Ecological site F134XY021AL
Northern Backswamp - PROVISIONAL

Accessed: 04/30/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 134X–Southern Mississippi Valley Loess

The Southern Mississippi Valley Loess (MLRA 134) extends some 500 miles from the southern tip of Illinois to southern Louisiana. This MLRA occurs in Mississippi (39 percent), Tennessee (23 percent), Louisiana (15 percent), Arkansas (11 percent), Kentucky (9 percent), Missouri (2 percent), and Illinois (1 percent). It makes up about 26,520 square miles. Landscapes consist of highly dissected uplands, level to undulating plains, and broad terraces that are covered with a mantle of loess. The soils, mainly Alfisols, formed in the loess mantle. Stream systems of the MLRA typically originate as low-gradient drainageways in the upper reaches that broaden rapidly downstream to wide, level floodplains with highly meandering channels. Alluvial soils are predominantly silty where loess thickness of the uplands are deepest but grade to loamy textures in watersheds covered by thin loess. Underlying the loess mantle are Tertiary deposits of unconsolidated sand, silt, clay, gravel, and lignite. Crowley's Ridge, Macon Ridge, and Lafayette Loess Plains are discontinuous, erosional remnants that run north to south in southeastern Missouri - eastern Arkansas, northeastern Louisiana, and south-central Louisiana, respectively. Elevations range from around 100 feet on terraces in southern Louisiana to over 600 feet on uplands in western Kentucky. The steep, dissected uplands are mainly in hardwood forests while less sloping areas are used for crop, pasture, and forage production (USDA-NRCS, 2006).

This site is of large extent in MLRA 134 with a maximum distribution and occurrence in the Loess Plains (EPA Level IV Ecoregion: 74b) from western Kentucky to the Southern Rolling Plains (EPA Level IV Ecoregion: 74c) in southwestern Mississippi. The site extends into the adjoining Southern Coastal Plain, MLRA 133A to the east. Although broadly mapped, the actual distribution and number of occurrences likely exceeds what is illustrated on the accompanying map.

Classification relationships

All or portions of the geographic range of this site falls within a number of ecological/land classifications including:
-NRCS Major Land Resource Area (MLRA) 134 – Southern Mississippi Valley Loess (USDA-NRCS, 2006)
-Environmental Protection Agency's Level IV Ecoregion: Loess Plains, 74b (Griffith et al., 1998; Woods et al., 2002; Chapman et al., 2004)
-231H - Coastal Plains-Loess section of the USDA Forest Service Ecological Subregion (McNab et al., 2005)
-LANDFIRE Biophysical Setting 4514730 Gulf and Atlantic Coastal Plain Floodplain Systems (LANDFIRE, 2008)
- East Gulf Coastal Plain Small Stream and River Floodplain Forest CES203.559 (NatureServe, 2012)
- East Gulf Coastal Plain Large River Floodplain Forest CES203.489 (NatureServe, 2012)
- Southern Coastal Plain Bald-cypress - Tupelo Swamp Forest, CEGL007422 (NatureServe, 2013)
-Western Mesophytic Forest Region - Mississippi Embayment Section (Braun, 1950)
-Low-gradient Riverine Wetlands (Wilder and Roberts, 2002)

Ecological site concept

The Northern Backswamp belongs to an intricate complex of floodplain ecological sites that developed from the fluvial dynamics of low-gradient, sinuous riverine systems. Soils that define the site formed in silty or loamy alluvium and are very deep, poorly drained, and ponded or flooded for much or all of the year. Soil reactions range from very strongly acid to strongly acid throughout all horizons. Flooding of this site is generally frequent and a critical source of nutrient-rich sediments. These wetlands generally form on floodplain concavities or depressions that are situated between natural levees and upland or terrace scarps. Floodplain features that support this site include abandoned river channels or oxbows, relict stream channels or sloughs, and broad depressions that receive a near constant supply of ground and surface water from springs and runoff from receiving tributaries. Backswamps can also occur on alluvial fans where they sometimes develop as linear features, especially where they have formed on relict stream channels, channel scours, and sloughs. Occasionally, backswamps form on loess-covered terraces (above the 100-yr flood zone). The latter may occur where runoff from adjoining uplands and/or conveyance of local streams collect along concavities or depressions between the terrace proper and upland scarp. Natural vegetation of this site is characteristically typed as a bald cypress - water tupelo swamp. Associates commonly found on drier positions include willow oak, overcup oak, pumpkin ash, green ash, sweetgum, red maple, water locust, and water hickory. Depending on canopy closure and water depth, the shrub-small tree stratum often ranges from dense, impenetrable thickets to sparse, local patches that are frequently composed of black willow, common buttonbush, Virginia sweetspire, hazel alder, eastern swamp privet, and planertree.

Associated sites

F134XY020AL	**Northern Wet Alluvial Flat - PROVISIONAL** This site occurs in close association with backswamps and represents the next "drier" ecological site along the wet - dry gradient and catena of floodplain ecological sites in MLRA 134.

Table 1. Dominant plant species

Tree	(1) *Taxodium distichum* (2) *Nyssa aquatica*
Shrub	(1) *Cephalanthus occidentalis* (2) *Planera aquatica*
Herbaceous	Not specified

Physiographic features

The Northern Backswamp is broadly distributed across the largest physiographic subsection or ecoregion of the MLRA, the Loess Plains. West to east, this ecological site extends from the border of the Loess Hills (EPA Level IV Ecoregion: 74a), across the Loess Plains, and into portions of the Southeastern Plains (EPA Level III Ecoregion: 65) where loess continues to cap old fluvial terraces and broad valleys. North to south, the site extends from the plains in western Kentucky to the border of the Southern Rolling Plains in southwestern Mississippi. The latter forms the southern-most boundary of the site due to warmer average annual air temperatures, greater annual rainfall, and a transition to slightly warmer soils (Chapman et al., 2004).

Characteristics of this region generally include undulating uplands, gently rolling hills, and irregular plains. Topographic relief of the Loess Plains is generally low, averaging about 30 to 70 feet. Upland slopes typically range from 0 to 20 percent with 1 to 8 percent being dominant. Elevations in the range of 300 to 400 feet are commonplace to the south but increase to nearly 600 feet in the north. In portions of western Kentucky and Tennessee, the undulating pattern of the plains is interrupted by dissected landscapes. Such areas tend to be hillier with steeper slopes and greater relief and appear to be concentrated along the borders of broader valleys and floodplains. As the plains continue eastward, starkness of the terrain becomes even more pronounced, which signals the transition of the Loess Plains to the thin loess-capped ridges, hills, and plateaus along the western edge of the Southeastern Plains. To the south, through much of Mississippi, the Loess Plains consists of a very thin east – west belt, compressed between the dissected Loess Hills and Mississippi Alluvial Plain to the west and the Coastal Plain to the east. The convergence of such contrasting ecoregions contribute to a very complex pattern of soils, landforms, and vegetation communities.

Key to the development and occurrence of this ecological site is the presence of standing water for most or all of the year. From a physiographic perspective, this site is found in a variety of geomorphic situations (Conner and Buford, 1998). These wetlands generally form on floodplain concavities or depressions that are situated between natural levees and upland or terrace scarps. Floodplain features that support this site include abandoned river channels or oxbows, relict stream channels or sloughs, and broad depressions that receive a near constant supply of ground and surface water from springs and runoff from receiving tributaries. Backswamps can also occur on alluvial fans where they sometimes develop as linear features, especially where they have formed on relict stream channels, channel scours, and sloughs. Occasionally, backswamps form on loess-covered terraces (above the 100-yr flood zone). The latter may occur where runoff from adjoining uplands and/or conveyance of local streams collect along concavities or depressions between the terrace proper and upland scarp.

The influences of aspect are negligible in this site.

Table 2. Representative physiographic features

Landforms	(1) Backswamp (2) Oxbow (3) Slough
Flooding duration	Very long (more than 30 days)
Flooding frequency	Frequent to very frequent
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	23–105 m
Slope	0–2%
Ponding depth	0–155 cm
Water table depth	0–30 cm
Aspect	Aspect is not a significant factor

Climatic features

This site falls under the Humid Subtropical Climate Classification (Koppen System). The average annual precipitation for this site from 1980 through 2010 is 56 inches and ranges from 53 in the north to 58 inches in the south. Maximum precipitation occurs in winter and spring and precipitation decreases gradually throughout the summer, except for a moderate increase in midsummer. Rainfall often occurs as high-intensity, convective thunderstorms during warmer periods but moderate-intensity frontal systems can produce large amounts of rainfall during winter, especially in the southern part of the area. Snowfall generally occurs in the north during most years. However, accumulations are generally less than 12 inches and typically melt within 3 to 5 days. South of Memphis, winter precipitation sometimes occurs as freezing rain and sleet. The average annual temperature is 60 degrees F and ranges from 58 in the north to 64 degrees F in the south. The freeze-free period averages 222 days and ranges from 206 days in the north to 252 days in the south. The frost free period averages 197 days and ranges from 191 in the north to 224 days in the south.

The broad geographic distribution of this site north to south naturally includes much climatic variability with areas farther south having a longer growing season and increased precipitation. These climatic factors likely lead to important differences in overall plant productivity and key vegetation components between the southern and northern portions of this site. As future work proceeds, the current distribution of the Northern Loess Interfluve will likely be revised with a “central” site interjected between the northern and southern extremes of this MLRA.

Table 3. Representative climatic features

Frost-free period (average)	197 days
Freeze-free period (average)	222 days
Precipitation total (average)	1,422 mm

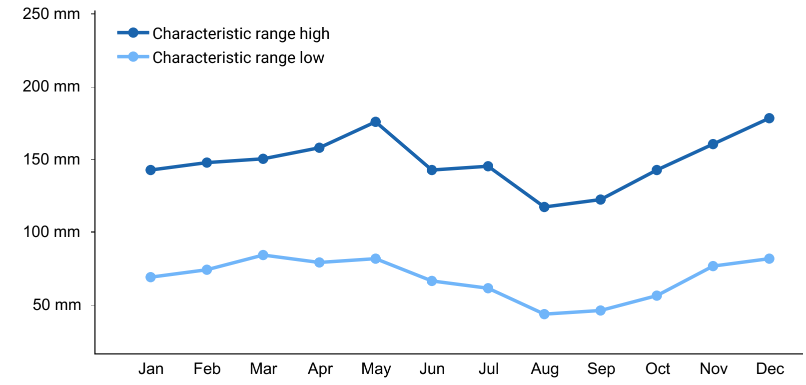

Figure 1. Monthly precipitation range

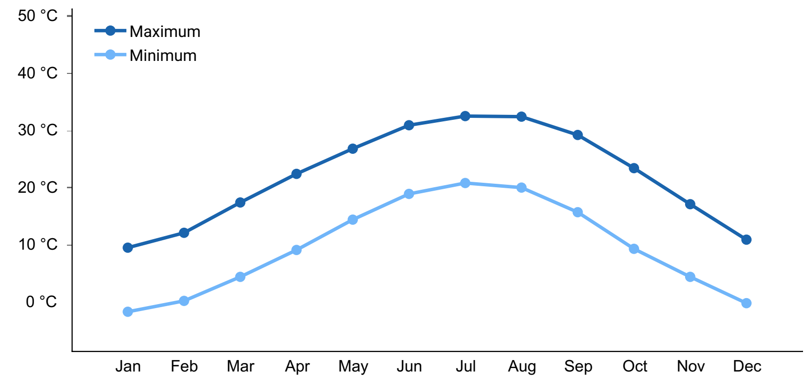

Figure 2. Monthly average minimum and maximum temperature

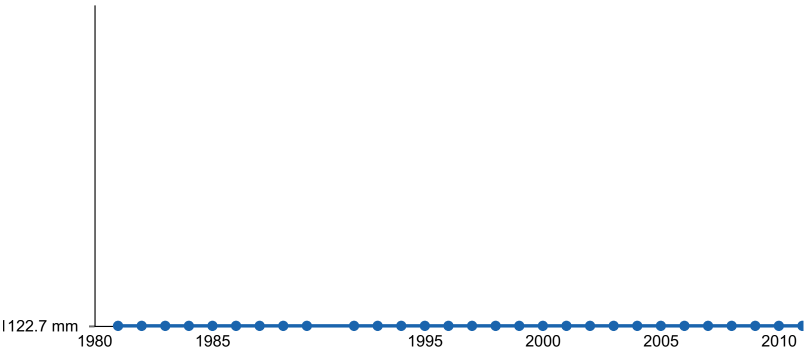

Figure 3. Annual precipitation pattern

Climate stations used

- (1) BARDWELL 2 E [USC00150402], Bardwell, KY
- (2) LOVELACEVILLE [USC00154967], Paducah, KY
- (3) CANTON 4N [USC00221389], Canton, MS
- (4) OAKLEY EXP STN [USC00226476], Raymond, MS
- (5) BOLIVAR WTR WKS [USC00400876], Bolivar, TN
- (6) COVINGTON 3 SW [USC00402108], Covington, TN
- (7) DRESDEN [USC00402600], Dresden, TN
- (8) BATESVILLE 2 SW [USC00220488], Batesville, MS
- (9) GRENADA [USC00223645], Grenada, MS
- (10) SENATOBIA [USC00227921], Coldwater, MS
- (11) COLLIERVILLE [USC00401950], Collierville, TN
- (12) NEWBERN [USC00406471], Newbern, TN
- (13) UNION CITY [USC00409219], Union City, TN
- (14) JACKSON INTL AP [USW00003940], Pearl, MS
- (15) BROOKPORT DAM 52 [USC00110993], Paducah, IL
- (16) MURRAY [USC00155694], Murray, KY

- (17) LEXINGTON [USC00225062], Lexington, MS
- (18) GILBERTSVILLE KY DAM [USC00153223], Gilbertsville, KY
- (19) HOLLY SPRINGS 4 N [USC00224173], Holly Springs, MS
- (20) VICKSBURG MILITARY PK [USC00229216], Vicksburg, MS
- (21) YAZOO CITY 5 NNE [USC00229860], Yazoo City, MS
- (22) MILAN EXP STN [USC00406012], Milan, TN
- (23) PADUCAH [USW00003816], West Paducah, KY

Influencing water features

This site remains flooded or ponded for most or all of the year and is directly influenced by a high water table (groundwater) and overland flow from frequent flooding. Dominant vegetation of the site is comprised of wetland obligates. This site is the classic, alluvial deep water swamp of the Southeast. From a wetland classification perspective, the reference state represents “Palustrine – Forested Wetland”. However, following large-scale disturbances, this site is reset to Palustrine – Emergent Wetland followed by Palustrine – Scrub-Shrub. Natural succession transitions the site back to a wetland forest.

Soil features

Please note that the soils listed in this section of the description may not be all inclusive. There may be additional soils that fit the site’s concepts. Additionally, the soils that provisionally form the concepts of this site may occur elsewhere, either within or outside of the MLRA and may or “may not” have the same geomorphic characteristics or support similar vegetation. Some soil map units and soil series included in this “provisional” ecological site were used as a “best fit” for a particular soil – landform catena during a specific era of soil mapping, regardless of the origin of parent material or the location of MLRA boundaries. Therefore, the listed soils may not be typical for MLRA 134 or a specific location, and the associated soil map units may warrant further investigation in a joint ecological site inventory – soil survey project. When utilizing this provisional description, the user is encouraged to verify that the area of interest meets the appropriate ecological site concepts by reviewing the soils, landform, vegetation, and physical location. If the site concepts do not match the attributes of the area of interest, please review the Similar or Associated Sites listed in the Supporting Information section of this description to determine if another site may be a better fit for your area of interest.

This site is characterized by very deep, poorly drained soils that formed in silty or loamy alluvium. These level to nearly level soils are typically on wide floodplains. The site is subject to frequent flooding and ponding for very long durations for much, if not all, of the year. The seasonally high water table is typically above the soil surface and lasts well into the growing season. Soil reactions generally range from strongly acid to very strongly acid.

The soils of this site are very similar to those of the Northern Wet Alluvial Flat ecological site. The primary difference for this site is that the soils are ponded for very long duration. Hence, a “ponded phase” distinguishes the soils and vegetation communities associated with this site. Unfortunately, this may create misleading information when an accurate distribution of this site is desired. Not every soil survey area (e.g., the individual county soil surveys) recognized or described a ponded phase for alluvial soils. Therefore, the actual distribution of backwater swamps is not precisely represented on the accompanying distribution map. It should be noted that this site may occur as inclusions within many of the large, alluvial soil mapping units that are frequently flooded.

The principal soils associated with this site include the Rosebloom (Fine-silty, mixed, active, acid, thermic Fluvaquentic Endoaquepts), and Waverly (Coarse-silty, mixed, active, acid, thermic Fluvaquentic Endoaquepts) series. Rosebloom soils formed in silty alluvium and have a fine-silty particle-size class. Waverly soils also formed in silty alluvium but have a coarse-silty particle-size class (USDA-NRCS, 2016).

Table 4. Representative soil features

Surface texture	(1) Silt loam (2) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Poorly drained
Permeability class	Moderate

Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	17.27–21.08 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5–5.3
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This ecological site is representative of the fabled southern deep water swamp. Key to the development and occurrence of this ecological site is the presence of standing water for most or all of the year. These wetlands occur in a variety of geomorphic situations (Conner and Buford, 1998). For MLRA 134, they generally form on floodplain concavities or depressions that are situated between natural levees and upland or terrace scarps. Floodplain features that support this site include abandoned river channels or oxbows, relict stream channels or sloughs, and broad depressions that receive a near constant supply of ground and surface water from springs, runoff from receiving tributaries, and overbank flooding from the river. Backswamps can also occur on alluvial fans where they sometimes develop as linear features, especially where they have formed on relict stream channels, channel scours, and sloughs. Occasionally, backswamps form on loess-covered terraces (above the 100-yr flood zone). The latter may occur where runoff from adjoining uplands and/or the conveyance of local streams collect along concavities or depressions between the terrace proper and upland scarp.

Perhaps no other diagnostic feature depicts this site more than the dominant species that characterizes it: bald cypress and water tupelo. Dominance by one or both species may vary by site. Some locations may be comprised almost entirely by cypress whereas other sites may consist of a preponderance of water tupelo. In general, the two form the dominant plant association of this site. Where backswamps occur on smaller floodplain systems, water tupelo may be replaced or accompanied by the closely related swamp tupelo. Reportedly, swamp tupelo may increase in presence and abundance along the margins of alluvial swamps where maximum water depth is less than 2 feet (Eyre, 1980). Of the three species, bald cypress and water tupelo appear to be most tolerant of inundation and may advance into the deepest portion of a swamp when water levels are at their lowest during droughts.

Summarizing the work of others, Mitsch and Gosselink (1993) emphasized the role of a periodic flooding and inundation on the functionality of backwater swamps. They noted that the productivity of swamps were inextricably linked to the local hydrologic conditions. Sites that exhibited the greatest productivity were associated with a pulsing hydroperiod – one directly associated with seasonal overbank flooding followed by a period of drier conditions. Sites that had the poorest productivity were drained areas and/or swamps that were continuously inundated. This is particularly concerning for alluvial swamps that have become disconnected from the associated stream or river through channelization and levee construction. When periodic flooding of an alluvial river swamp is prevented, nutrient rich sediment that is so important to the system may be reduced or halted altogether. In cases where inundation is retained due to artificial means or through the actions of beaver, these continuously flooded low spots will stagnate, which ultimately decreases productivity.

Succession of the bald cypress – water tupelo association is not known or well documented, and some regard it as “arrested” (Hodges, 1997) or a permanent cover type as long as excessive sedimentation does not alter drainage characteristics (Eyre, 1980). Hodges (1997) emphasized that the cypress – tupelo cover type is the oldest association of the alluvial floodplain and stands may survive for 200 to 300 years before canopy breakup occurs. If depositional rates are extremely slow, and barring catastrophic disturbances, some stands may last for even longer periods. Mitsch and Gosselink (1993) referred to the documentation of some cypress stands existing for 400 to 600 years. Nonetheless, this site does occur in a highly dynamic, constantly changing environment. Over time, even the old, low-lying floodplain depressions aggrade, leading to higher positions, better soil drainage, and eventual colonization by other hardwood species such as the overcup oak – water hickory association of the adjoining wet alluvial flats.

Even though these sites are sometimes viewed as timeless, mature cypress – tupelo stands can experience catastrophic disturbances. Some potential stand initiating events include particularly destructive wind and ice storms. Fire in this system is considered to be rare, however destructive fires into and through backwater swamps have occurred, especially during extreme droughts or following artificial drainage (Mitsch and Gosselink, 1993). In situations where the overstory has been removed or where a new backswamp system is just developing, a series of successional transitions (i.e., seral stages) will occur, the rates of which ultimately depend on deposition rates and a naturally connected hydroperiod. One of the dominant pioneer tree species on this site is black willow, which may dominate an area for up to 30 years before breakup or transition to the next vegetation type (Hodges, 1997; Conner and Buford, 1998). If sedimentation rates remain low and the site does not aggrade rapidly, the next seral stage may be characterized by an association of swamp privet, water elm, and buttonbush. This association may then be replaced by the cypress – tupelo type, which again, may endure for hundreds of years (Hodges, 1997).

As alluded to above, the largest and most significant alteration to this site has been channelization and levee (or spoil bank) construction. Such hydrologic alterations have become the norm for floodplains in this MLRA. This action results in a disconnection between the stream - floodplain environment, which interrupts and alters the ecological processes and functions of the system as a whole. Shankman (1993) emphasized that the development of cypress – tupelo swamps were the collective effects of channel migration across the floodplain environment over long periods of time. The disconnection of this natural process via channelization effectively reduces the formation of this natural community (Pierce, 2005). Additionally, many local backswamps have been drained and converted to other uses. For this very reason, reference conditions of this site are modeled after and representative of mature stands occurring in unmodified, low-gradient riverine floodplains.

Following this narrative, a “provisional” state and transition model is provided that includes the “perceived” reference state and several alternative (or altered) vegetation states that have been observed and/or projected for this ecological site. This model is based on limited inventories, literature, expert knowledge, and interpretations. Plant communities will differ across MLRA 134 due to natural variability in climate, soils, and physiography. Depending on objectives, the reference plant community may not necessarily be the management goal.

The environmental and biological characteristics of this site are complex and dynamic. As such, the following diagram suggests pathways that the vegetation on this site might take, given that the modal concepts of climate and soils are met within an area of interest. Specific locations with unique soils and disturbance histories may have alternate pathways that are not represented in the model. This information is intended to show the possibilities within a given set of circumstances and represents the initial steps toward developing a defensible description and model. The model and associated information are subject to change as knowledge increases and new information is garnered. This is an iterative process. Most importantly, local and/or state professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

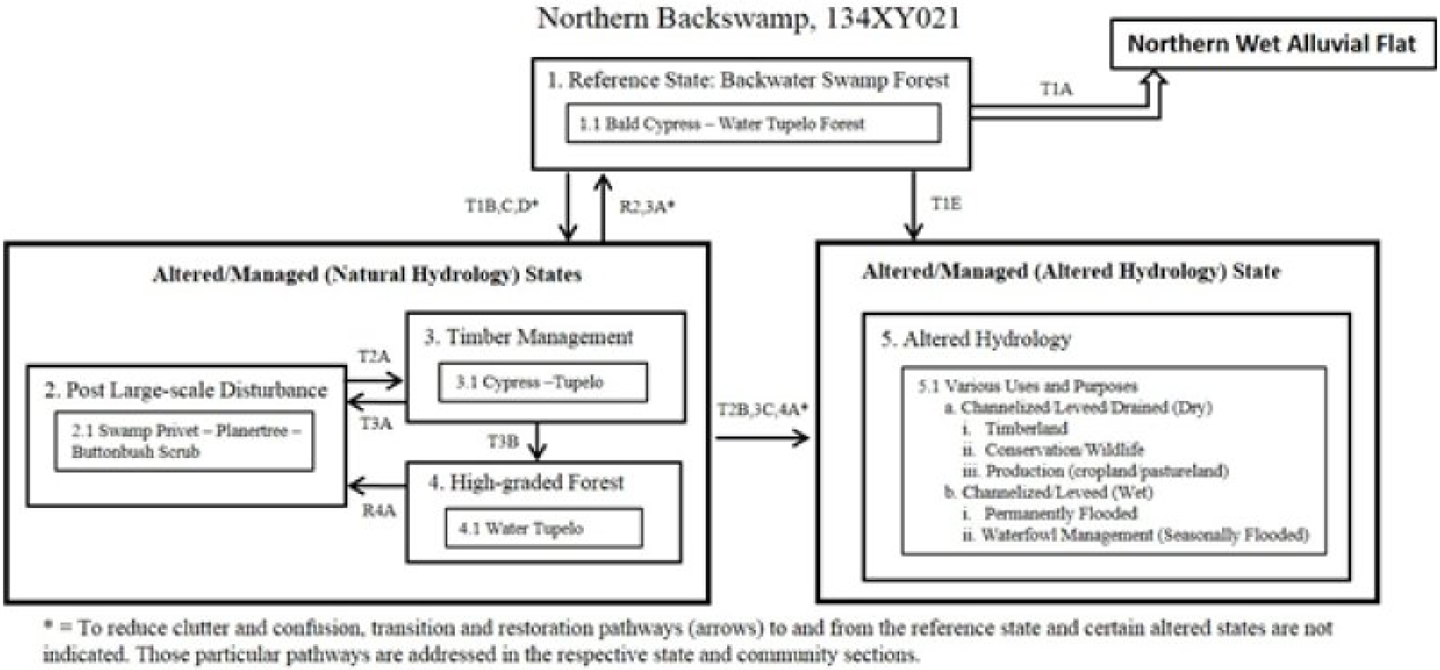

Figure 5. STM - Northern Backswamp

Pathway	Practice
T1A	sediment deposition leading to Northern Wet Alluvial Flat ecological site
T1B, T3A, R4A	large-scale stand initiating disturbance (wind, ice, clearcut; State 2)
T1C	beginning point uneven-aged stand; goal of timber management (State 3)
T1D, T3B,	repeated select harvest of bald cypress (high-grading) (State 4)
T1E, T2B, T3C, T4A	altered hydrology; includes channelization/levee construction and the installation of water control structures for multiple purposes (e.g., wildlife, timberland, agriculture, etc.) (State 5)
T2A,	beginning point even-aged stand; potential planting; competitor control – herbicide/mechanical; TSI (State 3)
R2A, R3A	natural succession over time; may require exotic plant control and reestablishment of missing species (State 1)

Figure 6. Legend - Northern Backswamp

State 1
Backwater Swamp Forest

Perhaps no other landform or ecological system conjures such strong images of the Southeast than the iconic backwater alluvial swamp forest. Towering cypress and broad buttressed tupelo trees provide deep shade over the calm waters that “feed” this venerated system. Yet, this ecological site has experienced tremendous impacts from a variety of activities and uses over the past few centuries. Among the most irrevocable impacts is the draining of these low-lying landforms and converting them to completely different uses. Additional impacts include the disconnection of this site from the rivers and streams that developed it through channelization and levee construction. Therefore, reference conditions for this site are modeled after existing swamps within naturally meandering and free-flowing stream systems. A key characteristic of this ecological site is periodic flooding that generally occurs on a frequent basis. Flood duration of this site may vary by location, landform within the floodplain (e.g., linear slough, lake-edge oxbow swamp, etc.), stream size, and the extent of the drainage basin. In general, flood duration on this site is very long, lasting most if not all of the growing season. Plants that can withstand such long term inundation and such extreme anoxic conditions are relatively few. Two species that can withstand these conditions often co-occur and form the characteristic and dominant natural vegetation of this site, bald cypress and water tupelo. Dominance by either or both of these species and additional associates, such as swamp tupelo, may vary by location and across a range of local hydrodynamics. For instance, swamp tupelo may co-occur with water tupelo along the shallower margins of some sites, or the former may be dominant in smaller stream systems and in the upper reaches of local watersheds. Yet, water tupelo may be the dominant species in some sites and cypress forming an almost monoculture in other locations (Eyre, 1980). Determining the causes of these varying patterns are not always clear, but some dominance patterns may have explanations associated with former disturbances and/or land use actions.

Community 1.1
Bald Cypress – Water Tupelo Forest

This community phase represents the successional stage, composition, and structural complexity of stands supporting perceived reference conditions. This community is representative of maturing stands (late development) occurring within unmodified (non-channelized/non-leveed) floodplains. Natural vegetation of this site is characteristically typed as a bald cypress - water tupelo swamp. Associates commonly occurring include Drummond’s maple, pumpkin ash, and water locust. Species occupying slightly drier positions or where the Northern Wet Alluvial Flat intergrades to the backswamps may include swamp tupelo, overcup oak, water hickory, green ash, sweetgum, willow oak, Nuttall oak, laurel oak, and occasionally swamp cottonwood. Typically, this phase consists of a closed-canopy community, with cover ranging from 60 to 100 percent but with most stands supporting 80 to 90 percent cover. Depending on canopy closure and water depth, the shrub-small tree stratum may range from dense, impenetrable thickets to sparse, local patches that are frequently composed of black willow, common buttonbush, Virginia sweetspire, hazel alder, eastern swamp privet, possumhaw, American snowbell, American hornbeam, and planertree. Herbaceous cover is often patchy with estimates in the 30-percent range, and this layer is frequently interspersed by deep, open water, non-vegetated muck, and woody debris. The herbaceous stratum is often represented by lizard’s tail, green arrow arum, arrowhead, swamp dock, marsh St. Johnswort, savannah-panicgrass, catchfly grass, redtop panic grass, greater bladder sedge, blunt broom sedge, fringed sedge, hop sedge, Louisiana sedge, along with additional forbs and graminoids (NatureServe, 2013). TRANSITION T1A This pathway represents natural sedimentation and aggradation of local swamps, transitioning them to slightly higher and better drainage conditions. The ecological site that borders and forms a transitional zone with the Northern Backswamp is the Northern Wet Alluvial Flat. As sedimentation levels continue to aggrade, components of the latter will filter into the backswamp and eventually assume dominance as the older cypress and tupelo trees begin to breakup. Breakup may affect numbers of the shorter lived water tupelo before affecting the longer lived cypress.

State 2
Post Large-scale Disturbance

This state is characterized by the regeneration or regrowth of a pre-existing forest stand following a major, stand-replacing disturbance. Scale of the disturbance is at the stand level and is greater than one acre in size (Johnson et al., 2009). Potential types of disturbances include catastrophic windstorms, silvicultural clearcuts, and particularly destructive ice storms. Fire may be an additional disturbance, although fire in this hydric system is considered to be very rare (Conner and Buford, 1998; Mitsch and Gosselink, 1993). The resulting even-aged stand (or single-cohort) is set on a new course of development, which is highly dependent upon several critical factors including: the composition and structure of the stand prior to the disturbance; the degree or intensity of the disturbance; size and configuration of the disturbed area (Oliver and Larson, 1990); and sedimentation or deposition rates into the site (Hodges, 1997). Following the destruction of the overstory, a series of seral stages or community transitions and transforms will occur. Depending on water depths and length of the hydroperiod, a predominantly open herbaceous marsh with a secondary shrub-scrub component may represent the first major stage. Later stages will include a predominant small tree – shrub component followed by a transition to young wetland forest. The rapidity or length of these major transitions (seral stages) again, depend directly upon flooding frequency and duration.

Community 2.1
Swamp Privet – Planertree – Buttonbush

This community phase is the reportedly dominant association that develops following disturbance of the cypress – tupelo forest. Initial colonization of the site is anticipated to include herbaceous marsh-like community in complex with released shrubs and small trees. The dominant shrub/small tree component is often black willow before transitioning to a swamp privet – planertree – buttonbush association. The latter may later be replaced by bald cypress and water tupelo forest, which may endure for many years (Hodges, 1997).

State 3
Timber Management

This state represents the breadth of forest management activities on this site. Various management or silvicultural methods can lead to very different structural and compositional results within a managed stand. The range of methods are diverse and include even-aged (e.g., clearcut and shelterwood) and uneven-aged (single tree, diameter-limit, basal area, group selection, etc.) approaches. Included within these methods is an option to reduce competition and achieve maximum growth potential of the desired species. Inherently, these approaches result in different community or “management phases” and possibly alternate states, depending on local floodplain dynamics. This state, as indicated, occurs within floodplains that have not been modified through drainage, channelization, or levee construction. A major limitation of this site is frequent flooding and ponding over long to very long durations. Management activities may need to be adjusted to accommodate those natural conditions. Care should be taken on this site to avoid unscrupulous impacts to the soils and natural vegetation during management and extraction activities. Finding the appropriate approach for a given stand and environment necessitates close consultation with trained, experienced, and knowledgeable forestry professionals. If there is a desire to proceed with this state, it is strongly urged and advised that professional guidance be secured and a well-designed silvicultural plan developed in advance of any work conducted.

Community 3.1
Cypress – Tupelo

This phase represents the prevailing composition and/or association of the species occurring on this site. In general, this wet site is not very productive and species richness is generally low. Because tree diversity is low, any of the regeneration methods mentioned above may result in regeneration of the cypress – tupelo association. The most serious problem that may be encountered is the possibility of no reproduction of the commercially desirable species (typically cypress) following a harvest. This may be primarily due to the absence of advance reproduction beneath the shaded forest. Additional complications arise from the difficulty of germination and seedling development due to excessively long hydroperiods. A dry cycle of several years may be the requirement for advancement of young seedlings in this environment. One possible method for attaining advance reproduction is to thin a particularly dense stand to 130 to approximately 150 square feet per acre during a dry cycle to allow greater sunlight to reach the forest floor. This approach may help to establish new seedlings and a sufficient level of advance reproduction. Once the young trees reach a height greater than normal flooding, a regeneration harvest may be conducted to take advantage of the advance reproduction in the understory (Meadows and Stanturf, 1997).

State 4
High-graded Forest

Forests in this state have undergone repeated select harvests over time. Actions leading to this condition consist of removing the biggest and best trees of the most desirable species and leaving low-quality trees (damaged and deformed) and undesirable species. This action, conducted repeatedly, can cause tremendous shifts in species composition and can decrease the vigor and health of the residual stand. Without implementing carefully prescribed management actions, species composition of extreme high-graded stands may remain in a highly altered condition for many decades, even after large, stand-replacing disturbances resets “successional opportunity.”

Community 4.1
Water Tupelo

Bald cypress is typically the most desirable commercial species of this ecological site. Repeated selective harvests for cypress alone can render affected stands void of any merchantable stems. This action coupled with a typically low market for water tupelo can lead to single-species stands of the latter. Getting cypress back into these types of affected stands can be very problematic and difficult.

State 5
Altered Hydrology

This state is included and intended to capture the range of modifications to the natural hydrology of this site. The largest and most significant alteration to this site has been channelization and levee (or spoil bank) construction. Such hydrologic alterations have become the norm for floodplains in MLRA 134. This action results in a disconnection between the stream - floodplain environment, which interrupts and alters the ecological processes and functions of the system as a whole. Mitsch and Gosselink (1993) noted that the productivity of swamps were inextricably linked to the local hydrologic conditions. Sites that exhibited the greatest productivity were associated with a pulsing hydroperiod – one directly associated with seasonal overbank flooding followed by a period of drier conditions. Sites that had the poorest productivity were drained areas and/or swamps that were continuously inundated. This is particularly concerning for alluvial swamps that have become disconnected from the associated stream or river through channelization and levee construction. When periodic flooding of an alluvial river swamp is prevented, nutrient rich sediment that is so important to the system may be reduced or halted altogether. In cases where inundation is retained due to artificial means or through the actions of beaver, these continuously flooded low spots may stagnate, which ultimately decreases productivity and limits germination and future stand recruitment. Categorizing all modified sites as non-functioning is altogether inaccurate. There are many altered floodplains that still support exemplary stands of southern bottomland hardwoods, and those areas provide numerous resources and incredible benefits. Managed and water-manipulated back-lying swamps and inundated wetlands provide habitat for numerous wildlife species as well as some State-protected rare, threatened, and endangered plants. Because the vast majority of floodplain environments, including backswamps, have incurred some form of modification, the various altered states and major uses warrant recognition. Tremendous conservation benefits can be established in many of these altered areas. The altered hydrology state is "provisionally" included here to begin the process of gathering and tracking additional uses of this site where the natural processes have been modified. Future iterations and inventories should provide full description of the various uses and the conservation measures and actions that are applicable to this site. Of note, a restoration or return pathway from this state to reference conditions is not provided. Too few evidences exist where channelized, leveed, and/or drained backswamps have been restored to the historic, natural hydrodynamics and hydroperiod. However, examples may exist and restoration seems plausible. Wetland environments can be forgiving following former disturbances and modifications. However, the time period required before reference conditions of the bald cypress – water tupelo swamp is realized could be exceedingly long with much management effort involved. Successful restoration ultimately depends on the level of degradation and disruption of a given site.

Community 5.1
Various Uses and Purposes

Although not a legitimate community phase, this category is included here to emphasize the various transitions and modified conditions that occur or have occurred to many backswamps across the Southern Mississippi Valley Loess. The following is not an exhaustive treatment but instead, is provided for tracking purposes and consideration during future description iterations and inventories of this site. Some of the uses below provide incredible conservation opportunities, even in an altered or modified condition. They warrant consideration and recognition.
Channelized/Leveed/Drained (Dry): This is a broad category representing the general condition of most existing and "former" backswamps that are situated on channelized and leveed floodplains. This altered condition pertains to areas where periodic flooding and associated durations have been shortened ("protected" floodplains). Additionally, this category is meant to represent drained or ditched sites as well. Obviously, there is a strong separation and distinction among the two conditions. Within channelized and leveed systems, there are many examples of backswamps and back-lying alluvial flats that are "set aside" for many purposes. Some impressive wildlife management areas and privately managed timberland are situated in these modified environments. State parks and even natural areas have been designated on the floodplains associated with some channelized river systems. Both conservation measures and commercial products are keenly supported and managed in this example. Perhaps the greatest transformations of this site occur within former backswamps that have been drained. Here, hydrologic influences have been so disrupted that these former swamps function as a different ecological site, albeit a heavily altered one. The soils are drier and vegetation response reflects these changes. Uses within these examples may include managed timberland (including pine monocultures), cropland, and pastureland.
Channelized/Leveed/Drained (Wet): This category represents situations where backwater swamps are inundated for much longer periods than what occurred naturally. Various actions may lead to this condition including intentional ponding for waterfowl management and hunting or unintentional consequences of flood water entrapment. The former often consists of various management actions, such as the seasonal manipulation of water levels, to maximize conservation benefits to migratory and resident waterbirds, especially waterfowl. Water entrapment occurs in locations where flood waters become entrapped behind constructed levees, resulting in exceedingly long ponding durations. A similar situation may occur in areas where a former modified channel develops obstructions (e.g., valley plug), leading to levee breaching and stream entrapment behind the breached levee. These situations often become focal areas for beaver colonization, which leads to additional challenges concerning long-term inundation.

Transition T1B

State 1 to 2

This pathway represents a large-scale, stand replacing disturbance, which may be caused by a catastrophic windstorm (e.g., straight-line winds, tornado), ice storm, severe fire, or a silvicultural clearcut. For this stressor to occur, most or all of the overstory must be removed or destroyed. A few residual trees may persist, but overall, the disturbance must be intensive enough, at least one acre or larger (Johnson et al., 2009), that a new, even-aged stand is created.

Transition T1C
State 1 to 3

This pathway consists of prescribed silvicultural activities specifically designed to meet stand compositional and production objectives. Activities may include release cuttings and/or basal area reductions to aide advance regeneration. A variety of silvilcultural methods may be employed including group selection, single tree selection harvests (all classes/condition; avoid “high-grading”), or even-age management (clearcut).

Transition T1D
State 1 to 4

This pathway represents repeated, single-tree, selective harvests and leaving behind undesirable species. In this case, cypress is generally the preferred species, which can effectively remove it from local stands, leaving water tupelo as the dominant species (sometimes the only species) in its place.

Transition T1E
State 1 to 5

This pathway represents an alteration or modification of the natural hydrodynamics of the site, which may include stream channelization, levee construction, draining, and/or establishment of water control structures to artificially manipulate the hydroperiod.

Restoration pathway R2A
State 2 to 1

This pathway represents a return to reference conditions through natural succession, if the disturbance occurred within the reference community. Depending upon objectives and stand condition, management activities to aide recovery may include exotic species control and silvicultural treatment that benefits cypress regeneration and establishment (e.g., artificial regeneration, advance regeneration). This pathway will occur only under the natural hydrologic regime (i.e., naturally meandering channel with no levees). It should be noted that a return to reference conditions requires that the natural hydrodynamics must be restored to the system, if alteration occurred. (Of note, exceptional conservation measures may be implemented in hydrologically altered systems, but the natural ecological processes and functions between the stream and its associated floodplain remains disconnected and all resulting actions remain in an altered state.)

Transition T2A
State 2 to 3

This pathway consists of prescribed silvicultural activities specifically designed to meet stand compositional and production objectives. Activities may include release cuttings and/or basal area reductions to aide advance regeneration. A variety of silvilcultural methods may be employed including group selection, single tree selection harvests (all classes/condition; avoid “high-grading”), or even-age management (clearcut).

Transition T2B
State 2 to 5

This pathway represents an alteration or modification of the natural hydrodynamics of the site, which may include stream channelization, levee construction, draining, and/or establishment of water control structures to artificially manipulate the hydroperiod.

Restoration pathway R3A
State 3 to 1

Natural succession over a period of time may transition a former timber-managed stand to one supporting reference conditions. Some question remains whether a return to reference conditions will occur in every situation, especially since some components may have been either selectively culled or their numbers dangerously reduced from the stand (e.g., bald cypress). Management activities to aide recovery may include exotic species control, artificial regeneration during dry cycles, and silvicultural treatments.

Transition T3A
State 3 to 2

This pathway represents a large-scale, stand replacing disturbance, which may be caused by a catastrophic windstorm (e.g., straight-line winds, tornado), ice storm, severe fire, or a silvicultural clearcut. For this stressor to occur, most or all of the overstory must be removed or destroyed. A few residual trees may persist, but overall, the disturbance must be intensive enough, at least one acre or larger (Johnson et al., 2009), that a new, even-aged stand is created.

Transition T3B
State 3 to 4

This pathway represents repeated, single-tree, selective harvests and leaving behind undesirable species. In this case, cypress is generally the preferred species, which can effectively remove it from local stands, leaving water tupelo as the dominant species (sometimes the only species) in its place.

Transition T3C
State 3 to 5

This pathway represents an alteration or modification of the natural hydrodynamics of the site, which may include stream channelization, levee construction, draining, and/or establishment of water control structures to artificially manipulate the hydroperiod.

Restoration pathway R4A
State 4 to 2

This pathway represents a large-scale, stand replacing disturbance, which may be caused by a catastrophic windstorm (e.g., straight-line winds, tornado), ice storm, severe fire, or a silvicultural clearcut. For this stressor to occur, most or all of the overstory must be removed or destroyed. A few residual trees may persist, but overall, the disturbance must be intensive enough, at least one acre or larger (Johnson et al., 2009), that a new, even-aged stand is created. For high-graded stands, this pathway via clearcutting may be the first important step toward establishing cypress back into an affected site.

Transition T4A
State 4 to 5

This pathway represents an alteration or modification of the natural hydrodynamics of the site, which may include stream channelization, levee construction, draining, and/or establishment of water control structures to artificially manipulate the hydroperiod.

Additional community tables

Other references

Braun, E.L. 1950. Deciduous Forests of Eastern North America. Hafner Press, New York. 596 p.

Chapman, S.S, G.E. Griffith, J.M. Omernik, J.A. Comstock, M.C. Beiser, and D. Johnson. 2004. Ecoregions of Mississippi (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S.

Geological Survey (map scale 1:1,000,000).

Conner, W.H. and M.A. Buford. 1998. Southern deepwater swamps. p.:261-287. In: Messina, M.G. and W.H. Conner (eds.). Southern forested wetlands: ecology and management. Boca Raton, FL: Lewis Publishers/CRC Press. 616 p.

Eyre, F.H. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington, DC. 148 p.

Hodges, J.D. 1997. Development and ecology of bottomland hardwood sites. Forest Ecology and Management 90:117-125.

Johnson, P.S., S.R. Shifley, and R. Rogers. 2009. The Ecology and Silviculture of Oaks. 2nd Edition. CABI, Cambridge, MA. 580 p.

LANDFIRE. 2008. LANDFIRE Biophysical Setting Models. Biophysical Setting 45. (2008, February - last update). Homepage of the LANDFIRE Project, U.S. Department of Agriculture, Forest Service; U.S. Department of Interior, [Online]. Available:
http://www.landfire.gov/index.php (Accessed: 1 July 2014).

McNab, W.H.; Cleland, D.T.; Freeouf, J.A.; Keys, Jr., J.E.; Nowacki, G.J.; Carpenter, C.A., comps. 2005. Description of ecological subregions: sections of the conterminous United States [CD-ROM]. Washington, DC: U.S. Department of Agriculture, Forest Service. 80 p.

Meadows, J.S. and J.A. Stanturf. 1997. Silvicultural systems for southern bottomland hardwoods. Forest Ecology and Management 90:127-140.

Mitsch, W.J. and J.G. Gosselink. 1993. Wetlands. Second Edition. Van Nostrand Reinhold Co., New York, NY. 722 p.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available: http://www.natureserve.org/explorer. (Accessed: 8 August 2012).

NatureServe. 2013. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: April 1, 2013).

Oliver, C.D. and B.C. Larson. 1990. Forest Stand Dynamics. McGraw Hill, Inc., New York, NY. 476 p.

Pierce, A.R. 2005. Sedimentation, hydrology, and bottomland hardwood forest succession in altered and unaltered tributaries of the Hatchie River, TN. Ph.D. Dissertation. University of Tennessee, Knoxville, TN.

Shankman, D. 1993. Channel migration and vegetation patterns in the southeastern Coastal Plain. Conservation Biology 7(1):176-183.

[USDA-NRCS] United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

[USDA-NRCS] United States Department of Agriculture, Natural Resources Conservation Service. 2016. Official Soil Series Descriptions. Available online: https://soilseries.sc.egov.usda.gov/osdname.asp. (Accessed: 17 May 2016).

Wilder, T. C. and T.H. Roberts. 2002. A regional guidebook for applying the hydrogeomorphic approach to assessing wetland functions of low-gradient riverine wetlands in western Tennessee. ERDC/EL TR-02-6, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Contributors

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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	
Approved by	
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:**

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

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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:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
