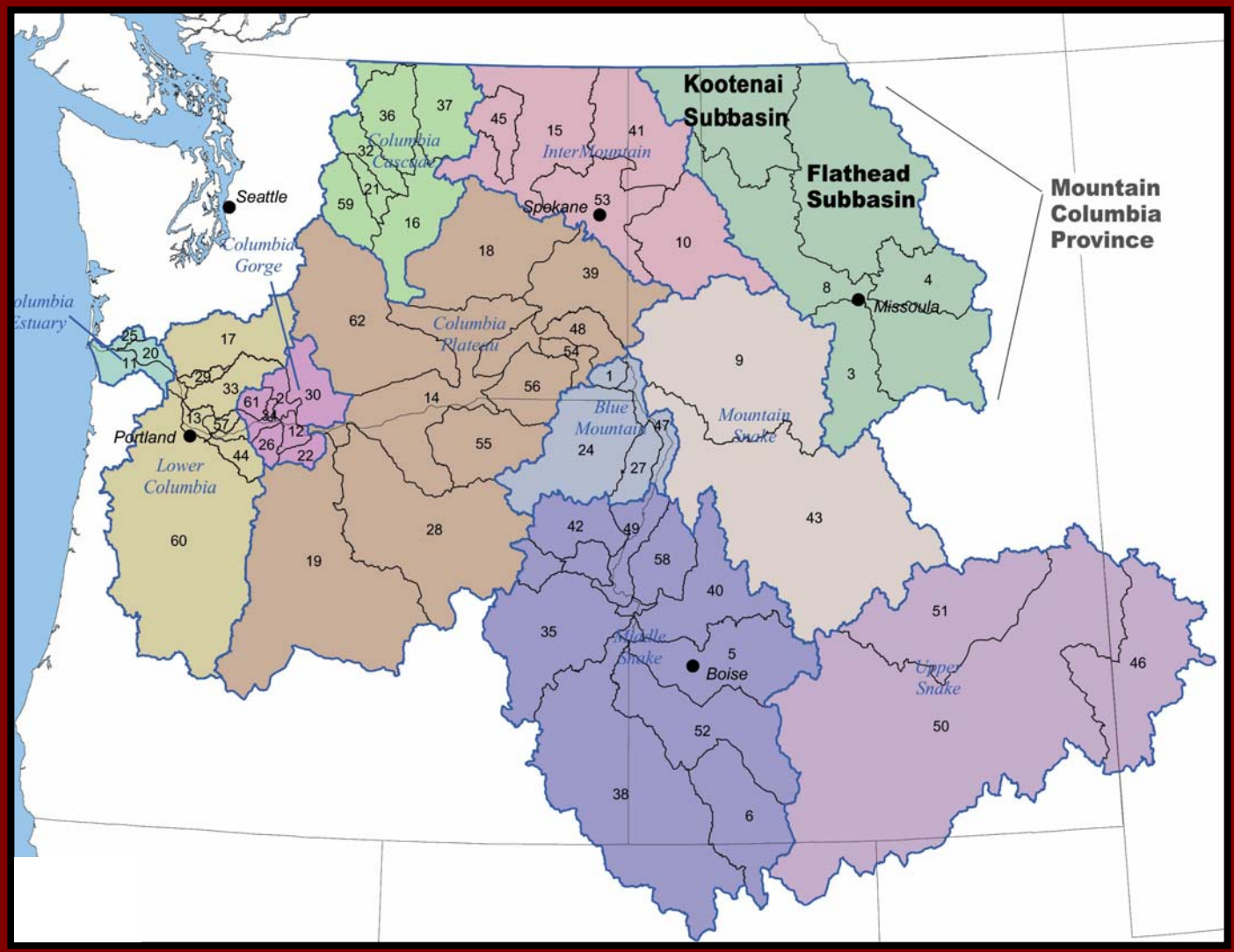
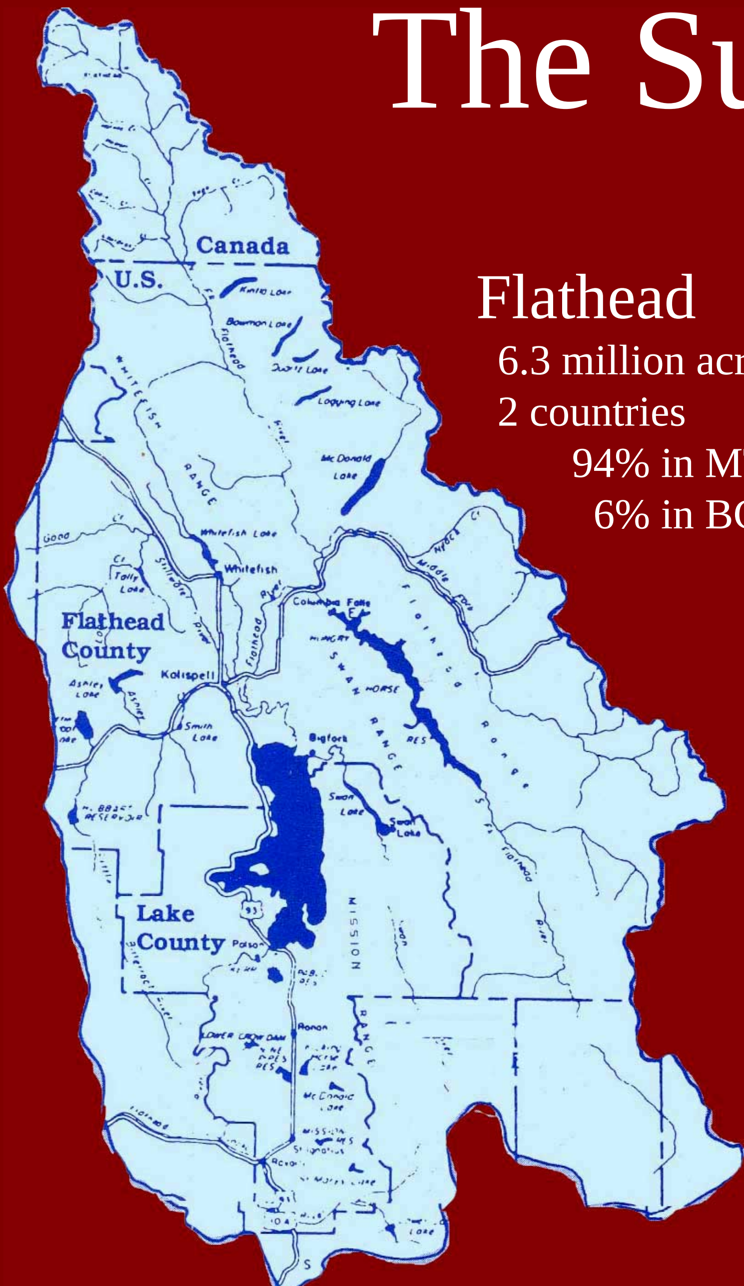
Presentation to the ISRP on the Flathead and Kootenai Subbasin Plans

The Subbasins

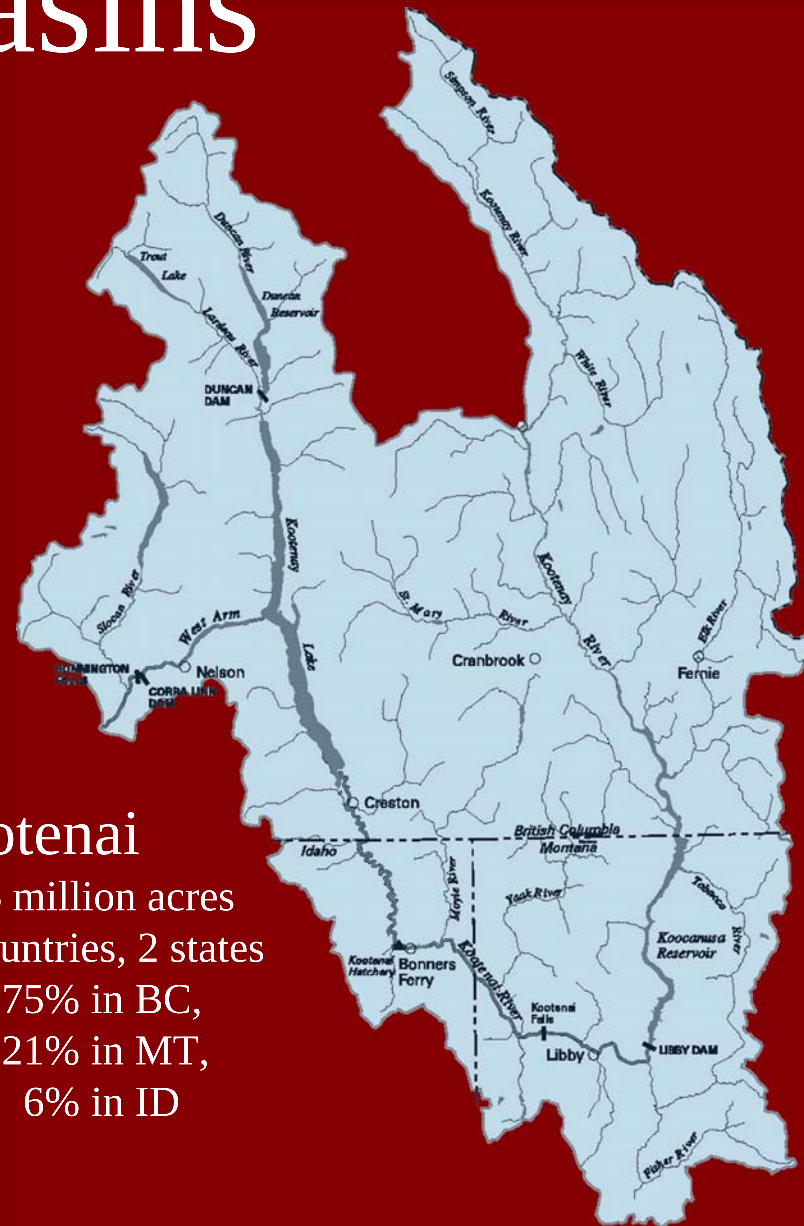


The Subbasins



Flathead

6.3 million acres
2 countries
94% in MT
6% in BC



Kootenai

8.96 million acres
2 countries, 2 states
75% in BC,
21% in MT,
6% in ID

The Flathead & Kootenai Subbasins

The two subbasins are midway in the north-south gradient of the Rockies and are dominated by maritime and continental climates. Stanford (2000) calls the area a "continental biodiversity node", a natural mixing zone for biota .

Within the two subbasins is one of the greatest and most diverse concentrations of wetlands in the Rocky Mountains (Greenlee 1998).

The subbasins hold the highest diversity of aquatic invertebrate species in the Rocky Mountains from New Mexico to the Yukon (Long 2000).

The Flathead & Kootenai Subbasins

Portions of the subbasins support the highest density of inland grizzlies in North America (the North Fork of the Flathead may be the single most important drainage for carnivores in the Rockies) (Weaver 2001).

The two subbasins host virtually a full constellation of native wildlife; almost all the species here 400 years ago remain (Long 2000).

The Flathead & Kootenai Subbasins

The subbasins are thought to have supported the largest migratory bull trout assemblage in the world (MBTSG 1995).

Flathead Lake is one of the 300 largest lakes in the world and one of the least culturally eutrophied large lakes in the northern hemisphere (Stanford and Ellis 2002).

The Flathead & Kootenai Subbasins

The subbasins hold populations of, or habitat for terrestrial threatened and endangered species, including gray wolf, grizzly bear, lynx and caribou. The area contains most of the region's carnivore species, including fisher and wolverine.

The Kootenai River population of white sturgeon (*Acipenser transmontanus*), an endangered species, and burbot, the only freshwater member of the cod family.

Prior to European-American settlement, the floodplain from Bonners Ferry to Creston was one of the largest and richest riparian forest and wetland complexes in the Pacific Northwest (Jamieson and Braatne 2001).

The Flathead & Kootenai Subbasins

The Nature Conservancy's Dancing Prairie Preserve harbors the world's largest known population (90 percent of the species' entire population) of the threatened Spalding's catchfly .

The Ural-Tweed sheep herd, whose range includes the rocky faces along the east side of Libby Reservoir, are the last native bighorn sheep in northwestern Montana.

Our Organizational Structure

Organization

Lead Agency: Oversees and manages process

Kootenai

Lead is MFWP (Montana) and KTOI (Idaho).

Coordinators: Brian Marotz (MFWP) for MT portion
Sue Ireland (KTOI) for ID portion

Flathead

Lead is CSKT, Co-lead is MFWP

Coordinator: Lynn DuCharme (CSKT)

Co-coordinator: Brian Marotz (MFWP)

Technical Team: Responsible for Assessment

Composed of scientific experts. Approximately forty biologists, hydrologists, riparian ecologists, and water quality specialists have participated.

Flathead:
CSKT, MFWP, MTDEQ, ACOE, FWS, FNF, Conservation Districts, two provincial Canadian ministries, and a private consulting firm.

Kootenai:
KTOI, IDFG, MFWP, IDEQ, ACOE, FWS, KNF, IPNF, Conservation Districts, two provincial Canadian ministries, and a private consulting firm

Coordination with Canada

We coordinated with the provincial (B.C.) ministries with authority for managing fish and wildlife.

They provided data, helped score QHA and TBA, and helped rank HUCs and Subunits. They also provided input on assessment analysis and design.

We are not writing objectives or strategies for Canada, but we are coordinating on transboundary planning issues.

Planning Team: Responsible for Management Plan

Composed of agencies with management jurisdiction in the subbasin. Develops the management plan—the vision, objectives, and strategies.

Includes: KTOI, CSKT, USFS, FWS, USACOE, NRCS, Conservation Districts, GNP

Working Group

Composed of stakeholders from the public

Represents key stakeholder interests in the subbasin: agriculture, business, hunters & anglers, timber industry, utilities, tribes, realtors, etc.

Focuses on and discuss key issues beyond what can be accomplished in a public meeting.

Website and Newsletter

In addition to the Working Group, we have done outreach through a quarterly newsletter that we mail out and a website that has been on the web since we started.

Our Approach

- Electronic Document
- Organization
- Biome Based
- Focus on Function and Process
- Focal/Target Species Selection
- Overall Logic Path

Our Approach: Electronic Document

Our subbasin plans:

1. Contain hundreds of internal and external links. Our goal has been to build an electronic library of F&W information in each subbasin.

2. Information and links will be updated periodically. Creating a living document that will be used both as an information source and as a planning document for years to come.

Our Approach: Assessment Organization

Technical Guide

Overview (broad view of subbasin)

Species Characterization & Status

Environmental Conditions (Habitat)

Ecological Relationships

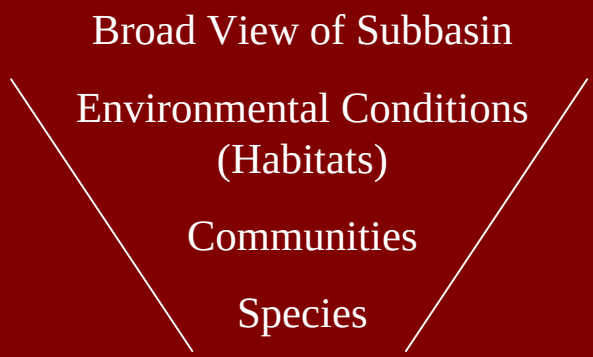
Our Assessment

Overview (broad view of subbasin)

Environmental Conditions (Habitat)

Fish & Wildlife Communities & Ecological Relationships

Species Characterization & Status



Our Approach: Biome-based

Our characterization and assessment of the environmental conditions is biome based:

- Aquatic
- Wetland & Riparian
- Grassland/Shrub
- Xeric Forest
- Mesic Forest

Our Approach: Function & Process

Our assessment focuses on ecosystem function and process. For each biome:

1. Critical Functional Processes
2. Human Alterations to Functional Processes
3. Pre-Settlement Habitat Conditions
4. Present Conditions
5. Potential Conditions
6. Future No New Action Conditions

Our Approach: Focal Species

Aquatic Focal Species:

Flathead:

Bull Trout and Westslope Cutthroat Trout

Kootenai:

White Sturgeon, Burbot, Bull Trout, Westslope Cutthroat Trout, Redband Trout, and Kokanee

Our Approach: Target Species

Terrestrial

Chosen in part to represent biomes, functional specialists (FS), critical functional link species (CFLS), ESA-listed, or culturally important.

MAMMALS	IBIS STATUS
American Beaver	*CFLS*
American Pika	*CFLS*
Big Brown Bat	*CFLS*
Black Bear	*CFLS*
Bushy-tailed Woodrat	*CFLS*
Deer Mouse	*CFLS*
Fisher	*CFLS*
Golden-mantled Grnd Squirrel	*CFLS*
Grizzly Bear	*CFLS*
Lynx	*FS*
Mink	*CFLS*
Montane Vole	*CFLS*
Moose	*CFLS*
Mule Deer	*CFLS*
Northern Bog Lemming	*FS*
Northern Pocket Gopher	*CFLS*
Nuttall's Cottontail	*CFLS*
Raccoon	*CFLS*
Red Squirrel	*CFLS*
River Otter	
Rocky Mountain Elk	*CFLS*
Snowshoe Hare	*CFLS*
Wolverine	*FS*
BIRDS	
American Crow	*CFLS*
Bald Eagle	
BarrowÕs Goldeneye	

BIRDS (CONT.)	IBIS STATUS
Black Swift	*FS*
Black Tern	*CFLS*
Black-backed Woodpecker	
Black-chinned Hummingbird	*CFLS*
Boreal Owl	*FS*
BrewerÕs Sparrow	
Brown Creeper	
Brown-headed Cowbird	*CFLS*
Calliope Hummingbird	
Canada Goose	*CFLS*
Columbian Sharp-tailed Grouse	
Common Loon	
Common Nighthawk	*FS*
Cordilleran Flycatcher	
Flammulated Owl	
Grasshopper Sparrow	
Great Blue Heron	*CFLS*
Great Horned Owl	*CFLS*
Gyrfalcon	*FS*
HammondÕs Flycatcher	
Harlequin Duck	*FS*
Hooded Merganser	
Horned Grebe	
House Finch	*CFLS*
Lazuli Bunting	
LewisÕs woodpecker	
Long-billed Curlew	

BIRDS (CONT.)	IBIS STATUS
Merlin	*FS*
Northern Goshawk	
Northern Pygmy-owl	*FS*
Olive-sided Flycatcher	
Peregrine Falcon	*FS*
Pileated Woodpecker	
Red-eyed Vireo	
Red-naped Sapsucker	
Ruffed Grouse	
Rufous Hummingbird	*CFLS*
Snowy Owl	*FS*
Three-toed Woodpecker	
Trumpeter Swan	
Tundra Swan	*CFLS*
Turkey Vulture	*FS*
VauxÕs swift	
Veery	
Williamson's Sapsucker	*CFLS*
Willow Flycatcher	
Winter Wren	
AMPHIBIANS	
Boreal Toad	
Long-toed Salamander	*CFLS*
Northern Leopard Frog	
Spotted Frog	

Our Approach: Logic Path

Assessment

Identify Limiting Factors and Classify HUCs/Subunits.
Tools: QHA & TBA

Inventory

Use Limiting Factors from Assessment to Assess Past and Current Projects

Management Plan

Write Objectives for Limiting Factors prioritized through the Assessment.
Tools: QHA and TBA

Questions?

Assessment Tools

We used several tools in the Assessment

Aquatics

- QHA (Qualitative Habitat Assessment)

Terrestrial

- TBA (Terrestrial Biome Assessment)
- IBIS

Aquatic Assessment Tool

QHA was used for salmonids **not** sturgeon and burbot

Qualitative Habitat Assessment (QHA)

Attribute Confidence		1	1	1	1	1	1	1	1	1	1	1	
Attribute Toggle		1	1	1	1	1	1	0	1	1	1	1	
Reach Name	Not Rated	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions	Reach Confidence
Upper West Bull		4.0	4.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.0
Upper East Bull		4.0	4.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.0
Quinn Creek		3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Galbraith Creek		2.5	2.5	2.5	2.5	3.0	3.0	4.0	4.0	4.0	4.0	4.0	2.0
Mid Bull		2.0	2.0	2.0	2.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	1.0

Lacustrine Qualitative Habitat Assessment (LQHA)

Lake Unit	Temperature	Oxygen	Gas saturation	Volumetric turnover rates	Pollutants	Trophic status	Entrainment	Migratory obstruction	Macrophytes	Hydaulic regime	Shoreline condition	Habitat diversity	Substrate condition	Reach Confidence
pper Stillwater	4.0	4.0	4.0	4.0	3.5	4.0	4.0	3.0	4.0	3.5	3.0	3.5	4.0	1.0
Whitefish	4.0	3.5	4.0	4.0	3.0	3.5	4.0	4.0	4.0	4.0	2.5	4.0	4.0	2.0
Lindbergh	4.0	4.0	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	3.5	4.0	4.0	1.0
Holland	4.0	4.0	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	3.5	4.0	4.0	1.0

LQHA is unique to Flathead and Kootenai Subbasin planning

QHA

QHA starts with the technical team scoring the **current condition** of each of the HUC-6 scale watersheds in the subbasin on a scale of 1 to 4 (with 4 = to the pre-settlement condition and 0 = to completely degraded).

Attribute Confidence		1	1	1	1	1	1	1	1	1	1	1	
Attribute Toggle		1	1	1	1	1	1	0	1	1	1	1	
Reach Name	Not Rated	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions	Reach Confidence
Upper West Bull		4.0	4.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.0
Upper East Bull		4.0	4.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	2.0
Quinn Creek		3.0	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Galbraith Creek		2.5	2.5	2.5	2.5	3.0	3.0	4.0	4.0	4.0	4.0	4.0	2.0
Mid Bull		2.0	2.0	2.0	2.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0	1.0

Attribute Rating
0 = 0% of normative
1 = 25% of normative
2 = 50% of normative
3 = 75% of normative
4 = 100% of normative

Confidence Rating
0 = Unknown
1 = Expert Opinion
2 = Well Documented

QHA

Then the technical team scored the **reference (pre-settlement) condition** of each HUC.

Attribute Confidence	ID	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	
Attribute Toggle		1	1	1	1	1	1	0	1	1	1	1	
Reach Name	Not Rated	Riparian Condition	Channel stability	Habitat Diversity	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions	Reach Confidence
Barron Creek	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0	2.0
Big Creek	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
Big Creek South Fork	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
ek South Fork East Branch	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
Boulder Creek	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
Bristow Creek	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
Dodge Creek	0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0

QHA

Next they scored the species hypothesis page

	Spawning/incubatio	Summer Rearing	Winter Rearing	Migration	Error Check
Life Stage Rank (1-4)	3.0	3.0	0.0	2.0	
Assign a weight to each attribute (0-2) relative to its importance to the life stage					
Riparian Condition	1.0	2.0	2.0	0.5	FALSE
Channel stability	2.0	2.0	2.0	0.5	FALSE
Habitat Diversity	1.0	2.0	2.0	0.5	FALSE
Fine sediment	2.0	2.0	2.0	0.5	FALSE
High Flow	2.0	1.0	1.0	0.5	FALSE
Low Flow	2.0	2.0	2.0	2.0	FALSE
Oxygen	2.0	2.0	2.0	2.0	FALSE
Low Temp	0.5	0.0	0.0	0.0	FALSE
High Temp	2.0	2.0	2.0	2.0	FALSE
Pollutants	2.0	2.0	2.0	2.0	FALSE
Obstructions	0.0	1.0	1.0	2.0	FALSE

Life stage rank prioritizes habitat condition for use by a life stage. 4 = highest sensitivity; 1= lowest sensitivity

The attribute scores rank the importance of the attribute to the life stage of the focal species. 2 = highest; 0 = lowest

QHA

Finally, the team completed the species range page for each life stage for both current and reference.

1= present; 0 = absent

Reach Name	Confidence	Spawn and incubation	Summer rearing	Winter rearing	Migration	Spawn and incubation	Summer rearing	Winter rearing	Migration
Big Creek 1	0	0.0	1.0	1.0	0.0	0.0	1.0	1.0	0.0
Big Creek 2	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Canyon Creek	0	0.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0
Coal Creek 1	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Coal Creek 2	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

QHA Habitat Scores

QHA then generated:

1. A weighted Protection Habitat Score (yellow) (Protection Score = 0 - Current * LSWeight)

2. A weighted Restoration Habitat Score (green) (Restoration Score = Reference - Current * LSWeight).

Reach Name	Reach Score	Reach Score
Upper West Bull	-0.11	0.01
Upper East Bull	-0.15	0.01
Quinn Creek	-0.10	0.01
Galbraith Creek	-0.13	0.03
Mid Bull	-0.12	0.04

QHA Tornado Diagram

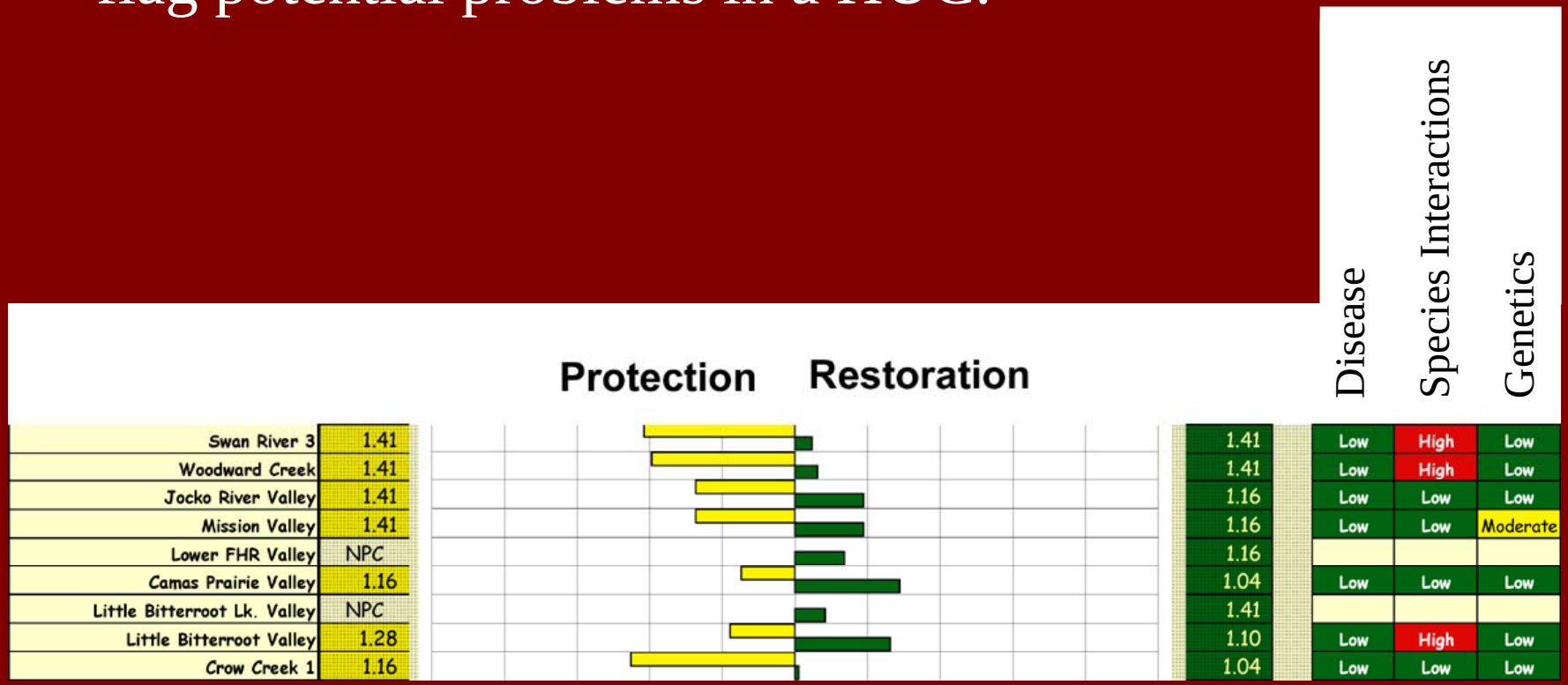
The two habitat scores are displayed in a "tornado diagram"

The longer the protection bar (or the higher the score) the more optimal the stream condition is for the focal species.

The longer the restoration bar (or the higher the score) the more degraded the stream is for the focal species.

QHA Tornado Diagram

We added three biological modifiers intended to flag potential problems in a HUC.



Swan River 3	1.41	1.41	Low	High	Low
Woodward Creek	1.41	1.41	Low	High	Low
Jocko River Valley	1.41	1.16	Low	Low	Low
Mission Valley	1.41	1.16	Low	Low	Moderate
Lower FHR Valley	NPC	1.16			
Camas Prairie Valley	1.16	1.04	Low	Low	Low
Little Bitterroot Lk. Valley	NPC	1.41			
Little Bitterroot Valley	1.28	1.10	Low	High	Low
Crow Creek 1	1.16	1.04	Low	Low	Low

How we use QHA

- The condition of the habitat for a given salmonid focal species and the overall aquatic habitat condition for resident salmonids
- Distribution of focal species (both historic and current)
- Limiting factors for a given focal species at several scales (HUC-6, HUC-4, and Subbasin-wide)
- Prioritization of streams for restoration and protection
- Writing objectives

Terrestrial Assessment Tool

Terrestrial Biome Assessment (TBA)

Unique to Flathead and Kootenai Subbasin planning

Unit	Subunit	Area_size_Index	Area_change_index	Forest_Structure_departure (1= significant departure from pre-settlement, 10= similar to pre-settlement)	Fire_Interval Disruption_Index	exotic_vegetation (1=heavy, 10= none)	Road Density (miles/section)
NFFR-bdr	North Fk-border		#DIV/0!	0	9.00	0	0.00
NFFR-for	North Fk-USFS	4.57	10.00	6	8.89	8	5.52
NFFR-np	North Fk-GNP	3.00	10.02	6	9.40	9	9.77
MFFR-np	Middle Fk-GNP	3.54	10.01	6	8.90	9	9.66
MFFR-wild	Middle Fk-Wilderness	4.48	10.01	6	9.18	9	8.93
Ashley-for	Ashley Ck watershed	1.17	10.00	4	9.45	5	1.61
FHL-for	Flathead Lake	1.39	10.03	6	9.31	8	1.56
UFHR-val	Kalispell Valley	1.29	9.91	4	9.13	5	3.08
SFFR-for	South Fk-USFS	5.17	9.66	6	9.20	8	5.97
SFFR-wild	South Fk-Wilderness	6.85	10.01	6	8.96	9	10.00
Stlwtr-for	Upper Stillwater	4.53	10.00	6	9.24	8	3.07

Terrestrial Assessment Tool

Terrestrial Biome Assessment (TBA):

Is biome based

Divides the subbasin into units and subunits

Rates the biomes in each of these subunits by biome-specific indices (e.g. changes in area, fire interval, exotic species, grazing, habitat diversity, and road density) and identifies primary and secondary impacts in each subunit.

Result is an overall impact index (the current condition for wildlife relative to an optimal condition) for each subunit

How we use TBA

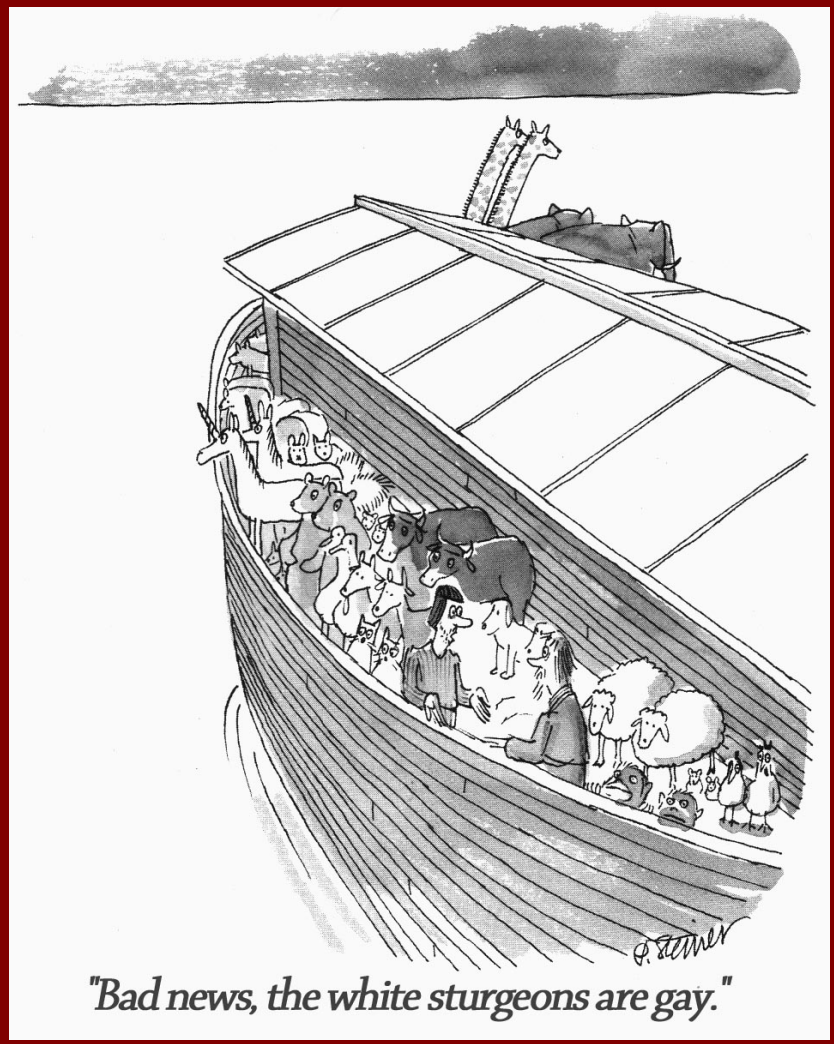
- Describe the condition of the habitat in each subunit for wildlife relative to an optimal condition
- Identify the primary and secondary limiting factors for wildlife
- Prioritize subunits for restoration and protection based on an Overall Impact Index
- Write objectives

IBIS

We use IBIS to:

- Identify biomes most affected by at-risk species
- Numbers of introduced species in each biome
- Key Ecological Function (KEF) declines in target biomes
- The percentage of species in each main Key Ecological Correlate (KEC) category that are in decline
- Target species with aquatic KECs
- Number of terrestrial species dependent on salmonids

Questions?



Classification Schemes

HUC Classification Scheme

Stream Aquatic Classification
Class 1 Waters **Most intact stream habitats; high protection value** Bear the closest resemblance to waters unaltered by modern human activities, contain a complete set of native biota, and have a high degree of natural protection. **Management Goal:** Keep as pristine as possible, recognizing that some biotic change is inevitable or necessary. Conduct restoration as necessary to perpetuate values.
Class 2 Waters **Low to moderate degree of degradation; high to moderate protection value** Low to moderate degree of modification by human activity. Contain mainly native organisms and have reasonable potential to be restored to Class 1. **Management Goal:** Restore degraded areas, maintain natural diversity, and prevent further degradation.
Class 2.5 Waters **High restoration priority driven by ESA needs or the needs of species of concern** Habitat heavily modified by human activity; may contain many nonnative species and may require significant investment of time and money to be restored, but are restoration priorities because of their value to ESA-listed species. **Management Goal** Manage for protection of listed species, prevent further degradation and restore degraded habitat to extent possible.

HUC Classification Scheme

Stream Aquatic Classification
Class 3 Waters **Moderate to high degree of degradation; low protection value** Appear natural, but their biotic communities have been significantly and possibly irreversibly altered. Difficult to restore to Class 1 given current technology, but can be refuges for native species or migration corridors for adfluvial species. Vulnerable to change and current condition cannot be relied upon for long-term preservation of species. **Management Goal:** Prevent further degradation. Restore areas as opportunities arise. Maintain supplemental populations and gene pools, sources of organisms to stock restored waters, and ŅwildÓ areas that can sustain fairly heavy public use.
Class 3.5 Waters **High degree of degradation; low protection value** Highly altered waters that do not appear natural, and their biotic communities have been irreversibly altered. Very unlikely ever to be restored to Class 1 given current technology, but can be refuges for native species or migration corridors for adfluvial species. Cannot be relied upon for long-term preservation of species. **Management Goal:** Maintain value as migration corridor and, to extent possible, utilize for recreational fishery to relieve pressure on native populations. Prevent further degradation. Consider restoration projects only if cost effective and benefits can be clearly demonstrated.

Subunit Classification Scheme

Terrestrial Classification

Class 1 Subunits

Most intact wildlife habitats; high protection value

Habitat Scores 60 to 85 Percent of Optimum

These areas are generally the most intact wildlife habitats within a given biome. Because they are the most intact, they typically contain may areas worthy of protection. But because they are only 60 to 85 percent of optimum, they also encompass areas that have a high priority for restoration.

Management Goal:

Protect to keep as intact as possible while restoring areas to enhance the subunit's biological value.

Class 2 Subunits

Moderate degree of degradation; high to moderate protection value

Habitat Scores 40 to 60 Percent of Optimum

Relative to other subunits in the biome, these subunits have generally been moderately impacted. A given subunit may have areas within it that are worthy of protection, but most are in need of restoration.

Management Goal:

Restore areas to enhance the subunit's biological value while protecting any intact areas that remain.

Subunit Classification Scheme (cont.)

Terrestrial Classification

Class 3 Subunits
High degree of degradation; low protection value

Habitat Scores less than 40 Percent of Optimum

These subunits are generally the most impacted or degraded wildlife habitats within a given biome. They may encompass areas that are economically feasible to restore and that should be restored because they are contiguous to adjacent habitats that are more intact, but generally, they are a lower priority for restoration and protection because of the cost and time required to achieve moderate gains and benefits.

Management Goal:
Prevent further degradation. Restore degraded habitats only when cost effective and clear benefits can be shown.

The Assessment

Outline

1. Overview of Environment
2. Description of Biomes (aquatic, riparian/wetland, grassland, forest)
3. Fish & Wildlife Communities
4. Focal/Target Species Descriptions
5. HUC/Unit Classification
6. Interpretation & Synthesis

Limiting Factors

Part 4 of the Assessment (Focal Species) identifies limiting factors for each focal species (aquatic) and biome (terrestrial).

- To identify salmonid limiting factors, we used QHA
- To identify white sturgeon and burbot limiting factors we used analyses from recent studies and recovery plans.
- To identify wildlife limiting factors by biome, we used TBA

Aquatic Limiting Factors

This is how we ranked stream-habitat attributes at the subbasin scale in the Flathead Subbasin for bull trout (identifying the most degraded attributes). We did this for each focal species.

Flathead Regulated Mainstem

Habitat Attribute	Score	Rank
Low Temperature	0.00	1
Obstructions	0.00	1
Oxygen	0.00	1
High Temperature	0.07	2
Channel stability	0.10	3
Pollutants	0.10	3
High Flow	0.14	4
Fine sediment	0.22	5
Low Flow	0.28	6
Habitat Diversity	0.34	7
Riparian Condition	0.46	8

Flathead Tributaries

Habitat Attribute	Score	Rank
Low Temperature	0.00	1
Pollutants	0.01	2
Oxygen	0.01	2
High Temperature	0.02	3
Obstructions	0.03	4
High Flow	0.06	5
Low Flow	0.08	6
Habitat Diversity	0.10	7
Riparian Condition	0.12	8
Fine sediment	0.12	8
Channel stability	0.13	9

Aquatic Limiting Factors

Ranking of key stream-habitat attributes at the subbasin scale in the U.S. portion of the Kootenai Subbasin for bull trout (identifying the most degraded attributes). We did the B.C. portion of the subbasin separately.

Kootenai Regulated Mainstem

Habitat Attribute	Score	Rank
Oxygen	0.00	1
Low Temperature	0.03	2
Obstructions	0.16	3
Pollutants	0.17	4
Habitat Diversity	0.23	5
High Temperature	0.33	6
Channel stability	0.34	7
Fine sediment	0.37	8
High Flow	0.44	9
Riparian Condition	0.50	10
Low Flow	0.86	11

Kootenai Tributaries

Habitat Attribute	Score	Rank
Low Temperature	0.00	1
Oxygen	0.03	2
Obstructions	0.06	3
Pollutants	0.07	4
High Flow	0.15	5
Low Flow	0.17	6
Habitat Diversity	0.20	7
Fine sediment	0.26	8
Channel stability	0.26	8
Riparian Condition	0.27	9
High Temperature	0.28	10

Aquatic Limiting Factors

Ranking of key stream-habitat attributes at the HUC-4 scale and for the regulated mainstem in the Flathead Subbasin for bull trout (identifying the most degraded attributes).

	Regulated Mainstem		North Fork Flathead		Middle Fork Flathead		South Fork Flathead		Swan River		Lower Flathead		Stillwater River	
Habitat Attribute	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Channel stability	0.10	3	0.06	3	0.15	6	0.08	5	0.12	6	0.35	6	0.43	10
Fine sediment	0.22	5	0.17	7	0.02	3	0.06	4	0.14	7	0.38	8	0.46	11
Habitat Diversity	0.34	7	0.15	6	0.07	5	0.02	3	0.07	5	0.38	8	0.15	5
High Flow	0.14	4	0.07	4	0.00	1	0.01	2	0.04	4	0.37	7	0.19	6
High Temperature	0.07	2	0.00	1	0.00	1	0.01	2	0.03	3	0.17	3	0.10	4
Low Flow	0.28	6	0.12	5	0.04	4	0.02	3	0.04	4	0.28	5	0.33	9
Low Temperature	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.01	2	0.00	1
Obstructions	0.00	1	0.01	2	0.01	2	0.02	3	0.04	4	0.19	4	0.04	2
Oxygen	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.20	7
Pollutants	0.10	3	0.00	1	0.00	1	0.00	1	0.02	2	0.00	1	0.07	3
Riparian Condition	0.46	8	0.15	6	0.04	4	0.08	5	0.14	7	0.41	9	0.23	8

Aquatic Limiting Factors

Ranking of key stream-habitat attributes at the HUC-4 scale in the Kootenai Subbasin for bull trout (identifying the most degraded attributes). We did the B.C. HUC-4 watersheds separately.

	Regulated Mainstem		Fisher		Lower Kootenai		Moyie		Upper Kootenai	
Habitat Attribute	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Channel stability	0.34	7	0.28	6	0.41	8	0.30	8	0.21	8
Fine sediment	0.37	8	0.32	8	0.41	8	0.27	7	0.20	7
Habitat Diversity	0.23	5	0.25	5	0.28	6	0.23	5	0.17	5
High Flow	0.44	9	0.13	3	0.22	4	0.10	2	0.14	3
High Temperature	0.33	6	0.31	7	0.50	9	0.33	10	0.19	6
Low Flow	0.86	11	0.24	4	0.22	4	0.17	4	0.15	4
Low Temperature	0.03	2	0.00	1	0.01	1	0.00	1	0.00	1
Obstructions	0.16	3	0.04	2	0.11	2	0.16	3	0.04	2
Oxygen	0.00	1	0.00	1	0.15	3	0.00	1	0.00	1
Pollutants	0.17	4	0.00	1	0.24	5	0.25	6	0.00	1
Riparian Condition	0.50	10	0.38	9	0.29	7	0.31	9	0.25	9

Aquatic Limiting Factors

From these tables, we identify limiting factors for each focal species:

Flathead Subbasin: Westslope Cutthroat Trout

Waterbody Type and Area	Primary Westslope Cutthroat Trout Limiting Factors				
Streams	Habitat-Related				Biological
Subbasin-wide	Riparian Condition	Channel Stability	Habitat Diversity	Fine Sediment	Non-native Spp & Introgression
Regulated Mainstem	Riparian Condition	Habitat Diversity	Altered Hydrograh	Fine Sediment	Non-native Spp & Introgression
North Fork Flathead	Habitat Diversity	Riparian Condition	Fine Sediment	Channel Stability	Non-native Spp & Introgression
Middle Fork Flathead	Channel Stability	Habitat Diversity	Riparian Condition	Fine Sediment	Non-native Spp & Introgression
South Fork Flathead	Riparian Condition	Channel Stability	Fine Sediment	Habitat Diversity	Non-native Spp & Introgression
Swan River	Riparian Condition	Fine Sediment	Channel Stability	Habitat Diversity	Non-native Spp & Introgression
Stillwater River	Riparian Condition	Fine Sediment	Channel Stability	Habitat Diversity	Non-native Spp & Introgression
Flathead Lake	Riparian Condition	Channel Stability	Habitat Diversity	Fine Sediment	Non-native Spp & Introgression
Lower Flathead	Riparian Condition	Habitat Diversity	Channel Stability	Fine Sediment	Non-native Spp & Introgression
Reservoirs	Habitat-Related				Biological
Subbasin-wide	Shoreline Condition	Hydraulic Regime	Habitat Diversity	Macrophytes	Non-native Spp & Introgression

Aquatic Limiting Factors

From these tables, we identify limiting factors for each focal species:

Kootenai Subbasin: Bull Trout

Waterbody Type and Area	Primary Bull Trout Limiting Factors			
Streams	Habitat-Related			Biological
Subbasin-wide	Riaprian Condition	High Temperature	Channel Stability	Non-native Species
Regulated Mainstem	Altered Hydrograph	Riparian Condiiton	Fine Sediment	Non-native Species
Upper Kootenai	Riparian Condition	High Temperature	Channel Stability[1]	Non-native Species
Fisher	Riparian Condition	Fine Sediment	High Temperature	Non-native Species
Lower Kooteani	Channel Stability	High Temperature	Fine Sediment	Non-native Species
Moyie	Riaprian Condition	High Temperature	Channel Stability	Non-native Species
Reservoirs	Habitat-Related			Biological
Subbasin-wide	Migrat. Obstruction	Volumet. Turnover	Hydraulic Regime	Non-native Species

Terrestrial Limiting Factors

In TBA, after the biologists scored each subunit, we asked them to identify the major impacts in that subunit and used these to identify the key factors limiting wildlife productivity and abundance in each biome.

Terrestrial limiting factors for the Flathead:

Mesic Forest	Fire Exclusion	Forest Management	Roads	Exotics	
Grassland/Shrub	Forest Encroachment	Land Conversion	Exotics	Overgrazing	
Riparian	Land Conversion	Altered Hydrograph	Human/wildlife Conflicts	Exotics	
Wetland	Land Conversion	Forest Management	Human/wildlife Conflicts	Exotics	Altered Hydrograph
Xeric Forest	Fire Exclusion	Encroachment	Forest Fragmentation	Human/wildlife Conflicts	

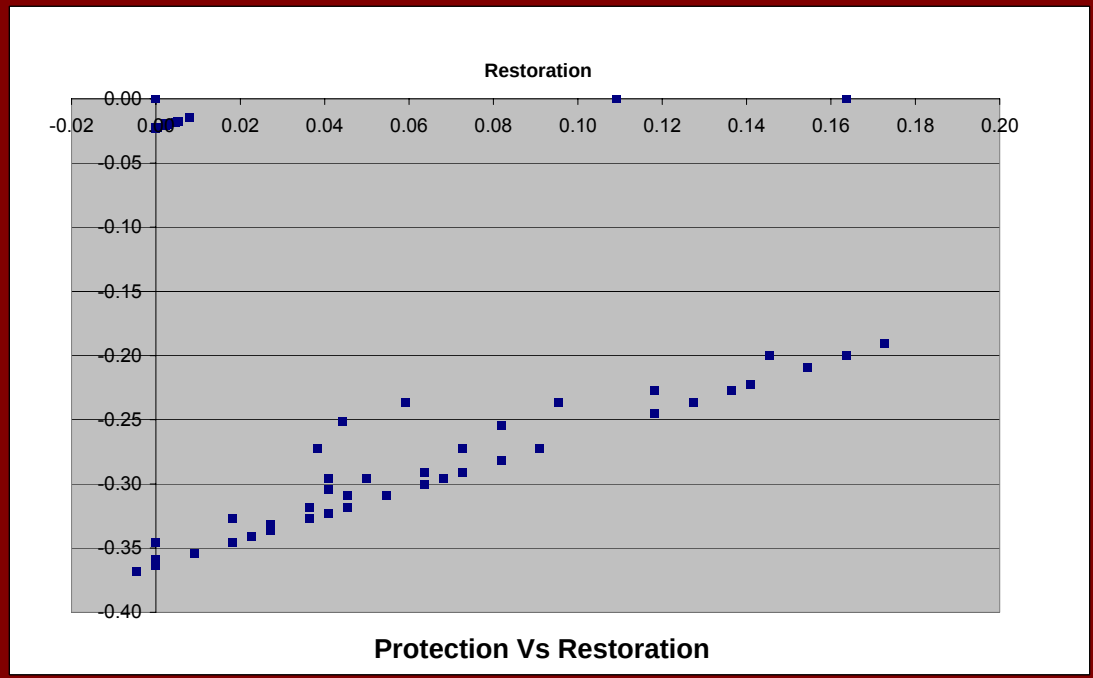
Classification of HUCs/Subunits

Part 5 of the Assessment classifies HUCs (aquatic) and Subunits (terrestrial).

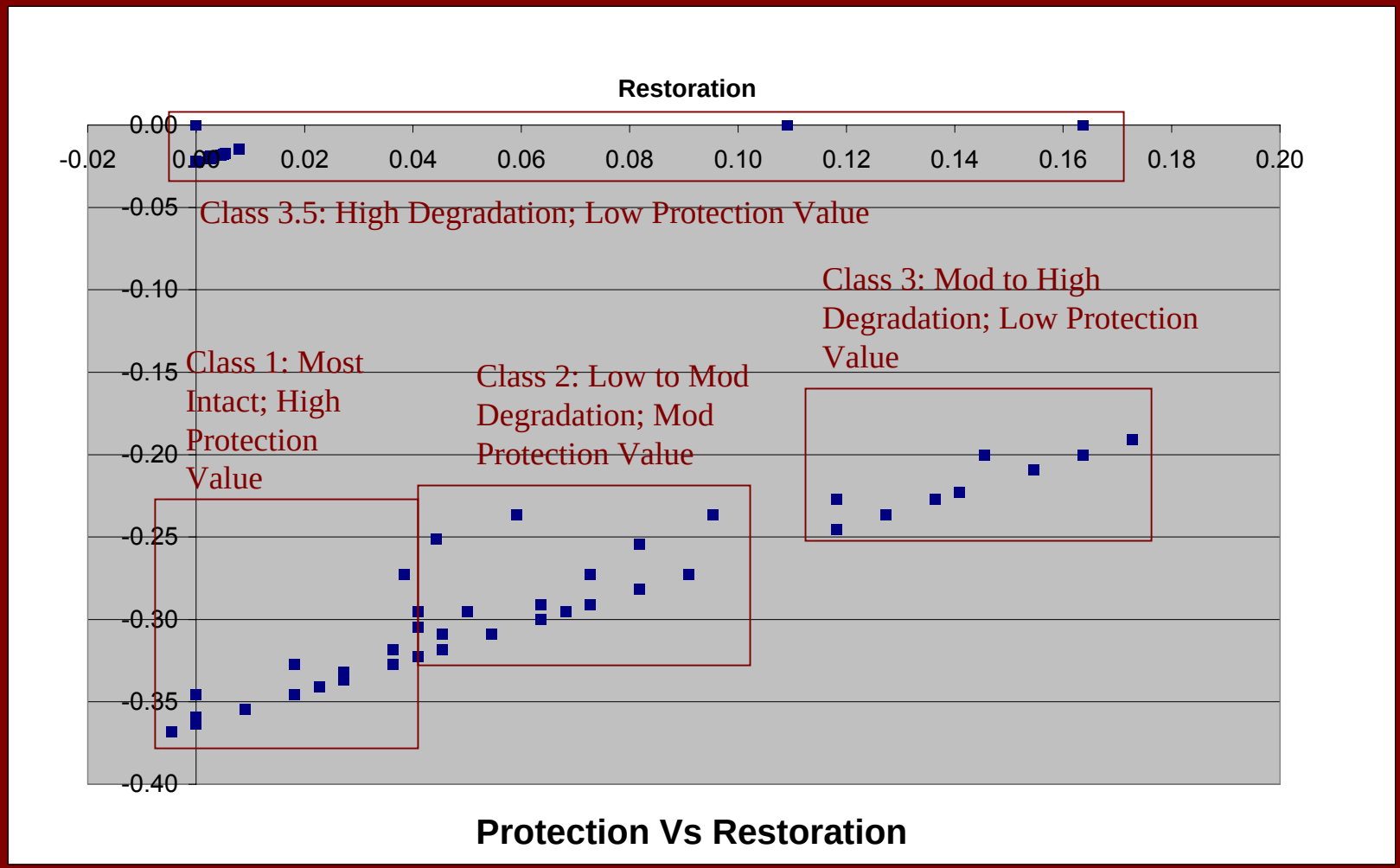
- To place HUCs in our classification scheme, we used QHA.
- To place subunits in our scheme, we used TBA

QHA gives “restoration” and protection scores

HUCs	Restoration (Extent Degraded)	Protection (Extent Pristine or Intact)
Upper West Bull	0.02	-0.43
Upper East Bull	0.02	-0.43
Quinn Creek	0.05	-0.41
Galbraith Creek	0.09	-0.36
Mid Bull	0.12	-0.35
Sulphur Creek	0.14	-0.32
West Bull (above dam)	0.11	-0.34
Iron Creek	0.18	-0.27
Bull Below Dam	0.10	-0.36
Sand Creek	0.20	-0.27
Ha Ha Creek	0.09	-0.36
Plumbob and Chipka Creeks	0.08	-0.37
Kikomun Creek	0.06	-0.39
Gold Creek	0.15	-0.30
Englishman Creek	0.17	-0.28
Grasmere	0.00	0.00
Linklater Creek	0.17	-0.28
Phillipps Creek	0.11	-0.34
Lower Elk	0.17	-0.27
Upper East Elk	0.00	-0.46
Upper West Elk	0.00	-0.46
Mid East Elk	0.00	-0.46
Fording River	0.17	-0.29
Mid West Elk	0.00	0.00
Brule Creek	0.03	-0.27
Grave Greek	0.03	-0.27
Michel Creek	0.20	-0.25
Cummings Creek	0.05	-0.42
Sparwood	0.07	-0.39
Hosmer West	0.06	-0.40
Hosmer East	0.06	-0.40



Grouping HUCs into our Classes



Classification of HUCs

Class 1 Waters – partial list (Protection)

Class 1 Streams	
Upper Kootenai	
Kootenai River 1 / koocanusa	Kootenai River 5
Kootenai River 2 / koocanusa	Lake Koocanusa Valley
Kootenai River 3 / koocanusa	Ross Creek
Kootenai River 4 / koocanusa	
Lower Kootenai	
Long Canyon	Trout Creek
Parker Creek	
Moyie	
no name 3	
Bull River	
Quinn Creek	Upper West Bull
Upper East Bull	
Duncan Lake	
Asher Creek	Lake Creek
Cooper and Meadow Creeks	Lower Lardeau River
Duncan Lake Tribs.	Lower Trout
East Creek	Rapid Creek
Ferguson Creek	Stevens and Hall Creeks
Glacier Creek	Upper Duncan River
Hamill Creek	Upper Trout
Healy Creek	Westfall River
Houston Creek	Wilkie Creek
Howser Creek	

Class 2 Waters – partial list (Restoration)

Class 2 Streams	
Upper Kootenai	
Big Cherry Creek 1	Kootenai River 10
Big Creek	Lake Creek 1
Big Creek South Fork	Lake Creek 2
Big Creek South Fork East Branch	Libby Creek 1
Bobtail Creek	Libby Creek 2
Boulder Creek	Libby Creek 2 Valley
Boulder Creek 2	McGuire Creek
Bristow Creek	Meadow Creek
Callahan Creek	Middle Fork Parsnip Creek
Deep Creek	North Callahan Creek
Dodge Creek	OBrien Creek
Dunn Creek	Paramenter Creek
Fivemile Creek	Phillips Creek
Flower Creek	Pipe Creek
Fortine Creek 1	Pipe Creek 1
Fortine Creek 2	Pipe Creek 2
Fortine Creek 3	Quartz Creek
Granite Creek	Ruby Creek
Grave Creek 1	Sinclair Creek
Grave Creek 2	South Callahan Creek
Indian Creek	Star Creek
Jackson Creek	Sullivan Creek
Keeler Creek	Sutton Creek
Kootenai River 5 Valley	Therriault Creek

We did this for all the Aquatic Classes: 1, 2, 2.5, 3, and 3.5.

Classification of Subunits

Class 1 Subunits – partial list (Protection)
These areas are at 60-85% of Optimum

Grassland/Shrub Biome	
Trench-val	Old Kimberly Airport grasslands
Wigwam-for	Wigwam Flats grassland
Mesic Mixed Conifer Biome	
UPELK-for	Upper Elk River unit
UPKOOT-np	Upper Kootenay River-National Parks
BULL-for	Bull River
Wigwam-for	Wigwam Ck trib of Elk River-border
KTLK-wild	NE side of Kootenay Lk/Purcell Mtns
KTLK-for	NW side Kootenay Lk/Slocan
Wigwam-bdr	Wigwam Ck to CAN border
WTRVR-for	White River watershed-CFS
KTLK-val	S half Kootenay Lk to US border
PRCL-wild	Purcell Mtns in St Marys unit-Wilderness
KTLKWA-for	West Arm Kootenay Lk/Nelson
MDLELK-for	Middle region Elk River
KOCNUSA-val	Lk Koocanusa east
YAHK-bdr	Upper Yahk(Yaak) River to US border
Fernie-val	Fernie area on lower Elk River
TBCO-val	Tobacco River watershed
LOKOOT-for	Selkirks west of lower Kootenai River valley-USFS
KOCNUSA-for	West of Lk Koocanusa-USFS
YAAK-for	Yaak River watershed S of CAN border
MOYIE-bdr	Upper Moyie River to US border
CABMTN-for	Lake Ck watershed-USFS
CABMTN-wild	Libby Ck watershed-Wilderness +
UPFSHR-for	Upper Fisher River/Paradise Valley

Class 2 Subunits – partial list (Restoration)
These areas are at 40-60% of Optimum

Grassland/Shrub Biome	
Trench-val	Premier Ridge grasslands
YAAK-for	Yaak River watershed S of CAN border
LOKOOT-for	Selkirks west of lower Kootenai River valley-USFS
CABMTN-for	Lake Ck watershed-USFS
MOYIE-for	Lower Moyie River S of CAN border
KOCNUSA-for	West of Lk Koocanusa-USFS
UPFSHR-for	Upper Fisher River/Paradise Valley
CABMTN-wild	Libby Ck watershed-Wilderness +
KOCNUSA-val	Lk Koocanusa east/US border portion Tobacco Plains
KOCNUSA-cval	Other Lk Koocanusa CAN grassland/shrub
BNFRY-val	Deep Ck/Bonners Ferry south
TBCO-val	Other Tobacco River grass/shrub
Trench-val	Skookumchuck grasslands
LOKOOT-val	Lower Kootenai River valley and bench
KOCNUSA-cval	Tobacco Plains in Lk Koocanusa CAN unit
LOFSHR-for	Lower Fisher River/Wolf Ck
TBCO-val	Tabacco Plains in the Tobacco River unit
Trench-val	Other St Marys Trench grassland/shrub
Mesic Conifer Forest Biome	
Bvrft-for	Beaverfoot Range-CFS
KOCNUSA-cval	Lk Koocanusa CAN unit
MOYIE-for	Lower Moyie River S of CAN border
LOKOOT-val	Lower Kootenai River valley and bench

We did this for all the Terrestrial Classes: 1, 2, 2.5, and 3

Working Hypothesis

Salmonids:

1. The primary habitat factors limiting salmonids in the regulated mainstem portion of the subbasin are an altered hydrograph, riparian condition, turbidity and fine sediments, and an altered thermal regime.
2. Habitat factors limiting salmonids in tributary streams are riparian condition, channel stability, fine sediment, and an altered thermal regime.
3. In reservoirs, the primary habitat factors for salmonids are hydraulic regime, migratory obstructions, shoreline conditions, volumetric turnover rates, and for kokanee system productivity.
4. The primary biological factor limiting salmonids is the presence of nonnative species.

Working Hypothesis

White Sturgeon:

1. Recent decadal recruitment failure is the main driver of extinction.

2. Current effects of post-development physical & biological changes have reduced the size & all but eliminated natural recruitment.

    a. Spawning and rearing habitats are altered and degraded. Along with the loss of large-river floodplain ecosystem functions and dynamics, this appears to be a key driver of extinction.

3. The current demographic condition of the population appears to be the acute internal driver of extinction.

    a. Reduced system productivity, predation on and suffocation of early life stages, and indirect reverberating ecological responses to primary system change contribute to extinction risk.

Working Hypothesis

Burbot:

1. Recent, ongoing recruitment failure is the main driver of extinction.

2. Past over-harvest and post-development physical and biological changes in the Kootenai River ecosystem have reduced the size and recruitment frequencies of burbot. Currently used spawning and rearing habitats are altered and degraded, and this along with the loss of large-river floodplain ecosystem functions and dynamics, appears to be an important driver of extinction.

3. Current demographic conditions and post-development and post-hydro operations may have reduced success of spawning and spawning migrations. Reduced system productivity, altered thermographs and hydrographs in the post-dam system, and indirect reverberating ecological responses to system change contribute to burbot extinction risk.

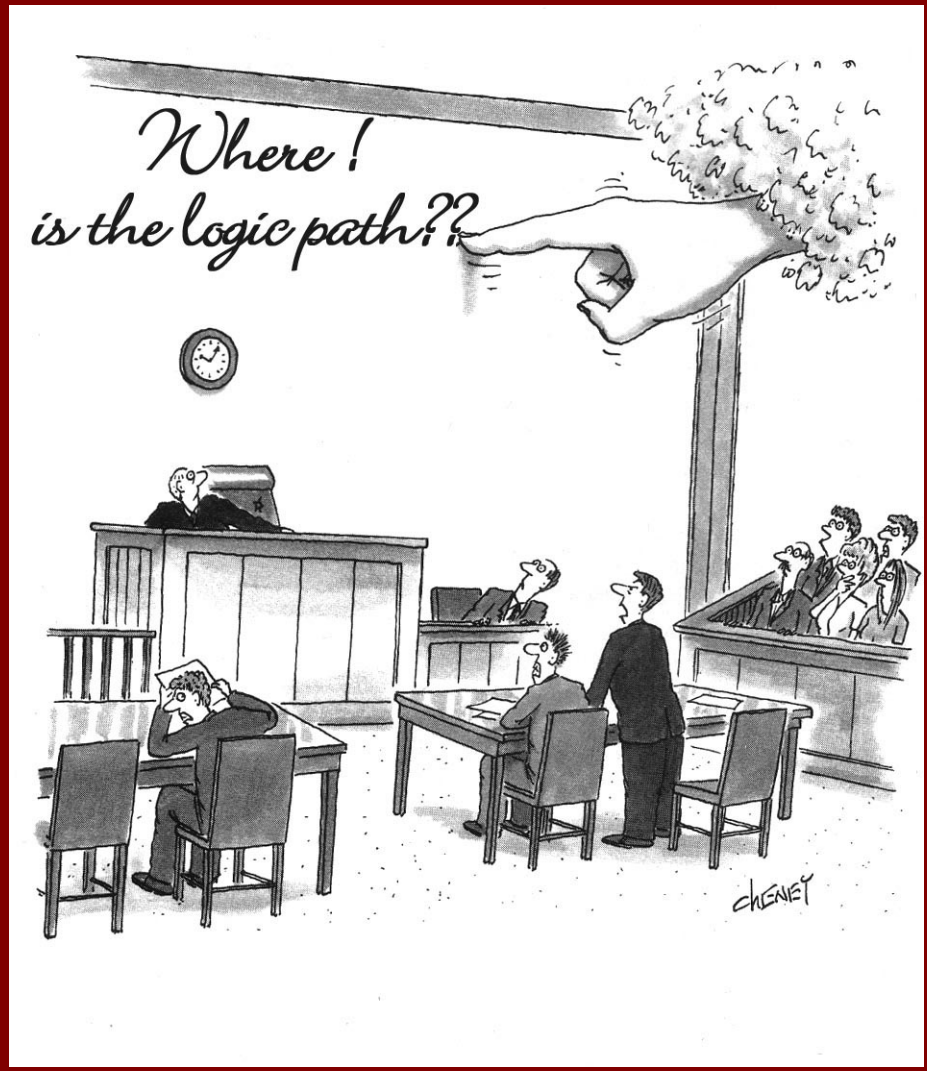
Near-term Opportunities

1. Our near-term protection opportunities are our Class 1 streams, lakes, and subunits

2. Our near-term restoration opportunities are our Class 2 and Class 2.5 streams, lakes, and subunits

3. Our reference streams, lakes, and subunits are those that score the highest in QHA and TBA.

Questions?



The Inventory

Outline:

Current Management Activities

- Existing Protected Areas
- Existing Plans
- Management Programs
- Last 5 Years of Restoration and Conservation Projects
  - Annotated list of ongoing activities
  - Assessment of past and current activities

The Inventory

Our assessment of past and current activities

Aquatic Limiting Factor for Resident Salmonids	Projects (by number)	Projects' Efficacy with Respect to Limiting Factor		
		General	Mainstem	Tributaries
Habitat: Streams				
Altered hydrograph	4U, 5U, 12U, 40, 44, 75, 78	2B	4	1B
Altered Thermal Regime	4U, 5U			
Subbasin-scale Connectivity	4U, 5U, 40, 51			
Nutrients/Productivity	4U, 5U, 14U, 49	1C North Arm, 4		
Degraded Riparian Areas	4U, 5U, 7U, 10U, 16U, 18U, 21, 22, 24, 27, 31, 36, 37, 38, 42, 69, 70, 71, 73, 74, 81U, 82U, 83U, 84, 88, 89, 90U, 91, 92, 93, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109	2B	4	1B
Fine Sediment	4U, 5U, 7U, 22, 24, 26, 27, 31, 36, 37, 38, 40, 42, 69, 70, 71, 73, 74, 76, 79, 82U, 90U, 91, 92, 93, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109		3A	2B
High Temperature	4U, 5U, 25			
Channel Stability	4U, 5U, 7U, 10U, 22, 27, 31, 35, 36, 37, 38, 40, 41, 42, 43, 46, 69, 70, 71, 73, 74, 82U, 90U, 91, 92, 93, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109		3A	1B
Habitat Diversity	4U, 5U, 7U, 10U, 22, 27, 31, 35, 36, 37, 38, 42, 46, 69, 70, 71, 74, 82U, 90U, 91, 92, 93, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109		2B, 4	1C, 4
Habitat: Lakes and Reservoirs				
Hydraulic Regime	12U, 75, 78, 5U, 4U	3A, 4		
Migratory Obstructions		3A, 4		
Shoreline Condition	55U, 84, 86			
Trophic Status	14U, 86	1C North Arm, 4		
Biological: Streams and Lakes				
Non-native Species and Genetic Purity	30, 34, 43, 46, 68, 94, 110, 111, 112, 113, 114	2B, 4		

The Inventory

Scoring system:

Rating	Subrating/Description
1. Highly effective	1a. Highly effective: Problem solved; Future projects not required to address this limiting factor 1b. Highly effective: but significant problems remain and future projects will be needed. 1c. Highly effective: but needs continued annual implementation
2. Moderately effective	2a. Moderately effective: The degree to which the limiting factor is a problem is substantially reduced. Can reduce emphasis on projects designed to address this limiting factor. 2b. Moderately effective: but significant problems remain and future projects will be needed. 2c. Moderately effective: but needs continued annual implementation.
3. Low effectiveness	3a. Low level of effectiveness: Approaches of past projects have not worked well, and new approaches are needed to address this limiting factor 3b. Low level of effectiveness: Low effectiveness on Subbasin scale but highly effective at local (individual project) scale.
4. New/Unevaluated Projects	4. New Projects: Projects in planning phase, newly implemented, or insufficient monitoring ot time has elapsed to evaluate effectiveness.

The Management Plan

Objectives need to be:

- Measurable
- Have a time frame
- Linked to a limiting factors from the Assessment
- Focal species specific
- Life stage specific
- Spatial

How we Developed Objectives

For salmonids, we used QHA to write objectives:

Waterbody Type and Area	Primary Westslope Cutthroat Trout Limiting Factors			
Streams	Habitat-Related			Biological
Subbasin-wide	Riaprian Condition	Fine Sediment	Channel Stability	Non-native Spp & Introgression
Regulated Mainstem	Riparian Condition	Altered Hydrograph	Fine Sediment[1]	Non-native Spp & Introgression
Upper Kootenai	Riparian Condition	Fine Sediment	Habitat Diversity	Non-native Spp & Introgression
Fisher	Fine Sediment	Riparian Condition	Channel Stability[2]	Non-native Spp & Introgression
Lower Kooteani	Channel Stability	Riparian Condition	Fine Sediment	Non-native Spp & Introgression
Moyie	Riaparian Condition	Habitat Diversity	Channel Stability	Non-native Spp & Introgression
Yaak	Riaprian Condition	Fine Sediment	Channel Stability	Non-native Spp & Introgression
Lakes	Habitat-Related			Biological
Subbasin-wide	Shoreline Condition	Hydraulic Regime	Macrophytes	Non-native Spp & Introgression

Example: QHA identifies fine sediments as one of the habitat attributes most limiting westslope cutthroat trout abundance and productivity at the subbasin scale.

Objectives

Our QHA-based draft objective for fine sediments in the Kootenai is:

Species/Lifestage	All Salmonid Focal Species, Spawning/Incubation and Rearing
4th-Code HUC	Tributaries (All 4th-Code HUCs) (Habitat)
Limiting Factor	**Fine Sediment**
Timeframe	2005 to 2020
Measurable Action	Reduce the delivery of fine sediments to a level equivalent to the fine-sediment habitat restoration score of appropriate reference streams.
Where	In Class 2 and 2.5 streams.
Number of Projects	30 projects over 15 years (average of 2 projects per year)

The objective is: measurable, has a time frame, is linked directly to our limiting factors, is species and life-stage specific, is prioritized, and is spatial (linked to specific geographical areas).

It is a direct outcome of our assessment.

Objectives

Another example: Our QHA-based draft objective for riparian condition in the Flathead:

Species/Lifestage	All Focal Species, Rearing and Spawning/Incubation
4th-Code HUC	Tributaries (All 4th-Code HUCs) (Habitat)
Limiting Factor	**Riparian Condition**
Timeframe	2005 to 2020+
Measurable Action	Restore riparian habitats to a level equivalent to the riparian condition habitat restoration score of reference streams.
Where	In Class 2 and 2.5 streams.
Number of Projects	30 projects over 15 years (average of 2 projects per year)

Objectives

We also used QHA for to write draft objectives for biological limiting factors:

Species/Lifestage	Bull Trout, All Life Stages
4th-Code HUC	Tributaries and Lakes (All 4th-Code HUCs) (Biological)
Limiting Factor	**Non-native Species**
Timeframe	2005 to 2020+
Measurable Action	Prevent further expansion, suppress, and where possible, eradicate congeneric species in streams and lakes ranked as high risk for non-native species interactions in the QHA spreadsheet model.
Where	In Class 2 and 2.5 streams ranked as high risk for non-native species interactions in the QHA spreadsheet model.
Number of Projects	30 projects over 15 years (average of 2 projects per year)

Objectives we used QHA for:

Resident Salmonids (bull trout, WCT, redband, kokanee)

Tributary objectives linked to QHA

Habitat

1. Riparian Condition
2. Fine Sediment
3. Channel Stability
4. Altered Thermal Regime
5. Habitat Diversity
6. Altered Hydrograph (Low and High Flows for Kokanee)

Biological

Non-native Species

We have some objectives not linked to QHA and TBA

Other Objectives

QHA was not used for white sturgeon or burbot objectives, and we do not have reference reaches for the regulated mainstem.

Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Mainstem Kootenai River (Upper and Lower Kootenai) (Habitat)
Limiting Factor	**Riparian Condition**
Timeframe	By 2020
Measurable Action	Improve riparian function and complexity of the mainstem to a level that supports sustainable, harvestable levels of focal species.
Where	All regulated mainstem reaches of the Kootenai River.

Other Objectives

Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Mainstem Kootenai River (Upper and Lower Kootenai) (Habitat)
Limiting Factor	**Altered hydrograph**
Timeframe	2005 to 2020+
Measurable Action	Working with Action Agencies, bring Libby Dam operations 50% closer to normative conditions during summer and spring while providing flood control. Determine opportunities, and where appropriate, remove delta blockages from tributary streams.
Where	Downstream from Libby Dam to Kootenay Lake

Species/Lifestage	All Focal Species, Spawning/Incubation
4th-Code HUC	Mainstem Kootenai River (Upper and Lower Kootenai) (Habitat)
Limiting Factor	**Altered thermal regime**
Timeframe	2005 to 2020
Measurable Action	Modify the mainstem thermal regime to be more normative (accepting the current thermal limitations imposed by Libby Dam and Koocanusa Reservoir) and more within the tolerance range of all life stages of burbot, white sturgeon, and bull trout.
Where	All regulated mainstem reaches of the Kootenai River

Writing of Terrestrial Objectives

Similarly, we also used TBA to write our wildlife objectives

TBA identifies Fire Exclusion as one of the factors limiting overall wildlife abundance and productivity in the Mesic Forest Biome. Our draft objective reads:

Species	All Mesic Forest Target Species
Units	All Units (Habitat)
Limiting Factor	**Fire Exclusion**
Timeframe	2005 to 2020+
Measurable Action	Using appropriate prescribed fire and mechanical treatments, alter an average of 10% of acreage in identified subunits.
Where	In Class 2 and 2.5 subunits for which the Fire Interval Disruption Index in the TBA spreadsheet tool exceeds a value of 8.5, consistent with exisiting management and mitigation plans.

Terrestrial Objectives

Mesic Forest Limiting Factors

- Forest Management (TBA)
- Fire Exclusion (TBA)
- Exotic Species (TBA)
- Forest Insects and Disease

Grassland Shrub Limiting Factors

- Forest Encorachment (TBA)
- Land Conversion (TBA)
- Overgrazing (TBA)
- Human Developments
- Exotic Species (TBA)

Riparian Biome Limiting Factors

- Forest Management (TBA)
- Land Conversion (TBA)
- Altered Hydrograph (QHA)
- Diking
- Exotic Species (TBA)

Wetland Biome Limiting Factors

- Roads (TBA)
- Land Conversion (TBA)
- Forest Management (TBA)
- Altered Hydrograph (QHA)
- Diking

Xeric Forest Limiting Factors

- Fire Exclusion (TBA)
- Forest Management (TBA)
- Exotic Species (TBA)

Strategies

Fine Sediment Example

1. Maintain and protect habitat by achieving compliance with existing habitat protection laws, policies, and guidelines.
2. Reduce general sediment sources by stabilizing roads, crossings, and other sources of sediment delivery.
3. Implement stream bank stabilization measures where necessary.
4. Implement riparian revegetation/rehabilitation projects.
5. Agitate embedded gravels to remove silts and fine sands.
6. Install artificial spawning structures where necessary.
7. Participate with the Idaho and Montana Department of Environmental Quality in the TMDL planning, implementation, and monitoring process. Achieve compliance with water quality standards.
8. Support habitat protection and monitoring in British Columbia.

Strategies

Riparian Condition Example

1. Identify impaired riparian areas and implement tasks to restore their appropriate functions.
2. Conduct watershed problem assessments. Identify site-specific limiting focal species in watersheds .
3. Improve grazing practices. Reduce negative effects of grazing with improved grazing management or riparian fencing.
4. Revegetate denuded riparian areas.
5. When possible (i.e. with willing landowners) provide long-term protection through purchase, conservation easements, landowner incentives, management plans, and other means.

Strategies

Riparian Condition Example (cont.)

6. Coordinate riparian activities with appropriate agencies and organizations.
7. Use partnerships and collaborative processes whenever possible.
8. Support watershed group restoration efforts and encourage establishment of new watershed groups to implement restoration objectives.
9. Initiate and develop cooperative adaptive management strategies with British Columbia ministries

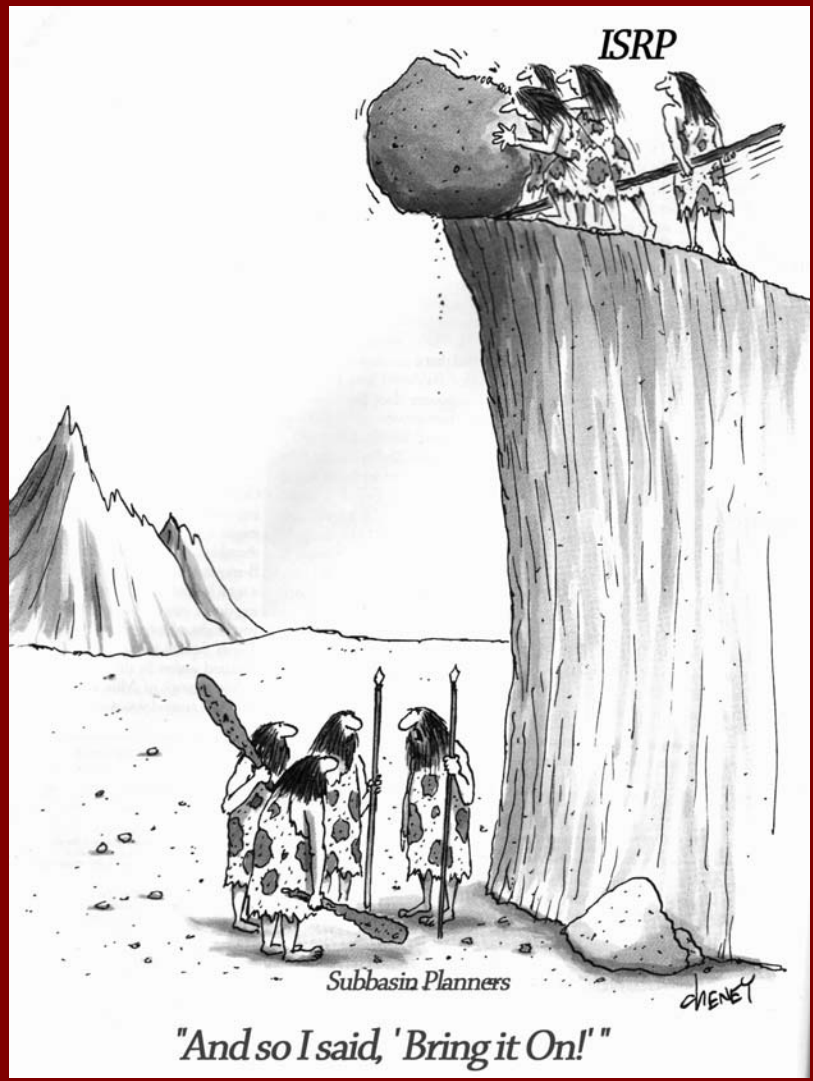
Strategies

Other Examples: White Sturgeon

See the White Sturgeon handout and the objective for System Productivity and Altered Thermal Regime

RM&E Discussion

Questions?



QHA Restoration Scores

The formula for restoration is:

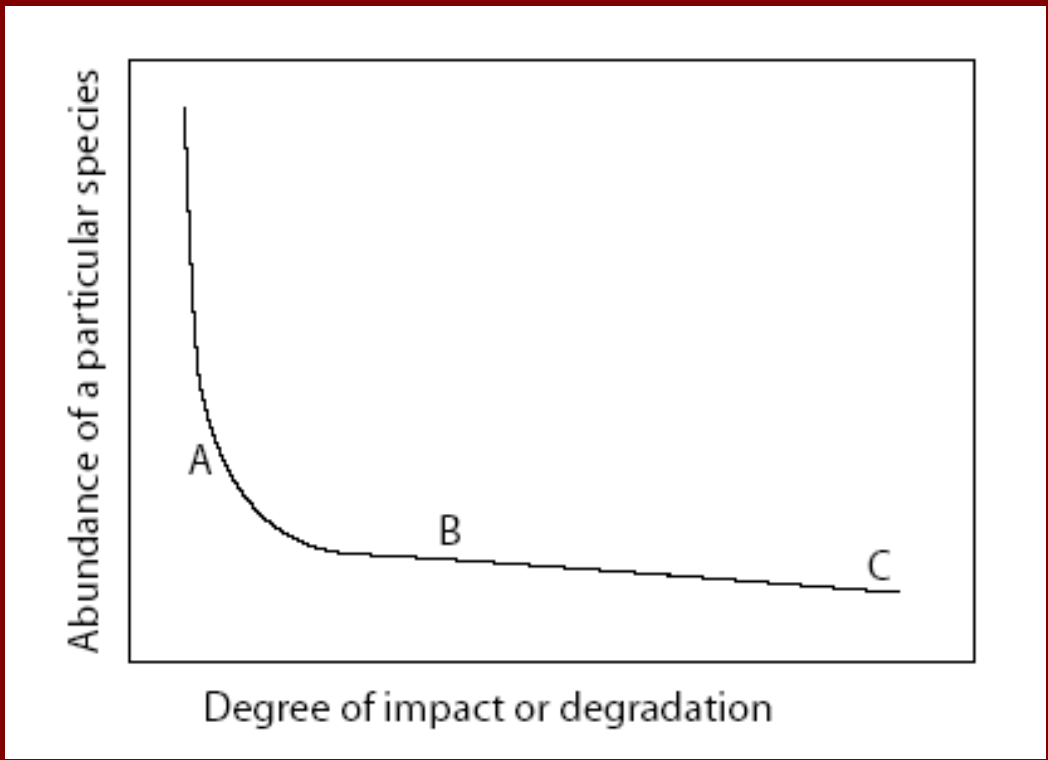
Restoration = Reference - Current * LSWeight

So the higher the score, the more degraded the stream, and the more important it is to the focal species.

But when it comes to setting restoration priorities, the highest priority for restoration in most cases is not be the most degraded streams unless there are ESA-listed spp. present.

QHA Restoration Scores

Our restoration potential measured as biological gain per unit of investment, is not a linear function of the difference between the reference and current conditions. It is a dome shaped function.



QHA Restoration Scores

- The high quality habitat cannot be improved much.
- Because of irreversible constraints and intractable ecological problems, the heavily degraded habitat (B to C) can be exceedingly expensive and take a very long time.
- The most cost effective restoration action is to restore moderately degraded watersheds (A to B).