USDA Natural Resources Conservation Service

Ecological site F152BY013TX
Poorly Drained Loamy Bottomland

Last updated: 9/22/2023
Accessed: 05/12/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

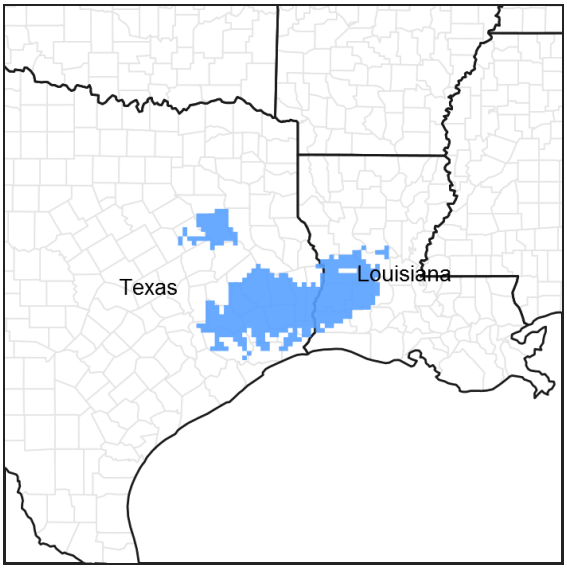


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 152B–Western Gulf Coast Flatwoods

Major Land Resource Area (MLRA) 152B, Western Gulf Coast Flatwoods, is in eastern Texas and western Louisiana. Locally termed the Flatwoods, the area is dominated by coniferous forest covering 5,681 square miles (14,714 square kilometers). The region is a hugely diverse transition zone between the northern and eastern mixed forests and southern and western coastal prairies and grasslands.

Classification relationships

Major Land Resource Area (MLRA) (USDA-Natural Resources Conservation Service, 2006)

Ecological site concept

The Poorly Drained Loamy Bottomland ecological site has very deep, somewhat poorly drained soils that are frequently flooded. The site is typically flooded for brief to long periods during normal rainfall years. They will stay flooded starting in November and ending in May. The loamy-textured soils combined with the flooding frequency form the plant community.

Associated sites

F152BY004TX	**Clayey Flat** Soils are clayey throughout and on a higher landform.
F152BY005TX	**Seasonally Wet Loamy Upland** Soils are on a higher landform.
F152BY007TX	**Poorly Drained Loamy Upland** Soils are on a higher landform.
F152BY012TX	**Well Drained Bottomland** Soils are better drained.
F152BY014TX	**Poorly Drained Clayey Bottomland** Soils are clayey throughout.
F152BY011TX	**Swamp** Soils are in a lower depressional landform that remains ponded after flood events.

Similar sites

F152BY014TX	**Poorly Drained Clayey Bottomland** Soils are clayey throughout.
F152BY011TX	**Swamp** Soils are semi-permanently ponded.
F152BY012TX	**Well Drained Bottomland** Soils are better drained.

Table 1. Dominant plant species

Tree	(1) *Quercus phellos* (2) *Quercus nigra*
Shrub	(1) *Ilex decidua*
Herbaceous	(1) *Carex* (2) *Cyperus*

Physiographic features

The ecological site includes areas on flood plains. Slope is 0 to 1 percent. Elevation ranges from 20 to 150 feet. Water table depth fluctuates throughout the year. From December to June, the depth to the top of the water table will be 0 to 9 inches. These months will also flood longer. The water table will deepen during the warmer months of the year and flooding times will be shorter.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Flood plain
Runoff class	Negligible to high
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Frequent
Ponding frequency	None
Elevation	20–150 ft
Slope	0–1%
Water table depth	0–9 in
Aspect	Aspect is not a significant factor

Climatic features

The Western Gulf Coast Flatwoods (MLRA 152B) is within the humid subtropical climate zone. The region boasts one of the highest rainfall averages in the southern United States, over 60 inches (152 centimeters) annually. This is due to the gulf currents that carry humid air to the region, where it condenses and precipitates. Rainfall averages are fairly consistent month by month, ranging from the lowest of 3.5 inches (8.9 centimeters) in March and the highest of 5.6 inches (14.3 centimeters) in June.

The area is prone to severe thunderstorms and tornadoes when the proper conditions exist, generally in the springtime. Sometimes excessive rainfall occurs, leading to flooding. Hurricanes also strike the region, generally in late summer or early fall. These extreme weather events can be quite destructive, toppling trees, and serves to naturally reset the vegetation to primary succession. The higher humidity of the region amplifies the feeling of heat during the summer. Prolonged droughts and snowfall events are rare.

Table 3. Representative climatic features

Frost-free period (average)	249 days
Freeze-free period (average)	289 days
Precipitation total (average)	63 in

Climate stations used

- (1) DE QUINCY [USC00162361], Dequincy, LA
- (2) LIBERTY [USC00415196], Liberty, TX
- (3) LUMBERTON [USC00415435], Silsbee, TX
- (4) TOWN BLUFF DAM [USC00419101], Jasper, TX
- (5) CLEVELAND [USC00411810], Cleveland, TX
- (6) ORANGE 9 N [USC00416680], Orange, TX
- (7) WILDWOOD [USC00419754], Kountze, TX
- (8) DE RIDDER [USC00162367], Deridder, LA
- (9) ELIZABETH [USC00162800], Oakdale, LA
- (10) OBERLIN FIRE TWR [USC00166938], Oberlin, LA

Influencing water features

The site supports hydrophytic vegetation and the soils are hydric as long as natural flooding has not been manipulated. Onsite delineations are required as some mapped areas and locations on the peripheries may not fall within the United States Army Corps of Engineers (USACOE) definition of a wetland.

Wetland description

The soils associated with this site are hydric. Some sites may have small areas that are non-hydric. These small areas are typically on better drained levees. Onsite investigation is needed to determine local conditions.

Soil features

The soils consist of very deep, poorly drained soils that formed in loamy alluvial deposits of the Holocene age. Kian, Pluck, and Sourlake are the representative soil series. All three have slightly different taxonomic classifications, but all are within the endoaquept great group. The soils belong to the inceptisol soil order, meaning they have weak horizon development and are generally separated by changes in color. This is due to the addition and removal of soil as the site floods. Also due to flooding, prolonged intervals without access to air cause the soil to have a gleyed, or grey, color. The gleyed horizon can be found within 6 to 27 inches.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous, metamorphic and sedimentary rock
Surface texture	(1) Fine sandy loam (2) Loam

Family particle size	(1) Fine-loamy (2) Coarse-loamy
Drainage class	Poorly drained
Permeability class	Slow to very slow
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-60in)	8–12 in
Calcium carbonate equivalent (0-60in)	0%
Electrical conductivity (0-60in)	0–1 mmhos/cm
Sodium adsorption ratio (0-60in)	0–4
Soil reaction (1:1 water) (0-60in)	3.5–6
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The information in this ecological site description (ESD), including the state-and-transition model (STM), was developed using archeological and historical data, professional experience, and scientific studies. The information is representative of a complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals, and ecological processes are described to inform land management decisions.

Introduction – In southeastern Texas and southwestern Louisiana the transition from coastal grasslands to the large expanse of coniferous forest has been deemed the “Flatwoods”. As the name suggests, the region is relatively flat and, with many transitional areas, highly diverse in flora and fauna. Historically, the area was covered by pines with mixed hardwoods, sparse shrubs, and a diverse understory of grasses and forbs. Fire and drainage patterns play a significant role in shaping the plant communities and their development. Fire suppression, drainage alterations, and land conversion have reduced the amount of historical communities in existence today.

Background – Prior to settlement by the Europeans, the reference state for the Poorly Drained Loamy Bottomlands were Willow Oak/Water Oak Forests. Remnants of this presumed historic plant community still exist where natural conditions are intact. Evidence of the reference state is found in accounts of early historic explorers to the area, historic forest and biological survey teams, as well as recent ecological studies in the last 30 years. The age of this community varies, and has a diverse flora.

Settlement Management – As human settlement increased throughout the area, so did the increase in logging and grazing by domestic livestock. The logging became so extensive that by the 1930’s most of the region had been cut-over. Replanting trees to historic communities was not common and early foresters began planting loblolly pine (*Pinus taeda*) for its quick growth. As more people colonized they began suppressing fire, which allowed dense thickets of shrubs to replace the herbaceous understory.

Current Management and State – Today much of the historic forest is gone, replaced by pine plantations, crops, and pastures. The areas that were not converted have been fire-suppressed so long that loblolly pine and fire intolerant hardwoods populate the overstory structure. Currently, federally-managed properties are the best place to view the remnant sites (National Park Service, U.S. Fish and Wildlife Service, etc.). Some private individuals have begun restoring communities through selective tree planting and retention of communities that remain. Other restoration efforts include mimicking natural-disturbance regimes through gap-phase regeneration on plantation

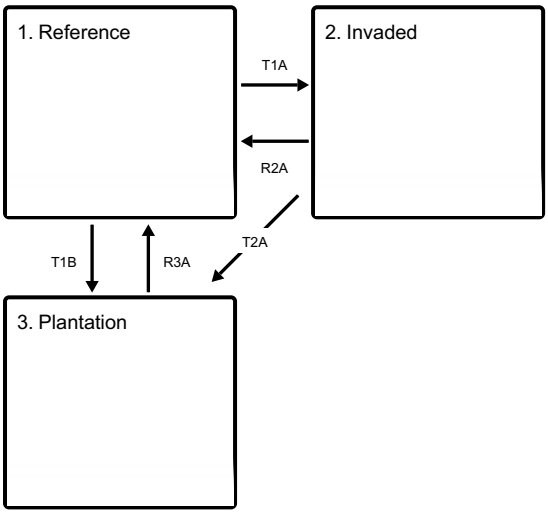
sites.

Fire Regimes – Fire was a natural and important disturbance throughout the region. Fire occurred naturally from lightning strikes, by Native Americans for game movement, and eventually early European settlers. Fires throughout the Flatwoods occurred at two different times. Early in the year, they would occur during late winter and early spring, removing senescent vegetation, recycling nutrients and minerals, and spurring new plant growth. Late summer and early fall fires occurred as well, but with a different community effect. Summer fires burned hotter and with more intensity, greatly suppressing the shrub canopy layer. The summer fires also shifted the ecological site transitional state by decreasing grass densities and increasing forb densities. The topography, fuel loads, and other conditions caused patchy burns throughout the region resulting in mosaic patterns of plant communities and a heterogeneous landscape.

Disturbance Regimes – Extreme weather events occur occasionally throughout the region. Tornados uproot trees and open canopies in the spring months. In the late summer and early fall, hurricanes or tropical depressions can make landfall, dumping excessive amounts of rain and toppling trees with high winds. Another cause of large canopy openings is the effects of the southern pine beetle (Dendroctonus frontalis). Starting in the late 1950's, beetle outbreaks have occurred every 6 to 9 years (although a major attack has not occurred in some time); usually when the trees are stressed due to multiple environmental factors.

State and transition model

Ecosystem states



T1A - Introduction of non-native Chinese tallow

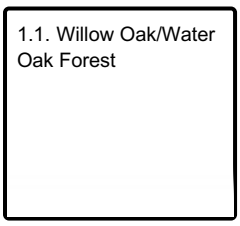
T1B - harvested by clearcut and planted to a monoculture of hardwood trees

R2A - Chemical and/or mechanical control of Chinese tallow

T2A - Harvested by clearcut and planted to a monoculture of hardwood trees

R3A - selective harvest coupled with reintroduction of native species

State 1 submodel, plant communities



State 2 submodel, plant communities

2.1. Exotic Thicket

State 3 submodel, plant communities

3.1. Hardwood Plantation

State 1
Reference

The Poorly Drained Loamy Bottomland ecological site is a Willow Oak/Water Oak Forest. The deep loamy soils are poorly drained and support hydrophytic vegetation. The overstory is moderate to heavy from 75 to 95 percent canopy cover. The basal areas are high, from 80 to over 100 square feet per acre. Fire is infrequent, occurring at intervals greater than 20 years apart, typically when lengthy dry periods occur. The dominant force in shaping the ecosystem is the flooding regimes. When flooding saturates the soil, water does not allow oxygen to flow through the soil, causing anoxic conditions. Some soil indicators include: gleyed (grey) colors with redoximorphic features (reds and yellow intermixed) and manganese nodules. The understory vegetation has adapted to the seasonally anaerobic conditions and are dominant. The USACOE classifies plants that occur in wetlands with an estimated probability greater than 99 percent obligate (OBL), and those 67 to 99 percent facultative wetland (FACW) plants. Facultative wetland plants are the most common encountered throughout the bottomlands, with obligate plants found in the longer flooded areas and facultative wetland plants found on the peripheries.

Dominant plant species

- willow oak (*Quercus phellos*), tree
- water oak (*Quercus nigra*), tree

Community 1.1
Willow Oak/Water Oak Forest

The overstory canopy is co-dominated by willow oak (*Quercus phellos*) and water oak (*Quercus nigra*). Other species commonly found mixed in are sweetgum (*Liquidambar styraciflua*), blackgum (*Nyssa sylvatica*), and bald cypress (*Taxodium distichum*). Buttressed trunk bases are found on most of the overstory trees. Possumhaw (*Ilex decidua*) is the most common shrub found, while red maple (*Acer rubrum*) and hophornbeam (*Ostrya virginiana*) are shrub-like trees found onsite. The herbaceous understory can be lush or nearly vacant depending on flood

length and canopy cover. Sedges (Carex sp.), flatsedges (Cyperus sp.), and rushes (Juncus sp.) dominate the understory.

State 2
Invaded

Chinese tallow (*Triadica sebifera*) is an undesired, invasive species brought to the United States in 1776 (Randall and Marinelli, 1996). Rapid expansion along the gulf coastal states has allowed the species to invade many ecosystems and consequently reduce diversity. Tallow trees are known to cause gastrointestinal upset, contact dermatitis, and toxicity in livestock and humans. Mechanical and chemicals options exist as a means to control the trees.

Dominant plant species

- Chinese tallow (*Triadica sebifera*), tree

Community 2.1
Exotic Thicket

Chinese tallow invade the ecological site via flooding events as nearby waterways transport seeds. Once settled, the seeds produce saplings viable to reproduce seeds in as little as three years. The rapid establishment immediately blocks sunlight to understory species and reduces diversity. Unabated growth quickly allows the saplings to grow into the overstory, thus changing the ecological state entirely. Reductions in size and number of all vegetative species are seen in all canopy tiers.

State 3
Plantation

The Plantation State is a result of conversion activities. The landowner has maximized silviculture production by planting a monoculture of hardwood species.

Community 3.1
Hardwood Plantation

In the immediate years following the initial plantation tree planting, the understory community will resemble the reference state (State 1). During this early growth period, the landowner will typically remove unwanted hardwoods and herbaceous plants to reduce competition with the planted pine trees. As the overstory canopy closes, less understory management is required due to sunlight restrictions to the ground layer.

Transition T1A
State 1 to 2

The transition from State 1 to State 2 is a result of occupancy by Chinese tallow or other noxious weeds. Invasive plants outcompete, and eventually choke out, all other native species.

Transition T1B
State 1 to 3

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut. Then, the site is prepared and planted to a monoculture of hardwood trees.

Restoration pathway R2A
State 2 to 1

The driver for restoration is control of Chinese tallow. Although an option, mechanical removal of the trees is difficult because they readily regrow from roots and seeds. Several chemicals methods are available including glyphosate for cut-stump treatments, triclopyr for cut-stump and foliar treatments, imazamox for broad spectrum application, and imazapyr as a foliar spray. Many aquatic herbicides have water use restrictions and can potentially kill

hardwoods, so labels and restrictions should be read carefully prior to application.

Transition T2A
State 2 to 3

The transition is due to the land manager maximizing silviculture potential. Merchantable timber is harvested by clearcut, the site prepared and planted to a monoculture of hardwood trees.

Restoration pathway R3A
State 3 to 1

This restoration pathway may be accomplished by removing unwanted overstory trees (if present) and replanting bottomland hardwoods. Restoration efforts for bottomland hardwood forests have proven difficult and much research has been done on these ecosystems. Many times restoring the function of the ecosystem is the most difficult obstacle. Evapotranspiration and hyrdoperiod are closely linked and may never fully be restored until a forested condition exists again (Stanturf et al., 2001). Local tree availability may limit the possibilities of species composition. Careful planning of available species, site design, and further management actions should be conversed with a knowledgeable restoration source. With this in mind, oftentimes late summer and early fall are the best times to begin due to possibly wet conditions during the late fall to early spring. Many detailed guides have been written to assist with restoration, and suggested readings include, “A Guide to Bottomland Hardwood Restoration” (Allen et al., 2001).

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
sweetgum	LIST2	*Liquidambar styraciflua*	Native	–	–	–	–
blackgum	NYSY	*Nyssa sylvatica*	Native	–	–	–	–
bald cypress	TADI2	*Taxodium distichum*	Native	–	–	–	–
willow oak	QUPH	*Quercus phellos*	Native	–	–	–	–
water oak	QUNI	*Quercus nigra*	Native	–	–	–	–

Table 6. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
sedge	CAREX	*Carex*	Native	–	–
flatsedge	CYPER	*Cyperus*	Native	–	–
rush	JUNCU	*Juncus*	Native	–	–
Forb/Herb					
hydrocotyle	HYDRO2	*Hydrocotyle*	Native	–	–
lizard's tail	SACE	*Saururus cernuus*	Native	–	–
Shrub/Subshrub					
possumhaw	ILDE	*Ilex decidua*	Native	–	–
Tree					
red maple	ACRU	*Acer rubrum*	Native	–	–
hophornbeam	OSVI	*Ostrya virginiana*	Native	–	–
Vine/Liana					
peppervine	NEAR5	*Nekemias arborea*	Native	–	–
greenbrier	SMILA2	*Smilax*	Native	–	–
Alabama supplejack	BESC	*Berchemia scandens*	Native	–	–

Wood products

These soils occur in the Woodland Suitability Group 2w6 and have a high potential for hardwood management. The 50-year site index for bottomland oaks averages 90 feet and ranges from 80 to 100 feet, depending on drainage. Although management can substantially increase yield, it should also include attention to streamside management zone considerations to protect water quality. Access and equipment operability on these soils is poor for long periods due to flooding and wetness. Harvesting and other operations may need to be suspended during these periods. Rutting during these operations can be severe due to the low strength of these soils. Flooding also makes these soils poorly suited for log landings and roads. Road construction should be limited. Planting will be made difficult due to wetness and the sticky nature of these soils. Site preparation operations should be limited to the dry months and planting should be planned for the drier part of the planting season. Use of herbicides for site preparation must also take into consideration the possibility for flooding to prevent the possible contamination of surface waters.

Inventory data references

This site description was developed as part of the provisional ecological site initiative using historic soil survey manuscripts, available range site descriptions, and low intensity field sampling.

Other references

Ajilvsgi, G. 2003. Wildflowers of Texas. Revised edition. Shearer Publishing, Fredericksburg, TX.
Ajilvsgi, G. 1979. Wildflowers of the Big Thicket. Texas A&M University Press, College Station, TX.
Allen, J. A., B. D. Keeland, J. A. Stanturf, and A. F. Kennedy Jr. 2001. A guide to bottomland hardwood restoration. Technical report, USGS/BRD/ITR-2000-0011.
Bray, W. L. 1904. Forest resources of Texas. Bureau of Forestry Bulletin 47, Government Printing Office, Washington D.C.
Diggs, G. M., B. L. Lipscomb, M. D. Reed, and R. J. O'Kennon. 2006. Illustrated flora of East Texas. Second edition. Botanical Research Institute of Texas & Austin College, Fort Worth, TX.
Jones, S. D., J. K. Wipff, and P. M. Montgomery. 1997. Vascular plants of Texas: a comprehensive checklist including synonymy, bibliography, and index. University of Texas Press, Austin.
Liu, C., P. A. Harcombe, and I. S. Elsik. 1990. Fire study report, including Roy E. Larsen Preserve species list. Summer 1990. Department of Ecology and Evolutionary Biology, Rice University, Houston, TX.
Marks, P. L., and P. A. Harcombe. 1981. Forest Vegetation of the Big Thicket, southeast Texas. Ecological

Monographs 51:287-305.
Matos, J. A. 1985. Roy E. Larsen Sandylands Sanctuary vascular plant species list. Master thesis, Stephen F. Austin University, Nacogdoches, TX.
NatureServe. 2002. International classification of ecological communities: Terrestrial vegetation of the United States. National forests in Texas final report. NatureServe, Arlington, VA.
Nixon, E. S. 2000. Trees, shrubs & woody vines of East Texas. Second edition. Bruce Lyndon Cunningham Productions, Nacogdoches, TX.
Randall, J. M., and J. Marinelli. 1996. Invasive plants: weeds of the global garden. Volume 149. Brooklyn Botanic Garden, Brooklyn, NY.
Stanturf, J. A., S. H. Schoenholtz, C. J. Schweitzer, and J. P. Shepard. 2001. Achieving restoration success: Myths in bottomland hardwood forests. Restoration Ecology, 9:189-200.
Stringham, T. K., W. C. Krueger, and P. L. Shaver. 2003. State and transition modeling: An ecological process approach. Journal of Range Management 56:106-113.
Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database.
Truett, J. C. 1984. Land of bears and honey: A natural history of East Texas. The University of Texas Press, Austin, TX.
Van Kley, J. E., R. L. Turner, L. S. Smith, and R. E. Evans. 2007. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. Second approximation. Stephen F. Austin University and The Nature Conservancy, Nacogdoches, TX.
USDA-NRCS Ag Handbook 296 (2006).
Vines, R. A. 1960. Trees, shrubs, and woody vines of the Southwest. University of Texas Press, Austin, TX.
Watson, G. E. 2006. Big Thicket Plant Ecology. Third Edition. University of North Texas Press, Denton, TX.

Contributors

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Approval

Bryan Christensen, 9/22/2023

Acknowledgments

Thanks to all involved during the preparation, sampling, and reviewing of the Flatwoods project. Thanks to Josh Berry, Dennis Brezina, Kenny Hall, Jason Hohlt, Stacey Kloesel, Ricky Lambert, Cody Langston, Mark Moseley, Ramiro Molina, Mike Oliver, Alan Peer, Sara Russell, Don Sabo, Mary Webb-Marek, and Jon Wiedenfeld for all their help.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	09/21/2021
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**