

# Phase 1 Green Lake OCP Area Watershed Assessment

## Sediment Source Survey, Riparian Assessment and Reconnaissance Channel Assessment

prepared by

Ken L. MacKenzie, R.P. Bio

Iverson & MacKenzie Biological Consulting Ltd.

For

Green Lake and Area Rate Payers Association

### Green Lake and Area OCP Statistics

The total area of the Green Lake OCP area is 87,942 ha, of which 7775 ha are lakes (8.8% of the total area), and 4139 ha (4.7%) are wetlands leaving a total land area of 76,028 ha in the OCP. Of this, 332 ha (0.4%) are in Provincial Park (a number of parcels including islands in Green Lake) and 476 ha (0.6%) in Wildlife Habitat Area (WHA) for badger (*Taxidea taxus*) and great basin spadefoot (*Spea intermontana*) in the OCP area.

### Biogeoclimatic Units in the OCP Area

Two Biogeoclimatic Ecosystem Classification (BEC) units are found in the OCP area, the Fraser variant of the dry, cool Interior Douglas-fir (IDFdk3) and the moist cool variant of the Sub-Boreal Pine-Spruce (SBPSmk). The IDFdk3 is characterized by average annual temperatures of 3.3 °C and moderate annual precipitation (433 mm) and forests dominated by Douglas-fir (*Pseudotsuga menziesii*) or Lodgepole pine (*Pinus contorta*). The SBPS is found in the north-east part of the OCP area and is wetter than the IDF (506 mm annual precipitation), but with similar temperatures (3.2 °C average annual temperature) and forests dominated by lodgepole pine or white spruce (*Picea glauca*).

### Road Density

Road density is fairly high in the OCP area with overall density 2.04 km/km<sup>2</sup> (Table 1, Figure 1). Over 70% of the roads are rated as Rough or Overgrown Roads, mostly forestry and other resource roads. A number of these roads

were identified for field inspection as potential sediment sources where restoration activities could be undertaken to reduce sediment input into waterways.

Little area in the OCP area is greater than 1 km from a mapped road (Figure 2).

*Table 1: Road density by road class in the Green Lake and Area OCP area.*

<b>Road Type</b>	<b>Road Length (km)</b>	<b>Percent</b>	<b>Road Density (km/km<sup>2</sup>)</b>
paved	114.9	7.4%	0.15
loose	324.1	21.0%	0.43
rough	1103.3	71.0%	1.45
overgrown	10.7	0.7%	0.01
<b>All</b>	<b>1553</b>		<b>2.04</b>

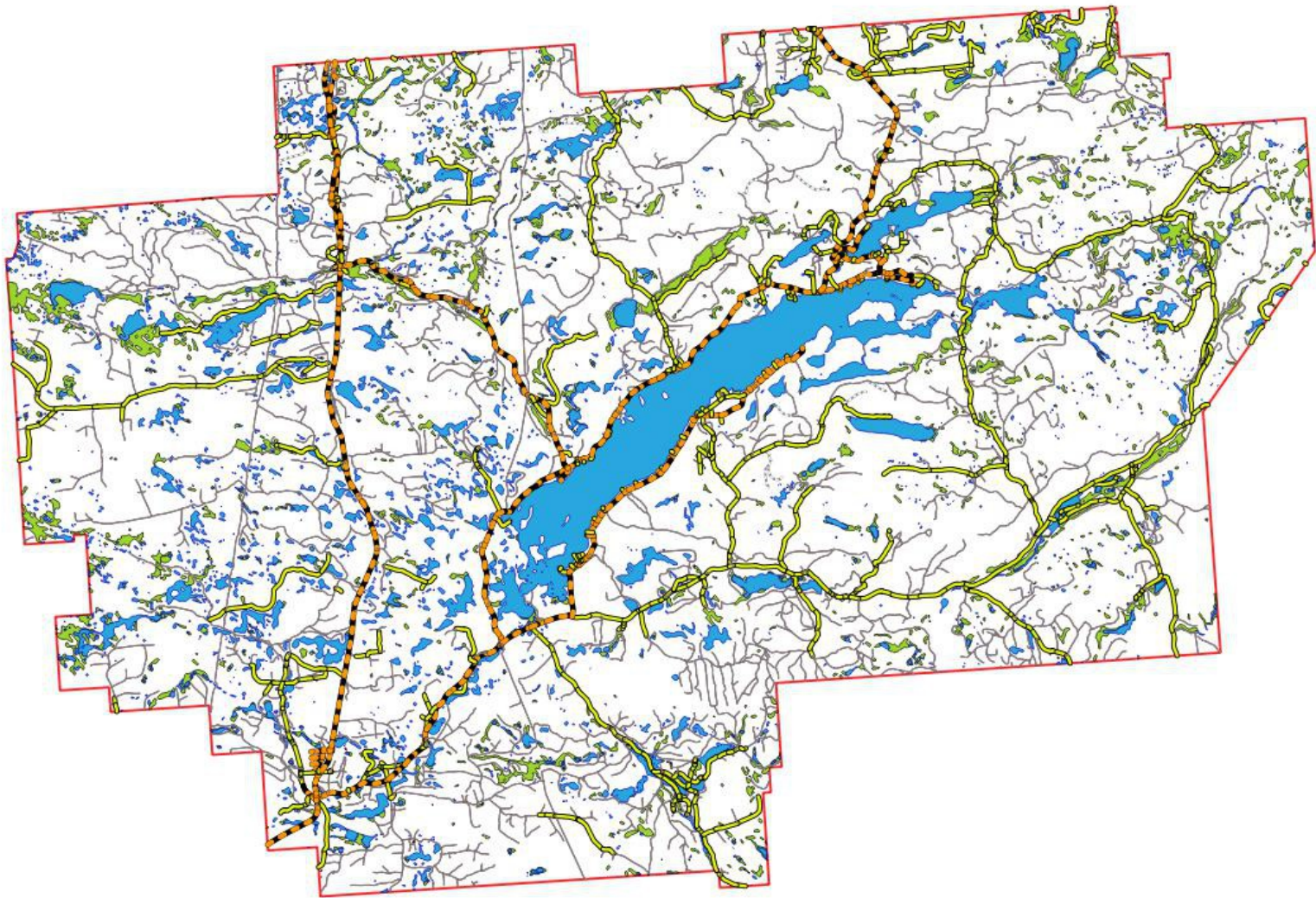


Figure 1: Mapped roads in the Green Lake OCP area. Orange/Black – paved, green - loose surface, grey – rough and dashed grey – overgrown.

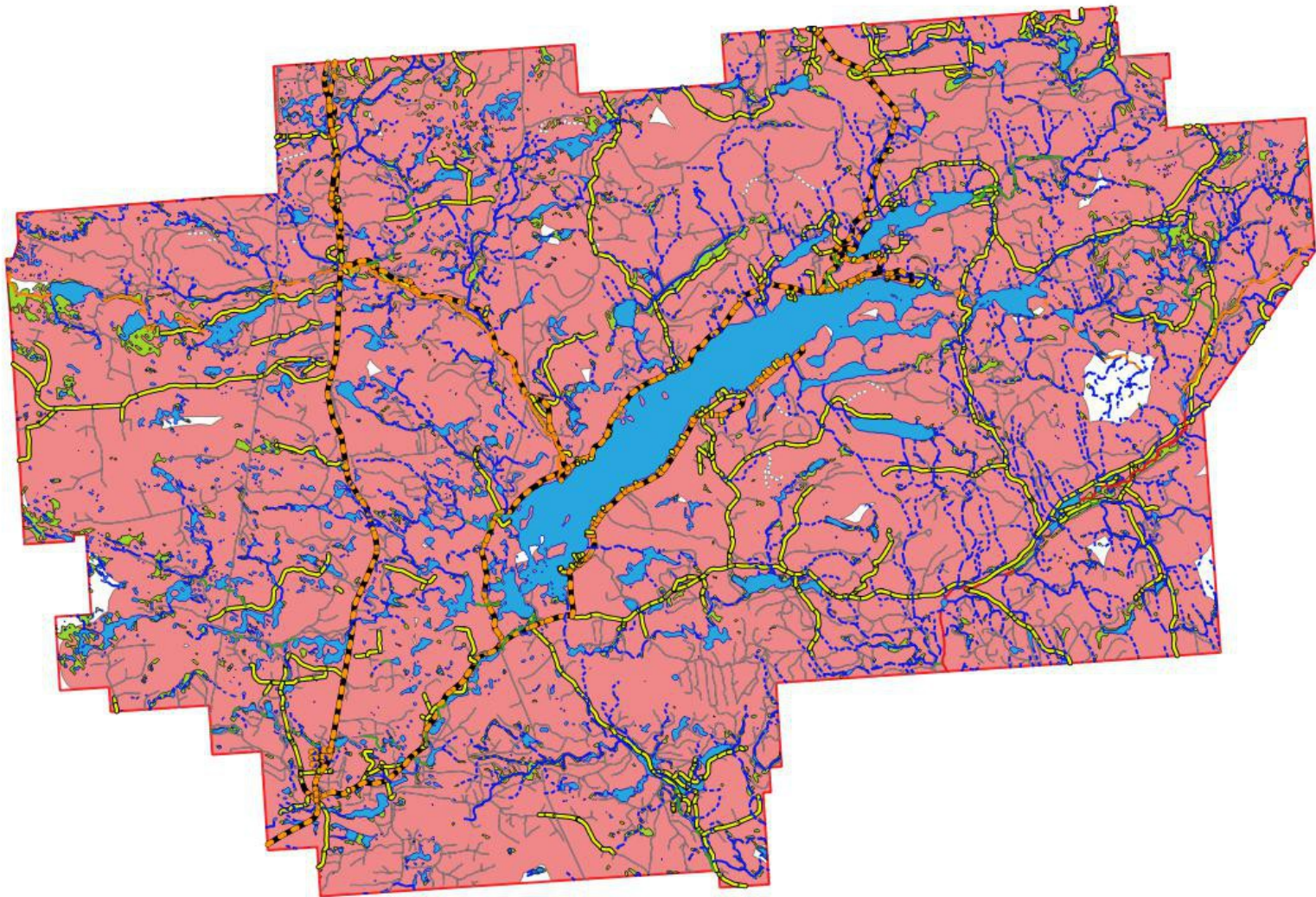


Figure 2: Area within 1 km of a mapped road in the Green Lake OCP area. Only the small white areas are those greater than 1 km from a road.

## Streams

767 km of streams and rivers are mapped in the OCP area (Table 2, Figure 3). 434 km (56.6%) of all streams mapped are order 1 streams, that is headwater streams with no tributaries. An additional 195 km (25.5%) of streams were second order streams, those that are formed when 2 first order streams conjoin. Many of these first and second order streams will not be fish bearing and many may not be streams on the ground. Mapped third order and larger streams make up 58.0 km of stream and include 87 Mile Creek, 83 Mile Creek, Watch Creek, and the Rayfield River.

Given the fairly flat topography in the OCP area and the relatively low summer precipitation experienced in most years, many of the mapped streams are likely ephemeral, intermittent or seasonal and may not meet the definition of a stream under the Forest and Range Practices Act. All mapped streams were treated as actual streams during the aerial photograph review and will be evaluated during the field inspection component.

*Table 2: Stream length by stream order for the Green Lake and area OCP area.*

<b>Stream Order</b>	<b>Length</b>	<b>Main Waterbody</b>
1	434.3	
2	195.8	
3	79.1	87 Mile Creek
4	19.8	Watch Creek
5	28.8	83 Mile Creek
6	9.4	Rayfield River
<b>Total</b>	<b>767.2</b>	

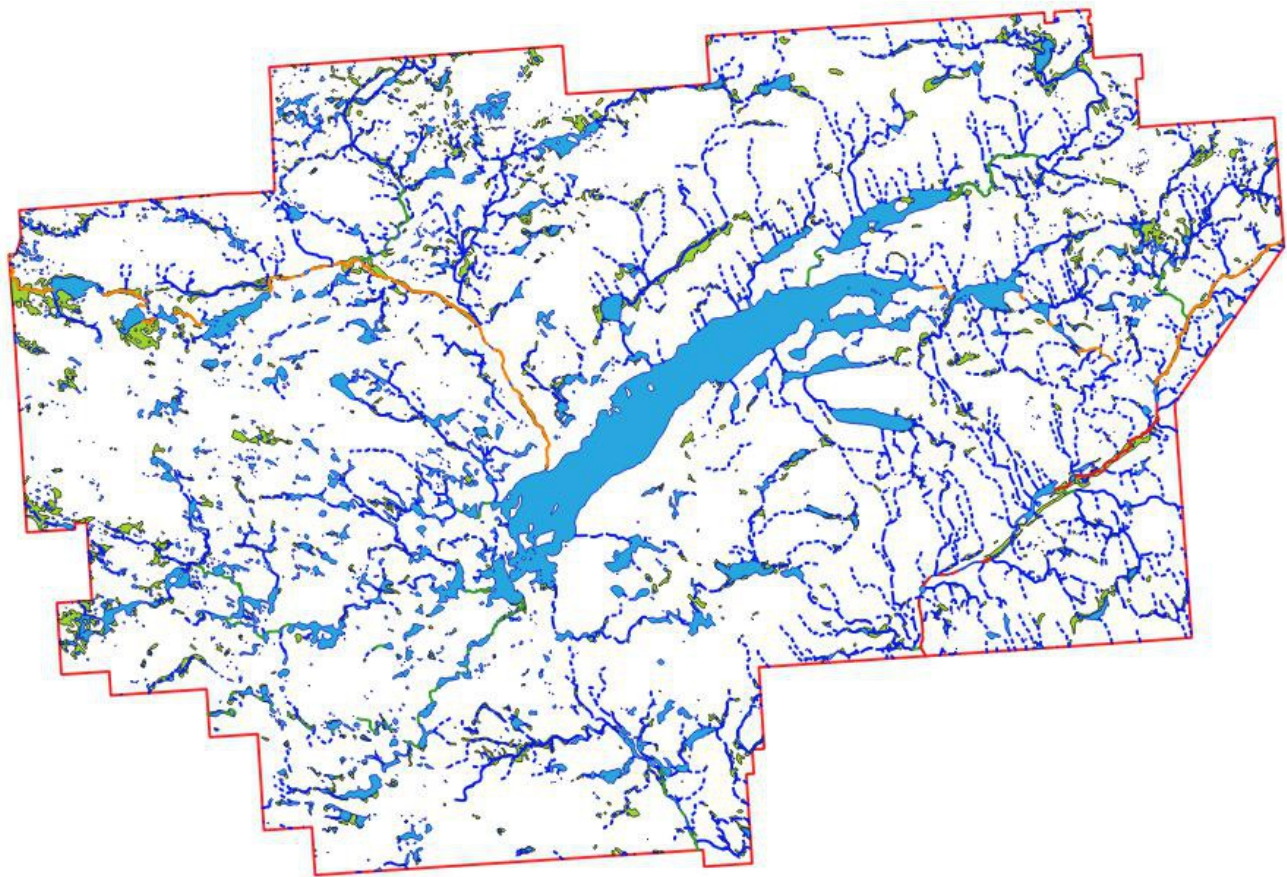


Figure 3: Mapped streams in the Green Lake OCP area. First order streams - dotted blue, second order - dashed blue, third order - solid blue, fourth order - green, fifth order - orange, sixth order - red.

## Lakes

There are a total of 1263 mapped waterbodies in the OCP area (Table 3). The large majority of these are less than 5 ha in size (91.4%) and many are likely to be shallow open water wetlands with poor fisheries potential. These smaller waterbodies may provide some of the best habitat for waterfowl, amphibians and other wildlife. These waterbodies may also provide critical habitat for rare and endangered wildlife species such as American avocet, great basin spadefoot, painted turtle, western toad, common nighthawk, or American bittern.

*Table 3: Waterbody count and area by size class for the Green Lake Official Community Plan area.*

<b>Waterbody Type</b>	<b>Total Number (%)</b>	<b>Area (ha)</b>	<b>Proportion of OCP area</b>
<b>Lakes</b>	<b>2232</b>	<b>7775.4</b>	<b>8.80%</b>
Lakes >1000 ha	1 (0.04)	2881.6	
Lakes 200-1000 ha	1 (0.04)	241.0	
Lakes 100-200 ha	3 (0.13)	384.3	
Lakes 20-100 ha	36 (1.6)	1510.4	
Lakes 5-20 ha	152 (6.8)	1388.4	
Lakes <5 ha	2039 (91.4)	1369.7	
<b>Wetland</b>	<b>1263</b>	<b>4139.1</b>	<b>4.70%</b>
>100 ha	1 (0.08)	251.8	
50-100 ha	8 (0.6)	520.9	
20-50 ha	17 (1.3)	491.0	
5-20 ha	153 (12.1)	1376.3	
<5 ha	1084 (85.8)	1499.2	

The larger lakes in the OCP area are shown in Table 4. Of these larger lakes, 7 are shown to have game fish populations.

Table 4: Main lakes in the Green Lake OCP area with physical characteristics and fish species known to be present.

Lake Name	Area (ha)	Elevation (m)	Mean Depth (m)	Max Depth (m)	pH	Fish Species Present
Green Lake	2881.6	1074	10.3	36	9.3	Rainbow Trout, Kokanee, Lake Chub, Bridge-lip Sucker, Long-nose Sucker, Red-side Shiner, White Sucker
Watch Lake	241.0	1077	4.3	9.8	9	Rainbow Trout, Long-nose Sucker
Little Green Lake	147.4	1068	1.1	4	9	Rainbow trout, Lake chub, Long-nose sucker
Jim Lake	125.8	1161	8	21.5	7	Rainbow Trout, Lake Chub, Long-nose Sucker, Large-scale Sucker
Eighty-three Lake	111.1	1121		4.9	9	Rainbow trout
Nolan Lake	83.03	1084			9	Rainbow Trout, Lake Chub
Taylor Lake*	78.2	1164	1.3	4.9		Rainbow Trout
Cunningham Lake	77.1	1101				None recorded
Bullock Lake	75.5	1129	1.6	4	8	Lake Chub, Long-nose Sucker
Tin Cup Lake	72.8	1116	1.5	8	9	Lake Chub
Loch Lomond	71.3	1081				None recorded
Lesser Green Lake	69.7	1090				None recorded
Boyd Lake	57.8	1072				None recorded
Little Horse Lake	55.7	1093	2.1	3.4		None recorded
Trapping Lake	55.1	1177				None recorded
Round Lake	52.4	1098				None recorded

\*Taylor Lake was rehabilitated and restocked with rainbow trout in 1956, 1960 and 1961, and it is not specified whether the introduced fish have survived until now.



## Methods

### Sediment Source Surveys

1 m resolution orthophotos were examined for signs of landslides or debris flow, gullies with channel or sidewall failures, and ravelling streambanks or channels. Sediment generation and potential habitat loss was marked on roads where they met any of the following criteria:

1. any slides from road fill slopes
2. un-vegetated road fills or cuts
3. erosion at crossing structures,
4. road sections with steep grades that connect to streams
5. road sections that are close to or encroaching on stream channels

2011 orthophotos were the most recent available.

*Table 5: Sediment Source Points by waterbody in the Green Lake OCP area.*

Waterbody	Number of Points	Dominant Type
83 Mile Creek	12	Road crossings and road surface close to waterbody
Rayfield River	12	Mainly road proximity to waterbody.
Watch Creek	8	Mainly road crossings
Green Lake	15	Road crossings and adjacency, some substrate disturbance near waterbody.
Other	22	Road crossings and proximity
Total	69	

### Riparian Assessment

Riparian areas are those sites adjacent to water bodies where the water table influences vegetation allowing it to be distinguished for adjacent upland sites. Riparian vegetation plays an important role in modifying water temperatures, channel morphology and fisheries and wildlife habitat values. Riparian areas were examined on the orthophotos for signs of clearing or other damage. A number of the sediment source sites identified may also have riparian vegetation impacts, particularly those sites where the road proximity to waterbodies was listed as the reason for the field examination. These sites were listed under the sediment source survey as these impacts are likely more

significant than riparian vegetation damage. The riparian vegetation condition will be assessed at all of these sediment source sites during the field work phase of the project

### Channel Assessment

Three streams in the OCP area are of sufficient size to warrant a channel assessment, Rayfield River, 83 Mile Creek and Watch Creek. No obvious channel problem sites were seen during the orthophoto review, but as all of these streams have a road running parallel to them for most of their length in the OCP, all of these streams will be assessed in the field during the sediment source survey field work.

### **Results**

Seven lakes in the OCP area are known to have game fish (Table 4) and an additional two have only non-game fish species listed.

### Sediment Source Survey

69 sites were identified as being potential sediment sources and require field verification (Table 6, Page 13).

### Riparian Assessment

21 areas where a significant length of riparian vegetation appeared to have been disturbed were identified (Table 7, Page 16). The sites were found on Green Lake, Watch Lake and Little Green Lake and most or all of the sites are associated with private property.

### Channel Assessment

Only three streams in the OCP area are large enough for channel assessment procedures, 83 Mile Creek, Watch Creek, and the Rayfield River. There are roads running along much of their length in the OCP and all reaches visible from the roads will be assessed during the field phase of the project.

### Hydrological Recovery

No peak flow or hydrological recovery component will be undertaken.

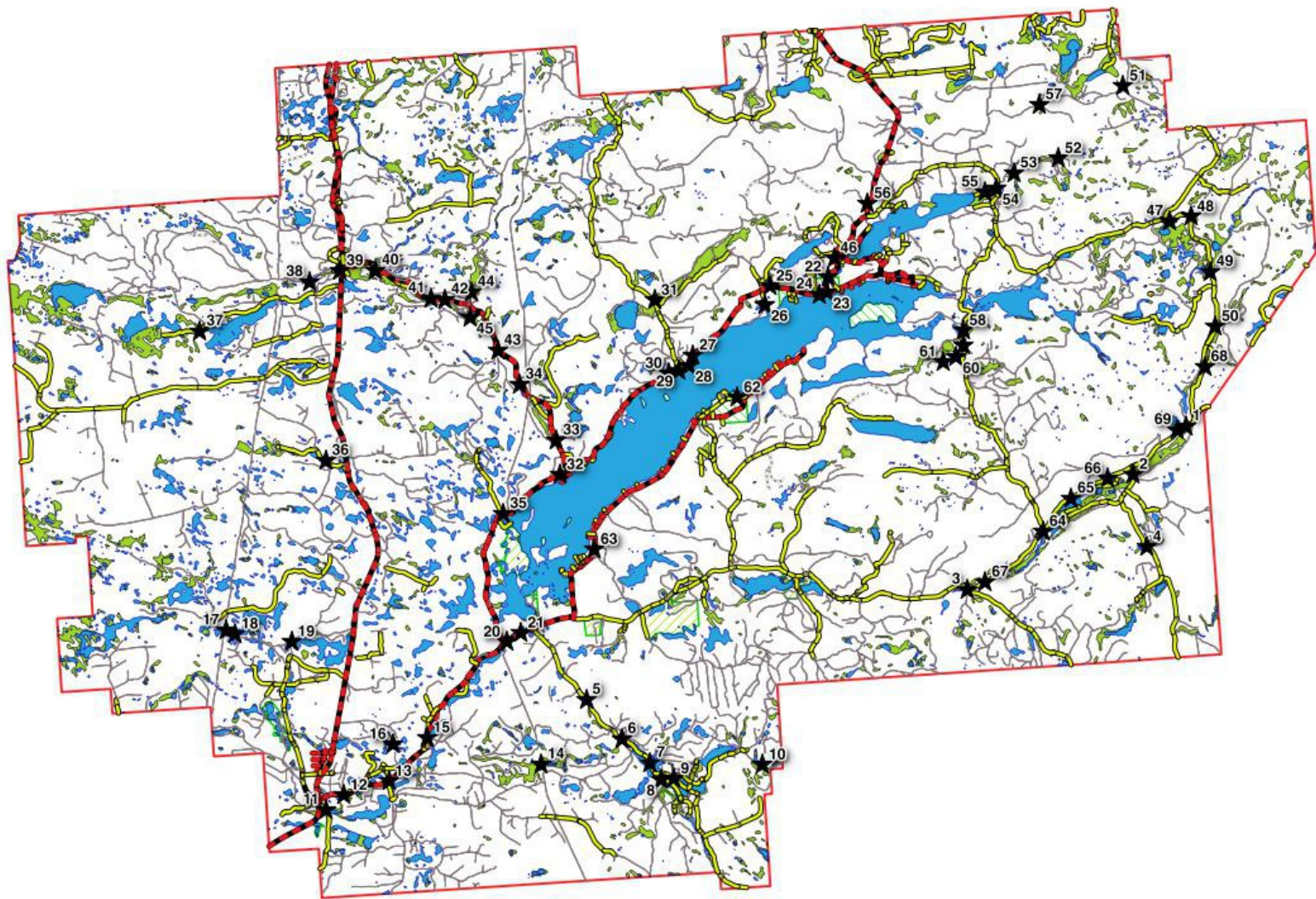


Figure 1: Sediment Source Survey sites identified for field survey in the Green Lake OCP area.

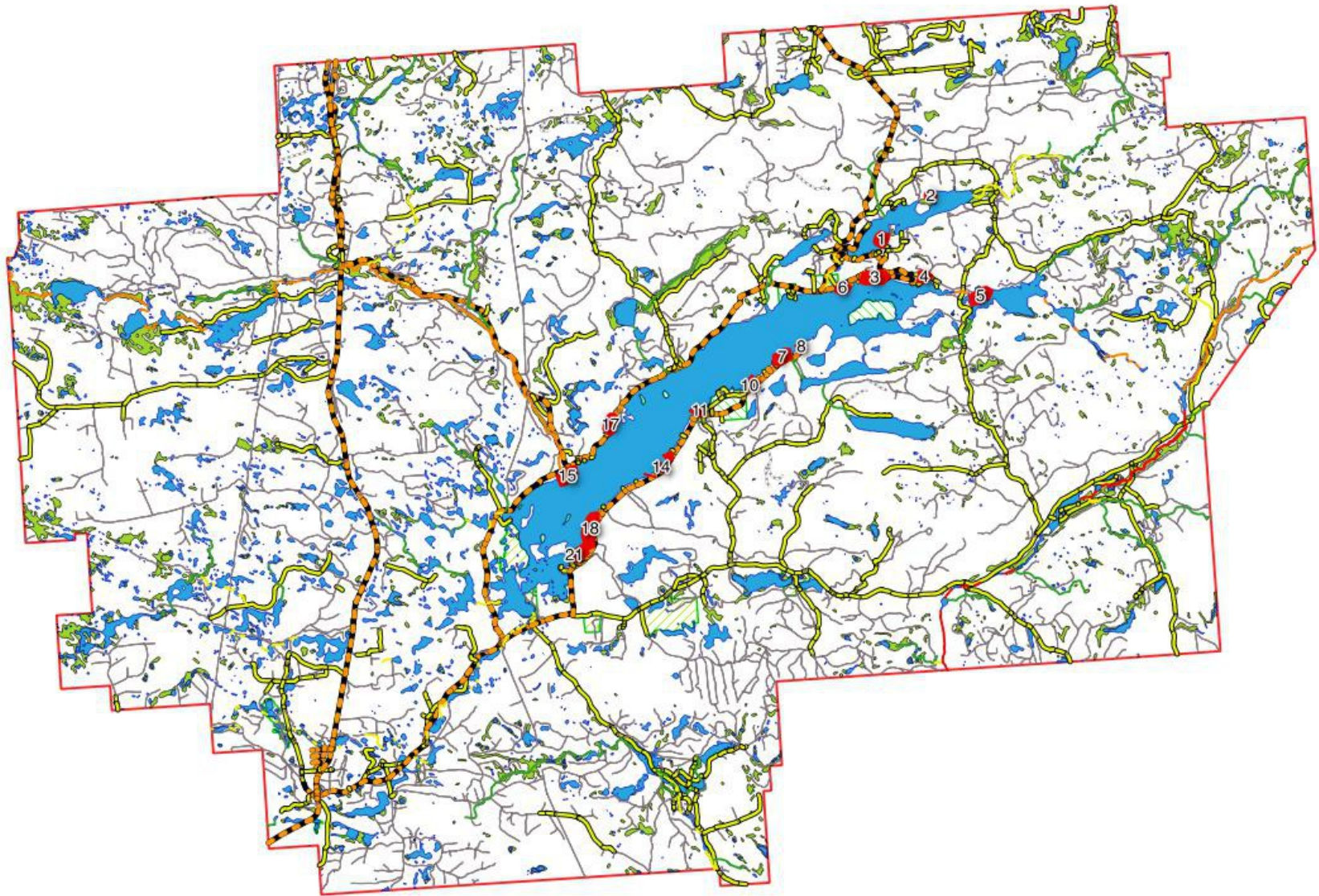


Figure 2: Riparian Assessment sites identified for field survey in the Green Lake OCP area.

Table 6: Sediment Survey sites

Site Number	Type	Location (latitude, longitude)
1	Road crossing	Point (-120.97997528406521894 51.3954985778747897)
2	Road crossing	Point (-121.00635772749089369 51.38245530858669952)
3	crossing	Point (-121.08780422475409466 51.35241947850278166)
4	crossing	Point (-121.00230549958762083 51.36105846847188161)
5	road and crossing	Point (-121.26920322611351821 51.32785481253408477)
6	road adjacency	Point (-121.25389291731274 51.31571352821477916)
7	road adjacency	Point (-121.24114712616369616 51.30819761212669761)
8	road crossing	Point (-121.23652261302987654 51.30299321652121591)
9	road adjacency	Point (-121.23042823156889369 51.30295730376997199)
10	clearing adjacency	Point (-121.18884076704969743 51.30528374009819004)
11	crossing	Point (-121.39431655996982329 51.30074591271870332)
12	road adjacency	Point (-121.38519422992108332 51.30454354439837772)
13	road crossing	Point (-121.36391228442032286 51.3077647081561139)
14	clearing adjacency	Point (-121.29209042681704034 51.30986354161012741)
15	road adjacency	Point (-121.34473035614549019 51.31971958561225478)
16	road adjacency	Point (-121.36096428577013739 51.31847707484715926)
17	clearing adjacency	Point (-121.43544434367122165 51.35497783070867683)
18	crossing	Point (-121.43121490483071057 51.3536382991992042)
19	crossing	Point (-121.40509035186966003 51.35031998338053683)
20	crossing	Point (-121.3045098931857666 51.34609057879798399)
21	crossing and adjacency	Point (-121.29736876723909234 51.34843518784496297)
22	road adjacency	Point (-121.1427099939368901 51.44618777027606171)
23	crossing and adjacency	Point (-121.143776830738787 51.4417335883519371)
24	crossing and adjacency	Point (-121.14726435516971037 51.44142634050987795)
25	crossing	Point (-121.17018885377578385 51.44471986800585483)
26	crossing	Point (-121.17318601864573679 51.43933688980428087)
27	road and clearing adjacency	Point (-121.20837543017216831 51.42609100084615648)
28	road and clearing adjacency	Point (-121.210633556244332 51.42312141969163264)
29	crossing and adjacency	Point (-121.21520703742329772 51.42194505748609856)

Site Number	Type	Location (latitude, longitude)
30	road and clearing adjacency	Point (-121.22040779177669378 51.42125144955403471)
31	crossing	Point (-121.22444670545790757 51.44285976898068924)
32	crossing	Point (-121.27415471375927325 51.3938503606750885)
33	adjacency	Point (-121.27483862399384407 51.40405165748791916)
34	crossing	Point (-121.29058524218525861 51.42107431800218365)
35	road adjacency	Point (-121.30189553525936219 51.38365756916110172)
36	adjacency	Point (-121.38356674670740176 51.40258239311859256)
37	crossing	Point (-121.43840002301696757 51.44271541277250748)
38	crossing	Point (-121.38573396270780336 51.45504365442128147)
39	crossing	Point (-121.37096863243692724 51.45760453351091712)
40	road adjacency	Point (-121.35437654624220727 51.45712213648209143)
41	road adjacency	Point (-121.32902950819402577 51.44789865480553459)
42	road adjacency	Point (-121.32276003112089313 51.44731434996643316)
43	road adjacency	Point (-121.29955543847573551 51.43135797179688495)
44	road adjacency and crossing	Point (-121.31011968838683401 51.44894429354466325)
45	crossing	Point (-121.31154656562878813 51.4414395077929143)
46	road adjacency	Point (-121.13922140094211954 51.451597944054555)
47	crossing	Point (-120.98076828143310024 51.45555767739656261)
48	road adjacency	Point (-120.97072661100187929 51.45638487844403386)
49	road adjacency	Point (-120.96348557159592474 51.44005050917009214)
50	road adjacency	Point (-120.96285954294226883 51.42390329223027123)
51	crossing	Point (-120.99800252672295642 51.49590077869032712)
52	crossing	Point (-121.03079089061853324 51.47607856352815503)
53	crossing	Point (-121.05210896858741876 51.47280315425130937)
54	crossing	Point (-121.06105026065750963 51.46861094513590018)
55	crossing	Point (-121.06645177463158802 51.46783906240677453)
56	crossing	Point (-121.12164440203392246 51.4668662029608015)
57	crossing	Point (-121.03804703044042412 51.49219947503589623)
58	crossing	Point (-121.08118077128980872 51.42785534344528031)
59	crossing	Point (-121.08110854356817754 51.42368787709811073)
60	crossing	Point (-121.08509843533938977 51.42027097120756451)

---

Site Number	Type	Location (latitude, longitude)
61	crossing	Point (-121.09167577990302789 51.41911996540494556)
62	crossing	Point (-121.18888720963101946 51.4128389998057358)
63	crossing	Point (-121.2606367836819885 51.37140925216374399)
64	road adjacency	Point (-121.05023823405956307 51.36767924192249524)
65	road adjacency	Point (-121.03600561592983809 51.3768328314077749)
66	road adjacency	Point (-121.0183601254102399 51.38175437693542591)
67	road adjacency	Point (-121.07883281634754269 51.35413989383611266)
68	crossing	Point (-120.96925187408993452 51.41240966753868236)
69	crossing	Point (-120.98397538953359742 51.39461947271660591)

---

Table 7: Riparian Assessment sites.

Site Number	Waterbody	Comments
1	Watch Lake	
2	Watch Lake	
3	Green Lake	
4	Green Lake	
5	Little Green Lake	
6	Green Lake	
7	Green Lake	
8	Green Lake	
9	Green Lake	
10	Green Lake	
11	Green Lake	
12	Green Lake	
13	Green Lake	
14	Green Lake	
15	Green Lake	
16	Green Lake	
17	Green Lake	
18	Green Lake	
19	Green Lake	
20	Green Lake	
21	Green Lake	



## Conclusions

No significant problem areas, such as slumps, highly eroded roads or slopes, or mass wasting sites were identified on the orthophoto review. The fairly low relief of the OCP area means there are few significant slopes and fewer potential failure sites. Most of the potential sediment source sites identified are road sites where a stream crossing or the proximity of the road to a water body may be a source of sediments and may be potential project areas.

Riparian health does not appear to be a significant problem in the OCP area. Generally the riparian area in the OCP are fairly narrow bands due to the dry conditions and generally coarse and well drained soils in the area. Some areas that have experienced riparian impacts may be suitable sites for restoration projects.

The fairly high road density in the OCP area could be a cause for concern. Road deactivation of some of the resource roads no longer required may be a project possibility. West Fraser Mills has identified road deactivation as a priority for their forest management and they may wish to act as project partners for a road deactivation project in the area. In any event, they and the Ministry of Forests Lands and Natural Resource Operations will need to be contacted about a project such as this.

Invasive plant and noxious weed sites will be recorded during field work and weed control activities may also be a potential project.

Specific sites and project areas will be identified during the field review component of the project.