YRERFS GIS WORKFLOW AND MODELING PROCESS

Presenter Name

Presenter Title

Duty Location

Date of Presentation







US Army Corps of Engineers BUILDING STRONG®

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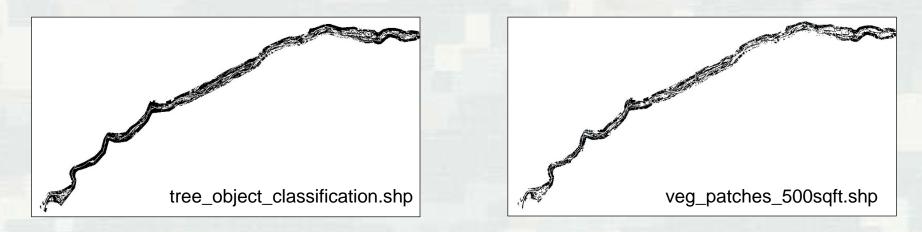
YRERFS Yellow Warbler Riparian Scrub Shrub (RSS) Habitat Determination

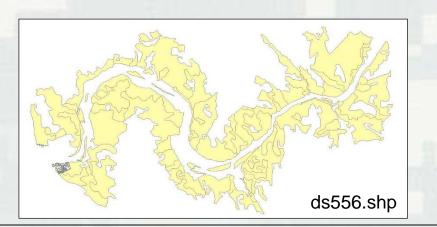




Original Data Sets

Three datasets were initially used to produce the base data workflow. The tree object classification and vegetation patch datasets were provided by HDR and the third dataset for the area east of HWY 20 came from the Department of Fish and Wildlife web mapping portal.



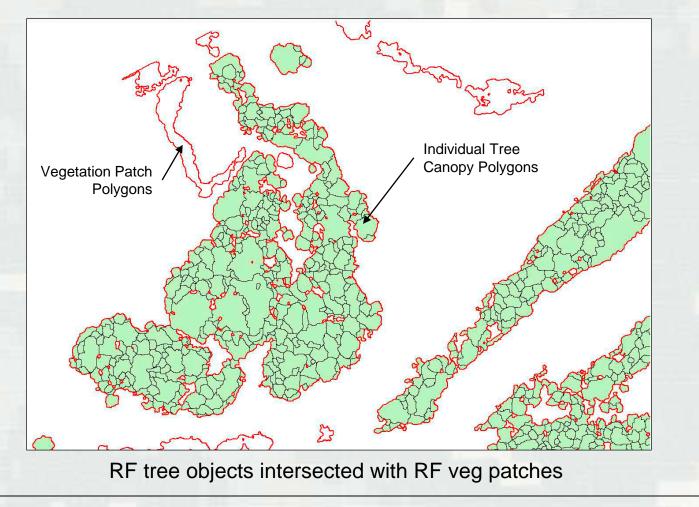








Prior to conducting an intersect between the layers several new fields were added to the veg patch layer; unique ID, patch area, and canopy type. Canopy type is determined based on the average height of the patch. A height of greater than 16.5 feet was designated Riparian Forest (RF) and 16.5 feet or less was designated Riparian Scrub Shrub (RSS). Similarly new fields of canopy type and canopy area were added to the tree object layer to determine and label each polygon with an RF or RSS designation based on its height. The layers were then intersected so the tree object layer was connected with the veg patch it fell within and given the corresponding unique ID. Since we are dealing with RSS only for Yellow Warbler habitat, the objects designated RSS were queried out as their own layer to conduct the calculations.





Three elements needed to determine HSI for Yellow Warbler:

- 1. % Canopy Cover: percentage of RSS per unit
- 2. % Hydrophytic Shrub: percentage of hydrophytic shrub area per patch
- 3. Average Canopy Height: average height of RSS from 0 to 16.5 feet





Percent Hydrophytic

 Sum of the canopy area (sqft) for all hydrophytic RSS within each RSS designated veg patch divided by the total patch area (sqft) for that patch.

Ex:

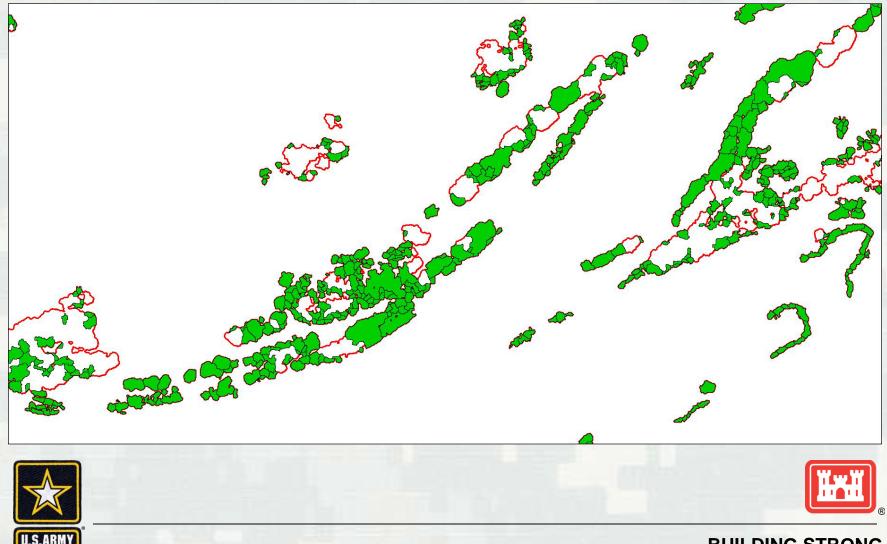
Patch #1011 has a total patch area of 22,458.99 sqft and the sum of all the hydrophytic shrubs canopy area within that patch is 15,670.99. thus the percentage of hydrophytic shrubs is 69.77%

(15670.99/22458.99) * 100 = 69.77%





Percent Hdyro Layer:



Percent hydrophytic resulting table should look similar to the one below after all calculations have been done.

OBJECTI	uniq_patch_ID *	cover_type	veg_canopy_mrh_mean_16_5	Max_nDSM	final_pred	veg_canopy_type	canopy_area	shrub_sum_per_patch	patch_area	perc_hydro_per_patch
1	P1011	hydrophytic	RSS	4.360001	ald	shrub	30	15670.999997	22458.999999	69.776036
2	P1011	hydrophytic	RSS	1.739998	wil	shrub	15	15670.999997	22458.999999	69.776036
3	P1011	hydrophytic	RSS	2.530003	wil	shrub	39	15670.999997	22458.999999	69.776036
4	P1011	hydrophytic	RSS	1.789997	wil	shrub	10	15670.999997	22458.999999	69.776036
5	P1011	hydrophytic	RSS	1.480003	wil	shrub	1	15670.999997	22458.999999	69.776036
6	P1011	hydrophytic	RSS	1.640007	wil	shrub	18	15670.999997	22458.999999	69.776036
7	P1011	hydrophytic	RSS	2.309998	eld	shrub	32	15670.999997	22458.999999	69.776036
8	P1011	hydrophytic	RSS	3.41	wil	shrub	103.000001	15670.999997	22458.999999	69.776036
9	P1011	hydrophytic	RSS	1.82	eld	shrub	29	15670.999997	22458.999999	69.776036
10	P1011	hydrophytic	RSS	1.66	wil	shrub	42	15670.999997	22458.999999	69.776036
11	P1011	hydrophytic	RSS	9.700001	wil	shrub	124.999999	15670.999997	22458.999999	69.776036
12	P1011	hydrophytic	RSS	5.709999	wil	shrub	85	15670.999997	22458.999999	69.776036
13	P1011	hydrophytic	RSS	10.579998	eld	shrub	485	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	2.529999		shrub	125.999999	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	3.770004		shrub	303	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	6.27		shrub	234.999999	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	3.540001		shrub	259	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	3.830002		shrub	81.999999	15670,999997	22458,999999	69.776036
	P1011	hydrophytic	RSS	6.340004		shrub	355	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS		wil	shrub	277	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	7.739998		shrub	510.000001	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	12.280006		shrub	1367.999999	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	9.900002		shrub	202.000001	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	5.110001		shrub	176	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	5.41		shrub	296.000001	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS		wil	shrub	125,999999	15670.999997	22458,999999	69.776036
	P1011	hydrophytic	RSS	2.02		shrub	73	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	3.489998		shrub	79	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	6.540001		shrub	586.000001	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	10.079998		shrub	276	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	13.140007		shrub	389	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	12.379997		shrub	276	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	4.510002		shrub	108	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	11.460003		shrub	1029	15670,999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	9.18		shrub	350	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	8.189999		shrub	124	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	7.010002		shrub	341	15670.999997	22458,999999	69.776036
	P1011	hydrophytic	RSS	10.920002		shrub	1069	15670.999997	22458.999999	69.776036
	P1011	hydrophytic	RSS	8.670002		shrub	94	15670.999997	22458.999999	69.776036
	P1011	hvdrophytic	RSS	11.480003		shrub	676	15670.999997	22458.999999	69.776036





Percent Cover:

- Sum of the canopy area (sqft) for all RSS within each Unit (1-9) divided by the area (sqft) of that unit.

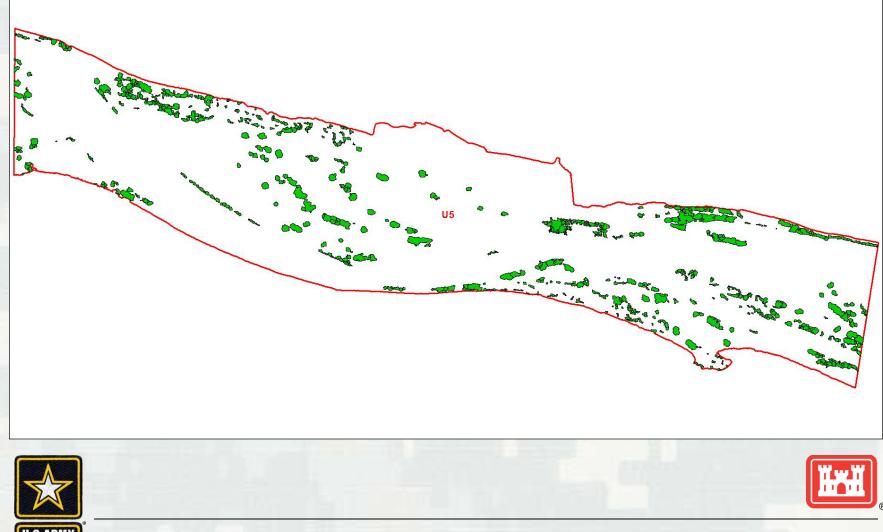
Ex:

Patch #1460 has an RSS canopy total of 927,406.89 sqft and the Unit (#1) has an area of 5,960,601.90 sqft giving a percent cover total of 15.56%

(927,406.89/5,960,601.90) * 100 = 15.56%



Percent Cover Layer:



Percent cover resulting table should look similar to the one below after all calculations have been done:

OBJECTID *	uniq_patch_ID *	canopy_area_sqft	FWOP_hab_type	unit_ID	sum_canopyarea_sqft	unit_area_sqft	perc_cover_per_unit
2755	P1460	124.999999	RSS	U1	927406.897374	5960601.9	15.558947
2756	P1460	98.335794	RSS	U1	927406.897374	5960601.9	15.558947
2757	P1460	607.311242	RSS	U1	927406.897374	5960601.9	15.558947
2758	P1460	277.615582	RSS	U1	927406.897374	5960601.9	15.558947
1799	P1461	98	RSS	U1	927406.897374	5960601.9	15.558947
1864	P1461	418		U1	927406.897374	5960601.9	15.558947
1865	P1461	73.999999	RSS	U1	927406.897374	5960601.9	15.558947
1866	P1461	30		U1	927406.897374	5960601.9	15.558947
1691	P1462	2	RSS	U1	927406.897374	5960601.9	15.558947
1796	P1462	20.46464		U1	927406.897374	5960601.9	15.558947
1797	P1462	1	RSS	U1	927406.897374	5960601.9	15.558947
1798	P1462	12	RSS	U1	927406.897374	5960601.9	15.558947
1863	P1462	29.854741	RSS	U1	927406.897374	5960601.9	15.558947
1793	P1463	302	RSS	U1	927406.897374	5960601.9	15.558947
1794	P1463	75.999999	RSS	U1	927406.897374	5960601.9	15.558947
1795	P1463	16	RSS	U1	927406.897374	5960601.9	15.558947
1860	P1463	86.000001	RSS	U1	927406.897374	5960601.9	15.558947
1861	P1463	256	RSS	U1	927406.897374	5960601.9	15.558947
1862	P1463	52	RSS	U1	927406.897374	5960601.9	15.558947
1891	P1464	90.737638	RSS	U1	927406.897374	5960601.9	15.558947
1690	P1465	50	RSS	U1	927406.897374	5960601.9	15.558947
1790	P1465	52	RSS	U1	927406.897374	5960601.9	15.558947
1791	P1465	32	RSS	U1	927406.897374	5960601.9	15.558947
1792	P1465	34	RSS	U1	927406.897374	5960601.9	15.558947
1859	P1465	187	RSS	U1	927406.897374	5960601.9	15.558947
1894	P1465	161	RSS	U1	927406.897374	5960601.9	15.558947
1895	P1465	234.000001	RSS	U1	927406.897374	5960601.9	15.558947
1689	P1466	29	RSS	U1	927406.897374	5960601.9	15.558947
1788	P1466	61	RSS	U1	927406.897374	5960601.9	15.558947
1789	P1466	2	RSS	U1	927406.897374	5960601.9	15.558947
1858	P1466	378	RSS	U1	927406.897374	5960601.9	15.558947
1870	P1466	418.999999	RSS	U1	927406.897374	5960601.9	15.558947
1871	P1466	143	RSS	U1	927406.897374	5960601.9	15.558947
1682	P1467	22	RSS	U1	927406.897374	5960601.9	15.558947
1683	P1467	6	RSS	U1	927406.897374	5960601.9	15.558947
1684	P1467	2	RSS	U1	927406.897374	5960601.9	15.558947
1685	P1467	15	RSS	U1	927406.897374	5960601.9	15.558947
1686	P1467	30	RSS	U1	927406.897374	5960601.9	15.558947
1687	P1467	23	RSS	U1	927406.897374	5960601.9	15.558947
1688	P1467	8	RSS	U1	927406.897374	5960601.9	15,558947





Average Height:

- Within the original *veg_patches_500sqft.shp* there is a column labeled mrh_mean. This layer is based on the values of that column.

Ex:

Patch #2 mrh_mean equals 10.0074 feet





Average Height Layer:





Average height resulting table should look similar to the one below after all calculations have been done:

	OBJECTID *	uniq_patch_ID	veg_canopy_mrh_mean_16_5	patch_area	mrh_MEAN
	2	P2	RSS	1173	10.007
	3	P3	RSS	1253.000001	9.239
	4	P4	RSS	873	7.4253
	5	P5	RSS	1038	8.6587
	6	P6	RSS	602.000001	8.9824
	7	P7	RSS	1415	9,493
	8	P8	RSS	1046	8.9874
	9	P9	RSS	2637	10.02
	10	P10	RSS	2937.999999	10.730
	11	P11	RSS	3212,999999	10.67
	12	P12	RSS	3156.000001	11.235
	13	P13	RSS	1000.000001	12.603
	14	P14	RSS	3809.000001	11.547
	15	P15	RSS	2879.000001	12,499
	16	P16	RSS	7968	13.357
	17	P17	RSS	552	9.978
	18	P18	RSS	66963.999995	14.65
	19	P19	RSS	76775.999995	11.33
	20	P20	RSS	589.999999	10.24
	21	P21	RSS	757	8.1664
	22	P22	RSS	68674.000002	10.33
	23	P23	RSS	124133.000002	11.51
	24	P24	RSS	785.000001	16.39
	28	P28	RSS	38533	10.38
	29	P29	RSS	580	11.64
	30	P30	RSS	738	7.674
	31	P31	RSS	981	7.879
	32	P32	RSS	519.000001	7.744
	33	P33	RSS	727	6.6363
	34	P34	RSS	8059,999998	9,269
	36	P36	RSS	531	2,449
+	37	P37	RSS	574	6.648
	38	P38	RSS	2192.000001	9.117
-	39	P39	RSS	689.000001	5.189
-	40	P40	RSS	601.000001	1.669
+	40	P41	RSS	3197.000001	10.74
+	41	P42	RSS	715	13.0
+	42	P43	RSS	2069	16.14
+	43	P43	RSS	552	15.59
-	44	P44 P45	RSS	707	15.49





Convert the RSS polygons into future without project (FWOP) rasters based on values under the following column titles in each table:

Percent Hydrophytic

ch area	perc_hydro_per_patch
458,999999	09.770030
458,999999	69,776036
458,999999	69,776036
458.999999	69,776036
458.999999	69,776036
158,999999	69.776036
158.999999	69,776036
158.999999	69,776036
158.999999	69.776036
158.999999	69,776036
158.999999	69.776036
458.999999	69.776036
458.999999	69.776036
458.999999	69.776036
458.999999	69.776036
158.999999	69.776036
458.999999	69.776036
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458.999999	69.776036
458.999999	69.776036

a_sqft	perc_cover_per_unit
5960601.9	15,550
5960601.9	15.558
5960601.9	15.558

Percent Cover

5960601.9	15.55894/
5960601.9	15.558947
5960601.9	15.558947
5960601.9	15.558947
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5960601.9	15,558947

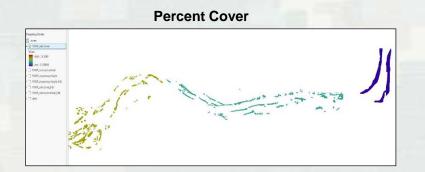
Average Height

rea	mrh_MEAN
1173	10.00/4
00001	9.2399
873	7.42536
1038	8.65874
00001	8.98248
1415	9.4933
1046	8.98746
2637	10.024
99999	10.7309
99999	10.677
00001	11.2352
00001	12.6037
00001	11.5473
00001	12.4995
7968	13.3574
552	9.9786
99995	14.6527
99995	11.3317
99999	10.2476
757	8.16641
00002	10.3313
00002	11.5152
00001	16.3967
38533	10.3815
580	11.6401
738	7.67482
981	7.87983
00001	7.74452
727	6.63634
99998	9.26979
531	2.44963
574	6.64849
00001	9.11792
00001	5.18902
00001	1.66924
00001	10.7447
715	13.073
2069	16.1482
552	15.5906
707	15,4921

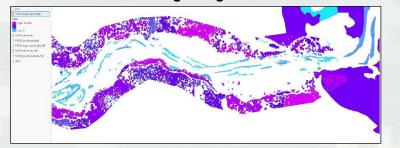


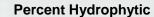


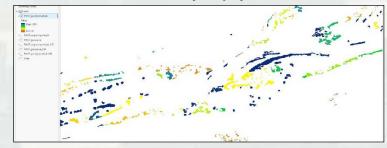
RSS FWOP rasters based on values in each table:



Average Height











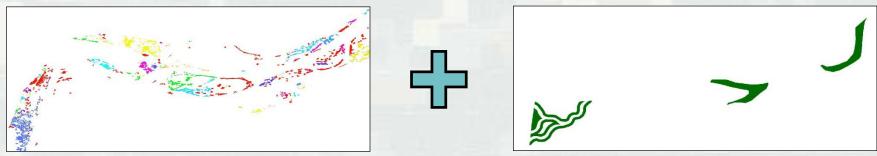
Create a raster of the measures polygon and assign the following values:

	Year1			
	7 ear 1 1% Decidious Shrub	1 1	T	-
	Canopy Comprised of			
	Hydrophytic Shrubs	2 2 2		
	(% of hydrophytic			21 No.
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	shrubs per patch)			
RSS	81.3	2	1.5	FWOP
	Year5			
	% Decidious Shrub			
	Canopy Comprised of			
	Hydrophytic Shrubs		% Cover of Shrub	
	(% of hydrophytic	dof bs Average height of Canopy 2 15 2 15 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5	canopy (% of polygon	
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	shrubs per patch)	Canopy	area)	
RSS .	81.3	9.6	7.5	FWOP
and the factor	Year 15	and the second second	ter an	
	C Decidious Shrub	1		-
	Canopy Comprised of			
	Hydrophytic Shrubs		% Cover of Shrub	
	(% of hydrophytic	Average height of	canopy (% of polygon	
anopy Type (Riparian Scrub-shrub or Riparian Forest)	shrubs per patch)			Basal Area
RF	81.3		171.7.7.7.W	
	Year 25			
	C Decidious Shrub	l i		T
	Canopy Comprised of			
	Hydrophytic Shrubs		And the second se	
	(% of hydrophytic	Average height of	% Cover of Shrub	
anopy Type (Riparian Scrub-shrub or Riparian Forest)	shrubs per patch)	A REAL PROPERTY AND	and the second	Basal Area
BE	81.3			
	Year 50	01.0	01.0	Basal Area FWOP
	% Decidious Shrub	8	1	
	Canopy Comprised of			
	Hydrophytic Shrubs	and the second	and the second second	
	(% of hydrophytic	Austran hoight of	*/ Count of Shrut	
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	shrubs per patch)	A CONTRACTOR OF		Basal Area
	shrubs per patch)			and active topic of activation.
	813	44.8		33.7





Mosaic: Use mosaic to new raster tool to combine the FWOP perc hydro shrub with the measures only raster to create a Future With Project (FWP) raster.
Take that raster and copy it to make one for years 1, 5, 15, 25, & 50. Note: for years 15, 25 & 50 you will see decreased numbers for RSS because the shrubs will have grown above the 16.5 foot shrub height designation.



FWOP_perchydroshrub: Values of 0 - 100 percent

FWP_yr1_perchydroshrub_measureonly: Value of 81.3%



FWP_yr5_perchydroshrub: Values of 0 - 100 percent





Suitability Index (SI) needs to be determined for FWOP, FWP yrs 1, 5, 15, 25, & 50 using the tables below:

Percer	nt Cover
% cover range	Formula
for % cover from 0 to 60%	SI = 0.0167(% Cover)
for % cover from 60 to 80%	SI =1
for % cover from 80 to 100%	SI = -0.05(% Cover) + 5
Averag	e Height
Average Canopy Height (ft)	Formula
for canopy from 0 to 6.56ft	SI = 0.1524 x height
for canopy greater than 6.56ft	SI =1

Percent Hydrophytic

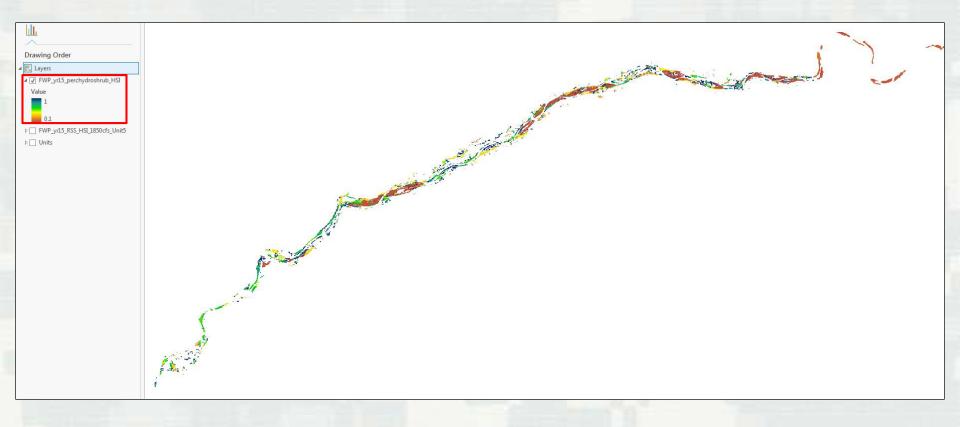
% Hydrophytic Cover	Formula
All values	SI = 0.009(% cover hydro) + 0.1

Ex. A hydrophytic cover with a percentage of 55.86 would yield an SI value of 0.60. (SI = 0.009(55.86) + 0.1)





SI values should be between 0 and 1







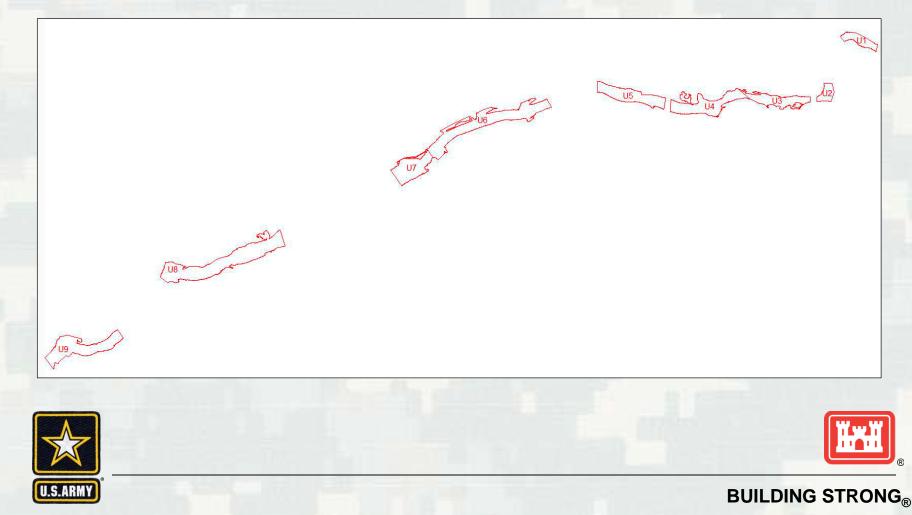
After all SI calculations have been determined those values will be used to determine the HSI values using the following formula:

Yellow Warbler AKA Riparian Scrub Shrub HSI RASTER = $(SI_{\% cover} \times SI_{height} \times SI_{\% hydro})^{1/2}$

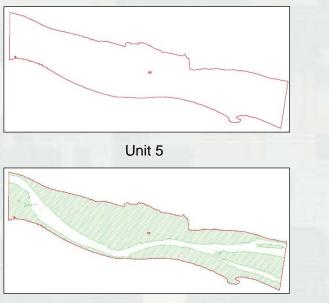




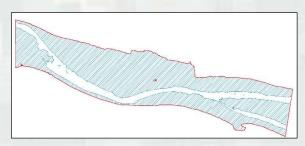
To refine results of the HSI and make it pertinent to the areas where measures are, a new layer was created to clip out the needed features. The layer, "Units", has a north-south boundary based on the 84,000 cfs flow boundary and an east west boundary of 500 feet off either end of the widest measure in each measure grouping. There are 9 units total.



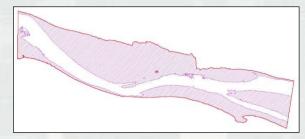
All 9 units were then clipped by three flow boundaries (750, 1850, and 5000 cfs) to get 27 individual polygons that will be used to clip the rasters.



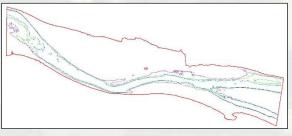
Unit 5: 1850 cfs flow boundary clipped out



Unit 5: 750 cfs flow boundary clipped out



Unit 5: 5000 cfs flow boundary clipped out



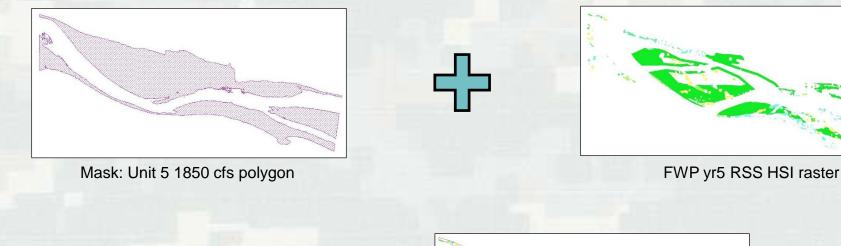
Unit 5: all 3 flows to show the difference between them.

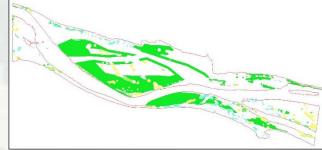






Extract by Mask: to do this you take a unit polygon (unit_5000cfs_unit5 polygon) and use it to mask and HSI raster (FWP_yr25_basalarea_HSI) raster and the resulting output from the process is portions of the input raster bound by the unit mask.





Result: raster within the bounds of the unit 5 polygon







When done with all the extracts, you will have approximately 162 rasters:

FWP_yr1_RSS_HSI_1850cfs_Unit1 PWP_yrl_RSS_HSI_1850cfs_Unit2 FWP_yr1_RSS_HSI_1850cfs_Unit3 FWP_yr1_RSS_HSL1850cfs_Unit4 PWP_yr1_RSS_HSI_1850cfs_Unit5 FWP_yr1_RSS_HSI_1850cfs_Unit6 FWP vr1 RSS HSI 1850cfs Unit7 PWP_yr1_RSS_HSI_1850cfs_Unit8 FWP_yr1_RSS_HSI_1850cfs_Unit9 FWP_yr1_RSS_HSL_5000cfs_Unit1 FWP_yr1_RSS_HSI_5000cfs_Unit2 FWP vr1 RSS HSI 5000cfs Unit3 FWP yr1 RSS HSI 5000cfs Unit4 PWP_yr1_RSS_HSI_5000.cfs_Unit5 FWP_vr1_RSS_HSI_5000cfs_Unit6 FWP vr1 RSS HSI 5000cfs Unit7 FWP_yr1_RSS_HSI_5000cfs_Unit8 FWP_yr1_RSS_HSI_5000cfs_Unit9 FWP yr1 RSS HSI 750cfs Unit1 FWP_yr1_RSS_HSI_750cfs_Unit2 FWP vr1 RSS HSI 750cfs Unit3 FWP_yr1_RSS_HSL750cfs_Unit4 FWP_yr1_RSS_HSI_750cfs_Unit5 FWP_vr1_RSS_HSI_750cfs_Unit6 FWP_yr1_RSS_HSL750cfs_Unit7 FWP_yr1_RSS_HSI_750cfs_Unit8 FWP_yr1_RSS_HSI_750cfs_Unit9 FWP yr15 RSS HSI FWP_yr15_RSS_HSL1850cfs_Unit1 FWP yr15 RSS HSI 1850cfs Unit2 FWP_yr15_RSS_HSI_1850cfs_Unit3 FWP_yr15_RSS_HSI_1850cfs_Unit4 FWP_yr15_RSS_HSL_1850cfs_Unit5 FWP_yr15_RSS_HSI_1850cfs_Unit6 FWP_yr15_RSS_HSL1850cfs_Unit7 FWP_yr15_RS5_HSI_1850cfs_Unit8 FWP yr15 RSS HSI 1850cfs Unit9 FWP_yr15_RSS_HSI_5000cfs_Unit1 PWP_yr15_RS5_HS1_5000cfs_Unit2 FWP_yr15_RSS_HSI_5000cfs_Unit3 FWP_yr15_RSS_HSI_5000cfs_Unit4 FWP_yr15_RS5_HSL_5000cfs_Unit5 FWP yr15 RSS HSI 5000cfs Unit6 FWP_yr15_RS5_HSI_5000cfs_Unit7 FWP_yr15_RSS_HSI_5000cfs_Unit8 FWP_yr15_RSS_HSI_5000cfs_Unit9 FWP_yr15_RSS_HSL_750cfs_Unit1 FWP_yr15_RSS_HSL750cfs_Unit2 FWP_yr15_RSS_HSL750cfs_Unit3 FWP vr15 RSS HSI 750cfs Unit4 FWP_yr15_RSS_HSL750cfs_Unit5 FWP_yr15_RSS_HSI_750cfs_Unit6 FWP_yr15_RSS_HSL750cfs_Unit7 FWP_yr15_RSS_HSL750cfs_Unit8 FWP_yr15_RSS_HSL750cfs_Unit9

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FWP vr25 RSS HSI 1850cfs Unit1 PWP_yr25_RSS_HSL_1850cfs_Unit2 FWP_yr25_RSS_HSI_1850cfs_Unit3 FWP_yr25_RSS_HSL1850cfs_Unit4 PWP_yr25_RSS_HSI_1850cfs_Unit5 FWP vr25 RSS HSI 1850cfs Unit6 FWP vr25 RSS HSI 1850cfs Unit7 FWP_yr25_RSS_HSI_1850cfs_Unit8 FWP_yr25_RSS_HSI_1850cfs_Unit9 FWP_yr25_RSS_HSL_5000cfs_Unit1 FWP_yr25_RSS_HSI_5000cfs_Unit2 FWP vr25 RSS HSI 5000cfs Unit3 FWP yr25 RSS HSL 5000cfs Unit4 PWP_yr25_RSS_HSI_5000cfs_Unit5 FWP vr25 RSS HSI 5000cfs Unit6 FWP vr25 RSS HSI 5000cfs Unit7 FWP_yr25_RSS_HSL5000cfs_Unit8 FWP_yr25_RSS_HSI_5000cfs_Unit9 FWP yr25 RSS HSL 750cfs Unit1 FWP_yr25_RSS_HSI_750cfs_Unit2 FWP vr25 RSS HSL 750cfs Unit3 FWP_yr25_RSS_HSL750cfs_Unit4 FWP_yr25_RSS_HSI_750cfs_Unit5 FWP_yr25_RSS_HSL750cfs_Unit6 FWP_yr25_RSS_HSL750cfs_Unit7 FWP_yr25_RSS_HSL750cfs_Unit8 FWP_yr25_RSS_HSL750cfs_Unit9 FWP_yr5_RSS_HSL FWP_yr5_RSS_HSI_1850cfs_Unit1 FWP vr5 RSS_HSI 1850cfs Unit2 FWP_yr5_RSS_HSL1850cfs_Unit3 FWP yr5 RSS HSE 1850cfs Unit4 FWP_yr5_RSS_HSI_1850cfs_Unit5 FWP_yr5_RSS_HSL1850cfs_Unit6 FWP vr5 RSS HSI 1850cfs Unit7 FWP_yr5_RSS_HSI_1850cfs_Unit8 FWP yr5 RSS HSI 1850cfs Unit9 FWP_yr5_RSS_HSI_5000cfs_Unit1 PWP_yr5_RSS_HSI_5000cfs_Unit2 FWP_yr5_RSS_HSL5000cfs_Unit3 FWP vr5 RSS HSI 5000cfs Unit4 FWP_yr5_RSS_HSI_5000cfs_Unit5 FWP vr5 RSS HSI 5000cfs Unit6 FWP_yr5_RSS_HSI_5000cfs_Unit7 FWP_yr5_RSS_HSI_5000cfs_Unit8 FWP_yr5_RSS_HSL_5000cfs_Unit9 FWP_yr5_RSS_HSL_750cfs_Unit1 FWP_yr5_RSS_HSL750cfs_Unit2 FWP_yr5_RSS_HSI_750cfs_Unit3 FWP vr5 RSS HSI 750cfs Unit4 FWP_yr5_RSS_HSL750cfs_Unit5 FWP_yr5_RSS_HSI_750cfs_Unit6 FWP yr5 RSS HSL 750cfs Unit7 FWP_yr5_RSS_HSL_750cfs_Unit8 FWP_yr5_RSS_HSL750cfs_Unit9

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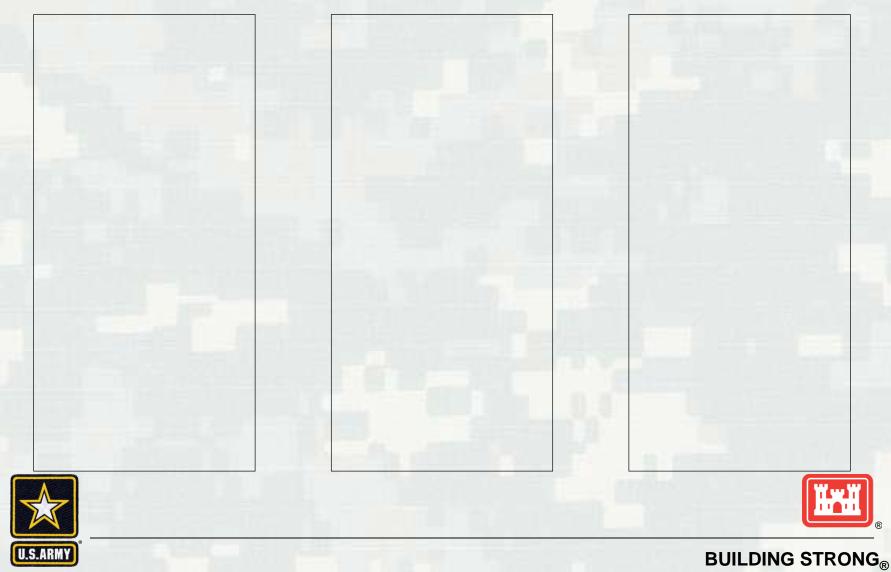
FWP_yr5_RSS_HSI_1850cfs_Unit1 FWP_yr5_RSS_HSL_1850cfs_Unit2 FWP_yr5_RSS_HSI_1850cfs_Unit3 FWP_yr5_RSS_HSI_1850cfs_Unit4 FWP_yr5_RSS_HSI_1850cfs_Unit5 FWP vr5 RSS HSI 1850cfs Unit6 FWP yr5 RSS_HSL1850cfs_Unit7 PWP_yr5_RSS_HSI_1850cfs_Unit8 FWP_yr5_RSS_HSI_1850cfs_Unit9 FWP_yr5_RSS_HSI_5000cfs_Unit1 FWP_yr5_RSS_HSI_5000cfs_Unit2 FWP vr5 RSS HSI 5000cfs Unit3 FWP yr5 RSS HSI 5000cfs Unit4 PWP_yr5_RSS_HSI_5000cfs_Unit5 FWP_vr5_RSS_HSI_5000cfs_Unit6 FWP_yr5_RSS_HSL 5000cfs_Unit7 FWP_yr5_RSS_HSL_5000cfs_Unit8 FWP_yr5_RSS_HSI_5000cfs_Unit9 FWP vr5 RSS HSL 750cfs Unit1 FWP_yr5_RSS_HSL750cfs_Unit2 FWP vr5 RSS HSI 750cfs Unit3 FWP_yr5_RSS_HSE_750cfs_Unit4 FWP_yr5_RSS_HSI_750cfs_Unit5 FWP_yr5_RSS_HSI_750cfs_Unit6 FWP_yr5_RSS_HSL750cfs_Unit7 FWP_yr5_RSS_HSL750cfs_Unit8 FWP_yr5_RSS_HSI_750cfs_Unit9 FWP yr50 RSS HSI FWP_yr50_RSS_HSI_1850cfs_Unit1 FWP yr50 RSS HSI 1850cfs Unit2 FWP_yr50_RSS_HSL 1850cfs_Unit3 FWP yr50 RSS HSI 1850cfs Unit4 FWP_yr50_RSS_HSI_1850cfs_Unit5 FWP_yr50_RSS_HSI_1850cfs_Unit6 FWP_yr50_RSS_HSI_1850cfs_Unit7 FWP_yr50_RSS_HSI_1850cfs_Unit8 FWP_yr50_RSS_HSI_1850cfs_Unit9 FWP_yr50_RSS_HSI_5000cfs_Unit1 FWP_yr50_RS5_HS1_5000cfs_Unit2 FWP_yr50_RSS_HSL_5000cfs_Unit3 FWP_yr50_RSS_HSI_5000cfs_Unit4 FWP_yr50_RSS_HSL5000cfs_Unit5 FWP_yr50_RSS_HSI_5000cfs_Unit6 FWP_yr50_RS5_HSI_5000cfs_Unit7 FWP_yr50_RSS_HSL5000cfs_Unit8 FWP_yr50_RSS_HSI_5000cfs_Unit9 FWP_yr50_RSS_HSI_750cfs_Unit1 FWP_yr50_RSS_HSL750cfs_Unit2 FWP_yr50_RSS_HSL750cfs_Unit3 FWP_yr50_RSS_HSL 750cfs_Unit4 FWP_yr50_RSS_HSL750cfs_Unit5 FWP_yr50_RSS_HSL750cfs_Unit6 FWP_yr50_RSS_HSL750cfs_Unit7 FWP_yr50_RSS_HSI_750cfs_Unit8 FWP_yr50_RSS_HSL750cfs_Unit9

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To calculate actual Habitat Units (end product) need to create a table for each raster. To create a table use the Zonal Statistics tool and input the rasters you want to create a table for.



Once the table is created, create a new field in each raster and call it "Habitat Unit" then use the field calculator tool to determine the total ft² of for each raster.

Use the formula "Sum * 9" where nine is the dimensions of each individual raster cell (3X3) and Sum is the total number of cells.





Final Product: after calculating all the habitat units, input values for each Evaluation unit based on flow into the GIS Outputs Table of Values

A	В	C	D	E	F	G	H		1	K	L	M	N	0	P	Q	R	S		U	V	W	X	Y	1
			FWOP				FWP Year	1		FWP Year 5				FWP Year 15			FWP Year 25				FWP Year 50				
		Ke	y Habitat T	ype	ļ.	Ke	y Habitat 1	ype		Ke	y Habitat 1	ype		Ke	y Habitat 1	ype		Ke	y Habitat T	ype		Ke	y Habitat 1	ype	
			Riparian				Riparian				Riparian				Riparian				Riparian				Riparian		
Evaluation Unit			Scrub-	Riparian			Scrub-	Riparian			Scrub-	Riparian			Scrub-	Riparian			Scrub-	Riparian			Scrub-	Riparian	
	Flow	Riverine	Shrub	Forest	total HU	Riverine	Shrub	Forest	total HU	Riverine	Shrub	Forest	total HU	Riverine	Shrub	Forest	total HU	Riverine	Shrub	Forest	total HU	Riverine	Shrub	Forest	total HU
	750 cfs	193205.7	879.179	97344	NA	311537.2	22736.21	96345	NA	311537.2	69792.41	96345	NA	311537.	879.179	235872	NA	311537.2	879.179	235872	2 NA	311537.2	879.179	166108.5	NA
valuation Unit 1	1850 cfs	37164.55	827.7795	94554	NA	267084.9	22562.09	93555	NA	267084.5	69381.65	93555	NA	267084.	834.4117	232551	NA	267084.9	834.4117	232551	NA	267084.9	834.4117	163053	NA
	5000 cfs	115831	764.7738	88672.5	NA	101367.7	21471.10	87673.5	NA	101367.7	66701.84	87673.5	NA	101367.	768.9189	224428.5	NA	101367.7	768.9189	224428.5	NA	101367.7	768.9189	156051	NA
	750 cfs	114298.2	23240.65	129685.5	NA:	114373.6	31413.51	129685.5	NA	114373.6	55103.63	129685.5	NA	114373.	23240.64	233230.5	NA	114373.6	23240.64	233230.5	NA	114373.6	23240.64	181458	NA
Evaluation Unit 2	1850 cfs	65548.23	22704.84	129470	NA	65602.24	30899.97	129469.5	NA	65602.24	54590.09	129469.5	NA	65602.24	22727.11	233014.5	NA	65602.24	22727.11	233014.5	NA	65602.24	22727.11	181242	NA
raluation Unit FI raluation Unit 1 18 raluation Unit 2 18 raluation Unit 2 18 raluation Unit 3 18 raluation Unit 3 18 raluation Unit 3 18 raluation Unit 4 18 raluation Unit 5 18 raluation Unit 4 18 raluation Unit 5 18 raluation Unit 6 18 raluation Unit 7 18 raluation Unit 7 18 raluation Unit 8 18 raluation Unit 9 18	5000 cfs	11888.87	20655.75	128790	NA.	45088.91	28853.2	128790	NA	45088.91	52543.32	128790	NA	45088.9	20680.33	232335	NA	45088.91	20680.33	232335	NA	45088.91	20680.33	180562.5	NA
	750 cfs	196839.2	72865.38	29655.92	NA	199996.8	147916.8	29655.92	NA	199996.8	369216.2	29655.92	NA	199996.	72865.38	1016821	NA	199996.8	72865.38	1016821	NA	199996.8	72865.38	523238.4	NA
Evaluation Unit 3	1850 cfs	91020.04	7800.34	29157.02	NA	96267.56	141820.8	29157.02	NA	96267.56	353028	29157.02	NA	96267.5	70279.59	971124	NA	96267.56	70279.59	971124	NA	96267.56	70279.59	500140.5	NA
	5000 cfs	33702.89	55371.71	27586.76	NA	45986.5	122669.2	27586.76	NA	45986.5	322040.5	27586.76	NA	45986.	55556.45	899488.8	NA	45986.5	55556.45	899488.8	NA	45986.5	55556.45	463537.8	NA
	750 cfs	480576.6	170498.7	206497.2	NA:	481359.1	238845.9	206497.2	NA	481359.1	445186.3	206497.2	NA	481359.3	170498.7	1060390	NA	481359.1	170498.7	1060390	NA	481359.1	170498.7	633443.7	NA
Evaluation Unit 4	1850 cfs	361285.3	167336.8	203876.5	NA	379780.6	232424.7	203876.5	NA	379780.6	429199.1	203876.5	NA	379780.0	167221.8	1018377	NA	379780.6	167221.8	1018377	NA	379780.6	167221.8	611126.5	NA
	5000 cfs	174374.4	145911.2	199642.9	NA:	223459	203420.6	199642.9	NA	223459	377064.7	199642.9	NA	22345	145880.5	917896.9	NA	223459	145880.5	917896.9	NA	223459	145880.5	558769.9	NA
	750 cfs	257867.8	129830.1	91714.85	NA	253215.6	187430	55836.7	NA	253215.6	417017.3	55836.7	NA	253215.0	111535.3	1003545	NA	253215.6	111535.3	1003545	NA	253215.6	111535.3	527975.6	NA
Evaluation Unit 5	1850 cfs	163370.6	128760.6	91669.85	NA.	211864.2	185910.1	55791.7	NA	211864.2	414302.5	55791.7	NA	211864.3	110406.9	998955.5	NA	211864.2	110406.9	998955.5	NA	211864.2	110406.9	525658.1	NA
	5000 cfs	96459.36	121115.3	91642.85	NA	215582.2	176722.9	55764.7	NA	215582.2	397344.4	55764.7	NA	215582.	103789.3	966636.5	NA	215582.2	103789.3	966636.5	NA	215582.2	103789.3	509485.1	NA
	750 cfs	1056181	237846.7	1227707	NA:	1071368	187430	1227662	NA	1071368	945853	1227662	NA	107136	228078.2	3473495	NA	1071368	228078.2	3473495	NA	1071368	228078.2	2350471	NA
Evaluation Unit 6	1850 cfs	918752.1	228337	1199839	NA	953001.6	385630.5	1199839	NA	953001.6	890670.4	1199839	NA	953001.	218722.3	3301888	NA	953001.6	218722.3	3301888	NA	953001.6	218722.3	2250787	NA
	5000 cfs	651583.8	192333.9	1152603	NA:	870146.4	309854	1152603	NA	870146.4	690131.7	1152603	NA	870146.4	184228.3	2731473	NA	870146.4	184228.3	2731473	NA	870146.4	184228.3	1941962	NA
	750 cfs	196517.6	80896.33	885859.8	NA	197847.2	116857	885859.8	NA	197847.2	230680.4	885859.8	NA	197847.3	79354.79	1362329	NA	197847.2	79354.79	1362329	NA	197847.2	79354.79	1124094	NA
Evaluation Unit 7	1850 cfs	124249	78543.98	885859.8	NA.	189286.8	113764.5	885859.8	NA	189286.8	225121.5	885859.8	NA	189286.	77073.52	1351871	NA	189286.8	77073.52	1351871	NA	189286.8	77073.52	1118865	NA
	5000 cfs	83883.57	53690.05	885859.8	NA	145851.9	85589.1	885859.8	NA	145851.9	186214.7	885859.8	NA	145851.5	52495.9	1304054	NA	145851.9	52495.9	1304054	NA	145851.9	52495.9	1094957	NA
	750 cfs	569354.1	328516	1351397	NA.	627476.6	509193.3	1238848	NA	627476.6	1205309	1238848	NA	627476.	278049.5	4137283	NA	627476.6	278049.5	4137283	NA	627476.6	278049.5	2685371	NA
Evaluation Unit 8	1850 cfs	346215.7	316398.2	1337438	NA	831331.8	496713.8	1224889	NA	831331.8	1189460	1224889	NA	831331.	266701.4	4107925	NA	831331.8	266701.4	4107925	NA	831331.8	266701.4	2663713	NA
	5000 cfs	175974.3	276220.4	1282781	NA	621838.4	452652.3	1170232	NA	621838.4	1120579	1170232	NA	621838.4	230896.8	3946357	NA	621838.4	230896.8	3946357	NA	621838.4	230896.8	2555600	NA
	750 cfs	475289.7	254159.2	1611219	NA	480432.7	280980.2	1429319	NA	480432.7	355856.9	1429319	NA	480432.	253929.8	1755005	NA	480432.7	253929.8	1755005	NA	480432.7	253929.8	1581665	NA
Evaluation Unit 9	1850 cfs	339733	248122.7	1595793	NA.	400054.5	273876.7	1414190	NA	400054.5	345269.5	1414190	NA	400054.	247989.7	1724891	NA	400054.5	247989.7	1724891	NA	400054.5	247989.7	1559044	NA
	5000 cfs	228382.9	206035.3	1530084	NA	361362.3	227650.9	1349057	NA	361362.3	286983.1	1349057	NA	361362.3	206035.3	1597595	NA	361362.3	206035.3	1597595	NA	361362.3	206035.3	1462829	NA



