

1-27-2006

Ex. 277-US-448

Mike Gagner
R2 Resource Consultants

Dudley Reiser
R2 Resource Consultants

Follow this and additional works at: <https://digitalcommons.law.uidaho.edu/all>

Recommended Citation

Gagner, Mike and Reiser, Dudley, "Ex. 277-US-448" (2006). *Hedden-Nicely Collection, All*. 370.
<https://digitalcommons.law.uidaho.edu/all/370>

This Correspondence is brought to you for free and open access by the Hedden-Nicely at Digital Commons @ UIIdaho Law. It has been accepted for inclusion in Hedden-Nicely Collection, All by an authorized administrator of Digital Commons @ UIIdaho Law. For more information, please contact annablaine@uidaho.edu.

Task Completion Report

Date: January 27, 2006 *Project Number:* 1530.03
Prepared By: Mike Gagner and Dudley Reiser *Trip Date:* October 17-20, 2005
Location: Upper Klamath River Basin
Distribution: M. Dammarell (BIA), B. Scott-Brier (DOI), D. Harder (DOJ), file

Introduction

This Task Completion Report summarizes the procedures and results of stream habitat surveys completed on portions of three streams (Scott Creek, Sand Creek, Wood River) located within the Upper Klamath River basin, Oregon during the October 17-20, 2005 time period. This report and attached materials constitute the final deliverable for Task 3 as outlined in the September 2005 scope of work for contractual services (CMP 000685) being conducted by R2 Resource Consultants (R2) for the Bureau of Indian Affairs (BIA). The purpose of this task was to locate, map, and evaluate fish habitat conditions within each of the three streams in areas outside of the former Klamath Tribes reservation boundary.

Survey Reaches

The three streams selected for sampling included Scott and Sand creeks and the Wood River. All of these streams are either direct or indirect tributaries to Upper Klamath Lake. Scott Creek, a second order stream, flows approximately 13 miles from numerous springs and spring tributaries on Mt. Scott in Crater Lake National Park to the Antelope Desert where it currently disappears into the subterranean flow about two miles west of Klamath Marsh (USFS unpublished report). The reach surveyed on Scott Creek extends from the U.S. Forest Service campground upstream for a distance of 3,700 feet (Attachment A-1).

Sand Creek is a 4th order stream that originates from its headwaters at 7,680 feet elevation on Mt. Scott in Crater Lake National Park and extends eastward approximately 14 miles to the Antelope Desert where it also currently disappears into the subterranean flow west of Klamath Marsh (USFS unpublished report). The reach surveyed on Sand Creek extends from approximately the old Klamath Reservation Boundary upstream for a distance of 4,141 feet (Attachment A-1).

The Wood River is a 4th order stream that originates from its headwater spring in Jackson Kimball State Park and extends south for approximately 13 miles to Agency Lake. The Wood River is the largest tributary to Agency Lake, and provides the second largest inflow overall to the Agency-Upper Klamath Lake complex (R2 2001). The reach surveyed on the Wood River extends from the headwater spring downstream for a distance of 5,390 feet to the Dixon Road crossing (Attachment A-2).

Field Procedures

The fish habitat surveys were conducted using a modified Hankin and Reeves method originally developed in Region 6 (Oregon and Washington) of the U.S. Department of Agriculture, Forest Service (Stream Inventory Handbook, Region 6, 1998). The surveys were conducted during a low flow period to ensure the accurate identification of individual habitat units and the assessment of habitat conditions during a time of naturally limited habitat availability. Each of the measurements described below was selected to provide quantification of habitat size and conditions important to fish migration, spawning, incubation, and rearing.

Field measurements consisted of measuring and defining a number of habitat characteristics. Each survey reach was divided up into discrete habitat units. Habitat units were broken up into the following habitat types: pool, riffle, run, glide, and cascade. They were distinguished using the following criteria:

Pool: A portion of the stream with reduced current velocity, often with water deeper than the surrounding areas, and which is frequently usable by fish for resting and cover.

Riffle: A shallow rapids where the water flows swiftly over completely or partially submerged obstructions to produce surface agitation, but standing waves are absent.

Run: An area of swiftly flowing water, without surface agitation or waves, which approximates uniform flow and in which the slope of the water surface is roughly parallel to the overall gradient of the stream.

Glide: A slow moving, relatively shallow type of run. Calm water flowing smoothly and gently, with moderately low velocities, and little or no surface turbulence.

Cascade: Areas with uneven water surface elevation, extremely turbulent with high velocities, many times containing exposed bedrock and boulder substrate.

Data collected at each habitat unit included measurement or estimate of wetted channel width, maximum and control depth for pool units, visual characterization of dominant and subdominant substrate composition, available fish cover, and incidental characterization of dominant riparian vegetation and streambank conditions. Habitat unit lengths and widths were measured using a calibrated English units hip chain or a laser range finder. Substrate classes were visually categorized as boulder (>12 inch diameter [30.5 mm]), cobble (3-12 inch diameter [7.6-30.5 cm]), large gravel (1-3 inch diameter [2.5-7.6 cm]), small gravel (0.25 – 1 inch diameter [0.64-2.5 cm]), sand, silt, and vegetation. Stream cover types were also visually estimated and

included overhanging vegetation, undercut bank, and instream cover (e.g., boulder, Large Woody Debris (LWD)). The percent area of each habitat unit providing fish cover was estimated to the nearest whole percentage and the area of available salmonid spawning habitat was also estimated. Bankfull width was measured at approximately every 10th habitat unit. A handheld Global Positioning System unit was used to map the start and end location of each reach and representative photographs were taken throughout each survey reach (Attachment B). All data and anecdotal information were recorded in “Rite in the Rain” level books (Attachment C).

Survey Results

A summary description including information on habitat composition and overall habitat condition is provided below (in the order surveyed) for each of the reaches surveyed during the October 17 – 20, 2005 field effort. A summary of data collected at each of the three streams is presented in Table 1.

Wood River

The Wood River habitat survey was completed on October 17, 2005 at a stream flow of approximately 155 cubic feet per second (cfs) (R2 staff gage reading). The survey reach began at Jackson Kimball State Park (GPS N42.739787 W121.979619) and extended downstream 5,390 feet to the Dixon Road crossing (GPS N42.733669 W121.988417). The average wetted width of the channel throughout the survey section was 130 feet. The reach was characterized by low gradient, relatively high sinuosity, and limited habitat diversity. There were only eight habitat units within the reach, which was made up of 70 percent glide, 17 percent pool, and 13 percent riffle by length. Although only two of the eight units in the reach were pools, they comprised 25 percent of the reach surface area. Both pools were formed by lateral scour on acute meander bends, but only one of the pools contained fish cover. The pools were relatively deep with maximum depth of 4.5 feet or greater. Average residual depth for the pools was just over 2.5 feet. Although spawning sized gravels were somewhat limited in the reach with only 25 percent of the stream area containing spawning substrate, there was an estimated 5,291 square feet of potential salmonid spawning area in the reach. The remainder of the stream bottom (75%) was covered with sand (pumis), silt, or organic type substrates. The total number of LWD pieces found in the reach was low with 78 pieces counted. This was not surprising since the riparian community consists primarily of grasses, willow, and only a few scattered large conifers. Cattle grazing effects were evident along both sides of the stream channel resulting in the loss of riparian vegetation, trampling of stream banks, and compaction of streamside soils.

Table 1. Summary of habitat data collected on three streams in the Upper Klamath Basin, Oregon, October 17-20, 2005.

Habitat Attribute	Survey Stream		
	Wood River	Sand Creek	Scott Creek
Total Reach Length (ft)	5,390	4,141	3,700
Total Reach Area (sq. ft)	686,664	59,967	54,631
Average Wetted Width (ft)	130	14.7	14.5
Average Bankfull Width (ft)	150	19	25.3
Number of Habitat Units Surveyed	8	69	70
Habitat Composition (% of total reach length)			
Riffle	13	56	24
Pool	17	24	25
Glide	70	0	0
Run	0	20	51
Cascade	0	0	0
Average Maximum Depth of Pool Units (ft)	4.8	2.7	2.4
Average Residual Depth of Pool Units (ft)	2.5	1.8	1.7
Substrate Composition (% of total area)			
Gravels	25	77	59
Sand-Silt-Organics	75	23	41
Potential Spawning Area (sq ft)	5,291	1,508	524
Average Percent Embeddedness of Gravels (%)	25	26	25
Number of LWD pieces	78	354	311
Percentage of Pools with Cover	50	100	100
Average Pool Cover (%)	20	39	20

Sand Creek

The Sand Creek habitat survey was completed on October 18, 2005 at a stream flow of approximately 16 cubic feet per second (cfs) (Attachment C). The survey reach began near the Klamath Tribes old reservation boundary (GPS N42.845821 W121.915609) and extended upstream 4,141 feet to near the center of Section 31 (GPS N42.839936 W121.929417). The average wetted width of the channel throughout the survey section was 39 feet. The reach was characterized by moderate gradient, low to moderate sinuosity, and moderate to high confinement by surrounding hill slopes. There were 69 habitat units within the reach, comprised of 56 percent riffle, 24 percent pool, and 20 percent run by length. Most pools in the reach were formed by scour around LWD pieces. All pool units in the reach contained LWD cover. Pool habitat was generally complex providing multiple types of fish cover including undercut bank,

overhanging vegetation, and object cover. Average maximum pool depth was relatively high for this size stream at approximately 2.7 feet. Residual depths were also relatively high averaging just over 1.8 feet. Spawning sized gravels comprised 77% of the surveyed reach; the remainder of the stream area (23%) was covered with sand (pumice), silt, or organic type substrates. There was a large supply of LWD found in the reach with 354 pieces counted during the survey. The streambanks were lined by a thick stand of mature conifer and hardwood species providing a good supply of LWD and shade.

Scott Creek

The fish habitat survey of Scott Creek was completed on October 20, 2005 at a stream flow of approximately 8 cubic feet per second (cfs) (Attachment C). The reach survey started at the Forest Service campground near the Klamath Tribes old reservation boundary (GPS N42.885389 W121.9925056) and continued upstream 3,700 feet to the western edge of Section 13 (GPS N42.88370 W121.937330). The average wetted width of the channel throughout the survey section was 14.5 feet. The reach was characterized by low to moderate gradient, moderate sinuosity, and low to moderate confinement. There were 70 habitat units within the reach, comprised of 24 percent riffle, 25 percent pool, and 51 percent run by length. Pool units were generally formed by lateral scour or LWD obstructions. Like Sand Creek, pool habitat in Scott Creek was generally complex providing multiple types of fish cover including undercut bank, overhanging vegetation, and object cover (i.e., LWD). The average maximum pool depth and residual pool depth were relatively high for this size of stream at 2.4 feet and 1.7 feet, respectively. Spawning sized gravels were the dominant substrate in 59 percent of the total survey area. However, Scott Creek had the least amount of potential spawning habitat of the three streams, with only 524 square feet (1% of total area). There was a large supply of LWD pieces found in the reach (311 pieces) providing excellent fish cover and channel complexity. Streambanks were lined by a thick stand of mature conifer and hardwood species.

Habitat Assessment

To evaluate the general condition of fish habitat in each of the three streams, data from the habitat survey reaches were compared to habitat benchmarks developed by the Oregon Watershed Professionals Network (1999) and the Environmental Protection Agency (1997). No single habitat parameter can effectively reflect overall habitat conditions because different species and life history stages use different types of habitat. Integration of the quality of many habitat components and indicators provides a better understanding of overall habitat conditions. A comparison of habitat attributes to habitat benchmarks is presented in Table 2.

For the Wood River, the categories of pool frequency, percent substrate comprised of sand-silt-organics, frequency of LWD, and bank vegetation protection were all characterized as in “poor” condition when compared to habitat condition benchmarks. Pool complexity and residual pool depth were the only attributes to be considered in “good” condition. Pool area and percent gravel composition fell in the “average” range. There are several possible reasons for the “poor” habitat

ratings including, proximity of the survey reach to the source spring, high percentage of pumice in the surrounding bedform material, the effects of grazing, and the sampled reach flows through a meadow area that is largely devoid of riparian vegetation. The downstream third of the survey reach does provide considerable spawning potential with over 5,000 square feet of suitable spawning area identified during the survey; redband trout spawning has been observed on numerous occasions in this section (R2 Trip Report 2004). In addition to providing important spawning habitat, the reach extends just downstream from the major source of spring-fed flow of the Wood River and therefore provides a large, stable source of good quality water that supports and promotes salmonid production in downstream reaches.

In general, fish habitat attributes for Scott and Sand creeks would be categorized as average to good when compared to assessment benchmarks. Pool area, pool frequency, and the percentage of substrate comprised of sand-silt-organics were the only attributes that would fall below the “good” condition criteria. Habitat condition for these three attributes would be considered “average,” but they are much closer to the criteria used to define “good” habitat than those used to define “poor” habitat. Habitat conditions within the surveyed reaches of both Scott and Sand creeks indicate these streams provide good quality spawning, incubation, and rearing habitat for salmonid fishes. Unfortunately, neither of these streams is believed to currently support native salmonid fish species (e.g., redband or bull trout) (USFS unpublished report). Moreover, both of these streams are currently isolated from downstream connecting waters (i.e., Williamson River), eliminating the opportunity for natural recruitment of salmonid stocks from downstream waters.

Table 2. Assessment of habitat attributes for three streams in the Upper Klamath Basin, Oregon using Oregon Department of Fish and Wildlife Habitat Benchmarks (1999) and Environmental Protection Agency Rapid Bioassessment Protocols (1997).

Habitat Attribute	Habitat Benchmarks		Sand Creek	Scott Creek	Wood River
	Poor	Good			
Pool Area (% area)	<10	>35	21	26	25
Pool Frequency (channel widths between pools)	>20	5-8	11.3	8.5	21
Residual Pool Depth					
Small Stream (<23 ft width) ¹	<0.2	>0.5	1.0	1.7	
Large Stream (>46 ft width) ²	<0.8	>1.5			2.6
Complex Pools (% pools w/cover) ³	<20	>50	100	100	50
Gravel (% area)	<15	≥35	43	59	25
Sand-Silt-Organics (% area)	>25	<12	18	21	75
Large Woody Debris (Pieces/328-ft)	<10	>20	27.7	27.5	4.7
Bank Vegetation Protection ³ (% bank cover)	<50	>70	80	80	40

¹The average width of both Scott and Sand creeks was less than 23 feet.

²The average width of the Wood River was greater than 46 feet.

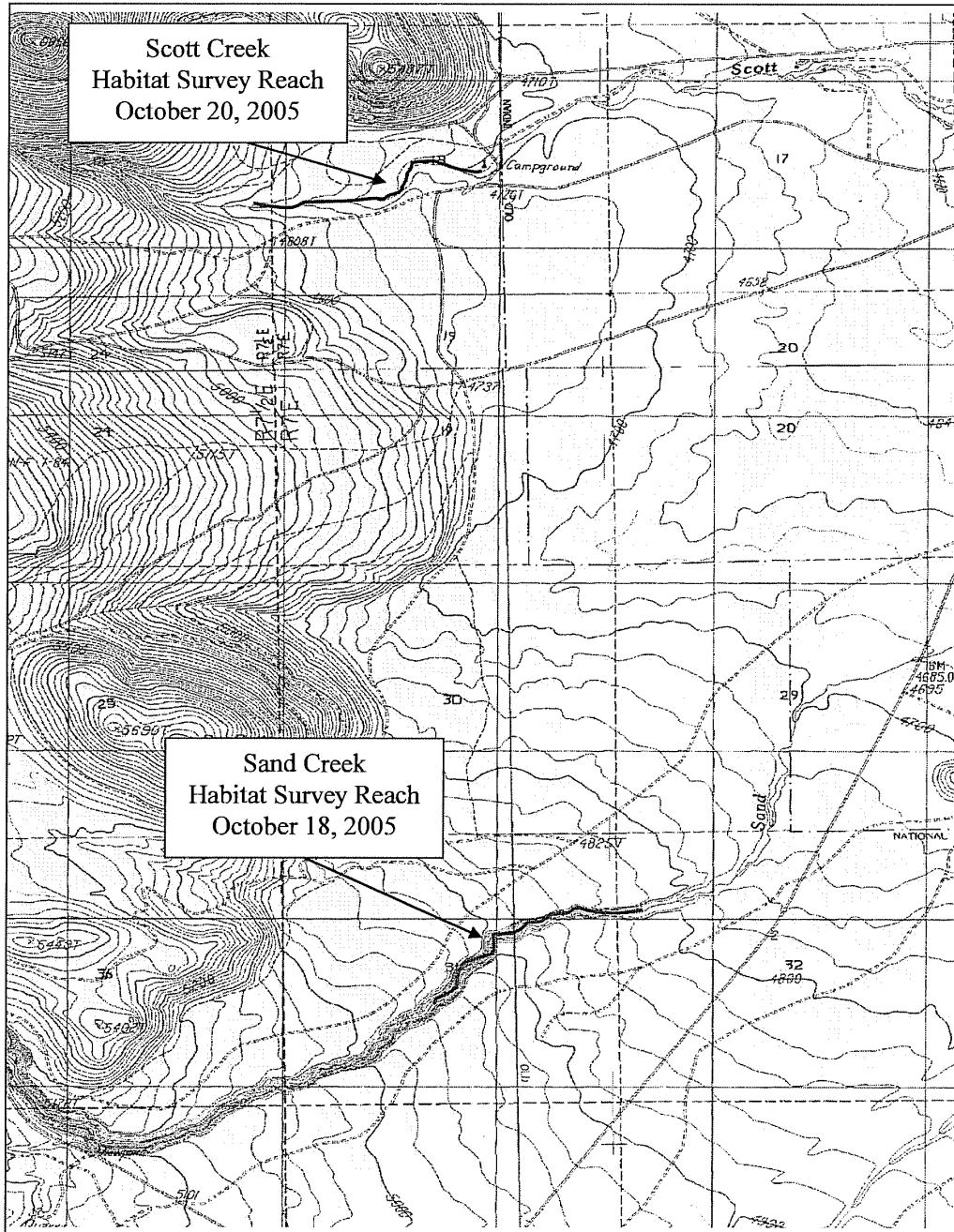
³Rapid Bioassessment Protocols for Use in Streams and Rivers 1997.

REFERENCES

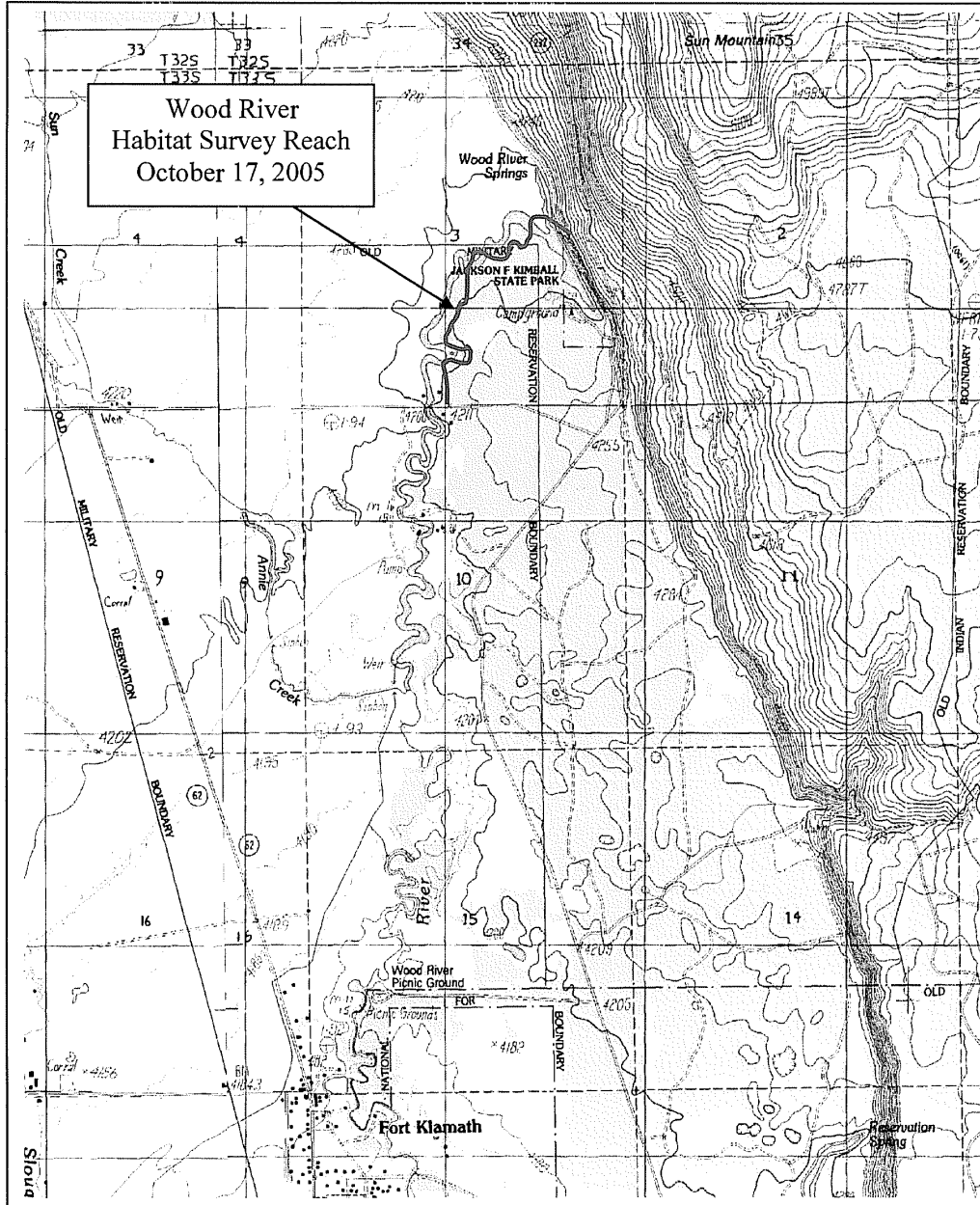
- Environmental Protection Agency. 1997. Rapid Bioassessment Protocols for Use in Streams and Rivers. EPA 841-D-97-002
- U.S. Forest Service. 1998. Stream Inventory Handbook Level I & II. Pacific Northwest Region, Region 6, 1998. Version 9.8. pp 84.
- U.S. Forest Service. Unpublished technical reports. Received from Dick Ford, Winema National Forest, Klamath Falls, Oregon, March 17, 2004.
- Watershed Professionals Network. 1999. Oregon Watershed Assessment Manual. June 1999. Prepared for the Governor's Watershed Enhancement Board, Salem, Oregon.

ATTACHMENT A

Survey Reach Maps



Attachment A-1. Scott and Sand creek fish habitat survey reaches, October 2005.



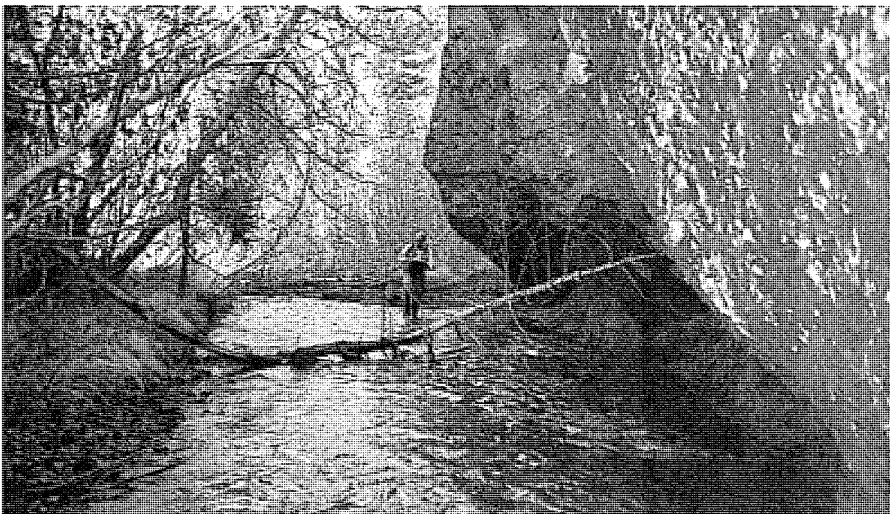
Attachment A-2. Wood River fish habitat survey reach, October 2005.

ATTACHMENT B
Representative Site Photographs

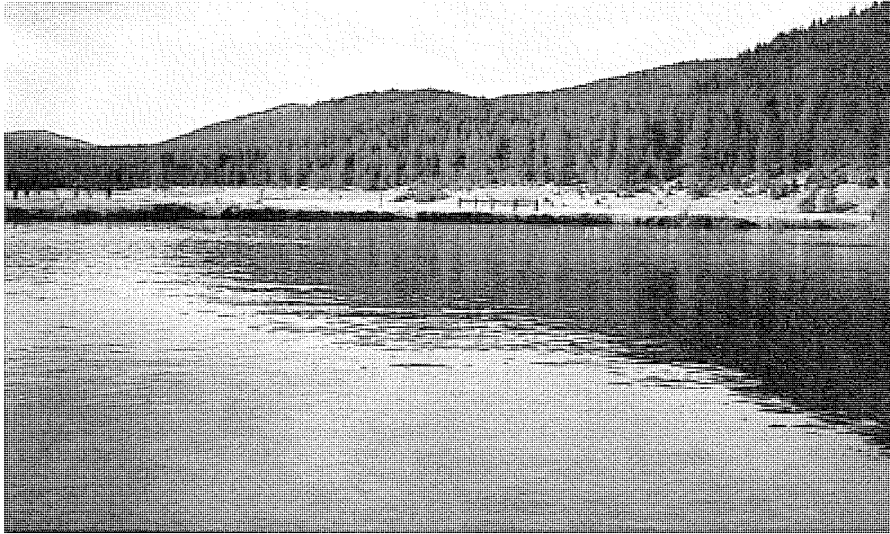
Scott Creek – 2005 Habitat Survey Reach



Sand Creek - 2005 Habitat Survey Reach



Wood River - 2005 Habitat Survey Reach



ATTACHMENT C

Field Notes

Wood R. 10/17/05

Hub. stat Survey

Equipment check
Bushman Yardage Pro
sa SD1341

ft	m	Dist.	ft
140	43 m	141	
120	37 m	121.4	
100	30 m	98.4	
80	24 m	78.7	
50	15 m	49.2	

Station had checked against
300' Fiberglass survey tape
all feet dit. within 1/4" to 1/2"
1.05 ft.

start 42° 44, 30.7 stop 42° 41, 0.24
121.59.000 121.59.294

Wood @ Spring 10/17/05
Photo Log Roll #1

Photo #	Description
25	a/s from start
24	a/s @ Lake Sacore unit #2
23	a/s from unit 4
22	a/s from mid unit 4
21	a/s from 3/4 unit
20	a/s "
19	a/s small island & gravel patch
18	a/s from top unit 5 ripple
17	a/s from top unit 7 ripple
16	a/s @ dis end of survey

2.09 staff gage reading

Unit #	Unit (m)	Hub	Unit (m)	Ave (m)	Wet with	Depth (m)	pool count	10/17/05	Area	%UCB
1	40	glide	25	30	2.4	3.8			20	
1	28	rip								
2	80	water glide	50		2.8					
3	50	rip			2.5	5.8				
3	131	"			2.6					
4	52, 58, 58	glide	40		1.9					
	80, 62, 57		30-40 m							
	45, 42, 39									
	70, 140, 82									
	80									
5	45	rip								
6	100	rip								
7	84, 56, 19	glide	20							
8	43, 130	rip								

* right bank has no riparian veg. (low positive)
left bank has some timber w/ willow (also)
* habitat is very homogeneous

* LWSL provides cover habitat along channel
riparian, upper 1/2 of reach had 10
spawning groups (sand/silt/pools)

~~Sand Cr. 10/18/05~~
~~Discipline~~
~~STA Depth Vel Comments~~

Crews: M. Gagnier, M. Ramoro
Sand Cr. Hab. Survey
10/18/05

Equipment: Swiffer #
prop #

Station	Depth	Velocity	Comments
12.20	15.2'	4.655	
Start:	12.1'	5.655	
Stop:			

Photo Log: Roll #1

#	Description
15	Start of survey looking ups
14	0/5 @ 210' from start
13	looking d/s from unit #5
12	" d/s from to nearby debris pool complex
11	" 0/5 from unit #12
10	" @ ground profile in unit #13
9	looking ups
8	" d/s from unit #28
7	" d/s from top unit #28
6	" d/s from top of unit #46
5	" d/s from unit #47 ground (up)
4	" 0/5 @ interface from unit #57
3	" " " " " "
2	" d/s " " " " "

Photo Log: Roll #2

#	Description
25	looking d/s from top unit 61
24	" 0/5 from bottom unit 66

Unit #	Hab. Type	Sand Unit Length	Cn. Ave	Hub, Dist	Depth	Inch	Survey		#	Cover Type	% Cover	Area
							Spans	Area				
1	pool	20	13	2.0	0.9		20	3	obj, ovr	20	3' x 5'	
2	riff	355	15	0.5	0.7		10	30	obj, ovr, obj	40	2' x 2' packets	
3	pool	12	30	0.8	1.1			15	obj, ovr	60		
4	riff	50	12	0.7			10	1	ovr, obj	25	side panels	
5	pool	19	16	2.3	1.0		50	7	obj, ovr	30		
6	riff	38	20	0.8			20	2	"	20		
7	pool	15	18	3.0	1.1			1	ovr, obj	60	6' x 2'	
8	riff	175	14	1.2			15	4, 4, 3	"	15	7.5' x 15'	
9	pool	51	16	2.7	1.0			3, 2	obj, ovr	40	4' x 2'	
10	run	49	9	1.3			20	2	"	50		
11	pool	19	12	3.1	1.2			6	"	70	7' x 7'	
12	run	208	15	2.4	0.9		20	7	"	20	8' x 8'	
13	riff	40	14	3.2	0.7		20	2	ovr		1' x 6'	
14	pool	65	13	3.2	0.7			25	obj, ovr	70	7' x 2'	
15	pool	97	13	1.0			25	12	"	30	7' x 3'	
16	pool	55	10	1.6			30	6	obj	15		
17	pool	66	12	3.7	1.0			16	obj, ovr	50		
18	run	41	10	1.5			40	15	obj, ovr	70		
19	run	41	11	1.5			20	7	"	10		
20	pool	12	16	3.0	1.5			10	"	30		
21	riff	88	15	3.0			15	3	obj	10	2' x 2'	
22	pool	127	11	3.4	1.3		20	15	obj, ovr, obj	60	2' x 2'	

10/18/05

Unit #	Hub Type	Sand Unit Length	Ci. Width	Hub Area	Substrate	% Cover	Spawm Area
23	riff	45	14	22	0.9	90	3' x 4'
24	pool	50	18	2.4	1.1	30	—
25	riff	95	12	1.0	—	30	7' x 8'
26	pool	18	11	2.4	0.5	—	—
27	riff	15	8	3.2	1.0	30	—
28	pool	31	13	0.9	—	30	—
29	riff	107	13	0.9	—	30	10' x 20'
30	riff	55	16	0.9	—	40	—
31	riff	125	14	1.1	—	40	—
32	pool	13	15	2.7	1.3	—	—
33	riff	42	13	1.5	—	40	—
34	riff	180	14	2.5	1.2	30	6' x 20' 4' x 25'
35	riff	16	20	0.8	—	—	—
36	riff	73	14	0.8	—	25	5' x 8'
37	pool	22	17	0.7	—	40	—
38	riff	45	15	1.2	—	30	—
39	riff	60	14	0.8	—	10	—
40	riff	40	16	0.8	—	20	—
41	riff	35	14	1.3	0.8	20	—
42	riff	38	14	0.8	—	20	—
43	pool	10	18	2.6	0.9	—	—
44	riff	40	16	0.9	—	35	—
45	pool	63	16	2.7	2.2	35	—

Unit #	Unit Type	Unit Length	Sand C. Horizontal		Max Depth	Max Depth	Substrate	% Frags.	LVA	#	Concn Type	% Cover	Spurn Area
			Width	Depth									
46	concrete	80	15	13	1.3	0.7	sm. grav, sand	25	6	2	obj, vvt	20	6' x 8.5'
47	c/b	125	16	0.8	0.8	2.6	sm. grav, sand	20	5	5	obj	5	6' x 8.5'
48	pool	25	17	0.8	0.8	2.2	sm. grav, sand	40	2	2	obj, vvt	30	
49	c/b	35	15	0.8	0.8	2.0	sm. grav, sand	40	2	2	obj, vvt	30	
50	pool	35	8	0.7	0.7	2.0	sm. grav, sand	40	2	2	obj, vvt	30	
51	c/b	20	13	0.7	0.7	2.0	sm. grav, sand	25	2	2	obj	25	
52	pool	22	12	0.8	0.8	2.1	sm. grav, sand	25	2	2	obj	25	
53	c/b	23	14	0.8	0.8	2.4	sm. grav, sand	15	2	2	obj	25	
54	pool	53	17	0.7	0.7	2.4	sm. grav, sand	15	3	3	obj, vvt	40	4' x 8'
55	c/b	141	15	0.7	0.7	2.3	sm. grav, sand	25	4	4	obj, vvt	10	4' x 12'
56	pool	43	18	0.7	0.7	2.3	sm. grav, sand	25	5	5	obj	25	4' x 11'
57	c/b	22	17	1.0	1.0	2.4	sm. grav, sand	30	3	3	obj	2	2' x 2'
58	pool	30	12	0.9	0.9	2.4	sm. grav, sand	30	2	2	obj	15	4' x 10'
59	c/b	40	18	0.9	0.9	2.7	sm. grav, sand	15	1	1	obj	1	4' x 10'
60	run	45	19	1.5	1.5	2.5	sm. grav, sand	25	3	3	obj	10	4' x 20'
61	c/b	122	17	0.6	0.6	2.3	sm. grav, sand	20	1	1	obj	1	4' x 20'
62	pool	21	13	0.6	0.6	2.3	sm. grav, sand	20	2	2	obj	5	4' x 20'
63	c/b	215	15	0.6	0.6	2.7	sm. grav, sand	20	3, 2	2	obj	2	4' x 20'
64	pool	60	23	0.6	0.6	2.7	sm. grav, sand	20	2	2	obj	20	3' x 8'
65	run	50	14	1.2	1.2	2.7	sm. grav, sand	25	1	1	obj	5	4' x 20'
66	c/b	105	15	0.6	0.6	2.0	sm. grav, sand	15	4	4	obj, vvt	30	4' x 20'
67	pool	25	14	0.6	0.6	2.0	sm. grav, sand	40	4	4	obj, vvt	30	4' x 20'
68	run	40	14	1.3	1.3	2.0	sm. grav, sand	16	2	2	obj, vvt	10	4' x 20'
69	pool	37	16	0.9	0.9	2.9	sm. grav, sand	16	4	4	obj, vvt	30	4' x 20'

10/18/05

Sand Cr. Discharge 10/18/05

Scott G. Habitat Survey

SIA Depth Vel. Comments

Row	4.0	4.1	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	13.9	14.0
Depth		0.45	0.55	0.50	0.55	0.65	0.67	0.72	0.80	0.85	0.78	0.80	0.87	0.87	0.85	0.85	0.80	0.80	0.80	0.90	0.70	0.80	0.00
Vel.		1.40	1.78	1.78	1.86	2.10	2.05	2.30	2.33	2.36	2.28	2.17	2.18	2.31	2.37	2.33	1.97	1.69	1.91	2.36	2.31	1.25	0.00

lowe
Swoffer Unit #3602
Proprietary 2A
Photos #23 of discharge measurement
@ bridge King

Crews: M. Cooper, W. Reynolds

weather: clear, cool w/55°
No precip. in past several days

Location: unable to obtain GPS
position, started survey
@ western most extremity of
FS campground

N 42° 53.09' 2' lead survey

W 121° 56.85' 1'
Photo Log: Roll #2
#9 Lowering w/s from station
#8 " w/s from unit #6
#7 " w/s from top Unit 22
#6 " w/s " " 33
#5 " w/s from top Unit 49
#4 " w/s " bottom Unit 49
#3 " w/s " top unit #68
#2 " w/s from 178' w/s point 71
#1 " w/s from end of survey (mont)

Unit #	Scott Unit Type	Cr. Holes	Unit Width	Unit Depth	Substrate	#	Cover	10/20/05
1	run	35	12.0	19	0.7	4	off, 10H	10
2	pool	48	12.0	2.5	0.8	4	"	30
3	run	30	14	0.6		3	"	10
4	pool	54	16	2.4	1.0	5	"	20
5	run	37	15	0.7		3	"	5
6	pool	44	17	2.9	0.7	4	"	20
7	run	156	15	1.1		3	"	10
8	run	22	15	0.7		2	"	5
9	pool	41	14	1.9	0.7	4	"	20
10	run	167	14	1.1		10	"	15
11	pool	52	15	1.9	0.7	10	"	20
12	run	32	15	0.9		5	"	10
13	pool	22	16	2.2	0.7	3	"	5
14	run	20	14	0.8		2	"	5
15	run	52	15	1.1		1	"	10
16	pool	26	17	2.7	0.8	2	"	30
17	run	15	14	0.8		2	"	5
18	pool	19	13	3.2	0.7	3	"	5
19	run	15	10	2.4		1	"	10
20	pool	25	14	2.1	1.1	2	"	10
21	run	34	15	0.9		1	"	10
22	run	50	17	0.7		3	"	2
23	pool	22	16	2.6	0.8	3	"	30

Unit #	Scott Unit Type	Anchor Unit Length	Anchor Unit Width	Survey Depth	Pool Control	Substrate	Substrate %	Substrate Type	% Cover	Species	Area
24	run	37	16	0.8		sub, sand	20	sub, sand	10		2' x 2'
25	pool	25	17	0.8	0.7	sub, sand	20	sub, sand	20		2' x 2'
26	riff	20	16	2.5	0.7	sub, sand	20	sub, sand	2		
27	pool	35	16	2.5	0.7	sub, sand	20	sub, sand	15		
28	run	106	18	1.1		sub, sand	20	sub, sand	10		
29	pool	20	17	2.5	0.6	sub, sand	20	sub, sand	10		
30	pool	34	14	2.3	0.6	sub, sand	20	sub, sand	10		
31	riff	57	17	0.7		sub, sand	20	sub, sand	15		4' x 15'
32	pool	20	14	2.2	0.7	sub, sand	20	sub, sand	2		
33	run	46	15	0.9		sub, sand	20	sub, sand	20		
34	pool	67	20	2.2	0.7	sub, sand	20	sub, sand	5		
35	run	103	11	0.2		sub, sand	20	sub, sand	20		
36	pool	38	16	2.3	0.7	sub, sand	20	sub, sand	10		3' x 3'
37	run	177	15	1.0		sub, sand	20	sub, sand	5		
38	pool	23	15	2.8	0.2	sub, sand	20	sub, sand	5		2' x 2'
39	pool	45	14	2.6	0.6	sub, sand	20	sub, sand	10		
40	riff	81	15	0.7		sub, sand	20	sub, sand	15		3' x 15'
41	pool	30	15	2.3	0.6	sub, sand	20	sub, sand	2		
42	riff	30	14	0.9		sub, sand	20	sub, sand	15		
43	pool	27	11	0	0.7	sub, sand	20	sub, sand	5		
44	riff	20	9	0.8		sub, sand	20	sub, sand	15		2' x 2'
45	pool	17	16	2.3	0.6	sub, sand	20	sub, sand	5		
46	riff	139	16	0.7		sub, sand	20	sub, sand	20		3' x 15'

Unit #	Scott Unit Type	Crs. Unit Length	Headcut Ave. Width	Survey Depth	Surveys	Depth	Dist. to Canal	Area	Volume	Notes	10/20/05
47	run	73	17	1.0	1.0	1.0	1.0	2.5	10		
48	pool	18	11	2.5	0.8	0.8	1.0	3.2	15		
49	pool	20	13	2.3	0.8	0.8	1.0	"	20		
50	run	112	14	1.3	2.6	0.8	1.0	3.4	8		
51	pool	25	11	1.3	2.6	0.8	1.0	3.2	2		
52	run	55	15	1.3	2.6	0.8	1.0	3.4	10		
53	riff	100	16	0.9	2.6	0.8	1.0	3.4	7		
54	run	170	15	1.3	2.6	0.8	1.0	4.5	15		
55	pool	18	16	2.0	0.9	0.9	1.0	3.2	3		
56	run	87	15	1.2	2.2	0.7	1.0	3.4	2		
57	pool	16	13	1.2	2.2	0.7	1.0	3.2	3		
58	run	51	14	1.2	2.2	0.7	1.0	3.2	2		
59	riff	53	15	0.8	1.9	0.7	1.0	4.5	1		
60	pool	23	14	1.1	1.9	0.7	1.0	3.2	3		
61	run	43	15	1.1	2.5	0.5	1.0	3.4	3		
62	pool	14	12	1.2	2.5	0.5	1.0	2.3	3		
63	run	30	13	1.2	2.5	0.5	1.0	3.4	3		
64	pool	40	12	0.8	2.2	0.8	1.0	2.3	4		
65	riff	91	14	0.8	2.2	0.8	1.0	4.5	3.2		
66	run	47	13	1.2	3.4	0.8	1.0	3.4	4		
67	riff	25	13	0.9	4.5	0.8	1.0	4.5	6		
68	run	106	13	1.1	4.5	0.8	1.0	4.5	1		
69	riff	87	14	0.7	4.5	0.8	1.0	4.5	10.14		

