

# UPPER NORTH FORK SMITH RIVER

**2006 LEVEL II STREAM SURVEY**

**Submitted to:**

Rogue River-Siskiyou National Forest  
Gold Beach Ranger District  
Gold Beach, Oregon

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### Information Block

Stream Name: North Fork Smith River

Tributary to: Smith River

Stream Order 5

Mouth Location: T41S, R11W, S14

Distance Surveyed: 12.61 miles

USGS Quadrangle: Biscuit Hill

Ranger District: Gold Beach

County, State: Curry, Oregon

NFS Watershed Code: 18,01,01,01,02

Surveyors: G. Bennett, S. Bowman

## **EXECUTIVE SUMMARY**

### **INTRODUCTION**

Upper North Fork Smith River, a south flowing fifth order stream, is located in the Siskiyou Mountains of eastern Curry County in southwestern Oregon. Upper North Fork Smith River and its tributaries flow from the southern portion of the Kalmiopsis Wilderness Area and its main tributary, Baldface Creek, flows through the South Kalmiopsis Inventoried Roadless Area. Upper North Fork Smith River drains a watershed area of approximately 40,000 acres (this includes the Baldface Creek watershed) of mountainous terrain before leaving Rogue River - Siskiyou National Forest at the Oregon-California border near the confluence with Cedar Creek (T41S, R11W, Section 14) approximately 2.4 river miles south of Sourdough Camp and approximately 10 miles north of Gasquet, California. Elevations within the watershed range from 1,080 feet at the survey start to 4,660 feet at the top of Chetco Peak. Annual precipitation within the watershed can exceed 95 inches with most of this moisture coming in the form of rain during the winter months. Temperate, moisture-laden storms from the Pacific Ocean often deliver rain in events that frequently bring North Fork Smith River to bankfull flow. The portion of the watershed located above 2,500 feet is considered to be within the transient snow zone, meaning this area can receive moisture either as rain or snow. The transient snow zone is susceptible to rain-on-snow events that can generate large stream flows.

The Upper North Fork Smith River watershed is located entirely on public land managed by the Gold Beach Ranger District of the Rogue River-Siskiyou National Forest. North Fork Smith River is designated as a Tier 1 key watershed and is currently managed outside of the Kalmiopsis Wilderness Area as a late successional reserve and riparian reserves as defined in the 1994 Northwest Forest Plan. Further, the designation of a Tier 1 key watershed means management priority will be given for the protection and propagation of at risk anadromous fish populations (ROD, USDA Forest Service, 1994).

Upper North Fork Smith River from Baldface Creek to Horse Creek marks the southwestern boundary of the Kalmiopsis Wilderness. At Horse Creek, North Fork Smith River veers east and fully enters the Kalmiopsis Wilderness Area. Road systems within the surveyed section of the watershed are largely concentrated in the western portion between Horse Creek and Hardtack Creek spurring off Forest Service road 1107. The eastern portion of the watershed, including Baldface Creek, drains a Wilderness Area and an inventoried roadless area. Past and present land uses within the watershed have included backcountry recreation, ecological research and monitoring, mining, logging and road building, homesteading, and livestock grazing. Sourdough Camp (mouth of Baldface Creek) appears to be a popular off-road vehicle recreation area as evidenced by a network of roads and eroding hillslopes from vehicle use. A historic large-scale hydraulic mining operation was located up Spokane Creek (tributary to Baldface Creek), and the largest chromite mine found in Curry County located at 'The Oaks' (T40S, R10W, Section 1) was operated during the wartimes of World War I, World War II, and Korean War for the production of strategic metals (Ramp and Peterson, 1977).

Beginning August 14, 2006 through August 18, 2006 and August 25 through August 26, 2006 approximately 12.61 miles of Upper North Fork Smith River were surveyed for type and quality of aquatic habitats, composition and quality of channel substrates, degree of stream bank erosion, amount and distribution of large woody material (LWM), and structure and quality of riparian habitat using a protocol described in the 2006 Forest Service Region 6 Stream Inventory Handbook. Additionally, we conducted fish surveys to assess species composition, abundance, and distribution. The survey of Upper North Fork Smith River began at the confluence with Cedar Creek (T41S, R11W, Section 14) and ended 12.61 miles upstream at the confluence with Tributary 23 (T39S, R11W, Section 35, SW). Five reaches were delineated based on changes in stream flow from tributary contributions or changes in dominant valley morphology, often these gross morphological changes led to changes in the dominant type of aquatic habitats. Right and left stream bank designations are of the perspective of looking upstream. All aquatic habitats were measured for length, width, and depth (or height in the case of waterfalls, dams, or chutes). **Table 1** summarizes information collected during the survey of Upper

North Fork Smith River. This table also serves as a comparison of data between the reaches. An explanation of codes used in this report is found in **Appendix A**. Survey maps showing the location of survey start and end points, reach breaks, tributaries, special case habitats, and photographic points are found in **Appendix B**. Photographs taken during the survey depicting representative habitats, unusual or permanent features, and reach start and end locations are found in **Appendix F**.

## **GEOLOGY / GEOMORPHOLOGY**

Upper North Fork Smith River is located in the geologically complex Klamath Mountains Physiographic Province. The bulk of the watershed draining Upper North Fork Smith River, excluding the Baldface Creek portion, has been mapped as late Jurassic sedimentary and volcanic rock consisting of graywacke, sandstone, mudstone, minor conglomerate, and chert of the Dothan and Otter Point Formations (Ramp 1977). The Baldface Creek portion is largely comprised of ultramafic rock consisting of serpentinite and various peridotites including harzburgite (saxonite), dunite, and pyroxentite (Ramp and Peterson, 1977).

The Upper North Fork Smith watershed contains moderately sloped to steeply sloped mountainous terrain, moderately entrenched V-shaped colluvial canyons, and slightly entrenched flat-floored alluviated canyons. In general, Upper North Fork Smith River flows through colluvial and alluviated canyons with some sections incised within bedrock outcrops. Overall stream gradient is mild, the channel is wide, and the aquatic habitats are large. Elevated terraces and floodplains were uncommon in all but Reach 1. Long and well-developed side channels were uncommon throughout the survey. Valley bottom width estimates ranged from greater than 300 feet in Reach 1 to 80 feet in Reach 5.

**Table 1. Summary of North Fork Smith River Attributes. 2006 Stream Survey.**

Reach	1	2	3	4	5
Stream Order	6	5	4	4	3
Rosgen Channel Type	B3c	B3c	B4	B4	A3
Valley Segment Type	Alluviated Valley	Colluvial Canyon	Colluvial Canyon	Alluviated Valley	Colluvial Canyon
Valley Form	Narrow Flat-floored	Moderate V-shaped	Moderate V-shaped	Moderate V-shaped	Moderate V-shaped
Valley Width Estimate (ft)	300	100	85	150	80
Measured Length (miles)	2.42	2.24	3.80	3.36	0.78
Mapped Gradient (%)	1	1	2	2	9
Measured Sinuosity	1.06	1.04	1.13	1.18	1.06
Entrenchment Ratio	2.10	1.24	1.48	1.64	1.00
Bankfull Width:Depth	24.93	29.43	28.65	36.61	27.86
Ave. Bankfull Width (ft)	66	54	39	33	26
Ave. Bankfull Depth (ft)	2.9	1.9	1.4	1	0.9
Ave. Floodprone Width (ft)	130	66	57	53	26
Ave. Floodprone Depth (ft)	8.2	6.4	4.6	3.4	3.8
Ave. FW Width (ft)	53	39	25	19	12
Ave. FW Depth (ft)	1.3	1	0.8	0.5	0.5
% SW Habitat in FW	67	58	57	50	37
SW <sub>(area)</sub> :FW <sub>(area)</sub>	1.21	1.25	0.70	0.52	0.12
SW Units / Mile	9.5	15.2	21.6	23.5	16.7
Ave. Residual SW Depth (ft)	6.2	5	3.2	2.4	2.4
% SW Units	55	55	41	34	11
Bank Instability (% reach length)	3.2	0	1.3	1.4	0.9
# Special Case Units	0	0	0	0	0
Dominant / Subdominant Substrate	Boulder / Cobble	Cobble / Boulder	Grav.-Cobb./ Boulder	Grav.-Cobb./ Boulder	Grav.-Cobb./ Boulder
D <sub>50</sub> - 1 (mm)	103	194	73	76	63
D <sub>84</sub> - 1 (mm)	353	728	239	191	197
D <sub>50</sub> - 2 (mm)	166	51	100	62	170
D <sub>84</sub> - 2 (mm)	437	272	367	201	743
Dominant / Subdominant Riparian Veg. Class	Small tree / Shrub-seedl.	Small tree / Large tree	Large tree / Small tree	Large tree / Small tree	Large tree / Sapling-pole
Overstory / Understory Riparian Species	CD,CT,CK,HL / HA,HT,HM,HB	CD,CT,HT,HO / HA,HW,HB,HL	CD,CD,HT,HL / HA,HB,HV,HW	CD,CT,HT,HY / HA,HB,HV,SS	CD,CT,HT / HB,HV,HY,HT
SWD / Mile	4.1	2.2	23.9	16.1	53.8
MWD / Mile	0	0.5	7.9	3.6	6.4
LWD / Mile	0	0.5	2.1	4.8	2.6
Hi/Lo H <sub>2</sub> O Temp. (°C)	19 / 21	19 / 16	17 / 13	17 / 14	15 / 15
Dominant Cover Type for Fish	Depth, Subst., Hab. Size	Depth, Subst., Hab. Size	Depth, LWM, Hab. Size	Substrate, LWM, Veg.	Substrate, LWM
Fish Species Observed	ONMY, ONCL	ONMY, ONCL, ONTS	ONMY, ONCL, ONTS	ONMY, ONCL, ONKI, ONTS	ONMY
Salmonid Density (fish/yd <sup>2</sup> )	0.120	0.095	0.091	0.104	0.058

## **RIPARIAN**

The riparian habitat, as defined by the 2006 Forest Service Region 6 Stream Inventory Handbook, consists of an area extending 100 linear feet out from each stream bank. This survey divided the riparian habitat into an inner zone (25 feet) and an outer zone (75 feet). We reported the average vegetative condition regarding dominant species and size class in the overstory and understory at each measured unit to help characterize the riparian forest. We also noted the general condition of riparian habitat throughout each reach with qualitative observations regarding effects of landslides, fire, and underlying geology. The reach summaries contain descriptions of the riparian condition for that reach. Generally, the riparian forest consisted of a relatively homogenous mature mixed conifer forest that provided shade, LWM, stream bank stabilization, and habitat complexity to North Fork Smith River. The relative homogeneity of the forest structure and composition (with the exception of lower Reach 1) was directly related to the consistent underlying metasedimentary geology. Tree species commonly encountered included Douglas-fir, Port-Orford-cedar, Pacific yew, Bigleaf maple, red alder, vine maple, canyon live oak, tanoak, Oregon myrtle, willow, and madrone. The riparian and canyon vegetation located in lower Reach 1 was typical of vegetation found growing on ultramafic soils of serpentinite or peridotite parent rock. Vegetation in this area lacked the large hardwoods such as bigleaf maples and alders and instead consisted of stunted and sparsely growing conifers, including pines such as lodgepole, knobcone, and western white pine and hardwoods such as white oaks and madrone. Understory vegetation consisted of shrubs common to serpentine soils such as coffeeberry, manzanita, azalea, and willow near the water's edge.

The riparian vegetation, with exception, was largely unmanaged so as to be free of roads and past timber harvesting activity. The exceptions to this generalization include the degradation of riparian vegetation on the long elevated terrace at Sourdough Camp by campers and off-road vehicle users, past timber harvest units located on the upland slopes adjacent to and sometimes entering the riparian zone in Reach 3 and Reach 4, and the felling of large conifers on the Wilderness side of the river (right bank or east side) from fire suppression activities during the Chrome Creek fire in 1987. Riparian provided

shade and the recruitment and retention potential of LWM increased as we surveyed upstream due to the decreasing channel size.

The 2002 Biscuit Fire had a minor impact on the riparian vegetation in the upper reaches of the North Fork and was largely confined to a cool understory burn. The fire had a greater impact on the vegetation downstream of the survey start point (below Major Moore's ) and on the upland slopes and along the ridges of the upper watershed.

## **AQUATIC**

The aquatic habitats of Upper North Fork Smith River ranged from very large and deep mid channel scour pools (photos 1, 4, 7) and long cobble dominated, deep channeled rapids (photos 2, 15) located in the lower reaches, to small scour pools (photos 68, 81), shallow, gravel dominated riffles (photo 6) and long cobble dominated rapids (photo 65) located in the upper reaches. Sections of bedrock were encountered in all reaches creating aquatic habitats that were atypical for that reach such as bedrock controlled scour pools and trench pools (photos 11, 45) and deep channeled bedrock controlled non-turbulent riffles (photo 20). Generally, the aquatic habitats were diverse and complex and anadromous fish spawning and rearing habitat was abundant and extended deep into the watershed. Side channel habitat was uncommon, located only in Reach 4 and Reach 5, and well-developed floodplains and elevated terraces were also uncommon and found only in Reach 1. Boulder and bedrock substrate, scattered LWM, habitat depth, and the occasional debris jam provided habitat complexity and cover for fish. Channel sinuosity was low and channel entrenchment was variable but on average considered moderate.

Upper North Fork Smith River lacks large woody material in the lower reaches most likely as a result of a large wide channel capable of transporting LWM out of the system during periods of high stream flow. We speculate that as the channel diminishes in size in the upper reaches, LWM tends to reside longer within the system due to decreased transport capabilities of a smaller stream. The upper reaches contained considerably more instream LWM than was found in lower in the system. A total of 277 pieces of LWM (combined size classes) were counted for an average of 22 pieces/mile. LWM was

found mostly in the upper reaches (3-5) as scattered individual pieces and LWM tied up in debris jams (photos 40, 55, 59). Further, the upper reaches held a number of downed trees that spanned the channel but did not engage the bankfull plane and were not counted as LWM but do represent future LWM.

## **FISHERIES**

Biological surveys of Upper North Fork Smith River were conducted with a mask and snorkel and found mostly young-of-the-year (YOY) and first year winter steelhead and rainbow trout. Common also were YOY Chinook salmon and adult cutthroat trout. Conversely, coho salmon (YOY) were found only in Reach 4. Anadromy extended into Reach 5 but ends midway through the reach as an increasing and sustained gradient, large substrate, small channel, and lack of suitable spawning habitat discourages anadromous fish from pushing deeper into the watershed. Resident rainbow and cutthroat trout distribution extend past the survey endpoint. Fish densities were moderate but probably higher than reported, as it is extremely difficult to count all fish in such large and complex habitats. In fact the size and complexity of aquatic habitats located in Reach 1 required the use of two snorkel surveyors swimming lanes within the habitat to adequately cover the entire area. We reported no anadromous barriers and the low gradient, small substrate, and intact riparian forest of Upper North Fork Smith River provides excellent spawning, rearing, and thermal refuge for steelhead, Chinook, and coho salmon.

## REACH SUMMARIES

### REACH 1

Reach 1 began at a very long lateral scour pool located immediately upstream of the confluence of Cedar Creek with North Fork Smith River (T41S, R11W, Section 14) and ended 2.42 miles upstream at the confluence with Baldface Creek (T41S, R11W, Section 11). The reach was ended at this location due to the large flow contribution of Baldface Creek and the corresponding change in canyon morphology and type of aquatic habitats.

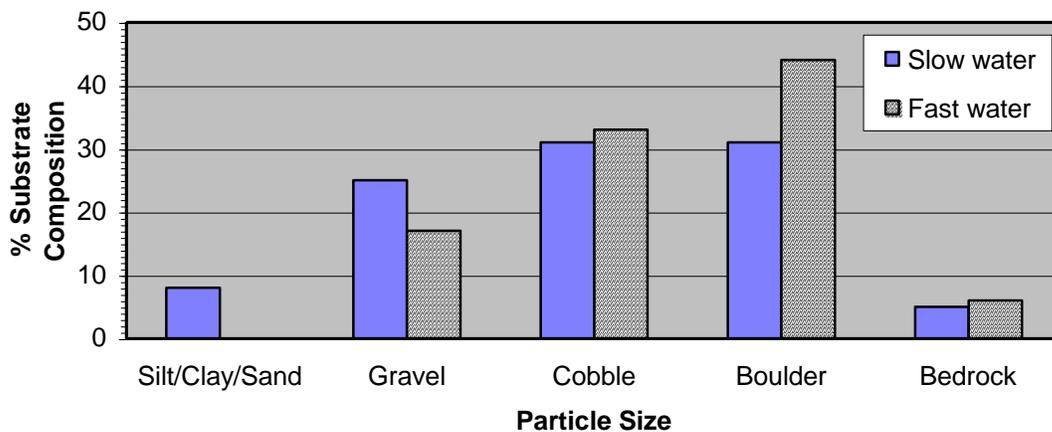
### GEOMORPHOLOGY / HYDROLOGY

Reach 1 flows through a wide, moderately sloped, flat-floored alluviated canyon (photo 3) trending toward a narrow steeply sloped colluvial canyon (photo 8) that widens and relaxes again at Sourdough Camp (photo 13) before narrowing into Reach 2 (photo 20). Floodplains, elevated terraces, large cobble bars, and section of bedrock outcrop describe some of the morphological features found in Reach 1. Sedimentary and volcanic rock of the Dothan-Otter Point formation is the dominant geology throughout most of the reach but ultramafic rock does occupy portions of lower Reach 1 (photos 1, 2). Average canyon width was estimated to be 300 feet but widths were variable and ranged between 100 feet and over 500 feet. Stream gradient was mild with the average gradient calculated to be 1%. Measured sinuosity was low at 1.06 (measured sinuosity used the ratio between field measured reach distance and map wheel-measured valley length). Stream bank erosion and canyon instabilities were found in 3 habitat units as moderately large landslides (photos 2, 6) that engaged 413 feet of stream bank (3.23% of total reach length) and approximately 64,480 ft<sup>2</sup> of canyon side slope area. A discharge measurement of 38.6 ft<sup>3</sup>/sec was collected on August 14, 2006 at pool tail of the large pool found upstream of the Wimer road bridge crossing North Fork Smith River at Major Moore's using a calibrated and spin-tested pygmy velocity meter.

Channel substrate composition estimates were made at every pool and riffle in order to describe the streambed for each habitat type. These estimates were then averaged for the reach. The results depict a boulder and cobble and dominated channel for both slow water and fast water habitats (**Figure 1**). Gravel was sub-dominant and was found in

large patches in pool tails and along the margin of fast water habitat. Both bedrock and sand occurred in small amounts and each substrate class accounted for less than 10% of the total substrate make up. Two cross section measurements were conducted in Reach 1. These results were averaged to describe a slightly entrenched channel with an entrenchment ratio of 2.10 and a moderately large bankfull width-to-depth ratio of 24.93. Two Wolman pebble counts were averaged to give a median channel substrate size ( $D_{50}$ ) of 134 mm (Wolman pebble count graphs are found in **Appendix D**). Based on an average of cross section data, Wolman pebble counts, substrate estimates, measured stream gradients, and qualitative interpretation, Reach 1 was classified as a B3c stream type (Rosgen 1996).

**Figure 1. Average Substrate Composition  
Upper North Fork Smith River Reach 1**



## **RIPARIAN**

The riparian vegetation of Reach 1 appears to be intact and properly functioning with little evidence of past large scale management activities such as roads and clearcut logging practices. The richer soils derived from sedimentary and volcanic rock foster a densely stocked and diverse riparian forest of Douglas-fir, Port-Orford-cedar, red alder, tanoak, canyon live oak, madrone, bigleaf maple, and willow (photo 8). Riparian vegetation provided shade to the stream only in a few areas of Reach 1, notably where the channel and canyon widths narrowed (photos 8, 11). Otherwise, the large and wide channel of Reach 1 did not provide any appreciable shade to Upper North Fork Smith River (photos 2, 15). For the same reasons, large woody material recruitment and

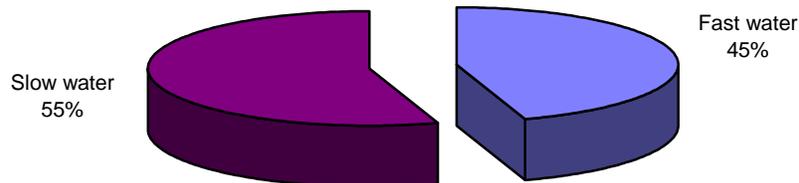
retention potential are low for Reach 1. Many of the riparian size class determinations made at measured units fell into the small tree category while in some areas the riparian forest could be characterized as mature. The small tree make up of the riparian forest in some areas could have been the result of either past logging or fire events.

## AQUATIC

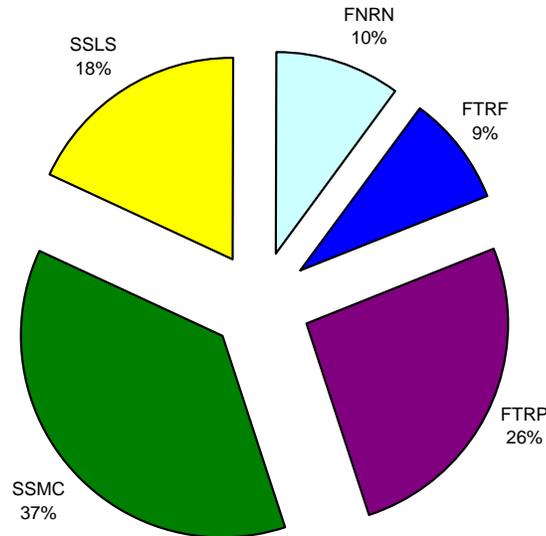
The aquatic habitats of Reach 1 were comprised mostly of cobble and boulder dominated rapids and mid channel scour pools. Aquatic habitats were deep channeled and complex (i.e. were large in area, contained abundant pocket pools, boulder cover, and edge water). Fast water habitat comprised 45% of the total habitat area (**Figure 2**) and consisted of rapids (26% of fast water area), non-turbulent riffles (10% of fast water area), and riffles (9% of fast water area). Slow water habitat comprised 55% of the total habitat area and consisted of large mid channel scour pools (37% of slow water area) and lateral scour pools (18% of slow water area). No side channel habitat was identified in Reach 1.

**Figure 3** provides a specific breakdown of the aquatic habitat composition in Reach 1 of Upper North Fork Smith River. An explanation of codes used in this figure can be found in **Appendix A**.

**Figure 2. Habitat Composition  
Upper North Fork Smith River Reach 1**



**Figure 3. Upper North Fork Smith River Channel Unit Composition Reach 1**



Twenty-three pools were identified in Reach 1 for a pool frequency of 9.5 pools/mile. Seven pools exceeded 6 feet in depth and 20 pools exceeded 3 feet in depth for a deep pool frequency of 8.3 pools/mile. All 23 pools were greater than 2 feet deep. Average residual pool depth was 6.2 feet and the deepest pool was 16 feet. Total pool area in Reach 1 was approximately 387,095 ft<sup>2</sup>. Pools in Reach 1 were large and deep and in many instances contained suitable spawning habitat in the pool tails. We observed 27 redds in Reach 1 (some large and quite possible redds of Chinook salmon). Eighteen fast water units were identified in Reach 1. Average fast water depth was 1.3 feet and average fast water width was 53 feet. Average bankfull depth was 2.9 feet and average bankfull width was 66 feet (n=2). An estimated 67% of fast water habitat was comprised of pocket pools as determined by ocular estimates of pool-like habitat contained in each fast water unit. Pocket pools include side pools, eddy pools, backwater areas, or any area of calm water within a fast water habitat. Pocket pool percentage calculations were weighted for habitat area.

Reach 1 was deficient in LWM in all size classes. A total of 10 pieces of LWM were counted for a reach density of 4.1 pieces/mile. All LWM counted in Reach 1 was of the small size class. **Figure 4** compares the densities of LWM between the five reaches. We conclude that natural recruitment and retention of LWM is low in Reach 1 based on a wide channel that appears capable of carrying LWM out of the system during flushing winter flows.

**Figure 4. Large Woody Material  
Upper North Fork Smith River**



## FISHERIES

Fish identification and enumeration were obtained from snorkel surveys. Sampling frequency, based on a random start, was every fifth slow water unit and every tenth fast water unit. Five slow water units and two fast water units were snorkeled in Reach 1 for a sampled area of 58,777 ft<sup>2</sup>, and 30,788 ft<sup>2</sup>, respectively. We identified winter steelhead, cutthroat trout (possibly sea-run cutthroat trout), and resident rainbow trout. We mostly observed fish in the 0+ (young-of-the-year) and 1+ (yearlings) age/size class. The fish we identified as potential sea-run cutthroat were all large adult fish that were densely spotted. In the snorkeled slow water habitats we counted 613 young-of-the-year (0+) and 196 yearlings or older ( $\geq 1+$ ) rainbow/steelhead. We also counted 16 yearlings or older ( $\geq 1+$ ) cutthroat trout (including 3 adults – possibly anadromous) for a combined density of 0.126 fish/yd<sup>2</sup>. In the snorkeled fast water habitats we counted 256 YOY and 103

yearlings or older ( $\geq 1+$ ) rainbow/steelhead and 6 ( $\geq 1+$ ) cutthroat trout for a combined density of 0.107 fish/yard<sup>2</sup>. Combined salmonid density for Reach 1 was 0.120 fish/yard<sup>2</sup>.

**Table 2** summarizes the results of the snorkel survey data for species, habitat type, and age class. **Appendix C** contains habitat dimensions and fish counts in a calculation table used to derive fish densities. Stream temperatures were taken at every measured unit in Reach 1 and ranged from 19°C to 21°C.

**Table 2. Summary of Fish Species, Age Class, and Density by Habitat Type  
Upper North Fork Smith River 2006 Stream Survey Snorkel Results**

Reach #	Habitat Type	% Area Sampled	Species Code	Tally by Age			Total Salmonids			Salmonid Density (fish/yard <sup>2</sup> )									
				0+	1+	$\geq 2+$	SW	FW	Sum	SW	FW	ONMY	ONCL	ONKI	ONTS	0+	$\geq 1+$	Total	
1	SW	15.2	ONMY	613	173	23													
			ONCL	0	3	13													
	FW	9.6	ONMY	256	89	14													
			ONCL	0	0	6													
Salmonid Age Class Totals				869	265	56	825	365	1190	0.126	0.107	0.117	0.002	0	0	0.087	0.032	0.120	
2	SW	14.4	ONMY	256	85	26													
			ONCL	0	5	4													
			ONTS	17	0	0													
	FW	7.8	ONMY	128	45	8													
			ONCL	0	1	2													
			ONTS	0	0	0													
Salmonid Age Class Totals				401	136	40	393	184	577	0.093	0.101	0.090	0.002	0	0.003	0.066	0.029	0.095	
3	SW	17.3	ONMY	297	52	6													
			ONCL	0	1	3													
			ONTS	24	0	0													
	FW	6.7	ONMY	168	39	4													
			ONCL	0	3	1													
			ONTS	2	0	0													
Salmonid Age Class Totals				491	95	14	383	217	600	0.091	0.093	0.086	0.001	0	0.004	0.075	0.017	0.091	
4	SW	20.8	ONMY	208	41	1													
			ONCL	0	14	6													
			ONKI	74	0	0													
	FW	9.8	ONMY	184	18	0													
			ONCL	0	3	0													
			ONTS	1	0	0													
Salmonid Age Class Totals				467	76	7	344	206	550	0.124	0.082	0.085	0.004	0.014	0.0002	0.088	0.016	0.104	
5	SW	20.3	ONMY	17	5	0													
	FW	20.5	ONMY	39	3	0													
Salmonid Age Class Totals				56	8	0	22	42	64	0.183	0.043	0.058	0	0	0	0.051	0.007	0.058	
Age conversion to size:				(0+) = up to 76mm			(1+) = 76mm to 152mm			(≥2+ = >152mm)									

## **REACH 2**

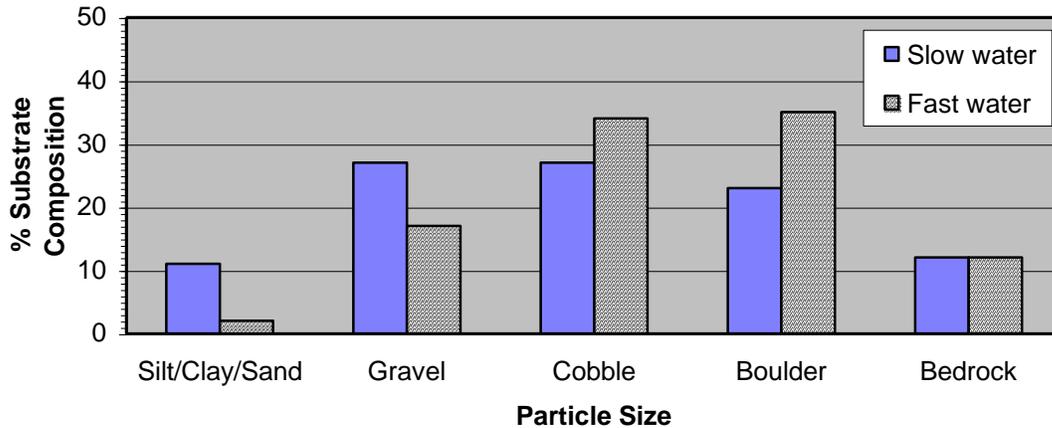
Reach 2 began at the confluence with Baldface Creek (Tributary 5) and ended 2.24 miles upstream at the confluence with Chrome Creek (Tributary 9). Reach 2 was ended due to the large flow contribution of Chrome Creek and associated changes in canyon morphology.

### **GEOMORPHOLOGY / HYDROLOGY**

Reach 2 flows through a moderately narrow, V-shaped colluvial canyon. Canyon side slopes are moderately steep and stable and Reach 2 contains substantial amounts of bedrock outcrops. Elevated terraces, floodplains, and side channels were uncharacteristic of the canyon morphology found in Reach 2. Stream gradient was mild (1%) and estimated valley width ranged between 80 feet and 120 feet (average 100 feet). Measured sinuosity was calculated using the ratio between measured reach length and map wheel-measured valley length and was low (1.04) indicating a lack of meander. Channel substrate composition estimates depict boulder dominated fast water and gravel dominated slow water habitats (**Figure 5**). Cobble was subdominant and bedrock was found in appreciable amounts in both fast water (12%) and slow water (12%). Sand/silt was present in appreciable amounts (111%) in slow water habitat. Spawning habitat was moderately abundant and several redds were observed throughout Reach 2.

Three cross section measurements were conducted in Reach 2 and the results were averaged to describe an entrenched channel (entrenchment ratio of 1.24) with a moderate bankfull width-to-depth ratio of 29.43. No areas of bank instability were observed. The average median particle size ( $D_{50}$ ) using two Wolman pebble counts was 122 mm (Wolman pebble count graphs are found in **Appendix D**). Based on quantitative data and qualitative interpretation, Rosgen stream type B3c best describes Reach 2 of Upper North Fork Smith River.

**Figure 5. Average Substrate Composition  
Upper North Fork Smith River Reach 2**



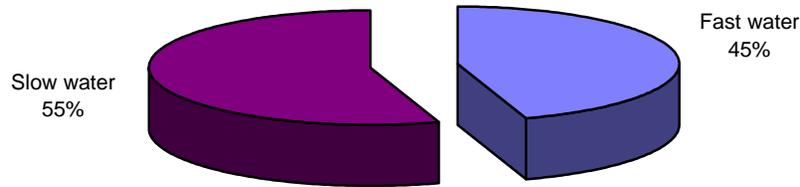
## **RIPARIAN**

The riparian vegetation of Reach 2 was intact and did not appear to have been subjected to management practices such as logging, road building, or large-scale mining. Mature conifers reside within the riparian zone however many size class determinations were of the small tree category. Shade to the stream from the riparian forest was more consistent in Reach 2 due to a narrower channel without a floodplain or elevated terraces and LWM recruitment and retention were also better than Reach 1 but still considered only fair. Species composition of overstory and understory vegetation was diverse but consisted of species commonly found in this region such as Douglas-fir, Port-Orford-cedar, red alder, bigleaf maple, vine maple, canyon live oak, tanoak, willow, white oak, Pacific yew, and Oregon myrtle. The riparian vegetation of Reach 2 was not affected by the 2002 Biscuit Fire.

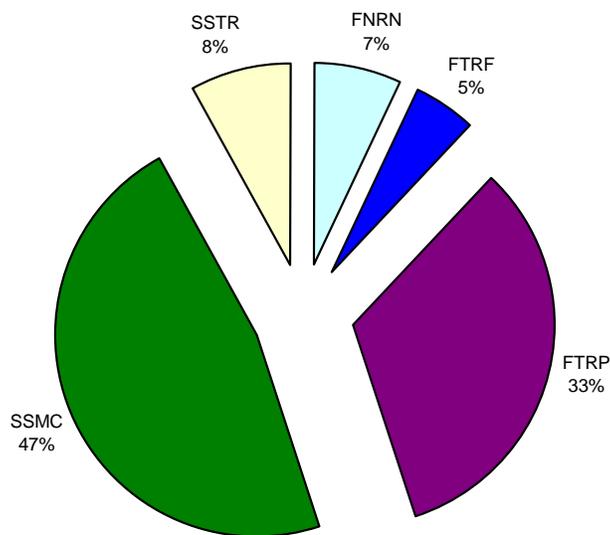
## **AQUATIC**

The aquatic habitats of Reach 2 consisted of large mid channel scour pools and long cobble-dominated rapids. No side channel habitat was found in Reach 2. Fast water habitat comprised 45% of the total habitat area and slow water habitat comprised 55% of the total habitat area (**Figure 6**). Specifically, fast water habitat consisted of 33% rapids, 7% non-turbulent riffles, and 5% low gradient riffles (glides). Slow water habitat consisted of 47% mid channel scour pools and , 8% bedrock trench pools (**Figure 7**).

**Figure 6. Habitat Composition  
Upper North Fork Smith River Reach 2**



**Figure 7. Upper North Fork Smith River Channel Unit Composition Reach 2**



Thirty-four pools were identified in Reach 2 for a pool frequency of 15.2 pools/mile. Seven pools exceeded 6 feet in depth and 22 pools exceeded 3 feet in depth for a deep pool frequency of 9.8 pools/mile. Average residual pool depth in Reach 2 was 5.0 feet and the deepest pool was 15.7 feet. Reach 2 contained 264,518 ft<sup>2</sup> of pool area. The slow water habitats of Reach 2 were large, frequently encountered, relatively deep, and many contained suitable spawning habitat in the pool tails. Twelve redds were observed

in Reach 2. Thirty fast water units were identified in Reach 2. Average riffle width was 39 feet and average riffle depth was 1.0 foot. Fast water habitat contained an estimated 58% pocket pool habitat. Fast water habitat was generally long, deep channeled, and cobble and boulder dominated. Spawning habitat was found along the habitat margins and in eddy deposits. Substrate, depth, and turbulence provided cover for fish in fast water habitats.

Reach 2 lacked instream LWM mostly likely as a result of a large channel combined with winter flows that appear capable of transporting large wood out of the system.

Recruitment potential from the riparian habitat is good but retention potential appears poor. Only 7 pieces of LWM were counted for a density 3.1 pieces/mile. Specifically, we counted 5 pieces of small LWM for a density of 2.2 pieces/mile, 1 piece of medium LWM for a density of 0.5 pieces/mile, and 1 piece of large LWM for a density of 0.5 pieces/mile.

## **FISHERIES**

Fish densities calculated for Reach 2 were similar to the fish densities calculated in Reach 1. Further, we first encountered Chinook salmon in our snorkel survey in Reach 2.

These YOY fish were found in one pool. one pool in Reach 2. lower than the fish densities reported for Reach 1, further we did not see any Chinook salmon or large adult (sea run) cutthroat trout. Our mask and snorkel survey tallied mostly young-of-the-year and yearling rainbow trout/steelhead. Slow water habitat contained more fish than fast water habitat but this result may be skewed by the fact that fish contained within the confines of a defined pool are much easier and more accurately counted than fish scattered in a large and complex rapid. Six slow water units and four fast water units were snorkeled in Reach 2 sampling an area of 38,175 ft<sup>2</sup> and 16,468 ft<sup>2</sup>. In the six slow water habitats 256 YOY, and 111 first year or older rainbow trout/steelhead, 9 first year or older cutthroat trout, and 17 YOY Chinook salmon were counted for a combined density of 0.093 fish/yd<sup>2</sup>. In the four fast water habitats 128 YOY and 53 first year or older rainbow trout/steelhead, and 3 first year or older cutthroat trout were counted for a combined density of 0.101 fish/yd<sup>2</sup>. Combined fish density for Reach 2 was 0.095

fish/yard<sup>2</sup> (**Table 2**). Other aquatic species (or aquatic obligate species) observed include yellow-legged frogs, aquatic garter snakes, dippers, kingfishers, crayfish, and evidence of river otter. Stream temperatures taken at every measured unit in Reach 2 ranged from 16°C to 18°C. **Appendix C** contains habitat dimensions and fish counts in a calculation table used to derive fish densities.

### **REACH 3**

Reach 3 began at the confluence of Chrome Creek and ended 3.80 miles upstream at the confluence of Tributary 15. Reach 3 was ended at this location not because of flow contribution of Tributary 15 but rather because of a marked change in canyon morphology from a relatively narrow, moderately entrenched colluvial canyon into a flat floored, slightly entrenched alluviated canyon of Reach 4.

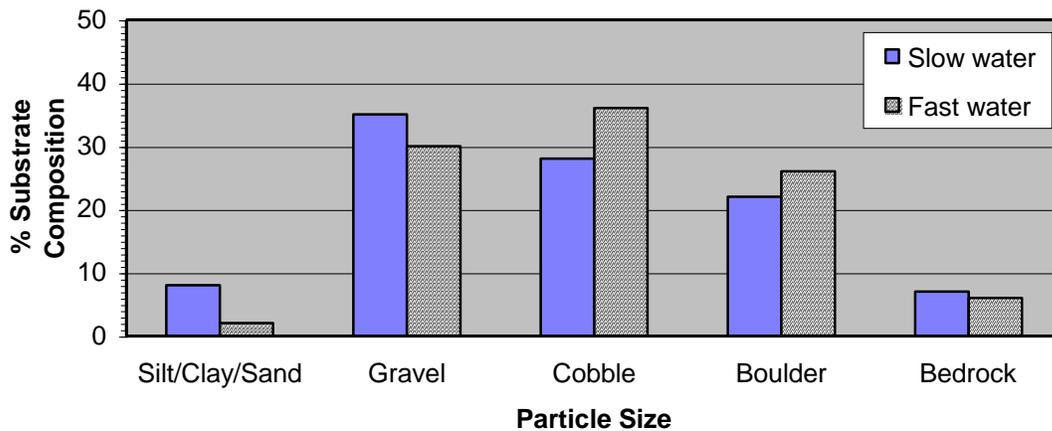
### **GEOMORPHOLOGY / HYDROLOGY**

Reach 3 flows through a moderately narrow colluvial canyon containing sections of entrenched channel within bedrock outcrop (photos 45, 46). In most areas, Reach 3 flows through a moderately sloped colluvial canyon with a mild stream gradient characterized by long riffles, rapids, non-turbulent riffles, and straight scour pools. Metasedimentary and volcanic geology was dominant throughout Reach 3. Average canyon width was estimated to be 85 feet but ranged between 70 feet and 100 feet. Stream gradient was mild with an average gradient calculated to be 2%. Measured sinuosity was low at 1.13. Stream bank erosion and canyon instabilities were noted as minor cut banks and small inner canyon landslides. Five habitat units contained bank instabilities for a total length of 263 feet (1.31% of reach length) and a combined area of 6,581 ft<sup>2</sup>.

Channel substrate composition estimates depict Reach 3 to be a cobble and gravel dominated reach with substantial amount of boulder substrate (26% for fast water and 22% for slow water). Bedrock substrate and sand/silt substrate was present in Reach 3 but found in amounts less than 10% for fast and slow water (**Figure 8**). Eight cross section measurements were conducted in Reach 3. These results were averaged to describe a moderately entrenched channel with an entrenchment ratio of 1.48 and a

moderate bankfull width-to-depth ratio of 28.65. The median particle size ( $D_{50}$ ) averaged from two Wolman pebble counts was 86 mm (Wolman pebble count graphs are found in **Appendix D**). Based on an average of cross section data, Wolman pebble counts, substrate estimates, measured stream gradients, and qualitative interpretation, Reach 3 was classified as a B3 stream type (Rosgen 1996).

**Figure 8. Average Substrate Composition  
Upper North Fork Smith River Reach 3**



## **RIPARIAN**

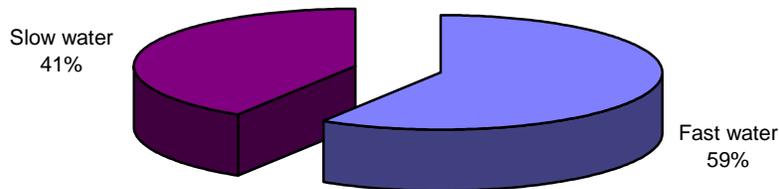
The riparian vegetation of Reach 3 was similar to the riparian vegetation found in Reach 2, with the exception that we noted several instances where the upland slope and portion of the riparian forests on the west bank had been harvested by past logging.

Nevertheless, in most areas the riparian forest could be characterized as being a mature mixed conifer forest offering moderate amounts of shade and canopy closure to the stream and providing a moderately high degree of LWM recruitment potential. The smaller channel of Reach 3 did not have the ability to move instream LWM as did Reach 2 so more LWM was retained. The east bank of Reach 3 is the Wilderness boundary and the riparian forest on this side was intact with the exception of felled mature conifers that appear to have been dropped during fire suppression efforts battling the Chrome Creek fire in 1987.

## AQUATIC

The aquatic habitats of Reach 3 were comprised mostly of cobble dominated rapids and gravel dominated mid channel scour pools. Water quality based on clarity and temperature was excellent, stream flow was strong, and aquatic habitats were complex with boulder substrate and LWM providing habitat complexity. One side channel was identified in Reach 3. This habitat contained slow water and provided rearing and spawning habitat for anadromous fish. Further, this side channel appeared to have been created and maintained by a logjam (photo 40). Fast water habitat comprised 59% of the total habitat area and slow water habitat comprised 41% of the total habitat area (**Figure 9**). Specifically, fast water consisted of 42% rapids, 9% non-turbulent riffles, and 8% low gradient riffles. Slow water habitats consisted of 33% mid channel scour pools, 7% lateral scour pools, and 1% bedrock trench pools (**Figure 10**).

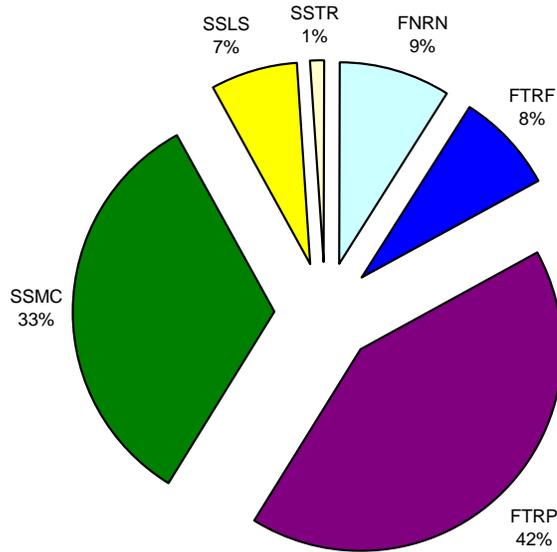
**Figure 9. Habitat Composition  
Upper North Fork Smith River Reach 3**



Eighty-two pools were identified in Reach 3 for a pool frequency of 21.6 pools/mile. Four pools exceeded 6 feet in depth and 38 pools exceeded 3 feet in depth for a deep pool frequency of 10 pools/mile. Average residual pool depth was 3.2 feet. Generally, pools in Reach 3 were abundant, relatively deep, and large in area relative to the channel size. The pools in Reach 3 also contained large patches of suitable spawning habitat and 31 redds were counted. Seventy-five fast water units were identified in Reach 3. Average

fast water depth was 0.8 feet and average fast water width was 25 feet. An estimated 57% of fast water habitat was comprised of pocket pools.

**Figure 10. Upper North Fork Smith River Channel Unit Composition Reach 3**



Instream LWM amounts found in Reach 3 were substantially higher than found in the previous reaches. This was attributed to a considerably smaller channel that resulted in greater retention. LWM found in Reach 3 was contributing to aquatic habitat complexity and influencing stream morphology (photos 39, 40). Also, we noted many pieces of woody material above bankfull that represent future instream or countable LWM. A total of 129 pieces of LWM were counted for a reach density of 33.9 pieces/mile. Specifically, we counted 91 pieces of small LWM for a density of 23.9 pieces/mile, 30 pieces of medium LWM for a density of 7.9 pieces/mile, and 8 pieces of large LWM for a density of 2.1 pieces/mile. Again, refer to **Figure 4** for a comparison of LWM amounts for each size class for the five reaches surveyed.

## **FISHERIES**

The composition of fish species, age classes, and combined fish densities found in Reach 3 were similar to that found in Reach 2. Specifically, YOY and first year rainbow trout/steelhead were the most abundant. Less abundant were cutthroat trout and Chinook salmon. Sixteen slow water units and eight fast water units were snorkeled in Reach 3 for a sampled area of 38,075 ft<sup>2</sup>, and 20,973 ft<sup>2</sup>, respectively. In the snorkeled slow water habitats we counted 297 YOY and 58 first year or older rainbow/steelhead, 24 YOY Chinook salmon, and 4 first year or older cutthroat trout for a combined density of 0.091 fish/yd<sup>2</sup>. In the snorkeled fast water habitats we counted 168 YOY and 43 first year or older rainbow/steelhead, 4 first year or older cutthroat trout, and 2 YOY Chinook salmon for a combined density of 0.093 fish/yd<sup>2</sup>. Combined salmonid density for Reach 3 was 0.091 fish/yd<sup>2</sup>. **Table 2** summarizes the results of the snorkel survey data for species, habitat type, and age class. **Appendix C** contains habitat dimensions and fish counts in a calculation table used to derive fish densities. Stream temperatures were taken at every measured unit and ranged from 13°C to 17°C.

## **REACH 4**

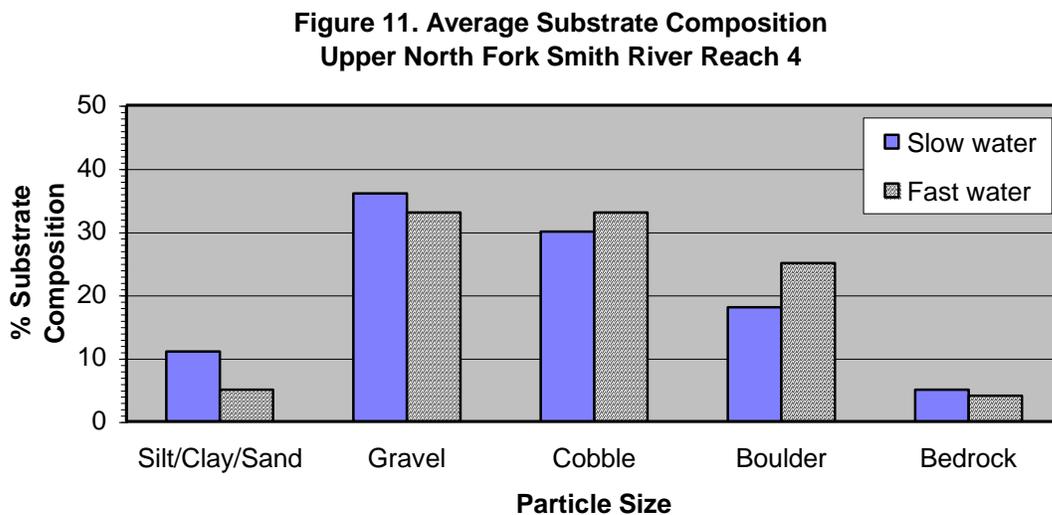
Reach 4 began at the confluence of Tributary 15 and ended 3.36 miles upstream at the confluence of Tributary 22. Reach 4 was ended due to the large flow contribution of Tributary 22 (50%) and the associated changes in canyon morphology and type of aquatic habitats.

## **GEOMORPHOLOGY / HYDROLOGY**

Reach 4 flows through a moderately sloped, flat-floored alluviated canyon that trends toward a moderate V-shaped colluvial canyon. The wide flat-floored alluviated canyon contains areas of elevated terraces, sections with a developed floodplain, and some side channel habitat. Average canyon width was estimated to be 150 feet but ranged between 40 feet (hillslope bound) and greater than 300 feet (wide floodplain and associated valley floor). Stream gradient was mild with an average gradient of 2%. Measured sinuosity was moderately low at 1.18 indicating some meander in the wider valley areas. Stream bank erosion and canyon instabilities occurred in Reach 4 as relatively small inner

canyon landslides. Bank instability occurred over six habitat units for a total length of 254 feet (1.43% of total reach length) and engaged an area of 17,765 ft<sup>2</sup>.

Channel substrate composition estimates depict gravel and cobble dominated fast water and gravel dominated slow water (**Figure 11**). Boulders were common in the colluvial canyon section and less common in the flat-floored alluviated canyon section. Sand/silt was present in pools (11%) but not embedding the surrounding substrate. Bedrock substrate was uncommon in the habitats of Reach 4. Seven cross section measurements were conducted in Reach 4. These results were averaged to describe a moderately entrenched channel with an entrenchment ratio of 1.64 and a relatively high bankfull width-to-depth ratio of 36.61. The median particle size calculated from two Wolman pebble counts were averaged to give a median channel substrate size ( $D_{50}$ ) of 69 mm (Wolman pebble count graphs are found in **Appendix D**). Based on an average of cross section data, Wolman pebble counts, substrate estimates, measured stream gradients, and qualitative interpretation, Reach 4 was classified as a B4 stream type (Rosgen 1996).



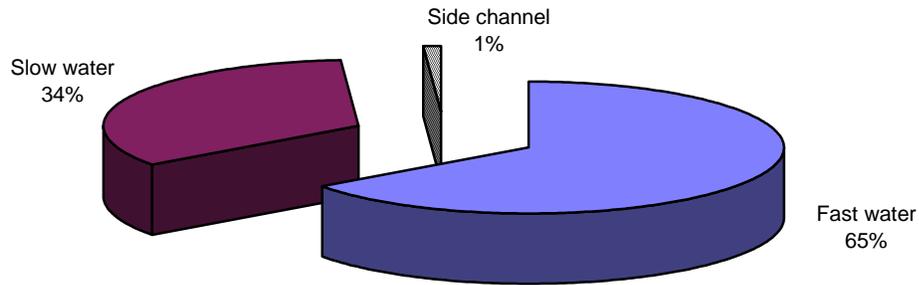
## **RIPARIAN**

The riparian forest of Reach 4 was characterized as a mature mixed conifer forest with a large tree overstory of Douglas-fir and Port-Orford-cedar in both the inner and outer riparian zone. Understory vegetation included red alder, Pacific yew, madrone, tanoak, Oregon myrtle, bigleaf maple, and vine maple. The 2002 Biscuit Fire affected small areas sporadically through Reach 4 often burning lightly through the understory but occasionally burning a pocket of overstory trees. The Biscuit Fire burned the hottest in this portion of the watershed on the upland slopes and along the ridgelines. The large tree overstory combined with a smaller stream channel provided abundant stream shading for Upper North Fork Smith River in most areas of Reach 4. Also, the mature riparian forest generated appropriate amounts of LWM. Reach 4 (with the exception of lower Reach 4) is within the Kalmiopsis Wilderness Area.

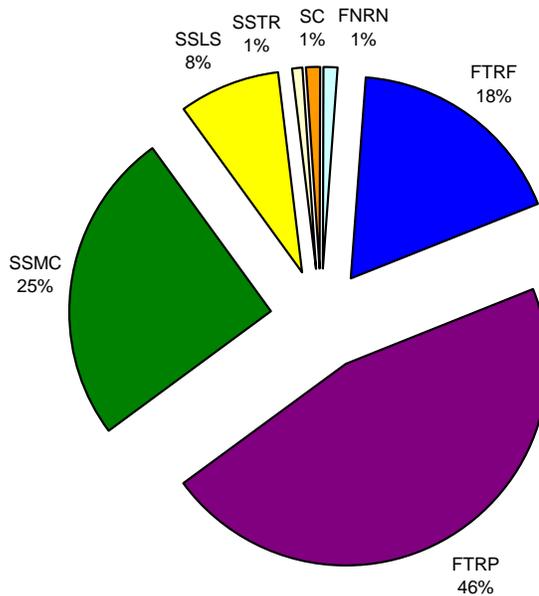
## **AQUATIC**

The aquatic habitats of Reach 4 consisted of mostly of cobble dominated rapids and gravel dominated mid channel scour pools. The lower portion of the reach flowing through the flat-floored alluviated valley section contained wide and shallow gravel and small cobble dominated riffles and long mid channel scour pools. Fast water habitat comprised 65% of the total habitat area, slow water habitat comprised 34% of the total habitat area, and side channels comprised 1% of the total habitat area (**Figure 12**). Specifically, fast water consisted of 46% rapids, 18% low gradient riffles, and 1% non-turbulent riffles (glides). Slow water habitats consisted of 25% mid channel scour pools, 8% lateral scour pools, and 1% bedrock trench pools (**Figure 13**).

**Figure 12. Upper North Fork Smith River Habitat Composition Reach 4**



**Figure 13. Upper North Fork Smith River Channel Unit Composition Reach 4**



Seventy-nine pools were identified in Reach 4 for a pool frequency of 23.5 pools/mile. One pool exceeded 6 feet in depth and 18 pools exceeded 3 feet in depth for a deep pool frequency of 5.4 pools/mile. Average residual pool depth was 2.4 feet. Generally, pools in Reach 4 were relatively long and deep, abundant, and containing suitable spawning habitat in the pool tails. Twenty-two redds were counted in Reach 4. Sixty-nine fast

water units were identified in Reach 4. Average fast water depth was 0.5 feet and average fast water width was 19 feet. An estimated 50% of fast water habitat was comprised of pocket pools.

Reach 4 contained moderate amounts of LWM but perhaps less than what would have been expected for a wilderness stream having a riparian habitat of a mature mixed conifer forest. A total of 82 pieces of LWM were counted for a reach density of 24.4 pieces/mile. Specifically, we counted 54 pieces of small LWM for a density of 16.1 pieces/mile, 12 pieces of medium LWM for a density of 3.6 pieces/mile, and 16 pieces of large LWM for a density of 4.8 pieces/mile. The instream wood encountered in Reach 4 was found as scattered individual pieces and tied up in logjams and was in some areas influencing habitat complexity (photos 59, 63).

## **FISHERIES**

Mask and snorkel surveys in Reach 4 found rainbow trout/steelhead, resident cutthroat trout, adult cutthroat trout (possibly sea run), and Coho salmon. One unconfirmed sighting of a YOY Chinook salmon was reported. Fish densities were comparable to the fish densities reported for the previous reaches. Sixteen slow water units and seven fast water units were snorkeled in Reach 4 for a sampled area of 25,033 ft<sup>2</sup>, and 22,614 ft<sup>2</sup>, respectively. We identified mostly rainbow trout/steelhead in the YOY age/size class. In the snorkeled slow water habitats we counted 208 YOY and 42 first year or older rainbow/steelhead, 20 first year or older cutthroat trout, and 74 YOY coho salmon for a combined density of 0.124 fish/yd<sup>2</sup>. In the snorkeled fast water habitats we counted 184 YOY and 18 first year or older rainbow/steelhead, 3 first year or older cutthroat trout, and 1 unconfirmed YOY Chinook salmon for a combined density of 0.082 fish/yd<sup>2</sup>. Combined salmonid density for Reach 4 was 0.104 fish/yd<sup>2</sup>. Stream temperatures taken at every measured unit ranged from 14°C to 17°C.

## **REACH 5**

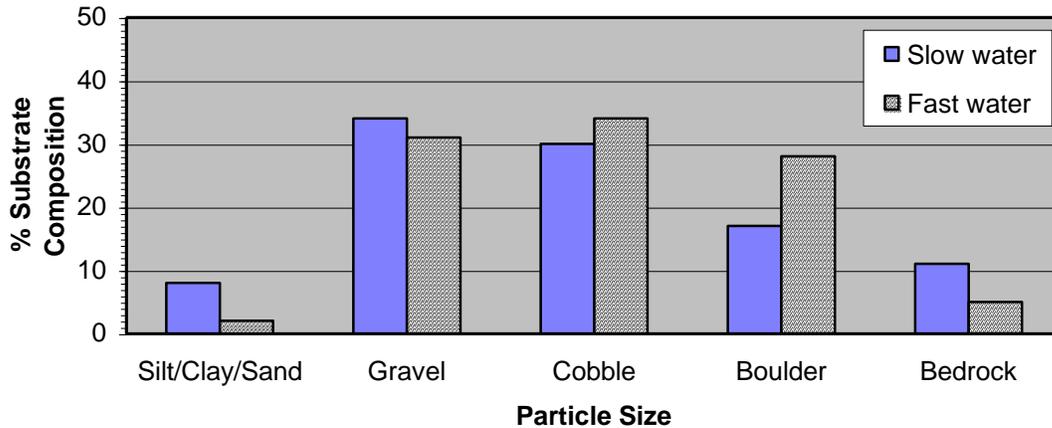
Reach 5 began at the confluence of Tributary 22 and ended 0.78 miles upstream at the confluence of Tributary 23. Reach 5 was delineated due to the flow contribution of Tributary 22 and a change in canyon morphology from that of Reach 4. The survey was ended at Tributary 23 because it is a permanent feature even though we were unable to determine the limit of fish distribution in Upper North Fork Smith River.

## **GEOMORPHOLOGY / HYDROLOGY**

Reach 5 flows through a moderately to steeply sloped, V-shaped colluvial canyon. Average canyon width was estimated to be 80 feet. Stream gradient was moderate with an average gradient of 9%. Measured sinuosity was low at 1.06 suggesting a lack of channel meander (an expected value for a moderately steep mountain stream). Stream bank erosion and canyon instabilities were minor and only 1 reported instance of bank instability occurred as a small inner canyon landslide.

Channel substrate composition estimates depict gravel and cobble dominated fast water with substantial amounts of boulders, and gravel dominated slow water with substantial amounts of cobble (**Figure 14**). Bedrock constituted 5% of the substrate make up of fast water and 11% of the substrate make up of slow water. One cross section measurement was conducted in Reach 5 and was used to describe an entrenched channel (ratio 1.00) with a bankfull width-to-depth ratio of 27.86. The median particle size calculated from two Wolman pebble counts were averaged to give a median channel substrate size ( $D_{50}$ ) of 116 mm (Wolman pebble count graphs are found in **Appendix D**). Based on cross section data, Wolman pebble counts, substrate estimates, measured stream gradients, and qualitative interpretation, Reach 5 was classified as a A3 stream type (Rosgen 1996).

**Figure 14. Average Substrate Composition  
Upper North Fork Smith River Reach 5**



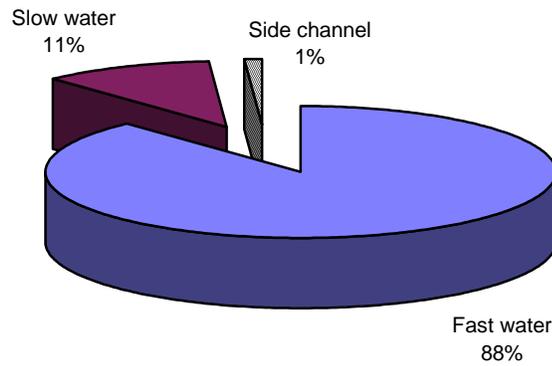
## **RIPARIAN**

The riparian habitat of Reach 5 is similar in structure and composition to the riparian vegetation found throughout most of Reach 4 and is characterized by a mature conifer forest with a large tree overstory of Douglas-fir and Port-Orford-cedar in both the inner and outer riparian zone. Understory vegetation included alder, Oregon myrtle, tanoak, bigleaf maple, and vine maple. The 2002 Biscuit Fire burned in a low intensity fire throughout the understory of the riparian habitat of Reach 5. Our observations suggest that the riparian habitat of Reach 5 is in a reference condition and recruitment potential for instream LWM from the riparian habitat is high.

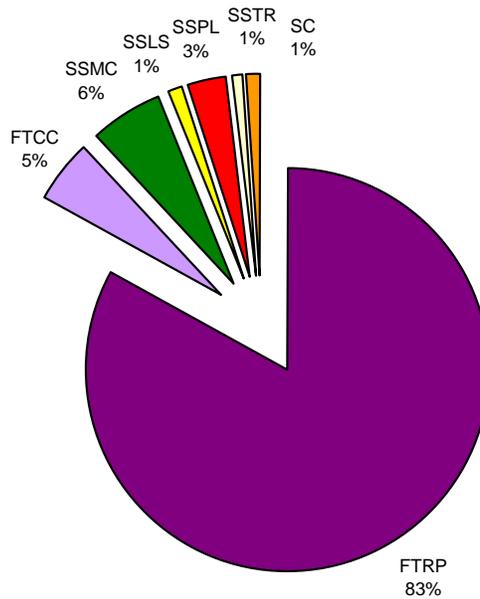
## **AQUATIC**

The aquatic habitats of Reach 5 were dominated by long rapids. Less common were small mid channel scour pool and boulder cascades. Fast water habitat comprised 88% of the total habitat area, slow water habitat comprised 11% of the total habitat area, and side channels comprised 1% of the total habitat area (**Figure 15**). Specifically, fast water consisted of 83% rapids and 5% cascades. Slow water habitats consisted of 6% mid channel scour pools, 3% plunge pools, 1% lateral scour pools, and 1% bedrock trench pools (**Figure 16**).

**Figure 15. Upper North Fork Smith River Habitat Composition Reach 5**



**Figure 16. Upper North Fork Smith River Channel Unit Composition Reach 5**



Thirteen pools were identified in Reach 5 for a pool frequency of 16.7 pools/mile. No pools exceeded 6 feet in depth and 3 pools exceeded 3 feet in depth for a deep pool frequency of 3.8 pools/mile. Average residual pool depth was 2.4 feet and the deepest pool measured 4.2 feet. Generally pools in Reach 5 were small in area, infrequent, and

relatively deep. Pool habitat did contain some spawning gravels but no redds were found. Twelve fast water units were identified in Reach 5. Average fast water depth was 0.5 feet and average fast water width was 12 feet. Fast water habitat in Reach 5 tended to be long, relatively shallow, and did contain some spawning habitat along the habitat margins. One redd was found in a fast water habitat of Reach 5. An estimated 37% of fast water habitat was comprised of pocket pools.

Instream LWM densities were the highest for Reach 5, which would be expected for a mountain stream located in a Wilderness setting flowing through mature mixed conifer forest. In 0.78 miles we counted 49 pieces of LWM for a density of 62.8 pieces/mile. Specifically, we counted 42 pieces of small LWM for a density of 53.8 pieces/mile, 5 pieces of medium LWM for a density of 6.4 pieces/mile, and 2 pieces of large LWM for a density of 2.6 pieces/mile. The instream wood encountered in Reach 5 was found mostly as scattered individual pieces. Further, we documented many pieces of LWM that spanned the stream channel but did not engage the bankfull plane. This wood was not counted but does represent future LWM.

## **FISHERIES**

No Chinook salmon or coho salmon were found in Reach 5. YOY fish densities for rainbow/steelhead dropped substantially in Reach 5 indicating the upper limit of anadromy. One redd was found but above this habitat stream gradient increased and spawning habitat became uncommon. Two slow water units and one fast water unit was snorkeled in Reach 5 for a sampled area of 1,080 ft<sup>2</sup>, and 8,862 ft<sup>2</sup>. In the snorkeled slow water habitats we counted 17 YOY and 5 first year or older rainbow/steelhead for a combined density of 0.183 fish/yd<sup>2</sup>. In the snorkeled fast water habitats we counted 39 YOY and 3 first year or older rainbow/steelhead for a density of 0.43 fish/yd<sup>2</sup>. Combined salmonid density for Reach 5 was 0.058 fish/yd<sup>2</sup>. Stream temperatures taken at every measured unit was a constant 15°C.

## TRIBUTARIES

Thirty-two tributaries of greater than 1% flow contribution feed Upper North Fork Smith River within the surveyed section. Twelve tributaries were believed to be fish bearing. Tributary 17 (Horse Creek) was surveyed in 2006 and Tributary 5 (Baldface Creek) was surveyed in 2005 according to the same protocol used for the Upper North Fork Smith River survey. **Table 3** provides a summary of information collected at the mouth of each tributary.

**Table 3. Tributary Information, Upper North Fork Smith River 2006.**

Tributary Number	Reach #	Est. Flow Contrib.	Fish Bearing?	Dom./Subdom. Substrate	Temp. (°C)	Time	Gradient @ Mouth	Enters From	Tributary Name
1	1	1%	No	Cobble / Boulder	20	1253	49%	Left	None
2	1	1%	No	Cobble / Boulder	17	1432	17%	Right	None
3	1	1%	No	Boulder / Cobble	17	1547	34%	Right	None
4	1	4%	Yes	Cobble / Boulder	16	1117	6%	Right	Fall Cr.
5	1	65%	Yes	Boulder / Cobble	19	1238	4%	Right	Baldface Cr.
6	2	3%	Yes?	Boulder / Cobble	16	1357	16%	Left	Packsad. Cr.
7	2	1%	No	Boulder / Bedrock	16	1725	39%	Right	None
8	2	6%	Yes	Boulder / Cobble	15	1300	7%	Left	Hardtack Cr.
9	2	50%	Yes	Boulder / Bedrock	18	1330	3%	Right	Chrome Cr.
10	3	2%	No	Boulder / Cobble	14	1642	14%	Left	None
11	3	1%	No	Cobble / Boulder	13	1319	23%	Left	None
12	3	10%	Yes	Cobble / Boulder	13	1642	4%	Left	None
13	3	1%	No	Bedrock	13	1120	43%	Right	None
14	3	1%	No	Bedrock / Boulder	13	1204	47%	Right	None
15	3	1%	No	Bedrock / Cobble	13	1424	24%	Right	None
16	4	3%	Yes?	Cobble / Boulder	13	1520	3%	Left	None
17	4	15%	Yes	Cobble / Gravel	13	1227	1%	Left	Horse Cr.
18	4	1%	Yes	Cobble / Boulder	15	1546	10%	Right	None
19	4	2%	Yes?	Boulder / Bedrock	14	1652	6%	Left	None
20	4	25%	Yes	Cobble / Gravel	14	1034	5%	Right	None
21	4	1%	No	Bedrock	14	1234	200%	Right	None
22	4	50%	Yes	Boulder / Bedrock	15	1309	8%	Right	None
23	5	50%	No	Boulder / Cobble	13	1554	27%	Right	None

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- USDA Forest Service, 2004. Stream Inventory Handbook Level I and II, Version 2.4. Pacific Northwest Region (Region 6).

## APPENDIX A:

## EXPLANATION OF CODES

### CHANNEL UNIT CODES

- SSMC:** a mid-channel pool scoured beneath woody debris or downstream of one or more boulders that have partially dammed the stream. A straight scour pool.
- SSLS:** a pool scoured against a streambank, the bank forces a change in the direction of streamflow causing scour. A lateral scour pool.
- SSPL:** a plunge pool scoured downstream of a woody debris jam, a waterfall, a transverse bar of substrate, a human-built dam, or a culvert.
- SSTR:** a trench pool scoured in a bedrock controlled streambed.
- SSCV:** a pool scoured at a channel convergence by the addition of a tributary's streamflow.
- SDDD:** a dam pool upstream of a woody debris jam that has captured sediment effectively raising the streambed.
- SDBV:** a beaver dam pool upstream of a beaver dam.
- SDLS:** a landslide dam pool upstream of coarse sediment that has dammed the stream.
- SDDSD:** a dam pool upstream of a human-built dam.
- FNRN:** a non-turbulent riffle with near laminar flow, a homogeneous streambed, no residual depth, and nearly no stream gradient...a glide.
- FNSH:** a non-turbulent riffle with bedrock or hardpan clay as its streambed, very shallow flow, and a noticeable stream gradient.
- FTRF:** a riffle with stream gradient less than 3%.
- FTRP:** a rapid with stream gradient greater than 3% but less than 10%.
- FTCC:** a cascade with stream gradient greater than 10%.
- WF:** waterfall.
- CH:** chute...typically bedrock dominated.
- SC:** side channel.
- CU:** culvert.
- DC:** dry channel.
- SW:** slow water...pool habitat.
- FW:** fast water...riffle, rapid, cascade habitat.
- SO:** sequence order. The numerical label for all stream channel units; it is assigned in order as the channel units are encountered.

### RIPARIAN VEGETATION CODES

#### Hardwood

HA = Alder  
HB = Bigleaf maple  
HC = Cottonwood, ash, poplar  
HD = Dogwood  
HL = Canyon liveoak  
HM = Madrone  
HO = Oak, Oregon white, California black  
HR = Myrtle  
HT = Tanoak  
HV = Vine maple  
HW = Willow

#### Conifer

CC = Western red cedar  
CD = Douglas fir  
CH = Western hemlock  
CI = Incense cedar  
CL = Lodgepole pine  
CM = Mountain hemlock  
CP = Ponderosa or Jeffrey pine  
CQ = Western white pine  
CR = Red fir  
CT = Port Orford cedar  
CW = White or grand fir  
CY = Yew

SS = Shrub-seedling mix; GF = Grass-forb; NV = No vegetation

### FISH CODES

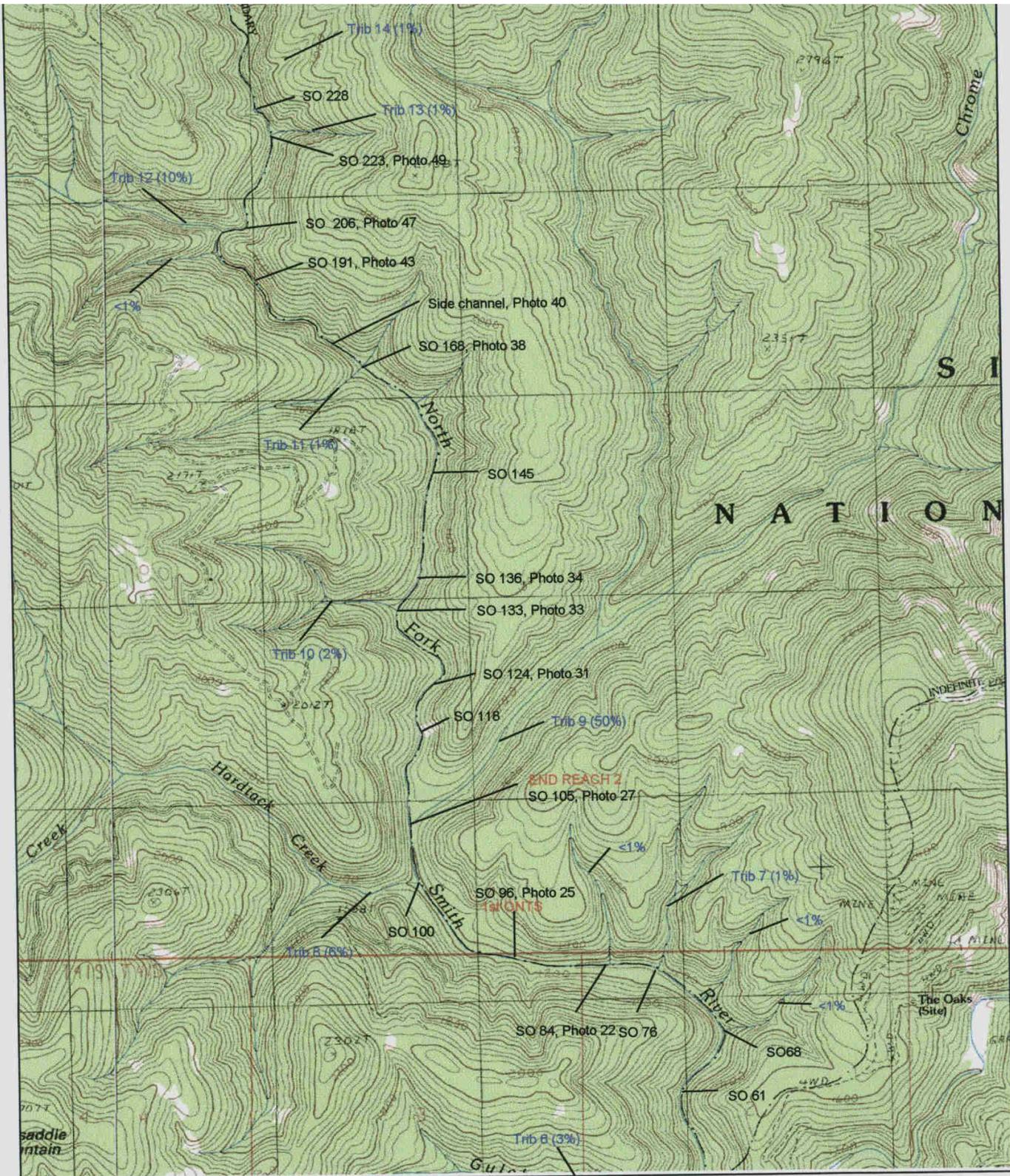
**ONMY** = Rainbow/steelhead trout   **ONCL** = Cutthroat trout   **ONKI** = Coho salmon  
**ONTS** = Chinook salmon   **SAFO** = Brook trout   **SACO** = Bull trout   **SATR** = Brown trout  
**RHXX** = Unknown dace   **COXX** = Unknown sculpin   **CAXX** = Unknown sucker

APPENDIX B:

Upper North Fork Smith River 2006 Stream Survey Maps

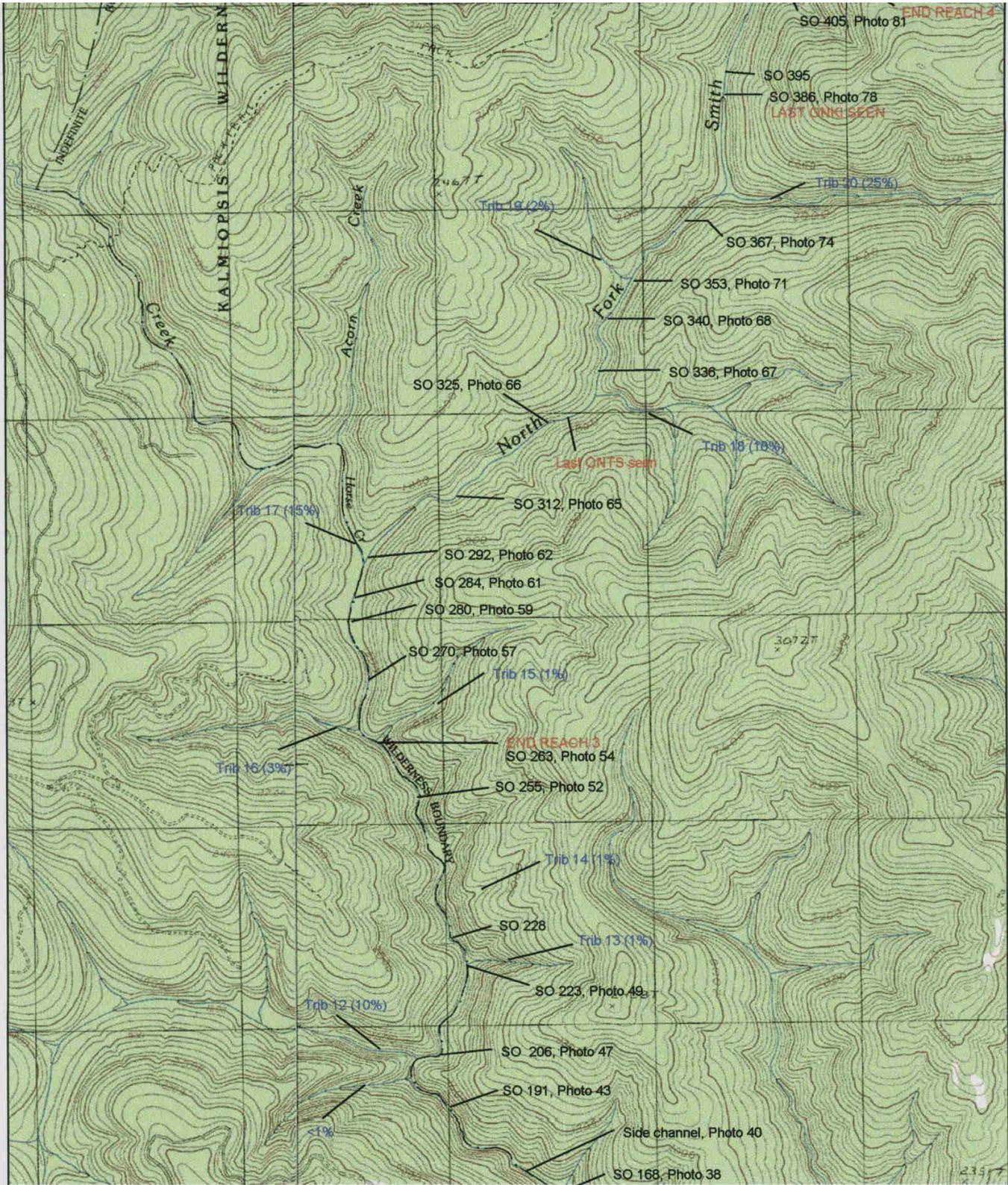


<p>Name: HIGH PLATEAU MT          Date: 4/11/2010          Scale: 1 inch equals 2000 feet</p>	<p>Location: 042° 00' 49.1" N 123° 58' 06.8" W          Caption: Upper North Fork Smith River 2006 Level II Stream Survey Map 1</p>
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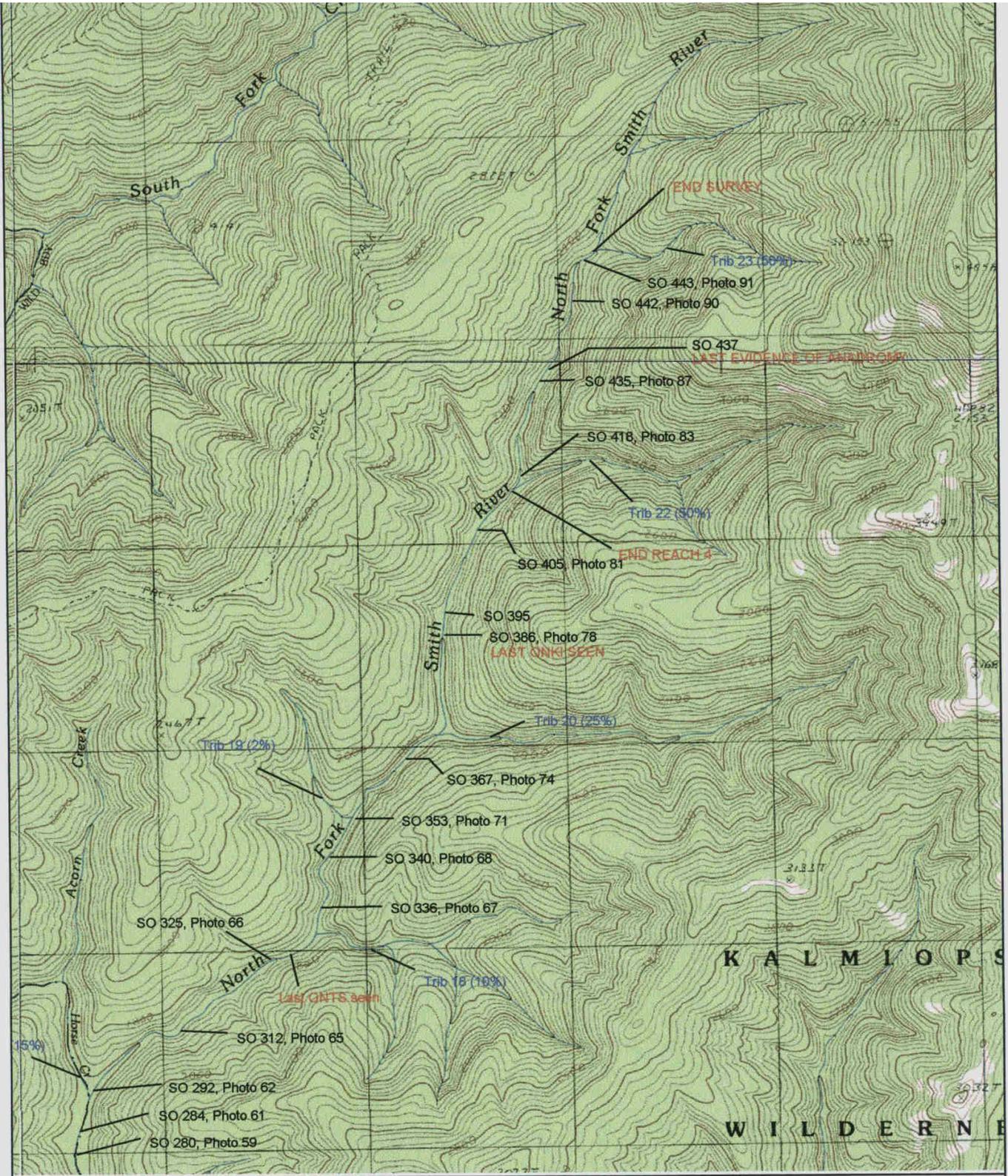
Name: BISCUIT HILL  
 Date: 4/11/2010  
 Scale: 1 inch equals 2000 feet

Location: 042° 03' 15.0" N 123° 58' 35.3" W  
 Caption: Upper North Fork Smith River 2006 Level II Stream Survey Map 2



Name: BISCUIT HILL  
 Date: 4/11/2010  
 Scale: 1 inch equals 2000 feet

Location: 042° 05' 26.6" N 123° 59' 15.7" W  
 Caption: Upper North Fork Smith River 2006 Level II Stream Survey Map 3



Name: BISCUIT HILL  
 Date: 4/11/2010  
 Scale: 1 inch equals 2000 feet

Location: 042° 06' 53.6" N 123° 58' 16.5" W  
 Caption: Upper North Fork Smith River 2006 Level II Stream Survey Map 4

**Selected Photographs of the Upper North Fork Smith River  
2006 Level II Stream Survey**



**Photo 1, SO 1, SSLS 1, view upstream.** Begin survey of North Fork Smith River immediately upstream of the confluence with Cedar Creek at the Forest Service property boundary. The first habitat is a very long (484 feet) lateral scour/mid channel scour pool containing several redds (NFSmith06SO1).



**Photo 4, SO 9, SSMC 5, view upstream.** The pools in Reach 1 tended to be very large and deep often with excellent spawning gravels located in the pool tails. Up to SO 9 we have observed 16 steelhead redds – all located in pool tail gravels (NFSmith06SO9).



**Photo 6, SO 13, FTRP 6, view upstream.** Toe of slide that was depicted in previous photo. Note the LWM and sediment that has been delivered to the channel (NFSmith06SO13).



**Photo 10, SO 26, SSMC 15, view upstream.** This large mid channel scour pool contained emergent boulders that added to the habitats complexity (NFSmith06SO26).



**Photo 15, SO 40, FTRP 18, view upstream.** This habitat was long (1,133 feet), contained a high percent of pocket pool habitat (70%), and was relatively homogeneous (NFSmith06SO40).



**Photo 18, SO 44, SSMC 25, view downstream.** While substantially smaller in size and flow due to the loss of the Baldface Creek contribution, Reach 2 still contains large and deep pools and long, deep channeled, and complex rapids. Between the pool tail of this large mid channel scour pool and the previous scour pool we observed 9 redds. This pool was 15 feet deep (NFSmith06SO44).



**Photo 23, SO 90, FNRN 42, view upstream.** Non-turbulent riffles were not uncommon in Reach 2 and were characterized by a lack of hydraulic controls, a lack of scour or depth, and a strong current. Note the LWM at center of photo. Instream wood remains scarce in Reach 2 (NFSmith06SO90).



**Photo 27, SO 105, SSMC 57, view upstream.** This is the confluence pool of Chrome Creek with North Fork Smith River and marks the end of Reach 2. Chrome Creek enters North Fork at right of center in photo. Chrome Creek contributes approximately 50% flow into the North Fork (NFSmith06SO105).



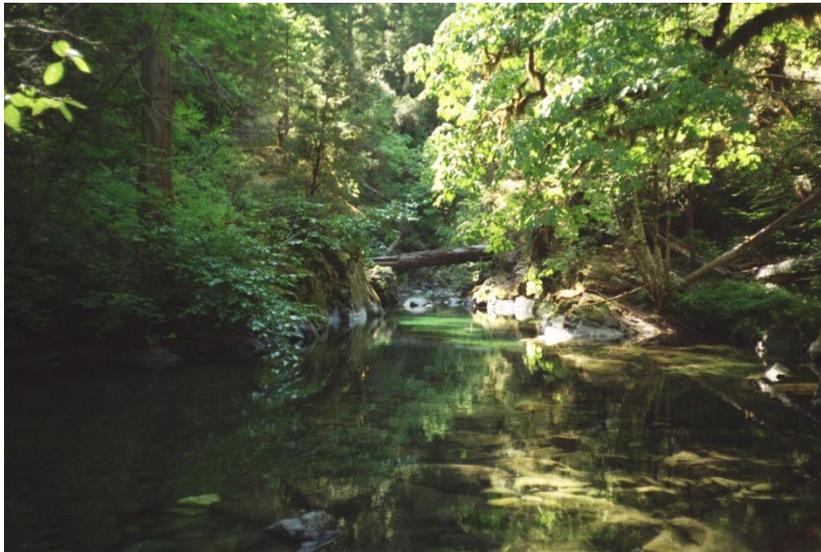
**Photo 31, SO 124, SSMC67, view upstream.** This mid channel scour pool was 6.0 feet deep and was gravel and small cobble dominated. It contained 1 redd in the pool tail and several pieces of LWM were scattered throughout the habitat. LWM is more common in Reach 3 due to a mature riparian forest adjacent to a stream reach that has less of an ability to wash wood downstream (NFSmith06SO124).



**Photo 35, SO 140, SSMC 74, view upstream.** Another large mid channel scour pool located in a forested canyon containing suitable spawning habitat and LWM (NFSmith06SO140).



**Photo 39, SO 171, SSMC 91, view upstream.** This area contained several pieces of LWM and several spanners (downed trees spanning the channel but not within bankfull. This area was cobble and small boulder dominated (NFSmith06SO171).



**Photo 45, SO 195, SSTR 102, view upstream.** Pools found in bedrock areas were deep. This pool was 13 feet deep and 176 feet long. Note the water clarity and the channel spanning downed tree at the top of the pool. Note also the hardwood dominated inner riparian zone (NFSmith06SO195).



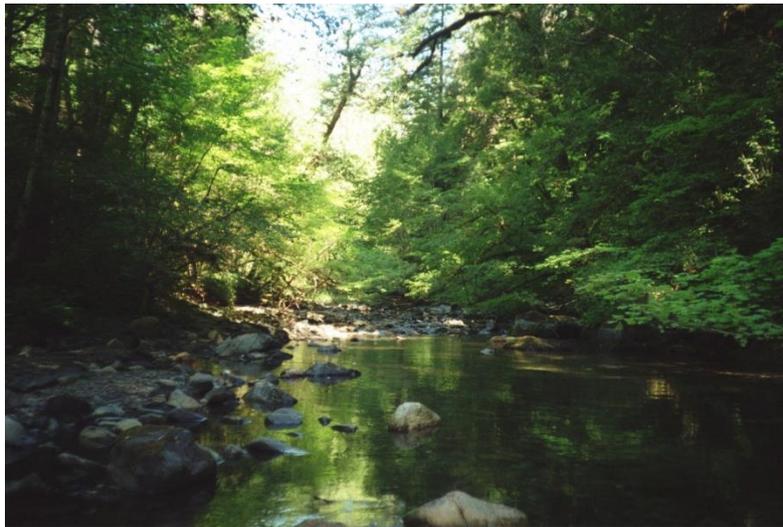
**Photo 46, SO 197, FTRP 93, view upstream.** This area was atypically narrow and bedrock dominated. It also was the steepest section encountered in the North Fork survey. It was short in length and soon gave way to the typical wide and low gradient channel. Note this section did not impede fish migration as redds and coho juveniles were seen upstream (NFSmith06SO197).



**Photo 50, SO 228, SSMC 120, view upstream.** This large gravel dominated pool contained 3 redds. The LWM seen in this photo was above bankfull and thus not counted (NFSmith06SO228).



**Photo 55, SO 265, SSLS 141, view downstream.** This logjam is located on the outside bend of a lateral scour pool and is providing excellent cover for fish. This habitat is located at the beginning of Reach 4, which is characterized by large mid channel and lateral scour pools and long, gravel dominated riffles. Coho salmon were abundant in the pools in Reach 4 and in the tributary of Horse Creek (NFSmith06SO265).



**Photo 58, SO 275, SSMC 147, view upstream.** Typical low gradient channel, gravel and cobble substrate, large pool habitat, and mature riparian forest located in lower Reach 4 (NFSmith06SO275).



**Photo 61, SO 284, FTRF 132, view upstream.** Typical wide bottomed, low gradient, small substrate channel found in Reach 4. Several winter steelhead redds and lamprey redds were observed in this area (NFSmith06SO284).



**Photo 63, SO295, SSMC 157, view upstream.** Instream LWM adds complexity to the aquatic habitat by retaining spawning gravels, promoting scour, and providing cover. Reach 4 is exceptional coho salmon habitat (NFSmith06SO295).



**Photo 67, SO 336, SSMC 179, view upstream.** This photo is of the area of Reach 4 just above the confluence of Tributary 18. Note the narrower canyon and channel and small tree class riparian vegetation (NFSmith06SO336).



**Photo 77, SO 384, FTRP 178, view upstream.** Typical rapid habitat located in upper Reach 4. The 2002 Biscuit fire burned lightly through the understory in this area (NFSmith06SO384).



**Photo 80, SO 399, FTRP 184, view upstream.** Most common substrate mix, channel morphology, riparian vegetation, and rapid habitat found in Reach 4. One redd was found in this rapid (NFSmith06SO399).



**Photo 87, SO 435, FTRP 200, view upstream.** This photo is representative of the channel morphology, channel substrate, riparian vegetation, and aquatic habitat found in upper Reach 5. The amount of instream LWM increased in Reach 5 due to a small channel and a mature riparian forest (NFSmith06SO435).



**Photo 91, SO 443, FTRP 203, view upstream.** This photo is a view of upper Reach 5 near the survey endpoint (NFSmith06SO443).



**Photo 93, SO 445, FTCC 204, view upstream.** This photo is taken from the survey endpoint at the confluence with Tributary 23 looking upstream into the headwater reach of North Fork Smith. Anadromy persisted to the mid point of Reach 5 where the steeper gradient gave way to a resident fish population only. Fish distribution continues past the end of Reach 5 (NFSmith06SO445a).