See also: Appendix 24 Baseline Conditions for Bull Trout, South Fork of the Flathead
Appendix 25 Baseline Conditions for Bull Trout, Stillwater Drainage

Appendix 23
Baseline Conditions for Bull Trout (*Salvelinus confluentus*), North and Middle Forks of the Flathead Drainage

Excerpt from the Biological Assessment for Bull Trout

Habitat Condition at Sub-basin Scale

Environmental baseline conditions of watersheds that have bull trout populations will be discussed at the 5th and 6th level HUC. Habitat monitoring using McNeil core samples and substrate scores suggest that spawning and rearing habitat is as good as during any time since measurements were first taken in the early 1980's (Table 4). Improvements are primarily a result of good water years when runoff brakes up the armoring layer and reduces sediments. Sediment levels were the highest during the drought years of the late 1980's.

Habitat conditions historically would have been in optimal condition. Natural erosional processes have occurred in these drainages which created pulse disturbances that fish evolved with. An assumption is made that if catastrophic events occurred in one drainage that bull trout from an adjacent drainage would re-colonize or "refound" that drainage where bull trout where lost. (Rieman et al. 1993). It is important to recognize that the headwaters of these sub-basins are primarily protected in Glacier National Park, wilderness, and roadless areas. Wilderness and roadless areas are important components in maintaining fisheries populations due to minimizing influences from forest management (USDA 1997).

Baseline Environmental Conditions

The format below follows *A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale* (1998). The format uses a matrix designed to integrate the biological and physical conditions to a determination of the potential effects of management activities on bull trout. A brief narrative description is provided for each indicator to help substantiate the determination. A call of functioning appropriately (FA), functioning at risk (FAR), and functioning at unacceptable risk (FUR) is given for each parameter in the matrix.

All habitat data is from Montana Department Fish, Wildlife, and Parks surveys from 1979-1981 (MDFWP 1983). These surveys were comprehensive; measuring gradient, drainage area, channel width, pools, riffles, substrate composition among other parameters. R1/R4 survey data (Overton et al. 1997) was also used where available. This data is generally less than 5 years old. Where available, sediment data from McNeil core samples, which measures percent fines less than 6.4 mm in spawning gravels, was used. Temperature data is from incidental measurements taken during fisheries and hydrologic surveys. Substrate scores and D-90 measurements were used as surrogates for embeddedness. Streambank stability was measured using the R1 Stream Bank Stability (Pfankuch Method).

Population characteristics are from our knowledge of the existing population from redd counts, juvenile population estimates, and best professional judgement.

North Fork Streams

Trail Creek (1700)

Trail Creek is a 5th order stream. Bull trout, westslope cutthroat trout, mountain whitefish and sculpins are present. Bull trout distribution is limited to the first 7.5 miles to just below Thoma Creek. At this point, the stream goes subsurface for about 1 mile upstream and predominantly cutthroat trout have been found above. Juvenile bull trout would have access to the upper reaches during high flow periods. Several springs provide excellent water around 4-5 C that feeds Trail Creek at this point. This subterranean flow is a natural phenomenon given the cavernous geology of this area and is not believed to be man induced.

Subpopulation Characteristics-

Subpopulation Size- Redd counts over the last 19 years have shown a precipitous decline with the exception of the last 2 years. Juvenile populations have not been collected with the exception of 1989.

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Redd Cnts	34	31	78	94	56	32	25	69	64	62	51
Pop. Est.											47

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Redd Cnts	65	27	26	13	15	28	8	9	17	21

These declines reflect a trend in all North and Middle Fork Flathead River bull trout streams. Declines are due in part from drought in the late 1980's, overfishing, and habitat modification. But perhaps the most responsible mechanism for decline are changes in Flathead Lake's ecosystem and food chain as discussed in the overview. Habitat degradation does not appear to be a leading factor for decline in Trail Creek. This subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As noted above, this population is in decline and may not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70%

probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat-

Temperature- Temperature data is sketchy. Peak summer time temperature in 1979 was 60 F. Given the springs and upwelling areas in this stream, temperature is not anticipated to be limiting. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission (Weaver and Fraley 1991) recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have been taken in Trail Creek since 1982. Fines have never been measured above 35% in Trail Creek but have fluctuated from a high 34.6 in 1991 to a low of 24.8 in 1995. The McNeil core for 1999 was 30.1 which is good, however it most likely will increase following the Nokio Cr. culvert failure. Sediment would be considered FA based upon the existing data.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. As mentioned above, adult bull trout do not have access to upstream reaches. FA

Embeddedness- The Flathead National Forest does not measure embeddedness, however, substrate scores which indicate the quality of rearing habitat based upon quality of interstitial space for juvenile bull trout have been taken. The scores indicate that rearing habitat is good. FA

Large Woody Debris- The 1979 survey on the lower 7.5 miles indicate that debris was low and unstable. As a whole, recruitment of LWD has not been compromised from riparian harvests. FAR

Pool Frequency- The 1979 survey determined that there was a 60% run, 40% riffle and a trace of pool habitat. This most likely correlates with the low amount of wood in the stream. FAR

Large Pools- The 1979 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Only 4% of the pools were classified as Class I or II. Therefore, pool quality would be poor. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. A large part of this drainage is in Management Allocation 11 which is primarily for the conservation of the grizzly bear. This situation has resulted in a reduction of ground disturbing activities in this drainage. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had some increase peak flows from timber harvest and road construction which has resulted in

some bedload movement. In other North Fork streams this has resulted in increased W/D ratios. FAR

Streambank Stability- The R-1 Stream Channel Stability Ratings completed in 1979 range from 47 to 56, all within the good condition range (39-76). FA

Floodplain Connectivity- The stream has access to its floodplain. The average valley width is 115m and is generally unconfined with a sinuous pattern. FA

Peak Flow- The water yield increase was modeled for the basin in 1991 using the H2OY model. That model predicted a 4.6% annual water yield increase due to the roading and harvest activities. Water yield in this basin is somewhat buffered due to the amount of flow transmitted by underground springs within the limestone bedrock portion of the basin. FA

Drainage Network- No direct measurements of this indicator. Generally there are only isolated areas of skid trails or roads causing increases in the active channel length. FA

Road Density and Location- There are 64 miles of road in this HUC. Densities ranged from 1.0 mi/mi in lower Trail to 0.1 mi/mi in Tuchuck. The main road parallels the stream and in a few locations it infringes upon the streams natural meander pattern, however, there doesn't appear to be effects on the stream from the road location. A culvert blew out in Nokio Creek in November 1999 releasing upwards of 400 yds of sediment into the stream. FA

Disturbance History- Harvest history has been light in Trail Creek. High intensity harvest (removal of greater than 60% canopy cover) less than 20 years old has occurred on 720 acres and 1900 acres of harvest are older than 20 years. Light harvest (< 60% removal of canopy cover) has occurred on 886 acres (greater than 20 yrs.) and 81 acres (less than 20 yrs.). FA

Riparian Conservation Areas- The riparian areas provide adequate recruitment of trees and shade. FA

Disturbance Regime- There is no recent fire activity in Trail Creek. Avalanches are numerous in headwater tributaries. FA

Integration of Species and Habitat Conditions- Habitat conditions provide very good rearing and spawning habitat, however , the migratory bull trout form has been greatly depressed as a result of changes in Flathead Lake. FAR

Teepee Creek (1601)

Teepee Creek is a 3rd order stream. Bull trout, westslope cutthroat trout, mountain whitefish and sculpins are present. Bull trout distribution is limited to the first 3 miles to just below Teepee Lake. Bull trout occur in limited numbers and no redd counts for bull trout have been conducted in Teepee Creek. Teepee Creek is not a priority bull trout watershed.

Subpopulation Characteristics-

Subpopulation Size- Redd counts have not been conducted. A FNF electrofishing survey in 1992 failed to find any bull trout in 2 stations near the Ford Work Station and above Road #5399 crossing. However, several bull trout were captured near Teepee Lake the following year. No population estimates could be derived from this sample. In all likelihood, bull trout were never abundant in Teepee Creek. No bull trout were collected in Teepee Creek in 1955 which was one of the first studies on record (Block 1955). However, given that this population is part of the larger Flathead Lake meta-population this subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this meta-population is in a rapid decline and may not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Re-colonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat- Most North Fork Flathead River tributaries were surveyed between 1979 and 1982 by Montana Department of Fish, Wildlife and Parks personnel as part of an Environmental Protection Agency study. However, Teepee Creek was not surveyed. Habitat data presented here is from a 1992 R1/R4 survey.

Temperature- The maximum temperature recorded in 1992 was 16.7 C while the average temperature was 10 C . FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission (Weaver and Fraley 1991) recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have never been taken in Teepee Creek. Pebble counts were taken in 1993 at 3 locations and percent fines ranged from 4% in riffles to 19%. As a whole the percent of fines does not appear to be limiting bull trout spawning in Teepee Creek if spawning does indeed occur. FA

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. About a mile of stream above Wedge Canyon goes dry in the summer. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Given the small amount of fines and comments from the survey an inference will be made that embeddedness does not appear to be a problem. FA

Large Woody Debris- LWD ranged from 100 pieces/mile to 125 pieces/mile. However, potential recruitment of lwd was low. FA

Pool Frequency- Pools made up less than 5% of the streams total area in the 1992 survey and were predominantly formed by lwd. FAR

Large Pools- Pool quality was rated as poor. FAR

Off Channel Habitats- Sufficient off channel habitat exists. FA

Refugia- This stream is too small to serve as a refugia for bull trout. Large and more important streams exist within this sub-basin. FAR

Wetted Width/Max. Depth Ratio- The wetted width/ maximum depth is about 5 while the average width/depth ratio is about 10. These are favorable width/depth ratios. FA

Streambank Stability- R1/R4 Fish Survey bank stability rating in 1992 was 95% stable. There were ten R-1 Stream Channel Stability Ratings completed in 1976 to 1979 range was from 54 to 87, all but 1 was within the good condition range (39-76).FA

Floodplain Connectivity- The stream has access to its floodplain. The stream is generally unconfined with a sinuous pattern. FA

Peak Flow- There are visual indicators of bedload movement in the mid to lower portions of Teepee Creek, which are probably associated with water yield increases from past logging and roading within the drainage. FAR

Drainage Network- There are some areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 60 miles of road in this HUC. The density is the second highest of any North Fork HUC at 2.6 mi/mi . The road parallels the stream and there has been slumps into the creek over the years. FAR

Disturbance History- High intensity harvest greater than 20 years was 2,476 acres and less than 20 years was 1,440 acres. Low intensity harvest was 1,392 acres and 318 acres, respectively. FAR

Riparian Conservation Areas- Recruitment of trees has been reduced in some areas from roads and harvest. FAR

Disturbance Regime- There was a 41 acre burn in 1961. There hasn't been many natural disturbances in Teepee Creek. FA

Integration of Species and Habitat Conditions- Teepee Creek is not an important bull trout stream but juveniles have been known to enter this stream below Teepee Lake to rear. The migratory form is depressed due to changes in Flathead Lake. FAR

Whale Creek (1500)

Whale Creek is a 4th order stream. Bull trout, westslope cutthroat trout, mountain whitefish and sculpins are present. Bull trout distribution is limited to just above Shorty Creek confluence where a waterfall prevents upstream movement. Bull trout have been found several miles up Shorty Creek.

Subpopulation Characteristics-

Subpopulation Size- Redd counts over the last 19 years have shown a precipitous decline. Juvenile populations have fluctuated with some of the highest numbers in the 1990's.

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Redd Cnts	35	45	98	211	141	33	94	90	143	136	119
Pop. Est.			76		38			32	63		33

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Redd Cnts	109	61	12	46	32	28	35	17	40	49
Pop. Est.	36		100	62	79	72	34	9	134	49

Redd counts have also been completed in Shorty Creek during basin wide surveys.

	1980	1981	1982	1986	1991	1992	1997
Shorty Cr	4	17	56	35	6	3	2

These declines reflect a trend in all North and Middle Fork Flathead River bull trout streams. Declines are due in part from drought in the late 1980's, overfishing, and habitat modification. But perhaps the most responsible mechanism for decline are changes in Flathead Lake's ecosystem and food chain as discussed in the overview. Habitat degradation does not appear to be a leading factor for decline in Whale Creek. This subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this subpopulation is in a rapid decline and may not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat- In addition to the MDFWP survey in 1979, FNF R1/R4 survey data exists from 1995 for Shorty Creek and 1996 from South Shorty Creek.

Temperature- Temperature data is sketchy. Peak summer time temperature in 1979 was 15.6 C for Whale Creek. The highest temperature recorded in S. Shorty Creek was 14 C and 15 C in Shorty Creek. There were 23 incidental temperature measurements associated with water quality monitoring procedures between 1977 to 1981 in upper Whale Creek. The maximum water temperature recorded was 11.0 C. There were 205 incidental temperature measurements associated with water quality monitoring procedures between 1977 to 1994 in lower Whale Creek. The maximum water temperature recorded was 17.2 C. There was a mid April through October continuous recording water temperature monitoring site on lower Whale Creek. This site was monitored from 1988 to 1991. The maximum temperature recorded for those years ranged from 9.5 to 11.7 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission (Weaver and Fraley 1991) recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have been taken in Whale Creek since 1982. McNeil core sample Fines in Whale Creek have fluctuated from a high of 37.2 in 1989 to a low of 22.5 in 1986. Surface fines measured occularly in S. Shorty Creek were 24.5 in 1995. Sediment for 1999 was 31.4. Sediment would be considered FAR since % fines have consistently been higher than other North Fork Flathead tributaries.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is listed on the State's 303(d) list of impaired water bodies due to siltation associated with timber harvest and roads. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness, however, substrate scores which indicate the quality of rearing habitat for juvenile bull trout have been taken. The scores (12.1 in 1999) indicate that rearing habitat is good. FA

Large Woody Debris- The 1979 survey indicates that debris was low and unstable. There are locations along streams where riparian harvest has occurred which has compromised recruitment of lwd. LWD in S. Shorty Creek averaged 214 pieces/mile. This should provide a source of lwd to be distributed downstream in Whale Creek. FAR

Pool Frequency- The 1979 survey determined that there was a 50% run, 40% riffle and 3% pool in Reach 1 and 50% run, 20% rifle, and 19% pool in Reach 2. Reach 1 started at the mouth and extended to about a mile above the bridge on Road #1671. Reach 2 extended to the Shorty Creek confluence. This most likely correlates with the low amount of wood in the stream. Pools comprised 19% of the habitat units in S. Shorty Creek. FAR

Large Pools- The 1979 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Pool quality was good in Reach 2 with 37% of pools being Class I or II while only 15% were Class I or II in Reach 1. Pool quality was not measured in S. Shorty Creek. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists however, they are not necessarily protected. INFISH will play a major role in protecting riparian zones however as is the case in most North Fork Flathead tributaries early timber harvest in the headwaters has resulted in increased peak flows and increased bedload movement and deposition. FA

Wetted Width/Max. Depth Ratio- No W/D data exists for Whale Creek, however, it is inferred that this system has had some increase peak flows from timber harvest and road construction which has resulted in some bedload movement. In other North Fork streams this has resulted in increased W/D ratios. The width/max. depth ratio for S. Shorty Creek is around 9 while the wetted width/depth ratio is 26. FAR

Streambank Stability- Stability for S. Shorty Creek is 76%. The R-1 Stream Channel Stability Ratings for Shorty Creek completed in 1979 range from 55 to 67, all within the good condition range (39-76). The R-1 Stream Channel Stability Ratings for Whale Creek completed in 1976 to 1979 were 50 to 99, which range between a good and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. The average valley width is 115m and is generally unconfined with a sinuous pattern. FA

Peak Flow- The water yield increase was modeled for the basin in 1991 using the H2OY model. That model predicted a 6.5% annual water yield increase due to the roading and harvest activities. FAR

Drainage Network- There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 83 miles of road in Whale Creek. Densities range from 2.2 mi/mi in Lower Whale to 0.2 mi/mi in upper Whale. Fortunately, many of the roads are below bull trout spawning. For the most part, the road is away from the stream. FAR

Disturbance History- High intensity harvest greater than 20 years has occurred on 7,600 acres and 1,700 acres less than 20 years. Low intensity harvest has occurred on 2,202 acres greater than 20 years and 740 acres less than 20 years. Much of the older harvest occurred in the headwaters in the 1960's which has resulted in bed load deposition in lower reaches. FAR

Riparian Conservation Areas- There has been some riparian harvest in the past which has reduced the amount of trees available for recruitment. FAR

Disturbance Regime- There was a 148 acre fire in 1973 in upper Shorty Creek and a 167 acre fire in 1985 in upper Whale Creek. Whale Creek also has several avalanche chutes. FA

Integration of Species and Habitat Conditions- Habitat in Whale Creek is in fair condition and recovering from impacts from old logging. The stream is connected and would provide a good refugia. However, bull trout are depressed as a result of changes in Flathead Lake. FUR

Moose Creek (1501)

Moose Creek is a 3rd order tributary. Bull trout, westslope cutthroat trout, and sculpins are present. Bull trout have only been found in the lwer 2.5 miles. Bull trout occur in limited numbers and no redd counts for bull trout have been conducted in Moose Creek. Moose Creek is not a priority bull trout watershed.

Subpopulation Characteristics-

Subpopulation Size- This population is part of the larger Flathead Lake meta-population this subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this meta-population is in a rapid decline and may not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Re-colonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout

populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat- Most North Fork Flathead River tributaries were surveyed between 1979 and 1982 by Montana Department of Fish, Wildlife and Parks personnel as part of an Environmental Protection Agency study.

Temperature- The average temperature recorded in 1980 was 15 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission (Weaver and Fraley 1991) recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have never been taken in Moose Creek.
Percent fines were 27% in 1980, if Moose Creek is following the trends of other North Fork streams then sediment is FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. A beaver dam near the mouth may be limiting bull trout migration upstream. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Given the small amount of fines and comments from the survey an inference will be made that embeddedness does not appear to be a problem. FA

Large Woody Debris- Channel debris was low in the 1980 survey. FAR

Pool Frequency- Pools made up less than 5% of the streams total area in the 1980 survey. FAR

Large Pools- Pool quality was rated as poor. FAR

Off Channel Habitats- Sufficient off channel habitat exists. FA

Refugia- This stream is too small to serve as a refugia for bull trout. Large and more important streams exist within this sub-basin. FAR

Wetted Width/Max. Depth Ratio- There has been less headwater harvesting in this drainage compared to other North Fork tributaries. Bed load movement is not as prevalent. FA

Streambank Stability- The R-1 Stream Channel Stability Ratings completed in 1976 to 1979 were from within the good condition range (39-76). FA

Floodplain Connectivity- The stream has access to its floodplain. The stream is generally unconfined with a sinuous pattern. FA

Peak Flow- Bedload is not prevelant in this drainage and headwater harvest is minimal. FA

Drainage Network- There are some areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 56 miles of road in this HUC. The density is the second highest of any North Fork HUC at 1.7 mi/mi . The road parallels the stream and there has been slumps into the creek over the years. FAR

Disturbance History- High intensity harvest greater than 20 years was 2728 acres and less than 20 years was 338 acres. Low intensity harvest was 720 acres and 980 acres, respectively. FAR

Riparian Conservation Areas- Recruitment of trees has been reduced in some areas from roads and harvest. FAR

Disturbance Regime- There was a 1381 acre burn in 1967. There hasn't been many other natural disturbances in Moose Creek. FA

Integration of Species and Habitat Conditions- Moose Creek is not an important bull trout stream but juveniles have been known to enter this stream to rear. The migratory form is depressed due to changes in Flathead Lake. FAR

Red Meadow Creek (1401)

Red Meadow Creek is a 3rd order stream. Bull trout, westslope cutthroat trout, mountain whitefish and sculpins are present. Arctic grayling were stocked in Red Meadow Lake and are also present in the stream.

Subpopulation Characteristics-

Subpopulation Size- Redd counts are conducted during basin wide years. It's assumed that bull trout spawners have decline in Red Meadow Creek similar to declines in other North Fork Flathead tributaries. Juvenile populations have shown a similar trend.

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Redd Cnts		6	19	10				8			
Pop. Est.					75			68	48	40	24

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Redd Cnts		15	--					3		
Pop. Est.	50				5	2	5	--	14	11

These declines reflect a trend in all North and Middle Fork Flathead River bull trout streams. Declines are due in part from drought in the late 1980's, overfishing, and habitat modification. But perhaps the most responsible mechanism for decline are changes in Flathead Lake's ecosystem and food chain as discussed in the overview. Habitat degradation does not appear to be a leading factor for decline in Trail Creek. This subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this subpopulation is in a rapid decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Temperature- Temperature data is sketchy. Peak summer time temperature in 1979 was 15.6 C. Red Meadow Lake may contribute to warmer temperatures as surface water is drained through the outlet. There were 13 incidental temperature measurements associated with water quality monitoring procedures between 1979 to 1981 in upper Red Meadow Creek. The maximum water temperature recorded was 15.0 C. There were 21 incidental temperature measurements associated with water quality monitoring procedures between 1978 to 1981 in lower Red Meadow Creek. The maximum water temperature recorded was 12.0 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission (Weaver and Fraley 1991) recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples were taken in Red Meadow Creek in 1990 (40.1% fines). No other sediment data exists for Red Meadow Creek however, given the pattern of disturbance is similar to the North Fork tributaries an inference will be made that sediment would be considered FAR.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients for Red Meadow Creek. This stream is listed on the State's 303(d) list of impaired water bodies. The stream is listed as impaired for aquatic life support (cold water fishery), caused by siltation and other alteration, with natural and silviculture treatments the sources. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Substrate scores (12.3 in 1999) indicate that rearing habitat is good. Embeddedness is FA.

Large Woody Debris- The 1979 survey indicates that debris was moderate and stable. Extensive harvest along the riparian zone has occurred along Red Meadow Creek. Recruitment of potential lwd to the stream has been reduced. FAR

Pool Frequency- The 1979 survey determined that pool habitat was limited and was highest in the headwaters at 15%. This most likely correlates with the low amount of wood in the stream. FAR

Large Pools- The 1979 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Only 14% of the pools were classified as Class I or II. Therefore, pool quality would be poor. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Red Meadow Creek has limited habitat which is not protected. FAR

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had some increase peak flows from timber harvest and road construction which has resulted in some bedload movement. In other North Fork streams this has resulted in increased W/D ratios. FAR

Streambank Stability- The R-1 Stream Channel Stability Ratings for Red Meadow Creek completed between 1976 to 1982 were 53 to 108, which range between a good condition (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. The average valley width is 100m and is occasionally confined with a sinuous to an irregular pattern. FA

Peak Flow- The water yield increase was modeled for the North Fork of Red Meadow Creek in 1991 using the H2OY model. That model predicted a 7.8% annual water yield increase due to the roading and harvest activities. There are visual indicators of bed load movement in the tributaries affected by the 1988 wildfire. FAR

Drainage Network- There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 37 miles of road in Red Meadow with a density of 1.3 mi/mi . The road is away from the creek for the most of its length. FA

Disturbance History- High intensity harvest older than 20 years has occurred on 2,080 acres and 1,024 acres less than 20 years. Low intensity harvest older than 20 years has occurred on 1,753 acres and 439 acres less than 20 years. Much of the harvest was in the headwaters. FAR

Riparian Conservation Areas- There was some riparian harvest in the headwaters which jeopardized recruitment of trees to the stream. FAR

Disturbance Regime- In 1970 there was a 1,800 acre burn and a 1988 burn in the lower drainage. There are numerous avalanche chutes in this drainage. FA

Integration of Species and Habitat Conditions- Habitat is in fair condition and connected to the North Fork, however populations are depressed due to changes in Flathead Lake. FUR

Hay and Moran creeks (0901)

Hay and Moran creeks are both 3rd order streams. Bull trout, westslope cutthroat trout, mountain whitefish, and sculpins are present. Neither one of these streams are priority bull trout watersheds. Bull trout occur throughout Hay and Moran creeks albeit in limited numbers. Hay Creek has had subsurface flow above its confluence with the North Fork Flathead River which may be restrict upstream access for bull trout in the fall. It appears that this dates back at least 1955 as documented in Dan Block's Master's Thesis (Block 1955). This is most likely from the low gradient in this area and extensive beaver dam complexes. Deposition of bedload in later years has aggravated this problem. Montana Fish, Wildlife, and Parks has completed some channel work on private land over the last three years to alleviate this problem.

Subpopulation Characteristics-

Subpopulation Size- Redd counts and juvenile population estimates have not been conducted on these streams. It assumed that the factors that affect other North Fork Flathead tributaries are also at work here. This subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this subpopulation is assumed to be in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is assumed to still be present albeit in depressed numbers. A resident form may exist because of the seasonal and partial access problems but more work needs to be conducted to determine if this is true. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70%

probability that this interaction is preventing a recovery goal maintaining bull trout populations for at least 15 years McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Temperature- Peak summer time temperature in 1980 for both streams was 10 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken for these streams. Sediment would be considered FAR given the pattern of disturbance in Hay Creek.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon other streams suggests FAR.

Large Woody Debris- The 1980 survey indicates that debris was low to moderate and stable. As a whole, recruitment of LWD has not been compromised from riparian harvests in Moran Creek however, a moderate amount of harvest has occurred within and along riparian areas in Hay Creek. FAR

Pool Frequency- The 1980 survey determined that pool habitat made up 19% at most in one reach but about 5% in many of the other reaches. This most likely correlates with the low amount of wood in the stream. FAR

Large Pools- The 1980 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. The upper reaches of Hay Creek and the lower reaches of Moran Creek had a high percentage of Class I or II pools. Therefore, pool quality appears good. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- More important bull trout streams exist in the North Fork Flathead. These streams would not serve as good refugias for bull trout. FAR

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had some increase peak flows from timber harvest and road construction which has resulted in some bedload movement. In other North Fork streams this has resulted in increased W/D ratios. FAR

Streambank Stability- The R-1 Stream Channel Stability Ratings for Moran Creek completed between 1976 to 1980 were 53 to 104, which range between a good condition (39-76) and a fair condition (77-114). The R-1 Stream Channel Stability Ratings for Hay Creek completed between 1976 to 1980 were 44 to 100, which range between a good condition (39-76) and a fair

condition (77-114). Note there is a trend of increasing rating values in the later years of measurement. FAR

Floodplain Connectivity- The stream has access to its floodplain. The average valley width for Hay Creek is 90m and is generally confined with a sinuous pattern. Moran Creek has an average valley width of 70m and is occasionally confined. FA

Peak Flow- There are visual indicators of bed load movement in the main stem of Hay Creek. With the amount of road construction and past harvest activities increases in peak flow would be expected. FAR

Drainage Network- There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 83 miles of road in this HUC. The density is 1.9 mi/mi . The road isn't in the valley bottom but there are numerous stream crossings. FAR

Disturbance History- High intensity harvest older than 20 years has occurred on 3,172 acres and 517 acres less than 20 years. Low intensity harvest older than 20 years has occurred on 1,589 acres and 356 acres less than 20 years. Much of the harvest was in the headwaters. FAR

Riparian Conservation Areas- There has been considerable riparian harvest in the headwaters. FAR

Disturbance Regime- In 1981 there was a 237 acre fire and there are avalanche chutes in the headwaters. FA

Integration of Species and Habitat Conditions- Hay Creek is marginal bull trout habitat. Beaver dams and subsurface flows near the mouth most likely limit upstream migration of adults in the fall. MDFWP has made some attempts the last 2 years to channelize flow and reconnect upstream habitats. It is too early to tell if this will work. FUR

Coal Creek (0800)

Coal Creek is a 4th order stream. Bull trout, westslope cutthroat trout, mountain whitefish and sculpins are present. Bull trout distribution extends into both forks of Coal Creek as well as Mathias Creek. No bull trout spawning occurs in Deadhorse Creek, however, juveniles will immigrate into the lower reaches to rear. Cyclone Lake has a disjunct population of bull trout which do not migrate to Flathead Lake to rear but rear in Cyclone Lake and spawn below the outlet of the lake.

Subpopulation Characteristics-

Subpopulation Size- Redd counts over the last 19 years have shown a precipitous decline. Juvenile populations have been sampled in 6 different locations in Coal Creek and have also declined markedly.

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Coal	38	34	23	60	61	53	40	13	48	52	50
S. Coal	--	2	24	9	--	--	--	4	--	--	--
Mathias	--	10	10	17	--	--	--	10	--	--	--

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Coal	29	34	7	10	6	13	3	9	14	7
S. Coal	--	8	5	--	--	--	--	4	--	--
Mathias	--	8	4	--	--	--	--	0	--	--

Population Estimates

Stream	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Coal @ Cyclone	42	34	51	--	--	28	19	--	--	--	--	--	--	--	--
Coal @ Deadhorse	97	99	85	159	152	179	131	95	51	106	67	47	61	39	4
NF Coal	17	18	48	41	29	47	39	44	33	9	17	6	2	3	1
SF Coal (L)	--	--	--	--	--	--	65	40	128	64	--	--	--	--	--
SF Coal	--	--	--	62	--	12	24	14	49	58	59	16	9	45	5
SF Coal (U)	--	--	--	--	--	--	160	101	108	69	121	55	--	--	--

Stream	1998	1999
Coal @ Cyclone	--	--
Coal @ Deadhorse	7	9
NF Coal	1	2
SF Coal (L)	--	--
SF Coal	2	15
SF Coal (U)	--	--

These declines reflect a trend in all North and Middle Fork Flathead River bull trout streams. Declines are due in part from drought in the late 1980's, overfishing, and habitat modification. But perhaps the most responsible mechanism for decline are changes in Flathead Lake's ecosystem and food chain as discussed in the overview. Habitat degradation does not appear to be a leading factor for decline in Trail Creek. This subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this subpopulation is in a rapid decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and

all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat- In addition to the 1979 survey, North Fork Coal Creek was surveyed in 1994 using R1/R4.

Temperature- Peak summer time temperature in Coal Creek in 1979 was 15.6 C. The highest recorded temperature in 1994 was 15.5 C in August. There were 212 incidental temperature measurements associated with water quality monitoring procedures between 1982 to 1995 in North Fork of Coal Creek. The maximum water temperature recorded was 14.5 C. There were 190 incidental temperature measurements associated with water quality monitoring procedures between 1983 to 1995 in the South Fork of Coal Creek. The maximum water temperature recorded was 12.5 C. There was a mid April through October continuous recording water temperature monitoring site on lower Whale Creek. This site was monitored from 1987 to 1991. The maximum temperature recorded for those years ranged from 13.0 to 14.6 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have been taken in Coal Creek in 4 separate locations and trends have improved from the 1980's. Sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Both the North Fork and the South Fork of Coal Creek are on the State's 303(d) list of impaired water bodies. The probable impaired use is aquatic life support - cold water fishery. The probable cause in South Fork Coal is siltation and the probable source is silviculture. The probable cause in North Fork Coal is siltation and nutrients, with the probable source being natural sources and silviculture. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness, however, substrate scores which indicate the quality of rearing habitat for juvenile bull trout have been taken. The scores (10.1- 13.6 in 1999) indicate that rearing habitat is good. FA

Large Woody Debris- The 1979 survey indicated that debris ranged from low to moderate and was unstable. Some reaches along Coal Creek have had significant riparian harvest which has reduced recruitment potential. The 1994 survey showed that lwd ranged from 101- 219 pieces/mile. FAR

Pool Frequency- The 1979 survey determined that pool habitat ranged from 2% to 10%. This most likely correlates with the low amount of wood in the stream. The 1994 survey showed that pools ranged from 9% to 23% of the area. FAR

Large Pools- The 1979 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Two reaches had greater than 32% of the pools classified as Class I or II. Therefore, pool quality would be good. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists however, it is not necessarily protected. INFISH will play a major role in protecting riparian zones however as is the case in most North Fork Flathead tributaries early timber harvest in the headwaters has resulted in increased peak flows and increased bedload movement and deposition. FA

Wetted Width/Max. Depth Ratio- The average width/depth ratio ranged from 13 in the upper reaches to 26 in the lower reaches. This is indicative of bedload moving through the system which has widened the stream. FAR

Streambank Stability- The R-1 Stream Channel Stability Ratings for the North Fork of Coal Creek completed in 1985 were 75 to 125, which range between a good condition (39-76) and a poor condition (115+). The R-1 Stream Channel Stability Ratings for South Fork Coal Creek completed between 1976 to 1985 were 62 to 126 which range between a good condition (39-76) and a poor condition (115+). Note there is a trend of increasing rating values in the later years of measurement. FUR

Floodplain Connectivity- The stream has access to its floodplain. The average valley width is 115m and is generally unconfined with a sinuous pattern. FA

Peak Flow- The water yield increase was modeled for the North Fork and South Fork of Coal Creek in 1991 using the H2OY model. That model predicted a 10.0% annual water yield increase due to the roading and harvest activities for the north fork and 7.5% for the south fork. There are visual indicators of bed load movement in the North Fork of Coal Creek. FUR

Drainage Network- There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FUR

Road Density and Location- There are 98 miles of road in Coal Creek and another 24 miles in Cyclone Lake HUC. Densities range from 2.1 mi/mi in North Coal to 0.8 mi/mi in Deadhorse. Densities in Cyclone Lake HUC are 1.8 mi/mi . The roads are out of the valley bottoms for the most part but there are numerous stream crossings and several culvert failures in Mathias Creek. There has been quite a bit of road reclamation in Coal Creek the last several years. FAR

Disturbance History- High intensity harvest older than 20 years has occurred on 3,380 acres and 1,134 acres less than 20 years in Coal Creek. Low intensity harvest older than 20 years has occurred on 700 acres and 2382 acres less than 20 years in Coal Creek. Much of the harvest was in the headwaters. High intensity harvest older than 20 years has occurred on 430 acres and 191 acres less than 20 years in Cyclone Creek. Low intensity harvest older than 20 years has occurred on 311 acres and no acres less than 20 years in Cyclone Creek. FAR

Riparian Conservation Areas- There has been considerable amount of riparian harvest in the headwaters which has reduced recruitment of trees to the stream. FAR

Disturbance Regime- There are no recent fires in this drainage. FA

Integration of Species and Habitat Conditions- Coal Creek has fair habitat conditions but has been impacted by old logging that has resulted in bed load deposition and loss of pool habitat in the lower reaches. It is connected to the North Fork but bull trout populations are depressed due to changes in Flathead Lake. FUR

Big Creek (0700)

Big Creek is a 5th order stream. Bull trout, westslope cutthroat trout, mountain whitefish and sculpins are present. Bull trout distribution extends into the headwaters of Big Creek. Hallowat Creek is also an important bull trout stream while Nicola and Skookoleel creeks don not contain bull trout except near the mouth. Langford Creek appears to be an important rearing stream but redds have not been identified.

Subpopulation Characteristics-

Subpopulation Size- Redd counts over the last 19 years have shown a precipitous decline. Juvenile populations have also declined.

Year	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Big	38	34	23	60	61	53	40	13	48	52	50
Hallowat		8	14	31	--	--	--	3			

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Big	25	24	16	2	11	14	6	13	30	34
Hallowat	--	27	2	--	--	--	--	--	--	--

Population Estimates

Stream	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Big	--	--	--	--	47	48	67	83	65	47	42	28	4	8	13

Stream	1998	1999
Big	46	38

These declines reflect a trend in all North and Middle Fork Flathead River bull trout streams. Declines are due in part from drought in the late 1980's, overfishing, and habitat modification. But perhaps the most responsible mechanism for decline are changes in Flathead Lake's ecosystem and food chain as discussed in the overview. Habitat degradation does not appear to be a leading factor for decline in Big Creek. This subpopulation is functioning at unacceptable risk. FUR

Growth and Survival- As note above, this subpopulation is in a rapid decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is still present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat- In addition to the 1979 survey, Big Creek was surveyed in 1997 using R1/R4 in 1994.

Temperature- Peak summer time temperature in Big Creek in 1979 was 15.6 C . There were 179 incidental temperature measurements associated with water quality monitoring procedures between 1986 to 1995 on Big Creek at Lookout Bridge. The maximum water temperature recorded was 13.9 C. A higher temperature was noted but it was determined that the sensor was exposed to the air.

There were 190 incidental temperature measurements associated with water quality monitoring procedures between 1983 to 1995 on Big Creek above Nicola Creek. The maximum water temperature recorded was 12.5 C.

There were 11 incidental temperature measurements associated with water quality monitoring procedures between 1979 to 1981 on upper Big Creek. The maximum water temperature recorded was 12.0 C. There were 4 incidental temperature measurements associated with water quality monitoring procedures between 1979 to 1980 on Big Creek above Hallowat Creek. The maximum water temperature recorded was 8.0 C.

There was a mid April through October continuous recording water temperature monitoring site on lower Big Creek. This site was monitored in 1987, 1990, and 1991. The maximum temperature recorded for those years was 14.1 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have been taken in Big Creek as shown below:

The 51.8% reading was the largest recorded for any bull trout stream. Sediment would be considered FAR despite improving conditions.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Big Creek is on the State's 303(d) list of impaired water bodies. The probable impaired use is aquatic

life support - cold water fishery. The probable cause is siltation and habitat alteration. The probable source is channelization and silviculture. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness, however, substrate scores which indicate the quality of rearing habitat for juvenile bull trout have been taken. The scores indicate (11.8 in 1999) that rearing habitat is good. FA

Large Woody Debris- The 1979 survey indicated that debris ranged from low to moderate and was unstable. Some reaches along Big Creek in the headwaters have had significant riparian harvest which has reduced recruitment potential. The 1997 survey showed that lwd range was 400 pieces/mile in upper Big Creek. FA

Pool Frequency- The 1979 survey determined that pool habitat ranged from 4% to 15%. This most likely correlates with the low amount of wood in the stream. The 1997 survey showed that there were 68 pools/mile or 18% of the area. FAR

Large Pools- The 1979 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools ranged from none to 29% in the 1979 survey. There were no large pools in the 1997 survey. Therefore, pool quality would be poor. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists however, it is not necessarily protected. INFISH will play a major role in protecting riparian zones however as is the case in most North Fork Flathead tributaries early timber harvest in the headwaters has resulted in increased peak flows and increased bedload movement and deposition. FA

Wetted Width/Max. Depth Ratio- The average width/depth ratio was 30. This is indicative of bedload moving through the system which has widened the stream. FAR

Streambank Stability- The R-1 Stream Channel Stability Ratings for Big Creek completed between 1979 to 1993 were 50 to 102, which range between a good condition (39-76) and a fair condition (77-114). There are areas of streambank instability in Big Creek where the stream is laterally eroding into the abandoned glacial-fluvial stream terrace deposit. FAR

Floodplain Connectivity- The stream has access to its floodplain. The average valley width is 150m in the lower reach and 15m in the upper reach. The stream is generally unconfined with a sinuous pattern. FA

Peak Flow-The water yield increase was modeled for the basin in 1991 using the H2OY model. That model predicted a 18.6% annual water yield increase due to the roading and harvest activities. There are visual indicators of bedload movement in several reaches of this stream system. FUR

Drainage Network- There are several areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. Some of these areas have been rehabbed or targeted for rehab. FUR

Road Density and Location- There are 179 miles of road in Big Creek. Densities are the highest in Lower Big at 2.9 mi/mi and the lowest in Hallowat at 1.5 mi/mi . There are numerous road crossing and very few roads in the valley bottom. FAR

Disturbance History- High intensity harvest older than 20 years has occurred on 8,307 acres and 2,489 acres less than 20 years. Low intensity harvest older than 20 years has occurred on 3,878 acres and 2,010 acres less than 20 years. Much of the harvest was in the headwaters. FUR

Riparian Conservation Areas- Numerous riparian areas have been harvested in Big Creek. Big Creek has been the site of large woody debris additions the last three years. FAR

Disturbance Regime- There are no recent fires or avalanche chutes in Big Creek. FA

Integration of Species and Habitat Conditions- Habitat in Big Creek is recovering from old logging and has been the focus of restoration projects on the district for the last 3 years. The stream is connected to the North Fork and has the ability to support large numbers of fish, however the population is depressed due to changes in Flathead Lake. FUR

Canyon Creek (0102)

The only stream in this HUC that contains bull trout of any significance is McGinnis Creek which is a 3rd order tributary to Canyon Creek. Bull trout only occur below a 15m falls which is a barrier. The falls is about 1 km from the confluence with Canyon Creek. There is another barrier falls in Canyon Creek about 400m from the confluence with the North Fork Flathead River. Bull trout have been detected here in limited numbers. This is not a priority bull trout watershed.

Subpopulation Characteristics-

Subpopulation Size- No redd counts have been conducted. Juvenile populations have only been measured in 1980; it was determined that the short reach below the falls in McGinnis Creek is most likely an important rearing section with 1.5 bull trout per 100 square meters.

This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is assumed to still be present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Habitat- In addition to the 1980 survey, McGinnis Creek was surveyed in 1990 using modified Hankin and Reeves, however, the survey is above the falls and does not include bull trout habitat.

Temperature- Peak summer time temperature was not recorded in 1980. The highest recorded temperature in 1990 was 12.2 C in July. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission (Weaver and Fraley 1991) recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Canyon Creek or its tributaries. Best professional judgement is FAR

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Canyon Creek is not on the State's 303(d) list of impaired water bodies, but most likely should be. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. FA

Large Woody Debris- The 1980 survey indicated that debris was moderate and stable. Some reaches along McGinnis Creek have had significant riparian harvest which has reduced recruitment potential. The 1990 survey didn't measure lwd. FAR

Pool Frequency- The 1980 survey determined that pool habitat was 6%. The 1990 survey showed that pools were 3% of the area. FAR

Large Pools- The 1980 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools were 16% in the 1980 survey. Large pools were limited in the 1990 survey. Therefore, pool quality would be poor. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- This area would not be considered as a refugia due to the limited habitat available for bull trout. FAR

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. Canyon Creek has had extreme scouring and bedload movement. McGinnis Creek is much more stable but has had its share of deposition. FAR

Streambank Stability- Stability in 1980 was good and in 1990 it was 95% in McGinnis Creek. The R-1 Stream Channel Stability Ratings for Canyon Creek completed between 1976 to 1980 were 53 to 104, which range between a good condition (39-76) and a fair condition (77-114). The R-1 Stream Channel Stability Ratings for McGinnis Creek completed between 1979 to 1982 were 49 to 113, which range between a good condition (39-76) and a fair condition (77-114). The streambanks along the middle portion of Canyon Creek have poor stability because the stream in this reach is downcutting through some very unstable glacial-fluvial deposits. FUR

Floodplain Connectivity- The stream lacks access to its floodplain in several locations. The stream is generally entrenched with an irregular stream pattern. FAR

Peak Flow- There are visual indicators of bedload movement in the mid to lower portions of Canyon Creek, which are probably associated with water yield increases from past logging and roading within the drainage, as well as the naturally unstable streambanks. FAR

Drainage Network- There are some areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 73 miles of road in Canyon Creek with a density of 2.5 mi/mi . The main road infringes on the streams meander pattern and would be considered the most impactive road of any roads in North Fork streams. FUR

Disturbance History- High intensity harvest older than 20 years has occurred on 4,950 acres and 1,062 acres less than 20 years. Low intensity harvest older than 20 years has occurred on 1,720 acres and 934 acres less than 20 years. FAR

Riparian Conservation Areas- The riparian area along Canyon Creek has been severely compromised due to the road. This has most likely increased water temperatures and has reduced the amount of large woody debris. FAR

Disturbance Regime- There was a 56 acre fire in Canyon Creek in 1974 and there are a couple of avalanche chutes in the headwaters. FA

Integration of Species and Habitat Conditions- Canyon Creek and its tributaries do not have the potential to be an important bull trout stream due to the barrier falls. FUR

Middle Fork Streams

Bull trout streams in the wilderness are assumed to be functioning appropriately for habitat calls since there hasn't been any recent natural catastrophic events that would lead to major changes in stream processes. Population calls are similar to North Fork calls due to bull trout's dependence on Flathead Lake, except where brook trout are present in Bear and Deerlick creeks. Therefore, only managed streams will be discussed below.

All stream habitat data is from MDFWP surveys from 1979-1981 unless otherwise noted.

Bear Creek (1201)

Bear Creek is a 5th order tributary to the Middle Fork. All northern tributaries to this creek originate in Glacier National Park. Highway 2 parallels the creek for much of its length. The highway infringes upon the stream, has resulted in stream straightening, and reduced large woody debris. Bull trout are present and redds have been found in Bear, Skyland, and Giefer creeks.

Subpopulation Size- Redd counts are conducted during basin wide years.

	1980	1981	1982	1986	1991	1992	1997
Bear Cr	9	12	23	21	23	9	2

In 1981, Reach 1 which starts at the confluence upstream to above Tranquil Basin had very high densities of juvenile bull trout (2.8/100m). Densities were also very high (3.4/100m) in Skyland Creek. No dead fish were observed after the fire.

This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is high given that brook trout are present in the watershed. This stream is one of the few streams in the Middle and North Forks that has brook trout in it. More work is needed to determine the densities of brook trout and if hybridization is occurring. There is a concern that as a result of the fire that stream temperatures may increase which could contribute to brook trout expansion in Skyland Creek.

Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70%

probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at an unacceptable risk. FUR

Temperature- The highest average peak summer time temperature in 1980 was 18 C. There were 145 incidental temperature measurements associated with water quality monitoring procedures between 1980 to 1993 on Skyland Creek above the West Fork of Skyland Creek. The maximum water temperature recorded was 12.2 C. There were 147 incidental temperature measurements associated with water quality monitoring procedures between 1980 to 1987 on the West Fork of Skyland Creek. The maximum water temperature recorded was 13.5 C. FA After the fire on September 24, 1998 the water temperature was 6 C. FUR

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Bear Creek or its tributaries. The 1981 survey measured surface fines. Reach 2 in Bear Creek had 48% fines while the highest in the other reaches, including Gaffer and Skeined creeks was 16%. Highway 2 is paved but there are numerous slumps along Bear Creek due to stream straightening. Sediment levels have already increase significantly after the fire due to large inputs of ash and fines. FUR

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Bear Creek is not on the State's 303(d) list of impaired water bodies with aquatic life support (cold water fishery - trout) the probable impaired use. Skyland Creek is on the list with the probable cause being siltation , suspended solids, or habitat alterations. The probable source is silviculture practices and natural sources in Skyland Creek. FUR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement is that it is FAR

Large Woody Debris- The 1981 survey indicated that debris was low. This is due to the influence of Highway 2. LWD will increase in Skyland Creek. FAR

Pool Frequency- The 1981 survey determined that the highest pool habitat was 10% in reach 2. FAR

Large Pools- The 1981 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools were 90% in the 1981 survey in reach 2. Large pools were limited in the remaining reaches. Therefore, pool quality would be poor. FAR

Off Channel Habitats- Off channel habitats are limited. FAR

Refugia- This area would not be considered as a refugia due to brook trout inhabitance and habitat is limited due to the influence of Highway 2. FAR

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. A walk through of the stream suggests FAR

Streambank Stability- Stability in 1981 was good but there appears to be numerous slumps along the creek that are visible from the highway. The R-1 Stream Channel Stability Ratings for Skyland Creek completed between 1980 to 1987 were 47 to 98. The R-1 Stream Channel Stability Ratings for the 2nd tributary of Skyland Creek completed between 1980 and 1987 were 56 to 107. The R-1 Stream Channel Stability Ratings for the West Fork of Skyland Creek completed between 1980 and 1987 were 44 to 111. The R-1 Stream Channel Stability Ratings for Bear Creek completed between 1979 and 1981 were 55 to 104. All of these ratings range between a good condition (39-76) and a fair condition (77-114). The lower portions of Bear Creek have extensive areas of unstable streambanks caused by erosion during the 1964 Flood. Stability will decrease in both forks of Skyland Creek due to vegetation loss. FUR

Floodplain Connectivity- The stream does not have access to its floodplain. The stream is very diverse with numerous channel types. FAR

Peak Flow- There are visual indicators of streambank erosion in the Skyland Creek. With the amount of road construction and past harvest activities some increases in peak flow would be expected. Water yield will increase significantly after the fire due to vegetation loss. FUR

Drainage Network- There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 35 miles of road in Bear Creek with a density of 0.6 mi/mi . The highway infringes on the streams meander pattern. FAR

Disturbance History- High intensity harvest older than 20 years has occurred on 734 acres and 288 acres less than 20 years. Low intensity harvest older than 20 years has occurred on zero acres and 287 acres less than 20 years. FA

Riparian Conservation Areas- The riparian area along Bear Creek and parts of Skyland Creek has been severely compromised due to the highway and road. This has most likely increased water temperatures and has reduced the amount of large woody debris. FAR

Disturbance Regime- There was a 282 acre fire in Giefer Creek in 1987 and an 8,000 acre Challenge Creek fire in 1998 that burned hot throughout both forks of Skyland Creek. FA

Integration of Species and Habitat Conditions- Brook trout are present and the bull trout population is depressed due to changes in Flathead Lake. Habitat in Skyland Creek is good but somewhat limited in Bear Creek. FUR

Granite Creek (1402)

Granite Creek is a 4th order tributary to the Middle Fork. The lower half of the creek is in the wilderness. Bull trout spawn just below the wilderness boundary to below Dodge Creek. Bull trout juveniles are occasionally collected in Challenge Creek but numbers appear to be increasing. No bull trout have been found in Dodge Creek. Granite Creek goes subsurface just downstream of the confluence of Dodge and Challenge creeks which prohibits any spawning further upstream into these two creeks. Most rearing occurs in Granite Creek.

Subpopulation Size- Redd counts are conducted annually and have ranged from a low of 4 in 1996 to a high of 47 in 1984 (see redd count Table above).

Juvenile bull trout populations in Challenge Creek.

Year	1981	1982	1983	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Pop. est.	7	1	2	1	8	6	3	2	2	21	1	9	57	9	25

The increase in juveniles in 1995 and 1997 is hard to explain. It's possible that for some reason fish moved up from Granite Creek to rear. No dead fish were observed in Challenge Creek after the fire, however 39 dead cutthroat trout were found in Dodge Creek on September 24, 1998. A population estimate the next week in Dodge Creek was 45 trout/100m which is similar to other population estimates in Dodge Creek.

This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Temperature- There were 145 incidental temperature measurements associated with water quality monitoring procedures between 1980 to 1995 on Dodge Creek. The maximum water temperature recorded was 13.0 C. There were 149 incidental temperature measurements associated with water quality monitoring procedures between 1980 to 1995 on Challenge Creek. The maximum water temperature recorded was 12.8 C. Challenge Creek and Dodge Creek

were 13 C on September 24 in the late afternoon. Temperature may increase in Dodge Creek due to the fire but is doubtful temperatures will increase in Challenge Creek. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have been taken in Granite Creek since 1982. Sediment will increase significantly in Dodge Creek but very little in Challenge Creek. It is difficult to determine what the effect will be on Granite Creek, but it is anticipated that levels will increase. FAR

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Both Granite and Challenge creeks are on the State's 303(d) list of impaired water bodies with aquatic life support (cold water fishery - trout) the probable impaired use. And the probable cause being siltation , or habitat alterations, with the probable source being silviculture practices, and natural sources in Granite Creek. FUR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement is that it is FAR.

Large Woody Debris- The 1981 survey indicated that debris was moderate. Most riparian zones are intact. The fire will contribute increasing amounts of LWD in Challenge and Dodge creeks. FA

Pool Frequency- The 1981 survey determined that pool habitat ranged from 4 to 15%. FAR

Large Pools- The 1981 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools were zero to 67% in the 1981 survey. Overall, pool quality was poor. FAR

Off Channel Habitats- Off channel habitats are available throughout Granite Creek. FA

Refugia- There is a lot of available habitat in this system that is connected to the Middle Fork and there are no exotic species in the drainage. FA

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. Best professional judgement suggests FAR due to the lack of pools and bedload in Dodge Creek.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Granite Creek completed between 1980 were 95 to 102. The R-1 Stream Channel Stability Ratings for Challenge Creek completed between 1980 and 1987 were 62 to 102. The R-1 Stream Channel Stability Ratings for Dodge Creek completed between 1980 to 1987 were 74 to 100. All of these ratings between a good condition (39-76) and a fair condition (77-114). There are several areas in Challenge, Dodge, and Granite Creek where streambanks are unstable and slumping into the creeks. Stability should decrease significantly in Dodge Creek but is not expected to change much in the other streams. FAR

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- The water yield increase was modeled for the basin in 1991 using the H2OY model. That model predicted a 7.5% annual water yield increase due to the roading and harvest activities. There are visual indicators of bedload movement in several reaches of this stream system. Water yield will increase significantly due to vegetation loss after the fire. FUR

Drainage Network- There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 20 miles of road in Granite Creek with a density of 0.7. The roads are not in the stream bottom. FA

Disturbance History- High intensity harvest older than 20 years has occurred on 1,124 acres and 181 acres less than 20 years. Low intensity harvest older than 20 years has occurred on 156 acres and 1,803 acres less than 20 years. Upper Granite Creek and Challenge Creek has had a fair amount of harvest on what is considered the most sensitive soils on the Forest. FAR

Riparian Conservation Areas- The riparian area for the most part is intact although there is a lot of blowdown along the stream. FA

Disturbance Regime- The 1998 Challenge Fire burned hot in Dodge Creek throughout 90% of the drainage while only a small portion of Challenge Creek burned. FA

Integration of Species and Habitat Conditions- Granite Creek and its tributaries provide good habitat that is connected but populations are depressed due to changes in Flathead Lake. FAR

Morrison Creek (1403)

Morrison Creek is a 4th order tributary to the Middle Fork. Bull trout have access throughout the stream. A partial log jam barrier was worked on in 1995 to allow complete passage. Most spawning occurs about a mile below Lodgepole Creek to just below the trailhead.

Subpopulation Size- Redd counts are conducted annually and are shown in the Table above. Juvenile population estimates have been taken since 1980.

This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Temperature- There were 3 incidental temperature measurements associated with water quality monitoring procedures in 1980 on Morrison Creek. The maximum water temperature recorded was 11.7 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples were taken in Morrison Creek **i**n 1990 with a 39.2% measurement. The 1981 survey measured surface fines. Fines ranged from 10 to 30%. The highest was in reach 1 which is below bull trout spawning. FA

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Morrison Creek is on the State's 303(d) list of impaired water bodies with aquatic life support (cold water fishery - trout) the probable impaired use. And the probable cause being siltation , or habitat alterations, with the probable source being silviculture practices. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Substrate scores (13.3 in 1999) indicate that rearing habitat is in excellent condition. FA

Large Woody Debris- The 1981 survey indicated that debris was moderate. FA

Pool Frequency- The 1981 survey determined that the highest pool habitat was 25% in the lowest reach and only 15 in the upper most reach. FA

Large Pools- The 1981 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools averaged 20 to 70%. FA

Off Channel Habitats- Off channel habitats are abundant in Morrison Creek. FA

Refugia- Morrison Creek is a good refugia with the lower half of the drainage in the wilderness, the habitat is connected and no exotic species have been found in the drainage. FA

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. Best professional judgement from walking the stream indicates FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Morrison Creek completed between 1980 to 1981 were 88 to 105. Some streambank instability is associated with streambank erosion during the 1964 flood. FA

Floodplain Connectivity- The stream has access to its floodplain. The stream is a very broad valley bottom. FA

Peak Flow- The water yield increase was modeled for the basin in 1991 using the H2OY model. That model predicted a 6.5% annual water yield increase due to the roading and harvest activities. FA

Drainage Network- There are very few areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period; that would effectively extend the channel network. FA

Road Density and Location- There are 6 miles of road in Morrison Creek with a density of 0.2. The roads are closed yearlong. FA

Disturbance History- High intensity harvest older than 20 years has occurred on 421 acres and zero acres less than 20 years. Low intensity harvest older than 20 years has occurred on zero acres and 72 acres less than 20 years. FA

Riparian Conservation Areas- The riparian area along Morrison Creek is fully intact. FA

Disturbance Regime- There are no recent natural disturbances. FA

Integration of Species and Habitat Conditions- Habitat in Morrison Creek is good however, bull trout populations are depressed due to changes in Flathead Lake. FAR

Deerlick Creek (0501)

Deerlick Creek is a 3rd order tributary to the Middle Fork. It's a low gradient stream that parallels Hwy. 2 for part of its length. Beaver dams are common and brook trout densities are high. Bull trout were detected in 1981 in limited densities.

Subpopulation Size- Bull trout were not estimatable in 1981 due to low numbers. This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is assumed to be present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is high given that brook trout are present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at an unacceptable risk because brook trout are present. FUR

Temperature- No temperature data is available. The area is heavily influenced by springs, therefore temperature is assumed to be FA.

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Deerlick Creek. The 1981 survey measured surface fines at 40%. FAR

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Deerlick Creek is not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement is that it is FA.

Large Woody Debris- The 1981 survey indicated that debris was low. FAR

Pool Frequency- The 1981 survey determined that the highest pool habitat was 8%. FAR

Large Pools- The 1981 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I pools were 50%. FA

Off Channel Habitats- Off channel habitats are abundant in Deerlick Creek. FA

Refugia- Deerlick Creek would not make a good refugia. FAR

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. Best professional judgement from walking the stream indicates FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Deerlick Creek completed in 1981 were 71. FA

Floodplain Connectivity- The stream has access to its floodplain. The stream has a very broad valley bottom. FA

Peak Flow- There is no harvest in the headwaters, peak flow should not be elevated. FA

Drainage Network- There are very few areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period; that would effectively extend the channel network. FA

Road Density and Location- Roads consist of Hwy. 2 and access to private homes. FA

Disturbance History- There has been very little disturbance in Deerlick Creek. FA

Riparian Conservation Areas- The riparian area along Deerlick Creek has been modified to some extent by Hwy 2, but the headwaters have not. FA

Disturbance Regime- There are no recent natural disturbances. FA

Integration of Species and Habitat Conditions- Habitat in Deerlick Creek is marginal for bull trout due to its natural potential not because of modifications, however, bull trout populations are depressed due to changes in Flathead Lake. FAR

Stanton & Tunnel creeks (0801)

Stanton and Tunnel creeks are both 3rd order tributaries to the Middle Fork. Bull trout have not been found in either creek. Highway 2 on Tunnel Creek is a fish barrier while fish passage was just restored in 1996 on Stanton Creek at Hwy. 2.

Subpopulation Size- This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is small given that brook trout were found in Stanton Creek. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout populations for at

least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Temperature- No temperature data is available, however its assumed to be FA based upon observations of surrounding streams.

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in these creeks. The 1981 survey measured surface fines. Fines were 10% in Stanton Creek and 15% in Tunnel Creek. FA

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. These streams are not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- Highway 2 is a barrier on Tunnel Creek. FAR

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement is that it is FA.

Large Woody Debris- The 1981 survey indicated that debris was low. FA

Pool Frequency- The 1981 survey determined that the highest pool habitat was 5% in Stanton Creek and 8% in Tunnel Creek. FA

Large Pools- The 1981 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools averaged 15% In Stanton Creek and 27% in Tunnel Creek. FA

Off Channel Habitats- Off channel habitats are available but confined due to the valley bottom in both creeks. FA

Refugia- These streams are not good refugias. Habitat is limited FAR

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. Best professional judgement from walking the stream indicates FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Stanton Creek in 1979 was 51 and ranged from 49 to 92 in Tunnel Creek. FA

Floodplain Connectivity- The streams have access to its floodplain. The streams have confined valley bottoms. FA

Peak Flow- Peak flow has not been modeled. Harvest has been limited in both streams. There is no evidence of increase bedload associated with timber harvest and roading. FA

Drainage Network- There are very few areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period that would effectively extend the channel network. FA

Road Density and Location- Road densities are limited in both drainages. FA

Disturbance History- Timber harvest has been limited in both drainages. FA

Riparian Conservation Areas- The riparian area along both streams is fully intact. FA

Disturbance Regime- There are no recent natural disturbances. There are several avalanche chutes in the headwaters. FA

Integration of Species and Habitat Conditions- It is not clear whether bull trout historically occupied these streams. Habitat in both streams is good however, bull trout populations are considered depressed due to changes in Flathead Lake. FAR

Paola Creek, Essex, & Dickey creeks (0803)

Paola Creek is a 4th order tributary to the Middle Fork. Bull trout have access for about 1/2 mile to Rd 1638 which is a barrier culvert. Dickey Creek is also in HUC 0803 and bull trout have only been found at the mouth. A natural bedrock falls barrier about 1/4 mile upstream prevents further passage in Dickey Creek. Essex Creek is also in HUC 0803 and no bull trout have been found. There is a man made diversion at Essex for the community water supply that is a barrier, in addition to high cascade reaches near the mouth.

Subpopulation Size- Juvenile bull trout were found in 1981 in fair densities (26/100m) above Hwy 2. No redds have been found in Paola Creek. This subpopulation is functioning at unacceptable risk since its dependent on Flathead Lake bull trout. FUR

Growth and Survival- This subpopulation is most likely in decline and will not improve until measures are taken to alleviate the changes in Flathead Lake. This subpopulation is functioning at unacceptable risk. FUR

Life History Diversity and Isolation- The migratory form is present albeit in depressed numbers. No resident forms are known to exist. Recolonization is unlikely if the migratory form is lost. This subpopulation is functioning at risk. FAR

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. Competition/predation is occurring with lake trout in Flathead Lake and all 12 members on a panel of fishery experts responded that there is a greater than 70% probability that this interaction is preventing a recovery goal maintaining 1980's bull trout

populations for at least 15 years (McIntyre 1998). Therefore, the probability of this population persisting is low and is functioning at risk. FAR

Temperature- No temperature data is available, however its assumed to be FA based upon observations of surrounding streams.

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Paola Creek. The 1981 survey measured surface fines. Fines were 10%. FA

Chemical Contamination/Nutrients- There are no concerns with chemical contamination. Paola Creek is not on the State's 303(d) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this drainage. The culvert on Rd 1638 was removed in 1999. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement is that it is FA.

Large Woody Debris- The 1981 survey indicated that debris was low. This stream was walked last year and lwd appear to be abundant. FA

Pool Frequency- The 1981 survey determined that the highest pool habitat was 18% . FA

Large Pools- The 1981 survey used a pool classification system to indicate the value of the pool as fish habitat based upon size, depth and cover. Class I or II pools averaged 36%. FA

Off Channel Habitats- Off channel habitats are available but confined due to the valley bottom in Paola Creek. FA

Refugia- Paola Creek is not a good refugia. Habitat is limited FAR

Wetted Width/Max. Depth Ratio- The average width/depth ratio is not available. Best professional judgement from walking the stream indicates FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Paola Creek in 1981 was 94. The high gradient section from the 1638 rd. crossing downstream has some slumping. FA

Floodplain Connectivity- The stream has access to its floodplain. The stream has a confined valley bottom. FA

Peak Flow- Peak flow has not been modeled. Harvest has been limited in Paola Creek. There is no evidence of increase bedload associated with timber harvest and roading. FA

Drainage Network- There are very few areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period that would effectively extend the channel network. FA

Road Density and Location- There were 4 miles of road in Paola Creek. The roads were reclaimed in 1998 and 1999. FA

Disturbance History- Timber harvest has been limited in Paola Creek. FA

Riparian Conservation Areas- The riparian area along Paola Creek is fully intact. FA

Disturbance Regime- There are no recent natural disturbances. There are several avalanche chutes in the headwaters. FA

Integration of Species and Habitat Conditions- Habitat in Paola Creek is good however, bull trout populations are depressed due to changes in Flathead Lake. FAR

Wilderness Streams
Bull trout also occur in the HUCs listed above under "core" streams inside the Bob Marshall Wilderness Complex. Environmental baseline will not be discussed but habitat conditions are assumed to be functioning acceptable since there hasn't been any recent natural catastrophic events or man induced changes. Bull trout populations in the wilderness have also been influenced by factors in Flathead Lake and as such populations have declined.

Consultation Process for Ongoing Actions

This document is designed to complement past and ongoing Section 7 consultation for bull trout. It is based on previous interagency guidance given in February 1998, as modified by the "Montana Level I Bull Trout Consultation Team"(hereafter referred to as MT Team). This Team consists of biologists from the six National Forests, the Missoula Field Office of the BLM and the Helena Office of the US Fish and Wildlife Service (USFWS) that meet on a regular basis to provide for consistency in analysis, determinations, reporting, and monitoring of the Section 7 process.

In February 1998, an interagency team (USFWS, FS, BLM) presented a workshop on "*A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale*" (USFWS 1998) to fisheries biologists and other federal agency representatives in western Montana, as preparation for the listing of the bull trout in June 1998. Using this guidance and the existing "Streamlined Process for Section 7 Consultation (USFS 1997), the MT Team met regularly to coordinate the development of the consultation packages for ongoing actions.

Due to staffing shortages and required timeline for actions to meet section 7 consultation (June 15, 1998, amended guidance issued from an interagency meeting in Portland OR), the MT Team modified the original February *Framework* guidance to allow timely project review and clearance as mandated in ESA regulations. The guidance in the January 1998 letter was to complete subbasin-level (Section 7) Watershed Biological Assessments for all ongoing actions on federal lands. The Montana Field Office of the FWS did not agree that they could implement

(due to lack of staffing) the "streamlined consultation timeframes" as the reason to deviate from the original guidance. When it was apparent this process would not allow timely review and consultation before the effective date of listing, the MT Team, working with interagency, regional-level staff, developed a screening process to review and provide for consultation on the hundreds of activities that take place on each administrative unit (Montana Level 1 Team meeting, July 21, 1998). The Flathead NF submitted our list of screened projects on August 3, 1998 to USFWS (Project Files). This process effectively covered "no effect"(NE) and "Not Likely to Adversely Affect" (NLAA) actions. Concurrence for NLAA activities from USFWS was obtained on August 4, 1998.

The review process also identified projects across western Montana that were determined to be "Likely to Adversely Affect" (LAA). These projects were "bundled" or assembled for all administrative units in the MT Team area, and a separate Biological Assessment prepared for the region. Formal consultation on timber sales was initiated by FWS on August 12 1998 and the biological opinion issued on January 11, 1999. The batched BA for range allotments was submitted on January 11, 1999, and the biological opinion issued on June 22, 1999. The batched BA for mining actions was submitted on March 16, 1999, and the biological opinion is still pending. A few LAA ongoing actions were consulted on separately, and the LAA special use permits have waited to be submitted while other high-priority NLAA actions have been reviewed and received concurrence by USFWS. All units were encouraged to complete their Section 7 Watershed BAs as soon as possible which the Flathead NF did in July 1998 and modify projects to: Meet the Inland Native Strategy (INFISH 1995) and reduce the effects to "Not Likely to Adversely Affect" wherever possible.

The MT Team also initiated programmatic Biological Assessments to cover routine, or reocurring, ongoing actions such as road, trail, and recreation site maintenance, timber stand improvement, and fisheries and aquatic surveys. Programmatic BAs are still being considered for use with Prescribed fire (NLAA), fire suppression (LAA), and adverse road maintenance activities. Because the MT Team consultation process has already covered ongoing actions and many programmatic BA's, this document is considered a "Watershed Baseline Assessment", rather than a Watershed Biological Assessment. Each federal agency administrative unit has worked toward developing these Watershed Baseline Assessments, incorporating information into programmatic and project-level BA's as developed.

Throughout the consultation process, the Level 1 team has worked toward consistency in NLAA and No Effect determinations, through general discussion and review of sample projects. Baseline conditions and effects are reported at the 5th or 6th HUC level. Unit biologists are to consider the cumulative effects of all ongoing actions within the 6th HUC when evaluating the effects of any one project. The review of all ongoing projects throughout the 4th code watershed is included in this Watershed Baseline documents, and will be discussed under Cumulative Effects Section.

All ongoing projects in the Middle and North Fork Flathead Sub-basins have been consulted on and concurrence received. The focus of the consultation process now is to complete the environmental baselines to assist in expediting consultation and to meet our requirements under the Programmatic BO.

Combined Effects of Actions

It is possible that a project such as a mine or some chemical contamination in a tributary stream could render a reach downstream impassable or unusable by a migratory fish. Therefore, all projects, including **"no effect"** projects, in the Flathead River Sub-basin have been reviewed to determine the effect of bull trout in the watershed, for example can the project or suite of projects in a drainage impact migration corridors or rearing habitat of bull trout. It was determined that all ongoing projects will maintain the environmental baseline in the Flathead River sub-basin. Specifically, the **"no effect"** projects in those HUCs that do not contain bull trout will not provide a cumulative effect on the Middle and North Fork Flathead rivers such that migration corridors will be impacted.

Cumulative Effects

As mentioned above there are influences other than habitat degradation that are affecting the Flathead Lake bull trout population. Bull trout populations have declined equally in wilderness streams, Glacier National Park streams, and managed streams. The rivers and the lake can not be separated, they function as one. If bull trout are to occur in the river system then measures must be first taken in Flathead Lake to restore bull trout. Monitoring of bull trout habitat by MDFWP indicates that bull trout habitat is as good as it has been since monitoring began in the early 1980's. The habitat is available to support bull trout.

The Flathead River Drainage Bull Trout Status Report indicates that the three highest risks to bull trout are legal introductions, fisheries management, and forestry. Rural residential development was listed as a lesser concern. Land ownership in the Middle and North Forks of the Flathead is very similar in that private land (34,000 acres) is concentrated along the main rivers but predominantly outside the Wild & Scenic River corridor. Therefore, activities on private land rarely influence spawning habitat and to a limited extent any rearing that would occur near the mouths of tributaries. The ownership pattern also influences the Forest's permitting process where few very permits are required for easements and access through NFS land as access is provided from county or state roads.

Glacier National Park manages lands to the east of the North Fork Flathead River and to the north of the Middle Fork Flathead River and provides excellent habitat for bull trout in occupied streams. Many Park streams are limited in their importance for bull trout due to elevated water temperatures that flow from the outlet of lakes. The Department of Natural Resources and Conservation manages over 15,000 acres in the Coal Creek State Forest, including the majority of lands in the disjunct Cyclone Lake population. DNRC is planning activities including logging and road building in this area that may contribute to effects on this population.

See also: Appendix 23 Baseline Conditions for Bull Trout, North & Middle Forks of the Flathead
Appendix 25 Baseline Conditions for Bull Trout, Stillwater Drainage

Appendix 24
Baseline Conditions for Bull Trout (*Salvelinus confluentus*), South Fork of the Flathead Drainage

Excerpt from the Biological Assessment for Bull Trout

Habitat Condition at Sub-basin Scale

Environmental baseline conditions of watersheds that have bull trout populations will be discussed at the 5th and 6th level HUC. An occasional bull trout stray will be caught in electrofishing efforts in the following streams: Emery, Hungry Horse, Doris, Lost Johnny, and Clark creeks. Biologists have collected habitat data and electrofishing populations on these streams over the last 15 years and do not consider these steams to have bull trout populations. Quantitative stream surveys and walk-through surveys indicate that these streams generally do not have the drainage size, extensive low gradient reaches, groundwater influence areas, and substrate to support bull trout spawning. These parameters were determined by the Montana Bull Trout Scientific Team (1998) as key habitat requirements for bull trout.

Once again, it's important to reiterate that the South Fork Flathead supports a healthy bull trout population and it can be expected to find a stray in a stream where you would not ordinarily find a bull trout. This situation is a much different scenario from a depressed population where you may find one bull trout in a stream and it's much more likely that that fish may be the last fish holding on. It is difficult to determine why a fish would move into these streams from the reservoir. We do not know to what extent it happens or if it occurs on a seasonal basis, but we suspect that an individual fish may move into a tributary in search of food.

The South Fork Flathead River is considered a pristine, natural, unmanaged river within the wilderness. That is, management activities such as timber harvest, road, construction, grazing, dam construction, fish stocking, and human settlement have not altered the river's water quality, hydrological and erosional processes, and fish distribution. The drainage's fire regime has been altered through fire suppression activities. Numerous authors have documented the changes these activities have on aquatic environments at various scales (Meehan 1991, Reeves and Sedell 1992, Everest et al. 1985).

Fifty-one miles of the South Fork Flathead River is classified as a "Wild & Scenic River" under the Wild and Scenic Rivers Act. The section below the Spotted Bear Ranger Station to the reservoir (9 miles) is considered a "Recreational" river under the act.

Spotted Bear River and it's tributaries are considered a "priority" bull trout watershed. The Spotted Bear River is considered an unstable river, presumably as a result of the 1964 flood that dramatically changed the river channel. The Spotted Bear River also originates in wilderness and there have been very few activities outside the wilderness that have influenced it's natural characteristics. Numerous braiding occurs throughout the river which limits fish populations because of habitat simplification.

Based upon field observations within and outside the wilderness, the South Fork Flathead and Spotted Bear rivers are in an unmodified, natural condition, albeit, the Spotted Bear River is an unstable, braided river resulting from the 1964 flood. It is difficult to ascertain what effects fire

suppression has had on the rivers and tributaries. A safe assumption may be that it has had little effect since suppression has occurred for about 55 years which is close to the fire interval for these forests. Therefore, it may be safe to assume that effects may start to develop if suppression continues into the future. Efforts are underway to allow natural wildfires to burn in wilderness areas.

Habitat Conditions of 5th and 6th level HUCs-

The format below follows *A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale* (1998). The format uses a matrix designed to integrate the biological and physical conditions to a determination of the potential effects of management activities on bull trout. A brief narrative description is provided for each indicator to help substantiate the determination.

Most habitat data is from Montana Department of Fish, Wildlife, & Parks surveys from 1983-84. The surveys measured drainage area, barrier locations, gradient, amount of spawning gravel, d-90, instream cover and percent pool and run (MDFWP 1984). Best professional judgement from having walked some of the streams was also used. Where available, sediment data from McNeil core samples, which measures % fines less than 6.4 mm in spawning gravels, was used. Temperature data is from incidental measurements taken during hydrological measurements. Constant recording thermographs were used where available. Substrate scores and D-90 measurements were used as surrogates for embeddedness. Streambank stability is from a Region 1 method developed by Pfankuch.

Population characteristics are from our knowledge of the existing population from redd counts, juvenile population estimates, gill net series, and best professional judgement.

Doris Creek (0102)

Doris Creek is a 3rd order stream. Westslope cutthroat trout, and mountain whitefish are present. An occasional bull trout is captured during electrofishing efforts. Redd surveys were conducted in 1993 and 1999 with no redds found.

Subpopulation Characteristics-

Subpopulation Size- The population size in this creek is unknown but based upon the habitat, this creek would not be a significant contributor of bull trout to Hungry Horse Reservoir. Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data has been collect on Doris Creek. Best professional judgement based upon the condition of the riparian zone is that Doris Creek water temperatures are within their natural range. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Doris Creek. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Doris Creek (D-90 ranged from 38cm-64cm in 1983) suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been little riparian harvest therefore best professional judgement suggest that lwd is FA.

Pool Frequency- The 1983 survey determined that pools ranged from 10% to 14% of the area. This most likely lends itself to the large substrate in the stream which would need considerable scour to form pools. FAR

Large Pools- No information exists but given that there are few pools, it can be assumed that large pools would also be limited. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Doris Creek completed between 1975 and 1979 were 44 to 98, which range between a good (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density is 1.1 miles/m . No roads infringe upon the creek. FA

Disturbance History- Harvest in Doris Creek has been relatively light. High intensity harvest less than 20 years is 50 acres while older than 20 years is 196 acres. Low intensity harvest less than 20 years is 18 acres and older than 20 years is 22 acres. FA

Riparian Conservation Areas- Riparian areas are intact. FA

Disturbance Regime- There are several avalanches in the headwaters. No major slumps are present. FA

Integration of Species and Habitat Conditions- The habitat in Doris Creek is considered good to excellent and the bull trout population in the South Fork is stable. FA

Lost Johnny Creek (0103)

Lost Johnny Creek is a 3rd order stream. Westslope cutthroat trout, and mountain whitefish are present. An occasional bull trout is captured during electrofishing efforts. There is a barrier falls about 0.6 miles up from the mouth.

Subpopulation Characteristics-

Subpopulation Size- The population size in this creek is unknown but based upon the habitat, this creek would not be a significant contributor of bull trout to Hungry Horse Reservoir. Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data has been collect on Lost Johnny Creek. Best professional judgement is that Lost Johnny Creek water temperatures are within their natural range. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Lost Johnny Creek. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Lost Johnny Creek (D-90 was 56cm in 1983) suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been little riparian harvest therefore best professional judgement suggest that lwd is FA.

Pool Frequency- The 1983 survey determined that pools were 18% of the area. FA

Large Pools- Walk through surveys indicate that large pools are common in the lower reaches. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Lost Johnny Creek completed in 1979 were 54 to 92, which range between a good (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density is 1.0 miles/m . No roads infringe upon the creek. FA

Disturbance History- Harvest in Lost Johnny Creek has been relatively light. High intensity harvest less than 20 years is zero acres while older than 20 years is 807 acres. Low intensity harvest less than 20 years is zero acres and older than 20 years is 45 acres. FA

Riparian Conservation Areas- Riparian areas are intact. FA

Disturbance Regime- There are several avalanches in the headwaters. No major slumps are present. FA

Integration of Species and Habitat Conditions- The habitat in Lost Johnny Creek is considered good to excellent and the bull trout population in the South Fork is stable. FA

Wounded Buck Creek (0104)

Wounded Buck Creek is a 4th order stream. Bull trout, westslope cutthroat trout, and mountain whitefish are present. Bull trout distribution is limited to the first 7 miles.

Subpopulation Characteristics-

Subpopulation Size- Redd counts have been conducted the last 6 out of the 7 years which is about one life cycle. The record indicates that bull trout populations are stable. Juvenile populations were collected in 1985, 1995, 1997, and 1998. The estimates were 68, 59, 70, and 34 juveniles/ 150m, respectively.Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- There were 149 incidental temperature measurements associated with water quality monitoring procedures between 1981 to 1993 on Upper Wounded Buck Creek. The maximum water temperature recorded was 12.0 C. There were 175 incidental temperature measurements associated with water quality monitoring procedures between 1976 to 1993 on Wounded Buck Creek. The maximum water temperature recorded was 13.3 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples were taken in 1996 and 1997 in Wounded Buck Creek. Percent fines were 27.1 and 17.4 respectively. Sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Wounded Buck Creek (D-90 ranged from 21cm-43cm in 1983) suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been little riparian harvest therefore best professional judgement suggest that lwd is FA.

Pool Frequency- The 1983 survey determined that pools ranged from none to 14% of the area. This most likely lends itself to the large substrate in the stream which would need considerable scour to form pools. FAR

Large Pools- No information exists but given that there are few pools, it can be assumed that large pools would also be limited. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Wounded Buck Creek completed in 1979 were 54 to 113, which range between a good (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density is 0.7 miles/m . No roads infringe upon the creek. FA

Disturbance History- Harvest in Wounded Buck Creek has been relatively light. High intensity harvest less than 20 years is 68 acres while older than 20 years is 503 acres. Low intensity harvest less than 20 years is 18 acres and older than 20 years is 980 acres. FA

Riparian Conservation Areas- Riparian areas are intact with the exception of a small reach near the confluence of Wildcat and Wounded Buck creeks. FA

Disturbance Regime- There are several avalanches in the headwaters. No major slumps are present. FA

Integration of Species and Habitat Conditions- The habitat in Wounded Buck Creek is considered good to excellent and the bull trout population in the South Fork is stable. FA

Emery Creek (0201) and Hungry Horse Creek (0202)

Emery Creek and Hungry Horse Creek are both 4th order streams. Westslope cutthroat trout, and mountain whitefish are present. One bull trout was captured during electrofishing efforts in Emery Creek and several in Hungry Horse Creek tributaries (see Table above).

Subpopulation Characteristics-

Subpopulation Size- The population size in these creeks is unknown but based upon 10 years of electrofishing efforts, these creeks would not be a significant contributor of bull trout to Hungry Horse Reservoir. Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- There were 25 incidental temperature measurements associated with water quality monitoring procedures between 1976 to 1981 on Emery Creek. The maximum water temperature recorded was 9.5 C. There were 87 incidental temperature measurements associated with water quality monitoring procedures between 1989 to 1994 on Hungry Horse Creek. The maximum water temperature recorded was 17.0 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples are shown in the Table below. FA.

Percent of fine sediments (<6.4mm) from McNeil core samples.

STREAM	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U. Hungry Horse	33.2	37.4	--	--	--	--	--	--	--	--
L. Hungry Horse	28.4	35.0	34.8	29.2	36.0	36.1	36.6	--	--	23.0
Tiger Cr.	23.4	35.9	30.2	--	--	--	--	--	--	31.9
Margaret Cr.	31.6	34.8	33.9	--	--	--	--	--	--	32.3
Emery Cr.	--	--	37.8	36.4	36.4	--	34.8	--	--	30.7

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. These streams are not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large suggests that this would be FA.

Large Woody Debris- In 1996, an R1/R4 stream survey was conducted in Emery Creek and in Hungry Horse Creek in 1997 to assess stream habitat conditions. The survey in Emery Creek started at the bridge on Rd #38 just upstream from the reservoir and proceeded 6.3 miles upstream to section 29, T31N, R18W. Hungry Horse Creek was surveyed from the bridge on

Rd #1630 just upstream from the reservoir upstream to just below the Rd #38 road crossing in section 25, T30N, R18W. The table below displays habitat parameters from Emery and Hungry Horse creeks and Riparian Management Objectives for the Inland Native Fish Strategy (INFISH).

Riparian Management Objectives for INFISH and measured for Emery Creek in 1996 and Hungry Horse Creek in 1997.

	LWD/Mile	W/D Ratio	Bank Stability	Pool Frequency
INFISH RMO's	>20 (12")	<10	>80%	65/mile
Emery Cr				
Reach 1	46	15.3	91	14
Reach 2	68	15.6	63	10
Reach 3	69	14.8	76	16
Reach 4	178	18.9	89	18
Reach 5	215	21	74	16
Reach 6	244	7	87	24
Hungry Horse Cr.				
Reach 1	181	34.2	86	21
Reach 2	176	32.5	94	38
Reach 3	256	30.6	95	53
Reach 4	337	33	97	69

Pool Frequency- Hungry Horse Creek is FA and Emery is FAR.

Large Pools- The surveys indicate that large pools are uncommon. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- These streams do not serve as refugia for bull trout because the habitat potential is not there. FA

Wetted Width/Max. Depth Ratio- The data above for Emery Creek is from 1996. In 1997, the stream channel changed dramatically from the high spring runoff resulting in large depositional areas. Both streams are FAR

Streambank Stability- The R-1 Stream Channel Stability Ratings for Emery Creek completed between 1978 and 1981 were 50 to 119, which range between a good (39-76) and a poor condition (114+). The R-1 Stream Channel Stability Ratings for Hungry Horse Creek completed in 1979 were 51 to 60, which is in the good condition range (39-76). FA

Stability is fair to good. FA

Floodplain Connectivity- Roads infringe upon both streams. FAR

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density is 2.9 miles/m in Emery and 1.2 miles/m in Hungry Horse Creek. Roads infringe upon both creeks. FAR

Disturbance History- High intensity harvest less than 20 years is 965 and 434 acres while older than 20 years is 2019 and 576 acres. Low intensity harvest less than 20 years is 810 and 256 acres and older than 20 years is 1590 and 1739 acres for Emery and Hungry Horse creeks, respectively. FAR

Riparian Conservation Areas- Riparian areas have been impacted by the roads. FAR

Disturbance Regime- There are several avalanches in the headwaters. No major slumps are present. FA

Integration of Species and Habitat Conditions- The habitat in these creeks is considered good but does not meet the requirements of bull trout as demonstrated by their limited presence despite a stable and healthy population in the South Fork Flathead. FA

Firefighter (0301)

The major streams in this HUC are Clayton and Riverside creeks. Juvenile bull trout have been found in Riverside Creek since fish passage was restored at the Rd. 38 crossing in 1996. Clayton Creek has an impassable waterfall at its mouth.

Subpopulation Characteristics-

Subpopulation Size- Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence

among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data has been collected on these streams. Best professional judgement is that water temperatures are within their natural range. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in these streams. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Riverside Creek (D-90 was 68cm in 1983) suggests that this would be FA.

Large Woody Debris- LWD has not been measured. The headwaters are in protected areas suggesting that recruitment is good despite some riparian harvest along the stream. FA.

Pool Frequency- The 1983 survey determined that pools were 33% of the area in Riverside Creek but pools were not measured in Clayton due to the barrier. FA

Large Pools- Walk through surveys indicate that large pools are common in the lower reaches of Riverside Creek. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that these systems have had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Rating for Riverside Creek completed in 1979 was 58, which is good (39-76). The R-1 Stream Channel Stability Ratings for Clayton Creek in 1975 and 1979 were 46 to 78 which is good. FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density in this HUC6 is 1.7 miles/m . No roads infringe upon the creek. Fish passage was restored to Riverside Cr. in 1996. FA

Disturbance History- Harvest is by HUC6. High intensity harvest less than 20 years is 1932 acres while older than 20 years is 2560 acres. Low intensity harvest less than 20 years is 2500 acres and older than 20 years is 2520 acres. FA

Riparian Conservation Areas- Riparian areas are intact for the most part. FA

Disturbance Regime- A fire in 1981 burned 981 acres. FA

Integration of Species and Habitat Conditions- The bull trout population in the South Fork is stable. FA

Goldie/Knieff/McInernie/Deep/Clorinda (0302)

The major streams in this HUC are McInernie and Deep creeks. Juvenile bull trout have been found in McInernie Creek. Fish passage was restored at the Rd. 38 crossing in in McInernie Creek in 1995. Goldie, Knieff, and Clorinda creeks have barriers at their mouths.

Subpopulation Characteristics-

Subpopulation Size- Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data has been collected on these streams. Best professional judgement is that water temperatures are within their natural range. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in these streams. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. D-90 was 36 in McInernie Creek in 1983. FA.

Large Woody Debris- LWD has not been measured. The headwaters are in protected areas suggesting that recruitment is good despite some riparian harvest along the stream. FA.

Pool Frequency- The 1983 survey determined that pools were 18% and 33% in 2 reaches of McInernie Creek but pools were not measured in the other creeks due to barriers. FA

Large Pools- Walk through surveys indicate that large pools are common in the lower reaches of McInernie Creek. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that these systems have had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Clorinda, McInernie, and Deep creeks completed in 1979 were 60, 61, and 60, respectively which is good (39-76). The latest R-1 Stream Channel Stability Ratings for Goldie Creek and Knieff Creek in 1989 were 74 to 111 and 51 to 104, respectively which is fair. FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density in this HUC6 is 2.0 miles/m . No roads infringe upon the creek. Fish passage was restored to McInernie Cr. in 1995. FA

Disturbance History- Harvest is by HUC6. High intensity harvest less than 20 years is 780 acres while older than 20 years is 1913 acres. Low intensity harvest less than 20 years is 650 acres and older than 20 years is 1446 acres. FA

Riparian Conservation Areas- Riparian areas are intact for the most part. FA

Disturbance Regime- A fire in 1969 burned 295 acres. FA

Integration of Species and Habitat Conditions- The bull trout population in the South Fork is stable. FA

Trout Lake (0301)

The major streams in this HUC are Felix and Harris creeks. Juvenile bull trout have been found in Felix and Harris creeks. Fish passage was restored at the Rd. 38 crossing in 1997 for these two streams. Paint Creek has an impassable culvert near its mouth and a waterfall just upsream.

Subpopulation Characteristics-

Subpopulation Size- Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data has been collected on these streams. Best professional judgement is that water temperatures are within their natural range. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in these streams. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. These streams are not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- Paint Creek culvert remains a barrier, however, replacing it would not provide a significant amount of habitat due to a barrier falls 1/4 miles upstream. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. D-90 for Harris, Felix, Canyon creeks in 1983 was 49, 41&52, and 53, respectively. FA

Large Woody Debris- LWD has not been measured. The headwaters are in protected areas suggesting that recruitment is good despite some riparian harvest along the stream. FA.

Pool Frequency- The 1983 survey determined that pools were 0%, 3%, and 13% of the area for Canyon, Harris, and Felix creeks, respectively. FAR

Large Pools- Large pools are common in the lower reaches of Felix Creek. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that these systems have had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Felix, Harris, and Canyon creeks completed in 1979 were good (39-76) except for 1 reach in Canyon Creek that was 92 (Fair). FA

Floodplain Connectivity- The streams have access to their floodplains. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density in this HUC6 is 2.7 miles/m . No roads infringe upon the creek. Fish passage was restored to Felix and Harris creeks. in 1997. FAR

Disturbance History- Harvest is by HUC6. More harvest has occurred in this HUC than any other in the South Fork. Most harvesting has occurred along the reservoir rather than in the headwaters which is good. High intensity harvest less than 20 years is 2081 acres while older than 20 years is 5656 acres. Low intensity harvest less than 20 years is 2056 acres and older than 20 years is 2837 acres. FAR

Riparian Conservation Areas- A considerable amount of riparian harvest has occurred. FAR

Disturbance Regime- There is no recent fire activity. FA

Integration of Species and Habitat Conditions- The bull trout population in the South Fork is stable. FA

Graves/Aeneas creeks (0402)

These streams enter Hungry Horse Reservoir at Graves Bay and have an impassable waterfall at their mouth. Bull trout area not present.

Logan/SF Logan/Hoke (0501)

The major streams in this HUC are Logan & SF Logan creeks. Juvenile bull trout have been found in Logan Creek. Baffles were installed in the Rd. 38 culvert in Logan Creek in 1995.

Subpopulation Characteristics-

Subpopulation Size- Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data has been collected on these streams. Best professional judgement is that water temperatures are within their natural range. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in these streams. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. Logan Creek had baffles install in a culvert in 1995. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Logan and SF Logan had D-90's of 43 and 23, respectively. FA

Large Woody Debris- LWD has not been measured. The headwaters are in protected areas suggesting that recruitment is good despite some riparian harvest along the stream. FA.

Pool Frequency- The 1983 survey determined that pools were 20% and 17% of the area in Logan and SF Logan, respectively. FA

Large Pools- Large pools are common in lower Logan Creek. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that these systems have had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Logan, SF Logan, and Hoke creeks completed in 1979 are 76, 42, and 62 which is good (39-76). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a minor increase to the peak flow associated with the road construction and timber harvest activities. But the increase may be so small that it would be within the undisturbed natural range of variability. FA

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FA

Road Density and Location- Road density in this HUC6 is 1.9 miles/m . No roads infringe upon the creek. Fish passage was restored to Logan Cr. in 1995. FA

Disturbance History- Harvest is by HUC6. High intensity harvest less than 20 years is 1367 acres while older than 20 years is 1682 acres. Low intensity harvest less than 20 years is 1112 acres and older than 20 years is 1911 acres. FA

Riparian Conservation Areas- Riparian areas are intact for the most part. FA

Disturbance Regime- There are no recent disturbances. FA

Integration of Species and Habitat Conditions- The bull trout population in the South Fork is stable. FA

Wheeler Creek (0502)

Wheeler Creek is a 4th order stream. Bull trout, westslope cutthroat trout, and mountain whitefish are present. Bull trout distribution is limited to the first 6 miles.

Subpopulation Characteristics-

Subpopulation Size- Redd counts have been conducted the last 5 years which is about one life cycle. Juvenile populations have not been collected.

	1993	1994	1995	1996	1997
Redd Cnts	12	10	1	3	1

Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- There were 13 incidental temperature measurements associated with water quality monitoring procedures between 1976 to 1980 on Wheeler Creek. The maximum water temperature recorded was 10.0 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Wheeler Creek. Best professional judgement suggests that sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Wheeler Creek (D-90 ranged from 33cm-45cm in 1983) suggests that this would be FA.

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been some riparian harvest therefore best professional judgement suggest that lwd is FAR.

Pool Frequency- The 1983 survey determined that pools ranged from 27% to 33% of the area. FA

Large Pools- No information exists. It can be assumed that large pools should be present given the very favorable amount of pools. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Although there has been some headwater logging, habitats are connected and can maintain all life stages of bull trout. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- No stability data exists but best professional judgement based upon pattern of use and other factors suggest that stability is FA.
Streambank Stability- The R-1 Stream Channel Stability Ratings for Wheeler Creek completed between 1975 to 1979 range from 45 to 98, which range between a good (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- Given the location of the harvest units and size, it is assumed that there has been some increase in peak flows. FAR

See also: Appendix 23 Baseline Conditions for Bull Trout, North & Middle Forks of the Flathead
Appendix 24 Baseline Conditions for Bull Trout, South Fork of the Flathead

Appendix 25
Baseline Conditions for Bull Trout (*Salvelinus confluentus*), Stillwater Drainage

Excerpt from the Biological Assessment for Bull Trout

6. Environmental Baseline for individual 6th code field level

The following pages describe the baseline condition for each of the 4 subwatersheds.

a. Major Watershed #1. Upper Stillwater Lake

Upper Stillwater Watershed
170102100601 (Lower Stillwater)
170102100702 (Upper Stillwater)
170102100703 (Fitzsimmons Creek)
Unknown HUC # (Sunday Creek)

CRB Status: Migration Corridor, except Fitzsimmons which is Depressed
CRB Predicted Status: Absent, except Fitzsimmons which is Depressed
Population Use: Migration Corridor in Stillwater Lakes system, Fitzsimmons is Spawning & Rearing

The bull trout population of Upper Stillwater Lake is considered disjunct, but some migration may occur within the Stillwater river through Lower Stillwater Lake and further downstream. This population is thought to spawn only in Fitzsimmons Creek and a portion of the Stillwater River just upstream of Fitzsimmons Creek. The majority of these watersheds is on state and private land. Only LeBeau Creek (which is fishless), a portion of Upper Stillwater Lake, two small stretches of Stillwater River and the extreme headwaters of Fitzsimmons Creek is on Flathead National Forest system lands. Sunday Creek is a large tributary on the Kootenai National Forest but it does not contain bull trout. Sunday Creek is not reviewed in this assessment.

Subpopulation Characteristics
Subpopulation Size Redd count data has been collected annually only since 1994. Prior to 1997 it was uncertain where bull trout spawn and redd counts only focused on Fitzsimmons Creek. Redd counts in 1994 were 4 redds, in 1995 there were 2 redds and in 1996 there were 8 redds. In 1997 the redd counts began including the Upper Stillwater and a total of 13 redds were found between the two streams. In 1998 the entire headwater area was surveyed and a total of 47 redds were counted, the highest ever. The 1999 redd counts found a total of 25 redds but again, only a portion of the upper Stillwater was surveyed. Assuming a simple pairing per redd, there may be about 100-200 migratory adults in Upper Stillwater Lake. A 1993 population survey in Fitzsimmons Creek and Stillwater River (in spawning areas) estimated about 5-20 juvenile fish per 300 meters. Since there are about 6 miles of suitable habitat, the total juvenile population may be about 300-600 individuals. *Baseline condition = Functioning at Risk*

Drainage Network- Given the location of the roads and the soils in the area and the bedload observed in the creek, there most likely has been a low increase in channel length. There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- Road density in Wheeler Creek is 1.5 miles/m . There are no valley bottom roads. There is a major road slump below bull trout spawning that has not increase since its detection in the 1960's. FAR

Disturbance History- High intensity harvest less than 20 years is 831 acres and older than 20 years is 1720 acres. Low intensity harvest less than 20 years is 587 acres and older than 20 years is 236 acres.

Riparian Conservation Areas- There has been some riparian harvest in Wheeler Creek, particularly in the headwaters. FAR

Disturbance Regime- Natural processes in Wheeler Creek have not been modified. FA

Integration of Species and Habitat Conditions- Habitat has been modified in Wheeler Creek due to headwater harvest and road building on sensitive soils. Redd counts are the lowest of known bull trout spawning streams. Whether this is habitat related or due to historically limited bull trout distribution in Wheeler Creek is hard to determine. None the less, given the small number of redds and disturbed habitat, the call is FAR.

Quintonkon Creek (0604)

Quintonkon Creek is a 3rd order stream. Bull trout, westslope cutthroat trout, and mountain whitefish are present. Bull trout distribution is limited to the first 3 miles where a barrier falls prevents further upstream migration.

Subpopulation Characteristics-

Subpopulation Size- Redd counts have been conducted the last 5 years which is about one life cycle. Juvenile populations were collected in 1987. The estimate was 77 juveniles/ 150m section.

	1993	1994	1995	1996	1997
Redd Cnts	5	3	7	4	0

Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No temperature data exists. It is assumed that the geology of the area has a groundwater influence that keeps temperatures down which would make this parameter FA.

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples were taken in Quintonkon Creek in 1992; percent fines were 39.6%. Best professional judgement suggests that sediment would be considered FAR.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is on the State's 305(b) list of impaired water bodies for excess siltation associated with logging. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Quintonkon Creek (D-90 34cm in 1983) suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been some riparian harvest therefore best professional judgement suggest that lwd is FAR.

Pool Frequency- The 1983 survey determined that pools comprised 7% of the area. This most likely lends itself to the large substrate in the stream which would need considerable scour to form pools. FAR

Large Pools- No information exists but given that there are few pools, it can be assumed that large pools would also be limited. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Considering that bull trout are limited to the first 3 miles and that limited spawning habitat exists, Quintonkon Creek would not serve as a good refugia. FAR

Wetted Width/Max. Depth Ratio- No W/D data exists, however, peak flows are about 3% over natural based upon a 1992 analysis for Rock Creek Timber Sale. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Quintonkon Creek completed between 1974 to 1979 were 44 to 90, which range between a good condition (39-76) and a fair condition (77-114). Best professional judgement based upon pattern of use and other factors suggest that stability is FA.

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- A 1992 analysis for Rock Creek Timber Sale showed that peak flows were about 3% over natural. FAR

Drainage Network- Best professional judgement from walking sections of the stream indicates that there has been some channel movement. There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- There are 26 miles of road in this HUC. The density is 1.1 miles/ mile . This density does not reflect the 3 miles of reclamation from 1997. So, densities would be less. There are no valley bottom roads and few stream crossings. There are 7 miles of trail in this HUC. FA

Disturbance History- High intensity harvest less than 20 years is 10 acres and older than 20 years is 2070 acres. Low intensity harvest less than 20 years is zero and older than 20 years is 525 acres. FAR

Riparian Conservation Areas- There has been some riparian harvest in the headwaters but large woody debris, shade, etc. appear to be functioning appropriately. FA

Disturbance Regime- In 1984 there was a 22 acre fire in Quintonkon Creek. Environmental disturbances are minor, including several avalanches in the upper drainage. These are old and are not inputting sediment into the stream. FA

Integration of Species and Habitat Conditions- Quintonkon Creek has limited gravels for spawning, thus the low number of redds. Given that there has been moderate headwater harvest and limited spawning habitat, FAR.

Sullivan Creek (0600)

Sullivan Creek is a 4th order stream. Bull trout, westslope cutthroat trout, and mountain whitefish are present. Bull trout occur throughout Sullivan Creek, however, redds have not been found in Ball, Branch, Conner, and Slide Creeks. Redds have been found in the upper reaches of Sullivan Creek starting about a mile below the confluence with Slide Creek.

Subpopulation Characteristics-

Subpopulation Size- Redd counts have been conducted the last 5 years which is about one life cycle. Juvenile populations have not been collected.

	1993	1994	1995	1996	1997
Redd Cnts	25	8	--	52	50

Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- There were 96 incidental temperature measurements associated with water quality monitoring procedures between 1978 to 1989 on Sullivan Creek. The maximum water temperature recorded was 15.5 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Sullivan Creek. Best professional judgement suggests that sediment would be considered FAR based upon observed sediment contributed from road reclamation activities.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is on the State's 303(d) list of impaired water bodies with aquatic life support (cold water fishery - trout) the probable impaired use. And the probable cause habitat alterations, with the probable source being silviculture practices. FAR

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Sullivan Creek (D-90 ranged from 16cm-40cm in 1983) suggests that this would be FA.

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been some riparian harvest. LWD distribution is scattered with the upper reaches of Sullivan Creek having a lot of LWD while the lower reaches are deficient, therefore best professional judgement suggest that lwd is FA.

Pool Frequency- The 1983 survey determined that pools ranged from none to 17% of the area. This may be partly due to several culverts failing sometime in the 1980's which released a tremendous amount of materials that could have filled pools in Sullivan Creek. FAR

Large Pools- No information exists but given that there are few pools, it can be assumed that large pools would also be limited. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Sullivan Creek is a large watershed with numerous tributaries. These tributaries are connected and provide sufficient rearing and spawning habitat. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had a lot of bed material moving through it which would cause pools to fill and the stream to widen. Best professional judgement suggest that W/D ratio is FAR.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Sullivan Creek completed between 1974 to 1979 were 44 to 90, which range between a good condition (39-76) and a fair condition (77-114). But best professional judgement based upon pattern of use and other factors suggest that stability is FAR.

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There is evidence of peak flow increase due to the amount of bedload in the system. FAR

Drainage Network- Road densities are variable in Sullivan Creek. There were some culvert failures which has caused the channel to change. There are areas of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- Road density is highest in 0601, primarily in Battery Creek which is not bull trout habitat. Densities and miles of road are 0.3 mi/m (5 miles), 1.2 mi/m (36 miles), and 2.6 mi/m (49 miles) respectively for 0602, 0603, and 0601. Most of the roads in this drainage have been surveyed for sediment sources and culverts. This drainage is rated as FAR for roads. There is also 15 miles of trails in these 3 HUCs.

Disturbance History- High intensity harvest less than 20 years is 210 acres and older than 20 years is 5,328 acres. Much of the harvest has occurred in Ball, Branch, Conner and Slide creeks where bull trout spawning has not been documented. FAR

Riparian Conservation Areas- Riparian areas are relatively intact and have not been compromised. FA

Disturbance Regime- There was a 66 acre fire in 1964 in Sullivan Creek. There are several avalanche chutes in the upper drainage that are old. Sometime in the 1980's about 4 culverts failed and inputted large amounts of sediment into the creek. That road which goes up Slide Creek was reclaimed in 1993. Given the large amount of bedload in this stream, presumably from this event, this parameter is FAR.

Integration of Species and Habitat Conditions- Bull trout redds have been primarily found above the confluence of Slide Creek. Habitat above this section has not been modified. Sullivan Creek supports a robust bull trout population. FA

Crossover (0701)

Clark Creek is a 3rd order stream. Westslope cutthroat trout, and mountain whitefish are present. Up to 6 bull trout have been captured during electrofishing efforts.

Subpopulation Characteristics-

Subpopulation Size- The population size in this creek is unknown but based upon the habitat, this creek would not be a significant contributor of bull trout to Hungry Horse Reservoir. Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- No water temperature data is recorded for Clark Creek. Professional judgement is that the water temperatures are in their natural range of variability. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Clark Creek. Based upon sampling in adjacent streams with similar disturbance sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Clark Creek (D-90 was 27cm in 1983) suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been little riparian harvest therefore best professional judgement suggest that lwd is FA.

Pool Frequency- The 1983 survey determined that pools ranged from 10% to 17% of the area. FAR

Large Pools- Walk through surveys indicate that large pools are common in the lower reaches. FA

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. Very little logging has occurred in the headwaters. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Clark Creek completed between 1976 and 1979 were 52 to 102, which range between a good (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- There would be a moderate increase to the peak flow associated with the road construction and timber harvest activities. FAR

Drainage Network- There are short lengths of roads and skid trails that intercept near surface groundwater during the spring snow melt period. These areas effectively extend the channel network. FAR

Road Density and Location- Road density is 2.1 miles/m . No roads infringe upon the creek. FAR

Disturbance History- High intensity harvest less than 20 years is 1435 acres while older than 20 years is 3050 acres. Low intensity harvest less than 20 years is 841 acres and older than 20 years is 1885 acres. FAR

Riparian Conservation Areas- Some riparian harvest has occurred. FAR

Disturbance Regime- There are several avalanches in the headwaters. No major slumps are present. FA

Integration of Species and Habitat Conditions- Clark Creek doesn't contain the habitat requirements to support large populations of bull trout. FA

Addition/Bruce (0902)

Addition Creek has a hydro-electric dam 1/2 mile from its confluence with the South Fork. This dam provides power to the Spotted Bear Ranger Station. Juvenile bull trout have been found below the dam during electrofishing efforts, the most recent survey being 1999. Bull trout were not found above the dam during efforts in 1995, but cutthroat were found in high numbers. No spawning habitat exists below the dam.

Larch/Jungle/Cedar (0903)

Ther is a barrier falls at the mouth of these streams that prevents upstream migration. These streams are fishless.

Bunker Creek (1204)

Bunker Creek is a 5th order stream. Bull trout, westslope cutthroat trout, and mountain whitefish are present. No habitat surveys have been done on Bunker Creek, therefore all determinations are based upon best professional judgement. There is a falls near South Bunker Creek that prevents upstream migration.

Subpopulation Characteristics-

Subpopulation Size- Two redds were found in 1993 which is the only year that counts were done in Bunker Creek. Juvenile populations have not been estimated.

Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow

among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat- Habitat data is from Montana Department Fish, Wildlife, and Parks from 1983-84.

Temperature- There were 21 incidental temperature measurements associated with water quality monitoring procedures between 1978 to 1981 on Bunker Creek. The maximum water temperature recorded was 14.0 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Bunker Creek. Best professional judgement suggests that sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Bunker Creek suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been little riparian harvest therefore best professional judgement suggest that lwd is FA.

Pool Frequency- There has been relatively little harvest in Bunker Creek and even less in headwaters therefore the processes that affect pool formation haven't been radically altered. FA

Large Pools- Same as above for pool frequency. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. However, bull trout distribution is limited, therefore Bunker Creek is not the best refugia. FAR

Wetted Width/Max. Depth Ratio- No W/D data exists, however, it is inferred that this system has had little increase in peak flows that would lead to stream widening and pool filling. Best professional judgement suggest that W/D ratio is FA.

Streambank Stability- The R-1 Stream Channel Stability Ratings for Bunker Creek completed between 1974 to 1979 were 49 to 87, which range between a good condition (39-76) and a fair condition (77-114). FA

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- Best professional judgement indicates that there has been very little peak flow increases in Bunker Creek.

Drainage Network- There is no evidence of increases in channel length. FA

Road Density and Location- Densities and miles are 0.8 mi/m (19 miles), 0.6 mi/m (9 miles), and 1.0 mi/m (10 miles) for 1201, 1204, 1205, respectively. There are no valley bottom roads and only a few stream crossings. About 8 miles of road in 1205 are scheduled for reclamation in 1998. There are 13 miles of trail in this HUC. FA

Disturbance History- High intensity harvest less than 20 years is 538 acres and older than 20 years is 910 acres. Low intensity harvest less than 20 years is 74 acres and older than 20 years is 869 acres. FA

Riparian Conservation Areas- There has been little riparian harvest in Bunker Creek. FA

Disturbance Regime- There are no recent fires, only avalanches. Natural processes appear to be stable. FA

Integration of Species and Habitat Conditions- Habitat in Bunker Creek is in good to excellent condition. Although there haven't been many redds found in Bunker Creek, bull trout are healthy and stable in the South Fork. FA

Spotted Bear River (1000)

Spotted Bear River and it's tributaries are considered a "priority" bull trout watershed. The Spotted Bear River is considered an unstable river, presumably as a result of the 1964 flood that dramatically changed the river channel. The Spotted Bear River also originates in wilderness and there have been very few activities as mentioned above that have influenced it's natural characteristics. Numerous braiding occurs throughout the river which limits fish populations. Bull trout can only be found below Dean Falls (10m) which is just inside the wilderness boundary. Sergeant Creek, which is almost entirely in the wilderness, is the only tributary to Spotted Bear River where bull trout can be found. Bull trout do not occur in tributaries to the Spotted Bear River outside of the wilderness.

Subpopulation Characteristics-

Subpopulation Size- Redd counts have been conducted sporadically over the years. Juvenile populations have not been estimated.

Given what we know about the bull trout population in Hungry Horse Reservoir from gill net catch rates and redd counts, this subpopulation is functioning acceptable. FA

Growth and Survival- This subpopulation is functioning acceptable. FA

Life History Diversity and Isolation- The migratory form is still present and assumed to be stable. No resident forms are known to exist. This subpopulation is functioning acceptable. FA

Persistence and genetic Integrity- No introgression of bull trout has been documented. The potential for hybridization is non-existent given that brook trout are not present in the watershed. Evidence suggests that there is substantial genetic divergence among bull trout populations from different sub-basins in the Flathead (Kanda et al. 1994). The amount of genetic divergence among populations within sub-basins is smaller which suggests that there is some gene flow among subpopulations. There are no competitors to bull trout in the South Fork Flathead River sub-basin. FA

Habitat-

Temperature- There were 17 incidental temperature measurements associated with water quality monitoring procedures between 1986 to 1987 on Spotted Bear River. The maximum water temperature recorded was 15.6 C. FA

Sediment- The Flathead National Forest adopted Flathead Basin Commission recommendations for sediment in 1992 through Implementation Note #10. In short, streams that have greater than 35% fines (<6.4mm) are considered threatened while streams with greater than 40% fines are considered impaired. McNeil core samples have not been taken in Wounded Buck Creek. Best professional judgement suggests that sediment would be considered FA.

Chemical Contamination/Nutrients- There are no concerns with chemical contamination or excess nutrients. This stream is not on the State's 305(b) list of impaired water bodies. FA

Habitat Access- There are no man made barriers in this watershed. FA

Embeddedness- The Flathead National Forest does not measure embeddedness. Best professional judgement based upon the fact that the substrate is rather large in Spotted Bear River suggests that this would be FA

Large Woody Debris- LWD has not been measured. Using aerial photos of the stream shows that there has been little riparian harvest therefore best professional judgement suggest that lwd is FA.

Pool Frequency- Pools are limited in the Spotted Bear River below Dean Falls. FAR

Large Pools- No information exists but given that there are few pools, it can be assumed that large pools would also be limited. FAR

Off Channel Habitats- Sufficient off channel habitat exist. FA

Refugia- Quality habitat exists. The headwaters provide quality water downstream and spawning and rearing occur above most management activities. FA

Wetted Width/Max. Depth Ratio- No W/D data exists, however, the 1964 flood had a major affect on the river which resulted in braiding. Best professional judgement suggest that W/D ratio is FAR.

Streambank Stability- No stability data exists but best professional judgement based upon pattern of use and other factors suggest that stability is FA.

Floodplain Connectivity- The stream has access to its floodplain. FA

Peak Flow- Peak flow increase are limited. FA

Drainage Network- Road densities are below bull trout spawning and haven't led to increases in drainage efficiencies. FA

Road Density and Location- Road densities and miles are 1.4 mi/m (37 miles) and 0.2 mi/m (8 miles) for the two roaded HUCs (1001 and 1101) in this drainage. The Bent Flat II project will reclaim 17 miles and close 5 miles so densities will be reduced in 1001. There are 49 miles of trails in these 2 HUCs and 82 miles in the 5 HUCs in wilderness. FA

Disturbance History- High intensity harvest less than 20 years is 538 acres and older than 20 years is 1692 acres. Low intensity harvest less than 20 years is 822 acres and older than 20 years is 561 acres.

Riparian Conservation Areas- There has been little riparian harvest. FA

Disturbance Regime- About 15,000 acres burned in Dean Creek (1102) in 1994. This drainage was also impacted from the 1964 flood which caused numerous braiding in the lower river. The river appears to be still recovering from the flood. FAR

Integration of Species and Habitat Conditions- Bull trout spawning is limited in Spotted Bear River due to the size of the gravel in the river and the presence of Dean Falls. Habitat has been modified by the 1964 flood. Despite this limitation, connectivity is high and a healthy meta-population exists. FA

Lower Twin Creek (0702) No quantification of bull trout has occurred. We know that distribution in limited to the first 2 miles of stream where a barrier falls prevents upstream passage. This stream originates in the Great Bear Wilderness and only the lower mile is outside wilderness. No management activities with the exception of Trail # 385 have occurred in this HUC. All parameters are assumed to be FA.

Wilderness Streams
Bull trout also occur in the following HUCs inside the Bob Marshall Wilderness. Environmental baseline will not be discussed but habitat conditions are assumed to be functioning acceptable since there hasn't been any recent natural catastrophic events or man induced changes.

Little Salmon Creek- 1501 & 1502. Bull trout have access to the entire length of this creek.

Big Salmon Creek- 1601, 1602, & 1603. Big Salmon Lake supports a disjunct population of bull trout. Redd counts were first completed in 1993. This population is believed to be healthy and self-supporting. The warm water temperature released from the lake surface is believed to be a thermal barrier to upstream migrating bull trout from the South Fork Flathead. There is no barrier

between the lake and the river. There is an upstream migration barrier about 3 miles above the lake.

	1993	1994	1995	1996	1997
Big Salmon	92	91	93	61	55

White River- 1801-1804. Bull trout have access to about 7 miles of stream. Needle Falls is an upstream barrier. Redd counts were done in the South Fork White River in 1993, however, no redds were found.

Danaher- 2001-2003 and 2101-2103. Nine redds were found in 1993 in lower Danaher Creek. The upper reaches of this creek are Rosgen E channels through meadows which generally isn't typical bull trout habitat. Rapid Creek, a tributary to Danaher Creek provides the best habitat and 12 redds were found in 1993.

Gordon Creek- 2301-2303. Bull trout have access the entire length of this creek. There is a disjunct population of bull trout in Doctor Lake. Very little is known about this population. There are no projects in the headwaters of above Doctor Lake.

Youngs Creek- 2201-2205. Bull trout have access to the entire length of this creek. Preliminary genetic analysis (Kanda et al. 1997) suggests that there may be a resident population of bull trout as these fish had significant genetic variation. Babcock Creek, a tributary to Youngs Creek, had 4 redds in 1993.

The South Fork Flathead River for about 1 mile below the confluence of Youngs and Danaher creeks could also provide spawning habitat since suitable gravels are available. The following is a list of streams where redd counts were conducted in 1993 and no bull trout redds were found:

Harrison Creek
Mid Creek
Black Bear Creek
Holbrook Creek
Burnt Creek
Bartlett Creek
South Fork White River
Hahn Creek
Otter Creek
Cabin Creek
Marshall Creek
Jenny Creek
Camp Creek
Basin Creek
Foolhen Creek
Spring Creek
Calf Creek
Bar Creek
Limestone Creek

Growth and Survival There is insufficient data to determine if this population is stable or increasing. The 1998 redd counts were much higher than the earlier redd counts but it is important to remember the earlier counts did not cover all spawning areas and cannot be used for comparison. In 1993, 29 juveniles were collected from Upper Stillwater river and all were determined to probably be the progeny of a single mated pair. This implies an extreme population bottleneck or poor survivorship from other redds. Therefore it cannot be concluded that this population is experiencing extreme decline but nor does it seem likely it could rebound easily from a short term disturbance. *Baseline condition = Functioning at Risk*

Life History Diversity and Isolation This population is considered disjunct and is not located near other subpopulations. The migratory corridor of the Stillwater River is considered to have poor habitat for migration and is probably seldom used. However migratory adults are still found in this population and it does not consist of just resident life forms. *Baseline condition = Functioning at Risk*

Persistence and Genetic Integrity Exotic brook trout are found in high numbers throughout these watersheds. Brook trout pose a threat to bull trout genetic integrity but so far genetic samples collected have not found evidence of hybridization. Other exotic species such as rainbow trout and northern pike are present and known to displace bull trout. There is very little connectivity with other populations since it is considered disjunct. *Baseline condition = Functioning at Unacceptable Risk*

Water Quality

Temperature Seven day average maximum temperature is not known due to lack of water quality data in this system. Due to the warming effect of the Stillwater Lakes, the Stillwater River probably has marginal habitat for migration. Temperature data in spawning streams is unknown. *Baseline condition = Functioning at Risk*

Sediment Data on surface fines is not known, but in 1996 coring data on Stillwater River found 29.1% fines and Fitzsimmons Creek had 24% fines. The Flathead National Forest LRMP adopted the recommendations of the Flathead Basin Committee (1991) and considers bull trout streams with over 35% fines to be 'threatened'. Therefore the only available information suggests these streams have optimal sediment conditions. *Baseline condition = Functioning Appropriately*

Chemical Contaminants/ Nutrients The lower Stillwater river is listed on the Department of Environmental Quality's 303(d) list as threatened. The reason for listing is nutrients, pathogens, siltation, suspended solids and thermal modifications. The cause of these problems are agriculture, silviculture and natural causes. The upper Stillwater river system, where bull trout spawn and rear, is not listed. *Baseline condition = Functioning at Unacceptable Risk*

Habitat Access

Physical Barriers There are no natural barriers and no known man made barriers on the Stillwater system and spawning streams. Other tributaries have natural barriers and are not used by bull trout. *Baseline condition = Functioning Appropriately*

Habitat Elements

Substrate embeddedness Embeddedness data has never been collected on Stillwater Lakes watershed. Embeddedness problems would be detectable if visual surveys saw high amounts of fines yet the coring data suggests low amounts of fines. Based on this tangent parameter, it is assumed that this component is functioning appropriately. *Baseline condition = Functioning Appropriately*

Large Woody Debris No data is available about the large woody debris of these watersheds. Much of the Stillwater river has a road immediately adjacent and there may have been some riparian harvest. However, most streams in the Flathead National Forest have 50-400 pieces of large woody debris per mile and so it is highly likely that the Stillwater Creek has the minimum of 20 pieces per mile. *Baseline condition = Functioning Appropriately*

Pool Frequency and Quality No data is available about the pool frequency of these watersheds. Much of the Stillwater river has a road immediately adjacent and there may have been some riparian harvest which reduces pool frequency. Considering how many streams fall short of bull trout optimal habitat needs, even pristine streams, it is likely that the Stillwater system has fewer pools than optimal. *Baseline condition = Functioning at Risk*

Large Pools No data is available and so large pool frequency is also likely to relatively uncommon, similar to other streams on the forest. *Baseline condition = Functioning at Risk*

Off-channel habitat This condition is unknown. Indications are that juvenile bull trout are present in Stillwater Lakes watershed and it will be assumed that off-channel habitat is not limiting. *Baseline condition = Functioning Appropriately*

Refugia The condition of Stillwater Lakes watershed habitat connectivity is not known. It is assumed that some areas of high quality habitat exist considering the occurrence of some spawning but it is not know how well connected all stream reaches are since portions of these streams flow through private land. *Baseline condition = Functioning at Risk*

Channel Condition & Dynamics

Wetted Width/Max. Depth Ratio No width/depth data is available. Fitzsimmons Creek is thought to be relatively unmanaged and so width/depth ratios are predicted to be natural. Much of the remainder of the watershed is thought to have been extensively harvested by Stillwater State Forest. However, due to the presence of so many wetlands and lakes, the flow regime has probably been buffered and has not caused changes in the stream channels. *Baseline condition = Functioning Appropriately*

Streambank Condition No channel stability data is available. Soils in this watershed are fine textured and have a tendency to erode and leave raw banks. Considering the extensive timber harvest that has occurred, it is likely that some streambank erosion is occurring. *Baseline condition = Functioning at Risk*

Floodplain Connectivity Some roads are located near streams, especially along upper Stillwater river and Fitzsimmons Creek which is, unfortunately, where the bull trout spawn. It is predicted that these roads are having a moderate to heavy influence on restricting floodplains. *Baseline condition = Functioning at Unacceptable Risk*

Flow/Hydrology

Change in Peak Flow/Base Flows A hydrograph is not available. Evidence from aerial photos demonstrate that the Stillwater State Forest has completed extensive timber harvest. Although much of these watershed are not in high elevation and in high precipitation zones, they are predicted to have experienced some alteration in peak flows due to timber harvest. *Baseline condition = Functioning at Risk*

Drainage Network Increase No data is available. As described earlier, it appears that much of the watershed has been harvested. Due to the gentle topography of the area, it is assumed that much of this harvest was accomplished by ground based equipment. The combination of moderate road densities and numerous skid trails would probably mean some areas have increased scour channel lengths. *Baseline condition = Functioning at Risk*

Watershed Conditions

Road Density & Location A computer analysis estimates that the entire watershed of Upper Stillwater Lake has an average of 2.16 road miles per square mile (all landownerships). This is a high road density (USDI Fish and Wildlife Service 1999) and unfortunately two roads travel right up the riparian valley of Fitzsimmons and Upper Stillwater River. *Baseline condition = Functioning at Unacceptable Risk*

Disturbance History Since the majority of these watersheds are not on National Forest system lands, a detailed analysis of disturbance history is not possible. Much of these watersheds are on Stillwater State Forest lands. The Stillwater State Forest is mandated to harvest timber to support the school system, so it is highly likely that much of the watershed has been harvested. It seems probably that the ECA is over 15%. *Baseline condition = Functioning at Unacceptable Risk*

Riparian Conservation Areas The condition of riparian areas is not known. There is no data about the extent of riparian harvest and virtually nothing is known about fish habitat parameters. Lack of data implies a risk. *Baseline condition = Functioning at Risk*

Disturbance Regime A review of fire regime maps found that vast majority of the Upper & Lower Stillwater HUC are in areas that experienced mixed severity, frequent fires. This areas have a low risk of catastrophic fire. However, nearly all of the Fitzsimmons watershed which is where the bull trout spawn is in lethal fire regime. Historically this watershed experienced periods of fire, debris flows and scour events. It is probable that the harvest activity by Stillwater State Forest has reduced some fuel loading but this area is still prone to lethal fires. Taken as a whole, Fitzsimmons watershed is only a part of the whole watershed so the majority would not experience a catastrophic event at any one time. *Baseline condition = Functioning at Risk*

Integration of Species and Habitat Conditions The bull trout population of Upper Stillwater system is tenuous and disjunct. Population data suggests that the bull trout population is small but a migratory life form still exist. Little data is available about the quality of spawning and rearing habitat available and there is concern about degradation from land management activities. The greatest threats to this population are land management activities, lack of data, and exotic species. *Baseline condition = Functioning at Unacceptable Risk*

b. Major Watershed #2. Tally Lake

Logan Creek and Tally Lake
170102101002
170102101001

CRB Status: Depressed
CRB Predicted Status: Depressed
Population Use: Spawning & Rearing, Adult Use in Lake (Disjunct Population)

This population is considered disjunct from the Stillwater system. Logan Creek, which is the outflow from Tally Lake to the Stillwater system is a naturally warmer stream than optimal bull trout conditions. However this river was also severely impacted by turn-of-the-century log drives and at one time bull trout migration may have been more plausible. The bull trout population of Tally Lake has apparently experienced severe decline and may be extirpated, probably due to the presence of exotic species. The only known spawning habitat for this population is a 3 mile stretch of Logan Creek as it enters the lake. It is possible that bull trout may ascend above the waterfall located at mile 3 but this has never been proven. A 1937 report mentions bull trout found above the falls but this report is questionable. More recent population surveys conducted in streams above the waterfall have not detected any bull trout and therefore it is concluded that these streams do not contain bull trout.

Subpopulation Characteristics
Subpopulation Size Spawning habitat on Logan Creek is extremely limited as the upper extent of bull trout migration is believed to stop at a waterfall about 3 miles upstream of Tally Lake. This short section is characterized as having large substrate and high gradient and is naturally limited in spawning gravels. Redd count data has been collected from time to time since 1994. Seven redds were observed in 1994, none in 1995 and two in 1996 and none in 1999. No population estimates have been collected in Logan Creek. The only inventory to date was a September 1999 nighttime snorkeling effort on 100 meters but it failed to find any bull trout (only exotic rainbow trout and brook trout were observed). Net surveys in Tally Lake in 1990, 1994, and 1999 did not find any bull trout. This data leads to the conclusion that the bull trout population is very small (below detcction) and may be extirpated. *Baseline condition = Functioning at Unacceptable Risk*

Growth and Survival The Tally Lake population is considered to have experienced extreme declines in the past decade and may even been extirpated. The reason for this decline is probably the presence of exotic lake trout and northern pike in the lake which prey on juvenile bull trout. There is no indication that things will improve any time soon and the state of Montana has not identified any action to recover bull trout in this lake. *Baseline condition = Functioning at Unacceptable Risk*

Life History Diversity and Isolation Since the 1996 redd count did find a few redds, it is possible that a few migratory adults still exist (bull trout are a long lived species that can repeat spawning). The populations is considered disjunct from other populations due to the warm water

conditions in the Logan Creek outflow, although occasional migration may occur. *Baseline condition = Functioning at Risk*

Persistence and Genetic Integrity The Tally Lake population is disjunct and has little connectivity with other populations. All spawning appears to be naturally limited to just a 3 mile stretch on one stream. Competitive species such as rainbow trout, lake trout and northern pike readily displace bull trout. Exotic brook trout are present in the watershed and pose a threat to genetic integrity. The long term persistence of this population is bleak. *Baseline condition = Functioning at Unacceptable Risk*

Water Quality

Temperature Seven day average maximum temperature is not known, but STORET data can display mean temperature plus standard deviation to get an approximate average maximum temperature. The lower Logan Creek, which is a sometime migration corridor, had 40 samples from 1974-1987 and the result was 13.1 C plus a single maximum temperature at 20 C. In 1997 a continuously recording thermometer found a daily average around 22 C (eyeball estimate) and found a few maximum temperatures at 26 C. This is poor habitat for migration. Above Tally Lake, Logan Creek was sampled 52 times from 1974-1981. Findings were 11.8 C which is acceptable for rearing but not optimal for spawning. The cause of the warm water may be due to extensive Star Meadows wetlands just upstream. *Baseline condition = Functioning at Unacceptable Risk*

Sediment No coring data is available. A 1996 habitat survey of upper Logan Creek (in spawning habitat) found only 3-4% surface fines in a series of Wolman pebble count surveys. This extremely low figure is due to the high gradient of this section. While the recommendations of the Flathead Basin Committee (1991) are intended for coring data, I consider Wolman pebble count data to be roughly compatible and this stream apparently has very little fine sediment. *Baseline condition = Functioning Appropriately*

Chemical Contaminants/ Nutrients Logan Creek (the entire stream) is listed by the Department of Environmental Quality on the 303(d) list as partially impaired to coldwater fisheries. The cause of this is siltation and suspended solids. This may be from private ranch lands in Star Meadow which is upstream of the spawning area. *Baseline condition = Functioning at Risk*

Habitat Access

Physical Barriers There are no man made barriers on either the spawning channel or migration corridor. All road crossings are bridges. *Baseline condition = Functioning Appropriately*

Habitat Elements

Substrate embeddedness Embeddedness data has never been collected on Logan Creek. Embeddedness problems would be detectable if visual surveys saw high amounts of surface fines. The 1996 survey found very few fines and therefore it is assumed that this component is functioning appropriately. *Baseline condition = Functioning Appropriately*

Large Woody Debris The 1996 survey of the 3 mile of bull trout spawning habitat found an average of 67 pieces of large woody debris per mile. Data has not been collected in the stream below the lake and it is thought to have much less wood due to the large size of the stream but it is still likely to have at least 20 pieces per mile. *Baseline condition = Functioning Appropriately*

Pool Frequency and Quality The 1996 survey of the bull trout spawning habitat found an average of 33 pools per mile. This is below the recommended 48 pools per mile for a stream of this size. Aerial photograph analysis of the lower migration corridor found only 4 large pools for a 6 mile migration corridor. It is likely the overall number of pools for this river is below standard due to the historical log drives around the turn-of-the-century. *Baseline condition = Functioning at Unacceptable Risk*

Large Pools Large pools are not needed in spawning and rearing areas but they are desirable in migration corridors. Aerial photographs suggest only 4 large pools are found in the 6 mile long migration corridor, and this may be due to historical log drives. The loss of deep pools could be detrimental to a migration corridor that has warm water temperatures. Deep pools could have at one time provided thermal refuge for bull trout in this river. *Baseline condition = Functioning at Unacceptable Risk*

Off-channel habitat This condition is unknown. Due to the high gradient nature of the spawning and rearing channel, this feature may be somewhat limited. *Baseline condition = Functioning at Risk.*

Refugia The Tally Lake population is considered disjunct and does not have any opportunities for habitat refugia. Lake netting and redd counts indicate the population is not strong and found only in low numbers. *Baseline condition = Functioning at Unacceptable Risk*

Channel Condition & Dynamics

Wetted Width/Max. Depth Ratio The district hydrologist has observed that most of Logan Creek has a low to moderate width/depth ratio. Since Logan Creek has such large substrate, it is unlikely that width/depth ratio has been altered. *Baseline condition = Functioning Appropriately*

Streambank Condition Only limited data exists on streambank condition. Much of the upper Logan Creek (immediately above Tally Lake) has large boulders and is naturally very stable. However two areas of severe instability are known. One is in section 34, above Tally Lake, where the presence of a road appears to have caused a rotational slump. Secondly, there are several large unstable banks downstream of Tally Lake that may have been used in the historic log drives and have not healed yet. *Baseline condition = Functioning at Unacceptable Risk*

Floodplain Connectivity Although one road is adjacent to bull trout spawning areas, most of the roads in this watershed are not near streams and would have little risk to floodplain connectivity. *Baseline condition = Functioning Appropriately*

Flow/Hydrology

Change in Peak Flow/Base Flows A hydrograph is not available. Timber harvest has occurred at moderate levels (ECA of 12.8%) and road densities are moderately high (average of 2.1 road miles per square mile). This is predicted to have had a moderate to high potential for change in peak flows. *Baseline condition = Functioning at Risk*

Drainage Network Increase No data is available that compares historic channel lengths to present day channel lengths. The moderately high road density is likely to be increasing scour channel lengths. *Baseline condition = Functioning at Risk*

Watershed Conditions

Road Density & Location A computer generated analysis found that HUC 170102101001 (Tally Lake and downstream) had a road density of 1.4 road miles per square mile. The Logan Creek HUC 170102101002 had a road density of 2.8 road miles per square mile. The average of these two watershed is 2.1 road miles per square mile. This is not an extremely high road density, but one road (FR 913) travels the length of the only bull trout spawning area. This road may be constricting the stream and altering channel conditions, although this is not proven. *Baseline condition = Functioning at Unacceptable Risk*

Disturbance History A database of all forest service harvest activities in the Tally Lake HUC found 848 acres of "heavy" harvest intensity and 148 acres of "light" harvest intensity and no fire activity as of 1998. This equates to a ECA of 885 acres, which is 7.6% of the watershed. A significant amount of harvest has occurred on the north side of Logan Creek in the riparian area. On the Logan Creek HUC, the database showed 1393 acres of "heavy" harvest intensity and 555 acres of "light" harvest intensity and no fires. This equates to a ECA of 1532 acres which is 12.8% of the watershed. Some riparian harvest had occurred upstream of the bull trout spawning area. Therefore, while the ECA figures were relatively low the disturbance that took place in riparian areas pose a risk. *Baseline condition = Functioning at Risk*

Riparian Conservation Areas Riparian conservation areas are assumed to be in poor condition. Cattle grazing is occurring in the lower Logan Creek area. Past timber harvest has occurred on the Logan Creek riparian areas. Some fish habitat attributes, such as pool quality and water temperatures are in poor condition and this may be caused by impaired riparian functions. *Baseline condition = Functioning at Unacceptable Risk*

Disturbance Regime A review of fire regime maps found that most of the Tally Lake HUC and roughly half of the Logan Creek HUC is in a mixed severity, frequent fire regime. While some areas certainly are at risk of catastrophic fire, the majority of the watershed is not likely to experience a catastrophic fire or debris torrents. *Baseline condition = Functioning at Risk*

Integration of Species and Habitat Conditions The Tally Lake bull trout population appears to be on the verge of extirpation. The total population is thought to be very small and the species is threatened by numerous exotic species. Available spawning habitat appears to be very limited, although this is thought to be a natural condition. The population is disjunct and unlikely to be reestablished due to poor habitat in the migration corridor. The migration corridor is probably naturally limited by temperature but historical timber harvest and cattle grazing may be further impairing this habitat. *Baseline condition = Functioning at Unacceptable Risk*

c. Major Watershed #3. Upper Whitefish Lake

Upper Whitefish Lake Watershed
170102100503

CRB Status: Depressed
CRB Predicted Status: Depressed

Population Use: Adult use in Upper Whitefish Lake, Spawning & Rearing in East Fork Swift Creek

The bull trout population of Upper Whitefish Lake is probably disjunct from the rest of the Whitefish river system, but this is not certain. At the present, it is thought bull trout ascend about 2 to 4 miles from Upper Whitefish Lake to spawn in East Fork Swift Creek but it is also possible that some spawning occurs immediately downstream of the lake too. This would be an unconventional strategy (bull trout usually go upstream to spawn). In 1998 and 1999 between 15 and 18 redds were found just several hundred meters below the lake. But it is uncertain if these redds were truly bull trout redds or perhaps spring spawners (cutthroat trout are abundant in Upper Whitefish Lake). There is also the possibility that the Upper Whitefish population spawns in the West Fork Swift Creek along with bull trout from Whitefish Lake and thus are not really disjunct. Upper Whitefish Lake and most of East Fork Swift Creek are on Stillwater State Forest land but the upper 1/3 of East Fork Swift Creek watershed is on National Forest system lands.

Subpopulation Characteristics

Subpopulation Size It is challenging to characterize the population size of Upper Whitefish Lake. No gill net data or creel surveys are available for Upper Whitefish Lake. Redd count data has been collected intermittently since 1989. In 1989 four redds were found in upper East Fork Swift Creek. However in 1993, 1994, 1996, 1998 and 1999 no redds were found. In some years East Fork Swift Creek does not have continuous flow and this may naturally limit spawning habitat. Perhaps bull trout are only able to spawn once every few years. Or perhaps bull trout descend downstream to spawn just below Upper Whitefish Lake or travel to West Fork Swift Creek. Yet it is certain that the lake does have a bull trout population. Anglers do occasionally catch bull trout. Furthermore, in 1999 both the Forest Service and Montana FWP conducted population inventories in upper East Fork Swift Creek. The Forest Service snorkeled 3 different locations and observed no bull trout. Montana FWP conducted a 2 pass population estimate and estimated 15 juvenile bull trout per 150 meters. A population survey in 1989 estimated 4 juvenile bull trout per 150 meters. Therefore, it cannot be determined that the population has experienced a sharp decline but neither is it a very large population since it is so difficult study. This small population is restricted to a small spawning area, presumably disjunct and may not be able to recover from a short term disturbance. *Baseline condition = Functioning at Unacceptable Risk*

Growth and Survival There is insufficient data to determine if this population is declining, increasing or stable. But the since the total population appears to be rather small, it may be at risk of extirpation if there successive years of unfavorable conditions in East Fork Swift Creek. *Baseline condition = Functioning at Unacceptable Risk*

Life History Diversity and Isolation This population is considered disjunct from the Whitefish system but it is close to Whitefish Lake and it is possible that some recovery could occur. It is uncertain if the migratory life form is present anymore and since both the Upper Whitefish and the Whitefish population are maintained in low numbers, recovery may take a long time. *Baseline condition = Functioning at Unacceptable Risk*

Persistence and Genetic Integrity No exotic species are known to exist in this watershed and therefore genetic integrity is not threatened. However this population is maintained in low

numbers and is considered disjunct and therefore its long term persistence is doubtful. *Baseline condition = Functioning at Unacceptable Risk*

Water Quality

Temperature In 1999, 3 continuously recording thermometers were placed in East Fork Swift Creek from mid June until late September. This thermometers were placed about a mile apart yet all three found virtually identical cold water conditions. Spawning and rearing temperatures were within optimal ranges as defined by Fish and Wildlife Service (USDI Fish and Wildlife Service 1999) and within normal parameters found by Reiman and Chandler (1999). *Baseline condition = Functioning Appropriately*

Sediment No coring data is available. In 1999, 3 Wolman Pebble counts were collected in survey reaches about a mile apart (different Rosgen channel types). These found between 12 to 18% fine sediment (less than 6.4 mm) in potential spawning areas. This is well below the threshold of concern defined by the Flathead Basin Committee (1991). *Baseline condition = Functioning Appropriately*

Chemical Contaminants/ Nutrients This watershed is listed on the Department of Environmental Quality's 303(d) along with the rest of Swift Creek. I am unaware of any data to support this listing for East Fork Swift Creek but since it is on the list, it may be vulnerable to contamination. *Baseline condition = Functioning at Risk*

Habitat Access

Physical Barriers There are several areas of very low flow conditions that may cause occasional barriers to migratory bull trout but no known man made barriers. *Baseline condition = Functioning Appropriately*

Habitat Elements

Substrate embeddedness Embeddedness data has never been collected on East Fork Swift Creek. Since it is closely linked with fine sediment deposition, and since sediment is considered within optimal conditions so I assume embeddedness is also. *Baseline condition = Functioning Appropriately*

Large Woody Debris In 1999, 3 short representative reaches had fish habitat data collected. This had between 107 and 449 pieces of large woody debris per mile. This is plenty of wood and well over the minimum of 20 pieces per mile. *Baseline condition = Functioning Appropriately*

Pool Frequency and Quality The three representative survey reaches found between 18 and 76 pools per mile. Based on wetted width, two of these reaches exceed the recommended frequency (USDI Fish and Wildlife Service 1999) but the lowest stream reach falls just short of the target. Surveyors noted that the quality of the pools was only fair since the stream was at very low flow and the pools were not deep. *Baseline condition = Functioning at Risk*

Large Pools No pools found in the 1999 survey were considered deep enough for large pools. Since East Fork Swift Creek is a high elevation stream that apparently goes dry in some areas, it probably is a natural feature but this does restrict suitability for bull trout, especially for overwinter habitat. *Baseline condition = Functioning at Unacceptable Risk*

Off-channel habitat This condition is unknown. Indications are that juvenile bull trout are present in Upper Whitefish Lake watershed and it will be assumed that off-channel habitat is not limiting. *Baseline condition = Functioning Appropriately*

Refugia The condition of Upper Whitefish Lake watershed habitat connectivity is not known. It is assumed that some areas of high quality habitat exist considering the occurrence of some spawning but it appears that some areas go dry and connectivity may be limited. *Baseline condition = Functioning at Risk*

Channel Condition & Dynamics

Wetted Width/Max. Depth Ratio At each representative survey reach examined in 1999, 10 channel cross sections were collected. Wetted width/depth ratio ranged between 22 and 34.8. This is much wider and shallower than optimal habitat (USDI Fish and Wildlife Service 1999). Aerial photograph interpretation by the district hydrologist found that the stream appears to be widening and increasing bar formation. *Baseline condition = Functioning at Unacceptable Risk*

Streambank Condition Aerial photograph interpretation by the district hydrologist found a very active channel and predicts that with the extensive riparian harvest, the stream is experiencing streambank erosion. The 1999 survey estimated between 40% to 95% of the streambanks were stable (depending on the reach). *Baseline condition = Functioning at Risk*

Floodplain Connectivity Although there appears to have been riparian harvest in lower reaches, there are no roads in the valley bottom. The floodplain is assumed to be fully connected. *Baseline condition = Functioning Appropriately*

Flow/Hydrology

Change in Peak Flow/Base Flows A hydrograph is not available. The upper portion of East Fork Swift Creek is unharvested but much of the lower portion has been harvested. This may have altered flow regimes somewhat. *Baseline condition = Functioning at Risk*

Drainage Network Increase Although there are relatively few roads in this watershed, aerial photographs reveal extensive skid trails and temporary roads on Stillwater State Forest lands. These roads are highly likely to be transporting water and increasing scour channel lengths. *Baseline condition = Functioning at Unacceptable Risk*

Watershed Conditions

Road Density & Location A computer generated analysis found this watershed has an average road density of 1.87 road miles per square miles (across all ownership). This is considered more roads that providing for optimal conditions but not severely degraded. One road travels the length of the stream but is usually just outside of the riparian area. *Baseline condition = Functioning at Risk*

Disturbance History In 1998, a review of the database found that on National Forest system lands 44 acres of this watershed received "light" harvest activity while there has been no "heavy" harvest activity and no fire in the past 20 years. This equates to a ECA of 11 acres or just 0.1% of the watershed. Much of the watershed is on Stillwater State Forest and it appears that a considerable portion has been harvested. This may average out to putting the watershed at risk. *Baseline condition = Functioning at Risk*

Riparian Conservation Areas Aerial photographs of the portion of East Fork Swift Creek on Stillwater State Forest have received intensive riparian harvest. This has probably reduced riparian functions in these areas. The headwaters of the stream are thought to be in natural condition. *Baseline condition = Functioning at Risk*

Disturbance Regime A review of fire regime maps found that the entire Upper Whitefish Lake watershed is in areas that experiences lethal, stand replacing fires. This watershed naturally has a high risk of a catastrophic fire. A small 24 acre fire burned here in 1970 but majority of the watershed is ripe for another fire. *Baseline condition = Functioning at Unacceptable Risk*

Integration of Species and Habitat Conditions The bull trout population of Upper Whitefish Lake appears to be very small and could be at risk if conditions are unfavorable over a length of time in the spawning stream. The migratory life form has not been observed for several years yet juvenile bull trout have been found in 1999. The population may be able to reestablish itself since there are no exotic species in the system but it is considered disjunct from other bull trout sources. Habitat conditions do have adequate cover, cold water and substrate condition but is limited by shallow water, wide width and few large pools. Past riparian harvest probably reduced habitat quality but the stream may also be naturally limited by low flows. The threats to this population are naturally limiting flow conditions in East Fork Swift Creek, some potential for degraded habitat from land management activities, poor data and understanding of population characteristics, and a disjunct status. *Baseline condition = Functioning at Unacceptable Risk*

d. Major Watershed #4. Whitefish Lake

Whitefish Lake Watershed
170102100401 (Whitefish Lake)
170102100402 (Whitefish Lake & Lazy Creek)
170102100501 (Swift Creek)
170102100502 (West Fork Swift Creek)

CRB Status: Migration Corridor, except West Fork Swift Creek which is Depressed
CRB Predicted Status: Absent, except West Fork Swift Creek which is Depressed
Population Use: Adult use in Whitefish Lake, Migration Corridor in Swift Creek, and West Fork Swift is Spawning & Rearing

The bull trout population of Whitefish Lake is disjunct from the Flathead system. The population is considered to be in very low numbers. Bull trout appear to ascend to Swift Creek and West Fork Swift Creek for spawning and rearing habitat. An optimistic scenario is that it is possible that there is some exchange of individuals with the bull trout of Upper Whitefish Lake

and thus they are not truly disjunct. A pessimistic scenario is that all the spawning observed in West Fork Swift and Swift Creek is actually from the bull trout of Upper Whitefish Lake and the Whitefish Lake population has collapsed. Lazy Creek is not considered bull trout habitat. Whitefish Lake is mostly private land and Lazy Creek is primarily private timber land. Nearly all of Swift Creek and West Fork Swift Creek is on the Stillwater State Forest. Extremely little of these watersheds are on National Forest system lands, only the high elevation headwaters of tributary streams to Swift Creek. Due to limited ownership, the Forest Service has collected no data on these watersheds and all information used in this review is from state data.

Subpopulation Characteristics

Subpopulation Size Redd count data has been collected intermittently since 1994. For several years redd counts in mainstream Swift Creek failed to locate any redds but in 1998 4 redds were found (and none in 1999). Prior to 1996 it is understood that the West Fork Swift Creek never has more than 3 redds but exact numbers are vague. In 1998, 8 redds were observed in the West Fork Swift Creek and 9 redds observed in 1999. Assuming a simple pairing per redd, there may be about 20-50 migratory adults. Bull trout are only rarely caught by anglers in Whitefish Lake and so appear to exist in very low numbers. Results of 1999 gill nets surveys in Whitefish Lake are not available at the time of this writing. Population survey in West Fork Swift Creek in 1995 estimated 9 juvenile bull trout per 300 meters. A survey in mainstream Swift Creek in 1989 estimated 4 juveniles per 300 meters. Considering the limited amount of rearing habitat, low juvenile numbers and low migratory redds, it appears the entire populations is about 200-500 individuals. *Baseline condition = Functioning at Unacceptable Risk*

Growth and Survival There is insufficient data to determine if this population is declining rapidly since the historical levels are not know. But the total population appears to be very low and may not persist much longer. *Baseline condition = Functioning at Unacceptable Risk*

Life History Diversity and Isolation This population is considered disjunct from the Flathead system but it is close to the Upper Whitefish Lake system and it is possible that some recovery could occur. A migratory life form is present but maintained in very low numbers. *Baseline condition = Functioning at Risk*

Persistence and Genetic Integrity Exotic brook trout are found in high numbers throughout these watersheds. Brook trout pose a threat to bull trout genetic integrity but so far genetic samples collected have not found evidence of hybridization. Other exotic species such as lake trout, rainbow trout and northern pike are present and known to negatively impact bull trout. There is a limited amount of connectivity with Upper Whitefish Lake but otherwise it is disjunct from the Flathead system. *Baseline condition = Functioning at Unacceptable Risk*

Water Quality

Temperature Seven day average maximum temperature is not known due to lack of water quality data in this system. Casual observation has noted the presence of groundwater input in Swift Creek and cutthroat trout exist throughout the system. These factors imply coldwater that is probably suitable for bull trout. *Baseline condition = Functioning Appropriately*

Sediment 1990 coring data on Swift Creek found 28.4% fines. No other data is available. The Forest Plan uses 35% fines as a threshold of concern for bull trout streams so it assumed the stream offers optimal conditions. Although siltation is a concern of Department of

Environmental Quality, the only available data suggests that these streams offer optimal spawning habitat conditions. *Baseline condition = Functioning Appropriately*

Chemical Contaminants/Nutrients Swift Creek and West Fork Swift Creek are listed on the Department of Environmental Quality's 303(d) as impaired streams due to nutrient loading, siltation, flow alterations and other habitat alterations. Probably sources of this impairment are highway, roads, bridge construction and silviculture. Whitefish Lake is also listed for excess nutrients, siltation, oil and grease pollution. Although the state is preparing a monitoring plan to better determine the extent and severity of the concerns, this watershed is unusual to have so many streams and the lake listed as impaired. *Baseline condition = Functioning at Unacceptable Risk*

Habitat Access

Physical Barriers There are several areas of very low flow conditions (natural) that may cause occasional barriers to migratory bull trout but no known man made barriers. *Baseline condition = Functioning Appropriately*

Habitat Elements

Substrate embeddedness Embeddedness data has never been collected on Swift Creek but a observation by a state fisheries biologist in 1992 noted "embeddedness was high in many areas" of Swift Creek. This could reduce bull trout rearing habitat and more data would be needed to determine the extent of this. *Baseline condition = Functioning at Risk*

Large Woody Debris No data is available about the large woody debris of these watersheds but an observation by a state fisheries biologist in 1992 noted "many deep pools with large woody debris cover". Most streams in the Flathead National Forest have 50-400 pieces of large woody debris per mile and so it is highly likely that the Swift Creek has the minimum of 20 pieces per mile. *Baseline condition = Functioning Appropriately*

Pool Frequency and Quality No data is available about the pool frequency of these watersheds other than the above comment about "many deep pools". Many streams on the Flathead National Forest, even pristine streams, are barely within optimal habitat conditions. Lacking any data, it is assumed that Swift Creek system is typical of roaded/harvested systems which tend to be deficient in pool habitat. *Baseline condition = Functioning at Risk*

Large Pools No data is available other than the comment about "many deep pools". It is assumed that there are enough large pools for bull trout based on this comment. *Baseline condition = Functioning Appropriately*

Off-channel habitat This condition is unknown. Indications are that juvenile bull trout are present in Whitefish Lake watershed and it will be assumed that off-channel habitat is not limiting. *Baseline condition = Functioning Appropriately*

Refugia The condition of Whitefish Lake watershed habitat connectivity is not known. It is assumed that some areas of high quality habitat exist considering the occurrence of some spawning but it is not know how well connected all stream reaches are since portions of these streams flow through harvested state land. *Baseline condition = Functioning at Risk*

Channel Condition & Dynamics

Wetted Width/Max. Depth Ratio No data is available. Considering the moderate amount of roads in this watershed and the state's concern about habitat and flow alterations, it may be that this channel feature has been altered. *Baseline condition = Functioning at Risk*

Streambank Condition No data is available. For the same reasons as listed above, this channel feature may be altered. *Baseline condition = Functioning at Risk*

Floodplain Connectivity This condition is unknown. Some roads appear to travel the length of the streams and the state has listed a concern about highways, roads and bridges, so this may indicate some floodplain areas are disconnected. *Baseline condition = Functioning at Risk*

Flow/Hydrology

Change in Peak Flow/Base Flows No hydrograph is available. Since the state has listed Swift Creek watershed has having a concern about flow alterations and since there appears to be a high amount of disturbance, it may be that this watershed has unnatural flow regimes. *Baseline condition = Functioning at Risk*

Drainage Network Increase No data is available. Considering the high road density and high amount of disturbance, there may increase scour channel lengths in lower elevation areas. *Baseline condition = Functioning at Risk*

Watershed Conditions

Road Density & Location Much of this watershed is on Stillwater State Forest and private land and road density is very high (especially around Whitefish Lake itself). A computer generated model estimates an average road density across all ownerships at 2.26 road miles per square mile. *Baseline condition = Functioning at Unacceptable Risk*

Disturbance History Again, since the majority of these watersheds are not on National Forest system lands, a detailed analysis of disturbance history is not possible. Much of these watersheds are on Stillwater State Forest lands. The Stillwater State Forest is mandated to harvest timber to support the school system, so it is highly likely that much of the watershed has been harvested. It seems probably that the ECA is over 15%. *Baseline condition = Functioning at Unacceptable Risk*

Riparian Conservation Areas No data is available and no speculation can be made about the amount of disturbance in riparian areas. *Baseline condition = Functioning at Risk*

Disturbance Regime A review of fire regime maps found that vast majority of the Whitefish Lake and Swift Creek are in areas that experienced mixed severity, frequent fires. This areas have a low risk of catastrophic fire. However, nearly all of the West Fork Swift watershed which is where the bull trout spawn is in lethal fire regime. Historically this watershed experienced periods of fire, debris flows and scour events. It is probable that the harvest activity by Stillwater State Forest has reduced some fuel loading but this area is still prone to lethal fires. Taken as a whole, West Fork Swift watershed is only a part of the whole watershed so the majority would not experience a catastrophic event at any one time. *Baseline condition = Functioning at Risk*

Integration of Species and Habitat Conditions The bull trout population of Whitefish Lake system is poorly understood and appears to have a bleak outlook. The population still retains a migratory life form but is only found in very low numbers. Even this is uncertain, it is possible the redd counts observed are actually from Upper Whitefish Lake stock. The population is threatened by exotic species and has little chance of reestablishing itself since it is disjunct from the Flathead system although it might benefit from some exchange with Upper Whitefish Lake. Habitat data is virtually non-existent and there are concerns about the water quality and disturbance history in this watershed. The threats to this population are exotic species, cumulative effect of harvest and roads, disjunct from other populations and poor data. *Baseline condition = Functioning at Unacceptable Risk*