Ecological site F154XA006FL
Dry White Sand Scrubs

Last updated: 2/21/2024
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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): 154X–South-Central Florida Ridge

MLRA 154 is entirely in Peninsular Florida, and contains 8,285 square miles. The landscape of MLRA 154 is characterized by a series of parallel, prominent sandy ridges of Pleistocene marine origin, including the Brooksville and Mount Dora Ridges. These North to South oriented parallel ridges are interspersed with more low lying physiographic provinces, including: upland hills, plains, valleys and gaps (Puri and Vernon, 1964). The extreme western portion of the MLRA consists of thin belt of coastal lowlands and marshlands.

Many of the soils of MLRA 154 are Pleistocene or Holocene sands that are underlain with older, loamy Pliocene marine sediments (Cypresshead formation) or the clayey Miocene marine sediments (Hawthorne formation). A combination of marine depositional events and the dissolution of underlying limestone (karst geology) is responsible for surficial topography throughout Peninsular Florida.

Classification relationships

All portions of the geographical range of this site falls under the following ecological / land classifications including:

-Environmental Protection Agency’s Level 3 and 4 Ecoregions of Florida: 75 Southern Coastal Plain; 75c Central Florida Ridges and Uplands (Griffith, G. E., Omernik, J. M., & Pierson, S. M., 2013)

-Florida Natural Area Inventory, 2010 Edition: Scrub (State 1) and Xeric Hammock (State 2) (FNAI, 2010)

Ecological site concept

The central concept of the Dry White Sand Scrubs is very deep, white, acid sands that are infertile and droughty. The map unit components of this site occur on low gradient slopes of <5%. Soils are very deep, infertile, excessively drained sands (St. Lucie series). These sands are uncoated, droughty, white, and lack any evidence of a seasonal high water table.

This site is limited to the Central Valley, Mount Dora Ridge, and Marion Upland physiographic units in MLRA 154.

Associated sites

R154XX001FL	**Yellow Sands Xeric Uplands** These sites are excessively well drained and will occur on slightly higher, more xeric landscape positions
F154XX002FL	**Xeric Bicolor Sandy Uplands** These sites are excessively well drained and will occur on slightly higher, more xeric landscape positions
F154XA003FL	**Dry Yellow Sands Pine Woodland** These sites are excessively well drained and will occur on slightly higher, more xeric landscape positions

F154XA009FL	**Moist Basic Pine Uplands** These sites are well drained and will occur on slightly lower, more mesic landscape positions

Similar sites

R154XX001FL	**Yellow Sands Xeric Uplands** These sites will be found on slightly higher landscape positions with a depth to seasonal high water table greater than 152 cm. Natural vegetation, management, and land use history will differ drastically due to this very deep, undeveloped yellow sands upland site.
F154XX002FL	**Xeric Bicolor Sandy Uplands** These sites will be found on slightly higher landscape positions with a depth to seasonal high water table greater than 152 cm. Natural vegetation, management, and land use history will differ drastically due to this very deep, undeveloped white and multicolor sands upland site.
F154XA003FL	**Dry Yellow Sands Pine Woodland** These sites will be found on slightly higher landscape positions with a depth to seasonal high water table greater than 152 cm. Natural vegetation, management, and land use history will differ drastically due to this deep, undeveloped yellow sands upland site.

Table 1. Dominant plant species

Tree	(1) *Pinus clausa* (2) *Quercus geminata*
Shrub	(1) *Quercus chapmanii* (2) *Quercus inopina*
Herbaceous	(1) *Rhynchospora megalocarpa* (2) *Bulbostylis ciliatifolia*

Physiographic features

The physiography of the area is among the best defined in Peninsular Florida with rolling topography consisting of ridges, hills, and dunes interspersed with low-lying valleys, depressions, and drainageways. The entire area is located within the Floridian Section of the Coastal Plain Province of the Atlantic Plain. Elevations for this site range from 49 to 197 feet (15 to 60 m).

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope (2) Summit
Landforms	(1) Marine terrace > Ridge
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	3–40 m
Slope	0–8%
Ponding depth	0 cm
Water table depth	203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate varies considerably across the latitudinal gradient of MLRA 154. The north to south orientation of MLRA 154 spans three USDA plant hardiness zones in the Florida Peninsula (USDA-ARS).

The climate is characterized by humid subtropical with long hot summers and mild winters. In the winter months, Canadian air masses move across Peninsular Florida and produce cool, cloudy, rainy weather. Below freezing temperatures are occasional in the northern sections of the MLRA, but very rare in the southern. Overall, there are typically fewer than 30 days of the year with below freezing temperatures in MLRA 154.

Similarly, average temperatures vary considerably from north to south over the range of the site. Average seasonal low temperature in the northern areas is 12.7°C in January, and prolonged freezing temperatures are common in the winter months. In contrast, the southern areas have more uniformity of seasonal temperatures and winter freezes are rare.

Table 3. Representative climatic features

Frost-free period (characteristic range)	263-365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	1,295-1,372 mm
Frost-free period (actual range)	225-365 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	1,270-1,372 mm
Frost-free period (average)	319 days
Freeze-free period (average)	365 days
Precipitation total (average)	1,321 mm

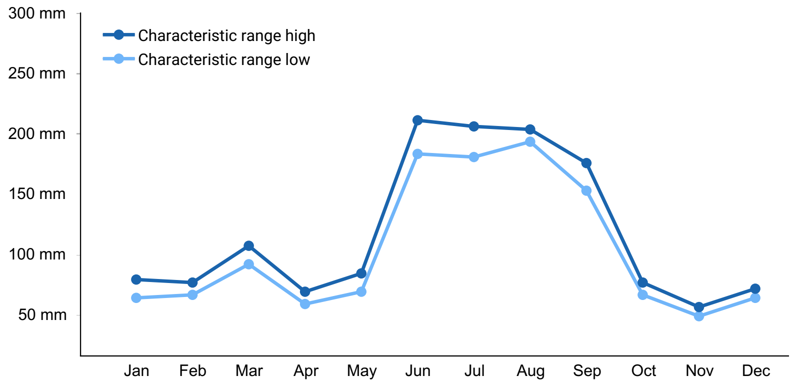

Figure 1. Monthly precipitation range

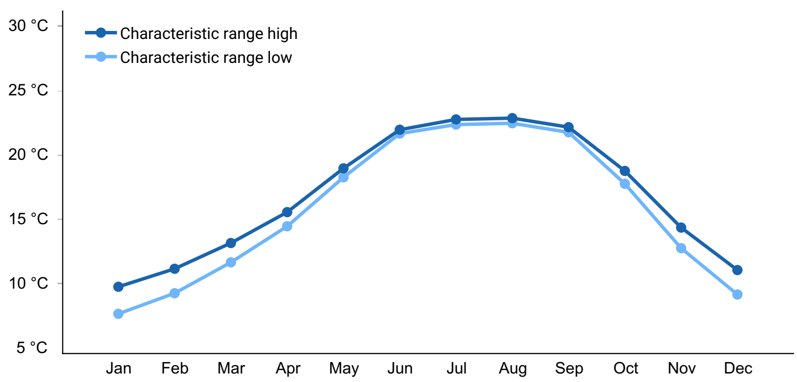

Figure 2. Monthly minimum temperature range

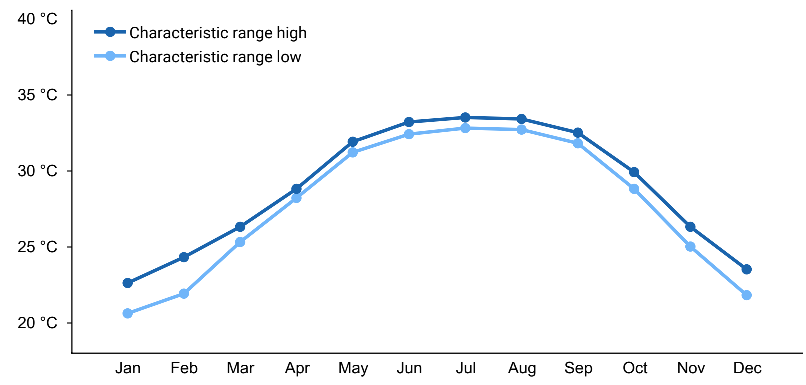

Figure 3. Monthly maximum temperature range

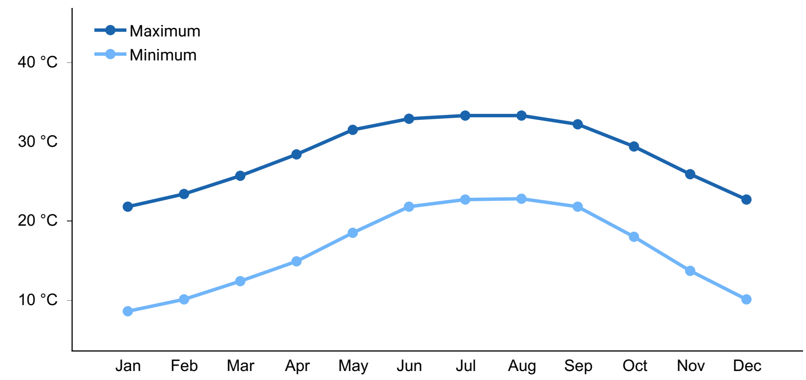

Figure 4. Monthly average minimum and maximum temperature

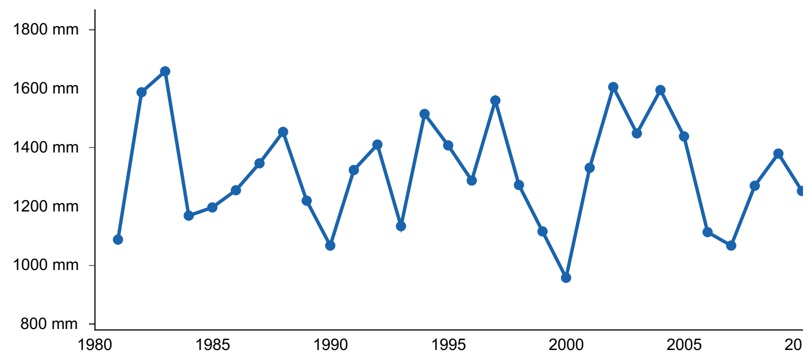

Figure 5. Annual precipitation pattern

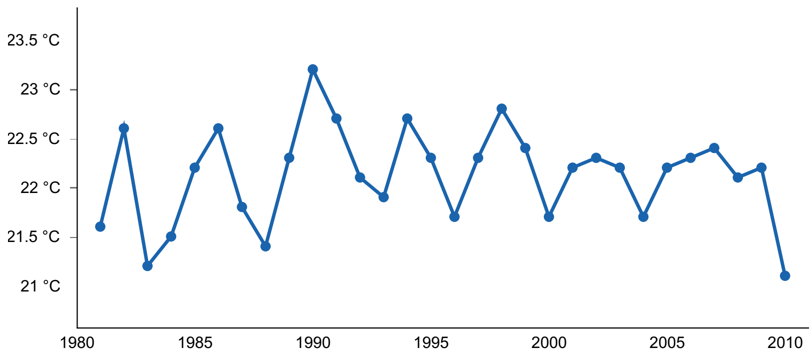

Figure 6. Annual average temperature pattern

Climate stations used

- (1) CLERMONT 9 S [USC00081641], Clermont, FL
- (2) INVERNESS 3 SE [USC00084289], Inverness, FL
- (3) ORANGE SPRINGS 2SSW [USC00086618], Fort Mc Coy, FL

- (4) BROOKSVILLE CHIN HILL [USC00081046], Brooksville, FL
- (5) PLANT CITY [USC00087205], Plant City, FL
- (6) TARPON SPGS SEWAGE PL [USC00088824], Tarpon Springs, FL
- (7) BARTOW [USC00080478], Bartow, FL
- (8) MTN LAKE [USC00085973], Lake Wales, FL
- (9) SAINT LEO [USC00087851], San Antonio, FL
- (10) LAKE ALFRED EXP STN [USC00084707], Haines City, FL
- (11) LISBON [USC00085076], Leesburg, FL

Influencing water features

Most of this site occurs as isolated, fragmented scrublands on ridges surrounded by wetter environments. Soils have very deep seasonal high water tables (usually > 80 inches). Low slope gradient and very rapid infiltration and saturated hydraulic conductivity results in negligible or very low surface runoff. Subsurface water flow is dependent on the presence or absence of an aquitard (loamy or clayey layer). The presence, depth, and orientation of this water restrictive layer may affect subsurface water movement.

Given the isolated settings and hydrologic differences of surrounding areas, this site has a very abrupt ecotone which dramatically shifts species composition from scrublands to wetter sites within short distances. Some deep rooted species of this plant community are able to tap into the very deep seasonal high water table.

Local precipitation comprises the sole source of water inputs of this site. Rainwater infiltrates the soil to the Florida Aquifer or through seepage or local runoff to adjacent wetter sites. Slope gradient, very rapid infiltration, and saturated hydraulic conductivity results in negligible to very low surface runoff.

Soil features

Soils are excessively drained, uncoated Typic Quartzipsamments, and are classified as St. Lucie sands and fine sands. These white sands are eolian or marine sediments. Slopes range from 0 to 5%. These infertile sands are nearly devoid of silt and clay particles, and have low pH and low base saturation.

These very deep, porous sands will not restrict rooting depth, and some deep rooted species may be able to access the deep water table. Without sufficient, periodic precipitation, shallower rooted species will develop moisture stress during the hot summers.

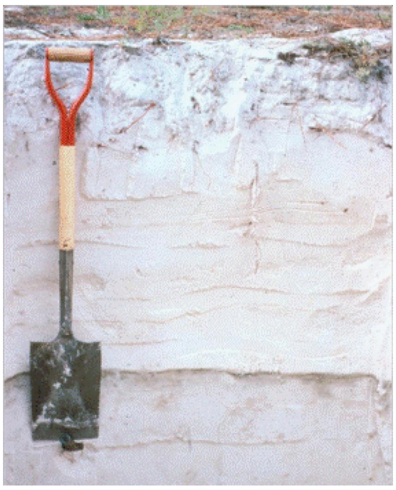

Figure 7. St. Lucie Sands

Table 4. Representative soil features

Parent material	(1) Eolian deposits (2) Marine deposits
Surface texture	(1) Sand (2) Fine sand

Drainage class	Excessively drained
Permeability class	Rapid to very rapid
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	3.05–4.06 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	1
Soil reaction (1:1 water) (0-101.6cm)	4.7–6
Subsurface fragment volume <=3" (0-101.6cm)	0–3%
Subsurface fragment volume >3" (0-101.6cm)	0%

Table 5. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	3.05–7.87 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	3.5–7.3
Subsurface fragment volume <=3" (0-101.6cm)	Not specified
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

Fire is the dominant disturbance factor driving ecological dynamics of the Dry White Sands Scrub vegetation. Although estimates vary in the literature, pre-settlement fire regimes of Central Florida white sand scrubs had infrequent return intervals on the order of once every one to several decades (Myers, 1985). Scrub vegetation of St. Lucie sands may have burned less frequently due to low statured and slow growing scrub vegetation.

Scrub fires are typically intense and ignite in droughty conditions. Clonal scrub oaks and palmettos vigorously re-sprout, rapidly re-colonizing the post-fire environment (Abrahamson, 1984; Freeman and Kobziar, 2011). Recovery of pre-fire plant composition and cover typically occurs within one to five years following fire, although oak height growth continues for longer periods (Abrahamson, 1984; Greenberg, 2003; Schmalzer, 2003). Dominant clonal oaks persist and resprout rapidly from underground parts in the post-fire environment (Abrahamson, 1984). Myrtle oak (*Q. myrtifolia*) growth is most rapid immediately following fire, whereas sand live oak (*Q. geminata*) growth peaks years after fire (Freeman and Kobziar, 2011). Non-clonal plants, including herbaceous plants, are typically killed in hot fires.

Other scrub plants reseed and colonize amid post-fire conditions (Johnson, 1982; Menges and Hawkes, 1998). The most notable seeder is the Florida Peninsula variety of sand pine (*Pinus clausa* var. clausa). This pine species is short lived (less than 80 years) and has serotinous cones which open after being super-heated. Seeds colonize open ground following intense fires. Sand pine seedlings are shade tolerant, thus able to grow amid dense scrub oak cover (Greenburg et al., 1995; Freeman and Kobziar, 2011). Fire return intervals in excess of 80 to 90 years disfavor sand pine regeneration, leading to “oak scrub” lacking pine canopy cover. Conversely, fire return intervals of less than 15 years in scrub may prevent sand pine regeneration, as seedlings are fire intolerant (Myers, 1995; Menges and Hawkes, 1998).

In the long term absence of fire (greater than 100 years) white sands scrubs may eventually transition to xeric hammock (FNAI, 2010). Xeric hammock does not differ much from scrub in terms of floristic composition, although the two communities are structurally distinct (forest vs. shrubland). In xeric hammocks, the closed canopy, moist ground cover litter, and almost complete absence of herbaceous vegetation precludes fire spread in all but extremely droughty conditions (Givens et al., 1984; Myers and White, 1987). Under these circumstances, intense canopy fire will kill all above ground vegetation, and trigger succession to scrub vegetation.

Wind and water damage associated with hurricanes and strong storms affect the ecological dynamics and distribution of the white sand scrubs. Although hurricanes usually dissipate before reaching the interior of the peninsula, large storms do affect the region on the order of two to three per century (Myers and Ewel, 1990). Strong winds can cause widespread pine mortality in where sand pine is present. Fire following wind damage may be particularly intense because of the abundance of dead woody fuels.

State and transition model

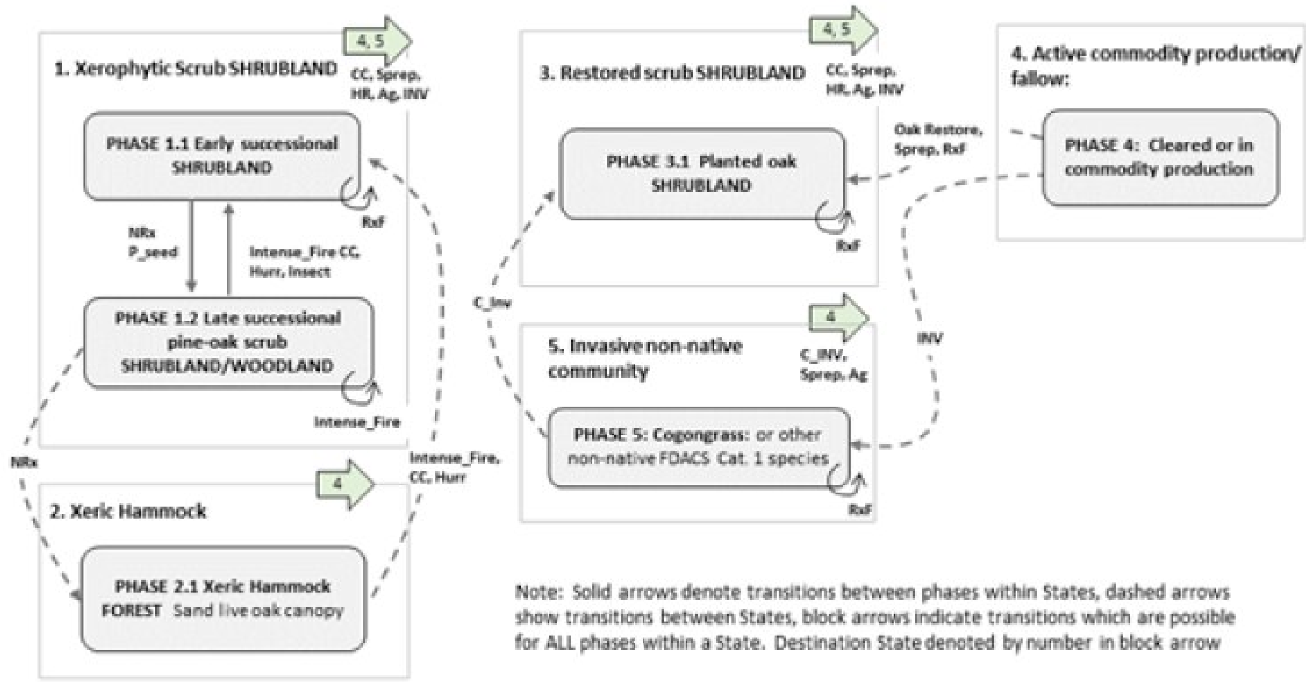

Figure 8. White sand scrub

RxF	Frequent interval prescribed fire
Intense_Fire	Infrequent (intense) fire, often stand replacing catastrophic fire
NRx	Fire suppression, or very infrequent non-catastrophic fire
HR	Hardwood reduction (mechanical and chemical, no ground disturbance)
CC	Clearcut
Hurr	Hurricane effects (wind): overstory mortality
Insect	Overstory mortality due to major insect outbreak
Sprep	Site prep (mechanical and chemical)
INV	Invasion of noxious non-native plant species
C_INV	Mechanical/chemical control of invasive plant species
Ag	Various agricultural practices for crop cultivation
P_seed	Availability of Pinus serotina propagules for colonization

Figure 9. White Sands Scrubs Legend

State 1
Xerophytic scrub shrubland

Dry white sands scrub vegetation (State 1) is predominantly dense growths of scrub oaks (myrtle, Chapman’s and sand live oaks) and palmetto (saw and scrub palmetto). In addition, the presence the clonal sandhill oak (*Quercus inopina*) is a diagnostic feature of Central Florida white sands scrubs. A sparse canopy of sand pines may be present or absent, depending on seed source and fire disturbance frequency. Herbaceous ground cover of State 1 scrubs is very sparse or completely absent. Where present, it is patchily distributed in openings among scrub oaks. The diversity and density of herbaceous plants are highest in the years immediately following fire, gradually decreasing as oak growth dominates (Menges and Hawkes 1998).

State 2
Xeric Hammock

State 2 describes late successional vegetation resulting from long term fire suppression (>100 years) of former scrub (FNAI, 2010). Xeric hammocks are compositionally similar to State 1 white sands scrub in that the same clonal oak species are dominant. However, xeric hammock is a forest with a closed canopy of sand live oak overtopping lower growths of clonal scrub oaks and hardwood seedlings. Sand pine is either absent, having failed to regenerate under densely forested conditions, or is present as a few old emergent trees. The mid- and under-story strata are overwhelmingly dominated by scrub oaks and palmetto. Other shrubs are sometimes irregularly distributed, including rusty staggerbush (*Lyonia ferruginea*), sparkleberry (*Vaccinium arboreum*), deerberry (*V. stamineum*), garberia (*Garberia heterophylla*), and Florida rosemary (*Ceratiola ericoides*). The forest floor is covered with oak leaf litter which holds considerable moisture, creating mesic conditions at ground level and further depressing native herbaceous growth as well as pine germination (FNAI, 2010).

State 3
Restored scrub shrubland

This state describes a restored shrubland with similar structure and ecological function to that of native white sands scrub. Notably, this state describes conditions where native propagules have been extirpated following long term fire suppression and/or extensive soil disturbance associated with commodity land uses, followed by artificial establishment of native clonal oaks and other scrub shrub species. Many native species are absent, and weedy or residual non-native species may persist in this restored scrub community. Herbaceous species are absent, weedy or non-native, depending on pre-restoration conditions and geography. Restoration of native oaks provides fuels for infrequent fires necessary for ecological functioning and dynamics. Once established, clonal oaks may provide habitat suitable for establishment of other native plant populations, either from artificial seeding or natural recruitment. The full complement of scrub species composition remains incomplete in State 3. Perennial grasses and forbs with seed dispersal mechanisms not conducive to colonization of distant and disturbed sites are notably absent (i.e. big seeded species which rely on animal and gravity dispersal, and long lived clonal species). However, over time, native scrub plants may recolonize, particularly wind-dispersed native herbaceous species.

State 4
Community land uses

This state describes commodity land uses of this concept. Due to their infertility and doughtiness, agriculture and timber production is limited on these white sand soils.

State 5
Invasive non-native community

State 5 describes a condition where one or more noxious non-native plant species has invaded and dominated the site. By far the most common invasive plant species is cogongrass (*Imperata cylindrica*; (MacDonald, 2004)). This highly clonal grass spreads rapidly by underground rhizomes and windblown seeds, forming dense circular patches which can become very large (on the order of 100’s of acres). Cogongrass grows vigorously in full sunlight and thrives on acidic, nutrient-poor soils and droughty conditions such as those of Astatula and Candler soils (MacDonald, 2004). Furthermore, cogongrass is a prolific seed producer, and readily invades following soil disturbances (Yager, Miller, and Jones, 2010). Once clones are established, rapid cogongrass growth will extirpate native ground cover plant populations. In addition, cogongrass may be allelopathic in some situations (Brook 1989, Bryson and Carter 1993). In general, cogongrass may colonize conditions with plenty of sun exposure and open ground. Soil disturbance is conducive to cogongrass colonization.

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Contributors

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Approval

Charles Stemmans, 2/21/2024

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	05/04/2024
Approved by	Charles Stemmans
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:**