USDA Natural Resources
Conservation Service

Ecological site QX197X01X504
Alluvial Valley 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.

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.

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.

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 island of Tutuila in American Samoa. It occurs on nearly level to gently sloping (0 to 6 percent) valley floors and coastal plains at elevations ranging from 0 to 250 feet (0 to 77 meters) elevation. It is accessible on the southern side of Tutuila.

Soils are Cumulic Hapludolls (Mollisols soil order). “Cumulic” means they have a thick mollic epipedon that developed by accumulation of surface material as the soils developed. They formed in alluvium deposited over basic igneous rock. Soil temperature regimes are isohyperthermic; soil moisture regimes are udic. Average annual rainfall ranges from 150 to 250 inches (375 to 625 centimeters). Water runoff is slow. Effective rooting depths are more than 60 inches (150 centimeters). The soils in this ecological site are somewhat poorly drained and undergo occasional, brief flooding.

This forest type has a stratified canopy. The upper canopy grows up to 100 feet (30 meters) tall. Ground cover is moderate to dense; epiphytes and lianas are common.

Associated sites

QX197X01X501	**Mangrove Swamp** Mangrove Swamp adjoins Alluvial Valley Forest where valley floors and coastal plains descend to partially-protected coastal salt water. Mangrove Swamp differs from Alluvial Valley Forest in being very poorly drained rather than somewhat poorly drained, having salt water rather than fresh water, and by undergoing twice-daily tidal flooding rather than occasional, brief flooding.
QX197X01X503	**Lavaflow Forest** Lavaflow Forest adjoins Alluvial Valley Forest in the few locations where alluvial valleys descend to young aa lava flows near the coast. Alluvial Valley Forest has somewhat poorly drained, mineral soils; Lavaflow Forest has well drained, organic soils in the interstices between aa rocks.
QX197X01X507	**Dry Coastal Forest** Dry Coastal Forest adjoins Alluvial Valley Forest where sloping uplands, side slopes, and mountain slopes descend to alluvium-filled valleys near the coast. Dry Coastal Forest has well drained Andisols with limited rooting depth formed from volcanic ash deposited over hard tuff, or, in one case, in the interstices between aa rocks; Alluvial Valley Forest has somewhat poorly drained Cumulic Mollisols with very deep rooting depth and formed in alluvium.
QX197X01X505	**Skeletal Pachic or Fulvic Forest** Skeletal Pachic or Fulvic Forest adjoins Alluvial Valley Forest where uplands, talus slopes, and mountain slopes descend to alluvium-filled valleys near the coast. It occurs on mountain slopes up to 900 feet in elevation, undergoes no flooding, and has well drained soils, in contrast with Alluvial Valley Forest, which ascends to 250 feet elevation, undergoes occasional brief flooding, and has somewhat poorly drained soils.

QX197X01X509	**Very Steep Forest** Very Steep Forest adjoins Alluvial Valley Forest where very steep mountain slopes descend to alluvium-filled valleys near the coast. It occurs on slopes up to 2100 feet in elevation, undergoes no flooding, and has well drained soils, in contrast with Alluvial Valley Forest, which ascends to 250 feet elevation, undergoes occasional brief flooding, and has somewhat poorly drained soils.

Table 1. Dominant plant species

Tree	(1) *Dysoxylum* (2) *Myristica*
Shrub	Not specified
Herbaceous	(1) *Lomagramma cordipinna*

Legacy ID

F197XY504AS

Physiographic features

This ecological site occurs on valley floors.

Table 2. Representative physiographic features

Landforms	(1) Island > Valley floor
Runoff class	Very low to low
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	0–198 m
Slope	0–30%
Water table depth	122–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The area is characterized by abundant rain and warm, humid days and nights. Average annual precipitation in this ecological site ranges from 150 to 250 inches (3750 to 6250 millimeters). Mean annual air temperature is 79 to 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)	3,810-6,350 mm
Frost-free period (actual range)	365 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	3,810-6,350 mm
Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	5,004 mm

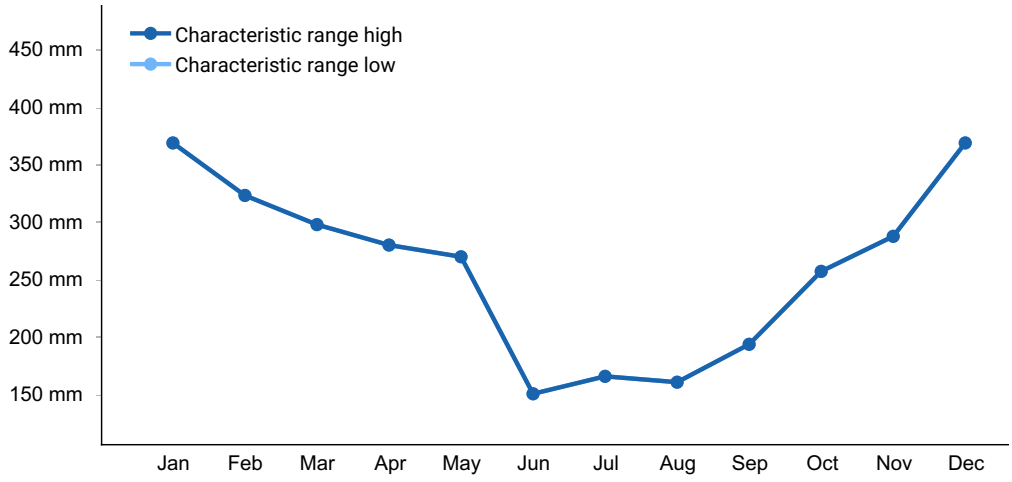

Figure 1. Monthly precipitation range

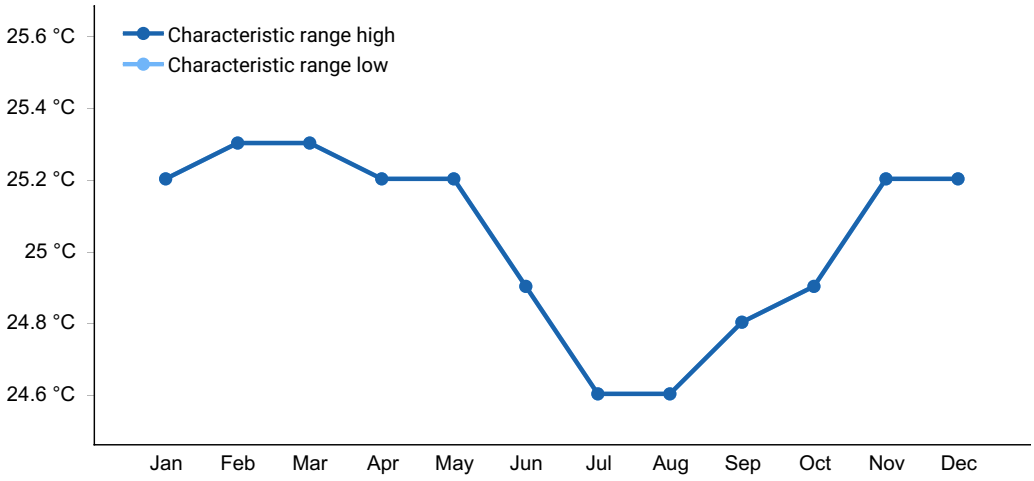

Figure 2. Monthly minimum temperature range

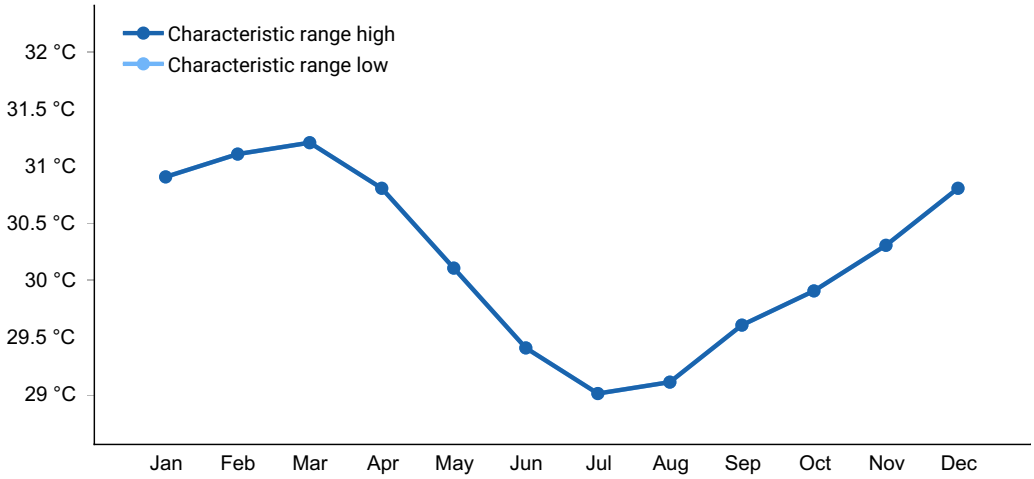

Figure 3. Monthly maximum temperature range

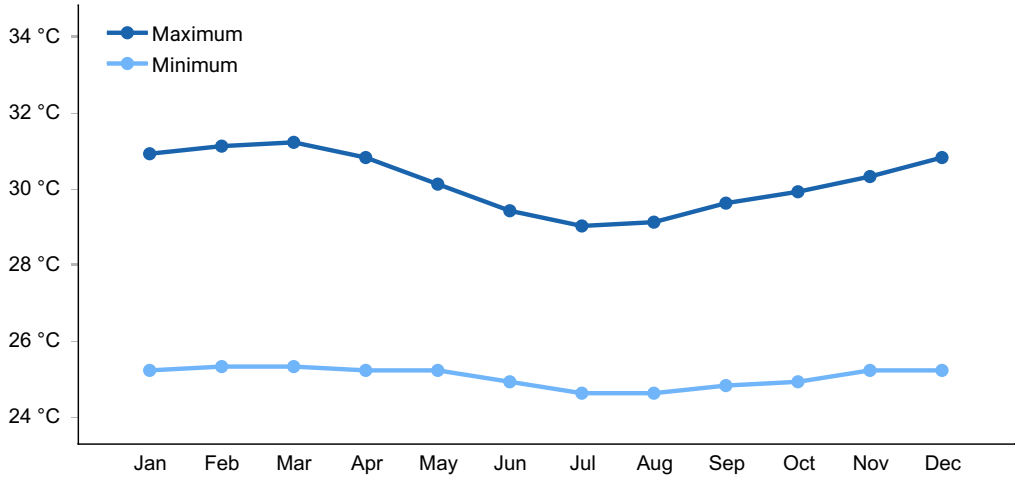

Figure 4. Monthly average minimum and maximum temperature

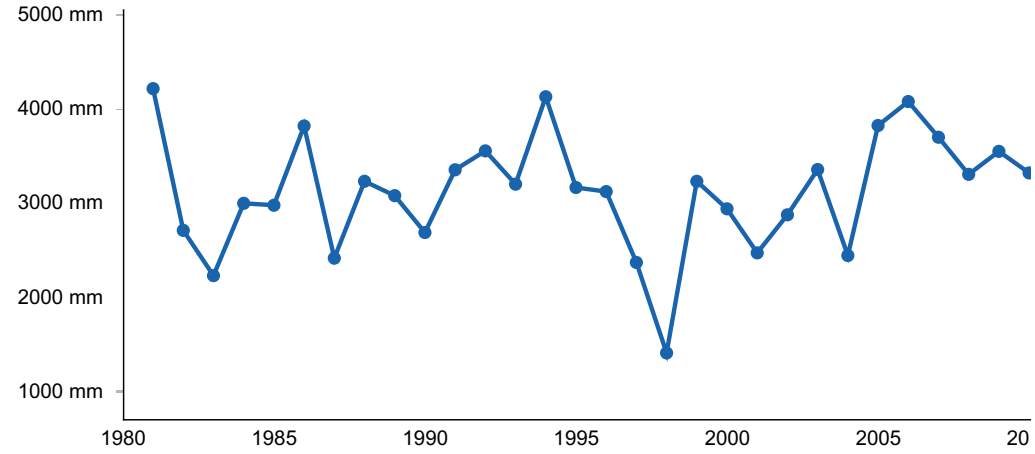

Figure 5. Annual precipitation pattern

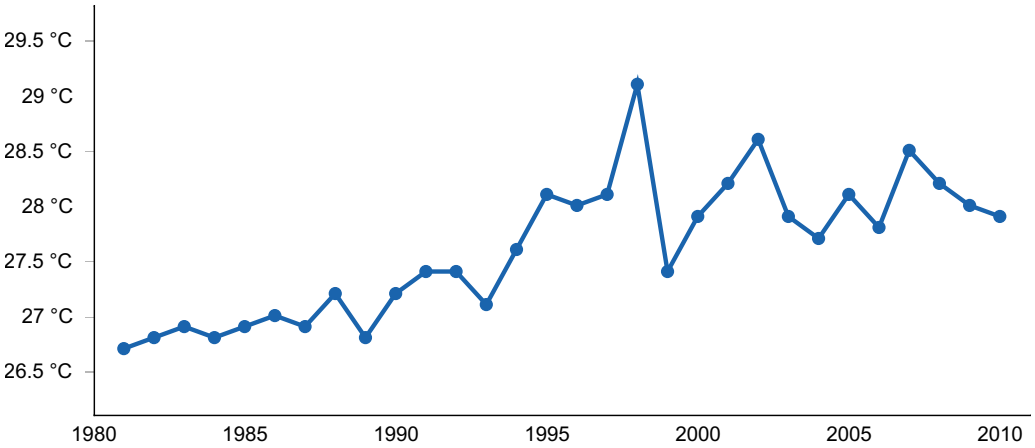

Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

Small streams are present in the ecological site. This site receives runoff from surrounding slopes.

Soil features

LEAFU

Soils are Cumulic Hapludolls (Mollisols soil order). “Cumulic” means they have a thick mollic epipedon that developed by accumulation of surface material as the soils developed. They formed in alluvium deposited over basic igneous rock. Soil temperature regimes are isohyperthermic; soil moisture regimes are udic. They are very deep and somewhat poorly drained.

Table 4. Representative soil features

Parent material	(1) Alluvium (2) Colluvium
Surface texture	(1) Stony silty clay
Family particle size	(1) Very-fine (2) Clayey-skeletal
Drainage class	Somewhat poorly drained
Permeability class	Moderate
Depth to restrictive layer	183 cm
Soil depth	183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	5.6–7.3
Subsurface fragment volume <=3" (0-101.6cm)	5–7%
Subsurface fragment volume >3" (0-101.6cm)	2–29%

Ecological dynamics

The main natural disturbance is strong storms that can damage or kill vegetation by high wind speeds. The main human disturbance is clearing of native vegetation for agriculture and abandonment of plantations that results in at least temporary dominance of introduced weedy plants.

State and transition model

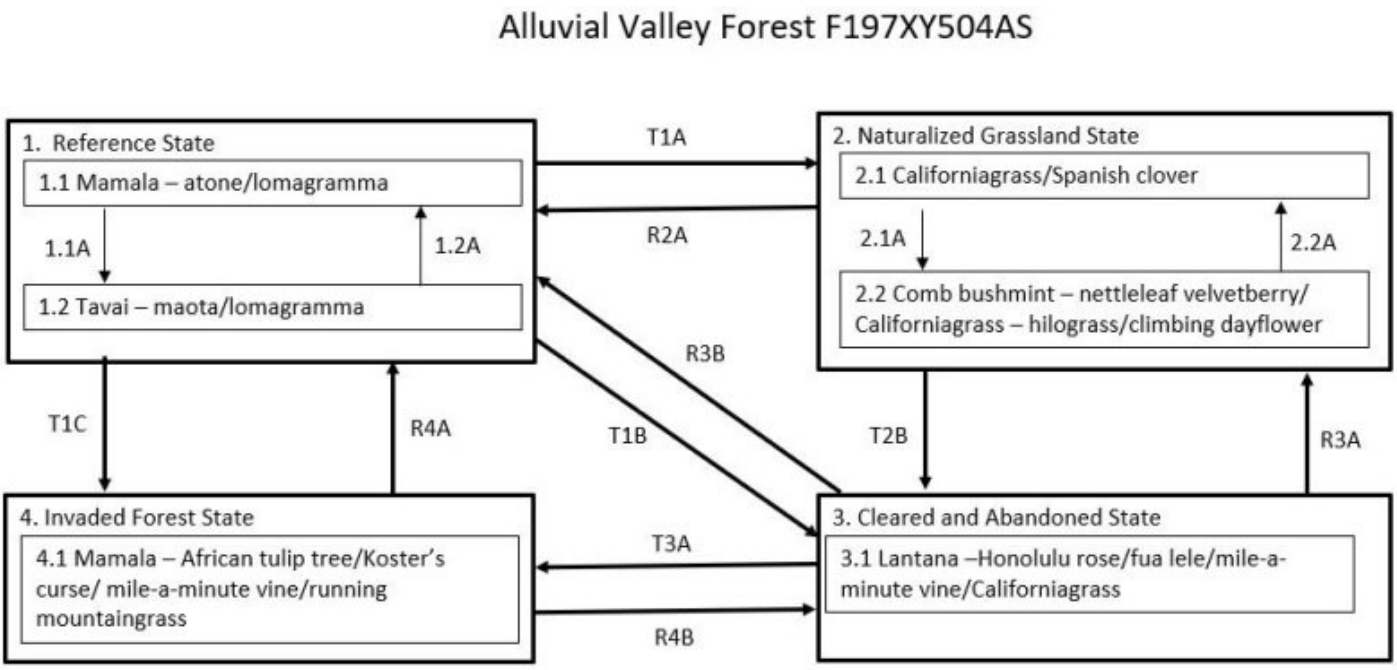

Figure 7. State and Transition Model (STM) for F197XY504AS (Alluvial Valley Forest)

State 1
Reference State

This ecological site is forest with a very tall (80 to 100 feet or 25 to 30 meters), stratified tree canopy. Ground cover is moderately dense to dense. Epiphytes and lianas are common.

Community 1.1
Mamala - atone/lomagramma

Dominant tree species are mamala (Homalanthus nutans), maota (Dysoxylum maota), fuafua (*Kleinhovia hospita*), atone (Myristica inutilis), mamalava (Planchonella samoensis), ifi (*Inocarpus fagifer*), auauli (Diospyros samoensis), fanaio (Sterculia fanaiho), and mati vao (Ficus scabra). The subcanopy usually consists of auauli (Diospyros samoensis), atone (Myristica inutilis), and/or falaga (*Barringtonia samoensis*). Nontree species are diverse. Examples of these include the native creeping and climbing fern lomagramma (*Lomagramma cordipinna*). Other ferns are bird's nest fern (*Asplenium nidus*), musk fern (Microsorum grossum), *Nephrolepis biserrata*, Asplenium marattioides, and *Tectaria dissecta*. Two common epiphytic orchids are Dendrobium dactylodes and Dendrobium biflorum. Common lianas are sea bean (*Mucuna gigantea*), mamalupe (Faradaya amicorum), St. Thomas bean (*Entada phaseoloides*), and *Gynochthodes epiphytica*. Climbing vines include fue manogi (Piper graeffei) and fue laufao (*Epipremnum pinnatum*).

Dominant plant species

- (*Dysoxylum*), tree
- nutmeg (*Myristica*), tree

- (*Lomagramma cordipinna*), other herbaceous

Community 1.2
Tavai – maota/lomagramma

The same tree species as in Community Phase 1.1 remain in this phase, but other tree species, commonly tavai (*Rhus taitensis*) and maota (Dysoxylum maota) can join the canopy as the forest regrows. Ground vegetation becomes temporarily more abundant. Epiphytes are less common than in 1.1.

Dominant plant species

- (*Rhus taitensis*), tree
- (*Dysoxylum*), tree
- (*Lomagramma cordipinna*), other herbaceous

Pathway P1.1A
Community 1.1 to 1.2

Storms or fires that damage or kill trees causes a phase change from 1.1 to 1.2 typified by a partial, temporary change in dominant tree species and a temporary increase in ground level vegetation.

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.

State 2
Naturalized Grassland

This state consists of two community phases that has been cleared of natural vegetation and planted or colonized with introduced grass species. It can be used for cattle grazing.

Community 2.1
Californiagrass/Spanish clover

This community phase is dominated by californiagrass (also called para grass) (*Urochloa mutica*). When not excessively grazed, it includes the legume Spanish clover (also called Zarabacoa comun) (*Desmodium incanum*). There may be small amounts of hilograss (*Paspalum conjugatum*) and climbing dayflower (*Commelina diffusa*) present.

Dominant plant species

- para grass (*Urochloa mutica*), grass

- zarzabacoa comun (*Desmodium incanum*), other herbaceous

Community 2.2
Comb bushmint – nettleleaf velvetberry/Californiagrass – hilograss/climbing dayflower

This community phase consists largely of Californiagrass and some hilograss. Shrubs, vines, and forbs occupy some of the site due to reduction of grass competitiveness by excessive grazing. Some common species include mile-a-minute vine (*Mikania micrantha*); fua lele (*Crassocephalum crepidioides*) a large, invasive forb; climbing dayflower (*Commelina diffusa*), a low-growing invasive forb; comb bushmint (*Hyptis pectinata*), a shrub; mautofu (*Triumfetta rhomboidea*), a tall shrub; and nettleleaf velvetberry (*Stachytarpheta urticifolia*), a low shrub.

Dominant plant species

- comb bushmint (*Hyptis pectinata*), shrub
- nettleleaf velvetberry (*Stachytarpheta urticifolia*), shrub
- para grass (*Urochloa mutica*), grass
- hilograss (*Paspalum conjugatum*), grass
- climbing dayflower (*Commelina diffusa*), other herbaceous

Pathway P2.1A
Community 2.1 to 2.2

Community phase 2.1 will change to 2.2 by invasion of the site by shrubs and forbs. This process is facilitated by excessive grazing, which reduces the competitive advantage of Californiagrass.

Pathway P2.2A
Community 2.2 to 2.1

Community phase 2.2 can shift back to phase 2.1 by reducing grazing pressure on Californiagrass and, when necessary, performing spot weed control on shrubs and vines

State 3
3 Cleared and Abandoned

This state consists of one community phase dominated by a variable mixture of small trees, shrubs, vines, forbs, and grasses that thrive in sunny environments. Remnant Californiagrass and hilograss are present.

Community 3.1
Lantana – Honolulu rose/fua lele/mile-a-minute vine/Californiagrass

This community phase remnant stands of Californiagrass and hilograss with a variable array of shrubs, forbs, vines, and young trees that thrive in sunny environments. Shrubs such as lantana (*Lantana camara*), Honolulu rose (*Clerodendrum chinense*), comb bushmint (*Hyptis pectinata*), mautofu (*Triumfetta rhomboidea*), and nettleleaf velvetberry (*Stachytarpheta urticifolia*) are dominant. The shrub layer may also include seedlings and saplings of any native trees that may have persisted on or near the site or invasive, introduced tree species such as African tulip tree (*Spathodea campanulata*), red beadtree (*Adenanthera pavonina*), and tamaligi or peacocks plume (*Falcataria moluccana*). Mile-a-minute vine (*Mikania micrantha*) and the large, introduced forb fua lele (*Crassocephalum crepidioides*) may be present.

Dominant plant species

- lantana (*Lantana camara*), shrub
- stickbush (*Clerodendrum chinense*), shrub
- para grass (*Urochloa mutica*), grass
- redflower ragleaf (*Crassocephalum crepidioides*), other herbaceous
- mile-a-minute (*Mikania micrantha*), other herbaceous

State 4
Invaded Forest State

This state consists of one community phase. It is forest with both overstory, and understory composed of a variable mix of native and introduced species. The actual species composition on a given site depends on the original native species composition, the disturbance history, and the species composition existing near the site before, during, and after disturbances.

Community 4.1
Mamala – African tulip tree/Koster’s curse/ mile-a-minute vine/running mountaingrass

The overstory consists of large trees. Any of the native species listed for State 1 Reference may be present. Introduced tree species are likely to be present; common examples of these are African tulip tree (*Spathodea campanulata*), tamaligi or peacocks plume (*Falcataria moluccana*), and red beantree (*Adenanthera pavonina*). The understory consists of an unpredictable mixture of native and introduced shrubs, ferns, vines, forbs, and grasses that have some shade tolerance. See State 1 Reference for examples of native species. Common examples of introduced understory species are the shrubs Koster’s curse (*Clidemia hirta*) and Honolulu rose (*Clerodendrum chinense*), mile-a-minute vine (*Mikania micrantha*) and running mountaingrass (*Oplismenus compositus*).

Dominant plant species

- (*Dysoxylum*), tree

- African tuliptree (*Spathodea campanulata*), tree
- soapbush (*Clidemia hirta*), shrub
- running mountaingrass (*Oplismenus compositus*), grass
- mile-a-minute (*Mikania micrantha*), other herbaceous

Transition T1A
State 1 to 2

The Reference State (1) transitions to the Naturalized State (2) by removal of native vegetation and planting, or allowing colonization by, introduced grass species.

Transition T1B
State 1 to 3

The Reference State (1) transitions to the Cleared and Abandoned State (3) if previously cleared of forest and then abandoned. This allows heliophytes, both native and introduced, to temporarily cover the ground.

Transition T1C
State 1 to 4

The Reference State (1) transitions to the Invaded Forest State (4) by wind damage to the forest when there is a nearby source of seeds of invasive species or, more gradually, by damage to the forest understory by ungulates, especially feral pigs, when there is a source of seeds of invasive species.

Restoration pathway R2A
State 2 to 1

The Naturalized Grassland State (2) could theoretically be restored to the Reference State (1) by suppression of grassland vegetation and replanting with native species. Natural reseeding by native forest species can be expected if there is a nearby stand of suitable species.

Transition T2B
State 2 to 3

The Naturalized Grassland State (2) transitions to the Cleared and Abandoned State (3) with abandonment of grasslands, which are invaded by low-statured, native and/or introduced heliophytes.

Restoration pathway R3B
State 3 to 1

The Cleared and 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 invasive trees present on the site, especially if many competitive introduced species are present.

Restoration pathway R3A
State 3 to 2

The Cleared and Abandoned State (3) may be restored to the Naturalized Grassland State by land clearing, weed control, and replanting grasses.

Transition T3A
State 3 to 4

The Cleared and Abandoned State (3) transitions to the Invaded Forest State (4) by growth of an overstory of trees with an understory of shade-tolerant shrubs, vines, ferns, forbs, and grasses. The species mix is variable but may be mostly introduced species or a combination of native and introduced species.

Restoration pathway R4A
State 4 to 1

The Invaded Forest State (4) can be restored to the Reference State (1). The difficulty, cost, and likelihood of success will depend on the species composition and amount and competitiveness of introduced species present on a given site.

Restoration pathway R4B
State 4 to 3

The Invaded Forest State (4) can be restored to the Cleared and Abandoned State (3). After this “restoration,” State 3 is likely to rapidly transition back to State 4 due to presence of an abundant tree seed bank in the soil.

Additional community tables

Other references

Annotated References for F197XY504AS Alluvial Valley 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:**
