

**STUDY REPORT W&AR-04
SPAWNING GRAVEL IN THE LOWER TUOLUMNE RIVER**

ATTACHMENT B

**CURRENT AND HISTORICAL RIFFLE MESOHABITAT AREAS
AND SPAWNING GRAVEL AREAS WITHIN RIFFLES**

Table B-1. Historical and current riffle mesohabitats and spawning gravel areas within riffles.

Reach	Riffle ID before 2012	2012 Riffle ID	RM (2012 Centroid)	Estimated Historical Spawning Area (ft ²)	1988 Riffle Area (ft ²)	2001		2012		Change in Riffle Area					
						Riffle Area (ft ²)	Spawning Habitat Area (ft ²)	Riffle Area (ft ²)	Spawning Gravel Area in Riffles (ft ²)	1988 to 2001		1988 to 2012		2001 to 2012	
										ft ²	%	ft ²	%	ft ²	%
La Grange Dam to Basso Bridge	RA1	--	--		7,603	not surveyed	not surveyed	not surveyed	not surveyed	not surveyed		not surveyed		not surveyed	
	RA2	--	--		2,965	3,989	not surveyed	not surveyed	not surveyed	1,024		not surveyed		not surveyed	
	RA3/4	4 FW Riffle	51.9		22,475	11,762	3,702	78,200	38,804	-10,713		55,725		66,438	
	RA7A/RA7B	11 FW Riffle	51.0		7,596	33,099	16,740	77,046	74,090	25,503		69,450		43,947	
	R1A	14 BC Riffle	50.6		92,257	23,559	31,989	122,751	117,859	-68,698		30,494		99,192	
	R1B	18 BC Riffle	50.4		27,269	19,735	13,150	32,468	30,596	-7,534		5,199		12,733	
	R2	21 FW Riffle	50.0		86,867	103,766	76,072	77,528	63,348	16,899		-9,339		-26,238	
	R3A	--	--		38,268	15,622	7,076	0	0	-22,646		-38,268		-15,622	
	R3B	25 BC Riffle	49.5		44,135	77,606	70,137	62,923	60,699	33,471		18,788		-14,683	
	R3C	27 FW Riffle	49.2		0	0	0	18,171	15,468	0		18,171		18,171	
	R4A	30 FW Riffle	49.1		125,523	94,827	57,821	120,956	114,769	-30,696		-4,567		26,129	
	R4B	33 FW Riffle	48.5		178,077	171,421	108,810	165,171	155,935	-6,656		-12,906		-6,250	
	R5A	36 BC Riffle	48.3		64,395	31,773	18,140	24,545	24,008	-32,622		-39,850		-7,228	
	R5B	38 BC Riffle	48.1		9,167	19,407	6,936	13,651	13,651	10,240		4,484		-5,756	
	RA5A	--	--		16,277	0	0	0	0	-16,277		-16,277		0	
RA5B	--	--		8,336	0	0	0	0	-8,336		-8,336		0		
RA6	--	--		10,147	0	0	0	0	-10,147		-10,147		0		
Subtotal				660,000	741,357	606,566	410,573	793,411	709,226	-134,791	-18	52,054	7	186,845	31
Basso Bridge to Turlock Lake State Recreation Area	R6	--	--		26,050	0	0	0	0	-26,050		-26,050		0	
	R7	41 BC Riffle	47.2		67,747	76,643	34,489	71,449	68,536	8,896		3,702		-5,194	
	R8	43 FW Riffle	47.0		22,023	8,536	5,449	31,425	30,414	-13,487		9,402		22,889	
	R9	46 FW Riffle	46.8		34,862	0	0	35,455	26,942	-34,862		593		35,455	
	R10	--	--		7,458	0	0	0	0	-7,458		-7,458		0	
	R11	--	--		23,206	0	0	0	0	-23,206		-23,206		0	
	R12	--	--		5,959	52,321	12,627	0	0	46,362		-5,959		-52,321	
	R13A	54 BC Riffle	46.0		10,551	10,116	779	64,960	55,788	-435		54,409		54,844	
	R13B	57 BC Riffle	45.9		10,151	6,494	3,103	103,128	96,122	-3,657		92,977		96,634	
	R13C	61 BC Riffle	45.7		12,283	6,335	1,357	49,521	38,773	-5,948		37,238		43,186	
	R14	70 BC Riffle	45.2		9,478	7,847	1,064	28,938	20,526	-1,631		19,460		21,091	
	R15/16	72 BC Riffle	45.0		26,598	24,167	4,456	75,252	47,953	-2,431		48,654		51,085	
	R16A	--	--		0	0	0	14,114	10,295	0		14,114		14,114	
	R17A/17B	81 BC Riffle	44.7		15,703	14,099	2,502	32,021	23,334	-1,604		16,318		17,922	
	R17C	--	--		18,315	0	0	0	0	-18,315		-18,315		0	
	R17D	--	--		2,072	0	0	0	0	-2,072		-2,072		0	
	R18	--	--		17,421	12,129	2,181	0	0	-5,292		-17,421		-12,129	
	R19	--	--		9,736	0	0	0	0	-9,736		-9,736		0	
	R20	89 BC Riffle	43.5		19,203	26,321	1,766	30,933	22,310	7,118		11,730		4,612	
	R21	91 BC Riffle	43.1		5,974	18,900	2,469	19,602	16,373	12,926		13,628		702	
R22	94 BC Riffle	43.0		4,037	17,978	2,954	12,010	11,183	13,941		7,973		-5,968		
R23A	96 BC Riffle	42.8		6,933	12,110	1,016	10,363	7,851	5,177		3,430		-1,747		
R23B	--	--		9,091	4,693	612	0	0	-4,398		-9,091		-4,693		
R23C	102 BC Riffle	42.4		14,088	18,062	3,454	71,015	57,206	3,974		56,927		52,953		
R23D	107 BC Riffle	42.2		22,698	36,229	7,627	54,441	37,954	13,531		31,743		18,212		
R24	109 BC Riffle	41.9		18,175	20,935	11,348	40,175	29,689	2,760		22,000		19,240		
Subtotal				936,000	419,812	373,915	99,253	744,803	601,250	-45,897	-11	324,991	77	370,888	99

Reach	Riffle ID before 2012	2012 Riffle ID	RM (2012 Centroid)	Estimated Historical Spawning Area (ft ²)	1988 Riffle Area (ft ²)	2001		2012		Change in Riffle Area					
						Riffle Area (ft ²)	Spawning Habitat Area (ft ²)	Riffle Area (ft ²)	Spawning Gravel Area in Riffles (ft ²)	1988 to 2001		1988 to 2012		2001 to 2012	
										ft ²	%	ft ²	%	ft ²	%
Turlock Lake State Recreation Area to Santa Fe Aggregates Bridge	R25	--	--		18,785	19,104	0	0	0	319		-18,785		-19,104	
	R26	116 BC Riffle	41.1		21,214	26,726	7,246	25,918	19,520	5,512		4,704		-808	
	R27	--	--		4,003	6,747	518	0	0	2,744		-4,003		-6,747	
	R28A	120 BC Riffle	40.4		29,887	15,126	0	131,352	126,474	-14,761		101,465		116,226	
	R28B	--	--		0	--	--	0	0	--		0		--	
	R28C	124 BC Riffle	39.6		10,381	11,795	9,060	30,866	28,817	1,414		20,485		19,071	
	R29	285 BC Riffle	39.3		43,994	9,421	5,262	6,806	6,786	-34,573		-37,188		-2,615	
	R29A	126 BC Riffle	39.1		0	--	--	36,449	36,186	--		36,449		--	
	R30A	--	--		11,268	8,772	4,158	0	0	-2,496		-11,268		-8,772	
	R30B	128 FW Riffle	38.7		13,496	8,311	2,757	13,813	13,475	-5,185		317		5,502	
	R30C	132 FW Riffle	38.4		21,326	0	0	9,215	9,176	-21,326		-12,111		9,215	
	R31	135 BC Riffle	38.3		25,033	32,902	13,692	60,636	45,119	7,869		35,603		27,734	
	R32	--	--		3,628	6,605	6,605	0	0	2,977		-3,628		-6,605	
	R33	140 BC Riffle	37.9		29,472	13,934	25,662	36,258	36,089	-15,538		6,786		22,324	
	R34A	144 BC Riffle	37.7		16,667	8,704	10,823	42,122	42,122	-7,963		25,455		33,418	
	R34B	--	--		8,005	0	0	0	0	-8,005		-8,005		0	
	R34C	146 BC Riffle	37.5		0	--	--	24,624	24,624	--		24,624		--	
R35A/B	148 BC Riffle	37.3		66,792	94,316	38,686	63,383	62,688	27,524		-3,409		-30,933		
R36A	156 BC Riffle	36.9		34,954	44,690	1,910	37,938	36,182	9,736		2,984		-6,752		
R36B	158 BC Riffle	36.7		53,974	17,312	--	13,961	13,904	-36,662		-40,013		-3,351		
Subtotal				801,000	412,879	324,465	126,379	533,342	501,162	-88,414	-21	120,463	29	208,877	64
Santa Fe Aggregates Bridge to RM 23.6	R36C	160 BC Riffle	36.5		0			14,322	14,309						
	R37	162 BC Riffle	36.4		25,207			30,224	27,731			5,017			
	R38	165 FW Riffle	35.7		26,316			47,890	37,627			21,574			
	R39	--	--		12,972			0	0			-12,972			
	R40	--	--		22,801			0	0			-22,801			
	R41A	167 BC Riffle	35.3		62,483			49,475	44,029			-13,008			
	R41B	172 BC Riffle	35.1		3,739			13,278	13,278			9,539			
	R42	--	--		55,941			0	0			-55,941			
	R43	175 BC Riffle	34.8		7,758			27,174	21,135			19,416			
	R43A	182 BC Riffle	34.3		0			32,441	32,429			32,441			
	R44/R45	185 BC Riffle	34.2		45,643			55,649	54,462			10,006			
	R46	187 BC Riffle	34.0		23,414			77,766	67,286			54,352			
	R47	--	--		20,095			0	0			-20,095			
	R48A	190 BC Riffle	33.8		6,968			34,998	31,455			28,030			
	R48B	194 BC Riffle	33.4		22,020			55,113	45,803			33,093			
	R49	--	--		16,672			0	0			-16,672			
	R50	--	--		20,118			0	0			-20,118			
	R51	197 FW Riffle	32.6		31,594			47,581	25,154			15,987			
	R52/52B	200 BC Riffle	32.4		53,659			60,008	51,066			6,349			
	R53	206 BC Riffle	32.0		13,488			40,227	28,305			26,739			
	R54	--	--		14,611			0	0			-14,611			
R55/R56	209 BC Riffle	31.8		108,161			46,404	42,196			-61,757				
R57	211 BC Riffle	31.7		30,427			19,365	11,667			-11,062				
R58	--	--		22,193			0	0			-22,193				
R59	214 FW Riffle	31.3		5,201			25,154	22,235			19,953				
R60/60A	216 BC Riffle	31.1		46,590			157,216	144,060			110,626				
R61	221 BC Riffle	30.8		37,389			43,517	29,697			6,128				
R62	227 FW Riffle	30.2		41,808			9,107	8,050			-32,701				

Reach	Riffle ID before 2012	2012 Riffle ID	RM (2012 Centroid)	Estimated Historical Spawning Area (ft ²)	1988 Riffle Area (ft ²)	2001		2012		Change in Riffle Area					
						Riffle Area (ft ²)	Spawning Habitat Area (ft ²)	Riffle Area (ft ²)	Spawning Gravel Area in Riffles (ft ²)	1988 to 2001		1988 to 2012		2001 to 2012	
										ft ²	%	ft ²	%	ft ²	%
	R63	229 FW Riffle	--		41,179			5,379	5,379			-35,800			
	R64	235 BC Riffle	29.9		62,384			28,144	26,243			-34,240			
	R65	--	--		95,072			0	0			-95,072			
	R66	237 BC Riffle	29.7		40,814			48,795	19,403			7,981			
	R67	240 FW Riffle	27.9		0			25,661	6,845			25,661			
	R68	242 FW Riffle	27.8		90,824			31,382	12,750			-59,442			
	R69	244 FW Riffle	26.0		51,198			46,390	44,415			-4,808			
	R70	246 FW Riffle	25.9		12,862			19,839	11,081			6,977			
	R71	248 FW Riffle	25.7		22,457			27,609	16,353			5,152			
	R72	250 FW Riffle	25.6		60,905			111,822	104,566			50,917			
	R73	253 FW Riffle	25.2		18,503			37,111	33,484			18,608			
	R74	255 FW Riffle	24.8		14,567			37,694	37,399			23,127			
	R75	257 FW Riffle	24.6		9,265			40,270	26,956			31,005			
	R76	259 BC Riffle	24.2		13,053			65,619	28,935			52,566			
	R77	261 FW Riffle	23.8		16,493			22,953	17,155			6,460			
	R78	263 FW Riffle	23.6		16,307			20,032	12,972			3,725			
Subtotal					1,343,152			1,455,610	1,155,909			112,458	8		
Total La Grange Dam to RM 34.2				2,397,000	1,574,048	1,304,946	636,205	2,071,556	1,811,638	-269,102	-17	497,508	32	766,610	59
Total La Grange Dam to RM 23.6					2,917,200			3,527,166	2,967,547			609,966	21		