Inland West Watershed Initiative (IWWI)

The IWWI is a coarse filter assessment used by the USFS in describing the watershed conditions of the 6th code HUCs which range in size from 5,000 to 50,000 acres. The main purpose of the IWWI is "to allow the Forest Service to focus limited federal dollars on the most important watersheds, and to provide for the orderly management of all watersheds over time." Secondary purposes are to:

- Estimate the probable status of watersheds and aquatic systems so that managers can work with appropriate state and federal agencies to focus subsequent analysis, management, and restoration work on key water resources,
- Rate watershed vulnerability, geomorphic integrity, and water quality conditions for 6th code HUCs as high, moderate, and low given three sets of defined criteria. Geomorphic Integrity describes the existing watershed conditions.

The IWWI is an iterative process and some initial judgments may prove to be wrong later. One of the main values is to give the Forest Service a sense of direction for further study and work. Geomorphic integrity reflects the soil-hydrologic function as a sponge and filter system to absorb and store water and physical soil-stream resilience. Ratings are based on "Preliminary Professional Judgments" with often limited data according to IWWI protocols provided by the BDNF.

The Watershed Vulnerability rating reflects inherent risks of conditions becoming degraded if certain sensitive lands in the watershed are disturbed. The ratings are as follows:

- Low: A minor part (less than 20%) of the watershed is in sensitive lands.
- Moderate: A moderate part (20-50%) of the watershed is in sensitive lands.
- High: A major part (more than 50%) of the watershed is in sensitive lands.

Sensitive lands include:

a) Areas with highly dissected slopes.
b) Highly erodible soils.
c) Landslide deposits and potential landslides.

The Geomorphic Integrity rating reflects current conditions by assessing watershed condition given the watershed's basic elements (geology, soils, vegetation, and hydrology) and the disturbance regimes imposed on them. Each watershed is placed in a categorical rating based on three criteria: soil-hydrologic function, properly functioning condition, and dynamic equilibrium. The criteria are defined as:

- Soil-hydrologic function is the lands ability to absorb and store water based on organic ground cover (plants, litter, humus), soil porosity, and soil structure relative to its natural potential condition.
- Dynamic equilibrium is the continual adjustment within a historic range of variability of upland, valley, and stream channel morphology by dynamic physical processes, interrupted only by extreme disturbance (reset) events.
- Properly functioning condition is adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows such as the 25 year flood.

Using the above criteria geomorphic integrity for each 6th code HUC is rated as high, moderate, and low based on the following definitions.

- High: The watershed has high soil and water integrity relative to its natural potential condition. Disturbance does not compromise soil-hydrologic function or soil-stream resilience.
    a) Soil-hydrologic function is estimated to be excellent or good throughout the watershed; AND
    b) All streams are estimated to be in dynamic equilibrium relative to their own potential; AND
    c) All riparian areas are estimated to be in properly functioning condition.
- Moderate: the watershed has moderate soil and water integrity relative to its natural potential condition. Disturbance partly compromises soil-hydrologic function or soil-stream resilience. Recovery can occur naturally or through revised management with minimal investment.
    a) Soil-hydrologic function is estimated to be damaged in isolated areas (e.g. less than 20%) of the watershed; OR
    b) A minor part (less than 20%) of stream miles are estimated not to be in dynamic equilibrium relative to their own potential; OR
    c) A minor part (less than 20%) of riparian miles are estimated to be functioning at risk or non-functioning.
- Low: The watershed has low soil and water integrity relative to its natural potential condition. Disturbance widely compromises soil-hydrologic function or soil-stream resilience. Recovery requires capital investments and revised management. Management must complement recovery. Criteria are:
    a) Soil-hydrologic function is estimated to be degraded over much (e.g. more than 20%) of the watershed; OR
    b) A major part (e.g. more than 20%) of stream miles are estimated not to be in dynamic equilibrium relative to their own potential; OR
    c) A major part (e.g. more than 20%) of riparian miles are estimated to be functioning at risk or non-functioning.

The Water Quality Integrity rating reflects overall water quality in a 6th code HUC based on water quality impacts including bank damage, sediment loads, channel modification, flow disruption, thermal change, chemical contamination, and biological stress. The ratings are based on mapped damaged segments as follows:

- High: No segment is damaged by physical, chemical, or biological impacts such that any resource value appears to be seriously degraded.
- Moderate: A minor part (less than 20%) of segment miles are damaged.
- Low: A major part (more than 20%) of segment miles are damaged.

The IWWI watershed condition assessment displays the existing status of the Forest's watersheds and identifies broad scale disturbance mechanisms. The IWWI geomorphic integrity ratings (high, moderate, and low) can be equated to the FP (1987) watershed condition ratings (Class I, II, and III). The main difference between the rating definitions is that the IWWI uses three criteria (i.e. dynamic equilibrium, soil-hydrologic function, and properly functioning condition) instead of one (i.e. potential) and the IWWI defines a disturbance threshold for being outside the historic range of variation.

IWWI ratings for the landscape are shown in table IIB-2.

Table IIB-2: Inland West Watershed Initiative rating by 6th code HUC.

Watershed	*6th code HUC*	*Watershed vulnerability rating*	*Geomorphic integrity rating*	*Water quality integrity rating*
Cottonwood/Baggs Crk	170102011502	Moderate	Moderate	Moderate
Peterson Crk	170102011503	Moderate	Moderate	Moderate
Orofino/Racetrack Crk	170102011701	High	Low	Moderate
Perkins Gulch/Warm Springs Crk	170102011901	Moderate	Low	Low
Dry Cottonwood Crk	170102011902	Moderate	Low	Low

Stream Sensitivity to Management

Landtype Associations (LTAs) are interpreted in terms of erosion potential and sediment delivery potential as part of the Clark Fork-Flints LA. This qualitative interpretation formed the basis for determining inherent sensitivity and risk of managment induced alteration to the desired functioning of the hydrologic system. The interpretation provided a rating (high, moderate, or low) and ranked existing condition for each 6th code HUC with significant Forest Service ownership, based on past and present management actions affecting the water resource. This includes such actions as roads, timber harvest, mining, grazing, diversions, etc. Sensitivity and existing condition were integrated, resulting in a rating and ranking of management risk. These risk ratings are presented in table IIB-3.

Table IIB-3: Landtype association management risk rating by 6th code HUC.

5th Code HUC Name	**6th Code HUC Name**	**6th Code HUC HRU(s) within 6th**	**Sensitivity**	**Existing Condition** (High = poor existing condition)	**Risk Rating**	**Management Risk Ranking**
Clark Fork- above Dempsey	Perkins/ Girard Gulch	17010201040030 8V	High	High	High	2
Clark Fork- above Dempsey	DryCottonwood/ Sand Hollow	17010201040060 8V	High	High	High	1
Clark Fork- Dempsey to Mullan Gulch	Peterson/ Burnt Hollow	17010201050040 8V	High	Moderate	Moderate	3
Clark Fork- Dempsey to Mullan Gulch	Cottonwood/ Fred Burr	170102010500 60 1V	Moderate	Moderate	Moderate	4
Clark Fork- Dempsey to Mullan Gulch	Caribou/ Orofino	170102010500 10 8V	High	Moderate	High	1

Watersheds with high risk may need extra mitigation, restoration activities, or allowable recovery time in achieving a desired condition. The needs of high risk watersheds need to be addressed on a site specific basis and are best identified through field investigations.

Riparian Health

Riparian health of streams in the landscape has been evaluated by a number of methods. Discussed below are formal riparian functioning surveys performed systematically on many of the streams in the landscape. Section IIC-1 Vegetation of this assessment includes discussion of riparian health on allotments, including compliance with the 1997 Interim Riparian Mitigation Measures, under the subsection Allotment Status and General Range Conditions.

Hansen Assessments

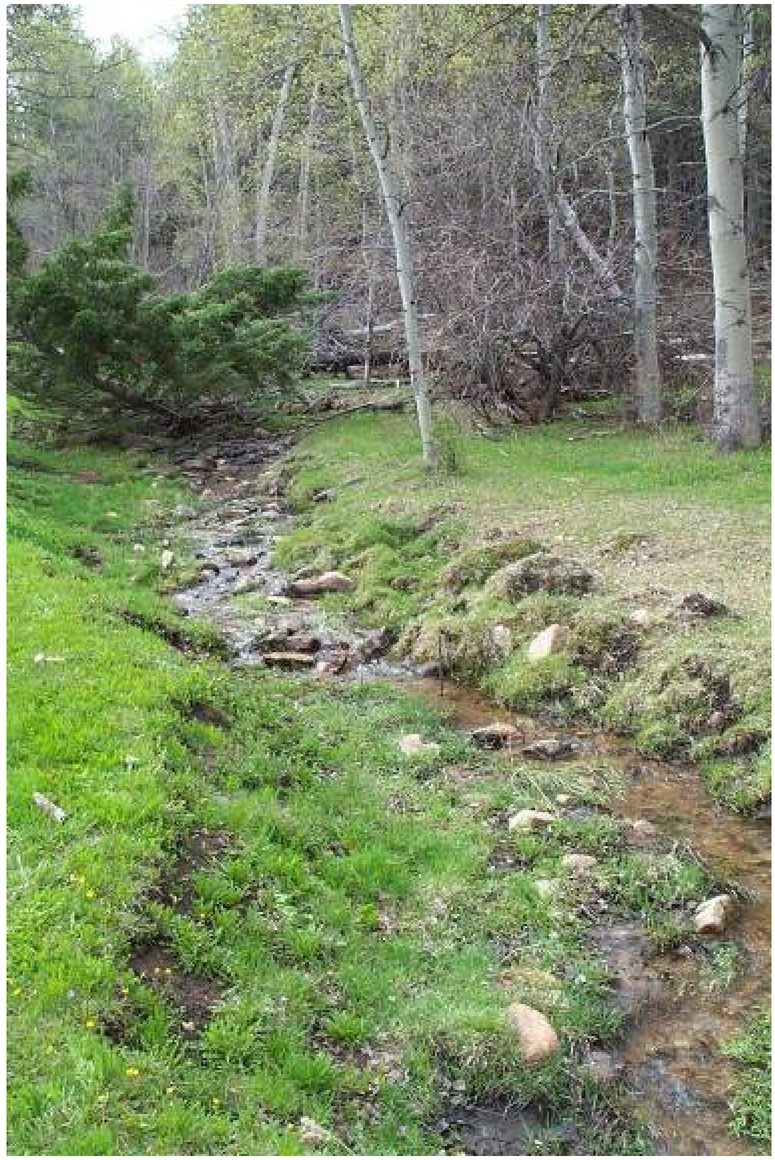
As part of the KirK Environmental (2003) study, riparian health assessment using the Hansen Lotic method (Hansen, 2002) was performed on 46% of the stream miles within the landscape, not including the Clark Fork River (figure IIB-3 provided in appendix 1). Beaver ponds were not scored as they are not a lotic system. As part of the riparian assessment, invasive species are scored providing a measure of invasive species coverage and distribution in the riparian corridor. Many of the Hansen polygons in the lower elevation foothills score low due to invasive weed occurrence in the riparian area. Riparian condition scores nonfunctional to functional at risk in many of the lower elevations and private lands often owing to weed occurrence and heavy livestock use of the stream corridor.

The Hansen riparian assessment included 23% of the stream miles on BDNF land (figure IIB-3). All Hansen riparian assessment reach polygons and scores are tabulated in appendix 4. Riparian condition is variable on USFS lands and scores 19% (2.9 miles) proper functioning condition, 52% (7.8 miles) functional at risk, and 29% (4.4 miles) nonfunctional. In higher elevation areas where riparian condition scores as functional the riparian zone is relatively free on invasive and disturbance increaser species and the stream channel does not exhibit degradation due to encroachment of roads or from streambank trampling by livestock. The opposite is true in high elevation riparian areas that are nonfunctional where roads may channelize the stream corridor, livestock use is heavy, or past placer mining has disturbed the functioning of the stream system. Peterson and Dry Cottonwood Creeks stand out as having the lowest riparian health on national forest lands.

Impacts to the riparian zone as identified in the Hansen assessments are further categorized for this assessment into invasive species, grazing, and sediment associated.

The degree of invasion by invasive weed species is quantified in the Hansen method by both canopy cover and density distribution. Invasive weed species are not differentiated, rather the presence of all invasive weeds are taken together in measuring canopy cover or density. Figure IIB-4 in appendix 1 shows riparian assessment reaches that scored 33% or less of potential for invasive weed metrics. The weed impacted riparian areas identified in this figure are widespread and indicate areas where invasive weeds have either already taken over a riparian zone or are present and widely distributed and have the potential for expanding in coverage. In addition to riparian areas, figures IIC-8, IIC-9 and Section C – Invasive Weeds of this assessment shows that invasive weeds are widely impacting the landscape. Lower elevation grasslands with a western aspect are especially vulnerable to takeover by weeds.

Photo: Riparian and stream channel impacts on Perkins Gulch due to grazing practices (BDNF).



Impacts to riparian areas due to grazing management are identified using the Hansen assessment by metrics quantifying the presence of disturbance increaser species (e.g.: cheatgrass *(Bromus tectorum*, dandelions *(Taraxacum sp.),* and others), grazing and regeneration of riparian trees and shrubs, and hoof action pugging/hummocking of the ground surface. Disturbance increaser species generally are less productive, have shallow roots, and poorly perform riparian functions (Hansen, 2002). The root system of riparian trees and shrubs are excellent bank stabilizers and their spreading canopies provide protection to soil, water, livestock, and wildlife. Loss of trees and shrubs, if indicated by the assessment, points to high potential for streambank instability and floodplain erosion due to grazing management. The third metric, pugging and hummocking is a direct indicator of livestock use of the riparian area when soils are wet and easily compactable. Grazing impacted riparian areas shown in figure IIB-5 in appendix 1 are those which score 33% or less of potential for these metrics. Grazing impacted riparian areas shown in this figure are widely distributed in grassland and forest habitat types within the landscape. Grazing impacts are not evaluated for Sand Creek. Because Sand Creek does not typically contain flowing water and does not contain an established channel the potential for grazing impacts to affect watershed health is limited.

Sediment impacts can be identified using the Hansen assessment by metrics quantifying streambank root mass protection, human caused bare ground, and structural alteration of streambanks. These metrics describe streambank stability and riparian/floodplain cover and indicate potential for increased sediment delivery to stream from streambank failure and erosion of bare floodplains. Riparian areas which score 33% or less for these metrics are shown in figure

IIB-6 in appendix 1. Sediment impacts are not evaluated for Sand Creek. Because Sand Creek does not typically contain flowing water and does not contain an established channel the potential for sediment impacts to affect watershed health is limited. As shown in this figure, sediment impacts are widespread within riparian areas of the landscape.

PFC Assessments

Proper Functioning Condition (PFC) is a qualitative method for assessing the condition of riparian-wetland areas (BLM, 1993). PFC describes both the assessment process and the on-the ground condition of a riparian-wetland area and evaluates how well the physical processes are functioning. The USFS evaluated the stream reaches listed in table IIB-4 and shown in figure IIB-3 in 1997 and 1998. Results of the PFC assessments as described in the draft Clark-Fork Flints Landscape Analysis are provided below. The BDNF has indicated that the PFC assessment was completed by hydrology resource specialists and was not an interdisciplinary process. However, the PFC assessment does provide a gauge for comparing riparian and stream health. The results of the PFC and Hansen assessments are compared below where the two assessments took place on the same stream.

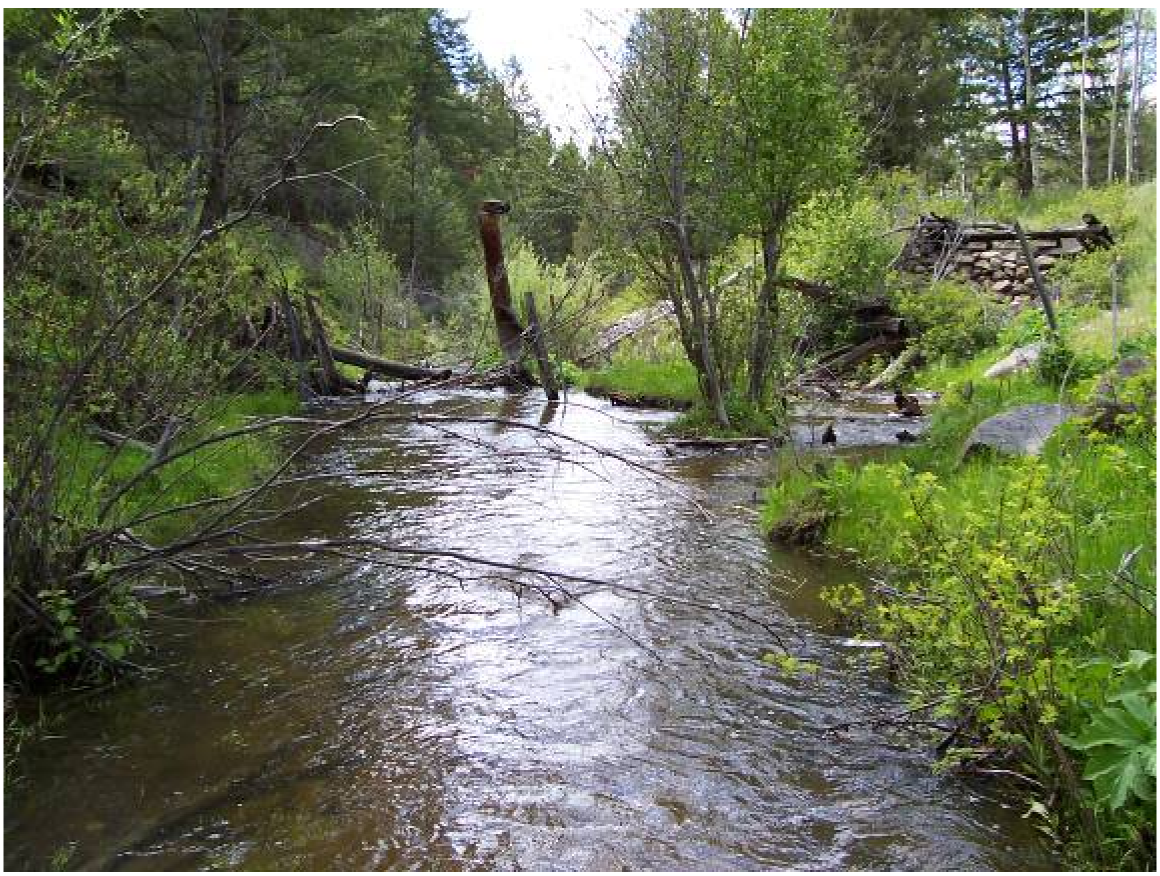


Photo: Dry Cottonwood Creek on the BDNF during spring runoff. This reach was non-functioning during the 2002 Hansen assessment.

<u>North Fork Cottonwood</u>

This site represents most of the lower North Fork. While roading, timber harvest, and grazing activities exist, any impacts are very localized. The rocky stream banks provide good resistance to alteration. Trend appears stable. The PFC assessment generally agrees with the Hansen method that this is a functioning reach.

Middle Fork Cottonwood

This reach represents the very upper end of the Middle Fork. Many stream and erosion control structures exist in this area, with varied success. Some have captured sediment and have been restabilized with vegetation. Others have promoted channel overwidening, and "end cut" into the bank, negating any positive gains. The B and G channel classes (table IIB-1) demonstrate the entrenched situation common throughout much of the meadow section. Grazing pressure has been lifted, but natural recovery will take time, especially on G channel type sections. Properly designed and placed structures would expediate the recovery process. This requires treating the entire reach of stream in question, and is likely to prove costly. The nonfunctioning status of the PFC assessment does not agree with the Hansen assessment from 2002. Although, the two assessments are not directly comparable they measure similar processes and condition and suggest an improving trend for the upper Middle Fork.

Table IIB-4: USFS PFC assessment.

Stream & Reach	Function Class	Bank Erosion Potential	Percent Over-widened	Percent Fines (Silt and Sands)
N Fk Cottonwood (above FR 1504)	PFC	Moderate	~10%	23
M Fk Cottonwood (upper)	Non-function	Moderate-High	30	30
Baggs (above FS boundary)	PFC	Moderate	15	5
N Fk Dry Cottonwood	Function-at-high-risk/Non function	Moderate/High	40	62
Perkins Gulch (lower)	Non-Function	High	>70	47

Baggs

This reach represents approximately ½ mile of stream above the USFS boundary. Most of this reach shows good stability from rock content and large woody debris. Historic activities include a road and homestead in the valley-bottom. Grazing has changed vegetation (dandelion, etc.), but only limited effects to the stream. Some minor bank instability exists downstream.

North Fork Dry Cottonwood

The North Fork varies in stream type in the lower 1½ miles before joining the mainstem. Steep sections are estimated as A channel types. This reach typifies the lower gradient areas, which are less resistant to management actions. Livestock, roads and historic mining have all played a role in loss of function, demonstrated by a shift in stream type discussed in the Channel Morphology section above. Trend is likely static, but recovery through better management is attainable as resilience is high. This PFC assessment agrees with the Hansen assessment from 2002.

Perkins Gulch

The non-functioning status represents a meadow section where livestock concentrate during warm weather and exert high pressure on streambanks, soils and vegetation. Existing condition has degraded to the point that recovery will occur slowly. The road system that follows the stream receives light use, and does not constitute a serious sediment source. The Hansen assessment in 2002 determined that lower areas of the BDNF on Perkins Gulch have highly variable condition. In addition, the road constitutes a serious sediment source in other areas of the watershed.

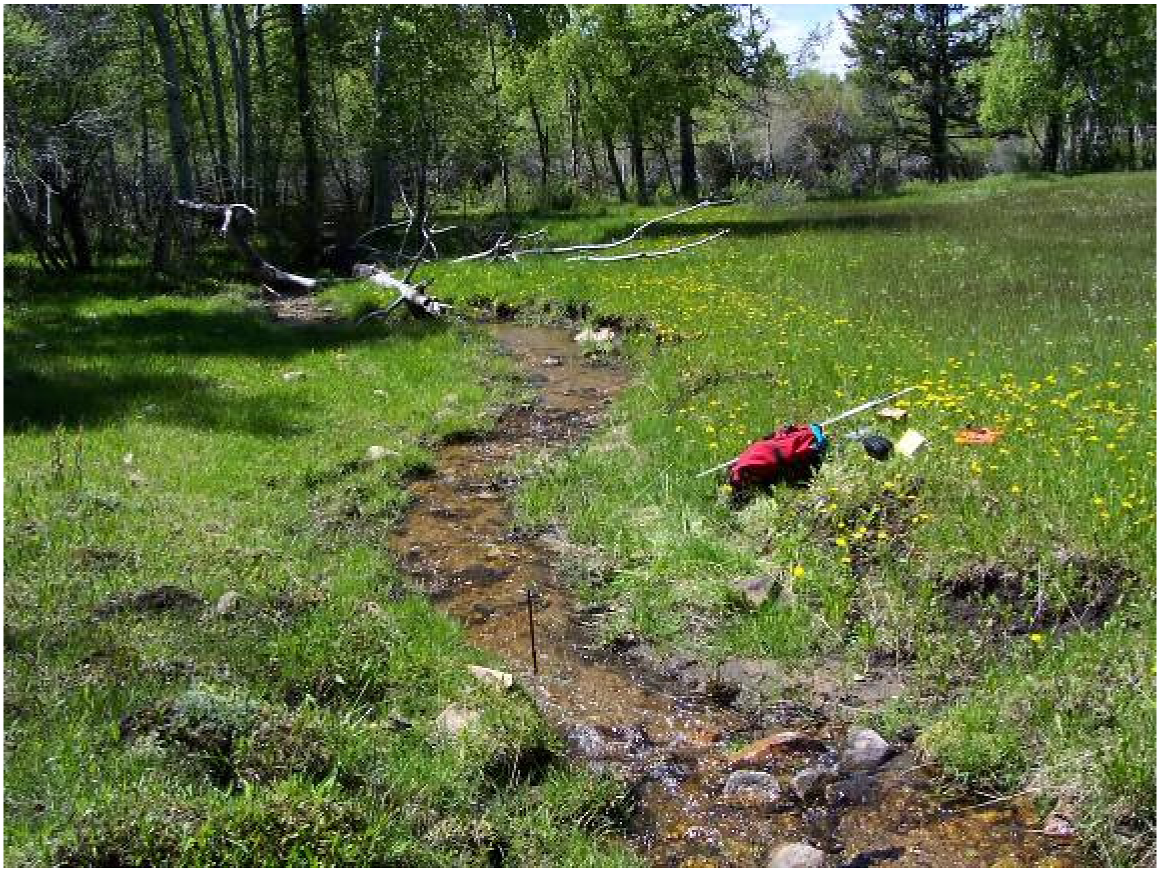


Photo: Perkins Gulch on the BDNF lacks woody vegetation. This reach scored functioning at-risk during the 2002 Hansen assessment and nonfunctioning during the USFS PFC assessment.

Dry Cottonwood Creek

(Reconnaissance, no PFC assessment)

Many reaches are non-functioning due to past and present impacts of placer mining. Livestock and roads also play a role in affecting function. Restoring function would require major reclamation work. Hansen assessment in 2002 determined that these reaches have variable condition and most are in the nonfunctional category.

Aquatic Habitats/Fisheries

Upper Clark Fork River Basin Overview

Fisheries health within the landscape needs to be put into perspective of the conditions in the Upper Clark Fork River Basin as a whole. The over-riding high risk factor to native salmonids in the Upper Clark Fork River Basin is mining. Water pollution occurring prior to the turn of the century essentially eliminated trout from much of the mainstem of the Clark Fork River. As recently as the early 1970s, the river ran red from mine wastes that had been heaped along its headwaters by the copper industry in Butte and Anaconda.

In 1992, EPA designated the Clark Fork River, from the outlet of Warm Springs Ponds to upstream of the Milltown Reservoir, as a distinct operable unit of the Milltown Reservoir Superfund Site. An investigation into the nature and extent of contamination of the Clark Fork River began in 1995. According to EPA's Ecological Risk Assessment (EPA, 1999), historic impacts of mine waste on the Clark Fork River were severe. The report indicates "essentially no fish existed in the upper Clark Fork River dating from the late 1800s into the 1950s." Fish populations began to reestablish to some degree after construction of the third Warm Springs sediment pond in 1959, and a new water treatment system for mine water discharge was installed in Butte between 1972 and 1975 that resulted in improved water quality. Documented fish kills, however, continued as late as 1991 and State of Montana studies show a significantly reduced trout population.

In May of 2004, the Environmental Protection Agency released a Record of Decision (ROD), for the preferred method of cleanup for the upper Clark Fork River. The $120 million, ten-year cleanup decision calls for a mix of toxic sediment removal and on-site treatment, bank stabilization, revegetation and weed control. Currently, EPA is engaged in settlement discussions with the potentially responsible party, Atlantic Richfield Company, in an effort to settle clean up responsibilities and costs associated with the remedy proposed in the ROD.

Dewatering from agriculture and interactions with introduced species also rank as high concerns in the mainstem Clark Fork River. Other major risk factors include habitat degradation from grazing in riparian areas and roads associated with forestry and mining. Warm water temperatures in the river are also a major factor affecting native fish distribution (MBTSG 1995).

Fish Populations

FWP data showing fish species distribution by stream in shown in table IIB-5.

Bull Trout

Bull trout are an ESA listed threatened species native to larger streams and the mainstem of the Upper Clark Fork River. Presently, bull trout are incidental within the Clark Fork River and are absent from all tributary streams within the landscape (FWS, 2002). It is unknown if bull trout ever inhabited the larger streams in the landscape, Cottonwood and Peterson Creeks (Brammer et al., 2000).

Issues currently limiting bull trout use of the Upper Clark Fork River include habitat degradation and fragmentation, the blockage of migratory corridors by dams, poor water quality, angler harvest, entrainment in diversion channels and dams, and introduced non-native species. At present, bull trout populations in the Upper Clark Fork River drainage above the Little Blackfoot River are composed of resident fish inhabiting Warm Springs and Racetrack Creeks adjacent to the landscape in the West Deer Lodge Valley.

A serious impediment to restoration of bull trout in the Upper Clark Fork is fragmentation of bull trout populations into isolated units. Because the remaining bull trout populations are fragmented, they are at a high risk of extinction and the effects of other risk factors such as mining, grazing, agricultural impacts on water quantity and quality and introduced species are locally exacerbated. When these isolated populations become extinct, the probability of natural recolonization is low. In addition, the high number of risk factors and the interactions between risk factors complicate restoration efforts (MBTSG 1995).

Table IIB-5: FWP fish presence by stream.

Waterbody	*Beginning mile*	*End mile*	*Species*	*Abundance*	*Origin*	*Data source*
Baggs Creek	0	6	Brook Trout	Unknown	Introduced	Extrapolated based on surveys
	0	6	Brown Trout	Unknown	Introduced	Extrapolated based on surveys
	0	6	Rainbow Trout	Unknown	Introduced	Extrapolated based on surveys
	0	8	Westslope Cutthroat Trout	Common	Native	Extrapolated based on surveys
Clark Fork River	311	325	Brown Trout	Rare	Introduced	Extrapolated based on surveys
	222	325	Bull Trout	Incidental	Native	Extrapolated based on extensive samples
	59	327	Largescale Sucker	Abundant	Native	Extrapolated based on surveys
	103	327	Longnose Dace	Common	Native	Extrapolated based on surveys
	59	327	Longnose Sucker	Abundant	Native	Extrapolated based on surveys
	311	314	Mottled Sculpin	Unknown	Unknown	Extrapolated based on surveys
	59	327	Mountain Whitefish	Common	Native	Extrapolated based on surveys
	239	325	Rainbow Trout	Rare	Introduced	Extrapolated based on surveys
Cottonwood Creek	0	10	Brook Trout	Common	Introduced	Extrapolated based on surveys
	0	10	Brown Trout	Common	Introduced	Extrapolated based on surveys
	0	1	Common Carp	Unknown	Introduced	Extrapolated based on surveys
	0	1	Largescale Sucker	Unknown	Native	Extrapolated based on surveys
	0	1	Longnose Sucker	Unknown	Native	Extrapolated based on surveys
	0	1	Mottled Sculpin	Unknown	Native	Extrapolated based on surveys
	0	1	Redside Shiner	Unknown	Native	Extrapolated based on surveys
	0	10	Slimy Sculpin	Common	Native	No Survey, Professional judgment
	0	4	Westslope Cutthroat Trout	Rare	Native	Extrapolated based on surveys
	4	10	Westslope Cutthroat Trout	Common	Native	Extrapolated based on surveys
Rocker Gulch	0	2	Westslope Cutthroat Trout	Common	Native	Extrapolated based on surveys
South Fork Dry Cottonwood Creek	0	5	Westslope Cutthroat Trout	Rare	Native	Extrapolated based on surveys
Middle Fork Cottonwood Creek	0	3	Brook Trout	Rare	Introduced	Extrapolated based on surveys
	0	3	Westslope Cutthroat Trout	Common	Native	Extrapolated based on surveys
North Fork Cottonwood Creek	0	3	Brook Trout	Unknown	Introduced	Extrapolated based on surveys
	0	3	Westslope Cutthroat Trout	Common	Native	Extrapolated based on surveys
Dry Cottonwood Creek	0	6	Brook Trout	Unknown	Introduced	Extrapolated based on surveys
	4	6	Westslope Cutthroat Trout	Rare	Native	Extrapolated based on surveys
North Fork Dry Cottonwood Creek	0	4	Westslope Cutthroat Trout	Rare	Native	Extrapolated based on surveys
Orofino Creek	5	9	Westslope Cutthroat Trout	Rare	Native	Extrapolated based on extensive samples
Perkins Gulch	2	6	Westslope Cutthroat Trout	Common[1]	Native	Extrapolated based on surveys
Peterson Creek	0	6	Brook Trout	Rare	Introduced	No Survey, Professional judgment
	6	11	Brook Trout	Common	Introduced	No Survey, Professional judgment
	0	6	Brown Trout	Rare	Introduced	No Survey, Professional judgment
	0	6	Longnose Sucker	Rare	Native	No Survey, Professional judgment
	0	6	Slimy Sculpin	Rare	Native	No Survey, Professional judgment
	0	13	Westslope Cutthroat Trout	Rare	Native	Extrapolated based on surveys

1- USFS population sampling has shown westslope cutthroat to be rare in Perkins Gulch.

The Bull Trout Draft Recovery Plan (FWS, 2002) details goals and objectives for the recovery of bull trout, actions needed, as well as criteria for recovery. Bull trout recovery will require reducing threats to the long-term persistence of populations, maintaining multiple interconnected populations across the diverse habitats of the native range of bull trout, and preserving the diversity of bull trout life-history strategies (e.g., resident and migratory forms, emigration age, spawning frequency, local habitat adaptations).

The landscape is located within the Upper Clark Fork Recovery Subunit of the Clark Fork River Unit. In this recovery unit, the historical distribution of bull trout is relatively intact, and no vacant core habitat was recommended for reestablishment in FWS (2002). Emphasis in the Clark Fork Recovery Unit is placed on securing the existing distribution of bull trout within core areas and increasing the abundance and connectivity of local populations. Specific goals and objectives for the Upper Clark Fork Recovery Subunit are described further under section IIB-3 Desired Future Conditions. Specific actions needed for the recovery of bull trout within the Upper Clark Fork Recovery Subunit are itemized in the Draft Recovery Plan (FWS, 2002). Within the landscape, the Clark Fork River is designated critical habitat for bull trout. Federal agencies are required to consult with the Service on non-emergency actions they carry out, fund, or authorize that might affect critical habitat. Although, the BDNF within the landscape does not contain habitat presently used by bull trout nor designated critical habitat, numerous watersheds with headwaters on the BDNF contribute to the Clark Fork River. Management which maintains high water quality and streamflow within these tributary streams will aid in reaching objectives for bull trout recovery in the Clark Fork River.

Westslope Cutthroat Trout

Westslope cutthroat trout *(Oncorhynchus clarki lewisi)* are the only native trout remaining in the many small streams in the landscape. Westslope cutthroat trout is listed on the State of Montana's list of Animal Species of Special Concern (Carlson, 2001) with a state rank of S2. An S2 rank is described as "imperiled because of rarity or because of other factors demonstrably making it very vulnerable to extinction throughout its range". Westslope cutthroats are also listed as a sensitive species by the USFS Region 1 (R1) ("animal species ... for which population viability is a concern as evidenced by a significant downward trend in population or a significant downward trend in habitat capacity") and "special status" by the BLM ("federally-listed Endangered, Threatened, or Candidate species or other rare or endemic species that occur on BLM lands) (Carlson, 2001).

Westslope cutthroat trout distribution within the landscape is shown in figure IIB-7 provided in appendix 1. Westslope cutthroat trout are generally absent from the Clark Fork River but are well distributed in many of the tributary streams which support perennial flow within the landscape. Many of the same threats and risk factors affecting bull trout in this landscape also apply to westslope cutthroat trout. Poor water quality and competition from non-native species have eliminated westslope cutthroat from the mainstem Clark Fork River. Mining, road siltation and stream encroachment, riparian grazing, and historic silvicultural practices have reduced habitat capability in many tributary streams. Westslope cutthroat are highly susceptible to displacement by non-native brook trout and brown trout and will hybridize with the non-native rainbow trout and other subspecies of cutthroat trout such as the Yellowstone cutthroat trout (Behnke 2002).

Genetic testing of westslope cutthroat fins has been performed for the majority of the perennial streams in the landscape (table IIB-6). Genetic testing reveals whether resident westslope cutthroat populations have hybridized with introduced species. Genetically pure populations of westslope cutthroat are known to exist in Baggs, Cottonwood, Perkins Gulch, Orofino, and Peterson Creek. Cutthroats in Dry Cottonwood Creek are a westslope/Yellowstone cutthroat hybrid. Generally, higher value is placed on westslope cutthroat populations that are genetically pure because they provide important stock for future persistence or restoration of a native westslope cutthroat fishery.

Table IIB-6: Westslope cutthroat trout genetic testing.

Stream	species	date	sample size	% WCT	river mile start[1]	river mile end	TRS[2]	source
Baggs	WCT	8/10/1988	25	100%	2.4	2.5		MFISH
Baggs	WCT	10/6/1988	26	100%	-	-	T7N R8W S3	USFS
Cottonwood	WCT	8/10/1988	25	100%	9.3	9.4		MFISH
N Fk Cottonwood	WCT	8/10/1988	25	100%	0.2	0.3		MFISH
Dry Cottonwood	WCT/YCT	8/26/1988	26	93%	-	-	T5N R9W S1	USFS
Dry Cottonwood	WCT/YCT	10/19/1995	25	97%	-	-		USFS
Perkins Gulch	WCT	10/14/1998	5	100%	3.1	3.2		MFISH
Perkins Gulch	WCT	8/1/2002	23	100%	3.5	5.2		KirK (2003)
N Fk Perkins Gulch	WCT	8/1/2002	combined w/ Perkins	100%	0	2		KirK (2003)
Orofino	WCT	8/27/2002	25	100%	6	6.5		KirK (2003)
Peterson	WCT	8/9/1988	26	100%	10.3	10.4		MFISH

1- river mile only given in MFISH database.
2- township-range-section given in USFS records.

The Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout and Yellowstone Cutthroat Trout in Montana (Cutthroat Trout Conservation Agreement) details conservation measures, goals and objectives for protecting westslope cutthroats throughout their historical range in Montana (MCTSC, 2007). Goals and objectives from the Cutthroat Trout Conservation Agreement are listed in section IIB-3 Desired Future Conditions.

Westslope cutthroat trout conservation populations as described in the Cutthroat Trout Conservation Agreement are shown in figure IIB-7. Conservation populations have specific objectives as listed in section IIB-3. Conservation populations include westslope cutthroat core populations (genetically pure) and also those populations that have unique ecological and behavioral traits of the subspecies. Introgressed conservation populations will typically be <10% introgressed. Often, these slightly introgressed conservation populations will either have migratory life history forms, be adapted to unique environments, be the least introgressed populations within a geographic area, or have distinctive phenotypes or behaviors that local experts deem important enough to conserve. Figure IIB-7 indicates that inadequate data prevented making a call on whether Orofino Creek is a designated conservation population. Genetic testing of westslope cutthroat in Orofino Creek from 2002 indicated this as a genetically pure population. There is currently inadequate genetic data available to determine the genetic status of the westslope cutthroat population in lower Cottonwood Creek.

Other Fish Species

According to FWP data (table IIB-5), other native fish species present in the EDLV landscape area include largescale sucker, longnose sucker, longnose dace, mottled sculpin, mountain whitefish, redside shiner, and slimy sculpin. Non-native brown and brook trout are common in Cottonwood and Peterson Creeks and their tributaries. Non-native rainbow trout are documented in Baggs Creek and the Clark Fork River. Non-native carp are believed to use lower Cottonwood Creek based on FWP surveys (table IIB-5).

Fish Habitat

The Inland Native Fish Strategy Environmental Assessment (INFISH - USDA, 1995) addresses strategies, goals, objectives, and standards for conservation of native fish and their habitat in the Upper Columbia River. INFISH takes a riparian management approach to conserving native fish and their habitat. INFISH Riparian Goals are presented with the DFCs for aquatic habitats and fisheries in section IIB-3 below. Specific Riparian Management Objectives (RMOs) presented in INFISH are detailed and are not repeated in this landscape assessment. The reader is referred to USDA (1995) for these objectives. Under INFISH, interim RMOs apply to watersheds supporting inland native fish.

INFISH sets interim standards for delineating Riparian Habitat Conservation Areas (RHCAs). Specific standards and guidelines apply to RHCAs for timber, roads, grazing, recreation, minerals, fire/fuel, land, riparian area, watershed and habitat, fisheries and wildlife management. These standards are detailed in the INFISH document and are not repeated in this landscape assessment. Watershed analysis as described in INFISH can be used to delineate specific RHCAs where interim RMOs and RHCAs do not adequately reflect specific watershed capabilities or where standards and guidelines require watershed analysis prior to project implementation.

Section 7 Baseline

The USFS assessed bull trout habitat in the Upper Clark Fork Section 7 Watershed Baseline Report (Brammer et al., 2000). The Section 7 report describes existing habitat conditions at the 5th code watershed scale and is summarized here. Data include area, ownership, stream miles, vegetative cover, allotments, timber harvest, recreation sites, mine sites, road density, roads within 300 ft of a stream, and road crossing information derived from GIS analysis at the 6th code HUC scale (table IIB-7). Some of the Section 7 data including road crossings and roads within 300 ft of streams is of suspect quality because the intended scale of the GIS layers used was larger than this analysis allowed (for instance roads and streams may intersect in the GIS where they are parallel on the ground).

In the 5th code HUC 1701020104, Perkins Gulch and Dry Cottonwood Creek are the principal drainages on the east side of the Clark Fork River. The portions of these sub-watersheds downstream of the Forest boundary exhibit substantial impacts resulting from the legacy of smelting in Anaconda. Soil loss and vegetation composition (noxious weeds) are widespread consequences of past smelting as well as livestock management. These same conditions exist to a lesser degree on USFS lands. Local mining in these sub-watersheds, along with the road network and livestock grazing has reduced habitat capability for native fish.

Table IIB-7: Section 7 Watershed Baseline Report watershed condition data.

Name	6HUC #	Size (acre)	Ownership % Federal %State % Private	Miles of Stream perennial/intermittent	Vegetation[1] % forest/ % non-forest/ shrub
Perkins Gulch	170102010403	19,450	24/3/73	25/33	32/62/6
Dry Cottonwood Creek	170102010406	22,280	48/14/38	41/34	39/49/12
Orofino Creek	170102010501	12,900	19/5/76	26/24	29/60/11
Peterson Creek	170102010504	20,000	32/8/60	44/17	39/54/07
Cottonwood Creek	170102010506	40,500	45/8/47	92/37	51/28/23

[1]: Vegetation classes are derived from satellite imagery land cover classification system (SILC) data.

Name	Allot. acres	# Allotments	Acres Regen. Harvest[1]	# Rec. Sites[2]	# Mining Sites
Perkins Gulch	19,450	2	141	0	8
Dry Cottonwood Creek	12297	2	1793	0	8
Orofino Creek	2,300	2	410	0	7
Peterson Creek	6,146	4	1540	1	3
Cottonwood Creek	18,235	3	2690	0	31

[1]: Includes timber harvest only on National Forest lands.
[2]: Includes both developed and "dispersed" recreation sites. Some sites contain multiple camping sites.

Name	Miles of Road	Road Density	Miles of road w/in 300' of stream	# Road/Stream Crossings
Perkins Gulch	72	2.4 mi/mi^2	22.4	57
Dry Cottonwood Creek	77	2.2 mi/mi^2	25	56
Orofino Creek	46	2.3 mi/mi^2	13	29
Peterson Creek	81	2.6 mi/mi^2	15.8	43
Cottonwood Creek	146	2.6 mi/mi^2	36.1	123

In the 5th code HUC 1701020105, most timber harvest on USFS lands has occurred on the east side of the valley in Peterson Creek and Cottonwood Creek sub-watersheds. These sub-watersheds have the highest road densities in the watershed and have moderate-to-high sensitivity to disturbance. Most mining activity has occurred in the Orofino Creek and Cottonwood Creek drainages. Spring Creek mine on North Fork Cottonwood Creek was remediated in 2002. As part of the mine cleanup, a contractor removed approximately 11,000 cy of mill tailings from the channel and floodplain and placed them in an engineered repository improving water quality conditions in the creek.

Habitat Surveys

Fish habitat surveys have been performed on portions of most streams in the landscape by the BDNF. USFS surveys consist of both a detailed assessments and an abbreviated “walk through survey” (table IIB-8). BDNF files also contained narrative records of historic surveys that predate the habitat surveys listed in table IIB-8. However, no date is given in the historic narrative. The more detailed surveys shown in table IIB-8 contain channel metrics and streambed substrate measurements whereas the walk through survey contains only percent pool and riffle by length and pool structural association. The data compiled in table IIB-8 is from USFS field forms. Over the period of time included in the habitat inventory data field forms varied in what data was collected. There are also instances where information provided on field forms was missing or ambiguous. The information provided is the best available pertaining to fish habitat conditions.

Table IIB-8: USFS fish habitat surveys.

USFS stream habitat surveys						% by stream length		Pool structural association					
Stream	*Reach*	*Survey type/year*	*Rosgen Class*	*Gradient*	*Average width/ depth*	*Pools*	*Riffles and Glides*	*% boulders*	*% LWD*	*% rootwad*	*% other*	*% fine substrate (<1/4")*	*Active erosion*
Cottonwood Creek	USFS lands below Middle and North Fk	detailed/1991	A3	5%	18	68%	32%	98%	2%	0%	0%	10%	1%
	Lower Middle Fk	detailed/1991	A3/B3	5%	21	66%	33%	92%	5%	0%	1%	8%	3%
	Upper Middle Fk	walk through/1991	A3	6-7%	-	56%	44%	89%	10%	0%	1%	-	-
	Unnamed trib to Middle Fk	walk through/1991	A3	7+%	-	52%	48%	87%	12%	1%	0%	-	-
	North Fk	detailed/1991	A3	6%	15	47%	52%	91%	4%	4%	1%	19%	1%
Baggs Creek	Lower	detailed/1991	B3	3-4%	22	61%	39%	79%	0%	18%	3%	12%	4%
	Upper	walk through/1991	A3	6%	-	70%	30%	95%	0%	4%	1%	-	-
Dry Cottonwood	USFS lands below north and south fork confluence	walkthrough/1992	B4	3%	21	30%	70%	-	-	-		56%	-
	Lower North Fk	walkthrough/1995	A5	6-8%	15	50%	50%	dominant	co-dominant	-		55%	-
	Upper North Fk	detailed/1991	B4	4%	-	50%	50%	8%	66%	2%	24%	-	-
	Lower South Fk	walkthrough/1992	B3	6%	23	40%	60%	dominant	-	-		24%	-
	Upper South Fk	unknown[1]	B/C/E[1]	-	-	-	-	-	-	-		-	-
Perkins Gulch	North Fk Perkins downstream of rd 5165	walkthrough/1995	B5a	6	12	60%	40%	-	-	-		80%	
	downstream of rd 5165	walkthrough/1998	A5	6%	10	20%	80%	Primary	Minor	-		80%	-

note: "-" denotes data not measured with method used or survey data missing.
1- Where indicated with [1], information taken from Dry Cottonwood Allotment EA (USFS, 1995) and Cliff Mountain Allotment EA (USFS, 1995b).

Fish habitat, fish presence, and genetic data from all USFS surveys as well as surveys performed in 2002 as part of KirK Environmental (2003) are summarized below by stream. Where noted in the discussion below, the information and habitat metrics provided are from the historic USFS narrative.

Perkins Gulch

Trout were observed along much of the length of this creek in 2002, as well as in the North and South Forks where westslope cutthroat trout determined to be pure strain were collected in August, 2002 (table IIB-6). From a small sample of 5 fish collected by the USFS in 1998 (between river mile 3.1 and 3.2, upper end of mainstem) a determination was made of 100% pure westslope cutthroat trout as well. Perkins Gulch is "undesignated" from a management standpoint by the FWP (MFISH 2003). Bull trout are known absent and likely this creek never provided suitable habitat (Brammer et al. 2000).

Fish sampling in August, 2002 revealed low abundance of trout in the 2 forks of Perkins Creek (7 fish sampled in the South Fork and 18 in the North Fork) with electrofishing being conducted over approximately a mile of stream to obtain the desired sample of 25 clipped fins. Cattle use of these creeks was noted resulting in serious impacts to banks and creek bottoms. As well, very recent erosion of unstable granitic sediments from nearby forest roads into these creeks that resulted in flattening and spreading out of stream bottoms, and degradation of trout habitat, was documented. This recent occurrence of severe sedimentation was confirmed at that time by KirK Environmental based on a comparison to physical assessments and inspections of these creeks earlier in 2002.

A 1995 USFS walkthrough survey of the North Fork of Perkins Gulch determined that the stream shows impacts from cattle, mining, and logging. Figure IIA-2 shows no abandoned mines in this drainage, but numerous prospects are shown on USGS Quad maps. The substrate during the 1995 survey was dominated by fines from granitic soils. Banks were 20% trampled and 25% of streambanks were actively eroding. A 1998 walkthrough survey of the North Fork found the stream receiving direct sediment from a private road above FS Rd 5165 and no mining impacts.

A 1998 USFS survey of the South Fork of Perkins Gulch determined that 25% of the streambanks were eroding from trampling.

Dry Cottonwood Creek

Trout were observed along much of the length of this creek in 2002, as well as in the North Fork. Hybridized westslope cutthroat trout/Yellowstone cutthroat trout were previously reported by FWP in 1988 and 1995 (table IIB-6). Electrofishing in August 2002 found good numbers of westslope cutthroat trout with 25 fish sampled in a reach of only about 100 yards. These fins have been retained by the USFS and have yet to be analyzed for genetic purity. Brammer et al. (2000) report that there are no records of bull trout here and it is unknown if this stream ever provided suitable habitat.

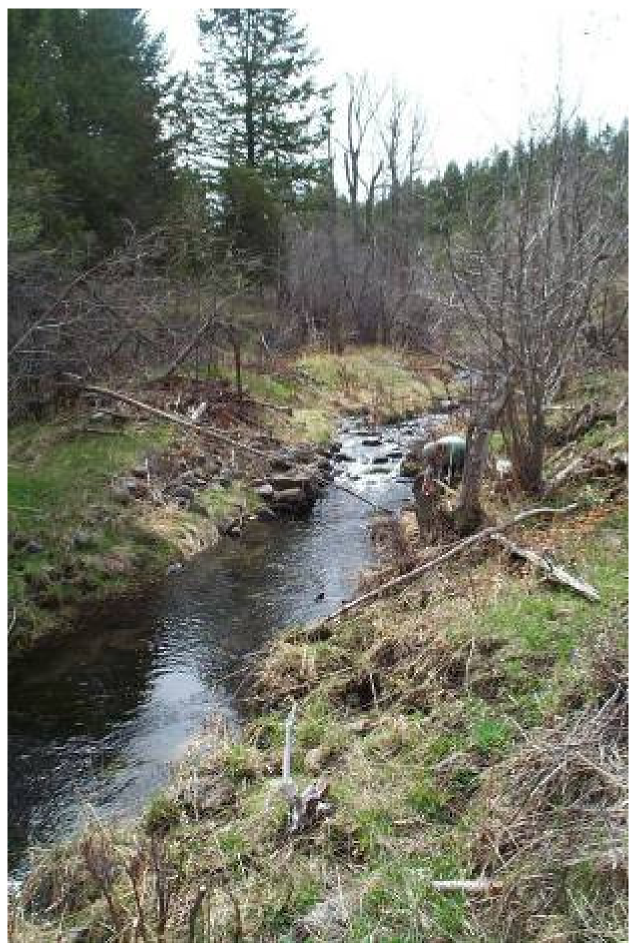
While fish sampling in the North Fork of Dry Cottonwood on August 7, 2002 a quick moving rainstorm/hailstone passed over and runoff from forest roads close to the North Fork quickly muddied the stream. Based on the rapid nature of this stormwater/sediment flow into the stream it appears that this problem may be chronic and routinely creating unstable conditions in this reach of creek and downstream areas.

Historic USFS surveys recorded that Dry Cottonwood contains up to 50% fine material in the stream substrate resulting from the granitic geology. Forest road #85 and #8634 parallel the stream and encroach on the channel. Erosion from the road surface is contributing to sediment loading in both the Main Fork and South Fork of this creek.

A 1991 walk through survey of the mainstem of Dry Cottonwood found old placer mining and a head-cut possibly related to the placer activity. A 1992 USFS walk through survey of the South Fork of Dry Cottonwood found placer mining had affected the channel to varying degrees.

USFS habitat surveying of the upper reach of the North Fork of Dry Cottonwood in 1991 indicated the lower and middle portions contained numerous beaver dams. Stream substrate of the upper reach of the North Fork contained a lot of silt and mud. The lower reach of the North Fork were impacted by cattle, logging, and mining.

Photo: Fish habitat conditions on private lands, upper Peterson Creek.



Orofino Creek

Electroshocking on August 27, 2002 as noted above produced 25 fins for genetic sampling in about 2000' feet of stream. The fins were analyzed and reported as pure westslope cutthroat trout (table IIB-6). Stream flow at the time of sampling was about 0.25-0.50 cfs. This subwatershed did not likely support bull trout historically (Brammer et al. 2000). An old mine (Champion) is located in the headwaters of this creek and has degraded the upper reaches of this creek in the past.

Peterson Creek

Trout were observed along much of the length of this creek in 2002 and in Jack Creek and Spring Creek. In 1988, fin sampling of westslope cutthroat trout by the FWP and genetic analysis revealed pure westslope cutthroats (table IIB-6). The FWP manages the stream as trout water, considers the lower 5.9 miles to be of moderate fisheries resource value and the upper 5 miles to be of high value, and lists a concern about chronic dewatering throughout its length (MFISH, 2003). Brook trout are reported as common, and there are no records of bull trout but it is a fair sized stream with a sizeable drainage area and numerous tributaries (Brammer et al., 2000).

In August 2002, inspection revealed flows of about 0.5 cfs in the lower end of Jack Creek and a bad culvert in place at FS road 19870 crossing (culvert ID #516 in table IIB-9), and flows of about 2 cfs in a steep upper reach of Spring Creek. Dieders Fork of this creek was inspected in September 2002 and little flow was detected, what water was found was muddy and heavily impacted by cattle, and old, remnant beaver ponds were observed. Upper reaches of the private portion of Peterson Creek were inspected in September, 2002 and trout were observed although the reach was found to be heavily impacted by cattle.

A walk through survey of Peterson Creek in 1995 found a short section of the stream heavily impacted by cattle, roads, and logging. Streambank stability was poor with erosion due to heavy cattle use and past logging.

The 1995 survey of Dieders Fork of Peterson found shallow water and a silted streambed. The surrounding riparian area was either hummocked or trampled to bare soil.

Cottonwood Creek

Trout were observed along much of the length of Cottonwood Creek in 2002, in the Middle Fork and in Baggs Creek, a major tributary. Cottonwood Creek is managed as trout water by the FWP, low angling use by residents and non-residents was documented between 1982 and 1999, fisheries resource value is considered substantial in the lower 5.8 miles and high-value in the next 4.8 miles, and chronic dewatering is a concern in the lower 8 miles (MFISH 2003). In 1988, fin sampling of westslope cutthroat trout by the FWP and genetic analysis revealed pure westslope cutthroats in the mainstem and North Fork of Cottonwood Creek (table IIB-6).

“Surprisingly abundant” amphipods were collected in Cottonwood Creek at the Grant Kohrs National Historic Site (Tohtz, 1994). Although there are major habitat limitations and water quality issues on lower Cottonwood Creek. A barrier exists in Deer Lodge to fish movement upstream. It is reported that based on the size of the drainage that it appears possible that bull trout existed in this subwatershed historically, but are not known to be present now (Brammer et al. 2000).

Historic USFS surveys of Cottonwood Creek above the Forest boundary and below the junction of the Middle Fork and North Fork indicate that that active erosion was low and livestock impacts to the channel were minimal. In the lower Middle Fork, the USFS found that evidence of the 1981 flood was apparent, with much of the woody debris deposited above the active channel. Records indicate several mass wasting banks in the Middle Fork which had stabilized at the toe and active erosion was low and livestock impacts to the channel were minimal. In the upper Middle Fork, records indicate that pool habitat is well developed and diverse and woody debris is abundant. In the Middle Fork above road #1518 fish habitat becomes limited due to increased gradient and reduced stream flow. In the unnamed tributary to the Middle Fork, historic USFS records suggest that pool habitat is moderately developed and diverse and woody debris is common.

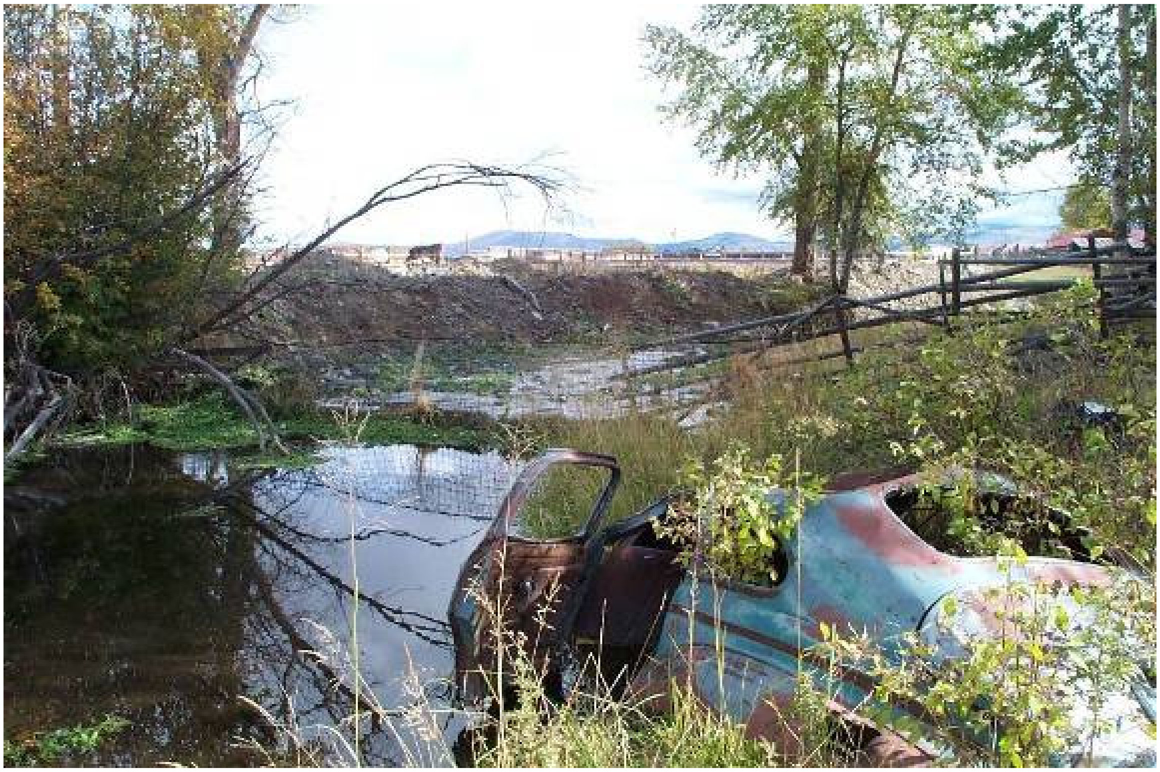


Photo: A car body, over widened stream, and feed lot on private lands on lower Cottonwood Creek. The feedlot has been re-contoured, fenced, and revegetated to mitigate nutrient runoff from the site in coordination with the WRC.

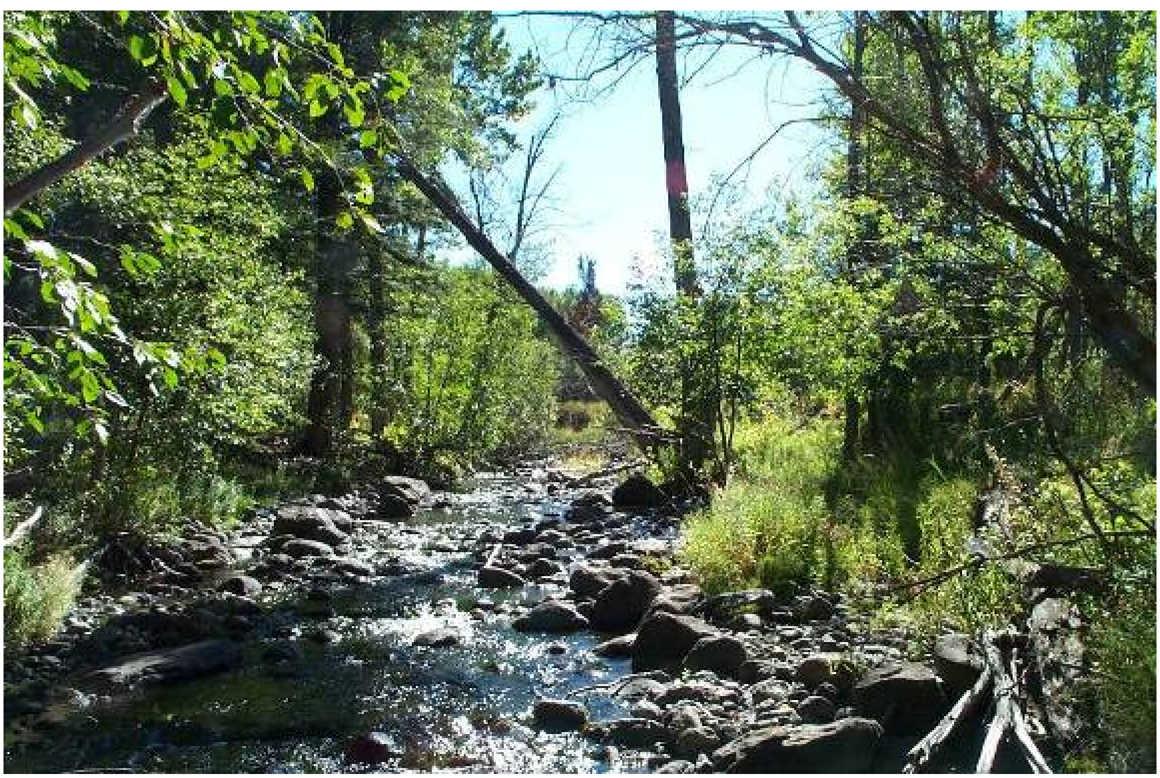


Photo: Fish habitat conditons in the Middle Fork of Cottonwood Creek on the BDNF in 2002.

In the North Fork Cottonwood Creek, historic USFS records show that pool habitat is poorly developed with pools formed mostly by boulder associated scour and woody debris is common but contributes little to instream habitat because it is mostly located above the channel. Streambed substrate percent surface fines in the North Fork averaged 27%, higher than other streams in the Cottonwood Creek drainage. Evidence of channel changes and bank erosion from the 1981 flood were present in the North Fork, but streambanks had mostly stabilized. Active streambank erosion was occurring at the upper end of the reach where Forest road #5173 encroaches on the channel. Habitat conditions within North Fork Cottonwood Creek were rated in poor condition, especially in the upper ½ of the reach. Livestock impacts to the North Fork channel occur in the upper end of the reach and at stream crossings with trampling of streambanks contributing to the bank erosion noted. Livestock were concentrated near the upper end of the North Fork reach due to the accessibility via the road. Past mining activity may also be contributing sediment to the North Fork.

A USFS detailed survey of the Middle Fork of Cottonwood Creek from 1992 found previous logging within the riparian zone, a considerable amount of erosion, and algae covering the substrate.

A USFS detailed survey of the North Fork of Cottonwood from 1992 found some cattle use of the stream and evidence of past mining. Sections of an old road were encroaching on the North Fork. The Spring Creek Mine, on a tributary to the North Fork, was the site of a recent mine tailings remediation project which may have alleviated sedimentation issues.

Baggs Creek

Baggs Creek is managed as trout water by the FWP, supports 4 species of trout (table IIB-5), and the fisheries resource value is considered high-value (MFISH, 2003). Flow in the lower reach of Baggs Creek was estimated at about 2-2.5 cfs on inspection in September 2002 and stream health and stability appeared good. Pure westslope cutthroat trout were found in Baggs Creek by the FWP in 1988 (table IIB-6).

Historic USFS surveys of the lower reaches of Baggs Creek showed that the effects of the 1981 flood are still apparent, having caused considerable channel changes. Active erosion was limited to only 4% of the streambank length, however many sections of the streambank had just recently stabilized. Woody debris was common but the majority was deposited above the channel. This elevated woody debris appeared to be providing some limited overhead cover, but was not contributing to instream habitat as indicated by the absence of pools formed by woody debris. Historic USFS records indicate that impacts of livestock grazing on the lower stream channel were moderate and physical habitat alteration was concentrated around watering areas and crossings and consisted of bank trampling and widening of the channel. Indirect effects of livestock grazing on the lower reaches included alteration of riparian vegetation and suppression of vegetation establishment on banks exposed during the 1981 flood. Pool depths within this reach were lower than expected given stream size and channel type and may be due to a combination of the effects of the 1981 flood and localized impacts from bank trampling by livestock.

Historic USFS surveys of the upper reaches of Baggs Creek indicated that pools are mostly plunge pools formed by scour below boulder checks and woody debris was common but mostly located out of the active channel. Impact to the upper reach from livestock was low. Evidence of channel change and bank erosion from the 1981 flood was present but stream banks had revegetated and stabilized. Upstream migration of fish in Baggs Creek was limited by a barrier waterfall approximately 3½ miles above the Forest boundary.

Fish Passage

Connectivity between stream reaches is often limited by barriers to fish movement such as culverts. In certain instances, fish barriers may protect native fish populations from invading non-native fish. Small, isolated stream segments are commonly the only places where habitat conditions or barriers prevent non-native trout from interbreeding with westslope cutthroats. When cutthroats move down out of the headwaters, they are exposed to unnatural competition and hybridization risks. In other instances, fish barriers have negative consequences to native fish by affecting fish growth, vulnerability to adverse environmental events, predator interactions, spawning success, and other consequences.

The USFS R1 fish passage evaluation criteria screening process is used to quickly classify fish passage at existing culvert crossings for juvenile and adult salmonids. Culverts have been inventoried and fish passage evaluated by BDNF for fish bearing streams in the landscape as shown in figure IIB-7 and table IIB-9. All of the inventoried culverts for which fish passage has been evaluated fail to provide passage to either juvenile or adult lifestages. The records provided by the BDNF for culvert #517 on Peterson Creek did not include measurements for tailwater control or outlet pool height and as such determination of fish passage at this location was not possible.

Table IIB-9: Inventoried culverts.

Culvert ID	Road #	UTM Easting	UTM Northing	Stream	Survey date	Adult fish passage	Juvenile fish passage	Culvert shape	Horizontal size (in)	Vertical size (in)	Length (ft)	Culvert gradient	Material	Outlet configuration
729	8634	373260	5117832	SOUTH FORK DRY COTTONWOOD	7/9/2002	Barrier	Barrier	Pipe Arch	68	49	37	0.082	Annular CMP	Freefall onto Riprap
732	85	372751	5118621	NORTH FORK OF DRY COTTONWOOD	7/8/2002	Barrier	Barrier	Pipe Arch	55	33	41	0.056	Annular CMP	Freefall into Pool
755	85	373112	5117889	DRY COTTONWOOD	7/8/2002	Barrier	Barrier	Pipe Arch	72	44	35	0.053	Annular CMP	Cascade over Riprap
913	5165	370725	5113024	PERKINS GULCH NORTH FORK	7/10/2002	Barrier	Barrier	Circular	24	24	44	0.164	Annular CMP	Cascade over Riprap
914	5165	371494	5114290	PERKINS GULCH	7/10/2002	Barrier	Barrier	Circular	28	22	20	0.010	Annular CMP	Freefall into Pool
730	1518	381962	5134309	MIDDLE FORK COTTONWOOD	7/9/2002	Barrier	Barrier	Circular	72	72	85	-0.139	Spiral CMP	Freefall into Pool
601	5174	378272	5135661	COTTONWOOD CREEK NORTH FORK	6/11/2002	Barrier	Barrier	Pipe Arch	72	44	71	0.042	Annular CMP	At Stream Grade
602	1504	378750	5134945	MIDDLE FORK OF COTTONWOOD	6/11/2002	Barrier	Barrier	Open Bottom Arch	77	10	68	0.011	Annular CMP	At Stream Grade
516	19870	376248	5130236	JACK CREEK	9/12/2002	Barrier	Barrier	Circular	48	48	51	0.069	Annular CMP	Freefall into Pool
517	1504	375673	5126899	PETERSON CREEK	9/16/2002	Unknown[1]	Unknown[1]	Pipe Arch	81	59	83	0.000	Annular CMP	Cascade over Riprap

1- BDNF records provided do not include tailwater control or outlet pool measurements needed to determine passage.

Benthic Macroinvertebrates and Periphyton

BMI and periphyton assessments were completed for the East Valley Watershed Baseline Report (KirK Environmental, 2003). Table IIB-10 presents the results of the BMI assessment; see figure IIB-1 for site locations. Results of the periphyton assessment are narrative. The BMI and periphyton assessments are summarized below. BMI and periphyton impairment issues by stream are summarized in appendix 3. Further detail is found in the respective reports in KirK Environmental (2003) appendix 3 and 4.

Table IIB-10: 2002 BMI assessment results.

Site	% of Max Score	Impairment Classification	Use Support	Issues (from KirK Environmental, 2003 appendix 3)
C1	17	Severe	Non	Thermal impairment, nutrient impairment, potential hypoxic sediment, loss of riparian cover, potential fine sediment deposition.
C2	33	Moderate	Partial	Thermal impairment, nutrient enrichment, fine sediment deposition and loss of riparian cover.
C4	72	Slight	Partial	Potential impaiment of riparian condition.
C5	50	Moderate	Partial	Thermal impairment, potential mild nutrient enrichment, fine sediment deposition.
C6	94	Non-impaired	Full	None
C8	94	Non-impaired	Full	None
CB2	56	Slight	Partial	Nutrient enrichment, loss of riparian function, potential sedimentation.
DC2	33	Moderate	Partial	Nutrient enrichment, sedimentation, and thermal impairment,
DC3	61	Slight	Partial	Potential sedimentation impacts and hypoxic sediment.
DC4	89	Non-impaired	Full	None
O3	44	Moderate	Partial	Severe fine sediment impairment, thermal impairment.
P3	33	Moderate	Partial	Severe thermal and nutrient impairment, hypoxic sediment, potential mild sedimentation.
P5	72	Slight	Partial	Reach scale habitat may be disturbed.
P6	78	Slight	Full	None
PG2	44	Moderate	Partial	Thermal and nutrient impairment, disruption of riparian integrity.
PG3	83	Non-impaired	Full	Some fine sediment impacts.
PG4	67	Slight	Partial	Potential damage to streambank integrity, sediment impairment, possible mild thermal impairment.
	-indicates site is on BDNF.			

Analysis conducted by Wease Bollman (Rhithron Associates, Inc.) of the 17 BMI samples collected from six streams in the landscape indicated that the middle reach of Caribou Creek is slightly impaired, the upper reaches of Dry Cottonwood Creek were non-impaired to slightly impaired and that the middle to lower reach of Dry Cottonwood Creek was moderately impaired. In addition, Cottonwood total bioassessment scores generally decreased downstream, as did scoring on Peterson Creek and Dry Cottonwood Creek. Headwater samples from these streams typically supported a very rich, diverse, and sensitive invertebrate assemblage characteristic of montane sites, with little or no human disturbance. The sample from upper Orofino Gulch indicated moderate impairment; this site is located on an inholding within the BDNF. Samples from Perkins Gulch indicated slight impairment (upper reach), non-impairment (middle reach) and moderate impairment (lower-middle reach). It should be noted that a high-energy precipitation event in 2002 that occurred after collection of the BMI samples on Perkins Gulch produced a significant amount of sediment that was deposited in Perkins Gulch. Biologic recovery of the Perkins Gulch system from excessive siltation was noted in 2003, based on natural movement of sediment out of the system.

A total of 13 periphyton samples from five streams in the project area were also collected for analysis. Values for selected periphyton association metrics analyzed by Loren Bahls, Ph.D. suggested that the middle reaches of Dry Cottonwood Creek and the lower-middle reaches of Perkins Gulch are severely impacted by sedimentation and that the upper reaches of Dry Cottonwood Creek are moderately impaired by sedimentation. Also indicated by the association metrics is that the lower-middle reaches of Dry Cottonwood Creek are moderately impaired by organic loading. The composition of the diatom associations indicates that the excessive organic matter in this stream reach is rich in nitrogen. Additional sites that are moderately impaired by sedimentation are upper and middle Peterson Creek and lower Cottonwood Creek. Sites that are moderately impaired by organic loading include middle Peterson Creek.

2. Range of Natural Variability

Streams generally maintain a quasi-dynamic equilibrium state wherein the sediment supply to stream channels is roughly balanced by the streams transport of that sediment. This dynamic state is controlled by the natural climatic variability, parent geology, and geomorphic processes. Droughts and floods cause adjustment to streams and rivers by changing sediment and water supplied to streams. A stream channel maintains dynamic equilibrium by adjusting channel morphology in response to climate and sediment drivers. The natural range of stream morphological variation is difficult to determine without knowledge of a streams attributes prior to impacts by human settlement. It is also difficult to evaluate the effects of contemporary climate on streams that currently exhibit morphology better suited to periods of wetter or drier climate. Generally, functioning riparian systems aid in a streams resiliency to natural disturbances. Deep rooted riparian vegetation, large woody debris, and vegetative ground cover all help to dissipate flood energy, maintain stream banks in high flows, and reduce sediment and soil loss. Following wildfire, burned areas may release rain and snowmelt in a flash flood action resulting not only in higher than normal flood events but also large debris flows. Functioning riparian systems are critical in this instance to prevent stream channel avulsion. The current degradation of many of the riparian areas inventoried as well as the channel morphologic data which indicates that channels in some areas are straightened and widened over natural conditions suggests that streams in the landscape are not as resilient to disturbance in their existing condition.

Nature produces sediment as episodic (e.g. landslides) and chronic events (e.g. surface erosion). Common erosion processes occurring in the landscape include surface erosion, rilling, gullying, landslides (i.e. rock avalanches, rock fall, earthflows, and slumps).

Natural fire can increase sediment loads and change the water flow regime (e.g. flow magnitude, timing, and overall yield) to a stream system. Many studies have examined regional fire effects on stream channels (Gerhardt and Green, 1991; Minshall et al., 1989). The results are extremely variable. Generally, increases in fine sediment are found in the streambed and suspended sediment samples (Novak 1988; Swanston 1991) following a moderate or larger size fire. The magnitude and quantity of increase sediment is mainly dependent on the burn intensity, size and subsequent hydrologic events. Droughts, floods, and rainfall events all play an important role on the ground surface recovery rate and hillslope sediment transport rates. Fires can also change coarse sediment storage and transport rates. For example, Meyer et al. (1992) described large changes in the sediment transport and storage rates associated with the Yellowstone fire. Fires can burn logjams which leave large sediment wedges available for transport during the next large flow. If a moderate to large rainstorm hits an area following a fire it is not uncommon to see extensive surface erosion and debris flows down hillslope channels. However, given time to recover streams will return to their approximate dynamic-equilibrium state.

3. Desired Future Conditions

FP (1987) and INFISH amendment

Two hundred acres of streams will have been improved by the end of the first decade (pp II-10). One hundred miles of low-to-moderately damaged riparian habitat and 7 ½ miles of heavily damaged riparian habitat will have been rehabilitated by the end of the first decade. The result will be a higher water table in some meadows. The higher water table will increase the forage production on these areas (pp II-11). One thousand acres of stream environment will have been improved by the end of the fifth decade. Improvements will consist of streambank stabilization, creation of pools, and establishment of overhanging cover (pp II-12). By the end of the fifth decade, the Forest's riparian habitat rehabilitation program, involving the riparian zones along 115 miles of streams, will have been completed (this program will actually have been completed by the end of the second decade (pp II-12).

Goals

- To meet or exceed State water quality standards. (pp II-1)
- To restore damaged riparian zones. (pp II-1)
- Maintain or restore: (INFISH)
    a) Water quality, to a degree that provides for stable and productive riparian and aquatic ecosystems.
    b) Stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment transport) under which the riparian and aquatic ecosystems developed.
    c) Instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges.
    d) Natural timing and variability of the water table elevation in meadows and wetlands.

e) Diversity and productivity of native and desired non-native plant communities in riparian zones.
f) Riparian vegetation to:
    a. Provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems.
    b. Provide adequate summer and winter thermal regulation within the riparian and aquatic zones.
    c. Help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
g) Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region.
h) Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian dependent communities.

Objectives

- Wildlife and Fish - Fisheries habitat will be maintained and improved through emphasis on riparian zone restoration and management. (pp II-3)
- Water - The quality of water produced on National Forest lands will meet or exceed State water quality standards by applying soil and water conservation practices that have been developed cooperatively by the State Water Quality Agency and the Forest Service. Best Management Practices (BMPs) will be identified for projects that could degrade water quality. (pp II-4)
- Water - Water needed for National Forest purposes will be filed for and protected through State water rights procedures. (pp II-4)
- Riparian - The quality of water coming from degraded watersheds will be improved through restoration projects and changed management practices. Riparian areas which are presently damaged will be restored by the year 2000. (pp II-4)
- Achieve interim RMOs delineated in INFISH (USDA, 1995) or site specific RMOs determined by watershed analysis. (INFISH)

Bull Trout Draft Recovery Plan (FWS, 2002)

Goals

- Ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the Clark Fork River basin so that the species can be delisted.
- Maintain current distribution of bull trout and restore distribution in previously occupied areas.
- Maintain or increase trends in abundance of bull trout.
- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
- Conserve bull trout genetic diversity and provide opportunity for genetic exchange.

Objectives

- Sustained net increase in bull trout abundance, and increased distribution of some local populations within existing core areas.

- Within the Upper Clark Fork River Complex core area, a minimum of 5 local populations with >100 adult bull trout.
- Within the Upper Clark Fork River Complex core area, a minimum of 1,000 adult bull trout.
- Functionally rejoin two currently fragmented bull trout population segments upstream and downstream of Milltown Dam.

Cutthroat MOU (MCTSC, 2007):

Goals

- Ensure the long-term, self-sustaining persistence of westslope cutthroat trout distributed across their historical range as identified in the recent status reviews listed in MCTSC (2007).
- Maintain the genetic integrity and diversity of non-introgressed populations, as well as the diversity of life histories, represented by remaining westslope cutthroat trout populations.
- Protect the ecological, recreational, and economic values associated with westslope cutthroat trout.

Objectives

- Maintain, secure, and/or enhance all cutthroat trout populations designated as conservation populations, especially the genetically pure components.
- Continue to survey waters to locate additional cutthroat trout populations and determine their distribution, abundance, and genetic status.
- Seek collaborative opportunities to restore and/or expand populations of westslope cutthroat trout into selected suitable habitats within their respective historical ranges.
- Continue to monitor cutthroat trout distributions, genetic status, and abundance using a robust, range-wide, statistically sound monitoring design.
- Provide public outreach, technical information, inter-agency coordination, administrative assistance, and financial resources to meet the listed objectives and encourage conservation of cutthroat trout.

FSP

Goals

Watershed:

- Reduce road densities in watersheds; prioritize roads near streams for obliteration.

Aquatic Habitats:

- Design management practices to keep the aquatic ecosystems free from permanent or long-term human caused stress.

Objectives

Watershed:

- Identify watersheds where restoration efforts are required to attain properly functioning condition and protect beneficial uses. Non-functioning streams are identified and evaluated for channel reconstruction or riparian restoration.
- Comply with state approved BMPs and soil and water conservation practices.

Aquatic Habitats:

- Achieve non-impaired status for BMI and periphyton.