Cows and Fish Report

2011 to 2015 Highlights Summary: Westslope Cutthroat Trout Riparian Health Evaluation, Public Outreach and Habitat Improvement Initiative




Alberta Riparian Habitat Management Society (Cows and Fish)
Report No. 045

Cows and Fish

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About the Alberta Riparian Habitat Management Society

The Alberta Riparian Habitat Management Society (known as "Cows and Fish") is a non-profit, charitable society that strives to promote improved management and stewardship of riparian areas. As the transition zone between our uplands and waterways, protecting riparian areas and improving riparian health provides numerous benefits including runoff filtration, reduced erosion, flood mitigation, groundwater recharge, and fish and wildlife habitat. Cows and Fish has worked with landowners, land managers, livestock producers and community groups across Alberta since 1992 on riparian awareness, stewardship and monitoring projects.

Cows and Fish Supporters and Members: Alberta Environment and Parks, Alberta Agriculture and Forestry, Alberta Beef Producers, Trout Unlimited Canada, Alberta Conservation Association, Department of Fisheries and Oceans, Agriculture and Agri-Food Canada, the Canadian Cattlemen's Association, producers and community groups.

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1 2011-2015 WESTSLOPE CUTTHROAT TROUT PROJECT OVERVIEW

Reduced to less than 10% of its historic range, native pure strains of Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisii*) are now confined to a small number of isolated headwater reaches in Alberta's eastern slopes (Costello 2006). As such, native pure stocks of Westslope Cutthroat Trout are designated as *Threatened* under Alberta's *Wildlife Act* and the federal *Species At Risk Act* (The Alberta Westslope Cutthroat Trout Recovery Team 2013). Given the importance of riparian areas to this species, maintaining and improving riparian health in these remaining reaches is a priority for its continued survival.

In 2011, the Alberta Riparian Habitat Management Society (Cows and Fish) initiated a multi-year riparian health inventory (RHI) and riparian habitat improvement project focused on streams and rivers with native pure strains of Westslope Cutthroat Trout populations in the south eastern slopes of Alberta. The main intent of this project is to assess the current condition of priority native Westslope Cutthroat Trout riparian habitat, offer suggestions and technical support to land managers and users on ways to maintain or improve this habitat, ultimately leading to habitat improvements. This project was initiated by Cows and Fish in collaboration with Alberta Environment and Sustainable Resource Development (AESRD) (now AEP), Fisheries and Oceans Canada (DFO), the Alberta Conservation Association (ACA) and Trout Unlimited Canada (TUC). Primary funding for this project was provided through grants administered by ACA and through financial support provided by the Government of Canada (Environment Canada's Habitat Stewardship Program, part of the National Conservation Plan). This initiative has and will continue to involve close collaboration with fisheries biologists, Public Land managers, grazing disposition holders, private landowners, industry and recreational user groups. In particular, collaboration with and input from local and regional watershed organisations (Elbow River Watershed Partners, Ghost Watershed Alliance Society, and Oldman Watershed Council), off-highway vehicle groups (Crowsnest Pass Quad Squad, Canada Toyota 4WD Association, and Rocky Mountain Land Cruisers Association) and timber industry (Spray Lake Sawmills), along with individual landowners, has been instrumental in our successes. Since 2011, a key component of this project has been the coordination of annual multi-stakeholder workshops, educational field days and hands-on restoration demonstration days aimed at building awareness about the threats facing Westslope Cutthroat Trout, identifying solutions and encouraging collaborative management actions to promote habitat improvement.

This report describes the riparian health results for 54 Westslope Cutthroat Trout sites assessed during the 2011-2015 field season on the Ghost, Oldman, Bow, Castle, Crowsnest and Upper Oldman River watersheds, in addition to five other sites previously assessed by Cows and Fish (2005 and 2010) in the Ghost and Oldman watersheds. Individual site scores and details are provided in individual RHI summary reports submitted to AEP, private landowner project participants and grazing disposition and allotment holder participants.

1.1 Project Goals

There were three main project goals, which included:

- Evaluation of riparian health in priority (native pure) Westslope Cutthroat Trout stream reaches
- Identification of riparian habitat issues and improvement opportunities
- Engagement with multiple stakeholders, landowners and community groups to implement habitat improvement projects and improve general awareness about Westslope Cutthroat Trout conservation needs

1.2 RHI Site Selection

RHI locations for this project were identified and selected in consultation with and by collaboration of fisheries and rangeland experts from AEP, DFO, ACA and TUC. RHI sites were strategically selected on watercourses where fisheries assessments have confirmed the presence of genetically pure or near pure (95% purity or higher) Westslope Cutthroat Trout populations. To assist with site selection, AESRD provided Cows and Fish with a database of Westslope Cutthroat Trout population surveys locations and genetic purity for the Southern Rockies. All RHI sites were located within 1 km of these genetically pure or near pure Westslope Cutthroat Trout sampling sites. Final site selection was determined based on access considerations, field scouts and/or consultation with the appropriate regional AEP Fisheries Biologist and Public Lands, Rangeland Agrologist. For more detailed methods see Appendix B (Hunter 1991; Fitch, Adams and Hale 2001).

1.3 RHI Project Area Description

In total, 59 RHIs have been conducted on Westslope Cutthroat Trout stream systems, encompassing a total of approximately 35 km of bank length and 110 ha of riparian habitat within five river sub-basins: Ghost, Elbow, Highwood, Lower Oldman and Upper Oldman (Table 1, Maps A to D – Appendix A). This included 15 sites inventoried in 2011, 17 sites inventoried in 2012, 5 sites inventoried in 2013, 14 sites inventoried in 2014 and 3 sites inventoried in 2015, specifically as part of this project. Five additional sites were coincidentally inventoried on priority stream reaches prior to 2011 as part of other watershed health evaluation projects led by Cows and Fish. These included two sites from 2005 and three sites from 2010. The average RHI reach length and area, with the exclusion of nine 'hotspot' and three 'HBP' sites, was approximately 0.7 km and 2.3 ha respectively.

Table 1 Westslope Cutthroat RHI Sites 2005, 2010 to 2015

RHI Site ID	Watercourse	Date of RHI	Bank Length Inventoried (m)	Approximate Riparian Area Inventoried (ha)	ACA/AEP Record No.	WSCT Purity
GHOST RIVER SUB-BASIN (MAP A – APPENDIX B)						
WAZ1	Unnamed tributary to Waiparous Creek	2010	560	0.3	J-G3	>=0.99
JON1	Johnson Creek	2010	1000	4.0	AFW-JC	>=0.99
WAI9	Waiparous Creek	2010	300	0.2	AFW-WC	>=0.99
ELBOW RIVER SUB-BASIN (MAP B – APPENDIX B)						

SIL1	Silvester Creek	2012	400	1.0	AFW-SiC	≥0.99
SIL2			410	1.5		
SIL3			410	1.0		
HIGHWOOD RIVER SUB-BASIN (MAP C – APPENDIX B)						
GOR1	Gorge Creek	2012	740	0.5	J-S17a	>=0.95 but <0.99
CTH1	Cutthroat Creek	2012	620	1.0	AFW-CuC	≥0.99
DEE1	Deep Creek	2011	1130	1.8	J-H11	>=0.99
FLA1	Flat Creek	2012	680	0.8	J-H7b	>=0.95 but <0.99
PEK15	Pekisko Creek	2012	710	0.7	AFW-PeC	>=0.95 but <0.99
PEK17			550	0.6	AFW-PeC	>=0.95 but <0.99
ZEP1	Zephyr Creek		550	1.0	J-H18	>=0.99
LOWER OLDMAN RIVER SUB-BASIN (MAP D – APPENDIX B)						
BVR42	Beaver Creek	July 17	800	0.8	D-01	>=0.95 but <0.99
COL1	Corral Creek	2011	690	2.5	J-C1	≥.99
COL2		2011	450	1.1	D-W4	≥.99
JOH3	Johnson Creek	2011	890	3.6	D-W2	<0.95
JOY1	Unnamed Tributary to Johnson Creek	2011	660	0.9	D-W1	<0.95
TRO1	Trout Creek	July 10	490	1.98	AFW-TrC1	>=0.95 but <0.99
WIL15	Willow Creek	2011	730	3.3	No data point	N/A*
UPPER OLDMAN RIVER SUB-BASIN (MAP E – APPENDIX B)						
Livingstone River Watershed						
LIV1	Livingstone River	2013	1430	15.9	(downstream from AFW-LR; but still above falls)	>=0.99
Oldman River Watershed						
HID1	Hidden Creek	2011	750	1.9	AFW-HC	>=0.99
HID2		2011	690	1.6	above D-04	>=0.99
OLD37	Oldman River (above falls)	2011	930	1.6	AFW-Ora	>=0.95 but <0.99
Callum Creek Watershed						
SHA1	Sharples Creek	2011	890	0.5	D-O3	>=0.99
SHA3		2014	550	0.39	D-O3	>=0.99
Todd Creek Watershed						
TCT1	Unnamed Tributary to Todd Creek	2012	30	<0.1	ACA-Crow-8	>=0.95 but <0.99
TCT2		2012	510	0.8		
TCT3		2012	230	0.4		
Crowsnest River Watershed						
ALL1	Allison Creek	2012	1730	3.5	D-Cr2	>=0.95 but <0.99
ALL2			470	0.5	ACA-Crow-24	>=0.95 but <0.99
ALL3		2014	70	0.03	DCR2	>=0.95 but <0.99
BLC1	Blairmore Creek	2005	90	0.1	BCA	0.95-0.99
DUT1	Dutch Creek	2014	830	6.33	DVN-DCH1	>=0.95 but <0.99
DUT2		2015	80	0.41	DVN-DCH1	>=0.95 but <0.99
DUT3		2015	30	0.01	DVN-DCH1	>=0.95 but <0.99
DOM1	Dome Creek	2015	50	0.02	DVN-DCH1	>=0.95 but <0.99
GOL1	Gold Creek	2013	560	0.8	(between GC13BP and GC18BP)	>=0.99
GOL2		2014	100	0.07	between GC13BP and GC18BP	>=0.99
GOL3		2014	80	0.1	between GC13BP and GC18BP	>=0.99
GRE1	Green Creek	2014	80	0.25	Between GC13BP and GC18BP	>=0.99
MOR1	Morin Creek	2014	90	0.03	between GC13BP and GC18BP	>=0.99
NRC1	North Racehorse Creek	2014	660	0.34	AFW-NRC	>=0.99
RCK1	Rock Creek	2013	820	0.8	(upstream of AFW-RoC1)	>=0.99
SMT1	Smith Creek	2014	610	0.62	DVN-SRAC2	>=0.99
SMT2		2014	90	0.05	DVN-SRAC2	>=0.99
STA1	Star Creek	2014	460	1.86	ACA-Crow-21	>=0.99
VIC1	Vicary Creek	2014	470	0.47	AFW-VC	>=0.99
Castle River Watershed						
CRT1	Carbondale River Tributary	2005	50	0.2	D-C4	>=0.99
CRB1	Carbondale River	2012	990	2.5	AFW-CaR	≥0.99
CRB2			690	2.1	ACA-59	>=0.95 but <0.99

LST1	Lost Creek	2011	870	5.5	AFW-LoC	>=0.95 but <0.99
LYX1	Lynx Creek	2011	880	1.1	ACA-83	>=0.99
LYX2		2011	1000	8.1	AFW-LyC	>=0.99
LYX3		2013	1390	11.2	(upstream of AFW Lyc and the Lynx Creek falls)	>=0.99
LYX4		2013	820	4.9		>=0.99
NLS1	North Lost Creek	2011	670	2.7	ACA-51	>=0.99
OHA1	O'Hagen Creek	2012	830	3.4	D-C4	≥0.99
SYN1	Syncline Brook	2012	520	0.4	ACA-44	≥0.99
		TOTALS	**34860**	**110.08**		

Sites are listed alphabetically by sub-watershed based on geographic location from north to south.

Land Use and Land Management

With the exception of four private landholdings (Table 3), on Waiparous Creek (2010), Pekisko Creek (2012), Todd Creek (2012) and Rock Creek (2013), all of the RHI sites were located on headwater stream reaches in multi-use Public Land Forest Reserves managed by AEP (Table 2). The majority of sites fall within the M.D. of Ranchland No. 66 (46%), followed by the Kananaskis Improvement District (18%) and the M.D. of Pincher Creek (15%) (Figure 1). The remaining sites are divided between the Municipality of Crowsnest Pass (7%), M.D. of Foothills (7%), M.D. of Bighorn (5%) and the M.D. of Willow Creek (2%). The project area can be further subdivided by natural region and subregion with the majority of the sites located within the Montane Natural Subregion of Alberta's Rocky Mountain Natural Region. The remaining sites were located within the Upper Foothills Natural Subregion of Alberta's Foothills Natural Region, Foothills Parkland Subregion of Alberta's Parkland Natural Region and Sub-Alpine Natural Subregion of Alberta's Rocky Mountain Natural Region (Natural Regions Committee 2006).

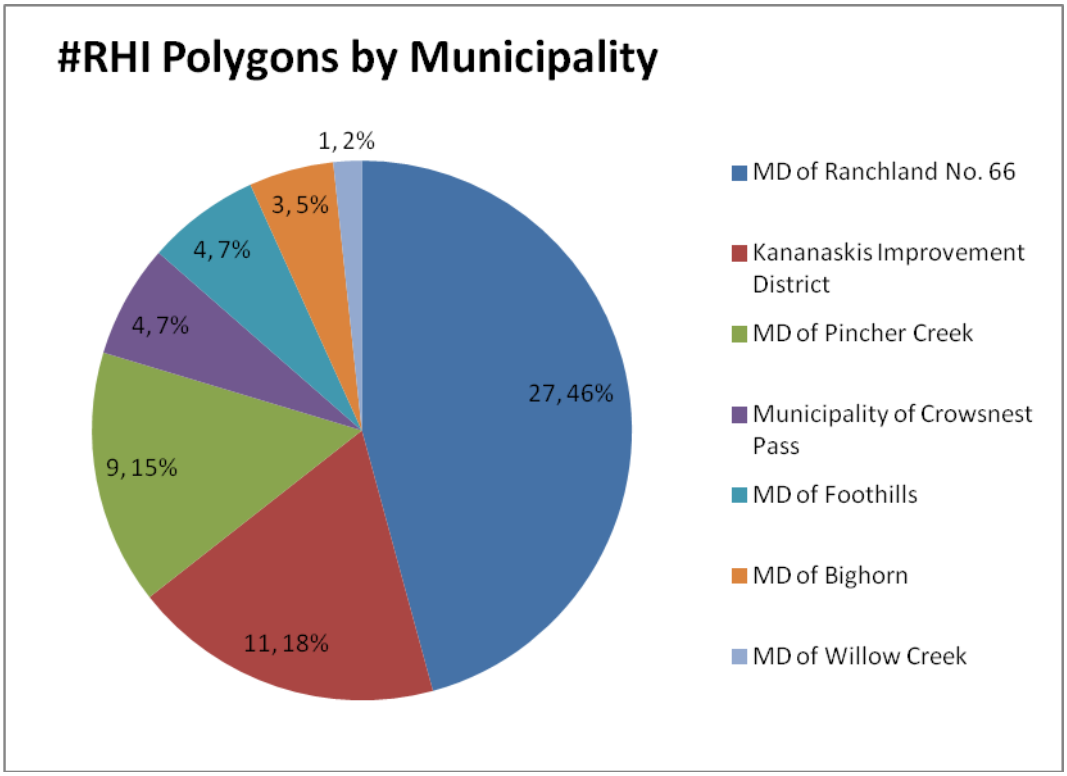


Figure 1 Project Area Break-out By Municipality (n=59)

Most of the project area (98%) was in Public Land used for livestock grazing, recreation and industrial land uses (i.e. logging, oil and gas exploration). There were various grazing dispositions in the project area (Table 2). Many of the sub-basins within the project area are popular with both non-motorized (horseback riding, hiking, biking, random camping) and motorized recreational users (various types of off-highway vehicles [OHVs]). Several of these activities have increased in recent years (recreation) or are likely to increase in the future (i.e. logging and oil and gas development).

Table 2 Public Land Administration Description of the 2011-2015 RHI Project Area

#RHI Polygons	Date Range	Agrologist	Gazing Disposition Names	# Unique Disposition Holder Contacts	Total Length (km)	Total Area (ha)	% of Project Area
37	2005, 2011-2015	Candace Piccin	Allison McGillvary Disposition, Beaver Creek Allotment, Castle River Allotment, GAP Allotment/North Fork Livestock Association, Lower Livingstone Allotment, Pincher Creek Stock Association, West Trout Allotment, Willow Creek Allotment, PNT930175, PNT970052	17	24.3	92.5	84%
9	2010, 2011, 2012	Christine Boulton (previously Melissa Schening)	Ghost River Allotment, Sullivan Flat Grazing Allotment, GRL880178, PNT 930439, PNT 940128, PNT 940129	7	5.4	11.1	10%
2	2011, 2012	John Carscallen	GRL 35696, GRL 030004	2	1.7	2.4	2%
7	2012, 2013, 2014	Jody Best / Stephanie Jaffray	GRP 870052, GRL 32699, GRL38170, PNT 930163	3	1.2	1.7	2%
55				**29**	**32.5**	**107.7**	**98%**

Sites are listed based on geographic location from north to south.

Only 4 sites were conducted within privately owned land (Table 3, below).

Table 3 Private Land Administration Description of the 2011-2015 RHI Project Area

#RHI Polygons	Date Range	#Unique Landowners	#Unique Municipalities	Total Length (km)	Total Area (ha)	% of Project Area
4	2010, 2012, 2013	4	4	2.3	2.5	2%

1.4 2014-2015 RHI "Hotspot" Stream Crossing RHIs

In 2014 and 2015, priority was given to assessing nine short 'hotspot' reaches at stream crossings including several crossings where streambank riparian restoration and plantings or bridge installation has been done or was anticipated. Riparian health inventories and stream crossing assessments were done for these 'hotspot' reaches which vary in length from 70 m to 100 m (Table 4). 'Hotspot' stream crossing reaches include the stream crossing itself and immediately adjacent riparian habitat approximately 40 m upstream and downstream from the crossing.

Table 4 Westslope Cutthroat Trout 2014 and 2015 "Hotspot" RHI Sites

RHI Site ID	Watercourse	2014 RHI Assessment Date	Streambank Length Inventoried (m)	Approximate Riparian Area Inventoried (ha)	ACA/AEP Record No.	WSCT Purity	Stream Crossing Assessment Done?
UPPER OLDMAN RIVER SUB-BASIN (MAP E – APPENDIX B)							
ALL3	Allison Creek	2014	70	0.03	DCR2	>=0.95 but <0.99	YES
DUT2	Dutch Creek	2015	80	0.41	DVN-DCH1	>=0.95 but <0.99	YES
DUT3		2015	30	0.01	DVN-DCH1	>=0.95 but <0.99	YES
DOM1	Dome Creek	2015	50	0.02	DVN-DCH1	>=0.95 but <0.99	YES
GOL2	Gold Creek	2014	100	0.07	between GC13BP and GC18BP	>=0.99	YES
GOL3		2014	80	0.1		>=0.99	YES
GRE1	Green Creek	2014	80	0.25	Between GC13BP and GC18BP	>=0.99	YES
MOR1	Morin Creek	2014	90	0.03	between GC13BP and GC18BP	>=0.99	YES
SMT1	Smith Creek	2014	610	0.62	DVN-SRAC2	>=0.99	
SMT2		2014	90	0.05	DVN-SRAC2	>=0.99	YES
		TOTAL	5380	13.33			

Sites are listed based on geographic location from north to south.

2 2005 TO 2015 RHI RESULTS AND DISCUSSION

2.1 Overview of Riparian Health Results

Detailed riparian health results for the RHI sites listed in Table 1 are described in previous summary reports compiled by Cows and Fish (Cows and Fish 2011; 2012; 2013 and 2014). These reports are available on-line: http://cowsandfish.org/publications/reports.html

The average riparian health rating for the entire 2005-2015 Westslope Cutthroat Trout project area (n=59) is 81% (*Healthy*). Of the 59 native pure Westslope Cutthroat Trout RHI sites within this overall project area, 36 (61%) rate as *Healthy*, 20 (34%) rate as *Healthy, with Problems* and 3 (5%) rate *Unhealthy* (Figure 2). Based on area, 63.5 ha (58%) of the project area rated as *Healthy*, while approximately 38 ha (34%) rated as *Healthy, with Problems* and approximately 9 ha (8%) rated as *Unhealthy* (Figure 3).

The average riparian health rating for the three RHI 'Hotspot' sites assessed in 2015 was 68% (*Healthy, with Problems*). Of these sites, Dome Creek (DOM1) and one of the Dutch Creek (DUT3) sites rated at *Healthy* with scores of 77% and 73% respectively, while the other Dutch Creek site (DUT2) rated as *Unhealthy* with an overall score of 55%.

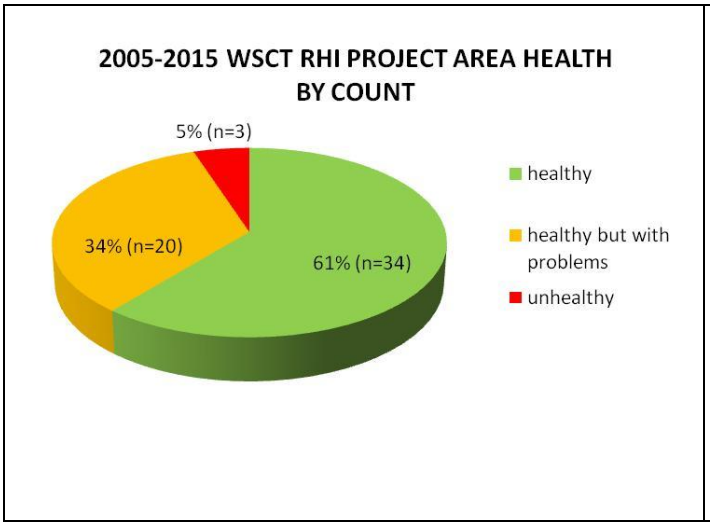


Figure 2 2005-2015 Riparian Health Results (n=59)

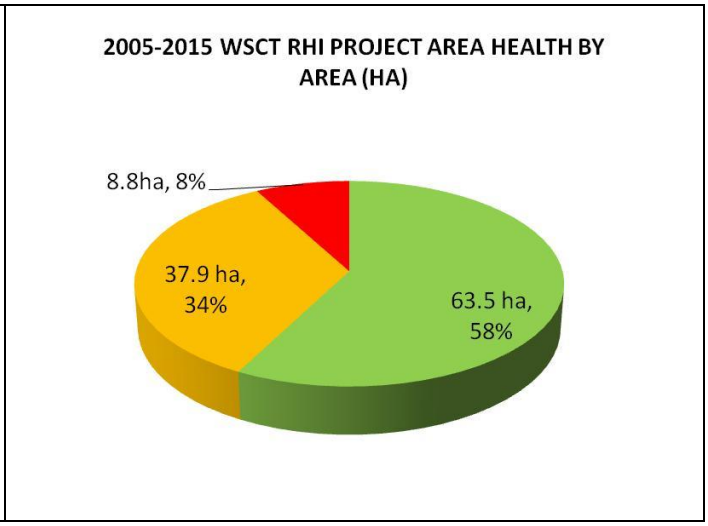


Figure 3 2005-2015 Riparian Health Results by Area (n=59)

2.2 Vegetation Health Parameter Results[1]

The average vegetation health rating for the 2015 RHI sites was 77% (*Healthy, with Problems*). The DOM1 and DUT3 sites rated as *Healthy* with scores of 90% and 87% respectively, while DUT2 rated as *Unhealthy* with an overall vegetation rating of 55%.

The overall average vegetation health rating for all 2005-2015 RHI sites was 78% (*Healthy, with Problems*). On average, most sites had healthy amounts of native tree and shrub regeneration, good vegetative cover of floodplains and streambanks, minimal woody cover removal by humans or beavers and few dead or decadent trees or shrubs (Figure 4). Vegetation health concerns included the encroachment of disturbance-caused and/or invasive plant species due to high density and widespread distribution of these species (Figure 4). Although browse utilization was apparent at many sites, it is not a management concern in most sites given the overall high density, cover and regeneration of preferred woody plants.

[1] Identification of vegetation followed descriptions in Moss 1994 and Tannas 2004

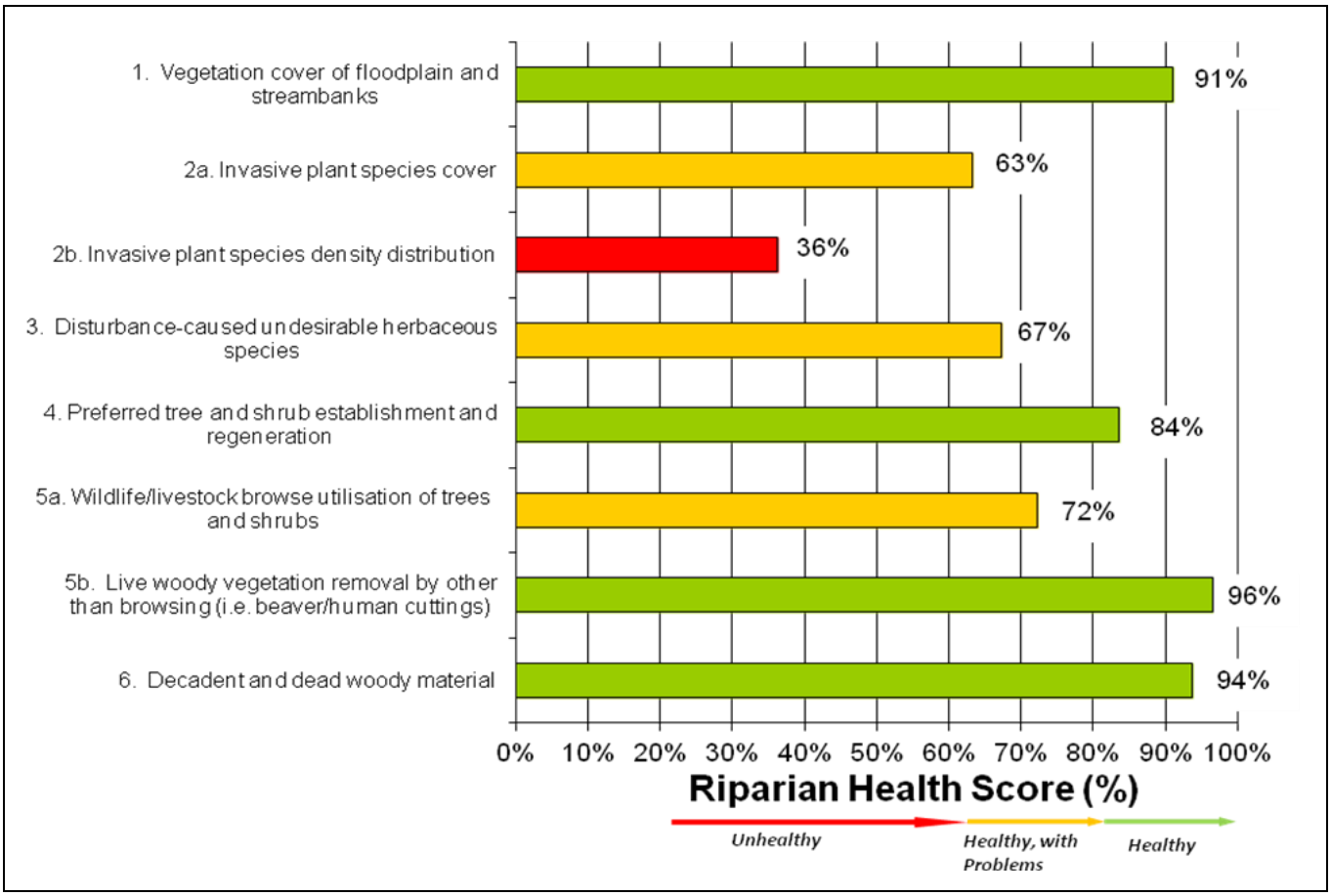


Figure 4 Vegetation Health Parameter Results (n=59)

Herbaceous (Non-Woody) Riparian Health Parameters

Disturbance-caused undesirable herbaceous species as well as invasive species were prevalent in the project area and are of management concern across most sites. Invasive plants are introduced species that are listed on Alberta's *Weed Control Act* as ***prohibited noxious*** and ***noxious*** weeds and others known to be problematic in riparian areas. They are non-native species that spread rapidly and are difficult to control. Disturbance-caused plants are typically non-native grasses and forbs that aggressively displace native plants once the soil surface has been disturbed.

Forty-seven (80%) of the sites contained *noxious weeds*, many containing multiple invasive species of concern within a single site. Six *noxious weeds* were observed in the project area: blueweed (*Echium vulgare*), Canada thistle (*Cirsium arvense*), hounds tongue (*Cynoglossum officinale*), ox-eye daisy (*Chrysanthemum leucanthemum* syn. *Leucanthemum vulgare*), perennial sow-thistle (*Sonchus arvensis*) and tall buttercup (*Ranunculus acris*). **Of note, orange hawkweed (*Hieracium aurantiacum*), a *prohibited noxious weed,* was observed in trace amounts in the LST1, VIC1 and ALL3 sites.** Detailed location information for these weeds has been given to AEP and is described in the individual report summaries for these sites. There is a legal requirement to immediately 'destroy' weeds in the *prohibited noxious* category. Unlike many *noxious weeds*, *prohibited noxious weeds* are

presently not yet widespread in Alberta, and a priority for the Alberta government and land managers is to prevent further invasion by these species.

Table 5 2005-2015 Invasive Species Results

	% of Project Area	Frequency of Occurrence	Constancy (%) (proportion of polygons present)
Canada thistle	0.93%	36	61%
tall buttercup	0.44%	31	53%
ox-eye daisy	1.87%	24	41%
perennial sow-thistle	0.08%	8	14%
common mullein	0.17%	8	14%
blueweed	0.04%	4	7%
orange hawkweed	0.03%	3	5%
yellow toadflax	0.07%	2	3%
common hounds tongue	0.01%	1	2%

The most widespread and abundant invasive species within the project area were Canada thistle, ox-eye daisy and tall buttercup. Canada thistle is the most frequently occurring invasive (Table 5), being recorded in 36 sites and covering approximately 1 ha of the project area. Canada thistle is especially abundant in Lynx Creek (LYX4), with a canopy cover of approximately 10% and is also quite abundant on Willow Creek (WIL15) and Beaver Creek (BVR42), with between 1-5% canopy cover. Although Canada thistle is the most frequently recorded invasive, ox-eye daisy is the most abundant, occurring in 24 sites and covering approximately 2 ha of the project area. Ox-eye daisy is especially abundant on one of the Lost Creek (LST1) and Carbondale River (CRB1) sites, with approximately 20% and 10% canopy cover, respectively. In addition, sites with more than trace levels of ox-eye daisy include LYX2, North Lost Creek (NLS1), CRB2, Gold Creek (GOL1, GOL2, GOL3), LYX4, Green Creek (GRE1) and Allison Creek (ALL3). Tall buttercup was recorded in 24 sites and covers approximately 0.4 ha of the project area. This species is especially abundant at the unnamed tributary to Johnson Creek (JOY1), Johnson creek (JOH3), unnamed tributary to Todd Creek (TCT3), GOL1, Morin Creek (MOR1) and GOL2, with approximately 3% canopy cover.

Collectively, invasive plants comprise approximately 2.6% (approximately 3 ha) of the 2005-2015 project area. Combined weed canopy cover was highest for the Lost Creek (LST1) (20%), Carbondale River (CRB1) (10%), Gold Creek (GOL1) (10%) and Lynx Creek (LYX4) (10%) sites, while density distribution was highest for LST1, unnamed tributary to Johnson Creek (JOY1), Johnson Creek (JOH3) and GOL1.

The dominant **disturbance-caused plants** recorded within the project area include: timothy, smooth brome, Kentucky bluegrass, common dandelion and clover. Within the project area, there were seven sites that had greater than 50% cover from disturbance caused plants (i.e. score of 0/6): CRB2, Trout Creek (TRO1), TCT2, LST1, WIL15, BVR42 and LYX2.

Total Vegetation Cover and Woody Canopy Cover

A high level of vegetation cover in the riparian area, in particular cover from native trees and shrubs, provides soil stabilization and minimizes the potential for erosion and sediment runoff into these trout bearing streams. A diversity of native woody plants provides short, medium, and tall wildlife habitat layers and diversity of rooting depths across the site.

Most sites (49 of 59), had more than 95% vegetation cover (score of 6/6) in the riparian area.

- Sites where vegetation ground cover was lacking by at least 10% are the ALL3, Smith Creek (SMT2) and GRE1 stream crossings. Sites with slight amounts of reduced vegetation (5%-10%) included Silvester Creek (SIL3), Carbondale River tributary (CRT1), Johnson Creek (JON1), DUT1, CRB1, BVR42 and GOL2.

Woody (Tree and Shrub) Riparian Health Parameters:

- ***Establishment and Regeneration***

A good indicator of ecological stability of a riparian reach is the presence of woody plants in all age classes, especially young age classes. To maintain age class structure, at least 15% of the total woody cover of preferred trees and shrubs should be comprised of seedlings and samplings. Preferred woody plants include those species that provide a good indication of a healthy woody plant community and generally include deeply rooted native species, often which are preferred browse species for livestock or wildlife such as red-osier dogwood and willows.

- Just over half (n=34, 58%) of the sites had healthy amounts of native tree and shrub regeneration, while 35% (n=21) have slightly less regeneration than needed, with between 5% and 15% canopy cover from seedling or sampling preferred trees and shrubs.
- The Corral Creek (COL2), TCT2, SMT2 and DUT2 sites rated poorly (2/6) for regeneration, indicating that there is less than 5% canopy cover here from seedling or saplings of preferred trees and shrubs. Riparian planting was done at SMT2 in the fall of 2014 (after the riparian health inventory was conducted).
- Of note, riparian plantings done in the fall of 2013 at the ALL3 site could not yet be counted toward seedling or sapling cover at the time of the 2014 assessment. Human plantings need to have survived for at least one full growing season before they can be counted as successfully established.

Ox-eye daisy is especially abundant along Lost Creek where it is encroaching from an old (inactive) road that parallels the north side of the creek. (*Photographer: K. Stebanuk, Catalogue No: RHIP01LST017)*

Pipeline rights-of-way are another source of non-native disturbance-caused herbaceous species, such as this pipeline crossing near the downstream end of the unnamed Johnson Creek tributary (JOY1). Disturbance-caused plants lack deep binding roots, contributing to outward channel erosion here. (*Photographer: C. Wood, Catalogue No: RHIP01JOY008)*

Disturbance-caused herbaceous plants like Kentucky bluegrass and others in addition to the invasive ox-eye daisy have encroached into fire disturbed areas along the Carbondale River (CRB2). (*Photographer: K. Low, Catalogue No: RHIP02CRB016*)

Browse is minimal in most sites, but moderate along North Racehorse Creek (NRC1) as indicated by flat-topped willows like these. (*Photographer: A. Sarrazin, Catalogue No: RHIP01NRC004*)

Human-cut stumps in a random campsite adjacent to Beaver Creek (BVR42). (*Photographer: A. Sarrazin, Catalogue No: RHIP42BVR005*)

Lynx Creek sites have high levels of dead and decadent woody material due to fire; fire killed trees are susceptible to floods and winds, creating log jams and high in-stream woody debris. (*Photographer: J. Melsted, Catalogue No: RHIP03LYX019*)

VEGETATION HEALTH CONCERNS IN THE PROJECT AREA

- ***Browse and Woody Plant Removal***

  - Two sites (COL1 and SIL3) had heavy amounts of browse from livestock and wildlife (i.e. score of 0/3)
  - Nine sites (ALL1, COL2, CRB2, Hidden Creek [HID2], North Racehorse Creek [NRC1], SIL1, TCT2, unnamed tributary to Waiparous Creek [WAZ1], WIL15) had moderate levels of utilization from livestock and wildlife (i.e. score of 1/3) while the remaining 48 sites have minimal amounts of browse (i.e. score of 3/3).
  - Evidence of beavers was recorded in 16 sites within the project area. Past (not currently active) beaver activity was noted in 11 of these sites. The WIL15, HID2, Oldman River (OLD37), CRB2 and Syncline Brook (SYN1) sites showed evidence of recent beaver activity within the sites.

- ***Woody Canopy Dead and Decadence***

Most of the sites (86%) within the project area had tree and shrub communities with minimal amounts of dead and decadent branches in the upper canopy of the woody plant community, rating healthy (i.e. score of 3/3). This indicates that there is sufficient moisture within the system, and that disease is not a problem significantly impacting these communities. Six sites (LYX3, LYX1, JOY1, CRB2, LYX4 and LYX2) had somewhat elevated amounts of dead and decadent branches (between 5% and 25% of the canopy cover decadent or dead). The LST1 and NLS1 sites had the highest percentages of decadent or dead woody canopy, with 25-45% and >45%, respectively due to a large forest fire in 2003.

2.3 Soil and Hydrology Health Parameter Results

The average soil and hydrology health rating for the 2005-2015 RHI sites is 85% (*Healthy*) (Figure 5). Most of the sites (81%) had less than 5% human-caused bare ground while nine sites (15%) had between 5% and 15% human-caused bare ground. The most severely impacted sites were those that had more than 15% human-caused bare ground, and included ALL3 and SMT2. The SMT2 and ALL3 sites are severely impacted 'hotspot sites', where the stream crossing reach has human-caused bare ground, soil compaction and soil alteration that extends beyond the immediate crossing.

The average soil and hydrology health rating for the 2015 RHI sites was 60% (*Healthy, with Problems*). The DOM1 and DUT3 sites individually scored as *Healthy, with Problems* (63% and 60% respectively) while the DUT2 sited scored as *Unhealthy* with 57%.

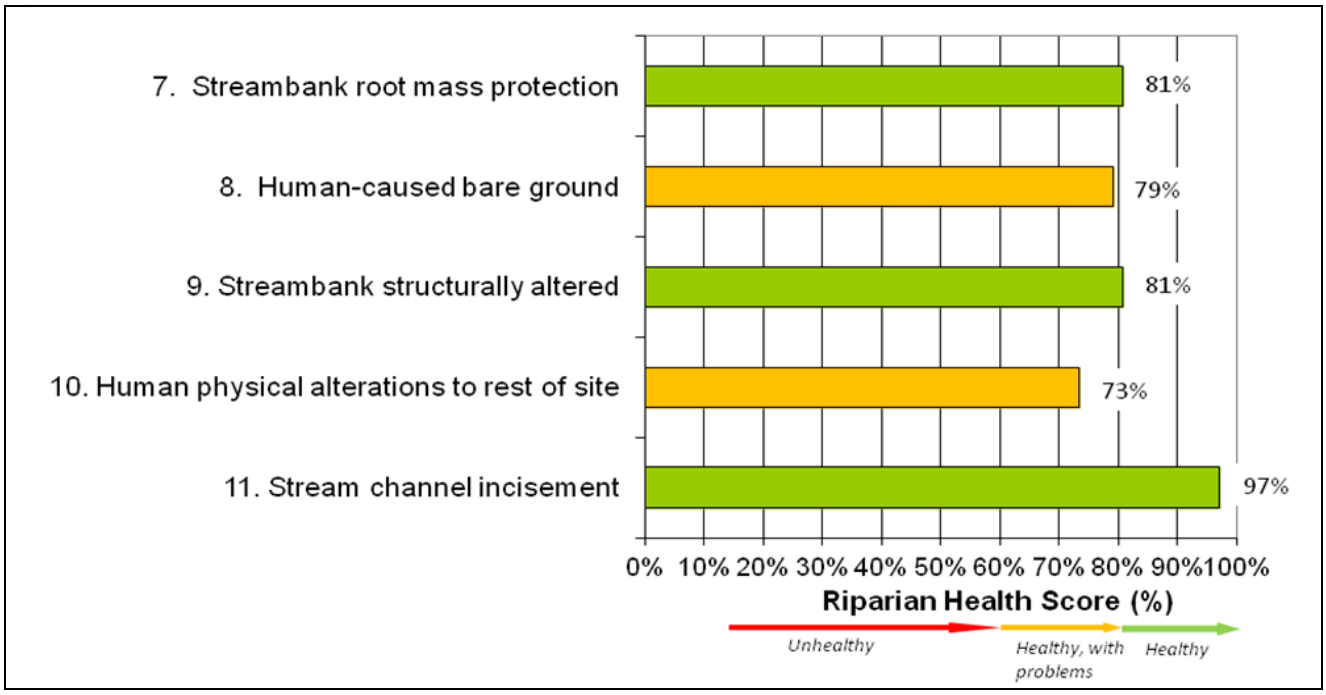


Figure 5 Soil and Hydrology Health Parameter Results (n=59)

Streambank Stability and Root Mass Protection

The role of streambank vegetation is to maintain the integrity and structure of the bank by dissipating energy, resisting erosion and trapping sediment to build and restore banks. Healthy, well vegetated riparian areas slow the rate of erosion and balance erosion in one spot with the bank increases through deposition elsewhere. If unstable banks are occasional, limited to a few outside meander bends and the banks re-vegetate within a year, erosion rates are likely minor. Accelerated bank erosion and removal of streambank vegetation can lead to rapid loss of riparian function, including degradation of habitat for Westslope Cutthroat Trout due to sediment inputs, loss of overhead cover, depleted water quality and degraded spawning and rearing habitat.

- High amounts of cover from disturbance-caused plants and invasive species has reduced streambank root mass protection ratings to 2/6 for the TRO1, NLS1, CRB1, LST1, WIL15, BVR42 and LYX2 sites. A rating of 2/6 indicates that root mass protection is adequate in only 35-66% of the streambank length. Similarly for sites GOL2 and GRE1, high cover of disturbance-caused undesirable herbaceous species has reduced streambank root mass protection ratings to 0/6, indicating that less than 35% of streambank has deep, binding roots.
- 36 of the sites (61%) have adequate cover from deeply rooted plants along more than 85% of their bank length (i.e. a rating of 6/6), while the remaining 14 sites have adequate deep binding root mass along 65%-85% of their bank length (i.e. a rating of 4/6).

Human-caused Bare Ground

Bare ground is unprotected soil that is capable of being eroded by rain drops, overland flow and wind. Bare ground in riparian areas is often present due to natural processes (e.g. sediment deposition from

recent flood events). Bare ground can also result from activities such as vehicle traffic, livestock hoof shear and trailing, recreational trails, timber harvest and other human activities. Areas of natural or human-caused bare ground are susceptible to the encroachment of invasive and disturbance-caused species. Elevated levels of exposed soil due to human causes can also contribute to abnormally high sediment inputs into trout bearing streams with negative consequences to the availability of suitable spawning habitat and degraded water quality.

- Approximately 2.5% of the total project area (i.e. 2.7 ha) has human-caused bare ground, primarily due to recreation and grazing, with small amounts due to logging and construction (Figure 6).
- Human-caused bare ground was highest (i.e. 0/6) in ALL3, SMT2 and DUT2, with more than 15% of the site having human-caused bare ground. ALL3 and SMT2 have wide road crossings along active or decommissioned logging roads in addition to smaller off-highway vehicle crossings (both bridges and fords), contributing to the increase in human-caused bare ground. The Dutch Creek site (DUT2) which was assessed in 2015 has recreational use and random campsites, which has contributed to the increase in human-caused bare ground as well as soil compaction (see page 17 for photos).

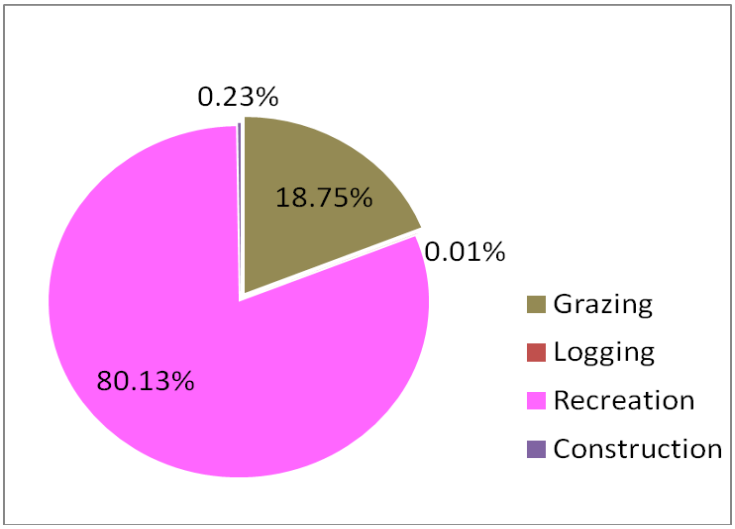


Figure 6 Human Caused Bare Ground Project Area Break-out By Cause (n=59)

Human-caused Alterations to the Streambank and Floodplain

A key function of riparian areas is to filter and trap sediment. This builds a soil layer of moist, fine-textured material. Associated with this, roots and underground fauna create soil structure and macropores that allow water infiltration and storage. These types of soils are very susceptible to vehicle traffic, hoof action and compaction. When a streambank is physically altered, erosion may increase, mobilizing channel and bank materials. As a consequence, water quality may deteriorate and instability can increase within the reach as well as downstream, with negative consequences to Westslope Cutthroat Trout habitat and downstream water users.

Streambank Alterations –

- Two of the three 2015 sites were heavily altered by human activity on the streambanks. In contrast, DUT2 had less physical bank alterations, with 5%-15% of the bank structurally altered. DUT3 was most heavily altered with more than 35% of the bank affected (i.e. score of 0/6) while DOM1 had between 15%-35% of the bank affected (i.e. score of 2/6).
- A small proportion of the total project bank length has been structurally altered. Approximately 6% of the total bank length inventoried from 2005-2015 was structurally altered (i.e. 2.1 km altered/ 34.9 km inventoried) due to grazing, recreation, construction, logging or other human activities (Figure 7).
- Most of the sites assessed from 2005-2015 (83%), had less than 15% (score of greater than or equal to 4/6) of the bank structurally altered by human activity. Those sites with more bank alterations varied in amount. The Rock Creek (RCK1), DOM1, TCT3, ALL3, SMT2, BVR42 and LYX2 sites all had between 15% and 35% (i.e. score of 2/6) structurally altered bank, while SIL1, DUT3 and GRE1 had more than 35% (i.e. score of 0/6) structurally altered bank.

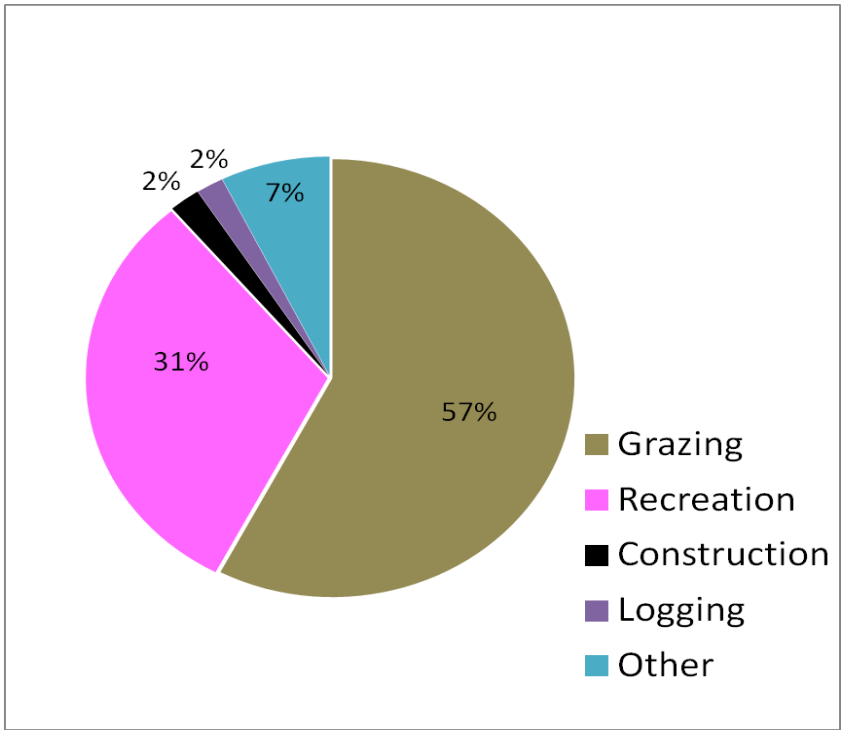


Figure 7 Streambank Alterations Break-out By Cause (n=59)

Alterations in the remainder of the riparian site –

- Approximately 11% (i.e. 12 ha) of the 2005-2015 project area has human physical alterations to the rest of the site (excluding the bank) due to recreation, grazing, construction, logging or other human activities (Figure 8).
- Two of the 2015 sites that were assessed were extensively affected by human alterations. DUT3 had more than 25% of the site (beyond the strambanks) affected by human alterations while

DUT2 had between 15% and 25% affected. As mentioned previously, the Dutch Creek sites have extensive recreational use and random camping which has contributed to site alterations (see page 17 for photos).

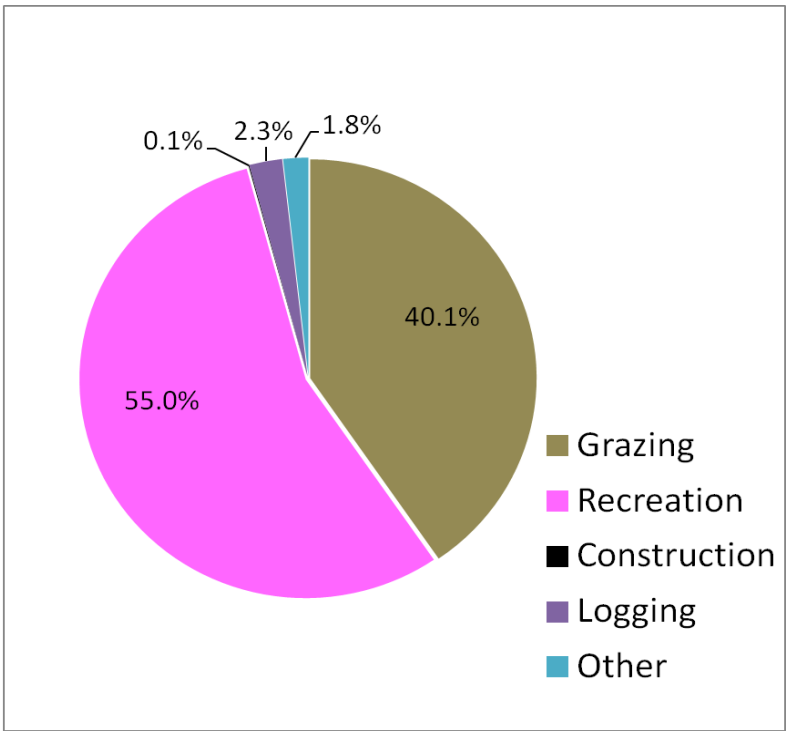


Figure 8 Remainder of Riparian Area Alterations Break-out By Cause (n=59)

Channel Incisement

Periodic flood events disperse moisture in the riparian area, helping to maintain riparian vegetation. Flooding also spreads the energy of moving water over the riparian area, allowing sediment to be deposited and creating new areas for seedling tree and shrub establishment. Channel incisement, or downcutting, can limit the ability of a river to access its floodplain during high water events. In generally, streams are incised when downcutting has significantly lowered the channel so that the average two-year flood event cannot escape the existing channel.

All but four sites rate healthy for this parameter. This means that high water events can regularly access an appropriate width of floodplain, because there sites are not incised. The WAZ1, Pekisko Creek (PEK17, PEK15) and O'Hagen Creek (OHA1) sites rated slightly lower (i.e. score of 6/9) indicating some slight channel incisement within the assessed stream reaches.

A livestock watering access point along Pekisko Creek with erosion and bare soil concerns. Installing an off-stream water trough could allow this portion of the bank to naturally revegetate. (*Photographer: K. Hull, Catalogue No: RHIP15PEK020*)

This vehicle crossing along Pekisko Creek presently receives low amounts of use as general public access is restricted. Ongoing monitoring of weeds and erosion is suggested here. If erosion and bare soil concerns worsen, bridge installation or other crossing measures may be appropriate. (*Photographer: K. Hull, Catalogue No: RHIP15PEK020*)

Recreational trails and roads contribute to soil compaction and sedimentation concerns in the project area, including at this Lynx Creek site. (*Photographer: J. Melsted, Catalogue No: RHIP03LYX010*)

Random camping is a major contributor to soil compaction, bare ground and native vegetation disturbance in the meadows in the Dutch Creek valley. (*Photographer: J. Melsted, Catalogue No: RHIP01DUT007*)

All terrain vehicle trail rutting, soil compaction and erosion along a tributary of Dutch Creek. (*Photographer: J. Melsted, Catalogue No: RHIP01DUT011*)

Human-caused bare ground is a concern along portions of numerous streams, such as Dutch Creek, with recreational use impacts such as all-terrain vehicle trails. (*Photographer: J. Melsted, Catalogue No: RHIP01DUT015*)

SOIL AND HYDROLOGY HEALTH CONCERNS IN THE PROJECT AREA

3 PUBLIC OUTREACH AND ENGAGEMENT

Our goal with this work is to improve overall riparian habitat and sport-fishery habitat, focused on areas where westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) populations still remain, by enhancing habitat through site and area specific improvements. A combination of impacts has led to habitat degradation and loss, including those related to riparian areas disturbance and stream bank structure. Specifically, sedimentation and habitat loss and degradation resulting from off-highway vehicles, random camping, linear disturbance and grazing are threats. These threats can be reduced by working with the relevant stakeholders, partners (AEP, DFO, ACA, TUC, Oldman Watershed Council (OWC), Ghost Watershed Alliance (GWAS), Crowsnest Pass Quad Squad, Spray Lake Sawmills and others), landowners and community members. Some of the initiatives that were part of this project included stakeholder workshops, field days, landowner and/allotment holder consultations and presentations.

The following is a summary of stakeholder and community engagement events completed as part of this project:

- **Annual Stakeholder Workshop** at M.D. of Ranchlands Building was held each year from 2012-2015. These meetings were attended by between 30 and 60 individuals and featured presentations on riparian health results and issues found, showcased examples of successful actions, as well as gathered input from participants on needs and locations for future work. At each workshop, various partners and stakeholders presented in addition to Cows and Fish. M.D. of Ranchlands graciously provided the facilities at no cost.
- Several **Field Days** were held from 2012-2015 at different locations with the project area. Some of these included:
    - In October 2012, a Field Day was held at Todd creek (36 attendees) which included presentations from Cows and Fish, in addition to electro-fishing and streambed freeze-coring demonstrations by Fish and Wildlife staff.
    - A field day in October of 2013 within the Castle Public Land Use Zone (PLUZ) with 14 attendees. Discussion included grazing and recreational use management, as well as viewing of impacts on riparian habitat.
    - An interpretive walk of Hidden Creek took place in August 2014 with the intention to examine and find solutions to watershed issues and challenges that threaten local pure populations of Westslope Cutthroat Trout.
    - In September 2015, a headwaters tour with the Oldman Watershed Council, MLA Marie Fitzpatrick and a community member took place. This included discussing the impacts of land uses, examining a restoration site on Allison Creek, and discussion of the challenges to see continued success of such restoration sites with unmanaged land uses in the area continuing.

- Many **presentations** have also been given throughout the duration of this project and include:
    - October 10, 2012 - Oldman Watershed Council Science Forum (Lethbridge, AB) (90 attendees)
    - February 20, 2013 - 10th Prairie Conservation and Endangered Species Conference (Red Deer, AB) (25 attendees)
    - April 18, 2013 - College of Alberta Professional Forest Technologists Technical Session (Edmonton, AB) (180 attendees)
    - April 9, 2014 - Alberta Society of Professional Biologists Conference (Edmonton, AB) (266 attendees)
    - March 4, 2015 - Rocky Mountain Forage Range Association AGM (Nanton, AB) (45 attendees)
    - March 15, 2016 – Winter Speaker Series – Chinook Arch Library System (Lethbridge Public Library and approx. 8 other southern Alberta libraries) (47 viewers)
- **Social Media** has been an area we have continued to expand our outreach and engagement efforts through. In 2015-16 we used these media extensively to reach our audiences, as did our partners, particularly OWC. Our Facebook and Twitter feeds are interconnected, and also show on our website, so the summary here just highlights some of the Cows and Fish Facebook use:
    - 25 posts related to the project; of these:
    - Average post reach was 521 people, but ranged from 40-4,560
    - Total cumulative post reach of all 25 posts was 13,037
    - Total lifetime post impressions were 25,122

4 SUMMARY OF HABITAT IMPROVEMENT PROJECTS

Another continued focus for Cows and Fish has been to work closely with RHI participants to date (including private landowners, Public Land Agrologists and their respective grazing disposition holders) to help plan and facilitate range improvements that will benefit Westslope Cutthroat Trout habitat. All project participants have received detailed site specific reports detailing the results of the RHI work to date. Each report contains a management summary that highlights recommended steps to be taken to maintain and/or improve riparian health, including addressing specific riparian health parameters of concern. In addition, several habitat improvement projects were completed in areas that would benefit pure populations of Westslope Cutthroat Trout. These projects include:

- Riparian fencing projects funded by ACA to prevent use of sensitive riparian areas
- Three spring developments for off-stream watering, including sites on Rock Creek (1 project) and Sharples Creek headwaters on the Waldron Ranch (2 projects – 2015)
- Two Bridges installed by the Crowsnest Pass Quad Squad along Gold and Green Creeks as part of the Ed Gregor Memorial Stewardship Day
- Support of MD of Ranchland weed control efforts along 2 sites in Gold Creek (multiple years)
- Stream crossing and erosion control structure project on Rock Creek (planned, approved and materials purchased; to be installed 2016)
- "Steer Clear" Signage installed at Dome Creek stream ford next to a bridge in November 2015
- Bridge component purchase for new/post-flood bridge replacement at 8 sites through ESRD's Backcountry Trails Program[2]. These included 5 replacements along the Carbondale River, 1 along South Lost Creek, 1 along Goat Creek and 1 along 4-Mile Creek.
- Stream crossing restoration projects:
    - November 2013 – Allison Creek (ALL3) Restoration which included plantings on willow, balsam poplar and red-osier dogwood stakes and fascines to help control fording of the river.
    - October 2014 – Allison Creek (ALL3) and Smith Creek (SMT2) Restoration which included localized riparian plantings of willows, balsam poplar and red-osier dogwood stakes. Some of these plantings were to repair continued OHV impacts that had resulted in destruction of some 2013 planted material, despite the presence of silt fences and logs in place to act as barriers. October 2015 – Dutch Creek Restoration at the bridge leading to the Atlas Road, which included localized riparian plantings along with the installation of fence posts to prevent OHVs and trucks from fording the creek. Prominent "Steer Clear" signage was also installed to encourage positive behaviour and emphasise the importance of avoiding natural waterways and using the available bridge. The event was dubbed 'Restoration for Recreation' to encourage participation and involvement of the recreational users. This event was a joint effort with the Oldman Watershed Council.

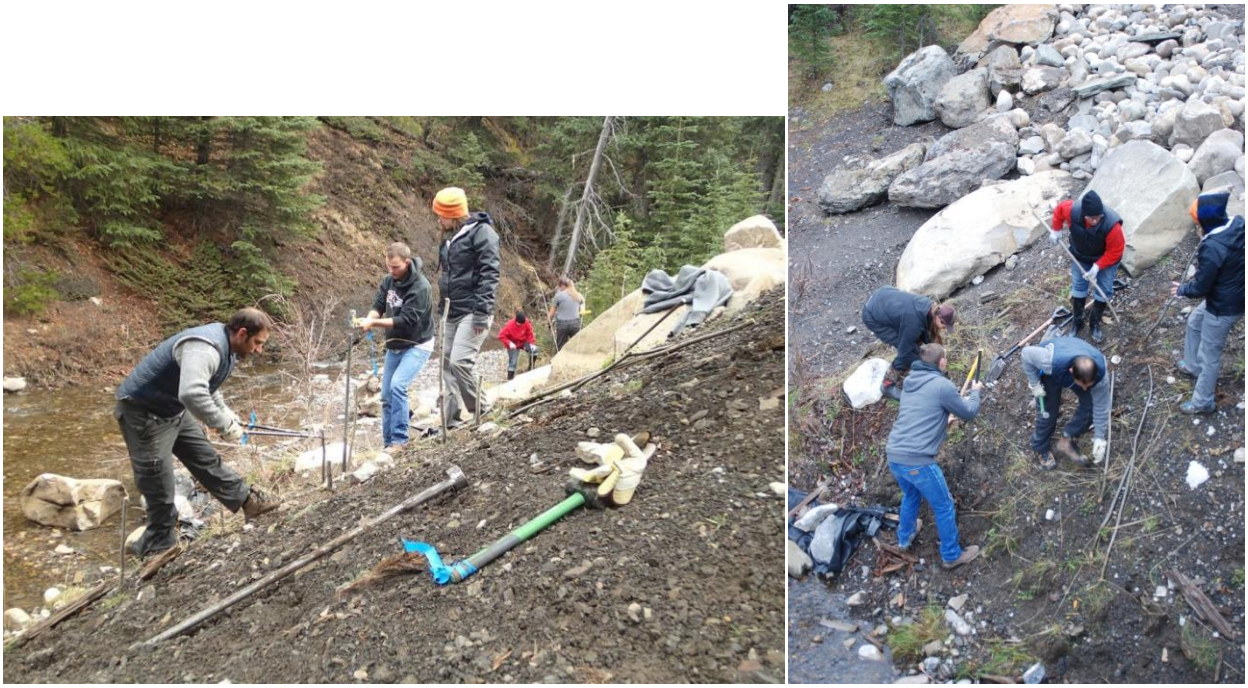
[2] Some of these projects also involved forded stream crossing closures and ongoing revegetation/reclamation works led by Backcountry Trails Program

Dutch Creek restoration October 2015. This was a collaborative effort with the Oldman Watershed Council and involved input from Spray Lake Sawmills, Crowsnest Pass Quad Squad and many (47) volunteers.

Dutch Creek (DUT2) riparian planting and restoration project – October 27, 2015. Balsam poplar, willow and red-osier dogwood live stakes were installed along with fencing and prominent signage to prevent OHVs from fording through the creek.

Allison Creek (ALL3) riparian planting project – November 8, 2013 (Left) and October 24, 2014 (Right). Balsam poplar, willow and red-osier dogwood live stakes were installed in both years. In 2013 and 2014, large woody debris was placed on the left bank by Spray Lake Sawmills to prevent OHVs from fording through the creek.

Subsequent return to the 2013 Allison Creek site (shown above) in August 2014 showed successful growth of live willow stakes along the banks.



Smith Creek (SMT2) riparian planting project, October 24, 2014. Live willow and balsam poplar stakes were installed on the steep approach slopes adjacent to the quad bridge to help stabilize and reduce bank erosion.

New bridges were installed along Gold Creek (left) and Green Creek (Right) by the Crowsnest Pass Quad Squad to prevent continued fording of the creek.

5 LESSONS LEARNED

This work has required significant investment in time, energy, funding and ideas. Over the past five years, we have learned a few key things in leading this initiative. Some of these are operational or logistical, while others are more social and political system related, and still others are biological lessons.

Positive Power

There is a considerable interest by the public and community in these areas to make a difference. This includes the organisations and groups that work in the region and on related issues or topics. The volunteers and the many people that have attended our Stakeholder Workshops each February have expressed a strong sense of commitment, interest and desire to see change, and to help make that change happen.

Need for Collaboration

This project was initiated with the strong urging and support from several partners involved in fisheries management and the draft Recovery Team. Over the past five years, that support has been challenged by budget cuts, changes in mandate and priorities and staff turnover, to people that do not all have that original commitment to support the work, which has predominantly been led by Cows and Fish staff. The need for ongoing input and involvement from other partners remains a key role. There are many individuals and organisations that have the experience and familiarity with the landscape, the issues, and the land uses. These individuals and organisations are required to enable us to work on the most meaningful and impactful areas and have the greatest influence with land users and decision makers. The commitment and support from the many partners, landowners and others has been instrumental in prioritising and selecting sites, understanding the history of sites, and in reaching others land users to draw them in, to engage them. In 2015-16, the Oldman Watershed Council involvement expanded considerably which has been extremely helpful in focusing efforts to better understand the recreational user and find ways to bring that land use group more into the initiative, which had been limited in past years.

Need for Continuity and Multi-Year Approaches

One of the challenges with actually getting on the ground changes in place is the timeframe to engage, discuss management, develop partnerships and relationships, get the necessary approvals and then implement the work, whether restoration, grazing changes, bridges, or other work. Most of the funding over the past five years has been provided one year at a time and that has not allowed for much planning or continuity, when all work must be started and completed in a one year window. One of the areas where we would like to see an increase in work is the commitment to monitoring and follow up of restoration sites, to revisit them and do repairs as needed, but this has been limited because new work is always required with new annual funding. When funding has not been confirmed until well into the year, which has happened repeatedly,

planning and delivery have been more challenging. Having multi-year, committed funding would lead to better planning, reduce time spent on finding funding and increase successes.

Keep and Expand What is Healthy

Many of the sites with pure and near pure westslope cutthroat trout that we have visited to examine riparian health have been very healthy. Often, these sites have relatively steep valleys, with extensive bedrock at the surface, and are thus relatively inaccessible by humans (and their machines) or livestock. Keeping these relatively pristine and healthy sites is critical but so is adding to these healthy areas. Perpendicular crossings and trails of many kinds are often only a very small amount of the riparian area, and may not significantly affect the overall riparian health of a larger reach, but they may have considerable detrimental impact on the aquatic habitat which westslope cutthroat trout rely upon. Focusing on the "hot-spots" and linear features that bisect even otherwise healthy riparian areas is important, as is focussing on the sites where overall riparian health has been degraded but can be improved.

Increase Interconnectedness of Management and Land Use Decisions

In most areas of the eastern slopes included in this initiative, multiple land uses have been poorly interconnected and planned. For example, the historic accumulation of cutlines, seismic lines and roads from oil and gas, timber and other resource extractions efforts have resulted in a boon of access for recreational users, but these were not designed for recreational use. Livestock grazing patterns are also influenced by these uses, and historic pasture improvements (to create open, tame pastures) have contributed to non-native plant community expansion and increased recreation access to areas as well. Unfortunately, these overlapping uses create cumulative effects that have not been planned for - this planning and integration is a major need if impacts to westslope cutthroat trout and the overall landscape are to be effectively managed and ultimately, reduced. The ability to determine road or access closures and changes, restoration and re-routing or modifying each of the land use activities is lacking now, but offers the potential for big, positive impacts, if it can be done in an integrated, thoughtful way and can be supported and maintained.

Other Tools Needed

The current issues facing westslope cutthroat trout and their habitat are an accumulation from decades of issues and impacts, policies and approaches, which need to be addressed with new and different approaches. Greater enforcement and user fees are common tools recommended at our Stakeholder Workshops to drive change forward. These would act as mechanisms to help reach desired outcomes and provide resources to implement work to support those outcomes.

Need for more education and increased stewardship ethic

In our education and outreach efforts we have frequently heard from people that they had no idea that there was a threatened fish species in the area, let alone in a particular small, inconspicuous

stream. In addition, often land users have not previously made any connection from their actions to a negative consequence to fish and riparian resources. The installation of several of the habitat improvement measures in this project, by livestock producers in particular, was a direct result of them learning that there were such fish in the stream and that they could do something about their management that would be beneficial to the fish, and to their grazing operations. There are many land managers that still do not know where the fish exist, because it is not publically signed or promoted. Clear, consistent and widespread education about the presence of these fish is needed, in addition to supportive management recommendations for various land uses.

Many in the non-organised recreational community are less directly tied to ownership of the land through title or permits (compared to livestock grazers), but they do have a sense of ownership of the places they frequent. Reaching them with a stewardship message will be needed before they can make a connection to land use changes they have control over. The informed and engaged OHV clubs are striving to improve practices by OHV users, but based on our observations, the majority of random camping and OHV users are not part of such organised groups. Reaching all users so they are aware and can become stewards is no small task but is required to have the long-term impacts needed.

6 CLOSING

Our emphasis is to help individuals, resource managers, municipalities and local communities address riparian management issues on a watershed basis by increasing awareness, obtaining baseline riparian health information and offering realistic, practical management options and alternatives that can be implemented to improve riparian habitat. Riparian health assessment enables local communities and managers to identify and effectively develop and implement approaches to address specific land use issues, using our recommendations, and it offers a benchmark to monitor long-term success of our work. Working locally and collaboratively to develop common goals and objectives for these watersheds is rewarding – it helps keep people invested in natural landscapes and will help them take a key role in managing these areas.

To inquire about additional references for riparian health monitoring and management and for further information on any aspect of this report, please contact:

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7 LITERATURE CITED

Costello, A. B. 2006. Status of the Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) in Alberta. Prepared for Alberta Sustainable Resource Development and Alberta Conservation Association. Alberta Wildlife Status Report No. 61. 34 pp.

Cows and Fish (Alberta Riparian Habitat Management Society). 2011. 2011 Riparian Health Inventory Project: Westslope Cutthroat Trout Priority Streams- A Summary of the Riparian Health Status and Habitat Improvement Needs for 20 Priority Westslope Cutthroat Trout Sites in the South Eastern Slopes of Alberta. Cows and Fish Report No. 041.

Cows and Fish (Alberta Riparian Habitat Management Society). 2012. 2012 Riparian Health Inventory Project (Year 2): Westslope Cutthroat Trout Priority Streams; A Summary of the Riparian Health Status and Habitat Improvement Needs for 17 Priority Westslope Cutthroat Trout Sites in the South Eastern Slopes of Alberta. Cows and Fish Report No. 042.

Cows and Fish (Alberta Riparian Habitat Management Society). 2013. 2013 Riparian Health Inventory Project (Year 3): Westslope Cutthroat Trout Priority Streams; A Summary of the Riparian Health Status and Habitat Improvement Needs for Five Priority Westslope Cutthroat Trout Sites in the South Eastern Slopes of Alberta. Cows and Fish Report No. 043.

Cows and Fish (Alberta Riparian Habitat Management Society). 2014. 2014 Riparian Health Inventory Project (Year 4): Westslope Cutthroat Trout Priority Streams; A Summary of the Riparian Health Status and Habitat Improvement Needs for 14 Priority Westslope Cutthroat Trout Sites in the South Eastern Slopes of Alberta. Cows and Fish Report No. 044.

Fitch, L., B.W. Adams and G. Hale. 2001. Riparian Health Assessment for Streams and Small Rivers – Field Workbook. Lethbridge, Alberta: Cows and Fish Program.

Hunter, Christopher J. 1991. Better Trout Habitat: A Guide to Stream Restoration and Management. Montana Land Reliance. Island Press, Washington, DC, and Covelo, CA. 320 pp.

Moss, E. H. (revised by John G. Packer). 1994 (2nd Ed.). Flora of Alberta. University of Toronto Press. Toronto, Canada.

Natural Regions Committee 2006. Natural Regions and Subregions of Alberta. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852. https://www.albertaparks.ca/media/2942026/nrsrcomplete_may_06.pdf

Tannas, K. 2004. Common Plants of the Western Rangelands: Volume 3, Forbs. Published by Olds College and Alberta Agriculture, Food and Rural Development. Edmonton, Alberta.

The Alberta Westslope Cutthroat Trout Recovery Team. 2013. Alberta Westslope Cutthroat Trout Recovery Plan: 2012-2017. Alberta Environment and Sustainable Resource Development, Alberta Species At Risk Recovery Plan No. 28. Edmonton, Alberta. 77pp.

GLOSSARY

Bankfull channel width – width of a stream channel at the point where high water will begin to escape the channel during floods. This point may be determined by: the elevation at the top of depositional features like sand, silt or gravel bars; changes in bank material from coarse substrate within an active channel to deposited material of a smaller size; or exposed roots below an intact, vegetated soil layer indicating erosion.

Canopy cover – the ground area covered by vegetative growth. Different plant species can provide varying degrees of cover depending on their overall size and abundance. Total canopy cover can be greater than the area being studied due to overlap in plant structural layers.

Community type – An aggregation of all plant communities distinguished by floristic and structural similarities in both overstory and undergrowth layers. For the purposes of this document, a community type represents seral vegetation, and is never considered to be climax.

Disturbance-caused undesirable herbaceous species – native or introduced non-woody plant species that are well adapted to disturbance or an environment of continual stress. This term *does not* include invasive plant species.

Floodplain – the land base alongside a stream that has the potential to be flooded during high water events.

Habitat type – the land area that supports, or has the potential to support, the same primary climax vegetation. It is based on the potential of the site to produce a specific plant community (plant association).

Human-caused bare ground – areas devoid of vegetation as a result of human activity. This can include vehicle roads, recreational trails and livestock trampling.

Invasive plant species – plant species that are designated by the *Weed Control Act* of Alberta as *restricted* or *noxious* weeds, as well as some additional species identified by Cows and Fish and/or Public Lands (Alberta Sustainable Resource Development) to be invasive within riparian areas.

Lotic – this term means *flowing water* (i.e., streams and rivers).

Lentic – this term means *standing* or *still water* (i.e., lakes, ponds and sloughs).

Pointbar – areas along the stream edge where sediment has been naturally deposited by moving water. These typically occur on the inside portion of a channel bend. Also known as a *sandbar*.

Polygon – term used to describe a riparian inventory site. On lotic systems, a polygon has an upstream and downstream end along a reach of a stream and an associated riparian width. The lateral extent (width) of the riparian area is subjectively determined in the field based on vegetation and terrain clues indicating the flood prone area.

Reach – section of a stream or river with similar physical and vegetative features and similar management influences.

Riffle –*A riffle is a short, relatively shallow and coarse-bedded reach where the stream flows at higher velocity and higher turbulence than it normally does in comparison to a pool* (source: http://en.wikipedia.org/wiki/Riffle)

Stream channel incisement – the degree of downward erosion within the channel bed.

Structural alteration – physical changes to the shape or contour of the streambank caused by human influences. Some examples are livestock crossings, culverts and 'riprap'

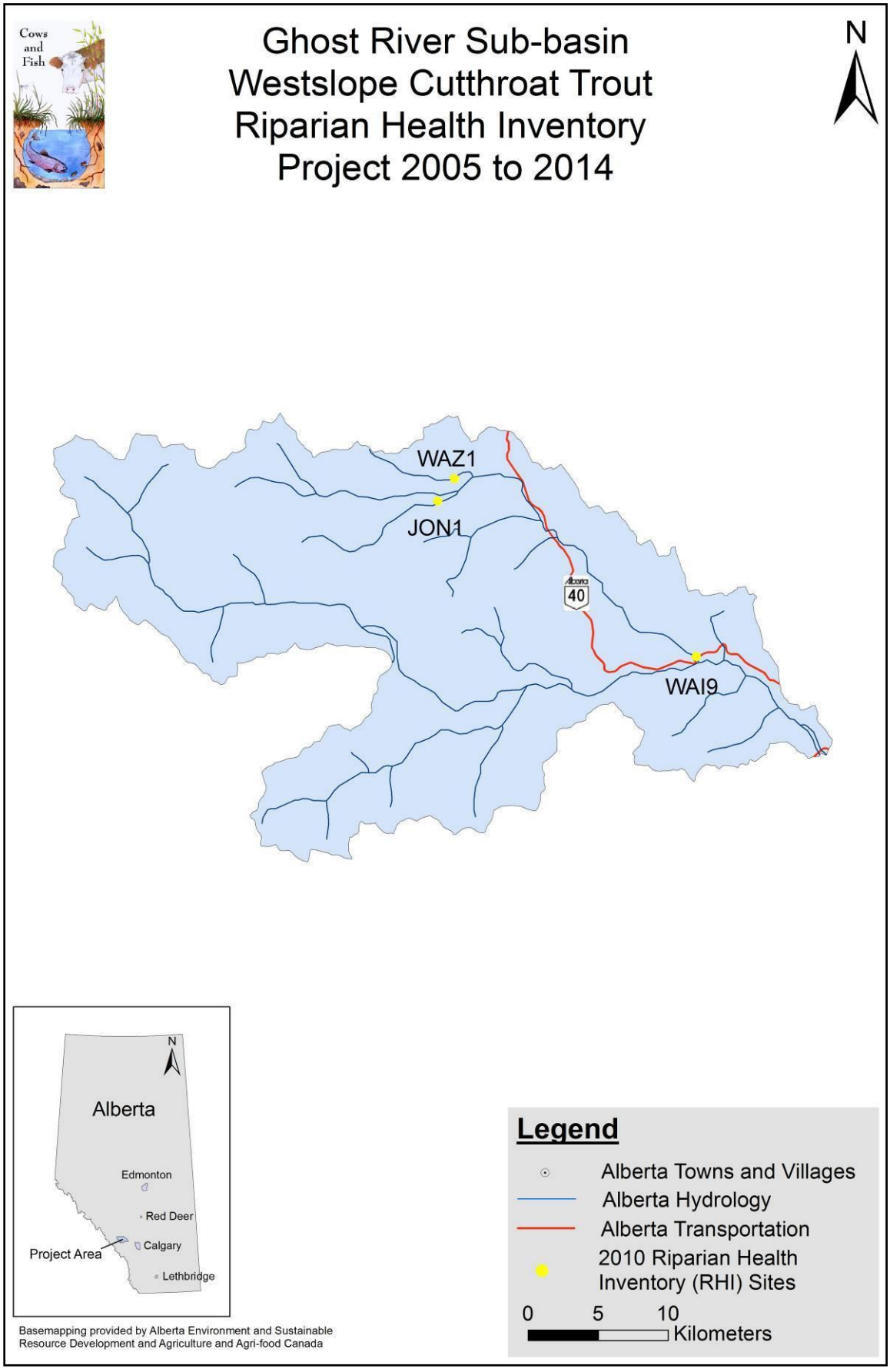
Tree and shrub regeneration – the presence of seedlings and saplings, or the 'new growth'.

Woody plant species – simply refers to trees and shrubs. These plants serve different riparian functions than grasses and broad-leaf plants.

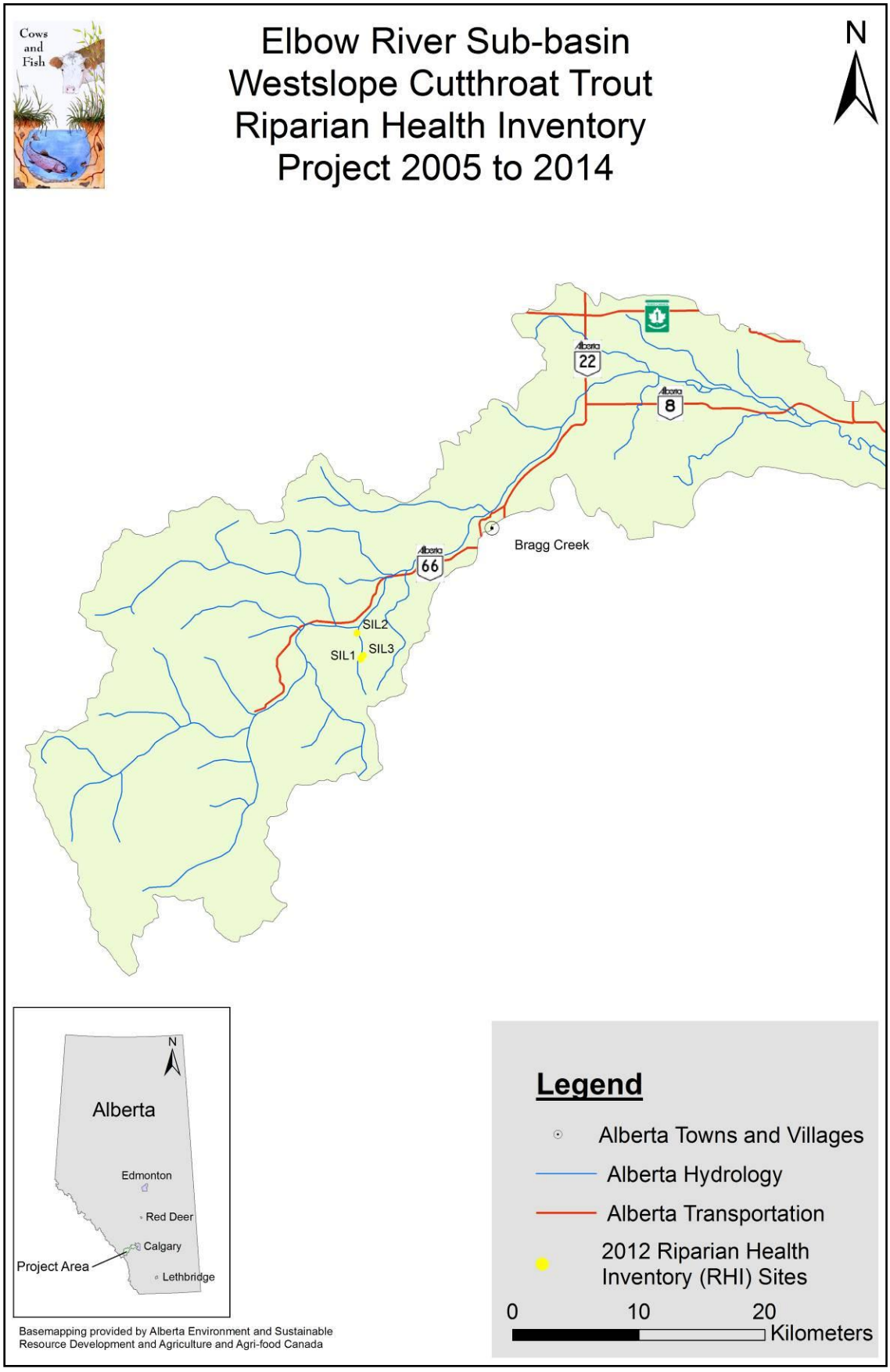
APPENDIX A

2005-2015 WESTSLOPE CUTTHROAT TROUT RHI SITE LOCATION SUB-BASIN MAPS

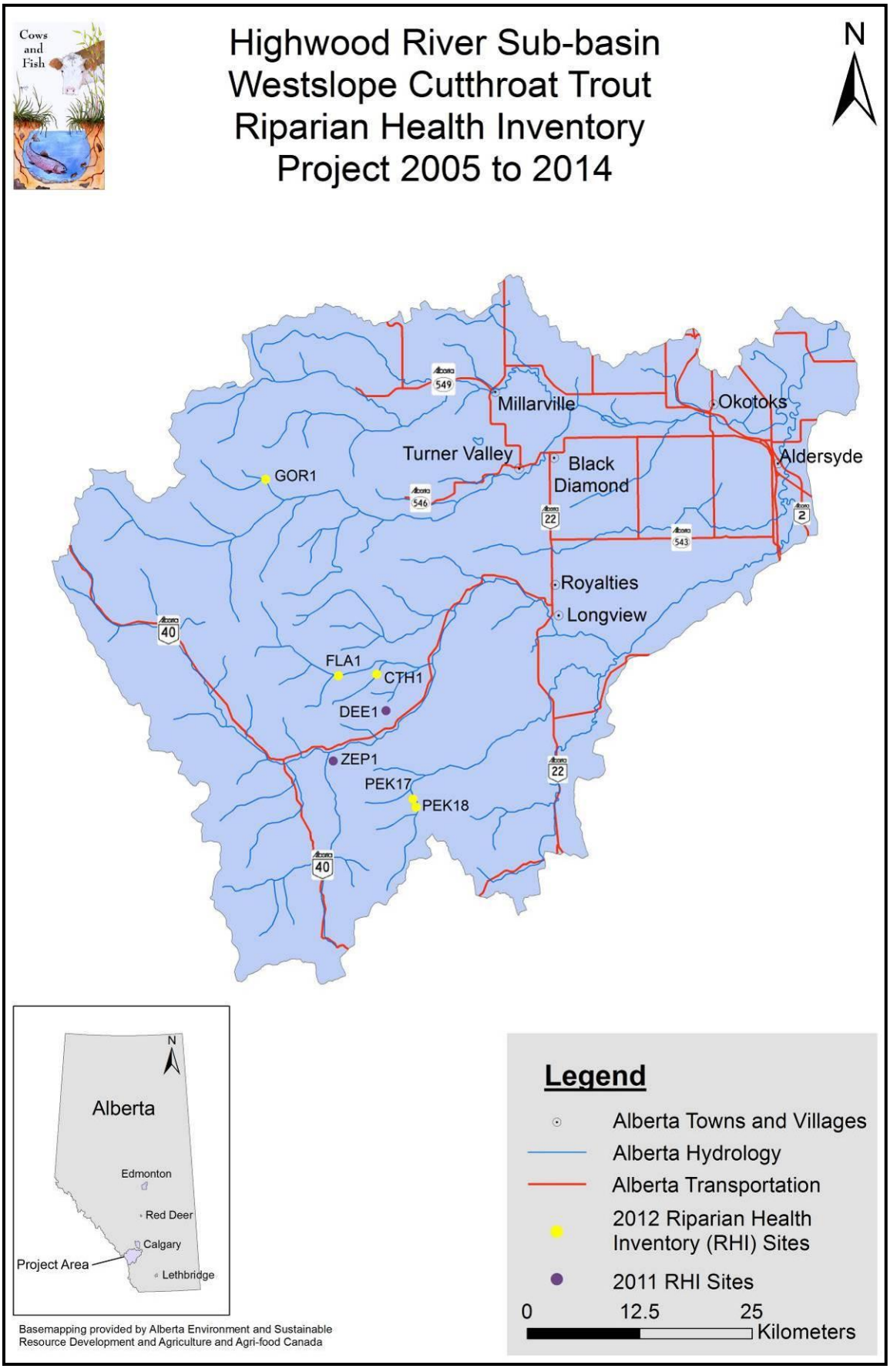
MAP A – GHOST RIVER SUB-BASIN



MAP B – ELBOW RIVER SUB-BASIN



MAP C – HIGHWOOD RIVER SUB-BASIN



MAP D – LOWER OLDMAN RIVER SUB-BASIN

MAP E – UPPER OLDMAN RIVER SUB-BASIN

Upper Oldman River Sub-basin
Westslope Cutthroat Trout
Riparian Health Inventory
Project 2005 to **2015**

N

LIV1
OLD37
HID1
HID2
DUT1
DOM1
DUT2
SHA1
SHA3
NRC1
SMT1
SMT2
TCT2
TCT3
TCT1
VIC1
ALL3
BLC1
ALL2
MOR1
GOL3
GRE1
RCK1
STA1
Burmis
Lundbreck
Cowley
Pincher
LYX4
LYX3
LYX2
Pincher Creek
NLS1
LYX1
LST1
CRB2
CRT1
Beaver
Mines
CRB1
OHA1U
SYN1

Alberta 40
Alberta 22
Alberta 510
Alberta 507
Alberta 774
Alberta 6

Legend

- Alberta Towns and Villages
- Alberta Hydrology
- Alberta Transportation
- 2015 Riparian Health Inventory (RHI) Sites
- 2014 RHI Sites
- 2013 RHI Sites
- 2012 RHI Sites
- 2011 RHI Sites
- 2005 RHI Sites

0 5 10 Kilometers

Basemapping provided by Alberta Environment and Sustainable Resource Development and Agriculture and Agri-food Canada

APPENDIX B

DESCRIPTION OF RIPARIAN HEALTH PARAMETERS

This description of riparian health parameters is based on the Alberta Lotic Wetland Health Assessment for Streams and Small Rivers (Survey) User Manual (Cows and Fish, current as of April 18, 2014). The complete user manual can be found at: http://cowsandfish.org/riparian/documents/ALBLoticSurveyManual_000.pdf

Each riparian health parameter is rated according to conditions observed on the site at the time of evaluation. Parameters are assessed using ocular estimates by trained practitioners. The parameter breakout groupings and point weightings were developed by a collaboration of riparian scientists, fisheries biologists, range professionals and land managers.

1. Vegetation Cover of Floodplain and Streambanks

6 = More than 95% of the polygon area is covered by plant growth.
4 = 85% to 95% of the polygon area is covered by plant growth.
2 = 75% to 85% of the polygon area is covered by plant growth.
0 = Less than 75% of the polygon area is covered by plant growth.

2a. Total Canopy Cover of Invasive Plant Species

3 = No invasive plants (weeds) on site.
2 = Invasive plants present with total canopy cover less than 1% of the polygon area.
1 = Invasive plants present with total canopy cover between 1 and 15% of the polygon area.
0 = Invasive plants present with total canopy cover more than 15% of the polygon area.

2b. Density/Distribution of Invasive Plant Species (Table 1)

3 = No invasive plants (weeds) on site.
2 = Invasive plants present with density/distribution in categories 1, 2 or 3.
1 = Invasive plants present with density/distribution in categories 4, 5, 6 or 7.
0 = Invasive plants present with density distribution in categories 8 or higher.

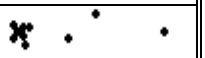
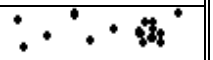
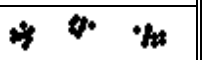
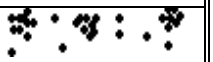
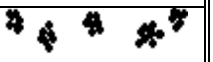
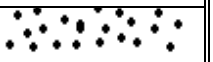
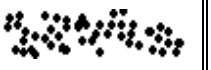
CLASS	DESCRIPTION OF ABUNDANCE	DISTRIBUTION PATTERN
0	No invasive plants on the polygon	
1	Rare occurrence	
2	A few sporadically occurring individual plants	
3	A single patch	
4	A single patch plus a few sporadically occurring plants	
5	Several sporadically occurring plants	
6	A single patch plus several sporadically occurring plants	
7	A few patches	
8	A few patches plus several sporadically occurring plants	
9	Several well spaced patches	
10	Continuous uniform occurrence of well spaced plants	
11	Continuous occurrence of plants with a few gaps in the distribution	
12	Continuous dense occurrence of plants	
13	Continuous occurrence of plants associated with a wetter or drier zone within the polygon	

Table 1. Density/distribution of invasive plant species.

3. Disturbance-Caused Undesirable Herbaceous Species

3 = Less than 5% of the site covered by disturbance-caused undesirable herbaceous species.

2 = 5% to 25% of the site covered by disturbance-caused undesirable herbaceous species.

1 = 25% to 50% of the site covered by disturbance-caused undesirable herbaceous species.

0 = More than 50% of the site covered by disturbance-caused undesirable herbaceous species.

4. Preferred Tree and Shrub Establishment and Regeneration

(N/A will appear in the Riparian Health Score Table if the polygon lacks potential for preferred trees or shrubs)

6 = More than 15% of the total canopy cover of preferred trees/shrubs is seedlings and saplings.

4 = 5% to 15% of the total canopy cover of preferred trees/shrubs is seedlings and saplings.

2 = Less than 5% of the total canopy cover of preferred trees/shrubs is seedlings and saplings.

0 = Preferred tree/shrub seedlings and saplings absent.

5a.Utilisation of Preferred Trees and Shrubs

(N/A will appear in the Riparian Health Score Table if the polygon lacks potential for preferred trees or shrubs)

3 = None (0% to 5% of available 2nd year and older leaders of preferred species are browsed).

2 = Light (5% to 25% of available 2nd year and older leaders of preferred species are browsed).

1 = Moderate (25% to 50% of available 2nd year and older leaders of preferred species are browsed).

0 = Heavy (More than 50% of available 2nd year and older leaders of preferred species are browsed).

5b. Live Woody Vegetation Removal by Other than Browsing

(N/A will appear in the Riparian Health Score Table if the polygon lacks potential for trees or shrubs)

3 = None (0% to 5% of live woody vegetation expected on the site is lacking due to cutting and/or removal by beaver).

2 = Light (5% to 25% of live woody vegetation expected on the site is lacking due to cutting and/or removal by beaver).

1 = Moderate (25% to 50% of live woody vegetation expected on the site is lacking due to cutting and/or removal by beaver).

0 = Heavy (More than 50% of live woody vegetation expected on the site is lacking due to cutting and/or removal by beaver).

6. Standing Decadent and Dead Woody Material

3 = Less than 5% of the total canopy of woody species is decadent or dead.

2 = 5% to 25% of the total canopy of woody species is decadent or dead.

1 = 25% to 45% of the total canopy cover of woody species is decadent or dead.

0 = More than 45% of the total canopy cover of woody species is decadent or dead.

7. Streambank Root Mass Protection

6 = More than 85% of the streambank has deep, binding root mass.

4 = 65% to 85% of the streambank has deep, binding root mass.

2 = 35% to 65% of the streambank has deep, binding root mass.

0 = Less than 35% of the streambank has deep, binding root mass.

8. Human-Caused Bare Ground

6 = Less than 1% of the sites is human-caused bare ground.

4 = 1% to 5% of the site is human-caused bare ground.

2 = 5% to 15% of the site is human-caused bare ground.

0 = More than 15% of the site is human-caused bare ground.

9. Streambank Structurally Altered by Human Activity

6 = Less than 5% of the bank is structurally altered by human activity.

4 = 5% to 15% of the bank is structurally altered by human activity.

2 = 15% to 35% of the bank is structurally altered by human activity.

0 = More than 35% of the bank is structurally altered by human activity.

10. Human Physical Alteration to the Rest of the Polygon

3 = Less than 5% of the polygon is affected by human causes.

2 = 5% to 15% of the polygon is affected by human causes.

1 = 15% to 25% of the polygon is affected by human causes.

0 = More than 25% of the polygon is affected by human causes.

11. Stream Channel Incisement (Vertical Stability) (Figure 1)

9 = Not incised

6 = Slightly incised

3 = Moderately incised

0 = Severely incised

Incisement Severity	Channel Development Stage	Rosgen Types Included	Description of Incisement Situation
Not Incised (9 points)	A	A, B, C, E	Channel is vertically stable and not incised; 1-2 year high flows can begin to access a floodplain appropriate to the stream type. Active downcutting is not evident. Any old incisement is characterized by a broad floodplain inside which perennial riparian plant communities are well established. This category includes a variety of stream types in all land forms and substrates. The floodplain may be narrow or wide, depending on the type of stream, but the key factor is vertical stability. The system may have once cut down, and later become healed and is now stable again, with a new floodplain appropriate to its stream type. In this case, the erosion of the old gully side walls will have ceased and stabilised. A mature, or nearly mature, vegetation community will occupy much of the new valley bottom.
Slightly (6 points)	B/D	C, F, G	This category contains both degrading and healing stages. In either case, the extent of incisement is minimal. In Stage B, the channel is just beginning to degrade, and a 2 year flood event may still access some floodplain, either partially or in spots. Downcutting is likely progressing. In Stage D, the system is healing. Downcutting should have ceased at this stage. A new floodplain should be well established with perennial vegetation, although it may not yet be as wide as the stream type needs. This is indicated by continuing lateral erosion of the high side walls of the original incisement, as the system continues to widen itself at its new grade level.

Moderately (3 points)	B/D	C, F, G	This category also contains both degrading and healing stages. In both cases, the extent of incisement is significant. In Stage B, the channel has downcut to a level that floods of the 1-5 year magnitude cannot reach a floodplain. Downcutting is likely still progressing, but the channel may already have the appearance of a gully. In Stage D, the system has only just begun to heal. A small floodplain along the new meanders within the gully is forming, and perennial vegetation is starting to colonize the new sediment features. The high side walls of the gully are being actively eroded as the system widens, and much of the fallen material is being incorporated along the bottom.
Severely (0 points)	C	F, G	This is the worst case category, where the system has no floodplain in the bottom of a deep entrenchment, and small-to-moderate floods cannot reach the original floodplain level. Downcutting may, or may not, still be in progress. High side wall banks may have begun to collapse and erode into the bottom, but high flows typically just wash this material directly through the system, with none of it being trapped to build a new floodplain. At this stage, the system has lost practically all of its riparian function and habitat value.

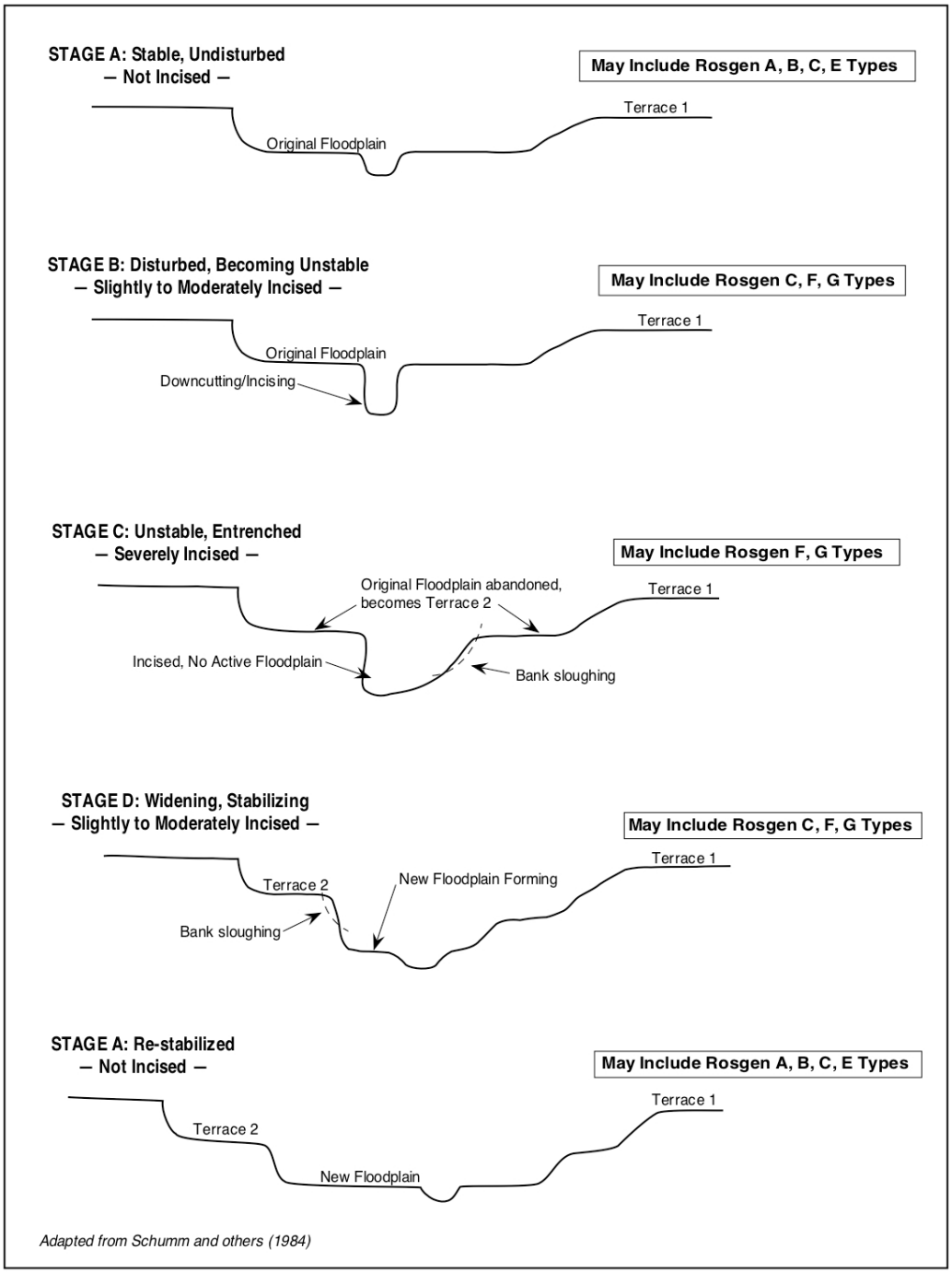


Figure 1. Guide for estimating channel incisement stage.