2001 Interior Watershed Assessment Update

for the

LAMBLY CREEK WATERSHED

(Penticton Forest District)

Prepared for
Riverside Forest Products Ltd. and the
Small Business Forest Enterprise Program (Penticton)

By

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Engineering Ltd.

December 2001

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2001 Interior Watershed Assessment Update
for the
LAMBLY CREEK WATERSHED

December 11, 2001

1.0 INTRODUCTION

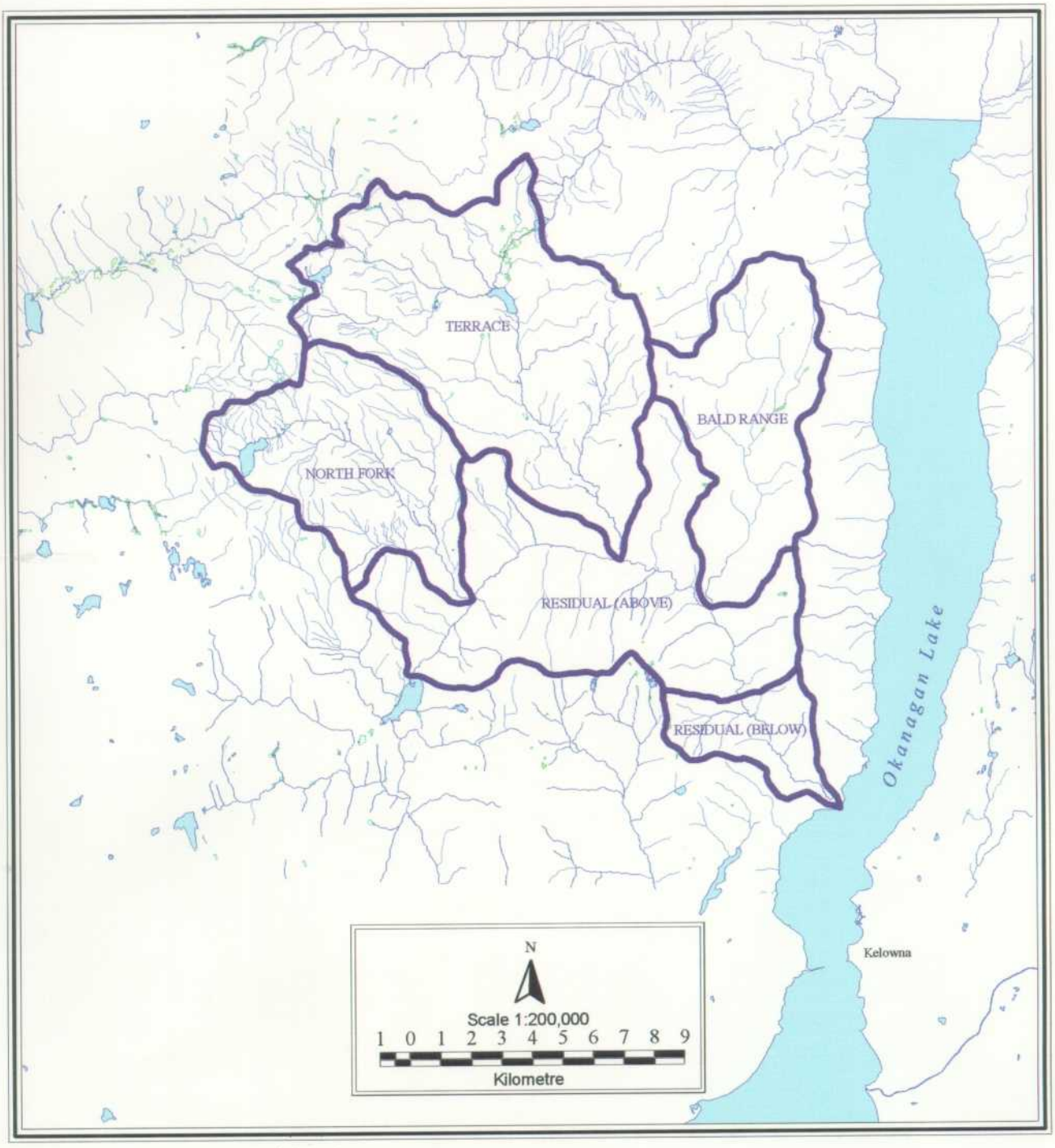
As requested by Riverside Forest Products Ltd., Kelowna Division (Riverside), and the Small Business Forest Enterprise Program (Penticton) (the licensees), the Interior Watershed Assessment Procedure (IWAP) for the Lambly Creek watershed has been updated from the November 1998 report to 2001. The IWAP update includes a summary of the 1998 IWAP, an office review of work completed since 1998, field assessments of selected sites in the watershed, and recommendations for the development proposed in the forest development plan (FDP) update for the period of 2002 to 2006. The current assessment was conducted in accordance with the requirements of the Okanagan-Shuswap Land and Resource Management Plan (LRMP) (refer to Appendix A for details).

The objectives of the report are as follows:

- Address the issues identified by the Watershed Assessment Committee (WAC) at the May 16, 2001 initial IWAP meeting.
- Present the current condition of the watershed based on the field assessments conducted in September 2001.
- Review the current five-year FDP (2002-2006) in relation to the current watershed condition.
- Discuss the potential hydrologic effects of the proposed development and provide recommendations.
- Comply with the requirements of the Forest Practices Code Operational Planning Regulation that watershed assessments must be completed for community watersheds every three years and prior to submitting an FDP.

The Lambly Creek community watershed drains southeast into Okanagan Lake at Bear Creek Provincial Park near Kelowna, BC (Figure 1). The watershed encompasses an area of approximately 244km^2 ranging from 342m at Okanagan Lake to over 1,800m at the summit of Whiterocks Mountain. Forest development in the watershed has taken place since approximately the mid-1960s. Early harvesting efforts were directed towards the control of mountain pine beetle infestations. Clearcutting has been the dominant silvicultural system.

Figure1
Location and Sub-basins of the Lambly Creek Watershed



2.0 Methods

This IWAP report updates the results of the 1998 IWAP report and provides a summary of the pertinent background information. Some of the hazard ratings reported in this update report vary from those reported in the 1998 report because the methodology of the assessment has changed. The current IWAP procedure utilizes the April 1999 Interior Watershed Assessment Procedure Guidebook, which is based primarily on professional judgement and field investigations with office analyses as supporting information; whereas, the 1998 IWAP report was based primarily on results from office analyses with limited field investigations. The change in the assessment procedure results in the hazard ratings reflecting the actual field conditions rather than the results of an office-based numerical analysis.

To initiate the IWAP process, an initial round table meeting was held with the members of the WAC on May 16, 2001. At the initial WAC meeting, the 1998 IWAP report was reviewed and current water-related concerns for the Lambly Creek Watershed were discussed (refer to Appendix B for initial meeting minutes). To finalize the IWAP process, a final round table meeting was held with the members of the WAC on December 13, 2001. The findings of the 2001 Lambly Creek IWAP draft report were presented and the report recommendations were discussed (refer to Appendix B for final meeting minutes).

3.0 KEY WATERSHED ASSESSMENT ISSUES

At the May 16, 2001 WAC meeting, the following outstanding issues were identified:

- Conduct a modified reconnaissance channel assessment procedure (Re-CAP) on the watershed and sub-basin mainstem channels downstream from recent and proposed development.
  Status—Addressed in section 5.5 and Appendix E.

- Determine the costs to re-establish non-active hydrometric stations.
  Status—Addressed in section 4.2.

- Summarize the water quality monitoring objectives completed in the spring of 2001.
  Status—Addressed in section 4.3 and Appendix D.

4.0 BACKGROUND INFORMATION

4.1 Summary of the 1998 IWAP Conditions

The following is a summary of the 1998 IWAP conclusions:

- The Lambly Creek watershed is in good overall condition. Stream channels are stable and robust to increases in peak flows.

- The roads are in good condition, but surface erosion is a concern based upon the high density of roads throughout the watershed.

- Riparian vegetation has been extensively harvested, but has had limited impact on channel stability. Fish habitat may have been impacted in some of the tributary channels due to a reduction in large woody debris and shade cover.

- Five landslides have occurred, but stream channels have not been substantially impacted.

- The proposed forest development is a low concern for watershed impacts.

- Surface erosion is a low concern with the proposed development, but roads should be maintained or promptly deactivated following harvesting.

- Peak flow and channel stability impacts is a low concern with the proposed development based on the stable, robust channels and the reduction in spring freshet peak flows created by the diversion and storage of water at Tadpole Lake.

- The proposed development should have minimal impacts on riparian conditions provided that appropriate riparian management strategies are followed.

- The proposed development should not increase the frequency of landslides since the majority of development is not proposed on unstable terrain.

A summary of the overall hazard ratings for 1998 is presented in Table 1. The 1998 watershed report card is presented in Appendix C.

TABLE 1
1998 Hazard Ratings for the Lambly Creek Watershed.

Drainage	HAZARD CATEGORY				
	Peak Flows*	Surface Erosion	Landslides	Riparian	Channel Stability*
North Fork	Moderate	High	Low	High	Moderate
Terrace	Moderate	High	Low	High	Moderate
Bald Range	Moderate	High	Low	High	Moderate
POI 2**	Moderate	High	Low	High	Moderate
POI 1**	Moderate	High	Low	High	Moderate

* The hazard category was "Peak Flows and Stream Channels" in the 1998 IWAP.
** POI 1 is at the confluence with Okanagan Lake. POI 2 is at the LID intake.

4.2 Status of the 1998 IWAP Recommendations

The following list presents the recommendations from the 1998 IWAP and the current status of each:

- *Recommendation 1*—Following the completion of the proposed development, roads associated with the cutting permits should be deactivated or maintained to a level appropriate with their anticipated future use. Natural drainage should be maintained or restored within all blocks and on access roads.
  Status—Forest Practices Code requirement.

- *Recommendation 2*—Riparian management strategies should be developed to protect streambank stability, fish, and fish habitat. Particular attention should be focused on those areas logged adjacent to streams to determine the state of streamside conifer regeneration.
  Status—Ministry of Environment (pre-June 2001) and licensees plan to develop site specific requirements. Riverside is currently completing the first phase of a results-based riparian management strategy.

- *Recommendation 3*—Inactive roads at stream crossings should be deactivated or maintained to minimize the delivery of sediment into streams. One year after deactivation, these roads should be inspected to determine the effectiveness of deactivation measures. For those roads that may be maintained, periodic monitoring should be scheduled based upon potential risks of the delivery of sediment to streams.
  Status—All high priority sites on status and non-status roads that were noted in the 1997 Sediment Source Survey completed by Dobson Engineering Ltd. have been addressed through the Forest Renewal BC funding program. For maintained roads (i.e. permit roads), road maintenance is required by the Forest Practices Code.

- *Recommendation 4*—Permanent channel monitoring sites should be established within the mainstem of Lambly Creek and the three major tributaries to provide information with regards to channel stability.
  Status—No channel monitoring sites have been established in Lambly Creek watershed due to funding limitations and priorities in other watersheds.

- *Recommendation 5*—A combined long-term FDP should be developed for the watershed that incorporates the results of the Complan work developed by Riverside along with the portion of the watershed that is outside of the TFL, which includes the Small Businesses Forest Enterprise Program operating area.
  Status—Completed.

- *Recommendation 6*—The recently decommissioned hydrometric station located on Lambly Creek above Terrace Creek should be reactivated to provide a long-term

streamflow record that could assist in making future forest development decisions in the Lambly Creek watershed and nearby watersheds.
Status—The hydrometric station on Lambly Creek has not been reactivated. The cost to re-activate the station is approximately $15,000 and the cost to operate the station is approximately $8,000/year. The cost to re-activate other hydrometric stations in the watershed would be between $5,000 to $15,000 per station depending on the condition of the weir and bridge at each site.

- *Recommendation 7*—The long-term sustainable level of harvest and associated ECAs for the watershed should be based on information collected from the channel monitoring sites, streamflow information, and the long-term FDP (e.g. Complan) to ensure that stream channel stability and water quality are protected.
Status—A long-term sustainable timber harvest plan is being developed as part of the TFL 49 results-based code project currently underway.

4.3 Water Quality Assessments

A report titled, *Water Quality Assessment and Objectives for Lambly Creek Community Watershed,* was completed by Mould Engineering in April 2001 for the BC Environment and Riverside. The report summarized the results from samples taken at a continuous monitoring station established above the Lakeview Irrigation District (LID) between December 1996 and December 1999, and from three additional sampling sites in the watershed where grab samples were collected for laboratory analyses between 1972 and November 1999.

The report concluded that the most sensitive water use in the Lambly Creek watershed was the potable water supply. Forest harvesting and cattle grazing were identified as the two activities that have the greatest potential to impact the water quality in the watershed. Water quality objectives for turbidity, non-filterable residue, stream temperature, true color, fecal coliform, and *E. coli* bacteria are summarized in Appendix D. Water quality objectives were not established for nitrate/nitrite, dissolved oxygen, pH, metals, total phosphorus, specific conductance, and total dissolved solids. The report recommended establishing a monitoring program for continuous sampling at two sites within the watershed and collection of grab samples at various frequencies at several sites in the watershed.

In the fall of 2000, Riverside assumed operation of the water quality station at the LID intake as part of the TFL 49 project. It is the intention of Riverside to continue with the monitoring program for at least four more years, if funding is available.

5.0 CURRENT WATERSHED CONDITION

The current watershed report card for the Lambly Creek watershed is presented in Appendix C. The 2001 report card includes all forest development completed up to and including January 1, 2001. A modified channel assessment was completed at the sites assessed in the 1998 IWAP, as well as downstream from recent and proposed development. The detailed results of the

assessment are presented in Appendix E and the maps are in Appendix F. In the current assessment (2001), some of the hazard ratings are lower than those reported in the 1998 IWAP report due to changes in the assessment procedure, as explained in the Methods section (section 2.0).

5.1 Peak Flows

The current peak flow hazard ratings are low for the Terrace Creek and Bald Range Creek sub-basins and for the entire Lambly Creek watershed (previously rated as moderate). The peak flow hazard rating is maintained at moderate for the North Fork sub-basin.

Substantial hydrologic recovery has occurred in the Lambly Creek watershed since the 1998 IWAP with a decrease in ECA of 5.5% (refer to Appendix C to review the 1998 and 2001 ECAs). The ECAs for the Bald Range Creek sub-basin and the entire watershed are currently low at 17.7% and 23.8%, respectively, and moderate for the Terrace Creek sub-basin at 34.7% (Table 2). As in 1998, peak flow related disturbance was not observed in any of the mainstem channels within these basins. The mainstem channels are mainly boulder/cobble dominated and, therefore, are robust to potential impacts from increases in peak flows. In addition, based on the analysis presented in the 1998 IWAP report, reservoirs in the watershed may act to reduce peak flows through water storage; thereby, the potential for peak flow impacts may be reduced. Minor peak flow impacts were observed in Lean-To Creek (sites O and P), but the associated influence on Terrace Creek is negligible. The stable conditions of the Bald Range, Terrace, and Lambly Creeks warrant low peak flow hazard ratings for the corresponding basins.

The ECA and road density for the North Fork sub-basin are high at 40.5% and 3.2km/km^2, respectively. Minor peak flow impacts were observed in the middle portion of North Lambly Creek (site K) warranting a moderate peak flow hazard rating.

TABLE 3
Current and Proposed ECAs for the Lambly Creek Watershed.

Drainage	Equivalent Clearcut Area (%)	
	Current (January 1/2001)	Proposed (2006)
North Fork	40.5	39.8
Terrace	34.7	31.4
Bald Range	17.7	21.4
POI 2	26.9	26.5
POI 1	23.8	23.4

5.2 Surface Erosion

The surface erosion hazard ratings are low for all of the sub-basins and the entire Lambly Creek watershed (previously rated as high). The subgrade materials for many of the roads in the watershed are rated as moderately to highly erodable; however, the roads are well maintained and stable, and most of the eroded surfaces are disconnected from the channel system. Since 1998, remedial work has been completed at all of the high priority sediment source sites to curtail surface erosion. All of the deactivated roads and restoration works reviewed during the field investigations are stable and effective at reducing erosion. The reduction in surface erosion related to the recent road deactivation and restoration activities, along with the change in the assessment procedure (section 2.0), warrants decreasing the surface erosion hazard ratings for the sub-basins and the entire watershed to low.

Cattle activity around channel crossings has resulted in the delivery of sediment to channels. The impacts are generally localized and minor, but chronic. The only notable sediment point source is the landslide adjacent to the North Lambly Creek (site J). Soil is exposed on the slide and the surface is poorly vegetated. The slide continues to erode, but the amount of sediment delivered to the channel is small and likely does not significantly impact the water quality.

5.3 Landslides

The landslide hazard ratings remain low for all of the sub-basins and the entire Lambly Creek watershed. A total of seven landslides have been identified. Five were noted in the 1998 IWAP report and two new failures have occurred. A group of slope failures (recorded and mapped as one failure) initiated in 1999 to the west of Terrace Creek near the confluence with Lean-to Creek. The 1999 failures initiated primarily due to increased hydrostatic pressures on the slope related to a beaver pond, not forest development. A stability assessment was conducted and indicated that the group of failures did not impact Terrace Creek. The second recent failure is the previously mentioned failure that is adjacent to North Lambly Creek. These failures and the previously reviewed failures are not significantly impacting the overall hydrologic condition of the watershed.

5.4 Riparian

The riparian hazard ratings are reduced to low for all of the sub-basins and the entire watershed. The hazard ratings were previously established as high based on the extensive amount of past riparian harvesting adjacent to fish bearing streams. Besides the additional growth of the regenerated riparian vegetation, the riparian condition is generally the same as in 1998. However, with the change in the assessment procedure (section 2.0), low riparian hazard ratings are warranted as they more adequately reflect the limited influence of the riparian harvesting on channel stability.

5.5 Channel Stability

The channel stability hazard ratings are low for the Terrace Creek and Bald Range Creek sub-basins and for the entire watershed (previously rated as moderate). The channel stability hazard rating remains moderate for the North Fork sub-basin.

Most of the major tributaries to Lambly Creek, as well as Lambly Creek mainstem, are stable with negligible channel disturbance. The condition of the channels is similar to that in 1998; however, low channel stability hazard ratings are warranted for Terrace and Bald Range Creeks and for the entire watershed based on the change in the assessment procedure (section 2.0) and the fact that low hazard ratings more adequately reflect the actual field condition. Bald Range Creek is moderately aggraded at the Bear FSR crossing (site C). The sediment may be remnant from surface erosion prior to the restoration of the road crossing, from the adjacent recreation site, or from upstream erosion. The source of the sediment is unclear, as existing sediment point sources were not identified. It is likely that the channel aggradation is related to a reduction in stream gradient slightly upstream. The overall impacts on the watershed condition are negligible.

North Lambly Creek is slightly degraded with disturbed stone lines. Some of the disturbance is associated with past stream cleaning in the middle reaches, but is also related to increased peak flows. The extent of channel disturbance warrants a moderate hazard rating.

5.6 Grazing Impacts

Cattle are present in the watershed and contribute to channel disturbance in those areas where they congregate for water. Repeated movement in and out of the channels, along with grazing of the riparian vegetation, leads to destabilization of the banks and an influx of sediment to the channel system. The cattle activity often occurs in the same locations year after year.

5.7 Hazard Ratings

A summary of the overall hazard ratings is presented in Table 3 below:

TABLE 3
2001 Hazard Ratings for the Lambly Creek Watershed.

Drainage	HAZARD CATEGORY				
	Peak Flows	Surface Erosion	Landslides	Riparian	Channel Stability
North Fork	Moderate	Low	Low	Low	Moderate
Terrace	Low	Low	Low	Low	Low
Bald Range	Low	Low	Low	Low	Low
POI 2	Low	Low	Low	Low	Low
POI 1	Low	Low	Low	Low	Low

6.0 ASSESSMENT OF PROPOSED FOREST DEVELOPMENT

A total of 1,305.6ha of timber are proposed for harvest in the Lambly Creek watershed during the period of 2001 to 2006 representing 4.7% of the watershed area. The blocks are dispersed between all of the sub-basins and the residual area with a greater concentration of harvest in the Bald Range Creek sub-basin. The watershed report card incorporating the development proposed to 2006 is presented in Appendix C.

6.1 Peak Flows

The proposed development will increase the ECA for the Bald Range Creek sub-basin to 21.4% by the end of 2006 (Table 2). The ECA level is low and detectable increases in peak flows are not expected to occur. In addition, Bald Range Creek is stable and it is unlikely that potential minor increases in peak flows would significantly impact the overall hydrologic condition of the sub-basin.

For the North Fork and Terrace Creek sub-basins, the ECAs will decrease to 39.8% and 31.4%, respectively. For the entire watershed, the ECA will decrease to 23.4%. Decreasing ECAs indicate that hydrologic recovery is occurring; therefore, it is highly unlikely that the proposed development will increase peak flows in these sub-basins or the entire watershed. The peak flow hazard ratings for all of the sub-basins and the entire Lambly Creek watershed should remain the same.

6.2 Surface Erosion

With the abundance of restoration work that has been completed in the Lambly Creek watershed and with the current conditions of the roads, the surface erosion concerns are currently minimal. It is expected that the forest development proposed for the watershed should not increase the surface erosion hazard ratings for the entire watershed and the sub-basins, as long as the cumulative impacts from roads are limited by road

construction, deactivation, and maintenance procedures consistent with the Forest Practices Code.

6.3 Landslides

Four blocks proposed in the Bald Range Creek sub-basin and one block in the residual area above the intake are located on terrain mapped as potentially unstable or unstable. Terrain stability field assessments (TSFA) are required for these blocks. Provided that the proposed development does not increase the likelihood of landslides, the landslide hazard ratings for the entire watershed and the sub-basins are expected to remain low.

6.4 Channel Stability

Most of the channels in the Lambly Creek watershed are stable and should not be impacted by the proposed forest development. The section of Bald Range Creek in the vicinity of the Bear FSR crossing is aggraded, but provided peak flows do not significantly increase in the Bald Range Creek, the channel stability hazard rating for the Bald Range Creek sub-basin should remain low. For the remaining sub-basins and the entire watershed, the channel stability hazard ratings should not change provided peak flows do not significantly increase.

7.0 CONCLUSIONS

The following conclusions were determined for the current condition of the Lambly Creek watershed and for the proposed forest development:

- The Lambly Creek watershed is considered to be in good overall condition.
- North Lambly Creek is slightly disturbed due to past stream cleaning in the middle reaches and likely due to increased peak flows, which is a moderate concern. Bald Range Creek is moderately aggraded at the Bear FSR crossing due to a reduction in stream gradient. Otherwise, the channels are generally stable.
- Surface erosion is a low concern since the roads are generally well maintained and the recent watershed restoration activities have been effective at reducing surface erosion.
- A landslide adjacent to North Lambly Creek continues to erode, but it appears that the amount of sediment delivered to the channel is small and likely insignificant.
- Landslides and riparian areas are generally low hydrologic concerns.
- The proposed forest development is generally a low concern for peak flow, surface erosion, landslide, and channel stability impacts to the watershed.

8.0 RECOMMENDATIONS

Forest Development Plan (FDP) Related Issues

- The ECA for the North Fork sub-basin should not be increased in the future unless a detailed channel assessment confirms that it is appropriate to do so.

- Deactivate or maintain inactive permitted roads in accordance with the Forest Practices Code.

Non-FDP Issues

- Address the remaining high priority sediment sources on non-status roads as identified in the 1997 Sediment Source Survey (if funding is available).

- Establish permanent channel monitoring sites on Lambly Creek and on North Lambly Creek as a first priority and the two other major tributaries as a second priority (if funding is available).

- Establish a permanent channel monitoring photo site on the aggraded section of Bald Range Creek (if funding is available).

- Reactivate the hydrometric station located on Lambly Creek above Terrace Creek to provide information for forest development and watershed planning (if funding is available).

R.S. Smith, FIT, Project Hydrologist

D.A. Dobson, P. Eng., Senior Reviewer

RS/dd/fw

APPENDICES

APPENDIX A

Okanagan-Shuswap LRMP

Okanagan Shuswap LRMP

WATER 3-26

Table 2 Attributes Addressed in the Lambly Creek IWAP Update

The following text is a presentation of the issues addressed in the current IWAP as they relate to the requirements presented in Table 2 of the Water sub-section within the General Resource Management section of the Okanagan-Shuswap LRMP.

1) Sediment

Suspended solids or non-filterable residue (NFR) data are available for Lambly Creek watershed for the period 1996-1999. There is no guideline for NFR for potable water; however, there are guidelines for aquatic life (25 mg/L) and for wildlife (20 mg/L). The median value for NFR at the LID intake is <5 mg/L and the maximum value is 127 mg/L.

Turbidity data are also available for Lambly Creek. The acceptable turbidity level for raw drinking water that is to be chlorinated is ≤ 5 NTU. The guideline for aquatic life is 8 NTU. The Water Quality Branch has established "clear flow" and "turbid flow" periods for interior streams. For Lambly Creek, the clear flow period is June 16-March 14 and the turbid flow period is March 15-June 15. For the period 1996-1999, the turbidity values for Lambly Creek at the LID Diversion are as follows:

- Clear Flow: mean (NTU) = 0.64, max (NTU) = 3.0 (88 samples)
- Turbid Flow: mean (NTU) = 4.57, max (NTU) = 24 (37 samples)

For an interior stream, these are unusually low values indicating good water quality. It is likely that the suspended sediment concentrations would be similarly low and would be consistent with the following criteria:

- Waters with <25 mg/SS/L should support excellent fisheries; however, the best trout streams are characterized by clear water with <5 mg SS/L for most of the hydrological cycle.

2) Peak Flows

The peak flow hazard rating for the watershed with regards to forest development is low. Based on the channel conditions and the ECA for the entire watershed, the current and proposed development should achieve the following criteria:

- Maintain the hydrograph peak flow and return periods within the range of the downstream-evolved natural channel capacity.
- Maintain the timing of the rising and falling limbs and the base flow components of the hydrograph within the normal range.

Peak Flows

Drainage	HAZARD CATEGORY	ECA (%)	
	Peak Flows	Current (January 1/2001)	Proposed (2006)
North Fork	Moderate	40.5	39.8
Terrace	Low	34.7	31.4
Bald Range	Low	17.7	21.4
POI 2 (LID intake)	Low	26.9	26.5
POI 1(Okanagan Lake)	Low	23.8	23.4

3) Riparian

The riparian hazard ratings, considering proposed development, are low for all sub-basins and the watershed. Although there has been riparian harvesting in the past, regeneration is occurring and the channels are generally stable.

4) Channel Assessments

The channel stability hazard ratings, considering forest development, are low for all sub-basins and the entire watershed. The only exception is the North Fork sub-basin, which is rated as moderate. It is expected that the development proposed for the North Fork sub-basin will not exacerbate the existing channel instabilities.

5) Other attributes concerning water quality for human consumption

- **Coliform:** For raw, untreated water, the Water Quality Guidelines recommend a 90th percentile of 10 CFU/100ml (based on a minimum of 10 samples collected over a 30-day period). For the period 1996-1999, 17% of the raw water samples exceeded this value.
- **temperature:** Data are only available at the LID intake. Water Quality Guidelines recommend temperatures <15°C. For the period 1996-1999, water temperatures exceeded the guideline periodically during the summer months reaching a maximum temperature of 20 °C.
- **nitrate** (N): Trace
- **pesticides**: Not sampled
- **algae**: Not sampled

APPENDIX B

Round Table Meeting Minutes

Interior Watershed Assessment Procedure
for the
Lambly Creek, Powers Creek, Trout Creek and Ellis Creek Watersheds

Initial Roundtable Meeting Minutes

Date: **May 16, 2001**
Location: **Riverside Woodlands Office**
#11 – 368 Industrial, Kelowna (across from OK builders on Ellis)

Call to order: 9:25 a.m.

1. **Participants:** Pat Poulin, Westbank Irrigation District (Powers)
Pete Rodd, District of Summerland (Trout)
Bill Muir, City of Penticton (Ellis)
Ted Jefferey, Lakeview Irrigation District (Lambly)
Greg Baytalan, Okanagan Similkameen Health Region
Dr. Bill Moorehead, Okanagan Similkameen Health Region
Nelson Grant, Penticton Forest District
Tony Zanotto, Penticton Forest District
Ken Langedyk, Dobson Engineering Ltd.
Mike Doiron, Riverside Forest Products Ltd.
Don McKee, BC Environment
Kerry Rouck, Gorman Bros. Lumber Ltd. (Trout)
Brian Harris, BC Environment
Jerome Jang, Penticton Forest District
Alan Rasmussen (Chair), Penticton Forest District
Mike Jobke, Penticton Forest District

2. **Introduction of Attendees**
   - invitation was also extended to Westbank First Nation, however there was no reply

3. **Review of meeting agenda**
   - Alan reviews the agenda
   - The following format will be used for each watershed:
     - Summarize work completed on recommendations in IWAP report – DEL
     - Summarize FDP – Licensees/SBFEP
     - Any work since last IWAP (1998) – Licensees/SBFEP/Irrigation District.
     - Water delivery system – Irrigation district or DEL
     - WAP direction and next steps – Alan/DEL
     - Add other business at the bottom of each watershed

4. Watershed Assessments according the Forest Practice Code

- Jerome provides background/summary
- As part of operational planning regulations, watershed assessments need to be carried out every three years
- Early Jan/Feb 2001 MELP and MOF met to review which watersheds would require assessments and determined that it be those impacted by heavy developments
- Licensees were asked to review those watersheds with heavy development
- Some were requested to be deferred
- Mike Doiron comments that forest development plans are on crown land, information is included that is not related to the crown land but is considered as additional info
- Regulation states the interior watershed assessment procedures are to be followed
- Mike Doiron comments that changes have been made since 1998 like the inclusion of Health and Range
- Jerome's response is at that time it didn't have the same profile as it does today

5. Terms of Reference for Technical Advisory Committee

- Ken Langedyk lists the following:
  a) Bring background information to the table
  b) Provide direction to the hydrologist
  c) Identifying any issues from the last IWAP
  d) Make recommendation to be included in the IWAP, bring these forward
  e) Provide summary

6. LAMBLY CREEK WATERSHED

- Alan reviews process

Review previous WAP report – DEL

- Ken distributes handout "Interior Watershed Assessment Procedure for the Lambly Creek Watershed, November 1998 report" (copy on file)
- identifies area on map
- reviews the conclusions and recommendations
- a number of naturally occurring landslides are located within the watershed
- recommendations were put together from the IWAP committee
- some of the action items were FPC requirement
- Mike Doiron discusses the role of the hydrologist
- Hydrologist organizes field assessment based on initial IWAP meeting

Jerome provides background as to how the committee and recommendations came about

- committees are co-chaired by MOE and MOF who both have approval for the development plans; initially the first round of meetings looked at who should be involved and it was determined that technical input is necessary; look at present condition of the watershed, then issues; what things should the hydrologist look at…erosion disturbance to roads, etc, as per watershed assessment guidebook
- hydrologist then reports on this, and IWAP committee reviews the report

- decide what can be dealt with within the FDP process legislation vs. those that weren't
- committee then came up with...prescribing foresters to consider and justify action taken
- were the issues addressed
- changes will include the authority of the health board, relating to health issues

Ken continues reviewing the recommendations from the last IWAP

Discussion generated re Riparian Mgmt

Nelson questions – has there been any consideration to cattle, within the riparian zones

- by removing timber you remove the natural barrier that prevents cattle movement into these riparian areas
- is there something to monitor changes in water quality and/or measure the level of consequence that may exist by removing these natural cattle barriers (strategic level planning)
- consider as food for thought
- Jerome questions if there is anything in the range plan that looks at this situation
- water quality objectives, is there a noticeable impact from cattle
- note this issue has come up in a number of watersheds, but at this time is not an issue at Lambly Creek
- when it is an issue, it needs to be looked at separately as to what can be done to resolve
- this should be something to look at, and is a bigger issue than what's been discussed
- Jerome comments that these reports have identified the watersheds where this is an issue, and needs to be dealt with in a case by case matter
- at this time the issue (of protocol?) hasn't been resolved
- cattle were not an issue that was brought up in the 1998 report

Inactive roads and stream crossing

- Riverside has looked for funding to deal with the non status roads
- approximately 60% of roads are non status in Lambly
- Jerome defines status road vs. non status roads (has to do with legal liability not whether it's pre-code)
- some non status roads were worked on through FRBC - watershed by watershed
- specific problems are addressed by the Ministries or licensee(s)

FRBC funding for the next 3 years is focused on the target watershed (high priority/high risk).

- Lambly Creek is not considered a high priority or a target watershed because there's not a lot of issues there
- COMPLAN defined as a spatial model to keep sustainability within a watershed over a 200 year period
- Alan questions getting costs back for the Irrigation District
- ECA (Equivalent Clear-cut Area) defined
- H 60 line defined

Summarize work completed on recommendations in IWAP report

Mike Doiron - FDP

- map overview
- since '98 a number of CP's have been added
- looks at amount of harvesting within the sub-basins and focus harvesting at the lower level, to balance within community watersheds
- long term levels in most watershed is about 30% EAC
- COMPLAN identifies that because of green up you can still harvest 1% and have the EAC levels balance off; you get a mosaic of older and younger forest
- in the past have not been operating in winter deer range... now have started subdividing (with the help of MELP) areas into 100 hectare units and taking the deer and water into account

Tony – SBFEP

- map overview
- 12500 m^3 between Esperon Lake and Big Horn, and Steward FSR
- past harvesting has been outside watershed boundaries
- planning 6 blocks to be reviewed in this IWAP
- mostly 2nd pass harvesting
- at preliminary planning stage

Significant works identified

- small amount of FRBC work that has been done on non-status road, no main problems
- Paul MacNamara will get back to Ken with details
- Tony comments only code requirement work to date
- Irrigation District will provide Ken with a copy of 20-year plan
- water delivery plan - status quo
- Mike Doiron will provide mine claim contact to Ken
- Ted from Irrigation District raised concern that the Regional District has not considered much about water quality issues
- let them know concerns have been brought up in other watersheds
- getting back to Nelson's range issue, the Irrigation District is trying to get water testing done through FRBC
- Question: "Would these tests not identify increases of *E. coli* that indicate a problem of cattle?"
- Response: "It may indicate problem but would be difficult to pinpoint the cause."

Health Region provides overview of the new *Water Act*

- responsible to monitor on continual basis
- *E. coli* has been discussed
- resources/money in the past has delayed implementation of changes in regulation, therefore the new *Water Act* may not be implemented in the immediate future

- Irrigation District questions if programs are available to help assist with fencing
  - Nelson says maybe

Side discussion over report

- objectives have not been finalized
- Brian Harris comments that the recommendations should be the objectives
- Ken to outline on the 2001 report if recommendations from the 1998 report have been achieved

Outstanding Issues

- hydrometric stations – cost –Ken
- water quality objectives – summarize in report –Ken.
- recommended modified re-cap – on areas/sub-basins that have been operated in since 1998 or proposed, include analysis of trend/disturbance level –Ken

Alan suggests that people can contact Ken or himself directly for any other issues that have been missed or come up later

Next Meeting planned for October (set date once the following has been done)

- Field work to be done July/August
- Licensees/SBFEP to supply Ken with info by July 13, 2001
- Ken to provide preliminary draft report 2 weeks before October meeting (will be emailed)

7. COFFEE BREAK 11:15

8. POWERS CREEK WATERSHED *(follow above format)*

Powers Creek meeting minutes removed.

9. LUNCH 12:30 P.M. TO 1:00 P.M.

10. TROUT CREEK WATERSHED *(follow above format)*

Trout Creek meeting minutes removed.

11. ELLIS CREEK WATERSHED *(follow above format)*

Ellis Creek meeting minutes removed.

12. OTHER BUSINESS

- Mission Watershed WAC meeting suggested to be held in Fall (October)

Ken comments on LRMP discussion with Steve Carr. EWAC committee won't be formed until next year and should not hold up the IWAP.

- discuss further whether or not to bring in EWAC participants in as observers.
- Suggestion: information be provided to them in report format and visa versa for us.
- Suggestion: invitations should be extended to Regional District, and City of Kelowna
- adaptive mgmt plan - Should be incorporated in IWAP

Open Discussion/Comments:

- good to have Health Region participate and Irrigation Districts
- good mix of people to whom issue may impact
- encourage licensees to meet with ranchers and discuss issues regarding cattle

Meeting adjourned at 14:35 hrs.

Watershed Assessment Procedure for the LAMBLY CREEK WATERSHED

Final Watershed Assessment Committee (WAC) Meeting Summary Notes December 11, 2001

Location: Riverside Forest Products, Kelowna B.C.

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1. Introduction of Attendees

Des Anderson	MWLAP, Kamloops
Greg Baytalan	Okanagan Similkameen Health Region, Kelowna
Don Dobson	Dobson Engineering Ltd., Kelowna
Mike Doiron	Riverside Forest Products Ltd., Kelowna
Jerome Girard	Riverside Forest Products Ltd., Kelowna
Dave Gooding	MSRM, Victoria
Jerome Jang	MOF, Penticton
Ted Jeffery	Lakeview Irrigation District (LID)
Bernie Kaplun	MOF, Penticton
Barb Pryce	MOF, Penticton
Alan Rasmussen (Chair)	MOF, Penticton
Russell Smith	Dobson Engineering Ltd., Kelowna
Tony Zanotto	SBFEP, MOF, Penticton

2. Review of WAC Terms of Reference

- IWAPs are a Forest Practices Code requirement, to be completed every three years.
- purpose is to review the Hydrologist's report and work towards achieving consensus on the recommendations.
- this information feeds into the Forest Development Plan (FDP).
- if the hydrologist notes other issues in the watershed (e.g. range, recreation or private land impacts) these will be forwarded as appropriate for possible resolution.
- the WAC does not approve the report, but provides advice to the Prescribing Forester.

Presentation of Watershed Assessment Report

Don Dobson reviewed the 2001 Lambly Creek Watershed Assessment Report.

Discussion

- hope to establish two more sampling stations, location to be determined
- new hazard ratings are based on the new April 1999 WAP guidebook; the old guidebook ratings were more office based, new guidebook ratings are based on field visits and are therefore more accurate.
- 1998 WAP included a RECAP.
- 2001 hazard ratings are based on field review.
- conditions in 1998 may have been the same as now, but numerical values generated high hazard ratings.
- DEL knew the watershed was in good condition, and now the ratings are reflective of that.
- DA asked for clarification and rationale on why the channel hazard ratings are lower for the 2001 report, given that the ReCAP was used in the 1998 and 2001 field assessment. DEL agreed to provide this.
- how did the rating go from high to low for riparian?
    - work in progress re: fish habitat
    - detailed assessment was done this summer and fall
    - riparian harvesting along fish reaches was older and is recovering
    - channels are not being destabilised, therefore can conclude that old riparian harvesting and S4 streamside harvesting away from main channels is not resulting in significant impacts
- suggest explaining how the current guidebook rates hazards in the Hydrologist's report

- DG disagrees that channels are stable; believes they are unstable, aggraded; last WAP they were rated as moderate, now rated as low; how so?
- DD is not seeing many changes in the channels over the past 20 years; not seeing changes suggesting channels are unstable; must take into account modified flow regimes; there are no problems at the intake, no concerns identified by LID
- JJ – what is being measured by stability? Is it change from historical vs. channel blowing apart now? Stable as measured from what time?
- MD – is FDP changing the 1998 basecase where channels are being impacted?
- DG – is it acceptable from historical condition to current, which includes 40 – 50 years of harvest?
- LRMP wanted stable or improving condition
- DG – problem with channels being rated as low when they are a long way from a stable morphology
- DD – not seeing that channels are unstable
- want to come to agreement on acknowledgement of past history that meets Hydrologist's needs and DG's needs. DD will try to work into report.
- do fish values constrain forest development?
- more detailed information about fish habitat coming out from the TFL pilot. Work done on fish

habitat did not identify any issues
- from FDP perspective, do not want to impact fish values
- DD presented table comparing channel reach data from 1998 to that of 2001. This will be added to the report, along with explanation
- FDP proposal does not indicate concerns
- about 5 years of volume is reflected in the assessment (2000 FDP)

LRMP Direction:

- LRMP Table 2 with WAP attributes was presented – will be included in report
- WAP conforms with LRMP direction
- can't count on reservoirs to attenuate peak flows; and this is not the case
- section 5.1 will be clarified
- grazing – occurs everywhere as dispersed use over the watershed. Does cause some sedimentation, deposition of manure in and about the creek as well as some bank disturbance
- GB – water treatment plant does not treat for crypto as it does giardia
- DD – there is substantial giardia settlement time in Rose Valley
- GB – Kelowna crypto was genetically tested and proven that it was human caused; same in Penticton

Action: DEL will provide field information on cattle concerns to DPE Range staff for consideration in the Lambly Range Use Plan. New WAC recommendation.

- E. Coli has been shown to come equally from human, cattle and wildlife sources
- new WAC recommendation directed at FDP re: prevention of cattle congregation sites in riparian areas. (Note: this recommendation will be included in the FDP and non-FDP WAC recommendations).
- Irrigation District to consider natural flow patterns according to LRMP recommendations in their storage and release operations.
- link to fisheries and fish habitat to be added to the report.
- DEL to provide clarification and rationale on why the channel hazard ratings are lower for the 2001 report, given that the ReCAP was used in the 1998 and 2001 field assessment.

4. Recommendations

See attached document for Final WAC Recommendations.

5. Next Steps.

Barb Pryce will draft meeting notes and recommendations from today's meeting. A draft will be forwarded to all WAC members for comment prior to forwarding to Prescribing Foresters.

DEL will make modifications to Hydrologist's report and will forward complete copies to WAC members. To be complete by the end of February, 2002.

6. Other Items.

Okanagan Shuswap LRMP website: http://srmwww.gov.bc.ca/sir/lrmp/okan/index.html

7. Adjourn. Lambly Creek Watershed Assessment Process completed.

APPENDIX C
Watershed Report Cards

Watershed Report Card for Lambly Creek 1998

Basin	Gross Area km^2	Total Harvested Area ha %	ECA %	ECA Below H60 %	ECA Above H60 %	Total Road Density km/km^2	Total Road Length km	Landslides Entering Streams	High Sediment Source Roads	Roads On Class IV or V Terrain	Stream Crossings	Streams Logged To Bank **km/km**	Length of Disturbed Mainstem **km**
North Fork	41.8		35.6		34.1	3.2		0	0.0	0.0	159	0.43	0
Terrace	79.2		38.1		35.4	3.4		1	0.0	0.1	181	0.53	0
Bald Range	40.7		27.3		17.6	3.2		0	0.0	0.5	56	0.48	0
Above LID (POI 2)	231.1		30.6		24.4	3.2		5	0.0	1.1	467	0.46	0
Entire Watershed (POI 1)	244.1		29.3		23.1	3.2		5	0.0	1.9	482	0.44	0

Watershed Report Card for Lambly Creek January 1, 2001

Basin	Gross Area ha	Total Harvested Area ha %	ECA ha %	ECA Below H60 ha %	ECA Above H60 ha %	Total Road Density km/km^2	Total Road Length km	Landslides Entering Streams	High Sediment Source Roads	Roads On Class IV or V Terrain	Stream Crossings	Streams Logged To Bank km	Length of Disturbed Mainstem km
North Fork	4183.3	2073.4 49.6	1692.6 40.5	21.2 0.5	1671.4 40.0	3.2	133.1	1	0.0	0.9	163	105.2	0
Terrace	7919.6	3997.8 50.5	2751.5 34.7	133.0 1.7	2618.4 33.1	2.5	200.7	0	0.0	1.4	158	144.4	0
Bald Range	4072.0	1000.8 24.6	719.3 17.7	154.0 3.8	564.3 13.9	3.0	122.3	0	0.0	2.4	59	11.6	0
Above LID (POI 2)	23118.6	9258.8 40.0	6226.5 26.9	843.5 3.6	5381.9 23.3	2.8	648.1	5	0.0	13.2	465	291.5	0
Entire Watershed (POI 1)	24418.7	9309.1 38.1	6258.1 25.6	875.2 3.6	5381.9 22.0	2.8	690.4	5	0.0	13.2	482	291.5	0

Watershed Report Card for Lambly Creek December 31, 2006

Basin	Gross Area ha	Total Harvested Area ha %	ECA ha %	ECA Below H60 ha %	ECA Above H60 ha %	Total Road Density km/km^2	Total Road Length km	Landslides Entering Streams	High Sediment Source Roads	Roads on Class IV or V Terrain	Stream Crossings	Streams Logged To Bank km	Length of Disturbed Mainstem km
North Fork	4183.3	2380.7 56.9	1665.9 39.8	15.1 0.4	1650.8 39.5	3.2	133.1	1	0.0	0.9	163	117.5	0
Terrace	7919.6	4240.5 53.5	2485.4 31.4	129.5 1.6	2356.0 29.7	2.5	201.7	0	0.0	1521.3	158	147.4	0
Bald Range	4072.0	1374.8 33.8	870.8 21.4	348.4 8.6	521.4 12.8	3.1	124.5	0	0.0	2.4	59	23.3	0
Above LID (POI 2)	23118.6	10564.4 45.7	6128.6 26.5	1038.8 4.5	5089.0 22.0	2.8	652.2	5	0.0	1533.5	465	322.7	0
Entire Watershed (POI 1)	24418.7	10614.7 43.7	6152.3 25.2	1062.3 4.4	5088.9 20.8	2.8	694.4	5	0.0	1533.5	482	322.7	0

APPENDIX D

Water Quality Assessment Summaries

Water Quality Assessment and Objectives for Lambly Creek Community Watershed

Mould Engineering. 2001. *Water Quality Assessment and Objectives for Lambly Creek Community Watershed.* Water Quality Branch; Water Management Division; Ministry of Environment, Lands, and Parks; Southern Interior Region; and Riverside Forest Products Ltd.; Kelowna. pp. 45.

Turbidity Measured by Laboratory Analysis

Where attainment is to be checked by samples submitted for laboratory analysis, the recommended water quality objective for turbidity for Lambly Creek at the LID diversion during the clear flow period shall not exceed a mean value of 0.64NTU and a maximum value of 3.0 NTU based on a minimum of five samples collected within a 30-day period. During the turbid flow period, turbidity shall not exceed a mean of 4.57 NTU and a maximum of 24 NTU based on a minimum of five samples collected in a 30-day period. At all other locations in the watershed upstream of the intake and at all times of the year, turbidity induced by anthropogenic activity shall not increase by more than 5 NTU or 10% (whichever is greater) above upstream concentrations.

Turbidity Measured by Continuous Monitoring Equipment

Where attainment is to be checked by samples submitted for laboratory analysis, the recommended water quality objectives for turbidity for Lambly Creek at the LID diversion is not to exceed the percent occurrence of values for the ranges set out in the table below.

	Clear Flow Period (Jun 16 – Mar 14)		**Turbid Flow Period (Mar 15 – Jun 15)**	
Sample Distribution	**Frequency**	**Percentage**	**Frequency**	**Percentage**
<1	38063	84.5	3350	29.0
1 – 5 NTU	4916	10.9	3913	33.8
>5 – 10 NTU	716	1.59	1541	13.3
>10 – 50 NTU	1220	2.71	1753	15.2
>50 NTU	136	0.30	1014	8.76
Total	**45051**	**100.0**	**11571**	**100.0**

Non-Filterable Residue

The recommended water quality objective for non-filterable residue for Lambly Creek at the LID Diversion during the clear flow period shall not exceed a mean value of 3.69 mg/L and a maximum value of 18 mg/L based on a minimum of five samples collected within a 30-day period. During the turbid flow period, non-filterable residue shall not exceed a mean of 12.5 mg/L and a maximum of 127

mg/L based on a minimum of five samples collected in a 30-day period.

At all other locations in the watershed upstream of the LID Diversion, the recommended water quality objective for non-filterable residue during the clear flow period shall not exceed 25 mg/L increase over background at any one time for a duration of 24 hours or 5 mg/L increase at any one time over background for a duration of 30 days.

The recommended water quality objective for non-filterable residue during the turbid flow period shall not exceed 10 mg/L increase over background when background ranges from 25 mg/L to 100 mg/L and shall not exceed 10% increase over background when background is greater than 100 mg/L.

Stream Temperature

The recommended objective for protection of aquatic life from anthropogenically-induced temperature change at all other locations in the watershed upstream of the LID diversion shall not exceed 1° C change in the Maximum Weekly Mean Temperature (MWMT). Change in MWMT shall be determined by hourly measurements with electronic instrumentation deployed at locations upstream and downstream of anthropogenic activity.

Fecal Coliform and *E. coli* bacteria

The recommended objective for fecal coliform and E. coli for Lambly Creek at the LID diversion shall not exceed 10 CFU/100mL (90^{th} percentile) based on a minimum of 10 samples collected in a consecutive 30-day period between June and September.

True Colour

To protect from further increases in true colour from anthropogenic activity, the recommended water quality objective for true colour shall not exceed a 20% increase over samples taken immediately upstream of anthropogenic activity.

APPENDIX E

Field Assessment Information

1998 and 2001 Field Assessment Information

Reach	1998 Channel Information	Slope (%)	Assessment Sites	2001 Site Information
A	CPb-D1	2	W	CPb-D1
B	N/A	-	N/A	
C	CPb-S	4	N/A, ANC	
D	CPb-D1	2	E	CPb-D1
E	CPb-A1	3	N/A, ANC	
F	N/A	-	N/A	
NF1	SPb-S	4	H,M	SPb-S
NF2	CPc/b-A1	2.5	J,K	CPc/b-D1[1]
NF3	CPb-S	2	L	CPb-S
T1	CPb-S	4	U	CPb-S
T2	CPb-A2	2	Q	CPb-S[2]
T3	N/A	-	N/A	
Esperon	RPc/w-S	3	T	RPc/w-S
Duo Via	RPc/w-S	4	R	RPc/w-S
Lean-to	CPb-A2	6	O,P	CPb-A2
BR1	RPc/w-A1	0.5	C,V	RPc/w-A1
BR2	RPc/w-A2	3	A,B	RPc/w-A2

N/A-Not Assessed, ANC-Assumed No Change

Legend

Channel Types
SP - Step Pool
CP - Cascade Pool
RP - Riffle Pool
Substrates/Large Wood
s - Sand
g - Gravel
c - Cobble
b - Boulder
r - Boulder Block
w - Large Wood Present
Channel Descriptor
A3 - Severely Aggraded
A2 - Moderately Aggraded
A1 - Slightly Aggraded
S - Stable
D1 - Slightly Degraded
D2 - Moderately Degraded
D3 - Severely Degraded

1. Aggradation and degradation often occur in combination within a channel reach and, in this reach, degradation is more dominant than aggradation; however, there is no evidence that the channel morphology has changed since 1998.

2. It is unclear why the channel was assessed as moderately aggraded in 1998. The channel sections reviewed during the 2001 field investigations are generally stable and there is no evidence that the channel morphology has changed.

2001 IWAP FIELD ASSESSMENT

Site Number: A

Site Location: Bald Range Creek, 30m upstream from road crossing

Date: September 10, 2001

Sub basin: Bald Range

Channel Type: Riffle pool, cobble, moderately aggraded (RPc-w:A2)

Disturbance Indicators: Homogenous bed texture, extensive bars, extensive riffles or cascades, minimal pool area, elevated mid-channel bars

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Extensive beaver activity may have caused aggradation, 3% grade, cattle impacts at crossing

Looking downstream

2001 IWAP FIELD ASSESSMENT

Site Number: B

Site Location: Bald Range Creek, 35m upstream from road crossing

Date: September 10, 2001

Sub basin: Bald Range

Channel Type: Riffle pool, gravel, moderately aggraded (RPg-w:A2)

Disturbance Indicators: Homogenous bed texture, extensive bars, minimal pool area, small woody debris, LWD function

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Extensive gravel deposits, 4% grade, gradient >15% at next crossing upstream

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: C

Site Location: Bald Range Creek, 77m downstream of road crossing.

Date: September 10, 2001

Sub basin: Bald Range

Channel Type: Riffle pool, cobble, LWD, slightly aggraded (RPc-w:A1)

Disturbance Indicators: Extensive bars

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Gradient 2%, sand/silt in bars, some LWD/SWD clusters, some boulders in creek

Looking downstream

2001 IWAP FIELD ASSESSMENT

Site Number: D

Site Location: Reil Creek, 55m upstream from crossing

Date: September 10, 2001

Sub basin: Residual Above Intake

Channel Type: Step pool, boulder, slightly degraded (SPb:D1)

Disturbance Indicators: Eroding banks

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Intermittent flows, 6% gradient

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: E

Site Location: Lambly Creek, 280m downstream from confluence with Terrace Creek

Date: September 10, 2001

Sub basin: Residual Above Intake

Channel Type: Step pool, cobble, slightly degraded (CPc:D1)

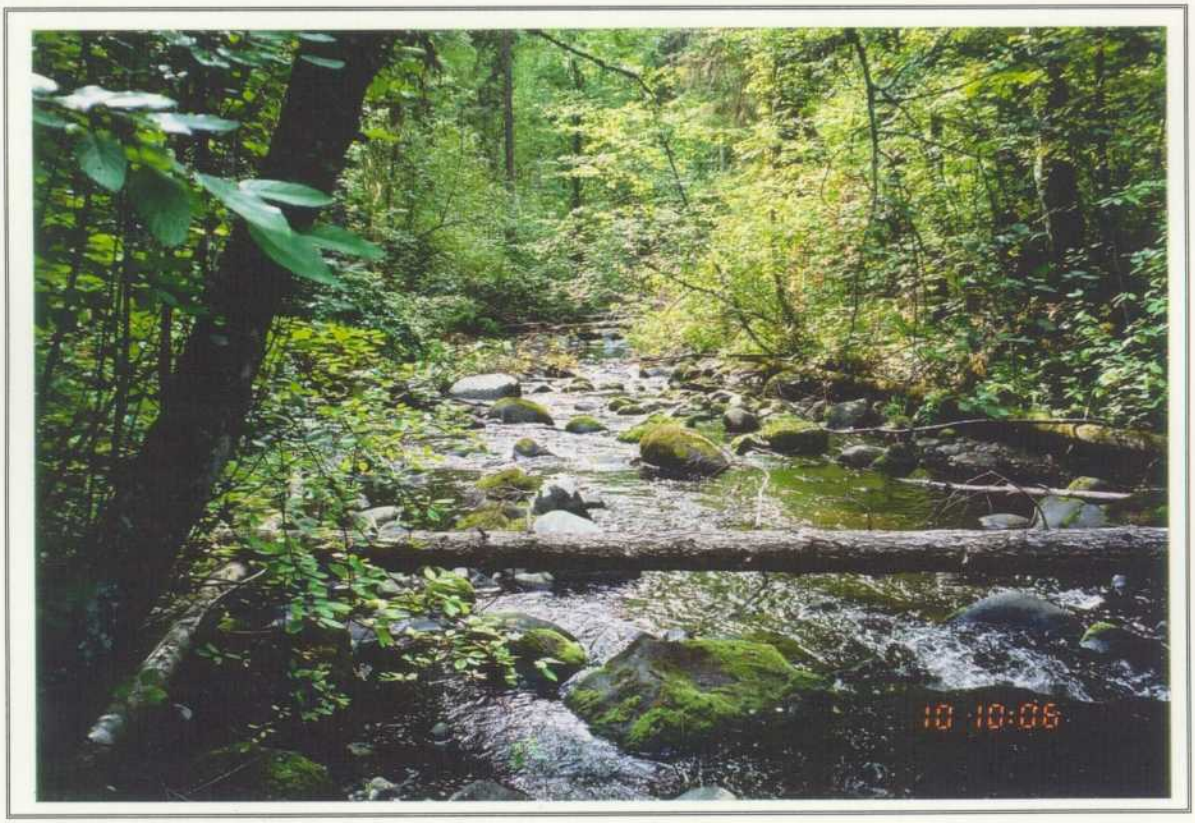
Disturbance Indicators: Disturbed stone lines

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Moss covered boulders, 3% gradient



Looking downstream

2001 IWAP FIELD ASSESSMENT

Site Number: F

Site Location: Tributary to Lambly Creek, 25m upstream from crossing

Date: September 10, 2001

Sub basin: Residual Above Intake

Channel Type: Step pool, cobble, slightly degraded (CPb:D1)

Disturbance Indicators: Homogenous bed texture, minimal pool area, disturbed stone lines

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Broken cobble lines, intermittent flows, cross-ditch at crossing

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: G

Site Location: Tributary to Lambly Creek, 20m upstream from crossing

Date: September 10, 2001

Sub basin: Residual Above Intake

Channel Type: Step pool, cobble, stable (CPb:S)

Disturbance Indicators:

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 8% gradient

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: H

Site Location: North Lambly Creek, 25m upstream from crossing

Date: September 10, 2001

Sub basin: North Fork

Channel Type: Step pool, boulder, slightly degraded (SPb:D1)

Disturbance Indicators: Partially disturbed boulder lines

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 3% gradient, moss covered boulders

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: I

Site Location: Tributary to North Lambly Creek, 15m upstream from crossing

Date: September 10, 2001

Sub basin: North Fork

Channel Type: Step pool, boulder, slightly degraded (SPb:D1)

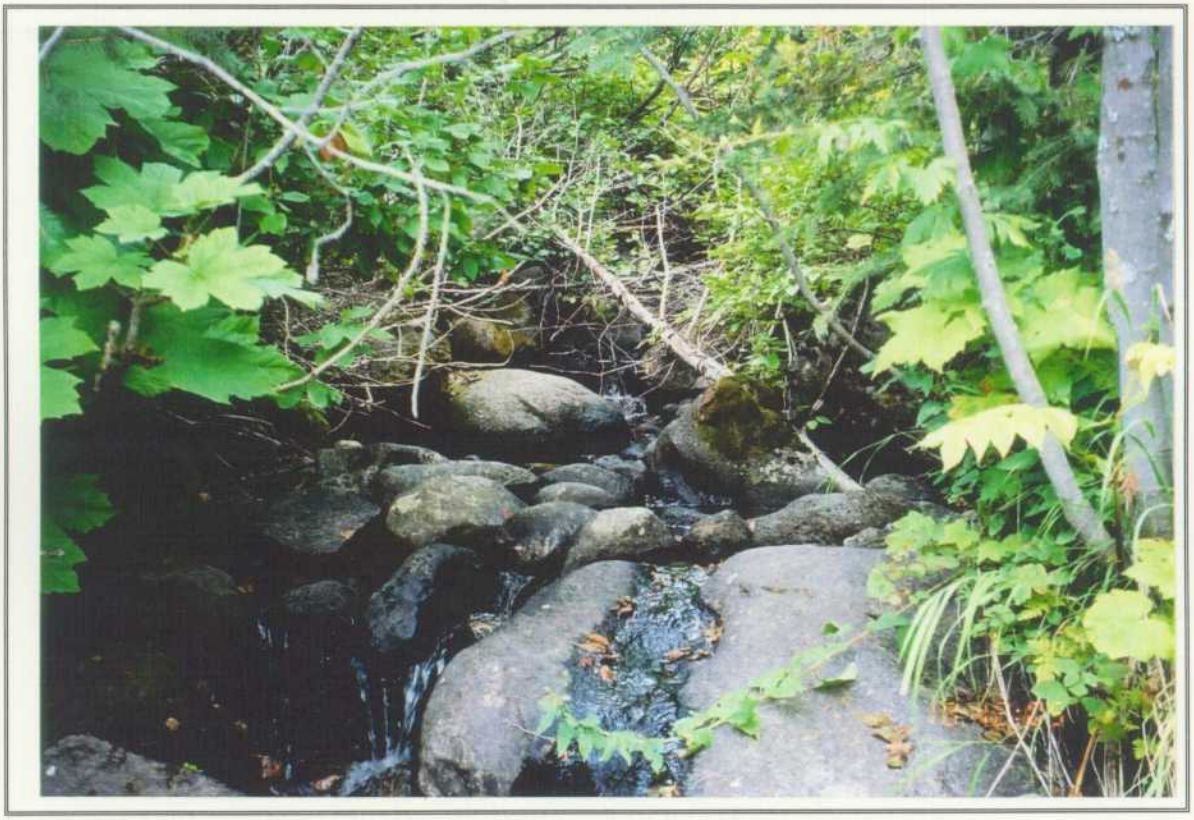
Disturbance Indicators: Partially disturbed boulder lines

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

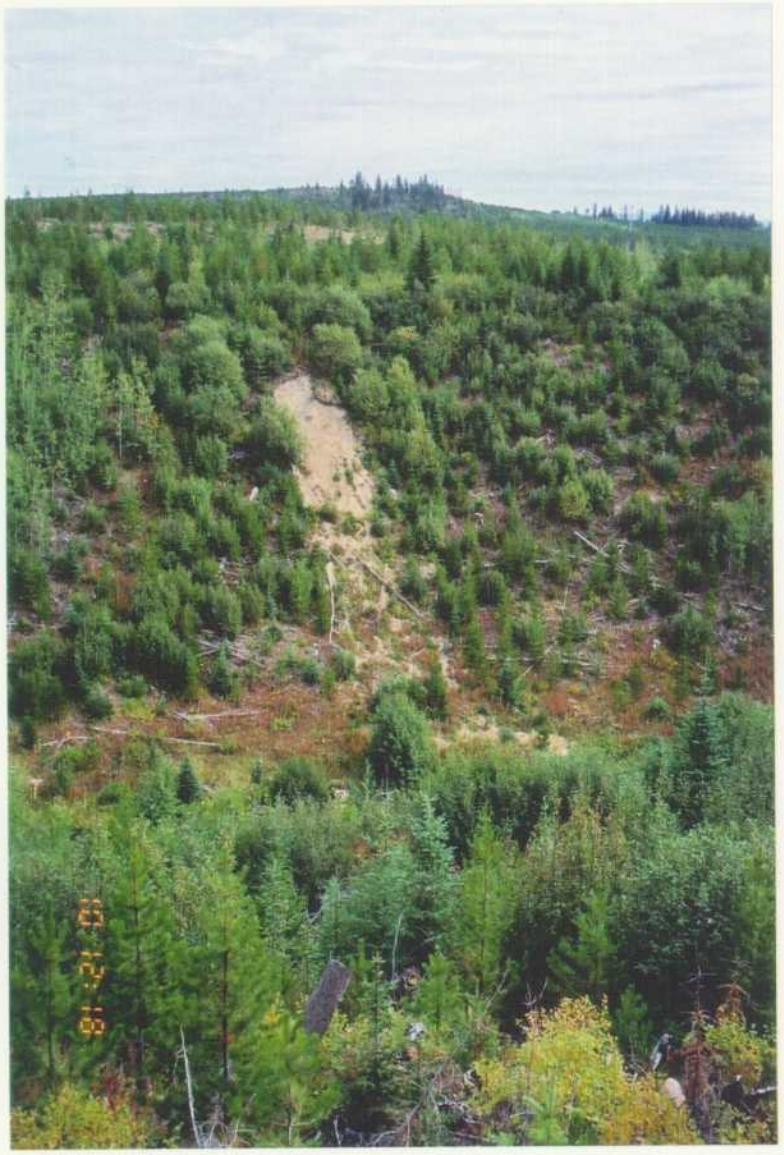
Comments: 16% gradient, moss covered boulders



Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: J
Site Location: North Lambly Creek, 22.5km on Whiterocks FSR
Date: September 10, 2001
Sub basin: North Fork
Channel Type: N/A
Disturbance Indicators: N/A
Reviewed in 1998 IWAP: No
Trend: Continued erosion
Downstream from Proposed Harvesting: In recent cutblock
Comments: Recent landslide that impacted North Lambly Creek



Looking across Lambly Creek at failure

2001 IWAP FIELD ASSESSMENT

Site Number: K

Site Location: North Lambly Creek, 22.75km on Whiterocks FSR at upstream edge of cutblock boundary

Date: September 10, 2001

Sub basin: North Fork

Channel Type: Cascade pool, boulder/cobble, slightly degraded (CPb/c:D1)

Disturbance Indicators: Partially disturbed boulder lines

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Boulder lines disturbed, moss covered boulders, LWD trapping sediment, 5% gradient

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: L

Site Location: North Lambly Creek, 20m upstream from crossing

Date: September 10, 2001

Sub basin: North Fork

Channel Type: Cascade pool, boulder, stable (CPb:S)

Disturbance Indicators: None

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 5% gradient, LWD spanning channel

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: M

Site Location: North Lambly Creek, 20m upstream from Bear FSR crossing

Date: September 10, 2001

Sub basin: North Fork

Channel Type: Step pool, boulder, stable (SPb:S)

Disturbance Indicators: None

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 8% gradient, boulder/bedrock banks, boulder lines intact

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: N

Site Location: Tributary to Lambly Creek, 20m upstream from crossing on Bear FSR at 21.5km

Date: September 10, 2001

Sub basin: Residual Above Intake

Channel Type: Cascade pool, boulder, slightly degraded (CPb:D1)

Disturbance Indicators: Minimal pool area, homogenous bed texture

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 8% gradient, cobble/boulder banks, boulder lines intact

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: O

Site Location: Lean-to Creek, 30m downstream from crossing

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Cascade pool, boulder, slightly degraded (CPb:D1)

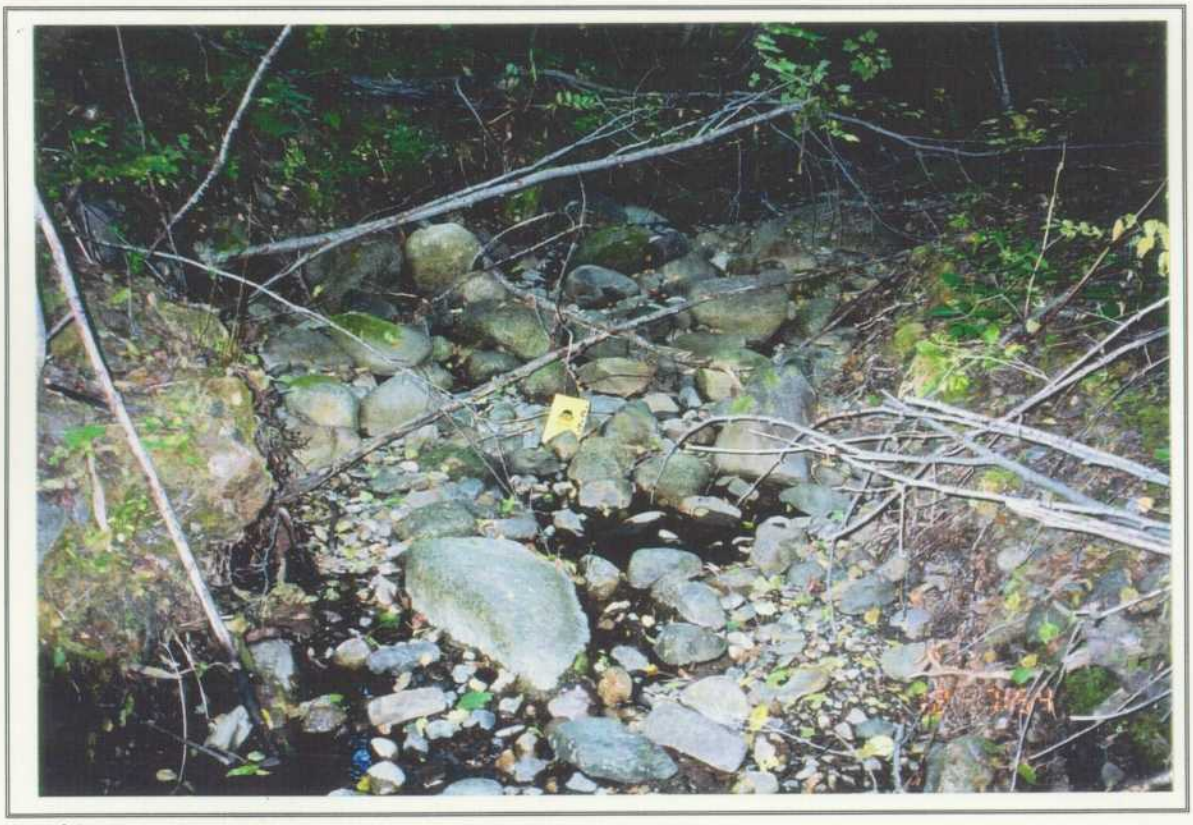
Disturbance Indicators: Scoured zones, disturbed stone lines, abandoned channels

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Moss covered boulders, 6% gradient



Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: P

Site Location: Lean-to Creek, 45m upstream from crossing

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Cascade pool, boulder, moderately aggraded (CPb:A2)

Disturbance Indicators: Sediment wedges, extensive scoured zones, minimal pool area, elevated mid-channel bars, small woody debris, LWD function

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Moss covered boulders, 6% gradient, slightly eroded banks

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: Q

Site Location: Terrace Creek, within cutblock by Terrace FSR

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Step pool, boulder, stable (SPb:S)

Disturbance Indicators: Homogenous bed texture, channel avulsions, eroding banks

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Moss covered boulders, 5% gradient, boulder lines intact, slightly eroded banks

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: R

Site Location: Duo Via Creek, 100m upstream from road crossing

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Riffle pool, cobble, LWD, stable (CPb-w:S)

Disturbance Indicators: Minimal pool area, channel avulsions, extensive riffles or cascades, multiple channels or braids

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: Moss covered rocks, 5% gradient, no fines, LWD spanning banks, multiple channels, significant amount of blowdown

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: S

Site Location: Tributary to reservoir, 80m upstream from road crossing

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Step pool, boulder, stable (SPb:S)

Disturbance Indicators: Multiple channels or braids

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 1% gradient, confined channel, LWD spanning channel

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: T

Site Location: Tributary to reservoir, 25m upstream from old weir

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Riffle pool, cobble, LWD, stable (RPc-w:S)

Disturbance Indicators: Abandoned channels, disturbed stone lines

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 2% gradient, no fines upstream from weir, slightly eroded banks, LWD influencing channel and spanning banks

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: U

Site Location: Terrace Creek at confluence with Lambly Creek

Date: September 12, 2001

Sub basin: Terrace Creek

Channel Type: Cascade pool, boulder, stable (CPb:S)

Disturbance Indicators: None

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 6% gradient, moss covered boulders, cobble and boulder banks, robust channel

Looking upstream from Lambly Creek

2001 IWAP FIELD ASSESSMENT

Site Number: V

Site Location: Bald Range Creek 800m upstream from Bear FSR

Date: September 12, 2001

Sub basin: Bald Range

Channel Type: Riffle pool, gravel, slightly aggraded (RPg:A1)

Disturbance Indicators: Homogenous bed texture, extensive bars, elevated mid-channel bars

Reviewed in 1998 IWAP: No

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 0.5% gradient, some LWD in channel, minor bank erosion

Looking upstream

2001 IWAP FIELD ASSESSMENT

Site Number: W

Site Location: Lambly Creek at 400m upstream from Okanagan Lake

Date: September 12, 2001

Sub basin: Residual Below

Channel Type: Cascade pool, boulder, slightly degraded (CPb:D1)

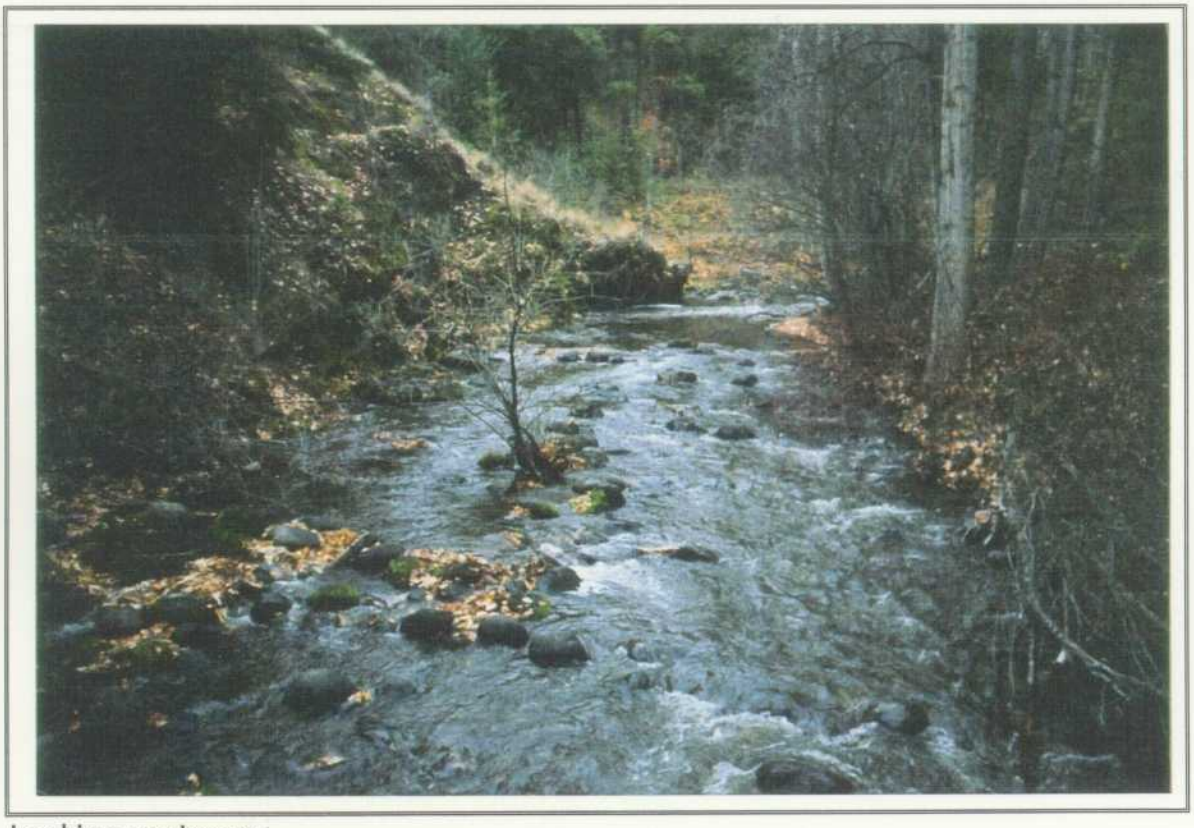
Disturbance Indicators: None

Reviewed in 1998 IWAP: Yes

Trend: Stable

Downstream from Proposed Harvesting: Yes

Comments: 6% gradient, lack of LWD, stone lines intact



Looking upstream