

We are considering . . . moving some portion of the herd into one of the impoundments to allow the ponies to graze on the plants for a while, to clear away undergrowth and use their hooves to punch in seed. The waste will be broken down by other invertebrates and microorganisms, and that becomes nutrients for worms and other things shorebirds feed on. . . . It is something that needs to be looked at and studied, but it might be possible to use the ponies in my wildlife management practices. (Personal communication, May 21, 2010)

People like easy explanations and cause-effect relationships. Ecology, however, involves a complex, ever-changing web of relationships, many of which are poorly understood. A change in one part of the web can cause unexpected problems in another part.

The marsh snail (or marsh periwinkle, *Littoraria irrorata*) is found in salt marshes all along the Atlantic coast and is most abundant—as many as 1,500 snails per square meter—in “die-back” zones, where large areas of *Spartina* are dead or dying (Bertness et al., 2004). This predilection led ecologists to conclude that *Littoraria* is a detritivore that feeds on microorganisms that live on decomposing plants. As it turns out, the snails were actually causing the die-offs to supply themselves with food. Grazing *Littoraria* damage the stalks of live cordgrass, creating lesions that become infected by the fungus that is their primary food. In this way the snails cultivate crops of nutritious fungi, fertilizing it with their dung. Snail grazing and fungus growth kill the cordgrass and causes marsh die-offs. Crabs preying on the snails keep the population in check, minimizing die-offs. Overharvesting blue crabs may be an important contributor to die-offs. Horses also eat cordgrass, but without destroying it, and their grazing thwarts die-offs by increasing the population of crabs (Levin et al., 2002) and limiting the population of *Littoraria* snails (Turner, 1987).

When one component of an ecosystem veers off-balance, other components are affected. Until recently, the grazing of lesser snow geese (*Chen caerulescens caerulescens*) strongly benefitted south-central salt marsh communities. These geese spend their summers grazing the Hudson Bay lowlands, then each fall migrate along the Mississippi and Central flyways to winter in Texas and Louisiana. When the geese were surveyed 30 years ago, 600,000 of them (Bertness et al., 2004) grazed these southern marshes and fertilized them with their nitrogen-rich excrement, causing plants to quickly regenerate. Goose population size was limited by the availability of food in the Gulf salt marshes. When farmers along the migration route began using nitrogen fertilizer and high-yield crops in the 1960s, lesser snow geese stopped to feed on corn, soybeans, and wheat, and their reproductive rate sharply increased. Many of these birds began to winter in Arkansas and Missouri, foraging on crops, and many more survived the winter. Today, the census counts 3 million birds, which is probably half the actual total. After gorging on grains all winter, the birds return to the Hudson Bay area to breed alongside Canada geese and destroy the vegetation in the marsh above and below ground. A single goose can strip a square meter (10.8 ft²) of marsh in an hour, creating a barren mudflat that is unlikely to recover while occupied by geese (Bertness et al., 2004).

Historically, the Atlantic flowed directly into Currituck Sound via inlets, creating a high-salinity estuarine habitat favorable to oysters and eelgrass and a nursery for saltwater fish (Lloyd, 2006). When the three closest inlets—New Currituck, Caffeys, and Roanoke—closed between 1795 and 1828, Currituck Sound became an estuary of increasingly fresh water fed by the tannin-rich rivers draining the Great Dismal Swamp. Shellfish beds disappeared, and sunlight filtered down through the shallow waters and encouraged the growth



At Mount Rogers National Recreation Area and the adjacent Grayson Highlands State Park, the U.S. Forest Service and the state of Virginia use Shetland Ponies to maintain scenic grassy vistas by limiting the growth of brushy plants.

of aquatic vegetation such as wild celery and wigeon grass. Migrating waterfowl, always plentiful, flocked to this banquet until they literally blackened the sky in a phenomenon known by the locals as “smoke” (Lloyd, 2006). Recreational hunters were secretive about the whereabouts of their hunting grounds. An exclusive invitation-only organization known as the Currituck Hunting Club purchased more than 3,000 acres/1,214 ha of waterfowl habitat by 1857 (Lloyd, 2006). Following the Civil War, word of the bountiful waterfowl had spread, and affluent Northerners established more than 100 hunt clubs within a 50-mi/80-km radius of Currituck Sound. Wealthy and powerful men such as J.P. Morgan and Andrew Carnegie made annual pilgrimages to Currituck Banks to hunt waterfowl, as did hunters and fishermen of lesser means. The economy centered on the waterfowl hunting business, with locals working as guides, offering lodging to hunters, and guarding hunting grounds from poachers.

Currituck’s waterfowl population, once seemingly infinite, has taken many devastating hits over the past few centuries. Market hunters shot great numbers of wild ducks for commercial sale, using enormous guns up to 10 ft/3 m in length mounted on flat-bottomed “punt” boats propelled by poles (Lloyd, 2006). One shot could slay as many as 100 ducks. Working in a team of about 10, each gunner could kill up to 700 ducks in a single day. Around the turn of 20th century, the seemingly inexhaustible flocks grew sparse, not only around Currituck Sound, but all along the Atlantic Flyway.

Thousands of adult snowy egrets were killed in the breeding season, when their plumes were most beautiful—leaving their chicks to starve in the nest. After Congress tightened restrictions, birds were still shot for the black market and shipped in trunks, suitcases, butter

firkins, egg crates, horse trailers, and the carcasses of other animals. In 1902, a raid on one cold-storage house in New York yielded 8,058 snow buntings, 7,607 sandpipers, 5,218 plover, 7,003 snipe, 788 yellow legs, 288 bobolinks, 96 woodcock, 7,560 grouse, 4,385 quail, and 1,756 ducks. Most of these birds were illegally hunted, and fines would have totaled \$1,168,315 had they been imposed (Hornaday, 1913).

Fashion-conscious women and their hatmakers created a seemingly insatiable demand for feathers, and the rarest and most exotic species fetched the highest prices. Species facing extinction brought the highest prices of all. Even hummingbirds were hunted relentlessly to be sold to European hat manufacturers. In 1911, three London millinery-trade auctions included the plumage from 129,168 egrets, 13,598 herons, 20,698 birds of paradise, 41,090 hummingbirds, and 9,464 eagles and condors put on the block (H.R. Doc. No. 1447, 1913b). Before April 1911, when Governor Dix signed the Bayne law and halted the sale of wild native game in the state of New York, Currituck County saw the slaughter of about 200,000 wild fowl annually (H.R. Doc. No. 1447, 1913a). Members of sportsmen's clubs could shoot without limit, often bagging 150 or more birds on a two-day hunting trip. Coveting the money that wealthy sportsmen brought in and fearing the consequences of antagonizing them, local and state governments made no move to limit their excesses.

By 1913, Currituck County had earned a reputation as “the bloodiest slaughter-pen for waterfowl that exists anywhere on the Atlantic Coast” (Hornaday, 1913, p. 292). Hunters plied their trade without bag limits, even during the nesting season, and shipped vast quantities of birds to Northern restaurants and dealers.

Habitat loss and wanton hunting caused the American passenger pigeon (*Ectopistes migratorius*) population to collapse from 5–6 billion birds to ignominious extinction in less than 100 years. It appeared that the waterfowl of the Atlantic Flyway would soon follow suit. When President William McKinley signed the Lacey Act (16 U.S.C. §§ 3371–3378) into law in 1900, it became illegal to trade or sell wildlife, and many commercial killing machines were silenced, though illicit market gunning continued for decades. Hunt clubs encouraged the avian population to recover by limiting hunting to strictly defined seasons, creating refuges on key portions of their property, prohibiting spring hunting, and imposing bag limits on game. The National Audubon Society incorporated in 1905 as a grassroots conservation agency. In 1918, the Migratory Bird Treaty Act (16 U.S.C. §§ 703–712) protected over 800 species by making it illegal to possess these birds, alive or dead, intact or in part, including feathers, eggs, and nests. From his 7,000-acre/2,800-ha estate on Mackay Island in Currituck Sound, Joseph Palmer Knapp organized international conservation efforts for migratory waterfowl that became Ducks Unlimited in 1937. Knapp's estate later became Mackay Island NWR.

Besides the challenge of heavy hunting pressures, waterfowl populations have suffered large, mysterious die-offs. By the middle of the 20th century 3,000 tons/2.7 million kg of expended lead shot was piling up in the marshes every year, and it was ingested by waterfowl in great quantities. Roughly 2 million ducks succumbed to lead poisoning every year, and many more became chronically ill and slowly wasted away (Bolen, 2000). The birds of Currituck Sound and Back Bay were afflicted in great numbers—yet hunters opposed legislation that would require nontoxic shot, fearing that it would be more expensive or damage their weapons. Ammunition manufacturers, reluctant to retool to accommodate new materials, also resisted a shift away from lead.



After initial problems, the sea-to-sound barrier has been generally effective in keeping wild horses north of Corolla. Yet careless motorists continue to maim and kill horses in vehicular accidents on the beach.

The connection between lead ingestion and waterfowl die-offs was recognized in 1874. Lead shot remained entirely unrestricted until 1975 when hunters were required to use steel shot at locations where more than 5% of the ducks harvested were positive for lead ingestion. In 1986, the secretary of the Interior finally imposed a nationwide ban on lead shot for waterfowl hunting in the United States, which took effect in 1991. This ban reduced mortality from lead poisoning in mallards by 64% in the Mississippi Flyway alone and probably saved about 1.4 million ducks annually in the United States in the first years after its enactment (Bolen, 2000).

In the late 19th century, epizootics also devastated the duck population in California, Utah, and other western states, sometimes leaving more than 1,000 dead birds to the acre (2,500/ha) (Bolen, 2000). Outbreaks also occurred in North Carolina and the Chesapeake Bay region. Some killed more than a million birds, and mortality of half that number was not uncommon (Locke & Friend, 1989). The best minds of science could not find a cause, though it appeared that toxins such as the chlorides of calcium and magnesium were responsible. Decades later, in 1930, researchers determined that botulism was the true culprit, and it was somehow related to the multitude of aquatic invertebrates dying on mud flats (Bolen, 2000). As it turns out, *Clostridium botulinum* lives in the wetlands as spores, ready to proliferate under the right conditions. When something shifts the balance and causes a large die-off of invertebrates and other small fauna, *Clostridium* spores germinate and produce toxins. When waterfowl feed on the toxin-ridden remains, they die. The maggots that feed on the carcasses also contain high levels of *Clostridium* toxins. Sudden fluctuations in water level, pollution, and agricultural runoff can precipitate an outbreak of avian botulism.

Today, waterfowl are challenged by environmental contaminants, invasive plants, and the insidious creep of development (Pease, Rose, & Butler, 2005). Despite improvements in

several water quality elements, submerged vegetation has apparently declined in Currituck Sound and Back Bay since tide locks were removed from the Albemarle and Chesapeake Canal, allowing brackish water from Chesapeake Bay to enter through the Elizabeth River.

Bhattacharyya et al. write,

Interviews with some field managers—resident and nonresident in the area—indicate a tendency to rationalize land use and range management decisions as though the manipulation of a single species (in this case horses) could rectify a century of environmental degradation that has occurred as a result of multiple disturbance factors. In reality, horses are one of many elements impacting ecosystems, any or all of which may require active management in areas where the land becomes degraded. (2011, p. 624)

Some managers of federal lands reject free-roaming horses out of hand as an invasive exotic species that can only cause damage. Many public land managers are pressured by professional wildlife biologists and wildlife interest groups who themselves are heavily biased against wild horses (Vavra, 2005). Others are more open to solutions that accommodate horses as a *resident* species, native or not.

Although horses and hogs are vastly different species that occupy different ecological niches, the Currituck NWR conservation plan makes no distinction between the two, stating unequivocally that “feral hogs (*Sus scrofa*) and horses (*E. caballus*) have overgrazed areas near Carova Beach to the elimination of habitat for native mammal species” (USFWS, 2008, p. 36). Later in the document, under the heading of “Pest Animals,” the agency appears less certain: “Animals such as feral horses, feral hogs, and nutria *may* [emphasis added] have an impact on habitat and other species, but the Service does not currently staff or fund the refuge to investigate that impact” (p. 88).

In fact, ongoing research has demonstrated that the horses cause no lasting damage to the refuge. Rheinhardt and Rheinhardt (2004) studied the Currituck Banks herd as it foraged on the refuge and found that the herd (including two donkeys) was well below the carrying capacity of the range. They concluded that horses do affect native vegetation “primarily via cropping and trampling” (2004, p. 258), but any damage is temporary. Horses consumed few forb (herbaceous) species, preferring instead graminoid (grass) species, which “seem to recover from grazing by early summer when primary production is highest” (2004, p. 258).

Photographs presented by McCalpin at the July 27, 2010, hearing on H.R. 5482 (the Corolla Wild Horses Protection Act) showed no evidence of overgrazing in the vicinity of six 16 ft x 16 ft/4.9 m x 4.9 m enclosures on refuge property (McCalpin, 2010, July 27). At the 2009 census, only eight members of the 121-horse herd were counted foraging on federal land—a population clearly too small and diffuse to impact the environment to any measurable degree. The Wild Horse Fund argued that over a 3-year period, there were never more than 26 horses counted on Fish and Wildlife Service property (CWHF, 2008). Her testimony in 2011 (*H.R. 306, Corolla Wild Horses Protection Act, 2011b*), included the following figures:

- Before 2006, no official census records were found in CWHF archives. Beginning in 2006, aerial counts were conducted by the CWHF Herd Manager and the CNWR Manager . . .
- 2006—119 horses . . .



A mare crosses a tangle of sand fencing in the village of Carova. The sure-footedness of Banker horses is legendary, largely because they learn to negotiate endlessly varied obstacles in their life in the wild.

- 2007—94 ... 26 horses on CNWR property; 68 on private property; 0 on NCNERR
- 2008—101 ... 23 horses on CNWR property; 74 on private property; 4 on NCNERR
- 2009—88 ... 0 horses on CNWR property; 84 on private property; 4 on NCNERR.
- 2010—115 ... 35 horses on CNWR property; 71 on private property; 9 on NCNERR

In March 2010, the Currituck NWR fenced two large areas with electrified high-tensile wire to determine the impact horses have on the barrier island environment—143 acres/58 ha in Swan Beach, and 135 acres/55 ha in North Swan Beach. Thirteen horses grazed the North Swan Beach tract at the time the fence was erected. Refuge staff literally built the fence around these horses, trapping them, and then asked the Wild Horse Fund to extricate the animals. Stallings complied, but the evicted horses were displaced into the home ranges of other existing harems (McCalpin, 2010, July 27).

For days, the expatriate horses battled with the resident band and resisted its efforts to drive them away. Harem stallions clashed violently over mares, sustaining cuts and bruises, and one pregnant mare from the displaced group miscarried a foal that was very close to full term (McCalpin, 2010, July 27). Another mare, apparently healthy when removed from the enclosure, dramatically lost condition over the next month and was euthanized after an heroic attempt to save her life.

Feral horses occupy a home range and will attempt to return to it if moved (Goodwin, 2002). Horses have been known to travel more than 9 mi/15 km to return to a home range.



If enough people work together to protect them, wild horses will continue to roam free on the Outer Banks.

The displaced horses wandered up and down the fence, eating grass near the border of their former home ground, trying to get back in, and competing with other horses for resources in the area to which they were banished.

The Currituck NWR built the enclosures to evaluate how the ecosystem functions in the absence of horses. In actuality, the area surrounding the enclosure was used much more heavily and irregularly by horses than it would have been without the fence. Stallings expressed doubt that the results of this experiment are meaningful: “A 12x12 or 16x16 foot enclosure would provide more accurate results, because it does not displace horses from their home ranges” (personal communication, May 25, 2010). “If a stallion has raised a family in a home range, when removed from the 100 acres he will stay as close to the excluded land as possible and possibly overgraze the borders, whereas if the exclusion site were open to horses, the grazing would be more evenly distributed.”

Meanwhile, development continues to boom on the northern Banks. Horses graze amid real estate signs that mark where the next homes will be built. Stallings maintains that development poses a greater threat to sensitive species than do horses. “Each house has a septic field and a well,” he explained. “The water table is high here. Eventually water quality will become affected, and plants adjacent to septic systems will hold toxins detrimental to the environment” (personal communication, May 25, 2010).

“Horses don’t destroy grass,” Stallings says. “They mow it to a height of 4–6 inches, which is no different than trimming a shrub at your house to a proper level” (personal communication, May 25, 2010). Moreover, light grazing stimulates plants to grow lower and denser (Taggart, 2008).

The fence keeps the horses out of the paved and thickly settled village of Corolla, but the problems it was meant to solve remain. Horses are still being hit by vehicles and left to die slowly, only now the vehicles are 4x4s and ATVs on the beach. Three horses were struck by vehicles in 2009. A young foal was hit on the beach by a reckless driver and was euthanized

while his mother stood nearby, unwilling to leave him. “Most of the incidents are centered around Carova,” says Stallings (personal communication, May 25, 2010).

T-Rex, a Corolla stallion in the prime of his life, was struck by a hit-and-run driver in March 2009. The driver knew that she had hit him, but did not report the accident, leaving him to suffer for many hours, in agonized terror, shaking from the effort to remain upright, until the vet finally came to euthanize him. The driver—a recent college graduate whose parents own a beach house in Carova—owned up to the crime more than *two months* after the incident.

Two months later, Spec, another proud stallion featured in a Wild Horse Fund brochure, was struck and left to suffer. It appears that ATVs were being used to chase the horse around the beach at 1 or 2 a.m. before one hit him from the side with force enough to snap his leg in two. With his leg dangling by a piece of skin, in unimaginable pain, Spec dragged himself almost a mile (1.6 km) across sand and dunes to return to his band. Spec suffered for hours before he could be euthanized. McCalpin wrote, “Spec did not want to die and he fought and struggled long and hard” (2009, May 24). “It was gut wrenching. It was a waste. It was sickening. He was terrified.”

In her first four years as director of the Corolla Wild Horse Fund, McCalpin experienced the deaths of 19 horses. In 2009, a lactating mare almost died of agonizingly painful colic after being fed by a resident. This mare was lucky—she lived. Horses are exceptionally vulnerable to digestive disturbances and cannot vomit. A horse’s intestines contain great lengths of loopy, mobile, narrow, winding passages that can easily twist, shift, or become obstructed. Consuming unusual foods, even those enjoyed by domestic horses, can kill a wild horse. A lactating mare died of colic in 2006. Attempts to bottle-feed her newborn colt were unsuccessful, and he died shortly after she did. Then in 2008 another horse died after eating moldy alfalfa hay put out by some well-meaning person. Every death subtracts rare and possibly irreplaceable genes from the herd.

Unintentional killings are heartbreaking enough, but, incomprehensibly, there have also been premeditated shootings. From 2001 to 2008, seven horses were gunned down in cold blood and left to decompose (Hampton, 2001; Owens, 2008). The shooters are still at large despite a \$12,550 reward for information leading to their arrest.

Although it is illegal to approach closer than 50 ft/15 m to a Corolla horse, and a \$500 fine awaits anyone who violates the statute, people still ignore the boundaries. In 2009, a mother sat by while her two young boys walked up to a stallion and patted him on his hindquarters, oblivious to the danger of even a casual kick. A mother and father attempted to place their child on the back of an unbroken wild horse for a photograph (Hampton, 2009). A woman walked down the beach alongside a group of mares. A family renting a cottage was charged by a stallion when they approached for pictures. A tour group operator prevented a group of children from shooting at a harem of horses with paintball guns (McCalpin, 2011, March 21).

Although the Corolla horses are maintained as wildlife, and herd managers do not typically interfere with natural sickness and death, the Wild Horse Fund rescues and rehabilitates wild horses injured by encounters with people. Horses are treated in the wild whenever possible. Some problems are fairly minor, such as the colt with a can stuck on his hoof or the filly with a fishhook caught in her leg. One mare was trapped in a deep rut where she would have drowned if not extricated. Another mare managed to ensnare her head in a tomato cage.



As lethal as a gun, but much slower acting, concentrated grain pellets can kill a wild horse geared to digesting high-fiber, low-energy grasses. Here somebody dumped a bag of grain on the ground in Swan Beach, presumably to attract horses and bring them within easy viewing range. The herd manager, with the help of the author, scooped the hazard into plastic bags before any horses were poisoned.

Another horse was trapped in a deep, flooded canal till she was saved by Kimberlee Hoey, president of the board of directors for the Wild Horse Fund. Hoey ran from dock to dock, climbing fences and clawing through heavy brush, pushing the mare with a lunge whip. Determined that the horse would not drown, she forced her to swim north toward the nearest break in the bulkhead and guided her to safety.

As if to intensify pressure on the horses from development and traffic, in December 2013, the Fish and Wildlife Service erected 2.9 mi/4.7 km of 15-gauge, 4-strand, 4-point barbed-wire fence, which connects with an existing 142-acre parcel surrounded by high tensile wire electric fence. The combination effectively transformed the entire Swan Beach Unit of Currituck NWR, 1,390 acres/563 ha, ocean to sound, into an enclosure that restricts access by horses and deer, but freely admits destructive feral hogs (Corolla Wild Horse Fund, 2013; Hampton, 2013; U.S. Dept. of Interior, 2010). The agency's reasoning is elusive. Barbed wire is difficult to see and frequently maims or kills not only horses, but also other wildlife, notably deer and large birds such as owls. Kline (2005) says authoritatively that it "should never be used for horse fencing." The Service strung the fence on uncapped metal t-posts, which pose a risk of impalement. Because the refuge has no regularly assigned staff, this fence cannot be monitored. It is easy to foresee that entangled horses, deer, or off-roaders might suffer for hours or days awaiting help. The Corolla Wild Horse Fund posted a photograph of this fence on Facebook, and within days hundreds of outraged people barraged the agency and local politicians with demands to remove it. Yet the fence still stands.

Volunteers must permanently remove some injured horses from the wild. Once a horse relies on humans for its care or is exposed to the diseases carried by domestic horses, it



Horses feed and nap on the lawn surrounding a community of beach houses near Carova. When development transformed their home ranges into suburban outposts, the animals adapted by using the manicured lawns as a food source. Some of the visitors taking horse tours to view the animals are disappointed to find them lounging in back yards and carports rather than galloping wildly down an empty beach.

can never rejoin its wild brethren. Veterinary care is expensive, as are boarding fees. Horses unable to return to the beach must be gentled and trained for months before they are suitable for adoption.

Rescues are resource-intensive. When capturing a Corolla horse, volunteers use steel panels to set up a “chute” to funnel the horse into a trailer. The group surrounds the horse and closes the circle toward the trailer. The horse then takes a 2-hr ride to the Dominion Equine Clinic in Suffolk, Va., a hospital with the staff and experience to manage wild horses (CWHF, 2008). In the past few years, many horses have been saved from certain death, including Uno, Tresie, Sunny, Hope, Croatoan, Manteo, Pomiatic, Suerte, Tradewind, Valor, Barb, and Rainbow.

A young black stallion, Edward Teach (a.k.a. “Blackbeard”), was rescued after a bite wound laid open his neck during a fight with a rival stallion. *En route* to Dominion Equine Clinic he kicked 15 dents in the trailer. After more than \$2,500 worth of veterinary care, the stallion was healed. Unable to return to the herd, he was trained to saddle by Steve Edwards of Mill Swamp Indian Horses in Smithfield, Va., and was eventually adopted.

Rainbow, a black yearling filly, sustained a puncture wound above her chest. Infection traveled up her neck to within 0.25 in./6 mm of her jugular vein and blew out a hole near her jowl almost the size of a tennis ball. Stallings and CWHF volunteers captured her. Dominion Equine Clinic brought her back to health, improved her nutrition, and used physical therapy to return flexibility to her neck. Visitors can see her at the Island Farm, a living-history site near Manteo.



In 2012, the Corolla Wild Horse Fund rescued a curious young horse that ascended a flight of stairs and was unable to get down. It also rescued one horse who got a tomato cage stuck on its head and neck, potentially life threatening—or blinding—for the horse. Photographs courtesy of the Corolla Wild Horse Fund.



Suerte, from the Spanish for “lucky,” was rescued near death after he had ingested something toxic, perhaps antifreeze. Sunny, another young foal, was orphaned when her mother was stolen by another stallion. Young foals must be bottle-fed every 2 hr, so Stallings took the night shift, sleeping in his truck between feedings. McCalpin says, “These little horses have the strongest will to live that I have ever seen” (2009, August 24).

Sometimes horses are removed for their own good. Croatoan, Red Feather, and Swimmer were all escape artists who would not stay between the fences of the north beach and were likely to be struck by vehicles in town. Croatoan was so thin and weak when he was captured in March 2007, a well-meaning bystander pleaded for his euthanization because he was “old and hungry” (Edwards, 2008). As it turned out, he was only 11 years old, and with medical attention and good nutrition he achieved robust health. Edwards found him surprisingly easy to train. A few months after his capture, young children were using him in riding lessons, and a 10-year-old student rode him in the 2007 Smithfield Christmas Parade. In 2009, the Horse of the Americas Awards Committee gave 8-year-old Sarah Kerr-Applewhite its Buckaroo Award for her long-distance riding accomplishments on Croatoan.

In 2006 a young stallion was removed from the herd and gelded after he begged a resident for food, then knocked her down and injured her when no food was forthcoming. People had been feeding him, so he grew bold and aggressive. A mare named Baton Rouge was removed because she would bite people who came too close, and she gained a new career as a lesson horse.

An adoption system places Corolla horses in loving homes from Texas to Maine. Some are maintained in off-site breeding programs so that the Banker Horse might not become extinct if a disease or disaster devastates the island herds. Some are halter-trained before adoption, and some are broken to ride. Martin Community College in Williamston, N.C., trains adoptable Corolla horses as part of its degree program in equine technology. The goal is to place horses in good “forever” homes.

Adopters must demonstrate that they have the knowledge and skills to care for a horse. They are required to provide a shelter or box stall and an outside corral that is at least 20 ft x 20 ft/6 m x 6 m and at least 5 ft/1.5 m high, made of approved, sturdy materials such as pipes or planks. Barbed wire is forbidden because of the horrific injuries a horse may sustain if he becomes entangled. It is easy to adopt a horse in an impulsive emotional rush, but much harder to commit to the daily reality of feeding, watering, cleanup, expense, and meaningful interaction over the long term. A horse can live 20, 30, or even 40-plus years—as much as half a human lifetime.

The legend of Betsy Dowdy’s midnight marathon underscores the stamina and heart of the North Carolina Banker Pony. Feats of endurance are well within the repertoire of a marsh pony. Edwards (2011) wrote,

Exactly what can one expect from a Corolla Colonial Spanish mustang? I can only speak from experience. They are the easiest horses to train with which I have ever worked. They are strong, easy-keeping horses with incredible endurance. Many of our horses have completed rides of 50 miles in a day.

Tradewind, the 2011 Horse of the Americas Registry’s National Pleasure Trail Horse of the Year, is a 12.2 hand stallion, weighing 626 pounds in peak condition. In 2011 he carried me 206 hours in the woods, the vast majority of those hours either trotting or cantering. This does not include the many hours that others rode

him on the trails. At the time my weight was from 212 to 222 pounds. He did so even though he was captured because he was utterly crippled with founder. He is now wonderfully recovered and has produced two beautiful colts.

The Corolla horse is one of the oldest and rarest strains of Colonial Spanish Horse in the United States. They can trace their ancestry through centuries of free-roaming horses that probably descend from the initial Spanish horses to set hoof in the New World. Other breeds have contributed their genes over the years, but their conformation gives little hint of these introductions. Mill Swamp is one of the off-site breeding farms that raise domestic Banker Horses in an attempt to continue this rare, ancient lineage. Edwards (2011) writes,

We rehabilitate and train these horses and breed them domestically, not as a replacement for the wild herd, but as a safety net in the event that the wild herd is destroyed by bureaucrats, developers, or a natural catastrophe. The off-site breeding program is designed to insure that these horses, which are the state horse of North Carolina and are among the rarest and oldest distinct genetic grouping of American horses, will always be with us.

It is equally important, however, to preserve this breed as free-roaming. Wesley Stallings, herd manager, believes that a designated wild horse sanctuary would be an optimal solution. He envisions a fenced area that limits the wild horse range to the marsh, maritime forest, and high ground such as Penny Hill. The marsh would meet the majority of the horses' nutritional needs. The high dunes would provide the same benefits as the beach—strong breezes and insect relief. The horses would remain safely out of the way of traffic, and the prime beachfront property valued by developers would be available for vacation homes. A greenway or boardwalk could allow people to observe the horses in their natural environment from a safe distance. Admission fees would enable the Corolla Wild Horse Fund to better preserve and maintain the herd.

The Fund works tirelessly to raise public awareness and support of the Corolla wild horse. More than 1,000 schoolchildren petitioned to have the Colonial Spanish Mustang designated the North Carolina state horse, a dream that was realized in 2010.

These horses and their ancestors have ranged freely over the dunes of Currituck County for hundreds of years, and cling to existence in the windswept wilds north of Corolla. "It is their last stand—all that remains of their habitat," says McCalpin (2011, February 28).

These animals owe their liberty to the advocates who have battled so relentlessly on their behalf. With continued providence and careful protection, these beautiful horses can remain free on the shifting sands that cover the bones of their ancestors; but maintaining a viable herd will require deliberate conservation efforts. Says Edwards (2011), "Extinction lasts forever and the clock is ticking."

References

- An Act Relating to Fences, and for the Protection of Crops. (1873). NC Sess L 1873 ch 103.
An Act To Place Certain Portions of Currituck County under the State-Wide Stock Law. (1937). NC Sess L 1937 ch 389.
An Act To Place Certain Portions of Dare County under the State-Wide Stock Law. (1935). NC Sess L 1935 ch 263.

- Altman, J. (2009). *Cape Lookout National Seashore seabeach amaranth (Amaranthus pumilus): 2009 report*. Retrieved from <http://www.nps.gov/caloparkmgmt/upload/CapeLookoutNationalSeashoreSeaBeachAmaranth-2009.pdf>
- Anderson, E.W. (1993). Prescription grazing to enhance rangeland watersheds. *Rangelands*, 15(1), 31–35.
- Anderson, V.D. (2002). Animals into the wilderness: The development of livestock husbandry in the seventeenth-century Chesapeake. *William and Mary Quarterly, 3rd Series*, 59(2), 377–408. Retrieved from <http://www.jstor.org/stable/3491742>
- Andreoni, F. (1998). *Evaluating environmental consequences of feral horses in Guy Fawkes River National Park: A report to National Parks and Wildlife Service*. NR 490 Project. Armidale, New South Wales, Australia: University of New England.
- Ashton, A. (2005). *Bark chewing by the wild horses of Guy Fawkes River National Park, NSW: Impacts and causes* (Unpublished B.Sc. honors thesis). University of New England, Armidale, New South Wales, Australia.
- Bakker, J.P. (1985). The impact of grazing on plant communities, plant populations and soil conditions on salt marshes. *Vegetatio*, 62(1–3), 391–398.
- Barber, D.C., & Pilkey, O.H. (2001). *Influence of grazing on barrier island vegetation and geomorphology, coastal North Carolina*. Paper No. 68-0 given at the Geological Society of America Annual Meeting, November 6, 2001. Retrieved from https://gsa.confex.com/gsa/2001AM/finalprogram/abstract_28327.htm
- Barlow, C. (2000). *The ghosts of evolution: Nonsensical fruit, missing partners, and other ecological anachronisms*. New York, NY: Basic Books.
- Barth, J.E. (2010). “The sinke of America”: Society in the Albemarle borderlands of North Carolina, 1663–1729. *North Carolina Historical Review*, 87(1), 1–27.
- Bazely, D.R., & Jefferies, R.L. (1986). Changes in the composition and standing crop of salt-marsh communities in response to the removal of a grazer. *Journal of Ecology*, 74(3), 693–706.
- Beever, E.A., & Herrick, J.E. (2006). Effects of feral horses in Great Basin landscapes on soils and ants: Direct and indirect mechanisms. *Journal of Arid Environments*, 66(1), 96–112. doi:10.1016/j.jaridenv.2005.11.006
- Beever, E.A., and Brussard, P. F. (2000). Examining ecological consequences of feral horse grazing using exclosures. *Western North American Naturalist*, 60(3), 236–254.
- Bellis, V.J. (1995, May). *Ecology of maritime forests of the southern Atlantic coast: A community profile* (Biological Report 30). Washington, DC: U.S. National Biological Service.
- Benot, M.L., Bonis, A., Rossignol, N., & Mony, C. (2011). Spatial patterns in defoliation and the expression of clonal traits in grazed meadows. *Botany*, 89(1), 43–54. doi: 10.1139/B10-082
- Bertness, M., Silliman, B.R., & Jefferies, R. (2004). Salt marshes under siege. *American Scientist*, 92(1), 54–61.
- Bhattacharyya, J., Slocombe, D.S., & Murphy, S.D. (2011). The “wild” or “feral” distraction: Effects of cultural understandings on management controversy over free-ranging horses (*Equus ferus caballus*). *Human Ecology*, 39(5), 613–625. doi: 10.1007/s10745-011-9416-9
- Bill Summary & Status, 112th Congress (2011–2012), H.R.306: All Congressional Actions*. (2012). Retrieved from <http://thomas.loc.gov/cgi-bin/bdquery/z?d112:HR00306:@@X>

- Bill Summary & Status, 113th Congress (2013–2014), H.R.126: All Congressional Actions.* (2013). Retrieved from <http://thomas.loc.gov/cgi-bin/bdquery/D?d113:13:/temp/~bdWbBw:@@X|/home/LegislativeData.php?n=BSS;c=113>
- Binkley, C. (2007, August). *The creation and establishment of Cape Hatteras National Seashore: The Great Depression through Mission 66*. Atlanta, GA: U.S. National Park Service, Southeast Regional Office, Cultural Resource Division. Retrieved from <http://archive.org/stream/creationestablis00bink#page/n1/mode/2up>
- Bolen, E.G. Waterfowl management: Yesterday and tomorrow. *Journal of Wildlife Management*, 64(2), 323–335.
- Bond, J.F. (1908). Report on an examination of the sand banks along the North Carolina coast. In *Biennial Report of the State Geologist, 1907-1908* (pp. 42–48). Raleigh, NC: E.M. Uzzell.
- Bos, D., Bakker, J.P., de Vries, Y., & van Lieshout, S. (2002). Long-term vegetation changes in experimentally grazed and ungrazed back-barrier marshes in the Wadden Sea. *Applied Vegetation Science*, 5(1), 4–54.
- Bratton, S.P., & Davison, K. (1987). Disturbance and succession in Buxton Woods, Cape Hatteras, North Carolina. *Castanea*, 52(3), 166–179.
- Burney, D.A., & Burney, L.P. (1987). Recent paleoecology of Nags Head Woods on the North Carolina Outer Banks. *Bulletin of the Torrey Botanical Club*, 114(2), 156–168.
- Carroll, W.D., Kapeluck, P.R., Harper, R.A., & Van Lear, D.H. (2002, September). Background paper: Historical overview of the southern forest landscape and associated resources. In D.N. Wear & J.G. Greis (Eds.), *Southern forest resource assessment* (General Technical Report SRS-53) (pp. 583–605). Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station.
- Carson, R. (1947). *Chincoteague: A National Wildlife Refuge* (Conservation in Action 1). Washington, DC: U.S. Fish and Wildlife Service. Retrieved from <http://digitalcommons.unl.edu/usfwspubs/1>
- Chapman, W.R., & Hanson, J.K. (1997, January). *Wright Brothers National Memorial historic resource study*. Atlanta, GA: U.S. National Park Service, Southeast Field Area.
- Chater, M. (1926). Motor-coaching through North Carolina. *National Geographic*, 49 (5), 475–523.
- Chen, H. (2013, June 26). Ellis-van Creveld Syndrome. *Medscape*. Retrieved from <http://emedicine.medscape.com/article/943684-overview#a0199>
- Chincoteague ponies: Good points of diminutive draft horses of the coast islands. (1905, September 17). *Washington Post*, p. E2.
- Cobb, C. (1906). Where the wind does the work. *National Geographic*, 17(6), 310–317.
- Comberford, N. (1657). *The south part of Virginia, now the north part of Carolina* [Map]. Retrieved from http://digitalgallery.nypl.org/nypldigital/dgkeysearchdetail.cfm?trg=1&strucID=744285&imageid=ps_mss_cd18_271&total=1&e=w
- Conant, E.K., Juras, R., & Cothran, E.G. (2012). A microsatellite analysis of five colonial Spanish horse populations of the southeastern United States. *Animal Genetics*, 43(1), 53–62. doi: 10.1111/j.1365-2052.2011.02210.x
- Congressional Budget Office. (2011, November 9). *Cost estimate: H.R. 306, Corolla Wild Horses Protection Act*. Retrieved from <http://www.cbo.gov/sites/default/files/cbofiles/attachments/hr306.pdf>

- Corolla Wild Horse Fund. (2008, November). Shackleford 127—Corolla 60. *Wild and Free*, 1(7), 1. Retrieved from <http://www.corollawildhorses.com/Images/Newsletter/November%202008%20Newsletter.pdf>
- Corolla Wild Horse Fund. (2013, September 23). *YOUR tax dollars at work on the Outer Banks*. Retrieved from <http://www.corollawildhorses.com/tax-dollars-work-outer-banks/>
- Corolla Wild Horses Protection Act. H.R. 5482, 111th Cong. (2010).
- Corolla Wild Horses Protection Act, H.R. 306, 112th Cong. (2011).
- Corolla Wild Horses Protection Act, H.R. 126, 113th Cong. (2013).
- Cothran, E.G. (2008). *Analysis of genetic diversity in the Corolla feral horse herd of North Carolina*. Retrieved from <http://www.corollawildhorses.com/Images/News/genetic-diversity-analysis.pdf>
- County of Currituck. (2007). Currituck Banks wild horse management plan: *Final cooperative plan among Currituck County, Corolla Wild Horse Fund, North Carolina Department of Environment and Natural Resources and U.S. Fish and Wildlife Service*. Currituck, NC: Author.
- Creedy, R.B. (1901). The legend of Betsy Dowdy: An historical tradition of the Battle of Great Bridge. *North Carolina Booklet*, 1(5).
- Currituck County Wild Horse Advisory Board. (2008, October 16). *Currituck County Wild Horse Advisory Board Meeting, October 16, 2008* [Minutes]. Retrieved from <http://co.currituck.nc.us/pdf/wild-horse-advisory-board-2008-2011/wh-minutes-08oct16.pdf>
- Currituck Outer Banks wild horse management plan*. (n.d.). Retrieved from <http://www.corollawildhorses.com/wp-content/uploads/2012/08/wild-horse-management-plan.pdf>
- Daniels, J.T. (Photographer). (1903, December 17). *First flight, 120 feet in 12 seconds, 10:35 a.m.; Kitty Hawk, North Carolina*. Library of Congress, Prints & Photographs Division, LC-DIG-ppprs-00626.
- De Bry, T. (Engraver). (1590). The arrival of the Englishmen in Virginia. In T. Harriot, *A briefe and true report of the new found land of Virginia* (plate 2). Frankfurt-am-Main, Germany: Johann Wechel.
- DeKimpe, N.M., Dolan, R., & Hayden, B.P. (1991). Predicted dune recession on the Outer Banks of North Carolina, USA. *Journal of Coastal Research*, 7(2), 451–463. <http://www.jstor.org/stable/4297850>
- De Stoppelaire, G.H., Gillespie, T.W., Brock, J.C., & Tobin, G.A. (2004). Use of remote sensing techniques to determine the effects of grazing on vegetation cover and dune elevation at Assateague Island National Seashore: Impact of horses. *Environmental Management*, 34(5), 642–649. doi: 10.1007/s00267-004-0009-x
- DeBlieu, J. (1998). *Hatteras journal*. Winston-Salem, NC: John F. Blair (Original work published 1987).
- Dolan, R., & H. Lins. (1987). Beaches and barrier islands. *Scientific American*, 257(1), 68–77. doi:10.1038/scientificamerican0787-68
- Donlan, C.J., Berger, J., Bock, C.E., Bock, J.H., Burney, D.A., Estes, J.A., . . . Greene, H.W. (2006). Pleistocene rewilding: An optimistic agenda for twenty-first century conservation. *American Naturalist*, 168(5), 660–681. doi: 10.1086/508027
- Dunbar, G.S. (1958). *Historical geography of the North Carolina Outer Banks*. Louisiana State University Studies, Coastal Studies Series 3. Baton Rouge: Louisiana State University Press.