ROCKY REACH FISH PRESENCE AND HABITAT USE SURVEY SUMMARY
June 15, 2000

Summary from DE&S:

Depth, velocity, substrate and cover measurements were taken at all sampling sites where fish were captured in the late spring/early fall period (i.e., late May). Measurements of habitat variables will continue to be taken during the late summer 2000 sampling period.

Habitat information gathered at sites where fish were found will be analyzed and turned over the Aquatic Habitat Mapping group. This information will be used to show not only where fish have been found during surveys, but also to indicate other areas which have similar habitat characteristics.

The summer sampling period is scheduled to begin August 8, 2000 conditioned upon receipt of permits from the appropriate state and federal agencies. It is anticipated that this survey will focus on sturgeon and the use of other gear, which have not been allowed under our current permit.

Summary from RL&L:

SAMPLING SCHEDULE AND SITE LOCATIONS
Methods of collecting data on fish distribution, relative abundance, and habitat utilization were consistent with federal collection protocols prescribed for use in areas with the potential presence of ESA–listed species. Fish sampling in the reservoir was done with Fyke nets (FN), beach seining (BS), Gee traps (GT), swim surveys (SS), and angling (AN). Restrictions in the fish collection permit for this study specified that other methods such as backpack electrofishing, boat electrofishing, and setlines were not permitted. The methods used during each of the sample periods are presented in Table 2.1. Locations of sampling sites are shown in Figure 1.1 (in progress).

The relative abundance and distribution of fish with respect to habitat varies considerably among seasons. In order to characterise fish assemblages and habitat use in Rocky Reach Reservoir during different seasons, the following three study periods were selected:

1. Fall Session (October 1999).
   Water temperatures during fall are generally intermediate between the summer high and winter low temperature extremes and this period therefore represents the transition between summer and winter conditions. Aquatic plants (macrophytes) are at their maximum extent and density along shoreline areas during this period. The presence of fall spawning fish may be observed.

2. Spring Session (May 2000).
   Water temperatures increase during spring to a point intermediate between winter low and summer high temperature extremes, and macrophyte density is low during this

period. The presence of spring spawners and progeny of fall spawners may be observed.

3. Summer Session (August 2000).
Water flows and temperature conditions during summer typically represent annual maximum values, and macrophyte growth is most rapid during this period. Fish use of habitats during peak flow and temperature conditions may be observed.

A stratified sampling design was used to collect data from different areas of the reservoir. Rocky Reach Reservoir was divided into lower (RRL), middle (RRM), and upper (RRU) sections (Figure 1.1 – in progress) and all sampling methods were used in each of these sections. Rocky Reach Dam tailrace and Wells Dam tailrace were identified as additional sections of the study area in the original study plan. High flows and substantial changes in water elevation precluded the use of Fyke nets in the Wells Dam tailrace; therefore, this area was incorporated as an extension of the RRU section and was sampled by the other collection methods. Due to the water depths and velocities present in the tailrace of Rocky Reach Dam, this area could not be effectively sampled using the methods permitted in this study and was excluded from the study area.

The lower section of Rocky Reach Reservoir represented deep, slow water habitat typically found near the forebay of dams. The upper section represented riverine habitat with faster flows and greater mixing of water. The middle section represented the transition zone between the two habitat types and included the confluences of two tributary rivers (Entiat River and Chelan River). Within each section, fish sampling sites were selected that represented the various shallow water habitat types present.

FISH CAPTURE METHODS

Fyke Nets

Fyke net trapping was used to assess fish use of nearshore areas during 24 hour periods. This method is effective for determining nocturnal movements of fish into shallow water areas, and for sampling fish of different life stages. A Fyke net set consisted of two Fyke net traps, each with a 1.5 x 1.5 m entrance leading to a series of four progressively smaller compartments. Each compartment had a small tapered entrance designed to allow fish to swim into the next section and to inhibit fish from returning. Two of these traps were attached side by side, facing the shore, and set at a depth equal to the height of the trap. A block net made of panels of seine mesh was set perpendicular to the shoreline and extended from the beach out to the attachment point between the two traps. The block net had a lead line and a float line to prevent fish from moving under or over the net. One trap captured fish on the downstream side of the block net, and the other trap captured fish on the upstream side. Wing nets, constructed in the same manner as the block net, were attached to the side of each trap and set perpendicular to the block net. Catch-per-unit-effort (CPUE) was calculated as number of fish captured per hour for each species.

Beach Seining

Beach seining was used to determine use of shallow water habitat (less than 1.0m deep) by fish. This is an effective technique for sampling young-of-the-year, and juvenile fish

that use these habitats. Sampling was done using an 8 m long by 1.5 m deep seine with 0.2 cm mesh size. Length and width of the area sampled and estimated efficiency of sampling were recorded for each seine haul. The CPUE (number of fish captured/100 m^2) was calculated for each species captured.

Gee Minnow Traps

Gee minnow traps were used as a complementary sampling method and were used near where other sampling methods were used or in habitats similar to those sampled by other methods. This method also was used to sample nearshore habitats that could not be effectively sampled by other methods. These habitats included areas with steep banks or large uneven substrates. The Gee traps were set in pairs at each sampling station for two consecutive 24 hour sessions. Traps were baited with roe, cheese, and dog food. The CPUE was calculated for each species as the number of fish captured per hour.

Swim Surveys

Swim surveys were done along 100 m transects at Gee trap sample sites. A crew member wearing a dry suit, snorkel, and mask floated along the transects and visually identified and counted fish species. This sampling method may detect the presence of fish species that avoid captured by other methods. The CPUE for each species observed was recorded as the number of fish per 100m.

Angling

Angling surveys were done with shore based angling and mid-stream boat angling, using casting rods with a variety of gear and cast-retrieve techniques. Shore based angling was done at sites established for other sampling methods. During boat angling, the boat drifted mid-stream down the reservoir enabling the crew to sample offshore areas and deep water. Angling was also done in the Wells Dam tailrace and selected sites downstream. The CPUE (number of fish/angler hour) was recorded for all species captured.

DATA SUMMARY AND ANALYSIS

Data was tabulated and used to provide summaries of total catch, catch-per-unit-effort, and life history information. Graphical analysis of the temporal and spatial distribution of each species and of life history data was done using Microsoft® Excel™. The statistical relationship between fish length and weight was calculated using Systat® to generate a linear regression model for each of the major fish species captured.

Table 1.1 Fish species known or thought to occur in Rocky Reach Reservoir.

Family	Common Name	Species Code	Scientific Name
SPORTFISH			
Acipenseridae	White sturgeon	WSG	*Acipenser transmontanus*
Salmonidae	Chinook salmon	CH	*Oncorhynchus tchawytscha*
	Sockeye salmon	SK	*Oncorhynchus nerka*
	Kokanee	KO	*Oncorhynchus nerka*
	Rainbow trout	RB	*Oncorhynchus mykiss*
	Steelhead	ST	*Oncorhynchus mykiss*
	Cutthroat trout	CT	*Oncorhynchus clarki*
	Brown trout	GT	*Salmo trutta*
	Bull trout	BT	*Salvelinus confluentus*
	Mountain whitefish	MW	*Prosopium williamsoni*
Percidae	Walleye	WP	*Stizostedion vitreum*
	Yellow perch	YP	*Perca flavescens*
Centrarcidae	Largemouth bass	LMB	*Micropterus salmoides*
	Smallmouth bass	SMB	*Micropterus dolomieui*
	Black crappie	BCB	*Pomoxis nigromaculatus*
	Bluegill sunfish	BGS	*Lepomis macrochirus*
	Pumpkinseed	PMB	*Lepomis gibbosus*
Gadidae	Burbot	BB	*Lota lota*
Ictaluridae	Catfish	BH	*Ameiurus spp.*
NON-SPORTFISH			
Catostomidae	Longnose sucker	LSU	*Catostomus catostomus*
	Bridgelip sucker	BSU	*Catostomus columbianus*
	Largescale sucker	CSU	*Catostomus macrocheilus*
	Mountain sucker	MSU	*Catostsomus platyrhynchus*
Cyprinidae	Carp	CP	*Cyprinus carpio*
	Redside shiner	RSC	*Richardsonius balteatus*
	Northern pike minnow	NPC	*Ptychocheilus oregonensis*
	Peamouth	PCC	*Mylocheilus caurinus*
	Dace spp.	DC	*Rhynicthys*
	Chiselmouth	CMC	*Acrocheilus alutaceus*
	Tench	TC	*Tinca tinca*
Percopsidae	Sand roller	SR	*Percopsis transmontanus*
Cottidae	Prickly sculpin	CAS	*Cottus asper*
	Torrent sculpin	CRH	*Cottus rhotheus*
Gasterosteidae	Three spined stickleback	TSB	*Gasterosteus aculeatus*
Petromyzontidae	Pacific lamprey	PL	*Lampetra tridentatus*

Table 2.1 Fish sampling schedule in Rocky Reach study area, 1999 and 2000.

Location	Sample Method	1999	2000	
		Fall	Spring	Summer
Rocky Reach Reservoir	Fyke Net	October	May	August
	Beach Seine	October	May	August
	Gee minnow traps	October	May	August
	Swim Survey	October	May	August
	Angling	October	May	August

Table A1 Summary of fish abundance at sample sites during the fall 1999 sampling session.

End Date (d/m/y)	Reach code[a]	Bank code[b]	River miles	Trap meth[c]	Trap site	Trap effort[d]	Species code[e]											
							TSB	NPC	RSC	CMC	PCC	CAS	CRH	CSU	TC	BGS	RB	WP
10/19/99	RRT	RUB	471.5	BS	BS1	256	1281	46	5	2								
10/19/99	RRT	LUB	471.0	BS	BS2	1200												
10/19/99	RRT	LUB	473.4	AN	AN1	3.6												
10/20/99	RRL	LUB	475.4	BS	BS1	600	2	488	38					16				
10/21/99	RRL	RUB	475.9	BS	BS2	600	798	83	30									
10/21/99	RRL	LUB	477.0	BS	BS3	461	1149	22		1								
10/21/99	RRL	LUB	475.6	BS	BS4	184	31	4	3									
10/21/99	RRL	RUB	474.6	BS	BS5	600	26		11									
10/21/99	RRL	RUB	474.6	AN	AN1	2												
10/22/99	RRL	LUB	474.4	GT	GT1	46.3	23											
10/22/99	RRL	LUB	475.8	GT	GT2	46.2	26											
10/22/99	RRL	RUB	475.8	GT	GT3	46.3	38	1										
10/22/99	RRL	LUB	474.9	GT	GT4	46.3	77	1										
10/22/99	RRL	RUB	475.0	GT	GT5	46	43	7	1									
10/22/99	RRL	LUB	474.4	SS	SS1	100	80		80					8				
10/22/99	RRL	LUB	475.8	SS	SS2	100	800	200	100					1				
10/22/99	RRL	RUB	475.8	SS	SS3	100	250							2				
10/22/99	RRL	LUB	474.9	SS	SS4	100	80	50	80									
10/22/99	RRL	RUB	475.0	SS	SS5	100	450	100	100					2				
10/22/99	RRL	LUB	475.4	FN	FN	46	259	89	316	561	12			87	3		1	
10/23/99	RRM	LUB	500.3	AN	AN1	3												
10/23/99	RRM	LUB	483.8	BS	BS1	150												
10/24/99	RRM	RUB	483.8	BS	BS2	450	133	41	2									
10/24/99	RRM	RUB	486.6	BS	BS3	300	1											
10/24/99	RRM	LUB	488.2	BS	BS4	150	16											
10/24/99	RRM	LUB	500.2	BS	BS5	280	727	83	2			1						
10/25/99	RRM	LUB	483.8	GT	GT1	44.1												
10/25/99	RRM	RUB	483.8	GT	GT2	44.2	2			2								
10/25/99	RRM	RUB	486.6	GT	GT3	44.5	1					1						
10/25/99	RRM	LUB	488.2	GT	GT4	44.2	14											
10/25/99	RRM	LUB	500.3	GT	GT5	44.1	22	2	5									
10/30/99	RRM	RUB	504.0	GT	GT6	43.7	6	1	1									
10/30/99	RRM	LUB	504.0	GT	GT7	43.8	3											
10/30/99	RRM	LUB	503.7	GT	GT8	43.9	4					1						
10/30/99	RRM	RUB	503.6	GT	GT9	43.9	4		1					1				
10/25/99	RRM	LUB	483.8	FN	FN	44.2	10	96	100	127	2		1	11	1	2		
10/25/99	RRM	MID	488.2	AN	AN2	3												
10/29/99	RRM	MID	504.0	AN	AN3	3												

[a]Rocky Reach code: RRT = tailrace, RRL = lower, RRM = middle, RRU = upper
[b]Bank code: LUB = Left Upstream Bank, RUB = Right Upstream Bank, MID = Midstream
[c]Trap method: GT = Gee Trap, SS = Snorkel Survey, BS = Beach Seine, AN = Angling, FN = Fyke Net
[d]Trap effort: GT (hours), SS (m), BS (m^2), AN (hours), FN (hours)
[e]See Table 3.1 for species code definitions.

Table A1 Continued.

Date	Reach	Bank	River	Trap	Trap	Trap	Species code[e]											
(d/m/y)	code[a]	code[b]	miles	meth[c]	site	effort[d]	TSB	NPC	RSC	CMC	PCC	CAS	CRH	CSU	TC	BGS	RB	WP
10/25/99	RRM	LUB	483.8	SS	SS1	100	154		50					13				
10/25/99	RRM	RUB	483.8	SS	SS2	100	4150		90	1				3				
10/25/99	RRM	RUB	486.6	SS	SS3	100	2							3				
10/25/99	RRM	LUB	488.2	SS	SS4	100	70		2					6				
10/25/99	RRM	LUB	500.3	SS	SS5	100	1							1				
10/30/99	RRM	RUB	504.0	SS	SS6	100	5100		1					1				
10/30/99	RRM	LUB	504.0	SS	SS7	100	20							1				
10/30/99	RRM	LUB	503.7	SS	SS8	100	12							22				
10/30/99	RRM	RUB	503.6	SS	SS9	100								2				
10/27/99	RRU	LUB	514.4	BS	BS1	280												
10/27/99	RRU	RUB	513.4	BS	BS2	200												
10/27/99	RRU	RUB	509.7	BS	BS3	240	2											
10/27/99	RRU	RUB	508.1	BS	BS4	350	4											
10/27/99	RRU	LUB	506.8	BS	BS5	375												
10/27/99	RRU	RUB	510.6	AN	AN1	2												
10/27/99	RRU	MID	506.8	AN	AN2	3												
10/28/99	RRU	LUB	514.4	GT	GT1	44.6												
10/28/99	RRU	LUB	513.5	GT	GT2	46.5	1											
10/28/99	RRU	RUB	513.5	GT	GT3	47.7												
10/28/99	RRU	RUB	508.1	GT	GT4	46.4	1											
10/28/99	RRU	LUB	506.8	GT	GT5	46.5	1											
10/30/99	RRU	LUB	504.5	GT	GT6	44.3	4											
10/28/99	RRU	LUB	514.4	SS	SS1	100								24				
10/28/99	RRU	LUB	513.5	SS	SS2	100								3				
10/28/99	RRU	RUB	513.5	SS	SS3	100								10				
10/28/99	RRU	RUB	508.1	SS	SS4	100	2							3				
10/28/99	RRU	LUB	506.8	SS	SS5	100	16							8				
10/30/99	RRU	LUB	504.5	SS	SS6	100								8				
10/28/99	RRU	MID	515.3	AN	AN3	2												
10/29/99	RRU	RUB	509.7	FN	FN	47.7	16	71	366	2	13			13		1	1	1

[a]Rocky Reach code: RRT = tailrace, RRL = lower, RRM = middle, RRU = upper
[b]Bank code: LUB = Left Upstream Bank, RUB = Right Upstream Bank, MID = Midstream
[c]Trap method: GT = Gee Trap, SS = Snorkel Survey, BS = Beach Seine, AN = Angling, FN = Fyke Net
[d]Trap effort: GT (hours), SS (m), BS (m^2), AN (hours), FN (hours)
[e]See Table 3.1 for species code definitions.

Table A2 Summary of fish abundance at sample sites during the spring 2000 sampling session.

End Date (d/m/y)	Reach code[a]	Bank code[b]	River miles	Trap meth[c]	Trap site	Trap effort[d]	Species code[e]													
							TSB	NPC	RSC	CMC	PCC	LNC	CAS	CSU	LSU	TC	BGS	RB	CO	CH
5/20/00	RRL	LUB	475.4	BS	BS1	180														
5/20/00	RRL	RUB	475.9	BS	BS2	110	5													
5/20/00	RRL	LUB	477.0	BS	BS3	200														
5/20/00	RRL	LUB	475.6	BS	BS4	80														
5/16/00	RRL	RUB	474.6	BS	BS5	360	32	69	669											
5/25/00	RRL	RUB	474.6	AN	AN1	2														
5/18/00	RRL	LUB	474.4	GT	GT1	21.1	9	1		1										
5/18/00	RRL	LUB	475.8	GT	GT2	21.1	2	1												
5/18/00	RRL	RUB	475.8	GT	GT3	21.5	10	3												
5/18/00	RRL	LUB	474.9	GT	GT4	21.6	2													
5/18/00	RRL	RUB	475.0	GT	GT5	21.9		2												
5/21/00	RRL	LUB	474.4	SS	SS1	100	650		200											1
5/21/00	RRL	LUB	475.8	SS	SS2	100	60													1
5/21/00	RRL	RUB	475.8	SS	SS3	100	315		30											
5/21/00	RRL	LUB	474.9	SS	SS4	100	20		90					1						
5/21/00	RRL	RUB	475.0	SS	SS5	100								2						
5/18/00	RRL	LUB	475.4	FN	FN	21	41	279	239	423	111			29	6	5	1	3		24
5/25/00	RRM	LUB	500.3	AN	AN1	3														
5/19/00	RRM	LUB	483.8	BS	BS1	120														
5/19/00	RRM	RUB	483.8	BS	BS2	140	426	306	68					3						17
5/19/00	RRM	RUB	486.6	BS	BS3	120	2		13					1						2
5/19/00	RRM	LUB	488.2	BS	BS4	60	2													
5/19/00	RRM	LUB	500.2	BS	BS5	180	3													1
5/18/00	RRM	LUB	483.8	GT	GT1	22.9		1												
5/18/00	RRM	RUB	483.8	GT	GT2	22.9	95	7					1							
5/18/00	RRM	RUB	486.6	GT	GT3	22.9	13	6												
5/18/00	RRM	LUB	488.2	GT	GT4	22.9		5												
5/18/00	RRM	LUB	500.3	GT	GT5	23	23	19	2	2										
5/24/00	RRM	RUB	504.0	GT	GT6	23.7	12													
5/24/00	RRM	LUB	504.0	GT	GT7	23.6	5	1												
5/24/00	RRM	LUB	503.7	GT	GT8	23.7														
5/24/00	RRM	RUB	503.6	GT	GT9	23.7														
5/20/00	RRM	LUB	483.8	FN	FN	20.5			3	1				7				1		10
5/25/00	RRM	MID	488.2	AN	AN2	3														
5/25/00	RRM	MID	504.0	AN	AN3	3														

[a]Rocky Reach code: RRT = tailrace, RRL = lower, RRM = middle, RRU = upper
[b]Bank code: LUB = Left Upstream Bank, RUB = Right Upstream Bank, MID = Midstream
[c]Trap method: GT = Gee Trap, SS = Snorkel Survey, BS = Beach Seine, AN = Angling, FN = Fyke Net
[d]Trap effort: GT (hours), SS (m), BS (m^2), AN (hours), FN (hours)
[e]See Table 3.1 for species code definitions.

Table A2 Continued.

Date (d/m/y)	Reach code[a]	Bank code[b]	River miles	Trap meth[c]	Trap site	Trap effort[d]	Species code[e]												
							TSB	NPC	RSC	CMC	PCC	LNC	CAS	CSU	LSU	TC	BGS	RB	CO	CH
5/24/00	RRM	LUB	483.8	SS	SS1	100								3						
5/24/00	RRM	RUB	483.8	SS	SS2	100	75		15											
5/24/00	RRM	RUB	486.6	SS	SS3	100	1		1											
5/24/00	RRM	LUB	488.2	SS	SS4	100	42		3											
5/24/00	RRM	LUB	500.3	SS	SS5	100	72													1
5/23/00	RRM	RUB	504.0	SS	SS6	100	80													
5/23/00	RRM	LUB	504.0	SS	SS7	100	3				2			2						8
5/23/00	RRM	LUB	503.7	SS	SS8	100								1						
5/23/00	RRM	RUB	503.6	SS	SS9	100	62							1						
5/21/00	RRU	LUB	514.4	BS	BS1	100		29					2	2						5
5/21/00	RRU	RUB	513.4	BS	BS2	100														
5/21/00	RRU	RUB	509.7	BS	BS3	100														
5/21/00	RRU	RUB	508.1	BS	BS4	100	13													
5/21/00	RRU	LUB	506.8	BS	BS5	100	2					1								27
5/24/00	RRU	RUB	510.6	AN	AN1	2														
5/24/00	RRU	MID	506.8	AN	AN2	3														
5/24/00	RRU	LUB	514.4	GT	GT1	24.2														
5/24/00	RRU	LUB	513.5	GT	GT2	24.2														
5/24/00	RRU	RUB	513.5	GT	GT3	24.2														
5/24/00	RRU	RUB	508.1	GT	GT4	23.6														
5/24/00	RRU	LUB	506.8	GT	GT5	23.6		1												
5/24/00	RRU	LUB	504.5	GT	GT6	23.7	1													
5/23/00	RRU	LUB	514.4	SS	SS1	100			25										3	
5/23/00	RRU	LUB	513.5	SS	SS2	100								2						
5/23/00	RRU	RUB	513.5	SS	SS3	100														7
5/23/00	RRU	RUB	508.1	SS	SS4	100														
5/23/00	RRU	LUB	506.8	SS	SS5	100	1													
5/23/00	RRU	LUB	504.5	SS	SS6	100	20							11				30		##
5/23/00	RRU	MID	515.3	AN	AN3	2														
5/24/00	RRU	RUB	509.7	FN	FN	21.3		15	210		1		1	4				3		3

[a]Rocky Reach code: RRT = tailrace, RRL = lower, RRM = middle, RRU = upper
[b]Bank code: LUB = Left Upstream Bank, RUB = Right Upstream Bank, MID = Midstream
[c]Trap method: GT = Gee Trap, SS = Snorkel Survey, BS = Beach Seine, AN = Angling, FN = Fyke Net
[d]Trap effort: GT (hours), SS (m), BS (m^2), AN (hours), FN (hours)
[e]See Table 3.1 for species code definitions.