USDA Natural Resources
Conservation Service

Ecological site QX197X01X502
Sandy Littoral Forest

Last updated: 6/12/2025
Accessed: 03/12/2026

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): 197X–Volcanic Islands of American Samoa

This MLRA consists of the islands of Tutuila, Aunuu, Ofu, Olosega, and Tau. The islands have extremely steep, highly dissected mountains, small valleys, and a narrow coastal plain. More than half of the area has slopes of more than 70 percent. The highest elevations are 3,056 feet (931 meters) on Tau and 2,142 feet (653 meters) on Tutuila. The islands consist of Pleistocene-age, basic igneous rocks, mainly basalt with some andesite and trachyte (USDA-NRCS, 2006).

The climate is moist, warm, and humid. Average annual rainfall ranges from 125 inches (3,175 millimeters) to more than 250 inches (6,350 millimeters). Rainfall varies over short distances due to topography. The driest months are June through September; the wettest months are December through March. Average annual temperature is 81 degrees F (27 degrees C). Relative humidity is 73 to 90 percent throughout the year. Prevailing winds are easterly trade winds. Cyclones occasionally strike the area (USDA-NRCS, 2006).

Soils are Mollisols, Andisols, Entisols, Oxisols, and Histosols. Soil moisture regimes are udic or perudic; the soil temperature regime is isohyperthermic. Natural vegetation is mostly tropical hardwood forest (USDA-NRCS, 2006).

Classification relationships

This ecological site occurs within Major Land Resource Area (MLRA) 197 – Volcanic Islands of American Samoa.

Ecological site concept

This ecological site occurs on the islands of Tutuila, Aunuu, Ofu, Olosega, and Tau in American Samoa. It occurs on nearly level to gently sloping (0 to 15 percent) coastal plains at elevations ranging from 0 to 15 feet (0 to 5 meters) elevation. It is most easily accessible on the southeastern coast of Tutuila.

Soils are Psamments (sandy Entisols) that formed in sand and rubble derived from coral and seashells deposited along the seashore of coastal plains. Soil temperature regimes are isohyperthermic; soil moisture regimes are udic. Average annual rainfall ranges from 120 to 200 inches (300 to 500 centimeters). Water runoff is very slow to slow, but drainage is somewhat excessive to excessive. Effective rooting depth is greater than 60 inches (150 centimeters), but available water-holding capacity is low (about 3.5 inches). Windborne salt spray and occasional, very brief to brief flooding by seawater help determine the vegetation type.

Much of this ecological site is forested, but thin bands of small herbaceous plants, shrubs, and scrub forest typically occupy the zone closest to the ocean. The forest canopy grows up to about 50 feet (15 meters) tall. The forest floor is usually open due to dense shade. Epiphytes and vines are sparse.

Associated sites

QX197X01X501	**Mangrove Swamp** Mangrove Swamp occurs along partially-protected coastlines where it may adjoin sandy bars and oceanfront areas that support Sandy Littoral Forest. Soils are very poorly drained and flooded twice daily by tides, in contrast with somewhat excessively to excessively
QX197X01X505	**Skeletal Pachic or Fulvic Forest** Skeletal Pachic or Fulvic Forest adjoins Sandy Littoral Forest where uplands, talus slopes, and mountain slopes descend to sandy coastlines. It occurs on mountain slopes up to 900 feet in elevation, undergoes no flooding, and has well drained soils, in contrast with Sandy Littoral Forest, which ascends to 15 feet elevation, undergoes occasional, very brief to brief flooding by seawater, and has somewhat excessively to excessively drained soils.
QX197X01X506	**Tuff or Rock Subsurface Forest** Tuff or Rock Subsurface Forest can adjoin Sandy Littoral Forest where uplands and mountain slopes come down to coastlines where Sandy Littoral Forest occurs. It occurs on mountain slopes up to 1500 feet in elevation, undergoes no flooding, and has well drained soils, in contrast with Sandy Littoral Forest, which ascends to 15 feet elevation, undergoes occasional, very brief to brief flooding by seawater, and has somewhat excessively to excessively drained soils.

QX197X01X509	**Very Steep Forest** Very Steep Forest adjoins Sandy Littoral Forest where very steep mountain slopes descend to sandy coastlines. It occurs on slopes up to 2100 feet in elevation, undergoes no flooding, and has well drained soils, in contrast with Sandy Littoral Forest, which ascends to 15 feet elevation, undergoes occasional, very brief to brief flooding by seawater, and has somewhat excessively to excessively drained soils.

Similar sites

QX197X01X507	**Dry Coastal Forest** Dry Coastal Forest is similar to Sandy Littoral Forest in that both ecological sites are exposed to more-or-less salt-laden winds near the coast. They differ in that Dry Coastal Forest occurs to elevations of 400 feet, has well drained soils, and does not undergo flooding, whereas Sandy Littoral Forest occurs to elevations of 15 feet, has somewhat excessively to excessively drained soils, and undergoes occasional, very brief to brief flooding by seawater.

Table 1. Dominant plant species

Tree	(1) *Barringtonia asiatica* (2) *Pisonia grandis*
Shrub	Not specified
Herbaceous	(1) *Asplenium nidus*

Legacy ID

F197XY502AS

Physiographic features

This ecological site occurs mostly on deposits of coral sand or coral rubble on coastal plains (USDA-SCS, 1984).

Table 2. Representative physiographic features

Landforms	(1) Island > Coastal plain
Runoff class	Very low
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Occasional
Ponding frequency	None
Elevation	0–5 m
Slope	0–5%

Water table depth	99–152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The area is characterized by abundant rain and warm, humid days and nights. Average annual precipitation in this ecological site ranges from 98 to 162 inches (2490 to 4115 millimeters). Mean annual air temperature is 80F (27C). The driest period is June through September (winter), and the wettest is December through March (summer), although heavy showers and long, rainy periods can occur in any month. June, July, and August are the coolest months, and January, February, and March are the warmest. Daytime temperatures typically reach the upper 80s in summer and the middle 80s F in winter, while nighttime temperatures are in the middle 70s in summer and low 70s in winter.

The prevailing winds throughout the year are the easterly trade winds. They tend to be more directly from the east in December through March and mostly from the east-southeast and southeast during the rest of the year. The trade winds are less prevalent in summer than in winter. About 25 to 30 thunderstorms occur in an average year, mainly during the rainy season. The area lies across the path of tropical disturbances, including cyclones, that come usually from the north, but occasionally from east or west.

Table 3. Representative climatic features

Frost-free period (characteristic range)	365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	2,489-4,115 mm
Frost-free period (actual range)	365 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	2,464-5,055 mm
Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	3,302 mm

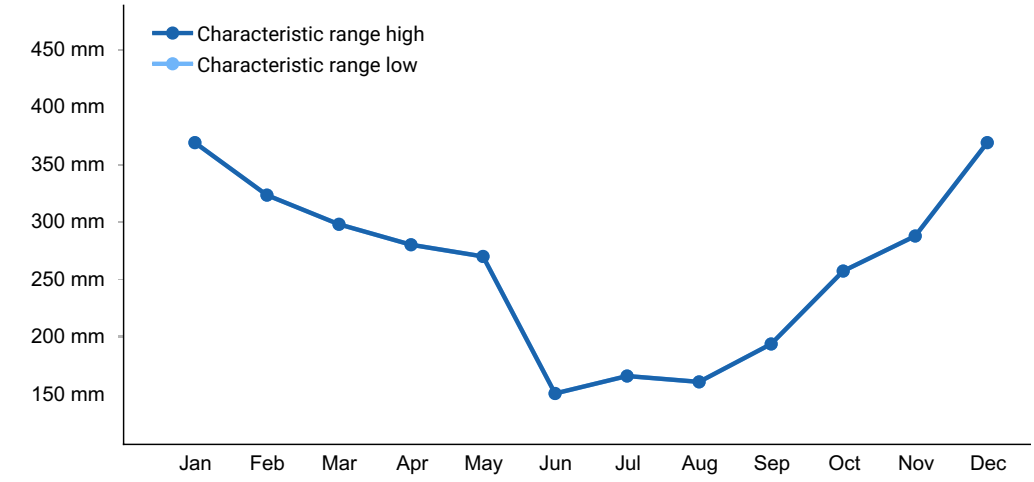

Figure 1. Monthly precipitation range

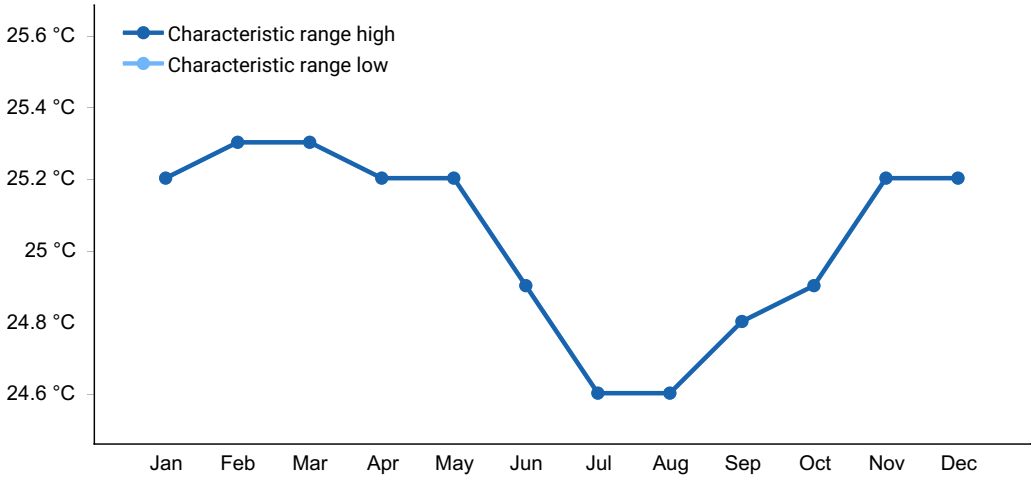

Figure 2. Monthly minimum temperature range

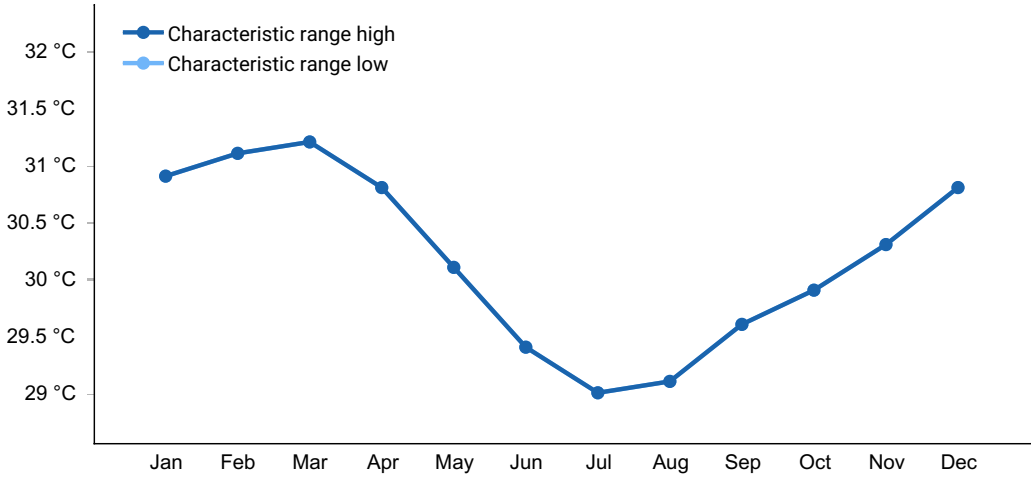

Figure 3. Monthly maximum temperature range

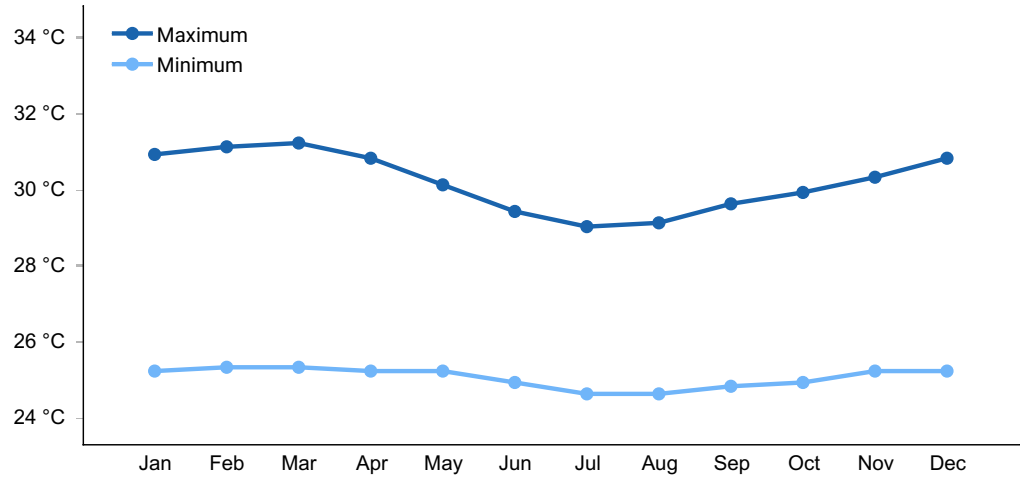

Figure 4. Monthly average minimum and maximum temperature

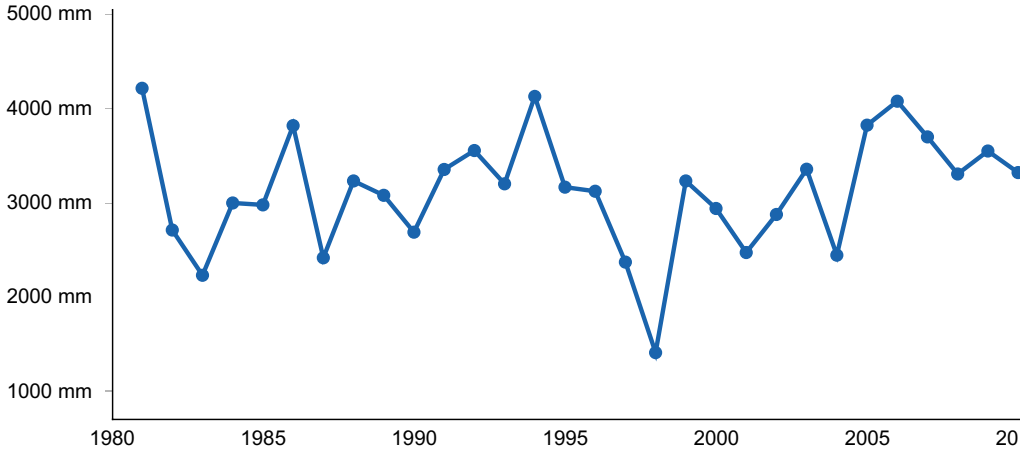

Figure 5. Annual precipitation pattern

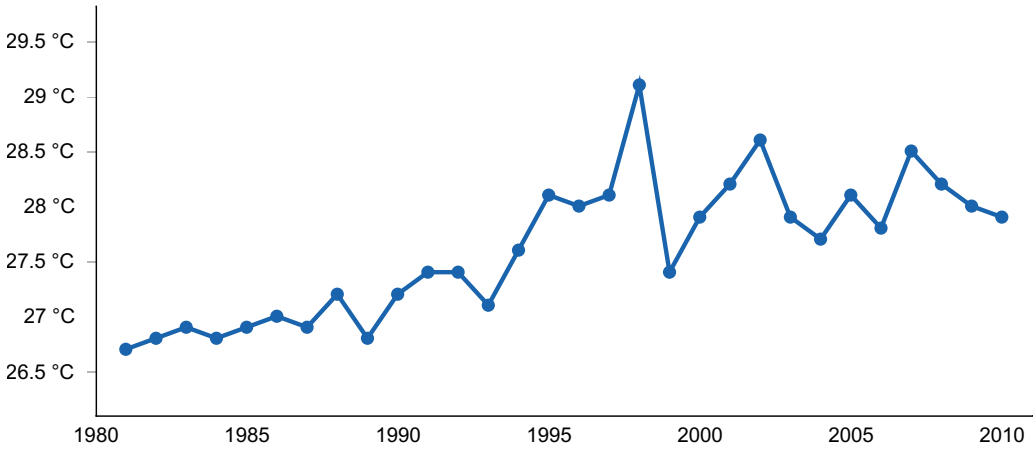

Figure 6. Annual average temperature pattern

Climate stations used

- (1) PAGO PAGO WSO AP [AQW00061705], AS

Influencing water features

There are no water features in this ecological site.

Soil features

NGEDEBUS, NGEDEBUS VARIANT

The soils in this ecological site are in the Entisols soil order. They are somewhat excessively to excessively drained that formed in deposits of seashells and coral sand and rubble. The soil temperature regimes are isohypothermic (very warm) with a mean temperature of 80F (27C). The soil moisture regimes are udic. The soils are sometimes flooded by large ocean waves. The water table is deeper than 39 inches (100 centimeters) below the soil surface.

Table 4. Representative soil features

Parent material	(1) Marine deposits–coral limestone
Surface texture	(1) Mucky, extremely cobbly sand
Family particle size	(1) Sandy-skeletal
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Rapid
Depth to restrictive layer	183 cm
Soil depth	183 cm
Surface fragment cover <=3"	5%
Surface fragment cover >3"	60%
Available water capacity (0-101.6cm)	2.54–7.62 cm
Calcium carbonate equivalent (0-101.6cm)	10–95%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–9
Subsurface fragment volume <=3" (0-101.6cm)	5–17%
Subsurface fragment volume >3" (0-101.6cm)	7–33%

Ecological dynamics

Although annual rainfall is high and well distributed throughout the year, the rapid permeability of the sandy soils results in dry conditions as indicated by the low waterholding capacity and somewhat excessive and excessive drainage classes of the soils. Ground water is saline or brackish, soil fertility is low, winds are laden with salt, and daytime soil surface temperatures are high where sunlight penetrates the canopy. These soil conditions limit the plant species able to thrive in this ecological site.

The main natural disturbance is strong storms that can damage or kill vegetation by wind and wave action. The main human disturbance is clearing of native vegetation to plant coconut plantations and abandonment of plantations that results in at least temporary dominance of introduced weedy plants.

State and transition model

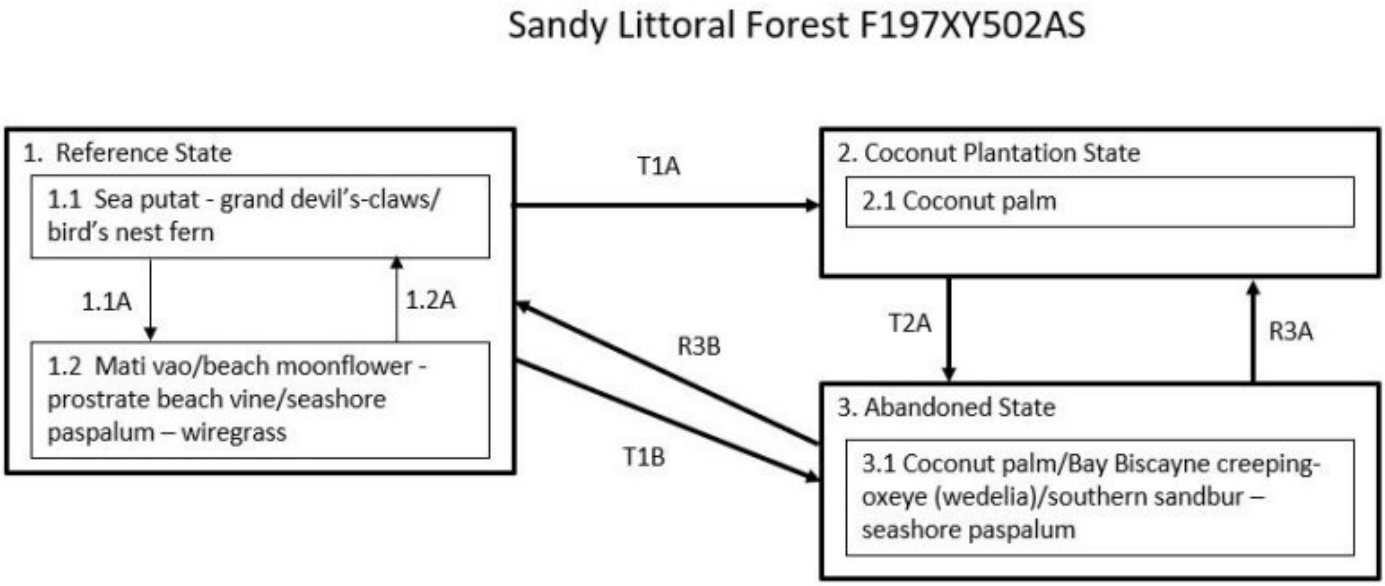

Figure 7. State and Transition Model (STM) for F197XY502AS (Sandy Littoral Forest).

State 1
Reference State

This ecological site occupies a narrow area on the immediate coast and typically exhibits zonation into several bands that run roughly parallel to the coastline. These zones may be indistinct or missing in some locations. There are two community phases dominated. Plant species here are primarily salt-resistant heliophytes that propagate by seeds that are buoyant and salt-resistant or are transported by birds.

Community 1.1
Sea putat - grand devil's-claws/bird's nest fern

At the seaward margin there may be a band of grasses, sedges, and creeping vines.

Inland from this may be a band of shrubs about 7 feet (2 meters) tall. Next may be a band of Tahitian screw pine (*Pandanus tectorius*) forest about 13 to 26 feet (4 to 8 meters) tall. This community is defined by the forest that grows to over 50 feet (15 meters) tall. The forest floor is typically open, with no shrubs and very little ground cover due to shade. Dominant species vary among locations. The most common tree species are sea putat (*Barringtonia asiatica*), Alexandrian laurel (*Calophyllum inophyllum*), and grand devil's claws (*Pisonia grandis*). Other trees species may include lantern tree (*Hernandia nymphaeifolia*), tiger's claw (*Erythrina variegata*), tropical almond (*Terminalia catappa*), and talie (*Terminalia samoensis*). Coconut (*Cocos nucifera*) is uncommon in undisturbed forest; it is common only where it has been planted intentionally.

Dominant plant species

- sea putat (*Barringtonia asiatica*), tree
- grand devil's-claws (*Pisonia grandis*), tree
- Hawai'I birdnest fern (*Asplenium nidus*), other herbaceous

Community 1.2
Mati vao/beach morning-glory – prostrate beach vine/seashore paspalum – wiregrass

The dominant species vary by location but consist of low stature heliophytes that temporarily occupy the ground, in addition to seedlings of the previously dominant tree species. Common species may include the native shrub mati vao (Ficus scabra), native vines such as beach morning-glory (*Ipomoea violacea* (syn. macrantha) and prostrate beach vine (*Triumfetta procumbens*), and grasses such as introduced seashore paspalum (*Paspalum vaginatum*) and native wiregrass or syn. Pacific Island thintail (*Lepturus repens*).

Dominant plant species

- fig (*Ficus*), tree
- seashore paspalum (*Paspalum vaginatum*), grass
- Pacific Island thintail (*Lepturus repens*), grass
- beach moonflower (*Ipomoea violacea*), other herbaceous
- (*Triumfetta procumbens*), other herbaceous

Pathway P1.1A
Community 1.1 to 1.2

Storms that disturb or kill trees causes a phase change from 1.1, which has all native tree species, to 1.2, which temporarily has an open stand of native trees with an understory of mostly native vines and grasses.

Pathway P1.2A

Community 1.2 to 1.1

This community phase will revert to phase 1.1 with gradual regrowth of native species when given adequate time to recover after disturbance. However, it is likely that some introduced species will remain.

State 2
Coconut Plantation

This state consists of one community phase that has been cleared of natural vegetation and planted with coconut palms (*Cocos nucifera*).

Community 2.1
Coconut palm

This community phase consists of planted coconut palms (*Cocos nucifera*). Highly variable low ground cover is present.

Dominant plant species

- coconut palm (*Cocos nucifera*), tree

State 3
Abandoned State

This state consists of one community phase dominated by a variable mixture of native and introduced small trees, shrubs, vines, forbs, and grasses that thrive in sunny environments. Remnant coconut palms are likely be present.

Community 3.1
Coconut palm/Bay Biscayne creeping-oxeye (wedelia)/southern sandbur – seashore paspalum

This community phase a variable amount of remnant coconut palms with a variable understory of native and introduced shrubs, forbs, vines, and grasses that thrive in sunny environments. Bay Biscayne creeping-oxeye (*Sphagneticola trilobata*), also known as wedelia, is a weedy, introduced forb that can form a dense, competitive ground cover. Southern sandbur (*Cenchrus echinatus*) and seashore paspalum (*Paspalum vaginatum*) are competitive, introduced grasses. A wide variety of other species may occur depending on location of the site.

Dominant plant species

- coconut palm (*Cocos nucifera*), tree
- Bay Biscayne creeping-oxeye (*Sphagneticola trilobata*), shrub
- southern sandbur (*Cenchrus echinatus*), grass

- seashore paspalum (*Paspalum vaginatum*), grass

Transition T1A
State 1 to 2

The Reference State (1) transitions to the Coconut Plantation State (2) by removal of native vegetation and planting coconut palms (*Cocos nucifera*).

Transition T1B
State 1 to 3

The Reference State (1) transitions to the Abandoned State (3) if cleared and abandoned. This allows heliophytes, both native and introduced, to temporarily cover the understory.

Transition T2A
State 2 to 3

The Coconut Plantation State (2) transitions to the Abandoned State (3) with abandonment of coconut plantations, which are quickly invaded by low-statured, native and/or introduced heliophytes.

Restoration pathway R3B
State 3 to 1

The Abandoned State (3) may be restored to the Reference State (1). The intensity of active restoration measures will be determined by the presence or lack of nearby native forest or, at least, some native trees as well as the density and species mix of grasses, vines, shrubs, and trees present on the site, especially if many competitive introduced species are present.

Restoration pathway R3A
State 3 to 2

The Abandoned State (3) may be restored to the Coconut Plantation State (2) by land clearing, weed control, and replanting coconut palms.

Additional community tables

Other references

Annotated References for F197XY502AS Sandy Littoral Forest

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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	03/12/2026
Approved by	Kendra Moseley
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:**

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

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

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

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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:**
