Columbia Lake Ecological Reserve #20

Warden Report, 2023

Giant helleborine (*Epipactis gigantea*) orchid, also known as stream orchid

Report completed by: Ian W. Hatter, ER Warden for Columbia Lake Ecological Reserve, and Dr. Jenny Feick, ER Warden for Mt. Sabine Ecological Reserve. All photos were taken by Jenny Feick.

Report completion date: October 25, 2023

Ecological Reserve Warden Trip Report

ER Name: Columbia Lake Ecological Reserve (CLER), **Ecological Reserve #:** 20

Location: 4.5 km N of Canal Flats, **Size:** 32 ha, **Date Established**: May 4, 1971

Trip Dates: April 16, June 4, June 16, June 27, July 9, Sept. 9, and Oct. 20, 2023

Field Trip Participant Names:

Date	Participants	Driver and Vehicle	Volunteer Hours Logged
April 16, 2023	Ian Hatter, Jenny Feick	Ian Hatter, Subaru	0 hrs (road blocked)
June 4, 2023	Ian Hatter, Jenny Feick	Ian Hatter, Subaru	2 hrs
June 16, 2023	Ian Hatter, Jenny Feick, Wayne Stetski (ER Warden, Gilnockie Cr), Ian Adams, Trevor Kinley	Ian Adams, Ford Lariat ½ ton pick-up	2 hrs
June 27, 2023	Ian Hatter, Jenny Feick	Ian Hatter, Subaru	1 hr
July 9, 2023	Ian Hatter, Jenny Feick	Ian Hatter, Subaru	4 hrs
Sept. 9, 2023	Ian Hatter, Jenny Feick	Ian Hatter, Subaru	5.5 hrs
Oct. 20, 2023	Ian Hatter, Jenny Feick	Ian Hatter, Subaru	4.5 hrs

Number of volunteer hours logged: 19 hours total at the CLER plus two hours travel from Invermere to the CLER and return for each trip. (This does not include time spent visiting Mt Sabine ER on June 16). Many more hours were spent on follow-up action and the report (approx. 60 hrs).

Extent of the ecological reserve visited, or tour routes

April 16, 2023: Jenny Feick and Ian Hatter tried to visit the CLER but the access road was completely blocked by a large fallen ponderosa pine (see Fig. 1) about 300 metres after the Wildlife Management Area (WMA) notification sign near Canal Flats. We notified BC Parks the same day.

Figure 1. Fallen ponderosa pine across access road to the CLER, April 16, 2023.

May 11, 2023: Liza Pegura, BC Parks Ranger, checked on access into the CLER and confirmed that the tree had been removed and the road was passable to km 6. Km 6 is at the very north end of Columbia Lake ER just before where the road becomes washed out.

June 4, 2023: Jenny Feick and Ian Hatter drove the lower road to Spirit Trail turnoff (SPIRIT TK on Fig. 3), and located two TUFA deposits (TUFA 1 and TUFA2). We cleaned up garbage thrown into the ER from the access road and checked for flowering giant helleborine (stream orchids). We spoke with a local mountain biker on the access road who reported that a motorized trail biker had repeatedly accessed the upper areas of the ER. We noted biodiverse wet areas and tufa deposits just outside of the ER boundaries.

June 16, 2023: Participants (Ian Hatter, Jenny Feick, Ian Adams, Trevor Kinley, and Wayne Stetski (Fig. 2) drove the W and N perimeter access road, and inspected the ridge on the east side of the ER (see Fig. 2 and the GPS track in Fig. 3). We also located the giant helleborine (stream orchid) patch (GIANT HELLI) shown to us in 2022 by Liza Pegura (Fig. 3) and confirmed no blooms yet. We removed alien invasive species (e.g. patch of white sweet-clover).

June 27, 2023: Jenny Feick and Ian Hatter drove to the giant helleborine (stream orchid) patch (GIANT HELLI, Fig. 3). The orchid flowers were just starting to come out.

July 9, 2023: Jenny Feick and Ian Hatter drove to the giant helleborine (stream orchid) patch again (GIANT HELLI, Fig. 3). Our objective was to count the flowering giant helleborine in the GIANT HELLI patch and explore the northern portion of the ER to document natural history observations. We also explored the NE portion of the ER (Fig. 4). We removed more alien invasive plants (e.g. dandelions, cheatgrass, lamb's-quarters).

September 9, 2023: Jenny Feick and Ian Hatter drove to SW corner. We hiked just inside the perimeter of the CLER and recorded natural history observations, noting limber pine on cliffs (Fig. 5).

October 20, 2023: Jenny Feick and Ian Hatter drove to the SW corner. We hiked into the center of the CLER and along the northern perimeter to record natural history observations and pick up litter (Fig. 6).

Figure 2. Ian Adams, Wayne Stetski, Trevor Kinley, and Ian Hatter on a lunchbreak in the Columbia Lake ER on June 16, 2023.

Figure 3. June 4, 2023 (access road) and June 16 (GPS track on east side of Columbia Lake ER).

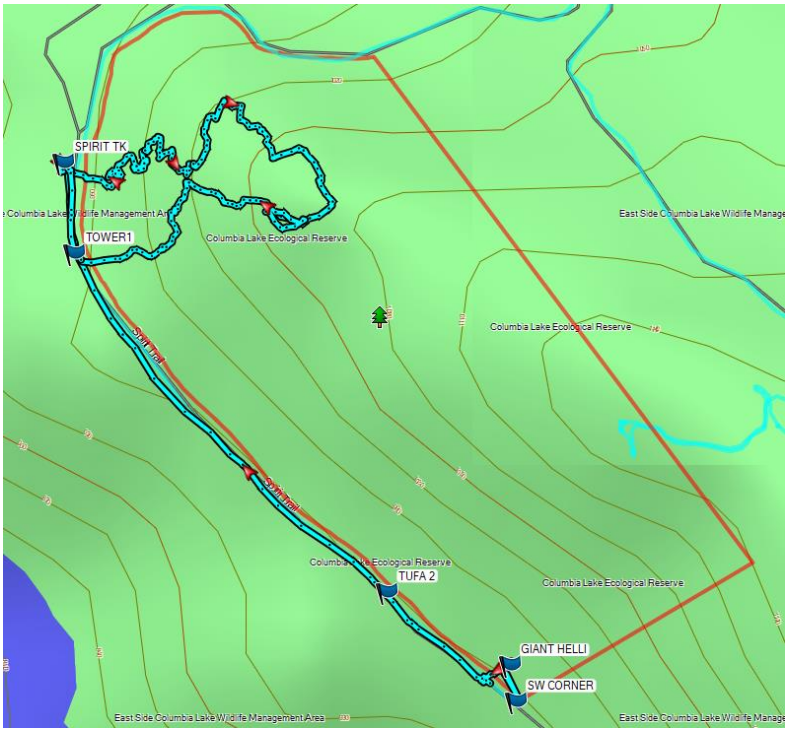

Figure 4. July 9, 2023 GPS track. It includes a 3.1 km round trip from SPIRIT TK to Tower1 waypoints with 162 m elevation gain.

Figure 5. Sept. 9, 2023 GPS track. It includes a 4.3 km navigation route just inside the perimeter of the ER with 299 m elevation gain.

Figure 6. Oct. 20, 2023 GPS track. It includes a 6.6 km navigation route to the centre of the ER and a return trip along the access road. The elevation gain was 350 m.

Purpose and Objectives for Site Visits

Purpose: To assess condition of the Columbia Lake ER since our last visit in 2022, continue to explore and learn about the Columbia Lake ER, record natural history observations, and monitor giant helleborine (also called stream orchids) in the patch identified as GIANT HELLI (Fig. 3).

Objectives:

1. Check the state of the access road and compare it with its condition in 2022.
2. Assess if the boundaries of the CLER are adequately identified/marked, and if not, what needs to be done to better demarcate the boundaries;
3. Assess the basic condition of the CLER and identify any obvious damage and threats;
4. Record natural history observations (evidence of wildlife and vegetation, especially the species/plant communities related to the purpose for establishing the ER). Take pictures and post natural history observations on iNaturalist. Post bird sightings and/or calls on eBird.
5. Conduct a count of the giant helleborine (*Epipactis gigantea*) or stream orchids at the GIANT HELLI patch (Fig. 3).
6. Search for and identify tufa deposits in and outside of the CLER.
7. Monitor the condition of limber pine (*Pinus flexilis*), an endangered species. Specifically look for the presence of white pine blister rust.
8. Discuss potential ideas for research, inventory and monitoring activities for 2023.

Key Findings

Objective 1: The access continues to be a rugged, but passable road for our AWD Subaru Forester from the southwest corner (SW CORNER) to the Spirit Trail turnoff (SPIRIT TK) (Fig. 3). The road then deteriorates rapidly after the turnoff and is only passable along the north side with a heavy duty 4WD pick-up truck or ORV. The road is in worse condition than in 2022 with water creating gullies.

Objective 2: The two signs along the access road on the west side, and one along the north side, continue to be in good shape. There continues to be no signs marking the CLER on its upper east side.

Objective 3: ATVs continue to make frequent use of the access road (five ATVs observed on June 4 visit; four ATVs, a motorcycle and pick-up truck observed on July 9 visit; one truck and one ATV on Sept. 9). Alien invasive plant species are intruding into the CLER from the margins of the access road. Litter was found in the CLER near the access road on most visits. Trail bike tracks were observed going up very steep inclines on both the north and south sides or the CLER as well as on top, eroding the soil and facilitating the growth of alien invasive plant species. A new fire pit was found on Oct. 20.

Objective 4: During site visits, we documented sightings and other evidence of numerous mammals (primarily sign such as scat, tracks, bones, or rodent nests/middens), recorded sightings of birds, bird calls and bird songs (confirmed with the Merlin app), noted arthropods (insects and arachnids), and kept a record of lichens, fungi, non-vascular and vascular plants observed (see species lists in Appendix 1). We posted observations to iNaturalist and eBird.

Objective 5: We made several site visits to monitor the giant helleborine patch (marked as GIANT HELLI patch in Fig. 3). We saw no evidence of flowering plants on June 4 or June 16. On June 27, we observed that flowers were just starting to emerge. We counted a total of 177 flowering giant helleborine plants on July 9 (Fig. 7). This is thought to be close to a total count in the GIANT HELLI patch. The site was very damp, with many water seeps. On September 9, we found additional stream orchid plants outside of the GIANT HELLI patch, including another significant patch (GIANT HELLI_2, Fig. 5).

Figure 7. Giant helleborine (stream orchid) patch on July 9, 2023. GPS waypoint marked as GIANT HELLI in Fig. 3.

Objective 6: In total, we observed two major tufa deposits (Fig. 8 and 9), with locations shown in Fig. 3. Both tufa deposits were outside the CLER (note: TUFA2 was just outside the CLER by a few metres).

Figure 8. Tufa deposit (TUFA1) along access road on south-west side of Columbia Lake ER. (See Fig. 3 for location).

Figure 9. Tufa deposit (TUFA2) just outside the west boundary of the Columbia Lake ER. (See Fig. 3 for location), left photo is looking up at TUFA deposit, right photo is looking down on TUFA deposit.

Objective 7: Most limber pine trees observed grew at the south end of the CLER (See Fig. 10). We saw no evidence of white pine blister rust on limber pine in the CLER on the July 9, Sept. 9 and Oct. 10 searches, but could check only a few trees. The majority of the limber pines clung to steep limestone cliffs. The difficult terrain made it impossible for us to examine the trees up close (See Fig. 11).

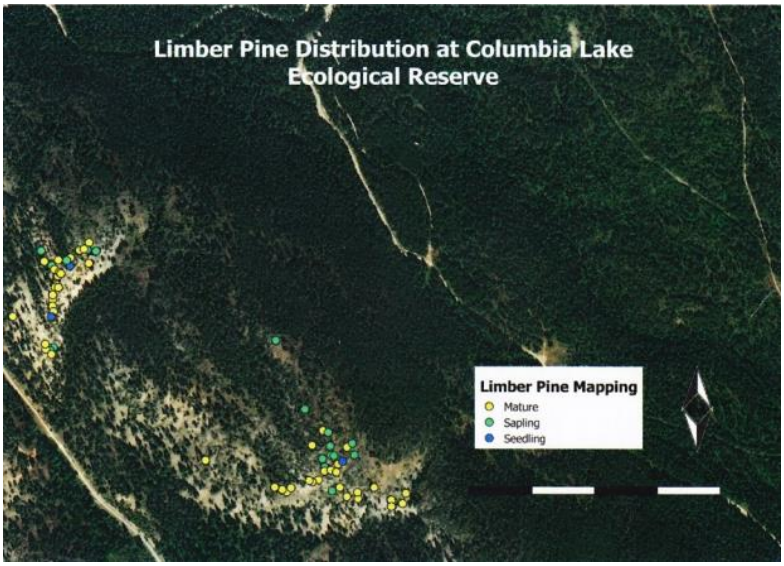

Figure 10. Limber pine distribution in the CLER as documented in Randy Moody's report (date unknown). He located a total of 139 limber pines. These pines were concentrated at the north and south ends of the CLER.

Figure 11. Limber pine on limestone ridge in the south end of the CLER.

Objective 8: In late August, Ian Adams offered to set up bat detectors at Columbia Lake. However, there was insufficient time in September, 2023 to both deploy and take down the detectors. Ian Adams will have them back in 2025, if not before, and the plan is to deploy them at that time.

Plant and Animal Species Observed

The link to all of the iNaturalist observations for the Columbia Lake Ecological Reserve Project is https://www.inaturalist.org/projects/columbia-lake-ecological-reserve. As of Oct. 25, 2023, this ER had 671 observations of 211 species made by seven observers (Jenny Feick, Shane Johnson, Liza Pegura, Brett McCull, Ian Adams, A. Pumphrey, and Ranger Robyn). Species observations have been reviewed by 93 identifiers. Research grade has been assigned to 356 or 53% of the observations (i.e. identification has been verified or corrected by an expert). Note: these figures change each time another observation is added or a review is done. See map (Appendix 2) for locations of observations. The project for this ER is part of the overall iNaturalist BC Parks Ecological Reserves Project. Appendix 1: Tracking Biodiversity – Toward a Species List for Columbia Lake Ecological Reserve lists 240 species identified to date in the CLER (17 species of arthropods, 27 bird species, ten mammal species, 20 lichen species, four fungi species, 19 species of moss, and 143 vascular plant species including six fern species, one horsetail, eight conifer species and 128 flowering plants) through iNaturalist, eBird, and personal observations by ER wardens during site visits (Ian Hatter, Jenny Feick) with assistance from Gilnockie ER Warden Wayne Stetski, Ian Adams and Trevor Kinley on June 26, 2023.

Forest Composition:

- A Douglas-fir-bluebunch wheatgrass-rabbitbush community occurs on the drier sites in the upper part of the CLER. It is the only ER in East Kootenay Trench Ecosection (IDFdm2 biogeoclimatic subzone/variant), but its contribution for protection is minimal (0.41%).
- Ponderosa pine and limber pine occur in the more rugged and drier areas.
- We did not observe any lodgepole pine. There is, however, one record on iNaturalist for this ER.
- Trembling aspen, paper birch, water birch, and Rocky Mountain maple grow at lower elevations.

Figure 12. Well-spaced Douglas-fir trees and Rocky Mountain juniper cover most of the CLER.

Figure 13. Trembling aspens flourish in the southwest corner of the CLER.

Shrub layer:

- Common juniper was most common on the north end and lower elevations on the west side.
- Prickly wild rose and woods' rose bloomed in June/early July.
- Rubber rabbit-brush and shrubby cinquefoil were still in bloom Sept. 9, but not on Oct. 10.
- Western snowberry, buffalo-berry, Saskatoon and chokecherry bushes were present but we saw few berries in the dry spring-fall of 2023.

Figure 14. Common juniper on north summit.

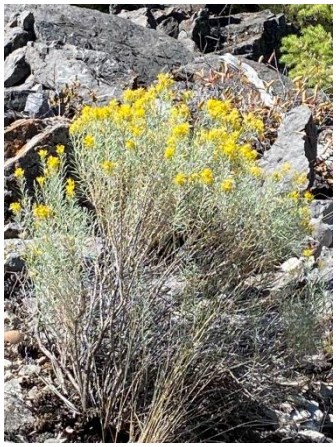

Figure 15. Flowering rubber rabbit-brush on Sept. 9, 2023.

Figure 16. Unripe choke cherries.

Ground covers:

- **Grasses:** nine native species (Bluebunch wheatgrass, Canadian bluejoint, a fescue, Great Basin wildrye, Northwestern wild rye, pine reed grass, prairie Junegrass, sand ricegrass, and swamp meadow-grass) and one invasive alien grass species (cheatgrass).
- **Low evergreen plants:** creeping junipers usually occurred near springs at lower elevations. We also saw bearberry, bunchberry, twinberry, and Oregon grape.

Figure 17. Great Basin wildrye grows in tall robust clumps in lower elevations in the CLER.

Figure 18. Creeping juniper flourishes in open areas near cold springs.

- **Forbs:** In damp areas, six species of orchids (green bog orchid, north wind bog orchid, rattlesnake plantain orchid, slender bog orchid, stream orchid and yellow lady's slipper) have been documented; along with Kalm's lobelia, horned butterwort, dark-throated shooting star, and wood lily. Other forbs include six species of asters, six species of goldenrods, three species of arnicas, three species of beardtongues, four species of groundsels/ragworts, two other species of lily, two species of paintbrush, two species of phacelia, two species of deathcamas, common gaillardia, prairie cinquefoil, and nodding onion.

Figure 19. North wind bog orchid, sagebrush mariposa lily, and Kalm's lobelia are among the many forbs we saw in flower in 2023.



- **Ferns:** Besides Fee's lip fern, iNaturalist records show five other species of ferns growing in cracks and crevices amid the limestone cliffs. We observed mostly Oregon woodsia in June and July. Fee's lip fern was most evident in late summer after other ferns died back.

Figure 21 Dense reddish-brown hairs that obscure the sori cover the undersides of the fronds of Fee's lip fern.

Figure 20. Oregon woodsia has thick leaves with veins, and bears small glandular hairs.

- **Mosses:** iNaturalist notes 19 species of moss in the CLER, 16 of which we observed, including several species of feather mosses. We saw mosses in both wet and dry habitats within the CLER.

Figure 22. This Scorpidium sp., one of the many feather-mosses in the ER, was very moist as it was growing beside one of the cold springs.

Figure 23. We saw Grimmia dry rock moss growing on boulders in talus slopes.

- Lichens and Fungi: iNaturalist records 20 lichen species in the CLER, 18 of which were our observations. We saw crustose lichens on rocks, fallen logs and stumps, hair lichens on trees, and leaf lichens on logs. Douglas-fir trees provide suitable substrate for numerous lichen species. Despite extensive searches, we documented only four species of fungi in this arid ER.

Figure 26. Bristly beard lichen on Douglas-fir tree branch.

Figure 25. Shield lichen on Douglas-fir tree trunk.

Figure 24. Juniper-hawthorn rust on Saskatoon leaves.

Special Habitats:

Calcareous mineral springs

We found three cool springs and seeps where the water came right out of the ground and then flowed downhill, forming cool mossy glades along the rivulets. Different calcareous plant species, i.e. plants growing in soils rich in calcium carbonate grew in these areas and they all looked vibrant and healthy.

Figure 27. Cool spring creating moss-lined rivulet.

Figure 28. Smooth blue asters blooming Sept. 9, 2023, near the source of the cool spring.

In the vicinity of the springs, several trees were covered with white clematis vines that grew 15-20 metres in height to the treetops. We did not find this phenomenon anywhere else in the CLER. We saw large middens made by generations of American red squirrels near every spring and associated rivulet.

Figure 29. ER Warden (Mt. Sabine) Jenny Feick estimating the height of white clematis vines on a Douglas-fir tree.

In the CLER, certain areas hold greater moisture, indicating seeps. The patches of giant helleborine (stream orchids) are in a couple of these wet areas. Cool springs and seeps extend beyond the CLER and some of the best, most biodiverse examples are just outside the CLER's boundaries. Just below the road, outside the CLER, the water flowing through TUFA2 creates a seep with a wide array of plant species, including the yellow lady's slipper orchid, which we did not find inside the CLER boundaries, but has been documented in iNaturalist by others.

Figure 30. Yellow lady's slipper orchids, the biodiverse seep below the access road, and dark-throated shooting star. These wildflowers were found by this seep on June 4, 2023.

Tufa outcrops

Tufa is a rare type of limestone rock composed of calcium carbonate ($CaCO_3$) that forms at the mouth of a spring. Tufa formations derive from the dissolution of rocks rich in calcium carbonate. When calcium carbonate-saturated ambient temperature water releases carbon dioxide it precipitates this soft, calcium carbonate-based rock. We only saw certain plant species near the tufa deposits.

Figure 31. Clockwise from upper left - Tufa rock, Western Indian paintbrush, wood lily, and horned butterwort.

Figure 32. Two tufa deposits below the giant helleborine (stream orchid) patch.

Limestone Cliffs

The CLER contains a series of low limestone cliffs, talus slopes, and mini-canyons. The height of the cliff bands is about 150 metres. The south and west facing aspects are very dry and exposed, which limits what plants can grow there successfully. This part of the CLER is where one finds the limber and ponderosa pines, Fee's lip-fern, and two species of cliffbrake ferns. This is also where we found the two species of phacelia. The north side contains steep moss-covered slopes with cliffy areas.

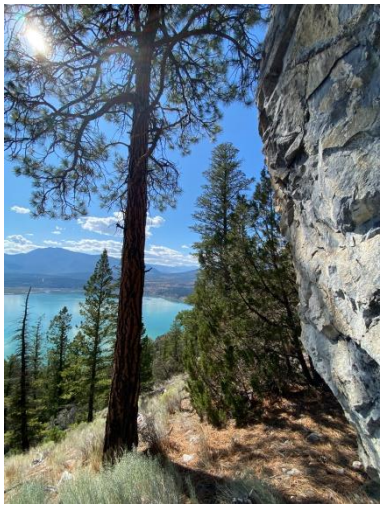

Figure 33. Four examples of the dry, rugged cliffs, steep slopes, and talus characteristic of the CLER, plus an example of the north-facing mossy cliffs (bottom left), and the mini-canyon where the bushy-tailed woodrat lives in the northwest part of the CLER (bottom right).

Animal Species Observed or Evidence of Wildlife

- There are currently ten mammal species, 27 bird species and 11 arthropod species that have been identified in the CLER. See Appendix 1.
- Mammals:
    - On June 16, 2023, we witnessed a red fox running across the access road into the CLER.
    - We frequently saw bighorn sheep and mule deer just outside the CLER and often saw their scat inside its boundaries. We found the jaw and other bones of a Bighorn sheep while exploring the cliffs.
    - We found a bushy-tailed woodrat den in a small canyon.
    - We noticed that American red squirrels had more middens in the areas close to the cold springs.

Figure 34. Bighorn sheep ewe along the access road just outside the CLER boundaries on June 16, 2023.

Figure 35. Mule deer doe feeding along the access road to the CLER on June 27, 2023.

Figure 36. Bushy-tailed wood rat nest. Note the gold cobblestone lichen growing where wood-rat urine stains made conditions more acidic.

Figure 37. American red squirrel midden near the source of one of the cold springs.

- Birds: We observed, found evidence of (e.g., feather, excavations, droppings), and/or heard the calls or songs of 27 species of birds. On July 9, 2023, we discovered a common nighthawk 'nest' with eggs on the flatter summit area after the parent bird flushed off the nest.

Figure 39. Turkey vulture soaring above the limber pines on the limestone cliffs.

Figure 38. Two common nighthawk eggs on the "nest" on a dry open ridgetop in the CLER on July 9, 2023.

- Arthropods: We observed numerous insect and arachnid species within and near the borders of the CLER, including several species of butterflies and bees, a few species of dragonflies, several species of ants, a stink bug, jewel beetles, a gall made by a wasp, and a few species of spiders.

Figure 40. A few of the multitude of arthropod species observed in the CLER (L to R) – a northern crescent butterfly resting briefly on a limestone rock, mating jewel beetles on a wild rose, and a bowl-and-doily spider injecting venom into a moth caught in its web.

Public Access Issues

- Access to the lower portion of the CLER is along a rough 2WD gravel road that has deteriorated since 2022 due to poor water drainage. The town of Canal Flats has posted a sign that the access road is now an unmaintained trail. For now, it remains accessible with the AWD 2007 Subaru Forrester owned by the ER rangers.
- The upper portion of the declining 4WD access road with its deep ruts, rocks, and steep grades make the north and east sides of this ER inaccessible to all but rugged high-clearance ORVs.
- Trail bikers have left tracks throughout the ER, including above the cliffs (see Figure 42).
- Since the upper perimeter of this ER is unmarked, people may not know they are trespassing.

Figure 41. Rugged, high clearance ORVs were commonly seen or heard on the access road during the site visits. We saw or heard a total of 10 ORVs during our visits.

Figure 42. Trail bike tracks eroding a steep slope in the CLER.

Signage Issues

- The signs that have been placed adjacent to the lower access roads remain clear and current (See Figure 42).

Figure 43. BC Parks signs marking the west boundary (left) and north boundary (right) of the CLER.

- There are still no signs or markers of any kind along the actual upper boundary of this ER.
- The one directional sign on the access road is still in the wrong location. It makes people think that they've passed the upper boundary of the CLER when in reality it is further up the road (See Figure 44).

Figure 44. Directional sign in incorrect location with a close-up of the map on the sign showing where the sign should be put.

Maintenance Issues

- The access road's condition deteriorated significantly over the winter of 2022/23. We removed rocks that had fallen on the road. On each visit, we saw water running down the road from cold springs and seeps in and around the CLER, causing gullying. Ruts and potholes have deepened. These drainage issues also divert much-needed water from natural ecosystems onto the road.
- Trail bike tracks have eroded the soil surface allowing several invasive plant species to colonize. These include common dandelion, cheatgrass, and lamb's quarters.
- Other alien plant species are invading the CLER from the access road, including sweet white clover and perrennial sow thistle. Common mullein is starting to establish on dry talus slopes.

Figure 45. A rutted area on the access road near the N side of the CLER.

Figure 46. Water running down access road from cold springs in and around the CLER, causing ruts and potholes and depleting the CLER of water.

Figure 47. Common dandelions on motorcycle tracks.

Figure 48. Common mullein is colonizing steep rocky slopes.

Visitor Activities

- The access road is used often by recreational ATVs. We observed ten quads during our visits.
- The campfire pit observed last year was less evident suggesting it had not been recently used.
- A local mountain biker on the access road informed us that a trail biker had made multiple trips through the CLER. We found several obvious tracks with erosion, and invasive alien plant species.

Figure 50. Passing a quad on the access road.

Figure 49. Local mountain biker taking a break along the access road.

Warden Activities

Figure 51. ER Warden Ian Hatter removing the invasive white sweet clover from the CLER.

- We made six trips into the ER, each time checking the giant helleborine (stream orchid) patch and exploring different areas.
- We recorded observations of plant and animal species in and around the CLER. We took pictures and posted them to iNaturalist, and logged bird calls and sightings on eBird.
- We investigated special habitats adjacent to the CLER (e.g., tufa deposits and wetlands, with species such as horned butterwort and yellow lady's slipper orchids).
- We looked for and removed trash and alien invasive plant species.
- We noted ATV, truck, and mountain bike activity on the road.

Figure 53. Ian Adams making bird observations in the CLER.

Figure 52. ER Warden Ian Hatter picking up garbage thrown into the ER from the access road.

Wardens' Proposals or Suggestions

Tasks Remaining from 2022

1. BC Parks Ranger and/or ER Warden(s) – Obtain generic BC Parks Ecological Reserve signs and clearly mark the upper boundary of the CLER so that it is clear when people enter it. Use the CLER boundaries that appear in the BC Data Catalogue.
2. BC Parks Ranger - Move the directional sign that is in the wrong place to the correct location.
3. BC Parks Regional Staff and ER Wardens - Clarify which agency (e.g. Village of Canal Flats, a timber company, or the Ministry of Forests District Office in Cranbrook) is responsible for road maintenance in the area and see if some minimal level of maintenance can be done at least to correct drainage issues.
4. ER Wardens and BC Parks - Discuss acquiring and setting up at least one wildlife camera to document wildlife use of the area.
5. ER Wardens and BC Parks – Discuss using a drone to help to monitor the less accessible portions of this ER (e.g. limestone cliffs).
6. BC Parks – Inventory Indigenous cultural and archaeological resources (location and significance) in collaboration with the Ktunaxa First Nation.

Continuing Tasks

1. BC Parks Ranger and ER Wardens – Conduct annual monitoring of Giant Helleborine (stream orchid) within the CLER
2. ER Wardens – Survey for presence of alien invasive plants near areas adjacent to access roads. Remove alien invasive plants when observed during site visits.

Figure 54. ER Warden Ian Hatter counting flowering giant helleborine (stream orchid) plants.

3. ER Wardens – Assess ongoing health of limber pine trees (e.g. evidence of white pine blister rust), to follow up on the "Columbia Lake Ecological Reserve Limber Pine Survey" by R. Moody.
4. ER Wardens – Continue to investigate adjacent Crown land in the East Side Columbia Lake Wildlife Management Area for ecological and biological values particularly the calcicolous vegetation growing in the wet sites along the spring-fed stream on the west and south sides of the CLER and below the access road.

New Suggestions in 2023

1. BC Parks Ranger and Conservation Officer – Conduct compliance monitoring to detect and deter off-road trail bike use inside the CLER.
2. Ian Adams and ER Wardens – Acquire and employ bat detectors in 2024 or 2025 to document bats in the CLER.
3. BC Parks Regional Staff and ER Wardens – Devise a plan to monitor change in vegetation in response to climate change on the limestone cliffs and on the wet sites along the spring-fed streams on the west side of the CLER.

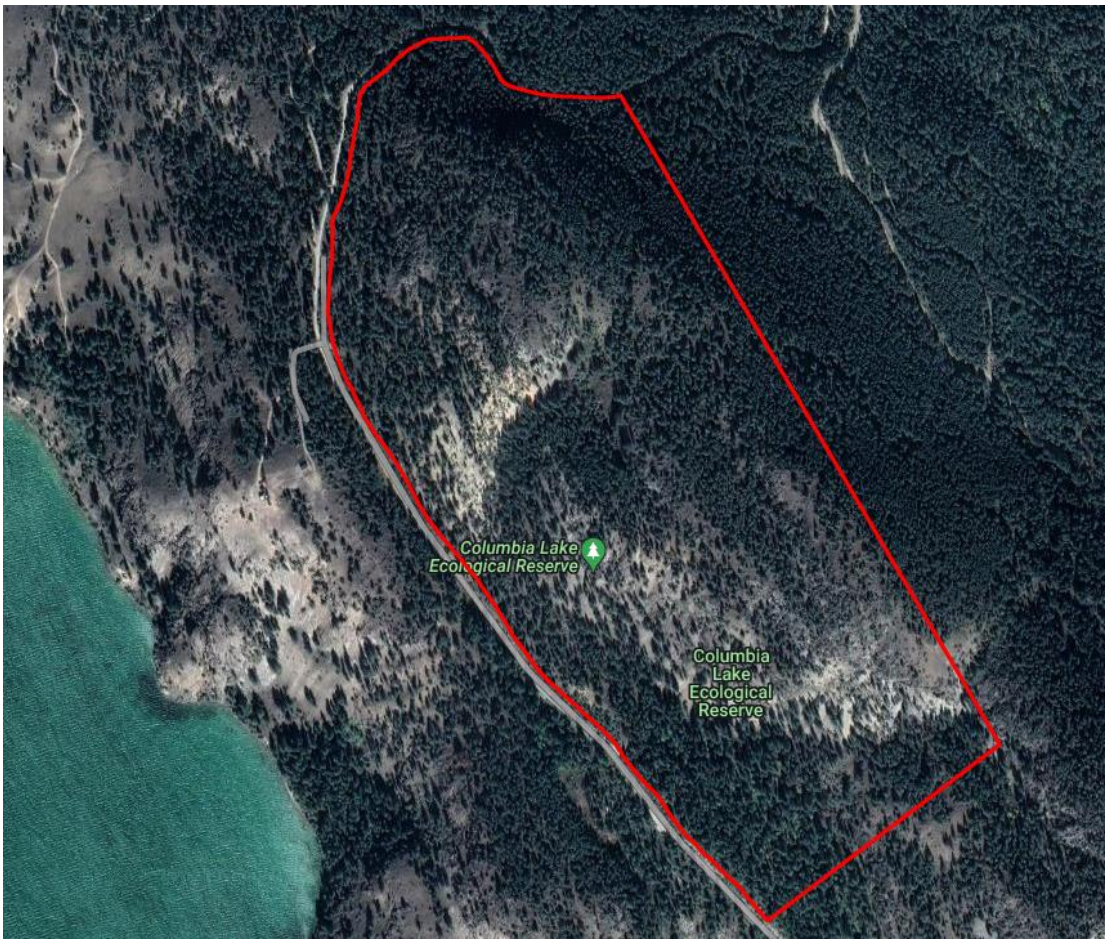

Figure 55. Google Earth photo of Columbia Lake Ecological Reserve.

For more information the Columbia Lakes ER, see the Friends of Ecological Reserves (FER) website at https://ecoreserves.bc.ca/portfolio_item/020-columbia-lake/

Appendix 1: Tracking Biodiversity – Toward a Species List for Columbia Lake Ecological Reserve

This list includes both the common and scientific names for species documented as occurring in the Columbia Lake Ecological Reserve (CLER). The first set of lists is arranged within its taxonomic category in alphabetical order according to common name. The second set of lists is arranged withon its taxonomic category in alphabetical order according to scientific name. Naming protocols follow iNaturalist and eBird. An asterisk indicates an alien invasive species.

Species Lists with Common Name First

Animals

Arthropods

Ant, (*Formica subpolita)*
Bowl-and-doily spider, (*Frontinella pyramitela*)
Fall webworm moth, (*Hyphantria cunea)*
Filmy dome spider, (*Neriene radiata*)
Goldenrod crab spider, (*Misumena vatia*)
Jewel beetle, (*Anthaxia prasina*)
Lorquin's admiral, (*Himenitis lorquini*)
Mourning cloak butterfly, (*Nymphalis antiopa*)
Native bee, (*Anthophilia, Epi* Family)
Native dragonfly, (*Aeshna sp*.)
Northern crescent butterfly, (*Phyciodes cocyta*)
Northern checkerspot butterfly, (*Chlosyne palla*)
Rose gall wasp, (*Diplolepis spinosa*)
Rufous-backed cellophane bee, (*Colletes thoracicus*)
Two-tailed swallowtail, (*Papilio multicaudata*)
Ugly-nest caterpillar moth, (*Archips cerasivorana*)
Uhler's stink bug, (*Chlorochroa uhleri*)

Figure 56. A gall on a prickly rose bush made by a rose gall wasp, Sept. 9, 2023.

Birds

American crow, (*Corvus brachyrhyncho*)
American robin, (*Turdus migratorius*)
American three-toed woodpecker, (*Picoides dorsalis*)
Bald eagle, (*Haliaeetus leucocephalus*)
Black-capped chickadee, (*Poecile atricapillus*)
Cassin's vireo, (*Vireo cassinii)*
Chipping sparrow *(Spizella passerina)*
Common nighthawk, (*Chordeiles minor*)
Common raven, (*Corvus corax*)
Dark-eyed junco, (*Junco hyemalis*)
Dusky flycatcher, (*Empidonax oberhoiseri)*
Falcon, *(Falco sp.)*

Figure 57. Holes in fallen Douglas-fir tree made by a pileated woodpecker.

Golden-crowned kinglet, (*Regulus satrapa*)
Hummingbird, (*Selasphorus sp.)*
MacGillivray's warbler, (*Geothlypis tolmiei*)
Mountain chickadee, (*Poecile gambeli*)
Northern flicker, (*Colaptes auratus*)
Pileated woodpecker, (*Dryocopus pileatus*)
Pine siskin, (*Spinus pinus*)
Red-breasted nuthatch, (*Sitta canadensis*)
Ruffed grouse, (*Bonasa umbellus*)
Spotted towhee, (*Pipilo maculatus*)
Swainson's thrush, (*Catharus ustulatus*)
Townsend's solitaire, (*Myadestes townsendi*)
Turkey vulture, (*Cathartes aura*)
Warbling vireo, (*Vireo gilvus*)
Western tanager, (*Piranga ludoviciana*)

Mammals

American black bear, (*Ursus americanus*)
American red squirrel, (*Tamiasciurus hudsonicus*)
Bighorn sheep, (*Ovis canadensis*)
Bushy-tailed woodrat, (*Neotoma cinerea)*
Least chipmunk, (*Neotamias minimus*)
Red fox*, (Vulpes vulpes)*
Rocky Mountain elk, (*Cervus canadensis* ssp. *canadensis*)
Rocky Mountain mule deer, (*Odocoileus hemionus* ssp. *hemionus*)
Snowshoe hare, (*Lepus americanus*)
White-tailed deer, (*Odocoileus virginianus*)

Figure 58. Elk scat, Oct. 9, 2023.

Fungi

Fungi and Rusts

Hoof fungus, (*Fomes fomentarius*)
Huckleberry broom rust fungus, (*Calyptospora columnaris*)
Juniper-hawthorn rust, (*Gymnosporangium globosum*)
Tarspot fungus, (*Rhytisma arbuti*)

Figure 59. This hoof fungus on a dead paper birch was one of the four species of fungi we found and the only conk.

Lichens

Blue-gray rosette lichen, (*Physcia caesia*)
Bristly beard lichen, (*Usnea hirta*)
Burred horsehair lichen, (*Bryoria furcellata*)
Elegant sunburst lichen, (*Rusavskia elegans*)
Gold cobblestone lichen, (*Pleopsidium flavum*)
Leather lichen, (*Dermatocarpon miniatum*)
Lung lichens, (*Lobaria sp*.)
Pebbled pixie cup, (*Cladonia pyxidata*)

Figure 60. Elegant sunburst lichen, Oct. 9, 2023.

Peppered rock tripe, (*Umbilicaria deusta*)
Pitted beard lichen, (*Usnea cavernosa*)
Powder-headed tube lichen, (*Hypogymnia tubulosa)*
Powder-tipped rosette lichen, (*Physeia dubia*)
Powdery goldspeck, (*Candelariella efflorescens*)
Powdery sunburst lichen, (*Xanthomendoza ulophyllodes*)
Shield lichen, (*Parmelia sulcata*)
Smooth-footed powderhorn, (*Cladonia ochrochlora*)
Veinless pelt lichen, (*Peltigera malacea*)
Witch's hair, (*Alectoria sarmentosa*)
Wolf lichen, (*Letharia vulpina*)
Yellow map lichen, (*Rhizocarpon geographicum*)

Non-vascular Plants (Bryophytes)

Acrocarpous mosses, (Family Bryaceae)
Brachythecium moss, (*Brachythecium* sp.)
Broom forkmoss, (*Dicranum scoparium*)
Bud-headed groove-moss*, (Aulacomnium androgynum)*
Feather mosses, (Family *Hypnaceae*, Order *Hypnales*)
Feather moss, *(Hygrohypnum sp.)*
Feather moss*, (Scorpidium sp.)*
Fern-leaved hook-moss, (*Cratoneuron filicinum*)
Fir tamarisk-moss, (*Abietinella abietina*)
Golden feather-moss, (*Campliadelphus chrysophyllus*)
Golden glade-moss, (*Rhytidum rugosum*)
Grimmia dry rock moss, (*Grimmia laevigata*)
Lyell's bristle-moss, (*Pulvigera lyellii*)
Red-stemmed feather moss, (*Pleurozium schreberi*)
Sickle-leaved hook-moss, (*Sanionia uncinata*)
Square gooseneck moss, (*Rhytidiadelphus squarrosus*)
Stairstep moss, (*Hylocomium splendens*)
Star moss, (*Syntrichia ruralis*)
Woodsy thyme-moss, (*Plagiomnium cuspidatum*)

Figure 61. Stairstep moss, Oct. 9, 2023.

Vascular Plants

Ferns and Fern Allies

Fee's lip fern, (Myriopteris gracilis)
Field horsetail, (*Equisetum arvense*)
Fragile fern, (*Cystopteris fragilis*)
Gastony's Cliffbrake (*Pellaea gastonyi*)
Oregon woodsia, (*Woodsia oregana*)
Rocky Mountain woodsia (*Woodsia scopulina*)
Smooth cliffbrake, (*Pellaea glabella*)

Figure 62. Oregon woodsia can also grow on limestone cliffs like Fee's lip fern, July 9, 2023.

Gymnosperms, Conifers

Common Douglas-fir, (*Pseudotsuga menziesii*)
Common juniper, (*Juniperus communis*)
Creeping juniper, (*Juniperus horizontalis*)
Limber pine, (*Pinus flexilis)*

Figure 63. Mature Douglas-fir on steep dry slopes, Oct. 9, 2023.

Lodgepole pine, (*Pinus contorta*)
Ponderosa pine, (*Pinus ponderosa*)
Rocky Mountain juniper (*Juniperus scopulorum*)
White spruce, (*Picea glauca*)

Angiosperms, Flowering Plants

Alpine sorrel, (*Oxyria digyna*)
American dwarf mistletoe, (*Arceuthobium americanum*)
Arrowleaf balsamroot, (*Balsamorhiza sagittata*)
Balsam ragwort, (*Packera paupercula*)
Bastard toadflax, (*Comandra umbellata*)
Bearberry, (*Arctostaphylos uva-ursi)*
Bigseed biscuitroot, (*Lomatium macrocarpum*)
Bluebunch wheatgrass, (*Pseudoroegneria spicata*)
Bush penstemon, *(Penstemon fruticosus)*
Canadian bluejoint, (*Calamagrostis canadensis*)
Canadian buffaloberry, (*Sheperdia canadensis*)
Canadian gooseberry, (*Ribes oxyacanthoides*)
Carrotleaf biscuitroot, (*Lomatium multifidum*)
Cheatgrass, (*Bromus tectorum*)*
Choke cherry, (*Prunus virginiana*)
Common dandelion, (*Taraxacum officinale*)*
Common gaillardia, (*Gaillardia aristata*)
Common harebell, (*Campanula rotundifolia*)
Common lambsquarters, (*Chenopodium album*)*
Common mullein, (*Verbascum thapsus*)*
Common snowberry, (*Symphoricarpos albus*)
Common yarrow, (*Achillea millefolium*)
Creeping snowberry, (*Symphoricarpos mollis)*
Crested-tongue beardtongue, (Penstemon eriantherus)
Cushion buckwheat, (*Eriogonum ovalifolium*)
Dark-throated shootingstar, (*Primula pauciflora*)
Elegant goldenrod, (*Solidago lepida*)
Fescues, (*Festuca sp*.)
Field locoweed, (*Poxytropis campestris*)
Fringed sagebrush (*Artemisia frigida*)
Giant red Indian paintbrush, (*Castilleja miniata*)
Glaucous honeysuckle, (*Lonicera dioica*)
Golden corydalis, (*Corydalis aurea*)
Gordon's bladderpod, (*Thysaria gordonii*)
Great Basin wildrye, (*Leymus cinereus*)
Grey goldenrod, (*Solidago nemoralis*)
Green bog orchid (*Platanthera huronensis*)
Groundsels, (*Senecio sp*.)
Heartleaf arnica, (*Arnica cordifolia*)
Hairy false goldenaster, (*Heteroheca villosa*)
Hillside arnica, (*Arnica fulgens*)
Hooker's thistle, (*Cirsium hookerianum*)
Hookspur violet, (*Viola adunca*)
Horned butterwort (*Pinguicula macroceras*)

Figure 64. Common Gaillardia blooming on June 4, 2023.

Figure 65. While most of the harebells in the ER are North American harebells, we found one patch of common harebells at the base of a cliff on July 9, 2023.

Figure 66. Hairy false goldenaster blooming on the ridgetop on June 16, 2023.

Lanceleaf stonecrop, (*Sedum lanceolatum*)
Leafy aster, (*Symphyotrichum foliaceum*)
Lemon sagewort, (*Artemisia michauxiana*)
Lewis flax, (*Linum lewisii*)
Lindley's aster, (*Symphyotrichum ciliolatum*)
Linearleaf phacelia, (*Phacelia linearis*)
Kalm's lobelia, (*Lobelia kalmii*)
Maryland sanicle, (*Sanicula marilandica*)
Matte saxifrage, (*Saxifraga bronchialis*)
Meadow deathcamas, (*Toxicoscordion venenosum*)
Missouri goldenrod, (*Solidago missouriensis*)
Mountain deathcamas (*Anticlea elegans*)
Nodding onion, (*Allium cernuum)*
North American harebell, (*Campanula alaskana*)
North wind bog orchid, (*Platanthera aquilonis*)
Northern bedstraw, (*Galium boreale*)
Northern comandra, (*Geocaulon lividum*)
Northern goldenrod, (*Solidago multiradiata*)
Northwestern wild rye, (*Leymus innovates*)
Oregon grape*, (Berberis aquifolium)*
Paper birch, (*Betula papyrifera*)
Perennial sow thistle (*Sonchus arvensis*)*
Prairie cinquefoil, (*Potentilla pensylvanica*)
Prairie Junegrass, (*Koeleria macrantha*)
Prairie smoke, (*Geum triflorum*)
Prickly wild rose, (*Rosa acicularis*)
Purple clematis, (*Clematis occidentalis*)
Red osier dogwood, (*Cornus sericea*)
Reflexed rockcress, (*Boechera retrofracta*)
Rocky Mountain groundsel, (*Packera streptanthifolia*)
Rocky Mountain maple, (*Acer glabrum*)
Rosy pussytoes, (*Antennaria rosea*)
Rough-fruited fairybells, (*Prosartes trachycarpa*)
Roundleaf alumroot, (*Heuchera cylindrica*)
Rubber rabbitbrush, (*Ericameria nauseosa*)
Sagebrush mariposa lily, (*Calochortus macrocarpus*)
Sand ricegrass, (*Eriocoma hymenoides*)
Saskatoon, (*Amelanchier alnifolia)*
Shinyleaf meadowsweet, (*Spirea lucida*)
Showy aster, (*Eurybia conspicua)*
Shrubby cinquefoil, (*Dasiphora fruticosa*)
Sickletop lousewort, (*Pedicularis racemosa*)
Silver wormwood, (*Artemisia ludoviciana*)
Silverleaf phacelia (*Phacelia hastata*)
Slender bog orchid, (*Platanthera stricta*)
Slender hawksbeard, (*Crepis atribarba*)
Smooth blue aster, (*Symphyotrichum laeve*)
Spreading dogbane, (*Apocynum androsaemifolium*)
Spreading fleabane, (*Erigeron divergens*)
Starry false Solomon's-seal, (*Maianthernum stellatum*)

Figure 67. Mountain deathcamas blooming on July 9, 2023 near HELLE1.

Figure 68. Green bog orchid blooming before the stream orchids in the HELLE1 patch on June 27, 2023.

Figure 69. Saskatoon berries forming June 16, 2023. Note rust infection on the leaves.

Sticky goldenrod, (*Solidago simplex*)
Stream orchid, (*Epipactis gigantea*)
Striped coralroot, (*Corallorhiza striata*)
Sutherland's larkspur, (*Delphinium southerlandii*)
Swamp meadow-grass, (*Poa palustris)*
Tall goldenrod, (*Solidago altissima*)
Ternate desert-parsley, (*Lomatium triternatum*)
Thread-leaf fleabane, (*Erigeron filifolius*)
Timber milkvetch, (*Astragalus miser*)
Trembling aspen, (*Populus tremuloides)*
True sedges, (*Carex sp*.)
Twinflower, (*Linnaea borealis*)
Umber pussytoes, (*Antennaria umbrinella*)
Veiny meadow-rue, (*Thalictrum venulosum*)
Virginia strawberry, (*Fragaria virginiana*)
Water birch, (*Betula occidentalis*)
Wavyleaf thistle, (*Cirsium undulatum*)
Western Indian paintbrush, (*Castilleja oxidentalis*)
Western meadow-rue, (*Thalictrum occidentale*)
Western rattlesnake plantain, (*Goodyera oblongifolia*)
Western snowberry, (*Symphoricarpos occidentalis*)
Western stoneseed, (*Lithospermum ruderale*)
Western white clematis, (Clematis ligusticifolia)
White prairie aster, (*Symphyotiachum falcatum)*
White sweet clover, (*Meliotus alba*)*
Wild lettuces*, (Lactuca sp.)*
Wild sarsaparilla, (*Aralia nudicaulis*)
Wood lily, (*Lilium philadelphicum*)
Woods' rose, (*Rosa woodsii*)
Woolly groundsel, (*Packera cana*)
Yellow beardtongue, (*Penstemon confertus)*
Yellow lady's slipper (*Cyparipedium parviflorum*)
Yellow salsify, (*Tragopogon dubius*)*
Yellow-spot saxifrage, (*Saxifraga bronchialis austromontana*)

Figure 70. Tiny ripe Virginia strawberries on June 16, 2023.

Figure 71. Wood lily blooming in wet area near HELLE1 on June 16, 2023.

Figure 72. Yellow beardtongue blooming on June 4, 2023.

Species Lists with Scientific Name First

Kingdom Animalia (Animals)

Figure 73. Uhler's stink bug on rubber rabbitbrush flowers, Sept. 9, 2023

Phylum Arthropoda (Arthropods)

Aeshna, dragonfly
Anthaxia prasina, jewel beetle
Anthophilia (*Epi Family*)d, native bee
Archips cerasivorana, ugly-nest caterpillar moth
Chlorochroa uhleri, Uhler's stink bug
Chlosyne palla, Northern checkerspot butterfly
Colletes thoracicus, rufous-backed cellophane bee
Diplolepis spinose, rose gall wasp
Formica subpolita, wood, mound, and field ants
Frontinella pyramitela, bowl-and-doily spider
Himenitis lorquini, Lorquin's admiral
Hyphantria cunea, fall webworm moth
Misumena vatia, goldenrod crab spider,
Neriene radiate, filmy dome spider
Nymphalis antiopa, mourning cloak butterfly
Papilio multicaudata, two-tailed swallowtail
Phyciodes cocyta, Northern crescent butterfly

Figure 74. Bald eagle feather on dirt bike track in the ER, July 9, 2023.

Phylum Chordata, Class Aves (Birds)

Bonasa umbellus, ruffed grouse
Catharus ustulatus, Swainson's thrush
Cathartes aura, turkey vulture
Chordeiles minor, common nighthawk
Colaptes auratus, Northern flicker
Corvus brachyrhyncho, American crow
Corvus corax, common raven
Dryocopus pileatus, pileated woodpecker
Empidonax oberhoiseri, dusky flycatcher
Falco sp., falcon (probably peregrine)
Geothlypis tolmiei, MacGillivray's warbler
Haliaeetus leucocephalus, bald eagle
Junco hyemalis, dark-eyed junco
Myadestes townsendi, Townsend's solitaire
Picoides dorsalis, American three-toed woodpecker
Pipilo maculatus, spotted towhee
Piranga ludoviciana, Western tanager
Poecile atricapillus, black-capped chickadee
Poecile gambeli, mountain chickadee
Regulus satrapa, golden-crowned kinglet
Selasphorus sp., hummingbird (rufous or calliope)
Sitta canadensis, red-breasted nuthatch
Spinus pinus, pine siskin
Spizella passerina, chipping sparrow
Turdus migratorius, American robin
Vireo cassinii, Cassin's vireo
Vireo gilvus, warbling vireo

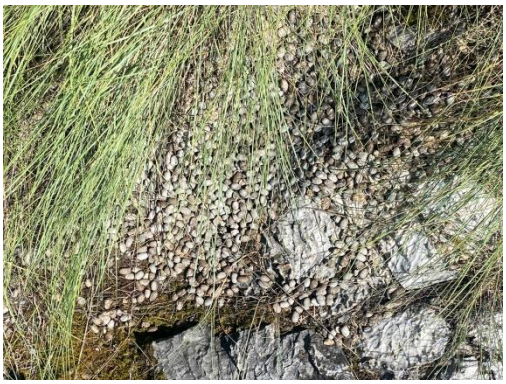

Figure 75. Bighorn sheep latrine high up on the limestone cliffs, July 9, 2023.

Phylum Chordata, Class Mammalia (Mammals)

Lepus americanus, snowshoe hare
Cervus canadensis ssp. *canadensis*, Rocky Mountain elk
Neotoma cinerea, bushy-tailed woodrat
Neotamias minimus, least chipmunk
Odocoileus hemionus ssp. *hemionus*, Rocky Mountain mule deer
Odocoileus virginianus, white-tailed deer

Ovis canadensis, bighorn sheep
Tamiasciurus hudsonicus, American red squirrel
Ursus americanus, American black bear
Vulpes vulpes, red fox

Kingdom Fungi

Figure 76. Tarspot fungus on yellowing trembling aspen leaves help decompose them in the fall, Oct. 9, 2023. We found only one tree with this fungus on its leaves.

Division Basidiomycota, Fungi and Rusts

Calyptospora columnaris, huckleberry broom rust fungus
Fomes fomentarius, hoof fungus
Gymnosporangium globosum, juniper-hawthorn rust
Rhytisma arbuti, tarspot fungus

Figure 77. Pebbled pixie cup lichen, Oct. 9, 2023.

Division Ascomycota (Lichens)

Alectoria sarmentosa, witch's hair
Bryoria furcellata, burred horsehair lichen
Candelariella efflorescens, powdery goldspeck
Cladonia ochrochlora, smooth-footed powderhorn
Cladonia pyxidata, pebbled pixie cup
Dermatocarpon miniatum, leather lichen
Hypogymnia tubulosa, powder-headed tube lichen
Letharia vulpina, wolf lichen
Lobaria sp., lung lichens
Parmelia sulcata, shield lichen
Peltigera malacea, veinless pelt lichen
Physcia caesia, blue-gray rosette lichen

Physeia dubia, powder-tipped rosette lichen
Pleopsidium flavum, gold cobblestone lichen
Rhizocarpon geographicum, Yellow map lichen
Rusavskia elegans, elegant sunburst lichen
Umbilicaria deusta, peppered rock tripe
Usnea hirta, bristly beard lichen
Usnea cavernosa, pitted beard lichen
Xanthomendoza ulophyllodes, powdery sunburst lichen

Kingdom Plantae

Division Bryophyta (Bryophytes)

Figure 78. While many mosses in the dry interior of the ER had dried out, this broom forkmoss on the shady north side of the ER was still green on Oct. 9, 2023.

Class Bryopsida (Mosses)

Aulacomnium androgynum, bud-headed groove-moss
Abietinella abietina, fir tamarisk-moss
Brachythecium sp., brachythecium moss
Bryaceae (Family), acrocarpous mosses
Campliadelphus chrysophyllus, golden feather-moss
Cratoneuron filicinum, fern-leaved hook-moss
Dicranum scoparium, broom forkmoss
Grimmia laevigata, Grimmia dry rock moss
Hygrohypnum sp., feather moss
Hylocomium splendens, stairstep moss
Hypnaceae (Family), Order *Hypnales*, feather mosses
Plagiomnium cuspidatum, woodsy thyme-moss
Pleurozium schreberi, red-stemmed feather moss
Pulvigera lyellii, Lyell's bristle-moss
Rhytidiadelphus squarrosus, square gooseneck moss
Rhytidum rugosum, golden glade-moss
Sanionia uncinata, sickle-leaved hook-moss
Scorpidium sp., feather moss
Syntrichia ruralis, star moss

Clade Tracheophyta (Vascular Plants – Ferns, Gymnosperms, Angiosperms)

Figure 79. Some Fee's lip fern fronds were still green on Oct. 9, 2023.

Division Pteridophyta, Class Pteridophyta (Ferns)

Cystopteris fragilis, fragile fern
Myriopteris gracilis, Fee's lip fern
Pellaea gastonyi, Gastony's cliffbrake
Pellaea glabella, smooth cliffbrake
Woodsia oregana, Oregon woodsia
Woodsia scopulina, Rocky Mountain woodsia

Figure 80. Field horsetail near a cold spring.

Subclass Equisetidae, Order Equisetales, Family Equisetaceae

Equisetum arvense, field horsetail

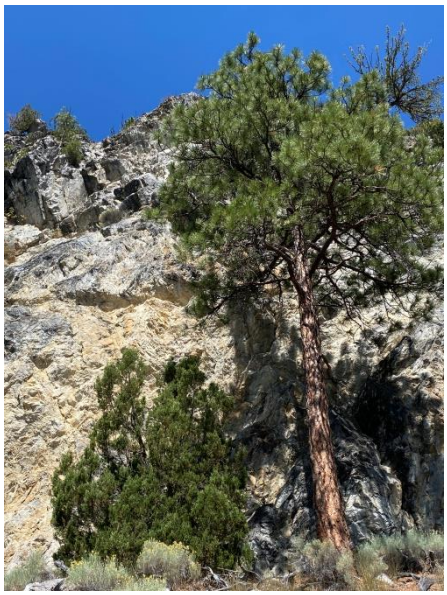

Figure 81. Rocky Mountain juniper and ponderosa pine at base of cliff with limber pine above

Sub-kingdom Embryophyta, Clade Gymnospermae (Gymnosperms), Division Pinophyta or Coniferae, Class Pinopsida or Conifera (Conifers)

Juniperus communis, common juniper
Juniperus horizontalis, creeping juniper
Juniperus scopulorum, Rocky Mountain juniper
Picea glauca, white spruce
Pinus contorta, lodgepole pine
Pinus flexilis, limber pine
Pinus ponderosa, ponderosa pine
Pseudotsuga menziesii, common Douglas-fir

Figure 82. Angiosperms can be divided into monocots such as the nodding onion, and dicots like the linearleaf phacelia, both in bloom on July 9, 2023.

Clade Angiospermae, Division Anthophyta (Flowering Plants)

Acer glabrum , Rocky Mountain maple
Achillea millefolium, common yarrow
Allium cernuum, nodding onion
Amelanchier alnifolia, Saskatoon
Antennaria rosea, rosy pussytoes
Antennaria umbrinella, umber pussytoes

Anticlea elegans, mountain deathcamas
Apocynum androsaemifolium, spreading dogbane
Aralia nudicaulis, wild sarsaparilla
Arceuthobium americanum , American dwarf mistletoe
Arctostaphylos uva-ursi, bearberry
Arnica cordifolia, heartleaf arnica
Arnica fulgens, hillside arnica
Artemisia frigida, fringed sagebrush
Artemisia ludoviciana, silver wormwood
Artemisia michauxiana, lemon sagewort
Astragalus miser, timber milkvetch
Balsamorhiza sagittata, arrowleaf balsamroot
Berberis aquifolium, Oregon grape
Betula occidentalis, water birch
Betula papyrifera, paper birch
Boechera retrofracta, reflexed rockcress
Bromus tectorum, Cheatgrass*
Calamagrostis canadensis, Canadian bluejoint
Calochortus macrocarpus, Sagebrush mariposa lily
Campanula alaskana, North American harebell
Campanula rotundifolia, common harebell
Carex sp., true sedges
Castilleja miniata, giant red Indian paintbrush
Castilleja oxidentalis, Western Indian paintbrush
Chenopodium album, common lambsquarters*
Cirsium hookerianum, Hooker's thistle
Cirsium undulatum, wavyleaf thistle
Clematis ligusticifolia, Western white clematis
Clematis occidentalis, purple clematis
Comandra umbellate, bastard toadflax
Corallorhiza striata, striped coralroot
Cornus sericea, red osier dogwood
Corydalis aurea, golden corydalis
Crepis atribarba, slender hawksbeard
Cyparipedium parviflorum, yellow lady's slipper
Dasiphora fruticosa, shrubby cinquefoil
Delphinium southerlandii, Sutherland's larkspur
Epipactis gigantea, stream orchid (giant helleborine)
Ericameria nauseosa, rubber rabbitbrush
Erigeron divergens, spreading fleabane
Erigeron filifolius, thread-leaf fleabane

Eriocoma hymenoides, sand ricegrass
Eriogonum ovalifolium , cushion buckwheat
Eurybia conspicua, showy aster
Festuca sp., fescues
Fragaria virginiana, Virginia strawberry
Gaillardia aristata, common gaillardia
Galium boreale, Northern bedstraw
Geocaulon lividum, Northern comandra
Geum triflorum , prairie smoke
Goodyera oblongifolia, Western rattlesnake plantain
Heteroheca villosa, hairy false goldenaster
Heuchera cylindrical, roundleaf alumroot
Koeleria macrantha, prairie Junegrass
*Lactuca sp., w*ild lettuces
Leymus cinereus, Great Basin wildrye
Leymus innovates, Northwestern wild rye
Lilium philadelphicum, wood lily
Linnaea borealis, twinflower
Linum lewisii, Lewis flax
Lithospermum ruderale, Western stoneseed
Lobelia kalmii, Kalm's lobelia
Lomatium macrocarpum, bigseed biscuitroot
Lomatium multifidum, carrotleaf biscuitroot
Lomatium triternatum, ternate desert-parsley
Lonicera dioica, glaucous honeysuckle
Maianthernum stellatum, starry false Solomon's-seal
Meliotus alba, white sweet clover*
Oxyria digyna, alpine sorrel
Packera cana, woolly groundsel
Packera paupercula, balsam ragwort
Packera streptanthifolia, Rocky Mountain groundsel
Pedicularis racemosa, sickletop lousewort
Penstemon confertus, yellow beardtongue
Penstemon eriantherus, crested-tongue beardtongue
Penstemon fruticosus, bush penstemon
Phacelia hastata, silverleaf phacelia
Phacelia linearis, linearleaf phacelia
Pinguicula macroceras, horned butterwort
Platanthera aquilonis, North wind bog orchid
Platanthera huronensis, green bog orchid
Platanthera stricta, slender bog orchid

Poa palustris, swamp meadow-grass
Populus tremuloides, trembling aspen
Potentilla pensylvanica, prairie cinquefoil
Poxytropis campestris, field locoweed
Primula pauciflora, dark-throated shootingstar
Prosartes trachycarpa, rough-fruited fairybells
Prunus virginiana , choke cherry
Pseudoroegneria spicata, bluebunch wheatgrass
Ribes oxyacanthoides, Canadian gooseberry
Rosa acicularis , prickly wild rose
Rosa woodsia, Woods' rose
Sanicula marilandica, Maryland sanicle
Saxifraga bronchialis austromontana, yellow-spot saxifrage
Saxifraga bronchialis, matte saxifrage
Sedum lanceolatum, lanceleaf stonecrop
Senecio sp., groundsels
Sheperdia canadensis, Canadian buffaloberry
Solidago altissima, tall goldenrod
Solidago lepida, elegant goldenrod
Solidago missouriensis, Missouri goldenrod
Solidago multiradiata, Northern goldenrod
Solidago nemoralis, grey goldenrod
Solidago simplex, sticky goldenrod
Sonchus arvensis, perennial sow thistle*
Spirea lucida, shinyleaf meadowsweet
Symphoricarpos albus, common snowberry
Symphoricarpos mollis, creeping snowberry
Symphoricarpos occidentalis, Western snowberry
Symphyotiachum falcatum, white prairie aster
Symphyotrichum ciliolatum, Lindley's aster
Symphyotrichum foliaceum, leafy aster
Symphyotrichum laeve, smooth blue aster
Taraxacum officinale, common dandelion,*
Thalictrum occidentale, Western meadow-rue
Thalictrum venulosum, veiny meadow-rue
Thysaria gordonii, Gordon's bladderpod
Toxicoscordion venenosum, meadow deathcamas
Tragopogon dubius, yellow salsify*
Verbascum Thapsus, common mullein*
Viola adunca, hookspur violet

Appendix 2. Animal, fungi, and plant observation locations in the Columbia Lake Ecological Reserve.

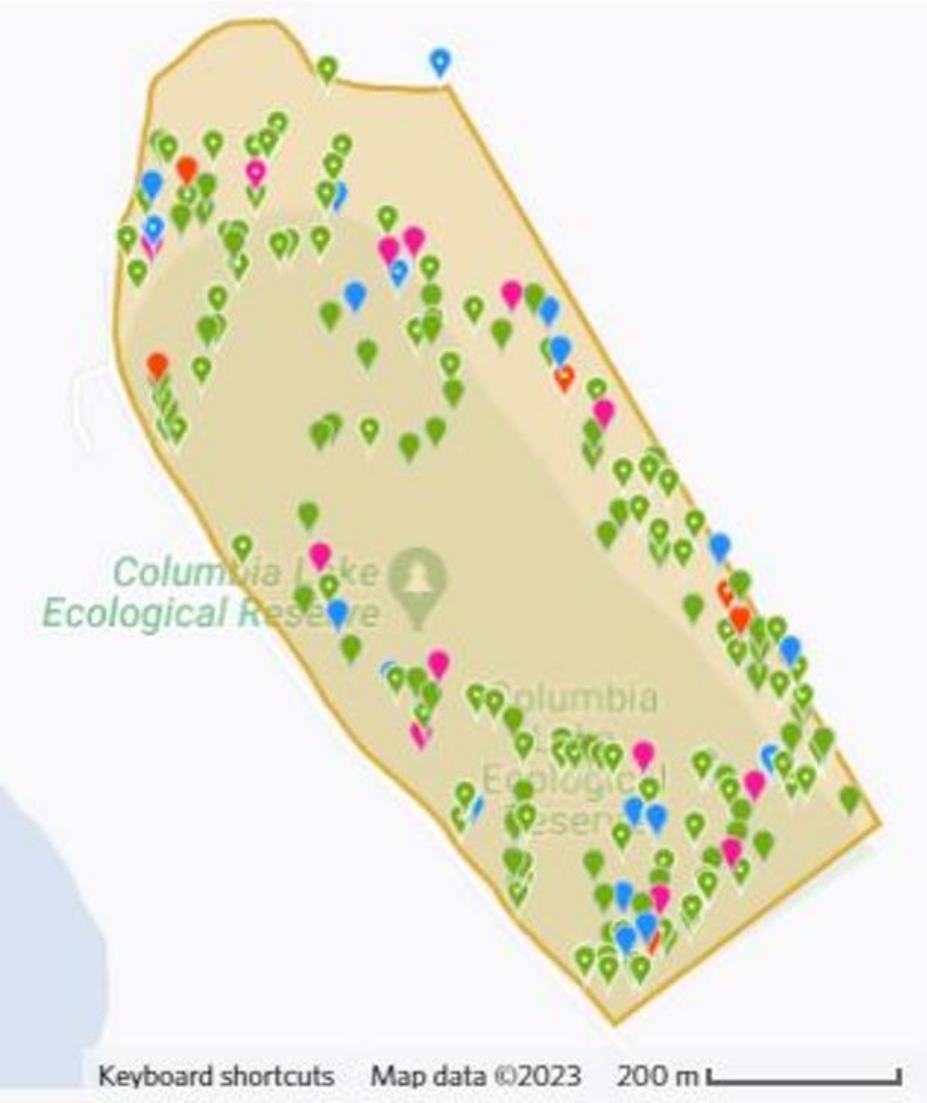

Figure 83. Map of iNaturalist observations as of October 22, 2023. Green refers to plants, blue to mammals or birds, red to insects or arachnids, and purple to lichens or fungi.

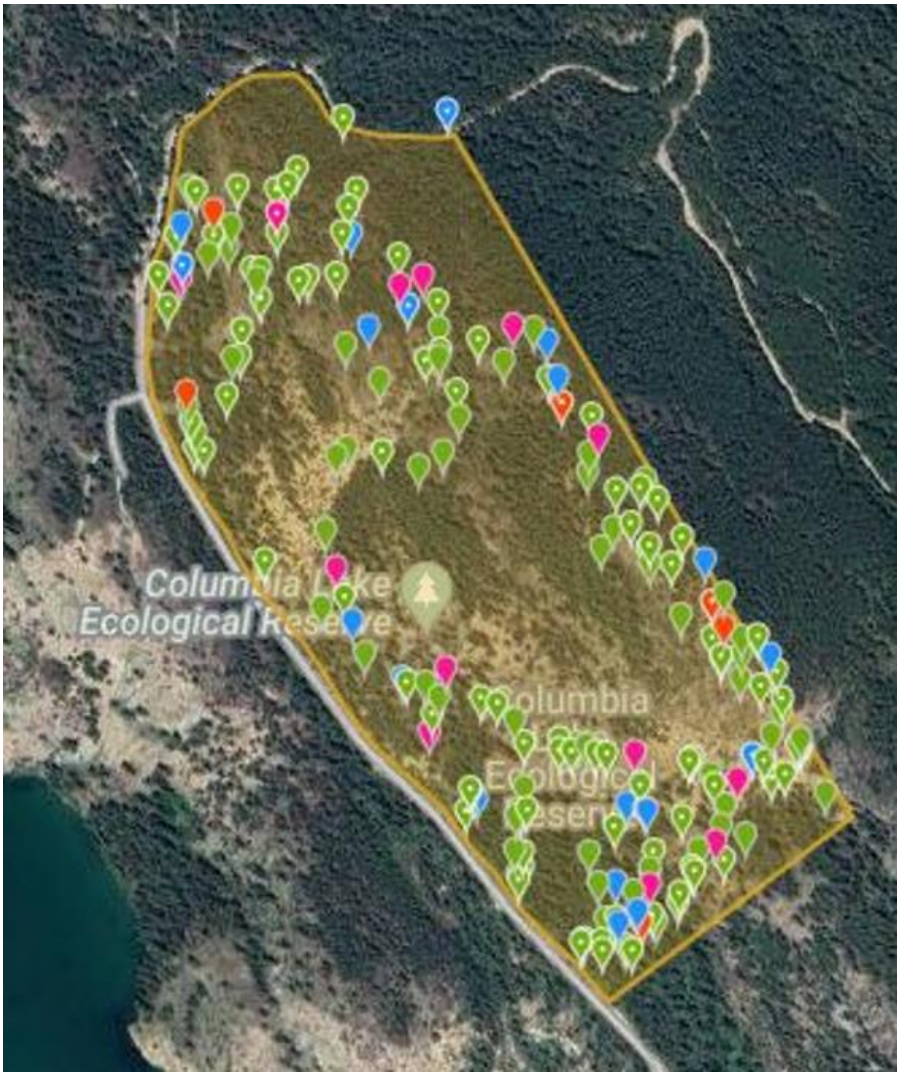

Figure 84. Google Earth map of iNaturalist observations as of October 22, 2023. Green refers to plants, blue to mammals or birds, red to insects or arachnids, and purple to lichens or fungi.

Link to iNaturalist observations – https://inaturalist.ca/projects/columbia-lake-ecological-reserve

Stats as of Oct. 25, 2023: 671 observations, 211 species, 93 identifiers, seven observers

Link to Ian Adams' eBird checklists for CLER - https://ebird.org/checklist/S141934909 and https://ebird.org/checklist/S141934908

Link to Ian Hatter's eBird checklists for CLER - https://ebird.org/canada/checklist/S149595696