CITY OF SUNSET VALLEY
WILDLIFE MANAGEMENT PLAN

OCTOBER, 2015

Table of Contents

EXECUTIVE SUMMARY

The City of Sunset Valley has a long history of environmental stewardship. This Wildlife Management Plan continues those efforts by providing a framework for managing human-wildlife interactions. The goals of this plan are to:

- Protect and enhance wildlife habitat
- Promote environmental education
- Promote volunteer involvement in wildlife and habitat protection and enhancement projects
- Promote internal education and consistency in Department actions

In addition species specific management plans have been developed for several vertebrate and invertebrate species. This includes:

- White-tailed deer
- Golden-cheeked Warblers
- Red Imported Fire Ants
- Feral Hogs, Dogs, and Cats
- Mosquitoes
- Coyotes

Each of these species specific management plans includes biological information and management actions to be carried out by City staff and volunteers. In particular fire ant, mosquito and coyote coexistence will require a community approach to management.

PURPOSE

The purpose of this Wildlife Management Plan (WMP) is to provide the guidelines and policies for managing wildlife within the City of Sunset Valley. The overall goal of this plan is to integrate the management of the natural and human systems within Sunset Valley to benefit both the residents of the City and the wildlife that depend on the land. This WMP establishes a framework for making wildlife management decisions, provides direction on regulatory and program changes, and outlines a set of actions for long-term management of human-wildlife conflicts.

This plan is written with the understanding that very few of Sunset Valley's greenspace and conservation areas are fenced and wildlife moves freely between public and private land. Any wildlife management activities will need to include aspects of public education.

BACKGROUND

The City of Sunset Valley has a long history of environmental stewardship. Incorporated in 1954, the City has been able to balance economic development with conservation and water quality protection. More than 25% of the City is dedicated as greenspace and conservation areas which are located over the Edwards Aquifer. A diverse wildlife population and protection of the natural habitat is important to the residents of Sunset Valley.

GREENSPACES AND CONSERVATION AREAS

The City of Sunset Valley has five dedicated greenspace and conservation areas and a trail system that are maintained in accordance with the City's Open Space Management Plan and Trails Master Plan. Residential areas abut all of these areas..

SOUTH HILLS CONSERVATION AREA

The South Hills Conservation Area is located at the southern edge of the City, along the western edge of the Cherry Creek neighborhood. The tract is 42.83 acres. The South Hills Conservation Area has a peak elevation of approximately 740 feet above sea level and the lowest elevation is 670 feet. Soils within the area include Ferris-Heiden along slopes and flats. The extant plant community of the South Hills Conservation Area is Ashe Juniper –Oak woodland. The Kincheon branch of Williamson Creek is also found within this area.

GAINES GREENBELT

The Gaines Greenbelt is located at the northern edge of the City of Sunset Valley, and connects with the City of Austin's Barton Creek Greenbelt. The area is bisected several times by Gaines Creek. Gaines Creek is ephemeral and is a tributary for Barton Creek. The tract is 22.08 acres in

extent. The Gaines Greenbelt has an elevation varying from 570 to 660 feet along the plateau. The soil of the Gaines Greenbelt is mostly Tarrant soils and rock outcrops. This is a soil that is commonly found on steep slopes along rivers. The plant community of the Gaines Greenbelt is that of an Oak – Juniper woodland.

INDIAN GRASS PRAIRIE PRESERVE

The Indian Grass Prairie Preserve is located along Williamson Creek between Country White Lane, Home Depot Boulevard, Brodie Lane, and the apartment complex. Part of the western boundary is adjacent to watershed protection lands of the City of Austin. Contained within the preserve area are a radio tower, an associated small building, and a gravel road. A wastewater line is also located north of Williamson Creek. The area comprises 21.43 acres in extent. Located approximately 700 feet above sea level, the Indian Grass Prairie Preserve has several interesting physical features. The substrate of the Indian Grass Prairie Preserve is Edwards Limestone and a cave occurs along the northern edge of the area. This cave commonly called Sunset Valley Cave (Goat's Head Cave) and Rattlesnake Sink is a recharge feature for the Edwards Aquifer. The cave is composed of two main chambers and is home to a variety of invertebrate species. The Indian Grass Prairie Preserve is located within the Edwards Aquifer recharge zone.

The site is bisected by Williamson Creek, which is composed of Mixed Alluvial Land. Mixed Alluvial Land is comprised of beds of exposed limestone and gravelly alluvium (USDA, 1974). The majority of the site is composed of Tarrant and Speck soils. Tarrant soils are well-drained clay soils found atop limestone. Speck soils are reddish brown and also overlay a limestone substrate. The plant community of the Indian Grass Prairie Preserve is that of a Plateau Live Oak – Midgrass vegetative community (*Quercus spp*.).

COUGAR CREEK GREENBELT

The Cougar Creek Greenbelt is located along the Sunset Valley Branch (commonly called Cougar Creek) of Williamson Creek. The tract extends from Brodie Lane, across Ernest Robles Way, and south of Jones Road. The tract is 23.37 acres in extent.

The Cougar Creek Greenbelt has an elevation ranging from 680 to 700 feet above sea level. Soil types include Crawford clay, Speck stony clay loam, and Tarrant soils. The construction of berms along the tributary along with a nearby re-irrigation system has caused the formation of an ephemeral wetland on a southwestern portion of the property. The berms were constructed to constrain the flow of the creek, a concrete dam was also constructed at the terminus of the berm. The plant community of the Cougar Creek Greenbelt is that of a Plateau Live Oak (*Quercus spp*.) – Midgrass series.

SUNSET VALLEY NATURE AREA

The Sunset Valley Nature Area is located between Lovegrass Lane and Oakdale Drive. The tract surrounds a portion of the main branch of Williamson Creek and connects with the South Hills Conservation Area. Brodie Lane separates the Sunset Valley Nature Area from the Indian Prairie Grass Preserve. The flow of Williamson Creek is ephemeral and no permanent body of water is located on the tract. The tract is 64.59 acres in extent. The elevation of the Sunset Valley Nature Area extends from approximately 670 to 700 feet. A third of the tract has an Edward's Limestone substrate and the remainder of the site is Buda Limestone. The tract is bisected by Williamson Creek, which is composed of Mixed Alluvial Land (Md). The majority of this tract is composed of Tarrant and Speck soils. The Sunset Valley Nature Area is considered to be a Plateau Live Oak (*Quercus fusiformis*) - Midgrass plant community.

WILDLIFE DESCRIPTIONS

Sunset Valley is home to a variety of plant and animal species. Wildlife observed within the City of Sunset Valley includes White-tailed Deer (*Odocoileus virginianus*), Coyote (*Canis latrans*), Raccoon (*Procyon lotor*), Striped Skunk (*Mephitis mephitis*), Virginia Opossum (*Didelphis virginiana*), Eastern Cottontail Rabbit (*Sylvilaus floridanus*), Bobcat (*Lynx rufus),* Common Gray Fox (*Urocyon cinereoargenteus*), Nine-banded Armadillos (*Dasypus novemcinctus*), Squirrels (*Spermophilus sp*.) and other various rodent species. Texas Rat Snake (*Elaphe obsoleta lindheimeri*), Prairie Kingsnake (*Lampropeltis calligaster calligaster*), Western Diamondback Rattlesnake (*Crotalus atrox*), Rough Earth Snake (*Virginia striatula*), Red-eared Slider (*Trachemys scripta elegans*), Texas River Cooter *(Pseudemys texana*), Green Anole (*Anolis carolinensis*), Reticulated Gecko (*Coleonyx reticulates),* and and Gulf Coast toad (*Incilius valliceps)* are the reptile and amphibian species identified to date. Central Texas is along a migratory bird path and has a rich diversity of bird species. Texas is centrally located along a migratory bird route. As such over 100 bird species have been identified in Sunset Valley as seen in Appendix A.

Endangered Wildlife Description: The Gaines Greenbelt is unique in that it provides habitat for the endangered Golden-cheeked Warbler (*Dendroica chrysoparia)*. Golden-cheeked Warblers nest in the Ashe-Juniper and Oak woodlands surrounding canyons and ravines. These small songbirds (~4.5 inches) were listed as endangered in 1990, their decline is related to habitat loss and fragmentation. Migratory in nature, these birds spend the winter in Mexico and Central America, and Central Texas is the only place where these birds nest and raise their young.

GENERAL WILDLIFE MANAGEMENT GOALS

Recognizing that effective wildlife management takes a comprehensive approach that integrates city resources and resident actions, the following goals have been developed:

- Protect and enhance wildlife habitat
- Promote environmental education
- Promote volunteer involvement in wildlife and habitat protection and enhancement projects
- Promote internal education and consistency in Department actions

PROTECT AND ENHANCE WILDLIFE HABITAT

Objective 1: Protect existing habitat from degradation

Wildlife habitat within the City's green spaces and conservation areas should be protected from degradation at all times. Conservation Areas in particular should be designated primarily as wildlife habitat. These areas should have limited development and humans should stay in designated areas, such as trails. The green spaces and conservation areas should be monitored on a regular basis for degradation and deterioration. When habitat deterioration is found, plans to restore the site should be developed.

A list of potential habitat protection and enhancement plans should be developed. The plan for each specific area should include:

- A site description and nature of the problem
- Detailed actions to be taken
- A project schedule
- Materials and equipment needed
- Maintenance and monitoring program
- Potential corrective actions if project is not successful

Actions to protect wildlife habitat include:

- Monitoring and removal of invasive, exotic species
- Planting native vegetation
- Creek restoration
- Trail maintenance
- Closing informal, social trails
- Enforcing applicable laws and regulations

Objective 2: Allow human use of natural areas while protecting wildlife and habitat

A balance must be achieved between people accessing the green spaces and conservation areas and habitat protection. Trails and viewing areas should be designed and maintained in accordance with the approved Trails Master Plan. People entering into green spaces and conservation areas should have control of their pets at all times. Domesticated cats and dogs have been documented to have negative effects on wildlife.

Increased support of trail maintenance is needed to prevent erosion. Methods should be used to help keep people on the trails. Additional signage will also be needed to keep people on the trails and to provide educational opportunities.

Objective 3: Maintain habitat and species diversity

Efforts should be made to maintain or increase species diversity within the green spaces and conservation areas. This can be achieved through restoration projects and insuring habitat does not get further fragmented by trails and development.

Objective 4: Protect critical and sensitive habitats

Critical and sensitive habitat should be protected from development and degradation. The Gaines Greenbelt is critical habitat for an endangered species. Karst features are also sensitive habitats, including the majority of Williamson Creek within Sunset Valley. These areas require monitoring and management to protect not only wildlife habitat but water quality.

Objective 5: Promote native plant communities and enhance wildlife habitats

Native plant communities should be protected and enhanced. This can be achieved by removing exotic species and replanting with native species. Areas that lack vegetation should be restored using a native seed mix. Structure diversity within plant communities is an important factor. Site specific plans should be developed for each restoration project.

Objective 6: Control exotic plants

Methods to control exotic, invasives should be researched and developed as the need arises. Plans to remove known invasives such as Chinaberry, Chinese Tallow, Japanese Ligustrum, and Nandina should be site specific. Minimal applications of herbicide can be used on those invasive, exotics that can re-grow from root stock.

Objective 7: Monitor for invasive species

Staff will monitor for potential invasive species within the City. For example, the Tawny Crazy Ant (*Nylanderia spp. near pubens*) has been found within Travis County. If invasive species are

found within Sunset Valley appropriate actions will be taken to notify residents and begin control measures.

Objective 7: Enforce Existing Regulations to protect wildlife

Chapter 96 of the Code of Ordinances is related to public parks. This ordinance has provisions for protecting wildlife. It is unlawful for a person to:

(N) Hunt or molest, harm, frighten, kill, trap, pursue, tease, shoot or throw missiles at any animal, wildlife, reptile or bird in a public park. Hazing of coyotes is not considered a prohibited act.

More rigorous enforcement of this law is necessary as well as increased education on the ecological reasons behind these ordinances.

Objective 8: Educate residents and visitors on the ecological reasons for regulations.

Increased effort to educated residents and visitors to the City on the ecological reasons for regulations is necessary. This should hopefully lead to better compliance; thus habitat and wildlife will be better protected.

Objective 9: Develop and maintain a wildlife resource inventory.

Maintaining an inventory of wildlife resources including vegetation maps and wildlife species will aid in making management decisions. In addition vegetative mapping can help determine areas of degradation and where improvement projects should be focused.

PROMOTE ENVIRONMENTAL EDUCATION

OBJECTIVE 1: Provide wildlife biology and ecology education to residents and visitors.

Informed users in the green spaces and conservation areas are a valuable asset to the City. Active education such as training classes and seminars, along with passive education such as interpretive signage should be utilized. The City's Conservation Rangers program should be expanded to allow participation from people living outside of Sunset Valley. Many of the trail users are from the City of Austin. Empowering them with the knowledge necessary to protect the green spaces and conservation areas is beneficial to the City. Periodic newsletter articles would be a simple way to disseminate ecological information.

Objective 2: Educate residents and visitors on the ecological reasons for regulations.

Increase efforts to educate residents and visitors to the City on the ecological reasons for regulations. This will lead to better compliance, thus habitat and wildlife will be better protected.

Objective 3: Use green spaces and conservation areas for school trips and educational programs

Efforts should be continued to take schools and community groups into the green spaces and conservation areas on guided hikes. These programs should be expanded to include additional ecological and wildlife information. Outdoor fieldwork experience could also be offered to interested individuals or groups, such as mapping vegetation communities.

Objective 4: Promote use of the City's environmental resource library.

The City maintains an environmental resource library at city hall. Residents should be informed of this resource and a check out system developed. The list of available books should be kept online.

Objective 5: Promote biological research within the green spaces and conservation areas

Researchers should be encouraged to use green spaces and conservation areas for biological and ecological research. The City should receive reports and data from all research conducted. The data from these research projects can aid the city in management of the green spaces. The Public Works and Environmental Services Department should pursue partnering with local universities for research opportunities.

PROMOTE VOLUNTEER INVOLVEMENT IN WILDLIFE HABITAT PROTECTION AND MANAGEMENT

Objective 1: Promote Conservation Ranger Program

One of the greatest assets the City has is its volunteers. Their efforts can make a huge impact on management of the green spaces and conservation areas. The City's Conservation Ranger program should be revitalized to enhance volunteer involvement in the City's open spaces. Projects that can be conducted by volunteers include:

- Baseline habitat and wildlife surveys (e.g. Hahn surveys)
- Trail rehabilitation and stream restoration
- Removal of invasive, exotic species
- Selective removal of Ashe Juniper

- Surveying trail users attitudes and knowledge of green spaces
- Monitoring habitat quality

For any project involving volunteers, planning meetings will need to be held to ensure projects meet their goals. City staff should have a list of potential habitat projects and work with interested volunteers.

OBJECTIVE 2: Integrate environmental education with volunteer projects

All projects should contain educational opportunities. This includes explaining the reasons behind a project. Volunteers can also develop and teach seminars. The volunteers become local stewards of the green spaces. Conservation Rangers should receive training in various aspects of site specific wildlife biology and ecology and will identify specific problems or opportunities that need to be addressed.

PROMOTE INTERNAL EDUCATION AND CONSISTENCY IN DEPARTMENT ACTIONS

Objective 1: Provide wildlife biology and ecology education for City staff

Educational opportunities for City staff should be promoted. This is especially important for staff involved in vegetation and landscaping management and those who respond to wildlife calls on a routine basis. The focus of the courses should be on ecology and ecological principles, and should emphasize the ecological communities of Sunset Valley. Ecological processes, including energy flow, nutrient cycling, and water movement should be included in the training. Education courses will be designed to provide applicable tools to everyday management decisions made by staff.

Objective 2: Develop policies for how wildlife-related incidents are handled

Inter-departmental policies and response plans on how to handle wildlife-related incidents should be developed. This will create consistency in how staff responds to wildlife issues.

SPECIES SPECIFIC MANAGEMENT PLANS

Due to various factors, some animals require specific plans to manage populations and mitigate potential human-wildlife conflicts. The following sections include information on specific species and how they shall be managed within the City of Sunset Valley.

WHITE-TAILED DEER (WTD)MANAGEMENT PLAN

Texas is home to one of the largest White-tailed deer (*Odocoileus virginianus*) populations in North America. The Edwards Plateau in particular produces more White-tailed deer than any other region of the state. A large population of free-ranging, browsing ungulates can have a significant effect on open space habitat as well as residential areas. Deer cause localized damage to landscaping and can be responsible for car accidents. If over-populated, WTD can also cause damage to open spaces by decreasing species diversity.

SPECIES DESCRIPTION

White-tailed deer refers to the underside of the tail that is raised when the animal is alarmed. WTD are relatively small deer weighing between 100 to 300 pounds and maximum heights of approximately 3 ½ feet shoulder height (Curtis and Sullivan,2001). Does are smaller and lighter than bucks and lack antlers. In the summer, WTD have a red-brown coat that becomes gray-brown in the fall and winter. WTD breeding occurs mid-September through late February. The peak of the breeding season, also called rut, is in November. There is a 200 day gestation period with fawns being born in early summer. Fawns are red-brown with white spots, weighing between 4 to 8 pounds at birth. Twins are common in years where food is abundant. Bucks begin to develop antlers in April and these grow through August. Antler size depends on age and nutrition. Older bucks will have larger antlers. Antlers are covered with skin called velvet. This skin contains blood vessels that provide nutrients to the growing antlers. When the antlers stop growing, the velvet dries and is rubbed off. Bucks damage small trees and shrubs as they remove the velvet. Each winter bucks lose their antlers and will grow a new set in the spring.

HABITAT INFORMATION

In Sunset Valley, WTD are found throughout all of the green spaces and conservation areas. WTD are also commonly spotted in residential areas. WTD are considered an edge adapted species. This means that they thrive in areas with a diversity of habitat and a high proportion of habitat edges. Habitat edges refer to the area where two differing habitats meet. In urban areas this can be the areas where green spaces meet the urbanized residential and commercial areas. This urban-wildland interface plays an important role in species diversity and richness. Habitat in Sunset Valley consists of Oak-Juniper woodlands and Oak-Midgrass plant

communities. Deer feed primarily on grasses, forbs, leaves, twigs, and buds. Deer will also eat acorns, as well as the buds and twigs of leafy plants, in the winter.

WILDLIFE DAMAGE

Damage caused by WTD ranges from eating landscaping to injuring young trees. It is estimated that deer are responsible for nearly $250 million dollars in damage each year to household landscaping nationwide (Curtis and Sullivan, 2001). Deer also affect vegetative diversity as they over-browse tree seedlings. As deer forage and eat the seedlings of oaks, other less desirable species such as Japanese Ligustrum (*Ligustrum japonica*) or Chinaberry (*Melia azaderach*) may reach maturity. This leads to a loss of mature, native trees in natural areas and changes vegetation composition (Bishop et al., 2007). Deer may also reduce understory coverage which can affect the nesting and foraging areas of many songbirds. This can in turn affect the species diversity and abundance of these songbirds. Deer also cause over 1 billion dollars in auto damage each year in the United States (Curtis and Sullivan, 2001). Deer may also be host to the Lone Star Tick (*Amblyomma americanum*) that can induce allergy to red meat and the Black-legged Tick (*Ixodes pacificus*) that is a vector for Lyme disease.

MANAGEMENT PROGRAM

With a lack of natural predators and little to no hunting pressure in urban areas there are very few factors that limit white-tailed deer population sizes. Management will be focused on the following areas:

- Monitoring deer populations
- Enforcement of local ordinances
- Public education and residential damage prevention
- Chronic Wasting Disease monitoring and education program
- Population reduction

MONITORING DEER POPULATIONS

Monitoring should be the first step of any wildlife management activity. Texas Parks and Wildlife (TPWD) has several census and survey techniques for the Hill Country. Technical assistance for deer surveys is also available from TPWD. Sunset Valley uses a combination of techniques to monitor deer populations: modified Hahn Line and camera surveys. The Hahn line survey consists of several trails and roads. Visibility estimates, recorded perpendicular to the route, are used to estimate acreage sampled. The camera survey utilizes a static location with a feed station. The Hahn line gives a good population estimate, however it has been found to underreport bucks. The camera survey allows staff to estimate the number of bucks in the population, as well as provide a population estimate. A minimum of five Hahn line surveys

should be conducted on non-consecutive days, at either dawn or dusk. This is the minimum number of visits required to generate a population density estimate. These surveys should be conducted in the late summer to give an accurate account of bucks, does and fawns. Camera surveys can be conducted at different times of the year to check population estimates. Population estimates will play a factor in determining whether any population control measures will be conducted.

LOCAL ORDINANCE ENFORCEMENT

In most cases feeding wildlife is not recommended and can lead to several problems. Food manufactured for people is not nutritionally adequate for wild animals and can lead to health problems. When wildlife become accustomed to eating near humans, they often lose their fear of humans and this can lead to nuisance behavior. When wildlife discovers a constant food source at a single location, this may cause animals to congregate in larger groups and can lead to the spread of disease or fighting among the animals. Chapter 94 of Sunset Valleys Code of Ordinances contains provisions preventing the feeding of wildlife.

§ 94.03 FEEDING OF DEER AND OTHER WILDLIFE

(A) No person shall purposely feed wild deer, cause wild deer to be fed or provide food or edible matter to wild deer through a ground-feeding station, salt lick or other means to feed wild deer in the city on any public or private land.

(B) No person shall purposely feed raccoons, coyotes, opossum, skunks, ringtail cats, and foxes except as allowed by wildlife rehabilitators holding appropriate state and/or federal permits. Except as allowed to wildlife rehabilitators holding state and/or federal permits.

(C) A person shall be deemed to have purposely fed or caused the wildlife listed in (A) and (B) above to be fed if:

(1) A person places edible matter on the ground or any place less than six feet off the ground that is not intended for domestic livestock.

(2) The distribution of edible matter is through a commercially sold automatic feeder.

(3) The edible matter is in an area that is neither in an enclosed building nor in an area that is not fully enclosed by a fence or other enclosure sufficient to keep out wild animals and without a closed receptacle reasonably sufficient to keep wild animals from eating the edible matter.

(B) The presence of edible matter on the ground or any place less than six feet off the ground that is not intended for domestic livestock is hereby declared to be a nuisance if the edible matter is;

(1) Outside an enclosed building, fence or other enclosure sufficient to keep out wild deer; and/or;
(2) Not enclosed in a receptacle reasonably sufficient to keep wild deer from eating the edible matter.

(E) No person shall permit, allow or suffer the presence of edible matter that constitutes a nuisance on land owned, leased, occupied or controlled by the person.

(F) The prohibition of this section shall not apply to any peace officer or other agent of the city acting in conformance with an animal control program.

No person shall purposely feed wild deer, cause wild deer to be fed or provide food or edible matter to wild deer through a ground feeding station, salt lick or other means to feed wild deer in the City on any public or private land.

The term edible matter is defined as any wheat, pelleted livestock food, corn in any form, fruit vegetables, hay alfalfa human food scraps, any form of commercially sold wildlife feed, birdseed or livestock feed, or any other edible matter.

This ordinance shall be enforced to prevent the feeding of deer and other wildlife. The City endeavors to attract the deer to areas deeper in the green spaces and conservation areas to avoid human-wildlife conflicts.

PUBLIC EDUCATION AND DAMAGE PREVENTION

Public education is key to all aspects of wildlife management. Educating residents on the dangers of feeding wildlife, especially corn, should be the first part of any deer education program. Next, educating residents on deer resistant plants for landscaping will help lower the likelihood of this type of damage. A variety of repellents and scare devices are available to deter deer from entering into areas. Repellents work best in small areas such as gardens or landscape plantings. Repellents come in two categories: those that repel by taste and those that repel by odor. Repellents should be applied at the first sign of damage. The effectiveness of repellents depend on the number of deer, feeding habits and environmental conditions.

Scare devices such as lights, whistles, and air horns have been effective at keeping deer from certain areas. However, in suburban and urban areas their use may be violations of noise

ordinances and disturb nearby neighbors. Deer also habituate to scare devices in a short amount of time.

Sunset Valley has installed wildlife reflectors along Brodie Lane and Ernest Robles Way to deter wildlife from entering traffic when cars are present. At night when a car comes near these reflectors, light is reflected into the open spaces. When deer see this light they are startled and stop before entering the roadway. These have reduced the number of deer killed along the roadways. If another area in town begin to have an increased number of automobile related deer mortalities, these streets should be considered for installation of wildlife reflectors.

POPULATION MANAGEMENT

Habitat carrying capacity and climatic stress may reduce deer populations. However with limited hunting ability in urban areas it may become necessary for the City to reduce deer populations to sustainable levels. There are a variety of ideas of how to accomplish this goal. Trap, transport, and release techniques have been used in some parts of Texas and are popular with the public. There are several problems with this method. Given the widespread population of WTD there are few places with excess carrying capacity to take deer. Although trap and release is publicly popular the reality is that the survivability of translocated deer is often very low (DeNicola et al., 2000). Muscle tissue degeneration, muscle stiffness, lack of coordination, paralysis and death due to the stress of capture and handling may occur up to 26 days after capture (Beringer et al., 1996). Mortality in translocated deer, also known as capture myopathy, is very high. Translocated deer have a mortality rate upwards of 49% (Beringer et al., 2004, Beringer et al., 2002; Beringer et al., 1996; Bishop et al., 1999; Cromwell et al., 1999; Hawkins and Montgomery, 1969).

Trap and euthanize has been the method used by the City in the past. This method uses baited traps and drop nets to capture WTD, which are then euthanized with a firearm. Trap and kill methods are considered to be less humane than recreational hunting or sharpshooting. This is due to the stress the deer is under prior to euthanization. However, given the urbanized nature of Sunset Valley, hunting and to some degree sharpshooting may not be as desirable.

Population estimates for the deer of Sunset Valley have estimated between 40 to 60 deer in the area in the last few years. In comparison in 2000, it was estimated that there were nearly 165 deer in the area. Limited trapping was completed in the early 2000's to reduce the number of deer in the area. Increased urbanization of the southwest Austin area may have contributed to the population reduction. Also, Sunset Valley has a healthy coyote population. Although coyotes generally do not take down adult deer, they can kill fawns. It is possible that this has reduced recruitment of new members to the population.

If the deer population increases above the carrying capacity, evidenced by browse lines in the nature areas and increased population estimates, population reduction measures may become necessary. If this becomes necessary the information will be presented to the public at a City Council meeting. At that time staff will receive proper permitting from the TPWD. It is highly encouraged that the City works with local meat processors and organizations such as Hunters for the Hungry, Caritas of Austin, and the Capital Area Food Bank to distribute venison resulting from any population reduction management activity.

CHRONIC WASTING DISEASE

Chronic Wasting Disease (CWD) is a fatal, transmittable neurological disease effecting members of the deer family. This disease was first recognized in a captive deer population in Colorado in 1967. Since then it has been documented in 21 states in free ranging deer.

Chronic Wasting Disease is transmissible spongiform encephalopathy or prion disease. Various prion diseases exist including Creutzfeldt-Jakob disease in humans. Prions are misfolded proteins that attack the nervous system. Symptoms include emaciation, excessive salivation, thirst, and urination. Many of these symptoms can be caused by other diseases or conditions. Definitive diagnosis is only made through post-mortem laboratory testing.

Chronic Wasting Disease causes significant decline in deer populations. Eradication of established CWD in a population is nearly impossible. The best approach is disease prevention. Managing for CWD will consist of monitoring the deer population on an annual basis to determine population health. Residents will be encouraged to report animals that appear unhealthy for additional surveillance efforts. Public education will also be included as part of this plan. Public education includes providing information on CWD including what symptoms to look for and to not eat meat from suspect animals. In addition the public will be apprised of deer population health and if the disease is found within Travis County.

GOLDEN CHEEKED WARBLER MANAGEMENT

Sunset Valley is home to the endangered Golden Cheeked Warbler (GCWA). In 1990 the GCWA was listed a federally endangered species due to habitat loss (USFWS, 1992). In 2014, Sunset Valley joined the City of Austin, Travis County, and the Lower Colorado River Authority in a Managing Partner Agreement to join the Balcones Canyonlands Conservation Plan in the regional protection of the GCWA. All management activities in regards to the GCWA must conform to the approved Land Management Plan (LMP) for the Gaines Greenbelt.

SPECIES DESCRIPTION

Adult Golden-cheeked warblers reach a length of 4.5 inches. GCWA's are small songbirds with a yellow face, a white belly, and a black throat. The warbler was named for the distinctive radiant yellow cheeks. Females look similar to males although their plumage is duller. GCWA only nest in the central Texas area within Ashe Juniper-Oak woodlands. Warblers eat spiders and insects found among the hardwoods.

Male GCWA arrive in Texas in early March, a few days before young males and females. Males mark territories and begin vocalizing in preparation of the females arrival. The female builds a small compact nest made of Ashe Juniper bark bound together with grass and spider webs. Females generally place their nests in the upper two-thirds portion of the trees. Females lay 3-4 eggs and incubate them for twelve days. Hatchlings are fed by both the male and female. Fledging occurs after about nine days. The fledglings remain with their parents for about four weeks. By mid-July the young are ready for the journey south.

HABITAT DESCRIPTION

GCWA occur on upland plateaus, gently sloping hills, and steep canyon slopes. GCWA occupy a variety of topographical niches. GCWA habitat is found on the shallow limestone soils of the Edwards Plateau. The vegetation structure of GCWA habitat is a mix of mature Ashe Juniper (*Juniperus asheii*) and broad-leaved hardwoods (Campbell, 2003). Tree canopy must be generally greater than 50%. However, some areas with 35-50% are used at times by GCWAs. The vegetative structure must contain both low (less than 5m) and high (above 5m) foraging substrates. In general, GCWAs forage and display in Plateau Love Oaks (*Quercus fusiformis*), Shin Oak (*Quercus sinuata*), and Cedar Elms (*Ulmus crassifolia*) more frequently. In Sunset Valley, GCWA habitat exists only in the Gaines Greenbelt. This is the City's only open space north of Highway 290.

THREATS

The main threats to GCWAs are habitat loss and habitat fragmentation. Habitat fragmentation results in an increase in edge to area ratio, which in turn can lead to increased rates of predation, cowbird parasitism, noise and light pollution and a decrease in prey abundance (USFWS 1992; Campbell, 1995; USFWS 1996). Red imported fire ants (*Solenopsis invicta*) which are more common in disturbed areas, are known to prey on GCWA nestlings (Reidy et al., 2008). Increased populations of blue jays (*Cyanocitta cristata*) and brown-headed cowbirds (*Molothrus ater*) which are common in urban and agricultural areas, may also cause increased mortality, parasitism, and stress, compared to areas less impacted by humans(Stake et al., 2004). Brood parasitism occurs when one species lays eggs in another species nest and the host species raises the young. Over-browsing by deer has impacted recruitment of hardwood seedlings. The loss of hardwoods has lead to habitat degradation. Oak species are also susceptible to oak wilt. Human disturbance has also been shown to have effects on the foraging and nesting behavior of GCWAs, especially through increased habitat fragmentation and increased edge effects (Davis et al., 2010; Reidy et al., 2004)

MANAGEMENT PROGRAM

The Gaines Greenbelt is a small portion of a much larger preserve system. The goals of Sunset Valley's management program is to preserve the habitat within the Gaines Greenbelt. Management goals reflect compliance with the BCCP Permit and associated documents, including the Land Management Plan standards of practice. Primarily, the Gaines Greenbelt will be managed to:

- benefit GCWA occupation and productivity during the breeding season,
- preserve and recover native diverse oak-juniper woodland,
- promote and contribute to a sustainable and diverse native ecosystem, and

Natural Resource Surveys and Monitoring

Surveys and monitoring are intended to provide better information for conservation and management decisions.

Golden Cheeked Warbler

To track any change(s) to the baseline condition of GCWA territories partially or wholly occupying the tract, a federally permitted biologist will conduct territory-level mapping every two years using the same protocols that other BCP land managers are using. Other local organizations may be involved in the survey and monitoring effort, as long as they are or are with a federally permitted biologist.

Vegetation

Permanent photo points will be established and documented for annual use to monitor visitor impacts, changes in plant communities, help map invasive species issues, determine effects of management and restoration, and revise management approach as needed to meet goals. No specified number of points is required. Points should be positioned to be repeated annually and sufficient to represent trail management and restoration needs (e.g. places where trails impact habitat quality and/or highest erosion potential over time), rare species' habitat condition, and boundary issues. Each point will be documented in the following framework and the collection will be reported as baseline and updates in the Annual Report:

Oak Wilt

Sunset Valley will coordinate with the City of Austin for oak wilt surveys (City of Austin flies every two years for monitoring oak wilt centers). Oak wilt areas will be mapped. If detected, treatment and/or containment options will be discussed with BCCP land managing partners. Treatment plans which include mechanical removal or trimming will also include debris removal from the preserve as a wildfire prevention measure.

INVASIVE SPECIES CONTROL

Non-native vegetation focal areas will be mapped within the first two years of this LMP. A treatment plan will be developed and included in this document, based on highest priority, highest risk, standards of practice that protect/not adversely impact the surrounding environment; means and methods will be included in the treatment plan (e.g. mechanical or chemical means, depending on the site type within the parcel). Treatment plans which include mechanical removal or trimming will also include debris removal from the preserve as a wildfire prevention measure.

Red imported fire ants will be controlled using BCCP accepted practices for preserve areas with karst potential as needed, using the BCP Tier II Karst Management Plan as a guide. No chemical means will be used within surface drainage zones of karst features.

Patrol and outreach events will make an effort to document colonies of Tawny Crazy Ant (*Nylanderia fulva*) and Sunset Valley will coordinate with BCP Land Managers to determine if a course of action is needed and how best to address the issue.

Brush Control

The land management practice in Texas to reduce juniper cover and enhance savannah and mosaic (grassland - oak motte) vegetation communities (colloquially, "brush control") is not an acceptable practice on sites suitable for, occupied by, and managed for GCWA. No largescale vegetation management will be practiced on this site unless a restoration plan is submitted to

and approved by the BCP Land Managers. Restoration plans which include mechanical removal or trimming will also include debris removal from the preserve as a wildfire prevention measure.

Wildlife Management in Regards to GCWA

The Gaines Greenbelt should provide habitat for a diverse variety of wildlife. Browsing ungulates (e.g. white-tailed deer, non-natives like axis or blackbuck), if not managed at or below carrying capacity, can cause a significant amount of habitat damage by feeding on tender new hardwood shoots. Hardwoods are a significant component of GCWA habitat and regeneration is a concern in this area.

Surveys will be conducted in conjunction with TPWD biologists' recommendations to establish whether deer control is needed and feasible to implement.

If needed, targeted outreach to Preserve-adjacent neighbors and general outreach during regular programs will be implemented to reduce and deter deer feeding. Outreach programs will be companion efforts to the existing Sunset Valley "no feeding" ordinance.

Feral hogs decrease native vegetation abundance, diversity, and resiliency; create pathways for non-native invasive species (e.g. vegetation, fire ants); and severely degrade water resources (creekways and springs). Hog control is paramount when hogs are detected. BCP Land Managers can provide recommendation for feral hog trapping and control methods if feral hog damage is detected.

Outreach and Education

Sunset Valley has an active Conservation Rangers program and regular community outreach related to natural resources conservation and management. BCCP and BCP information provided by existing Travis County and City of Austin preserve outreach programs can be incorporated into Sunset Valley programs, providing additional opportunities and new habitats for constituents and volunteers to engage.

RED IMPORTED FIRE ANT MANAGEMENT

BACKGROUND

Indigenous to the floodplain of northern Argentina, southern Brazil and Paraguay, the Red Imported Fire Ant (*Solenopsis invicta*) is a damaging pest in the United States. The Red Imported Fire Ant (RIFA) is a highly invasive species that was introduced in the 1930's near Mobile, Alabama (Davis et al., 1994). The spread of RIFA can be contributed to the movement of infested sod and nursery stock from around the country. In 1958, The U.S. Department of Agriculture enacted Federal Quarantine 301.81 that regulated the movement of items containing soil and hay into uninfected areas (USDA, 2013). The RIFA was first recorded in Texas in 1956. It is estimated that RIFA will inhabit nearly one quarter of the United States wherever the average minimum temperatures are greater than 10 degrees Fahrenheit (Allen et al, 1995).These small insects pose a threat to people, small animals and endangered species within Sunset Valley.

RIFA presents several problems. They can eliminate native ant species with data indicating that overall ant diversity has decreased in areas where RIFA are present (Porter et al., 1988). RIFA are omnivourous and feed on both plant and animal material. RIFA feed on other arthropods and have been recorded attacking lizards, turtles, snakes, young mammals such as fawns, and eggs and young of birds (Allen et al, 2004; Morisawa 2000; Morris and Steigman, 1993; Porter and Savignano, 1990). RIFA may also invade caves and can impact cave fauna including predation of endangered cave fauna.

SPECIES DESCRIPTION

The RIFA is a small reddish brown ant, with workers of many sizes (polymorphic) between 2.4-6mm. Worker ants are wingless, sterile females. These ants protect the nest, feed and defend the queen. They also forage and care for the developing brood. The winged, reproductive ants live in the mounds until their mating flights usually in the spring and fall. Males die soon after mating, while the queen finds a suitable nesting site. The queen will lay approximately a dozen eggs which hatch within ten days. As the workers begin to feed the queen, she can lay up to 800 eggs per day. Larvae develop and then pupate within ten days. Adults will emerge within fifteen days. The average RIFA colony contains between 100,000-500,000 worker ants.

There are two types of RIFA colonies: single queen (monogyne) and multiple queens (polygyne). In single queen colonies worker ants are very territorial. Multiple queen colonies have worker ants that travel between mounds. The travel between colonies increases the numbers of mounds found within any given area. For example, areas infested with single queen colonies have 40-150 mounds per acre. In comparison, multiple queen colonies can have more than 200 mounds per acre (Texas Imported Fire Ant Research and Management Project, 2014). Fifty

percent of RIFA colonies in Texas are of the polygyne type (Allen et al., 1994). RIFA are highly aggressive and inject necrotizing venom when they sting. Workers live about five weeks, while queens can live more than seven years.

COLONY ESTABLISHEMENT AND BEHAVIOR

RIFA spread by one of the following methods:

1. Transport of colonies or mated queens in items that contain soil such as nursery stock and sod and soil used for construction purposes.
2. Mating flights of queens that are blown by strong winds into new areas.
3. Queens are transported to new areas in trucks, cars, and trains.
4. Floodwaters move ants to new locations.

Once mated, queens will find a suitable site and dig a small burrow. Queens are most vulnerable at this time. It is estimated that 90-99% of mated queens are killed during their mating flight or the early colony establishment. The queens will lay their eggs within a day and within six months colonies of several thousand ants will be found at the surface.

RIFA construct mounds that have conical domes with rain resistant crusts. Mounds are approximately 16 inches in diameter and 10 inches high. In heavy soils mounds may be larger. Mounds are more active at the surface in cooler, rainy weather. Below the mound is a hive of activity and intricate tunnel system. Chambers and tunnels below the mound may extend to depths of five feet. The tunnels branch and open at the surface to allow workers to forage.

RIFA are territorial and will defend their mounds from intruders. Disturbances to the mounds results in the workers rushing out and attacking anything that moves. Worker ants are sensitive to vibrations and release pheromones that signal other workers to attack. During the disturbance worker ants will move the queen to deeper parts of the colony. As long as the queen and a few workers survive the colony will survive and rebuild.

RIFA cannot regulate mound temperature and humidity. As the day heats up larvae and queens move deeper into the mounds. During periods of drought and high heat RIFA may remain deep underground. If water invades a mound workers will create a raft to safely move the queen, larvae and eggs to a new location.

MONITORING

Monitoring of RIFA can be done using baited sampling stations. These stations can provide data on species abundance and diversity in a relatively short time. This data will help determine management options and protect native ant populations.

MANAGEMENT

There are many methods of control available. Since half of the RIFA colonies in the area are polygynic there are additional management challenges to consider. In colonies with multiple queens, all the queens must be killed to eliminate the colony. The following methods have proven successful in managing RIFA.

CHEMICAL CONTROL

Baits are generally formulated using slow-acting poisons that control mounds within weeks (abamectin, spinosad, amindinohydrazone, etc). The baits may also use chemicals that impede worker ants and cause the colony to starve within months (fenoxycarb, pyriproxyfen, methoprene, etc). Sunset Valley has used Ascend (abamectin), Award (fenoxycarb), and various spinosad formulations in the past. Sunset Valley also encourages residents to treat RIFA as a community on their annual Fire Ant Control Day.

Baits are typically used for individual mound treatments or broadcasted over a larger area. There are some drawbacks to broadcast applications in that some colonies don't receive bait, the bait photochemically degrades, or the bait is not specific to RIFA. Hormone based formulations of bait are most effective using a fall application. In lightly infected areas it is best to use ant bait as a mound treatment. In areas with high infestations a mound treatment and broadcast treatment can be used.

Pesticide impacts on non target species should be considered. Native ants slow the invasion of RIFA and can kill new queens. Harvester ants can be protected from pesticide applications by applying ice to the mounds to keep them inactive 24 hours after bait application. Efforts must be made to reduce and contain the use of pesticides. Within 75 feet of known karst features, once it is determined that RIFA are present the following guidelines shall be followed:

1. Baits shall be placed in the morning.
2. Baits will be at least 15m from the cave or sinkhole entrance
3. Granular pesticides will be placed in small plastic containers with mesh covers. This allows RIFA to enter but not larger invertebrates.
4. Locations will be marked with wire flags such as used for irrigation markings.
5. Each evening the bait stations will be removed as well as dirt around the container that noticeably has fire ant bait.
6. These steps will allow the removal of all bait before cave crickets or other invertebrates emerge from the cave or sinkhole area.

The following areas will be regularly treated with fire ant bait:

- Valley Creek Park
- City Hall Complex at 3205 Jones Road
- 1 Sunset Trail
- 10 Sunset Trail
- 5012 Westgate Blvd.
- Villas Greenspaces
- 37 Lone Oak
- Crystal Mountain seating area.
- Homestead Hill
- Along all trails and within 2 meters either side of the trails. This includes all granite gravel trails, as well as, nature and conservation area trails.

BOILING WATER METHOD

Boiling water has proven to be an effective form of fire ant control for individual mounds. It is especially useful near karst features,a s it should have no negative impacts on other cave invertebrates. This method utilizes a portable high-intensity propane stove that will heat the water applied to individual mounds. For ant colonies within 15 m of known karst features this is the preferred method of control.

The following areas will be treated with boiling water methods to control RIFA:

1. Within 15m of all known karst features owned by the City of Sunset Valley.

Further, residents with known karst features may request assistance from the City to initiate this method of treatment in these areas on their property.

FERAL ANIMAL MANAGEMENT

FERAL DOGS AND CATS

Feral domesticated animals, in particular dogs and cats, can have a negative impact on the environment. Feral cats have been shown to significantly impact native populations of reptiles, small mammals, and birds (Winter and Wallace, 2006; Dickman, 2009). With the exception of habitat loss, cats have been involved in the extinction of more bird species than any other cause (Coleman, et al., 1997). Feral dogs may form packs and pose a safety threat to wildlife as well as people. Feral dogs may also carry diseases that are transmittable to wildlife such as distemper, rabies, and parvovirus (Sime, 1999).

MONITORING AND MANAGEMENT

City staff will monitor green spaces and conservation areas for feral cats and dogs. Staff will use live traps to capture these animals. Efforts will be made to locate owners using the Sunset Valley pet registration list. If no owner can be determined, the animals will be taken to the appropriate humane care facility. If cats are found with a tip of their ear missing, residents who participate in trap, neuter, and return (TNR) will be notified to determine if the animal in question is under their care.

EDUCATION AND OUTREACH

Public education will be provided to residents to encourage responsible pet care. In regards to domesticated pets outreach efforts will be done in conjunction with assistance from the Austin-Humane Society, and the Austin Animal Center. Public education and outreach information will include:

- Dangers to wildlife from feral dogs and cats.
- Dangers to pets that are dumped and left in wild environments.
- Dangers to free-roaming cats from coyotes.

FERAL HOGS

Feral hogs (Sus scrofa) include European wild hog (Russian boar), escaped domestic hogs and European-domestic crossbreeds. Feral hogs have been found throughout the southeastern United States in 19 states include Texas. It is estimated that there are two million feral hogs in Texas alone (Mapston, 2004). Feral hogs create ecological problems and significant financial damage. Although not currently found in Sunset Valley they have been located in nearby areas.

SPECIES INFORMATION

Feral hogs are members of the Suidae family and native to Europe and Asia. Domesticated over 9000 years ago, early Texas explores brought hogs to Texas as livestock. Over time, escaped hogs became feral. In the 1950's European wild hogs were released for sport hunting. These hogs began to interbreed with feral animals. Today, domestic and wild traits can be observed in feral hog populations.

Feral hogs have a shoulder height of approximately 36 inches and weigh between 100 to more than 400 pounds once mature. Males are larger than females. Feral hogs have poor eyesight but a good sense of smell and hearing. Feral hogs may breed before they are a year old. Gestation lasts 115 days with a liter of four to six. There are usually two litters a year. With this many hogs born each year, populations can expand rapidly. Hogs travel in family groups of two sows and their young. Boars are more solitary and only join the herd in order to mate (Mapston, 2004)

Home ranges for feral hogs range between 320 to 12,160 acres (Mapston, 2004; Taylor 2003). Mortality is greatest among the young with life expectancy between four to five years. Disease, parasite, tooth deterioration and hunting are main causes of mortality. Predation by coyotes and bobcats does not significantly affect feral hog populations (Mapston, 2004). Hogs are omnivorous and feed on small mammals, invertebrates, birds, amphibians, reptiles, vegetation and even carrion (Adkins and Harveson, 2006; Taylor, 1997).

FERAL HOG DAMAGE

Feral hogs can destroy fences, tearing down wiring and fence posts. Hogs compete with native wildlife for food, water, and space. Feral hogs can prey on newborn livestock and destroy gardens. Feral hogs are also known to carry diseases and parasites transmittable to livestock and humans (Simmons et al., 2011). Feral hogs prefer riparian areas where they increase soil erosion and create shifts in plant succession (Mapston, 2004). Hogs also destroy crops and greatly affect the agricultural industry (Texas Cooperative Extension, 2002)

MONITORING

Although not currently found in Sunset Valley it is important to monitor for potential introduction of feral hogs to the area. Feral hogs have been found in nearby communities and it is prudent to plan for the possibility they may reach Sunset Valley. Feral hogs are nocturnal and their presence is generally detected by the damage they leave. Signs such as wallows, rooting, and rubs along trees and fences. Hog tracks are more rounded and have a greater width to length ratio than WTD. Scat looks different than deer or predator droppings, most similar to a young cow (Mapston, 2004).

MANAGEMENT

Feral hogs are classified as non-game animals and are unprotected by the TPWD. This means that they can be taken by legal means at any time, with no size or bag limits. According to Parks and Wildlife Code, a resident landowner, or the owner's agent, or lessee may take feral hogs causing depredation on the resident's landowners land without a hunting license. The Texas Animal Health Commission controls the transport of feral hogs in order to reduce the spread of infectious diseases. Cage traps and pens can be used to capture feral hogs. Baits include fruit, vegetables, carrion, fermented corn or grain, livestock pellets. Hogs can quickly become "trap shy" so traps must be moved to different locations.

Feral hogs can be a very damaging species within an area. If feral hogs are found to be within Sunset Valley the following guidelines will be followed:

1. Public notice will be provided though mailings to all residents providing education information.
2. City Council will be briefed on feral hog activity.
3. With Council approval, staff will acquire a contractor to trap and kill feral hogs.
4. Green spaces and conservation areas used for trapping will be closed to public access.
5. Captured feral hogs will be euthanized in the most humane way possible. The feral hogs will then be sent for processing at the discretion of the contractor.

MOSQUITO MANAGEMENT

Mosquito control activities are important to protect public health. Mosquitoes are vectors for various arboviruses. Arbovirus is an acronym for Arthropod-borne viruses. Mosquitoes are vectors of dengue and yellow fever, chikungunya, various types of encephalitis including eastern and western encephalitis, St. Louis encephalitis, and California encephalitis. West Nile Virus is also carried by mosquitoes. Mosquitoes also transmit heartworms.

SPECIES DESCRIPTION

There are more than 2500 species of mosquitoes around the world, and over 165 species are found in the United States. In Texas at least 84 species of mosquito are found with 8-12 implicated in disease transmission (Steil and Marshall, Little Elm). In general mosquitoes need still, stagnant water away from predators such as fish to complete metamorphosis. Larval habitats can range from wetlands to human-made structures such as gutters and discarded tires. Not all mosquitoes feed on humans, some feed mostly on birds, reptiles and amphibians.

BREEDING CYCLES

There are four stages to a mosquito's life cycle: egg, larva, pupa and adult. Mosquitoes require water to breed and spend their larval and pupal stages in water. Flood-water mosquitoes such as *Psorophora, Ochlerotatus*, and *Aedes* lay in eggs in places where water collects. These eggs can remain in dry conditions for several months. When heavy rains come and water levels rise, the eggs can hatch in a few days. This produces swarms of aggressive, hungry mosquitoes. Another wave of mosquitoes hatch within 10 to 14 days after the rain stops. Other mosquitoes such as those in the *Culex* genus, lay eggs in the standing water left by heavy rains. The time it takes a mosquito to complete its life cycle depends on the species, however in general eggs hatch within 48 hours.

MANAGEMENT

The mosquito management program for the City of Sunset Valley has several objectives. The objectives of the plan are as follows:

1. Surveillance of Mosquito Populations for Arbovirus
2. Public Education and Outreach
    a. Stress source reduction on residential and municipal properties.
    b. Promote the use of personal mosquito protection.
    c. Provide information on West Nile virus.
3. Using larvicide where practical, feasible, and likely to be effective.

Surveillance of Mosquito Populations

Using gravid and other types of mosquito traps the City will capture mosquitos and have them sent to the Texas Department of State Health Services for testing. The laboratory tests for the presence of arboviruses. This will be done twice a month between May and November. If arbovirus is detected the City will increase public education efforts and look for pockets of standing water to treat with larvicide. The City will work with the Health Service Region and Zoonosis Control Team with the Department of State Health Services to determine if additional action is needed.

Public Education and Outreach

Public education is a key component for successful mosquito management. Helping residents understand that they should eliminate anything that can hold water for more than 2-3 days will reduce mosquito breeding locations. Removing buckets, tires, cleaning gutters, and dumping water from pet bowls can remove locations mosquitoes may be attracted to. The Southern House Mosquito, *Culex quinquefasciatus*, is a carrier of West Nile Virus. This species prefers to breed in artificial water sources such as buckets and tires, over wetland and marsh areas Banks, 2014). Helping citizens understand mosquitoes' role in spreading diseases such as West Nile Virus, will make them aware of the dangers of these illnesses. This will also help them understand their role in protecting themselves against mosquitoes. This information will be sent in the monthly newsletter and a fact sheet that can be placed online and in print at City Hall.

Residential site assessments to determine locations for potential mosquito breeding grounds will be offered to residents upon requests. This program will help residents find sources for mosquito breeding and properly mitigate for any larvae present.

Larvcide

Larvicides are an effective way to provide mosquito control. Certain types of *Bacillus* bacteria have been used to develop mosquito larvicides. *Bacillus thuringiensis* (BTi) is a naturally occurring soil bacteria that is capable of killing mosquito larvae. BTi is commercially available in various forms to put into water sources to control mosquitoes. Once mosquito larvae ingest the pesticide, the stomach cells begin to burst and the mosquitoes are unable to eat and soon die.

The application of mosquito larvae control will be done during the time period when average evening temperatures are above 60 degrees F. The City will use larvicides, when practical in areas where there is standing water with confirmed mosquito larvae. Water quality ponds are designed to redistribute water within 72 hours. The water quality ponds will be monitored to

determine proper functioning. If ponds are not emptying within their allotted period appropriate action will be taken to remove the water source.

Since the mosquitoes that are carriers for West Nile Virus prefer artificial water sources it is most important that these sources are removed. A plan for surveillance and public education combined with use of larvicide in infested areas should help provide protection for the general public.

COYOTE COEXISTENCE MANAGEMENT PROGRAM

Although the City of Sunset Valley has a long history of environmental stewardship, some wildlife has the potential for conflict with humans. Coyotes (*Canis latrans*) and to some extent raccoons can be considered nuisances and have a higher potential for human-wildlife conflict.

COYOTE BIOLOGY

Coyotes (*Canis latrans*) are one of the most adaptable animals in North America. As a member of the Dog (Canidae) family, they are close relatives of wolves, foxes, and domestic dogs. Coyotes are considered to be medium sized dogs ranging between 20 to 45 pounds. Coyotes are distinguished by their grayish brown coat with tinges of red and bushy tails. Unlike most dogs who have brown eyes coyotes have yellow eyes. In the dog family coyotes are one of its fastest members running up to 65km per hour (Vaught et al, 2000)

One of the reasons coyotes are so adaptable is that they are opportunistic omnivores. From fruits and insects, to rodents and rabbits coyotes will eat what is readily available (MacCracken, 1982; Morey et al., 2007). In urban environments coyotes will adapt to things that are associated with humans, such as dog food, domesticated cats, and even garbage.

WHERE ARE COYOTES FOUND

Unlike most carnivores whose range has decreased over time, coyotes have spread across North and Central America since European settlement (Berkoff, 2001). From the desert southwest to Canada, coyotes are found in almost every habitat. This adaptability has allowed coyotes to enter into the urban landscape successfully. Coyotes have been seen around Sunset Valley for years. Coyotes are commonly found in the City's green spaces and conservation areas.

RURAL vs. URBAN/SUBURBAN COYOTES

Entering into the urban and suburban arena has created opportunities for interactions between humans and coyotes. Although coyotes generally avoid humans and human activity, they can successfully survive in a human dominated landscape. In these areas coyotes generally have smaller home ranges, meaning the area in which an animal lives and travels (Grinder and Krausman, 2001). Suburban and Urban areas generally have adequate food sources requiring less movement. In more wild settings, coyotes are considered to exhibit peak activity is dusk and dawn (Andelt and Mahan, 1980; Grinder and Krausman, 2001). In an effort to avoid humans, coyotes in urban and suburban areas have become more nocturnal, more active during the middle of the night.

COYOTES IN THE URBAN ECOSYSTEM

In urban and suburban areas coyotes are apex predators. There are no natural predators of coyotes in these environments. As such coyotes may be considered a keystone species, an animal that has a crucial role in the function of the ecosystem.

ARE COYOTES OVERPOPULATED?

The question of whether coyotes are overpopulated is often asked. There is not a good method to estimate coyote populations. Camera survey techniques work well on wildlife that has distinctive patterns or individual animals. For example, deer populations can be surveyed because bucks look distinctive. Populations can be estimated from the number of individual bucks in the area. Coyotes generally look similar making it difficult to tell one animal from another. Tracking stations can also give presence absence data, but not population numbers. Coyotes are capable of moving long distances and are good at avoiding people. Coyotes generally have high mortality rates. Large numbers of coyotes die before they are a year old due to a variety of factors. The number of coyotes is not necessarily the problem. The problem occurs when coyotes lose their fear of people.

COYOTE BEHAVIOR

Coyotes are generally territorial animals; these animals are considered to be residential coyotes. However, there are transient coyotes that cover large areas and do not defend particular territories. Coyotes have been known to change from being residential to transient and vice versa. Coyotes usually avoid people and many of their habits demonstrate this. In several studies, coyotes showed preferences for natural areas in urban environments (Gehrt et al, 2009). The change to being nocturnal is also an effort to avoid human interaction. Although coyotes rarely interact with humans, there are times when coyotes begin to lose their wariness of people. By and large this happens when people have created environments that encourage coyotes to come into human dominated landscapes. By allowing coyotes to get close and having food sources on properties, coyotes may begin to habituate to the presence of people.

COYOTE BEHAVIORAL SCORES

When coyotes begin to habituate to human behavior, researchers have developed a score that demonstrates increased levels of aggression. The pattern of coyote behavior may show an increased likelihood of aggression against people (Timm et al., 2004). This scale ranges from 0-7, with zero representing a coyote calling at night and seven being aggression against an adult. If behavioral reports go up the scale, this is an indicator that coyotes have begun to lose their fear of humans and encounters are more likely to occur. When coyote behavior begins to go above a four, hazing may no longer be as effective a tool. Hazing coyotes includes throwing

items, making loud noises, and trying to scare the coyote away.

LIKELIHOOD OF INJURY OR DEATH FROM A COYOTE

Although coyotes are predators and wildlife can seem unpredictable, the likelihood of being injured or killed by a coyote is extremely small (White and Gehrt et al., 2009). There have only been two confirmed deaths due to coyotes nationwide and only one unprovoked attack in Travis County. For perspective, 38 people were killed in 2012 alone by domesticated dogs and 4.5 million people are bit each year by domesticated dogs. Nearly 200 people die each year in deer-related automobile accidents. Although the threat coyotes pose to people may be low, dogs and cats are more likely to be killed as coyotes hunt for food and defend territories.

MANAGEMENT OPTIONS

The question of what to do when coyotes begin to lose their fear of humans is not easily answered. There are a variety of options to manage coyotes but no single panacea. There are two extremes to management: eradication and leaving wild areas strictly to wildlife. Neither of these options will likely work for a variety of reasons.

COYOTE ERADICATION

Eradication is incredibly difficult and not cost-effective (Henke, 1995). Coyote populations generally remain stable unless large numbers are removed. Historically, this was attempted for a brief period of time in Central Texas. However, coyotes remain in these areas today. When populations of coyotes are threatened, females may enter estrus at a younger age adding a new generation of coyotes to the population. Eradication options also come with detrimental side effects. As an apex predator, coyotes prey on a variety of smaller predators (mesopredators) including raccoons, skunks, and rodents. When coyotes are removed these mesopredators are no longer under threat of predation and can change the balance of the ecosystem (Prugh et al, 2009). Prey populations could also be affected. Although coyotes will generally not attack adult healthy deer, they will kill fawns. Coyotes also feed heavily on rodents who may be disease vectors. Coyotes help keep these populations in balance (Whitaker and Lindsey, 1999; Henke, 1995).

LEAVE WILD AREAS FOR WILDLIFE

Greenspaces are set aside as habitat for wildlife. However, coyotes are capable of covering large distances. They will not strictly stay in open areas. Restricting human or domesticated dog access to these areas will not necessarily change the behavior of coyotes that have habituated to human presence.

OTHER MANAGEMENT OPTIONS

There are several methods that have been demonstrated to work in managing coyotes. First is aversive conditioning or hazing. This can be done in a variety of ways. When people encounter coyotes they can throw things, yell, and scream. This can also be done on a larger scale with groups of people going out to haze coyotes in a concerted effort to install a wariness of humans. Some researchers believe that once coyotes have begun to habituate to human behavior, hazing may only have a short term effect. If coyotes are just beginning to lose their wariness, hazing is a very effective tool.

In Southern California research demonstrates that the removal of a small number of coyotes can effectively change the behavior of a population. In several locations, trapping and euthanizing as few as two coyotes has stopped aggressive coyote behavior. These results are regardless of whether a particular aggressive coyote was captured (R. Baker 2007; Timm et al, 2004, Timm and Baker, 1998). This small scale lethal control has been used in Travis County in areas where coyotes appear to become more aggressive toward people.

Finally, public education is the most important part of any management plan. Educating the public on how to haze coyotes, to keep pets and their food indoors, and cleaning up yards to remove areas coyotes can hide are all important tools to coexisting with coyotes.

COYOTE COEXISTENCE MANAGEMENT PLAN

Coyotes are an important part of the ecosystem; however they do have the potential for conflicts with humans in specific situations. Since it is impossible and undesirable to completely remove coyotes from the environment, the best practice to manage wildlife through a coyote coexistence program. This program is a multi-faceted approach to balance respect and protection of wildlife and their habitats with concerns regarding public safety. The program will include the following:

- Public Education and Outreach
    - Human Behavior Modification
- Hazing Program
    - Coyote Behavior Modification
- Response Plan for Wildlife Incidents

PUBLIC EDUCATION AND OUTREACH

Public Education and Outreach are key to helping residents and visitors within the City's greenspaces to make responsible decisions near wildlife. Public education will focus on providing residents with accurate information regarding wildlife and what they can do to

reduce opportunities for conflicts. This will include decreasing wildlife attractants, safeguarding children and pets, and creating reasonable expectations of normal wildlife behavior. Table 1 has a list of normal and inappropriate coyote behavior.

Table : 1 Normal and Inappropriate Coyote Behavior

Normal Coyote Behavior	Inappropriate Coyote Behavior
Coyotes heard howling, yipping, or barking.	Coyote actively approaching a person, with no attractants as incentive.
Coyotes seen at a distance, resting or moving at dawn, dusk or at night.	Coyote stalking a person or pet under direct control of its owner.
Coyotes preying on small mammals such as rats, mice and domestic cats.	Coyote being aggressive toward a person, showing teeth, lunging or nipping.
Coyote entering a yard that is open, unfenced near, greenspaces, and/or has attractants such as pet food.	Coyote enters an area where humans and are pets are present and does not leave when hazed.
Coyotes crossing streets and sidewalks.	Coyote biting a person or pet on a leash.

Human behavior modification can have a major influence on wildlife behavior. Providing information to residents that allows them to make responsible choices to stop attracting coyotes into the human landscape will reduce human-wildlife conflicts.

Public education and outreach will primarily include dissemination of information through the following:

- Interpretive signs in parks, green spaces, and conservation areas.
- Periodic newsletter articles.
- Information bulletins at City Hall and on the website.
- Mailings and/or door hangers when human-wildlife conflicts occur.
- Public presentations as necessary.
- Hazing training to volunteers.

HAZING PROGRAM-COYOTE BEHAVIOR MODIFICATION

When urban wildlife becomes habituated to human presence, it may be necessary to modify the behavior of the animals. Hazing is a process that employs a use of deterrents to move an animal out of an area or to discourage inappropriate or undesirable behavior. Deterrents include noise-making tools such as whistles and horns, items such as spray bottles and bright lights, or simply yelling and throwing objects. Hazing helps to maintain animals' fear of

humans and discourages them from entering into more residential areas. Hazing should never cause harm or injure an animal. If an animal is injured by hazing it may become more aggressive and unpredictable. Hazing should not be used if an animal is trying to avoid humans or is concealed at a distance in its natural habitat.

It is not possible to remove coyotes from the urban ecosystem. Studies have shown that large scale removal of coyotes from an area may invite transient coyotes to remain or increase breeding within the existing population. Hazing is an essential part of the plan to create a safe environment of coexistence and reduce conflicts between humans and coyotes.

GOALS OF THE HAZING TRAINING PROGRAM

1. To change coyote behavior in order to avoid human conflicts. Human behavior has a strong influence on animal behavior. People living in areas where coyotes are present can remove items that attract coyotes to their yards, identify dangerous situations, and respond appropriately to wildlife interactions.
2. To provide residents with educational material and tools to actively participate in reshaping coyote behavior. This will help residents feel safe in their yards, as well as the greenspace and conservation areas.
3. To model hazing behavior and share information about coyotes and their behavior.
4. To develop a long-term community-based hazing program to shape coyote behavior.

HAZING PROGRAM GUIDELINES

1. Levels of hazing need to target coyote activity appropriately.
    a. Coyotes live within the green spaces and conservation areas. If coyotes are demonstrating avoidance behavior, hazing is not necessary.
    b. If coyotes are seen at night or near dusk or dawn, hazing may not be necessary.
    c. Coyotes that do not demonstrate appropriate avoidance behavior in all circumstances should be hazed.
2. Hazing must be exaggerated, aggressive and consistent when first beginning a program. As coyotes learn appropriate responses, it will take less to make them avoid humans. Early in the process, it is common for coyotes not to respond to hazing techniques. Without a history of hostility, they do not have the context to create the desired outcome.
3. Techniques and tools can be used in the same manner for one or multiple animals. Usually there is a dominant animal in the group who will respond and the others will follow. DO NOT ignore, turn away, or avoid hazing because there are multiple animals.
4. The more often a coyote is hazed by a variety of tools, techniques, and people, the more effective the hazing will be in changing the animal's behavior.

5. Hazing must be associated with the person doing the actions. The coyote must be aware of where the potential threat is coming from.
6. Coyotes can and do recognize individual people and animals in their territory. They can learn to avoid or harass specific individuals.
7. Coyotes are creatures of habit. Identifying the habits can help target which behaviors to change. For example if a coyote is reported in the same area at the same time several days in a row, hazers can target their efforts to change the animal's future behavior.
8. Regular hazing can insure that future generations of coyotes learn acceptable behavior.
9. Once hazing begins it must continue until the animal leaves, otherwise the coyote will wait until the person gives up and the coyote will be more resistant to additional hazing.
10. Hazing uses a variety of tools for deterrent. This is critical as coyotes get used to individual items and sounds.
    a. Noisemakers such as voice, whistles, air horns, shaker cans, pots, and pans.
    b. Projectiles such as sticks, small rocks, tennis balls, rubber balls.
    c. Other deterrents include hoses, spray bottles with vinegar, pepper spray, bear repellant, walking sticks, pop up umbrellas.
11. Human behavior must change to support hazing.
12. Education about exclusion techniques, removing attractants, and personal responsibility regarding pet safety are critical parts of a coyote hazing plan.
13. Coyotes are skittish by nature. Habituated behavior is learned and reinforced by human behavior. Coyotes as a rule DO NOT act aggressively toward aggressive people. The one exception is if the coyote is sick or injured. In this case the animal's behavior may be unpredictable. If a sick or injured animal is suspected the City should be contacted immediately.
14. Individuals involved in hazing need to be trained to explain hazing to residents who witness the process. They also need to explain the difference between hazing and harassment of wildlife and goals of appropriate behavior for coexistence.

HAZING TRAINING PROGRAM

Coexisting with wildlife requires a community approach. Hazing activities will need to be conducted by City staff and trained volunteers. Without community support, the program will not succeed and the likelihood of human-wildlife conflict will increase. The Hazing Training Program will include information on coyote ecology, current research, and an overview of hazing techniques. Volunteers will learn about the Coyote Coexistence Management Program, normal and abnormal coyote behavior, and how to respond to questions in the community regarding coyote management. Resident volunteers are the best equipped to respond consistently and at the opportune times in their own neighborhoods, parks, and open spaces.

The Hazing Training Program will empower residents to aid in changing coyote behavior in a safe and consistent manner.

Topics included in the Hazing Training Program will include:

1. Coyote behavior and ecology.
2. Why coyotes are in urban areas, specifically Sunset Valley.
3. Normal and abnormal coyote behavior.
4. Seasonal behavior changes, breeding, pup rearing, and denning behavior.
5. Reality of danger toward people vs. pets
6. Children and coyotes.
7. How human behavior influences coyote behavior.
8. Attractants.
9. Tips on deterring animals from entering private property.
10. Appropriate response when encountering a coyote.
11. What is hazing, including goals, and how to engage.
12. Appropriate hazing techniques
13. Pet safety tips.
14. Lethal control options.

Volunteers shall send detailed accounts to City staff to help track hazing activities. This will help the City determine what has been successful, techniques used and tools needed. The accounts will include the following,

1. Date, time, location, and number of animals hazed.
2. Initial coyote behavior, hazing technique, and coyote response.

Volunteers will also be notified of coyote hot spots and asked to haze in those areas. The Hazing Training Program is essential to coyote co-existence.

RESPONSE PLAN FOR HUMAN-COYOTE CONFLICT

The following charts detail the response plan for various types of human-coyote conflicts. These are the guidelines the City will follow in responding to conflicts. The Hazing Training Program will be offered throughout the year regardless of the conflicts that occur.

SIGHTING/OBSERVATION

Coyotes demonstrating normal coyote behavior.
1. The City will assess the situation and provide necessary training to the residents concerning interaction with wildlife.
2. The City will provide hazing training as requested.

ENCOUNTER

Interaction between wild animals and people that negatively impacts people or their resources or pets, or wild animals and their habitat.
1. The City will assess the situation and provide necessary training to the residents concerning interaction with wildlife.
2. The City will provide hazing training as requested.

INCIDENT

A conflict between a human and a coyote where the animal approaches a human and growls, bares, teeth, or lunges; or injures or kills pets under direct control (leash) of a pet, but no human injury occurs.
1. The Sunset Valley Police Department in cooperation with the Public Works and Environmental Services Department will investigate all aspects of the incident, determine possible causes, and enforce all applicable city regulations.
2. All residents within 500' of the incident will be notified.
3. Information will be placed on the Sunset Valley website and in the monthly newsletter.
4. The City will offer hazing training to all residents within 500' of the incident.
5. If there are more than two documented incidents within a six week period the City may consider lethal control to remove aggressive coyotes.

ATTACK

An aggressive action by a coyote that results in physical contact and injury to a human.
1. The Sunset Valley Police Department in cooperation with the Public Works and Environmental Services Department will investigate all aspects of the attack, determine possible causes, and enforce all applicable city regulations.
2. Texas Parks and Wildlife Department and the Texas Department of State Health Services will be notified of the attack.
3. The City will mail all residents information regarding the attack and will provide educational material regarding wildlife.
4. If the attack occurred within the greenspaces and conservation areas, they may be closed until the investigation has been completed.
5. Depending on the circumstances of the attack, lethal control may be considered to remove aggressive coyotes. Any coyote euthanized will be tested for rabies.
6. The City will offer hazing training to all interested residents and neighboring residential areas.

COYOTE BEHAVIOR and RESPONSE CLASSIFICATION

Coyote Behavior	Classification
Coyote heard howling, yipping, and/or barking.	Observation
Coyote seen moving in green spaces, conservation areas, and crossing streets at dawn, dusk, or at night.	Sighting
Coyote seen resting in green spaces or conservation areas.	Sighting
Coyote following or approaching a person and pet.	Sighting/Encounter
Coyote entering a yard without pets.	Sighting/Encounter
Coyote seen in residential or commercial areas during the middle of the day.	Encounter
Coyote entering a yard with pets.	Encounter
Coyote entering a yard and injuring or killing a pet (witnessed).	Encounter
Coyote entering a yard with people and pets, no injuries occurring.	Encounter
Coyote biting or injuring a pet in the green spaces and conservation areas while pet is not on leash.	Encounter/Incident
Coyote entering a yard and injuring or killing a pet with people present.	Incident
Coyote biting or injuring a pet on leash.	Incident
Coyote approaching a person without a pet.	Incident
Coyote demonstrating aggressive behavior such as baring teeth, lunging, or nipping and no injuries occur.	Incident
Coyote biting or injuring a person.	Attack

These are samples of the types of conflicts that occur and their response classification. Depending on the circumstances of a human-wildlife conflict the City may change conflict classifications to fit the situation. The goal of the Coyote Coexistence Management Program is to reduce human-wildlife conflict to sighting, observations, and minimal encounters. However, if coyote behavior escalates to a point where there are an increasing number of incidents or an attack, the City may take appropriate action. The City has the responsibility to protect public safety. Neighboring cities, such as Westlake Hills, (pers. comm., R. Wood 2013)have had success in curbing aggressive behavior in coyote populations by small-scale lethal removal.

Before this occurs, the City will make efforts to modify human and coyote behavior. The Hazing Training Program is an essential part of the plan to create a safe environment and reduce conflicts between humans and coyotes.

Literature Cited

Adams, C., Higginbotham, B, Rollins, D., Taylor, B., Skiles, R., Mapston, M. and S. Turman. 2005. Regional Perspectives and Opportunities for Feral Hog Management in Texas. Wildlife Society Bulletin. 33(4)1312-1320.

Allen, C., Epperson, D. and A. Garmenstani. 2004. Red Imported Fire Ant Impacts on Wildlife: A Decade of Research. American Midland Naturalist. 152(1):88-103

Bach, J. and J. Conner. 2014. Economics and Human Interactions of the Wild Hog in Texas. Texas Natural Wildlife. http:// agrilife.or/texnatwildlife/feral-hogs/economics-and-human-interaction-of-the-wild-hog-in-texas/. Accessed July 29, 2014.

Baker, R. 2007. A Review of Successful Urban Coyote Management Programs Implemented to Prevent or Reduce Attacks on Humans and Pets in Southern California. Proceedings of the 12th Wildlife Damage Conference.

Baker, R. and R. Timm. 1998. Management of Conflicts Between Urban Coyotes and Humans in Southern California. Proceedings of the 18th Vertebrate Pest Conference. University of California Davis.

Beringer, J., Hansen, L., Wilding, W., Fischer, J, and S.L. Sheriff. 1996. Factors Affecting Capture Myopathy in White Tailed Deer. Journal of Wildlife Management. 60(2):373-380.

Beringer, J. Hansen, L., Demand, J., Sartwell, J., Wallendorf, M. and R. Mange. 2002. Efficacy of Translocation to Control Urban Deer in Missouri: Costs, Efficiency and Outcome. Wildlife Society Bulletin. 30(3):767-774

Beringer, J., Mabry, P., Meyer, T., Wallendorf, M., and W. Eddleman. 2004 Post-release Survival of rehabilitated White-tailed Deer Fawns in Missouri. Wildlife Society Bulletin 32(3):732-738.

Bishop, P., Glidden, J, Lowery, M. and D. Riehlman. 2007. A Citizen's Guide to Management of White -tailed Deer in Urban and Suburban New York. New York State Department of Environmental Conservation.

Campbell, L. 2003. Endangered and Threatened Animals of Texas, Their Life History and Management. Texas Parks and Wildlife Department, Wildlife Division.

Coleman, J., Temple, S. and S. Craven. 1997. Cats and Wildlife, A Conservation Dilemma. University of Wisconsi Cooperative Extension Publications. Madison, WI.

Cromwell, J., Warren, R., and D. Henderson. 1999. Live-capture and Small Scale Relocation of Urban Deer on Hilton Head Island, South Carolina. Wildlife Society Bulletin. 27 (4): 1025-1031.

Curtis, P. and K. Sullivan. 2001. Wildlife Damage Management Fact Sheet Series, White Tailed Deer. Cornell Cooperative Extension, Ithaca, NY.

Davis. C. Leslie, D., Walter, W., and a. Graber. 2010. Mountain Biking Trail use Affects Reproductive Success of Nesting Golden-cheeked Warblers. The Wilson Journal of Ornithology. 122 (3)465-4740

DeNicola, A., VerCauteren, K., Curtis, P. and S. Hygnstrom. 2000. Managing White-Tailed Deer in Suburban Environments, A Technical Guide. Cornell Cooperative Extension. Ithaca, NY.

Dickman, C. 2009. House Cats as Predators in the Australian Environment: Impacts and Management. Human Wildlife Interactions. Paper 27.

Gerht, S., Anchor, C. and L. White. 2009. Home Range and Landscape Use of Coyotes in a Metropolitan Landscape: Conflict or Coexistence. Journal of Mammalogy. 90(5):1045-1057

Grinder, M. and P. Krausman. 2001. Home Range, Habitat Use, and Nocturnal Activity of Coyotes in and Urban Environmen. Journal of Wildlife Management. 65(4):887-898.

Grubbs, S. and P. Krausman. 2009. Use of Urban Landscape by Coyotes. The Southwestern Naturalist. 54(1):1-12.

Hawkins, R. and G. Montgomery. 1969. Movements of Translocated Deer as determined by Telemetry. The Journal of Wildlife Management. 33(1):196-203.

Henke, S. 1995. Effects of Coyote Control on Their Prey. Symposium Proceedings-Coyotes in the Southwest: A Compendium of Our Knowledge. Paper 27.

Knowlton, F. 1972. Preliminary Interpretations of Coyote Population Mechanics with Some Management Implications. The Journal of Wildlife Management. 36(2):369-382.

Knowlton, F., Gese, E. and M. Jaeger. 1999. Coyote Depredation Control: An interface between Biology and Management. The Journal of Range Manangement. 52(5):398-412.

MacCracken, J. 1982. Coyote Foods in a Southern California Suburb. Wildlife Society Bulletin. 10(3):280-281.

Mapston, M. 2004. Feral Hogs in Texas. Texas Cooperative Extension. College Station, TX.

Marks, B. and R. Duncan. 2009. Use of Forest Edges by Free-ranging Cats and Dogs in an Urban Forest Fragment. Southeastern Naturalist. 8(3):427-436.

Morisawa, T. 2000. Red imported Fire Ant: Solenopsis invicta Buren. The Nature Conservancy, Wildlland Invasive Species Program. Alexandria, VA.

Morris, J. and K. Steigman. 1993. Effects of Polygyne Fire Ant Invasion on Native Ants of a Blackland Prairie in Texas. The Southwestern Naturalist. 38(2):136-140.

Morey, P., Gese, E. and S. Gehrt. 2007. Spatial and Temporal Variation in the Diet of Coyotes in the Chicago Metropolitan Area. American Midland Naturalist. 158(1):147-161.

Porter, S. and D. Savignano. 1990. Invasion of Polygyne Fire Ants Decimates Native Ants and Disrupts Arthropd Community. Ecology. 71(6):2095-2106.

Prugh, L., Stoner, C., Epps, C., Bean, W., Ripple, A. Laliberte, A. and J. Brashares. 2009. The rise of the Mesopredator. Bioscience. 59(9):779-791.

Reidy, J., Stake, M., and F. Thompson. (2008). Golden-cheeked Warbler Nest Mortality and Predators in Urban and Rural Landscapes. The Condor. 220(3):458-466.

Reidy, J., Thompson, F., and R. Peak. 2009. Factors Affecting Golden-Cheeked Warbler Nest Survival in Urban and Rural Landscapes. The Journal of Wildlife Management. 73(3):407-413.

Sime, C.A. 1999. Domestic Dogs in Wildlife Habitats. Pages 8.108.17 in G. Joslin and H. Youmans, coordinators. Effects of recreation on Rocky Mountain Wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society. 307pp.

Stake, M., Faaborg, J., and F. Thompson. 2004. Video Identification of Predators at Golden-cheeked Warbler Nests. Journal of Field Ornithology. 75(4)337-344.

Taylor, R. and E. Hellgren. 1997. Diet of Feral Hogs in the Western South Texas Plains. The Southwestern Naturalist. 42(1):33-39.

Taylor, R., Hellgren, E., Gabor, T. and L. Ilse. 1998. Reproduction of Feral Pigs in South Texas. Journal of Mammology. 79 (4):1325-1331

Taylor, R. 1991. The Feral Hog in Texas. Texas Parks and Wildlife Department. Austin, TX.

Texas A&M Agrilife Extension. 2014. Texas Imported Fire Ant Research and Management Project. http://fireant.tamu.edu/ Accessed July 8, 2014.

Texas Parks and Wildlife Department and Texas Animal Health Commission. 2012. Chronic Wasting Disease Management Plan. Austin, TX.

Timm, R., Baker, R., Bennet, J. and C. Coolahan. 2004. Coyote Attacks: An Increasing Suburban Problem. Proceedings of the 21st Vertebrate Pest Conference. University of California Davis: 47-57.

Timmons, J., Cathey, J, Davis, D., Dictson, N. and Mark MacFarland. 2011. Feral Hogs and Disease Concerns. Texas Agrilife Extension Service. College Station, TX.

U.S Department of Agriculture. 2013. Imported Fire Ant: Quarantine Treatments for Nursery Stock, Grass Sod, and Related Materials. APHIS 81-25-001.

U.S. Fish and Wildlife Service. 1992. Golden-cheeked Warbler (*Dendroica chrysoparia*) Recovery Plan. Albuquerque, New Mexico.

Wigley, A. 1995. The Feral Hog: Are They a Damaging Agent on Texas Rangeland? Rangelands 17(6)189-190.

White, L. and S. Gerht. 2009. Coyote Attacks on Humans in United States and Canada. Human Dimensions of Wildlife. 14:419-432.

Winter, L. and G. Wallace. 2006. Impacts of Feral and Free-Ranging Cats on Bird Species of Conservation Concern, A Five State Review of New York, New Jersey, Florida, California, and Hawaii. American Bird Conservancy.

Wood, Robert. Personal Communication with Westlake Hills City Administrator, 2013.

Worcester, R. and R. Boelens. 2007. The Co-Existing with Coyotes Program in Vancouver, B.C. Proceedings of the 12th Wildlife Damage Conference.