OREGON DEPARTMENT OF FISH AND WILDLIFE

Fish Passage WAIVER Application

29 August 2008

APPLICANT INFORMATION

Applicant is the owner of the artificial obstruction and all mitigation measures.

ORGANIZATION/APPLICANT: Eugene Water &Electric Board
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SIGNATURE: _____ **DATE:** _____

OWNER (*if different than Applicant*)**:** Same
CONTACT: **TITLE:**
ADDRESS:
CITY: **STATE:** **ZIP:**
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E-MAIL ADDRESS:

SIGNATURE: _____ **DATE:** _____
Signature indicates that you understand and do not dispute this request.

APPLICATION COMPLETED BY (*if different than Applicant*)**:** Same
TITLE:
ORGANIZATION:
ADDRESS:
CITY: **STATE:** **ZIP:**
PHONE:
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E-MAIL ADDRESS:

SIGNATURE: _____ **DATE:** _____

To Be Completed by ODFW Fish Passage Coordinator

APPLICATION #: **DATE RECEIVED:**

FILE NAME:

APPROVED ☐ **SIGNATURE:** _____ **DATE:** _____

DENIED ☐ **TITLE:**

1 TYPE OF ARTIFICIAL OBSTRUCTION FOR WHICH A WAIVER IS BEING REQUESTED

☒	Dam	New	☐
☐	Culvert/Bridge	Existing	☒
☐	Tidegate		
☐	Other (describe):		

2 BACKGROUND AND DESCRIPTION OF THE PROPOSED ACTION TRIGGERING THE NEED TO ADDRESS FISH PASSAGE

The Oregon Department of Fish and Wildlife (ODFW) has requested that the Eugene Water & Electric Board (EWEB) propose aquatic measures to support a fish passage waiver application for Smith Dam. EWEB constructed Smith Dam in the 1950s pursuant to a license the Federal Power Commission, now the Federal Energy Regulatory Commission (FERC), issued for the Carmen-Smith Hydroelectric Project (Project) and an Agreement entered in August 1958 between EWEB and the State of Oregon acting by and through the Oregon State Game Commission and the Fish Commission of Oregon (1958 Agreement). Neither the FERC license nor the 1958 Agreement require fish passage at Smith Dam. EWEB is now in the process of relicensing the Project including Smith Dam. EWEB believes that the 1958 Agreement obviates the need for a fish passage waiver. Nevertheless, without intending to waive its rights under the 1958 Agreement, EWEB is willing to file this fish passage waiver application so long as filing the application and issuance of a waiver do not prejudice EWEB's rights under the 1958 Agreement.

3 PASSAGE WILL NOT BE PROVIDED FOR THE FOLLOWING REASONS

EWEB and other interested parties (including ODFW) have engaged in settlement negotiations since January 2007 for relicensing of the Project. The settlement parties have reached a proposed Settlement Agreement that provides that fish passage at Smith Dam will not be included as a settlement provision for EWEB to implement. EWEB has proposed numerous aquatic measures in the vicinity of Smith Dam (both upstream and downstream) in the settlement negotiations that ODFW can recognize as effective mitigation for a lack of fish passage to support this waiver application. The settlement parties have agreed to include these aquatic measures as parts of the settlement. EWEB understands that ODFW supports these settlement measures, and EWEB believes that many of these settlement measures address specific ODFW interests.

EWEB refers to these measures, that EWEB believes ODFW can recognize as effective mitigation for a lack of fish passage at Smith Dam, as "settlement measures" in this waiver application because the settlement parties have agreed to these measures as elements of a settlement for relicensing of the Project. However, it should be understood that these settlement measures can not be final and binding on EWEB and the other settlement parties until they are included in a final settlement agreement signed by the settlement parties and they are included in a new final license issued by FERC.

4 DATE THE TRIGGER ACTION IS SCHEDULED TO BEGIN

The FERC license for the Project expires in November 2008. FERC has stated that it intends to issue a Ready for Environmental Analysis notice in September 2008, a draft environmental assessment (EA) in December 2008, and the final EA in June 2009. FERC has not stated when it expects to issue a new license for the Project.

5 LOCATION

COUNTY: Linn
ROAD CROSSING (if applicable)**:** Smith Lo-level Road
RIVER/STREAM: Smith River
TRIBUTARY OF: McKenzie River
BASIN: Smith River basin
COORDINATES[a]**:** Longitude: -122.0504°W Latitude: 44.2735°N
[a]Geographic projection using NAD 83.

6 STREAM DESCRIPTION

6.1 Barrier Table

Table 1. Summary of information for Smith Dam (artificial obstruction) and barriers upstream and downstream of Smith Dam.

	DOWNSTREAM (TRAIL BRIDGE DAM)				SMITH DAM	UPSTREAM (NATURAL BARRIERS)		
Location	3	C/N	2	1	AO	1	2	E
Type				D	D	N	N	
Length				1,800 ft (549 m)	1,100 ft (336 m)	LWD jam of 44 pieces with a volume of 3,758 ft^3	2.7-m (8.9-ft) high bedrock wall	
Distance		3.2 km (2.0 mi)		4.2 km (2.6 mi)		4.7 km (2.9 mi)	5.8 km (3.6 mi)	5.8 km (3.6 mi)
Level				5	5	4	5	

Type = C (culvert/bridge), D (dam), T (tide gate), N (natural), O (other)
Length= length of the barrier in the stream
Distance = distance from the Artificial Obstruction (to closest point of other barriers)
Level= amount of passage at the barrier using the following codes:
5 - barrier to all native migratory fish
4 - barrier to some native migratory fish adults and/or species
3 - barrier to some native migratory fish adults and/or species for only part of migration period
2 - barrier to all native migratory fish juveniles
1 - barrier to some native migratory fish juveniles and/or for only part of migration period

LOCATIONS:
AO = the existing or proposed Artificial Obstruction
1,2 = other barriers in the same stream as the Artificial Obstruction
3 = downstream barrier outside the immediate stream in which the Artificial Obstruction is located
E = end of historical native migratory fish use, including all tributaries
C/N = first downstream confluence or complete natural barrier, whichever comes first

Additional descriptions for those barriers included in the barrier table or for other barriers affecting native Migratory fish movement to or from the artificial obstruction are provided below.

6.1.1 Artificial obstruction—Smith Dam

Smith Dam is 235 ft (72 m) high and 1,100 ft (336 m) long (EWEB 2003) (Table 1; Figure 1; Appendix A, Photos 1–2). It is currently a barrier to upstream passage of all fish species, and a partial obstruction to downstream passage. It is assumed that some fish species migrate downstream past the barrier over the spillway, and some species may migrate downstream through the Smith Power Tunnel (Appendix A, Photo 3).

6.1.2 Downstream barrier—Trail Bridge Dam

Trail Bridge Dam is 80 ft (24 m) high and 1,800 ft (549 m) long (EWEB 2003) (Table 1; Figure 1; Appendix A, Photos 4–5). It is currently a barrier to upstream passage of all fish species, and a partial obstruction to downstream passage. Downstream passage of Chinook salmon fry, juveniles, and smolts has been observed at the spillway and through the turbine; downstream passage by bull trout juveniles, subadults, and adults has also been documented. As part of the proposed Settlement Agreement reached thus far among the settlement parties, EWEB would provide upstream and downstream passage at Trail Bridge Dam.

6.1.3 Upstream barriers—natural

Two barriers mapped by ODFW and the USDA Forest Service on the Smith River upstream of the Browder Creek were characterized by Stillwater Sciences biologists, and include a log jam approximately 4.7 km (2.9 mi) upstream of Smith Dam (Table 1; Figure 1; Appendix A, Photos 6–7), and a 2.7-m (8.9-ft) high bedrock waterfall located approximately 5.8 km (3.6 mi) upstream of Smith Dam (Figure 1; Appendix A, Photos 8–9) (Stillwater Sciences 2006a). The log jam is located at a sharp bend in the channel, is composed of 44 pieces of large woody debris (LWD), and has a volume of approximately 106.4 m^3 (3,758 ft^3). Two smaller jams were observed upstream of the large jam for a total jam spacing of 90 m (298 ft) (Stillwater Sciences 2006b). It is assumed that both of these features would be barriers to the upstream migration of any native fish present upstream of Smith Dam. Cutthroat trout were observed upstream of the log jam by Stillwater Sciences (2006c) during the surveys, which may be due to the transitory nature of log jams, and the possibility that fish moved downstream from upstream resident populations, or were present before the log jam barrier was in place.

6.2 Summary Table of Current Conditions Downstream and Upstream of Smith Dam

Table 2. Summary of current conditions upstream and downstream of Smith Dam.

	DOWNSTREAM	UPSTREAM
NMF species present currently[1]	Cutthroat trout (*Oncorhynchus clarki*), rainbow trout (*O. mykiss*), mountain whitefish (*Prosopium williamsoni*), bull trout (*Salvelinus confluentus*), and spring Chinook salmon (*O. tshawytscha*)	Cutthroat trout, rainbow trout, and mountain whitefish

	DOWNSTREAM	UPSTREAM
NMF species present historically[1]	Pacific lamprey (*Lampetra tridentata*), cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, mountain whitefish. Historical presence of Pacific lamprey, bull trout, and Chinook salmon is not documented, as described below.
Habitat quality[2, 3, 4]	Degraded from reduced instream flows, and decreased sediment, large woody debris supply. Primarily characterized by riffles and pocket water with low abundance of spawning habitat and deep pools. Rearing for juveniles is abundant in shallow water habitat, although complexity is low.	Degraded from timber harvest activities, with altered supply of sediment and large woody debris. Characterized by riffles, pocket water, and pool habitat. Low abundance of spawning habitat, with abundant rearing habitat for juvenile salmonids in complex shallow water habitat.
Flows[5]	All flows from Smith River are diverted; the only source of flow is natural accretion (primarily Bunchgrass Creek) and spill releases from Smith Dam.	Natural, unregulated flows in the Smith River upstream of the reservoir. The Smith Reservoir collects water from the Smith River and the McKenzie River via the Carmen Diversion Tunnel.
Water quality[6]	Water temperature in the Smith Bypass Reach below Smith Dam often becomes quite warm in the summer, with areas that can be in excess of ODEQ criteria (if Smith Dam were not present) during August and early September. Other water quality parameters do not raise ODEQ compliance issues.	Water temperature in the Smith River upstream of Smith Dam often becomes quite warm in the summer, with areas that can be in excess of ODEQ criteria (if Smith Dam were not present) during August and early September. Johnson et al. (1985) characterized Smith Reservoir as oligotrophic (i.e., low nutrients), based upon low chlorophyll-a concentrations and water transparency. Other water quality parameters do not raise ODEQ compliance issues
Water right availability[7]	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-Smith Hydroelectric Project in perpetuity.	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-Smith Hydroelectric Project in perpetuity.
Land use/zoning[7]	The Project is primarily located on federal land and lies within eight of the Willamette National Forest (WNF) Management Areas (MAs), and two others are within the 0.8-km (0.5-mi) wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.	The Project is primarily located on federal land and lies within eight of the WNF MAs, and two others are within the 0.8-km (0.5-mi) wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.

NMF = native migratory fish
[1] Stillwater Sciences (2006c).
[2] Stillwater Sciences (2006d).
[3] Stillwater Sciences (2006e).
[4] Refer to Appendix A, Photos 10–13 for photographs of habitat in the Smith River upstream of Smith Dam.
[5] Stillwater Sciences (2006f).
[6] Stillwater Sciences (2006g).
[7] Martha Goodavish Planning & Design and Stillwater Sciences (2006).

Additional details regarding the information provided in the summary table are provided below.

6.2.1 Current and historical distribution of native migratory fish

Native migratory species currently and historically found upstream of Smith Dam include cutthroat trout, rainbow trout, and mountain whitefish. Pacific lamprey may also have occurred upstream of Smith Dam, although their historical presence has not been documented, and the likelihood of their occurrence has not been investigated. Bull trout have not been found above Smith Dam since the completion of the Project, and their historical presence above the Smith Dam location before completion of the Project is unlikely (EWEB 2003, Stillwater Sciences 2006h). Current temperature regimes in Smith River above the Project exceed the preferred range for bull trout during their spawning, fry, and juvenile life-stages (Stillwater Sciences 2006i). The U.S. Fish and Wildlife Service (USFWS) in designating critical habitat for bull trout did not designate the Smith Bypass Reach or Trail Bridge Reservoir as critical habitat (USFWS 2005).

The extent that spring Chinook salmon may have utilized the Smith River cannot be definitively determined from existing historical accounts. McIntosh et al. (1990) described notes from a U.S. Bureau of Fisheries survey in July 1938 of 2.6 miles of the Smith River starting from the mouth as follows: "This is a good trout stream at present, fry and fingerlings were numerous. It is doubtful if salmon would use this stream because of the cascades and large boulders throughout." Mattson (1948) listed the Smith River only as a tributary where spawning occurred, but without reference to specific locations. Parkhurst et al. (1950) related a survey of the 4.2 km (2.6 mi) of the Smith River upstream of the historical confluence with the McKenzie River (without citation), and note that although this does not appear to be a very good salmon stream, a few Chinook salmon had been observed utilizing the spawning area in the few years prior to the publication of the report. They further described the Smith River as having a channel gradient and banks that were steep, many cascades and low falls over large boulders and bedrock, and with spawning areas mostly behind boulders and log jams. In September 1958, the Oregon Fish Commission surveyed three quarters of a mile of Smith River starting from the mouth and concluded: "No salmon or nests were observed and the stream possessed what we would classify as a very poor potential for spring Chinook in the area observed. The stream bed is composed almost entirely of bedrock and large boulders" (Fish Commission of Oregon 1958).

Available topographic data and historical aerial photography were found to be insufficient to assess further the potential for historical Chinook presence in the Smith River. Longitudinal profiles constructed for the Project area from 1925 USGS topographic data did not include the Smith River, and as-built topography from October 1964 was altered by construction features necessary for the Smith Reservoir. Therefore, while it may never be known for certain, it is likely that spring Chinook utilized the lower Smith River to the limits of the available spawning habitat; however, use of this habitat would also be impeded by low-flow conditions during the fall in the lower Smith River, and thus the historical record does not support passage into and use of the Smith River above the present Smith Dam location. Currently, the National Marine Fisheries Service (NMFS) has designated the upper limit of critical habitat for threatened Upper Willamette River Chinook salmon at approximately the limit of the Trail Bridge Reservoir confluence with the Smith Bypass Reach (NMFS 2005), coincident with current use by hatchery Chinook salmon from the McKenzie Hatchery.

Based on historical evidence reviewed by EWEB, spring Chinook salmon and bull trout were likely not present in the Smith River above the location of the Smith Dam prior to the construction of Smith Dam. In addition, scientific literature related to water temperature preferences (for bull trout) and flows (for both Chinook salmon and bull trout) provide sufficient evidence to exclude these two species from having

a historical distribution upstream of Smith Dam. However, EWEB acknowledges that ODFW has asserted that spring Chinook salmon and bull trout would use habitat upstream of Smith Dam if fish passage were provided, and therefore, both species are included in this waiver application because of the ODFW assertion.

6.2.2 Population dynamics analysis of benefits of passage at Smith Dam

During the Project relicensing studies, population dynamics models were developed and used to quantitatively assess the relative influence of Project operations (e.g., benefits of fish passage at Smith Dam, or habitat projects throughout the Project area) on Chinook salmon and bull trout populations. Model development and results are described in Stillwater Sciences (2006i). Model results should not be interpreted as precise estimates of population size, but rather as predictions of relative changes in estimated population size. The Chinook salmon model predicts smolt production by assuming a smolt-to-adult survival rate and running through multiple generations until the number of returning adults is stable (i.e., to equilibrium). However, because the smolt-to-adult survival was not measured in the Project area, the primary means of evaluating alternative management actions were based on relative differences in smolt production, rather than the long-term equilibrium population of adults. Input values and source information for the Chinook salmon and bull trout models (under current conditions and under conditions of varying management scenarios, respectively) are provided in Appendices D and E of Stillwater Sciences (2006i).

6.2.2.1 Benefits of passage at Smith Dam for Chinook salmon

The primary effect of Smith Dam is blockage of upstream movement of all fish species, and limitation or delay of downstream passage of species from the Smith Reservoir and upper Smith River (Stillwater Sciences 2006c). Aquatic habitats in the upper Smith River are not available to species downstream that would otherwise seek them as part of resident or migratory life histories. If fish passage facilities (e.g., a fish ladder) were provided at Smith Dam, and certain settlement measures such as increased flows, pulse flows, and physical stream modifications were provided in the Smith Bypass Reach as needed, adult Chinook salmon could hypothetically migrate to Smith Reservoir from the Smith Bypass Reach. Potential production of smolts for the upper Smith River (the Smith River upstream of Smith Reservoir) and for the adult population in Smith Reservoir were modeled assuming that 80% of the current spawning population in the Smith Bypass Reach would hypothetically migrate upstream to the upper Smith River (Table E-6 of Stillwater Sciences 2006i), with no assumed mortality or delay associated with fish passage facilities.

Spawning habitat in the upper Smith River is adequate to support a spawning population of about 14 females. However, based on the survival of subsequent life-stages, a spawning population of fewer than 5 is predicted. Fry habitat, and secondarily juvenile habitat, limit rearing potential in the upper Smith River; most rearing would occur in the Smith Reservoir, where fry and juvenile survival strongly affect estimated production. Based on the same predation values estimated for Trail Bridge Reservoir, over 250 smolts would be produced from Smith Reservoir, with a total of 1,500 smolts produced upstream of Trail Bridge Reservoir, or a 20% increase over current production. Predation in Smith Reservoir from bull trout (assuming they had the same hypothetical access along with Chinook salmon), introduced hatchery fish, and native trout would be expected to be high (Tabor et al. 2004).

6.2.2.2 Benefits of passage at Smith Dam for bull trout

If upstream fish passage facilities were provided at Smith Dam, and certain settlement measures such as increased flows, pulse flows, and physical stream modifications were provided in Smith Bypass Reach, an adult bull trout population could hypothetically migrate to Smith Reservoir. The potential adult bull trout production for the upper Smith River was modeled separately from the potential Trail Bridge Reservoir population. Bull trout require a narrow range of cold-water temperatures for all of their life-stages (Buchanan et al. 1997). Water temperatures in the upper Smith River are currently and historically (pre-Project) higher than the preferred range for bull trout during their spawning, fry, and juvenile life-stages (Figure 2); however, for the passage at Smith Dam model, it was assumed that spawning would occur in the upper Smith River, and that all late fry would migrate from upper Smith River in June, as temperatures increase. Because of the high water temperatures, no late fry or juvenile use of upper Smith River was modeled.

Based on the analysis, Smith Reservoir and upper Smith River could not support a population of bull trout. Due to a lack of rearing habitat in the upper Smith River, all rearing of late fry and juveniles would occur in Smith Reservoir where survival is estimated to be very low (as it is in Trail Bridge Reservoir) because of predation from released hatchery trout, native trout, and any adult bull trout that would be in the reservoir. A population of bull trout in Smith Reservoir would be very sensitive to, and limited by, survival of fry and juveniles. The only scenario that maintained a stable population required a value for fry survival in Smith Reservoir considered to be unrealistically high (>20%); in that scenario, 13 subadults and adults were supported in the reservoir based on fry and juvenile bull trout rearing in Smith Reservoir.

Although a self-sustaining population of bull trout could not be supported in Smith Reservoir based on habitat mapping (Stillwater Sciences 2006d), Smith Reservoir does have the potential to provide adult bull trout habitat. If passage facilities were provided at Smith Dam, and assuming the settlement measures provided above, subadult and adult bull trout from Trail Bridge Reservoir could hypothetically migrate upstream to Smith Reservoir during the winter through summer period, and could return downstream in the fall to spawn in the lower Carmen Bypass Reach or Sweetwater Creek. Radio-tagged bull trout in other systems have been observed to migrate throughout a basin, even passing through warmer reaches, to access suitable habitat (Scholz et al. 2005), although there was no fish ladder to ascend. If subadult and adult bull trout used Smith Reservoir seasonally as additional foraging habitat, the overall subadult/adult population could increase by an estimated 108 individuals, which would effectively double the size of the current population upstream of Trail Bridge Dam. However, the likelihood of this behavior occurring in the Project area is unknown, especially considering a fish ladder as an additional factor.

6.2.2.3 Benefits of passage at Smith Dam for other native migratory fish species

The effect of Smith Dam on native migratory fish species other than Chinook salmon and bull trout was not quantitatively analyzed, and is currently unknown, but species that once utilized the connected habitats between the McKenzie River and the natural fish passage barriers in the upper Smith River are likely affected. Downstream migration at Smith Dam is also limited because of the low frequency of spills at Smith Dam (Stillwater Sciences 2006f) as well as the low likelihood of fish being entrained at the Smith Dam spillway or power tunnel due to species composition and distribution in the reservoir (Stillwater Sciences 2006c).

The consequences for native fish of losing connectivity at Smith Dam could include population-level effects, as indicated by species distribution, life history patterns, community structure, and genetics.

Overall, the greatest changes to community structure may have been the addition of non-native brook trout that compete with native trout, and hatchery rainbow and cutthroat trout that interact and hybridize with native trout species, as well as shifting the total fish abundance to stocked trout species and increasing angling pressure. The consequence of any genetic mixing between native and stocked fish could be the dilution of the native genetic structure and, eventually, the loss of adaptive traits that might only be preserved in portions of the Project area (e.g., upstream of natural migration barriers) where vestigial populations of native species survive separately from stocked species. In addition, isolated populations can experience genetic drift, resulting in a loss of genetic diversity, which can lead to a reduction in fitness and potentially extirpation.

Passage at Smith Dam would presumably either ameliorate genetic diversity and fish community structure issues by allowing greater mixing between native fish populations, or would exacerbate problems by allowing greater distribution of hatchery and non-native fish throughout the Project area. However, passage at Smith Dam would not be expected to result in a significant increase in population abundance because:

- extensive stocking of hatchery trout and recreational angling in Smith Reservoir decreases the suitability of habitat there, and
- habitat in the Smith River upstream of Smith Reservoir currently has abundant populations of native trout that do not appear to be limited by recruitment from downstream (Stillwater Sciences 2006c).

6.3 Sources for Information

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Stillwater Sciences. 2006c. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

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7 MITIGATIONS

7.1 Mitigation 1—Lower Carmen Bypass Reach Settlement Measures

EWEB's goal for the implementation of settlement measures in lower Carmen Bypass Reach is to increase the area of spawning habitat for spring Chinook salmon throughout the reach to a minimum of 300 m^2, if reasonably practicable, and then to maintain this amount (or higher as described below) of spawning habitat for the term of the license. To achieve this goal, EWEB will implement the following actions:

- addition of gravel in the lower Carmen Bypass Reach,
- placement and maintenance of a LWD average frequency of at least 80 pieces per mile in the lower Carmen Bypass Reach between Trail Bridge Reservoir and the confluence with Kink Creek, and
- provision of the required flow release.

Although not quantitatively defined, the lower Carmen Bypass Reach settlement measures that EWEB implements will also increase rearing and other habitat (in addition to spawning habitat for Chinook salmon) for Chinook salmon, bull trout, other native fish species, and macroinvertebrate forage for these fish within the reach. EWEB, in consultation with the Fisheries Work Group (FWG), will consider, but will have no independent obligation to increase, rearing and other habitat for native fish species in the lower Carmen Bypass Reach in the design and implementation of habitat projects and in its evaluation and consideration of the results from the monitoring of habitat projects.

7.1.1 Distance between mitigation site and Artificial Obstruction

Mitigation actions will be in the 2.3-km (1.4-mi) lower Carmen Bypass Reach (Figure 1; Appendix A, Photos 14–17), which terminates at the confluence with the Smith Bypass Reach at Trail Bridge Reservoir.

7.1.2 Date the mitigation is scheduled to be completed

Although FERC has not stated a date it expects to issue a new license, FERC has stated that it expects to issue its final Environmental Assessment in June 2009. Once FERC issues a final new license, and if the license reflects the proposed Settlement Agreement reached thus far among the settlement parties, EWEB would implement settlement measures in lower Carmen Bypass Reach as soon as EWEB completed the fish passage facilities at Trail Bridge Dam, the 1,000-cfs turbine bypass valve, and the remotely operated gate on the Carmen Diversion Tunnel.

7.1.3 Location

COUNTY:	Linn
ROAD CROSSING (if applicable)**:**	USDA Forest Service Road #2600730
RIVER/STREAM:	Lower Carmen Bypass Reach (regulated reach of McKenzie River)
TRIBUTARY OF:	Willamette River
BASIN:	McKenzie River
COORDINATES[a]**:**	Upstream end of lower Carmen Bypass Reach:
	Longitude: -122.0308°W Latitude: 44.3001°N
	Downstream end of lower Carmen Bypass Reach:
	Longitude: -122.0397°W Latitude: 44.2859°N

[a] Geographic projection using NAD 83.

7.1.4 Stream description and additional information regarding the mitigation in relation to native migratory fish movement

The settlement measures that could be recognized as effective mitigation for a lack of passage at Smith Dam are planned for the lower Carmen Bypass Reach, which terminates at the confluence with the Smith Bypass Reach at Trail Bridge Reservoir (Figure 1). Trail Bridge Dam impounds Trail Bridge Reservoir approximately 1.8 km (1.1 mi) downstream from the confluence with the lower Carmen Bypass Reach (Figure 1). Trail Bridge Dam is currently a barrier to upstream migration, but would be provided with fish passage facilities before these measures are complete. The settlement measures designed for this reach would provide the Carmen Bypass Reach with instream flows, gravel augmentation, and maintenance of instream LWD, which are anticipated to increase habitat quality throughout the reach. Smith Dam is currently a complete upstream migration barrier for all fish, and excludes fish from accessing habitat upstream of the dam. EWEB anticipates that the measures could be recognized as effective mitigation for a lack of passage for native migratory fish at Smith Dam primarily because habitat conditions for native fish upstream of Smith Dam would be poor, including:

- excessive summer water temperatures,
- low amounts of spawning habitat (~38 m^2 [409 ft^2] for Chinook salmon and bull trout),
- increased exposure to angling impacts in Smith Reservoir, and
- potential predation from native and non-native trout in Smith Reservoir.

7.1.4.1 Population dynamics benefits analysis for lower Carmen Bypass Reach settlement measures

Benefits of settlement measures for spring Chinook salmon

In general, increasing habitat for fry or juveniles in the lower Carmen Bypass Reach would have little effect on the production of smolts upstream of Trail Bridge Reservoir because of the abundant rearing habitat for Chinook salmon in Trail Bridge Reservoir. However, increasing available spawning habitat (and spawning habitat quality) would result in increased production of emergent fry and, whether they rear in lower Carmen Bypass Reach or in Trail Bridge Reservoir, in increased production of smolts (Table 3). Total estimated smolt production from Trail Bridge Reservoir is estimated to increase by over 40% (>2,200 smolts) with the spawning habitat projects planned for the lower Carmen Bypass Reach, based on the following assumptions:

1. Increases in fall instream flows and gravel augmentation results in at least 300 m^2 of spawning habitat.
2. Redd size in lower Carmen Bypass Reach will average 5.4 m^2 (58.1 ft^2).
3. Augmented gravel results in an increase in gravel quality, and subsequent 40% increase in egg-to-emergence survival.
4. Returning spawners will use the lower Carmen Bypass Reach in same proportion as currently observed (80% spawners).
5. Increased instream flow results in increases to a total of 2,397 m^2 of fry and 4,780 m^2 of juvenile rearing habitat.

Table 3. Summary of model results comparing the benefits of passage at Smith Dam with settlement measures in lower Carmen Bypass Reach for Chinook salmon and bull trout.

	Passage at Smith Dam	Settlement measures in lower Carmen Bypass Reach
Total miles of Chinook salmon and bull trout habitat	2.9	1.4
Primary benefits for Chinook salmon	Potential access to spawning and rearing habitat	Increased spawning and rearing habitat
Primary benefits for bull trout	Potential access to foraging habitat	Increased spawning and rearing habitat
Estimated production of Chinook salmon smolts	1,500 (20% increase)	2,240 (79% increase)
Estimated population of adult bull trout upstream of Trail Bridge Dam	• 218 subadults/adults (98% increase) with no spawning upstream of Smith Reservoir • 470 juveniles (0% increase)	• 111 subadults/adults • 470 juveniles (0% increase)

Benefits of settlement measures for bull trout

It is anticipated that implementation of settlement measures in the lower Carmen Bypass Reach would increase the carrying capacity for late fry and juvenile life stages of bull trout, but not for emergent fry or subadults/adults. Spawning habitat under current flows is adequate to "seed" the lower Carmen Bypass Reach with more emergent fry than can be supported at subsequent life-stages. While increasing flows during the spawning season (fall) would increase available spawning habitat, the number of fry produced are currently limited by early fry habitat, rather than spawning habitat (Table 3). Based on modeling results, early fry rearing habitat limits the production of juvenile bull trout from the lower Carmen Bypass

Reach. However, early fry rearing habitat peaks at 205 cfs, which is the current base flow during the early fry rearing period (spring). Increasing flows in the lower Carmen Bypass Reach during spring would likely not increase the carrying capacity for early fry substantially. Overall, this settlement measure will increase the resiliency of the bull trout population by increasing habitat for some life stages, but is not anticipated to increase the adult population.

Benefits of settlement measures for other native migratory fish

Native migratory fish, including cutthroat trout and mountain whitefish, currently occur both upstream and downstream of Smith Dam; however, habitat connectivity for these species between areas upstream and downstream of the dam is lost. In addition, Pacific lamprey could potentially have occurred upstream of the Smith Dam historically and thus could benefit from restoring access to these habitats. It is anticipated that the settlement measures agreed for the lower Carmen Bypass Reach can be recognized as effective mitigation for lack of fish passage at Smith Dam for native migratory species primarily because these measures would increase habitat quantity and complexity, which in turn would increase the population size and diversity by increasing the growth, survival, and density of native cutthroat trout, rainbow trout, mountain whitefish, and other native fish species.

The settlement measures designed for the lower Carmen Bypass Reach would enhance the entire length of the reach through the maintenance of LWD frequency, increased instream flow, and gravel augmentation. It is anticipated that maintenance of the proposed gravel augmentation and increased instream flows in combination with the maintenance of LWD in the reach would provide habitat complexity and cover for native trout, and would increase the area of potential spawning gravel for native trout. The benefits of LWD and habitat complexity for native trout are well documented (e.g., Wilzbach 1985, Harvey 1998), and have been shown to be effective at increasing adult populations of cutthroat trout (Gowan and Fausch 1996) and other trout species. Lamprey are anticipated to benefit from increased spawning habitat as well, in addition to a potential for increased rearing habitat from slack water areas and fine sediment depositional zones resulting from habitat complexity.

Overall, increased habitat quantity and complexity from these settlement measures would be anticipated to allow greater survival of young age classes of native migratory fish species, leading to increased resiliency of the populations to potential disturbance. These settlement measures would also be anticipated to contribute to greater growth rates, survival, and density of native fish.

7.1.5 Comparison of the proposed settlement measures for lower Carmen Bypass Reach with current habitat upstream of Smith Dam

Table 4. Comparison of proposed settlement measures for the lower Carmen Bypass Reach with current habitat upstream of Smith Dam.

	With settlement measures proposed for the Lower Carmen Bypass Reach	Current habitat upstream of Smith Dam
NMF Species Present Currently[1]	Cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, and mountain whitefish

	With settlement measures proposed for the Lower Carmen Bypass Reach	Current habitat upstream of Smith Dam
NMF Species Present Historically[1]	Pacific lamprey, cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, mountain whitefish. Historical presence of Pacific lamprey, bull trout, and spring Chinook salmon is not documented, as described below.
Habitat Quality[2, 3]	After settlement measures, it is anticipated that habitat quality would be high, with extensive spawning habitat from augmented gravel and extensive rearing habitat from maintained LWD.	Degraded from timber harvest activities, with altered supply of sediment and large woody debris. Characterized by riffles, pocket water, and pool habitat. Low abundance of spawning habitat, with abundant rearing habitat for juvenile salmonids in complex shallow water habitat.
Flows[4]	After settlement measures, instream flows would be regulated to be highly suitable for spawning and rearing of all native species.	Natural, unregulated flows in the Smith River upstream of the reservoir. The Smith Reservoir collects water from the Smith River and the McKenzie River via the Carmen Diversion Tunnel.
Water Quality[5]	After settlement measures, instream flows would be regulated to comply with all potentially applicable ODEQ standards, and would target water temperatures low enough to be suitable for summer rearing for native salmon and trout, and low enough for Chinook salmon spawning during fall.	Water temperature in the Smith River upstream of Smith Dam often becomes quite warm in the summer, with areas that can be in excess of ODEQ criteria (if Smith Dam were not present) during August and early September. Other water quality parameters do not raise ODEQ compliance issues.
Water Right Availability[6]	EWEB, as a public (municipal) entity, holds the water rights for the Project in perpetuity.	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-Smith Hydroelectric Project in perpetuity.
Land Use/Zoning[6]	The Project is located primarily on federal land and lies within eight of the WNF Management Areas (MAs), and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.	The Project is primarily located on federal land and lies within eight of the WNF MAs, and two others are within the 0.8-km (0.5-mi) wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.

NMF = native migratory fish
[1] Stillwater Sciences(2006a).
[2] Stillwater Sciences (2006b).
[3] Stillwater Sciences (2006c).
[4] Stillwater Sciences (2006d).
[5] Stillwater Sciences (2006e).
[6] Martha Goodavish Planning & Design and Stillwater Sciences (2006).

7.1.6 Proposed settlement measures for the lower Carmen Bypass Reach in relation to existing fish management plans

Although the Oregon Coastal Salmon Restoration Initiative Plan is primarily focused on the recovery of coastal coho salmon populations in Oregon, the three basic principles of this plan are directly applicable to the lower Carmen Bypass Reach settlement measures. These principles are outlined (State of Oregon 1997) as follows:

1. Restoration of salmon must address natural and cultural systems.
2. Salmon require complex and interconnected habitats which are created, altered, and maintained by natural physical processes.
3. Life history diversity, genetic diversity, and metapopulation organization (patterns of populations) are ways salmon adapt to their complex and interconnected habitats.

In addition to the Oregon Coastal Salmon Restoration Initiative Plan, there are several Oregon Administrative Rules (OARs) that relate to mitigation actions proposed in the vicinity of Smith Dam. These OARs include:

- 635-500-0120 (2) (d) to restore and enhance trout habitat and evaluate the effectiveness of enhancement projects;
- 635-500-0266 pertaining to the applicability of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0267 pertaining to habitat components of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0268 Sections (1) (b), (2), and (4) pertaining to specific policies that apply to resident trout and whitefish in the McKenzie River subbasin; and
- 635-500-1661 pertaining to operating policy and objectives for McKenzie River Basin Fish Management Plan for spring Chinook salmon.

There are also components of the McKenzie Subbasin Fish Management Plan (Howell et al. 1988) that would apply to mitigation actions described in this waiver including:

- apply new passage technology to reopen areas above dams,
- develop and evaluate techniques to enhance natural production of spring Chinook salmon,
- restore and enhance riparian and instream habitat, and
- enhance production of wild trout in the main stem above Paradise Campground and in tributaries.

Overall, it is anticipated that the measures included in the proposed Settlement Agreement reached thus far among the settlement parties for the lower Carmen Bypass Reach will address policies and objectives as outlined in the components of the Oregon Coastal Salmon Restoration Initiative Plan, OARs, and the McKenzie River Subbasin Fish Management Plan.

7.1.7 Known restoration or land use plans which might have an impact on the mitigation

The settlement measures would occur entirely on USDA Forest Service lands that are included in the Willamette National Forest. The settlement measures appear consistent with the USDA Forest Service

Northwest Forest Plan Aquatic Conservation Strategy. Many other settlement measures, if included in a final new license by FERC, would benefit and support these settlement measures, including upstream and downstream fish passage at Trail Bridge Reservoir. EWEB knows of no restoration or land use plans that would impact the settlement measures.

7.1.8 If the mitigation entails providing passage at an existing artificial barrier, what is the expected date of replacement or major repair for the structure if it were not used as mitigation?

Not applicable.

7.1.9 Does the mitigation include any activity that is a requirement or condition of any other agreement, law, permit, or authorization?

No.

7.1.10 Mitigation cost estimate and funding

Detailed costs have not been estimated. EWEB will provide all funding for relicensing of the Project once FERC issues a new license.

7.1.11 Mitigation evaluation, monitoring, and maintenance

Monitoring Frequency

EWEB shall include in its comprehensive implementation plan for the lower Carmen Bypass Reach the following periodic monitoring and maintenance activities for the term of the license, which are designed to ensure spawning habitat standards and LWD standards are maintained. EWEB shall commence implementation of these monitoring and maintenance activities in the fall of the calendar year after both: (a) the Long-Term Maintenance Standard is established and (b) the first 1,200 cfs (5-year recurrence interval) event or 5-year period (whichever is more frequent). EWEB shall continue to perform monitoring after any 1,200 cfs event or after 5 years (whichever is more frequent) for the license term, with additional gravel augmentation to be completed within one year after EWEB completes the habitat monitoring if the total habitat present is below the Long-Term Maintenance Standard.

Monitoring Performance

EWEB shall conduct a post-placement inventory of the reach, recording specific patch location and size meeting the criteria values in Table 5. EWEB shall determine the total spawning criteria and non-criteria area. EWEB shall compare the location and size of spawning habitat patches with the results of the immediately previous monitoring.

Decisions based on monitoring results.

EWEB shall take the following actions based on the results of monitoring:

a) Long-Term Maintenance Standard achieved. If the total amount of spawning habitat is at least equal to the Long-Term Maintenance Standard, EWEB is not obligated to take any action in the lower Carmen Bypass Reach until EWEB performs the next required monitoring.

b) Long-Term Maintenance Standard not achieved. If the total amount of spawning habitat is less than the Long-Term Maintenance Standard, EWEB shall augment gravel within the reach to attempt to achieve the standard. EWEB's obligation to augment gravel will not exceed a total of 750 tons in any 10-calendar year period.

   i) EWEB, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, may develop an alternative plan for long-term management if either of the two following conditions occurs:

      1') If monitoring results indicate a total of less than 300 m^2 of spawning habitat during each of three successive monitoring events, or

      2') If flows during any 5-year period are not greater than 1,200 cfs and the total amount of spawning habitat is reduced from the Long-Term Maintenance Standard at the beginning of the five-year period to less than 125 m^2 at the end of the period.

   ii) The alternative plan for long-term management will describe the next steps, which may include, but are not limited to:

      1') A determination if a reduced Long-Term Maintenance Standard is appropriate based on information to date; or

      2') An evaluation of habitat that is actively used by spawning Chinook salmon within the lower Carmen Bypass Reach, but that is not within the criteria values in Table 5 below, including the area of the lower Carmen Bypass Reach inundated by the daily water surface evaluation fluctuations of Trail Bridge Reservoir. Based on that evaluation, EWEB, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, may designate and count toward the 300 m^2 spawning habitat that is not within stated criteria if the non-criteria habitat is equally producing fry relative to criteria habitat (not significantly different at an alpha value of 0.05 between production of fry from redds in criteria and non-criteria habitat). If the spawning habitat, including the non-criteria spawning habitat is less than 300 m^2, then EWEB, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall add additional gravel (subject to the 10-year gravel limitation) as necessary to achieve a minimum of 300 m^2 (total) of Chinook salmon spawning habitat in lower Carmen Bypass Reach. Steps 1') and 2') will be completed before going to Step 3').

      3') EWEB shall prepare, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, an evaluation and report on whether geomorphologic constraints (e.g., steep reach channel gradients or strongly confined channel) or other reasons beyond the reasonable control of EWEB are limiting the potential for creating spawning habitat. If the determination is made that these geomorphic constraints or other reasons beyond the reasonable control of EWEB are limiting the potential for achieving the amount of spawning habitat designated in 1') and 2'), EWEB is not obligated to augment any additional gravel in the lower Carmen Bypass Reach.

LWD surveys

EWEB shall perform visual surveys of LWD in the lower Carmen Bypass Reach between Trail Bridge Reservoir and the confluence with Kink Creek during the monitoring described above to determine the frequency of LWD per mile in the reach. EWEB shall count all LWD ≥ 40 feet long and ≥ 24 inches diameter (Qualifying LWD), which are either wholly or partially within the lower Carmen Bypass Reach bankfull channel. EWEB shall also count as Qualifying LWD, LWD with attached rootwads if they are less than 40 feet in length but are still equal to or greater than 24 inches in diameter. If, based on a visual survey, the overall average frequency of Qualifying LWD is less than 80 pieces per mile, EWEB shall implement actions within 2 years to increase the Qualifying LWD average frequency to 80 pieces per mile, unless EWEB determines, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, that the additional LWD is not necessary.

Table 5. Spring Chinook salmon spawning habitat criteria values used to enumerate total spawning habitat.

Minimum patch size	Water velocity	Water depth	Substrate (D_{50})
1.3 m^2 (14 ft^2); minimum of 0.9 m (3 ft) wide	0.2 to 0.8 m/s (0.8to 2.5 ft/s)	≥0.2 m (≥ 0.8 ft)	10 to 50 mm (0.4 to 2.0 in)

7.1.12 Sources of information

Harvey, B. C. 1998. Influence of large woody debris on retention, immigration, and growth of coastal cutthroat trout (*Oncorhynchus clarki clarki*) in stream pools. Canadian Journal of Fisheries and Aquatic Sciences 55: 1902-1908.

Gowan, C., and K. D. Fausch. 1996. Long-term demographic responses of trout populations to habitat manipulation in six Colorado streams. Ecological Applications 6: 931-946.

Howell, P., J. Hutchison, and R. Hooton. 1988. McKenzie subbasin fish management plan. Oregon Department of Fish and Wildlife, Portland.

Martha Goodavish Planning & Design and Stillwater Sciences. 2006. Land use and management at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Martha Goodavish Planning & Design, Walnut Creek, California, and Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

State of Oregon. 1997. Oregon Coastal Salmon Restoration Initiative Plan: restoring an Oregon legacy through cooperative efforts. Final draft. Submitted to National Marine Fisheries Service. http://egov.oregon.gov/OPSW/archives/reports-subpage.shtml.

Stillwater Sciences. 2006a. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006b. Aquatic habitats and instream flows at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006c. Fluvial geomorphic processes and channel morphology at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006d. Hydrologic regimes at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006e. Water quality in the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Wilzbach, M. A. 1985. Relative roles of food abundance and cover in determining the habitat distribution of stream-dwelling cutthroat trout (*Salmo clarki*). Canadian Journal of Fisheries and Aquatic Sciences 42: 1668-1672.

7.2 Mitigation 2—Smith Reservoir Settlement Measures

EWEB will develop a comprehensive implementation plan and schedule for settlement measures in Smith Reservoir. EWEB will develop the plan and schedule in consultation with the Fisheries Work Group and with approval by the Fish Agencies and USDA Forest Service. The plan will include:

- type of materials to be used (boulders and/or anchored LWD, stumps/root wads, brush bundles),
- timing of implementation, such that the habitat structures would be placed within 5 years after license issuance,
- source of materials,
- volume and size of materials,
- configurations (including construction drawings/design) and locations for the placement of materials,
- method of placement of materials including access methods,
- detailed long-term monitoring, maintenance, and contingency activities, and
- considerations for recreation and aesthetic interests

EWEB shall install no more than a total of 20 habitat structures, for both adult and juvenile cutthroat trout in Smith Reservoir. The installed habitat structures are intended to be dispersed and of low profile. Both deep-water habitat structures and shallow-water structures are proposed. The goal of the deep-water habitat structures is to improve the quality and quantity of habitat for adult salmonids. The habitat structures are intended to increase adult salmonid abundance; however, increases in abundance are not a measurable objective leading to maintenance actions. EWEB shall provide deep-water habitat structures in the form of LWD, stumps/root wads, and boulders submerged on the reservoir bottom in deep-water areas (between 2538–2568 ft elevations). The goal of the shallow-water habitat structures is to improve the quality and quantity of fry and juvenile habitat. The habitat structures are intended to increase juvenile salmonid abundance, however, increases in abundance are not a measurable objective leading to maintenance actions. EWEB shall provide shallow-water habitat structures in the form of LWD,

stumps/root wads, cobbles, boulders, and bundles of brush and/or small trees in shallow-water areas (between 2575–2582 ft elevations).

EWEB, in consultation with FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall define what constitutes a structure (e.g., number/material type/complexity and an agreed upon distance/spacing apart)

7.2.1 Distance between mitigation site and Artificial Obstruction

Mitigation actions will be in Smith Reservoir (Figure 1; Appendix A, Photos 17–20), which is impounded by Smith Dam (artificial obstruction).

7.2.2 Date the mitigation is scheduled to be completed

Although FERC has not stated a date it expects to issue a new license, FERC has stated that it expects to issue its final Environmental Assessment in June 2009. Once FERC issues a final new license, and if the license reflects the proposed Settlement Agreement reached thus far among the settlement parties, EWEB would install the habitat structures in Smith Reservoir as soon as EWEB completed the fish passage facilities at Trail Bridge Dam, the 1,000-cfs turbine bypass valve, and the remotely operated gate on the Carmen Diversion Tunnel, or during any construction work that would result in lowering the Smith Reservoir elevation.

7.2.3 Location

COUNTY:	Linn
ROAD CROSSING (if applicable)**:**	No road crossings
RIVER/STREAM:	Smith Reservoir is impounded by Smith Dam on the Smith River
TRIBUTARY OF:	McKenzie River
BASIN:	Smith River Basin
COORDINATES[a]**:**	Upstream end of Smith Reservoir
	Longitude: -122.0481°W Latitude: 44.3331°N
	Downstream end of Smith Reservoir:
	Longitude: -122.0463°W Latitude: 44.3075°N

[a] Geographic projection using NAD 83.

7.2.4 Stream description and additional information regarding the mitigation in relation to native migratory fish movement

The mitigation actions are planned for Smith Reservoir, which is a narrow, steep-sloped reservoir situated directly upstream of a barrier (Smith Dam), and is approximately 1.9 mi (3.1 km) long and 1,500 ft (458 m) wide at its widest reach. The Smith Dam and Reservoir are located on the Smith River, which is a tributary of the McKenzie River. At full pool (2,605 ft [795 m] elevation), the Smith Reservoir covers an area of approximately 69 ha (170 ac) and stores 9,900 ac-ft. The mitigation actions designed for this reservoir reach will enhance the upper third of the reservoir through the placement of anchored LWD, stumps, root wads, boulders and anchored brush bundles at appropriate sites. These engineered structures are anticipated to increase the quality and quantity of adult and juvenile habitat for native cutthroat and rainbow trout, mountain whitefish, and other native fish species. It is anticipated that these mitigation actions will mitigate for fish passage at Smith Dam for native migratory species primarily by increasing population size and diversity by increasing the growth, survival, and density of native fish in the reservoir

with increased habitat quantity and complexity. Habitat structures are planned for the areas where most native fish were observed, and primarily in the margins (<6.1 m [20 ft]) of the reservoir's northern portion. It is anticipated that habitat improvements will increase the concentration of native cutthroat in this portion of the reservoir, as has been observed in riverine systems (e.g., Gowan and Fausch 1996). Since the reservoir is currently lacking habitat complexity, other native species (e.g., mountain whitefish) are anticipated to benefit as well. Overall, increased habitat quantity and complexity from this mitigation action is anticipated to allow greater survival of young age classes of native fish, leading to resiliency of the population upstream and downstream of Smith Dam to potential disturbance. Increased habitat quantity and complexity is also anticipated to allow greater growth, survival, and density of native fish, allowing an increase in the population upstream of Smith Dam.

7.2.5 Comparison of the proposed settlement measures for Smith Reservoir with current habitat upstream of Smith Dam

Table 6. Comparison of proposed settlement measures for Smith Reservoir with current habitat upstream of Smith Dam.

	With settlement measures proposed for the Smith Reservoir	Current habitat upstream of Smith Dam
NMF Species Present Currently[1]	Cutthroat trout, rainbow trout, and mountain whitefish	Cutthroat trout, rainbow trout, and mountain whitefish
NMF Species Present Historically[1]	Pacific lamprey, cutthroat trout, rainbow trout, and mountain whitefish	Cutthroat trout, rainbow trout, mountain whitefish. Historical presence of Pacific lamprey, bull trout, and spring Chinook salmon is not documented, as described below.
Habitat Quality[2, 3]	After settlement measures, it is anticipated that habitat quality would be high, with improved adult and juvenile rearing habitat from the addition of physical structure which may include LWD, stumps/root wads, cobbles/boulders, and brush bundles.	Degraded from timber harvest activities, with altered supply of sediment and large woody debris. Characterized by riffles, pocket water, and pool habitat. Low abundance of spawning habitat, with abundant rearing habitat for juvenile salmonids in complex shallow water habitat.

	With settlement measures proposed for the Smith Reservoir	Current habitat upstream of Smith Dam
Flows[4]	The typical summer elevation of Smith Reservoir is 792.5–793.7 m (2,600–2,604 ft). In winter months, Smith Reservoir's elevation is decreased and typically ranges from 790.3 to 791.6 m (2,593 to 2,597 ft). At full pool (2,605 ft [795 m] elevation), the Smith Reservoir covers an area of approximately 69 ha (170 ac) and stores 9,900 ac-ft.	Natural, unregulated flows in the Smith River upstream of the reservoir. The Smith Reservoir collects water from the Smith River and the McKenzie River via the Carmen Diversion Tunnel.
Water Quality[5]	Water quality parameters meet ODEQ criteria with the exception of water temperature. Water temperature in the Smith River upstream of Smith Dam often becomes quite warm in the summer, with areas that can be in excess of ODEQ criteria during August and early September.	Water quality parameters are in ODEQ compliance with the exception of water temperature. Water temperature in the Smith River upstream of Smith Dam often become quite warm in the summer, with areas that can be in excess of ODEQ criteria during August and early September. Johnson et al. (1985) characterized Smith Reservoir as oligotrophic (i.e., low nutrients), based upon low chlorophyll-a concentrations and water transparency.
Water Right Availability[6]	EWEB, as a public (municipal) entity, holds the water rights for the Project in perpetuity.	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-Smith Hydroelectric Project in perpetuity.
Land Use/Zoning[6]	The Project is located primarily on federal land and lies within eight of the WNF Management Areas (MAs), and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.	The Project is primarily located on federal land and lies within eight of the WNF MAs, and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.

NMF = native migratory fish
[1] Stillwater Sciences (2006a).
[2] Stillwater Sciences (2006b).
[3] Stillwater Sciences (2006c).
[4] Stillwater Sciences (2006d).
[5] Stillwater Sciences (2006e).
[6] Martha Goodavish Planning & Design and Stillwater Sciences (2006).

7.2.6 Proposed settlement measures for Smith Reservoir in relation to existing fish management plans

Although the Oregon Coastal Salmon Restoration Initiative Plan is primarily focused on the recovery of coastal coho salmon populations in Oregon, the three basic principles of this plan are directly applicable to the lower Carmen Bypass Reach settlement measures. These principles are outlined (State of Oregon 1997) as follows:

1. Restoration of salmon must address natural and cultural systems.
2. Salmon require complex and interconnected habitats which are created, altered, and maintained by natural physical processes.
3. Life history diversity, genetic diversity, and metapopulation organization (patterns of populations) are ways salmon adapt to their complex and interconnected habitats.

In addition to the Oregon Coastal Salmon Restoration Initiative Plan, there are several Oregon Administrative Rules (OARs) that relate to mitigation actions proposed in the vicinity of Smith Dam. These OARs include:

- 635-500-0120 (2) (d) to restore and enhance trout habitat and evaluate the effectiveness of enhancement projects;
- 635-500-0266 pertaining to the applicability of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0267 pertaining to habitat components of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0268 Sections (1) (b), (2), and (4) pertaining to specific policies that apply to resident trout and whitefish in the McKenzie River subbasin; and
- 635-500-1661 pertaining to operating policy and objectives for McKenzie River Basin Fish Management Plan for spring Chinook salmon.

There are also components of the McKenzie Subbasin Fish Management Plan (Howell et al. 1988) that would apply to mitigation actions described in this waiver including:

- apply new passage technology to reopen areas above dams,
- develop and evaluate techniques to enhance natural production of spring Chinook salmon,
- restore and enhance riparian and instream habitat, and
- enhance production of wild trout in the main stem above Paradise Campground and in tributaries.

7.2.7 Known restoration or land use plans which might have an impact on the mitigation

The settlement measures would occur entirely on USDA Forest Service lands that are included in the Willamette National Forest. The settlement measures appear consistent with the USDA Forest Service Northwest Forest Plan Aquatic Conservation Strategy. Many other settlement measures, if included in a final new license by FERC, would benefit and support these settlement measures, including upstream and downstream fish passage at Trail Bridge Reservoir. EWEB knows of no restoration or land use plans that would impact the settlement measures.

7.2.8 If the mitigation entails providing passage at an existing artificial barrier, what is the expected date of replacement or major repair for the structure if it were not used as mitigation?

Not applicable.

7.2.9 Does the mitigation include any activity that is a requirement or condition of any other agreement, law, permit, or authorization?

No.

7.2.10 Mitigation cost estimate and funding

Detailed costs have not been estimated. EWEB will provide all funding for relicensing of the Project once FERC issues a new license.

7.2.11 Mitigation evaluation, monitoring, and maintenance

EWEB shall conduct all monitoring and maintenance activities and contingency actions in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service. EWEB shall conduct visual (e.g., underwater camera) monitoring once every five years beginning the year after installation and continuing for the duration of the license to ensure habitat structures are maintained. During each structural monitoring event, visual assessments will be conducted, and habitat structures will be compared to original design drawings, as modified by actual implementation. Monitoring will be conducted during reservoir drawdowns, or using professional divers. If habitat structures appear to be degraded compared to their original implementation condition by being reduced in size or complexity, restoration plans will be designed and implemented within 1 year after monitoring.

7.2.12 Sources of information

Gowan, C., and K. D. Fausch. 1996. Long-term demographic responses of trout populations to habitat manipulation in six Colorado streams. Ecological Applications 6: 931-946.

Howell, P., J. Hutchison, and R. Hooton. 1988. McKenzie subbasin fish management plan. Oregon Department of Fish and Wildlife, Portland.

Martha Goodavish Planning & Design and Stillwater Sciences. 2006. Land use and management at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Martha Goodavish Planning & Design, Walnut Creek, California, and Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

State of Oregon. 1997. Oregon Coastal Salmon Restoration Initiative Plan: restoring an Oregon legacy through cooperative efforts. Final draft. Submitted to National Marine Fisheries Service. http://egov.oregon.gov/OPSW/archives/reports-subpage.shtml.

Stillwater Sciences. 2006a. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006b. Aquatic habitats and instream flows at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006c. Fluvial geomorphic processes and channel morphology at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006d. Hydrologic regimes at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006e. Water quality in the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

7.3 Mitigation 3—Smith Bypass Reach Settlement Measures

These settlement measures included in the proposed Settlement Agreement reached thus far among the settlement parties, are intended to increase the area of spawning habitat for Chinook salmon throughout the reach to a minimum total of 320 m^2 (3,444 ft^2) if reasonably practicable, and then to maintain this amount of spawning habitat for the term of the license. To achieve this goal, EWEB would implement the following measures:

1) Construct up to 30 engineered Chinook salmon spawning habitat structures in the Smith Bypass Reach. Because the actual number of engineered structures EWEB will be able to construct may be limited by the feasibility of constructing structures in certain locations in the Smith Bypass Reach, EWEB may determine, in consultation with the Fisheries Work Group (FWG), that fewer than 30 but not less than 25 engineered structures are reasonably feasible to construct
2) Add an initial maximum of 2,000 tons of gravel.
3) Place and maintain large woody debris (LWD) at a frequency of at least 80 pieces per mile.
4) Increase instream flow releases, as follows:
    a) Provide a minimum block flow release of 10 cfs from Smith Dam into the Smith Bypass Reach year-round.[1]
    b) Provide a total minimum block flow release of 35 cfs from Smith Dam into the Smith Bypass Reach from 16 August through 31 October.
    c) Ensure total minimum instream flows of 30 cfs from 1 November through 15 April, as measured within Smith Bypass Reach.
    d) Ensure total minimum instream flows of 25 cfs from 16 April through 15 August, as measured within Smith Bypass Reach.
    e) Provide a greater than 500-cfs channel maintenance flow for at least 5 hours at least every 5 years, unless a flow event meeting these criteria has already been exceeded by natural or other causes. Channel maintenance flow frequency, duration, or magnitude may be adjusted by EWEB in consultation with the FWG.

[1] Note the 10 cfs release in 4)a) is counted in meeting the requirements of 4)b),c) and d) above.

5) Install a 1,000-cfs turbine bypass valve at the Carmen Power Plant to divert up to 1,000 cfs of water from Smith Reservoir to Trail Bridge Reservoir and install a remotely operated gate on the Carmen Diversion Tunnel and operate the Carmen Power Plant at spin no load to protect habitat projects described above from potential high flow releases into the Smith Bypass Reach.

Although not quantitatively defined, the Smith Bypass Reach spawning habitat projects that EWEB would implement as described above would also increase rearing and other habitat for Chinook salmon, bull trout, and other native fish species, and macroinvertebrate forage for these fish within the reach.

7.3.1 Distance between mitigation site and Artificial Obstruction

Mitigation actions will be in the 3.7-km (2.0-mile) Smith Bypass Reach, which is approximately 100 m (328 ft) downstream of Smith Dam (artificial obstruction) (Figure 1; Appendix A, Photos 21–24).

7.3.2 Date the mitigation is scheduled to be completed

Although FERC has not stated a date it expects to issue a new license, FERC has stated that it expects to issue its final Environmental Assessment in June 2009. Once FERC issues a final new license, and if the license reflects the proposed Settlement Agreement reached thus far among the settlement parties, EWEB would implement settlement measures in Smith Bypass Reach as soon as EWEB completed the fish passage facilities at Trail Bridge Dam, the 1,000-cfs turbine bypass valve, and the remotely operated gate on the Carmen Diversion Tunnel.

7.3.3 Location

COUNTY:	Linn
ROAD CROSSING (if applicable)**:**	No road crossings
RIVER/STREAM:	Smith Bypass Reach (regulated reach of Smith River)
TRIBUTARY OF:	McKenzie River
BASIN:	Smith River basin
COORDINATES[a]**:**	Upstream end of Smith Bypass Reach:
	Longitude: 122.0476°W Latitude: 44.3053°N
	Downstream end of Smith Bypass Reach:
	Longitude: 122.0520°W Latitude: 44.2821°N

[a] Geographic projection using NAD 83.

7.3.4 Stream description and additional information regarding the mitigation in relation to native migratory fish movement

The settlement measures that could be recognized as effective mitigation for a lack of passage at Smith Dam are planned for the Smith Bypass Reach, which is an approximately 3.2-km (2.0-mile) reach with an upstream end directly downstream of Smith Dam and a downstream end at the confluence with Trail Bridge Reservoir. Trail Bridge Dam impounds Trail Bridge Reservoir, approximately 1.1 km (0.7 mi) downstream from the confluence with the Smith Bypass Reach (Figure 1). Trail Bridge Dam is currently a barrier to upstream migration, but would be provided with fish passage facilities before these measures are complete. The settlement measures designed for this reach would provide the entire length of the reach with habitat projects, LWD, instream flows, and gravel augmentation, which are anticipated to increase habitat quality throughout the reach. Smith Dam is currently a complete upstream migration barrier for all fish, and excludes fish from accessing habitat upstream of the dam. EWEB anticipates that

the measures could be recognized as effective mitigation for a lack of passage for native migratory fish at Smith Dam primarily because habitat conditions for native fish upstream of Smith Dam would be poor, including:

- excessive summer water temperatures,
- low amounts of spawning habitat (~38 m^2 [409 ft^2] for Chinook salmon and bull trout),
- increased exposure to angling impacts in Smith Reservoir, and
- potential predation from native and non-native trout in Smith Reservoir.

The overall benefits of passage at Smith Dam are discussed in part 6B and the relative benefits of the settlement measures for native fish are discussed below for Chinook salmon and bull trout based on a quantitative population dynamics analysis, and also discussed for other native fish based on a qualitative analysis.

7.3.4.1 Population dynamics benefits analysis for Smith Bypass Reach Settlement Measures

Benefits of settlement measures for spring Chinook salmon

In general, increasing habitat for Chinook salmon fry or juveniles with habitat projects in the Smith Bypass Reach would have little effect on the modeled production of smolts because of the abundant rearing habitat for Chinook salmon in Trail Bridge Reservoir. However, increasing available spawning habitat (and habitat quality) would result in increased production of emergent fry and, whether they rear in Smith Bypass Reach or in Trail Bridge Reservoir, in increased production of smolts (Table 7). Total estimated smolt production from Trail Bridge Reservoir is estimated to increase by over 200% (>4,000 smolts) with the habitat projects proposed for the Smith Bypass Reach, based on the following assumptions:

1. Increases in fall instream flows, habitat projects, and gravel augmentation will result in at least 320 m^2 (3,444 ft^2) of spawning habitat.
2. Redd area in Smith Bypass Reach will average 5.4 m^2 (58.1 ft^2).
3. Augmented gravel will result in an increase in gravel quality, which will contribute to a 40% increase in egg-to-emergence survival (assumption based on high intragravel permeability typically observed in augmented gravel).
4. The number of spawners using the Smith Bypass Reach will increase relative to the lower Carmen Bypass Reach as a consequence of spawning habitat increases in the Smith Bypass Reach (e.g., if 60% of spawning habitat in Smith Bypass Reach, then 60% of spawners will use it).
5. Increased LWD frequency (along with increased instream flows resulting in greater surface area of wetted channel and improved water quality) will result in increased total rearing habitat of 14,234 m^2 for fry and 10,958 m^2 for juveniles.

Table 7. Summary of model results comparing the benefits of passage at Smith Dam with settlement measures in Smith Bypass Reach for Chinook salmon and bull trout.

	Passage at Smith Dam	Settlement measures in Smith Bypass Reach
Total miles of Chinook salmon and bull trout habitat	2.9	2.0
Primary benefits for Chinook salmon	Potential access to spawning and rearing habitat	Increased quantity and quality of spawning habitat
Primary benefits for bull trout	Potential access to foraging habitat	Increased quality of foraging habitat

Estimated production of Chinook salmon smolts	1,500 (20% increase)	>4,000 (>220% increase)
Estimated population of adult bull trout upstream of Trail Bridge Dam	• 218 subadults/adults (98% increase) with no spawning upstream of Smith Reservoir • 470 juveniles (0% increase)	• 111 subadults/adults (0% increase) • 470 juveniles (0% increase)

Benefits of settlement measures for bull trout

No bull trout have been observed in the Smith Bypass Reach during snorkel or spawning surveys, although two bull trout were detected by a PIT-tag antenna (an adult in late October 2004, and a juvenile in mid-summer 2004) (Stillwater Sciences 2006a). The PIT-tag antenna was located at the downstream end of the Smith Bypass Reach, and the distance that the bull trout moved upstream is unknown. Maximum summer water temperatures were regularly over 16°C (60°F) in the Smith Bypass Reach during the late summer, as described in the *Water Quality* technical report (Stillwater Sciences 2006b). The probability of juvenile bull trout occurrence in streams with maximum daily temperatures above approximately 14–16°C (57–60°F) is relatively low (less than 50%) (Dunham et al. 2003). However, the agreed increases in instream flows in the Smith Bypass Reach would be anticipated to result in maximum daily temperatures of less than 13°C year-round, allowing bull trout to forage and rear in the Smith Bypass Reach, but no certainty that spawning would occur. There are many indirect benefits to the bull trout population in having enhanced water quality and habitat conditions in the Smith Bypass Reach. Bull trout foraging in this reach is currently observed, and is anticipated to benefit by increased ability to migrate into the reach due to lower water temperatures, as well as increased food availability resulting from increased production of Chinook salmon and trout. Although benefits to the population are anticipated, no increase in the adult population would be expected (Table 7) because the lack of adult habitat in Trail Bridge Reservoir would still be a limiting factor (settlement measures in Trail Bridge Reservoir are described in sections below). The following assumptions were made when modeling the bull trout population response to the settlement measures in the Smith Bypass Reach:

1. Due to barely suitable conditions for bull trout spawning, it was assumed for modeling that no spawning would occur in the Smith Bypass Reach.
2. Increased LWD frequency (along with increased instream flows resulting in greater surface area of wetted channel and improved water quality) would result in increased total rearing habitat of 5,231 m^2 for emergent fry, 8,674 m^2 for late fry, and 9,605 m^2 for juveniles. However, the model assumes that fry produced in the Carmen Bypass Reach or Sweetwater Creek can not access the Smith Bypass Reach for fry or juvenile rearing habitat.

Benefits of settlement measures for other native migratory fish

Native migratory fish, including cutthroat trout and mountain whitefish, currently occur both upstream and downstream of Smith Dam; however, habitat connectivity for these species between areas upstream and downstream of the dam is lost. In addition, Pacific lamprey could potentially have occurred upstream of the Smith Dam historically and thus could benefit from restoring access to these habitats. It is anticipated that the measures included in the proposed Settlement Agreement reached thus far among the settlement parties for the Smith Bypass Reach can be recognized as effective mitigation for lack of fish passage at Smith Dam for native migratory species primarily because these measures would increase habitat quantity and complexity which in turn would increase the population size and diversity by increasing the growth, survival, and density of native cutthroat trout, rainbow trout, mountain whitefish, and other native fish species.

The settlement measures designed for the Smith Bypass Reach would enhance the entire length of the reach through the placement of engineered habitat structures, LWD, increased instream flows, decreased water temperature, and gravel augmentation. It is anticipated that the placement of LWD would provide habitat complexity and cover for native trout, and would increase the area of potential spawning gravel for native trout when combined with proposed gravel augmentation and increased instream flows. The benefits of LWD and habitat complexity for native trout are well documented (e.g., Wilzbach 1985, Harvey 1998), and have been shown to be effective at increasing adult populations of cutthroat trout (Gowan and Fausch 1996) and other trout species. Lamprey are anticipated to benefit from increased spawning habitat as well, in addition to a potential for increased rearing habitat from slack water areas and fine sediment depositional zones resulting from habitat complexity.

Overall, increased water quality, habitat quantity, and complexity from these settlement measures would be anticipated to allow greater survival of young age classes of native migratory fish species, leading to increased resiliency of the populations to potential disturbance. These measures would also be anticipated to contribute to greater growth rates, survival, and density of native fish.

7.3.5 Comparison of the proposed settlement measures for Smith Bypass Reach with current habitat upstream of Smith Dam

Table 8. Comparison of proposed settlement measures for the Smith Bypass Reach with current habitat upstream of Smith Dam.

	With settlement measures proposed for the Smith Bypass Reach	Current habitat upstream of Smith Dam
NMF Species Present Currently[1]	Cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, and mountain whitefish
NMF Species Present Historically[1]	Pacific lamprey, cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, mountain whitefish. Historical presence of Pacific lamprey, bull trout, and spring Chinook salmon is not documented, as described below.
Habitat Quality[2, 3]	After settlement measures, it is anticipated that habitat quality would be high, with extensive spawning habitat from augmented gravel and habitat projects, and extensive rearing habitat from increased LWD.	Degraded from timber harvest activities, with altered supply of sediment and large woody debris. Characterized by riffles, pocket water, and pool habitat. Low abundance of spawning habitat, with abundant rearing habitat for juvenile salmonids in complex shallow water habitat.
Flows[4]	After settlement measures, instream flows would be regulated to be highly suitable for spring and summer rearing for salmon and trout, and fall spawning for Chinook salmon, and will protect incubating eggs (from fall spawners) during winter.	Natural, unregulated flows in the Smith River upstream of the reservoir. The Smith Reservoir collects water from the Smith River and the McKenzie River via the Carmen Diversion Tunnel.
Water Quality[5]	After settlement measures, instream flows would be regulated to comply with all ODEQ standards, and would target water temperatures low enough to be	Water quality parameters are in ODEQ compliance with the exception of water temperature. Water temperature in the Smith River upstream of Smith Dam

	With settlement measures proposed for the Smith Bypass Reach	Current habitat upstream of Smith Dam
	suitable for summer rearing for native salmon and trout, and low enough for Chinook salmon spawning during fall.	often become quite warm in the summer, with areas that can be in excess of ODEQ criteria during August and early September. Johnson et al. (1985) characterized Smith Reservoir as oligotrophic (i.e., low nutrients), based upon low chlorophyll-a concentrations and water transparency.
Water Right Availability[6]	EWEB, as a public (municipal) entity, holds the water rights for the Project in perpetuity.	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-Smith Hydroelectric Project in perpetuity.
Land Use/Zoning[6]	The Project is located primarily on federal land and lies within eight of the WNF Management Areas (MAs), and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.	The Project is primarily located on federal land and lies within eight of the WNF MAs, and two others are within the 0.8-km (0.5-mi) wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.

NMF = native migratory fish
[1] Stillwater Sciences (2006a).
[2] Stillwater Sciences (2006c).
[3] Stillwater Sciences (2006d).
[4] Stillwater Sciences (2006e).
[5] Stillwater Sciences (2006b).
[6] Martha Goodavish Planning & Design and Stillwater Sciences (2006).

7.3.6 Proposed settlement measures for Smith Bypass Reach in relation to existing fish management plans

Although the Oregon Coastal Salmon Restoration Initiative Plan is primarily focused on the recovery of coastal coho salmon populations in Oregon, the three basic principles of this plan are directly applicable to the Smith Bypass Reach settlement measures. These principles are outlined (State of Oregon 1997) as follows:

1. Restoration of salmon must address natural and cultural systems.
2. Salmon require complex and interconnected habitats which are created, altered, and maintained by natural physical processes.
3. Life history diversity, genetic diversity, and metapopulation organization (patterns of populations) are ways salmon adapt to their complex and interconnected habitats.

In addition to the Oregon Coastal Salmon Restoration Initiative Plan, there are several Oregon Administrative Rules (OARs) that relate to mitigation actions proposed in the vicinity of Smith Dam. These OARs include:

- 635-500-0120 (2) (d) to restore and enhance trout habitat and evaluate the effectiveness of enhancement projects;
- 635-500-0266 pertaining to the applicability of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0267 pertaining to habitat components of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0268 Sections (1) (b), (2), and (4) pertaining to specific policies that apply to resident trout and whitefish in the McKenzie River subbasin; and
- 635-500-1661 pertaining to operating policy and objectives for McKenzie River Basin Fish Management Plan for spring Chinook salmon.

There are also components of the McKenzie Subbasin Fish Management Plan (Howell et al. 1988) that would apply to mitigation actions described in this waiver including:

- apply new passage technology to reopen areas above dams,
- develop and evaluate techniques to enhance natural production of spring Chinook salmon,
- restore and enhance riparian and instream habitat, and
- enhance production of wild trout in the main stem above Paradise Campground and in tributaries.

Overall, it is anticipated that the measures included in the proposed Settlement Agreement reached thus far among the settlement parties for the Smith Bypass Reach will address policies and objectives as outlined in the components of the Oregon Coastal Salmon Restoration Initiative Plan, OARs, and the McKenzie River Subbasin Fish Management Plan.

7.3.7 Known restoration or land use plans which might have an impact on the mitigation

The settlement measures would occur entirely on USDA Forest Service lands that are included in the Willamette National Forest. The settlement measures appear consistent with the USDA Forest Service Northwest Forest Plan Aquatic Conservation Strategy. Many other settlement measures, if included in a final new license by FERC, would benefit and support these settlement measures, including upstream and downstream fish passage at Trail Bridge Reservoir. EWEB knows of no restoration or land use plans that would impact the settlement measures.

7.3.8 If the mitigation entails providing passage at an existing artificial barrier, what is the expected date of replacement or major repair for the structure if it were not used as mitigation?

Not applicable.

7.3.9 Does the mitigation include any activity that is a requirement or condition of any other agreement, law, permit, or authorization?

No.

7.3.10 Mitigation cost estimate and funding

Detailed costs have not been estimated. EWEB will provide all funding for relicensing of the Project once FERC issues a new license.

7.3.11 Mitigation Evaluation, Monitoring, and Maintenance

EWEB shall include in its comprehensive implementation plan for the Smith Bypass Reach, EWEB implementation of the following periodic monitoring and maintenance activities for the term of license, which are designed to ensure spawning habitat and LWD standards are maintained and Engineered Structures are functioning. EWEB shall commence implementation of these monitoring and maintenance activities in the calendar year after implementation of all habitat projects including construction of Engineered Structures, gravel augmentation, and LWD is complete.

7.3.11.1 Spawning habitat monitoring

a) EWEB shall perform monitoring by mapping Spawning Habitat in Smith Bypass Reach every 5 years or after a major bed mobilization event in Smith Bypass Reach occurs (>800 cfs flow for more than 2 hours), whichever is more frequent. EWEB shall provide a complete report including the results and supporting data and analysis of the mapping to the FWG. If the mapping indicates total Spawning Habitat in Smith Bypass Reach is less than the Maintenance Threshold, or less than the Alternative Maintenance Threshold (whichever applies), then EWEB shall, in consultation with FWG and subject to approval by the Fish Agencies and USDA Forest Service, develop and implement a habitat plan so that the amount of Spawning Habitat is returned to the Maintenance Objective or Alternative Maintenance Objective (whichever applies), which could include additional gravel augmentation(within the Gravel Cap described below), and improvements, modifications, and or additions to Engineered Structures. EWEB shall provide relevant data annually if requested by the FWG.

b) EWEB's obligation to augment gravel will not exceed 2,000 tons in any 10-year period (Gravel Cap). However, if EWEB has augmented 2,000 tons of gravel in any 10-year period and the Spawning Habitat mapped in Smith Bypass Reach is less than the Maintenance Threshold, or is less than the Alternative Maintenance Threshold (whichever applies), EWEB, in consultation with FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall determine if a re-evaluation of augmentation is needed. If a reevaluation is not approved (such as if a rare and extremely high flow event occurs between monitoring periods), the existing Maintenance Threshold and Maintenance Objectives will remain in place, and EWEB shall augment gravel to return the amount of Spawning Habitat to the Maintenance Objective during the first year when the addition of gravel is no longer restricted by the Gravel Cap. If a reevaluation is approved, EWEB, in consultation with FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall develop an evaluation to examine opportunities to improve Engineered Structures, gravel augmentation, or other activities in the Smith

Bypass Reach. If EWEB determines, in consultation with the FWG, and subject to approval by the Fish Agencies and USDA Forest Service, based on the results of the evaluation, that any reasonably practical additional opportunities will enhance the amount of Chinook salmon spawning habitat, EWEB shall implement the additional opportunities within the scope and limitations of the mitigation measure. If EWEB determines, in consultation with the FWG, and subject to approval by the Fish Agencies and USDA Forest Service, based on the results of the evaluation, that there are no reasonably practical opportunities to enhance Chinook salmon spawning habitat, then EWEB, in consultation with the FWG, and subject to approval by the Fish Agencies and USDA Forest Service, shall develop an evaluation to examine whether:

i) a number less than 320 m^2 for the Maintenance Objective should be established as an Alternative Maintenance Objective (in which case, 90% of the Alternative Maintenance Objective will become the Alternative Maintenance Threshold), and/or

ii) any reasonably practical opportunities to increase Spawning Habitat in the lower Carmen Bypass Reach above those measures already required in Section 7.1 of this waiver application, and/or

iii) Chinook salmon non-criteria spawning habitat is equally producing fry relative to criteria habitat (not significantly different at an alpha value of 0.05 between production of fry from redds in criteria and non-criteria habitat). If non-criteria habitat is "equally producing" as provided in prior sentence, EWEB shall include the non-criteria habitat producing Chinook salmon fry in meeting the 320 m^2 spawning habitat minimum.

However, if EWEB has augmented, 2,000 tons of gravel in any 10-year period and the Spawning Habitat mapped is less than the Maintenance Threshold, or is less than the Alternative Maintenance Threshold (whichever applies) and the activities in paragraphs ii) and iii) above have not resulted in determined Chinook salmon spawning habitat at least equal to the difference between the Alternative Mitigation Objective and 320 m^2, then EWEB shall establish and fund a Smith Fund or, if applicable, adjust its funding to an existing Smith Fund as described in Section 7.3.11.4) below.

7.3.11.2 Engineered habitat structure surveys

a) EWEB shall perform visual surveys of the Engineered Structures during the mapping described above to assess structure performance and establish any need for maintenance based on a procedure developed by EWEB in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service. EWEB shall provide a report summarizing the results of its visual survey to the FWG. If EWEB's visual survey shows that more than 20% of all of the Engineered Structures are nonfunctioning, EWEB shall repair, modify or replace the structures that are nonfunctioning within one year, if reasonably practicable. However, there will be no obligation for EWEB to repair, to modify or to replace such nonfunctioning Engineered Structures if the amount of spawning habitat is more than the Maintenance Threshold, or the Alternative Maintenance Threshold (whichever is applicable), and the LWD frequency requirements are achieved. If mapped Spawning Habitat is less than the Maintenance Threshold or is less than the Alternative Maintenance Threshold (whichever is applicable), EWEB, in

consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall evaluate modification or replacement of Engineered Structures even if they are functioning in an effort to increase Spawning Habitat to the applicable Maintenance Objective. EWEB shall, in consultation with FWG and subject to approval by the Fish Agencies and USDA Forest Service, determine and implement actions to modify or to repair any Engineered Structure that is causing, or potentially could cause, significant damage to infrastructure such as roads, pedestrian bridges or trails.

b) An Engineered Structure will only be considered nonfunctioning if it meets the following conditions:

    i) Key pieces of LWD in the Engineered Structure are out of the Smith Bypass Reach wetted channel during summer flows or have been displaced to the degree that they are no longer effectively retaining gravels or providing stable spawning habitat.

7.3.11.3 LWD frequency

EWEB shall perform visual surveys of LWD in the Smith Bypass Reach during the mapping described above to determine the frequency of LWD per mile in the reach. EWEB shall count all LWD ≥ 40 feet long and ≥ 24 inches diameter (Qualifying LWD), which are either wholly or partially within the Smith Bypass Reach bankfull channel. EWEB shall also count as Qualifying LWD, LWD with attached rootwads if they are less than 40 feet in length but are still equal to or greater than 24 inches in diameter. If, based on a visual survey, the overall frequency of Qualifying LWD is less than 80 pieces per mile, EWEB shall implement actions to increase Qualifying LWD frequency to 80 pieces per mile within 2 years, unless EWEB determines, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, that the additional LWD is not necessary.

7.3.11.4 Mitigation fund

a. Commencing in the year following any year in which EWEB determines, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, that an Alternative Maintenance Objective do not result in the presence of 320 m^2 of determined Chinook salmon spawning habitat, EWEB shall establish a Smith Fund and be obligated to contribute to the fund as provided in this paragraph. For the purpose of determining EWEB's contribution to the Smith Fund, EWEB shall calculate the actual costs EWEB incurs during implementation for 50% of the gravel initial augmentation (placement of the initial 2,000 tons of gravel) and for 10% of the Engineered Structures initial construction (collectively, the Base Amount). When 320 m^2 of determined Chinook salmon spawning habitat is not present as described above after EWEB has competed implementation and continuing until 320 m^2 of determined Chinook salmon spawning habitat is present, EWEB shall contribute to the Smith Fund at the end of each succeeding five-year period, the amount of money, if any, determined by subtracting from the Base Amount (adjusted for inflation), the amount of money that EWEB has expended in the five-year period for gravel augmentation and construction, repair, modification and maintenance of Engineered Structures and implementation of this mitigation measure. EWEB shall provide to the FWG a summary of the analysis used to determine any contribution it makes to the Smith Fund.

b. In the year following EWEB's establishment of the Smith Fund and first funding of the Smith Fund, EWEB, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall develop a plan for use of the Smith Fund to fund resource projects. Resource projects will be those EWEB activities that enhance Chinook salmon, cutthroat trout or bull trout spawning and rearing habitat within the Project area (defined as the McKenzie River and its tributaries upstream of the confluence with Horse Creek and downstream of Koosah Falls).

c. Any person or entity, including EWEB, may propose a resource project for funding from the Smith Fund. EWEB shall review all resource project proposals, and periodically provide a report to the FWG, describing each project proposal and recommending whether to fund one or more of the project proposals from the Smith Fund.

d. EWEB shall convene a meeting of the FWG no sooner than 30 days after distribution of the report set forth in paragraph c) immediately above for consultation regarding the proposed resource projects and EWEB's recommendations in the report. EWEB shall, after consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, file with the Commission a plan and schedule for implementing one or more resource project proposals using funds from the Smith Fund. Upon Commission approval, EWEB shall implement the plan and schedule.

7.3.12 Sources of information

Dunham, J., B. Rieman, and G. Chandler. 2003. Influences of temperature and environmental variables on the distribution of bull trout within streams at the southern margin of its range. North American Journal of Fisheries Management 23: 894-904.

Harvey, B. C. 1998. Influence of large woody debris on retention, immigration, and growth of coastal cutthroat trout (*Oncorhynchus clarki clarki*) in stream pools. Canadian Journal of Fisheries and Aquatic Sciences 55: 1902-1908.

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Stillwater Sciences. 2006a. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006b. Water quality in the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006c. Aquatic habitats and instream flows at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006d. Fluvial geomorphic processes and channel morphology at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

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7.4 Mitigation 4—Trail Bridge Reservoir Settlement Measures

EWEB will develop a comprehensive implementation plan and schedule for habitat structures in Trail Bridge Reservoir after license issuance. EWEB will develop the plan and schedule in consultation with the Fisheries Work Group and with approval by the Fish Agencies and USDA Forest Service. The plan will include:

- type of materials to be used (boulders and/or anchored LWD, stumps/root wads, brush bundles),
- timing of implementation (assumed to be when reservoir is drawndown for fish passage construction), such that the habitat structures would be placed within 5 years after license issuance,
- source of materials,
- volume and size of materials,
- configurations (including construction drawings/design) and locations for the placement of materials,
- method of placement of materials including access methods,
- detailed long-term monitoring activities maintenance, and contingency activities, and
- considerations for recreation and aesthetic interests.

EWEB shall install no more than a total of 40 habitat structures consisting of logs (6 m long and 0.3 m diameter at 1.4 m from the large end) and additional elements as described below, distributed between both shallow and deep water in Trail Bridge Reservoir. The goal of the deep-water habitat structures is to improve the quality and quantity of habitat for adult salmonids (principally subadult and adult bull trout, as well as other adult native trout). The habitat structures are intended to increase adult salmonid abundance; however, increases in abundance are not a measurable objective leading to maintenance actions. EWEB shall provide deep-water habitat structures in the form of anchored LWD, stumps/root wads, and/or boulders, submerged on the bottom at appropriate depths (at or deeper than elevation 2063).

The goal of the shallow-water habitat structures is to improve habitat for fry and juvenile salmonids. The habitat structures are intended to increase fry and juvenile salmonid abundance; however, increases in abundance are not a measurable objective leading to maintenance actions. EWEB shall provide shallow-water (e.g., between reservoir elevations 2070–2078) habitat structures in the form of anchored clusters of small whole trees, other woody debris, and/or single large whole trees extending perpendicular from the shore into the reservoir.

The total number of logs to be added to the reservoir shall not exceed 50 to the extent that these logs are available from the Willamette National Forest. The installed habitat structures are intended to be dispersed and of low profile. EWEB, in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, shall define what constitutes a structure (e.g., number/material type/complexity and an agreed upon distance/spacing apart).

7.4.1 Distance between mitigation site and Artificial Obstruction

Mitigation actions will be in Trail Bridge Reservoir (Figure 1; Appendix A, Photos 25–28), which is approximately 3.1 km (1.9 mi) downstream of the Smith Dam (artificial obstruction).

7.4.2 Date the mitigation is scheduled to be completed

Although FERC has not stated a date it expects to issue a new license, FERC has stated that it expects to issue its final Environmental Assessment in June 2009. Once FERC issues a final new license, and if the license reflects the proposed Settlement Agreement reached thus far among the settlement parties, EWEB would install the habitat structures in Trail Bridge Reservoir during construction of fish passage facilities at Trail Bridge Dam.

7.4.3 Location

COUNTY:	Linn
ROAD CROSSING (if applicable)**:**	NA
RIVER/STREAM:	Trail Bridge Reservoir is located at the confluence of the Smith Bypass Reach and the Carmen Bypass Reach
TRIBUTARY OF:	NA
BASIN:	McKenzie River
COORDINATES[a]**:**	Longitude: -122.0485°W Latitude: 44.2765°N

[a] Geographic projection using NAD 83.

7.4.4 Stream description and additional information regarding the mitigation in relation to native migratory fish movement

The mitigation actions are planned for Trail Bridge Reservoir, which is a 73.4-ac (29.7-ha) reservoir located about 3.1 km (1.9 mile) downstream of a barrier (Smith Dam), and directly upstream of Trail Bridge Dam. Trail Bridge Dam is currently a barrier to upstream migration, but will be provided with fish passage facilities before these mitigation actions are complete. The mitigations actions designed for this reservoir will enhance many areas of the reservoir with habitat structures, in addition to providing protection of key habitat for bull trout. Smith Dam is currently a complete upstream migration barrier for all fish, and excludes fish from accessing habitat upstream of the dam. EWEB anticipates that the measures could be recognized as effective mitigation for a lack of passage for native migratory fish at

Smith Dam primarily because habitat conditions for native fish upstream of Smith Dam would be poor, including:

- excessive summer water temperatures,
- low amounts of spawning habitat (~38 m^2 [409 ft^2] for Chinook salmon and bull trout),
- increased exposure to angling impacts in Smith Reservoir, and
- potential predation from native and non-native trout in Smith Reservoir.

The overall benefits of passage at Smith Dam are discussed in previous sections of this fish passage waiver application, and the relative benefits of the settlement measures for native fish are discussed below for Chinook salmon and bull trout based on a quantitative population dynamics analysis, and also discussed for other native fish based on a qualitative analysis.

7.4.4.1 Population dynamics benefits analysis for Trail Bridge Reservoir settlement measures

Benefits of settlement measures for spring Chinook salmon

Trail Bridge Reservoir provides abundant rearing habitat for all early life-stages of Chinook salmon produced in the bypass reaches. Survival in the reservoir strongly affects smolt production, and is influenced by factors such as stranding, entrainment, and predation. Increases in habitat complexity planned for Trail Bridge Reservoir are anticipated to increase Chinook salmon survival in Trail Bridge Reservoir, and are also predicted to increase smolt production by over 37% (> 2,000 smolts; Table 9) based on the following assumption:

- Habitat structures result in a 20% increase in survival for fry and juveniles based on increased cover from predation, decreased exposure to fish stranding, and decreased residency time in the reservoir (following construction of a planned downstream migrant bypass facility).

Table 9. Summary of model results comparing the benefits of passage at Smith Dam with settlement measures in Trail Bridge Reservoir for Chinook salmon and bull trout.

	Passage at Smith Dam	Settlement measures in Trail Bridge Reservoir
Total amount of Chinook salmon and bull trout habitat	2.9 mi	73.4 ac (29.7 ha)
Primary benefits for Chinook salmon	Potential access to spawning habitat	Increased fry, juvenile, and smolt survival
Primary benefits for bull trout	Potential access to foraging habitat	Increased survival for all life stages, and increased feeding opportunities for adults
Estimated production of Chinook salmon smolts[1]	1,500 (20% increase)	2,148 smolts (72% increase)
Estimated population of adult bull trout upstream of Trail Bridge Dam	• 218 subadults/adults (98% increase) with no spawning upstream of Smith Reservoir • 470 juveniles (0% increase)	223 subadults/adults (100% increase) 470 juveniles (0% increase)

[1] Based on population dynamics model assuming fish passage at Trail Bridge Dam or Smith Dam (Stillwater Sciences 2006i).

Benefits of settlement measures for bull trout

Population dynamics modeling results indicate that adult carrying capacity limits the current bull trout population. Increasing the values of all other parameters in the model does not lead to an increase in the adult population until the carrying capacity of the adult population is increased. Under current conditions, the carrying capacity for adult bull trout in Trail Bridge Reservoir is limiting the population. Therefore, increases in the population would likely occur if survival conditions for adult bull trout increased from the mitigation actions proposed. For example, increased habitat complexity in Trail Bridge Reservoir could decrease mortality or emigration. Bull trout adult mortality in the Study Area was estimated to be about 20% annually (Stillwater Sciences 2006a), which includes losses from natural causes, poaching, emigration, etc. (the rate of mortality from each source is unknown). The current adult population is composed of age 4+ to age 7+ individuals (Stillwater Sciences 2006a), which is consistent with estimates of high annual mortality or emigration. Angler surveys and Oregon police reports indicate that angling pressure (e.g., use of bait) and poaching of bull trout occur in the Study Area (Stillwater Sciences 2006b). If mortality of the adult population related to angling were reduced (e.g., via increased habitat complexity reducing fish efficiency), the adult population would increase. Reductions in adult mortality by any means (e.g., reducing emigration) would result in a larger adult population. In contrast to the Trail Bridge population, many other bull trout populations have long-lived individuals (>7 years old) (Hagen and Baxter 1992). A larger adult population would increase the resiliency of the population by increasing the number of individuals of spawning age, as well as the number of individuals from separate cohorts. Increases in habitat complexity (particularly those planned for deep water) planned for Trail Bridge Reservoir is anticipated to increase bull trout survival in Trail Bridge Reservoir, and is predicted to increase the adult/subadult population by over 100% (>200 subadult/adults; Table 9) based on the following assumptions:

- Habitat structures result in a 20% increase in survival for fry and juveniles, and a 50% increase in survival for adults, based on increased cover from predation, improved holding habitat, and decreased risk of angling impacts.
- Habitat structures result in a 100% increase in subadult/adult rearing density, to levels similar to what is observed in other reservoirs where bull trout occur (Stillwater Sciences 2006b).

Benefits of settlement measures for other native migratory fish

Native migratory fish, including cutthroat trout and mountain whitefish, currently occur both upstream and downstream of Smith Dam; however, habitat connectivity for these species between areas upstream and downstream of the dam is lost. In addition, Pacific lamprey could potentially have occurred upstream of the Smith Dam historically and thus could benefit from restoring access to these habitats. It is anticipated that the measures included in the proposed Settlement Agreement reached thus far among the settlement parties for Trail Bridge Reservoir can be recognized as effective mitigation for lack of fish passage at Smith Dam for native migratory species primarily because these measures would increase habitat quantity and complexity which in turn would increase the population size and diversity by increasing the growth, survival, and density of native cutthroat trout, rainbow trout, mountain whitefish, and other native fish species.

It is anticipated that the placement of shallow and deep water engineered habitat structures would (1) increase fry, juvenile, and adult habitat for native salmonids in Trail Bridge Reservoir; (2) increase survival of fry, juvenile, and adult native salmonids in Trail Bridge Reservoir, and (3) mitigate for reduced habitat quality potentially resulting from modifications to Potential Stranding Zones along Trail Bridge Reservoir. The benefits of LWD and habitat complexity for native trout are well documented (e.g., Wilzbach 1985, Harvey 1998), and have been shown to be effective at increasing adult populations of cutthroat trout (Gowan and Fausch 1996) and other trout species.

Overall, increased habitat quantity and complexity from these settlement measures would be anticipated to allow greater survival of young age classes of native migratory fish species, leading to increased resiliency of the population upstream and downstream of Smith Dam to potential disturbance. These measures would also be anticipated to contribute to greater growth rates, survival, and density of native fish.

7.4.5 Comparison of the proposed settlement measures for Trail Bridge Reservoir with current habitat upstream of Smith Dam

Table 10. Comparison of proposed settlement measures for Trail Bridge Reservoir with current habitat upstream of Smith Dam.

	With settlement measures proposed for Trail Bridge Reservoir	Current habitat upstream of Smith Dam
NMF Species Present Currently[1]	Cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, and mountain whitefish
NMF Species Present Historically[1]	Pacific lamprey, cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon	Cutthroat trout, rainbow trout, and mountain whitefish. Historical presence of Pacific lamprey, bull trout, and spring Chinook salmon is not documented, as described below.
Habitat Quality[2, 3]	After settlement measure, it is anticipated that habitat quality would be high, with extensive rearing habitat in shallow water for fry and juveniles, as well as high habitat quality for adult native trout in deep water areas.	Degraded from timber harvest activities, with altered supply of sediment and large woody debris. Characterized by riffles, pocket water, and pool habitat. Low abundance of spawning habitat, with abundant rearing habitat for juvenile salmonids in complex shallow water habitat.
Flows[4]	Does not apply to reservoir.	Natural, unregulated flows in the Smith River upstream of the reservoir. The Smith Reservoir collects water from the Smith River and the McKenzie River via the Carmen Diversion Tunnel.
Water Quality[5]	After settlement measures, water quality parameters would continue to be in ODEQ compliance.	Water quality parameters are in ODEQ compliance with the exception of water temperature. Water temperature in the Smith River upstream of Smith Dam often become quite warm in the summer, with areas that can be in excess of ODEQ criteria during August and early September. Johnson et al. (1985) characterized Smith Reservoir as oligotrophic (i.e., low nutrients), based upon low chlorophyll-a concentrations and water transparency.
Water Right Availability[6]	EWEB, as a public (municipal) entity, holds the water rights for the Project in	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-

	With settlement measures proposed for Trail Bridge Reservoir	Current habitat upstream of Smith Dam
	perpetuity.	Smith Hydroelectric Project in perpetuity.
Land Use/Zoning[6]	The Project is located primarily on federal land and lies within eight of the WNF Management Areas (MAs), and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.	The Project is primarily located on federal land and lies within eight of the WNF MAs, and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.

NMF = native migratory fish
[1] Stillwater Sciences (2006a).
[2] Stillwater Sciences (2006c).
[3] Stillwater Sciences (2006d).
[4] Stillwater Sciences (2006e).
[5] Stillwater Sciences (2006f).
[6] Martha Goodavish Planning & Design and Stillwater Sciences (2006).

7.4.6 Proposed settlement measures for Trail Bridge Reservoir in relation to existing fish management plans

Although the Oregon Coastal Salmon Restoration Initiative Plan is primarily focused on the recovery of coastal coho salmon populations in Oregon, the three basic principles of this plan are directly applicable to the lower Carmen Bypass Reach settlement measures. These principles are outlined (State of Oregon 1997) as follows:

1. Restoration of salmon must address natural and cultural systems.
2. Salmon require complex and interconnected habitats which are created, altered, and maintained by natural physical processes.
3. Life history diversity, genetic diversity, and metapopulation organization (patterns of populations) are ways salmon adapt to their complex and interconnected habitats.

In addition to the Oregon Coastal Salmon Restoration Initiative Plan, there are several Oregon Administrative Rules (OARs) that relate to mitigation actions proposed in the vicinity of Smith Dam. These OARs include:

- 635-500-0120 (2) (d) to restore and enhance trout habitat and evaluate the effectiveness of enhancement projects;
- 635-500-0266 pertaining to the applicability of the McKenzie Subbasin Fish Management Policies and Objectives;

- 635-500-0267 pertaining to habitat components of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0268 Sections (1) (b), (2), and (4) pertaining to specific policies that apply to resident trout and whitefish in the McKenzie River subbasin; and
- 635-500-1661 pertaining to operating policy and objectives for McKenzie River Basin Fish Management Plan for spring Chinook salmon.

There are also components of the McKenzie Subbasin Fish Management Plan (Howell et al. 1988) that would apply to mitigation actions described in this waiver including:

- apply new passage technology to reopen areas above dams,
- develop and evaluate techniques to enhance natural production of spring Chinook salmon,
- restore and enhance riparian and instream habitat, and
- enhance production of wild trout in the main stem above Paradise Campground and in tributaries.

7.4.7 Known restoration or land use plans which might have an impact on the mitigation

The settlement measures would occur entirely on USDA Forest Service lands that are included in the Willamette National Forest. The settlement measures appear consistent with the USDA Forest Service Northwest Forest Plan Aquatic Conservation Strategy. Many other settlement measure, if included in a final new license by FERC, would benefit and support these settlement measures, including upstream and downstream fish passage at Trail Bridge Reservoir. EWEB knows of no restoration or land use plans that would impact the settlement measures.

7.4.8 If the mitigation entails providing passage at an existing artificial barrier, what is the expected date of replacement or major repair for the structure if it were not used as mitigation?

Not applicable.

7.4.9 Does the mitigation include any activity that is a requirement or condition of any other agreement, law, permit, or authorization?

No.

7.4.10 Mitigation cost estimate and funding

Detailed costs have not been estimated. EWEB will provide all funding for relicensing of the Project once FERC issues a new license.

7.4.11 Mitigation Evaluation, Monitoring, and Maintenance

EWEB shall conduct two types of monitoring consisting of, 1) effectiveness monitoring for fish use of habitat structures, and 2) structural monitoring to ensure habitat structures are maintained to their original implementation condition. Both types of monitoring are described below.

Effectiveness monitoring

Effectiveness monitoring of treated and control areas will be conducted during the early summer for three seasons, after sufficient numbers of Chinook salmon fry are present, as determined by EWEB in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service. The intention of effectiveness monitoring will be to determine if habitat structures are successful at creating rearing habitat, and providing protective cover for target species/lifestages, and to determine if particular configurations appear to work better than others.

Effectiveness monitoring to determine if fish use habitat structures will consist of:

1. Direct observation (e.g., snorkel, SCUBA, and/or video) at enhanced- and control (untreated) sites during day and night.
2. Determine use by fish species, life stage, at each type of habitat structure, as well as fish use by reservoir elevation.

Habitat structures will be deemed successful if salmonids use them for rearing at a statistically significant higher density than is observed in control areas. If habitat structures are successful, future maintenance and replacement of habitat structures will be informed by the effectiveness monitoring results. However, if individual habitat structures are not successful, they will either be modified, or moved.

Structural monitoring

EWEB shall conduct all monitoring activities and maintenance actions in consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service. EWEB shall conduct visual (e.g., underwater camera) monitoring once every five years beginning the year after installation and continuing for the duration of the License to ensure habitat structures are maintained to their original implementation condition. During each structural monitoring event visual assessments will be conducted, and habitat structures will be compared to original design drawings, as modified by actual implementation. Monitoring will be conducted by video camera, during reservoir drawdowns, or using professional divers. If habitat structures appear to be degraded compared to their original implementation condition by being reduced in size or complexity upgrades will be designed and implemented as informed by the effectiveness monitoring.

7.4.12 Sources of information

Gowan, C., and K. D. Fausch. 1996. Long-term demographic responses of trout populations to habitat manipulation in six Colorado streams. Ecological Applications 6: 931-946.

Hagen, J., and J. S. Baxter. 1992. Bull trout populations of the North Thompson River basin, British Columbia: initial assessment of a biological wilderness. British Columbia Ministry of Environment, Lands and Parks, Fisheries Branch, Kamloops, British Columbia.

Harvey, B. C. 1998. Influence of large woody debris on retention, immigration, and growth of coastal cutthroat trout (*Oncorhynchus clarki clarki*) in stream pools. Canadian Journal of Fisheries and Aquatic Sciences 55: 1902-1908.

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State of Oregon. 1997. Oregon Coastal Salmon Restoration Initiative Plan: restoring an Oregon legacy through cooperative efforts. Final draft. Submitted to National Marine Fisheries Service. http://egov.oregon.gov/OPSW/archives/reports-subpage.shtml.

Stillwater Sciences. 2006a. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon

Stillwater Sciences. 2006b. Population dynamics of bull trout and spring Chinook salmon at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006c. Aquatic habitats and instream flows at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006d. Fluvial geomorphic processes and channel morphology at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006e. Hydrologic regimes at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006f. Water quality in the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Wilzbach, M. A. 1985. Relative roles of food abundance and cover in determining the habitat distribution of stream-dwelling cutthroat trout (*Salmo clarki*). Canadian Journal of Fisheries and Aquatic Sciences 42: 1668-1672.

7.5 Mitigation 5—Settlement Measures Downstream of Trail Bridge Dam

These settlement measures included as part of the proposed Settlement Agreement reached thus far among the settlement parties, are intended to maintain and increase and the quality of spawning, rearing, and foraging habitat for native salmonids in the mainstem McKenzie River downstream of Trail Bridge Dam. To achieve this goal, EWEB would implement the following measures:

- provide funding for habitat projects in side channel sites,
- improved upstream passage at Carmen-Smith Spawning Channel, and
- replacement of a nonfunctional culvert.

Side channel habitat projects
EWEB shall provide monetary funds to the USDA Forest Service for habitat project work in the two McKenzie River side channels downstream of Trail Bridge Dam (Appendix A, Photos 29–31). Side channel #1 is approximately 800 feet long and 40 feet wide. The general concept for side channel #1 is to add gravel and wood to enhance spawning habitat at the upstream end and add up to 20 pieces of LWD to enhance rearing habitat throughout the remainder of the channel. EWEB shall fund $75,000 (all funding amounts shown in 2008 dollars. All future costs for monitoring and maintenance to be adjusted for inflation) for LWD and gravel acquisition and placement, and $15,000 every 10 years for monitoring and maintenance. The USDA Forest Service will perform acquisition, placement, monitoring and maintenance. Specific actions will include the addition of LWD as necessary (est. 20 pieces) and initial augmentation not to exceed 100 tons of gravel. Three years after installation gravel patch areas will be measured to establish maintenance threshold.

Side channel #2 consists of two channels, a larger channel and a smaller channel. The larger channel is approximately 950 feet long with an average width of 20 feet. Some spawning habitat is present in the upper half of the larger side channel. The smaller side channel is disconnected from the surface flow of the larger side channel. The smaller side channel is approximately 1,000 feet long. EWEB shall fund $25,000 for LWD acquisition, placement, and side-channel opening excavation, and up to $10,000 every 10 years for monitoring, and maintenance. The USDA Forest Service will perform installation, excavation, monitoring and maintenance.

Upstream passage at spawning channel
In consultation with the FWG and subject to approval by the Fish Agencies and USDA Forest Service, EWEB shall design, construct, operate and maintain upstream fish passage with steps no higher than 6 inches at the Carmen-Smith Spawning Channel entrance consistent with NMFS 2008 Criteria (Anadromous Salmonid Fish Passage Facility Design, February 2008) and a facility for upstream passage out of the channel at the spawning channel water control structure for the purpose of supporting safe, timely and effective upstream passage of fish at the spawning channel (Appendix A, Photos 32–33; Figure 4; Appendix A, Photos 34–35).

Culvert replacement
EWEB shall replace a nonfunctional culvert site consisting of two 0.61-m (2-ft) diameter corrugated metal culverts located on an unnamed fish-bearing stream that is a tributary to the McKenzie River along the Carmen-Smith Transmission Line between Towers 109 and 110 (Appendix A, Photos 36–37).

7.5.1 Distance between mitigation site and Artificial Obstruction

Mitigation actions in the McKenzie River downstream of Trail Bridge Dam would be in two side channels located approximately 2.9 km (1.8 mi) and 5.5 (3.4 mi) downstream of Trail Bridge Dam (Figure 5). Mitigation actions within the Carmen-Smith Spawning Channel would be located approximately 1.6 km (1.0 mi) downstream of Trail Bridge Dam (Figure 5). The culvert replacement measure would occur in an unnamed tributary to the McKenzie River located approximately 26.7 km (16.0 mi) downstream of Trail Bridge Dam (Figure 6). Trail Bridge Dam is located approximately 4.2 km (2.6 mi) downstream of Smith Dam (artificial obstruction).

7.5.2 Date the mitigation is scheduled to be completed

Although FERC has not stated a date it expects to issue a new license, FERC has stated that it expects to issue its final Environmental Assessment in June 2009. Once FERC issues a final new license, and if the

license reflects the proposed Settlement Agreement reached thus far among the settlement parties, EWEB would implement the culvert replacement and side-channel habitat projects downstream of Trail Bridge Dam within 3 years and improvements to the Carmen-Smith Spawning Channel as soon as EWEB completes the fish passage facilities at Trail Bridge Dam.

7.5.3 Location

COUNTY:	Linn
ROAD CROSSING (if applicable)**:**	Culvert replacement is on an unnamed Transmission Line access road.
RIVER/STREAM:	Sites along the McKenzie River downstream of Trail Bridge Dam
TRIBUTARY OF:	Willamette River
BASIN:	McKenzie River
COORDINATES[a]**:**	Carmen-Smith Spawning Channel entrance: Longitude: -122.0516°W Latitude: 44.2692°N Upstream end of Carmen-Smith Spawning Channel: Longitude: -122.0515°W Latitude: 44.2708°N Side channels downstream of Trail Bridge Dam: Side channel #1 (Ollalie): Longitude: -122.0424°W Latitude: 44.2495°N Side channel #2: Longitude: -122.0581°W Latitude: 44.2327°N Transmission Line culvert on unnamed tributary of the McKenzie River downstream of Trail Bridge Dam: Longitude: -122.1886°W Latitude: 44.1817°N

[a] Geographic projection using NAD 83.

7.5.4 Stream description and additional information regarding the mitigation in relation to native migratory fish movement

The settlement measures included here that could be recognized as effective mitigation for a lack of passage at Smith Dam would be in the McKenzie River, downstream of Trail Bridge Dam. There are no barriers to migration downstream of the mitigation projects in the McKenzie River before its confluence with the Willamette River, approximately 129 km (80 mi) downstream. The settlement measures described here would increase access for native trout to habitat within the spawning channel and in reaches upstream of the replaced Transmission Line culvert, increase habitat complexity in side channels, and open access to a currently blocked side channel. Smith Dam is currently a complete upstream migration barrier for all fish, and excludes fish from accessing habitat upstream of the dam. EWEB anticipates that the measures could be recognized as effective mitigation for a lack of passage for native migratory fish at Smith Dam primarily because habitat conditions for native fish upstream of Smith Dam would be poor, including:

- excessive summer water temperatures,
- low amounts of spawning habitat (~38 m^2 [409 ft^2] for Chinook salmon and bull trout),
- increased exposure to angling impacts in Smith Reservoir, and
- potential predation from native and non-native trout in Smith Reservoir.

The overall benefits of passage at Smith Dam are discussed in part 6B, and the relative benefits of the settlement measures for native fish are discussed below for Chinook salmon based on a quantitative population dynamics analysis, and also discussed for other native fish based on a qualitative analysis.

7.5.4.1 Population dynamics benefits analysis for settlement measures downstream of Trail Bridge Dam

Benefits of settlement measures for spring Chinook salmon

Total available spawning habitat has not been assessed downstream of Trail Bridge Dam. However, the spawning channel has abundant spawning habitat, and currently is capable of producing over an estimated 250,000 emergent fry. Explicitly modeling smolt production from the fry produced downstream of Trail Bridge Dam would require populating the model with habitat and survival data from the mainstem McKenzie River, which are currently unavailable. However, assuming a lower estimate of emergent-fry-to-smolt survival (1%) than was used in the Trail Bridge Reservoir model, and using the same survival rates for fry to smolt (7.2%) assumed for the Chinook salmon population in Trail Bridge Reservoir, the production of fry from the spawning channel accounts for an estimated 2,700 smolts in the mainstem McKenzie River. Habitat projects in side channels downstream of Trail Bridge Dam included in this mitigation measure are anticipated to increase survival of fry and juveniles in the mainstem, and would increase smolt production from the river. Based only on production of fry from the spawning channel (which is the best estimate available for emergent fry production), and assuming an increase of survival for migrating fry of 2%, increases in smolt production to over 8,000 is estimated (Table 11), because most of the fry produced in the spawning channel rear in the mainstem.

Table 11. Summary of model results comparing the benefits of passage at Smith Dam with settlement measures in sites downstream of Trail Bridge Dam.

	Passage at Smith Dam	Settlement measures in sites downstream of Trail Bridge Dam
Total miles of Chinook salmon	2.9	Unquantified amount of habitat in the spawning channel, in addition to an unquantified amount of habitat in Side channel #2, which is 2 channels totaling around 2000 ft.
Primary benefits for Chinook salmon	Potential access to spawning and rearing habitat	Increased production of fry, and increased survival of fry and juveniles
Estimated production of Chinook salmon smolts	1,500 (20% increase)	8,000 smolts (196% increase)

Benefits of settlement measures for bull trout and other native migratory fish

Native migratory fish, including cutthroat trout and mountain whitefish, currently occur both upstream and downstream of Smith Dam; however, habitat connectivity for these species between areas upstream and downstream of the dam is lost. It is anticipated that the settlement measures being discussed for side channels downstream of Trail Bridge Dam, in the Carmen-Smith Spawning Channel, and for the replacement of the Transmission Line culvert can be recognized as effective mitigation for lack of fish passage at Smith Dam for bull trout and other native migratory species primarily because these measures

would increase habitat quantity and complexity which in turn would increase the population size and diversity by increasing the growth, survival, and density of Pacific lamprey, bull trout, native cutthroat trout, rainbow trout, mountain whitefish, and other native fish species. The nonfunctional culvert is currently a full migration barrier to fry and juvenile cutthroat trout at high and low flows, and adults at low flows. It is anticipated that the replacement of this culvert will provide access to 0.8 km (0.5 mi) of upstream habitat, and will allow for connectivity between upstream and downstream portions of this system.

7.5.5 Comparison of the proposed settlement measures downstream of Trail Bridge Dam with current habitat upstream of Smith Dam

Table 12. Comparison of proposed settlement measures for the Smith Bypass Reach with current habitat upstream of Smith Dam.

	With settlement measures proposed for sites downstream of Trail Bridge Dam	Current habitat upstream of Smith Dam
NMF Species Present Currently[1]	Cutthroat trout, rainbow trout, mountain whitefish, bull trout, and spring Chinook salmon. Pacific lamprey have not been observed, but are assumed to be potentially present.	Cutthroat trout, rainbow trout, and mountain whitefish
NMF Species Present Historically[1]	Pacific lamprey, cutthroat trout, rainbow trout, mountain whitefish, bull trout, spring Chinook salmon	Cutthroat trout, rainbow trout, and mountain whitefish. Historical presence of Pacific lamprey, bull trout, and spring Chinook salmon is not documented, as described below.
Habitat Quality[2, 3]	After settlement measures, it is anticipated that habitat quality would be high in side channels downstream of Trail Bridge Dam, with extensive rearing habitat from increased habitat complexity.	Degraded from timber harvest activities, with altered supply of sediment and large woody debris. Characterized by riffles, pocket water, and pool habitat. Low abundance of spawning habitat, with abundant rearing habitat for juvenile salmonids in complex shallow water habitat.
Flows[4]	Flows downstream of Trail Bridge Dam will not be affected by these settlement measures. However, flows in this reach are not substantially impacted by Project operations.	Natural, unregulated flows in the Smith River upstream of the reservoir. The Smith Reservoir collects water from the Smith River and the McKenzie River via the Carmen Diversion Tunnel.
Water Quality[5]	Water quality downstream of Trail Bridge Dam will not be affected by these settlement measures, and will continue to meet all ODEQ criteria.	Water quality parameters are in ODEQ compliance with the exception of water temperature. Water temperature in the Smith River upstream of Smith Dam often become quite warm in the summer, with areas that can be in excess of ODEQ criteria during August and early September. Johnson et al. (1985) characterized Smith Reservoir as oligotrophic (i.e., low nutrients), based upon low chlorophyll-a concentrations and water transparency.

	With settlement measures proposed for sites downstream of Trail Bridge Dam	Current habitat upstream of Smith Dam
Water Right Availability[6]	EWEB, as a public (municipal) entity, holds the water rights for the Project in perpetuity.	EWEB, as a public (municipal) entity, holds the water rights for the Carmen-Smith Hydroelectric Project in perpetuity.
Land Use/Zoning[6]	The Project is located primarily on federal land and lies within eight of the WNF Management Areas (MAs), and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities. The spawning channel is within the Project boundary, and the other projects downstream of Trail Bridge Dam are outside the Project boundary. Side channel locations are within the Wild and Scenic Reach of the McKenzie River.	The Project is primarily located on federal land and lies within eight of the WNF MAs, and two others are within the 0.8-km (0.5-mi)-wide buffer of the FERC Project Boundary. The primary use of federal lands within the FERC Project Boundary is for hydroelectric generation associated with the Project. A secondary use of the lands within the FERC Project Boundary is recreation, primarily fishing and boating. The primary recreational uses adjacent to the FERC Project Boundary are camping, hiking, and scenic driving associated with WNF recreation facilities.

NMF = native migratory fish
[1] Stillwater Sciences (2006a).
[2] Stillwater Sciences (2006b).
[3] Stillwater Sciences (2006c).
[4] Stillwater Sciences (2006d).
[5] Stillwater Sciences (2006e).
[6] Martha Goodavish Planning & Design and Stillwater Sciences (2006).

7.5.6 Proposed settlement measures downstream of Trail Bridge Dam in relation to existing fish management plans

Although the Oregon Coastal Salmon Restoration Initiative Plan is primarily focused on the recovery of coastal coho salmon populations in Oregon, the three basic principles of this plan are directly applicable to the lower Carmen Bypass Reach settlement measures. These principles are outlined (State of Oregon 1997) as follows:

1. Restoration of salmon must address natural and cultural systems.
2. Salmon require complex and interconnected habitats which are created, altered, and maintained by natural physical processes.
3. Life history diversity, genetic diversity, and metapopulation organization (patterns of populations) are ways salmon adapt to their complex and interconnected habitats.

In addition to the Oregon Coastal Salmon Restoration Initiative Plan, there are several Oregon Administrative Rules (OARs) that relate to mitigation actions proposed in the vicinity of Smith Dam. These OARs include:

- 635-500-0120 (2) (d) to restore and enhance trout habitat and evaluate the effectiveness of enhancement projects;
- 635-500-0266 pertaining to the applicability of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0267 pertaining to habitat components of the McKenzie Subbasin Fish Management Policies and Objectives;
- 635-500-0268 Sections (1) (b), (2), and (4) pertaining to specific policies that apply to resident trout and whitefish in the McKenzie River subbasin; and
- 635-500-1661 pertaining to operating policy and objectives for McKenzie River Basin Fish Management Plan for spring Chinook salmon.

There are also components of the McKenzie Subbasin Fish Management Plan (Howell et al. 1988) that would apply to mitigation actions described in this waiver including:

- apply new passage technology to reopen areas above dams,
- develop and evaluate techniques to enhance natural production of spring Chinook salmon,
- restore and enhance riparian and instream habitat, and
- enhance production of wild trout in the main stem above Paradise Campground and in tributaries.

7.5.7 Known restoration or land use plans which might have an impact on the mitigation

The settlement measures would occur entirely on USDA Forest Service lands that are included in the Willamette National Forest. The settlement measures appear consistent with the USDA Forest Service Northwest Forest Plan Aquatic Conservation Strategy. Many other settlement measures, if included in a final new license by FERC, would benefit and support these settlement measures, including upstream and downstream fish passage at Trail Bridge Reservoir. EWEB knows of no restoration or land use plans that would impact the settlement measures.

7.5.8 If the mitigation entails providing passage at an existing artificial barrier, what is the expected date of replacement or major repair for the structure if it were not used as mitigation?

Not applicable.

7.5.9 Does the mitigation include any activity that is a requirement or condition of any other agreement, law, permit, or authorization?

No.

7.5.10 Mitigation cost estimate and funding

Detailed costs have not been estimated. EWEB will provide all funding for relicensing of the Project once FERC issues a new license.

7.5.11 Mitigation Evaluation, Monitoring, and Maintenance

7.5.11.1 Side Channel Habitat Projects

In side channel #1 gravel patch area will be re-measured every 10 years following initial placement. If below threshold, augment as necessary to bring spawning gravel area up to maintenance threshold. Gravel maintenance will not exceed 100 tons every ten years. During 10-year maintenance surveys LWD will be surveyed and replaced to maintain total number as determined at time of installation. In side-channel #2 LWD will be surveyed every 10- years and replaced to maintain total number as determined at time of installation.

7.5.11.2 Upstream passage at spawning channel

EWEB shall develop an upstream passage study evaluating significant delay, serious injury, and substantial mortality to verify that the Project fish passage facilities, including the Carmen-Smith Spawning Channel entrance, are operating as designed to support safe, timely and effective passage for upstream-migrating adult salmonids. In general, the plan will provide for the capture tagging, and release of fish at a site downstream of the spawning channel entrance. In addition, native migratory trout captured during downstream biological evaluations will be tagged opportunistically.

7.5.12 Sources of information

Howell, P., J. Hutchison, and R. Hooton. 1988. McKenzie subbasin fish management plan. Oregon Department of Fish and Wildlife, Portland.

Martha Goodavish Planning & Design and Stillwater Sciences. 2006. Land use and management at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Martha Goodavish Planning & Design, Walnut Creek, California, and Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006a. Fish population distribution and abundance at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006b. Aquatic habitats and instream flows at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006c. Fluvial geomorphic processes and channel morphology at the Carmen-Smith Hydroelectric Project, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006d. Hydrologic regimes at the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

Stillwater Sciences. 2006e. Water quality in the Carmen-Smith Hydroelectric Project area, upper McKenzie River basin, Oregon. Final report. Prepared by Stillwater Sciences, Arcata, California for Eugene Water & Electric Board, Eugene, Oregon.

State of Oregon. 1997. Oregon Coastal Salmon Restoration Initiative Plan: restoring an Oregon legacy through cooperative efforts. Final draft. Submitted to National Marine Fisheries Service. http://egov.oregon.gov/OPSW/archives/reports-subpage.shtml.

8 SUMMARY OF COMPARISON OF BENEFITS FOR PROVIDING FISH PASSAGE AT SMITH DAM WITH ALL SETTLEMENT MEASURES

Settlement measures in the vicinity of Smith Dam (both upstream and downstream) included as part of the proposed Settlement Agreement reached thus far among the settlement parties, and that ODFW can recognize as effective mitigation for a lack of fish passage at Smith Dam include:

- **Lower Carmen Bypass Reach**
  - Gravel augmentation to increase spawning habitat for spring Chinook salmon with potential benefits for bull trout and other native salmonids
  - LWD frequency maintenance to protect available habitat for Chinook salmon and bull trout, and habitats for other native fish species and macroinvertebrate forage
- **Smith Reservoir**
  - Habitat projects to increases the quality and quantity of fry, juvenile, and adult habitat for native cutthroat and rainbow trout, mountain whitefish, and other native fish species
- **Smith Bypass Reach**
  - Habitat projects and increased seasonally variable instream flows to increase spawning habitat for spring Chinook salmon and to increase rearing and other habitat for Chinook salmon, bull trout, and other native fish species, and macroinvertebrate forage for these fish
  - Installation of a 1,000-cfs turbine bypass valve at the Carmen Power Plant to protect proposed habitat projects from potential high flow releases into the Smith Bypass Reach
- **Trail Bridge Reservoir**
  - Habitat projects to increase fry, juvenile, and adult habitat for native salmonids in Trail Bridge Reservoir, as well as increase survival of fry, juvenile, and adult native salmonids in Trail Bridge Reservoir
- **Downstream of Trail Bridge Dam**
  - Improved access for trout to the spawning channel
  - Access to the McKenzie River from the upstream end of the Carmen-Smith Spawning Channel
  - Spawning and rearing habitat projects in side channels to increase quality of spawning, rearing, and foraging habitat for native salmonids in the mainstem McKenzie River downstream of Trail Bridge Dam
  - Installation of a passable culvert on the unnamed fish-bearing stream along the Carmen-Cougar Transmission Line between Transmission Towers 109 and 110.

8.1 Spring Chinook salmon and bull trout

The results of quantitative population modeling for bull trout and spring Chinook salmon comparing providing passage at Smith Dam with proposed settlement measures are summarized in Table 13. Each settlement mitigation measure recognized by ODFW was modeled and analyzed independently (as described for each settlement measure above), and an analysis of the total benefit of implementing all settlement measures included in this waiver application and included as part of the proposed Settlement Agreement reached thus far among the settlement parties, was also conducted. It is not recommended to rely solely on the model predictions presented here, but to instead carefully consider these results in the context of other data and available information discussed for the settlement measures above, as well as in the *Population Dynamics of bull trout and spring Chinook salmon* technical report (Stillwater Sciences 2006i).

Table 13. Summary of the benefits of habitat projects proposed as settlement measures and passage at Smith Dam for Chinook salmon and bull trout.

Modeled scenario	Estimated production (percent increase from current conditions)			
	Chinook salmon smolts		Juvenile bull trout	Subadult/adult bull trout
	Upstream of Trail Bridge Dam	Downstream of Trail Bridge Dam[1]		
Current conditions	1,250	2,700 (spawning channel)	470	110
Habitat projects in the Smith Bypass Reach	4,000 (220%)	NM	470 (0%)	110 (0%)
Habitat projects in the Carmen Bypass Reach	2,240 (79%)	NM	470 (0%)	110 (0%)
Habitat projects in Trail Bridge Reservoir	2,148 (72%)	NM	470 (0%)	223 (100%)
Habitat projects downstream of Trail Bridge Dam, and maintenance of Carmen-Smith Spawning Channel	NM	8,000 (196%)	NM	NM
Total benefit of all habitat projects included in waiver application	**6,800 (444%)**	**8,000 (196%)**	**470 (0%)**	**223 (100%)**
Benefits of providing fish passage at Smith Dam	**1,500 (20%)**	**2,700 (0%)**	**470 (0%)**	**218 (98%)**

NM = not modeled
[1] Includes production from the spawning channel

The net benefits of the proposed settlement measures compared with passage at Smith Dam for the Chinook salmon population is apparent. Because this population is primarily limited by available spawning habitat, both alternatives would be anticipated to contribute to an increase in smolt production over the current population; however, the proposed settlement measures (especially those proposed for the Smith Bypass Reach) would be anticipated to contribute to a much larger gain in comparison with passage at Smith Dam. Even if not all the settlement measures were completely successful, the minimum increases in available habitat in the Smith Bypass Reach would be anticipated to be substantial enough to result in a large increase in Chinook salmon smolt production. If minimum increases were not achieved

in the Smith Bypass Reach, a mitigation fund would be implemented (as described in previous sections of this fish passage waiver application).

The net benefits of all settlement measures versus the benefits of passage at Smith Dam for the bull trout population is not as dramatic as it is for Chinook salmon. Because this population is limited by adult habitat, the benefits of passage at Smith Dam would likely be nearly equal to the benefits of all proposed mitigation actions. This is based on the assumption that if passage facilities were provided at Smith Dam along with other settlement measures, subadult and adult bull trout from Trail Bridge Reservoir could hypothetically migrate to Smith Reservoir during the winter–summer period and use the reservoir as additional foraging habitat, returning downstream during fall to spawn in the Carmen Bypass Reach or Sweetwater Creek. However, bull trout behaving in this manner in the Project area is an untested hypothetical scenario. In contrast, there is an established bull trout population in Trail Bridge Reservoir, providing much more confidence that settlement measures proposed there will provide a direct and immediate benefit to the population. In addition, there are many indirect benefits to the bull trout population in having enhanced water quality and habitat conditions in the Smith Bypass Reach. Bull trout foraging in this reach is currently observed, and is anticipated to benefit by increased ability to migrate into the reach due to lower water temperatures, as well as increased food availability resulting from increased production of Chinook salmon and trout.

For both species, the extensive long-term monitoring and contingency actions required for each settlement measure (as described for the settlement measures above) would assure that the anticipated benefits would be realized, or that additional in-kind efforts would be made to benefit the populations.

8.2 Other native migratory fish

Analyzing the net benefits of all proposed settlement measures in comparison with passage at Smith Dam for other native fish is complicated by the current abundance of native and non-native migratory fish species both upstream and downstream of the Smith Dam. However, the settlement measures proposed for areas both upstream and downstream of Smith Dam are extensive, and would be anticipated to directly benefit multiple species, life stages, and life histories by enhancing habitat in both riverine and reservoir areas. In addition, the settlement measures have a higher potential of increasing fish abundance because they would create new habitat for native fish, whereas passage at Smith Dam would only allow migration of fish between existing habitat areas. Overall, increased habitat quantity and complexity from mitigation actions would be anticipated to increase survival of younger age classes of native fish, which in turn would lead to the resiliency of populations upstream and downstream of Smith Dam in the case of potential disturbance. Increased habitat quantity and complexity would also be anticipated to allow greater relative growth, survival, and density of native migratory fish upstream and downstream of Smith Dam.

In addition to the benefits for spring Chinook salmon and bull trout, the extensive long-term monitoring and contingency actions required for each settlement measure (described for settlement measures above) would assure that the anticipated benefits for other native migratory fish would be realized, or that additional in-kind efforts would be made to benefit the populations.

9 MAPS AND PHOTOS

Maps indicating the Artificial Obstruction, mitigation sites, the streams on which they are located, and other barriers in those streams are provided in Figures 1 and 5–6. Photographs of the Artificial Obstruction, mitigation sites, habitat upstream and downstream of the Artificial Obstruction and mitigation sites, and barriers upstream and downstream of the Artificial Obstruction site and mitigation sites are provided in Appendix A.

Figures

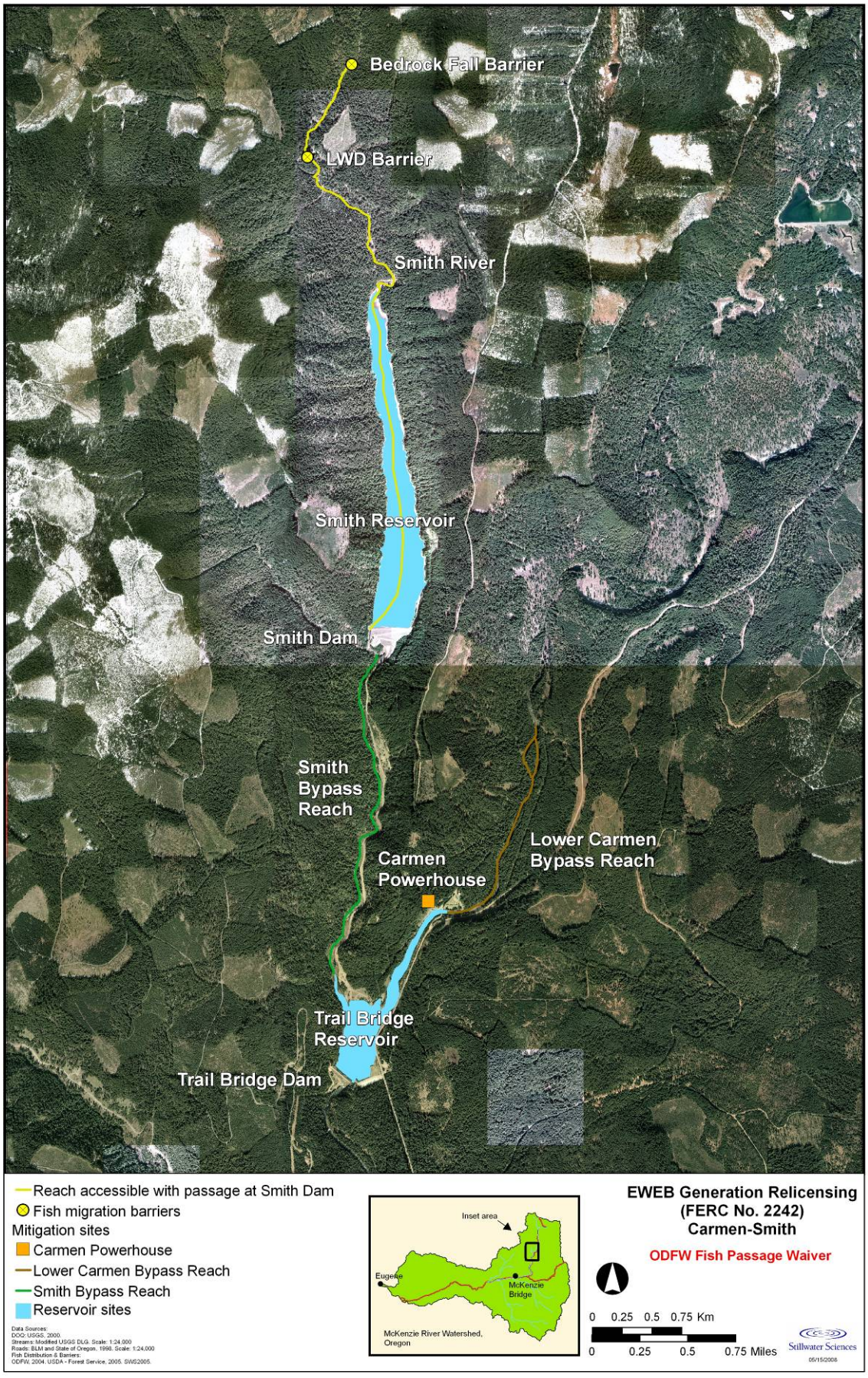

Figure 1. Smith Dam (artificial obstruction), natural barriers upstream of Smith Dam, and mitigation sites upstream of Trail Bridge Dam.

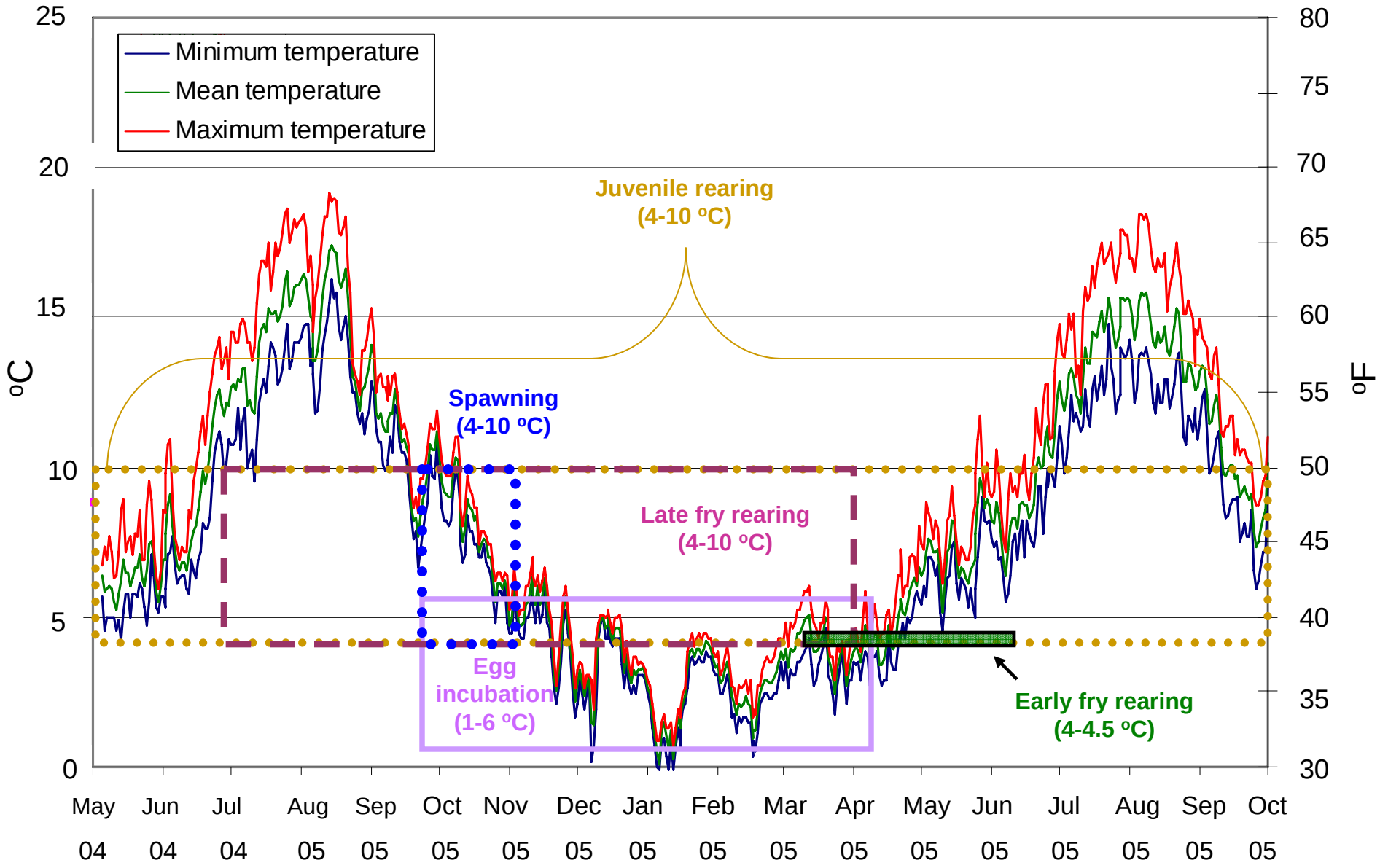

Figure 2. Optimal temperature for bull trout life stages. Bull trout temperature requirements based on Buchanan and Gregory (1997). Periodicity of bull trout based on *Fish Population Distribution and Abundance* study (Stillwater Sciences 2005a). Water temperature data recorded on Smith River, above Smith Reservoir (Stillwater Sciences 2005b).

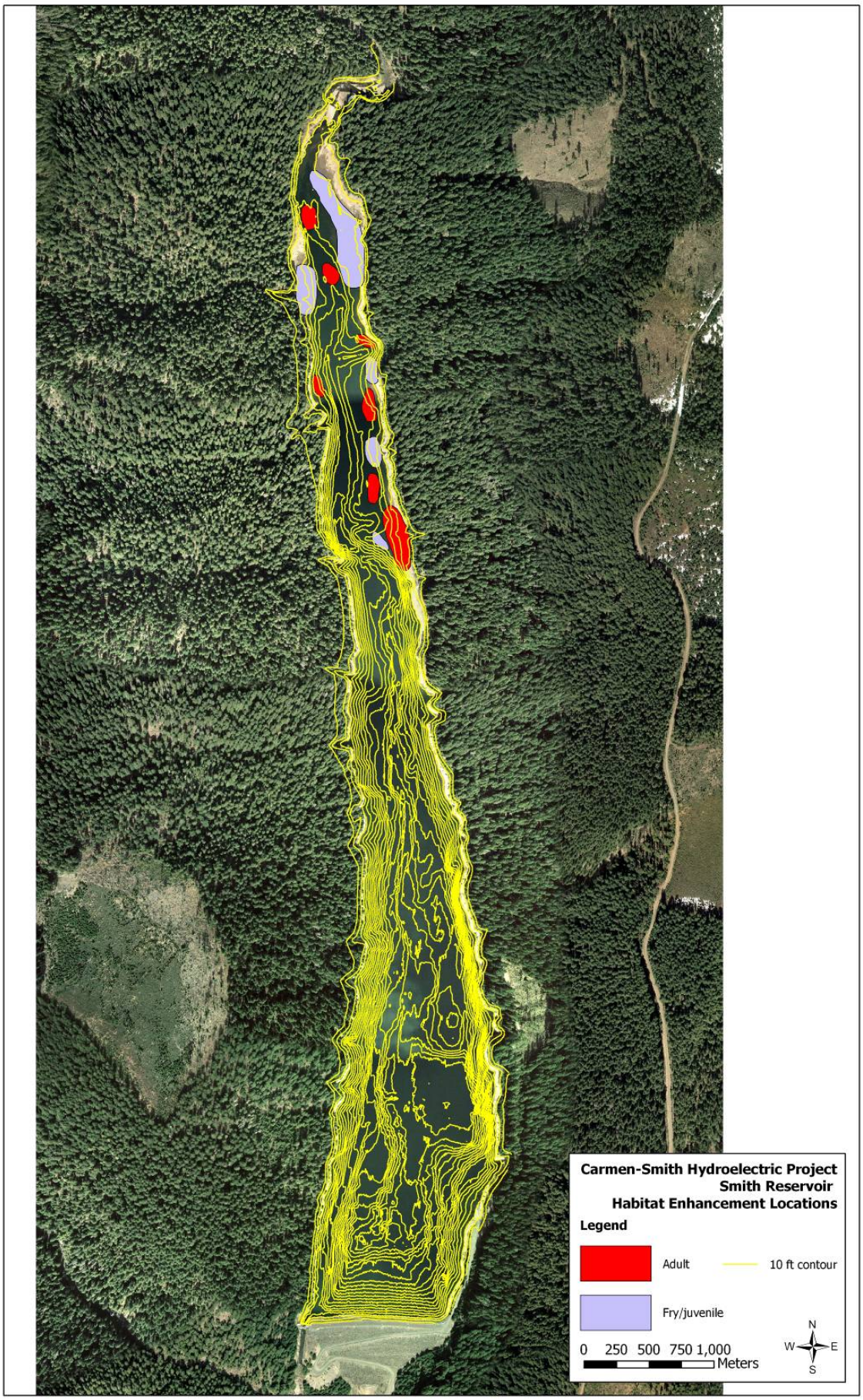

Figure 3. Potential engineered habitat structure sites in Smith Reservoir.

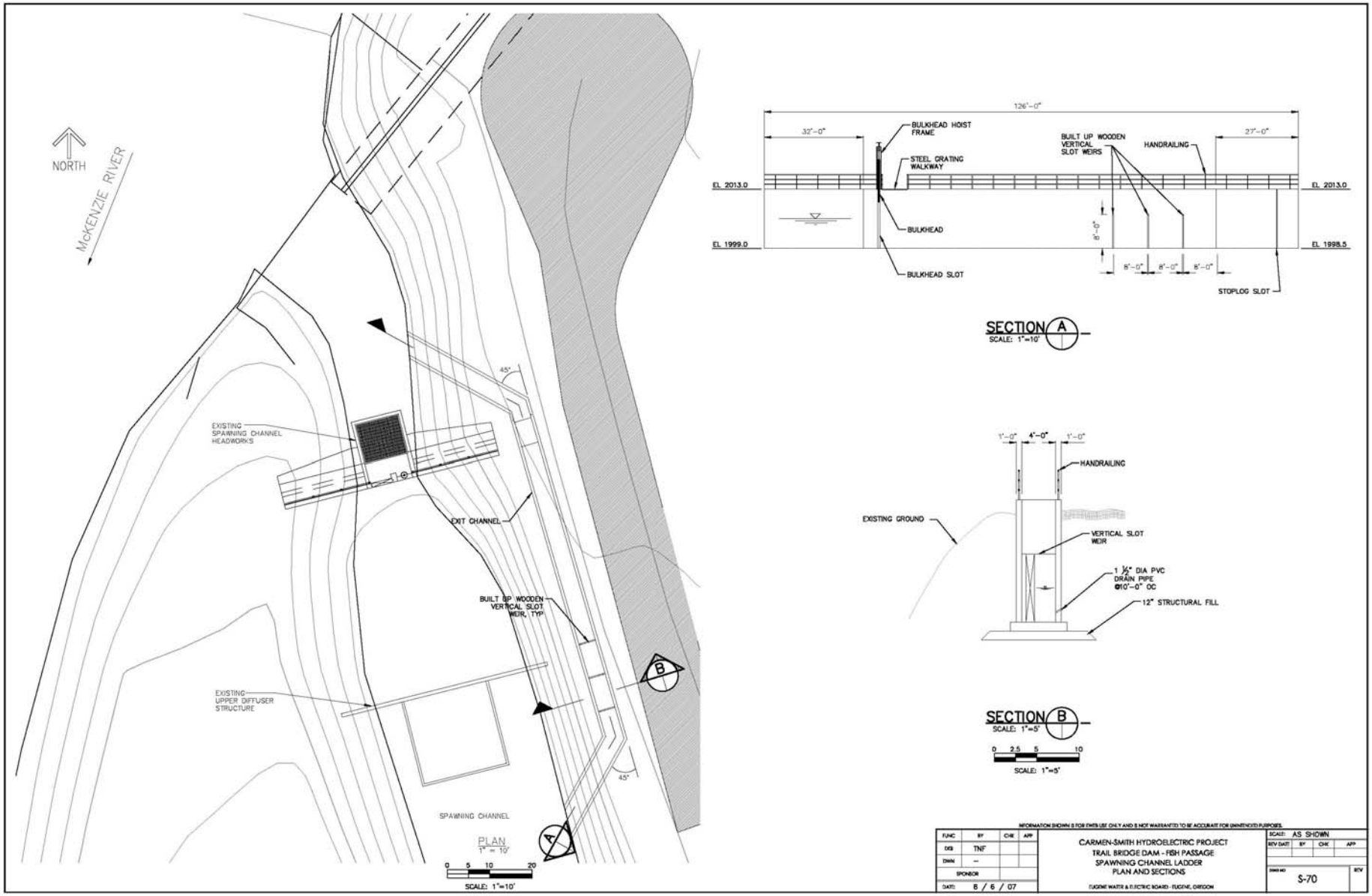

Figure 4. Construction design for the proposed Trail Bridge Dam Fish Ladder from the top of the Carmen-Smith Spawning Channel.

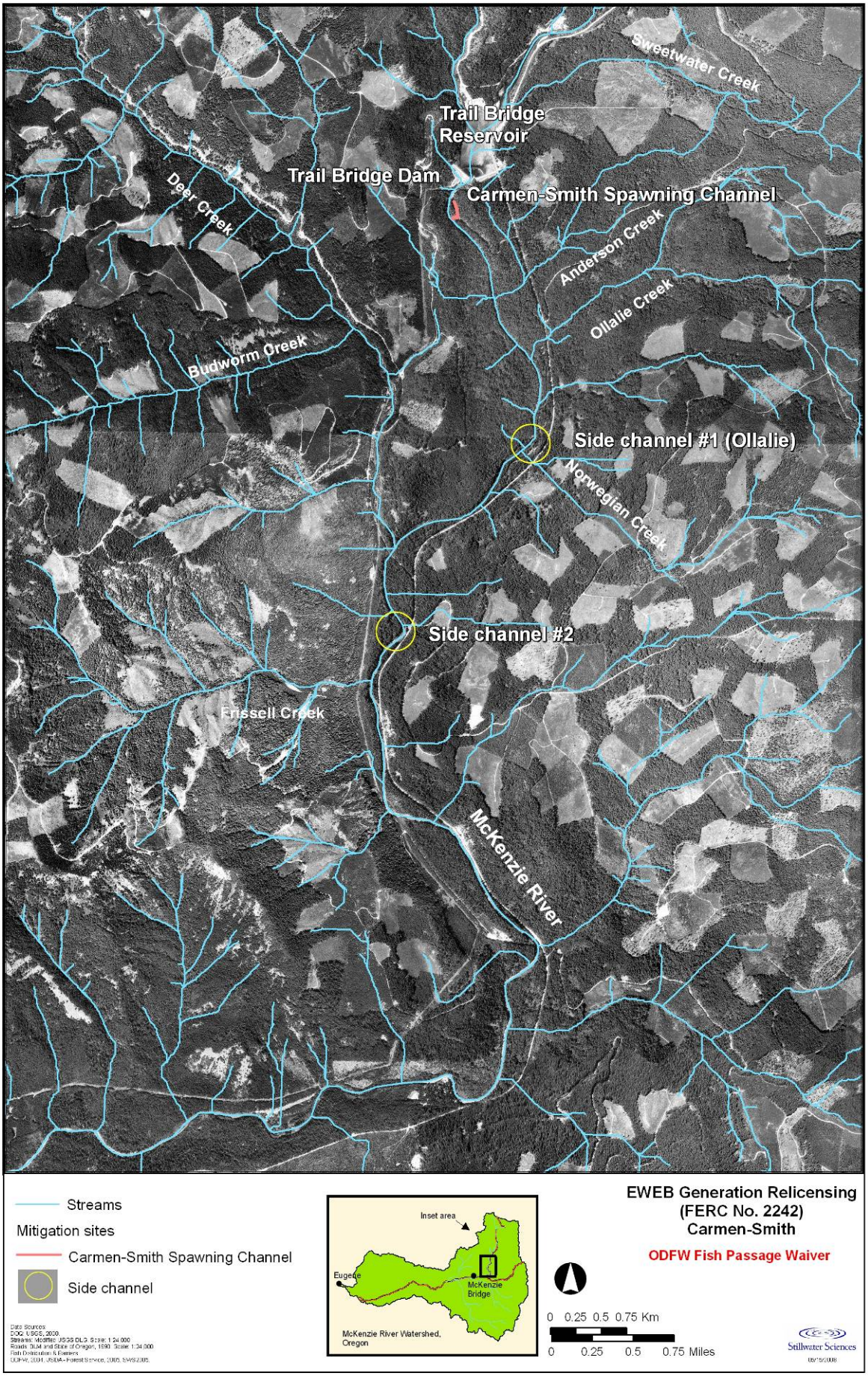

Figure 5. Carmen-Smith Spawning Channel and side channel mitigation sites downstream of Trail Bridge Dam.

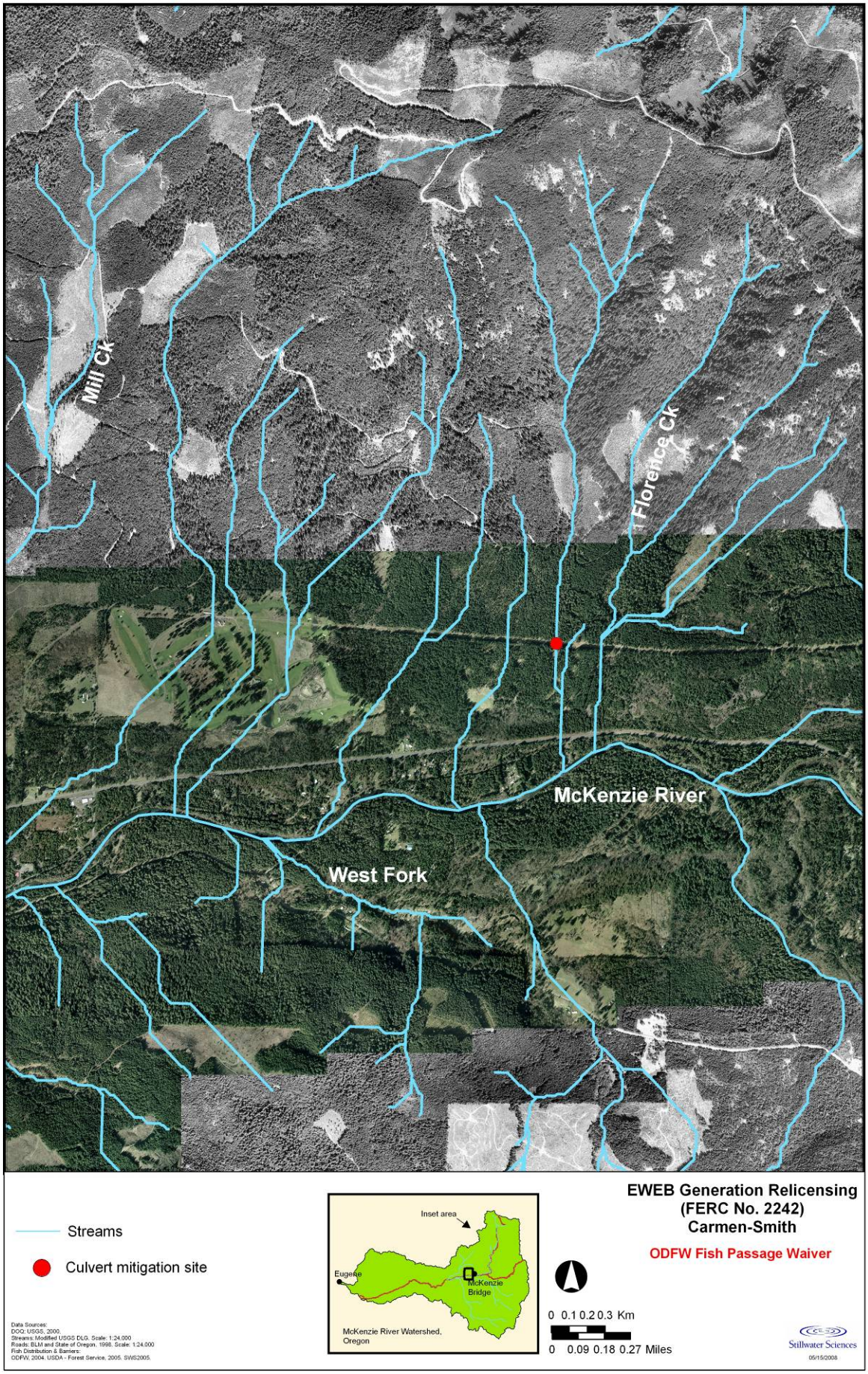

Figure 6. Culvert mitigation site downstream of Trail Bridge Dam.

Appendix A

Photo 1. Smith Dam and Spillway.

Photo 2. Smith Dam.

Photo 3. Smith Reservoir and Intake.

Photo 4. Trail Bridge Dam, Powerhouse, and spillway.

Photo 5. Trail Bridge Powerhouse and spillway, looking upstream.

Photo 6. LWD jam on the Smith River upstream of Smith Reservoir.

Photo 7. LWD jam on the Smith River upstream of Smith Reservoir.

Photo 8. Bedrock falls barrier in the Smith River upstream of Smith Reservoir.

Photo 9. Bedrock falls barrier in the Smith River upstream of Smith Reservoir.

Photo 10. Smith River upstream of Smith Reservoir.

Photo 11. Smith River upstream of Smith Reservoir.

Photo 12. Smith River upstream of Smith Reservoir.

Photo 13. Smith River upstream of Smith Reservoir.

Photo 14. Lower Carmen Bypass Reach.

Photo 15. Lower Carmen Bypass Reach.

Photo 16. Lower Carmen Bypass Reach.

Photo 17. Lower Carmen Bypass Reach.

Photo 17. Smith Reservoir.

Photo 18. Smith Reservoir.

Photo 19. Smith Reservoir.

Photo 20. Confluence of Smith River and Smith Reservoir.

Photo 21. Smith Bypass Reach.

Photo 22. Smith Bypass Reach.

Photo 23. Smith Bypass Reach.

Photo 24. Smith Bypass Reach.

Photo 25. Trail Bridge Dam and Reservoir.

Photo 26. Trail Bridge Reservoir.

Photo 27. Upstream portion of Trail Bridge Reservoir.

Photo 28. Trail Bridge Dam and downstream portion of Trail Bridge Reservoir.

Photo 29. Side channel #2 near confluence with the McKenzie River (Source: USDA Forest Service 2008).

Photo 30. Proposed excavation area for Side Channel #2 (Source: USDA Forest Service 2008).

Photo 31. Side channel #2 at source of flow (Source: USDA Forest Service 2008).

Photo 32. Carmen-Smith Spawning Channel entrance.

Photo 33. Carmen-Smith Spawning Channel entrance.

Photo 34. Trash rack at upstream end of the Carmen-Smith Spawning Channel.

Photo 35. Habitat directly upstream of the upstream end of the Carmen-Smith Spawning Channel.

Photo 36. Downstream end of culvert.

Photo 37. Upstream end of culvert.