



United States Department of the Interior

NATIONAL PARK SERVICE

Water Resources Division

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Through: John Wullschleger, Fish Program Lead, Water Resources Division (WRD), Fort
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cc: Forrest (Ed) Harvey, Chief, WRD, Fort Collins, CO.

Subject: Summary Report, Fish Survey, CARE, May 17 - 20, 2021.

Executive Summary

Single-pass electrofishing and minnow trap fish surveys were conducted at numerous sites on four small streams within Capitol Reef National Park (CARE), between May 17 and May 20, 2021. The objective of the surveys was to document the current status of the extant fish community in small streams within the park that have not been the primary focus of recent sampling efforts. The results will be incorporated into a Focused Condition Assessment (FCA) concerning aquatic resources within the park that is currently being drafted.

1. Park-wide, a total of 502 fish were captured consisting of seven species: 416 speckled dace (*Rhinichthys osculus*, SPD), 52 bluehead sucker (*Catostomus discobolus*, BHS), 4 flannelmouth sucker (*Catostomus latipinnis*, FMS), 23 leather-side chub (*Lepidomeda copei* or *aliciae*? LSC), 1 Utah sucker (*Catostomus ardens*, UTS), 4 rainbow trout (*Oncorhynchus mykiss*, RBT), 1 brook trout (*Salvelinus fontinalis*, BKT); and 1 hybrid recreational sportfish "tiger trout" (cross between a female brown trout (*Salmo trutta*), and male Eastern brook trout (*Salvelinus fontinalis*), TT).

2. Of the 502 fish captured, 472 were native species, numerically dominated by SPD, and represented approximately 94% of the total fish captured.
3. The current species' composition of each watershed and/or stream reach appears to be driven by the site-specific hydrologic conditions of each, and likely represents the native fish species that have managed to persist or re-establish under the past hydrology. Other factors include impediments to fish movement from both natural and constructed barriers, and invasion by non-native species from both upstream and downstream when conditions allow.

Purpose

The primary objective of the survey was to document the current fish species presence and relative abundance in four small streams within the park, that have not been the primary focus of recent sampling efforts. The new data will be incorporated into a Focused Condition Assessment (FCA) concerning aquatic resources within the park, that is currently being drafted for park by Utah State University.

Survey Dates, Locations and Methods

Dates: Fish surveys were conducted between May 17 and May 20, 2021.

Survey Locations: Surveys were conducted on four small streams within CARE; Pleasant Creek, Oak Creek, Sulphur Creek, and Halls Creek (Map 1., Map 2., Table 1.). Sites were chosen to survey the greatest geographical extent of perennial streams within the park based upon reasonable ease of access. Sites were generally accessed from park roads, (or a short distance from a road), or from roads outside the park that accessed irrigation infrastructure on the parks' eastern boundary. The exception was Halls Creek that was accessed by hiking ~ 8 km from the Halls Creek "Airport Route" trailhead off the Notum-Bullfrog Road on the east boundary of the park.

Pleasant Creek and Oak Creek originate in the high country on Boulder Mountain, west of the park (Map 1.). Both are tributaries of the Fremont River and flow east through the park, approximately parallel to one another, before joining the Fremont River at separate confluences, east of the park boundary. The Fremont River and the Muddy River join to form the Dirty Devil River, a significant tributary of the Colorado River.

For a detailed description of these streams and how to access them go to trail descriptions at “liveandlethike”, by Andrew Wojtanik (https://en.wikipedia.org/wiki/Andrew_Wojtanik).

<https://liveandlethike.com/2015/02/17/pleasant-creek-capitol-reef-national-park-ut/>
<https://liveandlethike.com/2015/05/16/oak-creek-canyon-capitol-reef-national-park-ut/>

Historically the natural hydrology of each stream was independent of the other, each characterized by high flows in spring from melting snow on Boulder Mountain, lower summer baseflows intermixed with large flood events originating from summer rainstorm runoff from the impervious rock of the lower elevation desert, and low winter baseflows. Both streams likely had continuous flow to the Fremont River for much of the year, though they were perhaps discontinuous during periods of drought.

However, at this time, the flows of Pleasant Creek and Oak Creek are hydrologically connected by considerable water management infrastructure that exists throughout their watersheds, and the baseflows of each are now highly modified by irrigation diversions to, and releases from Lower Bowns Reservoir that are determined by downstream irrigation demands.

Consequently, baseflows within the park may be both seasonally higher or lower than they were historically, and there is evidence that at sometimes of the year, both streams may experience extremely low flows and/or intermittent drying. Currently, both streams are hydrologically disconnected from the Fremont River for large periods of the year.

Additionally, there is an historic 80 feet tall irrigation diversion dam on Oak Creek at the parks’ eastern boundary. This is now a barrier to upstream fish movement. Consequently, at this time, Oak Creek within the park, is hydrologically seasonally disconnected, but ecologically, now permanently disconnected from the lower reaches of Oak Creek and the Fremont River. A low head diversion grade control structure also exists on Pleasant Creek, just outside the eastern boundary of the park, below the actual Notum Diversion, but it is unknown if it is a barrier to upstream fish movement.

Sulphur Creek is a small tributary of the Fremont River (Map 1.). Historically, it is likely that it was dry most of the time, but currently, irrigation returns from farmland in the upper Sulphur Creek watershed near the town of Torrey maintain a small baseflow through the park during irrigation season. Similarly, there is a more reliable baseflow for a short distance above the confluence with the Fremont River that is maintained by additional irrigation returns from nearby orchards within CARE, that are irrigated by water diverted from the Fremont River within the park. A series of natural falls exist within the park, a short distance upstream of the Visitors Center, which are a barrier to upstream fish movement.

For a detailed description of these streams and how to access them go to trail descriptions at: <https://liveandlethike.com/2015/04/08/sulphur-creek-capitol-reef-national-park-ut/>

Halls Creek is a small stream that used to be a tributary of the Colorado River, but which now flows directly into Lake Powell (Map 2.). The upper watershed is an ephemeral drainage, but approximately 0.5 kms above the Hall Creek Narrows a small spring is created by ground water moving slowly down-valley through the alluvium, that is forced to the surface as it intercepts the impervious rock that identifies the upstream mouth of the canyon. A very small baseflow maintains connected habitat through the bedrock pools of the narrows but the stream becomes ephemeral a short distance below the downstream mouth of the canyon. While a small baseflow maintains the perennial reach of Halls Creek, during wetter periods, larger baseflows, and flood flows originating in the upper watershed, allow a connection to Lake Powell.

For a detailed description of these streams and how to access them go to trail descriptions at: <https://liveandlethike.com/2015/04/15/halls-creek-narrows-via-airport-route-capitol-reef-national-park-ut/>

Methods

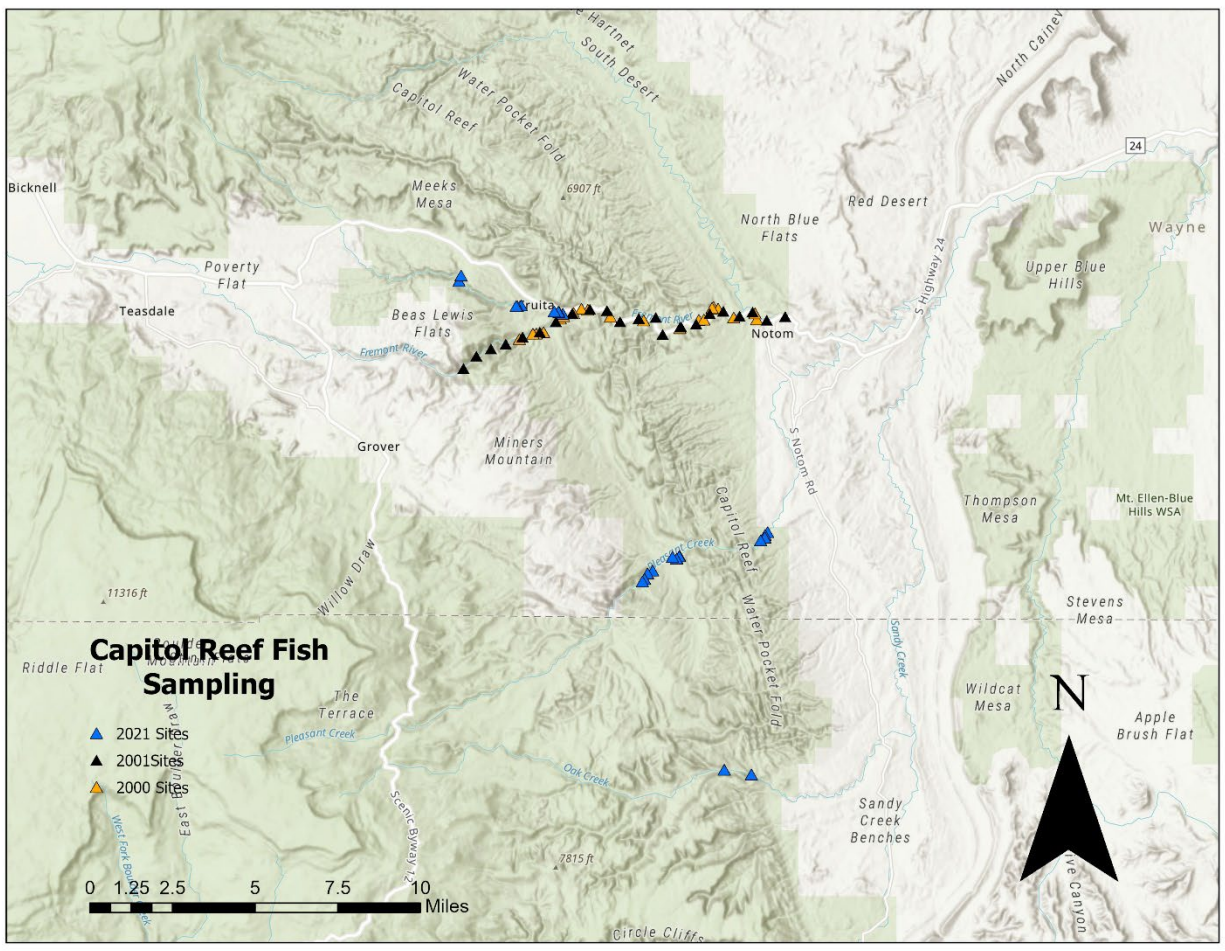
At each site within Pleasant, Oak and Sulphur creeks, electrofishing was conducted using a Smith Root backpack shocker (LR-20B). A single pass, of a non-standardized length, was conducted in an upstream direction in an effort to document species presence and to catch enough fish to get a representative sampling of the fish community. Reaches were generally 200 – 300 meters long, but some were considerably longer. Only one long reach (~1.5 km) was sampled on Oak Creek, from the park boundary to the “Alcove”, which could only be accessed from the parks’ eastern boundary.

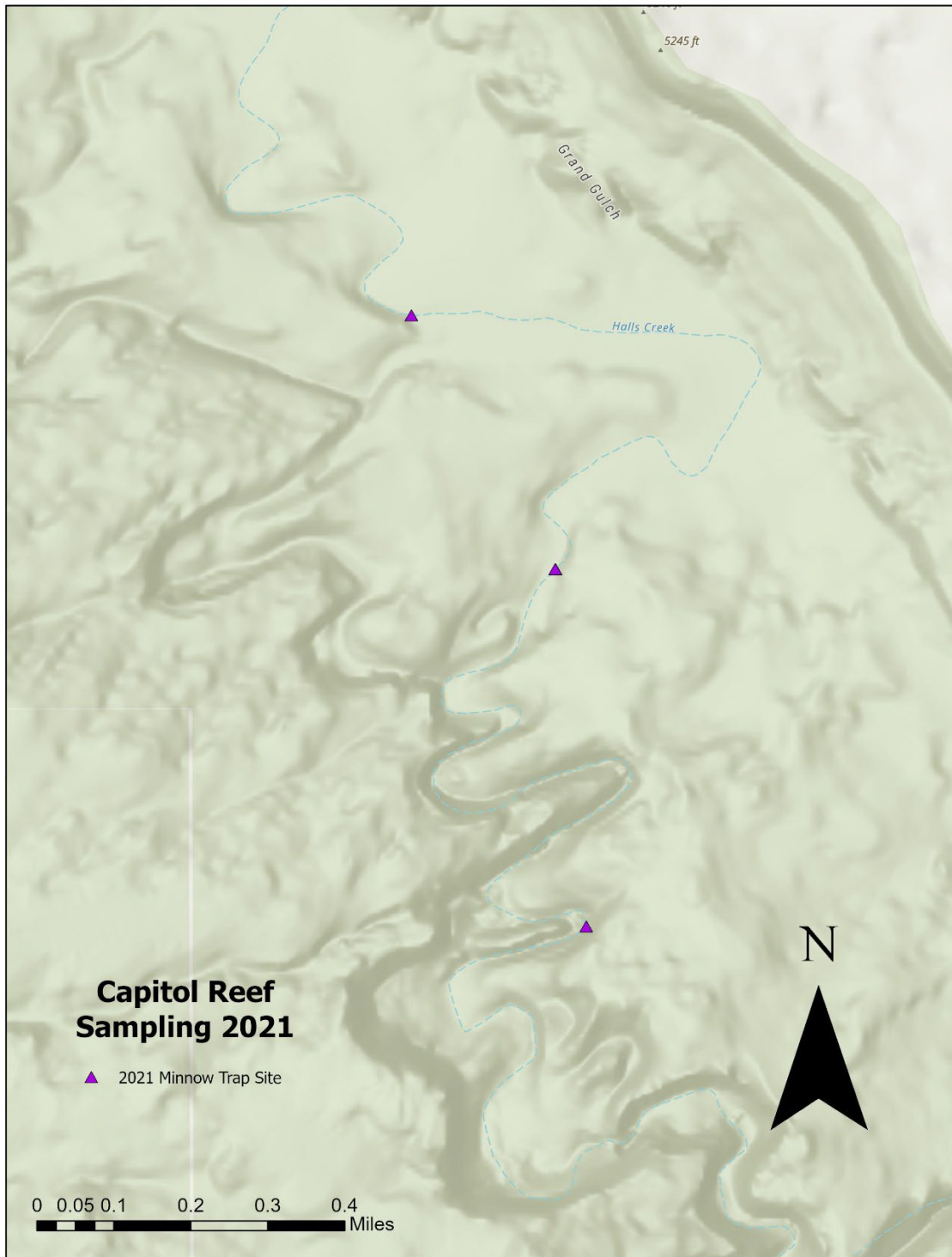
Due to the remote location, Halls Creek was not electrofished, and unbaited minnow traps were fished in pool habitats. Four traps were set, moving in a downstream direction, from the first perennial water above the upstream mouth of the canyon, to approximately 1 mile into the Narrows, and retrieved on the return trip. Consequently, the set times reflected this down and back journey, the upstream traps being fished for a considerably longer time.

All fish captured were identified to species, measured for total length (to the nearest millimeter), and released to the reach from which they were captured.

Table 1. UTM Easting and Northing defining the upstream and downstream location of the river reaches surveyed during the 2021 fish survey.

Survey Date	Stream	Site	Fishing Method	Zone	Reach Start Point		Reach End Point		Fishing Times		
					Easting	Northing	Easting	Northing	Start Time	Finish Time	Seconds
5/20/2021	Halls Creek	HC1	Minnow Trap	12S	509676	4164041	NA	NA	3:33 PM	4:35 PM	3720
5/20/2021	Halls Creek	HC2	Minnow Trap	12S	509612	4164788	NA	NA	2:45 PM	4:56 PM	7860
5/20/2021	Halls Creek	HC3	Minnow Trap	12S	509611	4164789	NA	NA	2:15 PM	5:10 PM	10500
5/20/2021	Halls Creek	HC4	Minnow Trap	12S	509310	4165320	NA	NA	2:00 PM	5:50 PM	13800
5/18/2021	Oak Creek	OC1	Electrofishing	12S	487686	4215202	486363	4215430	11:00 AM	12:14 PM	1408
5/17/2021	Pleasant Creek	PC1	Electrofishing	12S	488476	4226998	488351	4226861	2:20 PM	2:40 PM	498
5/17/2021	Pleasant Creek	PC2	Electrofishing	12S	488351	4226861	488341	4226736	3:13 PM	3:35 PM	541
5/17/2021	Pleasant Creek	PC3	Electrofishing	12S	488341	4226736	488135	4226602	4:04 PM	4:25 PM	423
5/17/2021	Pleasant Creek	PC4	Electrofishing	12S	484169	4225823	484039	4225704	9:30 AM	9:55 AM	?
5/17/2021	Pleasant Creek	PC5	Electrofishing	12S	484039	4225704	483840	4225788	10:42 AM	11:00 AM	473
5/20/2021	Pleasant Creek	PC6	Electrofishing	12S	482876	4225126	482625	4224970	9:45 AM	10:30 AM	1269
5/20/2021	Pleasant Creek	PC7	Electrofishing	12S	482625	4224990	482480	4224719	11:02 AM	11:36 AM	1223
5/20/2021	Pleasant Creek	PC8	Electrofishing	12S	482480	4224719	482377	4224597	12:27 PM	12:47 PM	948
5/19/2021	Sulfur Creek	SC1	Electrofishing	12S	478497	4237625	478315	4237715	9:25 AM	10:05 AM	1660
5/19/2021	Sulfur Creek	SC2	Electrofishing	12S	478281	4237730	478082	4237738	10:52 AM	11:35 AM	1545
5/19/2021	Sulfur Creek	SC3	Electrofishing	12S	476469	4238041	476288	4237990	1:55 PM	2:10 PM	806
5/19/2021	Sulfur Creek	SC4	Electrofishing	12S	476225	4238004	476225	4238004	3:00 AM	3:15 PM	824
5/20/2021	Sulfur Creek	SC5	Electrofishing	12S	473441	4239222	473541	4239492	3:42 PM	4:06 PM	1261





Note: The UTM coordinates for sites HC2 and HC3 were reported as being the same (within 1m of each other). The coordinates for one of these locations is incorrect, but it is not known which one. The location of the unknown site is a short distance either upstream of downstream of either HC2 or HC3.

Findings and Discussion

Pleasant Creek

Five species of fish were detected in Pleasant Creek; SPD, BHS, RBT, BKT and TT (Table 2.). The fish community was dominated by the two native species; SPD and BHS that represented the entire fish community other than 6 non-native trout, presumably originating from upstream. Both native species appear to be healthy and reproducing in place, indicated by the presence of several age classes. Several sites had small groups of males, perhaps associated with spawning.

The survey indicates that perennial flow exists throughout the year to support a persistent native fish community within the park. During irrigation season, water deliveries via Pleasant Creek to the Notum Diversion just inside the parks eastern boundary maintain perennial flow sufficient to sustain the fish community. Outside irrigation season, baseflows also appear sufficient. Below the Notum Diversion, the creek was dry during the survey and presumably is often in this condition during the irrigation season.

Sulphur Creek

Five species of fish were detected in the five sites in Sulphur Creek; SPD, BHS, FMS, LSC, and UTS (Table 2.), all below the natural barrier upstream of the Visitors Center. They comprise a subset of species which have previously been documented in the Fremont River. Where fish were found, the fish community was numerically dominated by SPD. LSC and UTS are non-native to the Fremont River and Colorado Basin, but native to streams of the Bonneville Basin to the west. These species almost certainly became established in the Fremont River and Sulphur Creek within the park by moving downstream from reservoirs and stream sections on the Fremont River above the park including Fish Lake where they became established as bait-bucket introductions (Hepworth et al. 1993 and McAda et al. 1978).

Fish were found from the confluence with the Fremont River, upstream to the pool below the falls, upstream of the Visitor Center (SC1 to SC4). Above the falls which act as a fish barrier, fish were absent (SC5). The absence of fish above the falls may suggest that fish were never native above this location. It may also indicate that the absence of any fish originating from the upstream irrigation system may suggest that outside irrigation season, flows in SC both above and below the falls are perhaps not sufficient to sustain a persistent fish community, except perhaps below the most downstream irrigation return (below SC1), but that fish can move in and out of Sulphur Creek from the Fremont River during periods when irrigation releases and returns allow. The presence of juvenile FMS also suggests that it may be used as a spawning tributary for FMS when flows are sufficient.

Leatherside chub (*Gila copei* and *Snyderichthys copei*), is the former, collective name for two species that have recently been split based upon genetic, morphological, and ecological differences (Johnson et al. 2004); Northern leatherside chub (*Lepidomeda copei*) and Southern

leatherside chub (*L. aliciae*).

(<https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/SWAP/Fish/Northern-leatherside-chub.pdf>). It is unknown which species is extant in CARE.

Halls Creek

Only SPD were found in the four sites sampled in Halls Creek (Table 2.). The population appears to be healthy and reproducing, sustained by reliable water presence in bedrock pools within the Hall Creek Narrows.

Previously, non-native black bullhead (*Ameiurus melas*) and bluegill (*Lepomis macrochirus*) have been reported in Halls Creek, but now appear to be extirpated, likely due to insufficient habitat during periods of drought, and the occurrence of large flushing flows during flood events, that they are unable to withstand. The source of these species is the almost certainly Lake Powell. It is likely that in wetter periods that can maintain a prolonged baseflow from the lake to the narrows, other non-natives may be able to migrate to the narrows, but their persistence is likely to be short-lived.

Oak Creek

No fish were documented in the lower ~1.5 kms of Oak Creek within the park above Oak Creek Dam. At the time of the survey, flows within the park, above the dam appeared adequate to sustain a native fish community, but apparently in the near past, have been low enough, or absent, to extirpate any fish community in this reach. The presence of abundant filamentous algae would also indicate that there was no BHS in this reach that would use this algae as a food source.

It appears that upstream water impoundment and irrigation diversion, and insufficient irrigation releases from Bowns Reservoir allow the stream to seasonally dry within the park. Fish are unable to reestablish from downstream by the presence of the dam, and long periods of no flow in lower Oak Creek to its confluence with the Fremont River.

Table 2. Species presence and abundance at survey sites on Pleasant Creek, Sulphur Creek and Halls Creek. No fish were found in Oak Creek.

Stream Reach	Species							
Pleasant Creek	SPD	BHS	FMS	LSC	UTS	RBT	BKT	TT
PC1	27	2	0	0	0	0	0	0
PC2	53	2	0	0	0	0	0	0
PC3	26	3	0	0	0	0	0	1
PC4	44	8	0	0	0	0	0	0
PC5	14	8	0	0	0	0	0	0
PC6	17	9	0	0	0	0	0	0
PC7	14	8	0	0	0	4	1	0
PC8	15	5	0	0	0	0	0	0
	210	45	0	0	0	4	1	1
Sulphur Creek								
SC1	44	2	0	3	1	0	0	0
SC2	91	3	4	19	0	0	0	0
SC3	48	1	0	1	0	0	0	0
SC4	10	1	0	0	0	0	0	0
SC5	0	0	0	0	0	0	0	0
	193	7	4	23	1	0	0	0
Halls Creek								
HC1	0	0	0	0	0	0	0	0
HC2	7	0	0	0	0	0	0	0
HC3	5	0	0	0	0	0	0	0
HC4	1	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0
Species Total	416	52	4	23	1	4	1	1
Grand Total	502							

SPD: speckled dace, *Rhinichthys osculus*; BHS: bluehead sucker, *Catostomus discobolus*; FMS: flannelmouth sucker, *Catostomus latipinnis*; LCS: leatherside chub, *Lepidomeda copei/aliciae*, UTS: Utah sucker, *Catostomus ardens*; 1RBT: rainbow trout, *Oncorhynchus mykiss*; BKT: brook trout, *Salvelinus fontinalis*; and, TT: hybrid recreational sportsfish “tiger trout” (cross between a female brown trout (*Salmo trutta*), and male Eastern brook trout (*Salvelinus fontinalis*)).

Conclusions

The current native species composition of each watershed and/or stream reach appears to be driven by the different hydrologic conditions of each and represents the native fish species that have managed to persist or re-establish under the past and current hydrology. Drivers of the larger fish community include impediments to fish movement from both natural and constructed barriers, and the invasion of non-native species from both upstream and downstream when conditions allow.

Pleasant Creek was previously surveyed in 2006, 2007 and 2009, and the fish community in this survey was similar to that seen in 2009 which was comprised entirely of native speckled dace and bluehead sucker. In 2021, low numbers of exotic species of salmonid, likely originating from upstream, were also captured, but are at low abundance and should not constitute a threat to the persistence of the native fish community. The bluehead sucker is one of the three native species in the 'Three Species' Range-Wide Conservation Agreement and Strategy (UDWR 2004). To better conserve the species and reduce the risks of listing under the federal Endangered Species Act, it is important to ensure that stream flows are protected within this reach.

Recommendations

The primary recommendation is to explore opportunities to maintain permanent flow in Oak Creek above the Oak Creek diversion dam sufficient to reestablish and maintain another persistent native fish community within the park. To that end, the park might consider contacting the Water Rights Branch of WRD to discuss strategies to protect instream flows.

Other recommendations are:

- Conduct periodic fish surveys in Pleasant, Oak, Sulphur, and Halls creeks to monitor status and health of fish communities.
- Conduct fish survey in Polk Creek in the north of the park.
- Install temperature loggers on each creek to track possible water temperature and suitability for fish habitat in response to climate change.
- Investigate the impacts of the Oak Creek dam on the hydrogeomorphology and ecology of the creek. Although dam removal is not a consideration, the historic and ongoing impacts should be documented.
- Conduct a riparian assessment on Oak Creek above the diversion dam to understand the impact of cattle management on stream habitat.

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