



STEWARDSHIP CENTRE
FOR BRITISH COLUMBIA

Stewardship Practices that Benefit Species at Risk: Perspectives from the Land



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We are committed to champion science-based stewardship practices so that British Columbians understand, enjoy, and sustain healthy ecosystems through stewardship. As good stewardship relies on good decision-making, we work closely with our partners to develop innovative technical, educational, and capacity building resources. For more information about the Stewardship Centre, go to www.stewardshipcentrebc.ca.

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Introduction

Riparian areas, or transition zones between land and water, provide habitat for many species at risk, as well as, proportionally high numbers of other plant and animal species. The areas can also provide a host of other benefits to plants, animals, and people. Land managers can take steps to ensure that these benefits are maximized and threats to riparian degradation are mitigated, we call these steps riparian stewardship practices. These practices include protecting, establishing or restoring riparian buffers, controlling invasive species, bioengineered bank stabilizing, restoration of aquatic habitats, and proper manure management and storage.

The Stewardship Centre for BC (SCBC) created the Stewardship Practices Gallery to showcase land managers who successfully implemented practices that restored or protected riparian areas and improved drainage management. The Stewardship Practices Gallery for Species at Risk (SP Gallery) and its associated work has four primary aims. It attempts to: (i) foster partnerships between local government, agricultural producers, and ENGOs who have a long term stake in stewarding the local land base; (ii) develop stewardship community champions; (iii) address science gaps related to the effectiveness of the different riparian area and agricultural waterways stewardship practices; and (iv) encourage people to take voluntary stewardship actions to safeguard the natural areas of species at risk need to live. It builds upon past work and projects which include the [Species at Risk Primer](#) and the [Stewardship Practices Guides for Species at Risk](#).



Figure 1: Untreated wood and tree stumps used to stabilize a stream bank

The purpose of this report is to analyze the work completed since the creation of the SP Gallery in 2014. The results include farm demographics, a summary of documented stewardship practices, a list of documented species at risk, and a qualitative report on land managers perceived motivations, challenges, and outcomes when participating in stewardship programs or activities. The report concludes with a discussion and recommendations for future work on the Stewardship Practices Gallery.

Methods

The Stewardship Centre completed 15 case studies with land managers throughout the Okanagan Valley, the Lower Mainland and Fraser Valley, the Kootenays, and Vancouver Island. All 15 participants had completed riparian projects mostly with the assistance of agricultural or non-profit stewardship organizations. These organizations played a bridging role in identifying and providing contact details or introductions to potential case study participants.

After selecting and contacting landowners, a one-hour semi-structured interview and tour was completed for each site. The semi-structured interview was based on a data collection form created by Bernardo Ranieri and an interview protocol designed by Mollie Chapman. The data collection form allowed for the gathering of systematic information about the implemented stewardship practices and species at risk. The interview was designed to capture why landowners adopted stewardship practices (motivations), what problems they had with implementation (challenges), and what were impacts of the adopted practices (outcomes). Pictures and field notes were also taken to document the implemented stewardship practices.

The analysis of the data was completed by Adrian Semmelink. The data collection forms were compiled and the number of implemented stewardship practices were calculated. A list of all reported species at risk was also generated. Data on farm demographics was also collated. Eight of the interviews were fully transcribed.

For the other seven only the parts deemed relevant to the motivations, challenges, and outcomes were transcribed.

We used a grounded theoretical approach to analyze the transcribed qualitative data collected in the 15 interviews (Marshall & Rossman, 2014). The approach required using NVivo to identify categories from within the interviews that were then used to find common themes present across multiple interviews.



Figure 2: Profiled participant standing in front of his restored and protected riparian area

Importantly, the results below should not be taken out of context. The interviews were conducted with an unusual demographic: early adopters of stewardship practices willing to be publicized. The results should not be extrapolated to the broader BC agricultural community, but do provide an in-depth view of some important considerations for organizations pursuing stewardship goals on agricultural lands. Future research could provide further evidence for whether the findings are indicative of the broader community.

Results

Property Demographics

Information about the size of the property, type of agricultural production, the number of people working the land, and the years that they managed the land were collected. The size of properties ranged from 1 acre to 92,000 acres. The average property size was close to 10,000 acres but this was skewed by two properties which managed over 50,000 acres.

The majority of land managers who participated in the SP Gallery program managed cattle (see Figure 3). Nearly one half of the participants were involved in the beef industry. Other participants managed dairy cows, horses, and a mixture of farm animals, vegetables and fruit. One participant, who managed only an acre, was currently not using the land for agricultural purposes.

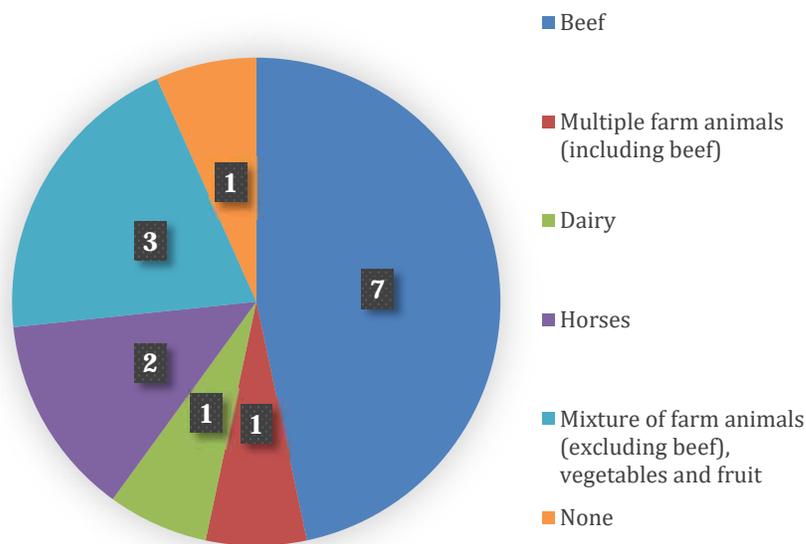


Figure 3: Breakdown of the major animals and/or crops land managers produced

The number of people working on the land ranged from 0 to 30, with an average of 6 people employed per site. Two operations used high numbers of volunteers to complete work on the property and this skews the number of employees hired by land managers. The land managed without volunteers the average number of people working on the land would be lower than 6. Participants, and their families, managed the property for between 6 and 100 years. The average participant and their family managed their land for 31 years.

Motivations for Participating in Stewardship Programs or Practices

The qualitative analysis of the motivations behind participating in stewardship programs and practices revealed ten common themes. Environmental stewardship, enjoyment of nature, financial incentives, working with nature, and familial obligations emerged as widely held motivations for completing stewardship practices. Other motivations for participation included a strong sense of community, management help, educational purposes, and historical importance. More information on each theme follows.

Environmental stewardship

A large majority of participants (11) were motivated by a desire to look after their land and felt a responsibility to do so. For example, one participant argued that farming with nature was just the 'right thing to do'.

"We saw potential for that to work with what we thought was the right thing, how we wanted to farm with the ecology."

Other participants expressed a desire to see improvements on their land related to increasing the 'natural activities' taking place on their property. The long-term goal of environmental stewardship was often tied to their feelings around family.

"So that when my grandfather started, till where my children, my grandchildren, may be involved, we think we've improved a lot of the natural activities that are occurring here. We look to pass it on in a better condition, a self-sufficient condition, than when we took it over from our family."



Figure 4: A participant with his cattle and protected riparian area

One participant viewed biodiversity as more important than financial goals. However, the participant did not rely on farming as a primary source of income.

"For me, maintaining biodiversity is extremely important, so for me that's an advantage. If I was coming (only) from a financial standpoint, maybe not so much because we really cut off a lot of our grazing. But for us our priority is to maintain this [biodiversity] so that would be the bonus."

Enjoyment of nature

Many participants (6) were motivated to complete stewardship practices by their enjoyment of nature. For example, one participant described their feeling towards the natural world.

"As long as you leave wildlife alone they will leave you alone. We like trees, vegetation and we like water."

Another participant mentioned their love for, and enjoyment of, nature. The participant said that they prefer to not leave their home as a result of their stewardship activities.

“I wanted it to be a kind of natural oasis.... When we come home here we don’t want to leave. I love gardening, I love nature, I love wildlife. Just bringing it to where you live makes it special.”

Financial incentive for completing work

A third of the participants mentioned some financial benefits associated with stewardship practices and stewardship of the land in general. One participant asserted that for a rancher to make a profit they had to have ‘healthy’ pastures and water.

“At the end of the day if you haven’t got healthy pasture lands and healthy water on your ranches, you are not going to be profitable”

Other producers mentioned the consumer support they receive because of the stewardship practices they implement. In one case the land manager linked the value of having his farm next to a water body that provided habitat for a species at risk (Salish Sucker) and how that would impact consumer support.

“I like to showcase what we have; we need the consumer support for all this to work.... A high producing dairy farm right next to a creek with Salish Sucker [species at risk]. I mean how good is that. You can’t buy that kind of advertising.”

Working with nature

Many land managers (5) mentioned that completing the stewardship practices were part of their attempt to work with nature. One participant viewed his/her role as working with nature to make the production of food more ‘fluid’ or productive.

“We call it holistic, natural, farming system, everything has to fit together and there’s no one part of the farm that’s really more important than the other. Our assistance as humans is to make the pieces fit together in a more fluid fashion, a more workable fashion as we understand the natural processes that are undergoing in the soil, in the water, or in the forest, or whatever.”

Familial obligations

A third of the participants (5) discussed the importance of family and their desire to either learn from their parents or show the next generation what they were doing. For some the stewardship practices allowed them to show their ‘grand-children’ what they were doing in terms of stewardship.

“Family, strong family ties, we’ve got grand-children, you want them to see what you are doing, I take that personally, so it is a personal thing”

Challenges in implementing and maintaining practices

We identified seven challenges that were themes across multiple interviews. Widely discussed challenges included technical challenges, continuity of practices, institutional problems, and financial barriers. Other challenges included negative off-property, social, and aesthetic impacts.

Technical challenges

More than half of participants (8) mentioned some technical challenges when implementing stewardship practices. The technical challenges were predominately to do with invasive weed control. The ongoing nature of work to remove invasive species was challenging.

“It’s an ongoing project that gives back. You get to watch the native plants grow but it does require effort and energy and ongoing commitment, especially if there are blackberries involved because they are persistent. It’s not a let’s do this and it will be fixed kind of thing.”

Other participants noted that the weed control options either have not worked or are impractical for larger areas. Some land managers expressed a desire to use chemical controls but noted that it was not legal to do so in riparian habitat.

“Yeah [burning] didn’t work, it’s so thick that the native plants can’t grow through We don’t want to use anything toxic. People don’t know what to do. Putting down cardboard and plastic is infeasible for large areas.”



Figure 5: Reed Canary grass resisted burning and is proving challenging to remove

Continuity of practices

Nearly half of the participants (7) discussed doubts that the stewardship practices they employed would continue into the future. One reason for this reservation was that some land managers were nearing retirement and did not know who would take over managing the land once they did.

“This farm is most probably going to go out of production when my brothers and I get so old we can’t do it and nobody has bought it.”

The same participant noted worried about what could happen if they were to sell to a farmer who did not use similar stewardship practices.

“It only takes one farmer to come along and start spraying chemicals and fertilizers and running off into creek and ditches again.”

Another continuity issue is fence maintenance as in the words of one participant: “a fence is only as good as the fence is maintained.” Maintenance can be very costly and many funding programs only provide funding for the installation of these projects.

“The maintenance on these riparian projects is a huge problem down the road. A lot of these developments are new and they have already started to become that [a huge problem]. We have been talking about how do we maintain all of this stuff. We have approximately 30 kilometers of fence and riparian zones, that doesn’t work for our operation. If you had one here and there you could maintain it. But you only have so much time, there is only so much to go around.”

Institutional problems

Five participants suggested that the many different players in agricultural stewardship made it time consuming, confusing, and at least one missed an opportunity to receive help with implementing some of the stewardship practices.

“If you are involved in these programs they become time consuming, I would love to see a way where programs all fit together so that the time the farmer has to spend is minimized. So I don’t have to do five separate inspections... They can all be minimized to reduce my time. That’s one thing that really [would] make it easier for a lot of farmers that are trying to start up. You go to a farm and say ‘Okay you going to spend 3 days a year for this and 5 days a year for that’ they’re going to say no”

One participant mentioned that s/he did not know about a program that could have helped him/her implement the stewardship practice.

“[The] EFP, the South Similkameen Conservation Program they are all there they even provide labour, which I didn’t know at the time. So go through all the programs, they would have been a lot of help. I would have gone through them knowing now.”

Other participants mentioned that the many different partners involved made it difficult to maintain communication and therefore, make the ‘best decisions’ for ‘land stewardship’.

“Communication can be challenging within the watershed. There is a need to maintain open and clear communication so we can continue to learn from each other and make the best decisions for land stewardship.”

Expensive to implement and maintain some practices

A third of participants discussed the difficulty of completing some of the stewardship practices due to expenses related to the implementation of the practice. In particular, one participant mentioned the expenses associated with building and maintaining riparian cattle exclusion fences.

“At the end of the day, its money, and available funds, available labour. Labour costs money too, and this is not easy country to build fence in, its expensive area to fence in.”

Another participant highlighted how maintaining some of these practices can be at odds with a farmer’s financial needs. Specifically, he discussed how cutting down trees, which provide wildlife habitat, could allow one to make a bank payment if you can sell the lumber.

“If you are busy trying to figure out how to make a bank payment you are not going to try to do stewardship just to make yourself feel better. Instead, you will be possibly cutting trees to pay the bills.”

Outcomes of participation in stewardship activities

We identified 8 common outcomes from the interview data. Widely discussed outcomes included an increase in habitat and biodiversity, educational opportunities, increase in ecosystem services, and an increase in public support. Other outcomes included financial benefits, decreases in invasive species, an increase in aesthetics, and better management options.

Increase in habitat and biodiversity

Nearly all participants saw increases in natural habitat and/or biodiversity as a result of the stewardship practices. Participants observed many different types of wildlife benefiting or using the habitat they had protected or restored.



Figure 6: Ducks swimming in a dam protected with fences and native vegetation newly planted in the riparian area

Educational opportunities

Two thirds of the participants mentioned educational outcomes related to the implementation of stewardship practices. Half of these educational outcomes results in other land managers considering or adopting similar stewardship practices. One participant discussed how her/his neighbours saw what he was doing and emulated his fencing project to decrease erosion and protect riparian habitat.

“Part of the process is not just admiring other people but spreading the word that there are programs and assistance available in the form of dollars. On the other side they saw what we were doing with the fence and going along the stream, where the horses are, that’s not our property, so they’ve fenced that big area to prevent more soil erosion.”

The other half mentioned learning opportunities on their own land either for themselves or others. In one case, protected wetlands were used as a science fair project giving the entire family a learning opportunity.

“My son used one of the wetlands as a reference for his science fair project and he made it all the way to the nationals in Montreal this year. It's provided learning for us all.”

Increase in ecosystem services

A third of participants mentioned ecosystem services, or benefits provided by nature to people, as outcomes of the stewardship practices. For example, one participant discussed how a wetland was created to serve as a natural waste water treatment project, where plants purified water moving through the wetland.

“[There is] so much bird life, cattail, wetland plants that are cleaning the water. It is a wetland, a dynamic and vibrant ecosystem”

Increase in public support

Nearly a third of the participants mentioned a positive public reaction to the implementation of their stewardship practices. For example, one participant discussed how they fenced a lake to prevent cattle from accessing the lake. Many people lived on the other side of the lake and the preventative steps made the public feel better about his cattle operation.

“Public perspective is probably the most important thing that you can develop. Everybody thinks we are a hero over there, because we fenced the lake.”

Reported stewardship practices

Table 1 contains a list of the stewardship practices that were documented throughout the 15 case studies. An important caveat is that we relied on the land managers to self-report many of these practices. Although we did our best to observe as many practices as possible, some practices such as 'avoiding over application of manure' are impossible to monitor in one visit. Notably most land managers avoided clearing riparian vegetation, the use of pesticides in riparian areas, controlled invasive species, and avoided the over application of manure. Fewer participants created pits and mounds, used plant whips to stabilize banks, composted, or were involved in data collection.

Table 1: A list of the stewardship practices used by participants

Document	Stewardship Practices	Recommended Techniques	Times Documented	Percentage Documented
Riparian Areas in Settled Landscapes/ Guidance for Restoration Activities in Riparian Areas	Protect Existing Riparian Areas	Avoid clearing of riparian vegetation	15	100
		Pesticide/herbicide use in riparian areas only to control invasive species	15	100
		Avoid dumping organic waste in riparian areas	11	73
	Establish New or Restore Degraded Riparian Buffers	Plant native vegetation	13	87
		Protect plantings from wildlife and livestock	13	87
		Install large woody debris	9	60
		Create pits and mounds	4	27
	Control Invasive Species	Varies by species	15	100
		Augment Riparian Areas with Agroforestry or Leave Strips	Maintaining unmown or seldom mown strips	6
	Drainage Maintenance in Agricultural Waterways	Use Sensitive Methods to Work in Waterways	Manual work used to clear ditches	7
Worked during in-stream work window (if in-stream work was necessary)			8	53
Stabilize Banks using Bioengineering Methods		Plant whips (cut branches or saplings)	4	27
		Construct structures (wattle fences, live palisade and live brush areas)	7	47
Restore Aquatic Habitats		Habitat complexing	8	53
		Constructed wetlands & stream Channels	7	47
Avoid Over application or Poor Storage of Manure		Avoid over application	14	93
		Composting program or digester	5	33
		Proper storage	12	80
Monitor and Evaluate Projects		Monitoring	Data collection	5
	Protect Species at Risk	Presence of species at risk	9	60

Reported Species at Risk

A list of species at risk (SAR) and their SARA designation as reported by land managers and their partner organizations. A number next to each species indicates the number of sites at which a SAR was reported at different study sites. The participants reported 75 different species at risk. The majority of these species were reported at the Okanagan Falls Biodiversity Ranch and/or the White Lake Biodiversity Ranch. However, 60% of participants reported at least one species at risk on the land that they managed (Table 1). Species of amphibians and fish (6), birds (25), invertebrates (11), mammals (12), reptiles (8), and plants (13) were reported (Table 2).



Figure 7: Western Painted Turtle

Table 2: List of species at risk reported by land managers and their partner associations

English Name	Scientific Name	BC List	COSEWIC	SARA
Amphibians and Fish (6)				
Blotched Tiger Salamander	<i>Ambystoma mavortium</i>	Red	E (2012)	1 (2003)
Great Basin Spadefoot (3)	<i>Spea intermontana</i>	Blue	T (2007)	1-T (2003)
Northern Red-legged Frog (2)	<i>Rana aurora</i>	Blue	SC (2015)	1-SC (2005)
Oregon Spotted Frog	<i>Rana pretiosa</i>	Red	E (2011)	1-E (2003)
Salish Sucker (2)	<i>Catostomus sp. 4</i>	Red	T (2012)	1-E (2005)
Western Toad (3)	<i>Anaxyrus boreas</i>	Blue	SC (2012)	1-SC (2005)
Birds (25)				
Barn Swallow	<i>Hirundo rustica</i>	Blue	T (2011)	
Bobolink	<i>Dolichonyx oryzivorus</i>	Blue	T (2010)	
Brewer's Sparrow, <i>breweri</i> subspecies	<i>Spizella breweri breweri</i>	Red		
Burrowing Owl	<i>Athene cunicularia</i>	Red	E (2006)	1-E (2003)
Canyon Wren (2)	<i>Catherpes mexicanus</i>	Blue	NAR (1992)	
Common Nighthawk (2)	<i>Chordeiles minor</i>	Yellow	T (2007)	1-T (2010)
Flammulated Owl (3)	<i>Psiloscoops flammeolus</i>	Blue	SC (2010)	1-SC (2003)
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Red		
Gray Flycatcher	<i>Empidonax wrightii</i>	Blue	NAR (1992)	
Great Blue Heron, <i>herodias</i> subspecies	<i>Ardea herodias herodias</i>	Blue		
Lark Sparrow (2)	<i>Chondestes grammacus</i>	Blue		
Lewis Woodpecker (3)	<i>Melanerpes lewis</i>	Blue	T (2010)	1-T (2012)
Long-billed Curlew (2)	<i>Numenius americanus</i>	Blue	SC (2011)	1-SC (2005)
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Blue	T (2007)	1-T (2010)
Peregrine Falcon, <i>anatum</i> subspecies (2)	<i>Falco peregrinus anatum</i>	Red	SC (2007)	1-SC (2012)
Prairie Falcon	<i>Falco mexicanus</i>	Red	NAR (1996)	
Sage Thrasher	<i>Oreoscoptes montanus</i>	Red	E (2010)	1-E (2003)
Sandhill Crane	<i>Antigone canadensis</i>	Yellow	NAR (1979)	
Short-eared Owl (2)	<i>Asio flammeus</i>	Blue	SC (2008)	1-SC (2012)
Swainson's Hawk	<i>Buteo swainsoni</i>	Red		

Western Screech Owl, <i>macfarlanei</i> subspecies (3)	<i>Megascops kennicottii macfarlanei</i>	Red	T (2012)	1-E (2005)
White-headed Woodpecker (2)	<i>Picoides albolarvatus</i>	Red	E (2010)	1-E (2003)
White-throated Swift	<i>Aeronautes saxatalis</i>	Blue		
Williamson's Sapsucker (2)	<i>Sphyrapicus thyroideus</i>	Blue	E (2005)	1-E (2006)
Yellow-breasted Chat (2)	<i>Icteria virens</i>	Red	E (2011)	1-E (2003)
Invertebrates (11)				
Behr's Hairstreak	<i>Satyrium behrii</i>	Red	E (2012)	1-T (2003)
California Hairstreak	<i>Satyrium californica</i>	Blue		
Common Sootywing	<i>Pholisora catullus</i>	Blue		
Half-moon Hairstreak	<i>Satyrium semiluna</i>	Red	E (2006)	1-E (2007)
Immaculate Green Hairstreak (2)	<i>Callophrys affinis</i>	Blue		
Lance-tipped Darner	<i>Aeshna constricta</i>	Blue		
Monarch	<i>Danaus plexippus</i>	Blue	SC (2010)	1-SC (2003)
Okanagan Robber Fly	<i>Efferia okanagana</i>	Red	E (2011)	
Oregon Forest Snail	<i>Allogona townsendiana</i>	Red	E (2013)	1-E (2005)
Twelve-spotted Skimmer	<i>Libellula pulchella</i>	Blue		
Vivid Dancer	<i>Argia vivida</i>	Blue	SC (2015)	
Mammals (12)				
American Badger (2)	<i>Taxidea taxus</i>	Red	E (2012)	1-E (2003)
Bighorn Sheep	<i>Ovis Canadensis</i>	Blue		
Fringed Myotis (2)	<i>Myotis thysanodes</i>	Blue	DD (2004)	3 (2005)
Great Basin Pocket Mouse	<i>Perognathus parvus</i>	Blue		
Mountain Goat	<i>Oreamnos americanus</i>	Blue		
Nuttall's Cottontail (2)	<i>Sylvilagus nuttallii</i>	Blue	SC (2006)	1-SC (2007)
Pacific Water Shrew	<i>Sorex bendirii</i>	Red	E (2016)	1-E (2003)
Pallid Bat (2)	<i>Antrozous pallidus</i>	Red	T (2010)	1-T (2003)
Spotted Bat (2)	<i>Euderma maculatum</i>	Blue	SC (2014)	1-SC (2005)
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Blue		
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Blue	SC (2007)	1-SC (2009)
Western Small-footed Myotis	<i>Myotis cilliolabrum</i>	Blue		
Reptiles (8)				
Desert Nightsnake (2)	<i>Hypsiglena chlorophaea</i>	Red	E (2011)	1-E (2003)
Gopher Snake, deserticola subspecies (2)	<i>Pituophis catenifer deserticola</i>	Blue	T (2013)	1-T (2005)
Northern Rubber Boa (2)	<i>Charina bottae</i>	Yellow	SC (2016)	1-SC (2005)
Pygmy Short-horned Lizard	<i>Phrynosoma douglasii</i>	Red	XT (2007)	1-XX (2003)
North American Racer (2)	<i>Coluber constrictor</i>	Blue	T(2015)	1-SC (2006)
Western Painted Turtle (3)	<i>Chrysemys picta pop. 2</i>	Blue	SC (2006)	1-SC (2007)
Western Rattlesnake	<i>Crotalus oreganus</i>	Blue	T (2015)	1-T (2005)
Western Skink	<i>Plestiodon skiltonianus</i>	Blue	SC (2014)	1-SC (2005)
Plants (13)				
Alkaline Wing-nerved Moss	<i>Pterygoneurum kozlovii</i>	Blue	T (2004)	1-T (2006)
Annual Paintbrush (2)	<i>Castilleja minor var. exilis</i>	Red		
Cut-leaved Water-Parsnip (2)	<i>Berula erecta</i>	Blue		
Flat-topped Broomrape	<i>Orobanche corymbosa ssp.</i>	Blue		

	<i>mutabilis</i>			
Lemmon's Holly Fern	<i>Polystichum lemmonii</i>	Red	T (2003)	1-T (2005)
Many-headed Sedge	<i>Carex sychnocephala</i>	Yellow		
Moss (no common name)	<i>Pteryganeurum lamellatum</i>	Red		
Narrow-leaved Brickellia	<i>Brickellia oblongifolia</i> var. <i>oblongifolia</i>	Blue		
Nettle-leaved Giant-hyssop	<i>Agastache urticifolia</i>	Blue		
Rusty Cord-moss	<i>Entosthodon rubiginosus</i>	Blue	E (2004)	1-E (2006)
Showy Phlox	<i>Phlox speciosa</i> ssp. <i>occidentalis</i>	Red	T (2004)	1-T (2006)
Western Centaury	<i>Zeltnera exaltata</i>	Red		
Whitebark Pine	<i>Pinus albicaulis</i>	Blue	E (2010)	1-E (2012)

Discussion

The program successfully profiled 15 'stewardship champions' who mainly raised livestock, were broadly motivated by goals of environmental stewardship, widely challenged by invasive species control, and generally noticed increases in habitat and biodiversity. Many of the participants interviewed implemented many stewardship practices and had species at risk on their property.

The heterogeneity of the sample in terms of motivations, challenges, and outcomes provides evidence that when dealing with land managers understanding the context under which they operate is vital (Reimer, 2012). Individualized support is required if land managers are going to more widely adopt these stewardship practices.

Many of the participants were motivated by finances, while others saw finances as a challenge to implement stewardship practices. Some participants even expressed that they were both motivated and challenged financially when implementing stewardship practices. It is important to acknowledge that all land managers are different and need to be appealed to in different ways. For example, Andrews et al. (2013), shows that when appealing to farmers who did not practice conservation tillage, an economic argument was counterproductive. However, concepts relating to stewardship did resonate with most of our participants and should continue to be the core focus of the Stewardship Centre for BC's attempt to spread stewardship practices.

It is difficult to estimate how many agricultural producers are currently using some of these stewardship practices. However, only 21% of BC farmers/ranchers were enrolled in Canada's Environmental Farm Plan (EFP) in 2011 (Statistics Canada, 2013). The EFP is a voluntary agri-environmental incentive program that provides farmers/ranchers access to financial and technical assistance to complete beneficial management or stewardship practices. The low EFP enrollment indicates that there is still more work to be completed in increasing the adoption of stewardship practices.

Ongoing support for some practices such as invasive plant removal and fencing maintenance could also make some of the stewardship practices more attractive for land managers. There are already some programs such as the Farmland Advantage Program (previously known as the Ecological Services Initiative) who are piloting ongoing support programs for agricultural producers using some of these practices. These and other programs need to be expanded to fully support producers.

Other research has advocated for the use of 'flagship' owners to ensure wider adoption of 'conservation' or stewardship practices (Wilcove & Lee, 2004). Our results show that land managers who adopt stewardship practices often 'spread' these practices even though education of others is often explicitly not part of their motivation for implementing stewardship practices. This result suggests that 'leading by example' is an effective strategy for spreading stewardship practices.

Recommendations for the future

Four major recommendations emerged for moving the Stewardship Practices Gallery project forward:

(1) Create resource tool for land managers

Update the Stewardship Practices Gallery (SPG) webpage to include more resources for producers such as links to organizations that can assist with implementation of stewardship practices. This will provide a "one stop shop" resource currently missing in British Columbia. This is a response to some of the challenges land managers face in navigating the many organizations attempting to increase the adoption of stewardship practices. The SCBC's SPG program could

become a hub where land managers are inspired by their peers, and then have some concrete resources to get started on their own projects.

(2) Complete more outreach

With the completion of three guides about stewardship practices and species at risk (SAR), one tool to search for SAR, and 15 case studies, the SPG program is now well positioned to increase outreach about SAR and stewardship practices with land managers. The creation of a resource tool for land managers noted above would complement these resources. Outreach should include:

- More advertising and outreach (social media and producer conferences (e.g. BC Cattlemen's Association Conference)
- Creating stronger links with agricultural producer associations (e.g. BC Cattlemen's Association) and the BC Agricultural Council (specifically the EFP)
- Making connections with farm schools about using materials generated from the SPG and associated SCBC works (e.g. UBC Farm, KPU, Okanagan College, Vancouver Island University)

(3) Complete interviews with more diverse participants

Complete more interviews with land managers who are not involved with livestock to increase case studies with producers in the tree fruits, vineyards, berries, vegetables and dairy sectors.

(4) Expand collaborative partnerships

Team up with organizations already working with land managers to deliver more on the ground work so that the SCBC does not contribute to the institutional confusion currently challenging land managers.

Literature Cited

Andrews, A. C., Clawson, R. A., Gramig, B. M., & Raymond, L. (2013). Why do farmers adopt conservation tillage? An experimental investigation of framing effects. *Journal of Soil and Water Conservation*, 68(6), 501–511. doi:10.2489/jswc.68.6.501

Chouinard, H. H., Paterson, T., Wandschneider, P. R., & Ohler, A. M. (2008). Will Farmers Trade Profits for Stewardship? Heterogeneous Motivations for Farm Practice Selection. *Land Economics*, 84(1), 66–82. doi:10.3368/le.84.1.66

Marshall & Rossman (2014). *Designing Qualitative Research* (5th ed.). Sage Publications.

Reimer, A. P., Weinkauff, D. K., & Prokopy, L. S. (2012). The influence of perceptions of practice characteristics: An examination of agricultural best management practice adoption in two Indiana watersheds. *Journal of Rural Studies*, 28(1), 118–128. doi:10.1016/j.jrurstud.2011.09.005

Statistics Canada (2013).

Wilcove, D. S., & Lee, J. (2004). Using economic and regulatory incentives to restore endangered species: Lessons learned from three new programs. *Conservation Biology*, 18(3), 639–645. doi:10.1111/j.1523-1739.2004.00250.x

