The Coyote in Florida

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Executive Summary

Coyotes are medium sized canids in the same family as dogs, wolves, and foxes. They are generally salt and pepper gray or brown with a bushy tail and weigh 9 – 16 kg (20-35 lbs). Tracks resemble those of dogs. Coyotes are habitat generalists and use all habitat types in Florida except dense urban areas. They are opportunistic omnivores, meaning that they eat whatever animal and plant material is most abundant. Although food items include wild species, conflicts with humans arise when coyotes prey on domestic animals such as sheep, goats, chickens, house cats, and consume agricultural products such as watermelons and cantaloupes.

Coyotes can occur singly, in pairs, or in small family groups depending on habitat quality and food supply. Home ranges typically average 10 square miles. They breed once per year during winter months, denning in thickets, brush piles, hollow logs, or burrows. Litters average 6 pups, and they are weaned at 8 weeks. Juveniles may disperse long distances in the fall or stay with their parents 2-3 years and provide care for future litters. In years with high food supply, 2 females in the group may breed, litters are larger, and some young may breed the year after they are born. Most mortality occurs in the first year of life and may exceed 60%; average life span is 5-6 years. In other areas, wolves and cougars kill them, but coyotes in Florida have few natural predators besides man. Coyotes can be legally hunted and trapped year-round, but there is little incentive to do so.

Coyotes should be considered native or naturalized species, not exotics. Fossil fragments recovered from Florida indicate coyotes occurred in the state as early as the late Pliocene (2 million years before present), but coyotes disappeared from eastern North America 12,000 years ago near the end of the last glacial period. After this period, the red wolf was the only canid in the region until the late 1920s when habitat loss and persecution (including government programs) reduced their numbers to near extinction. The extirpation of the wolf and deforestation of eastern forests opened a niche, and the nonspecific habitat and food requirements, large litters, short gestation times, and adaptable nature allowed coyotes to expand eastward. By the 1960s, coyotes had expanded past the Mississippi river into the Southeast. Although private citizens released coyotes in a few places around Florida, Florida Game and Fresh Water Fish Commission (GFC) surveys documented the expansion of coyote populations

from the panhandle southward, which suggested natural expansion as the main source of the current population. In 1983, coyotes were in 18 counties, mostly in the panhandle, but by 1990 they occupied at least 48 counties. In recent years, coyotes have been found in all 67 counties of Florida. Evidence suggests that population levels continue to increase in south Florida, where they recently arrived.

Coyotes have attacked humans only rarely, and most attacks have resulted in minor bites or scratches to adults attempting to save their pets. As with many wildlife species, habituation is a factor but in areas where they are hunted and trapped, coyotes remain wary of people. Coyote depredation on livestock has caused conflicts with humans throughout their range and sheep and calf losses (mainly in western states) amount to millions of dollars each year. In response, tens of thousands of coyotes are killed annually by landowners and by county, state, and federal agencies. The United States Department of Agriculture's (USDA) Wildlife Services in Florida remove only 75-100 coyotes per year in response to livestock depredations, threats to listed species, and potential collisions with aircraft on airport runways.

Efforts at controlling coyote populations in Florida have been temporary and localized. Although coyotes now occur statewide, FWC regional offices receive few complaints about them. Further, livestock losses due to coyotes are not significant relative to other causes. The "Livestock Protection Collar" has been successful in reducing losses but will not be available in Florida until the Florida Department of Agriculture and Consumer Services applies to the Environmental Protection Agency for approval for its use. Coyotes can cause damage to certain agricultural crops, but these losses are low as well. The conflict with potential to affect the greatest number of Floridians and increase the most in the future is coyote depredation on cats and small dogs. Because coyotes are often attracted to garbage, the remedies recommended by FWC staff are the same as for raccoons and bears. While problems with coyotes are currently low, they can be expected to increase in those areas where coyote numbers are still increasing. Attempting to completely eliminate coyotes is both expensive and futile; however, it may be possible to eliminate specific problem coyotes.

The impact and interactions between coyotes and other species is complex and dynamic. Because they prey on a wide variety of common species, coyotes are unlikely to have a significant affect on prey populations. However, predation can be a concern for listed species that are already in decline, such as beach-nesting birds and eggs from sea turtles and gopher tortoises. While some evidence suggests fewer bobcats in areas with coyotes, other studies found no negative impact and niche separation between the species based on food selection. Although birds and their eggs make up a small part of a coyotes diet, they prey on species such as raccoons and foxes that are more abundant and prey more frequently on birds. By reducing populations of these smaller predators, coyotes may improve nest success and survival of turkey, quail, and waterfowl. In the

absence of red wolves and with panthers restricted to south Florida, coyotes may fill an important predator niche in most of the state. Furthermore, coyotes also prey on feral cats and hogs, both species that cause serious ecological damage.

The coyote is classified as a furbearer, and can be legally hunted all year long with guns, dogs, live traps, or snares. A permit is required to use steel traps, to trap on another person's property, or to use a gun and light at night. Possessing or transporting a live coyote requires a Class II captive wildlife permit.

Description

The coyote is a member of the same family (Canidae) as wolves, foxes and dogs. Coyotes are about 1-1.5m (3-5 ft) in length; about 0.6 meters (2 ft) tall and generally weigh 9 to 16 kg (20-35 lbs). Coyote coloration is most often a salt and pepper gray or brown, commonly with a reddish tint and black animals are occasionally seen. The tail is thick and bushy, and generally points downward even when running. They have large, erect, triangle-shaped ears and a long slender muzzle. The coyote is an extremely lean animal and appears underfed even when healthy. Coyote tracks resemble those of dogs but are more elongate and compact than dog tracks. Claw marks are less prominent and middle claw marks usually converge in contrast to the splayed pattern typical of dogs. The coyote's scientific name, *Canis latrans* literally means "barking dog," and they frequently reveal their presence with a chorus of yipping and howling at evening or dawn. Coyotes are a social animal, and these vocalizations seem to function as a greeting among individuals.

General Biology

The coyote is a habitat generalist. In Florida, the coyote uses all available habitats, including swamps, dense forest, agricultural lands, and parks and other green spaces of cities. The only exception seems to be dense urban areas.

Coyotes are opportunistic omnivores, meaning they eat whatever animal and plant material is most abundant. Food in Florida includes prey such as rodents, rabbits, feral cats, deer (adults and fawns), insects, opossums, armadillos, birds, reptiles, amphibians, hogs, livestock, eggs (birds and turtles), and carrion and plant material including palmetto berries, persimmons, black berries, wild plums, wild grapes, cantaloupes, and watermelons. Conflicts with humans occur when coyotes prey upon domestic animals such as sheep, goats, and chickens and eat agricultural products such as watermelons and cantaloupes.

Coyote social behavior is shaped by habitat quality and food supply. Where food and habitat are plentiful, coyotes form larger groups. Generally though, the coyote is less social than wolves and the basic social unit is a breeding pair and their offspring. However, coyotes can occur singly, in pairs, or in small family groups. Coyotes are most active around dusk and dawn.

Coyotes breed only once per year between January and March. They are capable of producing fertile offspring with domestic dogs, but such pairings are not common in the wild. Mated pairs may breed for several consecutive years, but not necessarily for life. Dens are located in thickets, brush piles, hollow logs, or burrows. Gestation lasts about 63 days, and a litter averages 6 (2-12) pups. Young weigh about 250 g (9 oz.) and are blind and helpless at birth. Young are cared for by the mother and occasionally by siblings from a previous litter. The father and other males may provide food to growing young.

Pups are weaned at eight weeks of age but remain with their parents until fall, when they reach adult weight. Dispersal by juveniles usually occurs during fall though some offspring may stay with their parents and provide care to future siblings. Coyotes are capable of extensive movements and some dispersing juveniles have traveled over 160 km (100 miles) from their birthplace. Home range size typically averages 3.9 km^2 (10 square miles). In years with high food supply, litters are larger, 2 females in the family group may breed, and some 1-year old young may breed.

Most mortality to coyotes occurs in the first year of life and frequently exceeds 60%. Average life span is 5-6 years in the wild, but maximum known longevity is 14.5 years. Coyotes in Florida have few natural predators besides man, but in other areas wolves and cougars kill them. Coyotes can be legally hunted in Florida all year long, but low pelt prices provide little incentive for people to hunt them and most animals are killed for sport or to reduce depredation.

Coyote Range in Florida

The first canids in the new world were relatively small, but they evolved into increasingly larger species. The fossil record in Florida contains canid specimens from the same family (Canidae) as coyotes that date from the late Miocene (7 million years before present). This coyote-like species was eventually replaced by a small wolf and the modern coyote did not appear until the wolf line had grown much larger. Fossilized skull fragments from the earliest member of direct coyote lineage were recovered from the Sante Fe River in north Florida and date from the late Pliocene (2 million years before present). Fossil records of a species of large wolf and the coyote disappear from eastern North America in the late Pleistocene (15,000 – 20,000 years before present) near the end of the last glacial period at about the time humans began to inhabit North America and fossils of the red wolf (*Canis rufus*) became evident. From the late Pleistocene until recent years, the red wolf appears to be the only species of wild *Canis* that was present in much of the region. It was described by Bartram in 1791 during his Florida travels and persisted in the east until the late 1920s when habitat loss, broad scale persecution, government control programs, intensive hunting and hybridization with coyotes caused the near extinction of the red wolf (Note: the status of the red wolf as a distinct species remains uncertain.). Without competition from the larger red wolf, the coyote's nonspecific needs in habitat and food, large litter sizes, short generation time, and the ability of the species to adapt to human dominated landscapes they were able to successfully recolonize the eastern United States.

By the 1960s, coyotes had noticeably extended their range beyond the Mississippi River into southeastern states. This range expansion was in part natural, but was also aided by humans who imported and released coyotes to be chased by hounds. Early known releases in Florida included 2

coyotes in Palm Beach County (1925), 26 in DeSoto County (1925-1931), and 11 in Gadsden County (1940s). Coyotes have been noted in Polk County since at least 1970 shortly after several were released by a local fox hunter who believed he was stocking a depleted native fox population with animals sold to him as "black fox."

A survey by Florida Game and Fresh Water Fish Commission published in 1983 indicated that coyotes were reliably present in 18 Florida counties, mostly in the panhandle. The next year, an article in GFC's periodical, *Florida Wildlife,* noted that coyote populations occurred in two discrete locations; in the western panhandle (Gadsden County westward) and in the Columbia County – Hamilton County area. By 1990 coyotes were present in at least 48 counties that included most of the peninsula (Figure 1) and by 1992 they were occasionally seen as far south as Collier County (Roy McBride, personal communication). A cursory survey of coyote tracks and other field sign conducted in south Florida in 1995 found evidence of coyotes in Polk, Highlands, Glades, and Hendry counties. In recent years coyotes have been noted in all 67 Florida counties but their presence in the Florida Keys appears to be restricted to the upper keys.

Human-Coyote Conflicts

There has been little systematic documentation of attacks on humans by coyotes in the eastern United States. However, in California, where a more complete record is available, 89 attacks on humans took place from 1978 – 2003 including one fatality of a 3-year old child. Most of the attacks occurred in southern California where approximately 20 million humans share their living space with as many as 11 coyotes per square mile. Most attacks in California resulted in minor bites and scratches to adults attempting to intervene in an attack upon a pet. In areas where they are hunted or trapped, coyotes are wary of humans. However, most attacks occurred in suburban neighborhoods where wildlife-loving residents rarely showed aggression towards coyotes, allowed them to wander unimpeded through neighborhoods, and even fed them on occasion, with the result that coyotes learned to associate humans with a dependable source of food. This association often led to a sequence of increasingly bold coyote behaviors that typically preceded human-coyote contact, including day and nighttime attacks on pets, attacks on leashed pets, and chasing joggers and bicyclists.

Coyote depredation on livestock has created significant conflicts with humans. Livestock losses to sheep and calf producers amount to millions of dollars each year, primarily in western states. Tens of thousands of coyotes are killed each year by the combined efforts of private landowners, and county, state, and federal agencies. The USDA's Division of Wildlife Services alone killed more than 75,000 coyotes in 2004. These efforts are typically only temporary and localized. In Florida, USDA's Wildlife Services removes 75 -100 coyotes each year due to livestock

depredations, threats to listed species, and for public safety reasons around airport runways.

The best example of a large-scale, concerted effort to eradicate coyotes occurred in Texas. By the 1950's, a multi-decade organized effort by woolgrowers in Texas was successful in creating a "coyote free zone" of approximately 24 million acres in the intensive sheep producing hill country of central Texas. It was accomplished only through a concerted, multi-faceted, and persistent effort by an army of ranchers, their employees, volunteers, and county and state agencies coincident with a lengthy drought. This effort was ultimately thwarted when low prices for wool and lambs and high labor costs caused the conversion of a few sheep ranches in the zone to other uses not dependant upon predator removal. By 1973, coyotes were found in every formerly coyote-free county.

Although they currently reside in every county in the state, FWC regional offices receive very few complaints regarding coyotes. Further, losses due to coyotes are not currently a major concern for livestock producers in Florida (Jim Handley, Florida Cattlemen's Association, Andrew Walmsley, Florida Farm Bureau, personal communication). Since predation on livestock is a learned behavior, ranchers without problems should consider not removing resident coyotes. As territorial animals, non-problem coyotes may prevent other coyotes that may have learned to prey on livestock from becoming established. Should depredations occur, removing the offending animal is more efficient than indiscriminate elimination. In the event that coyote predation becomes a serious issue for Florida livestock producers, the best available remedy is the Livestock Protection Collar (LP). The LP collar is manufactured by the Livestock Protection Company and is used in many western states as well as in a number of other countries. It consists of a bladder filled with pesticide (sodium fluoroacetate, Compound 1080) and mounted on a collar that is affixed to a live animal. The collar exploits the coyote's usual predatory focus on the throat of sheep, goats and calves and therefore it is a highly selective method of predator control compared to leg-hold traps and snares. The Environmental Protection Agency has tested the LP collar and found no secondary toxicity. Use of the collar in Florida is not currently permitted pending application by Florida Department of Agriculture and Consumer Services to the Environmental Protection Agency. However, no application for its use has been sought by the state. Its use should be restricted to areas of the state that are not inhabited by Florida panthers due to the potential risk to them.

Perhaps more significant is the potential impact coyotes have upon crop agriculture. Among the many food items eaten by Florida coyotes are watermelons. Although Florida growers planted 27,000 acres in watermelons and produced a crop worth $67 million dollars in 2004, coyotes have not been reported as a significant nuisance to Florida watermelon growers (Adam

Walmsley, Florida Farm Bureau, personal communication). Of more direct significance to most Floridians is the coyote's established habit of preying upon domestic cats and small dogs and their attraction to garbage. If coyotes become so numerous around and within human communities that predation upon pets and their presence around dwellings becomes a problem, FWC personnel will likely be contacted to alleviate the problem. Many of the remedies that FWC can suggest to residents with coyote problems mirror the technical assistance currently provided residents experiencing bear problems. Problems can be significantly reduced if residents remove attractants (garbage, pet food, and bird seed) and protect their animals (fencing, secure nighttime housing). FWC educational materials and spokespersons should clearly communicate these prevention techniques. The emphasis should be on living with coyotes in the area rather than eradication.

Attempting to eliminate coyotes is both expensive and has proven to be futile. In addition, large scale eradication may be ecologically irresponsible because baits, snares, and leg-hold traps often kill non-target species. Furthermore propulsion baits (M-44, coyote getters) have killed people and are illegal.

Interactions with native species

Data are lacking to precisely describe the impact coyotes have on Florida's wildlife. As a predator, they impact prey species, and as a competitor they impact other carnivores, but both of these systems are dynamic and complex. Coyotes are opportunistic and prey upon many species, but because their food habits are diverse, coyotes are unlikely to significantly affect the population of any single species. Most of the coyote's common prey species, such as white-tailed deer, rodents, and rabbits are common in most of Florida.

Populations of any species are lower in the presence of a competitor, and coyotes usually do not tolerate the presence of foxes or bobcats unless food is abundant. A study of bobcats and coyotes in Avon Park of South-central Florida suggested coyotes had no negative impact on bobcats. Despite inhabiting similar habitats and displaying similar activity patterns, their diets overlapped very little, as bobcats primarily preyed on rodents and rabbits and coyotes consumed primarily large ungulates and large amounts of fruit. Where the ranges of both animals overlap coyotes appear as a common food item of cougars.

Although localized, coyote predation can become a concern for listed species such as the beach-nesting least tern and black skimmer and sea turtle and gopher tortoise eggs. Most of the control efforts by USDA Wildlife Services in Florida are along turtle-nesting beaches to mitigate this (Parker Hall, USDA Wildlife Services South Region District Supervisor, personal communication).

The presence of coyotes in Florida may have some positive aspects. Coyotes may fill part of the niche left vacant when red wolves

were extirpated, and they prey on unwelcome species. Although eggs of ground-nesting birds are a small part of the coyote's diet, these birds may actually benefit from the presence of coyotes. Coyotes also prey upon other predators of bird nests such as raccoons and foxes that exist at much greater densities than do coyotes. Coyotes may reduce numbers of both species improving survival of turkey, quail, and waterfowl. In the absence of red wolves and with panthers restricted to southern Florida, coyotes fill an available predator niche in most of the state.

Coyotes also prey upon feral cats and hogs. Managing feral cats is both controversial and difficult, but the negative impact they have on birds, small mammals, and reptiles (including endangered species) and the competition they constitute for native carnivores is well documented. Coyotes can significantly reduce feral cat numbers. Feral hogs are known to cause severe and wide-spread damage to habitats through their rooting, and they also prey on ground nesting species. Coyotes are not likely to have a major effect on hog populations, but they do prey on smaller individuals.

Status of Coyotes in Florida

The seasons and method of take for coyotes in Florida are very liberal. The FWC Code Book classifies coyotes as furbearers regarding license and tagging requirements and the seasons of take (68A-1.004) and as such, coyotes may be taken throughout the year using guns, dogs, live traps or snares (68A-24.002). However, possession and transport of live coyotes is prohibited unless authorized through a captive wildlife permit from FWC. Coyotes are Class II captive wildlife (68A-6.002).

There are general FWC regulations that affect taking coyotes. No permit is needed to kill coyotes causing damage to personal property, and a landowner may use traps (excluding steel traps) on their own property to catch coyotes. Hunting coyotes at night using a gun and light requires a permit from FWC, as does trapping coyotes with steel traps.

Implications

The coyote should be considered a "naturalized," not "exotic" species because fossil records indicate that they occurred in Florida in pre-historical times and resettled the state in recent decades primarily on their own in a natural expansion of their range. Their presence in Florida may be somewhat beneficial through filling the niche left empty by the eradication of the red wolf, or be no more harmful than the recently-arrived cattle egret. Negative effects of coyotes on native species are less than those caused by hogs and feral cats, and depredation upon livestock is likely less from coyotes than from feral dogs. Little research is available to specify the coyote's impacts on native species, but there is little reason to surmise a strongly negative association. Additionally, coyotes are known to prey on feral cats, an unwanted species that has been implicated in significantly reducing numbers of several species of small mammals, birds, and

rodents. Coyotes may prey on small hogs, which cause wide-spread habitat damage, a more serious threat to native species of animals and plants in Florida.

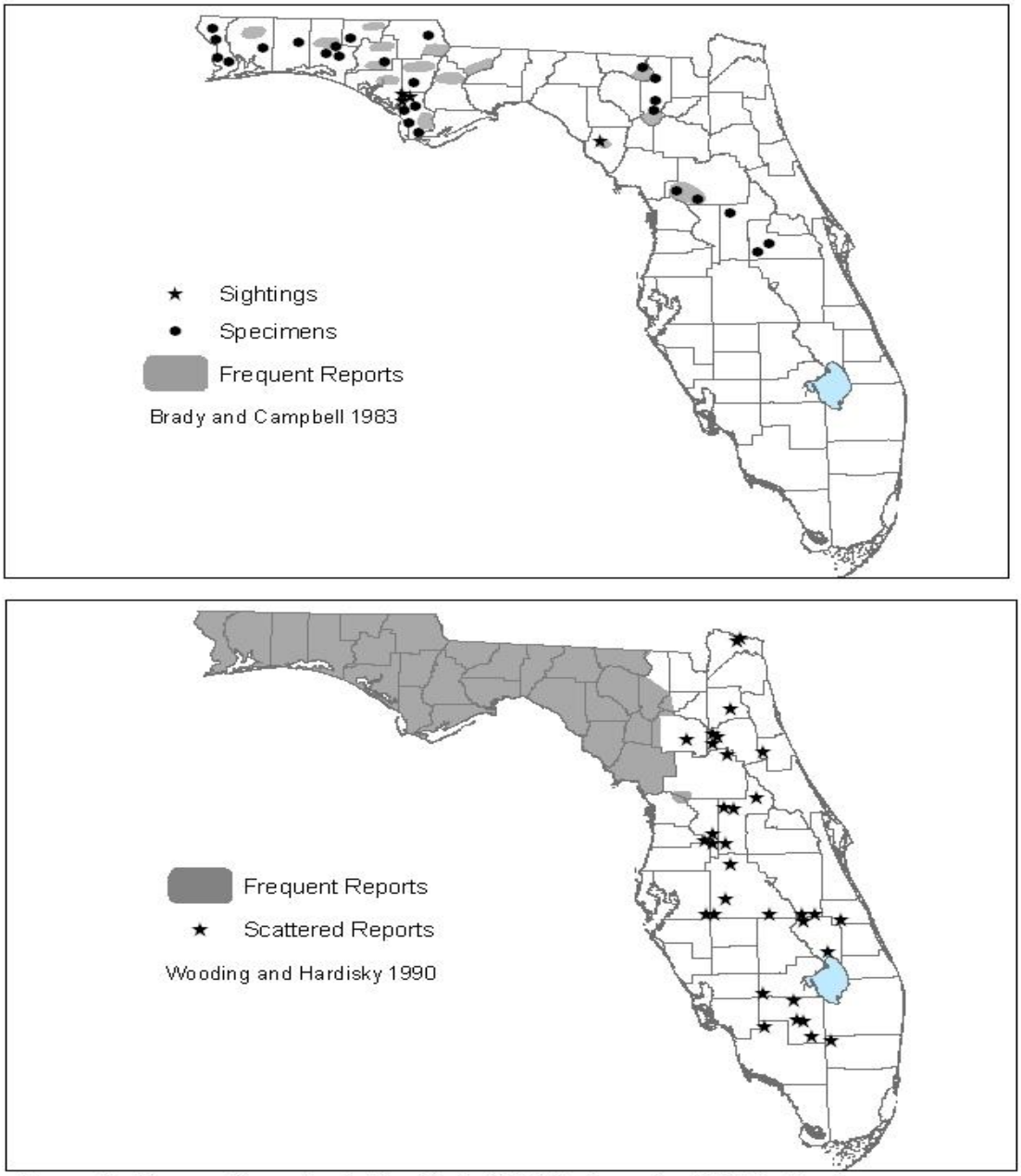

Figure 1. Range of coyotes in Florida in 1983 (top) and in 1990 (bottom).

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