

APPENDIX A

HARVEST ANALYSIS SUMMARY

Spatial analyses were conducted to describe the harvest activity that has occurred during the twentieth century primarily on National Forest in the Grave Creek Watershed. Data used included the USFS TSMRS (Timber Stand Management Recording System) and a GIS layer of stand polygons, also provided by the Kootenai National Forest. A polygon layer of USFS Land Type Associations (USFS) and related Land Type Association (LTA) interpretations described in the Kootenai National Forest Soil Survey (USFS, 1995a) were also used in these analyses.

TSMRS records acres treated per stand but the location of these acres within a stand cannot be distinguished using these records. Similarly, using the TSMRS records to break down harvest activity by LTA is not possible without assuming treatment of the entire stand. Therefore, analyses reflect the assumption that total stand was harvested, which may result in an overestimate of area treated. Conversely, using the planar area as opposed to area based on slope length (what is recorded in TSMRS) results in an underestimate of stand area. Somewhat of a counterbalance is reached between these two limitations. Accuracy and completeness of TSMRS database is another limitation. Analyses were conducted acknowledging these assumptions and limitations.

Table A-1 provides a list of the TSMRS activity codes included in this analysis. Activity acreages only reflect single stand entries. Map 9 displays stands that were entered multiple times throughout the analysis time frame. The acreages presented in this appendix do not reflect repeat stands entries. Activities with accomplishment year 0 were not included. It is assumed accomplishment year 0 activities have not been completed and therefore could not have contributed to current stream conditions.

TSMRS acreages and GIS stand acreages were compared to test the degree of discrepancy between the two (Table A-2). The TSMRS columns (Table A-2) include the totals for acreage reported by USFS. The GIS columns include acreage totals for the stands harvested. The GIS-based harvest totals are in general lower than the TSMRS total; however, the relative trends are the same. The GIS-based values will be used to be consistent with additional spatial analyses. Results likely provide a relatively adequate representation of the distribution of timber harvest activity on National Forest.

Approximately 10 miles² (13%) of the watershed have been harvested at least once. Of this, a little over 5 miles² (7%) was harvested in stands that are in or adjacent to the riparian corridor as shown in Table A-2 and by watershed in Table A-3. This is in comparison to 27 miles² of riparian-linked stands (Table A-4). A riparian-linked stand is a stand that has at least a part of the stand within the 300-foot riparian buffer. Harvest activity may not have occurred in the portion of the stand that is within the riparian buffer. Spatial distribution of activities below the stand level (i.e. within a stand) cannot be determined using the TSMRS because the minimum mapping unit of the TSMRS database is the stand.

Tables A-1 through A-7 and Figures A-1 through A-3 provide a comprehensive summary of harvest statistics by year, watershed and LTA.

Table A-1: TSMRS Activity Codes Included in Harvest Analysis.	
TSMRS Activity Code	TSMRS Activity Description
4111	Clearcut – Patch
4113	Clearcut – Stand
4114	Clearcut - with Reserves
4131	Shelterwood Seed Cut
4132	Seed Tree Seed Cut
4146	Shelterwood Final Cut
4147	Seed Tree Final Cut
4148	Shelterwood Final Cut with Reserves
4149	Seed Tree Final Cut with Reserves
4152	Group Selection Cut
4211	Liberation Cutting
4220	Thinning
4230	Sanitation Salvage
4521*	Pre-commercial thinning
4987*	Fireline construction

* Not included in the ECA/Water Yield analysis described in Appendix C. ECA/Water Yield analysis in Appendix C also included 4250 (natural changes – Blue Sky/Kopsi fire) and 4270 (permanent land clearing).

Table A-2: Comparison of GIS-based (stand polygon) Area Summaries Versus TSMRS-based Harvest Summaries.				
	Area Harvested in Sub-Watershed (mi²)	Area Harvested in Riparian-Related Stands (mi²)		
	GIS	TSMRS	GIS	TSMRS
	2.1	2.7	1.8	2.1
Blue Sky	2.1	2.7	1.4	2.2
Clarence-Stahl	2.7	3.4	0.4	0.6
Lower Grave Creek	2.4	2.8	0.9	0.8
Upper Grave-Foundation-Lewis	1.0	1.0	0.8	1.0
Williams	1.6	1.9		
			5.3	6.7
Total	9.8	13.7		

Sub-watershed	Total Area in Sub-Watershed	Area Harvested	Area Harvested In Riparian-Related Stands	Area Harvested In Rain-on-Snow zone		
				Total	%North	%South
Blue Sky	12.5	2.1	1.8	1.2	97	3
Clarence-Stahl	17.9	2.7	1.4	1.4	50	50
Lower Grave Creek	21.8	2.4	0.4	0.0	0	0
Upper Grave-Foundation-Lewis	13.6	1.0	0.9	0.4	68	32
Williams	9.45	1.6	0.8	0.3	39	61
Total	75.3	9.8	5.3	3.3	69	31

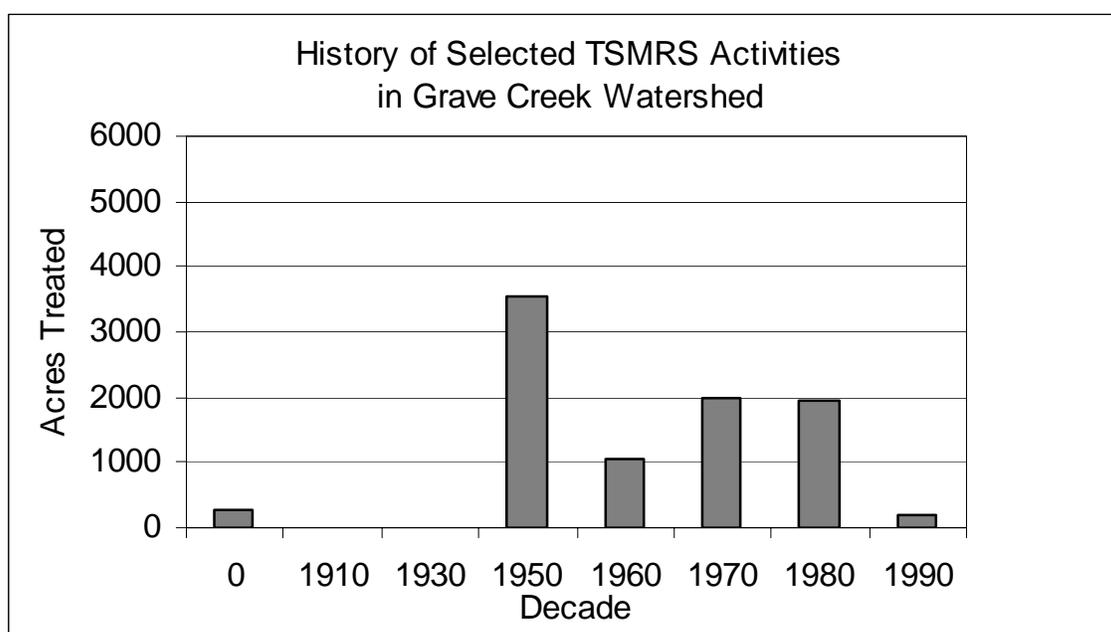


Figure A-1: History of Selected TSMRS Activities in Grave Creek Watershed.

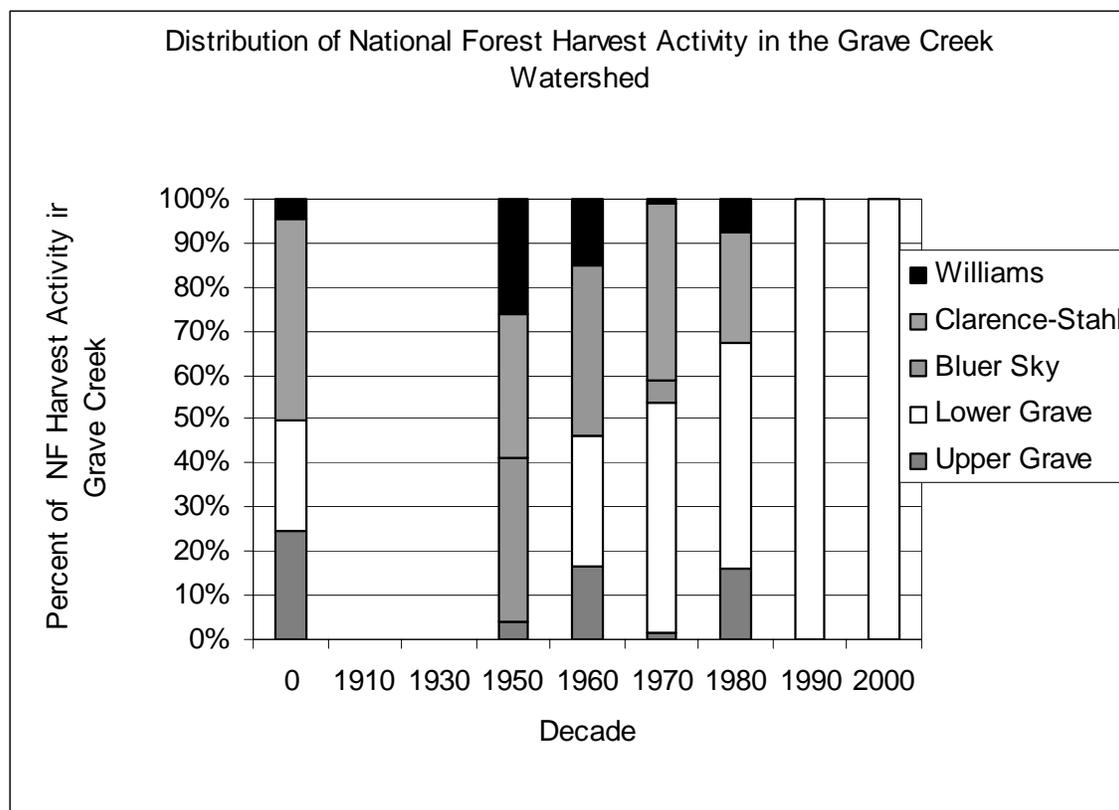


Figure A-2: Distribution of National Forest Harvest Activity in the Grave Creek Watershed.

Table A-4: Summary of Area within Riparian-linked Stands by Sub-Watershed.				
	Area within Riparian-linked Stands			
	Meters²	Acres	Miles²	Percent
Blue Sky	15328744	3788	5.92	22.0
Clarence-Stahl	19310475	4772	7.46	27.7
Lower Grave Creek	13412227	3314	5.18	19.2
Upper Grave-Foundation-Lewis	13130071	3244	5.07	18.8
Williams Creek	8652848	2138	3.34	12.4
Grave Creek Watershed	69834364	17256	26.96	100.0

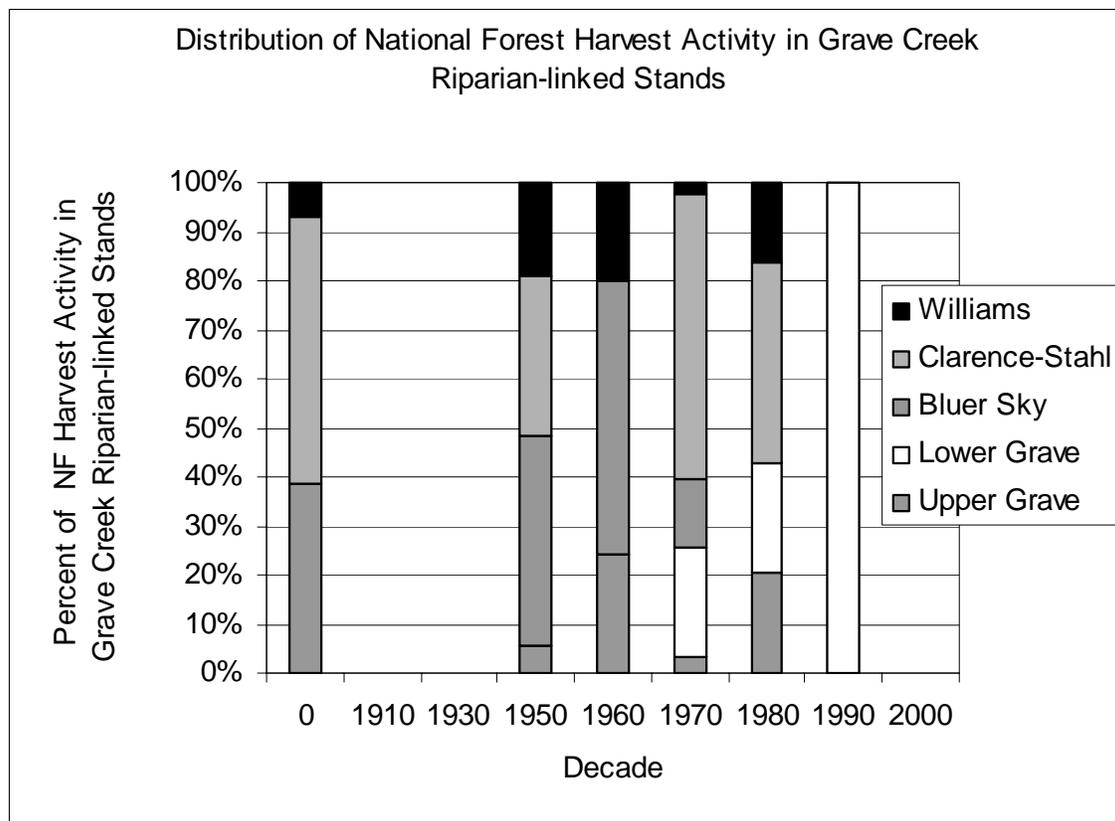


Figure A-3: Distribution of National Forest Harvest Activity in the Grave Creek Riparian-linked Stands.

Table A-5: Area Harvested at Least Once by Sub-Watershed.									
	Area Harvested			Area Harvested in Riparian Related Stands			Area Harvested in ROS Zone		
	Mil es ²	% Sub-Water-shed	%Water-shed	Miles ²	% Sub-Water-shed	%Wate r-shed	Miles ²	% Sub-Water-shed	%Water-shed
Sub-watershed									
Blue Sky	2.1	17.0	2.8	1.8	14.8	2.4	1.2	9.9	1.6
Clarence-Stahl	2.7	14.9	3.5	1.4	8.0	1.9	1.4	8.0	1.9
Lower Grave Creek	2.4	10.9	3.2	0.4	2.0	0.6	0.0	0.0	0.0
Upper Grave-Foundation-Lewis	1.0	7.3	1.3	0.9	6.3	1.1	0.4	3.0	0.5
Williams Creek	1.6	17.1	2.1	0.8	8.1	1.0	0.3	2.8	0.4
Total	9.8		13.0	5.3		7.1	3.3		4.4

Table A-6: Area Harvested at Least Once by LTA by Sub-Watershed.										
Harvest Area by LTA by Sub-Watershed										
Landtype	Meters2	KM2	Miles2	Acres	% Sub-Water-shed	%Water-shed	Surface Erodibility	Subsurface Erodibility	Delivery Efficiency	Sediment Hazard
Blue Sky										
351	389864	0.4	0.2	96	1.2	0.2	moderate	moderate	high	severe
401	3223	0.0	0.0	1	0.0	0.0	moderate	slight	high	severe
403	94985	0.1	0.0	23	0.3	0.0	moderate	slight	high	severe
404	395997	0.4	0.2	98	1.2	0.2	moderate	moderate	low	moderate
405	22799	0.0	0.0	6	0.1	0.0	moderate	slight	low	moderate
406	623607	0.6	0.2	154	1.9	0.3	moderate	slight	low	moderate
407	2015861	2.0	0.8	498	6.2	1.0	moderate	moderate	high	severe
408	1923845	1.9	0.7	475	6.0	1.0	moderate	slight	high	severe
	5470180	5.5	2.1	1352	17.0	2.8				
Clarence-Stahl										
108	47251	0.0	0.0	12	0.1	0.0	severe	severe	low	moderate
351	870667	0.9	0.3	215	1.9	0.4	moderate	moderate	high	severe
401	198159	0.2	0.1	49	0.4	0.1	moderate	slight	high	severe
403	10283	0.0	0.0	3	0.0	0.0	moderate	slight	high	severe
404	1875314	1.9	0.7	463	4.0	1.0	moderate	moderate	low	moderate
405	898312	0.9	0.3	222	1.9	0.5	moderate	slight	low	moderate
406	88666	0.1	0.0	22	0.2	0.0	moderate	slight	low	moderate
407	2913626	2.9	1.1	720	6.3	1.5	moderate	moderate	high	severe
408	1133	0.0	0.0	0	0.0	0.0	moderate	slight	high	severe
	6903412	6.9	2.7	1706	14.9	3.5				
Lower Grave Creek										
102	75521	0.1	0.0	19	0	0.0	moderate	severe	low	moderate
103	134544	0.1	0.1	33	0	0.1	moderate	severe	high	severe
105	156475	0.2	0.1	39	0	0.1	moderate	severe	low	moderate
108	945751	0.9	0.4	234	2	0.5	severe	severe	low	moderate
110	32599	0.0	0.0	8	0	0.0	moderate	severe	low	moderate
321	476874	0.5	0.2	118	1	0.2	moderate	moderate	low	moderate
322	2042682	2.0	0.8	505	4	1.0	moderate	severe	low	moderate
323	976375	1.0	0.4	241	2	0.5	severe	severe	low	moderate
324	1060842	1.1	0.4	262	2	0.5	moderate	moderate	low	moderate
408	90031	0.1	0.0	22	0	0.0	moderate	slight	high	severe
510	179712	0.2	0.1	44	0	0.1	severe	slight	moderate	severe
	6171406	6.2	2.4	1525	10.9	3.2				
Upper Grave-Foundation-Lewis										
108	306948	0.3	0.1	76	0.9	0.2	severe	severe	low	moderate
351	312877	0.3	0.1	77	0.9	0.2	moderate	moderate	high	severe
401	107250	0.1	0.0	27	0.3	0.1	moderate	slight	high	severe
404	849941	0.8	0.3	210	2.4	0.4	moderate	moderate	low	moderate
405	211722	0.2	0.1	52	0.6	0.1	moderate	slight	low	moderate
406	193902	0.2	0.1	48	0.5	0.1	moderate	slight	low	moderate

Table A-6: Area Harvested at Least Once by LTA by Sub-Watershed.

Harvest Area by LTA by Sub-Watershed										
Landtype	Meters2	KM2	Miles2	Acres	% Sub-Water-shed	%Water-shed	Surface Erodibility	Subsurface Erodibility	Delivery Efficiency	Sediment Hazard
407	515277	0.5	0.2	127	1.5	0.3	moderate	moderate	high	severe
408	72672	0.1	0.0	18	0.2	0.0	moderate	slight	high	severe
	2570588	2.6	1.0	635	7.3	1.3				
Williams										
108	99411	0.1	0.0	25	0.4	0.1	severe	severe	low	moderate
322	146471	0.1	0.1	36	0.6	0.1	moderate	severe	low	moderate
401	45382	0.0	0.0	11	0.2	0.0	moderate	slight	high	severe
403	114174	0.1	0.0	28	0.5	0.1	moderate	slight	high	severe
405	1255697	1.3	0.5	310	5.1	0.6	moderate	slight	low	moderate
406	678315	0.7	0.3	168	2.8	0.3	moderate	slight	low	moderate
407	1833424	1.8	0.7	453	7.5	0.9	moderate	moderate	high	severe
408	15747	0.0	0.0	4	0.1	0.0	moderate	slight	high	severe
	4188622	4.2	1.6	1035	17.1	2.1				
Grave Creek Watershed										
102	75521	0.1	0.0	19		0.0	moderate	severe	low	moderate
103	134544	0.1	0.1	33		0.1	moderate	severe	high	severe
105	156475	0.2	0.1	39		0.1	moderate	severe	low	moderate
108	1399361	1.4	0.5	346		0.7	severe	severe	low	moderate
110	32599	0.0	0.0	8		0.0	moderate	severe	low	moderate
321	476874	0.5	0.2	118		0.2	moderate	moderate	low	moderate
322	2189153	2.2	0.8	541		1.1	moderate	severe	low	moderate
323	976375	1.0	0.4	241		0.5	severe	severe	low	moderate
324	1060842	1.1	0.4	262		0.5	moderate	moderate	low	moderate
351	1573408	1.6	0.6	389		0.8	moderate	moderate	high	severe
401	354014	0.4	0.1	87		0.2	moderate	slight	high	severe
403	219442	0.2	0.1	54		0.1	moderate	slight	high	severe
404	3121252	3.1	1.2	771		1.6	moderate	moderate	low	moderate
405	2388530	2.4	0.9	590		1.2	moderate	slight	low	moderate
406	1584490	1.6	0.6	392		0.8	moderate	slight	low	moderate
407	7278188	7.3	2.8	1798		3.7	moderate	moderate	high	severe
408	2103428	2.1	0.8	520		1.1	moderate	slight	high	severe
510	179712	0.2	0.1	44		0.1	severe	slight	moderate	severe
	25304208	25.3	9.8	6253		13.0				

Table A-7: Area Harvested in Riparian-Linked Stands by LTA by Sub-Watershed.										
Harvest Area in Riparian Related Stands by LTA by Sub-Watershed										
Landtype	Meters2	KM2	Miles2	Acres	% Sub-Water-shed	%Water-shed	Surface Erodibility	Subsurface Erodibility	Delivery Efficiency	Sediment Hazard
Blue Sky										
351	389864	0.4	0.2	96	1.2	0.2	moderate	moderate	high	severe
401	3223	0.0	0.0	1	0.0	0.0	moderate	slight	high	severe
403	91639	0.1	0.0	23	0.3	0.0	moderate	slight	high	severe
404	252381	0.3	0.1	62	0.8	0.1	moderate	moderate	low	moderate
405	22799	0.0	0.0	6	0.1	0.0	moderate	slight	low	moderate
406	417922	0.4	0.2	103	1.3	0.2	moderate	slight	low	moderate
407	1870951	1.9	0.7	462	5.8	1.0	moderate	moderate	high	severe
408	1724480	1.7	0.7	426	5.3	0.9	moderate	slight	high	severe
	4773259	4.8	1.8	1179	14.8	2.4				
Clarence-Stahl										
108	47251	0.0	0.0	12	0.1	0.0	severe	severe	low	moderate
351	870667	0.9	0.3	215	1.9	0.4	moderate	moderate	high	severe
401	198159	0.2	0.1	49	0.4	0.1	moderate	slight	high	severe
404	681455	0.7	0.3	168	1.5	0.3	moderate	moderate	low	moderate
405	432746	0.4	0.2	107	0.9	0.2	moderate	slight	low	moderate
406	5129	0.0	0.0	1	0.0	0.0	moderate	slight	low	moderate
407	1470539	1.5	0.6	363	3.2	0.8	moderate	moderate	high	severe
	3705947	3.7	1.4	916	8.0	1.9				
Lower Grave Creek										
102	22542	0.0	0.0	6	0	0.0	moderate	severe	low	moderate
103	101309	0.1	0.0	25	0	0.1	moderate	severe	high	severe
105	67869	0.1	0.0	17	0	0.0	moderate	severe	low	moderate
108	572661	0.6	0.2	142	1	0.3	severe	severe	low	moderate
323	331267	0.3	0.1	82	1	0.2	severe	severe	low	moderate
324	4818	0.0	0.0	1	0	0.0	moderate	moderate	low	moderate
408	24553	0.0	0.0	6	0	0.0	moderate	slight	high	severe
	1125019	1.1	0.4	278	2.0	0.6				
Upper Grave-Foundation-Lewis										
108	306948	0.3	0.1	76	0.9	0.2	severe	severe	low	moderate
351	312877	0.3	0.1	77	0.9	0.2	moderate	moderate	high	severe
401	107250	0.1	0.0	27	0.3	0.1	moderate	slight	high	severe
404	631908	0.6	0.2	156	1.8	0.3	moderate	moderate	low	moderate
405	198628	0.2	0.1	49	0.6	0.1	moderate	slight	low	moderate
406	91505	0.1	0.0	23	0.3	0.0	moderate	slight	low	moderate
407	508914	0.5	0.2	126	1.4	0.3	moderate	moderate	high	severe
408	72672	0.1	0.0	18	0.2	0.0	moderate	slight	high	severe
	2230700	2.2	0.9	551	6.3	1.1				
Williams										
108	99408	0.1	0.0	25	0.4	0.1	severe	severe	low	moderate

Table A-7: Area Harvested in Riparian-Linked Stands by LTA by Sub-Watershed.										
Harvest Area in Riparian Related Stands by LTA by Sub-Watershed										
Landtype	Meters2	KM2	Miles2	Acres	% Sub-Water-shed	%Water-shed	Surface Erodibility	Subsurface Erodibility	Delivery Efficiency	Sediment Hazard
322	100900	0.1	0.0	25	0.4	0.1	moderate	severe	low	moderate
401	45382	0.0	0.0	11	0.2	0.0	moderate	slight	high	severe
403	69387	0.1	0.0	17	0.3	0.0	moderate	slight	high	severe
405	664160	0.7	0.3	164	2.7	0.3	moderate	slight	low	moderate
406	300175	0.3	0.1	74	1.2	0.2	moderate	slight	low	moderate
407	693530	0.7	0.3	171	2.8	0.4	moderate	moderate	high	severe
408	15747	0.0	0.0	4	0.1	0.0	moderate	slight	high	severe
	1988689	2.0	0.8	491	8.1	1.0				
Grave Creek Watershed										
102	22542	0.0	0.0	6		0.0	moderate	severe	low	moderate
103	101309	0.1	0.0	25		0.1	moderate	severe	high	severe
105	67869	0.1	0.0	17		0.0	moderate	severe	low	moderate
108	1026268	1.0	0.4	254		0.5	severe	severe	low	moderate
322	100900	0.1	0.0	25		0.1	moderate	severe	low	moderate
323	331267	0.3	0.1	82		0.2	severe	severe	low	moderate
324	4818	0.0	0.0	1		0.0	moderate	moderate	low	moderate
351	1573408	1.6	0.6	389		0.8	moderate	moderate	high	severe
401	354014	0.4	0.1	87		0.2	moderate	slight	high	severe
403	161026	0.2	0.1	40		0.1	moderate	slight	high	severe
404	1565744	1.6	0.6	387		0.8	moderate	moderate	low	moderate
405	1318333	1.3	0.5	326		0.7	moderate	slight	low	moderate
406	814731	0.8	0.3	201		0.4	moderate	slight	low	moderate
407	4543933	4.5	1.8	1123		2.3	moderate	moderate	high	severe
408	1837453	1.8	0.7	454		0.9	moderate	slight	high	severe
	13823614	13.8	5.3	3416		7.1				