Hernando County Preserves Master Land Management Plan:

Adaptive Management for Chinsegut Hill Preserve

Adopted by Hernando Board of County Commissioners: April 12, 2022

Introduction

This section constitutes an update of the Management Plan for Chinsegut Hill, a 114.5-acre property located approximately five miles north of Brooksville. The prior Management Plan was completed in March 2015 and released on May 5, 2015. The current revised Management Plan makes use of information that was not available at the time of the 2015 Plan, chiefly improved mapping of soils (i.e., a revision of the NRCS soils map to depict ground conditions more accurately), depth to water table, current land cover, and a July 2020 report and accompanying maps from an invasive non-native plant survey.

The latter report, produced by the Florida Natural Areas Inventory (FNAI), is noteworthy for its comprehensive list and commentary on invasive plants, based on intensive field work, and for its detailed descriptions of the natural and anthropogenic communities that formerly occurred or currently occupy various parts of the Preserve. FNAI (2020) used aerial imagery from 1944 to identify eight proposed management units on Chinsegut Hill, which are accepted as suitable units for management under this Plan (Fig. 2.1 A and B).

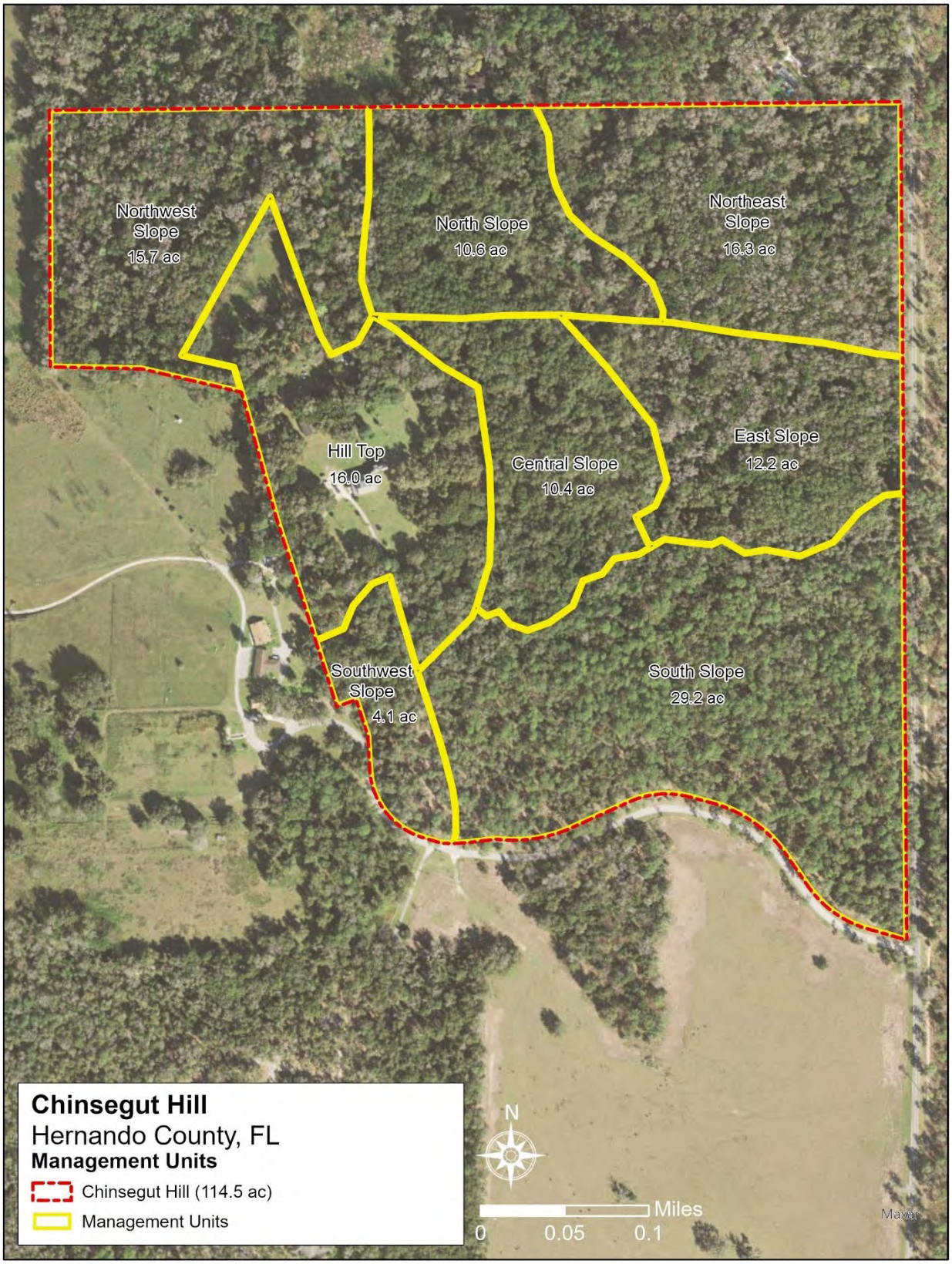


Figure 2.1. (A) Proposed management units for Chinsegut Hill, based on FNAI (2020) but superimposed on modern aerial imagery.

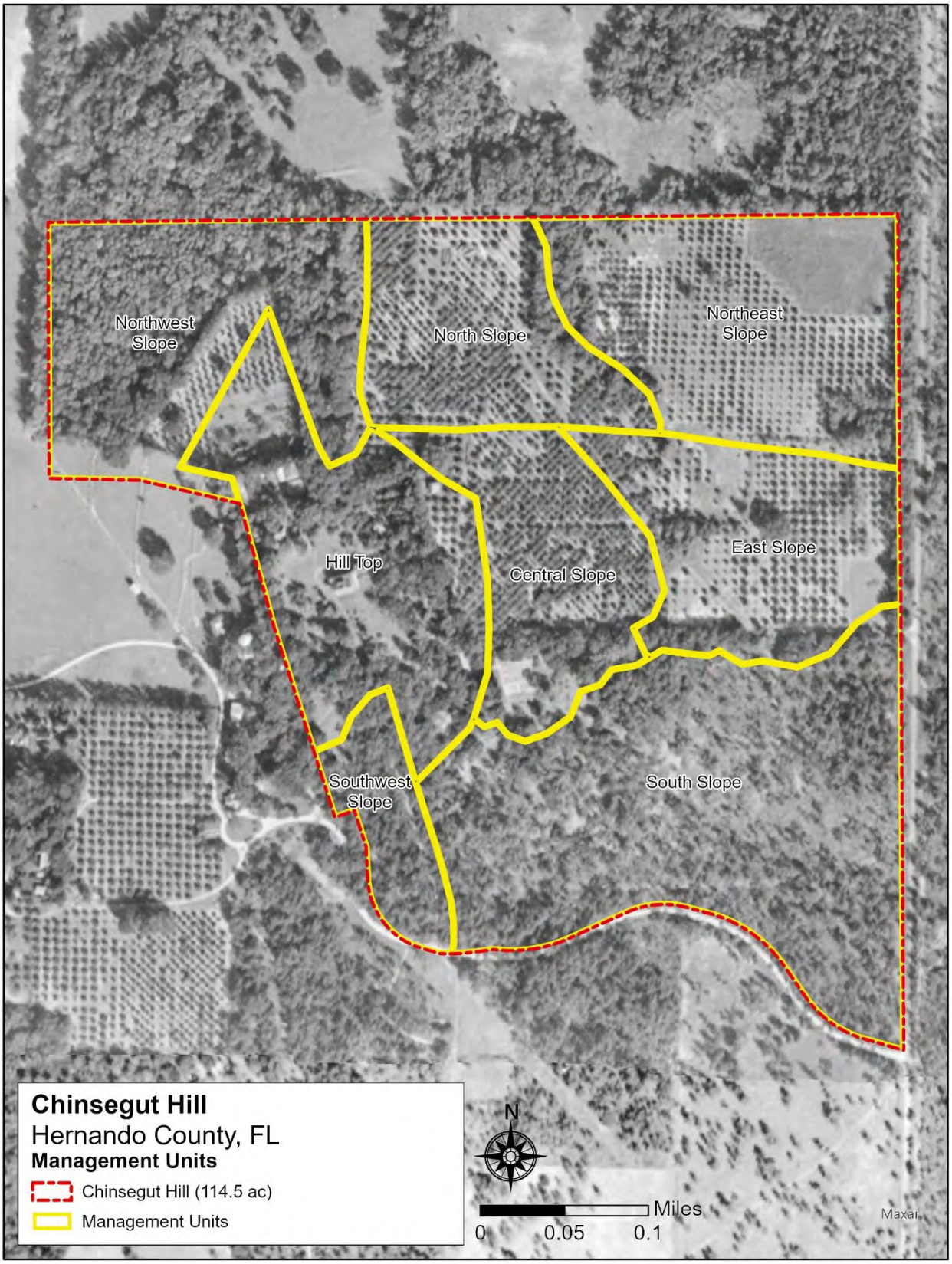


Figure 2.1. (B) The same management units superimposed on aerial imagery from 1944. Plantations of citrus and other tree crops are evident on nearly half of the site.

The Chinsegut Hill property is owned by the Department of Environmental Protection (FDEP)-Division of State Lands and leased to Hernando County for a current term of 50 years. The lease (#4715) was amended on November 28, 2017, and expires May 31, 2063. The lease requires a "Conservation Management Plan", which differs from this document and is to be updated every 10-years with the next update on June 1, 2027.

Chinsegut Hill is on the national register of historic places (NRHP), which includes three sites; #8HE496, #8HE673, #8HE269. About 16 acres of property serve as a Retreat Center with an historic Manor House (Fig. 2.2), cabins, dining hall, lecture hall, a variety of other out buildings, and extensive mowed areas and horticultural plantings. The ESL program is responsible for the management of the "natural areas" surrounding the historic Manor House, which is more or less of all proposed management units except the "hilltop unit".

A Memorandum of Agreement with the Florida Forest Service (FFS) was executed in 2014 with automatic renewals through 2029 to conduct habitat management in this area of responsibility (of approximately 108 acres more or less) per an annual workplan and budget. The annual workplan follows the current management plan for the property. Hernando County has also recently entered into a licensing agreement for services at Chinsegut Hill. Effective January 28, 2020 Tampa Bay History Center (TBHC) manages the historic building and showcases the history of the site. Hernando County Parks and Recreation currently manages the grounds surrounding the historic house, the retreat center, and other facilities on the property.

Figure 2.2. Two views of the Chinsegut Hill Manor House. Photos by Reed Noss.

Most of the Chinsegut Hill property has been heavily impacted for many years by agricultural and horticultural uses, to the extent that non-native plants, many of them invasive, dominate most of the property. Thus, the primary management focus of this preserve is invasive plant management and, when possible, eradication. The in-depth survey completed by FNAI (2020) identified 66 species of nonnative plants on the property. Three of the eight management units contain relatively intact (though invaded) natural communities, one contains the Manor House and retreat cabins, and the other four, which were previously agriculture, are now covered by various non-native plants as well as native species that colonized the site after the citrus groves and other tree crops were abandoned (Fig. 2.3).

Figure 2.3. Two views of the mixture of native and (mostly) non-native plant species that dominate Chinsegut Hill. Photos by Reed Noss.

Geography, geology, landform, and soils

Chinsegut Hill is located on the Brooksville Ridge, an ancient Plio-Pleistocene shoreline (terrace) with associated dunes, north of the town of Brooksville. At 269 feet (82 m) in elevation, Chinsegut Hill is the third highest peak on the Brooksville Ridge, after Clay Hill (301 feet) in Pasco County and an unnamed peak (270+ feet) in Hernando County southeast of Brooksville (https://en.wikipedia.org/wiki/List_of_Florida%27s_highest_points).

Chinsegut Hill lies entirely on the Brooksville Ridge, but the bedrock geology features limestones and dolomites of Miocene (Hawthorn Group) and Oligocene (Suwannee Limestone) age (Fig. 1.3). The soils are all sands, dominated by fine sands of the Arredondo series (Fig. 2.4, Table 2.1) on 5-8% slopes (52.3% of site) and 0-5% slopes (6.9% of site). This soil series consists of well drained soils that are rapidly permeable in the thick sandy surface and subsurface layers and moderate to very slow in the subsoil. They formed from sandy and loamy marine sediments on slopes ranging from 0 to 12 percent (https://soilseries.sc.egov.usda.gov/OSD_Docs/A/ARREDONDO.html). Arredondo fine sands lie more than 200 cm above the water table (Table 2.1). The next most common soil type on Chinsegut Hill is the Blichton loamy fine sand on slopes of 2-5% (23.3% of site) and 5-8% (4.1% of site). The Blichton series consists of very deep and very poorly drained, moderately slow or slowly permeable soils on uplands in central Florida. They formed in thick beds of loamy and sandy marine sediments. Slopes range from 0 to 8 percent (https://soilseries.sc.egov.usda.gov/OSD_Docs/B/BLICHTON.html) and the depth to water table is only about 15 cm (Table 2.1). Less abundant soil types on Chinsegut Hill are Flemington fine sandy loam on 8-12% slopes (6.8% of site) and Kendrick fine sand on 0-5% slopes (2.7% of site). The Flemington series consists of poorly drained, very slowly permeable soils formed in thick beds of clayey marine sediments on nearly level to strongly sloping areas. The soil is saturated in summer and early fall. Water runs off the surface moderately to rapidly. Slope ranges from 0 to 12 percent (https://soilseries.sc.egov.usda.gov/OSD_Docs/F/FLEMINGTON.html). The Kendrick series consists of well drained, slowly to moderately slowly permeable soils formed in thick beds of loamy marine sediments on nearly level to sloping areas. Slopes range from 0 to 8 percent (https://soilseries.sc.egov.usda.gov/OSD_Docs/K/KENDRICK.html). It is important to note that loams are more fertile soils than pure sands. Loam soils generally contain more nutrients, moisture, and humus than sandy soils, and have better drainage and infiltration of water and air than silt or clay-rich soils.

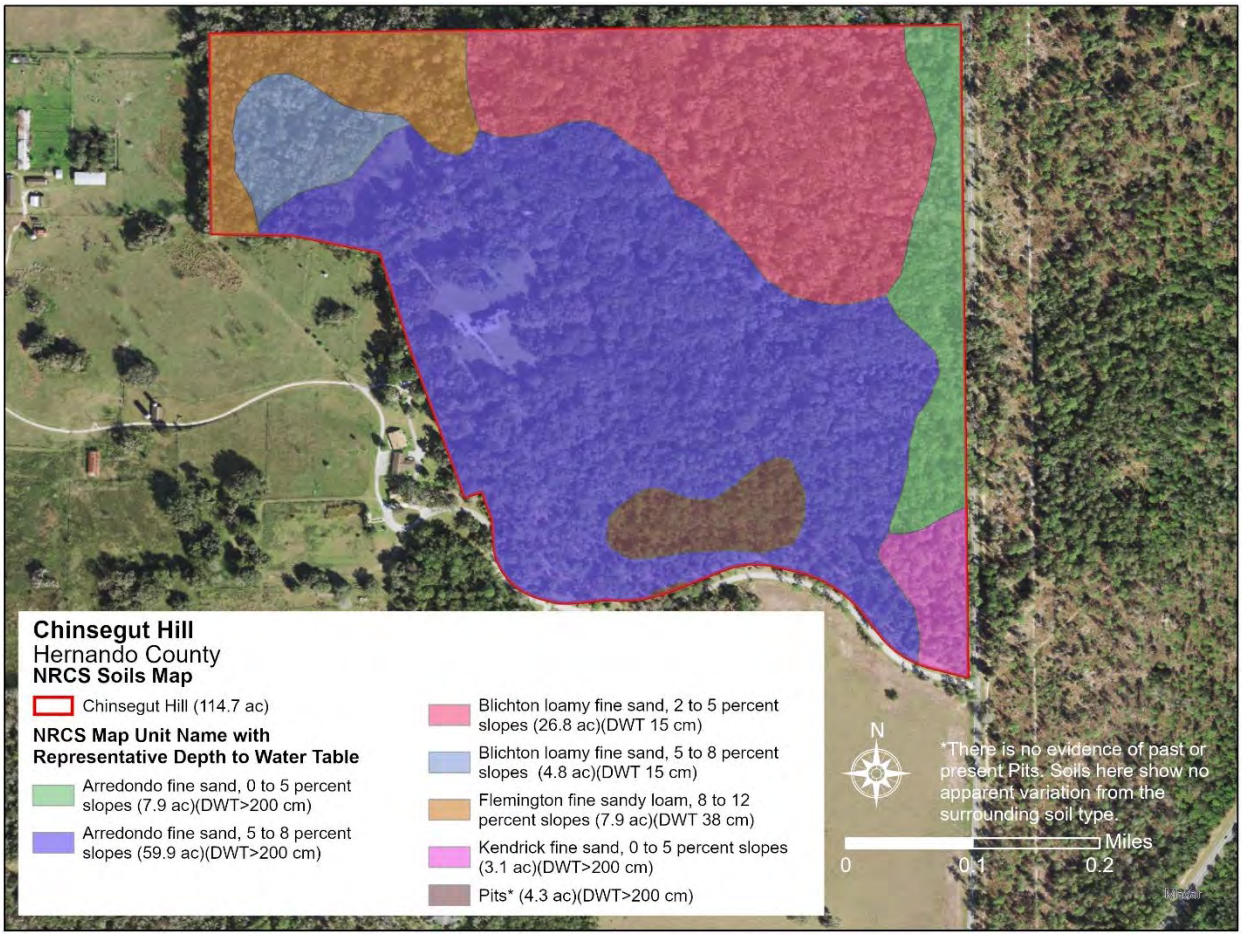


Figure 2.4. Natural Resources Conservation Service (NRCS) soils map of Chinsegut Conference Center (now Chinsegut Hill). The preserve is dominated by Arredondo fine sand on 5 to 8 percent slopes (52.3% of site; see Table 2.1 below). Although NRCS lists Pits as soil class, no pits are evident in this area.

Table 2.1. Soil types on Chinsegut Hill Preserve. The rating (in centimeters) refers to the depth to water table. The purported presence of pits is apparently an error. AOI is slightly larger than entire property.

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
6	Arredondo fine sand, 0 to 5 percent slopes	>200	8.0	6.9%
7	Arredondo fine sand, 5 to 8 percent slopes	>200	60.0	52.3%
12	Blichton loamy fine sand, 2 to 5 percent slopes	15	26.8	23.3%
13	Blichton loamy fine sand, 5 to 8 percent slopes	15	4.8	4.1%
22	Flemington fine sandy loam, 8 to 12 percent slopes	38	7.8	6.8%
29	Kendrick fine sand, 0 to 5 percent slopes	>200	3.1	2.7%
41	Pits	>200	4.3	3.7%
Totals for Area of Interest			**114.7**	**100.0%**

Landscape context

Chinsegut Hill is strategically located for large landscape conservation. It is part of a contiguous suite of conservation lands, mostly west-northwest of U.S. Highway 41, including units of the Withlacoochee State Forest, FWC's Chinsegut Wildlife and Environmental Area, the USDA Brooksville Plant Materials Center, and Audubon Florida's Ahhochee Hill Sanctuary. The western and southern boarders of the property are bounded by Florida Agriculture and Mechanical University's (FAMU) Brooksville Agricultural and Environmental Research Station (BAERS). While, FAMU is not managed for conservation, its large area of agricultural zoned property provides conservation value. Hernando County's Lake Townsen Preserve lies just 0.75 miles to the east of this complex. All of these areas are within the current conservation land network (see Fig. 1.2).

Hydrology

According to the 2015 Management Plan, Chinsegut Hill contains small seeps that might have previously supported populations of the Brooksville bellflower (*Campanula robinsiae*), a globally and state critically imperiled species that is narrowly endemic to the vicinity of Chinsegut Hill and in Hillsborough River State Park and Croom Wildlife Management Area (see below). No streams or other significant hydrological features are known from this preserve.

Vegetation and natural communities

The vegetation of Chinsegut Hill has been radically altered from its natural condition since at least the 19th century. The FNAI (2020) report on invasive and non-native plants at the preserve noted that, aside from the approximately 16 acres more or less of institutional or developed lands, the remaining acreage is mostly forested. Although a remnant upland hardwood forest with a canopy of native tree species occupies the northwestern portion of the preserve, most of the acreage consists of successional hardwoods that colonized land that had been previously cleared and converted to citrus and other tree crops (visible on 1944 aerial imagery; Fig. 2.1), but then abandoned. Although this hardwood forest can be classified as mesic hammock, it is hardly a natural example of this community. Rather, the site was colonized by a mix of native and non-native plants, predominantly the latter, such that most of the vegetation consists of non-native species, from low-growing ground cover to tall canopy trees (FNAI 2020). Many of the non-native species are ornamentals, which were deliberately planted on the site.

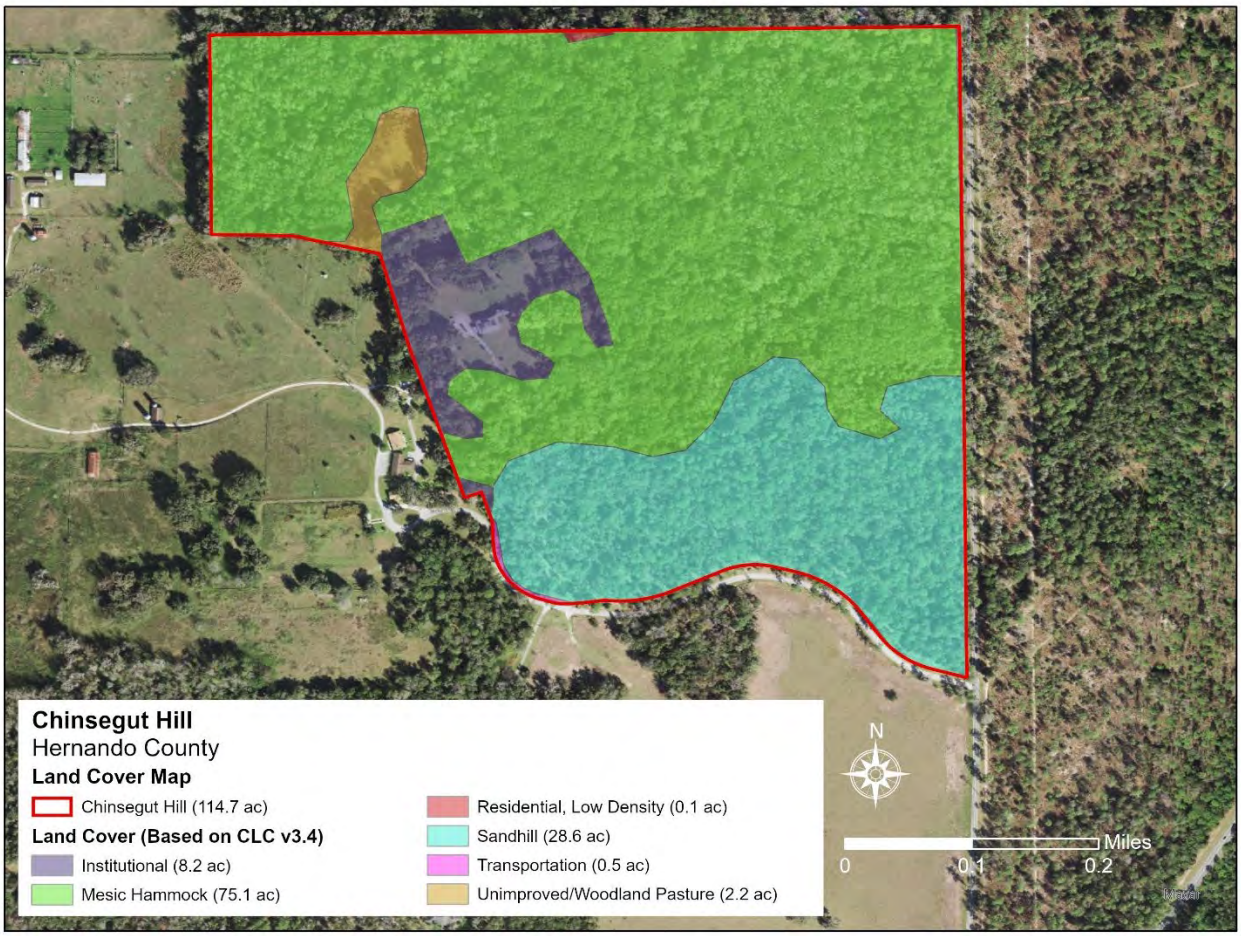


Figure 2.5. Land cover of Chinsegut Conference Center (now Chinsegut Hill). The site is dominated by "mesic hammock" consisting largely of non-native plants, and sandhill (or an interesting southern occurrence of the upland pine natural community), currently in the process of restoration after a long period of fire exclusion.

Referring to the proposed management units shown in Fig. 2.1, the following presumed historic and current vegetation types are as follows (mostly adapted from FNAI 2020):

South Slope (sandhill/upland pine)

The vegetation on the South Slope management unit of Chinsegut Hill has the highest restoration potential, and active restoration (mechanical treatments and prescribed fire) is currently being conducted by the FFS to counteract decades or more of fire exclusion (Fig. 2.6). This area is dominated by an open canopy of large longleaf pines (*Pinus palustris*) but also some large individuals of fire-sensitive sand laurel oak (*Quercus hemisphaerica*) that invaded after fire exclusion. Most of the wiregrass (*Aristida beyrichiana*) and other native groundcover has been lost in the absence of fire and no longleaf pine regeneration was observed.

Although identified by the FFS as a sandhill natural community, FNAI (2020) points out that some to most of the area may have historically been an upland pine natural community with inclusions of sandhill. Evidence for this conclusion includes: 1) the soil type – Arrendondo fine sand – contains loam, which is a richer soil that favors upland pine over sandhill; 2) only two turkey oaks (*Quercus laevis*) were found by FNAI on this site, but turkey oaks typically proliferate on sandhill after fire exclusion; and 3) sand post oak (*Quercus margaretiae*), which also indicates a richer soil than typical sandhill, occurs on the site, as well as several herbaceous species more closely associated with upland pine than sandhill (FNAI 2020).

Common invasive plants on the South Slope unit include arrow bamboo (*Pseudosasa japonica*), Caesar's weed (*Urena lobata*), and cogon grass (*Imperata cylindrica*). Fire and mechanical removal alone are unlikely to control these plants, so herbicide treatments will be necessary. Casear's weed requires multiple treatments annually to reduce cover to a maintenance level (FNAI 2020).

Figure 2.6. Restoration of sandhill (or upland pine) on the South Slope management unit of Chinsegut Hill to remove non-native plants and restore native vegetation. Photos by Reed Noss.

Northwest Slope (upland hardwood forest/mesic hammock and woodland/pasture)

As seen in the aerial photo from 1944 (Fig. 2.1) most of this area had not been converted to citrus or other tree crops and apparently was never clearcut. Hence, although the ground and shrub layers are heavily invaded by non-native species, the canopy trees are mostly old individuals of native species associated primarily with upland hardwood forest, a community near the southern limit of its range in Hernando County and typically associated with limestone near the surface. These species include sweetgum (*Liquidambar styraciflua*), sand laurel oak (*Quercus hemisphaerica*), southern magnolia (*Magnolia grandiflora*), pignut hickory (*Carya glabra*), live oak (*Quercus virginiana*) and some Florida maple (*Acer floridanum*), white ash (*Fraxinus americana*), winged elm (*Ulmus alata*), and scattered redbud (*Cercis canadensis*), flowering dogwood (*Benthamidia florida*), gum bully (*Sideroxylon lanuginosum*), ironwood (*Carpinus caroliniana*), and redbay (*Persea borbonia* var. *borbonia*). Species more typical of mesic hammock include persimmon (*Diospyros virginiana*), cherry laurel (*Prunus caroliniana*), beautyberry (*Callicarpa americana*), and saw palmetto (*Serenoa repens*). Species characteristic of mesic hammock often mix with species typical of upland hardwood forest near the southern range limit of the latter (FNAI 2010).

Invasive non-native species are abundant in this management unit, especially in the ground and shrub layers, with the most common being camphor tree (*Cinnamomum camphora*), cat's claw

vine (*Dolichandra unguis-cati*), air-potato (*Dioscorea bulbifera*), small-leaf spiderwort (*Tradescantia fluminensis*; Fig. 2.7), Chinaberry (*Melia azedarach*), shiny xylosma (*Xylosma congesta*), coral ardisia (*Ardisia crenata*), and Chinese fan palm (*Livistona chinensis*). The Chinese fan palm has spread beyond where it was apparently planted and is dense in the center of this management unit (Fig. 2.8).

Figure 2.7. Small-leaf spiderwort (*Tradescantia fluminensis*) dominates the ground cover of the Northwest Slope management unit and many other areas at Chinsegut Hill. Photo by Reed Noss.

Figure 2.8. Chinese fan palms (*Livistona chinensis*) dominate an area in the center of the Northwest Slope management unit. Photo by Reed Noss.

Despite the high cover of non-native plants in the Northwest Slope management unit, this unit has the next best restoration potential, in large part because the canopy is dominated by native tree species. FNAI (2020) recommends that removal of Chinese fan palm should be a top priority, but eradication of this and other invasives should avoid creating large canopy gaps, which would favor many other shade-intolerant invasive plants. The small-leaf spiderwort is a severe problem on the Northwest Slope and should be controlled by herbicide treatments. A recent study showed that triclopyr ester provides the best control of this plant in Florida, followed by triclopyr amine, triclopyr choline, and glufosinate, which all had similar effects (Marble and Chandler 2021).

Southwest Slope

This management unit is west of the entrance road off of Chinsegut Hill Road and west of the South Slope management unit. This is a small disturbed patch of land with abundant sandy field beaksedge (*Rhynchospora megalocarpa*), a native graminoid. Remnant live oak and pignut hickory are the only tree species in this unit. Although the original natural community type for this area is unknown, it is probably best restored and managed as mesic hammock. The most abundant invasive non-native plants in this unit are cogon grass, camphor tree, rosary pea (*Abrus precatorius*), arrow bamboo (the most problematic invasive present), Caesar's weed,

and skunk vine (*Paederia foetida*). Herbicide treatments, augmented by prescribed fire, will be needed indefinitely to control these species.

North, Northeast, Central, and East Slopes

As in FNAI (2020), these four management units are discussed collectively because they have similar histories and similar severe impacts from past agriculture and dominance by non-native plants. The current vegetation is composed of species that colonized the site after abandonment of agriculture. The vast majority of these species are non-native. Management unit boundaries for the north, center, and south edges of the units are the north preserve boundary, the powerlines right-of-way trail, and the fireline. Management unit boundaries between the North and Northeast Slopes, and the Central and East Slopes are not distinct, but their rationale is explained in FNAI (2020).

Although non-native species dominate these four management units, native trees and shrubs are present, including sand laurel oak, pignut hickory, sugarberry (*Celtis laevigata*), loblolly pine (*Pinus taeda*), southern magnolia, box elder (*Acer negundo*), roughleaf dogwood (*Swida asperifolia*), American elm (*Ulmus americana*), winged elm, and several large live oaks. Cypress (*Taxodium* sp.) was apparently planted near an apparent old home site or clearing. This tree species composition is not indicative of any pure natural community but is closest to hydric hammock (which it may have been before conversion to citrus and other tree crops), with higher areas formerly upland hardwood forest, as in the Northwest Slope unit. Just north of the preserve boundary on private land are swamp chestnut oak (*Quercus michauxii*) which is characteristic of upland hardwood forest and bottomland forest and is near its southern range limit here.

Invasive non-native species have extensive cover in these management units. The most common of these species are camphor tree, Caesar's weed, cat's claw vine, skunk vine, rosary pea, air-potato, small-leaf spiderwort, coral ardisia, Chinaberry, common asparagus fern (*Asparagus setaceus*), and sword fern (*Nephrolepis* sp.).

Figure 2.9. Caesar's weed, sword fern, and other invasive non-native plants with an overstory of mostly native sand laurel oak, in the Central Slope management unit. Photo by Reed Noss.

FNAI (2020) recommends that restoration of these four units not commence until the Northwest Slope unit is very close to its restoration targets. Restoration treatments can then begin on the North Slope unit, which is adjacent to the Northwest Slope, and then proceed to the other three units. FNAI (2020) further advises: "No restoration activities should be initiated in these four management units until they can be sustained and repeated for a number of years. Caesar's weed will require multiple treatments per year, and coral ardisia will require annual treatments for at least five years given the density of this plant within these management units."

<u>At-risk species and resource priorities</u>

Ironically, despite being the most disturbed and invaded by non-native species of any Hernando County preserve, Chinsegut Hill is rated as one of the two preserves of highest significance for potential habitat of imperiled plant and animal species and is rated as highest priority by the most recent version of the Florida Critical Lands and Waters Identification Project (CLIP v.4.0).

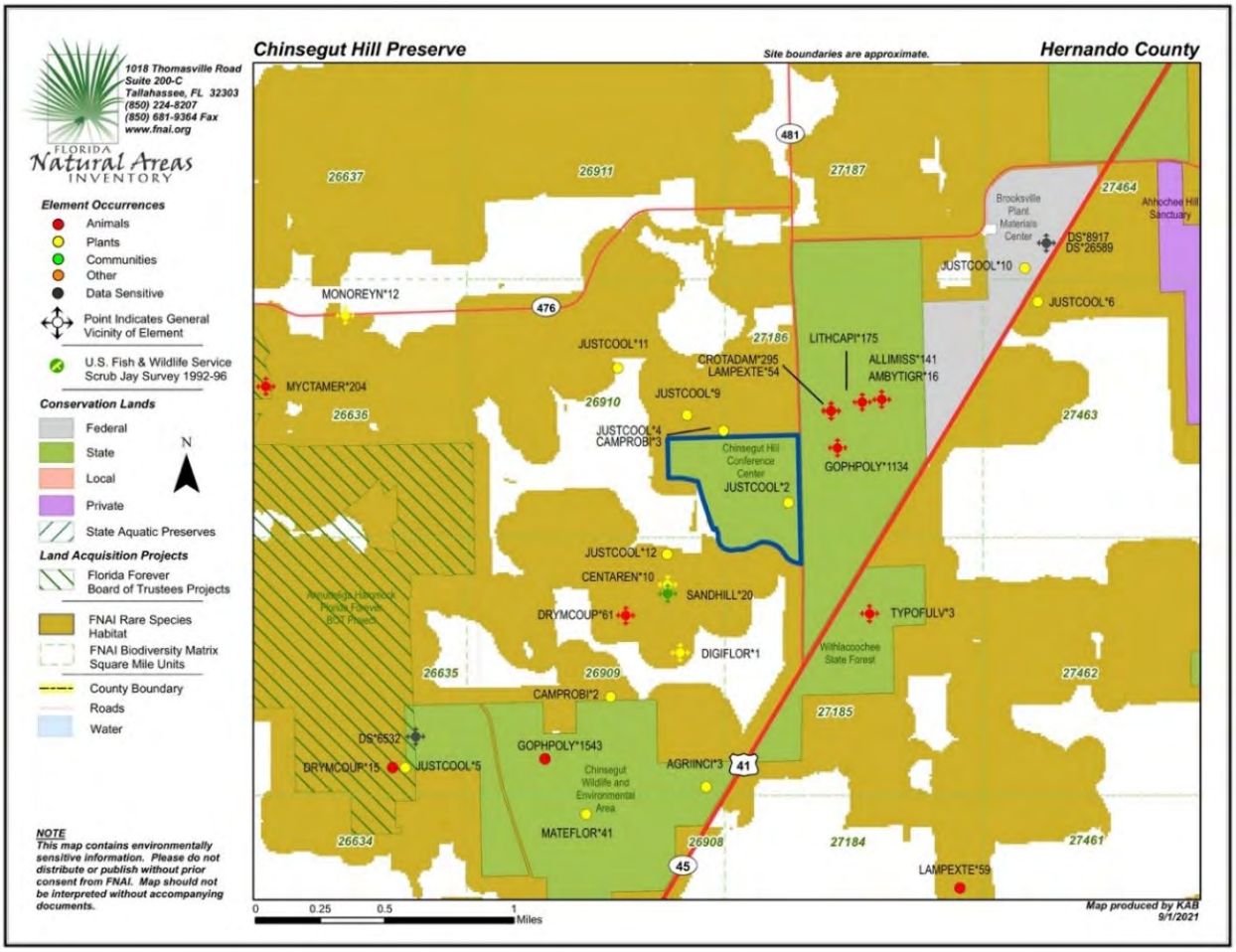


Figure 2.10. Species of conservation concern observed within or in the vicinity of Chinsegut Hill. Species names on occurrences are abbreviations of the scientific names in Table 2.2

Table 2.2. Species of conservation concern with documented or potential occurrence on Chinsegut Hill. In the far-right column, "close to" means that a species has been documented to occur within ca. 1 mile of the preserve boundaries. The species below are of concern due to their high G-ranks or S-ranks (3 or above), presence on the federal or state list of threatened and endangered species, or listing as Species of Greatest Conservation Need in the Florida Wildlife Action Plan. Note: Because there is not yet a comprehensive species or natural community inventory for Chinsegut Hill, additional species of conservation concern that are not on the list below likely occur within the preserves.

Species	G-rank	S-rank	Federal status	State status	SGCN	Present, close to, or potentially on site
Animals						
Yellow-banded Typocerus long-horned beetle (*Typocerus fulvocinctus*)	G2G3	S2S3				close
Gopher frog (*Rana [Lithobates] capito*)	G2G3	S3			Yes	close

Species	G-rank	S-rank	Federal status	State status	SGCN	Present, close to, or potentially on site
Eastern tiger salamander (*Ambystoma tigrinum*)	G5	S3				close
Eastern indigo snake (*Drymarchon couperi*) or Gulf Coast indigo snake (*Drymarchon kolpobasileus*)	G3	S3	T	FT	Yes	close
Short-tailed snake (*Lampropeltis extenuata*)	G3	S3		ST		close
Eastern diamondback rattlesnake (*Crotalus adamanteus*)	G3	S3				present
Gopher tortoise (*Gopherus polyphemus*)	G3	S3	C	ST	Yes	present
Southeastern pocket gopher (*Geomys pinetis pinetis*)					Yes	close
Florida black bear (*Ursus americanus floridanus*)	G5T4*	S4				potentially
Common Ground-Dove (*Columbina passerina*)					Yes	potentially
Wood stork (*Mycteria americana*)	G4	S2	T	FT	Yes	close
Little blue heron (*Egretta thula*)	G5	S4		ST	Yes	close
White ibis (*Eudocimus albus*)	G5	S4			Yes	close
Florida sandhill crane (*Antigone canadensis pratensis*)	G5T2	S2		ST	Yes	Close (directly adjacent)
Swallow-tailed kite (*Elanoides forficatus*)	G5	S2			Yes	close
Southeastern American kestrel (*Falco sparverius 54aulus*)	G5T4	S3		ST	Yes	(close, but outside breeding season)
Plants						
Hammock fern (*Blechnum appendiculatum)*	G5TNR	S1		E		**On site (2020)**
Cooley's water-willow (*Justicia cooleyi*)	G2Q	S2	E	E		**On site (1995) and on boundary (2021)**
Brooksville bellflower (*Campanula robinsiae*)	G1	S1	E	E		**Formerly present on boundary (1983), perhaps on site**
Incised grove-bur (*Agrimonia incisa*)	G3	S2		T		close

Species	G-rank	S-rank	Federal status	State status	SGCN	Present, close to, or potentially on site
Sand butterfly pea (*Centrosema arenicola*)	G2Q	S2		E		close
Florida fingergrass (*Digitaria floridana*)	G1	S1				close
Florida spiny-pod (*Matelea floridana*)	G2	S2		E		close

*Although not ranked high enough (G3 or S3 and above) to qualify for this list, we include the Florida black bear because it is a wide-ranging landscape species highly sensitive to habitat fragmentation by roads and development, with the Chassahowitzka population considered imperiled.

Two of the Endangered plants in Table 2.2 have been observed within or on the boundary of Chinsegut Hill:

Cooley's water-willow (*Justicia cooleyi*) is an imperiled G2Q/S2 species that is listed both federally and by the state of Florida as Endangered. It is a regional endemic known only from calcareous hammocks in Lake, Sumter, and Hernando counties. It has been documented on Chinsegut Hill and on the northern boundary, with populations confirmed in 1995 and then again in 2021 by Florida Forest Service and ESL staff on the northwest boundary along CR 581. With removal of invasive non-native plants and restoration of natural communities, it is possible that this species could be rediscovered within the preserve or could be reintroduced here.

Brooksville bellflower (*Campanula robinsiae*) is a critically imperiled G1/S1 species that is listed both federally and by the state of Florida as Endangered. It is a local endemic currently known only from wet, grassy slopes and drying pond edges in the vicinity of Chinsegut Hill (CAMPROBI*2 in Fig. 2.10) and from Hillsborough River State Park in Hillsborough County (as recently as 2006-2007) and in Croom Wildlife Management Area (still extant in 2021). With only three known extant populations, it is one of the rarest species in Florida and the U.S. (Chafin 2000). With removal of invasive non-native plants and restoration of natural communities, it is possible that this species could be rediscovered within the preserve or could be reintroduced here.

Hammock fern (*Blechnum appendiculatum*), classified as *B. occidentale* var. *minor* by Wunderlin and Hansen (2011), was documented on the preserve in 2020 by the Florida Forest Service and the Florida Natural Areas Inventory (FNAI), though is curiously absent from the rare species report for Chinsegut Hill provided by FNAI in 2021 (Fig. 2.10). Additional field work is needed to re-confirm the exact location of this fern, which is ranked as critically imperiled (S1) in Florida.

The statewide Critical Lands and Waters Identification Project (CLIP) shows Resource Priorities in the vicinity of Chinsegut Hill (Fig. 2.11) (https://www.fnai.org/services/clip). CLIP was created in 2006 in response to the Century Commission for a Sustainable Florida's call for an identification of those lands and waters that are critical to the conservation of Florida's natural

resources. CLIP was produced through a collaboration of the Florida Natural Areas Inventory, University of Florida Center for Landscape Conservation Planning, Florida Fish and Wildlife Conservation Commission, and an independent Technical Advisory Group. CLIP is a GIS database of statewide conservation priorities for a broad range of natural resources, including biodiversity, landscape function, surface water, groundwater, and marine resources. The latest version of CLIP (v4.0) shows Chinsegut Hill in the highest priority category (1) for biodiversity, landscape, and aggregated priorities, but lower for surface waters (Fig. 2.11).

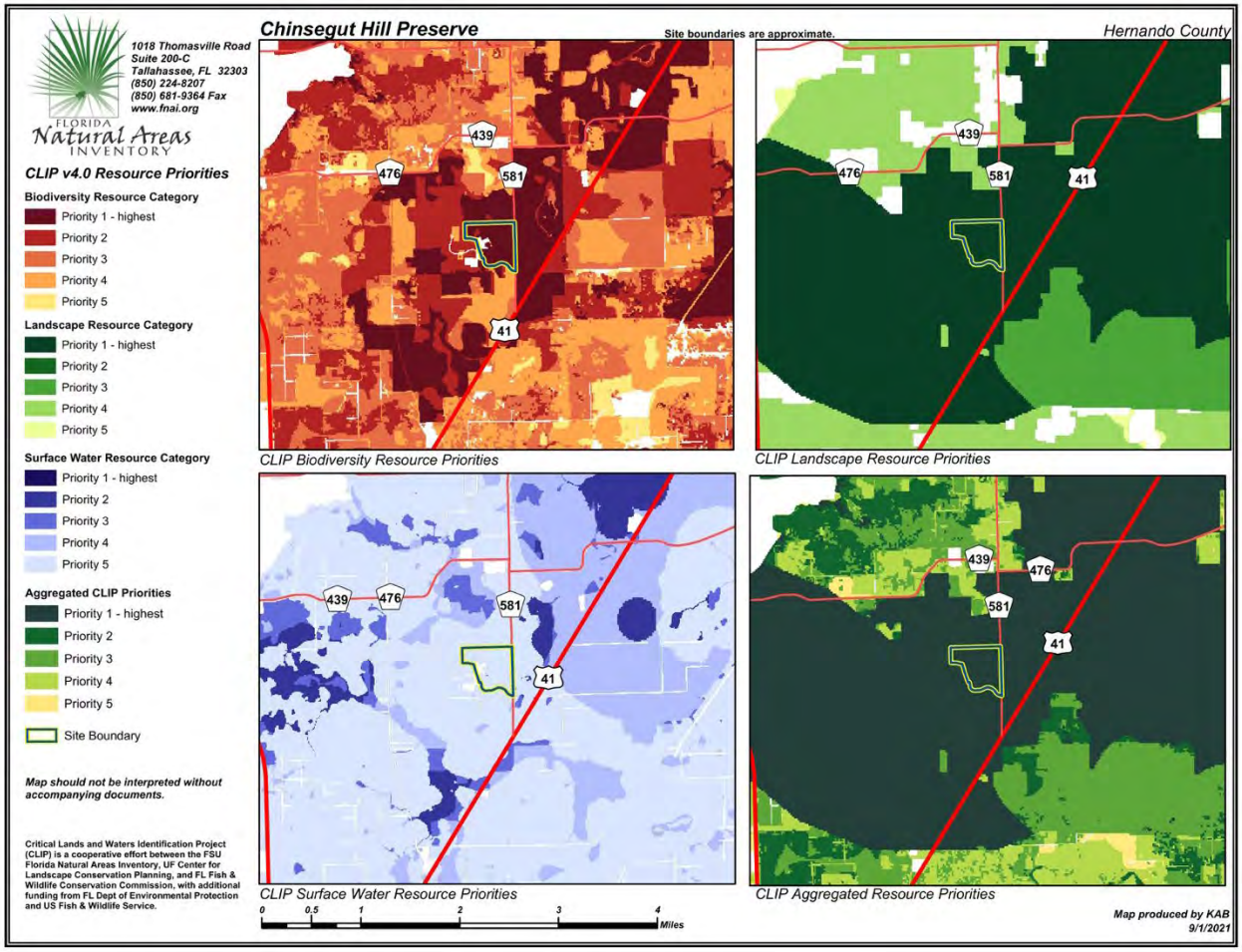


Figure 2.11. Resource Priorities in the vicinity of Chinsegut Hill, as identified in the statewide Critical Lands and Waters Identification Project (CLIP), version 4.

Non-native and invasive species

Chinsegut Hill has by far the greatest invasive non-native species problem of any Hernando County preserves. Table 2.2 shows the 10 most frequent non-native plants at the preserve (FNAI 2020). The preceding section on vegetation and natural communities by management unit presents more detail on the most problematic invasives in each area and treatment options.

Table 2.2 The most frequently encountered non-native plants at Chinsegut Hill and their average cover. From FNAI (2020).)For a comprehensive list of the 66 non-native plants recorded during the FNAI surveys, refer to the full FNAI (2020) report, included as Appendix 2 of this Master Management Plan Update.

Scientific name	Common name	UF IFAS Assessment Central	FISC[1] Category Rank	Frequency[2]	Average Cover in Sample Unit
Cinnamomum camphora	camphor-tree	Invasive	1	455	32.2%
Urena lobata	Caesar's weed	Invasive	1	374	8.9%
Ardisia crenata	coral ardisia	Prohibited	1	312	22.4%
Dioscorea bulbifera	air potato	Prohibited	1	283	16.5%
Dolichandra unguis-cati	cat's-claw vine	High Invasion Risk	1	275	12.7%
Paederia foetida	skunk vine	Prohibited High Invasion Risk	1	273	2.8%
Abrus precatorius	rosary pea	Prohibited	1	246	8.7%
Tradescantia fluminensis	small-leaf spiderwort	Invasive (No Uses)	1	167	44.6%
Xylosma congesta	shiny xylosma	*No Assessment*		109	7.4%
Melia azedarach	Chinaberry	Caution	2	100	21.8%

1 Formerly called Florida Exotic Pest Plant Council (FLEPPC)

Site development, improvements, and access

Existing improvements

Chinsegut Hill is recognized for its significant historic resources, especially the Manor House. Begun in the early 1850s, the Manor House has remained relatively unchanged since (https://en.wikipedia.org/wiki/Chinsegut_Hill_Manor_House). Hernando County will manage the infrastructure of the historic structures and the area surrounding them on the top of the hill.

Proposed improvements

No major structures or roads are planned at this time. However, the Tampa Bay History Center plans to build an elevator at the Manor House for Americans with Disabilities Act (ADA) compliance. In addition, there are plans to create additional hiking trails within the property and potentially create a connection to trails on the adjacent Chinsegut Wildlife and Environmental Area (WEA). The Florida Trail Association has also expressed interest in advanced planning of Florida National Scenic Trail connections to the Chinsegut WEA. Any connection would require approval from FWC and as such close coordination will be necessary.

Access

Chinsegut Hill is accessed from a paved road, Chinsegut Hill Road, which runs to the west from Snow Memorial Highway (County Road 581), and then from a paved entrance road, which runs north to the top of Chinsegut Hill and the Manor House. Snow Memorial Highway intersects U.S. 41 (North Broad Street) 0.38 miles south of Chinsegut Hill Road. No additional public access is planned, except for the potential connector trail to Chinsegut WEA noted above.

Easements, concessions, or leases

As noted earlier, the Chinsegut Hill property is owned by the Department of Environmental Protection (FDEP)-Division of State Lands and leased to Hernando County for a current term of 50 years.

<u>High-priority conservation values (summary)</u>

Two primary conservation values are recognized for Chinsegut Hill:

1. Potential habitat for the critically imperiled Brooksville bellflower, which could occur or be reintroduced to wet, grassy slopes or seeps on the preserve, as well as other species of conservation concern (Table 2.2).

2. An occurrence of upland hardwood forest/mesic hammock, near the southern range limit of the former, in the Northwest Slope management unit. This community, however, requires significant restoration, primarily removal of non-native species from the herbaceous, shrub, and canopy layers.

<u>Desired outcomes and strategies</u>

We retain, with some modification, the desired outcomes and strategies outlined in the 2015 Chinsegut Hill Management Plan.

Desired outcomes

The desired long-range outcome is ecological restoration of the native natural communities of Chinsegut Hill that have suffered the least degradation and which can be feasibly restored. For these communities, the goal is to restore them to the condition they were in prior to agriculture, horticulture, non-native species invasions, and other sources of degradation. An example is the sandhill community, which is currently in the process of restoration. For other,

more highly impacted areas, the goal is to reduce the cover and biomass of non-native plants to the degree possible. In the short term, the following outcomes will be the immediate focus:

1. Keep the worst invasive species from spreading to other nearby conservation lands.

2. Improve the user experience for visitors.

3. Test methods for an economical way to restore areas with native plant species.

4. Provide educational material/signs for visitors to understand and support the management activities occurring on the property.

Strategies

Many strategies can be pursued to achieve the desired outcome of a preserve eventually dominated again by native plant communities. The FNAI (2020) invasive non-native plant survey and documentation of the original natural communities present on Chinsegut Hill will be used to prioritize actions. Various combinations of treatments to eradicate or control invasives will be applied within an adaptive management framework (see Management Protocols section and Appendix 1). With adaptive experimentation with various combinations of management treatments, the strategies will be refined or may be changed depending on the initial outcomes. Identify treatment plans for specific species.

The 2015 management plan discussed an "initial strategy," most of which still applies:

> Considering that we do not want visitors to inadvertently transport exotics off the site and disperse them throughout the southeast we must consider removal and control of certain species from the area of highest traffic, on top of the hill. Species that can contaminate clothing and vehicles must be considered first. These include camphor, Caesar-weed, chinaberry, coral ardisia, privet, Sword fern, cogongrass, and Japanese climbing fern. These species should be removed from the top of the hill within the mowed periphery of any occupied building, parking lot, or frequently visited area. Initially the mowed grounds will be the responsibility of the Friends of Chinsegut Hill, Incorporated. In future years the Florida Forest Service may assume this responsibility as negotiated in an annual budget agreed upon by Hernando County and the Florida Forest Service.
>
> To keep invasive exotic plant species from spreading to neighboring properties a buffer around the perimeter of the property will be treated. This will start with existing roads and be augmented with a perimeter trail for access where no road exists. All exotics outside and within 25 feet of this trail will be frequently treated.
>
> To stop new invasives from spreading from the hill, treatment of any plant that is not

widespread on the property and has not already spread throughout Hernando County will be accomplished. Unidentified species such as the 3 veined trees, the spiny tree, perhaps one or more of the bamboos, and the Chinese fan palm are all examples of this.

In order to determine future native planting needs for restoration, an area with easy access will be selected near the top of the hill in which all exotics will be treated. This will test the treatment methods and note any desirable species that return. If there are no desirable native species present, introduction of plants or seed from some nearby natural areas will be the method to re-vegetate the area. The results of this trial area will eventually determine the final desired condition of the property, and the rate in which we try to achieve this condition.

Species that have a good chance of escaping the property, despite a buffer, will also be treated. Examples are sword fern that spreads by spore or coral ardisia that have seeds that are carried by animals.

Finally, any area that can/should be restored with fire will be identified. There is a sandhill in the SW portion of the tract in which fire may be introduced. This is the only area that seems to be recognizable as sandhill, a fire dependent plant community. If this area can be treated with fire it may be possible to reduce the exotic species more economically than with herbicides.

Since the above statement was written, mechanical treatments (cutting, chopping) and prescribed fire have been applied to restore the sandhill/upland pine in the South Slope management unit. Once invasive non-native and native (e.g., sand laurel oak) woody species have been knocked back, regular prescribed fire should be applied here. Sandhill requires fires every 1-3 years, preferably in the natural lightning fire season of late April through early July, peaking in May, to maintain its characteristic species composition and structure (Noss 2018).

Regular herbicide treatments will be needed indefinitely to control species (e.g., cogon grass) that are not fire-sensitive, and in upland hardwood forest and other hammock communities, which are not fire-dependent (albeit occasional fire in mesic hammock may be a helpful treatment). Especially in the upland pine/sandhill community, native ground cover species, including wiregrass, other native grasses, and forbs, need to be planted or re-seeded.

As noted in the 2015 management plan, the non-native plant species that are most invasive (that is, most likely to spread rapidly to other areas, including outside the preserve) should be the highest priorities for eradication. If complete eradication is not possible, these highly invasive species should at least be suppressed to low-density populations, where their chances of continued spread are minimized.

Managers will need to decide which of the less invasive or non-invasive species require treatments and which can be retained. It might be determined that some of the non-invasive horticultural species (e.g., sago palm [*Cycas revoluta*], Sengal date palm [*Phoenix reclinata*],

common bamboo [*Bambusa vulgaris*], and white ginger lily [*Hedychium coronarium*]) can be left on site for historical purposes, with interpretive signage to explain their history here. These non-invasive non-native species are listed in Table 2 of FNAI (2020) and denoted “not a problem species” (see Appendix 2). In areas of entirely consumed by invasive plant coverage, alternative non-conventional methods of control could be explored based on budgetary constraints (e.g., demonstration areas, living history etc.). Any uses considered outside of the existing Land Use Agreement (LUP) with DEP would require prior approval from DEP and a potential amendment to the LUP

Iterative monitoring will need to continue indefinitely to detect change of invasive and non-native plant communities and to measure progress towards restoration goals within an adaptive management framework. Refer to Chapter 7 (Management Protocols, Best Management Practices, and Performance Measures) for guidance on fire management, invasive non-native species control, viability of species of conservation concern, landscape context, adaptation to climate change, and visitor management.

Example of the Digital Management Activity Tracker for Chinsegut HIll. Activities and Units/Locations can be inserted into this spreadsheet and all tasks can be planned through 2032, taking into consideration given the resources of the ESL program.

Chinsegut Hill					2022				
Management Activity	Goal	Frequency	Target Season	Management Notes	Jan	Feb	Mar	Apr	May
Boundary									
Herbicide all exotics along boundary trail	Maintenance	4-6 months?	N/A						
Hill Top (Institutional/ Mesic Hammock)									
Mow around buildings	Maintenance	Bi-weekly	N/A	To disuade invasives from seeding in high traffic areas where they can be easily dispersed by visitors					
Herbicide invasives within high-use areas	Maintenance	4-6 months?	N/A	Camphor, Caesar-weed, chinaberry, coral ardisia, privet, Sword fern, cogongrass, and Japanese climbing fern					
Eradicate all invasives within the restoration area	Restoration		N/A	Test the treatment methods and note any desirable species that return. If there are no desirable native species present, introduction of plants or seed from some nearby natural areas will be the method to re-vegetate the area. The results of this trial area will eventually determine the final desired condition of the property, and the rate in which we try to achieve this condition.					
Northwest Slope (Upland hardwood forest/ mesic hammock and woodland/ pasture)									
Remove Chinese fan palm	Eradication		N/A	Avoid creating large gaps in the canopy					
Herbicide Small-leaf spiderwort	Eradication	6 months?	N/A	Triclopyr ester provides best control in FL					
South Slope (Sandhill/Upland Pine)									
Prescribed Fire	Restoration	1-3 years	April - July						
Mechanical Understory Restoration	Restoration		April - July	Chopping and cutting overgrowth due to fire supression					
Re-plant or re-seed native ground cover	Restoration		N/A	Should not commence until eradication of non-natives has made significant progress					
Herbicide Caesar's weed	Eradication	4-6 months?	N/A	multiple treatments per year					
Herbicide Cogon grass	Eradication	6 months	N/A	multiple treatments per year					
Herbicide Arrow bamboo, other invasives	Eradication	1 year?	N/A						
Southwest Slope (Disturbed, restore to Mesic Hammock)									
Prescribed Fire	Restoration	As necessary	April - July	No FRI mentioned - difficult because restoration unit					
Herbicide Cogon grass	Maintenance	6 months	N/A	multiple treatments per year					
Herbicide Caesar's weed	Maintenance	4-6 months?	N/A	multiple treatments per year					
Herbicide Other Invasives	Maintenance		N/A	Camphor tree, rosary pea (Abrus precatorius), arrow bamboo (the most problematic invasive present), and skunk vine (Paederia foetida)					
North, Northeast, Central and East Slopes (Non-native)									

Appendix 2. Adaptive Management Framework

Adaptive management can be defined as “an iterative process of gathering new knowledge regarding a system’s behavior and monitoring the ecological consequences of management actions to improve management decisions” (Howes et al. 2010). It is essentially a structured and systematic process of learning by doing. Adaptive management is especially applicable when resources are responsive to management intervention, but the impacts of those interventions are uncertain (Williams 2011).

Several characteristics of adaptive management distinguish it from business-as-usual or potentially nonadaptive management:

- recognition that the system being managed will never be understood completely, which is reflected in uncertainty about the ecological model chosen to represent the system;

- acknowledgement of uncertainty about what policy or practice is "best" for the particular management problem;

- careful implementation of a plan of action designed to reveal the critical knowledge about the system and its response to management that is currently lacking;

- acknowledgment of the trade-off between gaining the most knowledge about the system vs. achieving the best short-term results, and attempting to balance these often competing objectives;

- monitoring of carefully chosen response indicators to evaluate the outcome of alternative policies or management treatments;

- analysis of management outcomes in consideration of the original objectives; and:

- incorporation of the results of management experiments and other learning into future decisions about policies and management strategies and actions.

Adaptive management can be summarized by two questions site managers can ask: 1) If this strategy were successful, how would we know? And, 2) If this strategy were unsuccessful, what would we want to know to do better next time?

The iterative and cyclic nature of adaptive management is shown in Fig. 1. The figure illustrates the progression from defining the problem to articulating management goals; developing an ecological model of the system (which can include socioeconomic variables); defining desired outcomes and performance metrics; selecting and evaluating conservation measures; conducting pilot and full-scale research on the problem (note: this is desirable but not always possible); designing and implementing conservation actions (these could also be policies or management or restoration actions); designing and implementing monitoring; collecting and

managing data; analyzing and synthesizing the data, i.e., the results of management treatments; making recommendations; refining the knowledge base and the ecological models; refining management actions; revising objectives; and reassessing the problem…then begin the cycle anew.

Alternately, adaptive management can be more simply described as having two phases: a set-up phase during which key components are put in place and an iterative phase in which the components are linked together in a sequential decision process (Fig. 2; Williams 2011).

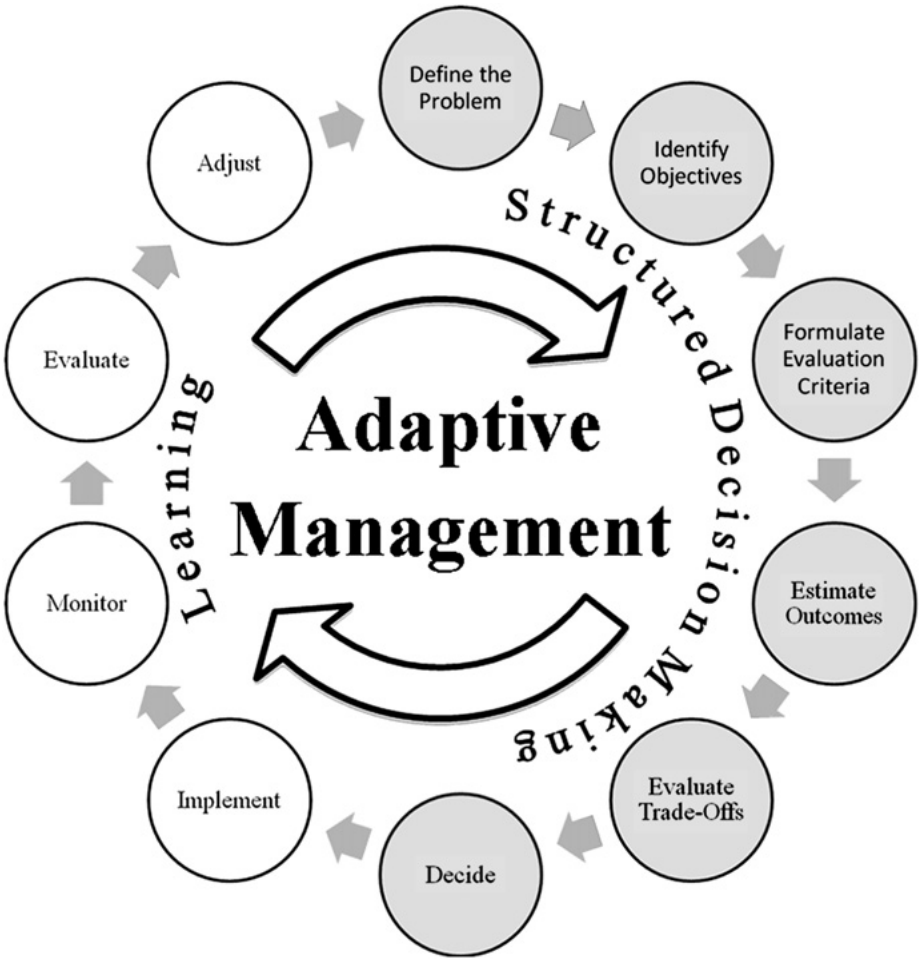


Figure 1. Adaptive management is learning by doing in a formal iterative process that acknowledged uncertainty and achieves management objectives by increasing knowledge of a system through a structured feedback process. Integral to adaptive management is both a learning process and a decision process. Structured decision making is an organized and transparent approach to the decision process. From Allen et al. (2011).

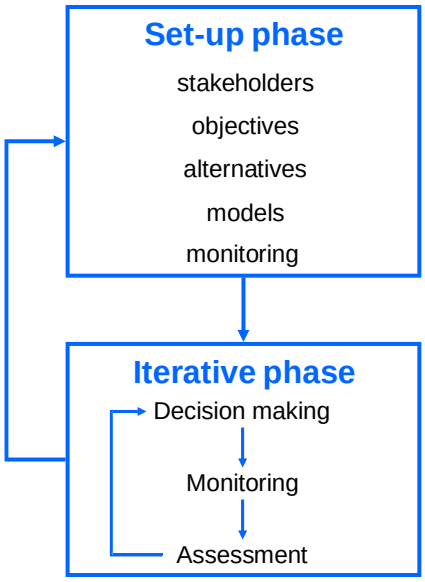


Figure 2. Two-phase learning in adaptive management (from Williams 2011).

Principles of adaptive management

Some emerging principles of adaptive management are becoming clear (from Noss 2011):

- Adaptive management must be driven by clearly stated goals and, when possible, quantitative objectives that are consistent with these goals.
- As one proceeds down the sequence from goals to specific actions, regular revision, refinement, and even change in direction in response to information obtained from ecological monitoring and other sources are usually necessary.
- Ecosystems are dynamic, not static, and often display non-linear dynamics with unpredictable outcomes. Hence, adaptive management plans – and their implementation – must be dynamic. Adaptive management must be modified and revised regularly to keep pace with new knowledge and understanding.
- Conservation and management actions, as well as human uses, that are in conflict within the boundaries of small sites can be accommodated and reconciled over a broader landscape by spatial (or sometimes temporal) partitioning of uses and management practices.
- A tradeoff exists between gaining the most knowledge about the system vs. achieving the best short-term goals. This tradeoff must be reconciled carefully.
- A management plan should be designed from the outset to 'learn by doing,' and to actively test hypotheses and adjust treatments as new information becomes available. However, Moore and McCarthy (2007) pointed out that "most AM examples to date suggest that knowledge and learning are not as important as scientists might like to

believe…when faced with uncertainty about the best course of action, managers should mostly implement management policies using the best-available information…"

- There is a crucial limit to the practice of adaptive management: it does not apply well to actions that result in irreversible impacts. For actions that irreversibly alter the environment, the best course is prevention, i.e., not permitting such activities in ecologically sensitive areas. This is the approach suggested by the precautionary principle, which suggests that the fewer data or more uncertainty about the effects of an action, the more conservative a plan should be.
- It is crucial that adaptive management projects "pass the test of management relevance" (Westgate et al. 2013).
- Involving stakeholders in adaptive management is a powerful method for enhancing ecological literacy and building environmental management capacity (Fujitani et al. 2017).

Methods of adaptive management

The tools of modern conservation planning (e.g., GIS spatial analysis, systematic site-selection algorithms, connectivity models, cost-benefit analysis, scenario modeling) are well suited to adaptive management on the scale of large landscapes (see **http://www.corridordesign.org/designing_corridors/resources/gis_tools** for handy access to many of these tools).

Structured decision making is one approach to adaptive management, which provides a logical and transparent process for making informed decisions. Martin et al. (2009) apply structured decision making to the particular case of threshold phenomena. Many processes in populations and ecosystems exhibit thresholds, points at which one or more properties of a system change rapidly in response to a small change in another property. Many species appear to have extinction thresholds, which although varying among species, correspond to the habitat area or population size below which decline to extinction is precipitous and difficult to reverse (Fahrig 2002). For example, hatching failure due to impacts of inbreeding in endangered birds increases rapidly when population size drops to below 100-150 individuals (Heber and Briskie 2010). Therefore, population bottlenecks of that size or smaller should be avoided.

Conceptual and ecological models for adaptive management

Newton et al. (1998) identify the following advantages of conceptual models:

- They provide general scientific agreement for the ecological framework of the system;
- They provide a basis to identify gaps in knowledge and understanding;
- They provide a basis for managers to ask questions, to see the complexity of the information required for answers, and to see relationships between management activities and ecosystem response;

- They provide a basis for scientists to design monitoring and research programs to answer questions;
- They provide context for presenting results.

Hierl et al. (2007) developed a flow chart (Fig. 3) to illustrate how conceptual models contribute to conservation planning.

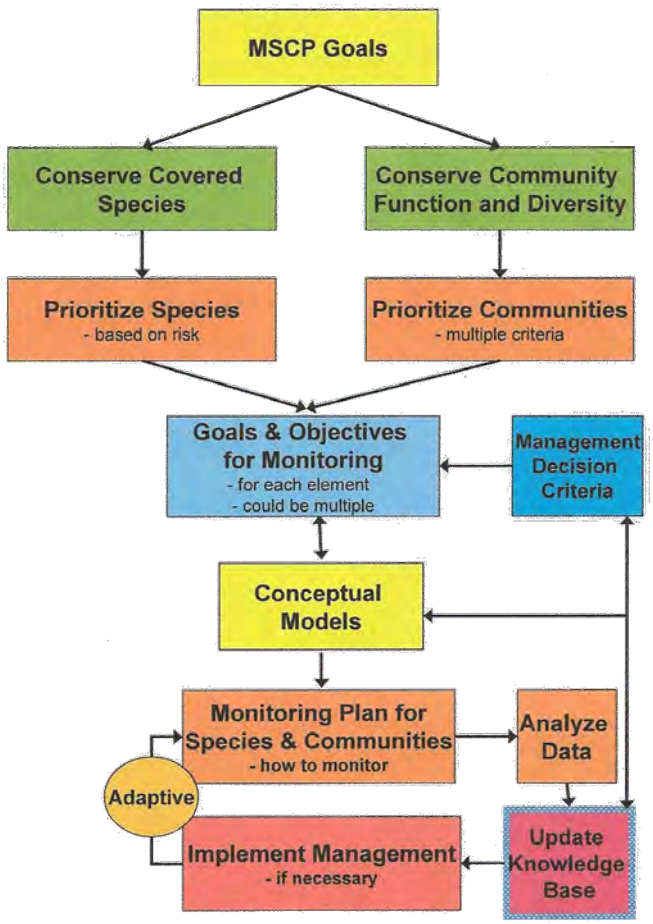


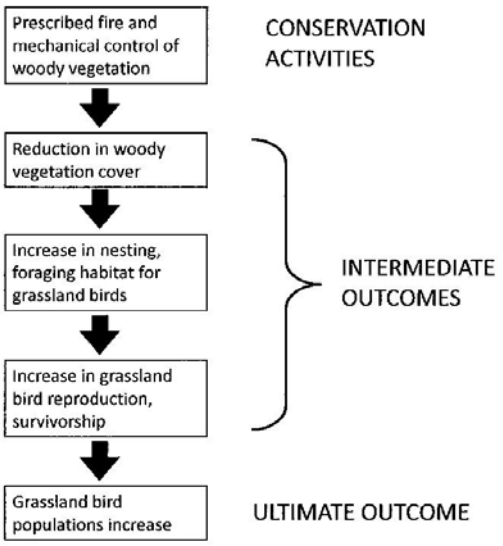
Figure 3. A flow diagram of the role of conceptual models in a monitoring program for a conservation plan, as applied to the San Diego Multiple Species Conservation Plan. From Hierl et al. (2007).

Logic models are commonly used as performance measurement and evaluation systems in the public health, social service, and philanthropic sectors (Heinz Center 2009). Logic models are simple box-and-arrow diagrams but can be quite helpful when data necessary for the development of more quantitative or mechanistic data are not available – which is a common situation for land managers.

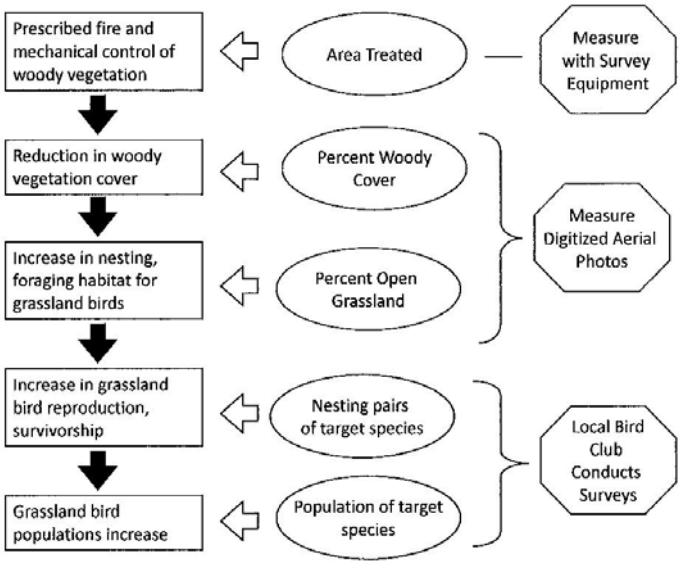
An important function of logic models is to help illuminate the intermediate as well as final indicators of management success. The “intermediate outcomes” can provide feedback to the

management team that they are headed in the right direction. Figure 4 is an example of a logic model for an adaptive management project designed to increase populations of grassland birds. Figure 4 (A) shows the general logic model for how conservation activities such as prescribed fire and control of woody vegetation can lead, through a series of intermediate outcomes, to an increase in grassland bird populations. Figure 4 (B) shows the same model, but with potential management indicators (in ovals) and potential metrics (in octagonal boxes), and Figure 4 (C) illustrates a case where direct measurement of conservation outcomes (nesting pairs and population size of target species) is not feasible, so measurement is shifted to a proxy indicator (percent open grassland) (Heinz Center 2009).

A



B



C

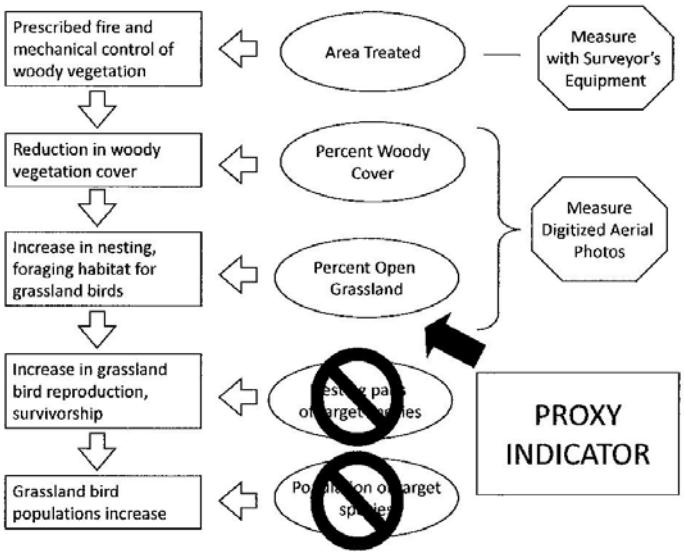


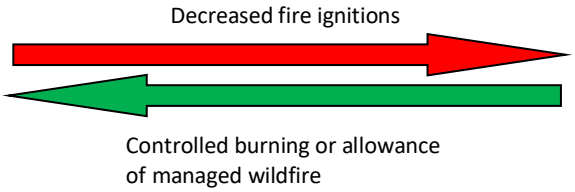
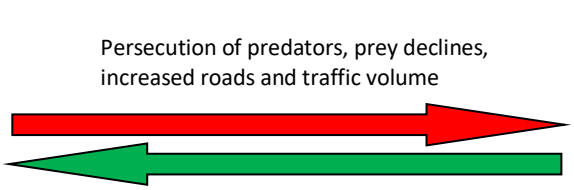
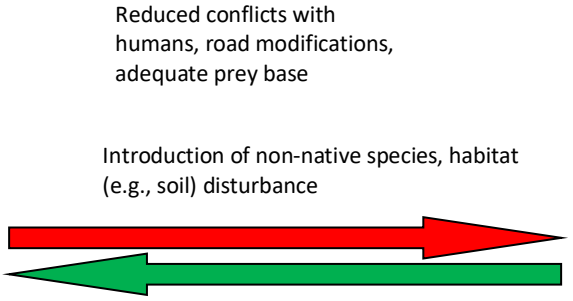
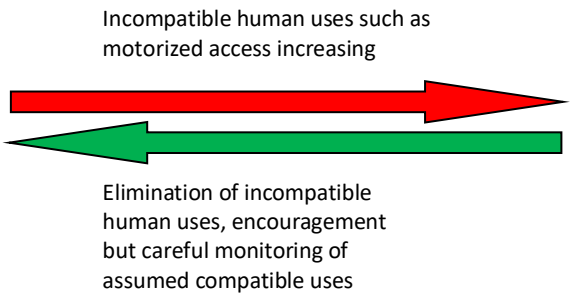
Figure 4. A logic model for management to increase populations of grassland birds. (A) The general logic model for how conservation activities (prescribed fire, control of woody vegetation) can lead, through a series of intermediate outcomes, to an increase in grassland bird populations. (B) The same model, but with potential management indicators (in ovals) and potential metrics (in octagonal boxes). (C) The same model, but assuming that direct measurement of conservation outcomes (nesting pairs and population size of target species) is not feasible (e.g., perhaps there is no "local bird club"), so measurement is shifted to a proxy indicator (percent open grassland). From Heinz Center (2009).

Threats as foci for adaptive management

A logical approach to adaptive management is a threat-based approach, where policy or management alternatives represent experiments to test the efficacy of different ways of addressing threats. A threat-based approach should be closely tied to conceptual models (see above), where specific threats are integrated into the model as drivers of system states and transitions.

For each identified threat, it is useful to characterize the present (often degraded or undesirable) condition, the trajectories of change that led to the current condition and, if reversed, could lead to a desired future range of conditions (Table 1).

Table 1. The trajectories of change between current and desired future range of conditions. Movement in either direction (red vs. green arrows) should be monitored, tracked, and reported using appropriate indicators. Adapted from Noss (2011) to make relevant to Florida.

Present Degraded Condition	Trajectory of Change	Desired Future Range of Conditions
Fire excluded; dense hardwood midstory		Fire intervals within historic range of variability
Habitat reduced, fragmented, and degraded		Habitat naturally patchy but intact
Large predators reduced or absent		Large predators in natural patterns of abundance and distribution
Invasive non-native species abundant, impacting system		Invasive non-native species rare and not impacting system
Human uses of area causing impacts to species and ecosystems		Human uses of area compatible with biodiversity conservation and leading to increased appreciation of area

Monitoring for adaptive management

Monitoring is generally considered a cornerstone of adaptive management (Holling 1978, Walters 1986, Noss 1990, Noss and Cooperrider 1994, Larson et al. 2013) – if we don't monitor, how can we learn about the effects of alternative policies or management actions and, from that knowledge, adjust our management toward an optimal course? Nevertheless, a considerable amount of monitoring has failed to produce useful information, such that monitoring has acquired a mixed reputation (Lovett et al. 2007, Lindenmayer and Likens 2009). Monitoring of abundance, for example, is often undertaken for species of conservation or recreational interest, but the information gained may, at best, discover a trend (decrease or increase), but without any hint of what is causing the trend because the data necessary to address that question either were not gathered or were gathered in such a way that rigorous statistical analysis is impossible.

Additional challenges to monitoring for adaptive management (Williams and Brown 2016) include:

- The frequency of monitoring cannot keep pace with changes in the natural system.

- A design for experimental management and monitoring cannot be developed to test hypotheses, either because understanding of the system is too limited or management is too constrained to design a meaningful experiment.

- No firm commitment is made to funding and institutional support for monitoring for the duration of the required learning. When budgets are tight, monitoring is often the first function to be curtailed.

Many recent papers have examined monitoring with a critical eye and made suggestions for improvement. Among the general suggestions for improvement are that monitoring programs: 1) address questions that are well defined and tractable; 2) pose these questions before the monitoring program is designed or implemented; 3) be based on a rigorous statistical design; 4) be founded on a sound ecosystem conceptual model, with emphasis on the components of the system (e.g., populations of imperiled species) that are of conservation interest and can be directly affected by management; and 5) be relevant to management decision making (Yoccoz et al. 2001, Nichols and Williams 2006, Lindenmayer and Likens 2009).

Monitoring requires repeated measurement of selected ecological indicators. Generally, indicators should be:

- Convenient and cost-effective for repeated measurement.

- Show a demonstrated relationship to the phenomenon of interest. For example, a plant species that is highly dependent on frequent fire during the growing season, such as wiregrass (*Aristida beyrichiana*), would be an appropriate indicator species for

determination of appropriate fire frequency and seasonality. Specific attributes to measure could include plant cover and estimated number (or percent) of flowering culms.

In addition to general indicator selection criteria stated earlier, crucial considerations in selecting indicators for monitoring in an adaptive management context include:

- What spatial/temporal extents does the indicator address? For example, local or regional, short-term (weeks, months) vs. long-term (years, decades) change?
- Are measurements sensitive to sample size?
- How long a time series will be necessary to distinguish between signal and noise (i.e., changes in the values of the metric that are likely to be deterministic vs. stochastic)?
- Are changes in the metric easily evaluated by decision-makers or the public?
- Is there a reference condition to specify an ideal value (or range) for the metric?
- Are data for the metric already being collected by someone?
- Sensitivity – how large a change in the metric is needed to determine that a significant change in the endpoint (e.g., key ecological attribute) has occurred? Do published studies provide statistical confidence in this relationship?

Critical elements of a successful monitoring program are summarized by Hierl et al. (2005), Doak et al. (2007), and Noss (2011). Those elements, which should be considered in developing and implementing a monitoring program, include:

- clear goals, objectives, questions, and hypotheses to guide monitoring;
- clear and tractable management triggers (i.e., at what point of change in indicator values do you implement or change management);
- mapped monitoring locations;
- a central repository of spatial and non-spatial data and documents;
- updated and scientifically defensible monitoring priorities;
- management-oriented conceptual models;
- analyses for statistical power and cost-effectiveness of monitoring techniques;

- data analysis and synthesis capacity;
- substantive and efficient feedback between decision-makers and land managers;
- application of appropriate statistical sampling theory;
- use risk projections from models to estimate status and warn of future changes.

Field programs should be configured with necessary capacity to ensure that appropriate techniques are field-tested and that quality data is collected, analyzed, and communicated, with an adequate budget, where possible, to effectively carry out these tasks. Especially critical is building an institutional structure to sustain monitoring, analyze the data gathered, and disseminate (publish) the results so that managers and others inside and outside the organization can learn from the process.

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Appendix 3. Florida Natural Areas Inventory (FNAI). 2020. Chinsegut Hill invasive and non-native plant survey. Final report to the Hernando County, Environmentally Sensitive Lands Program, Brooksville, FL.

CHINSEGUT HILL

INVASIVE AND NON-NATIVE PLANT SURVEY

Final report to the Hernando County,
Environmentally Sensitive Lands Program
Project Number 044690
Purchase Order 20000515

July 2020

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FLORIDA
Natural Areas
INVENTORY

Cover Photographs:

Top: Chinese fan palm (*Livistona chinensis*) infestation in the northwest region of Chinsegut Hill (Dexter Sowell).

Center: Area of closed canopy of camphor tree (*Cinnamomum camphora*) and a groundcover monoculture of common asparagus fern (*Asparagus setaceus*) (Dexter Sowell).

Bottom: Pindo palms (*Butia capitata*) killed or damaged from a prescribed fire in a previously fire-excluded sandhill or upland pine natural community (Dexter Sowell).

Recommended citation: Florida Natural Areas Inventory (FNAI). 2020. Chinsegut Hill invasive and non-native plant survey. Final report to the Hernando County, Environmentally Sensitive Lands Program, Brooksville, FL.

Contributions: Dexter Sowell developed the sampling methodology. Ethan Hughes and Dexter Sowell conducted the fieldwork and exported their data to GIS. Dexter Sowell mapped the invasive and non-native species findings. Dexter Sowell generated proposed management units and discussed their potential restoration goals and current status. Dexter Sowell and Ethan Hughes wrote up the natural community descriptions.

ABSTRACT

A non-native and invasive plant survey was conducted to document the presence and abundance of all terrestrial non-native plant species at Chinsegut Hill in Hernando County, Florida. Surveys focused on the undeveloped lands within Chinsegut Hill, with a brief survey of the developed grounds. We created a hexagon grid overlay of Chinsegut Hill, yielding 624 hexagons that encompass the entirety of the property plus acreage beyond the property boundary. We identified 60 non-native and invasive plant taxa to species level. Six taxa were recognized as likely non-native species, but could not be identified to family level. Camphor tree was the most frequent invasive plant at Chinsegut, occurring in 455 of 496 (92%) sampling units surveyed. Areas of Chinsegut Hill previously cleared for agriculture, based on aerial imagery from 1944, generally had the worst infestations of invasive and non-native plant species. We propose the creation of eight management units at Chinsegut Hill. Within the management units, we discuss the current invasive infestations, the native tree species indicative of possible previous native plant communities, and suggest a sequence in which management units should be restored.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

Florida Natural Areas Inventory (FNAI) conducted surveys for invasive (FLEPPC 2019) and non-native plants, identifying as many species as possible and quantifying their abundance at Chinsegut Hill. Chinsegut Hill is located northeast of Brooksville in Hernando County, Florida. Chinsegut Hill is a 114.5-acre conservation land whose management involves multiple public agencies. The property is leased from DEP-Division of State Lands to Hernando County, who has a Memorandum of Agreement for management of the natural areas on property with the Florida Forest Service (Hernando County 2015). Approximately 16 acres of institutional or developed lands of the property are managed in part by a non-profit, including regular mowing for the Chinsegut Hill manor house, retreat center, rental cottages and two on-site residences. The remaining acreage is forested, most of which is successional hardwoods on land that was cleared and planted in citrus and other tree crops as evidenced in 1944 aerial imagery. The cessation of agriculture and the subsequent colonization by non-native plants has allowed for the establishment of dense infestations of non-native species, from low-growing ground covers to tall canopy trees. In addition to agriculture, many non-native ornamental species were planted at Chinsegut Hill, with some of these persisting and spreading across the property.

METHODS

Using aerial imagery in ArcMap (ESRI, version 10.6.1), the 114.5-acre property was overlaid with hexagonal grid cells of 0.2 acre extent (15.285m/50.15ft inner radius). A total of 624 hexagonal sample units, some with large overlap of the surrounding private property, were arranged on a north/south axis, and completely overlaid the Chinsegut Hill property. Center points for each hexagonal sample unit (hereafter sample unit) were created in ArcMap. Data were recorded using handheld Trimble GPS units (models: Geo7X and Nomad).

Field Methods

Field surveys were conducted on foot. We navigated to the center point of each sample unit, then walked throughout the sample unit recording all non-native species observed, and estimated cover class for each non-native species. Using visual estimates at each accessible point, data were collected on the distribution of non-native plants within a 15.285-meter radius. The percent cover for each non-native plant were estimated using modified Daubenmire (1959) cover classes: <1%, 1-5%, 6-25%, 26-50%, 51-75%, 76-95%, and >95%. Though the cover classes of <1% is not traditionally a part of the Daubenmire method, they were included in this protocol to provide more precision when estimating cover class.

We sampled 496 of the 0.2ac sample units (ca. 100 acres) that overlaid the successional and degraded natural forest habitats. We did not collect data in sample units that had less than 50% of

their area within the Chinsegut Hill boundary (i.e., sample unit center point outside of Chinsegut Hill boundary). The developed area of Chinsegut Hill occupies about 16 acres, and we sampled this area by taking waypoints directly at 'islands' of non-native plant occurrences, typically where mowing does not occur between landscape ornamentals and trees. These waypoints are provided in a separate shapefile. A map of the Chinsegut Hill property, the sample unit overlay, and sample units sampled are provided (Figure 1). Species nomenclature generally follows that of the Plant Atlas of Florida (Wunderlin et al. 2020). No cover class of native species were made, but native species of interest were noted in a comments field.

Analysis

Data were downloaded from Trimble units with Trimble Pathfinder and exported as shapefiles. Data were visualized and edited in ArcMap 10.6. We exported a map for each non-native species encountered (included as Appendix 1).

RESULTS and RECOMMDATIONS

Non-native and invasive species

Sixty-six non-native plant species were found within the 100 acres surveyed. Table 1 lists the 10 most frequent (number of sample units observed) non-native plants at Chinsegut Hill and their average cover class. Table 2 provides a comprehensive list of the 66 non-native plants observed during the survey of Chinsegut Hill.

Table 1. Most frequently encountered non-native plants and their average cover.

Scientific name	Common name	UF IFAS Assessment Central	FISC[1] Category Rank	Frequency[2]	Average Cover in Sample Unit
Cinnamomum camphora	camphor-tree	Invasive	1	455	32.2%
Urena lobata	Caesar's weed	Invasive	1	374	8.9%
Ardisia crenata	coral ardisia	Prohibited	1	312	22.4%
Dioscorea bulbifera	air potato	Prohibited	1	283	16.5%
Dolichandra unguis-cati	cat's-claw vine	High Invasion Risk	1	275	12.7%
Paederia foetida	skunk vine	Prohibited High Invasion Risk	1	273	2.8%
Abrus precatorius	rosary pea	Prohibited	1	246	8.7%
Tradescantia fluminensis	small-leaf spiderwort	Invasive (No Uses)	1	167	44.6%
Xylosma congesta	shiny xylosma	*No Assessment*		109	7.4%
Melia azedarach	Chinaberry	Caution	2	100	21.8%

1 Formerly called Florida Exotic Pest Plant Council (FLEPPC)

Xylosma congesta (shiny xylosma), also known as dense logwood, is a spiny large shrub to small tree previously planted at Chinsegut Hill, where it has since spread across the property. On the northern part of Chinsegut Hill, it has formed stands near the property boundary, and is especially dense along a small seepage stream and has spread downstream and offsite to the north. The spread of shiny xylosma here may indicate that this species could possibly invade other disturbed forested wetland habitats in the vicinity of Chinsegut Hill. Besides Chinsegut Hill, there are only two other known occurrences are in the Orlando area (iNaturalist 2020).

Proposed Management Units

Utilizing aerial imagery from 1944, prior plantings of citrus, and likely Java cinnamon, shiny xylosma and other trees, were identified within the Chinsegut Hill property. We used these past agriculture clearings, uncleared forest, current two-trails and firelines, and the developed areas to create the eight proposed management units. Each proposed management unit is discussed below, starting with those management units with the highest restoration potential. Also, the names for each unit are suggestions, and the Environmentally Sensitive Lands staff should feel free to alter the names as they see fit.

South Slope-Identified as a Sandhill natural community by the Florida Forest Service on the southern portion of the property and adjacent to the road entering the property. This management unit has the highest restoration potential. This stand has a large and open canopy of *Pinus palustris* (longleaf pine) and has recently been managed with prescribed fire. It appears the stand may have been fire-suppressed for some years as places within the stand have large individuals of *Quercus hemisphaerica* (upland laurel oak), indicating absence of fire and progression of stand towards hammock vegetation. It appears a large majority of the original groundcover has been lost but small remnants remain scattered throughout the stand, including *Aristida beyrichiana* (wiregrass), *Pityopsis graminifolia* (grass-leaved golden aster), *Clitoria mariana* (Atlantic pigeonwings), *Asclepias tuberosa* (butterfly weed), *Vernonia angustifolia* (tall ironweed), *Sorghastrum secundum* (lopsided indiangrass), *Solidago odora* var. *chapmanii* (Chapman's goldenrod), *Ruellia ciliosa* (ciliate wild petunia), and *Berlandiera subacaulis* (Florida greeneyes). A number of shrubs occur in this community including *Vaccinium arboreum* (sparkleberry) and *Quercus margarettae* (sand post oak), with an inclusion of *Ximenia americana* (tallow wood) and *Sideroxylon lanuginosum* (gum bully), likely representing an ecotone area to a Mesic Hammock natural community to the north of this Sandhill.

It is possible that some to most of this area was historically Upland Pine, which would have been more species rich than Sandhill. According to the Chinsegut Hill Management Plan (2015), the soils of the South Slope are identified as belonging to the Arredendo Fine Sand series, which does contain some loam that could support an Upland Pine community. A classic Sandhill species, *Quercus laevis* (turkey oak), was only observed twice in the South Slope unit. When Sandhill is excluded from fire, turkey oaks can proliferate and vastly increase their numbers.

However, the near complete absence of turkey oaks here, with the presence of the aforementioned herbaceous plants and sand post oak, are likely indicative of this area having once been Upland Pine, with inclusions of Sandhill. Regardless of whether managed as Upland Pine or Sandhill, prescribed fire is the focal land management tool needed here.

The principal invasive plants of the South Slope management unit are arrow bamboo, Caesar's weed and cogon grass. Both prescribed fire and herbicide treatments, coupled with mechanical treatment for the arrow bamboo, are critical to gaining control of these invasive plants and returning the South Slope MU to a desired maintenance condition. Caesar's weed will require multiple treatments per year to reduce cover to maintenance level.

Northwest Slope-The northwest corner of the property, west of a two-trail running north from the cell tower, and north and west of the developed grounds looks to have never been clear-cut. The canopy tree species are composed of a mixture of Upland Hardwood Forest and Mesic Hammock natural community species. Tree species indicative of Upland Hardwood Forest include *Liquidambar styraciflua* (sweetgum), *Quercus hemisphaerica* (upland laurel oak), *Magnolia grandiflora* (southern magnolia), *Carya glabra* (pignut hickory), *Quercus virginiana* (live oak), and minor components of *Acer floridanum* (Florida maple) and *Fraxinus americana* (white ash). A number of large (>15m/49ft height) *Ulmus alata* (winged elm) were also noted in this stand with very scattered occurrences of the small trees to large shrubs *Cercis canadensis* (redbud), *Cornus florida* (flowering dogwood), *Sideroxylon lanuginosum* (gum bully), *Carpinus caroliniana* (ironwood), and *Persea borbonia* var. *borbonia* (redbay), many of which exhibited signs of laurel wilt disease (*Raffaelea lauricola*). The herb layer in this stand is quite depauperate and consists of scattered occurrences of *Chasmanthium sessiliflorum* (woodland oats), *Mitchella repens* (partridge pea), *Asplenium platyneuron* (ebony spleenwort), and *Oplismenus hirtellus* (basketgrass). A handful of species also were intermixed with the above and are more representative of the Mesic Hammock natural community and include *Diospyros virginiana* (persimmon)(>12m/39ft height), *Prunus caroliniana* (cherry laurel), *Serenoa repens* (saw palmetto), and *Callicarpa americana* (beautyberry). In this particular stand, no outcrops of limestone were observed but it is likely due to the slope and species composition that limestone is near the surface and providing appropriate habitat for more nutrient-demanding deciduous tree species.

This stand is invaded by a number of invasive species, with the most abundant being *Cinnamomum camphora* (camphor tree), *Dolichandra unguis-cati* (cat's claw vine), *Dioscorea bulbifera* (air-potato), *Tradescantia fluminensis* (small leaf spiderwort), *Melia azedarch* (Chinaberry), *Xylosma congesta* (shiny xylosma) and *Livistona chinensis* (Chinese fan palm).

The Chinese fan palm was likely planted along with other ornamental species near a man-made pool that intercepts a seepage stream. The Chinese fan palm has spread beyond the likely planting site and is thick in the center of the proposed management unit.

Due to the native indicator species present, the Northwest Slope management unit has the next best restoration potential. Invasive plant eradication should proceed slowly here, so as to not produce large gaps in the canopy. Large canopy gaps could allow too much sunlight to reach the forest floor, encouraging other non-native species to invade. The removal of Chinese fan palm should be a top priority in this management unit.

Southwest Slope-West of the Sandhill and narrow entrance road, is a small disturbed patch of land with *Rhynchospora megalocarpa* (sandy field beaksedge), which was not observed in the South Slope management unit but may have occurred there before fire suppression and colonization by invasive species. The only remnant tree species in the Southwest Slope are *Quercus virginiana* (live oak) and *Carya glabra* (pignut hickory). Though it is difficult to say what this community was before agriculture impacts and fire exclusion, given the well-drained soils present and lack of pines on site, it is probably best to be restored and managed as Mesic Hammock.

This Southwest Slope is invaded by a number of invasive plants and the most abundant are *Imperata cylindrica* (cogon grass), *Cinnamomum camphora* (camphor tree), *Abrus precatorius* (rosary pea), *Pseudosassa japonica* (arrow bamboo), *Urena lobata* (Caesar's weed) and *Paederia foetida* (skunk vine). The arrow bamboo is the most problematic invasive plant species present. If prescribed fires can be conducted here, it could bolster any management of the invasive species by herbicide treatments over time.

North, Northeast, Central and East Slopes-These four management units have had severe impacts from past agriculture and are discussed collectively. The current flora of these management units is the result of succession after the abandonment of agriculture, and is almost wholly non-native. The north boundary, power line right-of-way two-trail, and fireline make good management unit boundaries on the north, center and south ends of these units. However, the management unit boundaries between the North and Northeast Slopes, and the Central and East Slopes are not distinct geographic features. The former corresponds to the 160 foot elevation contour along a steep drop in elevation that appears to not have been cleared of vegetation in the historic aerials. The latter boundary appears to be a transition between citrus and other crop trees planted in the 1944 aerials, but may not now be a distinct boundary in the field. The local site manager may want to scout out any old two-trails, or a maintained hiking trail, to possible serve as a better boundary between management units.

Despite the dominance of non-native flora in these four management units, native trees and shrubs of interest in these units were *Quercus hemisphaerica* (upland laurel oak), *Carya glabra* (pignut hickory), *Celtis laevigata* (sugarberry), *Pinus taeda* (loblolly pine), *Magnolia grandiflora* (southern magnolia), *Acer negundo* (box elder), *Cornus asperifolia* (roughleaf dogwood), *Ulmus americana* (American elm), *Ulmus alata* (winged elm) and several large

Quercus virginiana (live oak). Possibly planted in one wet area was *Taxodium* sp. (cypress) adjacent to an old two-trail not far from an old home site or prior clearing.

The presence of sugarberry, roughleaf dogwood, American and winged elms, and box elder implies that some of the areas within these management units possesses the hydrology to have supported a Hydric Hammock, while the rest of the management units were likely Upland Hardwood Forest similar to the Northwest Slope management unit. The lowest elevations of the Northeast Slope management unit could have been Hydric Hammock given the flat terrain and hydrology present on site. Just north of the Chinsegut Hill boundary on private land, there are *Quercus michauxii* (swamp chestnut oak), suggesting the area just offsite may act as a bottomland forest.

The invasive plants of these four units are numerous in number and extensive in cover. Common invasive plants in these four management units include *Cinnamomum camphora* (camphor tree), *Urena lobata* (Caesar's weed), *Dolichandra unguis-cati* (cat's claw vine), *Paederia foetida* (skunk vine), *Abrus precatorius* (rosary pea), *Dioscorea bulbifera* (air-potato), *Tradescantia fluminensis* (small leaf spiderwort), *Ardisia crenata* (coral ardisia), *Melia azedarch* (Chinaberry), *Xylosma congesta* (shiny xylosma) and *Asparagus setaceus* (common asparagus fern).

We recommend these units not undergo any restoration activities until the Northwest Slope unit is well close to its restoration targets. Then, we recommend that the North Slope management unit should have restoration activities begun before the other three management units, since it is adjacent to the Northwest Slope management unit. No restoration activities should be initiated in these four management units until they can be sustained and repeated for a number of years. Caesar's weed will require multiple treatments per year, and coral ardisia will require annual treatments for at least five years given the density of this plant within these management units.

Hill Top- This unit encompasses the developed grounds about the manor house, rental cottages and retreat center. It is not managed as a natural resource, rather, as a cultural resource. We include in the attached geodatabase a separate layer with point locations of non-native and invasive plants within the Hill Top management unit.

CONCLUSION

This was a comprehensive mapping project with significant coverage and documentation of dense non-native vegetation. We recommend continued iterative monitoring following this relatively simple protocol to detect change of invasive and non-native plant communities to quantify progress towards management and restoration goals. We provide recommendations for management and sequence of restoration of the eight proposed management units.

TABLES

Table 2. List of non-native and invasive plant species observed at Chinsegut Hill.

Scientific name	Common name	UF IFAS Assessment-North	UF IFAS Assessment - Central	UF IFAS Assessment-South	FISC[1] Category Rank	Frequency[2]
Abrus precatorius	rosary pea	Prohibited	Prohibited	Prohibited	1	49.6%
Acrocomia totai	gru gru palm	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		0.8%
Alocasia macrorrhizos	giant taro	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (documented)		0.2%
Ardisia crenata	coral ardisia	Prohibited	Prohibited	Prohibited	1	62.9%
Aristolochia sp.[3]	calico flower	N/A	N/A	N/A		0.2%
Asparagus setaceus	common asparagus fern	Caution	Caution	Caution		15.5%
Bambusa vulgaris	common bamboo	Not a problem species (documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		0.6%
Broussonetia papyrifera	paper mulberry	Caution	Caution	Caution	2	4.0%
Butia capitata	pindo palm	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		1.2%
Carya illinoinensis	pecan	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		0.2%
Cenchrus purpureum	mission grass	High Invasion Risk	High Invasion Risk	High Invasion Risk	2	1.8%
Cinnamomum burmannii	Java cinnamon	No Assessment	No Assessment	No Assessment		6.5%

Cinnamomum camphora	camphor-tree	Invasive	Invasive	Caution	1	91.7%
Citrus x aurantium	sour orange	Caution	Caution	Caution		12.7%
Condea verticillata	John Charles	Not a problem species (un-documented)	Not a problem species (documented)	Not a problem species (un-documented)		9.5%
Costus woodsonii	red button ginger	No Assessment	No Assessment	No Assessment		0.6%
Crinum asiaticum	poisonbulb	No Assessment	No Assessment	No Assessment		0.4%
Crotalaria spectabilis	showy rattlebox	Caution	Caution	Caution		0.2%
Cycas revoluta	sago palm	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		0.2%
Dioscorea bulbifera	air potato	Prohibited	Prohibited	Prohibited	1	57.1%
Dolichandra unguis-cati	cat's-claw vine	High Invasion Risk	High Invasion Risk	High Invasion Risk	1	55.4%
Dracaena sp.	bowstring hemp relative	N/A	N/A	N/A		0.4%
Drymaria cordata	West Indian chickweed	No Assessment	No Assessment	No Assessment		6.9%
Eremochloa ophiuroides	centipede grass	Not a problem species (un-documented)	Not a problem species (documented)	Not a problem species (un-documented)		2.0%
Eriobotrya japonica	loquat	Not a problem species (documented)	Caution	Caution		0.0%
Eugenia uniflora	Surinam cherry	Caution	Caution	Invasive	1	1.0%
Hedychium coronarium	white gingerlily	Not a problem species (un-documented)	Not a problem species (documented)	Not a problem species (un-documented)		1.6%
Imperata cylindrica	cogongrass	Prohibited High Invasion Risk	Prohibited High Invasion Risk	Prohibited High Invasion Risk	1	0.6%

Lagerstroemia indica	crepe myrtle	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		9.5%
						0.8%
Lantana strigocamara	lantana, shrub verbena	Invasive	Invasive	Invasive	1	0.0%
Ligustrum lucidum	glossy privet	Caution	Caution	Caution	1	12.5%
Ligustrum sinense	Chinese privet	Prohibited	Prohibited	Prohibited	1	1.2%
Livistona chinensis	Chinese fan palm	Caution	Caution	Caution	2	0.4%
Lygodium japonicum	Japanese climbing fern	Prohibited	Prohibited	Prohibited	1	5.0%
Melia azedarach	Chinaberry	Invasive (No Uses)	Caution	Caution	2	2.2%
Mirabilis jalapa	four o'clock	No Assessment	No Assessment	No Assessment		20.2%
Musa x paradisiaca	common banana	Not a problem species (un-documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		1.0%
Nephrolepis cordifolia	tuberous sword fern	Invasive (No Uses)	Invasive (No Uses)	Invasive (No Uses)	1	1.2%
Nephrolepis sp.	sword fern	N/A	N/A	N/A		3.4%
Paederia foetida	skunk vine	Prohibited High Invasion Risk	Prohibited High Invasion Risk	Prohibited High Invasion Risk	1	0.4%
Paspalum notatum	bahia grass	Caution	Caution	Caution		55.0%
Phoenix reclinata	Senegal date palm	Not a problem species (un-documented)	Not a problem species (documented)	Invasive	2	0.4%
Phyllostachys aurea	golden bamboo	Caution	Not a problem species (documented)	Caution	2	0.6%
Pseudosasa japonica	arrow bamboo	High Invasion Risk	High Invasion Risk	High Invasion Risk		0.4%

Pueraria montana var. *lobata*	kudzu	Prohibited High Invasion Risk	Prohibited High Invasion Risk	Prohibited High Invasion Risk	1	11.9%
Rosa laevigata	Cherokee rose	No Assessment	No Assessment	No Assessment		1.4%
Senna obtusifolia	sicklepod	Not a problem species (documented)	Not a problem species (un-documented)	Not a problem species (un-documented)		0.2%
Setaria megaphylla	palm grass	No Assessment	No Assessment	No Assessment		0.2%
Solanum viarum	tropical soda apple	Prohibited	Prohibited	Prohibited	1	0.8%
Stenotaphrum secundatum	St. Augustine grass	No Assessment	No Assessment	No Assessment		2.6%
Syagrus romanzoffiana	queen palm	Caution	Caution	Caution	2	0.4%
Syngonium podophyllum	arrowhead vine	Invasive (No Uses) High Invasion Risk	Invasive (No Uses) High Invasion Risk	Invasive (No Uses) High Invasion Risk	1	0.2%
Thelypteris dentata	downy maiden fern	Not a problem species (documented)	Caution	Caution		0.6%
Tradescantia fluminensis	small-leaf spiderwort	Invasive (No Uses)	Invasive (No Uses)	Not a problem species (documented)	1	3.2%
Triadica sebifera	Chinese tallow-tree	Prohibited	Prohibited	Prohibited	1	33.7%
Urena lobata	Caesar's weed	Invasive	Invasive	Invasive	1	1.0%
Urochloa maxima	Guineagrass	Caution	Caution	Invasive (No Uses)	2	75.4%
Wisteria sinensis	Chinese wisteria	Invasive (No Uses) High Invasion Risk	Invasive (No Uses) High Invasion Risk	Invasive (No Uses) High Invasion Risk	2	14.1%

Xanthosoma sagittifolium	elephant ear	Caution	Invasive (No Uses)	Caution	2	0.2%
Xylosma congesta	shiny xylosma, dense logwood	No Assessment	No Assessment	No Assessment		4.0%
Unknown Coriaceous Climber		N/A	N/A	N/A		22.0%
Unknown Fern		N/A	N/A	N/A		0.6%
Unknown Grass		N/A	N/A	N/A		0.2%
Unknown Trifoliate Climber		N/A	N/A	N/A		0.2%
Unknown Trifoliate Shrub		N/A	N/A	N/A		0.4%
Unknown Unifoliate Climber		N/A	N/A	N/A		0.2%

1 Florida Invasive Species Council, formerly Florida Exotic Pest Plant Council (FLEPPC)

2 Percentage of 496 sample units that species was observed in

3 Probably *A. elegans*, elegant Dutchman's pipe

FIGURES

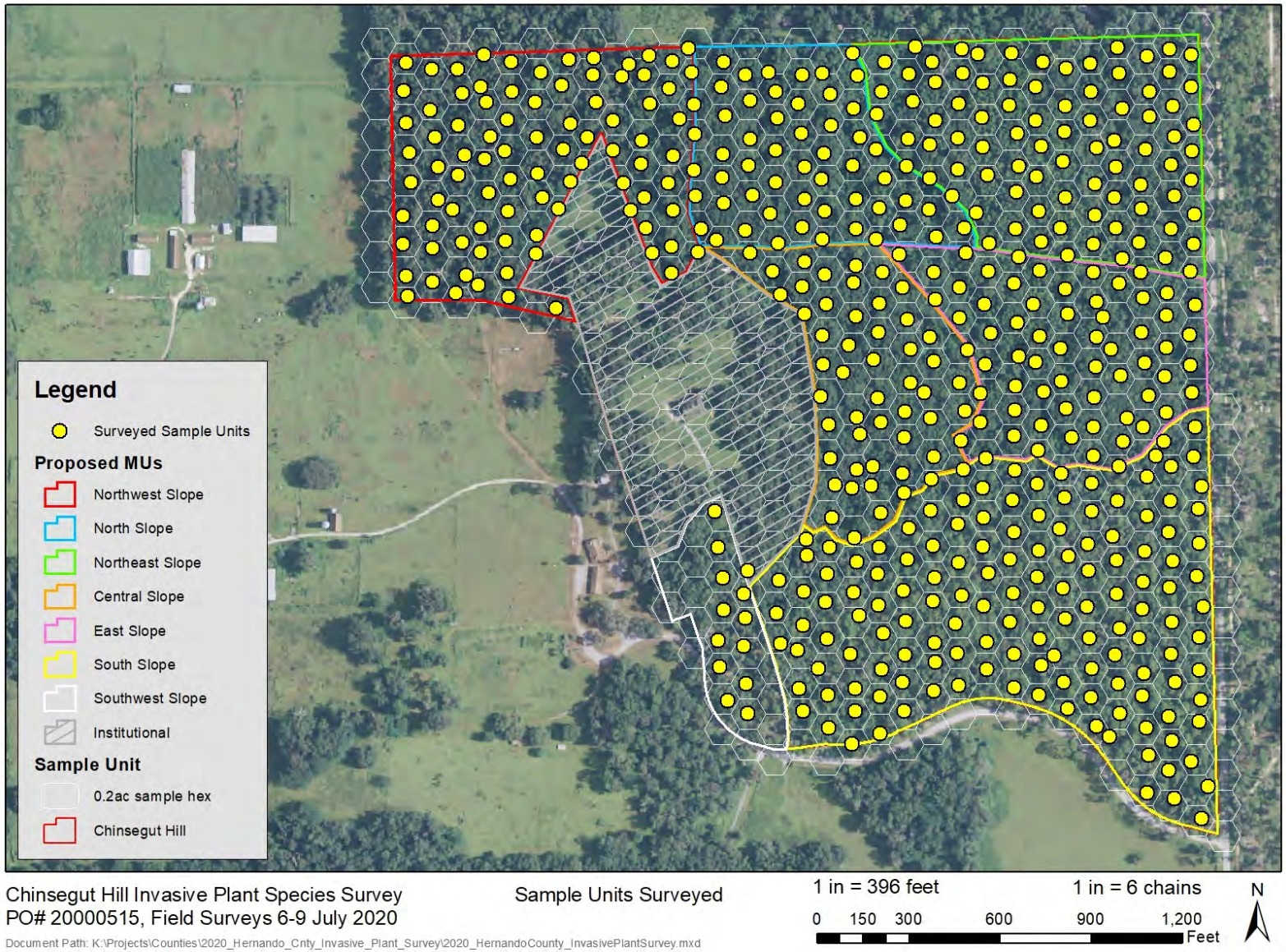

Figure 1. Chinsegut Hill, hexagonal sampling grids, and location of sample units surveyed.

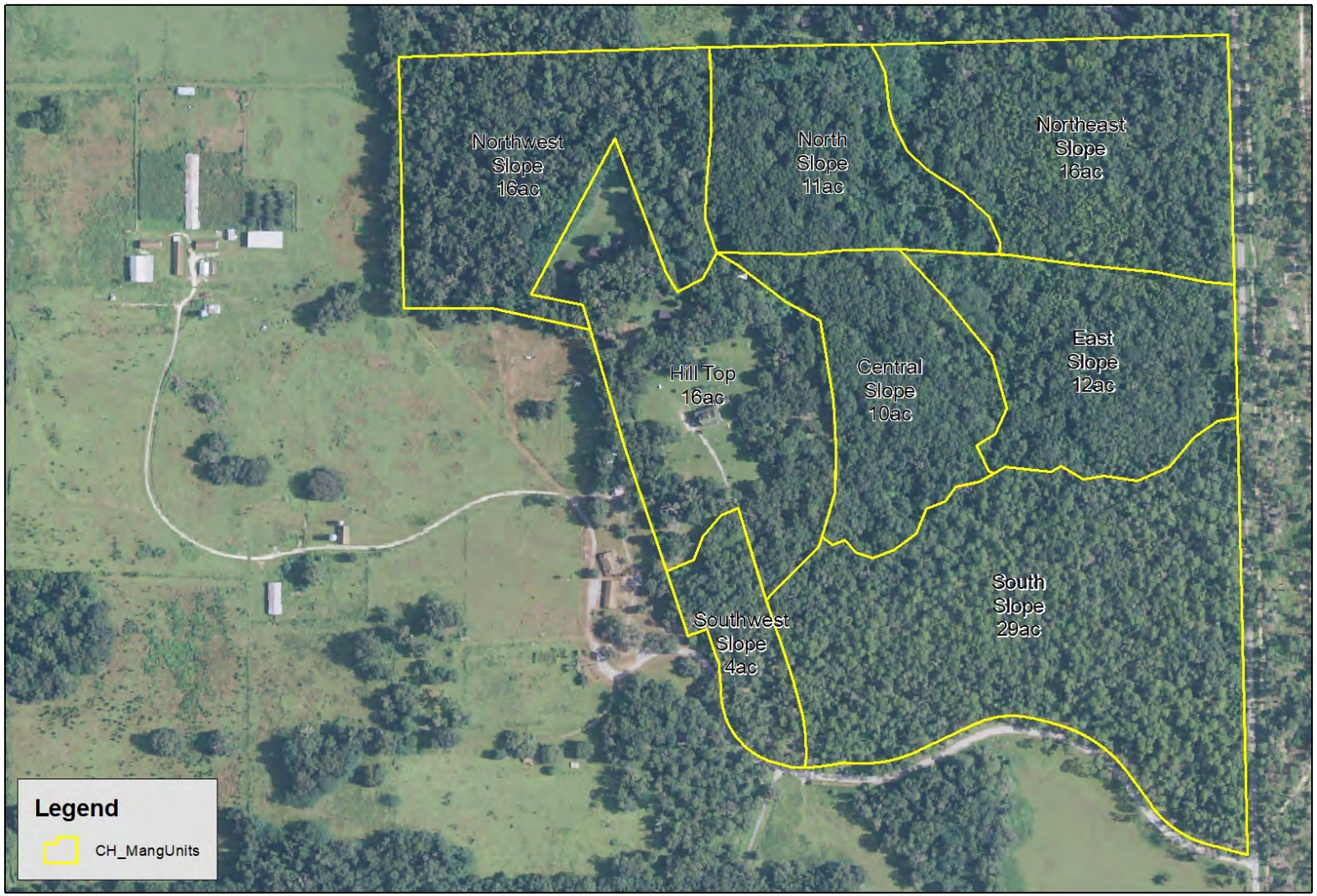

Figure 2. Proposed management units for Chinsegut Hill.

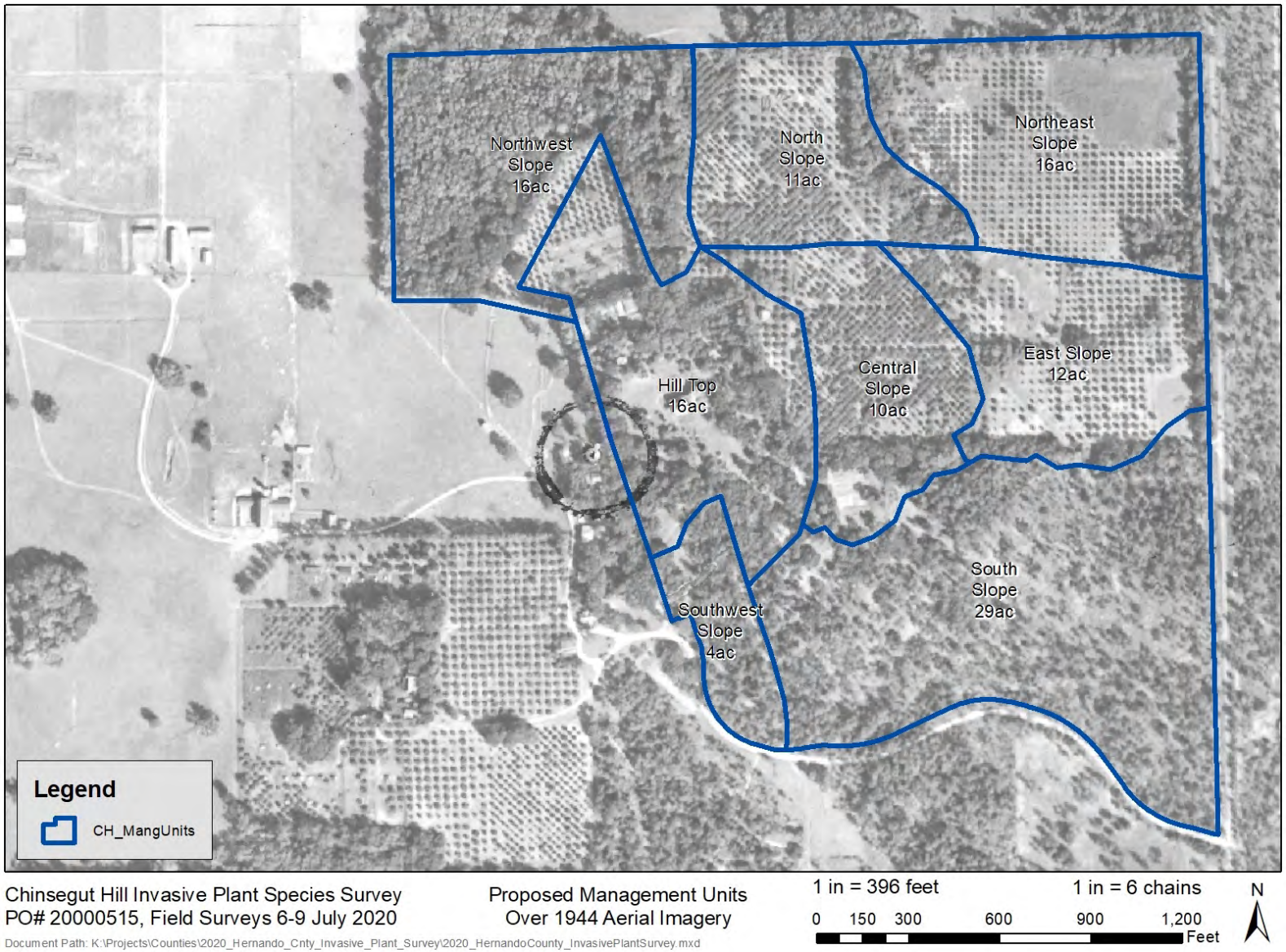

Figure 3. Proposed management units superimposed on 1944 aerial imagery.

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APPENDIX A

Table of all non-native and invasive species observed at Chinsegut Hill in descending frequency.

Scientific name	Common name	UF IFAS Assessment-Central Florida	FISC[1] Rank	Frequency[2]
Cinnamomum camphora	camphor-tree	Invasive	1	91.7%
Urena lobata	Caesar's weed	Invasive	1	75.4%
Ardisia crenata	coral ardisia	Prohibited	1	62.9%
Dioscorea bulbifera	air potato	Prohibited	1	57.1%
Dolichandra unguis-cati	cat's-claw vine	High Invasion Risk	1	55.4%
Paederia foetida	skunk vine	Prohibited, High Invasion Risk	1	55.0%
Abrus precatorius	rosary pea	Prohibited	1	49.6%
Tradescantia fluminensis	small-leaf spiderwort	Invasive (No Uses)	1	33.7%
Xylosma congesta	shiny xylosma, dense logwood	*No Assessment*		22.0%
Melia azedarach	Chinaberry	Caution	2	20.2%
Asparagus setaceus	common asparagus fern	Caution		15.5%
Urochloa maxima	guinea grass	Caution	2	14.1%
Citrus x aurantium	sour orange	Caution		12.7%
Lantana strigocamara	lantana, shrub verbena	Invasive	1	12.5%
Pseudosasa japonica	arrow bamboo	High Invasion Risk		11.9%
Condea verticillata	John Charles	Not a problem species (documented)		9.5%
Imperata cylindrica	cogongrass	Prohibited, High Invasion Risk	1	9.5%
Drymaria cordata	West Indian chickweed	*No Assessment*		6.9%
Cinnamomum burmannii	Java cinnamon	*No Assessment*		6.5%
Livistona chinensis	Chinese fan palm	Caution	2	5.0%
Broussonetia papyrifera	paper mulberry	Caution	2	4.0%
Xanthosoma sagittifolium	elephant ear	Invasive (No Uses)	2	4.0%
Nephrolepis cordifolia	tuberous sword fern	Invasive (No Uses)	1	3.4%
Thelypteris dentata	downy maiden fern	Caution		3.2%
Solanum viarum	tropical soda apple	Prohibited	1	2.6%
Lygodium japonicum	Japanese climbing fern	Prohibited	1	2.2%
Eremochloa ophiuroides	centipede grass	Not a problem species (documented)		2.0%
Cenchrus purpureum	mission grass	High Invasion Risk	2	1.8%
Eugenia uniflora	Surinam cherry	Caution	1	1.6%
Pueraria montana var. *lobata*	kudzu	Prohibited, High Invasion Risk	1	1.4%
Butia capitata	pindo palm	Not a problem species (un-documented)		1.2%
Ligustrum lucidum	glossy privet	Caution	1	1.2%
Musa x paradisiaca	common banana	Not a problem species (un-documented)		1.2%
Eriobotrya japonica	loquat	Caution		1.0%

Scientific name	Common name	UF IFAS Assessment-Central Florida	FISC[1] Rank	Frequency[2]
Mirabilis jalapa	four o'clock	*No Assessment*		1.0%
Triadica sebifera	Chinese tallow-tree	Prohibited	1	1.0%
Acrocomia totai	gru gru palm	Not a problem species (un-documented)		0.8%
Lagerstroemia indica	crepe myrtle	Not a problem species (un-documented)		0.8%
Setaria megaphylla	palm grass	*No Assessment*		0.8%
Unknown Coriaceous Climber		*N/A*		0.6%
Bambusa vulgaris	common bamboo	Not a problem species (un-documented)		0.6%
Costus woodsonii	red button ginger	*No Assessment*		0.6%
Hedychium coronarium	white gingerlily	Not a problem species (documented)		0.6%
Phoenix reclinata	Senegal date palm	Not a problem species (documented)	2	0.6%
Syngonium podophyllum	arrowhead vine	Invasive (No Uses), High Invasion Risk	1	0.6%
Unknown Trifoliate Climber		*N/A*		0.4%
Crinum asiaticum	poisonbulb	*No Assessment*		0.4%
Dracaena sp.	bowstring hemp relative	*N/A*		0.4%
Ligustrum sinense	Chinese privet	Prohibited	1	0.4%
Nephrolepis sp.	sword fern	*N/A*		0.4%
Paspalum notatum	bahia grass	Caution		0.4%
Phyllostachys aurea	golden bamboo	Not a problem species (documented)	2	0.4%
Stenotaphrum secundatum	St. Augustine grass	*No Assessment*		0.4%
Unknown Fern		*N/A*		0.2%
Unknown Grass		*N/A*		0.2%
Unknown Trifoliate Shrub		*N/A*		0.2%
Unknown Unifoliate Climber		*N/A*		0.2%
Alocasia macrorrhizos	giant taro	Not a problem species (un-documented)		0.2%
Aristolochia sp.[3]	calico flower	*N/A*		0.2%
Carya illinoinensis	pecan	Not a problem species (un-documented)		0.2%
Crotalaria spectabilis	showy rattlebox	Caution		0.2%
Cycas revoluta	sago palm	Not a problem species (un-documented)		0.2%
Rosa laevigata	Cherokee rose	*No Assessment*		0.2%
Senna obtusifolia	sicklepod	Not a problem species (un-documented)		0.2%
Syagrus romanzoffiana	queen palm	Caution	2	0.2%
Wisteria sinensis	Chinese wisteria	Invasive (No Uses), High Invasion Risk	2	0.2%

1 Florida Invasive Species Council, formerly Florida Exotic Pest Plant Council (FLEPPC)

2 The percentage of all (496) sample units that the species was observed in

3 Probably *A. elegans*, elegant Dutchman's pipe