

Soil Salinity and Demographic Characteristics of Saltcedar Invasions in Northcentral Wyoming

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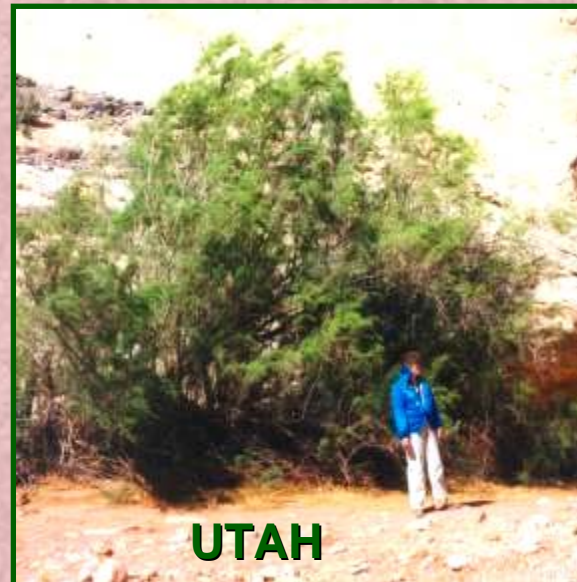
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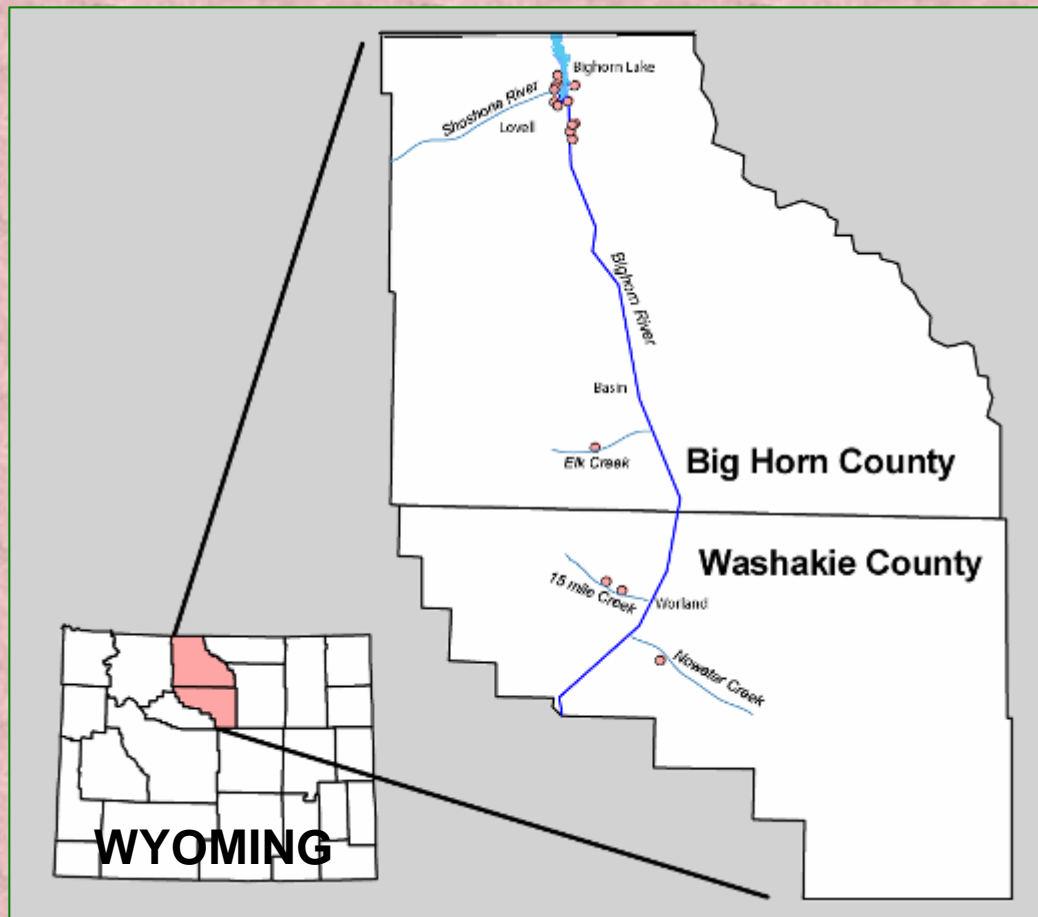
USDA-ARS-NPARL, Sidney MT

Bighorn Basin Saltcedar

- * Documented along the Bighorn River as early as 1950
- * *Tamarix ramosissima*, *T. chinensis*, and their hybrids
- * Northern accessions exhibit different growth characteristics than Southwestern U.S. shrubs



Study Area: Bighorn Basin



* Characteristics:

Elevation: 1170 - 1314 m

Temperatures:

January: -4°C (16.8°F)

July: 22°C (71.8°F)

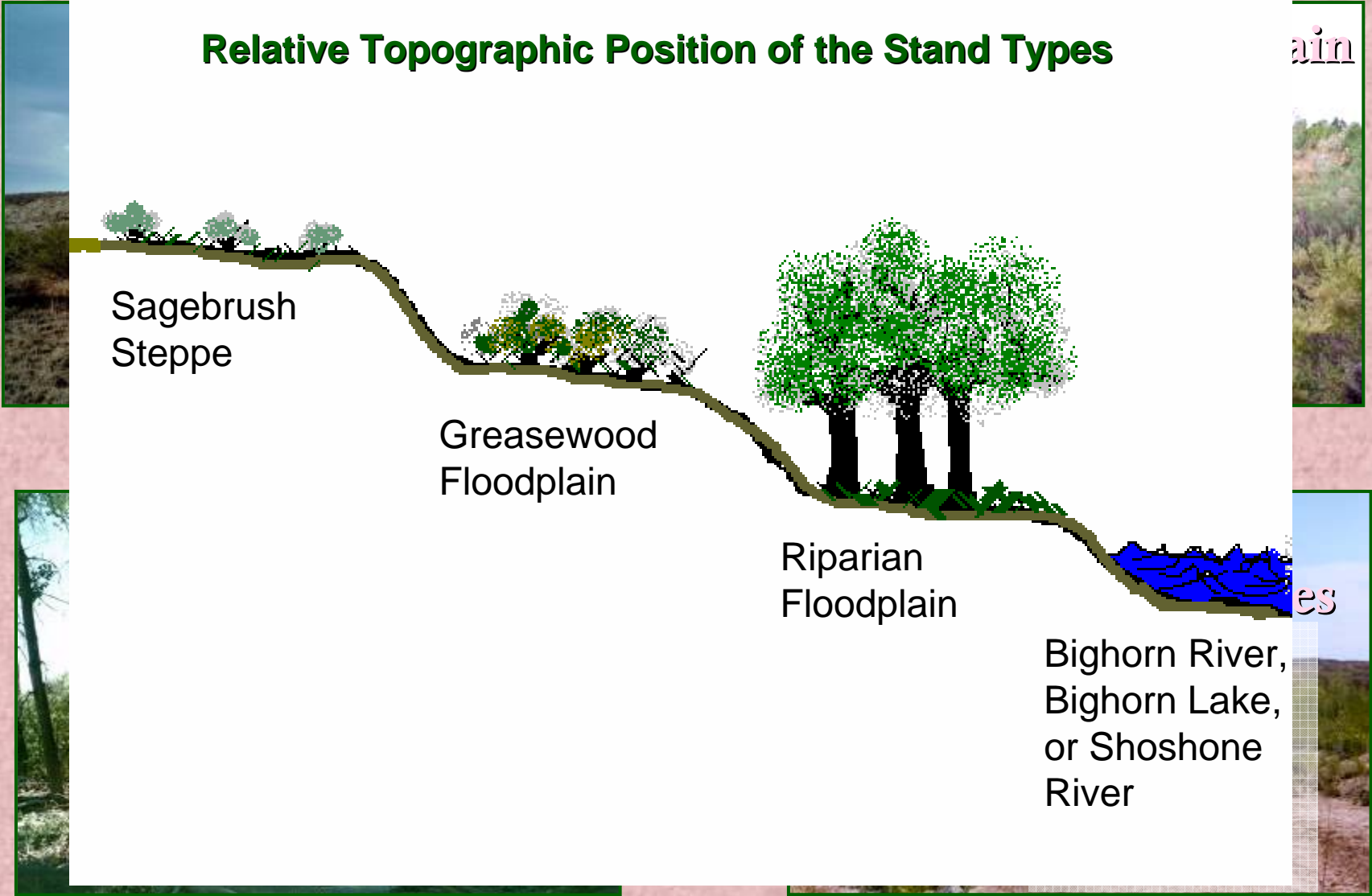
Precipitation:

17.8 cm (7 in.)

* Sixteen sites varying in topographic position and vegetative cover

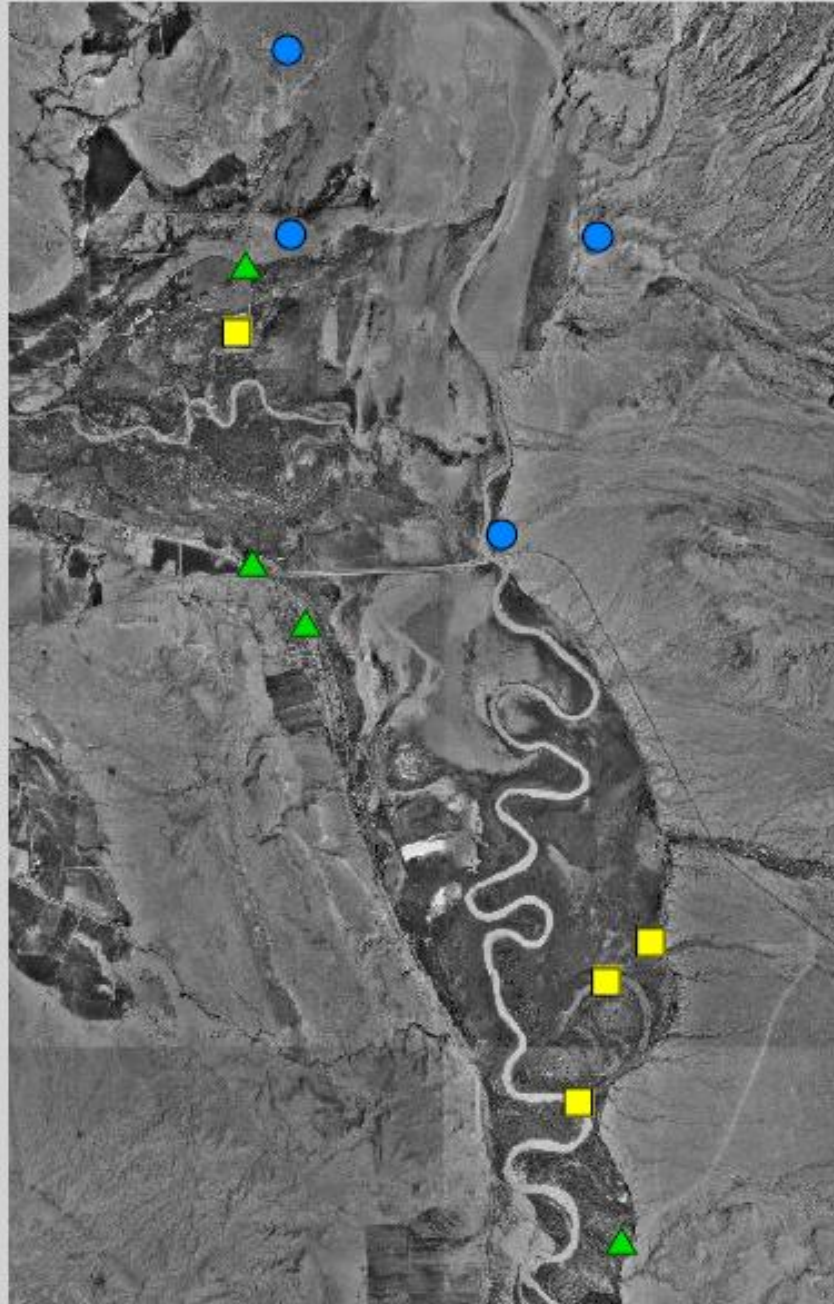
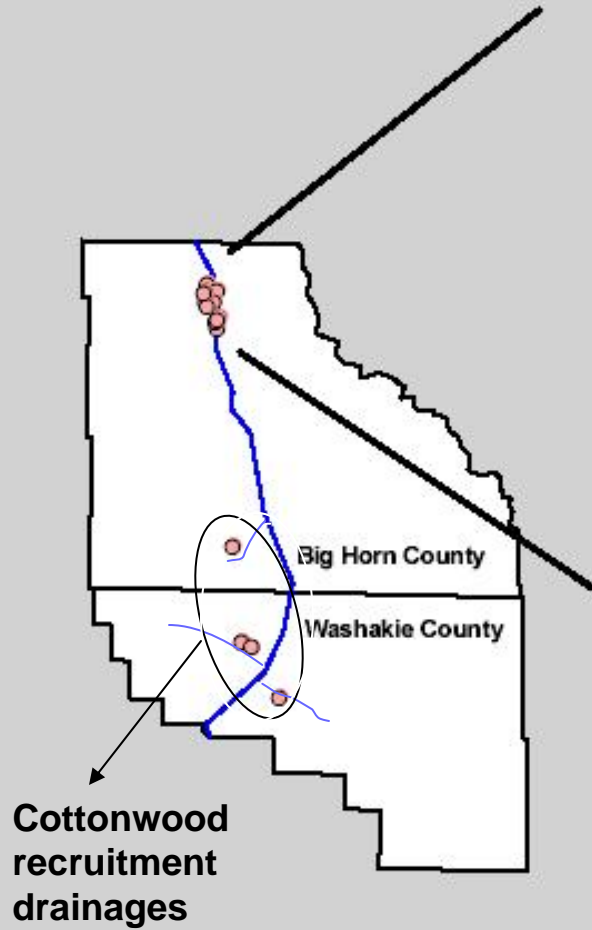
Site Selection: 4 replicates of each stand type

Relative Topographic Position of the Stand Types



SITE LOCATIONS

- Sagebrush steppe
- ▲ Greasewood floodplain
- Riparian floodplain



Vegetative Characteristics

Stand Type	Measurement			
	Production (kg/ha)	<i>Tamarix</i> Density (no./m ²)	<i>Tamarix</i> Cover (%)	Bareground (%)
Sagebrush Steppe	128.83	0.47	11.6%	50.0%
Greasewood Floodplain	53.02	0.68	44.3%	15.7%
Riparian Floodplain	333.54	0.32	15.4%	2.6%
Cottonwood Recruitment Drainages	156.04	0.09	4.5%	68.9%



Studies

1. Soil spatial patterns

- Soil sampling at microsites in saltcedar-invasions
 - beneath *Tamarix*, interspaces, beneath native species

2. *Tamarix* demography and relationship to soil conditions

- Soil sampling beneath *Tamarix*
- Aging of *Tamarix*

Study 1: Soil Spatial Patterns

* Soil Sampling

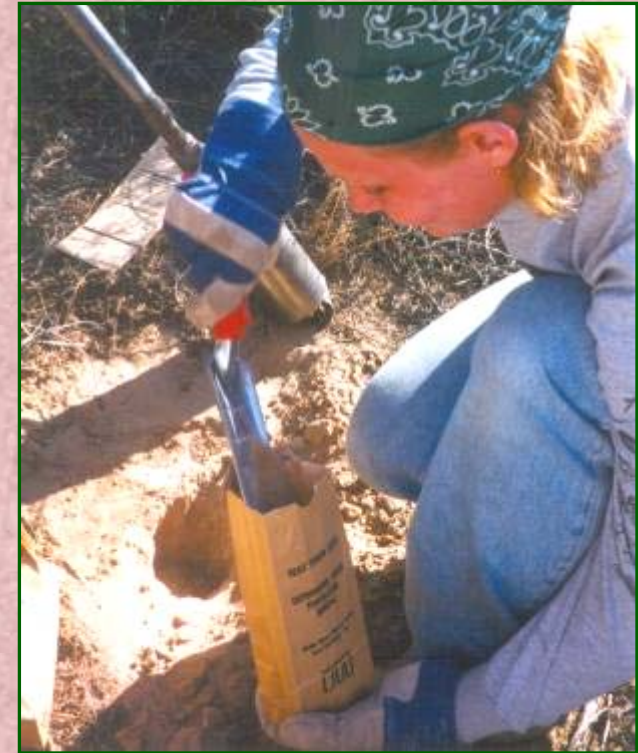
- At five microsite positions
- Soil depth (cm)
 - 0-5
 - 6-20
 - 21-35
 - 36-50

* Soil Analysis

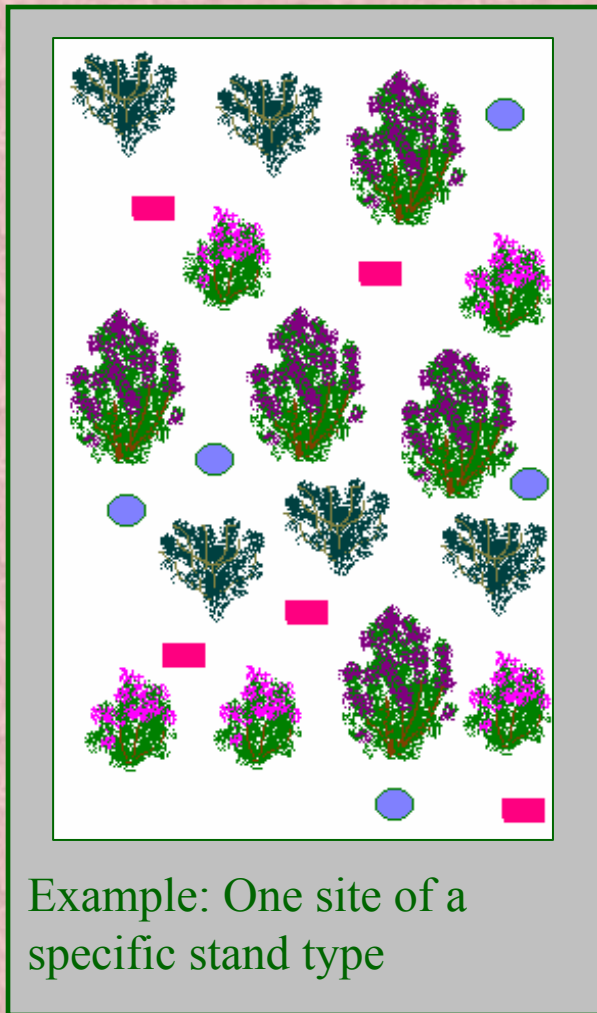
- Electrical Conductivity (EC)
- pH
- Organic matter, N, P, K
- Texture

* Statistical Analysis

- Split plot randomized complete block design



Microsite Positions



1. Beneath large-based *Tamarix* canopy



2. Interspaces of large-based *Tamarix*



3. Beneath random *Tamarix* canopy



4. Interspaces of random *Tamarix*

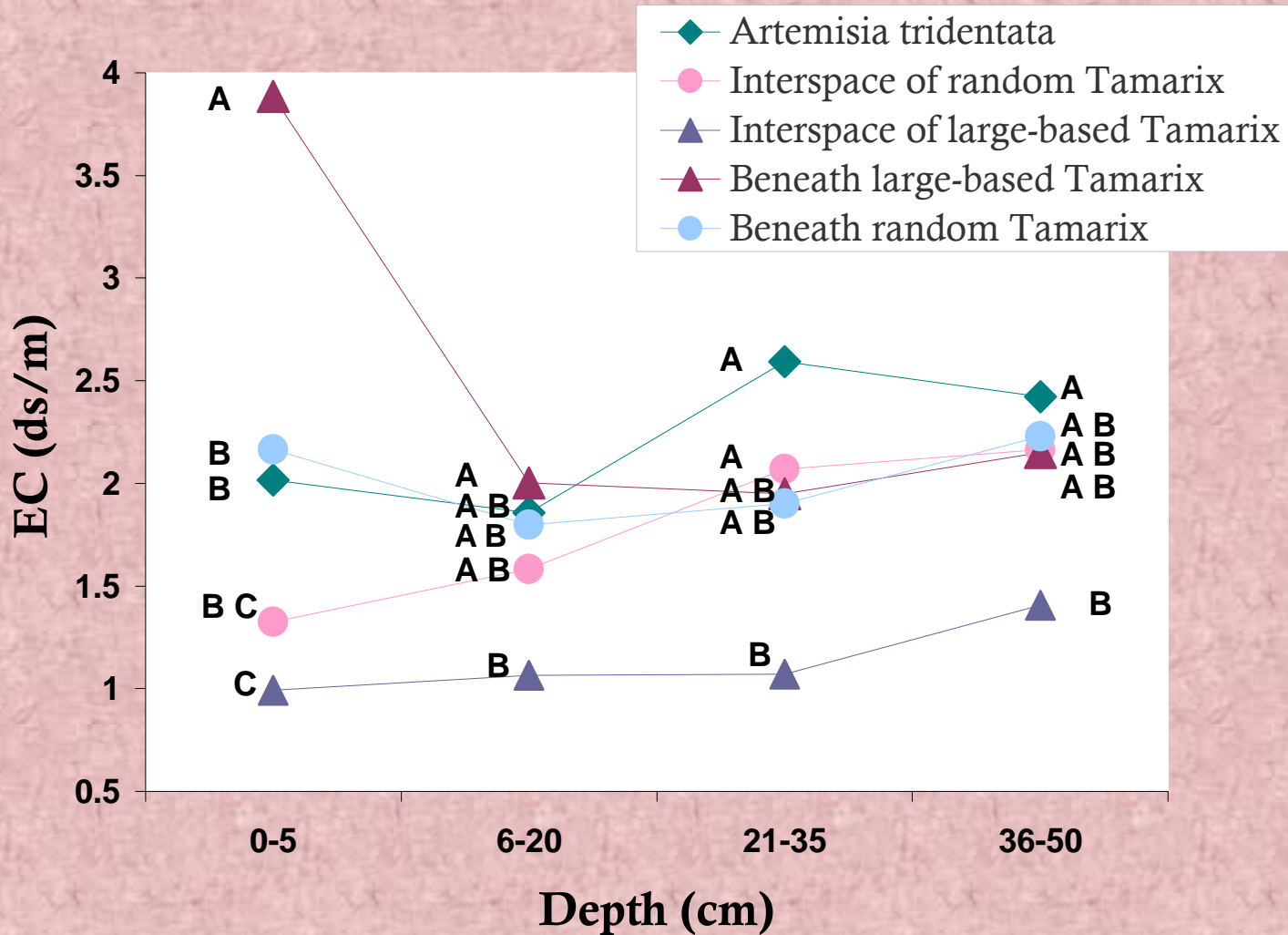


5. Beneath native species canopy



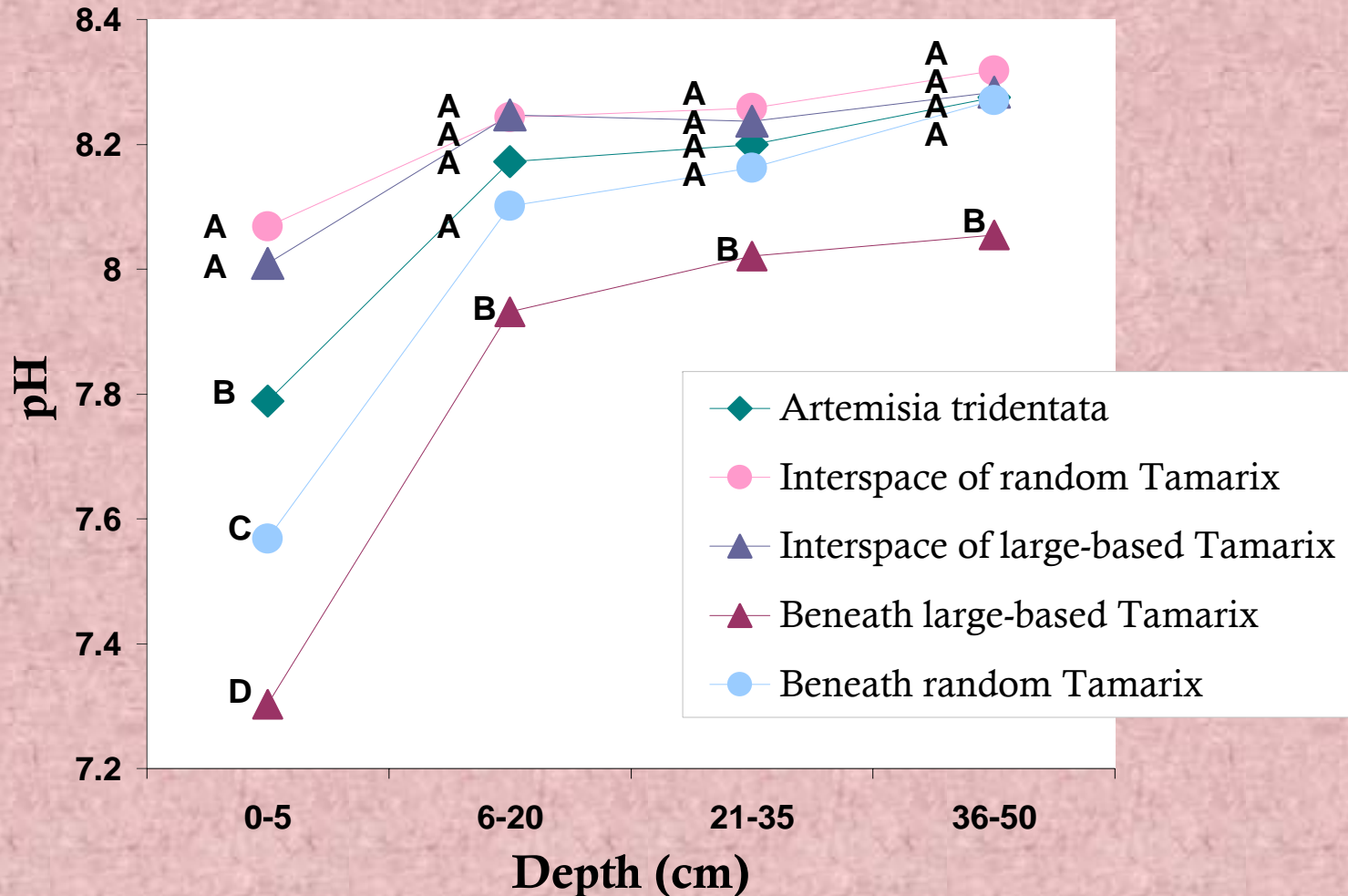
** Within a site: 5 Replicates of each microsite**

Soil Salinity in Sagebrush Steppe Sites



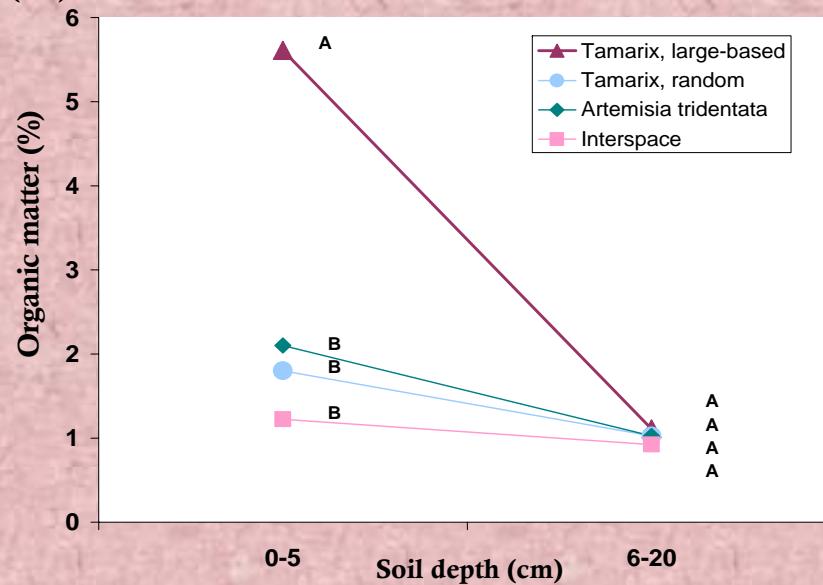
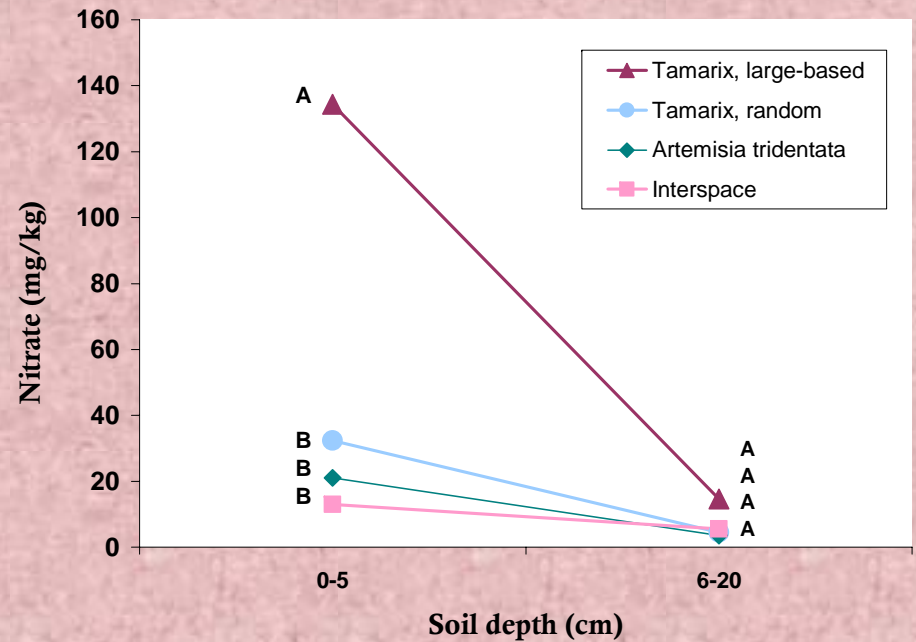
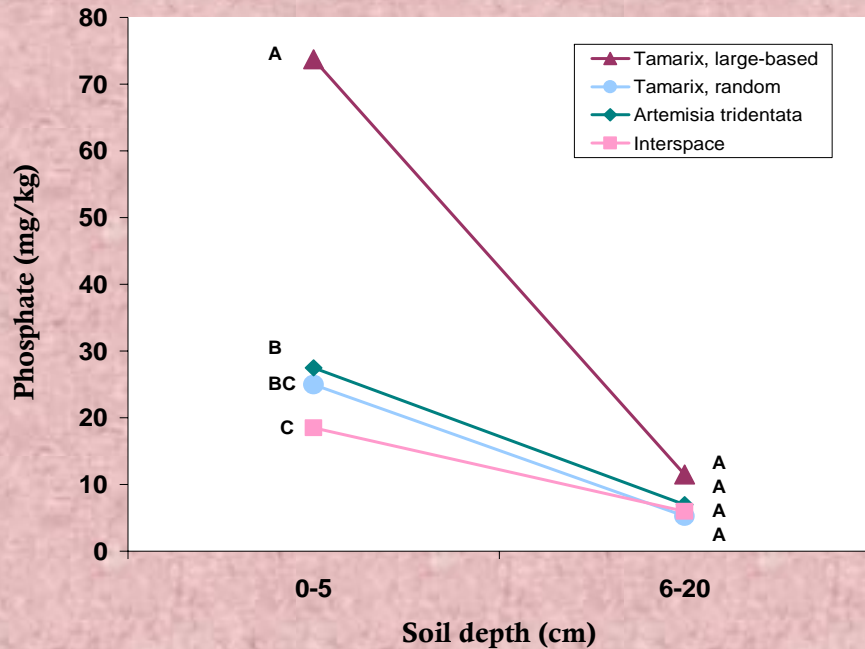
Within a soil depth, means with the same letter do not differ ($\alpha=0.05$)

Soil pH in Sagebrush Steppe Sites

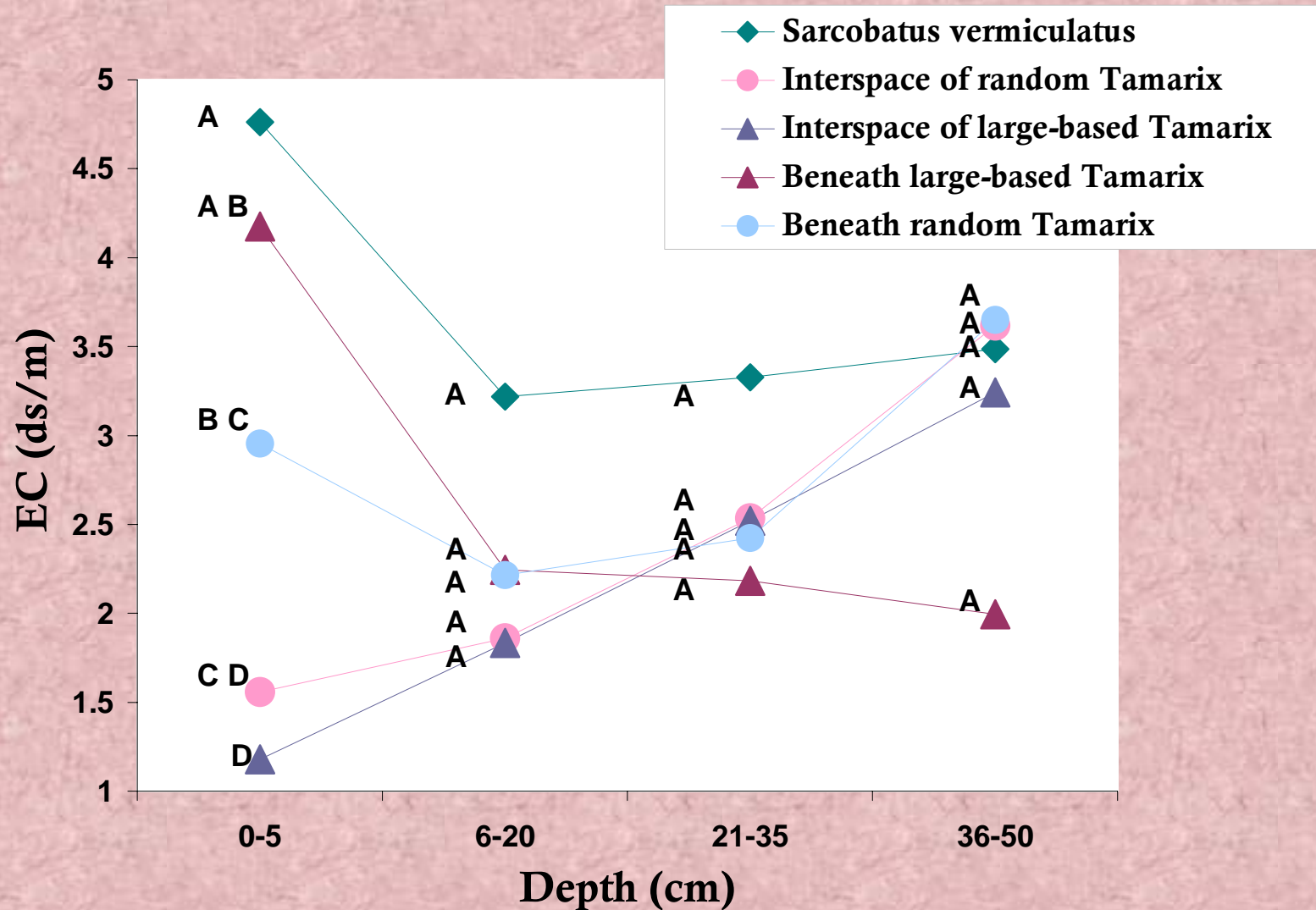


Within a soil depth, means with the same letter do not differ ($\alpha=0.05$)

Soil Nutrients and Organic Matter in the Sagebrush Steppe Sites

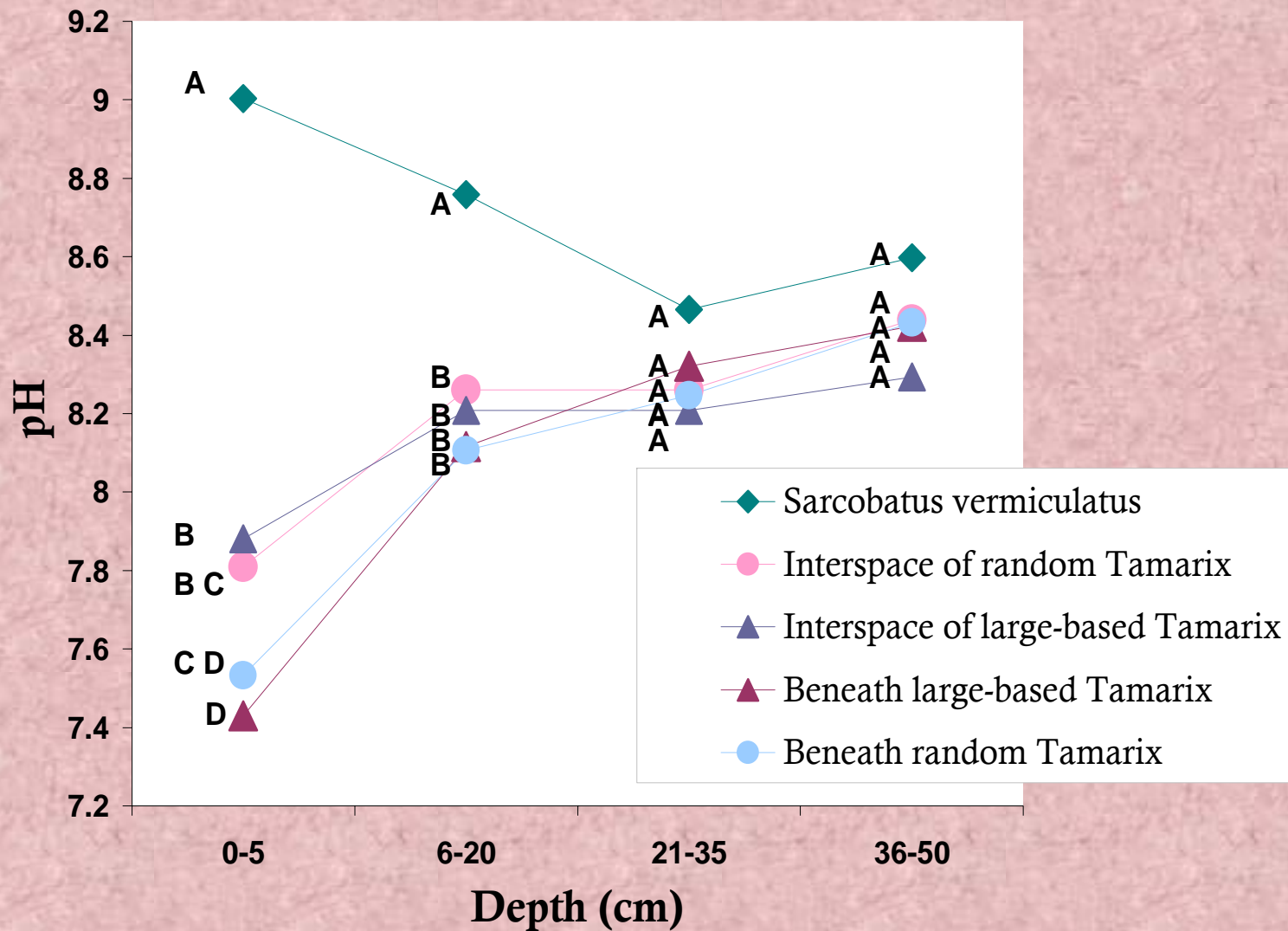


Soil Salinity in Greasewood Floodplain Sites



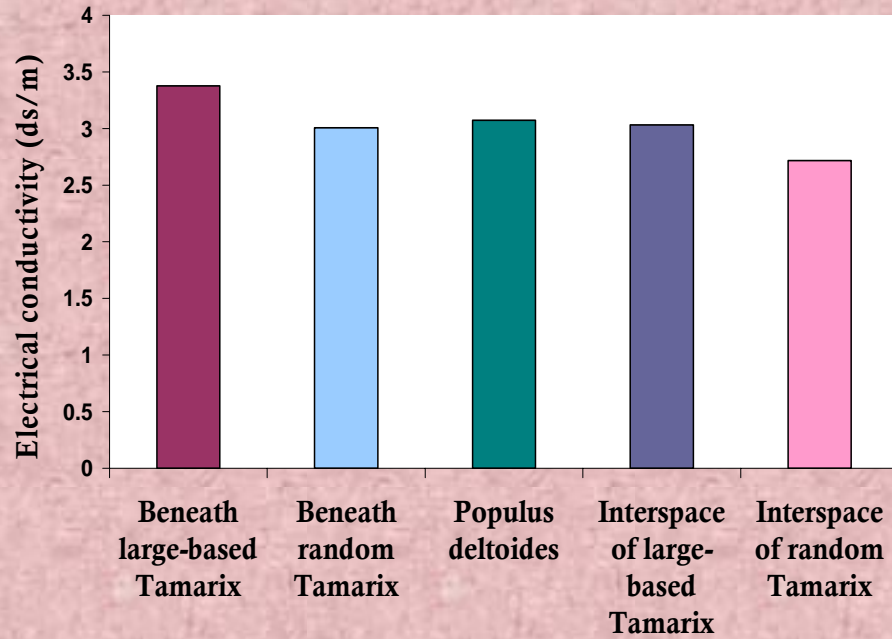
Within a soil depth, means with the same letter do not differ ($\alpha=0.05$)

Soil pH in Greasewood Floodplain Sites

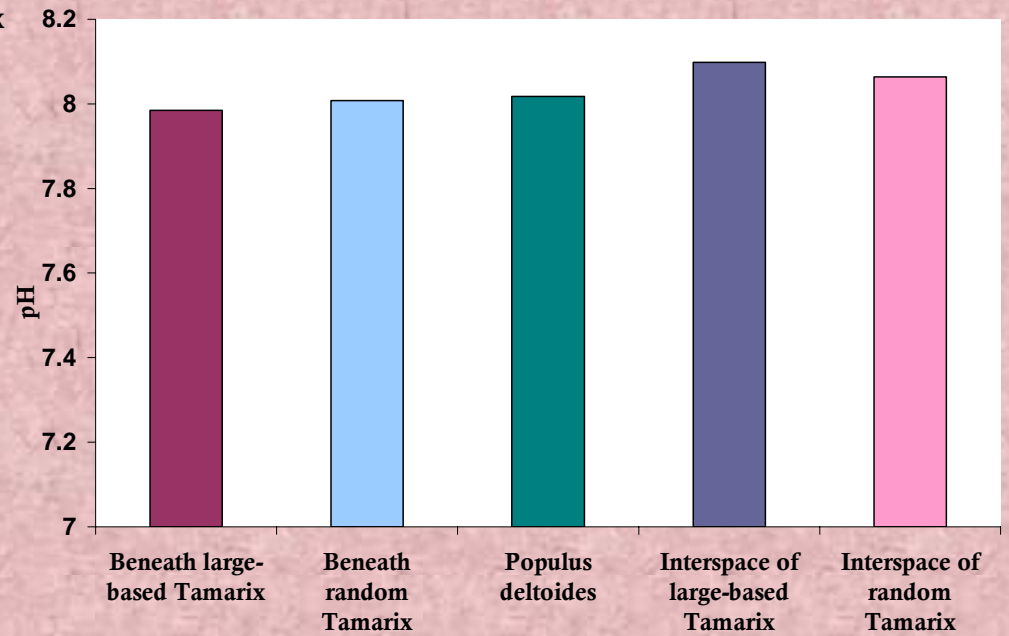


Within a soil depth, means with the same letter do not differ ($\alpha=0.05$)

Soil Salinity and pH in Riparian Sites

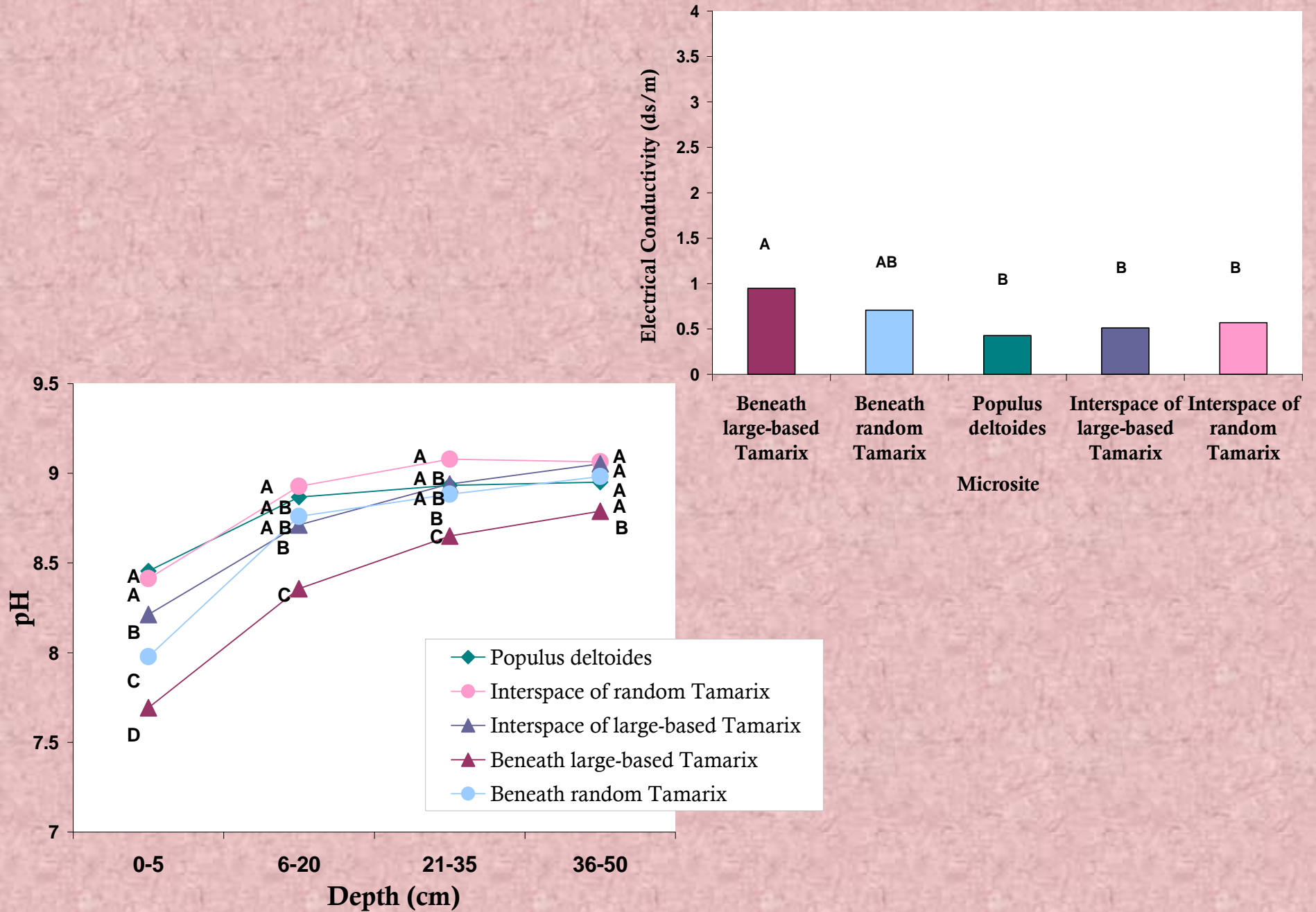


Microsite



Microsite

Soil Salinity and pH in Cottonwood Recruitment Sites



Study 2: Demography and Relationship to Soil Conditions

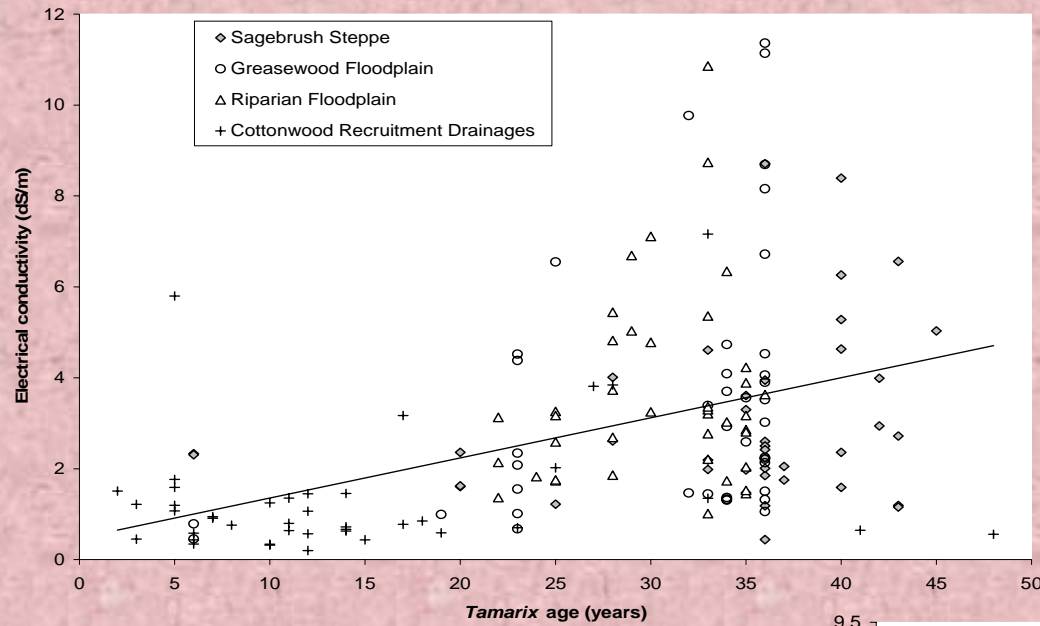
- Saltcedar selection
 - Ten shrubs per site (total = 160)
 - 5 - large basal size
 - 5 - random individuals
- Soil sampling and testing
 - Soil samples beneath saltcedar canopy
 - Four depths: 0-5, 6-20, 21-35, 36-50 cm
 - EC, pH, N, P, K, OM, and texture
- Age determination
 - Stem sections just below union of stems to root crown
 - Cross sectioned; sanded
 - Annual ring counts
- Statistical analysis
 - Simple linear regression



Age Determination



Relationship of Soil Salinity and pH (0-5 cm) to *Tamarix* Age



Electrical conductivity

$$y = 0.0881x + 0.4753$$

$$R^2 = 0.1854$$

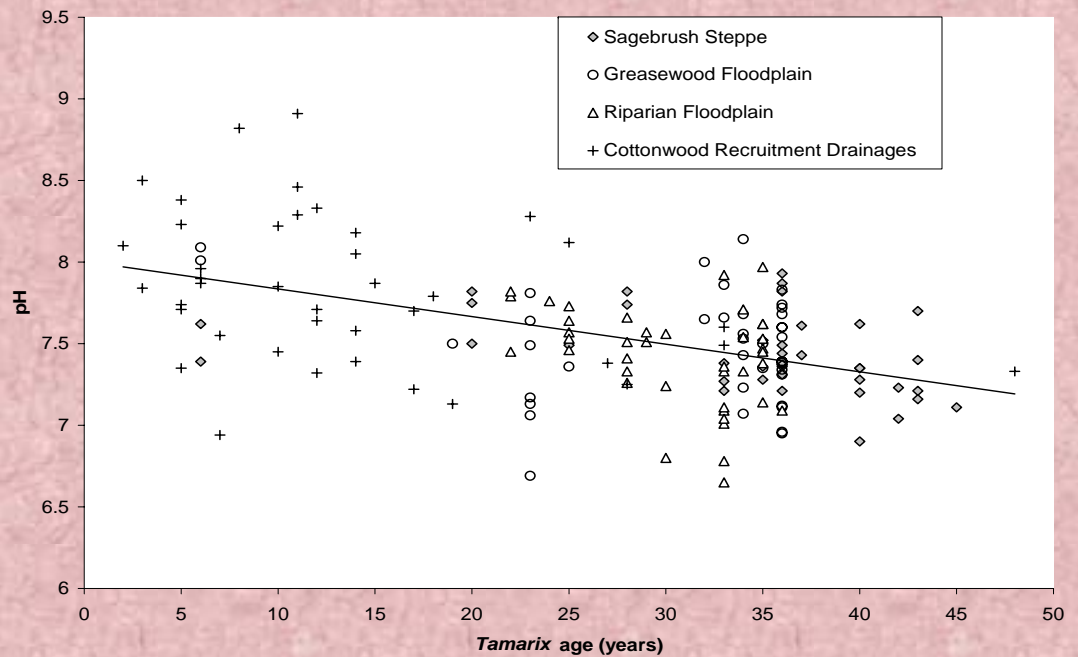
$$P < 0.0001$$

pH

$$y = -0.0169x + 8.0041$$

$$R^2 = 0.2516$$

$$P < 0.0001$$



Soil NO₃ and PO₄ (0-5 cm) and *Tamarix* age



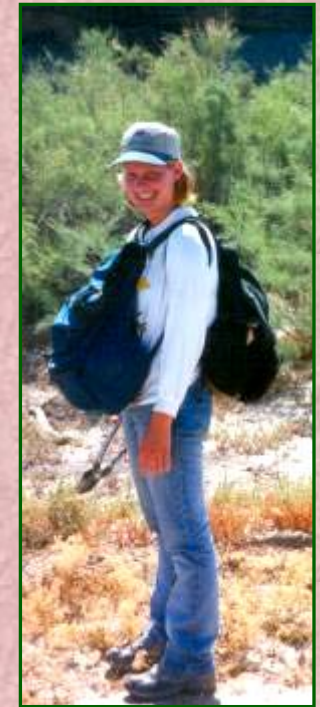
Conclusions

- * Saltcedar's success
- * Salinity, pH, Nutrients
- * Flooding
- * Revegetation implications
 - Stand structure
 - Natives present
 - Natural flooding disturbance



Acknowledgements

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