

Applying Monitoring Results to Design & Adaptively Manage Middle Rio Grande Restoration Projects

Ondrea Hummel,
USACE Albuquerque District
July 31, 2013



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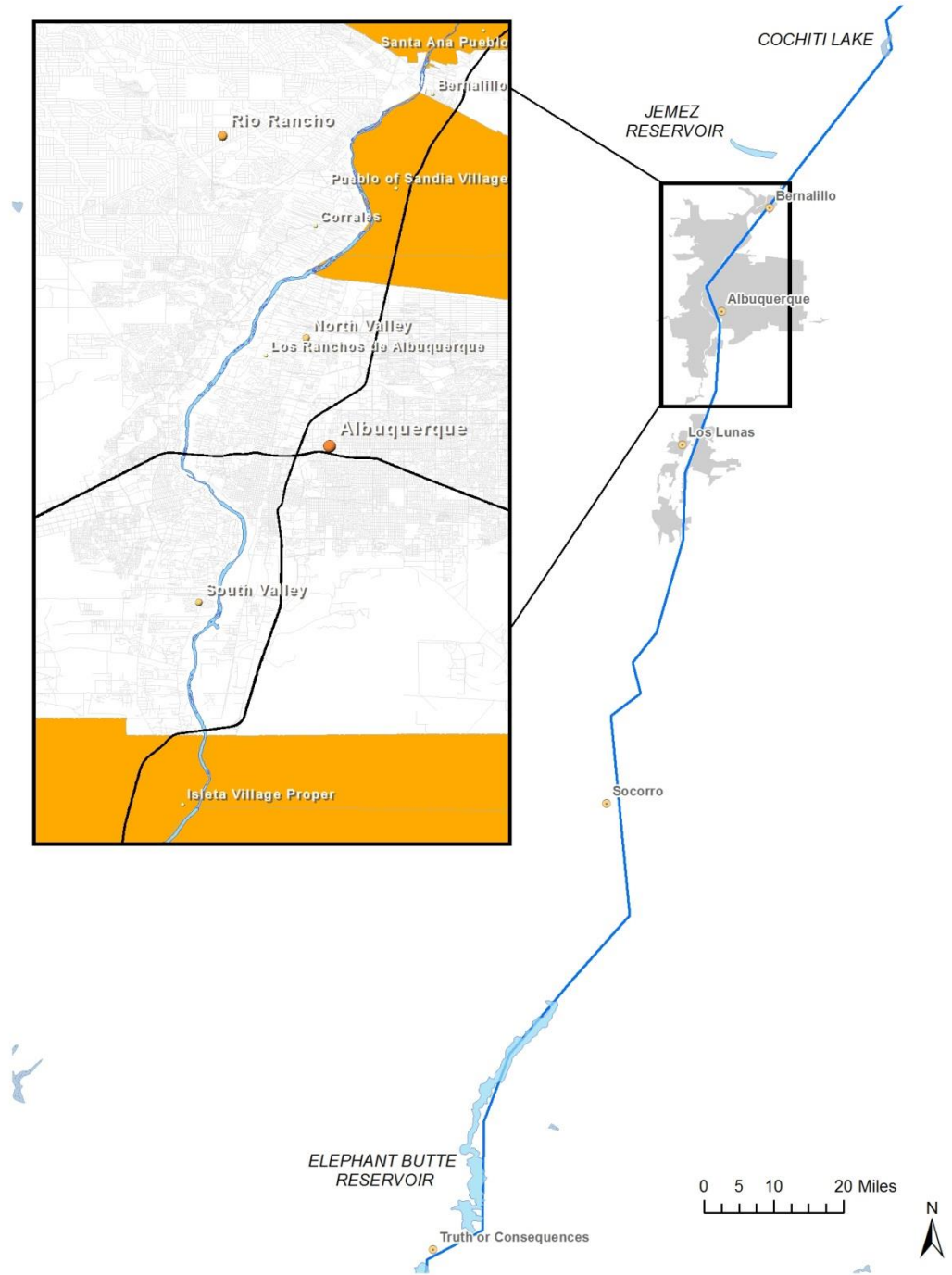
Rio Grande

- Originates in the San Juan Mountains, CO
- Flows for 1,900 miles to Gulf of Mexico near Brownsville, TX.
- Supports one of the longest contiguous cottonwood gallery forests (a.k.a. “bosque”) in the world.

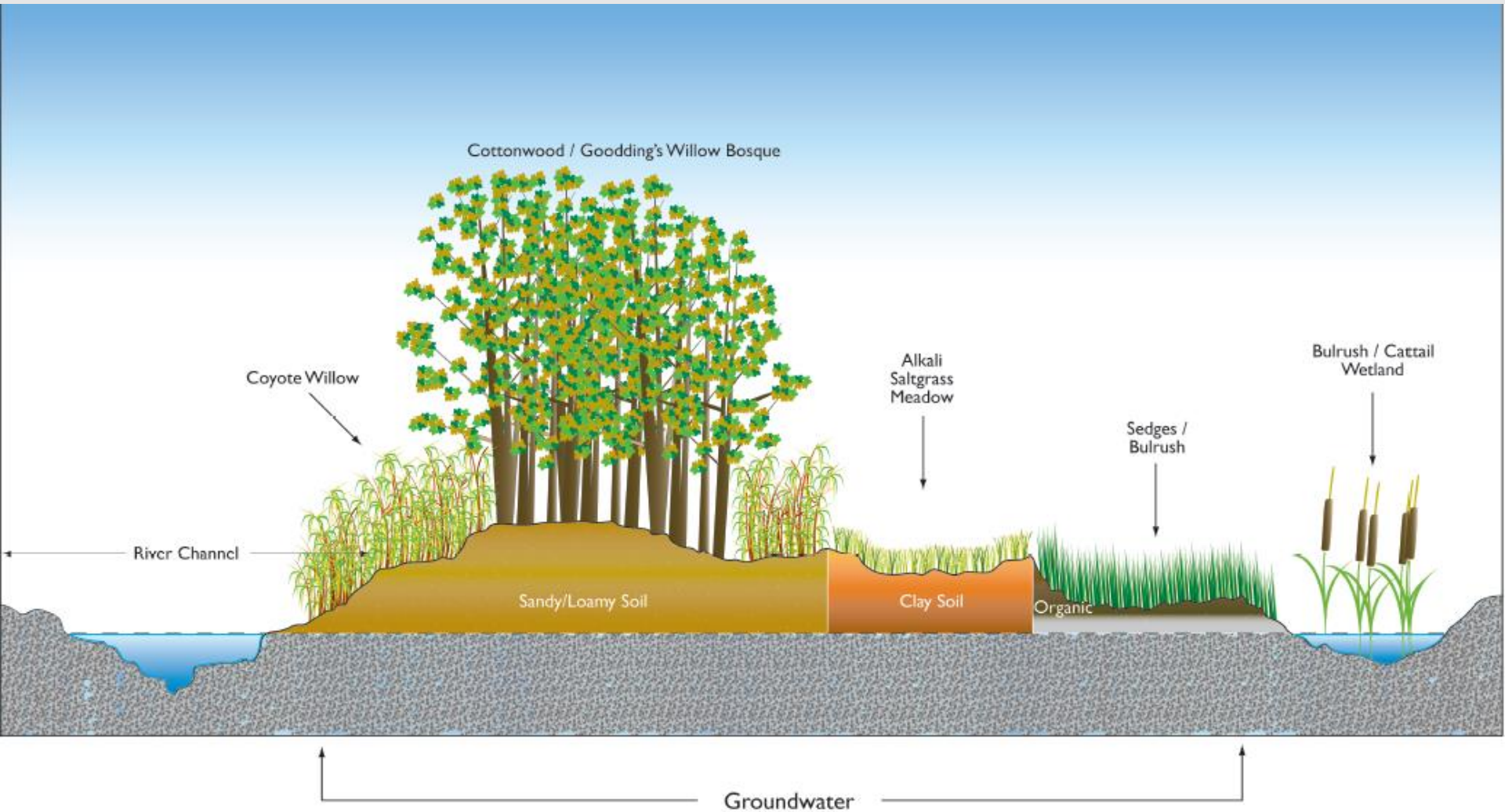


Middle Rio Grande

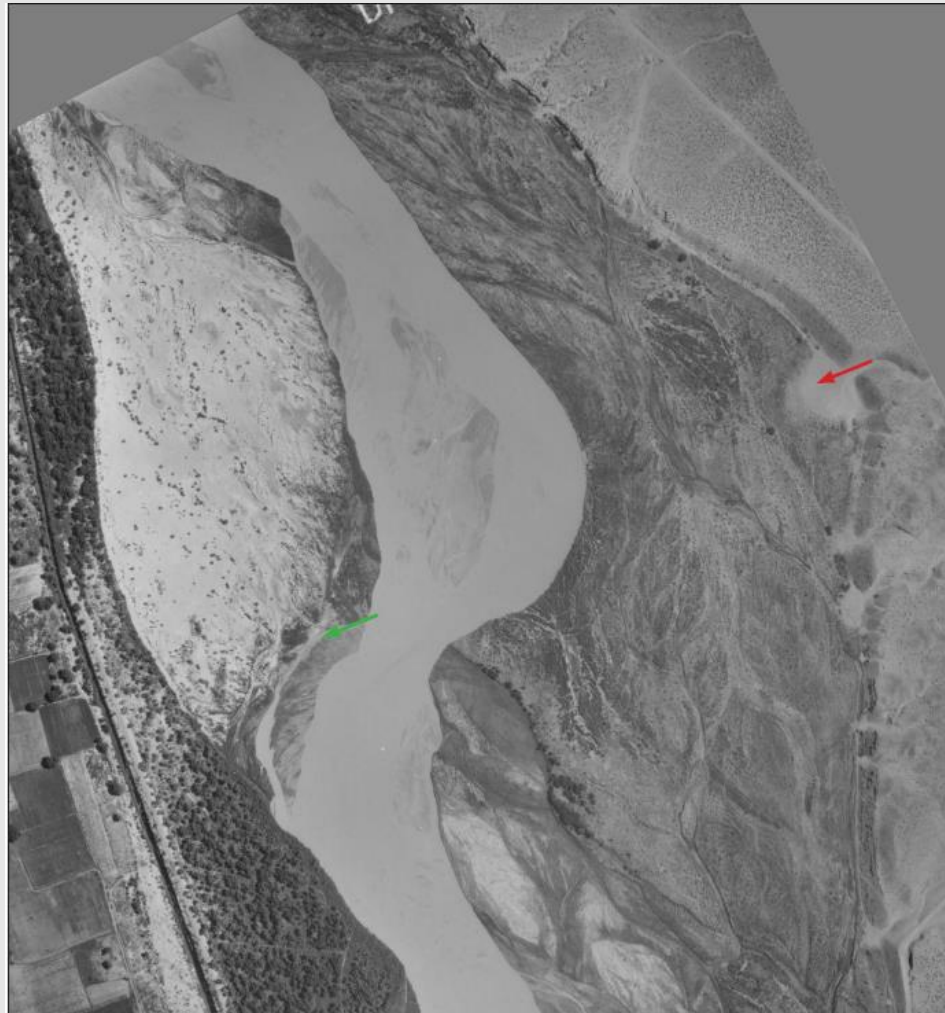
- Extends 120 miles between Cochiti Dam and Elephant Butte Reservoir
- Albuquerque Reach of MRG
 - 22 miles



Diverse Riparian-Wetland Habitats

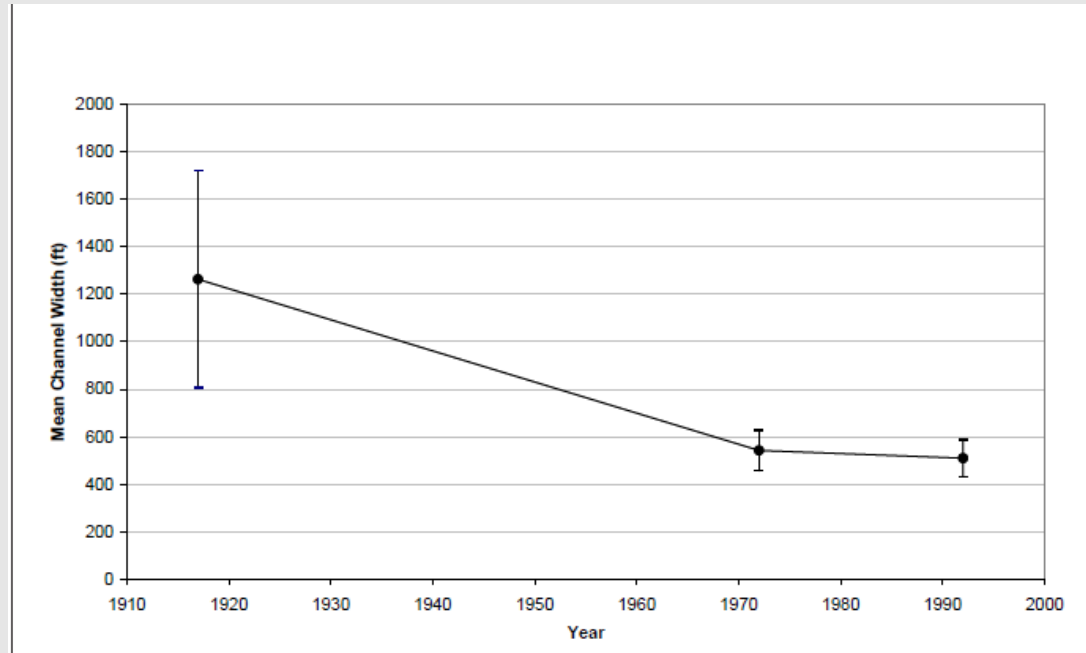


20th Century Development – Channelization, Dam Building, Diversions, GW Pumping...



Impacts to River and Associated Habitats

- Dramatic narrowing
- Flood control projects:
 - Cochiti Dam 1974
- Peak flows capped at 7,000 cfs
- Combination of flood control, channelization, surface water diversions
 - Flood inundation eliminated thru most of MRG
 - Inundation lacks energy for significant geomorphic alterations
 - Major decline in floodplain habitat diversity
 - Endangered species



	1935	1989	Change
Wet Meadow, Marsh Pond, or Lake	3,884 (9,593)	1,638 (4,046)	-2,246 (-5,547)
Scrub Shrub	13,370 (33,024)	9,304 (22,980)	-4,066 (-10,044)
Forest	8,432 (20,828)	7,812 (19,296)	-620 (-1,531)
River Channel	8,916 (22,023)	4,347 (10,736)	-4,569 (-11,287)

Exotic Plant Introductions

- Tamarisk (saltcedar)
- Russian olive
- Tree of Heaven
- Siberian elm
- Dense understory growth / ladder fuels
- **Frequent Wildfires!!**



Middle Rio Grande Restoration Project

Middle Rio Grande Restoration Project



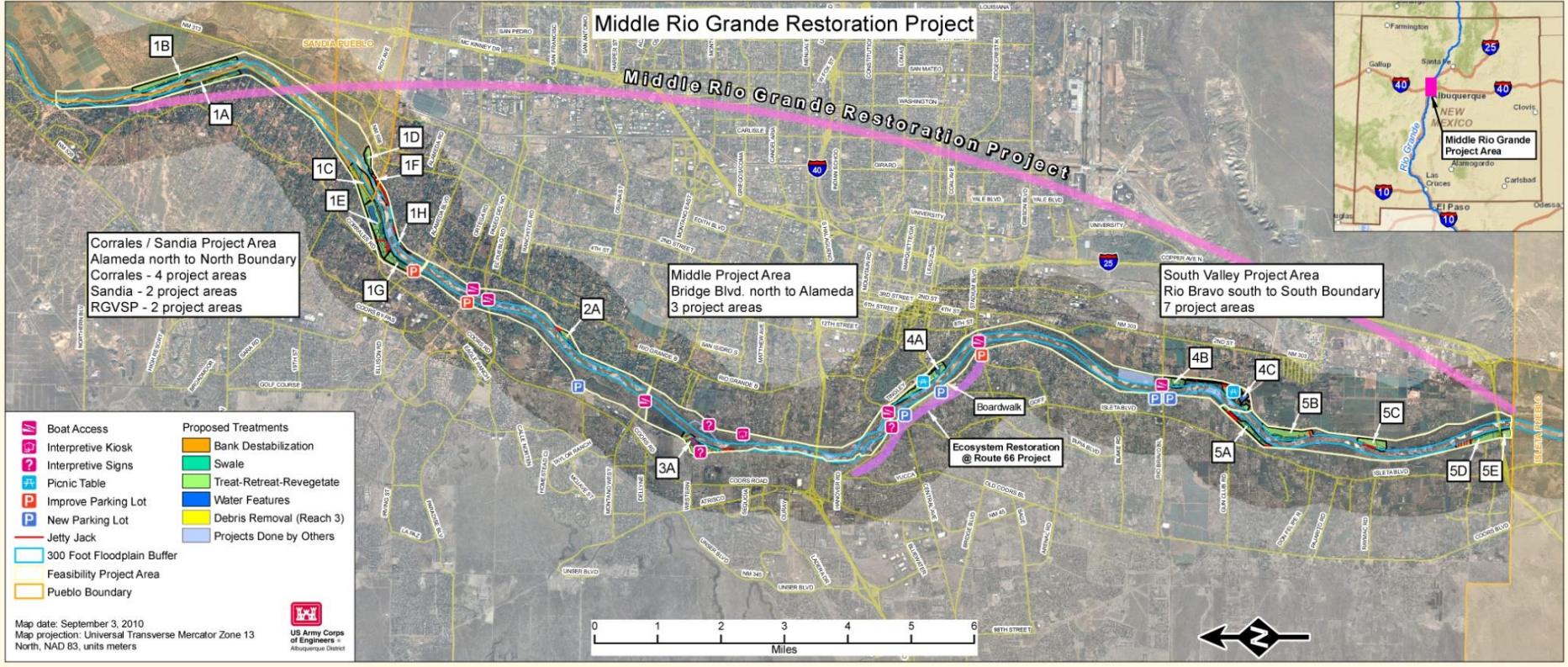
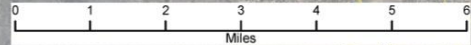
Corrales / Sandia Project Area
 Alameda north to North Boundary
 Corrales - 4 project areas
 Sandia - 2 project areas
 RGVSP - 2 project areas

Middle Project Area
 Bridge Blvd. north to Alameda
 3 project areas

South Valley Project Area
 Rio Bravo south to South Boundary
 7 project areas

- | | | | |
|--|----------------------------|--|--------------------------|
| | Boat Access | | Bank Destabilization |
| | Interpretive Kiosk | | Swale |
| | Interpretive Signs | | Treat-Retreat-Revegetate |
| | Picnic Table | | Water Features |
| | Improve Parking Lot | | Debris Removal (Reach 3) |
| | New Parking Lot | | Projects Done by Others |
| | Jetty Jack | | |
| | 300 Foot Floodplain Buffer | | |
| | Feasibility Project Area | | |
| | Pueblo Boundary | | |

Map date: September 3, 2010
 Map projection: Universal Transverse Mercator Zone 13
 North, NAD 83, units meters



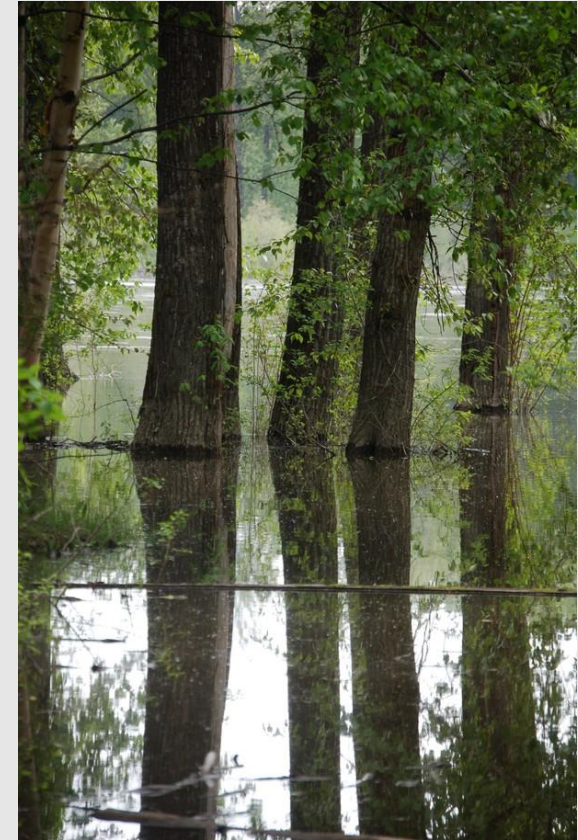
Bosque Wildfire Project (2003 – 2006)

- Hazardous fuels reduction
- Herbicide treatments
- Kelner jack removal
- Experimental revegetation
 - Willow swales
 - Pole planting
 - Riparian shrubs
- Monitoring



Ecosystem Restoration at Route 66 & Albuquerque BioPark (2006 – 2010)

- Funded through Section 1135 WRDA
- Continued fuels reduction etc...
- Open water & wetland habitats
- Construct high-flow channels
- Create willow swales
- Revegetation



Middle Rio Grande Restoration Project (2006 – present)

- Largest of the three projects
 - General Investigation
 - \$25m funding
- Emphasis on restoration techniques to
 - promote overbank flood inundation
 - create large willow swales
- Includes revegetation to date of approximately 75,000 native riparian shrubs and trees
- Applied monitoring results from other restoration projects.



Applying Monitoring Results to Design and Adaptive Management of MRG Restoration

- Monitoring results from experimental willow swales
 - Todd Caplan, GeoSystems Analysis
- Ecological functional assessments of restoration projects
 - Steve Albert, Parametrix
- Adaptive management strategies for controlling non-native vegetation
 - Chad McKenna, GeoSystems Analysis
- Avian response to restoration treatments
 - Trevor Fetz, Hawks Aloft

A person wearing a white protective suit and a white hood is crouching in a dense thicket of willow trees. The person is surrounded by green leaves and thin branches. The background is filled with more willow trees, creating a dense habitat. The text is overlaid on a semi-transparent dark grey box.

Site Attributes and Planting Techniques for Growing Dense Willow Habitat along the Middle Rio Grande, NM

Todd Caplan & Ondrea Hummel

Loss of Willow Dominated Riparian Habitat



Salix exigua – coyote willow / sandbar willow



S. gooddingii – Gooding's willow

Southwestern Willow Flycatcher

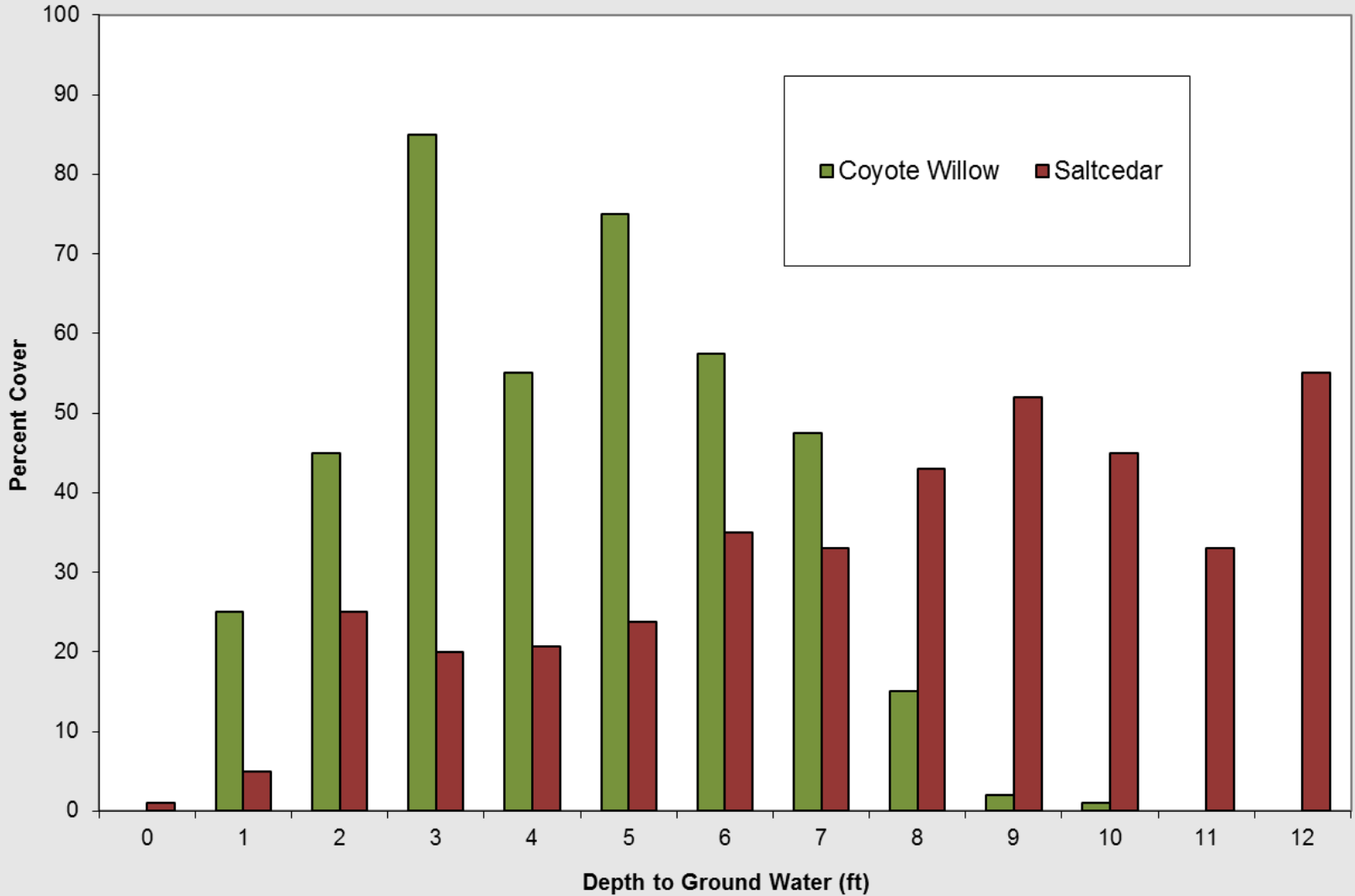


Natural Recruitment of Cottonwood-Willows

- Requires bare, moist alluvium
- Seed dispersal timed with mountain snow-melt runoff.
- Maintain root contact with moist soil
- Large-scale recruitment episodic



Groundwater Depth Threshold



Physical Site Manipulation

- Create high-flow channels to inundate floodplains
- Lower floodplain banklines/terraces
- Unpredictable vegetation response



Approaches with More Predictable Outcomes?

- Bosque Wildfire Project Area
 - 5 swales
 - ~1/4 acre
- Lower the floodplain terrace
- Excavate trenches
- Install willow cuttings & tree poles
- Backfill
- Walk away...



Variable Growth Response



Research Study

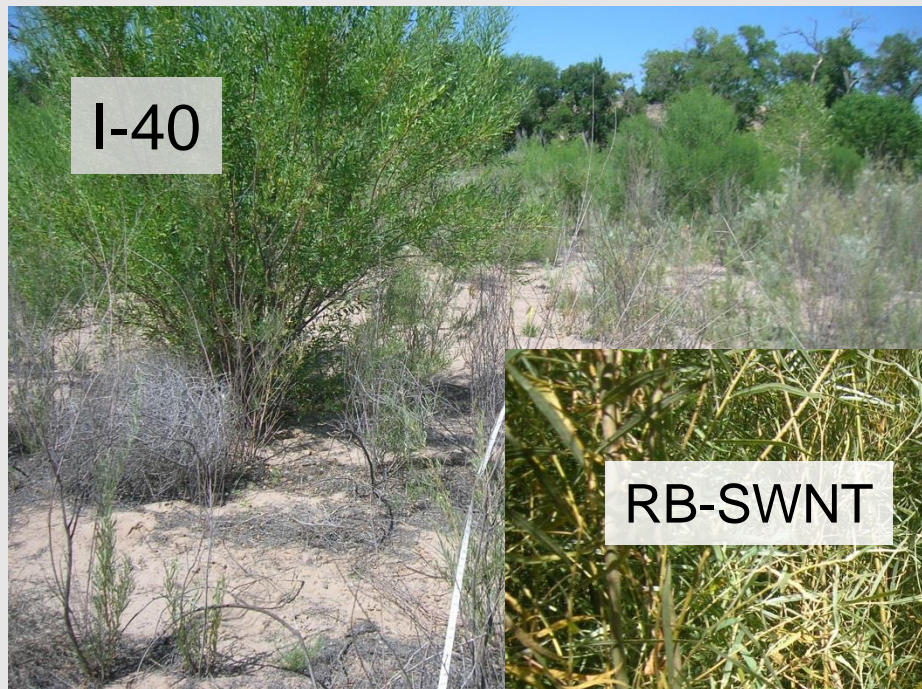
- Examine relationship between willow growth attributes and soil texture and moisture availability.
 - Hypotheses:
 - Growth attributes of coyote willow cuttings is significantly related to alluvial soil texture and water availability
 - Growth is significantly influenced by percent of fine textured soils immediately above the groundwater table.
- Apply results to design future restoration projects.

General Study Design

- 5 constructed willow swales
- 20 transects in each:
 - Plant spp. cover
 - Willow height
 - Willow stem density
- Soil samples @ 6" increments to 5' depth
 - Texture
 - Moisture content
 - Bulk density
 - Available water



I-40



RBSE-NS



RB-SWNT



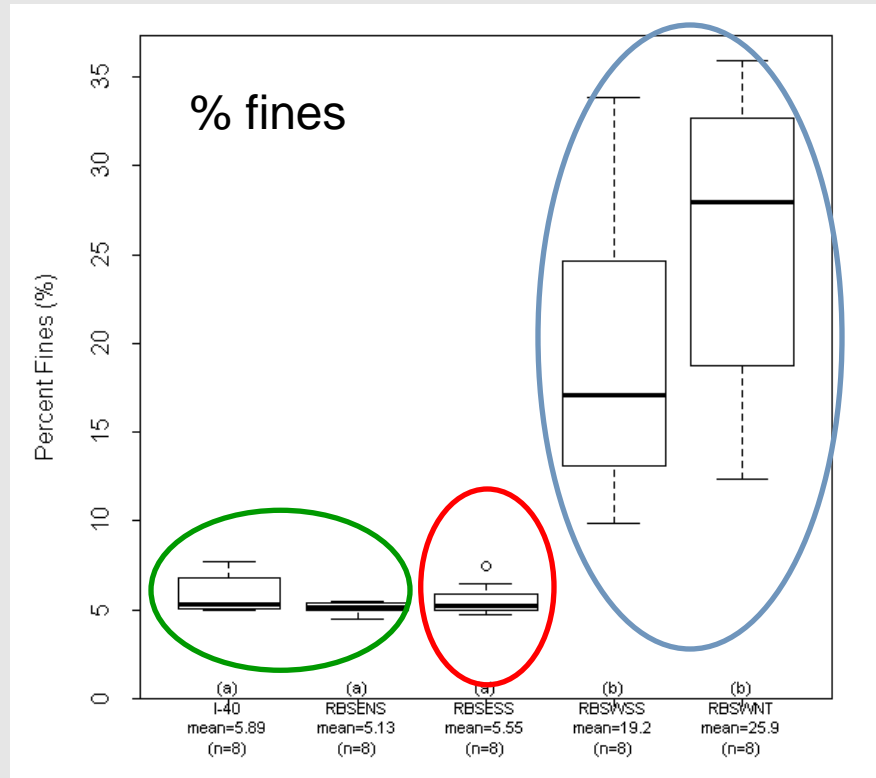
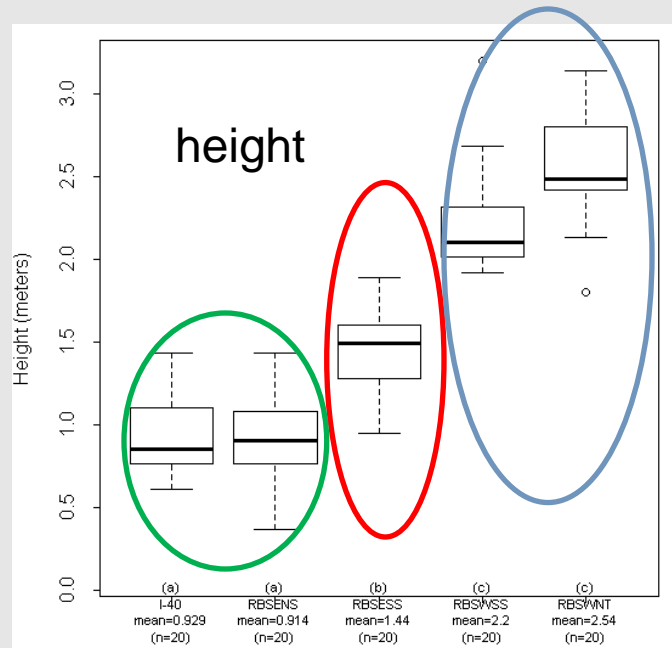
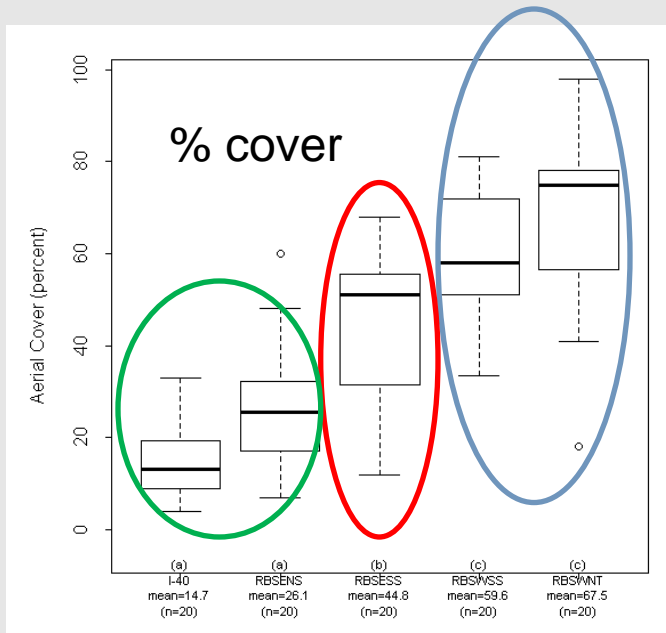
RBSE-SS



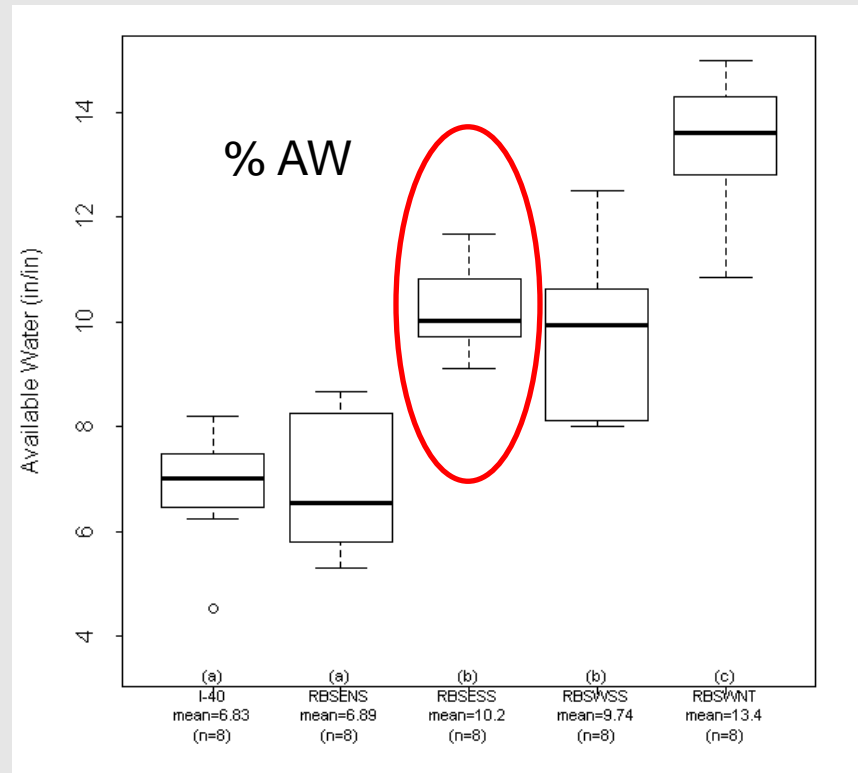
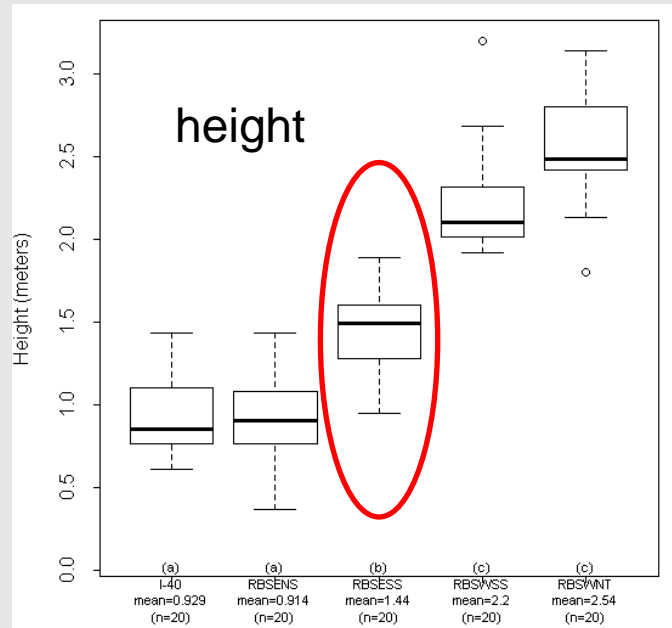
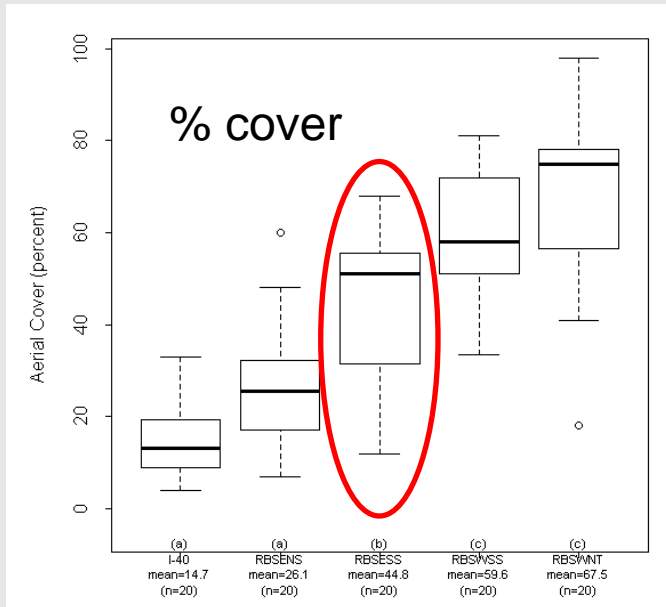
RBSW-SS



Percent Area Cover & Height Significantly Related to Soil Texture $p < .01$

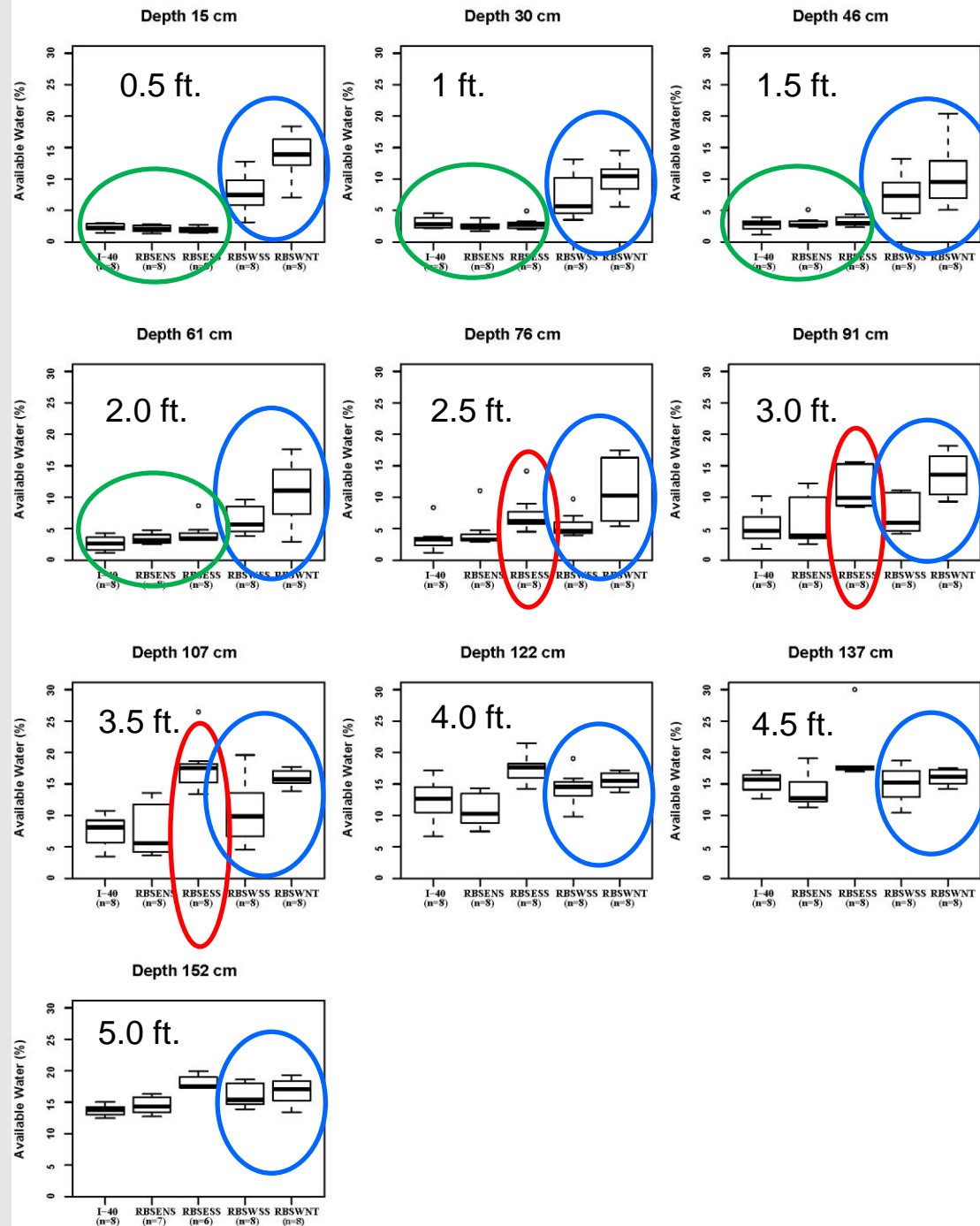


Percent Area Cover & Height Significantly Related to Plant Water Availability (AW) $p < .01$



Available Water 6" Depth Intervals

- RBSW-NT & RBSW-SS
 - Relatively high AW throughout 5.0 ft. profile
- RBSE-SS
 - Low AW in top 2.0 ft.
 - Relatively high AW below 2.5 ft.
- Indicates shallower depth to groundwater at this swale contributed to intermediate willow growth response



Conclusions

- Willow growth (canopy cover & height) significantly related to % fines and AW distribution across soil profile.
- Enables greater root biomass across depth profile → increased above ground biomass.

Design Implications

- If coarse sand dominates soil profile, lower floodplain terrace to maximum DTW 3 feet.
- Where feasible, create backwater channel connection to promote deposition of fine sediments.

Application to Larger MRG Restoration Project

- Field Assessments
 - Soil texture
 - DTW
 - Salinity (ECe)
- Provide to ACOE
 - Plant material quantities
 - Excavation volume
 - GIS
- Construction Oversight/Support
- Eight Sites Constructed in 2012
 - 17 Acres
- Monitoring Results
 - Pending...



QUESTIONS?

