6 Interpretation and Synthesis

6.1 Key Findings

The findings from the HUC-6 and HUC-4 evaluations and the biome, community, and single-species assessments are brought together in this section to form a more holistic view of the subbasin's biological and environmental resources. This information in turn provides a foundation for the development of scientific hypotheses concerning ecological behavior and the ways that human intervention might prove beneficial.

6.1.1 Status of Subbasin Environment

ICBEMP Ecological Integrity Ratings

In an integrated scientific assessment for ecosystem management in the Interior Columbia Basin, Quigley and others (1996) classified subbasins into forest and rangeland clusters that had common characteristics and similar current ecological conditions. The variables found most useful to explain and characterize the clusters were used to develop relative integrity estimates (meaning Columbia River subbasins were rated relative to each other). High levels of ecological integrity indicated that evolutionary and ecological processes were being maintained, as were functions and processes dependent on multiple ecological domains and evolutionary timeframes and viable populations of native and desired non-native species. These processes and functions were evaluated in a relative sense within the Columbia Basin, so that those areas exhibiting the most elements of a system were rated as high, and those with the fewest elements were rated low. The basic components of the ecological integrity rating included the forest, range, aquatic, and hydrologic systems. Table 6.1 shows the results of this assessment for the seven watersheds within the Kootenai Subbasin. With respect to the main ecosystem components, forest and aquatic ranked lowest (low) followed by hydrology (moderate). With respect to HUC-4 watersheds, the Fisher and Lower Kootenai watersheds ranked lowest (low) followed by the Upper Kootenai, Moyie, and Yaak (moderate). The composite rank for the Kootenai Subbasin was 1.6, which is just below moderate and 53 percent of optimum. These assessment scores provided a general but valuable indication of how the integrity of various ecological components of the Kootenai Subbasin compared to those of other subbasins in the Columbia River Basin.

Resident Salmonids

Aquatic System QHA Scores

As part of this assessment, the Kootenai Subbasin Aquatic Technical Team used

Table 6.1. Interior Columbia Basin Ecosystem Management Project (ICBEMP) Integrity ratings for watersheds within the Kootenai Subbasin

Watershed	Forest	Aquatic	Hydrology	Watershed Composite
Upper Kootenai	Low (1)	Moderate (2)	Moderate (2)	**Moderate (1.6)**
Fisher	Low (1)	Low (1)	Moderate (2)	**Low (1.3)**
Yaak	Low (1)	Moderate (2)	High (3)	**Moderate (2)**
Moyie	Low (1)	Low (1)	High (3)	**Moderate (1.6)**
Lower Kootenai	Low (1)	Low (1)	Moderate (2)	**Low (1.3)**
Biome Composite	**Low (1)**	**Low (1.4)**	**Moderate (2.4)**	**Moderate (1.6)**

Forest Integrity: *Measures of forest integrity include such elements as: (1) consistency of tree stocking levels with long-term disturbances typical for the forest vegetation present; (2) the amount and distribution of non-native species; (3) the amount of snags and down woody material present; (4) disruptions to the hydrologic regimes; (5) the absence or presence of wildfire and its effect on the composition and patterns of forest types; and, (6) changes in fire severity and frequency from historical (early 1800s) to the present.*
Aquatic Integrity: *An aquatic system that exhibits high integrity has a mosaic of well-connected, high-quality water and habitats that support a diverse assemblage of native and desired non-native species, the full expression of potential life histories and dispersal mechanisms, and the genetic diversity necessary for long-term persistence and adaptation in a variable environment. This definition is consistent with, and driven by, the goal to sustain biotic diversity and maintain ecological processes. Subbasins exhibiting the greatest level of these characteristics were rated high, those exhibiting the least were rated low, with medium ratings in between.*
Hydrologic Integrity: *Measures include elements like: (1) disturbance to water flow; (2) bare soil & disturbances to soil structure; (3) riparian vegetation; (4) sensitivity of stream banks and hill slopes to disturbance; (5) cycling of nutrients, energy, & chemicals; (6) surface & sub-surface flows; (7) stream-specific measurements such as gradient, stream bed substrate, full bank width, and depth; &, (8) recovery potential following disturbance.*

QHA to evaluate all the sixth-code HUCs in the Montana and Canadian portions of the Kootenai Subbasin on the basis of eleven habitat attributes for streams and thirteen habitat attributes for lakes. The attributes used in QHA are assumed to be the main habitat drivers of resident salmonid production and sustainability in streams (Parkin and McConnaha 2003). Tables 6.2 and 6.3 present the average subbasin-wide scores and ranks for all eleven stream attributes in the U.S. and Canadian portions of the subbasin respectively. Table 6.4 presents the scores and ranks for the thirteen lake attributes. Unlike the habitat-attribute ranking used to determine limiting factors, these scores are independent of the lifestage weight, and do not take into consideration how a specific focal species uses the habitat. They represent the current condition of the habitat relative to the normative or reference condition on a scale of 0 to 4 (where 0 = 0 percent of normative; 1 = 25 percent of normative; 2 = 50 percent of normative; 3 = 75 percent of normative; and 4 = 100 percent of normative). Normative conditions are defined as ideal conditions for a similar stream in this ecological province. The scores provide an indication of the subbasin's aquatic habitat's ability to provide the key ecological correlates for resident salmonids in general.

For tributaries in the U.S. portion of the subbasin, the average of the eleven habitat attribute scores gives an overall score for subbasin aquatic stream habitat of 3.11, which means that based on the QHA habitat assessment and with equal weight assigned to each attribute, overall the subbasin is currently operating at about 78 percent of optimum. For the regulated mainstem, the average score is 2.2, or 55 percent of optimum. The tributary score is considerably higher than the ICBEMP rating, but the ICBEMP rating included non-habitat attributes such as genetic purity and the presence of nonnatives, whereas QHA looked only at habitat. The habitat attributes currently functioning at the lowest levels in tributaries in the U.S. portion of the subbasin are riparian condition, fine sediment, channel stability, and habitat diversity. In the regulated mainstem, the attributes functioning at the lowest levels are flows (the hydrograph), riparian condition, temperature, and fine sediment.

For streams in the Canadian or B.C. portion of the subbasin, the average of the eleven habitat attribute scores gives an overall score for subbasin aquatic stream habitat of 3.43, which means that based on the QHA habitat assessment and with equal weight assigned to each attribute, overall the subbasin is currently operating at about 86 percent of optimum. Again, QHA looks only at habitat conditions and does not consider impacts from non-native species. The habitat attributes currently functioning at the lowest levels are riparian condition, habitat diversity, channel stability, and fine sediment. Low temperature, oxygen, and high temperature are currently functioning at nearest to optimum.

For lakes, the average of the thirteen attribute scores (without consideration to how they are used by any given focal species) gives an overall score for subbasin

Table 6.2. Average scores in the U.S. portion of the subbasin for eleven habitat attributes[1] important to resident salmonids.

	Tributaries		Regulated Mainstem	
Habitat Attribute	**Score**	**Rank**	**Score**	**Rank**
Channel stability	2.81	8	2.50	5
Fine sediment	2.33	9	2.33	6
Habitat Diversity	2.91	7	2.83	3
High Flow	3.10	5	0.67	10
High Temperature	2.81	8	2.17	7
Low Flow	3.26	4	0.67	10
Low Temperature	3.96	2	1.67	8
Obstructions	3.00	6	2.75	4
Oxygen	3.97	1	4.00	1
Pollutants	3.86	3	3.50	2
Riparian Condition	2.21	10	1.17	9
Average Score	3.11		2.20	
% of Optimum	78%		55%	

[1]*Attribute definitions are given in table 4.12.*

Table 6.3. Average scores in the B.C. portion of the subbasin for eleven habitat attributes important to resident salmonids.

Habitat Attribute	Score	Rank
Low Temperature	4.00	1
Oxygen	3.98	2
High Temperature	3.97	3
Pollutants	3.93	4
Low Flow	3.54	5
Obstructions	3.53	6
High Flow	3.49	7
Fine sediment	2.89	8
Channel stability	2.84	9
Habitat Diversity	2.83	10
Riparian Condition	2.74	11
Average Score	3.43	
% of Optimum	86%	

Table 6.4. Average scores for thirteen habitat attributes[1] in selected subbasin lakes and reservoirs.

	Lakes		Reservoirs	
Habitat Attribute	Score	Rank	Score	Rank
Volumetric turnover rates	3.95	2	2.00	7
Trophic status	3.70	6	2.75	4
Temperature	3.80	4	3.00	3
Substrate condition	3.65	7	2.13	6
Shoreline condition	3.45	9	1.75	9
Pollutants	3.70	6	3.25	2
Oxygen	4.00	1	3.25	2
Migratory obstruction	3.55	8	1.88	8
Macrophytes	3.85	3	2.50	5
Hydaulic regime	3.75	5	1.50	10
Habitat diversity	3.70	6	3.00	3
Gas saturation	4.00	1	4.00	1
Entrainment	4.00	1	2.75	4
Average Score	3.78		2.60	
% of Optimum	94%		65%	

[1] *Attribute definitions are given in table 4.13*

aquatic habitat of 3.78, which means that based on the QHA assessment, overall the subbasin aquatic habitat is currently operating at about 94 percent of optimum. Reservoirs had an average score of 2.6, which means they are operating at 65 percent of optimum. Again, QHA looks only at habitat. Based on the QHA scoring, the habitat attributes currently functioning at the lowest levels are hydraulic regime, shoreline condition, migratory obstructions, and volumetric turnover rates. In lakes, all of the habitat attributes scored relatively high.

By averaging the attribute scores for HUC-6 watersheds within each HUC-4 watershed, we can get an indication of how each HUC-4 watershed is operating (tables 6.5 and 6.6). In the U.S., scores range from 71 percent (Fisher) to 79 percent

Table 6.5. Average attribute scores for each HUC-4 watershed in the U.S. portion of the subbasin.

Habitat Attribute	Regulated Mainstem		Upper Kootenai		Fisher		Yaak		Lower Kootenai		Moyie	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Channel stability	2.50	5	2.93	8	2.56	5	3.12	4	2.44	11	2.82	6
Fine sediment	2.33	6	2.57	10	0.96	8	2.59	6	2.56	9	2.91	5
Habitat Diversity	2.83	3	2.97	7	2.56	5	3.35	2	2.76	6	2.91	5
High Flow	0.67	10	2.92	9	2.86	4	3.06	5	3.16	5	3.27	4
High Temperature	2.17	7	2.98	6	2.04	6	3.12	4	2.72	7	2.82	6
Low Flow	0.67	10	3.03	5	3.04	3	3.15	3	3.52	3	3.27	4
Low Temperature	1.67	8	3.86	3	4.00	1	4.00	1	3.72	2	3.73	2
Obstructions	2.75	4	3.15	4	3.50	2	2.38	7	2.52	10	2.73	7
Oxygen	4.00	1	4.00	1	4.00	1	4.00	1	3.84	1	4.00	1
Pollutants	3.50	2	3.97	2	4.00	1	4.00	1	3.36	4	3.45	3
Riparian Condition	1.17	9	2.21	11	1.88	7	1.59	8	2.60	8	2.45	8
Average Score	2.20		**3.15**		**2.85**		**3.12**		**3.02**		**3.12**	
Percent of Optimum	55%		**79%**		**71%**		**78%**		**75%**		**78%**	

Table 6.6. Average attribute scores for each HUC-4 watershed in the B.C. portion of the subbasin.

Habitat Attribute	Bull River		Duncan Lake		Elk		Kootenay Lake		Kootenay River		Slocan		St. Mary	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Channel stability	2.42	5	3.14	7	2.80	7	2.95	8	3.02	7	3.05	7	2.44	6
Fine sediment	2.19	7	3.36	4	2.75	8	2.97	7	3.20	5	2.82	9	2.76	4
Habitat Diversity	2.25	6	3.25	6	2.73	9	2.81	9	3.09	6	2.91	8	2.74	5
High Flow	2.78	4	3.95	2	3.45	4	3.45	6	3.74	3	3.64	5	3.35	2
High Temperature	3.94	2	4.00	1	4.00	1	4.00	1	4.00	1	3.73	4	4.00	1
Low Flow	2.78	4	4.00	1	3.40	5	3.58	5	3.78	2	3.82	3	3.35	2
Low Temperature	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1	4.00	1
Obstructions	3.67	3	3.48	3	3.90	2	3.63	4	3.30	4	3.27	6	3.26	3
Oxygen	4.00	1	4.00	1	4.00	1	3.94	3	4.00	1	3.95	2	4.00	1
Pollutants	4.00	1	4.00	1	3.65	3	3.97	2	4.00	1	3.82	3	4.00	1
Riparian Condition	2.19	7	3.30	5	2.83	6	2.65	10	2.96	8	2.73	10	2.41	7
Average Score	**3.11**		**3.68**		**3.41**		**3.45**		**3.55**		**3.43**		**3.30**	
Percent of Optimum	**78%**		**92%**		**85%**		**86%**		**89%**		**86%**		**83%**	

(Upper Kootenai) of optimum. In B.C., scores range from 78 percent (Bull River) to 92 percent (Duncan Lake) of optimum. Note that U.S. and Canadian HUCs were rated by separate teams of biologists, each familiar with the waters on their side fo the border. Readers are urged to use caution in making relative comparisons of the percent of optimum function between U.S. and Canadian waters.

Burbot

More normative river conditions may be needed for restoration of natural burbot production in the Kootenai River subbasin's imperiled riverine or migratory burbot stocks. However, it is unclear whether these stocks, including the remnant populations in the lower Kootenai River in Idaho retain adequate demographic or genetic vigor to serve as founding sources of population recovery (Hammond and Anders 2002; KVRI Burbot Committee 2004). Habitat conditions used by successfully reproducing burbot stocks within the Subbasin, especially those with high protection scores should be protected.

White Sturgeon

White sturgeon in the Kootenai River subbasin may be recruitment habitat limited, stock limited, or both, with a potential array of operating pre-zygotic and post-zygotic limiting factors (Anders et al. 2002.) Post-zygotic limiting factors may include embryo suffocation and predation on early life stages, contributed to by post-development habitat attributes and hydro operations. Limiting habitat conditions may be physical, thermal, and ecological, resulting from a long history of directly and indirectly altered habitats and habitat conditions.

USFS Watershed Ratings

The Kootenai and Panhandle National Forests (USFS KIPNF 2003) have estimated the expected or apparent watershed condition of the 166 sub-watersheds (HUC-6 scale) in the Kootenai River Subbasin. In the Idaho portion, 69 percent were functioning at risk or not properly functioning; in Montana the number was 83 percent. By this assessment, watersheds in the subbasin are operating at 66 percent of optimum.

Threat Posed by Non-natives

The other chief factor in the subbasin environment that affects the biological performance of focal species is the presence of nonnative species. Our analysis showed the threat to bull trout is high in 26 of the 94 bull trout watersheds in the U.S., moderate in 42, and low in 26. So with respect to non-native species, our QHA analysis showed that watersheds at the HUC-6 scale in the U.S. portion of the subbasin are functioning at about 66 percent of optimum for bull trout[1] (table 6.7). In the Canadian portion, the threat was high in 22 of 99 watersheds and low in 77, which indicates that bull trout watersheds there are operating at

---

[1] Based on February 13, 2004 revisions made by Jim Dunnigan and Mike Hensler (MFWP) and Greg Hoffman (USACOE) to the bull trout QHA file. We assigned a score of 1 to watersheds where the threat was high, a score of 2 to those where the threat was moderate, and a score of 3 where the threat was low. The average score was 2.0. If 3 is the optimum, then subbasin streams are functioning at about 66 percent of optimum for bull trout with respect to the threat posed by non-native species.

about 85 percent of optimum with respect to non-natives. In the 7 lakes with bull trout that we assessed using LQHA, we found that the known threat from non-native species is high in 6 lakes and low in 1. Hence, with respect to non-native species, the lakes assessed are functioning at about 43 percent of optimum for bull trout. Table 6.7 shows the results of a similar analysis for the other salmonid focal species in the Kootenai Subbasin.

Shepard and others (2003) report that 14 percent of historically occupied westslope cutthroat trout habitat in the Kootenai Subbasin and 15 percent currently occupied habitat has genetically unaltered stocks, stocks that are less than 10 percent introgressed, or are suspected to contains stocks that are genetically unaltered. Another 56 percent of historically occupied habitat and 59 percent of currently occupied habitat contains stocks that are potentially unaltered (table 6.8). Based on these numbers, our technical team concludes that from a purely genetics standpoint, westslope cutthroat trout are, at best, operating at between 14 to 70 percent of optimum.

Table 6.7. Threat from non-natives to focal species calculated as percent of optimum condition.

	Bull Trout	Westslope Cutthroat Trout	Redband Trout	Kokanee
HUC-6 Watersheds U.S.	66%	55%	48%	62%
HUC-6 Watersheds B.C.	85%	74%	93%	97%
Lakes	43%	55%	50%	56%

Table 6.8. Genetic Status of Westslope Cutthroat Trout by percent of historically and currently occupied habitat (in stream miles) in the Kootenai Subbasin. Source: Shepard et al. 2003.

Status	% Historic Distribution (stream miles)	% Current Distribution (stream miles)
Genetically Unaltered	5%	6%
<10% introgressed	1%	1%
Suspected Unaltered	7%	8%
Total (Genetically Unaltered + < 10% introgressed + Suspected Unaltered)	**14%**	**15%**
Potentially Unaltered	56%	59%
Grand Total (Genetically Unaltered + < 10% introgressed + Suspected Unaltered + Potentially Unaltered)	**70%**	**74%**

Terrestrial System TBA Scores

As part of our assessment, the Kootenai Subbasin Terrestrial Technical Team used a spreadsheet tool to evaluate units and subunits within target biomes in the Montana and Canadian portions of the Kootenai Subbasin. This Terrestrial Biome Assessment (TBA) relies on a combination of data and the expert knowledge of people intimately familiar with the areas being rated. The habitat impact variables used in TBA differ by biome and were selected because they provide a measure of habitat quality for a wide range of species, including target species. Table 6.9 gives the average, subbasin-wide scores (as percentage of a optimum condition) for each biome. Table 6.10 lists biome scores for each subunit as well as the overall subunit scores. The scores provide an indication of habitat quality for terrestrial species in each subunit. Table 6.10 also shows the biomes that occur in each subunit. The average of the subunit scores gives an overall score for the subbasin's terrestrial environment of 55 percent. Based on the TBA scoring, the biome currently functioning at the lowest level is the wetland biome. The biome currently functioning at the highest level is the mesic conifer forest.

Table 6.9. The TBA scores (as percentage of an optimum condition) for each biome.

Biome	Percent of Optimum
Mesic Coniferous Forest	66%
Riparian	55%
Xeric Forest	54%
Grassland/Shrub	50%
Wetland	49%

Table 6.10. TBA scores as a percent of optimum for Kootenai Subunits.

Unit/Subunit	Biome	Percent of Optimum
BNFRY-val		
Deep Ck/Bonners Ferry south	Mesic mixed conifer	61%
Deep Ck/Bonners Ferry south	Xeric	56%
Curley Ck watershed forested wetlands	Wetlands	52%
Other wetlands in Deep Ck/Bonners Ferry unit	Wetlands	42%
Deep Ck/Bonners Ferry south	Grassland/shrub	48%
Deep Ck valley riparian wetlands	Riparian	48%
Other riparian in Deep Ck/Bonners Ferry unit	Riparian	41%
Average for Unit		**50%**
BULL-for		
Bull River unit	Xeric	64%
Bull River	Mesic mixed conifer	76%
All Bull River	Wetlands	54%
All Bull River	Riparian	66%
Average for Unit		**65%**
Bvrft-for		
Beaverfoot Range-CFS	Mesic mixed conifer	59%
All Beaverfoot Range-CFS	Wetlands	55%
All Beaverfoot Range-CFS	Riparian	58%
Average for Unit		**57%**
CABMTN-for		
Lake Ck watershed-USFS	Mesic mixed conifer	62%
Lake Ck watershed-USFS	Xeric	51%
Lake Ck watershed-USFS	Grassland/shrub	53%
Alpine wetlands in Lake Ck unit	Wetlands	59%
Other wetlands in Lake Creek watershed-USFS	Wetlands	48%
All riparian in Lake Ck watershed-USFS	Riparian	56%
Average for Unit		**55%**
CABMTN-wild		
Libby Ck watershed-Wilderness +	Mesic mixed conifer	62%
Libby Ck watershed-Wilderness +	Xeric	51%
Libby Ck watershed-Wilderness +	Grassland/shrub	49%
All wetlands in Libby Ck watershed-Wilderness	Wetlands	47%
All riparian in Libby Ck watershed-Wilderness	Riparian	54%
Average for Unit		**52%**
Fernie-val		
Fernie area on lower Elk River	Mesic mixed conifer	66%
All Fernie area on lower Elk River	Grassland/shrub	39%
All Fernie area on lower Elk River	Wetlands	51%
All Fernie area on lower Elk River	Riparian	58%
Average for Unit		**54%**

Table 6.10 (cont.). TBA scores as a percent of optimum for Kootenai Subunits.

Unit/Subunit	Biome	Percent of Optimum
KOCNUSA-cval		
Koocanusa Res. CAN unit/CAN portion Tobacco Plains	Xeric	51%
Koocanusa Res. CAN unit	Mesic mixed conifer	58%
All Canadian Koocanusa Res. unit	Wetlands	47%
Tobacco Plains in Koocanusa Res. CAN unit	Grassland/shrub	46%
Other Koocanusa Res. CAN grassland/shrub	Grassland/shrub	48%
All Canadian Koocanusa Res. unit	Riparian	42%
Average for Unit		**49%**
KOCNUSA-for		
West of Koocanusa Res.-USFS	Mesic mixed conifer	65%
West of Koocanusa Res.-USFS	Xeric	48%
West of Koocanusa Res.-USFS	Grassland/shrub	51%
West of Koocanusa Res.-USFS	Wetlands	45%
All riparian West of Koocanusa Res.-USFS	Riparian	50%
Average for Unit		**52%**
KOCNUSA-val		
Koocanusa Res. east	Mesic mixed conifer	67%
Koocanusa Res. east/US border portion Tabacco Plains	Xeric	51%
Koocanusa Res. east/US border portion Tobacco Plains	Grassland/shrub	48%
All Koocanusa Res. east	Wetlands	39%
All Koocanusa Res. east	Riparian	32%
Average for Unit		**47%**
KTLK-for		
NW side Kootenay Lk/Slocan	Mesic mixed conifer	71%
All NW side Kootenay Lk/Slocan	Wetlands	53%
All NW side Kootenay Lk/Slocan	Riparian	62%
Average for Unit		**62%**
KTLK-val		
S half Kootenay Lk to US border	Xeric	63%
S half Kootenay Lk to US border	Mesic mixed conifer	70%
Other S half Kootenay Lk to US border	Wetlands	49%
CVWMA (Creston Valley Waterfowl Mgmt Area)	Wetlands	45%
Other S half Kootenay Lk to US border	Riparian	66%
CVWMA (Creston Valley Waterfowl Mgmt Area)	Riparian	51%
Average for Unit		**57%**
KTLKWA-for		
West Arm Kootenay Lk/Nelson	Mesic mixed conifer	69%
All West Arm Kootenay Lk/Nelson	Wetlands	47%
All West Arm Kootenay Lk/Nelson	Riparian	56%
Average for Unit		**58%**
KTLK-wild		
NE side of Kootenay Lk/Purcell Mtns	Mesic mixed conifer	75%
All NE side of Kootenay Lk/Purcell Mtns	Wetlands	52%
All NE side of Kootenay Lk/Purcell Mtns	Riparian	65%
Average for Unit		**64%**

Table 6.10 (cont.). TBA scores as a percent of optimum for Kootenai Subunits.

Unit/Subunit	Biome	Percent of Optimum
LOFSHR-for		
Lower Fisher River/Wolf Ck	Mesic mixed conifer	61%
Lower Fisher River/Wolf Ck	Xeric	46%
All Lower Fisher River/Wolf Ck	Wetlands	40%
Lower Fisher River/Wolf Ck	Grassland/shrub	45%
All Lower Fisher River/Wolf Ck	Riparian	39%
Average for Unit		**46%**
LOKOOT-for		
All Selkirks west of lower Kootenai River valley-	Xeric	58%
Selkirks west of lower Kootenai River valley-USFS	Mesic mixed conifer	66%
Selkirks west of lower Kootenai River valley-USFS	Wetlands	49%
Selkirks west of lower Kootenai River valley-USFS	Grassland/shrub	53%
Selkirks west of lower Kootenai River valley-USFS	Riparian	56%
Average for Unit		**56%**
LOKOOT-val		
Lower Kootenai River bench between valley and E mtns	Xeric	49%
Lower Kootenai River valley and bench	Mesic mixed conifer	55%
Other Lower Kootenai River valley and E non-bench	Xeric	53%
All Lower Kootenai River valley and bench	Wetlands	21%
Lower Kootenai River valley and bench	Grassland/shrub	46%
All Lower Kootenai River valley and bench	Riparian	28%
Average for Unit		**42%**
MDLELK-for		
Middle region Elk River	Mesic mixed conifer	67%
All Middle Elk River	Wetlands	54%
All Middle Elk River	Riparian	61%
Average for Unit		**60%**
MOYIE-bdr		
Upper Moyie River to US border	Mesic mixed conifer	64%
All Upper Moyie River to US border	Wetlands	45%
All Upper Moyie River to US border	Riparian	61%
Average for Unit		**57%**
MOYIE-for		
Lower Moyie River S of CAN border	Mesic mixed conifer	57%
Lower Moyie River S of CAN border	Xeric	53%
Round Prairie wetland complex	Wetlands	51%
Other wetlands in lower Moyie River watershed	Wetlands	50%
Lower Moyie River S of CAN border	Grassland/shrub	51%
All riparian in lower Moyie River watershed	Riparian	53%
Average for Unit		**53%**
PRCL-wild		
Purcell Mtns in St Marys unit-Wilderness	Xeric	60%
Purcell Mtns in St Marys unit-Wilderness	Mesic mixed conifer	70%
Purcell Mtns in St Marys unit-Wilderness	Wetlands	54%
Purcell Mtns in St Marys unit-Wilderness	Riparian	68%
Average for Unit		**63%**

Table 6.10 (cont.). TBA scores as a percent of optimum for Kootenai Subunits.

Unit/Subunit	Biome	Percent of Optimum
Stmry-np		
All wetlands St Marys Trench	Wetlands	50%
Average for Unit		**50%**
TBCO-val		
Tobacco River watershed	Mesic mixed conifer	66%
Tobacco River watershed	Xeric	50%
Tabacco Plains in the Tobacco River unit	Grassland/shrub	45%
All Tobacco River watershed	Wetlands	42%
Other Tobacco River grass/shrub	Grassland/shrub	48%
All Tobacco River watershed	Riparian	44%
Average for Unit		**49%**
TP-for		
Teepee Ck watershed	Mesic mixed conifer	60%
All Teepee Ck watershed	Wetlands	47%
All Teepee Ck watershed	Riparian	58%
Average for Unit		**55%**
Trench-val		
St Marys Trench	Xeric	51%
St Marys Trench	Mesic mixed conifer	61%
Other St Marys Trench grassland/shrub	Grassland/shrub	42%
Old Kimberly Airport grasslands	Grassland/shrub	65%
Premier Ridge grasslands	Grassland/shrub	59%
Wycliffe Prairie (in St. Marys Unit)	Grassland/shrub	34%
Skookumchuck grasslands	Grassland/shrub	47%
All riparian St Marys Trench	Riparian	55%
Average for Unit		**52%**
UPELK-for		
Upper Elk River unit	Mesic mixed conifer	78%
All Upper Elk River	Wetlands	53%
All Upper Elk River	Riparian	69%
Average for Unit		**67%**
UPFSHR-for		
Upper Fisher River/Paradise Valley	Mesic mixed conifer	62%
Upper Fisher River/Paradise Valley	Xeric	48%
All Upper Fisher River/Paradise Valley	Wetlands	46%
Upper Fisher River/Paradise Valley	Grassland/shrub	50%
All Upper Fisher River/Paradise Valley	Riparian	45%
Average for Unit		**50%**
UPKOOT-np		
Upper Kootenay River-National Parks	Mesic mixed conifer	76%
All Upper Kootenai River-National Parks	Wetlands	55%
All Upper Kootenai River-National Parks	Riparian	68%
Average for Unit		**66%**

Table 6.10 (cont.). TBA scores as a percent of optimum for Kootenai Subunits.

Unit/Subunit	Biome	Percent of Optimum
Wigwam-bdr		
Wigwam Ck to CAN border	Mesic mixed conifer	71%
All Wigwam Ck to CAN border	Wetlands	59%
Wigwam Ck to CAN border	Xeric	59%
All Wigwam Ck to CAN border	Riparian	62%
Average for Unit		**63%**
Wigwam-for		
Wigwam Ck trib of Elk River	Xeric	62%
Wigwam Ck trib of Elk River-border	Mesic mixed conifer	75%
Wigwam Flats grassland	Grassland/shrub	64%
All Wigwam Ck trib of Elk River	Wetlands	51%
All Wigwam Ck trib of Elk River	Riparian	64%
Average for Unit		**63%**
WTRVR-for		
White River watershed-CFS	Xeric	64%
White River watershed-CFS	Mesic mixed conifer	70%
All White River watershed-CFS	Wetlands	53%
All White River watershed-CFS	Riparian	62%
Average for Unit		**62%**
YAAK-for		
Yaak River watershed S of CAN border	Mesic mixed conifer	65%
Yaak River watershed S of CAN border	Xeric	52%
All wetlands in Yaak River watershed	Wetlands	50%
Yaak River watershed S of CAN border	Grassland/shrub	56%
All riparian in Yaak River watershed	Riparian	61%
Average for Unit		**57%**
YAHK-bdr		
Upper Yahk(Yaak) River to US border	Mesic mixed conifer	67%
All Upper Yahk(Yaak) River to US border	Wetlands	51%
All Upper Yahk(Yaak) River to US border	Riparian	59%
Average for Unit		**59%**

LINKS

For the Idaho Conservation Data Center, which has species lists and information on species at risk in Idaho, go to http://fishandgame.idaho.gov/tech/CDC/

Click Here

For the Montana Natural Heritage Program website, which has species lists and information on species at risk in Montana, go to: http://nhp.nris.state.mt.us/

Click Here

6.1.2 Status of Species

Many wildlife and aquatic species have seen range and population reductions since non-Indian settlement, some drastic. A few well known examples include grizzly bears, wolves, lynx, wolverines, trumpeter swans, leopard frogs, white sturgeon, burbot, bull trout, Columbia River redband trout, and westslope cutthroat trout. Appendices 13, 14, 20, and 21 list species of concern within the US portion of the Kootenai, the Canadian portion of the Kootenai, and the Mountain Columbia Province, respectively.

The Montana Natural Heritage Program and the Idaho Conservation Data Center use a number of factors (number, size, and distribution of known populations, trends (if known), habitat sensitivity, and life history factors that make species especially vulnerable) to assign and rank species of concern. Table 6.11 shows the number of species within the U.S. portion of the Kootenai Subbasin that have been assigned to each rank category. Table 6.12 shows the number of species in the Kootenai Subbasin in each group by Endangered Species Act status category. Figure 6.1 shows the percent of species at risk per total species for our targeted biomes using several different species of concern indices for US and Canadian portions of the Flathead and Kootenai Subbasins.

There are currently 130 state-classified species of concern in the Kootenai Subbasin, about 70 percent of which are plants. Of these, 39 are considered critically imperiled, just over 79 percent of that number being plants. Across the Flathead and Kootenai Subbasins, the grassland biome contains the highest number of sensitive species (species of concern). However, the herbaceous wetland biome has the highest number of declining or extirpated species, closely followed by the grassland and riparian/wetland biomes.

Table 6.11. The number of Montana Heritage Program and Idaho Conservation Data Center Species of Concern within the U.S. portion of the Kootenai Subbasin. The fish tally is for the Montana portion of the subbasin.

State Rank[1]	Amphibian	Bird	Fish	Mammal	Mollusk	Plant	Total
S1		3	2	2	1	31	**39**
S1,S3					1		**1**
S2	1		2	4		45	**52**
S2B		4					**4**
S2S3				1	1	1	**3**
S2B,S3N		1					**1**
S3	1	1		4		15	**21**
S3B		3					**3**
S3B,S3N		2					**2**
S4				1			**1**
S4N		2					**2**
SNR			1				**1**
SX						1	
Total	**2**	**16**	**5**	**12**	**3**	**92**	**130**

Grizzly bear is S3 in MT and S1 in ID, tallied as S3
Coeur D'Alene Salamander is S2 in MT and S3 in ID, tallied as S2
Harlequin duck is S2B in MT and S1B in ID, tallied as S2B
Bald eagle is S3B,S3N in MT and S3B,S4N in ID, tallied as S3B,S3N
Townsend Big-eared bat is S2,S3 in MT and S2 in ID, tallied as S2,S3
Northern bog lemming is S2 in MT and S1 in ID, tallied as S2
Lynx is S3 in MT and S1 in ID, tallied as S3
Gray wolf is S3 in MT and S1 in ID, tallied as S3

[1]Rank Definitions

- *S1* — *Critically imperiled because of extreme rarity, or because of some factor of its biology making it especially vulnerable to extirpation.*
- *S2* — *Imperiled because of rarity, or because of other factors demonstrably making it very vulnerable to extinction throughout its range.*
- *S3* — *Vulnerable because of rarity, or found in a restricted range even though it may be abundant at some of its locations.*
- *S4* — *Apparently secure, though it may be quite rare in parts of its range, especially at the periphery.*
- *S5* — *Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.*
- *S#S#* — *When two rankings appear side by side, for example "S2S3", it indicates some uncertainty about the ranking status.*
- *SU* — *Possibly in peril but status uncertain; more information needed.*
- *SH* — *Historical, known only from records over 50 years ago; may be rediscovered.*
- *SNR* — *State not ranked*
- *SX* — *Believed to be extinct; historical records only.*
- *?* — *Inexact or uncertain.*
- *B* — *A state rank modifier indicating breeding status for a migratory species. Example: S1B, SZN = breeding occurrences for the species are ranked S1 (critically imperiled) in the state; non-breeding occurrences are not ranked in the state.*
- *N* — *A state rank modifier indicating breeding status for a nonbreeding population. Example: S1N.*

Table 6.12. Number of species in the subbasin in each group by Endangered Species Act Status Categories. The fish tally is only for the Montana portion of the subbasin.

ESA Status[1]	Bird	Fish	Mammal	Plant	Total
LE		1	1		**2**
LT		1		1	**2**
PS			1		**1**
PS:LE	1				**1**
PS:LE,LT,XN			1		**1**
PS:LT			1		**1**
PS:LT,PDL	1				**1**
PS:LT,XN			1		**1**
Special Status		1			**1**
Total	**2**	**3**	**5**	**1**	**11**

[1]U. S. Fish And Wildlife Service Endangered Species Act Status

LE listed endangered

LT listed threatened

PE proposed endangered

PT proposed threatened

C candidate: Substantial information exists in U.S. Fish and Wildlife files on biological vulnerability to support proposals to list as threatened or endangered.

NL not listed or no designation (see below)

XN nonessential experimental population

(PS) Indicates "partial status" - status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population, that has a record in the database, has USESA status, but the entire species does not.

(PS:value) Indicates "partial status" - status in only a portion of the species' range. The value of that status appears in parentheses because the entity with status is not recognized as a valid taxon by Central Sciences (usually a population defined by geopolitical boundaries or defined administratively, such as experimental populations).

A species can have more than one federal designation if the species' status varies within its range. In these instances, the Montana designation is listed first. Example: LELT = species is listed as endangered in Montana; elsewhere in its range it is listed as threatened.

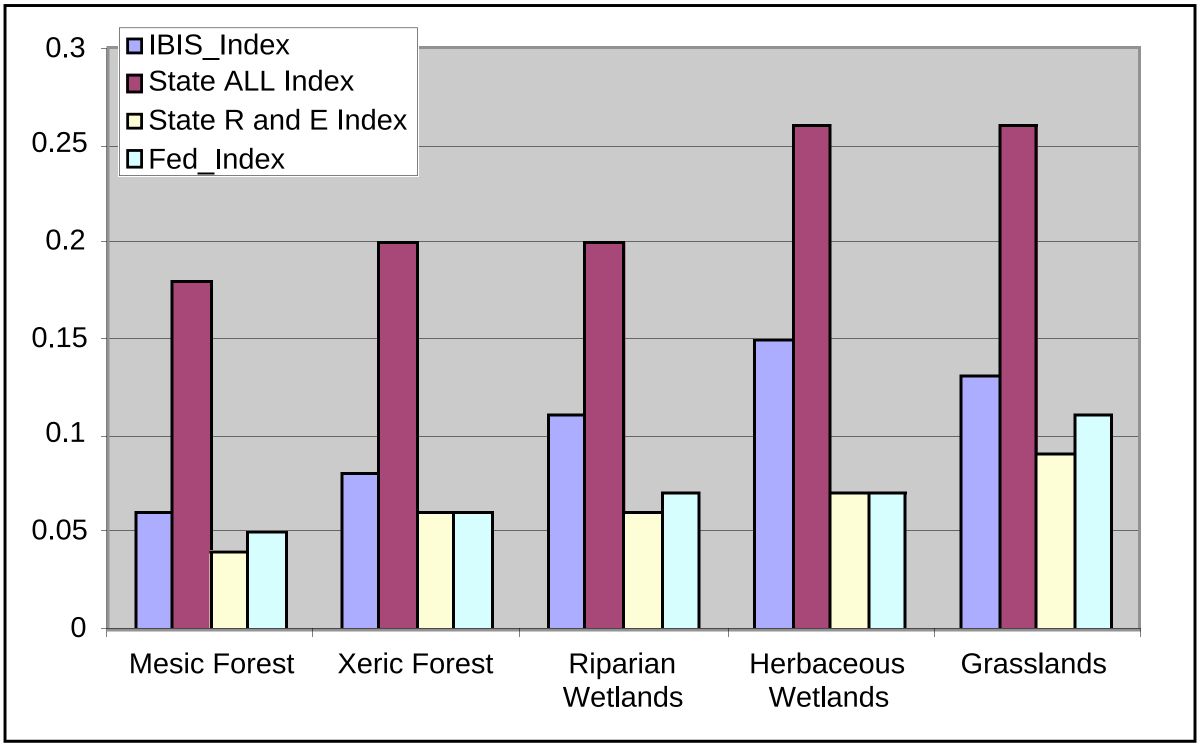

Figure 6.1. The percent of species at risk per total species in targeted biomes in the Kootenai and Flathead subbasins.

[1] Total Species: derived from IBIS-Canada
IBIS status: *derived from a column in IBIS-Canada that indicates whether a species is in decline, decreasing extirpated, stable, or increasing. This column is from IBIS-USA and has been edited to be more accurate for Canada*
State ALL: *from IBIS-USA for the sub basin planning and derived from the Montana and Idaho Natural Heritage programs lists as well as BC's red and blue list designation. Includes Blue and "Species of concern"*
State R and E: *from IBIS-USA for the sub basin planning and derived from the Montana and Idaho Natural Heritage programs lists. Includes only "Red" and Endangered" species*
Federal:" *From IBIS-USA sub basin planning and derived from Federal lists from Canada and the US.*
IBIS Index: *the* ***IBIS status*** *species/total species in IBIS-Canada*
State All Index: the ***State ALL*** *species/total species in IBIS-Canada*
Fed_Index: *the* ***Federal*** *species/total species in IBIS-Canada*

6.1.3 Biological Performance of Focal Species in Relation to the Environment

Bull Trout

Table 6.13 shows the results of a Kootenai National Forest baseline assessment of the current condition of bull trout subpopulations in the Upper, Middle, and Lower Kootenai River in Montana (USFS KNF 2002b). The assessment is qualitative in nature and should be considered subjective, but the KNF analysis shows that subpopulation size is functioning at 73 percent of optimum, growth and survival at 70 percent, life history diversity at 76 percent of optimum, and persistence and genetic integrity at 70 percent. When all four parameters are considered together with equal weight, according to this assessment, bull trout in this part of the subbasin are operating at about 72 percent of optimum[2]. A similar analysis does not exist for the Idaho portion of the subbasin.

Table 6.13. Biological performance of bull trout subpopulations in the Montana portion of the Kootenai Subbasin.

Performance Measure	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk
Subpopulation Size	2	9	0
Growth and Survival	1	10	0
Life History and Diversity	3	8	0
Persistence and Genetic Integrity	1	10	0

Westslope Cutthroat Trout

One measure of the status of westslope cutthroat trout is how much of their historical habitat is still occupied by genetically pure populations. Shepard and others (2003) report that genetically unaltered or suspected unaltered populations occupy only 12 percent of historically occupied habitat in the U.S. portion of the Kootenai Subbasin.

Shepard and others (2003) also assessed demographic and stochastic population risks for those existing westslope cutthroat trout conservation

[2] *We assigned a score of 1 to subpopulations that were functioning at an unacceptable risk, a score of 2 to those were functioning at risk, and a score of 3 to those that were functioning appropriately. The composite score for all four parameters is 2.16. If the optimum is 3, the species is functioning at about 72 percent of optimum with respect to these four measures.*

populations using criteria established by Rieman et al. (1993). All of the conservation populations in the subbasin were rated. Shepard's team considered four separate types of risk: temporal variability, population size, population productivity, and isolation (Appendices 71 and 72). These four main factors were assessed individually and then weighted and summed to derive a final composite risk factor. Weightings were assigned to each risk factor. Weighted composite risk scores ranged from 4 to 16 and were then ranked into four low to high risk categories by placing them in four nearly equal-sized bins (4 to < 7; 7 to < 10; 10 to <13; and 13 to 16) (Shepard et al. 2003).

We averaged these risk scores across all the populations assessed within the U.S. portion of the Kootenai Subbasin and found that when calculated by the number of populations, westslope cutthroat trout isolet populations are operating at 69 percent of optimum with respect to these risk factors (the lowest risk category being the optimum). Metapopulations are operating at about 81 percent of optimum. When calculated by stream miles occupied by each population, we found isolets were operating at about 74 percent of optimum and metapopulations at 79 percent of optimum.

Columbia River redband trout

The USFS reports that current populations on the Kootenai and Idaho Panhandle National Forests range from strong to depressed, although on the Idaho Panhandle National Forest, little is known about the status of Kootenai-drainage Columbia River redband trout populations. In all but five of the 6-field HUCs in the Idaho portion of the Kootenai, the Columbia River redband trout status is described by the USFS as "presence unknown." In three HUCs, redbands are known to be present but their population status is unknown, and in two they are present but depressed. Results of genetic surveys in Montana indicate that Columbia River redband trout, once native to low-gradient valley-bottom streams throughout the Kootenai River drainage, are presently restricted to a handful of headwater areas. In the Upper Kootenai Subbasin, Muhlfeld (2003) reports that genetically pure stocks of Columbia River redband trout have been identified in Callahan Creek, Basin Creek, the upper north (British Columbia) and east forks of the Yaak River, and upper Big Cherry Creek and Wolf Creek (Allendorf et al. 1980; Leary et al. 1991; Huston 1995; Hensler et al. 1996). Recent results of additional genetic testing conducted by MFWP (Allendorf 2003 unpublished) show the range of genetically pure populations of Columbia River redband trout also includes upper Libby Creek and the upper Fisher River (including the Pleasant Valley Fisher and East Fisher River drainages). The status of these Montana Columbia River redband trout populations is presumed to be stable (J. Dunnigan, MFWP, pers. comm. 2004). Allendorf and others (1980) surmised that "planting of hatchery rainbow trout has created a situation of tremendous genetic divergence among local populations."

Kokanee

From a Subbasin perspective, most kokanee populations appear relatively stable and abundant, bearing in mind that the impacts of the Duncan and Libby dams were never fully assessed. Therefore, pre-dam population levels are unknown. Abundance is a relative term, with today's observations of abundance most likely considered sparse by previous generations of Native Americans and early Europeans. There are currently six major populations of kokanee in the Kootenai River Subbasin, in Idaho, Montana, and British Columbia: Trout Lake, Duncan Reservoir, Kootenay Lake, Moyie Lake, and Koocanusa Reservoir. All these lakes, the Kootenai River, and their tributaries support natural kokanee populations, albeit the Koocanusa population and most likely the Moyie Lake population are naturalized as a result of earlier introductions (Appendix 1 and 2). In addition to the above 6 kokanee populations, a native South Arm (Kootenay Lake) kokanee stock historically reared in the lake's South Arm, and ascended upstream tributaries to spawn in BC and Idaho. However, this stock is thought to be functionally extinct (Ashley and Thompson 1994). In addition, the six major populations, there are probably dozens of other small lakes within the subbasin that support Kokanee.

Burbot

Substantial adult burbot populations in the Kootenai Subbasin currently exist in Lake Koocanusa and Trout Lake, with remnant populations between Libby Dam and Kootenai Falls and in the South Arm of Kootenay Lake. Burbot populations in the riverine portion of the Kootenai Subbasin and in the West Arm of Kootenay Lake have been reduced to substantially low levels and may be functionally extirpated. Very few burbot remain in the Kootenai River Subbasin between Kootenay Lake and Kootenai Falls. In this reach of the Subbasin, the greatest concentration occurs near and in the Goat River in B.C., and even there the numbers are quite small.

Imperiled status formed the basis for the petition to list Lower Kootenai River burbot as endangered under the Endangered Species Act (Prepared February 2, 2000, received by the USFWS February 7, 2000) (http://www.wildlands.org/w_burbot_pet.html). Based on most recent (2003) stock assessment modeling of burbot in this portion of the Subbasin, abundance estimates ranged between

50 and 500 fish, likely closer to 50 than 500 (Ray Beamesderfer, S.P. Cramer and Associates, personal communication, September 2003). No other current population abundance estimates exist for Kootenai Subbasin burbot.

Sturgeon

Empirical demographic modeling during 2002 revealed increasingly imperiled demographic status for the endangered Kootenai River white sturgeon population. Modeling suggested 90, 75, and 72 percent reductions in population abundance, biomass, and annually available spawners, respectively, during the past 22 years (1980-2002), and a current population "halving time" of 7.4 years. Recruitment failures continue to drive the decline of the Kootenai sturgeon population. No significant recruitment of juvenile sturgeon has occurred since at least 1974 and consistent recruitment has not occurred since at least 1965. A few wild juveniles are periodically captured (0-11 annually). Of 659 recently captured juveniles, 620 were hatchery-reared and 39 (~6 percent) were wild, confirming very low natural recruitment. Managed (augmented) flows have not stimulated recruitment to date as hoped. Thus, prospects for restoring natural production remain uncertain. Furthermore, this population may be currently or intermittently stock-limited (Anders et al. 2002).

6.1.4 Key Factors Impeding Optimal Ecological Functioning and Biological Performance

Aquatic System

Limiting factors vary by species and area. Tables 6.14 through 6.23 list the key factors identified through the use of QHA as the most limiting for aquatic focal species in the Kootenai Subbasin.

Table 6.14. Major limiting factors for bull trout in streams & reservoirs in the U.S. portion of the subbasin. Limiting factors (habitat attributes) are defined in tables 4.12 and 4.13.

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

[1] *Channel Stability and Fine Sediment have the same QHA score.*

Table 6.15. Major limiting factors for bull trout in streams and lakes in the Canadian portion of the subbasin. Based on our QHA assessment, various data sets, and professional knowledge.

Waterbody Type and Area	Primary Bull Trout Limiting Factors			
Streams	**Habitat-Related**			**Biological**
Subbasin-wide	Channel Stability	Fine Sediment	Riparian Condition	Non-native Species
Bull River	Low Flow	Fine Sediment	Channel Stability	Non-native Species
Duncan Lake	Channel Stability	Fine Sediment	Riparian Condition1	Non-native Species
Elk	Fine Sediment	Channel Stability	Riparian Condition2	Non-native Species
Kootenay Lake	Channel Stability	Riparian Condition	Fine Sediment	Non-native Species
Slocan	Fine Sediment	Riparian Condition	Channel Stability	Non-native Species
St. Mary	Channel Stability	Fine Sediment	Riparian Condition	Non-native Species
Lakes	**Habitat-Related**			**Biological**
Subbasin-wide	Migrat. Obstruction	Trophic Status	Hydraulic Regime	Non-native Species

[1] *Riparian Condition and Habitat Diversity have the same QHA score.*

Table 6.16. Major limiting factors for westslope cutthroat trout in streams and lakes in the U.S. portion of the subbasin. Based on QHA assessment, various data sets, and professional knowledge.

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	Riparian Condition	Habitat Diversity	Channel Stability	Non-native Spp & Introgression
Yaak	Riparian Condition	Fine Sediment	Channel Stability	Non-native Spp & Introgression
Lakes	**Habitat-Related**			**Biological**
Subbasin-wide	Shoreline Condition	Hydraulic Regime	Macrophytes	Non-native Spp & Introgression

[1] *Fine Sediment and Channel Stability have the same QHA score.*
[1] *Channel Stability and Habitat Diversity have the same QHA score.*

Table 6.17. Major limiting factors for westslope cutthroat trout in streams and lakes in the Canadian portion of the subbasin. Based on QHA assessment, various data sets, and professional knowledge.

Waterbody Type and Area	**Primary Westslope Cutthroat Trout Limiting Factors**			
Streams	**Habitat-Related**			**Biological**
Subbasin-wide	Riparian Condition	Channel Stability	Habitat Diversity	Non-native Spp & Introgression
Bull River	Fine Sediment	Habitat Diversity	Riparian Condition	Non-native Spp & Introgression
Elk	Habitat Diversity	Fine Sediment	Riparian Condition[2]	Non-native Spp & Introgression
Kootenay Lake	Habitat Diversity	Riparian Condition	Channel Stability	Non-native Spp & Introgression
Kootenay River	Riparian Condition	Channel Stability	Habitat Diversity	Non-native Spp & Introgression
St. Mary	Riparian Condition	Channel Stability	Habitat Diversity	Non-native Spp & Introgression
Lakes	**Habitat-Related**			**Biological**
Subbasin-wide	Shoreline Condition	Hydraulic Regime	Migrat. Obstruction	Non-native Spp & Introgression

[1] *Riparian Condition and Channel Stability have the same QHA score.*

Table 6.18. Major limiting factors for Columbia River redband trout in streams and lakes in the U.S. portion of the subbasin. Based on our QHA assessment, various data sets, and professional knowledge.

Waterbody Type and Area	**Primary Redband Trout Limiting Factors**			
Streams	**Habitat-Related**			**Biological**
Subbasin-wide	Riaprian Condition	Fine Sediment	Alterred Thermograph	Non-native Spp & Introgression
Regulated Mainstem	Altered Hydrograph	Riparian Condition	Altered Thermograph	Non-native Spp & Introgression
Upper Kootenai	Riparian Condition	High Temperature	Low Flow	Non-native Spp & Introgression
Fisher	Fine Sediment	Riparian Condition	High Temperature	Non-native Spp & Introgression
Lower Kooteani	Riparian Condition	Channel Stability	Fine Sediment	Non-native Spp & Introgression
Moyie	Riparian Condition	Channel Stability	Fine Sediment	Non-native Spp & Introgression
Yaak	Riparian Condition	Fine Sediment	High Temperature[1]	Non-native Spp & Introgression
Lakes	**Habitat-Related**			**Biological**
Subbasin-wide	Hydraulic Regime	Migrat. Obstruction	Shoreline Condition	Non-native Spp & Introgression

[1] *High Temperature, Channel Stability, and Low Flow have the same QHA score.*

Table 6.19. Major limiting factors for Columbia River redband trout in streams and lakes in the Canadian portion of the subbasin. Based on our QHA assessment, various data sets, and professional knowledge.

Waterbody Type and Area	**Primary Redband Trout Limiting Factors**			
Streams	**Habitat-Related**			**Biological**
Subbasin-wide	Riparian Condition	Channel Stability	Fine Sediment	Non-native Spp & Introgression
Duncan Lake	Channel Stability	Riparian Condition	Fine Sediment	Non-native Spp & Introgression
Kootenay Lake	Riparian Condition	Channel Stability	Fine Sediment	Non-native Spp & Introgression
Kootenay River	Riparian Condition	Channel Stability	Fine Sediment	Non-native Spp & Introgression
Slocan	Riparian Condition	Fine Sediment	Channel Stability	Non-native Spp & Introgression
Lakes	**Habitat-Related**			**Biological**
Subbasin-wide	Hydraulic Regime	Migrat. Obstruction	Shoreline Condition	Non-native Spp & Introgression

Table 6.20. Major limiting factors for kokanee in streams and lakes in the U.S. portion of the subbasin.

Waterbody Type and Area	Primary Kokanee Limiting Factors			
Streams		**Habitat-Related**		**Biological**
Subbasin-wide	Altered Hydrograph	Altered Thermograph	Pollutants	Non-native Species
Regulated Mainstem	Altered Hydrograph	Altered Thermograph	Fine Sediment[1]	Non-native Species
Lower Kootenai	Altered Thermograph	Channel Stability	Pollutants	Non-native Species
Moyie	Pollutants	Riparian Condition	Altered Hydrograph	Non-native Species
Lakes		**Habitat-Related**		**Biological**
Subbasin-wide	Hydraulic Regime	Volumetric Turnover	Migrat. Obstructions	Non-native Species

[1] *Fine Sediment and Channel Stability have the same QHA score.*

Table 6.21. Major limiting factors for kokanee in streams and lakes in the Canadian portion of the subbasin.

Waterbody Type and Area	Primary Kokanee Limiting Factors			
Streams		**Habitat-Related**		**Biological**
Subbasin-wide	Channel Stability	Fine Sediment	Riparian Condition	Non-native Species
Duncan Lake	Channel Stability	Fine Sediment	Riparian Condition	Non-native Species
Kootenay Lake	Riparian Condition	Fine Sediment	Channel Stability	Non-native Species
Slocan	FineSediment	Channel Stability	Riparian Condition	Non-native Species
Lakes		**Habitat-Related**		**Biological**
Subbasin-wide	Hydraulic Regime	Volumetric Turnover	Migrat. Obstructions	Non-native Species

Table 6.22. Major habitat and biological limiting factors for burbot in the mainstem Kootenai and lakes based on information from the KVRI Burbot Conservation Strategy (KVRI Burbot Committee 2004) and from Hammond and Anders (2003), Ahrens and Korman (2002), Paragamian (2002), and Anders et al. (2002).

Stream	Habitat Related	Biological
Upper Kootenai River	Increased winter water flow, Increased winter water temperature, Environmental degradation, Changes in primary and secondary productivity (downstream from Libby dam), and Altered ecological community composition	Small population size, Recruitment failure
Lower Kootenai River	Increased winter water flow, Increased winter water temperature, Environmental degradation, Changes in primary and secondary productivity (downstream from Libby dam), Kootenay Lake flood control, and Altered ecological community composition	Small population size, Recruitment failure
Kootenay River	Changes in primary and secondary productivity, Kootenay Lake flood control, and Altered ecological community composition	Small population size, Recruitment failure
Lakes	**Habitat Related**	**Biological**
Kootenay Lake	Changes in primary and secondary productivity, Kootenay Lake flood control, and Altered ecological community composition	Small population size, Recruitment failure
Duncan Lake		Small population size, Recruitment failure

Table 6.23. Major habitat and biological limiting factors for white sturgeon in the mainstem Kootenai and lakes.

Stream	Habitat Related	Biological
Upper Kootenai River	No sturgeon left/present	Small population size, Recruitment failure
Lower Kootenai River	Increased winter water flow, Increased winter water temperature, Environmental degradation, Changes in primary and secondary productivity (downstream from Libby dam), Kootenay Lake flood control, Loss of riparian habitat sloughs an side channels, and Altered ecological community composition	Small population size, Recruitment failure, loss of riparian habitat, sloughs, and side channels
Kootenay River	Increased winter water flow, Increased winter water temperature, Environmental degradation, Changes in primary and secondary productivity (downstream from Libby dam), Kootenay Lake flood control, and Altered ecological community composition	Small population size, Recruitment failure
Lakes	**Habitat Related**	**Biological**
Kootenay Lake	Environmental degradation, Changes in primary and secondary productivity (downstream from Libby dam), Kootenay Lake flood control, and Altered ecological community composition	Small population size, Recruitment failure

Terrestrial System

As with the aquatic biome, terrestrial-biome limiting factors vary by species and biome. Because we considered a large number of species in our terrestrial assessment, we identified the human impacts inhibiting populations of target species and ecological processes and functions. Those are listed in table 6.24 (not necessarily in order of importance).

Table 6.24. Human impacts inhibiting populations of target species and major terrestrial ecological processes and functions.

Regulated Mainstem					
Riparian	Altered Hydrograph	Diking			
Wetland	Altered Hydrograph	Diking			
Rest of the Subbasin					
Mesic Forest	Forest Management	Fire Exclusion	Non-native Species	Roads	Insect & Disease
Grassland/Shrub	Forest Encroachment	Land Conversion	Overgrazing	Human Developments	Non-native Species
Riparian	Forest Management	Land Conversion	Non-native Species	Human/Wildlife Conflicts	Impoundment Reduction in Nutrients/Productivity
Wetland	Roads	Land Conversion	Overgrazing	Forest Management	Impoundment Reduction in Nutrients/Productivity
Xeric Forest	Fire Exclusion	Forest Management	Non-native Species		

6.2 Subbasin Working Hypothesis

6.2.1 Aquatic System

Resident Salmonids

We developed the following four-part working hypothesis for resident salmonids at the subbasin scale in the U.S. portion of the subbasin:

1. The primary habitat factors limiting resident salmonids in the regulated mainstem portion of the subbasin are an altered hydrograph, riparian condition, turbidity and fine sediments, connectivity, and an altered thermal regime. Reduced nutrient loading to the Kootenai River downstream of Libby Dam (due to Koocanusa Reservoir acting as a nutrient sink) is also a primary factor limiting productivity of native species.

2. Habitat factors limiting resident salmonids in headwater and tributary streams on a subbasin scale are degraded riparian areas, channel stability, fine sediment, an altered thermal regime, and habitat diversity[3].

3. In lakes and reservoirs, the primary habitat factors for resident salmonids on a subbasin scale are hydraulic regime, migratory obstructions, shoreline conditions, and volumetric turnover rates.

4. The presence of nonnative species is a primary biological factor limiting resident salmonids on a subbasin scale.

We based this hypothesis on the QHA spreadsheet analysis, USFWS (2002), USFWS (1999), other published reports and studies, and professional knowledge and judgment. With regard to the determination of habitat factors, we assumed different habitat attributes and life stages should carry different weights. Those stream-habitat assumptions for bull trout, westslope cutthroat trout, Columbia River redband trout, and kokanee are shown in table 6.25. Lake-habitat assumptions are shown in table 6.26.

---

[3] *Our analysis of the QHA results did not identify habitat diversity as a major limiting factor for resident salmonids at the subbasin scale, however, it did identify it as a major limiting factor for westslope cutthroat trout in four of six HUC-4 watersheds. The Technical Team has therefore chosen to include it as part of our working hypothesis for resident salmonids.*

Table 6.25. Assumptions made with respect to focal species and their use of habitat. These took the form of weights assigned to different life stages and habitat attributes. Life stage weights range between 1 and 3, habitat attribute weights between 1 and 2.

Stream habitat utilization life stages	Life Stage Weight (1-3)	Riparian Condition	Channel Stability	Habitat Diversity	Fine Sediment	High Flow	Low Flow	Oxygen	Low Temp	High Temp	Pollu-tants	Obstructions
Bull Trout												
Spawning and incubation	3	1.0	2.0	1.0	2.0	2.0	2.0	2.0	0.5	2.0	2.0	0.0
Rearing (growth and feeding)	3	2.0	2.0	2.0	2.0	1.0	2.0	2.0	0.0	2.0	2.0	1.0
Migration	2	0.5	0.5	0.5	0.5	0.5	2.0	2.0	0.0	2.0	2.0	2.0
Westslope Cutthroat Trout												
Spawning and incubation	3	2.0	2.0	2.0	2.0	1.5	2.0	2.0	0.0	1.0	2.0	0.0
Rearing (growth and feeding)	3	2.0	2.0	2.0	2.0	1.5	1.0	2.0	2.0	2.0	2.0	1.5
Migration	1	0.5	0.5	1.0	0.0	0.5	2.0	2.0	0.0	1.0	2.0	2.0
Redband Trout												
Spawning and incubation	3	2.0	2.0	1.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	0.0
Rearing (growth and feeding)	3	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0	1.0
Migration	2	1.0	1.0	1.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	2.0
Kokanee												
Spawning and incubation	3	1.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Rearing (growth and feeding)	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Migration	2	1.0	1.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0

Life stage weights were assigned on the basis of the duration of the life stage and its potential vulnerability to physical habitat conditions for the focal species.

Attribute weights rank the importance the Technical Team ascribed to the attribute with regard to the life stage of the focal species.

Table 6.26. Assumptions made with respect to focal species and their use of lake habitats. These took the form of weights assigned to different life stages and habitat attributes. Life stage weights range between 1 and 3, habitat attribute weights between 1 and 2.

Stream habitat utilization life stages	Life Stage Weight (1-3)	Temperature	Oxygen	Gas saturation	Volumetric turnover rates	Pollutants	Trophic status	Entrainment	Migratory obstruction	Macrophytes	Hydraulic regime	Shoreline condition	Habitat diversity	Substrate condition
Bull Trout														
Spawning and incubation	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Young of the Year	1	2.0	2.0	2.0	0.0	1.0	1.5	2.0	0.0	0.0	2.0	2.0	2.0	2.0
Juvenile	4	2.0	2.0	1.0	1.5	1.0	2.0	2.0	2.0	0.0	1.0	0.5	0.5	0.5
Adult	4	2.0	2.0	0.5	1.5	1.5	2.0	1.5	2.0	0.0	1.0	0.5	0.5	0.5
Westslope Cutthroat Trout														
Spawning and incubation	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Young of the Year	1	2.0	2.0	2.0	0.0	1.0	1.5	2.0	0.0	1.0	2.0	2.0	2.0	2.0
Juvenile	4	2.0	2.0	1.0	1.5	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0
Adult	4	2.0	2.0	0.5	1.5	1.5	2.0	1.5	2.0	1.0	2.0	2.0	1.0	1.0
Redband Trout														
Spawning and incubation	4	2.0	2.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	2.0	1.5	0.0	2.0
Young of the Year	1	2.0	2.0	2.0	0.0	1.0	1.5	2.0	0.0	1.0	2.0	2.0	2.0	2.0
Juvenile	4	2.0	2.0	1.0	1.5	1.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	1.0
Adult	4	2.0	2.0	0.5	1.5	1.5	2.0	1.5	2.0	0.0	1.0	0.5	0.5	0.5
Kokanee														
Spawning and incubation	4	2.0	2.0	0.5	0.0	2.0	0.0	0.0	0.0	0.0	2.0	2.0	0.5	2.0
Young of the Year	4	1.5	1.0	0.0	2.0	0.5	2.0	2.0	0.0	0.0	2.0	1.0	1.0	1.0
Juvenile	4	1.5	1.0	0.0	2.0	0.5	2.0	2.0	0.0	0.0	2.0	0.0	0.0	0.0
Adult	4	2.0	1.0	0.0	2.0	0.5	2.0	2.0	2.0	0.0	2.0	0.0	0.0	0.0

Burbot

We developed the following working primary (numbers) and secondary (letters) hypotheses to explain limitation for burbot at the subbasin level in the Kootenai River Subbasin:

1. Recent, ongoing recruitment failure is the main external driver of extinction for burbot in the Kootenai River basin.

2. Past overharvest (contributing to current recruitment failures), and post-development physical and biological changes in the Kootenai River ecosystem during the past 75 years have reduced the size and recruitment frequencies of burbot in the Kootenai River Subbasin.

    a. Currently used spawning and rearing habitats are altered and degraded, and along with the loss of large-river floodplain ecosystem functions and dynamics, appears to be an important external driver of extinction.

3. The current demographic conditions of riverine burbot populations, as well as post-development and post-hydro may have reduced success of spawning and spawning migrations.

    a. 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.

These linked hypotheses represent findings and professional judgments based on several decades of intermittent empirical research of Kootenai River burbot. In some cases, the factors responsible for decline of extirpated or extremely depressed burbot stocks or populations can only be speculated in the absence of sufficient empirical data (Ahrens and Korman 2002).

LINKS

Holderman and Hardy (2004) discuss potential limiting factors for burbot, white sturgeon and other species in the Lower Kootenai.

Click Here

LINKS

For a riparian habitat hypothesis for successful reproduction of white sturgeon (Coutant 2004), go to Appendix 118.

Click Here

White Sturgeon

We developed the following working primary (numbers) and secondary (letters) hypotheses to explain limitation for white sturgeon at the Subbasin level in the Kootenai River subbasin:

1. Recent decadal recruitment failure is the main external driver of extinction for white sturgeon in the Kootenai River basin.

2. Current effects of post-development physical and biological changes in the Kootenai River ecosystem during the past 75 years have reduced the size and all but eliminated natural recruitment of the wild Kootenai River white sturgeon population.

    a. Currently used spawning and rearing habitats are altered and degraded, and along with the loss of large-river floodplain ecosystem functions and dynamics, appears to be an important external driver of extinction.

3. The current demographic condition of the population (n~600, 7.4 year mean halving time) appears to be the acute internal driver of extinction.

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

These linked hypotheses represent findings and professional judgments based on several decades of empirical research of Kootenai River white sturgeon, and recent demographic simulation modeling that also used empirical data.

6.2.2 Terrestrial System

For the terrestrial system at the subbasin scale, we have developed the following working hypotheses:

1. The chief impacts limiting wildlife populations in the Mesic Forest Biome on a subbasin scale are forest management, fire exclusion, non-native species (noxious weeds), roads, and forest insects and diseases.

2. The chief impacts limiting wildlife populations in the Grassland/Shrub Biome on a subbasin scale are forest encroachment, land conversion, overgrazing, human developments, and non-native species.

3. On the regulated mainstem, the chief impacts limiting wildlife populations in the Riparian Biome are altered hydrographs and diking.

4. The chief impacts limiting wildlife populations in the Riparian Biome on a subbasin scale are forest management, land conversion, non-native species, human/wildlife conflicts, impoundments, and reductions in nutrients/productivity.

5. On the regulated mainstem, the chief impacts limiting wildlife populations in the Wetland Biome are altered hydrographs and diking.

6. The chief impacts limiting wildlife populations in the Wetland Biome on a subbasin scale are roads, land conversion, overgrazing, forest management, impoundments, and reductions in nutrients/productivity.

7. In the Xeric (Ponderosa Pine) Forest Biome, the chief limiting factors are fire exclusion, forest management, and non-natives.

These hypotheses are based on our TBA spreadsheet analysis and various published and unpublished reports and studies, and professional knowledge. (Forest management impacts in the context of this section are defined as negative impacts on target wildlife species stemming from forest management practices that cause changes in thermal cover, hiding cover, large snage density, down woody debris, early seral forage habitat, the level of habitat fragmentation, and hydrologic processes. Changes to any one of these parameters may have negative or postive affects, depending on the wildlife species at issue.)

6.3 Reference Conditions

6.3.1 Aquatic and Terrestrial

Focal and target species populations have *not* been modeled on a subbasin scale for various reference conditions referenced in the *Technical Guide for Subbasin Planners* (NWPCC 2001). Consequently, the Technical Team could not make quantitative estimates. Instead, table 4.27 presents general qualitative estimates based upon the results of this assessment.

Table 6.27. Estimate of species abundance and productivity under various reference conditions (current, potential, and future/no new action)[1].

Species	Bull Trout	Westslope Cutthroat Trout	Redband Trout	Kokanee	Sturgeon	Burbot	Target Wildlife Species[3]
Relation of Current Populations to Historic Condition	60% of Historic	20% of Historic	10% of Historic	40-50%	0 to 10% of Historic	0 to 10% of Historic	50 to 70% of Optimum
Estimate of Species Abundance and Productivity under Potential Reference Condition	80 to 90% of Optimum	80% to 90% of Optimum	30% to 45% of Optimum	70-80%	25 to 30% of Optimum	25 to 30% of Optimum	70 to 80% of Optimum
Estimate of Species Abundance and Productivity under Future/No Action Reference Condition	0 to 20% of Optimum	<20% of Optimum	0 to 20% of Optimum	40-50%	0 to 5% of Optimum	0 to 5% of Optimum	30 to 50% of Optimum
Confidence of Preditions[2]	1	1	1	1	2	1	1

[1] The historic condition refers to the state of the environment at the time of European settlement, or 1850. Potential condition is defined as the desired end state or optimal condition for this subbasin in the year 2050 (similar to the historic condition but it also considers cultural modifications that are not reversible such as urbanization). Future/no new action condition is the state of the environment in 2050 assuming that current trends and current management continues. Optimum abundance and productivity means abundance and productivity of populations at time of European settlement or 1850.
[2] Confidence Scores: 0 = Unknown, 1 = Speculative, expert opinion without real data or modeling results, 2 = Expert opinion with some supporting data or modeling results, 3 = Well documented with data or modeling results.
[3] Estimates should vary by species, however insufficient data exsists to make predicitions of this nature on a species-by-species basis. The estimates presented here are general and a composite reference for all target species.

LINKS

For maps showing Class 1 and Class 2 aquatic 6th-code HUCs and terrestrial subunits (which are our near-term opportunities) as well as an overlay of aquatic and terrestrial protection and restoration areas, go to Appendix 112.

Click Here

6.4 Near-term Opportunities

Tables 6.28 to 6.30 list of near-term opportunities for protection and restoration of salmonids and potential reference sites. The lists are based on our QHA and TBA results. For aquatic opportunities we have lumped the Class 1 waters for all of the salmonid focal species to get near-term salmonid protection opportunities. Similarly, we lumped all the Class 2 and 2.5 waters for all the salmonid focal species to get the near-term salmonid restoration opportunities. If a body of water occurred in Class 1 for one focal species and Class 2 for another, it was grouped here as a Class 2 water. Within the group of Class 2 waters, streams and lakes with ESA-listed species will have a higher priority for restoration than those without ESA-listed species. Table 6.31 lists near term protection and restoration opportunities for burbot and white sturgeon. This list of near-term opportunities does not take into consideration socioeconomic concerns. The Planning Team will use the public review and management planning process to determine which opportunities are socially, economically, and politically feasible. The Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks consider all waters and lands in the subbasin worth of restoration and protection.

6.4.1 Aquatic

Class 1 Waters for Salmonids

Table 6.28. Class 1 waters for salmonids.

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	
Elk	
Brule Creek	Lizard Creek
Cummings Creek	Mid East Elk
East Fernie	Upper East Elk
East Fernie	Upper West Elk
Grave Greek	West Fernie
Kootenay Lake	
Arrow/Duck	Nixon Creek
Cultus and Next Creeks	La France, Lockhart, Akokli and Sanca Creeks
Fletcher and Bjerkness Creeks	Midge Creek
Fry Creek	North Kootenay Lake
Grohman, Duhamel, Sitkum and Sproule Creeks	Powder and Cambell Creek
Kamma and leadville Creeks	South Arm Kootenay Lake
Kianuka Creek	Sullivan Creek
Kid Creek	Summit and Corn Creeks
Kokanee and Redfish Creeks	Sunrise and Sundown Creeks

Class 1 Waters for Salmonids (cont.)

Table 6.28 (cont.). Class 1 waters for salmonids.

Class 1 Streams (cont.)	
Kootenay Lake (cont.)	
Lasca and Five Mile Creeks	Upper Moyie River and Lamb Creek
Daer Creek	West Moyie
Fenwick Creek	Ochre Creek
Lower West White River	Simpson River
Meadow Creek	Tokumm Creek
Mid Vermillion	Upper Kootenay River
Middle Fork White River	Whiteswan
Slocan	
Bonanza Creek	Seaton and Carpenter Creeks
Hoder Creek	Slocan
Koch Creek	Winlaw Creek
Gwillim Creeks	
St. Mary	
Dewar Creek	West Canal Flats
East Canal Flats	
Class 1 Lakes	
Trout Lake	

Class 2 Waters for Salmonids

Table 6.29. Class 2 waters for salmonids.

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
Kootenai River 6	Tobacco River
Kootenai River 7	Tobacco River Valley
Kootenai River 8	Wigwam River
Kootenai River 9	Young Creek
Fisher	
Bear Springs Creek	Pleasant Valley Creek
Cow Creek	Pleasant Valley / Fisher River
East Fisher Creek	Pleasant Valley Fisher River
Elk Creek	Pleasant Valley Fisher River 1
Fisher River 1	Pleasant Valley Fisher River 2
Fisher River 2	Silver Butte Fisher River
Fisher River 2 Valley	Weigel Creek
Fisher River 3	West Fisher Creek
Island Creek	Wolf Creek 1
Little Wolf Creek	Wolf Creek 2
Mainstem Fisher River Valley	Wolf Creek 2 Valley
MCGinnis Creek	Wolf Creek 3
McKillop Creek	

Class 2 Waters for Salmonids (cont.)

Table 6.29 (cont.). Class 2 waters for salmonids.

Class 2 Streams (cont.)	
Yaak	
Basin Creek	Yaak River 1
Burnt Creek	Yaak River 2
Hellroaring Creek	Yaak River 3
Pete Creek	Yaak River 4
Seventeenmile Creek 1	Yaak River 5
Seventeenmile Creek 2	Yaak River East Fork
South Fork Yaak River	Yaak River Upper West Fork
Spread Creek	Yaak Rvr. 2 Valley
Lower Kootenai	
Ball Creek	Fall Creek
Boulder Creek 1	Grass Creek
Boulder Creek 2	Kootenai River 9 Valley
Boundary Creek	Kootenai River 10 Valley
Caribou Creek	Mission Creek
Cow Creek	Myrtle Creek
Curley Creek	Smith Creek 1
Deep Creek 1	Smith Creek 2
Deep Creek 3	Snow Creek
Deep Creek 3 Valley	Twenty Mile Creek
East Fork Boulder Creek	
Moyie	
Canuck Creek	Moyie River Valley 2
Deer Creek	Moyie Tributaries
Lower Moyie River Tributaries	Round Prairie
Meadow Creek	Round Prairie Tributaries
Moyie River Valley 1	
Bull River	
Bull Below Dam	Mid Bull
Galbraith Creek	Phillipps Creek
Gold Creek	Plumbob and Chipka Creeks
Ha Ha Creek	Sand Creek
Kikomun Creek	Sulphur Creek
Linklater Creek	West Bull (above dam)
Lardeau Creek	Mobbs and Tenderfoot Creeks
Lower Trout	Poplar and Cascade Creeks
Elk	
Coal Creek	Michel Creek
Fording River	Morrissey Creek
Hosmer East	Sparwood
Hosmer West	Wigwam River

Class 2 Waters for Salmonids (cont.)

Table 6.29 (cont.). Class 2 waters for salmonids.

Class 2 Streams (cont.)	
Kootenay Lake	
Boundary Creek and Creston	Harrop Creek
Cottonwood Creek	Kaslo River
Crawford and Gray Creeks	Lower West Arm below Brilliant Dam
Goat River	Moyie River
Hawkins Creek	Woodbury and Coffee Creeks
Kootenay River	
Albert River	Lower East White River
Blackfoot, Thunder and East White	Middle Fork White River
Cochran Creek	Nine Mile Creek
Cross River	North White River
Elk Creek	Palliser River
Grave Greek	West Upper Kootenay River
Slocan	
Goose Creek	Slocan River
Silverton, Enterprise and Lemon Creeks	Wilson Creek
St. Mary	
Findlay Creek	Norbury Creek
Hellroaring and Perry Creeks	Redding and Meachen Creeks
Joseph Creek	Skookumchuck Creek
Lussier River	Upper St. Mary River
Mark Creek	Wasa
Mather and Lost Dog Creeks	Wild Horse River
Matthew Creek	
Class 2 Lakes	
Bull Lake	Koocanusa Reservoir
Boulder Lake	Leigh Lake
Duncan Lake	Moyie Lakes
Granite Lake	Sophie Lake
Kootenay Lake	Therriault Lake

HUCs with Segments or Reaches that can Serve as Reference Sites for Future Monitoring for Salmonids

Table 6.30. Waters that have segments or reaches that could serve as potential reference reaches for future monitoring for salmonids.

Potential Reference Waters	
US	
Big Creek South Fork	Long Canyon Creek
Big Creek South Fork East Branch	Middle Fork Parsnip Creek
Bristow Creek	Parker Creek
Canuck Creek	Pete Creek
Deer Creek	Phillips
Granite Creek	Phillips Creek
Grave Creek 1	Pipe Creek 1
Indian Creek	Ross Creek
Kootenai River 1 / Koocanusa	Silver Butte Fisher River
Kootenai River 2 / Koocanusa	Tobacco River
Kootenai River 3 / Koocanusa	Trout Creek
Kootenai River 4 / Koocanusa	West Fisher Creek
Kootenai River 5	Wigwam River
Lake Koocanusa Valley	Yaak River 3
Canada	
Arrow/Duck	Moyie River
Blackfoot, Thunder and East White	Nixon Creek
Cross River	North White River
Cummings Creek	Ochre Creek
Daer Creek	Quinn Creek
Dewar Creek	Simpson River
East Canal Flats	Skookumchuck Creek
East Fernie	Sparwood
East Fernie	St. Mary River
Fenwick Creek	Sullivan Creek
Findlay Creek	Sunrise and Sundown Creeks
Hawkins Creek	Tokumm Creek
Hosmer East	Upper East Bull
Hosmer West	Upper East Elk
Kamma and Leadville Creeks	Upper East Flathead
Kianuka Creek	Upper Kootenay River
Kid Creek	Upper St. Mary River
Kokanee and Redfish Creeks	Upper West Bull
Lasca and Five Mile Creeks	Upper West Elk
Lizard Creek	Upper West Flathead
Lower East White River	West Canal Flats
Lower West White River	West Fernie
Mark Creek	West Moyie
Meadow Creek	West Upper Kootenay River
Mid East Elk	Whiteswan
Mid Vermillion	Wigwam River
Middle Fork White River	

The list of reference HUCs (table 6.30) is preliminary and will be refined in the future as more data become available. Also note that when viewed as a whole, any given HUC on the list may be in relatively poor or moderate ecological condition. However, in our preliminary review, each was thought to contain at least one reach or segment that potentially could serve as a reference reach.

Prioritized list of River Reaches and Lakes for Protection and Restoration for Burbot and White Sturgeon

Table 6.31. River reaches and lakes that are a high priority for protection and restoration for burbot and white sturgeon.

Class 2 River Reaches: Restoration Priorities	
Braided Reach (Moyie River to Highway 95 Bridge)	Meander Reach (Deep Creek to Kootenay Lake)
Canyon (Idaho, MT Upstream to Kootenai Falls)	Straight Reach (Highway 95 Bridge to Deep Creek)
Class 1 Lakes: Protection Priorities	
Trout Lake	
Class 2 Lakes: Restoration Priorities	
Duncan Lake	Koocanusa Reservoir
Kootenay Lake	

6.4.2 Terrestrial

Class 1 Subunits (60 to 85 percent of optimum) by Biome

Table 6.32. Class 1 subunits by biome.

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	Koocanusa Res. 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 Koocanusa Res.-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
Trench-val	St Marys Trench
BNFRY-val	Deep Ck/Bonners Ferry south
LOFSHR-for	Lower Fisher River/Wolf Ck
TP-for	Teepee Ck watershed
Riparian Biome	
UPELK-for	All Upper Elk River
PRCL-wild	Purcell Mtns in St Marys unit-Wilderness
UPKOOT-np	All Upper Kootenai River-National Parks
BULL-for	All Bull River
KTLK-val	Other S half Kootenay Lk to US border
KTLK-wild	All NE side of Kootenay Lk/Purcell Mtns
Wigwam-for	All Wigwam Ck trib of Elk River
WTRVR-for	All White River watershed-CFS
KTLK-for	All NW side Kootenay Lk/Slocan
Wigwam-bdr	All Wigwam Ck to CAN border
YAAK-for	All riparian in Yaak River watershed
MDLELK-for	All Middle Elk River
MOYIE-bdr	All Upper Moyie River to US border

Class 1 Subunits (60 to 85 percent of optimum) by Biome (cont.)

Table 6.32 (cont.). Class 1 subunits by biome.

Xeric Forest Biome	
WTRVR-for	White River watershed-CFS
BULL-for	Bull River unit
KTLK-val	S half Kootenay Lk to US border
Wigwam-for	Wigwam Ck trib of Elk River
PRCL-wild	Purcell Mtns in St Marys unit-Wilderness

Class 2 Subunits (40 to 60 percent of optimum) by Biome

Table 6.33. Class 2 subunits by biome.

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 Koocanusa Res.-USFS
UPFSHR-for	Upper Fisher River/Paradise Valley
CABMTN-wild	Libby Ck watershed-Wilderness +
KOCNUSA-val	Koocanusa Res. east/US border portion Tobacco Plains
KOCNUSA-cval	Other Koocanusa Res. 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 Koocanusa Res. 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	Koocanusa Res. CAN unit
MOYIE-for	Lower Moyie River S of CAN border
LOKOOT-val	Lower Kootenai River valley and bench

Class 2 Subunits (40 to 60 percent of optimum) by Biome (cont.)

Table 6.33 (cont.). Class 2 subunits by biome.

Riparian Biome	
YAHK-bdr	All Upper Yahk(Yaak) River to US border
Bvrft-for	All Beaverfoot Range-CFS
Fernie-val	All Fernie area on lower Elk River
TP-for	All Teepee Ck watershed
CABMTN-for	All riparian in Lake Ck watershed-USFS
LOKOOT-for	Selkirks west of lower Kootenai River valley-USFS
KTLKWA-for	All West Arm Kootenay Lk/Nelson
Trench-val	All riparian St Marys Trench
CABMTN-wild	All riparian in Libby Ck watershed-Wilderness
MOYIE-for	All riparian in lower Moyie River watershed
KTLK-val	CVWMA (Creston Valley Waterfowl Mgmt Area)
KOCNUSA-for	All riparian West of Koocanusa Res.-USFS
BNFRY-val	Deep Ck valley riparian wetlands
UPFSHR-for	All Upper Fisher River/Paradise Valley
TBCO-val	All Tobacco River watershed
KOCNUSA-cval	All Canadian Koocanusa Res. unit
BNFRY-val	Other riparian in Deep Ck/Bonners Ferry unit
LOKOOT-val	All Lower Kootenai River valley and bench
Wetland Biome	
Wigwam-bdr	All Wigwam Ck to CAN border
CABMTN-for	Alpine wetlands in Lake Ck unit
UPKOOT-np	All Upper Kootenai River-National Parks
Bvrft-for	All Beaverfoot Range-CFS
PRCL-wild	Purcell Mtns in St Marys unit-Wilderness
BULL-for	All Bull River
MDLELK-for	All Middle Elk River
UPELK-for	All Upper Elk River
WTRVR-for	All White River watershed-CFS
KTLK-for	All NW side Kootenay Lk/Slocan
BNFRY-val	Curley Ck watershed forested wetlands
KTLK-wild	All NE side of Kootenay Lk/Purcell Mtns
Fernie-val	All Fernie area on lower Elk River
YAHK-bdr	All Upper Yahk(Yaak) River to US border
MOYIE-for	Round Prairie wetland complex
Wigwam-for	All Wigwam Ck trib of Elk River
MOYIE-for	Other wetlands in lower Moyie River watershed
YAAK-for	All wetlands in Yaak River watershed
Stmry-np	All wetlands St Marys Trench
LOKOOT-for	Selkirks west of lower Kootenai River valley-USFS
KTLK-val	Other S half Kootenay Lk to US border
CABMTN-for	Other wetlands in Lake Creek watershed-USFS
KTLKWA-for	All West Arm Kootenay Lk/Nelson
TP-for	All Teepee Ck watershed
CABMTN-wild	All wetlands in Libby Ck watershed-Wilderness
KOCNUSA-cval	All Canadian Koocanusa Res. unit
UPFSHR-for	All Upper Fisher River/Paradise Valley
MOYIE-bdr	All Upper Moyie River to US border
KOCNUSA-for	West of Koocanusa Res.-USFS
KTLK-val	CVWMA (Creston Valley Waterfowl Mgmt Area??)
BNFRY-val	Other wetlands in Deep Ck/Bonners Ferry unit
TBCO-val	All Tobacco River watershed
LOFSHR-for	All Lower Fisher River/Wolf Ck
LOKOOT-val	All Lower Kootenai River valley and bench

Class 2 Subunits (40 to 60 percent of optimum) by Biome (cont.)

Table 6.33 (cont.). Class 2 subunits by biome.

Xeric Forest Biome	
Wigwam-bdr	Wigwam Ck to CAN border
LOKOOT-for	All Selkirks west of lower Kootenai River valley-USFS
BNFRY-val	Deep Ck/Bonners Ferry south
MOYIE-for	Lower Moyie River S of CAN border
LOKOOT-val	Other Lower Kootenai River valley and E non-bench
YAAK-for	Yaak River watershed S of CAN border
KOCNUSA-cval	Koocanusa Res. CAN unit/CAN portion Tobacco Plains
CABMTN-wild	Libby Ck watershed-Wilderness +
KOCNUSA-val	Koocanusa Res. east/US border portion Tabacco Plains
CABMTN-for	Lake Ck watershed-USFS
Trench-val	St Marys Trench
TBCO-val	Tobacco River watershed
LOKOOT-val	Lower Kootenai River bench between valley and E mtns
KOCNUSA-for	West of Koocanusa Res.-USFS
UPFSHR-for	Upper Fisher River/Paradise Valley
LOFSHR-for	Lower Fisher River/Wolf Ck

Class 3 Subunits (Less than 40 percent of optimum) by Biome

Table 6.34. Class 3 subunits by biome.

Grassland/Shrub Biome	
Fernie-val	All Fernie area on lower Elk River
Trench-val	Wycliffe Prairie (in St. Marys Unit)
Riparian Biome	
LOFSHR-for	All Lower Fisher River/Wolf Ck
KOCNUSA-val	All Koocanusa Res. east
Wetland Biome	
KOCNUSA-val	All Koocanusa Res. east

6.5 Strategies

The Kootenai Subbasin Planning Team developed a list of appropriate strategies for accomplishing objectives as part of the Management Plan. Those strategies are based upon the results of this assessment and suggestions and comments received from the Kootenai Subbasin Technical Team, Working Group, and the public.

6.6 Maps Showing Near-term Opportunities

LINKS

For high resolution near-term opportunity maps, go to Appendix 112.

Click Here

The pages that follow present low resolution maps of: (1) aquatic near-term opportunities, (2) terrestrial near-term opportunties, and (3) overlays of aquatic and terrestrial near-term opportunities. For each of the three groups, a subbsin-scale map is followed by a series of five HUC-4 scale maps (Upper Kootenai, Fisher, Yaak, Moyie, and Lower Kootenai). These same maps in a higher resolution format are included as Appendix 112.

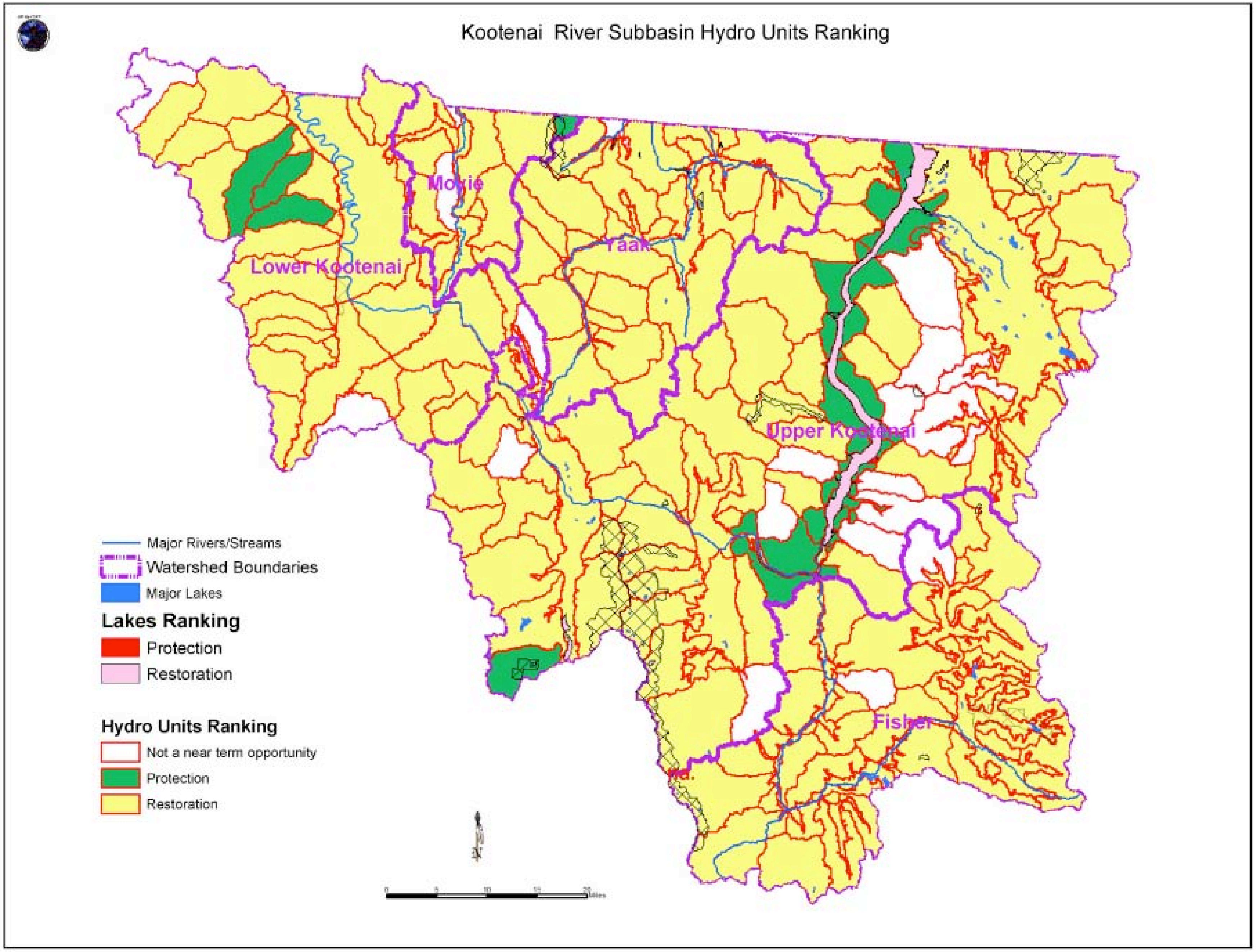

Figure 6.2. Aquatic near-term opportunities in the Kootenai Subbasin.

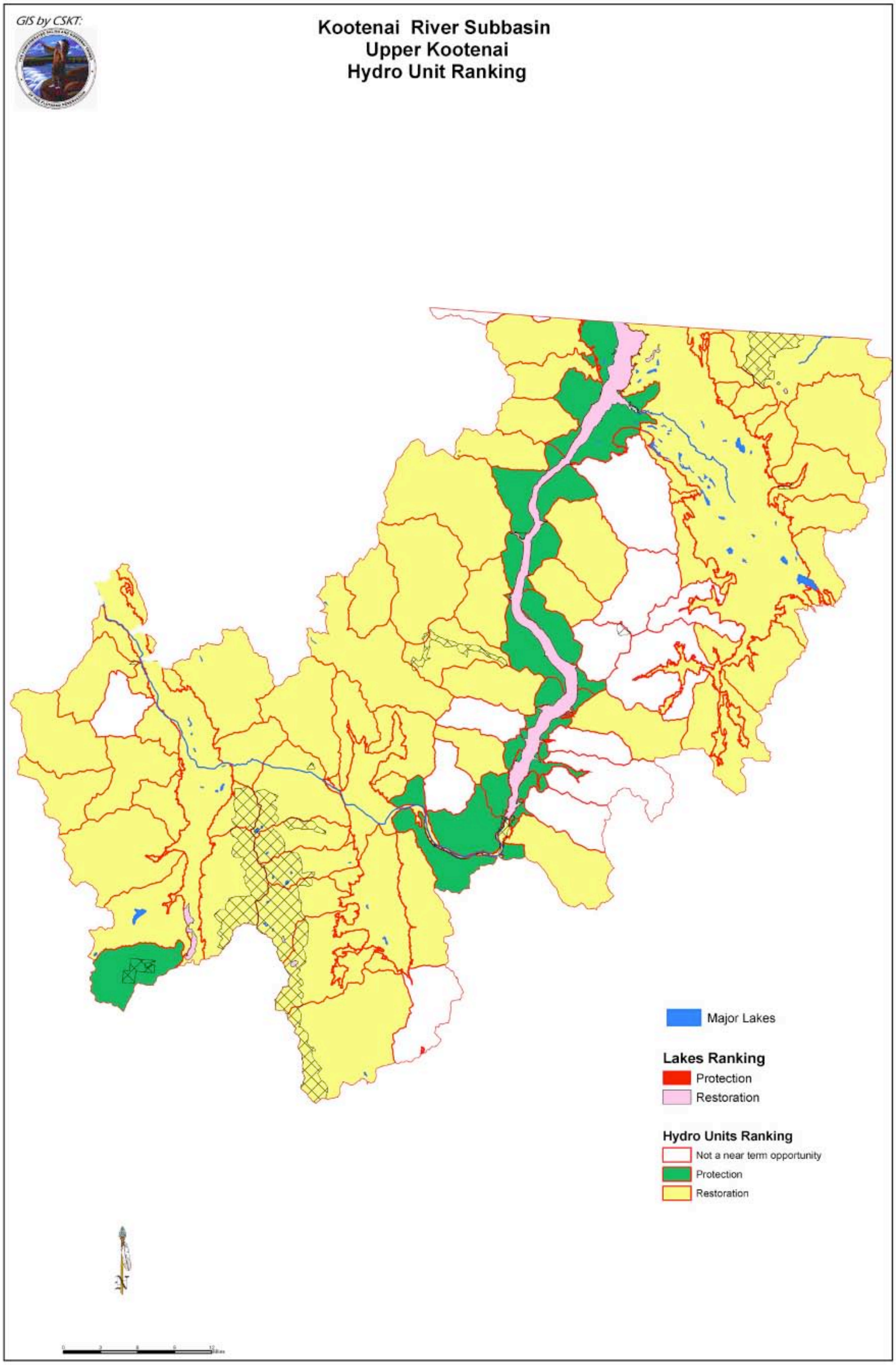

Figure 6.3. Aquatic near-term opportunities in the Upper Kootenai.

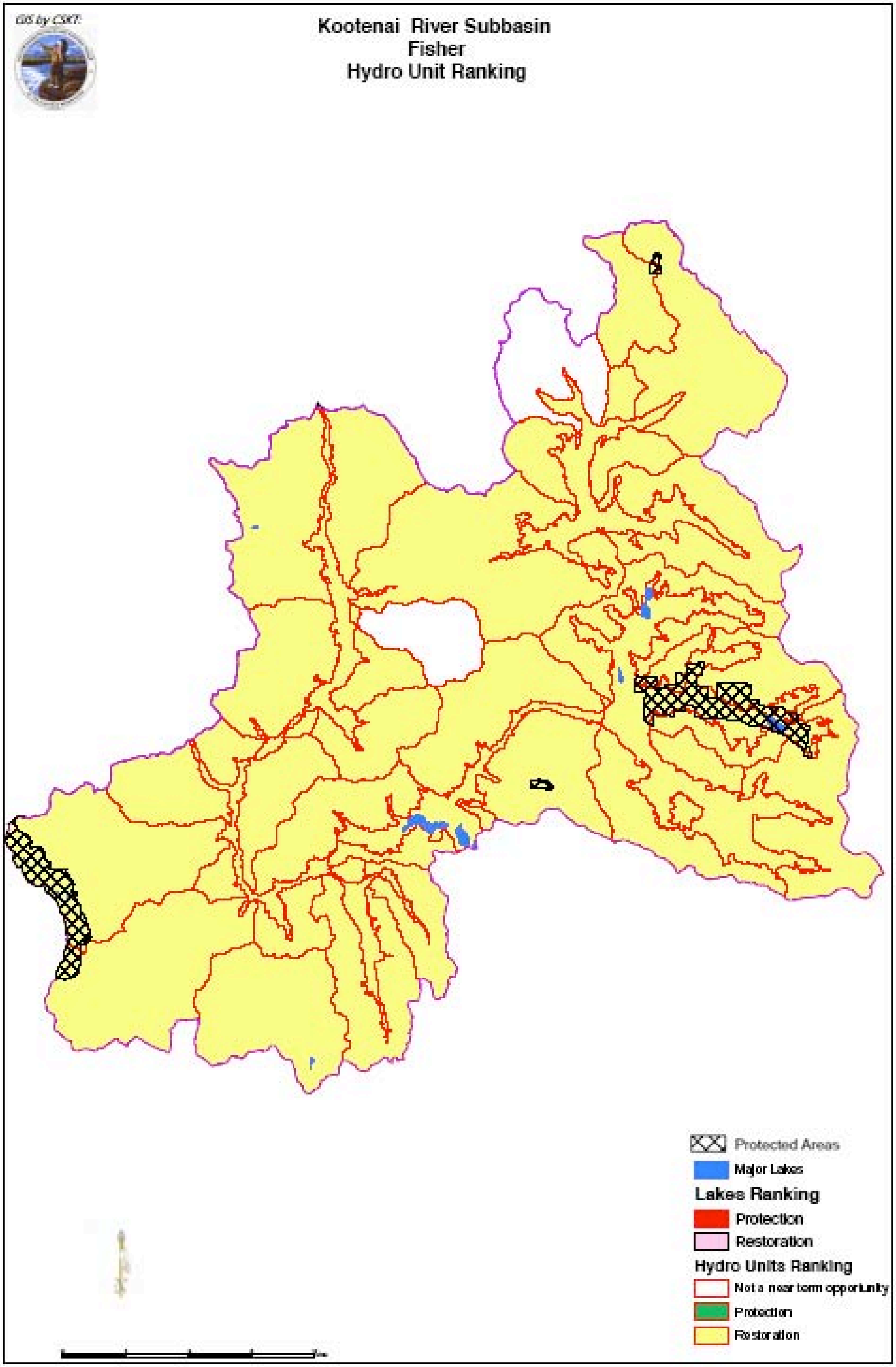

Figure 6.4. Aquatic near-term opportunities in the Fisher Watershed.

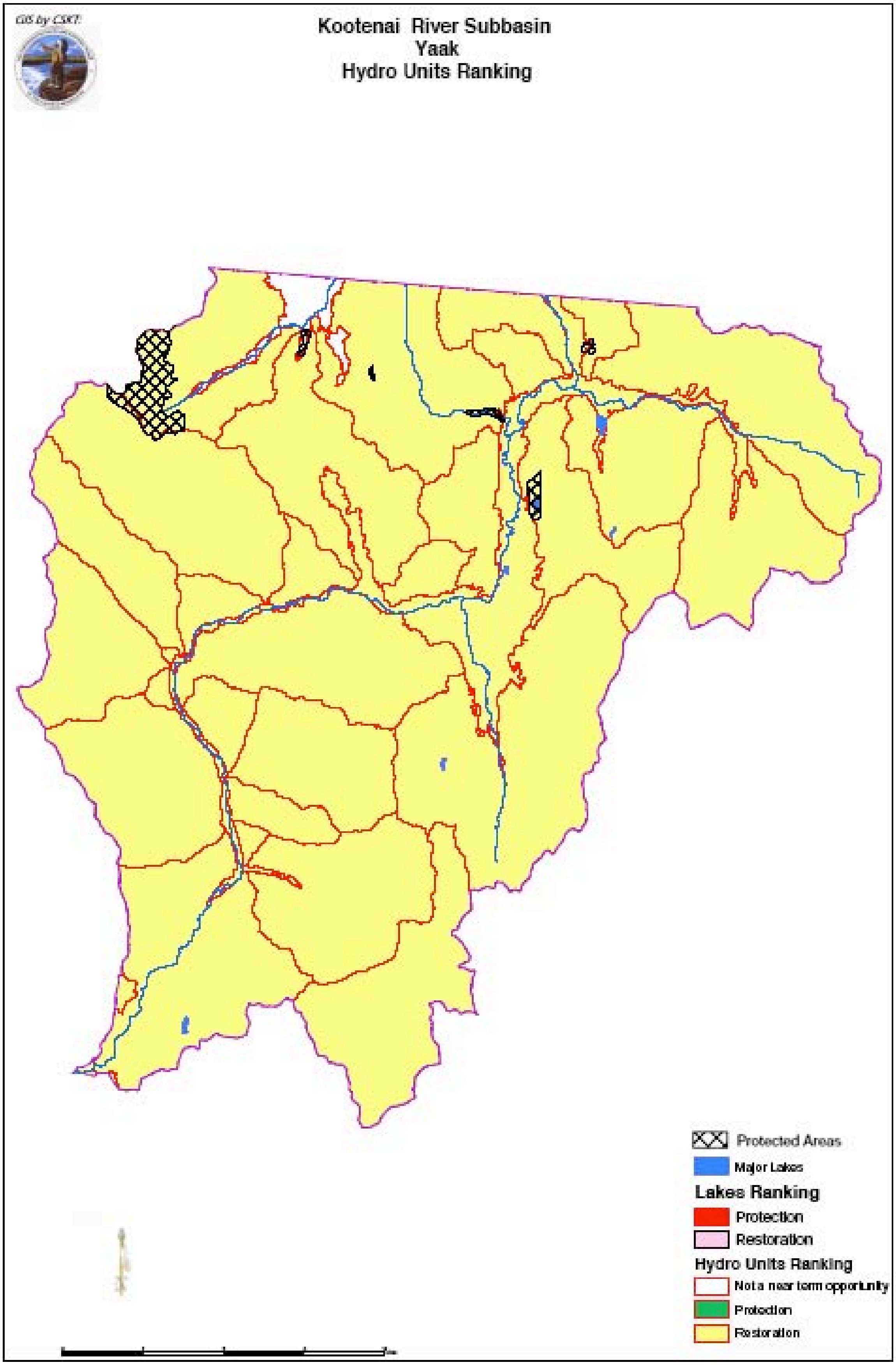

Figure 6.5. Aquatic near-term opportunities in the Yaak Watershed.

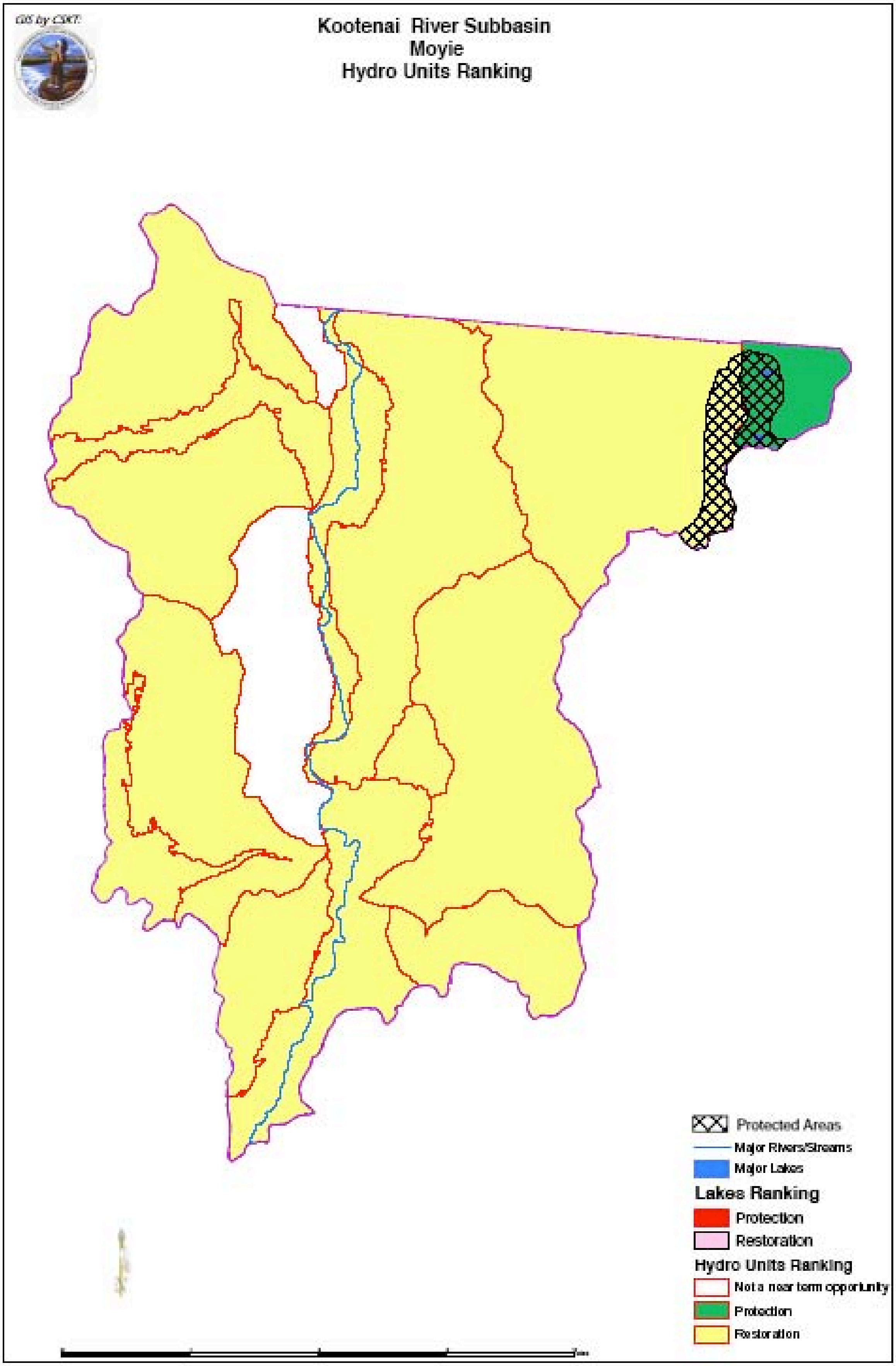

Figure 6.6. Aquatic near-term opportunities in the Moyie Watershed.

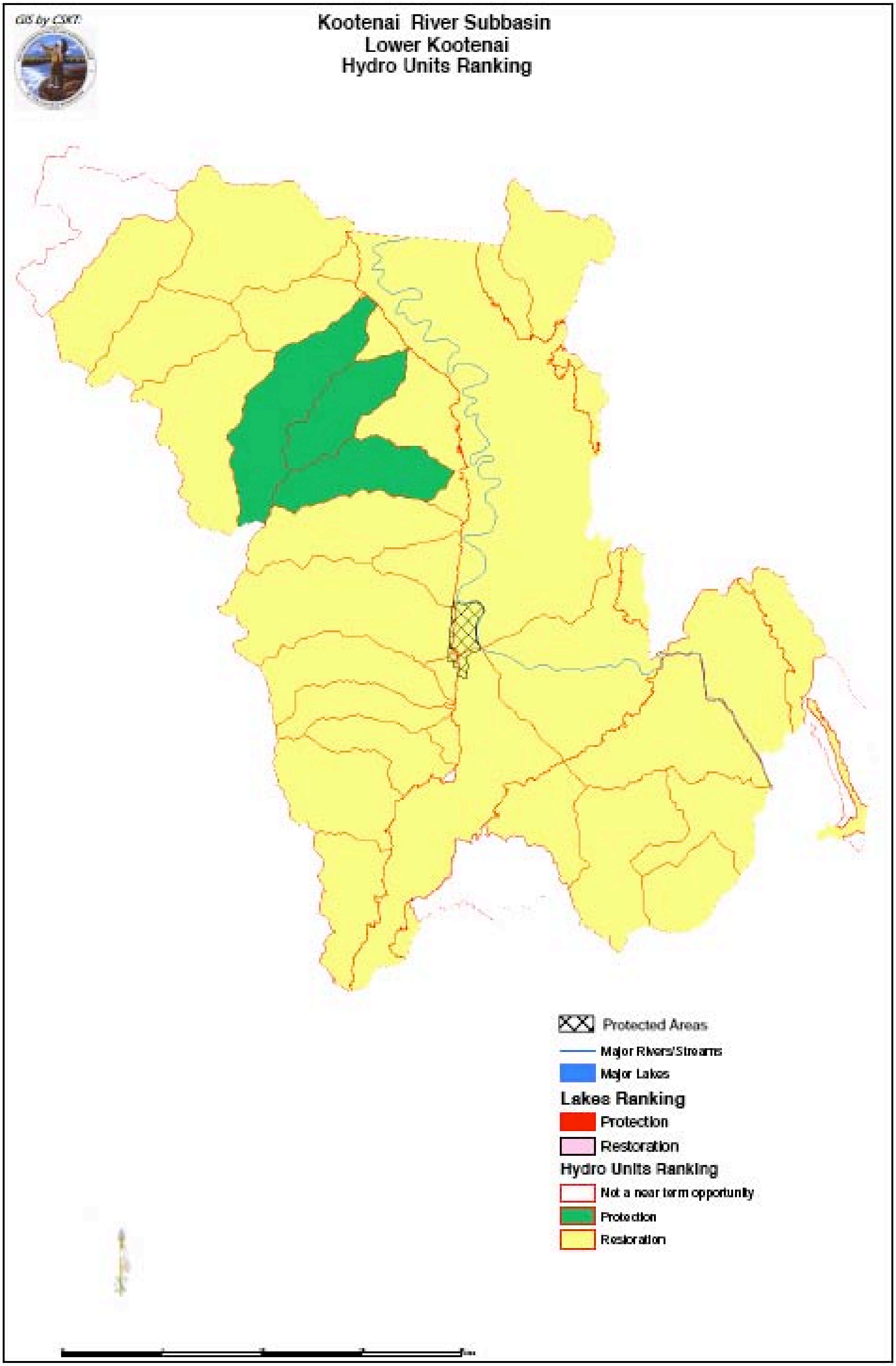

Figure 6.7. Aquatic near-term opportunities in the Lower Kootenai.

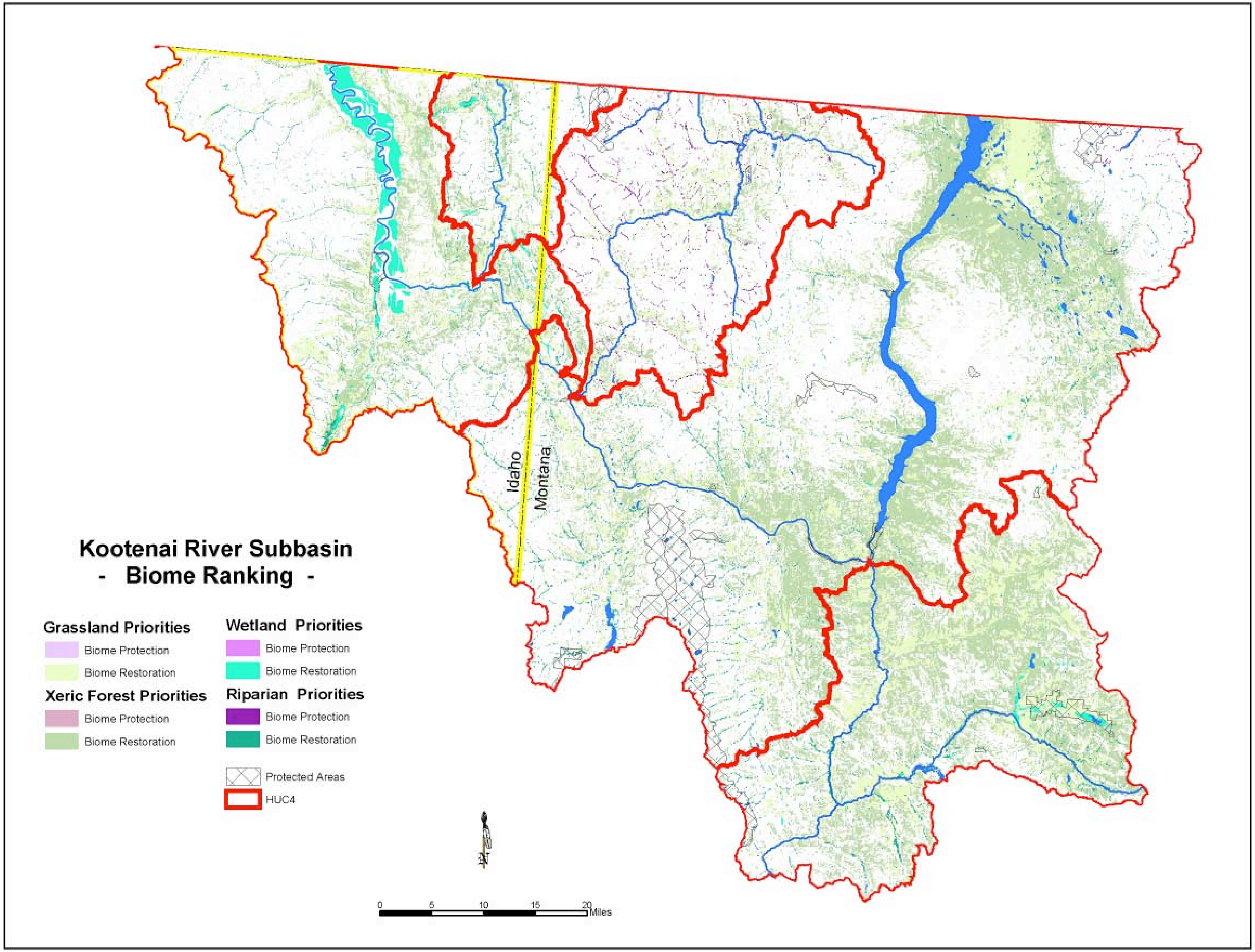

Figure 6.8. Terrestrial near-term opportunities in the Kootenai Subbasin.

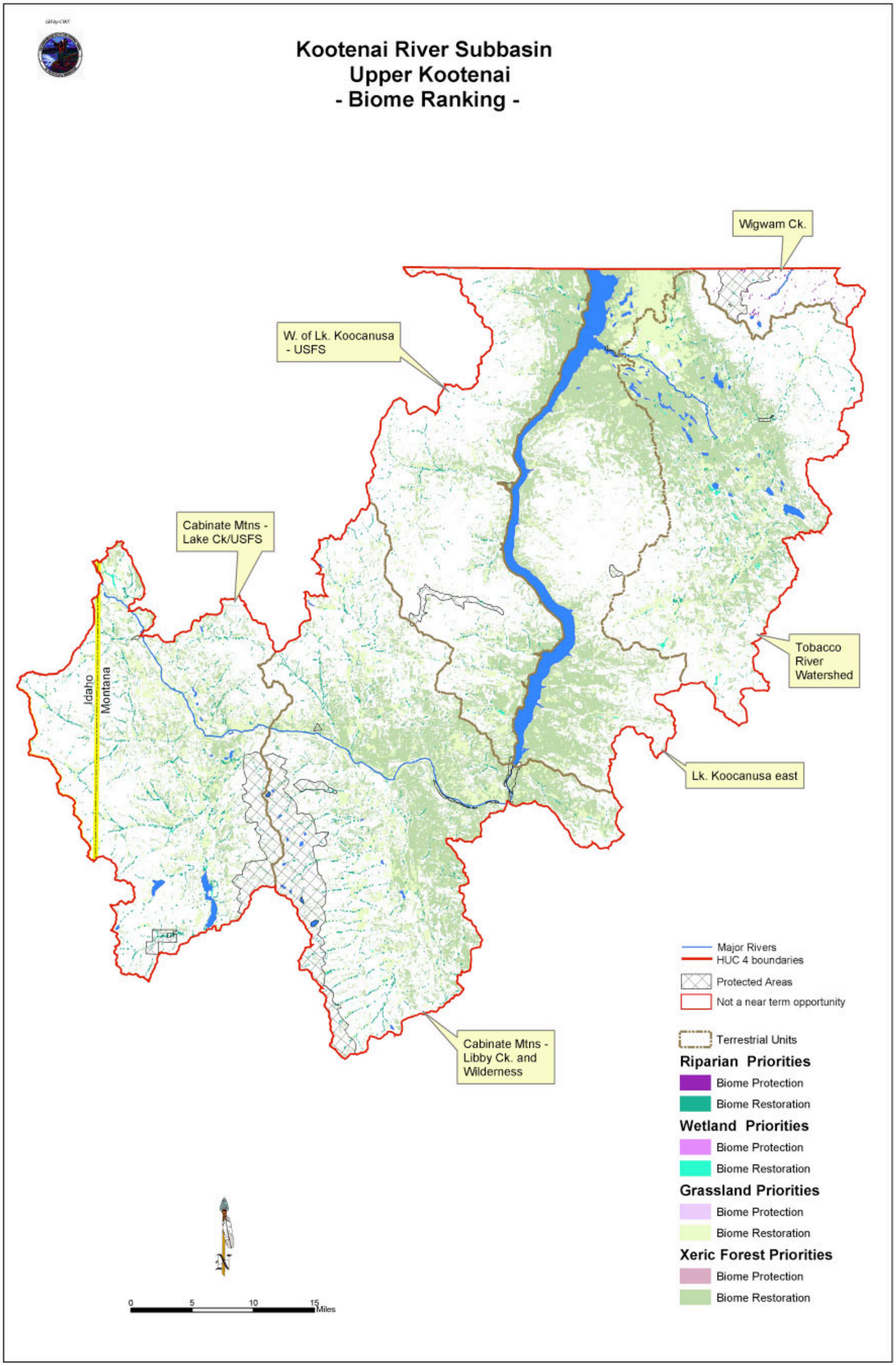

Figure 6.9. Terrestrial near-term opportunities in the Upper Kootenai.

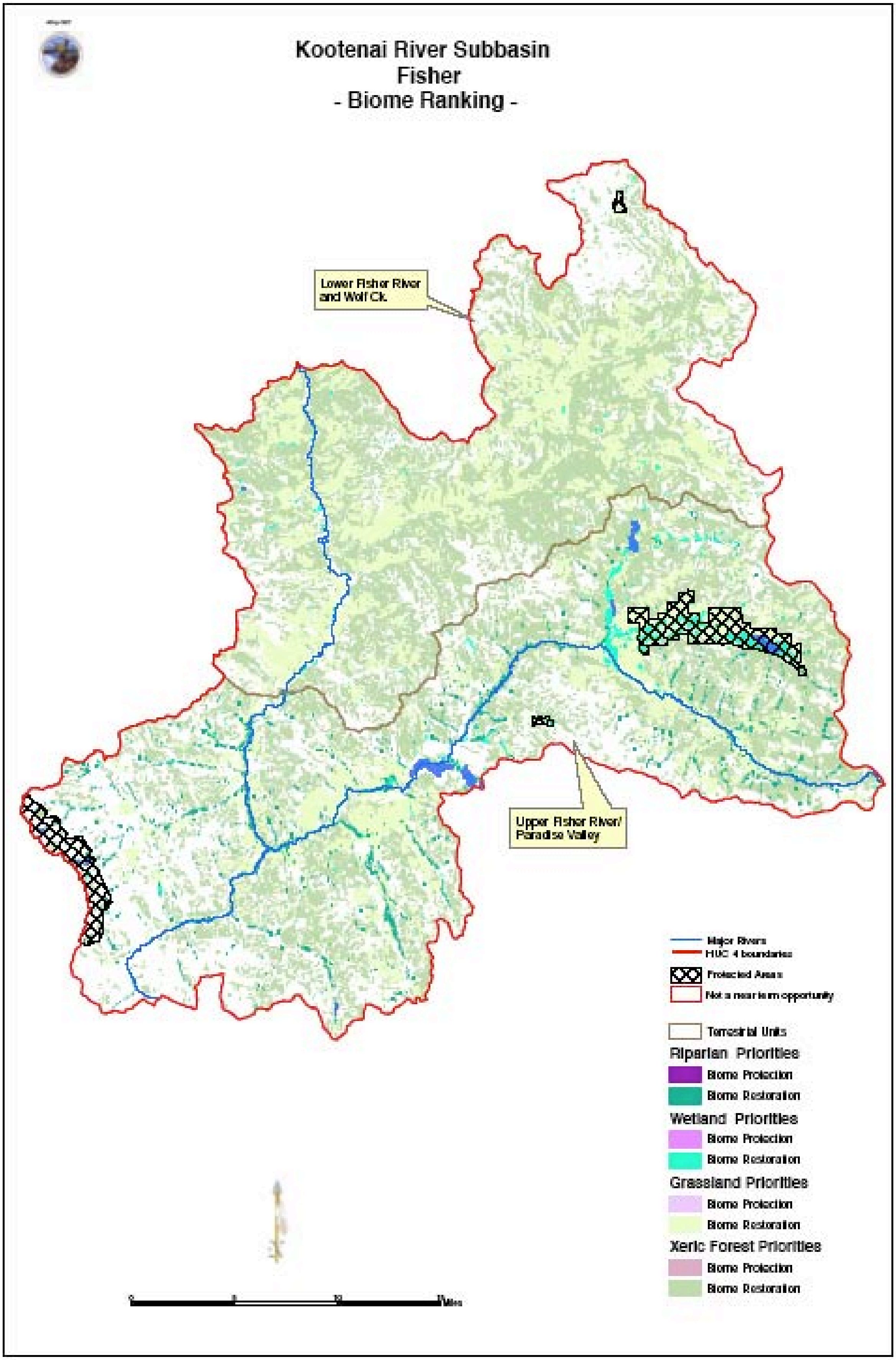

Figure 6.10. Terrestrial near-term opportunities in the Fisher Watershed.

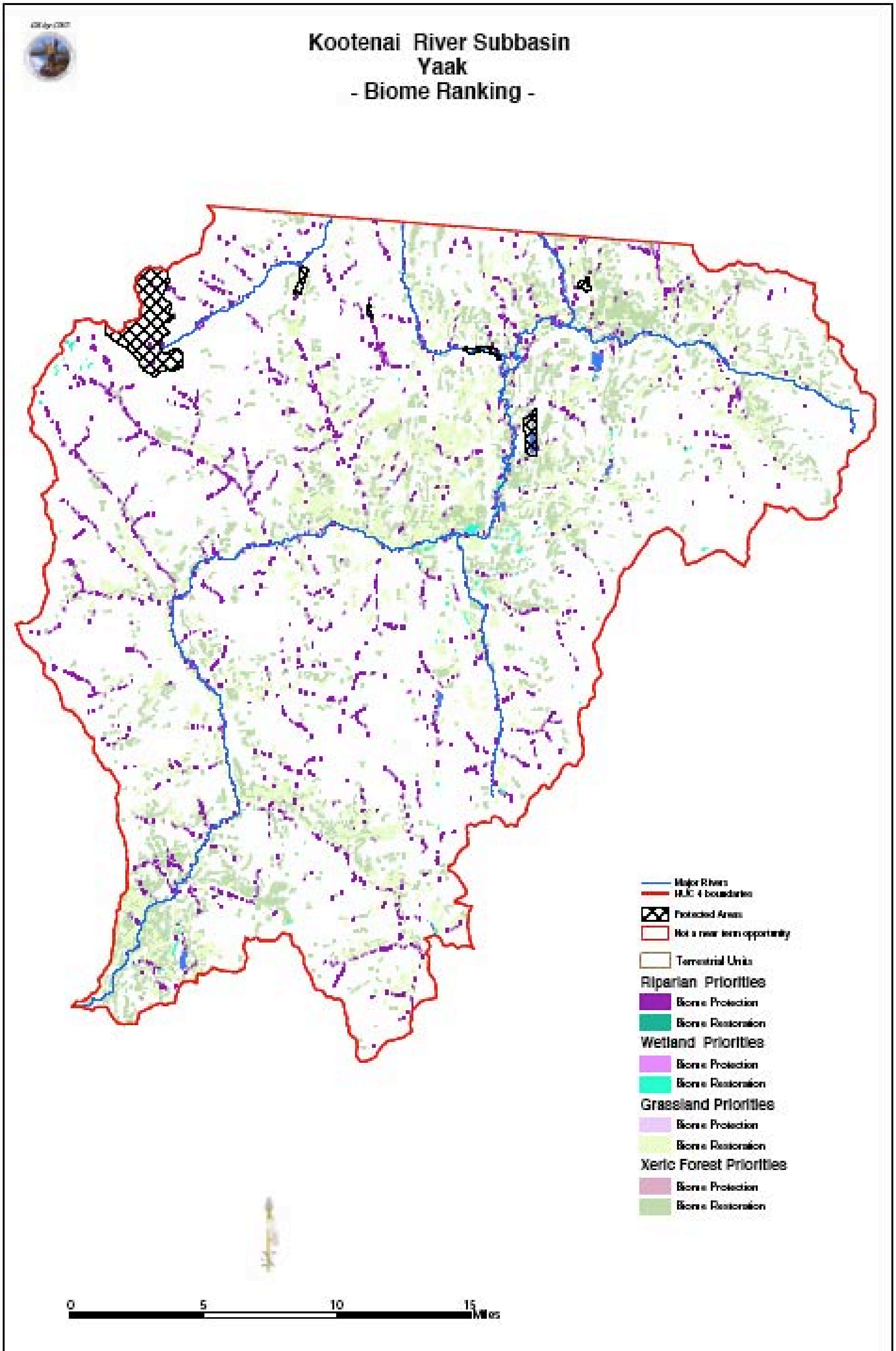

Figure 6.11. Terrestrial near-term opportunities in the Yaak Watershed.

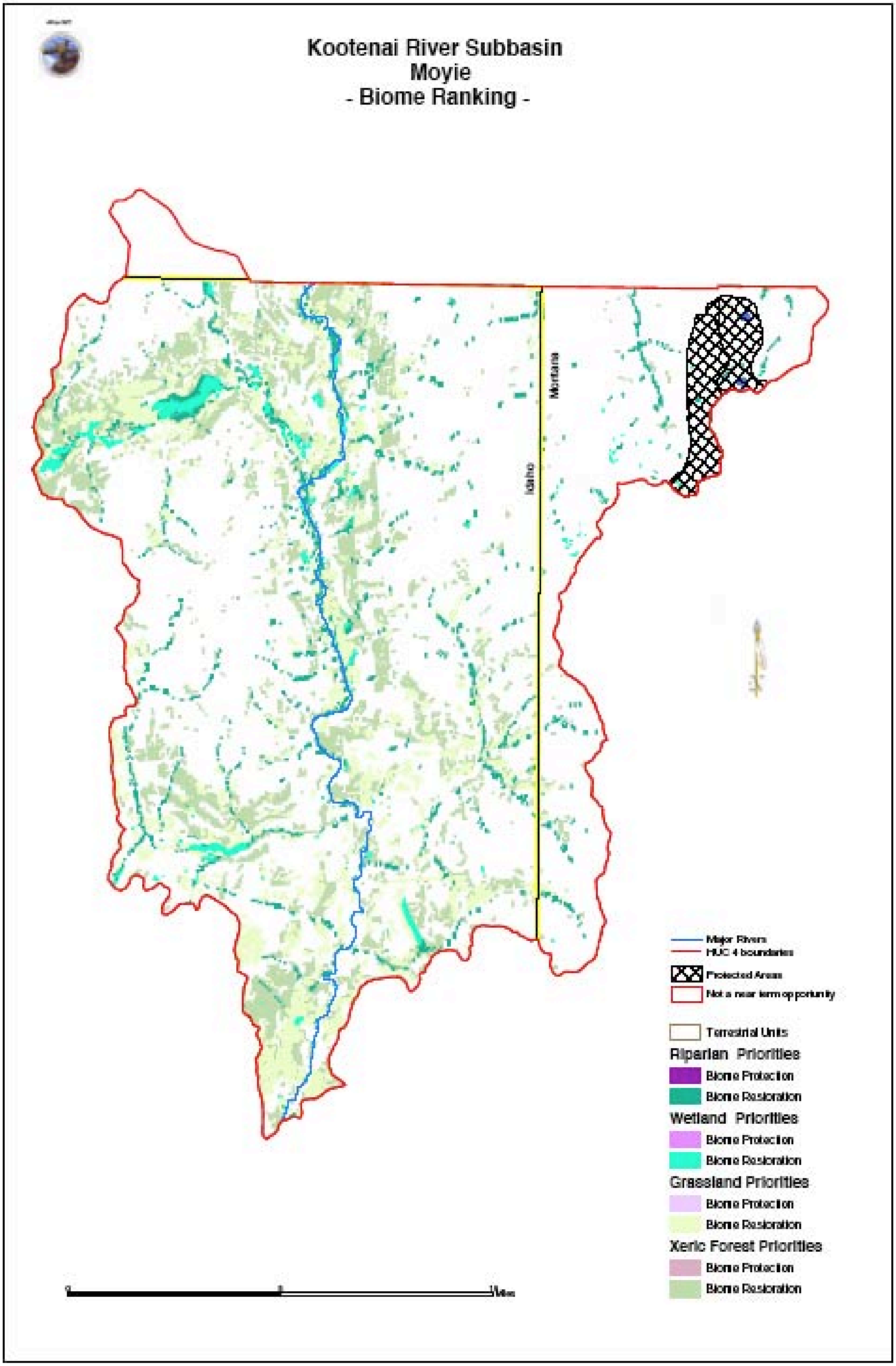

Figure 6.12. Terrestrial near-term opportunities in the Moyie Watershed.

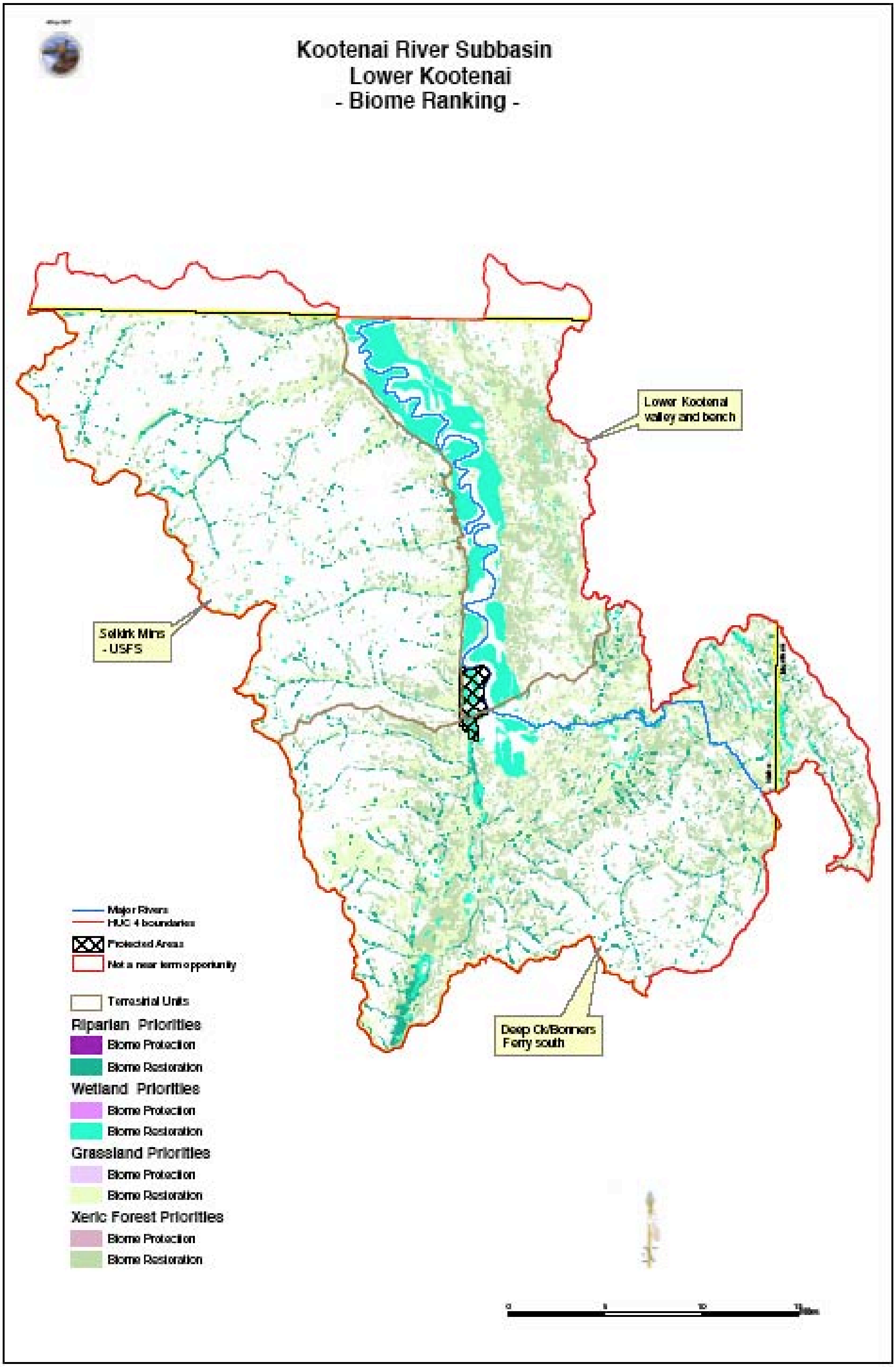

Figure 6.13. Terrestrial near-term opportunities in the Lower Kootenai.

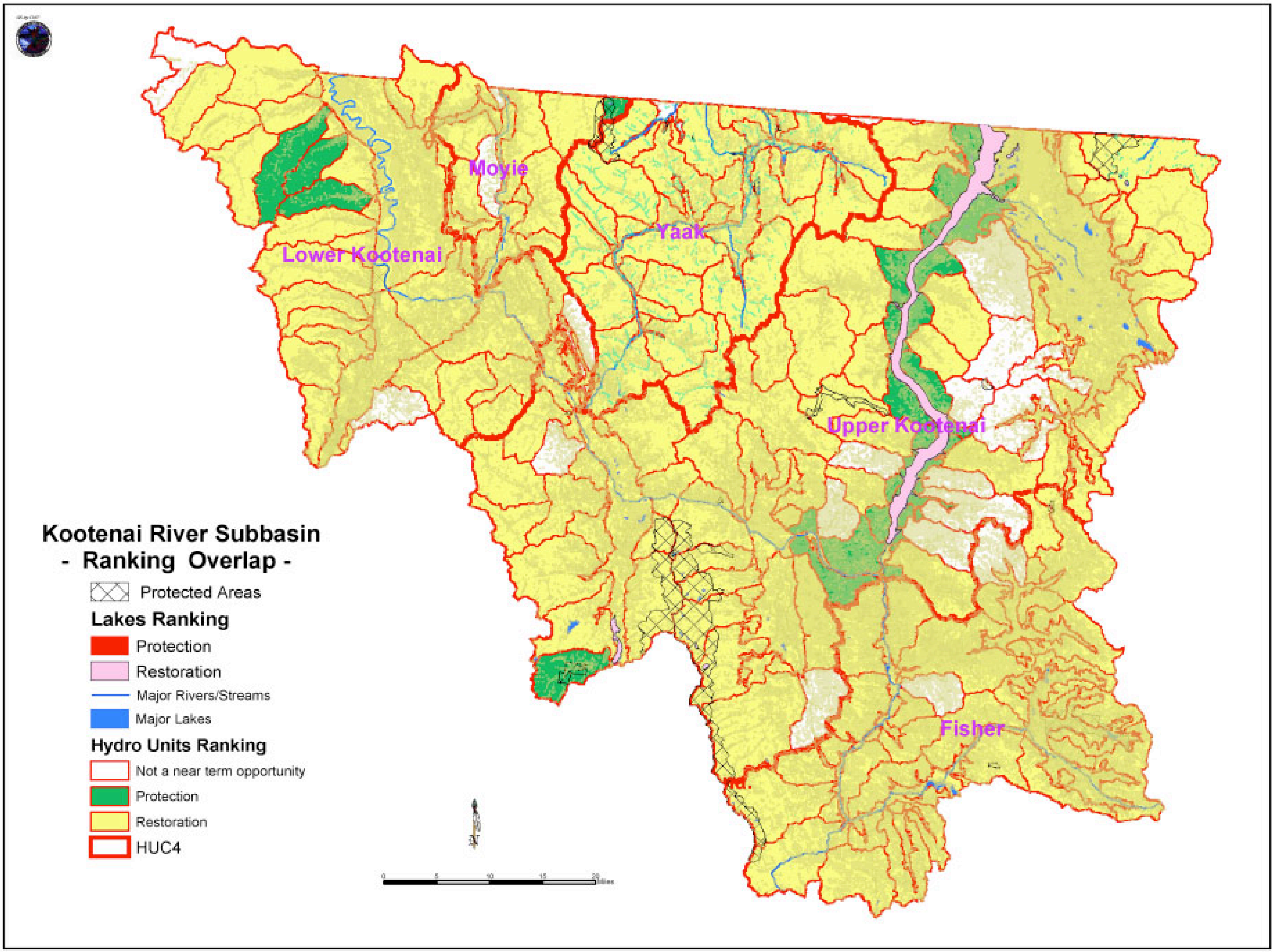

Figure 6.14. Overlay of aquatic and terrestrial near-term opportunities in the Kootenai Subbasin.

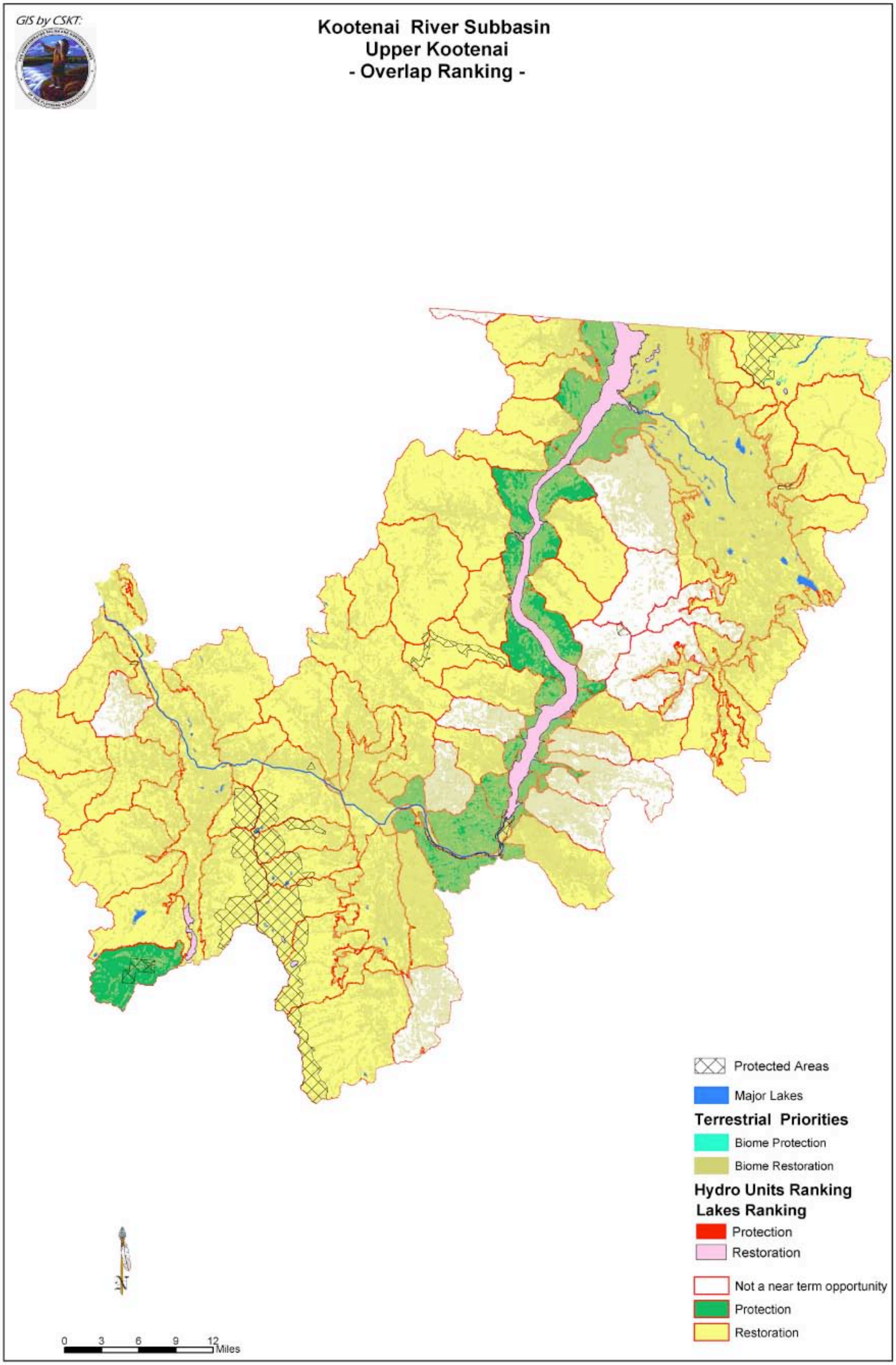

Figure 6.15. Overlay of aquatic and terrestrial near-term opportunities in the Upper Kootenai.

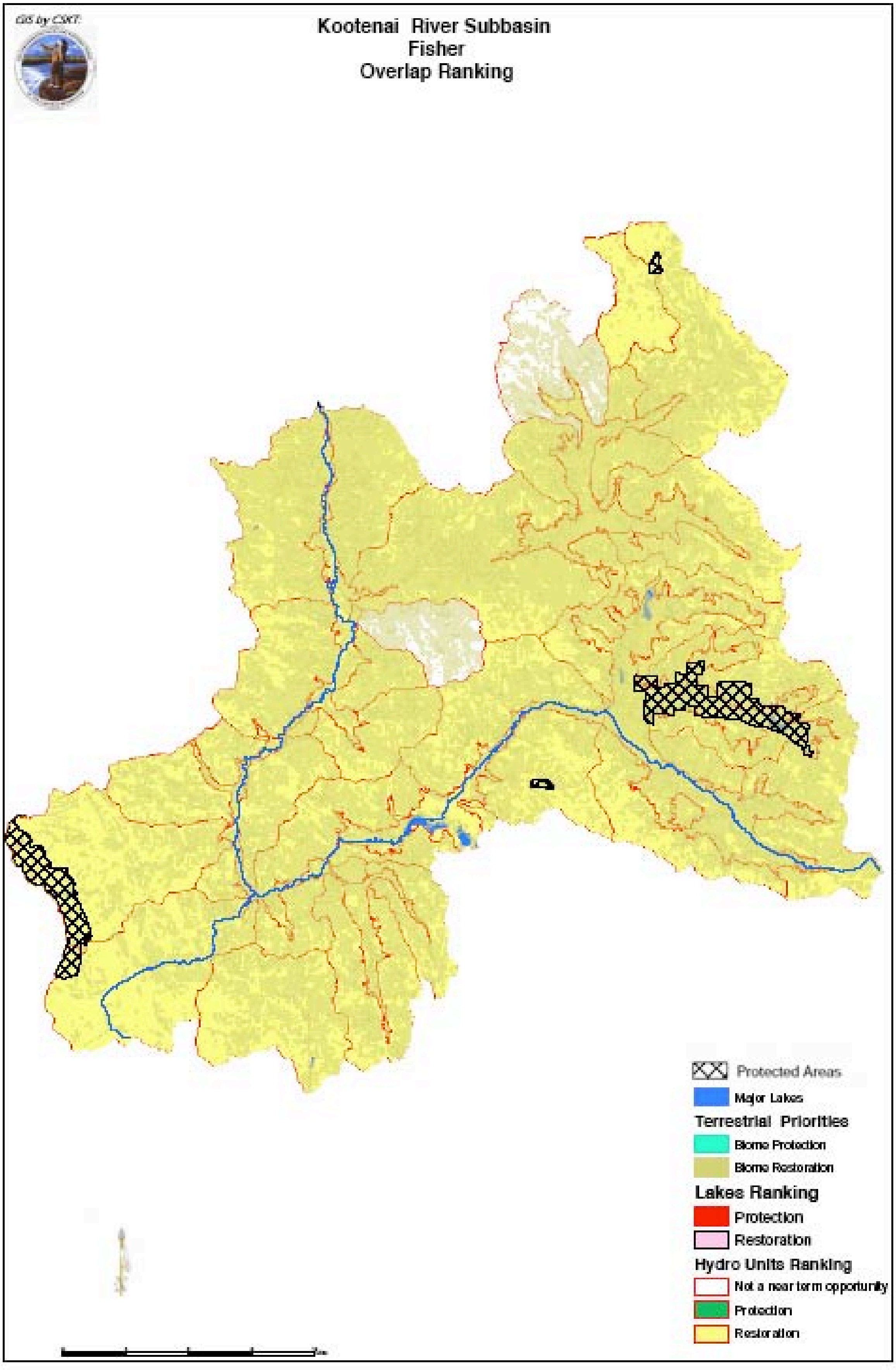

Figure 6.16. Overlay of aquatic and terrestrial near-term opportunities in the Fisher Watershed.

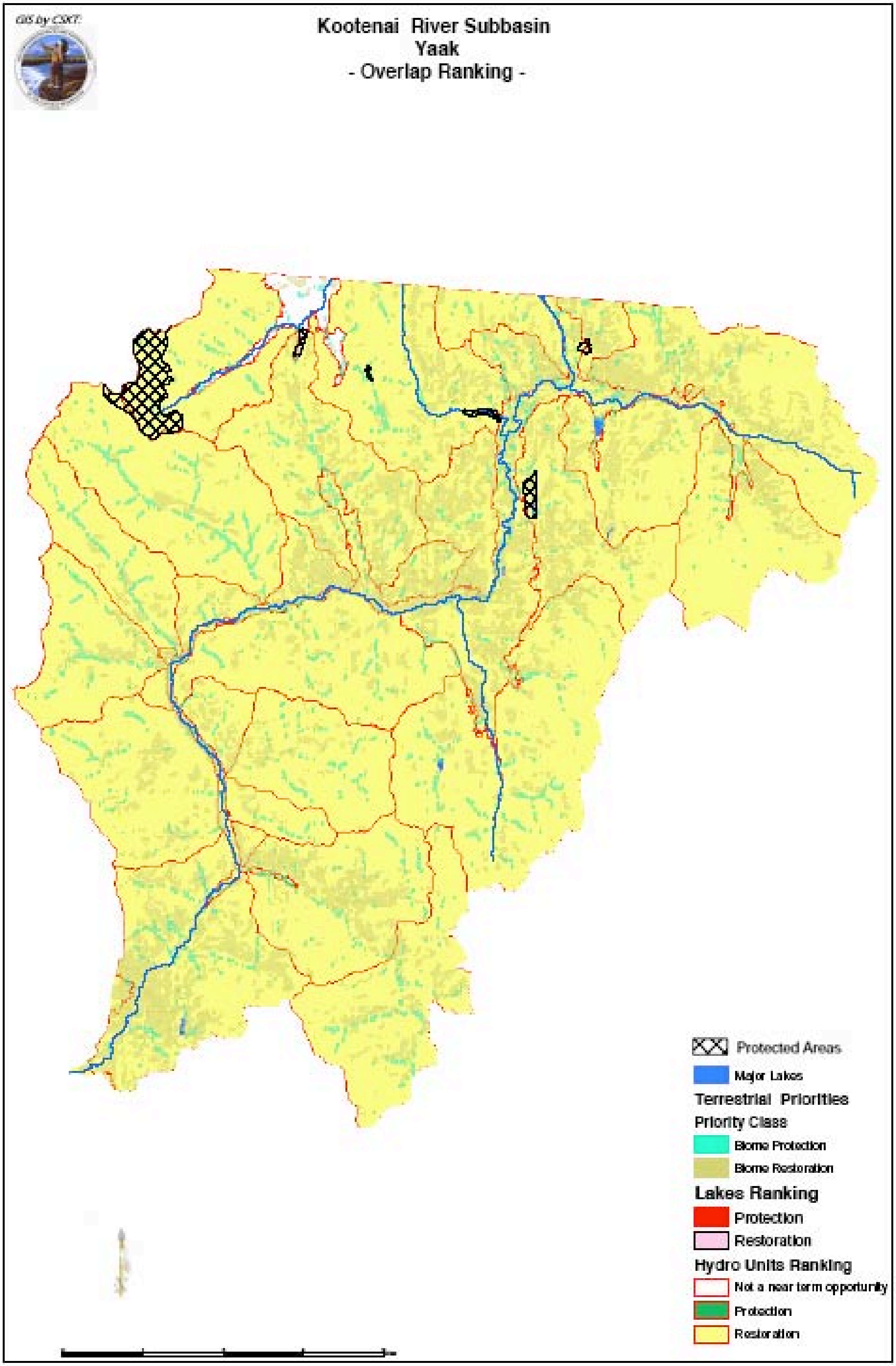

Figure 6.17. Overlay of aquatic and terrestrial near-term opportunities in the Yaak Watershed.

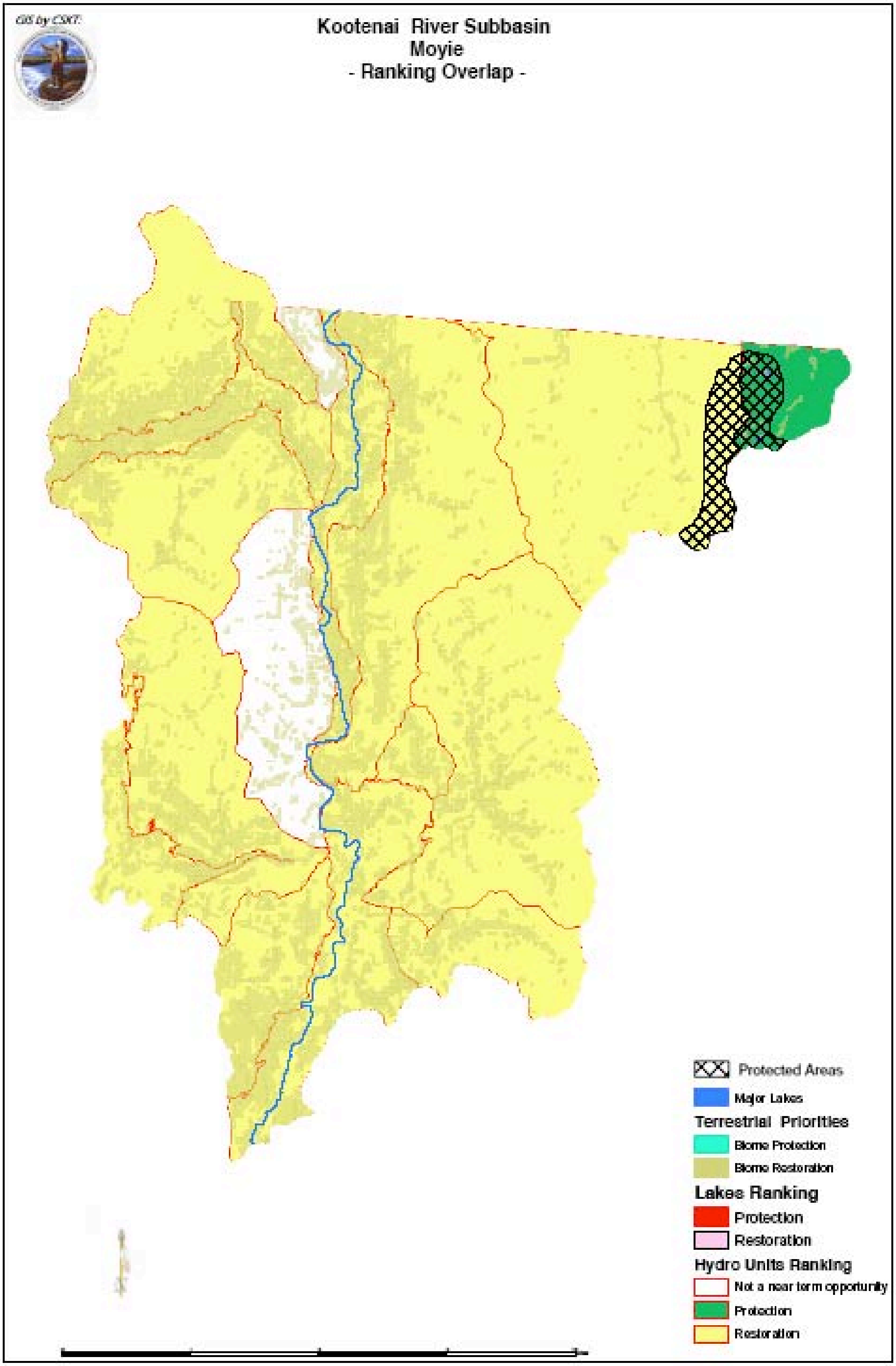

Figure 6.17. Overlay of aquatic and terrestrial near-term opportunities in the Moyie Watershed.

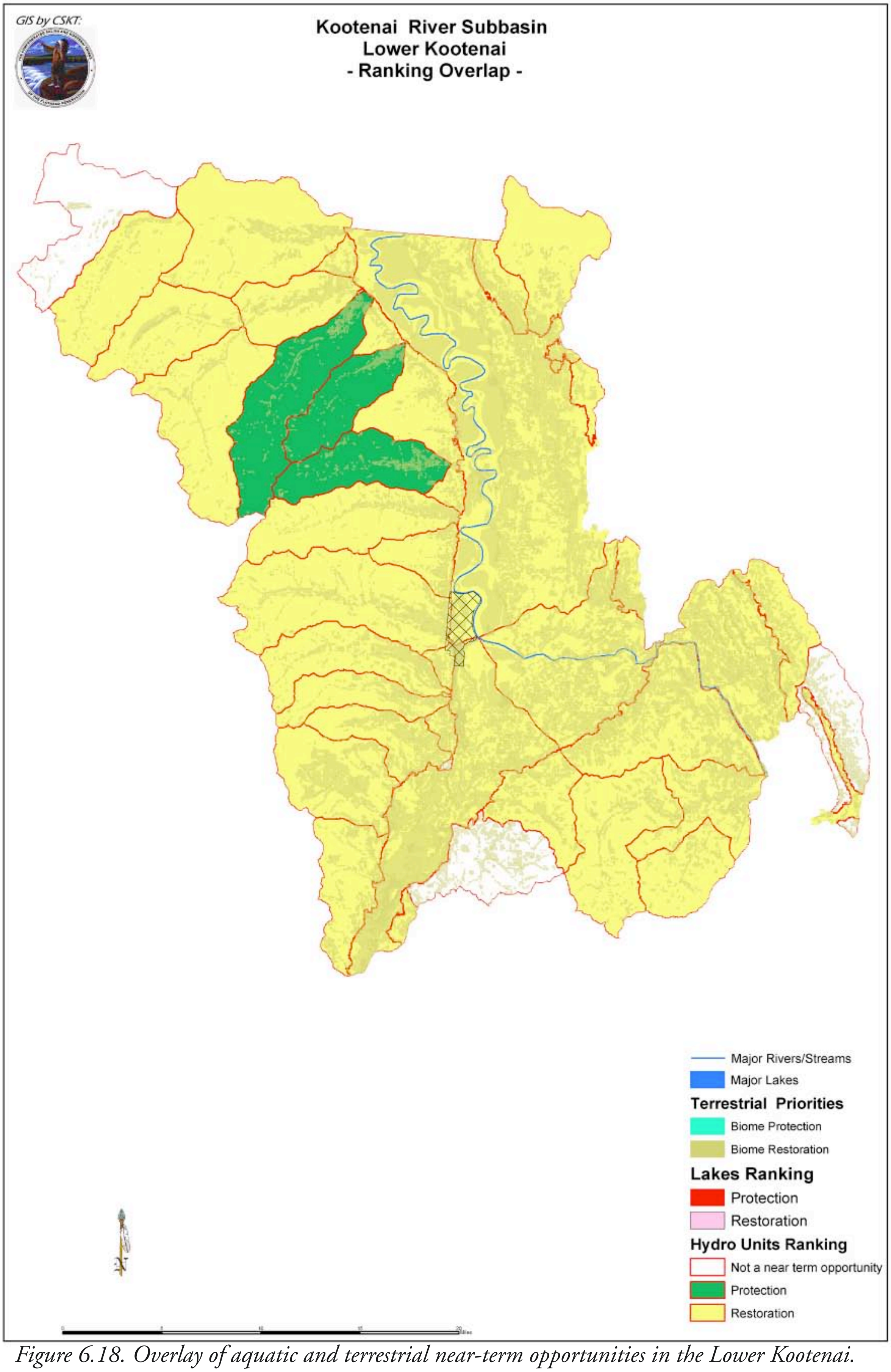

Figure 6.18. Overlay of aquatic and terrestrial near-term opportunities in the Lower Kootenai.