YRERFS GIS WORKFLOW AND MODELING PROCESS

Presenter Name

Presenter Title

Duty Location

Date of Presentation

U.S.ARMY

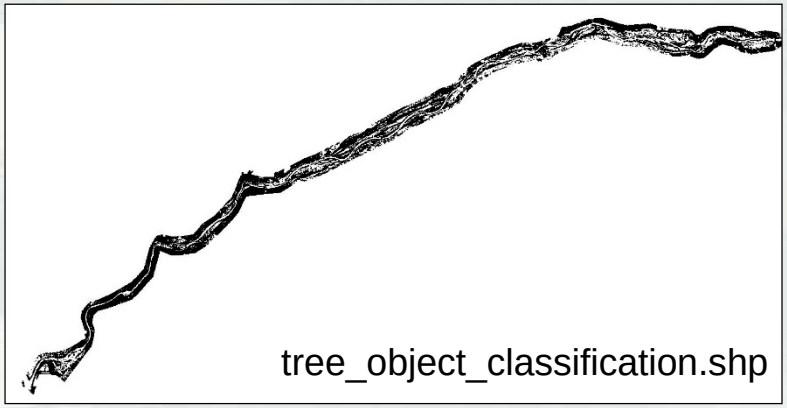
US Army Corps of Engineers

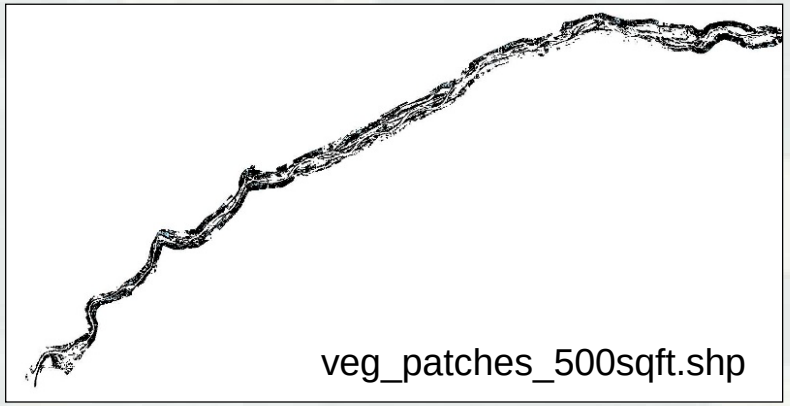
BUILDING STRONG®

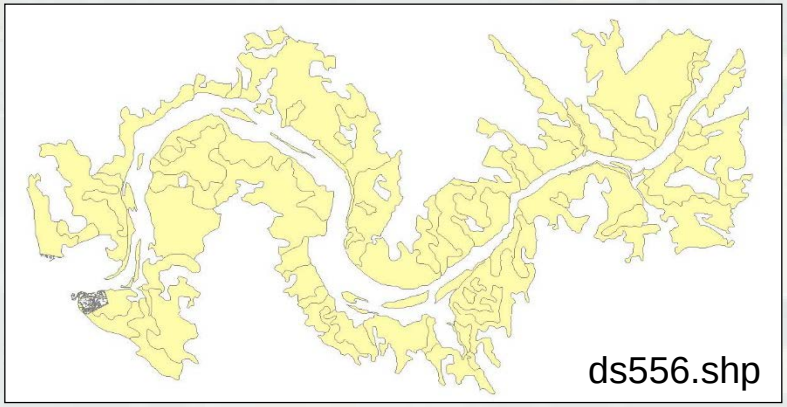
YRERFS Downy Woodpecker Riparian Forest (RF) Habitat Determination

Original Data Sets

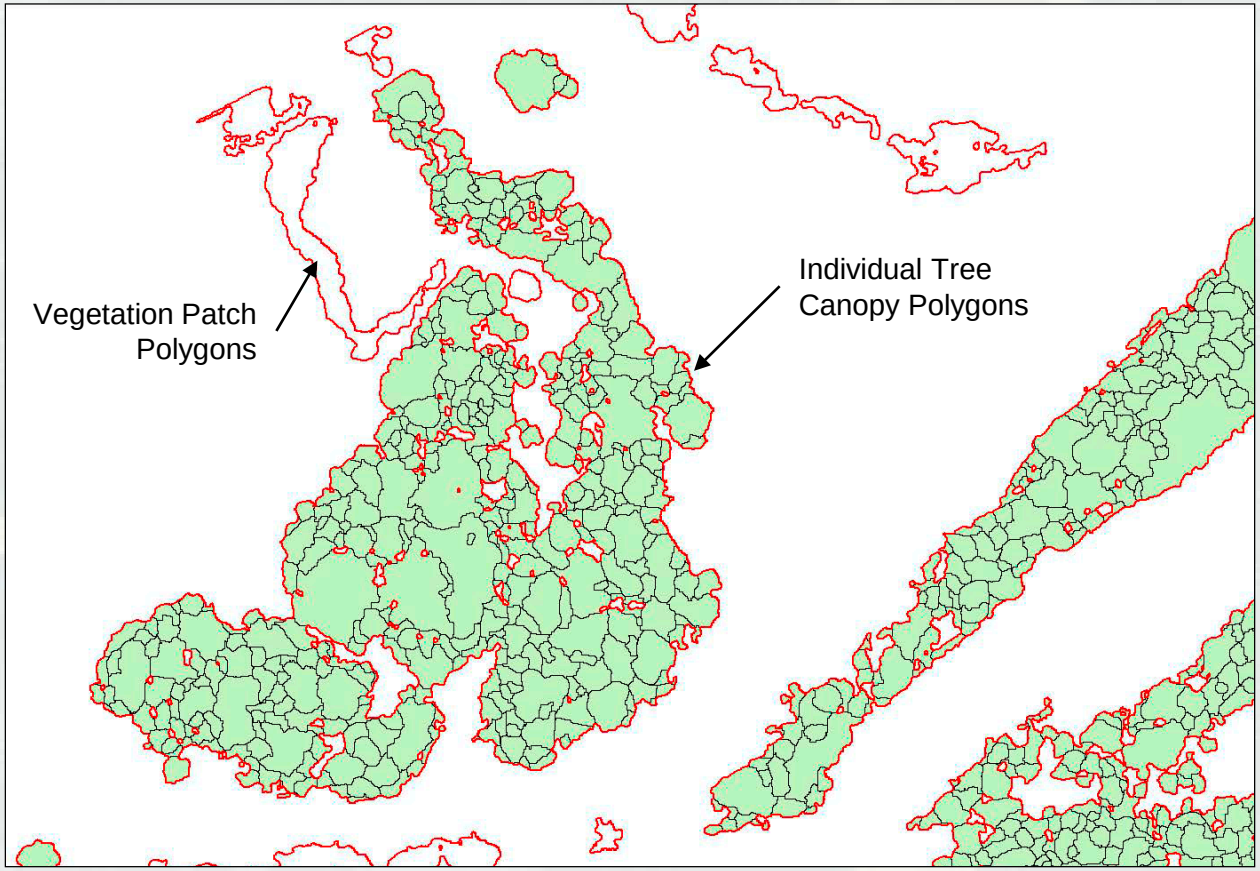
Three datasets were initially used to produce the base data workflow. The tree object classification and vegetation patch datasets were provided by HDR and the third dataset for the area east of HWY 20 came from the Department of Fish and Wildlife web mapping portal.







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 RF only for Downy Woodpecker habitat, the objects designated RF were queried out as their own layer to conduct the calculations.



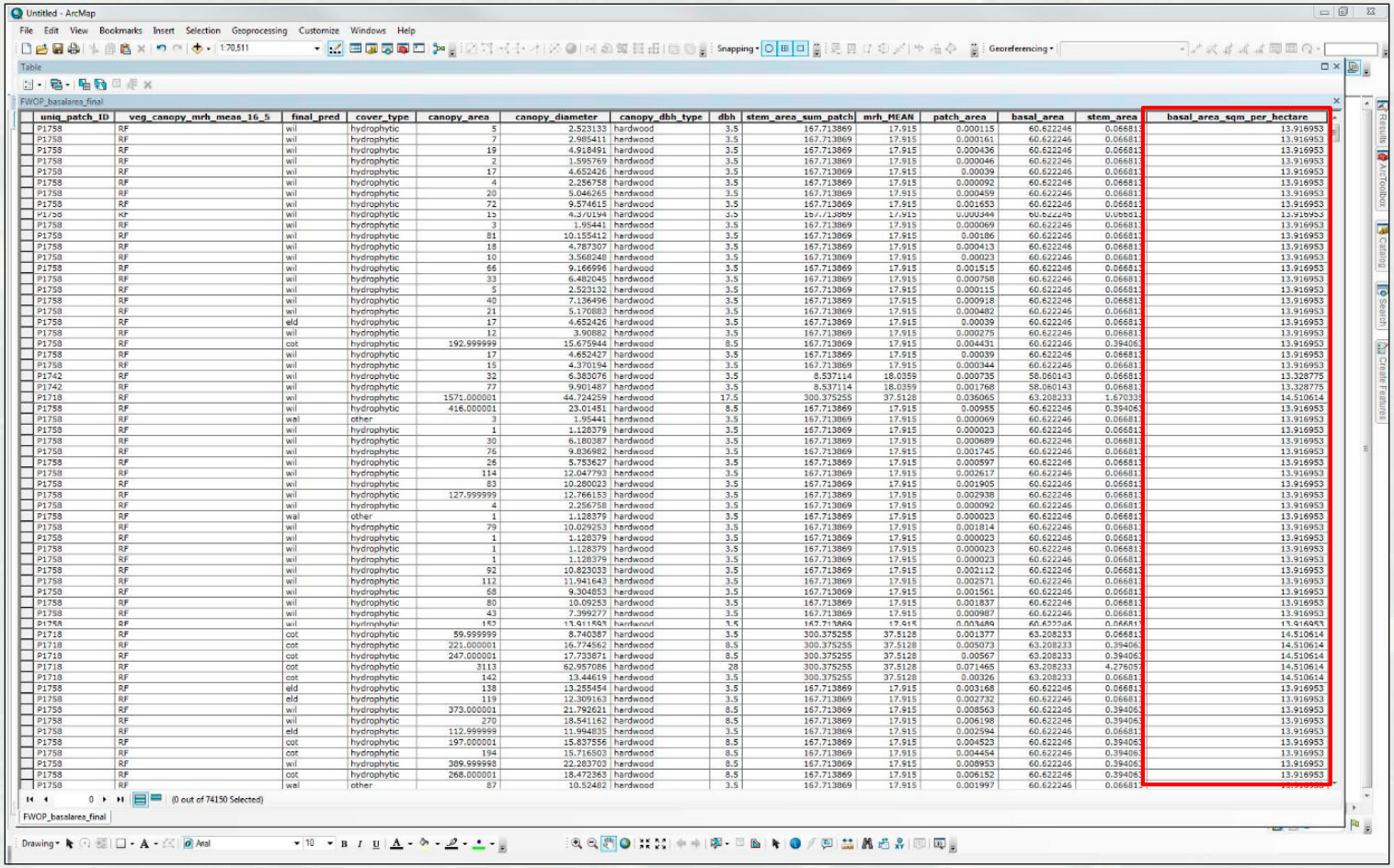
RF tree objects intersected with RF veg patches

A series of calculation need to be conducted within individual fields. Below is the list of steps taken to get to the final output of m^2/hectare:

*Underlined phrases are titles for new fields created in the layer table

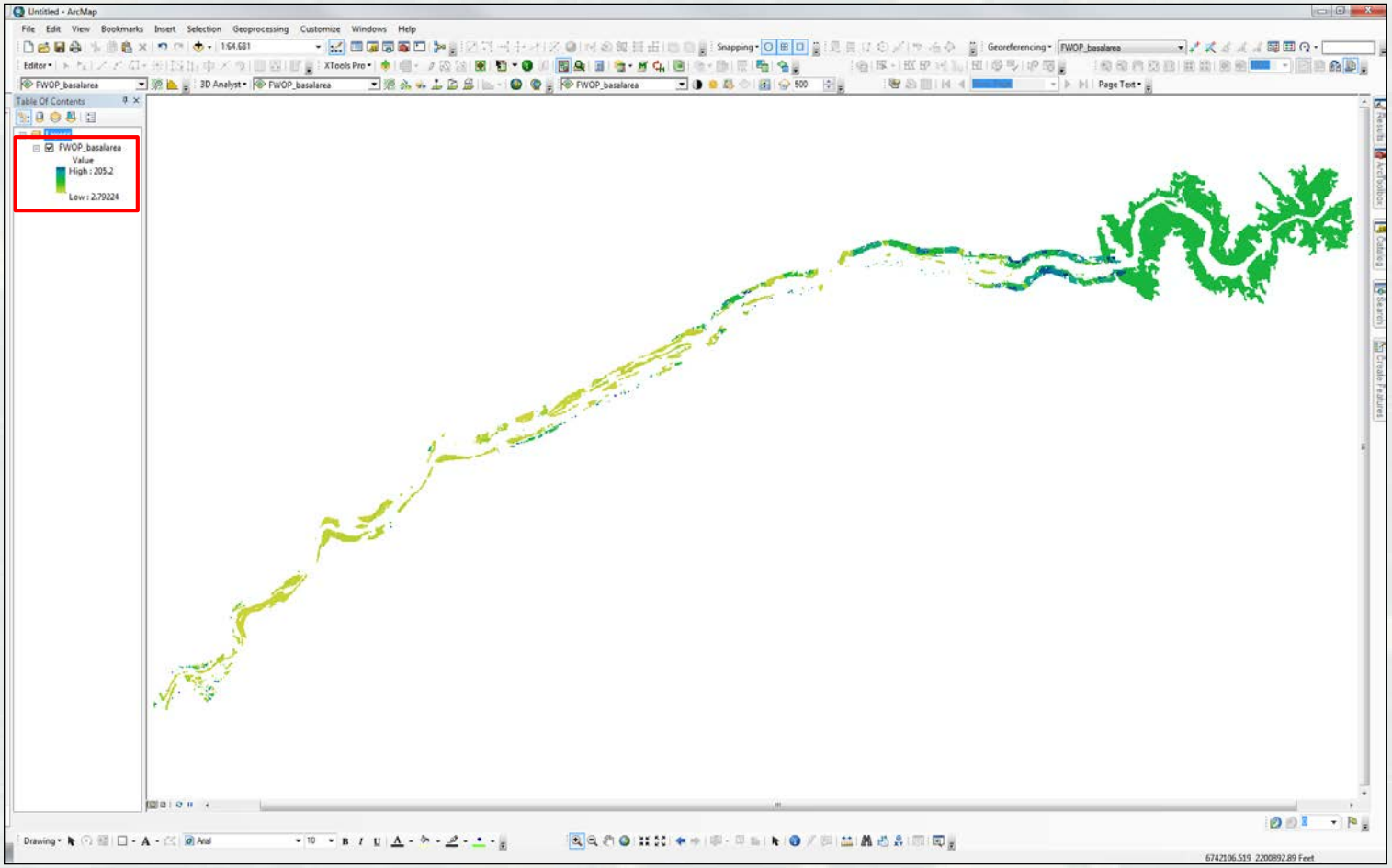
1. Determine canopy area and patch area in ft^2
2. Convert canopy area to <u>canopy diameter</u> using $d=2\sqrt{\frac{A}{\pi}}$
3. Use a cross-walk table to determine <u>dbh</u> based on canopy diameter and <u>canopy dbh type</u>
4. Determine <u>stem area</u> using the equation $\pi\left(\frac{d}{2}\right)^2/144$ where d=DBH
5. Do a dissolve in a separate feature to get the <u>sum of the stem area</u> then join back to the original feature.
6. Convert patch area to acres and divide sum of stem area by patch by patch area to get stem area by patch area in ft^2/acre
7. Convert ft^2/acre to m^2/hectare

Resulting table should look similar to the one below after all calculations have been done.



uniq_patch_ID	veg_canopy_mrh_mean_16_5	final_pred	cover_type	canopy_area	canopy_diameter	canopy_dbh_type	dbh	stem_area_sum_patch	mrh_MEAN	patch_area	basal_area	stem_area	basal_area_sqm_per_hectare
P1758	RF	wil	hydrophytic	5	2.523133	hardwood	3.5	167.713869	17.915	0.000115	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	7	2.985411	hardwood	3.5	167.713869	17.915	0.000161	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	19	4.918491	hardwood	3.5	167.713869	17.915	0.000436	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	2	1.595769	hardwood	3.5	167.713869	17.915	0.000046	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	17	4.652426	hardwood	3.5	167.713869	17.915	0.00039	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	4	2.256758	hardwood	3.5	167.713869	17.915	0.000092	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	20	5.046265	hardwood	3.5	167.713869	17.915	0.000459	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	72	9.574615	hardwood	3.5	167.713869	17.915	0.001653	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	15	4.370194	hardwood	3.5	167.713869	17.915	0.000344	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	3	1.95441	hardwood	3.5	167.713869	17.915	0.000069	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	81	10.155412	hardwood	3.5	167.713869	17.915	0.00186	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	18	4.787307	hardwood	3.5	167.713869	17.915	0.000413	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	10	3.568248	hardwood	3.5	167.713869	17.915	0.00023	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	66	9.166996	hardwood	3.5	167.713869	17.915	0.001515	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	33	6.482045	hardwood	3.5	167.713869	17.915	0.000758	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	5	2.523132	hardwood	3.5	167.713869	17.915	0.000115	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	40	7.136496	hardwood	3.5	167.713869	17.915	0.000918	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	21	5.170883	hardwood	3.5	167.713869	17.915	0.000482	60.622246	0.066813	13.916953
P1758	RF	eld	hydrophytic	17	4.652426	hardwood	3.5	167.713869	17.915	0.00039	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	12	3.90882	hardwood	3.5	167.713869	17.915	0.000275	60.622246	0.066813	13.916953
P1758	RF	cot	hydrophytic	192.999999	15.675944	hardwood	8.5	167.713869	17.915	0.004431	60.622246	0.394063	13.916953
P1758	RF	wil	hydrophytic	17	4.652427	hardwood	3.5	167.713869	17.915	0.00039	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	15	4.370194	hardwood	3.5	167.713869	17.915	0.000344	60.622246	0.066813	13.916953
P1742	RF	wil	hydrophytic	32	6.383076	hardwood	3.5	8.537114	18.0359	0.000735	58.060143	0.066813	13.328775
P1742	RF	wil	hydrophytic	77	9.901487	hardwood	3.5	8.537114	18.0359	0.001768	58.060143	0.066813	13.328775
P1718	RF	wil	hydrophytic	1571.000001	44.724259	hardwood	17.5	300.375255	37.5128	0.036065	63.208233	1.670333	14.510614
P1758	RF	wil	hydrophytic	416.000001	23.01451	hardwood	8.5	167.713869	17.915	0.00955	60.622246	0.394063	13.916953
P1758	RF	wal	other	3	1.95441	hardwood	3.5	167.713869	17.915	0.000069	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	1	1.128379	hardwood	3.5	167.713869	17.915	0.000023	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	30	6.180387	hardwood	3.5	167.713869	17.915	0.000689	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	76	9.836982	hardwood	3.5	167.713869	17.915	0.001745	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	26	5.753627	hardwood	3.5	167.713869	17.915	0.000597	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	114	12.047793	hardwood	3.5	167.713869	17.915	0.002617	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	83	10.280023	hardwood	3.5	167.713869	17.915	0.001905	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	127.999999	12.766153	hardwood	3.5	167.713869	17.915	0.002938	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	4	2.256758	hardwood	3.5	167.713869	17.915	0.000092	60.622246	0.066813	13.916953
P1758	RF	wal	other	1	1.128379	hardwood	3.5	167.713869	17.915	0.000023	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	79	10.029253	hardwood	3.5	167.713869	17.915	0.001814	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	1	1.128379	hardwood	3.5	167.713869	17.915	0.000023	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	1	1.128379	hardwood	3.5	167.713869	17.915	0.000023	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	1	1.128379	hardwood	3.5	167.713869	17.915	0.000023	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	92	10.823033	hardwood	3.5	167.713869	17.915	0.002112	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	112	11.941643	hardwood	3.5	167.713869	17.915	0.002571	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	68	9.304853	hardwood	3.5	167.713869	17.915	0.001561	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	80	10.09253	hardwood	3.5	167.713869	17.915	0.001837	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	43	7.399277	hardwood	3.5	167.713869	17.915	0.000987	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	152	13.911593	hardwood	3.5	167.713869	17.915	0.003489	60.622246	0.066813	13.916953
P1718	RF	cot	hydrophytic	59.999999	8.740387	hardwood	3.5	300.375255	37.5128	0.001377	63.208233	0.066813	14.510614
P1718	RF	cot	hydrophytic	221.000001	16.774562	hardwood	8.5	300.375255	37.5128	0.005073	63.208233	0.394063	14.510614
P1718	RF	cot	hydrophytic	247.000001	17.733671	hardwood	8.5	300.375255	37.5128	0.00567	63.208233	0.394063	14.510614
P1718	RF	cot	hydrophytic	3113	62.957086	hardwood	28	300.375255	37.5128	0.071465	63.208233	4.276057	14.510614
P1718	RF	cot	hydrophytic	142	13.44619	hardwood	3.5	300.375255	37.5128	0.00326	63.208233	0.066813	14.510614
P1758	RF	eld	hydrophytic	138	13.255454	hardwood	3.5	167.713869	17.915	0.003168	60.622246	0.066813	13.916953
P1758	RF	eld	hydrophytic	119	12.309163	hardwood	3.5	167.713869	17.915	0.002732	60.622246	0.066813	13.916953
P1758	RF	wil	hydrophytic	373.000001	21.792621	hardwood	8.5	167.713869	17.915	0.008563	60.622246	0.394063	13.916953
P1758	RF	wil	hydrophytic	270	18.541162	hardwood	8.5	167.713869	17.915	0.006198	60.622246	0.394063	13.916953
P1758	RF	eld	hydrophytic	112.999999	11.994835	hardwood	3.5	167.713869	17.915	0.002594	60.622246	0.066813	13.916953
P1758	RF	cot	hydrophytic	197.000001	15.837556	hardwood	8.5	167.713869	17.915	0.004523	60.622246	0.394063	13.916953
P1758	RF	cot	hydrophytic	194	15.716503	hardwood	8.5	167.713869	17.915	0.004454	60.622246	0.394063	13.916953
P1758	RF	wil	hydrophytic	389.999998	22.283703	hardwood	8.5	167.713869	17.915	0.008953	60.622246	0.394063	13.916953
P1758	RF	cot	hydrophytic	268.000001	18.472363	hardwood	8.5	167.713869	17.915	0.006152	60.622246	0.394063	13.916953
P1758	RF	wal	other	87	10.52482	hardwood	3.5	167.713869	17.915	0.001997	60.622246	0.066813	13.916953

Convert the basal area polygon into a future without project (FWOP) raster based on the (m^2/hectare) field



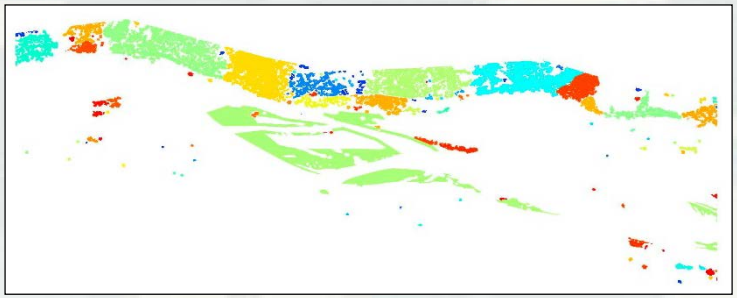
Create a raster of the measures polygon and assign the following values:

Year 1				
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	% Decidious Shrub Canopy Comprised of Hydrophytic Shrubs (% of hydrophytic shrubs per patch)	Average height of Canopy	% Cover of Shrub canopy (% of polygon area)	Basal Area
RSS	81.3	2	1.5	FWOP
Year 5				
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	% Decidious Shrub Canopy Comprised of Hydrophytic Shrubs (% of hydrophytic shrubs per patch)	Average height of Canopy	% Cover of Shrub canopy (% of polygon area)	Basal Area
RSS	81.3	9.6	7.5	FWOP
Year 15				
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	% Decidious Shrub Canopy Comprised of Hydrophytic Shrubs (% of hydrophytic shrubs per patch)	Average height of Canopy	% Cover of Shrub canopy (% of polygon area)	Basal Area
RF	81.3	25.8	22.5	10.1
Year 25				
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	% Decidious Shrub Canopy Comprised of Hydrophytic Shrubs (% of hydrophytic shrubs per patch)	Average height of Canopy	% Cover of Shrub canopy by Reach	Basal Area
RF	81.3	37.8	37.5	16.8
Year 50				
Canopy Type (Riparian Scrub-shrub or Riparian Forest)	% Decidious Shrub Canopy Comprised of Hydrophytic Shrubs (% of hydrophytic shrubs per patch)	Average height of Canopy	% Cover of Shrub canopy by Reach	Basal Area
RF	81.3	49.8	75	33.7

Mosaic: Use *mosaic to new raster* tool to combine the FWOP basal area raster 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 1 & 5 you will not see riparian forest in the areas of the measures because they are below the 16.5 feet RF designation*.

FWOP_basalarea: Values of 2.79 – 205.2 m^2/hectare

FWP_basalarea_measureonly: Value of 10.1 m^2/hectare



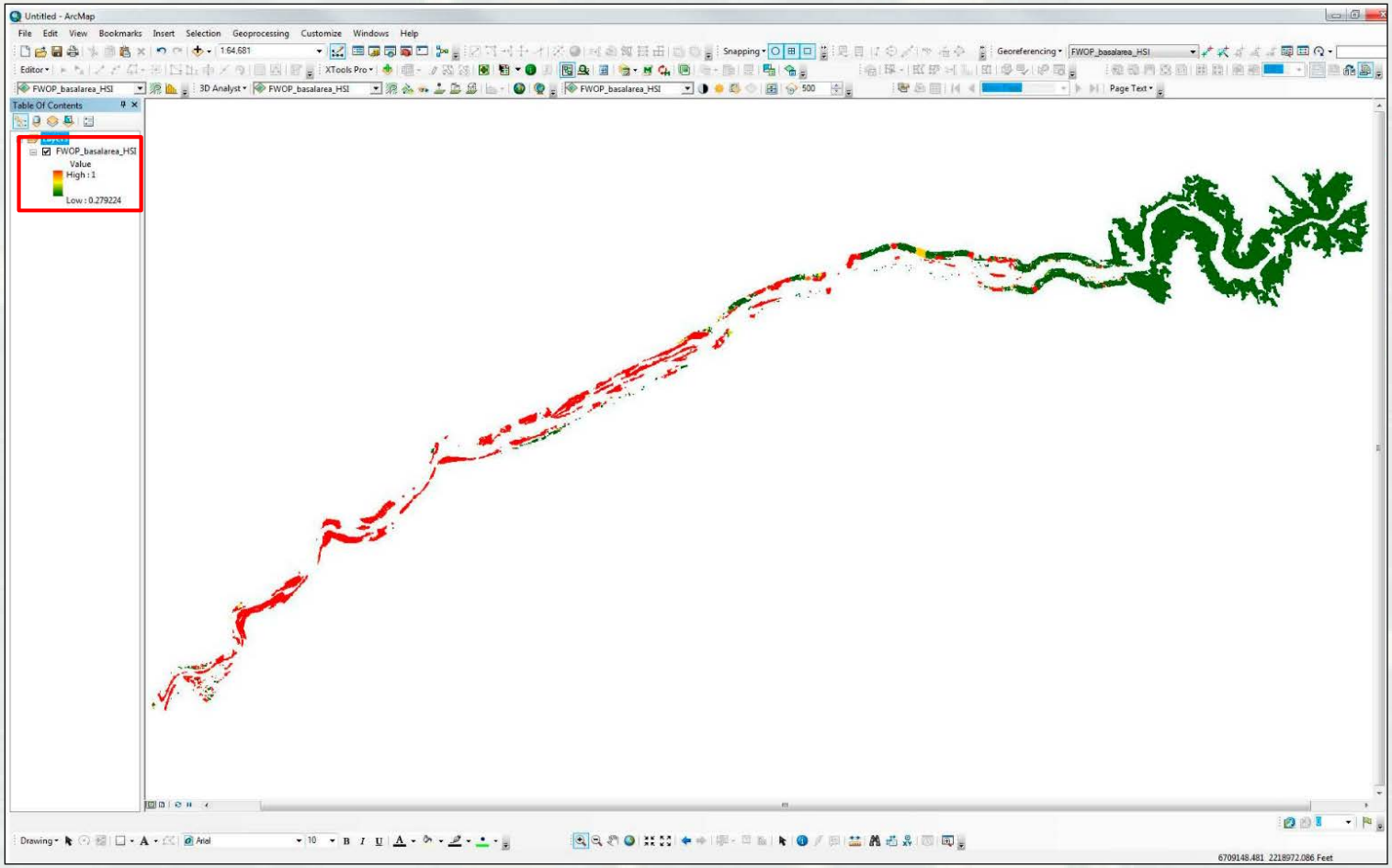
FWP_(yrs1, 5, 15, 25, 50)basalarea_SI: Value of 2.79 - 205.2 m^2/hectare

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

basal area range	Formula
for basal area from 0 to 10 (m2/ hectare)	SI = 0.1 (Basal Area)
for basal area from 10 to 20 (m2/ hectare)	SI =1
for basal area from 20 to 30 (m2/ hectare)	SI = -0.05 (Basal Area) + 2
for basal area greater than 30 (m2/ hectare)	SI = 0.5

Ex. A basal area of 9.2 m^2/hectare would yield an SI of 0.92. (SI = 0.1 * 9.2)

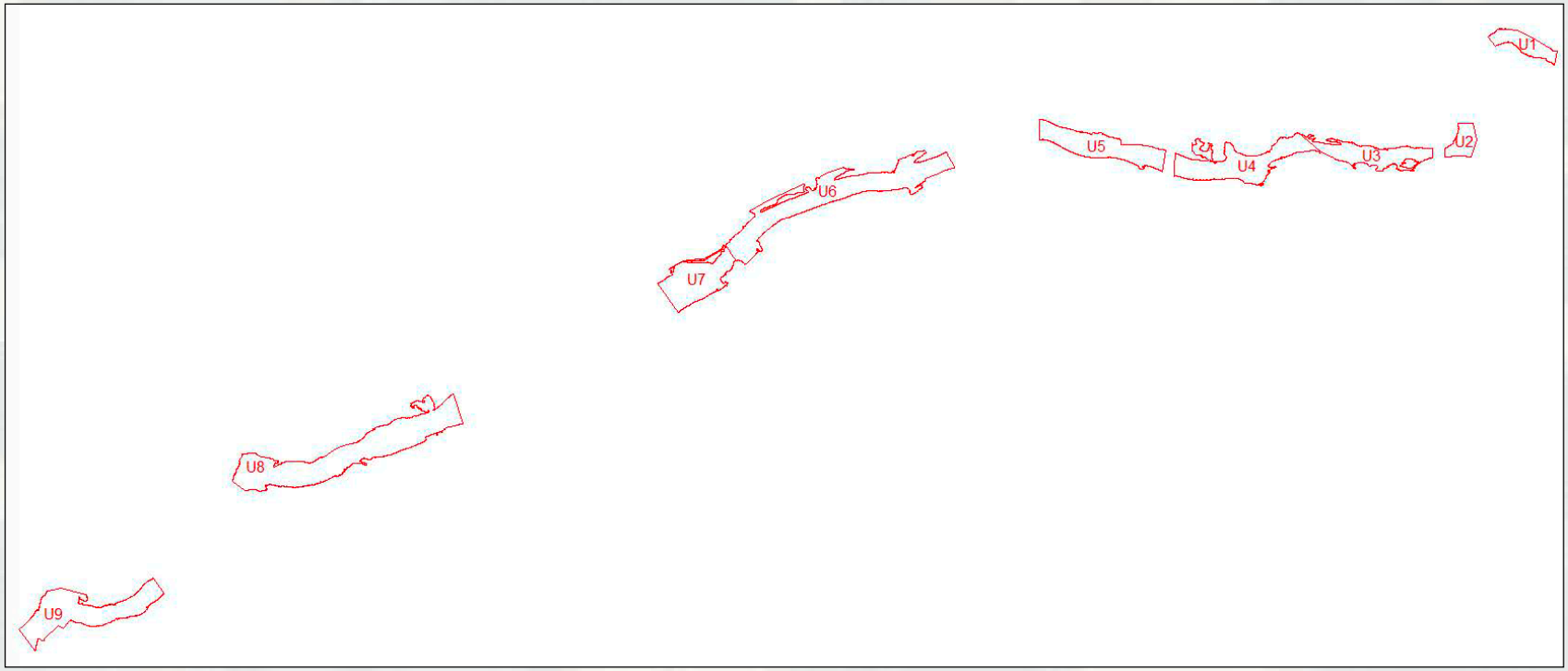
SI values should be between 0 and 1



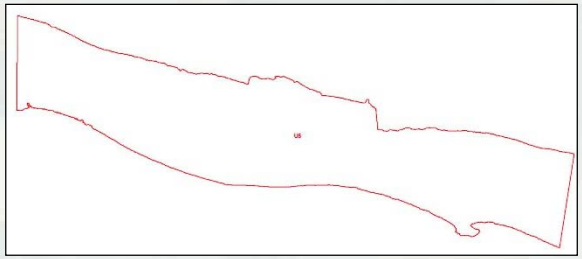
After all SI calculations have been determined those values will be used to determine the HSI values using the following formula:

Riparian Forest HSI = $SI_{basal\ area}$

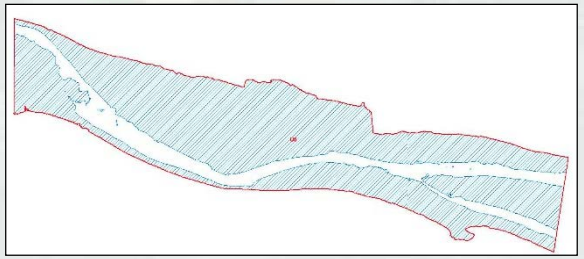
To refine results of the HSI and make it pertinent to the areas where measures are, a new layer was created to clip out the needed features. The layer, ”Units”, has a north-south boundary based on the 84,000 cfs flow boundary and an east west boundary of 500 feet off either end of the widest measure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



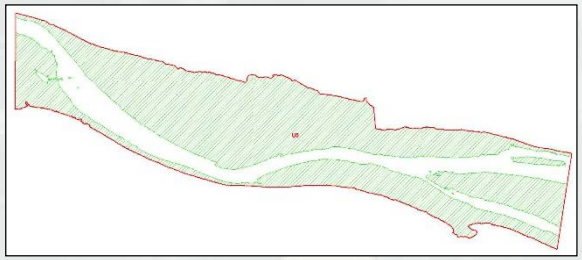
All 9 units were then clipped by three flow boundaries (750, 1850, and 5000 cfs) to get 27 individual polygons that will be used to clip the rasters.



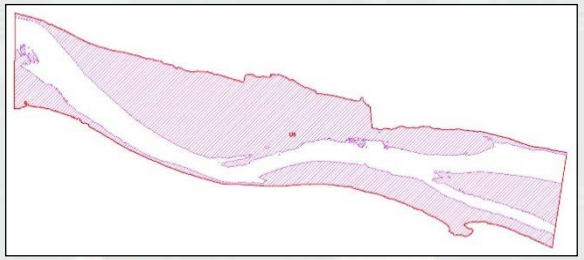
Unit 5



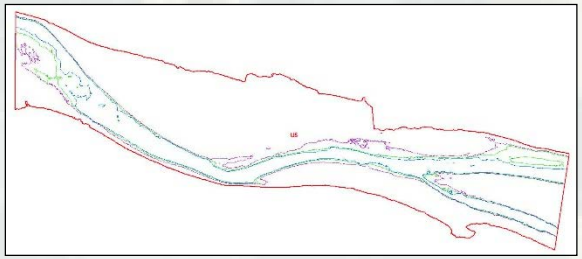
Unit 5: 750 cfs flow boundary clipped out



Unit 5: 1850 cfs flow boundary clipped out

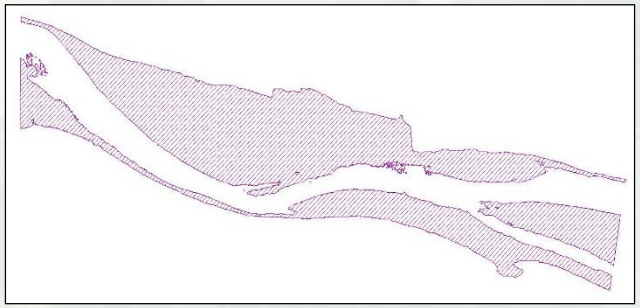


Unit 5: 5000 cfs flow boundary clipped out



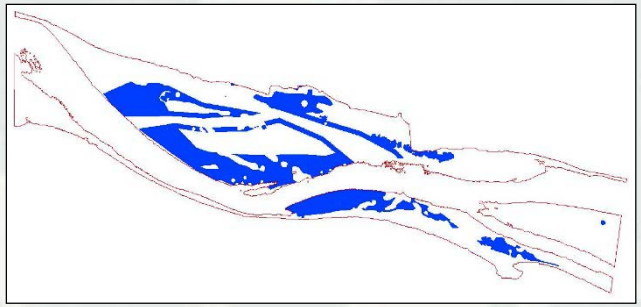
Unit 5: all 3 flows to show the difference between them.

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.



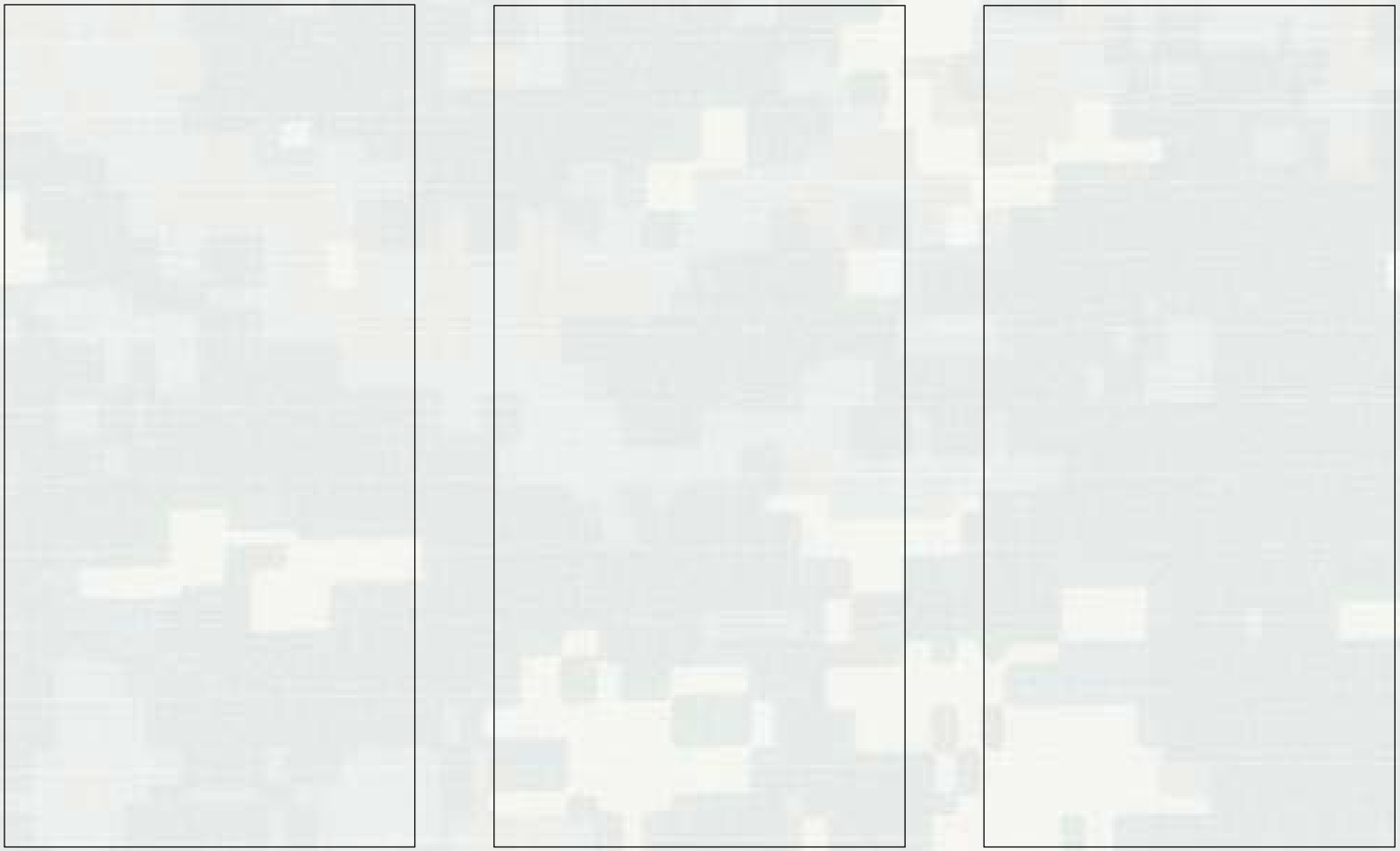
Mask: Unit 5 5000 cfs polygon

FWP yr25 HSI raster

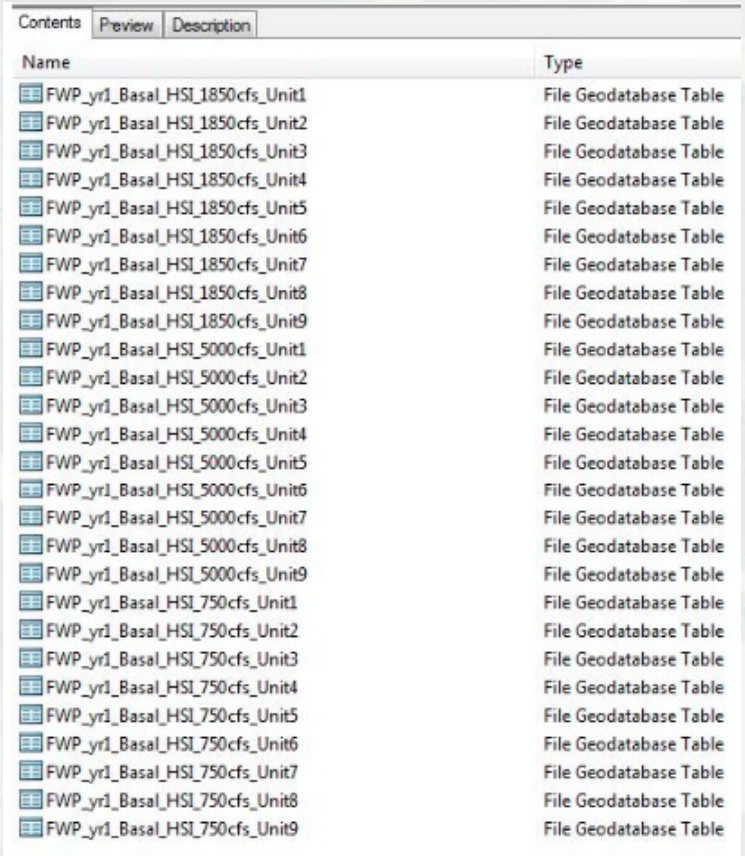


Result: raster within the bounds of the unit 5 polygon

When done with all the extracts, you will have a total of 162 individual rasters



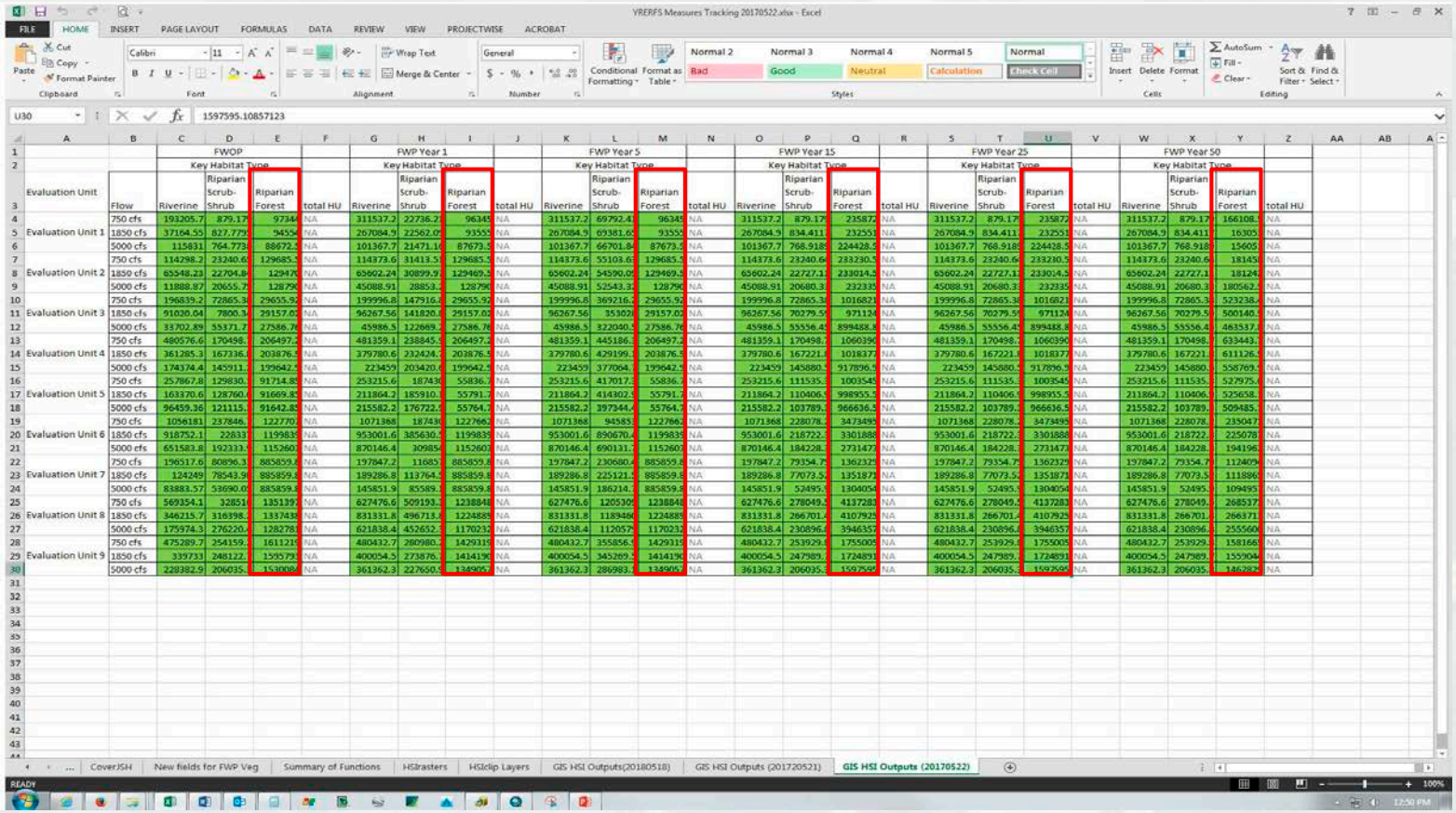
To calculate actual Habitat Units (end product) need to create a table for each raster. To create a table use the Zonal Statistics tool and input the rasters you want to create a table for.



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 ft^2 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



Evaluation Unit	Flow	FWOP Riverine	FWOP Riparian Scrub-Shrub	FWOP Riparian Forest	FWOP total HU	FWP Year 1 Riverine	FWP Year 1 Riparian Scrub-Shrub	FWP Year 1 Riparian Forest	FWP Year 1 total HU	FWP Year 5 Riverine	FWP Year 5 Riparian Scrub-Shrub	FWP Year 5 Riparian Forest	FWP Year 5 total HU	FWP Year 15 Riverine	FWP Year 15 Riparian Scrub-Shrub	FWP Year 15 Riparian Forest	FWP Year 15 total HU	FWP Year 25 Riverine	FWP Year 25 Riparian Scrub-Shrub	FWP Year 25 Riparian Forest	FWP Year 25 total HU	FWP Year 50 Riverine	FWP Year 50 Riparian Scrub-Shrub	FWP Year 50 Riparian Forest	FWP Year 50 total HU
		Key Habitat Type				Key Habitat Type				Key Habitat Type				Key Habitat Type				Key Habitat Type				Key Habitat Type			
Evaluation Unit 1	750 cfs	193205.7	879.17	97344	NA	311537.2	22736.2	96345	NA	311537.2	69792.47	96345	NA	311537.2	879.17	235872	NA	311537.2	879.17	235872	NA	311537.2	879.17	166108.1	NA
	1850 cfs	37164.55	827.779	9455	NA	267084.9	22562.07	93555	NA	267084.9	69381.69	93555	NA	267084.9	834.411	232551	NA	267084.9	834.411	232551	NA	267084.9	834.411	16305	NA
	5000 cfs	115831	764.773	88672.2	NA	101367.7	21471.16	87673.5	NA	101367.7	66701.84	87673.5	NA	101367.7	768.9185	224428.5	NA	101367.7	768.9185	224428.5	NA	101367.7	768.9185	15605	NA
Evaluation Unit 2	750 cfs	114298.2	23240.6	129685.5	NA	114373.6	31413.5	129685.5	NA	114373.6	55103.66	129685.5	NA	114373.6	23240.66	233230.5	NA	114373.6	23240.66	233230.5	NA	114373.6	23240.66	18145	NA
	1850 cfs	65548.23	22704.8	129470	NA	65602.24	30899.9	129469.5	NA	65602.24	54590.09	129469.5	NA	65602.24	22727.13	233014.5	NA	65602.24	22727.13	233014.5	NA	65602.24	22727.1	18124	NA
	5000 cfs	11888.87	20655.7	128790	NA	45088.91	28853.2	128790	NA	45088.91	52543.33	128790	NA	45088.91	20680.33	232335	NA	45088.91	20680.33	232335	NA	45088.91	20680.3	180562.5	NA
Evaluation Unit 3	750 cfs	196839.2	72865.33	29655.92	NA	199996.8	147916.2	29655.92	NA	199996.8	369216.2	29655.92	NA	199996.8	72865.33	1016821	NA	199996.8	72865.33	1016821	NA	199996.8	72865.3	523238.4	NA
	1850 cfs	91020.04	7800.3	29157.02	NA	96267.56	141820.1	29157.02	NA	96267.56	353020	29157.02	NA	96267.56	70279.55	971124	NA	96267.56	70279.55	971124	NA	96267.56	70279.5	500140.3	NA
	5000 cfs	33702.89	55371.7	27586.76	NA	45986.5	122669.2	27586.76	NA	45986.5	322040.5	27586.76	NA	45986.5	55556.45	899488.8	NA	45986.5	55556.45	899488.8	NA	45986.5	55556.4	463537.2	NA
Evaluation Unit 4	750 cfs	480576.6	170498.2	206497.2	NA	481359.1	238845.5	206497.2	NA	481359.1	445186.2	206497.2	NA	481359.1	170498.2	1060390	NA	481359.1	170498.2	1060390	NA	481359.1	170498.2	633443.7	NA
	1850 cfs	361285.3	167336.1	203876.5	NA	379780.6	232424.2	203876.5	NA	379780.6	429199.1	203876.5	NA	379780.6	167221.1	1018377	NA	379780.6	167221.1	1018377	NA	379780.6	167221	611126.7	NA
	5000 cfs	174374.4	145911.1	199642.5	NA	223459	203420.6	199642.5	NA	223459	377064.1	199642.5	NA	223459	145880.5	917896.5	NA	223459	145880.5	917896.5	NA	223459	145880	558769.5	NA
Evaluation Unit 5	750 cfs	257867.8	129830.1	91714.85	NA	253215.6	187436.1	55836.7	NA	253215.6	417017.3	55836.7	NA	253215.6	111535.1	1003545	NA	253215.6	111535.1	1003545	NA	253215.6	111535	527975.4	NA
	1850 cfs	163370.6	128760.1	91669.85	NA	211864.2	185910.1	55791.7	NA	211864.2	414302.1	55791.7	NA	211864.2	110406.1	998955.1	NA	211864.2	110406.1	998955.1	NA	211864.2	110406	525658.1	NA
	5000 cfs	96459.36	121115.1	91642.85	NA	215582.2	176722.5	55764.7	NA	215582.2	397344.4	55764.7	NA	215582.2	103789.5	966636.5	NA	215582.2	103789.5	966636.5	NA	215582.2	103789	509485.1	NA
Evaluation Unit 6	750 cfs	1056181	237846.1	122770.7	NA	1071368	187436.1	122766.1	NA	1071368	945853.1	122766.1	NA	1071368	228078.2	3473495	NA	1071368	228078.2	3473495	NA	1071368	228078.2	2350471	NA
	1850 cfs	918752.1	22833.1	119983.9	NA	953001.6	385630.3	119983.9	NA	953001.6	890670.4	119983.9	NA	953001.6	218722.2	3301888	NA	953001.6	218722.2	3301888	NA	953001.6	218722.2	2250788	NA
	5000 cfs	651583.8	192333.1	115260.3	NA	870146.4	309854.1	115260.3	NA	870146.4	690131.2	115260.3	NA	870146.4	184228.2	2731473	NA	870146.4	184228.2	2731473	NA	870146.4	184228.2	1941968	NA
Evaluation Unit 7	750 cfs	196517.6	80896.33	885859.8	NA	197847.2	11685.7	885859.8	NA	197847.2	230680.4	885859.8	NA	197847.2	79354.72	1362325	NA	197847.2	79354.72	1362325	NA	197847.2	79354.7	1124098	NA
	1850 cfs	124249	78543.98	885859.8	NA	189286.8	113764.5	885859.8	NA	189286.8	225121.5	885859.8	NA	189286.8	77073.52	1351871	NA	189286.8	77073.52	1351871	NA	189286.8	77073.5	1118865	NA
	5000 cfs	83883.57	53690.02	885859.8	NA	145851.9	85589.1	885859.8	NA	145851.9	186214.3	885859.8	NA	145851.9	52495.1	1304054	NA	145851.9	52495.1	1304054	NA	145851.9	52495.1	1094955	NA
Evaluation Unit 8	750 cfs	569354.1	32851.6	1351199	NA	627476.6	509193.1	1238848	NA	627476.6	1205309	1238848	NA	627476.6	278049.3	4137283	NA	627476.6	278049.3	4137283	NA	627476.6	278049.3	2685377	NA
	1850 cfs	346215.7	316398.1	1337438	NA	831331.8	496713.8	1224885	NA	831331.8	1189460	1224885	NA	831331.8	266701.2	4107925	NA	831331.8	266701.2	4107925	NA	831331.8	266701.2	2663715	NA
	5000 cfs	175974.3	276220.1	1282788	NA	621838.4	452652.3	1170233	NA	621838.4	1120579	1170233	NA	621838.4	230896.2	3946357	NA	621838.4	230896.2	3946357	NA	621838.4	230896.2	2555604	NA
Evaluation Unit 9	750 cfs	475289.7	254159.1	1611219	NA	480432.7	260980.2	1429319	NA	480432.7	355856.9	1429319	NA	480432.7	253929.8	1755005	NA	480432.7	253929.8	1755005	NA	480432.7	253929.8	1581685	NA
	1850 cfs	339733	248122.1	1595793	NA	400054.5	273876.1	1414190	NA	400054.5	345269.5	1414190	NA	400054.5	247989.2	1724891	NA	400054.5	247989.2	1724891	NA	400054.5	247989.2	1559044	NA
	5000 cfs	228382.9	206035.2	1530089	NA	361362.3	227650.5	1349065	NA	361362.3	286983.2	1349065	NA	361362.3	206035.2	1592595	NA	361362.3	206035.2	1592595	NA	361362.3	206035.2	1462824	NA