Sage Hen Integrated Restoration Project: Fisheries Effects Analysis

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1. Issues Addressed

This section includes issues pertaining to fisheries that have been identified for detailed analysis. "An issue is a statement of cause and effect linking environmental effects to actions" (FSH 1909.15).

Issue 1: How will bull trout, a threatened species, be affected by proposed project activities?

Issue 2: How will bull trout critical habitat be affected by proposed activities?

2. Methodology

See the Sage Hen Integrated Restoration Project Fisheries Biological Assessment and Hydrology specialist report.

2.1. Resource Indicators and Measures

Table 1. Resource condition indicators and measures for assessing effects

Issue	Indicator or Measure	Source
Sediment delivery	GRAIP_Lite Model	Hydrology specialist report
Habitat connectivity	Known migration barriers	Aquatics database

3. Environmental Consequences

3.1. Environmental Consequences of No Action

This section discloses the environmental impacts of not taking action.

3.1.1. Direct and Indirect Effects of No Action

The direct (same time and place) and indirect (occurs later in time or further in space) impacts of the no-action alternative are:

Issue 1: Sediment delivery levels would continue at existing levels throughout the project area. No change to sediment delivery would result in continued reduced pool volumes, increased substrate embeddedness, lowered egg and juvenile survivorship, and lowered abundance of prey for juvenile fish. All of these conditions would have continued negative effects on bull trout populations and their critical habitat. See the Fisheries Biological Assessment for more information.

Issue 2: Habitat fragmentation would continue to exist at the known migration barriers. See the Fisheries Biological Assessment for more information.

3.2. Environmental Consequences of the Proposed Action

This section discloses the environmental impacts of the proposed action.

3.2.1. Direct and Indirect Effects of the Proposed Action

Issue 1: Sediment delivery levels would increase in the temporary timeframe, but decrease to below pre-project levels within approximately six years after implementation. These increases in sediment delivery could result in minor impacts to bull trout or their critical habitat in the temporary timeframe. However, sediment levels recover to less than pre-project levels six years after implementation and that continues into the future. This would be a long term beneficial effect to bull trout and their critical habitat. Reduced sediment delivery would result in increased pool volumes after the sediment is flushed through the system, decrease substrate embeddedness, increasing egg and juvenile survivorship, and increases the abundance of prey for juvenile fish. See the Fisheries Biological Assessment for more information.

Issue 2: Habitat connectivity would be immediately restored as the aquatic organism passages (AOPs) are installed. Some adverse effects would likely occur during existing culvert removal and AOP installation activities. Replacement of these structures includes the following activities: placement of block nets, electrofishing and fish handling, dewatering of the channel, in-channel ground disturbance to remove the existing structure and install the new AOP structure, and rewatering the channel. It is possible for juvenile fish to be impinged on the block nets, resulting in negative effect or fatalities. It is also possible for electrofishing, fish handling, dewatering of the channel, as well as removal of the old structure, and installation of the new AOP to result in bull trout fatalities from various avenues. Regardless of the amount of effort during fish salvage, it is most likely that not every fish can be removed from the area and may result in a fatality.

While there are expected negative effects from AOP installations in the immediate timeframe, the positive effects that follow installation far outweigh them. Re-connecting steams at these locations would result in several miles of habitat in Cold Spring Creek, Pole Creek, and Antelope Creek being re-opened for potential bull trout colonization, spawning, rearing, and refugia. These results would most likely have beneficial effects to the local resident bull trout populations and critical habitat immediately following installation and recovery. See the Fisheries Biological Assessment for more information.

3.2.2. Cumulative Effects of the Proposed Action

Cumulative effects under NEPA are the combined effects that occur when project activities overlap in space and time with any other past, ongoing, and reasonably foreseeable activities in the action area, including Federal activities.

The project area encompasses the Upper Squaw Creek fifth hydrologic unit, which drains south to Black Canyon Reservoir. Water quality impacts in the project area would accumulate in Squaw Creek and flow to Black Canyon Reservoir. There are two federal actions which could be considered in cumulative effects: 1) Ongoing grazing, and 2) The Sage Hen Recreation Area Hazard Tree Mitigation Project. Grazing has been a regular part of the project area for decades. The effects of ongoing grazing which were observed during data collection were: a) grazing-related plant community changes in riparian areas (expressed as a paucity of woody riparian species in certain areas); b) mechanical destabilization of banks (trampling). Both of these lead to changes in stream shading and bank stability. Changes in bank stability lead to erosion, which leads to greater sediment inputs. Both changes in stream shading and bank stability have cascading effects on water and stream habitat quality as well as impact to bull trout. These effects are already accounted for in the baseline (pool tail fines and pebble counts, for example); however, grazing is expected to continue in the project area, and so will its effects.

The Sage Hen Recreation Area Hazard Tree Mitigation Project is being implemented in 2020, as of the writing of this report. That project was designed with soil and water protection in mind. There are skid trails but no temporary roads being built for that project. Though it is a small project, the temporary water quality impacts from that project would overlap in the Second Fork sub-watershed but they would be complete before the implementation of this project, so they will not overlap in time. These impacts would, however, affect Sagehen Reservoir and the Black Canyon Reservoir. The most likely impact would be an increase in sediment accumulation in Sagehen and Black Canyon reservoirs.

Because there are no foreseeable new impacts from grazing, and because the sediment impacts from the Sage Hen Recreation Area Hazard Tree Mitigation Project would not overlap in time, there is a very low likelihood that the cumulative effects from these actions within the project area would cause the project to be out of compliance with soil and water standards or have any additional effects to bull trout or their critical habitat.

4. Consistency with Relevant Laws, Regulations, and Policy

4.1. Land and Resource Management Plan

The Boise National Forest Land and Resource Management Plan (forest plan) provides standards and guidelines for fisheries. See the Forest Plan Consistency Checklist in the project record for this information.

4.2. Other Relevant Law, Regulation, or Policy

Forest plan standards, guidelines, management area direction, and management prescription conditions were developed to be consistent with each other and to be consistent with applicable State and Federal Law (in this case the Clean Water Act and the regulation thereof by the State of Idaho). In other words, a project which complies with water quality standards in the forest plan, would also comply with relevant State and Federal Laws, forest plan objectives, management area direction, and management prescription conditions. For example, forest plan soil and water standard SWST01 states, *"...Management actions shall be designed in a manner that maintains or restores water quality to fully support beneficial uses..."* This standard speaks directly to the Clean Water Act. In this project, this objective is met primarily through decommissioning and resurfacing roads, protecting stream shade, establishing riparian buffers, and using design features where appropriate. Doing so protects water quality through distancing activities from water and maintaining canopy densities. This supports the maintenance and/or improvement of beneficial uses as defined by the Clean Water Act and the State of Idaho.

Therefore, by meeting SWST01, for example, one demonstrates the maintenance or improvement of relevant forest plan watershed condition indicators, compliance with State water quality directives, the Clean Water Act, and with applicable forest plan objectives, management area direction, and management prescription conditions.

5. Conclusion

Indicator: Sediment Delivery

Increased sediment loads alter a stream's natural biotic community (algae, macrophytes, invertebrates, and fishes). Sediment fills in the interstitial spaces between the rocks in the stream bottom, which greatly influences the diversity and abundance of aquatic insects, particularly those species that rely on filter feeding and algal grazing, thus having a negative impact on bull trout growth and survival (watershed condition indicators) in the temporary timeframe, a neutral or immeasurable effect in the short-term, but a

positive trend in the long-term based on the design features, timing, and the sediment delivery watershed condition indicators. Sediment affects trout directly by smothering/burying their redds, which reduces oxygen supply to the eggs and the number of eggs that eventually hatch to fry (population size watershed condition indicator). This is known as entombment. The number of eggs that survive to fry is strongly affected by the amount of sediment in the stream bottom (Bjornn and Reiser 1991, Chapman 1988, Everest et al. 1987). As sediment goes up, egg survival goes down. Juvenile trout, particularly bottom-dwelling species like bull trout, also need clean hiding spaces between the rocks in the stream bottom to survive and grow. The more sediment that fills the spaces, the less hiding cover for trout, which leads to poorer juvenile survivorship. Sediment also reduces juvenile trout survivorship indirectly by altering aquatic insect composition (the main food source for juvenile trout), thereby decreasing the abundance of prey.

As discussed in the Hydrology specialist report and Fisheries Biological Assessment, Forest roads are the main source of sediment in the action area. There is a consistent relationship in the scientific literature between roads and the amount of sediment in streams (Quigley and Arbelbide, 1997). In general, the more roads in a watershed; the higher the sediment levels in the streams. The road density (watershed condition indicator) in the Pole Creek-Squaw Creek HUC is 2.37 miles per square mile, in the 3rd Fork Squaw Creek subwatershed it is 3.99 miles per square mile, and finally, the 2nd Fork Squaw Creek subwatershed has 5.35 miles per square mile without the inventoried roadless area. These densities are considered high. The proposed action would decrease overall road density and stream-connected road density, although it would not change the overall functional rating of the sub-watersheds for this watershed condition indicator. Skid trails and temporary roads could extend the length of the current drainage network in the temporary timeframe; however, in the long-term, all temporary roads, skid trails, and many unauthorized travel routes would be decommissioned, and no longer be present on the landscape. Thus, one would expect a net benefit (in the long-term) to this watershed condition indicator under the proposed action.

Forest roads are an example of a press disturbance, meaning that the road system delivers sediment to streams indefinitely throughout time whenever storm and runoff events occur. The most negative aspect of the press disturbance is that it never goes away. Surfacing with gravels, especially at stream crossings has been shown to significantly reduce sediment delivery. Fire, in contrast, is an example of a pulse disturbance. A pulse disturbance delivers a large slug of sediment in a short period of time, but then goes away and allows streams to flush the sediment out of their system. Some sediment is still being stored in the bottoms of pools and low velocity habitat types and only moves during high flows.

Other watershed condition indicators affected by the Sediment/Turbidity watershed condition indicator

Based on the Fisheries Biological Assessment, there could be some negative effects to bull trout or their critical habitat in the temporary timeframe from the expected effects to the sediment watershed condition indicator. Conversely, as the subwatersheds recover from various disturbances, the model reflects improvements in both the short- and long-term timeframes. Similarly, the watershed condition indicators of 1) bull trout population size, 2) growth and survival, 3) substrate embeddedness, 4) pool frequency and quality, and 5) width/depth ratio are expected to follow the same trends in all timeframes. In summary, these watershed condition indicators are expected to be negatively impacted for three years following implementation, but as the additional sediment load is flushed thru the systems, these watershed condition indicators will recover, and improve in the short- and long-term as sediment delivery levels drop below the pre-project conditions. This will result in improved habitat conditions throughout the project area, which would be beneficial to bull trout in the short- and long-term. See the Fisheries Biological Assessment for more info expected effects to watershed condition indicators.

Issue Indicator: Habitat Connectivity(Migration Barriers)

There are four known migration barriers in or adjacent to bull trout critical habitat proposed for replacement. The National Forest System road 625 crossings of Cold Springs Creek and Pole creek are in occupied bull trout habitat, with positive eDNA hits (Boise National Forest Aquatic Database). The barrier at the 2nd Fork Squaw Creek crossing on National Forest System road 609 and at the 609 crossing of Antelope Creek are identified as bull trout critical habitat, but are outside of a patch and eDNA samples near the site were negative for bull trout.

Replacement of these structures includes the following activities: placement of block nets, electrofishing and fish handling, dewatering of the channel, in-channel ground disturbance to remove the existing structure and install the new aquatic organism passage structure, and rewatering the channel. It is possible for juvenile fish to be impinged on the block nets, resulting in negative effects or fatalities. The project activities could result in injury or mortality to individual bull trout from electrofishing and handling, but the risk is lowered by following National Marine Fisheries Service Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (NMFS 2000, appendix D). Individual bull trout could also be injured or killed during construction activities if an individual was missed during the removal process or got through the block net and/or into the diversion pipe; it is expected that bull trout would be absent or removed from the construction area and placed outside the block nets and that mortality would be unlikely.

While there are anticipated negative effects from aquatic organism passage installations during implementation, the beneficial effects that follow installation far outweigh them. Re-connecting steams (physical barriers watershed condition indicator) at these locations would result in several miles of habitat in Cold Spring Creek, Pole Creek, 2nd Fork Squaw Creek, and Antelope Creek being re-opened for potential bull trout colonization, spawning, rearing, and refugia. These results would most likely have long-term beneficial effects to the local resident bull trout populations thru the following watershed condition indicators: 1) life history and diversity, 2) persistence and genetic integrity, and 3) change in drainage network. Additionally, beneficial effects to critical habitat would be expected immediately following installation and recovery.

6. References Cited

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