

Wamsutter Reclamation – Field Trip Preview

KC HARVEY
ENVIRONMENTAL, LLC



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Today's Discussion

Background on the Wamsutter Field

Reclamation Challenges

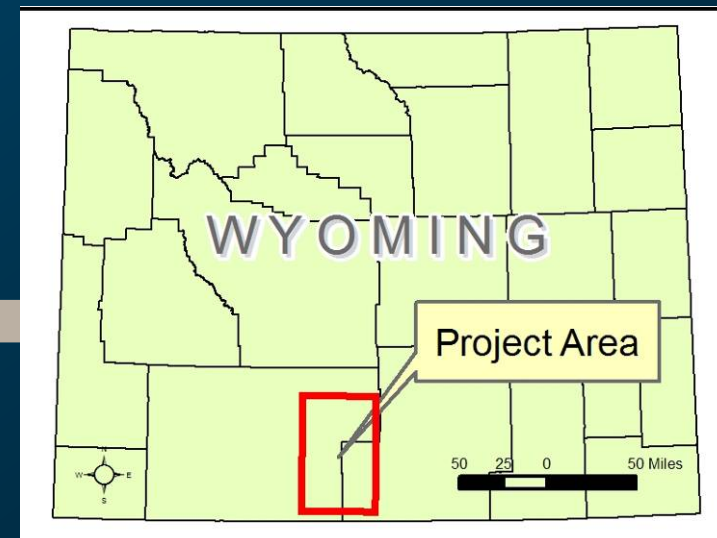
Ecology

- ✓ Soils – The Foundation for Reclamation
- ✓ Plant Communities
- ✓ Land Use

Conference Field Trip

Wamsutter Field

- ✓ 1700 Square Miles (1,100,000)
- ✓ 5000+ Natural Gas Wells
- ✓ Tight Gas
- ✓ Discovered in 1950s
- ✓ Estimated 50 TCF of Natural Gas
- ✓ BP, Devon, Anadarko, 50 more



KC Harvey Wamsutter Reclamation Program (Began 2007)

Reclamation Science and Monitoring

- ✓ Soils, Plants, Weeds, Water, Range



Implementation

- ✓ Seeding
- ✓ Amendments
- ✓ Weed Control
- ✓ Fencing
- ✓ Stormwater BMPs



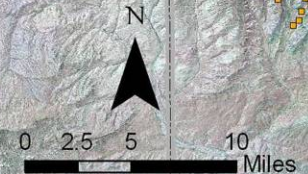
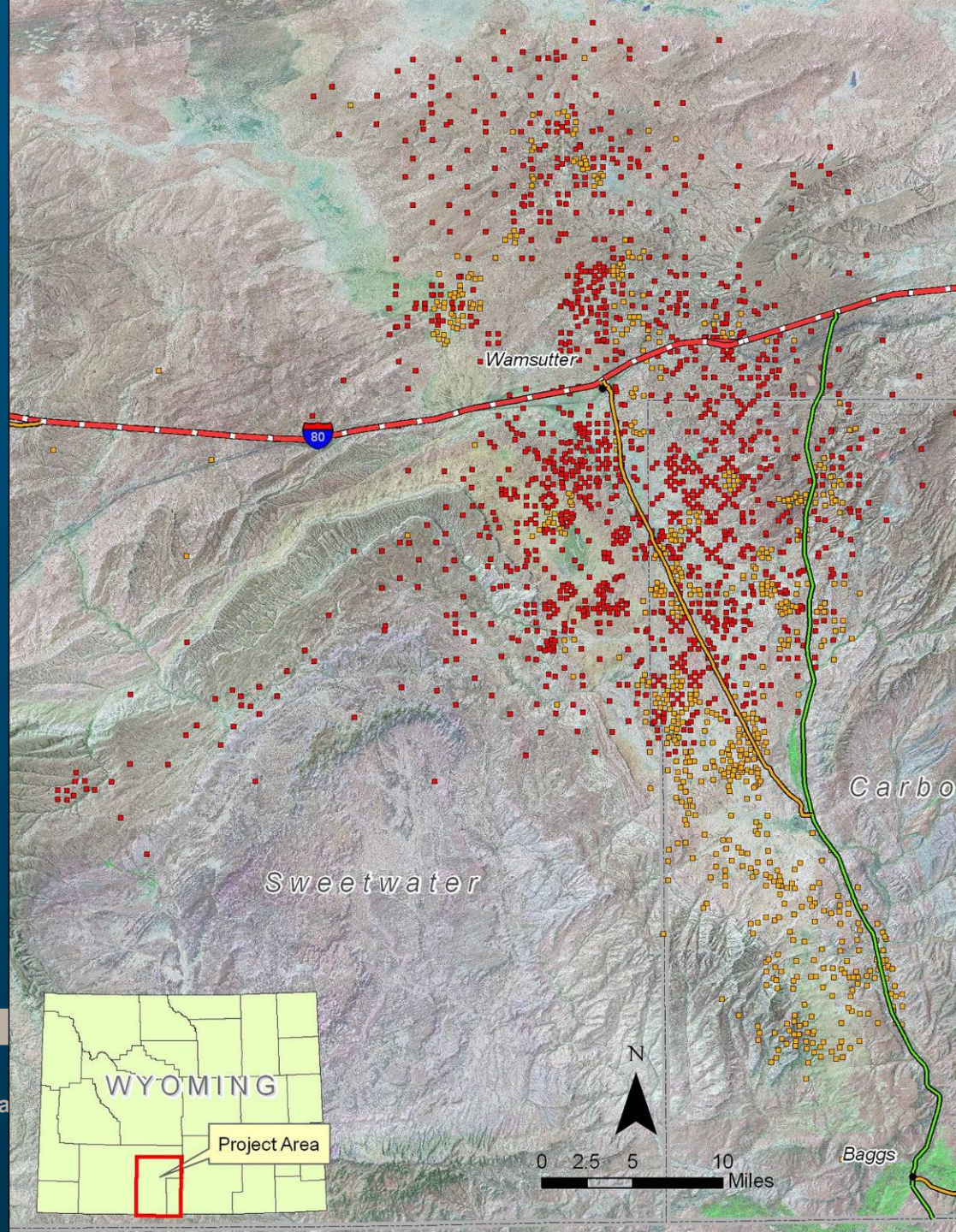
Wamsutter Area

2000 Well pads
Pipelines
Other Facilities



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Wamsutter Reclama



Regulatory Requirements

Rawlins Field Office RMP (2008)

Wyoming BLM Reclamation Policy (2009)

Rawlins BLM Field Office Reclamation Guidance (2011)

- ✓ Pre-construction soil salvage
- ✓ Construction
- ✓ Monitoring
- ✓ Reclamation Success Criteria

Wamsutter Area Reclamation Challenges

Limited Precipitation

- ✓ 7-9 inches/year

Limited Soils

- ✓ Thin, rocky, sandy, calcareous
- ✓ Saline or Sodic soil chemistry

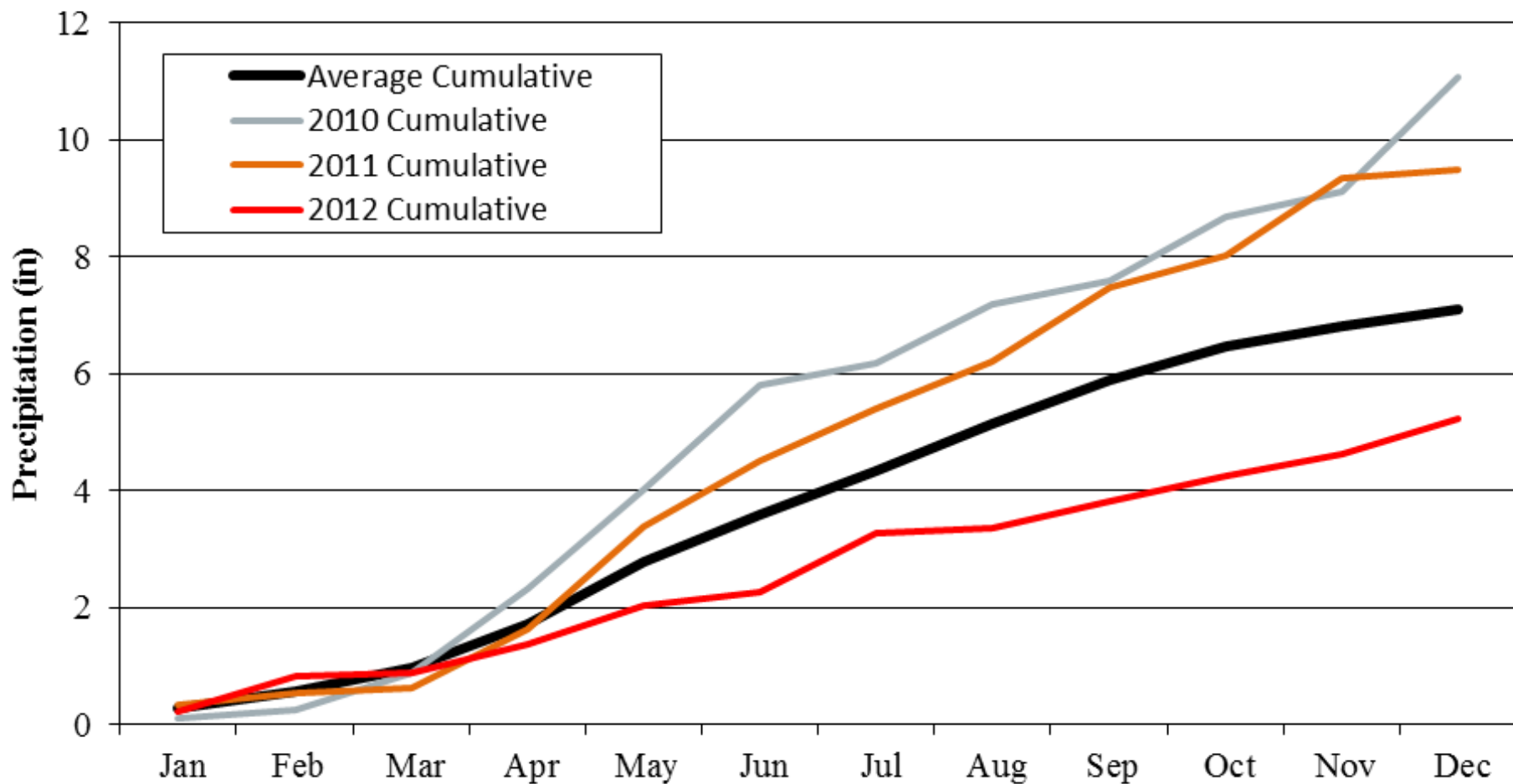
Invasive Weeds

- ✓ Halogeton, Russian Thistle, others

Grazing

Climate

Cumulative Precipitation for Wamsutter, WY



Soils – Foundation for Reclamation

Limited Soil Resources

Soil Chemistry Degrades with Depth

Without Good Soil Management, Reclamation will not be Successful



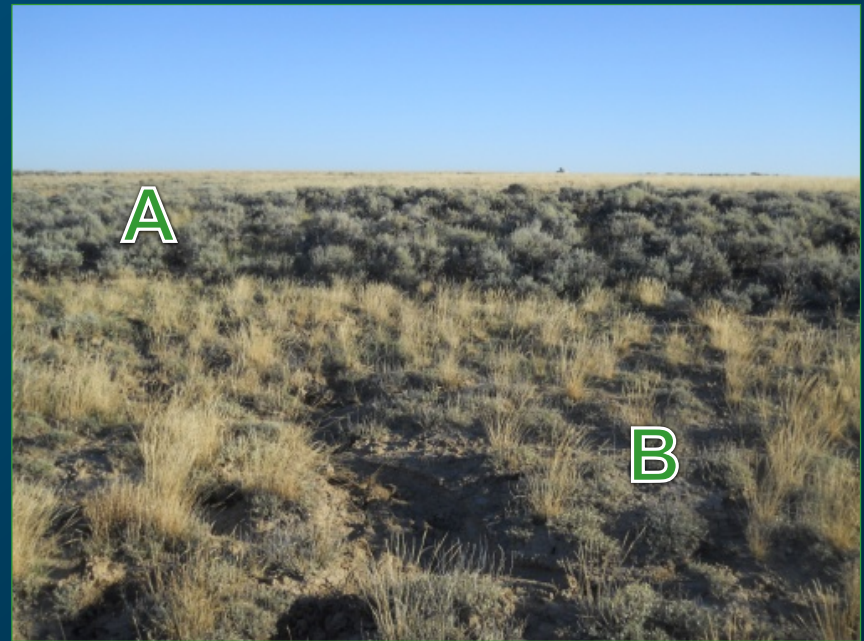
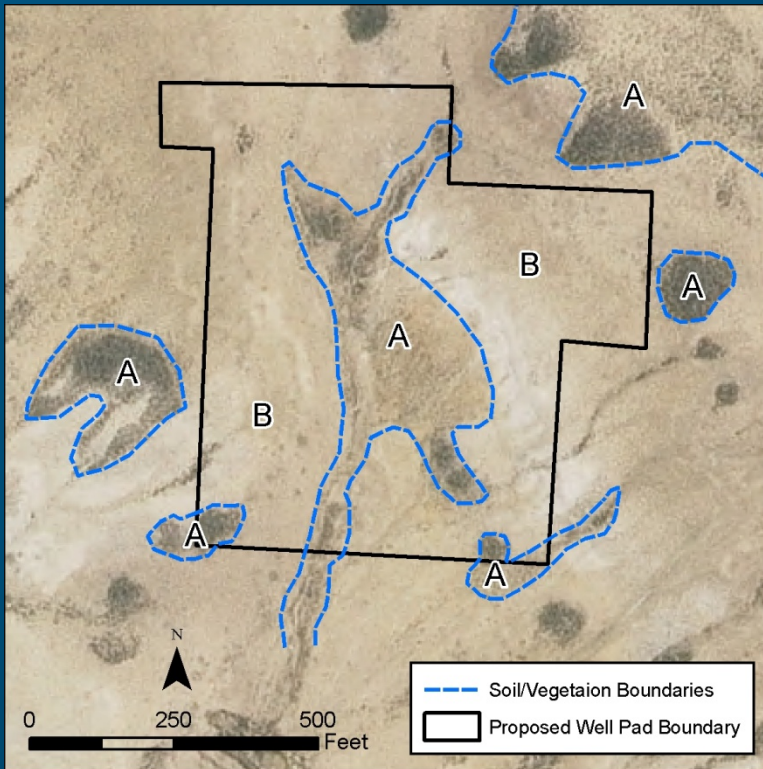
Soils – Wamsutter Field

Limited Soil Resources

- ✓ Thin, rocky, sandy, calcareous
- ✓ Saline or Sodic soil chemistry
 - 50% suitable soils
 - 30% saline soils (High total Salts Ca, Mg, Na)
 - 20% sodic soils (High Na)

Pre-Construction Assessment

Sagebrush and saltbush communities



Case Study 2

	Division	Depth (inches)	Parameter					
			pH	EC (dS/m)	SAR	% Saturation	% Lime	Texture
Pre-Construction	A	0-6	7.9	1.00	8.6	48.0	5.0	Clay Loam
		6-12	8.0	4.13	6.6	51.1	5.0	Clay Loam
	B	0-6	7.1	5.06	8.5	50.4	3.0	Clay Loam
		6-12	7.4	10.40	22.0	64.3	3.0	Clay
Post-Construction	All	0-6	7.8	1.7	11.1	49.1	9.4	Clay

Invasive Plants

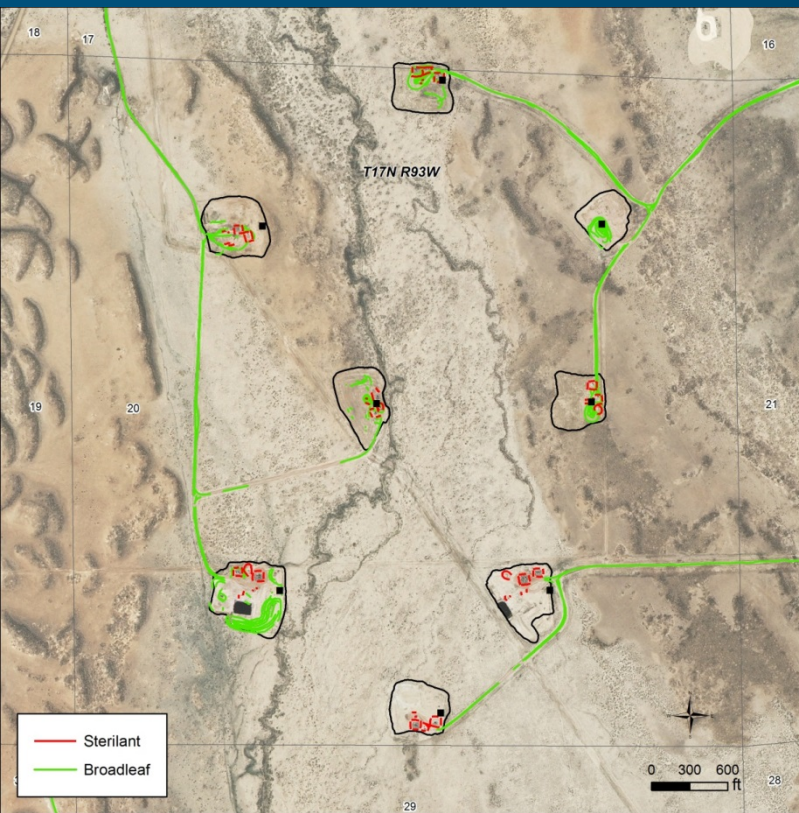
Monitoring

Seeding

Herbicide

Mechanical control

Data management and reporting

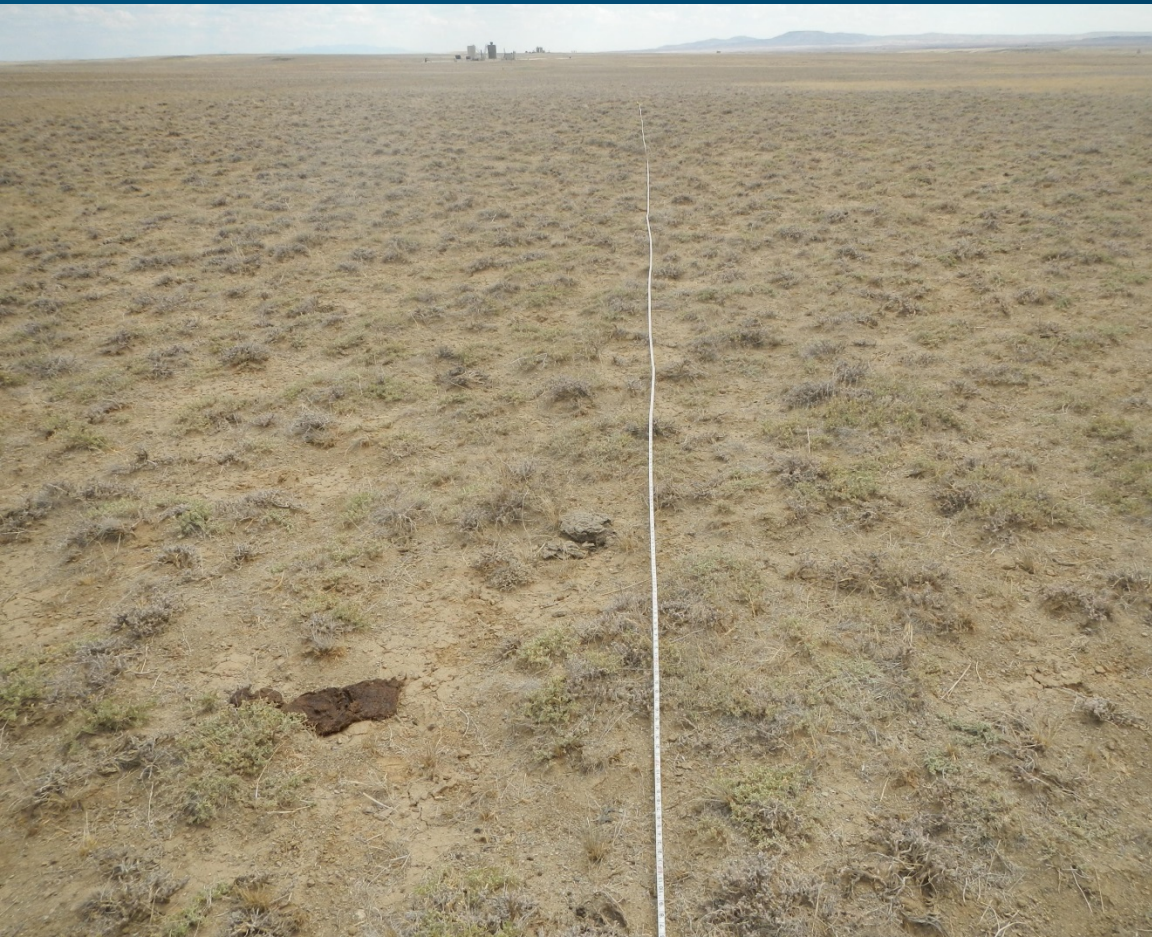


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Grazing

Wildlife and Livestock

✓ Larger Impact During Drought



Correlation of Soil Chemistry and Plant Community



Sagebrush, grass

✓ Suitable soils



Grass, saltbush, sagebrush

✓ Slightly-Moderately Saline soils



Saltbush, Grass

✓ Saline (or sodic) soils

Greasewood

✓ Sodic, (or saline/sodic)



**Suitability for
Plant Growth**

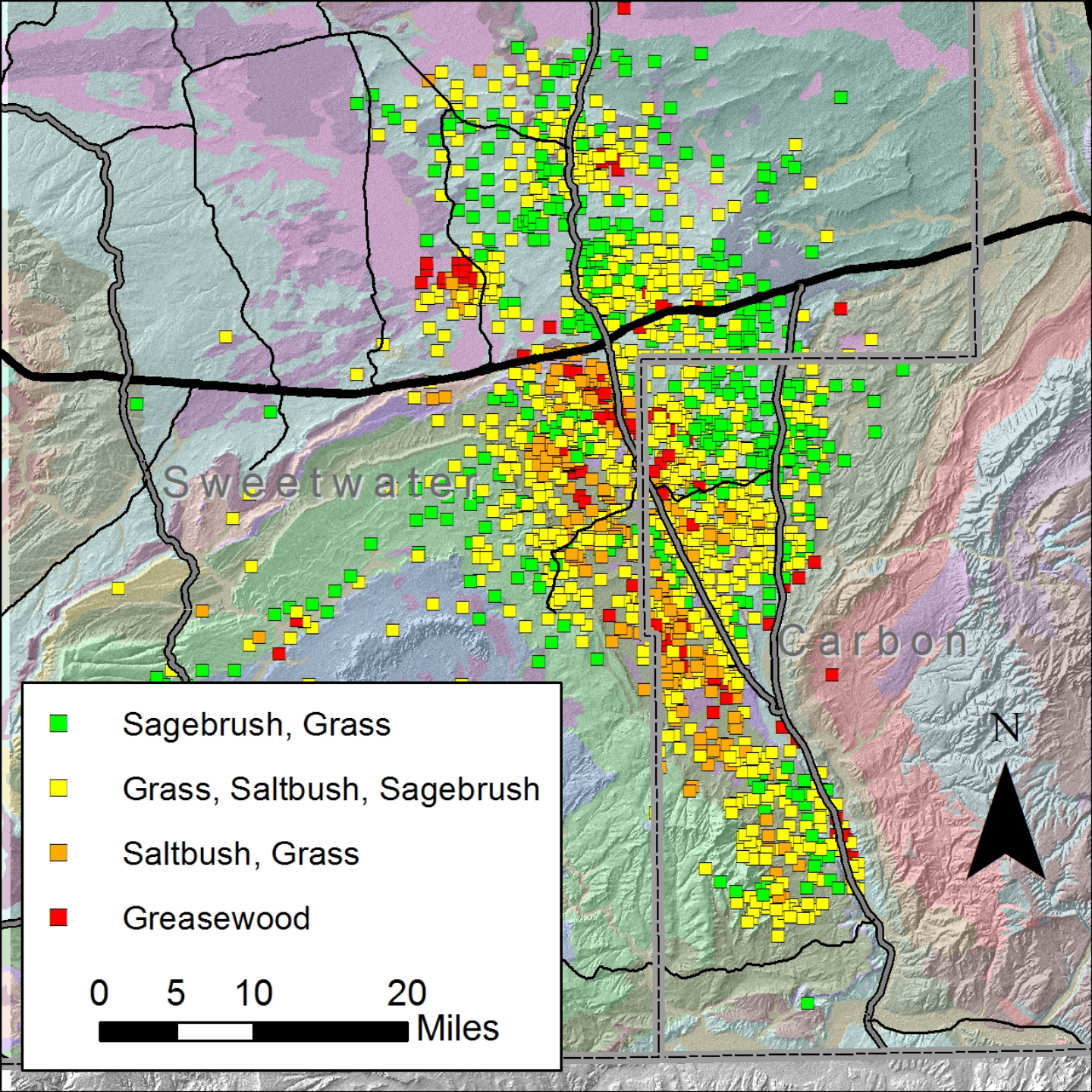
Correlation of Surface Soil Chemistry and Plant Community

Plant Community	pH	EC	SAR	% Sat	% Clay	% Lime
Sagebrush, grass	7.4	0.8	1.4	37.0	24.1	3.6
Grass, saltbush, sagebrush	7.7	1.1	3.6	39.3	30.1	6.4
Saltbush, grass	7.9	1.7	7.0	45.2	35.7	6.6
Greasewood	8.0	2.4	11.2	54.6	48.3	7.9

Correlation of Surface Soil Chemistry and ESD

ESD	Count	pH	EC	SAR	% Sat	% Clay	% Lime
Sandy (Sy) 7-9 GR	9	7.5	0.6	0.9	30.2	16.3	1.9
Loamy (Ly) 7-9 GR	146	7.5	0.8	1.8	36.1	24.2	4.7
Shallow Loamy (SwLy) 7-9 GR	15	7.6	1.2	2.1	36.9	26.1	6.1
Clayey (Cy) 7-9 GR	39	7.8	0.9	2.5	46.0	40.2	7.9
Dense Clay (DC) 7-9 GR	3	7.8	2.2	2.6	56.6	49.3	6.6
Shallow Clayey (SwCy) 7-9 GR	2	7.0	4.7	4.1	49.4	44.0	3.3
Impervious Clay (IC) 7-9 GR	24	7.8	1.1	4.4	45.7	38.4	6.2
Saline Upland (SU) 7-9 GR	54	7.8	2.3	9.0	43.9	33.4	6.4
Saline Lowland, drained (SLdr) 7-9 GR	14	8.1	1.6	12.6	58.5	50.0	9.4
Saline Lowland (SL) 7-9 GR	11	8.1	2.8	15.9	51.7	46.7	7.0

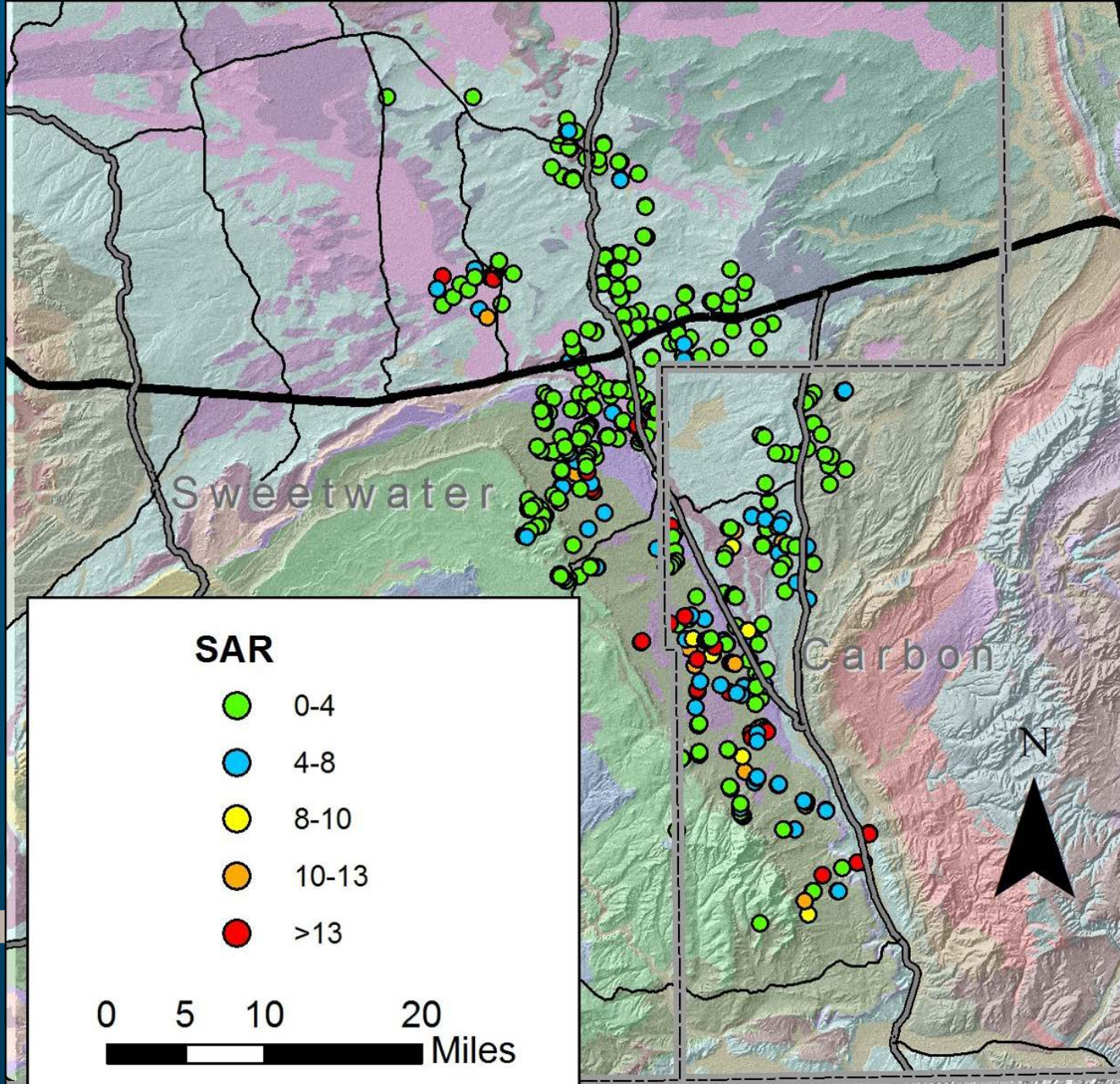
Vegetation



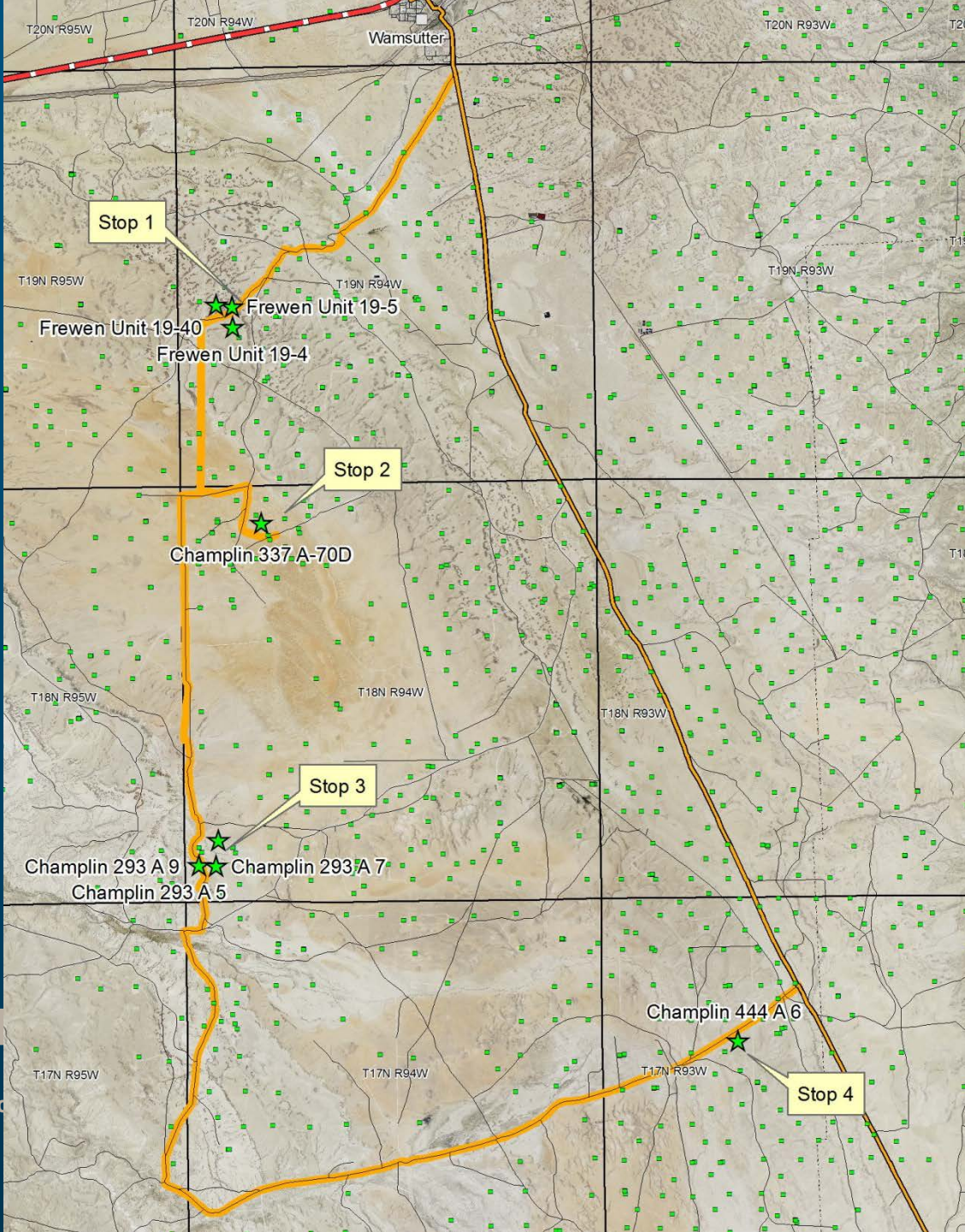
- Sagebrush, Grass
- Grass, Saltbush, Sagebrush
- Saltbush, Grass
- Greasewood

0 5 10 20 Miles

Soil SAR



Field Trip Route



Field Wide Reclamation Approach

