Reconnaissance
(1:20,000 Fish and Fish Habitat Inventory and 1:5,000 Stream Classification)
Of
Monashee Creek Watershed
WSC: 128-835500-61800-22600

Prepared for:

Riverside Forest Products

Lumby Division
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February 4, 2002

Project Reference Information

FRBC Multi-Year Agreement #	
MELP Project Number	TOM98242
FRBC Project Number	716570
FDIS Project Number	3600
FRBC Region	Thompson Okanagan Region
MELP Region	Southern Interior
MELP District	Okanagan
FW Management Unit	8-23
DFO Habitat Unit	Southeast British Columbia
Forest Region	Kamloops
Forest District	Vernon
Forest Licensee and Tenure #	Riverside Forest Products
First Nations Claim Area	Spallumcheen Indian Band

Watershed Information

Watershed Group	USHU
Watershed Name	Monashee Creek
Watershed Code	128-835500-61800-22600
UTM at Mouth	11 389392 5565252
Watershed Area	19,575 ha
Total of All Stream Lengths	394 km
Stream Order	5th order
NTS Map	82L/1, 82L/2
TRIM Map	82L.007, 82L.017 – .019, 82L.028-.029
BGC Zone	ICHmw2 & mk1, ESSFwc4, IDFmw1, ATp
Air Photos	BCC94049: 139-141, 173-176, 178-185 BCC94052: 63-65, 70-72, 159-160, 170-171 BCC94089: 139-140, 143-151, 153-156 BCC94098: 97-98, 103-104, 112-113 BCC94158: 108-120, 123-126

Sampling Design Summary

Total Number of Reaches	832
Random Sampling Sites	55
Bias Sample Sites	10
FSID Sample Sites	40
Total Sample Sites	105
Field Sampling Dates	August 01 to October 19, 2000

Contractor Information

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Acknowledgments

Trumbley Environmental Consulting Limited would like to recognize Forest Renewal British Columbia for providing the funding for this inventory. A special thank you to Mike Chamberlain of Ministry of Sustainable Resource Management and Sylvie Masse, QA/QC officer, for providing recommendations and guidance.

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1.0 Introduction

A 1:20,000 Fish and Fish Habitat Inventory and a 1:5,000 Fish Stream Identification study was conducted in accordance with the Resource Inventory Committee Standards (April 1998) and Forest Practices Code Fish Stream Identification Guidebook (August 1998) and the Forest Practices Code Riparian Management Guidebook (December 1995). In total fifty-five randomly selected, ten bias and fourty stream classification (FSID) sites were assessed. The stream classification study focuses specifically on the Yeoward, Railroad and Monashee Creek sub-basins. The fourty FSID sites have been incorporated into the 1:20,000 Fish and Fish Habitat Inventory; therefore, the remaining sixty-five sites will be assigned classifications within this report. An inset of mapsheet 82L.018 shows the stream classifications sites (FSID) at a 1:5000 scale.

1.1 Project scope/ objectives

The objectives of this contract were to complete a 1:20,000 Reconnaissance Fish and Fish Habitat Inventory and incorporate a 1:5,000 Fish Stream Identification component into the results.

1.2 Location

The Monashee Creek Watershed is located east of Cherryville, B.C. The watershed covers an area of 19,575ha and ranges in elevation from 580m at mouth of Monashee Creek to 2380m in reach two to ILP00870. The project boundary encompasses four biogeoclimatic zones and variants. The Interior Douglas - Fir moist warm Okanagan (IDFmw1) dominates the confluence of Monashee Creek with Cherry Creek and the valley bottom of Monashee Pass Creek. The site modifiers (mw) describe the medium textured soils and warm southerly or westerly aspects typical of the Okanagan. The Interior Cedar-Hemlock (ICH) moist cool, Kootenay (mk1) also contains medium textured soils however the aspect is cool northerly or easterly. The ICHmk1 occupies the upper reaches of Monashee Pass Creek and Yeoward Creek and along Monashee Creek to the confluence of Railroad Creek while the moist warm Columbia-Shuswap (mw2) is isolated to the Railroad Creek and Pinnacle Creek sub-basins and reaches 19 to 22 of Monashee Creek. The mw2 site modifier typically contains

medium textured soils similar to the mk1 however the warm southerly or westerly aspect differentiates this zone (mw2). The Engelmann Spruce – Subalpine Fir wet cold; Selkirk (ESSF wc4) is the transition zone between the ICH and Alpine Tundra (ATp) zones. The wc4 site modifiers indicate a warm southerly or westerly aspect with coarse textured soils. The Alpine tundra is exclusively high elevation and contains deep organic or peaty soils. The mainstem of Monashee Creek has 28 reaches. Reach one of Monashee Creek confluences with Cherry Creek. An overview map of the Monashee Creek Watershed study area in British Columbia is located in appendix 2.

1.2.1 Access

Directions from Vernon are as follows:

- Follow Highway 97 south turn onto Highway 6 east.
- Travel approximately 50km to Cherryville
- Access to the Monashee Watershed can be attained by several points such as Monashee Pass Creek by Highway 6, South Fork FSR, North Fork FSR, Campbell Road, Heckman FSR, Railroad FSR, Yeoward FSR

2.0 Resource Information

1. First Nations issues and interests in the study area

   No First Nations issues or concerns arose during this project.

2. Development and land use: logging, mining recreation

   Land use within the study area consists of forestry and agriculture. A separate discussion for each topic is as follows:

   - Forestry
     Land-use includes active logging operations in the Yeoward, Railroad and Monashee Creek sub-basins.
   - Agricultural
     The lower reaches of Monashee Creek are used for agriculture while range cattle are throughout the watershed.
   - Guide Outfitting
     No guide outfitters are situated within the Monashee watershed boundary.

- Recreation
  No hiking or recreational areas are located within the Monashee Watershed. Monashee Provincial Park is outside of the Monashee Watershed boundary.
- Mining
  No tenure activities including mineral, placer or coal were identified within the study area.
- Trapping
  Because of public pressure on trapping, the names of registered trappers will not be released.

3. Environmental Impacts and Uses by Wildlife

   Minimal environmental impacts were observed with the exception of the fisheries disturbances identified within the following FFHI in the Monashee Creek Watershed. The dominant game species within the study area include mule deer, black bear, coyote, ruffed grouse, blue grouse and spruce grouse. Sub dominant species consist of white-tailed deer.

4. Existing Water Quantity/ Quality Data

   The lower reaches of Half Mile Creek along highway 6 near the Goldpanner Café are used for drinking water by local residents. No other water quality data was available.

5. Previous presence of fish

Historical FISS information identified rainbow trout (*Oncorhynchus mykiss*), slimy sculpin (*Cottus cognatus*), and northern pike minnow (*Ptycheilus oregonensis*) in Cherry Creek near the confluence of Monashee Creek (Ref 8033). Several studies conducted in the Monashee Creek Watershed identified the presence of rainbow trout and bull trout (*Salvelinus confluentus*). Rainbow trout were captured in reaches 6, 15, 18 and, 22 however bull trout were restricted to reaches 15 and 22 of Monashee Creek (Wildstone, 1996). Seven adult rainbow trout were identified in reach one of ILP00205, (Wildstone, 1996). Three adult rainbow trout were captured in reach one of WSC 128-835500-61800-22600-4540, (Wildstone, 1996). Three rainbow trout were captured within reach 1 of Monashee Pass Creek. Two adult rainbow trout were identified within reach one of Pinnacle Creek. Two adult rainbow trout were

captured in reach 2 of Railroad Creek. Fish were also captured in reach three of Railroad Creek however a discrepancy in fish identification between site cards and report information resulted in suspected bull trout or eastern brook trout (*Salvelinus fontinalis*) presence. Three rainbow trout were captured in reaches one and two of Yeoward Creek and one adult bull trout captured in reach two of Yeoward Creek. Rainbow trout were identified in reaches one to three inclusive, (Trumbley Environmental Consulting, 1999, Wildstone Resources, 1997, Pointer Forestry Services, 1999). Rainbow trout were confirmed within reach one 128-835500-61800-22600-7220. Bull trout were captured in reach one of WSC 128-835500-61800-22600 (Wildstone, 1996). Rainbow trout were identified within reaches one, two and three of WC 128-835500-61800-22600-4850 (Trumbley, 1999). A summary of the historical presence of fish is included in table 1.

TABLE 1. HISTORICAL PRESENCE OF FISH WITHIN THE MONASHEE CREEK STUDY AREA

Source	Species	Location	Date
WLD	RB, BT	128-835500-61800-22600	1997
WLD	RB	L00205	1997
WLD	RB	128-835500-61800-22600-2560	1997
WLD	RB, BT	128-835500-61800-22600-3040	1997
WLD	BT	128-835500-61800-22600-4210	1997
TEC, WLD, PFS	RB	128-835500-61800-22600-4850	1999, 1997, 1999
WLD	RB, (BT, EB)	128-835500-61800-22600-6820	1997
WLD	RB	128-835500-61800-22600-6820-4320	1997
WLD	RB	128-835500-61800-22600-7220	1997

Note: WLD = Wildstone Res. Ltd., TEC = Trumbley Env. Cons. Ltd., PFS = Pointer Forestry Services

3.0 Methods

i) The Reconnaissance Fish and Fish Habitat Inventory was carried out in accordance with the Resource Inventory Committee Standards (April 1998), (Errata March 1999). MELP site and fish collection cards were utilized throughout the field-based sampling. Field data collected from August 1 to October 19, 2000 was conducted under Fish Collection Permit 00-30-0520.

ii) Fish distribution mapping was based upon the following information and guidelines:

- First order reaches located upstream of a field verified "no visible channel" with no headwater source of fish, were conservatively assigned a suspected stream classification of S6. Any reach having an order of greater than one was assigned a suspected S6 or S5

classification. Field verification is recommended to determine if a channel is visible and if so the channel width.

- Non-sampled reaches located downstream of a headwater source of fish were conservatively assigned a suspected stream classification of S1-S4. A reach having an order of one was assigned a suspected S4 class. Orders of two or greater were assigned suspected stream classes of S1-S3.
- Reaches upstream of field verified "no visible channels" within a third order or higher drainage was assigned suspected S1 or S4 classifications. The rationale is that a third order system may provide the overwintering habitat necessary during dry conditions.
- Reaches downstream of field verified fish streams were designated as fish bearing.
- Historical data such as fish observations, stocking records and obstructions were incorporated into fish distribution mapping.
- A suspected fish bearing class was assigned to reaches where non-sport fish (e.g. lake chub, redside shiner) were captured.

iii) The following is a list of materials utilized to complete the 2000 Monashee FFHI:

- 4x4 vehicle
- Type 12B & 15-D S&R Electrofisher
- Dipnets
- Buckets
- 5000V Gloves
- Alka Seltzer
- MELP Site Cards
- MELP Fish Collection Cards
- Garmin III GPS
- Mercury Thermometer
- Abney Levels
- Vernier Calipers
- Vinyl Surveyors Tape
- Cruiser Vests
- Folding Ruler
- Hip Chain
- Flagging Tape (Fisheries)
- Suunto Compass
- Fish Measuring Board
- 35mm Cameras
- 200-400 ASA Film
- 1:20,000 Maps
- Map Wheel
- Level 1 First Aid Kits
- Battery Charger
- Bear Spray (pepper)
- Bear Bangers
- Numbered Flip Cards
- Angling Equipment
- Pole Seines
- Gee Traps (Minnow)
- Cat Food (Bait)
- Neoprene Waders
- Felt Bottom Wader Boots
- Wader Patch Kit (Marine Goop)
- VHF Radios
- Formalin (10% solution)
- Whirl Packs

4.0 Results and Discussion

4.1 Logistics

1. Originally, 65 random and bias sample sites were allotted. Riverside Forest Products conducted 40 stream classification sites independently of the inventory. After discussions with Dave Tesch, the additional stream classification sites were entered into the FDIS database and the information collected was incorporated into the inventory report.

2. Several uncorrectable errors were generated by the FDIS database QA tool. The QA tool is designed to identify these errors in a hardcopy format to enable the user to make corrections. A discussion of the errors resulting from the QA tool is as follows: According to the Reconnaissance 1:20,000 Fish and Fish Habitat Inventory Standards, two methods must be utilized for fish sampling. In addition, a minimum of 100m must be assessed when electrofishing is employed. However, there are situations where inadequate water depths, less than 100m of channel, and access, limit the amount or type of fish sampling conducted. These errors were not corrected. The fish condition factor error is from an unknown source and adjustments to lengths and weights were not made. In addition, lake ILP's are assigned independently of stream reach ILP's therefore, gaps in reach numbering result. The resulting errors are a flaw within the QA tool program. Another error within the QA tool resulted from the average site gradient higher than the reach gradient plus the tolerance. No errors in gradient data entry were identified. Photodocumentation errors resulted when photos were missing from the CD layout because they were underexposed.

4.2 Summary of Sub-Basin Biophysical Information

Biophysical information for each sub-basin within the Monashee Watershed is summarized in table 2.

TABLE 2 SUMMARY OF WATERSHED INFORMATION FOR THE MONASHEE CREEK WATERSHED SUBDRAINAGES

Gazetteer Name	WSC	UTM at lowest reach	Watershed Area (ha)	Stream order	NTS Maps	BGC Zone	Lake names	Wetlands
Monashee Residual	128-835500-61800-22600	11 392209 5554883	2264	5	82L.018 82L.028 82L.029	IDFmw1, ICHmk1, ESSFwc4, ICHmw2, ATp	2 lakes	N/A

TABLE 2 CONTINUED

Gazetteer Name	WSC	UTM at lowest reach	Watershed Area (ha)	Stream order	NTS Maps	BGC Zone	Lake names	Wetlands
L00101	L00101	11 389496 5563550	460	3	82L.028 82L.018	IDFmw1, ICHmw2	N/A	N/A
Heckman Sub-basin	128-835500-61800-22600-1540	11 389461 5561133	3323	4	82L.018 82L.017 82L.007	IDFmw1, ICHmk1, ESSFdc1	N/A	N/A
Inches Sub-basin	128-835500-61800-22600-1540-3610	11 387006 5557019	666	3	82L.018	IDFmw2, ICHmk1	N/A	N/A
Big Goat Sub-basin	128-835500-61800-22600-1540-4420	11 386988 5554674	1077	3	82L.018	IDFmw1, ICHmk1, ESSFdc1	N/A	1 wetland
22600 1540 7150	128-835500-61800-22600-1540-7150		299	3	82L.017, 82L.018	ICHmk1	N/A	N/A
22600 2400	128-835500-61800-22600-2400	11 391073 5558933	313	3	82L.018	IDFmw1, ICHmk1	N/A	N/A
Monashee Pass Creek	128-835500-61800-22600-2560	11 391447 5559021	2002	4	82L.018	IDFmw1, ICHmk1, ESSFdc1	N/A	N/A
22600 2560 4300	128-835500-61800-22600-2560-4300	11 392209 5554883	494	3	82L.018	ICHmk1, ESSFwc4	N/A	N/A
Yeoward Sub-basin	128-835500-61800-22600-3040	11 392835 5558932	1628	3	82L.018 82L.019	IDFmw1, ICHmk1, ESSFwc4, ATp	N/A	N/A
Corion Sub-basin	128-835500-61800-22600-4020	11 395478 555990	404	3	82L.018 82L.028	ESSFwc4, ICHmk1	N/A	1 wetland
22600 4850	128-835500-61800-22600-4850	11 397942 5560189	652	3	82L.018 82L.028	ICHmk1, ESSFwc4, ICH mw2	1 lake	2 isolated wetlands

TABLE 2 CONTINUED

Gazetteer Name	WSC	UTM at lowest reach	Watershed Area (ha)	Stream order	NTS Maps	BGC Zone	Lake names	Wetlands
22600 5720	128-835500-61800-22600-5720	11 400205 5560116	288	3	82L.019	ICHmk1, ICHmw2, ATp	N/A	N/A
L00516	L00516	11 401183 5560733	90	3	82L.019	ICHmk1, ICHmw2	N/A	N/A
Railroad Residual	128-835500-61800-22600-6820	11 402988 5561308	1606	4	82L.019 82L.029	ICHmk1, ICHmw2 ESSFwc4, ATp	1 lake	N/A
Pinnacle Sub-basin	128-835500-61800-22600-6820-4320	11 405415 5559138	1588	3	82L.019 82L.029	ICHmw2, ESSFwc4, ATp	1 lake	N/A
Unnamed	128-835500-61800-22600-6820-6190	11 406251 5558040	818	3	82L.019	ICHmw2, ESSFwc4, ATp	N/A	N/A
Upper Monashee Sub-basin	128-835500-61800-22600-7220	11 403564 5562268	1602	3	82L.029	ICHmw2, ESSFwc4, ATp	1 lake	N/A

4.3 Habitat and Fish Distribution

Historically, rainbow trout (*Oncorhynchus mykiss*) were captured within 22 of the 28 reaches of Monashee Creek and throughout the watershed including Monashee Pass Creek, Pinnacle Creek, Railroad Creek, Yeoward Creek Sub-basins. Bull trout were captured in reach 22 of Monashee Creek, reaches 1 & 2 of Yeoward Creek and reach one of WSC 128-835500-61800-22600-4210. A discrepancy in historical fish identification resulted in a suspected bull trout or eastern brook trout presence within Railroad Creek. Rainbow trout presence was confirmed throughout the watershed and bull trout were confirmed in Monashee Creek and Railroad Creek. However, bull trout were not captured within the Yeoward Creek Sub-basin as historical data suggested. Gradients in excess of 25% limited much of the available habitat within the watershed. Reach 3 of Monashee Creek provided excellent spawning, an extended riffle in reach 8 provided a source for invertebrate production and excellent side channels for rearing, pools for overwintering, LWD and pools for cover and abundant flow were documented in reach 13 of Monashee Creek. Nine juvenile rainbow trout were captured within reach 3 of

Inches Creek mainstem, which provided excellent spawning and rearing habitat. The channel also contained evidence of high freshet flows and would provide major staging habitat. Reach 2 of Railroad Creek provided excellent adult and juvenile rearing habitat, abundant cover, flow and some side channel for staging. The average pool depth was 0.55m, which provided excellent overwintering potential.

Sampling was conducted from August 01 to October 19, 2000. The watershed was divided into 17 third order or higher sub-basins for ease of discussion. The sub-basins consist of the Monashee Residual, L00101, -22600-2400, Corion Creek Sub-basin, -22600-4850, Upper Monashee Creek sub-basin, L00516, -22600-5720, Monashee Pass sub-basin, -22600-2560-4300, Heckman Creek sub-basin, Inches Creek sub-basin, Big Goat Creek sub-basin, Railroad Creek sub-basin, Pinnacle Creek sub-basin, -22600-6820-6190 and Yeoward Creek sub-basin.

4.3.1 Monashee Residual WSC 128-835500-61800-22600

The Monashee Creek residual encompasses the mainstem of Monashee Creek (28 reaches) and the first and second order basins draining into it. The elevation ranges from 580m at the confluence with Cherry Creek to 2380m in reach two of L00870. Tributaries flowing into reach 1 of Monashee Creek are suspected to contain fish because gradients are conducive to fish passage and the connectivity to known fish bearing water. Two sites were conducted on L00106, outside of the Monashee watershed boundary that were included as additional data collected during FSID sites. A 3.7m falls identified at the reach 1 break is the upstream barrier to fish migration therefore reach 2 was assigned an S6 classification based upon the average channel width of 1.8m. Fish were not captured in reach one however connectivity to fish bearing water resulted in a suspected S3 classification. Two juvenile rainbow trout were captured in reach 3 of Monashee Creek. Reach three provided excellent spawning habitat in the form of pea sized gravel and adequate flow. Abundant deep pools also provided overwintering potential. One juvenile rainbow trout was captured in reach 8 of Monashee Creek. A sloughing bank (N8011) was a source of sediment resulting in the formation of sidebars. An extended riffle was noted as a disturbance but was a good source for invertebrate production. Two adults and one juvenile rainbow trout were captured in reach 10 of Monashee Creek. Abundant deep pools, boulders, LWD and good flow provided overwintering and rearing

habitat for adult rainbow trout. Minimal back eddies provided moderate juvenile rearing habitat however flow was generally turbulent. Two adult rainbow trout and bull trout were captured in reach 13 of Monashee Creek, which provided excellent side channels for rearing, pools for overwintering, LWD and pools for cover and abundant flow. Reach 14 of Monashee Creek was braided with numerous cobble sidebars. Reach 15 of Monashee Creek contained abundant side eddies for juvenile rearing and pea sized gravel for spawning. Pool depths provided the potential for overwintering habitat. Three adult rainbow trout and one juvenile bull trout were captured in the abundant usable cover for rainbow trout and bull trout. Reach 20 of Monashee Creek provided abundant cover for rainbow and bull trout. Boulder, deep pools, undercut banks and overstream vegetation provided cover and overwintering habitat for the two adult bull trout and one adult rainbow trout captured. Evidence of fascine bundles, revetment and riprap are present at the old FSR crossing. The side bar and island were a result of the old FSR crossing. Two adult bull trout were captured in reach 21 of Monashee Creek. Reach 21 provided overwintering habitat, excellent cover, good flow and some spawning habitat. The average channel width of reaches 3 to 21 ranges from 15.6m to 7.5m respectively. The average channel width in reach 23 was reduced to 4.10m, which resulted in an S3 classification. The gradient increased from 7% in reach 21 to 17% in reach 23. Fish were not captured in reach 23 however; a suspected S3 classification was assigned because of the presence of fish downstream and no barrier to upstream fish migration. Reach 26 of Monashee Creek, upstream of the lake in reach 25, had a gradient of 29% which is a barrier to fish migration. The cascade morphology does not provide fish access from the lake. The channel does not contain pools because the water is flowing over bedrock and boulders. Therefore, reach 26 was assigned an S5 stream riparian classification based upon an average channel width of 4.3m. Numerous first and second order tributaries of Monashee Creek mainstem were defaulted to S6 and S5 respectively based upon gradient >30%. Half Mile Creek is suspected to contain fish in reach one based on connectivity and gradient. Reach 1 of Silver Bell Creek is intermittent however; evidence of scour during freshet conditions was documented. Reaches 1& 2 may provide rearing habitat for adult and juvenile rainbow trout and bull trout during freshet conditions. One juvenile and one adult rainbow trout were captured in reach 2 of

WSC 128-835500-61800-22600-6440. Reach two provided excellent pool habitat, and abundant flow and cover for rainbow and bull trout. The average gradient and channel width of reach 2 was 17% and 3.1m respectively therefore; an S3 stream riparian classification was assigned.

4.3.2 ILP00101

Five sites were conducted within this third order sub-basin with its confluence in reach 2 of Monashee Creek mainstem. Elevations range from 620m at the confluence to 1620m in reach 6 of ILP00101 (the mainstem). A gradient of 50% in reach one of the L00101 is a barrier to fish passage. In addition, 350m of groundwater field evidence and 300m of subsurface flow in reach three also provided barriers to fish passage. Fish sampling conducted at the four sites included 37 hours of minnow trap effort and 1023 seconds of electrofishing covering an area of 1474m^2. Fish were not captured therefore; the sub-basin was classified as non-fish bearing.

4.3.3 Heckman Creek Sub-basin WSC 128-835500-61800-22600-1540

The Heckman Creek sub-basin is a fourth order drainage containing Inches, Big Goat Creek and -22600-1540-7150 sub-basins within its boundary however they will be discussed separately. Heckman Creek consists of seven reaches and flows into reach five of Monashee Creek mainstem at an elevation of 680m. The peak of the sub-basin occurs at 1560m in reach 2 of WSC 128-835500-61800-22600-1540-6930-685. Nine sites were conducted however only one site was conducted on the mainstem. Sixteen rainbow trout were captured in reach 2 of Heckman Creek downstream of a shotgun culvert (N08014). Numerous side channel bars were noted within this reach and an avulsion resulted in an abandoned channel that will contain flow during freshet conditions. The average channel width and gradient is 12m and 3% respectively, therefore a stream riparian classification of S2 was assigned to reach two. Reaches 3 to 5 of the mainstem are suspected to contain fish based upon gradient and connectivity to fish bearing water. Heckman Creek is confined within steep valley sides therefore first and second order tributaries of the mainstem were defaulted to non-fish bearing based upon gradients in excess of 25%. Five of the eight sites located on tributaries to Heckman Creek were NVC. Two of the remaining three sites were non-fish bearing and one site was suspected non-fish bearing.

4.3.4 Inches Creek Sub-basin WSC 128-835500-61800-22600-1540-3610

Elevations within the third order system ranged from 940m at the confluence with reach three of Heckman Creek to 1600m in reach two of WSC 128-835500-61800-22600-1540-3610-677. Nine juvenile rainbow trout were captured at the one site conducted within reach 3 of Inches Creek mainstem. Reach three provided excellent spawning habitat and the boulders, LWD overstream vegetation and undercut banks provided excellent cover and rearing habitat. The channel contained evidence of high freshet flows and would provide major staging habitat. Overwintering habitat consisted of deep pools with slow flowing water. The average channel width and gradient were 2.6m and 9% respectively therefore; a stream riparian classification of S3 was assigned to reaches 1-3. Tributaries of Inches Creek are not suspected to contain fish due to gradients in excess of 25%.

4.3.5 Big Goat Creek Sub-basin WSC 128-835500-61800-22600-1540-4420

This third order sub-basin ranges in elevation from 980m at the confluence with Heckman Creek to 1780m in reach four of WSC 128-835500-61800-22600-1540-4420-296. Reach one of Big Goat Creek confluences in reach four of Heckman Creek and is suspected to contain fish based upon gradient and connectivity to fish bearing water. The remainder of the sub-basin was either defaulted to non-fish bearing based upon gradient in excess of 25% or suspected non-fish bearing because random sample sites were not selected within this sub-basin.

4.3.6 WSC 128-835500-61800-22600-1540-7150

The elevation ranges from 1680m to 1140m, which is a relief of 540m. The third order sub-basin flows into reach 4 of Heckman Creek. One sample site was conducted however no fish were captured. Fish sampling effort included 56.5 hours of minnow trap effort and 588 seconds of electrofishing covering and area of 1344m^2. Despite not capturing fish, reach 1 was assigned a suspected S3 classification based upon an average channel width of 2.8m and a lack of barriers. Reach 2 was assigned a suspected S6 classification. The remaining tributaries within this sub-basin were defaulted to non-fish bearing because of gradients > 25%.

4.3.7 WSC 128-835500-61800-22600-2400

This third order sub-basin is a tributary of reach 6 of Monashee Creek. Elevations range from 760m at the confluence to 1560m. No randomly selected sites were selected however fish distribution was plotted based upon gradient and access to known fish bearing water. Reaches 1 and two of the mainstem were assigned a suspected stream riparian classification of S2-4 while reach 3 was assigned a suspected S5 classification. The remaining tributaries within the sub-basin were defaulted to non-fish bearing based upon gradient.

4.3.8 Monashee Pass Creek Sub-basin WSC 128-835500-61800-22600-2560

The Monashee Pass Creek Sub-basin is a fourth order system containing a third order basin (WSC 128-835500-61800-22600-2560-4300), which will be discussed separately. Monashee Pass Creek is a tributary of reach 6 of Monashee Creek. Five sites were randomly selected within this sub-basin. Reaches 2 and 3 of Monashee Pass Creek were dry however, they are suspected to contain fish because of historical sampling in 1997. Fish habitat and presence is confined to reach one of Monashee Pass Creek because it is downstream of known fish presence in reach 1 of WSC 128-835500-61800-22600-2560-4300. Reaches 4 & 5 of the mainstem were defaulted to suspected fish presence because of connectivity and gradient. The sub-basin ranges in elevation from 760m at its lowest point to 1720m in the headwaters. The relief within the Monashee Pass sub-basin resulted in numerous high elevation tributaries of Monashee Pass Creek defaulted to non-fish bearing based upon gradient.

4.3.9 WSC 128-835500-61800-22600-2560-4300

This sub-basin is located within the Monashee Pass Creek sub-basin and has its confluence in reach 1 of Monashee Pass Creek. The third order sub-basin ranges in elevation from 1000m to 1840m. Two sites were conducted in reaches 1 and 4 of the mainstem and one site on a tributary to the mainstem, which was NVC. One hundred and twenty meters of FSB was documented near the confluence of the mainstem and Monashee Pass Creek however one rainbow trout was captured upstream. Thus, reach 1 was assigned a stream riparian classification of S3 based upon an average channel width of 4.1m. A cascade was documented in reach 2.1 of the mainstem which is suspected to be the upstream barrier to fish migration. Shallow flows did not permit fish sampling

upstream of the cascade therefore reach 2 is suspected non-fish bearing. Upstream of the cascade, tributaries were defaulted to non-fish bearing based upon gradients >30%.

4.3.10 Yeoward Creek Sub-basin WSC 128-835500-61800-22600-3040

Yeoward Creek confluences with reach nine of Monashee Creek. Elevations range from 800m at the confluence to 2060m in reach 7 of Yeoward Creek. In total, thirty sample sites were conducted within the Yeoward sub-basin. Twenty-six of the sites were FSID sites and the remaining four were randomly selected. An 8m cascade (N08021) was located 5m upstream of the confluence of L00253 with Yeoward Creek. Fish sampling included 66 hours of minnow trap effort EF 330 seconds of electrofishing covering an area of 413m^2, which did not produce fish. Therefore, L00253 was assigned a stream riparian classification of S6 based upon an average channel width of 1.7m and a gradient of 25%. L02109 is possible rearing habitat for rainbow trout during freshet conditions. A suspected stream riparian classification of S3 was assigned based upon connectivity to known fish bearing water and an average channel width of 1.53m despite fish absence after electrofishing. L02110 was assigned a suspected stream riparian classification of S4 based upon connectivity to fish bearing water. Fish sampling did not capture fish however the gradient and lack of barriers would suggest excellent staging habitat during freshet conditions. Reaches 1 & 2 of L02115 are suspected to contain fish because of connectivity to known fish bearing water and gradient of 3%. The average channel width was 1.2m and provided adequate flow and cover for rainbow trout. Fish sampling did not produce fish, electrofishing and three minnow trap sets. Reach 4 of Yeoward Creek had an average channel width and gradient of 3.5m and 6% respectively. A 100m section of channel was dewatered however; freshet flows will connect the dewatered section. A sloughing bank extending 25m and having a height of 15m is a source of sediment. Three rainbow trout were captured in reach 4. Therefore, reaches 1-4 of Yeoward Creek were assigned a stream riparian classification of S3. A 22m cascade is the barrier to fish migration from Yeoward Creek into WSC 128-835500-61800-22600-3040-3660. Four hundred and ten meters of electrofishing for 386 electrofishing seconds did not produce fish. A 15m cascade is also a barrier to fish migration from Yeoward Creek into WSC 128-835500-61800-22600-3040-4620. The gradient and average channel widths are 14% and 2.6m respectively. 415m of electrofishing for 384 seconds did not produce fish.

One adult rainbow trout was captured in reach one of WSC 128-835500-61800-22600-3040-5880. Reach one provided moderate spawning habitat, adult and juvenile rearing habitat and cover for rainbow trout. The average channel width is 2.1m therefore; a stream riparian classification of S3 was assigned. Reach 2 was also samples however the 39% gradient and low flow resulted in an S6 classification. WSC 128-835500-61800-22600-3040-6160 is a tributary of Yeoward Creek. Reach one contained isolated pockets of spawning gravel, adult and juvenile rearing habitat and moderate cover. Three rainbow trout were captured and the average channel width was 2.0m therefore; an S3 classification was assigned to reach one. Fish presence and habitat was restricted to the mainstem of Yeoward Creek reaches 1-4 and reach one of WSC's 128-835500-61800-22600-3040-5880 and WSC 128-835500-61800-22600-3040-6160. The remainder of the sub-basin in non-fish bearing or suspected non-fish bearing based upon gradient or field verified barriers.

4.3.11 Corion Creek Sub-basin WSC 128-835500-61800-22600-4020

The mainstem of this third order sub-basin is a tributary of Monashee Creek reach 10. One sample site was conducted in reach 2. Despite 72 hours of minnow trap effort and 528 seconds of electrofishing for 210m, fish were not captured. Reach 1 contained a gradient of 33% which is a barrier to fish migration. The average channel width in reach one was 2.3m therefore; an S6 classification was assigned to all tributaries in this sub-basin. Elevations range from 1603m in the headwaters to 880m at the confluence with Yeoward Creek.

4.3.12 WSC 128-835500-61800-22600-4850

Historically rainbow were captured in reaches 1, 2 and three of the mainstem. L00130 was previously classified as S6 because of a dewatered section at the confluence. One randomly selected site was conducted on a tributary to reach 4 of the mainstem. The tributary was NVC. Fish presence is suspected in reach 4 and adjacent tributaries with gradient <30%. All other tributaries within this sub-basin were classified as non-fish bearing. Elevations in the third order sub-basin range from 940m at the confluence of reach 13 of Monashee Creek to 1760m in the headwaters.

4.3.13 WSC 128-835500-61800-22600-5720

The mainstem of this sub-basin is a third order tributary of reach 15 of Monashee Creek. Elevations range from 980m at the confluence to an elevation of 2080m. One randomly selected sample site was conducted in reach one however the channel was dry at the time of sampling. The gradient was conducive to fish passage (7%) and no barriers were identified therefore, reach one was assigned a suspected stream riparian classification of S3. Reaches 2 and 3 of the mainstem are not suspected to contain fish because of gradients of 22 and 23% respectively. Tributaries of the mainstem were in excess of 30% gradient and were defaulted to S5 and S6 accordingly.

4.3.14 ILP00516

The mainstem of this third order sub-basin consists of three reaches having a magnitude of 4. The confluence was at an elevation of 1000m and increased to a summit of 1840m. One sample site in reach one of L00516 was conducted. Reach one was dry at the time of sampling however a 14m cascade and 25m of dewatered channel provide a barrier to fish migration from reach 18 of Monashee Creek. Therefore, the mainstem and its tributaries were assigned stream riparian classifications of S6. The average channel width and gradient of reach one was 0.68m and 19% respectively.

4.3.15 Railroad Creek Sub-basin WSC 128-835500-61800-22600-6820

The Railroad Creek sub-basin confluences with reach 18 of Monashee Creek mainstem. Railroad Creek ranges in elevation from 1040m at the mouth of Railroad Creek to 2060m. Historical sampling in Railroad Creek suggests rainbow trout in reach 3. Five of the thirteen sample sites conducted within the Railroad Creek Sub-basin were NVC. Reach 2 of the mainstem provided excellent adult and juvenile rearing habitat, abundant cover, flow and some side channel for staging. The average pool depth was 0.55m, which provided excellent overwintering potential. The average channel width and gradient were 8.0m and 6% respectively. One juvenile eastern brook trout and two juvenile and one adult bull trout were captured in reach 2 which resulted in an S2 stream riparian classification. Three juvenile bull trout were also captured I reach 1 of WSC 128-835500-61800-22600-6820-0820. Reach 1 provided rearing habitat and was assigned a stream riparian classification of S3. Fish are not suspected upstream in reach 2 and are absent upstream of reach 2 based upon gradient default. Two adult Bull trout

were also captured in reach 1 of WSC 128-835500-61800-22600-6820-3250, which provided rearing habitat for adults and juveniles. The average channel width and gradient were 1.5m and 20% respectively. A stream riparian classification of S3 was assigned to reach 1. Reach 2 did not provide quality habitat and is suspected non-fish bearing. A cascade in combination with a reach gradient of 31% inhibits fish passage into reach 2. Fish sampling did not produce fish. A stream riparian classification of suspected S5 was assigned to reach 2. Fish bearing water was limited to the mainstem of Railroad Creek and reach one of side tributaries with gradient <30%.

4.3.16 Pinnacle Creek Sub-basin WSC 128-835500-61800-22600-6820-4320

The Pinnacle Creek Sub-basin is a third order system within the Railroad Creek Sub-basin. The lower elevation at 1160m is typical of the ICHmw2 zone. The transition occurs with the ESSFwc4 at mid elevation to the ATp at an elevation of 2360m. Historically, rainbow trout were captured in reach 1 of the mainstem. All tributaries of the mainstem were defaulted to non-fish bearing based upon gradient and no fish captured. Pinnacle Creek is suspected to contain fish downstream of the lake in reach 3. Therefore, a suspected stream riparian classification of S2-4 was assigned to reaches 1 & 2 while reaches 4 & 5 upstream of the lake were defaulted to non-fish bearing.

4.3.17 WSC 128-835500-61800-22600-6820-6190

This third order sub-basin is situated within the Railroad Creek sub-basin and confluences with reach two of Railroad Creek at an elevation of 1240m. The upper elevation in this sub-basin is 2080m. Two sample sites were conducted on tributaries to the mainstem. A 9.5m bedrock falls located at the confluence of L00575 and WSC 128-835500-61800-22600-6820-6190-287. No fish were captured upstream of the barrier therefore a stream riparian classification of S6 was assigned to reach one of WSC 128-835500-61800-22600-6820-6190-287. Fish presence is suspected along the mainstem reaches 1-5 because of gradient. In addition, reaches 1-2 of L00590 are suspected to contain fish. Suspected fish presence is based upon gradient default.

4.3.18 Upper Monashee Sub-basin WSC 128-835500-61800-22600-7220

The Upper Monashee sub-basin consists of the mainstem and its tributaries. The mainstem is a third order stream that ranges in elevation from 1100m at the confluence

with reach 19 of Monashee Creek to 1981m at the pinnacle of the sub-basin. One sample site was conducted on a second order tributary to the mainstem however a 25m cascade at the confluence was a barrier to fish passage. No fish were captured upstream of the barrier however three bull trout were visually observed in the mainstem. A stream classification of S6 was assigned to WSC 128-835500-61800-22600-7220-5130 based upon an average channel width of 2.46m and a gradient of 30%. The mainstem was assigned an S2-4 classification because of the bull trout observed in reach 3 of the mainstem. The tributaries of the mainstem were defaulted to non-fish bearing based upon gradient. Reaches 4-6 of the mainstem are suspected to contain fish based on connectivity and gradient. Three tributaries within the alpine tundra are not suspected to contain fish however gradient is conducive to fish passage.

Barriers to fish migration within the Monashee watershed are summarized in table 3.

TABLE 3 SUMMARY OF HISTORIC AND NEW BARRIERS TO FISH MIGRATION FOUND IN THE MONASHEE CREEK WATERSHED

Stream Name	Watershed Code of ILP	TRIM map #	Reach	Barrier Type	Height of barrier (m)	Verified in Field	Description of Barrier
Unnamed	00106	82L.028	1	F	3.7	Y	Bedrock falls, barrier to fish passage
Unnamed	00253	82L.018	1	C	8 x 100	Y	Cascade, no pools, gradient 31%
Unnamed	00255	82L.018	1	C	100m length	Y	Cascade extending 100m with no pools
Unnamed	00516	82L.019	1	C	14 x 30	Y	Minimal pool depth at base of FSB
Unnamed	00541	82L.019	1	C	15 x 20	Y	Cascade falls, dry channel, gradient
Unnamed	02006	82L.019	1	C	40 x 75	Y	Cascade falls barrier, no pools available
Unnamed	02101	82L.018	1	C	50 x 60	Y	Confluence with Yeoward Creek
Unnamed	02104	82L.018	1	C	100	Y	Cascade, gradient 45%
Unnamed	02107	82L.018	1	C	6 x 24	Y	Cascade, shallow flow
Unnamed	02113	82L.018	1	FSB	60	Y	Subsurface flow
Unnamed	128-835500-61800-22600-1540-6930	82L.017	3	C	35 x 15	Y	Cascade in combination with 27% gradient
Unnamed	128-835500-61800-22600-2560-4300	82L.018	2.1	C	40	Y	Cascade falls, shallow pool depth
Unnamed	128-835500-61800-22600-3040-3660	82L.018	1	C	22 x 45	Y	Cascade falls at confluence
Unnamed	128-835500-61800-22600-3040-4620	82L.018	1	C	15 x 25	Y	Cobble & boulder cascade, gradient 31%

TABLE 3 CONTINUED

Stream Name	Watershed Code of ILP	TRIM map #	Reach	Barrier Type	Height of barrier (m)	Verified in Field	Description of Barrier
Unnamed	128-835500-61800-22600-6050	82L.019	1	FSB	2	Y	FSB section 30m upstream of confluence
Unnamed	128-835500-61800-22600-6820-6190-287	82L.019	1	F	9.5	Y	Bedrock falls at confluence
Unnamed	128-835500-61800-22600-7220-5130	82L.029	1	C	25	Y	Cascade at confluence

4.4 Fish Age, Size and Life History

Within the Monashee Creek Watershed, 63 fish were captured from August 1 to October 19, 2000. Fourty-seven rainbow trout and fifteen bull trout were caught throughout the watershed and one Eastern brook trout in reach 2 of Railroad Creek. Figures 1 and 2 show the relationship between fish length and numbers of fish sampled whereas table 4 summarizes all fish captured by location. Adult and juvenile rainbow trout were captured in Monashee Creek, Heckman Creek and tributaries to Yeoward Creek. Nine juvenile rainbow trout were harvested in Inches Creek and three adult rainbow trout were sampled in the mainstem of Yeoward Creek, which supplied juvenile and adult rearing habitat, respectively. Adult and juvenile bull trout were captured upstream of reach 12 of Monashee Creek; reach two of Railroad Creek and a tributary of Railroad Creek. The bull trout captured covered all life stages except 70-95mm however, the omission of this life stage is likely due to the low sample size (15). Adult bull trout are suspected to inhabit the lower reaches of Monashee Creek, however a punt Electrofisher is required to effectively sample the 15.6m channel. Indications are that juvenile bull trout utilize the Monashee watershed as rearing habitat before migrating to Cherry Creek and into the Shuswap for the remainder of their life cycle (pers. comm. Mike Chamberlain). A larger sample size is required to accurately predict the life cycle. The absence of Eastern brook trout within the watershed with the exception of Railroad Creek would indicate a problem with the population. Further investigation would be required to determine the cause.

Figure 1 – Length Frequency Histogram of Sampled Rainbow trout within the Monashee Creek Watershed, August 1 to October 19, 2000.

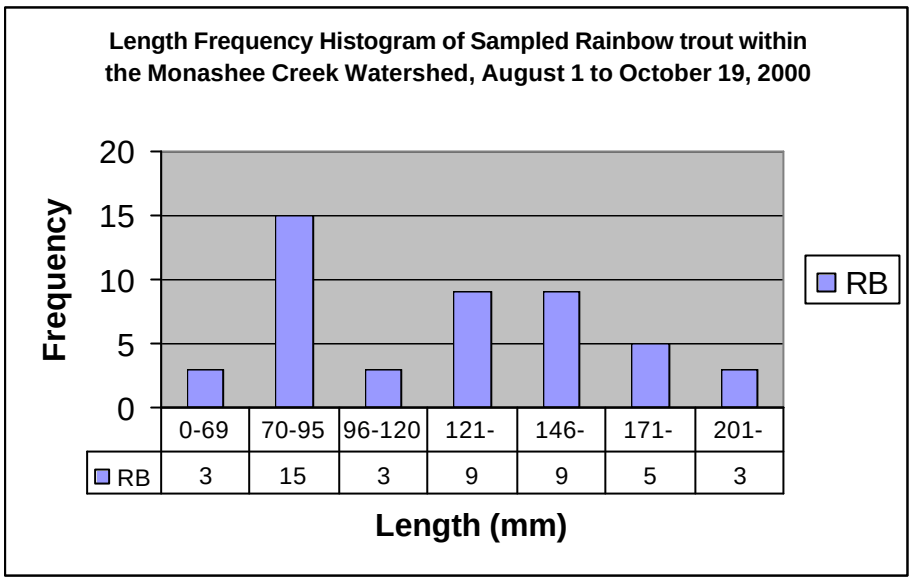

Figure 2 – Length Frequency Histogram of Sampled Bull trout within the Monashee Creek Watershed, August 1 to October 19, 2000.

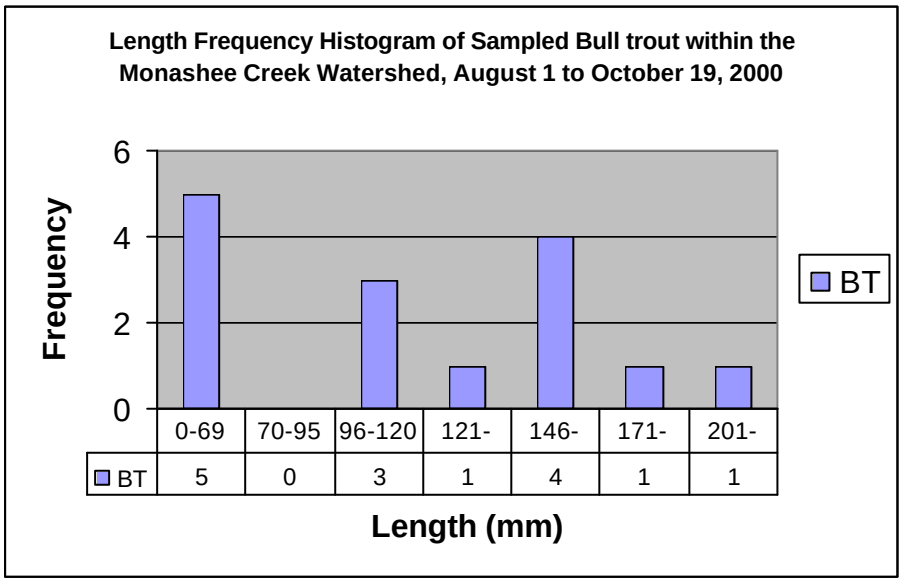

TABLE 4 – SUMMARY OF LENGTH DATA FROM FISH SAMPLED IN THE MONASHEE CREEK WATERSHED FROM AUGUST 1 TO OCTOBER 19, 2000.

Stream Name	Watershed Code/ ILP	Species	Number of fish	Mean Length (mm)	Life Stage	Range of lengths
Monashee Creek	128-835500-61800-22600	RB	5	86	J	70-120
Monashee Creek	128-835500-61800-22600	RB	7	151	A	128-189
Monashee Creek	128-835500-61800-22600	BT	3	112	J	101-119
Monashee Creek	128-835500-61800-22600	BT	4	154	A	147-165

Table 4 Continued

Stream Name	Watershed Code/ ILP	Species	Number of fish	Mean Length (mm)	Life Stage	Range of lengths
Heckman Creek	128-835500-61800-22600-1540	RB	5	87	J	49-114
Heckman Creek	128-835500-61800-22600-1540	RB	11	164	A	130-206
Inches Creek	128-835500-61800-22600-1540-3610	RB	9	72	J	66-80
Unnamed	128-835500-61800-22600-2560-4300	RB	1	223	A	223
Yeoward Creek	128-835500-61800-22600-3040	RB	3	186	A	150-215
Unnamed	128-835500-61800-22600-3040-5880	RB	1	134	A	134
Unnamed	128-835500-61800-22600-3040-6160	RB	1	117	J	117
Unnamed	128-835500-61800-22600-3040-6160	RB	2	134	A	131-137
Unnamed	128-835500-61800-22600-6440	RB	1	72	J	72
Unnamed	128-835500-61800-22600-6440	RB	1	170	A	170
Railroad Creek	128-835500-61800-22600-6820	BT	2	48	J	42-53
Railroad Creek	128-835500-61800-22600-6820	BT	1	140	A	140
Railroad Creek	128-835500-61800-22600-6820	EB	1	94	J	94
Unnamed	128-835500-61800-22600-6820-0820	BT	3	54	J	46-58
Unnamed	128-835500-61800-22600-6820-3250	BT	2	195	A	182-208

4.5 Significant Features and Fisheries Observations

4.5.1 Fish and Fish Habitat

Reach 3 of Inches Creek is a vital rearing habitat for juvenile rainbow trout. Reach 2 of Railroad Creek provided excellent adult and juvenile rearing habitat, abundant cover, flow and some side channel for staging. The average pool depth was 0.55m, which provided excellent overwintering potential. Sportfishing opportunities for rainbow trout and bull trout occur throughout the watershed. Vital opportunities exist within Monashee Creek and Heckman Creek.

4.5.2 Habitat Protection Concerns

4.5.2.1 Fisheries Sensitive Zones

Fisheries Sensitive Zones were not identified within the Monashee Creek Watershed.

4.5.2.2 Fish above 20% Gradients

Two Bull trout were captured in reach 1 of WSC 128-835500-61800-22600-6820-3250. The gradient of reach one was 20%.

4.5.2.3 Restoration and Rehabilitation Opportunities

Sixteen rainbow trout were captured in reach 2 of Heckman Creek downstream of a shotgun culvert (N08014). The culvert is a temporary barrier and should be replaced to allow for fish passage. Reach 4 of Yeoward Creek had a sloughing bank extending 25m and having a height of 15m, which is a source of sediment.

4.6 Fish Bearing Status

There were 830 reaches in the Monashee Creek watershed of which 18 were known to be fish bearing (section 4.6.1), 29 were known to be non-fish bearing (section 4.6.2) and 11 are of indeterminate status and are recommended for follow-up sampling (section 4.6.3). Thirty-two reaches were no visible channels. If fish were captured within a sampled reach, the species captured and relevant sampling information was recorded in table 5. Assumed fish presence was assigned to non-sampled reaches based upon known fish presence upstream. A detailed description of the methodology is located in section 3.0.

4.6.1 Fish Bearing Reaches

TABLE 5 SUMMARY OF DATA FROM SURVEYED FISH BEARING REACHES IN THE MONASHEE CREEK WATERSHED, AUGUST 1 TO OCTOBER 19, 2000

Stream Name	Watershed Code/ ILP	Reach	Species	Channel		Proposed Riparian Class	Follow-up Sampling (y or n)	Comments
				Width (m)	Site Gradient (%)			
Unnamed	106	1	NFC	1.59	10.25	(S3)	Y	Site 99, dewatered confluence, temporary barrier
Unnamed	132	2	NS	0.82	1.25	(S4)	Y	Site 2, dry/ intermittent
Unnamed	208	1	NS	0.94	11.25	(S4)	Y	Site 3, dry/ intermittent
Unnamed	255	1	NFC	1.90	10.00	(S3)	Y	Site 27, no barrier, fish in mainstem
Unnamed	2106	1	NFC	0.88	12.33	(S4)	Y	Site 92, minimal flow

Table 5 continued

Stream Name	Watershed Code/ ILP	Reach	Species	Channel		Proposed Riparian Class	Follow-up Sampling (y or n)	Comments
				Width (m)	Site Gradient (%)			
Unnamed	2109	1	NFC	1.53	7.33	(S3)	Y	Site 84, no barrier
Unnamed	2110	1	NFC	1.30	5.33	(S4)	Y	Site 85, possible use during freshet
Unnamed	2115	1	NFC	1.23	3.33	(S4)	Y	Site 86, connectivity with Yeoward Creek
Monashee Creek	-22600	3	RB	15.61	2.67	S2	N	Site 37
Monashee Creek	-22600	8	RB	12.52	1.50	S2	N	Site 19
Monashee Creek	-22600	10	RB	12.82	2.75	S2	N	Site 5
Monashee Creek	-22600	13	RB, BT	14.23	1.67	S2	N	Site 48
Monashee Creek	-22600	14	(RB, BT)	13.5	1	S2	N	Site 49, RB & BT captured u/s and d/s
Monashee Creek	-22600	15	RB, BT	14.10	1.33	S2	N	Site 50
Monashee Creek	-22600	20	RB, BT	6.93	1.67	S2	N	Site 24
Monashee Creek	-22600	21	BT	7.50	7.00	S2	N	Site 25
Monashee Creek	-22600	23	(RB, BT)	4.1	17	(S3)	N	Site 32, RB & BT captured d/s
Heckman Creek	-22600-1540	2	RB	11.98	3.33	S2	N	Site 38
Inches Creek	-22600-1540-3610	3	RB	2.95	8.67	S3	N	Site 46
Unnamed	-22600-1540-7150	1	NFC	2.85	7.33	(S3)	Y	Site 42, no barrier
Monashee Pass Creek	-22600-2560	2	NS	2.03	3.00	(S3)	Y	Site 18, dry/ intermittent
Monashee Pass Creek	-22600-2560	3	NS	1.79	6.50	(S3)	Y	Site 4, dry/ intermittent
Unnamed	-22600-2560-4300	1	RB	4.16	5.50	S3	N	Site 62
Unnamed	-22600-2560-5670	1	NS	1.89	2.33	(S3)	Y	Site 17, dry/ intermittent
Yeoward Creek	-22600-3040	4	RB	3.45	6.00	S3	N	Site 57
Unnamed	-22600-3040-5880	1	RB	2.05	6.25	S3	N	Site 59
Unnamed	-22600-3040-6160	1	RB	1.96	4.75	S3	N	Site 58
Unnamed	-22600-4820	1	NS	0.57	2.67	(S4)	Y	Site 47, minimal flow
Silver Bell Creek	-22600-5320	1	NS	1.30	13.25	(S4)	Y	Site 8, dry/ intermittent

Table 5 Continued

Stream Name	Watershed Code/ ILP	Reach	Species	Channel		Proposed Riparian Class	Follow-up Sampling (y or n)	Comments
				Width (m)	Site Gradient (%)			
Unnamed	-22600-5720	1	NS	2.24	6.67	(S3)	Y	Site 51, dry/ intermittent
Unnamed	-22600-6440	2	RB	3.08	16.50	S3	N	Site 63
Railroad Creek	-22600-6820	2	BT, EB	8.04	5.75	S2	N	Site 11
Unnamed	-22600-6820-0820	1	BT	1.86	6.67	S3	N	Site 21
Unnamed	-22600-6820-3250	1	BT	1.5	20.0	S3	N	Site 66
Unnamed	-22600-9260	1	NS	1.76	23.67	(S3)	Y	Site 33, dry/ intermittent

4.6.2 Non-Fish Bearing Reaches

4.6.2.1 ILP00101

Site 53 encompassed reaches one to three inclusive. Within the 30m of reach one, cobble was evident however there was no defined channel or connectivity to Monashee Creek. The cobble was flood sign from Monashee Creek. Reach two consisted of 300m of subsurface flow having no defined channel, alluvial deposition, or flow scour. Reach three contained 350m of dry channel when assessed on October 19, 2000. Electrofishing was conducted within the upper 350m of reach three however no fish were captured. Because of the combination of no connectivity to Monashee Creek, sections of undefined channel and subsurface flow within reaches 1-3, a stream riparian classification of S6 was assigned to reaches 1-3.

TABLE 6. SUMMARY OF THE DATA FROM SURVEYED NON-FISH BEARING REACHES IN THE MONASHEE CREEK WATERSHED, AUGUST 1 TO OCTOBER 19, 2000

Stream Name	Watershed Code/ ILP	Reach	Gradient (%)	Electrofishing Specifications				Other Methods		Comments
				Dist (m)	Time (s)	Cond (mS)	Temp °C	Type	Effort (hours)	
Unnamed	101	3	11	350	306	380	6	N/A	N/A	Site 104, reach 2 NVC
Unnamed	102	1	20	150	216	320	5	N/A	N/A	Site 105, NCD downstream
Unnamed	102	2	36	160	291	330	5	MT	37	Site 101
Unnamed	102	3	40	140	210	320	5	N/A	N/A	Site 102
Unnamed	103	1	66	N/A	N/A	300	4.5	N/A	N/A	Site 103
Unnamed	106	2	11	500	763	250	6	N/A	N/A	Site 100, u/s of falls barrier
Unnamed	253	1	24	295	330	160	10	MT	66	Site 26. u/s of cascade barrier
Unnamed	255	2	32	N/A	N/A	110	7	N/A	N/A	Site 28, 100m cascade

Table 6 Continued

Stream Name	Watershed Code/ ILP	Reach	Gradient (%)	Electrofishing Specifications				Other Methods		Comments
				Dist (m)	Time (s)	Cond (mS)	Temp °C	Type	Effort (hours)	
Unnamed	516	1	19	N/A	N/A	Dry	Dry	N/A	N/A	Site 78, 14x30m cascade
Unnamed	539	1.2	23	N/A	N/A	300	5	N/A	N/A	Site 65, 40m FSB
Unnamed	541	1	21	N/A	N/A	Dry	Dry	N/A	N/A	Site 76, 15x20m cascade
Unnamed	2004	1	55	N/A	N/A	270	7	N/A	N/A	Site 81, 60m FSB
Unnamed	2006	1	29	350	383	200	7	N/A	N/A	Site 75, u/s of cascade in reach 1
Unnamed	2101	1	51	N/A	N/A	190	10	N/A	N/A	Site 72, 50x60m cascade
Unnamed	2104	1	23	N/A	N/A	190	7	N/A	N/A	Site 68, 100m cascade
Unnamed	2107	1	17	510	415	200	5	N/A	N/A	Site 98, 6x24m cascade
Unnamed	2113	1	14	N/A	N/A	90	5	N/A	N/A	Site 91, 60m FSB
Monashee Creek	-22600	26	29	N/A	N/A	50	8	N/A	N/A	Site 30, 29% gradient, no habitat
Unnamed	-22600-1540-3120	3	2.33	450	300	200	6	MT	55	Site 39, frequent FSB
Unnamed	-22600-1540-6930	3	27	N/A	N/A	40	6	N/A	N/A	Site 54, 27% gradient, no fish habitat
Unnamed	-22600-2560-4300	4	11	N/A	N/A	70	6.5	N/A	N/A	Site 70, u/s of barrier
Unnamed	-22600-3040-3660	1	29	410	386	140	10	N/A	N/A	Site 56, u/s of cascade barrier
Unnamed	-22600-3040-4620	1	24	415	384	120	10	N/A	N/A	Site 60, u/s of cascade barrier
Unnamed	-22600-3040-5880	2	39	N/A	N/A	50	8.5	N/A	N/A	Site 93, 100 dewatered, 120x40m cascade
Unnamed	-22600-3040-6160	3	21	110	283	130	8.5	N/A	N/A	Site 61, 45m cascade
Corion Creek	-22600-4020	2	14.25	210	528	310	7	MT	72	Site 6, u/s of barrier
Unnamed	-22600-6050	1	9.67	150	182	300	9	N/A	N/A	Site 20, 30m FSB at confluence
Unnamed	-22600-6820-3250	2	31	510	383	150	7.5	N/A	N/A	Site 74, 50x100m cascade
Unnamed	-22600-6820-6190-287	1	6.50	110	276	90	5	MT	68	Site 14. 9.5m falls at confluence
Unnamed	-22600-7220-5130	1	30.00	100	147	170	7	N/A	N/A	Site 22, 25m cascade at confluence

4.6.2.2 ILP00102

One hundred and sixty meters of reach two was traversed revealing an average channel width and gradient of 2.1m and 36%, respectively on October 19, 2000. Fish sampling, limited by poor stream morphology, consisted of two minnow trap sets and 160m of electrofishing. A stream riparian classification of S6 was assigned based upon the sampling results and excessive gradient.

4.6.2.3 ILP00102

Two hundred meters of reach three was inventoried on October 19, 2000. The average channel width and gradient were 2.1m and 40%, respectively. One hundred and fourty meters of channel was electrofished, however, no fish were captured. Reach three was assigned a stream riparian classification of S6 based upon the sampling results, excessive gradient and the average channel width.

4.6.2.4 ILP00102

ILP00102 confluences with reach three of ILP00101 (site 53). One hundred and fifty meters of channel was surveyed on October 19, 2000. Fish sampling consisted of 150m of electrofishing however no fish were captured. Numerous features blocking the passage of fish from Monashee Creek were located downstream within site 53. Therefore, a stream riparian classification of S6 was based upon an average channel width of 2.0m, a gradient of 20% and the aforementioned features identified within site 53.

4.6.2.5 ILP00103

The average gradient and channel width was 66% and 1.6m, respectively on October 19, 2000. The gradient negates any possibility of presence thus; an S6 stream riparian classification was assigned.

4.6.2.6 ILP00106

On October 19, 2000, five hundred meters of reach two was surveyed. The average channel width and gradient was 1.8m and 11%, respectively. A 3.7m permanent bedrock falls identified upstream at the reach one break prevents fish migration into reach two (site 49). Five hundred meters of electrofishing upstream of the falls barrier, did not produce fish thus; a stream riparian classification of S6 was assigned.

4.6.2.7 ILP00253

Three minnow traps were set within reach, one and 195m of electrofishing was conducted however, neither produced fish. An 8m cascade with a gradient of 31% and no pools, identified near the confluence with Yeoward Creek inhibited fish migration upstream. A

stream riparian classification of S6 was assigned to reach one based upon an average channel width of 1.7m, an average field gradient of 25% and the fish sampling results.

4.6.2.8 ILP00255

A cascade extending 100m is a barrier to fish passage because of the absence of pools and a 32% gradient. One hundred and fifty meters of reach two had an average channel width of 0.52m. A stream riparian classification of S6 was assigned to reach two based upon the channel morphology and gradient.

4.6.2.9 ILP00516

A one hundred and fourty meter section of reach one was assessed on August 11, 2000. The channel was dry however; a twenty-five meter sediment wedge was deposited at the outflow. In addition, a fourteen-meter cascade extending thirty meters was identified twenty meters upstream from the confluence with Monashee Creek. The average channel width of 0.8m and gradient of 19% in combination with the 27% cascade will eliminate fish presence. Therefore, reach one of ILP00516 was assigned a stream riparian classification of S6.

4.6.2.10 ILP00539

On August 11, 2000, a fourty meter section of subsurface flow was identified twenty meters upstream of the confluence with Railroad Creek. The average gradient along the 450m of channel surveyed was 23%. Upstream of the subsurface flow, the average channel width was 0.4m, which prevented effective fish sampling and limited available rainbow trout and bull trout habitat. A stream riparian classification of S6 was assigned upstream of the subsurface flow however a suspected (S4) classification was assigned to the 20m section of channel accessible to Monashee Creek.

4.6.2.11 ILP00541

On August 10, 2000, one hundred and sixty meters of intermittent channel was assessed within reach one. A cut block located one hundred and fifty meters upstream from the confluence runs parallel to the channel however; a culvert was not installed at the road crossing. The average channel width and gradient were 0.38m and 21% respectively. A fifteen-meter cascade extending twenty meters with a gradient of 62% is located near the confluence. The excessive gradient and intermittent channel when compared to the average channel width eliminates the probability of fish usage therefore; reach one was assigned a stream riparian classification of S6.

4.6.2.12 ILP02004

Reach 1 was assessed on August 11, 2000 and the five hundred and fifty meters of surveyed channel consisted of groundwater seepage. Sixty meters of subsurface flow was documented near the confluence however, sections of discontinuous channel occurred throughout the reach. The average channel width and gradient was 0.33m and 55%, respectively. Based upon the discontinuous channel and gradient, a stream riparian classification of S6 was assigned.

4.6.2.13 ILP002006

On August 10, 2000, three hundred and fifty-six meters of reach one was surveyed. A 40m cascade extending 75m with a gradient of 45% was identified at the confluence with the mainstem. Three hundred and fifty meters of electrofishing was conducted however, no fish were captured. The average channel width and gradient upon investigation were 1.7m and 29% respectively. The sampling results, high gradient and average channel width gave rise to a stream riparian classification of S6.

4.6.2.14 ILP02101

Site 13 is located within reach one of ILP02101 and was assessed on August 09, 2000. A 60m x 50m cascade was identified at the confluence with Yeoward Creek. The average channel width and gradient were 0.57m and 51%, respectively. The channel morphology prevented effective fish sampling. The cascade in combination with the 51% gradient resulted in a stream riparian classification of S6.

4.6.2.15 ILP002104

Reach one was assessed on August 03, 2000. Within 50m of the confluence to fish bearing water, the field gradient was 18% and the channel exhibited minimal flow. A 45% cascade extending 100m was identified 50m upstream of the confluence. The average gradient and channel width was 23% and 0.35m, respectively. Based upon the average channel width, gradient and cascade, reach one was assigned a stream riparian classification of S6.

4.6.2.16 ILP02113

On August 08, 2000, a survey of four hundred and ten meters of reach one revealed a gradient of 14% and an average channel width of 0.23m. A sixty-meter section of subsurface flow was documented at the confluence with Yeoward Creek. The subsurface flow, which is a barrier to fish migration, in combination with the channel width and

gradient eliminated the probability of fish access from Yeoward Creek. Therefore, a stream riparian classification of S6 was assigned to ILP02113.

4.6.2.17 WSC – 22600-1540-3120

Reach 3 was assessed on September 15, 2000. The channel was 0.67m wide and did not provide any form of fish habitat. Fifty meters of subsurface flow was documented within reach 3. Despite 450m of electrofishing and two minnow trap sets, no fish were captured. Reach 2 had an average gradient of 42%, which is a barrier to upstream fish migration. A stream riparian classification of S6 was assigned based upon the absence of fish and the average channel width.

4.6.2.18 WSC – 22600-2560-4300

Reach four was assessed on August 08, 2000. The one hundred and fourty meter section of channel had an average channel width of 0.54m and gradient of 11%. Minimal flow and shallow pools prevented unbiased fish sampling however, downstream, reach three had an average gradient of 29% and a cascade barrier was previously identified within reach two (site 2). Therefore, an S6 stream riparian classification was assigned to reach four.

4.6.2.19 WSC – 22600-3040-3660

A field survey conducted within reach two on August 09, 2000 assessed four hundred and ten meters of channel. A 3.5m x 9m area of bank sloughing, consisting of clay, was a source of sediment to the channel. A twenty-two meter cascade extending fourty-five meters was identified at the confluence with Yeoward Creek. Due to the channel morphology and average gradient of 29%, fish sampling consisted of 410m of electrofishing. Fish were not captured upstream of the cascade barrier therefore, a stream riparian classification of S6 was assigned.

4.6.2.20 WSC – 22600-3040-4620

Four hundred and fifteen meters was surveyed on August 09, 2000. The average gradient within reach one was 24% upstream of the 15m cascade identified at the confluence. Electrofishing was conducted over a length of 415m however, no fish were captured and shallow water depths eliminated effective minnow trap sets. A stream riparian classification of S6 was assigned to WSC 128-835500-61800-22600-3040-4620 based upon an average channel width of 2.6m.

4.6.2.21 WSC –22600-3040-5880

Four hundred meters of reach two was assessed on August 09, 2000. The average channel width and gradient were 2.1m and 39%, respectively. A 120m x 40m cascade was identified upstream of 100m of dewatered channel. Fish sampling was not conducted upstream of the cascade however the minimal flow and gradient will negate fish passage. Reach 2v was assigned a stream riparian classification of S6.

4.6.2.22 WSC – 22600-3040-6160

Three hundred and seventy-five meters of reach three was assessed on August 03, 2000. A 35% cascade extending 45m prevented fish migration upstream. The average gradient of 21%, 1.1m channel, low bankfull depths and shallow pools provided minimal opportunities for fish access downstream of the barrier. Electrofishing was conducted for 110m however, no fish were captured and reduced water depths eliminated effective minnow trap sets. Upstream and downstream of the barrier a stream riparian classification of S6 was assigned due to the 21% average gradient and the stream morphology.

4.6.2.23 WSC - 22600-4020

Reach 2 of Corion Creek had an average channel width and gradient of 2.2m and 14% respectively. Two hundred and ten meters of channel was electrofished for 528 seconds. Three minnow traps set for a total effort of 72 hours. Neither method captured fish. The gradient in reach one was 33% inhibiting fish passage. Therefore, reach 2 of Corion Creek was assigned a stream riparian classification of S6.

4.6.2.24 WSC - 22600-6820-3250

Five hundred and ten meters of reach two was assessed on August 10, 2000. The average channel width and gradient were 4.3m and 31%, respectively. A 50m cascade extending 100m identified at the reach one break in combination with limited rearing, spawning and overwintering habitat reduced the potential for fish. Electrofishing conducted for a length of 510m did not capture fish. Minnow traps were not set due to the logistics of retrieval cost. Based upon the cascade barrier, gradient and the sampling results, reach two was assigned a stream riparian classification of S5.

4.6.2.25 WSC – 22600-6050

On September 12, 2000, one hundred and fifty meters of reach one was surveyed. A twenty-meter section of subsurface flow was identified at the confluence. Electrofishing did not produce fish and shallow water depths prevented minnow trap sets. A stream

riparian classification of S6 was assigned to reach one based upon an average channel width of 0.58m.

4.6.2.26 WSC - 22600-6820-6190-287

The average channel width and gradient of reach two was 2.7m and 7% respectively. A 9.5m bedrock falls located at the confluence is a barrier to fish passage. Three minnow trap sets and 110m of electrofishing did not produce fish. Therefore, reach 2 was assigned a stream riparian classification of S6.

4.6.2.27 WSC – 22600-7220-5130

One hundred meters of reach one was surveyed upstream of the 25m cascade located at the confluence. The average channel width and gradient were 2.5m and 30% respectively. No fish were captured by electrofishing. Bull trout were captured downstream in the mainstem (WSC –2260-7220). A stream riparian classification of S6 was assigned to reach one of WSC – 22600-7220-5130.

4.6.3 Follow-up Sampling Required

Follow up sample site locations were strategically placed to solidify stream classifications and provide additional biological information within sub-basins.

TABLE 7 FOLLOW-UP SAMPLING REQUIRED FOR CLASSIFICATION OF NON-FISH BEARING REACHES IN THE MONASHEE CREEK WATERSHED.

Stream Name	Watershed Code/ ILP	Reach	Timing	Methods	Comments
Big Goat Creek	-22600-1540-4420	2	Summer	EF&MT	Provide additional distribution data, no sample sites selected within this sub-basin
Unnamed	106	1	Freshet	EF&MT	Determine if fish access u/s of dewatered confluence
Unnamed	575	1	Summer	EF	Site 13, provide second sampling method, not conducted due to shallow water depth
Unnamed	576	1	Freshet	EF & MT	Site 12 (S6), confirm fish absence due to lack of habitat
Unnamed	596	1	Summer	EF	Site 15 (S6), provide second sampling method, not conducted due to shallow water depths
Unnamed	2103	1	Summer	EF	Site 69 (S6), confirm fish absence
Unnamed	2111	2	Freshet	EF	Site 89 (S6), freshet sampling recommended to determine fish usage in reaches one and two.
Unnamed	-22600-1540-5220	1	Freshet	EF	Site 44, (S6), determine if flow in freshet
Unnamed	-22600-1800-4650	1	Summer	EF	Site 52, (S6), confirm fish absence 22% gradient
Yeoward Creek	-22600-3040	7	Summer	EF, MT	Site 36, (S6), no fish habitat

5.0 Wildlife Observations

No significant wildlife observations were made other than species expected to reside within the study area.

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Appendices