# DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK

Park Chapter

NORTH FLORIDA HIGHLANDS REGION

PARK FEATURES
- Park Boundary
- Structures
- Paved Park Roads
- Unpaved Park Road
- Parking Lot
- Walkways
- Hiking Trails

WETLANDS
FORESTED AREA
PARK BOUNDARY
MESIC FLATWOODS
DEPRESSION MARSH
DOME SWAMP
UNIV. OF FLORIDA RADIO STATION
PARK BOUNDARY
DOME SWAMP
DEPRESSION MARSH
SANDHILL
SCRUBBY FLATWOODS
Sinkhole Rim Trail
MESIC FLATWOODS
DEVIL'S MILLHOPPER
Observation Deck
DEPRESSION MARSH
LIMESTONE OUTCROP
SEEPAGE STREAMS
Staircase
Footbridge
Deer Run
UPLAND HARDWOOD FOREST
NW 52nd TERR
PARK BOUNDARY
Visitor Center
PRIVATE DRIVE
SUCCESSIONAL HARDWOOD FOREST
Picnic Area
Parking Lot
Honor Box
UPLAND PINE
Staff Residence
GATE
TO SAN FELASCO HAMMOCK PRESERVE STATE PARK
NW 53rd AVE
(MILLHOPPER ROAD)
PARK ENTRANCE
TO GAINESVILLE

N
W E
S

# DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK

## ALACHUA COUNTY, FLORIDA

0 75 150 300 Feet

# INTRODUCTION

## LOCATION AND ACQUISITION HISTORY

Devil's Millhopper Geological State Park is located in Alachua County, just inside the northwestern city limits of Gainesville (see Vicinity Map). Access to the park is from State Road 232 (Millhopper Road/ Northwest 53rd Avenue) approximately a quarter mile west of Northwest 43rd Street. The Vicinity Map also reflects significant land and water resources existing near the park.

Devil's Millhopper Geological State Park was initially acquired when the University of Florida transferred the original 36.09-acre property to the Board of Trustees of the Internal Improvement Trust Fund (Trustees) in 1972. Additional parcels have since been purchased through the Land Acquisition Trust Fund (LATF) program and the Florida Forever Additions and Inholdings program. The park is currently comprised of 67.24 acres. The Trustees hold fee simple title to the park, and on Jan. 16, 1974, the Trustees leased (Lease No. 2697) the property to the Division of Recreation and Parks (DRP) under a 99-year lease. The current lease will expire on Jan. 15, 2073.

Devil's Millhopper Geological State Park is designated single-use to provide public outdoor recreation and conservation. There are no legislative or executive directives that constrain the use of this property (see Appendix). A legal description of the park property is available upon request to the Florida Department of Environmental Protection (DEP).

## SECONDARY AND INCOMPATIBLE USES

In accordance with 253.034(5) F.S., the potential of the park to accommodate secondary management purposes was analyzed. These secondary purposes were considered within the context of DRP's statutory responsibilities and resource values. This analysis considered the park's natural and cultural resources, management needs, aesthetic values, visitation and visitor experiences. It was determined that no secondary purposes could be accommodated in a manner that would not interfere with the primary purpose of resource-based outdoor recreation and conservation.

DRP has determined that uses such as water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry (other than those management activities specifically identified in this plan) would not be consistent with the management purposes of the park.

In accordance with 253.034(5) F.S., the potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that multiple-use management activities would not be appropriate as a means of generating revenues for land management. Instead, techniques such as entrance fees, concessions and similar measures will be employed on a case-by-case basis as a means of supplementing park management Generating revenue from consumptive uses or from activities that are not expressly related to resource management and conservation is not under consideration.

## PURPOSE AND SIGNIFICANCE OF THE PARK

### Park Purpose

Devil's Millhopper Geological State Park protects and preserves an exemplary geologic feature of statewide significance while interpreting the processes that shape and influence Florida's land and water resources.

### Park Significance

- The Millhopper sinkhole is a spectacular example of a solution collapse sinkhole. The unusually large size of the sinkhole and its exposed limestone strata make it a special natural feature that provides a wealth of information about north Florida's stratigraphy and paleontology.

- The cool microclimate of the sink supports a unique flora that is more characteristic of ravine systems farther north in the Piedmont region of southern Appalachia.

- Based on geological significance, paleontological record and regionally unique biota, the Devil's Millhopper was designated a National Natural Landmark in 1976.

- The park protects examples of early park development by the Works Project Administration (WPA) in the 1930s.

### Central Park Theme

Descend into the alluring mystery of the Devil's Millhopper sinkhole, where layers of sediment hold traces of Florida's natural history beneath lush mosses, ferns and waterfalls.

Devil's Millhopper Geological State Park is classified as a special feature site in the DRP unit classification system. A special feature is a discrete and well-defined object or condition that attracts public interest and provides recreational enjoyment through visitation, observation and study. A state special feature site is an area which contains such a feature, and which is set aside for controlled public enjoyment. Special feature sites for the most part are either historical or archaeological by type, but they may also have a geological, botanical, zoological or other basis. State special feature sites must be of unusual or exceptional character or have statewide or broad regional significance.

Management of special feature sites places primary emphasis on protection and maintenance of the special feature for long-term public enjoyment. Permitted uses are almost exclusively passive in nature and program emphasis is on interpretation of the special feature. Development at special feature sites is focused on protection and maintenance of the site, public access, safety and the convenience of the user.

## OTHER DESIGNATIONS

The unit is not within an Area of Critical State Concern as defined in section 380.05, Florida Statutes, and it is not under study for such designation. The park is a component of the Florida Greenways and Trails System, administered by the DEP Office of Greenways and Trails.

All waters within the park have been designated as Outstanding Florida Waters, pursuant to Chapter 62-302, Florida Administrative Code. Surface waters in this park are also classified as Class III (suitable for fish consumption and recreation) waters by DEP. The park is not within or adjacent to an aquatic preserve as designated under the Florida Aquatic Preserve Act of 1975 (Section 258.35, Florida Statutes).

## PARK ACCOMPLISHMENTS

- Listed in the National Register of Historic Places in 2016.
- Developed and implemented 65 interpretive, informational or educational programs.
- Successfully reintroduced prescribed fire in appropriate management zones.
- Increased visitor contact between visitors and staff through staff training, volunteer recruitment and partnerships with the Florida Conservation Corps.
- Maintained an effective invasive plant management program and regularly met annual treatment objectives.

# RESOURCE MANAGEMENT COMPONENT

| Devil's Millhopper Geological State Park Management Zones | | | |
|---|---|---|---|
| **Management Zone** | **Acreage** | **Managed with Prescribed Fire** | **Contains Known Cultural Resources** |
| DM-1A | 25.8 | Y | Y |
| DM-1B | 9.13 | Y | Y |
| DM-2 | 11.73 | Y | Y |
| DM-3 | 20.58 | Y | Y |

## TOPOGRAPHY

Devil's Millhopper Geological State Park is located in Alachua County near the southern edge of the Northern Highlands physiographic region (White 1970; Hoenstine, and Lane 1991) where an outfacing, relict marine feature known as the Cody Escarpment, or Cody Scarp, is situated (Puri and Vernon 1964). The Cody Scarp constitutes the most persistent topographic break in the state, its continuity unbroken except by valleys of major streams. The many incidences of subsidence and sinkhole collapse along the scarp have strongly influenced the topographical and hydrological characteristics of the region (Butt et al. 2006). A large portion of the surface runoff from the Northern Highlands drains across the Cody Scarp into sinkholes and rapidly infiltrates the subsurface limestone conduits of the Upper Floridan aquifer.

The most significant topographic feature in the park is the Devil's Millhopper sinkhole (Millhopper Sink), a 125-foot deep collapse sink with almost vertical slopes (Pirkle 1956) (see Topographic Map). Several seepage streams, most originating near the rim of the sinkhole, follow tiny, ever-changing courses down the steep slopes. A considerably larger seepage stream, Deer Run, flows through a ravine of substantial size before emptying into the sinkhole at its western rim. There are several other surface subsidence features in the Deer Run drainage area as well. Residential development has significantly altered the portion of Deer Run that is located outside the park.

With the exception of Millhopper Sink and the Deer Run ravine, topographic variation in the park is relatively minor. Small shallow depressions irregularly punctuate the park landscape. One sinkhole near the park's southern boundary receives direct storm water drainage from a private facility on adjacent property. The long-term impact of this storm water on park resources has not yet been determined.

Elevations within the park range from 55 feet mean sea level (msl) at the bottom of the sinkhole to about 180 feet msl at the north end of the park. Some of the park's terrain has been altered. During past stratigraphic research, geologists excavated sizeable sections along the upper slopes of the sinkhole. Over time, erosion may have enlarged these cuts. Minor topographic alterations have resulted from the

construction of now obsolete roads and firebreaks. Aerial photographs from the late 1930s indicate that land clearing, and possibly agricultural activity, took place in the southwestern part of the park. Although the area is now covered with second growth forest, the unusually flat terrain and decreased diversity of ground cover are persistent reminders of past land uses.

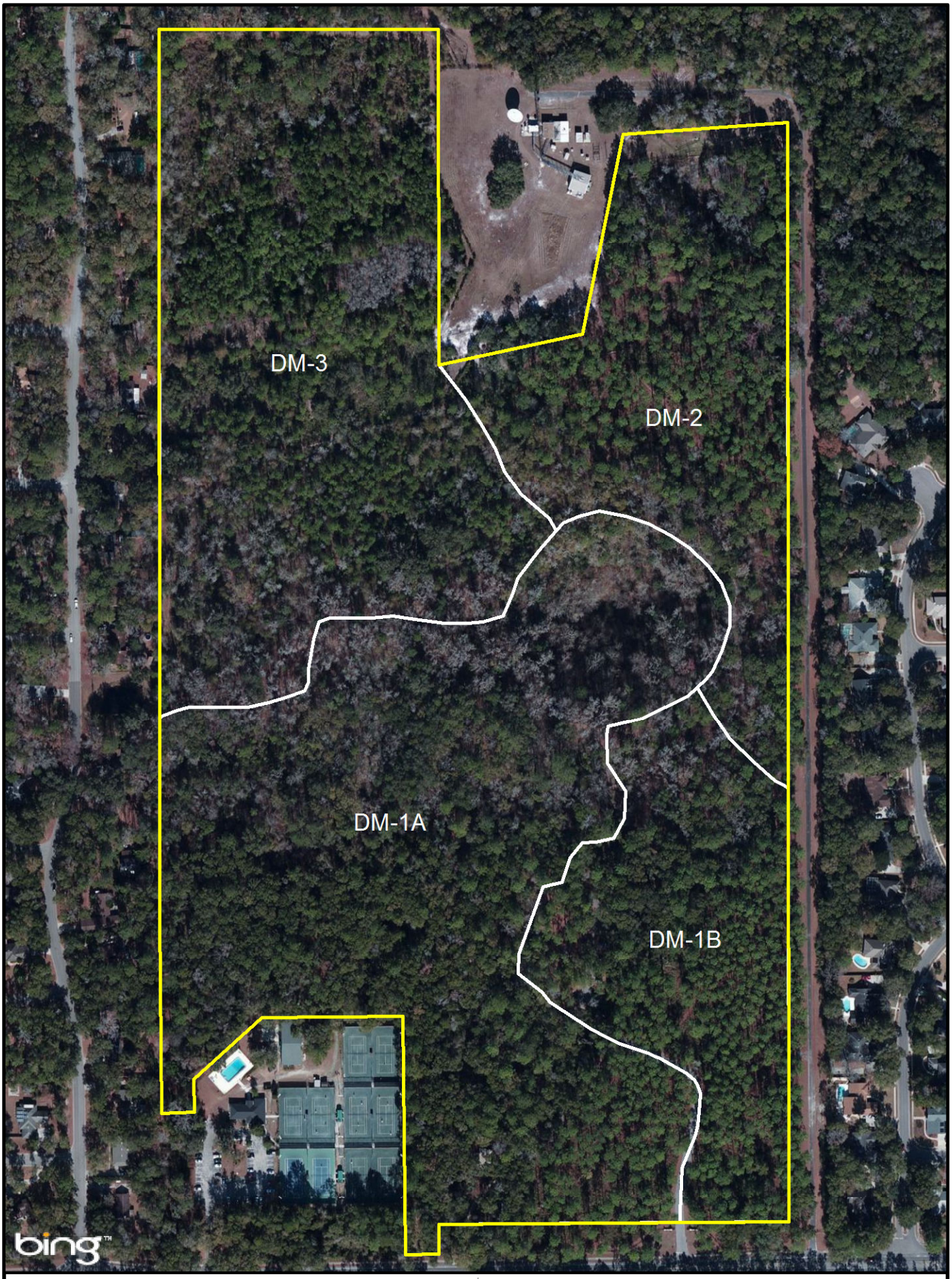
## SOILS

Only two soil types occur at Devil's Millhopper Geological State Park (Thomas et al. 1985), one well-drained (Millhopper sand) and the other poorly drained (Pelham sand). Complete descriptions of these soil types are contained in the Appendix (see Soils Map).

Geologists caused extensive soil disturbance in the past when they excavated test trenches on the slopes of Millhopper Sink and Deer Run ravine. Other soil disturbances have included the construction of now obsolete roads and firebreaks. The land clearing that once took place in the southwestern portion of the park also caused some soil disturbance, but probably only affected the topsoil and upper subsoil. Many of these impacts have partially healed over time. The sinkhole in the southwest portion of the park that functions as part of a private drainage easement continues to experience sediment loading, and erosion along the drainage ditch leading to the sinkhole occurs during storm water events.

Foot trails that approach the rim of the Millhopper Sink may carry non-attenuated storm water runoff and create erosion scours in isolated locations. Stabilization and erosion prevention measures are still needed in several scoured areas along the slopes of the sinkhole. Restoration of these deep gouges may require installation of ditch blocks and backfilling where practical. Management activities will follow generally accepted best management practices to prevent further soil erosion and to conserve on-site soil and water resources.

A depression marsh natural community intersects the west boundary of the park in management zone 3. This boundary has a fire line maintained for use during prescribed burns in the park. When the marsh has standing water, vehicular passage may cause rutting of soils along wetland edges. This may contribute to the movement of sediments into the marsh. Soil stabilization along that section of the fire line may be the best way to remedy the situation.



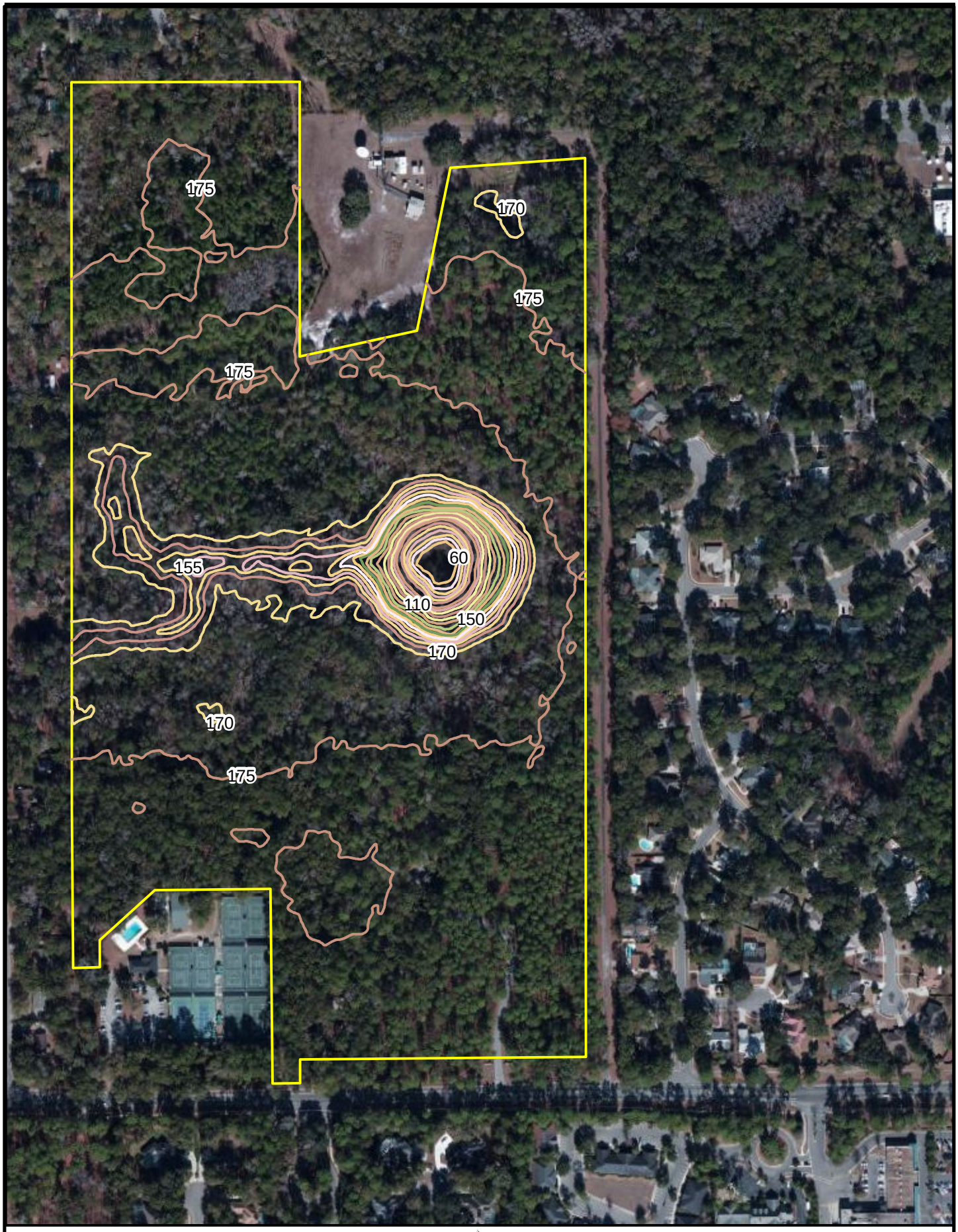

DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK

N

0 100 200 400 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

MANAGEMENT ZONES MAP



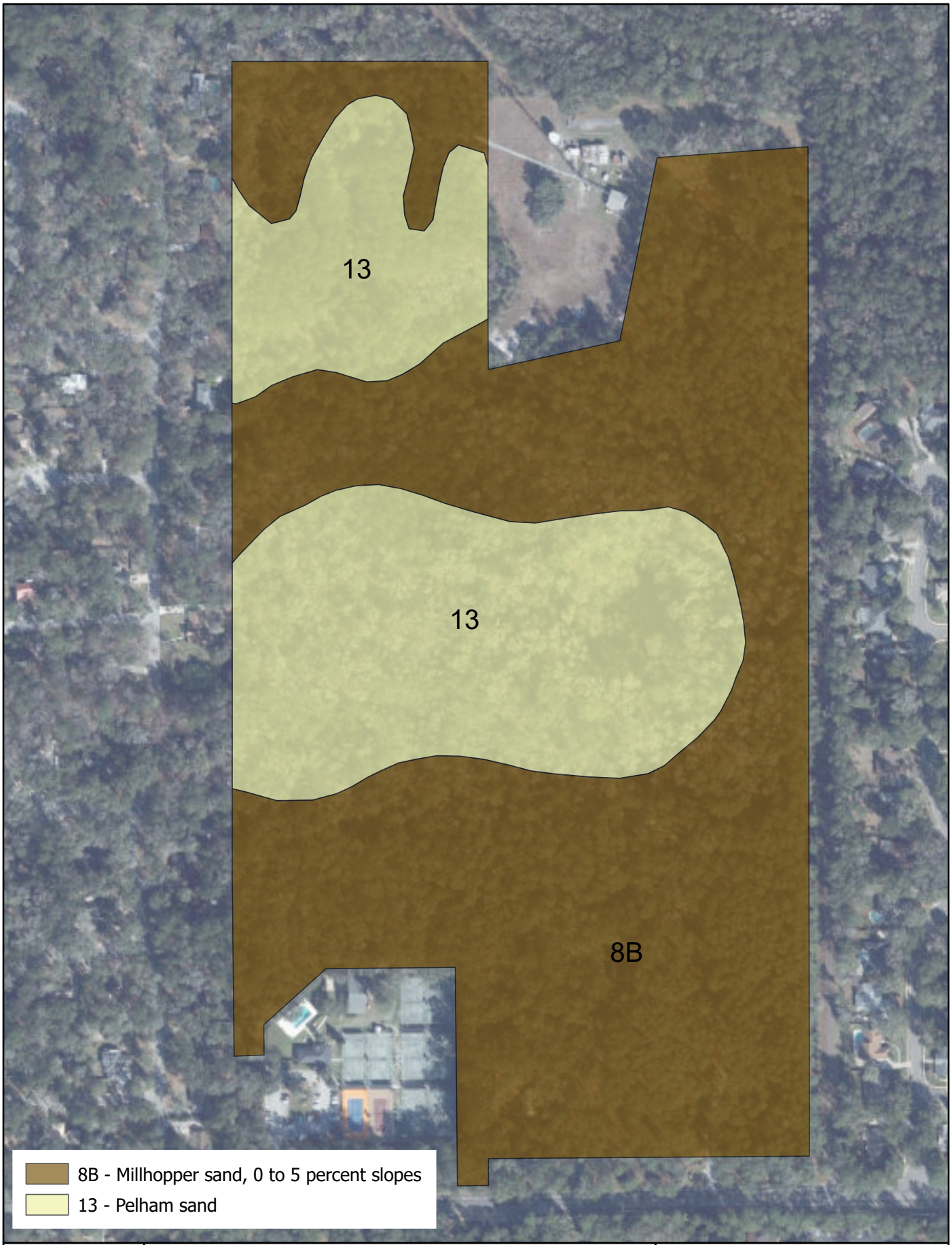

# DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK

N

0 100 200 400 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of Aerial: 2010

## TOPOGRAPHIC MAP




# DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK
Soils

N

0 250 500 Feet

This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

## HYDROLOGY

The Deer Run to Millhopper Sink system is a stream-to-sink hydrologic feature similar to several others found along the Cody Scarp, particularly in nearby San Felasco Hammock Preserve State Park. All are important to the hydrology of the region (Williams et al. 1977). The park sits on the boundary between two major drainage areas: the Santa Fe River watershed (Blues Creek sub-basin) to the north and the Orange Creek watershed (Possum Creek sub-basin) to the south. However, most current evidence suggests that the surface water entering Millhopper Sink funnels directly through a swallow hole into the Floridan aquifer and, as groundwater, then proceeds to the Santa Fe River Basin in Northwest Alachua County via the Cross-County Fracture Zone (Brooks 1967, Butt et al. 1996; Williams et al. 1977). The Santa Fe River basin, which covers nearly 1,400 square miles, is under the jurisdiction of the Suwannee River Water Management District (SRWMD) (Clark et al. 1964; Fernald and Purdum 1998). Portions of the Santa Fe River are impaired, and a Basin Management Action Plan has been developed for that water body (DEP 2012c; DEP 2018).

Surface water resources within the park include Deer Run, numerous seepage springs associated with the sinkhole, and two ephemeral dome swamps located north of Millhopper Sink. Rainfall, local surface water runoff and surficial groundwater maintain flows and water levels in these features.

The ecotone between the mesic flatwoods in zone 3 and an adjacent depression marsh and dome swamp contains hooded pitcherplants (*Sarracenia minor*), a species sensitive to hydrological changes. Some of the wetland areas near the pitcherplants had been altered before DRP assumed management of the park, probably to improve drainage. At least one shallow ditch that may still disrupt the natural hydrological regime of these wetlands persists today. Another factor affecting the surface hydrology of wetlands in zone 3 is soil compaction associated with heavy equipment use during a salvage logging operation in 1994 after a devastating pine beetle outbreak.

Deer Run, which originates in an adjacent subdivision, enters the park at its west boundary and then flows through a ravine for about 650 feet before spilling into the Millhopper Sink at its western rim. Flows in the stream are variable. During times of drought, the stream may barely flow, receiving water only from numerous small seeps along its short course through the park. At these times, only a few small standing pools of water may remain along the lower sections of the stream nearest the Millhopper Sink. Alternatively, after heavy rainfall events, large amounts of surface runoff enter the stream. The primary source of this surface runoff is overflow from the Deer Run subdivision's stormwater detention pond, which is located along the course of the stream at the western boundary of the park. After large storm events, significant sediment and nutrient loading may occur along Deer Run all the way to the Millhopper Sink.

The residential development that now virtually surrounds the park has negatively affected the water quality of wetlands in the park (Alachua County Environmental Protection Department 2004). Leakage from local septic systems and percolation of storm water runoff may degrade the surficial aquifer, which is the source of the seepage that feeds the park's surface waters. Pollutants, including substances derived from yard and pavement runoff, accumulate within the detention pond along Deer Run and periodically spill over into the downstream portion of the run that flows through the park. Park employees regularly place hay bales in Deer Run at the boundary of the park to filter out particulate matter suspended in the stream. Potential contamination of the stream is a concern because surface waters from the creek travel directly to the aquifer via the swallow hole at the bottom of Millhopper Sink.

From 2001 through 2003, the Alachua County Environmental Protection Department (ACEPD) performed stream assessments of waters within Deer Run as part of a larger study within the City of Gainesville (ACEPD 2004, ACEPD 2008). These assessments provided baseline water quality and biological analyses that indicated a high level of impairment within Deer Run (DEP 2012a).

***Objective A:*** Conduct/obtain an assessment of the park's hydrological restoration needs.

- Action 1 - Continue to cooperate with other agencies and researchers regarding hydrological research and monitoring.
- Action 2 – Continue to monitor, review and comment on proposed land use or zoning changes within lands bordering the park.
- Action 3 - Seek expertise to use dye trace studies to determine connections between park karst systems and Santa Fe River.
- Action 4 – Seek research and funding opportunities to conduct dye tracing to determine connections between park karst systems and Santa Fe River.
- Action 5 - Continue partnership with ACEPD to monitor water quality within Deer Run.
- Action 6 - Implement appropriate stormwater control measures where Deer Run enters the park, using best management practices to allow for increased filtration during storm events.
- Action 7 - Assess the impacts of soil erosion on the steep slopes of Millhopper Sink and, when appropriate, remediate using best management practices.

The most significant hydrological feature at the park is the giant Millhopper Sinkhole. Management of this important karst feature does not end at the park boundary. As described above, surface water that enters the park from Deer Run drains into the Floridan aquifer. Hence, urban communities surrounding the park directly influence the quality of groundwater in this region. That groundwater in turn has a significant influence on the Santa Fe River. Successful protection of the park's wetland resources will require a concerted effort to focus on limiting nutrient loading within the park's surface watershed.

DRP will continue its tradition of close cooperation with state and federal agencies and independent researchers engaged in hydrological research and monitoring programs, both within the park and in the adjacent local neighborhoods. The Division will also encourage and facilitate additional research in those areas. The Division will rely upon agencies such as the SRWMD, the U.S. Geological Survey and DEP to keep it informed about any declines in surface water quality or any suspected contamination of groundwater in the region. Additional cooperative efforts may include facilitating the review and approval of research permits and providing researchers with assistance in the field, including orientation to park resources. Recommendations derived from these monitoring and research activities will be essential to the decision-making process during management planning.

DRP staff will continue to monitor land use or zoning changes within the area bordering the park. Major ground disturbances in that area, or inadequate treatment of runoff from adjacent lands into the park, could cause serious degradation of water quality in the park. As appropriate, District 2 staff will provide comments to other agencies regarding proposed changes in land use or zoning on neighboring properties when such changes may negatively influence the hydrology of the park.

The park will continue to work with the ACEPD to encourage documentation of any water quality abnormalities that might derive from outside the park, especially during large storm water events. DRP staff will seek to increase the frequency of monitoring of Deer Run or any of the park's sensitive karst features that receive significant stormwater inputs if there are indications of severe degradation to the quality of water entering the park. To the same extent, staff will continue to assess the sensitive slopes of Millhopper Sink for any significant changes associated with soil erosion or sedimentation.

DRP will encourage appropriate hydrological experts to achieve a greater understanding of the groundwater flow regime associated with surface waters that drain into Millhopper Sink. In that respect, the DRP should seek funding for dye trace studies to delineate groundwater connections between the Millhopper and the Santa Fe River.

***Objective B:*** Restore hydrological conditions and functions to approximately two acres of depression marsh and dome swamp natural communities.

- Action 1 - Assess the need to install ditch blocks in zone 3.
- Action 2 - Assess the need to install low water crossings where service roads and fire lines cross the depression marsh in zone 3.
- Action 3 - Seek funding and implement installation of low water crossings where service roads and fire lines cross the depression marsh in zone 3.

DRP staff will assess the hydrological impacts of ditching that connects wetlands in zone 3 in the northwest section of the park. If the assessment indicates that restoration is needed, staff will evaluate the best available means for restoring the local hydrology, including the possible installation of ditch blocks. DRP staff will also assess the hydrological impacts of a fire line through a depression marsh that reaches the west boundary of the park. Sometimes the marsh may be too wet to allow vehicle passage along the fire line without causing significant rutting and erosion. Such disturbances could hinder prescribed fire activities in the zone. DRP will determine if there is a need to install a low water crossing where the fire line passes through the depression marsh. Best management practices will be used for any hydrological restoration.

## NATURAL COMMUNITIES

### Limestone Outcrop

Limestone outcrops occur within the Devil's Millhopper sinkhole. Although small areas of limestone occur on the slopes, the largest extent of exposed limestone occurs at the base of the slopes, primarily on the north side of the bottom of the sinkhole. The limestone is encrusted with many types of ferns and other species that thrive in humid microclimates. Although past recreational uses seriously degraded the slopes of the sinkhole prior to DRP management, the limestone outcrops are in good condition.

Measures must be taken to prevent runoff and erosion from degrading limestone outcrops. This may include monitoring stormwater impacts from outside the park, as well as monitoring ground disturbance during the removal of invasive plant species in the surrounding sinkhole and upland hardwood forests.

### Mesic Flatwoods

Prior to DRP management, this community had an extensive history of alteration due to various land use practices, including timbering and perhaps farming. Offsite species such as loblolly pine, sweetgum and laurel oak successfully invaded the mesic flatwoods during the decades of fire exclusion. Ditching historically occurred within the mesic flatwoods to connect isolated wetlands, including a depression marsh and dome community. A 1994 clear-cut to control southern pine beetles (SPBs) removed nearly the entire pine overstory from the flatwoods. Hardwood species remain the dominant vegetation, but a restoration project in 2006 and 2007 included offsite hardwood treatment and wiregrass planting in the northern portion of the flatwoods. The mesic flatwoods have not been burned since the hardwood treatment, so hardwood sprouts are again proliferating and longleaf pines have not yet been reintroduced. The mesic flatwoods are currently in poor to fair condition.

The combination of shading and litter buildup in the past has inhibited the growth of herbaceous plants, including the rare hooded pitcher plant in the wetter portions of the flatwoods. Active management is required, including the use of prescribed fire and other means of hardwood control to ensure survival of the pitcher plant population and to encourage its expansion. Regular prescribed fire is essential for the health of this community.

One problem that will likely recur is invasion of the mesic flatwoods by invasive plant species such as the Chinese tallowtree (*Sapium sebiferum*). This plant presumably spread into the park from nearby residential subdivisions. Developments near the park continue to increase in number and extent.

Additional herbiciding or mechanical removal of offsite hardwoods, along with increased frequency of prescribed fire, will be necessary to improve the condition of the mesic flatwoods. Planting of longleaf pines will also be necessary in the future. Groundcover plantings may be required depending on how the remnant herbaceous species respond to prescribed fires.

Sandhill

Fire was reintroduced to this community after a long absence. However, the offsite hardwoods required treatment in 2006 to open the canopy and expedite restoration. Fire-intolerant species persist in some areas. Certain plant species that are characteristic of the system have decreased in numbers due to historical disturbance and long-term fire exclusion. Some species may have even disappeared altogether. The SPB clear-cut of 1994 had a minimal impact on this community. Only a small number of pines were removed, and these were located along the edge of the sandhill. The sandhills are in fair to good condition. Additional prescribed fires are needed to improve the condition of the sandhills.

Scrubby Flatwoods

Few longleaf pines were present in the scrubby flatwoods before the clear cut to control SPBs in 1994. The area was dominated by offsite loblolly pines. Once the clear cut occurred and most overstory pines were removed from the scrubby flatwoods, the community was vulnerable to an invasion by offsite oaks and to a repeat invasion by loblolly pines. Off-site hardwoods were removed in 2006. This community still has too few overstory longleaf pines. Additional prescribed fires are needed to improve the condition of the scrubby flatwoods.

Sinkhole

The most notable feature in the park is the large sinkhole known as the Devil's Millhopper (Millhopper Sink). Before the property was placed under DRP jurisdiction, there were no restrictions on visitor activities that might degrade the sinkhole. Visitors climbed indiscriminately up and down the sides of the sinkhole and caused problems such as soil compaction, erosion, vegetation loss and littering. These activities resulted in an accelerated accumulation of sediments on the sinkhole floor and the loss of sensitive plant and animal species.

Before DRP assumed management of Millhopper Sink, unauthorized foot traffic had caused extensive destruction of vegetation and exposure of the topsoil within the sinkhole, primarily along the steep slopes. Efforts to reduce visitor impacts included the construction of a boardwalk that followed natural contours with a gradual descent to the bottom of the sinkhole, as well as the installation of fences and signs around the rim of the sinkhole. All have been effective. The slopes are now largely stabilized, and vegetation has largely recovered. Visitors occasionally still wander off the designated trails and boardwalk, causing compaction and erosion of soils on the ravine and sinkhole slopes. Park staff provide frequent interpretation to visitors about the fragile nature of this community to foster greater public understanding about the consequences of increased erosion. The sinkhole is in good condition.

An invasive plant known as perpetual begonia (*Begonia cucullata*) occurs on the lower slopes near the sinkhole floor. The plant persists despite continued removal efforts, particularly in seepage areas.

Unique microclimatic conditions such as cool temperatures, elevated humidity and moist soils exist within the sinkhole. Similar microclimatic conditions are found much further north in ravines and valleys of the Piedmont and southern Appalachian region. Devil's Millhopper is one of the southernmost sites to harbor several species characteristic of Appalachian flora such as Wagner's spleenwort (*Asplenum heteroresilians*). The microclimatic conditions supportive of this unique flora are sensitive to increases in the size and number of canopy openings, as well as to changes in seepage or surface flow.

Necessary management measures include continuing to restrict visitor access to the sinkhole slopes and monitoring hydrological disturbances within and adjacent to the park. Particular attention will be paid to the seepage stream that receives stormwater flow from the Deer Run subdivision located on the park's western boundary. The Sinkhole Rim Trail will also be monitored for excessive runoff into the sinkhole.

Upland Hardwood Forest

The upland hardwood forest community grades into the sinkhole community along the upper slopes of the sinkhole. The upland hardwood forest that extends beyond the rim of the sinkhole grades into fire-maintained natural communities, including mesic flatwoods, sandhill and upland pine. Agricultural activities, most likely for pasture development, removed most of the upland pine community to the southwest of the sinkhole. Suppression of natural fires may have also allowed the upland hardwood forest to expand away from the sinkhole and into adjacent fire-maintained communities. Restoration of a natural fire regime in these ecotone areas would help establish a more natural transition. The upland hardwood forest also extends naturally to the west along the seepage stream that flows into the sinkhole. The upland hardwood forest is in good to excellent condition.

Upland hardwood forests typically require less active management than fire-maintained natural communities. Monitoring and removal of invasive plants along with monitoring of recreational impacts are the main management measures recommended for the upland hardwood forest.

Upland Pine

In the past, hardwoods largely dominated this community. In recent years, prescribed fire and selective removal of offsite hardwoods have helped restore a more characteristic species composition. Despite successes in restoration, however, some plants characteristic of the community have disappeared, and certain weedy species of vines such as muscadine (*Vitis rotundifolia*) and hardwoods such as laurel oak (*Quercus laurifolia*) still dominate. The upland pine community is in fair condition. Most of the southwestern section of the park is currently classified as successional hardwood forest since it was cleared of native vegetation prior to 1937. This area was likely upland pine prior to being cleared. The lack of remnant upland pine species in this well-developed hardwood forest makes restoration of this community a low priority at this time.

Frequent prescribed fires are recommended to promote restoration of the structure and composition of the park's upland pine community.

Depression Marsh

Two depression marshes occur within the mesic flatwoods, and one occurs in the bottom of the Devil's Millhopper sinkhole. The marshes within the mesic flatwoods are dominated by grassy species with scattered woody shrubs. Although suffering from lack of fire, the depression marshes retain their natural appearance and are in fair to good condition. The ecotones between the marshes and the surrounding mesic flatwoods are somewhat overgrown, and the larger depression marsh is connected via an artificial ditch within the dome that lies to the east.

As recently as the early 1930s, the marsh in the sinkhole was dominated by annual plant species (Arnold 1936). Currently, perennial species are more common in the flora of the sinkhole depression marsh than are annual species. During the many years of unrestricted access to the sinkhole, the elevation of the floor rose due to erosion of organic and inorganic materials along the slopes of the sinkhole and the deposition of these materials at the bottom. Several feet of sediment have now accumulated at the bottom of the sinkhole. It is thought that herbaceous species once flourished in the depression marsh and that they had a competitive advantage over woody species when the substrate was lower and the sinkhole held greater volumes of water for longer periods. Restoring the sinkhole floor to its natural condition would be problematic at best. Removing the accumulated sediment has not been attempted and may not be practical. At present, in order to encourage the dominance of herbaceous annuals in the plant cover, park rangers remove woody perennials from the floor of the sinkhole as necessary. The depression marsh is in fair to good condition.

Monitoring and removing invasive plant species is the primary management measure needed for the depression marshes. Control of woody native species may also be required depending on the frequency and duration of flooding events. Restoration of hydrological disturbances, such as ditches, may also be necessary.

Dome Swamp

The dome in the northeast corner of the property is in good condition. This dome is adjacent to a service road that is used by neighboring landowners and park staff. The second dome is dominated by invasive hardwoods and is in poor condition. Both domes are dominated by gum trees and other hardwoods rather than cypress.

Prescribed fires in the surrounding fire-maintained natural communities should be allowed to burn into ecotones surrounding these dome swamps during wetter conditions to restore the natural transition zone. Removal of offsite hardwoods in the dome swamps may be necessary depending on water levels and the results of future prescribed fires. Monitoring and removal of any invasive plant species is also recommended.

Seepage Stream

Deer Run, augmented by flow from several small tributaries, is the major seepage stream in the park. Several other very small, independent seepage streams exist. These streams all eventually flow into the Millhopper Sink. Problems with water quality and flow in the seepage streams are discussed in the *Hydrology* section. The seepage streams in the park are in good condition.

Monitoring stormwater impacts to the seepage stream that originates outside the park is an important management priority. It is also important to protect all the seepage streams from accelerated erosion resulting from foot traffic or other human impacts.

Developed

The developed areas within the park will be managed in a manner that minimizes their effects on adjacent natural areas. Park staff will regularly check developed areas for the presence of priority invasive plants (Florida Invasive Species Council Category I and II species) and will remove any that are discovered. Other management measures will include the proper management of stormwater and the use of development guidelines that are compatible with prescribed fire management in adjacent natural areas.

Successional Hardwood Forest

Successional hardwood forest occurs in the southern portion of the park from the parking lot to the western boundary. An aerial photograph from 1937 suggests that this area once was cleared pasture.

The area is currently dominated by large laurel oaks and other offsite hardwood species. The lack of any remnant species makes restoration a low priority at this time.

***Objective A:*** Maintain 30 acres within the optimum fire return interval**.**

Performing prescribed fire at Devil's Millhopper Geological State Park is becoming increasingly complex, and continuation of a successful program is compromised by increased development on adjacent lands. Protection of the residential and commercial properties that border the park on the east, south and west is extremely important. Because of concerns about smoke management and property protection, prescribed fires that meet ecological goals can only be conducted under restricted conditions. Fire weather parameters critical to a favorable dispersion of smoke include a wind speed of moderate velocity and a wind direction with a southerly component. Humidity levels in the moderate range may also be required to achieve better control of fire behavior, especially along park boundaries. In some years, only a few days will be available in which weather conditions match those stipulated in burn prescriptions. With the limitations imposed by restrictive parameters, achieving prescribed fire goals at the park may at times be challenging. DRP will seek opportunities to include other groups, including those involved with the statewide Interagency Cooperative Agreement, to increase prescribed fire opportunities within the park (Interagency Cooperative Agreement 2012).

To achieve a successful prescribed fire program, the park must ensure that fire lane preparation is completed on schedule and that fire equipment is always well maintained. Park staff must constantly be aware of weather conditions during fire season, and staff must seize the opportunity to burn when suitable windows appear. Staff shortages may be overcome by recruiting assistance from the District 2 office and from other parks. Additional steps may include promoting local volunteerism, educating the public, local media organizations and adjacent homeowners about the importance of prescribed fire, and alerting adjacent homeowners when fire season begins.

Prescribed fire is an essential tool in maintaining the natural communities within the park, and staff should diligently pursue the program. The annual target fire acreage for the park is 12 to 20 acres per year. The mesic flatwoods community requires more frequent and intense fires to reverse the decline of the hooded pitcher plant, a species that may be threatened with extirpation in the park (Johnson 2001).

The upland pine community may benefit from a shorter fire rotation. Zone 1A should be burned on an annual rotation over the short term to determine if the more frequent fire will speed restoration of the upland pine species. Zone 1B is recommended to remain on a two-to-three-year fire return interval.

Many species of wildlife are dependent on natural fires to maintain their habitats. At the Devil's Millhopper, species such as the gopher tortoise that persist on site will require periodic fire. Other species such as the eastern indigo snake, Florida pine snake and southern fox squirrel also depend on periodic fires. Due to their larger home ranges and the dramatic loss of appropriate habitat outside the park, these species may no longer occur within the park.

The table below contains a list of all fire-dependent natural communities found within the park, their associated acreage and optimal fire return interval, and the annual average target for acres to be burned.

| Prescribed Fire Management | | |
|---|---|---|
| **Natural Community** | **Acres** | **Optimal Fire Return Interval (Years)** |
| Upland Pine | 13.52 | 1-3 |
| Mesic Flatwoods | 12.51 | 1-3 |
| Sandhill | 7.90 | 1-3 |
| Scrubby Flatwoods | 2.60 | 3-8 |
| Dome Swamp | 1.97 | 2-10 |
| Depression Marsh | 0.83 | 2-10 |
| | | |
| Annual Target Acreage | 12-36 | |

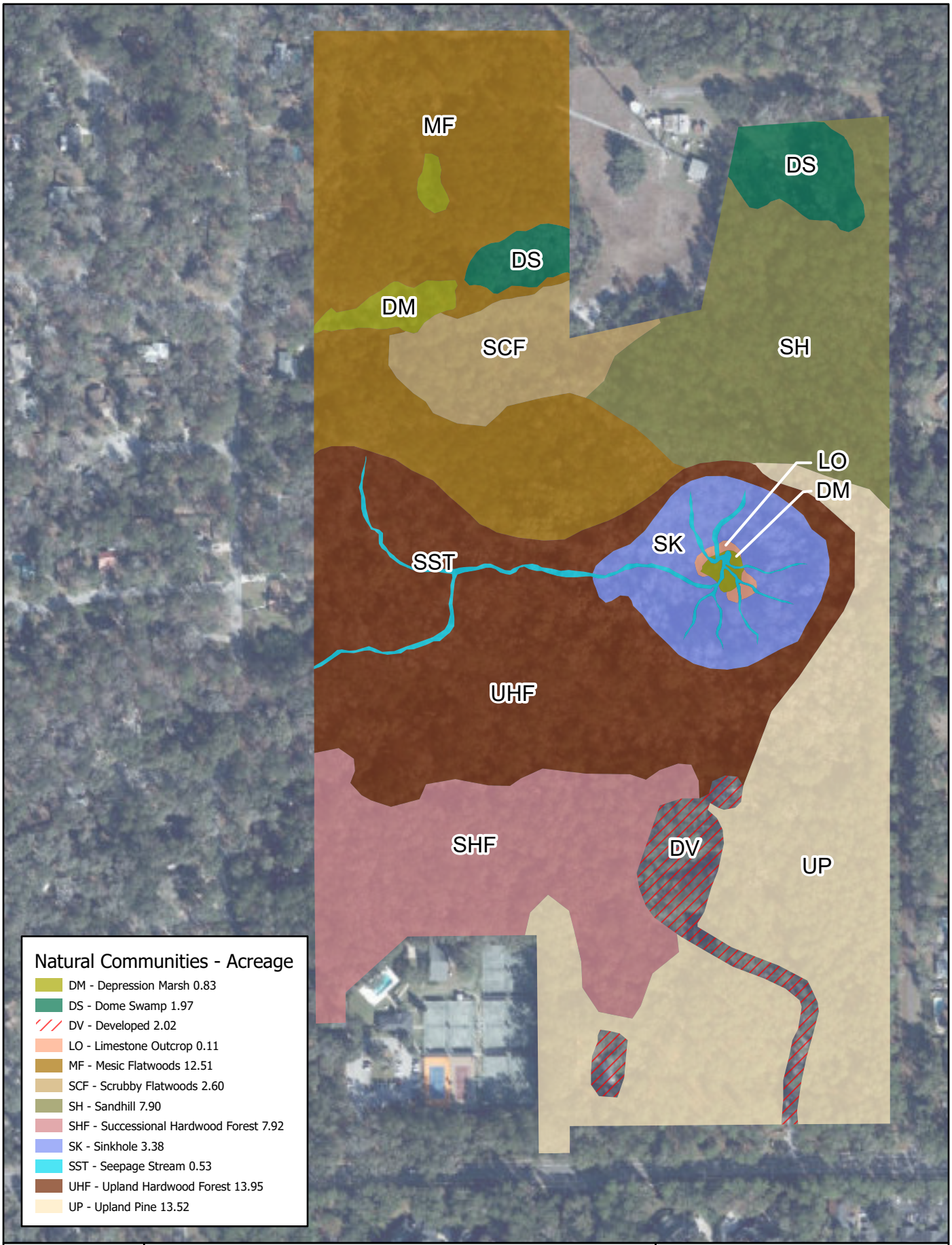
***Objective B:*** Conduct natural community restoration activities on eight acres.

Zone 3 in the northwest part of the park consists mainly of mesic flatwoods. DRP treated much of this area in 2006 to remove offsite hardwoods and subsequently planted it with wiregrass. The park will apply prescribed fire to the zone and then plant longleaf pines to begin restoration of the canopy. After prescribed fire, staff will determine the need for supplemental plantings of groundcover species. Follow-up activities will include frequent prescribed fire, chemical treatment of offsite hardwood sprouts and, possibly, the supplemental planting of groundcover species. This project is the highest resource management priority in the park.

***Objective C:*** Conduct natural community improvement activities on 5.5 acres**.**

Due to a lack of fire, pines are invading the depression marsh in zone 3. The perimeter of the depression marsh should be delineated, and pines should be removed from the interior. Large pines in the transition zone between marsh and flatwoods should be left in place. Frequent prescribed fire will be necessary.

Management zones 1a and 1b contain upland pine and successional hardwood forest. Due to the lack of frequent fire, offsite hardwoods such as laurel oaks are encroaching on the upland pine community. To reverse that trend, staff will initiate chemical and mechanical treatment of offsite hardwood sprouts. Follow-up actions will include frequent prescribed fire and retreatment of offsite hardwood sprouts as needed.

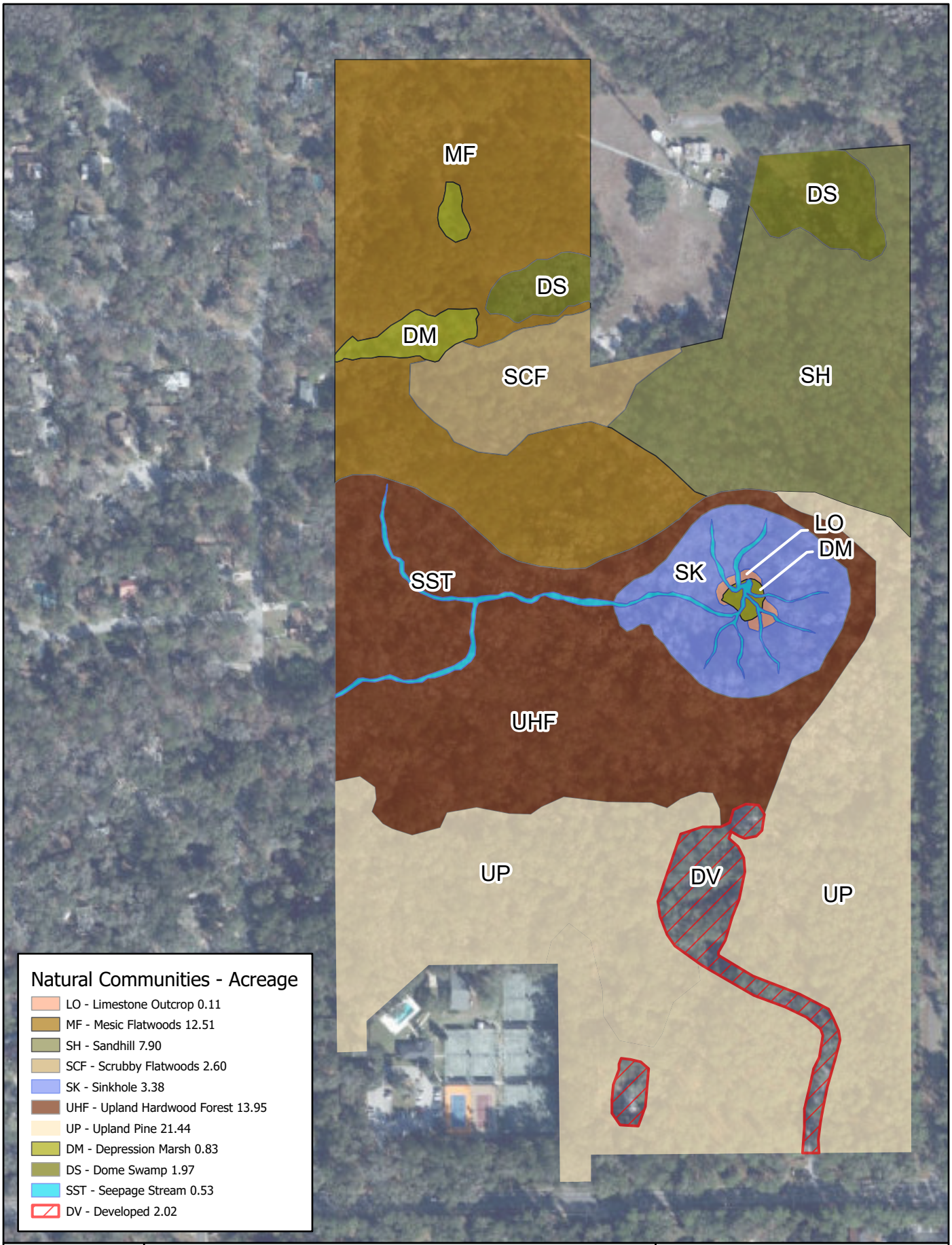



# DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK
## Natural Communities - Existing Conditions

N

0 250 500 Feet

This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.




# DEVIL'S MILLHOPPER GEOLOGICAL STATE PARK
## Natural Communities - Desired Future Conditions

N

0 250 500 Feet

This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

## IMPERILED SPECIES

Imperiled species are those that are (1) tracked by the Florida Natural Areas Inventory (FNAI) as critically imperiled (G1, S1) or imperiled (G2, S2); or (2) listed by the U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FWC) or the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened or of special concern.

Six plant species at Devil's Millhopper Geological State Park are listed as imperiled. Most of the imperiled plants are ferns or orchids, some of which prefer the unique microclimate of the sinkhole.

Hooded pitcher plant, a species listed as threatened by FDACS, was the subject of a specific resource management evaluation at the park in 1998. The insufficient application of prescribed fire, overgrowth of the mesic flatwoods community by woody plant species, and hydrologic alterations in the mesic flatwoods all threaten to extirpate the park's small population of hooded pitcherplants (Johnson 2001). Active measures are required to ensure that the existing population sufficiently increases to prevent its disappearance. This will entail increasing the frequency and intensity of prescribed fire and reducing the density of undesirable woody plants within the mesic flatwoods.

Imperiled animals recorded at the park include several species that likely range far beyond park boundaries. All of the park's listed reptile species (four species) use fire-maintained communities and presumably breed or have bred within the park. These imperiled reptile populations are of special concern due to the increasing isolation and the small size of Devil's Millhopper Geological State Park. The southern dusky salamander (*Desmognathus auriculatus*) was once common at the Devil's Millhopper (Dodd 1998). However, the population apparently disappeared within the park during the early 1970s. This species has experienced declines at other locales as well (Dodd 1998). Dodd conducted multiple surveys of the Devil's Millhopper in 1996 and 1997 and failed to find any southern dusky salamanders (Dodd 1998). Subsequent staff surveys have also failed to document the species in the park.

No species-specific management program exists for the park. Park staff protects the sinkhole community as a whole, so many of the park's imperiled plant species also receive protection. Staff members provide additional protection by periodically inspecting the sinkhole for evidence of unauthorized removal of ferns and orchids.

Prescribed fire in fire-adapted communities in the park will benefit the hooded pitcher plant and incised groovebur (*Agrimonia incisa*), as well as most of the imperiled animal species. Because the park is small and increasingly isolated from other natural areas, long-term maintenance of populations of imperiled species may be difficult.

The table below contains a list of all known imperiled species within the park and identifies their status as defined by various entities. It also identifies the types of management actions currently being taken by DRP staff and identifies the current level of monitoring effort. The codes used under the column headings for management actions and monitoring level are defined following the table. Explanations for federal and state status as well as FNAI global and state rank, are provided in the Appendix.

| Imperiled Species Inventory | | | | | | |
|---|---|---|---|---|---|---|
| **Common and *Scientific* Name** | **Imperiled Species Status** | | | | **Management Actions** | **Monitoring Level** |
| | **FFWCC** | **USFWS** | **FDACS** | **FNAI** | | |
| **PLANTS** | | | | | | |
| Incised groovebur *Agrimonia incisa* | | | LT | G3, S2 | 1,6 | Tier 1 |
| Wagner's spleenwort *Asplenium x heteroresiliens* | | | | G2, S1 | 4,9, 10 | Tier 1 |
| Green adder's-mouth orchid *Malaxis unifolia* | | | LE | G5, S3 | 10 | Tier 1 |
| Yellow fringed orchid *Platanthera ciliaris* | | | LT | | 10 | Tier 1 |
| Widespread polypody *Polypodium dispersum* | | | LE | | 10 | Tier 1 |
| Hooded pitcherplant *Sarracenia minor* | | | LT | | 1,4,6 | Tier 2 |
| **AMPHIBIANS** | | | | | | |
| Southern dusky salamander *Desmognathus auriculatus* | | | | G3, S1 | 4,9, 10 | Tier 3 |
| Florida gopher frog *Lithobates capito* | | | | G2G3, S3 | 1,6 | Tier 1 |
| **REPTILES** | | | | | | |
| Eastern Indigo snake *Drymarchon couperi* | FT | LT | | G3, S2? | 1,6 | Tier 1 |
| Gopher tortoise *Gopherus polyphemus* | ST | | | G3, S3 | 1,6 | Tier 1 |
| Short-tailed Snake *Lampropeltis extenuata* | ST | | | G3, S3 | 1,6 | Tier 1 |
| Florida Pine Snake *Pituophis melanoleucus mugitis* | ST | | | G4, S3 | 1,6 | Tier 1 |
| **BIRDS** | | | | | | |

| Imperiled Species Inventory | | | | | | |
|---|---|---|---|---|---|---|
| **Common and *Scientific* Name** | **Imperiled Species Status** | | | | **Management Actions** | **Monitoring Level** |
| | **FFWCC** | **USFWS** | **FDACS** | **FNAI** | | |
| Florida Sandhill Crane *Antigone canadensis pratensis* | ST | | | G5T2, S2 | 4,10 | Tier 1 |
| Little blue heron *Egretta caerulea* | ST | | | G5, S4 | 4,10 | Tier 1 |
| Wood Stork *Mycteria americana* | FT | LT | | G4, S2 | 4,10 | Tier 1 |

Management Actions:

1. Prescribed fire
2. Exotic plant removal
3. Population translocation/augmentation/restocking
4. Hydrological maintenance/restoration
5. Nest boxes/artificial cavities
6. Hardwood removal
7. Mechanical treatment
8. Predator control
9. Erosion control
10. Protection from visitor impacts (establish buffers)/law enforcement
11. Decoys (shorebirds)
12. Vegetation planting
13. Outreach and education
14. Other

Monitoring Level:

Tier 1: Non-Targeted Observation/Documentation: includes documentation of species presence through casual/passive observation during routine park activities (i.e. Not conducting species-specific searches). Documentation may be in the form of Wildlife Observation Forms, or other district specific methods used to communicate observations.

Tier 2: Targeted Presence/Absence: includes monitoring methods/activities that are specifically intended to document presence/absence of a particular species or suite of species.

Tier 3: Population Estimate/Index: an approximation of the true population size or population index based on a widely accepted method of sampling.

Tier 4: Population Census: A complete count of an entire population with demographic analysis, including mortality, reproduction, emigration, and immigration.

Tier 5: Other: may include habitat assessments for a particular species or suite of species or any other specific methods used as indicators to gather information about a particular species.

***Objective A:*** Update baseline imperiled species occurrence list.

Plant surveys have been conducted by DRP staff in the past but should be updated. Surveys for imperiled animal species at the park have focused primarily on vertebrates. Additional surveys for potential imperiled invertebrate species are needed to ensure documentation of all imperiled species.

DRP will enlist the assistance of academic researchers and staff from other agencies during development of species occurrence inventory lists, especially where necessary for certain taxonomic groups.

***Objective B***: Monitor and document one selected imperiled animal species in the park.

The southern dusky salamander (*Desmognathus auriculatus)* appears to have been extirpated from the park for unknown reasons in the early 1970s. Although extensive surveys in 1996 and 1997 failed to locate any southern dusky salamanders, DRP staff will periodically conduct additional surveys of the Millhopper to document occurrence of the species should it reappear. Survey methodology will include time-constraint sampling similar to that described by Dodd (1998). Assistance will be solicited from other agencies and volunteers as necessary.

***Objective C:*** Monitor and document one selected imperiled plant species in the park.

Additional surveys of the hooded pitcher plant are needed to verify locations of the remaining individuals using sub-meter GPS technology. Surveys will be more productive if conducted several weeks or months after a prescribed fire.

## INVASIVE SPECIES

The park should continue to be surveyed for invasive plants every few years. Survey information is contained in the statewide invasive database. Higher concentrations of invasive species occur on or near the western property boundary where an older residential development and a tennis club abut the park. Homeowners often throw discarded potted plants and landscaping debris over the backyard fence into the park. This material often becomes the source of invasive infestations. Park staff should check this area regularly for new infestations. Outreach about invasive plants to the surrounding community might help reduce the invasive infestations on the western and northwestern boundaries.

Several other species of invasive plants have recently appeared in the park. Arrow bamboo (*Pseudosasa japonica*) is expanding into the park from a neighboring property in the northwest corner. While the bamboo is not a Florida Invasive Species Council (FISC) Category I or II species, its infestation is increasing in size and the park should treat it more frequently, about twice per year, with the goal of eliminating it. Other invasive species in the genus *Liriope*, and possibly in *Ophiopogon* as well, are now known to occur in the park and require treatment. None of these are listed by FISC as Category I or II species. These genera are very common landscape plants in the surrounding community of Gainesville. Unfortunately, they are becoming increasingly apparent in natural areas.

| Species Name<br>Scientific Name - Common Name | FLEPPC Category | Distribution | Zone ID |
|---|---|---|---|
| Albizia julibrissin - Mimosa | I | Single Plant or Clump | DM-1 |
| Ardisia crenata - Coral ardisia | I | Single Plant or Clump, Scattered Plants or Clumps | DM-1, DM-1A, DM-1B, DM-2, DM-3 |
| Elaeagnus pungens - Silverthorn | II | Single Plant or Clump | DM-1 |
| Melia azedarach - Chinaberry | II | Scattered Plants or Clumps | DM-1B |
| Nephrolepis cordifolia - Tuberous sword fern | I | Single Plant or Clump, Scattered Plants or Clumps | DM-1A, DM-3 |

| Species Name<br>Scientific Name - Common Name | FLEPPC Category | Distribution | Zone ID |
|---|---|---|---|
| Sapium sebiferum - Chinese tallow tree | I | Scattered Plants or Clumps | DM-2, DM-3 |
| Solanum viarum - Tropical soda apple | I | Scattered Plants or Clumps | DM-1B, DM-2 |

***Objective A:*** Annually treat 6 gross acres of invasive plant species.

Although most of the current invasive infestations occur along the western and northern boundaries, park staff need to scout the entire unit for invasives every two years. Adopting this schedule will increase the likelihood of finding and treating new invasives in the park before they become serious problems.

Japanese climbing fern in the park needs to be treated every year. This should occur before spore production begins, if possible. Fire lines should be scouted regularly to detect new occurrences of Japanese climbing fern. If any are found, they should be treated thoroughly before the lines are disked to reduce the chances of the invasives spreading to other parts of the park.

Areas containing coral ardisia, mimosa, and Chinese tallowtree should be treated once every three years at minimum, and preferably more often. That frequency of treatment will interrupt the seed production cycle of those species. Park staff should become familiar with *Liriope and Ophiopogon* species so that they can survey, record and treat any occurrences of these species in the park. Research on effective treatment methods for arrow bamboo, as well as for other running bamboo species, is needed.

***Objective B:*** Develop and implement measures to prevent the accidental introduction or further spread of invasive plants in the park.

Invasive plants often invade an area accidentally through preventable methods of entry. To limit accidental introduction and movement of invasive species, park staff will need to develop and practice preventative measures, including a protocol for equipment inspection and decontamination. Activities such as mowing, landscaping debris disposal, logging, fire line preparation and road building can introduce or redistribute invasives through contaminated equipment. Fill dirt, lime rock, potted horticultural plants and mulch are all potentially contaminated by invasives even if they are not readily visible at the time of entry into the park. Some new infestations of invasives may be preventable by ensuring that contractors clean their equipment before entering the park. The further spread of invasives already established in the park may be avoided by ensuring that staff and contractors do not move equipment, landscaping debris or soil from a contaminated area to an invasive-free area within the park. Any such equipment should be cleaned prior to moving it.

Of particular concern at the park is Japanese climbing fern and possibly golden bamboo. These species can spread rapidly when spores or rhizomes are carried into non-infested areas. When fire lines are prepared or an area is mowed in the park, equipment should be cleaned before it leaves any area infested with these species.

***Objective C:*** Implement control measures on four nuisance and invasive animal species in the park.

Feral hogs, armadillos and feral cats and dogs will be removed if they are encountered in the park. Their removal will help protect sensitive habitats and species.

## CULTURAL RESOURCES

### Prehistoric and Historic Archaeological Sites

Devil's Millhopper Geological State Park has four recorded archaeological sites. Over the years several prehistoric archaeological artifacts have been found. These incidental finds may indicate early visitation to the area, if not habitation. Further research is required to identify during which time periods.

The Millhopper Sink has been a draw for visitors since at least the 1880s. The Works Progress Administration (WPA) (reportedly constructed a stairway to view the sink in the 1930s (Byrd, J. C. 2014). Other recent historic use includes turpentining of longleaf pines in the area. There are a few "catface" pines that remain in the park and serve as reminders of the turpentine industry.

A predictive model indicates that about 32% of the park is associated with features related to high archaeological sensitivity and 30% of the park is classified as having medium archaeological sensitivity (Collins et al. 2012). A subsequent assessment of the park's cultural resources was completed in 2014 (Byrd, 2014). This revealed several new archaeological sites.

Park staff should encourage visitors to leave all artifacts in place and notify staff of the location of any finds. This will help the park maintain any future discoveries.

The park should continue to consult with Division of Historical Resources (DHR) regarding potential ground disturbance. Given the unique geologic feature within the park, as well as its water sources and proximity to natural resources within San Felasco Hammock Preserve State Park, it is likely that archaeological finds will continue to be discovered by park visitors. Park staff should record any cultural resource discoveries with the Florida Site Master File (FSMF).

### Historic Structures

The park has two historic structures, AL05656 and AL05657. One structure is the limestone park entrance gate (AL05656). The other is a remnant of a trail to the bottom of the sink (AL05657). All that remains of the trail are a few timbers. Both structures are from approximately 1935-42 and were constructed by the WPA (Byrd, J. C. 2014). A comprehensive survey for historic structures in Alachua County covered the area. No structures were identified (Quatrefoil 2000). However, the 2014 assessment determined that the entrance gate was constructed by the WPA.

The sites are in good condition. The gate is made of limestone and is maintained by park staff. The trail remnants consist of partially buried timber next to the current boardwalk. It is not threatened by erosion at this time. The boardwalk may be providing some protection.

The park entrance gate and the old trail to the bottom of Devil's Millhopper were constructed by the WPA in the later 1930s or early 1940s. These structures are newly documented and have not been evaluated by the State Historic Preservation Office.

The entrance gate should be maintained in good repair, and the WPA Trail Remains should be protected from disturbance.

The park has a very small collection on display at the visitor center. Several copies of old photographs that show the original boardwalk from the WPA era are on display. The rest of the collection consists of fossil bones found in the Millhopper Sink and a few projectile points.

All items are in good condition. The entire collection occupies approximately 1 cubic foot. The visitor center is climate controlled and locked when not in use.

While the collection is very small, the items relate to the history and natural history of the park. Since all the items were found inside the park, they are significant to interpretation of the park's resources.

The park does not have a Scope of Collection Statement or an inventory of collection items. Park staff should develop a Scope of Collections Statement that contains a statement of interpretive themes. This will serve to guide interpretative programs and determine which items should be included in a collection. Items should only be accepted for the collection if they fit within the goals of the Scope of Collection and interpretive themes. The park also needs to inventory its collection items.

| **Cultural Sites Listed in the Florida Master Site File** | | | | | |
|---|---|---|---|---|---|
| **Site Name and FMSF #** | **Culture/Period** | **Description** | **Significance** | **Condition** | **Treatment** |
| AL05656<br>Devil's Millhopper Park Entrance Gate | c. 1935-1942, WPA | Historic Structure | NE | G | RH |
| AL05657<br>WPA Trail Remains | c. 1935-1942, WPA | Archaeological Site | NE | G | P |
| AL05697<br>Millhopper | c. 1900-present; early Archaic and more | Archaeological Site | NE | G | P |
| AL05698<br>Old Picnic | c. 1900-present | Archaeological Site | NE | G | P |
| AL05699<br>Sink House | c. 1900-present | Archaeological Site | NE | G | P |
| AL5718<br>Florida's New Deal Resources | c. 1900-1970 | Historic Structure | NR | G | P |

***Objective A:*** Assess and evaluate six of six recorded cultural resources in the park.

- AL05656 and AL05657 will be assessed and evaluated over the course of this plan.
- AL05656 will continue to be maintained in good condition.

***Objective B:*** Compile reliable documentation for all recorded historic and archaeological resources.

- Since the WPA constructed the entrance gate and steps to the bottom of the sinkhole in the park, additional information about their time in the area will be compiled if possible.
- The park will develop a Scope of Collections Statement.

***Objective C:*** Maintain the six recorded cultural resources in good condition.

The few collection items that belong to the park are in good condition. Currently, all cultural resources are in good condition. For Site AL05657 (WPA trail remains), good condition is equivalent to stable condition, which can be achieved by regularly monitoring remnants (i.e. crossties) and protecting them from disturbance.

# LAND USE COMPONENT

## VISITATION

Devil's Millhopper Geological State Park, a National Natural Landmark, has drawn attention from tourists and nearby residents since the 1800s. Unregulated use of the large sinkhole as a dump site continued until DRP assumed management in 1974. Upon acquisition, the sink was cleared of trash and other materials and fully restored to its natural condition for visitors to appreciate and enjoy.

Devil's Millhopper is the most dramatic example of a "dry" sinkhole in Florida. The exceptional depth of the sinkhole supports a cool microclimate evident as one descends a staircase to an observation platform several feet above the surface of the water. This deep vantage point offers an immersive experience into one of Florida's most inaccessible natural environments.

Visitors receive a comprehensive park orientation by first visiting a uniquely constructed open-air interpretive center that provides detailed geological and ecological information. There is also a short loop trail that provides opportunities to learn about the surrounding natural communities.

### Trends

Located within the city of Gainesville, Devil's Millhopper Geological State Park averages more than 100 visitors daily, with annual visitation averaging 50,000. Like many other parks, Devil's Millhopper Geological State Park experiences the most visitation in the spring and winter. Visitor attendance can be affected by routine hurricanes and associated wind damage to canopy trees from August to November.

## EXISTING FACILITIES AND INFRASTRUCTURE

Park infrastructure includes a paved parking lot with about 30 spaces, a picnic area on an island in the middle of the lot, an open-air visitor center with interpretive panels and restrooms, a loop trail that traverses the rim of the sinkhole, and a vertical staircase with an observation deck that provides visitor access into the sinkhole. Several resting spaces are available throughout the park, including benches and picnic tables.

The visitor center provides interpretive displays and an audiovisual program featuring the sinkhole and its formation. Some interpretive panels are also found along the Sinkhole Rim Trail, including information regarding the impacts of unregulated foot traffic on fragile natural resources.

A staff residence and storage structure are located in the southwestern corner of the park and are accessible via an unstabilized management road that terminates at the main park entrance road.

### Facilities Inventory

| | |
|---|---|
| *Support Area* | |
| Residence | 1 |
| Equipment Storage | 1 |
| *Entrance* | |
| Civilian Conservation Corps Water Fountain | 1 |
| Honor Box | 1 |
| Paved Parking Area (30 spaces) | 1 |
| Visitor Center | 1 |
| Restroom | 2 |
| Office | 1 |

| *Sinkhole Area* | |
|---|---|
| Sinkhole Rim Trail Mileage | 1 |
| Footbridge | 1 |
| Vertical Boardwalk (Feet) | 726 |

## CONCEPTUAL LAND USE PLAN

### Detailed Conceptual Land Use Plan Objectives

Four use areas at Devil's Millhopper Geological State Park are listed below for improvements to be implemented within the 10-year planning cycle. Specific plan details are available in the next section.

**Parkwide**

***Objective: Create and implement an interpretive plan.***

Comprehensive interpretive planning is recommended to determine the most effective way to connect visitors to the park's significance on the Sinkhole Rim Trail and at the visitor center. The type, design, quantity, and placement of interpretive elements to deepen understanding and improve resource protection will be specified during this planning process. The following objectives provide additional details per area.

**Sinkhole Rim Trail**

***Objective: Protect natural resources and improve interpretation.***

*Actions:*

- Provide protected area interpretation.
- Revegetate unauthorized entry points.
- Provide interpretive elements.
- Improve viewshed.
- Conduct hydrological/erosion assessment.

Prior to acquisition, there were no restrictions on visitor activities, such that foot traffic into the sink was common. To reduce negative impacts on this significant formation, a boardwalk and staircase were constructed to sensitively provide access into the sink. The staircase was truncated to more effectively preclude unauthorized access to the sink bottom. This reduced descent still allows visitors to observe and interpret the sink while improving protection.

Unauthorized footpaths occasionally appear along the Sinkhole Rim Trail. These impacts can lead to erosion. Staff has laid down loose gravel along the sidewalks, expecting it to pack down and reduce the erosion issue. Appropriate interpretive elements should be provided to prevent visitors from further eroding the landscape. Interpretive elements could be considered near the visitor center or before visitors descend the vertical staircase. Interpretive topics may emphasize the fragile nature of the sinkhole and the impacts of unauthorized erosion-forming paths.

Revegetation should also be considered as necessary. While denuded slopes will often revegetate without intervention, in some cases plantings and temporary barriers may be required.

Park interpretation is currently concentrated in the visitor center. To maximize the interpretive experience, a suite of interpretive elements should continue along the trail, with focus on the surrounding natural communities and their signature biota. Content may be interrelated to merge natural history with natural process, e.g., geological influences on the surrounding flora and fauna. Sequencing may foster a cumulative interpretive experience such that elements placed at the beginning of the trail contribute to comprehension of components later in the trail. Placement should maximize interpretation while avoiding detraction from the natural viewshed. The importance of staying on the designated trail at this erosion-prone site should be appropriately conveyed.

At the northernmost point on the loop trail, an offsite University of Florida radio transmitting tower is visible to trail users. Obscuring this tower from view would improve the viewshed and immersive experience. Options include screening with vegetation or possible trail realignment.

The sloping terrain surrounding the trail naturally directs surface waters into the sink. In accordance with hydrological objectives described in the *Resource Management Component*, a hydrological assessment should consider and include erosion abatement measures within the Sinkhole Rim Trail vicinity as necessary.

**Parking Area**

***Objective: Improve parking area.***

*Actions:*

- Reconfigure parking area.
- Repave parking lot.
- Consider installing picnic pavilions.

Repaving of the entire parking area is needed. Concurrently, the parking area should be reconfigured with the aim of including at least five more parking spaces.

The picnic area is often used by local school groups and yoga participants. To provide additional shade and rain protection for visitors, strategically placed pavilions should be considered.

**Visitor Center**

***Objective: Update interpretation and restroom facilities.***

*Actions:*

- Update interpretation.
- Increase restroom capacity.
- Connect to municipal sewer.
- Address issues with skylight guard on roof.

The visitor center displays are dated and the interpretive materials require modernization. Visitor center displays should be updated, repaired, or replaced as needed.

Structurally, there is a design element of the roof that is problematic, as falling tree debris accumulates in the steel guard that surrounds the plexiglass sky light at the roof apex. A redesign of the skylight guard or perhaps its removal may improve matters.

Additional restroom capacity is needed to accommodate an increase in visitation. Given that surface streams and groundwater drain directly toward the sinkhole and the Floridan aquifer, any renovations should include connection to the municipal sewer system.

The visitor center is ideally located for the purposes of initial interpretation and orientation. If redesign or replacement of the visitor center is deemed necessary, the new structure should occupy the existing footprint.

**Staff Residence**

***Objective: Switch from septic to sewer.***

*Actions:*

- Connect to municipal sewer.

The current staff residence is located near the southern boundary of the park. The residence should be connected to the municipal sewage system whenever this infrastructure becomes accessible and connection is feasible. This connection will reduce impacts to the sensitive karst environment.

## OPTIMUM BOUNDARY

No additional parcels were recommended for park boundary expansion or modification when the last unit management plan for Devil's Millhopper State Geological Park was approved in 2014.

No further recommendations regarding land acquisition are appropriate at this time, as the park is surrounded to the west, south, and east by residential development, Interstate 75, and U.S. Highway 441. Large natural areas also border the park to the north, east and west, supplementing the protection efforts this park provides. A cooperative partnership to expand recreation to the city of Gainesville's San Felasco Park, to the north should be explored.


- Proposals
- Structures
- Parking Lot
- Millhopper Sink
- Deer Run Creek
- Bridges
- Hiking Trail
- Paved Park Roads
- Unpaved Park Roads
- Walkways

1. Support Area - Provide sewer connections.
2. Parking Area - Reconfigure and repave parking lot. Consider installing picnic pavilions in the picnic area.
3. Visitor Center - Update interpretive panels. Increase restroom capacity and provide sewer connections. Redesign roof or consider structure replacement.
4. Sinkhole Rim Trail - Provide interpretive elements. Revegetate unauthorized entry points. Improve viewshed from adjacent tower. Consider conducting a hydrological study.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

# Devil's Millhopper Geological State Park

Conceptual Land Use Plan

0 250 500 Feet

N