Growth Energy

ESA Comments - Attachment B

Docket # EPA-HQ-OAR-2019-0136

Supplemental Notice of Proposed Rulemaking; Renewable Fuel Standards Program: Standards for 2020 and Biomass-Based Diesel Volume for 2021, and Response to the Remand of the 2016 Standards

November 29, 2019

ENVIRONMENT
& HEALTH

MEMORANDUM

SUPPLEMENTAL ANALYSIS REGARDING ALLEGATIONS OF POTENTIAL IMPACTS OF THE RFS ON SPECIES LISTED UNDER THE ENDANGERED SPECIES ACT

Prepared for **Growth Energy**

Date **11/29/2019**

OBJECTIVES AND SCOPE

This memorandum supplements the analysis in our August 2019 report, "*The RFS and Ethanol Production: Lack of Proven Impacts to Land and Water*" ("Ramboll Report"), in which we analyzed potential environmental impacts of the RFS program and concluded that there are no proven adverse impacts to land and water associated with increased corn ethanol production under the RFS. The impetus for this supplemental memorandum is a recent D.C. Circuit opinion on a petition for review of EPA's final rule setting the renewable fuel standards for 2018 (the "2018 RVO Rule"). *Am. Fuel & Petrochemical Mfrs. v. EPA*, No. 17-1258 (D.C. Cir. Sept. 6, 2019). The Court remanded the rule back to the agency to further consider petitioners' claims that EPA failed to comply with the Endangered Species Act (ESA). Specifically, the Court directed that under ESA Section 7, EPA must make an appropriate determination as to whether the 2018 RVO Rule "may affect" a listed species or critical habitat.

We are aware that the ESA Section 7 consultation issue is relevant not only to the remand in the above case, but also to future EPA rulemakings with respect to the Renewable Fuel Standard Program (RFS), including EPA's proposed rule setting the renewable fuel standards for 2020 (the "2020 RVO Rule"). Following on our 2019 Report, we are providing this supplemental analysis to explore further whether there is any evidentiary basis in the record for EPA to conclude that the RFS program "may affect" a listed species or critical habitat. This memorandum focuses on the technical aspects of the record relied upon by the Court that were supplied by petitioners' exhibits, including:

- Declaration of Dr. Tyler Lark (July 27, 2018; referred to herein as the Lark Declaration)
- U.S. Environmental Protection Agency, *Biofuels and the Environment: Second Triennial Report to Congress.* Washington, D.C. (June 29, 2018)
- Declaration of C. Elaine Giessel (July 27, 2018)
- Declaration of Aaron Viles (July 20, 2018)
- Declaration of William A. Fontenot (July 24, 2018)
- Declaration of Katherine M. Slama (July 26, 2018)
- Declaration of Andrew E. Whitehurst (July 26, 2018).

Problem Understanding

The allegations of potential impacts to listed terrestrial species that are presented in the Lark Declaration (and referenced in the Court opinion) center on an assumed relationship between the RFS and habitat loss or degradation due to presumed land conversion to grow biofuel feedstock. The Lark Declaration also references potential impacts to aquatic species due to an assumed relationship between biofuel feedstock grown for ethanol production and water quality degradation due to use of agrichemicals (e.g., fertilizers and pesticides) and the potential for increased erosion.

The relationship between the RFS and impacts to land and water, if any, would be effected via a complex causal chain consisting of the following major relationships:

A. RFS and increased demand for ethanol

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B. Increased demand for ethanol and upward pressure of this demand on the price of ethanol feedstock (mainly corn)

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C. Price of corn and an individual farmer's decision to plant corn

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D. Individual farmer's decision to double crop corn, switch from another crop to corn, or farm new land

↓

E. Location, type, and magnitude of adverse impact to terrestrial and aquatic habitat

Each of the above relationships, in turn, encompasses several interrelated variables, each variable is likely to change on an annual basis, and many of the relationships are co-dependent. The Lark Declaration does not consider these relationships in a meaningful way, and instead relies on unsupported assumptions and speculation.

There are several lines of evidence indicating that increased demand, if any, for ethanol resulting from the RFS has not been a discernible driver of land use change. One of the most basic lines of evidence has to do with the historical trend in the number of acres in the U.S. devoted to growing corn. Historical data generated by the U.S. Department of Agriculture (USDA) shows that acres planted in corn nationwide is currently at or below levels reported in 1926 and in the last 2 decades has generally fluctuated between 80 million acres and 100 million acres (Figure 1).

The amount of land in the U.S. devoted to growing corn has remained at or below historical levels despite the following trends:

- Total corn production (bushels per year) has increased about 7-fold over the period of record
- Corn produced for ethanol has increased by a factor of 12.5 since 1986 and now accounts for about 50% of corn grown.

This increase in corn production and corn production devoted to ethanol, without an apparent increase in acres planted, is attributed to a 7-fold increase in corn yield (bushels per acre).

The 7-fold increase in corn production nationwide over the period of record has not been accompanied by a nationwide increase in the acres of corn planted. This lack of association in itself calls into question whether there is a causal link between increased demand for corn grown for ethanol and demand for increased acreage of corn, which in turn calls into question the causal relationship between increased demand for corn for ethanol and land conversion. The remainder of the report delves more deeply into each step in the potential causal chain between the RFS and impacts to species. In particular, causal steps B, C, and D are discussed in Section 2 below, and causal step E is discussed in Section 3 (for terrestrial listed species mentioned in the Lark Declaration) and Section 4 (for aquatic listed species mentioned in the Lark Declaration). Analysis of the effect of the RFS on increased demand for ethanol (causal step A above) is outside the scope of this memorandum.

Summary of Findings

Our technical review of the assertions made in the Lark Declaration lead to the following overall conclusions:

- Assertions that increased corn ethanol production under the RFS has resulted in land use change and conversion of non-agricultural land to production of biofuel feedstock are unsubstantiated for several reasons, including the following:
  - Acres planted in corn across the United States has remained close to or below the total acres planted in the early 1930s despite increases in demand for corn as human food, animal feed, and biofuels over this nearly 90-year period. This fact by itself calls into question the relationship between the RFS and land use change.
  - The causal relationship between the RFS and the price of corn is not supported by the evidence, and therefore, the Lark Declaration's presumption that increased corn prices drive land use change are unsubstantiated.
  - The Lark Declaration does not adequately consider the many disincentives to the farmer of converting non-agricultural land to growing any given crop, and thus assertions in the Lark Declaration that the RFS and price of corn has resulted in land conversion are also unsubstantiated.
- Assertions that RFS-driven land use change has resulted in impacts to particular ESA listed species are without foundation for multiple reasons, including:
  - The Lark Declaration asserts that land use change spurred by the RFS has resulted in impacts to listed terrestrial species of birds, mammals, and insects.
  - The evidence presented in the Lark Declaration to support the alleged impacts are poorly researched and the examples used to support many assertions instead actually *refute* the assertions.
- Assertions that RFS-driven biofuels agriculture adversely impacts water quality are also unsubstantiated for multiple reasons, including:
  - The Lark Declaration asserts that biofuels (corn and soy) agriculture has worsened the Gulf of Mexico dead zone, imperiling Gulf sturgeon, loggerhead turtles, and sperm whales, yet provides no supporting evidence; no studies are cited that specifically quantify the effect of corn or soy crops as threatening these species or their habitats.
  - The Lark Declaration also asserts that biofuel (corn and soy) agriculture is associated with impaired waters pursuant to Section 303(d) of the Clean Water Act but fails to acknowledge cases in which such designations were made well before the RFS came into effect. Our independent assessment of specific examples presented in the Lark Declaration indicates that the allegations of impacts from corn or soy on impaired water bodies is unsubstantiated.

In sum, there are least two important causal chains that must be quantified and linked together to demonstrate a relationship between increased corn ethanol production under the RFS and impacts to ESA-listed species: 1) a causal chain linking the RFS to land use change and water quality impacts; and 2) a causal chain linking impacts to land and water with specific impacts on the survival or reproduction of ESA-listed species. Each of these causal chains is made up of many embedded biophysical and economic relationships that, in turn, are influenced by a myriad of interrelated variables. The Lark Declaration fails to consider these causal relationships in a meaningful way, relying instead on unfounded assumptions and speculation to support its thesis.

1. Examination of the Causal Link Between the RFS and Impacts to Listed Species

1.1 Overview of Causal Analysis

Causal analysis is a method that is used to determine root causes for observed outcomes. It is used in many fields such as medicine, business management, economics, ecology, and has been used to explore the causes of land use change (Efroymson et al. 2016). The point of causal analysis is to look behind outcomes or symptoms to determine the actual cause, instead of assuming the most obvious cause is the root of the issue. For example, if a patient presents to a doctor with knee pain because they hurt themselves gardening, the doctor may simply give pain medication. If the doctor looks deeper using a more holistic causal analysis approach, the doctor may find that the patient is out of shape or that they have arthritis. If the symptom is treated without fully understanding the root cause of the problem, the problem will not be solved in the long term.

Causal analysis begins with creating a causal diagram that includes all causal components of an outcome. In the next section, we use a causal diagram to examine how farmers make decisions about crop species planted and land expansion.

1.2 The RFS/Land Conversion Causal Chain

The relationship between the RFS and the potential for land conversion is addressed in the Ramboll report, primarily in **Section 3.2**. The decision to alter land from non-agricultural uses to agriculture in general is made at the farm level and is influenced by a myriad of factors including predicted weather conditions, crop output and input prices, innovations in cropping equipment, crop insurance, disaster assistance, and marketing loans. The Ramboll report cites three publications in particular which address the complexity of the causal relationship between increased production of corn ethanol and land use change (**Section 3.2 page 16-17**). As one example, Efroymson et al. (2016) discusses the use of formal causal analysis to clarify the relationship between biofuels policy and land use change and concludes that studies relying on single lines of evidence alone are insufficient for establishing probable cause. Many such studies are cited by EPA (2018) and indeed, many such studies rely on simple temporal changes occurring around the time of the enactment of the Energy Independence and Security Act (ESIA) or simple spatial associations (e.g., land use change proximity to ethanol plants) in an attempt to link land use change and increasing corn production.

The assertion that the EISA increased the expected market price of corn and directly caused land use change is not supported by a causal analysis. Figure 2 illustrates a simplified causal diagram including the many components that influence planting decisions by farmers. It is clear from this diagram that the expected market price of any given crop is not the only relevant factor in planting decisions. Farmers often have limited freedom to change crop types or expand their farmed areas. For example, planting, cultivating, and harvesting machinery is not interchangeable between all crop types. Farmers may only be able to choose between two or three crops that their current machinery is capable of handling. Additionally, farmers are locked into crop rotation schedules to maintain soil conditions and crop health. Furthermore, all fields cannot be harvested at the same time due to limited machinery, so crops with different harvest times must be planted to ensure high-quality output. If farmers are participating in government subsidy or incentive programs, they may be limited in the types of crops they can plant. Areas in the conservation reserve program cannot be planted until the term of the contract expires, and water use restrictions, or limitations of irrigation machinery, can limit expansion of field size.

For farms, even if the species of crop or the expansion of field size were not restricted as described above, market forces themselves affect planting decisions. Deciding what to plant is a gamble. Farmers must consider many factors, including their own costs, resources, and market price estimates.

Successful farmers must bring in enough profit for both salaries and capital costs; meaning that costs must be well below profits. Besides the obvious costs of fertilizer, water, labor, and machinery, the price of transportation to get products to market must be considered, as well as costs of insurance given the location, climate, and predicted weather. The decision to expand farmed areas could be a poor one if the marginal costs exceed marginal profits. This is especially a concern when expanding farmland into areas around currently farmed fields, which may be less suitable for farming because of steeper inclines or poorer quality soil. Additional costs will also be incurred when expanding into natural areas where drainage of wetlands or removal of trees and other obstructions will be required, which is a disincentive to increase farmed acreage. These dynamics are explored in more detail in the following section.

2. Lack of Evidence of a Causal Link Between RFS and Land Use Change

A recent report by Lark et al. (2019) is a comprehensive attempt to establish quantitative causal linkages between the enactment of the RFS and a variety of environmental outcomes using a series of interlinked models. The fundamental premise of their work is the assumption that the price of corn is heavily influenced by increased demand for ethanol due to the RFS, yet the authors ignore other important factors that have a considerable effect on demand and supply conditions (Lark et al. 2019 is discussed in detail in the Ramboll Report at **Section 3.4**.) Staab et al. (2017), for example, find that there are many other contributing factors affecting demand for corn, including market speculation, stockpiling policies, trade restrictions, macroeconomic shocks to money supplies, currency exchange rates, and economic growth. As one example, rapid economic growth in developing countries led to growing food demand and a dietary transition from cereals toward more animal protein and the corn products used as cattle feed. As a result, global consumption of agricultural commodities has been growing rapidly. In fact, it appears that most of the increase in corn prices has actually been driven by higher oil prices (Figure 3). The U.S. Energy Information Administration estimated that of the total cost per acre of producing corn in 2013 (approximately $350/ac.), nearly two thirds was spent on fuel, lubricants, electricity and fertilizer[1]; and fertilizer is known to be closely linked to oil prices[2].

Moreover, Lark et al. (2019) and other authors who have attributed land use change to the RFS do not adequately consider the wide range of factors that influence farmers' individual planting decisions. These factors determine the relative prices expected to be faced by farmers. That is, the futures prices of different crops relative to each other help a farmer determine the crop planting mix (what and how much). While relative prices may help a farmer determine the potential crop mix farmed on the land, other supply factors influence the potential costs of production. These include weather, soil quality and temperature conditions; pests and disease (McConnell 2018); moisture (Queck-Matzie 2019);energy and fuel costs; interest rates; storage costs; seed and fertilizer costs; and "preventive" planting (Schnitkey et al. 2019) programs such as COMBO (Crop Insurance), the Cropland Reserve Program (CRP), and others.

Temporal uncertainty is something that farmers face in all their planting decisions. Farmers need to decide today what and how much to plant in the next growing season. Farmers are responsive to crop prices which act as a clearing house to reflect future demand and supply conditions and help alleviate the uncertainty associated with future conditions. This means that a variety of factors described above determine planting decisions, and these factors, coupled with the uncertainty of future prices and costs, weakens the link between the supposed increase in price of corn due to the RFS and planting decisions.

In making crop mix decisions, farmers consider relative futures prices and expected profitability of plantings (futures price vs. cost to produce; (Kleiber 2009, Staab et al. 2017, Hecht 2019, Springborn

[1] https://www.eia.gov/todayinenergy/detail.php?id=18431#
[2] https://agmanager.info/sites/default/files/pdf/2019.4.pdf

2019). Weather is also an important consideration in a farmer's decision on whether to implement "prevented" planting (Reiley 2019, Springborn 2019). Futures prices, profitability, and weather forecasts are factors assessed by a farmer to determine where to plant and how much of each crop to plant (Kleiber 2009, Reiley 2019, Springborn 2019). Farmers examine, among many other factors, the relative price ratios of crops to determine an optimal planting mix, and if a farmer decides to increase production of a certain crop, this can be accomplished by either producing more of the crop on existing land (intensification) or putting new land into production (extensification, which may result in land use change). All else being equal, extensification is the least preferred option as it is the option most likely to involve additional expenditures such as land clearing and other preparation. This option will also be dependent on the expected yield of new fields, which relative to existing fields, is most likely to be sub- or infra-marginal and will require more intensive inputs to achieve desired yields (Schiller 2017). Given these considerations, farmers will typically consider switching crops and increasing yield on existing acreage (Ling and Bextine 2017) before farming new land. Intensification efforts can include precision farming as well as traditional techniques regarding plant spacing, pest management, etc. (Queck-Matzie 2019). (The positive environmental effects of precision farming and other technological advances in agriculture are described at length in the Ramboll report at **Section 4**).

In summary, studies have shown only a modest effect on corn prices potentially associated with the RFS (Kleiber 2009, Babcock and Fabiosa 2011, Carter et al. 2018, Renewable Fuels Association 2019). In addition, factors affecting farmers' planting decisions include much more than the expected market price of the crop (Kleiber 2009, Staab et al. 2017). Other important factors include the expected yield of the crop (Reiley 2019); and a myriad of production costs including the cost of seed, fertilizers and pesticides, machinery, crop insurance, labor, fuel, and land rental costs (Corn Agronomy 2006, Staab et al. 2017, Hecht 2019). The decision to expand crops onto new land entails additional hurdles and costs beyond costs associated with changing crops or intensifying production on existing acreage. For these reasons and those discussed more extensively in the Ramboll report (at **Section 3.4**), it is unreasonable to draw a direct causal connection between the RFS and land use change.

3. Lack of Evidence of a Causal Link Between the RFS and Impacts to Terrestrial Species

In the absence of a causal link between the RFS and land use change—and in particular land conversion from grassland, wetland, or forest to corn and soy—there can be no causal link between the RFS and impacts to terrestrial species due to loss or degradation of habitat. In an attempt to establish a causal link between the RFS and impacts to terrestrial listed species, the Lark Declaration presented several examples of quantitative analysis of land conversion from presumably natural land cover to presumably corn and soy. These examples relied on approaches to land conversion analysis presented by Lark et al. (2015). Lark et al. (2015) analyzed land use change nationwide during the period 2008-2012 using the U.S. Department of Agriculture (USDA) Cropland Data Layer (CDL), calibrated with ground-based data from USDA's Farm Service Agency (FSA), and further refined using data from the National Land Cover Database (NLCD). The approach used by Lark et al. (2015) purportedly included methods to "correct" for known errors and uncertainties in the CDL database. However, the approach used by Lark et al. (2015) has been shown to be flawed, resulting in a gross overestimate of land use change.

The Ramboll Report (**Section 3.3 pages 19 and 20 and Table 1**) discusses work by Dunn et al. (2017) which examined data for 2006-2014 in 20 counties in the prairie potholes region using the CDL, a modified CDL dataset, data from the National Agricultural Imagery Program, and in-person ground-truthing. Dunn et al. (2017) concluded that analyses relying on CDL returned the largest amount of land use change by a wide margin. They further concluded that errors associated with CDL-based analyses are a major limitation of conclusions drawn from such analyses. In fact, Dunn et al. (2017) concluded that "the number of hectares in the potential error associated with CDL-derived results is generally greater than the number of hectares the CDL-based analysis determined had undergone a transition from grassland, forested land, or wetland to agricultural land". This suggests that errors in classification inherent in the CDL can result in uncertainty bounds that are of a larger magnitude than the estimates themselves (thereby even predicting "negative" land conversion to agriculture within the uncertainty bounds). Specifically, Dunn et al. (2017) pointed out that the findings reported by Lark et al. (2015) contradict USDA data indicating that cropland area has remained almost constant during the period 2008-2012.

The Lark Declaration also cited other authors who purport to establish a quantitative link between the RFS and land use change based on geographic associations (e.g., increased conversion of land to biofuel feedstock in close proximity to ethanol refineries). The Ramboll report specifically identified the following key flaws in studies that attempt to quantify land use change to biofuel feedstocks (**Section 3.1 pages 14 and 15**):

- Like Lark et al. (2015), many other studies of land use change to agriculture depended on unreliable data sets such as CDL data, lacked ground-truthing, and were regional or state-specific. These problems preclude extrapolation of results nationwide.
- The literature assessing LUC relative to the RFS generally fails to consider the considerable loss of agricultural land due to growth in urban areas and the role this loss may have on the pressure to expand agricultural lands elsewhere.

It is reasonable to presume that the Lark Declaration presented the best examples that could be found to make the case for the habitat of a particular species having been impacted by land conversion to corn or soy spurred specifically by the RFS. In the following sections, we analyze and respond to specific examples presented in the Lark Declaration. In each case we analyzed, we found fatal flaws in the examples presented in the Lark Declaration. These flaws are either associated with a lack of temporal association or a lack of geographical association (or both) and a lack of potential causative mechanism.

3.1 Whooping crane (*Grus americana*)

The Whooping Crane is currently classified as an endangered species. Current places of residence include Florida, Texas, central Canada, and Wisconsin. Migrating flocks reside in either Texas, Florida, central Canada, or Wisconsin (Cornell University 2019) primarily in wetlands or muskeg (swampy woods with lakes). In 1941, the total population had declined to 21 birds. Conservation efforts, including protection of wintering grounds and educating hunters, has helped increase the population. As of 2019, more than 350 whooping cranes reside in North America, including 174 migrating cranes (USFWS n.d.). The population has been increasing over time, with no dip apparent after the RFS in 2008 (Figure 4). In fact, after 2007, the population of whooping cranes appears to have increased even faster than it did between 1990 and 2007 (Figure 4)

A total of three known flocks currently exist throughout North America: two migrating flocks and one non-migrating flock. One migrating flock spends summers in the Wood Buffalo National Park in Canada and winters in Texas at the Aransas National Wildlife Refuge. The other migrating flock nests in Wisconsin for the summer and flies south to Florida in the winter. These flocks have been sighted taking short rests in Kansas at either Cheyenne Bottoms or Quivira National Wildlife Refuge (QNWR) whilst migrating. A non-migratory flock remains in Florida year-round (USFWS n.d.).

The migrating flocks reside in national refuges or national parks that have protection plans in place. For example, the QNWR prohibits hunting when whooping cranes are present to avoid accidental shootings. The U.S. Fish & Wildlife Service reports that refuges only integrate farming for specific wildlife conservation efforts.

Whooping Cranes spend time in marshes, shallow bays and tidal flats, with the occasional venture to nearby farmland. Their diet varies by area but may include fish, mice, insects, berries, seeds, crabs and snakes. The Whooping Crane's wide variety of food preferences opens opportunity to scavenge in several locations, including corn fields (USFWS n.d.).

The Lark Declaration argues that conversion to cropland "adjacent to its critical habitat and wintering grounds" may negatively impact the livelihood of the Whooping Cranes. Lark does not discuss the landscape of the adjacent land at issue nor the distance of these adjacent habitats from the whooping crane's current nesting grounds. The images Lark refers to in support of this claim are in Appendix 7 to the Lark Declaration. The image in Appendix 7 includes boundary locations of the critical habitat (Cheyenne Bottoms and QNWR) briefly visited by the Whooping Cranes (Bloomberg n.d.), as well as the nearest ethanol refinery. Ramboll further investigated these images and found that they did not support Lark's claims.

Multiple areas on the Lark Declaration's maps that show corn or other crops growing in or near Cheyenne Bottoms and QNWR were errors in the USDA Cropland Data Layer (CDL). One particularly egregious error shows corn growing in the southeast corner of Cheyenne Bottoms Pool 2 (Figure 5). It is clear from aerial imagery in Google Earth going back to 1992 that no corn is growing in Pool 2 (Figure 5). Ramboll further confirmed the lack of corn by contacting staff at the reserve on November 18 and 19 of 2019. Reserve staff confirmed that Pool 2 was usually under water, and although they had planted a cover crop for the benefit of wildlife in some dry years, the cover crop had never been corn[3]. Ramboll investigated multiple years of Google Earth aerial imagery for areas near to Cheyenne Bottoms and QNWR and also within QNWR that Lark showed as converted to corn; these images failed to show any new crop cultivation after 2007.

In summary, the data presented in Lark's declaration does not support his assertion that the RFS spurred land use change to biofuels in or near Cheyenne Bottoms and the QNWR. To the contrary, it appears that there is little or no land use change to agriculture near either reserve that supports whooping crane migrations in Kansas, and that such land use change, if any, has not been attributed to the RFS. Further, the population of whooping cranes in the United States has risen and continues to rise since the RFS, suggesting that even if the RFS has resulted in some land conversion in areas potentially used by the whooping crane, this conversion has not resulted in any discernible adverse impact on whooping crane populations. Due to the lack of evidence of land use change, any assertion that the recovery of whooping crane populations would have been more rapid had it not been for the RFS would be purely speculative[4].

3.2 Piping Plover (*Charadrius melodus*)

There are three distinct populations of piping plover in the U.S.: Great Lakes, Northern Great Plains, and Atlantic Coast. Piping plover populations on the Great Lakes are listed as endangered, whereas populations in the Northern Great Plains and Atlantic coast are listed as threatened. Piping Plover population declines have been attributed to human disturbance, habitat loss and predation. Piping

[3] Phone communication between Ramboll and Cheyenne Bottoms Ranger Station (620-793-3066) on November 17th and 19th, 2019

[4] This point applies as well to other species discussed below, where the data show recovery of the species during the time frame in which the RFS program has been implemented.

plover management strategies are targeted at limiting access to beachgoers and off-road vehicles, pet restrictions, and public education[5].

The Lark Declaration implicates land conversion for crop production (and presumably by extension, land conversion to corn or soy as a result of the RFS) as a potential impact to piping plover populations, citing Cohen (2009)[6] as documenting "disruption of plover habitat" in the Great Lakes endangered population. In fact, Cohen et al. (2009) studied two Atlantic Coast piping plover breeding areas in West Hampton Dunes, a barrier island in New York State. The only mention of land conversion made by the authors was in reference to urban development. In addition, the authors cite predation management (domestic cats and fox) as key to the recovery of the populations at the sites they studied. Thus, this study cited in the Lark Declaration is not relevant to the premise that land conversion spurred by the RFS results in impacts to piping plover, and in fact specifically points to urban development and predation as the primary stressors to these populations.

The U.S. FWS Midwest Region fact sheet describes the following threats to Great Lakes piping plover populations: Coastal beach habitat loss due to commercial, residential, and recreational developments; and effect of water control structures on nesting habitat; vehicle and pedestrian use of beaches; harassment or mortality of birds by dogs and cats; and predation by fox, gulls, and crows[7]. Habitat protection measures include controlling access to nesting areas, nest monitoring and protection, limiting residential and industrial development, and properly managing water flow[8]. Thus, like the Atlantic Coast populations, land use change due to agriculture is not a recognized threat to the Great Lakes populations.

In the Northern Great Plains, piping plover breed on river sandbars, along reservoir shorelines, and in manmade habitat such as commercial sand mines. Similar to the Atlantic Coast and Great Lakes populations, declines of this population are attributed mainly to harassment of birds and nests by people, domesticated animals, and vehicles; shoreline habitat loss due to development projects; human-induced increased predation; and water-level regulation policies that disrupt nesting behavior or destroy nesting habitat (NRC 2005). Appendix 8 to the Lark Declaration provides an example of conversion of some riparian forest habitat adjacent to a farm field along the Missouri River sometime between spring 2012 and late winter 2015. This example, however, does not portray any loss of critical habitat for this species (i.e., critical habitat for the piping plover in the Missouri River is sand bar or sandy shoreline habitat and not forest), and therefore does not support the premise in the Lark Declaration that land conversion spurred by the RFS results in impacts to piping plover.

Thus, based on a review of the specific citations relied upon by the Lark Declaration as well as publications by the U.S. Fish and Wildlife Service (USFWS) regarding endangered and threatened populations of piping plover, we find no evidence that agriculture in general, or land conversion to corn and soy due to the RFS in particular, results in impacts to piping plover. Such claims in the Lark Declaration are unsubstantiated.

It is worth noting that, in addition to discussing land conversion, the Lark Declaration cites a study by Fannin (1993)[9] when suggesting that pesticides or other contaminants from agricultural practices (and by extension, presumably agriculture for biofuels feedstock spurred by the RFS) could jeopardize piping plover egg survival. Fannin and Eamoil (1993) collected 16 piping plover addled (unhatched) eggs in 1989 and 3 piping plover addled eggs in 1990 and analyzed the contents for a wide range of metals and

[5] https://naturalhistory2.si.edu/smsfp/irlspec/Charad_melodu.htm
[6] The Lark Declaration incorrectly cites Cohen et al. (2009)
[7] https://www.fws.gov/midwest/endangered/pipingplover/pipingpl.html
[8] https://www.fws.gov/midwest/endangered/pipingplover/pipingpl.html
[9] We believe that the Lark Declaration incorrectly cites Fannin and Eamoil (1993)

several organochlorine pesticides, including DDT and its breakdown products. DDT and to a lesser extent, other organochlorine pesticides are known to cause eggshell thinning and reproductive failure, principally in raptors and fish-eating birds. DDT was banned from use in the United States in 1972, and chlordane was banned in 1988. It is also widely known that many species made dramatic recoveries in the years following the ban of DDT, most notably the bald eagle. Use of these and other organochlorine pesticides in agriculture were terminated decades prior to the enactment of the EISA and implementation of the RFS. Thus, any suggestion in the Lark Declaration that the use of pesticides on biofuel crops may be resulting in eggshell thinning in piping plover lacks foundation.

3.3 Yellow-Billed Cuckoo (*Coccyzus americanus*)

The Western U.S. Distinct Population Segment of *C. americanus* (western yellow-billed cuckoo) was proposed as threatened on October 3, 2013 (FR 79:192, October 3, 2014; USFWS 2014). Within the last 50 years the species' distribution west of the Rocky Mountains declined substantially mainly due to loss of streamside habitat. USFWS (2014) reports that current impacts from agricultural activities on yellow-billed cuckoo habitat are mainly associated with livestock overgrazing in riparian areas.

Yellow billed cuckoo breed in dense willow and cottonwood stands in river floodplains. The Lark Declaration states that their threatened status is due largely to the "destruction of these habitats from anthropogenic activities, including agriculture," and presumably by extension, land conversion to biofuel feedstock (corn and soy). However, the Lark Declaration fails to acknowledge that with the exception of Glenn County in California, there is no overlap between significant corn or soy growing areas and critical habitat for the species. This is primarily due to the fact that most corn and soy production in the U.S. occurs east of the Rocky Mountains.

Figures 6, 7, and 8 show areas reported to be in corn in the USDA CDL database for 2018 within the boundaries of designated critical habitat for the Western yellow-billed cuckoo in Glenn County, along with available Google Earth aerial images of these areas. The maps in figure 6 show that with only a couple of exceptions there is no overlap between Western yellow-billed cuckoo habitat and counties with corn and soy cultivation. The Google Earth images in figure 7 and 8 clearly show that these areas were in agricultural production as early as 1998, a decade before the RFS could possibly have influenced land conversion, and at approximately 55.5 acres, they account for only 0.036% of the total available critical habitat for the species in California (155,635 acres). Thus, not only is there no overlap between critical habitat for this species and significant corn growing areas, but in the two instances in California where the CDL reports corn to be grown in critical habitat, areas were in agricultural production long before the RFS.

As with the piping plover, the Lark Declaration also suggests that western yellow-billed cuckoo is adversely impacted by eggshell thinning due to pesticides. For the reasons described above, any eggshell thinning observed in this species cannot possibly be associated with the RFS and any such implied association is unsubstantiated.

3.4 Poweshiek Skipperling (*Oarisma poweshiek*)

The Poweshiek skipperling, was once abundant in remnant native prairie habitat in Indiana, Illinois, Iowa, Michigan, Minnesota, North Dakota, South Dakota, Wisconsin, and Manitoba, Canada; but is now thought to be present only in Wisconsin, Michigan, and Manitoba. The USFWS lists several stressors that may be acting to reduce populations of the butterfly, with loss and degradation of habitat being one of the initial stressors for its decline. The USFWS states that other stressors are unknown but might include disease or pesticides.

The Lark Declaration (paragraph 15, page 12) states "Habitat fragmentation poses a key threat to the Poweshiek skipperling, and there are several instances where land has recently been converted to cultivate either corn or soybeans within close proximity to its critical habitat in Minnesota, North Dakota, and South Dakota". Paragraph 15 refers to Appendix 6, which we presume to be their best example to illustrate land conversion due to RFS. Appendix 6 presents a map showing Poweshiek skipperling critical habitat in Minnesota, the location of an ethanol refinery, and polygons depicting presumed land conversion from native tall grass prairie to corn or soy. Appendix 6 is based on a comparison of data from 2008 to 2016 and methods documented in Lark et al. (2015; see above description of shortcoming of these methods). The second page of Appendix 6 shows two images from Google Earth, one from May 21, 2008 and another from June 23, 2011--presumably showing conversion of two farm fields adjacent to Poweshiek skipperling critical habitat from grassland to cropland. The refinery depicted in Appendix 6 was confirmed by Ramboll to be the Valero refinery in Aurora, North Dakota; approximately 28 miles from the illustrative farm fields.

Several facts indicate that the assertions in the Lark Declaration regarding the Poweshiek skipperling are flawed, and, in fact, land conversion from tall grass prairie to corn or soy due to the RFS could not have had an impact on this listed species:

- The last confirmed sightings of *O. poweshiek* in Minnesota were in 2007, despite extensive annual surveys beginning in 2013[10]. The RFS went into effect in 2008 so could not possibly have had an adverse effect on this species in Minnesota. Similar trends were seen in other states (Environment Canada 2011):
  - In Iowa, the species was in decline by 2003 and was last observed in 2008
  - In North Dakota, the species was thought to be extirpated by 2008; with only 8 individuals seen in a survey in 2001.
  - In South Dakota, The species began to disappear from five South Dakota sites in 2002 and many of these sites were observed to be idle with no range or grass management. At these sites, the decline was attributed loss of floral diversity, increase in grasses and forbs, and an increase in exotic species. The species was last observed at Hartford Beach State Park and the Waubay National Wildlife Refuge in 2002, Pickerel Lake State Recreation Area in 2004, Wike Waterfowl Production Area in 2006, and Scarlet Fawn Prairie in 2008. Several sites where they had been recorded in the past were surveyed in 2010 and no adults were observed.

- The Valero Aurora refinery in North Dakota began operation in 2003 and reached a capacity of 120 million gallons per year (MGY) in 2005[11], three years before the enactment of EISA. Therefore, any increased demand for corn in the vicinity of the refinery would have been met prior to any possible effect of the RFS, and therefore there cannot be a causal relationship between the RFS and land conversion impacting *O. Poweshiek* in Minnesota.

- Dana (1997) conducted a survey for the Dakota skipper (*Hesperia dacotae*) butterfly in several critical habitat areas of Minnesota, including Hole-in-the-Mountain Prairie Lincoln County, Minnesota South of the town of Lake Benton (the same area depicted as critical habitat in the Lark Declaration Appendix 6). The Dakota skipper has very similar habitat requirements as Poweshiek skipperling. Dana (1997) states that the principal threat to this species in this area is probably the use of herbicides for weed and brush control in privately owned pastures as well as overgrazing and mowing

[10] https://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IILEP57010
[11] https://www.valero.com/en-us/AboutValero/ethanol-segment/aurora

by County Park staff, and possibly excavation for construction materials. Dana (1997) specifically states that conversion of additional prairie to cropland (in general) is at most, a minor threat[12].

- Appendix 6 of the Lark Declaration shows satellite images from Google Earth for the years 2008 and 2011 presumably to contrast land use in the year the EISA was enacted and several years after the RFS went into effect. However, there is no information provided to substantiate the claim that the highlighted areas were indeed grassland in 2008. In fact, when other satellite images readily available on Google Earth are examined, it is clear that the subject areas were in agriculture as early as 1992. Further, upon viewing the Google Earth images available in subsequent years for the subject areas, there is no evident expansion of cropland since 1992 into what is now designated as critical habitat for the Poweshiek skipperling (Figure 9).

For the reasons described above, the assertion in the Lark Declaration that land conversion spurred by the RFS has adversely impacted critical habitat of the Poweshiek skipperling are unsubstantiated.

3.5 Other Insects

The Lark Declaration also mentions the threatened Dakota skipper (*Hesperia dacotae*), the endangered rusty patched bumble bee (*Bombus affinis)*, the endangered Hine's emerald dragonfly (*Somatochlora hineana*), and the endangered Salt Creek tiger beetle (*Cicindela nevadica lincolniana*) as other insect species that could "potentially be affected by biofuel feedstock production". In no case, does the Lark Declaration provide any evidence to support that assertion. The Dakota skipper and rusty patched bumble bee are both prairie/grassland species. Although there has been habitat loss and fragmentation to varying degrees across the ranges of these species, there is no evidence presented that habitat loss occurring after 2008 was directly linked to the presumed RFS-induced land conversion.

As to Hine's emerald dragonfly, USFWS (2013) states the following:

- The greatest current threat to this species is from invasive plants
- There are effective protections against habitat loss (wetland filling and draining)
- Past habitat loss was due to commercial and industrial development.

USFWS (2013) does not mention any impact related to agriculture. Therefore, the Lark Declaration's assertion of impacts to Hine's emerald dragonfly due to the RFS is unsubstantiated.

With regards to the Salt Creek tiger beetle, the Lark Declaration also provides no evidence or discussion of the causal relationship between the RFS and impacts to this species. The Salt Creek tiger beetle is currently found at only three sites in Lancaster County, Nebraska occupying 15 acres in saline wetland habitat[13]. The Nebraska Game and Parks Commission states that the biggest threat to the habitat of this species is stream channel modification[13]. The USFWS (2013b; page 33284) cites two publications from 2003 and 2005 in its statement that "in the past 150 years, approximately 90 percent of these wetlands have been degraded or lost due to urbanization, agriculture, and drainage" but does not mention agriculture as a threat to habitat of this species after the implementation of the RFS in 2008. In fact, the USFWS (2013; page 33285) shows a graph presenting results of surveys of adult Salt Creek tiger beetles 1991 to 2012 which indicates a consistent increase in population over the period 2008-2012 with an approximate doubling in numbers over that period (Figure 10). Based on the information presented above, we find that the Lark Declaration's assertion of impacts to the Salt Creek tiger beetle due to the RFS is also unsubstantiated.

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[12] Note that these observations, including the statement regarding habitat threats, predate the EISA by 11 years.
[13] Nebraska Department of Game and Parks

3.6 Blackfooted Ferret (*Mustela nigripes*)

The black-footed ferret was listed as endangered across its entire range on March 11, 1967.[14] The is no critical habitat designated for this species. Black-footed ferret population status and distribution is closely tied to that of prairie dogs. Prairie dogs make up more than 90% of the black-footed ferret's diet and prairie dog burrows provide shelter and den habitat for the species. Major threats to black-footed ferret populations include conversion of native grasslands to agriculture, prairie dog eradication programs that were once widespread, and disease; and much of the remaining habitat for black-footed ferret is fragmented due to fragmentation of prairie dog towns by agriculture and human development (USFWS 2018).

The Lark Declaration states that "Given the connection between the Renewable Fuel Standard and the conversion of grasslands to agricultural land within the Black-footed ferret's range, further assessment seems warranted", but provides no explanation or evidence to support such a "connection". The Center for Biological Diversity (CBD 2019) reports that the last captive black-footed ferret died in 1980, and at that time, the animals were thought to be extinct in North America. In 1981 the species was re-discovered in a Wyoming prairie dog colony. Between 1991 and 1999, about 1,200 ferrets from that population were released at sites in Wyoming, Montana, South Dakota, Arizona and along the Utah/Colorado border (CBD 2019). It is estimated that about 1,410 black-footed ferrets are currently living in the wild (CBD 2019). Figure 11illustrates the estimated population status of black-footed ferrets in the wild, including a rapid recovery beginning in about 2000 and extending past 2008, the year the EISA was enacted and the RFS was implemented. The continual and unabated recovery of black-footed ferret populations after 2008 also serves to undermine the assertion in the Lark Declaration that the RFS has had adverse impacts on black-footed ferret.

Figure 12 illustrates the locations of black-footed ferret populations (reintroduced) and acres planted in corn and soy in 2018. With few exceptions, there is no overlap between counties with some acreage in corn or soy and locations where black-footed ferret have been introduced. The Lark Declaration presents no evidence of impacts from land conversion spurred by the RFS, and, in fact, evidence suggests that impacts due to loss of habitat (for all reasons) occurred long before any potential influence of the RFS and most of the species recovery has occurred since 2008. Therefore, we conclude that the Lark declarations' assertions of a causal relationship between the RFS and impacts to black-footed ferret lack foundation.

4. Lack of Evidence of a Causal Link between the RFS and Hypoxia in the Gulf of Mexico or the RFS and Water Quality Impacts in Streams Supporting Listed Species

4.1 Lack of Evidence of a Causal Relationship Between the RFS and Hypoxia in the Gulf of Mexico

The alleged link between increased corn production for ethanol and hypoxia in the Gulf of Mexico (and western Lake Erie) is addressed in **Section 4.1** of the Ramboll report. While it is not unexpected that nutrient loading (including from agriculture in general) to the Gulf of Mexico via the Mississippi River contributes to the formation of a seasonal hypoxic "dead zone" in the Gulf of Mexico, there is no information demonstrating a link between increased corn ethanol production under the RFS and specific and quantifiable causes of observed hypoxic conditions in the northern Gulf of Mexico. The consensus, based on the vast majority of technical articles we have reviewed is that hypoxia is due to algal

[14] https://www.fws.gov/mountain-prairie/es/blackFootedFerret.php

production driven by excess nitrogen that enters the northern Gulf of Mexico via the Mississippi River and related watersheds together with certain hydrologic conditions, including vertical stratification and temperature dynamics within the Gulf of Mexico water column. The hypoxia condition is not new and as shown by the U.S. Geological Survey and other institutions, has been an ongoing phenomenon for several decades and well before the RFS was initiated in 2008. The loading of annual nitrate plus nitrite to the Gulf of Mexico has been relatively consistent since comprehensive monitoring began in approximately 1980[15] with the three largest measured annual loading values occurring in 1993, 1983, and 1984, respectively, and thus well before the RFS was envisioned. Bianchi et al. (2010) conclude that understanding the complexity of this highly dynamic system or predicting flux and source areas with high precision is not reliable by simply referring to the numerous mostly general models that are relied on by recent authors (including Lark).

The Lark Declaration (at page 20), for example, refers to the pre-RFS study by Donner and Kucharik (2008) that "predicts" an increase in flux of dissolved inorganic nitrogen (DIN) by the Mississippi and Atchafalaya Rivers of between 10% and 34% using models that rely on hypothetical predictions of land use scenarios and discharge. Although Donner and Kucharik (2008) discuss the model validation approach, the validation results are imperfect indicating considerable overestimates in some cases, and underestimates in others. Furthermore, the model does not appear to provide a precise fit between the simulated results and the observed DIN discharge numbers collected from the few field stations identified in the study. An important complication in using a model like this to make predictions is the differentiation between urban (e.g., septic, industrial and municipal waste water plants, and residential runoff) and agricultural sources. As noted by Alexander, et al (2007), additional complications also are that nutrient sources typically are statistically estimated in the models, and then adjusted based on the model calibration. Model calibration uses "trial and error" processes for simulating numerous parameters that are themselves influenced by hydrologic and biogeochemical processes, nutrient uptake by a wide variety of soil types, climatic (short and long-term) conditions, and (as most relevant currently), improvements in fertilizer application and cropping and drainage patterns. Essentially, by providing examples of failed predictions using models, Bianchi, et al. (2010) make the case to not rely solely on numerical models.

Notably, the influence of weather is a very important condition for the formation of the Gulf of Mexico "dead zone" and is totally independent from loading of DIN from any particular sources. The influence of weather on the formation of the Gulf of Mexico "dead zone" is discussed in the Ramboll report in **Section 4.1, page 26**, where for example, the U.S. Geological Survey[16] estimated that flooding in the spring of 2019 resulted in an increased loading of nitrate and nitrite of approximately 18% when compared to the long-term average loading to the Gulf of Mexico.

The alleged quantitative relationship between increased corn grown for ethanol and nutrient loading to the Gulf of Mexico is further called into question by data from the U.S. Geological Survey indicating that annual nitrate plus nitrite loading to the Gulf of Mexico has remained relatively constant over the period 1980 to 2017 (Figure 13). This indicates that even during the period of increased use of corn for ethanol, there has been no appreciable net change to nutrient loading to the Gulf of Mexico. For this reason alone, there is no support for the assertion of a direct relationship between ethanol production on the hypoxia conditions in the Gulf of Mexico. In addition, EPA (2018) reports that there has actually been a reduction in total nitrogen concentrations in surface water bodies in Iowa which is the highest

[15] https://nrtwq.usgs.gov/mississippi_loads/#/GULF
[16] https://www.usgs.gov/news/very-large-dead-zone-forecast-gulf-mexico?qt-news_science_products=4#qt-news_science_products

corn producing state. This further refutes the broadly stated allegation that there is a link between expanded corn production (for any reason) and increased nutrient loading to the Gulf of Mexico.

The Lark Declaration mentions the following listed species as potentially impacted by the Gulf of Mexico dead zone: the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), the loggerhead turtle (*Caretta caretta* listed as endangered and threatened depending on location), and the endangered sperm whale (*Physeter macrocephalus*). With regards to Gulf sturgeon, it is instructive to look at the geographical location of critical habitat for the species and the occurrence of the dead zone in the Gulf of Mexico. The dead zone forms west of the Mississippi River Delta over the continental shelf (< 200 m water depth) of Louisiana and sometimes extends to Texas[17]. Figure 14 depicts Gulf sturgeon critical habitat occurring exclusively to the east of the Mississippi River delta and the hypoxic zone in 2019 (the largest recorded) located exclusively to the west of the Mississippi River delta. NOAA's Gulf of Mexico Hypoxia Watch site presents results from dissolved oxygen monitoring for the period 2001 to 2019[18]. These results show that hypoxia rarely extends near critical habitat areas for Gulf sturgeon, and when these conditions exist, they are limited to a relatively small area offshore of Biloxi, Mississippi. Waters to the east and south did not exhibit hypoxic conditions in any year monitored.

Moreover, the migratory behavior of Gulf sturgeon minimizes the probability of encountering hypoxic waters, should they occur in their critical habitat. Oxygen depletion in the Gulf of Mexico increases in late spring, worsens over the summer, then dissipates in the fall; whereas gulf sturgeon move into rivers in the spring and fall and spend the summer months in the riverine habitat, then subadults and adults move into estuarine waters in the fall to feed and then move into marine waters in the winter. Thus, the Lark Declaration provides no evidence of a relationship between Gulf sturgeon critical habitat and potential impacts from hypoxia in the Gulf of Mexico due to nutrient inputs from the Mississippi River basin. In addition, NOAA does not list hypoxia as a threat to the species, rather it lists contaminants, dredging, dams, and climate changes as the threats[19]. For these reasons, the presumption in the Lark Declaration that the RFS has resulted in impacts to Gulf sturgeon is unsubstantiated.

Loggerhead turtles and sperm whales have pan-global ranges and only a limited number of individuals over a limited portion of their life spans would be likely to encounter the Gulf of Mexico dead zone. Because both are air-breathing animals, adverse effects to these species from hypoxia, if any, could only be indirect (e.g., reduced prey abundance).

The loggerhead turtle is the most common sea turtle in the southeastern U.S., and they nest mainly along the Atlantic coast of Florida, South Carolina, Georgia, and North Carolina and along the Florida and Alabama coasts in the Gulf of Mexico[20]. The Lark declaration states that "The increasing frequency of red tides and harmful algae blooms in the Gulf of Mexico as well as the increased duration and extent of the hypoxic dead zone caused by agricultural runoff in the Mississippi River have been reported to both directly and indirectly affect sea turtles" and cites NMFS et al. (2011) for this proposition. Yet, NMFS (2011) makes no mention of hypoxia, and red tide is only mentioned in the context of the west coast of Florida. The Lark Declaration also states that "Loggerheads in the near-shore northern Gulf of Mexico waters may be exposed to hypoxia…", citing Hart et al. (2013) for this proposition. However, Hart et al. (2013) studied nesting sites and movement patterns only along the Alabama and Florida coasts and reported movement patterns southward along the Florida west coast, away from the Gulf of Mexico dead zone. As noted above, since 2001, hypoxia in the Gulf of Mexico did not extend to the west

[17] https://pubs.usgs.gov/fs/2006/3005/fs-2006-3005.pdf
[18] https://www.ncddc.noaa.gov/hypoxia/
[19] https://www.fisheries.noaa.gov/species/gulf-sturgeon
[20] https://www.fisheries.noaa.gov/species/loggerhead-turtle

coast of Florida. Therefore, the assertions in the Lark Declaration that the RFS has resulted in impacts to loggerhead turtles by means of hypoxia in the Gulf of Mexico lack foundation.

Sperm whales inhabit all of the world's oceans, having one of the widest distributions of any marine mammal. NOAA does not list hypoxia as a threat to this species, rather vessel strikes, entanglement, ocean noise, marine debris, climate change, oil spills, and contaminants are listed as threats.[21] Several researchers have investigated the distribution of sperm whales and other cetaceans in the Gulf of Mexico. Davis et al. (2002) report a resident breeding population within 100 km of the Mississippi delta and suggest that the edge of the continental slope south of the Mississippi River delta provides the oceanographic deep-water conditions with locally enhanced primary and secondary productivity. The Gulf of Mexico dead zone does not extend to the continental slope, rather it is oceanographically limited to the continental shelf where water depths are less than 200 m.

In sum, attributing adverse impacts to these species to hypoxia induced by nutrient enrichment in the Mississippi River basin is speculative. Attributing any potential for adverse effects due solely to theoretical increases in nutrient inputs from expanded corn production spurred by the RFS is unsupportable.

4.2 Lack of Evidence of a Causal Relationship Between the RFS and Water Quality Impairment in Streams Supporting Listed Species

Surface water use impairment is determined under Section 303(d) of the Clean Water Act, which predates initiation of the RFS program by several decades. The Lark Declaration at Appendix 5 provides maps of 303(d) impaired water bodies in several geographic regions and asserts a causal relationship between the RFS and the 303(d) listing. Figure 15 compares the 303(d) maps for 2002 (as produced by the State of Illinois) and the 2015 map presented in the Lark Declaration. This figure clearly shows that a major water body near Carbondale has been impaired for more than 17 years—well before the RFS went into effect in 2008. Similar comparisons can be made for areas of North Dakota used for illustration in the Lark Declaration at page 92 where 303(d) impairments were tracked by the State in 2004[22]), and for areas of central Minnesota (Lark Declaration at page 94) where in 2002, the Minnesota Pollution Control Agency (MPCA) provided a list of its 303(d) impaired lakes[23] noting that nutrients were part of the root cause in many of them. The attempt in Lark's Declaration to tie such impairments to the RFS using the 303(d) maps (Appendix 5) is fundamentally flawed, for the reasons described below.

The maps shown in the Lark Declaration (Appendix 5) do not show watershed hydrology that explicitly links areas of crop production, ethanol refining, and impaired water bodies. As Bianchi, et al (2010) observed, general maps and information, such as the geographic placement of crop production in a regional map, is insufficient to establish a causal link between the RFS and water quality due to the complexities of numerous factors, including timing, weather, local farming practices, soil chemistry and physical properties, hydrology, other rural and urban release mechanisms.

Another example of the Lark Declaration's presentation of faulty data—with respect to the alleged link between the RFS and streams with impaired water quality—is a sub-basin in northeastern Kansas depicted on figure 5-6 of the Lark Declaration. We selected this sub-basin for closer examination because it appears to be a worst-case example of the purported causal relationship, based on the relatively large proportion of area identified as land converted to corn or soy and the proximity of a relatively large area to a 303(d) listed water body. Figure 16 presents a reproduction of figure 5-6 from

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[21] https://www.fisheries.noaa.gov/species/sperm-whale

[22] https://deq.nd.gov/publications/WQ/3_WM/TMDL/1_IntegratedReports/2004_Final_ND_Integrated_Report.pdf

[23] https://mn.gov/law-library-stat/archive/urlarchive/a042033-1.pdf

the Lark Declaration, together with the selected sub-basin and presumed land conversion area immediately adjacent to the stream. Figure 17 presents a simple examination of publicly-available Google Earth aerial images of this area over time is instructive. Google Earth aerial images of this area clearly depict it in agricultural use as early as 1991 with no apparent expansion since that time including the period 2008-2018.

Further, we performed a spatial analysis of land allegedly converted to biofuels feedstock cultivation after 2008 (using figure 5-6 from the Lark Declaration) within the watershed depicted in Figure 17 (even though we know that in at least the case illustrated by Figure 17; this allegation is incorrect). Such an analysis indicates that in the watershed area of 55,840 acres, the total area devoted to crops (exclusive of grassland) in 2015 based on LCD NASS data, was approximately 18,940 acres (or 34% of the total watershed area). Of the total acres in crops, approximately 880 acres (or 1.6% of the watershed) was in corn or soy in 2015. Of the allegedly "converted" fields identified in the watershed in figure 5-6 of the Lark Declaration, the closest field to the impaired water body is approximately 390 feet (the field shown in Figure 17) and the average distance of all presumably converted fields to the impaired stream is approximately 4,860 feet. Barring mass wasting of agricultural soils, very poor practices, or spills of fertilizers, loading of nutrients to water bodies from agricultural fields (e.g., in pounds per acre per year) is expected to decrease with distance; even at a distance of 390 feet, an appropriately managed farm field would be expected to have very little transport of nutrients over that distance. Even if one assumed that all of the presumably "converted" areas were indeed converted, the total loading of nutrients from these fields (all else being equal) compared to all other agriculture would be expected to be vanishingly small (e.g., the presumably "converted" soy and corn area is only about 4.6% of the total crop area).

As an additional example, we performed a spatial analysis of the watershed associated with critical habitat for the Arkansas shiner (*Notropis girardi*) as depicted in the Lark Declaration at page 105. For this watershed area of 471,400 acres, the total area devoted to crops (exclusive of grassland) in 2016 based on LCD NASS data, was approximately 175,500 acres (or 37% of the total watershed area). Of the total acres in crops, approximately 590 acres (or 0.13% of the watershed) was in corn or soy in 2016. Of the allegedly "converted" fields identified in the watershed in the figure at page 105 of the Lark Declaration, the closest field to the impaired water body is approximately 2.5 miles and the average distance for all fields to the critical habitat is approximately 10 miles. For this example, even if one assumes that all the area devoted to corn or soy in 2016 was the direct result of the RFS, the proportion of total crop area and the distance between the corn or soy fields is so vanishingly small as to undermine any claims of impact to the Arkansas shiner.

These quality control checks on the evidence presented in the Lark Declaration demonstrate the flawed nature of the assertions presented therein. This analysis, along with the fact that the 303(d) designations predate the RFS, undermines the assertion that there is a causal relationship between the RFS, reduced water quality in Section 303(d) impaired streams, and potential adverse impacts to listed aquatic species.

5. Conclusions

Our conclusions follow from the technical review of the assertions made in the Lark Declaration including an evaluation of the literature cited and an independent check of the geographical information presented in the Declaration. Our conclusions include the following:

- **Assertions that increased corn ethanol production under the RFS has resulted in land use change and conversion of non-agricultural land to production of biofuel feedstock are unsubstantiated**

- Acres planted in corn across the United States has remained close to or below the total acres planted in the early 1930s despite increases in demand for corn as human food, animal feed, and biofuels over this nearly 90-year period. The increase in demand has largely been met by an approximately 7-fold increase in yield (bushels per acre). The lack of causal relationship between demand for corn and acres planted in corn calls into question the causal relationship between increased demand for corn for ethanol and land conversion, and, in turn, potential impacts of land conversion on endangered species.
- The causal relationship between the RFS and the price of corn is unsupported by the evidence. Recent efforts to quantify the relationship ignore the multiple domestic and international economic factors affecting the price of corn. These factors include the overall increase in global consumption of agricultural commodities in general, due to expanding economies. In addition, most of the increase in the price of corn (as well as other crops like soy and wheat) since 2005 has been attributed to higher oil prices.
- The Lark Declaration (and the literature relied upon therein) does not adequately consider the myriad factors that influence a farmer's decision to convert non-agricultural land to growing any given crop. In addition, the Lack Declaration fails to consider that converting new land is likely the least preferred option a farmer has for increasing production because it most likely involves additional expenditures such as land clearing and other preparation. Nor does it consider that the potential yield that can be expected of new fields, which, relative to existing fields, may be sub- or infra-marginal and may require more intensive inputs to achieve desired yields. For these and other reasons, assertions in the Lark Declaration that the RFS has resulted in land conversion are unsubstantiated.

- **Assertions that RFS-driven land use change has resulted in impacts to particular ESA listed species are without foundation —**The Lark Declaration asserts that land use change spurred by the RFS has resulted in impacts to listed terrestrial species of birds, mammals, and insects. However, the evidence presented is poorly researched (including citations to irrelevant documents and misinterpretation of data) and the examples used to support many assertions instead actually *refute* the assertions. For example, eggshell thinning in birds is mentioned as a potential impact of biofuels production, yet the chemicals responsible for this adverse effect were banned decades before the RFS took effect. In addition, several examples of supposed land use change were presented using approaches that are shown to be flawed, among other things, by testing the assertions against images from Google Earth. Specifically, we checked several claims of land conversion that are based on methods by Lark et al. (2015) against historical Google Earth Images that clearly show fields had been converted long before the RFS went into effect (e.g., in areas allegedly impacting the whooping crane, Poweshiek skipperling, and yellow-billed cuckoo).
- **Assertions that RFS-driven biofuels agriculture adversely impacts water quality are unsubstantiated—**The Lark Declaration asserts that biofuels (corn and soy) agriculture has worsened the Gulf of Mexico dead zone, imperiling Gulf sturgeon, loggerhead turtles, and sperm whales, yet provides no supporting evidence. The Lark Declaration fails to cite any studies that associate corn or soy crops (let alone corn or soy crops directly traced to the RFS program) to any impacts to these species or their habitats. In fact, information related to the life histories of all three species indicates that the area within which the dead zone forms each summer does not overlap geographically (or temporally, in the case of the Gulf sturgeon) with critical or important habitat of any of the species. The Lark Declaration also fails to consider that the Gulf of Mexico dead zone had been forming on a regular basis for decades before the RFS went into effect. The Lark Declaration also asserts that biofuel (corn and soy) agriculture is associated with state designation of impaired waters pursuant to Section 303(d) of the Clean Water Act but

fails to acknowledge cases in which such designations were made well before the RFS came into effect. it also presents no assessment of the potential loading of nutrients to impaired water bodies. Our independent assessment of specific examples indicates that an assertion of impacts from corn or soy on impaired water bodies is unsubstantiated.

In sum, there are at least two important causal chains that must be quantified and linked together to demonstrate a relationship between increased corn ethanol production under the RFS and impacts to ESA-listed species: 1) a causal chain linking the RFS to land use change and water quality impacts; and 2) a causal chain linking these impacts to land and water with specific impacts on the survival or reproduction of ESA-listed species. Each of these causal chains is made up of many embedded biophysical and economic relationships that, in turn, are influenced by a myriad of interrelated variables. The Lark Declaration fails to consider these causal relationships in a meaningful way, relying instead on unfounded assumptions and speculation to support its thesis.

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7. Figures

Figure 1. Total U.S. Planted Acres of Corn Per Year

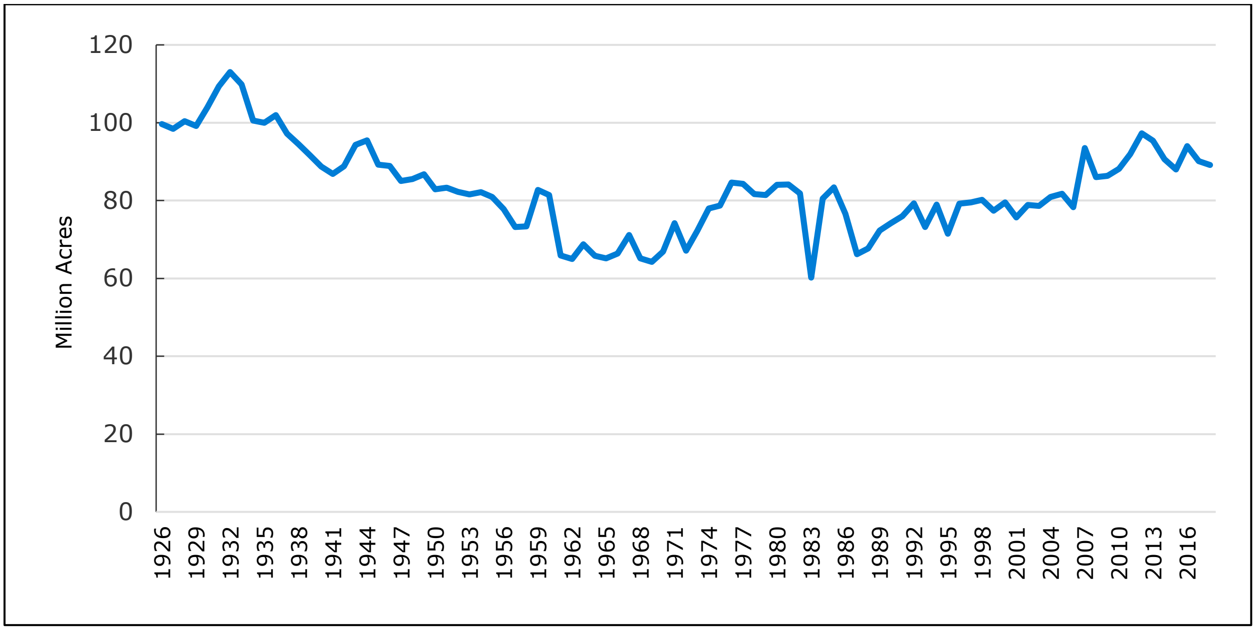


Figure 2. The decision about which crop to plant is made at the farm level, and takes many different components into account

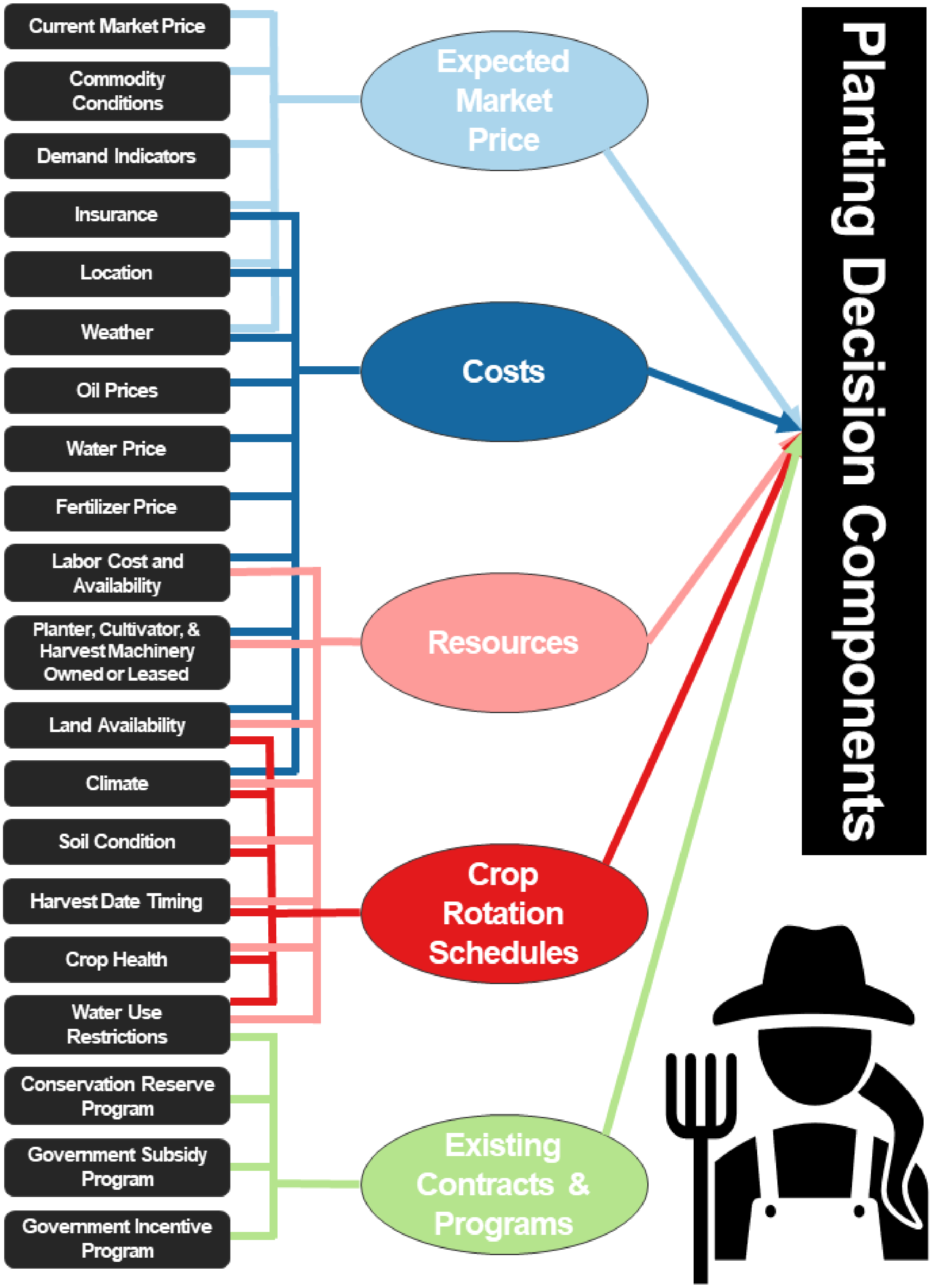


Figure 3. U.S. crude oil prices compared to crop prices, 2005 to 2015. From Staab, et. al. 2017

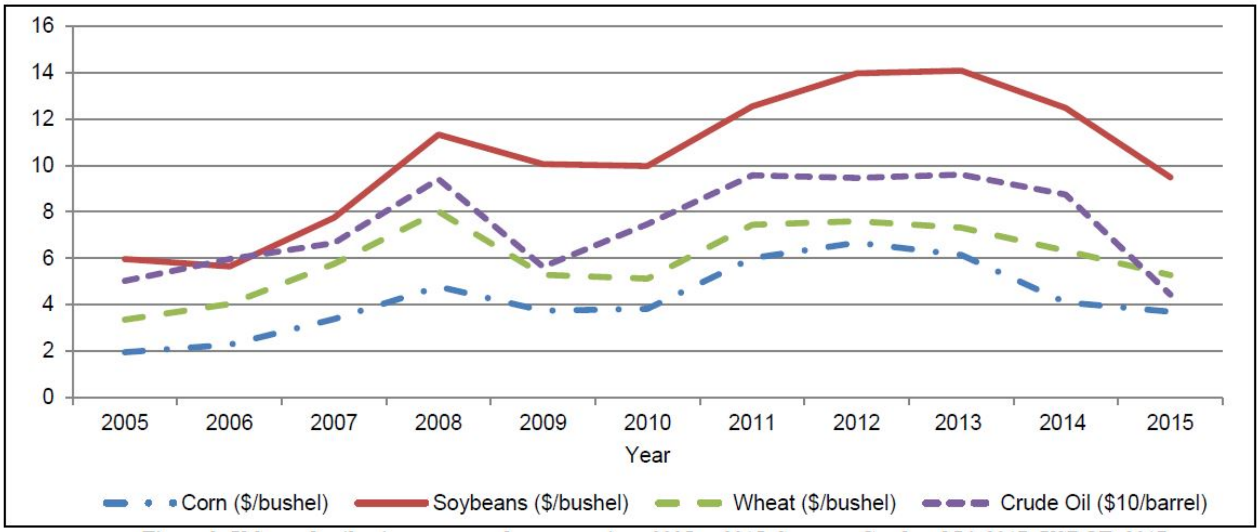
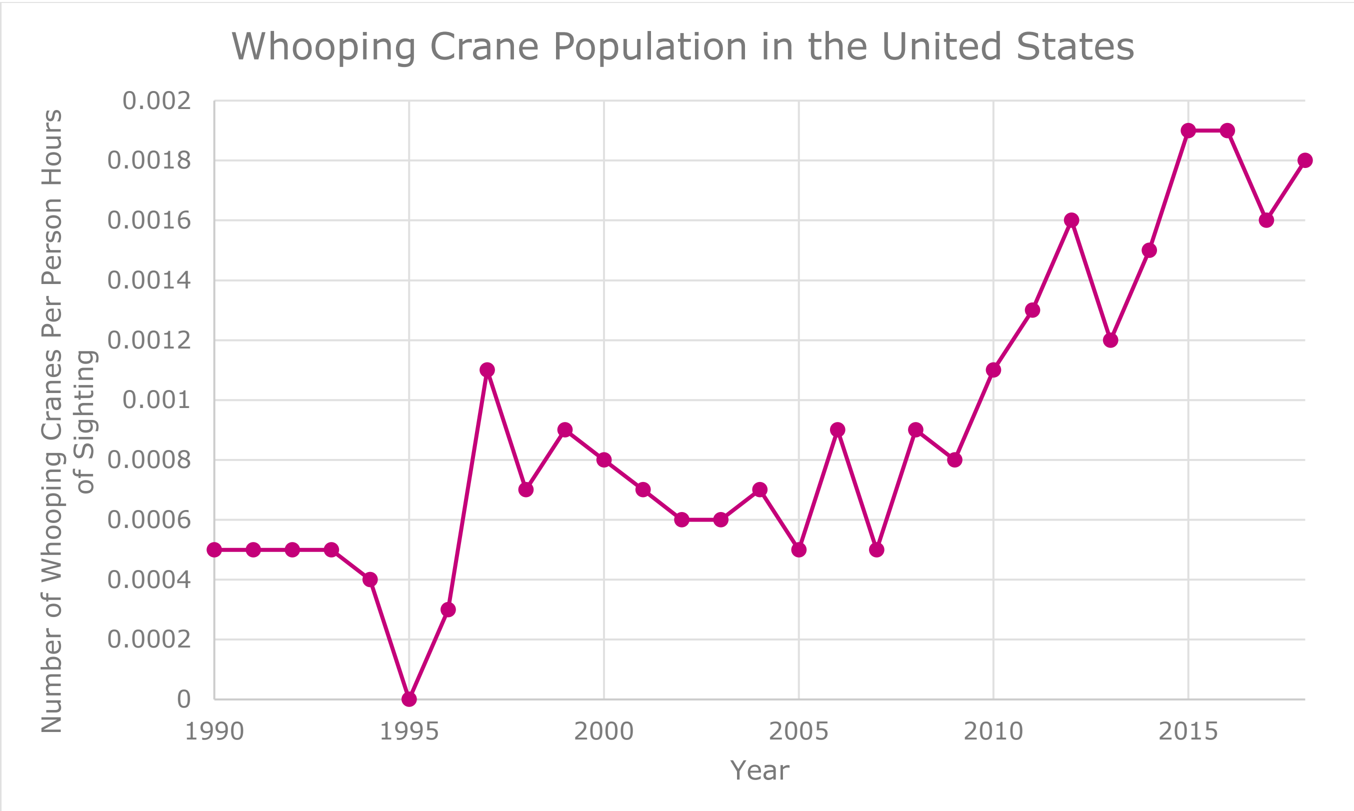


Figure 4. United States whooping crane population 1990 to present. Data are from the Audubon Society's Christmas Bird Count Database[24] and are shown here by the number of cranes per person hour of observation time.



[24] http://netapp.audubon.org/CBCObservation/

Figure 5. Example of error in USDA Cropland Data Layer upon which Lark's argument rests. An area within the Cheyenne Bottoms Reserve was identified as corn by the USDA CDL. Examination of aerial imagery showed no corn, and conversations with staff at the reserve confirmed that corn was never planted there.

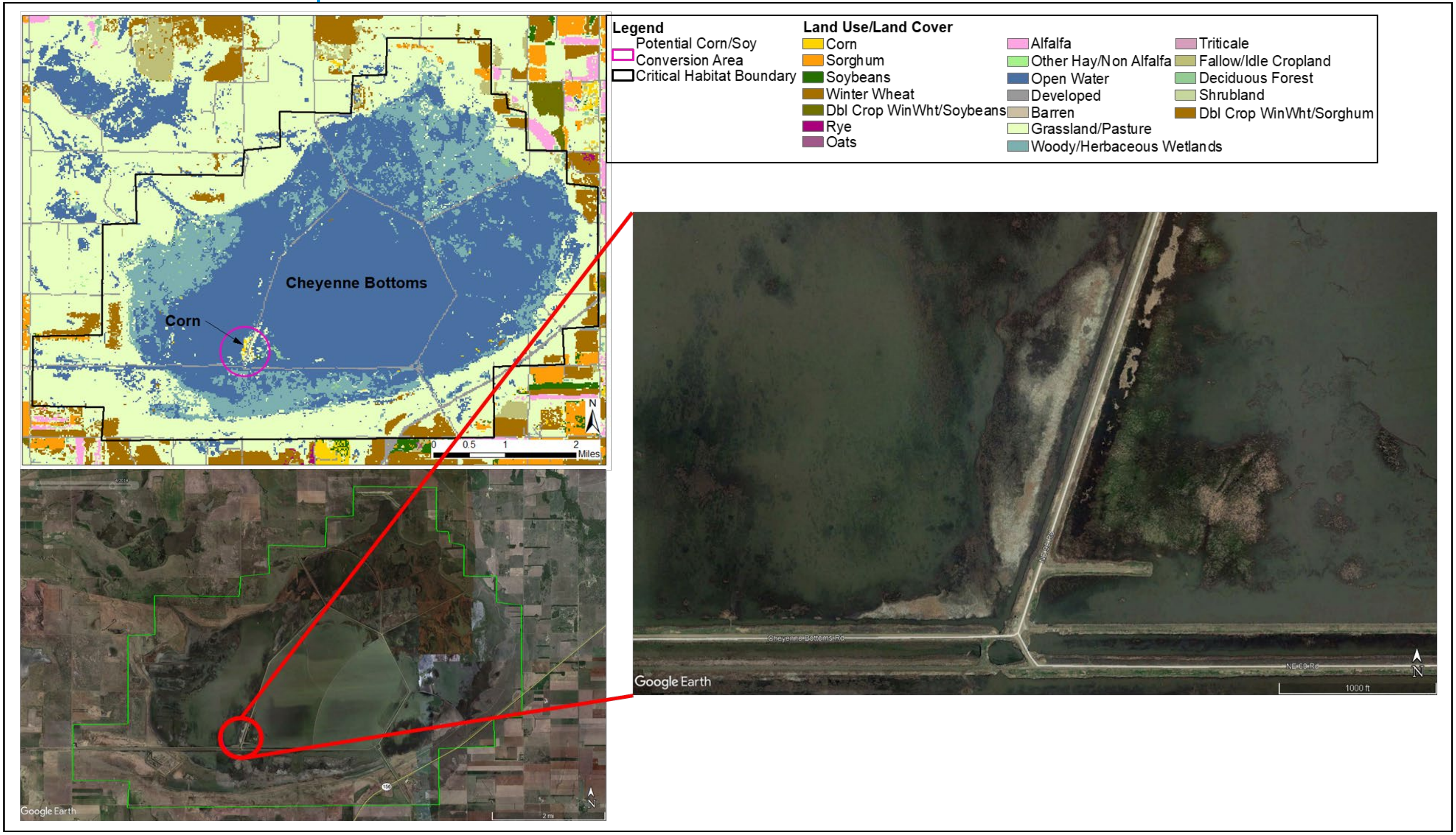


Figure 6. Western yellow-billed cuckoo critical habitat and corn and soy production by county

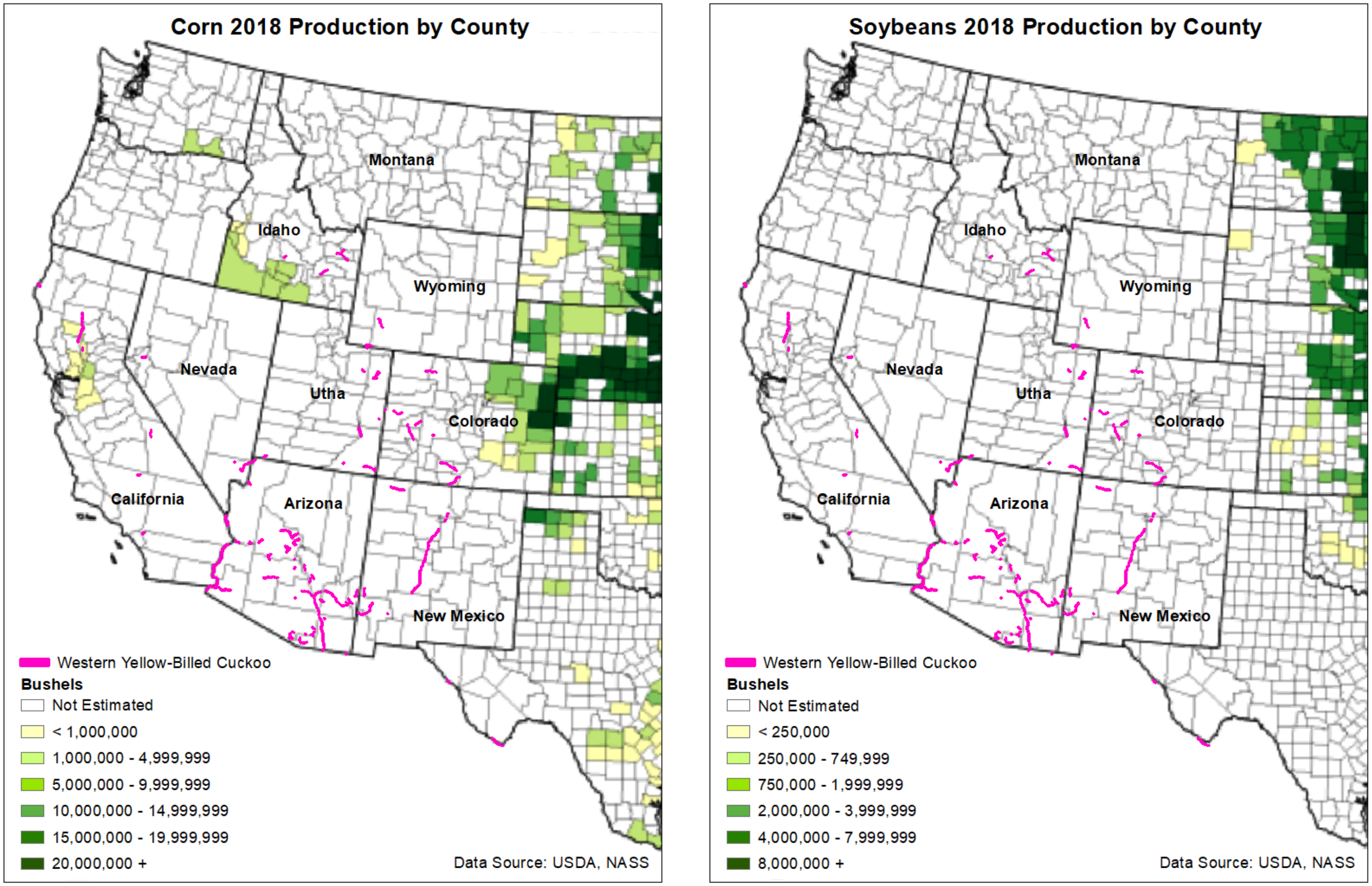


Figure 7. Area near Los Molinos, CA where 2018 CDL show corn within the boundaries of the critical habitat for Western yellow-billed cuckoo and Google Earth images from 1998 2014 document no conversion after 2008.

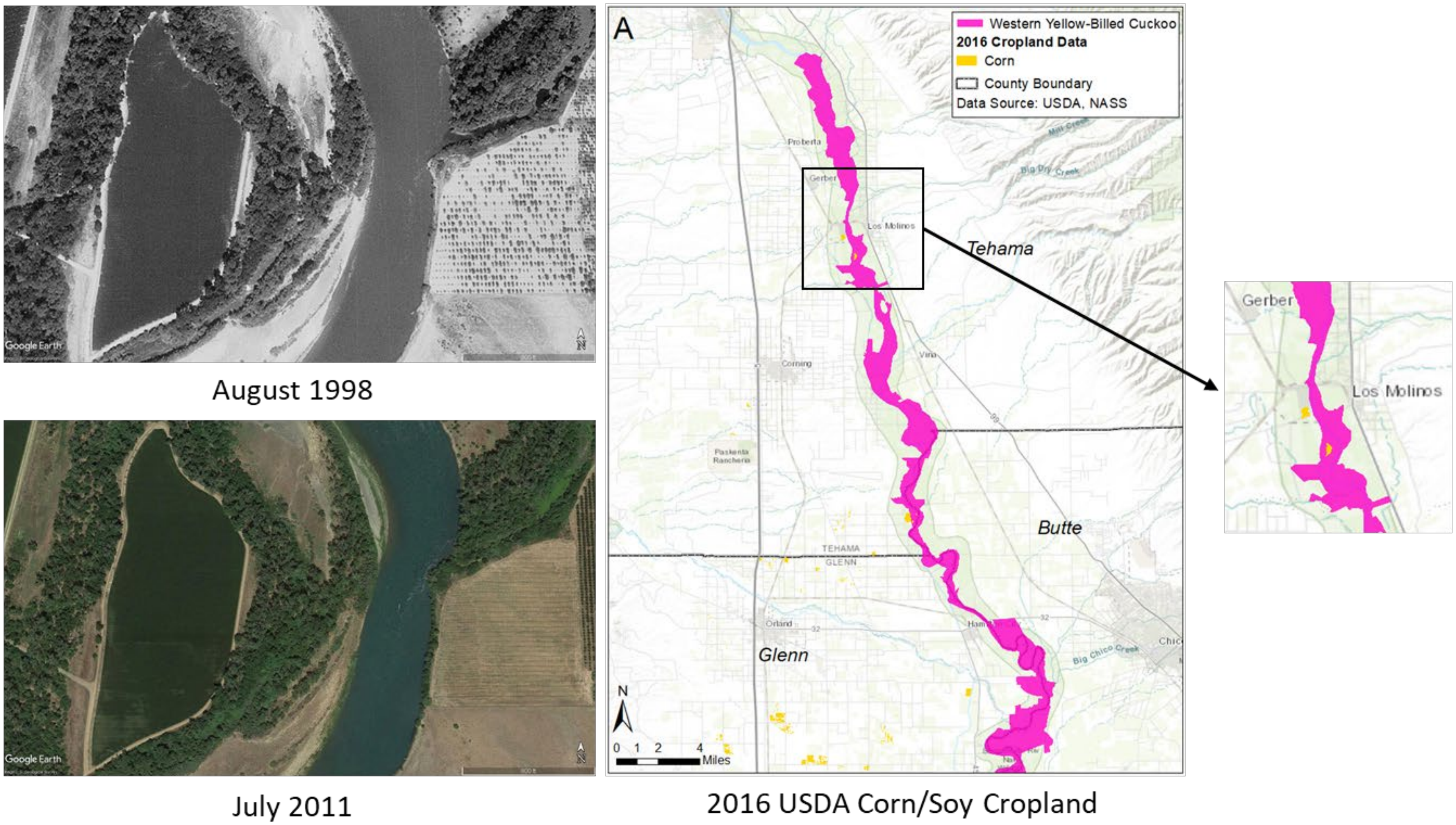


Figure 8. Area near Butte, CA where 2018 CDL show corn within the boundaries of the critical habitat for Western yellow-billed cuckoo and Google Earth images from 1998 2014 document no conversion after 2008.

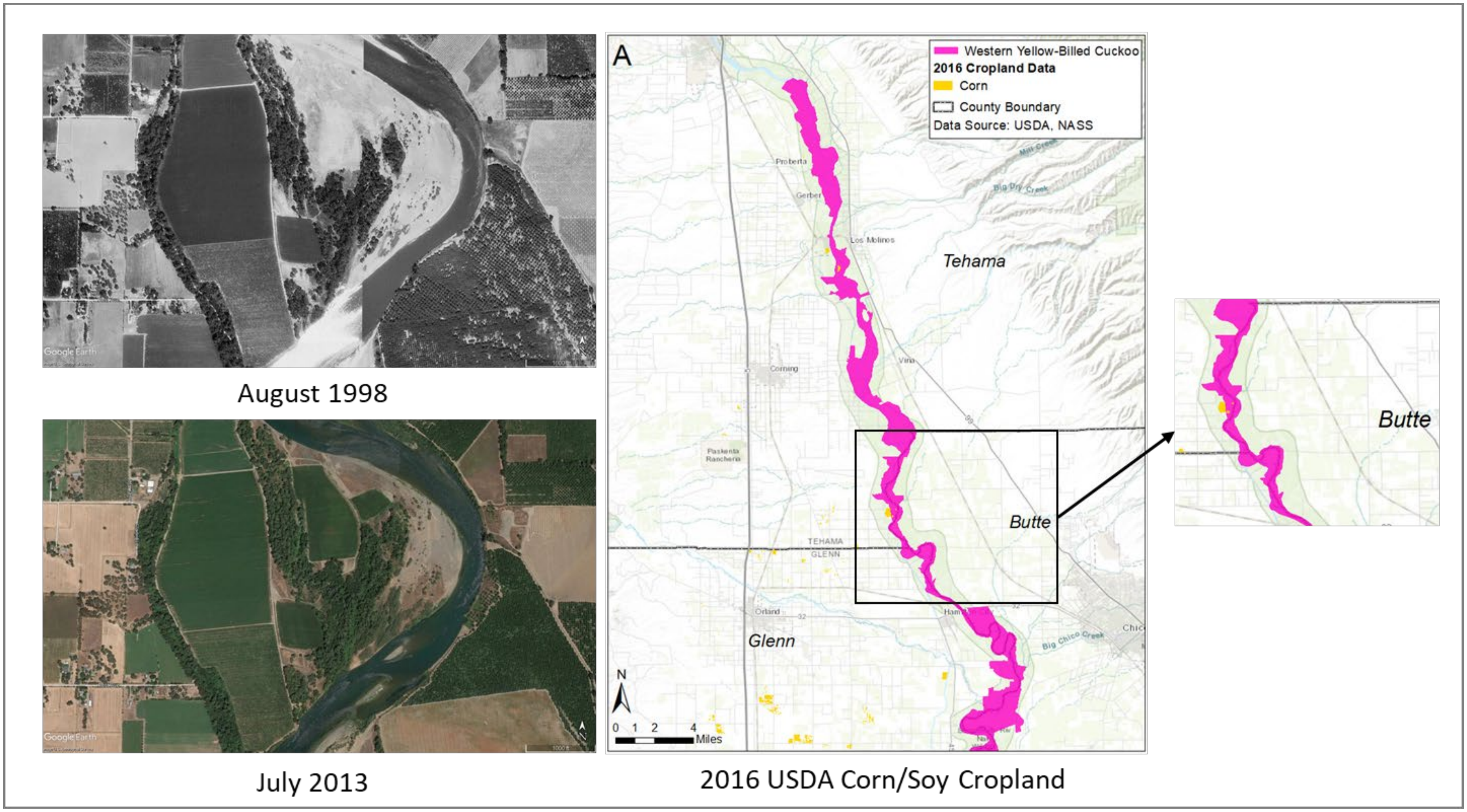


Figure 9. Aerial images from Google Earth demonstrating that the area highlighted in the Lark Declaration Appendix 6 was clearly in agriculture as early as 1991, and there was no evident expansion of the area into what is now designated as critical habitat for Poweshiek skipperling after 2008

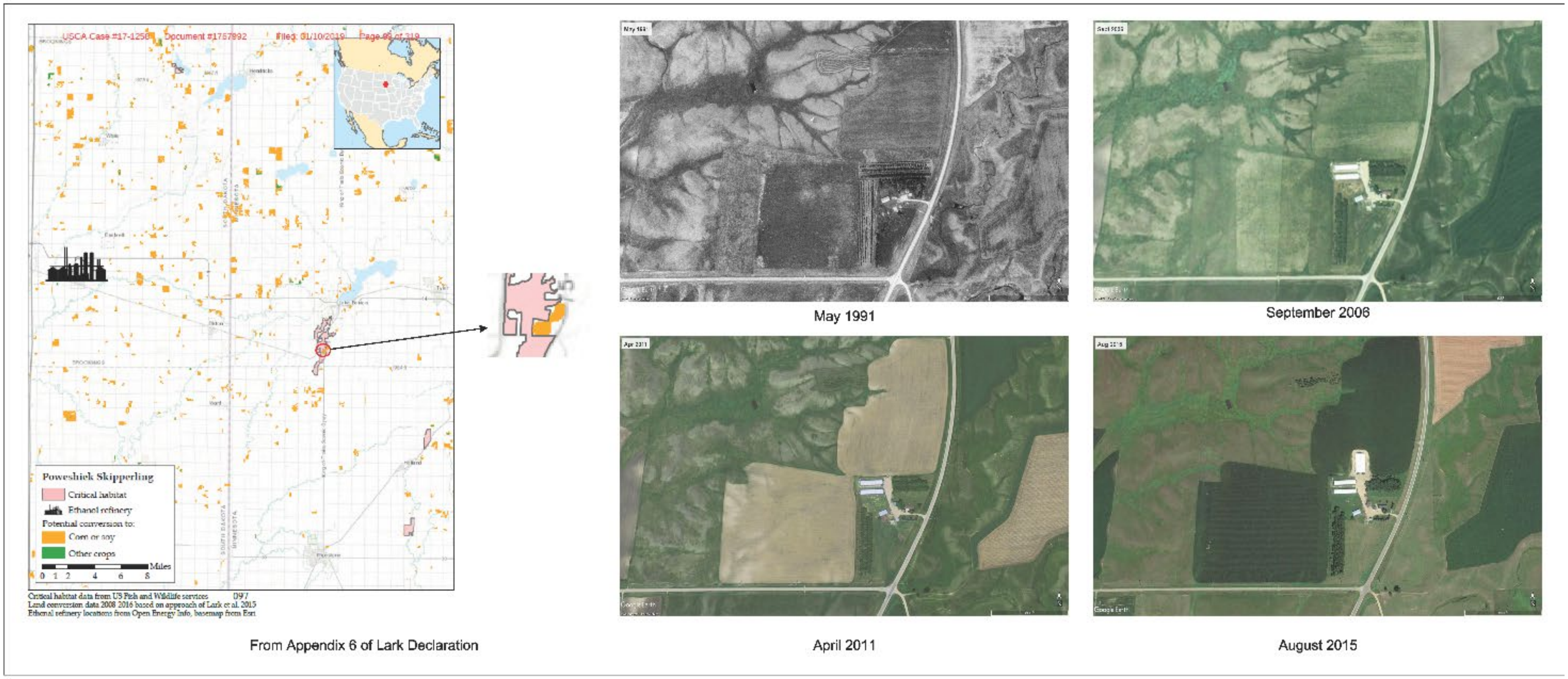


Figure 10. Adult Salt Creek tiger beetles counted during visual surveys 1991-2012 (excerpted from Federal Register 2013)

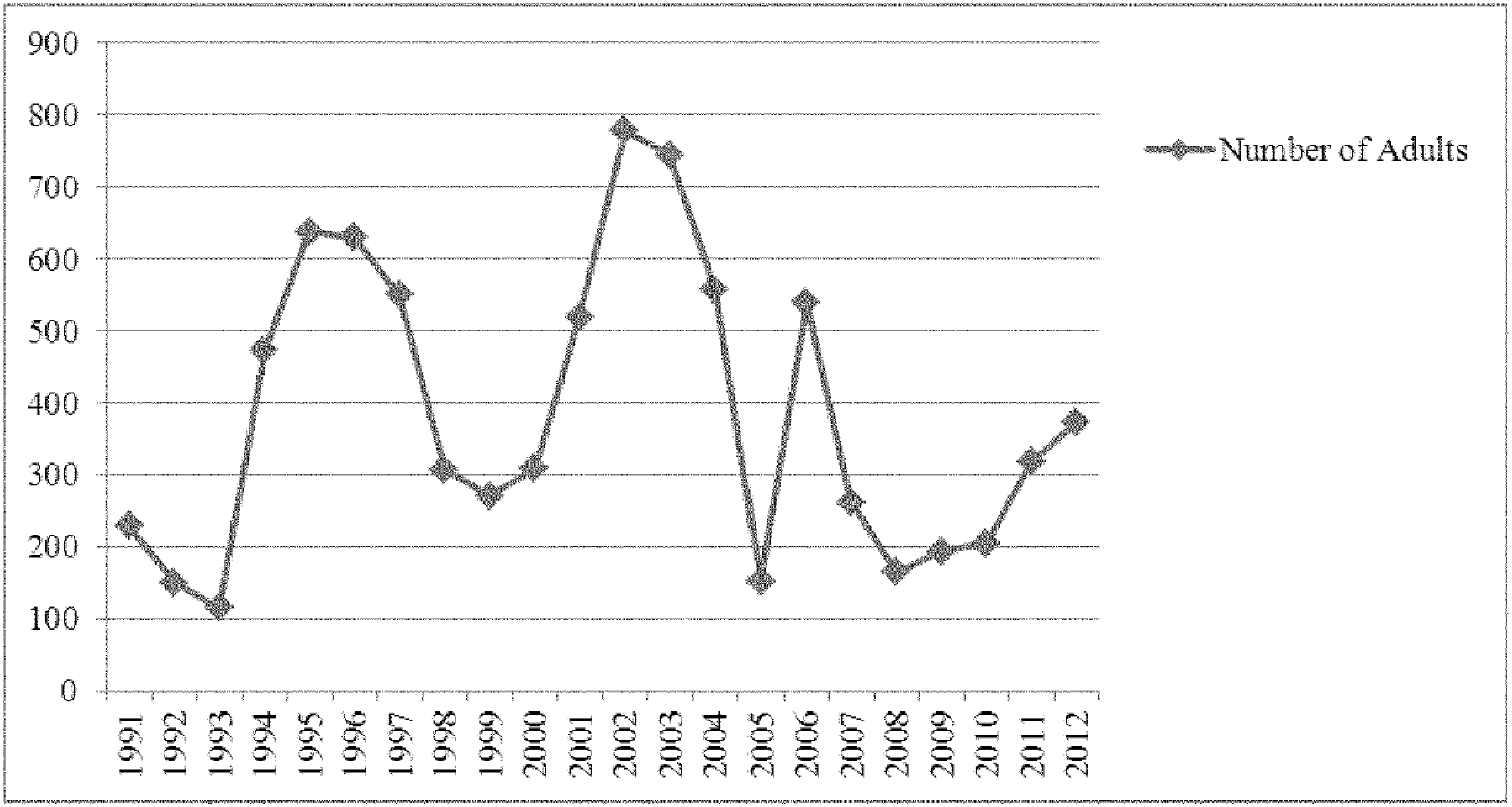
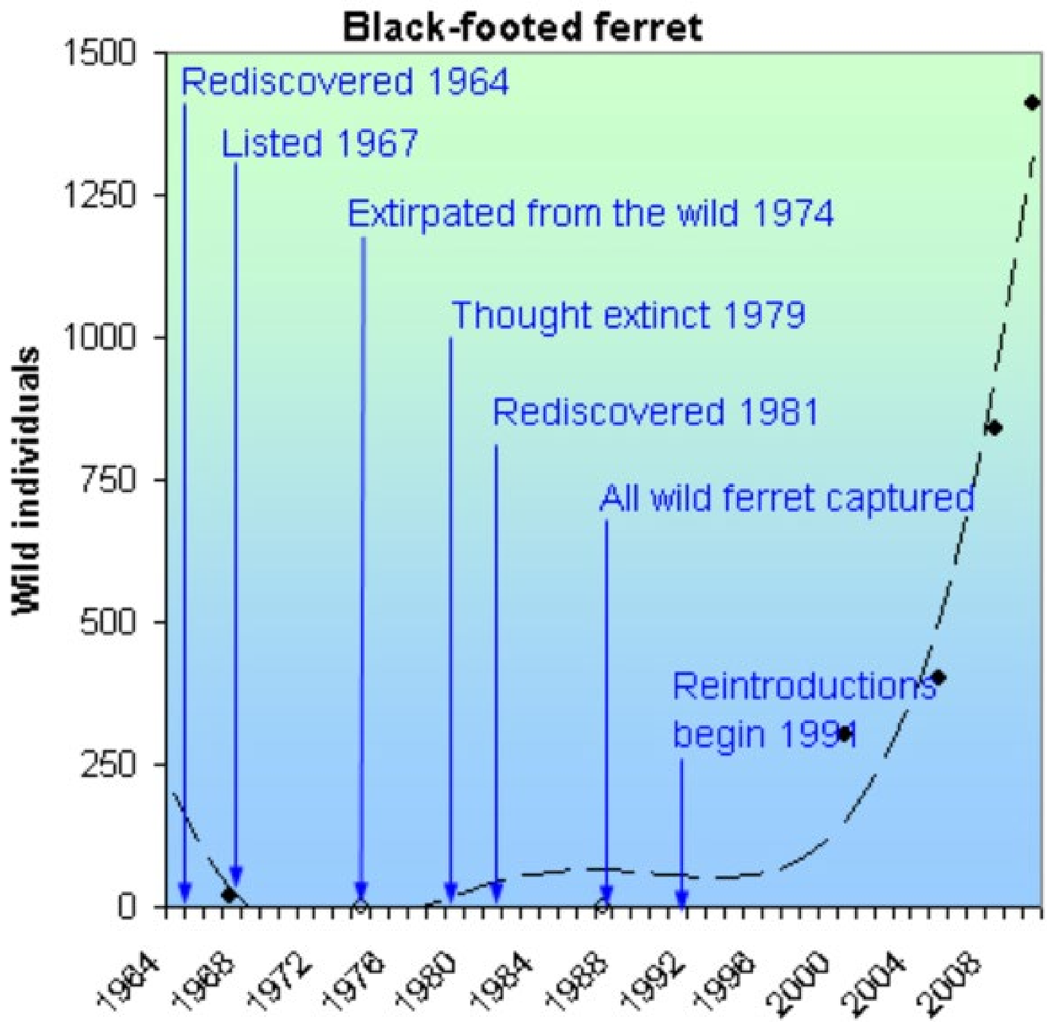
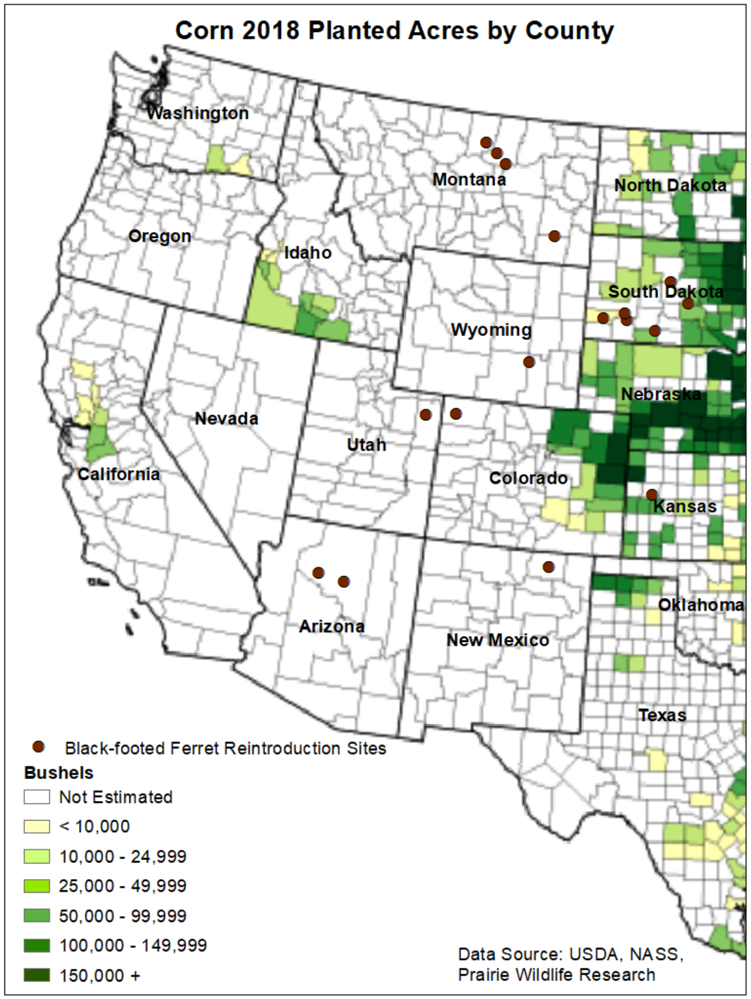


Figure 11. Wild black footed ferret population status 1964 to 2012



SOURCE: https://www.biologicaldiversity.org/species/mammals/black-footed_ferret/

Figure 12. Location of black-footed ferret populations and counties with corn and soy planted 2018



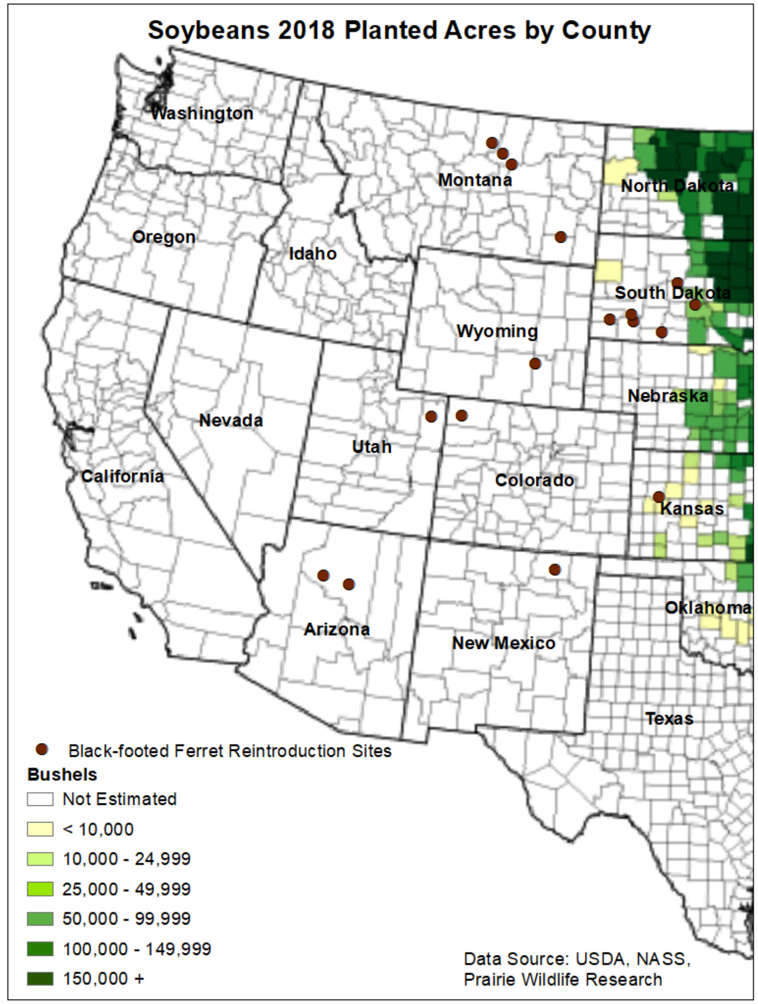
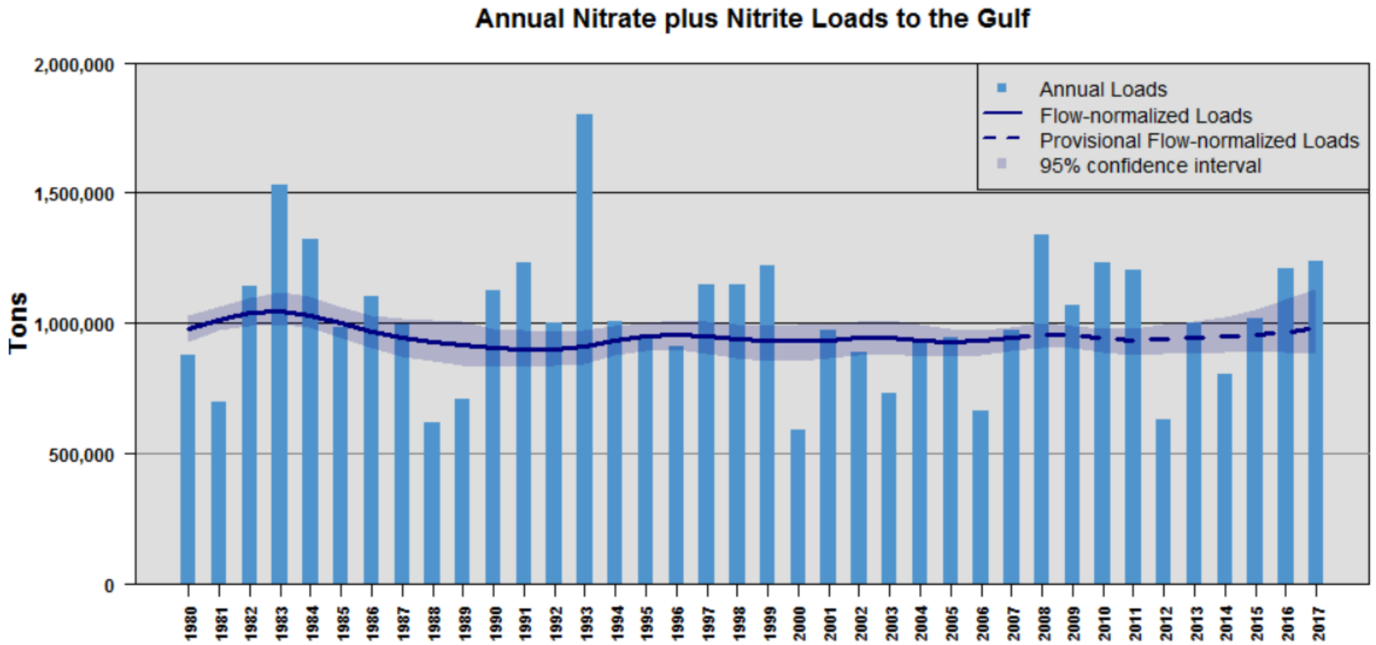
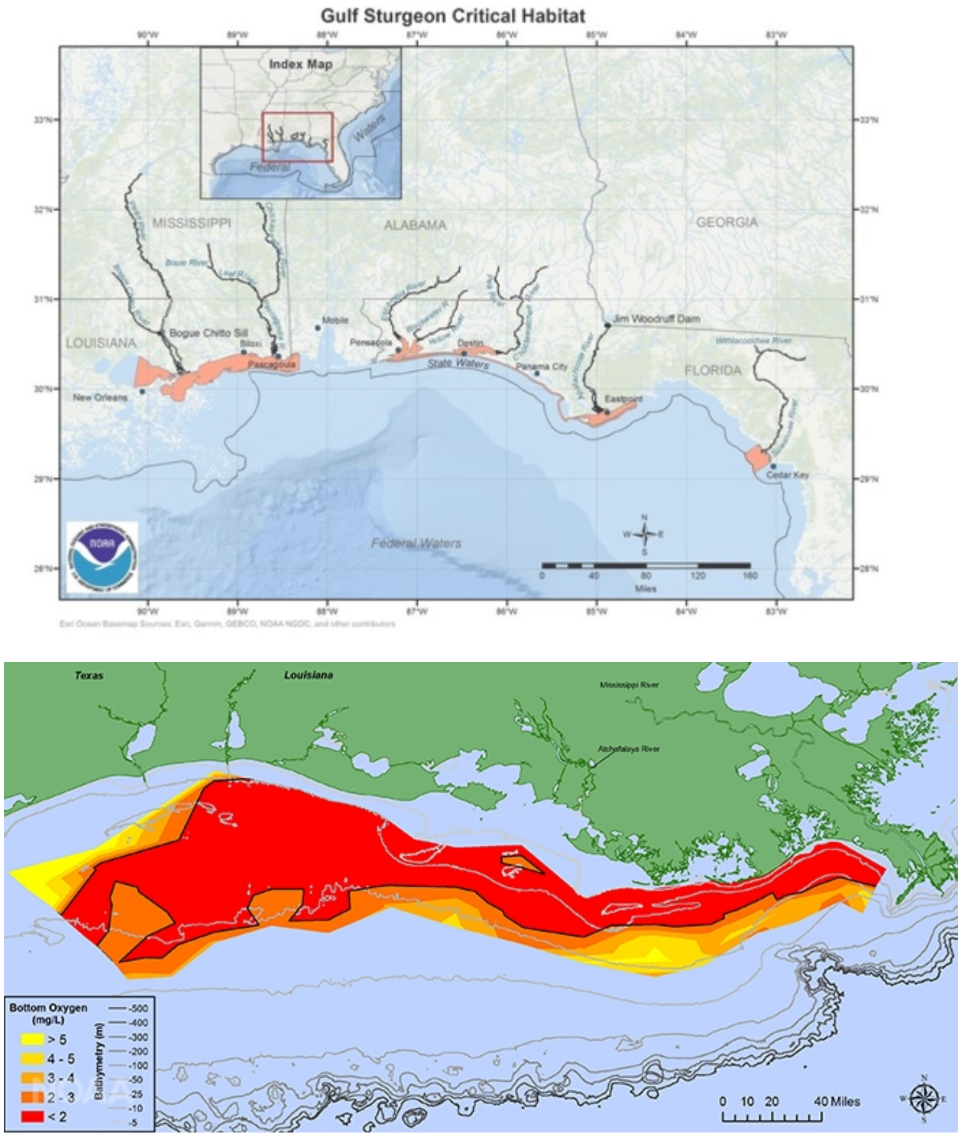


Figure 13. Annual nitrate plus nitrite loading to the Gulf of Mexico 1980 to 2017



Source: USGS n.d.

Figure 14. Gulf sturgeon critical habitat and the Gulf of Mexico dead zone in 2019; the largest dead zone recorded



SOURCE: https://www.noaa.gov/media-release/gulf-of-mexico-dead-zone-is-largest-ever-measured by (Courtesy of N. Rabalais, LSU/LUMCON)

Figure 15. 303(d) maps for 2002 (as produced by the State of Illinois) and the 2015 map presented in the Lark Declaration showing that a major water body near Carbondale has been impaired for more than 17 years—well before the RFS went into effect in 2008.

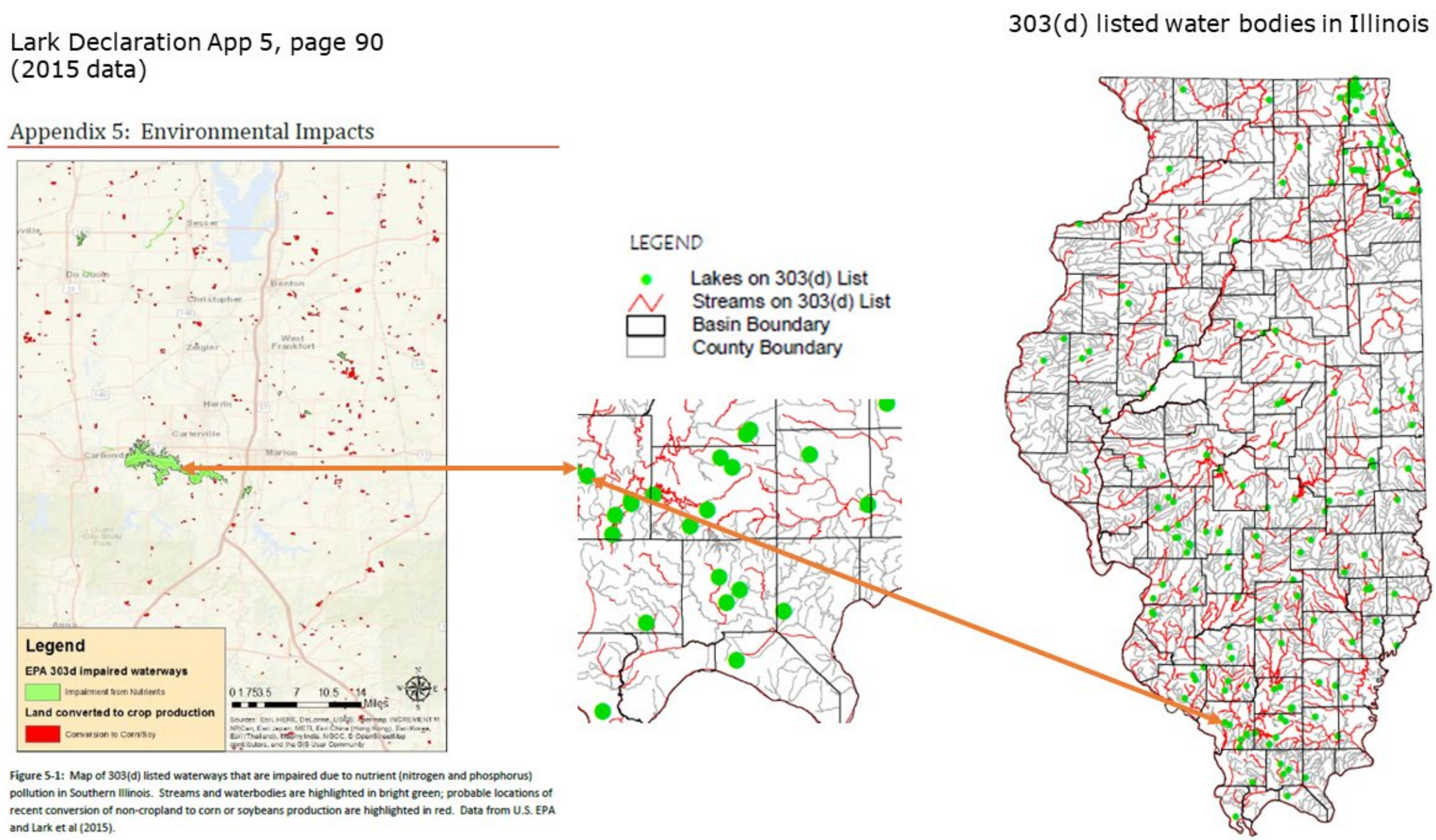


Figure 16. Watershed area selected for spatial analysis of presumed land conversion relative to 303(d) designated streams as identified in Figure 5-6 of the Lark Declaration

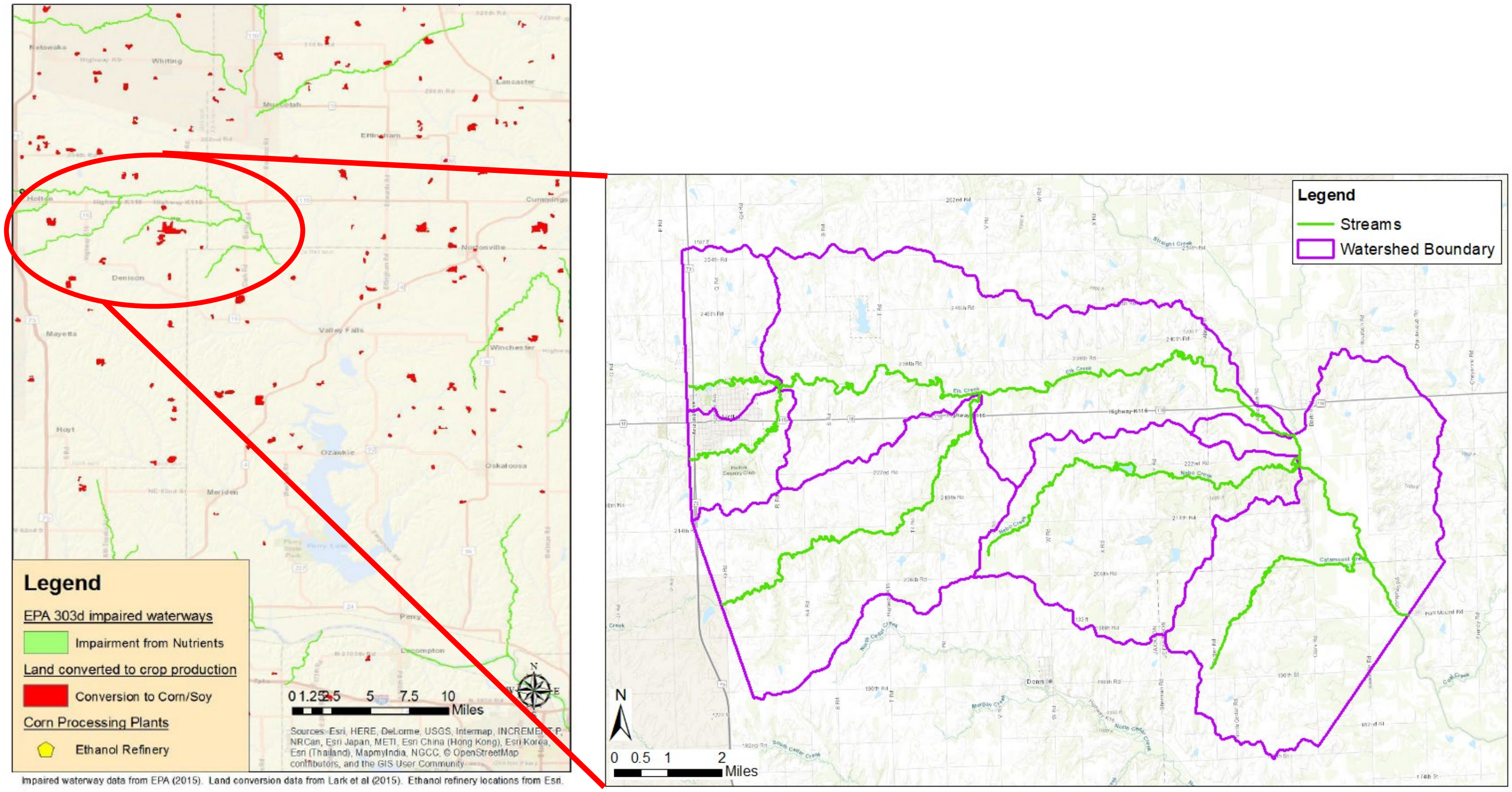


Figure 17. Google Earth Images for the period 1991 through 2018 for fields adjacent to a 303(d) impaired water body identified in Figure 5-6 from the Lark Declaration as having been converted from grassland to corn or soy after 2008