Riparian Habitat Success Criteria for the Colorado River Delta

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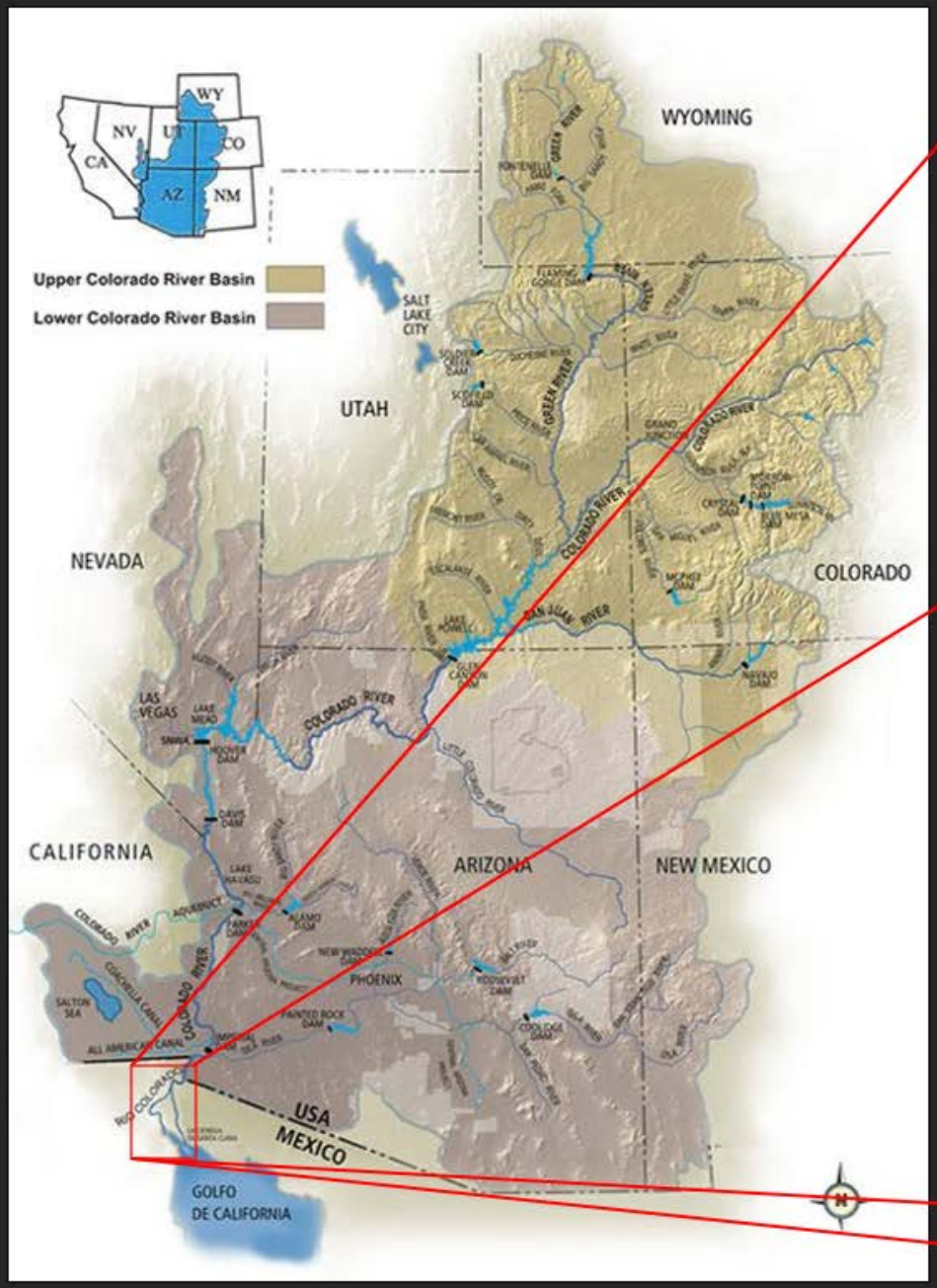
WY
NV
UT
CO
CA
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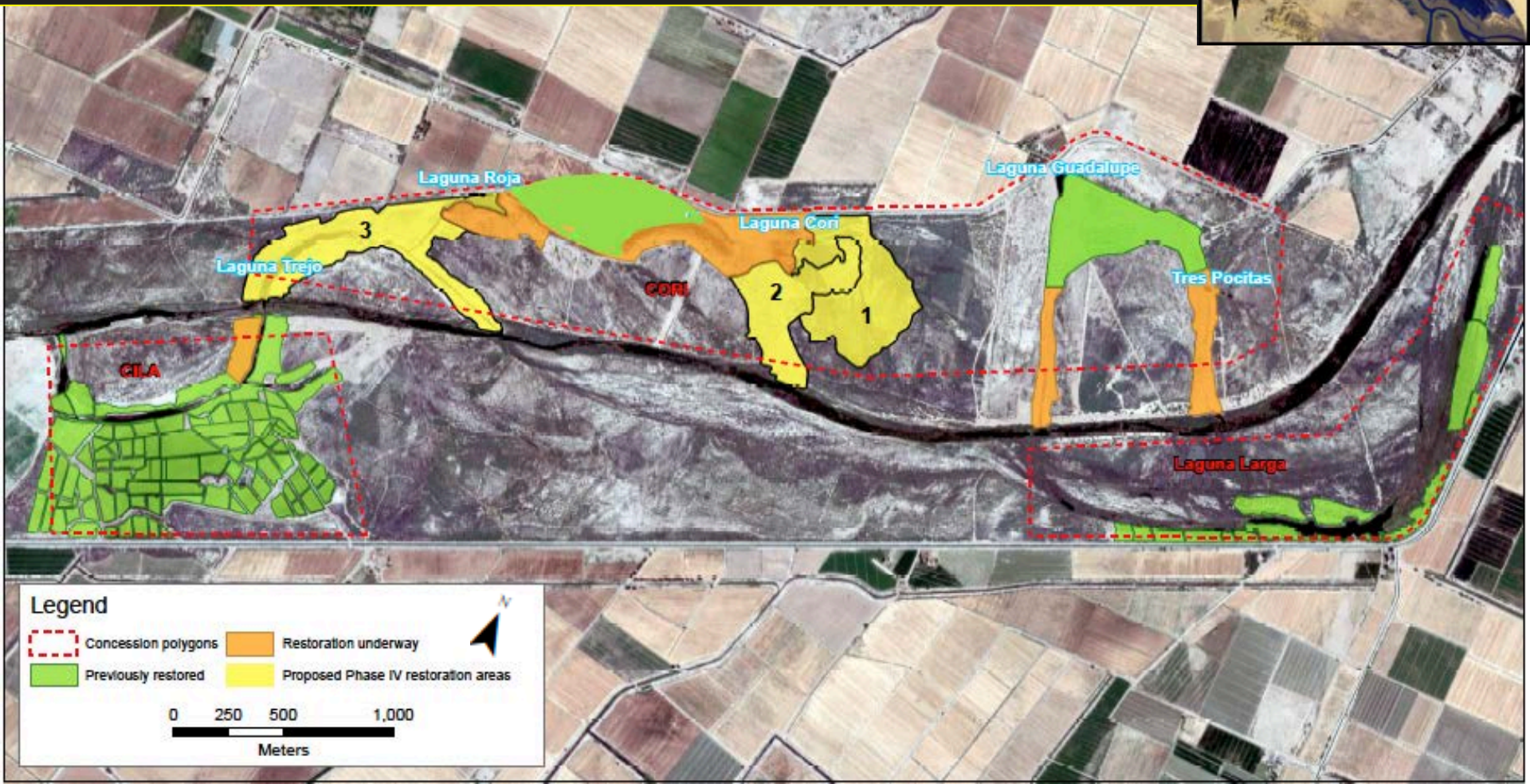
NM
Upper Colorado River Basin
Lower Colorado River Basin
WYOMING
SALT LAKE CITY
UTAH
NEVADA
COLORADO
LAS VEGAS
CALIFORNIA
ARIZONA
NEW MEXICO
PHOENIX
USA
MEXICO
GOLFO DE CALIFORNIA

Mexicali
U.S.
San Luis
MEXICO
San Luis Rio Colorado
Colorado River
Rio Hardy
Laguna Grande Restoration Area
Ciénega de Santa Clara
Upper Gulf of California

Minute 319 Pulse Flow: March 23-May 18, 2014 – 105,000 acre-feet (130 mcm)

Minute 319 Base Flows: 2012-2017: 52,000 acre-feet (65 mcm)

Laguna Grande

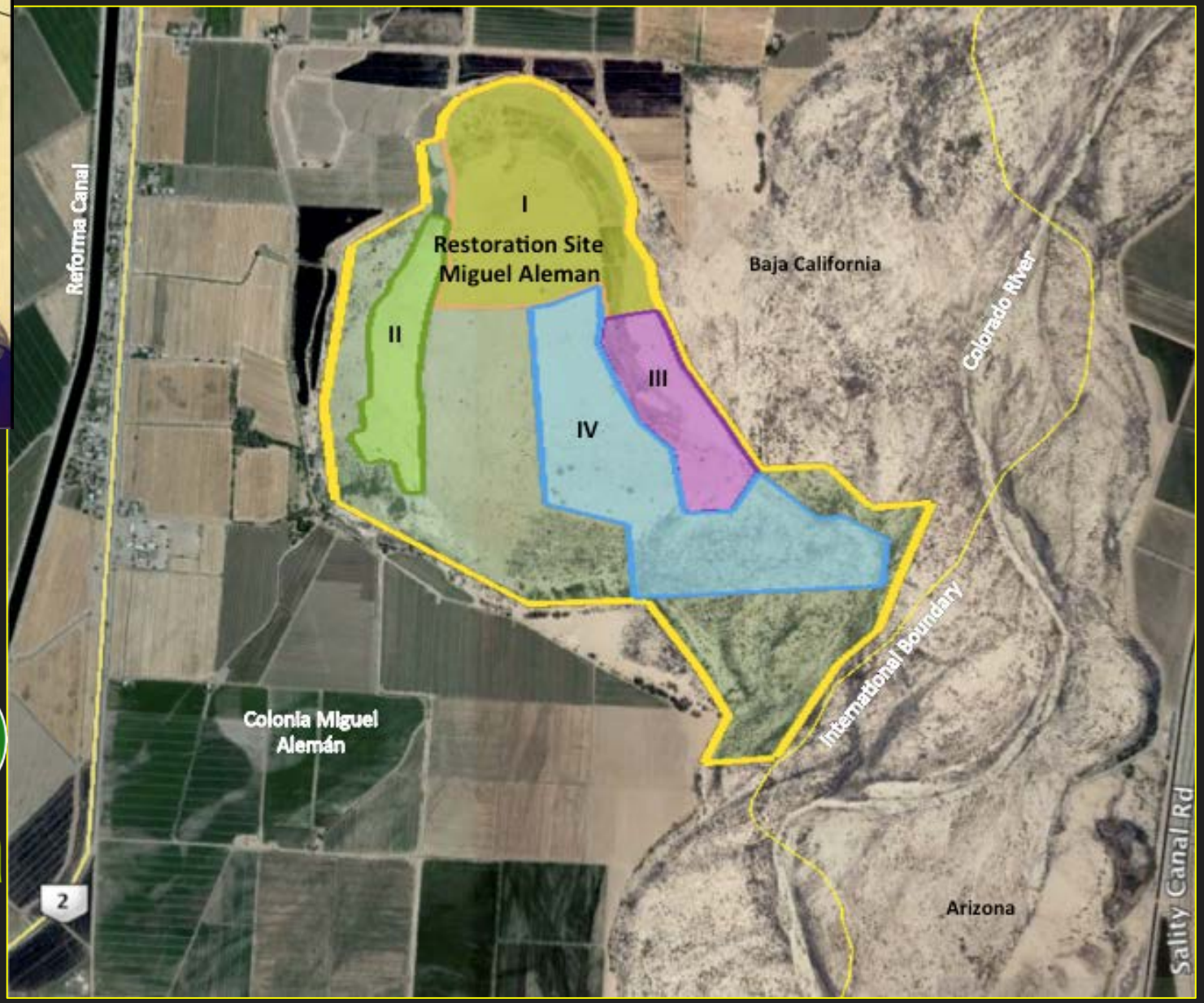


Laguna Grande Restoration Area

Progress to Date:

Habitat Type	Acres
Open water and marsh	8
Wet riparian	22
Low and high-density riparian	243
Mesquite bosque	59
Total	332

Miguel Aleman



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Miguel Aleman Restoration Area

Progress to Date:

Habitat Type	Acres
Upland	69
Low and high-density riparian	31
Mesquite bosque	48
Total	148

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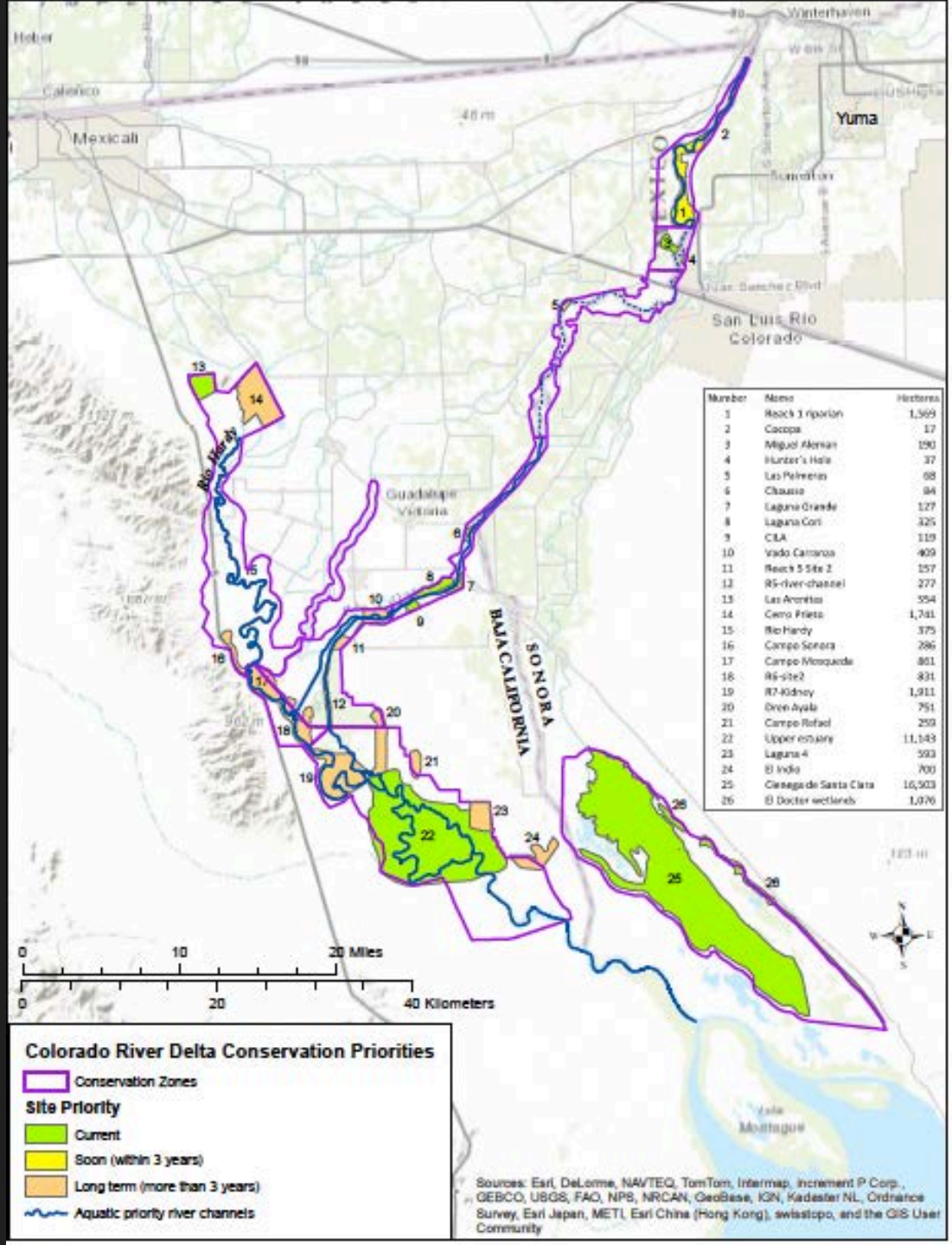
REDFORD CENTER

Audubon

Delta Conservation Priorities



Number	Name	Hectares
1	Reach 1 riparian	1,369
2	Cocopa	17
3	Miguel Aleman	190
4	Hunter's Hole	37
5	Las Palmeras	68
6	Chaussa	84
7	Laguna Grande	127
8	Laguna Cori	325
9	CILA	119
10	Valle Carranza	409
11	Reach 5 Site 2	157
12	R5-river-channel	277
13	Las Arenitas	554
14	Cerro Prieto	1,741
15	Rio Hardy	375
16	Campo Sonora	286
17	Campo Mosquida	861
18	R6-site2	831
19	R7-Kidney	1,911
20	Oren Ayala	751
21	Campo Rafael	259
22	Upper estuary	11,143
23	Laguna 4	593
24	El Indio	700
25	Cienega de Santa Clara	16,503
26	El Doctor wetlands	1,076

Ecological Success Criteria

- Measureable metrics used to quantitatively assess how well projects meet objectives
- Critical link between project goals and outcomes
- Way to assess best practices and approaches

Photo: Bill Hatcher

Ecological Success Criteria: Key Components

- Use of ecologically functional reference sites to define criteria
- Repeatable, rapid methods for assessment
- Range of acceptable and not-acceptable criteria based on restoration goals (species specific, geomorphic functions, habitat structure, etc.)
- Long-term monitoring (minimum of 5 years)

Delta Success Criteria Objectives

- Define habitat quality of restoration sites relative to mature functioning habitat
- Standardize meaning of “restoration” across sites and projects for different habitat types
- Provide quantitative assessment of progress to donors, potential investors
- Inform restoration design and management decisions (adaptive management)

Riparian Habitat

- Cottonwood and willow forest
- Mesquite bosque
- Other riparian woodlands/shrublands

Photo: Bill Hatcher

Vegetation Indicators and Metrics

1) Vegetation foliar cover
2) Vegetation structure (total vegetation volume)

Bird Indicators and Metrics

1) Bird Diversity: Hill's N_2 diversity index
2) Bird Abundance: Number of target riparian species present

Abiotic Indicators and Metrics

1) Average annual depth to groundwater
2) Average area (m2) over year of surface water present in site

*Variation in depth to groundwater will be monitored, but not used as success criteria

Indicator Quality Thresholds

Cottonwood Willow Habitat Thresholds			
Quality Level	**Abiotic**	**Vegetation**	**Bird**
Excellent	Depth to Groundwater is 0-1 m deep,	Cover • Average Total Woody % Cover > 70% • Ave Salt cedar % Cover < 25% • Ave Cottonwood Willow % Cover > 40% Structure • Total Veg Volume > 1.5 (m^3/m^2) • > 100m^2 of surface water within site (Y/N)	Hill's N_2 Diversity is > 6.0 AND Abundance of target species is > 7.5
Good	Depth to Groundwater is 1 - 2.5 m deep	Cover • Average Total Woody % Cover > 70% • Ave Salt cedar % Cover < 25% • Ave Cottonwood Willow % Cover > 30% Structure • Total Veg Volume > (0.5m^3/m^2)	Hill's N_2 Diversity ranges between 5.1 - 6.0 AND Abundance of target species is > 5.8
Fair	Depth to Groundwater is < 3.5 m deep	Cover • Average Total Woody % Cover > 50% • Ave Salt cedar % Cover < 50% • Ave Cottonwood Willow % Cover > 20% Structure • Total Veg Volume > 0.5 m^3/m^2	Hill's N_2 Diversity ranges between 4.1-5.1 OR Abundance of target species is > 3.9

Indicator Quality Thresholds

Mesquite Habitat Thresholds			
Quality Level	**Abiotic**	**Vegetation**	**Bird Diversity**
Excellent	Depth to Groundwater is 2-4 m deep	**Cover** • Ave Tamarisk % Cover < 25% • Ave Honey Mesquite % Cover > 75% **Structure** • Total Veg Volume > 1.5 (m^3/m^2) • Average mesquite canopy height > 4m	Hill's N_2 Diversity is > 4.8 AND Abundance of target species is > 6.0
Good	Depth to Groundwater is 4-6 m deep	**Cover** • Ave Tamarisk% Cover < 25% • Ave Mesquite% Cover > 50% **Structure** • Total Veg Volume > 1 (m^3/m^2) • Average mesquite canopy height > 2 m	Hill's N_2 Diversity ranges between 4.0 - 4.8 AND Abundance of target species is > 4.6
Fair	Depth to Groundwater is < 8 m deep	**Cover** • Ave Tamarisk% Cover < 50% • Ave Mesquite% Cover > 25% **Structure** • Total Veg Volume > 0.5 m^3/m^2	Hill's N_2 Diversity ranges between 3.2– 4.0 OR Abundance of target species is > 3.1

Indicator Quality Thresholds

Riparian and Other Shrubland Thresholds			
Quality Level	**Abiotic**	**Vegetation**	**Bird Diversity**
Adequate	Ave Depth to Groundwater is < 8m deep	**Cover** • Average Total Woody % Cover > 50% **Structure** • Total Veg Volume > 0.5 (m^3/m^2)	Hill's N_2 Diversity ranges between 3.2 - 4.0 OR Abundance of target species is > 3.1

Survey Methods and Design

Abiotic:

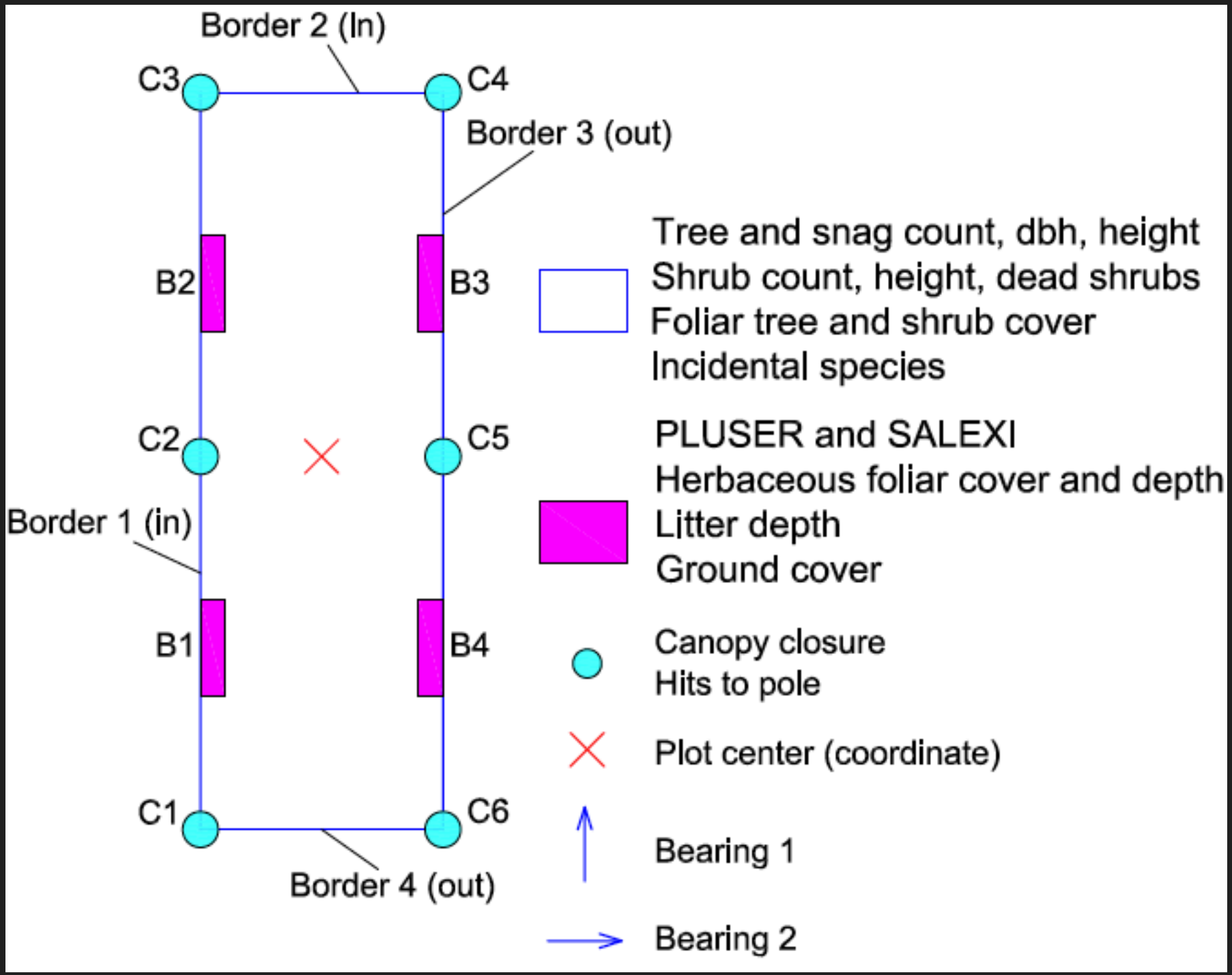
- Use existing network of piezometers to monitor groundwater
- Remote sensing to determine average size of surface water present over 1 year

Birds:

- Variable distance point count with 100m radius
- Sites of 40ha, need 8-10 point count plots
- 3 visits for 1 season (March-July)

Vegetation:

- 3-5 monitoring plots (5x15m) within circular bird sampling area (density of ~1 plots per 4 acres)


Border 2 (In)
C3
C4
Border 3 (out)
B2
B3
C2
C5
Border 1 (in)
B1
B4
C1
C6
Border 4 (out)
Tree and snag count, dbh, height
Shrub count, height, dead shrubs
Foliar tree and shrub cover
Incidental species
PLUSER and SALEXI
Herbaceous foliar cover and depth
Litter depth
Ground cover
Canopy closure
Hits to pole
Plot center (coordinate)
Bearing 1
Bearing 2

Future Work

- Power analysis on SI vegetation data to determine sampling design
- Test methods and metrics in 2017; assess and revise
- Develop criteria for other habitat types
- Additional funding!

Thank you!

Photo: Bill Hatcher