

## Appendix A. Land Use Land Cover Conversion

Initial Southwest Regional Gap Analysis Project (SWReGAP) land cover descriptions and codes are shown in the table below. The associated SWAT landuse database entry is listed within the landuse column. SWAT requires the landuse codes to assign properties

Value	Landuse	Code	SWReGAP Descriptions
2	SWRN	S002	Rocky Mountain Alpine Bedrock and Scree
5	SWRN	S006	Rocky Mountain Cliff and Canyon
10	SWRN	S011	Inter-Mountain Basins Shale Badland
22	FRSD	S023	Rocky Mountain Aspen Forest and Woodland
26	FRSE	S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
28	FRSE	S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
30	FRST	S032	Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
32	FRST	S034	Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
36	FRSE	S039	Colorado Plateau Pinyon-Juniper Woodland
38	FRST	S042	Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex
41	FRSD	S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland
44	FRSD	S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland
48	RNGB	S054	Inter-Mountain Basins Big Sagebrush Shrubland
50	RNGB	S056	Colorado Plateau Mixed Low Sagebrush Shrubland
58	RNGE	S065	Inter-Mountain Basins Mixed Salt Desert Scrub
62	RNGE	S071	Inter-Mountain Basins Montane Sagebrush Steppe
69	SWRN	S081	Rocky Mountain Dry Tundra
70	BROM	S083	Rocky Mountain Subalpine Mesic Meadow
71	SPAS	S085	Southern Rocky Mountain Montane-Subalpine Grassland
79	WETL	S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland
82	RNGB	S096	Inter-Mountain Basins Greasewood Flat
86	BROM	S102	Rocky Mountain Alpine-Montane Wet Meadow
110	WATR	N11	Open Water
111	URLD	N21	Developed, Open Space - Low Intensity
112	URHD	N22	Developed, Medium - High Intensity
114	AGRL	N80	Agriculture
121	SWRN	D08	Invasive Annual Grassland

to and calculate output from each appropriate landuse/land cover within the watershed.

## Appendix B. Water Budget Calculation

A water budget measures all watershed inputs and outputs that occur throughout the year. The inputs in the water budget for Newcastle include precipitation and diversion into the watershed. The outputs or losses include evapotranspiration (ET), surface water flow into reservoir, and deep aquifer recharge. The yearly averages for the watershed based upon SWAT model inputs and outputs are shown below. The values for watershed output have been area weighted adjusted from the SWAT output and used to complete the water balance for the watershed. The SWAT watershed boundary is slightly larger (2%) than the actual Newcastle Reservoir watershed boundary. On an annual basis, unsaturated storage acts as a net sink or source of antecedent water. Over a long period of time (i.e. 10 years) this unsaturated storage balances. Therefore, it was not included in the “average” water balance for the watershed.

Year		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Average
Input	Precipitation (mm)	423.7	536.2	793.6	374.1	756.2	477.2	263.8	418.9	1034.6	1042.0	238.5	578.1
	Grass Creek Diversion (mm)	10	10	10	10	10	10	10	10	10	10	10	10
	<b>Total Input</b>	<b>434</b>	<b>546</b>	<b>804</b>	<b>384</b>	<b>766</b>	<b>487</b>	<b>274</b>	<b>429</b>	<b>1045</b>	<b>1052</b>	<b>249</b>	<b>588</b>
Output	ET (mm)	256.4	336.1	406.0	305.5	302.4	304.9	223.6	263.4	333.2	468.4	225.0	311.4
	Deep Aquifer Recharge (mm)	0.108	0.560	0.846	0.163	0.931	0.750	0.164	0.253	1.340	2.229	0.140	0.680
	Watershed Output (mm)	143.5	234.2	381.1	120.3	393.2	185.8	102.3	109.4	583.6	719.5	63.0	276.0
	Unsaturated storage	33.7	-24.6	15.7	-41.9	69.7	-4.3	-52.3	55.9	126.4	-138.1	-39.7	0.0
	<b>Total Output</b>	<b>434</b>	<b>546</b>	<b>804</b>	<b>384</b>	<b>766</b>	<b>487</b>	<b>274</b>	<b>429</b>	<b>1045</b>	<b>1052</b>	<b>249</b>	<b>588</b>

## **Appendix C. Watershed Model Load Output**

Model output for each drainage within the watershed is shown below by both year and monthly average outputs. Outputs include flow out for each reach at the drainage boundary as well as sediment and nutrient loads.

**Pinto Creek**

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Flow Out (cms)	0.62	1.14	1.82	0.51	1.83	0.95	0.44	0.48	2.82	3.53	0.32
Sediment Out (tons)	1419.0	2174.0	2827.0	511.5	2817.0	796.3	332.9	313.7	4749.0	3928.0	65.1
Organic Nitrogen (kg)	399.5	1694.0	2608.0	206.7	2383.0	3011.0	102.2	360.5	2272.0	4321.0	491.2
Organic P(kg)	1093.0	3232.0	5836.0	88.4	2193.0	1146.0	8.7	106.1	1973.0	3577.0	38.2
Nitrate Nitrogen (kg)	161900.0	80300.0	29790.0	7710.0	19660.0	12120.0	8883.0	6976.0	57150.0	46880.0	4029.0
Ammonium (NH4) kg	460.4	1446.0	1847.0	520.6	1409.0	1018.0	469.6	649.9	1713.0	3393.0	515.0
Nitrite Nitrogen (kg)	193.2	559.8	770.8	234.4	592.6	513.7	176.9	306.5	720.7	1408.0	251.0
Mineral P (kg)	8656.0	24580.0	37930.0	710.6	18990.0	8018.0	590.1	660.0	23220.0	27370.0	278.9

Month	January	February	March	April	May	June	July	August	September	October	November	December
Flow Out (cms)	1.32	1.16	3.77	1.15	0.47	0.48	0.67	1.67	1.39	2.31	1.28	0.32
Sediment Out (tons)	143.1	158.6	433.0	103.7	27.1	41.3	47.2	203.4	156.9	378.8	298.2	22.6
Organic Nitrogen (kg)	279.6	349.7	715.9	92.0	3.5	7.8	6.0	24.7	12.6	49.4	185.3	53.2
Organic P (kg)	268.9	457.3	532.4	215.6	0.8	7.6	0.5	17.8	17.7	127.6	185.7	102.2
Nitrate Nitrogen (kg)	2530.4	3232.2	3141.6	2195.9	2329.0	788.2	3676.0	5744.1	4954.8	5688.4	8457.4	1383.2
Ammonium (NH4) kg	184.9	154.2	260.9	91.0	50.5	41.6	45.3	84.6	75.9	105.4	182.2	73.1
Nitrite Nitrogen (kg)	61.2	57.4	103.0	33.0	25.2	32.1	44.3	44.7	36.3	42.1	71.2	23.5
Mineral P (kg)	1770.3	3052.5	4310.3	1210.2	23.0	70.4	39.2	462.9	369.5	1544.6	1645.6	679.4

**Little Pinto Creek**

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Flow Out (cms)	0.70	1.08	1.63	0.51	1.69	0.77	0.51	0.49	2.67	3.64	0.33
Sediment Out (tons)	1245.0	1678.0	2317.0	445.8	2375.0	572.6	397.5	304.0	4296.0	4010.0	74.5
Organic Nitrogen (kg)	243.7	621.3	2568.0	86.8	2474.0	2551.0	74.4	279.2	2909.0	8060.0	376.4
Organic P (kg)	234.9	254.8	3323.0	8.8	1776.0	1205.0	3.4	75.9	2015.0	5600.0	36.0
Nitrate Nitrogen (kg)	320700.0	195800.0	65680.0	9681.0	25280.0	8778.0	12270.0	7638.0	51480.0	58440.0	3372.0
Ammonium (NH4) kg	441.5	1018.0	2684.0	474.4	1922.0	1599.0	471.0	632.9	2971.0	7127.0	468.7
Nitrite Nitrogen (kg)	184.2	473.4	1218.0	268.8	1085.0	856.4	249.8	395.9	1468.0	3456.0	405.6
Mineral P (kg)	2028.0	2840.0	21140.0	295.1	15180.0	5876.0	421.5	555.3	18570.0	37220.0	280.7

Month	January	February	March	April	May	June	July	August	September	October	November	December
Flow Out (cms)	1.18	1.05	3.18	1.26	0.47	0.44	0.60	1.75	1.47	2.41	1.39	0.35
Sediment Out (tons)	128.8	126.2	333.3	105.4	26.1	30.4	41.6	197.5	145.7	365.3	267.8	24.5
Organic Nitrogen (kg)	462.8	250.9	719.2	128.6	2.0	7.8	3.4	52.7	9.7	144.8	211.0	30.6
Organic P (kg)	323.2	178.3	433.6	181.7	0.1	2.1	0.2	23.8	0.5	147.0	142.8	23.4
Nitrate Nitrogen (kg)	4850.0	9058.0	7533.1	4822.0	4848.4	1019.0	6063.9	8330.8	7324.4	7472.9	12938.1	2510.0
Ammonium (NH4) kg	365.6	193.4	474.1	151.5	49.8	39.2	40.8	87.8	79.7	194.6	249.9	61.4
Nitrite Nitrogen (kg)	143.1	74.7	215.0	66.3	26.7	34.6	59.3	111.4	52.5	90.9	114.5	18.9
Mineral P (kg)	1793.0	1032.6	2789.4	1154.5	14.4	44.3	29.8	844.1	108.1	1423.3	1098.8	165.2