Snooka Creek

Habitat Reconnaissance &

GPS Mapping Surveys

February 19-22, 2009

Prepared for

Bella Coola Watershed Conservation Society

Bella Coola

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RESOURCEFUL BY NATURE

March 15, 2009

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1.0 INTRODUCTION

In February 2009, Kynoch Resources submitted a proposal to the Bella Coola Watershed Conservation Society (BCWCS) to complete habitat mapping and GPS (Global Positioning System) ground surveys on portions of Snooka Creek flowing west into lower reaches of Thorsen Creek, in the lower Bella Coola Valley. Project objectives were to ground-truth survey techniques to determine feasibility of habitat mapping of small stream channels for which 1:20,000 TRIM maps were suspected to have significant errors in stream delineation. BCWCS recommended Snooka Creek receive this type of pilot project based on local knowledge of deficiencies in the stream position on TRIM maps, and recommendations made for habitat mapping presented in the BCWCS Watershed Based Fish Sustainability Plan Stage III report (Kynoch Resources, 2008).

Kynoch Resources coordinated a project team of biologists, and fisheries and mapping technicians with considerable experience in habitat assessment and mapping, GPS data collection and GIS (Geographic Information System) map production. BCWCS supplied a Trimble Pathfinder Pro XRB GPS receiver and appropriate TRIM II map data and ortho-rectified aerial photograph mosaics. Field work was completed between February 19 and 22, 2009.

1.1 Assessment Area

Snooka Creek (Watershed Code 910-290700-15300) was located immediately west of Thorsen Creek (910-290700-10000) and encompassed the drainages of Noohalk Creek (910-290700-10000-01400) and streams locally referred to as Dump Creek and Grant Creek (local alias'). Various other first order streams and sloughs also have tributary confluences with Snooka Creek.

As existing (2007) TRIM II maps had poorly defined stream channel delineation for Snooka Creek, exact extent of survey limits, scope of data collection and length of stream to be surveyed remained unknown at project start-up; however, it was proposed that the largest extent of area possible would be assessed within the scope of budget and time allotted.

1.2 Project Scope

In consultation with BCWCS it was determined that habitat data collection would be limited to key habitat factors easily identified in the field at reconnaissance levels. Those habitat features included:

- Stream Gradient (assessed in field using inclinometer)
- Substrate type for each stream reach (major classifications only)
- Erosion Features (left or right bank, type of erosion)
- Major riparian vegetation differences (assessed from airphotos and field observations)
- Culverts and other potential barriers to fish migration (spot locations)
- Existing habitat restoration projects, flood management, or stream channel diversion points (observed anthropogenic influences)
- Fences crossing stream,
- Observed livestock crossing/access of stream
- Digital site photographs of each reach and observed barriers, etc.

These reconnaissance level habitat features were selected from the features catalogue of the established Sensitive Habitat Inventory Mapping (SHIM) methods; however, were adapted for this project specific to Snooka Creek.

1.3 Methods

This reconnaissance mapping project required integration of GPS data collection and habitat feature interpretation and recording. Fisheries biologists and technicians familiar with local watershed habitat and conditions, as well as being familiar with SHIM methods designed a field form and data collection methods suitable for recording key habitat features (described above) along with GPS positions (waypoints) and a photo record. Habitat Data and representative photographs were collected by fisheries personnel in the field. Coordination between the GPS survey technician and fisheries personnel enabled field data to be fixed to positional waypoints for future cross-referencing.

Fish Habitat data for each recorded waypoint are presented digitally in Appendix 1 and photographs are presented digitally in Appendix 2.

1.3.1 GPS Survey Methods

It was determined during field assessment that the BCWCS Trimble GPS receiver did not provide consistent GPS/Satellite coverage within the accuracy required for the proposed mapping. This was likely due to the unit being an older model receiver (2000) and typically being required to receive differential data input from a base station, which is not available in Bella Coola and was beyond the scope of this project to acquire.

In substitution, a Garmin GPSMAP 60Cx GPS with external antenna mounted on a 2.5 m mast was used to collect GPS coordinates. Field observations and subsequent GIS integration showed that this unit received data at <5m accuracy >95% of the time, with accuracy often noted to be <3 m. The survey technician collecting data monitored real-time accuracy of GPS reception and only collected geographical data (waypoints) when accuracy was <5 m.

1.3.2 Fish Habitat Assessment Methods

Fish habitat was assessed and recorded using standards derived from WRP Fish Habitat Assessment Procedures (Johnston and Slaney, 1996). Where practical, measurements were completed for field assessments (e.g., widths, depths, gradient); however, owing to reconnaissance level mapping, calibrated estimates of stream widths were often completed to expedite field activities.

Gradients were measured using a hand held inclinometer over as long a stream distance length as feasible within representative areas. Widths were estimated and periodically measured with an field measuring tape. Stream depths were most often estimated owing to periodic ice cover and deep stream channel depths in areas of low gradient sloughs. Substrate was classified as; sand/fine, gravel, cobble, boulder or bedrock according to WRP standards. Riparian cover was assessed as conifer; deciduous, mixed or other (e.g., farm land, swamp, etc.).

All fish habitat observation points were recorded with a numeric waypoint and can be identified on the final map produced with this report. Confluences, barriers, bridges, erosion areas and other points of interest are also identified by a waypoint on the final project map. Appendix 1 provides complete digital fish habitat and survey data with corresponding waypoints for map location.

1.3.3 Map Production

The final project map was produced by integrating GPS data collected from the field with existing orthographically rectified aerial photo mosaics (ortho-photos) of the study area. GIS software (ArcView) was used to create a geo-referenced base layer for the map, upon which the GPS data could be plotted. Line work and features were then annotated on the map as required, with a reference table of habitat features created independently in MS .xls format. This simple and efficient approach to map production enabled the project team to collect data and accurately represent geographic locations within the limited scope of the project budget and still produce a usable and effective final deliverable.

1.4 Project Deliverables

As project deliverables Kynoch Resources has produced the following:

- Text summary report of mapping project (this report) ;
- Digital PDF format mapfile in three plot sizes (same map in three file sizes for various applications and download speeds if posted to internet);
- Digital .xls file of habitat field data (Appendix 1 of report);
- Collection of digital field photographs from assessment (Appendix 2 of report); and,
- GIS Shape File (.shp) of final digital map deliverable for future end-user GIS integration.

These project deliverables are archived on the Project Data Disc, of which three have been provided by Kynoch Resources.

2.0 RESULTS

Main results of this Reconnaissance Mapping Survey were production of the Project Map (Digital Attachment 1). This map shows the traced channel of Snooka Creek from near its confirmed headwater channels flowing from Snooka Valley, to the confluence of Thorsen Creek. Habitat data and descriptions, along with a photographic log are provided as digital Appendices 1 and 2 of this report. A brief summary of fish habitat based on reach delineation and an account of the mapped stream channel route and observations is provided below.

2.1 Stream Channel Location and Route Summary

Snooka Creek channel proved to be challenging to map, owing mainly to recent TRIM II data and digital data from Fish Wizard and Mapster (2009: internet based mapping tools) being incorrect and misleading.

The stream channel originally identified as Snooka Creek from road signs that flowed beneath Hwy 20 (near Lobelco Hall /exhibition grounds) and below Grant Road North, was determined not to actually comprise the mainstem of Snooka Creek at all. For this report we refer to this channel as the North Branch (see map).

Snooka Creek mainstem was divided into eight specific reaches based on field observations. The stream channel was determined to actually be identified by the road sign as Noohalk Creek, approximately 400 m east of Thorsen Creek, where it flowed beneath Highway 20. This stream channel (Snooka Creek) continues upstream through a variety of private properties, crosses beneath Grant Road South as a stream channel identified as Grant Creek (by the road sign), and continues to flow from upstream sources positively identified (mapped) as originating from Snooka Creek Valley near the south end of Snooka Creek FSR (refer to map).

The main observation from this is that the identified channels of Snooka Creek represented on TRIM and other maps did not exist as such, at the time of this survey (February, 2009), nor did it appear that they have existed as such for several years. Snooka Creek appears to be misnamed at two locations. First, the North Channel (refer to Map) does not appear to be the actual Snooka Creek channel, and secondly, the channel identified as either Noohalk Creek or Grant Creek appeared to be the actual observed channel of Snooka Creek (during this survey).

There is likely some ephemeral hydraulic connectivity between the upstream end of the North Channel and Snooka Creek (at approximately reach 6; refer to map); however, the most evident channel did not appear to have perennial connectivity and appeared to flow west at Reach 6 towards its eventual confluence with Noohalk Creek.

2.2 Habitat Summary

This report section provides a brief description of each of the eight reaches identified in the mainstem of Snooka Creek (refer to map) and areas of the North Channel. Refer to the Project Map, Habitat Data in Appendix 1 and Site Photos in Appendix 2.

2.2.1 Snooka Creek Mainstem

Reach 1: Map References POC to CON 1 Photos 1-4

Reach 1 was characterised by glide habitat with 0.5% gradient, fine organic substrate and mixed/deciduous riparian coverage. The stream channel was adjacent to a containment dike of Thorsen Creek (left bank) and had received habitat restoration and enhancement through LWD and boulder placement and dyke creation in the 1980's and 1990's. At waypoint Con 1, Dump Creek (local alias) flowed into Snooka Creek from the south, entering on the left bank.

Reach 2: Map Reference Con 1 to Con 3, Photos 5 to 18

Reach 2 was characterised by glide/slough habitat with moderate to abundant off-channel habitat. Reach 2 extended from the confluence of Dump Creek to the confluence of the North Channel, and had one additional channel flowing from the east into Snooka Creek (refer to map point Con 2). Reach 2 varied from ~4 to > 20 m wide and was predominantly noted to have fine organic substrate and low gradient. Three distinct off-channel ponds were identified and riparian cover was predominantly mixed deciduous and conifer forest. Substrate of Reach 2 was predominantly fine organics. LWD and SOD were locally abundant but did not appear to influence stream morphology. Historic beaver activity was noted throughout reach 2.

Reach 3: Map Reference Con 3 to Con 13, Photos 82 to 89

Reach 3 of Snooka Creek flowed beneath Highway 20 and was identified by road signs as Noohalk Creek. The stream channel was between 3 and 7 m wide and had a gradient of approximately 1%. Dominant riparian cover was mixed with deciduous trees prevalent and areas of agricultural/private land clearings noted. Foot and vehicle bridges were also noted in this stream reach (Appendix 1). Substrate of Reach 3 was predominantly fine organics.

Reach 4: Map Reference Con 13 to Point S236, Photos 73 to 81

Reach 4 was between 3 and 5 m wide with a gradient of approximately 1%. Riparian cover was mixed and substrate of Reach 4 was a variety of localized gravels, fines and cobble. This stream section flowed beneath Grant Road South and was identified by signage as Grant Creek. There were two bridge crossings and one culvert in reach 4.

Reach 5: Map Reference Con 9 to Con 8, Photos 65 to 71

Reach 5 was adjacent to cleared agricultural lands on the left bank, with right bank riparian areas being noted as mixed/deciduous forests. Signs of cattle access to the stream was noted and localised bank erosion also noted. Stream width was from 2 m to 3 m with fines and limited localised gravel substrate and a gradient of approximately 1% with glide morphology. The stream entering from the left bank at the downstream end of Reach 5 was considered to be a large stream channel in comparison to the mainstem (Photo 71) and contributed considerable stream flow (volume). This tributary was not mapped or assessed as part of this project.

Reach 6: Map Reference Con 8 to WP S193, Photos 60 to 64

Reach 6 of Snooka Creek was a mall braided channel between 1.5 and 2 m wide with ~1% gradient and predominantly glide morphology. Fine sediment was the predominant substrate type. Riparian Cover was mixed with dense shrub (*Salix*) adjacent to the stream channel. A fence line running at a bearing of 50º was noted as the reach break between Reached 6-7 and

was at a transition point from upstream wetlands to downstream (Reach 6) stream channel habitat. .

Reach 7: Map Reference WP S198 to WP S184, Photos 58 & 59

Reach 7 was predominantly a wetland stream section with open riparian cover and many dead conifer trees remaining without foliage. The stream channel was low gradient with ~<1% slope and a meandering glide/slough channel type. Much of the stream channel was frozen at the time of the survey, but it appeared fine organic sediment was the predominant substrate type.

Reach 8: Map Reference WP S181 and upstream, Photos 44 to 57

Reach 8 was the upstream-most section of Snooka Creek surveyed during this project. The stream channel of Reach 8 was highly aggraded and showed signs of recent and continuous channel avulsions and transportation of considerable amounts of fine sediment and large and small clastic and woody debris. Cobble, sand and gravel were the dominant substrate types in Reach 8 and LWD jams were common in this stream section. It appeared there are numerous other ephemeral channels in the vicinity of Reach 8 during higher flow regimes, this is evident from channel braiding and past knowledge from project personnel.

Reach 8 fish habitat was varied and numerous salmonid juveniles were observed. Riffle and pool habitat were the predominant habitat types, with residual pools noted in late February during this project period. Upstream of GPS point BRD 1 it appeared another channel flowed into Snooka Creek, forming the mainstem. This channel was not assessed owing to time and logistics, but appeared to be the primary (mainstem) perennial source of stream flow. The upstream-most point of GPS and habitat survey data was POCU (upstream Point of Commencement), where survey teams accessed Snooka Creek from the existing Snooka Creek trail network and progressed downstream (refer to map).

2.2.2 North Channel

The North Channel of Snooka Creek was originally surveyed from its confluence with Snooka Mainstem (at CON 3) in an upstream direction to a wetlands at GPS point S131. During the initial survey period, the North Channel was originally thought to be Snooka Mainstem. It was only after assessing areas from Snooka Creek recreation area and west that it was realised there was little or no notable fluvial activity. The project map shows the obvious wetland where fluvial disconnection appears to separate the Snooka Mainstem from the North Channel (separation is approximately ~150 m). Anecdotal reports with local land owners (Pers. Com. M. Tuck, February 21, 2009) indicate that there was likely higher connectivity between these points (e.g., areas of reach 6 and GPS point S131), but direct fluvial connectivity was not observed during this assessment.

The habitat of the North Channel was relatively homogenous for most of the channel and is easily accessible from Grant Road North or Highway 20. Fish habitat was predominantly Glide and pool habitat with areas of localised riffles. Pool and glide habitat typically exhibited fine sediment substrate and riffles exhibited fines, gravels and cobbles. Stream gradient was between ~0.5 % and 1.0 %. Riparian vegetation varied from agricultural influenced clearings or residential yards, to mixed deciduous forests. Photographs 19 through 43 show representative habitat of this channel.

3.0 RECOMMENDATIONS

Based on preliminary findings of this reconnaissance mapping project of Snooka Creek, it is recommended that BCWCS consider similar small to medium scale mapping projects throughout the Bella Coola watershed. Objectives of subsequent mapping projects could be adjusted according to project needs, and based on relative ease of data collection (assuming similar GPS coverage) it is assumed field costs and logistics could be kept reasonable through readily available survey instruments and experienced local professionals.

Since BWCS has acquired ortho-photos of the watershed through previous projects (2007-2008) these in-house data will provide sufficient base layers for developing usable and effective mps for most regional applications. GIS mapping (i.e., geographic data interpretation and presentation) will likely be the largest single unit expense as these data require significant time for manipulation and integration (e.g., edits, addition of layers, etc), which requires specialized skills and training.

Based on findings of this project, it appears there are significant mapping errors in available TRIM data and it appears that basic field reconnaissance mapping can correct these errors at limited cost through reconnaissance mapping similar to that completed by Kynoch Resources during this project. It is likely that some form of dialogue will be required between BCWCS and other regional or provincial agencies for full GIS/data integration to higher level mapping systems, but it appears through this project that local capacity is being developed for this form of mapping and surveying.

3.1 Land Management or Habitat Restoration Opportunities

While this project was intended to determine stream-channel course and location, observations were made that indicated this stream section may be suitable for a variety of restoration projects. While it is beyond the scope of this reconnaissance level mapping project to prescribe habitat restoration, the following opportunities may exist.

- Livestock exclusion
- Bank stabilization
- Riparian enhancement
- Stream channel redirection/alteration to redirect flow to historic/established channels
- Land management for future land/resource use.

This mapping project, combined with recommendations of the Stage III Watershed Report and BCWCS member and technical team knowledge could form the basis of a regional restoration or monitoring program.

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