# Colorado Trout Unlimited and Boulder Flycasters South Boulder Creek Stream Management Plan Phase I Final Report May 31, 2020

**Colorado Trout Unlimited and Boulder Flycasters**
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**Final Report**

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## 1.) Executive Summary

Colorado Trout Unlimited (CTU) and Boulder Flycasters (BFC), a Trout Unlimited local chapter, along with our partners, completed Phase I of a Stream Management Plan (SMP) for lower South Boulder Creek (SBC). The project location was the (approximately) 9 mile reach of SBC beginning at the FRICo (Community Ditch) check structure at the mouth of Eldorado Canyon (LAT: 39.932 / LONG: -105.281), to the confluence with Boulder Creek (LAT: 40.033 / LONG: -105.217). **Please refer to Key Deliverables – A. in the Appendix for the project Reach Map.** The overall project scope included Stakeholder Outreach, Data Collection / Assessment, River Health Assessment Methodology Selection, and Existing Physical Infrastructure Assessment. The project commenced in March 2019, and all field work tasks were completed in November 2019. Consolidation and final analysis of findings, and report writing, were completed from November 2019 to April, 2020. This final report completes the agreed-to scope of work.

The project was funded by cash grants, direct cash match contributions, and in-kind services contributions from the following organizations:

- Colorado Water Conservation Board (CWCB) – Colorado Watershed Restoration Program – Stream Management Plan grant
- Metro Basin Round Table – Water Supply Reserve Fund – cash match
- South Platte Basin Round Table – Water Supply Reserve Fund – cash match
- Trout Unlimited (CTU and BFC) – cash and in-kind services match
- City of Boulder – Water Utilities Division (Boulder Water) – in-kind services match
- City of Boulder – Open Space & Mountain Parks (OSMP) – in-kind services match
- City of Lafayette – Public Works (Lafayette Water) – in-kind services match
- Denver Water – in-kind services match
- Colorado School of Mines – Senior Engineering Design Project Team – in-kind services match

The prime consultant, sub-contractors and advisers to the project were:

- Biohabitats, LLC – prime consultant / contractor
- Wright Water Engineers – sub contractor
- GEI – sub contractor
- Colorado Water Conservation Board – advisor
- Colorado Parks and Wildlife – advisor
- District 6 Water Commissioner – advisor
- Lefthand Watershed Center – advisor

In 2017 BFC identified this reach of SBC as an important improvement opportunity within the overall Boulder Creek watershed (our “home waters”). As we researched how to approach improvement for this reach, and discussed opportunities with key stakeholders, we found there was growing interest for action. Local municipalities were interested in overall watershed improvement, due to a combination of post-2013 flood impacts, public recreation / open space along the reach, and long term plans for watershed resiliency. A second important factor was the growing likelihood that Denver Water would gain permitting to expand Gross Reservoir. Based on an existing intergovernmental agreement (IGA) between Denver Water, Boulder and Lafayette, the expansion would create a 5,000 AF Environmental Pool. Water stored in the Environmental Pool would be from water rights owned by Boulder and Lafayette. It would be used to help maintain minimum sustainable in-stream flows throughout the year. This is especially important in the drier, “non-irrigation,” winter months (approximately October to March).

Beginning in December of 2017, BFC worked with Boulder and Lafayette to explore opportunities for collaboration and resource leverage to maximize any improvements to the reach. In the summer of 2018, Denver Water joined these discussions. In parallel BFC researched opportunities for watershed improvement

project funding. CTU (grantee) and BFC (program manager) subsequently applied for and were awarded an SMP Phase I grant in March 2019.

This reach of SBC is a highly segmented and diverted waterway. For its relative length, it is heavily used by a wide range of stakeholders. There are consumptive and non-consumptive users across multiple categories (municipal, agricultural, industrial / commercial, private landowners). This reach passes through or along approximately 5 miles of City of Boulder Open Space and is a heavily used recreation area (hiking, running, biking, bird watching, fishing). City of Boulder Open Space lands are also leased to farms / ranches. The reach is segmented by eighteen (18) creek-spanning structures, of which there are fourteen (14) ditch head-gates with diversion structures. There are an additional two (2) side-channel diversions to head gates, and one (1) in-stream diversion pipe. It is home to native / non-native fish and habitat, including eight (8) species of plants and animals classified as sensitive or threatened. During the non-irrigation winter months the reach suffers from no-to-extremely-low flows (1 CFS or less).

The background information above informed our decision to engage the SMP process. With an existing key stakeholder group in place and supporting the project, we moved forward with the key tasks. A summary of findings and recommendations is as follows:

- A steering committee was organized to include Boulder, Lafayette, Denver Water, BFC and our consultants. Through on-going meetings, the priorities of our municipal partners were discussed, existing relationships with other stakeholders (primarily ditch companies) were identified, and the "what" and "how" to message this project to the broader stakeholder groups were defined. This resulted in going slower than our original assumptions regarding stakeholder outreach to ensure we first had meaningful and actionable messages. An overall Communications Plan was developed to guide these efforts. Some key industrial / commercial stakeholders were approached as part of the Communications Plan roll out. The bulk of the Communications Plan will be executed in Phase II.
- We found that a significant body of scientific and engineering studies (mostly from our municipal partners), as well as indicative data (largely from State and municipal sources) existed. However, data were highly fragmented across many organizations / entities and pertained to different points in time. As we collected and reviewed information, we tested the reports and data for relevance against post-2013 flood conditions. This effort resulted in the creation of a central data base for use in this and future phases, as well as the identification of data gaps to be filled in Phase II.
- We collaborated with other SMP experts and projects to identify and select a River Health Assessment (RHA) methodology. We selected COSHAF / FACStream as the base methodology and then modified / fleshed out the framework with categories / components specific to SBC circumstances. We then compared existing data against the assessment categories and identified data gaps to be filled in Phase II. We also recommend further refinement of the RHA methodology in Phase II.
- R2-cross section analysis was applied to four (4) selected sub-reaches, roughly aligned with past sub-reach analyses, to provide a preliminary analysis of current flow needs. This preliminary data was then compared to existing flow regime data, and previously recommended sustaining and improvement flow levels. The preliminary results did not deviate substantially from existing flow level recommendations, but there are gaps in the flow history, much of which is from the lack of gauges post-2013 flood (gauges blown out and not yet replaced). Additional flow data gathering and sub-reach analysis is recommended in Phase II. We propose to complete point flow analysis for the project reach, develop the "highest practical" flow scenario and assess flow parameters as part of the RHA.
- A significant part of the field work in Phase I was to identify, survey and assess the physical infrastructure on this reach.
    - We enlisted a student engineering team from Colorado School of Mines through their Senior Engineering Design Project program. These students were all seniors nearing graduation. They were supervised by a project advisor, a PE member of the faculty, and our registered engineer consultants.

- These resources, combined with BFC volunteers and our consultants, created an inventory of the structures including GPS location, ownership, water rights data, photos, and other indicative data.
- The infrastructure analysis identified 21 structures in the reach. The infrastructure inventory includes eighteen (18) channel-spanning structures, two (2) side channel / return channels to a ditch head gate, and one (1) in-stream diversion pipe. Fourteen (14) of the channel spanning structures are ditch head gates and accompanying diversion structures.
- We established assessment criteria based on four opportunity improvement categories: 1) ability to pass and administer low flows, 2) potential for channel connectivity to enhance aquatic organism passage, 3) habitat improvement proximate to the structure, and 4) water use / operational efficiency potential. Four priority levels were created based on scoring each structure against the above criteria, with low flow passage / administration being heavily weighted. This resulted in recommendations for improvement (if any) for each structure. This then guided our recommendations for Phase II preliminary engineering design on the highest priority structures.
- In summary, we identified seven (7) structures as the highest priorities for modification. With low flow capabilities and aquatic organism passage as our top two criteria, the proposed modifications would not only allow for administration and passage of low flows, but also reconnect ~ 7 miles of this reach.

The above findings and recommendations are described in more detail in the next section of this report. **Please refer to Key Deliverables – B. in the Appendix for a Summary of Findings and Recommendations.**

Phase I results provide the basis for the Phase II scope of work and the completion of the SMP. Phase II will focus on executing the Communications Plan, closing the data gaps, performing the RHA, completing flow regime analysis, and performing the preliminary engineering design work on the seven (7) high priority structures. The engineering design work will require the participation of the ditch owners, and that participation is not guaranteed. However, gaining their cooperation is the first step in the Communications Plan execution. Many of the identified structures are either majority-owned / operated by our municipal partners, and / or our municipal partners hold significant shares in these ditch companies, which should increase our chances of successfully engaging these stakeholders.

*(Continued on next page)*

## 2.) Findings and Recommendations

This section will provide more detail regarding Phase I findings and associate recommendations. We will present these results using the key deliverables as the main organizing construct, and reference other scope of work deliverables in summary.

### Task 1.0 – Stakeholder Engagement and Communications

### Communications Plan (see Appendix: Key Deliverables – C.)

Most of this task work in the SMP Phase I was focused on identifying stakeholder groups, developing an inventory of existing data / information sources, selecting assessment methodologies, cataloging physical infrastructure within the reach, and performing preliminary assessments of physical structures and flow requirements. As such, much of the Phase I communication efforts focused on our direct project partners. There were few actionable recommendations to communicate to infrastructure / land owners resulting from the SMP Phase I work. The Steering Committee discussed the makeup of each stakeholder group, municipal partner experiences in working with these stakeholders, and how and when to best approach these stakeholders. Originally, we planned to begin outreach to the major ditch company stakeholders in Phase I. However, until the scope of Phase II was defined, funding secured, and actionable recommendations made ready to communicate, the Steering Committee believed that direct outreach would be premature. This was further reinforced by our municipal partners' experience. As a result, the project team decided to delay most of this outreach until Phase II. In Phase II we would be much better positioned to solicit specific input and bring relevant, concrete, actionable recommendations forward. However, during the SMP Phase I we did develop preliminary recommendations / priorities for physical infrastructure modifications and data monitoring that we believed would allow limited outreach. We began to communicate in 2019 with two key stakeholders on a very preliminary basis – Xcel Energy regarding Leggett / Jones-Donnelly and East Boulder Ditch, and Eldorado Artesian Water regarding access to their property near the FRICo check structure..

Overall, and as a result of the SMP Phase I, we recommend dividing the next steps between the remaining SMP tasks (in a separate SMP Phase II grant application) and the engineering / design and structural tasks (in a separate Watershed Restoration (WSR) Phase I grant application). Execution of the Communications Plan beyond the SMP Phase I will support both projects.

We recommend executing the Communications Plan across targeted groups, in order of degree of impact and direct participation in final solutions, as follows:

1. Steering Committee (Direct Project Partners): City of Boulder – Water Utilities Division, City of Boulder – Open Space & Mountain Parks, City of Lafayette – Public Works, and Denver Water (began March 2019 – on-going Phases I & II)
2. Core (Directly Affected) Stakeholders: High Priority Infrastructure Owners (Ditch Companies and Commercial Entities), High Priority Water Rights Owners (Other Private, Industrial, Commercial and Municipal Entities), and Immediately Proximate Landowners (Industrial); (limited 2019 communications in Phase I, with the majority of outreach in Phase II)
3. Secondary (Indirectly Affected) Stakeholders: Other Infrastructure Owners (Ditch Companies and Commercial Entities), Other Water Rights Owners (Other Private, Industrial, Commercial and Municipal Entities), and Other Proximate Private Landowners (2020 – Phase II)
4. Other Related Stakeholders: Conservation / Advocacy / Recreational Groups with a Boulder Watershed Mission, Other Adjacent Private Landowners (limited engagement in Phase I; expanding into Phase II)
5. General Public as Stakeholder (2020 – Phase II)
6. Advisors Stakeholder Group: Colorado Water Conservation Board, Colorado Parks & Wildlife, District Water Commissioner, and other select stakeholders

- Communication on-going with CWCB, CPW, and the District Water Commissioner (began in March 2019 and on-going)
- Update the Basin Roundtables (Q4 2019 and Q1 2020, and then on-going)
- Communication with the District Water Commissioner (began in March 2019 and on-going)

The Communications Plan is intended to be a "living" document. It will guide the work of BFC / CTU and their consultant team, continue to use guidance from our Steering Committee, and evolve over time based upon recommended future projects and feedback from the stakeholders.

Other Scope of Work Deliverables for Task 1.0

- Stakeholders list and commitments / level of involvement – embedded within the Communications Plan
- Meeting notes and project memorandum – Steering Committee presentations, notes, and meeting summaries (see Appendix: Additional Project Management Documentation i.)
- Interview / discussion notes, and inventory of needs, objectives, etc. - Steering Committee recommended delaying this level of outreach until Phase II beyond what resulted from Steering Committee interaction
- Communication Protocols – embedded within the Communications Plan
- PR Plan – embedded within the Communication Plan

**Task 2.0 – Governance and Third Party Relationships**

This task involves the efforts to establish the steering committee and other communications protocols. In hindsight, this task should have been combined with Task 1.0. As such, the background narrative in Task 1.0 (above) is sufficient to cover this task as well. The specific tasks in 2.0 included:

- Establish steering committee
- Establish relationship structures with other related groups
- Set up communication and collaboration technology as needed

In Phase I we established lines of communication with multiple groups / stakeholders as described in Task 1.0 above. Of special mention are other watershed and SMP education organizations. We received invaluable input and guidance from the Lefthand Watershed Center regarding our River Health Assessment methodology selection. In this same regard, the SMP Resource team (the "Colorado SMP Library"), led by River Network, provided overall assistance and guidance. Additionally, we reached out to various local watershed advocacy groups to discuss opportunities for collaboration and / or learning from their projects; including, Fourmile Watershed Coalition, Boulder Waterkeeper, Keep It Clean Partnership, and Boulder Creek Watershed Initiative. As appropriate we attended formal meetings, had less formal in-person discussions, read reports, and exchanged information via email. Lastly, we extended a relationship with Colorado School of Mines (CSM), started by CTU in 2018. The relationship involves using senior student engineers (near graduation) as project resources, on an in-kind basis. The CSM structure for this was the engineering student Capstone Senior Design Project program held every semester. The CSM students provided valuable field work and data collection in regard to infrastructure assessment.

Other Scope of Work Deliverables for Task 2.0

- Steering Committee Membership List – embedded in Communications Plan
- 2019 Schedule – steering committee reports
- Identified people for each relationship and frequency / type of contact – see narrative above
- Identified tool(s) – google, slack, drop box etc. - the level of communications with third party organizations in Phase I was generally handled using email, in-person meetings and exchanges of

reports / documents via email. Our prime contractor, Biohabitats, established a SharePoint collaboration space for all project team members using their Microsoft 365 technology platform. In addition, BFC established a Google-based email, document storage and calendar to facilitate BFC sharing of information within our organization.

**Task 3.0 – River Health Assessment (RHA) Methodology**

**River Health Assessment Methodology Selection (see Appendix: Key Deliverables – D.)**

After consultation with advisors and reviewing other SMPs' selected methodology, we chose to use Colorado's COSHAF / FACStream framework, with modifications for "human values" assessment, as the basis for this project's RHA methodology. We then customized the categories / components:

- Hydrology
  - Flow Regime
  - Sediment
- Water Quality
  - Chemistry (including metals and organics)
  - Temperature
- Biology
  - Riparian Condition (critical habitat)
  - Organics
  - Stability
  - Biota (native, non-native, invasive, sensitive / threatened)
- Morphology
  - Floodplain / Wetted Perimeter
  - Buffer Capacity
  - Connectivity (terrestrial and aquatic)
  - Structure
- Values
  - Recreation
  - Resilience (based on flow regime scenarios)

The process by which the methodology was fleshed out included:

- Leaning heavily on the results of other completed SMPs to create a starting point for discussing an overall RHA methodology; including categories; components; measurement types; data sources; notes, level of uncertainty, data and information gaps, for each component; and baseline measurement criteria to be applied to each component.
- A facilitated (by BFC), half-day, working session with representatives from Biohabitats project team, Boulder Flycasters, and City of Boulder Water Utility and Open Space & Mountain Parks personnel to discuss, edit and create an SBC specific methodology
- Mapping existing data collected (Data Inventory) to the categories of the RHA to confirm our ability to create a baseline, and to also identify data gaps.
- Adding to the COSHAF / FACStream categories (hydrological, biological and geo-morphological) to represent unique circumstances in the SBC reach under study (values assessment, such as recreation).
- We also consulted EPA Rapid Assessment and CDPHE 303 (d) listings of impaired waters and data categories.
- Then participants reviewed the draft result to incorporate edits and updates.

The major, overarching limitations identified were gaps in existing data (lack of historical data) and standard measurement criteria (objective measures). In some cases, given the dearth of existing scientific standards and

/ or inability fill a data gap for some of the categories / components, the working group recommended eliminating the least critical in order to have a practical assessment process. The biggest of these gaps in the historical data are: dry up locations, flow gauge data at needed level of detail (particularly on the downstream part of the reach), limited location water / biomass testing, and lack of sub-reach differentiation of water chemistry measurement. Because there are gaps in the availability of objective measures, there will be a reliance on professional judgment applied to some critical assessment areas. Areas deemed low priority and lacking historical data / objective measures were identified as potential components for elimination. Given the assumed level of analysis provided by the CDPHE during the Tri-annual Water Quality Review, the 303 (d) listing of water quality impairments will be used as an overall indication of water quality impacts on the entire stream segment. Other specific concerns resulting from other water quality data sources will be considered on an exceptions basis.

In Phase II we recommend one more process cycle to finalize the RHA before proceeding. This area is rapidly evolving, with new frameworks, criteria refinement, and data sources coming available.

**Initial Low-Flow Analysis (see Appendix: Key Deliverables E.)**

Minimum flows necessary to support fish / aquatic biota populations have been evaluated several times over the last 40 years. We looked at the following assessments:

- CDOW's work that led to in-stream flow recommendations (1980)
- Hydrosphere's 1994 re-analysis of the CDOW data along with newer information from a 1992 study
- CPW's re-analysis of historical CDOW R2Cross data (2019)
- Our analysis using recently surveyed cross sections (2019)

Considering the potential variability possible with R2Cross, particularly regarding the selection of a representative critical riffle, which sets the channel geometry and bank-full top width (the big drivers of the model), the estimated flows from the different studies are similar. See Appendix E for more detail. We then compared these to the minimum target flows agreed upon by Denver Water, City of Boulder, and City of Lafayette that would result from an Environmental Pool, if the proposed Gross Reservoir expansion project is approved. Based on this initial, high level assessment, the Environmental Pool minimum flows appear reasonable for preserving current conditions while also being feasible to implement. In addition, we recommend that additional opportunities for higher flows be pursued to help create a more resilient system.

While the current approach is to make use of a newly expanded Environmental Pool in an expanded Gross Reservoir to provide storage, if the reservoir expansion does not go forward or is significantly delayed, flow goals might still be met through other arrangements that, and while not preferred, would still be worth pursuing.

In Phase II we recommend confirming in-stream flow targets at different levels of beneficial outcomes; i.e. base line (status quo), with the Environmental Pool, and at highest practical levels. The RHA evaluation of sub-reaches will be used to establish potential benefits of structural, stream and riparian area modifications. In parallel, we recommend that monitoring already in place and proposed for the near future move ahead independent of the SMP project to build the data base as quickly as possible. This includes collecting flow data at key locations through existing and new measurement devices.

**Existing Data Inventory (see Appendix: Key Deliverables F.)**

The project team, with significant help from municipal partners' professional staff, identified and evaluated existing information pertinent to South Boulder Creek, and, in particular, the reach under study. We found that a significant body of scientific and engineering studies, as well as indicative data (largely from State and

municipal sources) existed. However, it was highly fragmented across many organizations / entities and varied in terms of time frame, level of detail, assessment criteria used, and grading scales applied. We also tested the reports and data for relevance against post-2013 flood conditions. This resulted in the creation of a central data base for use in this and future phases, as well as the identification of data gaps to be filled in Phase II.

The Inventory of existing Data / information includes, but not limited to:

- Biological and chemical testing
- Flow records from stream gauges
- In-stream flow rights / water rights
- Ditch companies / operators
- Habitat / biological studies
- Bio-mass counts
- Flood plain analysis

The project team also compared the existing data inventory against the RHA and flow needs. In general, the major findings are: 1) the lack of key historical data – dry up locations, flow gauge data at needed level of detail (particularly for the downstream part of the reach), limited location water quality testing; and 2) the lack of objective measures for some RHA categories / components will likely result in reliance upon professional judgment in the Phase II field assessment.

Overall, the project team has a better understanding how this data will be used for ongoing improvement and monitoring, and as the foundation of the River Health Assessment Methodology. In Phase II, we recommend closing data / criteria gaps required for RHA. We also recommend the project team perform a self-defined "reference reach" (basis for the "highest practical" scenario) exercise based on professional judgment to help fill in gaps for which quantitative data is unlikely to be found or developed within a the Phase II project time frame (2020 – 2021). And as stated above in regard to flow, in parallel, we recommend that the monitoring already in place and proposed move ahead independent of the SMP project so as to build the data base as quickly as possible. This includes collecting data at key locations through existing and new measurement devices: air and water temperature data, dissolved O2, chemical, and biomass data.

**Task 4.0: Existing Physical Infrastructure Assessment (see Appendix: Key Deliverables G.)**

A significant part of the field work in Phase I was to identify, survey and assess the physical infrastructure on this reach. The initial survey of infrastructure was performed by BFC chapter volunteers. These volunteers walked the reach, took notes and photos for each structure, and prepared a preliminary inventory and associated reach map. The project team reviewed these findings with our municipal partners and made corrections as needed. The project team also walked the City of Boulder Open Space with municipal partners to discuss Boulder Open Space & Mountain Parks' long term plans for each structure on their property.

The project team looked into university programs that might be appropriate to help with the Phase I structures work, particularly confirming and adding to the preliminary inventory. We were invited to present to, and then later engage with, the Colorado School of Mines' engineering Capstone Senior Design Projects program. The team consisted of 6 senior engineering students nearing graduation, and covering the disciplines of mechanical, civil and environmental engineering. We agreed on a scope of work and time frame for their participation. They were supervised by their faculty advisor, a registered PE member of the engineering faculty, and our registered engineering consultants from Wright Water Engineers and geo-morphologistsfrom GEI. These resources, combined with BFC volunteers and our functional consultants, created a more complete inventory of the structures including GPS location, ownership, water rights data, photos, and other indicative data.

The infrastructure inventory includes twenty-one (21) structures; eighteen (18) of which are creek spanning. Fourteen (14) of the eighteen (18) are ditch head gates and accompanying diversion structures, three (3) are small concrete drop structures, and one (1) is a pipeline. There are two (2) with side-channel / return-channels serving ditch head-gates with no in-stream structures. There is one (1) pipe in the channel diverting water to a pond on private property.

Our consultants developed an infrastructure assessment score card (Key Deliverables E) that incorporated the priorities for structure modification from the 2010 IGA to allow for low flow passage and administrations, improvement opportunities important to BFC / TU, and factors from the consultant's experience. This produced a priority ranking by structure for the team to consider. Based on this information and further discussions with our Steering Committee, we simplified this to four primary criteria as follows below (in order of importance):

1. Ability to pass and administer low flows,
2. Potential for channel connectivity to enhance aquatic organism passage,
3. Habitat improvement proximate to the structure, and
4. Water use / operational efficiency potential.

We then scored each structure against the above criteria, with low flow passage / administration being heavily weighted. Recommendations for improvement (if any) for each structure were then described based on the evaluation process. The outcome guided our recommendations for Phase II preliminary engineering design on the highest priority structures.

After grouping the structures based on the above assessment criteria, we then looked across Priority groups to identify the structures for emphasis in Phase II. We identified seven (7) structures from the Priority 1 (5 structures) and Priority 2 (2 structures) groups as the highest priorities for modification (*see below). With low flow capabilities and aquatic organism passage as our top two criteria, the proposed modifications would not only allow for administration and passage of low flows, but also reconnect ~ 7 miles of this reach.

Priority 1 Structures – inhibiting low flow passage / administration, as well as opportunities for channel connectivity / passage, habitat improvement and operational efficiency improvements

1. FRICo ("Community Ditch")* Check Structure (Mouth of Eldorado Canyon) -High Complexity. The FRICo structure is a relatively large and complex structure. It is the first structure downstream of Gross Reservoir with senior enough water rights to "sweep" the creek of all water during low flow periods. As such the ability to measure and administer the Environmental Pool flows is of critical importance. The district water commissioner reports that, at its present configuration, it would not be possible to administer the Environmental Pool low flows through this structure. The downstream segment of the creek is approximately 1 mile of cold-water fishery habitat supporting good populations of brown, brook, and rainbow trout. Very low populations of native species of fish are also present. The diversion structure is approximately 9-feet high, representing a significant barrier to fish passage. Providing fish passage is likely to be very expensive and of limited benefit, since the upstream segment is only about 200 meters long before another man-made diversion provides the next barrier to connectivity. As a result the FRICo structure is a very high priority for low flow management, with some potential opportunities to improve operational efficiency. Stream connectivity and habitat improvement opportunities are judged to be relatively low.
2. Goodhue Ditch* (along Prado Road neighborhood) – Low Complexity. The Goodhue Ditch diversion structure is a simpler structure than the FRICo diversion, with a water surface height of approximately 5-feet. The structure is not currently set up to measure and control low flows, but repairs and modifications to existing equipment may be sufficient to do this. The upstream segment is approximately 2500 meters, while the downstream segment is approximately 215 meters. Both segments are fair to good cold water fisheries with populations of brown, brook, and rainbow trout.

Native species are present in low populations. Fish passage using a grouted boulder ramp was previously designed to a 90% stage, but was not constructed. It appears that this configuration, or an alternate approach using more natural channel modifications may be able to provide fish passage at a moderate cost. The benefits of providing passage for native and non-native species is considered relatively high, given the length and quality of the upstream habitat. This structure is considered high priority for both low flow management and fish passage. Significant opportunities for habitat and operational efficiency improvements have also been identified.

3. New Dry Creek Carrier Ditch* (Downstream of South Boulder Road) – High Complexity. The New Dry Creek Carrier Ditch Diversion has two flow paths. It has a large swing gate leading to the Ditch, and a shallow, wide main channel overflow weir with a sand gate that is rusted and structurally undercut. This location is difficult for the district water commissioner to administer given current water rights requirements. The existing facilities will not be able to measure and administer the Environmental Pool low flows without significant modification. The upstream segment is 3600 meters of good cold water fishery habitat. Good populations of brown, brook, and rainbow trout are found, along with low populations of native species. Downstream is a 238 meter transitional habitat that contains native and non-native species. This structure is a significant barrier to cold water fish stranded in downstream segments that get very warm during the summer. It also is a barrier to native species from migrating to portions of the creek that contained a more diverse mix of species prior to the 2013 flood. Despite the high level of complexity of modifications required, this structure is considered high priority for both low flow water management and fish passage. There are also significant opportunities for improving habitat and operational efficiencies.
4. East Boulder Ditch* (Upstream of Baseline Road) - Conceptual Design Existing – Moderate to High Complexity. The East Boulder Ditch diversion manages relatively senior water rights that currently allow the entire creek flow to be swept under some low flow conditions. While the existing sand gate may be sufficient to measure and administer low flows, there are serious operational efficiency issues that also need to be addressed for this to work. This structure is one of the most significant barriers to the passage of trout trapped in the lower part of the stream when summer temperatures warm the water beyond what the trout can tolerate. It also is a barrier to native species free movement through this transition zone, preventing re-population to pre-2013 flood levels. Boulder OSMP has identified this as a priority location for fish passage improvement. A project is currently underway to design a natural channel approach to this fish passage. The needs for low flow management and operational improvements should also be considered either within this project or in a future project initiated in response to implementation of the Environmental Pool.
5. Leggett Inlet / Jones-Donnelly Diversion* (Downstream of Arapahoe Road) – Moderate Complexity. The Leggett Inlet is a large and complex structure that diverts water to Xcel cooling ponds. This structure currently is used to sweep all available flow under certain low flow conditions. There is currently no provision for management of low flows passing to SBC. This makes low flow measurement and management a high priority to ensure that Environmental Pool flows can be passed through to SBC, facilitating the water exchange agreements to make the in-stream flows possible. The upstream creek segment is fair for native and non-native species. Trout are found in this segment during high flows, but when flows drop off the upstream fish passage barriers trap trout in warm water that trout do not tolerate well. The downstream segment terminates at the KOA Lake inlet, which is a drop structure that forms a barrier to fish passage from the Lake. Given the invasive species present in the KOA Lake, fish passage through the lake inlet is not proposed, and the segment downstream from Leggett is relatively low priority for establishing fish populations. In addition, the Xcel cooling ponds are known to contain invasive species of fish and other aquatic life, so connectivity through those gates is not desired. Based on this, the Leggett Inlet Diversion is considered a very high priority for low flow management, and a very low priority for fish passage. Opportunities for operational improvements are limited to correcting structural degradation of the concrete. Habitat improvement opportunities are considered relatively low.

Priority 2 Structures – representing best opportunities for channel connectivity / passage, as well as habitat improvement and operational efficiency improvements

6. Marshallville Ditch* (at the State Hwy 93 overpass). The Marshallville Ditch is a side-channel diversion to the ditch head gate, with a return side-channel to the main channel when the gate is closed. However there is a weir / drop structure in the main channel where the side-channel exits the main channel. This creates a stream spanning barrier to fish passage in the main channel year round, and through the side channel at low flow. The side channel passage is further complicated by debris build up in and around the channel. Providing fish passage appears to be relatively easy, with the potential for a grouted rock ramp leading up to the crest of the weir. The Marshallville Ditch water rights are relatively minor, and will likely not be taking water during low flow periods when the Environmental Pool flows are in the creek. The aquatic and terrestrial habitats in this area are poor. Riparian areas are mostly privately owned. Ditch modification and habitat improvement may be more difficult due to land issues rather than stream conditions.
7. Howard Ditch* (downstream of South Boulder Road). The Howard Ditch head gate is off to the side of the main flow. However the main channel passes over a channel wide weir with two concrete steps downstream. Providing fish passage appears to be relatively low complexity, with the potential for a grouted rock ramp leading up to the crest of the weir.
8. KOA Lake Outlet (upstream of Valmont Road overpass). The KOA Outlet is a small structure that controls the level of the KOA Lake. No fish passage is envisioned. While the current outlet can manage flow flows adequately, operational improvements are recommended to reduce icing problems at the control structure and improve the ability to more precisely control lake levels and pass low flows.
9. Butte Mill Ditch (immediately upstream from confluence with Boulder Creek). The Butte Mill ditch is used to pass water from Boulder Creek (main stem) upstream of the confluence with SBC, to the Butte Mill ditch. In doing so it creates a complex structure to allow SBC water to pass through to Boulder Creek, and diverted Boulder Creek water to the ditch. Riparian areas are on public and private land. Water management efficiency is low. This structure effectively blocks the migration of fish between Boulder Creek, SBC and KOA lake.

Priority 3 Structures – representing opportunities for habitat improvement and operational efficiency improvements improvement:

10. Davidson Ditch (downstream of Eldorado Springs)
11. Bear Creek Ditch (diversion / return side canal along Prado Road Neighborhood)
12. New Dry Creek #2 (upstream of State Hwy 93)
13. Shearer Ditch (upstream of US 36 / modified for fish passage in the past)
14. South Boulder Canon (upstream of US 36 / modified for fish passage in the past)
15. McGinn Ditch (downstream of US 36 / modified for fish passage in the past)

Priority 4 Structures – representing minimum habitat improvement and / or operating efficiency improvement opportunities

16. Hunter-Hinde Property Diversion Pipe (in-stream pipe diverting water to private pond – just upstream of Baseline Road)
17. KOA Lake Inlet (upstream of Valmont Road)
18. Small concrete drop structure #1 (between Leggett / Jones-Donnelly and KOA Lake inlet)
19. Small concrete drop structure #2 (between Leggett / Jones-Donnelly and KOA Lake inlet)
20. Small concrete drop structure #3 (between Leggett / Jones-Donnelly and KOA Lake inlet)
21. Pipeline (between Leggett / Jones-Donnelly and KOA Lake inlet)

Based on recommendations from CWCB, the originally proposed SMP Phase II project will spin-out the infrastructure preliminary engineering tasks into a separate, but integrated project ("WSR Phase I"). SMP Phase I results provide the basis for the WSR Phase I. WSR Phase I will focus on performing the preliminary

engineering design work on the seven (7) high priority structures. In parallel, SMP Phase II will focus on executing the Communications Plan, closing the data gaps, performing the RHA, and completing flow regime analysis. These SMP Phase II tasks will directly inform WSR Phase I design decisions. The WSR Phase I work will begin later than the SMP Phase II work to allow for the data to be available and not delay engineering design work.

The engineering design work will require the participation of the ditch owners, and that participation is not yet guaranteed. However, gaining their cooperation is the first step in the Communications Plan execution. Many of the identified structures are either majority-owned / operated by our municipal partners, and / or our municipal partners hold significant shares in these ditch companies. This should increase our chances of successfully engaging these stakeholders.

**Task 5.0 – Program Management and Administration**

Phase I program management and project administration followed along typical project management tasks:

- We established a Program Management Office led by the sponsors' representative, a BFC board member and volunteer with extensive program and project management experiences
- After an RFP competitive process, we contracted with a consortium led by Biohabitats Environmental Consultants, and included Wright Water Engineers and GEI Fish Biologists
- Colorado Trout Unlimited (CTU), the CWCB grantee, managed the payment of invoices and collection of cash funds from our funding sources. The program management office provided monthly updates on costs expended and hours worked, matched to invoices. And also tracked work / schedule to date, and estimates to complete, versus budgets
- CTU provided financial reporting to funding sources. While BFC provided interim and final reports
- All major deliverables were reviewed and authorized by a BFC project oversight committee consisting of board members and project volunteers

As of this writing the project is complete, under budget and applying for grant funds for SMP Phase II and WSR Phase I

**Scope of Work Deliverables for Task 5.0 (see Appendix: Supporting Documentation)**

- Grant specific reports
- RFP process
- Biohabitats contract
- Budget reporting
- In-Kind services time sheets and reports

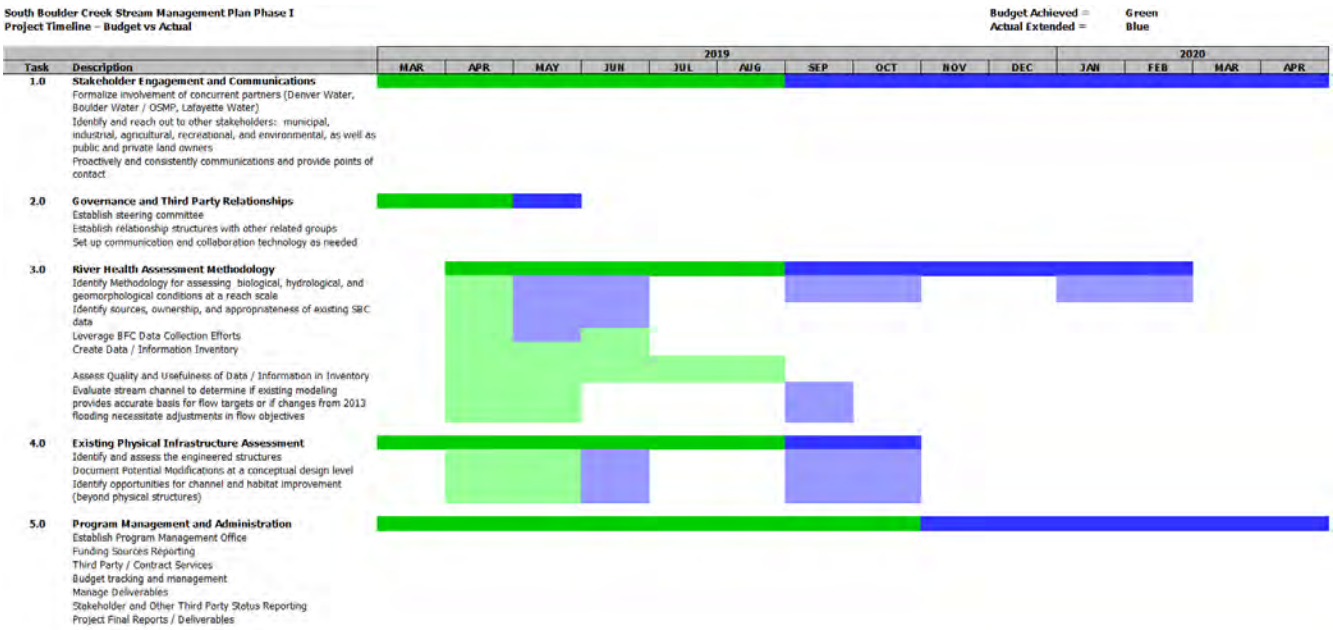
This Final Report, required by CWCB, will be used to complete the reporting requirements to each funding source:

- South Platte Basin Round Table
- Metro Basin Round Table
- Colorado Trout Unlimited
- City of Boulder
- City of Lafayette
- Denver Water

The final report will also be transmitted to CPW, the District Water Commissioner and the Colorado SMP Library.

## 3. Task Completion / Time Line (see Appendix: Supporting Documentation)

As of this writing, the project is complete, under budget and applying / contracting for grant funds for SMP Phase II and WSR Phase I. The project commenced in March 2019, and all field work tasks were completed in November 2019. Consolidation and final analysis of findings, and report writing, were completed from November 2019 to April, 2020. This final report completes the agreed-to scope of work.




Material exceptions to the planned and actual tasks completed are as follows:

- **Task 1.0 – Stakeholder Engagement and Communications**
  - The project team decided to delay this outreach beyond the Steering Committee stakeholders until Phase II (see comments page 5). However, key stakeholders from the Steering committee were actively engaged in providing feedback, priorities, concerns and future plans. This included the City of Boulder Water Utility, City of Boulder Open Space & Mountain Parks, City of Lafayette, and Denver Water
  - In April and May preliminary discussions were held with Eldorado Springs Artesian Water regarding access to their property for assessing the FRICo structure and for establishing flow, temperature and dissolved O2 monitoring. These discussions are on-going.
  - In April and May, preliminary discussions regarding Leggett / Jones Donnelly potential modification were held with Xcel Energy. And in September and October, preliminary discussions were held with Xcel Energy regarding East Boulder Ditch proposed modifications. These discussions are on-going.

- **Task 2.0 – Governance and Third Party Relationships**
  - In hindsight this task should have been combined with Task 1.0. As such the exception narrative in Task 1.0 (above) applies to this task as well
  - There were no material exceptions from the original statement of work

- **Task 3.0 – River Health Assessment (RHA) Methodology**
  - The project team did not make substantial progress in determining how best to normalize the wide array of data available and collected. We did create a meta-data key word list and housed all data

in a common shared repository. We will move to incorporating the data in a searchable database in Phase II

- **Task 4.0: Existing Physical Infrastructure Assessment (see appendix)**
  - There were no material exceptions from the original statement of work

- **Task 5.0 – Program Management and Administration**
  - There were no material exceptions from the original statement of work

*(Continued on next page)*

**4. Budget-to-Actual Project Financial Results (see Appendix: Supporting Documentation)**

The project was completed on time and under budget. Below is a summary of the financial results.

| South Boulder Creek Stream Management Plan Phase I<br>Budget to Actual Financial Summary<br>Under / Over | as of: | 05/31/20 | |
|---|---|---|---|
| | PROJECT ESTIMATE (FUNDED) | ACTUAL | TOTAL VARIANCE |
| **CASH:** | | | |
| Sub Contractor (Biohabitats) | **$85,000** | $83,195 | -$1,805 |
| BFC Admin / Out of Pocket Expenses (5%) | **$5,000** | $2,351 | -$2,649 |
| Contingency (10%) | **$10,000** | $0 | -$10,000 |
| **TOTAL CASH** | **$100,000** | **$85,546** | **-$14,454** |
| **IN-KIND:** | | | |
| CTU / BFC | **$11,000** | $14,494 | $3,494 |
| Municipalities | **$7,000** | $19,925 | $12,925 |
| CSM Student Team | **$20,000** | $20,487 | $487 |
| **TOTAL IN-KIND** | **$38,000** | **$54,906** | **$16,906** |
| **PROJECT TOTAL** | **$138,000** | **$140,452** | **$2,452** |

Each funding source was supporting the project in total, and not by specific task. Therefore, the expected, final funding by source for the project is as follows:

| South Boulder Creek Stream Management Plan Phase I<br>Budget to Actual Financial Summary<br>Funding Source Reconciliation | Final as of: 05/31/20 | | | under / over |
|---|---|---|---|---|
| **FUNDING SOURCES** | **ORIGINAL BUDGET** | **FUNDED** | **ACTUAL** | **VARIANCE to BUDGET** |
| **CASH:** | | | | |
| CWCB | $55,500 | $55,500 | $47,478 | -$8,022 |
| MBRT | $13,500 | $13,500 | $11,549 | -$1,951 |
| SPBRT | $13,500 | $13,500 | $11,549 | -$1,951 |
| CTU / BFC | $17,500 | $17,500 | $14,971 | -$2,529 |
| **TOTAL CASH** | **$100,000** | **$100,000** | **$85,546** | -$14,454 |
| **IN-KIND:** | | | | |
| CTU/ BFC | $9,700 | $11,000 | $14,494 | $4,794 |
| Municipalities | $1,300 | $7,000 | $19,925 | $18,625 |
| CSM Student Team | $0 | $20,000 | $20,487 | $20,487 |
| **TOTAL IN-KIND** | **$11,000** | **$38,000** | **$54,906** | **$43,906** |
| **TOTAL PROJECT** | **$111,000** | **$138,000** | **$140,452** | **$29,452** |

CTU, as the grantee, completed the invoicing and accounting as required by our contract with the State of Colorado.

*(end of report)*

## APPENDIX

**Key Deliverables**

A. Reach Map
B. Summary of Findings and Recommendations
C. Communications Plan (and Supporting Graphic Representation)
D. River Health Assessment Methodology Selection
E. Preliminary Flow Analysis and Cross Section Survey Locations Map
F. Data Inventory
G. Infrastructure Assessment Summary, Evaluation and Detail Assessment / Inventory

**Supporting Documentation**

a. Volunteer / In-Kind Hours Summary
b. Steering Committee Presentations

| Structure | Name | Location | Priority Group |
|---|---|---|---|
| 1 | Community Ditch | 39.932, -105.281 | 1 |
| 2 | Davidson Ditch | 39.939, -105.23 | 3 |
| 3 | Goodhue Ditch | 39.951, -105.242 | 1 |
| 4 | S Boulder Bear Cr Ditch | 39.972, -105.223 | 3 |
| 5 | Dry Creek No 2 Ditch | 39.956, -105.238 | 3 (off-line) |
| 6 | Marshallville Ditch | 39.959, -105.233 | 2 |
| 7 | Schearer Ditch | 39.968, -105.227 | 3 |
| 8 | S Boulder Canon Ditch | 39.953, -105.242 | 3 |
| 9 | McGinn Ditch | 39.981, -105.221 | 3 |
| 10 | New Dry Cr Carrier Ditch | 39.986, -105.221 | 1 |
| 11 | Howard Ditch | 39.989, -105.22 | 2 |
| 12 | East Boulder Ditch | 39.996, -105.216 | 1 |
| 13 | Hunter/Hine Ditch | 40.004, -105.216 | 3 |
| 14 | Legget-Valmont Inlet D | 40.016, -105.214 | 1 |
| 15-18 | Series of concrete weirs and pipe crossings | 40.022, -105.216 | 3 |
| 19 | KOA Inlet | 40.026, -105.217 | 3 |
| 20 | KOA Outlet | 40.029, -105.218 | 2 |
| 21 | Butte Mill Ditch Confluence | 40.031, -105.218 | 2 |

# Colorado Trout Unlimited and Boulder Flycasters
# South Boulder Creek Stream Management Plan Phase I
# Final Report - May 31, 2020

## A. Reach Map

**Note: on this map Priority 3 and 4 structures were combined into the "green" coded priorities**

**Lower South Boulder Creek**

**Diversion Structure Summary**



Structures - Priority Group

1 2 3

Lower South Boulder Creek

0 2,000 4,000 Feet

N

March 2020

Sources: Boulder County, CDSS, ESRI, HERE, Garmin, Intermap, USGS

**Colorado Trout Unlimited and Boulder Flycasters**
**South Boulder Creek Stream Management Plan Phase I**
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## B: SUMMARY OF FINDINGS AND RECOMMENDATIONS

### Communications Plan

1. Status
   A) Complete
   B) Reviewed and approved by Steering Committee
   C) Will Begin Roll-out in Q4 2019 (limited roll out via Steering Committee and Advisors in Q2 2019)
2. Findings
   A) Project has better understanding of the stakeholder groups
   B) Municipal partners are in good position to help provide background on key relationships / points of and facilitate introductions
3. Phase II / Next Steps:
   A) Execute Communications Plan across targeted groups, in order of degree of impact and direct participation in final solutions, are as follows:
      (a) Steering Committee (Direct Project Partners): City of Boulder – Water Utilities Division, City of Boulder – Open Space & Mountain Parks, City of Lafayette – Public Works, and Denver Water ***(began March 2019 – on-going Phases 1&2)***
      (b) Core (Directly Affected) Stakeholders: High Priority Infrastructure Owners (Ditch Companies and Commercial Entities), High Priority Water Rights Owners (Other Private, Industrial, Commercial and Municipal Entities), and Immediately Proximate Land Owners (Industrial) ***(limited communications for Phase 1 and extending and expanding into Phase 2)***
      (c) Secondary (Indirectly Affected) Stakeholders: Other Infrastructure Owners (Ditch Companies and Commercial Entities), Other Water Rights Owners (Other Private, Industrial, Commercial and Municipal Entities), Proximate Private Landowners ***(2020 – Phase 2)***
      (d) Other Related Stakeholders: Conservation / Advocacy / Recreational Groups with a Boulder Watershed Mission, Other Adjacent Private Landowners ***(2020 – Phase 2)***
      (e) General Public as Stakeholder ***(2020 – Phase 2)***
      (f) Advisors stakeholder group: Colorado Water Conservation Board, Colorado Parks & Wildlife, District Water Commissioner, and the Metro and South Platte Basin Roundtables
         - Communication on-going with CWCB, CPW, and the District Water Commissioner (began in March)
         - Update the Basin Roundtables (Nov Q4 – Jan Q4)
         - SBC SMP overview posted to the CWCB sponsored SMP Resource Guide (River Networks) (May 2019) / Final Report May 2020
   B) Communication Plan as "Living Document" – Add to / Update On-Going (2020 forward)

### Data Inventory

1. Status
   A) Inventory of Existing Data / Information Complete and Cataloged
   B) Identification of Remaining Data / Criteria Gaps Completed Relative to RHA Needs; in General:
      (a) Lack of some Historical Data – dry up locations, flow gauge data at needed level of detail, limited location testing, unclear state standards
      (b) Lack of some Objective Measures – professional judgment to be applied
2. Findings:
   A) Project team has a better understanding how this data will be used for:
      (a) Ongoing improvement and monitoring
      (b) The foundation of the River Health Assessment Methodology
      (c) Input for infrastructure modifications
   B) The Steering Committee and their staffs agreed on the RHA methodology components and data sources (July 2019), and provided final comments (October 2019)

C) Specific Data Gap Recommendations
   (a) Phase I Gaps list completed – establishes scope of Phase II (primarily RHA driven)
3. Phase II / Next Steps:
   A) Consensus kick off meeting
   B) Close data / information gaps
   C) RHA and Infrastructure inputs

**Flow Analysis**

1. Status
   A) Complete
   B) Historical Flow Data Collected
   C) DNR / CPW Historical Flow Analysis (sustainable, functioning) Documented
   D) In-Stream Flow Right in Process (between Boulder and CWCB)
   E) R2X Data Collected at 4 Sample Locations and Analyzed
   F) Received Cross Section Information from DHI hydraulic model – Analysis Completed in September
2. Findings
   A) Historical Flows from multiple State and Municipal studies are within reasonable statistical range.
   B) This creates a good data set for minimum flow targets
   C) Limitations / Gaps: See Data Inventory – Lack of historical data and objective measures
      (a) Data is not at the sub-reach level, nor was it consistently collected for this reach over history.
      (b) Gauges were blown out in 2013 flood and only one replaced so far, creating another histrionic data gap
3. Phase II / Next Steps
   A) Consensus kick off meeting
   B) Complete point flow analysis for project reach
   C) Develop highest practical flow scenario
   D) Assess flow parameters as part of RHA

**River Health Assessment Methodology**

1. Status
   A) Matrix of RHA Categories and Components Complete
   B) Data Sources Identified - ~80% Complete (remaining to be closed in Phase II – see above)
   C) Assessment Criteria - ~80% Complete (remaining to be closed in Phase II – see above)
2. Findings
   A) Limitations / Gaps need to be filled to be able to complete RHA: See Data Inventory – Lack of historical data and objective measures
   B) Three levels of assessment identified – base case, Environmental Pool benefit, highest practical benefit
3. Phase II / Next Steps
   A) Close Data / Criteria Gaps required for RHA (see Data Analysis) and Adding Recreational Category (State Water Plan Goals)
   B) Consensus kick off meeting to finalize Methodology
   C) Conduct RHA across the three assessment levels (base, EP benefit, highest practical benefit (i.e., self-defined “reference reach” exercise based on professional judgment)
   D) Performing the River Health Assessment – Biological, Hydrological and Geomorphological through minimum three iterations – desktop with data; field observations to update data; desktop with full data set; repeat as needed
   E) Confirming In-Stream Flow Targets (Environmental Pool and Highest Practical Levels) will be a key input
   F) Defining monitoring requirements, and associated benefits

**Structures Assessment Methodology**

1. Status
   A) Structures Documentation Completed by Colorado School of Mines Student Team, and Reviewed and Confirmed by Project Team
   B) Structures Assessment and Prioritization is Complete
   C) Final Assessment / Priorities completed
2. Findings
   A) Phase I Confirmed / Updated Previous Physical Structures Inventory Prepared by BFC in 2018
   B) Phase I raised questions regarding how Far to Go in Defining / Creating Preliminary Engineering Design for Priority 1 Structures
   C) 21 Structures Identified, Cataloged and Assessed for Low-Flow Capability, Channel Connectivity / Fish Passage, Operational Efficiency and Proximate Habitat Improvement
   D) Five structures ("Priority 1") inhibit low flow passage and administration by district water commissioner. There are also opportunities for channel connectivity / passage, habitat improvement and operational efficiency improvements
      i. FRICo ("Community Ditch") Check Structure (Mouth of Eldorado Canyon) -High Complexity
      ii. Goodhue Ditch (Upstream of HWY 93) – Low Complexity
      iii. New Dry Creek Carrier Ditch (Downstream of South Boulder Road) – High Complexity
      iv. East Boulder Ditch (Upstream of Baseline Road) - Preliminary Engineering Design Existing – Moderate to High Complexity
      v. Leggett Inlet / Jones-Donnelly Diversion (Downstream of Arapahoe Road) – Moderate Complexity
   E) Four Structures ("Priority 2") represent opportunities for channel connectivity / passage, habitat improvement and operational efficiency improvements
      i. Marshallville Ditch
      ii. Howard Ditch
      iii. KOA Lake Outlet
      iv. Butte Mill Ditch
   F) Eleven Structures ("Priority 3") represent opportunities for habitat improvement and operational efficiency improvements improvement
      i. Davidson Ditch
      ii. Bear Creek Ditch
      iii. Dry Creek #2 Ditch
      iv. Shearer Ditch
      v. South Boulder Canon
      vi. McGinn Ditch
      vii. Hunter
      viii. KOA Inlet
      ix. to xii. Three (3) small concrete drop and 1 pipe obstructions between Leggett / Jones-Donnelly and KOA Lake inlet

3. Phase II / Next Steps
   A) Focus on Priority 1 Physical Infrastructure Modifications Requirements – Low-Flow Capability, Channel Connectivity / Fish Passage, Habitat Improvement and Operational Efficiency (see above list)
   B) Scope of work to include two, complex, Priority 1 structures (ex: New Dry Creek Carrier and East Boulder) taken to a ~20% preliminary design level to facilitate fast transition to a design-build project

C) Scope of work to include three, lower complexity, Priority 1 structures (ex: Goodhue, Leggett, FRICo / Community) taken to a ~10% preliminary design level to facilitate fast transition to a design-build project
D) Scope of work to include two, Priority 2 structures to level of engineering notes, rough drawings and photos (ex: Marshallville, Howard)

**Colorado Trout Unlimited and Boulder Flycasters**
**South Boulder Creek Stream Management Plan Phase I**
**Final Report**

## C. Communications Plan

### The Purpose of This Document

The purpose of this Communications Plan is to outline the process and messaging to engage the broad range of stakeholders. These stakeholders are either directly or indirectly impacted by recommendations from the Phase I SMP. The communication plan will also support associated design / build / implementation projects that are recommended by and spin out of the over SMP process.

Most of the work in the SMP Phase I was focused on identifying stakeholder groups, developing an inventory of existing data / information sources, selecting assessment methodologies, cataloging physical infrastructure within the stretch, and performing preliminary assessments of physical structures and flow requirements. As such, there is not much to communicate as there are few actionable recommendations resulting from the SMP Phase I work. During the SMP Phase I we did developed preliminary recommendations / priorities for physical infrastructure modifications. Specifically, Xcel Energy participated in the Colorado School of Mines student design project for East Boulder Ditch, and discussions regarding land access around Leggett / Jones-Donnelly. We reached out to Eldorado Artesian Water Company regarding private land access permission near the FRICo check structure. (see "Core Stakeholders" in this document.)

As a result of the SMP Phase I, we are dividing the recommended next steps between the remaining SMP tasks (in a separate SMP Phase II grant application) and the engineering / design and structural tasks (in a separate Watershed Restoration (WSR) grant application). Execution of the Communications Plan beyond the SMP Phase I will support both projects.

Going forward we will move from the planning stage to the execution stage. For the SMP Phase II this will include: filling data gaps through field work and analysis, RHA assessment execution, and active stakeholder outreach. For the WSR Phase I project this will include operational and engineering design recommendations, and associated design-build projects going forward. As these concrete recommendations emerge, the Communications Plan will be executed in support of informing stakeholders, listening to needs and building consensus for action.

The Communications Plan is intended to the a "living" document. It will guide the work of Boulder Flycasters ("BFC") / Colorado Trout Unlimited ("CTU") and their consultant team, and evolve over time based recommended future projects, municipal partner guidance and feedback from the stakeholders.

## The Stakeholders

The knowledge, input, and ideas of the people and organizations whom care about and know South Boulder Creek must be at the foundation of the SMP and associated implementation projects. Clearly there are many organizations and individuals that are stakeholders, ranging from those directly impacted by any SMP recommendations, to the general public that may only have a casual interest in the SMP. In Phase I we identified the following stakeholder cohorts:

- Steering Committee (Direct Project Partners)
- Core (Directly Effected) Stakeholders
- Secondary (Indirectly Effected) Stakeholders
- Other Related Stakeholders
- General Public as Stakeholder

There also organizations that are providing support, funding and expertise (collectively referred to as "Advisors") that need to be within the overall stakeholder set.

### Steering Committee (Direct Project Partners)

The dedication and cooperation of a core group of water users / landowners is largely responsible for this project becoming a reality. This group of directly involved partners is known as the Steering Committee. The Steering Committee meets regularly and dives more deeply into the process and recommendations with the consultant team and BFC / CTU. The Steering Committee members also provide staff support for various tasks defined in the Scope of Work. In addition to providing information vital to the project, the Steering Committee works to refine ideas and converge or agree on specific actions or approaches. During Phase I, the Steering Committee was the most active stakeholder group and played a key role in guiding the project. We expect this group to continue forward into future Phases. It consists of the following individuals:

1. Joanna Bloom, Special Projects, City of Boulder Public Works Water Utility ("Boulder Water Utility")
2. Laila Parker, Source Water Administrator, Boulder Water Utility
3. Don D'Amico, Ecological Stewardship / Wetland Ecology, City of Boulder Open Space & Mountain Parks ("OSMP")
4. Melanie Asquith, City of Lafayette Water Dept Capital Projects and Engineering ("Lafayette Water Utility")
5. Travis Bray, Denver Water Gross Reservoir Expansion Project Office
6. Stephen Brant, Chair and Sponsor's Representative, BFC / CTU
7. Gary Swanson, BFC
8. Mike Lighthiser, Project Manager, Biohabitats, Inc.

| Phase II Activity Per Person / Entity – Steering Committee Members (or their staffs) | Hours |
|---|---|
| One kick off meeting and three progress meetings (3 hours per meeting x 4 meetings) | 12 |
| Participation in Core Stakeholder meetings (2 hours) | 2 |
| Participation in Secondary Stakeholder meetings (2 hours) | 2 |
| Additional time assisting project – will vary from one member to another | varies |
| TOTAL ESTIMATED HOURS | 16+ |

Examples of the type of assistance from this group may include the following items:

- Project Scope
- Assessment
- Recommendations
- Deliverables Execution/Advisory

Timing: Ongoing for project duration

**Core (Directly Effected) Stakeholders**

The Core Stakeholders group consists of high priority infrastructure owners (ditch companies and commercial entities), as well as high priority water rights owners (other private, industrial, commercial and municipal entities), and immediately proximate landowners (industrial) directly effected by SMP recommendations. We will engage these stakeholders early in Phase II. And then ramp up efforts to maintain regular contact. Since stakeholders are extremely busy and have limited available time in their respective schedules, meetings and other engagement efforts will likely be one entity / person at a time. We will work to have meetings with a larger group at key points in the process.

The owners of the seven (7) "high priority structures" are in this group. These are the structures culled from our structures assessment work in Phase I for recommended improvement projects in Phase II. Five (5) of these structures were identified as "Priority 1" structures, based on limited / no ability to allow low flow passage, and to support administration of flows by the District Water Commissioner. Another two (2) structures from the "Priority 2" group were added based on ability to significantly increase channel connectivity.

The structures that have been identified as high priority (proposed modifications) are as follows (in upstream to downstream order):

1. Community Ditch – Farmers Reservoir and Irrigation Company (FRICo)
    - Contact: Scott Edgar, 303-659-7373
    - Ditch Rider: Larry Lewis, 303-961-8046(c), 303-659-7373(o), larryfrico@wildblue.net
2. Goodhue Ditch
    - President: Melanie Asquith (City of Lafayette), 303-661-1279, melanie.asquith@cityoflafayette.com

- Secretary: Dmitry Tepo, 303-335-4607, dmitryt@louisvilleco.gov
- Ditch Rider: Larry Lewis, 303-961-8046 (c), 303-499-1249(o), larryfrico@wildblue.net

3. Marshallville Ditch
   - President: Tim Dufficy, tim@cdironworks.com
   - Head-gate Superintendent: Kristyna Shanahan, 303-570-3145, ranchersdaughter@msn.com
   - Secretary: Linda Biella, 303-460-9244, 303-818-4519, andersonbiella@comcast.net
4. New Dry Creek Carrier Ditch
   - President: C.D. Bodam, 303-444-5340 ext 113, cdb@RMSBoulder.com
   - Secretary: Melanie Asquith (City of Lafayette), 303-661-1279, melanie.asquith@cityoflafayette.com
   - Ditch Rider: Bob Juhl, 303-359-8284, boblj21@aol.com
5. Howard Ditch
   - President: Jeanette Hillary, 303-494-7718
   - Superintendent: Bob Juhl, 303-359-8284, boblj21@aol.com
6. East Boulder Ditch
   - Rich Belt, Water Resources Lead, Xcel Energy, 970-222-7681, richard.l.belt@xcelenergy.com
7. Leggett-Valmont Inlet D (Jones-Donnelly)
   - Rich Belt, Water Resources Lead, Xcel Energy, 970-222-7681, richard.l.belt@xcelenergy.com

In addition, the Core Stakeholders with high priority water rights, augmentation requirements, and / or immediately proximate private land ownership will include the following organizations due to their overall importance to the project:

- Boulder County – owns significant water rights in the reach, and associated with these structures
- City of Louisville – the Louisville water utility diverts water to their pipeline at the FRICo check structure
- Private Landowners immediately proximate to Marshallville Ditch
- Eldorado Artesian Water – owns land around and downstream of the FRICo check structure
  - Doug Larsen, President, 303-604-3012, doug@eldoradosprings.com

| Phase II Activity Per Person / Entity | Hours |
|---|---|
| Engagement following initial assessment (2 hours per stakeholder x 11 stakeholders) | 22 |
| Regular contact through project (2 hours per stakeholder x 11 stakeholders) | 22+ |
| Meeting to review recommendations (2 hours per stakeholder x 11 stakeholders) | 22 |
| TOTAL ESTIMATED HOURS | 66+ |

Examples of the type of input from this group may include the following items:

- Operational Needs (strengths, weaknesses, threats, opportunities)
- Recommendations Buy-In

Timing: Expect to reach out to Core Stakeholders early in the Phase II process. This should also be after the irrigation season when personnel may be more readily available.

**Secondary (Indirectly Effected) Stakeholders**

The Secondary Stakeholders group consists of other infrastructure owners (ditch companies and commercial entities), other water rights owners (other private, industrial, commercial and municipal entities), and other proximate private landowners within the stretch of SBC in the scope of this project, but indirectly impacted by any recommendations. We believe that engaging this group of stakeholders will be important to consolidate community consensus. We will inform / educate and solicit feedback from this group. This group will consist of individuals yet to be determined from the following categories:

1. Remaining Ditch Companies within lower SBC stretch of SMP
    - Davidson Ditch
    - Bear Creek Ditch
    - Dry Creek #2 Ditch
    - Shearer Ditch
    - McGinn Ditch
    - South Boulder Canon Ditch
    - Hunter Hine (in-stream pipeline to private pond / land owner)
    - KOA Lake Inlet
    - KOA Lake Outlet
    - Butte Mill Ditch
2. Landowners Proximate to any Structural Changes (examples)
    - Prado Neighborhood (between Eldorado Springs and CO HWY 93) – proximate to Goodhue Ditch
    - Commercial entities near Leggett-Valmont / Jones-Donnelly
3. Any Significant Water Rights Owners / Operators not Represented by Ditch Companies (examples)
    - Eldorado Springs Local Improvement District – waste water treatment / return flows
    - Martin Marietta Aggregate Mining (KOA Lake outlet pumping station and Butte Mill)

| Phase II Activities Per Person / Entity | Hours |
|---|---|
| Engagement at preliminary recommendations stage (2 hours per stakeholder x 14 stakeholders) | 28 |
| Final results reviews (1 hour per stakeholder x 14 stakeholders) | 14 |
| TOTAL ESTIMATED HOURS | 42 |

Examples of the type of input from this group may include the following items:

- Project Objectives/Process
- Solicit Interest and Concerns
- Direct Results Communication

Timing: Q1 of CY 2020 once final project reports are completed.

**Other Stakeholders**

As this project progresses, it is likely that other conservation, advocacy, and / or recreational groups with a Boulder watershed mission, as well as, other adjacent private landowners will be important to building broader understanding and consensus. This group will consist of entities / individuals yet to be fully determined. We engaged some conservation groups in Phase I. These contacts were primarily status and information sharing, to date. We will engage these stakeholders directly regarding project objectives after funding for Phase II is secured. And solicit feedback during Phase II.

| Phase II Activities Per Entity (estimated @ 8 entities) | Hours |
|---|---|
| Engagement at preliminary recommendations stage (2 hours per stakeholder x 8 stakeholders) | 16 |
| General communication over 18 months (2 hours per stakeholder x 8 stakeholders) | 32 |
| **TOTAL ESTIMATED HOURS** | 48 |

Examples of the type of interaction from this group may include the following items:

- Direct Engagement/Communications of Project Results and Next Steps
- Solicitation of Interest and Concerns

Timing: Q2 of CY 2020 after Phase II funding

**General Public**

South Boulder Creek is a valuable asset not only to the stakeholders described above, but also to the larger community in this watershed. These creeks and riparian areas provide recreational opportunities to residents,

habitat for wildlife, ecosystem services like clean drinking water and flood attenuation, and many other important and treasured services. For this reason, the broader community voice must be a part of this SMP. However, Phase I, which is basically an assessment of existing conditions, is too early in the process to bring in the diverse opinions of the wider community. The SMP process will engage the broader community as needed during Phase II, before final decisions are made on future opportunities.

| Phase II Activities Per Person / Entity | Hours |
|---|---|
| Indirect engagement through PR or web-based communications per group | 1+ |
| Individual contact during field visits | varies |
| TOTAL ESTIMATED HOURS | 1+ |

Examples of the type of interaction from this group may include the following items:

- Indirect Communications of Results and Next Steps
- Process for Input

Timing: As needed and as requests received, or events unfold (ex: press contact, local municipality request, etc.). Proactive communications will require Phase II funding to be available to produce any meaningful, generally available results (ex: website). Final reports will be in the public domain once submitted to CWCB.

**Advisors**

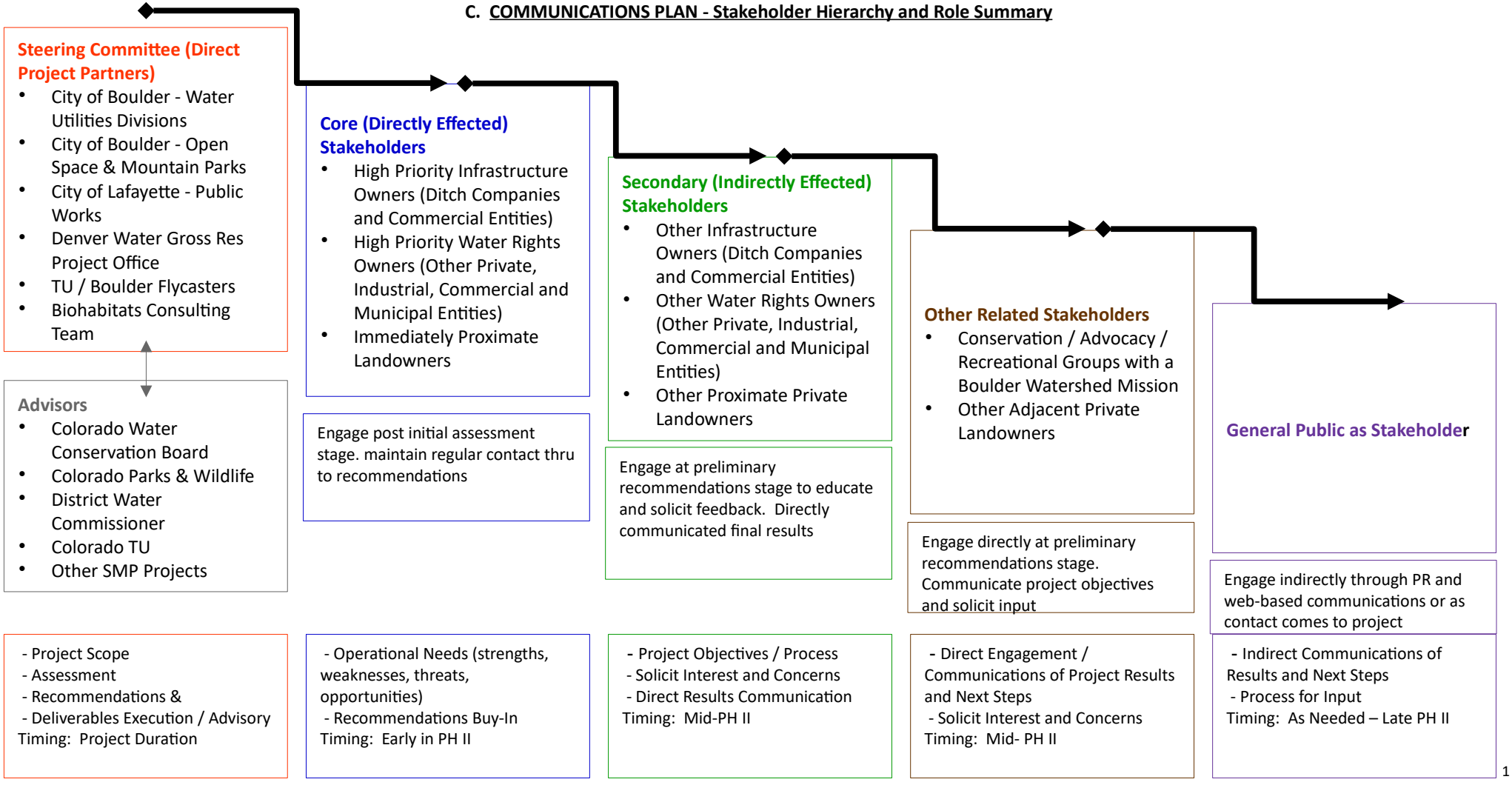
Due to their existing authority or position, a small group will play the role of project Advisors. This group will consist of representatives from state agencies (Colorado Parks & Wildlife (CPW) and Colorado Water Conservation Board (CWCB – also is major granter for this project)), as well as the District 6 Water Commissioner and other select stakeholders:

- Bob Carlson, District 6 Water Commissioner (engaged)
- Linda Bassi, Colorado Water Conservation Board (engaged)
- Chris Sturm, Colorado Water Conservation Board (engaged
- Katie Birch, Colorado Parks & Wildlife (engaged)
- Amy Willhite, City of Boulder OSMP (engaged)
- Dave Nickum, Colorado Trout Unlimited (engaged)

The time commitment of the advisors will vary depending on the needs of the project.

**Colorado Trout Unlimited and Boulder Flycasters**
**South Boulder Creek Stream Management Plan Phase I**
**Final Report - May 31, 2020**

## C. COMMUNICATIONS PLAN - Stakeholder Hierarchy and Role Summary



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**C. COMMUNICATIONS PLAN - Stakeholder Hierarchy and Role Summary**

### Steering Committee

- **Joanna Bloom - BWUD**
- **Laila Parker - BWUD**
- **Don D'Amico – BOSMP**
- **Melanie Asquith - LPW**
- **Travis Bray - DW-GRPO**
- **Stephen Brant. Chair and Sponsors Representative - TU/BFC**
- **Gary Swanson – TU/BFC**
- **Mike Lighthiser – Project Manager - BiohabitatS**

### Core (Directly Effected) Stakeholders

- FRICo / Community Ditch
- Goodhue Ditch
- Marshallville Ditch
- New Dry Creek Carrier Ditch
- Howard Ditch
- East Boulder Ditch
- Leggett Inlet / Jones-Donnelly - Xcel Energy
- Boulder County - Ditch Owner / Water Rights
- Eldorado Artesian Water Company - landowner / augmentation requirements
- City of Louisville – municipal water utility
- Marshallville Ditch - immediately proximate landowners

### Secondary (Indirectly Effected) Stakeholders

- Remaining Ditch Companies on SMP Reach (10 from field assessment)
- Other Landowners Proximate to Any Structural Changes:
  - Prado Neighborhood – near Goodhue
  - Commercial Entities – near Leggett Inlet
- Other Significant Water Rights Owners not Represented by Ditch Companies:
  - Eldorado Springs Local Improvement District – Waste Water Treatment
  - Martin Marietta Aggregate Mining

### Other Related Stakeholders

- Conservation / Advocacy / Recreational Groups with a Boulder Watershed Mission (TBD)
- Other Adjacent Private Landowners (TBD)

### General Public as Stakeholder

### Advisors

- Chris Sturm – Colorado Water Conservation Board
- Linda Bassi - Colorado Water Conservation Board
- Katie Birch - Colorado Parks & Wildlife
- Bob Carlson - District Water Commissioner
- Amy Willhite, City of Boulder OSMP
- David Nickum - Colorado TU
- Other Select Stakeholders (as appropriate)

**Colorado Trout Unlimited and Boulder Flycasters**
**South Boulder Creek Stream Management Plan Phase I**
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**D: River Health Assessment Methodology / REV 2.2**

| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| **HYDROLOGY** | FLOW REGIME | Compare ratio of existing vs. natural conditions for following items:<br>-Mean Annual Q<br>-Mean Aug Q<br>-Mean Sept Q<br>-Mean Jan Q<br>-Mean Annual Peak Daily Q (NEED DAILY FLOWS)<br>-7-Day Min. (NEED DAILY FLOWS) | Lower SBC flow from StateMod<br><br>Current flow data from USGS and UDFCD gauges<br><br>New data collection from Boulder flow gauge at S. Boulder Road, and new staff gauges at Dry Creek Carrier and Leggett | Few gauges below Eldorado Springs with limited length of record (mostly post-flood)<br><br>Monitoring locations up stream of the lower stretch of limited value due to large diversion points in lower stretch<br><br>StateMod flow provides both existing and natural, but as monthly (not daily) averages – extra work required to estimate daily flows | <10% change is highly functioning<br><br>For low flows: Environmental Pool 2010 IGA flow agreements set minimum "acceptable" threshold and CPW biological recommendations set higher threshold<br><br>>20% change is significant<br><br>>50% change is non-functioning |
| | FLOW REGIME | Dry up locations | StateMod<br><br>Stakeholder observations<br><br>Known locations below structures that sweep creek (Water Commissioner) | Data may be spotty and mainly observational in nature | Occurrences could be used to modify result of earlier flow regime category (above) |
| **WATER QUALITY** | WATER QUALITY – aquatic habitat | Dissolved Oxygen: Sampling requires that a DO logger be deployed for at | Boulder Water Quality Lab data from 10/2013 to 12/2018 – annual | Sampling protocols need to be followed to be compatible with scoring criteria; they | Dissolved Oxygen:<br>>9 mg/l high functioning<br>8-9 mg/l functioning |

| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| | | least one week during the summer months of July or August recording at least daily measurements between one and three in the afternoon<br><br>Temperature: Daily maximum (DM) = highest 2-hour average temperature recorded during a given 24-hour period during months of July and August with a maximum sampling interval of 30 minutes<br>Maximum Weekly (MWAT) = largest weekly average temperature in months of July and August; weekly average is average of daily average temperatures over a 7-day consecutive period | testing at site upstream of US36 crossing<br><br>TU started collecting air and water temperature data at 4 locations along Lower SBC in March 2018 using data loggers; DO to be added in late 2019; 5th location desired near FRICo structure, but permission needed from landowner | are not currently being followed.<br><br>Data will be available at 4 (maybe 5) locations along lower reach. | 7-8 mg/l part functioning<br>6-7 mg/l low functioning<br><6 mg/l not functioning<br><br>Temperature:<br>Cold and warm stream habitat delineated by South Boulder Rd *(from pg 333 of CDPHE Regulation No. 38)*<br><br>Cold stream:<br>DM – threshold 23.9C<br>MWAT –<br>Optimum 16.6<br>Threshold 18.3<br><br>Warm stream:<br>DM – threshold 28.6C<br>MWAT –<br>Optimum 22.5<br>Threshold 27.5 |
| | WATER QUALITY – metals | Metals:<br><br>CDPHE identified issues with Copper | According to REGULATION #93 – COLORADO'S SECTION 303(D) | Exact location and frequency of measurements are not clear. | High functioning: not applicable<br>Functioning: not listed on 303D |

| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| | | (dissolved) and Arsenic (total) in reach between Gross Reservoir and South Boulder Road | LIST OF IMPAIRED WATERS AND MONITORING AND EVALUATION LIST 5 CCR 1002-93<br><br>Lower SBC is divided as follows: COSPBO05b_B – Outlet of Gross Reservoir to South Boulder Road COSPBO05_A – South Boulder Road to confluence with Boulder Creek<br><br>Also need to check with Boulder Water Quality Lab | State limits and monitoring criteria are difficult to follow – need to learn more. | Partly functioning: 303D for monitoring and evaluation<br>Low functioning: 303D for TMDL<br>Not Functioning: not applicable<br><br>Arsenic (total chronic) threshold = 0.02 ug/L<br><br>Copper (dissolved) |
| **LANDSCAPE** | BUFFER CAPACITY | System's ability to buffer stream and riparian function (laterally) | Aerial photography, Field observation | Need to set distance from riparian zone that will be assessed – was 200 m for Yampa (bigger system) and define "high-intensity" uses | Negligible – no appreciable land use change<br>Mild – high-intensity land uses<10%<br>Significant – high-intensity uses 10-40%<br>Severe – 40-75%<br>Profound - >75% |
| | TERRESTRIAL CONNECTIVITY | Impairment to migration and dispersal of terrestrial organisms into and out of the reach | Aerial photos, Field observation, mapping | Need to determine habitat connectivity envelope; Yampa used 500 meters out from the riparian zone | Percent of habitat loss (isolated):<br><10%<br>10-25%<br>25-50%<br>50-75% |

| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| | | based on the loss of habitat and dispersal/migration barriers within a habitat connectivity envelope | | | >75% |
| | AQUATIC CONNECTIVITY | Impairment of migration/dispersal to adjacent stream reaches | Aerial photos/map with structures<br>Field observations, mapping | Other assessments set an arbitrary distance to evaluate impact of structures. For this project, we will look into using the number of reaches that separate closest structure from the reach under evaluation. This metric will be further developed at the beginning of Phase II. | Negligible – no significant barriers throughout entire system<br>Mild – impermeable barriers 10 miles away or just minor barriers<br>Significant – Impermeable barriers 5 miles away or multiple minor barriers in reach or adjacent reaches<br>Severe – Impermeable barriers or severe impediments in reach or adjacent reaches<br>Profound – isolated reach |
| **HYDROLOGY/RIPARIAN ATTRIBUTES** | FLOODPLAIN CONNECTIVITY (moved from Hydrology to Riparian Attributes) | Compare peak flows for 1.01-, 1.5-, 2-, and 5-year flow events for existing vs natural conditions | Pre-1936 Eldorado Gage data for natural conditions – can apply to entire reach<br><br>Existing peak flows dependent on upstream | Existing conditions downstream of Eldorado Gage not readily available – peak flows will need to be estimated from results of hydrologic analysis | Grade function level based on percent change from natural.<br><br>For example:<br><10%<br>10-20%<br>20-33%<br>33-50% |

| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| | | | structures | Natural condition channel and floodplain elevations not available – will not bother with quantifying floodplain changes. "Landscape" parameters will help account for changes in floodplain. | >50% |
| **RIPARIAN ATTRIBUTES** | RIPARIAN CONDITION | Assess woody vegetation extent/succession, wetland extent/quality, rare and protected species, invasive species. | Field observation<br>Aerial imagery | Existing data does not consistently cover entire reach.<br><br>Depends on professional judgment | Level of degradation:<br>Negligible<br>Mild<br>Significant<br>Severe<br>Profound |
| | ORGANIC MATERIAL | Wood & Detritus | Field observation | No reference condition – based on professional opinion | Estimated decrease from natural:<br><10% - no real change<br>10-25% - minimum change<br>25-50% - significantly limited<br>50-80% - seriously limited<br>>80% - nonexistent |
| **GEOMORPHOLOGY** | MORPHOLOGY | Dimension | Width/Depth ratio is key parameter. Cross section data from various sources incl. hydraulic model. Field observation. | Don't have natural condition for comparison – use professional judgment | Exact criteria TBD. Use different ranges of W/D for negligible, mild, significant, severe, and profound degradation level |
| | | Profile | Presence and | Need to refine | No structures in reach |

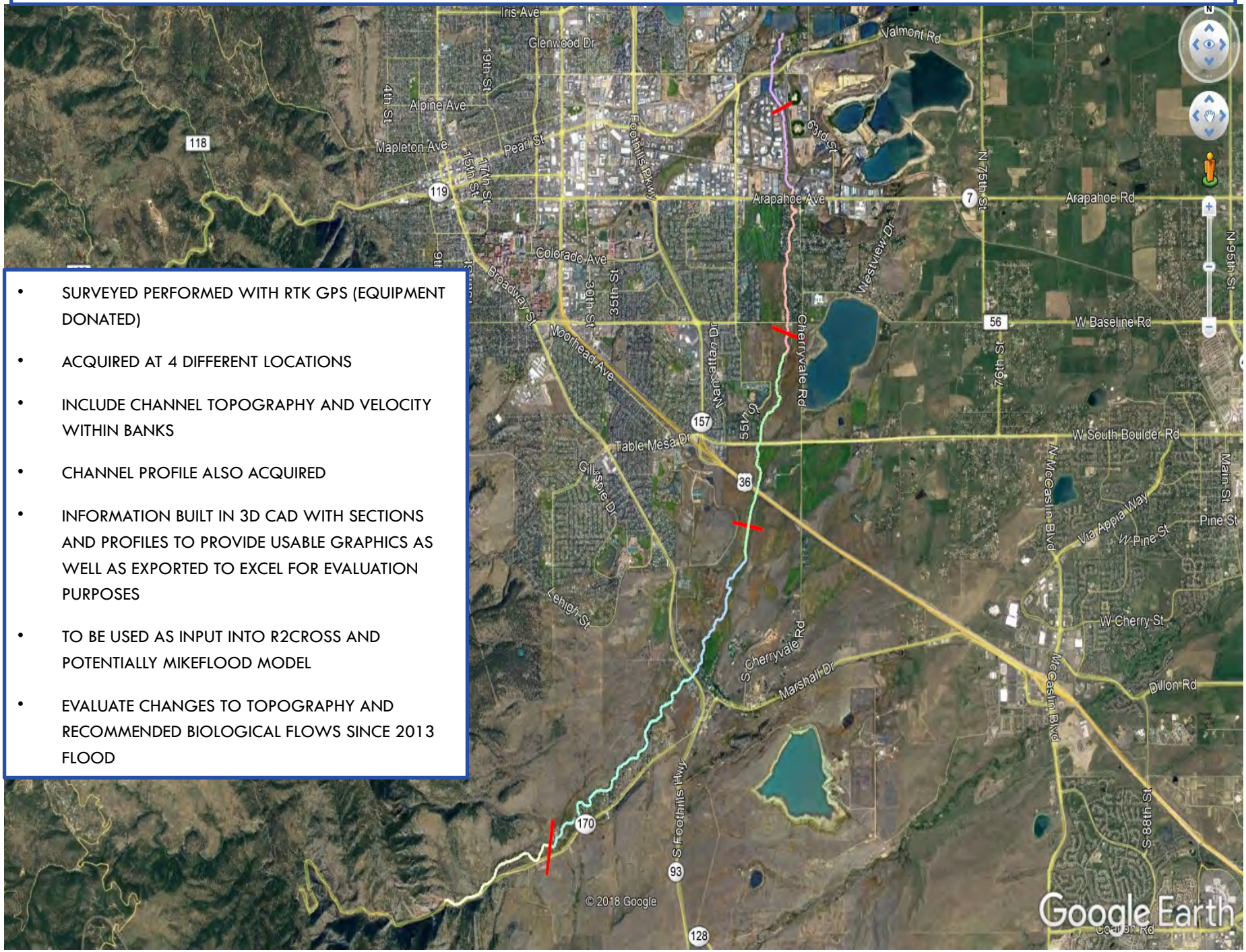
| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| | | | extent of grade control structures | criteria | – negligible<br>One structure upstream only – mild<br>One structure downstream – significant<br>Multiple structures – severe<br>Structure causes permanent ponding – profound |
| | RESILIENCY | Resistance – extent of woody vegetation along bank | Field observations | Professional judgment | TBD |
| | | Equilibrium – floodplain connectivity | Frequency of overbank flow | Need hydraulic model | Negligible – overbank flow at or below 1.01-year flow<br>Mild – overbank flow between 1.01- and 2-year flow<br>Significant – overbank flow between 2- and 5-year flow<br>Severe – overbank flow between 5- and 10-year flow<br>Profound – overbank flow > 10-year flow |
| | PHYSICAL STRUCTURE | Macro- and Micro-habita | Field Assessment – method developed by Ashley | Professional judgment | Rating of 1-5 based on partitioning analysis, with 5 being high-functioning and 1 being low functioning. |

| Data Category | RHA Component | Measurement Type | Data Source & Notes | Uncertainty, Data & Information Gaps | Criteria (Draft) |
|---|---|---|---|---|---|
| **RECREATIONAL** | Hiking / Running<br>Biking<br>Boating<br>Fishing<br>Open Space/Park<br>Other | Number of Recreational Users by Type | City of Boulder OSMP | Information may be focused in protected open space/parks and not available for other areas along reach. | Trend lines |

**OTHER NOTES:**

1. EPA Rapid BIO Assessment Tool – might be a good source for additional methodology details
2. Mile High Flood Control District – identified needed future projects within the watershed – especially downstream of Arapahoe Avenue

**COLORADO TROUT UNLIMITED AND BOULDER FLYCASTERS**
**SOUTH BOULDER CREEK STREAM MANAGEMENT PLAN PHASE I**
**FINAL REPORT**
**E: CROSS SECTION SURVEY LOCATIONS MAP**




- SURVEYED PERFORMED WITH RTK GPS (EQUIPMENT DONATED)
- ACQUIRED AT 4 DIFFERENT LOCATIONS
- INCLUDE CHANNEL TOPOGRAPHY AND VELOCITY WITHIN BANKS
- CHANNEL PROFILE ALSO ACQUIRED
- INFORMATION BUILT IN 3D CAD WITH SECTIONS AND PROFILES TO PROVIDE USABLE GRAPHICS AS WELL AS EXPORTED TO EXCEL FOR EVALUATION PURPOSES
- TO BE USED AS INPUT INTO R2CROSS AND POTENTIALLY MIKEFLOOD MODEL
- EVALUATE CHANGES TO TOPOGRAPHY AND RECOMMENDED BIOLOGICAL FLOWS SINCE 2013 FLOOD

**Colorado Trout Unlimited and Boulder Flycasters**
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## E: Flow Assessment

### Overview

Minimum flows necessary to support fish populations have been evaluated using R2Cross methods several different times over the last 40 years. Examples of these efforts include CDOW's work that led to in-stream flow recommendations in 1980 and Hydrosphere's 1994 re-analysis of the CDOW data along with newer information from a 1992 study. As part of Phase I of the South Boulder Creek Stream Management Plan (SBC SMP), there was interest in checking how those past results might compare to more recent conditions, particularly considering that the channel experienced a significant flood event in 2013. This analysis was meant to be a check on past results, not a re-analysis to update or replace past results.

### Methods

During the spring of 2019, the consultant team for the SBC SMP performed cross sectional surveys at four locations along South Boulder Creek using RTK GPS equipment with sub-centimeter accuracy and a USGS wading rod with velocimeter. This information provided the cross-sectional area and velocity to allow calculation of the flow rate on that day for each cross-section location. The team also surveyed the channel's profile. The USGS wading rod and velocimeter data were entered and evaluated in Excel, and cross sections and profiles developed in a computer-aided drafting program. Following previous studies, the lowest flow to meet two of the parameters (depth, wetted perimeter, and velocity) was considered the winter minimum while the lowest flow to meet three of the parameters was considered the summer minimum. We grouped results by location, with South Boulder Road forming the border for the upper and lower reaches, as defined in the earlier studies. In developing findings we are comparing measurements to CDOW established criteria for depth, wetted perimeter, and velocity.

### Results

The table below, provided by the City of Boulder, compares past studies. We added the bottom row showing results from the SMP. Considering the potential variability possible with R2Cross, particularly regarding the selection of a representative critical riffle, which sets the channel geometry and bank-full top width (the big drivers of the model), the estimated flows from the different studies are similar. In particular, the R2Cross results that we completed as part of this SMP fall within the range already established by past efforts."

| **Stream Flow Studies, Recommendations and Targets** *(see notes below; all values in cfs)* | | **SUMMER** (May – Sept) | | **WINTER** (Oct – Apr) | |
|---|---|---|---|---|---|
| | | **UPPER** | **LOWER** | **UPPER** | **LOWER** |
| (1) | Range of instream flows indicated by CDOW R2 Cross studies. | 22 - 38 | 1.6 - 5.8 | 4.5 - 6.3 | 1.5 - 2.5 |
| (2) | 1982 CDOW Instream Flow Recommendations | 15 | NA | 8 | NA |
| (3) | 1992 Preliminary CDOW Minimum Flow Recommendations | 17 | 4 | 9 | 2 |
| (4) | CWCB Instream Flow Right | 15 | NA | 2 | NA |
| (5) | Gross Environmental Pool IGA average year target flows | 10 | 4 | 7 | 2.5 |
| (6) | 2019 SMP Phase I R2 Cross Assessment | 10.9 - 16.6 | 2.3 | 4.6 - 8.0 | 2.0 |

*Notes for Table:*

*(1) Results of CDOW R2 Cross analysis of South Boulder Creek at two Upper Reach locations: the Dunn Property (1976), and 200 yards above South Boulder Road (1980); and two Lower Reach locations: below South Boulder Road (1980), and 200 yards upstream of Baseline Road (1980). Summer flows meet all three CDOW-established criteria of average depth, wetted perimeter and average velocity. Winter flows meet two of the three criteria.*

*(2) South Boulder Creek Stream Flow Report by Rex Taliaferro, November 10, 1982. These were the CDOW's flow recommendations to the CWCB in support of the CWCB's ISF appropriation in Case No. 80CW379. Flow recommendations were refined based on physical water availability.*

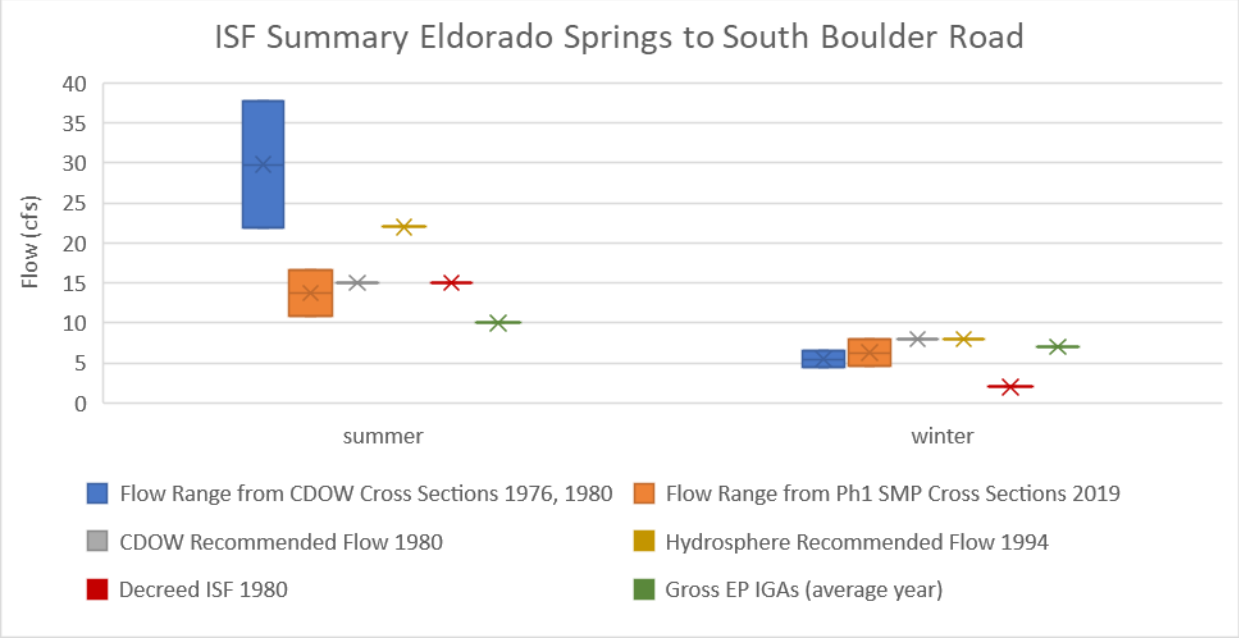
*(3) Preliminary minimum instream flow recommendations provided by Jay Skinner and Greg Policky to Robert Weaver on April 2, 1992 as input to the South Boulder Creek Instream Flow Enhancement Study, prepared by Hydrosphere Resource Consultant. Inc., June 29, 1994.*

*(4) CWCB appropriated instream flow rights for South Boulder Creek between Gross Dam and South Boulder Road, Case No. 80CW379. The 2 cfs ISF right during the winter season was due to limited water availability. Further, this ISF right is very junior and not administered . The ISF right does offer protection from future water rights development, and if it were to be administered in the future, it would offer protection.*

*(5) 2010 IGA Gross Environmental Pool target flows.*

*(6) New results estimated from cross sections measured during the summer of 2019 as part of the South Boulder Creek Stream Management Plan (Phase I) by Biohabitats, Wright Water Engineers, and GEI Consultants.*

The graph below shows results for the upper reach. The largest scatter is in the summer flows ranging from 10 to 38 cfs. The values estimated for the lower reach (not shown) were even closer to one another.




**Conclusion**

These results suggest that current creek conditions indicate similar low-flow ranges as past work used to inform flow targets in the 2010 IGAs between Denver, Boulder and Lafayette.

**Colorado Trout Unlimited and Boulder Flycasters**
**South Boulder Creek Stream Management Plan Phase I**
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**F: Data Inventory**

*(Public and Project Derived Information Sources to Support Phase I - Current Available Data)*

| Description |
|---|
| **Boulder Water Utility biological and chemical testing in SBC** |
| Reference Site testing on South Boulder Creek 2008 to 2018 |
| Denver Water - South Boulder Creek – Flow and Chemical Testing Data |
| Data collected from above and below Gross Reservoir |
| **Lafayette Water Utility biological and chemical testing in SBC** |
| Lafayette Water Quality Report 2018 |
| **Boulder Water Utility and OSMP Studies and Reports related to South Boulder Creek:** |
| CWCB / City of Boulder – In-Stream Flow Right Use in SBC, 3/20-21/2019 |
| City of Boulder WRAB In-Stream Flow Rights on SBC Update, 10/15/2018 |
| Boulder City Council – Irrigation Ditch Overview - overview of irrigation ditches in Boulder, including a summary of their ownership and management structure, operation and maintenance practices and property rights 7/12/2018 |
| South Boulder Creek Native Fish Species – List from OSMP 2018 |
| Survey of Fishes and Habitat of South Boulder Creek, Colorado, within City of Boulder Open Space and Mountain Parks Property, 12/29/2016 |
| ***Final South Boulder Creek Major Drainage-way Plan – Alternatives Analysis Report – Urban Drainage and Flood Control District, 08/2015 (summarizes many other listed studies)*** |
| South Boulder Creek Flood Mitigation Plan 2015 CH2MHILL |
| City of Boulder Wetlands Maps City of Boulder, GIS Mapping Services |
| City of Boulder Habitat Areas City of Boulder, GIS Mapping Services |
| Critical Facilities City of Boulder, GIS Mapping Services |
| Storm and Sanitary Sewer System Maps City of Boulder , GIS Mapping Services |
| City of Boulder UTILITIES - 2013-2018 Capital Improvement Program 2013 memo |
| South Boulder Reconnaissance Study 2010 USACE |
| The Potential Consequences of Climate Change for Boulder Colorado's Water Supplies 2/3/2009 |
| US-36 Corridor EIS 2009 CDOT |
| South Boulder Creek Risk Assessment 2009 HDR Engineering, Inc. |
| Aerial Photography 2008 DRCOG |
| South Boulder Creek Hydraulics Report 2008 HDR Engineering, Inc. |
| South Boulder Creek Climatology/Hydrology Report February 2007 HDR Engineering, Inc. |
| City of Boulder Stormwater Master Plan 2007 HDR Engineering, Inc. |
| 1' Interval Topographic Map 2003 Merrick and Company |
| Structure Field Surveys 2003 Merrick and Company |
| South Boulder Creek Phase A 2001 Taggert Engineering Inc. |
| WRIR Chapter 1: Comprehensive water quality of the Boulder Creek Watershed, Colorado, during high-flow and low-flow conditions, 2000 |
| Fishes, Macro Invertebrates, and Habitat of South Boulder Creek, Colorado, within City of Boulder Open Space Property, 1/31/1996 |
| **University of Colorado Relevant Studies and Reports** |
| South Campus Conceptual Master Plan CU – Facilities Management |

**Boulder County Relevant Studies and Reports related to South Boulder Creek:**

Boulder County Wetlands Maps Boulder County , Geographic Information Services

Boulder County Habitat Areas Boulder County , Geographic Information Services

**Denver Water Gross Reservoir Expansion Project relevant information from permit documents**

Attachment E to EIS and Army Corp of Engineers by Denver Water: Final Mitigation Plan for the Moffat Collection System Project, CORPS File # NWO-2002-8072-DEN

Environmental Protection Agency

Army Core of Engineers

Federal Energy Regulatory Commission

National Forest Service

CDPHE – 410 Permit – Regulation 82 Requirements 6/23/2016

CDPHE / CWCD - Rationale for Conditional 401 Certification of the Moffat Collection System Project

CDPHE / CWCD - Appendix A: Assessment of the Narrative Temperature Standard in South Boulder Creek below Gross Reservoir

CDPHE / CWCD - APPENDIX B: Guidance for Voluntary Pilot Projects

Denver Water Expansion Project Brochure

Denver Water - South Boulder Creek – Mitigation and Enhancement monitoring obligations (list from DW 2019)

**Environmental Pool IGA between Denver Water, Boulder and Lafayette**

South Boulder Creek Offer of Settlement Agreement (IGA) between Denver Water and City of Boulder Related to Gross Reservoir Expansion Hydrology and FERC Permitting, for Creation of a 2,500 AF Environmental Pool, 1998

Boulder City Council – Motion to Approve IGA with Denver Water for Environmental Pool with attachments - A Draft Intergovernmental Agreement Between the City And County of Denver, the City of Boulder, and the City of Lafayette for an Environmental Pool in Gross Reservoir; B - Draft Intergovernmental Agreement Between the City of Lafayette and the City of Boulder Regarding the Operation of the Environmental Pool in Gross Reservoir; C - Draft of the City of Boulder Comments to the Corps on the Moffat Expansion Project Draft EIS 2/16/2010

IGA Between Denver Water and the Cities of Boulder and Lafayette for the creation of an Environmental Pool in an enlarged Gross Reservoir 2/24/2010

Gross Reservoir Enlargement Update to Boulder City Council Regarding Environmental Pool and Associated IGA, 8/10/2016

Boulder City Council Memo - Gross Reservoir Enlargement - Project Update 08/16/2016

**Final Report**

**G: Structures – Preliminary Evaluation**

**Scoring**

| | IGA Rank | Ecological Benefits | | | | | Additional Considerations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Priority Structure (Listed in IGAs for low flow modification) | Partial vs total barrier to aquatic passage | Length of reconnected stream | Trout Present | Habitat Quality in Vicinity of Diversion | Invasive Fish below diversion | Diversion with high maintenance or repair needs TBD | Stream stability benefits TBD | Simplicity of modification or removal TBD | Availability of Funding TBD | Ditch & land owner participation TBD | Cost | | |
| **Criteria Weighting (5=Highest, 1=Lowest)** | *5* | *3* | *4* | *1* | *3* | *3* | *2* | *1* | *2* | *3* | *3* | *2* | | |
| **Structures** | **Each structure is scored individually for the criteria listed above with 3=Highest / Most, 1=Lowest / Least.** | | | | | | | | | | | | **Score** | **Ranking** |
| Leggett-Valmont Inlet Ditch / Jones-Donnelly | 3 | 3 | 3 | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 55 | 1 |
| East Boulder Ditch | 3 | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 53 | 2 |
| New Dry Creek Carrier Ditch | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 50 | 3 |
| Community Ditch | 3 | 3 | 1 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 43 | 4 |
| Goodhue Ditch | 2 | 3 | 2 | 3 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 41 | 5 |
| Butte Mill Ditch Confluence | 2 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 39 | 6 |
| Howard Ditch | 1 | 2 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 36 | 7 |
| Marshalville Ditch | 1 | 2 | 3 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 34 | 8 |
| South Boulder Cañon Ditch | 2 | 1 | 1 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 34 | 8 |
| Davidson Ditch | 1 | 2 | 1 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 10 |
| KOA inlet | 1 | 2 | 1 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 11 |
| KOA outlet (also Martin Marietta Pumping Station) | 1 | 3 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 28 | 12 |
| Schearer Ditch | 1 | 1 | 1 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 13 |
| McGinn Ditch | 1 | 1 | 1 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 13 |
| Sewer Pipe Crossing | 1 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 15 |
| Flood Control Channel near Stazio (3 concrete weirs ) | 1 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 15 |
| South Boulder Bear Creek Ditch | 1 | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 17 |
| Dry Creek #2 Ditch | 1 | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 17 |
| Hunter/Hine Ditch | 1 | 1 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 19 |

## G: Structures Assessment Summary

The infrastructure inventory includes twenty-one (21) structures; eighteen (18) of which are creek spanning. Fourteen (14) of the eighteen (18) are ditch head gates and accompanying diversion structures, three (3) are small concrete drop structures, and one (1) is a pipeline. There are two (2) with side-channel / return-channels serving ditch head-gates with no in-stream structures. There is one (1) pipe in the channel diverting water to a pond on private property.

Our consultants developed an infrastructure assessment score card that incorporated the priorities for structure modification from the 2010 IGA to allow for low flow passage and administration (referred to as "low flow modification" below), improvement opportunities important to BFC / TU, and factors from the consultant's experience. This produced a priority ranking by structure for the team to consider. Based on this information and further discussions with our Steering Committee, we simplified this to four primary criteria as follows below (in order of importance):

1. Ability to pass and administer low flows,
2. Potential for channel connectivity to enhance aquatic organism passage,
3. Habitat improvement proximate to the structure, and
4. Water use / operational efficiency potential.

We then scored each structure against the above criteria, with low flow passage / administration being heavily weighted. Recommendations for improvement (if any) for each structure were then described based on the evaluation process. The outcome guided our recommendations for Phase II preliminary engineering design on the highest priority structures.

### Priority 1 Structures – primary criteria: ability to pass and administer low flows

Phase I findings generally agree with the highest priorities expressed by the City of Boulder and the Water Commissioner. Structures the City of Boulder listed as high priority to allow the passage and administration of in-stream low flows, include: FRICo Check Structure (Community Ditch), New Dry Creek Carrier Ditch, East Boulder Ditch and Leggett / Jones-Donnelly Inlet. Our objective continues to try and leverage any targeted investment (i.e., low flow modifications) to also improve other SBC aspects, including channel connectivity / fish passage, habitat improvement, and water use / operational efficiency of or near those same structures. Of the above four high priority structures for low flow modification, New Dry Creek Carrier Ditch and East Boulder Ditch are in locations that provide great opportunities to also address connectivity, habitat restoration, and improved efficiency. Phase I work also identified Goodhue Ditch as a structure that needs work to effectively administer low flows, as well as a candidate for other improvements. Goodhue is a barrier to channel connectivity, could benefit from habitat improvement, and the structure could also be a candidate for more efficient water use / operations. Phase I work revealed that the FRICo Check Structure

(Community Ditch) and Leggett / Jones-Donnelly Inlet structures, are not good candidates for channel connectivity, habitat improvement or efficiency due to a combination of location and complexity. Additionally, Leggett / Jones-Donnelly Inlet acts as a barrier to undesirable species migrating further up stream. (see detail "scoring" from Assessment Tasks).

**Priority 2 Structures – no barriers to low flow passage / administration; primary criteria: channel connectivity**

Phase I work found that four (4) Priority 2 structures are barriers to channel connectivity in key locations, and are also candidates for habitat improvement, and / or operational improvements (Marshallville Ditch, Howard Ditch, KOA Lake Outlet, Butte Mill Ditch). Of these structures, Marshallville Ditch and Howard Ditch present the best opportunities for improved connectivity. And all could benefit from habitat and efficiency improvements.

**Priority 3 Structures – no barriers to low flow passage / administration and no important channel connectivity opportunity; primary criteria: habitat improvement**

Priority 3 structures will be further evaluated in Phase II based on additional habitat improvement needs derived from the River Health Assessment.

**Conclusion**

After grouping the structures based on the above assessment criteria, we then looked across Priority groups to identify the structures for emphasis in Phase II. We identified seven (7) structures from the Priority 1 (5 structures) and Priority 2 (2 structures) groups as the highest priorities for modification (*see above). With low flow passage / administration and aquatic organism passage as our top two criteria, the proposed modifications would not only allow for administration and passage of low flows, but also reconnect ~ 7 miles of this reach, and allow access for sport fish, native fish, and other aquatic life to move freely. This would also be an opportunity to increase the overall habitat quality.

**The following tabs list 19 structures that the Colorado School of Mines Eldorado Engineering Team have identified. The structures are numbered in order starting at the most western location (FRICO) and then succeeding downstream in order. Each structure has then been assessed on five criteria that will help the team evaluate its potential for redesign. The criteria are listed below:**

**Structural Integirty / Age**
**Fish Passage Need**
**Aesthetics**
**Feasibility by Cost**
**Impacts to Ecology and Habitat Health**

**Each Structure will receive a rating of** GREEN, YELLOW, or RED for each of the categories listed above on their score card. Green shall indicate that the category is "good" and improvements will not be necessary. Red indicates that the item is either missing or in poor condition and presents a large opportunity for improvements. For cost, red shall indicate low cost and redesign potential while green is high cost. This maintains that the most red categories are the best for redesign.

This rating will contribute to the overall assessment of South Boulder Creek (SBC)

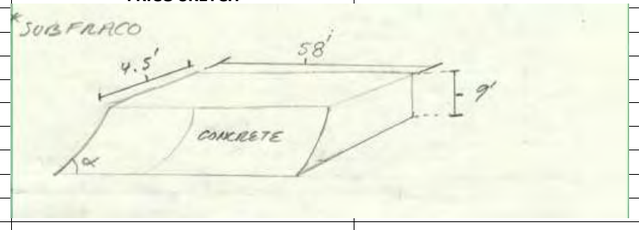
**NOTE: This report was prepared by senior engineering students from the Colorado School of Mines, as part of the school's Capstone Senior Design Project program. Boulder Flycasters and Colorado Trout Unlimited worked with this program to provide a meaningful, in-the-field project for these students to experience just prior to graduation. The student team collected and documented valuable field data in support of the overall structures assessment for the South Boulder Creek SMP Phase I project. Due to staff availability constraints, these findings and data were not independently verified by our municipal partners. Some of the data areas, specifically regarding structure ownership and decreed water rights were not independently verified by the project team. However, that data was not used in any of the Phase I assessment results. We used other data sources for these areas. Data regarding physical description, location and opportunities for improvement was verified by the project team, and used to inform our overall structures assessment findings and recommendations.**

| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 1 - Community Ditch | 39°55.941'N, -105°16.858'W | FARMERS RESERVOIR & IRRIGATION COMPANY Priority Date: 12/19/1900 | Total Decreed Rate: 3162.225 | See FRICO sketch | The ability of flow to get over concrete weir, gate from FRICO Ditch closed, height difference from creek level to ditch, all flow to SBC must pass throgh structure (no natural | Good | Explore Fish Passage- more water needed in upper part of SBC directly below diversion, there is an apparent need for natural stream habitat to connect the easta nd west sides of SBC |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Built in 1880 | -FRICO 3rd oldest Water Rights owner |
| - Has gates for water and silt contents | -Silt never removed |
| - Artisan Water owns land around creek | -Louisville pulls all water from FRICO ditch |
| to creek | past ditch |
| - No fish passage | -Potentially need to set up measurment devices in outflow |
| - Louisville pulls water from ditch with pipe | -Gates Mechanically assisted |
| - Lafayette pulls water from ditch | -Pipes below ditch return water that Eldo (potentially hot springs) uses to creek |
| - New meter present on top | -FRICO can take all water in low flow |
| - Gate and componets are composed of Concrete and Steel | |

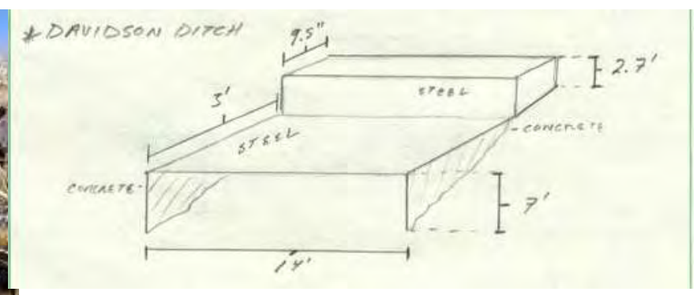
**FRICO SKETCH**



| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 2 - Davidson Ditch | 39°56.318'N, -105°15.583'W | Davidson Ditch Company, City of Lafayette | Total Decreed Rate: 359.7665 | See Sketch | Concrete Weir backs up water to pool in front of ditch gate, rebar intake delivers water back to SBC but also serves as a sink for sediment and debris | Good | Fish Passage would be needed here, more flow directed in main stream path, not in intake structure |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Has monitoring station | -Has main gate & bypass |
| - Corregated steel pipe | -bypass goes to unkown location |
| - Weir for creek | -gate not mechanically assisted |
| - Available to create head pressure | -fish can't make it up to FRICO in low flow |
| - Large steel headgate | -Potential fish passage but must maintain proper head pressure |
| - Has bypass surrounded by rebar | -fish passage may not be desirable: might leave fish stranded in low flow |
| | -Monitoring station downstream ditch |
| Split in creek | |
| eadgate exposed to wear due to age | - Concrete component shows no cracks |
| rank operated | - No fish passage |

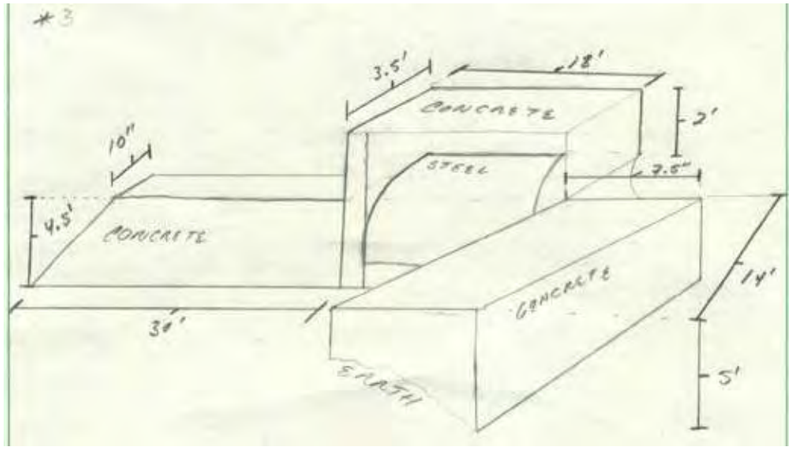


| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 4 - Goodhue Ditch | 39°57.065' N, -105°14.526' W | BOULDER COUNTY PARKS & OPEN SPACE DEPT, City of Lafayette | Total Decreed Rate: 549.2881 | See Sketch | Flow has potential clearance of about a foot from main steel gate | Fair | Fish Passage possible |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

Pictures:

| Description | |
|---|---|
| s monitoring station | -Gate not mechanically assisted |
| rge concrete weir with headwall | |
| aller headgate for ditch | -Potentially make head wall smaller |
| ncrete footing is eroding | -decent flow |
| rge crack in weir | -weir at end of gate |
| ll seems structurally sound | - Structure is composed of mainly concrete with steel parts |
| h can get through but no designated passage | - Ditch has pinch point |



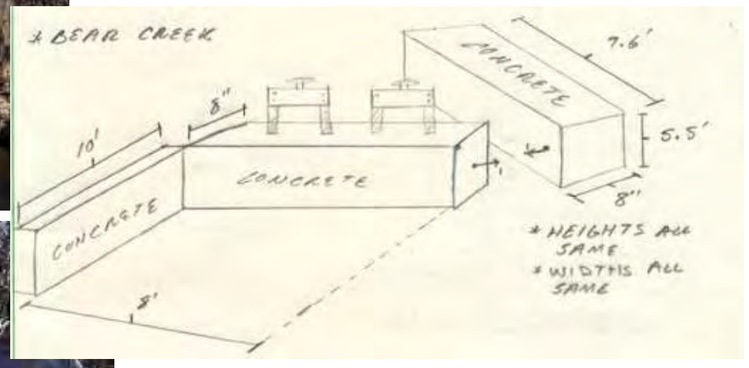
| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 5 - Bear Creek Ditch | 39°57.203' N, -105°14.502' W | S BO + BEAR CK DITCH | Total Decreed Rate: 263.4811 | See Sketch | Passage contains heavy debris from sedimentation | Fair | Fish passage most likely not desired. Good pooling area at gate. A lot of silt and debris build up |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Diversion using land | -Diversion uses rocks |
| - Creates channel to ditch | -Natural diversion |
| - Owned by Lafayette | |

Pictures:

**BEAR CREEK SKETCH**

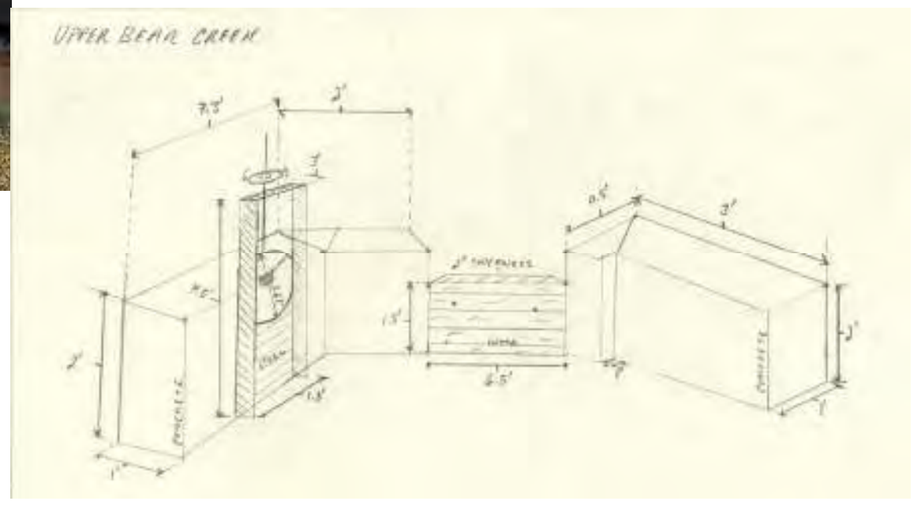


| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 6 - Upper Bear Creek Ditch | 39°57.232' N, -105°14.472' W | TBD- TU | TBD- TU | See Sketch | Overcome heavy organic debris | Fair | Probably no fish passage wanted |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Small conrete structure | -ditch is a primary water source for Lafayette |
| - 2 steel gates into ditch | -water leaking through gate |
| -gate not mechanically assisted | -no fish passage needed |
| -stream that goes to Laf has another monitoring station | -Overall goal to make easy fishing spots |
| - Structure is in ditch, not main channel | -water infiltrating groundwater after ditch to return to South Boulder Creek |
| - Concrete narrows channel | -monitoring station below |
| - Concrete seems to be in acceptable conditions | - Has second structure down the ditch but is out of scope |
| - Steel components seem in new conditions | |

Pictures:



| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 8-MARSHALLVILLE Ditch | 39°57.578'N, -105°13.938' W | MARSHALVILLE DITCH CO | Decreed Rate: 52.734 | See Sketch | N/A | Good | N/A |

**We still have not granted access to this structure**

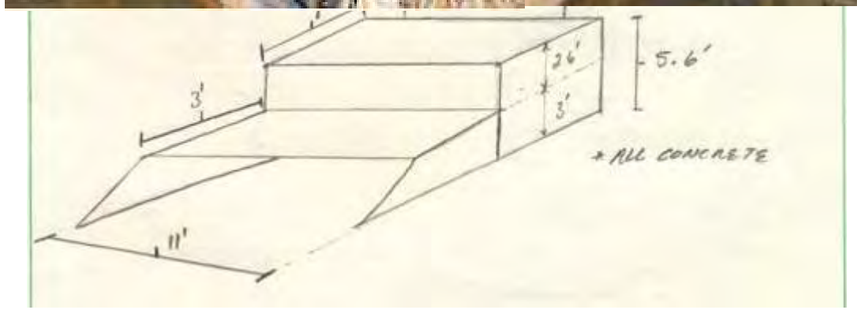
| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Rock Diversion | - Life confirmed |
| - Small Concrete with steel headgates | - Gate under diversion |
| - Has monitoring station | - Monotoring station |
| - Private property | |
| | |

| Structure Number | GPS Location | Water Rights | Relative | Structure Dimensions | Approximate Flow/ Barriers to | Soil Stability | Potential |
|---|---|---|---|---|---|---|---|
| SBCS 9- SHEARER | 105°13.628'W | VLEET, L W VAN | Total decreed | See Sketch | The ability of flow to get over | Fair | |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Diversion structure into | -treated poorly |
| - 2 Concrete arms into creek | -smaller structure |
| - Ditch off to side | -small diversion to |
| - One gate | -bad water |
| - Leaking | -wild flower ranch |
| - Wood paneln one side | -boulder shares |
| - Also Leaking | -water leaking |
| ish passage | -potentially leaking |
| crete looks good | -confirmed life |
| lflower Ranch | -gate not |

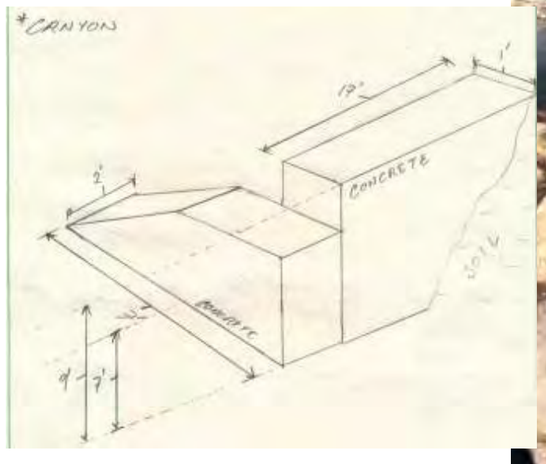


| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 10- CANYON Ditch | 39°58.340'N, -105°13.396'W | S BO CANON DITCH CO | Total Decreed Rate: | See Sketch | None | Good | Good fish passage here |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| HAS FISH PASSAGE | - Structure is relatively large |
| Low flow channel of rocks | -weir diversion |
| Ditch to side | -return gate leaking |
| Structure rebuilt recently | - Pool at bottom for fish |
| 2 gates on concrete face | -meets env standard (5-7 cfs) |
| Rocks in channel | -not restorative flow however |
| Large pool downstream from hat | -Boulder road is division btw/cold (5 cfs) and warm (3 cfs) water fisheries |
| Gate at top of passage | -pool system rn w/rocks |
| - Electric monitoring station | -potentail leaks on main strucutre |
| - Concrete appears to be in fair conditions | -monitoring system w/ALERT (can upload data online) |
| - Rocks placed to improve structure | -gate not mechanically assisted |

Pictures:

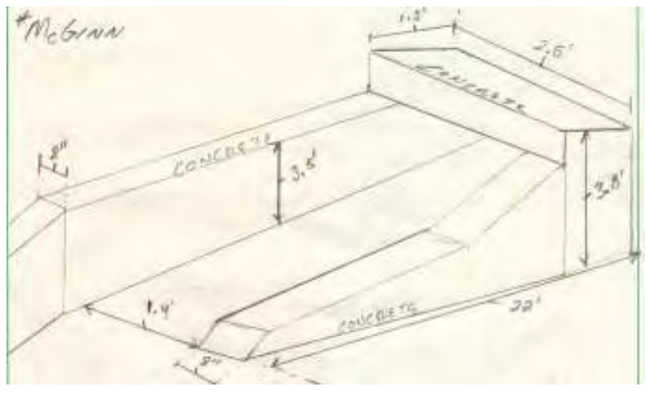



| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 11- MCGINN | 39°58.851'N, -105°13.263'W | MC GINN DITCH CO | Total decreed rate: 10.892 | See Sketch | N/A | Good | Great fish passage |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Man made fish passage | - Concrete looks good |
| - Low flow channel | -leaks in return strucutre |
| - Small weir into steps | -mainstructure doesn't leak |
| - All new concrete | -monitoring station |
| - Headgate for fish | -gate not mechanically assisted |
| - Seperate headgate for d | - Concrete blocks to create channel in ditch |

Pictures:

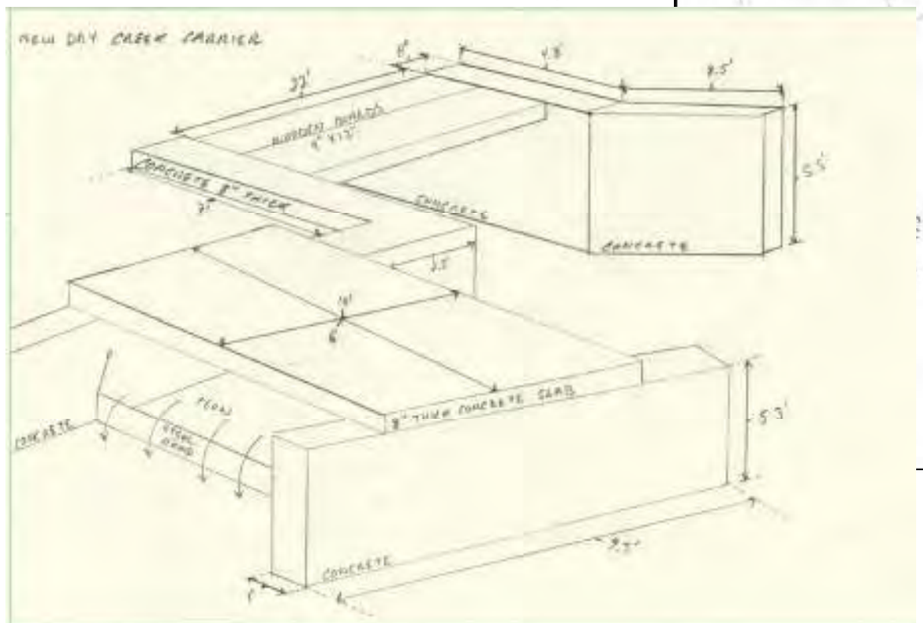


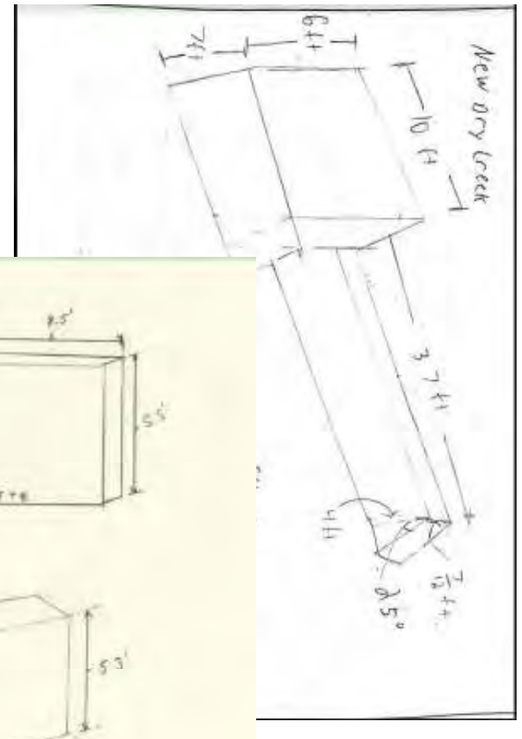
| Structure Number | GPS Location | Water Rights | Relative | Structure Dimensions | Approximate Flow/ Barriers | Soil Stability | Potential Habitat |
|---|---|---|---|---|---|---|---|
| SBCS 12- NEW DRY | 39°59.166'N, - | City of Lafayette | Total | See Sketch | Odd angle that the water | Fair | No fish passage present. Poor |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - Large weir to SBC | -potential habitat improvement |
| - No fish passage | -one of most formindable to low |
| - Large steel door into ditch | -gate not mechanically assisted |
| - Concrete in fair conditions | -leaking through passage to South |
| - Large door into creek next | -Other passage takes water to |
| ight next to boulder road | -Marks fishery transistion |
| o diversion, flow just | -wall blocks low flow |
| eed special tool to | -no fishing after this until KOA |

Pictures:

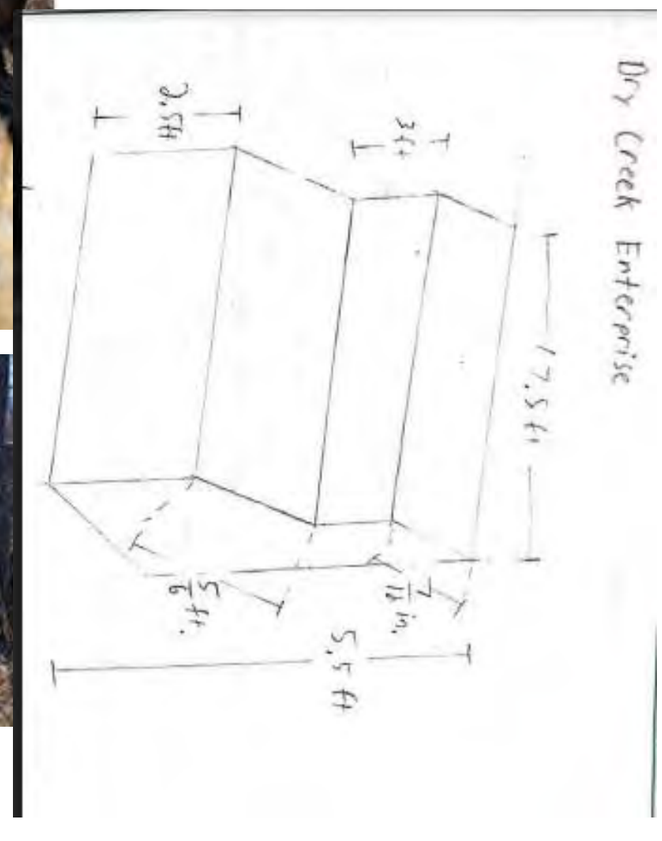



| Structure Number | GPS Location | Water Rights Owner | Relative | Structure Dimensions | Approximate Flow/ | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 13- | n/a | ENTERPRISE DITCH | Total Decreed | See Sketch | Big debris blockage | Fair | No fish passage most liekly |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

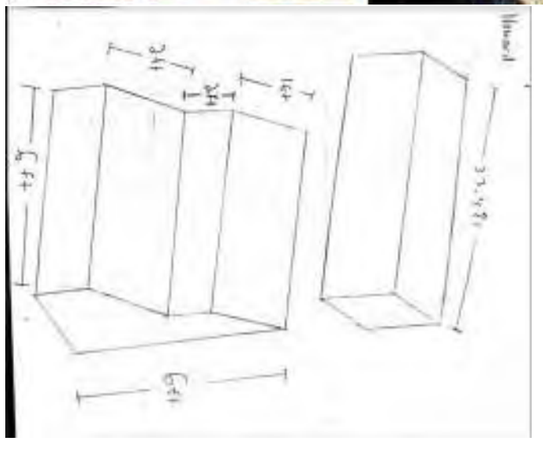
| Description | |
|---|---|
| - 4 gates to enterprise | -4 gates |
| - Wood blockage to DCD | ---1 gate clogged |
| - Sits at seperation of the | -probably want to work on this |
| - Concrete ok | -board and sandbags toi stop |
| - Located in the ditch | -gate not mechanically assisted |
| - Downstream from | -non operable monitoring station |
| -splits downstream | |



| Structure Number | GPS Location | Water Rights | Relative | Structure Dimensions | Approximate Flow/ Barriers to | Soil Stability | Potential |
|---|---|---|---|---|---|---|---|
| SBCS 14- HOWARD | 39°59.298'N, - | HOWARD | Total | See Sketch | no fish passage and large | Good | Fish passage |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Description | |
|---|---|
| - One for most senior water rights | -two planks of wood are weirs |
| - Small wier into rocks | -one plank had huge hole in it |
| - Small headgate to ditch off on | -plenty of flow |
| - No diversion, just off to side | -leaks on east county diversion |
| - No fish passage | -gate not mechanically assisted |
| - Concrete looks old | -monitoring station |
| - Damaged from floods | -theditchproject.org shows |
| - Cracks and missing pieces | - Has monitoring station |
| - Couple wood planks in weir | - Silt backup |
| aking | |

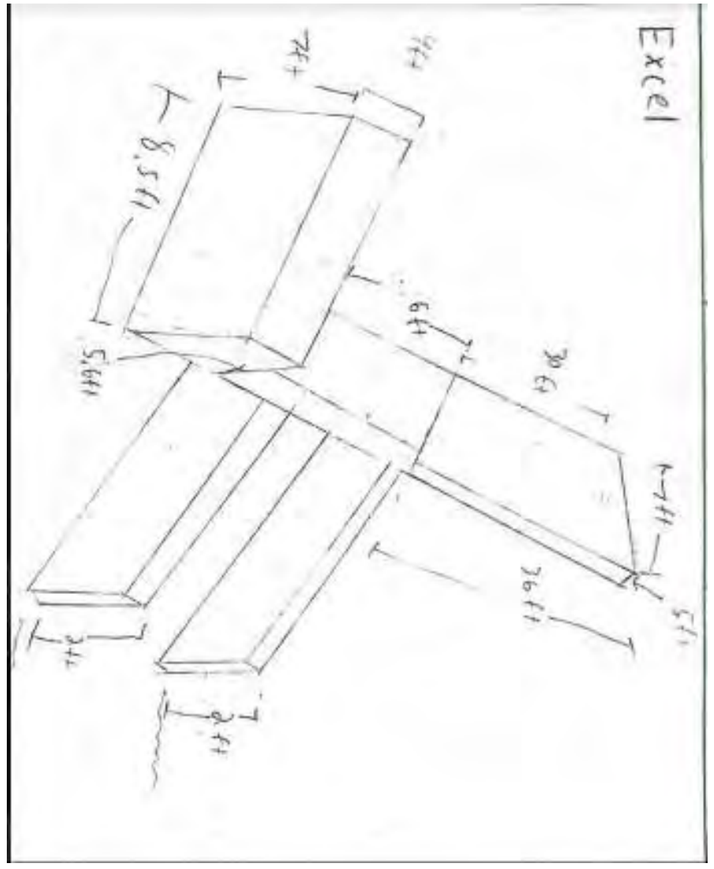


| Structure Number | GPS Location | Water Rights | Relative | Structure Dimensions | Approximate Flow/ Barriers to | Soil Stability | Potential Habitat |
|---|---|---|---|---|---|---|---|
| SBCS 15- E. BOULDER | 39°59.788'N, - | Ditch Compa | decreed rate10 | See Sketch | Yes, major sand build-up and | Fair | Fish passage and a |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

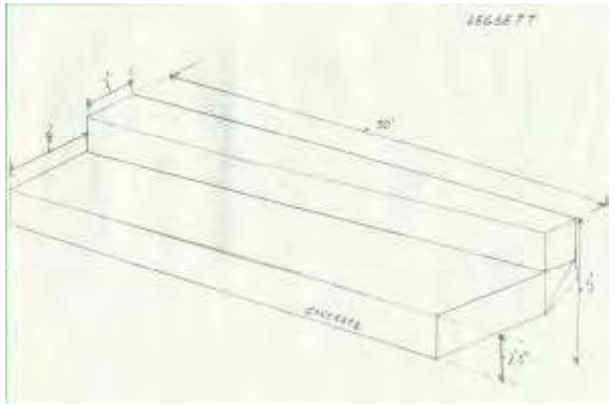
| Description | |
|---|---|
| - Boulder wants to redesign | -excel owns |
| - Move upstream 100 feet | -current plans for fish passage would |
| - Put in fish passage | -gate not mechanically assisted |
| - Owned by excel | -water goes over weir in hig flow |
| - Large weir pushes water into | -measuring stating in low flow |
| - Foundation looks eroded | ---big ol rocks interfere with |
| - Has a conceptual design for | -potential habitat improvement |
| steel headgates into ditch | ---large soot buildup from flood event |
| as monitoring station | ---lot of debris downstream from |
| abitat improvements | -metal on dam rusted |
| rea damaged by floods | -2 gates in diversion |
| arge door down to SBC | -targetted for fish pissage |
| ater eating into weir | -next strucutre of any size at leggett |
| | -Then next is at small dam |

Pictures:



| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | tructure Dimension | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements | Description | |
|---|---|---|---|---|---|---|---|---|---|
| SBCS 15- Leggett | 40°00.951'N, -105°12.858'W | Public Service Company of Colorado (Xcel | TBD | See sketch | Lots of trash, solids, dirt accumulation from slowing down of creek, Massive intake into leggett structure, little to no flow observed most the time | Fair | Cleaning out area, fish passage, keeping invasives out of creek | James:<br>-Huge concrete structure<br>-Massive weir on NW side<br>-9 steel gates on east side<br>-4 more steel gates to the north<br>-Large concrete crack by weir<br>-Gates create large holding pond<br>-Newer concrete by gates<br>-Gates look new<br>-Gates are hydraulic powered<br>-TU has data logger down stream | Sam: |

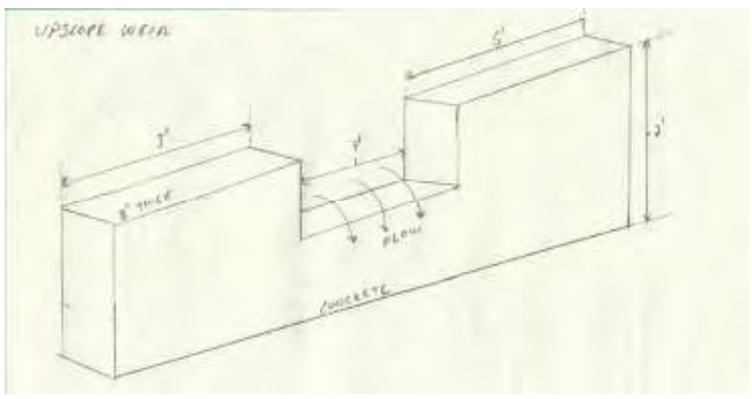
| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |



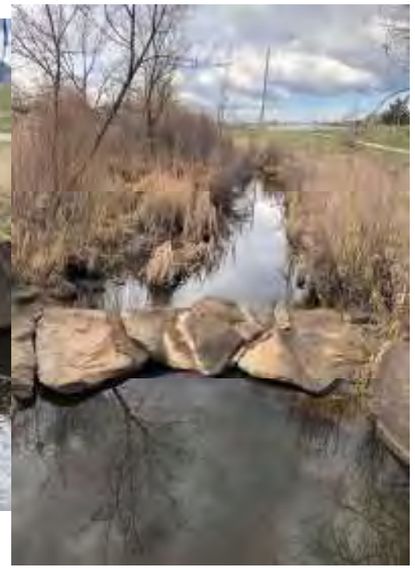

| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 16- Upslope Weir | 40°01.168'N, -105°12.940'W | Boulder? | tbd | See sketch | N/A other than weir | Good | Fish passage in low flow, aesthetics |

| Descriptions | |
|---|---|
| James | |
| -Small concrete weir | |
| -Half is open | |
| -Flow into rocks | |
| -Channeleized into ditch and smaller passage | |
| -Wall extends entire channel | |
| | |
| | |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

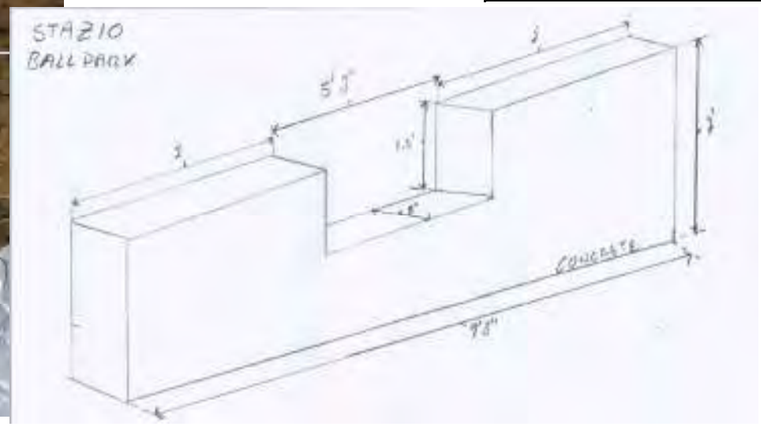


| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 17- Stazio Ballpark Weir | 40°01.332'N, -105°12.954'W | Boulder County? | tbd | see sketch | Fish passage in low flow times, only a small opening for flow | decent | Improve aesthetics and fish passage |

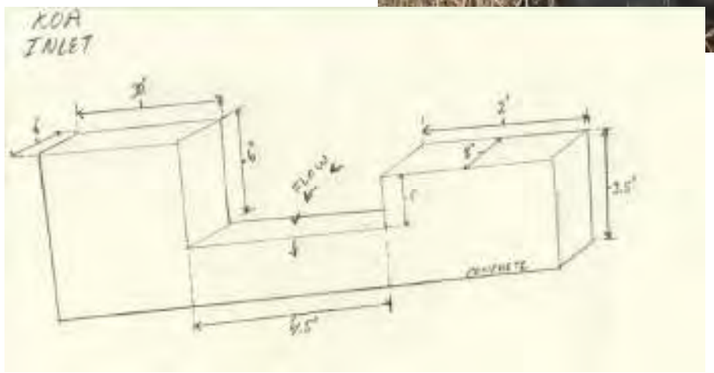


| Descriptions | |
|---|---|
| James | |
| -Man made rocks lead to flow under bridge | |
| -Flow then goes to concrete wier | |
| -Large opening with wood board | |
| -Unclear why it exists | |
| -Very simple | |
| -Manmade pools | |
| | |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| Structural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |



| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 18-KOA Inlet Weir | 40°01.552'N, -105°13.035'W | ? | tbd | see sketch | only one inlet here along concrete weir | decent | Fish passage if needed, concrete aesthetics |




| Descriptions | |
|---|---|
| James: | |
| -Large concrete weir | |
| -Boat ramp 50' west | |
| -2 weirs | |
| -Large busted opening | |
| -Concrete in poor condition | |
| -No fish passage | |
| -Has staff gauge | |
| -Lots of sediment | |

| Score Card | |
|---|---|
| **Category** | **Scoring** |
| uctural Integrity | |
| Fish Passage | |
| Aesthetics | |
| Cost Feasibility | |
| Habitat Health | |

| Structure Number | GPS Location | Water Rights Owner and Date Associated | Relative Priorities and Flow (X cfs) | Structure Dimensions | Approximate Flow/ Barriers to Flow | Soil Stability | Potential Habitat Improvements |
|---|---|---|---|---|---|---|---|
| SBCS 19-KOA Outlet | 40°01.725'N, -105°13.111' | Western Mobile - Boulder Inc. (1993) | 11.2 acre-ft stored in lake | see sketch | Wooden weir is getting old | N/A all concrete | Better fish passage |

| Descriptions | |
|---|---|
| James: | |
| -Weir for overflow | |
| -Steel headgate for control of flow | |
| Wooden board next to headgate | |
| ce is problem in winter | |
| -Last structure befor confluence | |
| -Concrete looks ok | |
| -2 ramp arms lead to headgate | |
| ake owned by Boulder | |
| -Water owned by multiple groups | |

| Scoring |
|---|
| |
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