LESSON ELEVEN:

Ecological Sites of Nebraska
Ecological Site

A distinctive kind of land with specific soil and physical characteristics that differ from other kinds of land in its ability to produce a distinctive kind and amount of vegetation and its ability to respond similarly to management actions and natural disturbances.

An identifiable unit of rangeland that allows range managers the ability to predict potential vegetative production for allocating forages to livestock and wildlife.

See Lesson 10 for general information about ecological sites.

Source: Natural Resources Conservation Service
12 Common Ecological Sites of Nebraska

- Choppy Sands
- Clayey
- Limy Upland
- Loamy Upland
- Loamy Overflow
- Loess Breaks
- Saline Subirrigated
- Sands
- Sandy
- Shallow
- Subirrigated
- Wetland

Photo: Range Judging Near Hyannis
Steps in Ecological Site Identification

1. Identify landscape position – Is the site on upland or lowland position (run off or run on landscape position)?
2. Dig a hole approx. 30” deep
3. Determine depth of soil – Is bedrock, shale or coarse gravel layer within 20” of surface?
4. Determine depth to water table – Is there a water table within 36” of surface?
5. Determine slope – Is the slope so steep that there are catsteps* (generally >24%)?
6. Determine soil texture – Is the soil sandy, loamy or clayey?
7. Determine if the soil is calcareous – Does the soil contain lime and does it effervesce (react to acid by bubbling)?

*Catsteps are small terrace-like formations or ridges created on steep hillsides by the slumping of the soil. The soil is so steep that the soil can not hold its form.
HOW TO DETERMINE SOIL TEXTURE

Procedure for Analyzing Soil Texture by Feel.

Place 25–50 g soil in palm. Add water slowly and knead soil to wet all aggregates. Soil is at the proper consistency when plastic and moldable, like moist putty.

Start

Does soil remain in a ball when squeezed?

Yes

No

Is soil too dry?

Yes

Is soil too wet?

No

Add more dry soil.

Place ball of soil between thumb and forefinger, gently pushing the soil with the thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over the forefinger, breaking from its own weight.

Does the soil form a ribbon?

Yes

No

LOAMY SAND

Does soil make a ribbon 2.5 cm or less before breaking?

Yes

No

Excessively wet a small pinch of soil in palm and rub with forefinger.

SANDY LOAM

Does gritty feeling predominate?

Yes

No

SANDY CLAY LOAM

Does gritty feeling predominate?

Yes

No

SANDY CLAY

Does gritty feeling predominate?

Yes

No

SILTY LOAM

Does smooth feeling predominate?

Yes

No

SILTY CLAY LOAM

Does smooth feeling predominate?

Yes

No

SILTY CLAY

Does smooth feeling predominate?

Yes

No

CLAY

CLAY LOAM

Does smooth feeling predominate?

Yes

No

LOAM
Ecological Sites: Upland Landscape, Deep, Sandy Soils

Ecological Sites
- Choppy Sands
- Sands
- Sandy (can also be located on run-on positions)
Choppy Sands Ecological Site

• Occurs on steep uplands with slopes greater than 20 percent
• Sandy soil texture, well drained
• Wind erosion and “blowouts” are common if vegetation is lacking
• “Catsteps” are characteristic of this site
• Dark color from organic buildup in the surface is less than 3 inches to absent
• Primary use: Grazing

Photo Source: Jeff Nichols, NRCS
Choppy Sands Ecological Site

- Reduced Vegetative Cover
- Little or no dark surface layer
Choppy Sands Ecological Site

**Common Plants**
- Little Bluestem
- Prairie Sandreed
- Hairy Grama
- Blowout Grass
- Sandhill Muhly
- Small Soapweed
- Lemon Scurfpea
Choppy Sands Ecological Site

Blowouts are common in Choppy Sands Ecological Sites

The predominant grass in this blowout is blowout grass
Sands Ecological Site

- Most widespread ecological site in the Sandhills
- Occurs on gently sloping to rolling uplands, but may be found on bottomlands or stream terraces
- Sandy texture soils, deep, well drained
- Dark color accumulation of less than 6 inches at the surface
- Subject to severe wind erosion if vegetation is absent
- Primary use: Grazing
Sands Ecological Site

Less than 6 inches of dark layer at surface

Photo Credit: Jeff Nichols
Common Plants
Sand Bluestem
Little Bluestem
Prairie Sandreed
Switchgrass
Needleandthread
Porcupine Grass (eastern sandhills)
Sand Lovegrass
Indiangrass
Sedges
Small Soapweed
Leadplant
Sand sagebrush (SW NE & western sandhills)
After disturbances such as drought, wildfire, or heavy grazing, annual forbs, such as the sunflower and annual buckwheat in the photo, increase due to the amount of bare ground present. Annual forbs will decrease and native grasses will increase after the site recovers from the disturbance.
Sandy Ecological Site

- Occurs on nearly level to steep uplands.
- In Sandhills occurs in dry, flat valleys between rolling dunes.
- Organic accumulation (dark layer) at the surface is 6” or greater.
- Soils have a fine sandy loam to fine sand surface and subsurface.
- Common land uses: grazing, haying, irrigated cropland.
Sandy Ecological Site

Organic layer greater than 6 inches at surface

Photo Source: Jeff Nichols, NRCS
Sandy Ecological Site

Common Plants
- Sand Bluestem
- Prairie Sandreed
- Needleandthread
- Blue Grama
- Western Ragweed
- Little Bluestem
- Western Wheatgrass
- Scribner’s Rosettegrass
- Woolly Plantain
Ecological Sites: Upland Landscape, Deep Loamy or Clayey Soils

Ecological Sites

- Clayey
- Loamy Upland
- Limy Upland
- Loess Breaks
Loess Breaks Ecological Site

- Occurs on steep to very steep uplands >24% slopes
- Are located on canyons or hillsides associated with major drainageways.
- Deep soils with a silt loam surface layer
- Contains land slips or cat steps
- Sub-soils are limy (calcareous) and effervesce with acid
- Occurs in association with loamy upland, limy upland, shallow, and loamy overflow sites
- Primary Land Use: Grazing
Loess Breaks Ecological Site

Reaction to acid applied to subsoil

Photo Source: Jeff Nichols, NRCS
Loess Breaks Ecological Site

Common Plants
Little Bluestem
Sideoats Grama
Needleandthread
Threadleaf Sedge
Plains Muhly
Variety of forbs
Loess Breaks Ecological Site

Eastern red cedar encroachment is common on loess breaks sites.

Photo Source: Jeff Nichols, NRCS
Clayey Ecological Site

- Occurs on nearly level to strongly sloping uplands
- Soil texture ranges from a silt loam to a clay loam in the surface with a silty clay or clay subsoil
- Water movement in the soil is restricted by clay
- Site occurs primarily in Northern and Northwest Nebraska
- Primary land use: Grazing
- Photo Source: Jeff Nichols, NRCS
Clayey Ecological Site

Soils are sticky when wet and very hard when dry.

Photo Source: Jeff Nichols, NRCS
Clayey Ecological Site

Clayey site in foreground with badlands in background

Common plants include:
- Western wheatgrass
- Green Needlegrass
- Buffalograss
- Blue Grama
- Needleandthread
- Sedges
- Prickly pear cactus
- Variety of forbs
Clayey Ecological Site

Clayey site close-up showing cracks which are common when clayey soils are dry.

Photo Source, Jeff Nichols, NRCS
Limy Upland Ecological Site

• Occurs on nearly level to steep uplands, foot slopes and stream terraces

• Soils may be fine sandy loams to clay loams and have an abundance of lime in the surface layer, so they will show a reaction when acid is applied to the soil surface

• The gently sloping areas on the photo are limy upland sites. Shallow sites are found on the steeper areas in this MLRA and mixed among the limy upland sites. In this photo, the eastern red cedar trees are on shallow sites. The short grass areas in center of photo are limy upland sites.

• Primary Land Use: Grazing and Cropland
Limy Upland Ecological Site
(limy upland site in foreground; shallow in the background)

Common Plants:
- Little Bluestem
- Sideoats Grama
- Western Wheatgrass
- Needleandthread
- Plains Muhly
- Threadleaf Sedge
Limy upland Sites are on the less steep slopes and loess breaks occurs on the canyon coming through the right center of the photo.
Loamy Upland Ecological Site

• Occurs on nearly level to steep uplands and stream terraces
• Soils are deep to very deep and soil textures range from very fine sandy loam to clay loam
• Most common range site outside of the Sandhills
• Many loamy upland sites are farmed or have become invaded by smooth brome and/or eastern red cedar.
• Common land uses: Cropland, Grazing, Haying

Photo Source: Jeff Nichols, NRCS
Loamy Upland Ecological Site

Common Plants
- Blue Grama
- Needleandthread
- Buffalograss
- Western Wheatgrass
- Plains muhly
- Little Bluestem
- Annual Bromes
- Big Bluestem (>20” precipitation)

Foreground: Loamy Upland, Canyon in background: Loess Breaks
In eastern and central Nebraska, Loamy Upland sites are often invaded by smooth bromegrass.
Loamy Upland Ecological Site
Loamy Upland Ecological Site

This site occurs some of our most productive soils and is frequently cropped. Most loamy upland sites remaining as rangeland are small areas that are too small or remote to farm.
Shallow Ecological Site

- Occurs on nearly level to steep uplands
- Soils are less than 20 inches deep over shale, mixed sand and gravel, limestone, siltstone or caliche
- Common land uses: Grazing
This example of a shallow site is < 20” over limestone

Photo credit: Kristin Dickinson.
Shallow Ecological Site

Common Plants
- Little Bluestem
- Blue Gama
- Plains Muhly
- Sideoats Grama
- Needleandthread
- Hairy Grama
- Western Wheatgrass
- Big Bluestem >20” Precip.
- Wide Variety of Forbs

Photo Credit: Kristin Dickinson
Sites that are very shallow will have large amounts of fringed sagewort and cacti, and will usually have more forbs than grass. Those sites also contain a large amount of annual grasses such as six-weeks fescue and annual brome grasses.
Ecological Sites: Lowland or Run on Landscape, All Soil Types

Ecological Sites
- Loamy Overflow
- Saline Subirrigated
- Subirrigated
- Wetland
Loamy Overflow Ecological Site

- Occurs on bottomlands that receive additional water from periodic overflows or run-in from higher elevations
- Water table is more than 60 inches below the soil surface
- Soils range from silty clay loam to silt loam
- Common land uses: Cropping, Grazing, Haying
Loamy Overflow Ecological Site

**Common Plants**
- Big Bluestem
- Western Wheatgrass
- Indiangrass
- Kentucky Bluegrass
- Green Muhly
- Buffalograss
- Skunkbush Sumac
- Western Snowberry
- Ironweed
- Western Ragweed
- Annual Bromes
Loamy Overflow Ecological Site

The loamy overflow site is in the bottom to middle of the photo on the level area of the landscape. The adjacent hills are limy upland sites.
Saline Subirrigated Ecological Site

- Occurs on nearly level bottomlands, upland basins and stream terraces
- Water table is between 10-60” of the surface during the majority of the growing season.
- Soils are strongly saline and/or alkaline near the surface, and there is often a whitish-gray deposit on the surface.
- Common land uses: Grazing, Haying
On extremely saline sites, there is very little vegetation and what vegetation is present is clumped and cushion-like. Saltwort is common on saline subirrigated sites like this one in Lancaster County, NE.
Saline Subirrigated Ecological Site

- Common plants vary with the degree of salinity and alkalinity of the soils. Soils with very high levels of salinity grow only very salt tolerant species such as saltwort, sea blight, and inland saltgrass.

- Moderately saline sites grow switchgrass, alkali sacaton, alkali cordgrass, foxtail barley and sedges. Prairie gentian can be found on this site.

- Arrowgrass can be common on this site.

*Photo: Prairie gentian on a saline subirrigated site in Garden County, NE*
Subirrigated Ecological Site

- Occurs on nearly level bottomlands, upland basins, stream terraces and foot slopes
- Water table is between 10 to 60 inches from surface.
- Surface layer is high in organic matter
- Common land uses: Grazing, Haying

Photo Credit: Jeff Nichols, NRCS
Subirrigated Ecological Site

High organic layer at surface indicated by dark color at the surface.

During dry periods look for gray colored or rust colored spots in the soil profile. These indicate that the soil has a high water table during wetter times of the year.

Photograph by: NRCS
Common Plants:
Big Bluestem
Indiangrass
Switchgrass
Prairie Cordgrass
Sedges
Sites may have been interseeded with red clover and other pasture legumes and grasses
Wetland Ecological Site

- Occur on nearly level ground or depressions
- High water table within three feet of the surface
- Water table may be above the soil surface early in the growing season
- Soils can be limy at the surface
- Common land uses: Haying, Grazing after haying, Wildlife Habitat
Wetland Ecological Site

Reaction to acid. Some wetlands are limy at the surface.

Photo Credit: Jeff Nichols

Water Table within 3 feet of the soil surface
Wetland Ecological Site

Plant community is highly variable and is related to the length of ponding. Wetlands with longer or more frequent ponding have more annual plants. If water is below the surface most of the year, common plants include:

- Sedges
- Rushes
- Prairie Cordgrass
- Canada thistle
Wetland Sites often become invaded with Reed Canarygrass.
Ecological Site Key  Part I

I. Upland or “Run-off” Landscape Position

A. Soils are 0-20” deep over rock, shale or coarse gravel; any soil texture
   ................................................................................................................Shallow

B. Soils are > 20” deep

A. Soil textures are silt loams on very steep, rough broken
   slopes ........................................................................................................Loess Breaks

B. Soil textures are loams, silt loams or silty clay loams and are calcareous (limy) in the surface soil.........................Limy Upland

C. Soil textures are loams, silt loams and silts on nearly level to steep
   slopes ........................................................................................................Loamy Upland

D. Soil textures are clay loams, silty clay loams, or clay textures on nearly
   level to steep slopes ..............................................................................Clayey

E. Soil textures are sand, fine sand, fine sandy loam or loamy sand
   a) Sands on steep, irregular slopes; catsteps are
      common ....................................................................................................Choppy Sands

   b) Sands and loamy sands on nearly level to rolling slopes with dark
      layer at soil surface <6” .................................................................Sands

   c) Fine sandy loams to loamy sands on nearly level to gently rolling
      slopes with dark layer at soil surface >6” .................. Sandy
Ecological Site Key part II

II. Run-on Landscape position (receives additional water from stream flow or runoff from uplands).

A. Water table at 60” from surface or less all or part of the growing season
   A. Water table is within 36” of the soil surface. Site is poorly drained. Ponding may occur during part of the growing season......................................................Wetland
   B. Water table is 10-60” of the soil surface during a much of the growing season
      a) Salts or alkali accumulate near or at the soil surface.................................................................Saline Subirrigated
      b) Salts or alkali do not accumulate near or at the soil surface......................................................Subirrigated

B. Water table deeper than 60” from surface
   A. Soils loams, silt loams, silts or silty clay loams. Site receives additional water from stream overflow or run-in....Loamy Overflow
Identify the Different Ecological Sites in this Photo

Site 1 outlined in red
(water table below 6’)

Site 2 outlined in green
(reacts with acid in top 2” of soil surface)

Site 3 (reacts with acid in top 4” of soil surface)
Site Answers

Limy Upland
Upland Landscape position
Calcareaous near surface

Loamy Overflow
Run In Landscape Position
Does not have high water table

Loess Breaks
Very Steep
Has Catsteps
Calcareaous (usually)
ECOLOGICAL SITES

ACTIVITIES

- Obtain several soil samples. Using the soil texture key in this lesson, identify the soil texture for each sample.

- Study the differences in ecological sites and learn the key concepts for each site. Go to the field and identify the ecological sites present.

REFERENCES

- Range Judging Handbook and Contest Guide for Nebraska
Loamy Upland Site – Frontier County

END OF LESSON ELEVEN