TOWN OF BRECKENRIDGE
OPEN SPACE & TRAILS

**Breckenridge Open Space Advisory Commission**
March 27, 2023
Council Chambers in Town Hall
150 Ski Hill Road, Breckenridge, CO 80424

THE TOWN OF BRECKENRIDGE IS NOW HOLDING HYBRID MEETINGS. THIS MEETING WILL BE HELD IN PERSON AT BRECKENRIDGE TOWN HALL. ALL MEMBERS OF THE PUBLIC ARE INVITED TO ATTEND. IN PERSON ATTENDEES MUST NOT ACCESS THE VIRTUAL MEETING WHILE IN COUNCIL CHAMBERS.

This meeting will also be broadcast live over Zoom. Log-in information is available in the calendar section of our website: www.townofbreckenridge.com.
Questions and comments can be submitted prior to the meeting to websiteopenspace@townofbreckenridge.com.

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| ***5:30 pm*** | ***Call to Order*** | |
| ***5:35 pm*** | ***Discussion/Approval of Minutes*** | ***1*** |
| | • February 23, 2023 Draft BOSAC Meeting Minutes | |
| ***5:40 pm*** | ***Discussion/Approval of Agenda*** | |
| ***5:45 pm*** | ***Public Comment (Non-Agenda Items)*** | |
| ***5:50 pm*** | ***Staff Summary*** | ***12*** |
| | • Winter Field Season Update<br>• Seasonal Hires<br>• Grants Updates<br>• Horses at the McCain Property<br>• Trails and Signage Workplans Update<br>• Accepting BOSAC Applications Through March 31, 2023<br>• Quandary Parking & Shuttle Program<br>• Open Space & Trails Master Plan Adoption<br>• BOSAC Meetings on YouTube | |
| ***5:55 pm*** | ***Open Space Discussion*** | ***16*** |
| | • Breck History Keystone Driller<br>• Cucumber Gulch Preserve 2022 Report<br>• Council Matters Related to Open Space Topics<br>• Other Matters | |
| ***7:15 pm*** | ***Executive Session*** | |
| ***7:30 pm*** | ***Adjournment*** | |

## I) CALL TO ORDER

Nikki LaRochelle called the February 27, 2023, the regular meeting of BOSAC to order at 5:37 pm. Other members of BOSAC included Krysten Joyce, David Rossi, Bobbie Zanca, and Council liaison Jeffrey Bergeron. Duke Barlow and Chris Tennal were absent from the meeting. Staff members present included Anne Lowe, Zara Hickman, and Tony Overlock. Members of the public included: Tamara Nuzzaci Park (BreckCreate), Avery Glassman (BreckCreate), Paul Semmer (OSAC), Rae Moody, and Katherine King (Summit County Open Space).

## II) APPROVAL OF MINUTES

A) BOSAC REGULAR MEETING – JANUARY 23, 2023

The minutes were approved as presented.

## III) APPROVAL OF AGENDA

The agenda was approved as presented.

## IV) PUBLIC COMMENT

Mr. Semmer: I am an Upper Blue Resident with two comments for BOSAC.
The elk populations west of the Blue River between Coyne Valley Road and Gold Hill Road. Since the 1990s, the herd has been pinched due to the construction and expansion of State Highway 9. Please do whatever possible to preserve the area west of the Blue River and look for conservation values for the Upper Blue Watershed. Second, the Royal Placer on the east side of the Town of Blue River is the last unit of the WRNF's East Blue River Vegetation Management Plan. The Colorado State Forest Service (CSFS) will cut jointly with the WRNF, Town, and County. Access for this project goes directly through the Town of Blue River. When this work is complete, management is needed for social trails, system trails, and overall vegetation management.

## V) STAFF SUMMARY

A) WINTER FIELD SEASON UPDATE

Ms. Lowe: Staff received comments from the community about the dog waste along the B&B and Wellington Trails. We are planning another Doody Free Breck event, but we are open to other ideas, as this is a problem throughout the town.

Mr. Bergeron: Is poop a health issue or just an aesthetic issue?

Ms. Lowe: In the past, we had a big issue at Carter Park, as it entered the waterways. Dog waste poses many environmental concerns.

Mr. Bergeron: I am bringing this up at Town Council tomorrow. My HOA has spent a lot of money on dog waste stations and bags. I think the Town should allocate some funds for this. I would like to see bags and stations at major trailheads and public pathways. So far, this has not received a lot of traction with Council.

B) SEASONAL HIRE

Ms. Lowe: Staff are currently in the midst of seasonal hiring, and we are excited to have many of our OST Technicians and Naturalists returning for the season.

C) FRIEND OF BRECKENRIDGE TRAILS

Ms. Lowe: Staff are planning our Friends of Breckenridge Trails (FOBT) events for the season, and it will be a good mix of trail maintenance and stewardship events.

## VI) DISCUSSION

2022 State of the Open Space Report

Ms. Lowe: This is the 2022 Open Space and Trails program draft report. We can review this quickly, and the staff would love feedback on what we are missing or what should change. Staff will take your feedback, incorporate it, and then take the report to Town Council. This report showcases the different aspects of the OST program and how funds are being spent. This year, the report ties in to the four Master Plan strategic goals while keeping familiar elements such as the statistics at a glance. Another element Staff wanted to highlight is the effort and amount of time dedicated to regular trail maintenance. Last year staff logged over 4,600 hours of maintenance, including precipitation event blowouts, removing hazardous trees, and addressing general wear and tear. Additionally, the report summarizes our volunteer season, hours, and accomplishments. For Cucumber Gulch Preserve (CGP), the Naturalists provided 115 hikes throughout the 2022 summer season. The report provides an overview of the program's budget. Last year, we operated with a conservative pandemic budget with a total budget of $2.7 million as we worried sales dollars would decrease, but they did not. The Open Space Fund balance tipped over $10 million dollars at the end of 2022. Going forward, we will put the pandemic budget cuts behind us and keep moving forward with our usual growth assumptions.

Ms. Zanca: Would we ever consider using goats for weed control? Colorado Springs uses goats, and it works very well.

Ms. Lowe: Staff will look into that, but fear that goats eat everything, both good and bad.

Ms. Lowe: Regarding conservation, the OST program protects almost 5,100 acres of Town, most of which is jointly-owned property with Summit County. Most of our open space is outside of Town limits throughout the Upper Blue Basin to protect our watersheds, wildlife corridors, and viewsheds.

Ms. Joyce: For the budget, is that also laid out with our goals, or is it how it is paid out?

Ms. Lowe: The report shows how it was initially budgeted with our budget assumptions, as Staff does not know specific acquisitions we will make from one year to the next. The OST program will change its accounting system to make it more sense and be more transparent. Last year, the OST program completed five trail projects: Mineral Hill, Galena Ditch, Purple Pass, Chantilly, and Little Mountain Trails. Projects vary from year to year, with some years having more new trail construction than others. This was done while still maintaining trail corridors, removing trees, addressing erosion, and adding hundreds of feet of buck and rail fencing to high-use areas.

Previously, Access and Inclusion weren't a program focus, but we want to do more going forward. Also, our program aims to ensure that Breckenridge homes are connected to the trail network. Connectivity is important, especially with the new workforce housing neighborhoods. In areas where terrain prevents fully ADA-accessible trail design, the

OST program works to provide wheelchair-friendly trails. Additionally, staff want to address language barriers with signage and interpretive programming.

Cucumber Gulch Preserve, the crown jewel of the Open Space program, opens on July 6, 2023, to the public. EcoMetrics estimates between 6-18 individual beavers living in the Preserve. Last year the beaver documentary was filmed and is in the editing stage now. Everyone involved is anxious to see how it turned out and raise awareness for the importance of beavers to wetland ecosystems. The producer is working with a Colorado wildlife foundation, and they are creating a documentary on beavers to be entered into a wildlife-focused film festival. Beavers have been trapped, killed, or removed from natural systems, but ecosystems thrive when humans can coexist with beavers and allow them to do their work.

OST and our contractor partners continue to monitor birds in the Preserve. Unfortunately, there is a downward trend over time that is hard to explain. No Boreal toads were observed this year, but staff remains ever hopeful. For the 2023 season, the OST program will work with the Denver Zoo and its volunteer program to monitor for toads. Through this partnership, we are hoping to work with the Colorado Parks and Wildlife (CPW) breeding and release program to determine if Cucumber Gulch Preserve is a good release site. Lastly, the beavers are so active in the upper ponds we did not want to dredge the spreader pond.

The OST program had a big year for forest health projects. The Wellington piles on jointly-owned land were burned in November. Staff is working on the planning and details for developing the Town's burn plans for piles on Town-owned open spaces. For river restoration, the Swan Reach B was completed with vegetation work. Staff is working to plant willow plugs and seed to help restored areas. Lastly, staff hopes to implement a management plan for the Sawmill Reservoir and Creek area in partnership with the BOEC.

Mr. Rossi: I have a question about the photo on the Access and Inclusion page.

Ms. Lowe: I know; I am having trouble finding photos available for our use. The BOEC's photos are the best, but their staff does not want to release them. I'll keep looking.

Ms. LaRochelle: Should we include the Master Plan in our budget? Also, isn't there a better aerial photo to use for the River Restoration section?

Ms. Lowe: I believe you are referencing the photo of Reach A. I'll check with the County for any Reach B photos.

Ms. Zanca: I think adding a comment about the Master Plan is important. Shouldn't that be captured somewhere like the budget?

Ms. Lowe: It depends on the level of detail BOSAC would like included about the Master Plan in the budget. Right now, the budget is grouped into large categories and much of the work for the Master Plan was done in 2021's budget.

Mr. Rossi: Could it be mentioned as an accomplishment?

Ms. Joyce: I really like that this report gives symmetry to the Master Plan. Also, Breckenridge is not capitalized on the At a Glance Page.

Ms. Lowe: That is stylistically intentional, but I can override the font.

2023 Trailhead Projects on Joint Open Space

Ms. Lowe: Staff has discussed trailhead maintenance for some time now; many need some love, access, and additional parking. We ran each of the following projects through the Master Plan decision-making framework and analyzed them through that lens. There are three projects that the Town and County Open Space programs want to address and seek BOSAC's feedback on.

Mr. Overlock: Let's begin with Brown's Gulch Trailhead, located down Tiger Road at the beginning of the river restoration projects. A new trail along the river joins the Royal Tiger and Galena Ditch Trails. In this area, recreation has increased year-round. The proposed parking area would be behind the existing green gate. The area is flat and only requires minimal grading to add a parking lot. It is a low-sensitivity area due to its proximity to the road. It is in the midcountry zone and thus an intermediate area with infrastructure. Staff worked with the County Open Space program to identify this location, which avoids sensitive habitat. This project creates a designated parking area alternative to parking illegally on the County roads.

Ms. Zanca: How is this creating equitable access and inclusion?

Mr. Overlock: This project provides access to the river for anglers; there is no parking otherwise.

Ms. Lowe: Many fishermen and trail users could not easily access the newly restored river. This project provides access to many different user types, including a growing angler group.

Mr. Bergeron: I sent some photos to BOSAC and the staff. I am all for added parking in some of these sneak places, like Western Sky or Rakjak, but I think there are two really good parking areas right now. I skied Brown's Gulch 10-15 times this winter. This parking at Muggins can do ten parking spots. I just do not know if parking is necessary; maybe a kiosk would be nice. This could accommodate snowshoeing and cross-country skiing.

Ms. Lowe: That parking in that pull-out snow storage area is on the County Road right of way. It is illegal to park on County roads.

Mr. Bergeron: But they have been plowing it for over ten years.

Ms. Zanca: I do not see any numbers for this project.

Mr. Overlock: Staff wanted to discuss with BOSAC before we talked to contractors for estimates. We wanted to provide off-road parking for groups with children and pets.

Mr. Rossi: When you are talking about head-in parking, if you drive another half mile east, to me, that's more access to fishing than this project would provide.

Mr. Bergeron: My parking is just before Muggins Gulch, 5-10 cars; there is another before Good Times that could have thirty cars. The second parking spot goes to the bottom of Rock Island Road. It really is the best Nordic skiing in Summit County. Cold snow and not a lot of foot traffic. It is mainly snowshoeing and Nordic skiing. I read the decision-making framework and this area; there is not a lot of people there, and I never had a lot of trouble parking there. If you have a dog, you pay attention to the road, and you cross the road.

Mr. Overlock: I hear your points, but the problem is it is illegal to park on County roads.

Ms. King: The County Open Space has heard complaints about parking along County Roads. Our staff cannot guarantee that it will not go away or get better. In the summer, it is motorized use overflow, and users park in front of the green gate. It is safe off-street parking. The parking in front of Muggins Gulch is in the County right away, and at some point, the Sherriff may change their mind about enforcing parking violations.

Mr. Bergeron: I talked to the Sherriff today, and they do not plan to ticket at the Muggins Gulch parking. I have been there well over ten times this winter but do not spend time there in the summer.

Ms. King: There is no public input from the Sherriff so far. This project is an opportunity to provide off-street parking for summer and winter use.

Ms. Lowe: A concern for the Town and staff is that we cannot direct people to do something that is illegal, such as parking on County roads. There is no fishing access in this area.

Ms. Zanca: Is it likely to get busier?

Ms. Lowe: Use trends across the trail network are increasing, and fishermen in the Upper Blue are looking for places to go.

Mr. Rossi: Is there parking at Muggins Gulch gate only 3-4 cars? This is pretty small.

Mr. Overlock: It also alleviates some traffic from the Horseshoe Dredge trailhead parking area.

Mr. Bergeron: Whatever, I said my peace. I wish you all got my photos.

Mr. Rossi: I use this area quite a bit. It was always my process to go to the eastern side and across the bridge. I feel like the head in parking is weird that it is getting plowed if it is illegal.

Mr. Overlock: Good Times runs tours between December to March. There is traffic out there for dog sledding and snowmobiling.

Ms. LaRochelle: Any other throughs for the Brown's Gulch parking upgrade project?

Mr. Rossi: I like the idea of the kiosk versus the parking lot. I do not love the PTSD and expansion of the B&B parking lot. That feels like it filled to the gills before we expanded it. I would like to wait and see. It is not a big expense, but there is so much parking to the east. Fishing access has a steep ledge. You have to cross back over.

Ms. Zanca: I am in favor of this concept. I do not like to say yes without a cost estimate. That makes a difference to me. I would like to see estimate numbers, even if it's a guesstimate. I am ok.

Ms. Joyce: It is ok for me, too; the most compelling part is that we cannot direct people there if it is illegal. It is a hard balance of areas that local people know and love, but we cannot tell people about it if we cannot direct them to park there. I do agree about the B&B parking lot. Access overrides it for me, so I support it.

Mr. Bergeron: I am fine losing this one. If you are talking about the road with traffic. Make a sharp right turn by the gate; that could be safer. I have never had a lot of traffic there at all. I am there only in the wintertime, not a big deal. I do not support it.

Ms. LaRochelle: I agree most consistently with Ms. Joyce. I appreciate the other parking area, but I do agree about the formal parking. It is dubious support.

Ms. Lowe: We can report that the vote was not unanimous.

Ms. King: Ms. Lowe brings up a good point about formalized parking areas if the parking is technically illegal. I can talk to the Sherriff about what to do.

Mr. Rossi: It goes with midcountry zoning and if there is a parking consideration with midcountry versus frontcountry. This is midcountry. I remember Peter's comments about the further out you get; it is a primitive experience.

Mr. Overlock: Transitioning to the Laurium trailhead proposal. There are current parking issues. It is one of the network's busier trailheads, and the overflow parking is along County Road 528. The road grades are 14% downhill and sloped towards the road. Even when users park correctly, their cars slide into neighboring cars because of the steep grades. Staff is looking at ways to provide a better and safer user experience here. The Town engineering department's first looked into regrading the road and elevating the trailhead. If staff were to do so, the dirt berm required would be ten feet high. Because of the amount of work involved in this option, Staff recommends moving the trailhead off the road and behind the existing green gate.

Ms. Zanca: Would this require a new road?

Mr. Overlock: There is an existing road used for mining and a previous Nordic ski area.

Mr. Bergeron: Is it between the gate and the bridge?

Mr. Overlock: Yes. It is already flat, and no grading is required. Additionally, no new material is necessary. The OST program would flatten the existing trailhead to create 20 spots. The current parking alignment provides 15 spots.

Mr. Bergeron: Do you envision leaving the old spots?

Mr. Overlock: Staff wants to leave the upper spots but remove the lower area and use it for snow storage.

Mr. Bergeron: You know how much I love parking lots. I support this, and it is needed. It has gotten so much use, and with grades like this. Does it accommodate 15 cars?

Mr. Overlock: Yes, 15 cars if no one parks awkwardly.

Ms. Joyce: I am in support of this. It is not a safe parking lot. I do not know how I feel about doubling the parking lot. I would like to see the lower area become more established. It could create a bottleneck.

Ms. Zanca: I do not have a problem with the parking lot; it is the cost estimate.

Mr. Overlock: I estimate this project to cost $15,000-$20,000. The OST Techs do not have to trek any material to the location. We can use existing on-site materials.

Ms. Zanca: I am in favor.

Mr. Rossi: I am in favor; I wonder what kind of neighborhood outreach we would need to do in that area. I have seen the experience and anger of drivers and proactive neighbor outreach. I agree with everyone else. We did talk to the plow drivers; they favor this. At one point, a plow truck slid into a parked car.

Ms. LaRochelle: I am in favor of this.

Mr. Overlock: Lastly, staff plans to retrofit the Reiling Dredge trail to create a wheelchair-friendly trail. This project was recommended by the Social Equity Commission. Parking expansion creates two ADA-accessible parking spots.

Ms. Lowe: The Mayor directed staff to examine the south side of French Gulch Road for the ADA parking spaces. The BOEC recommends this location as well.

Mr. Overlock: Option B has accessible parking off the road and on the same side of the road as the trail, as recommended by the BOEC. By creating parking on the south side, the ramp necessary to access the trail would be smaller due to the mellower grades.

Ms. Lowe: This parking area and the trail would not be maintained in the winter months. The trail and bridge bump-outs must be done to create a wheelchair-friendly trail to provide more mobility access.

Mr. Bergeron: Didn't Council say to use the bridge as is?

Mr. Overlock: Currently, the bridge is 40 inches wide, and it is almost impossible to pass. It is an issue even before thinking about increasing access for wheelchairs. Staff is working with the contractor who completed the Sallie Barber stabilization project. He devised a plan using the existing infrastructure and bridge upright supports to expand the bridge in two places. It would provide safe passing zones for all users, but is essential for wheelchair access.

Ms. Lowe: This is the recommendation from the BOEC.

Mr. Bergeron: Is there a price tag?

Mr. Overlock: The contractor estimates $37,000 for the bridge and the trail improvements, with parking an additional $30,000, for a total of $67,000.

Ms. Joyce: It would be helpful to see this project presented as the entire package.

Mr. Bergeron: I thought the project cost was closer to $150,000.

Mr. Overlock: Staff estimated on the high end, as we did not know if the bridge needed additional supports into the creek corridor below.

Mr. Bergeron: I was in Boston recently and pushing my father-in-law in a wheelchair. It can be really hard to push a wheelchair on surfaces that are not designed for them. This cannot be a regular crusher fine trail; it has to be pretty flat to be user-friendly.

Mr. Overlock: I have worked with Jaimie Overmyer from the BOEC throughout this process. We plan to grade and remove crushers to keep them intact at grade. There will be no need for bumpers or elevated timbers. BOEC strongly supports this project as it provides a wheelchair-friendly trail with a destination.

Ms. LaRochelle: When this project was presented, I remember the Mayor particularly hating the bridge bump-out idea. Was there an estimate for replacing the bridge?

Ms. Lowe: They are at least $200,000 minimum with extensive floodplain permits for bridge replacement costs.

Mr. Overlock: The minimal grades are where we see the crusher fines.

BOSAC recommended this project using Option B ADA-accessible parking on the south side of French Gulch Road.

Trails and Signage Workplans

Ms. Lowe: This spreadsheet organizes all ideas provided by BOSAC at the January meeting into a workplan that ties into the Master Plan with an additional element of priority status. Staff hopes to capture all thoughts and feedback on both workplans before going to Council for direction.

Ms. Zanca: Weren't there trail plans in the past?

Ms. Lowe: The previous trail and open space plans were combined into the new OST Mast plan. These workplans support the Master Plan and implementation of it. This is not meant to be like the old trail plans.

Ms. Zanca: The old plans had very specific projects. This one has good things, but they are vague.

Ms. Lowe: The specific projects are typically outlined in the OST annual workplan. We are trying not to tie ourselves to specific projects in the workplan in order to be more dynamic for annual planning.

Ms. Zanca: Where do the specifics show up?

Ms. Lowe: Within the OST annual workplan. This is where specific planning is always listed. BOSAC provided a few ideas at the previous meeting, but it was not an exhaustive list. Staff wants to take this to Council and see what direction they want to go before proceeding any further.

Ms. Joyce: One of the actions listed was to expand parking where possible; maybe the language for that action item is not great. Bobby's questions are good and clarifying as they are open-ended. Annually, we would choose to address several items. Just communicating how these translate to annual work plans.

Mr. Bergeron: Expanding parking where possible and feasible relates to my previous comments about summer versus winter parking. It would be nice to make some of these parking areas codified.

BreckCreate BIFA – Trail Mix 2023

Ms. Glassman: BreckCreate wanted to discuss Trail Mix and to ensure it is directionally correct. BreckCreate is working on the event's special event application (SEPA) and is seeking BOSAC's feedback. This year, the Breckenridge International Festival of Arts (BIFA) returns through programs, exhibitions, concerts, and Trail Mix. Trail Mix features one artist, and her work will reimagine gold as protection, drawing connections from pre-colonial Filipino death masks and the history of gold mining. Her installation features metal eyes attached to trees with simple twines to be low impact. The installation will

occur from August 7-10, the exhibition between August 11 through Labor Day, and deinstall September 5-8. BreckCreate proposes using Iowa Hill, Moonstone, and Illinois Creek for art locations and hosting the musical performance at Illinois Creek.

Ms. Joyce: So, each location will be the same artist.

Ms. Glassman: Yes, each location will be done by one artist.

Ms. Park: In the past, BIFA paired art installations with musical performances during the ten-day event. BreckCreate wants to be mindful of impact as previous performances drew 100-200 people. For 2023, BreckCreate proposes a scaled-back version during the weekend of August 18-20 to have a morning and evening ensemble performance. Like past Tree-O performances, this year, three singers would be on deer stands in the trees. We are considering Carter Park or Illinois Creek for performance locations.

Ms. Glassman: There were several successes for 2022. BOSAC told us last year to be mindful of installations creating new social trails, so each piece was intentionally put right next to the trail. BreckCreate added signage using Leave No Trace messaging to remind visitors to stay on the trail. Lastly, one of our biggest successes was working on an installation with the OST Technicians; it was a wonderful synergy.

Ms. LaRochelle: After we talked last year, I might lean on staff for their observations, but I sensed a discrepancy about the installation on Moonstone. BOSAC recommended not to use the Moonstone Trail.

Ms. Lowe: BOSAC's recommendation was not to use the Moonstone Trail due to access and illegal parking from the top of the trail. Also, there was never approval for the Sound Tank.

Ms. Glassman: I recall the discussion, but I thought we were allowed to.

Mr. Bergeron: What is BreckCreate thinking about doing along Illinois Creek?

Ms. Glassman: The plan is to surround the trail with eyes as much as possible.

Mr. Overlock: Staff would like to participate in site walks and conversations.

Ms. Park: The focus of Trail Mix has shifted to serving visitors that are already here and residents. Trail Mix is the trademark signature event of BIFA. The goal is for trail users to stumble upon the exhibits.

Ms. Joyce: I know it had a big impact, but I thought the people in the trees were so magical. It doesn't sound like it would be the same this time.

Ms. LaRochelle: Did you say that there were 200 people at one performance?

Ms. Park: That was the highest attended performance. Now BreckCreate is trying for a group of 30-50.

Ms. LaRochelle: The sound tank was not something that BreckCreate discussed with BOSAC.

Ms. Park: No, we did not mention it to BOSAC then, but it was added to the SEPA application. The trail was acceptable. As an art, we are looking for locations. BreckCreate consults BOSAC to ensure we hit the criteria. That is my understanding of what happened.

Mr. Rossi: I like the idea of one artist in different locations. I agree with what everyone else is saying.

BOSAC voted to recommend the Trail Mix plan as presented to Town Council.

Ms. LaRochelle: I want to ensure we are clear with staff; that everyone is on the same page as to what is being done.

Ms. Lowe: From a staff perspective, I think Moonstone Trail is a fine alternative, but we would like to be on site. We have concerns about many diseased trees at Illinois Creek.

Ms. Glassman: We have general consensus for the three proposed sites.

Council Matters Related to Open Space Topics
No updates.

**VII) ADJOURNMENT**

Ms. LaRochelle moved that BOSAC go into executive session under C.R.S.§ 24-6-402(4)€ for the purpose of determining positions relative to matters that may be subject to negotiations, developing strategies for negations, and/or instructing negotiators concerning a property that the Town may be interested in acquiring for open space purposes. Ms. Zanca seconded the motion. BOSAC went into an executive session at 8:06 pm.

The executive session of BOSAC concluded at 8:21 pm. The participants in the executive session were Krysten Joyce, Nikki LaRochelle, David Rossi, Bobbie Zanca, and Council liaison Jeffrey Bergeron. Chris Tennal joined the executive session virtually. Staff present included Anne Lowe, Zara Hickman, and Tony Overlock.

A motion to adjourn the BOSAC meeting was made by Ms. Zanca, and Mr. Rossi seconded it. The February 27, 2023 meeting of BOSAC ended at 8:22 pm.

The next regular meeting of BOSAC is scheduled for March 27, 2023, at 5:30 pm.

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Duke Barlow, Chair

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| Memorandum | |
| To: | Breckenridge Open Space Advisory Commission |
| From: | Open Space & Trails Staff |
| Re: | March 27, 2023 Meeting |

**Staff Summary**

**Winter Field Season Update**
Staff is currently working on:

- Cleaning up popular trailheads, removing dog waste, and bonfire debris.
- Grooming trails surrounding the Gold Run Nordic Center, including Gold Run Road, Upper Flume, Slalom, Dry Gulch, Middle Flume, Tom's Baby, Hard Luck, and Fall Classic.
- Removing downed trees system-wide.
- Conducting sign inventory and assessment.

**Seasonal Hires**
Seasonal OST Technicians and Naturalist positions are posted. If you know of any potential candidates, please reach out to staff or check out the employment opportunities on the Town website.

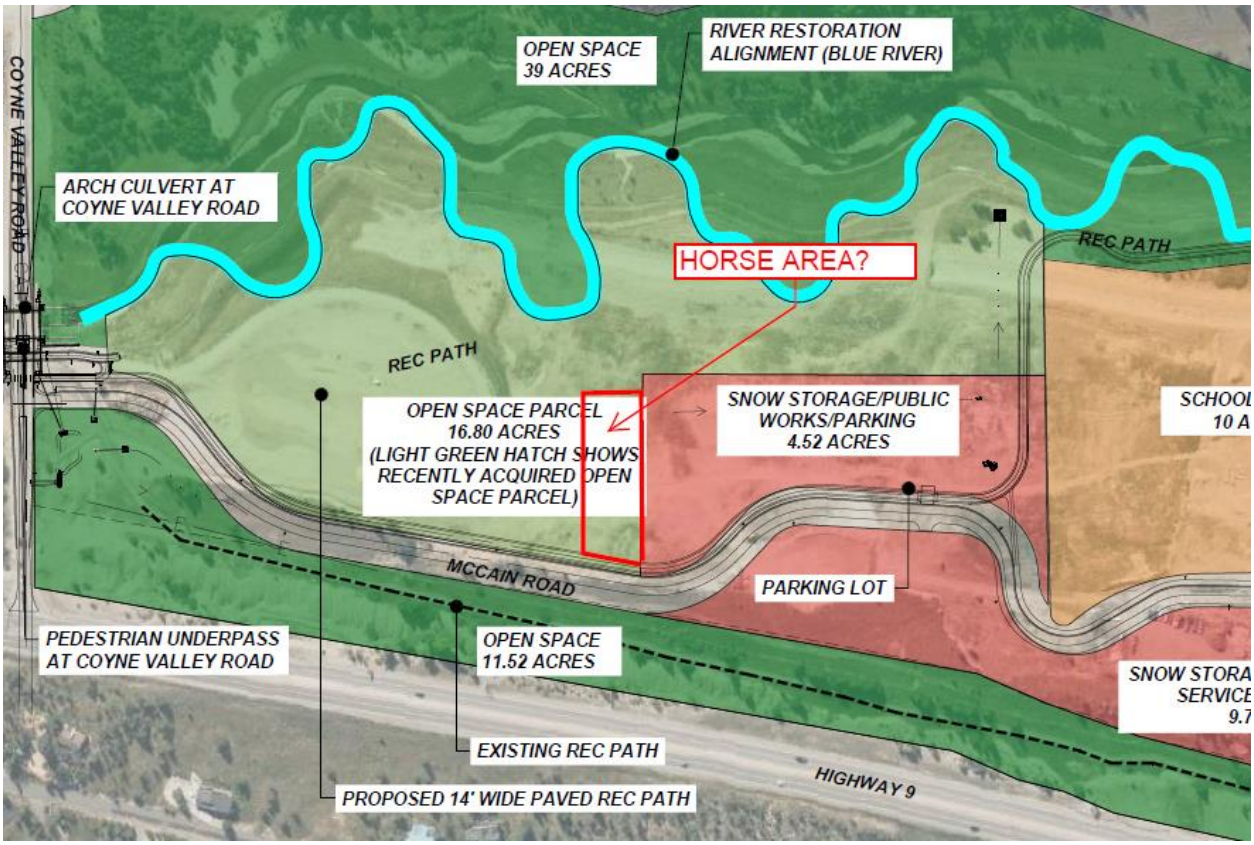
**Grants Updates**
Staff recently learned of two grant opportunities with immediate deadlines and submitted applications for both. The first is a grant application to the CPW Partnerships in the Outdoors grant for the Sawmill Reservoir Wheelchair-friendly Access project, a partnership with the Breckenridge Outdoor Education Center (BOEC). This project would create a new wheelchair-friendly trail from the existing trailhead parking area to the Sawmill Reservoir through the forest around the Griffith Lodge. Additionally, this project improves the short trail connector to the Reservoir Trail by making wheelchair friendly upgrades and also updates the trailhead kiosk with new signage and information for individuals with disabilities to make their own recreational choices.
Staff also submitted a grant for the 2023 BILS Noxious Weed grant application, a collaboration between the US Forest Service and the Colorado Department of Agriculture to establish a plot-based monitoring program of noxious weeds for Cucumber Gulch Preserve.

**Horses at the McCain Property**
Public Works, in cooperation with Town administration, is working to find a temporary location during winter months for the 12+ horses used for the Gold Run Nordic Center sleigh ride operations, as well as Peak 9 sleigh rides. The owner of the horses had previously leased space at the stables, which is being developed for workforce housing this year.

The Town is proposing using an approximately one-acre site on the McCain property immediate south of the snow storage area and away from the river corridor. Because it is adjacent to existing snow storage, it consolidates all horse activity against the snow storage to help preserve the newly acquired open space east of the river (16.8 acres). Runoff would go to the infiltration facility for the snow storage, so it wouldn't require additional water quality protection measures. All horse manure would be removed from site by April prior to any melt-out.

The Town plans to set up the agreement to be year-to-year, potentially up to five total years or

whatever duration the Town feels is appropriate. The owner of Breck Stables is encouraged to find a long-term permanent solution. Please see map below of the proposed area.




*McCain Property – proposed winter horse area*

**Trails and Signage Workplans Update**

Following the March 14th Council meeting, staff are making initial changes to the trails workplan and signage workplan. Staff will bring the updated workplans for discussion and brainstorming at the April BOSAC meeting.

**Accepting BOSAC Applications Through March 31, 2023**

The Town of Breckenridge is seeking three motivated, community-minded volunteers to serve a 4-year term on the Breckenridge Open Space Advisory Commission (BOSAC). BOSAC is responsible for advising Town Council on matters of open space and trails acquisition, protection, and land management.

Regular meetings are held on the fourth Monday of each month, and more frequently if the need arises. Applicants must be residents and electors of the Town of Breckenridge. Apply by Friday, March 31st.

To apply, please complete the application form: **bit.ly/BOSACApplication2023**.

**Quandary Shuttle & Parking Program**

Town and County staff have been working together to develop and review RFP's for the 2023 Quandary parking and shuttle program. The Board of County Commissioners will be meeting on Tuesday, March 28tt to review costs and potential vendors for the summer season. Please see enclosed memo on the Quandary parking and shuttle program that was included in the Council packet.

**Open Space & Trails Master Plan Adoption**
The Town code requires an ordinance to adopt the Open Space & Trails Master Plan. The first reading for the adoption of the plan is scheduled for Tuesday, March 28th at the Town Council meeting. BOSAC is encouraged to attend the meeting.

**BOSAC Meetings on YouTube**
The February BOSAC meeting has been uploaded to YouTube. Please find it here.

# Memo

TOWN OF BRECKENRIDGE

**To:** Breckenridge Town Council Members

**From:** Matt Hulsey, Assistant Public Works Director, Mobility & Sustainability
Anne Lowe, Open Space and Trails Manager
Shannon Haynes, Deputy Town Manager

**Date:** 3/23/2023

**Subject:** Quandary Peak and McCullough Gulch Summer 2023 Parking & Shuttle Program

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Overview
Town staff has been working with representatives from Summit County Open Space and Trails (SCOST) on their development of a parking and shuttle program for Quandary Peak and McCullough Gulch. This has been a priority for the Board of County Commissioners (BOCC) after parking became a safety issue in the area. For the past two seasons Town staff provided input specific to parking management. Also, on behalf of the County, the Town entered into an agreement with Interstate Parking to provide parking management at the Quandary trailhead (Town Open Space has joint ownership in the property). Based on the agreement, Interstate Parking remitted a portion of parking fees and citation revenue to the Town, and it was passed, in whole, to the County.

In planning for the 2023 season Town staff have taken a more active role in partnering with County staff. Staff believes that a successful rollout of the program will reduce vehicle traffic coming in and out of Breckenridge, may be replicated in other areas, and may serve as a model for utilizing transit for trailhead access. Success will further Town sustainability and mobility goals.

Overview
In January SCOST staff, with involvement from Town staff, discussed recommendations for the 2023 Quandary Peak shuttle and parking program, with the BOCC. The BOCC directed SCOST staff to issue a Request for Proposals (RFP) for both parking and shuttle services for the 2023 summer season.

SCOST staff, with input from Town staff, developed an RFP and worked diligently to contact various parking and shuttle service providers to encourage proposal submissions. Bids were received from three potential contractors. After review of all three proposals, SCOST and Town staff have developed a series of recommendations for the BOCC to consider during an executive session scheduled for Tuesday, March 28th. During your work session on the same date, staff will provide a general overview of the recommendations accepted by the BOCC. Depending on the BOCC's decisions, staff will request Council feedback on:

1) Providing free parking for the Quandary Shuttle operations in the South Gondola lot; and
2) Splitting the subsidy cost with Summit County Government

Staff will be available at the March 28th work session to provide additional detail and answer any questions.

**Open Space and Trails Discussion**

**Breck History – Keystone Drill Location Proposal**
Larissa O'Neil will present Breck History's request to house the Keystone Drill on open space lands. The drill is currently being stored at Country Boy Mine, which is not a viable long-term location. They are seeking to store the drill, with a roof structure, near the Reiling Dredge bridge on jointly-owned Town and County open space. Please see the enclosed proposal from Breck History. Breck History has not yet discussed the Keystone Drill proposal with the County.

Staff requests that BOSAC review the enclosed proposal and answer the following questions.

1. ***Does BOSAC have any questions or concerns regarding the Keystone Drill and roof structure in the proposed location?***
2. ***Does BOSAC recommend other possible locations for the Keystone Drill?***
3. ***Is BOSAC in support of the proposal as presented?***

**Cucumber Gulch Preserve 2022 Annual Reports**
EcoMetrics completed their 2022 Wetland and Wildlife Monitoring Report for Cucumber Gulch Preserve, while Christy Carrello completed the 2022 Avian Community Monitoring Report. Both reports are included in the BOSAC packet.

Jessica Doran from EcoMetrics will join us for a presentation and discussion of the 2022 Wetland and Wildlife monitoring report.

Staff requests that BOSAC review the enclosed monitoring reports and answer the following questions.

1. ***Does BOSAC have any questions regarding the wetlands and wildlife or avian monitoring reports?***
2. ***Does BOSAC have any questions regarding future monitoring efforts in Cucumber Gulch?***

**Council Matters Related to Open Space Topics**
Jeffrey Bergeron, in his role as Council liaison to BOSAC, will provide updates on open space-related topics that Council has recently discussed.

**Other Matters**
This standing agenda item is intended to provide commissioners an opportunity to raise questions for a brief discussion and response, or to suggest items for upcoming agendas.

March 21, 2023

To: BOSAC

From: Larissa O'Neil

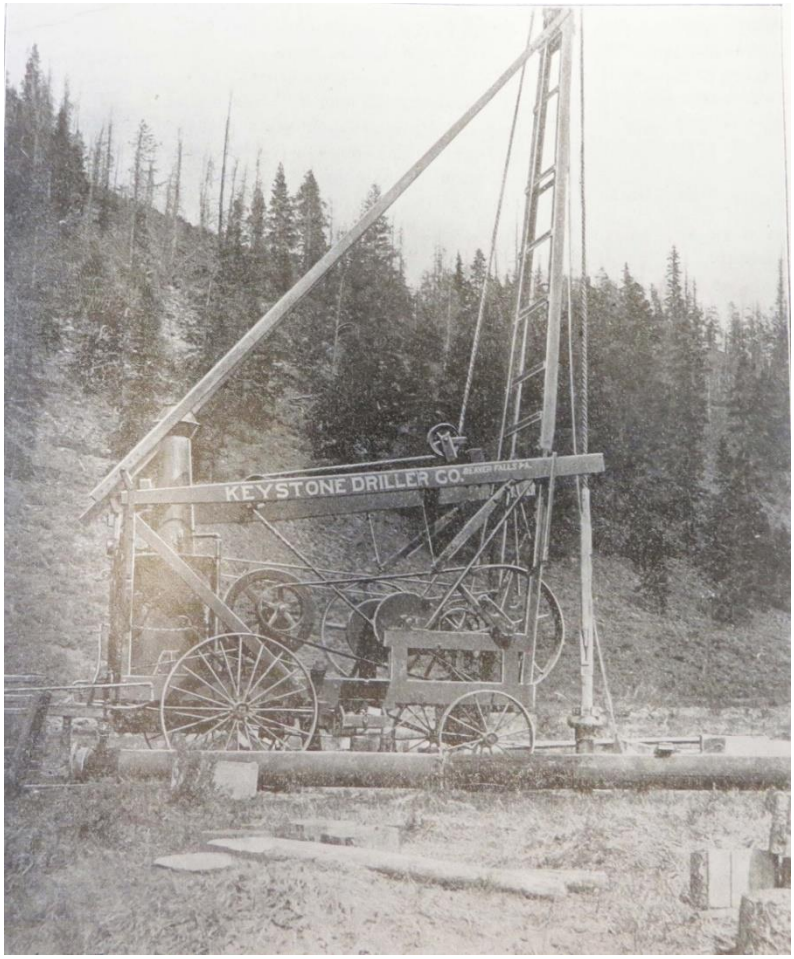
Re: Keystone Drill location

Background: Breckenridge miners used the portable Keystone Drill to test gold-bearing ground. The results from drilled samples directed the paths of dredges and underground mines. Historical evidence suggests our drill was owned by Breckenridge's famed dredge boat king, Ben Stanley Revett. His Continental Dredge was dismantled in Breckenridge and moved to Fairplay in 1938, along with the drill. Nearly 50 years later, the drill was discovered near the Fairplay dredge piles and moved to the Como Roundhouse for storage. Breck History acquired the drill in 2019 and moved it to Country Boy Mine. Since then, due to several factors, the drill has sat uncovered and without a confirmed long-term home.

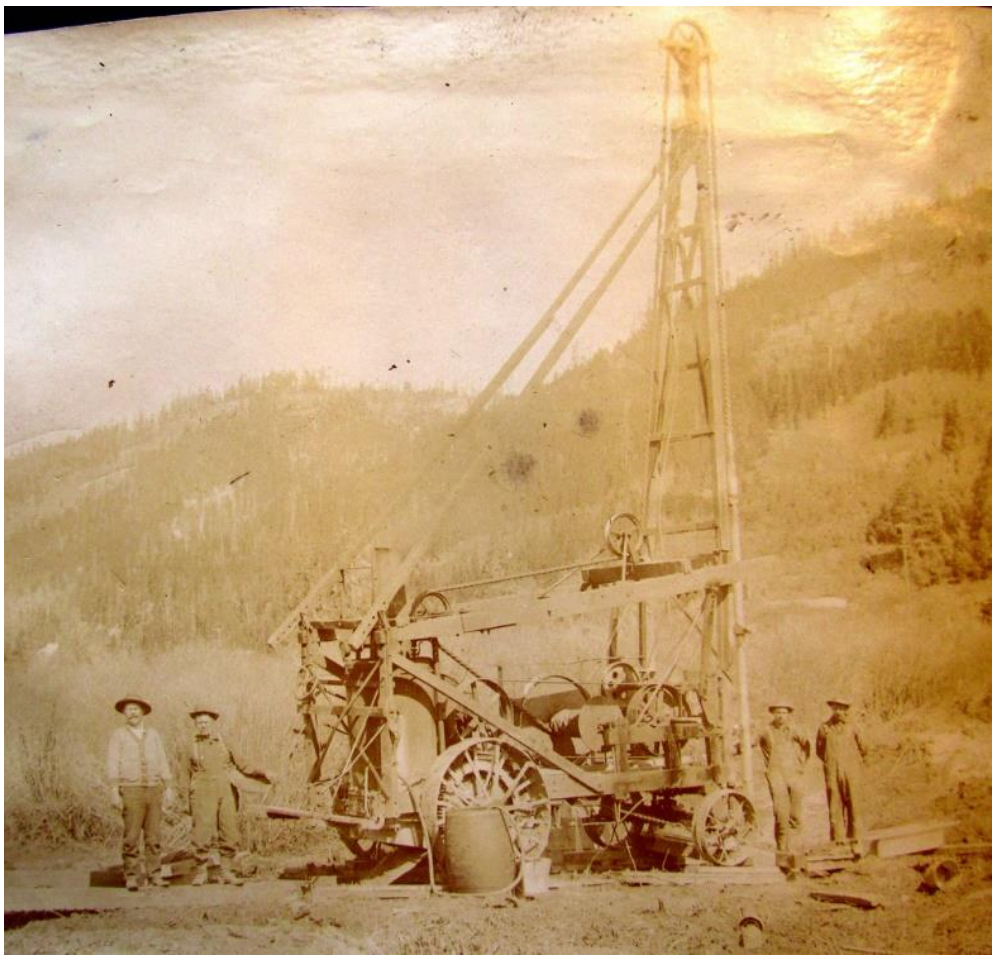
Proposal: Breck History has discussed potential locations for the Keystone Drill, keeping in mind its size, current state and historical context. The preferred spot is along the Reiling Dredge trail, between French Gulch Road and the bridge over French Creek. This location is historically accurate, as the drill was used to test undisturbed ground near mining operations. The site also aligns with our historic resources management plan, which focuses on resources within French Gulch. The B&B-Reiling-Minnie-X10U8 loop currently has nine signed historical sites. The drill provides another opportunity for interpretation along the new wheelchair friendly Reiling Dredge trail. Breck History does not anticipate increased visitor use, as the drill doesn't possess the same visual appeal as other sought-after photo op locations. Similar to other one-of-a-kind outdoor artifacts, like the Lucky Jig on the north side of French Gulch Road, the drill needs a shelter for long-term preservation.

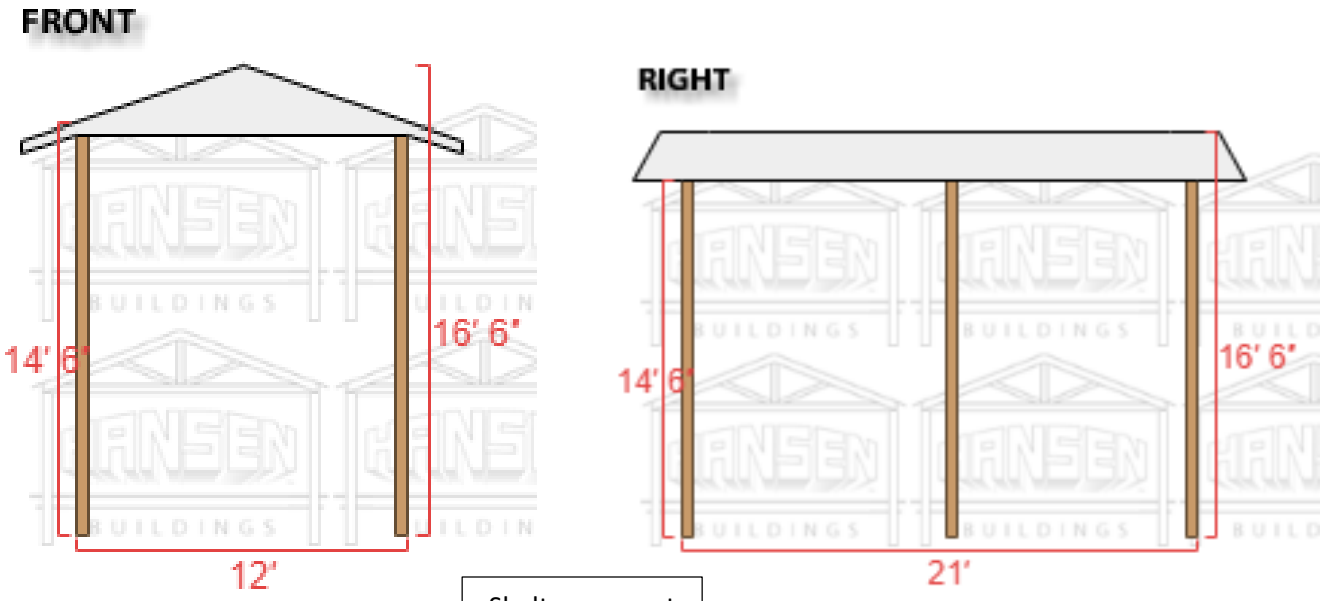
Dimensions: The drill measures 17 L x 8' W x 12' H. The derrick, approximately 25' tall, is not part of the proposed exhibit. Draft designs for a basic, open-air outdoor shelter are: 21' L x 12' W x 16'6" H at its peak.

Breck History is seeking support from BOSAC to move the Keystone Drill from Country Boy Mine to the proposed location. Funding for the move and shelter construction are not part of this request.




Keystone Drill, ca. 1900






Shelter concept

Lucky Jig shelter

Potential location

Keystone Drill, summer 2022

# 2022 Cucumber Gulch Preserve Wetland and Wildlife Monitoring Report

**Submitted to the Town of Breckenridge, Open Space and Trails Department**
**By EcoMetrics, February 1, 2023**


## Introduction

Cucumber Gulch Preserve (CGP) is a 139-acre protected area dedicated to the conservation of biodiversity. Formed in 1999 by the Town of Breckenridge, the preserve has been the focus of ecological studies and monitoring efforts committed to documenting, understanding, and preserving the extraordinary diversity of wetland and forested habitat. It is this complexity which sets it apart from any other area in the region and is the main reason biodiversity is so exceptional.

Situated between the Town of Breckenridge and Breckenridge Ski area, CGP is surrounded by high levels of human activity. Stewardship aimed at the protection of biodiversity in a changing landscape is a challenge. Annual monitoring efforts provide the Town with ongoing input on the health of the system and knowledge to support adaptive management of this valuable natural resource.

# Background

## Why are healthy wetlands important?

In the arid west, wetlands are recognized as biodiversity hotspots supporting a high variety and density of life. They provide critical aquatic and terrestrial habitat that has limited availablity to many species in Colorado. Different types of wetlands offer diverse physical habitat, thermal and chemical conditions, and support high biological productivity.

In CGP, wetland habitats comprise 57.3 acres or 41% of the total area. Habitat mapping in 2020 identified the location, extent, and type of each wetland habitat finding 13 distinct types of wetlands. It is precisely these varied and interspersed habitats that support the treasured biodiversity and the biotic communities known to the area. The array of habitat types and their spatial configuration create opportunity for many species to find food, water, shelter, and breeding grounds supporting many species through many life stages. The connection between wetland health and biodiversity is well documented and the ecologic value well understood, but the benefits of healthy wetlands extends well beyond wildlife species. Wetlands also support human welfare, and the ecosystem services wetlands provide to communities are garnering more attention and research. An ecosystem service is any positive benefit, direct or indirect, wildlife or ecosystems provide to people. This summary below highlights the most cited services of healthy wetlands.

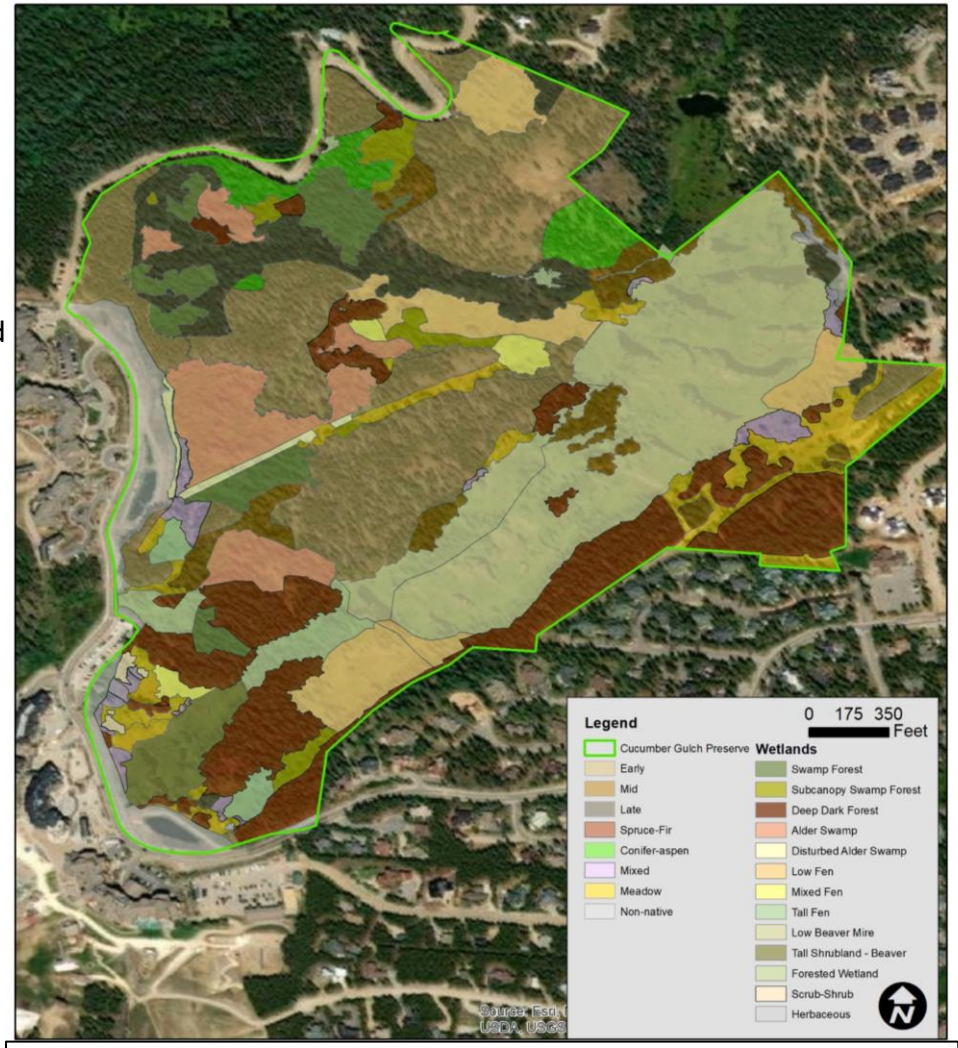
## Ecosystem service provided by healthy wetlands

**Drought resilience** - Healthy wetlands detain water (*i.e.*, water moves through more slowly), increasing the extent of aquatic and wetland habitat, and supporting higher ground and surface water elevations. Aquatic habitats persist longer through dry periods and have greater hydraulic head resulting in more alluvial aquifer recharge.

**Flood resilience -** Healthy wetlands attenuate flood flows and flood energy because their floodplains are activated more frequently, have a greater extent, and offer more complex topography and roughness.

**Wildfire resilience -** Healthy wetlands, with a greater extent of aquatic habitat, saturated ground, and hydric vegetation, are less prone to burning, increasing their potential as fire breaks that can retard the expansion of small fires. They are also critical refugia habitat for all types of plants and animals when wildfires occur. Healthy wetlands also retain more sediment because they are depositional and can act to mitigate the negative effects of sedimentation following wildfire or other anthropogenic disturbances in the watershed.

**Climate resilience and water quality -** Healthy wetlands retain water and support diverse micro-biotic communities. These factors combine to yield greater rates and magnitudes of biogeochemical processing that reduce nutrient loads and other water pollutants. They also have greater productivity and increased retention of organic material creating opportunities to capture and sequester more carbon.




**↑ Map from 2020 study to locate and characterize wetland and upland habitats in CGP. The patchwork nature of habitat types supports high levels of biodiversity**

**Recreation** - Healthy wetlands have more aquatic habitat, more diverse aquatic habitat types, and more deep-water overwinter habitat. They support more waterfowl and other riparian-dependent game bird species as well as, small and large game.



**Sustainability** – Healthy wetlands are resilient to changing conditions.

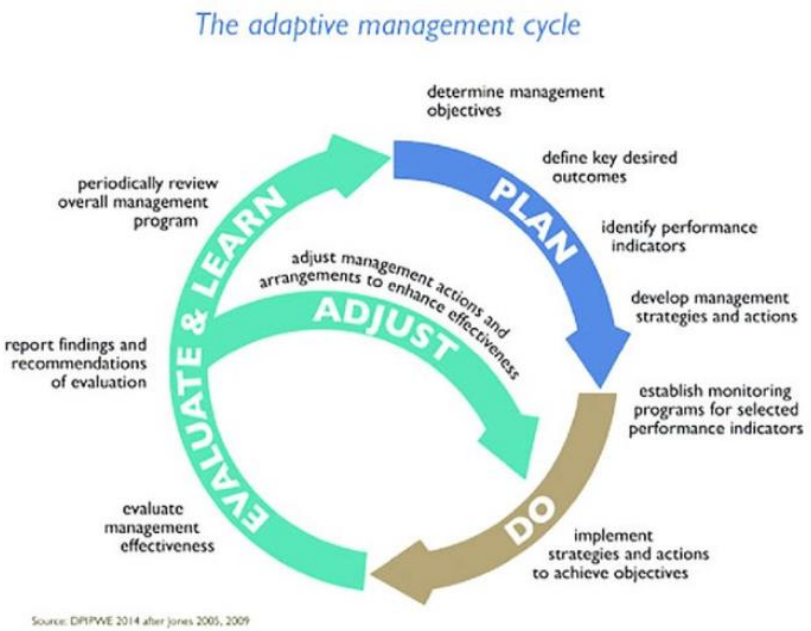
# Adaptive Management at Cucumber Gulch Preserve

An adaptive approach is essential to meeting management goals in this dynamic environment. Since establishment, this approach has been the guiding image to stewardship in the Preserve. Just like with human health, management for wetland health needs to be holistic with consideration of key contributing variables. An ongoing picture of system health is important for management to respond to impacts and ecological stress from concentrated human activity. Maintaining biological integrity and diversity in the Preserve is more challenging each year as development and recreational pressures continues to intensify. Each year's monitoring efforts provide the opportunity to observe changes in key wetland health attributes, to reevaluate our assessments of current and potential condition, and to make recommendations on important management decisions and actions.

The history of management of CGP is an excellent example of the adaptive management cycle. In an everchanging world, managers must be willing to act on the best available information and be ready to adjust to incorporate new information and evolving needs.

The Town has accumulated an impressive data set over the last 23 years of adaptive management and monitoring. These data, weighed alongside community interests and values, have informed management decisions and guided stewardship efforts. With the abundance of information on various aspects of CGP, it can be difficult to see how monitoring data is applied to health evaluation and eventually management decisions. To help clarify this process, the **Monitoring Summary** table (Sheet 4) provides a connection between the key wetland health variables and monitoring efforts. Additionally, this table provides brief explanation of trends and 2022 observations. A link to detailed description of each effort is also referenced.

The next step is turning monitoring observations into guidance for stewardship actions. This is not a linear process and ecological, cultural, societal, and practical considerations all feed into any decision to adjust the management plan. As wetland scientist we can provide the ecologically informed piece of this equation for the Town to consider. Informed by prior reports and the past 10 years of monitoring, **stewardship consideration** for each monitoring effort are included in the detailed sheets.




**Plan**

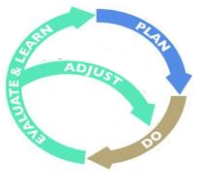
Planning started with efforts to establish protection of the Preserve and continues to meet the needs of a dynamic natural environment and evolving community setting.

**Adjust and Do**

From 1999 to present, management decisions have been updated to meet needs. While management must be dynamic, it continues to be founded on Town statute adopted in 1999 to protect the unique biodiversity of the Preserve.

**Evaluate and Learn**

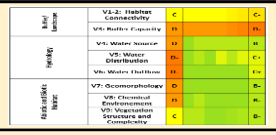
Stewardship plans are created based on existing knowledge of the system. Monitoring response to the plan allows for further learning and reevaluation of efforts. Adjustments are made to improve stewardship or accommodate new conditions.




**Stewardship considerations**:
On following sheets, monitoring efforts will have descriptions of current conditions with suggestions of when stewardship action may be considered.

# Monitoring Summary



| | Monitoring effort | Trends | Observed ranges (2011-2022) | 2022 summary | |
|---|---|---|---|---|---|
| Overall Heath | FACWet evaluation: Holistic evaluation of wetland health | Existing condition and trends in eight key variables show minimal variations over the last 10 years. Overall wetland health maintained or improved over recent years. | UCG: dynamic system, varying D to C+<br>MCG: dynamic system, varying B to C<br>LCG: stable system , B rating<br>Peak 7 SS CG: stable system , B rating | Sheet 5  | Peak 7 SS and UCG are unchanged from 2021 conditions. LCG had decreasing level of beaver activity, but ponds and wetland extent and function persist. MCG health is improving with increasing water distribution resulting in expanded, more diverse aquatic habitat. |
| | Photopoint monitoring: Qualitative tracking of general conditions throughout the Preserve | Photopoint monitoring have been most helpful in tracking changes in pond levels, vegetation structure, and land use changes in surrounding area. | The extent and depth of ponds varies with beaver activity, but ponds can maintain in the absence of beaver. Invasive weeds continue to be a stressor in UCG. | Sheet 6  | No major changes were noted in 2022. Images show increasing pond extent where beavers are active in UCG and MCG. LCG ponds appear to be decreasing in extent. Vegetation appears like 2021 conditions. No new threats observed in land surrounding CGP. |
| Buffer/ Landscape | Habitat Connectivity and Buffer Capacity: Periodic evaluation of land use changes near CGP | Increasing area with altered land use due to expanding development footprint. | 1999: 30% developed or deforested<br>2015: 56% developed or deforested<br>2019-2022: slight increase on SE boundary | Housing development continues in the Shock Hill neighborhood and near Nordic Center. Quantitative assessment was not done in 2022 because, except for a few homes, most development is within areas previously included in “developed or disturbed” category. | |
| Hydrology | Water Source: ground water monitoring within the Preserve and contributing watershed | The influence of past landscape level and internal level impacts continue simplify the water sources of CGP. | Groundwater monitoring has not identified any negative trends within or outside of the Preserve. | Data provided for the first half of 2022 did not indicate any new threats to water source. Ground water levels in the wetland followed seasonal trends of increasing between Feb to March. | |
| | Water Distribution: Surface water monitoring of beaver ponds throughout the preserve | Surface water area varies with beaver activity. Ponds can persist in the absence of beavers but slowly decline over time. | UCG: 0.2-0.9 acres<br>MCG: 0.2-1.1 acres total: 2.5-4 acres<br>LCG: 1.3 – 3 acres | Sheet 7  | Increases in pond area were observed in UCG and MCG where beavers were most active over the summer months. Pond area decrease slightly in LCG but the overall pond area throughout the Preserve is 4.0 acres which is one of the highest values recorded since 1999. |
| | Water Distibution: Ground water monitoring in MCG | Ground water elevation increased after beaver mimicry structures were implemented in 2019-20. Beaver returned in 2022 causing further increases. | Wetland hydrology present in 2 of 7 well locations in 2019. Wetland hydrology present in 5 of 7 well locations in 2022. | Sheet 8-9  | Ground water elevations increased in 2022 with several well locations showing surface water and longer hydroperiods than 2021. Well locations T and R do not show wetland hydrology conditions suggesting potential for future increases with expanded beaver activity. |
| Abiotic and Biotic Habitat | Geomorphology: Volume of sediment accumulation in UCG Spreader Pond | Input from the watershed varies annually. Inputs were highest from 2012-2017 and decreases from 2019 to 2022. | Approx 20 cy/year from 2012 to 2017, 10 cy in 2019, zero in 2020-2021, 9.6 cy accumulation in 2022. | Sheet 10  | In contrast to the 2 years prior, nearly 10 cu yards of material deposited in the Spreader pond in 2022. This suggests the rate of allochthonous input may be decreased but it remains a stressor on the system. |
| | Chemical environment: Water Quality monitoring | Data show no element routinely above established limits. | Plotted values for all elements are available for 2004 to 2020. | No data provided in 2022 but no new threats to water quality are expected to be identified in 2022. | |
| | Wildlife: Beaver activity between May and September | Beavers are successfully observed May through September, with evening surveys more active than morning surveys. | Most activity was observed in June and August with slightly less in July. The highest number of individuals/survey was 6 during an August survey. The lowest is zero. | Sheet 12  | Identification of individual beavers is hard, so the best chance to estimate numbers of individuals is when multiple beavers are spotted at the same time. In 2022, we adjusted to have multiple observers at the most active locations. Beaver population is estimated to be higher than previous years. |
| | Wildlife: Beaver lodge survey | Highest observed number in 1999 and since then leveled off with average of 2 lodges per year. | Since 2004, there have been 1 to 3 active lodges throughout CGP. | Sheet 13  | IN 2022, 3 active lodges were observed. One lodge and very large cache at the top of the preserve and the lodge in the Reset pond is also active. In LCG, a lodge and cache were located but not next to each other. This suggests there could be a 4th overwintering location. |
| | Wildlife: Boreal Toad monitoring | Periodic observation of individuals average about every other year. No evidence of breeding since 1997 | Zero to 1 or 2 adult observations per summer. | Sheet 14  | Boreal toad surveys were done in June, July and August of 2022. Surveys consisted of 1-4 people walking the perimeter of all open water ponds. There were no adults, tadpoles, or egg masses observed. |

# Wetland Health in Cucumber Gulch Preserve



In 2011, we synthesized diverse studies into formal wetland health report cards, structured around the Functional Assessment of Colorado Wetlands (FACWet) framework, to communicate the current condition and trends in key attributes including landscape support, hydrology, chemical environment, geomorphology, vegetation, and wildlife. Stressors (anthropogenetic changes influencing how the system functions) were identified and monitored to understand impacts to wetland health.

Annual monitoring show that a few critical stressors have an outsized potential to impact wetland health and are an important focus in ongoing management efforts for Cucumber Gulch Preserve. Preserving wetland health and biodiversity is largely a matter of managing and mitigating stress. In general, there is opportunity to alleviate impacts from interior stressors as these are within CGP boundaries under Town management.

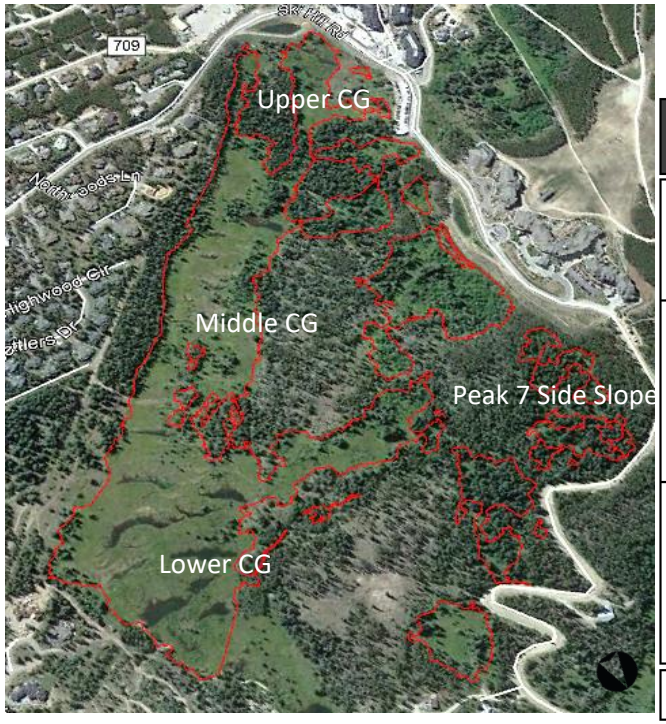
**Interior wetland stressors**

- Artificial drainage and ditches (history of mining activity)
- Sedimentation from the contributing watershed
- Inconsistent and isolated beaver populations
- Channel incision
- Weeds
- Recreational activities

**Exterior Stressors**

- Commercial and residential development (roads, parking, homes, etc)
- Artificial drainage and ditches (Ski Area, Base Areas, and roads)
- Sedimentation from the contributing watershed
- Inconsistent and isolated beaver populations
- Forest clearing and devegetation in the watershed
- Augmented snowpack (snowmaking, compaction)

↑ Interior and exterior critical stressors are the focus of monitoring efforts as they have direct impacts to overall wetland health.




| | FACWet Variables | Upper CG 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Middle CG 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2020 | 2021 | Lower CG 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2020 | 2021 | Peak 7 SS CG 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Buffer/ Landscape | V1-2: Habitat Connectivity | C | | | | | | | | | | | C- | B | | | | | | | | | | | B+ | B | | | | | | | | | | | B | C | | | | | | | | | | | C |
| | V3: Buffer Capacity | D | | | | | | | | | | | D- | B | | | | | | | | | | | B+ | B | | | | | | | | | | | B- | B | | | | | | | | | | | B- |
| Hydrology | V4: Water Source | D | | | | | | | | | | | C | C+ | | | | | | | | | | | B- | C+ | | | | | | | | | | | C+ | B+ | | | | | | | | | | | B+ |
| | V5: Water Distribution | D- | | | | | | | | | | | B- | B- | | | | | | | | | | | B- | B- | | | | | | | | | | | B- | B+ | | | | | | | | | | | B |
| | V6: Water Outflow | D- | | | | | | | | | | | B- | B+ | | | | | | | | | | | B- | B+ | | | | | | | | | | | B+ | B+ | | | | | | | | | | | B |
| Abiotic and Biotic Habitat | V7: Geomorphology | D | | | | | | | | | | | B- | B+ | | | | | | | | | | | B- | B+ | | | | | | | | | | | B+ | B+ | | | | | | | | | | | B+ |
| | V8: Chemical Environment | D | | | | | | | | | | | B- | B+ | | | | | | | | | | | B- | B+ | | | | | | | | | | | B+ | B | | | | | | | | | | | B |
| | V9: Vegetation Structure and Complexity | C | | | | | | | | | | | B- | B+ | | | | | | | | | | | B- | B+ | | | | | | | | | | | B+ | B- | | | | | | | | | | | B |
| | Wetland Health | D | | | | | | | | | | | C+ | B | | | | | | | | | | | B- | B | | | | | | | | | | | B | B | | | | | | | | | | | B |

Overall, wetland health in CGP has maintained or improved over the last 11 years. Exterior stressors primarily impact UCG and this portion of the Preserve acts as a buffer for downgradient wetlands (MCG and LCG). Peak 7 SS is also by exterior stressor related to watershed development but to a lesser degree than UCG. Peak 7 SS is primarily slope and fen wetlands fed by springs and therefore hydrology and habitat variables are relatively stable with few internal stressors acting on the system. UCG, MCG, and LCG also have spring inputs are more strongly influence by beaver activity. Thus, the health of these areas varies relative to the status of beaver presence.


**Stewardship consideration:**

The last 11 years of overall health evaluation provide baseline for comparison to future condition. Action should be considered if health variables decrease with particular focus on hydrology and habitat variables.

# Wetland health - photopoints

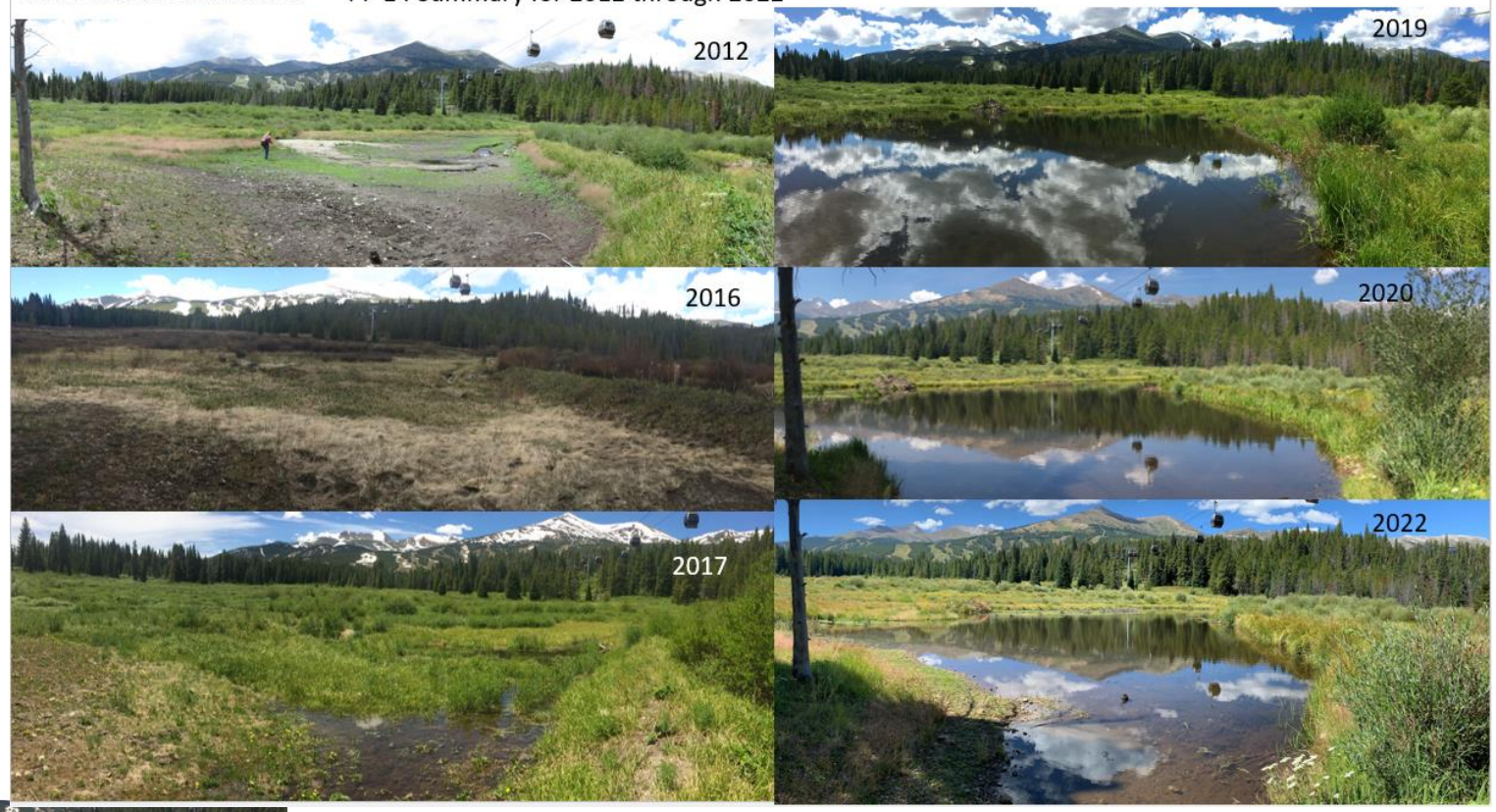


Photopoints are a valuable tool for qualitatively recording and communicating changes to habitat condition and stressors, including factors like vegetation type, extent of pond habitat, beaver activity, and surrounding land use. Time series comparison of annual photos taken at 35 points in CGP (see map below) are available from 2012 through 2022.


Lower Cucumber Gulch Preserve PP 15a

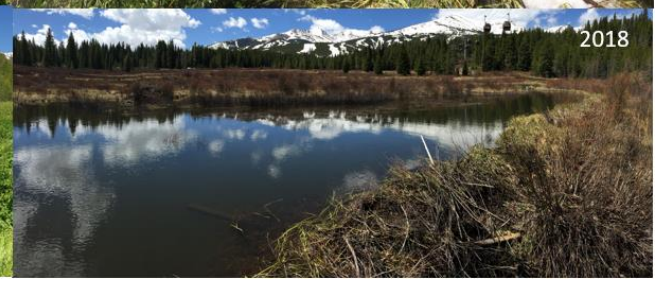
For each photopoint, a timeseries of images allow for quick side by side comparison of conditions each year. One challenge of long-term monitoring is slow moving processes that reflect health condition are hard to observe at any one moment. Photopoints offer objective comparison of condition over time and record of past condition.

Lower Cucumber Gulch Preserve PP 14 Summary for 2012 through 2022

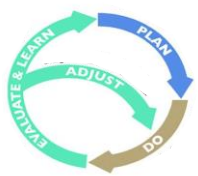









Photopoints 14 (↑) and 15a (←) are images of the pond next to Josie's Cabin in LCG. This has been a dynamic portion of the preserve ranging from a completely dry pond and breached dam in 2012 to one of the largest and most active beaver ponds between 2017 to 2020. In 2021 and 2022, there was little to no evidence of beaver occupation and the area of the pond is decreasing without dam upkeep. The factors influencing patterns of beaver occupancy in any given system are somewhat unknown and documentation of change over time create a record of beaver activity and provide context for realistic expectations.




**Stewardship consideration:**

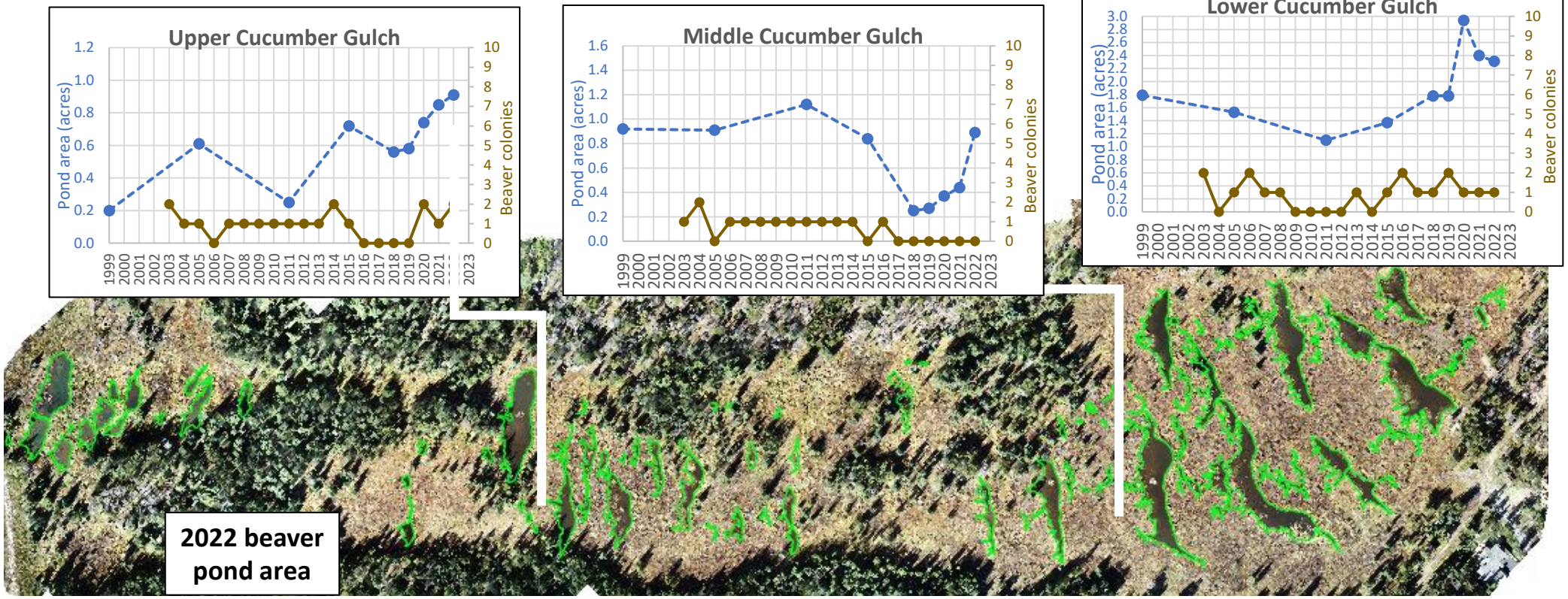
Healthy systems are resilient to changes over time and the pace and nature of change depends on local events. Changes observed in photopoints may indicate health shifts. If changes are documented, actions can be considered to investigate drivers causing declines or improvements.

# Hydrology - Water distribution



Beaver pond area is a good indicator of how much beavers are influencing wetland hydrology, geomorphology, and vegetation. Beavers are notoriously vulnerable to predation on land and therefore build ponds to expand aquatic habitat where they can live in relative safety. Their dams and canals spread and slow water, distributing it across the valley floor to maintain extensive, dynamic wetland systems. We quantify beaver pond area using orthorectified aerial imagery and have been tracking it for the past 23 years (Figure A).

Beaver populations vary spatially and temporally in CGP, and so does the influence beavers have on water distribution. While beaver pond area varied significantly over 23 years in UCG, MCG, and LCG when viewed separately (Figure B), combined pond area for Cucumber Gulch remained relatively consistent with a recent increase over the last 3 years.



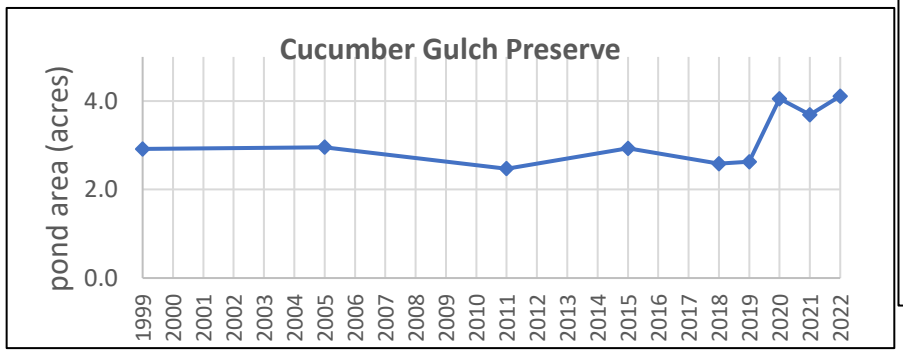




**Figure A:** This graph shows beaver ponds area for the combined area of UCG, MCG, and LCG from 1999-2022. Each of these areas is viewed separately in the graphs and images above. Overall, this data suggests the wetland extent and condition of the preserve is improving with increases in pond area due to beaver activity.

**Figure B:** Water distribution varies on a shifted time scale because the beaver's works (dams, ponds, canals, and plant communities) can persist after they leave an area. Graphs in Figure B chart pond area alongside the number of beaver lodges in each area of the Preserve.

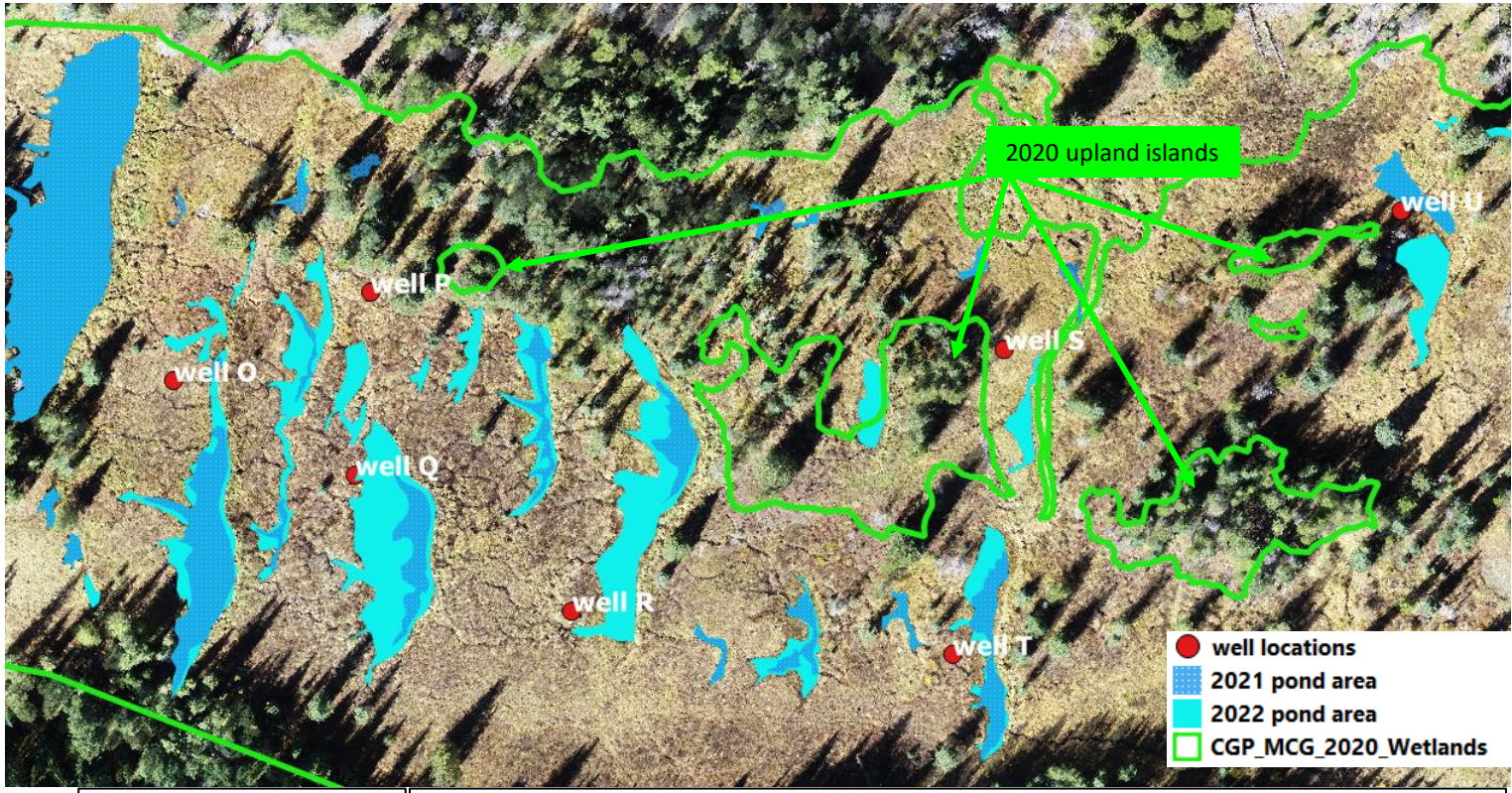
MCG and LCG are broad, low-gradient valleys where beaver ponds persist on the landscape longer than in steeper and narrower systems, like UCG. On UCG, beaver ponds tend to erode quicker after beavers leave. This trend is evident in the more variable pattern of beaver pond area in UCG compared to MCG or LCG. In 2022, UCG and MCG surface areas are increasing due to expanded beaver activity. Dam building was observed to be expanding existing ponds and creating new (or renewed) ponds. There was little evidence of new beaver activity in LCG in 2022 and the lack of activity is reflected as minor decrease in pond area over the last 2 years.


**Stewardship consideration**:
The observed range of total surface water area over the last 23 years is 2.5 to 4 acres in CGP. Surface water extent is a direct measure of wetland extent and indicator of beaver influence on the system. Action should be considered if acreage declines over several years or is less than 3 acres total.

# Hydrology – Middle Cucumber Gulch water distribution



In in 2018, the flow in MCG was consolidated into a single incised flow path along the north side of the valley. The channel was effectively draining the wetland in this area and, as seen on the previous slide, pond area dropped from a high of 1.12 acres in 2011 to a low of 0.25 acres in 2018. This trend was largely due to the absence of beavers in this portion of the preserve and prompted stewardship action to improve the local conditions. In 2019 and 2020, people used hand tools to mimic the influence of beavers on the flow patterns with treatments aimed at slowing and spreading water. This work had the short term benefit of improving the wetland hydrology to some degree and the long term benefit of improving habitat conditions increasing the likelihood that beavers will reoccupy the area. To monitor the response of the system to treatments, changes in the hydrologic condition were tracked with 7 shallow ground water wells spread throughout MCG and with pond area monitoring. Increases in the hydroperiod were observed at 5 of the 7 well locations (detailed data for 2022 is on the next sheet). Wells near ponds with increasing surface area show the strongest response suggesting a high degree of interaction between surface and ground water. Overall, mitigation efforts to improve wetland health in MCG were successful in improving hydrologic condition and enabling beaver reoccupation which is the key to long-term health.




| Site | 2019 Wetland Hydrology criteria met? | 2020 Wetland Hydrology criteria met? | 2021 THD | 2021 CHD | 2021 Wetland hydrology criteria met? | 2022 THD | 2022 CHD | 2022 Wetland hydrology criteria met? |
|---|---|---|---|---|---|---|---|---|
| O | Negative | Positive | 136 | 136 | Positive | 142 | 142 | Positive |
| P | Negative | Positive | 72 | 66 | Positive | 83 | 72 | Positive |
| Q | Negative | Positive | 88 | 80 | Positive | 139 | 139 | Positive |
| R | Negative | Negative | 1 | 0 | Negative | 0 | 0 | Negative |
| S | Negative | Negative | 2 | 0 | Negative | 0 | 0 | Negative |
| T | Negative | Positive | 65 | 34 | Positive | 130 | 125 | Positive |
| U | Negative | Negative | 100 | 36 | Positive | 142 | 142 | Positive |

← This table summaries the hydroperiod at MCG well locations from 2019 to 2022 relative to US Army Corps of Engineers wetland hydrology criteria. Total Hydric Days (THD) is the number of days in the growing season when the water table was 1 foot deep or less. Consecutive hydric days (CHD) is the number of days in a row that the water table was 1 foot deep or less during the growing season.

↑ In this figure, the shaded polygons show the dramatic increase in pond area between 2021 (dark blue) and 2022 (light blue). As beaver reoccupied MCG, their dam building activities refilled existing pond footprints that had been dry since 2015. The 2020 wetland delineation line (green) is included in this figure to contrast the dry condition in portions of MCG that justified delineation of upland islands in the valley floor that are now hydrologically connected to surrounding wetland areas. Well data and aerial imagery show hydrologic condition has improved throughout MCG.

Beaver-mediated systems are naturally dynamic and fundamentally dependent on the robustness of the local beaver population. Relative to historic conditions, CGP is one of few beaver dominated riverscapes persisting on tributaries to the Blue River. Connectivity corridors still exist to dome degree allowing beavers to move down-vallley and through neighboring systems.

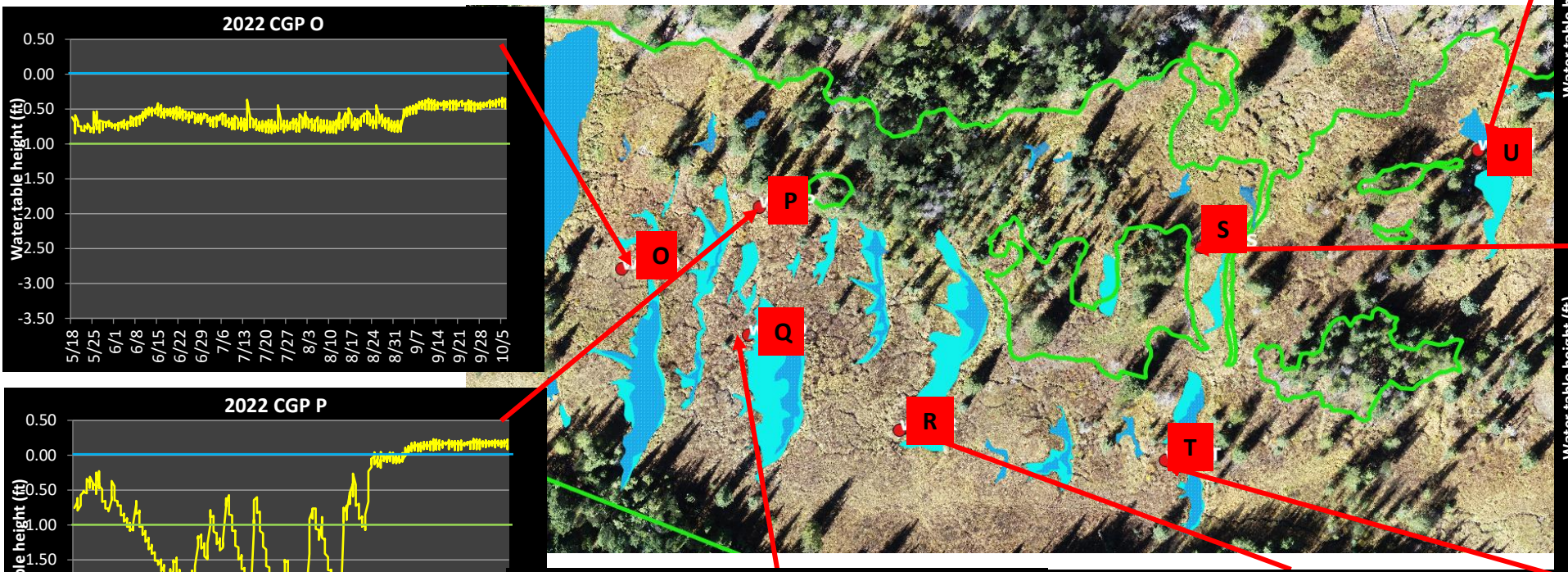

**Stewardship consideration:**

Monitoring since 2019 shows a strong relationship between ground water elevations, surface water pond area, and beaver activity. Decreasing trends may warrant investigation into possible causes.

# Hydrology – Middle Cucumber Gulch water distribution

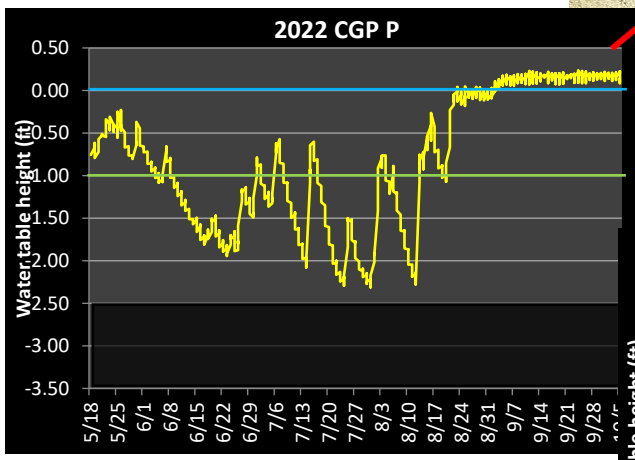


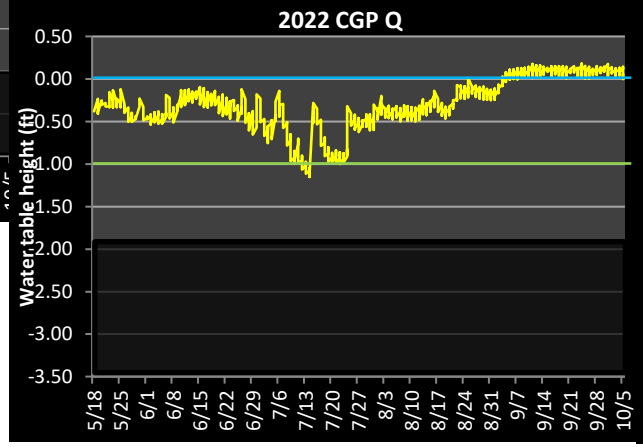
Ground water wells with sensors track the water elevation through the growing period in MCG. At the outset of the mimicry work, none of these wells showed wetland hydrology condition (water within 12 inches of the ground elevation). In 2021 and 2022, all but 2 wells show wetland hydrology. With the return of beavers in 2022, there are now 4 wells showing water above the ground level ( Well P, Q, T and U) for some period. With the exception of Well U, all locations show an increase in water level in late August to early September. This is commonly the period of increased activity for beavers as they build dams and prepare for winter.

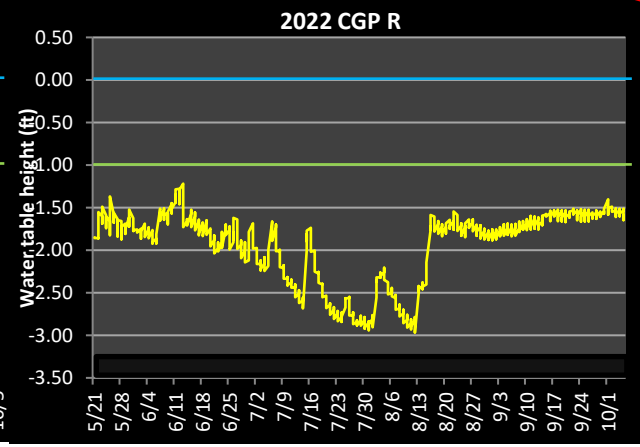


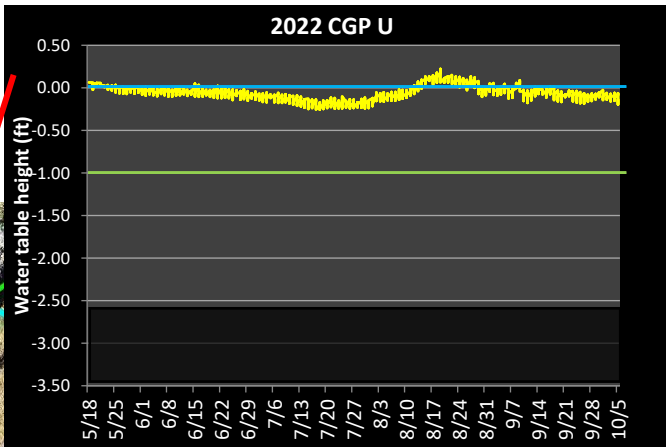


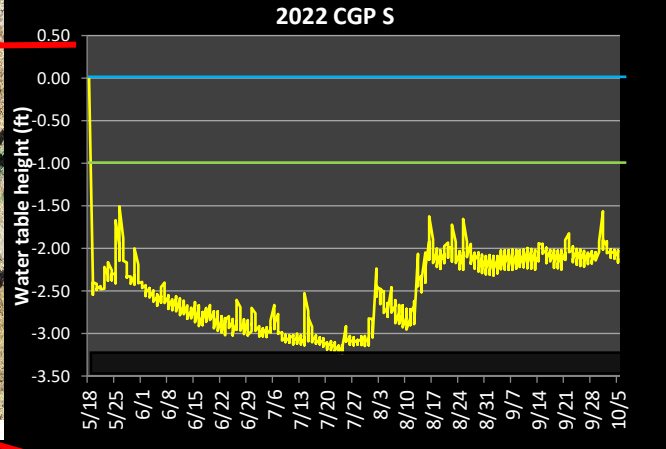


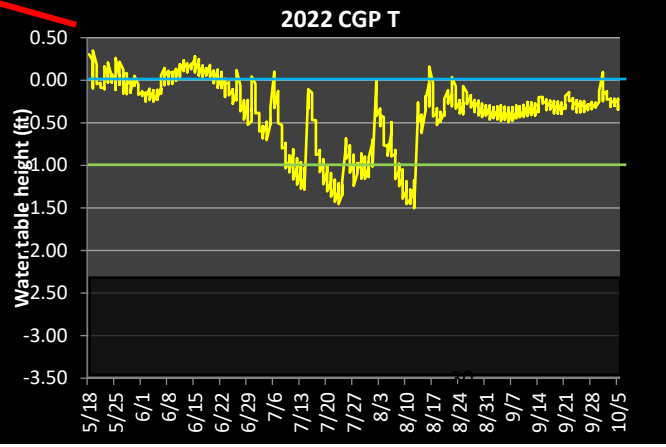


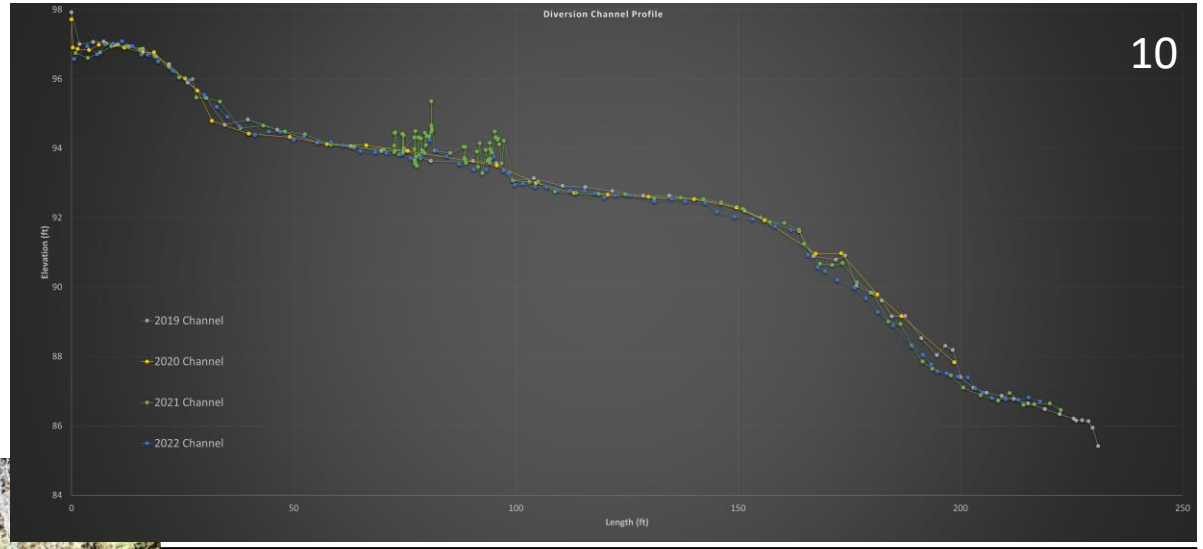



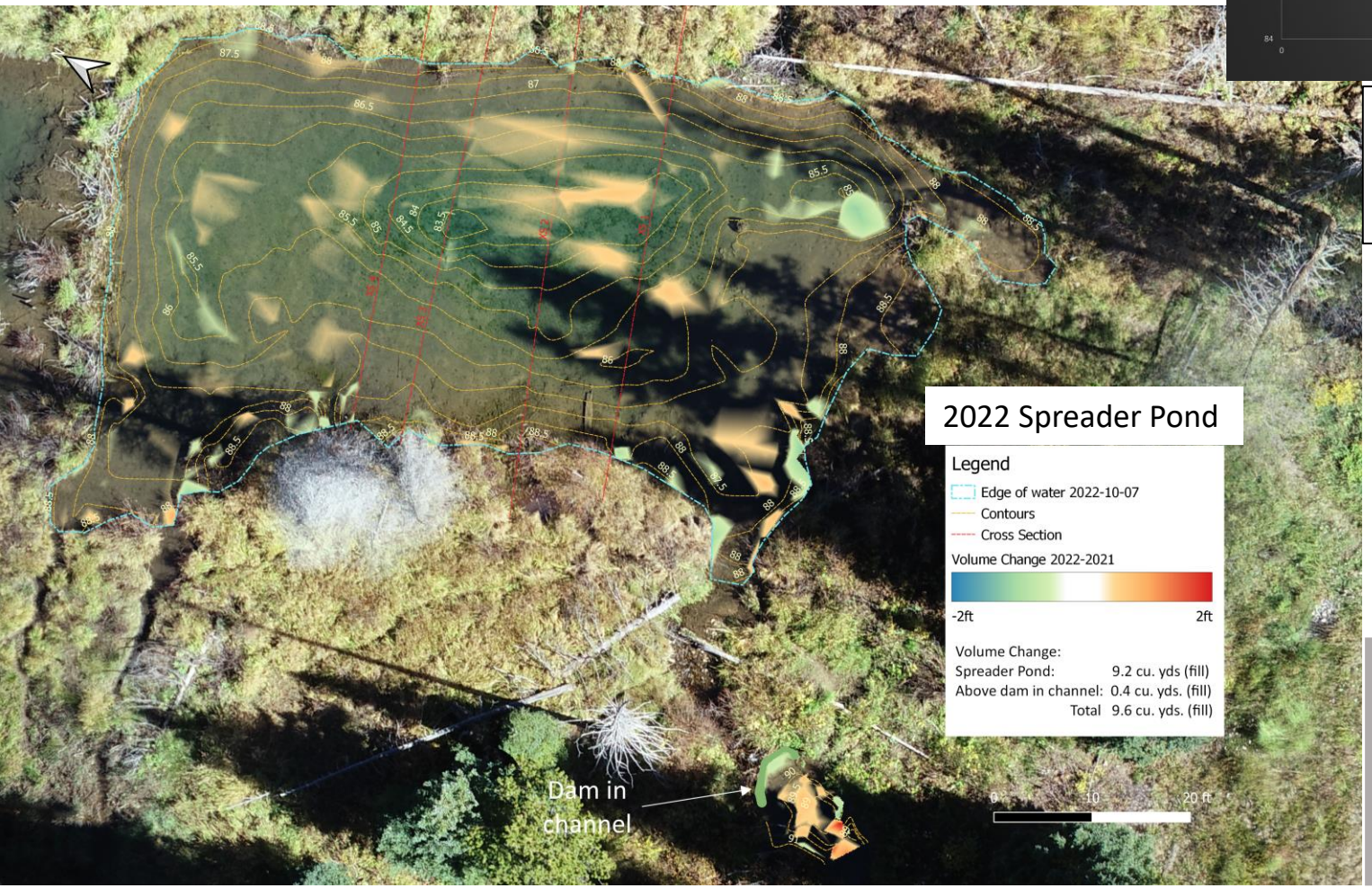
# Abiotic Habitat - geomorphology



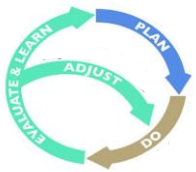
Sediment inputs from the watershed are mostly being mitigated within CGP by using the uppermost beaver pond in UCG (the Spreader Pond) as a retention basin. Sediment that accumulates in the pond can be removed and hauled away. If the ponds in UCG are not constantly maintained they can become uninhabitable by beavers and dam failure becomes inevitable. Annual bathymetric surveys of the Spreader Pond are made to monitor the volume of sediment retained and removed. Surveys from 2013 to 2017 indicated an average accumulation of about 20 cubic yards of sediment per year. The last sediment removal was in 2019 when 10 cubic yards were removed. 2020 survey did not show accumulation and 2021 survey showed a net loss of 3.8 cubic yards of material believed to be due to beaver digging the pond floor deeper.




↑ Beavers built 2 dams along the diversion channel in 2021 which are visible in the channel profile as the clusters of green points. The structures changed the flow and deposition pattern, but the diversion channel is still effective at providing a secondary water source to the North Spreader Pond.




The 2022 survey shows a net increase of 9.6 cu yards of material. Most of this material settled in the spreader pond with 0.4 cu yards accumulating above the dam in the channel. Beavers constructed dams in the diversion channel (profile above) and in the channel upstream of the Spreader Pond. Material accumulated upstream of all these structures. The Spreader Pond was designed to allow machine access to the southeast side of the pond which is the area where sediment accumulation is often greatest. As the 2022 Spreader Pond map shows, a substantial amount of material settled in the center of the pond which is inaccessible for machine removal. Therefore, material removal was not recommended this year but should be considered in 2023 depending on the quantity and pattern of deposition.

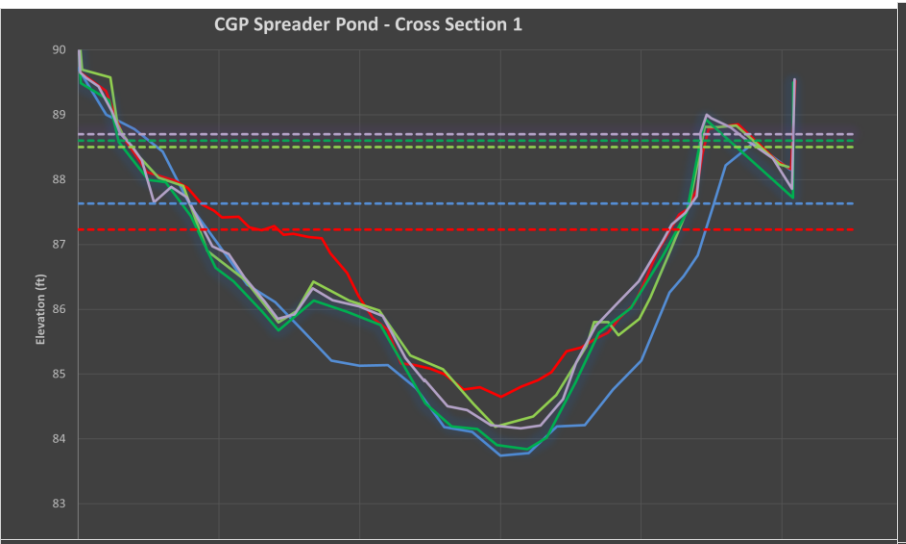


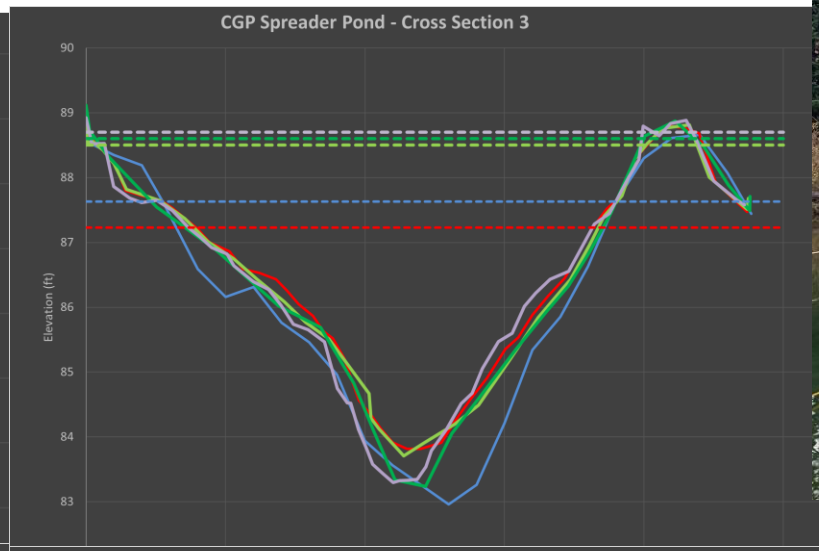

**Stewardship consideration**:
The observed range of allochthonous input to the Spreader Pond in Upper CG is between 0 and 20 cu yds/year. As material accumulates, beaver habitat decreases and potential for dam failure increases. Action should be considered when annual accumulation exceeds 10 cu yards.

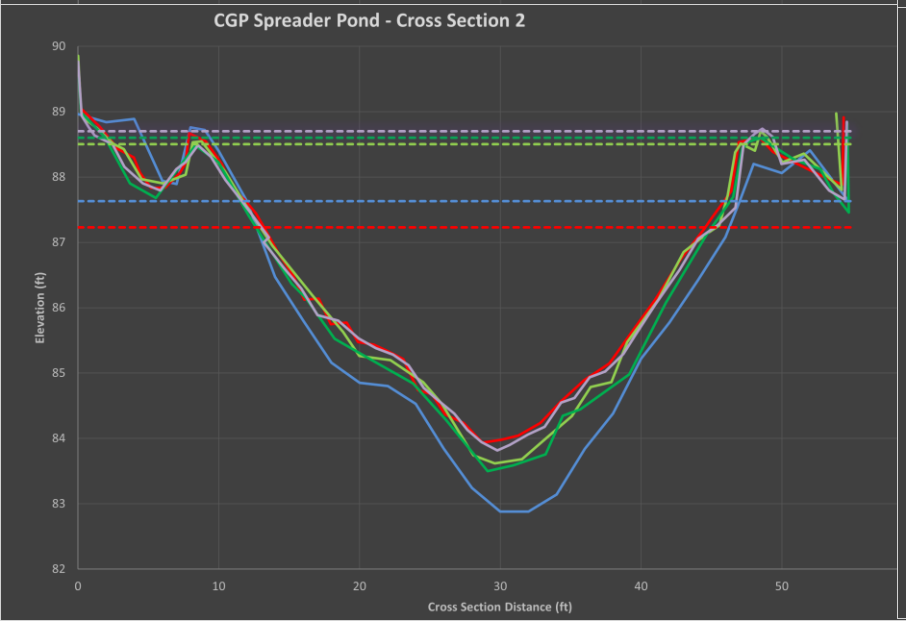
# Abiotic Habitat - geomorphology

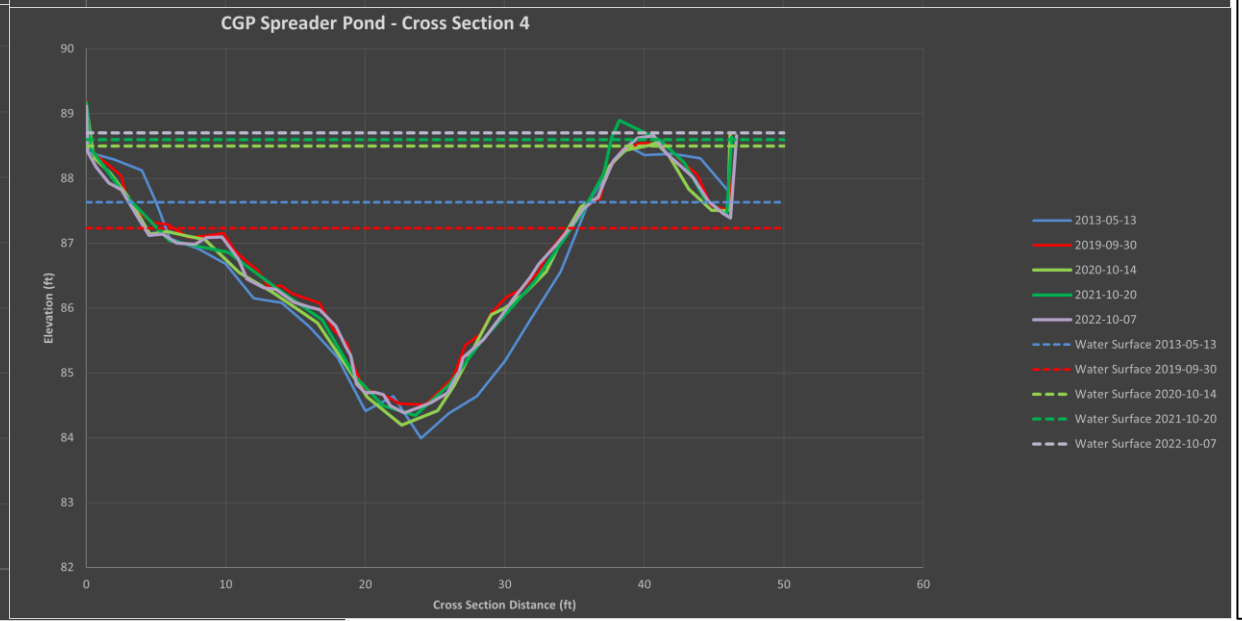


In addition to the bathometric survey, four cross-sections spanning the Spreader Pond allow for detailed surveys repeated annually tracking changes in the water elevation, pond bed topography, and dam height. Survey results from 2013 to 2022 are shown in these graphs. At all cross sections, the pond was deepest immediately after the ponds were mechanically built (blue line in 2013). Cross section 1 is nearest to the inlet and shows the most variable bed elevations as incoming sediment accumulated and was then removed with machines.




↑ Due to pond depth, it is necessary to use a boat to traverse the pond. When present, beavers raise the water level by building up the dam crest.

←Cross sections overlaid year to year to observed changes in the pond bottom. 2021 is green and 2022 is purple. Cross sections 3 and 4 did not change significantly, however cross sections 1 and 2 had accumulation of up to 0.5 ft in the deepest areas of the pond.

# Biotic Habitat - Beaver and Muskrat Survey

Beaver are a keystone species in Cucumber Gulch Preserve. By constantly working to create dams, ponds, channels, lodges, and food caches, they are the ecosystem engineers that maintain dynamic and diverse wetland habitat upon which many other species in the Preserve depend. Beaver are especially critical to the proper functioning of tall willow and low beaver mire wetland habitat. Systematic beaver population monitoring has been ongoing since 2003.

In 2022, we continued biweekly seasonal beaver population surveys in locations where beavers were known to be active, and multiple observers simultaneously watch all neighboring ponds. By comparing the location and time of observations, it is possible to determine the minimum number of individual beavers present in the surveyed areas. Beavers were observed in all surveyed months from May through September, with a minimum estimate of 6 individual beavers observed on August 18th from the UCG and International observation points. This is a conservative estimate of the number of beavers present in CGP.

←Beaver surveys often give observers the opportunity to watch beaver behavior in CGP. This video is of a beaver in UCG eating Reed canary grass which is an invasive species that is beginning to dominate the vegetation community in UCG. Beaver behavior is known to vary with location and this is an example of an individual making use of local resources.

→ Total beaver and muskrat sightings by month. Periods of highest activity are in the late summer and fall. This pattern coincides with preparations for upcoming winter. Sightings in May are valuable as they can inform survival over the winter months and indicate locations of future activity through the summer. Muskrat commonly cohabitate with beavers and their presence is not an indicator or deterrent of beaver presence.

| | loation | number of beaver sightings | | | | | | location | number of muskrat sightings | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | May | June | July | August | September | Total | | May | June | July | August | September | Total |
| Josies pond observation point | Josies pond | 0 | 0 | 0 | 0 | 0 | 0 | Josies pond | 0 | 0 | 0 | 3 | 2 | 5 |
| International observation point | lower international | 0 | 6 | 1 | 1 | 0 | 8 | lower international | 0 | 0 | 0 | 4 | 5 | 9 |
| | upper international | 0 | 0 | 0 | 0 | 0 | 0 | upper international | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cresent pond | 2 | 2 | 1 | 6 | 1 | 12 | Cresent pond | 5 | 2 | 0 | 0 | 0 | 7 |
| | Upper west side | 0 | 0 | 0 | 0 | 0 | 0 | Upper west side | 0 | 0 | 0 | 0 | 0 | 0 |
| | Middle west side | 0 | 0 | 0 | 0 | 0 | 0 | Middle west side | 0 | 0 | 0 | 0 | 0 | 0 |
| | Lower west side | 0 | 0 | 0 | 0 | 0 | 0 | Lower west side | 0 | 0 | 0 | 1 | 0 | 1 |
| | Tower 18 | 0 | 0 | 0 | 0 | 0 | 0 | Tower 18 | 0 | 0 | 0 | 0 | 0 | 0 |
| Beaver sign observation point | Reset | 3 | 0 | 0 | 0 | 0 | 3 | Reset | 2 | 4 | 0 | 0 | 0 | 6 |
| UCG observation point | N Spreader | 3 | 0 | 6 | 6 | 9 | 24 | N Spreader | 0 | 1 | 0 | 2 | 0 | 3 |
| | Spreader | 0 | 2 | 6 | 3 | 0 | 11 | Spreader | 0 | 0 | 0 | 0 | 1 | 1 |
| | Stump pond | 9 | 23 | 12 | 6 | 19 | 69 | Stump pond | 0 | 0 | 1 | 4 | 5 | 10 |
| | Well H | 0 | 5 | 2 | 2 | 0 | 9 | Well H | 0 | 0 | 0 | 0 | 0 | 0 |
| | Well G | 0 | 1 | 0 | 2 | 1 | 4 | Well G | 0 | 0 | 0 | 0 | 0 | 0 |
| | Well N | 0 | 1 | 2 | 3 | 0 | 6 | Well N | 2 | 0 | 0 | 2 | 0 | 4 |
| | Well I (Mini stump) | 0 | 1 | 1 | 11 | 14 | 27 | Well I (Mini stump) | 0 | 0 | 0 | 0 | 0 | 0 |
| | Well M | 0 | 0 | 0 | 0 | 3 | 3 | Well M | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total by month | 17 | 41 | 31 | 40 | 47 | 176 | Total by month | 9 | 7 | 1 | 16 | 13 | 46 |

Throughout the summer, most beaver activity was observed in Upper CG. At least 3 beavers inhabit UCG and beavers of differing size were observed suggesting successful reproduction. A lactating beaver was also capture on trail camera footage further supporting the presence of kits. For the first time in several years, beavers were observed in the Reset pond although this observation location was problematic and not used often. No beavers were observed at Josie's pond which has been a consistently active area since 2014.


**Stewardship consideration:**

Beavers are commonly observed in 2 or more locations from May through September with increasing activity in Fall. Action should be considered if beavers are absent during evening surveys through the observation period.

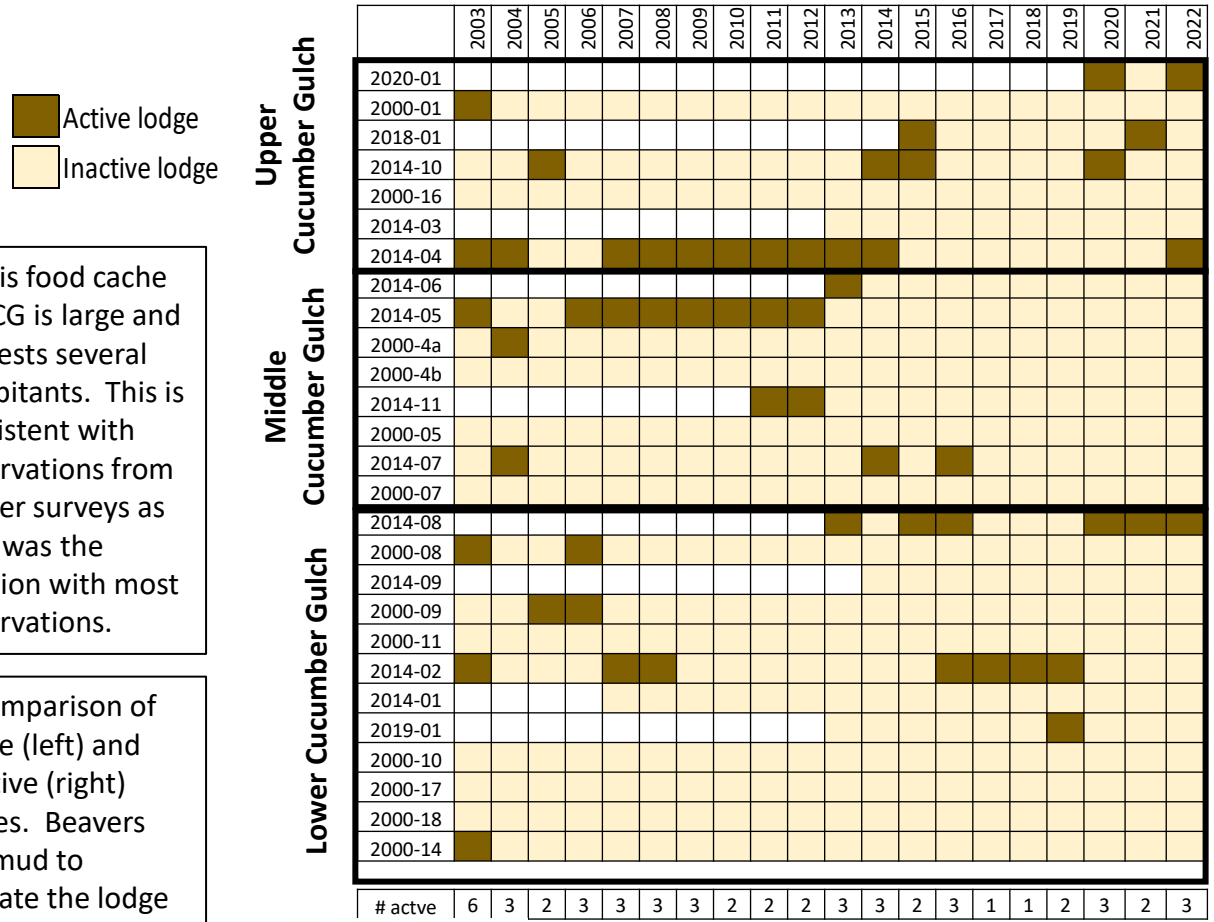
# Biotic Habitat - Beaver Lodge Survey

Monitoring the number of actively occupied lodges is a reliable way to track the number of beaver colonies residing in CGP from year to year. Beavers do not hibernate but instead overwinter in lodges, making them relatively easy to find and count. Active lodges are identified by fresh mudding on the lodge and adjacent dams, and by the presence of a food cache in fall and winter. Lodges are associated with deep ponds where there is sufficient depth to maintain portions of open water. Each occupied lodge indicates one family group, a colony, usually consisting of 2-6 individuals.

In 2022 three occupied lodges were observed in fall suggesting there are 6-18 beavers residing in CGP. The location of each active lodge is tracked over time to try to better understand if there is a pattern of occupancy across both space and time. The chart below shows all active lodges since 2003. With few exceptions, lodges are commonly occupied for 1 or 2 years, occasionally 3 or 4 years. There is no strong pattern.

←This food cache in UCG is large and suggests several inhabitants. This is consistent with observations from beaver surveys as UCG was the location with most observations.

←Comparison of active (left) and inactive (right) lodges. Beavers use mud to insulate the lodge against cold in the winter. Freshly mudded surfaces are clear indication of inhabited lodges.





## Stewardship action consideration:

The observed range of active beaver lodges over the last 10 years is 1-3 lodges throughout CGP. Since beavers are integral to wetland health and extent, action should be considered when the lodge count is less than 2.

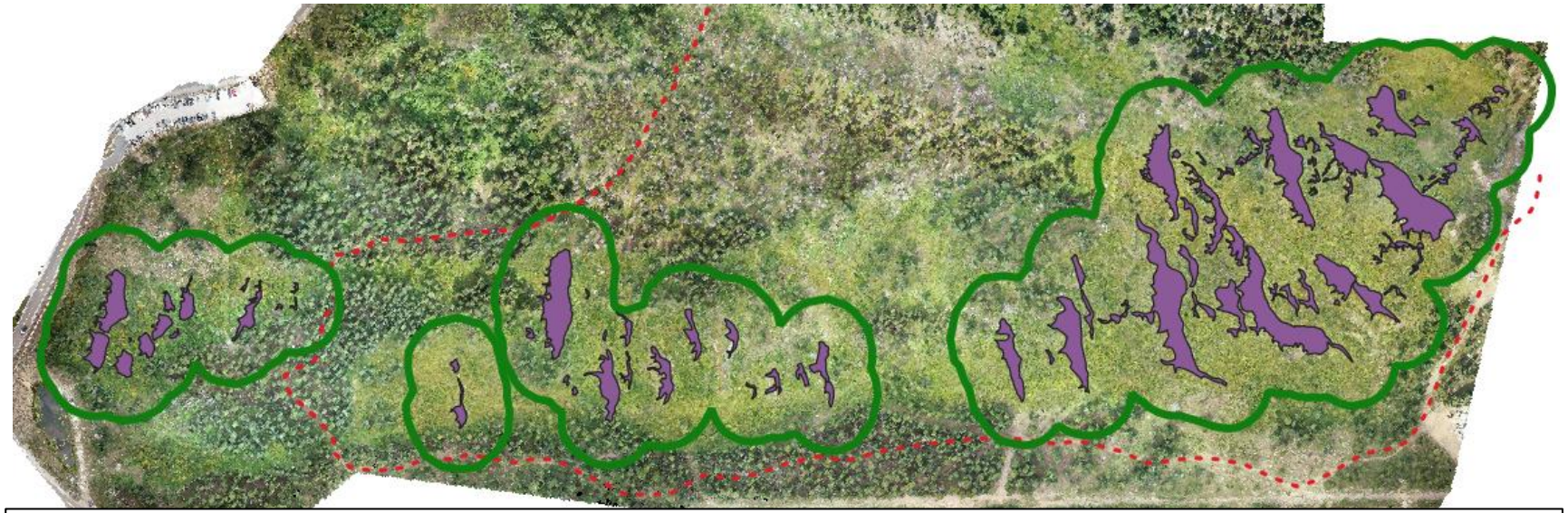
# Biotic Habitat Wildlife– Boreal Toad Survey



Boreal toads, an endangered species in Colorado, were historically abundant and breeding in CGP. Since monitoring started, toads have been observed in 1995, 1996, 1997, 1998, 2005, 2014, 2016, and 2019. Toads, or sign of toad breeding, have not been observed in 2020-2022 surveys.

2021 research into threats to toad population revealed the Town's protection and management of CGP have minimized the impact of many of the potential threats to toads. The primary remaining threats are water management (through alteration of stream areas with the decline of beaver influenced area) and recreation (through direct physical impact of habitat, fragmentation of habitat, and possible pathogen transport). Hydrologic monitoring in 2022 showed improving conditions with expanding pond area due to consistent beaver activity. Threats related to recreation might be an influencing factor to toad population decline but a direct connection is not apparent.

Conclusive reasons for the decline of Boreal toads in CGP are not clear. Amphibian populations are in sharp decline on a global level, so we know CGP is not an anomaly, but this does not get us closer to a specific reason for this local trend. In the absence of an identifiable cause of impairment that can be mitigated, surveys will continue to look for evidence of presence and breeding. Additionally, we will continue to reach out to conservation partners with expertise in Boreal Toad biology. The conservation department of the Denver Zoo is a promising new partner. Plans are set to have personnel from the Denver Zoo evaluate CGP for habitat suitability and as a possibly reintroduction site for their captive breeding program. The Zoo also has a citizen science program to assist with the June Boreal Toad survey.

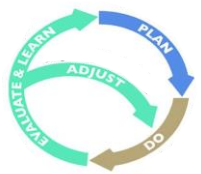


↑This figure is pond area (purple polygons) with a 100ft buffer (green polygons). Ponds are the potential, and past, breeding habitat for Boreal toads and male toads are commonly found within 100ft to 300 ft of breeding habitat. Toads breed in early summer in areas with enough permanent water to support the egg masses and tadpoles until they metamorphose into juvenile toads able to transition to terrestrial habitat. Beaver ponds of upper, middle and lower CG offer ideal habitat while the Peak 7 SS wetlands (not shown here) offer smaller pockets of ponded water. All aquatic habitat with sufficient ponding, slow moving waters are observed during the monthly Boreal Toad surveys.

## 2022 Boreal Toad Survey Log

| Date | Area | Weather | Observers | Notes | Adult Male | Adult Female | Egg Masses | Successful Metamorphosis |
|---|---|---|---|---|---|---|---|---|
| 2022-06-28 | MCG and LCG | partly cloudy, 65°, calm | Jess, Maddie, Zara, Ella | Ran out of time to survey P7SS area | -- | -- | -- | -- |
| 2022-06-29 | Peak 7 Side Slope springs, UCG | clear, 65°, calm | Maddie, Ella, Jess | Completed effort from previous day | -- | -- | -- | -- |
| 2022-07-28 | all areas | overcast to clear, 65°, calm | Maddie, Ella, Jess | Overcast skies make for challenging visibility | -- | -- | -- | -- |
| 2022-08-26 | all areas | partly cloudy, 54°, calm | Maddie, Ella, Jess | Frequent sign of beaver activity (fresh mudding, pealed sticks, scat) | -- | -- | -- | -- |

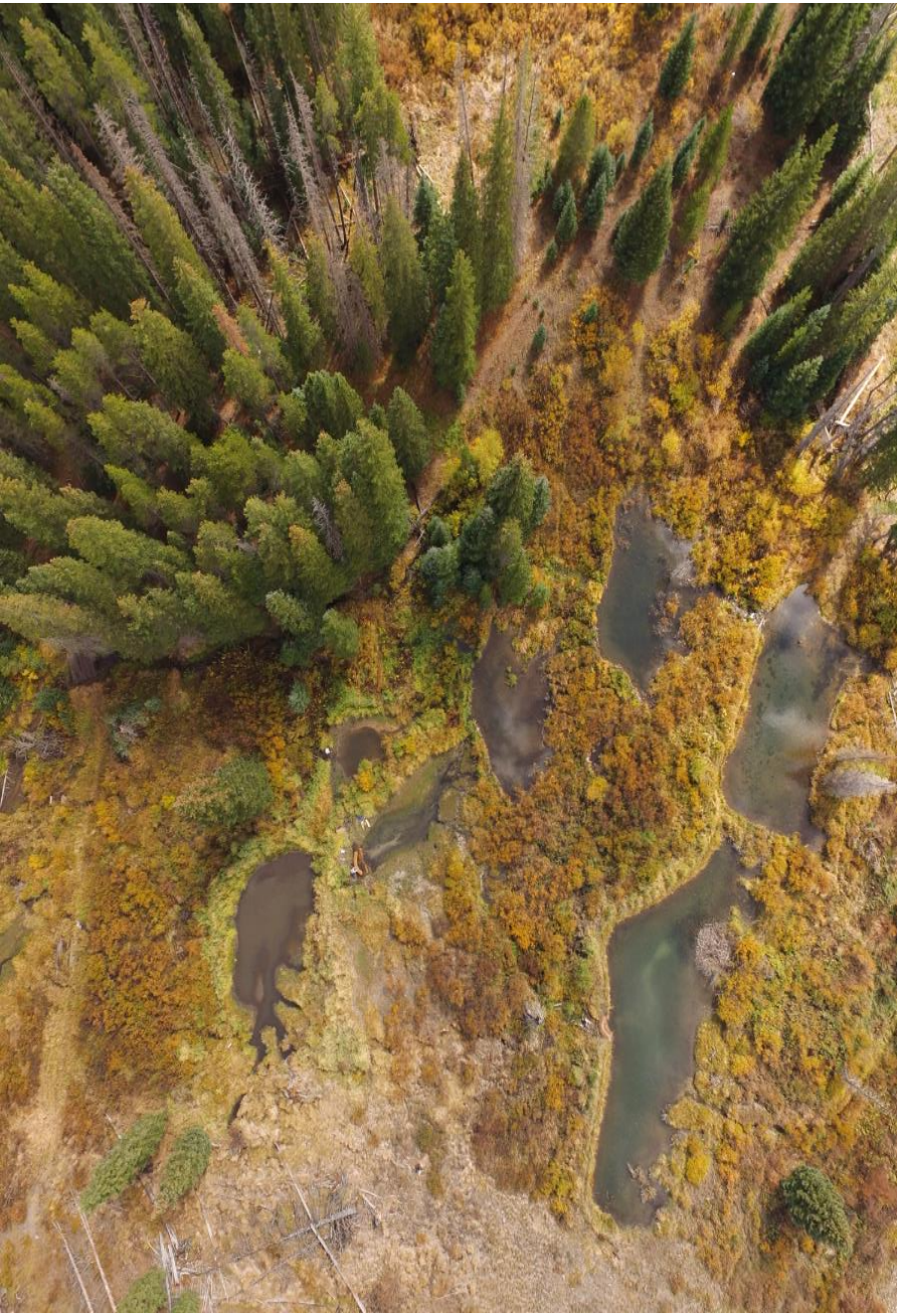
↑ In 2022, toad surveys were performed in June, July, and August by visually searching all ponded and slow-moving water in the Preserve for eggs, tadpoles, or toads. No adult toads, eggs or tadpoles were observed.




**Stewardship consideration:**

The last evidence of reproduction was observed in 1999. It is unlikely there is a reproducing population of toads that was not seen in the last 23 years of surveys. While individual toads may remain, without successful reproduction the future of toads in CGP is questionable. If no evidence of reproduction is found, consider actions to reestablish a robust population.

# Resources




**Beardsley and Johnson. 2011.** *A Comprehensive Assessment of Wetland Condition in Cucumber Gulch Preserve, Breckenridge, Colorado.* Submitted to Town of Breckenridge. October 31, 2011.

**Beardsley and Johnson. 2012.** *2012 Wetlands Monitoring in Upper Cucumber Gulch Preserve*
*Breckenridge, CO: A report of baseline conditions and initial indications of success for wetlands restoration.* Submitted to Town of Breckenridge. December 26, 2012.

**Beardsley and Johnson. 2013.** *2013 Wetlands Monitoring in Upper Cucumber Gulch Preserve*
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**Beardsley and Johnson. 2014.** *2014 Wetlands Monitoring in Upper Cucumber Gulch Preserve*
*Breckenridge, CO: Restoration performance monitoring.* Submitted to Town of Breckenridge. February 10, 2014.

**Beardsley and Johnson. 2015.** *2015 Wetlands Monitoring in Upper Cucumber Gulch Preserve*
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**Beardsley. 2017.** *Sediment Traps on Boreas Creek.* Submitted to Town of Breckenridge. September 9, 2017. (ATTACHED).

**Carello, Christy, 2008-2021** *Cucumber Gulch Annual Monitoring Report*. Submitted to Town of Breckenridge annually.

**Claffey Ecological Consulting, Inc. 2013.** *Cucumber Gulch Boreas Creek Restoration.* Submitted to Lesley McWhirter, US Army Corps of Engineers . August 12, 2013

**Claffey Ecological Consulting, Inc. 2012a.** *UPPER CUCUMBER GULCH, Breckenridge, Colorado, RESTORATION PLAN.* Submitted to Town of Breckenridge, Open Space and Vail Summit Resorts. July, 2012.

**Claffey Ecological Consulting, Inc.. 2012b**. *REQUEST FOR VERIFICATION OF NATIONWIDE GENERAL PERMIT AUTHORIZATION. CUCUMBER GULCH RESTORATION PROJECT. PHASE 1, STAGE 2 & PHASE 2.* Submitted to Army Corps of Engineers Sacramento District, on behalf of the Town of Breckenridge Open Space and Trails Department, Scott Reid. July 25, 2012.

**Cluer and Thorne. 2014.** *A Stream Evolution Model Integrating Habitat And Ecosystem Benefits.* River Research and Applications. Volume 30, Issue 2.

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# Avian Monitoring Report 2022 - Cucumber Gulch

*Breckenridge, Colorado*

***Prepared for the Town of Breckenridge, Colorado***

by
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Submitted 28 Dec 2022

Red Crossbill (**Loxia curvirostra**)

## Introduction to Avian Monitoring in Cucumber Gulch

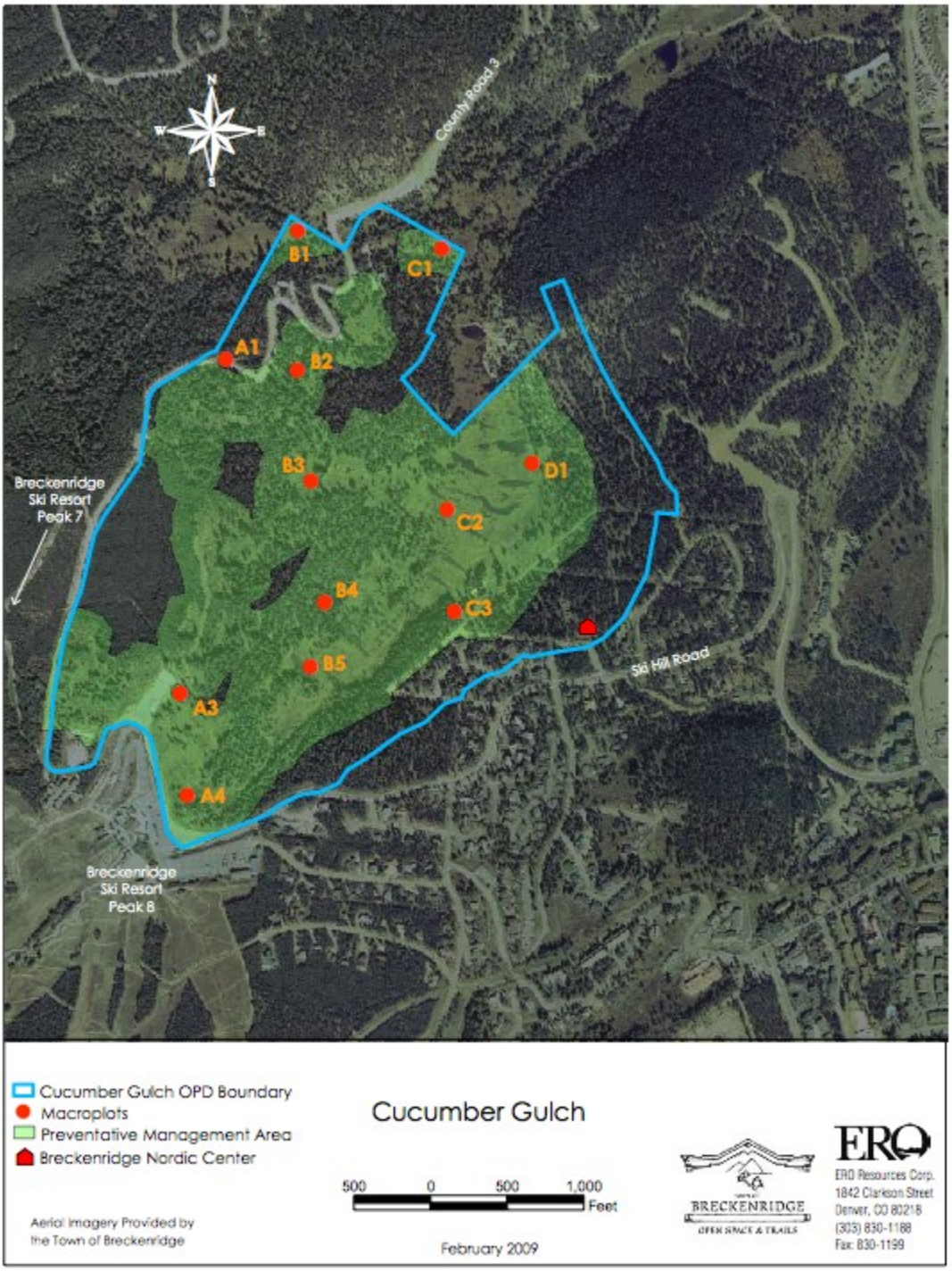
Breckenridge Colorado has experienced rapid development on previously undeveloped land and redevelopment near Cucumber Gulch, an Aquatic Resource of National Importance (ARNI). ARNI's are designated based on the aquatic resource's importance to the economy, the contribution to the Nations water and its rarity or uniqueness. Cucumber Gulch meets all three criteria as it is an area for recreation that contributes to the economy, it is connected to the greater watershed and it contains fens, which are rare. The biodiversity found in Cucumber Gulch is higher than what is found in surrounding areas, and several species that warrant protection because of declining numbers or specific habitat requirements have been documented in the area. Besides the shrub dominated wetlands, Cucumber Gulch has mixed conifer habitat that is also important for many subalpine species. In addition, many species of birds depend on the ability to move between the two habitats.

Avian populations are important for monitoring the quality of the habitats within Cucumber Gulch. Bird populations are particularly sensitive to habitat disturbances and act as indicators of overall habitat quality. Birds select habitats based on the type of terrain (presence of lakes, ponds, streams and wetlands), vegetative features (grasslands, types and extent of forests, shrubby areas) and structural configuration of vegetation (density of leaves at various levels above the ground or patchiness) (Smith and Smith 2001). Thus, it is necessary to maintain and protect those aspects of the landscape that are important to birds.

## Methods for Avian Monitoring in Cucumber Gulch

Avian monitoring surveys were conducted monthly from May to August, with two surveys in June, from 2012-2022. Previously (2003-2011) surveys were also conducted in December, February and April. Surveys consisted of 13 randomly chosen observation points (Map 1) on North/South transect lines that are a minimum of 200 meters apart from each other (A1, A3, A4, B1, B2, B3, B5, C1, C2, C3, D1, SW4, and GW1). Sampling sites A1, B2, C3 are located in mixed conifer habitat. A3, A4 and GW1 are located in mixed conifer/shrubland habitat. The final 7 sites are located in the shrubland habitat. Site A2 on the map was in lodgepole pine habitat and was eliminated in April of 2006 because of the Peak 7 development. A point-count method of survey was used in which all species were identified by both audio and visual cues for a total of 5 minutes within 50 meters from the center of a circular plot. At least 3 minutes were allowed to elapse prior to each sampling episode to minimize disturbance caused by accessing the site. The Simpson's Index was used to calculate both species diversity and evenness.

Single factor Analysis of Variance statistics and/or two sample t-test statistics were used to determine statistically significant differences between means on the data from the two June surveys from 2004-2022 (data prior to 2004 was collected by different personnel at SAIC and show different trends). Data from 2001-2006 is presented on graphs in previous reports and is not included on graphs in this report due to space limitations. A standard probability value of 0.05 was used to determine significance, meaning that there is less than a 5% chance that the statistical differences reported are a result of error or chance.




**Map 1. Cucumber Gulch Map illustrating locations of avian point counts**

**Results for Avian Monitoring 2022**

Comparing habitat types across metrics in Cucumber Gulch in 2022, significantly fewer birds were seen in the mixed conifer habitat type when compared to the shrubland/mixed conifer ecotone (t=2.85, p=0.047). No other significant differences were found across habitat types. (Table 1; Abundance: F=0.825 p=0.37; Richness: F=0.147, p=0.70; Diversity: F=0.153, p=0.70; Evenness: F=0.126, p=0.73).

Table 1. Overall comparison of means (+/-standard error) between different habitat types for 2022.

| | **Abundance** | **Richness** | **Diversity** | **Evenness** |
|---|---|---|---|---|
| Mixed Conifer | 9.0 (1.53) | 7.3 (2.03) | 4.9 (0.42) | 0.9 (0.06) |
| Shrubland | 18.9 (4.50) | 9.3 (0.97) | 4.6 (0.63) | 0.7 (0.12) |
| Shrub/Mixed Conifer | 26.3 (5.90) | 11.7 (0.88) | 5.9 (0.87) | 0.8 (0.10) |

Comparison of Avian Abundance by Year

In 2022 there were no significant differences in the number of songbirds found in the shrubland habitat or the ecotone (mixed conifer and shrub habitat) when compared to 2021 (Respectively: Fig 1: t=0.45, p=0.66; t=0.45, p=0.58). The apparent increase and the large standard error bars seen in the shrub/mixed conifer habitat in 2021 is a result of a large number of Violet-green Swallows observed during one of the sampling episodes; the lesser number reported in 2022 is more in line with previous years. While a decrease was reported in the number of individual birds in the mixed conifer habitat in 2022 when compared to 2021 (Fig 1: t=0.35, p=1.05), this difference is not statistically significant and is at least partially related to a drop in the number of Violet-green Swallows observed. Overall, abundance values for 2021 are consistent with previous years.

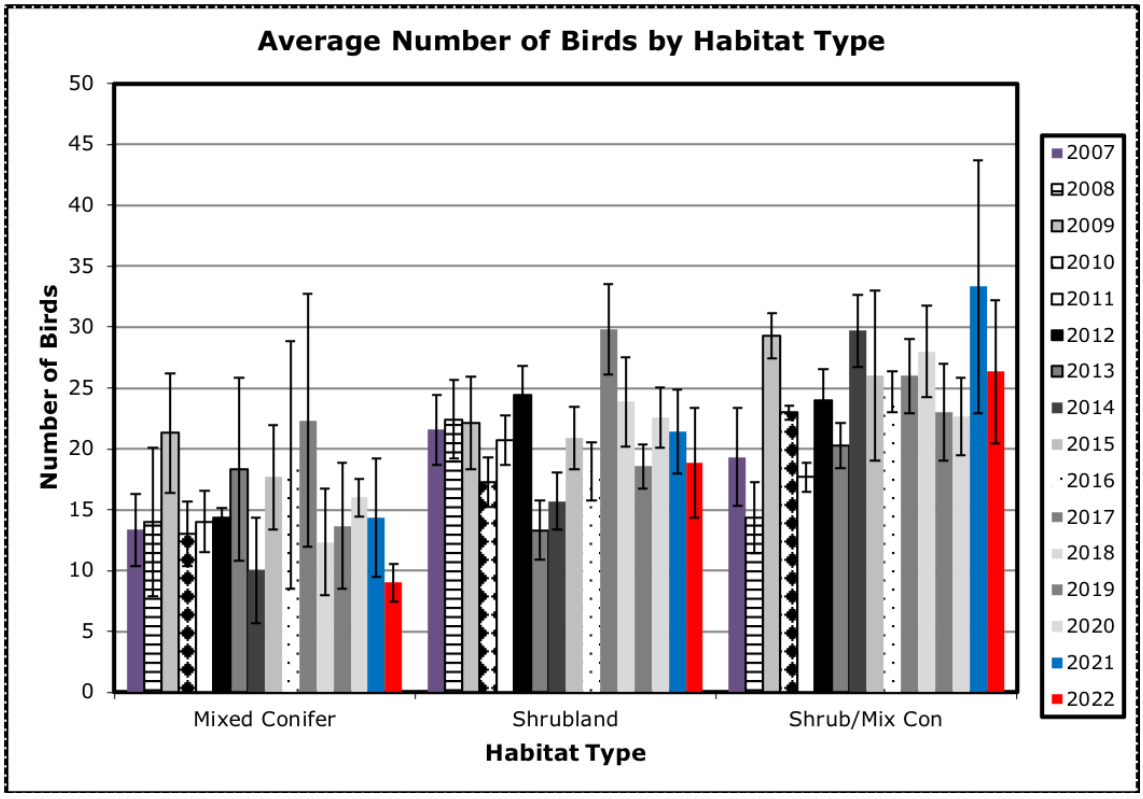



Figure 1. Comparison of the average number of birds seen or heard during two avian point counts in

June 2007-2022 in Cucumber Gulch, Breckenridge, Colorado.

Comparison of Avian Species Richness by Year

Avian species richness (the average number of different species observed) did not differ significantly in any of the habitat types in 2022 when compared to 2021 (Fig 2: mixed conifer: t=0.12, p=0.91; shrubland: t=0.12, p=0.91; ecotone: t=0.49, p=0.35).

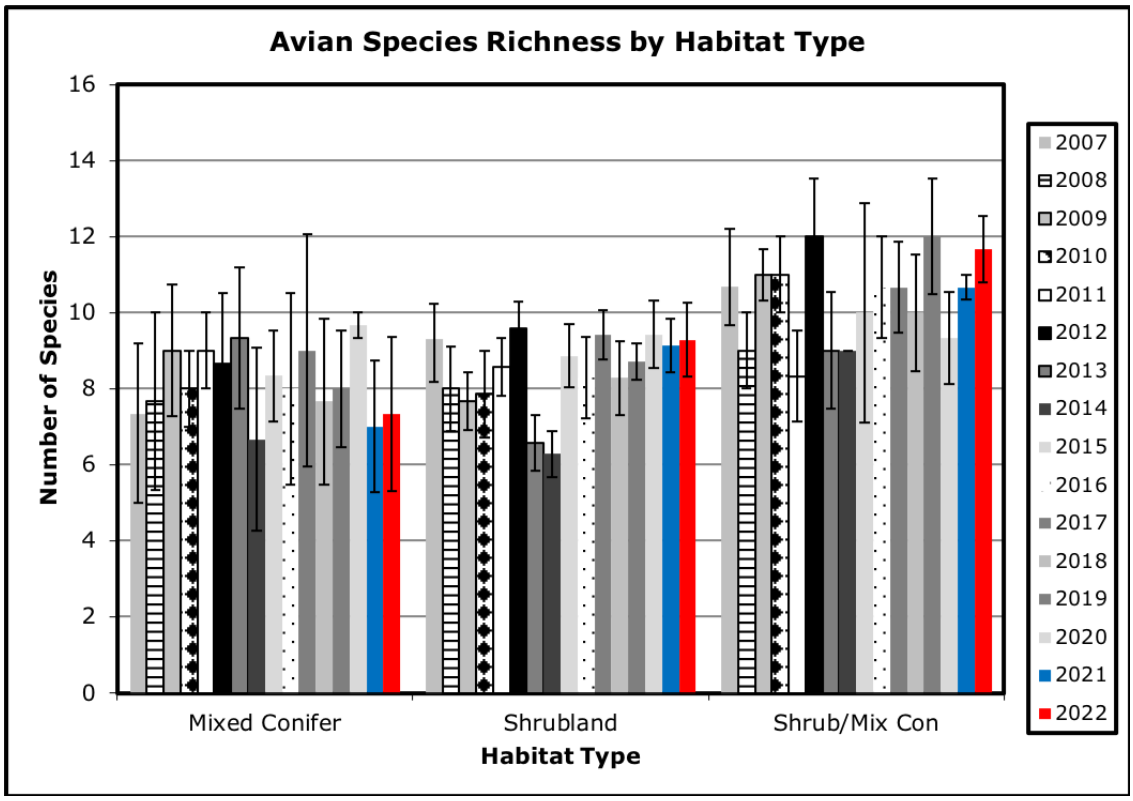



Figure 2. Comparison of the average avian species richness from two avian point counts in June 2007-2022 in Cucumber Gulch, Breckenridge, Colorado.

Comparison of Avian Diversity by Year

Diversity is a measure that considers the number of species and the relative abundance of each species. The Simpson's diversity index was used to account for changes in avian biodiversity of birds. Avian diversity in all habitat types was not statistically different from 2021 (Fig 3: mixed conifer: t=0.50, p=0.64; shrubland: t=0.95, p=0.36; ecotone: t=0.23; p=0.82). However, species diversity in mixed conifer habitat, where summer recreation trails are located, has returned to an a more consistent average with previous years. It is possible that the spike in species diversity in 2020 in mixed conifer habitat was a result of fewer people on the trails due to the SARS-CoV-2 virus pandemic.

While the year-to-year comparison of avian diversity does not show a significant change, a comparison across all seasons 2007 to present reveals a much different trend. Overall, there has been a statistically significant decline in species diversity across all years of monitoring (p=0.013, $r^2$=0.3, df=14)(Fig. 4). The downward trend is clear with a demarcation starting with summer 2010 coinciding with summer gondola operation.

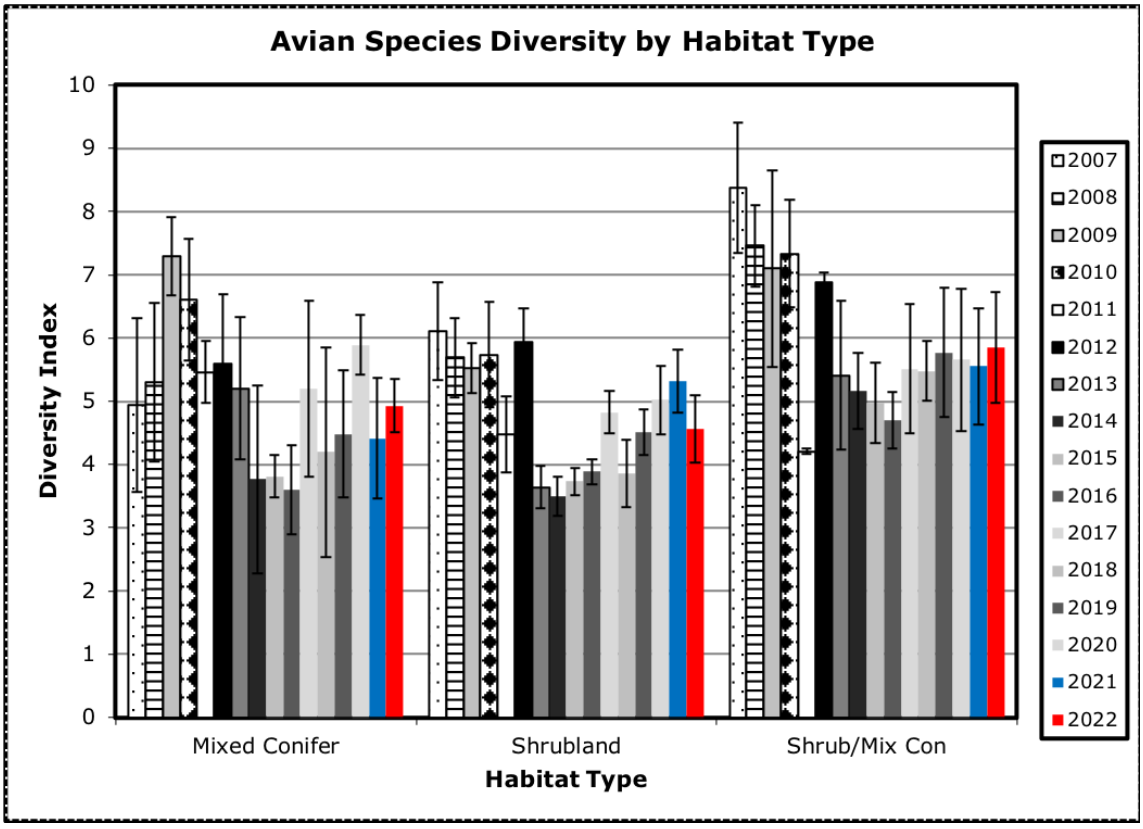



Figure 3. Comparison of the average avian species diversity from two avian point counts in June 2007-2022 in Cucumber Gulch, Breckenridge, Colorado.

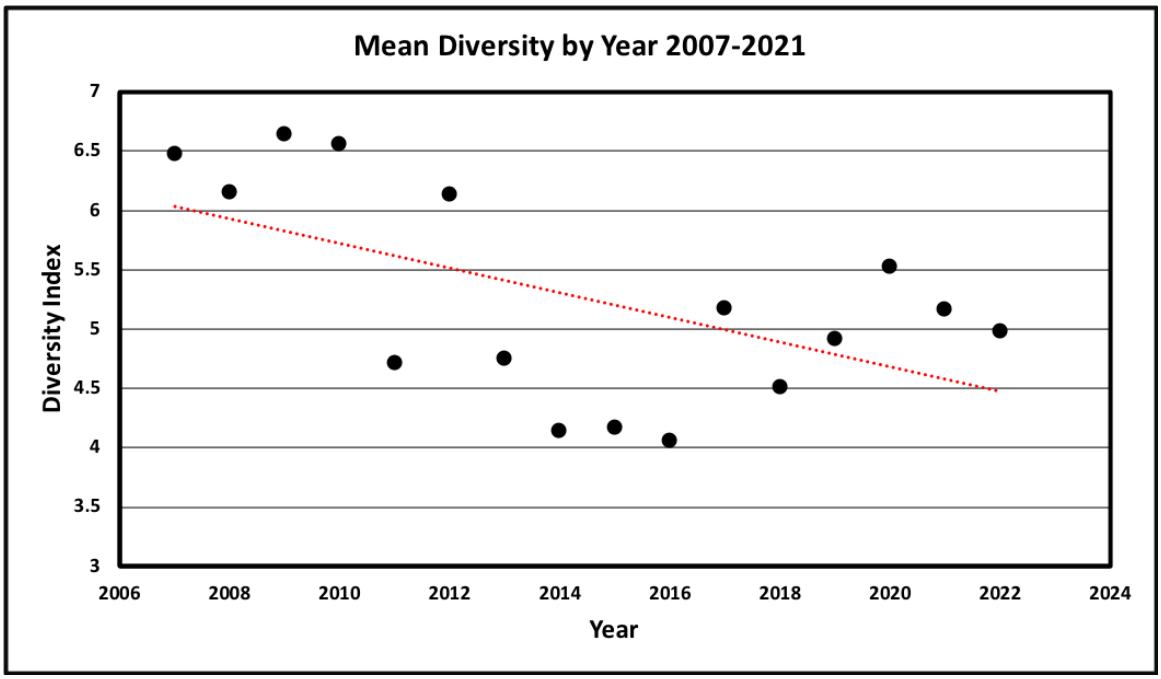



Figure 4. Avian species diversity across years of monitoring.

Monthly averages of Avian Abundance in Cucumber Gulch

Peak numbers of individual birds and species have consistently been observed May through July (Figures 6 and 7). Metrics for the average number of birds and species were only higher in July of 2022 when compared to the 2021 season. None of these values are out of the ordinary range for past years.

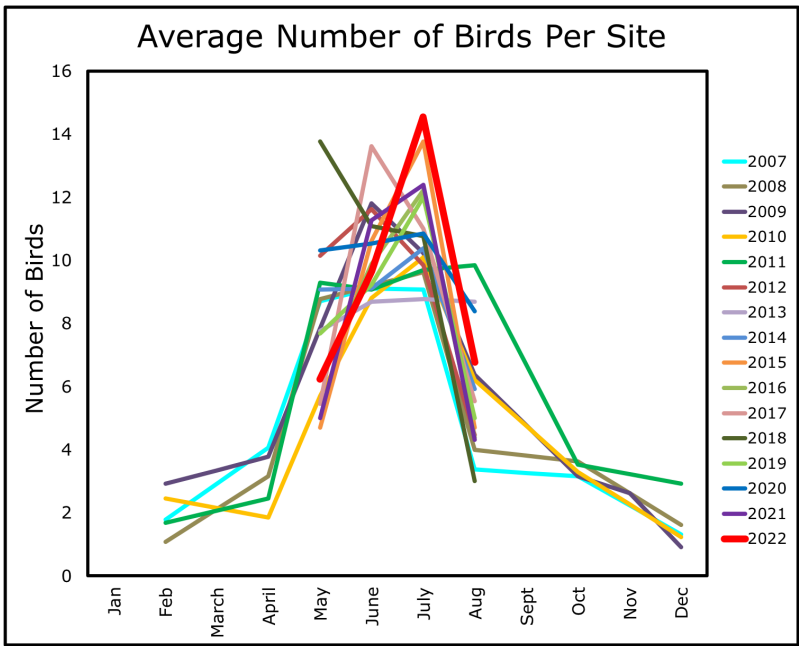



Figure 6 Mean number of birds at each point count location observed in all habitats in Cucumber Gulch, Breckenridge, CO 2007 - 2022.

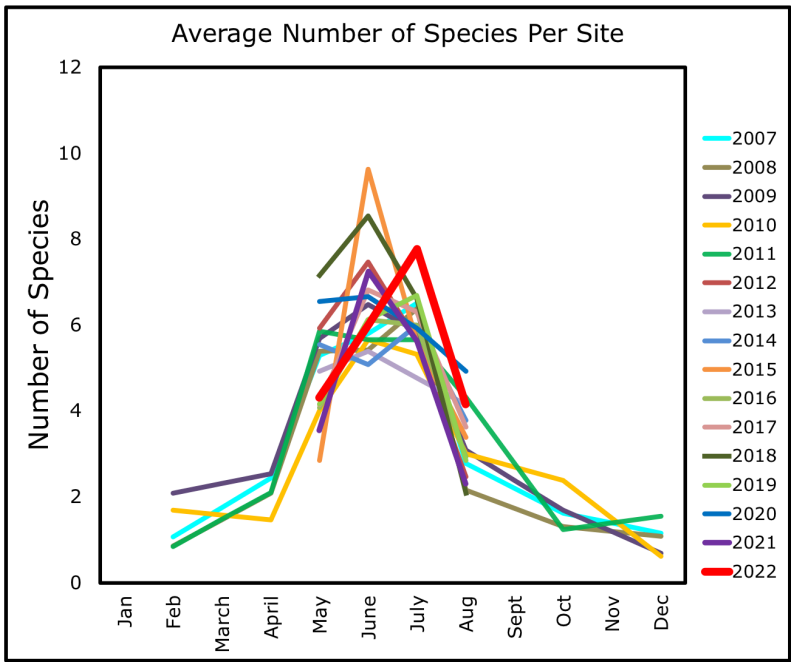



Figure 7 Mean number of species at each point count location observed in all habitats in Cucumber Gulch, Breckenridge, CO 2007 – 2022.

Brown-headed Cowbirds in Cucumber Gulch

Brown-headed Cowbirds are in Breckenridge from April to August. Brown-headed Cowbirds are nest parasites meaning that they lay their eggs in the nests of other bird species. The host birds incubate the cowbird's eggs and raise the cowbird's young, often at the expense of their own brood. There was an overall significant increase in the number of cowbird sightings from 2005-2009 (Fig 8: $r^2 = 0.74$, $p = 0.01$). This may have been a result of the activities that were associated with deforestation such as the construction of the gondola and the development at Peak 7. This is because as Cowbirds tend to exploit birds that are forced to construct nests near the edges of habitats. The number of Brown-headed Cowbirds sighted during avian surveys from 2010 – 2022 have not exceeded the highpoint observed in 2009. Brown-headed Cowbirds may have reached a saturation point and may have stabilized around the 2008-2022 numbers. The trend suggests that if there is no more large-scale tree removal, resulting in more forest edge in Cucumber Gulch, that the damaging effects of cowbirds may not increase significantly in the future.

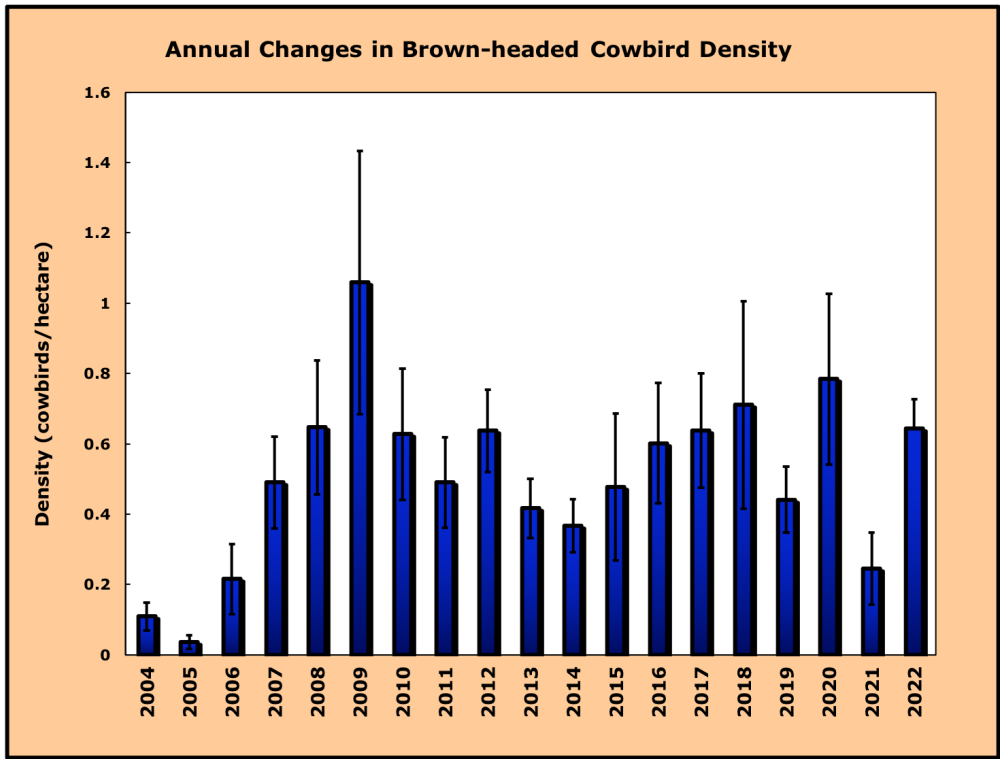



Figure 8. Average density of Brown-headed Cowbirds seen in Cucumber Gulch, Breckenridge Colorado during April - July point counts from 2004-2011 and May - July of 2012-2022.

Violet-Green Swallows in Cucumber Gulch

There was a 53% decrease in the number of Violet-green Swallows (*Tachycineta thalassina*) seen in Cucumber Gulch between 2018 and 2019 (Figure 9). Violet-green Swallow numbers noticeably decreased from 129 individuals seen in 2018 to 61 individuals identified 2019. In 2020 and again in 2021 the numbers recorded were significantly higher than in 2019 and are more in line with the values reported from 2014 to 2018. While dramatic, the 2019 decline is not unprecedented. A similar 45% decrease was observed in the years between 2004 and 2007. It was thought that this previous population drop may have been a result of the tree removal operation and construction sounds of the gondola and the Peak 7 development that began in April of 2006. The 2019 decline may have been the result of the loud construction activity at both the top and bottom of Cucumber Gulch. Violet-green Swallows are particularly sensitive to anthropogenic activity and depend on mature trees with pre-existing cavities for nesting. Though fewer swallows were reported in 2022 than in the previous two seasons, the number observed is still significantly higher than those seen in the 2019, and the 2006-2007 seasons. This decline could be the natural fluctuations of a population near carrying capacity or the result of noise disturbance from construction activities near the wetland complex.

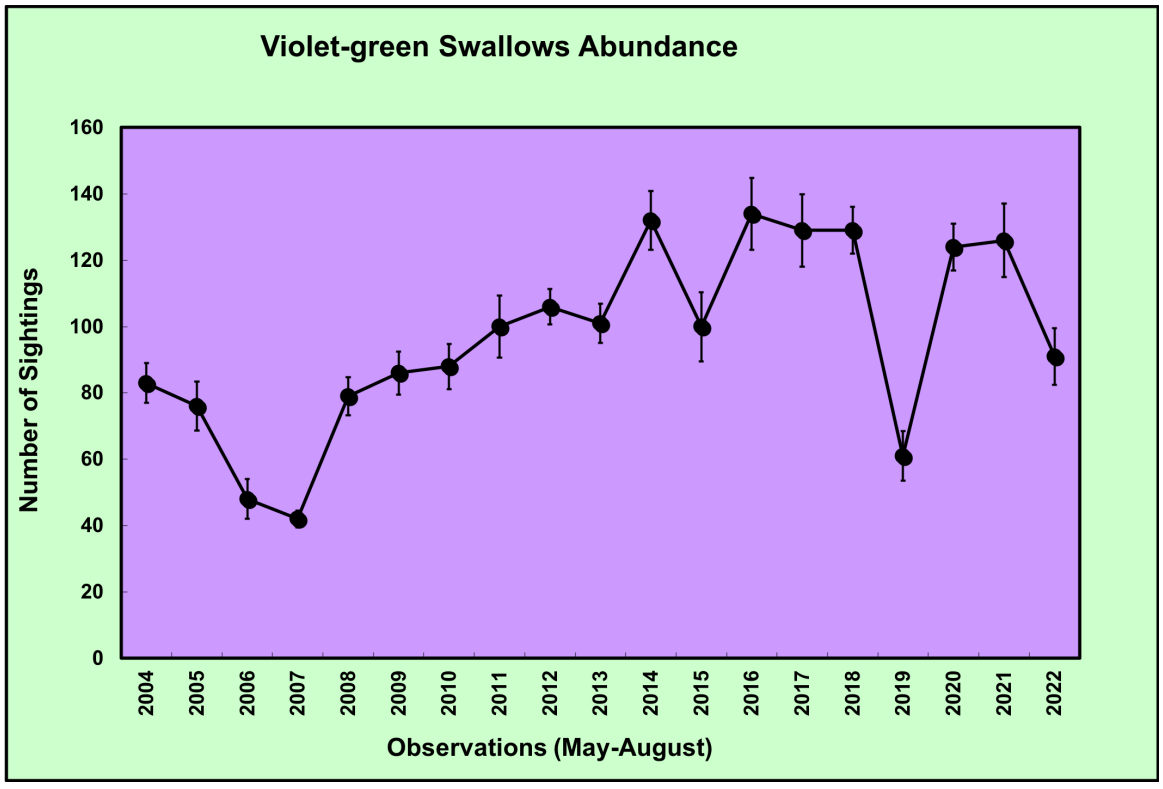



Figure 9. Number of Violet-green Swallow sightings in Cucumber Gulch, Breckenridge, CO in 2004 - 2021.

**Discussion of Avian Monitoring Results 2022**

The diversity of habitats found in Cucumber Gulch provide numerous niches for avian species that are both generalists and specialists (see Appendix 1 for a list of avian species observed in 2022). The wetland habitat, consisting mostly of shrubland vegetation, is a rare habitat in Colorado and attracts species not found in other habitat types. Birds are used as indicators of habitat health as they are easily observed and highly sensitive to habitat change.

This long-term monitoring project has allowed for an analysis comparing overall avian diversity in Cucumber Gulch over the last 16 years. A regression analysis of the last ten years using the average diversity figures shows a decreasing trend which is alarming(Figure 4). This means that the number of different species is decreasing compared to the number of individuals being observed. For example, in a disturbed landscape there may be an increase in the number of birds because of an influx of opportunistic/anthropophilic species such as crows and ravens and a simultaneous decrease in the number of small perching birds. The decline in avian diversity may be a result of summer gondola operation and an increase in construction activity around most of the perimeter of Cucumber Gulch. This pattern coincides with the start of summer gondola operation first in July of 2010 and then a move to an even earlier start of June 16, 2012. Two previous studies were conducted on the short-term impact of summer gondola operation on birds using a before-after/control-impact (BACI) design in 2010 and again in 2011 which showed that the avian community was affected by the gondola operation and that two management indicator species (Cordilleran Flycatcher and Wilson's Warbler) were significantly impacted in the gondola corridor (Carello, C.A. 2010 & 2012). Although only correlative, the decrease in diversity may be a result of the long-term effects of this activity compounded by an increase in other disturbances. Finally, this longitudinal study spanning over 16 years reflects recent reports of overall decreases in birds in North America since the 1970s which shows that two thirds of bird populations are declining in Western Forests ().

The results of avian monitoring in 2022 mostly followed previous trends. While not statistically significant, songbird abundance in the mixed conifer habitat has declined to its lowest point since we began sampling in 2007. With worldwide bird populations steadily declining, further monitoring is necessary to determine if this decline is indicative of a larger trend. That said, 2022 has been an interesting year for birds in the gulch with the observation of several species that have not been seen for several years.

The Olive-sided Flycatcher was sighted for the first time in four years. Breeding in high altitude coniferous forests and wetland edges this bird is listed as near-threatened by the IUCN due to habitat loss and insecticide use. The Fox Sparrow, an uncommon breeding migrant, was recorded for the first time in five seasons. The American Dipper, an indicator of good water quality was recorded again after a two year absence. The Red Crossbill was present throughout the summer season in numbers previously unreported; an irruptive species, Red Crossbills breed anywhere conifer cones/seeds are abundant. Once more commonly sighted in the gulch, Warbling Vireos, and Osprey were sighted this season as well.

House Wrens were also present in the gulch this season. First spotted in 2018 the House Wren is an anthropophilic species and is one of the few species whose range is expanding in North America. Correlated with human settlement and activity, House Wrens are known to usurp and destroy the nests and clutches of other birds. As human activity in and around Cucumber Gulch increases, continued monitoring is necessary to assess the potential impact an increase in the number of anthropophilic species may have on other avian communities.

**Concluding Remarks**

The avian community in Cucumber Gulch has changed over the last 17 years of monitoring. Some species that had been regularly sighted in the past have not been sighted in recent years. Species, such as the Red-winged Blackbird, were regular breeding birds in the Gulch in the past but have not been observed breeding in the last several years, including 2022. Other species such as the Warbling Vireo, Osprey and Cooper's Hawk were once sighted every year, and now rarely seen. Also, Eurasian Collared Dove's, an invasive species, have been spotted in the Gulch. In addition, avian diversity over a seventeen-year period has shown a significant decline. It is unclear what the direct cause of the decline is, however, the increase in construction at the top of the Gulch (Peak 7 and 8) and the bottom of the Gulch (visible from Josie's Cabin), summer gondola operation and habitat change as a result of hydrological change may have contributed to this outcome. We are hopeful that construction activities will begin to diminish around the perimeter of the Gulch and that birds in Cucumber Gulch will have an opportunity to only experience predictable disturbance such as noise from the Peak 8 Fun Park and the visual disruption and noise from the gondola.

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# APPENDIX 1 – List of Birds 2022

| Common Name | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
| American Crow | X | X | X | X | X | X | X | X | X | X | X | X | X |
| American Dipper | | X | X | | X | X | X | X | X | X | | | X |
| American Robin | X | X | X | X | X | X | X | X | X | X | X | X | |
| Amrican Three-toed Woodpecker | X | X | X | X | | | X | X | X | X | | | |
| Bald Eagle | | X | X | | | | | | | | | | |
| Band-tailed Pigeon | | | | | | | | | | | | | |
| Barn Swallow | | | | | | | | | | | | | |
| Black-capped Chickadee | | | | | | | | | | | | | |
| Belted Kingfisher | X | | X | | | X | | | | | | | |
| Blue-winged Teal | | | | | | | | | | | | | |
| Brewer's Blackbird | X | | | | | | | | | | | | |
| Broad-tailed Hummingbird | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Brown Creeper | X | X | X | X | X | X | X | X | X | | X | | X |
| Brown-headed Cowbird | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Canada Goose | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Cassin's Finch | X | X | X | X | X | X | X | X | | | X | X | |
| Chipping Sparrow | X | X | X | X | X | | | X | | | | X | |
| Cliff Swallow | | X | X | | | X | | X | X | X | X | X | X |
| Common Raven | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Common Snipe | | | | | | | | | | | | | |
| Cooper's Hawk | X | X | X | X | X | X | X | X | X | X | | | |
| Cordilleran Flycatcher | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Dark-eyed Junco | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Downy Woodpecker | X | X | X | X | X | X | X | X | X | | X | X | X |
| Dusky Flycatcher | | | | | | | | | | | | | |
| Dusky Grouse | | | | | | | | | | | X | | |
| Eurasian Collared Dove | | | | | | | X | X | | | | | |
| Fox Sparrow | | X | | X | | | | | X | | | | X |
| Golden-crowned Kinglet | | | | | X | X | X | X | | X | X | X | X |
| Canada Jay | X | X | X | X | | X | | X | | X | X | X | X |
| Gadwall | | | | | | | | | | X | X | | X |
| Great Blue Heron | X | X | | X | X | X | | X | X | X | X | | |
| Great Horned Owl | | | | | | | | | | | X | | |
| Green-winged Teal | X | X | X | X | | | X | X | X | X | X | X | |
| Hairy Woodpecker | X | X | X | X | | X | | X | X | X | | X | X |
| Hermit Thrush | X | X | X | X | | X | X | X | X | X | X | | |
| House Wren | | | | | | | | | X | X | | | X |
| Killdeer | | | | | | | | | | | | | |
| Lincoln's Sparrow | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Long-eared Owl | | | | | | | | | | | | | |
| Mallard | X | X | X | | X | X | X | X | X | X | X | X | X |
| Mountain Bluebird | | | X | | | | | X | | | | | |
| Mountain Chickadee | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mourning Dove | X | X | X | X | | X | | X | | | | | |
| Northern Flicker | X | X | X | X | | X | X | X | X | X | | X | X |
| Northern Shrike | | | | | | | | | | | | | |
| Olive-sided Flycatcher | | X | | | | | X | | X | | | | X |
| Osprey | | | | X | X | | | | X | | | | X |
| Pine Grossbeak | X | X | X | X | | | | X | X | | | X | |
| Pine Siskin | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Pygmy Nuthatch | | | | | | | | | X | X | | | |
| Red-breasted Nuthatch | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Red Crossbill | | | X | X | | | | | X | | | | X |
| Red-naped Sapsucker | X | | | | X | | | | | | | | |
| Red-tailed Hawk | X | X | X | X | | | X | X | | | | | |
| Red-winged Blackbird | | X | X | X | | X | | | | X | | X | X |
| Ruby-crowned kinglet | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Rufous Hummingbird | | X | | | | | | X | | | | | |
| Solitary Sandpiper | | | | | | | | | | | | | |
| Song Sparrow | | | | | | | X | X | X | X | | X | X |
| Spotted Sandpiper | X | X | X | X | X | X | X | X | | | X | | |
| Stellar's Jay | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Townsend's Solitaire | | | | | | | | | | | | | |
| Tree Swallow | | | | | | | | | | X | | | |
| Violet-green Swallow | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Warbling Vireo | | | | | | | | | X | X | X | | X |
| Western Wood Pewee | | | | | | | | | | | | | X |
| White-breasted Nuthatch | X | X | X | X | X | X | X | X | X | X | X | X | X |
| White-crowned Sparrow | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Wilson's Snipe | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Wilson's Warbler | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Yellow Rumped Warbler | X | X | X | X | X | X | X | X | X | X | X | X | X |
| | | | | | | | | | | | | | |