APPENDIX G
Fire Effects on Fisheries

Appendix G

Fires of 2000 Assessment
FISHERIES
October 2000
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Preface

The fires of 2000 affected roughly 2% of the lands within the Kootenai National Forest boundary. There was approximately 28% of that ground affected by stand replacing fire. The remainder was mixed lethal fire with moderate to low burn intensity. There were small isolated areas that burned within riparian areas, but for the most part, riparian areas were not affected by stand replacing fire.

Historically, fish persisted through large stand replacing events. Stochastic events such as fire, or the subsequent floods that commonly follow fire, are natural events that are much more common in a geologic context. This is analogous to the pulse disturbance that occurs one time with no further direct effects to the environment.

Fish populations have functioned quite successfully under this disturbance pattern. However, with increased management in the last 50, years the disturbance pattern is better described as a press pattern where there are continual direct effects to the aquatic environment and its associated fish species. It is this chronic disturbance pattern that is responsible for the downward trend in the numbers of fish populations and individuals, not the large-scale environmental events that occur so infrequently.

The real difference between pulse and press disturbance patterns is the much longer timeframe between events under the pulse pattern. The interim period allows affected populations to recover to pre-disturbance levels. Press disturbance patterns produce chronic effects that preclude total recovery through the duration of the disturbance. The task at hand will be to implement restoration and rehabilitation without creating a chronic disturbance pattern in the areas to be treated.

Threatened, Endangered & Sensitive Species (TE&S)

Threatened, endangered & sensitive fish species on the Kootenai National Forest include the Kootenai River white sturgeon *Acipenser transmontanus*, burbot *Lota lota*, torrent sculpin *Cottus rhotheus,* bull trout *Salvelinus confluentus*, westslope cutthroat trout *Oncorhynchus clarki lewisi*, and interior redband trout *Oncorhynchus mykiss gairdneri*. Effects to the white sturgeon are likely discountable for several reasons. The Recovery Plan for sturgeon identifies the primary factor affecting sturgeon is an altered hydrograph caused by operations at Libby Dam (USFWS 1999, pages 7-10). The size, distance to sturgeon habitat, and wide distribution of the 2000 fires is such that their effects to sturgeon are negligible. Effects from the larger fires in the upper Kootenai watershed will be buffered by the reservoir and dam operations.

Similarly, effects to burbot would be negligible as well. These fish inhabit the mainstem Kootenai and Koocanusa Reservoir, both of which are large enough to dilute the effects from fires that occurred in tributaries to the Kootenai River.

The species most likely to be affected by the fires themselves and any post fire activity would be bull trout, westslope cutthroat, redband trout, and sculpins. These species are most likely to occur in the smaller tributaries impacted by fire or directly downstream. Resident fishes would potentially be most affected. They are dependent on available habitat, which, if greatly altered, would not provide adequate habitat. Stochastic events like fires have been identified as a threat to small resident populations (Rieman and Macintyre 1993). Figure G-1 shows the location of the 2000 fires in relation to known bull trout and redband trout distributions. Westslope cutthroat trout are distributed across the Kootenai National Forest and would be affected by all the fires, either directly or indirectly.

Migratory bull trout and westslope trout are more resilient to environmental effects as they have access to the Kootenai River and Koocanusa Reservoir for rearing habitat. There is the potential to weaken or eliminate certain year classes should the indirect impacts of the fires create unsuitable conditions, but this would be mitigated by multiple spawnings by older individuals. The impacts that could affect the 2001+ year classes would be loss of suitable spawning areas, pools, and instream cover through excessive sedimentation. The duration of these effects would be short term as the riparian and upper slope vegetation recovered through reforestation.

Consistency with INFS standards and guidelines

The Inland Native Fish Strategy (1995) provides Forest Plan direction for management activities conducted in and adjacent to riparian areas. It is important that all restoration actions be consistent with INFS direction to insure legal consistency as well as protecting riparian qualities. INFS does provide flexibility for management inside riparian areas.

Riparian Habitat Conservation Areas (RHCA)

Default RHCA widths are provided in INFS for priority and non-priority watersheds (Table 1). Watersheds supporting bull trout populations within the boundaries of the KNF are considered special emphasis watersheds and treated as INFS priority watersheds (Table 2). These special emphasis watersheds have been identified through consultation with the US Fish and Wildlife Service (USFWS) and Montana Fish Wildlife & Parks (MFWP).

In some cases it will be appropriate to modify RHCA widths either by increasing or decreasing them as compared to the default widths stated in INFS. This decision will be validated with field data in concert with comparison to the historic range of variability. Certain drainages within the areas affected by fire need vegetative management to occur within the RHCAs. These sites presently support tree species, which are more commonly associated with drier upslope VRUs because the original riparian canopy was removed either through fire or historical riparian harvest. Site-specific analysis will identify sites where restoration by vegetation treatment is appropriate inside RHCAs.

Some silvicultural treatment followed by planting would be used to accelerate the vegetation community toward a desired future condition. An example would be the removal of existing trees, i.e., lodgepole pine, Douglas fir and converting the stand to cedar, cottonwood, and aspen. This is consistent with INFS guidelines TM-1 (a & b).

Riparian Management Objectives (RMO)

The Forest Plan, as modified by INFS, has standards by which aquatic habitat can be compared to determine whether it currently meets minimum qualities of good fisheries habitat. The Plan directs that project implementation will not retard the attaining or exceeding these standards for aquatic habitat. Unless otherwise noted, default RHCA widths should be implemented to protect riparian habitat qualities. Where there is sufficient data, RHCA widths should be modified to potentially permit restoration activities within the RHCA.

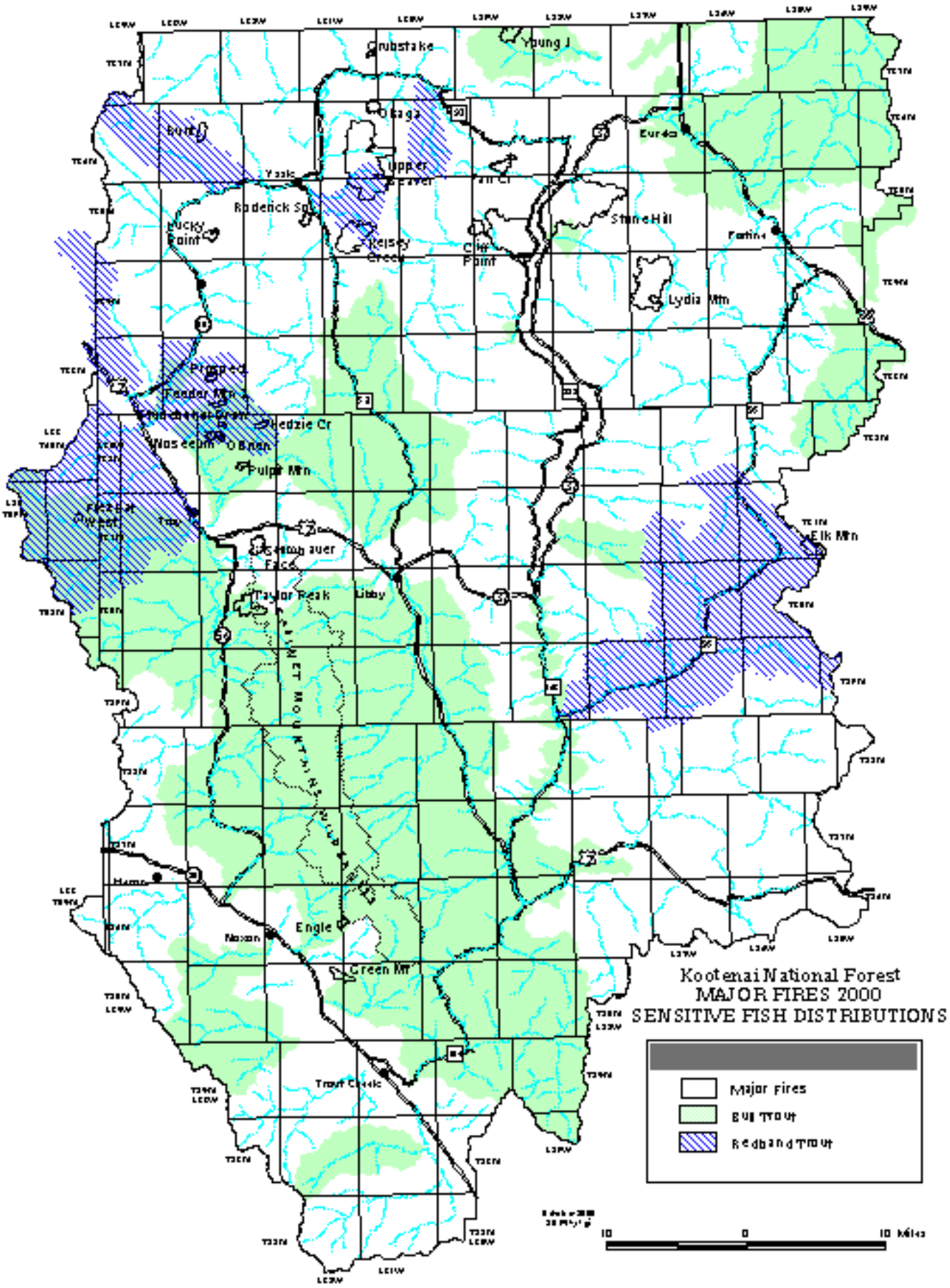
Table 1 – Default INFS RHCA widths

	Category 1	**Category 2**	**Category 3**	**Category 4**
	Fish-bearing	*Perennial Non-fish-bearing*	*Ponds, Lakes, Reservoirs, >1ac*	*Intermittent streams, wetlands, <1 ac*
Priority	Extends to the top of the inner gorge, 100 yr floodplain or 300′ either side, whichever is greater	Extends to the top of the inner gorge, 100 yr floodplain or 150′ either side, whichever is greater	Extends to the outer edge of riparian veg extent of seasonally saturated soils, over unstable soils, or 150′, whichever is greater	Extent of landslide prone areas, area to top of gorge, edge of riparian veg, or 100′ either side, whichever is greater
Non-priority	Same	Same	Same	Extent of landslide prone areas, area to top of gorge, edge of riparian veg, or 100′ either side, whichever is greater

Table 2 – Special Emphasis Watersheds on the Kootenai National Forest by District

Eureka	**Murphy Lakes**	**Three Rivers**	**Libby**	**Cabinet**
Young Cr.	Wigwam River*	O'Brien Cr.*	Canyon	Bull River*
Sophie Cr.*	Grave Cr.*	Callahan Cr.*	Libby Cr.*	Marten Cr.
Phillips Cr.*		Lake Cr.*	West Fisher*	Rock Cr.*
Parsnip Cr.		Lower Yaak R*.	Silver Butte*	Pilgrim Cr.
Sutton Cr.		Keeler Cr.	Quartz Cr.*	Swamp Cr.
			Pipe Cr.*	Vermilion R. *
			Bear Cr	Whitepine Cr.
			Fisher River	
			Bobtail Cr.	
			Parmenter Cr.	
			Flower Cr.	

* Priority bull trout watershed identified in INFS


Grubstake
Young J
Olaga
Eureka
Upper Fever
Yaak
Roderick Sp
Lucky Point
Kelsey Creek
Clif Point
Stone Hill
Lydia Mtn
Fortine
Prospect
Feeder Mtn
Pledzie Cr
Wasdeem
O'Brien
Pulpit Mtn
Elk Mtn
Taylor Peak
Libby
Engle
Noxon
Green Mt
Trout Creek
Kootenai National Forest
MAJOR FIRES 2000
SENSITIVE FISH DISTRIBUTIONS
Major Fires
Bull Trout
Redband Trout
10
0
10 Miles

Large Woody Debris (LWD)

Large woody debris is one structural component that is lacking in most managed watersheds on the Kootenai National Forest. The fires of 2000 increased LWD recruitment by burning trees and snags in RHCAs that then fell or will fall into the stream channels. INFS requires certain frequencies of LWD dependent on stream size. RHCAs affected by stand replacing events during the 2000 fires will have a short term increase in LWD recruitment; however, long-term recruitment will be greatly reduced. Areas affected by mixed lethal fire should experience a more tempered response in LWD recruitment rates.

Stream segments that were not directly impacted by fire, but are downstream of affected reaches, will see a lag in recruitment, as LWD is washed downstream or recruited through mass wasting upstream.

Long term LWD recruitment needs to be addressed, particularly in areas where much of the riparian overstory has been removed either by previous harvest or by fire. For the purposes of this assessment, 20 years is considered long term. Large wood recruited into streams as a result of the 2000 fires will likely begin to diminish during that time either by way of transport or decay. Sites identified as having stand replacing fire or identified for harvest in riparian could be revegetated with cedar and cottonwood. Areas that are currently below INFS standards for wood could be enhanced by adding large wood to the stream channel. The bulk of the affected sites do not support fish populations directly; however, the wood acts as velocity dissipaters and sediment traps.

Thermal Regime

There is the potential for a shift in thermal regime for some smaller tributaries affected by fire. This may in turn affect larger watersheds downstream. Those areas that have had a reduction in riparian vegetation should be considered for reforestation with the long-term goal of maintaining thermal stability during periods of low flow. These areas would be prime candidates for reestablishing cedar and cottonwood. Planting red osier dogwood, willows and other appropriate species would provide quick canopy and stabilize streambanks while larger overstory species became established.

Pool Frequency

Pools are a critical component of quality fish habitat. They provide rearing habitat throughout the year with larger, deeper pools critical for survival during periods of low flow. Generally, pools in smaller Kootenai Forest tributaries are associated with LWD. The LWD either forms the pool or adds complexity of cover, which enhances the quality of the pool. Pools in excess of 1.5 ft in depth are extremely valuable in the winter when streams often freeze, particularly where they do not have the insulating cover of an intact riparian area to help prevent freezing.

The Forest Plan, as modified by INFS, sets standards for pool frequency based on stream size. Special consideration should be given to the relationship between long-term LWD recruitment and the formation of large, deep pools

Width to Depth

This standard reflects stream function. An increase in this metric is usually indicative of inefficient sediment transport. The potential exists, particularly in unstable landtypes affected by stand replacing fire, for erosion and slope failures to increase sediment delivery to adjacent stream segments. This would be reflected by an increase in this metric.

Streamside Management Zones (SMZ)

The guidelines in INFS are generally more restrictive than State SMZ law especially in special emphasis watersheds. State SMZ standards can be more restrictive on non-fish bearing, intermittent tributaries outside special emphasis watersheds. One specific exception is the SMZ direction for Class III streams in steep topography. State SMZ law calls for a 100-foot buffer, which would exceed the default INFS RHCA width. State SMZ law and KNF riparian guidelines prohibit the use of equipment inside the SMZ.

124 Permit

Restoration will be coordinated with MFWP. Restoration requiring instream excavation will be submitted for 124 Permit approval from MFWP. This will include culvert replacements, culvert removals, channel stabilization, adding LWD and similar projects

Section 7 Consultation

The listing of white sturgeon as endangered, September 1994, and bull trout as a threatened species, June 1998, requires that projects with potential effects to these species go through the consultation process with the USFWS. There is no potential for effects to white sturgeon or its habitat. Therefore, the level of effects to listed species will be determined based on project scale, scope of activities and proximity to bull trout habitat.

Emergency

Suppression and rehabilitation efforts associated with initial attack are to be covered under a Region wide emergency consultation with USFWS. These activities as a whole were determined to have adversely affected bull trout and their habitat, which requires formal consultation.

Project

There are two ways consultation could be accomplished for the restoration efforts. The first would be the more traditional process by which a biological assessment is prepared for each project. Concurrence or formal consultation would then be requested on each project as they are proposed. Another option would be to put together a programmatic BA to cover all the potential restoration opportunities identified through this assessment and subsequent analysis. The latter option would require knowledge of the extent of work to be proposed in conjunction with sideboards developed to reduce the potential for take to bull trout.

Effects

The effect of fire on aquatic ecosystems is well documented in the literature. Specific effects analysis should be developed with respect to each restoration proposal. Common direct effects will vary from decreased riparian vegetation to actual fish mortality. There were no instances of actual fish mortality reported with the fires of 2000 on the KNF. Indirect effects will be more prevalent in the analysis of our recent fires. These types of effects are most commonly manifested as altered habitat through changes in thermal regime, increased sediment, reduced complexity, etc. The level of effects will be dependent on several factors and will vary across the Forest depending on landtypes, VRUs, and burn intensity. Indirect effects are not immediately obvious on the landscape

but instead will require one or two high water events before they are noticed. A similar lag but more extended would occur in fish populations negatively affected by gross changes in the habitat quality. Again, it is not apparent at this point that any of the fires caused this kind of shift.

Post fire restoration planning will need to consider this lag in effects to the aquatic environment and organisms so as not to exacerbate conditions established by the actual fires. The mosaic pattern left by the fires of 2000 are likely to impact most watersheds to a very limited extent which should allow a large degree of flexibility on most sites. The limiting factor continues to be overall watershed condition that was possibly confounded by the recent burns. This is most true in watersheds with native fish populations either within fire perimeters or directly downstream.

Considerations

Watersheds supporting TE&S fish species should be treated to minimize effects to those species. As discussed in the 1994 assessment, activities planned in watersheds supporting TE&S species should limit ground-disturbing activities through treatment types and timing.

BA/BEs will be prepared as appropriate for TE&S species.

Ground disturbing activities in special emphasis bull trout watersheds occurring outside the time period July 15 to September 1 will probably require formal consultation with the USFWS.

All construction activity in defined channels will require consultation with MFWP and 124 permits.

BMP implementation, activities to reduce erosion, or improve channel function should be considered to reduce management effects.

Riparian areas affected by stand replacing fire should be considered for reforestation. Consideration should be given to planting spruce, hemlock, cedar, black cottonwood, and other appropriate riparian vegetation.

Intact riparian areas within burn perimeters should be considered for regeneration where appropriate.

A road system analysis should be done to identify roads for obliteration.

Abandoned roads within riparian areas should be obliterated wherever possible.

Known pumping sites used in 2000 should be hardened and mapped for future use.

Undersized pipes within the fire perimeters should be replaced to facilitate potential increased water yield and sediment production.

Monitoring should include effectiveness monitoring to determine what works and what does not. This will require specific objectives and trigger points for restoration.

References

Rieman, B.E., and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. General Technical Report INT-302, U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Ogden, Utah.

USDA Forest Service. 1995. Environmental Assessment: Decision Notice and Finding of No Significant Impact. Interim Strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana and portions of Nevada.

USDA, Forest Service, Intermountain, Northern, and Pacific Northwest Regions.

U.S. Fish and Wildlife Service. 1999. Recovery Plan for the White Sturgeon (*Acipenser transmontanus*): Kootenai River Population. U.S. Fish and Wildlife Service, Portland, OR. 96 pp. plus appendices.