Supplementary Materials

Section A

Restoration Initiative One (RI1) Description

RI1 involves the improvement of habitat for a dragonfly, the clamp-tipped emerald (*Somatochlora tenebrosa*), at Scotsdale Farm located within the Silver Creek Watershed, a subwatershed of the Credit River. The area surrounding Scotsdale Farm has been the focus of restoration efforts (e.g., riparian tree planting) for close to two decades and the property itself, with trout streams and a small dam, has received attention for a number of years from different groups wanting to build on the positive work done in the area. In the past, conservation organizations were unsuccessful in obtaining permission to plant trees at Scotsdale Farm which is owned by Ontario Heritage Trust (OHT). This changed however, with the discovery, made by an entomologist hired by Credit Valley Conservation (CVC), of a provincially rare dragonfly at Scotsdale Farm. On several occasions in 2011 and 2012, the entomologist identified the presence of a number of adult clamp-tipped emeralds (Frania 2012). He suggested to Trainee A that the habitat for this dragonfly could be improved by planting trees in a swale to increase water retention which would create a greater source of water for nearby streams and a greater source of food for fish in the streams. Through a collaborative effort including CVC, OHT, and a stewardship organization, a plan was created to plant 150 trees and shrubs in a wet, low-lying area near a perennial stream. The plan was approved in 2014 and the work was completed in fall 2015 with the help of high school students participating in a program run by CVC. While the goal for this project was to improve habitat for the rare dragonfly, Trainee A also saw this project as an opportunity for future work as part of a larger, longer term restoration program at Scotsdale Farm.

Evaluation Framework

Table S1. Framework for evaluating process and outcomes of restoration initiatives in relation to social-ecological resilience

			GENERAL PHASES OF ECOLOGICAL RESTORATION PROCESS					RESTORATION OUTCOMES	
			Problem identification	Defining goals and objectives	Designing a restoration plan	Implementation	Monitoring and evaluation	Ecological outcomes	Social outcomes
PRINCIPLES FOR BUILDING RESILIENCE IN SES	Key SES properties to be managed	Maintain diversity and redundancy							NA
		Manage connectivity							NA
		Manage slow variables and feedbacks							NA
	Key attributes of the governance system	Foster CAS thinking						NA	
		Encourage learning and experimentation						NA	
		Broaden participation						NA	
		Promote polycentric governance systems						NA	

NA = not assessed

Breakdown of Data Sources Used

Table S2. Breakdown of data sources used for evaluation of Restoration Initiative One

Description of Initiative	Evaluation of Initiative
- Transcript from semi-structured interview with a past trainee who was extensively involved in the initiative - Excerpt from the entomologist's final report to Credit Valley Conservation on rare Odonata in the Credit River Watershed - Scotsdale Farm website	- Transcript from semi-structured interview with a past trainee who was extensively involved in the initiative - Data from vegetation inventories

Treatment of Biophysical Data for Restoration Initiative One

Woody Vegetation Inventories

Data from the vegetation inventories were used to create a table summarizing and comparing what was found in each inventory. The table contains names of the species identified, total number of individuals and stems for each species, and total number of individuals and stems across all species. The information in the table was then used to calculate and compare Shannon entropy (*H*), also called the Shannon-Wiener or Shannon-Weaver index (Spellerberg and Fedor 2003), and true diversity (Jost 2006) for both areas. *H* is calculated using the following formula:

$$H = -\sum_{i=1}^{S} p_i \ln p_i$$

where *S* is the total number of species identified in the woody vegetation inventory for the area and *pi* is the proportion of individuals found in species *i* (Beals et al. 2000). As richness and evenness increase, the Shannon entropy value increases (Spellman 2012, Hollister et al. 2014).

Using the resulting values, true diversity was then calculated for each area of equal size to facilitate a meaningful interpretation of the difference in woody plant diversity between the restoration area and the reference area. True diversity is the exponential of the Shannon entropy value (exp(*H*)) (Jost 2006).

Shannon entropy and true diversity values for the two areas were compared to determine whether the species assemblage in the restoration area could be considered diverse relative to the reference area. A diverse species assemblage in the restoration area would represent an expression of the 'diversity of system components' criterion for the principle 'maintain diversity and redundancy'.

Vegetation Structure

The information obtained from researching the growth rates, average life span, and height classes of the species identified in the restoration area woody vegetation inventory was used as a proxy to evaluate the future structural diversity of the area. Using this information, a table was created to categorize the species according to several classification systems. The table was reviewed for the presence of a mix of growth rates, life spans, and heights which suggests that the planted area is on a trajectory towards exhibiting diversity in terms of vertical structure and age structure. Moreover, it would represent evidence of the 'diversity of system components' criterion for the principle 'maintain diversity and redundancy'. It is important to note, however, that age structure and vertical stratification of the restoration area would need to be assessed in the future as the information presented in the table reflects the potential of the species inventoried, not a guaranteed outcome.

Species' Tolerances

The information regarding species' tolerances to different disturbances was organized in a table. The table presents the percentage of species in each area that tolerate the disturbances and pests considered. The disturbances and generalist insect pests considered included drought, flooding, wind, ice storms, shade, browsing, heat, fire, gypsy moth, and Asian longhorned beetle. Generalist insect pests were selected from the list of forest pests on the Ontario Invading Species Awareness Program website (www.invadingspecies.com). Host-specific pests and diseases were not considered because the fact that they are selective with regard to a host means that only a certain species or genus would potentially be weakened, damaged, or killed by the pest or disease. Therefore, as long as the vegetation in an area is not comprised of only one species or plants from one genus, the other species would likely persist in the event of an outbreak.

No generally applicable method exists to determine how much response diversity is 'enough' as the answer is case dependent (Benson 2009, Biggs et al. 2012). For this study, response diversity in the restoration area was considered relative to response diversity in the reference area. The previously mentioned table facilitated the evaluation of response diversity by showing the percentage of species in the restoration area able to tolerate each of the disturbances and pests relative to the same percentages calculated for the reference area. Based on this comparison, a determination was made regarding whether or not the degree of response diversity in the restoration area is sufficient to be considered evidence of the 'response diversity' criterion for the principle 'maintain diversity and redundancy'. As the information presented in the table reflects the average or typical response of the species to the named disturbances and pests, future evaluations of actual responses would be required to determine whether the restoration area truly exhibits response diversity.

Examples of the Analysis of Restoration Initiative One Process and Outcomes

Table S3. Key social-ecological system properties to be managed

Principle	Categories Summarizing Evidence of Principles in Restoration Process	Analysis of Ecological Outcomes
Maintain diversity and redundancy	1. Creation and/or enhancement of habitat to support a goal of improving biodiversity *"To increase the availability of water for the dragonfly. There's a damp area and we felt with trees that would become a little bit more wet because a little bit further on there is a running stream. This is an intermittent stream, I guess that we planted and we thought it would help make it full time."* 2. Stakeholders with diverse perspectives, knowledge, and authority working together throughout the restoration process towards a common goal *"Now the exact planning was done in cooperation with the Credit Valley Conservation. So their experts came out and other forestry experts came out and we all had a site meeting with my contact from Ontario Heritage Trust..."* 3. Loss of biodiversity in the watershed identified as a problem *"...[he] was involved through the Credit Valley Conservation on studying some rare types of dragonflies. He did study at Scotsdale Farm and he found there was a rare type of dragonfly there and he suggested to me in discussions that the habitat for this dragonfly, which is fish food, could be improved."*	• The diverse species assemblage in the restoration area, relative to the reference area, fully reflects the criteria for this principle. • The presence of species with a variety of growth rates, life spans, and heights in the restoration area suggests that the area may be on a trajectory towards exhibiting diversity in terms of vertical structure and age structure. • The presence of species in the restoration area with varying tolerances to a variety of disturbances and pests suggests that the area may be on a trajectory towards exhibiting a sufficient degree of response diversity relative to the reference area.
Manage slow variables and feedbacks	1. Monitoring and capitalizing on changes in slow variables *"...this was an opportunity and we had been working on Ontario Heritage Trust on this property for quite a few years and this was the opportunity so we jumped in and took advantage of it."*	• NATA

Table S4. Key attributes of the governance system

Principle	**Categories Summarizing Evidence of Principles in Restoration Process and Social Outcomes**
Foster complex adaptive systems thinking	1. Projects are intended to be part of a long-term, large-scale program of restoration *"Yes, and with the intent at the same time to do more. To work with Ontario Heritage Trust to raise some money and do more of that kind of thing."*
Encourage learning and experimentation	1. Openness to trying techniques new to the area and/or project team *"It's essentially abandoned farmland and there were wet areas that we thought we could improve the water retention capacity – so this kind of thing I learned from the course – by putting in some trees"*
Broaden participation	1. Collaboration between groups and individuals with applicable local and scientific knowledge throughout the restoration process *"That was our plan, the detailed plan. Now that was done in cooperation with a forester and with Credit Valley Conservation."* 2. Providing opportunities for interested stakeholders to get involved in the project and acquire new skills *"The trees were planted through the Credit Valley Conservation [Branch Out! program]."*
Promote polycentric governance systems	1. Project deliberations and decision-making involve agencies and individuals with various sources of authority and expertise *"Yes, informally and formally through the Stewardship Council. We had our meetings and said this is what we would like to do, we've been trying to get our foot in the door for many years but the actual plan was agreed to and approved by the Stewardship Council."*

Section B

Restoration Initiative Two (RI2) Description

RI2 focuses on restoring in-stream habitat in order to address declining brook trout populations identified through long-term watershed monitoring. Concern over declines in this population in the Credit River Watershed prompted collaborative action from Credit Valley Conservation (CVC), a local stewardship organization, and several conservation-minded angling groups. Led by CVC, a plan was created to guide restoration and monitoring activities within the Upper Credit Conservation Area (UCCA) over five years starting in 2015. The plan is intended to remediate the issues caused by historic agricultural activities (e.g., cattle pasturing) and builds on previous work done in UCCA. Over the course of five years the following restoration work is planned: installation of silt traps to narrow and deepen the channel; installation of habitat structures and boulders to increase fish and benthic macroinvertebrate habitat; addition of gravel in sections of the stream to increase the availability of spawning substrate suitable for brook trout; and planting native vegetation in the riparian zone to shade the channel and reduce water temperatures. Furthermore, yearly monitoring includes electrofishing, collection of temperature data, benthic macroinvertebrate sampling, spawning surveys, substrate surveys, and monitoring plant survivorship. Implementation of the plan is being led by the local chapter of a conservation organization with support from the other project partners and interested volunteers.

Breakdown of Data Sources Used

Table S5. Breakdown of data sources used for evaluation of Restoration Initiative Two

Description of Initiative	**Evaluation of Initiative**
- Transcript from semi-structured interview with a past trainee who is extensively involved in the initiative	- Transcript from semi-structured interview with a past trainee who was extensively involved in the initiative
- Five year restoration plan	- Data from vegetation inventories
- Personal observations from volunteer involvement	- Data from temperature monitoring
	- CVC water and air temperature data
	- Underwater video footage

Treatment of Biophysical Data for Restoration Initiative Two

Woody Vegetation Inventories

The woody vegetation inventory data from the right and left banks were combined to create one species list each for the restoration and references reaches. The next steps in the treatment of the woody vegetation inventory data were the same as the steps outlined for the RI1 vegetation inventories. A table was created to summarize and compare what was found in each inventory and for calculating Shannon entropy values and true diversity.

Vegetation Structure

Following the same procedure outlined for RI1, the growth rates, average life spans, and height classes of the species identified in the restoration area woody vegetation inventory were compiled and categorized according to existing classification systems (Daigle and Havinga 1996, Barnes and Wagner 2011). These classifications served as a proxy for evaluating the future structural diversity of the planted area. The summary table created using this information was reviewed to determine whether different growth rates, life spans, and heights were represented by the inventoried species. Representation from a variety of categories suggests that the area may be on a trajectory towards exhibiting diversity in vertical structure and age structure and as such, provides evidence of the 'diversity of system components' criterion for the principle 'maintain diversity and redundancy'. As previously mentioned, an assessment of structural diversity would be required in the future given that the information in the table refers to the potential of the inventoried species and actual outcomes would depend on many factors that cannot be predicted.

Species' Tolerances

As was done for RI1, inventoried species' tolerances to the same selection of disturbances and generalist insect pests were recorded and presented in a table. Response diversity in the restoration reach was subsequently compared to that of the reference reach to determine whether or not the degree of response diversity in the restoration reach is sufficient to be considered evidence of the 'response diversity' criterion for the principle 'maintain diversity and redundancy'. Again, evaluation of actual responses to disturbances and pests would be required in the future to understand whether the species in the restoration reach do in fact demonstrate response diversity.

In-stream Habitat

Video files were downloaded from the underwater camera and viewed one at a time using Windows Media Player. Every appearance of a fish in the frame was recorded including the time it entered and exited the frame, as well as, any additional notes such as the number of fish in the frame (if more than one). Once all of the files had been viewed, a table was created summarizing which of the habitat structures fish had been seen utilizing. The presence of fish at one or more habitat structures would indicate that habitat structures installed to increase habitat availability and diversity are in fact serving that purpose and by doing so, represent evidence of the 'diversity of system components' criterion for the principle 'maintain diversity and redundancy'.

Temperature

With the stream temperature data for June 3, 2014, 2015, and 2016, the temperature ranges (maximum temperature – minimum temperature) and average hourly rates of change (change in temperature/change in time) were calculated for the 12-hour period from 7:30 am to 7:30 pm. Maximum air temperatures for the same 12-hour period were also determined. The ranges and hourly rates of change from 2014 and 2015 were compared to 2016 to determine whether an increase, decrease, or no change has been experienced. A decrease in the range and hourly rate of change from 2014 and 2015 to 2016 would be considered an early sign of the silt traps and riparian plantings contributing to the function of lowering stream temperatures and in doing so, providing evidence of the 'functional redundancy' criterion for the principle 'maintain diversity and redundancy'.

Examples of the Analysis of Restoration Initiative Two Process and Outcomes

Table S6. Key social-ecological system properties to be managed

Principle	Categories Summarizing Evidence of Principles in Restoration Process	Analysis of Ecological Outcomes
Maintain diversity and redundancy	1. Stakeholders with diverse perspectives, knowledge, and authority working together throughout the restoration process towards a common goal *"But then they developed this formal five year plan in concert with the other groups..."* 2. Use of several monitoring techniques to observe changes in biodiversity and the conditions necessary to support the desired biodiversity *"...so we were just out doing a spawning survey this weekend, there was benthic surveys done, temperatures are being logged..."* 3. Creation and/or enhancement of different kinds of habitat to support a goal of improving biodiversity *"... in narrowing the stream, it'll deepen the water which will keep it cooler and then put in habitat structures and some spawning substrate and hopefully increase the brook trout population numbers in that reach, in that area."*	• The diverse species assemblage in the restoration area, relative to the reference area, fully reflects the criteria for this principle. • The presence of fish at each of the habitat structures indicates that the structures are serving their purpose and may be on a trajectory towards providing enhanced habitat diversity for brook trout. • The decrease in stream temperature range and hourly rate of change from 2014 and 2015 to 2016 is an early sign that the silt traps and riparian plantings are beginning to contribute to the function of lowering stream temperature.
Manage connectivity	1. Building a network of organizations, agencies, and landowners that work together throughout the restoration process with varying degrees and kinds of involvement *"Certainly a big component of the project is collaboration with the partners that I told you about..."* 2. Importance of getting volunteers involved in implementation and monitoring *"Certainly a big component of the project is collaboration with the partners that I told you about and volunteer engagement is huge as you know having gone to them."*	• NATA

Table S7. Key attributes of the governance system

Principle	**Categories Summarizing Evidence of Principles in Restoration Process and Social Outcomes**
Foster complex adaptive systems thinking	1. An adaptive approach to restoration is taken given the fact that conditions and knowledge are constantly changing and uncertainty is pervasive *"We didn't do any substrate addition this year but I think we're on schedule to do some next year. Basically put gravels in the bed. So if we did that one year and then we went and monitored it and it's not there anymore, we wouldn't keep putting gravel there, that sort of thing..."* 2. Creating favourable conditions for a specific species involves first restoring a healthy system with appropriate form and function *"So I guess the overarching goal is to narrow the stream to the reference conditions that are downstream of the site and in narrowing the stream, it'll deepen the water which will keep it cooler and then put in habitat structures and some spawning substrate and hopefully increase the brook trout population numbers in that reach, in that area."*
Encourage learning and experimentation	1. Diverse range of stakeholders involved in monitoring system response during and/or after project completion using a variety of techniques *"Everyone. Everyone could be. So anyone from the project partners could be [involved in monitoring] and we welcome volunteers to come out for any event..."* 2. Volunteer engagement creates opportunities to share information about the watershed and teach new skills *"I would say that every day a new volunteer comes out, they're learning something because we always make a point of explaining what we're doing and why."*
Broaden participation	1. Collaboration between groups and individuals with applicable local and scientific knowledge throughout the restoration process *"But then they developed this formal five year plan in concert with the other groups to sort of – CVC wanted to sort of hand it off. Say, "we've done some work, there's more work that needs to be done. Let's create a plan and hand it off so that volunteer groups can do it with our help still", that kind of thing."* 2. Providing and promoting opportunities for interested stakeholders to get involved in the project, learn about the watershed, and acquire new skills *"I'm not sure if that's sort of a stated goal of the project but it's certainly the intent – is to build on those relationships and foster those relationships between the different organizations and to engage volunteers and citizens and everything and that sort of stuff."*

Section C

Restoration Initiative Three (RI3) Description

RI3 is an ongoing program of restoration focused on restoring clean, clear, cold water in the Mill Creek Watershed (a subwatershed of the Southern Grand River Watershed, Ontario) following the 2005 removal of a small dam erected in the 1950s. The removal of the dam and the discovery of a spring-fed creek in the watershed brought attention to the potential of the system to support a brook trout population again. Led by the local chapter of a conservation organization, and with the support and involvement of many other conservation and stewardship organizations, landowners, and community members, a number of projects all working towards the goal of restoring a healthy system capable of supporting brook trout have been completed throughout the watershed. Examples of the work done includes, putting up fencing to stop cattle from entering the stream, installing beaver bafflers, creating rocky ramps and vortex weirs, and most recently, the wild transfer of brook trout from a neighbouring watershed. Aided by PIT tags implanted in the transferred fish, monitoring will provide information on the survival and preferences of the fish. RI3 has evolved over several years as new issues come to light and as the system responds to the work done in previous years. Presently, a plan is being created to guide the next five years of the project.

Breakdown of Data Sources Used

Table S8. Breakdown of data sources used for evaluation of Restoration Initiative Three

Description of Initiative	**Evaluation of Initiative**
- Transcript from semi-structured interview with a past trainee who is extensively involved in the initiative - Publicly available presentations and documents - Personal observations from volunteer involvement - Five year restoration plan	- Transcript from semi-structured interview with a past trainee who was extensively involved in the initiative - Five year restoration plan

Treatment of Biophysical Data for Restoration Initiative Three

Fish Species Diversity and Response Diversity

Direct comparisons regarding the fish community observed in Mill Creek watershed between years could not be made due to differences in the monitoring locations and methods used (e.g., electrofishing, spawning surveys, portable PIT tag antenna surveys). Rather, the fish monitoring data were reviewed collectively to qualitatively evaluate fish species diversity and response diversity (i.e., thermal tolerance). A change in species diversity and response diversity to include a coldwater species or community would be considered evidence of the ‘diversity of system components’ and ‘response diversity’ criteria for the principle ‘maintain diversity and redundancy’.

In-stream Habitat Diversity

Drawing on qualitative descriptions of the availability of brook trout (*Salvelinus fontinalis*) habitat in the Mill Creek watershed in 2008, accounts of the restoration work done in Emerson Creek in 2015, and the results of 2015 spawning surveys and 2016 portable PIT tag antenna surveys, consideration was given to whether in-stream habitat diversity has been improved. The addition of habitat that was not previously available and/or the enhancement of existing habitat would suggest greater in-stream habitat diversity and would be considered evidence of the 'diversity of system components' criterion for the principle 'maintain diversity and redundancy'.

Barriers to Flow

The information available on presence or absence of barriers to flow was reviewed to determine whether beaver bafflers installed in July 2010 were successful in discouraging beavers from damming the channel again. No signs of new beaver dams would indicate that connectivity between upstream and downstream areas has been maintained, evidence of the principle 'manage connectivity'.

Examples of the Analysis of Restoration Initiative Three Process and Outcomes

Table S9. Key social-ecological system properties to be managed

Principle	**Categories Summarizing Evidence of Principles in Restoration Process**	**Analysis of Ecological Outcomes**
Maintain diversity and redundancy	1. Creation and/or enhancement of different kinds of habitat to support a goal of improving biodiversity *"Then I guess the third thing is the actual building spawning areas and improving the stream for natural habitat areas and nursery areas for the brook trout."* 2. Stakeholders with diverse perspectives, knowledge, and authority working together throughout the restoration process towards a common goal *"Everybody's been always in touch and we've had to get GRCA approvals for everything we want to do..."* 3. Use of several monitoring techniques to observe changes in biodiversity and the conditions necessary to support the desired biodiversity *"...temperature is the critical one because without the cold temperatures you don't have brook trout, you have a brown trout stream"*	• The fish species diversity data are not directly comparable. However, in general terms it can be said that there is greater diversity now that a coldwater species has been observed surviving and spawning in the watershed. The survival of the transferred brook trout suggests that the watershed may be on a trajectory towards supporting a self-sustaining coldwater community and thus, greater species diversity and response diversity. • The creation of spawning habitat in Emerson Creek and its utilization for brook trout redds fully reflects the criteria for this principle.
Manage slow variables and feedbacks	1. Monitoring as a specific form of feedback *"In our case, like the beaver bafflers we installed them once and we found out that in the one location it didn't work very well. You know, we had to learn ourselves how to modify it a bit to make it work for our application."*	• NATA

Table S10. Key attributes of the governance system

Principle	Categories Summarizing Evidence of Principles in Restoration Process and Social Outcomes
Foster complex adaptive systems thinking	1. An adaptive approach to restoration is taken given the fact that conditions and knowledge are constantly changing and uncertainty is pervasive *"It was Mill Creek going into Rogers Creek and that was sort of an accidental discovery, finding this little stream and so on, so it's been added on."* 2. Creating favourable conditions for a specific species involves first restoring a healthy system with appropriate form and function *"Then I guess the third thing is the actual building spawning areas and improving the stream for natural habitat areas and nursery areas for the brook trout."*
Encourage learning and experimentation	1. Diverse range of stakeholders involved in monitoring system response during and/or after project completion using a variety of techniques *"I would say it's probably observational by the chapter ... Habitat Haldimand and then the landowners as well just all sort of meeting and talking on a casual basis more than a big meeting or anything like that about what's happening, what's changing, what's not changing.."* 2. Openness to trying techniques new to the area and/or project team *"So some of it's new techniques or adaptations of techniques so there's no, "we have to do it this way because we've always done it this way" kind of thing."*
Broaden participation	1. Collaboration between groups and individuals with applicable local and scientific knowledge throughout the restoration process *"They weren't there all the time but definitely they had an advisory role you know on how things are going to be done. You know, look out for this or do that. Again, sometimes more so like definitely when we were building the spawning areas the rocky ramps and so on, they were there."* 2. Sharing information about the outcomes of the project with relevant stakeholders in the watershed and at the larger scale *"There have been articles in "Currents" magazine from Trout Unlimited Canada which is the middle of the "Fly Fusion" and also on the Trout Unlimited website some sort of information things that have gone in..."*
Promote polycentric governance systems	1. Working with multiple governing bodies at different scales to obtain the necessary approvals and permission to implement the project plan *"Yea, at different stages of, you know, what they wanted to do. Definitely they had to get approvals for doing certain things."*

Section D

Assessment Framework

Table S11. Framework for assessing the Stream Rehabilitation, From Form to Function Training Program in relation to social-ecological resilience

<table>
<tr><th colspan="3" rowspan="2"></th><th colspan="5">GENERAL PHASES OF ECOLOGICAL RESTORATION PROCESS</th></tr>
<tr><th>Problem identification</th><th>Defining goals and objectives</th><th>Designing a restoration plan</th><th>Implementation</th><th>Monitoring and evaluation</th></tr>
<tr><td rowspan="7">PRINCIPLES FOR BUILDING RESILIENCE IN SES</td><td rowspan="3">Key SES properties to be managed</td><td>Maintain diversity and redundancy</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Manage connectivity</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Manage slow variables and feedbacks</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="4">Key attributes of the governance system</td><td>Foster CAS thinking</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Encourage learning and experimentation</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Broaden participation</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Promote polycentric governance systems</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Breakdown of Data Sources Used

Table S12. Breakdown of data sources used for assessment of the training program

Overview of the History and Evolution of the Training Program	**Assessment of Training Program**
- TUC website - Publicly available presentations and documents - Personal communications with a key informant	- Transcripts from semi-structured interviews with six individuals involved in the development of the training program - Stream Rehabilitation, From Form to Function Training Program manual (most current version as of fall 2015)

Examples of Categories Summarizing Evidence of the Principles From the Assessment

Table S13. Categories summarizing evidence of the principles from the assessment of the training program

Maintain diversity and redundancy

1. Monitor biodiversity and take steps to maintain or enhance it
   "Restoring native species begins with determining the cause of the loss and whether this cause has been or can be resolved. Then consideration for restoration of the species can proceed."
2. Identify where and how habitat diversity and redundancy have been lost or reduced and seek to restore or enhance them
   "Organisms are not separate from their environment, so one of the principles to sound rehabilitation is ensuring that each species and its community have the elements needed for their entire life cycles from a healthy natural system."

Manage connectivity

1. Understand how dynamically stable channels function and seek to restore balance between sediment and flow regimes in degraded channels
   "...then the instructors specifically talk about the diagnostic features that you would see if a channel is changing its equilibrium form. You'll be able to identify things that are changing but are things that you would expect in a dynamically stable system"
2. Analyze ecological pathways to determine where there may be discontinuities that need to be addressed
   "Analyzing ecological pathways can determine which ones are or are not functioning in this particular watershed. Some watersheds, depending on their make-up will naturally have some pathways that are not there. Other watersheds will have broken or lost pathways because of human activities."

Manage slow variables and feedbacks

1. Monitoring as a specific form of feedback
   "...it's kind of like a feedback loop in terms of assessing for success. So you know if it worked, why did it work? Or if didn't work, kind of you know, go back. So there's kind of a feedback loop there."

2.	Selection of techniques to disrupt or dampen undesirable feedbacks *"Deflecting or redirecting high velocity streamflow are two other solutions to reducing or mitigating excessive bank erosion and also can be used to restore meander patterns."*
	Foster complex adaptive systems thinking
1.	Context plays a critical role in each phase of the restoration process *"We kept stressing, don't take that cookbook approach. You know, really go back to the problems and the issues and then try to work on what will solve those"*
2.	Design plans based on an understanding of past and present conditions at the focal scale and the scales above and below *"Understanding the historical changes to the watershed as well as recent and potentially future changes is necessary in order to determine what solutions or treatments to apply to the stream in order to restore function..."*
	Encourage learning and experimentation
1.	Explain the purpose and process of the project to stakeholders and be open to input *"People like to know why and what is planned in a rehabilitation program. Bringing interested people from your organization and others together and discussing how to proceed is an important step. Timely discussions that occur early on will lead to buy-in and support for each endeavour."*
2.	Establish mentoring partnerships to facilitate the acquisition of new knowledge and skills *"But the intent was to have the information collected in a suitable method that an expert could analyze it and then the volunteers would be along to learn from that and have it explained as it was being analyzed so that they would have some context for their work and the situation of their stream."*
	Broaden participation
1.	Seek partnerships with professionals for expert advice and mentorship *"... once you come up to some conclusions that perhaps erosion is excessive in some areas or deposition is excessive then go back to these people that you've sought as mentors and ask them if they could confirm your conclusions."*
2.	Engage the appropriate agencies and individuals to secure permits, approvals, and permissions *"Once you've got that all set out, the next step is to look at approvals process because you can't just go out there and do things."*
	Promote polycentric governance systems
1.	Engagement with multiple governing bodies is required to obtain formal approvals and permits as well as formal and informal permission *"Permission for work on public properties is required from multiple agencies."*
2.	Project deliberations and decision-making should involve agencies and individuals with various sources of authority and expertise *"All projects, involving instream channel or flow modification, need to be reviewed by a professional and approvals will likely be required by environmental/conservation/natural resource agencies."*

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