



— BUREAU OF —
RECLAMATION



2003



2019

Los Lunas Habitat Restoration

17 Years of Monitoring

Los Lunas Restoration Site

Background

- Site burned in 2000



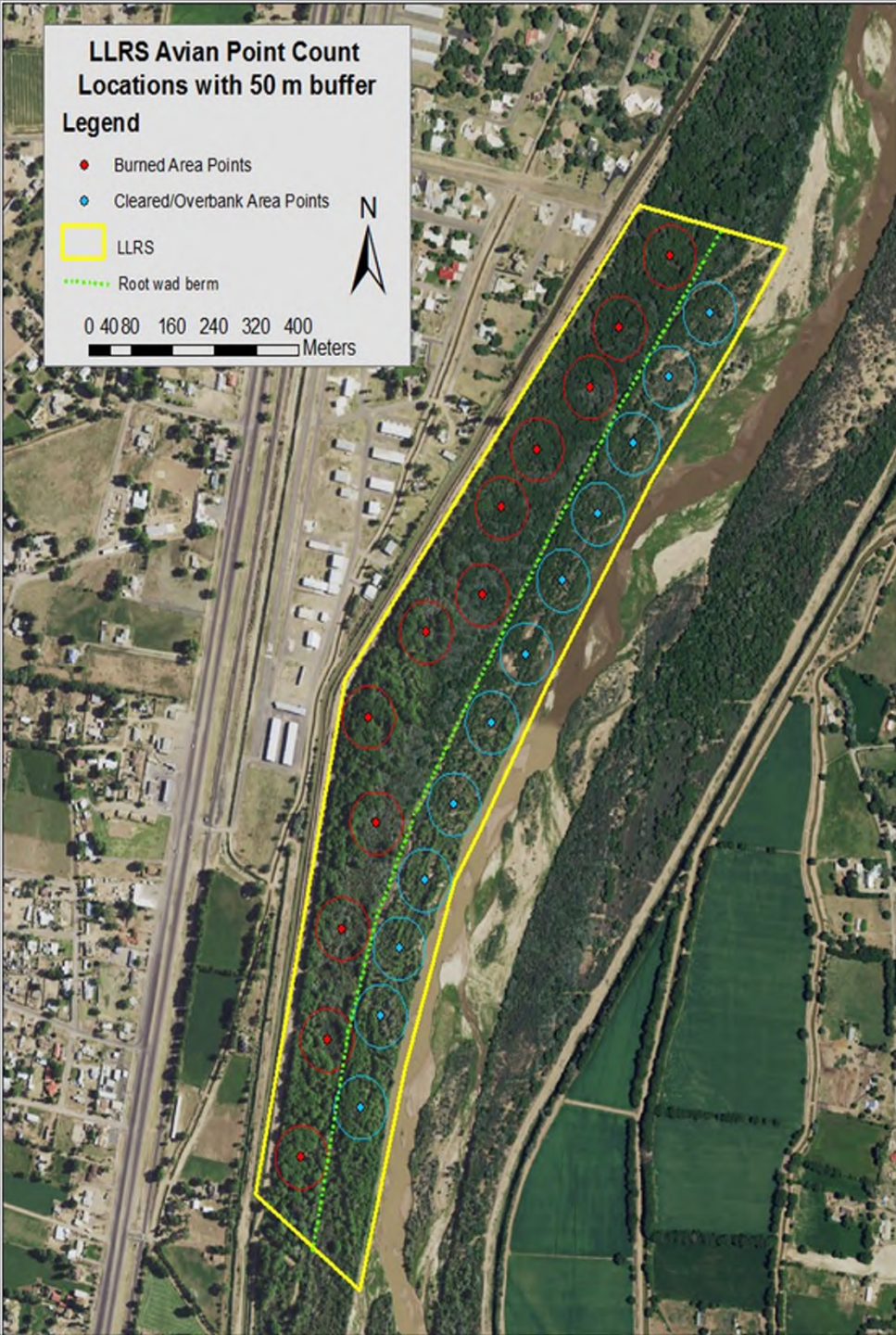
- LLRS was first restoration site selected to meet USFWS requirements
- Primary objectives were to improve silvery minnow and Southwestern willow flycatcher habitat



Background

- Restoration work began in 2002
- Designed to flood $\geq 2,500$ cfs
 - Excavated and lowered floodplain
 - Incorporated network of side channels
- Monitoring required for 15 year period
- Reclamation began avian, vegetation, and groundwater monitoring in 2003

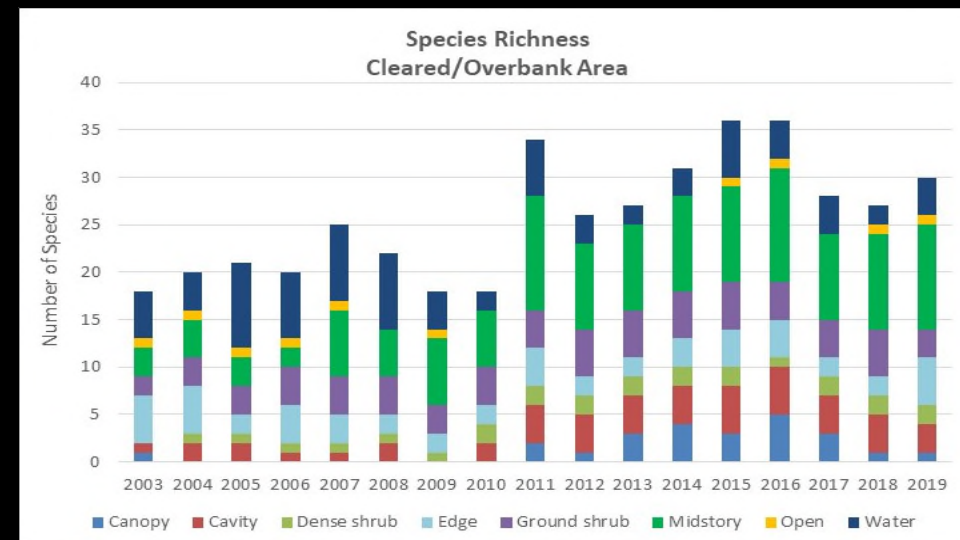
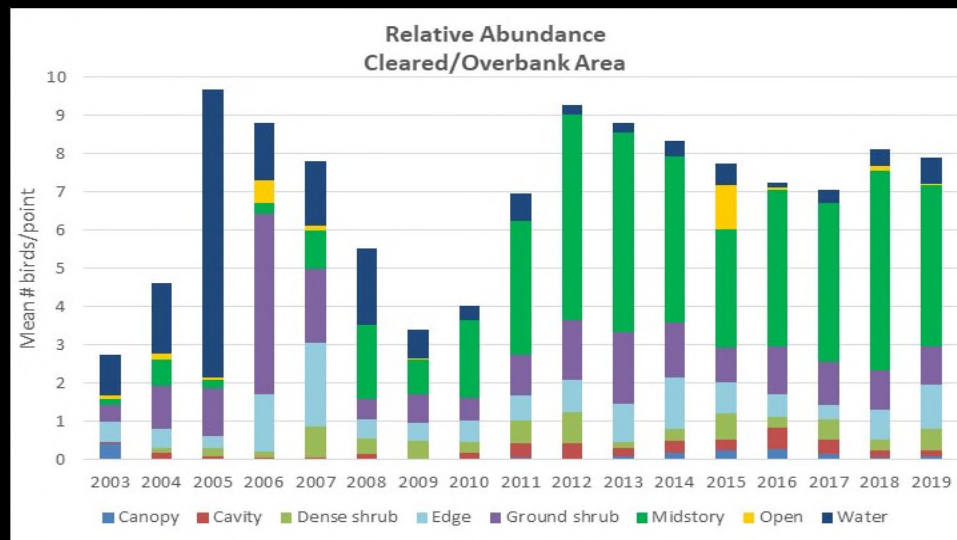




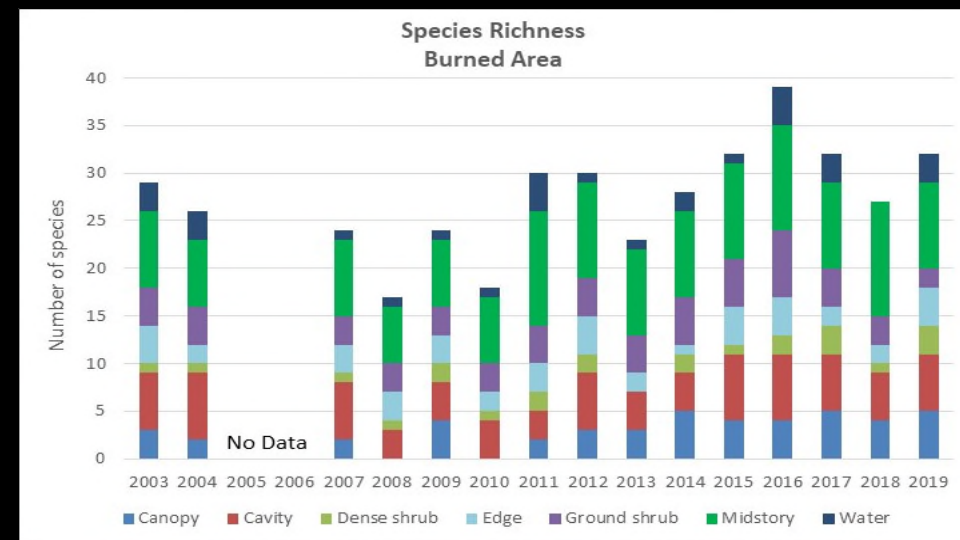
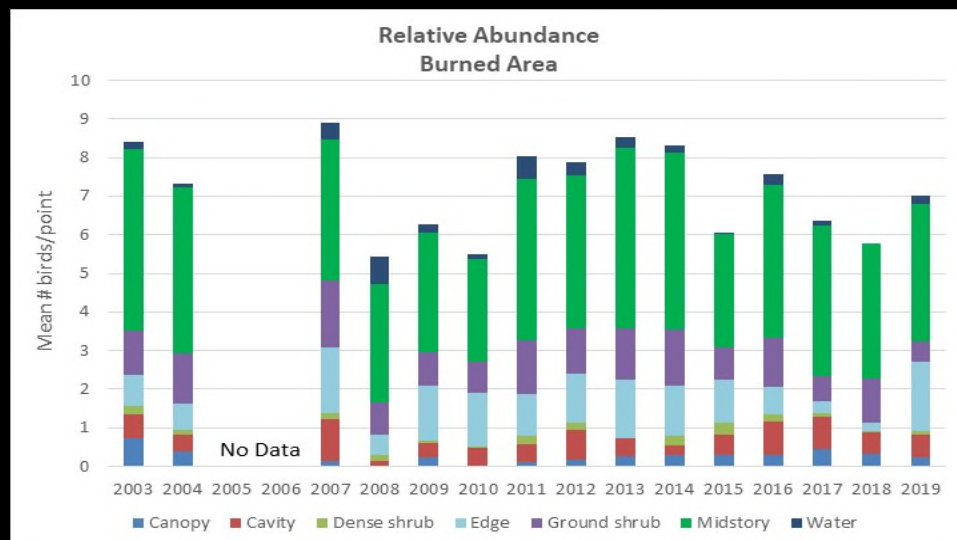
Avian Point Counts

- 12 points per Area
- Cleared/Overbank Area
 - Active restoration site adjacent to river
 - Surveyed 2003 to 2019
- Burned Area
 - Passive restoration site west side of root wad berm
 - Surveyed 2003, 2004 and 2007 to 2019

Cleared/Overbank Area

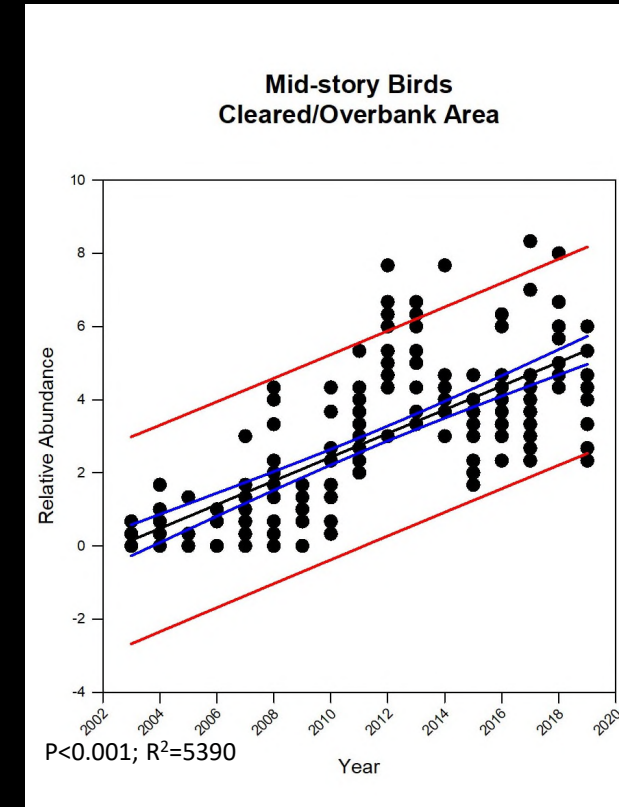
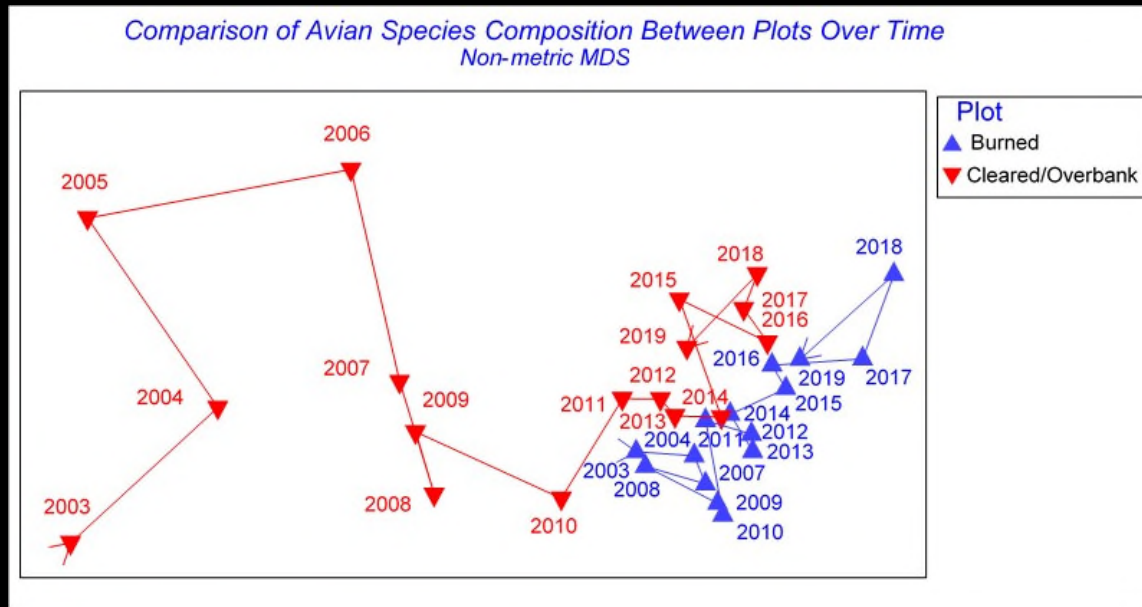


Burned Area

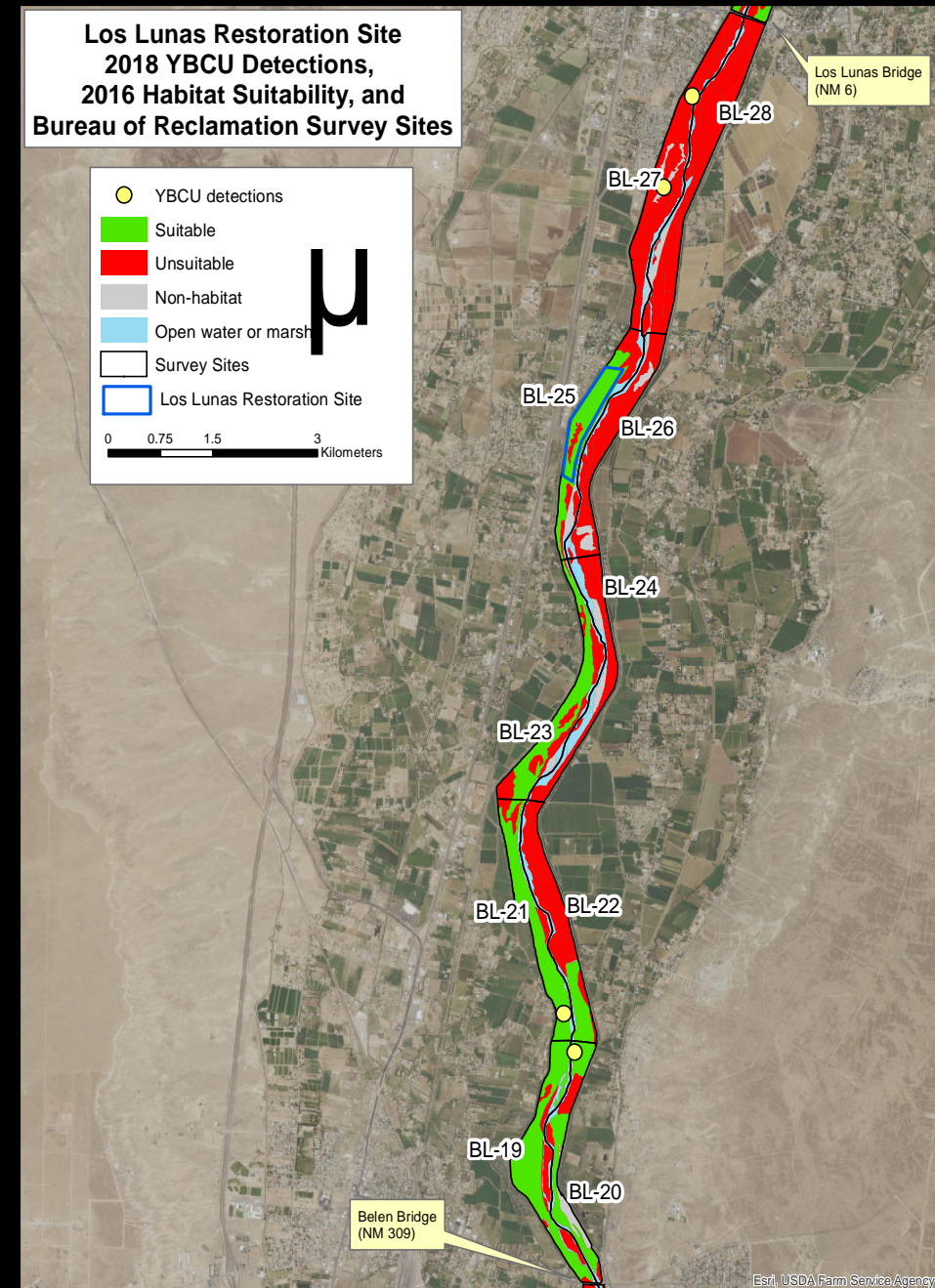


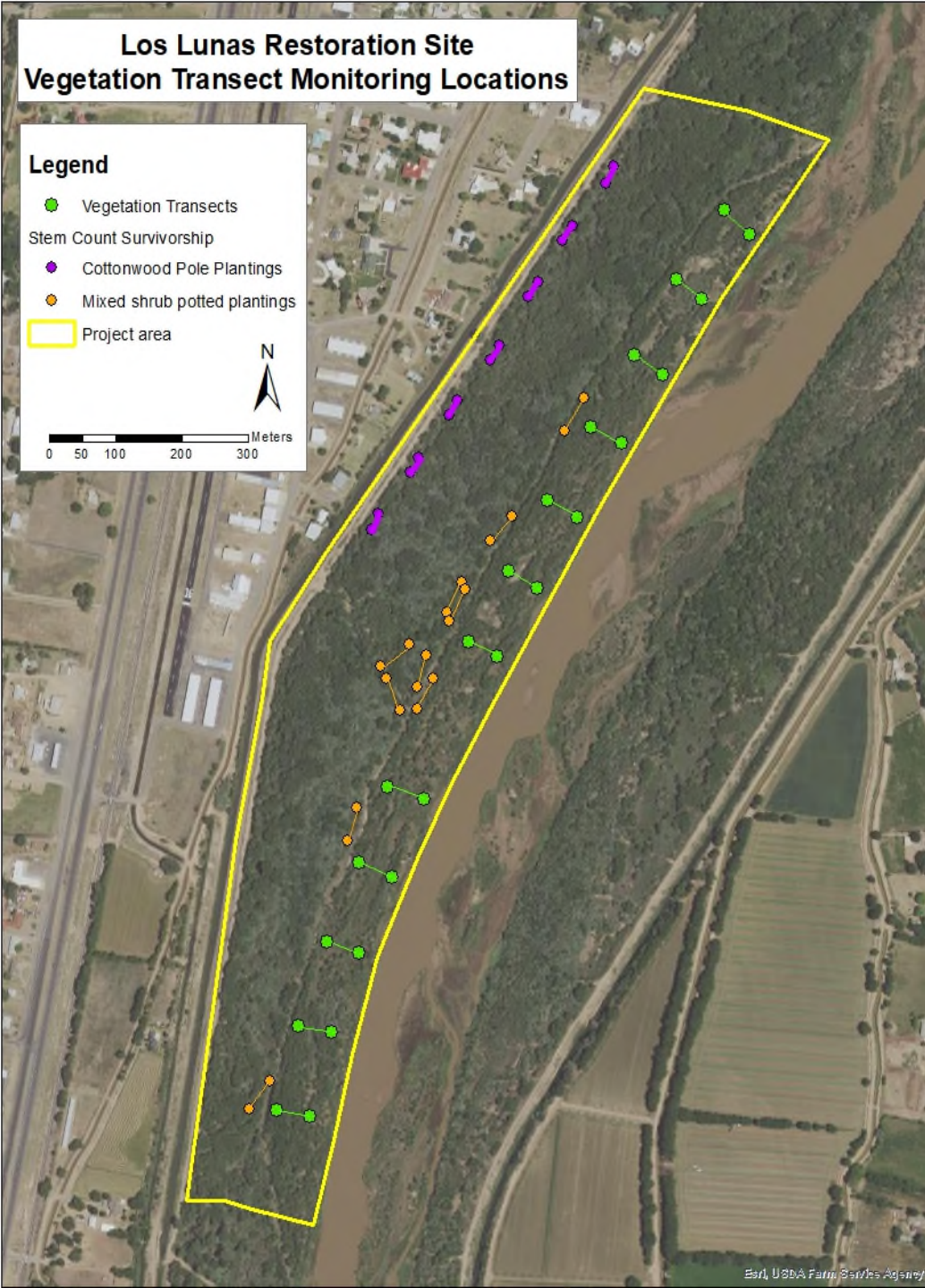
Avian Point Counts

- There was a moderately strong relationship between relative abundance of Midstory birds and time in Cleared/Overbank Area
- When comparing species composition, avian community in Cleared/Overbank Area became similar to Burned Area in 2012



SWFL & YBCU Surveys





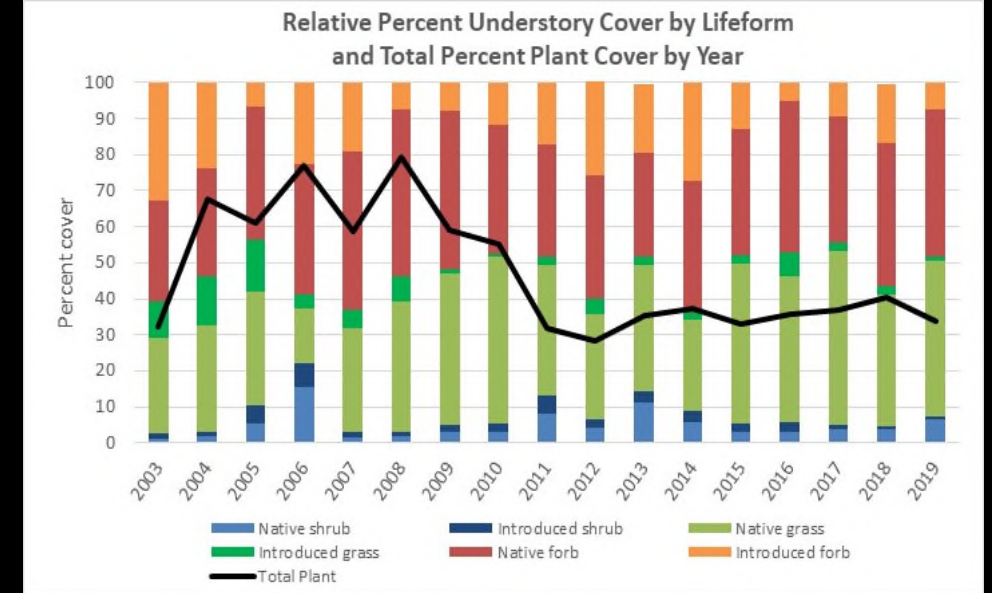
Vegetation Transects

- 12 permanent vegetation transects in Cleared/Overbank Area 2003-2019
 - Understory cover and species composition
 - Overstory cover, species composition, and height
- Stem count survivorship 2005 – 2006
 - Potted mixed shrub transects
 - Cottonwood pole plots

Vegetation Transect Results

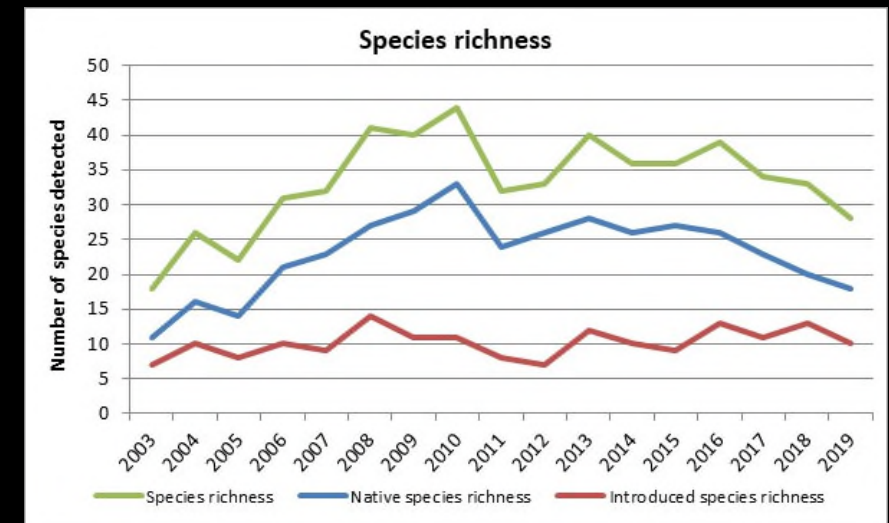
Understory

- Plant cover significantly higher 2004-2010 than other years
- Native grasses and forbs were dominant lifeforms over study period



Species richness

- 82 plant species detected in both under and overstory throughout monitoring period



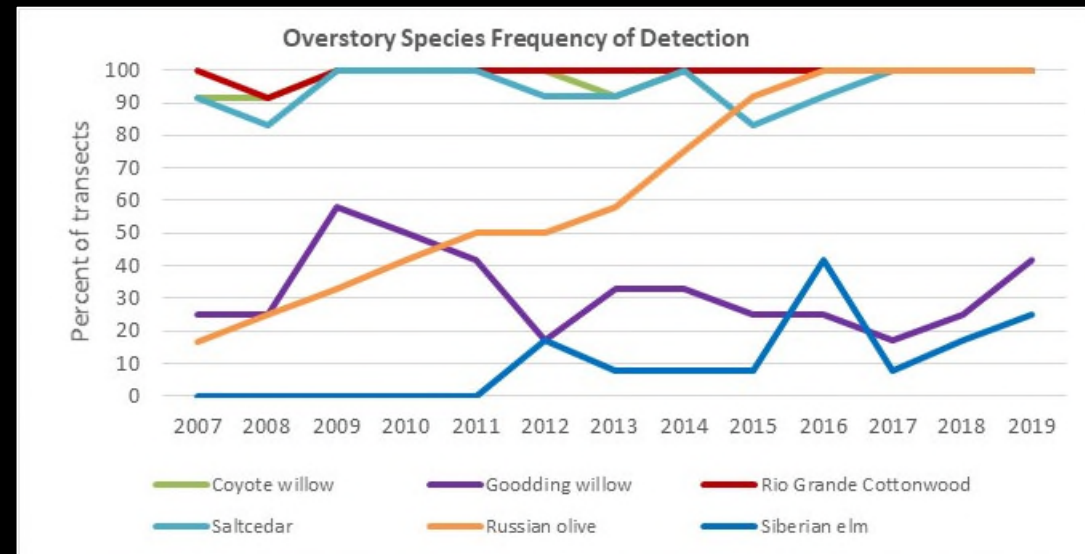
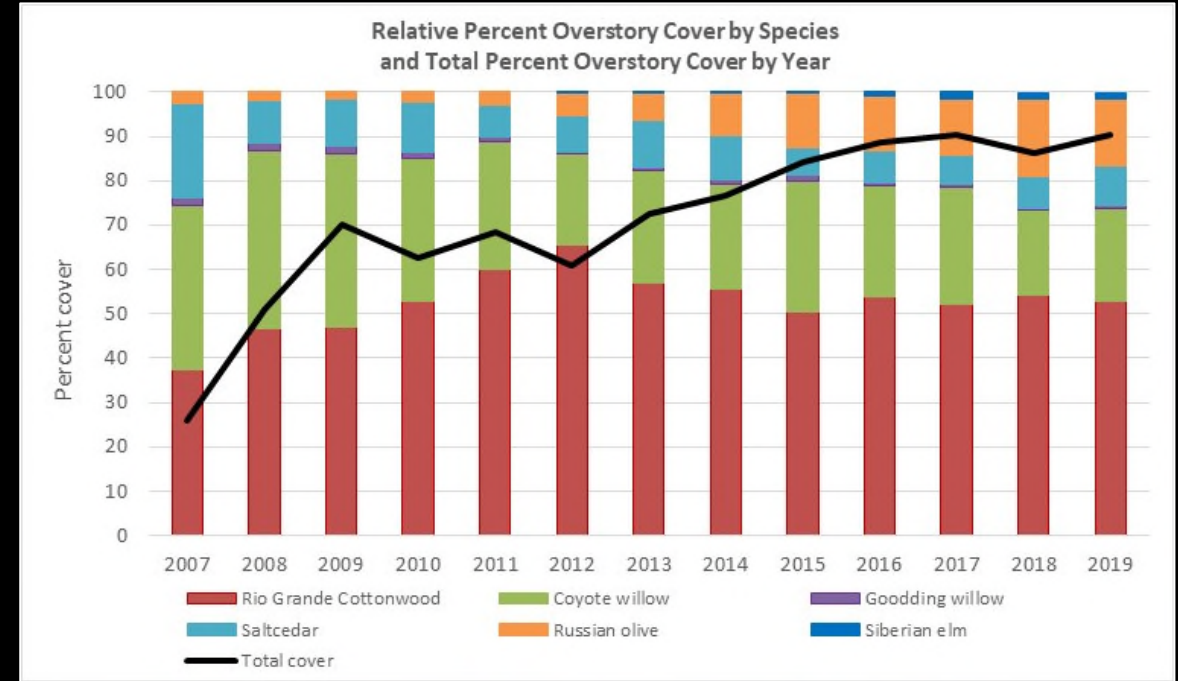
Overstory Vegetation

Cover

- Overstory cover significantly increased since 2007
- Cottonwood and coyote willow dominant based on cover

Frequency

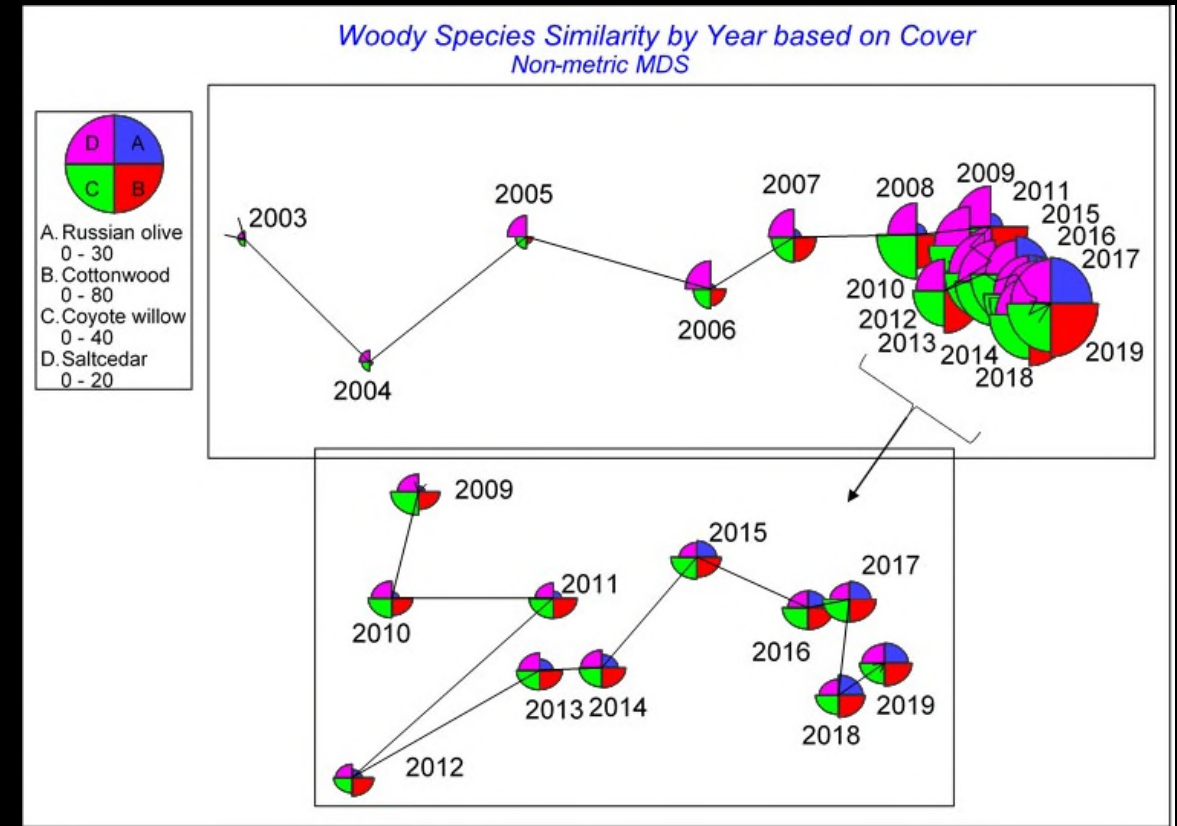
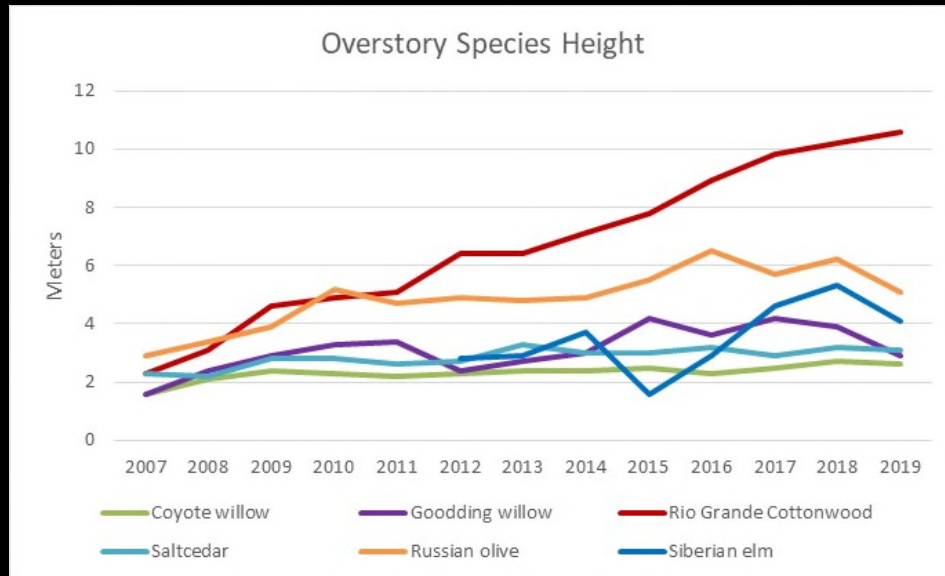
- Cottonwood, coyote willow, and saltcedar have been detected in most plots since 2007
- Russian olive was found in 17% of plots in 2007 and in 100% of plots by 2016



Overstory Vegetation

Woody species composition

- Highest similarities in the woody species composition from about 2013 through 2019
- Saltcedar cover has increased less than other species



Overstory Height by Species

- Cottonwood has grown to > 10 m



Vegetation in 2019



Vegetation in 2019

Survivorship of Plantings

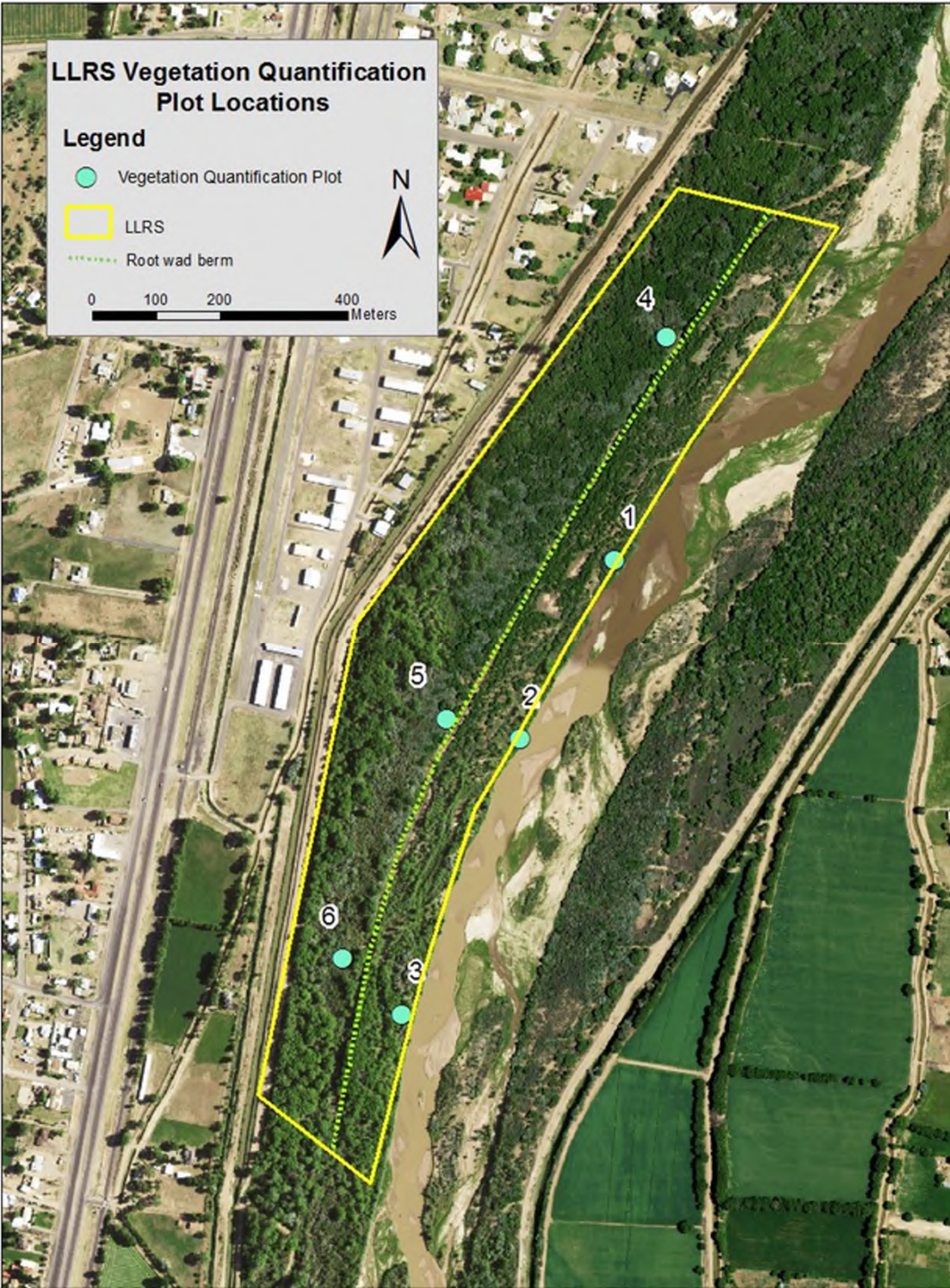
- 54 % of potted mixed shrubs survived from 2005 to 2006 (n=160)
 - New Mexico olive and Gooddings willow most successful
- 38 % of Cottonwood poles survived from 2005 to 2006 (n=47)
 - Root sprouts most successful



Cottonwood poles planted along west side of project



Goodding's willow planted just east of rootwad berm matured to create a willow and cottonwood stand



Vegetation Quantification Plots

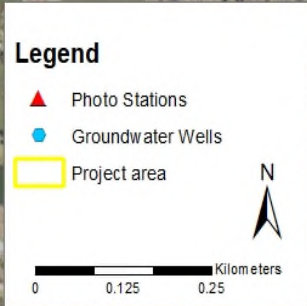
- 6 plots
 - 3 plots in Cleared Area 2015-2019
 - 3 plots in Burned Area 2016-2019
- Compared to Reference Sites where vegetation data was collected at 112 SWFL nest sites 2004-2006
 - Created a subset of selected sites for an additional comparison (n=22)

Vegetation Quantification Plots

- Vegetation parameters in Cleared/Overbank Area met 37% of Original Reference Site criteria and 37% of Selected Reference Site criteria
- Vegetation parameters in Burned Area met 26% of Original Reference Site criteria and 59% of Selected Reference Site criteria

Vegetation parameter	Original Reference Nest sites mean	Selected Reference Nest sites mean	LLRS Cleared/OB Area 2019 mean	LLRS Burned Area 2019 mean
	(n = 112)	(n = 22)	(n = 3)	(n = 3)
Mean Cover Value (%)				
0 – 3 m	28.70 (19.23 to 38.17)	37.51 (29.08 to 45.94)	54.11	51.89
3 – 6 m	33.40 (23.77 to 43.03)	37.41 (28.65 to 46.18)	34.11	66.89
>6 m	20.09 (11.49 to 28.70)	13.85 (8.91 to 18.79)	24.78	31.22
Shrub Stem Density (#/m2)	3.64 (2.44 to 4.84)	5.62 (4.08 to 7.16)	5.36	1.33
Shrub Stem Spp Composition %				
Salix gooddingii	36.82 (17.52 to 56.12)	1.39 (0 to 3.85)	0	0
Salix exigua	31.11 (13.81 to 48.41)	16.9 (3.40 to 30.41)	70.16	23.82
Both Salix species	67.93 (49.23 to 86.63)	18.29 (4.99 to 31.59)	70.16	23.82
Populus deltoides	1.26 (0 to 3.56)	2.28 (0.78 to 6.36)	9.65	0
Tamarix sp.	23.15 (6.65 to 39.65)	50.24 (28.57 to 71.91)	10.82	38.20
Eleagnus angustifolia	6.05 (0 to 15.6)	26.26 (11.02 to 41.51)	9.37	37.98
Dead Shrubs %	37.00 (26.35 to 47.65)	33.10 (23.15 to 43.05)	48.68	80.34
Tree Stem Density (#/ha)	2,782 (1,979 to 3,586)	2,782 (1,979 to 3,586)	1005	1359
Tree Size Class Composition %				
Class 1 (5-9.9 cm DBH)	70.06 (61.91 to 78.21)	78.71 (71.03 to 86.40)	22.33	34.00
Class 2 (10-19.9 cm DBH)	29.02 (21.07 to 36.97)	18.91 (12.52 to 25.31)	16.67	16.00
Class 3 (≥ 20 cm DBH)	0.92 (0 to 1.97)	2.38 (0.75 to 4.01)	1.00	3.00
Tree Species Composition %				
Goodding's willow	71.50 (52.35 to 90.65)	5.47 (0 to 12.30)	0	11.52
Coyote willow	5.09 (0 to 11.49)	0.78 (0 to 2.15)	1.01	0
Both willow species	76.59 (57.54 to 95.64)	6.25 (0 to 13.05)	1.01	11.52
Rio Grande cottonwood	3.36 (0 to 8.21)	7.42 (0 to 14.90)	42.42	2.96
Saltcedar	11.93 (0 to 25.33)	49.14 (28.56 to 69.73)	16.67	67.74
Russian olive	8.12 (0 to 20.22)	37.20 (17.20 to 57.20)	39.90	22.54
Dead Trees %	3.96 (0.71 to 7.21)	7.31 (3.56 to 11.06)	9.68	11.42
Average Tree Height (m)				
Goodding's willow	8.66 (7.91 to 9.42)	9.48 (8.26 to 10.70)	NA	10.50
Coyote willow	6.39 (5.86 to 6.92)	6.60 (5.99 to 7.21)	5.50	NA
Rio Grande cottonwood	8.53 (7.61 to 9.45)	8.77 (7.58 to 9.96)	8.90	14.65
Saltcedar	6.42 (5.66 to 7.18)	6.76 (5.94 to 7.58)	4.00	6.38
Russian olive	7.13 (6.44 to 7.81)	7.15 (6.46 to 7.85)	6.20	7.02
	Met original reference site criteria			
	Met selected reference site criteria			
	Met both criteria			

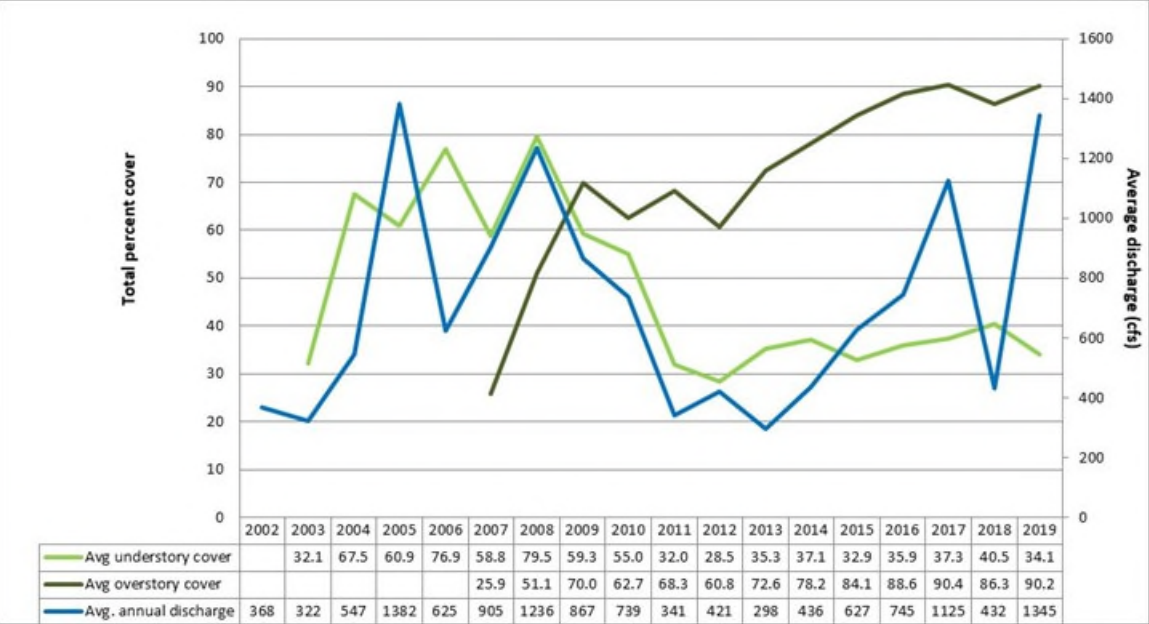
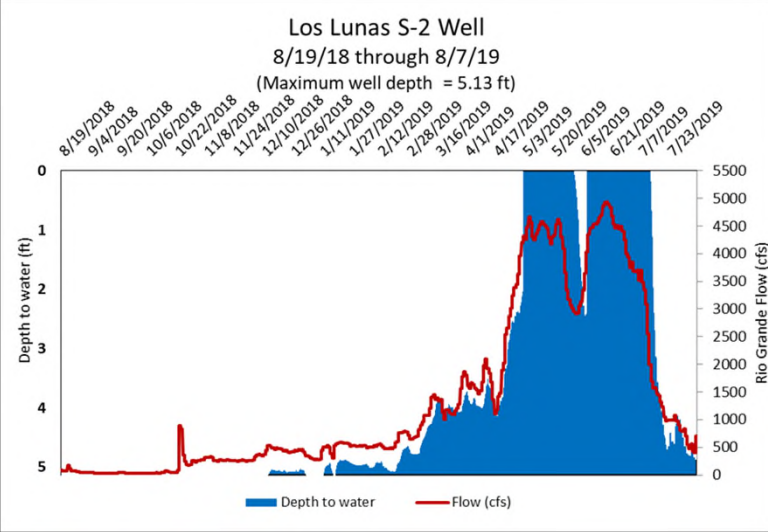
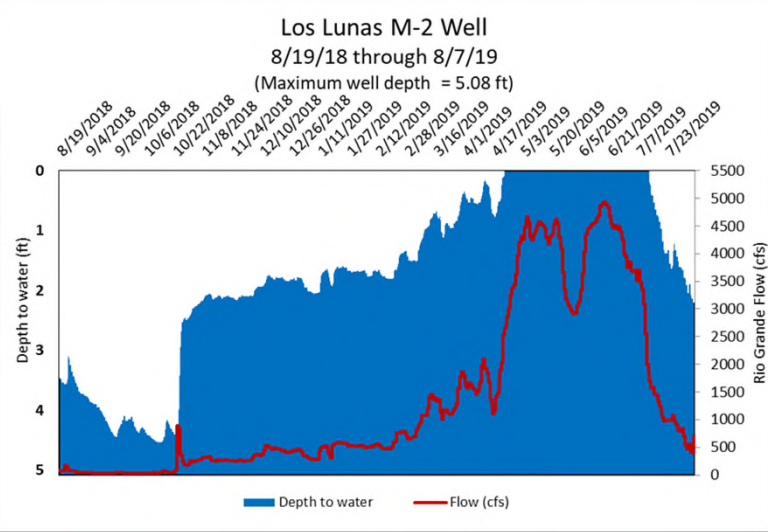
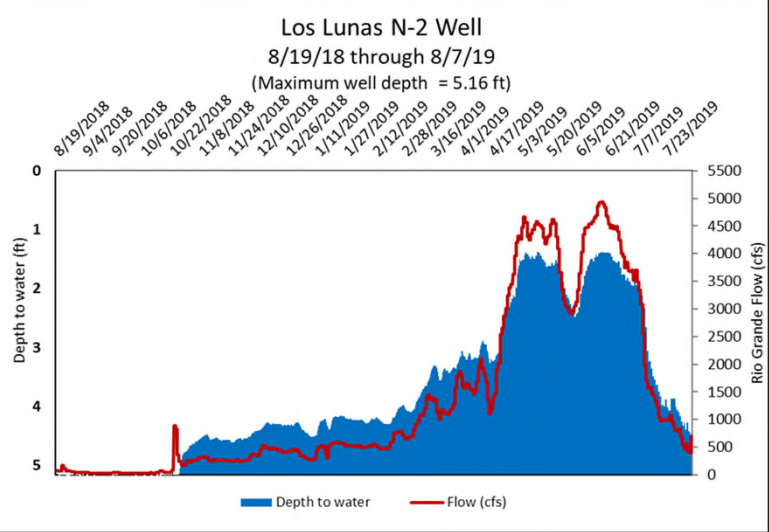
Los Lunas Restoration Site Groundwater Well and Photo Station Locations



Groundwater Wells

- 9 shallow groundwater wells
 - 3 across North, Middle, and South sections of project area
 - Depths averaged 5 ft
 - HOBO loggers installed in 2011

Groundwater Wells



Vegetation and Groundwater

Photo Stations



2003



2008



2014



2019

Conclusions



Important trends identified in avian studies

- Development of a diverse bird population
- Increasing abundance of mid-story birds
- No SWFL and YBCU territories detected within LLRS but have been detected in surrounding areas





Important trends identified in vegetation studies

- Development of a diverse plant community where native riparian species dominate
- Long-term success of naturally established vegetation
- Spread of invasive Russian olive
- Limited development of variables conducive to SWFL breeding habitat
- Potential to provide occupied YBCU breeding habitat



Important trends in groundwater studies

- Water table levels have been closely linked to river flows, indicating connectivity
- Groundwater is shallow enough to support recruitment and establishment of cottonwood and willow stands

Value of Continued Monitoring

- Requirements of the BO were met in 2017

Avian monitoring

- Determine if the LLRS can continue to sustain habitat for most bird guilds
 - Especially for mid-story species that include the SWFL and YBCU.
- Document occurrence of breeding SWFLs to determine if suitable habitat has developed
 - One of the objectives for restoration at this site.
- Document presence of YBCU and track development of suitable habitat

Vegetation Monitoring

- This study is unique
 - Extensive data sets
 - Long time period
- Reference for examining trends and evaluating success in desert riparian environments
 - Data from LLRS is being used for Reclamation's BDANWR river alignment project
- Track the spread of Russian olive and Siberian elm
 - Goal in the restoration effort should be to sustain native habitat
 - Treatment recommended regardless of continued monitoring

Los Lunas Habitat Restoration Site



2004



2018