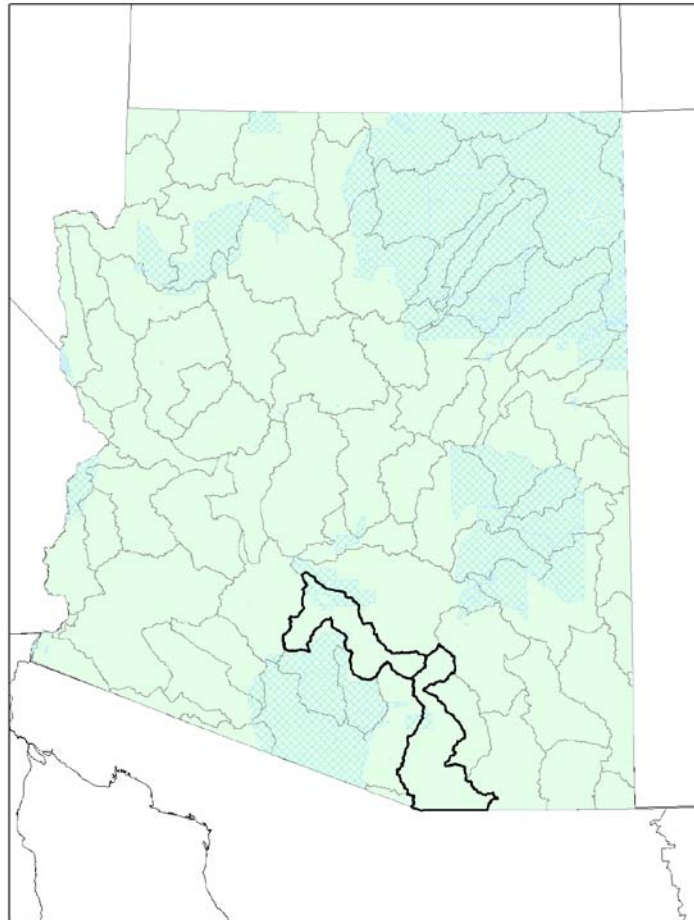


Arizona Wetlands Mapping Project

L. Campbell, L. Mexicano, U. Nguyen, L. Perry, M. Reed, C. Wissler, D. Yeasmin

Advanced Resource Technology, School of Natural Resources and the Environment, University of Arizona.

Goal Create a statewide wetlands map, excluding tribal areas, based on Cowardin 1979 classification system.



Approach

- delineate and classify according to Cowardin (1979) system
- utilize USFWS NWI mapping standards
- map by 8 digit HUC
- utilize commonly available spatial data on wetlands
- utilize common imagery for mapping (NAIP)
- develop maximum likelihood rasters
- scan imagery for wetlands aided by likelihood rasters
- Develop workflow and review QA/QC Protocols
- Develop Metadata



U.S. Fish & Wildlife Service

Data Collection Requirements and Procedures for Mapping Wetland, Deepwater and Related Habitats of the United States

U.S. Fish and Wildlife Service
Division of Habitat and Resource Conservation
Branch of Resource and Mapping Support
Arlington, VA 22203

July 2009

persistent emergents, mosses, or banks forming the outer limits of

The riverine system terminates at derived salts in the water exceed or where the channel enters a lake streams originate, or where the channel are considered part of the riverine

Where a river enters a lake, the river forms the riverine - lacustrine systems unless they are where water flows either on a point should be handled in the same manner extending upstream to the contour

Lacustrine System

The lacustrine system includes wetlands characteristics:

- deepwater situated in a topographic depression or a dammed river channel
- lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% aerial coverage;
- total area exceeds 8 hectares (20 acres).

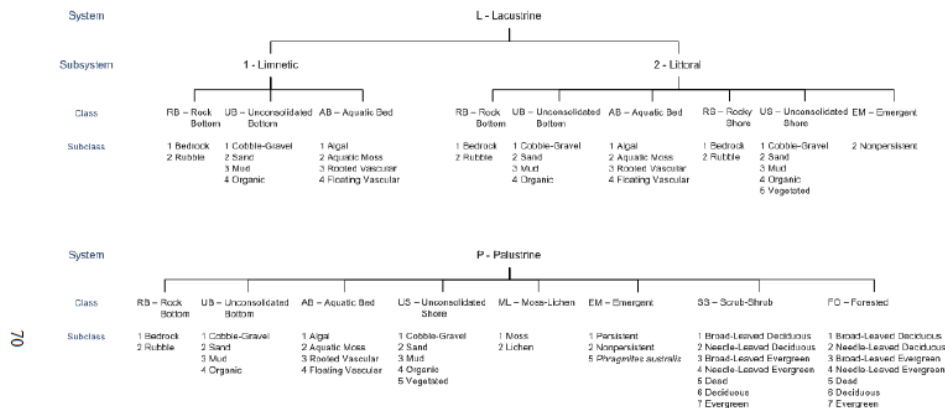
Basins or catchments less than 8 hectares in size are included if they have at least one of the following characteristics:

- a wave formed or bedrock feature forms all or part of the shoreline boundary
- at low water the water depth is greater than 2 meters (6.6 feet) in the deepest part of the basin

Lacustrine habitats formed by damming a river channel are confined by the contour approximating normal spillway elevation or summer pool elevation. Rivers with dams and associated locks that impound water to the extent that the ecological character of the river is significantly impacted, are considered lacustrine to the upstream point that approximates spillway or normal pool elevation, or to the upstream point where riverine characteristics return.

Limits: The lacustrine system is bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Lacustrine systems formed by damming a river channel are bounded by a contour approximating the normal spillway elevation or normal pool elevation, except where palustrine wetlands extend into the lake

WETLANDS AND DEEPWATER HABITATS CLASSIFICATION



MODIFIERS

In order to more adequately describe the wetland and deepwater habitats, one or more of the water regime, water chemistry, soil, or special modifiers may be applied at the class or lower level in the hierarchy. The named modifier may also be applied to the ecological system.

Water Regime			Special Modifiers	Water Chemistry			Soil
Nontidal	Saltwater Tidal	Freshwater Tidal		Coastal Salinity	Inland Salinity	pH Modifiers for all Fresh Water	
A. Temporarily Flooded	L. Subtidal	S. Temporarily Flooded-Tidal	b. Beaver	1. Hypersaline	7. Hypersaline	a. Acid	g. Organic
B. Saturated	M. Irregularly Exposed	R. Seasonally Flooded-Tidal	4. Partly Drained/Diked	2. Euxaline	8. Euxaline	1. Circumneutral	
C. Seasonally Flooded	N. Regularly Flooded	T. Temporarily Flooded-Tidal	1. Farmed	3. Microhaline (Brackish)	9. Microsaline	1. Alkaline	
E. Seasonally Flooded/ Saturated	P. Irregularly Flooded	V. Permanently Flooded-Tidal	h. Diked/Impounded	4. Polyhaline	0. Fresh		
F. Semi-permanently Flooded			r. Artificial	5. Mesohaline			
G. Intermittently Exposed			s. Spoil	6. Oligohaline			
H. Permanently Flooded			x. Excavated	6. Fresh			
J. Intermittently Flooded							
K. Artificially Flooded							

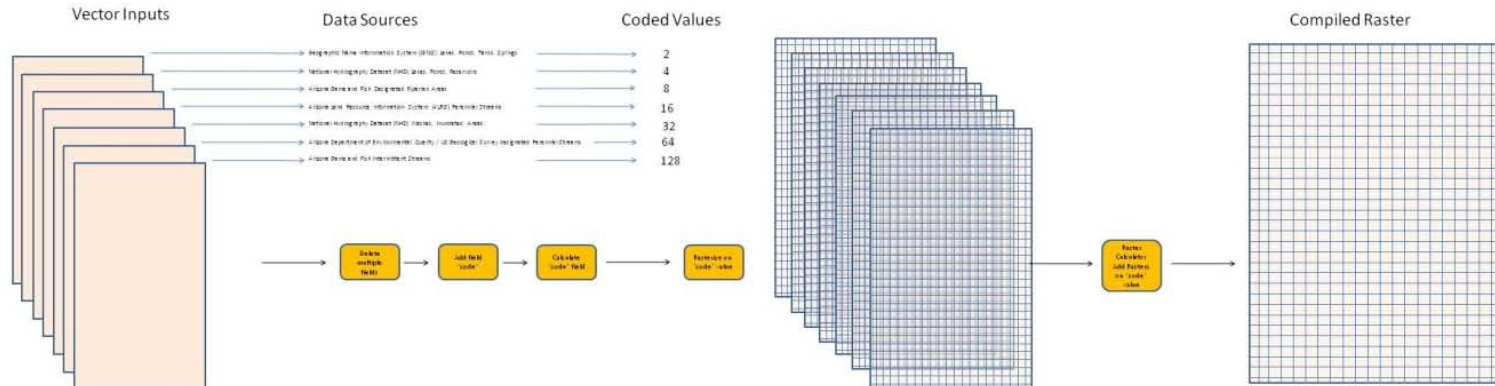
Page

Guiding Documents

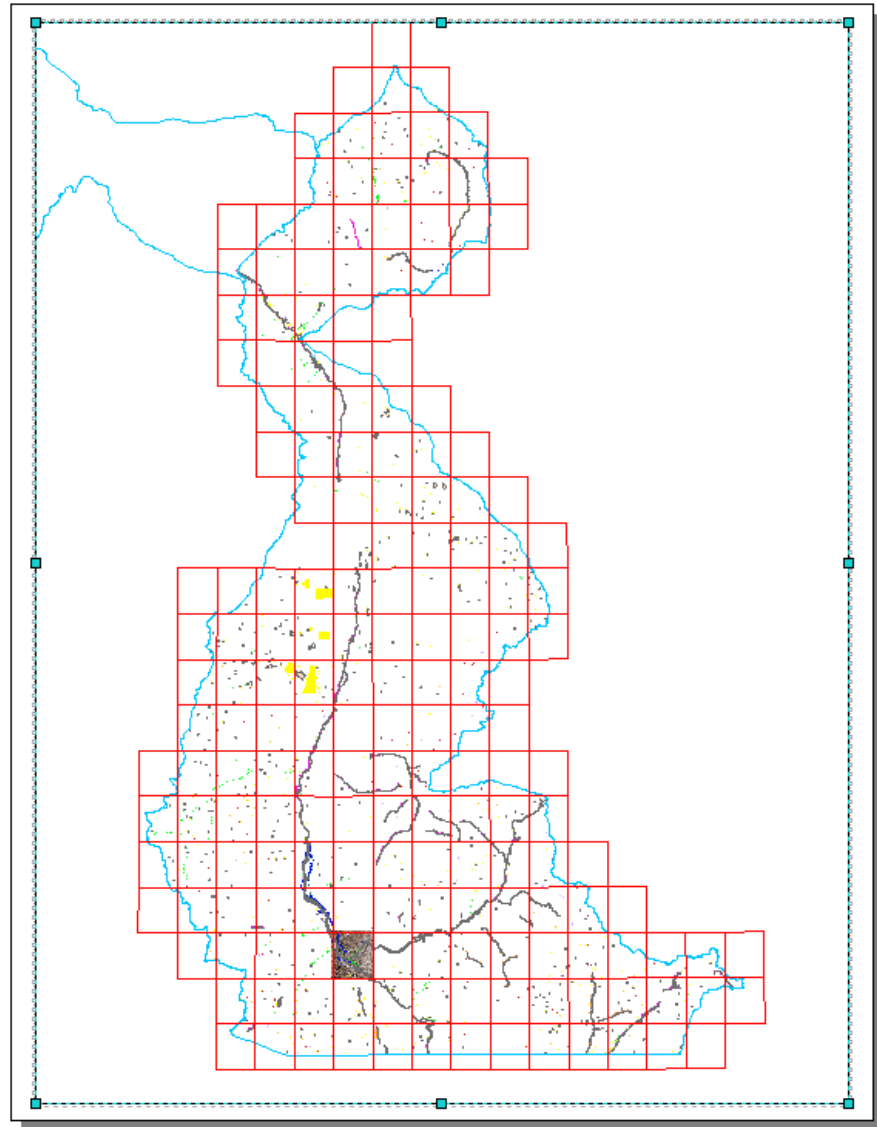
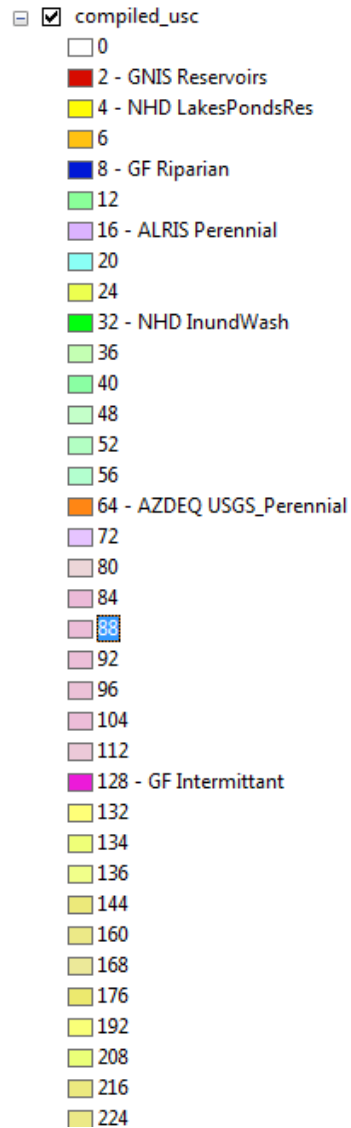
External Data Sources

Name	Source	Key Attributes	Selection Values
Geographic Names Information System (GNIS)	USGS http://geonames.usgs.gov/domestic/	Feature Class	"reservoirs"
Streams	ALRIS Arizona Land Resource Information System, Arizona State Land Department	perennial code, class	1
Riparian Vegetation	ALRIS Arizona Land Resource Information System, Arizona State Land Department	NAME	n/a
National Hydrography Dataset: NHDWaterbody	USGS http://nhd.usgs.gov/data.html	Ftype	"Lake/pond", "reservoir"
National Hydrography Dataset: NHDArea	USGS http://nhd.usgs.gov/data.html	Ftype	"inundation area", "wash"
National Agriculture Imagery Program	Arizona Imagery Server http://imagery.azmap.org/arcgis/services	n/a	n/a

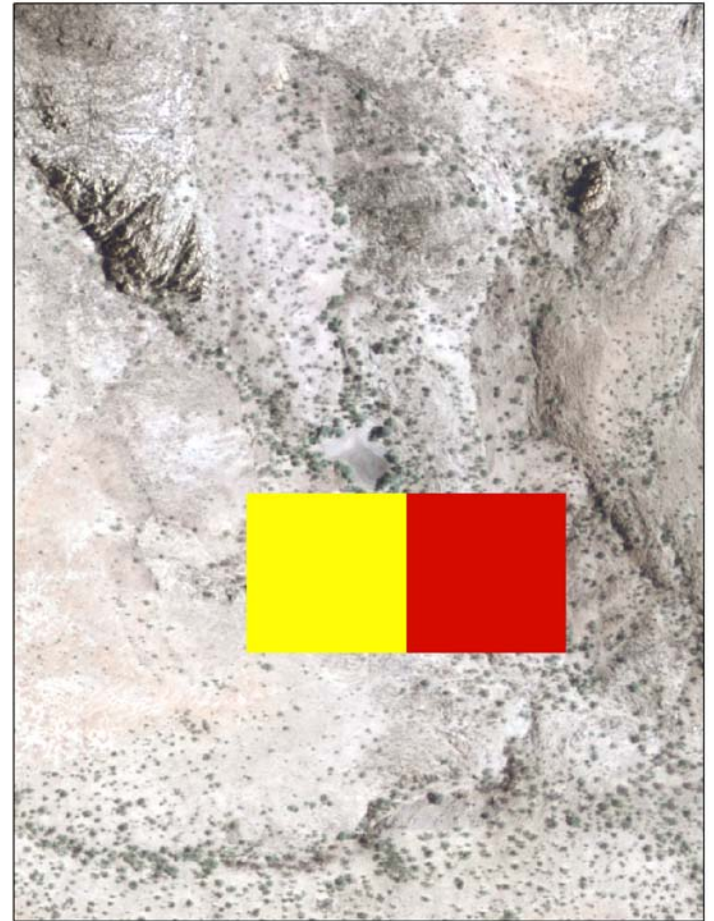
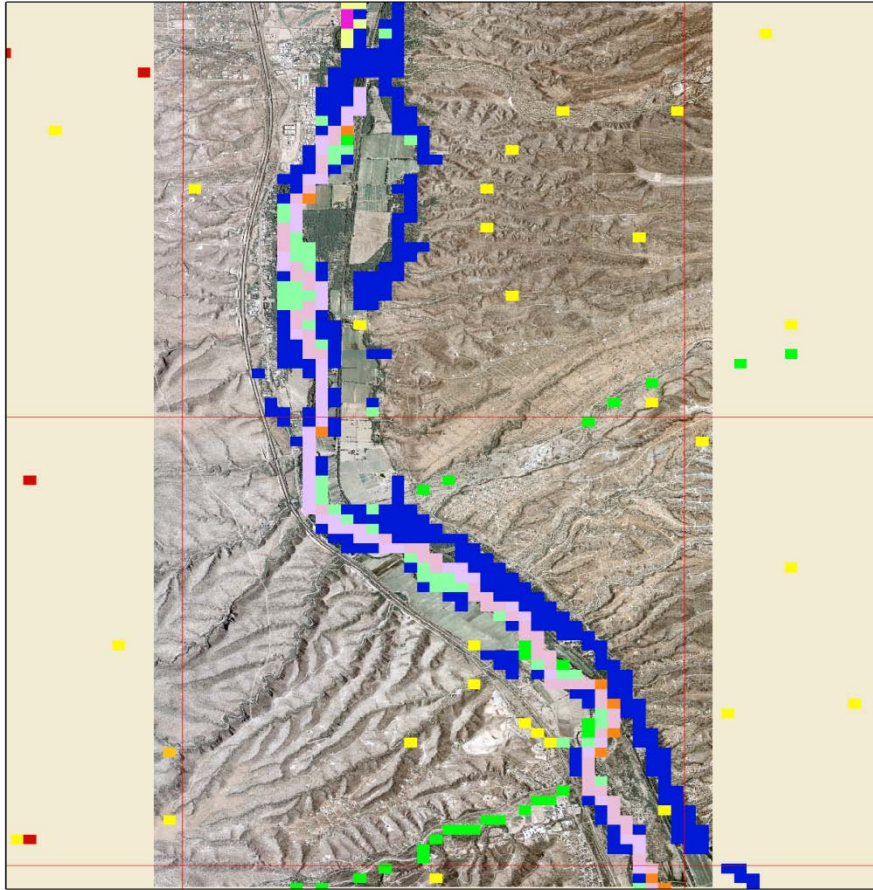
Data Fusion - Developing maximum likelihood rasters



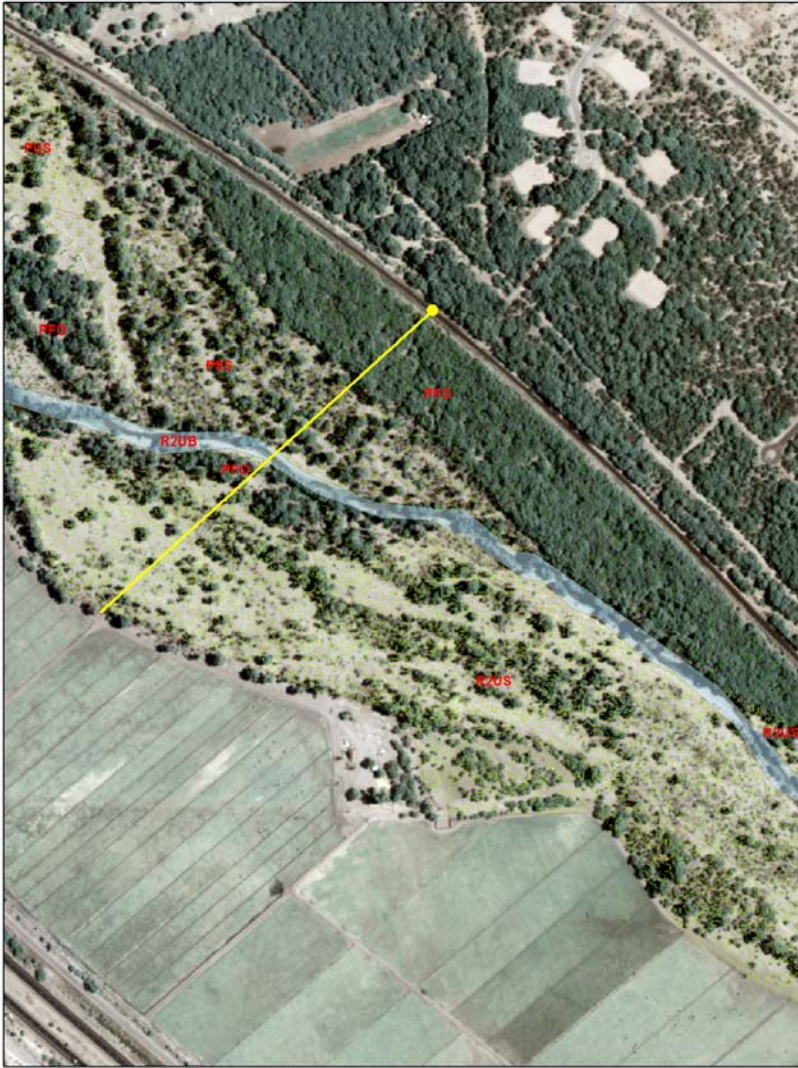
Likelihood Indicators



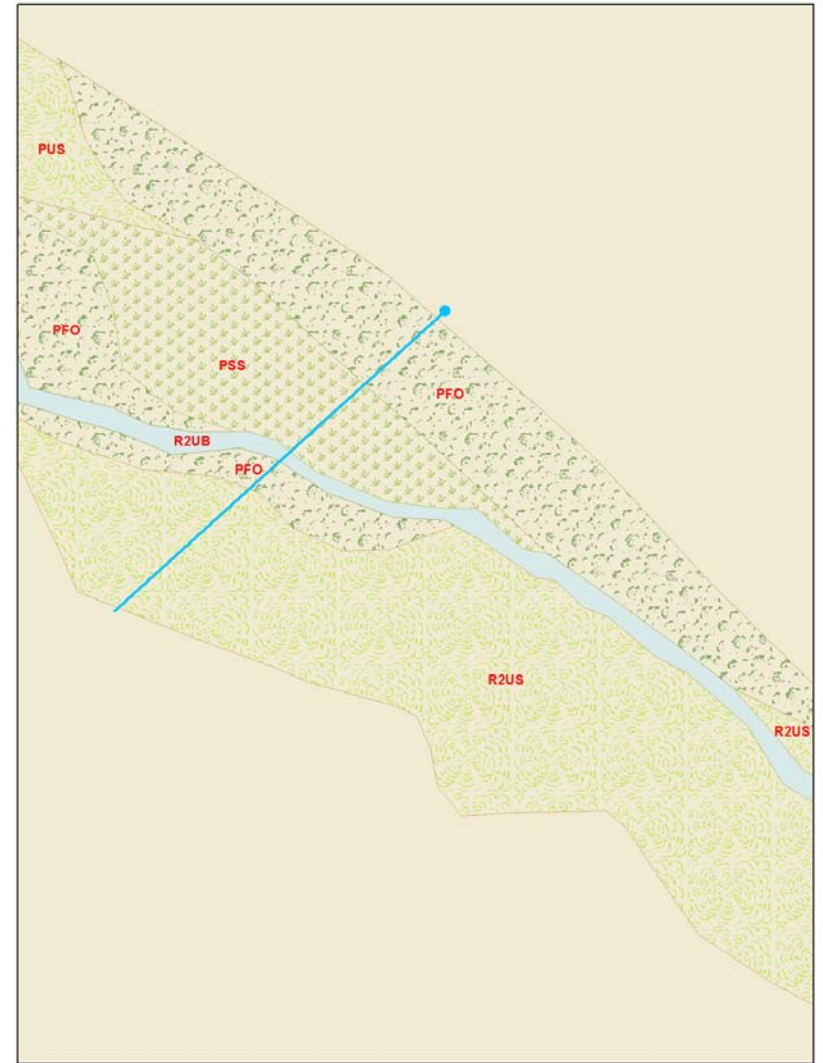
Upper Santa Cruz



Upper Santa Cruz watershed



Two miles S. of the Mission – 2007 NAIP Imagery with feature attribution and photo transect. 3307 ft. at thalweg.



Features and feature labels only. Labeled with Cowardin System/Subsystem/Class taxonomy.

USC – Ground-truthing - 2013



Likelihood Indicators

☒ compiled usc

0

2 - GNIS Reservoirs

4 - NHD LakesPondsRes

6

8 - GF Riparian

12

16 - ALRIS Perennial

20

24

32 - NHD InundWash

36

40

48

52

56

64 - AZDEQ USGS_Perennial

72

80

84

88

92

96

104

112

128 - GF Intermittant

132

134

136

144

160

168

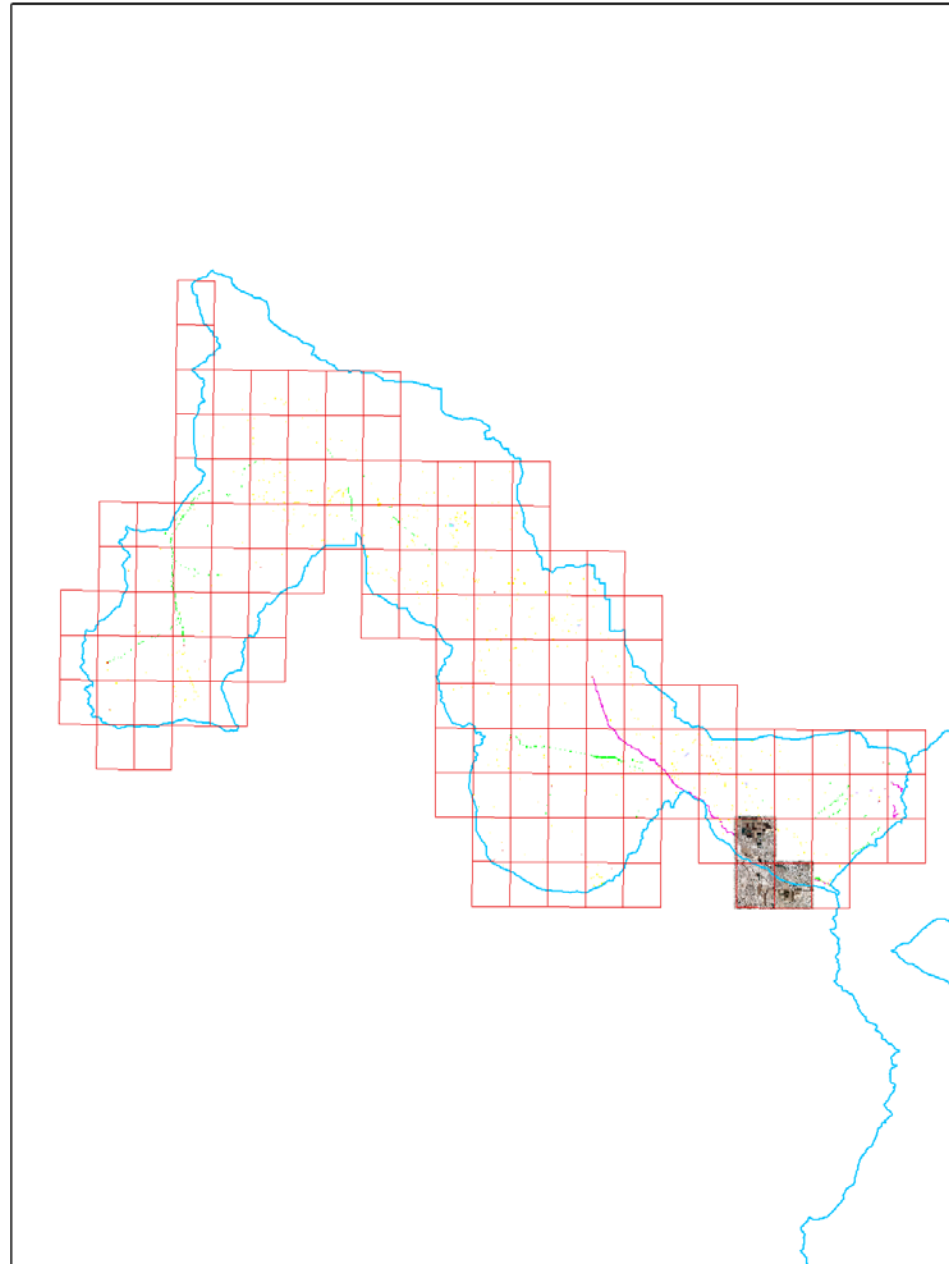
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192

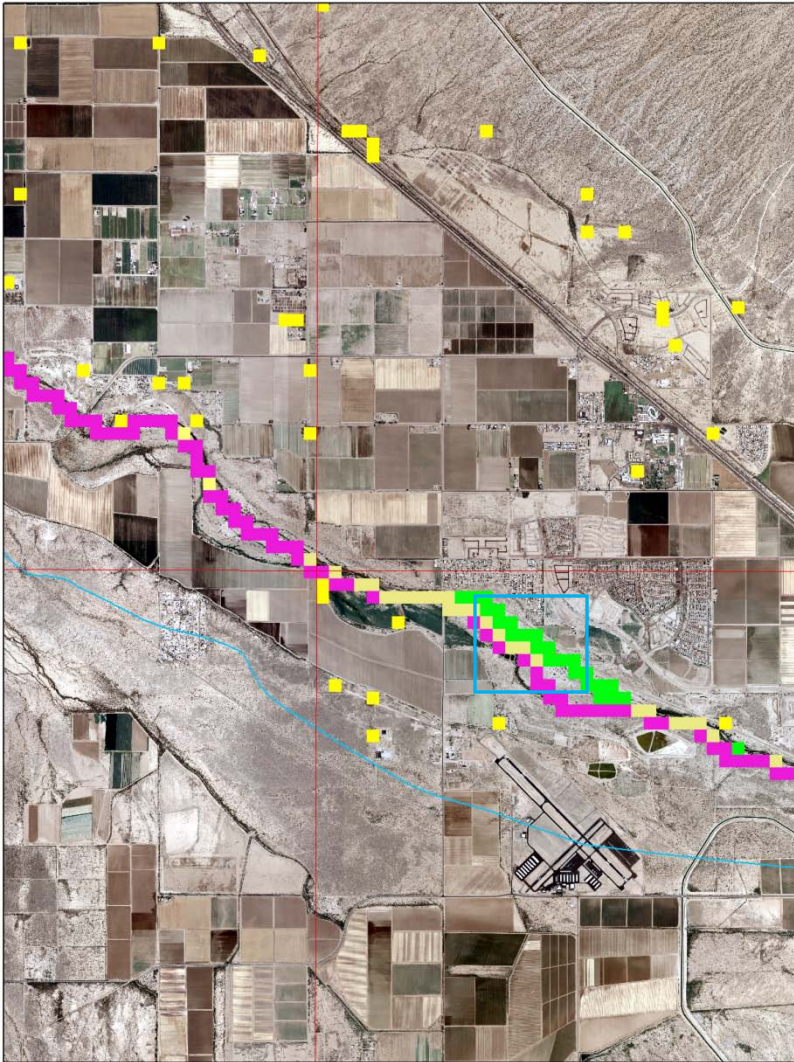
208

216

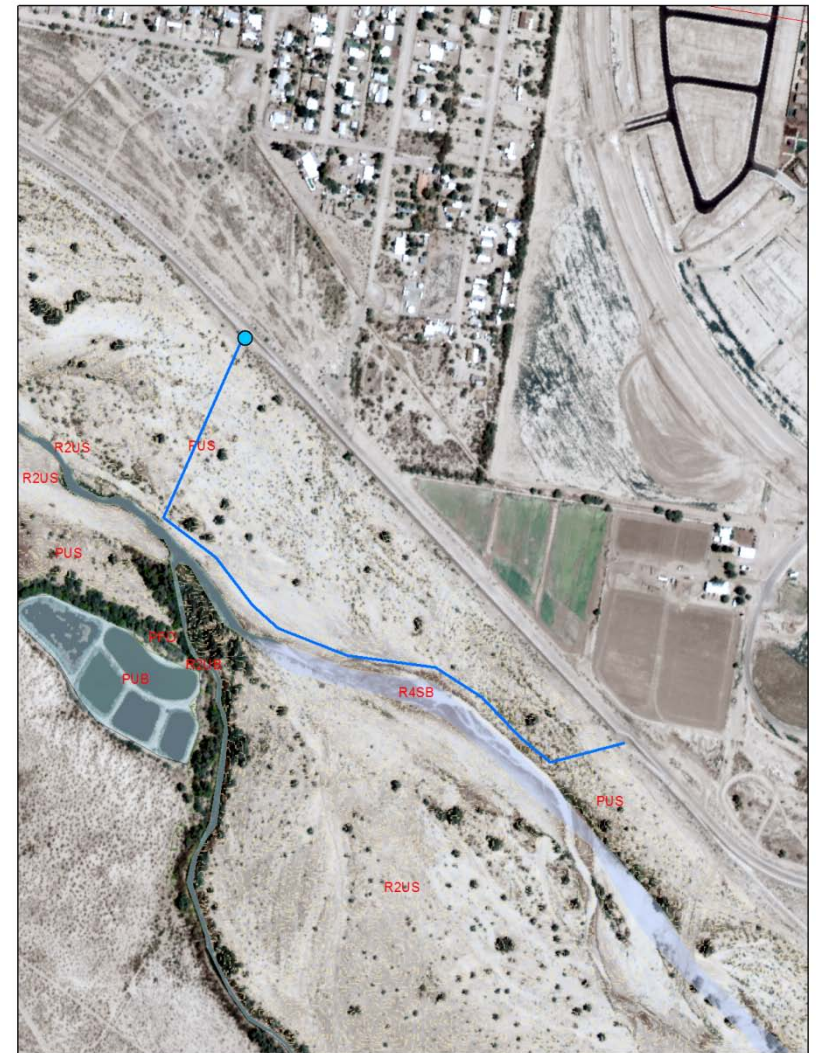
224



Lower Santa Cruz watershed

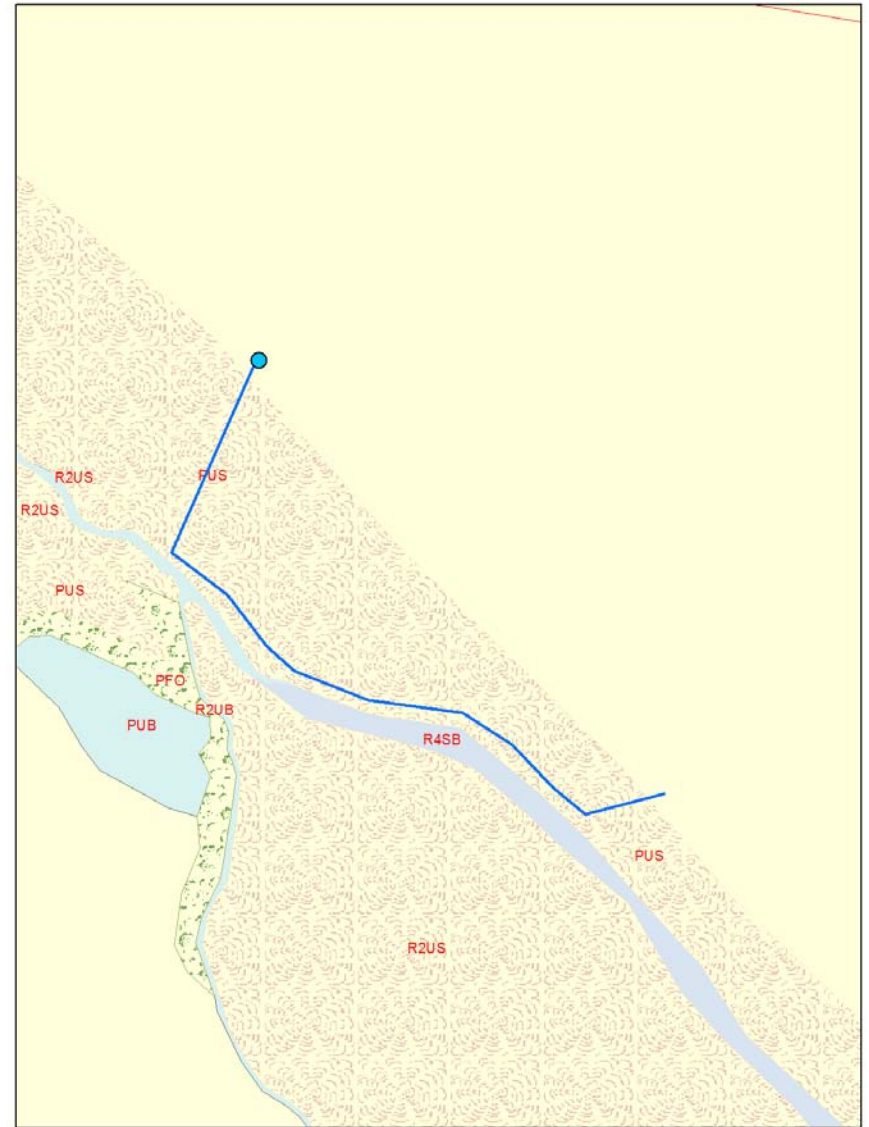
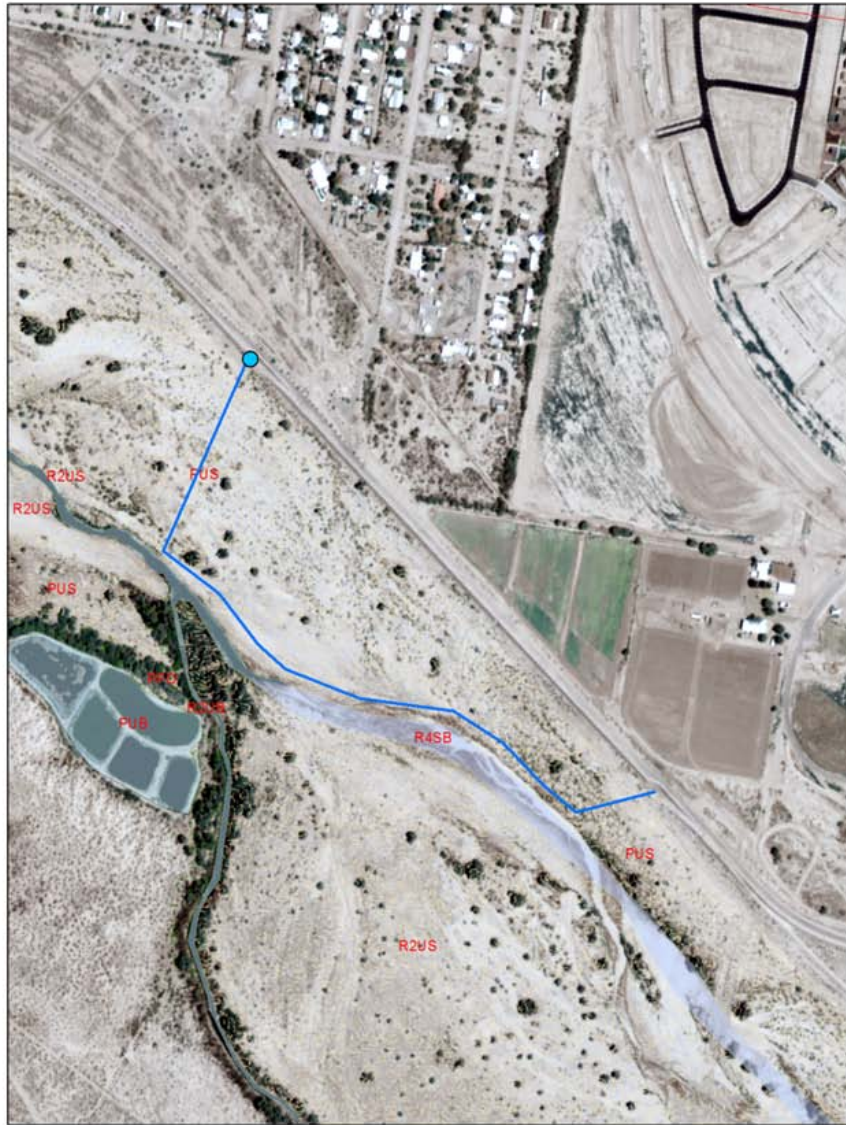


East end of the Lower Santa Cruz 8-digit HUC - 2007 NAIP Imagery. 1:45,000



Half mile SW of Sanders Rd bridge – 2007 NAIP Imagery with feature attribution and photo transect. 1984 ft. at thalweg. 1:6000

Lower Santa Cruz watershed

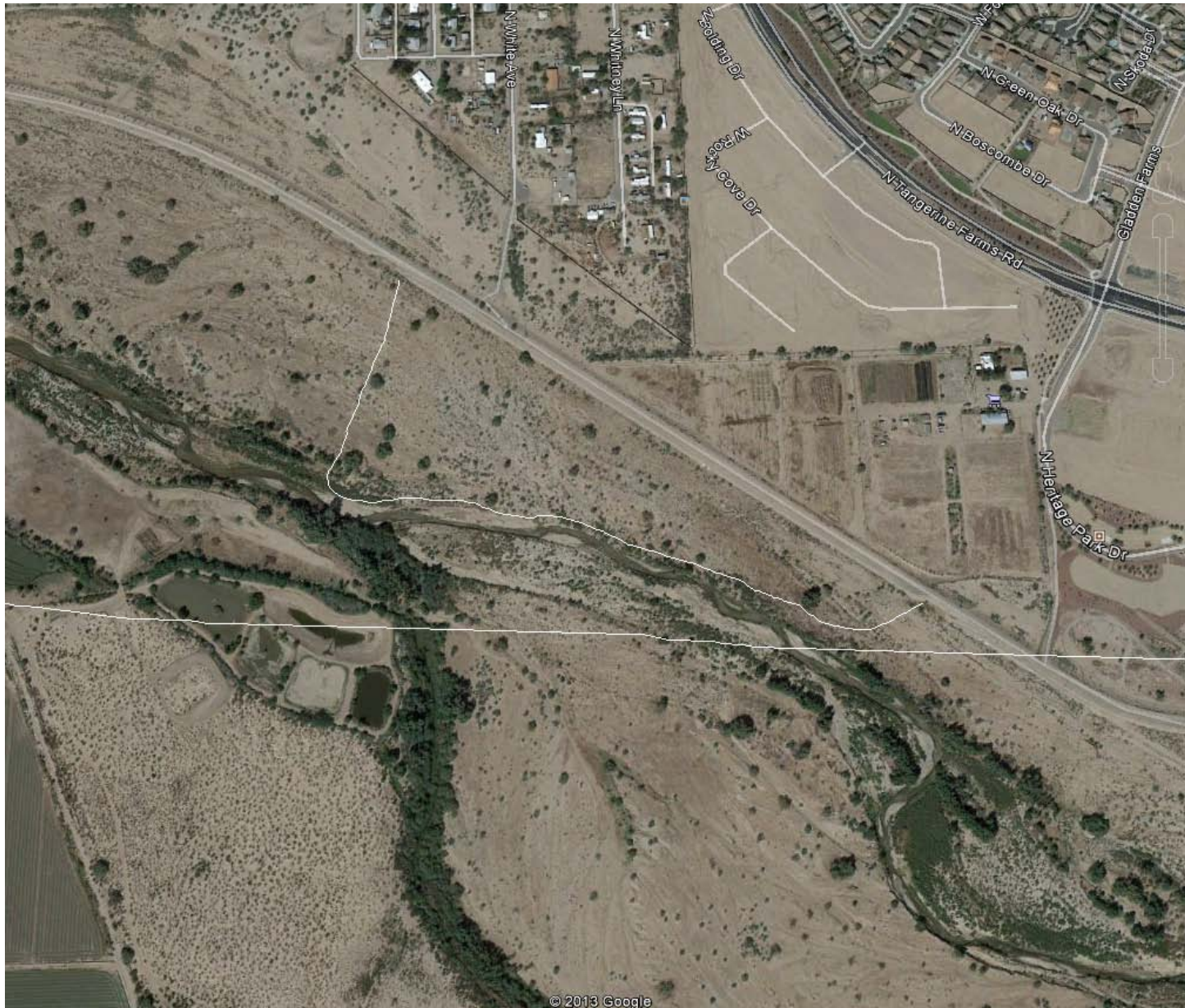


Half mile SW of Sanders Rd bridge – 2007 NAIP Imagery with feature attribution and photo transect. 1984 ft. at thalweg. 1:6000

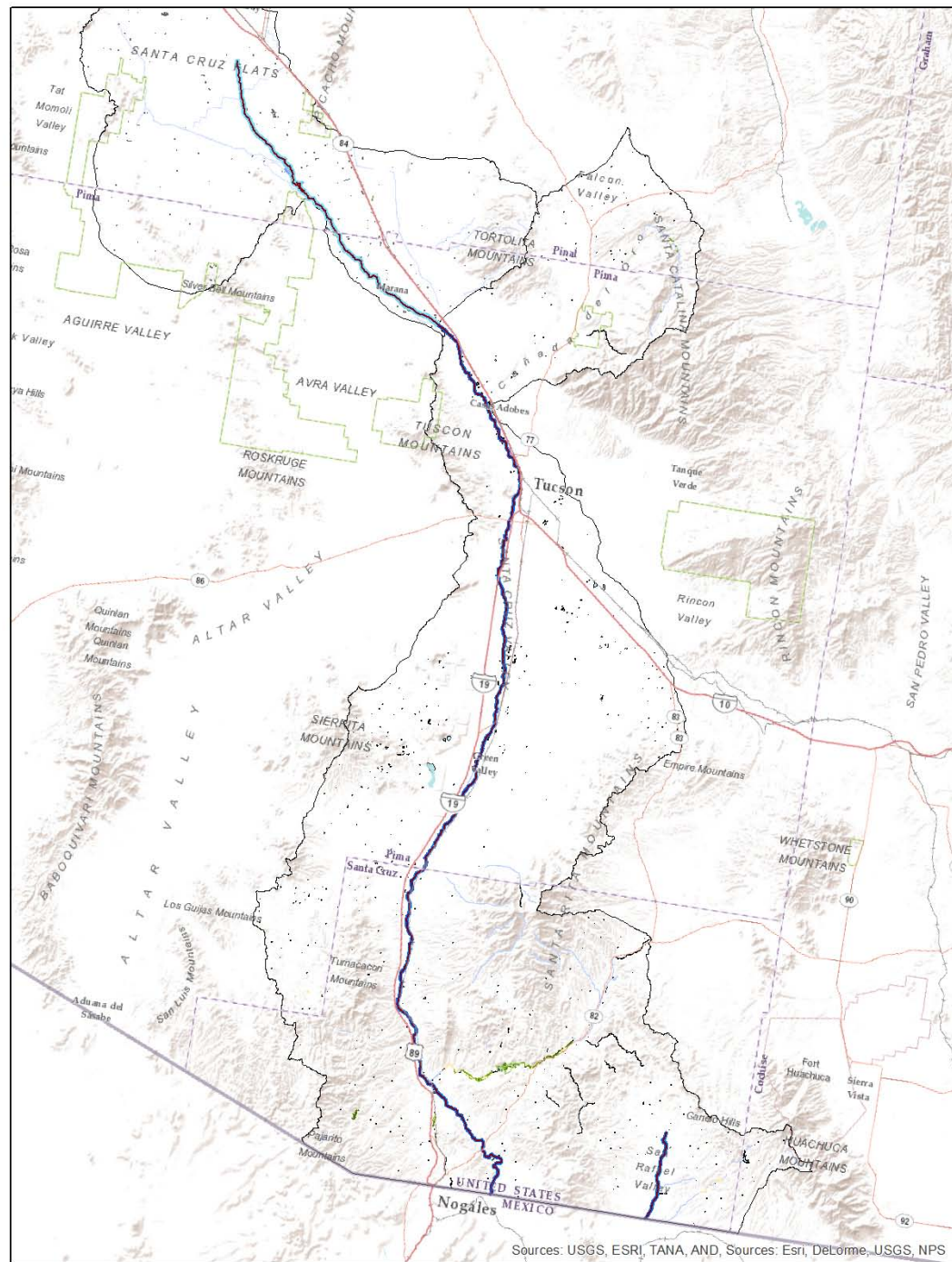
LSC – Ground-truthing - 2013



LSC – NAIP - 2010



Context



Analytical Products

Cowardin Wetland Type

System	Subsystem	Class	Code	Lower Santa Cruz Watershed (60 km.)				Upper Santa Cruz Watershed (167 km.)				
Palustrine					ha.		ha. / km.		ha.		ha. / km.	
		emergent	PEM			2		0.0		--	0.0	
		forested	PFO			48		0.8		222	1.3	
		scrub-shrub	PSS			23		0.4		74	0.4	
		unconsolidated bottom	PUB			3		0.1		24	0.1	
		unconsolidated shore	PUS			43		0.7		118	0.7	
						total	118	2.0		total	437	2.6
Riverine												
	Perennial	emergent	R2EM			13		0.2		--	0.0	
		unconsolidated bottom	R2UB			94		1.6		190	1.1	
		unconsolidated shore	R2US			207		3.5		103	0.6	
							314	5.2		293	1.8	
	Intermittent	streambed	R4SB			7				263		
						total	7	0.1		total	263	1.6
					total wetlands		439	7.3	994		6	