Action on Recovery:
Native Salmonid Recovery in the Crown of the Continent

Photo source: U.S. Geological Survey, Department of the Interior/ USGS, U.S. Geological Survey

Crown Managers Partnership 2018 Forum Report

March 20th-22nd, 2018 in Lethbridge, Alberta

For all supporting materials, please visit: http://crownmanagers.org/2018-forum/

***Organized by*:**

NATIONAL PARK SERVICE

Parks Canada / Parcs Canada

CMP Crown Managers Partnership

Alberta Environment and Parks

U.S. FISH & WILDLIFE SERVICE

THE WILDERNESS SOCIETY 75 1935 – 2010

Great Northern LANDSCAPE CONSERVATION COOPERATIVE

FLATHEAD LAKE BIO STATION UNIVERSITY OF MONTANA

USGS science for a changing world

Montana Fish, Wildlife & Parks

Table of Contents

Workshop participant list

Last Name	First Name	Email	Job Title	Company
Adams	Ross	ross.adams@gov.ab.ca	Area Range Management Specialist	Alberta Environment and Parks
Ambrose	Norine	nambrose@cowsandfish.org	Executive Director	Cows and Fish - Alberta Riparian Habitat Management Society
Bartlett	Mike	mbartlett@mems.ca	QAES	Millennium EMS Solutions Ltd
Benoit	Kristina	kristina.benoit@rivresources.com	Environmental Advisor	Riversdale Resources
Bettles	Cory	cbettles@hatfieldgroup.com	Senior Fisheries Scientist	Hatfield Consultants
Blackburn	Mike	mike.blackburn@gov.ab.ca	Fish Biologist	Alberta Environment and Parks
Blackburn	Jason	jason.blackburn@ab-conservation.com	Fisheries Biologist	Alberta Conservation Association
Bourret	Sam	sbourret@mt.gov	Fisheries Biologist	Montana Fish, Wildlife, and Parks
Boyer	Matt	mboyer@mt.gov	Science Program Supervisor	Montana Fish, Wildlife, and Parks
Bruised Head	Diandra	dbruisedhead@btlands.com	Climate Change Coordinator	Blood Tribe Land Management
Bumstead	Sara	sara.bumstead@gov.ab.ca	Fisheries Biologist	Alberta Environment and Parks
Burnham	Maggie	bswc.flbs@gmail.com	-	Crown Managers Partnership
Carlson	Anne	Anne_Carlson@tws.org	Senior Climate Adaptation Specialist	The Wilderness Society
Christensen	Paul	paul.christensen@gov.ab.ca	Senior Fisheries Biologist	Alberta Environment and Parks
Cline	Erik	erik.cline@uleth.ca	M.Sc.	University of Lethbridge
Coombs	Matthew	matthew.coombs@gov.ab.ca	Fisheries Biologist	Alberta Environment and Parks
Crowshoe	Stephanie	stephanie.crowshoe@gov.ab.ca	Fisheries Tech	Alberta Government
Curtis	Martyn	martyn.curtis@dfo-mpo.gc.ca	Regional Manager, Species at Risk Program	Fisheries and Oceans Canada
D'Angelo	Vincent	vdangelo@usgs.gov	Fisheries Biologist	U.S. Geological Survey
Dick	Kelly	kelly.dick@gov.ab.ca	Fisheries Biologist	Alberta Environment and Parks
Downs	Chris	chris_downs@nps.gov	Fisheries Program Manager	Glacier National Park
Drummond	Rod	rod.drummond@aer.ca	Fisheries Biologist	Alberta Energy Regulator

Earle	Jennifer	jennifer.earle@gov.ab.ca	Fisheries Biologist	Alberta Environment and Parks
Fargey	Patrick	Pat.Fargey@gov.ag.ca	Species at Risk Specialist	Government of Alberta
Fitch	Lorne	lafitch@shaw.ca	Biologist	Cows and Fish
Gardner	Beth	bgardner@fs.fed.us	Fisheries Biologist	USDA Forest Service
Harper	Paul	pharps@gmail.com	Senior Fisheries Biologist	University of Lethbridge
Hendrickson	Shane	shendrickson@fs.fed.us	Fisheries Biologist	USDA Forest Service
Humphries	Shelley	shelley.humphries@pc.gc.ca	Aquatic Specialists	Parks Canada
Hunka	Mike	mike.hunka@aer.ca	Fisheries Biologist	Alberta Energy Regulator
Hurkett	Brad	brad.hurkett@ab-conservation.com	Biologist	Alberta Conservation Association
Janssens	Emeric	emeric.janssens@gov.ab.ca	Fisheries Biologist	Alberta Environment and Parks
Johnson	Craig	craig.johnson@gov.ab.ca	Resource Manager - Fisheries	Alberta Environment & Parks
Johnston	Barb	barb.johnston@pc.gc.ca	Park Ecologist	Waterton Lakes National Park
Koentges	Bryan	bryan.koentges@rivresources.com	Environmental Field Technician	Riversdale Resources
Kovach	Ryan	rkovach@usgs.gov	Research Fisheries Biologist	U.S. Geological Survey
Madsen	Dennis	dennis.madsen@pc.gc.ca	Resource Conservation Manager	Waterton Lakes National Park
Markle	Josh	josh.markle@gmail.com	President	Oldman River Chapter TUC
Mayhood	David	dmayhood@fwresearch.ca	Aquatic Ecologist, President	FWR Freshwater Research Limited
Meagher	Brian	brian.meagher@gov.ab.ca	Fisheries Biologist	Alberta Government
Meinke	Adrian	adrian.meinke@gov.ab.ca	Senior Fisheries Biologist	Alberta Environment and Parks
Morrison	Katie	kmorrison@cpaws.org	Conservation Director	CPAWS Southern Alberta
Moser	David	davemoser@mt.gov	Fisheries Biologist	Montana Fish, wildlife & Parks
Muhlfeld	Clint	cmuhlfeld@usgs.gov	Research Aquatic Ecologist	USGS Northern Rocky Mountain Science Center
Nelson-Chorney	Hedin	hedin.nelson-chorney@pc.gc.ca	Aquatic Biologist	Parks Canada
Petry	Shane	shane.petry@gov.ab.ca	Senior Fisheries Biologist	Alberta Environment and Parks
Redman	Logan	logan.redman@ab-conservation.com	Junior Biologist	Alberta Conservation Association
Reilly	Jessica	jessica.reilly@gov.ab.ca	Fisheries Biologist	Alberta Environment and Parks

Riddle	Mary	mary_riddle@nps.gov	Chief of Planning	Glacier National Park
Rutherford	Dona	donar@blackfeetnation.com	Director	Blackfeet Fish and Wildlife Department
Sexton	Erin	erin.sexton@flbs.umt.edu	Oversight Director	Crown Managers Partnership
Simieritsch	Rob	Rob.SImieritsch@gov.ab.ca	Regional Resource Manager	Alberta Environment and Parks
Skrajny	Joanna	jskrajny@abwild.ca	Conservation Specialist	Alberta Wilderness Association
Van Eimeren	Pat	pvaneimeren@fs.fed.us	Fisheries Biologist	USDA Forest Service
Watson	Ernest	ernest.watson@dfo-mpo.gc.ca	Team Leader, Species at Risk Program	Fisheries and Oceans Canada
Wilcox	Kayedon	kayedon.wilcox@gov.ab.ca	Resource Manager	Alberta Environment and Parks
Williams	Jim	jiwilliams@mt.gov	Regional Supervisor	Montana Fish, Wildlife and Parks
Wilton	Sarah	ag2@ranchland66.com	Agricultural Assistant	MD of Ranchland

Executive Summary

Action on Recovery: Native Salmonid Recovery in the Crown of the Continent

In late 2013, the Crown Managers Partnership, the Crown of the Continent Conservation Initiative, and The Wilderness Society came together to begin working collaboratively with one another and with their respective partners to advance Crown-wide climate adaptation projects on a variety of natural resource values. Over the course of the past four years, the Crown Adaptation Partnership and Crown Managers Partnership have been working together to facilitate a series of 'Big Tent' workshops with state, federal, and provincial agency managers; Tribes and First Nations; non-profit conservation organizations; citizen groups; and universities to identify Crown-wide opportunities for implementing collaborative and/or complementary adaptation actions driven by a shared landscape-scale strategy. Two 'Big Tent' workshops were held in 2014 that identified opportunities and priorities in the Crown for recovery of Native Salmonids.

Figure 1. The second 'Big Tent' native salmonid workshop in the Crown of the Continent focused on delivering and applying new, sophisticated scientific analyses and tools to identify priority management actions and timelines for both bull trout and westslope cutthroat trout at various geospatial scales across the Crown. *Photo courtesy of Anne Carlson*.

At the very top of the list of priorities - under a category of new Crown-wide tactics that could significantly improve our collective ability to move forward together – was a request from the group to "map conservation populations and priorities by population across the Crown of bull trout and westslope cutthroat trout (inspired by the work of the Multi-State Interagency Yellowstone Cutthroat Trout Conservation Work Group)". Clint Muhlfeld and his colleagues at the U.S. Geological Survey -Vin D'Angelo, Ryan Kovach, and Ben Letcher – spent the next four years rising to this challenge by building a set of online interactive tools that incorporated empirical datasets and climate modeling at various

spatial scales as the basis for the identification of 450 WSCT conservation populations and 300 bull trout conservation populations across the Crown: http://ice.ecosheds.org/cce/

This second 'Big Tent' workshop on native salmonids offered workshop participants the opportunity to become familiar with those tools, suggest additions and/or revisions to specific aspects of those tools, and – finally- use the new Crown-wide native salmonid vulnerability web tools to identify and update the list of priority actions moving forward.

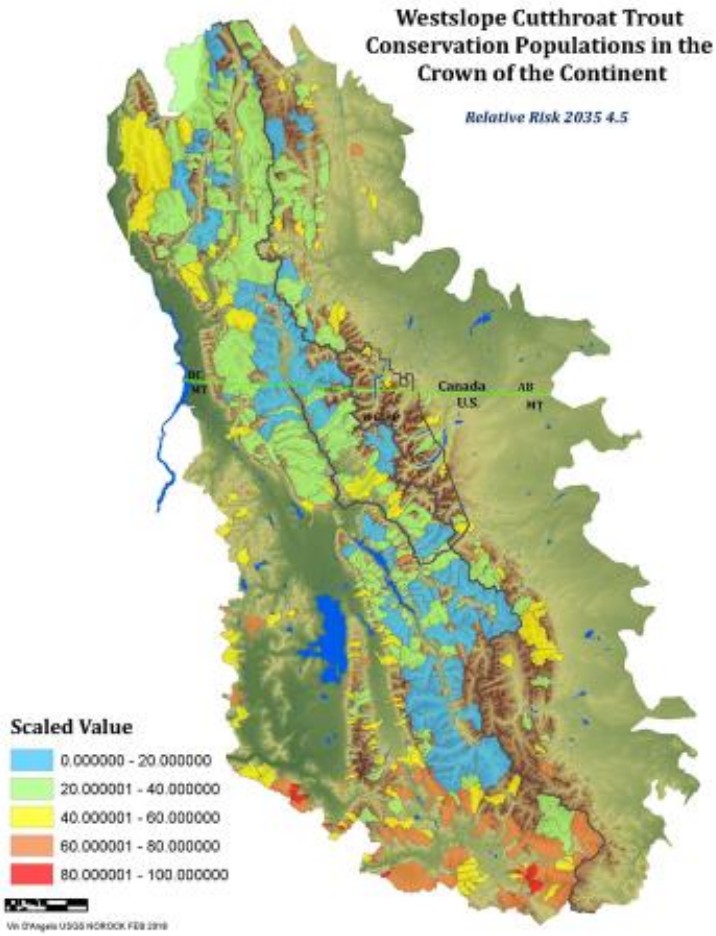


Figure 2. Crown-wide map of the newly-identified westslope cutthroat trout conservation populations across the Crown; with relative risk for each population under the 2035 RFP climate scenario depicted for each conservation population. Clint Muhlfeld, Vin D'Angelo, Ryan Kovach and Ben Letcher of the U.S. Geological Survey developed the new set of online interactive web tools in response to a direct request from managers at the last Crown-wide native salmonid workshop.

Fifty-six participants from 23 state, federal, and provincial agencies; Tribes; non-governmental conservation organizations (NGO's); university staff; private and community groups convened in Lethbridge, Alberta for the three-day Crown Managers Partnership Forum in March. By the workshop's end, participants had created two discrete lists of priority actions for each native salmonid species: one for the East side of the Continental Divide, and one for the West side.

As was the case with the last native salmonid workshop, these final lists were informed by panels and presentations during the workshop that focused on current examples of on-the-ground management actions intended to restore or protect native salmonids in the Crown, as well as discussions of challenges and barriers to restoration in specific areas. The final lists of priorities for bull trout and westslope cutthroat trout at specific locations include:

MANAGEMENT STRATEGY CODING		
Code	**Description**	**Detail**
A	Little or no management	Monitor infrequently; site characteristics exhibit high abililty to resist or adapt to stressors (or stressors are not primary factor)
B	Moderate management invention	Maintian or enhance XXX characteristics at these sites. Site Characteristics exhibit moderate ability to resident or adapt to stresstors (or stressors not primary factor)
C	High management intervention	Maintain or enhance XXX characteristics at these sites. Site characteristics exhibit low ability to resist or adapt to stressors (or stressors are not primary factor). BUT social, landscape, connectivity etc. characteristics of the site is importance for the XXX
D	Little to no management invention	Monitory infrequently or not at all. Site character istics exhibit low ability to resist or adapt to stressors (or stressors are not primary factor). And social, landscape, connectivity etc. of the characteristics of the site are NOT importance for the XXX.

Westslope cutthroat trout priority actions **– West side of the Continental Divide**

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	South Fork Flathead	A	Monitor	Consider autonomous eDNA Minor habitat Genetic Donor Stock	Easy to do, already set up
2	Middle Fork (same as NF)	B	Piscicide lakes w/Yellowstone Cutthroat Trout + selective isolation. Pike-BT suppression (Lake Trout NOP)	Remove Yellowstone Cutthroat Trout Selective isolation or non-DV watersheds	High

			Angling regulations	Angling regulation for Pike, Lake Trout - suppression. Single lake- remove rainbow trout?, closures, tags-quotas	
3	North Fork Flathead	B	Piscicide lakes w/Yellowstone cutthroat trout selective isolation. Pike-BT suppression (Lake trout NOP) Angling regulations	Remove Yellowstone Cutthroat Trout Select isolation or non-DV watersheds Angling regulation for Pike, Lake Trout - suppression. Single lake remove Rainbow Trout?, closures, tags-quotas	
4	Middle Kootenai	C	Habitat restoration Rainbow Trout suppression Angling effort?	Mining regulations?	
5	Swan		Relocation Isolate Fire Mitigation	Secure barriers Downstream, piscicides Prescribed burn Move fish to fishless waters	High
6	Blackfoot	C	Habitat restoration Relocation	Minimum restoration Water flows, screens, grazing restoration round work, conservation easements, Nevada Creek reservoir work Rainbow Trout suppression	High
7	Stillwater	C	Habitat Isolation	Fix roads Move fish downstream, expand	Low
8	Lower Flathead	C	Habitat restoration Water rights Suppression	Rainbow Trout suppression	Medium
9	Flathead Lake	C/D	Genetic rescue		

Westslope cutthroat trout priority actions – East side of the Continental Divide

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	Upper Oldman	C	Upper Oldman-expansion of Non-native trout, -Close Oldman above Cache Creek Falls (changing/reduce angling effort) - Hybridization risk needs to be managed (suppress rainbow trout)		
2	Porcupine Hills	C	Hybridization risk, habitat (same as above).		

3	Crowsnest River	C	- increase population numbers, expand range + habitat recovery		
4	Crowsnest Pass area	C	Demographic and habitat Issues Maintain	Build some barriers. Address hybridization issues like restoration stocking. Reassess angling regulations for key stream segments. Some targeted restoration activities (trail reclamation).	Medium
5	Castle	C	- benchmark for intact & functioning pops – Lynx Creek - habitat restoration - removal of non-natives reclaiming crossings & installing barriers		
6	Highwood River	C	Renewal of non-native in areas	Habitat intactness can be improved relatively easily compared to other watersheds. Reduce/close fishing pressure in areas for Westslope Cutthroat Trout recovery	High: Anglers Transportation & industry Oil & gas wells Forestry & allotment Holders Private land covers Managing public land
7	Sheep-Highwood River/Little Bow	C	Demographic/habitat risk Protect/maintain existing Westslope Cutthroat Trout streams Address invasive & roads	High level of angling impacted Address Hybrids issue (restoration/stock) Habitat fragmentation & made sure barrier permanent	Medium
8	Willow		Removal of invasive & introduction of Westslope Cutthroat Trout, sediment control management of linear disturbance	Stacking of Westslope Cutthroat Trout in Chain Lakes and above	High Allotment & leaseholders Private land covers Managing public land
9	St Mary River	C	Demographic and habitat risk	Boulder Creek - Observe/monitor. Irrigation/in-stream flows in	High

				summer on main stem St. Mary River fish screens are critical ***	
10	Waterton River	D/C	Given it's a national park, conservation should be #1 priority but recovery requires high intervention		
11	Two Medicine River	B	No- native removal is key	Midvale Creek - invasives	

Bull trout priority actions – West side of the Continental Divide

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	Flathead Lake	C		Lake trout Suppression	
	Mission	C	Bull trout translocation		
2	Lower Flathead				
	Post	C		Very small population	
	North Jocko	C		Habitat irrigation	
	South Jocko	B	More primitive management		
3	Southfork Group 1	A			
	Bob Marshall Complex		No Action		
	Donahue,Young White				
	Gordon Creek; Spotted Bear		Bob Marshall		
4	Southfork Group 2	B			
	Sullivan		Road focus action		
	Wheeler				
	Wounded Buck		Culverts & roads		
5	Middle Fork Flathead	A			
	Bull Clack Straw		No actions for Bull Trout		
	Schacterlongm		Bob Marshall		
	Morrison, Grand				
6	Middle				
	Bear	B	Road Related actions		
	Minnco				
	Olue Park	A		Glacier NP	

	Nyack	B		Potential to net Harrison	
	Harrison	C		Lake Trout reduction	
	Lincoln	B		Nyack - Brook Trout issue	
7	Northfork Flathead	B			
	Quartz (Bowman's) Logging	C	Non-native fish removal		
	Upper Kintla	A			
	Trout Narrow	A			
	Lower Quartz	B			
	Kishneen	A			
	Big Creek	B/C	Trail	Forest Management Harvest	
	Coal Cyclone		Frozen Lake	Sediment and road issues	
	Red Meadow Whale				
8	Northfork Flathead Canada	B		Logging roads biggest Issue	
	Sage Couldrey				
	Howwell, North				
	Fork Kisaneen				
9	Stillwater				
	Swift & Stillwater	C		Forestry roads	
10	Swan				
	Linberg Lake	C		Lake Trout Removal	
	Holland Lake	C		Netting - suppression	
	Elk Coal Gem Sarp.	B/C		Road issue -small patch	
	Piper Lyon	B/C		Lower elevation, lake trout removal, Swan	
	Lost Goat	B/C			
11	Middle Kootenai				
	White	A			
	Lussier	B			
	Wildhorse	A			
	Elk Coal Gem Sarp.	B			
	Bull	B			
	Michel	B		Industrial activity in this area	
	Fording- not mapped or surveyed				
	Lizard Creek				

12	Blackfoot				
	Bold	D			
	Belmont	D			
	Placid	D			
	Marshal	C			
	West Fork of the Clearwater	C			
	East Fork of the Clearwater	B			
	Morrel	B			
	Cottonwood	C			
	Monture Creek	B			
	North Fork of the. Blackfoot	B/C			
	Landers	B			
	Arrastra	C		Two systems aren't mapped - light priority and active not in fish & wildlife	

Bull trout priority actions **– East side of the Continental Divide**

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	Highwood	B	Targeted/seasonal angling closures. Brock Trout removal Monitor logging. Assess risk based on FMP (stream crossings, buffer).	Potential expand current closures Maintain closures on Storm Creek etc.	Local knowledge ACA, AEP
2	Oldman	C	Angling limitations during spawn	Hidden Creek -trails -habitat/sediment	
	Upper Oldman	C	Reduce linear footprint	- Rec/Linear Management plans. Read Surveys, continued monitoring and expand. Measure angling effort.	
	Castle			**Castle Area** - Carbondale, w/s Castle etc. (integrated partially by Castle Park Plan)	
3	Waterton	D		Poaching/enforcement	

4	St. Mary				
5	Willow	D			
6	Waterton Lakes National Park	C	Non-native control. Increase connectivity. Restore native species Barrier installation/maintenance. Mechanical non-native removal	**<u>Drywood Yarrow</u>** Palmer Dam Beaver re-intro Drywood Yarrow. **<u>Blakiston</u>** Restore native populations **<u>N. Fork Belly</u>** maintain fish screens in diversion structures, reduce out migrant losses. Monitor angling effort.	Drywood Yarrow watershed Landowners

1. Welcome and Opening Remarks

The 2018 forum opened with a prayer offered by Blood Reserve member Travis Plaited Hair, who was kind enough to wish us luck with our goals for the Forum, and for the future.

We then had an introduction from Crown Managers Partnership (CMP) director, Mary Riddle, welcoming everyone in attendance, which led to participants going around the room and sharing a little about themselves as part of the introductions.

We next reviewed the ***Workshop Objectives***, which included:

- Reviewing decision support tools and applications for westslope cutthroat trout and bull trout in the Crown, and validating the outputs of the tools (Crown Vulnerability Assessment and the web-interface tool);
- Agencies and organizations providing updates of management actions toward native salmonid recovery in the Crown;
- Group work to assess and prioritize watersheds at the HUC 8 level (or finer scale) within the Crown, and to identify key actions specific to those watersheds for the recovery of native salmonids;
- Discussion of the challenges and opportunities for implementing management actions Crown-wide;
- Discussions and brainstorming sessions around evaluation and reporting currently underway, as well as ways to align into a consistent approach for the Crown.

Workshop Outcomes included:

- Fostering ongoing information and knowledge exchange between experts within and outside of the Crown on native trout recovery;
- Enhancing understanding of the current status of each jurisdiction's approach to native trout recovery;
- Validating the results of the new Crown Vulnerability assessment tool;
- Prioritizing a list of strategies and actions at the HUC 8 level for the Crown for westslope cutthroat trout and bull trout;
- Identifying key Crown-wide recovery actions and important opportunities for collaboration; and
- Gathering key information to develop a Crown-wide evaluation and reporting framework for native salmonids following the workshop.

2. Presentations

1. Anne Carlson - *The Wilderness Society:* Context Setting – Review of outputs of the native salmonids workshops in 2014

Anne began by talking about the history of the Crown Managers Partnership, and all of the work that culminated in us coming together at the 2018 forum.

That is: in late 2013, the Crown Managers Partnership, the Crown of the Continent Conservation Initiative, and The Wilderness Society came together to begin working collaboratively with one another and with their respective partners to advance Crown-wide climate adaptation projects on a variety of natural resource values. Through a series of 'Big Tent' workshops, we have been facilitating conversations between state, federal, and provincial agency managers; Tribes and First Nations; non-profit conservation organizations; citizen groups; and

universities to identify Crown-wide opportunities for implementing collaborative and/or complementary adaptation actions driven by a shared landscape-scale strategy.

The first 'Big Tent' workshop followed the Crown Managers Partnership Annual Forum in March, 2014. By the workshop's end, participants had identified multiple natural resource topics that represented opportunities for collaboration related to climate adaptation at the scale of the Crown:

(1) aquatic invasive species,
(2) whitebark pine restoration,
(3) cold-adapted, native salmonid species,
(4) noxious weeds, and
(5) prescribed fire in mixed severity fire regimes;
(6) meso-carnivores (wolverine, Canada lynx, and fisher) were added to this initial list after post-workshop meetings with the U.S. Forest Service staff and additional partners.

Based on subsequent feedback by workshop participants that identified native salmonids as the highest priority for collective action, the second 'Big Tent' workshop focused on 'Piloting adaptation strategies to reduce vulnerability and increase resilience for native salmonids in the Crown of the Continent ecosystem', and was held in Kalispell, Montana from November 18th-20th, 2014.

The subject of this second workshop provided an opportunity to welcome additional partners into our collaborative effort, including the U.S. Forest Service's Northern Rockies Adaptation Partnership (NRAP) and the

Great Northern Landscape Conservation Cooperative's (GNLCC) Rocky Mountain Partner Forum; this expansion enabled us to collectively integrate concurrent regional initiatives on native salmonids.

Forty-five participants from 20 state, federal, and provincial agencies; Tribes; non-governmental conservation organizations (NGO's); university staff and community groups convened in Kalispell for the three-day workshop. Six large-landscape collaboratives and initiatives were also represented, including: (a) the Crown Managers Partnership, (b) Crown of the Continent Conservation Initiative, (c) Crown Roundtable, (d) Southwestern Crown Collaborative Forest Landscape Restoration Project, (e) Great Northern Landscape Conservation Cooperative, and (f) Northern Rockies Adaptation Partnership of Region 1 of the U.S. Forest Service.

We began by reviewing the science available to support decision making by managers; moved into a panel framing the opportunities and challenges of managing native salmonids by different jurisdictions across the Crown; heard about long-term efforts by the Multi-State Interagency Yellowstone Cutthroat Trout Conservation Work Group to define conservation priorities for native salmonids at the landscape scale in the Greater Yellowstone Ecosystem (as an example of a regional prioritization process); listened to a panel focusing on examples of on-the-ground climate adaptation projects for bull trout and westslope cutthroat trout across the Crown; and then began in smaller groups to identify coarse- and fine-scale geographic priorities, strategies and tactics for managing bull trout and westlope cutthroat trout in the Crown. Finally, workshop participants used ecological and opportunity-related criteria to narrow down the list of potential projects that we could pursue collaboratively, and discussed opportunities and needs for implementation.

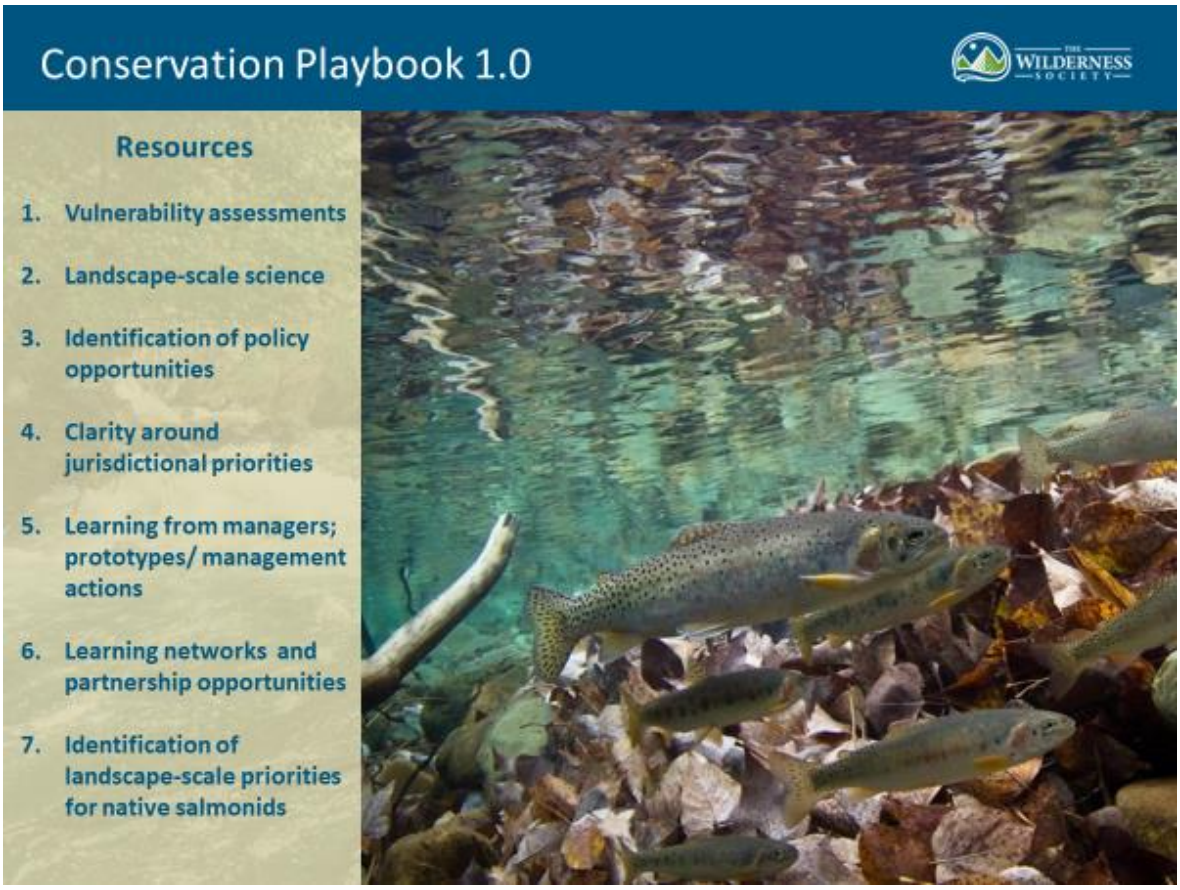
By the close of the workshop, the following short lists of potential projects and priorities for bull trout and westslope cutthroat trout in the Crown had been identified using a ranking process:

- *PROJECT #1*: Establish coordinated monitoring efforts across the CCE, including standard protocols, frameworks, and objectives, as well as a common data repository, for both fish populations and habitats;
- *PROJECT #2*: Complete prioritization and mapping of conservation populations and key watersheds most critical to sustain native salmonids across the CCE given both existing stressors and climate change, and simultaneously work to identify and secure groundwater upwelling areas and potential coldwater refugia at fine scales;
- *PROJECT #3*: Develop a set of consistent strategies for suppressing non-native fish species across Crown (e.g. prevention, monitoring, response, and enforcement) that is based on lessons learned about critical uncertainties and ecological function from ongoing projects; prioritize testing of these strategies in core areas and known cold water refugia;
- *PROJECT #4*: Secure the placement of fish screens on existing water diversions, including those on Saint Mary's River, and the Belly River;
- *PROJECT #5*: Replicate, restore and/or translocate native salmonid populations to cold water refugia in priority transboundary watersheds East of the Divide (including the Oldman Watershed).
- *PROJECT #6*: Implement strategic and coordinated suppression of invasive rainbow trout in the transboundary Flathead watershed, combined with exportation of best management practices to other locales;
- *PROJECT #7*: Improve and restore native salmonid habitat in headwaters by whatever suite of interventions are appropriate locally;
- *PROJECT #8*: Re-establish beavers across the landscape: launch a pilot project that incorporates efforts to (a) reduce trapping of existing beaver populations (i.e. to facilitate successful dispersal events by existing populations), (b) identify policy avenues that can incentivize expansion of beaver populations in key watersheds, and (c) identify educational outreach opportunities for private landowners, agency staff, and fisheries managers (Stillwater, Montana, and Alberta);
- *PROJECT #9*: Export successful bull trout translocation efforts piloted in the North Fork of the Blackfoot to other landscapes.

As part of this work, Anne has also developed a Conservation Playbook 1.0. that is based on the components and work at the first workshop. More specifically, the Playbook includes:

- vulnerability assessments for each species;
- landscape scale science via Clint Muhlfeld and Leslie Jones' work and analyses;
- policy opportunities;
- prototypes and management actions developed by managers across the Crown;
- identification of learning networks and partnership opportunities; and
- collaboratively-identified landscape scale priorities for native salmonids I the Crown.

In addition to sharing that Playbook with managers, we will be developing a Conservation Playbook 2.0 from this workshop's proceedings as an informational resource for this next phase of native salmonid recovery work.



2. Clint Muhlfeld - *U.S. Geological Survey:* Crown Vulnerability Assessment Tool and Results for Bull Trout and Westslope Cutthroat Trout

This presentation provided a deep dive into the threats and stressors underlying bull trout and westslope cutthroat trout vulnerability in the Crown. Using extensive, long-term empirical datasets and analyses, Clint reviewed impacts of the many threats facing native salmonids in this landscape. For example, climatic shifts and warming in the Northern Rockies are nearly double that of other parts of the world, leading to decreased snowpack and earlier spring runoff. These factors in turn threaten the aquatic ecosystems that the native salmonids depend on to be cold, clean, and connected. Non-native invaders are another highly significant threat to native salmonids. Clint added that our native salmonids have been able to adapt to climate change using their genetic diversity over geological periods of time, but that they still need help and intervention urgently right now if they are to persist on the landscape.

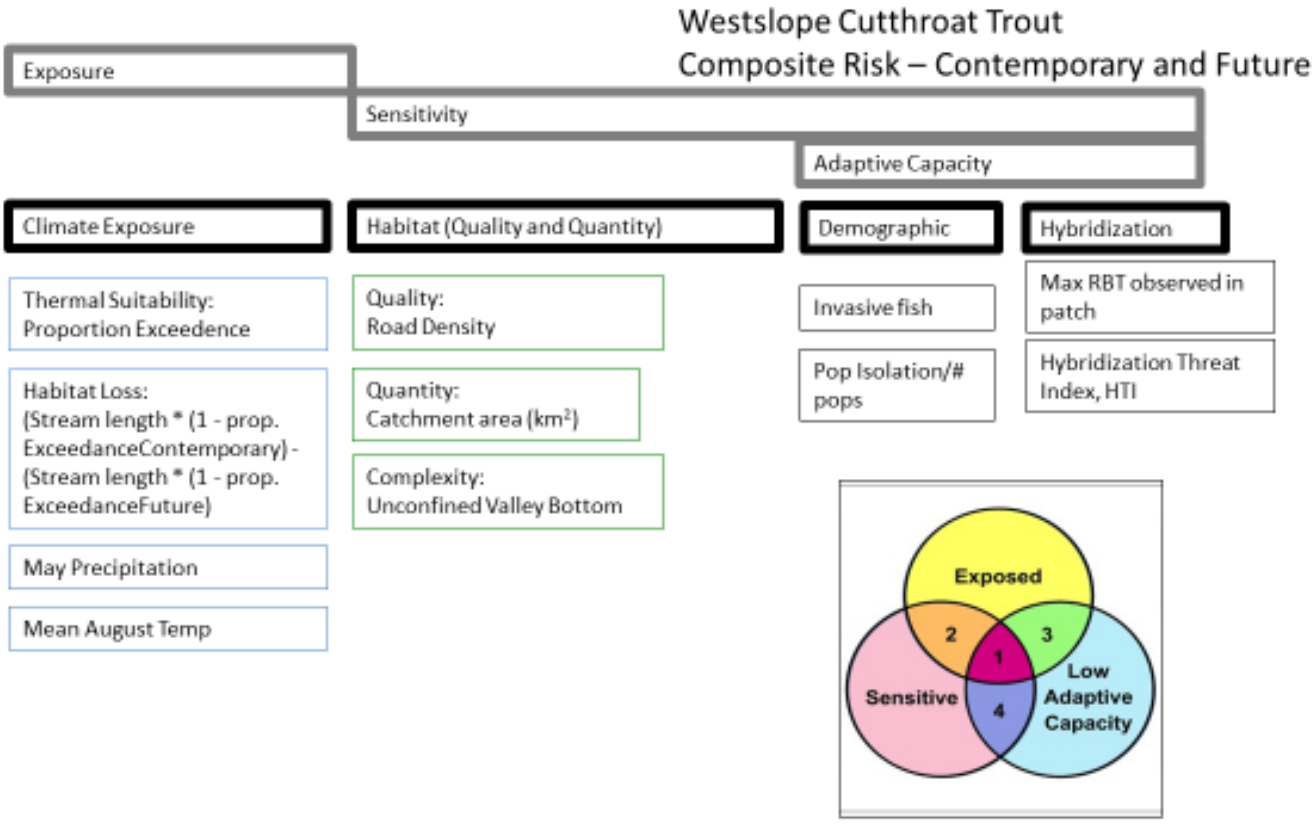
The greatest threats to these two species are habitat degradation and fragmentation, invasive species, over exploitation and climate change. The westslope cutthroat trout is a Species of Special Concern in Montana and British Columbia and is Threatened in Alberta, while the Bull trout is listed as Threatened in Montana, are a Threatened in Alberta, and are a Species of Special Concern in British Columbia.

Clint has been working with managers to develop an adaptation management approach to do the following:

- Identify the management target
- Assess the vulnerability to the stressor

- Identify and prioritize management options
- Assess the risk of management options
- Implement management options
- Monitor, review and revise continuously

He ended the presentation by saying that exposure, sensitivity and adaptive capacity were used to form the framework of the vulnerability dataset in the following ways, but that he and his colleagues were open to suggested changes in their conceptualization of these categories if managers had different ideas or needs:



$$\text{Invasives} = ((\text{Lake trout } (0/1) + 1/\text{LTd}) + ((\text{EBT } (0/1) + 1/\text{EBTd})) + \text{BR } (0/1) + 1/\text{BRd}))$$

$$\text{Hybridization} = \text{Distance to sources } (\Sigma\ p_i * (1/D))$$

Clint and his colleagues continue to regularly publish the results of their work and key components of the vulnerability assessment and threat analyses, summed up for invasive species' presence and impacts in the below slide as an example.

PRIMARY RESEARCH ARTICLE

WILEY Global Change Biology

Legacy introductions and climatic variation explain spatiotemporal patterns of invasive hybridization in a native trout

Clint C. Muhlfeld[1,2*] | Ryan P. Kovach[1*] | Robert Al-Chokhachy[3] | Stephen J. Amish[2] | Jeffrey L. Kershner[3] | Robb F. Leary[4] | Winsor H. Lowe[5] | Gordon Luikart[2] | Phil Matson[2] | David A. Schmetterling[4] | Bradley B. Shepard[6] | Peter A. H. Westley[7] | Diane Whited[2] | Andrew Whiteley[8] | Fred W. Allendorf[5]

LETTERS

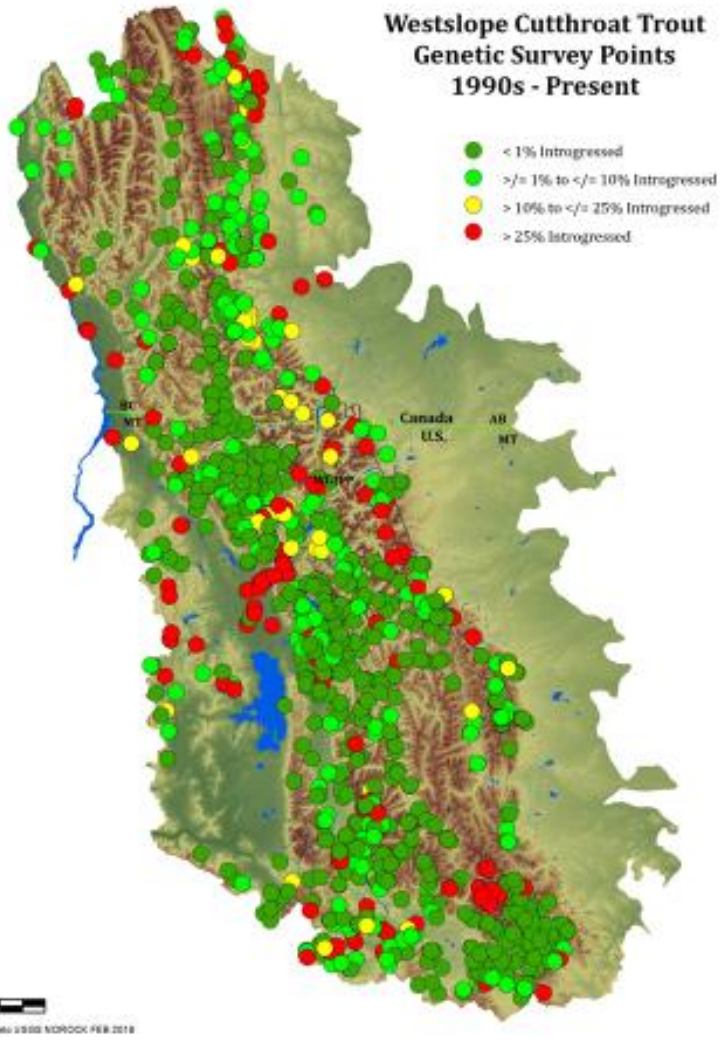
nature climate change

Invasive hybridization in a threatened species is accelerated by climate change

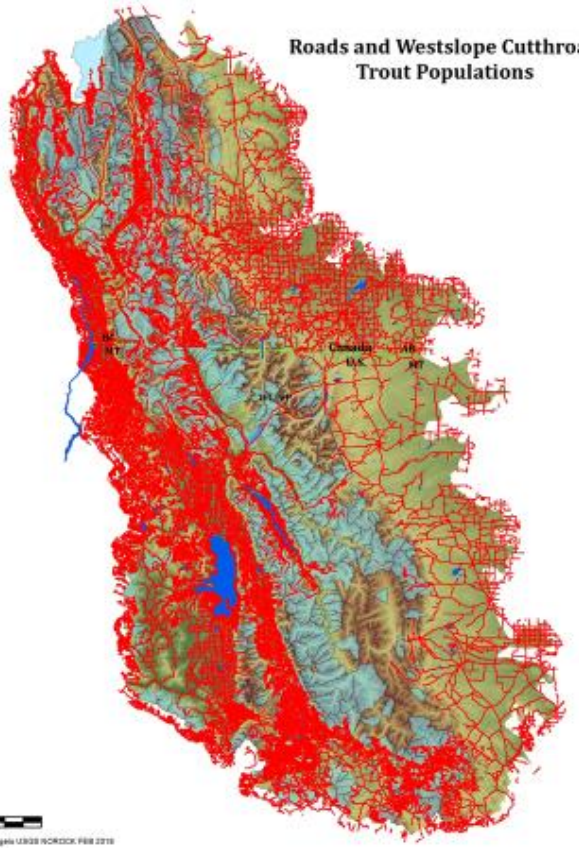
Clint C. Muhlfeld[1,2*], Ryan P. Kovach[2], Leslie A. Jones[1,3], Robert Al-Chokhachy[4], Matthew C. Boyer[5], Robb F. Leary[6], Winsor H. Lowe[7], Gordon Luikart[2] and Fred W. Allendorf[2]

Other work:

Muhlfeld et al. (2016, TAFS)
Kovach et al. (2016, ProcB)
Kovach et al. (2015, ProcB)
Hohenlohe et al. (2013, Mol Ecol)
Muhlfeld et al. (2009, Biol Lett, TAFS, CJFAS)
Boyer et al. (2008, CJFAS)
Hitt et al. (2003, CJFAS)



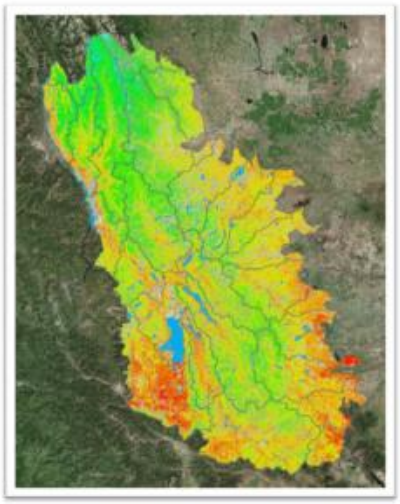
The importance of habitat fragmentation across the landscape received a great deal of attention along with other stressors like shifts in climate and resulting impacts on stream flows and temperatures during the hottest summer months (e.g. below slides).

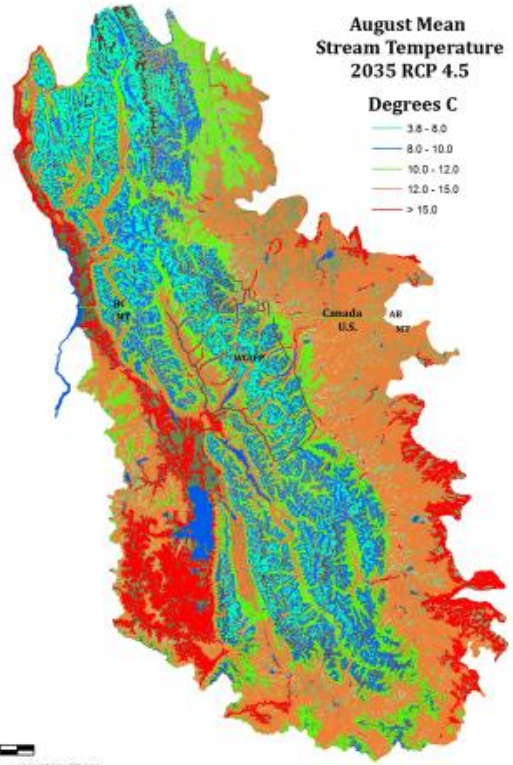


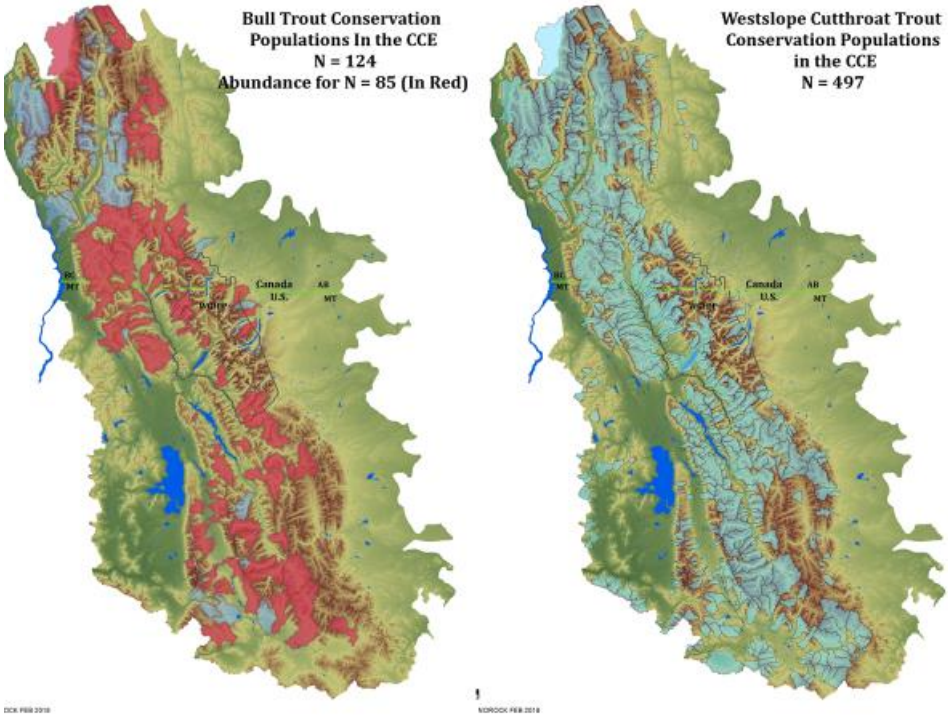
Climatic Change (2017) 144:641–655
DOI 10.1007/s10584-017-2060-7

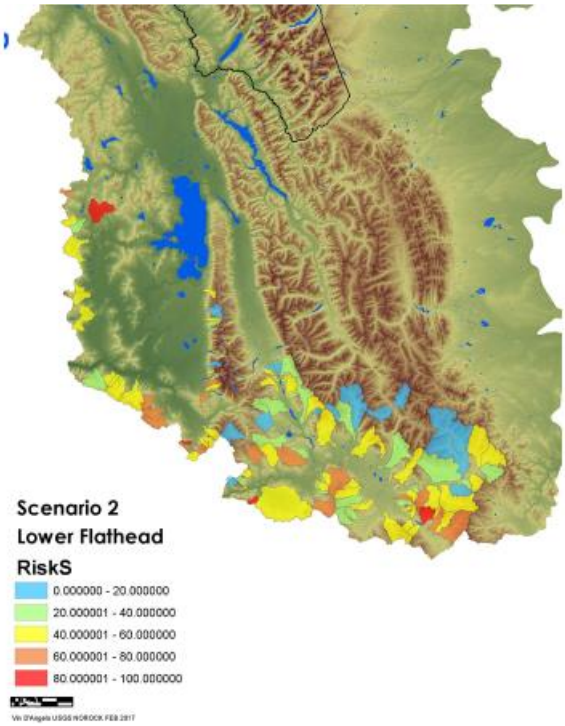
Projected warming portends seasonal shifts of stream temperatures in the Crown of the Continent Ecosystem, USA and Canada

Leslie A. Jones[1,2,3] · Clint C. Muhlfeld[1,4] · Lucy A. Marshall[5]









Clint ended with a call to action before revisiting the potential of his team's new SHEDS tool in facilitating the development of targeted management interventions across different jurisdictions, watersheds, and the entire Crown landscape moving forward.

3. *Who is doing what on native salmonid recovery in the Crown? Updates from organizations active in native salmonid recovery*

1. Ryan Kovach - *United States Geological Survey*

Ryan Kovach 's update focused on the data that he compiled and reviewed to inform the vulnerability assessment used in the SHEDS tool. He found that climate change plays a significant role in hybridization and that a decrease in May precipitation is linked to increasing hybridization of native salmonid species. This hybridization leads to a decline in the fitness of native trout in the wild. Ryan added that climate change is not the only negative factor affecting these fish populations, which also includes invasive fish species and the impacts on roads (through sediment) and habitat fragmentation. Bull trout have especially been negatively impacted by these factors because the most important variable for them is habitat availability. Between invasive fish taking over large portions of the bull trout's habitat, and roads frequently crossing streams and adding increased sediment loads to crucial bull trout habitat, the species is facing a significant suite of threats that have created real urgency in the need for immediate management interventions.

Question and answer session:
Q: Are you averaging out the most critical impacts? If you find a low habitat score, that will be the factor that kills the fish.
A: Everything will be ranked. You can see where the highest risks will be.

Q: What is the ability to expand the assessment outside of the Crown?
A: If there are data, it can be done.

Q: Population size is not included for cutthroat, why?
A: We do not have the data; but we could do this if we did.

Q: Have you documented the data gaps during your process?
A: We have a lot of good information but we will always have some data gaps. We are currently using Ryan's model to estimate the gaps.

Q: What is the smallest scale that the model is functional at?
A: This can be done at any scale.

3. Benjamin Letcher - *U.S. Geological Survey*

This presentation focused more heavily on the data used in the SHEDS tool. Letcher explained that the tool's purpose was to bring data sets and models to people in an interactive and easy to use way, which can then be used to prioritize areas for management. The key features of the tool were found to be spatial aggregation and filtering, as well as the ability to move from catchments up to the HUC 8 scale. The catchments, which are color coded by mean summer temperature, can be filtered based on criteria that the user finds important, such as climate change effect or overall threat level. Letcher closed the presentation by saying that it is a work in progress, and that they still need to identify how variables change across patches, correlations among variables, and patches that meet the criteria but that they are looking forward to hearing managers' reactions and requests as they begin to test these tools out.

4. Sam Bourret - *Montana Fish, Wildlife and Parks*

Bourret's presentation focused on innovative and ground-breaking management projects around Flathead Lake that have been developed to protect and improve the survival of the Flathead westslope cutthroat trout. In the Flathead area, they have seen a decline in westslope cutthroat trout due to habitat fragmentation and hybridization. There is a current initiative to protect the south fork Flathead westslope cutthroat trout by removing non-native trout. They are also considering the use of piscicides and genetic swamping to wipe out these invasive fish. In the meantime, they are stocking genetically pure westslope cutthroat trout that have been taken from a local drainage tested for purity.

The key learnings from this work are three-fold. First, it is possible for native trout recovery to be achieved at a landscape scale, with the main ingredients of this scale of recovery effort being the use of adaptive management, a dedicated and passionate staff, and the development of extensive partnerships and collaborations. The second learning is that genetic conservation and angling can go hand in hand if fish are collected at the right time, and fish are stocked soon after the application of piscicides. Finally, it is vitally important to have public involvement to create ambassadors who educate the general public about threats and solutions to native salmonid recovery, dispel myths, and build support for potentially contentious projects.

Q. Genetic swamping was tried in many lakes, but some did not take. Do you know why this is?
A: We are trying to get a better understanding of why this did not work in those lakes, and believe that we will understand more over time.

Q: What is the rationale for anglers being allowed to fish before determining that there is a stable population?
A: We have been stocking with angler-ready fish and some juveniles, so have a variety. This has helped get the public on board with the use of piscicides to eliminate non-natives.

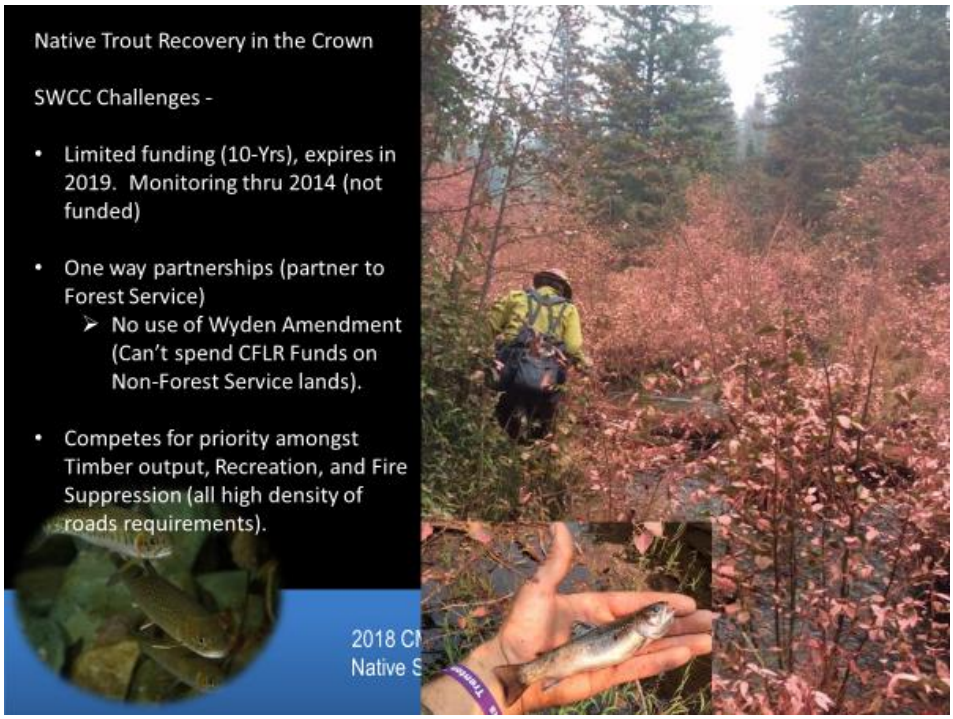
5. Ryan Kovach – *United States Geological Survey*

Ryan's presentation reviewed the efforts being made for the Westslope Cutthroat Trout in his area. He and his team are experimenting with genetic rescue with the hopes of alleviating the inbreeding depression as a path to increased persistence probability. The concerns associated with this are that it will lead to outbreeding depression and a loss of genetic distinctiveness. There is also the issue of the headwater trout being isolated and therefore inbred, so Kovach is trying to manage for that isolation. He believes that westslope cutthroat trout are ideal for rescue, and they will be monitoring these populations for growth and genetic variation. He stressed that this is a highly innovative and experimental management intervention that they are approaching with great care and thought, and by utilizing the principles and adaptive management.

6. Shane Hendrickson – *USDA Forest Service*

This presentation reviewed the mandate and formation of the Southwest Crown Collaborative (SWCC), and what has been achieved since then in terms of habitat restoration for native salmonids. The SWCC was formed from funds allotted from the Collaborative Forest Landscape Restoration Act in 2009 that specifically encouraged collaboration and holistic, integrated restoration projects on Forest Service lands. It allowed for budgetary requests of up to $40 million U.S. annually from 2009 to 2019, with funding to be used on projects on National Forest System land only. The SWCC's goal was to restore various natural resources with this money, of which $4 million U.S. could be spent annually on any one project.

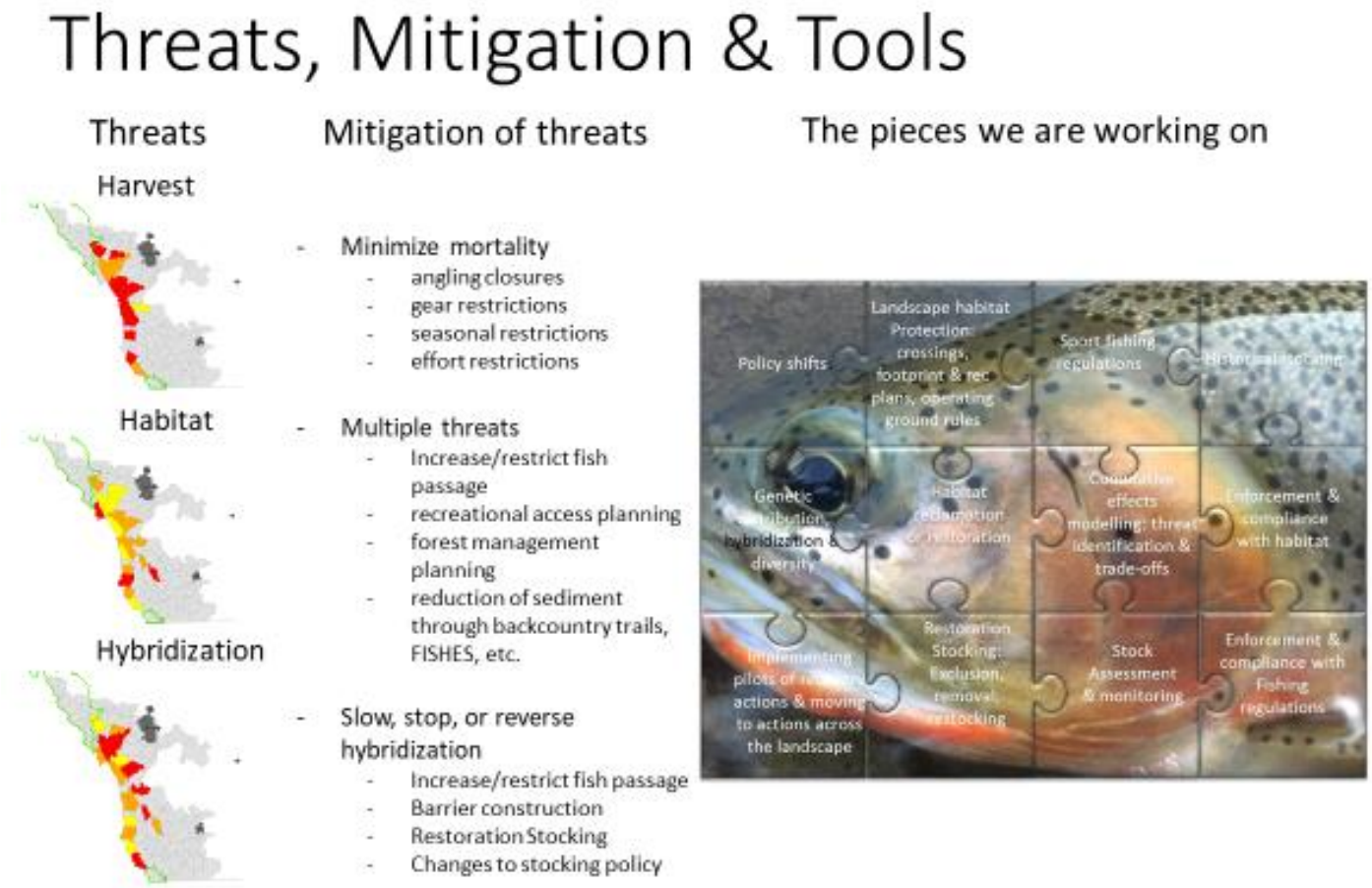
SWCC moved forward with restoration projects including land acquisitions, aquatic fish passage, fish barrier installation, road decommissioning and obliteration, and streambank restoration. They have also implemented intensive monitoring around terrestrial impacts on in-stream health. The challenges for the SWCC include the fact that this funding ends next year, and that their restoration projects compete for priority with timber output, recreation, and fire suppression. Hendrickson rounded out the presentation by saying that they need to integrate into the larger social structure.



Q: How do you measure or restore watershed function?
A: Measure sediment, number of stream crossings, etc. Depends on the watershed and how close it is to being restored.

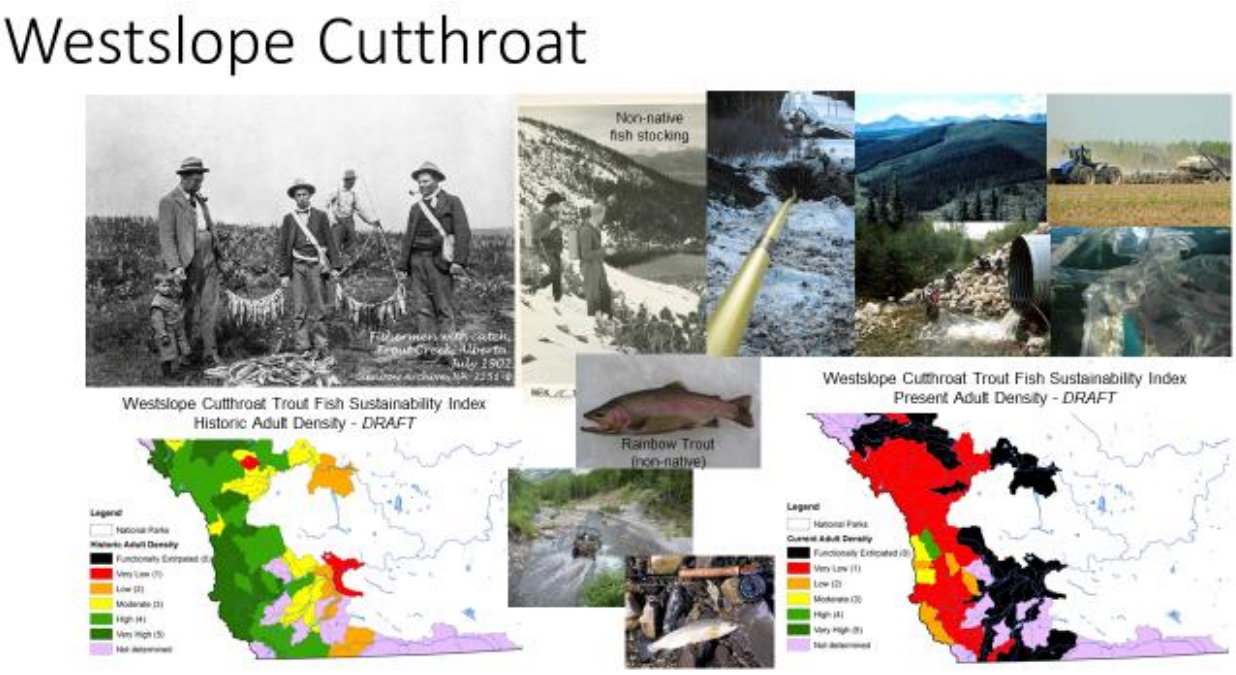
7. Craig Johnson – *Alberta Environment and Parks*

Craig Johnson with Alberta Environment and Parks gave on overview of the efforts being made with native trout recovery and management in Alberta. They are working on recovery plans for many of Alberta's native fish species, and trying to understand threats, as well as the strategies to mitigate those threats.



Non-native fish were stocked in Alberta early on, so one of the goals for Johnson is to determine where the hybridization levels are currently in light of that initial stocking. He also is hoping to get people comfortable with the idea of recovery stocking, which would require a negotiation of federal laws. The following needs and goals would significantly improve the potential for the recovery to succeed in his opinion:

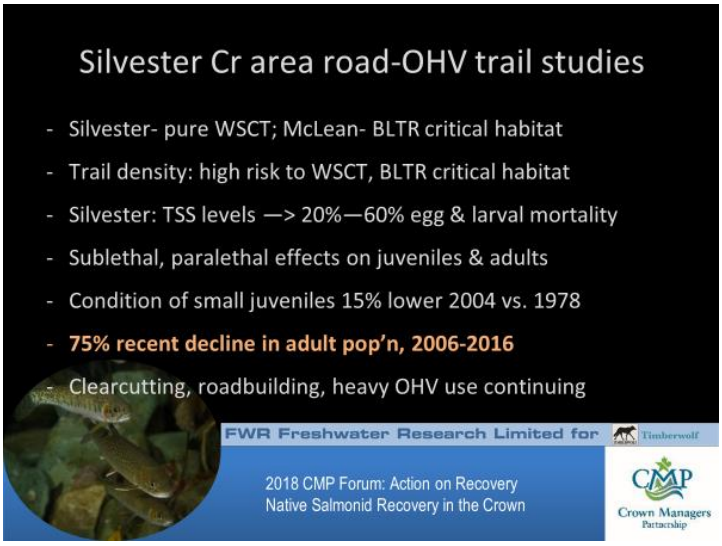
- Work closely with partners in Montana
- Develop a Fish Sustainability Index
- Standardized fisheries management system
- Have a Species Recovery Plan
- Cumulative effects models
- Push the system where it is not support recovery of native trout
- Engage stakeholders to identify both problems and solutions
- Tackle problems in a systematic manner



8. Dave Mayhood – *Freshwater Research Limited*

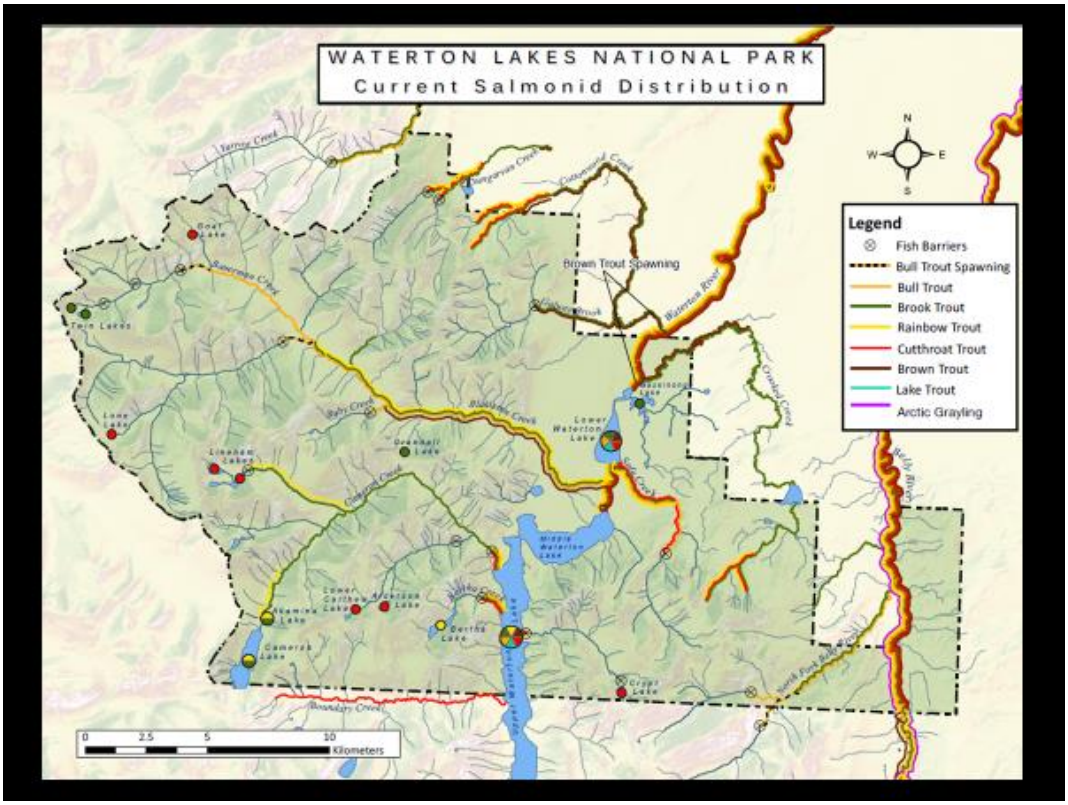
Dave Mayhood gave his presentation on the westslope cutthroat trout recovery projects that Freshwater Research Limited is working on in the Crown. One project is examining the effects of OHV trails on streams, in particular, Silvester creek which is critical habitat for westslope cutthroat trout . The main takeaway from that study was that there is a 75% recent decline for westslope cutthroat trout adult populations in that OHV trail dense area due to trail use and density, clearcutting, and road building which is highly significant in terms of framing up the scale of the threat that massive increases in OHV use pose to native salmonid recovery – especially in Alberta.

Another project looked at the Even Thomas Creek population and found that it had been extirpated in 2017. Going forward, they plan to take critical habitat threat surveys in the Alberta Native range, and create recovery strategies, action plans, and take legal action to support the native salmonids of the Crown.



9. Barb Johnston – *Waterton Lake National Park, Parks Canada*

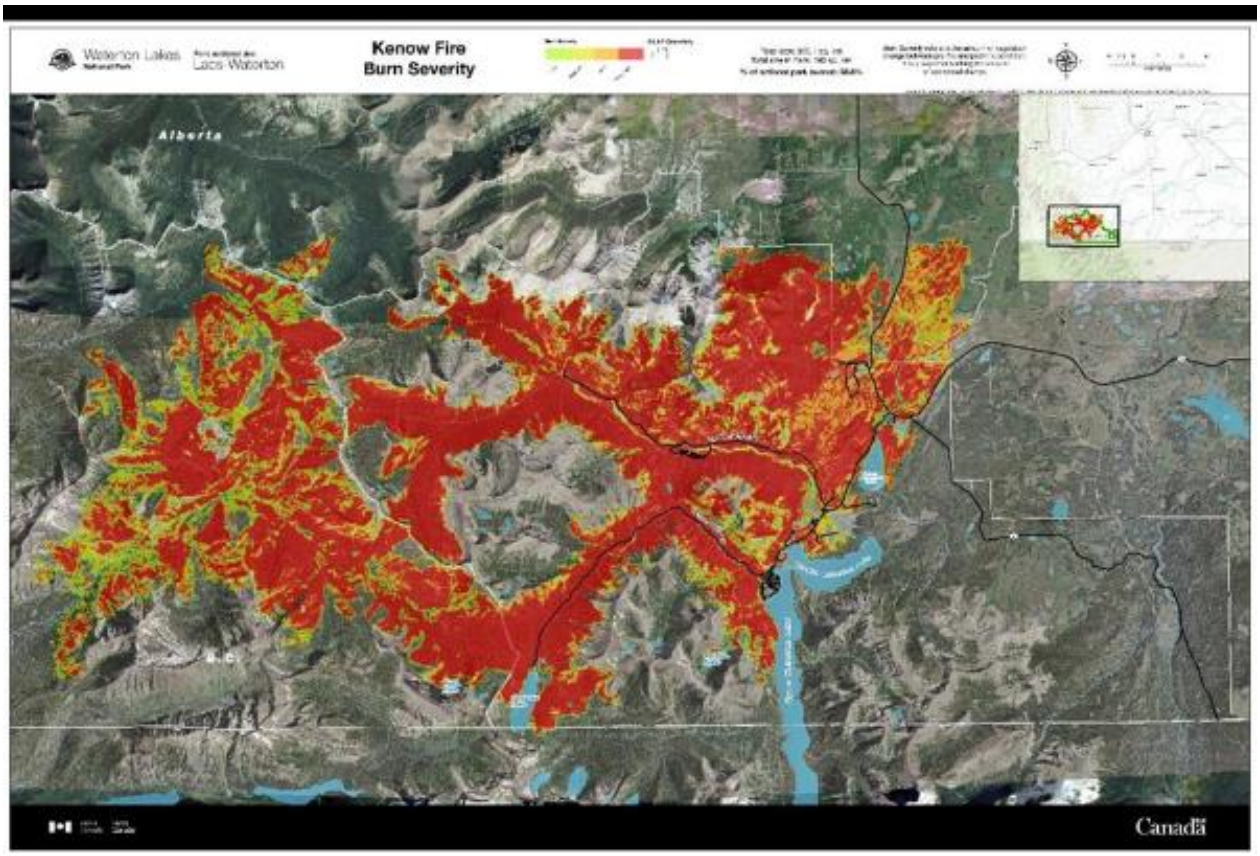
Barb Johnston gave an incredibly important and compelling overview of the current status of native salmonids in Waterton Lake National Park. Bull trout are almost entirely absent in the main stretch of the Waterton River, but there are some present in Blakiston Creek and the Belly River, while a conservation population of westslsope cutthroat trout persists in Goat Lake.



In 2017, the park was hit with the huge Kenow Fire, which has left much of the park heavily impacted. This was amplified by the fact that so much of the fire burned at high severity.

There are non-native fish present in the pristine habitat of the park, and there is talk of possibly removing them to make room for native salmonids that would thrive in the cold water there. The question becomes what management actions might be best to implement in which areas of the park, and in which order given the current status of native salmonid populations in the park, and the tremendous impacts of last year's fire season across the landscape.

Barb stressed that they are in the process of beginning these conversations and that she was interested in hearing from workshop participants on these questions.

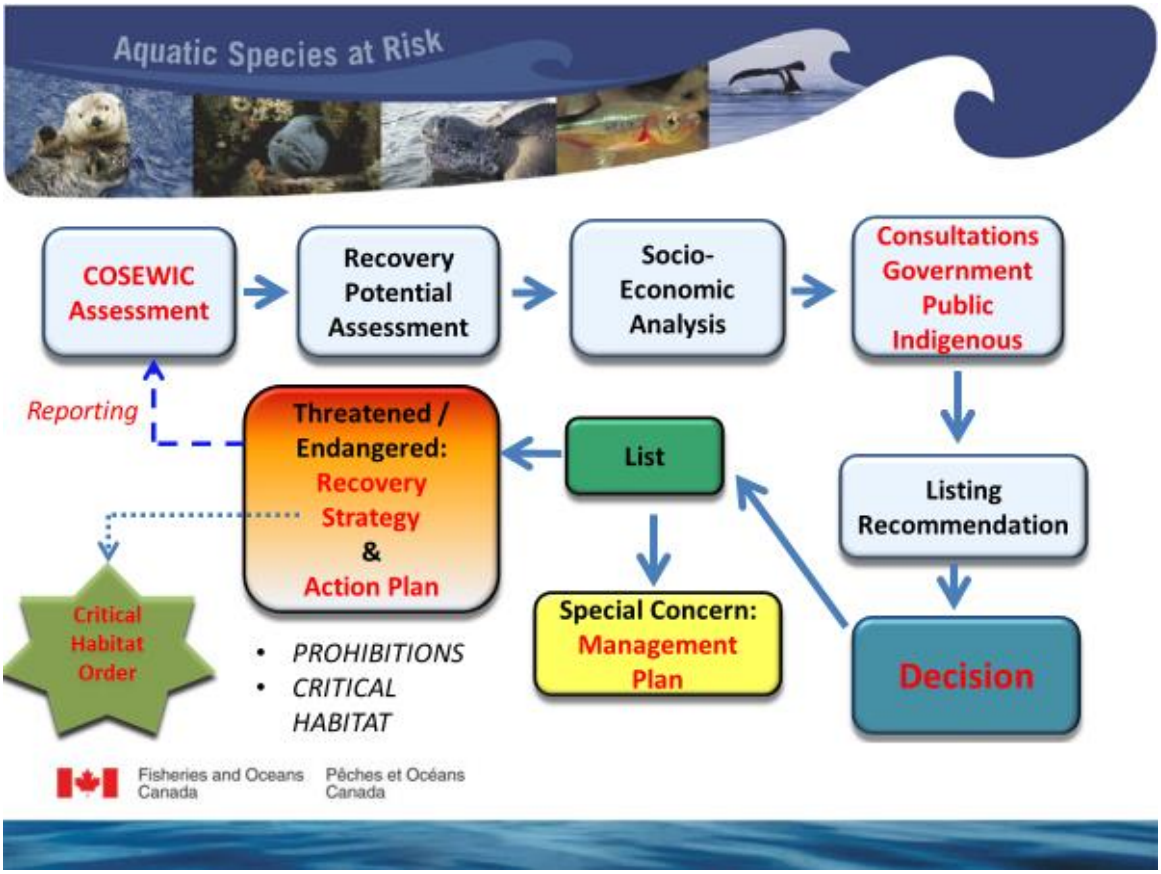


10. Ernest Watson- Fisheries and Oceans Canada

In his presentation, Watson gave an overview of the Species at Risk Act and how he is applying this Act to the populations of threatened and endangered salmonids in Alberta.

Fisheries and Oceans Canada, Parks Canada, Environment and Climate Change Canada all play a part in the protection of certain species under the Act, while Watson is responsible for species at risk.

He then reviewed the steps taken to decide whether or not a species should be listed as Threatened or Endangered.



Once a species is added to the listing, there are prohibitions in place to prevent killing, harming, possessing, and destruction of critical habitat. The westslope cutthroat trout is listed as Threatened, and in 2014, a multi-agency recovery team was established and a recovery strategy was developed. The goal for that recovery effort is to protect and maintain a 99% pure species and re-establish pure populations. To support the goal, the Department of Fisheries and Oceans Canada will be doing the following:

- Analyzing tissue samples collected by Alberta Environment and Parks and reporting of genetic status
- Partnering in the development of genetic diagnostic markers
- Supporting AB Agriculture and Forestry's riparian assessment project
- Collaborating in the development of interpretive signage.

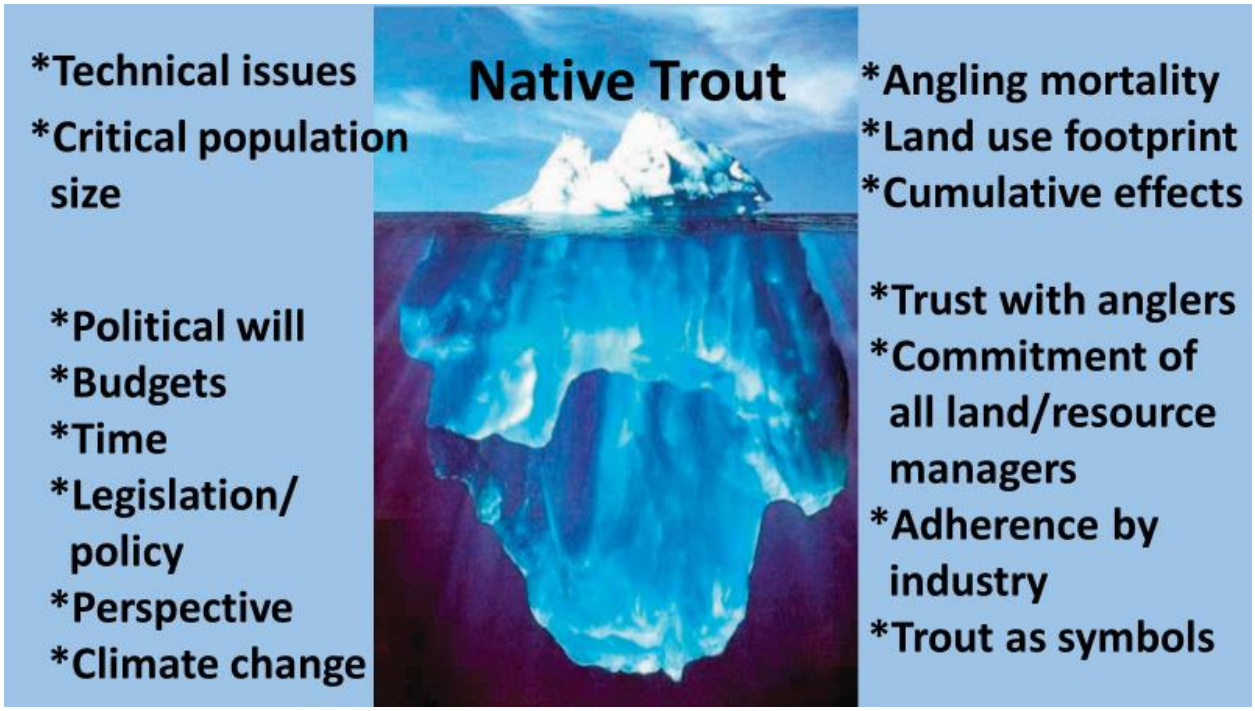
Bull trout have been assessed as a Threatened in Alberta, and managers anticipate using the provincial recovery plan to streamline the recovery plan and actions. They are currently developing eDNA markers and collection protocols for bull trout.

Lastly, Watson spoke briefly about Athabasca Rainbow Trout, which have been assessed as endangered in Alberta. They are working with Alberta to identify recovery habitat and historical habitat where there are near pure strains.

4. Keynote presentation

Poking a Dead Fish: Reflections on Native Trout Recovery - Lorne Fitch

The keynote presentation on the first night of the forum was given by conservationist and author Lorne Fitch. His reflection comes from years of working in conservation, fisheries management, and the founding of the Cows and Fish organization in Alberta. One of his main points was that there are many sub-surface issues complicating the recovery of native trout such as political will, budgets, trust between anglers and agencies, and commitment from land and resource managers. The problem here is that it evolves into a waiting game that the trout can't play in the state that they are in. Lorne went on to say that we need the involvement that is currently not there from government, industry, and anglers to make the recovery process work, and that starts with getting them to understand the values of stewardship, as well as what they stand to lose if they don't commit right now.



That is, these trout need to be seen as something more than a fish and instead as a life and an existence that needs assistance from us to flourish. Lorne commented that these trout are not to be taken lightly because they have been and continue to be used as indicator species that tell us about the overall health of a watershed. Trout need cold, clean, complex and connected landscapes, so if the trout are not there, that means one or many of those factors are impaired.

Lorne rounded out his presentation by saying that the long-term solution is watershed level restoration and changes to the current land use practices in those areas; and that the situation is now absolutely critical. The

actions that we all take – or fail to take – right now at this critical juncture will determine the future of native salmonids in this landscape.

DAY 2 - March 21, 2018

5. *Recovery Actions for Native Trout*

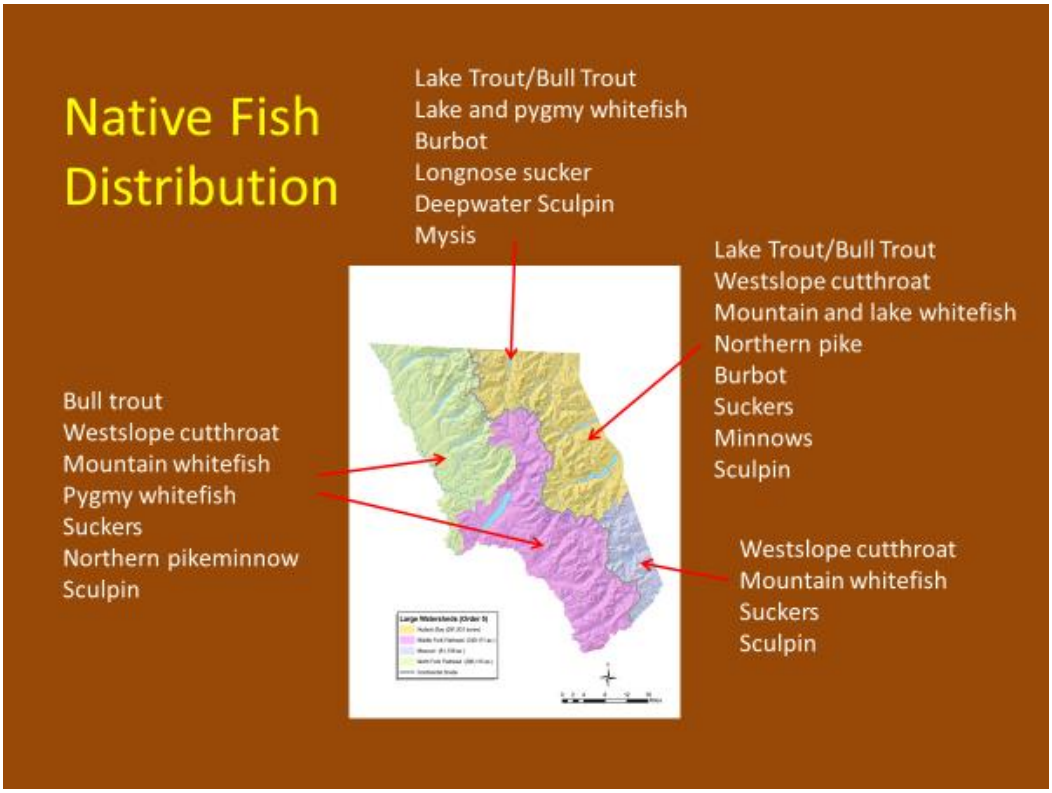
1. Paul Christensen – Alberta Environment and Parks

Paul Christensen gave an update on what Alberta Environment and Parks is doing to facilitate native trout recovery. Currently, they have a westslope cutthroat trout program and are working with the Athabasca rainbow trout and the Arctic Grayling. There is a lot of angling in Alberta due to large populations, rules on that are open, people come there from Montana and BC to take advantage of it which puts the native trout populations at risk.

They have been using a Fish Sustainability Index to determine suitability of watersheds for the at-risk populations. It also helps make recommendations on recovery actions and has been an inclusive and powerful communication tool.

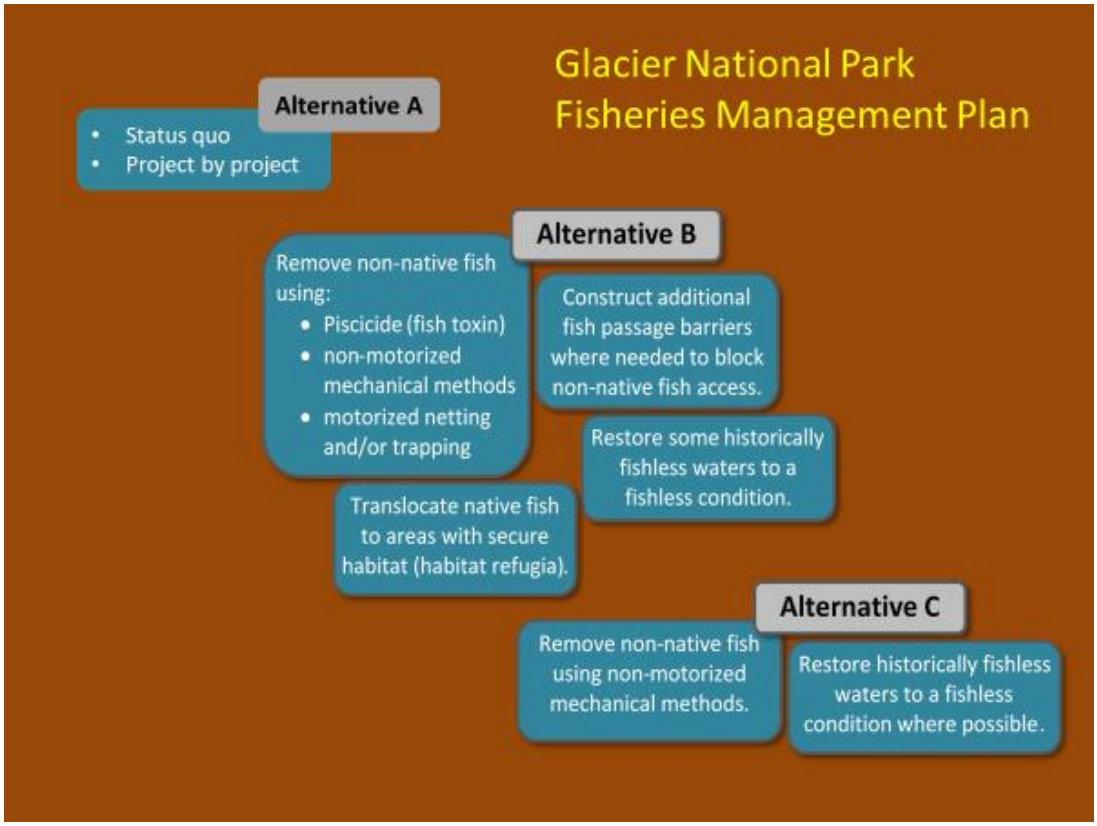
2. Chris Downs – Glacier National Park

Chris Downs began his presentation with a background on historic native fish locations in Glacier National Park.



He stated that there will not be westslope cutthroat trout restoration in the Waterton drainage, as they were not naturally there historically and their presence now would be considered a climate change refugia project.

At the Park, they are using an adaptive management plan and an EIA for fisheries management, and believe that to responsibly manage, you need extensive knowledge of the area and the species you are managing to be successful.



The greatest threat to the fish populations in Glacier now is the St. Mary canal water diversion that goes to Canada from the park. There is no screen on the diversion and it has been found that they are losing 22,000 to 31,000 fish to it annually. This is a huge opportunity – and challenge – to change the trajectory of native salmonid recovery efforts in the Crown over the long-term; but is politically difficult: after more than a decade of dedicated work by a collaborative group on this topic, they have yet to break through in terms of finding a path to action with the support of local communities.

Chris then described the tools that are used to manage and conserve the fish populations in the park. They include:

- Mechanical removal of non-natives in lakes using gill nets. Selective removal in streams, non-chemical;
- Construction of fish passage barriers in the back-country;
- Lake Tout removal and translocation;
- Egg take and conservation rearing.

3. Benjamin Letcher - Interactive Catchment Explorer – ice.ecosheds.org/cce

Ben went over the how-to's of the SHEDS tool in this presentation. The basics are as follows:

- It is an interactive web-tool, map-based system;

- Looks at isolated population patches for cutthroat trout or bull trout, there is a drop-down menu to switch between species;
- Looks at overall risk scores 0-100;
- It is extremely important for everyone to realize that the risk assessments are relative to all other conservation populations in the area selected rather than absolute;
- There are variables grouped into subgroups into risk scores (overall risk, climate, demographic, genetic and habitat;
- If you have questions about the variables can find out more information in the "about the data" box at the top left of the webpage.

Q: Is there a way to get the metadata for the streams or HUC?
A: No, there is not.

Q: Can it be exported into ArcGIS?
A: In the future it will be available. Planning to make this available in the future.

6. *Playing with Tools: Determining priority watersheds within the Crown and key actions for WCST and bull trout*

During this portion of the forum, participants got to view and use the ecosheds tool. Outline below is some of the feedback on the tool itself and application of it.

Breakout Group – Bull Trout – East of the Divide

- Valley bottom width, would be good to have consistent ways to measure
- Missing polygons for south and north Drywood Creek, bull trout are present in the south
- Rainbow trout are not included in presence/absence of non-natives
- Linkages to FWMIS (Alberta database)
- Had troubles getting into specific sections, possibly due to data lacking
- How were the polygons derived? Independently reproducing populations, were determined and refined by biologists, local populations that are genetically distinct.

Breakout Group - WSCT – West of the Divide

- Looking at inputs: does that include only natural or are man-made included
- Road density, does that include open and closed roads, does this include trails, these inputs could change the data dramatically
- Hybridization, only specifies rainbows, were Yellowstone trout included? Some uncertainty
- Absence of any type of risk from angling in Alberta
- No measure of the abundance of fish

Breakout Group - WSCT East of the Divide

- Off Highway Vehicle layer was missing because it was not available for the Crown, could possibly be put at another scale.

- Color scheme, green indicates ok in most peoples' minds, but they are threatened, so maybe not the right color scheme, different colors could make this perception less common
- Patch sizes were small and somewhat arbitrary. Downstream boundary was a genetic boundary, not entire watershed, should take a watershed approach
- Include patches that are considered barren as they contribute streamflow to the area

Breakout Group - Bull Trout West of the Divide

- Fishless areas could be considered high priority areas for translocation
- Anthropogenic footprint was difficult to capture in the model
- Crown-wide water quality data layer for the Crown would be helpful
- Logging and mining footprints would also be beneficial
- Size of the catches, relative size of the patch versus relative road density
- Populations that were near conservation populations were not included
- Populations are currently ranked against each other. If road density was tied to species sustainability, picture would be different
- There may be threshold data for Alberta, possibly

7. Finalizing priority watersheds within the Crown and key actions for WCST and bull trout

What are the high-level strategies for the Crown? What are the strategies at a HUC8 (Hydrologic Unit Code – HUS) level? Have a conversation about each HUC and prioritized management actions.

The attendees were broken into four groups based on east/west of the continental divide and by species. Outlined below are general comments and the summary tables generated by the groups assigning management action for specific locations in the area and outlining specific management actions and priorities for a given watershed. The group also identified areas where collaboration with other organizations is a potential for on the group actions.

Breakout Group - Bull Trout East of the Divide

- Priorities: St Mary HUC, Upper Oldman, Highwood, Waterton
- Tricky: missing data (upper Oldman, etc.)
    - Some of the input data that would drive risk was missing, linear footprint, industry
- Themes: fewer bull trout populations in the face of climate change
- Local scale priorities: Livingstone/Porcupine Hills linear footprint plan, potential bull trout restoration in the Crowsnest. There is already a park plan for the Castle, priority that Park can sustain the development (infrastructure, demand on resources) Waterton (non-native control)

Breakout Group - Bull Trout West of the Divide

- Priorities - All 9 HUCS and patches
- Large HUC but Bull Trout only found in limited areas of the HUC
- 2 major themes: industrial development (agriculture and forestry, mining) affecting the north
- Hard time dividing between A's and C's
- Logging roads came up as a major theme.

- Swan lake has a big problem with lake trout, area for hanging onto bull trout, priority watershed, lots of opportunity for collaboration

Breakout Group - WSCT East of the Divide

- Protect and maintain light green status
- Looking for areas of hotspots for collaboration and determining if there was a potential for conflict
- Addressing angling pressure needed
- Scores for hybridization were low, needed expert opinion
- Instream flow (water withdrawals) is not represented in the tool
- Protect, maintain for St. Mary's, MT - Fish screens are critical
- Identify historical fisheries to determine replication/translocation
- Priorities: Montana – St Mary Alberta-upper Oldman
- Tricky – money, coordination
- Distribution of westslope cutthroat trout was patchy

Breakout Group - WSCT West of the Divide

- 9 watersheds
- South Fork Watershed – A level
- Tricky – challenge of suppression of non-native species. Concerned about conflicting issues with other native species.
- Stillwater – lack of collaboration
- Collaboration is key

MANAGEMENT STRATEGY CODING		
Code	**Description**	**Detail**
A	Little or no management	Monitor infrequently; site characteristics exhibit high abililty to resist or adapt to stressors (or stressors are not primary factor)
B	Moderate management invention	Maintian or enhance XXX characteristics at these sites. Site Characteristics exhibit moderate ability to residet or adapt to stresstors (or stressors not primary factor)
C	High management intervention	Maintain or enhance XXX characteristics at these sites. Site characteristics exhibit low ability to resist or adapt to stressors (or stressors are not primary factor). BUT social, landscape, connectivity etc. characteristics of the site is importance for the XXX
D	Little to no management invention	Monitory infrequently or not at all. Site character istics exhibit low ability to resist or adapt to stressors (or stressors are not primary factor). And social, landscape, connectivity etc. of the characteristics of the site are NOT importance for the XXX.

Westslope cutthroat trout priority actions – West side of the Continental Divide

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	South Fork Flathead	A	Monitor	Consider autonomous eDNA Minor habitat Genetic Donor Stock	Easy to do, already set up
2	Middle Fork (same as NF)	B	Piscicide lakes w/Yellowstone Cutthroat Trout + selective isolation. Pike-BT suppression (Lake Trout NOP) Angling regulations	Remove Yellowstone Cutthroat Trout Selective isolation or non-DV watersheds Angling regulation for Pike, Lake Trout - suppression. Single lake- remove rainbow trout?, closures, tags-quotas	High
3	North Fork Flathead	B	Piscicide lakes w/Yellowstone cutthroat trout selective isolation. Pike-BT suppression (Lake trout NOP) Angling regulations	Remove Yellowstone Cutthroat Trout Select isolation or non-DV watersheds Angling regulation for Pike, Lake Trout - suppression. Single lake remove Rainbow Trout?, closures, tags-quotas	
4	Middle Kootenai	C	Habitat restoration Rainbow Trout suppression Angling effort?	Mining regulations?	
5	Swan		Relocation Isolate Fire Mitigation	Secure barriers Downstream, piscicides Prescribed burn Move fish to fishless waters	High
6	Blackfoot	C	Habitat restoration Relocation	Minimum restoration Water flows, screens, grazing restoration round work, conservation easements, Nevada Creek reservoir work Rainbow Trout suppression	High
7	Stillwater	C	Habitat Isolation	Fix roads Move fish downstream, expand	Low
8	Lower Flathead	C	Habitat restoration Water rights Suppression	Rainbow Trout suppression	Medium
9	Flathead Lake	C/D	Genetic rescue		

Westslope cutthroat trout priority actions – East side of the Continental Divide

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	Upper Oldman	C	Upper Oldman-expansion of Non-native trout, -Close Oldman above Cache Creek Falls (changing/reduce angling effort) - Hybridization risk needs to be managed (suppress rainbow trout)		
2	Porcupine Hills	C	Hybridization risk, habitat (same as above).		
3	Crowsnest River	C	- increase population numbers, expand range + habitat recovery		
4	Crowsnest Pass area	C	Demographic and habitat Issues Maintain	Build some barriers. Address hybridization issues like restoration stocking. Reassess angling regulations for key stream segments. Some targeted restoration activities (trail reclamation).	Medium
5	Castle	C	- benchmark for intact & functioning pops – Lynx Creek - habitat restoration - removal of non-natives reclaiming crossings & installing barriers		
6	Highwood River	C	Renewal of non-native in areas	Habitat intactness can be improved relatively easily compared to other watersheds. Reduce/close fishing pressure in areas for Westslope Cutthroat Trout recovery	High: Anglers Transportation & industry Oil & gas wells Forestry & allotment Holders Private land covers Managing public land
7	Sheep-Highwood	C	Demographic/habitat risk Protect/maintain existing	High level of angling impacted Address Hybrids issue	Medium

	River/Little Bow		Westslope Cutthroat Trout streams Address invasive & roads	(restoration/stock) Habitat fragmentation & made sure barrier permanent	
8	Willow		Removal of invasive & introduction of Westslope Cutthroat Trout, sediment control management of linear disturbance	Stacking of Westslope Cutthroat Trout in Chain Lakes and above	High Allotment & leaseholders Private land covers Managing public land
9	St Mary River	C	Demographic and habitat risk	Boulder Creek - Observe/monitor. Irrigation/in-stream flows in summer on main stem St. Mary River fish screens are critical ***	High
10	Waterton River	D/C	Given it's a national park, conservation should be #1 priority but recovery requires high intervention		
11	Two Medicine River	B	No- native removal is key	Midvale Creek - invasives	

Bull trout priority actions – West side of the Continental Divide

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	Flathead Lake	C		Lake trout Suppression	
	Mission	C	Bull trout translocation		
2	Lower Flathead				
	Post	C		Very small population	
	North Jocko	C		Habitat irrigation	
	South Jocko	B	More primitive management		
3	Southfork Group 1	A			
	Bob Marshall Complex		No Action		
	Donahue,Young White				
	Gordon Creek; Spotted Bear		Bob Marshall		
4	Southfork Group 2	B			

	Sullivan		Road focus action		
	Wheeler				
	Wounded Buck		Culverts & roads		
5	Middle Fork Flathead	A			
	Bull Clack Straw		No actions for Bull Trout		
	Schacterlongm		Bob Marshall		
	Morrison, Grand				
6	Middle				
	Bear	B	Road Related actions		
	Minnco				
	Olue Park	A		Glacier NP	
	Nyack	B		Potential to net Harrison	
	Harrison	C		Lake Trout reduction	
	Lincoln	B		Nyack - Brook Trout issue	
7	Northfork Flathead	B			
	Quartz (Bowman's) Logging	C	Non-native fish removal		
	Upper Kintla	A			
	Trout Narrow	A			
	Lower Quartz	B			
	Kishneen	A			
	Big Creek	B/C	Trail	Forest Management Harvest	
	Coal Cyclone		Frozen Lake	Sediment and road issues	
	Red Meadow Whale				
8	Northfork Flathead Canada	B		Logging roads biggest Issue	
	Sage Couldrey				
	Howwell, North				
	Fork Kisaneen				
9	Stillwater				
	Swift & Stillwater	C		Forestry roads	
10	Swan				
	Linberg Lake	C		Lake Trout Removal	
	Holland Lake	C		Netting - suppression	
	Elk Coal Gem Sarp.	B/C		Road issue -small patch	

	Piper Lyon	B/C		Lower elevation, lake trout removal, Swan	
	Lost Goat	B/C			
11	Middle Kootenai				
	White	A			
	Lussier	B			
	Wildhorse	A			
	Elk Coal Gem Sarp.	B			
	Bull	B			
	Michel	B		Industrial activity in this area	
	Fording- not mapped or surveyed				
	Lizard Creek				
12	Blackfoot				
	Bold	D			
	Belmont	D			
	Placid	D			
	Marshal	C			
	West Fork of the Clearwater	C			
	East Fork of the Clearwater	B			
	Morrel	B			
	Cottonwood	C			
	Monture Creek	B			
	North Fork of the. Blackfoot	B/C			
	Landers	B			
	Arrastra	C		Two systems aren't mapped - light priority and active not in fish & wildlife	

***Bull trout priority actions* – East side of the Continental Divide**

Rank	Name/Site	Strategy assignment (Color code)	Management actions	Specific management actions/ relevant information	Hotspots of collaboration? High, medium, low
1	Highwood	B	Targeted/seasonal angling closures. Brock Trout removal Monitor logging. Assess risk based on FMP (stream crossings, buffer).	Potential expand current closures Maintain closures on Storm Creek etc.	Local knowledge ACA, AEP

2	Oldman	C	Angling limitations during spawn	Hidden Creek -trails -habitat/sediment	
	Upper Oldman	C	Reduce linear footprint	- Rec/Linear Management plans. Read Surveys, continued monitoring and expand. Measure angling effort.	
	Castle			**Castle Area** - Carbondale, w/s Castle etc. (integrated partially by Castle Park Plan)	
3	Waterton	D		Poaching/enforcement	
4	St. Mary				
5	Willow	D			
6	Waterton Lakes National Park	C	Non-native control. Increase connectivity. Restore native species Barrier installation/maintenance. Mechanical non-native removal	**Drywood Yarrow** Palmer Dam Beaver re-intro Drywood Yarrow. **Blakiston** Restore native populations **N. Fork Belly** maintain fish screens in diversion structures, reduce out migrant losses. Monitor angling effort.	Drywood Yarrow watershed Landowners

Day 3- March 22, 2018

1. Summary of Day 2 and Priorities

The morning started with a summary of the day before. The watersheds that had been identified as priority based on the tool were Oldman, Glacier/Waterton, Swan and the Flathead.

2. Report Out

- It's a long game, need patience, small steps
- Shortening learning curve, share failures and have Alberta learn from Montana.
- Have consistency in lab results, sending samples to Montana
- We need to collaborate better within the entire watershed
- Share ownership of recovery, working between departments
- We can achieve more with more people
- Using HUC8 was difficult, challenge of scale
- Surprise of emphasis of harvest in Alberta

- Transboundary watershed synergy and information sharing
- Difficult to prioritize one HUC over another, will always work within the jurisdiction
- North Fork Flathead and Middle Fork Flathead and Upper Oldman River are priority areas.
- Waterton and Belly River (diversions)
- Alberta has a lot to learn from Montana - Cross border field trips
- Montana has a voluntary forest audit program
- Protect the best of the best. Especially in the high priority areas
- Bull trout genetics
- Drywood system, have restoration for both Westslope Cutthroat Trout and Bull Trout. Have anglers come in and fish out the brook trout
- Opportunity to come together at the Forum has allowed sharing and jump started on the ground action
- Diversions, with joint efforts in Montana, there may be an opportunity to look at the issues with diversions by collaborating
- Anglers do not believe that native trout are in trouble, this is an opportunity to educate anglers who will then be more invested in conserving.
- Failures that are encountered are based on lack of relationships, lack of trust
- How do we create new or enhanced angling opportunities, to create balance when there are stream closures
- Bull Trout- look at having a cross border project
- Cost and time it will take to restore these watersheds will need political capital
- Direction of identifying priority watersheds
- BC has protection of their waters. Shifting pressure into Alberta
- Alberta, BC and Montana differ greatly in their Off Highway Vehicle rules
- Montana model for managing habitat is superior, shift from stocking rivers - stopped decades ago.
- Opportunities to collaborate earlier with Tribes and First Nations, they have a seat at the federal table
- Crowsnest for westslope cutthroat trout, action seems probable
- Oldman, high priority but high challenges
- All forks of the Flathead for Montana.

Q: What is the OHV usage on public lands in Montana and the impact on native salmonids?

- Use is variable.
- No use in the parks
- Variable in the Forest, but differs between forest areas, depends on management plan
- BLM land differs
- Variable and dependent upon resource plans that are built by the public.

Volunteer Audit

- Other states have taken a legislative approach
- Buy in from industry, keeps them honest. Creates an ethic within industry to achieve best environmental practices.
- Have a forest stewardship certification specifically for native trout.
- There is no strength on the backend

Blackfoot Area

- Seeing increases in native fish.
- Great things happening in Glacier National Park, saving the last of the best
- Taking care of things that are good
- Suppression can work
- Focus on saving something that is really good now, West of the Divide
- Highly fragmented, isolated populations East of the Divide
- Create new areas of refugia in Waterton and Glacier National Park
- Have money, people and opportunity in the Upper Oldman River

Conference meeting – Clint Muhlfeld

Clint saw that there was a desire from attendees to move forward with some of the plans they had been brainstorming, and they decided to form a native salmonid working group for the Crown that would drive action in the Crown and do the following:

- Include a field portion
- Meet annually
- Pick a project and make a difference
- Act on a small scale

Breakout Group: Swan and Flathead

- Available funding is a concern
- Bi-catch issue
- 8-year gill netting, with goal to knock down the lake trout population
- None of the 3 success criteria were met after the 3 years
- Goal was to hold bull trout steady.
- Writing plan for increasing bull trout, but need funding to write a plan.
- Until plan is in place, continue
- Ad-fluvial population, high priority
- Agency will power is also a problem
- More support to suppress on Swan Lake than there is on Flathead Lake
- Gill netting spawning areas
- Shared effort for funding
- Lake trout suppression would be the action for Swan
- East side of the Missions, opportunity to take Swan Lake bull trout and translocate east side Mission Alpine Lakes
- Could put money towards hiring a grant writer to tap into non-government funding
- Glacier Park Conservancy could be a possible
- Target water bottling, or big corporations for funding.
- Bull Trout working group needs a more formal plan
- Northfork Blackfoot bulltrout and WSCT
- Use Crown for support to make recommendations and get support for action

- Suppression of non-natives rainbow, removal of hybrids
- Visual identification
- Survey of biologists that asked questions about fish species (a fish with 30-40% rainbow) to see accuracy, results were not very accurate.
- eDNA does not discern whether the fish is a hybrid, can only place rainbow or cutthroat.
- Reduce sediment and improve habitat, habitat restoration.
- Spring water restoration. Instream flow acquisition, attaining water rights.
- Intentional isolation of resident populations
- Action: GRAIP Analysis, prioritization based on sediment, for road reclamation.
- Need for a rapid response plan for invasives.

Report Back:

Flathead/Swan

- Lake trout suppression, engage working group have them come up a plan
- Flathead Lake trout suppression
- Translocate bull trout from Swan lake to east side Mission Lake
    - Identify working group and begin planning
- Northfork Flathead: translocation of bulltrout and WSCT. Currently underway and needs to continue
- Flathead, WSCT and RT hybridization, important to develop filed ID for rapid identification and engage WSCT Working Group
- Improve roads to reduce sediment and erosion
- Instream flow acquisition, working to secure water rights
- Look for opportunities to isolate WSCT
- AIS, involves everyone, UC3 is a helpful workgroup to engage
- Early warning network by eDNA
- Measure of success: monitoring, west side maintenance, east side expansion
- What: genetic sampling and redd counts
- Support: PIBO, develop a rapid response plan for lake trout invasion
- Barriers: inconsistent databases, questions around prioritization, need for emergency responses (threat of illegal fish in Hungry Horse reservoir.
- What else to consider: AIS and fire.

Q: Is poaching a threat?
A: Enforcement spends a lot of time on bull trout.

- Discussion about diversions. Many off of the Belly. Will require a group effort, DFO, Irrigation, Tribes and First Nations.
- Specific locations: identified Blakiston, over run with non-native fish at the lower end. Alberta, Bovine Lake, remove non-native fish, could be potentially used as a bull trout refuge. Waterton: high elevation lakes could maybe used as refuges, not policy for Parks Canada would likely take back as fishless lakes.
- Lee Creek – fluvial population of bull trout. Boundary Creek landowner association could be involved.
- Sofa Creek –occupancy needed. May be one of the last best spots in Waterton
- Crooked Creek – non-native trout suppression

- Agriculture issues, nutrient additions, into Waterton.
- Measure success: increase in preferred fish, decrease non-native. Need collaboration
- Monitoring: a lot going on at the Park level. State of the Park reports, management plans, move towards a watershed report. Provincial recovery plans
- Integrate into models that at the watershed level. ALCES
- Native salmonids working group, would be a measure of success for the Crown.
- Evaluation Framework at the Crown level.
- Update Clints' model with the latest data from Alberta.

Upper Oldman

- Focus on habitat: AEP
- Implementing WSCT recovery, working with Ag and Forestry, AER, DFO. Key agencies to work together: lead by DFO, with support by AEP and AER, Ag and Forestry.
- Completing the recovery plan and finalizing the definition of critical habitat. Policy needs to be written on how critical habitat will be integrated and implemented into the other governing policies
- DFO to develop an operational statement for critical habitat for industry to follow. (i.e. BMP's for critical habitat)
- Hybridization: identify pure sources for propagating on the east of the divide. AEP, ACA, working with MT Genomics Lab
- Harvest: Need to assess hooking mortality, work collaboratively with Fish and Game, backcountry hunting and anglers. Conduct studies to assess the effects of angling on fish mortality.
- Suppression of non-native species- areas where they are confined to a short reach of stream, surrounded by boundaries, could do mechanical removals and stock in the future with pure WSCT.
- Grazing: improvements for grazing, groups responsible in AB that are responsible for grazing. Not much engagement with producers around the grazing issue to date. Sensitive issue, need engagement with key producers and all stakeholders
- Success: reconnecting isolated populations and range expansion. Some measure of restoration of habitat. Changes in policy, habitat guidelines
- Monitoring: AB is focused on cash per unit effort on juvenile abundance, more consistency across the Crown is needed
- Crown- using Clint's tool. Evaluating the metrics in Clint's tool, give him feedback about key metrics that should be used/not used
- Build-on: Montana could build on Alberta's assessment of angling efforts. Have a standardized approach and thresholds. Habitat restoration and protection
- Barriers- relationships, need to build strength between provincial and federal government, Crown-wide
- Framework- seeking more consisting in the approaches that are being used across the Crown so that direct comparisons can be used across the Crown
- Trout Creek in Porcupine Hills: habitat restoration, barrier to prevent further integration, restoration stocking efforts, include science, social and policy groups Short-term channel restoration, mid-term linear disturbance and habitat restoration. Get support from C&F, OWC, TUC
- Callum Creek? Creek- extra genetic sampling, barrier installation, beaver reintroduction, NCC property. Planning and talking to groups. Consistent effort
- High mountain lakes in Castle Park – remove non-native from the system, replacing with WSCT, angling opportunity
- Continue training staff in removal methods, coordinating with stocking staff

- Hidden Creek: BT and WSCT. Reclaiming systems, reclaiming ford crossing, coordination with watershed groups
- Measuring success: looking past biological factors into the social, how many people are aware of the issues. Coordination between groups and keeping momentum through projects.

Closing remarks – Anne Carlson

Anne Carlson finished the forum with a summary of what was learned, and what the goals are for moving forward. Anne will be working on the Conservation Playbook 2.0, which will contain the progress made and new information. Clint will be taking the recommendations that attendees made for the tool and updating it to be sent back out to forum participants. The results from the forum will also be taken back to the USFS. It was identified in the breakout groups that an updated Crown-wide fire layer should be compared with fish populations to assess the risks that might pose. Lastly, a list was compiled of the attendees interested in being part of the Crown-wide Native Salmonids working group, and they will be re-convening in May.

By the close of the workshop, the following short list of priorities for bull trout and westslope cut-throat trout had risen to the top after a ranking process. These included:

- On-the-ground projects that could be scaled up and applied more broadly across the Crown ecosystem, (#1-5);
- Identification of one new tactic that could be implemented as a prototype project (#6); and
- Opportunities for Crown-wide coordination on one climate adaptation tactic (#7-9).

Added to the below list is a brief summary of progress to date on each priority since the 2014 workshop (**as of July, 2018**).

PROJECT #1: Establish coordinated monitoring efforts across the Crown, including standardized protocols, objectives, and a common data repository for both fish populations and habitats. *Progress to date*: Although components of this priority exist in the form of on-the-ground monitoring programs for portions of the Crown of the Continent landscape (e.g. Southwestern Crown of the Continent Collaborative Forest Landscape Restoration Project (CFLRP) for fish habitat; U.S. Forest Service PIBO monitoring for fisheries habitat), a set of standardized protocols and databases for the entire Crown has not been created yet. Alberta has adopted the protocols with genetic assessment used in Montana and is currently doing genetic analysis at the University of Montana.
PROJECT #2: Secure the placement of fish screens on existing water diversions, including those on Saint Mary's River and the Belly River. *Progress to date*: Unfortunately, no progress has been made since 2014 – despite the potential for this project to keep thousands of native salmonids in the ecosystem annually - due to the challenges presented by the current implementation plan to pass the substantial costs of adding fish screens directly onto local communities.
PROJECT #3: Replicate, restore and/or translocate native salmonid populations to cold water refugia in priority transboundary watersheds East of the Divide (including the Oldman Watershed). *Progress to date*: No progress to date on this priority on the American side of the Crown. In Alberta, fisheries managers are developing restoration stocking methods and build stocks that can be used to replicate

populations. Pilot locations are currently being explored and replication projects through restoration stocking being planned in 2019.

PROJECT #4: Improve and restore native salmonid habitat in headwaters by whatever suite of interventions are appropriate locally.

Progress to date: **ONGOING**: The multitude of projects either underway or completed for this priority within the Crown continues to grow, necessitating the need for a data call – and subsequent database – of management actions. Examples to date include: (1) the Memorandum of Understanding between Montana and British Columbia that retired all existing mining claims on the B.C. side of the Transboundary Flathead; followed by efforts to establish Best Management Practices for any subsequent timber harvest in this crucial area; (2) multiple projects by the Southwestern Crown of the Continent CFLRP to improve fisheries habitat; (3) multiple projects by Montana Fish, Wildlife & Parks and the U.S. Forest Service in the Clearwater, Blackfoot, and middle fork of the Clark Fork; (4) a collaborative Rock Creek restoration in a climatically-vulnerable reach of the Oldman Watershed led by the Oldman Watershed Council; (5) Alberta has completed a land footprint management plan and recreation management plan for the Livingstone/Porcupine Hills lands as well as creation of the Castle Park. Through these plans and current work, fish habitat is being improved by managing linear footprint, limiting motorized recreational access, fish habitat improvements and placement of bridges on fish bearing water bodies.

PROJECT #5: Export successful bull trout translocation efforts piloted in the North Fork of the Blackfoot to other landscapes.

Progress to date: **DEVELOPING**: A potential project – still in the planning stages -on the North fork of the Blackfoot is evolving in terms of interagency collaboration, bioassay tests to be completed this year, and-out year NEPA and MEPA evaluation of alternatives relative to native WSCT restoration - as well as the bull trout translocation aspect.

PROJECT #6: Re-establish beavers across the landscape: launch a pilot project that incorporates efforts to (a) reduce trapping of existing beaver populations (i.e. to facilitate successful dispersal events by existing populations), (b) identify policy avenues that can incentivize expansion of beaver populations in key watersheds, and (c) identify educational outreach opportunities for private landowners, agency staff, and fisheries managers (Stillwater, Montana, and Alberta).

Progress to date: **ONGOING IN ALBERTA, UNDER WAY IN MONTANA**: Extensive work by Cows and Fish in Alberta have included multiple workshops ("Beavers in Our Landscape") for the public; toolkits such as "Living with Beaver - Cows and Fish Workshop Options" and "An Overview of Beaver Management for Agricultural Producers - Decision Matrix Tool"; in addition to numerous other ground-breaking products (see 'What's New' on their website: http://cowsandfish.org).
On the Montana side of the Crown: the U.S. Forest Service and National Wildlife Federation held a two-day workshop on 2017 that focused on the science and outcomes of beaver translocation projects; with University of Montana professor Lisa Eby working in partnership with the Forest Service to better understand the science behind the use of beaver mimicry methodologies with regard to native salmonids. On-the-ground projects are currently in the works for Thompson Falls and on the Lolo National Forest that would apply lessons learned from extensive work and pilot projects by the Clark Fork Coalition in other areas of Montana.

PROJECT #7: Complete prioritization and mapping of conservation populations and key watersheds most critical to sustain native salmonids across the Crown given both existing stressors and climate change, and simultaneously work to identify and secure groundwater upwelling areas and potential coldwater refugia at fine scales.

Progress to date: **COMPLETED!** All of these analyses and data were shared with workshop participants at the second 'Big Tent' native salmonid workshop in Lethbridge in March of 2018. For much more detail, please see proceedings from the 2018 Forum on the Crown Managers Partnership website (http://crownmanagers.org/); or access the interactive web tool directly: http://ice.ecosheds.org/cce/
PROJECT #8: Implement strategic and coordinated suppression of invasive rainbow trout in the transboundary Flathead watershed; export best management practices to other locales; *Progress to date*: **ONGOING**: on the American side of the Crown, for example, Amber Steed and Sam Bourret have been leading this work for Montana Fish, Wildlife & Parks that includes monitoring effectiveness of current methodologies (i.e. trapping and electrofishing removal) as well as evaluation of other tools (i.e. the use of barriers and piscicide). Existing data on effectiveness will be compiled and used as the basis of a strategic planning discussion of next steps.
PROJECT #9: Develop a set of consistent strategies for suppressing non-native fish species across Crown (e.g. prevention, monitoring, response, and enforcement) that is based on lessons learned about critical uncertainties and ecological function from ongoing projects; prioritize testing of these strategies in core areas and known cold-water refugia. *Progress to date*: **DEVELOPING**: On the Montana side of the Crown, Montana Fish, Wildlife & Parks, the U.S. Forest Service and the University of Montana are collaborating on a westslope cutthroat trout genetic rescue project in the Missouri River drainage; while on the Canadian side of the Crown, Alberta is actively scoping non-native fish removal in key waterbodies as part of management actions to be implemented and piloted in 2019 and 2020.

Appendix I: *Final agenda for 'Action on Recovery' Forum.*

Action on Recovery – Native Salmonid Recovery in the Crown
March 20 – 22, 2018, Lethbridge, Alberta

Holiday Inn, Lethbridge Alberta
2375 Mayor Magrath Dr South

FINAL AGENDA

Workshop Objectives

- Review decision support tools and applications for Westslope and Bull Trout in the Crown and validate the outputs of the tools (Crown Vulnerability Assessment and the Web Interface tool)
- Agencies and Organizations provide updates on actions towards Native Salmonid Recovery in the Crown.
- Assess and prioritize watersheds at a HUC 8 level or finer scale within the Crown and identify key actions specific to those watersheds for recovery of Native Salmonids
- Discuss challenges and opportunities for implementing actions across the Crown.
- Discuss and brainstorm an evaluation and reporting currently under way and ways to align into a consistent approach for the Crown.

Workshop Outcomes

- Foster ongoing information and knowledge exchange between experts within and outside of the Crown on native trout recovery.
- Enhance understanding of current status of each jurisdiction's approach to native trout recovery
- Validate the results of the Crown Vulnerability Assessment Tool
- Prioritized list of strategies and actions at the HUC 8 level for the Crown for Westslope Cutthroat Trout and Bull Trout
- Identify key Crown wide recovery actions and key areas of collaboration
- Gather key information to develop a Crown wide Evaluation and Reporting Framework for Native Salmonids following the workshop

TUESDAY, MARCH 20, 2018	
TIME	**ACTIVITY**
9:00 AM – 12:00 PM	**Crown Managers Partnership Agency Meeting**
12:00 PM	**Registration**
1:00 PM	**Welcome and Opening Remarks** • *Welcome from Travis Plaited Hair, Kainai Nation* • *CMP Welcome – Mary Riddle* • *Introductions*
1:20 PM	**Context Setting – Review of outputs of the Native Salmonids workshops in 2014** *Presenter – Anne Carlson, The Wilderness Society*

1:45 PM	**Overview of Key Decision Support Tools to Inform the Workshop** *Presenters:* - *Crown Vulnerability Assessment Tool & Results for the Crown for Bull Trout and Westslope Cutthroat Trout - Clint Muhlfeld, USGS* *Web Interface Tool – Ideas for Application & Use – Benjamin Letcher, USGS*
3:00 – 3:20 PM	**Break**
3:20 – 5:00 PM	**Who is doing what on Native Salmonid Recovery in the Crown – Updates from organizations active in Native Salmonid Recovery** • *Sam Bourret, Montana Fish, Wildlife and Parks* • *Ryan Kovach, US Geological Survey* • *Shane Hendrickson, USDA Forest Service* • *Craig Johnson, Alberta Environment and Parks* • *Dave Mayhood, FWR, Freshwater Research Limited* • *Barb Johnston, Parks Canada – Waterton Lakes National Park* • *Martyn Curtis, Fisheries and Oceans Canada*
5:00 PM	**Reflections on Day 1 & Preparing for Day 2**
5:15 PM	**Adjourn for Dinner**
5:30 PM	**CASH BAR**
6:00 PM	**DINNER AT HOTEL – Buffet**
6:45PM	***Key Note Presentation: Lorne Fitch, Fisheries Biologist***

WEDNESDAY, MARCH 21, 2018	
TIME	**ACTIVITY**
7:30 AM	Registration for new arrivals
8:00 AM	**Welcome, Day 1 Recap and Context setting for Day 2**
8:30 AM	**Recovery Actions for Native Trout** • *Paul Christensen, Alberta Environment and Parks* • *Dave Moser, Montana Fish, Wildlife and Parks* • *Chris Downs, Glacier National Park*
10:00 – 10:20 AM	**Break**

10:20 AM	**Playing with Tools: Determining Priority Watersheds within the Crown and Key Actions for Westslope Cutthroat Trout and Bull Trout** - *Breakout groups to workshop decision support tools* - *Group to validate results of the crown vulnerability assessment tool, prioritize watersheds for recovery actions, determine specific actions for watersheds and identify performance measures.*
12:00 PM	**LUNCH**
1:00 PM	**Playing with Tools: Determining Priority Watersheds within the Crown and Key Actions for Westslope Cutthroat Trout and Bull Trout** - *Continued group work from morning*
2:20 PM	**Break**
2:40 - 5:00 PM	**Finalizing Priority Watersheds and Actions within the Crown for Westslope Cutthroat Trout and Bull Trout** - Report back from breakout groups - Review and confirm priority watersheds and actions for Bull Trout and Westslope Cutthroat Trout within the Crown - Discussion on convergence and divergence of priorities between Bull Trout and Westslope Cutthroat Trout - Identify possible evaluation indicators and performance measures
5:00 PM	**Wrap-up; Preview Next Day**
	Dinner will be on your own

THURSDAY, MARCH 22, 2018	
TIME	**ACTIVITY**
8:00 AM	**Welcome Back & Review of Day's Objectives**
8:20 AM	**Priorities for the Crown and Implementing Actions** - Based on the prioritization for Bull Trout and Westslope Cutthroat Trout, the group as a whole will identify the top ranked priority watersheds across the Crown and context between the different species. - Group identify areas where synergy around actions could occur at scale of Crown or around particular species. - Discussion of challenges to implementing the actions identified and some of the opportunities to address those challenges
10:00 – 10:20 AM	**Break**
10:20 AM	**Evaluation and Reporting on Native Salmonids in the Crown** - Review of monitoring, evaluation and reporting completed by Agencies

	- Identify key performance measures pertinent to all Crown members - Discussion opportunities to align key performance measures and build a consistent reporting framework for all working in the Crown
12:00 PM	**Lunch**
1:00 PM	**Identifying Next Steps; Who, What, When, Where, Why?**
	- Discussing how the work advances from here and potential next steps.
3:00 PM	**ADJOURN**

<u>Appendix II</u>: *Notes from final breakout session of 2018 CMP Forum.*

1. General policy

Specific Actions	Inter-jurisdictional/ Agency interdependencies	Who else needs to be engaged?	Timeline	How to advance ideas post-workshop
AEP/DFO finalize CH definition and decide how to implement with the land use stakeholders through education (also consider recovery CH)	Forestry, AEP		Target for late summer/fall 2018. Role out to new RS/AP March 2019	
AEP Policy needs to be written/updated WST USCT habitat/CH				
BMPs Like DFOs Operational Statements for Critical Habitat	AEP, Forestry, AER		2018	
Identify pure WSCT sources for propagating them to recovery areas	AEP, ACA, MTCGL			
Harvest associated with CuR Fisheries-monitor hooking mortality with key stakeholder like AFGA, BHA		AEP, ACA, AFGA, BHA	2049- ACA recommend to FPC for ACA Katie Morrison says BHA would be keen to volunteer or studies	
Suppression of BKTR win small, confinde reader where dectrofishing effective - same could be done in hybridized reaches (e.g.. Starkly, Etherinton)				
Changes to Grazing Practices - improving grazing systems producers watch low land areas more carefully	Collaborate with producers Rangeland with AEP may need more staff to focus efforts on WSCT streams move			
Change the schedule for renewal of leases/alotments	Rangeland Approvals,\ Lands Approals - Candice Picien Lands Policy			

2. Jurisdiction: Flathead/ Swan

Specific Actions	Inter-jurisdictional/ Agency	Who else needs to be engaged?	Timeline	How to advance ideas post workshop

Continue Lake Trout Suppression in Swan Lake	State FWP, USFS, USFWS, SCKT, DNRC	Trout Unlimited
		Swan Lakers, SEC
		UC3
		Swan Valley, ???
			Now	Re-engage Swan Valley BT working group

Continue Lake Trout Suppression Flathead Lake	State, FWP, SCKT, USFS, USFWS, GNP	Pat VanEimeran Universities research Bio Station, FBC, Flathead lakers, UC3 Trout Unlimited, Flathead wilife Inc., Charter Boat Companies, Walley's Unlimited, Chambers, Canada/BC wildsight	Now (soon)	Develop education effect on Native Salmonid
Translocate Swan Lake Bull Trout to east side Middion Lakes	USFS, FWP, CSKT	Swan Valley connections Backcountry horsemen	outside box idea - after continue suppression	Identify working group and begin planning
Have someone look for grant funding for projects				
Continue North Fork Blackfoot relocation and Bull Trout WCT	FWP, USFWS	Wilderness watch Blackfoot challenge BC Horseman, Trout Unlimited, Wilderness, Society,????, Guides Assoc., Bob		
Continue and expand efforts to suppress Rainbow/ Explore other areas of RB invasion in the	FWP, USFS< NPS	Some partners as ??	Now	Field DNA instant ID, * Engage CT tech working group
Develop a rapid response field technique to identify hybrids by DNA	Canada and US Fed, provincial, state	Some partners as ??		Field DNA instant ID, * Engage CT tech working group
Improve roads to reduce sediment & erosion to	USFS, DNRC	Put industry MLA	Ongoing	Ask Greg Watson (grade analysis): prioritization of id related actions???
Instream flow acquision of water rights	DNRC, DEQ, USFS, CSKT	Landowners, irrigators, Creston H2O bottling plant,	Medium	
Continue international isolation of resident WCT population in Flathead	USFS, FWP, NPS, CSKT, USFWS	???	Ongoing	Grants oversight Cutthroat Trout tech committee continue
Continue effort to suppress AIS into Flathead/Swan Basin	Everyone	Everyone	Immediate	Continue

3. Jurisdiction: Oldman Watershed

Specific Actions	Inter-jurisdictional/ Agency interdependencies	Who needs to be at the table? Who else needs to be engaged?	Timeline	How to advance ideas post workshop
Trout Creek				
Habitat restoration/flow restore natural function. Preserve genetics, isolation to prevent genetic introgression. Reduce linear disturbances. Restoration stocking	Range riders, MD Ranchlands, AEP, TUC, Public lands, SLS, Ranchers/Grazing lease holders, OHV community, Who maintains the roads. Rec Management Plan	Science community Social community Local residence & industry Policy coordinators	Rec management plan- implementation dependent Short term -channel restoration - funding & will dependent Mid term - restoration stocking	TUC, Cows & Fish, MD Ranchlands, OWC Create a local/region support group. Monitoring usage Organize funding (Federal, etc.) Focus on re management plan & OHV Education & communication.
Cullum Creek/Playle Creek				
Prairie stream population. Additional genetic sampling. Build barrier - prevent genetic introgression. Work on lower reaches, headwaters in good shape. Return beaver activity to landscape	NCC managed property Waldron Ranch Coop AEP (headwaters in public land)	Land use component	Short term - planning coordination. Mid term - implement beaver activity, additional data gathering	Consistency of effort, maintain priority. Learn from previous Cows & Sigh efforts. Trout recovery in headwaters. Lower section, potential for a land management shift. Coordinate w/public consultation.
High Mountain Lakes - Castle				
Remove non native (GLTR,BKTR,RNTR) Restock w/native WSCT Remove & replace angling opportunity Options for restoration/recreation stocking	AEP Fisheries Hatchery system Castle Park	Anglers may be lower pressure now of Castle Park preventing motorized access. Loosing opportunity for unique species	Short term - removal Short/mid term - prep hatchery system, begin WSCT stocking. Long term - self sustaining populations.	Continued training in removal methods. Coordinate w/hatchery system Study types of stocking options Coordinate w/ public consultation
Lynx Creek				
Genetically secure population. Maintain or increase population abundance & structure. ACTION for Multiple areas Mechanically, selectively remove non native hybrids	AEP Castle Park	OHV groups Anglers	Ongoing to maintain or increase pure WSCT population. Continued genetic testing Review selection criteria for success.	Continued to prioritize secure populations as part of the recovery effort. Watch other case studies in AB for success - this year. Coordination w/angling for harvest opportunities
Hidden Creek- BLTR and WSCT				
OHV roads - what will be designated & stay open? **Close & reclaim entire trail** Reclaim ford crossing - similar situation in White Creek	AEP Rec Management plan	OHV groups NGO groups	Dependent on trail designation in rec management plan	Review the inclusion of this trail as part of the designated trail network. Push for the permanent closure of trail to motorized use. Inform provincial processes.

4. Jurisdiction: Waterton/ Glacier/ St. Mary

Specific Actions	Inter-jurisdictional/ Agency interdependencies	Who needs to be at the table? Who else needs to be engaged?	Timeline	How to advance ideas post workshop
Waterton/Belly/St. Mary				
Dam on the Belly Diversion from Waterton to Belly to St. Mary Diversion from Waterton to Ed(?) Irrigation District Issue - we don't know why but a major decrease in Bull trout redds from 100-2 - diversion \ H2 O quality United Irrigation District to Canal from Belly	St. Mary to Blood	Irrigation District DFO, AEP, Water Management, Blood	Screening irrigation fish passage - we don't know what the problem is Redd 100-2	Mike Bryski to host a meeting, Waterton Big working group - AEP, Glacier
Blakiston				
Non native suppression Boi - is this a possible refuge. Twin Lakes	Clint's idea	ENGO's - fish rescue , Clint's idea - blitz area	Fall 2018	Waterton
Bovin Lake/Drywood and Blue Lake provincial/ Small Alpine Lake				
	Stocking of a refuge for Bull Trout Switch to native	AEP - Castle Park		Put this on work plan for AEP and Parks staff. Is this a rotenone pilot or is this a manual removal?
Waterton Lake				
High elevation lakes as refuge in Waterton Lake N.P. or fishless		work plan for new PCO2	Immediate	Waterton to lead
Lee creek - Alberta to St. Mary's				
Special sculpin bulls - research project WSCT?? purity	Research questions	Blackfoot reservation Bull trout flurial spawners Boundary Creek Landowners Association		
Water Quality issues downstream of farming (this is related to the diversion group - on				
Upper Crooked Creek				
Non native suppression	Cutthroat Trout	WLNP - barrier at park		New bio id inbound
Sofa Creek				
Need detailed occupancy data - DNA from	Could also be a team field project	WLNP - could get assistance	2018	Work plan for the new biologist

Appendix III: *Notes from final discussion of priorities and next steps from Forum.*

1. Monitoring population trends.
    a. West side – Mountain
    b. East side –expand
2. Redd counts – BT
    a. Population estimates -WCT
3. Develop minimum Sampling strategy at Crown scale.
4. Develop a Rapid Response Plan for Lake Trout invasion
    a. PIBO –good data on land use are not available
    b. ICE Tool
    c. Joey Tool – Develop at Crown scale
    d. Have trip at 13 doing w/Alberta
    e. Do field trips
5. Barriers
    a. Money
    b. Inconsistent databases
    c. Prioritization tool still doesn't have this
    d. Emergency responses (fire)
6. Evaluate Framework
    a. How does it tie into other priorities for the Crown – e.g. AIS, fire?

Biological (numbers, genetics, persistence)
Social (awareness, collaboration)
Economic (angling)

Oldman Group

1. Preserving unique genetics, allelic diversity. Range increase, abundance increase. Persisting, self-sustaining populations. (connectedness)
2. Measure genetic diversity, FSI scores and the variables included in that number, range area (stream km), connected populations. How many people know about /care about native trout? How many satisfied anglers? Success in collaboration.
3. How many pure populations over a critical size still exist in the Crown ecosystem?
4. System of genetic professionals/advisors for jurisdictions and at the Crown scale.
    a. Opportunity for Crown collaboration.
5. How to measure success
    a. Number of fish/population
    b. Number of populations
    c. Persistence through stochastic –fire, flood, drought- events
6. How to define a successful population?

a. Occupied reach
b. Connectedness

Bull trout- East

Playing with tools

1. Upper Oldman
2. Highwood
3. Waterton

1. How far did you get?
    - St. Mary

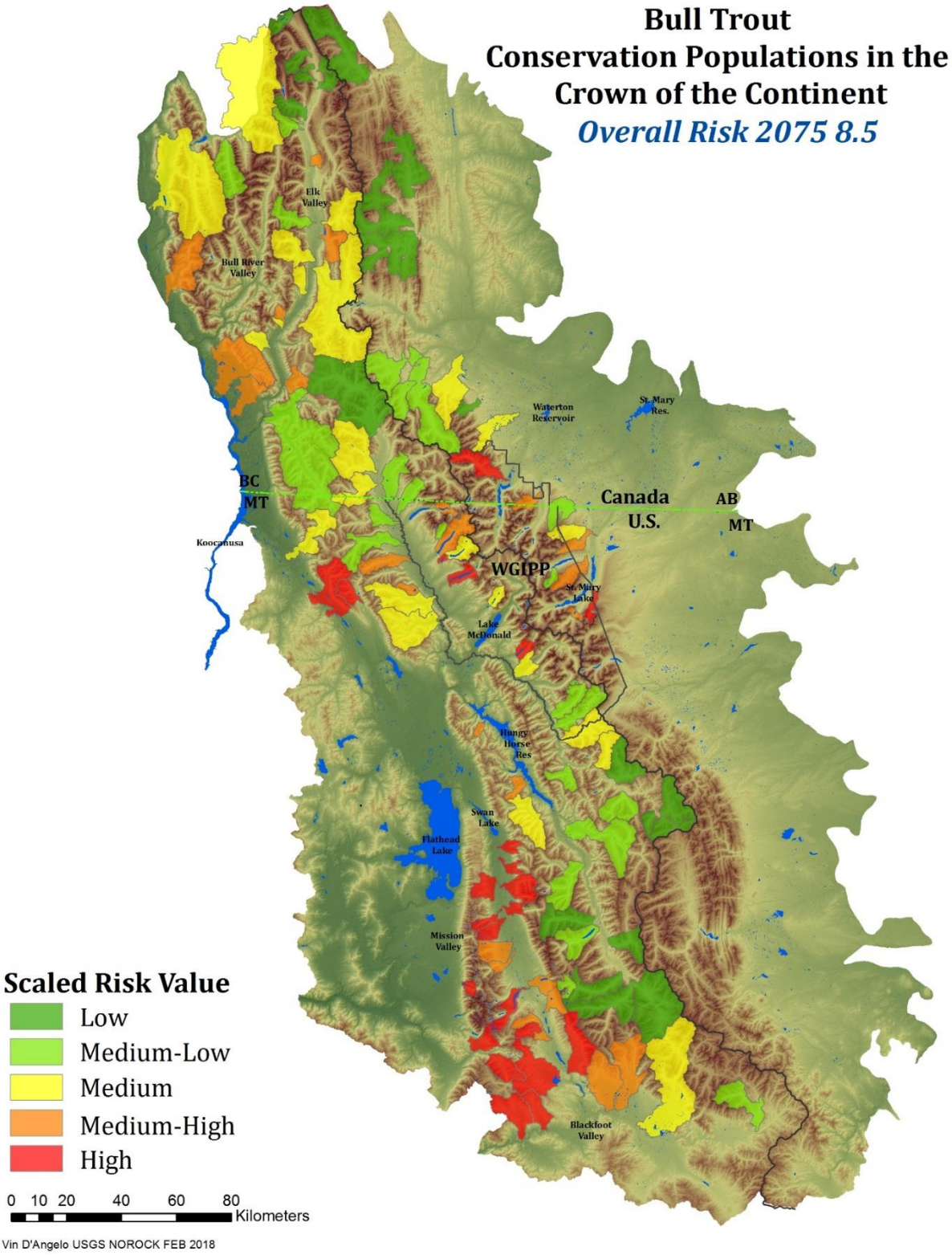
2. What are some of the??? Issues?
    - Missing data/watershed areas
    - Scale of patches sometimes misrepresented
    - Habitat – missing some big data inputs
3. Key themes at broad scale
    - East of the Divide, relativity few bull trout populations are at low risk of climate change. Priority of VOM
4. Local scale priorities
    - VOM – linear footprint reduction/Livingstone Porcupine Hills access management.
    - Crow – potential BLTR restoration stocking.
    - Castle – Park plan
        - Development restrictions – Water for ski-hill & expansions
        - Capacity – human
    - Waterton – non-native control
        - Range expansion?

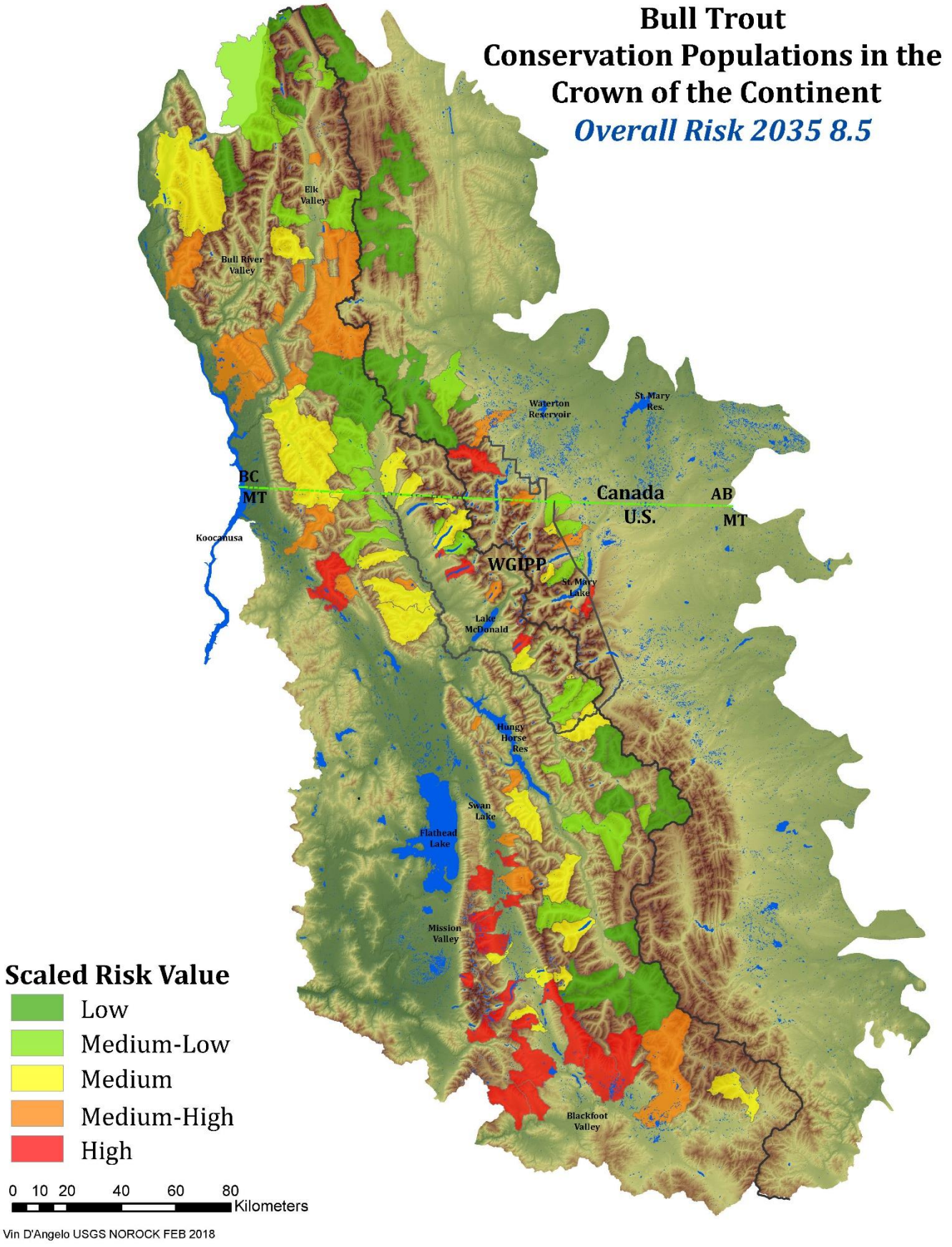
Discussion

1. How do we know success when we've achieved it?
    - Re-connecting isolated pops
    - Range expansion
    - Restoring habitat for recovery
        - Changes to policy/ legislation
2. What monitoring, evaluation, reporting approaches are we using?
    - They differ between AB,MT,BC
    - AB used CUE of adults/juv
    - Genetics monitored more simpler
3. The metrics in Clint's online tools provide some standard metrics.
4. MT could build on AB's creel Methods and abundance estimates.
   AB could learn from MT habitat restoration efforts, habitat protection.

5. Need to strengthen relationships
    - Resolves
    - Political will
6. Seeking more consistency in standard methods for evaluating and reporting

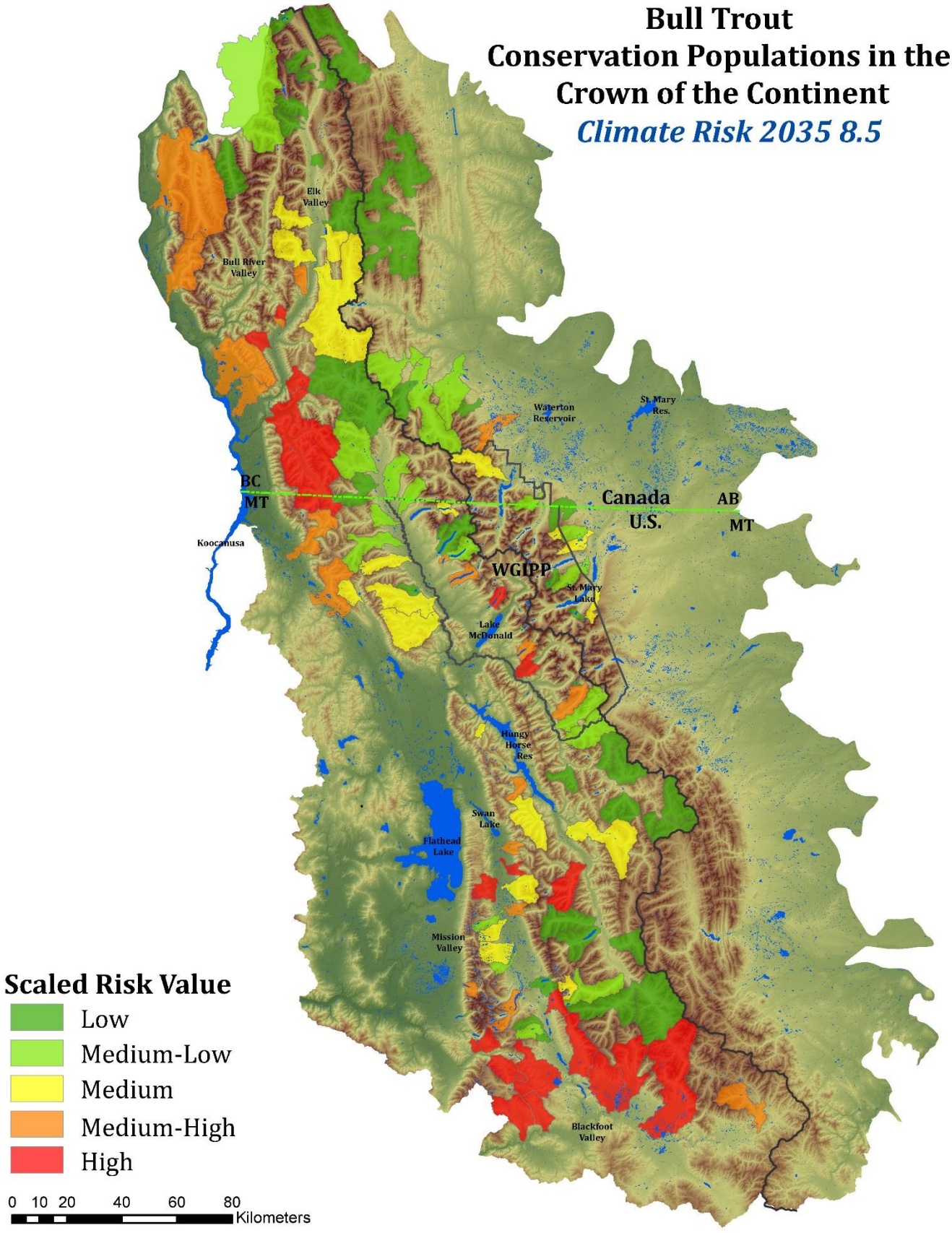
<u>Appendix IV</u>*: Map products from the Crown EcoSheds tool provided by U.S. Geological Survey scientists.*



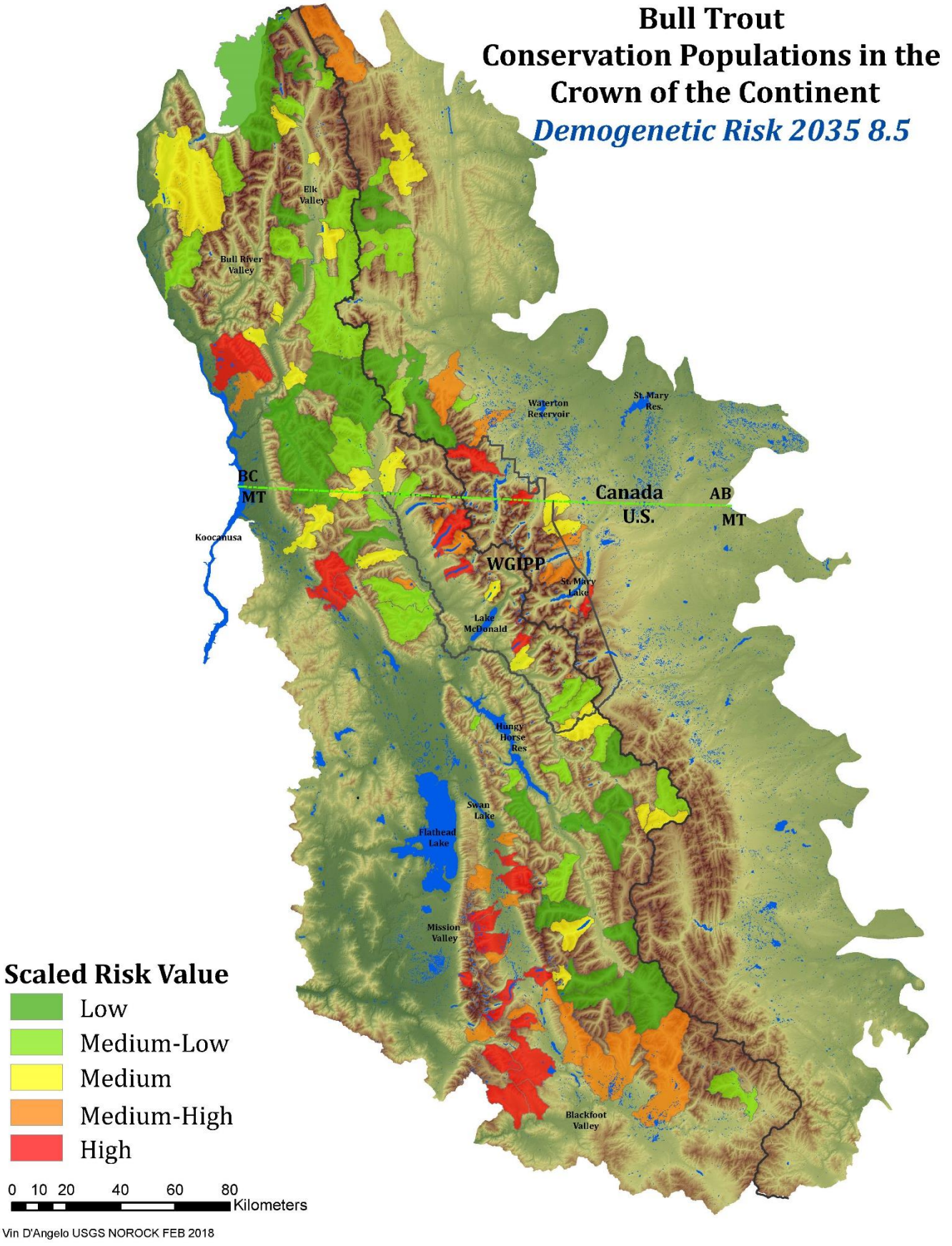

Bull Trout
Conservation Populations in the
Crown of the Continent
Overall Risk 2035 8.5
Elk Valley
Bull River Valley
Waterton Reservoir
St. Mary Res.
BC
MT
Canada
U.S.
AB
MT
Koocanusa
WGIPP
St. Mary Lake
Lake McDonald
Hungy Horse Res
Swan Lake
Flathead Lake
Mission Valley
Blackfoot Valley
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018

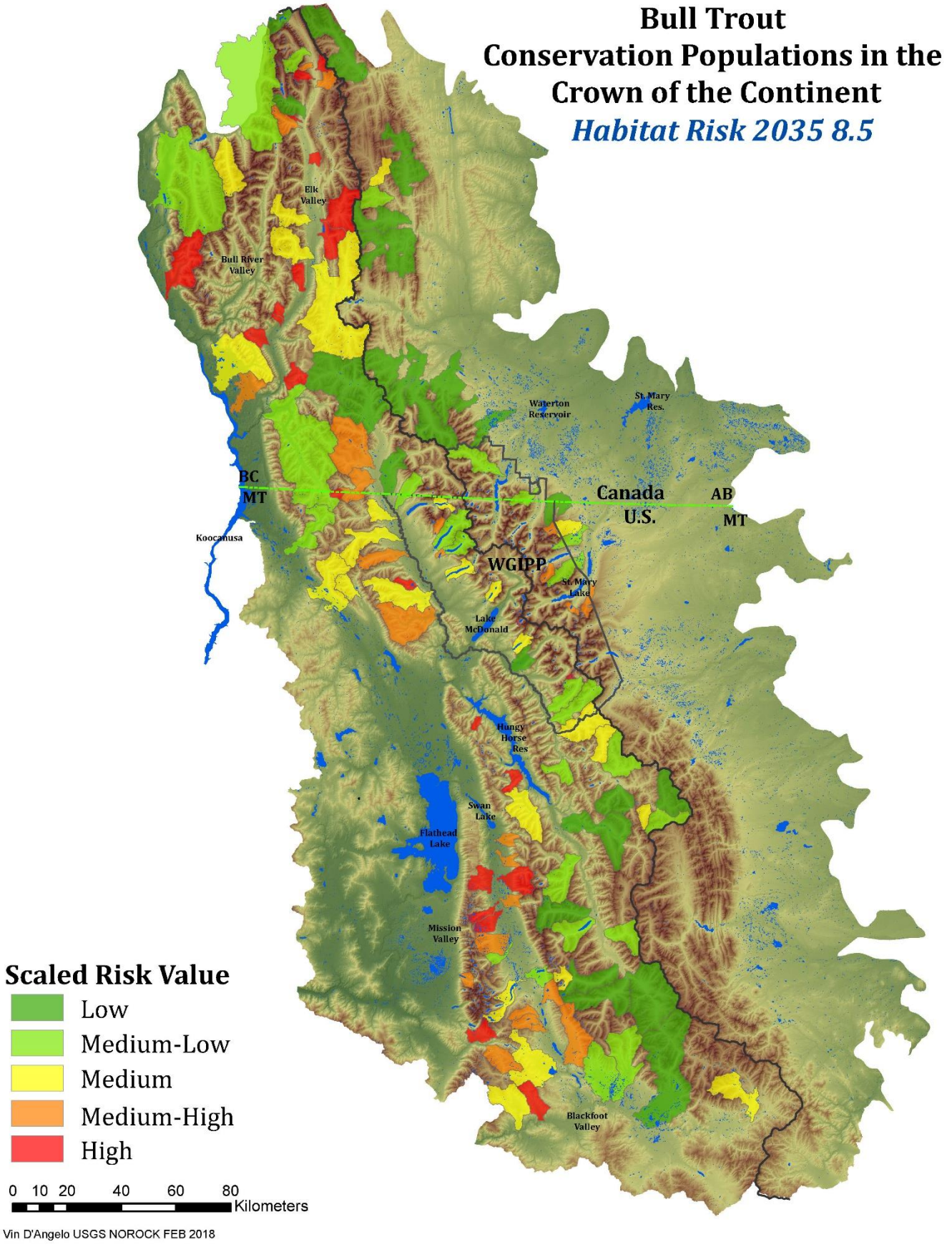
Bull Trout Conservation Populations in the Crown of the Continent

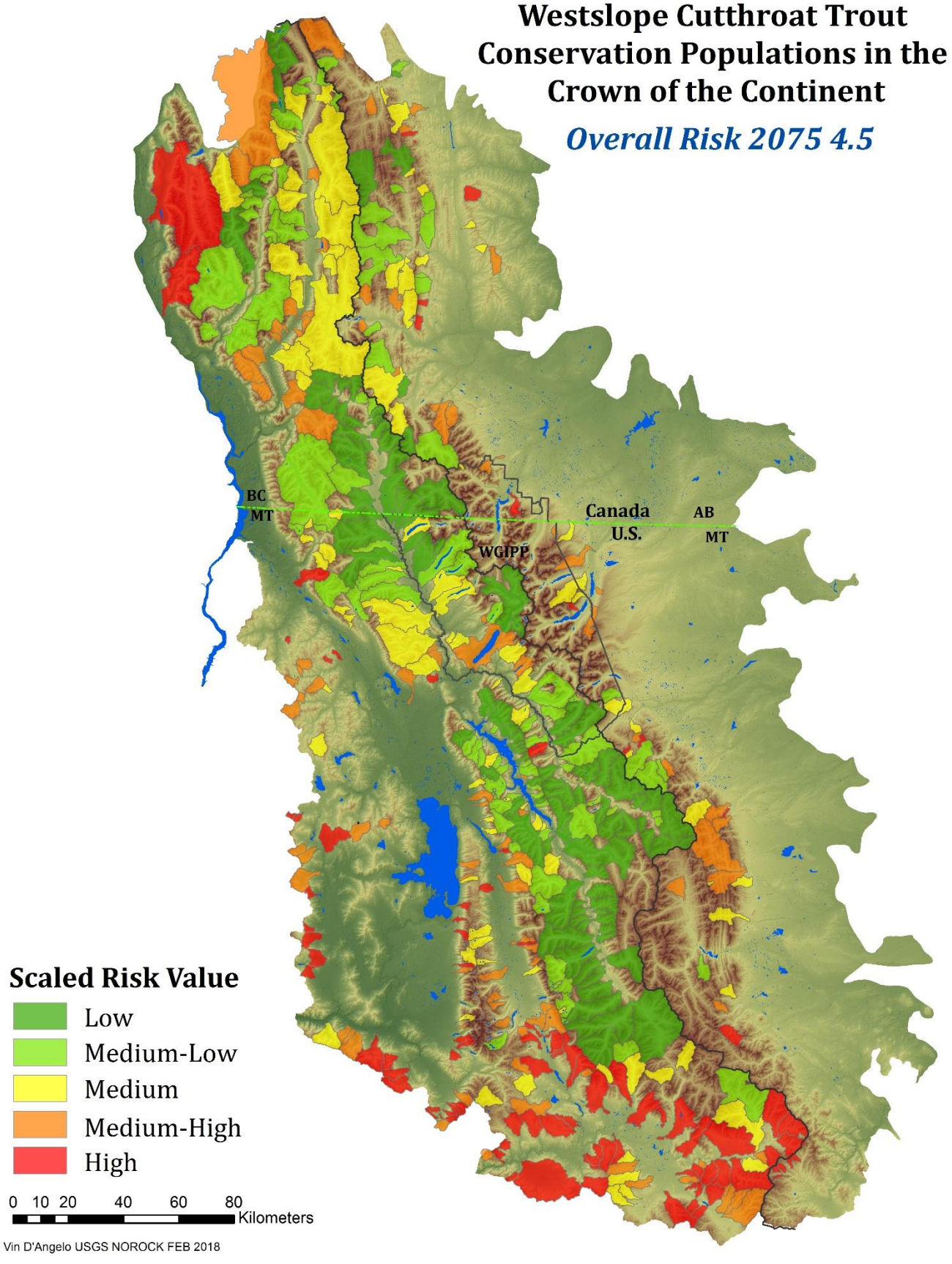
Climate Risk 2035 8.5

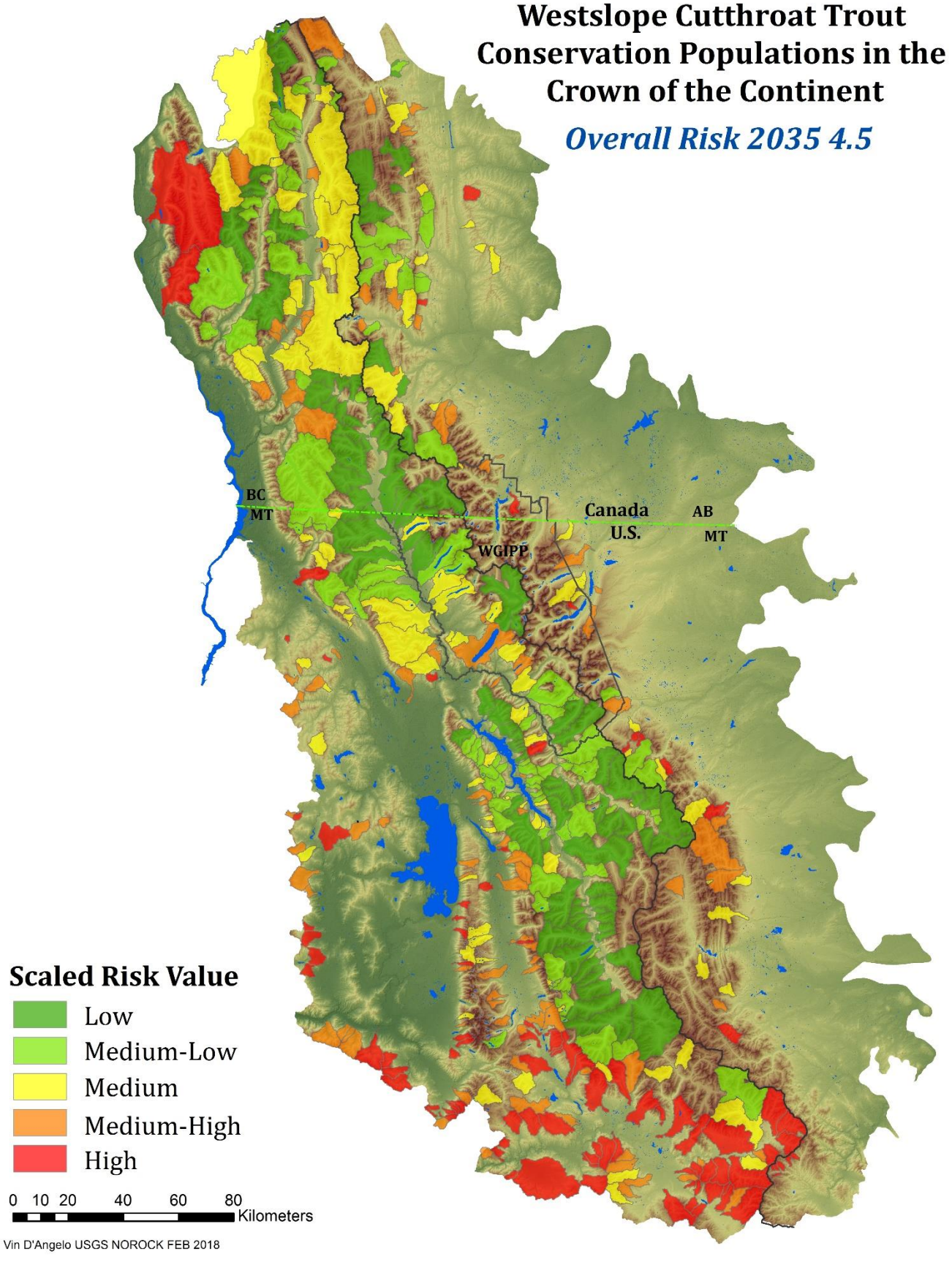


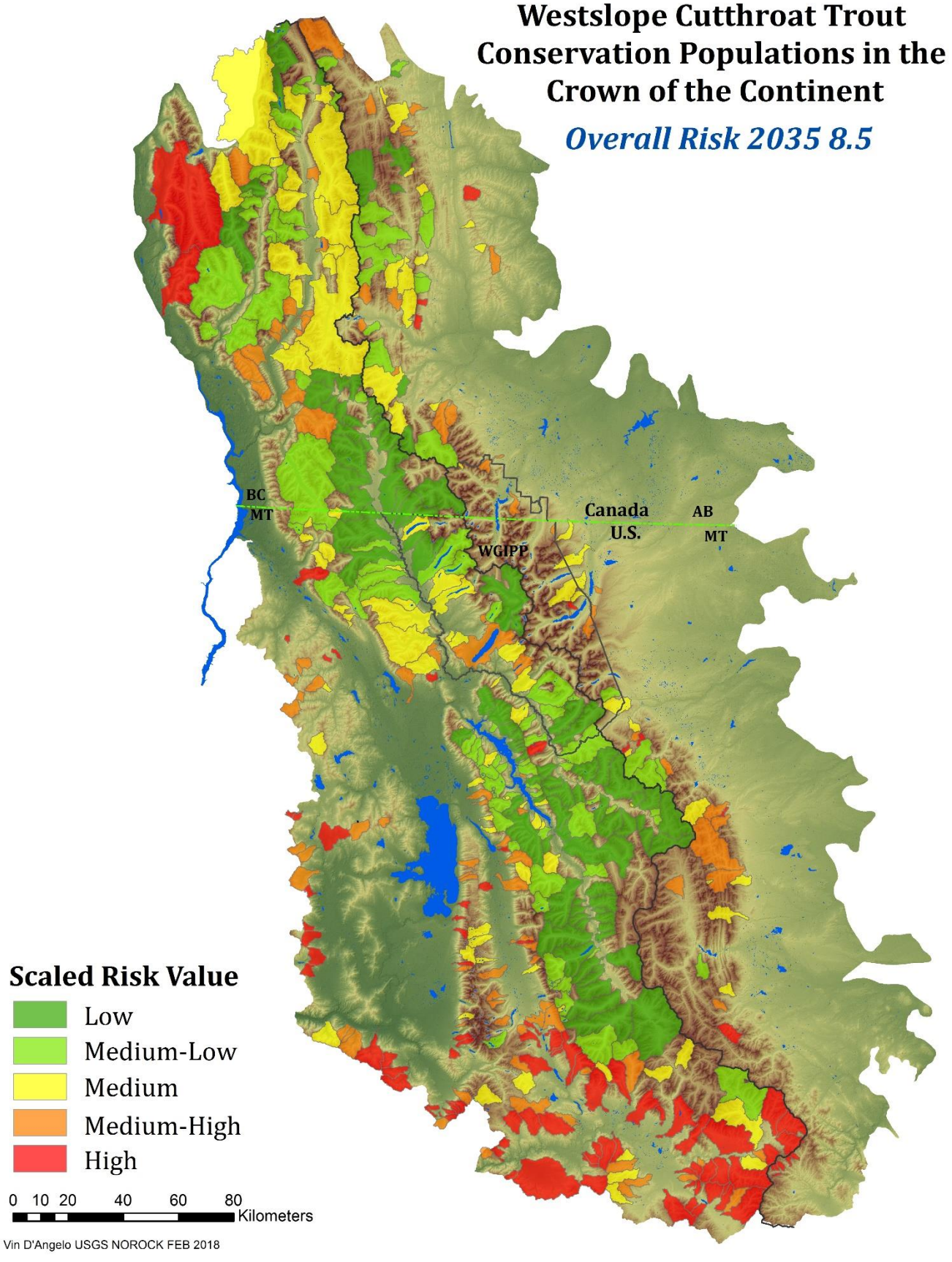
Vin D'Angelo USGS NOROCK FEB 2018

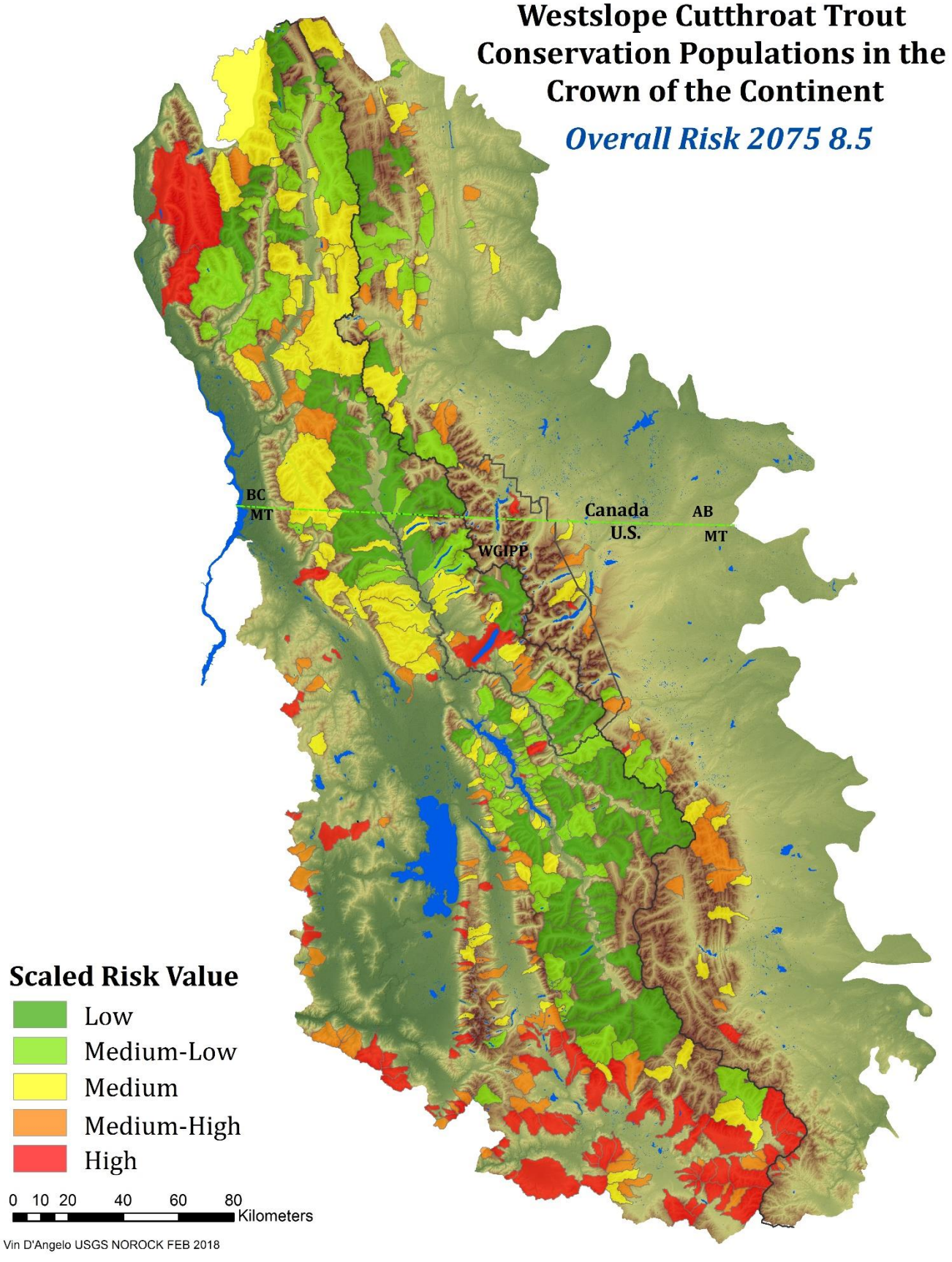

Bull Trout
Conservation Populations in the
Crown of the Continent
Demogenetic Risk 2035 8.5
Elk Valley
Bull River Valley
Waterton Reservoir
St. Mary Res.
BC
MT
Canada
U.S.
AB
MT
Koocanusa
WGIPP
St. Mary Lake
Lake McDonald
Hungy Horse Res
Swan Lake
Flathead Lake
Mission Valley
Blackfoot Valley
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018

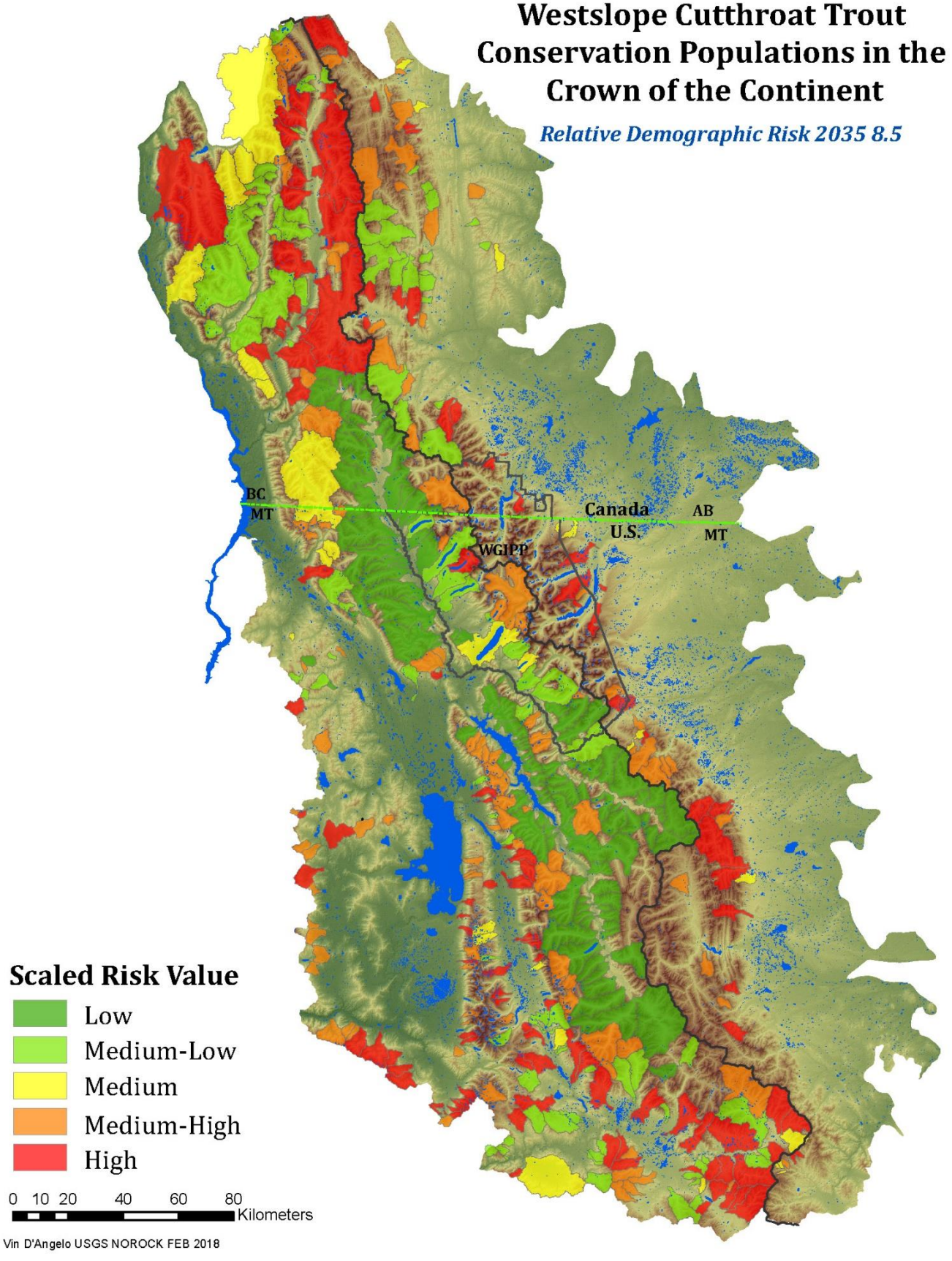

Bull Trout
Conservation Populations in the
Crown of the Continent
Habitat Risk 2035 8.5
Elk Valley
Bull River Valley
Waterton Reservoir
St. Mary Res.
BC
MT
Canada
U.S.
AB
MT
Koocanusa
WGIPP
St. Mary Lake
Lake McDonald
Hungy Horse Res
Swan Lake
Flathead Lake
Mission Valley
Blackfoot Valley
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018

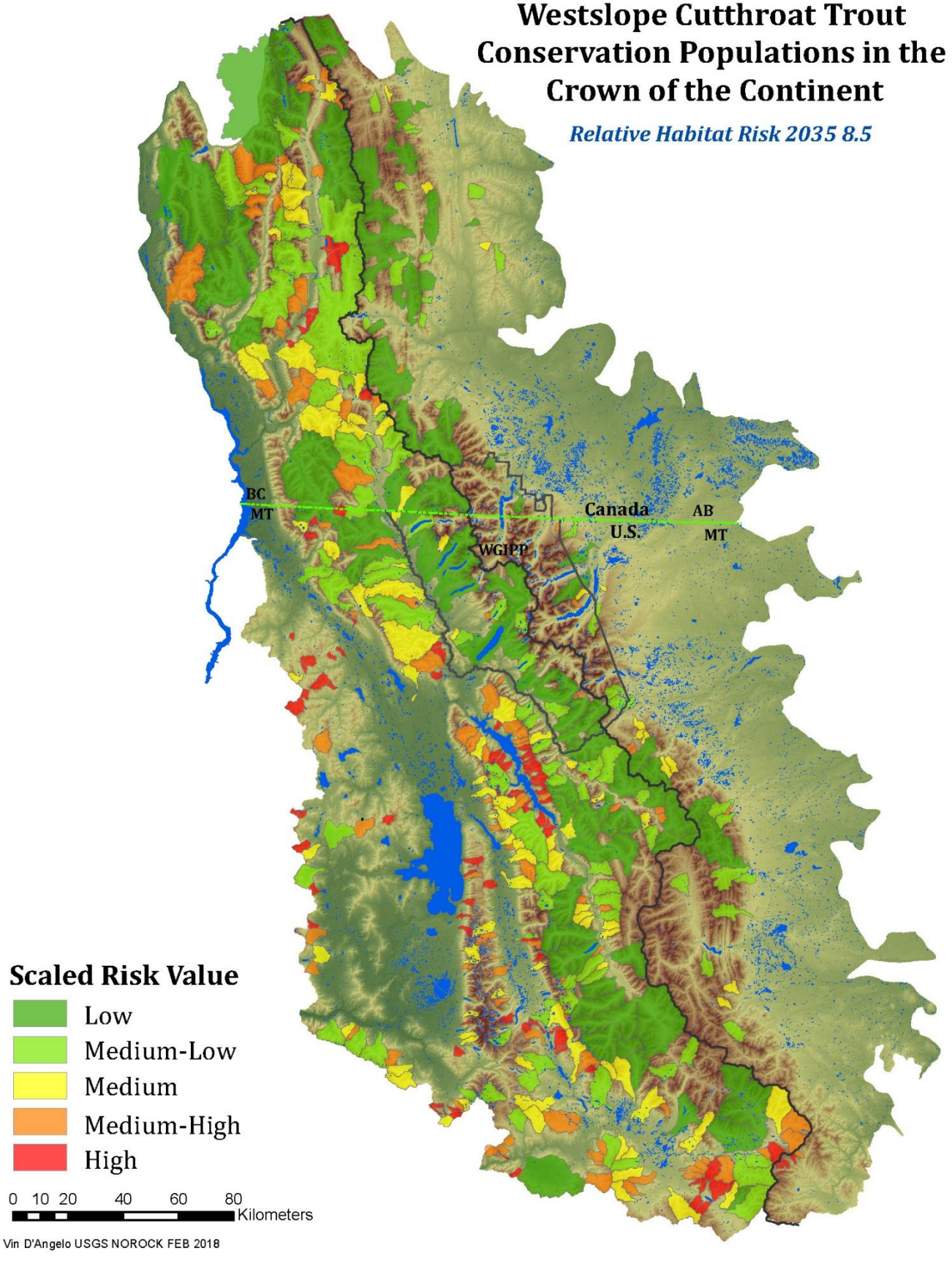

Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Overall Risk 2075 4.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018

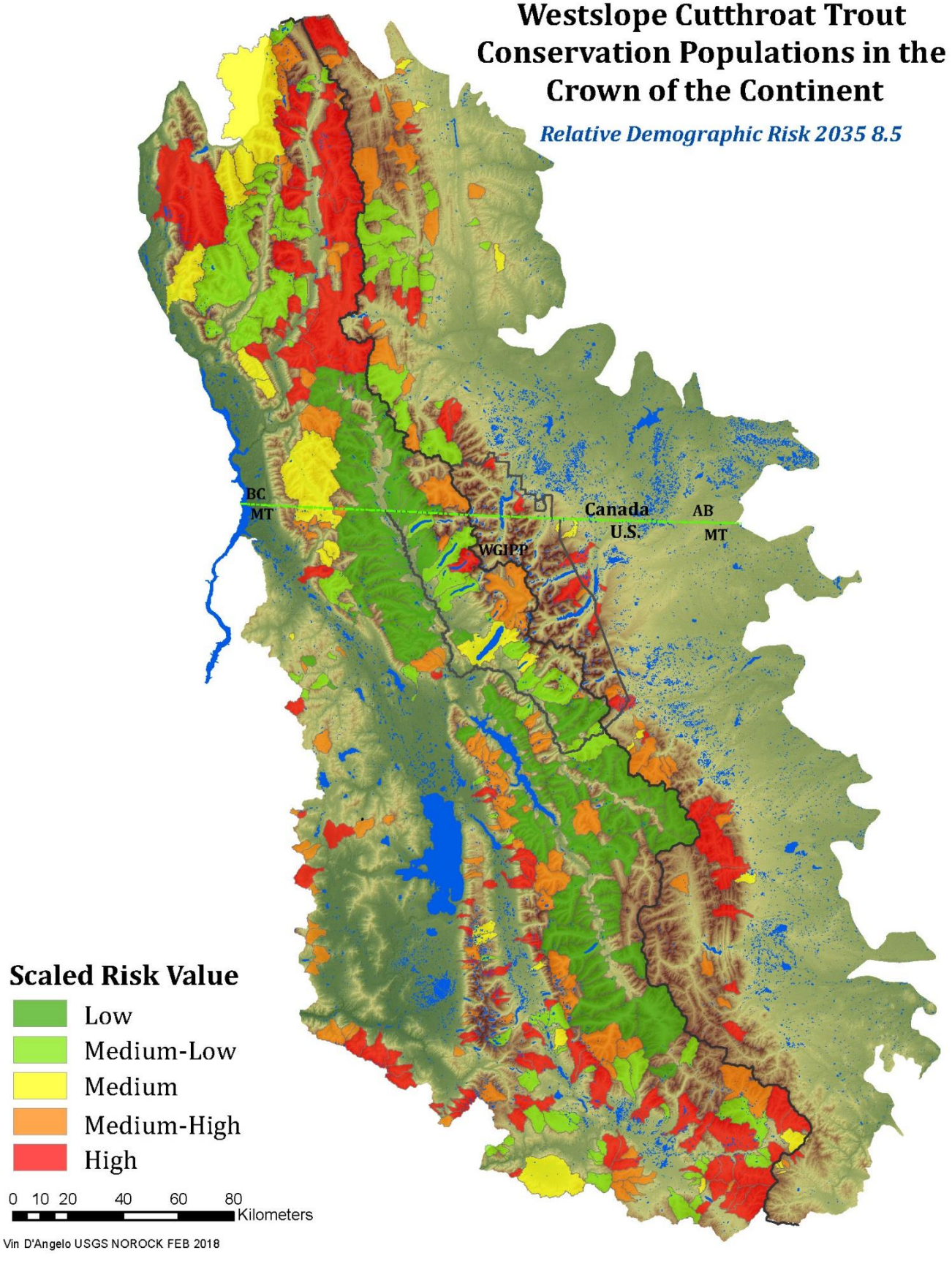

Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Overall Risk 2035 4.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018


Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Overall Risk 2035 8.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018


Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Overall Risk 2075 8.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018


Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Relative Demographic Risk 2035 8.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018


Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Relative Habitat Risk 2035 8.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018


Westslope Cutthroat Trout
Conservation Populations in the
Crown of the Continent
Relative Demographic Risk 2035 8.5
BC
MT
Canada
U.S.
AB
MT
WGIPP
Scaled Risk Value
Low
Medium-Low
Medium
Medium-High
High
0 10 20 40 60 80
Kilometers
Vin D'Angelo USGS NOROCK FEB 2018