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Nov. 16, 2005

RE: West Side Cameron River Drainages – Cathedral Grove Fish Habitat Assessment.

Introduction

This report was written as a response to concerns over lack of fish habitat information on the plans for construction of highways and parking areas in Cathedral Grove Park. As a Biologist who has worked on assessment and restoration of stream habitats on Vancouver Island for 25 years, I have witnessed many negative environmental impacts to the Park and area drainages over the years. My level of concern has been raised ever since the early 1980's with the slides from the logged off east slope of the valley resulting in sediment loads, debris jams and flooding. This was followed by indiscriminate Highways work on the bridges, shoulders and riparian zone that damaged Park ecology. I was very concerned during these events and reported them on several occasions to authorities.

It was very alarming to observe construction begin in 2003 for a parking lot. I was concerned the area was not assessed for the very fish habitat I had spoke up for in the Highways projects. It has been my experience that before you can plan a development such as a parking lot that you have to cover off all the basic environmental aspects. If not, one could damage habitat and be breaking the law. Fortunately, the resulting protest stopped the construction crew long enough for myself, my employees, a band of volunteers, students and environmental guardians to establish some basic assessments. I am offering this information to the public and the Parks Branch.

It is the sincere desire of all whom participated in the survey that the information proves useful in protecting Cathedral Grove from environmental harm.

Methods

The objectives of the survey were to identify location and fish habitat usage of all the drainages in the west side of the Cameron River in the proposed parking areas. The lot areas have since been expanded, our area of survey was restricted to around Lots A, B & C. We had no map of the exact Lot areas and our references are to known points (Roads/trees) or with flags we hung in the field.

The work was completed over several months between site visits dependent on volunteer time. Richard Boyce, Kyrti Eno, Richard Clough, Brad Remillard and "Wolf" all helped. Many others may have been involved as I asked Park residents to assist by flagging water levels. Our main survey dates were Dec. 12, 2003, June 10, 2004, Jan. 20, 2005, Mar. 4 & 21 2005. We tried to survey following high flow events to identify channels but found some days too difficult to walk safely in the routes.

The Floodplain routes were inspected at high flow to determine direction some were flagged then and others were flagged as water dropped. We then conducted traverses of the main flood channels labeled A and B. We used a Suunto compass, clinometer and hipchain for the stream traverses. The stations were generally hung in Pink flagging tape in the centre of the channel at 5-25 m intervals. The data was then entered into RoadEng by Softree Inc, which is industry standard forestry engineering software. Other drainages we did not have time to traverse were walked, some measured with hipchain others measured from air photos. Habitat was assessed for fish usage and their entrance to the main traverse catchments recorded. We also photographed each reach and measured channel and wetted widths with a fibre or steel tape. An overlay map of the drainage routes was then created with a base image air photo provided by Chris Kissinger Parks BC.

Results

There are various channels draining through Cathedral Grove we identified in this report. All are within the proximity of the proposed lots A, B, and C on the south side of the park. They are described with their value as fish habitat.

Cameron River Watershed:

The Cameron River is the catchment of all drainages through the Park. Its headwaters drain Mt. Moriarty from Moriarty Lake (elev. 905m) approximately 30km downstream to Cameron Lake (elev. 186m). The Little Qualicum River begins at the Cameron Lake outlet. It is approximately 20 km to the ocean. It has a barrier falls 5 km below the Lake.

The Cameron River is habitat to Cutthroat, Rainbow and Brown Trout (Introduced species). Kokanee (Sockeye) are also landlocked in Cameron Lake and would use the river habitat for spawning and fry rearing. All the trout species may live year round in the Cameron River as it offers suitable rearing and spawning habitat. Below the Little Qualicum Falls are all seven species of salmonids native to B.C. The Little Qualicum Sidechannel and hatchery project site is located approximately 13 km downstream from the Lake.

The Cameron River splits in two perennial channels adjacent the Park east boundary. Upstream of the braided reaches it has a mean channel width of 21.5 m. Each braid is 10 to 20 m wide as well. The channel is flowing on a 3-5% gradient where it offers long riffles and short scour pools preferential to native trout species. Most of the bank riparian vegetation outside the Park has been historically logged. There were sites observed with erosion from weak banks due to loss of trees. It also appears to lack stable LWD in the channel. We observed few LWD in areas adjacent Lots A, B, C. The native trout of the system will occupy the existing LWD cover pools and feed over the entire wetted area.

Creek 1: The furthest south drainage we inspected. It comes from the west side mountains and drains across the Fibre Optic Line and Highway at the Logging Truck Sign on the south border of the Park. It has a defined channel above the highway, which is approximately 35m long before it encounters a 1.5 m barrier caused by erosion over a clay seam. Above the barrier the habitat has winter pools but is hummocky and disconnected at normal flow. Water sources are groundwater seepage and surface flow. Above the highway culvert the fish habitat is seasonal with several shallow pools and gravel riffles. The metal culvert is set at 1-2 % gradient and is fish passable. Below the culvert the channel is confined for approximately 30 m and then spreads over the organic forest floor with only swales of needles to determine flow direction. It is dry except for high flows and saturated water tables. The lack of a confined channel below the highway may be due to disturbance of the historic channel or poor location of the culvert. During floods the floodplain of Creek 1 below the highway is a wide band of water that spreads out to several channels. The water heads north to the logging road crossing and enters Floodplain A approximately 200 m downstream.

Creek 2: Located at the old south Park Entrance Sign, it has a perennial reach above the highway. This creek offers year round fish habitat for spawning and rearing above the highway. The reach offers approximately 200m of accessible fish habitat as it rises in gradient coming off drainages on the steep east mountain sides. The channel above the highway is a 2.2 m channel with a wetted width in summer of 1.0 m. It has a substrate of 90% gravel and 10 % fines in the riffles. The habitat includes deep scour pools created by LWD. The cool channel offers resident trout year round habitat and migrating fish feeding and/or spawning habitat. The highway culvert is an arch metal pipe that has suitable gradient for fish passage and discharge. It appears that the downstream reach has been disturbed. The channel is braided and loaded with sediment, possibly from Fibre Optic Line Construction. There is also evidence of an old logging road below the highway that may have diverted the creek. the creek skirts a more recent logging block (Lot B) where the remaining logging debris is evident in the channel. This logging debris (Branches and tops was observed throughout the clearing and blocking flow on two other overland channels to the south. This logging debris is creating additional flooding as it impedes drainage through the narrow openings below the Lot B logged area. Creek 2 then enters Floodplain A below the logging area. It falls on a seasonal channel that is low gradient and fish accessible from the Cameron River 1.8 km from the Highway.

Creek 3: This channel was discovered during winter runoff January 2005 when the under-capacity culvert allowed flooding over the highway. It is located just north of the logging road turnoff. The water is a combination of groundwater and surface water. The culvert may not be in the historic location. There was no defined channel on the upstream side yet there was considerable flow over the road in January 2005. This flow was backed up ion the high side of the highway in a 256m long band. It washed across the highway and carried road shoulder gravel with it into the forest. It then picked up the Creek 1 drainage from across the logging road and flowed across the Lot B area through two wide natural swales. As mentioned above, the logging debris in the swales is blocking and damming flow before it connects with Floodplain A. This channel is ephemeral in its present state. The channel is entirely on organic material. It would offer feeding access for fish as there are no barriers for fish. The channel has been disrupted by the roads, logging and culvert locations. It needs a larger culvert at the highway but also an analysis of its best location. Investigation into upland drainages may determine the best route for the new culvert. Currently this channel offers no fish habitat above the highway and seasonal winter-feeding access downstream.

Flood Channel A: The main catchment for all the drainages. It was surveyed March 4 and 10th, 2005. This channel originates above the logging road from groundwater sources. There are several pits from blowdown in the old logging block where at winter flows; the water emerges from the ground. The main channel then crosses the logging road approximately 289 m from the highway in a flowing band over 70m wide and 0.3m deep at flood flows. There is a 800mm metal culvert along the road. It is undersized and poorly located. The road ballast is acting as a barrier to flow to the North.

The water flow in this channel during floods is significant. We measured a cross section of uniform flow in a 8.4 m wide channel that is 0.2 - 0.8 m deep with approximately 1.0 CMS flow. The channel substrate is mainly organics and clays with many pieces of LWD lying across the channel and parallel. The canopy consisted of old growth Douglas Fir as well as understory Red Cedar, Hemlock and Balsam.

Walking downstream 160 m (DRC Stn 12) we encountered a channel on river left that drains Creek 2 and 3. This channel is adjacent Lot B and drains several smaller winter flow channels from the Lot B area to the west and drainages from the logging road further south.

The channel is adjacent or in the approach road and parking areas for proposed Lots A, B and C. It gets very wide through its mid section and has winter wetted off-channel areas that spread to the east and west towards into the proposed parking Lot areas. Additionally, many small feeder flows originate in the Parking Lot areas. We flagged several water sources originating from the Lot areas.

The Flood Channel A location traverse with a compass ended at 816m, which we assumed was outside the Parking Lot areas. We continued downstream on the channel with a hipchain and measured 1746m to the pedestrian footbridge in Cathedral Gove Park. The Cameron River was approximately 150 m further downstream.

The channel was an average of 10.0 m wide at winter wetted width. The wetted area of the runs and glides may vary with rain events but the pools are wetted through the Fall rains to late Spring. There were small scour pockets of gravel occasionally (i.e. DRC Stn 22 at 397 m) that may offer spawning habitat. The gradient was 0-3% and there were no barriers to fish. The seasonal pools, plentiful log and vegetated cover, high organic inputs all create conditions that offer fish good winter rearing habitat for feeding or flood sanctuary from the mainstem Cameron River.

Flood Channel B: This channel is situated in Parking Lot C vicinity. It originates near the North end of Parking Lots A and C. The survey was conducted March 21, 2005. There had been no recent rains and flow was intermittent between some sections. The evidence of higher flow through flood debris and bent over vegetation was evident. The Channel originates from water table seepage from several sources in the second growth forest area. In floods (Jan. 20/05) we found a wetted channel from 1.0 m to 5.0 m wide. There were no fish barriers encountered. As we walked downstream the flood width increased to 8-10 m wide and in some cases it split into two or more channels. It drains north 323m to

meet Flood Channel A at station 40 at 601m. The proposed foot trail may cross this channel near station 8 109m from our start. This area consists of several channels of floodwater that head north east across the walkway route.

Other Flood Channels: The Lot C/A area is especially abundant with emergent groundwater that collects into surface flowing channels. We flagged but did not have time to measure channels D and E to the east of channel B. This water flows to the north as well. They were more hummocky and less likely to have fish access.

Table 1. Creek Summary – Flow and Habitat

Creek Name	Flow Characteristics (Ephemeral, Seasonal, Perennial)	Fish Habitat Usage (Spawning, rearing, winter feeding)
1	Above Hwy - Ephemeral Below Highway - Seasonal	No Fish habitat Winter Feeding
2	Reach 2 (above Hwy) - Perennial Reach 1 (below Hwy) - Seasonal	Spawning & Rearing Seasonal feeding/spawning
3	Entire Length – Seasonal	Winter feeding
FC A	Seasonal	Winter Feeding & potential spawning habitat.
FC B	Seasonal	Winter Feeding
FC D	Ephemeral	Not determined
FC E	Ephemeral	Not determined

Discussion:

SURVEY OMISSIONS: This was not a complete survey using all biological methods or covered the entire Park area. The methods were at a reconnaissance level for habitat inventory in the west side area of the proposed parking lots.

1. A discrete habitat survey such as the BC Environment Urban Salmon Habitat Program (USHP) Survey should be done. This will allow parks staff a comparative analysis of each streams health within the Park as well as compared to other Vancouver Island Streams.
2. Additional stream channel mapping is recommended as there are so many areas of emergent groundwater becoming surface flow.
3. Fish frequency of use and species data should be collected for the river and channels through minnow trapping, swim surveys or electroshocking.
4. Water quality analysis (temperature, Ph, Oxygen, minerals, PAH) needs to be done for background levels before development and to determine current habitat quality. All the drainage channels in the Park need to be mapped.

This work was partially done by the author and others it needs to be finished. Identification of the resource is the foundation for management. I am sure if Park staff lack the funds for their own surveys that Colleges, Universities or Streamkeepers organizations would be interested in data collection exercises. It is an opportunity for the Park to form a partnership with individuals or organizations interested in the well being of the Park.

FISH HABITAT IMPROVEMENT: The park streams have been damaged through alteration by man through the years. There are restoration methods available that offer enhancement of the park ecology in stream areas.

1. There is a perennial reach in Creek 1 above the highway. It is disconnected from lower habitat by braiding and debris jams in the 150 m below the highway and adjacent the old clearcut patch. These areas were damaged by historic logging debris buildup and sediment buildup (Highways grading and possibly fibre optic line construction). The channel would benefit from a stream habitat restoration crew to restructure some of the debris jams to encourage channel confinement and fish access while reducing erosion.
2. The upper reaches of Creek 1 are also braiding due to old growth blowdown. Assessment of restoration action where the channel may blow out and run overland should be done. The

current highway culvert is a continual sediment source from grading and runoff, it needs a more protective apron and sediment traps from ditch lines.

3. The Cameron River is relatively devoid of LWD except in large debris jam clusters widely spaced apart along the river. This is due to the volatile channel and historic logging of the riparian zone and upland slides. The LWD has been washed out along with the channel banks. The overly wide river channel results in the failure of remaining old growth LWD inputs being unable to "stick" to banks and they wash downstream. An assessment should be done on the current jams as well as the need for additional material in deficient or eroding areas. These structures are already in place in the lower river.

NON-FISH SPECIES: It is important to stress the non-fish values of these streams – insects, birds, amphibians and mammals. All these flowing channels offer the most basic need for life – water. In each case, depending on the longevity of the flow, the more aquatic is the drainage ecology. Insects move in quickly taking advantage of organic detritus or algae food sources. They are followed by amphibians such as Frogs (Red Legged & Tree) and Salamanders (Red Backed, Northwestern, Long Toed, Clouded) that can opportunistically take advantage of the water presence to incubate their eggs in late winter/early spring before it dries. These creatures all attract mammals from Shrews, Mink and Bear to take advantage of food offered in or near the aquatic habitats. The bird species such as Kingfisher, Great Blue Heron and Dipper are some of the more frequent water birds in the drainage area.

Wildlife road kill will increase proportionate to the increase in road areas and their frequency of use only diminished as wildlife is killed off. It is of great concern that there are no wildlife crossings employed. The replacement by Highways in 2004 of wildflowers with grass on the shoulders will create a concern about wildlife grazing next to the highway. There are few and poorly designed culverts that cross the highway. They do not allow full use for wildlife. It is unfortunate highways was able to pass through last year without any obligation to offer increased wildlife protection. The road kill susceptible species are likely already depressed from years of impacts. The amphibians are especially road kill vulnerable due to the abundant habitat for reproduction on one side of the road and food on the other combined with their high exposure time on roads. I observed hundreds of amphibians killed at Hamilton Marsh in the spring of the year the highway bypass opened, and then very few after that – most of the migrating population had been killed.

1. More crossings need to be installed for drainage and wildlife passage. They should be placed in the low swales most amphibians would use. Some form of diversion to the culverts in the form of fencing or natural logs may be employed. There are examples on the Vancouver Island Highway near Courtenay.
2. Large wildlife – Bears, Deer, Elk are vulnerable and should be protected with barriers, crossings and signage. A bridge or underpass would be best as long as there is through traffic.
3. At the very least wildlife crossing signs and should be placed at potential sites in the park and inform visitors in the park as well to be mindful of crossings, feeding and disturbance.

HIGHWAYS: The roughshod environmental practices of the highway crews need to be prevented in the future. The latest (2004) road-widening project resulted in many concerns. There were no Environmentally Sensitive Areas flagged to identify streams or river areas. I had to do this myself as well as notify the highways contractors there were streams on the job site. The construction areas were dirty with many releases of sediments into the river and creek channels during non "fish window" periods. (I have many photographs.) There was bark damage on old growth trees by the widening process. They scraped up all the wild flowers along the road edge (Trilliums, Lilies, Vanilla Leaf) and replaced it with a shoulder gravel mix and various non-native grasses, which will attract grazing wildlife (Bears, Deer) and increase road kill/human interaction issues. The highways crew blasted 100m of the riparian zone of the Cameron River just above the Park border at the Hump and replaced it with a rock pile with no mitigation. It appeared that neither Parks nor Environment staff were consulted on the plan. The Environment staff attended only after my concerns and by then it was too late. The damage needs to be addressed and the expectation can be of more of the same in the future.

The lack of foresight by highways on drainage issues across the highway has been their biggest fault. In January 2005, the road flooded across a 256m width while backing up on the west side into the old growth forest to a depth of 3m. The increased pavement thickness has only made the height and area of flooding worse. The overflow escaped the plugged undersize culverts and scoured the forest floor, disturbing many normally dry areas. The recently dumped road shoulder material was washed through the forest. The back- flooding by the Highway will kill the Douglas Fir trees if it hasn't already. The misdirection of the culvert placements has resulted in new channels and loss of historic channels on the downstream side of the highway. This particular situation has direct issues with parking lot locations on the river side of the highway. The floodwaters run across the entire area below the highway with no confinement, much of this is the fault of highways not locating suitably sized culverts at historical locations. There may also be upland disturbance of historical drainages by the Cable and Gas Right of Ways as well as the logging road. These routes cross the hill perpendicular to the grade and may be re-routing surface and subsurface water flow.

1. Installation of more and larger culverts at appropriate historical drainage sites to eliminate backwatering (to be done in summer).
2. Replacement of introduced grasses on shoulder with native plants.
3. Assess and mitigate the lost riparian zone from blasting damage upstream adjacent the "Hump" corner.
4. Improved sediment control at creek crossings – repair headwalls and add sumps. Inspect for additional drainage turnouts.
5. Road Grading and ditching operation limitations respecting sensitive trees, plants and drainages – summer only.
6. Stream signs at crossings to identify for maintenance contractors where to avoid disturbance.

LOGGING: The logging roads at the south side of the park next to proposed Lots A, B and C, were examined during several flood events in 2004/2005. These roads are filled with ballast material above the historic fall of the land, only a few small culverts were installed that only drain a fraction of the water at high flow. The road is awash during floods approximately 100m wide and 0.3m deep.

Upstream, there is logging of the old growth in the riparian zone of the Cameron River. This may result in a destabilizing influence on the river channel. The effects of riparian logging could be loss of stable LWD, increased water temperature, increased evaporative losses, soil erosion and blowdown of subdominant trees. The soil loss and subdominant trees entering the river are the biggest concerns. The channel could build up (aggraded) in sediments or the smaller LWD debris drift into oversize clusters that create new channels that could blow out the parking areas and forest. I have worked in many debris jam laden rivers. The input rate, size and function of LWD are adversely affected by logging in the riparian zone, which invariably affects downstream habitat.

1. The roads act as dams preventing natural flow of floodplain waters back to the river. The park logging roads should be deactivated back to the native relief and all culverts removed.
2. The access route to Lots A, B & C as described above is not an environmentally friendly option as it crosses the floodplain flow.
3. Parks needs to establish a no logging buffer zone along the river with their neighbours and discuss ecological integrity protection through reserves or more land purchases.

Conclusions:

It was the hope of all whom participated that this information would bring to light the important fisheries environmental issues surrounding the Cathedral Grove Park. We tried to bring as much data to bear as we could with limited time and resources.

This area is a massive floodplain of fish accessible habitat. It is highly sensitive to alteration through roads, logging or trails. It should not be further developed and needs restoration of existing works if it is to continue to support fish habitat within the ecosystem that they require.

Dave Clough, RPBio
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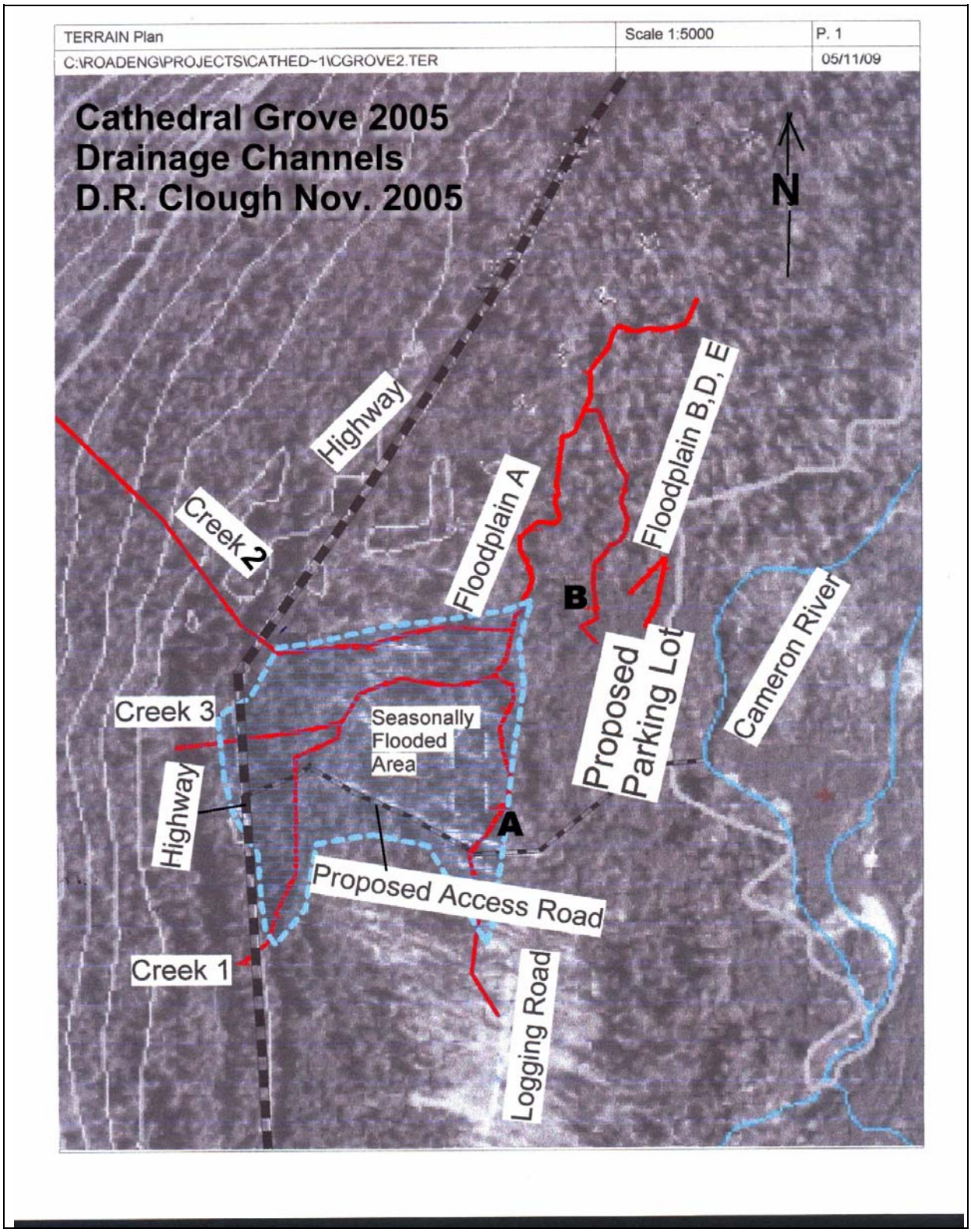
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05/11/09
Cathedral Grove 2005
Drainage Channels
D.R. Clough Nov. 2005
N
Highway
Creek 2
Floodplain A
Floodplain B,D, E
B
Proposed Parking Lot
Cameron River
Creek 3
Seasonally Flooded Area
Highway
A
Proposed Access Road
Creek 1
Logging Road

Cathedral Grove Fish Habitat -DRC Nov. 2005
Photo Page 1

1.) Creek 2 above Highway

3.) Floodchannel A just below Logging Rd

2.) Creek 1 above Highway

4.) Floodchannel B near origin.