



Failing the Fight:
The Historical Context of U.S Environmental Conservation and How Endangered Species
are Mismanaged in the Current Legislature

Samantha N. Hays

University of Missouri – Kansas City

HONORS 495C/ LIFE-SCI 497WI: Senior Thesis Biology/Directed Studies

Dr. Jess Magaña

May 10, 2020



Abstract

The Endangered Species Act (ESA) of 1973 established a baseline for the ethical treatment of threatened or endangered species and acted, in a pivotal time for environmental legislature, as the first large-scale species protective measure. Drafted on the heels of two other national environmental standards, the Clean Air Act of 1970 and the Clean Water Act of 1972, the ESA is composed of 18 sections dedicated to the documentation, monitoring, and protection of threatened or endangered species. However, due to the broad nomenclature found in Section 9, the strict implications for the public, the lack of expenditure documentations, the general lack of species successes, the immense backlog of unaddressed species and inadequate filing method, the ESA now provides little relief to the plants and animals it protects. Simply because the ESA is a foundational achievement of modern environmental legislature does not make it beneficial today – it also does nothing to acknowledge the displacement of species due to climate change. There is an environmental movement occurring which champions proposed amendments and alterations to the Act. This is quite possibly the only way to utilize the legislature without an altogether repeal. These actions must be taken quickly, as in recent years the ESA has become a target for American politicians looking to decrease government expenditures. Under the amendments proposed by the Obama administration, and further actions by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, the ESA has the potential to save countless species on the brink of extinction.

Perspective

The extinction rate of vertebrate species has increased a hundredfold over the last century (Ceballos et al 2015). This is not simply an aesthetic concern for the loss of posterchild species like the panda or the bumblebee – ecologist Robert Costanza and his colleagues estimated that the biosphere provides services worth around \$33 trillion a year (1997). Meanwhile in 1997, the year that study was completed, the entire global economy was only producing around \$18 trillion a year (Costanza et al 1997). A later study in 2010 confirmed these estimates and furthermore stated that if we did nothing to preserve species, it would cost us 18% of global economic output (Anderson). While placing economic values on the beautiful diversity of organisms may seem “cold and heartless”, many conservationists have embraced the concept of ecosystem services (Marshall 2015). (Ecosystem services will be later discussed in the “Environmental Species Act: Worth” subsection.) By providing these values to the public, conservationists are able to ascertain the worth of the land they serve. So, both for aesthetic pleasure and for economic practicality, preserving species produces net benefits and proves to be a worthwhile investment.

Historical Environmental Legislation and Context

In the United States, in order to place legal sanctions on aspects of the environment, Congress must pass a law otherwise known as a statute (Meyer 2017). A statute formally empowers entities such as the Environmental Protection Agency, or EPA, which operates as an independent agency of the federal government, outside of the Executive Office of the President of the 15 executive departments (Meyer 2017). Other entities such as the United States Fish and Wildlife Service and the National Marine Fisheries Service act as agencies of the U.S. federal government within the

Department of the Interior and the Department of Commerce, respectively. Congress also allots federal funding for the entities to enforce rules at both the federal and the state level (Meyer 2017). There are two laws that have allowed the EPA to set and federally enforce critical environmental standards: the Clean Air Act of 1970 and the Clean Water Act of 1972, otherwise known as the Federal Water Pollution Control Act Amendments of 1972 (Meyer 2017). The U.S. Fish and Wildlife Service as well as the National Marine Fisheries Service enforce and regulate protective measures under the Endangered Species Act of 1973 which is also still in effect today (Endangered Species Act). These historical environmental protection acts and amendments were spawned out of the increased public awareness of the late 1960s – 1970s following multiple national environmental crises and championed by an unlikely political figure (Rothman 2017).

The Federal Water Pollution Control Act of 1948 essentially replaced America's oldest environmental statute, the Rivers and Harbors Act of 1899 ("Section 404 of the Clean Water Act"), as the first major U.S. law to directly address water pollution ("History of the Clean Water Act"). Upon its first amendment in 1972, the Federal Water Pollution Control Act was henceforth known as the Clean Water Act, or CWA ("History of the Clean Water Act"). The Clean Water Act now establishes the basic structure for regulating pollutant discharges into U.S. waters, allows the EPA authority to implement pollution control programs and set wastewater standards, maintains existing requirements for setting water quality standards for surface water contaminants, makes it illegal for any person without a permit to discharge any pollutant from a point source into navigable waters, funds the construction of sewage treatment plants under the construction grants program, and recognizes the need for planning to address problems of nonpoint source pollution (Clean Water Act). According to the Water Education Foundation, point source pollution under regulation by the EPA is released from "discrete conveyances" such as factories and sewage treatment plants

via discharge pipes; conversely, nonpoint source pollution is a combination of pollutants from a large area accumulated in runoff (“Point Source vs. Nonpoint Source Pollution”). The Clean Water Act requires each state to identify a total maximum daily load, or TMDL, for each pollutant; this is the combined amount of pollution a body of water can accept from point and nonpoint sources without compromising the EPA’s water quality standards (“Point Source vs. Nonpoint Source Pollution”).

Prior to the amendment establishing the Clean Water Act of 1972 – and only seven years following the initial Federal Water Pollution Control Act of 1948 – Congress also passed the first federal legislation with the intent of researching air quality, the Air Pollution Control Act of 1955 (Clean Air Act). In 1960, President Eisenhower signed a bill to enact the first large-scale Air Pollution Study, a two-year long U.S. Public Health and Service study into car emissions (Stern 1982). The next large piece of air quality legislation would be the Clean Air Act of 1963, drafted to control air pollution control and replace the Air Pollution Control act by allowing for a specific focus on car emissions (Evolution of the Clean Air Act). This was followed shortly after by the Air Quality Act of 1967, enacted to expand federal government activities and air pollutant emission inventories as well as monitoring techniques (Evolution of the Clean Air Act). Even with these prior congressional acts, the Clean Air Act of 1970 would revolutionize air pollution control. The Clear Air Act of 1970 authorized the development of a comprehensive federal and state regulations to limit stationary, or industrial, and mobile source emissions (Clean Air Act). The Clean Air Act of 1970 would spur four major regulatory programs centered around stationary source sanctions, including: The National Ambient Air Quality Standards, or NAAQS, State Implementation Plans, or SIPs, New Source Performance Standards, or NSPS, and National Emission Standards for Hazardous Air Pollutants, or NESHAPs (Evolution of the Clean Air Act).

Regarding protection of fauna as well as flora, Congress passed the Endangered Species Preservation Act of 1966 signed by President Lyndon B. Johnson in order to list native animal species as endangered and provide some limited protective measures (U.S. Fish & Wildlife Service). This placed the responsibility of protecting listed species and preserving their native habitats on the Departments of the Interior, Agriculture, and Defense (U.S. Fish & Wildlife Service). The Act also authorized the U.S. Fish and Wildlife Service to acquire land as habitat for endangered species (U.S. Fish & Wildlife Service). The Endangered Species Preservation Act would be amended by congress in 1969 to provide additional protection to animals in danger of “worldwide extinction” by prohibiting their importation and sale in the United States and would change the Act’s title to the Endangered Species Conservation Act (U.S. Fish & Wildlife Service). Four years later in 1973, 80 nations signed the Convention on the International Trade of Endangered Species of Wild Fauna and Flora, otherwise known as CITES, at a conference in Washington, D.C. and in doing so agreed to the monitoring and restricting of international commerce in plant and animal species which could be harmed by trade (U.S. Fish & Wildlife Service).

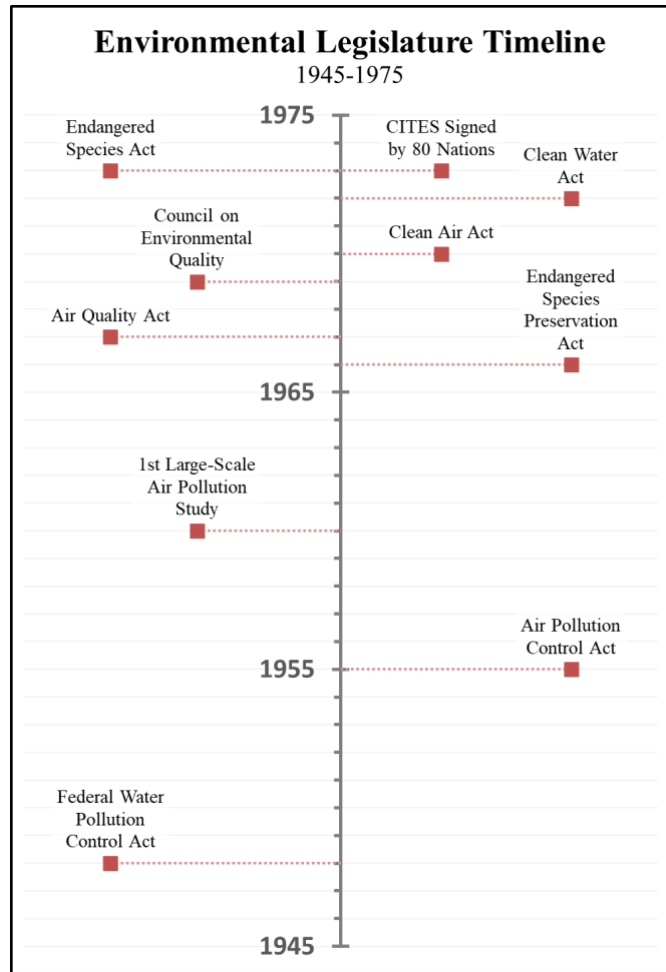


Figure 1. Environmental Legislation Timeline. Plot depicts the chronological order of several major pieces of environmental legislature.

Clearly, the 1960s and 1970s was a pivotal time for environmental legislature and increased public awareness. Particularly under the Nixon administration from 1969-1974, Americans began actively engaging in public environmental conversations in the wake of air and water pollution disasters (Rothman 2017). American biologist Rachel Carson would publish her controversial environmental classic, *Silent Spring*, in 1962 as an attack on indiscriminate use of pesticides such as dichloro-diphenyl-trichloroethane, or DDT (Carson 1962). Carson’s book was a call for humans to act responsibly as stewards of the living planet earth and had the ambitious goal of igniting a

democratic activist movement (Carson 1962). Other concerning events would further bring the topic of environmental protection to the American dinner tables later that decade. Acid rain was identified in North America for the first time at Hubbard Brook, New Hampshire in the mid-1960s and would later be linked to the long-range transport of sulfur dioxide and nitrogen oxide from coal-burning power plants (Dybas 2012). These chemicals leached calcium from the soil and dissolved aluminum-rich minerals, depriving plants of key nutrients and poisoning the flora with harmful metals (Weiss 2012).



Figure 2. Effects of Acid Rain. Aerial view of trees from a long-term Hubbard Brook ecosystem study (Lovett).

Then at the end of the decade, on January 28th, 1969, inadequate safety precautions taken by Unocal, at the time known as Union Oil, would trigger a massive explosion so powerful it cracked the seafloor in five places (Mai-Duc 2015). The resulting crude oil spill would expunge 1,000 gallons per hour for a month before it would be slowed, spewing an estimated total of 3 million gallons of oil into the ocean and creating a 35-mile-long oil slick across California's

coastline near Santa Barbara County (Mai-Duc 2015). In the same year, an oil slick on the Cuyahoga River near Cleveland, Ohio would become so saturated that by decades of industrial waste that it caught fire, causing nearly \$100,000 in damages to two railroad bridges (Rotman 2010).



Figure 3. Cuyahoga River Fire. Photo of the 1969 Cuyahoga River oil slick fire near Cleveland, Ohio (Rotman 2017).

About 100-miles away, Lake Erie was experiencing an extreme eutrophication and associated algal blooms due to the influx of pollutants; dead fish littered the shoreline as the algae reduced water oxygen levels below the basic survival needs of the fish (Rotman 2010). This led to the coining of the phrase “Lake Erie is dead”, which would appear in national publications throughout the late 1960s (Rotman 2010).



Figure 4. Santa Barbara Oil Spill Headline. The 1969 oil spill off the coast of California made the front page of the Los Angeles Times on February 6, 1969 (Doyle 2016).

Despite Nixon’s politically conservative nature and private disgust with environmentalists, the public was increasingly advocating for environmental protection sanctions in the wake of these national catastrophes (Blakemore 2018). Though often overshadowed by the political disgrace that would lead to his resignation, Nixon “became the unlikely champion” of air, water, and animal protection legislation during his short term as president (Blakemore 2018). In 1969, President Nixon created an executive office titled the Council of Environmental Quality (Blakemore 2018). In his State of the Union Address in 1970, he proposed the aforementioned clean air and water initiatives and/or amendments, stating, “The great question of the seventies is, shall we surrender to our surroundings, or shall we make peace with nature and begin to make reparations for the damage we have done to our air, to our land, and to our water?” (Blakemore 2018).

Overview of the Endangered Species Act of 1973

In 1973, Congress passed the Endangered Species Act, or ESA, composed of 18 sections; commonly cited sections which are pivotal to the understanding of the work of the ESA include Sections 3, 6, 7, 8, and 9 (U.S. Fish & Wildlife Service/Endangered Species Program).

Section 3, “Definitions” defines “endangered” and “threatened” and makes all plants and invertebrates eligible for protective measures (Endangered Species Act). As stated in Section 3, an endangered species is “any species which is in danger of extinction throughout all of a significant portion of its range” while a threatened species is defined as “any species which is likely to become an endangered species within the foreseeable future” (Endangered Species Act). Though threatened species are generally in less extreme circumstances than endangered species, threatened species have the real probability of becoming endangered species if no mitigative actions are taken. Other terms used throughout the ESA which are defined in Section 3 include “conserve”, “conserving”, and “conservation”, which collectively mean the actions necessary to bring either a threatened or endangered species “to a point which the measures provided pursuant to this Act are no longer necessary” (Endangered Species Act).

Section 6, “Cooperation with the States”, makes funds available to states and territories for species and habitat conservation actions on non-federal lands and optioned “cooperative agreements” through which states can receive funding from the U.S. Fish and Wildlife Services to implement species recovery programs (Endangered Species Act). Section 6 funds are awarded through four programs: Conservation Grants, Habitat Conservation Planning Assistance Grants, Habitation Conversation Plan Land Acquisition Grants, and Recovery land Acquisition Grants (Endangered Species Act). Conservation Grants provide financial assistance to states and territories to implement conservation projects such as: habitat restoration, species status surveys, public education and outreach, captive propagation and reintroduction programs, nesting surveys,

general studies, and development of management plans for listed and candidate species (Endangered Species Act). Habitation Conservation Planning Assistance Grants provide funds to states and territories to assist in the development of Habitation Conservation Plans, or HCPs, through support of baseline survey and inventories, document preparation, outreach, and various other planning activities (Endangered Species Act). Habitation Conservation Plan Land Acquisition Grants provide the funds necessary to states and territories looking to acquire land associated with approved HCPs (Endangered Species Act). And lastly, Recovery Land Acquisition Grants financially support states and territories in acquiring habitation to support draft and approved recovery plans (Endangered Species Act).

Section 7 prohibits federal agencies from authorizing, funding, or carrying out any action that could jeopardize a listed species or compromise its designated “critical habitat” (Endangered Species Act). This section requires federal agencies to consult with the Fish and Wildlife Service or the National Marine Fisheries Service to ensure any action authorized, funded, or implemented is not likely to further expose the listed species to dangers or adversely modify a critical habitat (U.S. Fish & Wildlife Services). Under Section 7, consultations can be formal or informal, the former being a process in which federal agencies can quickly evaluate potential mitigation action effects on species and their habitats and the latter a more extensive process to achieve a “biological opinion” from the appropriate Service (U.S. Fish & Wildlife Service). A biological opinion is an official document that determines the likely effects of a proposed action which may include an “incidental take statement” and “reasonable and prudent measures” to minimize adverse impacts of the anticipated “take” of the species (U.S. Fish & Wildlife Services). If the actions are likely to produce adverse effects on the species or habitat of concern, “reasonable and prudent alternatives”

will be included in the biological opinion to redesign the project and maximize the chances of positive assistance (U.S. Fish & Wildlife Service).

Section 8 provides funding authority for land acquisition for foreign species and implemented CITES protection in the United States through “encouragement of foreign programs” (Endangered Species Act). It states that “the President shall provide assistance (which includes, but is not limited to, the acquisition, by lease or otherwise, of lands, waters, or interests therein) to foreign countries under this section under such terms and conditions as he deems appropriate” (Endangered Species Act). Section 8 also permits “the entering into of bilateral or multilateral agreements with foreign countries to provide for such conservation” via the Secretary through the Secretary of State (Endangered Species Act).

Section 9 prohibits the broad “taking” of all endangered animal species (Endangered Species Act). Section 9 defines taking as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (Endangered Species Act). Once a species has been listed as threatened or endangered under the definitions provided by Section 3, any taking of said species by private or public entities is made unlawful by Section 9 (U.S. Fish & Wildlife Services/Endangered Species Program). In this section, the term “harm” appears in both the definition of “taking” and as its own term, wherein it is defined as “significant habitat modification or degradation” which injures or kills wildlife by impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, or sheltering (U.S. Fish & Wildlife Services/Endangered Species Program). These actions are referred to as “take prohibitions” and apply to any person or entity, unless taking occurs in a situation wherein one is protecting their life and/or property (U.S. Fish & Wildlife Services/Endangered Species Program). In such cases, Section 9 of the ESA states: “no civil penalty shall be imposed if it can be shown by a

preponderance of the evidence that the defendant committed an acted based on a good faith belief that he was acting to protect himself of herself, a member of his or her family, or any other individual from bodily harm, from any endangered or threatened species” (Endangered Species Act).

Endangered Species Act: Worth

In a 2011 study compiled by the National Fish and Wildlife Foundation, a government-affiliated conservation organization, it was found that the calculated the total value of ecosystem services in the 48 continental states to be \$1.6 trillion annually, equivalent to 10% of the U.S. Gross Domestic Product (Southwick Associates 2011). Of the annual \$1.6 trillion, National Wildlife Refuges are responsible for \$32 billion – these are lands protected under the Endangered Species Act (Worland 2018).



Figure 5. Prime Hook National Wildlife Refuge. Photo of gulls at a restored salt marsh in the Prime Hook National Wildlife Refuge in Delaware (Leggett 2016).

There are four main aspects of nature typically addressed by economists: the value of ecosystem services, the willingness-to-pay by visitors and residents to conserve species, a natural area's revenue, and the impact neighboring natural areas have on property values (Southwick Associates 2011). "Ecosystem services" are defined as all the beneficial functions performed by nature, such as climate regulation, carbon sequestration, nutrient cycling, waste treatment, water supply, habitat provision and a plethora of others. The second aspect, "willingness-to-pay", tabulates to value of rare and threatened species based on what the average household is willing to pay to preserve populations (Southwick Associates 2011). Certain factors which determine such quantity include if the person is a resident or visitor to the species' habitat, the rarity of the species, and the charisma of the species, among other things (Southwick Associates 2011). The third aspect, a natural area's revenue, is a calculated total of outdoor recreation spending in said area; recreation activities include hunting, fishing, boating, nature-viewing, and other visiting activities such as educational and social gatherings (Southwick Associates 2011). In 2011 the U.S. Department of Interior, or DOI, reported that 439 million visits were made to DOI lands, the revenue of which supported 388,000 jobs and provided over \$47 billion in economic activity (Southwick Associates 2011). The last aspect relevant to economists, a natural area's effect on nearby property values, is typically arranged in single-site studies (Southwick Associates 2011). One single-site study found that properties closer than 100 meters to the National Wildlife Refuge, or NWR, in Middlesex County, Massachusetts were valued at prices \$1,075 higher than properties further away (Neumann et al, 2009).

Endangered Species Act: Reported Costs

In the Endangered Species Act Document Library, made available to the public by the U.S. Fish & Wildlife Services, there are tabulated annual expenditure reports from 1996 to 2016. Complete

reports of fiscal year expenses related the Endangered Species Act prior to that year are unknown, as in 1988 the Act was reauthorized and amended under Public Law 100-478 to include Section 18 – requiring the U.S. Fish and Wildlife Service on behalf of the Secretary of the Interior to report annually the “reasonably identifiable” costs of conserving each species (2016 Expenditure Report). Expenditures also are listed for each individually listed species, subspecies, Distinct Population Segment (DPS), or Evolutionarily Significant Unit (ESU) (2016 Expenditure Report).

According to the first available report’s “Executive Summary”, “only those expenditures that are reasonably identifiable for a listed species are to be reported” from all federal agencies which receive the funds through grants listed in Section 6 (1996 Expenditure Report). These costs “include fisheries, refuges, land acquisition, law enforcement, research, and regional and field operations for listing, recover, consultation, environmental contaminant and habitat conversation activities” (1996 Expenditure Report). Excluded from these calculations are costs for conservation actions such as law enforcement, consultation, recovery coordination, litigation, and other actions not easily directed upon a particular species as well as any costs associated with species not natively domestic. Only refuge expenses that are “reasonably identifiable” as “dedicated” to a particular species are reported; for example, though listed fish species may benefit from fishery programs, costs are rarely associated to an individual species. Given these exclusions, the total in 1996 for costs considered “reasonably identifiable” to species listed and receiving protective measures was \$285,713690 – though this only accounted for 93% of the threatened or endangered species which were receiving assistance, leaving 7% unreported (1996 Expenditure Report).



Figure 6. National Fish Passage Program. Image from the U.S. Fish & Wildlife Service’s Fish Passage Program, expenses from which are unlikely to be reported under the Endangered Species Act as they are not “reasonably identifiable” to a certain species.

To break down the total cost, \$17,791,480 went towards land acquisition and 70% of the species with reported expenditures received \$0 - \$30,000 for non-land actions (1996 Expenditure Reports). The ten species with the highest reported expenditures were the chinook salmon (both the spring/summer run variety as well as the fall run variety), the sockeye salmon, the northern spotted owl, the red-cockaded woodpecker, the marbled murrelet, the razorback sucker, the Colorado squawfish, the desert tortoise, and the bald eagle. For comparison, in the most recent 2016 Expenditure Report, the spring/summer run variety of the chinook salmon is ranked second most costly species of the 2016 fiscal year and the fall run variety of the chinook salmon is ranked seventh most costly, totaling \$100,921,169 in “reasonable identifiable” conservation costs for both varieties (2016 Expenditure Report). Expenditures reported in the 2016 Expenditure Report for domestic and foreign species totaled \$1,478,692,129 – with slightly over 93% reported by Federal

agencies and the rest by the states. Of the ten costliest species of 1996, only the bald eagle no longer remains listed as threatened or endangered a decade later (2016 Expenditure Report).



Figure 7. Chinook Salmon. Chinook salmon, or king salmon, are the largest of all salmon, weighing up to 126 pounds, and they are also among the costliest species to protect (U.S. Fish & Wildlife Service Willapa National Wildlife Refuge).

Specifically noted in these reports, however, is that a “good faith effort” has been made to tabulate species-specific costs, yet “due to differences in reporting methods, this report cannot easily be compared to prior expenditure reports” (2016 Expenditure Report). The 2016 Expenditure Report notes that each year a different number of federal and state agencies report data, calculation methods change, the ability to track specific expenditures change, and the number of listed species changes, generally trending upward from year to year. If these annual fiscal year expenditure reports cannot be reasonably compared, particularly when they often list the same species in multiple reports, how reliable are the calculation methods and the “good faith” reporting of an unspecified number of federal and state agencies?

Endangered Species Act: Impacts

The Endangered Species Act, and in particular its broad definition of the term “take”, have inconvenienced landowners both professionally and personally since 1973. The development of land can be severely halted when endangered or threatened organisms are found to be inhabiting anything from an acre of crop land to a prospective construction site. Though this can seem like a reasonable protective measure, the limitations of illegally “taking” of an organism can also limit that organism’s conservation success. Not only does the market value of the land associated with an endangered species often suffer, the public’s perception of the species is negatively impacted as well. Overall, the ESA impacts four primary areas: the agricultural industry/land ownership rights, construction/land development activities, economic efficiency of a land, and public perception of endangered/threatened species.

The American Farm Bureau Federation, AFBF, also known as Farm Bureau Insurance and Farm Bureau Incorporated, is a United States-based insurance company and lobbying group acting in the interests of American agriculture (About – American Far Bureau). The AFBF website’s informational page describes the group as “non-partisan, non-sectarian, and non-secret”, their mission being to sustainably feed, clothe, and fuel the world. Shiloh Perry, a Media Relations Specialist for the AFBF, wrote in 2017 that the Endangered Species Act not only “prioritizes species listings over actual recovery and habitat conservation” but that it also places large regulatory burdens upon agricultural lands, impacting the “rural quality of life” and jeopardizing that facet of the economy.

Perry states that the law’s “litigation-driven model” makes it too easy for “radical environmental activists” to pursue legal measures against agriculturalists (2017). The cost of the resulting lawsuits often hurt rural economies and taxpayers alike without providing any tangible

protective resources to a species (Perry 2017). There have also been other circumstances in which farmers and landowners have pursued legal action against the federal government for unjust resource acquisition – a prime example is the *Orff v. United States* case (Minan 2005). The federal government had cutback 50 percent of the contracted water supplies in the WELANDS Water District in an attempt to conserve the winter run variety of Chinook salmon and Delta smelt, which posed an issue for farmland irrigation in the area (Minan 2005).

There are plenty of lawsuit examples wherein communities dispute the nomenclature and jurisdiction of the ESA. In 2018, the Pacific Legal Foundation filed on behalf of People for the Ethical Treatment of Property Owners in order to illustrate a better recovery plan to the threatened Utah prairie dog (Wood 2018). Due to the ESA's broad prohibition of "taking" any listed organism, citizens were not legally allowed to move the tunneling prairie dogs from playgrounds, cemeteries, or airport runways even for conservative measures (Wood 2018). Ultimately, the federal district court ruled in favor of the property owners and provided these citizens an unprecedented opportunity to work with the state to draft its own recovery program (Wood 2018). Given that the prairie dogs were not native to residential areas, the state invested in the improvement of natural habitat on state-owned lands to provide the organism with permanent protection there (Wood 2018). This conservation plan worked astronomically better than the prior federally-regulated management plan; under the state's new management plan, prairie dog populations had doubled in just five years – a population increase that took the previous plan almost 30 years to accomplish (Wood 2018).



Figure 8. Utah Prairie Dog. Photo via the Pacific Legal Foundation (Wood 2018).

Not only does the ESA’s broad definition of “take” affect current land use and ownership, it also impacts any possible construction which could occur in an area. There are three general construction scenarios the ESA applies to: 1) construction activities under the EPA’s Construction General Permit, CGP, 2) activities funded/permitted by federal agencies for a construction project not within the purview of the CGP, or 3) any construction activities which may impact a listed species and/or a critical habitat (Managing Your Environmental Responsibilities). Civil penalties can reach up to \$27,500 per day per violation; “knowing endangerment” violations which pose to injure or kill a protected species result in up to \$250,000 in fines and/or 15 years in prison (Managing Your Environmental Responsibilities). In 1978, the power of the ESA over construction was first realized in a ruling regarding the effects of the Tennessee Valley Authority dam’s construction on the snail darter, a 2-3-inch fish found in the upper Tennessee River basin (Gordon 2018). The court ruled that Congress – through the ESA – intended for federally endangered species to be saved “whatever the cost” of conservative action (Gordon 2018). The snail darter would later be found in numerous other locations and in vast quantities, and

construction would resume, but the precedent it set for the ESA's "fiscal responsibility" looms large (Gordon 2018). As previously noted, tens of billions of dollars in expenditures are often poorly estimated and tracked, and the lackluster recovery rate of listed species does little to support such high investments.



Figure 9. Snail Darter. Photo of the snail darter from the Center for Biological Diversity (Williams & Plater).

Though direct conservation costs are inconsistently reported, the effects of these measures are rarely tabulated. In May of 2018, the environmental news site EcoWatch reported that 100 miles of construction along a \$6.5 billion pipeline in Virginia and West Virginia was delayed as it posed a potential risk for listed species such as the Roanoke logperch and the Indiana and Northern long-eared bats (Chow). The delay is unable to be resolved unless the U.S. Fish and Wildlife Service revises the "incidental take statement", which limits the quantity of listed species which may be adversely affected during development activities and makes the movement/relocation of listed species to alternative habitats illegal (Chow). This has the potential to drastically impact the

opportunity costs and reductions in property values associated with non-critical habitat (Gordon 2018). By limiting what activities can occur on a parcel of land, the ESA potentially decreases the economic efficiency of the land with the listed species and the surrounding areas by lowering the market value of said land. Though, as illustrated by the property owners and Utah prairie dogs previously, by removing some of the risk associated with the “take” prohibitions, new conservation measures can be drafted which benefit both landowners and endangered/threatened organisms. As Texas Land Commissioner George P. Bush said, “The Endangered Species Act was designed to preserve biodiversity, not enrich trial lawyers and political activists” (Mutnick 2015).

Endangered Species Act: Successes

Less than one percent of the species which have been listed under the protection of the Endangered Species Act have recovered enough to qualify for delisting; only 47 out of 2,244 species have been removed, with an additional 18 under consideration (Rizzo 2019). When looking at the species which have been delisted, there is a clear trend – only species with simplistic threats to their proliferation have recovered. In 2012 the Center for Biological Diversity, a nonprofit membership organization founded in 1989 to enact conservation measures through legal action and grassroots activism, completed a survey of 110 species and later highlighted “Species Success Stories” of the most promising seven species. Those seven species included the Aleutian Canada goose, the California least tern, the black-footed fetter, the American crocodile, the whooping crane, the gray wolf of the norther Rocky Mountains, and the shortnose sturgeon.

Though formerly endangered, the U.S. Fish and Wildlife Service no longer lists the Aleutian Canada goose as threatened or endangered under the Endangered Species Act (National Archives and Records Administration 2001). The principle cause of their population decline was predation by larger Artic and red foxes, organisms introduced to the many North Pacific islands

for fur farming between 1915 and 1939 (U.S. Fish & Wildlife Service 1999). Additionally, some suitable wintering habitats such as those located in the Central Valley of California were disappearing due to increased urbanization and changing agricultural practices (U.S. Fish & Wildlife Service 1999). Following its listing, all known breeding locations of the Aleutian Canada goose were protected within the Alaska Maritime National Wildlife Refuge and efforts were taken to remove the introduced arctic foxes from former nesting islands (U.S. Fish & Wildlife Service 1999). After its initial listing with the U.S. Fish and Wildlife Service in 1967 as endangered prior to the Endangered Species Act itself, the goose was downlisted to threatened in 1991, and removed altogether as of 2001; though it still receives some protections via the Migratory Bird Treaty Act and CITES as well as some state laws and regulations (National Archives and Records Administration 2001). Ultimately, by setting aside federal land for breeding and removing the primary issue, non-natural predation, the species was saved with relatively straightforward changes.



Figure 10. Aleutian Canada Goose. Photo of the Aleutian Canada Goose via the U.S. Fish & Wildlife Service (1999).

The species information on the California least tern, provided by the Sacramento Fish and Wildlife Office as recently as 2017, currently lists the smallest North American tern as endangered (U.S Fish & Wildlife Service). Due to threats such as dredging, habitat loss nesting disturbance, pollution, and predation, the species was listed as federally endangered in 1970 and also received protections under the Migratory Bird Treaty Act (U.S. Fish & Wildlife Service 2017). The primary threat occurred in the early 20th century with the building of the Pacific Coast Highway, which destroyed shorebird nesting habitats and increased human encroachment of the area (Aquarium of the Pacific). Habitat management thusly focuses on protecting and monitoring other viable nesting sites (Aquarium of the Pacific). A large number of suitable breeding sites are located on military lands inaccessible to the public, these are protected through a partnership by the U.S Navy, Marine Corps, and U.S Fish and Wildlife Service (Aquarium of the Pacific). Almost entirely because of this partnership and allocation of viable nesting land, the Sacramento Fish and Wildlife Service

now states under the California least tern listing that the state believes the species should be downlisted to threatened (U.S. Fish & Wildlife Service 2017). With the number of sites allocated nearly doubled, the California least tern population has rebounded from nearly 600 in 1973 to nearly 7,100 nesting pairs in 2005 (U.S. Fish & Wildlife Service 2017). Yet again another example of a direct decline cause and direct conservation measures.



Figure 11. California Least Tern. Photo of the California least tern via the U.S. Fish & Wildlife Service (2017).

The black-footed ferrets have dwindled to significantly low numbers due to diseases such as plague and fragmented habitats due to agricultural practices; in 1986, only eighteen individuals were known to exist in an isolated wild population in Meeteetse, Wyoming (U.S. Fish & Wildlife Service 2017). The direct population decline in this case was due to the species heavily relying on prairie dogs, which comprise over 90% of the ferret's diet (U.S. Fish & Wildlife Service 2017). The burrows black-footed ferrets dig often coincide with the habitats of the prairie dogs, however with human activities and disease devastating prairie dog populations, this predator-prey reliance

left the ferrets also disease ridden and homeless (U.S. Fish & Wildlife Service 2017). Since 1967, even before the final amendment establishing the Endangered Species Act as it is currently known, the black-footed ferrets have been listed as endangered across their entire habitat range with the exception of several experimental reintroduction populations (U.S. Fish & Wildlife Service 2017). The U.S Fish and Wildlife Service has led such reintroduction efforts through a National Black-footed Ferret Conservation Center in northern Colorado and has reintroduced ferrets to 29 sites across 8 states, Canada, and Mexico (U.S. Fish & Wildlife Service 2017). Currently, 1,410 black-footed ferrets are estimated to exist in the wild (Lockhart). Compared to other species who have found themselves listed under protect of the ESA, ferrets exist in a fairly simple closed system wherein they are dependent on their primary prey. Since they are susceptible to the plague associated with their close neighbors, wild- and captive-born ferrets are now receiving inoculation with great success (Miller 2020). When half a colony of ferrets in Montana was vaccinated, their survival rose 240% (Miller 2020). Additionally, prairie dog colonies can be dusted with an insecticide which wipes out the plague-carrying fleas, increasing the density of prairie dogs and neighboring ferrets (Miller 2020). Though these insecticide and vaccination studies are relatively recent progressions, they are promising – as the cause of the ferret’s decline was easily tracked back to one suffering predator-prey relationship.



Figure 11. Black-footed Ferret. Photo of the black-footed ferret via the U.S. Fish & Wildlife Service (2017).

The American crocodile was listed as endangered by the U.S. Fish & Wildlife Service in 1975 and critical habitat was established for the species in 1979. The species had always been considered rare in southern Florida, as the region marks the most northern end of its range, which can dip as far south as the northern horn of Africa (Mazzotti & Cherkiss 2006). The primary cause for the decline in American crocodile populations is habitat loss in southeastern Florida, around Florida Bay and Biscayne Bay (Mazzotti & Cherkiss 2006). The loss in nesting sites has been compensated for by an increase in nesting on artificial substrates; the intentional establishment of the Crocodile Lake National Wildlife Refuge as well as the unintentional byproduct of construction activities at the Turkey Point Power Plant site created the perfect space for the species (Mazzotti & Cherkiss 2006). Additionally, seasonal restrictions for disruptive recreational uses are being explored near crocodile nesting locations to decrease human-crocodile conflict and further public education to develop positive public perception around crocodile conservation is deemed necessary (U.S. Fish & Wildlife Service). Though the species remains listed as endangered

federally, the outlook is optimistic – the status of the Florida population has been changed to threatened due to an increase in nesting females (U.S. Fish & Wildlife Service). This is another example of a direct population decline cause – lack of nesting land – and comparatively simplistic conservation measures – development of wildlife refuges.



Figure 12. American Crocodile. Photo of the American crocodile via the U.S. Fish & Wildlife Service.

The most recognizable conservation success in the eyes of the American public is likely to be the bald eagle. In 1940, Congress passed the Bald Eagle Protection Act, later expanded to the Bald and Golden Eagle Protection Act (U.S. Fish & Wildlife Service). Other protections were established via the Endangered Species Preservation Act of 1966 and the Endangered Species Conservation Act of 1969 (U.S. Fish & Wildlife Service). In 1972, the bald eagle gained safeguard under the Migratory Bird Treaty Act; this was also the same year the synthetic pesticide dichlorodiphenyltrichloroethane, or DDT, was banned for agricultural uses in the United States (U.S. Fish & Wildlife Service). The issue with DDT was that while it was an effective insecticide,

the residue that accumulated in runoff contaminated aquatic ecosystems (Heisman 2018). Bald eagles would then ingest contaminated fish, which affected their reproductive systems causing them to lay eggs with extremely weak shells which crushed upon incubation (Heisman 2018). In 1963, there were only 417 breeding pairs of bald eagles in the lower 48 states – by 1997, this number had increased to over 5,000 (Heisman 2018). Since 1973, when the toxic chemical had completely lifted from the market, multiple bird populations have seen significant rebounds; peregrine falcons, ospreys, brown pelicans, Cooper’s hawks, and bald eagle populations alike have all benefitted (Saha 2015). Though the bald eagle is often discussed as the “ultimate Endangered Species Act success story” (Heisman 2018), the conservation measures required to rebound a population hinged on alleviating a specific, often primary threat to sustainability.



Figure 12. Bald Eagle. Photo of the bald eagle via the U.S. Fish and Wildlife Service.

Endangered Species Act: Further Fallibilities

Clearly the ESA is only capable of assisting organisms with one of limited threat sources, such as the bald eagle. Though this fallibility is shown by reviewing species who are already listed, there

are multiple issues species face prior to securing protections under the ESA. The Act faces a chronic backlog of species which are doomed to fall into the purgatory of lengthy litigations before their threats are ever fully evaluated. Currently, the process of petitioning species for protection under the ESA is incredibly costly both financially and with respect to time such to the point that many petitioning entities have sought legal action against the U.S. Fish & Wildlife Service and the National Marine and Fisheries Services for lack of punctual action. While the Obama administration had drafted possible remedies for this pitfall, the succeeding Trump Administration has taken many actions in alternative directions.

While any interested person can petition either the U.S. Fish & Wildlife Service or the National Marine and Fisheries Service for a listing or delisting of species for free, the current petitioning process is neither cheap nor simple. From 2007 to 2011, two organizations dominated the process, filing 90% of the listing petitions (Woody 2011). This method of bombardment is called a “mass-listing strategy” (Woody 2011), and is only realistically feasible for organizations with large staffing efforts; the two organizations which filed the majority of listing petitions were the Center for Biological Diversity and WildEarth Guardians – both with annual budgets of over \$15 million (Wood 2019). Both organizations have also filed lawsuits against the Department of the Interior over listing delays, further exacerbating the wait time (Woody 2011).

Under the ESA, the Department of the Interior must determine if a petition to list a species warrants further investigation within 90 days of receiving it (Woody 2011). If the petition warrants further investigation, the DOI has 12 months to conduct a scientific investigation supporting a final decision on the species. Furthermore, all petitions made require a response. The U.S. Fish & Wildlife Service’s median response cost is \$39,276 (Wood 2019). If the petition then indicated listing may be warranted, an additional average of \$100,960 is spent (Wood 2019). In this process,

these funds are often exhausted on weak or difficult to understand petitions when already listed species need assistance. This is especially the case now, as the number of petitions is increasing dramatically. From 1993 to 2007, the U.S. Fish & Wildlife Service received 20 listing petitions per year (Wood 2019). Then from 2008 to 2011, the Service received 308 petitions per year (Wood 2019). Under the ESA as it is currently written, there is no cap on the number of petitions one person, or more applicably, one entity can file.

The Obama administration drafted new rules for petitions that would mitigate these issues under the ESA, but requirements were not finalized (Taylor & Hiar 2015). The drafted rules would have limited listing petitions to cover just one species at a time, banning the “mass listing strategy”. This would not have been a limit on the number of petitions which could be filed but would have acted as a requirement that petitions be filed on a species-by-species basis (Taylor & Hiar 2015). These new rules would have also required petitioners to provide a copy of their filing to the state fish or game agencies 30 days prior to submission. Those agencies would then be capable of commenting on the accuracy of the petition in a “state consultation” period. To further verify the authenticity of the filings, these changes would require petitions to contain literature citations, supporting materials, and a clear presentation of information to be considered complete. Failure to contain required elements would result in a returned petition (Taylor & Hiar 2015).

These new rules never made it into an official amendment to the ESA and instead alternative changes were made by the Trump administration in August of 2019 which primarily targeted Sections 4 and 7 (U.S. Department of the Interior 2019). With these changes, the government will now consider the economic factors before categorizing a species as threatened or endangered (Aguilera 2019). However, as Leah Gerber, professor of conservation science and founding director of the Center for Biodiversity Outcomes at Arizona State University says,

“Recovering species is a biological question, not an economic question”, and many conservations are concerned that these new changes will disregard recovery efforts which run perpendicular to construction ventures (Aguilera 2019). This completely ignored the economic benefits of

Additionally, the definition of risks is no longer associated with the “foreseeable future”, potentially ignoring the effects of climate change on a species and allowing for less transparency in the listing process (Aguilera 2019). The U.S. Fish & Wildlife Service finalized a separate revision around the same time the Trump administration was making changes. This separate revision rescinded the “blanket rule” under Section 4(d) of the ESA (U.S. Department of the Interior 2019). Previously, the rule had automatically granted threatened species the same protections as endangered species unless otherwise noted. This change has less harmful implications than the aforementioned alterations, particularly since the National Marine Fisheries Service has never operated under a “blanket rule” for species listed through its offices (U.S. Department of the Interior 2019). This change, and the majority of the Trump administration’s changes, will only impact future species listings or reclassifications.

The Endangered Species Act: Problem Summary

There are several problems with the Endangered Species Act as it currently operates. First, the rigid definition of the word “taking” in Section 9 of the ESA not only creates a negative public image of the Act but also has the potential of putting a species in jeopardy when actions such as moving a species to a more suitable habitat cannot be executed. This was proven in the aforementioned case wherein the People for the Ethical Treatment of Property Owners sued against the “taking prohibition” and were able to draft alternative means for protecting the Utah prairie dog with public input that proved to recover the species with a 6x greater success rate (Wood 2018). Secondly, there is an obvious lack of input and understanding from landowners and the

public. When the public is not allowed to contribute ideas and opinions, a division is created between the work of the ESA and the public perception of the species listed. Thirdly, there is a lack of consistency in the expenditure reports required under Section 18. This includes an inability to compare expenditure reports across fiscal years when costs are often associated with the same species each year (U.S. Fish & Wildlife Service 2016). Fourthly, there has been no action implemented which appropriately addresses the chronic backlogging of species (Woody 2011). Again, this involves a lack of input from the public when large, wealthy entities domination the species protection process. Furthermore, the lengthy and costly litigations which ensue often deter the ESA further from its intended function (Woody 2011). Fifthly, the future of the ESA is determined by partisanship and economy politics such to the point that the goals of some prominent politicians contradict the foundational goals of the ESA (Aguilera 2019).

Endangered Species Act: Solutions Concepts

Amending or repealing the Endangered Species Act is the current goal of many persons and politicians. The Center for Biological Diversity offers a comprehensive and continually updated database of “Legislative Attacks on the Endangered Species Act During the Trump Administration”. As of April 1st, there have been 13 different bills introduced which would alter the ESA (Center for Biological Diversity). Of the 34 different bills introduced in 2019, four have passed the House of Representatives, one became public law, and one has failed, with the rest still listed as “currently being considered” (Center for Biological Diversity). All of the bills which passed the House and/or became law prevented the listing of the greater and Columbia-basin sage grouse for one year. This is not altogether concerning, as the Washington Department of Fish and Wildlife’s Executive Summary of the species states that while the sage-grouse has been state-listed as threatened since 1998, the greater and Columbia-basin sage grouse Distinct Population Segment

(DPS) does not meet the criteria for listing (Stinson 2016). There are some potentially concerning bills which have not been voted on yet by the House, such as the “Endangered Species Management Self-Determination Act” which aims to strip all protections from every listed species until Congress is able to pass a resolution of approval as well as eliminating a citizen’s ability to submit petitions under the ESA (Center for Biological Diversity). Additionally, the “American Energy First Act” aims to exempt any oil and gas activities on non-federal land from being held to the standards of care imposed in Section 7 of the ESA (Center for Biological Diversity). Even worse, at the end of 2019 the “Endangered Species Accountability Reform Act” was introduced, which seeks to automatically remove ESA protections after 5 years of a species being listed (Center for Biological Diversity). All of the previously mentioned Acts have been proposed by Republican members of the House. In 2019, there were only 5 bills proposed by House Democrats, 4 of which involved the delisting of the greater and Columbia-basin sage grouse (Center for Biological Diversity).

The best solution will be one that 1) validates the impact of the ESA as historic environmental legislature, 2) reflects the original goals of the ESA and conservation science, 3) is drafted through consultation with reputable sources within the U.S. Fish & Wildlife Services, the National Marine Fisheries Service, and other national and state offices within the DOI, 4) addresses the inconsistency of the expenditure reports and consolidates funding data into a concise and comparable document each fiscal year through reporting methods which are consistent across species, 5) utilizes a non-affiliated collection entity which compiles financial data from all involved agencies and organizations that receive funding, 6) addresses the need for a petitioning reform and a method to sorting the backlogged species in a timely and fiscally responsible manner,

and 7) promotes a bipartisan agenda which is species-oriented and takes responsibility for our the impact of our actions on the environment.

References

- Aguilera, J. (2019, August 14). *What To Know About Changes to The Endangered Species Act*. Time.
<https://time.com/5651168/trump-endangered-species-act/>
- Anderson, R. (2010, October 24). *Nature's gift: The economic benefits of preserving the natural world*. British Broadcasting Corporation – News. <https://www.bbc.com/news/business-11606228>
- Aquarium of the Pacific. (n.d.). *California Least Tern*.
http://www.aquariumofpacific.org/onlinelearningcenter/species/california_least_tern
- Blakemore, E. (2018, August 1). *How Nixon Became the Unlikely Champion of the Endangered Species Act*. <https://www.history.com/news/richard-nixon-endangered-species-act-esa-environment>
- Carson, R. (1962). *Silent spring*. Boston, MA: Houghton Mifflin.
- Ceballos, G., Ehrlich, P., Barnosky, A., García, A., Pringle, R., & Palmer, T. (2015). *Accelerated modern human-induced species losses: Entering the sixth mass extinction*. *Sci. Adv.* 1, e1400253
- Center for Biological Diversity. (2012). *110 Success Stories for Endangered Species*. Center for Biological Diversity. <https://www.esasuccess.org/index2012.html>
- Center for Biological Diversity. (n.d.) *Legislative Attacks on the Endangered Species Act During the Trump Administration*.
https://www.biologicaldiversity.org/campaigns/esa_attacks/trumptable.html
- Center for Biological Diversity. (n.d.). *Listing Species Under the Endangered Species Act*.
https://www.biologicaldiversity.org/programs/biodiversity/endangered_species_act/listing_species_under_the_endangered_species_act/index.html
- Center for Biological Diversity. (n.d.). *The Endangered Species Act: A Wild Success*.
https://www.biologicaldiversity.org/campaigns/esa_wild_success/

Clean Air Act. Agencies: U.S. Environmental Protection Agency. Citation: 42 U.S.C. §§7401 et seq.

Enacted as: the “Clean Air Act”, on December 17, 1963.

Costanza, R., d’Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, K., Naeem, S., O’Neill, R.,

Paruelo, J., Raskin, R., Sutton., P., & van den Belt., M. (1997, May 15). *The value of the world’s ecosystem services and natural capital*. *Nature* 387, 253–260. <https://doi.org/10.1038/387253a0>

he value of the world's ecosystem services and natural capital. *Nature* 387, 253–260 (1997).

<https://doi.org/10.1038/387253a0>

Doyle, J. (2016, February 22). *Santa Barbara Oil Spill: California, 1969*. Pop History Dig.

<https://www.pophistorydig.com/topics/santa-barbara-oil-spill/>

Dybas, C. (2012, July 25). *Acid Rain: Scourge of the Past or Trend of the Present?*

https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=124955

Endangered Species Act of 1973, 16 U.S.C. § 1531 et seq. (1973). <https://www.fws.gov/endangered/esa-library/index.html>

Gordon, R. (2018, August 23). *"Whatever the Cost" of the Endangered Species Act, It's Huge*.

Competitive Enterprise Institute. <https://cei.org/content/whatever-cost-endangered-species-act-its-huge>

Leggett, K. (2016, December 7). *The Right Seed in the Right Place at the Right Time: National Wildlife*

Refuge System. U.S. Fish & Wildlife Service. <https://www.fws.gov/refuges/features/Seeds.html>

Lovett, G. M., Groffman, P. M., & Likens, G. E. (n.d.). *Hubbard Brook Ecosystem Study*. Cary Institute.

<https://www.caryinstitute.org/science/research-projects/hubbard-brook-ecosystem-study>

Mai-Duc, C. (2015, May 21). *The 1969 Santa Barbara oil spill that changed oil and gas exploration*

forever. <https://www.latimes.com/local/lanow/la-me-ln-santa-barbara-oil-spill-1969-20150520-htmlstory.html>

Mazzotti, F. & Cherkiss, M. (2006) *Ecology and Conservation of the American Crocodile (Crocodylus acutus) in Florida*. (n.p).

<https://crocdoc.ifas.ufl.edu/publications/posters/crocodileecologyconservation/>

Meyer, R. (2017, March 29). *How the U.S. Protects the Environment, From Nixon to Trump*.

<https://www.theatlantic.com/science/archive/2017/03/how-the-epa-and-us-environmental-law-works-a-civics-guide-pruitt-trump/521001/>

Michael Rotman. (n.d.). *Cuyahoga River Fire*. <https://clevelandhistorical.org/items/show/63>

Michael Rotman. (n.d.). *Lake Erie*. <https://clevelandhistorical.org/items/show/58>

Marshal, M. (2015, July 14). *What is the point of saving endangered species?* British Broadcasting

Corporation – Earth. <http://www.bbc.com/earth/story/20150715-why-save-an-endangered-species>

Mutnick, A. (2015, August 27). *Bush Leads Push for Endangered Species Reform*. Texas Tribune.

<https://www.texastribune.org/2015/08/26/george-p-bush-calls-endangered-species-act-reform/>

National Archives and Records Administration. (2001, March 20). *Endangered and Threatened Wildlife*

and Plants; Final Rule To Remove the Aleutian Canada Goose From the Federal List of

Endangered and Threatened Wildlife. [https://www.federalregister.gov/documents/2001/03/20/01-](https://www.federalregister.gov/documents/2001/03/20/01-6894/endangered-and-threatened-wildlife-and-plants-final-rule-to-remove-the-aleutian-canada-goose-from)

[6894/endangered-and-threatened-wildlife-and-plants-final-rule-to-remove-the-aleutian-canada-goose-from](https://www.federalregister.gov/documents/2001/03/20/01-6894/endangered-and-threatened-wildlife-and-plants-final-rule-to-remove-the-aleutian-canada-goose-from)

Neumann, B. C., Boyle, K. J., & Bell, K. P. (2009). *Property price effects of a national wildlife refuge:*

Great Meadows National Wildlife Refuge in Massachusetts. *Land Use Policy*, 26(4), 1011–1019.

doi: 10.1016/j.landusepol.2008.12.008

Water Education Foundation. (n.d.) *Point Source vs. Nonpoint Source Pollution*.

<https://www.watereducation.org/aquapedia-background/point-source-vs-nonpoint-source-pollution>

- Perry, S. (2017, February 8). *The Buzz on Endangered Species Act Reform*. American Farm Bureau.
<https://www.fb.org/viewpoints/the-buzz-on-endangered-species-act-reform>
- Rizzo, S. (2019, August 16). *Has the Endangered Species Act saved 'very few' plants and animals?*
Augusta Chronicle. <https://www.augustachronicle.com/news/20190816/has-endangered-species-act-saved-very-few-plants-and-animals>
- Rothman, L. (2017, March 22). *Environmental Protection Agency: Why the EPA Was Created*.
<https://time.com/4696104/environmental-protection-agency-1970-history/>
- Rott, N. (2019, August 12). *Trump Administration Makes Major Changes To Protections For Endangered Species*. National Public Radio. <https://www.npr.org/2019/08/12/750479370/trump-administration-makes-major-changes-to-protections-for-endangered-species>
- Southwick Associates. (2011, October 10). *The Economics Associated with Outdoor Recreation, Natural Resources Conservation and Historic Preservation in the United States*. Official Site of the State of New Jersey. [https://www.nj.gov/gsp/pdf/Reports/NFWF Report on Economic Value of Conservation 2011.pdf](https://www.nj.gov/gsp/pdf/Reports/NFWF%20Report%20on%20Economic%20Value%20of%20Conservation%202011.pdf)
- Stinson, D. (2016 February). *Periodic Status Review for the Greater Sage-grouse*. Washington Department of Fish and Wildlife – Wildlife Program. <https://wdfw.wa.gov/publications/01757>
- Taylor, P., & Hiar, C. (2015, May 19). *ENDANGERED SPECIES: Obama overhaul draws GOP support, raises legal questions*. E&E News. <https://www.eenews.net/stories/1060018813>
- U.S. Department of the Interior. (2019, August 13). *Trump Administration Improves the Implementing Regulations of the Endangered Species Act*. Department of the Interior.
<https://www.doi.gov/pressreleases/endangered-species-act>
- U.S. Environmental Protection Agency. (2017, January 3). *Evolution of the Clean Air Act*.
<https://www.epa.gov/clean-air-act-overview/evolution-clean-air-act>

U.S. Environmental Protection Agency (2017, August 8) *History of the Clean Water Act*.

<https://www.epa.gov/laws-regulations/history-clean-water-act>

U.S. Environmental Protection Agency. (2018, November 19). *The Origins of EPA*.

<https://www.epa.gov/history/origins-epa>

U.S. Fish & Wildlife Service. (1999, July). *Aleutian Canada goose (Branta canadensis leucopareia)*.

PDF.

U.S. Fish & Wildlife Service. (n.d.). *American Crocodile (Crocodylus acutus)*.

https://www.fws.gov/refuge/Crocodile_Lake/wildlife_and_habitat/american_crocodile/

U.S. Fish & Wildlife Service. (n.d.). *Bald and golden eagle protection and permitting*. U.S. Fish &

Wildlife Service. <https://www.fws.gov/cno/conservation/MigratoryBirds/EaglePermits.html>

U.S. Fish & Wildlife Service. (2017, November). *Black-footed Ferret (Mustela nigripes)*. U.S. Fish &

Wildlife Service. PDF.

U.S. Fish & Wildlife Service. (2017, November). *California Least Tern (Sterna antillarum browni)*. U.S.

Fish & Wildlife Service.

https://www.fws.gov/sacramento/es_species/Accounts/Birds/ca_least_tern/

U.S. Fish & Wildlife Service. (1996). *Federal and State Endangered and Threatened Species*

Expenditures. U.S. Fish & Wildlife Service.

U.S. Fish & Wildlife Service. (2016). *Federal and State Endangered and Threatened Species*

Expenditures. U.S. Fish & Wildlife Service.

U.S. Fish & Wildlife Service – Fish and Aquatic Conservation. (n.d.). *National Fish Passage Program*.

U.S. Fish & Wildlife Service.

<https://www.fws.gov/pacific/fisheries/AquaticHabitatConservation/R1NationalFishPassageProgram.cfm>

- U.S. Fish & Wildlife Service. (n.d.). *History of Bald Eagle Decline, Protection and Recovery*. U.S. Fish & Wildlife Service. <https://www.fws.gov/midwest/eagle/history/index.html>
- U.S. Fish and Wildlife Service/Endangered Species Program. (n.d.). *Endangered Species Act: A History of the Endangered Species Act of 1973*. <https://www.fws.gov/endangered/laws-policies/esa-history.html>
- U.S. Fish & Wildlife Service – Willapa National Wildlife Refuge. (n.d.). *Chinook Salmon (*Oncorhynchus tshawytscha*)*. U.S. Fish & Wildlife Service. https://www.fws.gov/refuge/wassaw/wildlife_and_habitat/alligator.html
- Williams, J., & Plater, Z. (n.d.). *Petition to Delist the Snail Darter Under the Endangered Species Act*. Center for Biological Diversity. <https://www.biologicaldiversity.org/>
- Wood, J. (2018, April 13). *A postscript to the Utah prairie dog case: federal agency embraces state-led reform*. Pacific Legal Foundation. <https://pacificlegal.org/a-postscript-to-the-utah-prairie-dog-case-federal-agency-embraces-state-led-reform/>
- Wood, J. (2019, April 29). *Modernization of the Endangered Species Act*. Property and Environment Research Center. https://www.perc.org/2018/09/26/modernization-of-the-endangered-species-act/#_ftn25
- Woody, T. (2011, April 21). *Wildlife at Risk Face Long Line at U.S. Agency*. New York Times. <https://www.nytimes.com/2011/04/21/science/earth/21species.html>