



Sockeye Habitat on Great Central Lake: Summary and Recommendations for Management

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Prepared for:

Hupacasath First Nation

and

**Coast Region Integrated Land Management Bureau
Ministry of Agriculture and Lands**

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Table of Contents

1.0 Introduction	3
1.1 Objectives.....	4
2.0 Description of the Watershed	4
3.0 Habitat Classification and the Department of Fisheries and Oceans Requirements When Impacts to Fish Habitat are Expected.....	4
3.1 Critical	5
3.2 Important	6
3.3 No Fish Observed	6
4.0 Recommendations on Land and Water Use Impacts on Beach Spawning Habitat.....	6
5.0 References.....	9

1.0 Introduction

Area planners rely on resource information supplied by a number of local and regional agencies and special interest groups when making decisions regarding industrial, urban and recreational development. The Great Central Lake watershed is under increasing development pressures and the impacts of development have come under increasing scrutiny.

The Great Central Lake watershed is responsible for >50% of the Somass watershed sockeye production. The majority of returning sockeye adults spawn along the shoreline of the lake (>70%) but very little information exists on spawner abundance for tributary spawning versus beach spawning sockeye. The only information that exists on locations of beach spawning populations in the lake was collected in 1957, 1981, 1985, 1992 and 2001. The 1981 and 1992 information consists of complete shoreline surveys of the lake. Each of these surveys provided information for one survey within the spawning season and provided limited information on fish distribution and abundance during the spawning season. The 2001 data was for multiple shoreline surveys on Great Central Lake providing fish distribution information throughout the spawning period of October to December. The other survey years (1957, 1985 and 1992) provided information on depth distribution at Forestry Camp Creek Beach, Lindsay Creek Beach, Fawn Point Creek Beach and Doran Creek Beach (1992 only).

Existing data confirms that spawning takes place along the lakeshore at depths ranging from <0.5 meters to greater than 55 meters (Wright 1992, Hyatt unpublished data 1995, Boyd 1957 and Barraclough 1961). The lake shoreline also provides important rearing habitat for a number of fish species within the watershed and provides critical holding waters for fish waiting to spawn in tributary streams in the watershed.

Sockeye originating from this watershed contribute significant numbers to the Barkley Sound aboriginal, recreational and commercial fisheries. The watershed is also an important contributor of chinook and coho salmon to the above fisheries. The Great Central Lake stock is also of high importance to First Nations for societal and ceremonial purposes. All of the species of salmon originating from Great Central Lake contribute significantly to various fisheries, which in turn create significant economic benefits to the region.

In recent years development in and along the shoreline of Great Central Lake has increased through logging activities, expanded fish farming, tourism and a proliferation of float houses along the lake shoreline. Historically there has been float houses in the E&N area of the lake and a few houses dispersed along the

lake shoreline. In recent years the number of houses has increased significantly without approvals from government agencies and First Nations. The proliferation of float houses has caused great concern for the Hupacasath First Nation. At the request of the Hupacasath First Nation and Integrated Land Management Bureau (ILMB), M.C. Wright and Associates was contracted to determine in consultation with the Department of Fisheries and Oceans (DFO), where critical fish habitat exists, what issues the siting of these houses has on fish and fish habitat along the shoreline and, provide management recommendations on potential impacts and how to minimize or avoid these impacts.

1.1 Objectives:

1. Identify critical and important fish habitat along the Great Central Lake shoreline
2. Identify data gaps for classification of habitats around the lake shoreline
3. Provide information on potential impacts of float houses on fish and fish habitat
4. Provide recommendations on how to avoid or minimize impacts to fish and fish habitat.

2.0 Description of the Watershed

Great Central Lake is located on central Vancouver Island, just west of Port Alberni. It is the most prominent feature of the Somass Watershed at 30 km long and draining an area of 651 km² (Cousens 1982). It is fed by Drinkwater and McBride Creeks and drained by the Stamp River (Stiff et al 2001). Stamp River exits the southeast corner of Great Central Lake, joins the Somass River at the confluence of the Sproat and Stamp Rivers, then flows into the Alberni Inlet (Fish Habitat Classification Overview Map).

Great Central Lake is influenced by high annual rainfall and is located in the biogeoclimatic zone designated as “Western Hemlock”.

3.0 Habitat Classification and the Department of Fisheries and Oceans Requirements When Impacts to Fish Habitat are Expected

Fish habitat classifications for the Great Central Lake shoreline are based on shoreline survey data for sockeye from 1992 and 2001, scuba dive surveys, deep water surveys using a Unmanned Remotely Operated Vehicle (ROV) to determine depth distribution of beach spawning sockeye and expert opinion provided by Brad Rushton, DFO and M.C. Wright, M.C. Wright and Associates.

It should be noted that the classification of fish habitat is based primarily on knowledge of beach spawning sockeye populations and holding areas utilized by sockeye, chinook and coho before migrating into tributary streams of Great Central Lake. This assessment does not address the use of shoreline habitat by other fish species and other aquatic flora and fauna.

DFO protects fish habitat through section 35 of the Fisheries Act. Within the Act there are provisions for DFO to authorize works where the harmful alteration, disruption or destruction of fish habitat (HADD) is expected (subsection 35(2)). If the proposed works will result in a HADD, then an Authorization under Subsection 35(2) of the Fisheries Act will be required. Before DFO will consider an approval for a HADD the proponent must consider the following management options:

Can the works proposed be;

- relocated,
- redesigned,
- mitigated or
- compensated

If relocating, redesign or mitigation cannot avoid triggering a HADD then compensation for the loss of fish habitat will be required. It is the proponent's responsibility to demonstrate to DFO that the siting of a float house will not cause a HADD. If the structure will cause a HADD then the owner would be required to compensate for the loss of fish habitat. For more information on the DFO review process go to:

<http://wlapwww.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf>

Although the main concern surrounding the use of float houses on Great Central Lake is the potential impacts to sockeye spawning habitat, we also need to look at the shoreline as habitat that is critical to other forms of aquatic plants and animals. While it is important to protect beach spawning habitat the health of the shoreline and its importance to other aquatic life is equally important.

For this project shoreline habitat was classified into three categories (see attached Maps: Fish Habitat Classification Overview and Fish Habitat Classification Maps 1 to 8).

3.1 Critical

DFO defines critical habitat as habitat that is essential to sustaining a species of fish. General indicators are:

- Presence of high-value spawning or rearing habitat

- Most sensitive biologically to disturbance
- Areas high in primary productivity

These areas include but are not limited to beach spawning areas and salmon holding areas. It is unlikely DFO will authorize proposed works that will impact this type of habitat if the HADD can be addressed through the above management options.

3.2 Important

DFO defines important habitat as habitat that has moderate amounts of suitable beach spawning and or rearing habitat for fish species present. This type of habitat is moderately sensitive to disturbance. It is unlikely DFO will authorize proposed works that will impact this type of habitat if the HADD can be addressed through the above management options.

3.3 No Fish Observed

These areas still provide opportunities for salmon holding areas and or rearing habitat for fish species present. The No Fish areas would require more investigation before consideration could be given to allowing a structure in the area. It is possible spawning occurs below the visible limits of a shoreline survey. Siting may be considered if the habitat is classified as marginal habitat after a detailed assessment has been completed and DFO agrees with the assessment.

Based on the available information it has been determined that 48.6% of the shoreline habitat surveyed is critical, 44.8% important and 6.6% no fish observed.

4.0 Recommendations on Land and Water Use Impacts on Beach Spawning Habitat

Locations of critical and important sockeye beach spawning habitat were supplied to ILMB. This data was used to create maps showing counting stations, fish habitat classification and locations of float houses (Fish Habitat Classification Overview, and Fish Habitat Classification Maps 1 to 8). A total of 49 float houses are located west of Fawn Point (Map 5). Eight float houses are located in an area where habitat has not been classified (Map 8). The highest densities (51%) of houses are along north shoreline near Browns Bay Dry Land Sort (Map 8).

Based on available information the following conclusions and recommendations

were made:

- During the process of acquiring approval for construction and siting of float houses, the proponent would have been required to make every effort to re-design and/or relocate the locations of float houses to avoid causing a HADD. In the event the proponent could not avoid a HADD then there would have been a requirement under the Fisheries Act to apply for an Authorization from DFO for a HADD of fish habitat. For DFO to authorize a HADD, compensation is required to achieve no net loss of the productive capacity of fish habitat.
- The fisheries act is in place to protect fish habitat by being proactive, unfortunately we are dealing with a problem after the fact because the owners did not go through the approval/consultation process with First Nations, ILMB, DFO, MoE and Navigable waters. As a result of the above, DFO and MoE are now in a position where they have to speculate what the impacts have been to fish habitat. With the existing data we cannot state unequivocally what the impacts have been. In order to get a definitive answer DFO would have to investigate each float cabin and determine if they have violated the fisheries act. If they have, then they could be charged.
- The float houses have the potential to impact fish and fish habitat. Impacts can be caused by:
 - o Anchors smothering valuable beach spawning substrate. A sockeye redd (contains several nests of eggs) requires 1.8 m² of spawning substrate per female (reference). Each cabin could use as many as four anchors, which could cover 8 m² of spawning habitat. The average number of eggs per female is 3,618 (Cook and Cousens, 1981). The impact could be loss of spawning habitat to support 16,080 eggs.
 - o Grounding of the float house or log booms during low water can cause compaction of spawning substrate which will effect the sockeyes ability to dig a redd (spawning nest). Destruction of fish eggs through grounding during winter lake draw down at the Great Central dam would be a violation of Section 32 of the Fisheries Act. This section of the act addresses the destruction of fish.
 - o Float houses create extensive shading of the littoral zone reducing the amount of sunlight penetrating the water column, which is detrimental to aquatic macrophytes. Macrophytes are aquatic plants, growing in or near water that are emergent, submergent, or floating. Macrophytes are beneficial to lakes because they provide cover for fish and substrate for aquatic invertebrates. They also produce oxygen, which assists with overall lake functioning, and

provide food for some fish and other wildlife. The absence of macrophytes may also indicate water quality problems as a result of excessive turbidity and herbicides. However, an overabundance of macrophytes can result from high nutrient levels and may interfere with lake processing, recreational activities (e.g. swimming, fishing, and boating), and detract from the aesthetic appeal of the system (Crowder and Painter 191). High nutrient levels can be caused by sewage.

- o Discharge of grey water and sewage can affect water quality by introducing deleterious substances into the water column, which can kill fish. Deposition of deleterious substances into the fish habitat is a violation of Section 36(3) of the Fisheries Act,
 - o Fuel spills can kill aquatic plants and animals. Deposition of deleterious substances into the fish habitat is a violation of Section 36(3) of the Fisheries Act.
- There has been some discussion to create a float house community in the area surrounding Browns Bay. This area has been impacted by past logging practices (log storage, dewatering and log sorting operations). The extents of the impacts are unknown for this area. Although this area has been impacted it still supports spawning sockeye and is an important holding area for salmon (chinook, coho and sockeye) waiting to spawn in Browns Bay Creek. If the float houses are to be located in this area then there would be a requirement to perform a habitat assessment of the lake bottom to determine the condition of existing fish habitat in the vicinity of the Browns Bay dry land sort. The areas surveyed will provide DFO with information on habitat condition by depth. This information would be the basis for whether or not the project will proceed and what DFO will required should they decide to authorize the area for a float house community. Approvals under section 35 of the Fisheries Act will be required. If it is determined that a HADD to fish habitat is expected then this will trigger a Canadian Environmental Assessment Act (CEAA) screening. Approval to move forward will also require consultation with the Hupacasath First Nation and local and regional government agencies.
- If impacted areas of the lake are going to be considered for float houses then the Lakeside and Mercks dump sites could be assessed for historic logging impacts to determine if the sites could be used for a float house community (see Fish Habitat Classification Overview map). Studies have demonstrated that impacts are significant to the marine and fresh water environments as a result of watering wood at log dumps and log storage sites. The primary impact is from wood waste smothering the lake or ocean floor. For Great Central Lake it is likely beach spawning habitat has been covered in a thick layer of bark which would have reduced the available habitat near the log dumps.

- If leaving the float houses in their existing location is acceptable to all the parties involved (First Nations, DFO, MoE and ILMB) then a detailed study of each float house location will be required to ensure that the classification is valid below the visible depths observed from a boat. If houses are left on the lake then a monitoring program should be in place to ensure owners are in compliance with the Sections 32 and 36(3) of the Fisheries Act. Monitoring would require random sampling for water quality and periodic inspections under the structures to ensure compliance with the Fisheries Act and other local or regional government bylaws.

5.0 References

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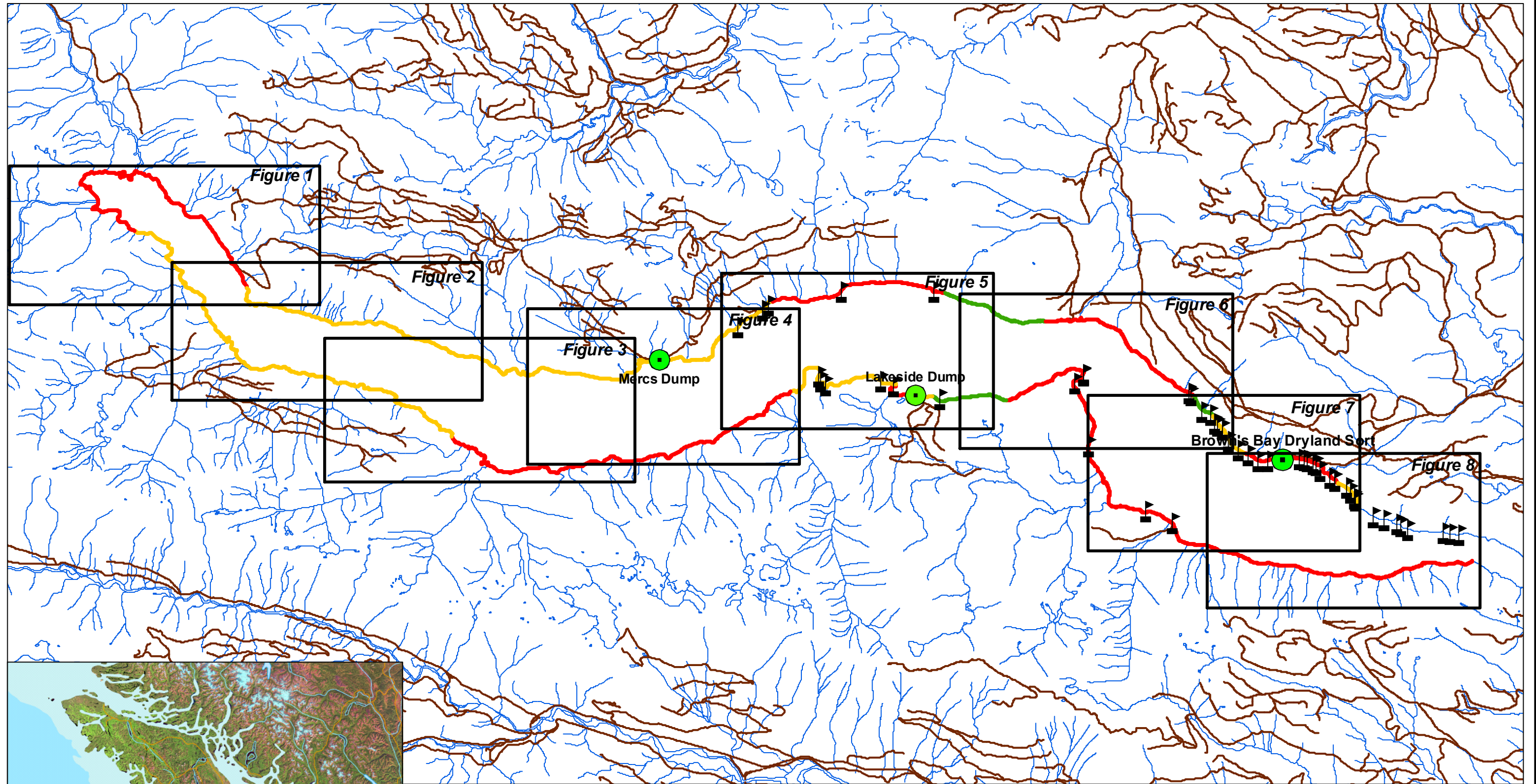
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Wright, M.C., P.L. Kelly and T.L. Wright. 2002. Shoreline Surveys of Sockeye (*Oncorhynchus nerka*) Spawner Distribution and Abundance for the Great Central Lake Sub-Basin – 2001/2002. Unpublished report prepared for Fisheries Renewal British Columbia and the Regional Aquatic Management Society, Port Alberni, B.C.

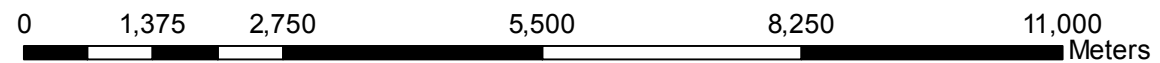
Disclaimer

This report refers to a specific site with a particular scope of work. It is not applicable to any other comparable sites regardless of the similarities, nor should it be relied on for any purpose other than that for which it was intended.

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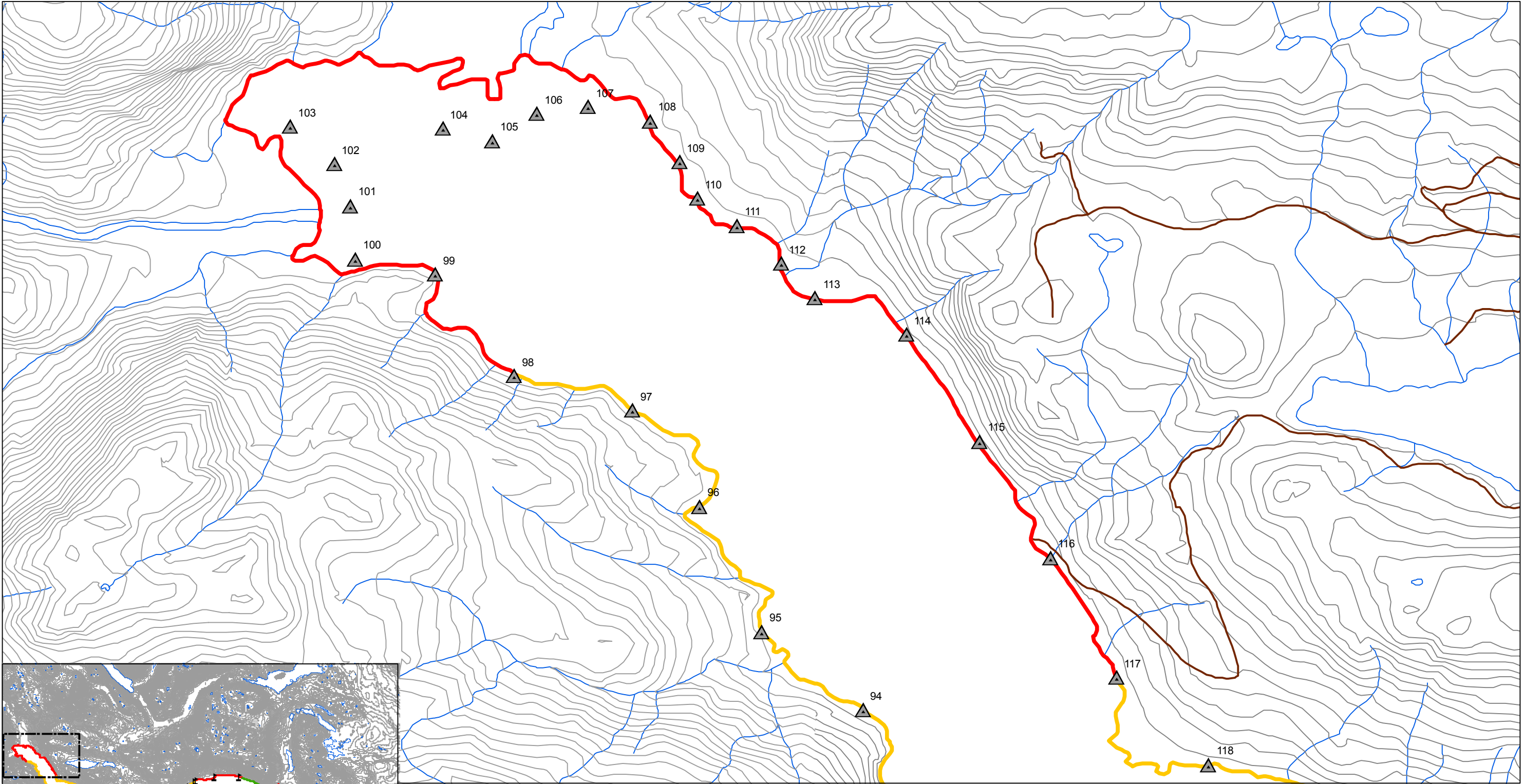
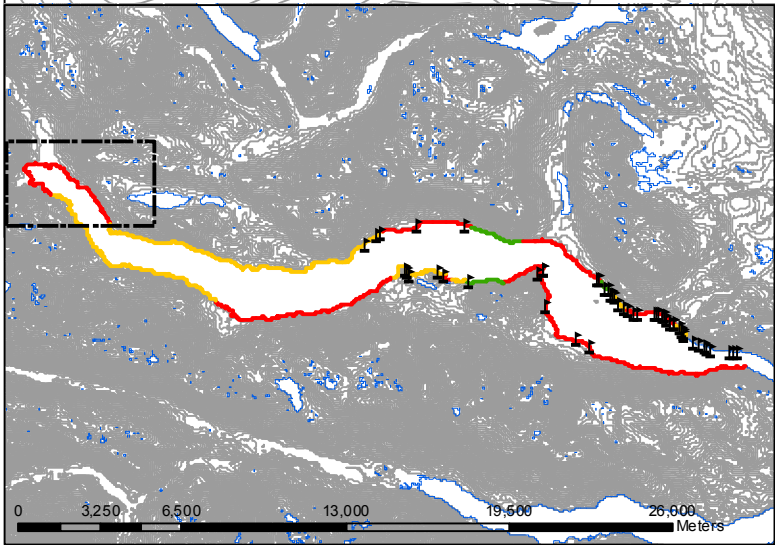


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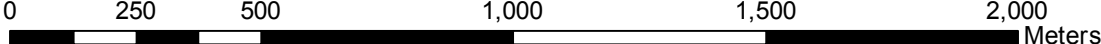


Site Details

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			<p>Fish Habitat Classification Overview</p>
			<p>Disclaimer: Sockeye may be present below the visible limits of surface observation, including areas shown here as zero density (green shoreline).</p>



Scale: 1:15,000



Site Details



Integrated Land Management Bureau
Nanaimo Service Center

- Legend**
- Floathouses
 - Sockeye Survey Reference Points
 - TRIM Rivers
 - TRIM Contours
 - TRIM Roads

Habitat Classification Rating

- Critical
- Important
- No Fish Observed

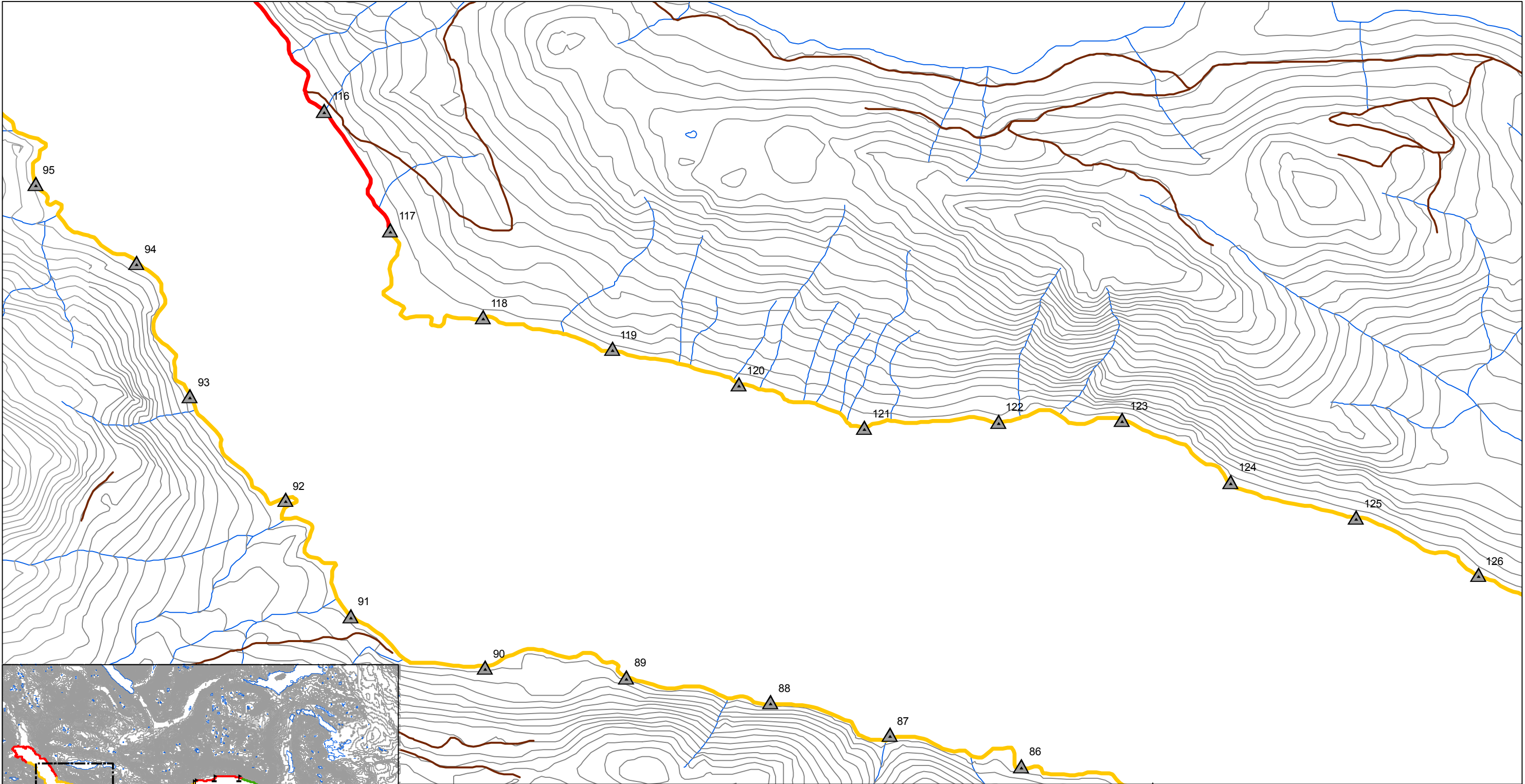


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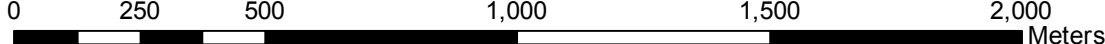
Great Central Lake Sockeye Survey

Fish Habitat Classification (1 of 8)

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Scale: 1:15,000



Site Details



Integrated Land Management Bureau
Nanaimo Service Center

- Floathouses
- Sockeye Survey Reference Points
- TRIM Rivers
- TRIM Contours
- TRIM Roads

Legend

- Habitat Classification Rating**
- Critical
 - Important
 - No Fish Observed

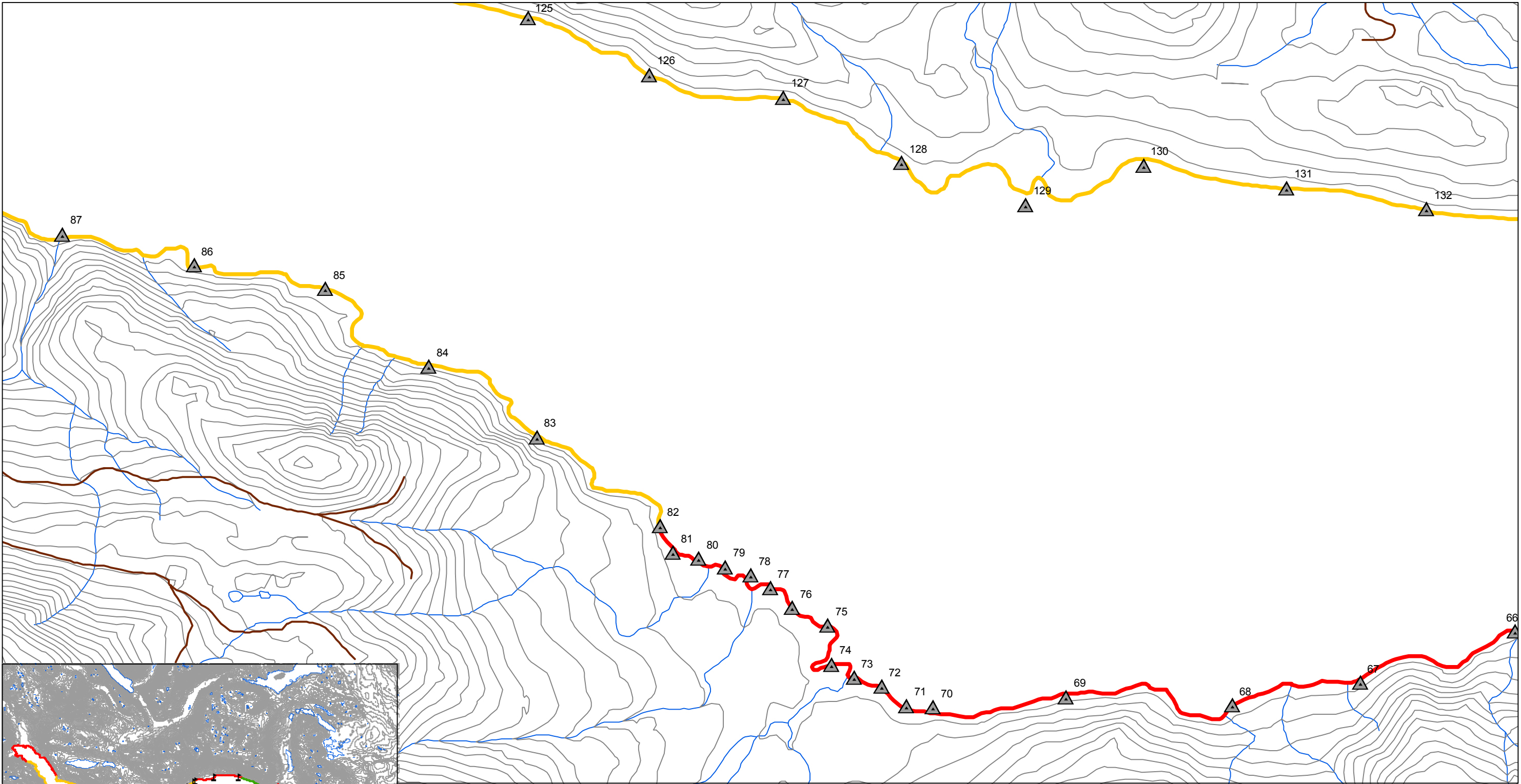
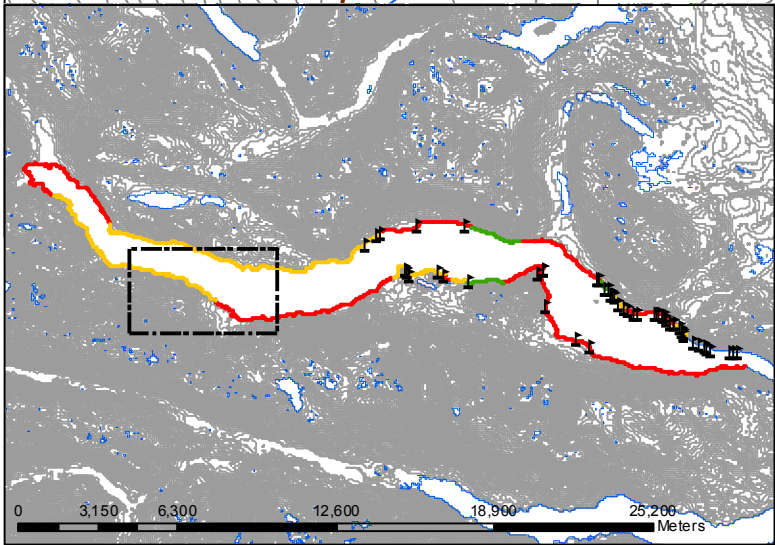


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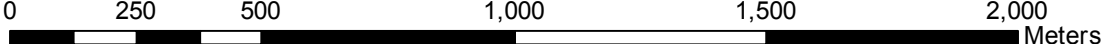
Great Central Lake Sockeye Survey

Fish Habitat Classification (2 of 8)

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Scale: 1:15,000



Site Details



Integrated Land Management Bureau
Nanaimo Service Center

- Roathouses
- Sockeye Survey Reference Points
- TRIM Roads
- TRIM Contours
- TRIM Rivers

Legend

- Habitat Classification Rating**
- Critical
 - Important
 - No Fish Observed

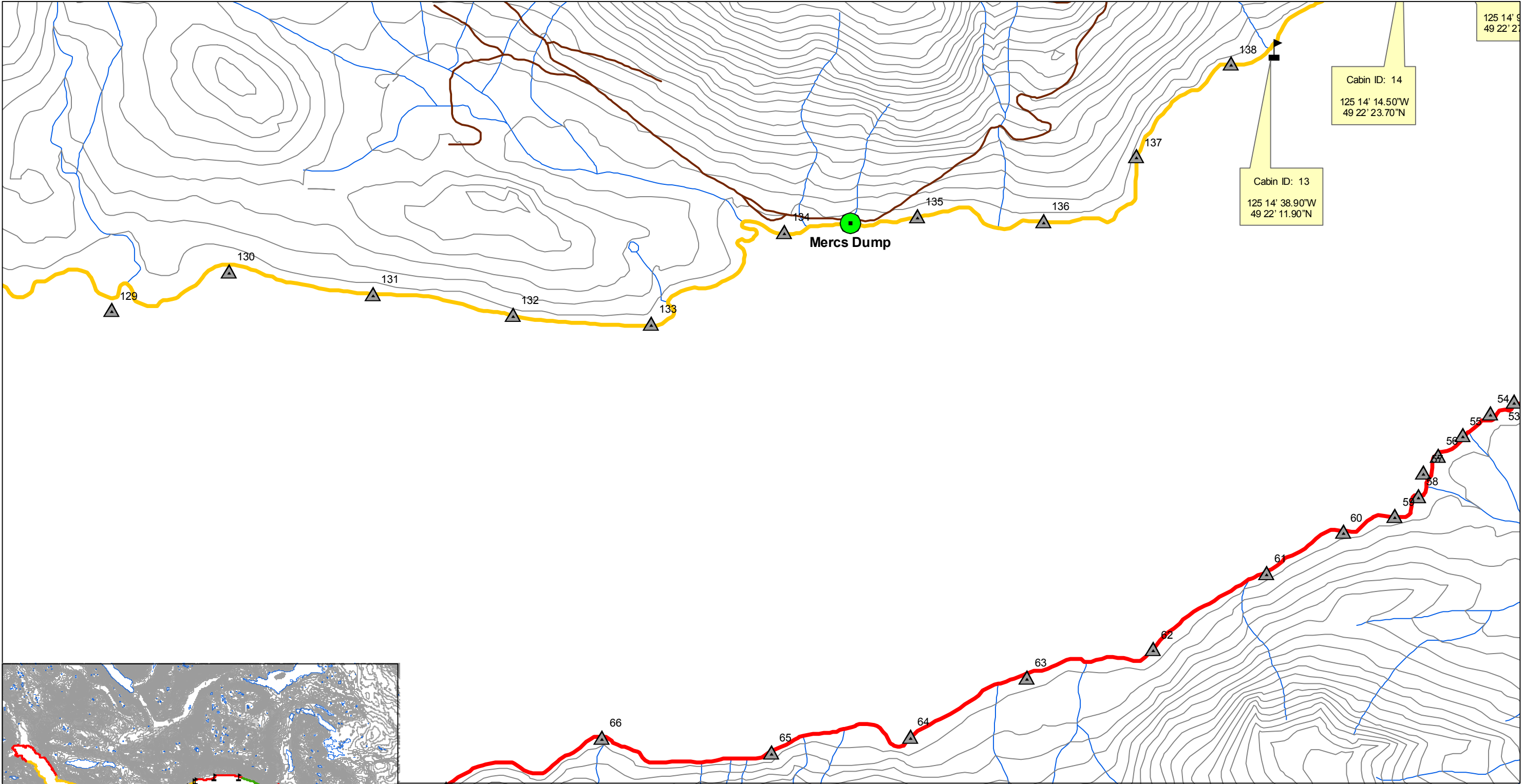
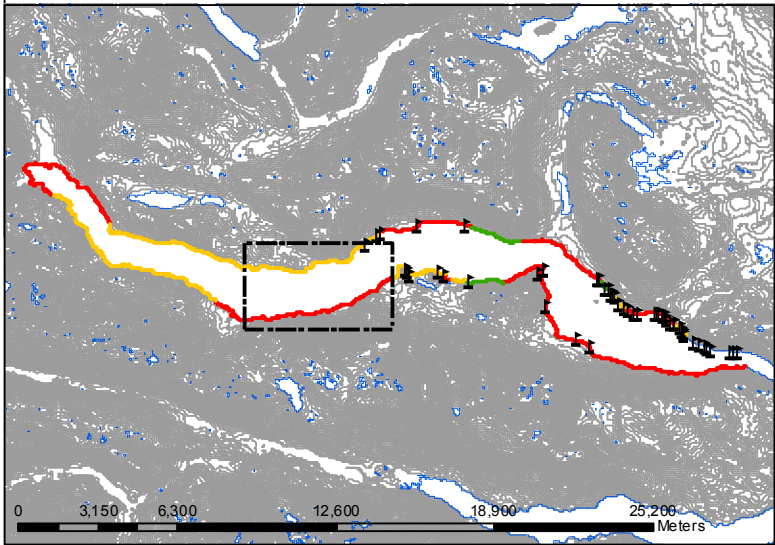


Survey Datum: NAD 83, UTM Z10
Map Base: Digital TRIM

Great Central Lake Sockeye Survey

Fish Habitat Classification (3 of 8)

Disclaimer:
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Scale: 1:15,000 0 250 500 1,000 1,500 2,000 Meters

Site Details



Integrated Land Management Bureau
Nanaimo Service Center

- Legend**
- Floathouses
 - Sockeye Survey Reference Points
 - TRIM Roads
 - TRIM Contours
 - TRIM Rivers

Habitat Classification Rating

- Critical
- Important
- No Fish Observed

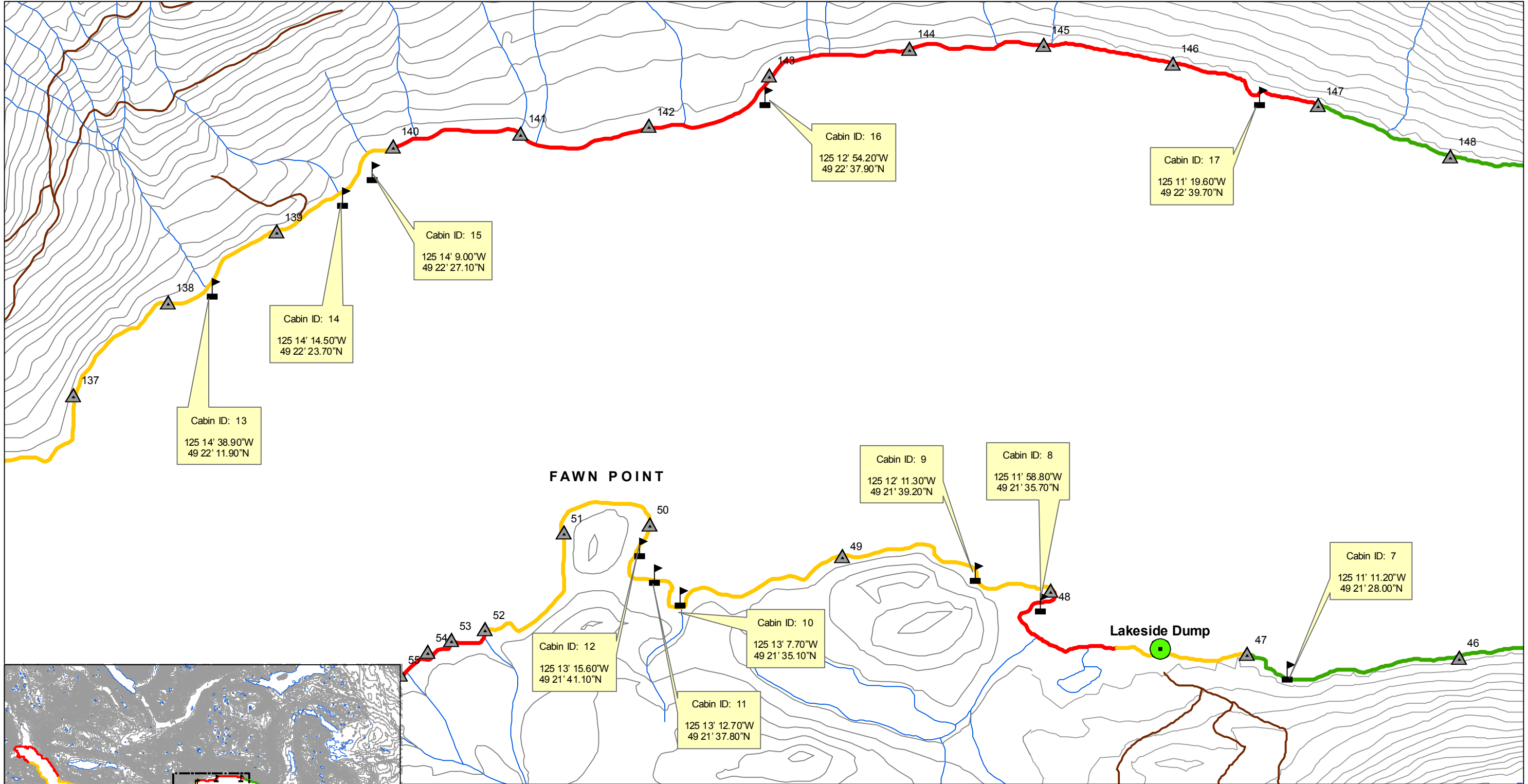


Survey Datum: NAD 83, UTM Z10
Map Base: Digital TRIM

Great Central Lake Sockeye Survey

Fish Habitat Classification (4 of 8)

Disclaimer:
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Scale: 1:15,000 0 265 530 1,060 1,590 2,120 Meters

Site Details

 **Integrated Land Management Bureau**
Nanaimo Service Center

Legend

 Floathouses
 Sockeye Survey Reference Points
 TRIM Rivers
 TRIM Roads
 TRIM Contours

Habitat Classification Rating

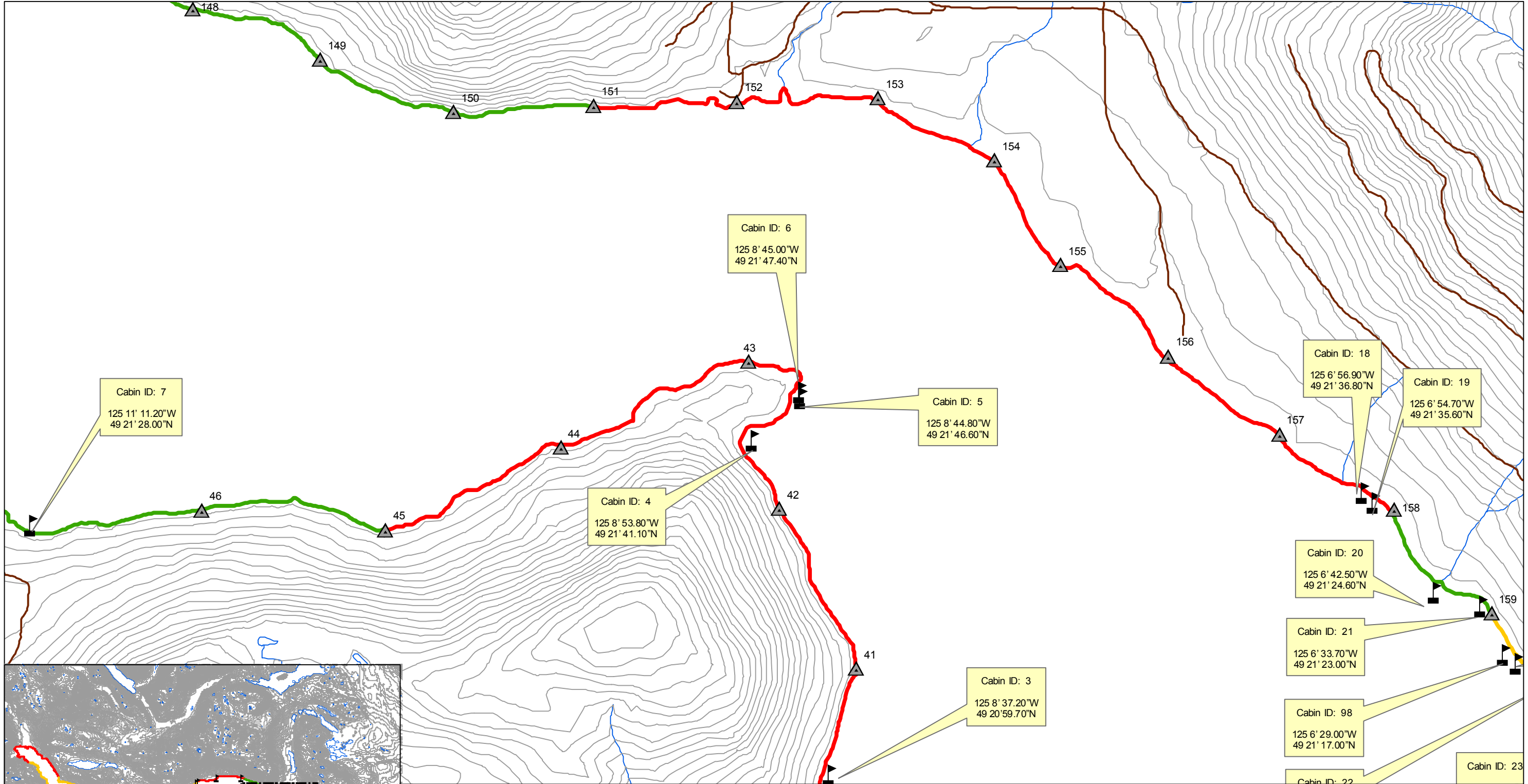
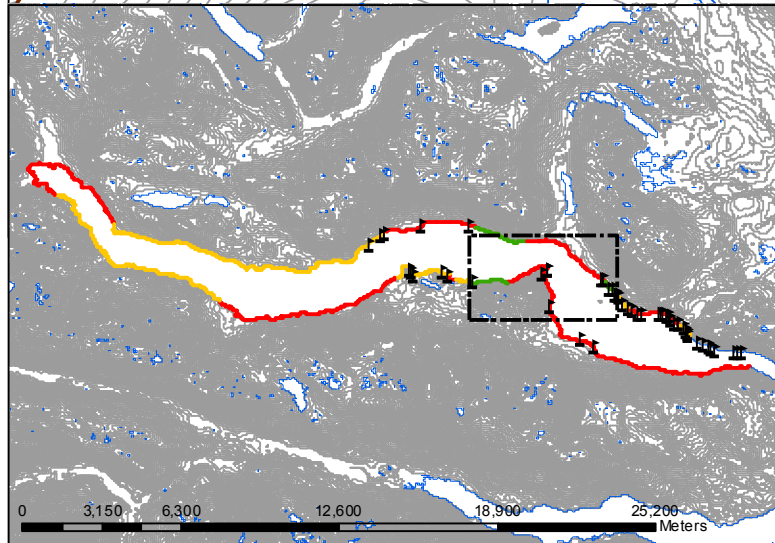
 Critical
 Important
 No Fish Observed


Survey Datum: NAD 83, UTM Z10
Map Base: Digital TRIM

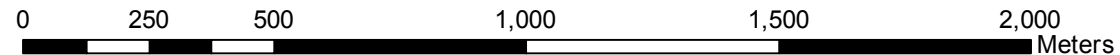
Great Central Lake Sockeye Survey

Fish Habitat Classification (5 of 8)

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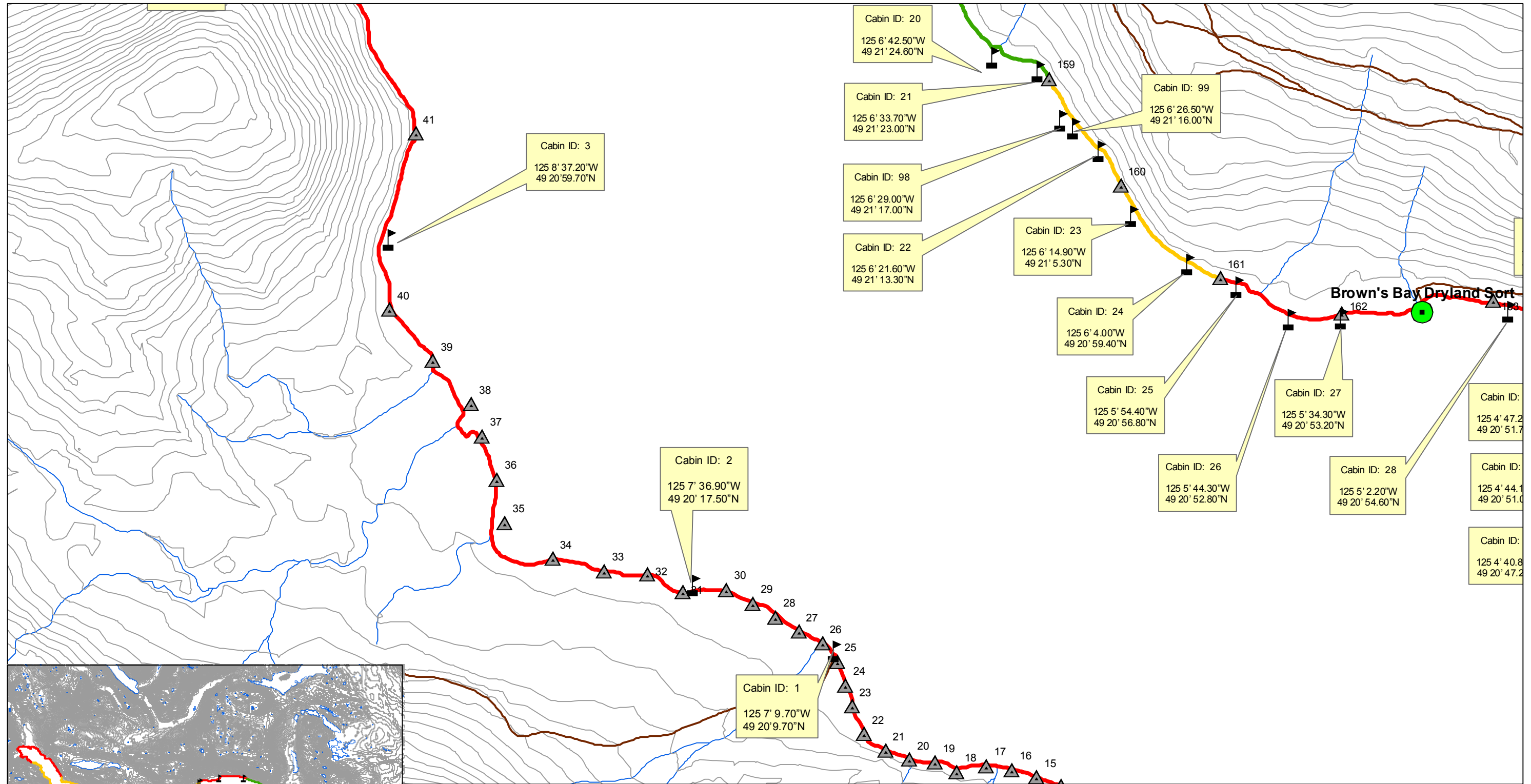


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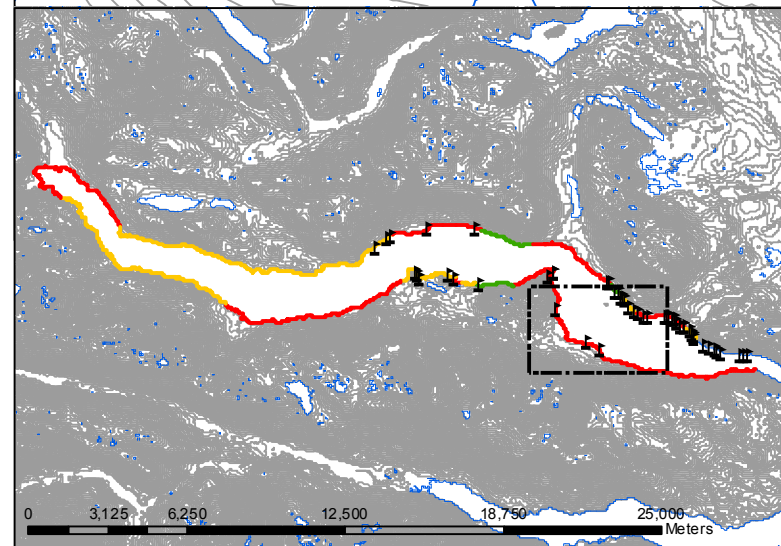
Site Details

 Integrated Land Management Bureau Nanaimo Service Center	 Legend Habitat Classification Rating Critical Important No Fish Observed	 Survey Datum: NAD 83, UTM Z10 Map Base: Digital TRIM	Great Central Lake Sockeye Survey
			Fish Habitat Classification (6 of 8)
			Disclaimer: Sockeye may be present below the visible limits of surface observation, including areas shown here as zero density (green shoreline).

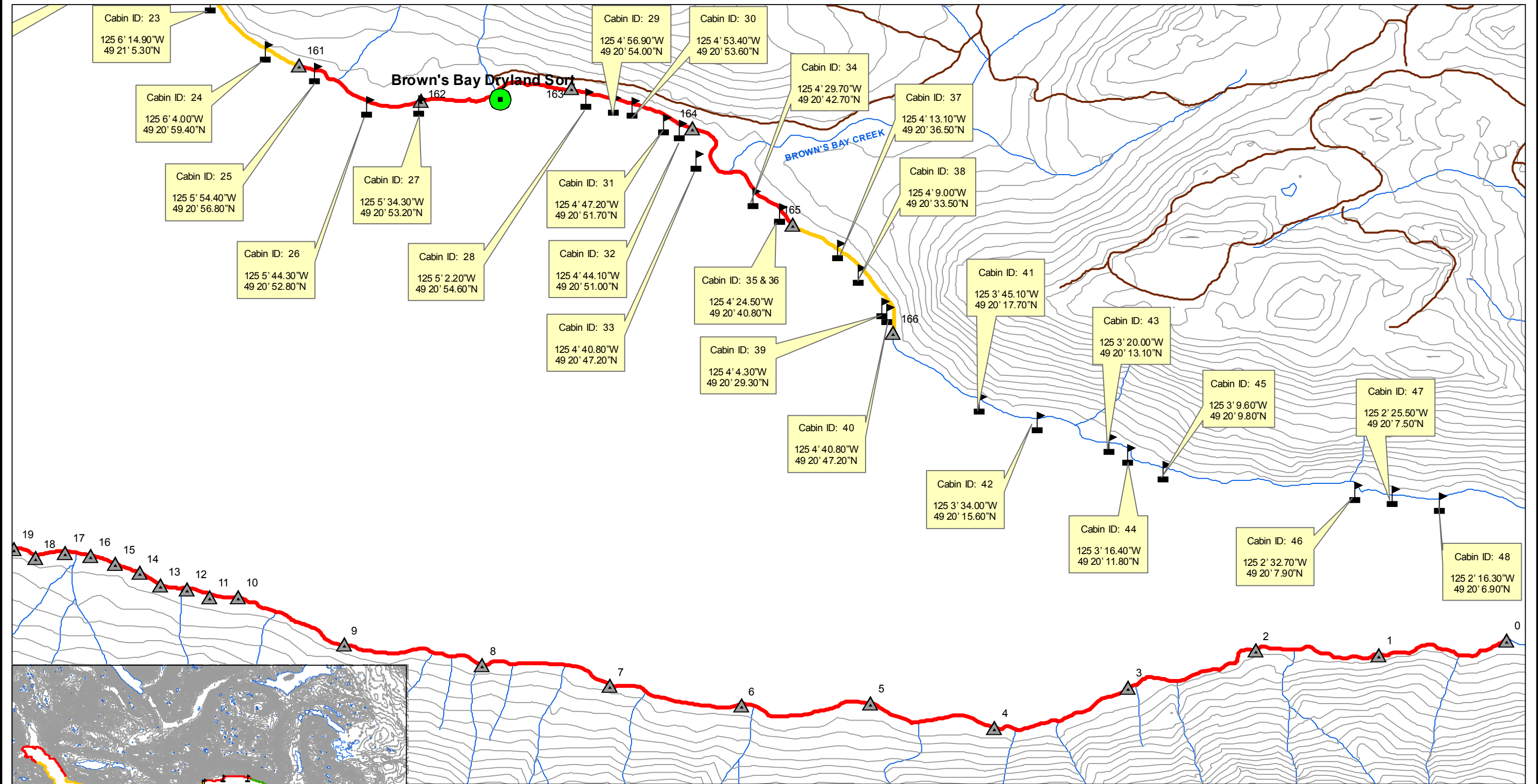
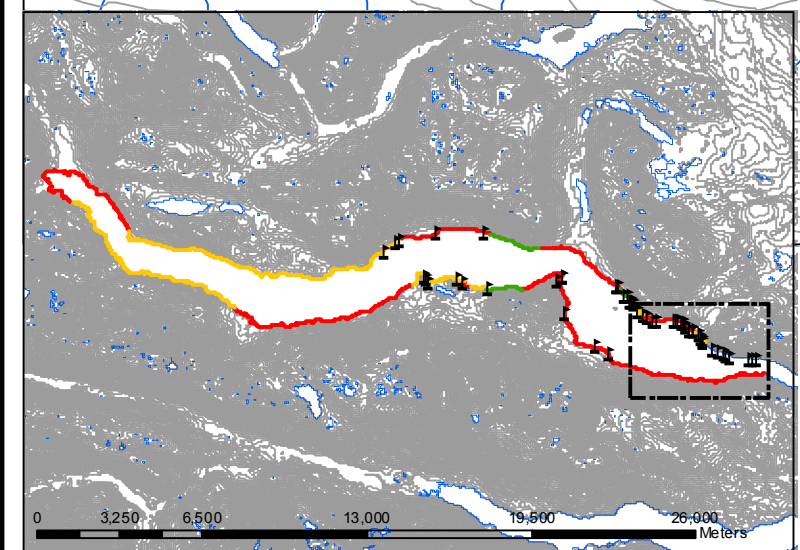


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Site Details



 <p>Integrated Land Management Bureau Nanaimo Service Center</p>	<p>Legend</p> <ul style="list-style-type: none"> Floathouses Sockeye Survey Reference Points TRIM Roads TRIM Contours TRIM Rivers <p>Habitat Classification Rating</p> <ul style="list-style-type: none"> Critical Important No Fish Observed	 <p>Survey Datum: NAD 83, UTM Z10 Map Base: Digital TRIM</p>	<p>Great Central Lake Sockeye Survey</p> <p>Fish Habitat Classification (7 of 8)</p> <p>Disclaimer: Sockeye may be present below the visible limits of surface observation, including areas shown here as zero density (green shoreline).</p>
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 Integrated Land Management Bureau Nanaimo Service Center	 Legend	 Survey Datum: NAD 83, UTM Z10 Map Base: Digital TRIM	Great Central Lake Sockeye Survey
			Fish Habitat Classification (8 of 8)
			Disclaimer: Sockeye may be present below the visible limits of surface observation, including areas shown here as zero density (green shoreline).

Habitat Classification Rating
Critical
Important
No Fish Observed