Flume Creek Westslope Cutthroat Trout Restoration Framework

Summary of Project Background, Methods, and Translocation Options

Boundary Hydroelectric Project: FERC No. 2144

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This document provides a framework for translocation of Westslope Cutthroat Trout into Flume Creek, Pend Oreille County, WA, following piscicide treatments to remove non-native Brook Trout.

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1. INTRODUCTION

On March 20, 2013, the City of Seattle was awarded a 42-year Federal Energy Regulatory Commission (FERC) license for operation of the 1,040-megawatt Boundary Hydroelectric Project (hereafter Project; FERC No. 2144), located on the Pend Oreille River in Pend Oreille County, Washington. The license stipulates that the City of Seattle (hereafter Seattle City Light; SCL) shall implement measures under License Article 9 to protect and enhance fish and aquatic resources in the Project area, especially in support of native salmonid recovery in Project tributaries (FERC 2013).

Westslope Cutthroat Trout *Oncorhynchus clarki lewisi* (WCT) are native to the Pend Oreille River basin in northeastern Washington (Gilbert and Evermann 1895), and historically occupied approximately 99% of all streams in the watershed (Andersen 2008). Legacy impacts of logging, road construction, mining, and agriculture have combined with the construction of three dams on the lower mainstem Pend Oreille River to degrade habitat and block fish passage (Baker et al. 2014). Non-native salmonids were also introduced into many areas of the Pend Oreille Basin, establishing self-perpetuating populations (WDFW unpublished stocking data; Andersen 2008). Habitat losses, combined with competition, predation, and hybridization with non-native fishes, have greatly reduced numbers of WCT in the Pend Oreille River watershed (Shepard et al. 2003). Sampling indicates that WCT are currently found in fewer than 35% of streams in the basin, and that WCT distribution and population sizes are shrinking (e.g., Cee Cee Ah Creek prior to 2011; Andersen 2008). Pure (non-hybridized) populations of WCT in the Pend Oreille watershed are now typically found only above fish passage barriers that prevent invasion from downstream populations of non-native salmonids (Small et al. 2007).

Flume Creek (Figure 1), the third largest watershed in the Boundary Hydroelectric Project area (19.5 mi^2), joins Boundary Reservoir from the west near Metaline Falls, Washington. A large cascade and 43-foot vertical waterfall at RM 0.30 isolate the drainage from the reservoir (McLellan and O'Connor 2001; Walker et al. 2015). Sampling in the Flume Creek watershed by multiple entities revealed a simple fish community consisting of Brook Trout *Salvelinus fontinalis* and WCT (R2 1998; McLellan and O'Connor 2001; Terrapin 2017; KNRD unpublished data). Sculpin *Cottus* spp. were reported from lower Flume Creek above the falls (WFE 2012), but the report may have been in error as Sculpin have not been observed in other surveys (R2 1998; McLellan and O'Connor 2001; Terrapin 2017) or recent focused attempts to sample them (KNRD unpublished data, WDFW unpublished data). Sculpin are also absent from other perched drainages with barrier falls within the Boundary Reservoir pool drainage (e.g., Slate and Pewee creeks; SCL unpublished data). The salmonid species occupying Flume Creek are geographically partitioned, with Brook Trout inhabiting most of the watershed and WCT limited to headwater areas above Brook Trout distribution.

In consultation with Project stakeholders that comprise the Fisheries and Aquatic Workgroup (FAWG), formed to oversee implementation of license requirements, SCL developed a Fish and Aquatics Management Plan (FAMP; SCL 2010) to guide measures implemented under the current FERC license. The presence of non-native fish species, particularly Brook Trout, has been identified as a serious threat to persistence and/or recovery of native salmonids in the Pend Oreille Basin through interbreeding or competition for habitat and food resources (Andonaegui 2003). License Article 9(D) and FAMP section 5.4.2 (SCL 2010) describe measures for the suppression or eradication of non-native fish species in the Project area, including eradication through piscicide treatments (SCL 2010, FERC 2013). Toward that end, WDFW and KNRD partnered with SCL to conduct non-native fish eradication via rotenone treatment in Flume Creek. Due to the size of the watershed, the Flume Creek treatment area was divided into 2 sections and a temporary fish management structure (tFMS) was constructed on October 11, 2019 at RM 3.0 (Figure 1; Photo 1). The Brook Trout-bearing portion of Flume Creek and its tributaries above the tFMS site was treated with rotenone on August 20, 2019, just prior to installation of the tFMS. A second rotenone treatment is scheduled for August 2020, with extensive environmental DNA (eDNA) and backpack electrofishing sampling to occur in spring 2021. Results of sampling will inform whether Brook Trout have been successfully eradicated from the upper Flume Creek watershed, or if additional eradication efforts are required.

Following successful removal of Brook Trout, SCL, KNRD, and WDFW propose to introduce native WCT to the treated area via translocation. Translocation of WCT to Flume Creek will represent the fourth native WCT restoration effort in the Washington portion of the Pend Oreille River Basin. From 2008-2010 WDFW and KNRD conducted rotenone treatments on upper Cee Cee Ah Creek to eradicate Brook Trout, resulting in the complete removal of the population above Cee Cee Ah Falls (Andersen 2008; Baker and Donley 2009; 2010; Andersen 2012). One hundred adult WCT were re-introduced to Cee Cee Ah Creek above Cee Cee Ah Falls in 2011 (Andersen 2012). In addition, 178 fry were released in 2012 from remote site incubators (RSI; Andersen and Bean 2013). Monitoring of the restored WCT population began in 2013, with confirmation of natural reproduction and an estimated population of 2,310 fish (age-1+). Cee Cee Ah Creek WCT have continued to increase in abundance, with approximately 5,000 fish present in 2016 (WDFW, unpublished data). Translocation of WCT, following successful rotenone treatments, also occurred in Highline Creek (treated 2017-2018; Baker and Walker 2018) and Smalle Creek (treated 2015-2017; Baker and Walker 2017) in October 2019 (Baker et al. 2020; Walker et al. 2020). Translocations of WCT into Smalle Creek will continue in 2020.

2. STUDY AREA

The upper Flume Creek project area encompasses the Brook Trout-bearing portion of Flume Creek and its tributaries above the tFMS, comprising a treatment area of approximately 5.1 stream miles (Figures 1 and 2). Significant tributaries to mainstem Flume Creek in the project area include the Middle Fork of Flume Creek, as well as 4 unnamed tributaries (T9, T10, T11,

and T12). Allopatric populations of Brook Trout occupied the entire length of T9 and T10, the lower portions of T11 and T12, Middle Fork Flume Creek below the confluence of the North and South forks of Middle Fork Flume Creek, and mainstem Flume Creek to approximately RM 5 (Figures 1 and 2). Allopatric populations of WCT persist in the North and South forks of Middle Fork Flume Creek and mainstem Flume Creek above Brook Trout distribution. Flume Creek was stocked with Brook Trout from 1933–1944 and in 1981, but no stocking records were found for WCT in the basin (WDFW unpublished data). Genetic sampling of WCT in the Flume Creek watershed in 2012 revealed a high degree of relatedness between Flume Creek WCT and the WDFW Kings Lake WCT broodstock (WFE 2012; Small et al. 2017). Whether WCT are endemic to the Flume Creek drainage is unknown, but genetic data suggests that undocumented stockings of Kings Lake-origin WCT likely occurred in the Flume Creek watershed at some point in the past.

3. PERMITTING

Permits and licenses required for implementation of the proposed 2021 translocation of WCT to Flume Creek are listed below, including a description, lead agency, permit numbers, valid dates, status update (if applicable), and access to permit/license information.

3.1 State Environmental Policy Act (SEPA)

A SEPA checklist for translocation of WCT must be submitted to the WDFW SEPA coordinator for review and public comment prior to stocking a species of fish into a specific waterbody for the first time. The SEPA checklist will be accompanied by this framework document.

3.2 USDA Forest Service Special Use Permit

The Flume Creek project area is located on property owned by the Colville National Forest, United State Forest Service (USFS). The USFS required a Special Use Permit (SUP) to authorize access for the Flume Creek translocation (SUP # SLK51, received July 30, 2019).

4. FISH HEALTH

Fish translocated to Flume Creek will be collected exclusively from a nearby tributary to the Pend Oreille River (Slate Creek), thus minimizing the risk of pathogen and parasite transfer into the Flume Creek watershed. Fish health sampling for disease surveillance was conducted annually in Slate Creek for both WCT and Brook Trout from 2016-2018. Virology samples were analyzed by the WDFW Fish Health Lab, and bacteriology and Whirling Disease samples were analyzed by the Washington State University Washington Animal Disease Diagnostic Laboratory (WADDL). Results revealed no significant findings for virology, bacteriology, and Whirling Disease screening (WDFW unpublished data; K. Britt, WDFW Fish Health Specialist, pers. comm).

5. TRANSLOCATION METHODS

The SCL Native Salmonid Conservation Facility (NSCF; FAMP section 5.6; SCL 2010), tasked with production of native trout to support SCL FERC license mitigation projects, has not yet been constructed. In the interest of expediting non-native fish eradication/WCT introduction projects, initial translocation of a limited number of WCT into upper Flume Creek is proposed to establish a population. Translocations of WCT to Flume Creek are tentatively scheduled to occur in fall 2021 (or 2022 if a third rotenone treatment is necessary in 2021) and may continue for two or more years. Tanslocations will occur during the fall, as lower water temperatures reduce handling stress (Piper et al. 1982), increasing survival of captured donor fish. Both adult and sub-adult WCT will be captured from the Slate Creek donor population and translocated to upper Flume Creek. It is anticipated that adult fish will spawn the following spring and contribute to the newly restored population (Small et al. 2014). Sub-adult fish are expected to mature over time to replace adult fish as they age out of the population, ensuring no gap in fry production (Walker et al. 2015b). Additional stocking of WCT may be required following initial translocations. It is assumed that construction of the NSCF will be completed prior to 2024 (Harry Rich, SCL Project Manager, pers. comm). If additional stocking is required, WCT produced in the NSCF will be utilized, likely beginning in 2025. Source stock for the NSCF will also originate from Slate Creek.

5.1 Westslope Cutthroat Trout Donor Stock Collection

Three-hundred WCT donor stock will be collected using a Smith Root LR-24 (or equivalent) backpack electrofishing unit fished with pulsed-DC at the lowest voltage, amperage, and frequency setting adequate to collect fish without injury. To achieve a mixture of adult and sub-adult fish, captured fish will be assigned to a size bin based on fork length (FL; Table 1). One quarter (25%; n = 74) of translocated fish will be from Size Class 1 (juvenile; 70-100 mm), 50% (n = 152) of translocated fish will be Size Class 2 (sub-adult; 101-150 mm), and 25% (n = 74) will be Size Class 3 (adult; 151-200 mm). To minimize relatedness of donor fish, only 25 total fish (across all bins) will be collected per each 200-m electrofishing unit. Prior to selecting captured WCT for translocation, individuals will be scanned for PIT tags to ensure they were not previously tagged. In the event a tagged fish is observed, it will be released to avoid influencing ongoing monitoring efforts within Slate Creek. Selected WCT will then be transported to Flume Creek (Photo 1), where fish will be measured for FL (mm), weighed (g), marked by clipping the adipose fin, tissue sampled for genetic analysis, and PIT-tagged.

5.2 Westslope Cutthroat Trout Translocation

Translocated fish will be held in Flume Creek in covered totes or pens for a 24-hour monitoring period. Holding containers will be perforated to allow stream flow to move freely through the container. Westslope Cutthroat Trout will be observed to determine condition post-transport and evaluated for PIT tag loss prior to release. The project area will be divided into 6 reaches (Figure 2), with each section to receive a specified number of fish (Table 2). Fish will be removed from

totes, placed into buckets, and scatter-planted throughout the introduction reaches (Photo 2). No fish will be planted downstream of the confluence of Middle Fork Flume Creek with mainstem Flume Creek to minimize loss of translocated individuals due to downstream emigration.

5.3 Westslope Cutthroat Trout Donor Stock(s)

Genetically pure (<1% introgression) populations of WCT occur in some tributaries to Boundary Reservoir (Small et al. 2017), although few populations are of sufficient abundance to allow mining of donor fish (SCL unpublished data). A geographically proximate, genetically robust population of WCT exists in Slate Creek with sufficient abundance to allow use as a donor stock for translocation into Flume Creek.

5.3.1 Slate Creek WCT

Slate Creek WCT are abundant and genetically pure (Young et al. 2004; Small et al. 2007; Bearlin and Simmons 2015; Small et al. 2017). The majority of the Slate Creek watershed is isolated from downstream fish populations by a natural waterfall/cascade barrier on mainstem Slate Creek near its confluence with Boundary Reservoir (Walker et al. 2015a). Genetic analysis indicates that Slate Creek WCT are closely related to the WDFW Kings Lake WCT broodstock (Young et al. 2004; Small et al. 2007; Small et al. 2017). Slate Creek WCT exhibit genetic diversity (0.242-0.301), allelic richness (1.52-1.65), and effective population (Ne) size (19-76) (Small et al. 2017) sufficient for use as a donor for population establishment in Flume Creek (Mo Small, WDFW Geneticist, pers. comm.).

5.3.2 Flume Creek and Middle Fork Flume Creek WCT

The headwaters of mainstem Flume Creek and the North and South forks of Middle Fork Flume Creek have allopatric populations of genetically pure WCT (Bean et al. 2019). However, genetic analysis of WCT populations in the project area revealed exceptionally low genetic metrics, indicating genetic bottleneck (Small et al. 2017). Westslope Cutthroat Trout are separated from downstream populations of Brook Trout by topographic features that function as upstream fish passage barriers (Figure 1; 1.5 m step on mainstem Flume Creek near RM 4.75; combination logjam and road crossing on Middle Fork Flume Creek; Terrapin 2017). Abundance of WCT is very low (KNRD unpublished data). Taken together, low abundance and genetic diversity metrics for populations in the Flume Creek watershed rule out their use as donor stock. However, downstream dispersal of resident WCT in the upper Flume Creek watershed will likely lead to intermingling and breeding with translocated WCT. Although comparatively genetically poor, naturalized WCT in the Flume Creek drainage may exhibit local adaptations conducive for survival in the watershed and could contribute to the newly established population.

6. MONITORING

The newly established WCT population in Flume Creek will be monitored annually via electrofishing within two years of initial translocation. Monitoring during 2021 and 2022 will utilize a mobile PIT tag reader (to assess survival and movement, e.g., Weber et al. 2016) and

snorkeling (to confirm successful reproduction; Apperson et al. 2015) in place of electrofishing to avoid undue impact on the newly established WCT population. Mobile PIT tag monitoring will occur in 2021 and 2022 to assess fish distribution and PIT tag loss. Mobile PIT tag monitoring utilizes a unit similar in design and use to a backpack electrofisher. When a tag is detected, the reader stores the tag number, date, time, and GPS coordinates for later download. The maximum read range of the system is approximately 60 cm (in air). The operator will walk upstream along the streambank, travelling out of the water except as needed. Detections will be visually investigated to determine if a live fish is present. If no fish are sighted, an attempt will be made to recover the PIT tag from the stream bottom via magnet.

In addition, a stationary PIT tag array will be installed at the tFMS in summer 2021 prior to translocation. The propane-powered thermoelectric PIT tag array will be used to monitor continuously for WCT emigration from the project area.

Monitoring via multiple-pass electrofishing will begin in fall 2023 and will consist of annual sampling of fish from index reaches (block netted) by multiple-pass depletion electrofishing surveys. One 100-m index reach will be established in each of the six translocation sections (Figure 2). Sampled young-of-the-year will be counted and transported above or below the index reach and released without further handling. Age 1+ fish will be enumerated, measured for FL (mm) and weight (g), inspected for an adipose fin clip, scanned for a PIT tag, and released. Unclipped age-1+ fish will be tissue sampled for genetic analysis to determine parentage.

Monitoring will continue on an annual basis to assess population abundance and geographic expansion. Monitoring beyond 2023 will follow the methods described above sans tissue sampling. However, it is recommended that genetic assessment of the population be conducted once every 10 years following 2023. If decreased genetic diversity, allelic richness, or N_e are detected, additional translocations of genetically pure WCT from the Slate Creek Basin may be conducted.

7. EFFECTS OF TRANSLOCATION ON FISH POPULATIONS OUTSIDE THE FLUME CREEK WATERSHED

Introduced populations of WCT should not impact fish populations outside of the project area. Westslope Cutthroat Trout in other Boundary Reservoir tributaries rarely make movements greater than 1 km (SCL, unpublished data). Small et al. (2017) found very little genetic exchange between discrete populations of WCT within the Pend Oreille River watershed. Interactions between introduced WCT and Endangered Species Act (ESA) listed Bull Trout *Salvelinus confluentus* are unlikely. However, the species co-occur in many locations throughout the Columbia Basin. Thus, no negative interactions would be anticipated.

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9. FIGURES

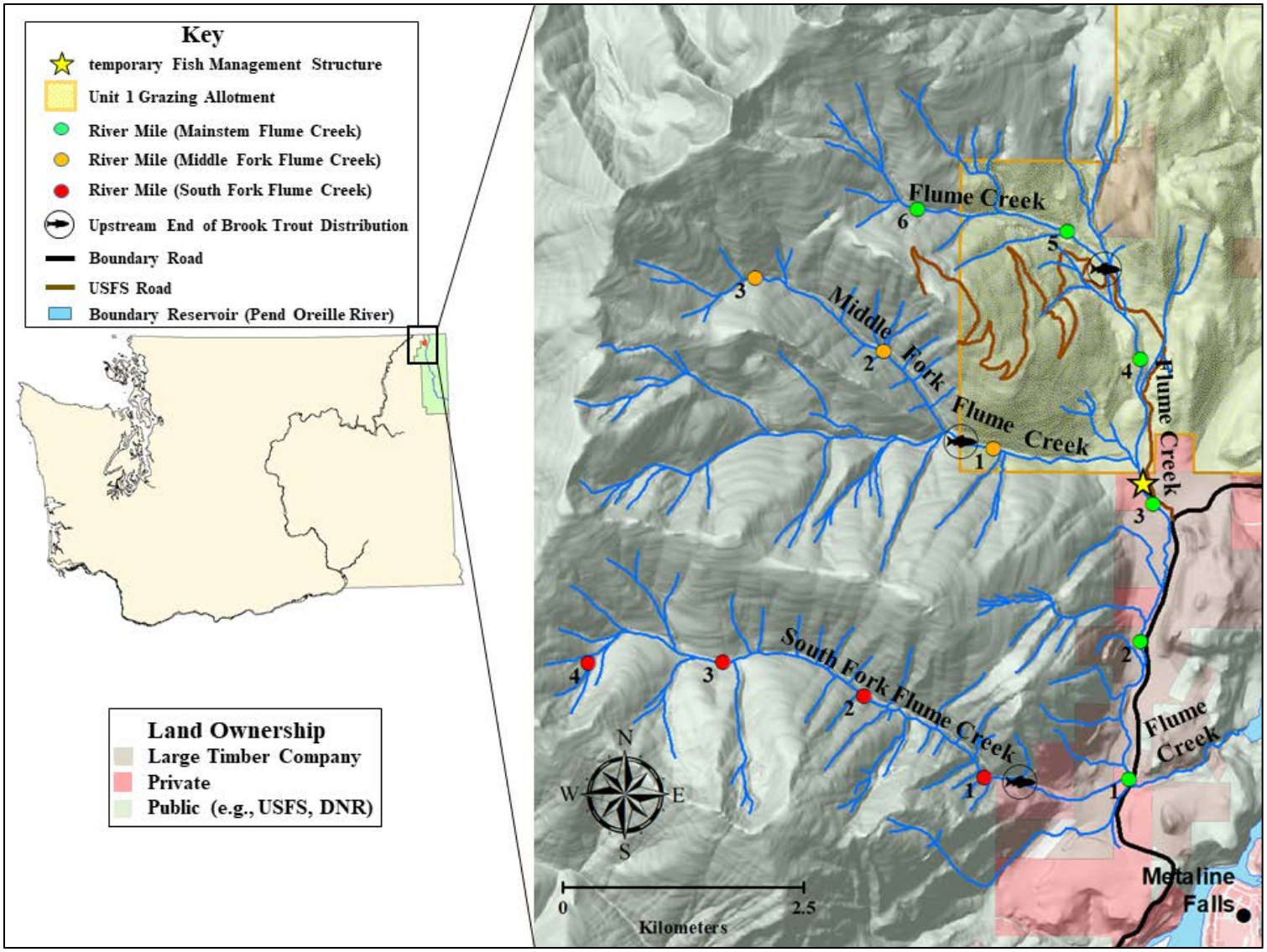

Figure 1. Flume Creek watershed with location of Flume Creek in Washington State.

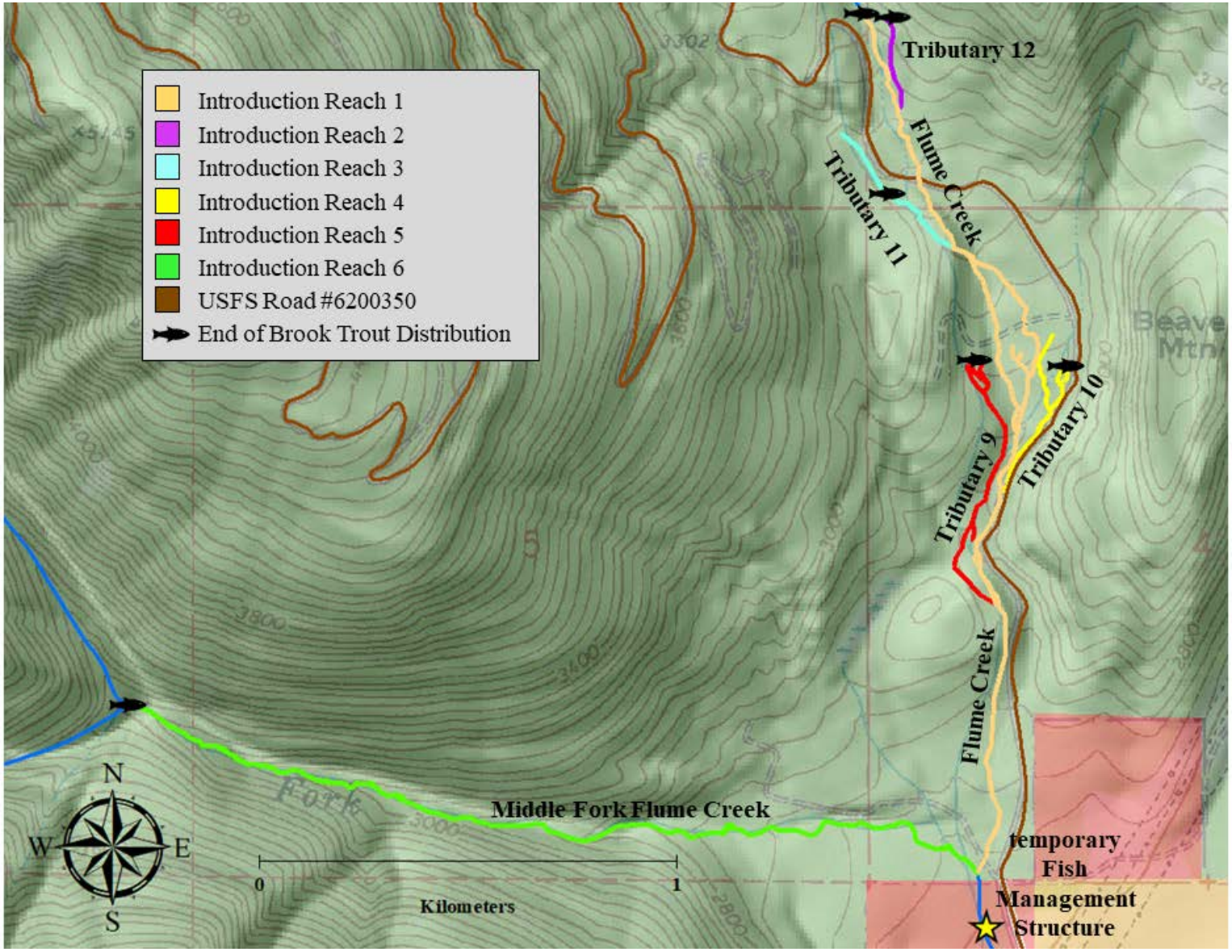

Figure 2. Proposed Flume Creek WCT introduction reaches.

10. TABLES

Table 1. Number of WCT by size class proposed for translocation into Flume Creek**.**

Source	70-100 mm	101-150 mm	151-200 mm	Total
Slate Creek	74	152	74	300
% of Total	**25**	**50**	**25**	

Table 2. Number of WCT by size class (FL), Stream, and Introduction Reach proposed for translocation into the upper Flume Creek watershed.

Stream	Introduction Reach	70-100 mm	101-150 mm	151-200 mm	Total
Flume Creek	1	25	50	25	100
Tributary 12	2	5	10	5	20
Tributary 11	3	5	10	5	20
Tributary 10	4	7	16	7	30
Tributary 9	5	12	26	12	50
Middle Fork Flume Creek	6	20	40	20	80
Total WCT		**74**	**152**	**74**	**300**

11. PHOTOGRAPHS

Photo 1. Flume Creek temporary fish management structure (SCL photos).

Photo 2. Transporting trout for out-planting.

Photo 3. Scatter-planting trout.