APPENDIX C: CURRENT AND MID-POINT AGGREGATE RECOVERY PERCENTAGES BY PLANNING SUBDRAINAGE (ARP)

Number	Name	Mid-Point ARP	Current ARP 1/	Number	Name	Mid-Point ARP	Current ARP 1/
181		85	71	18J		85	75
182		84	75	18K		83	70
183		85	75	18L		73	65
184		75	75	18M		81	65
185		86	75	18N		85	70
186		89	75	18P		100	60
187		93	70	18Q		100	60
188		NA	NA	18R		96	60
18A		92	60	18S		81	60
18B		90	70	18T		86	65
18C		92	75	18U		71	75
18D		87	80	18V		87	75
18E		86	75	18W		90	75
18F		88	65	18X		98	70
18G		87	75	18Y		80	70
18H		88	70	18Z		88	70
18I		84	70				

1/ Current ARP values may actually be lower due to incomplete vegetation information and incomplete information on area occupied by roads??

APPENDIX D: ROAD DENSITY BY PLANNING SUBDRAINAGE
(MILES OF ROAD PER SQUARE MILE)

Psub Number	Psub Name	Road Density
181	No Name	4.19
182	Warble	3.21
183	Heart	3.35
184	Squaw Butte	4.65
185	Salmon Falls	3.88
186	Heckletooth	3.63
187	Hatchery	2.45 *
188	Salmon Head	0.02
18A	Oakridge	12.85 *
18B	Flat	4.74 *
18C	Needle	3.64
18D	Eagle Butte	2.07
18E	Warm Spring	3.02
18F	Wall Head	3.08
18G	Tillicum	3.73
18H	Crevice	3.65
18I	Mule	3.33
18J	Pitch	2.90
18K	Lower Furnish	2.79
18L	Furnish Head	1.43
18M	Furnish Divide	2.23
18N	Salmon Canyon	1.06
18P	Nettie	0.00
18Q	Bingo	0.00
18R	Fuji	0.22
18S	Black Glacial	2.22
18T	Ranger	2.52
18U	Salmon Koch	4.65
18V	Black Koch	2.97
18W	Cedar	2.04
18X	Sideslope	1.66
18Y	Long Block	1.94
18Z	Kelsey	1.98

* Railroad densities included in these figures

APPENDIX E: AQUATIC HABITAT AND SPECIES LISTS

Streams Surveyed in the Salmon Creek Watershed

Stream	Subwatershed	PSUB	Miles Surveyed	Year Surveyed	Method
Salmon	NA	NA	12.3, 21.8	1990, 1995	GP, Reg
Warble	Lower Salmon (18 1)	182	.9	1990	GP
Salmon Trib	Lower Salmon (18 1)	183	.34	1990	GP
Wall	Lower Salmon (18 1)	18E	5.36, 7.01	1991, 1995	GP, Reg
--Tribs		18E & F	3.08	1991	GP
Mule	Lower Salmon (18 1)	18I	3.49	1995	Reg
Kelsey	Lower Salmon (18 1)	18Z	5.73	1992	Reg
--Tribs		18Z	1.5	1992	Reg
Black	Black Creek (18 2)	18X	8.99, 3.25	1992, 1995	Reg
Ranger	Upper Salmon (18 3)	18T	3.28	1995	Reg
Furnish	Upper Salmon (18 3)	18K	4.68	1990	GP

Observed Pool Values and Objectives for Mainstem Salmon Creek (1990 & 1995)

Stream Name	Reach Number	Reach Length (miles)	Gradient (%)	Average Width (ft)	Residual Depth (ft)	Width/ Depth Ratio	% Area in Large Pools	Observed Large Pools/ Mile	Minimum Objective PACFISH	Minimum Objective Forest Plan
Salmon	1	2.24	1	44	4.6	23.5	4	2.4	35	17
1990	2	0.27	1	65	-	-	3	3.9	25	12
	3	0.13	13	34	2.7	-	14	27.0	35	31
	4	0.49	3	78	1.8	-	3	2.9	23	14
	5	0.13	2	57	5.9	-	35	17.3	25	19
	6	0.40	4	40	1.8	-	4	6.7	35	26
	7	1.40	2	69	1.7	1.4	2	0.9	24	11
	8	0.34	3	62	2.5	-	5	3.9	25	17
	9	1.11	5	57	3.3	6.4	51	20.9	26	19
	10	2.66	5	51	2.7	24.5	8	2.9	26	21
1995	1	1.0	1	54.6	1.4	71.33	44.6	9.45	26	14
	2	1.1	1	66.8	1.6	-	63.1	11.22	23	11
	3	1.5	1	70.0	2.7	50.56	65.0	10.33	23	11
	4	2.2	1	66.5	3.7	46.55	50.6	11.44	24	11
	5	2.3	1	59.7	2.6	34.17	34.5	9.8	25	13
	6	0.7	2	56.8	6.2	-	72.3	17.58	25	13
	7	3.9	1	57.5	2.6	42.67	27.2	9.62	25	13
	8	1.7	2	53.8	2.0	30.40	13.9	8.94	26	14
	9	3.6	3	45.3	2.4	34.83	26.7	16.92	35	23
	10	1.8	4	26.8	2.2	22.92	14.1	20.08	47	39
	11	2.0	6	19.9	1.7	25.69	24.3	24.99	56	53

Aquatic Habitat and Species Lists (continued)

Observed Pool Values and Objectives for Subwatershed 18 1

Stream Name	Reach #	Reach Length (miles)	Gradient (%)	Average Width (ft)	Residual Depth (ft)	Width/ Depth Ratio	% Area in Large Pools	Observed Large Pools/Mile	Minimum Objective PACFISH	Minimum Objectives Forest Plan
Warble	1	.2	2	17	1.7	7.5	15	9.1	65	44
	2	.2	7	8	1.3	6.8	2	5.2	130	132
	3	.2	6	13	.8	--	2	4.8	80	81
	4	.3	8	13	1.2	14.2	4	11.2	80	81
Salmon Trib	1	.3	17	10	2.1	--	1	2.8	96	106
Kelsey	1	.8	5	18.1	2.6	13.97	5.3	7.5	62	58
	2	.7	5	23.6	3.1	11.27	4.2	8.6	50	45
	3	1.2	5	32.6	3.3	5.22	4.3	8.3	45	32
	4	.4	6	14.0	3.7	--	1.0	2.5	75	75
	5	.7	7	10.8	2.6	6.38	4.9	10.0	90	98
	6	.8	10	10.1	1.7	11.79	15.3	25.0	96	105
	7	.9	12	7.0	2.0	--	1.8	2.2	145	151
	8	.4	18	4.8	1.3	5.0	1.9	5.0	184	220
18Z09.7	1	.1	20	--	--	--	--	--	--	--
18Z20.5	1	.1	18	--	--	--	--	--	--	--
18Z22.9	1	.1	21	--	--	--	--	--	--	--
18Z24.8	1	.1	35	--	--	--	--	--	--	--
18Z26.6	1	.1	49	--	--	--	--	--	--	--
18Z48.0	1	.1	32	--	--	--	--	--	--	--
18Z50.4	1	.1	45	--	--	--	--	--	--	--
18Z53.5	1	.1	18	--	--	--	--	--	--	--
18Z26.6 42.1	1	.1	40	--	--	--	--	--	--	--
18Z54.3	1	.1	25	--	--	--	--	--	--	--
18Z67.2	1	.1	35	--	--	--	--	--	--	--
18Z79.5	1	.1	20	--	--	--	--	--	--	--
18Z81.6	1	.1	25	--	--	--	--	--	--	--
18Z90.0	1	.1	30	--	--	--	--	--	--	--
18Z94.7	1	.1	40	--	--	--	--	--	--	--
Mule	1	1.1	11	16.2	1.8	17.3	29.6	38	65	66
	2	1.4	22	11.4	1.5	8.5	30.1	48	90	96
	3	.7	21	10.4	.9	10.7	22.7	63	96	106
Wall-1992	1	.7	5	19	1.3	7.8	8	15.1	56	54
	2	1	10	20	1	9.7	3	7.2	56	53
	3	.4	11	15	1.6	--	3	7.7	70	81
	4	.6	4	16	.6	9	4	13	65	66
	5	.8	16	22	2.1	8.3	5	10.6	50	48
	6	.3	7	19	1.1	--	4	12.7	56	54
	7	.2	6	22	.6	--	4	11.8	50	48
	8	.4	12	14	.1	8.4	4	7.4	75	75
	9	.8	2	9	1.2	8	5	8.5	115	84
	10	.1	45	10	--	--	0	0	96	106
	11	.01	--	--	--	--	--	--	--	--
18E301	1	.46	20	4	--	--	0	0	184	264
18E302	1	.2	25	11	--	--	0	0	90	96
	2	.25	2	25	.5	--	85	3.4	47	30
18E303	1	.21	8	3	--	--	--	--	--	352
18E401	1	--	9	2	--	--	0	--	184	528
18E402	1	--	7	4	--	--	0	--	184	264
18E403	1	--	--	3	--	--	0	--	184	352
18E404	1	--	--	4	--	--	0	--	184	264
18F201 301	1	.37	16	22	.8	4.6	5	14.4	55	48
	2	.23	16	8	--	--	0	0	130	132
18E302	1	.7	13	10	.7	6	1	5.2	96	106
	2	1	4	3	--	--	0	0	184	352
18F303	1	.22	4	7	--	--	0	0	145	151
18F401	1	.04	30	5	--	--	0	0	184	211
18F402	1	.04	15	5	--	--	0	0	184	211
18F403	1	.04	30	4	--	--	0	0	184	264
18F404	1	.04	15	5	--	--	0	0	184	211
18F405	1	.04	20	8	--	--	0	0	130	132
18F440	1	.04	25	3	--	--	0	0	184	352
18F441	1	.04	10	4	--	--	0	0	184	264
Wall 1995	1	1.9	11	20.7	2.3	16.59	22.3	28.57	55	51
	2	2.4	8.7	20.7	2.1	17.07	29.6	30.41	55	51
	3	1	12	18.8	2.1	15.00	20.9	36.30	60	56
	4	6.7	8	11.7	1.1	13.88	41.6	39.96	95	90

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Observed Pool Values and Objectives for Mainstem Black Creek, Subwatershed 18 2 (1992 & 1995)

Stream Name	Reach #	Reach Length (miles)	Gradient (%)	Average Width (ft)	Residual Depth (ft)	Width/ Depth Ratio	% Area in Large Pools	Observed Large Pools/Mile	Minimum Objective PACFISH	Minimum Objective Forest Plan
Black	1	1.8	3	35.5	3.7	17.22	.3	.6	40	30
	2	.1	3	36.0	--	--	0	0	40	29
	3	1.2	3	36.3	3.0	10.67	7.1	10.8	40	29
	4	.7	4	26.3	3.7	9.38	12	22.9	45	40
	5	1.2	4	40.7	3.4	14.54	10.9	11.7	35	26
	6	.53	1	36.4	3.9	12.17	39.6	22.0	40	21
	7	.5	1	27.4	4.0	--	18.3	16.0	45	28
	8	.5	1	27.2	3.5	8.51	22.8	12.0	45	28
	9	.4	1	6.3	--	--	--	--	162	120
	10	1.0	1	29.2	3.5	14.35	43.4	28.0	45	13
	11	.9	3	33.7	3.8	8.9	6.2	5.6	40	31
1995	12	1.7	2	17.8	2.3	15.3	34.3	27.26	61	42
	13	.9	5	17.4	1.7	13.5	20.1	29.45	61	61
	14	.6	14	20.0	2.6	15.0	31.7	48.35	56	53

Observed Pool Values and Objectives for Streams Located in Subwatershed 18 3

Stream Name	Reach #	Reach Length (miles)	Gradient (%)	Average Width (ft)	Residual Depth (ft)	Width/ Depth Ratio	% Area in Large Pools	Observed Large Pools /Mile	Minimum Objective PACFISH	Minimum Objective Forest Plan
Ranger	1	.6	12	14.8	1.7	7.2	29.3	49.49	70	71
	2	.6	9	15.2	1.4	10.9	23.9	28.53	70	69
	3	1.3	11	8.9	1.0	10.9	32.3	75.9	115	119
	4	.6	20	5.6	.6	7.9	35.7	101.7	184	189
	5	Spirit Lake	--	--	--	--	--	--	--	--
Furnish	1	.7	8	29	1.2	3.9	7	24.1	45	36
	2	.5	7	41	11.7	--	10	13.8	35	26
	3	.4	7	41	7.3	--	8	4.7	35	26
	4	.3	4	21	2.9	10.2	15	12.8	56	50
	5	.5	5	29	2.3	--	7	6.8	45	36
	6	.3	6	22.7	1.8	10.6	9	10.5	47	39
	7	.1	6	41	-.5	--	4	10.7	35	26
	8	.6	3	29	1.2	15.0	3	9.3	45	36
	9	.4	5	29	1.4	2.7	3	6.8	45	36
	10	.2	4	19	.8	9.3	11	29.2	56	56
	11	.2	5	14	1.5	12.0	2	5.4	75	75
	12	.2	4	14	1.3	2.8	8	7.5	75	75
	13	.2	12	7	1.5	8.8	6	4.7	145	151

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Instream Large Woody Material (LWM) for Mainstem Salmon Creek (1990 & 1995)

Stream	Reach Number	Reach Length	# Small LWM	# Medium LWM	# Large LWM	# Med. + Large LWM/Mile	Minimum LWD/Mile PACFISH	Minimum LWD/Mile Forest Plan
Salmon	1	2.24	21.12	10.56	0	10.56	80	105
1990	2	.27	0	0	0	0	80	105
	3	.13	26.4	15.84	10.56	26.4	80	105
	4	.49	5.28	5.28	0	5.28	80	105
	5	.13	5.28	5.28	0	5.28	80	105
	6	.4	36.96	10.58	5.8	16.38	80	105
	7	1.4	10.56	5.28	5.28	10.56	80	105
	8	.34	142.56	100.32	58.64	158.96	80	105
	9	1.11	68.64	26.4	15.84	42.24	80	105
	10	2.66	26.4	10.56	10.56	21.12	80	105
1995	1	1.0	1.7	0	0	0	80	105
	2	1.1	6.7	1.1	1.1	2.2	80	105
	3	1.5	23.2	3.9	0	3.9	80	105
	4	2.2	18.9	5.7	0	5.7	80	105
	5	2.3	10.7	2.2	0	2.2	80	105
	6	.7	29.7	12.1	0	12.1	80	105
	7	3.9	16.8	7.2	.3	7.5	80	105
	8	1.7	13.4	7.0	0	7.0	80	105
	9	3.6	95.0	24.5	4.8	29.3	80	105
	10	1.8	84.4	58.5	4.1	62.6	80	105
	11	2.0	155.3	32.8	6.9	39.7	80	105

Note: Small LWD is 12" DBH and 25' in length Medium LWD is 24" DBH and 50' in length Large LWD is 36" DBH and 50' in Length

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Instream Large Woody Material (LWM) for Subwatershed 18 1

Stream	Reach #	Reach Length	# Small LWM	# Medium LWM	# Large LWM	# Med. + Large LWM/Mile	Minimum LWD/Mile PACFISH	Minimum LWD/Mile Forest Plan
Warble	1	.2	31.68	47.52	15.84	63.36	80	105
	2	.2	126.72	95.04	42.24	137.28	80	105
	3	.2	73.92	58.08	26.4	84.48	80	105
	4	.3	73.92	42.24	26.4	68.64	80	105
Salmon Trib	1	.3	68.64	36.96	10.56	47.52	80	105
Kelsey	1	.8	19.1	19.1	19.1	38.2	80	105
	2	.7	35.0	32.1	17.5	49.6	80	105
	3	1.2	330.8	140.6	95.7	236.3	80	105
	4	.4	--	--	--	--	80	105
	5	.7	89.0	53.0	25.4	78.4	80	105
	6	.8	152.9	85.8	51.5	137.3	80	105
	7	.9	72.8	60.6	62.4	123	80	105
	8	.4	69.8	31.5	31.5	63	80	105
Mule	1	1.1	95	62.8	20	82.8	80	105
	2	1.4	63.8	50.7	14	64.7	80	105
	3	.7	78.6	23.4	9.2	32.6	80	105
Wall 1992	1	.7	190.1	100.32	89.76	190.08	80	105
	2	1	3.69	21.12	21.12	42.24	80	105
	3	.4	47.52	47.52	47.52	95.04	80	105
	4	.6	79.2	15.84	5.28	21.12	80	105
	5	.8	21.12	21.12	10.56	31.68	80	105
	6	.3	126.72	79.2	21.12	100.32	80	105
	7	.2	89.76	58.08	63.36	121.44	80	105
	8	.4	47.52	31.68	10.56	42.24	80	105
	9	.8	179.52	5.28	0	5.28	80	105
	10	.1	52.8	10.56	21.12	31.68	80	105
	11	.02	--	--	--	--	80	105
18E301	1	.46	79.2	121.44	200.64	322.08	80	105
18E302	1	.2	142.56	205.92	100.32	306.24	80	105
	2	.25	5.28	5.28	15.84	21.12	80	105
18E303	1	.21	8.45	3.17	2.11	5.28	80	105
18F201301	1	.37	158.4	290.4	36.96	327.36	80	105
	2	.23	95.04	116.16	15.84	132	80	105
18F302	1	.7	110.88	100.32	84.48	184.8	80	105
	2	1.0	84.48	79.2	68.64	147.84	80	105
18F303	1	.22	179.52	0	0	0	80	105
Wall 1995	1	1.9	74.6	33.9	7.9	41.8	80	105
	2	2.4	34.6	24.6	5.0	29.6	80	105
	3	2	45.4	35.3	7.1	42.4	80	105
	4	1.7	29.5	12.7	1.2	13.9	80	105

Note: Small LWD is 12" DBH and 25' in length; Medium LWD is 24" DBH and 50' in length; Large LWD is 36" DBH and 50' in Length

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Instream Large Woody Material (LWM) for Mainstem Black Creek, Subwatershed 18 2 (1992 & 1995)

Stream	Reach #	Reach Length	# Small LWM	# Medium LWM	# Large LWM	# Med. + Large LWM/Mile	Minimum LWD/Mile PACFISH	Minimum LWD/Mile Forest Plan
Black 1992	1	1.8	10.2	6.6	3.6	10.2	80	105
	2	.1	3.6	0	0	0	80	105
	3	1.2	44	27.8	5.1	32.9	80	105
	4	.7	57.9	57.9	5.3	63.2	80	105
	5	1.2	105.9	78.7	9.3	88	80	105
	6	.5	92.7	54.4	6.0	60.4	80	105
	7	.5	59.5	24.0	0	24.0	80	105
	8	.5	30.2	24.5	0	24.5	80	105
	9	.4	--	--	--	--	80	105
	10	1.0	150.0	72.3	26.9	99.2	80	105
	11	.9	73.4	43.5	10.9	54.4	80	105
1995	12	1.7	29	11.9	3	14.9	80	105
	13	.9	53.4	54.5	14.2	68.7	80	105
	14	.6	42.1	39.0	4.7	43.7	80	105

Note: Small LWD is 12" DBH and 25' in length; Medium LWD is 24" DBH and 50' in length; Large LWD is 36" DBH and 50' in Length

Instream Large Woody Material (LWM) for Streams Located In Subwatershed 18 3

Stream	Reach #	Reach Length	# Small LWM	# Medium LWM	# Large LWM	# Med. + Large LWM/Mile	Minimum LWD/Mile PACFISH	Minimum LWD/Mile Forest Plan
Ranger	1	.6	75.8	100.5	20.1	120.6	80	105
	2	.6	34.7	37.2	7.4	44.6	80	105
	3	1.3	43.9	46.3	3.2	49.5	80	105
	4	.6	65.5	36.2	22.4	58.6	80	105
	5	Spirit Lake	--	--	--	--	--	--
Furnish	1	.7	137.28	132	137.28	269.28	80	105
	2	.5	31.68	15.84	36.96	52.8	80	105
	3	.4	21.12	31.68	15.84	47.52	80	105
	4	.3	68.64	73.92	21.12	95.04	80	105
	5	.5	36.96	36.96	21.12	58.08	80	105
	6	.3	79.2	47.52	21.12	68.64	80	105
	7	.1	31.68	21.12	15.84	36.96	80	105
	8	.6	79.2	105.6	42.24	147.84	80	105
	9	.4	84.48	100.32	21.12	121.44	80	105
	10	.2	216.48	79.2	21.12	100.32	80	105
	11	.2	63.36	73.92	5.28	79.2	80	105
	12	.2	95.04	36.96	0	36.96	80	105
	13	.2	31.68	31.68	10.56	42.24	80	105

Note: Small LWD is 12" DBH and 25' in length; Medium LWD is 24" DBH and 50' in length; Large LWD is 36" DBH and 50' in Length

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Physical Information for Mainstem Salmon Creek (1990 &1995)

Stream	Reach #	Reach Length (miles)	Valley Segment Type	Dominant Substrate	Subdominant Substrate	# Failures (Average Size)	# Failures (Average Size)	# Debris Jams
Salmon	1	2.24	1	RU	BO	FAIR	0	0
1990	2	.27	10	BO	RU	GOOD	0	0
	3	.13	4	BR	RU	FAIR	0	0
	4	.49	1	RU	CO	FAIR	3 (10X15)	0
	5	.13	3	BR	RU	FAIR	0	0
	6	.4	1	RU	CO	GOOD	0	0
	7	1.4	10	CO	RU	GOOD	0	0
	8	.34	10	LB	BO	GOOD	1 (100X40)	3
	9	1.11	3	LB	CO	GOOD	1 (20X15)	2
	10	2.66	10	RU	BO	GOOD	1 (30X50)	1

				Substrates							
				% SA	% GR	% CO	% BO	% BR			
1995	1	1.0	F4	6	43	43	8	0	GOOD	1 (30x10)	0
	2	1.1	M2	7	51	41	1	0	GOOD	0	0
	3	1.5	V4	7	45	41	5	2	GOOD	1	0
	4	2.2	V4	8	29	44	11	8	GOOD	5 (200x8)	1
	5	2.3	V4	17	21	41	10	10	GOOD	5 (125x15)	1
	6	.7	V3	22	19	23	20	16	EXCELLENT	0	0
	7	3.9	V4	10	22	57	11	8	GOOD	5 (175x20)	2
	8	1.7	V4	5	17	50	27	.6	GOOD	1	0
	9	3.6	V1	4	29	45	22	.8	GOOD	9 (75x15)	11
	10	1.8	V1	5	16	34	30	15	GOOD	0	1
	11	2.0	V1	3	32	41	23	.8	GOOD	1	6

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Physical Information for Streams Located in Subwatershed 18 1

Stream Name	Reach #	Reach Length (miles)	Valley Segment Type	Dominant Substrate	Subdominant Substrate	Channel Stability Rating	# Failures (Average Size)	# Debris Jams
Warble	1	.2	2	SA	CO	FAIR	--	1
	2	.2	2	RU	GR	FAIR	15X30	2
	3	.2	2	RU	BO	POOR	--	3
	4	.3	4	RU	CO/BO	POOR	3 LARGE	0
Salmon Trib	1	.3	4	BO	SA	FAIR	1 (70X30)	1
Kelsey	1	.8	6	SB	CO	FAIR	0	2
	2	.7	3	SB	CO	FAIR	2(30X15)	2
	3	1.2	6	CO	SB	POOR	5	4
	4	.4	6	SB	CO	FAIR	0	3
	5	.7	6	SB	LB	GOOD	0	0
	6	.8	6	CO	SB	FAIR	1(30X15)	3
	7	.9	8	CO	SB	FAIR	2(15X15)	4
	8	.4	8	CO	BR	FAIR	0	1
Trib 097	1	.1	8	CO	SB	GOOD	0	0
Trib 205	1	.1	8	CO	GR	GOOD	0	0
Trib 229	1	.1	8	GR	SA	FAIR	0	0
Trib 248	1	.1	8	GR	CO	FAIR	0	0
Trib 266	1	.1	8	GR	SA	FAIR	0	0
Trib 480	1	.1	8	GR	SA	GOOD	0	0
Trib 504	1	.1	8	SA	GR	FAIR	0	0
Trib 535	1	.1	8	GR	CO	GOOD	0	0
Trib 266 401	1	.1	8	BR	CO	GOOD	0	0
Trib 543	1	.1	8	LB	CO	FAIR	0	0
Trib 672	1	.1	8	GR	CO	FAIR	0	0
Trib 795	1	.1	8	SB	CO	FAIR	0	0
Trib 816	1	.1	8	SA	GR	--	--	--
Trib 900	1	.1	8	CO	GR	--	--	--
Trib 947	1	.1	8	SB	CO	--	--	--
Wall-1992	1	.7	5	BO	RU	FAIR		
	2	1.0	4	BO	RU	GOOD		
	3	.4	4	BO	RU	GOOD		
	4	.6	4	RU	BO	FAIR		
	5	.8	4	BO	LB	GOOD		
	6	.3	3	LB	BO	GOOD		
	7	.2	3	BO	BR	GOOD		
	8	.4	6	BO	CO	GOOD		
	9	.8	9	CO	GR	GOOD		
	10	.1	8	RU	BO	GOOD		
	11	.02	--	--	--	GOOD	0	0
18E301	1	.46	6	BR	CO	GOOD	0	0
18E302	1	.2	5	LB	CO	GOOD	0	3
	2	.25	6	SA	LB	GOOD	0	0
18E303	1	.21	8	CO	RU	GOOD	0	3
18E401	1	--	--	SA	SA	FAIR	0	0
18E402	1	--	--	SA	SA	FAIR	0	0
18E403	1	--	8	RU	CO	GOOD	0	0
18E404	1	--	8	RU	CO	FAIR	0	0
18F201301	1	.37	4	LB	BR	GOOD	0	0
	2	.23	4	RU	LB	GOOD	0	0
18F302	1	.7	6	RU	BO	GOOD	0	0
	2	1.0	9	SA	GR	GOOD	0	0
18F303	1	.22	9	SA	CO	GOOD	0	0
18F401	1	.04	8	RU	BO	GOOD	0	0
18F402	1	.04	8	RU	BO	GOOD	0	0
18F403	1	.04	8	RU	BO	GOOD	0	0
18F404	1	.04	8	RU	CO	GOOD	0	0
18F405	1	.04	8	--	--	GOOD	0	0
18F440	1	.04	8	RU	CO	GOOD	0	0
18F441	1	.04	8	GR	CO	GOOD	0	0

				Substrates							
				% SA	% GR	% CO	%BO	% BR			
Wall 1995	1	1.9	V1	7	26	36	30	1	GOOD	4 (32x9)	16
	2	2.4	V2	3	25	37	32	3	GOOD	13 (35x14)	12
	3	2	H2	2	15	26	29	28	GOOD	1 (14x3)	5
	4	1.7	M2	19	27	30	17	8	GOOD	2 (45x2)	8
Mule	1	1.1	H3	15	23	32	18	12	GOOD	0	6
	2	1.4	H3	14	27	32	17	10	GOOD	7 (16x6)	3
	3	.7	H3	18	32	34	16	1	GOOD	2 (16x4)	0

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Physical Information for Streams Located in Mainstem Black Creek, Subwatershed 18 2 (1992 & 1995)

Stream Name	Reach #	Reach Length (miles)	Valley Segment Type	Dominant Substrate	Subdominant Substrate	Channel Stability Rating	# Failures (Average Size)	# Debris Jams
Black	1	1.8	10	CO	GR	GOOD	2	2
1992	2	.1	10	CO	GR	GOOD	2	0
	3	1.2	10	CO	SB	FAIR	5 (100X20)	13
	4	.7	3	CO	GR/SB	GOOD	0	0
	5	1.2	5	CO	GR	FAIR	5 (100X50)	8
	6	.5	10	GR	CO	FAIR	5 (60X30)	4
	7	.5	10	GR	SA	GOOD	2 (30X10)	3
	8	.5	7	GR	CO	FAIR	0	2
	9	.4	7	SA	CO	FAIR	0	7+
	10	1.0	7	GR	SA	--	--	--
	11	.9	7	CO	SB	--	--	--

				Substrates							
				% SA	% GR	% CO	% BO	% BR			
1995	12	1.7	F6-E	24	45	27	4	0	FAIR	6	6+ many beaver dams
	13	.9	H1-A	13	34	38	16	.2	GOOD	3	10
	14	.6	H3-Aa+	11	20	25	21	23	GOOD	2	4

Physical Information for Streams Located in Subwatershed 18 3

Stream Name	Reach #	Reach Length (miles)	Valley Segment Type	Dominant Substrate	Subdominant Substrate	Channel Stability Rating	# Failures (Average Size)	# Debris Jams
Furnish	1	.7	2	BO	CO/RU	FAIR	0	7
	2	.5	3	RU	BO	FAIR	0	1
	3	.4	3	BO	RU	GOOD	1 (20X20)	1
	4	.3	10	RU	BO	FAIR	0	4
	5	.5	10	LB	RU	GOOD	0	2
	6	.3	10	RU	BO	FAIR	0	0
	7	.1	10	BO	RU	FAIR	0	0
	8	.6	10	RU	BO	GOOD	0	4
	9	.4	10	BO	CO	FAIR	0	3
	10	.2	10	BO	RU	GOOD	0	2
	11	.2	10	BO	CO/RU	FAIR	0	3
	12	.2	10	CO	RU	FAIR	0	3
	13	.2	8	BO	RU	FAIR	1 (30X40)	3

				Substrates							
				% SA	% GR	% CO	% BO	% BR			
Ranger	1	.6	V2	9	32	38	17	4	GOOD	0	7
	2	.6	V2	28	33	25	14	0	FAIR	0	9
	3	1.3	U3	12	32	36	15	5	FAIR	3 (20x4)	9
	4	.6	H2	28	19	15	23	14	FAIR	0	4
	5	Spirit Lake	--	--	--	--	--	--	--	--	--

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Biological Information About Species Located in the Riparian Area of Mainstem Salmon Creek (1990 & 1995)

Stream Name	Survey Date	Reach #	Seral Stage Inner	% Inner Riparian	Inner Riparian Species	Seral Stage Outer	% Outer Riparian	Outer Riparian Species	Water Temp. Deg. F (Time)	Fish Species	Amphib Species
Salmon	8/06/90	1	SS	46	HW/HX				64	ONCL,ONMY	
1990			ST	54	HA/HW					SUCKER,	
										LAMPREY	
		2	--						55		
		3	--						57		
		4	--						61		
		5	--						55		
		6	--						57		
		7	ST	100	HA/HW				55		
		8	--						61		
		9	ST	100	HA/CM				59		
		10	SP	46	HA/HW				61		
			ST	21	CF/HA						
			MT	33	CC/HA						
1995	7/24/95	1	SP	100	HA/HC				60 (1800)	ONCL, SCUL	
		2	ST	100	HA/HC				55 (1110)	SCKR, LAMP	
		3	SP	100	HA/HB				58 (1620)		
		4	SP	79	HA/HB	ST	100	CC.CD	--		
			ST	21	HA/HB						
		5	ST	100	HA/HB	LT	45	CD/CC	55 (1440)		
		6	ST	100	HA/HC	LT	100	CD/CC	50 (1015)		
		7	SS	7	HA/HC	ST	31	CD/CC	--		
			SP	93	HA/HB	LT	64	CD/CC			
		8	SP	100	HA/HV	LT	46	CD/CC	51 (1600)		
		9	SP	100	HA/HA	LT	96	CD/CC	52 (1600)		
						MT	4	CD/CH			
		10	SS	96	HV/HA	LT	100	CD/CH	--		
			SP	4	HA/HV						
		11	SS	95	HV/HA	ST	9	CC/CD	--	ONCL	
						LT	60	CD/CC			
						MT	31	CD/CC			

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Biological Information About Species Located in the Riparian Area of Subwatershed 18 1

Stream Name	Survey Date	Reach #	Seral Stage Inner	% Inner Riparian	Inner Riparian Species	Seral Stage Outer	% Outer Riparian	Outer Riparian Species	Water Temp. Deg. F (Time)	Fish Species	Amphib Species
Warble	8/23/90	1	ST	100	HA/CD						
		2	MT	100	HA/CD						
		3	--	--	--						
		4	MT	100	HA/CX						
Salmon Trib	9/5/90	1	--	--	--						
Kelsey	7/6/92	1	SP	100	HA/CC				54 (1140)	ONCL, SCUL	
		2	ST	100	HA/CD				54 (1330)	ONCL, SCUL	
		3	SP	50	HM/HA						
			MT	50	CD/CC						
		5	SP	100	CD/CH					ONCL, SCUL	
		6	ST	50	CH/CM				53 (1300)		
			LT	25	CD/CH				50 (0915)		
			MT	25	CH/CD				52 (1145)		
		7	MT	100	CD/CH						
		8	MT	100	CD/CH						
Trib 097	1992	1	MT								
Trib 205	1992	1	MT								
Trib 229	1992	1	MT								
Trib 248	1992	1	MT								
Trib 266	1992	1	MT								
Trib 480	1992	1	MT								
Trib 504	1992	1	MT								
Trib 535	1992	1	REPROD								
Trib 266 421	1992	1	MT								
Trib 543	1992	1	MT								
Trib 672	1992	1	MT								
Trib 795	1992	1	OG								
Trib 816	1992	1	OG								
Trib 900	1992	1	OG								
Trib 947	1992	1	OG								
Mule	10/24/95	1	GF	41	GF/HV	ST	61	CD/CC		ONCL	
			SP	55	HA/HV	LT	6	CC/CD			
						MT	33	CD/CC			
		2	GF	7	GF/GF	SP	51	CD/CC			ASTR
			SP	73	HW/HA	ST	7	CD/CF			GECO
						LT	31	CD/CH			
						MT	11	CH/CD			
		3	GF	33	GF/GF	SP	19	CF/CW	43 (1520)	SAFO	BUBO,
			SP	26	HV/GF	ST	25	CF/CD			TAGR
						LT	42	CD/CH			

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Biological Information About Species Located in the Riparian Area of Subwatershed 18 1 (Continued)

Stream Name	Survey Date	Reach #	Seral Stage Inner	% Inner Riparian	Inner Riparian Species	Seral Stage Outer	% Outer Riparian	Outer Riparian Species	Water Temp. Deg. F (Time)	Fish Species	Amphib Species
Wall1991	6/20/91	1	MT	100	HB/CD				48	ONMY, ONCL	
		2	SP	100	HP/CT				52	ONCL	DITE
		3	--	--	--				52		
		4	ST	100	HW/HV				52		
		5	MT	100	CC/CM				45		
		6	--	--	--				66		
		7	--	--	--				52	ONCL, SAFO	DITE
		8	SP	100	HX/HA				54	ONCL	DITE
		9	MT	100	HA/CF				48		
		10	--	--	--				48		
		11	--	--	--				48		
18E 301	7/2/91	1	MT						57		
18E 302	7/8/91	1	Buffer						50		
		2	Reprod						49		
18E 303	7/8/91	1	Reprod						48		
18E 401	6/28/91	1	OG						49		
18E 402	6/25/91	1	Second Growth						47		
18E 403	7/9/91	1	Reprod						57		
18E 404	7/9/91	1	Reprod						57		
18F 201 301	7/1/91	1	OG						50		
		2	MT						50		
18F 302	7/1/91	1	Hardwood						52		
		2	OG						48		
18F 303	6/27/91	1	Reprod						46		
18F 401	6/26/91	1	Reprod						48		
18F 402	6/29/91	1	Reprod						50		
18F 403	6/29/91	1	Buffer						30		
18F 404	6/26/91	1	Buffer						--		
18F 405	6/26/91	1	MT & Buffer						49		
18F 440	6/26/91	1	MT						48		
18F 441	6/26/91	1	MT						48		
Wall	9/26/95	1	SP	97	HB/HV	LT	36	CD/CH		ONCL	
		2	ST	3	HB/HV	MT	64	CC/CH			
			SS	5	HW/HV	SS	5	CD/CH	48 (1640)	ONCL	DITE
			SP	95	HV/HV	SP	10	CD/CH			
						ST	7	CD/CC			
						LT	40	CD/CC			
		3	SP	27	HA/HV	MT	36	CD/CC			DITE
						SP	27	CD/CH			
						LT	48	CC/CW			
		4	GF	27	GF/GF	MT	25	CH/CH		SAFO,	
			SP	59	HA/GF	SP	3	CF/CD		ONCL	
						ST	27	CF/CH			
						LT	22	CH/CD			
						MT	2	CH/CD			

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Biological Information About Species Located in the Riparian Area of Mainstem Black Creek, Subwatershed 18 2 (1992 & 1995)

Stream Name	Survey Date	Reach #	Seral Stage Inner	% Inner Riparian	Inner Riparian Species	Seral Stage Outer	% Outer Riparian	Outer Riparian Species	Water Temp. Deg. F (Time)	Fish Species	Amphib Species
Black	7/19/92	1	SP	80	HA/HB				51 (1030)		
			ST	20	CD/HA						
		2	--	--	--						
		3	SP	50	HA/HV						
			ST	50	CC/HA						
		4	SS	50	HB/CC						
			ST	50	HA/HV						
		5	SP,ST	20,60	HA/HA, CC/CD						
			LT	20	CH/CC						
		6	LT	100	CC/CC						
		7	--	--	--						
		8	SP	100	HV/CC						
					HX/HA						
		9	--	--	--						
		10	SS	40	HX/HA					ONCL	THSI
			SP	60	HA/HX					SCUL	
		11	ST	100	HA/CC						
					HX/HX						
	8/21/95	12	SP	90	HA/HX	SP,ST	12,4	CD/HV CD/HV	49 (1540)	ONCL	
			DT	10	HA/HX	LT,MT	5,13	CD/HV CD/CC	47 (1530)		
		13	GF	12	GF/GF	SP,ST	13,18	CC/CD CC/CD	45 (1530)	ONCL, SCUL	BUBO
			SP	80	HV/GF	LT,MT	8,61	CC/CD CD/CH			
		14	GF	17	GF/GF	LT	100	CD/CH			
			SP	19	HB/HV						

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

Biological Information About Species Located in the Riparian Area of Subwatershed 18 3

Stream Name	Survey Date	Reach #	Seral Stage Inner	% Inner Riparian	Inner Riparian Species	Seral Stage Outer	% Outer Riparian	Outer Riparian Species	Water Temp. Deg. F (Time)	Fish Species	Amphib Species
Ranger	7/24/95	1	SP	100	HV/HV	LT	42	CH/CD		ONCL	ASTR
						MT	58	CD/CH			
		2	SP	100	HV/HV	LT	11	CD/CH	54 (1645)		
						MT	89	CD/CH			
		3	GF,SP	40,53	GF/GF	SS,ST	2,8	CD/CF, CH/CD			RACA
					HV/CH	LT,MT	68,22	CH/CD, CD/CH			
		4	GF,SP	22,55	GF/HV	SS	45	CD/CF	62 (1545)	SAFO	DITE, TAGR
					HV/CH	LT	25	CF/CH			
						MT	31	CD/CH			
		5	Spirit Lake	--	--	--	--	--	--	--	TAGR
Furnish	8/7/90	1	ST	100	CM/CX				52		
		2	--	--	--				48		
		3	--	--	--				52		
		4	ST	64	HV/CM				48		
			MT	36	CX/HB						
		5	--	--	--				48		
		6	SP	20	HA/HV/CX				46		
			MT	80	CH/HX						
		7	--	--	--				48	ONCL	
		8	MT	100	CX/HG				45		
		9	MT	100	HA/CM				48		
		10	ST	100	CW/CX				45		
		11	MT	100	CH/CX				45	ONCL	
		12	MT	100	CH/CX				48	ONCL	
		13	MT	100	CX/CH				50		

Wolman Pebble Counts (1995)

Salmon Creek Wolman Pebble Count

Reach Number	D50 (mm)	D84 (mm)	Dominant Substrate	Subdominant Substrate
1	72 (100)	195 (220)	CO	GR
2	57 (82)	130 (170)	GR	CO
3	100 (63)	220 (200)	CO	GR
4	100 (70)	300 (175)	CO	GR
5	40 (100)	120 (280)	CO	GR
6	80 (110)	600 (510)	CO	GR
7	50 (53)	120 (130)	CO	GR
8	100 (62)	300 (300)	CO	GR
9	110 (120)	320 (310)	CO	GR
10	110 (125)	1000 (420)	CO	GR
11	175 (160)	600 (680)	CO	GR

Upper Black Creek Wolman Pebble Count

Reach Number	D50 (mm)	D84 (mm)
11	<.2 (73)	24 (160)
12	32 (140)	170 (210)
13	200 (115)	820 (500)

Ranger Creek Wolman Pebble Count

Reach Number	D50 (mm)	D84 (mm)
1	105 (240)	290 (600)
2	66 (70)	205 (165)
3	70 (55)	220 (300)
4	23 (60)	390 (195)

Wall Creek Wolman Pebble Count

Reach Number	D50 (mm)	D84 (mm)
1	150 (80)	300 (446)
2	160 (230)	1050 (800)
3	375 (1024)	>4096 (bedrock)
4	80 (28)	172 (145)

Mule Creek Wolman Pebble Count

Reach Number	D50 (mm)	D84 (mm)
1	135	620
2	490	>4096 (bedrock)
3	85 (2)	355 (96)

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

High Lakes Stocking Records

Stocking Record for Zircon Lake (ODFW)

Year	Species	Number	Year	Species	Number
1949	RB	1,380	1971	BT	1,140
1952	RB	2,090	1975	BT	600
1953	RB	2,897	1976	BT	400
1954	RB	2,990	1978	BT	403
1955	RB	960	1980	BT	498
1956	RB	1,120	1983	BT	510
1958	RB	1,025	1987	BT	543
1963	RB	1,950	1991	BT	518
1965	BT	836	1993	RB	506
1967	BT	855	1994	RB	480
1969	BT	880			

Stocking Record for Lower Salmon Lake (ODFW)

Year	Species	Number	Year	Species	Number
1949	BT	1,900	1966	RB	1,934
1955	RB	1,250	1967	RB	2,080
1956	RB	1,976	1969	RB	2,530
1957	RB	1,650	1971	BT	1,900
1958	RB	1,544	1972	CT	2,000
1959	RB	1,560	1974	RB	1,200
1960	RB	1,560	1975	CT	1,190
1961	RB	1,474	1982	BT	1,000
1962	RB	360	1985	CT	1,560
1963	RB	1,560	1989	RB	800
1964	RB	1,920	1995	RB	480
1965	RB	2,020	1995	CT	750

Stocking Record for Spirit Lake (ODFW)

Year	Species	Number	Year	Species	Number
1947	BT	2,250	1965	BT	2,200
1949	BT	10,000	1967	BT	2,420
1950	BT	8,730	1968	BT	2,550
1951	BT	5,950	1969	BT	2,420
1952	BT	7,522	1970	BT	2,700
1953	BT	4,400	1971	BT	2,660
1954	BT	4,250	1972	BT	2,560
1955	BT	4,540	1974	RB	1,800
1956	BT	5,250	1975	BT	1,484
1957	BT	4,945	1977	BT	1,432
1960	BT	2,464	1978	BT	1,398
1961	BT	2,750	1979	BT	1,422
1962	BT	2,310	1982	BT	1,200

Stocking Record for Fig Lake (ODFW)

Year	Species	Number	Year	Species	Number
1954	BT	974	1981	BT	398
1957	BT	1075	1983	CT	534
1959	BT	1067	1987	BT	868
1962	BT	990	1990	CT	412
1965	BT	1050	1992	CT	400
1968	BT	1020	1995	CT	563
1971	BT	1140	1996	CT	400
1975	BT	600			
1977	BT	537			
1979	BT	474			

Stocking Record for Blair Lake (ODFW)

Year	Species	Number	Year	Species	Number
1939	BT	14,000	1970	BT	3,510
1947	BT	5,130	1971	RB	1,620
1949	BT	15,200	1972	BT	3,520
1950	BT	15,740	1973	RB	1,605
1951	BT	5,950	1975	BT	3,250
1952	BT	4,867	1976	BT	3,200
1953	BT	4,400	1977	RB	938
1954	BT	4,870	1977	BT	1,074
1955	BT	4,540	1978	RB	960
1956	BT	4,900	1978	BT	1,001
1957	BT	4,945	1979	RB	1,040
1958	BT	5,040	1979	BT	1,008
1959	BT	3,540	1981	BT	1,935
1960	BT	3,520	1982	BT	3,000
1961	BT	3,230	1983	CT	2,992[A]
1963	BT	3,960	1983	BT	2,000
1964	BT	3,920	1984	CT	3,196[A]
1965	BT	3,300	1985	CT	5,160[B]
1966	BT	3,630	1988	RB	3,510
1968	BT	3,570	1990	RB	830
1969	RB	1,650			

[A] Long Tom R., OR strain
[B] Montana high lks strain

Stocking Record for Photo Lake (ODFW)

Year	Species	Number	Year	Species	Number
1954	BT	1,461	1976	RB	185
1956	BT	1,400	1976	BT	400
1958	BT	1,512	1978	RB	197
1960	BT	2,070	1978	BT	403
1962	BT	2,990	1979	RB	210
1964	BT	2,170	1979	BT	414
1966	BT	1,980	1980	CT	860
1968	BT	2,040	1983	BT	816
1970	BT	2,160	1987	CT	438
1971	BT	760	1990	BT	631
1974	RB	720	1992	CT	600
1975	RB	245	1995	RB	600
1975	BT	400			

Historical Fish Stocking Upper Salmon Lake (ODFW)

Year	Species	Number	Year	Species	Number
1938	RB	5,000	1953	BT	5,060
1941	BT	8,000	1955	RB	1,250
1946	RB	14,820	1956	RB	1,976
1949	BT	2,580	1957	RB	1,650
1953	RB	5,794			

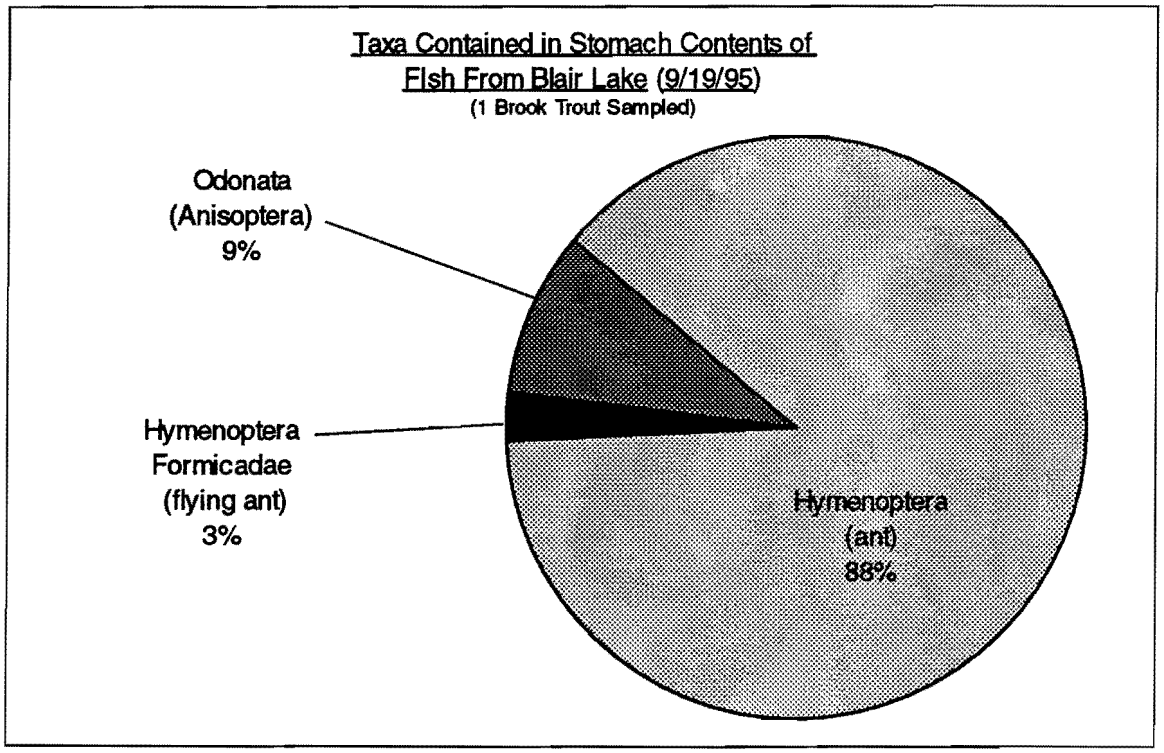
AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

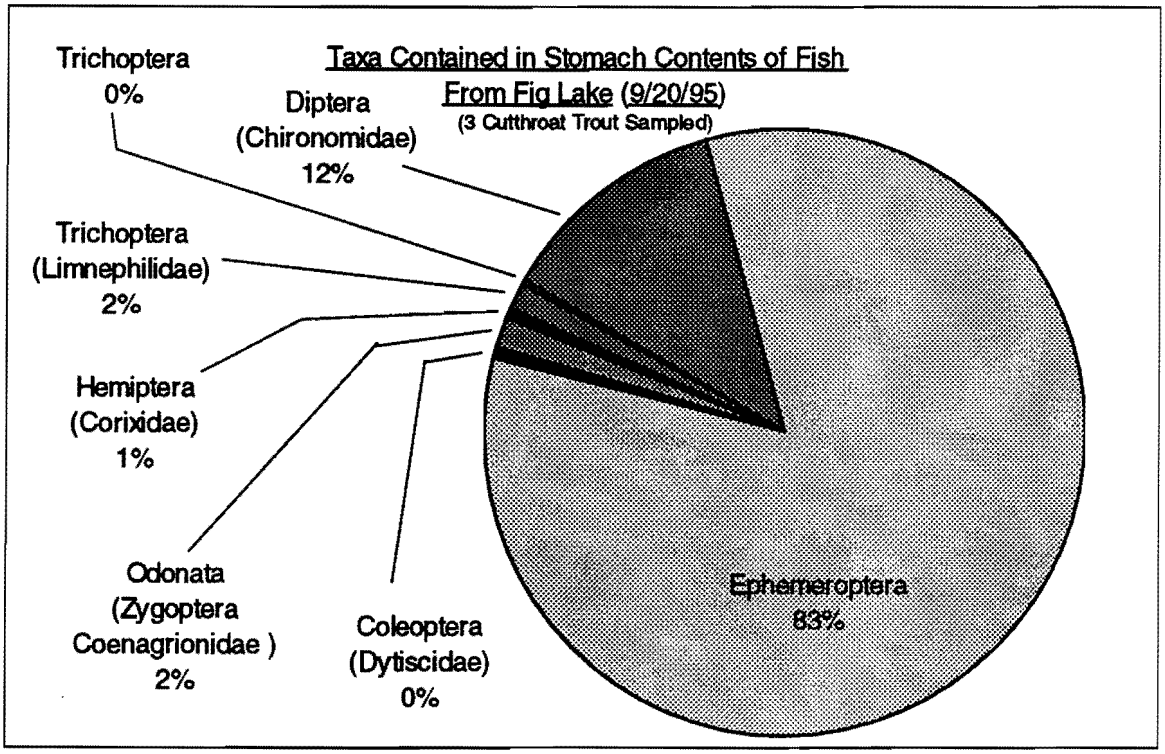
High Lakes Stomach Contents

Lake	Date	Fish #	Taxa	Stage	Number
Blair	9/11/95	F001	Hymenoptera (ant)	A	3
			Hymenoptera Formicadae (flying ant)	A	97
			Odonata (Anisoptera)	L	10
Fig	9/20/95	F001	Coleoptera (Dytiscidae)	A	2
			Hemiptera (Corixidae)		3
			Hymenoptera (yellow jacket)	A	1
			Odonata (Zygoptera Coenagrionidae)	L	8
			Trichoptera	A	1
		F002	Diptera (Chironomidae)	L	81
			Ephemeroptera	L	120
			Hemiptera (Corixidae)		1
			Odonata (Zygoptera Coenagrionidae)	L	3
			Trichoptera (Limnephilidae)	L	6
		F003	Ephemeroptera	L	420
			Trichoptera (Limnephilidae)	L	4
			Reabsorbed eggs		
Photo	34962	F001	Diptera (Chironomidae)	L	4
			Ephemeroptera	L	9
Salmon, U	34961	F00A	Diptera (Chironomidae)	L	2
			Megaloptera (Sialidae sialis)	L	12
			Pelycypoda (Sphaeridae)		23
			Reabsorbed Eggs		
		F00B	Megaloptera (Sialidae sialis)	L	11
			Pelycypoda (Sphaeridae)		2
			Trichoptera (Limnephilidae)	L	1
		F001	Megaloptera (Sialidae sialis)	L	6
			Pelycypoda (Sphaeridae)		4
		F002	Megaloptera (Sialidae sialis)	L	3
			Pelycypoda (Sphaeridae)		4
		F003	Trichoptera (Limnephilidae)	L	1
			Unidentified	Emerg. L	5
		F004	Pelycypoda (Sphaeridae)		1
			Odonata (Anisoptera)	A	1
Spirit (stream)	9/7/95	F001	Coleoptera (terrestrial)	A	1
			Ephemeroptera	L	1
			Trichoptera (Limnephilidae)	L	1
Spirit	9/7/95	F002	Ephemeroptera	L	1
			Odonata (Anisoptera libellulidae)	L	3
			Odonata (Zygoptera coenagrimidea)	L	2
			Trichoptera	L	1
		F003	Ephemeroptera	L	2
			Hymenoptera (yellow jacket)	A	1
			Odonata (Zygoptera coenagrimidea)	L	1
			Trichoptera	A	2
			Trichoptera (Limnephilidae)	L	2
		F004	None		
		F005	Amphipoda		1
			Coleoptera (terrestrial)	A	1
		F006	Diptera (Chironomidae)	L	4
			Megaloptera (Sialidae sialis)	L	2
			Odonata (Anisoptera libellulidae)	L	1
			Pelycypoda (Sphaeridae)		1
			Trichoptera (Limnephilidae)	L	4

AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

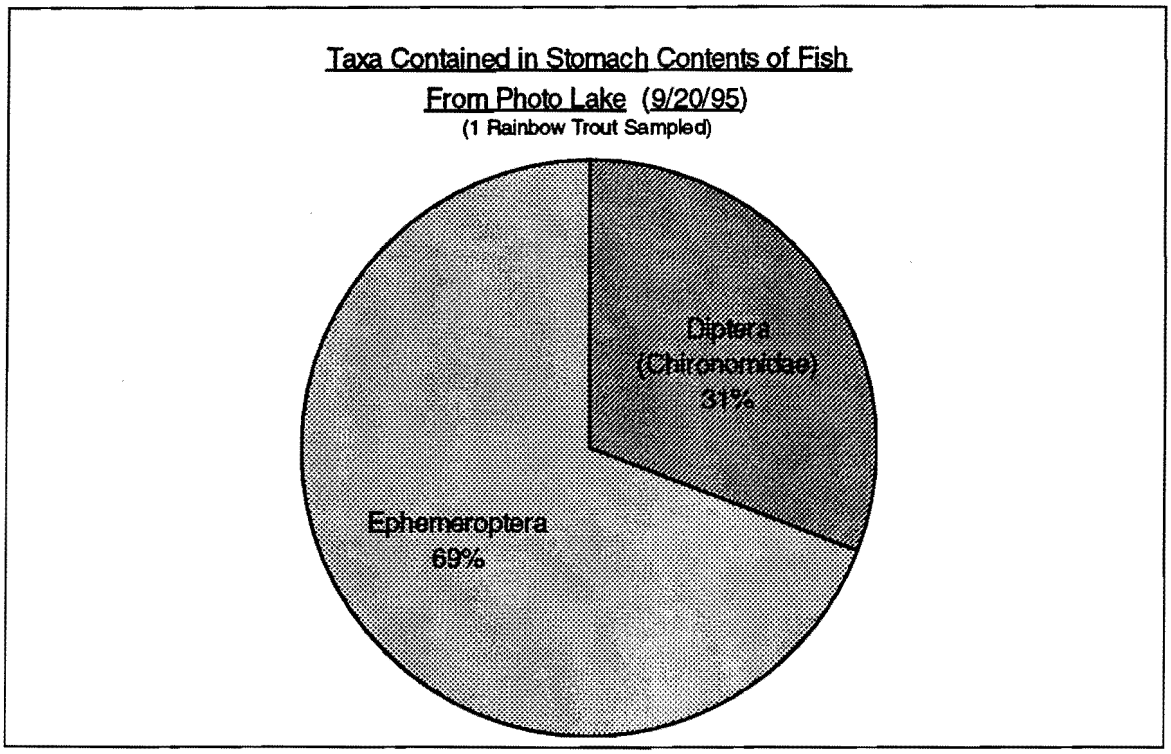
High Lakes Stomach Contents Pie Charts

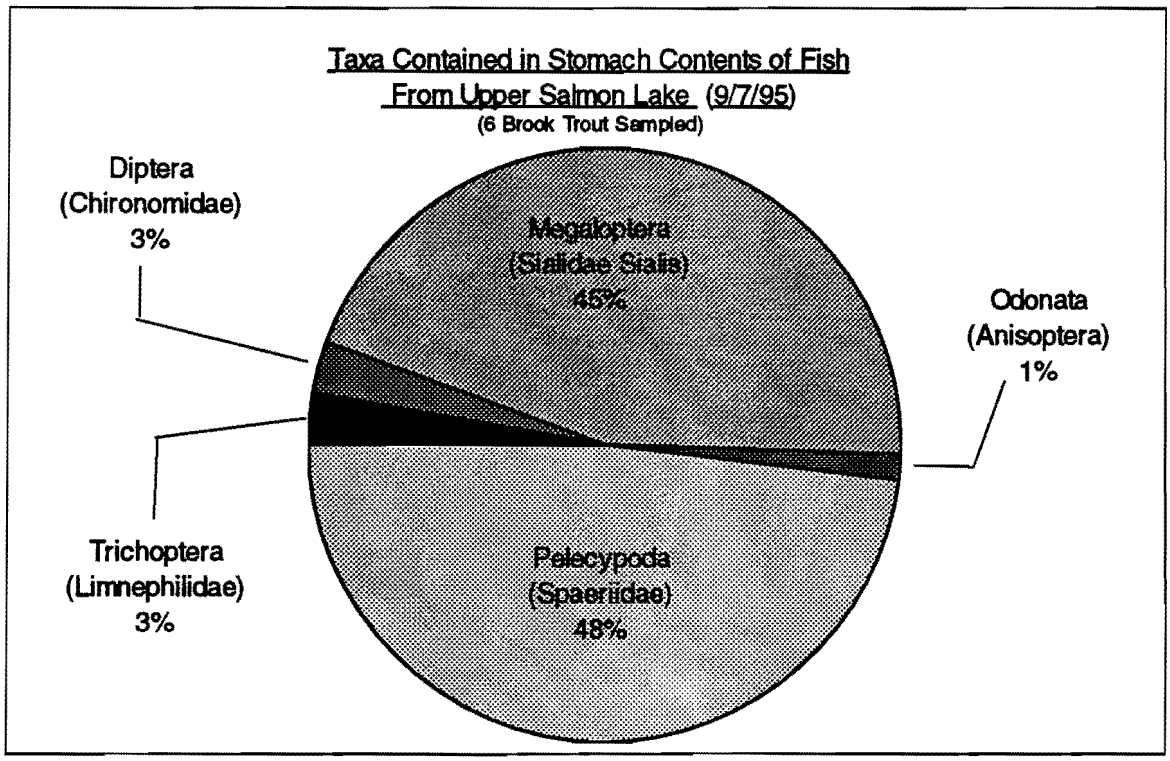




AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

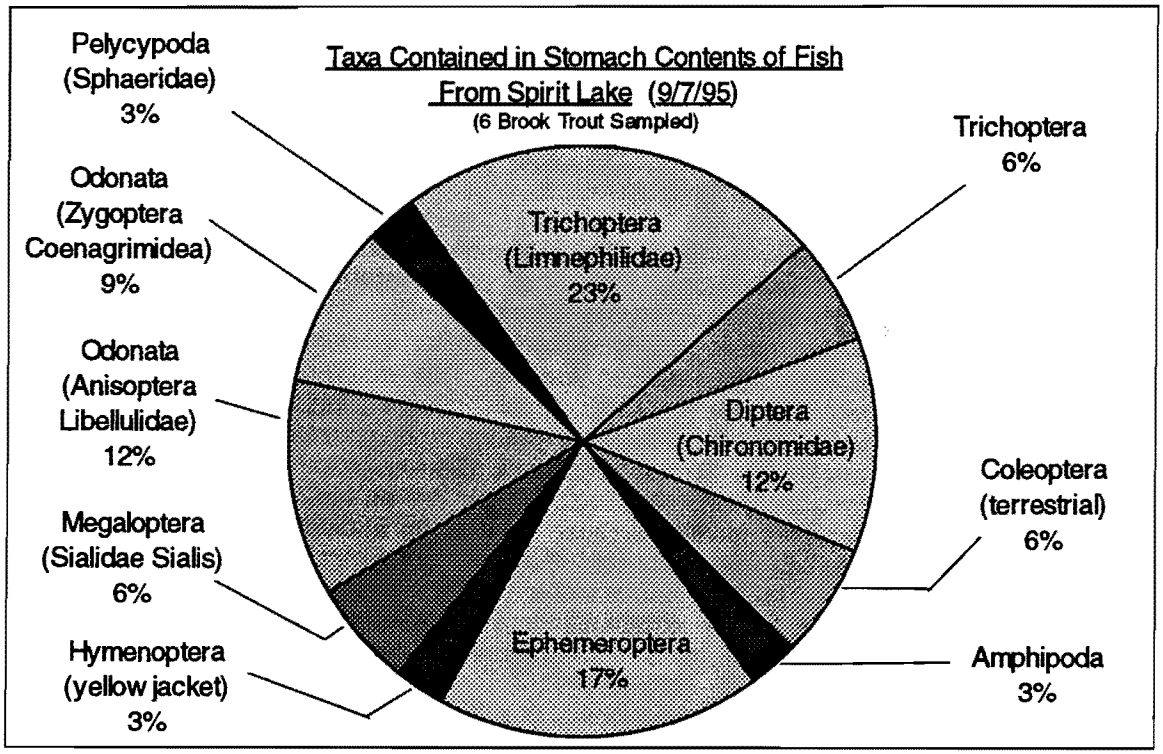
High Lakes Stomach Contents Pie Charts





AQUATIC HABITAT AND SPECIES LISTS (CONTINUED)

High Lakes Stomach Contents Pie Charts



APPENDIX F: BOTANICAL RESOURCES

POTENTIAL SENSITIVE PLANT HABITATS

The Regional Forester designates a list of species for which they and their habitat is managed by the Region's Sensitive Species Program in order to prevent a need for federal listing at a future date. Sensitive species are those that are vulnerable due to low population levels or have significant threats to their habitat (USFS, R-6 FSM). Known population locations are on the Oakridge Geogographical Information System (GIS) and population information is contained in an associated advanced revelation (ADREV) database. Sensitive plant surveys which are done in the watershed are generally associated with proposed management activities (timber sales and other projects).

There are no currently listed sensitive plant populations documented within the watershed.

Many plant species are known to be "fire-followers" as evidenced by documentation of occurrence after fire events, however, much is not yet known about the maintenance of plant/animal/fire evolutional relationships. A current sensitive plant species, the Woodland milkvetch (*Astragalus umbraticus*), and a former sensitive species, branching montia (*Montia diffusa*), are fire followers as well as being responsive to other disturbances which create openings, such as logging. The woodland milkvetch has recently been documented in the Warner Creek Fire area in the Salt Creek Drainage (Dimling/McMahan, 1993), and is the northernmost documented range for this species. It prefers open canopies, and was noted to follow moderate intensity burn patches for the Warner populations (Dimling/McMahan, 1993). Branching montia was discovered growing very profusely after the Shady Beach fire on the Rigdon District in 1988 in plant succession ecology plots. Branching montia was also found in the Baby Rock fire area on the Oakridge District (McCabe, 1993). This pattern of occurrence influenced the downlisting of the species from sensitive to a forest Watch List species. It is likely the woodland milkvetch could follow suite and eventually be dropped off the forest sensitive list in view of recently documented occurrences. The woodland milkvetch and the branching montia could potentially occur in the watershed.

The following table lists habitat in the watershed where sensitive plants may potentially be found.

Habitat	Species	Habitat	Species
Mesic meadows	*Agoseris elata*	Moist woods	*Botrychium minganense*
	Calamagrostis breweri		*Botrychium monatum*
	Delphinium oreganum		*Cimicifuga elata*
	Frasera umpquaensis		*Huperzia occidentalis*
	Gentiana newberryi		*Poa laxiflora*
	Sisyrinchium sarmentosum		
		Dry meadows/ open woods	*Agoseris elata*
Wet meadows/Bogs	*Carex livida*		*Allium campanulatum*
	Lycopodiella inudata		*Astragalus umbraticus*
	Ophioglossum pusillum		*Frasera umpquaensis*
	Oxypolis occidentalis		*Hiercacium bolanderi*
	Scheuchzeria palustris		
		Rocky outcrops/ cliff crevices	*Asplenium septentrionale*
Ponds	*Utricularia minor*		*Pellaea andromedaefolia*
	Wolffia columbiana		*Polystichum californicum*
Riparian	*Botrychium minganense*	Rocky slopes/Scree	*Arnica viscosa*
	Botrychium monatum		*Aster gormanii*
	Calamagrostis breweri		*Campanula scabrella*
	Huperzia occidentalis		*Lewisia columbiana var. clumbiana*
	Cimicifuga elata		*Romanzoffia thompsonii*
	Poa laxiflora		
	Sisyrichium sarmentosum		

(Note: under the currently proposed NFMA rule, 25 of the 28 sensitive species, including Thompson's mistmaiden, would be dropped from the Willamette NF Sensitive Species list.)

RARE AND UNIQUE PLANTS

Sensitive and other rare plants, including survey and manage species, whether they are occurring at the edge of their range, disjunct, regional endemics and/or those found only in unique habitats are important contributors to the overall diversity of landscapes; some may be genetically diverse (adapted to marginal conditions), and therefore necessary genotypes to maintain the species in the advent of environmental change. It is crucial to prevent the need to list these species by accounting for them in appropriate management actions.

Additional rare plant species of concern occur in the watershed, of which some, like most sensitive plants, are found within non-forested special habitats. Others occur in forested habitats. five species that are listed on the WNF Watch and Concern Lists are located within the watershed. These species are usually located and tracked along with sensitive plant inventories and other botanical inventories conducted in Wilderness, Special Interest Areas, and other non-timber allocation areas.

Rare and Unique Plants in the Salmon Creek Watershed

Watch List Species:	Occurrence
Erigeron cascadensis	Bunchgrass
Dulichium arundinaceum	FS road 1931
Montia diffusa	Baby Rock
Species Of Special Concern:	**Occurrence**
Isoates sp.	Spirit Lake

The Cascade daisy (*Erigeron cascadensis*) inhabits rock outcrops in high subalpine mountain peaks and is confined to bedrock and Scree microsites. Quillworts (*Isoates spp.*) are aquatic to terrestrial spore-bearing plants, found on wet ground to wholly submerged in deep water. Dulichium (*Dulichium arundinaceum*) is a member of the sedge family, and is found in marshes and wet meadows in the lower mountain elevations. The branching montia (*Montia diffusa*), a formerly on the sensitive list, is found in moist places. This species was delisted due to the discovery of it's being found growing profusely following major fire events.

SURVEY AND MANAGE SPECIES: FUNGI, BRYOPHYTES, LICHENS, & VASCULAR PLANTS

The ROD for the Management of Habitat for Late-Successional and Old-growth Forest Related Species within the Range of the Northern Spotted Owl (USDA and USDI, 1994a) contains management direction and standards and guideline provisions for survey and manage plant and animal species generally associated with late-successional and/or riparian forests (Table C-3 list in the ROD). Ecological goals of the S&G's is to maintain late-successional and old-growth habitat and ecosystems on federal lands and to maintain biological diversity associated with native species and ecosystems in accordance with laws and regulations. Late-successional species habitat in the watershed has declined due to extensive harvest of old-growth stands and associated road building. The current old-growth in the watershed, compared to reference conditions, has been highly fragmented. Many survey and manage species have limited dispersal capabilities, thus in fragmented habitat areas geneflow may be restricted between populations. Single species planting after harvest in riparian forests along with adjacent upland stands has contributed to a simplification of species richness in plant communities.

Survey and manage species have not yet been systematically inventoried in Region 6. The Regional Ecosystem Office (REO) is due to release C-3 species survey protocols in 1996. Location information was sent out in June of 1995. Existing biological and ecological information is minimal for most of these species. However, it is reasonable to assume that if systematic surveys were conducted for old-growth dependent species a much larger number would be found in the watershed.

Survey and Manage measures from the ROD (USDA, USDI, 1994a) which apply forestwide, regardless of allocation, are as follows:

Survey strategy 1: manage known sites
- Provisions must be made for these sites for activities implemented in 1995 and later. Survey strategies 1 and 2 are the responsibility of the National Forests.

Survey strategy 2: survey prior to activities and manage sites.
- For these species, activities implemented in 1999 or later must have completed surveys.

Survey strategy 3: conduct extensive surveys to find high priority sites for species management.

Survey strategy 4: conduct general regional surveys.
- Survey strategies 3 and 4 are more general and must be underway by 1996. These strategies are to be conducted at the regional level. Each species was rated during the analysis for the EIS and is designated certain survey strategy(ies) to follow, depending on the rarity of the species, potential threats, and numerous other factors.

Survey and Manage Species Occurring in the Watershed:

Species	Survey Strategy	Status
Vascular plants:		
Allotropa virgata	1,2	Numerous sites
Nitrogen fixing lichens:		
Lobaria oregana	4	Districtwide
Lobaria pulmonaria	4	Districtwide
False Truffles:		
Rhizopogon abietis	3	Waldo Wilderness
R. truncatus	3	
Rare false truffle:		
Rhizopogon evadens var. subalpinus	1,3	Waldo Wilderness
Mushrooms:		
Cantharellus cibarius	3,4	second growth stands
C.subalbidus	3,4	upper elevation areas

Discussion of groups: The following biological and ecological information regarding survey and manage species is taken from USDA, USDI, 1994a; USDA, USDI, 1994b; USDA et al., 1993.

Fungi-

Fungi have critical roles in forested systems, contributing to nutrient cycling and changes in structural and species diversity, which in turn provides habitat for other plant and animal organisms. Mycorrhizal fungi play an important role in transferring nutrients to vascular plants. Fungal fruiting bodies, mushrooms, conks and truffles, are an important food source to small mammals; some are important for their food or medicinal value in the special forest products industry. The rare false truffle, *Rhizopogon evadens var. subalpinus*, is found in the Waldo Lake Wilderness in mid-upper elevations near the timberline, and is ectomycorrhizal with mountain hemlock, fir and pine species. It is disjunct from Mt. Rainier to N. California. The two False truffles, *R. abietis* and *R. truncatus*, both are found in mixed conifer stands, in relatively high elevations, in moderately dry sites, associated with Doug fir, pine, true fir, and mountain hemlock. *R. abietis* ranges from Oregon to California in the Cascades. *R. truncatus* ranges from Oregon to Washington in the Cascades. The Waldo Wilderness and Torrey-Charlton RNA areas are good examples of the fungal diversity and richness in the watershed. Chantrelles (*C. cibarius* and *C. subalbidus* are both sought after as choice edibles. Golden chantrelles are not uncommon in second growth Douglas-fir stands. A mushroom study is currently underway in the Flat Walk Young Stand Study Project on Christy Flats for *C. cibarius*.

Bryophytes, Hornworts, Liverworts & Mosses-

Bryophytes, the hornworts, liverworts and mosses are small, non-green, non-vascular spore-bearing plants of highly diverse habitats from deserts to coastal shores. Like many late-successional dependent species, most bryophytes do not become established until at least 100 years, becoming well developed in much older stands (400 years) and in riparian areas on hardwoods. Like lichens, they are important to nutrient cycling, accumulate air pollutants, contribute to soil structure and stability, and are food and habitat for vertebrates and invertebrates. The traditional harvest of mosses and liverworts for floral arrangement material is a serious concern for long-term sustainability of bryophyte species and their connection to ecological processes.

Lichens-

Lichens occur on many kinds of specific substrates and habitats, either growing on trees as draping or matting epiphytes, imbedded into rocks, on exposed soil in a leaf-like form, in stream splash zones, or on decaying wood. Many lichens are critical for nitrogen-fixation, some are used for air-quality biomonitors. Many lichens are important forage, nesting material and camouflage for birds and mammals, and habitat and food for invertebrates. Forest development causes a succession of lichen species, which can grow slowly over time compared to other organisms. Late-successional lichens become established with increasing successional stabilization, which may take over 200 years, some old-growth dependent species do not become established until 500 years or so, when the ecological continuity of mature tress enable them to persist. As most lichens use vegetative propagules rather than spores as a means of dispersal, their dispersal range is relatively short. They have long been harvested as Special Forest Products for medicinal, floral, and dye-making uses.

Lobaria pulmonaria and *L.. oregana* are found forest-wide in old-growth stands, and are not uncommon in the watershed.

Vascular Plants

Two plants, Candystick (*Allotropa virgata*) and Hemlock dwarf mistletoe (*Arceuthobium tsugense* occur in the Salmon Creek watershed. Candystick grows in deep humus, in association with coarse woody debris, in dry, well-drained soils, primarily in old-growth Douglas-fir forests in the Salmon Creek watershed, though this species is also found in pole and mature stands. It is a non-green mycotrophic plant that may not flower or emerge from the soil every year, instead lying dormant underground. Fire suppression, fragmentation of habitat, and reduction of large decaying logs are contributing factors to declining occurrences of this species. Candystick is slow to establish and its minute seeds have a short survival span. It does not tolerate competition well and is never abundant. Repeated thinning and shorter rotations are considered detrimental, resulting in increased competition, reduced coarse woody debris, and mechanical disturbance to the ground.

NOXIOUS WEEDS AND OTHER NON-NATIVE INVASIVE PLANT SPECIES

Non-native plant species play a significant role in influencing changes to native plant communities. Many noxious weed species and other non-native invasive plants are found in the watershed. Many of these species are firmly established and have been for some time now, and some are currently increasing in their rate of spread largely due to logging and road building practices over the long term assisting in the establishment of dispersal pathways and mechanisms.

Those non-native plant species legally designated as noxious, mean "any weed designated by the Oregon State Weed Board that is injurious to public health, agriculture, recreation, wildlife, or any public or private property" (ODA Noxious Weed Policy and Classification System, 1995). Several detrimental effects are included as the basis for criteria for rating and classifying weeds as noxious, one being "a plant species that is or has the potential of endangering native flora and fauna by its encroachment in forest and conservation areas" (ODA, 1995). Most northwest weeds are originally native to Europe or Asia and were introduced intentionally or by accident. Noxious weeds and other invasive non-natives have the potential to alter native plant communities as they are able to displace and outcompete native species. They are opportunists with broad ecological tolerances, can grow under a wide range of climatic and soil conditions, and have excellent reproductive capabilities (Taylor, 1990).

The Willamette NF initiated the Integrated Weed Management Plan (WNF IWMP) in 1993 (USDA, 1993a). The standards and guidelines in the forest plan directs us to identify and analyze noxious weed sites for the most effective control methods based on site-specific analysis of populations. The highest priority species

for treatment are new invader species that are in the early stages of invasion and have not naturalized to the point that resource damage is occurring. New invaders are of biological concern in the watershed because of their potential to move from road systems in established sites into natural non-forested openings where they could outcompete natives. Control of new invaders may include hand-pulling, mechanical mowing or chemical application depending upon the characteristics of the site, closeness of water and/or human uses. Established infestations are weed species populations that have spread to the point that eradication is impossible and resource damage is unacceptable. Due to the sheer degree of infestations, control methods are generally limited to biocontrol agents, which involve the use of insects that naturally feed upon that plant and its seeds, affecting the vigor and reproduction abilities of the targeted weed.

Noxious weeds are classified on the Willamette NF as potential invader, new invader, or established species in the WNF IWMP. The following table lists the documented noxious weeds, potential noxious invaders, and several noted invasive non-natives:

Common Name	Scientific Name	Classification
rough pigweed	*Amaranthus retroflexus*	none
cheatgrass	*Bromus tectorum*	none
butterfly bush	*Buddljea*	none, present
spotted knapweed	*Centaurea maculosa*	new, established
meadow knapweed	*Centaurea pratense*	new, established
ox-eye daisy	*Chrysanthemum leucanthemum*	none
Canada thistle	*Cirsium arvense*	established
bull thistle	*Cirsium vulgare*	established
hedgehog dogtail	*Cynosurus echinatus*	none
wild carrot	*Daucus carota*	none, present
teasal	*Dipsacus sylvestris*	none
English ivy	*Hedera helix*	none, potential
St. John's-wort	*Hypericum perforatum*	established
spotted cat's-ear	*Hypochaeris radicata*	none
wall lettuce	*Lactuca muralis*	none
nipplewort	*Lapsana communis*	none
everlasting peavine	*Lathyrus latifolius*	none
rose campion	*Lychnis coronaria*	none
purple loosestrife	*Lythrum salicaria*	potential
coast tarweed	*Madia sativa*	none
canary reedgrass	*Phalaris arundinacea*	none, potential
plantian	*Plantango lanceolata*	none
Giant knotweed	*Polygonum sachalinense*	potential
heal-all	*Prunella vulgaris*	none
red sorrel	*Rumex acetosella*	none
curly dock	*Rumex crispus*	none
Himalaya blackberry	*Rubus discolor*	none
evergreen blackberry	*Rubus lacinatus*	none
tansy ragwort	*Scenecio jacobaea*	established
spiny sowthistle	*Sonchus asper*	none
dandelion	*Taraxacum officianle*	none
mullein	*Verbascum*	none, present
periwinkle	*Vinca major*	none, potential

Invasion and Establishment of non-native plants in the watershed are a serious threat to native plant diversity. The WNF Integrated Weed and Management Environmental Analysis lists 7 site types where potential occurs to harbor noxious weeds already established on the forest and potential invader weeds. All of these site types are found within the watershed. Site types range from bare, rocky, gravely ground such as road beds, quarries, etc., to floristically diverse areas such as meadows, sensitive plant sites, wetlands, etc., (see the EA for full descriptions).

Roadside inventories on the Oakridge Ranger District of noxious weeds were conducted by the ODA in 1988 and again in 1993. The results of these inventories have shown that some noxious weed species have increased in an alarming rate of spread. For instance, scotch broom was calculated to have infested an

additional 35% of sections and increased the number of roads infested to 51% (Glen Miller, personal communication).

Major forest roads and other corridors, such as right-of-way clearances, serve as noxious weed dispersal pathways and establishment sites. Timber sale units, associated roads and landing sites, trails, and other disturbed openings have seral conditions which typically support weed populations. Other spread mechanisms in the watershed include bird and mammal seed dispersal and weed seed contamination of forage and erosion control seeding mixes.

Scotch broom (*Cytisus scoparius*) is abundant in the lower elevation reaches of the watershed, particularly on river banks, gravel bars, roadsides, and other areas where past ground disturbance has resulted in openings. It competes with young conifers in plantations. This species is eventually outcompeted, due to lack of sunlight. A biocontrol agent, the seed feeding weevil (*Apion fuscirostre*), has been used on scotch broom since the 1980's and releases will be continued. Isolated targets will be emphasized in future releases. Scotch broom is a designated target or "T" weed, a selected weed that is included in an annual list of species the ODA develops to prioritize those species considered to be an economic threat to the State of Oregon and receive more intensive control treatments.

Spotted knapweed (*C. maculosa*) has 2 significant documented sites within the watershed. These are small roadside populations that were sprayed with herbicide in 1996 by the Oregon Department of Agriculture as part of their noxious weed control program. This species has also been given priority status as a target weed for established population control work and slowing population spread on the forest. It has been moving eastwards over the Cascade Crest through major travel routes and is considered a major threat to native biodiversity (USDA, 1993a). Several types of biocontrol agents are being considered for use in the spotted knapweed control program.

Bull and Canada thistle (*C. vulgare* and *C. arvense*) are commonly found in timber sale clear cuts, landings, roadside sites and other areas with prior ground disturbance and open canopies in the watershed. These weeds are also found in meadow communities. These are early seral species and eventually become shaded out with canopy closure, therefore are of low risk to forested interiors. Galls formed by the fly larvae of *Urophora stylata* are presently being used on bull thistle to reduce flower head formation to prevent seed dispersal.

Tansy ragwort (*Senecio jacobea*) is widely established west of the Cascades in Oregon and is moving east over the crest of the Cascades (USDA, 1993a). Tansy ragwort is well established in the watershed. Twenty-one significant roadside tansy populations were identified during the 1993 weed survey. Biocontrol agents have been in use on the district since late 1970s to control tansy densities and are still currently being released. The root-eating flea beetle (*Longitarsus jacobaea*), was last released on rosettes on several tansy populations within the watershed in winter 1995. Several sites, notably on FS Road 1912, contained already established flea beetle populations on plant rosettes. The Cinnabar moth (*Tyria jacobaeae*) was first released in Western Oregon in the 1960's to combat tansy ragwort. The moth was not tested thoroughly enough to determine plant host specificity (this testing and release of bio-control agents is accomplished by the APHIS, a section of the Federal Dept. of Agriculture) (MF WA, 1995). The Cinnabar moth was released on tansy ragwort populations to cause defoliation. Cinnabar moth defoliation damage to related native sencecio species such as arrow-leaf groundsel (*S. Triangularis*) has recently been of concern on the Rigdon District, where moderate impacts on the plant has been identified (MF WA, 1995). However, the cinnabar moth does not fare well during cold, wet spells, and eventually will disappear from the system (Glen Miller, pers. comm.). Informal tracking of such damage is now emphasized during SHAB surveys. Tansy ragwort has been included on the latest 1995 "T" list for future priority control work.

St. John's-wort (*Hypericum perforatum*) is an aggressive pioneer species which poses a threat to plant communities in dry and mesic meadow openings by displacing native forb and grass species via underground spread and seed set (USDA, 1993a). These areas often contain natural soil disturbers such as groundhogs and mountain beavers, who provide conditions where this pioneer weed thrives. It has become a common roadside noxious weed in the watershed. It is now found in most natural meadows on the district.

Weed competition is openly occurring with desirable native plant species in reforestation project areas, wildlife use areas (including small wetlands and river floodplains) and it has also been noted that some weeds are extending into natural dry/moist meadow openings and rock garden communities. In many

areas, non-desirable weed species are excluding other desirable plants to the point of forming dense weed patches and thickets. The non-native invasive Himalaya and evergreen blackberries (*Rubus discolor* and *R. lacinatus*) flourish in floodplain sites and form monocultures which often extend underneath the canopy. Blackberries are currently and have long been a formidable presence in lower elevation river flats on the district and their potential rate of spread in the watershed is of concern. They are of particular concern because there are currently no biological controls available to use on blackberries and they have the potential to directly compete with the sensitive plant, tall bugbane, by occupying the same habitat (S. Santiam WA, 1995). They have not been systematically surveyed on the forest, but are now a priority for informal tracking of new infestations and rate of spread. Blackberries have also been found at higher elevations (up to 4,000 feet) at several locations in the watershed, in moist ground along roadsides and in openings. Their vigor is noticeably less higher up due to harsher site conditions. Ox-eye daisy *(C. leucanthemum)*, another weed of concern for informal tracking, has become a common site along roads, in disturbed forest openings and meadows. It forms dense colonies and could move up into higher elevation reaches, invading meadows and reducing native plant diversity in them. This could be of special concern in wilderness and other special areas of botanical and wildlife interest. Sweet pea (*Lathyrus latifolius*), another potential species of concern, has been noted to occur along lower elevation roadsides on the Lowell Ranger District and the Oakridge District. It could potentially spread farther into the watershed. A noxious weed currently on the Forest's potential invader list meriting concern to watershed plant and wildlife values is purple loosestrife (*Lythrum salicaria*). Purple loosestrife is found in extremely wet habitats. It is currently invading the state of Oregon and is becoming established in the Willamette Valley. Wetland biodiversity in the watershed could potentially be seriously disrupted and wildlife habitat decreased by this very aggressive species. Prolific spread of purple loosestrife is accomplished by seed set (up to 3 million per plant annually) lasting several years, waterborne seed transport, and sprouting by fragmentation of plant parts and roots (ODA, 1995). No occurrence of this weed has yet been documented in the Willamette, however it is expected to eventually make its way into the forest (Glen Miller, pers. comm.). Giant knotweed (*Polygonum sachalinense*) is another potential invader of concern. Two populations have recently been noted on the Rigdon District (E. Everett, pers. comm.) and is found elsewhere in the Cascades. This species was introduced into the Coast Range to stabilize stream banks and is now widespread there in riparian areas (MF WA, 1995). Canary reedgrass (*Phalaris arundinacea*) is suspected to be present in the watershed. This grass is a very effective and widespread invader and has the potential to spread into upper elevations and wilderness areas. It is currently in use; propagated and dispersed for revegetation purposes (E. Everett, personal communication).

Non-native plant species have been introduced into Oregon since European settlers began bringing them into the state for uses such as ornamentals and herbal medicines. Many noxious weeds species were garden escapees or contaminants brought in inadvertently from shipping goods from overseas or overland. Scotch broom was introduced as an ornamental shrub and erosion control agent in the 1920s. The advent of logging forest land and building roads produced an abundant increase in noxious weeds and invasive non-natives since the 1930s, when many noxious weeds would have been considered newly invading species. Livestock grazing on forest land utilized on-site forage and initially did not contribute as much towards non-native invasion as did logging practices, but sheep grazing in non-forested openings likely brought in St. John's-wort and other non-native grass and forb species.

APPENDIX G: RIPARIAN THINNING ANALYSIS

On August 12, 1996 Al Johnson (hydrologist), Eric Ornberg (planner/silviculturist), Dede Steele (wildlife biologist), Tim Bailey (planner/silviculturist), and Mike Jenson (forester) met to determine whether thinning young managed stands within riparian reserves is needed to achieve Aquatic Conservation Strategy Objectives (ROD, page B-11) and if so, to develop prescriptions for these stands that are typically 35 to 45 years old and created by past harvest.

We were especially interested in these questions as most young managed stands contain riparian reserves as prescribed by the Northwest Forest Plan. We wanted to come to a common understanding as to whether it was appropriate and desirable to thin within riparian reserves (especially in regards to Willamette National Forest Land and Resource Management Plan MA 15-07 and FW-103) and if so, how thinning prescriptions should differ between riparian zones and Matrix and other adjacent lands.

Based upon typical age, densities, and general condition of these young stands, we feel it is appropriate to implement some thinning in riparian reserves. In consideration of our desire to minimize the number of harvest entries, therefore minimizing the amount of soil and residual tree disturbance, and the objective to increase within-stand structural diversity, we determined that some amount of thinning within young, managed riparian reserve stands is desirable and in many cases essential to achieve Aquatic Conservation Strategy objectives. We also determined that there should be no thinning within 50 feet of perennial channel edges or within 10 to 25 feet of intermittent streams or their inner gorge. This should maintain or improve current water temperatures, provide for a constant high level of fine organic material input, maintain existing rooting strength, and avoid the possibility of channel edge disturbance. We also recognized that often times the conifers immediately adjacent to the stream channels are not particularly dense due to the greater diversity of tree and shrub species in riparian environments, so there is often a lesser need to thin to promote diversity or to generate larger conifer stems near channel edges.

Recognizing that we want to assure (for both aquatic and terrestrial habitat long-term objectives) these stands will contain large-diameter dominant trees in the future, we believe thinning at some level is necessary within dense young stands in the riparian reserve. To reduce changes in microclimate however, we initially suggested that riparian reserve thinning be less intensive than what would be prescribed for Matrix and other adjacent lands.

Perennial Streams: The critical factor for these streams is shading and stream temperature since the Willamette National Forest Land and Resource Management Plan (MA 15-07) mandates trout stream temperatures be reduced in this watershed. Our discussion centered upon whether and how much the canopy within the zone of temperature influence could be reduced without significantly affecting stream temperatures.

Intermittent Streams: Stream stability is the critical factor. Shading is not as important since these streams are often dry during critical high heat period.

Recommendations-

With these qualifications, our recommendations for thinning in riparian reserves for the Salmon Creek watershed are as follows:

- No thinning should occur within 50 feet of any perennial stream channel (class I, II, or III).
- No thinning should occur within 10 to 25 feet of the edge of the inner gorge, or if there is no inner gorge, then within 10 to 25 feet of the channel, on any intermittent stream (class IV).
- The portion of the riparian reserve from the edge of the unthinned area to the edge of the riparian reserve should be thinned to a lesser degree than Matrix and other adjacent lands. Riparian reserves should be thinned to a canopy closure of no less than 25 percent on average, or to an average spacing between dominant conifers of 20 feet (110 TPA).
- The no harvest areas immediately adjacent to perennial channels could be narrower than 50 feet if site specific conditions indicate a need (i.e. very dense, stagnated stands), but will be no narrower than 20 feet. This situation is not expected to occur very often.

- Precommercial thinning could occur even closer to stream channels than above if the stand is dense. Serious consideration should be given to a fairly wide precommercial spacing in riparian zones to establish fast diameter growth early on in the hope of avoiding the need to commercially thin later when a change in microclimate and damage to understory vegetation could be of concern.

- Wetlands and special habitats less than one acre should be protected with a no-harvest buffer at least 50 foot wide and thinned the same as prescribed for Matrix and other adjacent lands in the remainder of the riparian reserve. In special situations where there is a need identified, this no-harvest buffer could be greater or a two-level thinning prescription could be implemented. In any case, such areas should be treated in accordance with the Forest Plan.

Advantages-
We identified the following advantages to thinning at a reduced spacing (compared to thinning prescriptions for Matrix and other adjacent lands) in the riparian reserves, while leaving a no-cut area adjacent to the channel:

- It would better buffer microclimate changes (temperature of air, soil, water; humidity; solar radiation; etc.) in the unthinned area immediately adjacent to the channels.

- The amount of crown damage and resultant microclimate changes and periods of crown closure recovery would be less than expected from a heavy thinning.

- There would be less potential for damage to understory layers near stream channels.

- It might provide better currently available dispersal habitat and more immediately effective dispersal corridors.

- It would provide for greater overall within-stand structural and species diversity.

- The reduced spacing prescription would leave more options for wildlife tree/large woody debris management, i.e. more trees would be available for falling or girdling without additional microclimate impacts or without causing the stands to become understocked.

- It would provide stand conditions with less potential for losses from windthrow.

Disadvantages-
We identified the following disadvantages of thinning the riparian reserves to a potentially lesser spacing than adjacent lands:

- There would be a reduced rate of diameter growth in the riparian reserve as compared to Matrix and other adjacent lands. This could result in a stand within the riparian reserve which has noticeably smaller dominant tree diameters as compared to Matrix and other adjacent areas in the future (50 to 100 years). There would also be a slower development of typical late-successional characteristics, such as deep crowns and establishment of a shade tolerant conifer understory.

The above stated advantages of thinning riparian reserves to a lesser spacing are more numerous than the disadvantages but it should be noted that the disadvantage of creating riparian stands with diameters smaller than the stands as a whole as the result of a different thinning prescriptions is of some concern. It should also be noted that many of the advantages are only short-term advantages and the disadvantage of slower relative diameter growth and longer establishment time for a shade tolerant understory is a long-term disadvantage. Potential micro-climate changes resulting from a heavier thinning might not last much longer than a decade, possibly less. That not withstanding, we have still opted to take a conservative approach in the short-term effects and have recommended that riparian reserves be thinned to leave a somewhat greater leave tree density to avoid potential excessive changes in micro-climate and general stand disturbance.

It should be kept in mind that growth rates for stands thinned as we suggest should be monitored and modeled, including a projection of diameter growth for the thinning prescriptions proposed. If we begin to see a trend indicating that riparian stands in decades hence may be of considerably smaller diameter than

adjacent upland stands such that we may not be able to produce stems of sufficient size to fully meet aquatic conservation strategy objectives within a reasonable period of time, we should then reconsider this conservative approach to thinning within riparian reserves.

How Thinning In Riparian Reserves Relates To The Northwest Forest Plan Aquatic Conservation Strategy Objectives

This discussion focuses on proposed thinning of young managed stands (from 25 to 50 years of age) created by past clearcut harvest. This past harvest did not treat riparian zones differently than upslope areas and the stands are more or less homogenous across the slope. As of this writing most of the stands in this age range contain moderate to large amounts of large woody debris in and near stream channels as well as in upland areas but they contain essentially no large residual trees or snags. Most of these young stands were planted almost exclusively with Douglas-fir, though other species have naturally established to a greater or lesser extent. These stands were densely planted and those proposed for thinning are quite dense, often to the extent that tree mortality is currently occurring, or soon will, and understory ground vegetation is sparse to non-existent. Thinning is proposed in the riparian portion of these managed stands generally to create a stand more diverse structurally and biologically, and to assure that riparian stands have comparable stem size distribution and understory composition as adjacent thinned upland stands. How thinning specifically affects the nine Aquatic Conservation Strategy Objectives presented on page B-11 of the Northwest Forest Plan follows below:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to assure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Thinning will help to better achieve this objective. Thinning is proposed in these young stands to provide for a more diverse riparian and terrestrial stand by opening up the canopy somewhat such that shade tolerant conifers and ground vegetation can become established or to provide for the more vigorous growth of that which already exists. Thinning will also provide for greater long-term structural diversity by generating larger stem diameters, overall greater variation in stem sizes, a structurally more complex dominant tree crown (deeper, with thicker branches) and future sources of appropriately large snags and down woody material. If these dense, young stands are not thinned there will be, to a large extent, a detrimental impact on aquatic and terrestrial populations and communities in the long-run as these stands may take a very long time to generate large stem calipers and late-successional habitat conditions in general if they remain at their current densities.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian dependent species.

Thinning will not affect the connectivity these recovering riparian stands now provide. While there may be some short-term negative effects in terms of micro-climate changes by reducing the current crown coverage, or in terms of branches and trees tops creating barriers to animal movement, there is an overall benefit in creating more structurally complex habitat for animals to travel through in the future.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks and bottom configurations.

Yarding systems and harvest prescriptions would be designed to protect and maintain channel stability in all cases including intermittent stream channels. Riparian areas within 10 to 50 feet of stream channels would generally not be thinned. Trees to be removed will not be transported across stream channels unless an analysis shows that additional road construction needed to avoid yarding across streams would be more harmful than a narrow skyline corridor through the riparian area. Skyline yarding corridors across stream channels would be minimized, however where analysis determined that yarding across a stream channel could be accomplished while protecting streambanks and channels, stream crossing corridors would be allowed. Logs would be fully suspended above intermittent and perennial stream channels unless analysis determined yarding could be accomplished while maintaining objectives for protection streambanks and channels.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
Thinning would have a neutral effect on water quality in the short run. In the long run it may have a slightly beneficial effect as thinning will speed up the creation of large stems, some of which will eventually fall into the streams to provide for more stable channels. Retention of all trees within 50 feet of perennial stream channels will provide for shade to maintain cool stream temperatures during critical summer months.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate and character of sediment input, storage and transport.
See the above discussion; thinning will have neutral effect on sediment regimes as long as road construction effects are balanced with the desire to minimize yarding across stream channels. Thinning would enhance development of course woody material which when incorporated into stream channels has beneficial effects on storage and routing of sediment. No harvest areas adjacent to stream channels will reduce the potential for stream bank erosion.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.
Thinning will have a neutral effect on in-stream flows. Though thinning would reduce the amount of evapotranspiration in riparian zones and adjacent uplands, this effect would be very temporary; there would not be long-term change in the amount of leaf area supported by these sites. To a large extent thinning can be thought of as an activity that re-structures, rather than reduces, the vegetation occurring on a site. Thinning would also have a long-term positive effect on sediment, nutrient, and wood routing as discussed in objectives 4. and 5. above.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.
Thinning will have a neutral effect on the timing and variability of floodplain inundation and wetland water table levels, similar to the effects on in-stream flows as discussed above.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration to supply amount and distributions of coarse woody debris sufficient to sustain physical complexity and stability.
Thinning is proposed in riparian stands primarily to better accomplish this strategic objective. Thinning will modify the species composition of these stands to more closely approximate the composition of stands occurring in these riparian areas prior to the regeneration harvest. Reducing the density of these stands will provide for growth of large tree boles which will ultimately have a number of positive effects on channel stability and complexity, as well as general stand structural diversity. Thinning will provide for the establishment and growth of understory vegetation which will provide for greater structural a diversity and for better thermal regulation and nutrient filtering. Thinning will have a neutral effect on surface and bank erosion. Thinning, through the eventual generation of larger in-channel woody debris, could influence future channel migration but the introduction of larger woody debris could also enhance channel stability.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian species.
The young, previously managed stands proposed for thinning do not currently comprise late-successional habitat. One of the primary objectives of this proposed thinning is to make these dense, young stands more diverse from a structural and species composition perspective. Thinning will ultimately produce a more structurally diverse stand which will provide for development of more diverse plant and animal communities.

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