

Ecosystem Management

(Species Status Assessments)

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Abstract

A healthy ecosystem is a diverse community of countless organisms. Where monocultures exist, disease, deficiencies and predators can overrun. As all things with the natural world, the food web is a delicate and intricate system full of predator-prey-decomposer and producer roles. By eliminating or adding one facet to the web, other points will be effected. All organisms play important roles in their own way. Some appear to be more vital and crucial to the wellbeing of their respective ecosystems, others may seem to add diversity to the complexities of their world. Nations worldwide have made incredible progress in the way of implementing and acting on laws to protect, preserve and conserve natural resources where before was much lawlessness and general unconcern for the natural world and its inhabitants.

Healthy ecosystems are in jeopardy when invasive species are present. Various creatures and plants are introduced into ecosystems can have major impacts of the health of the community. Some can benefit the environment while most wreak havoc on the delicate

balance that has been established. To better understand what has invaded The United States, it is important to discuss the ways of insertion and dispersal of several organisms.

The introduction of new and invasive species plays a great deal in the ecosystem. The addition of a new organisms threatens the chains in the food web. By adding a new link, the competition of resources below the new addition increases. The deletion of a link also effects the food web negatively and will force predators to seek out different means of nourishment, depleting sources for other predators. For instance; with the growing population of coyotes, there has been a threat to the prey lower in the food web. Should more prey, like rodents, be eaten by a new invasive species then there will be less readily available for other predators. Birds of prey, wolves, cats, snakes and others will need to find additional sources of nutrition. Extinction of organisms can also lead to violent disruption of the delicate ecosystems for similar reasons. In the absence of an organism there is chaos in rebalancing the order. With the deletion, now there are more consumers beneath that can thrive. Adding and taking away from the natural balance can be very malevolent.

This report will focus primarily on the efforts in the United States with past, current and future efforts on protecting its environment and ensuring the preservation and utilization of the natural resources for generations to come. Ecosystems are always in an ebbing and flowing trend, but with the rise of industry and the spread of the human population to areas that were once untouched, organismal balance of plants, animals and fungi are now in a precarious position. Some organisms have lost their habitats and are facing decreased ranges in where populations can be established, while other organisms have prospered in foreign lands which has proved critical in upsetting the ecosystems systemically.

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Introduction

Species Status Assessments stem from the U.S. Endangered Species Act of 1973 which lays the framework for protecting organisms of concern from the Canadian border to the Mexico border. The term “endangered species” pertains to organisms in danger of extinction in significant portions-to-the entire region to which the organism exists (*Offices of Protected Resources*). The causes for extinction of a species can include; habitat loss/destruction/modification, disease or predation and manmade or natural malefactors.

Species conservation status includes: 'least concern', 'near threatened', 'vulnerable', 'endangered', 'critically endangered', 'extinct in the wild', and 'extinct' (*Endangered Species: Terms & definitions*). An organism conservation status can be considered in one-to-all regions where the organism exists. The two main efforts in curbing the spread of non native species are

to prevent the introduction and to eradicate/control the population of non native species.

(Lodge et al. 2006)

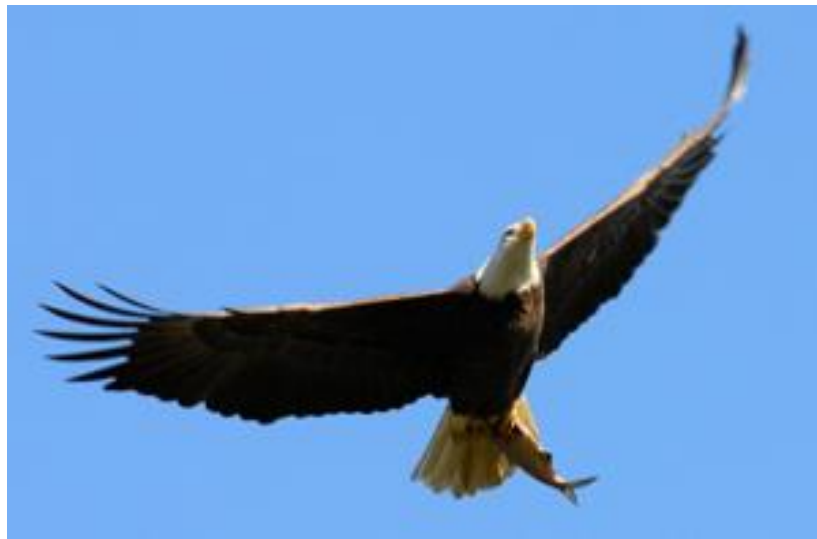
Native (indigenous) species are species, subspecies, or lower taxon, occurring within its natural range (past or present) and dispersal potential (i.e. within the range it occupies naturally or could occupy without direct or indirect introduction or care by humans. (IUCN, Native species are integral to their habitat that they are found and have been established for a significant period of time. While there has been natural methods in which organisms can be introduced to a foreign area and establish a population, typically native species are defined to their habitats by water barriers, elevation change, climate differences and food-source availability. Natives have naturalized and integrated themselves into the trophic systems of the environment they exist. The amount of time elapsed necessary for an organisms to be considered native/indigenous has not been defined.

Non-native species are species that are not naturally found in the ecosystem in question and have been introduced by man to grow outside of their normal range but are not naturalized or pose a threat to the ecosystem they have been introduced to (*Morse, et. all*).

Invasive species are specifically noted as “non-native (or alien) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.” (*What are invasive species?*). Invasive species do not naturally exist in the ecosystem in question and will disrupt the current balance in a potentially harmful manner.

Success of the 1973 Endangered Species Act

The Endangered Species Act of 1973 celebrated its 50th anniversary in 2023, and with it celebrated preserving 99% of listed species from extinction since its inception. Species such as the United States national symbol, the Bald Eagle and the Peregrine Falcon, both largely preserved due to the banning of insecticide Dichlorodiphenyltrichloroethane also known as DDT (*Celebrating 50 years of success in wildlife conservation*). Species listed in the Endangered Species Act are penned to preserve their esthetic, ecological, educational, recreational, and scientific value to our nation and its people (*Endangered Species: U.S fish & wildlife service*). “Endangered” means a species is in danger of extinction throughout all or a significant portion of its range. “Threatened” means a species is likely to become endangered within the foreseeable future.



(EPA) The Bald Eagle was brought back from decline due to the elimination of DDT

Species Status Assessments work for all variety of conservation status of organisms. Whether the species in question is down to the last remaining members, or a foreign invader of

a distant land from their origin, biologists and ecologists can assess the environment for individuals similar manners.

Practical Application and Implementation

While Species Status Assessments are done by government agencies to determine the status of various organisms, the private consulting world is also known to conduct the assessments prior to development of land. A Species Status Assessment oftentimes begins with compiling all information available on the species in question to determine the current known habitat range, ecological requirements, and specimen-to-population dynamics. After a baseline on the organism is established, the current habitat is evaluated to better understand the population dynamics of the species such as genetic material availability, resource availability, species variation, and geographic ranges. Finally, an outlook on the prospective trend for population is measured to evaluate the response to environmental conditions and to configure the growth of the species (*USFWS Species Status Assessment Framework*).

Various tools can be implemented in assessing the current status of specific species. While plant identification can begin with utilizing the region's topography, hydrologic profile and climate, organismal data collection often times requires field work with personnel, camera traps, drones, drift fences, netting, and more. Regulatory agencies, international federal, tribal, state, and local agencies, as well as nongovernmental organizations and private citizens are all employed in the effort to capture the best data possible (*Population assessments: Endangered species: NOAA fisheries*).

After the preliminary review of previous documentation, sightings, records and documents of the species, a habitat assessment is conducted. Habitat assessments begin from a desktop review employing LiDAR mapping, wetland mappers and other quantitative data to compile a consensus on the quality of habitat and potential carrying capacity of the habitat to support the species being assessed. It would be futile to expect quality data in surveying species populations when the habitat would not support a productive and healthy population. Habitat assessments begin with desktop review that determines the characteristics of the biome that will potentially be surveyed. Such key characteristics as vegetative type and abundance, water availability and characteristics, soil profiles and its respective slopes, makeup and nutrient composition, climate and preferred shelter availability (*General guidelines for conducting threatened and endangered*). A surveyor can form a better expectation for data acquisition by completing a pre-check on the surveyed region. Once it is determined that the prospective species in question has the potential to support a population, a field survey can be conducted.

Field surveys can be split into two categories: targeted field and full site field (*General guidelines for conducting threatened and endangered*). Targeted focuses on one particular species to be assessed and is done on portions of property that has been determined ideal for supporting the targeted species. The remainder of the full property is not surveyed and additional organisms are not considered. A full site field survey is a comprehensive, exhaustive study of the entirety of a property that takes into account any and all specimens encountered that are of a concerned status. Full site field surveys are typically conducted prior to a major development of the property (*General guidelines for conducting threatened and endangered*).

Field surveys require qualified personnel who have the expertise and education in appropriately identifying the species (*General guidelines for conducting threatened and endangered*). These individuals should know the life cycle of the targeted species and be able to differentiate them from the surrounding life. A field survey must also consider the level of effort and time frame to conduct the survey. Species should be surveyed during their opportune time of year to be prevalent, i.e. flowering plants in the warmer months and not surveyed in colder months, as well as the best time of day if applicable such as diurnal/crepuscular/nocturnal preferences for organisms (*General guidelines for conducting threatened and endangered*).

The following are basic components in habitat assessment to determine the presence of targeted species as per NJ.Gov guidelines:

- **Vegetation Community Analysis:** The plant life in the region being analyzed for targeted species should be accurately described with their respective abundance noted. Certain species of plants are essential for fostering the growth of particular targeted species such as nesting trees, appropriate structures, and food availability/the predation of appropriate trophic-level organisms.
- **Water Quality and Hydrology:** Hydrology quality should be analyzed for the targeted species being assessed. Indicators such as pH, turbidity, temperature, oxygen/carbon-dioxide levels, water movement speed, nitrogen and other parameters would be key to understanding the potential of SSA availability. The amount of water availability throughout the year in the form of both steady abundance or rainfall can be taken into account.

- Soils: Soils can be analyzed for its chemical properties such as pH, nitrogen, phosphate levels, carbon, runoff class, infiltration level and more. USGS has soil mappers available for preliminary desk top review.
- Wetlands: Wetlands and the presence of should be properly delineated as well as the types of wetlands.
- Topography: Topography and slope on the particular parcels involved in conducting a Species Status Assessment should be mapped and the key habitats prevalent due to the topographic features marked. While some creatures may not have issues with steep slopes, others may prefer flat terrain.
- Structures and Human Activities: Physical structure characteristics that are indicative of human activities (i.e. poles, fences, buildings, old foundations, cellar holes, roads and railroad beds) are to be noted. Such areas can be vital in the presence or ability to house targeted species.

While it is important to evaluate the presence of targeted species during a Species Status Assessment, it is also equally important to appropriately gauge the population of the species to prevent overestimations. Overestimations can result in wasting limited resources in preserving property where organisms are not extirpated, avoiding the loss of political and public confidence and the undermining of status determinations.

International Union for Conservation of Nature and the Red List

The International Union for Conservation of Nature (*IUCN red list of threatened species*) breaks down the distinction between least concern to extinct species in seven categories of increasing concern in the *Red List*. Each of the categories represents a severity of prevalence to endangerment of the species. (*Rutledge, et. all*). Species that are not in any danger of extinction are categorized as least-concern and near-threatened. The next three levels are vulnerable, endangered and critically endangered. Organisms in some levels of conservation fall into these three levels. The final levels are extinct in the wild and then extinct. (*Rutledge, et. all*).

A species is considered the least concern when it is at the lowest level of conservation. Species that are least concerning for status are readily abundant in their respective habitats and have a healthy population with genetic diversity. The associated Red List displays the trends and extinction risks for 163,040 species assessed and 45,321 threatened species (*IUCN red list of threatened species*). The IUCN Red List is the world's most comprehensive data repository and is available for all, utilized by governments and non-profits as well as individuals and businesses. The Red List is an indicator of health for not just a species but for the world and the effort to conserve and save our planet's diversity. With it, connections can be made to better understand the landscape, both physical and political, of conservation. (*IUCN red list of threatened species*).

Future Roles of Non-Native Species and Their Introduction

Methods of introduction plays a key factor in the efficiency of spreading across the land. Animals, plants and other organisms can be placed into new ecosystems in a multitude of ways. Most commonly known and accepted would be manually introducing new beings on purpose.

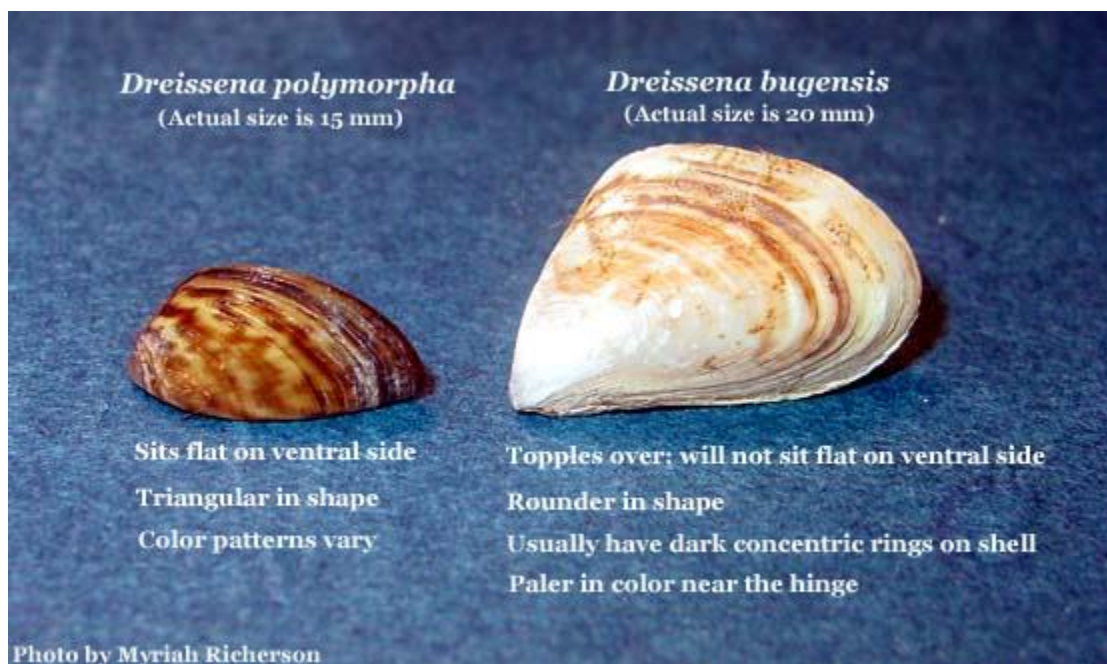
Generally, the addition is made for gain whether in resources/goods or in stifling other existing items. Commonly spread would be the practice of bringing new animals to other lands to increase revenue of fur, usability and produce. Then there is the pet-trade and the animals that either escape their enclosures or outgrow and are released into the wild. This is a growing problem in Florida. Meanwhile there are also creatures taken from their native land by accident threw shipping, luggage and clothing. South America has been known to accidentally enclose insects in crates of produce like fruit, nuts and berries. Luggage and clothing can entrap invasive species and unintentionally allow spreading to foreign areas (*Anderson 2004*).

Non-native species can serve important roles in their new found habitats. While often times there are negatives to the presence of foreign species, there are cases where the non-native species can be appreciated for their tolerance and adaptability to new surroundings.

Many native species are intolerant to certain changes in climate, water chemistry and human interference, but in the case of the domestic bovine (*Bos taurus*), they may fill a role that was lost due to the near extinction of the indigenous American Bison. Organisms like the European Honey Bee (*Apis mellifera*) have been considered beneficial for decades but recent studies are suggesting the non-native honey bee can be outcompeting native pollinators such as butterflies, hummingbirds and other native insects.

Pet trade animals include but are not limited to; various snakes, lizards, turtles, frogs, fish, birds, and other creatures. A notable state of which the issue is the growing pet trade is Florida. All listed above are problems in the panhandle state. Owners deem the pet an unwanted expenditure or the pet exceeds the size of its enclosure, then proceed to release for

nature to take over in caretaking. Many times, domesticated creatures perish in the wild for the lack of hunting and survival skills and become victims to predators, however often is it that the animal flourishes and reproduces, competing for resources with previously established life. Some have become a part of modern culture such as iguanas and pythons. Found throughout most of Southern and Central Florida, these creatures have integrated themselves into the very fabric of the food chain as one of the top predators (Hill 2014). Combating for food with natives, the new invasives have proven a formidable opponent.



Zebra Mussel to the left, native Quaaqa Mussel to the right

Non-native and invasive species have been introduced to new habitats by a multitude of means, many of which were intentional and done before understanding the full gravity of releasing or implanting foreign organisms without intensive research. Other introduction means

can be unintentional by transportation and aggressive weather. Hurricane Andrew in 1992 has been considered instrumental in the release of captive Burmese Pythons where a Miami-based breeding facility was destroyed resulting in the accidental release of this reptile. Zebra mussel have been noted as accidentally being released via ship ballasts that drew up the specimens from one port and inadvertently introduced into a system at the next port. Zebra mussels have the interesting characteristic of overly filtering the body of water they reside in, which in doing so depletes the water column of nutrients and starves aquatic life of sustenance. They also outcompete and proliferate so fervently that the lake floors are densely packed in a monoculture of this shellfish. Fishermen and boaters are advised to clean their equipment of any plant life that could harbor the Zebra Mussel or its larval form in an effort to quell the spread to other parts of the body of water as well as jumping to different waters. Fishermen on foot are recommended to not wear felt bottom waders (commonly used for their superior traction on slick riverine terrain) and instead, elect to use removable wading shoes or rubber soles. Warm, soapy water is best used while rinsing equipment, clothing and boats when removing oneself from the waters that may be afflicted with Zebra Mussels.

As is often the case, invasive species tend to be the ones more adaptable to posing threats and reproduce at rates that has proven difficult to outcompete by both native organisms and human intervention. Invasives have the characteristics of an apex organism given that much of their new found ecosystem has not evolved in a manner to deal with their presence such as predation or seasonal competition.

To enable an ecosystem to thrive in their previous state, it is imperative that invasive species are not added to the current species list of that area. Much of the environment is built

on a delicate balance of consumers, producers, and decomposers. With the deletion or addition of a new link then the system is disrupted and can be altered in a harmful way. Invasive species have cost countless organisms to die from the competition of resources and forced other to migrate away to satisfy their needs. The introduction of a new creature can spell danger for not just the ecosystem it now has found their way into, but also the neighboring ones that now must sustain more and a wider variety of organisms. The water can also be in trouble with new land creatures as the vegetation around the land can change creating more runoff and altering the water systems that were in place.

One of the major contenders in diminishing invasive species populations is through human intervention and restyling the invaders as cuisine. The mantra “If you can’t beat them, eat them” has been noted as a popular saying among those intrepid enough to find daring new ways to consume the problem away. Such notable examples are the efforts made to catch and eat invasive Lionfish off of the Gulf Coast, Florida and the Caribbean seas. Lionfish, while destructive in their new found habitats with essentially no “natural” predator, humans have taken the role of their apex predator through private funded lionfish hunting organizations that have learned to spear fish and eat the invasive fish.

There have been a few ways enacted on to decrease the effects and hold of these invasive species. One being to learn to hunt, trap and use the animals for self-gain, another to institute nuisance hunting to purely eradicate the organisms that are harming the ecosystem for no gain other than shrinking population and effect. Some areas have a *Shoot on Site* protocol that if seen, the animal is to be dispatched or authorities alerted to eliminate the animal.

Effects of Invasive Feral Hog

The North American Feral Hog descends from a European variety of swine classically known as *Sus Scrofa* and commonly known as Razorbacks, Wild Pigs, Wild Boars and Feral Hogs (*Introduction of feral hogs coping with feral hogs*). North America's only native hog-like species is the Collared Peccary (also known as the Common Javelina) which are actually a member of the *Tayassuidae* family rather than the *Suidae*. The Feral Hog is endemic to the southeastern portions of the United States, and was distributed by both the intentional and accidental release of domesticated swine (*Introduction of feral hogs coping with feral hogs*).

The term *Wild Boar* is generally a misnomer (*Center 2016*). Most are feral hogs that have escaped their pens and spread throughout the US. If they were not domesticated hogs originally, then the majority of others are Russian Boar and European Boar. Both brought over to hunt and for leather as well as the nutria, a rodent the size of beavers in The Gulf Coastal States. These animals have taken hold of America and adapted to intermingle within the ecosystem. After the collapse of the fur trade in 1940, penned animals were released when farmers could not afford to manage the animals for the fur. This attributed to a large swell of population with fur trade species. Hogs are detrimental to the environment. They are insatiable omnivores who spawn frequently with litters averaging six piglets (*Keller 2009*). Areas that are overridden with hogs can easily be found by their odorous, muddy waste that they leave behind in their wallows. Hogs excavate trenches in moist soil to cool down as hogs do not have sweat glands. Mosquitos often congregate in abandoned mud pits and can breed disease. In addition, swine are active scavengers and will raid crop fields decimating agriculture costing millions in infrastructure.

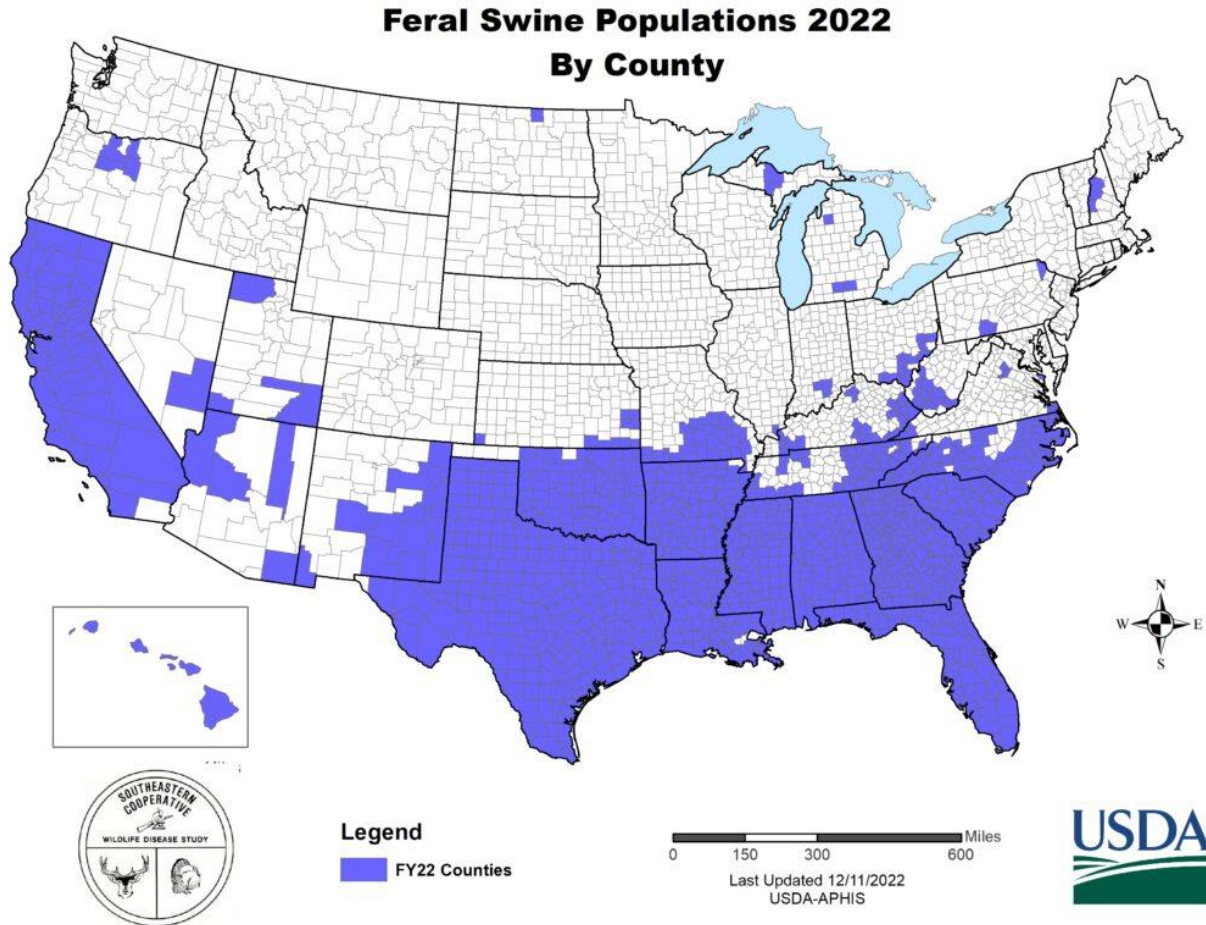
Areas that are heavily impacted currently are; Texas, Mississippi, Alabama, Georgia and Florida but are located in forty other states (*MSSState 2012*).

The first documented release of hogs was in 1493 by Columbus's second voyage to the Caribbean Islands where he as well as other European settlers established a population of hogs for reliable harvests (*Introduction of feral hogs coping with feral hogs*). Early settlers used domesticated breeds of hog that were brought over from their points of origin. Efforts across the East Coast and Gulf Coast of the United States also partook in bolstering the feral populations of swine through accidental/escaped means and by intentionally leaving them behind to ensure food was available upon return (*Introduction of feral hogs coping with feral hogs*).



Image of a group of feral hogs. Note the coloration differences. (NCWildlife)

By the early-mid 1600s, colonies in New Hampshire and Connecticut had already encountered and documented issues with feral pig populations. A Eurasian Wild Boar population was released in the late 1800s in New Hampshire and were introduced for hunting purposes (*Distribution and Expansion*). The Eurasian Wild Boar and the domesticated hog then cross-bred and hybridized with both the feral and domesticated populations of hog to the wild boar creating the population of swine seen today. Feral Hogs have been reported in 35/50 states (*Distribution and Expansion*). Some contributing factors in the spread of populations of feral hog are attributed to human assisted movements, natural encroachment and changed in land use (*Distribution and Expansion*).



Adult feral swine on average weigh between 75-250 pounds but some individuals have been documented as much as exceeding 500 pounds and beyond (*Identifying feral swine*).

Considering that a hog can reach sexual maturity at 6-8 months old, and produce two litters of 6-12 piglets a year, a hog population in an area has the ability and propensity to double in number in as little as four months (*Identifying feral swine*). The hogs feed often times at night and can be found in groups or *sounders* of up to 30 individuals of varying ages with the adult boars typically living alone or in bachelor groups, only to reintegrate with the sounder during mating.

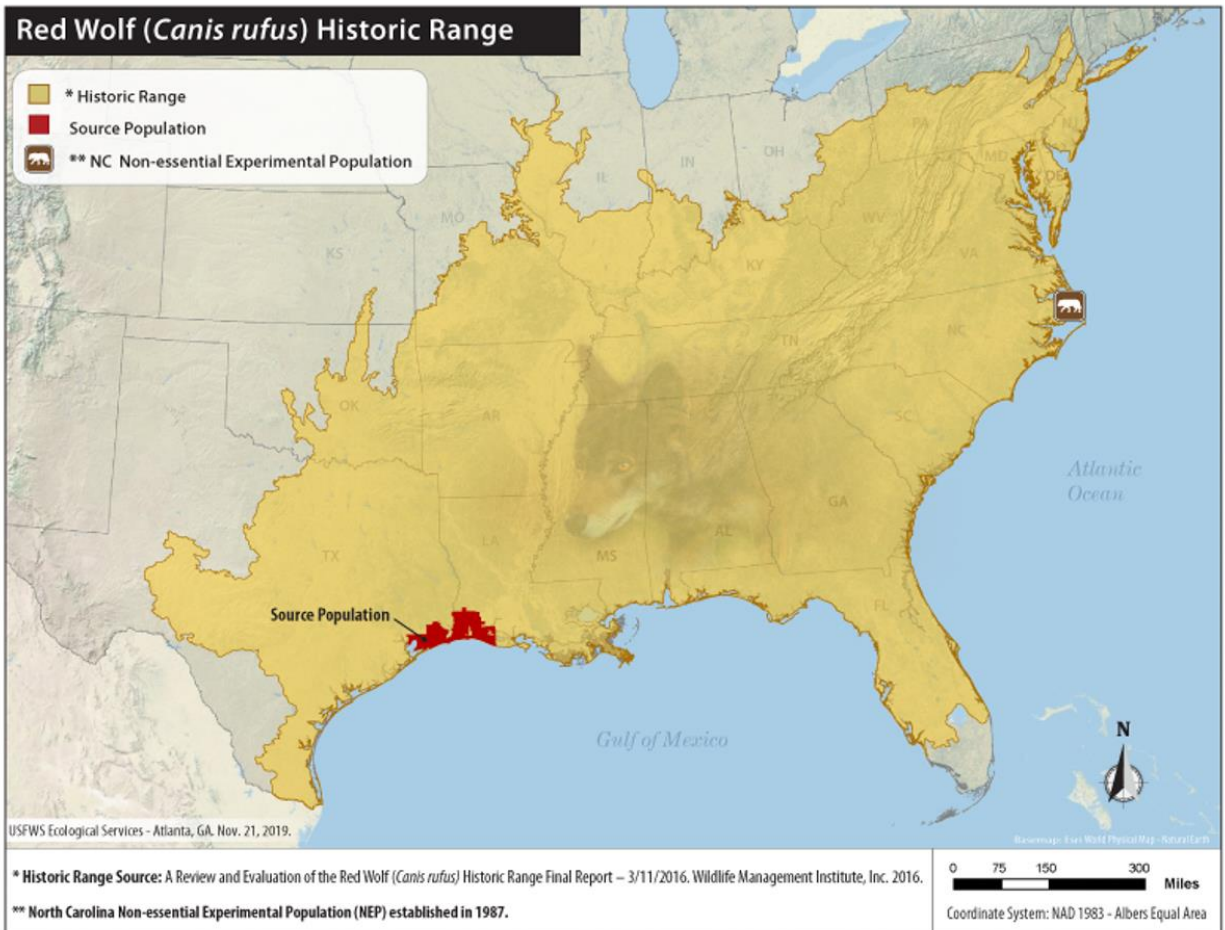
Telltale signs of a wild hog population are; root upheaval, tree rubs, ruts/muddy depressions from wallowing and hoof tracks by the water (*Identifying feral swine*). The hogs will compete with the local fauna for food and habitat, and overlap in the trophic levels with bears, deer and turkey with food selection. Wild hogs have also been known to prey on eggs, young/small mammals such as deer fawns, and small birds and reptiles. The presence of hogs also encourages mosquito growth with the wallows produced by the hogs themselves.

The USDA methods for hog management consist of whole sounder trapping (implementing drop-gate corrals to successfully capture a large population in one instance), fencing and fladry, vaccination, ground removal operations and aerial removal operations (*Identifying feral swine*). While nonlethal tactics can be employed to lessen the damage and stifle the growth of the nuisance species, lethal force is commonly utilized as the hogs are destructive, costly, dangerous and invasive to the ecosystems they have now made home.

The Endangered Red Wolf

Red Wolf (*Canis rufus*) was once a prominent canid species whose range spanned from the East Coast to the Rocky Mountain range where Grey Wolves reside. Red Wolves are often mistaken for their cousins, Coyotes (*Canis latrans*), who have begun to spread and naturalize in further regions that were once dominated by Red Wolves. Red Wolves' diet consists of small mammals, opossums, and deer while the Coyote is typically not large or bold enough to take on

deer as prey but instead will scavenge much of their calories.



The Red Wolf is endangered primarily to human interaction. From the early settlers time period to the mid 1900s, predator control measures were in place by farmers and land owners in an effort to quell the potential danger of wolves consuming livestock and endangering people's lives and livelihoods. Some states and areas had issued paid bounties on red wolf pelts to boost the drive to eradicate red wolves. By 1980, the Red Wolf was declared extinct in the wild with approximately 400 individuals captured and utilized for breeding programs (*Red Wolf Recovery Program: U.S. Fish & Wildlife Service*).

The Red Wolf played a similar role in the East Coast as the Grey Wolf did historically, that being one of the apex predators to keep populations of small to mid-sized mammals. Without the inclusion of Red Wolves, deer populations have increased as well as the spread of cervid disease such as Chronic Wasting Disease (CWD), a Cervidae specific illness that is not transmissible at this time to other organisms such as humans, but is decimating populations of deer where it runs rampant.

There have been documented cases of Red Wolf-Coyote hybridization, the Coywolf. The hybrid species is not sterile as the parent species contain 78 chromosomes allowing cross-breeding with ill effects. Coyotes have spread further into historic Red Wolf territory with the lessening opposition from larger predatory organisms. Coyotes, while considered a nuisance species and the state of North Carolina has issued an Open Season status on harvesting Coyotes year-round, the Red Wolf has found themselves in the crossfire given their physical similarities to their cousins.



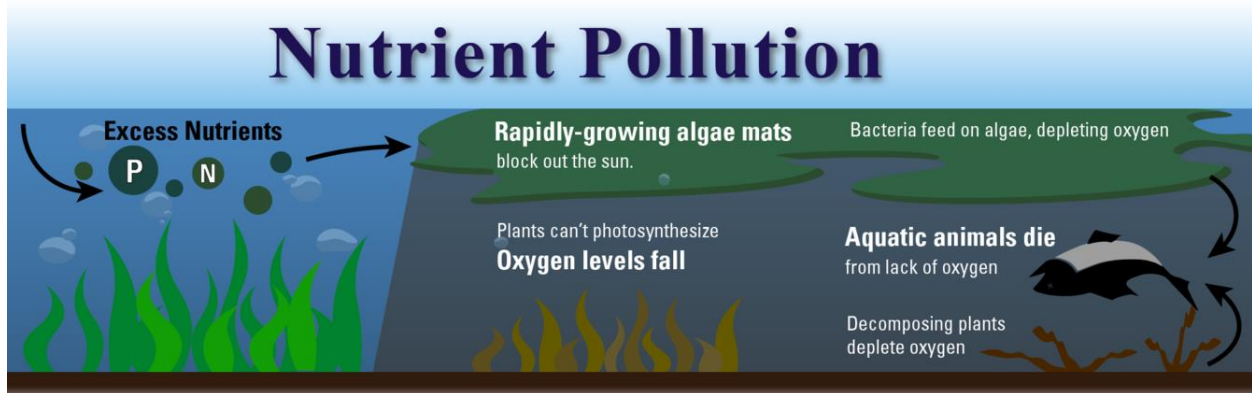
Coyote Vs Red Wolf (USFWS)

To this day, populations are threatened by disease, vehicle collisions and pressure from farmers and hunters. The prognosis for the continuation of the species is still slightly unclear as

there has not been a well-established wild population persist without direct management as of yet.

Governmental Role in Sustainability and the Public

Governments can play a major role in sustainable management decisions. Municipalities and government entities can give loans, stipends or subsidies to farmers who implement best management practices, or BMPs, that will prove more sustainable and more environmentally conscientious. The Living Soil video, released by the Soil Health Institute in 2019, referenced an issue of erosion and fertilizer pollution getting into the waterways and how the initial responses was to point fingers and blame the farmers. The solution became that the government had to step in and offer incentives to the farmers to lower their sediment and erosion pollution as well as curbing the amount of fertilizer leaching and running off into the waterways that cause fish die-offs and algal blooms. Nutrient pollution, which includes sediment as well as fertilizer, can result in an over-abundance of readily available nutrients in the water column which can disrupt the cycle of algae and bacterial growth. Such actions would cause organismal death, especially in the case of the already more sensitive and prone to water condition organisms like the trout (salmonoids) which require a high oxygenation level that is accomplished by diffusion from the atmosphere, movement of water (waves, turbulence, wind.), or as a byproduct of photosynthesis (generated plant life and green algae).



USGS Nutrient Pollution's Cascading Effects

The issue is that the farmers oftentimes do not have a significant benefit out of conforming to new environmental standards except in preserving the amount of soil present on the property and potentially lessening the costs of fertilizer uses as they had been proven to be leaving the initial property. This is one of the cases where government intervention can benefit with incentives, as in the off-hand the farmers would not readily comply considering it is a strain on their financial situation to suddenly have more issues to deal with as well as mounting costs to maintain. Governments can encourage farmers to use better management practices of their property with educating the populace and inform the farmers of growing new techniques that can be effective if implemented. The new age of farmers sharing trade secrets with each other is a delightful change of pace from the past where businesses often viewed each other as the enemy and not wanting to share any secrets as to how to improve production. Never before has there been such a hunger to learn how to better manage their properties and businesses yet also share their newfound knowledge with others. Governments can encourage this shared interest and information by meeting with the farmers and land owners in various settings.

When so much protected land and organisms are at stake, it is paramount that all parties are engaged in an approach to preserve the integrity of their land. Protected land and crucial habitats are being developed and encroached on at a quick pace. Each transaction and deal threatens the remaining portions of the environment needed to support the population of organisms for both the present and future.

Conclusions

Extinction of species and the introduction of new and invasive species plays a great deal in the ecosystem. Adding organisms can wreck the fragile balance. The addition of a new organisms threatens the chains in the food web. Extinction of organisms can also lead to violent disruption of the delicate ecosystems.

With the implementation of Species Status Assessments, targeted species can be better evaluated for their standing in an ecosystem. Invasive organisms can be accounted for and managed for their spread into habitats, and endangered organisms can be assessed for their population and presence in the environment to understand how to prevent their extirpation or extinction. With the help of the Endangered Species Act of 1973, an estimated 99% of species listed in the United States have been preserved from extinction and 90% of listed species in a recovering state. Under the protection of the law, 85% of continental bird species have increased. Conservation is a long-term investment and is a gradual process that takes time whereas neglect can quickly eradicate sensitive populations. While the federal government and local government can do much of the heavy lifting, it is vital to also mention the importance of public advocacy. The average, informed fisherman can help by noting where invasive and

critical organisms were caught. Bird watchers and outdoorsmen can report sightings and help with understanding the distribution and range of organisms. Vehicle motorists can document roadside accounts of endangered or invasive species in such areas as animal crossings and roadkill. Hunters and fisherman can know when to legally keep or release catches, as is the case with the elimination of any wild hogs or snakehead fish located, and ensuring critical species as the red wolf and native fisheries to not be overly depleted in a timely manner. It is essential for government entities to be involved in the preservation of the environment, but it is up to individuals to uphold those same standards in order to protect our planet for future generations.

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(Celebrating 50 years of success in wildlife conservation)

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