FISHERIES ASSESSMENT

Objectives

The objectives of this fisheries assessment are to 1) evaluate the risk to fisheries and their habitat from effects of the Twitchell Canyon fire, 2) recommend actions that can reduce adverse impacts to hydrologic function and associated fisheries values, 3) evaluate the value of other teams recommended actions to hydrologic function and associated fisheries values, and 4) discuss recovery actions for native Bonneville cutthroat trout and how they interrelate to the Twitchell Canyon fire, its effects, and BAER proposed actions.

Existing Conditions

The table below summarizes fish species, aquatic macroinvertebrate samples, survey dates, habitat impacts, limiting factors and current condition for the fish supporting streams affected by the Twitchell Canyon fire.

Stream Information Summary

HUC Number	Macro - invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
1603000301 Clear Creek (mainstem)	Below S&G. No trend data	Brown trout, brook trout	Electroshock 2000, 2003, 2006 IRE 2005	Freeway and highway, recreation	Temperature, water quality	Stream in relatively good condition but altered channel and water quality due to road/freeway.
160300030101 Fish Creek	Below S&G. No trend data	Brown trout, rainbow trout, Bonn. cutthroat trout*	Electroshock 2003, 2006 IRE 2005	OHV, grazing, past flooding damage (1983), historic mining	Sedimentation (upper), temperature (lower), channel morphology/ few pools on lower stream near/upstream from I-70	Upper stream is in relatively good condition but is impacted by user created OHV route along stream. Route closed out in 2009 and 2010. Area upstream from I-70 for several miles affected by grazing, which has limited recovery from 1983 flooding.

HUC Number	Macro - invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
160300030102 Shingle Creek	Below S&G. No trend data	Brown trout, rainbow trout, Bonn. cutthroat trout*	Electroshock 2002, 2003, 2004, 2007, 2010 IRE 2005	Grazing (lower), prescribed fire, recreation, OHV	Sedimentation, temperature, channel/pool (lower)	Upper stream is in relatively good condition. Lower stream affected by grazing and recreational use. Fish distribution appears to be potentially limited by temperature at lower end.
160300030104 Mill Creek	No data	Rainbow trout	Electroshock 2003 IRE 2005	Heavy recreational use, grazing, recreational dredging	Sedimentation	Banks in poor condition along road
160300070101 Indian Creek	Above S&G. No trend data	Brook trout, rainbow trout	Electroshock 2008 IRE 2003	Encroaching road, grazing, 1993 dam breach, flooding, and old mines. Whirling disease recently introduced into reservoir.	-	Good stream fishery. Popular reservoir fishery.
160300070203 South Fork of North Creek	No data	Rainbow trout, cutthroat hybrids	IRE 2003	Dam/water management, localized grazing.	-	Unknown numbers and trend but appears to be good fishery. Stream is near potential condition.
160300070208 North Fork of North Creek	Below S&G. No trend data	Bonn. cutthroat trout – trend up after treatments to eliminate lower hybrids	Electroshock 2001, 2009 IRE 2003	Road, grazing, recreation, OHV	Pool volumes, sedimentation	Stream has excessive riffles from past watershed impacts. Current impacts from road, grazing, and OHVs. Additional flood impacts in May 2005

HUC Number	Macro - invert.	Sport fish	Surveys	Current habitat impacts	Limiting Factors	Current Condition Summary
160300070501 Pine Creek (Sulphurdale)	Below S&G.	Bonn. cutthroat trout – trend static at low numbers 1995-2001, slightly up by 2005 after grazing rest for prescribed fire.	Electroshock 2001, 2005, 2008 IRE 2002	Grazing, road along creek with numerous stream crossings, recreation, prescribed fire	Pool volume, sedimentation	Sedimentation and bank damage has limited cover and pools.

*Bonneville cutthroat trout – Approved for reintroduction, recovery projects initiated.

The Fishlake N.F. Forest Plan specifies yearly monitoring of aquatic macroinvertebrates and has a Standard and Guideline relating to the Biotic Condition Index (BCI). The table below summarizes the BCI values for past aquatic macroinvertebrate monitoring on streams affected by the Twitchell Canyon fire.

Aquatic Macroinvertebrate Samples: Biotic Condition Index (BCI)

STATION	87	88	89	90	93	95	96	97	98	99	00	01	02	03	04	05	06	07	10
NFNC 1	-	-	-	-	-	-	-	-	68	68	-	-	-	-	-	69	-	-	-
NFNC 2	-	-	-	-	-	-	-	-	73	71	-	-	-	-	-	-	-	-	-
Indian Cr1	-	-	-	-	72	-	-	-	-	75	-	-	-	-	-	-	-	-	-
Indian Cr2	-	-	-	-	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pine 1	-	-	-	-	-	-	-	-	62	71	-	-	-	-	-	83	-	-	-
Pine 2	-	-	-	-	-	-	-	-	-	71	-	-	-	-	-	72	-	-	-
Low Clear	-	-	-	-	-	-	-	-	-	-	-	-	-	58	-	-	-	-	-
Clear Cr 5	-	-	-	-	-	-	-	-	-	-	-	-	-	60	-	-	76	-	C*
Shingle 1	-	-	-	-	-	-	-	-	-	-	-	-	-	62	-	-	-	-	C*
Shingle 2	-	-	-	-	-	-	-	-	-	-	-	-	-	65	-	-	-	-	-
Shingle 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C*
Shingle 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	C*
Fish Cr 1	-	-	-	-	-	-	-	-	-	-	-	-	-	64	-	-	-	-	-
Fish Cr 2	-	-	-	-	-	-	-	-	-	-	-	-	-	68	-	-	-	-	-

Note: BCI data for the table is found in Mangum (various dates) and Vinson (various dates). These reports are on file at the Fishlake N.F. Supervisor's Office.

*C-Collected pre-fire but not yet sent to lab

Other then Bonneville cutthroat trout no other sensitive fish species occurs in the vicinity of the Twitchell Canyon fire. There are no threatened, endangered, candidate, or proposed aquatic species in the general vicinity of the Twitchell Canyon fire. There are no sensitive amphibian species in the general vicinity of the Twitchell canyon fire. Leopard frogs, considered a common amphibian although quite restricted on the Forest, occur in upper Clear Creek and northern tributaries of Clear Creek outside of the fire affected area.

The Hydrologic Resource Assessment and Vegetation Resources Assessment contain background information regarding watershed size, geology, precipitation regimes, and plant cover helpful to understanding fisheries. The reader is referred to these two reports for additional information.

Potential Effects – Watershed Area Burned

Monitoring of southern Utah fires on the Dixie and Fishlake National Forests shows that percentage of the watershed burned in moderate to high severities can be used to predict the level of effects to stream fish populations and their habitats. The following figures were obtained by using GIS derived burned acres and watershed areas for HUC6 watersheds and smaller 7th and 8th field subwatersheds containing the Twitchell Canyon fire. Logical population extent boundaries were used for the analysis, such as confluences and diversions. Where HUC6 figures were used they are identified, otherwise the smaller subwatersheds were summed to create the figures.

South Fork of North Creek
HUC6 Watershed – 8% Moderate to High Severity
Pine Creek tributary – 48% Moderate to High Severity (24/24)

North Fork of North Creek
Watershed – 38% Moderate to High Severity
Pole Creek tributary - 54% Moderate to High Severity (47/7)

Indian Creek
Watershed –38% Moderate to High Severity
Twitchell Canyon tributary – 50% Moderate to High Severity (3/47)
Mill Hollow tributary - 74% Moderate to High Severity (26/48)

Wildcat Creek – No fishery

Pine Creek (Sulphurdale)
Watershed – 2% Moderate to High Severity

Sulphur Creek – No fishery

Cove Creek – No fishery

Shingle Creek
Watershed – 41% Moderate to High Severity
[Note: total above includes dry side drainages near confluence-fish portion only about 45-50% burned.]
Snow Canyon tributary - 21% Moderate to High Severity (6/15)

Fish Creek
HUC6 Watershed – 47% Moderate to High Severity
Hop Canyon (face drainage) - 96% Moderate to High Severity (32/64)
Line Canyon – 83% Moderate to High Severity (7/76)
Trail Canyon – 53% Moderate to High Severity (27/26)

Picnic Creek – 59% Moderate to High Severity (41/18)
Note: Line-Trail-Picnic subwatersheds together are 66% Moderate to High Severity (25/41)
East Fork Fish Creek - 19% Moderate to High Severity (11/8)
Upper Fish Creek - 39% Moderate to High Severity (24/15)

Mill Creek
HUC6 Watershed – 19% Moderate to High Severity
Sevier Creek tributary - 74% Moderate to High Severity (27/47)

The following table shows the above watershed burned figures in context with other large fires on the Dixie and Fishlake National Forests over the past decade. It can be seen that several of the watersheds within the Twitchell Canyon fire affected area are burned at levels where serious effects to fish populations and their habitat can be expected.

Fire Effects to Fisheries – Southern Utah 2000-2010

Stream	Total % M-H Severity	Fish Pop. Effects	Channel Effects	Fire/Year
Pine Creek (Sul)	2%	Expected-none	Expected-none	Twitchell/2010
Shingle Creek	2% (8% stream length)	Reach scale decline	Minimal	Pres. Burn/2002
SF North Creek	8%	Expected-minimal	Expected-none	Twitchell/2010
Oak Creek	12%	Extirpated*	1 to 2 foot downcutting*	Devils Den/2006
Pine Creek (Sul)	12%	Minimal	None	Pres. burn/2004
Mill Creek	19%	Expected-reach scale	Expected-minimal	Twitchell/2010
Sanford Creek	30% (Majority at moderate)	Extirpated - year 2	Minor	Sanford/2002
Deer Creek	37%	Extirpated	Moderate	Sanford/2002
Indian Creek	38%	Expected-severe upper, extirpated lower	Expected-major	Twitchell/2010
NF North Creek	38%	Expected-extirpation	Expected -major	Twitchell/2010
Shingle Creek	41%	Expected-extirpation	Expected-major	Twitchell/2010
Cottonwood Creek	45%	Extirpated	Major	Sanford/2002
Fish Creek	47%	Expected - extirpation	Expected-major	Twitchell/2010
Deep Creek	56%	Extirpated	Extensive	Sanford/2002

*A debris flow prone subwatershed with about 90% moderate to high severity burn was located at the head of the Oak Creek fishery. A 25-year storm event in October following the fire generated a 100-year flood event with extensive sediment from the burned subwatershed, accounting for the serious effects despite a relatively low overall watershed percentage burned.

The above table shows that the fish populations in North Fork of North Creek, Fish Creek, and Shingle Creek are at high risk of extirpation and major channel effects such as downcutting, aggradation, and lateral migration

are likely. South Fork of North Creek may have fish kills below the Pine Creek tributary confluence. North Fork of North Creek and its Pole Creek subwatershed will likely lose all fish. Upper Indian Creek was mostly moderate to low fire severities and will likely support trout but have decreased numbers for the next 2-5 years. Debris flows from the Twitchell and Mill Hollow subwatersheds that connect mid-canyon will likely have serious effects to fish populations and their habitat below their confluences. Pine Creek will not likely have any effects from the Twitchell Canyon fire. Shingle Creek will likely suffer extirpation and serious habitat effects in the mainstem, but some fish will likely survive in the Snow Canyon tributary. Fish Creek will likely suffer extirpation and serious habitat effects below the confluence of Line Canyon, Trial Canyon, and Picnic Canyon tributaries. Some fish will likely survive in the headwaters of Fish Creek and the upper elevation tributary East Fork of Fish Creek.

Initial Fire Effects – October 4 to 5, 2010 Ash Flow

To help with the BAER team work, we made a quick assessment on 10/10/2010 of the effects to fisheries from the ash flow that came down the streams on 10/4 to 10/5 during the rain event. The rain was gentle but prolonged, producing peak flows near or just over bankfull (i.e. a normal peak runoff flow; not a flood level). The following are the results:

South Fork of North Creek was not assessed. Only minor impacts would be expected in the mainstem, but impacts could be higher in the Pine Creek tributary.

North Fork of North Creek – Station 03 (upper canyon)

	Fish / Mile	Lbs / Acre
2010	117	7.8
2009	354	28
2002	290	17

The three sites checked in the upper canyon of North Fork of North Creek averaged 82 fish/mile. The figure dropped to 45 fish/mile and 3.6 lbs/acre at the fish barrier in the lower canyon.

Indian Creek was not assessed but probably had moderate impacts. We do have data from 2 stations in 2008 for a baseline for future assessments. Reports from the road crew are that some fish did survive the ash flow.

Pine Creek (Sulphurdale) was not assessed but probably had very minor impacts.

Shingle Creek – Station 01 (lower canyon)

	Fish / Mile	Lbs / Acre
2010	0	0
2007	1690	100.5
2004	483	30.6
2003	177	8.5
2002*	60	9.9

*0.5 miles of riparian area/stream was burned above S01 about 6 weeks before the 02 sample date. The 2007 population level would be a typical level for this stream. The increase in numbers and biomass from 2002 to 2007 shows the recovery of this station from the fire effects of the localized burn just upstream.

Fish Creek just above the confluence with Clear Creek had 13 fish/mile and .3 lbs/acre.

Clear Creek – Station 05 (upper between Fish Creek and Shingle Creek)

	Fish / Mile	Lbs / Acre
2010	0	0
2006	1575	111
2002	778	97.4

Clear Creek – Visitor Center Station (Fremont Indian State Park)

	Fish / Mile	Lbs / Acre
2010	211	8.6
2003	982	51

Mill Creek was not assessed, but was running clear on 10/4 near its confluence with Clear Creek. Impacts are possible below the Sevier Canyon confluence.

Typical fish abundance figures for the Fishlake N.F. would range from about 400 fish/mile (often streams with poorer water quality but with fewer larger fish) up to 2000 fish/mile. Typical standing crop figures for the Fishlake N.F. are about 50 to 60 lbs/acre with higher quality streams supporting over 100 lbs/acre. This is a better figure to compare [across] streams as it reflects the biomass that the stream is actually supporting (i.e. the streams productivity).

The above results are just the effects from the initial ash flow off of the burned areas and in the case of upper North Fork of North Creek, direct fire effects such as water heating. Future effects from sediment delivery off of burned areas into the stream channels, including possible debris flows, are expected to be much higher and more significant. This will impact not just the populations but the habitat that supports them.

Aquatic macroinvertebrates were checked at most of the sample sites. Very few aquatic macroinvertebrates were found at all sites except lower Clear Creek. Interestingly, almost all individuals observed were of a single mayfly taxon, although some were larger individuals. For comparison, greater numbers of live macroinvertebrates were seen when collecting a sample on a recently rotenoned stream [Pine Creek (Escalante) 2001].

Treatments

Grade Stabilizers

Grade stabilizers are designed to prevent channel incising and downcutting by providing grade control to systems that may become destabilized from increased storm runoff and velocities. It is expected that four streams directly affected by the Twitchell Canyon fire would likely be subject to channel grade changes that could affect infrastructure, human safety, hydrologic function, and secondarily fisheries habitat. These streams are North Fork of North Creek, Indian Creek, Shingle Creek, and Fish Creek. In addition, the Clear Creek mainstem was identified as having potential to downcut. Discussion with Forest Service and Utah Division of Wildlife Resources fisheries biologists and Forest engineers and hydrologists identified 30 potential grade stabilizer locations on these streams. Analysis indicated that 12 of these locations met the primary BAER objectives of immediate protection to Forest infrastructure, human health and safety, and preventing adverse changes to hydrological function. The other 18 locations act in concert with the 12 initial sites to further stabilize large stream reaches to prevent adverse changes in hydrologic function. By preventing or reducing adverse changes in hydrologic function these treatments will secondarily protect important fisheries habitat.

Cooperator funding will be requested through other avenues to construct the 18 additional grade stabilizers not included in the BEAR funding request.

Grade stabilizers would be constructed from large rocks in stream reaches where loss of large areas of upstream watershed vegetation and soil cover will result in increased runoff that would cause channel downcutting. Values at risk include hydrologic function on four watersheds with large areas of high to moderate burn severities. Loss of hydrologic function and downcutting would increase channel sediment bedload, lower water tables supporting riparian vegetation and decrease stream fisheries habitat condition and complexity. Other associated values protected by this project include Forest roads along two streams with multiple stream crossings and one crossing on each of the other two streams. One stream provides habitat for a remnant population of Bonneville cutthroat trout, a Forest Service sensitive species, and two streams are approved Bonneville cutthroat trout restoration streams where reintroduction work been initiated. Without treatments continued Bonneville cutthroat trout restoration work would likely be delayed resulting in a loss of momentum in species recovery projects being conducted under the Conservation Agreement and Strategy for this subspecies.

Grade stabilizer locations for BAER funding are shown on the Engineering map and their specifications are included in the Engineering specification sheets. General locations for grade stabilization work including both BAER funding and cooperator funding are shown on the Grade Stabilization map.

Construction: For each grade stabilizer site:

1. A hydrologist or fisheries biologist and engineer will coordinate to identify the treatment site by staking, flagging, and marking GPS coordinates.

2. Estimate the size and amount of material required for each structure.

3. Ensure rock is large enough to withstand the erosive force of the stream channel. Estimate the width of the channel for the targeted high flows to ensure the structure is built so that it is not outflanked by them.

4. Construct the structure at grade, which requires excavation.

5. Spread excavated material on the slopes and/or use it to fill around the rocks.

6. Inspect and monitor the structures for any signs of erosion after the first storm event.

Other treatments

The Hydrologic Resource Assessment identified that besides risk to human health and safety, Forest roads and trails, and the Shingle Creek fish barriers, adverse changes to hydrologic function are expected in several watersheds, which could result in channel downcutting and lateral migration which would further result in loss of riparian habitat and stream access to their floodplains. This would degrade aquatic habitat for Bonneville cutthroat trout existing remnant populations and restoration habitat, as well as non-native recreational trout fisheries. The Hydrologic Resource Assessment identified five watersheds as having a very high to high risk of erosion, large increases of peak stream flow, and debris flow events. These watersheds are Fish Creek, Shingle Creek, North Fork of North Creek, and two fishless tributary subwatersheds – Sevier Canyon (Mill Creek) and Twitchell Canyon (Indian Creek). To counter these risks the Hydrologic Resource Assessment identified 4,158 acres of aerial mulch treatments. These areas would be mulched at about 1.0 ton/acre on high to moderate soil burn severities on slopes under 70%. Watersheds treated would be the North Fork of North Creek, Twitchell Canyon and Mill Hollow tributaries in Indian Creek, Shingle Creek, Fish Creek, and the Sevier Canyon tributary of Mill Creek.

The Vegetation Resources Assessment found high potential for substantial soil loss in Fish Creek and its Line Canyon tributary, Shingle Creek, Sevier Canyon (Mill Creek tributary), Twitchell Canyon and Mill Canyon (Indian Creek tributaries), North Creek and its Pole Creek tributary, and Pine Creek (South Fork of North Creek tributary). Another risk was invasion of noxious weeds and cheatgrass into burned areas, which could displace native plants, disrupting and shortening the natural fire intervals leading to increased fire effects to streams in the future. The Vegetation Resources Assessment recommended seeding 844 acres of lower elevation areas to reduce cheatgrass infestation, seeding of higher elevation areas with native plants only on the 4,158 acres mulched and an additional 7,043 acres not mulched with native plants and 20 lbs/acre of a sterile hybrid (grows for one year to provide organic matter for soil cover and protection). Finally, 1,234 acres of steep slopes on less receptive soils in upper North Fork of North Creek (Bonneville cutthroat trout habitat) would be seeded at 40 lbs/acre with the sterile hybrid for organic cover but with no native seeds (these slopes are too steep for effective mulching).

Analysis

The streams with portions in the Twitchell Canyon fire include recreational fisheries, a remnant native Bonneville cutthroat trout stream, and two streams already identified and approved for recovery of native Bonneville cutthroat trout. Monitoring to date has shown that just the initial ash flow off of the burned areas into the streams reduced fish numbers in North Fork of North Creek and lower Clear Creek, nearly eliminated fish from lower Fish Creek, and eliminated fish from lower Shingle Creek and upper Clear Creek. High peak flows with high levels of sediment from spring runoff and summer thunderstorm events over the next few years are likely to extirpate fish populations in most of Fish Creek, Shingle Creek, and North Fork of North Creek based on the watershed burn percentages. Hydrologists and ecologists have identified large areas of the burn at risk for adverse changes in hydrologic function, soil loss, and invasion of noxious weeds and cheatgrass. Without treatments fish population loses would be even more severe, extending down into areas with lower burn percentages, and negative habitat effects would likely carry on for an extended period, perhaps beyond 5 years. Invasion by cheatgrass could increase long-term fire frequency and stream sedimentation rates in low to moderate elevation zones. Treatments will not likely be effective in preventing fish population loss in the most heavily burned watersheds. They will still be *critical*, however, for long-term habitat recovery. The Hydrologic Resource Assessment indicated that the mulch treatment would likely reduce sediment deliver off of the treated areas by 50%. They will also reduce downstream peak flows. The seeding treatments for areas unsuitable for mulching will be critical for stabilizing high burn severity units too steep to mulch, especially in Line Canyon and the upper watershed of North Fork of North Creek. The grade stabilization structures will act in concert with the above treatments, which reduce sediment delivery to the stream, to minimize stream downcutting and lateral migration on North Fork of North Creek, Indian Creek, Shingle Creek, and Fish Creek. Downcutting and lateral migration can result in further large sediment delivery to streams. Preventing downcutting is critical to maintaining the streams access to its floodplain for long-term fisheries habitat stability. These treatments acting together will shorten the watershed recovery time, reducing the time until fish population recovery actions can be undertaken (also see the Bonneville cutthroat trout write-up below).

Monitoring

For the Grade Stabilizers the following monitoring will be conducted by a fisheries biologist or hydrologist.

Implementation Monitoring

• Was the treatment implemented as designed?
• Is the structure at grade?
• Is the structure long enough to avoid outflanking?
• Were State or Federal streambank permit final reports submitted?

Effectiveness Monitoring

• Regularly inspect drainage structures and tread condition for the next 5 years or until side slopes revegetate noting the following items:
• What type of storm events did the structure receive prior to monitoring?
• Are there indications of channel downcutting? If so, are more structures needed?
• Is grade stabilizer structure maintenance needed?
• Did the structure function as designed?

Besides the BAER treatment monitoring described above for grade stabilizers, Fishlake N.F. and UDWR fisheries biologists will monitor fish survival, fisheries habitat, and aquatic macroinvertebrates in the affected streams.

Bonneville Cutthroat Trout

Bonneville cutthroat trout are a Forest Service Region 4 sensitive species and a Utah conservation species. They have been managed under a Conservation Agreement and Strategy since 1997. The Conservation Agreement was recently renewed in 2008 and the Conservation Strategy is currently undergoing revision for an expected renewal in the near future. The Conservation Agreement and Strategy direct signatory agencies to both protect populations and habitat, as well as undertake further recovery actions. Goal number 2 of the Conservation Agreement is to "Enhance or restore habitats used by conservation populations, including habitat associated with populations identified for restoration or expansion, to a desired, properly functioning. Actions should be also undertaken to curtail undesirable impacts from ongoing land uses, to the extent possible." (BVCT State of Utah Conservation Team 2008: p2.)

Bonneville cutthroat trout have been petitioned for listing as a threatened species multiple times. In the latest review the Fish and Wildlife Service (FWS) found they were not warranted for listing, in part due to the Conservation Agreement and Strategy protections and recovery actions. The Fish and Wildlife Service noted in their decision that their rationale was based on the fact that continued recovery actions would take place under the Conservation Agreement and Strategy with the expectation that the near future rate of recovery actions (i.e. momentum) would continue at recent levels. They further noted that it was important to work to recover Bonneville cutthroat trout into higher quality streams then have been done in the past, and that it was important to create metapopulations (connected populations within larger watersheds) of Bonneville cutthroat trout.

Bonneville cutthroat trout historic range is broken into separate Geographic Management Units (GMUs) in the Conservation Agreement and Strategy. The Fishlake N.F. is located in the southern GMU. The southern GMU currently has the smallest amount of historic habitat occupied by Bonneville cutthroat trout, currently about 11%. This makes the southern GMU vulnerable should a petitioner ask for listing of Bonneville cutthroat trout in a portion of their range instead of range-wide.

The Fishlake N.F. has a successful cooperative program with the Utah Division of Wildlife (UDWR) for restoration of Bonneville cutthroat trout. In the past decade on the Forest two new remnant populations have been identified and three additional streams have been restored to Bonneville cutthroat trout, although two of these are marginal lower quality streams.

The expected effects from the Twitchell Canyon fire place one historical remnant population in North Fork of North Creek at risk of extirpation. This population is considered a conservation population but is slightly introgressed. Habitat improvement projects (rock sills to create pools) have been constructed in North Fork of North Creek to improve Bonneville cutthroat trout habitat, and are threatened by high peak water flows and sediment from the burned areas.

The Twitchell Canyon fire will also impact current recovery efforts. Two larger higher quality drainages on the north side of the Tushar Mountains were selected and approved for recovery in a UDWR and FWS NEPA Environmental Analysis (EA), along with several other additional streams. With the planned recovery work four of the tributaries of Clear Creek would be restored to native Bonneville cutthroat trout, raising the potential of creating a southern Utah metapopulation. To begin the recovery work Shingle Creek had two fish barriers constructed at its confluence with Clear Creek in 2009. The first of two renovation treatments was planned for summer 2010 but was precluded by the fire. A natural barrier was identified in the upper portion of Fish Creek and initial treatment in upper Fish Creek was planned for 2011. High flows and sediment from the burned areas could threaten the Shingle Creek fish barriers. Unstable habitat in these drainages could delay these recovery projects for 2-5+ years, especially if treatments to reduce flood peaks and sediment delivery are not undertaken.

The general public has a neutral stance on native trout restoration – primarily they are interested in being able to catch a decent sport fish in a reasonable amount of time and effort. The effects of the Twitchell Canyon fire present both challenges and opportunities to the restoration of native Bonneville cutthroat trout. Fire watershed effects will greatly reduce habitat quality in the short term, and will likely increase the challenge of treating streams. Sport fisheries in the Clear Creek drainage and mainstem will be severely impacted by flooding and sedimentation and may suffer extensive declines and even extirpation over the next 2 to 5 years. If Bonneville cutthroat trout recovery actions are delayed by extended fire effects and do not take place until after the sport fishery and its habitat has recovered, the recovery work would impact public sport fishing for a second time. Public support for the native fish program would decline as anglers would not be supportive of treatments that impact their sport fishing after the fishery has recovered from an extended absence. If, on the other hand, BAER treatments, restoration and recovery treatments, and NFWF fisheries and cooperator funded treatments can speed habitat recovery, and management actions and funding can be undertaken to conduct native trout recovery actions timed to occur with the recovering habitat, there will likely be high public support. The latter scenario also ensures Bonneville cutthroat trout recovery momentum is maintained, thus supporting the Fish and Wildlife Service decision that listing is not warranted.

References

BVCT State of Utah Conservation Team. 2008. Conservation agreement for Bonneville cutthroat trout (*Oncorhynchus clarki utah*) in the State of Utah. Utah Division of Wildlife Resources, Salt Lake City, Utah.

(Prepared by Jim Whelan, Fisheries Biologist – Fishlake National Forest)