HYDROLOGY REPORT

FOR

PERRY RIDGE

by

J. ALLEN ISAACSON
HYDROLOGIST

APRIL 1996

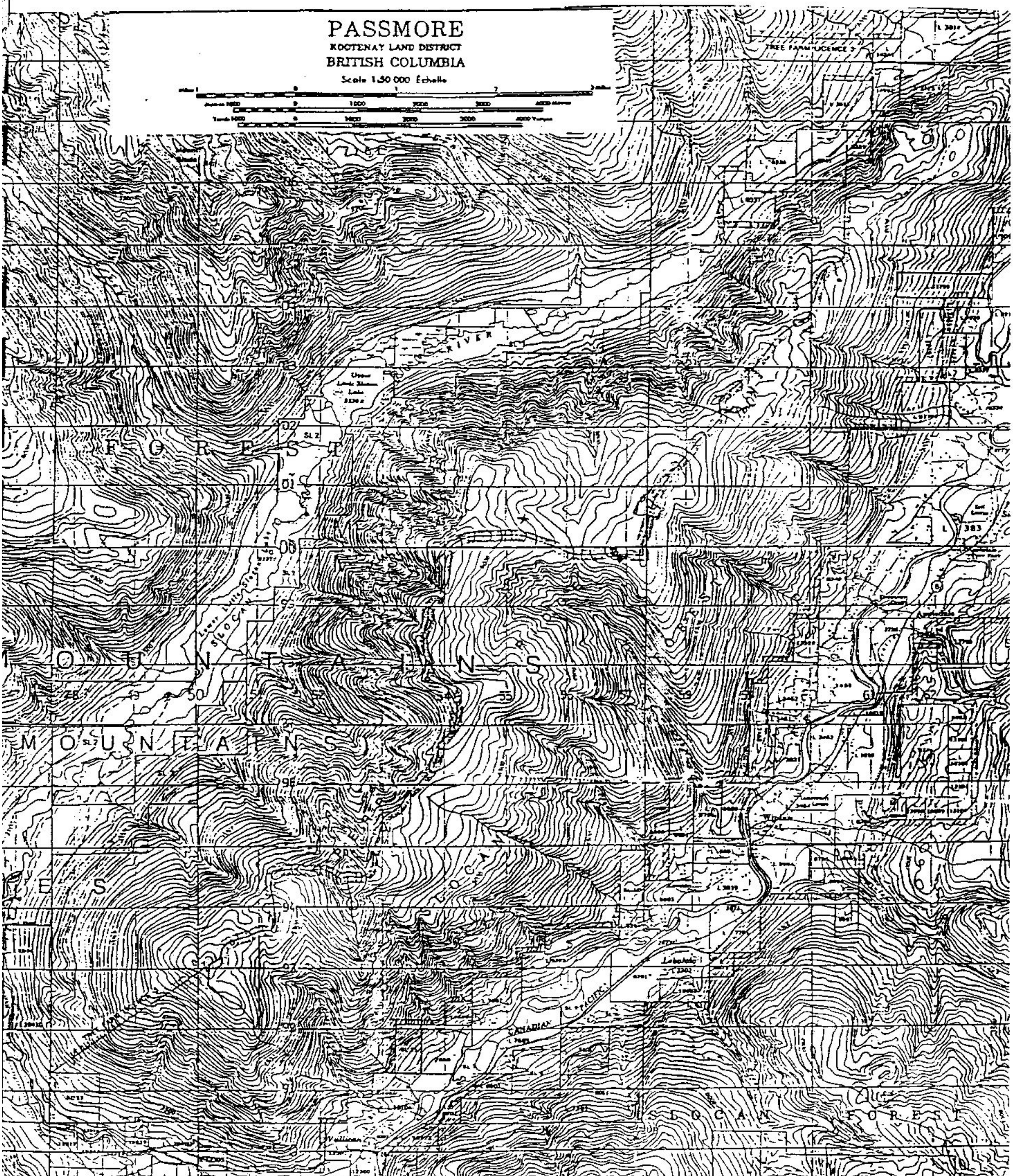
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Table of contents

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EOUCATION:

UNIVERSITY OF IOAnO, Moscow, TO
Masters student in Fisheries - Sept. 1996- May 1997
Completed 32 graduate credits in Aquatic Ecology
Completed requirements for Masters ill Aquatic Ecology 1998
Graduate Education --1987-1991
General Studies -1967-1975

LEWTS AND CLARK STATE COLLEGE, Lewiston, lD
Bachelor of Science -. Business Management - 1986

WASHINGTON STATE UNIVERSITY, Pullman. WA
Bachelor of Science - Forest Management 1964

mAHO STATE UNIVERSITY, Pocatello, ID
Fore.1 Management -1960-1961

NORTH IDAHO COLLEGE, Coeur d' Alene, ID
General Studies - 1967-1987

SPOKANE COMMUNITY COLLEGE. Spokane, **WA**
General Studies - 1986-present

WORK r,;XPERIENCF.:

Consultant, Coeur d alene, Idaho, 1986 until present

Since 1'}I171 have owned and operated a hydrology and aquatic ecology consulting business, with CODlrdCts over a wide range of the U.S. and Canada. There have been projects that included solving both surface water and groundwater quality and quantity problems.

I teach short courses fur various state agencies, US. Government agencies, soil conservation districlll, environmental organizations, foundations and privately funded organizations. Annually, a 5-day workshop on forest hydrology ;. prepared and presented in the Nelson Be area of Canada a part of a provincial continuilll! t:ducatioll program. Approximately five additional courses are presented in an average year's activities.

The fieldwork includes travel by helicopter, fixed wing, boats, and hiking over steep and treacherous terrain. Camping and backpacking arc part of the workload. Careful field data collection and documentation is essential.

The workload includes computer analysis and report writing for projects involving forest !l(.1ivitics, agricultural, municipal, area planning, aquifer delineation, monitoring and monitor plan writing. Documentation and reports generated are used for court briefs, depositions, and court appearances on many water and natural r~'SOUfcebased legal actions.

WATER RESOURCE INSTRUCTOR, Spokane Community College, Spokane, WA. 1986-prescnt

This is a full time tenured position teaching college level classes of tbe following titles: Geology, Hydrology, Ground Water, Wells and Aquifers, Water Quality, Advanced Water Quality, Fish Management and Ecology, Technical Writing, Weather and Climate, and three quarters of special seminar courses. I also teach a five-credit cooperative education cnurse for internships by students.

The water quality courses represent three separate classcs and five sections. These classes involve instruction 011 topics that range from the water in the atmosphere to that in lakes and large rivers. This requires lUiowledge in slope hydrology, fluvial hydrology, riparian management, wetlands management and limnology concepts in streams and lakes. Thc beginning course instructs students in slope and stream ecology and the effects of natural and man directed activities. The proper and currently used stream survey techniques are taught along with interpretation of the field studies. The advanced course instructs students in lakc ecology and proper sampling techniques for assessing the pollution level, nutrient level, and biological populations of the water body.

The wells and aquifers course is the third quarter of a continuous progrdlll including geology and groundwater. Knowledge and a strong background in these courses are required to effectively teach the wcll and aquifer course. Time. management, course outline and careful planning are required to teach these courses, along with knowledge and ability to eftCctively present material to the students. As.,isting students outside the classroom with their quest for jobs, school problems, study suggestions, etc. is an importaot and rewarding part of this position.

As a member of the campus "Outcomes Core Management Committee", the past six yt:ars have been spent working on student learning abilities. efficient and effective ways to improve student learning, and methods of improving retention of learned material by students.

SUPERVISORY HYDROLOGIST, U.S. Forest Service, Idaho Panhandle National fiorest-197J-J986

Forest Hydrologist - As. the Forest Hydrologist I was in charge of supervising and administrating the soil and water programs on approximately 2.5 million "LTe.. This required priority setting, work planning, and target attainment. The major workload was the analysis of road projects and timber sales.

The annual workload was approximately 85 timber sales for over 300 million board feet of timber harvested. Approximately 400-500 miles of road were constructed. I completed or supervised the watershed analysis for the impact statements completed fur each project A large part of the workload was the rehabilitation planning tor major floods and to recover land from past activities.

Water Quality - J served on the National Task Force 10 set water guidelines for monitoring forest activity. On the Forest Level I established a water quality laboratory, set five-year programs fur monitoring. I also hired and trained technit,;ans and· developed computer programs for storage analysis of the data From these programs I developed computer model s 10 predict the water quality impacts from proposed forest activit; es.

Biological - In forest planning it was important to work closely with the Fish Biologist. We developed integmted ·stream surveyt.ech"iques ilnd methods to integrate the field material intG the forest plans. This included knowledge of aquatic insects and fish species along with their needed water quality and requirements for survival.

Geology and Groundwater- The geology and soils of an Mea are the .prime parameters integrated into the land system inventory that 1 established on the J~o Panhandle. GeomorphiC principals are used in the inventory and the hydrologic interpretations.

Water lights, quantity and quality were the prime aspects upon which I made interpretations fur ground. water projectsGn federal lands. Pump-tests, drawdown tests, and quality tests were rull on all well projects. C.ontacts with well drllle!'s were maintained for knowledge of surrounding area. Geology was an important aspect when working with miners and when reviewing and recommending changes in operating plans and setting restoration goals for both hard rock and sur lace mines.

HYDROLOGIST, US. Forest Service, Coeur d'Alene National Forest -- 1966-1973

Duties w.,..e similar to th., above de:<cription only smaller geogrdphic area and less responsibility. I also doubled as-the-Fisheries Biologist and spem considerable time on restoration and fish habitat improvement projects. I began one of the first water quality monitoring systems in the Forest Service, also I established a "hydromet system" a network of precipitation gages, stream gages amt'SDOW courses. I developed and utilized a snowmelt simulation computer mudd.

HONORS AND AWARDS

Burlington Northern Foundation, Faculty Achievement Award, 1990
NISOD-Univer!;ity of Texas, Excellence in Teaching award, 1998
Selkirk-PrieM Basin: "Professional'oft!te Year Award", 1992
Numerous cash awards U.S. Forest Service, 1966-1986

rR.OFESSIONAL SOCIETIES:

AMERICAN WATER RESOURCE ASSOCIATION (AWRA)
AMERICAN F[SHERIES SOCIETY (AFS)

WORK OOBLlSHED:

Water Yield from Vegetative Manipulation. USDA.Forest Service, Coeur d'Alene, 10 (1968)

Computer Model for Determining Water.YieId.ftOlll.Forest Activities USDA Forest Service, Idaho Panhandle National Forest, Coeur d'Alene, ID (1977).

Hydrology Part II. USDA-Forest Service,.Region One, Missoula, MT. (Edited and team member ofrc;gional hydrologists group effort)(1975).

Snow Hydrology. Presented at Forest Hydrolo&,'Yin Interior Forests, Selkirk C<,>lIegeBritish Columbia, Canada (1981).

Instream Flow Methodology. American Fishery Society, Boise, ID (1980).

The Effects of Timber Harvest on die Quantity and Quality of Stream Flow. University of Washington Press, Seattle, WA (J 986).

Rocky Mountain Cha\len~ The Fish are Seeing Red. Association of Forest Service Employees for Environmental Ethics (1994).

TELEVTSTON SPECIALS

Roads to Nowhere. (KREM Television, Spokane, WA J987)

Critical Habitat. (Public Broadcasting System, Seattle, WA [994).

Outdoor Idaho, "Forest Health" (Idaho Public Television, Boise, ID Ju[y 1994).

HYDROLOGY REPORT
for
PERRY RIDGE

INTRODUCTION

Perry Ridge is a unique land form in the Selkirk Mountains of Southeast British Columbia. This mountain is a dome-like elongated structure that stands alone. The geology is a combination of intrusive volcanic granites and metamorphic gneiss The Siocan River fonns the eastem boundary and the Little Siocan River forms the western and southern boundary. The northem end is bordered by Siocan Lake. To the Northwest is the Valhalla Range of rugged steep peaks that reach above timberline. To the East is the Kokanee Range of steep rugged mountains. Perry Ridge does not resemble either of these ranges, but has a rounded, gentle relief top with abrupt, very steep incised side slopes of approximately 4500-5500 feet to the valley floor at the southern end, with less elevation difference toward the north end. This landform is approximately 15 miles long and averages about 5 miles wide and stretches from the Southwest toward the Northeast. The high point is about 6800 foot elevation with the low point of the Siocan Valley at approximately a 1600 foot elevation. The top elevation diminishes with a northern traverse.

The surface hydrology on the East side of Perry Ridge is characterized by sma" basins that begin at the top of the ridge, then quickly become very incised in colluvial material and bedrock. Many bedrock outcroppings are present in the form of steep cliffs, with associated talus slopes. The so~ development is very shallow over the colluvial rock on the side slope of these small"AA" channels. These are steep deeply incised streams, usually found at the headwaters of larger systems(Rosgen, 1994).

The water flowing off of Perry Ridge forms the domestic and community supplies for several water user groups and for individual household domestic uses. The population of the west side of Siocan valley depends upon high quality year around flows of water from this source, supplied to their homes by gravity without filtration or treatment.

This report is prepared in three major parts to enable a better understanding of both the slope and surface hydrology: 1) McFayden Creek, 2) The ridge top and high elevations, 3) The proposed road construction activity, 4) A summary and recommendations.

The description of conditions in McFayden Creek can be used to describe the other drainages on the East side of Perry Ridge. This should be kept in mind when reading • the descriptions of the ridge top conditions and wetland source of various creeks. The ,- down slope conditions are *very* similar to McFayden Creek.

For additional infonnation see the February 21,1994leUer in the Appendix.

MCFAYDEN CREEK

McFayden Creek is located on the southeast comer of Perry Ridge. This stream produces a *year* around flow of high quarrty water for many users in this area of the Siocan valley. This is a designated Community Watershed. The population is growing as this beautiful area of British Columbia is discovered. Any additional water licenses would put a strain on the volume for the dry summer months.

This watershed is a south facing drainage that win have a quicker snowmelt and a flashier runoff than other drainages on Perry Ridge. The drainages that face south and southwest are called high energy watersheds, due to the quick and many times flashy snowmelt and runoff due to the high amount of solar energy in the spring. These watersheds can have high snowmelt spring flows and very low summer flows. The key hydrologic consideration is to keep snow in the watershed as late into the spring as is possible under natural conditions. Research attempts to extend this timing using different cutting patterns have never proved out and at best have only approximated the natural regime.

McFayden Creek watershed is characterized as steep, 6800 elevation on the top north side down to 1600 at the valley floor. This is a drop of 5200 feet (about a mile in elevation) in a distance of 2.5 miles.

The field review of this drainage was completed on August 24, 1994. The top of the drainage was accessed via the west side from the Tedesco Road. This is a low grade road that was used in approximately 1980 to access a small clear cut that is on the ridge line behind McFayden Creek. This road in not passible at the present due to mining activity that blasted the bedrcick from the cut slope onto the road. There are many wet sites that would need culverts, the road is on bedrock or very shallow fill making culvert placement costly and difficult.

The old landing on the ridge top was covered with water and wetland species of vegetation even during August of one of the driest summers on record. There was a good volume of water standing in this cut over area. The timber that was harvested in this early cutting was very small in diameter. This was at an elevation of approximately 5700-5800 feet above sea level. The past cutting did not reach into the watershed, but was on the West side and extended onto the top of the drainage. This top ridge area was explored. Steep bedrock and talus slopes characterize the area North along the ridge top and down the northeast side of McFayden Creek. Road construction to the North would be difficult and expensive along the ridge top or on the East side of McFayden Creek. This is *very* steep and rocky. A full bench construction blasted out of • bedrock would be required. Many of these areas have deeply weathered bedrock that is not suitable for construction without very deep cuts and long cut slopes requiring the removal of large quantities of material. This road construction would leave a large permanent impact on the upper reaches of this community watershed, and if the soil was sidecast the impact would be horrendous.

In the saddle area(about the central part of the basin) the slope is gentle (about 15 %)

for a short distance to an elevation of about 5575. At this point the slope gets steeper, >50 %. This area has a stand of spruce that average about 18-24" in diameter. There is blow down and broken tops in this stand. This is the elevation zone that makes up the beginning of the water courses where surface water is encountered in the form of numerous seeps and springs. There is a small bench on this steep slope where water is first noticed percolating out of the ground around the tree roots. The rooting on the blow down is *very* shallow due to the high water table. (NOTE: THIS WAS AUGUST OF A RECORD VERY DRY YEAR AND THERE WAS STILL SURFACE WATER AT A HIGH ELEVATION).

At an elevation of 5450 the stream system was starting to come together in a central incised channel. The ground surface area between elevation 5575 to 5375 is where most of the surface water that flows in McFayden Creek originates Between the elevations of 5450 and 5375 the number of springs and seeps increases and the individual sources combine to feed a central channel.

The elevational zone of seeps and springs characterized by old growth spruce has the best developed soil profile and organic layering of anywhere in the watershed. <u>This is the key location in the watershed that stores and regulates the release of the surface flow of water. This is the zone that supplies the domestic and community use systems in the low flow summer months.</u> The rest of the watershed is very steep, with rock outcrops, talus rock falls, and is *very* thin soiled, with little slope water storage area. This elevation band needs to be protected to insure a continuous supply to the stream system during summer months. There should be no harvest, road construction or skidding that would eliminate the shading and/or cause *any* disturbance to the soil and surface organic layers in this important zone of water production.

Below an elevation of approximately 5375 the stream becomes *very* deeply incised in colluvial material and bedrock outcroppings. There is a high amount of natural bedload in the stream sized from sand to about 2" in diameter. The stream stability is accomplished by a high amount of large organic debris(LOD). The source of the important large organic debris is from the blow down and movement of trees on very steep continuous side slopes(over 50%).

At an elevation of 5250-5000 there is a central ridge with a surface of colluvial talus between the forks of the stream system. The creek gains in water during this reach. Most of the water that is diverted at the head works for domestic and community use at the bottom end of the drainage is already in the two forks of the creek by this elevation. The summer flows are higher or about equal here to the total at the gage at the bottom of the watershed. The stream drainage at the lower elevations(below 4000 feet) is a losing reach during summer flows. The vegetation on the slopes will use as much water as there is available leaving a slope water deficit(if more was available the trees would use it). The hydrologic interpretation of this is reached by quantifying the flows in the stream at different elevational locations and matching this with the vegetation habitat types on the drainage side slopes. The result of this analysis in McFayden Creek is that the water reaching the community water system is water that originates above this elevation as the system is losing water at the lower elevations during the summer and fall months.

Below 5000 feet the stream is highly incised, with some raw banks and slumps due to the diversion of the flow by the logs, rocks, and root-wads. These same deflectors also form steps and pools that work to hold back the sediment, bedload and movement of material down this steep "AA" stream. The importance of the large organic debris (LOD) to the stability of these streams cannot be emphasized enough. This material is what gives the stream structure, stores sediment, and of even more importance dissipates energy by creating a step-pool natural system. If this energy was not dissipated in this manner the stream would have the ability to move larger size sediment and a higher volume of sediment. This would result in increased channel cutting and more sediment delivered to the bottom of the watershed. This would cause more problems at the dam and head works of the resident's water systems.

The key to protecting and continuing the natural timing and quantity of the stream flow, is to keep the LOD from washing out. This is accomplished by preventing small to large debriS torrents from occurring. This is done by keeping the peak flows as natural as possible, by not increasing the flows during the peak flow of the snow-melt period. This is accomplished on southern aspects(southeast and southwest included) by shading the higher elevation snowpack so that the peak from the higher elevations does not reach the stream at the same timing as that of the mid-elevation runoff. The second consideration is to allow the soil water time to percolate slowly in the soil before emerging as a seep or spring to flow on the surface. Road construction and skidding on these steep shallow soils will concentrate the water in the road ditches by bringing soil water to the surface and quickly routing the water as a surface flow. This results in quick flashy high peak events that remove more water from the watershed earlier in the snowmelt season. Removal of vegetative cover by logging will remove the shade that is critical for snow management and water flow regulation.

The area from 4700 feet down to about 4100 feet in elevation is characterized by very steep stream side slopes of talus and colluvial material along with bedrock outcrops. At approximately 4100 feet the two major stream branches come together to form the main McFayden Creek in one channel. Even in their natural state there is a lot of movement in the channels of large material of the 6-8" size. Again this is stored by the LOD fanning pools and storage areas in the channel, even in these very steep incised channels.

The incised nature is important to discuss. This means that there is no floodplain or terrace for the peak water flows to flow onto or for the storage of sediment. The water flow and sediment storage has to be in the channel. The peak flows must stay in the confines of the channel area with no room to dissipate energy or for the storage of additional sediment and higher peak water flows. This means that during high flood flows the steep colluvial slopes are undercut by the water in the channel, These channels have not reached the degree of natural armbring that is seen in some of the other streams particularly examples in the Nelson area. This causes mass failures of the undercut banks depositing sediment directly into the stream channel. This can set up a domino effect by damming the flow and then cutting loose with a surge of water and sediment. A slurry from this type of event will allow the movement of much larger material. The erOSion and transportation of sediment is greatly increased by the lose of viscosity in a slurry. This is how debris flows begin that devastate steep mountain drainages.

- The stream side slopes are steep and of a straight landform. with no terrace or break in the slope for hundreds of feet. The material on the stream side slopes is colluvial talus and bedrock outcrops. The soil development on much of these steep side slopes is
- minimal. The tree growth is in pockets of soil between the talus or where there may be a short break in slope by a cliff of bedrock. The soil and organic layering is so shallow that when walking over it a person's foot will kick the soil off the underlying rock. Even footprints are setting back the ecologic development of this young landform by disturbing
- the duff and organic development that are the forerunners of soil.

These slopes become very dry as elevation decreases in the watershed. The fir in this --area are pistol butted to an extreme degree. This is in response to the trees trying to ~row straight while the slope is creeping due to the down slope movement of the soil and talus rock under the pull of gravity on *very* steep slopes of colluvial material.

Below an elevation of 4100-4000 feet the amount of cliff outcroppings of bedrock and the talus slopes increase as the stream becomes increasingly more incised, until it is in a gorge situation with cliffs and small talus slopes as the side boards. The vegetation responds to the drier conditions with decrease of elevation. The fir give way to ponderosa pine and some larch as the elevation drops and the slope flattens where the stream enters the Siocan River valley.

The head works are located in the flatter areas where the stream comes off of the steep gradient reaches and flows through the valley colluvium materials. The drop of gradient of the streams causes the sediments to be dropped out and bedload stored. This causes problems for water users in that they must keep deep enough dams or diversion works to keep from freezing. This requires continual maintenance. These water systems represent a high investment in funds, equipment, maintenance, upkeep, and time by the water user. This investment is in jeopardy by any activity at the headwaters. What comes out the faucet in the valley is directly tied to the management of the headwater area.

TOP AND HIGH ELEVATIONS OF PERRY RIDGE

This section of the report is based on the field review that was completed during September, 1994. This review began at an elevation of 5700 above Hird Creek on the ridge where it turns to the west. The field analysis worked along the ridge toward the Northeast toward a location on the ridge above Nelly Creek. As progress was made up the ridge toward the North, excursions were taken on each side of the ridge to look at the terrain and conditions for road location possibilities and to observe and map hazardous terrain and highly erosive landfonns. The terrain to the east side of the ridge (the area in the license) is very steep and unstable for the most part, there were . unconnected short slopes that would work as road construction sites. There were no connections found between these stable slopes without crossing unstable or very rocky reaches of slope.

We progressed in an easterty direction for about 1 mile above the rim of Hird Creek. This would be a difficult location for any road construction coming from the north, as there would be high costs to get around the headwater area of Hurd. It is very steep anSi rocky off the top on the east side. The ridge to the south around Hird Creek raises to a high pOint(above 6400 feet) and is mostly of rock outcroppings. This area would not be a good road construction chance.

The ridge above Hird and Rice Creeks is very wet, with stream channels and wetland areas along the ridge top and then flowing off to the west side of the ridge. There are very wet areas on the west side of the ridge, continuing to the west, There is a lot of wind throw and sections of high water table. The root development on the wind throw trees is very shallow due to the high water table. The hole or opening where the roots have been displaced would be full of water and in some cases would be the beginning of a surface flow. The small impact or disruption of the surface soil is enough from a very shallow wind throw(2-2.5') to start a surface flow of water. This wet area is located on the border and to the west of the SFP license area. The area adjacent to this in the SFP license is very rocky and goes off very steep right from the top of the ridge toward the Siocan valley. This condition holds for the headwater area of both Hird and Rice creeks.

In general the area along the ridge top within the license and down toward the east side of the ridge, between Rice Creek on the south, and north to Nelly creek have a unique set of landform and hydrologic conditions that are fairly uniform for this slope. The side slopes have a series of broken, nonconnected benches. These are short and shallow, 10-30 feet wide and about 200 feet to 4-500 feet in length. Some of these are almost flat. They contain good stands of old growth and mature timber with rock outcrops located between the benches that are also then bisected by deep stream patterns. The problem with access is that these benches are not continuous and it is very steep between the benches, both off the ends and in a vertical direction up and down the slope. This not only prevents the placement of roads using these short benches as locations, but it also breaks up the slope so that a high lead system would not work due to the poor deflection. There are many rock outcroppings shOwing between the benches. Interconnected with this are some well developed stream systems with deep gullies containing stream channels that carry a lot of water most of the year, but especially during spring snowmelt. These are drainage patterns originating from the wetlands that predominate as vegetated meadows and associated open water ponds on the ridge top. The side slopes directly adjacent to the ridge top falling off to the east are very steep and rocky with a timber cover intermixed with wet areas. There are many more deep incised drainages that are not shown on the map in the area above Rice, Jerome, Avis, and Nelly Creeks. The landform directly off the top of the ridge on the east side is much more broken and steeper than shown on the contour map.

The top of the ridge from 5750 feet down to 5650 feet has a series of bogs intennixed with rock outcroppings. There are deep draws that drain off toward the East some are *very* deep with running water and a few that are dry on the ridge top but contain water down slope a short distance. These landf orrns would present some difficult road building opportunities. At 5650 feet elevation there is a major draw off to the east with run Ring water. This is the ridge top above the drainages of Rice Creek and the South part of Jerome Creek.

In order to protect the wetlands that are the source areas of the stream systems used below for water sources, any road would have to wind around on the stable locations(rock) to avoid the wet areas and then would be faced with construction on rock outcroppings on the top of the ridge. There are numerous small bedrock ridges of from 10-30 feet in elevation with wet drainage areas and wet meadows located between the *dry* rocky areas(see appendix pictures). If constructed correctly this would resuH in a long road to go a short distance of expensive construction on rock.

Along the ridge top between the elevations of 4900-5400 feet and again at an elevation of about 5600-5700 feet there are extensive networks of wetlands and rock ridges. The - terrain is much more varied than shown on the topography maps. This is the ridge top _above Jerome Creek toward the north to above Nelly Creek. There are several Sites where a wet meadow will reach all the way across the ridge top. There will be stream channels that are connected on the top and flow off on both sides of the ridge that show - evidence of carrying large quantities of water. I am sure that there are several unique and probably rare or endangered plant species in these wet meadows(see pictures in appendix). Around many of the wet areas are poplar trees at an elevation of over 5000 feet. Most have some open water with rooted vegetation around the open zones. _These would classify as pond environs rather than a lake. There was much evidence that in recent times they have been much wetter than at ourvisit. It must be remembered that this has been a cycle of drought conditions and 1994 was one of the -driest summers of recent history. Under a normal snow pack and precipitation regime :here would be much more water in these ponds.

At an elevation of 5100 feet above Avis Creek, there is a large wetland complex --11c1udingjily pads with some wet ponds and meadows, that are from .8 acre to over an lcre in size. The wetlands drain into a developed drainage pattern to the east side of the ridge, that is the start of Avis Creek as shown on the contour map at the intersect 59-02 and 59-03. Continuing north on the ridge is a series of wet areas that stretch completely across the ridge intennixed with rock ribs between the wet sites down to an elevation of 4800 feet. This is the top of the ridge above Nelly Creek. Below this there are some dry rock outcrop pOints and spur ridges to an elevation of approximately 4700. The vegetation here is larch and pine from old fire activity and is younger than that at the higher elevations(see appendix pictures). The slopes become very wet and steep off of the ridge at this point and contain cedar and fir a short.distance down from the drier rock ridges.

The topography map does r.ot show the area below 4700 feet as steep as it is in the field. The ridge goes off *very* steeply with exposed bedrock from 4700 feet down to approximately 4200-4300 elevation. Where the man made trail is located on the center of the ridge in the <4700 elevation, there are several switchbacks due to the steepness and the rock outcrops encountered. 'This section of the ridge would entail some very expensive blasting and road construction costs along with leaving a large scar for the future.

The map of the proposed road shows it going off to the west and switching to get above this rock. The area to tlhe west contains sites that are wet and unstable.

The ridge from the bottom of the steep slope at about 4300 foot elevation traversing toward the north end of the ridge is flatter, but also very wet, with many bogs and a large lake on the northwest side of the ridge. There are many bogs and wet areas with numerous ponds and marshes that would be disturbed with any road construction. If a suitable road location was found up to the 4300 elevation, accessing from the north, there would have to be careful field analysis completed to find a location around the wet ponds and seeps. Then a careful location would need to be found that went around the steep rock face to make the jump from 4400 to 4700 feet in elevation. This would be most difficult from the limited field observations made of this site. After gaining the 4700 foot elevation, if poSSible, there would be many more difficulties encountered with road construction all along the ridge.

There seem to be many errors on the map compared to what was observed in the field. Any future work done off the topography map should be field checked with a GPS system to determine the accuracy of location and of the map. There are so many little spur ridges and draws that it is easy to get off the ridge and onto side ridges that stop a.l very steep dead ends.

REVIEW OF THE PROPOSED ACTIVITY

The material presented in this section is taken from a previous review of documents provided discussing the terrain analysis and other analysis completed for the proposed road location at the north end of Perry Ridge, along with the proposed plan of action. For more detail see Appendix V for February, 1994 preliminary analysis. The maps used for the proposal provided by Siocan Forest Products are of poor quarrty' and small scale, making it impossible to know in the field where the proposed road locations are located on the ground.

The proposed road location passes through many areas of inoperable land to reach stands Where harvesting is planned. The operablelinoperable deSignation indicates whether or not logging and road building eqUipment can work on the slope, but it does not evaluate whether or not water will be protected. For example, much of the area above Winlaw is a problem forest type and immature. To the southwest of Winlaw is a large area of inoperable that must be crossed to access the mature timber. The area above Appledale is a band of inoperable. A road through this area would have to pass through a very steep headwater zone that is fragile due to the geologic position.

The terrain survey completed in 1983 by Wehr identifies many areas that are very unstable with extensive areas of gneissic terrain exhibiting steep slopes and escarpments. These sites are potential mass failure sites and should be aVOided. There are some high erosion areas in Watson Creek also that are an exception to his general comment that the high mass failure sites are associated with the gneissic and not the intrusive terrain. It has been my experience that the two terrain types are usually found together or in very close proximity. One can go from some fairly stable intrusive bedrock to highly unstable gneissic without really seeing much for indicators until cutting into the bedrock with equipment. The most important point in Wehr's report, and one that is not emphasized, is that there are engineering limitations on the steep slopes. The plans call for a road location cutting through a steep cirque headwall at one location near Hird Creek to access the mature timber. This road location is inadvisable and will likely result in serious degradation to water.

The SIL 3 terrain analysis states: "There is much greater potential for erosipn and sediment than for mass wasting." Sixty percent of Perry Ridge is high to extreme hazard rating for sediment yield or induced mass wasting. These basins are directly above 56 licensed water sources. There are many sites of natural mass wasting and avalanche paths, especially in the Talbot to Watson area. The erosion that will occur from any ground disturbance wlll flow directly into the incised drainages discussed above. This will cause increased channel erosion and high rates of sediment and sluiced out channels.

This proposal is in violation of Forest Practices Code, Operational Planning, Part 5 Silvicullural Prescriptions, sections 41,42,46, and 48, and part 8, sections 64 and 67. Under Section Forest Road # 6 Site Data for Watercourse Crossings, there is a lot of hydrologiC data required. I have not seen any of this data for the stream crossings or for the proposed stream crossings.

Under the TImber Harvesting Section, part 6(a&B), there are standards for side casting material on unstable or steep slopes and the requirement that drainage patterns be maintained. This will not be accomplished with this road construction and harvesting proposal.

The proposed road is in violation of several sections in the TImber Harvest and Forest Road section(section 5(b),6, 7(e&d),8(d,e,f,h,) and 12.

COMMUNITY WATERSHED GUIDELINES

In the introduction to the British Columbia draft, "Community watershed Guidelines"(appendix IV), the following statement is given to guide the management of activities in watersheds, that are designated as community watersheds. "An ample supply of good quality water for domestic purposes is both desirable and essential for society. In British Columbia, this objective can be achieved by the protection of existing water resources (emphaSis added) as much good quality water is available throughout _ the province. If this statement is to mean anything then the water supplying domestic and community users will be protected. The McFayden Creek watershed is a deSignated community watershed and deserves the full protection of the guidelines. All the watersheds supplying Water User Communities(supplying 6 or more licensed water users) from sources on Perry Ridge would qualify for a Community Watershed designation and should be so deSignated.

In section 1.2 GOAL OF COMMUNITY WATERSHED GUIDELINES, the following statement is given, "The community watershed guidelines will recognize water quality, quantity and timing of flow as the principle values in community watersheds, and provide for their protection and enhancement by guiding and regulating resource management activities." In the steep, unstable landfonns at the headwaters of the watersheds draining off of Perry Ridge, it is impossible to construct roads and take out timber in the manner that is used in the surrounding drainages without having a large impact on the water quality, quantity, and timing of flow. This is due to the landform, aspect and steepness of the headwater basins.

IF THE COMMUNITY WATERSHED QUIDEUNES ARE TO MEAN ANYTHING TO THE RESIDENCE OF BRITISH COLUMBIA, THEN THE PROPOSALS TO CONSTRUCT ROADS AND REMOVE TIMBER FROM THESE FRAGILE WATERSHEDS WOULD BE PROHIBITED. IF THE PROPOSED ACTIVITY IS ALLOWED, THESE GUIDELINES ARE MEANINGLESS.

SUMMARY AND CONCLUSIONS

The top of McFayden Creek is a critical area for the production of water, unfortunately the main area of water production and the zone that needs the most protection is also the area of old growth that would be the most economic to log. The ridge on the southern side of McFayden Creek is steep off of the top with shallow soil on bedrock with some outcrops. The north side of McFayden is *very* steep with rock outcrops, there would be unacceptable resource damage for the amount of timber available. The road location proposed using the Todesco road could reach the top of the ridge but would have nowhere to go after the top is reached. This is a dead end proposal.

RECOMMENDATION: Do not enter the McFayden drainage, and fully protect the zone of water production in the elevation band 5375-5575 elevation. A road should not be attempted north on the ridge from this end due to the rock and steepness of slopes.

On the north end of Perry ridge there could probably be some access up to an elevation of about 4400 feet, If wet areas can be avoided and advanced road building techniques are applied. Based on observations, the engineering and construction techniques required to protect the surface hydrology have not been witnessed in any of the past logging activities in the Kootenay area of British Columbia. The assumption is that this knowledge is not available from the engineering firms and the construction techniques needed are not practiced. Unless a good road location is found that would not cause undue disruption of the soil water and surface flows the road should not proceed up Perry Ridge.

If a road location was found and construction proceeded there are sbll numerous wetlands and rock obstacles to construction in the area of 4400 to 5700 elevation. The headwater areas on the east side of tt)e ridge should be protected at all costs in order to protect the community water supplies and to protect the steep incised stream channels from blowing out. The description of McFayden Creek could be applied to all the other stream courses proceeding up the valley to the north. Any dear cutting or road construction on these slopes could trigger mass failures and damage to downstream water rights. Opening up these headwater areas to direct solar radiation would cause higher peak flows in the spring and lower summer flows, and would provide the energy to move larger sized and a higher volume of sediment, resulting in higher maintenance to water systems, and the loss of surface water during summer flows.

The goal of the Draft Integrated Watershed MaQagement Plan of *6123/92* states: "The number one priority is the protection of water quality, quantity, and timing of flow." However, The proposed road construction and dear cutting in the headwaters of streams supplying many water users will not accomplish this goal. The two are incompatible with the natural conditions present of steep slopes and an unstable geology.

RECOMMENDATION: Do not enter Perry Ridge with road construction, especially the • area above an elevation of 4400 feet. Any wetland, bog area, active stream course, and high elevation steep headwater landtypes should be avoided.