WATER RESOURCES

Introduction

The Logan Creek area has a wide variety of stream forms, wet meadows, and lakes. Humans have utilized water from Logan Creek and Tally Lake for many decades. The geomorphology of the landforms in the watershed is attributed to glacial scour and deposition.

At the largest scale, Logan Creek and its tributaries can be divided into three distinct segments: lower Logan Creek (between Tally Lake and the Stillwater River), middle Logan Creek (between Star Meadow and Tally Lake), and upper Logan Creek (between the headwaters and Star Meadow).

In the lowest reaches of Logan Creek the streambed is primarily boulder-sized rock. Along many sections of the stream are tall banks (greater than 20 feet in height) of fine sedimentary soils. These banks are easily eroded during high flow periods, during precipitation events, and if they are disturbed by human activities. Most of these fine sediments are flushed through the highest velocity areas and deposited in flatter streamside areas occupied by riparian vegetation. Some streamside roads have been relocated away from the active floodplains and areas scoured by the high water due to continuous slumping problems. Landtype mapping and aerial surveys indicate that these conditions occur to some extent throughout the Logan Creek drainage, but the largest sedimentary deposits are mostly located in the lowest reaches.

The lower and middle sections of Logan Creek contain few large downed trees within the active stream channel. Seasonal high stream flows in the lower section of Logan Creek are capable of carrying away the large downed trees that one would expect to find in similar stream types. Large woody material is a necessary component for forming a range of aquatic habitats that support various species and life stages. Historic photos show there was some kind of splash dam at the outlet of Tally Lake, with locals having some knowledge of log drives a century ago, but no remnants of log drives can be found at the outlet of the lake or down stream.

Channel surveys show that the middle section of Logan Creek is a swift-running stream whose bed is composed of medium-sized boulders with a small proportion of smaller-sized gravels. Most of he upper banks of the creek are composed of fine sedimentary soils. Road 913 encroaches on the stream channel and floodplain in one area for approximately 200 feet of length. The main road is in close proximity to the stream in several areas, making road maintenance difficult without risking water quality. There are also many "fishing trails" from the main road to the stream that have a potential to run water.

The stream flow in the upper section of Logan Creek is about a third that of the stream below Star Meadows because both Griffin and Sheppard Creeks flow into Logan Creek at Star Meadow. Logan Creek above this point has much less energy to move large woody debris or the finer materials that makes up more of the stream bottom (bedload) in this segment. Much of the lowest elevations of the stream have broad flood plains, with thick willows and tall sedges along the streamside areas. Stream surveys show that the uppermost elevations of most of the tributaries of Logan Creek have fine soils throughout their length in the form of wet meadows and older beaver dams. These fine-textured soils can be easily eroded when beavers abandon their structures, during intense storm events, and other natural processes. Many are also sensitive to ground-disturbing activities. In some side drainages, such as Meadow Creek, recent stream surveys have documented that gullies have carved through silt deposits that were left behind abandoned, decomposing beaver dams. These fine soils (organic silts and mineral soil fine sediments) are gradually routed downstream and settled out in the broad meadows below.

Differences Between the DEIS and FEIS

This Water Resources section in the FEIS differs from the same section in the DEIS in that analysis for the new Alternative F was included. Also, Table 3-43 displays updated information in the column entitled “Modeled Sediment”; the WATSED computer model was run using more recent information on road surfaces within sub-watersheds. Also, some sections and paragraphs within sections were rearranged to create a more logical flow of ideas. New sentences were added in various locations to better explain certain points.

Information Sources

The water resource analysis is based on a variety of surveys including channel morphology (trends of channel shape using Rosgen channel typing) and bottom particle distribution (Wolman Pebble Counts). These have been repeated several times at permanent cross-sections established in the early 1990s by trained personnel. “Stream Reach Inventory and Channel Stability Evaluations” (Pfankuch, 1978) have been conducted at many established locations, at dozens of sites since the late 1970s. Specific data on water quality are based on hundreds of samples taken from 1973 to the late 1980s, starting with the “Logan Creek Study” in 1973. This District-wide study was in response to monitoring outlined in the Clean Water Act.

A culvert survey was also conducted to determine if roads were having a visible effect on stream flows or sedimentation. These were basic surveys whose first phase included stream channel measurements above and below road crossings to determine if large volumes of water from the road were enlarging stream channels. The culvert size was also measured and photographed, and any drop-off or “shotgun” at the outlet of the pipe was measured. These preliminary measurements were used to indicate if there may be some problem with fish passage or ongoing erosion.

Road surveys were conducted in 2001 and 2002 to indicate whether segments of road might be in need of additional ditch relief culverts. These surveys also measured the total length of roadside ditch draining water directly into streams. Data from these surveys are on file at the Tally Lake Ranger District office.

Analysis Area

The watershed analysis area for the Logan Creek FEIS includes the entire watershed of Logan Creek from its headwaters downstream to where it flows into Good Creek, just short of where they flow into the Stillwater River, but *not including* the Sheppard and Griffin Creek watersheds. These latter two drainages were extensively evaluated within the past 10 years in the Sheppard-Griffin Environmental Assessment, so those two drainages are not being reevaluated in this document.

The physical attributes of Logan Creek require analysis to be conducted at a finer scale than the entire watershed. Star Meadow acts as a large buffer zone that influences the stream flows and transportation of fine-grained sediments. The valley bottom willows and other flood plain vegetation at Star Meadow trap most, if not all, sediment flowing into it and attenuates peak flows. The same situation occurs when Logan enters Tally Lake due to the large volume of the lake and its depth. For this reason, the Logan Creek "Ecosystem Analysis at the Watershed Scale" (EAWS) separated the stream into three segments: "Upper Logan," "Middle Logan," and "Lower Logan."

For this project-level FEIS, it is more applicable to look at smaller, representative tributaries of Logan Creek that could have a measurable response to management activity. These representative streams include Reid, Oettiker, Taylor, Bill, Cyclone, Meadow, "Pike," Sanko, Evers, and the Headwaters of Logan above Meadow Creek, which is a checkerboard ownership area. "Pike Creek" is an unnamed tributary to Logan Creek north of Meadow Creek that has been informally named by local people. The choice to use representative watersheds instead of the three larger segments of Logan Creek, as was done in the Logan Creek EAWS, is supported by long term monitoring at this scale and recent project analyses.

Affected Environment

The primary source of water to Logan Creek and its tributaries is precipitation in the form of snowfall. Spring runoff occurs from late April to late May. Runoff in streams at this elevation is somewhat bimodal, with the earliest peak typically less than the second peak. Rains and warmer nighttime temperatures of late April and May augment the second rise of stream flow. Precipitation ranges from about 20 inches at lower elevations near Logan Creek's confluence with the Stillwater River to about 30 inches on the ridge tops. Although rainstorms are often intense, they are normally brief. The only expected flooding in low-lying areas like Star Meadow occurs during snowmelt.

The Logan Creek watershed above Star Meadow is approximately 26,660 acres. Only the largest tributary streams in this area will be analyzed individually. Sub-watersheds of the entire Logan Creek area range in size from approximately 8439 acres for Evers Creek, to as small as 2930 and 3212 acres for Reid and Sanko Creeks, respectively.

Stream densities for the analysis area are typically around 1.7 miles of stream per square mile, with Evers Creek having the highest stream density of 2.0 miles per square mile. Intermittent streams shown on USGS maps are occasionally nonexistent, especially in the upper basin.

These estimated stream densities will be most valuable when comparing how current roads may be increasing runoff efficiency and the ability of streams to carry sediment. Stream densities can also be used to help explain changes in channel stability (Pfankuch surveys) or channel forms (Rosgen channel types).

There are several areas of riparian or wet habitat throughout the Logan Creek area that were formed by historic glacial activity. Glaciation in the upper Stillwater River basin in general left numerous hummocky deposits of rocks and soils of various sizes with depressions interspersed, many of which contain water all year. Finer soil particles deposited by the glaciers and in-channel erosion have promoted the formation of ponds, wetlands, and riparian areas in topographic depressions. There are several small ponds and lakes in the Logan Creek area. Tally Lake is the most prominent lake in the system, covering approximately 1300 acres and 492 feet deep at its deepest point. The inlet and outlet are presently on the north end of Tally Lake, but remnant landforms suggest it is likely water used to drain out the opposite end of the inlet during some period in the past, in what is now the Lost Creek drainage. Ground water is very near or at the surface for much of the year in low-lying areas (such as Star Meadow). See the Riparian Wildlife section in this chapter for further information on habitat descriptions and uses of wetland and riparian areas.

Water Quality

The Administrative Rules of Montana classify all waters in this area to be B-1, meaning the waters should be suitable for drinking, culinary, and food preparation after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fish and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. There are many registered water rights for "Consumptive Use" (households and stock watering) in the lower portions of the Logan Creek area. The primary "Nonconsumptive Use" of stream water in the analysis area is for the propagation of cold-water fisheries and habitat for other aquatic life forms.

Monitoring of sediment, water temperature, and many other variables has taken place at different times and locations across the Forest. As mentioned in the Information Sources section above, water quality monitoring began on the Forest in about 1973 with the "The Logan Creek Study." This study lasted approximately four years, but other sampling continued in this area until the 1980s. Long-term monitoring continued until 2002 in the neighboring Hand Creek drainage, west of Logan Creek. These data are currently being analyzed by the Flathead Lake Biological Station for trends and interpretations of measurable effects of fire and forest management activities as part of the Flathead Basin Commission Biannual Report.

The following is a summary of historic water quality data collected in the Logan Creek area since 1973. Although most of these data are about 20 years old, values are representative of the streams' primary characteristics. These parameters rarely change through time unless there is some major climatic or geologic change. These data are archived in the Environmental Protection Agency (EPA) STORET database, and summarized in Exhibit G-3, with the original field data forms stored at the Flathead National Forest Supervisor's Office.

Table 3-41. Representative Water Quality Data in Watersheds within the Logan Creek Drainage

Stream Name	Maximum Discharge (cubic feet/sec)	Maximum Turbidity (Formazin Turbidity Units)	Maximum Sediment (mg/l)	Maximum Water Temperature
Lower Logan	1500	8.5	38	68° F
Middle Logan	194	8.5	22	74° F
Upper Logan	60	3.2	17	60° F
Upper Cyclone	3	6.2	33	58° F
Lower Cyclone	16	21.0	81	53° F

In general, the water quality in the Logan Creek area is good. The pH is around 7.0, meaning the water is naturally neutral rather than acidic or alkaline. The dissolved oxygen was at or near saturation for most sites. Both of these conditions indicate the streams in the Logan Creek area should provide good conditions for fish and other aquatic life.

Sediment is normally low with the exception of extreme high flow periods such as were experienced in the spring of 1997 and in the upper basins in 1998. Surveys in 2001 and 2002 found the primary anthropogenic sources of sediment are the road system and a small mass failure of fine soil along the lower portion of Logan Creek (Project File G-9). Natural sources of large quantities of sediment have been identified when historic beaver dams have failed, allowing the deposited fine sediment to easily erode with stream flow. Sediment will be discussed in further detail under the Stream Channel Morphology discussion below.

Turbidity values are high throughout the Logan Creek drainage and most neighboring streams flowing from the Tally Lake Ranger District. The naturally high level of tannin is responsible for turning the waters a reddish-brown color and cause turbidity measurements in Logan Creek to be higher than streams in most other areas of the Forest. This coloration of the water is undoubtedly a contributing factor to the high stream temperatures.

Nineteen miles of the main stem of Logan Creek above Tally Lake were listed as impaired by siltation on the Montana State 303(d) list in 1996. The information that led to the initial listing is uncertain, and the stream was officially removed from the 2000 list because of a lack of "sufficient credible data" to support the finding of impairment. Due to a court decision, the Environmental Protection Agency (EPA) and Montana Department of Environmental Quality (DEQ) are required to address water quality issues for all waters on the 1996 list, either through development of a Total Maximum Daily Load (TMDL) plan or by demonstrating with "sufficient credible data" that the stream is not impaired.

In an effort to clarify the question as to whether Logan Creek is fully supporting the designated beneficial uses, District employees along with researchers from the Montana DEQ gathered and are analyzing information dealing with stream channel integrity, fish habitat quality, and the health of aquatic populations including fish, invertebrates, and aquatic plants. Preliminary analysis of this information indicates that the aquatic ecosystem in Logan Creek is healthy (Exhibits F-11 and F12). The results of these surveys are discussed further in the Fisheries section found later in this chapter.

Nutrients

Nitrogen, phosphorus, and carbon in various forms are the nutrients of highest concern to water quality and aquatic life. Local research has found only small amounts of biologically available nutrients are added to streams from increases in sediment because the nutrients are well attached to soil particles (Stanford, et al. in numerous Flathead Lake studies (See Exhibit G-2, "Monitoring Water Quality in Flathead Lake – 1992 Progress Report, Open File Report #128-92)). Water quality monitoring in nearby Hand Creek and other locations across the Forest has indicated the natural nutrient levels found in undisturbed streams in the Flathead Basin are well within acceptable levels for fish and other aquatic life (Complete data set archived in the EPA STORET system, and a summary sheet is found in Exhibit G-3). These levels are somewhat predictable because they are associated with the underlying geology and bedrock. However, short-term but substantial increases in nutrients have been measured in streams during and directly after large wildland fire events. These changes are typically short-term; nutrient levels are highest during the fire when smoke and ash fill the air. They are also high during the first year's snow melt then gradually decrease within the following three to five years. Weather conditions (wind speed, direction, and atmospheric pressure) influence how much smoke-borne nutrient lands in the immediate watershed and how much is transported and dispersed to neighboring areas.

Research in nearby Big Creek (The Big Creek Synoptic Study on file at the Flathead Lake Biological Station) and the Swan Valley (also a Biological Station study conducted for TMDL development) were unable to relate levels of harvest or roads to changes in nutrients. This is due in part to the great influence of groundwater inputs and vegetation decomposing in wetlands and other streamside areas. As previously mentioned, some increases would be expected from those nutrients attached to sediment (Stanford, et. al. 1992, Project file G-2) during spring peak flows. Research in areas with different geologies has found varying results.

Water Yield

The R1WATSED model (hereafter referred to as WATSED, Exhibit G-13) was used to estimate the current water yield levels. Models are used to simplify extremely complex physical systems and give repeatable predictions of potential affects from further management. In the case of the Flathead River Basin, and the Tally Lake area in particular, historic water quality data were used to help develop the sediment coefficients and calibrate annual water yields. Even so, it should be remembered that the water and sediment yields predicted by WATSED are intended to be an estimate. The modeled values do give a good basis for comparison and finding areas that may be most sensitive to further change. Information derived from a model is most useful to evaluate existing conditions in combination with watershed characteristics, field data, field experience of the analyst, and best professional judgment. WATSED water yield and peak flow figures reflect increases originating from changes in forest canopy, including transportation systems, compared to unmanaged drainages. The following table gives predicted conditions from WATSED, as well as area and harvest information, for the representative drainages of Logan Creek.

Table 3-42. Predicted Water Yields in Representative Streams of the Logan Creek Analysis Area.

Sub-watershed	% Increase in Water Yield, 2002	% Increase in Peak Flow	Area Acres	Total ECA 2002**	Total Acres Harvested 2002
Bill	9	10	2362	336 (14%)	1037 (44%)
Cyclone	11	11	2713	426 (16%)	1513 (56%)
Evers	5	5	8439	954 (11%)	4653 (55%)
Meadow	8	9	1767	214 (13%)	574 (32%)
Pike	10	10	1926	272 (14%)	671 (35%)
Oettiker	6	6	3165	263 (8%)	728 (23%)
Reid	7	7	2931	308 (11%)	1136 (39%)
Sanko	5	5	3212	203 (6%)	963 (30%)
Taylor	7	7	3259	348 (11%)	1301 (40%)
East Sanko	2	2	1096	40 (4%)	305 (28%)
Logan Headwaters	9	9	4047	450 (11%)	1259 (31%)

*These data have been updated to reflect current conditions as of February 2002. The watershed acres, harvesting, or road miles have been retrieved from the Flathead Forest GIS databases.
ECA represents Equivalent Clearcut Acres, which **is less than total acres harvested: Total harvested acres represent the entire management unit receiving treatment. ECA considers how much of the canopy is actually removed by partial harvest, commercially thinned, or clearcut. ECA also figures some clearing related to road building and regrowth of areas previously harvested.

Modeled current water yield and peak flow estimates derived from a consideration of land use history may be useful for predicting a stream's current condition as well as its ability to accommodate additional water yield increases. "Channel Stability Surveys," originated by Pfankuch in the 1970s (documentation found in Exhibit G-10), put the water yield predictions in perspective, as they help track and document channel changes over time, particularly when repeated in the same stream segment or reach. Rock and gravel size of the stream bank, potential recruitment of large woody debris, and stream bottom armoring can also be used to predict changes in channel condition and morphology caused by variability in water yields and peak flows. These habitat features are assessed during stream surveys such as the R1/R4 stream inventory and the Rosgen stream classification survey. Many of these surveys were conducted in the Logan Creek area in the late 1970s and repeated in the early 1990s, and in either 1999 or 2001. The stream surveys, in addition to the WATSED output, have been used to analyze the no-action alternative and help create Alternative E, the "Water Resources" Alternative.

Although water yields in the Logan Creek watersheds and sub-basins are currently below levels that have been identified as having the potential to change channel stability on the Flathead, WATSED modeling indicates that some streams have experienced higher levels within the last 15 years. As a result, caution was used when proposing management activities in catchments having recently experienced higher water yield levels. Streams in the Logan Creek area where the model indicates there have been higher water yields in the past decade are Reid, Bill, Cyclone, and Pike. Additionally, Channel Stability Surveys indicate that while most stream sections in these tributaries have "good" stream bank stability, there are a few streams segments that have a "fair" rating (see Exhibit G-4). Accelerated erosion occurring on some stream segments can be from natural climatic events, such as the extended high run-off of the 1997 snow pack. It can also be exacerbated by undersized culverts at road crossings or long sections of road without sufficient drainage.

Permanent cross-section surveys were established on several reaches of the mainstem of Logan Creek and major tributaries in the early 1990s. These surveys were repeated approximately ten years later. These cross-sections and Wolman pebble counts indicate a measurable difference in stream bottom particle size above and below Tally Lake, and in the upper reaches above Star Meadow (Project file G-1). As stated in the Analysis Area section above, this confirms the influence of Star Meadow and Tally Lake on water quality and flow rates, and adds weight to the decision to use representative tributaries to analyze proposed forest management.

Sediment Yield

Many factors control the timing, rate, volume, and delivery of sediment to streams and water bodies, including sediment from in-channel erosion. Some of these variables include natural activities, such as beaver activity, hill-slope steepness, the size of soil particles and their sensitivity to disturbance, basin size, precipitation patterns, and forest management, including road construction.

Land management activities such as urbanization, road construction, or associated projects (i.e., land clearing and timber harvest), can accelerate sediment production above what would be expected to occur with natural disturbance patterns. Some segments of streams in the Logan Creek area flow through sensitive landtypes that are prone to erosion and sediment transport. Roads built near streams on sensitive landtypes have a high risk of contributing sediment to streams and causing channel changes where stream crossings, either culverts or bridges, are not of sufficient size to handle periodic floods.

WATSED was used to calculate the miles of road per sub-watershed using data attained from the Forest's GIS road layer. These results will also be used for alternative comparisons of road improvements on designated haul routes and road reclamation for some alternatives. Table 3-43 presents the total miles of road, road density, and trail density within selected sub-watersheds in the Logan Creek area. It also presents the WATSED-modeled increases in current sediment yields above what would be expected if no management activities had previously occurred in these watersheds.

Table 3-43. Current Total Roads, Road Density, and Trail Density from Forest GIS Coverage and WATSED- Predicted Sediment Yields in Selected Sub-Watersheds of Logan Creek.

Logan Creek Sub-watershed	Total Road Miles	Road Density (mile/mile^2)	Trail Density (mile/mile^2)	Modeled Sediment (% increase over unmanaged condition)
Bill	15.1	4.1	1.3	515
Cyclone	23.6	5.1	0.1	432
Evers	35.4	2.7	0.1	169
Meadow	10.7	3.8	0.9	314
Pike	11.7	3.6	0.1	463
Oettiker	13.7	2.8	0.4	223
Reid	16.3	3.6	1.0	329
Sanko	9.5	1.9	0.4	255
Taylor	17.9	3.6	0.3	119
Logan Headwaters	31.2	4.9	0.3	687

Table 3-43 indicates that road densities for selected sub-watersheds of Logan Creek are relatively high. Guidelines for whether this is a concern for watershed health in the Northwestern United States was originally recommended in the INFISH guidelines and again in the Upper Columbia Basin analysis. The original effort at adopting some of these values was accomplished in the Inland West Watershed Reconnaissance (Exhibit G-11), in which four regions of the Forest Service reviewed watershed health and utilized three sources of information in their analysis to determine geomorphic integrity. They were:

Road density: Low intensity = 0.7 miles/square mile or less
Moderate intensity = 0.8 - 1.7 miles/square mile
High intensity = greater than 1.7 miles/square mile

Trail density: Low intensity = 1.4 miles/square mile or less
Moderate intensity = 1.5 - 3.4 miles/square mile
High intensity = greater than 3.4 miles/square mile

Total Harvest: Low intensity = less than 10% of watershed
Moderate intensity = 10% to 25% of watershed
High intensity = greater than 25% of watershed

Use of these indicators in comparison to the existing levels listed in Tables 3-42 (total harvest) and 3-43 (road and trail density), suggest that the current condition of all sub-watersheds used to analyze the Logan Creek area may have lost some geomorphic integrity due to past harvest activities and road building activities. These guides also suggest that the construction and use of trails in these watersheds has not contributed to any loss of geomorphic integrity.

Table 3-43 presents the modeled current stream sediment increases in selected sub-watersheds of Logan Creek over what is expected if no management had occurred. The percentages may be used to highlight the sub-watersheds that may be most at risk from future management activities and therefore warrant the most careful consideration when proposing ground-disturbing activities. The Headwaters of Logan Creek is the sub-watershed with the highest modeled sediment yield increase. However, this project proposes no management activities within the Logan headwaters, in part because past activity has occurred there on national forest land and, most recently, on Plum Creek Timber Company land. The four sub-watersheds with the highest modeled sediment yield increases in which management activities *are* proposed are Bill, Pike, Cyclone, and Reid Creeks. The results of computer modeling coupled with analysis of past management suggests that care must be taken in planning additional activities within the Bill, Pike, Cyclone, and Reid Creek sub-drainages.

Stream and road surveys were conducted in the fall of 2001 and summer of 2002 to help validate these assumptions, and to indicate whether culverts in the sub-watersheds were capable of carrying current flow as well as runoff during 50 or 100 year flood events. Surveys found that some culverts are not in alignment with the stream channel so crosscurrents have eroded the channel at several road crossings. Surveys also found several segments of road in need of additional ditch relief culverts. These smaller ditch relief culverts prevent large amounts of water from flowing into a stream. This can be detrimental to water quality and as mentioned earlier can alter the stream flow regime and decrease channel stability.

Many of these crossing have been redesigned so they comply with current standards outlined in Montana Best Management Practices guidelines.

The road surveys did indicate a few locations where water from spring runoff may be capable of traveling hundreds of feet down the roadside before being routed under the road. In effect, the lack of appropriate road drainage is adding an additional 4.7 miles to the stream density in the Logan Creek area, and road ditches may be adding approximately 2.7 additional miles. Added stream miles means more water running off the hillsides, and running off more quickly than in areas with lower drainage densities. This information helped recognize that adding ditch relief culverts to existing roads could improve stream stability and reduce sediment.

Stream Channel Morphology

Stream channel morphology and valley form in the Logan Creek area represents the entire range of variability, from narrow "V" shaped valleys with bedrock waterfalls, to broad slow meandering streams in unconfined valleys in Star and Round Meadows. Each valley form and stream shape represents a different sediment transport and deposition process. A computer model, developed cooperatively between the Kootenai and Flathead National Forests and used in conjunction with the Forest GIS stream layers, was used to predict the miles of different stream classifications within the analysis area (see map G-7 in the project file).

The proportion of stream types in Logan Creek above Star Meadow is representative of most streams in the analysis area. For this area the model calculated 42 miles of "A-type" streams, 16.5 miles of "B-type" streams, 15.5 miles of "C-type" streams, and approximately 1.5 miles of "E-type." Classifications are based on those described in "Applied River Morphology" by Dave Rosgen (1994) and are as follows:

Rosgen **A-type**: These steep streams range in gradient from four to ten percent. They commonly occupy narrow "V" shaped valleys, and are characterized by straight (non-sinuous) cascading reaches, with frequently spaced pools. Streams flowing through bedrock and boulders are very stable and have low sensitivity to increases in water yields, peak flows, or sediment caused by anthropogenic disturbances. This type of stream becomes increasingly sensitive to changes in flows when it passes through finer soil particles.

Rosgen **B-type:** These moderately steep streams range in gradient from two to four percent. They usually occupy narrow valleys with gently sloping sides. This type is characterized by riffles interspersed with frequently spaced pools. This type of stream is usually very stable, although streams flowing through finer particle soils can be moderately sensitive to channel erosion from increased peak flows.

Rosgen **C-type:** These streams are low gradient systems with moderate to high sinuosity. They occupy broad valleys with wide flood plains bordered by abandoned terraces of alluvial soils (rounded rocks and sand). Well-defined meanders, point bars, and alternating riffle/pool sequences characterize this type of stream. Most C-type streams have moderate to very high sensitivity to increases in stream flow or changes in sediment loads.

Rosgen **D-type:** The model used to predict the stream type distribution is not able to predict the presence of D-type channels. These braided channels are wide with gravel bars splitting the stream flow into many channels. Stream banks of this type are usually unstable. They are highly susceptible to increases in stream flow, but are relatively rare in the Logan Creek area.

Rosgen **E-type:** These are slow moving streams with very low gradient. They are very efficient in transporting water and fine suspended sediment. They form in broad valley bottoms, often through meadows. They are highly sinuous with stable banks when they are well vegetated. Because these streams are highly efficient at transporting water and sediment, they are only moderately sensitive to increases in stream flow or sediment loads if riparian vegetation cover is adequate. They can become unstable if vegetation is grazed or trampled.

REGULATORY FRAMEWORK

Water resources management in the Logan Creek area is regulated by the Clean Water Act, the Environmental Protection Agency's Antidegradation Policy, Montana Water Quality Standards, and the Streamside Management Zone Act. These are described in detail in Appendix D along with other appropriate water quality regulatory citations.

Environmental Consequences

During public comment periods, several concerns were raised involving water quality, water yield changes, and increases in suspended sediment, and these parameters will be addressed for all alternatives. All action alternatives would harvest timber in several drainages where channel conditions suggest the streams may be reacting to increases in water yield and peak flows. WATSED computer modeling and results of the watershed evaluation techniques described in the Affected Environment section suggest water yield increases related to the action alternatives could be of concern to fisheries or channel conditions in Reid, Pike, Bill, and Cyclone Creek drainages. Therefore, this Environmental Consequences section focuses on effects of the alternatives on the Reid, Pike, Bill, and Cyclone drainages. Areas of concern to these four watersheds include changes in sediment delivery to streams where ground-based logging equipment is used on steep slopes and in harvest areas near streams unless sufficient buffer zones are provided. Roads can also change runoff patterns where ditches intercept ground water and storm runoff, or where a low number of ditch relief pipes allow water to be concentrated in the ditch traveling hundreds of feet down slope. Where water is concentrated to the point it causes additional pathways to streams, decreased channel stability, increased channel erosion, and deterioration of fish habitat can be expected.

Direct, Indirect, and Cumulative Effects of the No-Action Alternative (Alternative A)

The No-Action Alternative provides a baseline to evaluate the effects of the action alternatives. The effects on water quality and water yield are discussed in terms of how they would change over time in the 10 major tributaries of Logan Creek.

With the No-Action Alternative, no forest management would occur on National Forest System lands in the Logan Creek area at this time. High levels of accumulated fuels would continue to pose a threat of wildland fire to national forest lands within the watershed and to human developments and private lands adjacent to the area. The size and intensity of the fire that could result from these fuel buildups is difficult to predict due to the irregular pattern of forest structure across the landscape (see the previous sections on Vegetation and Fire and Fuels). Changes in water yield and water quality vary depending on the size and intensity of the fires.

High-intensity fires are more probable where dead fuels have accumulated, such as the stands experiencing Douglas-fir bark beetle mortality. Concentrations of dead fuels or dead fuels mixed with green trees can cause torching of individual trees and groups of trees, resulting in a rapidly spreading intense fire. These may occur as narrow stringers up mountain slopes or involve much larger areas. High intensity fires in dry site, closed canopy stands are apt to remove most of the duff layer, expose mineral soil, and cause high mortality to standing live trees. These high intensity fires are most likely to have measurable effects on water quality.

The direct effects to the water resource of large fire events would be a short-term increase in nutrients, and depending on the size and intensity of the fire, an increase in water yield. The risk of increased sediment to the stream would depend on the intensity and location of the fires. Where large fuel buildups have occurred and all the duff is removed during a fire, the chance that intense rainstorms and accelerated snow melt could cause surface erosion and lead to "gully washers" increases. In extreme cases, the soil can become hydrophobic allowing for large amounts of overland flow that would increase the amount of water flowing directly into streams, possibly leading to increased stream channel erosion. Intense fires may also lead to extended revegetation periods because most of the small plant roots and seeds are consumed by the fire or killed by heat.

If no fire occurs, water yields, peak flows, and sediment increases caused by past harvest activities would slowly diminish over time. With or without a fire, elevated levels of sediment would continue to be produced by existing road systems and skid trails. Without sale area improvement funds from the sale of timber, it is unlikely roads would be brought up to current Best Management Practices (BMP) standards, so they would continue to route surface water to streams as long as they exist (National Council of the Paper Industry for Air and Stream Improvement, Inc. 1994).

Direct and Indirect Effects of the Action Alternatives

The direct and indirect effects of the action alternatives on water resources will be discussed in terms of their potential to affect water quality, nutrients, water yield, and to deliver suspended sediments to streams.

These predictions of potential effects to streams are based on some key assumptions:

1) Timing of the proposed harvest is critical in avoiding impacts to the soil and water resources. Timber harvest and log haul would occur either when soils are dry enough to prevent major rutting or soil displacement, or during the winter when the ground is frozen or sufficient snow is present.

2) All Best Management Practices (BMPs) and associated Soil and Water Conservation Practices (SWCPs) designed to control surface drainage from roads would be in place before the start of the timber harvest activities and would function throughout the life of the sale. All road drainage features must be fully functional before activities are shut down for the season and especially before spring runoff. See Appendix C for a complete discussion of BMPs and SWCPs.

3) Culverts would be flagged before winter snows so they can be found and cleared of debris in the spring to keep them functioning. This would greatly reduce the risk of them "blowing out" and would also help logging equipment avoid crushing the inlet or outlet of culverts. Marking culverts before roads are bladed is also critical to prevent side-casting road material into streams.

4) All wet areas within the active sale areas would be clearly marked with flagging so equipment operators can avoid them during winter logging or wet conditions. Even winter logging can compact and damage wet areas if the ground is not frozen or snow depths are insufficient to protect the soil.

All the action alternatives (Alternatives B, C, D, E, and F) involve some common features to protect water resources that would be implemented no matter which of them might be chosen. The effects of these features common to all action alternatives will be discussed in the following sections.

Effects of Features Common to All Action Alternatives

Road Management. The Best Management Practices would improve roads used to haul harvested timber by including the following:

- additional road ditch relief culverts to reduce the amount of water in roadside ditches that flows directly into streams.
- drive-through drain dips in the road matrix to reduce the water that drains from road surfaces into streams.
- additional dips as needed along the length of the roads to reduce erosion from road surfaces caused by flowing water.

- slash filter wind-rows, seeding, and fertilizer to reduce short-term sediment increases at stream crossings on newly constructed roads and soils disturbed by additional road drainage features.

When properly applied, these design criteria reduce the sediment generated by roads and delivered to streams by approximately 80 percent (Exhibit G-5). Monitoring results from other completed projects in neighboring areas show that BMPs are over 90 percent effective at protecting beneficial uses when properly applied (Exhibit G-5).

The two most proactive measures to reduce sediment, and thereby improve water quality, are:

- reducing the miles of roads that can contribute water and sediment to streams by installing cross-drain culverts and drain dips on the road surfaces and;
- Road decommissioning with culvert removals and armoring in active stream channels.

Placement of ditch relief pipes and drain dips should allow stream routing along road surfaces from either direction for no more than 100 feet of road surface. For a "ball park" estimate of improvements related to BMPs, each road/stream intersection in each sub-watershed was counted and multiplied by 200. This allowed a calculation of the total length of road likely to deliver ditch flow directly into streams following implementation of road BMPs.

The estimated lengths of ditch found to be contributing flow directly to streams in the 2002 road/stream survey can be seen in the table below for Alternative A and Alternative B:

Table 3-44. Approximate distance drained by roadside ditches and road surfaces for No-Action and Alternative B with proper installation of BMPs (Exhibit G-12).

Watershed Name	Measured length of road currently draining to stream (Alternative A)	Estimated length of road draining to stream with implementation of BMPs for the Proposed Action
1 – Bill Cr.	3925'	1245'
2 – Cyclone Cr.	2400'	590'
3 – Evers Cr.	3950'	1380'
4 – Meadow Cr.	850'	280'
5 – Oettiker Cr.	4050'	1135'
6 – Pike Cr.	5250'	1315'
7 – Reid Cr.	7125'	1345'
8 – Sanko Cr.	4650'	1095'
9 – Taylor Cr.	3834'	1949'
10 – Upper Logan	None estimated	None estimated

In all action alternatives, culverts related to fish passage problems would be upgraded to the size and installation needed to accommodate a 100-year flood as directed by current INFISH standards. In some cases larger drainage structures would replace undersized culverts, but the design may include measures intended to temporarily prevent fish passage (please review the effects analysis in the Fisheries section for further discussion). The number of culverts to be replaced for each alternative depends on the miles of haul route roads brought up to BMP standards and those culverts identified as needing improvement for fisheries management.

Culvert installation or replacement causes short-term, relatively small increases in sediment delivery to streams, even with all available tools and erosion control measures. Even though short-term increases cannot be completely avoided, the additional road drainage would lead to long-term improvements to water quality, channel stability, and hillside hydrologic function.

Trail Construction. All action alternatives propose approximately 2000 feet of new trail construction. This trail would be on the south-facing hillside on the north end of Tally Lake and would not likely contribute sediment to the lake or change hillside hydrology.

Placement of Large Woody Debris. Some areas have had timber harvest along the stream banks in the past and woody debris is less that what would be desired for fish habitat. This lack of large wood in the stream may also be contributing to channel stability problems (see the Fisheries analysis for placement details). Large woody debris placed in the active stream channels on approximately 3.7 miles of stream would enhance aquatic habitat. Placement of woody debris within the stream channel should not have any direct or indirect negative effects to water quality or channel morphology. Channel stability should improve at localized stream segments in response to the addition of wood.

Pool Habitat Construction. Approximately five sites in lower Logan Creek would have pools constructed in the main stream channel to replace pool habitat that log drives in the early part of the 1900s may have destroyed. These sites would be monitored on an annual basis for design effectiveness and related changes to aquatic species, and adjusted as needed.

Effects of Components of Specific Alternatives

Vegetation Management. Alternative B proposes the most vegetation management of the action alternatives. In this alternative, approximately 7455 acres would have some type of stand treatment within the Logan Creek drainage. Approximately 828 of those acres would reduce the existing fuels without timber harvest, including brush slashing and prescribed fires. As displayed in Tables 3-56 and 3-56a, this would in turn generate the highest potential for increased water yields and peak flows.

In addition to commercial harvest, Alternatives B, C, and E propose approximately 3783 acres of pre-commercial thinning on upland habitats, while Alternatives D and F propose 310 acres. Thinning in general removes less than 40 percent of the total canopy, equivalent to less than 25 percent of clearcut acres. Because the thinning acres are distributed throughout the Logan Creek drainage and the associated amount of disturbance is so small, there would be no measurable effects on water quantity. All thinning activities would be accomplished with hand equipment, so there would be no direct or indirect effects to sediment delivery to streams or other elements of water quality. Thinning has a positive effect on forest health, and when accomplished before the forest stand has stagnated, it usually initiates a release of growth to the remaining forest, accelerating water yield recovery.

In the Preferred Alternative F, the proposed vegetation treatments total about 6600 acres, with about 5520 acres of some type of commercial timber harvest and, as already stated, about 310 acres of pre-commercial thinning. Harvest was limited to stands with predominantly dead trees, or trees at a very high risk of mortality due to insects and diseases in the four water-sheds of most concern; i.e., Reid, Bill, Cyclone and Pike Creeks. The selected treatments in

Alternative F would promote healthy stand conditions, and thereby watershed health, by focusing on replacing dead and dying trees with vigorously growing trees that in turn would reduce the time of increased flows and increase risk of in-channel erosion.

Road Management (Construction and Reclamation). Access to the proposed harvest areas in Alternative B would require nearly 10 miles of system or temporary road construction, while Alternative C would need approximately 6 miles, Alternative D would need about 7 miles, Alternative F would need about 8 miles, and Alternative E would construct about 10 miles of either system or temporary roads. Alternative E would construct the most miles of road because it proposes to relocate a segment of road that is currently infringing on the floodplain of Reid Creek.

In Alternative B, approximately 141 miles of roads, proposed to be used as haul routes, would have drainage features added to their current design to reduce the amount of sediment and total water runoff routed to streams. These measures would improve water quality and aquatic habitat over the current condition and bring the haul routes up to current Montana BMP standards. The amount of road improvements would be relative to the amount and location of proposed harvest for the other alternatives and can be readily compared in the Table 2-1.

Alternative B, C, and D would reclaim approximately 16 miles of existing roads. Landslides, erosion, or deteriorating conditions on many of the roads proposed for reclamation have already effectively closed these roads to motorized travel. Others have been blocked by earthen berms, are closed year-round by gates, or have been overgrown with brush for years.

Some of the road segments designated for reclamation in Alternatives E and F are different than the other action alternatives (see alternative maps for specific roads.) Alternatives E and F would reclaim approximately 16.6 miles of road, with the focus on roads located in sensitive areas, such as those adjacent to streams. Some segments were identified as erosion sources during the stream/road surveys conducted in 2001 and 2002. See map and spread-sheet in Exhibit G-6 for more information.

Because Alternative B proposes more forest management activity than Alternatives C, D, E, and F, the number of miles of roads brought up to BMP standards for Alternative B would be proportionately greater because more miles of road would be used as haul routes for harvested trees.

Predicted Water Yields and Peak Flows. The WATSED computer model was used the determine differences in water yield and peak flows for all alternatives. Only the potential effect of vegetation change was used from the output of WATSED because we were able to take the time to measure the estimated reduction of miles of road surface and roadside ditches contributing sediment to stream in the road/stream survey of 2002. WATSED did estimate that implementation of any of the action alternatives would increase water yield and peak flows to some extent, but of all the action alternatives, Alternatives E and F would increase water yields the least.

WATSED is a mathematical model that uses a “baseline" condition to compare “natural” conditions to the existing condition (including a variety of management activities) and then allows input of potential changes resulting from each of the proposed activities. For the baseline condition each watershed is broken down into landtypes and habitat types, but generally the model is programmed to assume a fully forested or closed canopy condition within the watershed. However, this condition rarely represents the actual historic conditions in a watershed, especially this part of the Stillwater basin. Frequent low-intensity fires kept many of the drier sites open and occasionally stand replacement fires occurred in some Douglas-fir and larch stands allowing snow to accumulate in the openings. Other areas, such as rock outcrops in the upper basins, would never support a mature tree due to shallow soils.

The WATSED model includes clearing of forest for road construction, which varies by the width of driving surface. The person who runs the model inputs the projected date of road construction to reflect that any road associated with forest management occurs a year before harvest activities; this is the standard procedure for most timber sales. It is likely that road construction would actually take place over a five or ten-year period, preceding timber activities, but these small differences do not affect the output to any great extent.

Though the model predictions help compare potential change to the runoff regime in the tributaries of concern in the Logan Creek drainage, no total water yield or peak flow was estimated due to reasons previously discussed (e.g., the addition of Griffin and Sheppard Creeks and the inability to calculate the effects to Logan Creek from Tally Lake) and the limitations of modeling watersheds of this size.

Predicted water yields and peak flows for the tributaries of concern in Logan Creek are displayed in the following tables.

Table 3-45. WATSED Modeled Annual Water Yield Increases.*

	Alt. A		**Alt. B**		**Alt. C**		**Alt. D**		**Alt. E**		**Alt. F**	
Watershed Name	Year 2003	No change	Year 2003	After Project	Year 2003	After Project	Year 2003	After Project	Year 2003	After Project	Year 2003	After Project
1 – Bill Cr.	9	-	9	13	9	13	9	13	9	12	9	12
2 – Cyclone Cr.	10	-	10	14	10	11	10	12	10	12	10	12
6 – Pike Cr.	9	-	9	13	9	9	9	12	9	12	9	12
7 - Reid Cr.	7	-	7	14	7	12	7	11	7	12	7	12

** After Project figures are those for the year with the greatest level of increase. Figures displayed are in percent over predicted "natural" annual water yield in areas with no previous management.*

Table 3-46. WATSED Modeled Peak Flow Increases.*

	Alt. A		**Alt. B**		**Alt. C**		**Alt. D**		**Alt. E**		**Alt. F**	
Watershed Name	Year 2003	No change	Year 2003	After Project	Year 2003	After Project	Year 2003	After Project	Year 2003	After Project	Year 2003	After Project
1 – Bill Cr.	9	-	9	14	9	14	9	13	9	13	9	13
2 – Cyclone Cr.	11	-	11	14	11	11	11	12	11	12	11	12
6 – Pike Cr.	9	-	9	14	9	9	9	13	9	13	9	13
7 - Reid Cr.	7	-	7	14	7	12	7	11	7	12	7	12

** After Project figures are those for the year with the greatest level of increase. Figures displayed are in percent over predicted "natural" peak flow in areas with no previous management.*

All tributaries would gradually decrease in water yield and peak flow, as forest vegetation grows larger. An average annual increase ranging from 10 to 15 percent above naturally occurring flows is commonly used as a "safe" level of water yield for the streams to handle, depending on existing channel stability ratings, stream bed material, and the channel type. Predicted changes in water yield and peak flow associated with all action alternatives are within these recommended limits.

Some of Logan Creek's tributary drainages have been at or above these recommended levels within recent years, primarily due to extensive management of forest stands with mountain pine beetle outbreaks.

Alternative E and F were specifically designed to minimize the water yield and peak flow changes in Bill, Cyclone, Pike, and Reid Creeks while enabling as much treatment as possible of the current forest health problems. These are streams where recent harvest activity and mortality of forest trees due to diseases and insects have raised predicted stream flows and stream surveys have indicated that the stream channels are experiencing some level of instability. Concerns over Sanko Creek also exist because it has westslope cutthroat trout (*Oncorhynchus clarki lewisi*), and private-use woodcutters have created several unofficial roads and skid trails in the headwaters.

Sediment Production from In-Channel Erosion. Bill, Cyclone, Pike, and Reid Creeks are the tributaries of Logan that are most at risk of experiencing increased channel erosion because of continuing forest mortality in these watersheds. In-channel erosion would likely increase even more with the implementation of Alternative B than with the other alternatives because it proposes the most ground-disturbing activities, and water yield increases are mostly related to live vegetation that is removed with ground disturbing activities such as skidders. Localized channel erosion is also likely to increase over the short term with road decommissioning, but in the long term Alternative F should provide the most improvement to aquatic habitat because of the choice of roads to be reclaimed (like those in Alternative E) and the additional road drainage improvements. Where erosion is most likely to occur such as within higher gradient areas and where there are fine or sensitive soils, extra armoring would be placed in restored stream channels to minimize both short term and long-term sediment transport from culvert removal sites.

Stream channels that are mapped as "C" Rosgen Channel types are most likely to experience accelerated erosion and deposition (Exhibit G-7). This is because the "C" type channels have a moderate to high sensitivity to disturbance and a high potential for stream bank erosion, especially "C" channels with smaller channel bed composition (Decker 1994). Streams with the highest percent of "C" types, such as the lower reaches of Reid Creek, have the highest risk of channel degradation occurring from the effects of timber harvest. Reid Creek is particularly at risk of increased erosion if the existing road segment that is within the floodplain is not relocated, as proposed in Alternatives E and F. The sediment generated by in-channel erosion, undersized culverts, and the existing road location would be routed through the stream channels, causing direct effects to the aquatic habitat until the sediment is flushed through the system during the following snow-melt period. This sediment is eventually deposited in the broad flood plain and willow complex in Star Meadow, but several miles of in-stream habitat can be restored.

The management activities outlined in the different alternatives pose some risk that the supply of sediment may exceed the ability of the next spring's runoff to clean out the system, but this is not predictable because of the extreme variability of weather and runoff patterns and the sediment trapping potential of both Star Meadow and Tally Lake. In some cases, "flushing flows" generated by increased water yields may be beneficial to aquatic habitat, but there are no universally accepted models that can accurately predict sediment routing.

Channel Stability. Channel Stability ratings evaluate a stream's ability to adjust to and recover from additional changes in stream flow and/or increases in sediment production (Pfankuch 1978, Exhibit G-10). Most surveyed stream segments in the project area were rated as good, with a few reaches rated as fair, and fewer still rating poor (Exhibit G-4). This means most streams should be capable of handling some increases in water flow without channel cutting or erosion. As mentioned in the existing condition discussion, ongoing monitoring with channel cross-sections suggests that Reid, Bill, Cyclone, and Pike Creeks are most vulnerable to accelerated channel erosion because of their native soil properties and levels of historic forest management. Surveys have detected accelerated channel erosion in locations with finer soils for several years, especially in the lower reaches of Meadow Creek where it appears the stream has head-cut, (eroded) a gully through an ancient beaver dam filled with fine soils. Reid Creek is especially affected below the confluence of the northern fork with the main stem.

Concerns also exist over increases in sediment routed to streams from proposed forest management activities. Because no harvesting is proposed within the Riparian Habitat Conservation Area or Streamside Management Zones (see Exhibit F-4 for a discussion of riparian buffers) and it is not totally possible to predict the timing of the application and upkeep of BMPs, the WATSED model was not used to predict changes in sediment for the Logan Creek project. For a detailed discussion about INFISH and its implications to this project see the analysis in the Fisheries section.

It is likely that a short-term increase in sediment would occur in watersheds with the proposed new road construction involved with all alternatives, but very little change is anticipated because most new roads are located away from established stream courses and are proposed for the most stable soils. Alternative E and F would construct a new road to access the upper basin away from the road's current location and would obliterate the road segment impinging upon the flood plain of Reid Creek. Relocating the previously mentioned road and upgrading the culvert on the main Reid Creek road would greatly improve stream conditions in the near future while substantially reducing the risk that a large volume of sediment could enter the stream during high-flow events.

Long-term and short-term effects from installing larger stream crossings and repairing the bridges would vary. Removing old culverts may cause a small, short-term increase in sediment. Even with dewatering and sediment traps, some sediment may reach the stream, but this amount would be considerably less than if the pipes were left in place in their current condition and then failed. The stream's stability would benefit in the long-term by reducing the risk of channel erosion from culvert failure by increasing the size of culverts to enable them to pass 100-year floods. Where existing pipes are too small, larger pipes would also slow the velocity of water flowing through the pipe during peak run-off, thereby reducing channel scour and lowering sedimentation from channel erosion.

Alternatives that propose the most road improvements on haul routes would in effect offer the most opportunity to improve aquatic habitat.

Cumulative Effects of Action and No-Action Alternatives on Water Quality and Channel Morphology

As mentioned in the Introduction, Logan Creek goes through an extensive floodplain system before it joins Sheppard and Griffin Creeks in Star Meadow. Particle size analysis and cross-sections suggest the broad valley bottom and willows will normally ameliorate cumulative effects of management in the headwaters. Therefore the WATSED model used to estimate sediment yield from upstream sub-watersheds will not be used to suggest cumulative effects. Alternatives will be analyzed for this area with reduced miles of road and their reduced contributing area based on the 2002 road/stream survey.

Effects from Past Actions

Past actions such as tree planting and hand thinning would not contribute to negative cumulative effects on water yield, water quality, or channel morphology in any of the alternatives, including the No-Action Alternative. Many studies in neighboring areas in the northwest have demonstrated that there is little or no effect on hydrology by thinning (Megahan, 1980).

With the No-Action Alternative, there would be no regular funding source to fix erosion from roads built in the past and no revenue generated from timber sales to pay for work needed on the roads to bring them up to current BMP standards. For this reason they would likely continue to route sediment into the streams with negative cumulative effects to water quality. The existing road densities would remain at the current high levels and continue to elevate the risk of cumulative effects to water quality and channel morphology by routing precipitation and snow melt runoff through roadside ditches. While trees would continue to grow, helping the area recover hydrologically, normal hill slope hydrology would remain disrupted by roads.

By not reducing historically high fuel levels brought on partially though past suppression of wildland fire, a severe fire could lead to temporary, negative effects to water quality by increasing overland flow and fine sediment routed to streams from devegetated forests. Cumulatively, as more and more stands fill with dying Douglas fir and young, dense, shade tolerant trees, the risk of elevated flows and sediment levels would also increase.

Effects from Present Actions

There are a few ongoing projects in the Logan Creek drainage, such as reconstructing trail crossings at streams. There are also some proposed harvest activities on other ownership lands that are either ongoing or will occur within the same time period of the Logan Creek proposed actions, including harvest on both State and Plum Creek lands. All harvest activities whether on private or government owned land should have associated road improvements as required by law to be done in accordance with Best Management Practices. So, when added to the proposed actions, there should be no measurable negative cumulative effects on the aquatic resources.

Effects from Reasonably Foreseeable (Future) Actions

Some level of harvest on other parcels of land will continue, such as those managed by the Department of State Lands, Plum Creek Timber Company, and other landowners. More homes will likely be built in the private sections of the Logan Creek area. Usually along with this development means more cleared forest, either as converted pasturelands or yards and driveways. Cumulatively, these types of activities hold the largest risk to water quality because cleared or paved land means changes in runoff patterns. There could also be some increases in nutrients with increased grazing and use of horses on trail systems.

REGULATORY CONSISTENCY

Consistency with the Forest Plan. All action alternatives are consistent with the water quality goals, objectives, and standards outlined in the Flathead Forest Plan, as amended. This consistency is met primarily by application of Best Management Practices in timber harvest areas and roads associated with timber removals. Additional water quality improvements would be attained through 16.6 miles of road reclamation.

Clean Water Act (formally know as the Federal Water Pollution Control Act). The Environmental Protection Agency is the regulatory agency for administration of the Clean Water Act. Identification of impaired water bodies and calculation of Total Maximum Daily Loads (TMDL) for these water bodies is delegated to the states. In the case of Montana, this delegated agency is the Montana Department of Environmental Quality (DEQ). Streams or other bodies of water that do not fully support their designated beneficial uses are placed on the State 303(d) list for further study or for development of Total Maximum Daily Loads for the pollutant deemed to be impairing use. This list is updated every two years to reflect water bodies that are no longer considered impaired or are added to the list when sufficient credible data is made available.

The upper 19 miles of Logan Creek, above Tally Lake, were listed as “Impaired” on the 1996 State 303(d) list due to siltation and suspended solids. The “Probable Cause” was listed as “silviculture.” The “Probable Impaired Uses” were “Aquatic Life Support” and “Cold Water Fishery – Trout.” Logan Creek was taken off the 303(d) list in 2000 and placed in “Appendix F”, a category of streams for which additional credible data is required before beneficial use support can be determined. Logan Creek is currently scheduled to have a TMDL completed by 2005.

In the past several years, the Flathead National Forest has collected physical and biological data that strongly support removing Logan Creek from the list of impaired waters. The Forest and the Montana DEQ are currently cooperating to analyze data collected in the summer of 2003 to assess the appropriate classification of Logan Creek with regard to the 303(d) list. A preliminary review of these data indicates that aquatic life and cold-water fisheries are healthy and fully supported by conditions in the watershed (see Fisheries section and Exhibits F-11 and F-12).

Regardless of the final classification for Logan Creek relative to the 303(d) list, it is understood that the Forest Service will ensure all proposed activities would result in protection or improvement of all beneficial uses in the stream. All alternatives for the Logan Creek Ecosystem Restoration Project are designed to meet the requirements of the State water quality standards. This would be accomplished through application of Montana Best Management Practices and by prescribing additional design criteria that would prevent sediment from being transported to Logan Creek and its tributaries. All reasonably available measures would be taken to limit the routing of sediment to streams during road reconstruction and rehabilitation.

Streamside Management Zone Act. The State of Montana Streamside Management Zone (SMZ) Act of 1992 requires a minimum of 50- to 100-foot wide buffers on each stream adjacent to harvest activities. These buffers are to be expanded to include wetlands and in many cases would be wider than those needed to comply with INFISH regulation (see fisheries discussion). The SMZ Law prohibits seven forestry activities inside the streamside zones unless alternative practices have been approved by the Montana DNRC Service Forester. All prescriptions for harvest would meet the guidelines for SMZs without needing alternative practices.

Montana Stream Protection Act. The Montana Stream Protection Act requires a 124 Permit be issued for all activities occurring within a stream channel that would affect the stream channel's shape, form, or function. The Act was passed into law to protect and preserve fish and wildlife resources in their natural state. Examples of activities that may be implemented through the Logan Creek analysis that require a 124 Permit include culvert replacements, road construction and reclamation, and fish habitat improvement structures. The Montana Department of Fish, Wildlife, and Parks would approve the permits prior to implementation of any of these types of activities. All alternatives would meet the standards of all applicable laws as described in Appendix D.

Environmental Protection Agency's Antidegradation Policy. This policy was developed in 1975 by EPA requiring states to maintain and protect existing in-stream water uses and the water quality necessary to protect the existing uses. All alternatives would meet this requirement.

Montana Water Quality Standards. Water Quality Standards for Montana are outlined in the Administrative Rules of Montana and the Montana Water Pollution Control Law. Compliance with these Water Quality Standards is insured through the application of Best Management Practices. BMPs are a component of each action alternative. For a more complete discussion of this and other water quality regulations, please see Appendix D.