doing follow up
 - 3.2.4.5 timeline
 - 3.2.4.5.1 existing relationships make things faster
 - 3.2.4.6 when life stuff comes up
 - 3.2.5 covid
 - 3.2.6 distance
 - 3.2.6.1 move for position
 - 3.2.7 bad practices in the past
 - 3.2.8 lack of connection to peers, mentors, and training
 - 3.2.9 institution values novel, innovation
 - 3.2.10 publishing
 - 3.2.10.1 reviewers
 - 3.2.11 to Native scholars
 - 3.2.11.1 recruiting and retaining Indigenous faculty
 - 3.2.12 dangerous
- 3.3 recs
- 3.3.1 Revise promotion processes and evaluation criteria

- 3.3.1.1 rec: support from leadership
 - 3.3.1.2 incentives
 - 3.3.1.2.1 rec: reward long term research relationships
 - 3.3.1.2.2 rec: revise professional evaluation processes
 - 3.3.1.2.2.1 rec: counts as service
 - 3.3.1.2.2.2 rec: extended timelines
 - 3.3.1.2.2.3 rec: revise evaluation criteria
 - 3.3.1.2.2.3.1 rec: count non-academic publications
 - 3.3.1.2.2.3.2 rec: deemphasize importance of publicat
 - 3.3.1.2.2.3.3 rec: count societal impact in evaluation
 - 3.3.1.2.2.4 rec: count interdisciplinary work
 - 3.3.1.2.2.5 rec: provide evaluation guidance specific to c
 - 3.3.1.2.2.6 rec: make evaluation criteria more transparen
 - 3.3.1.2.3 rec: awards for work
 - 3.3.1.3 Rec: Support early career scholars to access this work
 - 3.3.1.4 rec: support through life stages
 - 3.3.1.5 rec: support processes-focused work
 - 3.3.1.6 rec: value 'mundane' work
- 3.3.2 Make access to resources easier and more flexible
 - 3.3.2.1 rec; make funding directly available to community men
 - 3.3.2.2 rec: more funding
 - 3.3.2.3 rec: revise funding criteria to include community engag
 - 3.3.2.4 rec: increased flexibility with funds, projects and produ
 - 3.3.2.5 rec: base grants, reserves, stable discretionary funding
 - 3.3.2.6 rec: make extensions easy, fast and transparent
 - 3.3.2.7 rec: more interdisciplinary funding opportunities
 - 3.3.2.8 rec: remove cost sharing for Tribes and Tribal nonprofi
 - 3.3.2.9 rec: longer term funding structures
 - 3.3.2.10 rec: small accessible grants
 - 3.3.2.11 rec: make resources easier to access
 - 3.3.2.11.1 rec: make it easier to pay people
 - 3.3.2.11.2 rec: make it easier to get cash or reimburse quick

- 3.3.3 Support Indigenous scholars and Indigenous scholarship
 - 3.3.3.1 REC: revise qualification standards
 - 3.3.3.2 rec: infrastructure to support Indigenous scholars
 - 3.3.3.2.1 rec: support language revitalization
 - 3.3.3.2.2 Native student scholarships
 - 3.3.3.2.3 support for Indigenous scholars
 - 3.3.3.2.4 flexible training programs
 - 3.3.3.2.5 rec: support and connect to Indigenous studies dep
 - 3.3.3.2.6 rec: include Indigenous studies in entire curriculur
 - 3.3.3.3 REC: more positions
 - 3.3.3.4 REC: make permanent position
 - 3.3.3.5 rec: Discuss support for Indigenous scholarship in hirin
 - 3.3.3.6 REC: hire more Indigenous scholars
 - 3.3.3.7 rec: support tribal colleges
 - 3.3.3.8 rec: build capacity at tribal colleges
- 3.3.4 Increase administrative capacity for boundary spanning proj
 - 3.3.4.1 permissions
 - 3.3.4.1.1 REC: Quality Tribal collaboration permission stan
 - 3.3.4.1.2 rec: Indigenous data contract
 - 3.3.4.1.3 rec: Indigenous ethics review board
 - 3.3.4.1.4 rec: Tribal relations office
 - 3.3.4.1.5 revise IRB/permission structures
 - 3.3.4.2 rec: reduce administrative burden on researchers
 - 3.3.4.3 rec: make admin personally accessible
 - 3.3.4.4 rec: offer guidance for administrators
 - 3.3.4.5 rec: specialist administrators
 - 3.3.4.6 rec: reduce administrative burden on Tribes/communiti
- 3.3.5 Reduce or remove preconception of grants/projects
 - 3.3.5.1 rec: provide support to take time before submitting proj
 - 3.3.5.1.1 rec: grant for pre-project relationships building
 - 3.3.5.2 rec: include incentives and support for submitting with
 - 3.3.5.3 rec: remove or reduce preconception of grant funding

- 3.3.6 Build an institutional culture that supports the work
 - 3.3.6.1 REC: deal with past injustice
 - 3.3.6.2 rec: enduring institutional relationships that mentees ac
 - 3.3.6.3 rec: support interdisciplinary teams
 - 3.3.6.4 rec: consider this work real science
- 3.3.7 Support boundary spanners to be physically present in comm
 - 3.3.7.1 rec: support researchers/institutions to be physically clc
 - 3.3.7.1.1 rec: events in community
 - 3.3.7.2 rec: get out of the university
 - 3.3.7.3 REC: remote access
- 3.3.8 Bring together boundary spanning researchers
 - 3.3.8.1 rec: bring together scholars, institutes
 - 3.3.8.1.1 rec: faculty peer learning
 - 3.3.8.2 rec: establish centers, institutes, and initiatives
- 3.3.9 Build time for boundary spanning work into positions
 - 3.3.9.1 rec: reward structure for DEI/community work
 - 3.3.9.2 rec: build the time for boundary spanning work into pos
 - 3.3.9.2.1 rec: rearrange teaching to facilitate time in commu
- 3.3.10 rec: provide training
- 3.3.11 Revise publishing processes
 - 3.3.11.1 rec: revise journal publishing policies
 - 3.3.11.2 rec: revise review structures
 - 3.3.11.3 rec: make publishing more accessible
 - 3.3.11.4 rec: include Indigenous peoples in all publishing