



United States Department of Agriculture



Ecological Sites and Conservation Decision Making

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Use of Ecological Sites and STMs

Nine Steps of Planning (three phases)

- Phase 1: Inventory; Phase 2: Alternative Systems/Practices;
Phase 3: Monitoring/Feedback

Suitability/Limitations for Land Uses and Practices

Response to Management and Disturbance

Resilience and Sustainability

Spatial Relevancy

State and Transition Models (STMs)

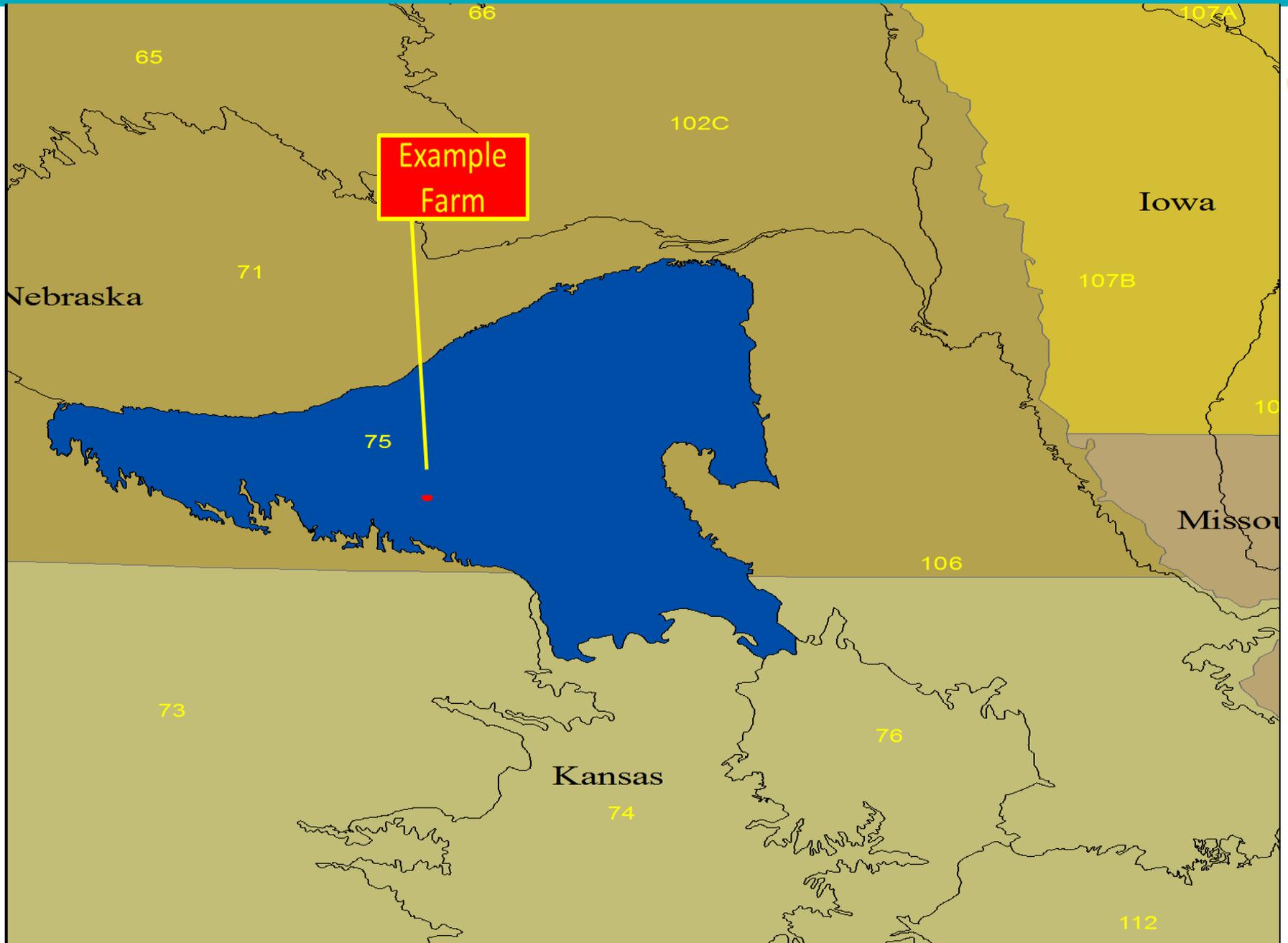
- Range of Conditions (soil health indicators)
- Transitions (Practices, Adaptive Management, Common Mistakes)
- Land use decision tree
- Nested STMs (i.e. orchards/vineyards vs. row crop)
- Decision-making
- FOTG Standards (i.e. seeding/planting practices)



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Major Land Resource Area (MLRA) 75

Ecological Site Description Selection

ESD Reports

Site Type Site Stage

* Click a column header to sort on the respective field

Report Link	Site Stage	Type	MLRA	Name	Bionic Name
R075XY050NE	Approved	Rangeland	075X	Loamy Lowland	/Andropogon gerardii-Schizachyrium scoparium
R075XY057NE	Provisional	Rangeland	075X	Clayey Upland	/Andropogon gerardii-Schizachyrium scoparium
R075XY058NE	Provisional	Rangeland	075X	Loamy Upland	/Andropogon gerardii-Schizachyrium scoparium
R075XY068NE	Provisional	Rangeland	075X	Loamy Overflow	/Andropogon gerardii-Sorghastrum nutans
R075XY077NE	Provisional	Rangeland	075X	Shallow Limy	/Andropogon gerardii-Schizachyrium scoparium

Site Concepts (aggregate for cropland or pastureland)

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Ecological Site Description

Section I: Ecological Site Characteristics

Ecological Site Identification and Concept

Site stage: Provisional

Provisional: an ESD at the provisional status represents the lowest tier of documentation that is releasable to the public. It contains a grouping of soil units that respond similarly to ecological processes. The ESD contains 1) enough information to distinguish it from similar and associated ecological sites and 2) a draft state and transition model capturing the ecological processes and vegetative states and community phases as they are currently conceptualized. The provisional ESD has undergone both quality control and quality assurance protocols. It is expected that the provisional ESD will continue refinement towards an approved status.

Site name: Loamy Upland

Andropogon gerardii - *Schizachyrium scoparium*
(/ big bluestem - little bluestem)

Site type: Rangeland

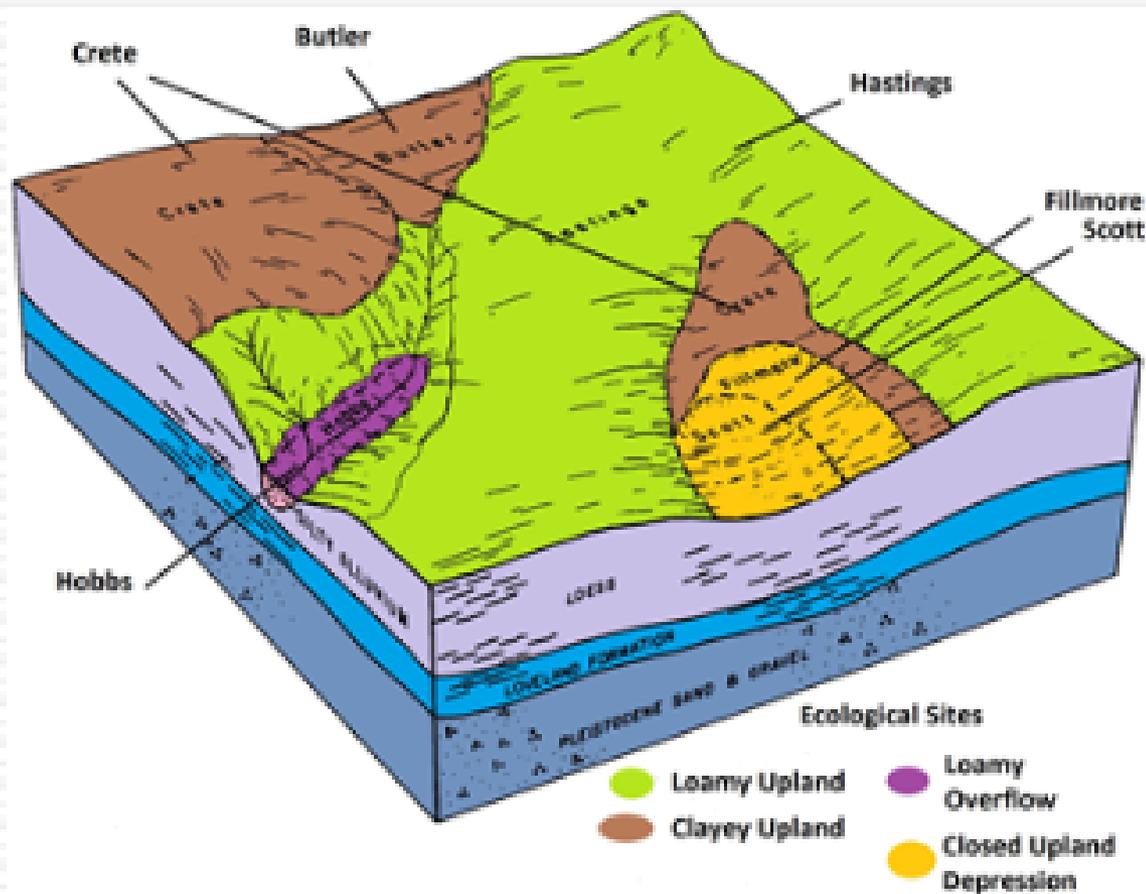
Site ID: R075XY058NE

Major land resource area (MLRA): 075-Central Loess Plains



Loamy Uplands Distribution Map





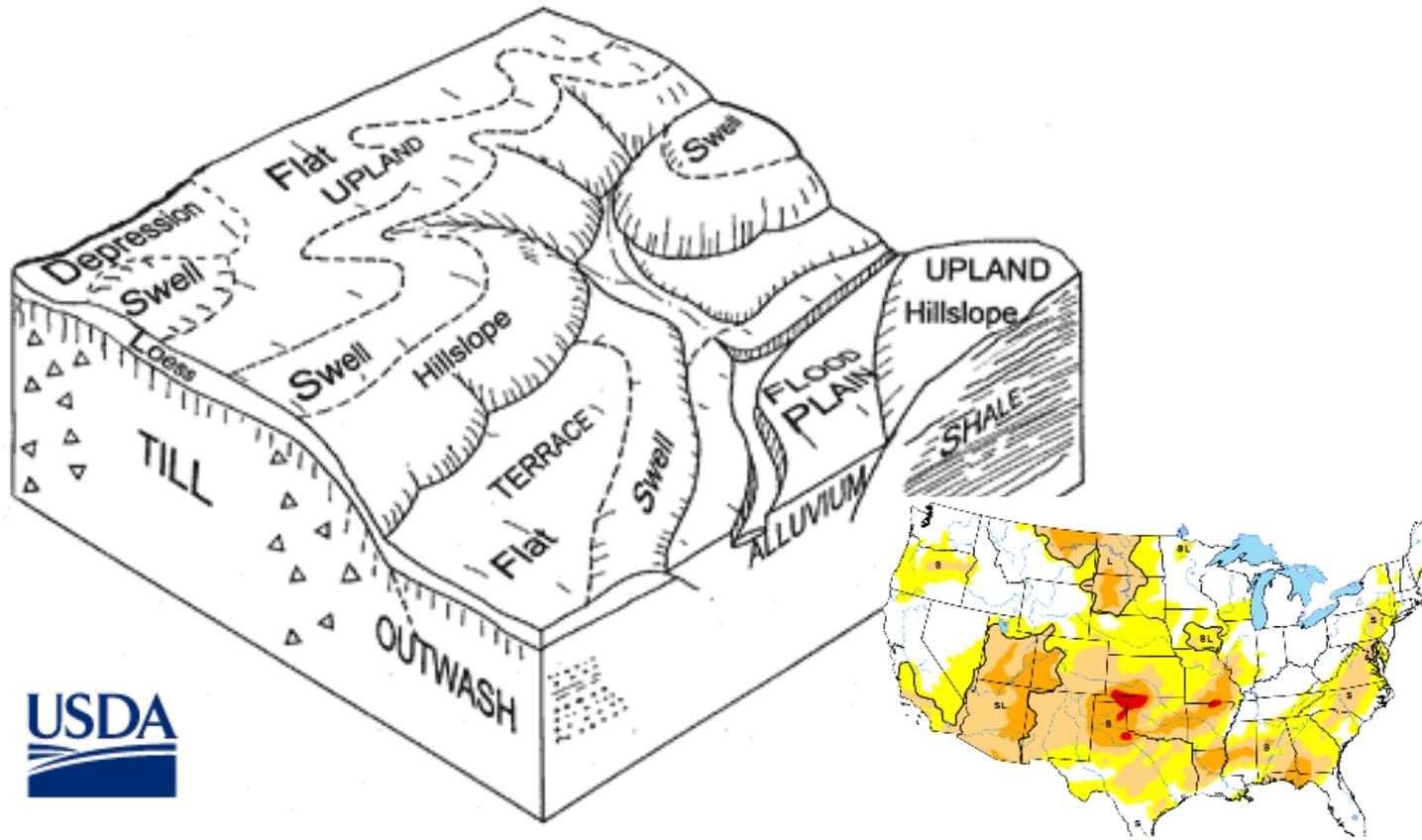
Physiographic Image.—Loamy Upland Geographic Diagram

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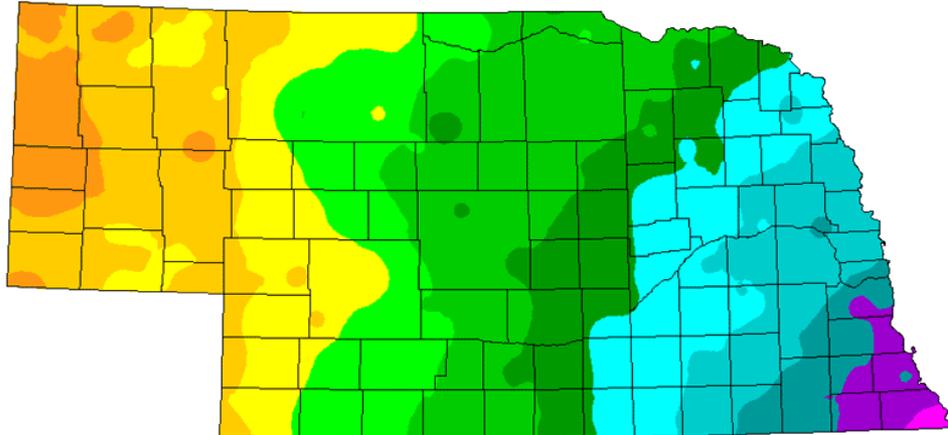


Management Adaptations Account for Site, Soil, and Climate Variables



Sites Have Similar Climate and Climate Variability

Average Annual Precipitation
Nebraska



This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS Snotel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.

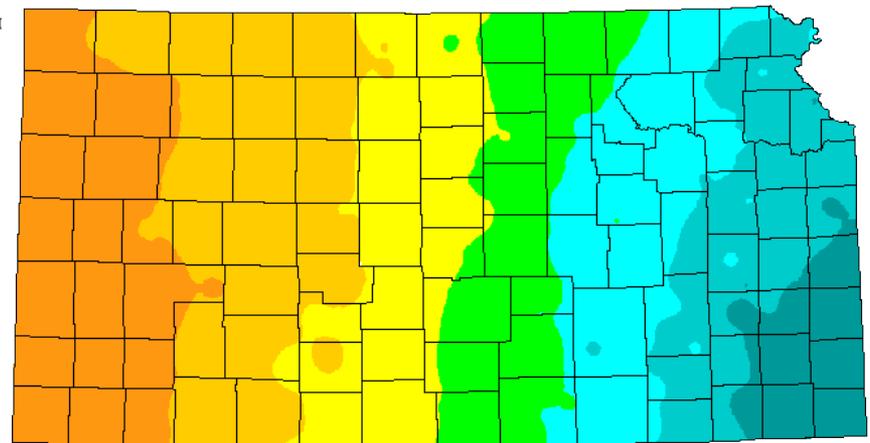
Copyright 2000 by Spatial Climate Analysis Service, Oregon State University

For information on the PRISM modeling system, visit the SCAS web site at <http://www.ocs.orst.edu/prism>

The latest PRISM digital data sets created by the SCAS can be obtained from the Climate Source at <http://www.climatesource.com>

Average Annual Precipitation
Kansas

Copyright 2000 by Spatial Climate Analysis Service, Oregon State University



This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS Snotel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.

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Ecological Sites (Conservation Planning on all Land Uses)

Spatial

Basis for aggregating soil map unit components across state and county boundaries

Similar ecological/management response, climate, soils, hydrology, physiography, and other factors

Consider all land uses common to the site

Similar native plant communities

Similar productivity

Similar Soil/Site Limitations (i.e. shallow soils, wetness, salinity)



State and Transition Models (STMs) For Conservation Planning on all Land Uses

Blue print for conservation planning for common landuses (from local planners, farmers, and others as knowledge is gained)

Support local priorities and programs (invasive species, restoration, wildlife, water quality, soil health, hydrology impacts, etc.)

Local expertise/knowledge used to establish common States (land use condition)

Transitions and Pathways describe how changes in states occur (conservation practices, management, climate, & time)

Separate STMs for each land use (focus on landuses that are most applicable for planning and programs)

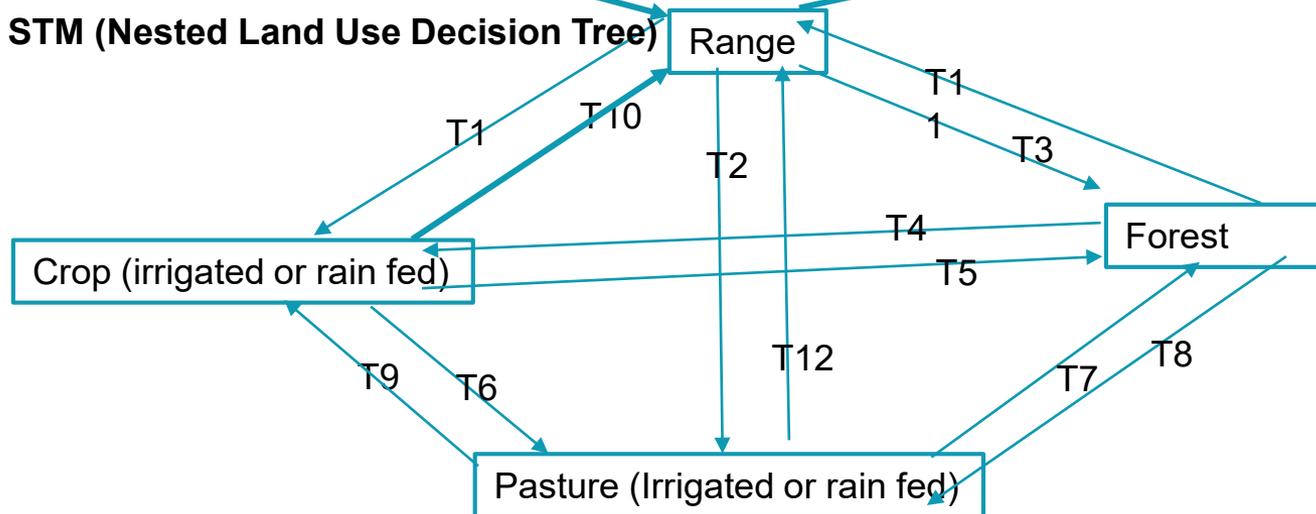
Restoration pathways (i.e. wetland restorations, Declining Habitat Restorations)

Indicators for Common States (Soil Health, Pasture Condition)



Loamy Upland Loess Mixed Grass Prairie Rangeland Ecotype (ESD)

Tier 1 STM (Nested Land Use Decision Tree)



LANDUSE CONVERSIONS AND RESTORATION PATHWAYS (general more detailed options/information will be developed)

- T1, T9 Cultivation/chemical kill, Irrigation Well and Irrigation Application System if irrigated
- T2 Cultivation and reseedling, abandoned or combination of fertilizer, seeding, heavy summer grazing
- T3, T7 Encroachment by Red cedar, Siberian elm and/or Locust and lack of fire or brush management; Cultivation Tree planting and Forest Stand Management
- T4 Clearing and cultivation
- T5 Abandonment and tree encroachment; Tree planting and Forest Stand Management
- T6 Site preparation and Pasture Seeding
- T8, T11 Clearing, and pasture seeding or range seeding
- T10 Site Preparation and Range seeding

LANDUSE INTERPRETATIONS (general information for each major land use)

Range: Refer to rangeland ESD, STM and other major range interpretations

Crop: Cropping limitations, equipment limitations, crop yields, crop adaptability, management limitations, other general cropland interpretations for site.

Pasture: Forage suitability group information, land use limitations, equipment limitations, productivity, grass/legume adaptability, management limitations, other general pasture interpretations for site.

Forest: Tree and shrub group information, land use limitations, equipment limitations, wildlife, production timber indexes, tree/shrub adaptability, management limitations, other general forest interpretations for site



Land Use Interpretations/Limitations/Suitability

Crop: Conservation practice limitations, Cropping limitations, equipment limitations, crop yields, crop adaptability, management limitations, other general cropland interpretations for site.

Pasture: Land use limitations, equipment limitations, productivity, grass/legume adaptability, management limitations, and other general pasture interpretations for site.

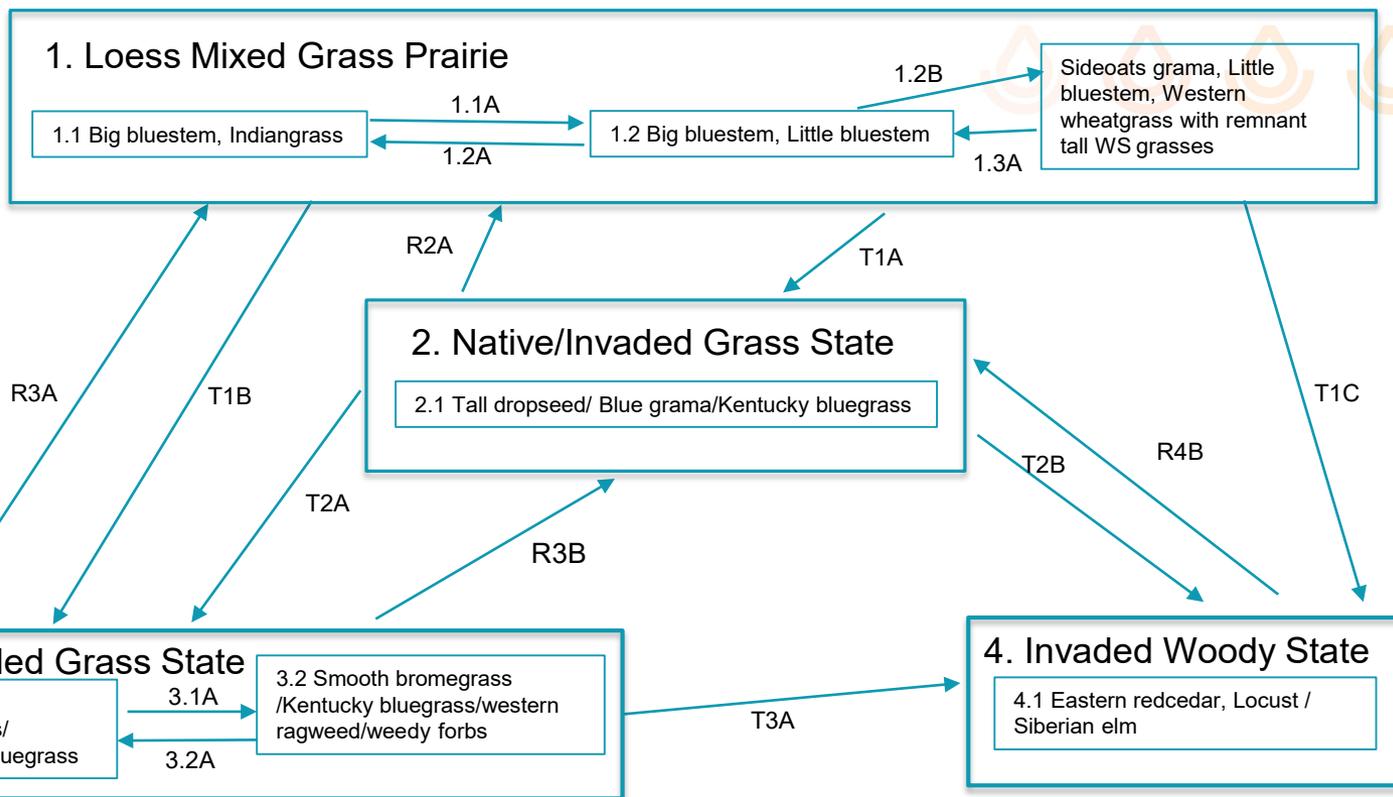
Forest: Tree and shrub group information, land use limitations, equipment limitations, wildlife, production timber indexes, tree/shrub adaptability, management limitations, other general forest interpretations for site



STM Using Structured Decision Making Model

- (1) define clients decision context;
- (2) identify measurable objectives;
- (3) formulate alternative management strategies;
- (4) explore the consequences of alternatives in relation to objectives;
- (5) select alternative but make trade-offs among objectives.





(Loamy Upland) Range STM

- 1.1A & 1.2B – Continuous season long grazing, inadequate recovery periods;
- 1.2A & 1.3A – Return to adequate recovery periods.
- T1A – Introduction/encroachment of non-native species.
- T1B & T2A – Outside energy inputs such as haying, fertilizer, seeding.
- T2B – Continuous season long grazing, inadequate recovery periods, lack of fire.
- T3A – Lack of brush management and/or

- R2A – Prescribed grazing with adequate recovery period.
- R3A – Range seeding with native species; if significant native remnants exist – prescribed fire, chemical treatments, animal impact with targeted prescribed grazing and adequate recovery periods.
- R4A – Wildlife, prescribed fire, brush management.
- 3.1A Continuous season long grazing, inadequate recovery periods.
- 3.2A Chemical spraying or sheep/goat grazing targeting weedy forbs.
- R3B – Prescribed burn, Early and Late Season targeted prescribed grazing



1.1 *Big bluestem, Indiangrass*



1.2 *Big bluestem, Little bluestem*



1.3 *Sideoats grama, Little bluestem, Western wheatgrass with remnant tall WS grasses*



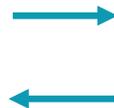
3.1 *Smooth brome grass/ Kentucky bluegrass*



2.1 *Tall dropseed/ Blue grama/ Kentucky bluegrass*



4.1 *Eastern redcedar, Locust / Siberian elm*



Dryland Crop (Loamy Upland)

1. High

1.3 High Level Soil Health Management System (long term)

1.2 High Managed Perennial Hayland (long term)

1.1 Short Term High level SHMS following range, pasture

2. Medium

2.2 Medium Managed/Per. Hayland

2.1 Mulch Tillage/Short term no-till

3. Low

3.3 Low condition Hayland

3.2 Silage/Stover Harvested, Overgrazed CT

3.1 Corn Soybean Conventional Tillage



On-site Soil Health Indicators





**Degraded Cropland State:
Management (Highly Erodible)**

Conventional Tillage (fall chisel spring disk)

328: Corn-Soybean Rotation

No Cover Crops

No Field Borders

Standard Nutrient Management

Pest Resistance

1. **What are the onsite indicators of this state/condition?**
2. **What are the limitations for this land use?**
3. **What practices and management will address erosion and other resource concerns when severe storms occur?**

**Enhanced Cropland
State:**

Conservation Practices

- 329: Continuous No-till
- 328: Diverse crop rotation
C-SB-W/CC rotated from
perennial hayland
- 330: Contour Farming
- 340: Cover Crops
- 528: Prescribed Grazing
- 386: Field Borders
- 600: Terraces
- 412: Grassed Waterway
- 620: Underground Outlets
- 590: Nutrient Management
(soil testing, zone mgt
liming, 4Rs)
- 595: Pest Mgt (Scouting,
Thresholds, Herbicide
Resistance Management)



Perennial Hayland (2000-2009 same field)



Adaptive Management On the Kucera Farm



CRP, CSP, EQIP, Local Programs



Perennial crops



Continuous No-till, crop rotation



High carbon cover crops



June, 13th 2018

Soil Health Management System
(IPM, Nutrient Mgt, Rotation, Continuous No-Till, Cover Crops)
(High drought resilience)



Onsite Indicators

- Physical?
- Chemical?
- Biological?
- Dynamic Soil Property Ranges?

June, 13th 2018

Corn-Soybean
Partial No-Till, Lack of IPM, Weed resistance, low infiltration rates



Transitions

- Conservation Practices?
- Time?
- Management?
- Site/Soil Resilience?

June, 18th 2018

Conventional Tillage
Lack of IPM, low drought resilience (low)

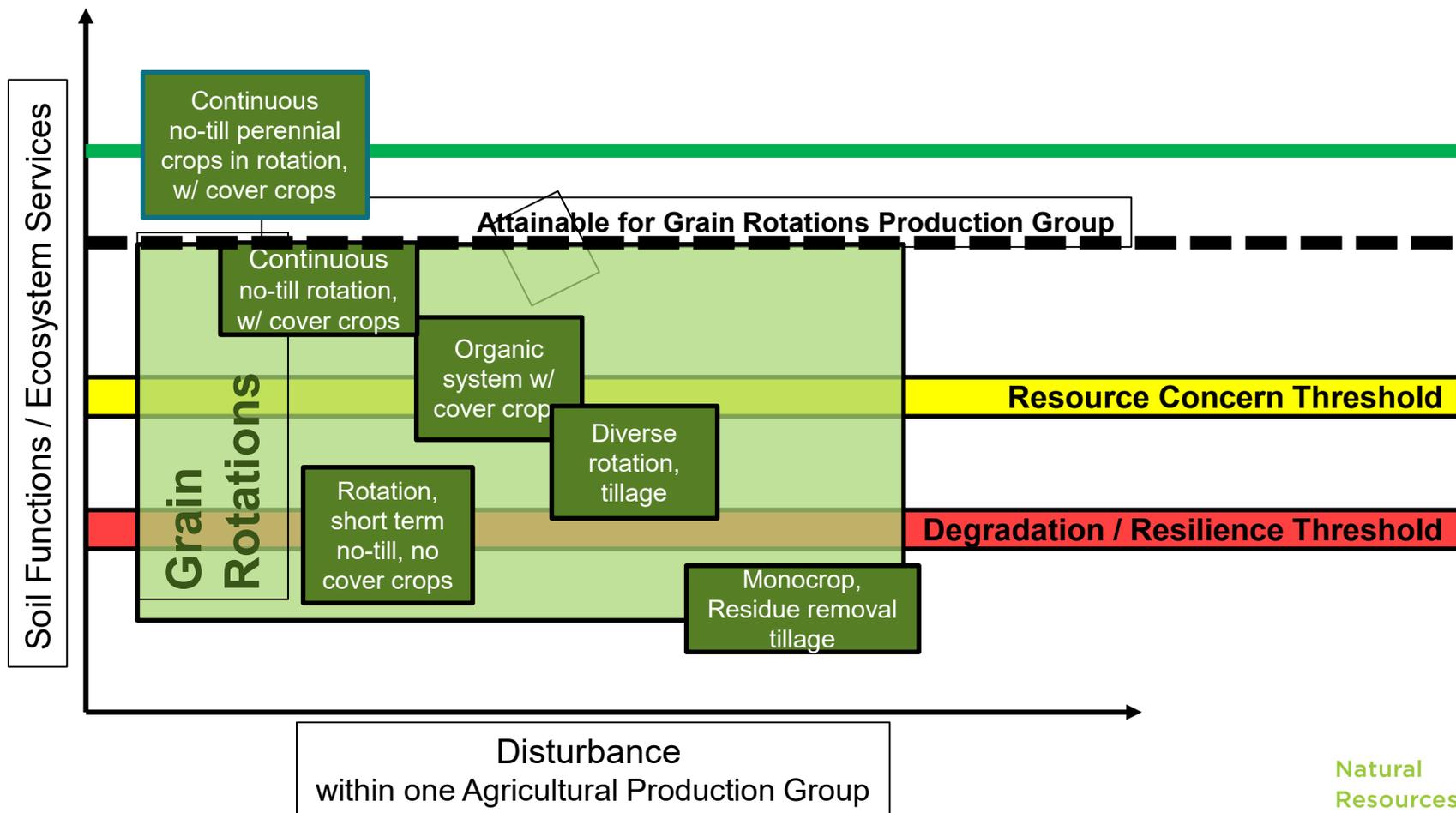


Resource Impacts

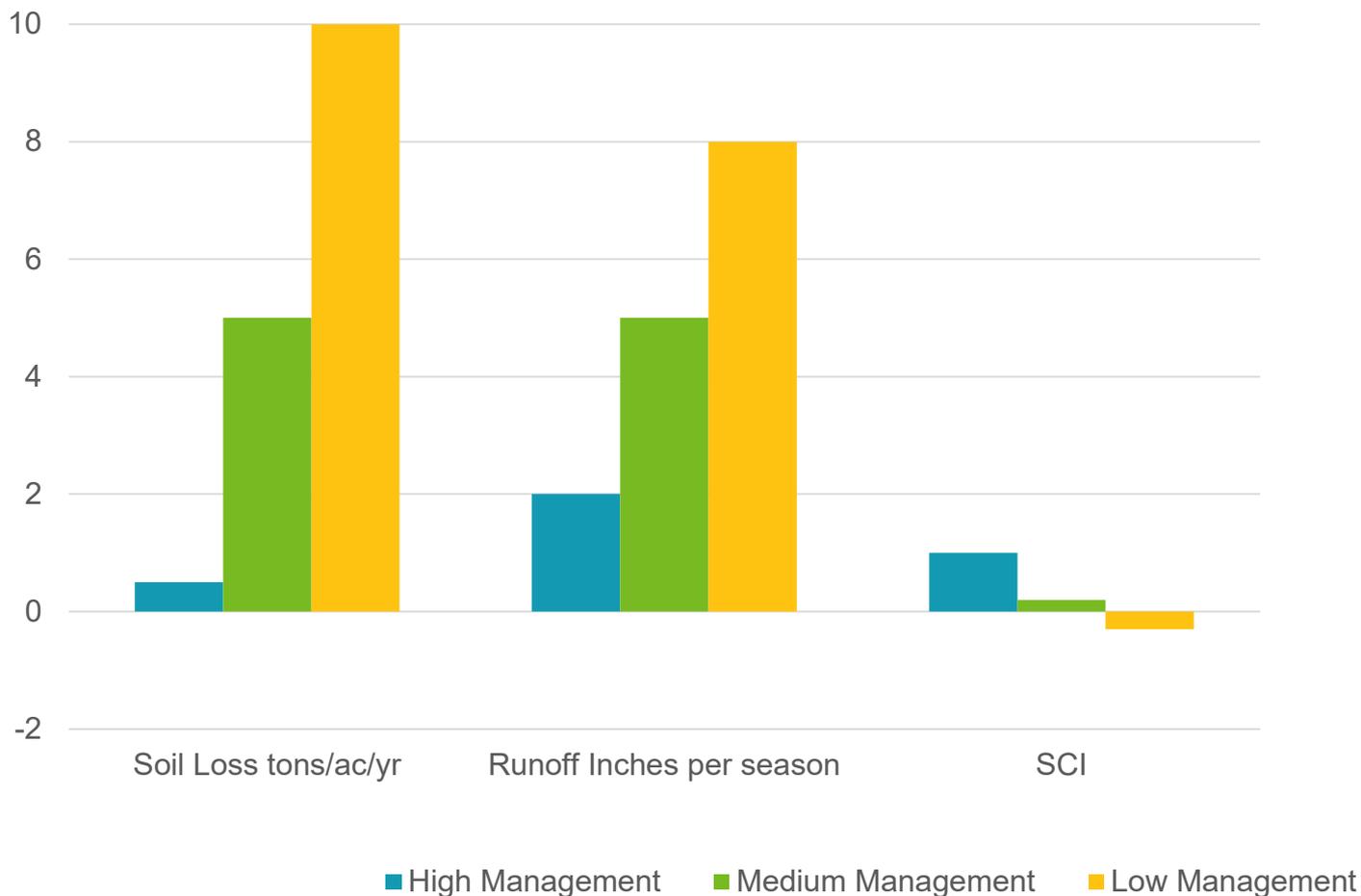
- Soil?
- Water?
- Air?
- Plants?
- Wildlife/Livestock?
- Human?



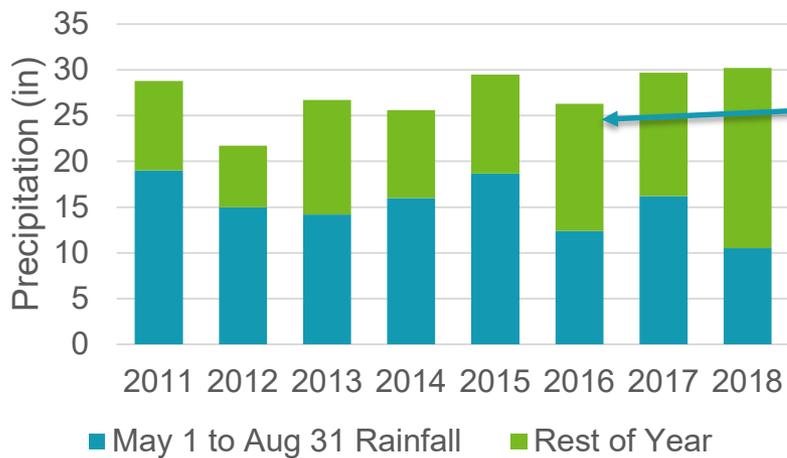
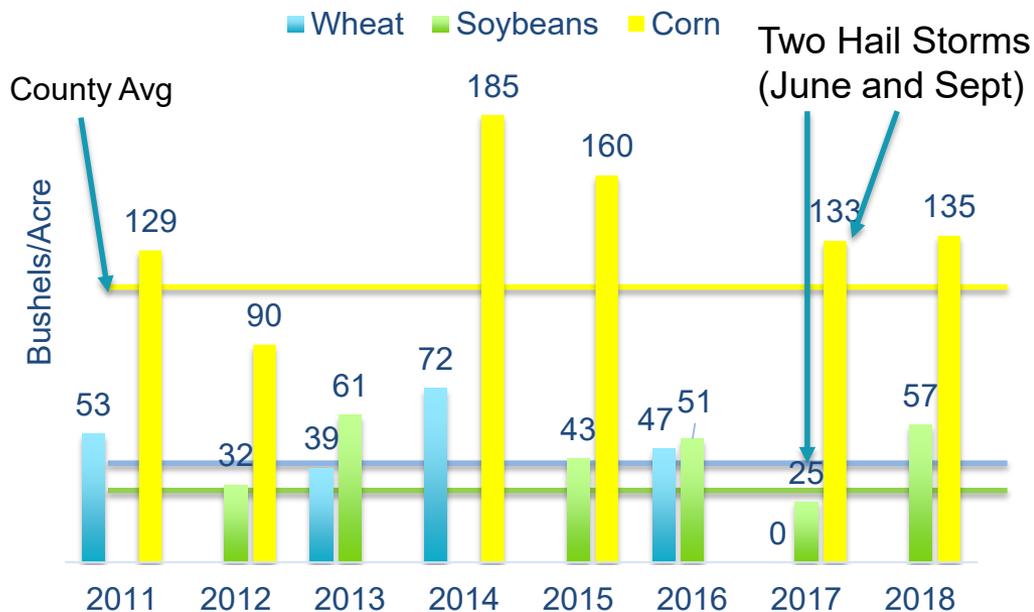
Ecological Potential (example graph)



Water Erosion Prediction Model Outputs (States)



Drought and Heavy Rainfall Resilience



Dryland Pasture (Loamy Upland)

1. High

1.1 Diverse forage system providing extended Season grazing - highly managed



2. Medium

2.1 Cool season dominated – average mgmt

2.2 Warm season dominated – average mgmt



3. Low

3.1 overgrazed, weed infested, low level of Management; most hardy forage survives

Resource Concerns in Degraded State:

SOIL EROSION: Sheet and rill erosion, ephemeral erosion, concentrated flow erosion

SOIL QUALITY DEGRADATION: SOM degradation, Compaction

WATER QUALITY DEGRADATION: sediments, nutrients, pathogens

DEGRADED PLANT CONDITION: weed infestation, over grazed, reduced yield

LIVESTOCK: inadequate feed/forage, inadequate water supply

WILDLIFE HABITAT: cover

Transition Descriptions

T1: Prescribed grazing with short rotations, residue management specific to each forage species, strategically located fence, water, shade, minerals, etc.; forage and biomass planting; nutrient management – strategic timing of N applications to extend

grazing season; IPM – weed control sensitive to desirable broadleaves

T2: lengthen grazing rotation, residue management not specific to species; adequate fence and water but not ideally located;

timing of fertilizer not aligned with extended production goals; broad application of herbicides

T3: overstock & overgraze; no fertilizer; no weed control

T4: Prescribed grazing of some kind; nutrient management – apply fertilizers; forage and biomass planting;

Information from FSGs (growth curves, production, species etc.)

Adapted Cool-Season Grasses

Creeping meadow foxtail
Meadow brome
Smooth brome
Orchardgrass
Canada wildrye
Tall fescue
Western wheatgrass
Intermediate wheatgrass
Tall wheatgrass

Adapted Warm-Season Grasses

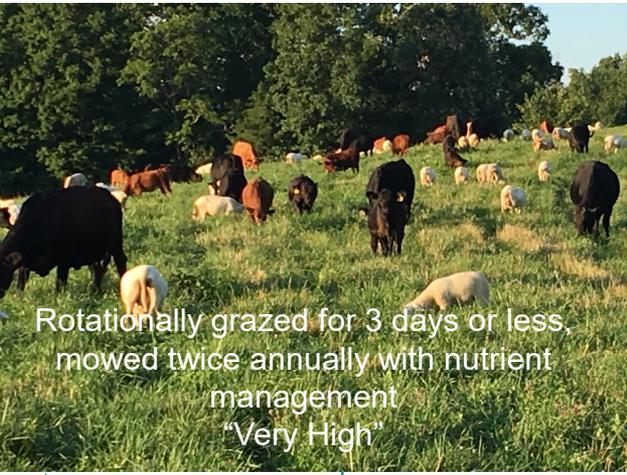
Big bluestem
Sideoats grama
Switchgrass
Little bluestem
Indiangrass

Adapted Legumes

Cicer milkvetch
Illinois ticktrefoil
Birdsfoot deervetch
Alfalfa
Red clover

Description of resource conditions for each state

1. Pasture Condition Scorecard 4 or 5 in every category
2. Pasture Condition Scorecard 3 or 4 in every category
3. Pasture Condition Scorecard < 3



Rotationally grazed for 3 days or less, mowed twice annually with nutrient management
"Very High"

Rotationally Grazed



"High"

Brush control and appropriate stocking rate

Reduced stocking rate and no mowing or herbicide



Low Stocking Rate Continuous Grazed
"Low"

Brush control and appropriate stocking rate

Appropriate Stocking Rate, Rotationally Grazed

Continuous Grazed with herbicide, mowing and nutrient management

rotationally grazed with nutrient mgmt

Appropriate stocking rate

Overstocked

herbicide and appropriately stocked

Continuous Grazed



"Medium"



"Medium"

Without herbicide
Cool Season Broadleaf herbicide



"Low"

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Conclusions

(Ecological Site uses for conservation decision-making)

Spatial Relevancy

Common conditions (States) within each land use

Conservation Practice Recommendations (blue print)

Ecosystem Services

Practice and Management Response (resiliency)

Site limitations and sustainable land uses

Common Transitions (negative & positive)

Restoration Pathways (i.e. wetland, prairie, forest)

Monitoring conditions and trends (site indicator, range of conditions)



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Questions?

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June 10, 2017



June 13, 2017

