# Ecological site F137XY020SC
# Hillside Seep

Last updated: 5/19/2025
Accessed: 08/21/2026

## 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): 137X–Carolina and Georgia Sand Hills

MLRA 137 covers approximately 8,665 square miles (22,450 square kilometers) in the states of South Carolina (44 percent), Georgia (34 percent), and North Carolina (21 percent). The Sand Hills region occurs below the "fall line", which delineates the older crystalline rocks of the Southern Piedmont (MLRA 136) from the younger sediments of the Southern Coastal Plain (MLRA 133A). The term "fall line" came about because the rivers of the Piedmont cut downward through hard bedrock to meet the lower Coastal Plain sediments. The elevational change is evident in the waterfalls and rapids that occur along this transitional line. This region is underlain by unconsolidated sediments deposited during the Cretaceous period. Overlying these sediments is the late Miocene to early Pliocene Pinehurst Formation. The Pinehurst Formation is of windblown or eolian origin. Soils in this formation are the subject of this ecological site. Deposits of kaolin and high-silica sands are found across the area and are often mined. This MLRA has an average annual precipitation of 40 to 50 inches (1,025 to 1,278 millimeters). The maximum precipitation occurs in midsummer during high-intensity, convective thunderstorms. The minimum precipitation occurs in autumn. Snowfall is light if it occurs at all. The average annual temperature is 60 to 65 degrees F (16 to 18 degrees C). The freeze-free period averages 250 days and ranges from 220 to 280 days, increasing in length from north to the south (USDA-NRCS 2022).

## Classification relationships

APPLICABLE USNVC ASSOCIATIONS CEGL004468 Gaylussacia frondosa - Clethra alnifolia - Arundinaria tecta / Aristida stricta - Pteridium aquilinum var. pseudocaudatum; CEGL004467 Clethra alnifolia - Toxicodendron vernix / Aristida stricta - Osmunda cinnamomea - Sarracenia spp. (USNVC 2023) APPLICABLE EPA ECOREGIONS Level III: 65. Southeastern Plains Level IV: 65c. Sand Hills (EPA 2013). APPLICABLE USFS ECOLOGICAL UNITS Domain: Humid Temperate Division: Subtropical Ecological province: 232. Outer Coastal Plain Mixed Forest Ecological section: 232J. Southern Atlantic Coastal Plains and Flatwoods Ecological subsection: 232Ja. Sand Hills (Cleland et al. 2007). Based on the USGS physiographic classification system (Fenneman and Johnson 1946), most of MLRA 137 is in the Sea Island section of the Coastal Plain province, in the Atlantic Plain division.

## Ecological site concept

This ecological site includes small, localized seepage-fed herbaceous or shrub-herb wetlands found on hillslopes and other inclined surfaces, which form in areas where an aquitard forces shallow groundwater to the surface. Hillside seeps of the Sandhills region are generally small-patch communities found on middle to lower slopes. They may occur as isolated seepage areas or as ecotonal communities between drier longleaf pine-dominated uplands and wetter seepage-fed streamheads. The water chemistry of these wetlands is usually nutrient-poor and acidic. Wildlife habitat is the dominant land use. Soils on this ecological site are typically very deep, poorly drained Ultisols. Surface layers are typically sandy but become finer with depth. A seasonal high water table is found at depths between 0 to 12 inches. ES CHARACTERISTICS SUMMARY • Occurs in small patches on slopes • Flooding from streams does not occur, though free water may be found at or near the surface in late winter and early spring • Soils are poorly drained, with a seasonal high water table within 12 inches of the soil surface

## Associated sites

| | |
|---|---|
| **F137XY030SC** | **Seasonally Wet Lowland and Valley Slope**<br><br>Often in close proximity to this ecological site, in the surrounding longleaf pine-dominated uplands that historically covered most of the landscape. Although landscape position can be similar, the seasonal high water table is deeper and groundwater discharge is absent. |
| **F137XY010SC** | **Flood Plains And Seepage Swamps**<br><br>Generally in lower landscape positions in seepage-fed drainageways, streamheads, and small stream bottoms. These sites are generally more prone to flooding and less prone to fire. Though the vegetation can be similar, species diversity is typically lower and a significant herb component is usually absent. |
| **F137XY050GA** | **Loamy Backslope Woodland**<br><br>Generally in higher landscape positions, in drier longleaf pine-dominated uplands. The seasonally high water table is much deeper. |
| **F137XY080SC** | **Dry Sandy Backslope Woodland**<br><br>Generally in higher landscape positions, in drier longleaf pine-dominated uplands. Soils are sandier throughout and the seasonal high water table is much deeper. |

## Similar sites

| | |
|---|---|
| **F137XY010SC** | **Flood Plains And Seepage Swamps**<br><br>Not on slopes. Flooding frequency is frequent to occasional. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Clethra alnifolia*<br>(2) *Gaylussacia frondosa* |
| Herbaceous | (1) *Osmunda cinnamomea*<br>(2) *Aristida* |

## Physiographic features

Hillside seeps of the Sandhills are found on gentle to steep slopes, over substrates where a more permeable layer overlies a less permeable layer at some depth, causing water to move laterally under the surface. These conditions are common in the Sandhills region, where younger and coarser eolian sediments often overly older and finer marine sediments. These seeps are usually found in lower landscape positions, on footslopes and toeslopes, or on slope breaks. Some seeps occur in distinctive amphitheater-shaped indentations in the slope. This configuration is likely a product of groundwater sapping, an erosional process unique to groundwater discharge (Schafale 2012a).

**Figure 1. Landscape-vegetation relationships of a typical hill in the Sandhills region, where localized seepage areas can often be found at the foot of slopes (Wells and Shunk 1931).**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Hillslope profile | (1) Footslope<br>(2) Toeslope |
| Landforms | (1) Sandhills > Hill<br>(2) Sandhills > Marine terrace |
| Runoff class | High to very high |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 50 – 80 m |
| Slope | 0 – 10 % |
| Water table depth | 0 – 30 cm |
| Aspect | Aspect is not a significant factor |

**Table 3. Representative physiographic features (actual ranges)**

| | |
|---|---|
| Runoff class | Negligible to very high |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 50 – 130 m |
| Slope | 0 – 20 % |
| Water table depth | 0 – 30 cm |

### Climatic features

On this ecological site, the average mean annual precipitation is 46 inches. On average, June, July, and August are the rainiest months. On average, December and January are the coldest months, while July and August are the warmest.

**Table 4 Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 180-210 days |
| Freeze-free period (characteristic range) | 210-250 days |
| Precipitation total (characteristic range) | 1,140-1,220 mm |
| Frost-free period (actual range) | 170-230 days |
| Freeze-free period (actual range) | 200-270 days |
| Precipitation total (actual range) | 1,120-1,270 mm |
| Frost-free period (average) | 190 days |
| Freeze-free period (average) | 230 days |
| Precipitation total (average) | 1,170 mm |

- (1) POPE AFB [USW00013714], Fort Bragg, NC
- (2) JACKSON SPRINGS 5 WNW [USC00314464], Jackson Springs, NC
- (3) HAMLET [USC00313784], Hamlet, NC
- (4) CHESTERFIELD 3 E [USC00381645], Chesterfield, SC
- (5) CHERAW [USC00381588], Cheraw, SC
- (6) PAGELAND [USC00386616], Pageland, SC
- (7) CAMDEN 3 W [USC00381310], Camden, SC
- (8) COLUMBIA [USW00013883], West Columbia, SC
- (9) PELION 4 NW [USC00386775], Pelion, SC
- (10) JOHNSTON 4 SW [USC00384607], Johnston, SC
- (11) AIKEN 5SE [USC00380074], Aiken, SC
- (12) AUGUSTA DANIEL FLD AP [USW00013837], Augusta, GA
- (13) AUGUSTA BUSH FLD AP [USW00003820], Augusta, GA
- (14) IRWINTON 4 WNW [USC00094594], Gordon, GA
- (15) MACON MIDDLE GA RGNL AP [USW00003813], Macon, GA
- (16) WARNER ROBINS [USC00099124], Warner Robins, GA
- (17) BYRON EXP STN [USC00091448], Byron, GA
- (18) COLUMBUS METRO AP [USW00093842], Columbus, GA

### Influencing water features

Though seasonal groundwater discharge often occurs during late winter and early spring, this ecological site sits well above any flooding that may occur from nearby streams. A seasonal high water table is found at depths between 0 to 12 inches, typically during the months of November through April. During these months, free water is often found at or near the surface.

### Wetland description

In the reference state, wetlands on this ecological site typically classify as one of the following according to the Cowardin system (Cowardin 1979).

System: Palustrine

Class: Scrub-Shrub
Subclass: Broad-leaved deciduous
Water Regime: Saturated
Water Chemistry: Fresh, acid
Soil: Mineral

System: Palustrine
Class: Emergent
Subclass: Nonpersistent
Water Regime: Saturated
Water Chemistry: Fresh, acid
Soil: Mineral

## Soil features

Soils on this ecological site are typically very deep, poorly drained Ultisols. Redoximorphic features (iron and/or manganese depletions) are found at depths between 0 to 12 inches and below. Soils are typically sandy to loamy at the surface, becoming finer with depth. Parent materials are marine sediments.

Soils associated with this ecological site are typically minor components, representing small dissimilar inclusions within a drier map unit concept. Representative soils include the Rains and Ogeechee series, but several other soil series may apply to unnamed inclusions in soil map units.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Marine deposits |
| Surface texture | (1) Sandy loam<br>(2) Loamy sand |
| Drainage class | Poorly drained |
| Permeability class | Slow |
| Soil depth | 200 cm |
| Surface fragment cover <=3" | Not specified |
| Surface fragment cover >3" | Not specified |
| Available water capacity (0-203.2cm) | 15.24 – 20.32 cm |
| Soil reaction (1:1 water) (0-101.6cm) | 0 – 5.5 |

| | |
|---|---|
| Subsurface fragment volume <=3" (0-203.2cm) | Not specified |
| Subsurface fragment volume >3" (0-203.2cm) | Not specified |

**Table 6. Representative soil features (actual values)**

| | |
|---|---|
| Drainage class | Poorly drained |
| Permeability class | Slow to moderate |
| Soil depth | 200 cm |
| Surface fragment cover <=3" | 0 % |
| Surface fragment cover >3" | 0 % |
| Available water capacity (0-203.2cm) | 15.24 – 25.4 cm |
| Soil reaction (1:1 water) (0-101.6cm) | 0 – 10 |
| Subsurface fragment volume <=3" (0-203.2cm) | 0 % |
| Subsurface fragment volume >3" (0-203.2cm) | 0 % |

## Ecological dynamics

U.S. National Vegetation Classification (USNVC) associations that are consistent with reference conditions on this ecological site include CEGL004468 Gaylussacia frondosa - Clethra alnifolia - Arundinaria tecta / Aristida stricta - Pteridium aquilinum var. pseudocaudatum, and CEGL004467 Clethra alnifolia - Toxicodendron vernix / Aristida stricta - Osmunda cinnamomea - Sarracenia spp., with the latter representing the innermost zone and the former representing the slightly drier, outer zone (USNVC 2023).

Hillside seeps of the Sandhills region are small, localized seepage-fed slope wetlands. In the reference state, with frequent fire, herb and shrubs dominate, though widely spaced trees can also be present. These wetlands are usually heterogeneous in cover and often visibly zoned in response to gradients of soil wetness and fire penetration. While seeps with little recent fire may be covered with shrubs throughout, even frequently burned seeps often have a wetter inner zone dominated by woody plants.

Wetlands of this type are known colloquially as seepage bogs. However, the term "bog," as applied here, is a technical misnomer, since these environments are not true peatlands, but rather nutrient-poor mineral wetlands with only limited organic matter accumulation at the surface. Further, these wetlands are not solely fed by precipitation, as they receive shallow groundwater from upslope. This term however, is widely used in the southeastern United States as a label for open, acidic seepage wetlands. This term will be retained here (for simplicity) to maintain congruence with other literary sources.

Seepage bogs of the Sandhills are extremely dependent on fire to maintain their open structure and characteristic herb diversity. Without fire, shrubs quickly expand to cover the entire site, and herb cover can be reduced or eliminated. Though fire ordinarily spreads from the surrounding longleaf pine-dominated uplands, the interaction of fire between drier uplands and seepage-fed wetlands is complex.

Many seeps show evidence of variable fire penetration, with a tall, unburned shrub zone in the center, a zone of intermediate fire penetration away from this zone, and a more frequently burned outer zone along the margins. These communities likely exhibited significant temporal variation, with shrub cover expanding and contracting over time. While the outer zone will likely burn every time fire moves across the landscape, the wetter inner zones usually dampen the spread of fire toward the center. Even if ignited, the innermost zone does not usually carry fire efficiently except during dry spells. However, as the source of ground water is local, shallow, and has limited residence time, the hydroperiod can vary greatly from year to year, periodically allowing fire to infiltrate the seep's innermost zone, while also allowing upland species to establish along its margins.

This ecological site is one of the principle habitat for the pine barrens tree frog (Hyla andersonii), a protected species found in wetlands of the Sandhills region. These frogs generally prefer acidic wetlands and are often found in the shrubbery around seepages. This species requires small-diameter woody vegetation for calling posts, which are found readily on this ecological site. Other wildlife that utilize hillside seeps include the Swainson’s warbler (Limnothlypis swainsonii), the prairie warbler (Dendroica discolor), the American woodcock (Scolopax minor), and the great crested flycatcher (Myiarchus crinitus) (Means and Moler 1979; Barry 1980; Wharton et al. 1978; Nelson 1986; Schafale and Weakley 1990; Peet 2007; USFWS 2010, 2014; Schafale 2012a, 2012b; Edwards et al. 2013; SCDNR 2015).

Canopy layer (where present): Pinus serotina, Liriodendron tulipifera, Acer rubrum, Persea palustris, Magnolia virginiana, Pinus palustris,

Shrub layer: Clethra alnifolia, Gaylussacia frondosa, Toxicodendron vernix, Arundinaria tecta, Kalmia latifolia, Leiophyllum buxifolium, Smilax laurifolia, Cyrilla racemiflora, Ilex glabra, Lyonia ligustrina, Lyonia mariana, Lyonia lucida, Vaccinium fuscatum, Kalmia carolina, Alnus serrulata, Viburnum nudum, Ilex opaca, Morella caroliniensis, Aronia arbutifolia, Kalmia cuneata, Amelanchier obovalis, Lindera subcoriacea, Rhododendron atlanticum, Fothergilla gardenii

Herb layer – forbs: Osmunda cinnamomea, Sarracenia spp. (rubra, purpurea var. venosa, flava), Xyris spp. (caroliniana, platylepis, scabrifolia, ambigua, chapmanii), Eupatorium spp. (pilosum, rotundifolium, leucolepis), Polygala lutea, Sphagnum spp., Lobelia nuttallii, Lobelia batsonii, Rhexia spp. (petiolata, lutea, alifanus, mariana), Utricularia spp., Woodwardia areolata, Pycnanthemum flexuosum, Woodwardia virginica, Bidens aristosa, Solidago salicina, Symphyotrichum dumosum, Osmunda spectabilis, Hexastylis sorriei, Calopogon tuberosus, Pogonia ophioglossoides, Cleistes divaricata, Cleistes bifaria, Spiranthes cernua, Lycopodium spp., Platanthera ciliaris, Anchistea virginica, Erigeron vernus, Desmodium tenuifolium, Pinguicula caerulea, Lilium catesbaei, Asclepias rubra, Burmannia biflora, Lysimachia asperulifolia, Platanthera clavellate, Lachnocaulon anceps, Marshallia graminifolia, Eryngium integrifolium, Gentiana autumnalis, Syngonanthus flavidulus, Pyxidanthera barbulata, Oxypolis ternata, Drosera spp. (capillaris, brevifolia, rotundifolia), Coreopsis linifolia, Doellingeria sericocarpoides, Chaptalia tomentosa, Ludwigia hirtella, Ludwigia virgata, Eriocaulon decangulare, Eriocaulon texense, Calopogon barbatus, Eriophorum virginicum, Triantha racemosa, Lilium pyrophilum

Herb layer – graminoids: Aristida stricta, Aristida beyrichiana, Ctenium aromaticum, Muhlenbergia expansa, Andropogon spp., Dichanthelium strigosum, Dichanthelium dichotomum var. ensifolium, Chasmanthium laxum, Glyceria obtusa, Scleria triglomerata, Scleria ciliata, Calamovilfa brevipilis, Fimbristylis spp., Juncus scirpoides, Carex collinsii, Carex styloflexa, Sporobolus pinetorum,

## State and transition model

## Additional community tables

**Table 7. Community 1.1 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|

**Table 8. Community 1.2 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|

**Table 9. Community 1.3 plant community composition**

| Group | Common Name | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|---|---|---|---|---|---|

## Inventory data references

Data collection and analysis of field data will be performed during the Verification Stage of ESD development.

## Other references


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## Contributors


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## Approval

Matthew Duvall, 5/19/2025

## 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 | 08/21/2026 |
| 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):**

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

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

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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:**

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