BALCONES CANYONLANDS PRESERVE
LAND MANAGEMENT PLAN

TIER III

TRAVIS COUNTY
HAMILTON POOL PRESERVE
PEDERNALES RIVER MACROSITE

August 2007

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1.0 BACKGROUND INFORMATION

Travis County's 232 acre (94 ha) Hamilton Pool Preserve, purchased by the County from private landowners in 1985, is one of the two Balcones Canyonlands Preserve (BCP) tracts in the Pedernales River macrosite. Hamilton Pool Preserve is owned by Travis County and managed by the County's Parks and Natural Resources Division of the Transportation and Natural Resources Department.

The previous landowners combined agricultural activities (raising cattle, sheep, goats, and cultivating areas of deep soil) with public use access. Many people paid fees to camp, picnic, and recreate in a largely uncontrolled manner, throughout what is now the preserve. In the 1980s, the visitation became extreme and the cumulative impacts of ranching and virtually unrestricted public use were taking their toll. When Hamilton Pool was purchased by the County, it was designated a park with emphasis on balancing public access with protection of the natural features. A master plan for development of the park was approved in 1987. In 1990, the Travis County Commissioners' Court approved designation as a preserve, with recognition that planned improvements would need to be scaled back to better protect endangered species and other species of concern. The County has since focused on a strategy of restricting public access combined with responsible management of the grotto, the scenic canyon along Hamilton Creek (also known as Basin Creek) and the surrounding upland acreage within the preserve. The heavily wooded canyon and Pedernales River frontage provide habitat for the federally endangered golden-cheeked warblers (*Dendroica chrysoparia*) and a population of canyon mock-orange (*Philadelphus ernestii*) a plant species of concern.

1.1 Description of tract

1.1.1 Location of Tract

The preserve is located on the east side of the Pedernales River, north of Hamilton Pool Road (the westward extension of FM 3238) and downstream of Hammett's Crossing in southwestern Travis County (see Figure 1). It includes most of the channel of Hamilton Creek north of the road and all of the limestone collapsed grotto and pool for which the preserve is famous (Carr 1996). The preserve has approximately 3,500 feet of river frontage and about a mile of the creek. The centerline of the Pedernales River forms the western boundary. Westcave Preserve, the other existing BCP unit in the Pedernales River Macrosite, is located across the Pedernales River from the southwest corner of Hamilton Pool Preserve.

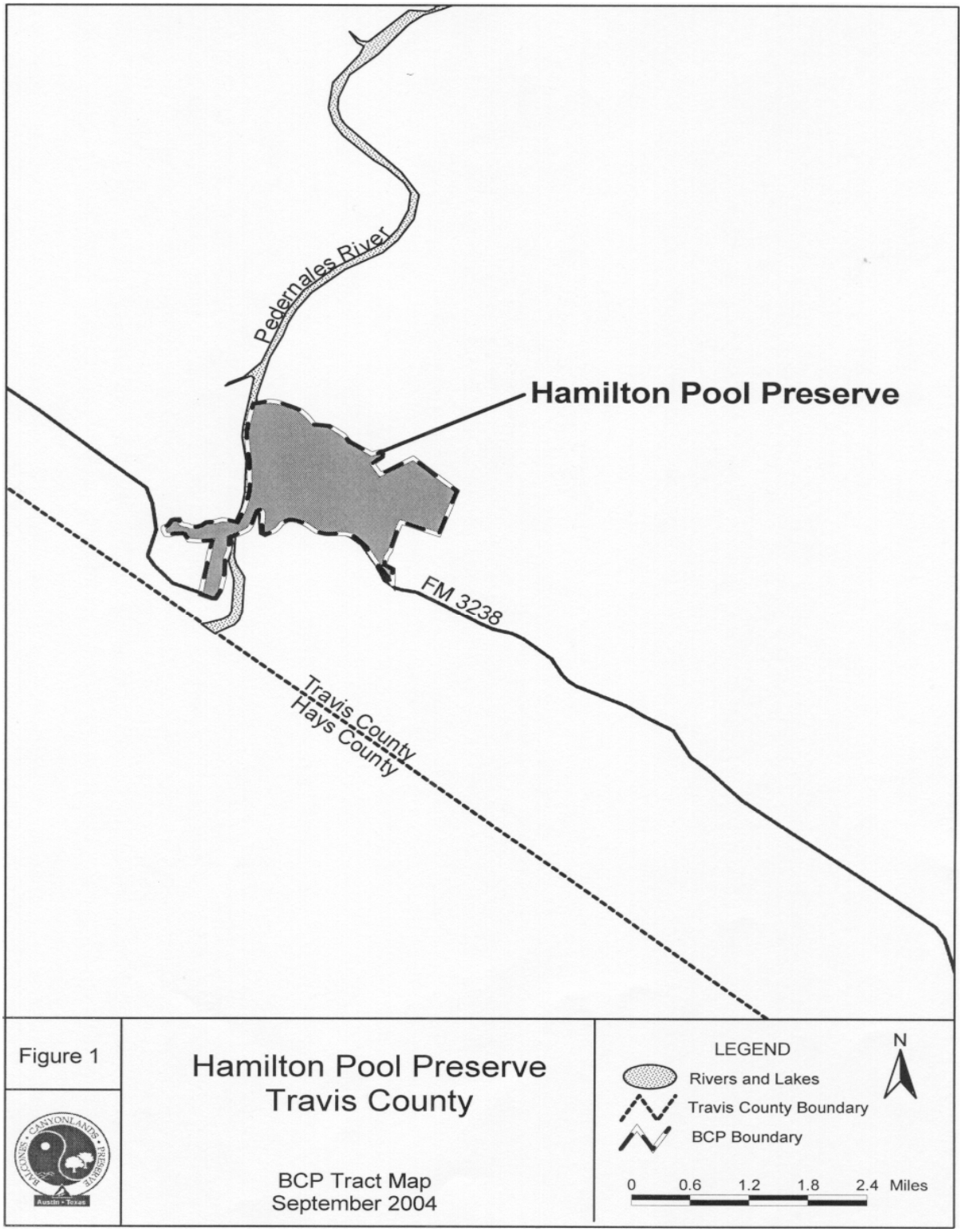

Figure 1. Travis County's Hamilton Pool Preserve Location Map.

1.1.2 Tract Features

Human-made features

Human-made features include the following:

- a paved entrance road from Hamilton Pool Road to a parking area for approximately 75 cars;
- an entrance station (10' x 12') with pay phone nearby;
- nine picnic tables with recycling and trash cans in the parking area;
- a demonstration composting toilet facility in the parking area;
- an information kiosk at the trailhead leading to the canyon;
- a 0.25 mile trail from the parking area to the grotto and a 0.8 mile trail from the grotto to the Pedernales River on the south side of Hamilton Creek (see Figure 2);
- several benches, one small footbridge and a metal staircase along the trails;
- two portable toilets and recycling/trash containers at base of 0.25 mile trail;
- an improved surface "Grasscrete" service road from the parking area down into the canyon;
- a seven foot chain link fence along the northern and eastern boundary, including demonstration water gaps across Hamilton Creek;
- a 20-acre fenced demonstration/research prairie (old crop field adjacent to Hamilton Pool Road)
- a well house with waterlines to the service road and composting toilet facility;
- a three-room storage/maintenance facility converted from a previously used bathhouse;
- a one-room storage facility formerly used as an entrance station;
- electric and phone lines crossing and serving the preserve;
- a helicopter landing site (mown grass 100 ft. by 100 ft.);
- filtration ponds to catch runoff from Hamilton Pool Road at Hamilton Creek

Other remnants of previous land use include: a windmill and water tower, a fenced corral, and some ranch fencing along portions of the canyon. After the County purchased the tract, two sets of iron staircases, concrete steps on the canyon slope, cross fencing, utility poles, and wiring for lights above the grotto were all removed; an iron grate platform atop a limestone wall still remains. The roads that led to the ranch house (off the preserve), the old bathhouse, and the old parking area, as well as sections of other unimproved roads, were regraded where necessary (to the extent possible) and revegetated with native plant species.

1.1.3 Land Status

1.1.3.1 Rights-of-Way and Easements

Travis County has a file on deeds, rights-of-way and easements on Hamilton Pool Preserve. The following easements are known to exist:

- County road easement for Hamilton Pool Road.
- Electric (PEC) and phone easements

1.1.3.2 In-Holdings

There are no in-holdings within the preserve. There is a small tract on the north side of Hamilton Pool Road with frontage on this road that is surrounded by the preserve on 3 sides.

1.1.3.3 Boundary Disputes

There are no known boundary disputes.

1.1.3.4 Regulatory Requirements

All applicable federal and state laws, including, but not limited to, the Federal Endangered Species Act and the Texas Parks and Wildlife Code, as well as the Travis County Park's rules and regulations, are enforceable on this site. Regulatory requirements of the Balcones Canyonlands Conservation Plan (BCCP) are discussed in Tier II-B Plan Administration.

1.1.3.5 Deed Restrictions

Travis County has a file with existing deed restrictions and will remain aware of restrictions that may directly impact land management.

1.1.3.6 Special Agreements

There are no known special agreements.

1.1.3.7 Mineral Rights

Travis County will research mineral rights and include them in the Travis County Real Property Records documents files.

1.1.3.8 Legal Issues

Other than those issues associated with participation in the BCCP, no tract-specific legal issues remain. BCCP requirements are treated elsewhere in this document; see Regulatory Requirements section, above.

1.1.3.9 Financial Issues

There are no debts or other outstanding financial obligations associated with this property.

1.2 Physical Characteristics

Elevation in the preserve ranges from about 930 feet on Glen Rose slopes in the northeast corner of the property to about 690 feet along the Pedernales River at the mouth of Hamilton Creek (Carr 1996). The land consists of a relatively flat plateau cut by two main canyons formed by the Pedernales River and Hamilton Creek, which run roughly north-south and east-west, respectively. The preserve is covered by the Hammett's Crossing quadrangle map (U.S. Geological Survey 7.5 minute topographic map).

1.2.1 Geology

The preserve is located on the Lower Cretaceous Trinity Division formation, which consists of three clastic-carbonate couplets separated by disconformities: Sycamore Sand and Sligo Limestone, Hammett Shale and Cow Creek Limestone, and Hensel Sand and Glen Rose Limestone. All formations are present in outcrop, except Sligo Limestone (Mahler 1991). Most of the preserve lies on a relatively flat bench of rolling grasslands, underlain by Hensell Sand; outcrops of Glen Rose Limestone occur in the hills in the northeast corner of the property. To the north and west, the bench drops off precipitously into the canyons of the Pedernales River and Hamilton Creek respectively, where layers of Cow Creek Limestone, Hammett Shale, and Sycamore Sand are exposed (Mahler 1991).

Vertical relief is rather dramatic along the canyons, particularly at Hamilton Pool, where Hamilton Creek drops as a waterfall 45 ft into a collapsed grotto. The pool is roughly circular, and is 130 ft across and approximately 20 ft deep. The grotto was formed by erosion of soft, calcareous Hammett Shale, leaving overhanging cliffs and rock shelters of Cow Creek Limestone (Mahler 1991). The Hensel Sand above the Cow Creek Limestone generally contains water, which drips down to the pool from on top of the limestone in a curtain flow, forming stalactites (Mahler 1991).

1.2.2 Hydrology

1.2.2.1 Surface water

The Hamilton Creek watershed covers about 5,000 acres (2024 ha) in western Travis County and northern Hays County. The creek originates in the Shingle Hills, then enters the preserve from the southeast, flows through the grotto, and continues northwestward to the Pedernales River

(Mahler 1991). The Pedernales River flows north along the western boundary of the preserve toward the Colorado River. Contributions from the nearly perennial Hamilton Creek and seepage from Cow Creek Limestone cliff faces maintain a fairly constant level of water in the plunge pool, except during periods of high rainfall. The water in the pool can be replaced at rates of 5 minutes to 48 days, depending on rainfall (Mahler 1991). Although the creek flow rises and falls with changes in rainfall, the curtain flow from the ceiling of the grotto and the flow from the springs in the upper creek maintain a relatively constant flow rate, which supplies the baseflow to the pool (Mahler 1991). During dry periods, the baseflow is the major contributor to the pool. However, this flow becomes insignificant during periods of heavy rainfall, when runoff becomes the major contributor. The creek has both ephemeral and perennial flow regimes, depending on time of year. Recharge of groundwater causes the change from ephemeral to perennial regimes (Mahler 1991).

1.2.2.2 Water quality

Because much of the land in the Hamilton Pool watershed has only a thin cover of vegetation, overland run-off can easily carry sediments and pollutants directly into Hamilton Creek. Therefore, the water in the creek and the pool is extremely vulnerable to degradation, especially after intense rainfall. The conduit flow regime of some of the springs in the creek also makes the creek vulnerable to water quality degradation, as the water in these springs is not filtered. The main sources of fecal coliform in the creek and pool water are livestock wastes from rainfall runoff (year-round) and also from cliff swallows (in the spring and summer) (Mahler 1991). The preserve staff regularly tests water samples from the pool for fecal coliform counts primarily as a means to determine when swimming will be allowed. The County installed water quality ponds within the right-of-way of Hamilton Pool Road to catch road runoff at Hamilton Creek. At the same time, the roadway was elevated and realigned where it crosses the creek.

1.2.2.3 Sub-surface water

In a general sense, karst includes all landforms produced by dissolution. Under this definition, Cow Creek Limestone is a karstic aquifer that discharges groundwater to Hamilton Creek and Hamilton Pool. Although Cow Creek Limestone lacks evidence of a cavern system, it displays other karstic features, such as springs and sinking streams (Mahler 1991). Studies of the springs in the upper creek and at the base of the falls indicate both diffuse and conduit flow contributions from the Cow Creek Aquifer. Hydrologic studies indicate that although there is a small spring near the base of the falls, creek and curtain flow are the primary contributors to the pool, and most if not all water exits the pool through the creek. Thus, there is no definitive evidence for a major subterranean source (spring) or sink in the pool itself (Mahler 1991).

1.2.3 Soils

Soils of the preserve are mapped on sheet 39 of the Travis County soil survey (Soil Conservation Service 1974). Soils of Glen Rose slopes are mostly mapped as Brackett soils, rolling. Brackett soils are shallow, well-drained soils of limestone uplands. The surface layer is light brownish-gray gravelly clay loam or gravelly loam about 4 inches thick; the next layer, about 10 inches thick, is pale-brown clay loam. These soils are calcareous and moderately alkaline.

Soils of relatively level areas just below the slopes are mapped as Volente complex, 1 to 8 percent slopes. Volente soils are deep, well-drained soils that developed in slope alluvium. The surface layer is dark grayish-brown silty clay loam; the underlying layer is silty clay. These soils are also calcareous and moderately alkaline.

Soils of the lower part of the bench (i.e., those closer to the bluffs along the creek and river canyons) are mapped as Tarrant soils, which are shallow to very shallow stony clays of limestone uplands. The surface layer is dark grayish-brown stony clay about eight inches thick. The underlying layer is limestone. These soils are well drained, calcareous, and moderately alkaline. Soils of canyon slopes and bottoms are not mapped separately (Soil Conservation Service 1974).

1.2.4 Caves and Subsurface Features

Although Cow Creek limestone is considered to be karstic (Mahler 1991), it is not known to form caves (Veni 1991), and no caves are known on the preserve.

1.3 Biological characteristics

1.3.1 Vegetation Currently on Tract

A total of 417 plant taxa have been reported from the preserve, including 16 species endemic to Texas, most of which are endemic to the Edwards Plateau (Carr 1996). The following description is excerpted from Carr 1996:

Highest parts of the (preserve), the Glen Rose slopes in the northeast corner of the (preserve), support patches of midgrass grassland composed primarily of seep muhly (*Muhlenbergia reverchonii*), tall grama (*Bouteloua pectinata*), little bluestem (*Schizachyrium scoparium*) and woodlands composed primarily of plateau live oak (*Quercus fusiformis*), Ashe juniper (*Juniperus ashei*) and various other species. Plateau live oak and Ashe juniper are also important species in the woodland/grassland mosaic on the Hensell Sand bench, although composition of the ground layer is probably significantly different. Steep rocky slopes within Hamilton Creek canyon

below the (grotto) support mixed evergreen/deciduous woodlands of diverse and variable composition. Characteristic canopy species include Texas oak (*Quercus buckleyi*), Arizona walnut (*Juglans major*), Texas ash (*Fraxinus texensis*), escarpment black cherry (*Prunus serotina* subsp. *eximia*), and cedar elm (*Ulmus crassifolia*). It is likely that all of the shrub and small tree species reported from the preserve are present in the understory, the most unusual of which is redbay (*Persea borbonia*). Moist soils along the creek support a strip of gallery woodland dominated by large bald cypress (*Taxodium distichum*). Drier rocky west-facing slopes along the Pedernales (River) support patches of juniper woodland and shrublands composed at least in part of species tolerant of more xeric habitats, including such conspicuous species as Spanish dagger (*Yucca treculeana*) and sotol (*Dasylirion texanum*) (Carr 1996).

A four-year demonstration prairie project, completed in 1992, was planned and conducted jointly by Travis County and the National Wildflower Research Center. Prairie management and educational tours continue.

1.3.2 Animal Species Currently on Tract

Approximately 180 species of birds has been reported from the preserve to date, including golden-cheeked warblers and a fluctuating population of cliff swallows which nest in the grotto. Nineteen species of native mammals have been reported, including recent observations of porcupine and beaver. The preserve logs also indicate sightings of 21 snake, 10 lizard, 4 turtle, and 10 frog species.

1.3.3 Endangered Species and Species of Concern

1.3.3.1 Golden-cheeked Warbler

Prime nesting habitat for golden-cheeked warblers (*Dendroica chrysoparia*) exists in the canyons along Hamilton Creek and the Pedernales River. This area consists of large, mature junipers and hardwoods in a closed-canopy woodland between the rims of the creek canyon and below the rim of the river canyon. In addition, golden-cheeked warblers (GCWA) use the more open grassland-mosaic uplands south of the creek and east of the river for foraging. Thus, much of the preserve should be considered habitat for GCWA. Also, because mature junipers already exist in the uplands, this area could become nesting habitat if the canopy were to become more closed.

Survey results for GCWA nesting seasons from 1990 to 2003 are shown in the Table 1 below. Most observations were located in the canyons or near the rimrock, where the survey effort was concentrated; however, many sightings were in the uplands. In addition to the males reported in

Table 1, 2 to 4 males were detected in areas adjacent to the preserve property in most years. All surveys were conducted by DLS Associates or by Travis County Parks and Natural Resources staff.

Table 1. Golden-cheeked warbler survey results for 1990 – 2000.

Year	Surveyor	Males	Females	Fledglings
1990	Travis County	7-8	1-2	0
1991	Travis County	10	0	0
1992	DLS	8-9	3	5
1993	DLS	12	1	0
1994	Travis County	12	1	0
1995	Travis County	10-12	1	0
1996	Travis County	9-11	1	0
1997	Travis County	9-12	4	16
1998	Travis County	11 (3-4)*	7	8
1999	Travis County	11 (3-4)*	9	18
2000	Travis County	9 (5-7)*	8	20

* Numbers in parentheses are males detected off property, usually across the Pedernales River.

Table 2. Golden-cheeked warbler survey results for 2001 - 2004. (All surveys conducted by Travis County staff.)[1]

Year	Total no. territories detected	Total no. territories on 100 ac. plot	Pairing success	Breeding success	Productivity (Average no. of fledglings per successful pair)	Total productivity (Average no. of fledglings per all territories)
2001	*8(3-4)**	*7*	0.78	0.44	1.0	n/a
2002	9(3-4)*	8	0.86	0.25	1.5	0.38
2003	10(5)*	9	0.78	0.56	2.00	1.12
2004	10.5	8	0.89	0.56	2.00	1.11

[1] Refer to Monitoring of the Golden-cheeked Warbler, 2002 Field Season, Travis County Natural Resources Project Number 0810-01001 for methodology descriptions.
* Numbers in parentheses are males detected off property, usually across the Pedernales River.

1.3.3.2 Black-capped Vireo

Black-capped vireos are not known to occur on this tract. No suitable habitat is present on the tract.

1.3.3.4 Karst species

Karst species are not known to occur on this tract. No suitable habitat is known to occur on the tract (see 1.2.4).

1.3.3.5 Plants

A canyon mock-orange (*Philadelphus ernestii*) population occurs on north-facing Cow Creek limestone bluffs, and on rubble slopes below the bluffs, along a short stretch of the creek canyon (Carr 1996). County staff found 150 plants in a 2002 fall census. Please refer to the Tier II-A, Chapter II for information on management and monitoring for the canyon mock-orange.

A thorough search by Carr (1996) did not reveal the five other globally-rare plant species thought possible here: Texas amorpha (*Amorpha roemerana*), Texabama croton (*Croton alabamensis* var. *texensis*), Glass Mountains coral-root (*Hexalectris nitida*), Heller marbleseed (*Onosmodium helleri*), and Buckley tridens (*Tridens buckleyanus*). Due to drought conditions in 1996, it was not possible to determine the occurrence of bracted twistflower (*Streptanthus bracteatus*); it was omitted from the study (Carr 1996). Plant surveys since 1996 have not located bracted twistflower.

1.3.3.6 Other Species of Concern

Though not protected as part of the regional permit, the Texas Salamander is believed to occur on the preserve. The Texas Salamander is an undescribed species of *Eurycea*, occurring southwest of the Colorado River. They are comparatively more surface-dwelling than the Barton Springs Salamander (believed to be mostly an underground species). Previously this species was considered to be part of the broad *Eurycea neotenes* species group. However, it may be genetically and geographically distinct from populations elsewhere and may merit specific status (Chippendale *et al.* 1994).

1.4 Land Uses

1.4.1 Pre-historic

In 1987, an archeological study found evidence of pre-historic use of the preserve by humans and resulted in the designation of three sites as state archeology landmarks. Due to past heavy use of what is now the preserve, much of the significance of the evidence has been lost (Turpin 1986). The County is protecting these sites from further damage through restricted public access within the preserve and careful land management.

Travis County is also committed to conserving any other archeological sites discovered in the future. Should the necessity arise for land management activities potentially harmful to cultural resources, Travis County will make every effort to locate and avoid destruction of any such resources and will consult with the Texas Historical Commission.

1.4.2 Historic

In the mid 1860s, Morgan C. Hamilton owned the property now known as Hamilton Pool Preserve. His brother Andrew J. (Jake) Hamilton (10th governor of Texas) is said to have often visited when he was governor and when he took refuge as a Union sympathizer during the Civil War. The property reverted back to the state when Morgan Hamilton left for the west. In the 1880s, the Reimers family, immigrants from Germany, bought the property to raise sheep and cattle. Over the years, the Reimers bought various tracts and have deeded portions to offspring.

During several generations of ranching, several dwellings and outbuildings were constructed and used on or near what is now the preserve. A one-room schoolhouse, which members of the Reimers family taught in and attended, was located near the vicinity of where Hamilton Pool Road crosses Hamilton Creek. All that remains of one home site on the preserve is an water well, an old windmill and a water tower. The 20-acre cultivated field was terraced and worked to grow several crops. The field had been fallow for a few years when the County purchased the tract in 1985. An old fence around a corral is still standing. Further research is needed to determine more details about land use history.

The Reimers realized the recreational value of the grotto, canyon, and river frontage, and eventually opened the property for public use. While transportation was a luxury of very few, impacts from visitors were probably negligible. During the 1960s, 70s and early 80s, however, the popularity of Hamilton Pool soared and the land was heavily impacted by visitors. People packed the famous swimming hole, drove their cars across the creek and parked, set up tents in the canyon and on the uplands, and hiked and climbed wherever they pleased. The cumulative impacts of livestock management, cultivation, and public use took their toll on the land and vegetation. Since purchase of the land by Travis County, staff has managed the preserve to restore Hamilton Pool to a natural state.

1.4.3 Current

1.4.3.1 On-site land use

The preserve is managed to protect the unique geological features, the surrounding land, and the preserve's plant and animal species. The preserve provides habitat for the golden-cheeked warbler and canyon mock-orange.

The preserve is open to the public during daytime hours. Public use is controlled by the size of the parking lot, user fees, and the extent of trails available to the public (off-trail access is not allowed) (see Figure 2). Approximately 50,000 people visit the preserve annually. The public is permitted to visit the preserve without a guide or in a guided group. Allowable activities include: hiking the designated trails, picnicking, nature study, and swimming (when the bacteria counts are within safe standards). The preserve is staffed during open hours with an emphasis on visitor contact, education and rules enforcement.

1.4.3.2 Adjacent land use

As shown on Travis Central Appraisal District (TCAD) maps 5-2626 and 5-3426, Hamilton Pool Preserve abuts the following properties:

- To the north and east are several ranch properties owned and operated by members of the Reimers family. The previous owner of the preserve still owns and resides on ranch property directly adjacent to the preserve.
- To the south is Hamilton Pool Road (RM 3238). South of Hamilton Pool Road are two ranches (one owned and operated by the Myers family) and several residences within one subdivision.
- To the north of Hamilton Pool Road is a small 2.54-acre privately owned tract that is bounded on three sides by the preserve. This gated tract is infrequently visited and has a cinder block, roofed shelter.
- To the west is the Pedernales River. West of the river is Westcave Preserve with a resident manager, and Hammett's Crossing subdivision with a few residences.

2.0 MANAGEMENT PROGRAM

2.1 Plan Administration

See Tier II-B Plan Administration for the description of Travis County as a managing entity, County staffing levels, equipment inventory, budget and annual reports as they pertain to the County's management of BCP lands.

2.2 Management Goals

Hamilton Pool Preserve was purchased by Travis County in 1985 to ensure its protection, enhancement, and restoration, while providing County residents and visitors an opportunity to experience and enjoy its natural beauty. Balancing natural resource protection with visitor access requires continual monitoring and re-assessment, to which Travis County is committed. Beginning with the hiring of a manager in 1987, staff of Hamilton Pool Preserve and Westcave Preserve have partnered on various aspects of managing the preserves and will continue to do so.

2.2.1 Primary Management Goals

- Maintain or improve vegetation quality and coverage to provide habitat for the GCWA.
- Maintain or improve habitat conditions to support the population of canyon mock-orange.
- Participate in the development and implementation of the BCP long-term biological monitoring program in conjunction with other preserves within the macrosite. Currently, Westcave Preserve is the only other preserve in the macrosite.
- Manage the preserve in accordance with applicable BCP Land Management Plans.

2.2.1.1 Golden-cheeked Warbler

Protection of the preserve's population of golden-cheeked warblers will include limiting human disturbance of golden-cheeked warblers and maintaining or improving existing habitat. The population will be monitored on a yearly basis to measure the success of management activities.

2.2.1.2 Black-capped Vireo

None are known to occur on this tract. No habitat creation is planned.

2.2.1.3 Federally listed karst species

None of the federally listed karst species protected under the regional permit (BCCP) are known to occur on this tract. No habitat is known to occur on the preserve (see 1.2.4).

2.2.1.4 Species of concern

The canyon mock-orange population is off limits to the public except for a few plants that grow near the trail. The County will continue to monitor these plants while maintaining or improving existing habitat. None of the other 26 species of concern covered by the regional permit are known to occur on this tract.

2.2.2 Secondary Management Goals

Secondary management goals include water quality protection, habitat restoration, erosion controls where needed, control of invasive species, and expanding the educational program for the visiting public.

2.3 Issues

Consistent findings in the GCWA surveys over the past 14 years indicate a successful balance between habitat protection for the warbler and public access on a restricted basis. However, public access is the greatest potential conflict with managing for endangered species at Hamilton Pool Preserve. Please refer to the Tier II-A, Chapter XII for information on public access.

Visitors are restricted to a single trail descending from the parking lot into the canyon. The height of the canopy in the creek canyon may allow the warblers to forage and nest at a sufficient distance from visitors. The shorter upland habitat of the warblers will be visited by preserve staff only, but visitors occasionally violate the rules and venture off the trails. In monitoring GCWA populations, the County policy will allow minimal intrusion to the habitat with minimal off-trail access by staff as needed.

The canyon mock-orange population will continue to be monitored for any habitat enhancement or other management activities that may be needed. Other management includes limiting visitor access to this area and rule enforcement.

2.4 Management Objectives

The main objectives for the Pedernales River Macrosite are, in the order of priority:
Protection of endangered species and species of concern, the land and water;
Management of endangered species and species of concern and their habitats;
Public education and outreach about endangered species and species of concern and their habitats;
Monitoring of the habitats for endangered species and species of concern; and
Enhancement of the habitats for endangered species and species of concern.

The macrosite land management plan provides more detail as to how activities are grouped under the above priority objectives (see Tier II-C Pedernales River Macrosite). Tier III documents for Travis County include general categories of activity. Following are the four categories with associated activities listed.

2.4.1 Vegetation Management:

(a) Continue to implement monitoring plan for canyon mock-orange to assess status and habitat needs.
(b) Monitor oaks for oak wilt and regeneration to assess action needed.
(c) Maintain and enhance GCWA habitat in the canyons and the uplands.
(d) Continue management of the demonstration prairie near the preserve entrance.
(e) Monitor savanna and native grassland species diversity in the uplands above the grotto.
(f) Monitor encroachment of invasive and/or non-native species throughout the preserve and control as needed.
(g) Continue inventory of plants in the preserve.
(h) Map vegetation zones and significant occurrences.
(i) Plan and conduct prescription burns as needed.
(j) Conduct pre-burn and post-burn plant surveys when possible to assess if burns are meeting burn objectives.
(k) Develop a fire management plan that addresses prescription fires as well as wild fires.
(l) Monitor changes in vegetation over time to the extent possible.
(m) Coordinate with regional colleges and universities to conduct needed research.

2.4.2 Animal Management:

(a) Continue to monitor GCWA nesting territories and habitat use within the preserve.
(b) Monitor other species impacts on GCWA to assess action needed.
(c) Continue management of native and non-native wildlife (brown-headed cowbirds, deer, feral hogs, fire ants, cats, dogs, etc.).
(d) Continue inventory of animals in the preserve, including salamanders and other aquatic species.
(e) Conduct pre-burn and post-burn animal surveys when possible to monitor impacts of burns on animal species.
(f) Coordinate with regional colleges and universities to conduct needed research.

2.4.3 Physical and Cultural Management:

(a) Continue sampling Hamilton Creek at the pool for fecal coliform, and periodically for other parameters that may include total suspended solids, biological oxygen demand, nitrogen and phosphate levels, and pH.
(b) Monitor erosion and sedimentation sources and stabilize/restore as needed.
(c) Monitor archeological sites for disturbance and take any corrective action needed.
(d) Conduct archeological assessments as needed.

2.4.4 Access Management and Public Education:

(a) Monitor the boundary at least monthly for signs of fence damage or trespass, and take appropriate action.
(b) Develop access plan that defines all types of access and associated restrictions; restrict public access to daytime hours and designated trails. Modify plan as needed.
(c) Monitor visitor impacts to the preserve and public use relative to rules compliance.
(d) Modify rules and methods for achieving compliance as needed.
(e) Increase public awareness of BCP through use of brochures, kiosk displays and signs.
(f) Include BCP information in public and private tours.
(g) Advertise events regularly with other BCP managers to increase public awareness of BCP and inform of BCP access opportunities.
(h) Join with macrosite BCP neighbor Westcave Preserve to conduct joint tours, workshops, etc. when possible.

A five year timeline follows in Table 3. This timeline assumes adequate funding for each activity will be provided. Staff efforts will be supplemented by volunteers and research interns whenever possible. Staff will collaborate with other managing partners to support and achieve common goals.

2.5 Specific Implementation Strategies

(See Tier II-A Management Handbook for more detailed guidance and applicable strategies and constraints.)

2.5.1 Vegetation management procedures

2.5.1.1 Control methods

Invasive and non-native vegetation is most often controlled with hand tools, digging or, in rare cases, occasional herbicide applications. Other methods such as mowing, prescribed fire and drill seeding will continue to be used to boost native species' competitive edge against non-native and/or invasive species.

2.5.1.2 Oak wilt

The County will continue to monitor the preserve's oaks and take appropriate action should oak wilt be discovered.

2.5.1.3 Prescribed fire and wildfires

Prescribed fire has been and will continue to be used as a management tool in limited areas of the preserve, to enhance native vegetation, reduce fuel loading, and control invasive and/or non-native species. Most of the preserve is bounded by the 50-ft wide County public road, the Pedernales River, and Hamilton Creek. Due to thin soils and past intensive use, much of the landscape does not support much accumulation of low-growing fuel. To reduce the chances of uncontrolled fire, visitors are not permitted to have fires of any kind, including stoves and grills.

2.5.1.4 Restoration and protection efforts

When acquired, the preserve had a network of camping roads trailing into the uplands from the upper creek. Some of these roads were actively restored while others have partially reclaimed themselves over time. The former ranch road, now known as the crossroad, was regraded and revegetated to control sedimentation of the pool and lower creek. The service road leading down into the canyon has been stabilized and revegetated. The Reimers' old crop field has been revegetated with locally hand harvested native grass and forb species. These restoration areas will be monitored. A 6-ft net wire fence surrounds the 20-acre prairie project near the preserve entrance but needs repairs.

2.5.1.5 Protection efforts for species of concern

Visitor disturbance of canyon mock-orange habitat will continue to be minimized through access design and monitoring. Should habitat manipulation be suggested as a result of the monitoring program, appropriate action will be taken and documented.

2.5.2 Animal Management Procedures

2.5.2.1 Golden-cheeked Warbler

Surveys will continue to be conducted no more than once per week in the same area during the nesting season. The vegetation will be managed to maintain/enhance closed-canopy mixed oak-juniper woodland to the extent applicable.

2.5.2.2 Black-capped Vireo

None are known to occur on this tract. No habitat creation is planned.

2.5.2.3 Karst Invertebrates

None are known to occur on this tract. Surveys will be conducted if any karst formations known to support karst species are found.

2.5.2.4 Browsing animals

Deer populations and regeneration of woody species will be monitored. Management of deer populations has been implemented in accordance with Tier II-A Chapter 10 and with Travis County's "Wildlife and Vegetation Management Guidelines" as approved by Commissioners Court on 17 December 2002.

2.5.2.5 *Feral animals*

Presence of feral animals will be monitored and feral animals will be removed from the preserve whenever possible and in accordance with Travis County's "Wildlife and Vegetation Management Guidelines" as approved by Commissioners Court on 17 December 2002. See Tier II-A Chapter 10 for information concerning management of feral animals.

2.5.2.6 Predation and parasitism

The Brown-headed cowbird population will be monitored and birds of any species feeding cowbirds will be noted. Cowbird trapping will be conducted when necessary. Red imported fire ants will be monitored and controlled with approved methods. Tier II-A Chapter X. provides guidance concerning management of predaceous and parasitic organisms.

2.5.3 Physical and Cultural Management Procedures

2.5.3.1 Hydrology and water quality

Water in the pool will continue to be tested regularly for fecal coliform. Contamination of water both via run-off and groundwater sources will be controlled when possible through restoration efforts.

2.5.3.2 Geology

No caves are known to occur on the preserve (see 1.2.4). If any caves or other karst features are found on the preserve, they will be considered for investigation.

2.5.3.3 Cultural resource protection

Cultural resources will be protected through careful management and any new project planning and monitoring. The Texas Historical Commission will be consulted prior to taking any action that might impact archeological or historical resources.

2.5.4 Access Management and Public Education

2.5.4.1 Access Control

The preserve is staffed during visitor hours (daytime hours only). Swimming is not permitted when the bacteria counts exceed safe standards set by the Texas Department of Health. The perimeter of the preserve is entirely fenced, except the west side, which is bounded by the Pedernales River. Preserve staff orient visitors to the rules through use of signs and one-on-one contact upon entrance to the preserve. Visitors are restricted to 1.5 miles of designated trails. Visitor use and rules compliance are monitored daily through staff patrols.

2.5.4.2 Individual or independent group use

(a) Non-commercial use

The education program at the preserve has varied over the years. It has included staff-led public and private group tours and some outreach programs. Informational brochures and interpretive displays on the trail kiosk are available to interested visitors. Occasionally, research projects including geography, botany, zoology, and architecture studies are conducted by students from local colleges and universities.

(b) Commercial use

The preserve is visited by various commercial tour groups. As long as the groups comply with all rules of the preserve, contractual agreements are not required. Several film companies have entered into license agreements with the County specifying use restrictions. Their actual use of the preserve is then closely monitored.

2.5.4.3 User/resource conflicts

When acquired, Hamilton Pool Preserve needed major trash removal and fire ring dismantling. Though ground litter was once ubiquitous, the staff's diligence in picking up all trash has eliminated this problem. Off-trail use, though infrequent, is the greatest concern. As visitor use increases in the warm season, staffing levels and patrols to monitor use and meet with visitors are also increased.

3.0 MANAGEMENT PROGRAM MONITORING

Travis County will monitor and evaluate habitat management in accordance with applicable biological monitoring procedures as defined in Tier II-A Management Handbook. Evaluation and reporting procedures will comply with applicable portions of the Tier II-B Plan Administration.

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