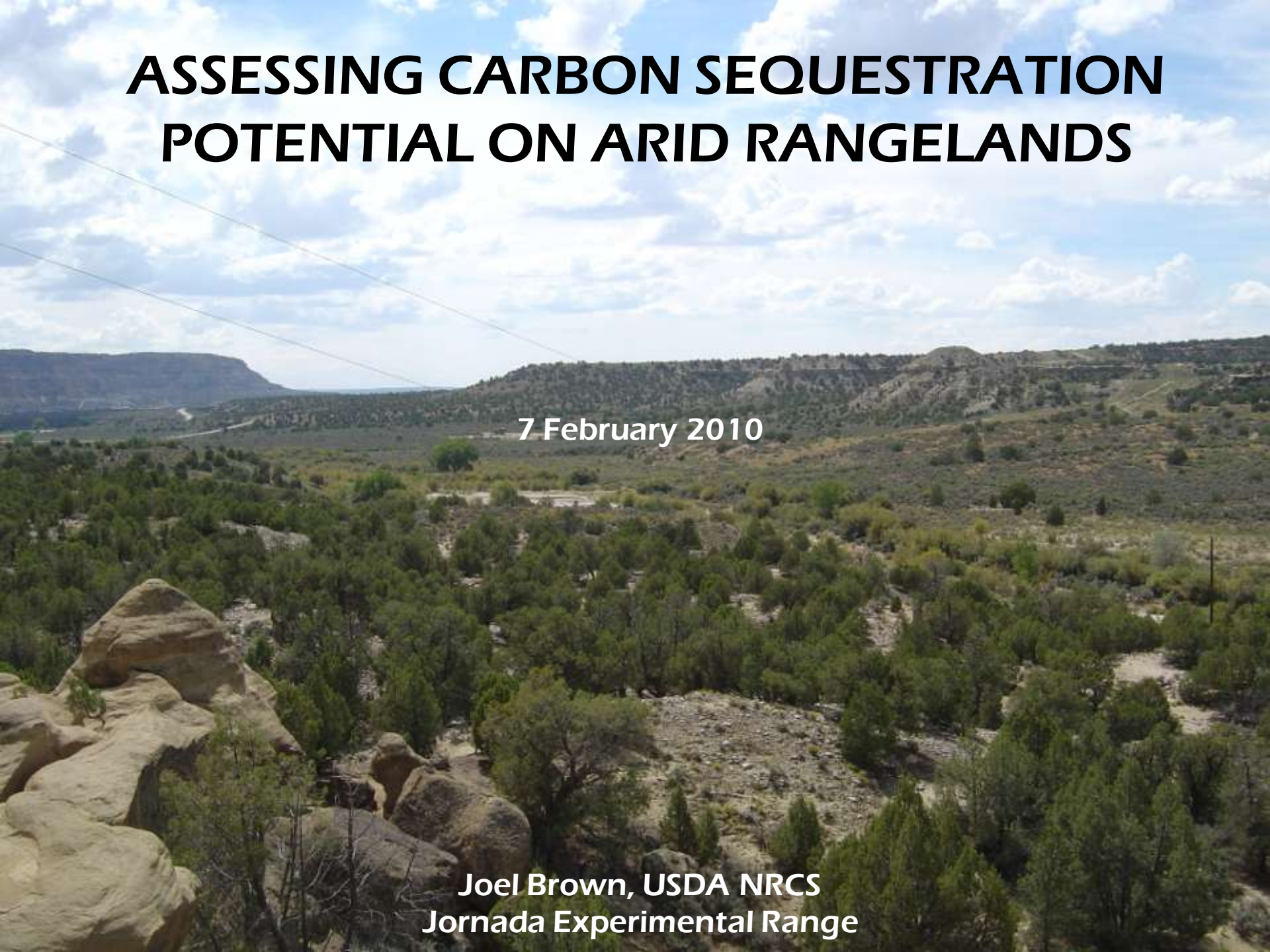
ASSESSING CARBON SEQUESTRATION POTENTIAL ON ARID RANGELANDS

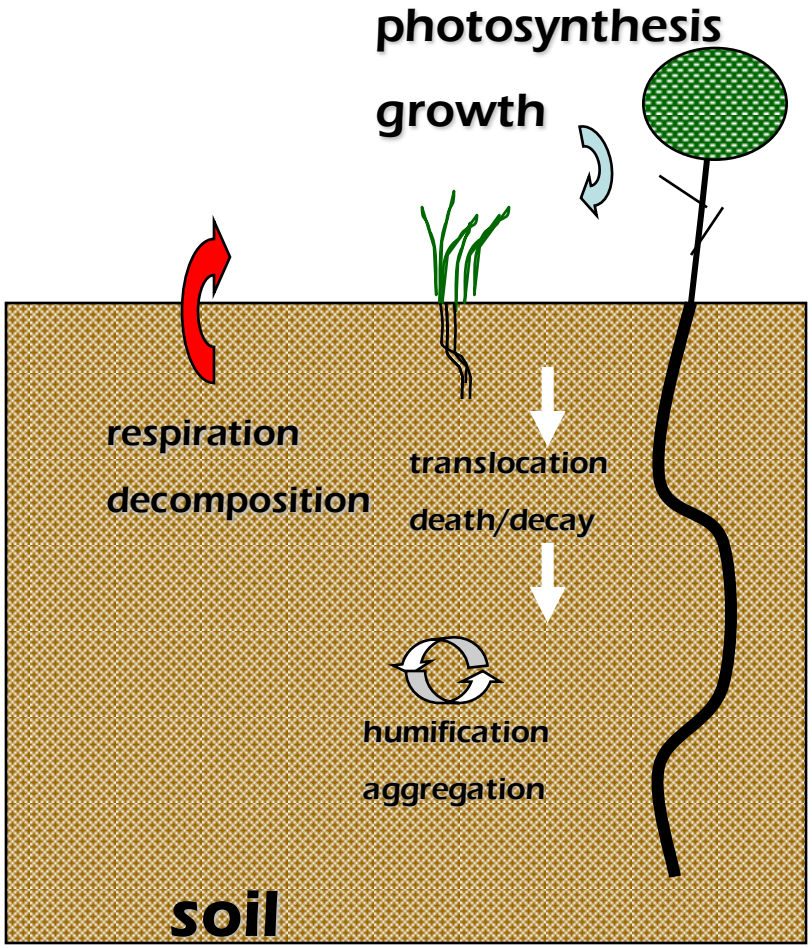


7 February 2010

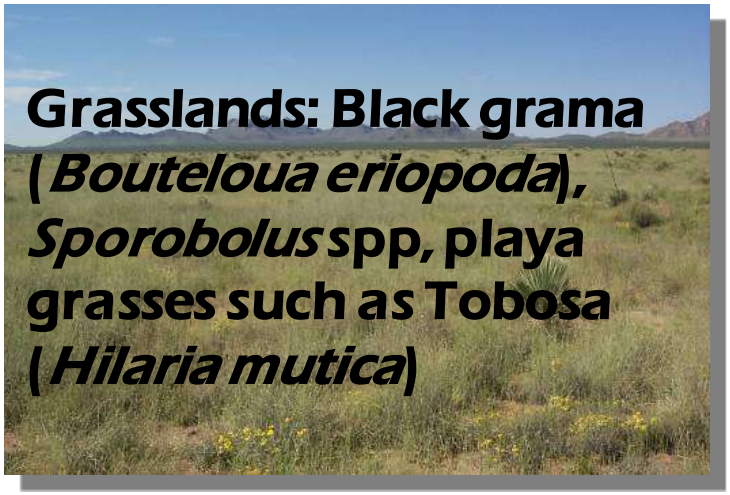
Joel Brown, USDA NRCS
Jornada Experimental Range

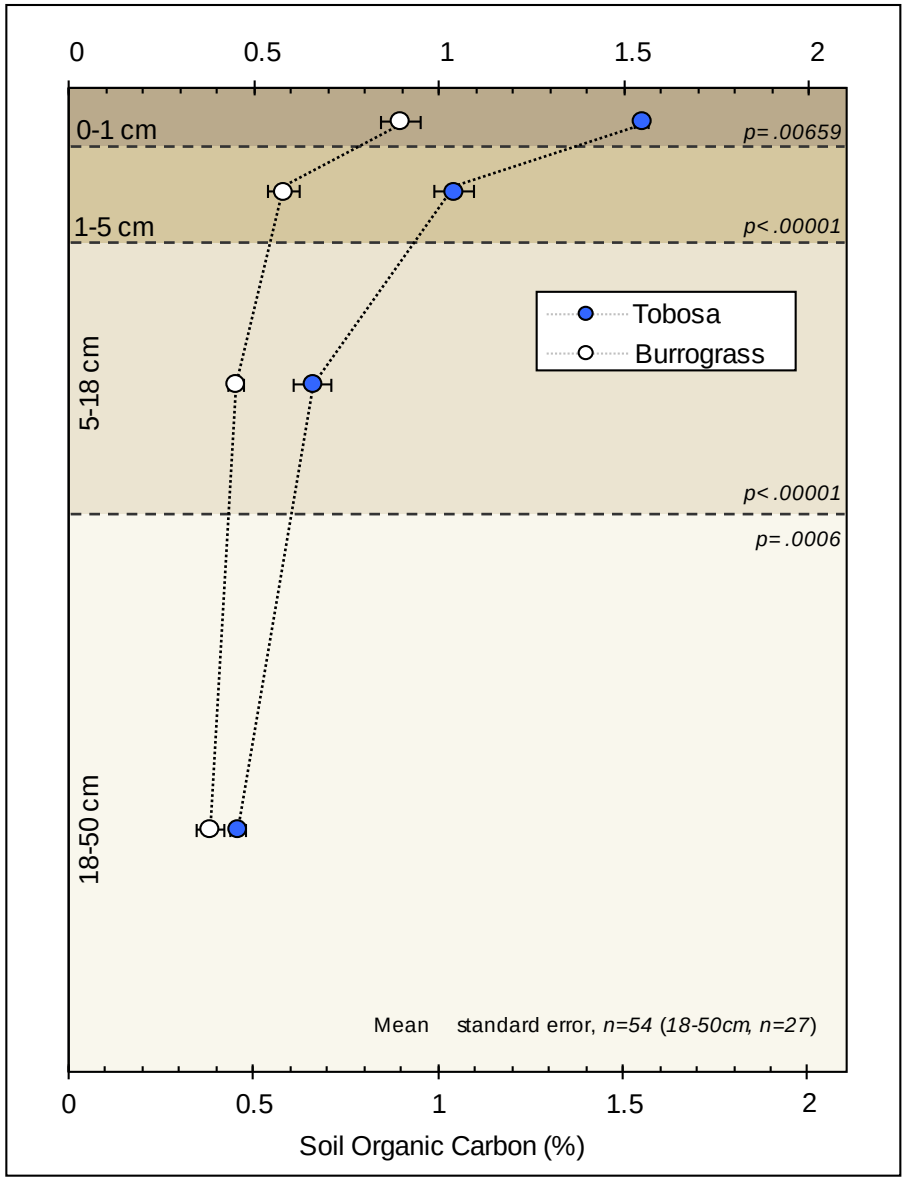
WHAT IS SOIL CARBON SEQUESTRATION?

- THE LONG-TERM STORAGE OF CARBON IN THE SOIL VIA THE PROCESSES OF PHOTOSYNTHESIS, HUMIFICATION AND AGGREGATION
- EXPOSING CARBON COMPOUNDS TO THE ATMOSPHERE RELEASES CO_2
- THREE FORMS-SHORT (ANNUAL), MEDIUM (DECADES), LONG (CENTURIES TO MILLENIA) TERM



Loss of soil carbon via degradation





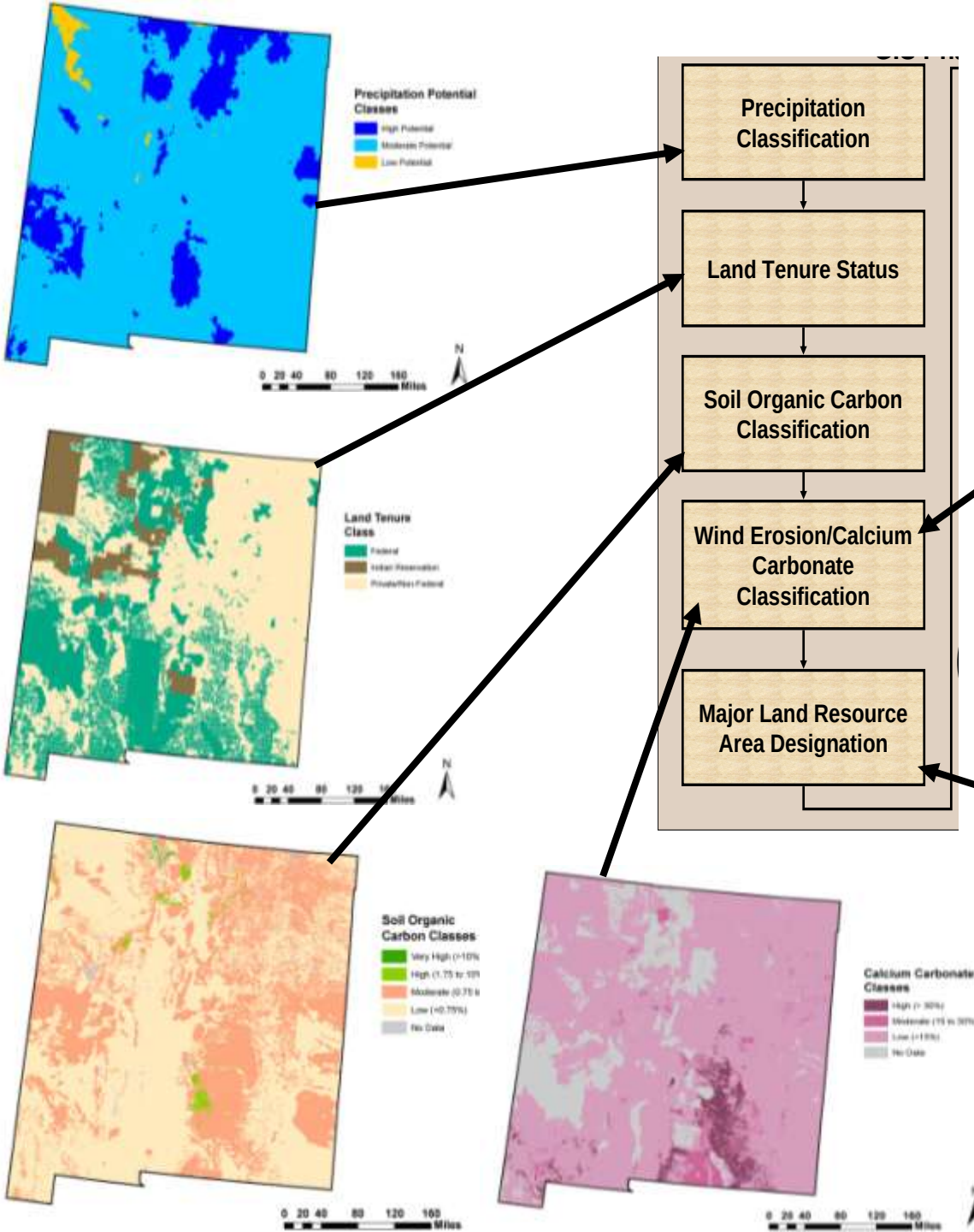
Estimating carbon sequestration potential

Land inventory

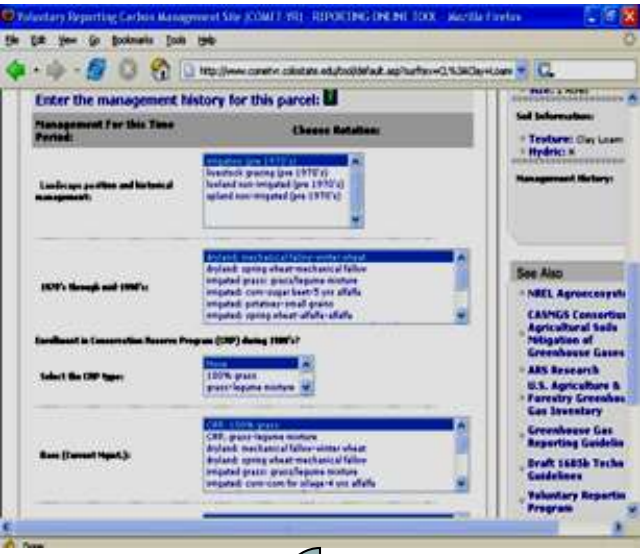
- soils (potential)
- vegetation (current state)

Management options

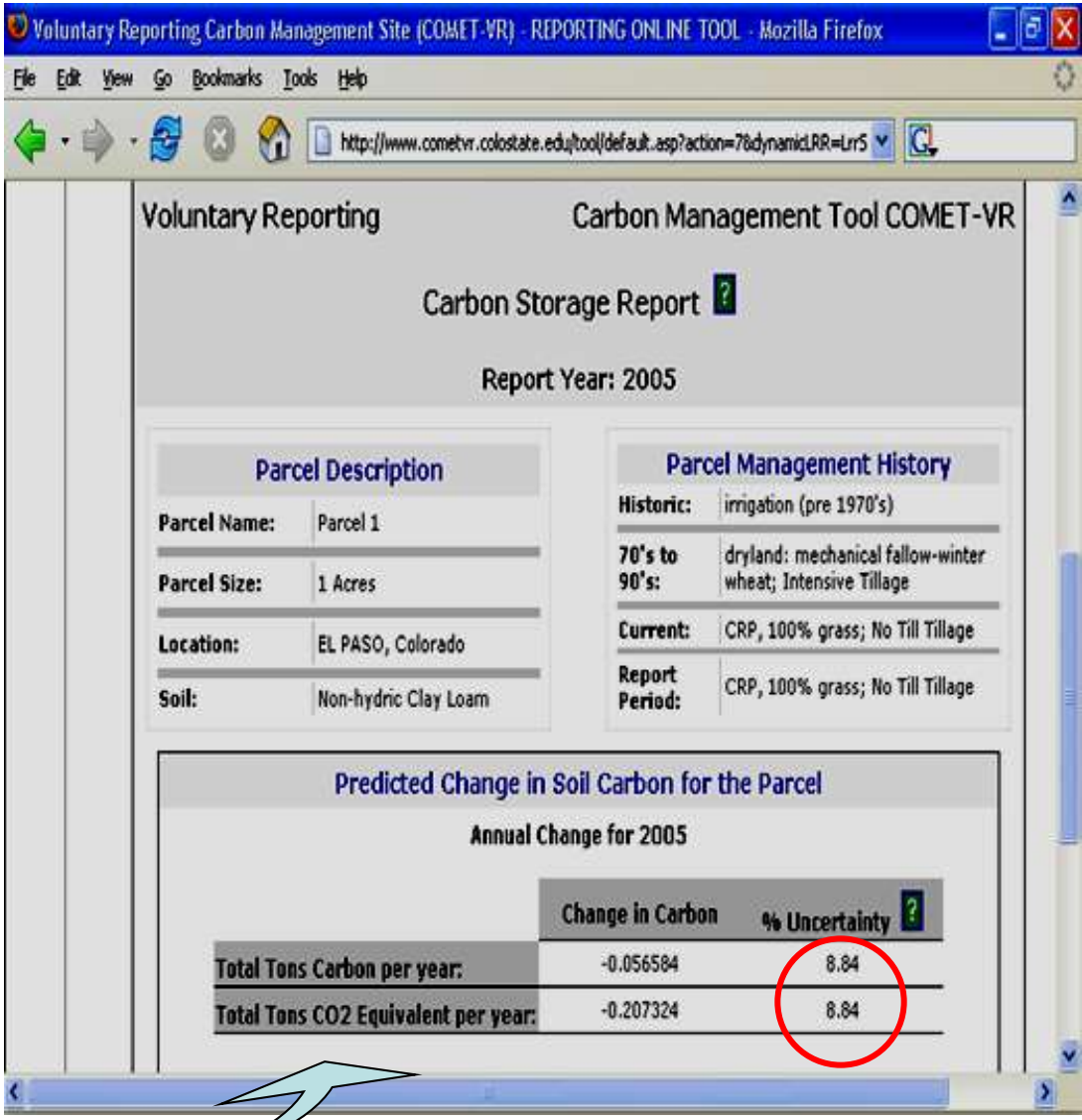
- probability of success

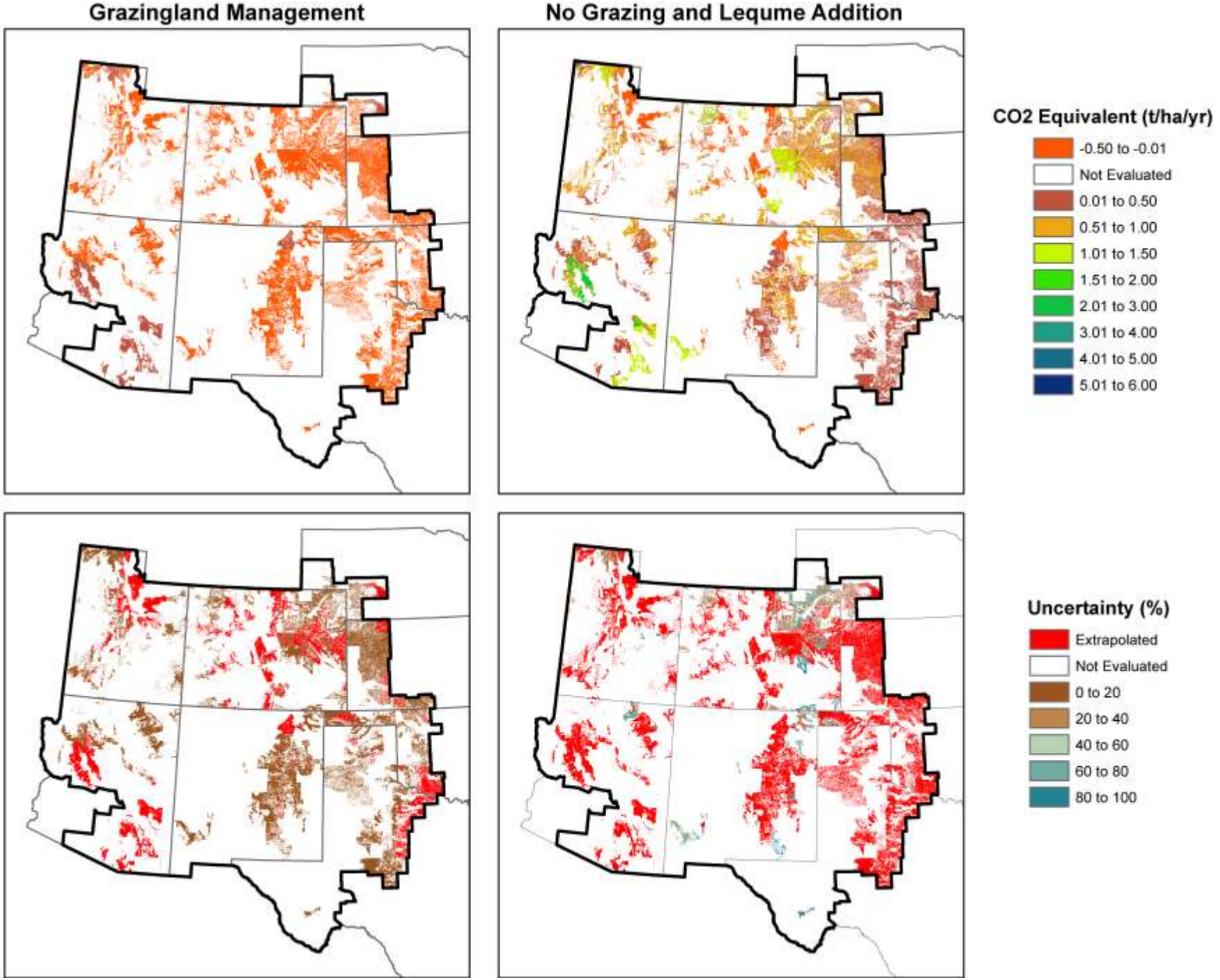

Precipitation Potential Classes
High Potential
Moderate Potential
Low Potential
0 20 40 80 120 160 Miles
N
Land Tenure Class
Federal
Indian Reservation
Private/Non-Federal
Soil Organic Carbon Classes
Very High (>10%)
Moderate (0.75 to
Low (<0.75%)
No Data
Calcium Carbonate Classes
Moderate (15 to 30%)
Low (<15%)
No Data
Precipitation Classification
Land Tenure Status
Soil Organic Carbon Classification
Wind Erosion/Calcium Carbonate Classification
Major Land Resource Area Designation
Wind Erodibility Index Classes
High (>200 t/ha)
Moderate (100 to 200 t/ha)
Low (<100 t/ha)
No Data
Major Land Resource Areas

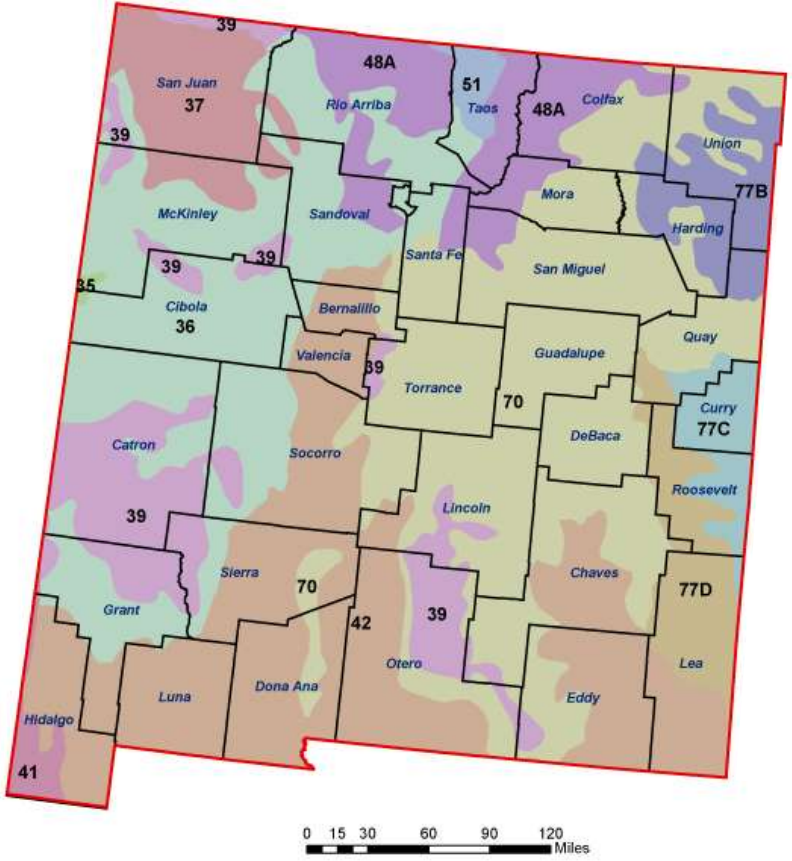
COMET VR


Enter the management history for this parcel:
Management For this Time Period:
Choose Rotation:
See Also


Voluntary Reporting Carbon Management Tool COMET-VR (Beta)
Step 6. Enter the land management information: Choose a tillage for the three time periods.
Enter the management history for this parcel:
Tillage For this Time Period:
Choose Tillage:
1970's through mid-1990's:
Base (Current Mgmt.):
2005 Report Period:
Back
Reset
Next
Selection


Voluntary Reporting Carbon Management Site (COMET-VR) - REPORTING ONLINE TOOL - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://www.cometvr.colostate.edu/tool/default.asp?action=78dynamicLRR=Lrr5
Voluntary Reporting
Carbon Management Tool COMET-VR
Carbon Storage Report
Report Year: 2005
Parcel Description
Parcel Name: Parcel 1
Parcel Size: 1 Acres
Location: EL PASO, Colorado
Soil: Non-hydric Clay Loam
Parcel Management History
Historic: irrigation (pre 1970's)
70's to 90's: dryland: mechanical fallow-winter wheat; Intensive Tillage
Current: CRP, 100% grass; No Till Tillage
Report Period: CRP, 100% grass; No Till Tillage
Predicted Change in Soil Carbon for the Parcel
Annual Change for 2005
Change in Carbon
% Uncertainty
Total Tons Carbon per year: -0.056584 8.84
Total Tons CO2 Equivalent per year: -0.207324 8.84


Grazingland Management
No Grazing and Lequme Addition
CO2 Equivalent (t/ha/yr)
-0.50 to -0.01
Not Evaluated
0.01 to 0.50
0.51 to 1.00
1.01 to 1.50
1.51 to 2.00
2.01 to 3.00
3.01 to 4.00
4.01 to 5.00
5.01 to 6.00
Uncertainty (%)
Extrapolated
Not Evaluated
0 to 20
20 to 40
40 to 60
60 to 80
80 to 100



MLRA 70
Pecos Canadian Plains and Valleys

- 2, 250, 308 ha

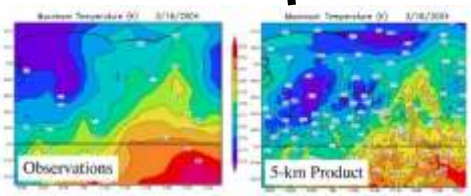
- Cropland-irr. corn to perennial grass
  8677 ha (0.6 T C/ha/y)
- Cropland-small grain to perennial grass
  3474 ha (1.1 T C/ha/y)

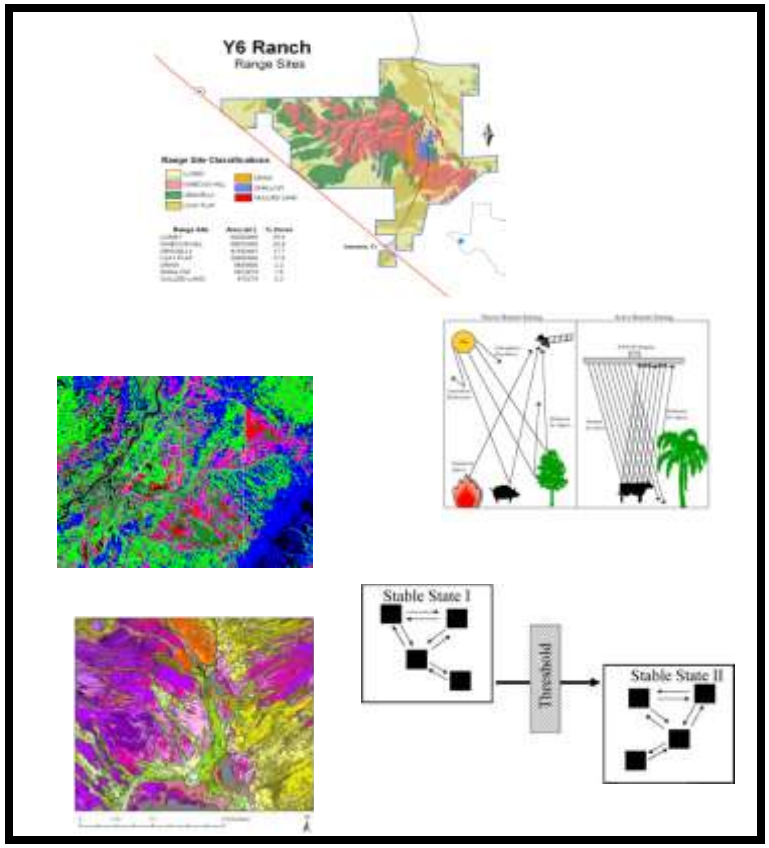
- No till gains little carbon

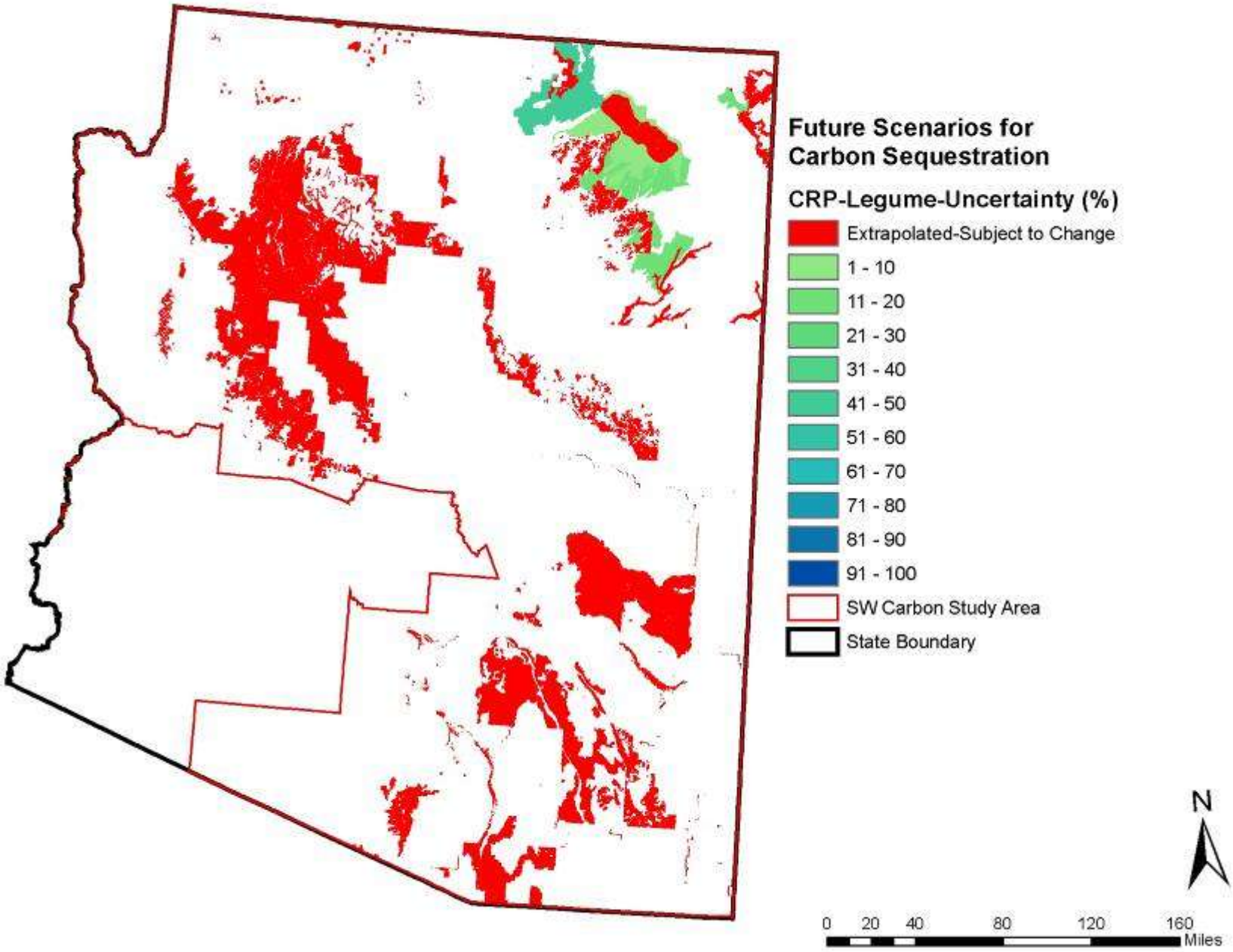
AN SYSTEMATIC APPROACH TO ESTIMATING C

- INTEGRATED SYSTEM OF FIELD PLOTS, STATISTICAL SAMPLING, REMOTE SENSING, FIELD VERIFICATION, WEATHER MONITORING, RECORD KEEPING AND COMPUTER MODELS
- BASED ON SIMILAR SOILS, VEGETATION, CLIMATE, MANAGEMENT SYSTEMS
- CENTERED AROUND 'CORE SITES' WHERE DATA IS COLLECTED INTENSIVELY AND USED TO PARAMETERIZE MODELS

C change

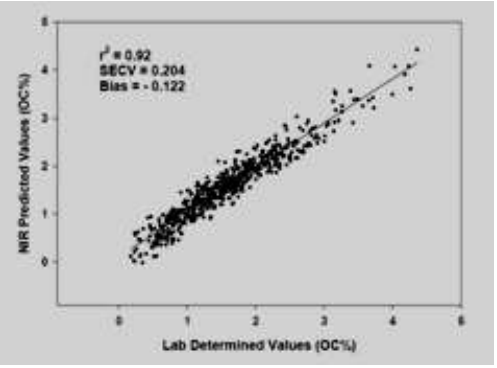


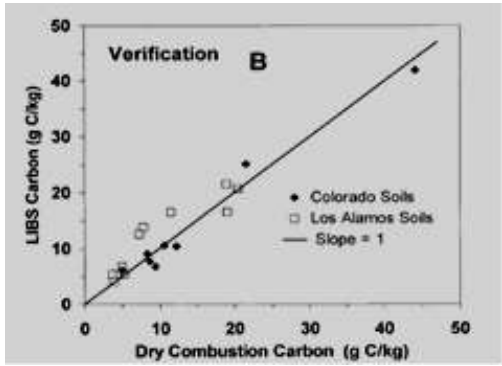



Future Scenarios for
Carbon Sequestration
CRP-Legume-Uncertainty (%)
Extrapolated-Subject to Change
1 - 10
11 - 20
21 - 30
31 - 40
41 - 50
51 - 60
61 - 70
71 - 80
81 - 90
91 - 100
SW Carbon Study Area
State Boundary
N
0 20 40 80 120 160
Miles

Direct Measurement

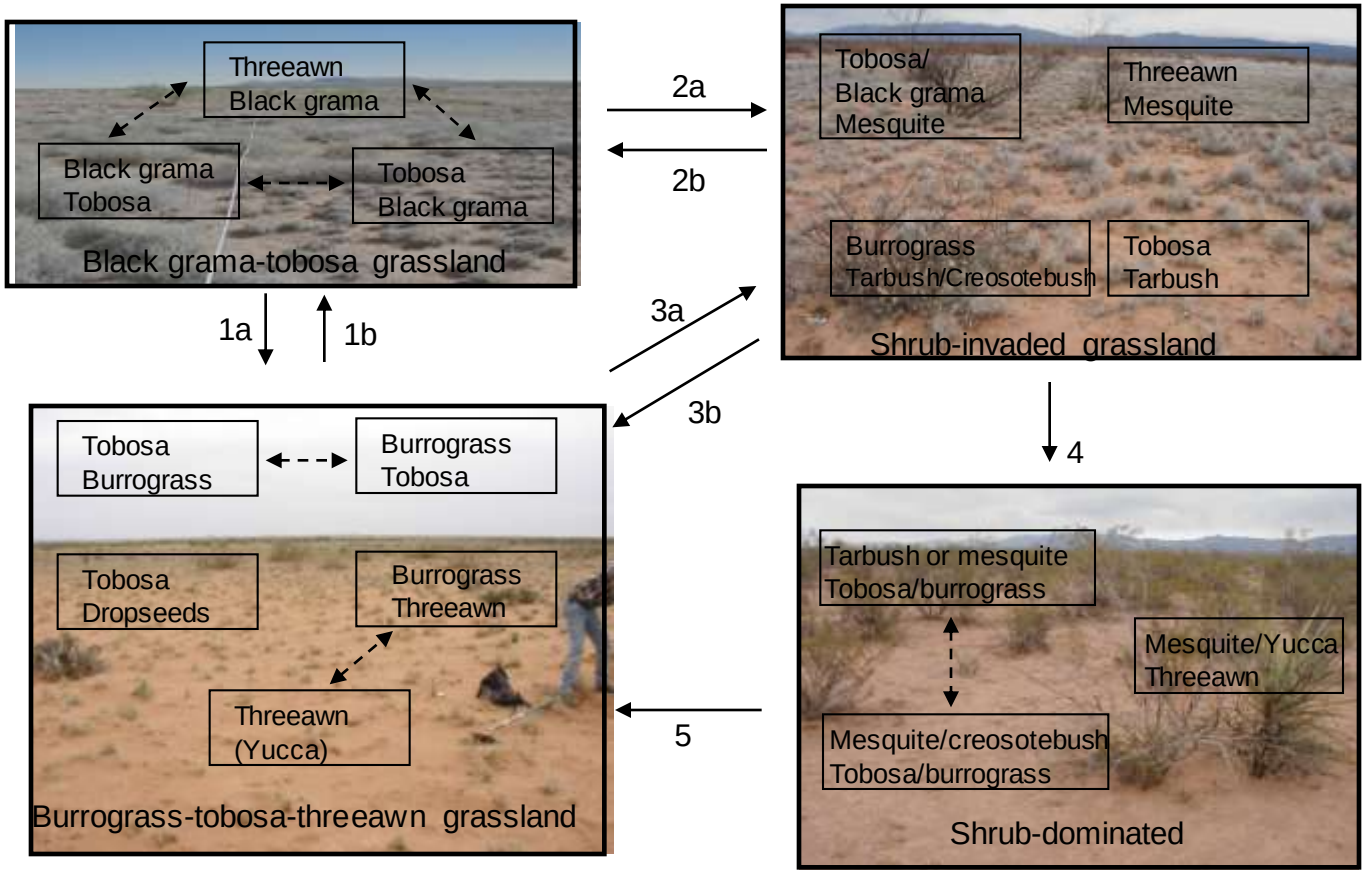
- Develop improved technologies and systems for direct measurements of soil and vegetation carbon at reference sites selected within the SW Region
  - LIBS and NIRS
  - Collect at existing long-term study sites
  - Correlation with other technologies
  - Principles for cost effective sampling





MANAGEMENT OPTIONS

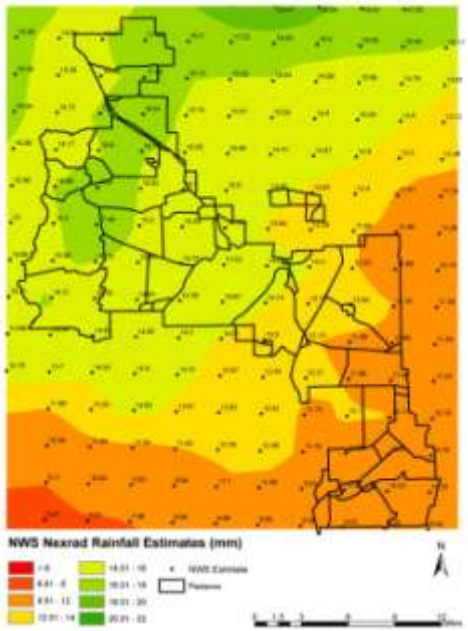
Loamy SD-2



1a-Overgrazing, soil fertility loss, erosion and sand loss; 1b-Soil stabilization or modification
2a-Shrub invasion due to overgrazing and/or lack of fire; 2b-Shrub removal, restore cover
3a-Shrub invasion; 3b-Shrub removal with grass recovery
4. Persistent reduction in grasses, competition by shrubs, erosion and soil truncation
5. Shrub removal with soil addition? (Bestelmeyer et al 2003)

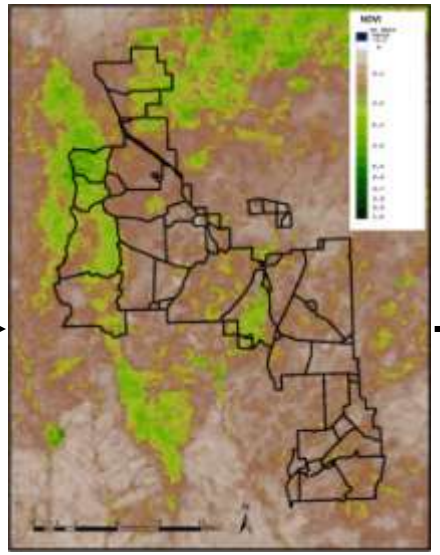
Early Warning Products

Near Real-Time Climate



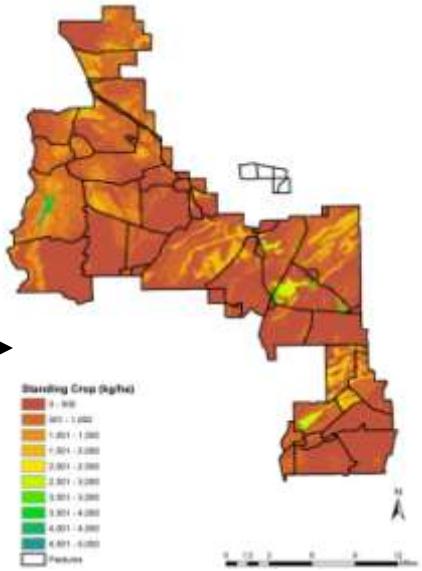
Plant Growth Models

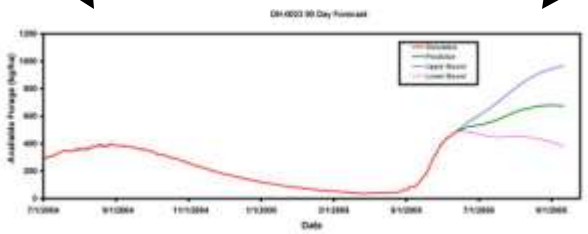
NDVI Imagery (Greenness)



Mapping and Forecasting

Standing Crop Mapping





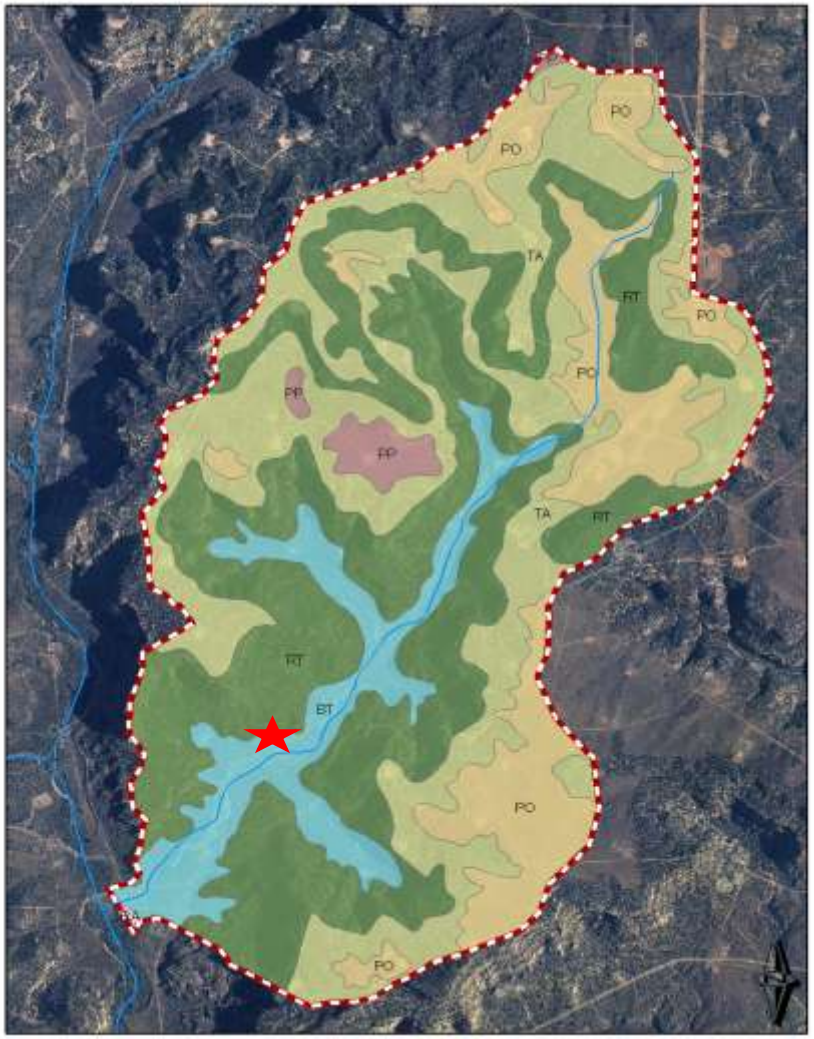
Site Analysis

Stabilizing and restoring damaged landscapes

- Energy exploration, along with historical grazing and recreation uses have degraded landscapes
- Limited resources for restoration
- Arid, highly variable landscapes
- Potential for substantial infrastructure damage and safety threats

ANALYSIS AND RESTORATION OF DEGRADED LANDSCAPES

LaManga Canyon



Symbol	Soil	Name	Percent of Area
	BT	Blancot-Notal association	10.2
	PO	Penistaja loam	17.0
	PP	Penistaja-Buckle association	1.8
	RA	River Wash	0.1
	RT	Rock-Travessilla-Weska cmplx	40.3
	TA	Travessilla-Weska-Rock cmplx	30.6

La Manga Canyon Watershed

- Soil carbon analysis of San Juan Basin landscapes affected by grazing and energy exploration
  - Increased pinon-juniper, decreased sagebrush, invasive cheatgrass, downcut drainages
- Landscape scale restoration

Southwest Regional Partnership for Carbon Sequestration