Fueling Destruction

The Unintended Consequences of the Renewable Fuel Standard on Land, Water, and Wildlife

By David DeGennaro

2016

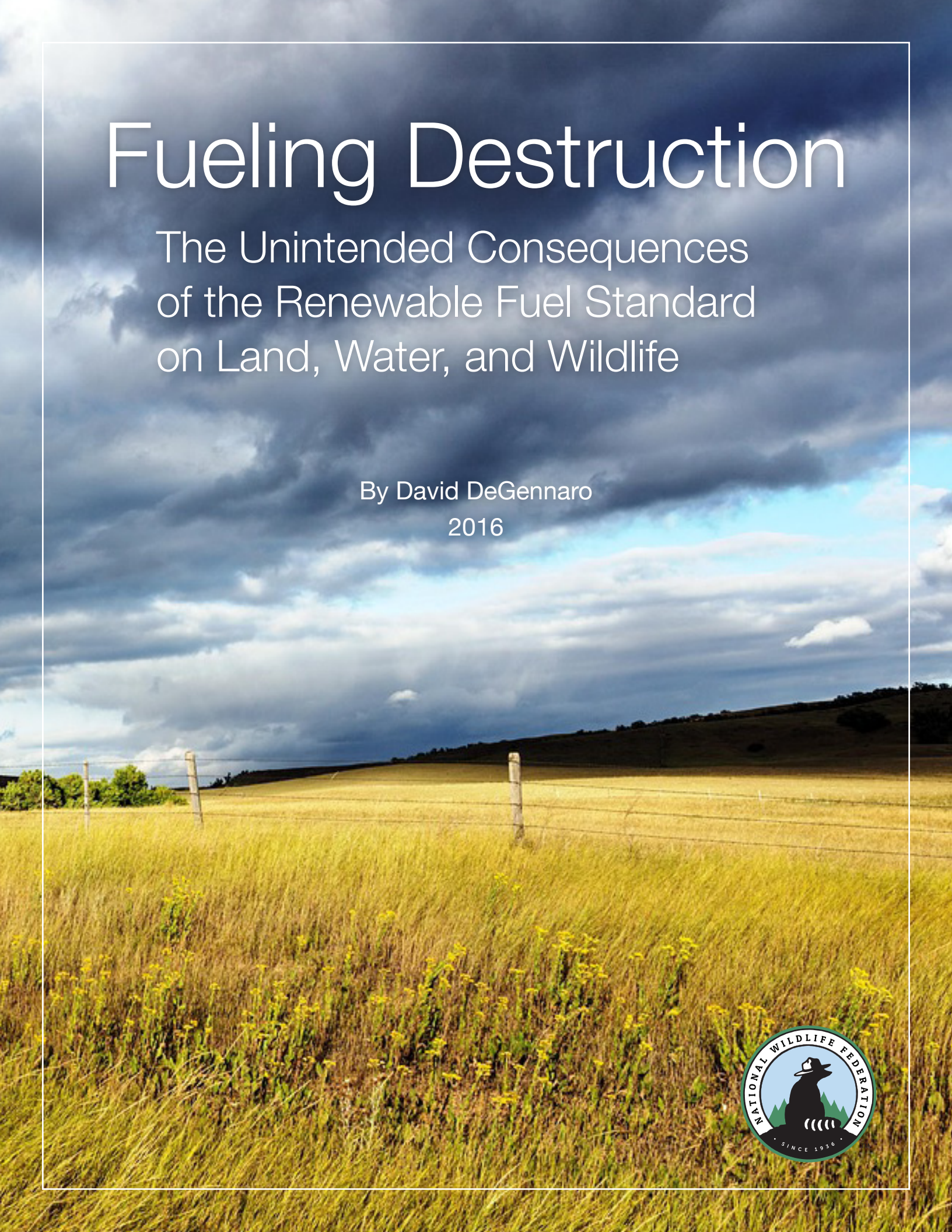

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Photo Credit: Tom Koerner / USFWS.

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Executive Summary

Ground nesting birds like this Baird's Sparrow are at risk thanks to conversion of grassland habitat to crop production. Photo Credit: Rick Bohn.

Areas in Minnesota, North Dakota, and South Dakota saw the most overall conversion at rates exceeding that of tropical deforestation, while some counties outside traditional agricultural areas saw their farmland more than double over the last decade.

Since Congress passed into law in 2005 a federal mandate to blend corn-based ethanol and other renewable fuels into conventional gasoline, the increased demand for corn – which has supplied nearly all of these mandated fuels to date – has resulted in a major transformation on the landscape. Farmers, hoping to take advantage of rising prices for corn and other commodity crops, converted more than 7 million acres of native prairie, rangeland, wetlands, and forests into cropland – a devastating loss of important wildlife habitat and critical ecosystem functions like water filtering across the country. This destruction occurred despite language in the law meant to prohibit this type of land conversion, thanks in large part to the government's refusal to enforce the provision.

With American farmers growing more corn today than at any time since the Great Depression, 40 percent of that crop now goes to produce fuel rather than feeding people or livestock. The staggering scale and swift rise of this massive biofuel industry has profound impacts to the environment as farmers cleared land, drained wetlands, and applied more fertilizers, pesticides, and irrigation water to maximize their production. These increased mechanical applications paired with the loss of buffer strips and wetlands that filter storm runoff have contributed to declining water quality in the Mississippi River watershed, Gulf of Mexico, Great Lakes, and elsewhere. And the law has provided little, if any, of the promised reduction in harmful greenhouse gas emissions that were supposed to make it a model environmental statute.

This report compiles the mounting research bringing to light the unintended consequences of requiring the use of corn-based fuels. Some of the research documented within shows that:

Antelope and other animals fare well on rangeland like this spot in Montana, but do not coexist with intensive row cropping. Photo credit: Gary Kramer / NRCS.

- More than 7.3 million acres were converted into cropland between 2008 and 2012, an area larger than the state of Massachusetts;

- Areas in Minnesota, North Dakota, and South Dakota saw conversion at rates exceeding that of tropical deforestation, while some counties outside traditional agricultural areas saw their farmland more than double over the last decade;

- Grasslands, which include native prairie, land returned to grass under the federal Conservation Reserve Program, and pasture and rangeland – were the habitat type providing the most land for new crops, but significant amounts of wetlands and forests were also lost;

- Corn and soybeans were the crops most commonly planted on new breakings, and corn ethanol plants are correlated both with the amount of corn grown in the surrounding area and with the conversion of new lands into farming;

- This land conversion largely took place on sensitive land and important wildlife habitat, exacerbating pressures on numerous types of wildlife, particularly waterfowl, monarch butterflies, honey bees and other pollinators, grassland nesting birds such as the prairie chicken, and mammals such as the swift fox;

- Water quality in many parts of the country has declined thanks in large part to agricultural runoff, killing aquatic life and promoting toxic algal blooms that threaten human health and render water supplies undrinkable; and,

- Intensive row crop agriculture is expanding into more arid lands requiring heavy irrigation, while ethanol refineries consume very large volumes of water, adding additional stress to areas already burdened with declining aquifers and water storage.

Finally, we call on Congress to fix the broken Renewable Fuel Standard in order to lower the demand for corn, move to more sustainable sources, and try to repair some of the damage that has been done on the landscape.

2

Introduction

This farm in Iowa demonstrates how stream buffers filter runoff and protect streambanks from erosion. Strips like this have been disappearing in corn country. Photo Credit: Lynn Betts / NRCS.

The expansion of row crop agriculture into sensitive habitats, driven in part by the Congressionally mandated use of corn ethanol, is having serious impacts on our land, water, and cherished wildlife populations.

For the last nine years, the United States has pushed full-steam ahead on a drive to infuse our transportation fuels with ever-growing volumes of alternative fuels to displace petroleum-derived gasoline. While the motivations behind this push – greater energy independence and security, reduced emissions of greenhouse gases and other harmful pollutants, and economic development in rural America – were well intentioned, the unanticipated impacts caused by the push for plant-based fuels have led to major impacts on land, water, and wildlife habitat.

Despite the good intentions of the policy, the expanded Renewable Fuel Standard (RFS), signed into law in 2007, has contributed to the destruction of threatened and biologically rich native habitats. Farmers across the country have responded to market incentives to grow ever more corn for ethanol and to meet international grain demand by increasing their production to historically high levels. They have done so not only by doubling down on land already under cultivation – changing crop rotations in favor of consecutive years of corn, double-cropping, increasing chemical fertilizer and pesticide application to maximize bushels per square foot – but also by bringing large new swaths of land under the plow, many for the very first time.

There is evidence that this new frontier of agricultural production has been spreading across the country, with a few hot spots with large amounts of habitat conversion and intensification. Unfortunately, these hot spots also serve as uniquely important areas of habitat for wildlife. Cropland conversion has swallowed many valuable wetlands, particularly in the Prairie Pothole Region of the Upper Midwest, an area that is the primary North American breeding ground for ducks and other waterfowl. And the expansion has taken a particularly heavy toll on native prairie that has never before been plowed for crops – a habitat type that is rapidly vanishing

Ground nesting birds like this lesser prairie chicken in Kansas depend on adequate intact grasslands for survival. Photo Credit: Greg Kramos / USFWS.

from the North American landscape. In addition, corn production has expanded into areas of grassland habitat that were previously removed from cropping and planted with native vegetation under programs like the federal Conservation Reserve Program, as well as millions of acres of pasture or grazing land. Also falling victim to conversion are many of the marginal lands along the edges of existing farms that had previously supported pollinators like bees and monarch butterflies, buffer strips along waterways that filtered out polluted farm runoff before it clogged the lakes, streams, and rivers that we rely on for drinking water and recreation, and which are home to myriad fish and other aquatic species. Somewhat startlingly, the advance of cropland over the last several years has even captured forested lands as farmers have found it profitable to harvest native trees and grow corn or cotton in their place.

The expansion of row crop agriculture into these sensitive habitats, driven in part by the Congressionally mandated use of corn ethanol in our transportation fuel, is having serious impacts on our land, our water, and on our cherished wildlife populations. Where will ducks, upon returning to the Plains each spring to breed, raise their young if they find corn or soybean fields in place of the wetlands and nearby grasslands they have always relied on for food and shelter? How will we recover monarch butterfly populations from their precipitous decline if we continue to replace milkweed-rich grassland habitats with vast monocultures devoid of other life? How will we ensure there is enough grass and shrub land to maintain beloved species like the swift fox and prairie chicken without some sort of firewall on expansion of crops into dwindling areas of range and pasture lands?

The impacts to wildlife come in addition to an increased contribution to poor water quality fed by farm runoff, which chokes our waterways with eroded soil, excessive nutrients, and toxic algal blooms. These water quality implications threaten aquatic life as well as human recreation and clean drinking water. Finally, all of these unintended negative impacts have accumulated for only

meager benefit, as there is debate about how much – if any – carbon reductions have come from the push for biofuels.

Although the RFS was a noble attempt to stimulate a cleaner, safer fuel supply, the time has now come to realize the policy has missed its mark, and to commit to doing a better job in achieving the law's good intentions. The law must be fixed to no longer add fuel to the destruction of our shared natural resources, so that all Americans now and in the future will be able to benefit from clean air, clean water, and abundant wildlife.

Background on the Renewable Fuel Standard (RFS)

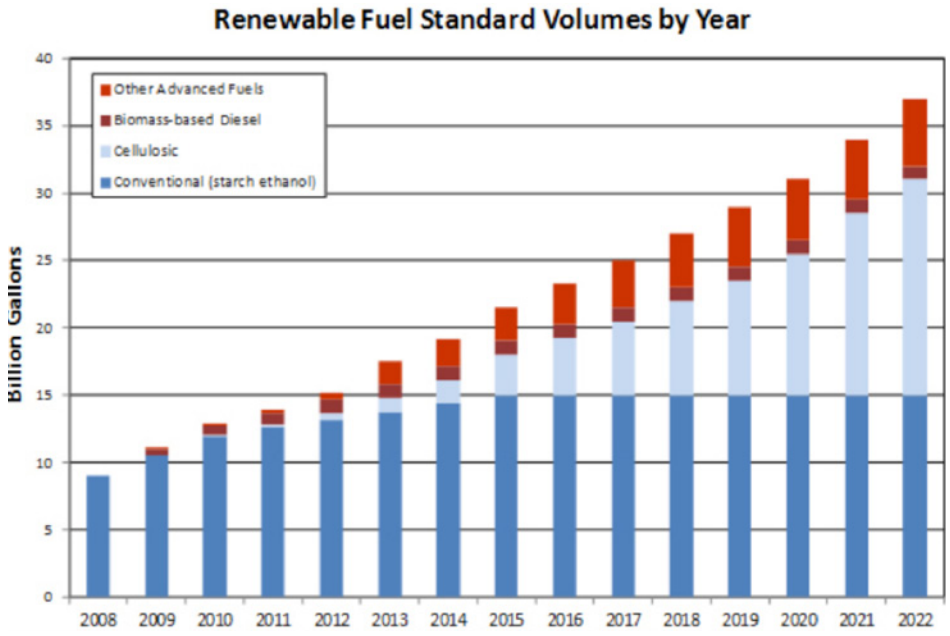
The current federal RFS, signed into law in 2007, requires the blending of increasing amounts of ethanol and other alternative fuels into gasoline. An alcohol predominantly produced by fermenting corn starch in the United States, ethanol has been blended into gasoline in increasing volumes to meet the law's requirements; the law calls for as much as 15 billion gallons of corn ethanol and an additional 21 billion gallons of "advanced" biofuels of other types by 2022. Ethanol produced from fermented corn starch powered Ford's first Model T engines more than 100 years ago. Since then, technology has developed to produce ethanol from the denser parts of plants – like grasses, cornstalks, and wood pulp – which is typically known as cellulosic or advanced ethanol. Other fuel types like bio-based diesel from soybean oil and even fuel mixtures produced from single-cell algae are being produced as well. While corn is the predominant source for ethanol in this country, other starchy plants are used to produce ethanol elsewhere, such as sugar cane in Brazil and sugar beets in Europe. These fuels were envisioned as a means to replace foreign-produced oil with domestically produced renewable fuel, and as a means of reducing greenhouse gas (GHG) emissions. To that end, the RFS includes GHG reduction requirements for each fuel type: in order to be comply with the mandate, conventional ethanol from new facilities would have to reduce lifecycle GHG emissions by 20 percent below the baseline emissions of producing the corresponding amount of gasoline, advanced biofuels and biomass-based diesel would require a 50 percent reduction, and cellulosic biofuels a 60 percent improvement over gasoline.

Federal interest in fostering the use of domestically produced fuel derived primarily from corn dates back to the Carter Administration following the Iran crisis and petroleum shortages. The corn-based ethanol industry and federal subsidies for the fuel remained small until the early 2000s when the fuel was recognized as a viable replacement for the fuel additive methyl tert-butyl ether (MTBE). A petroleum-derived chemical, MTBE had been infused in gasoline to make it perform better in vehicle engines. When MTBE was found to be leaking from storage tanks into underground drinking water supplies in the 1990s, the search for a replacement landed on ethanol.

Latching onto arguments around American energy independence and freedom from foreign sources of oil in order to help cement ethanol as the fuel oxygenate of choice, Congress passed and President George W. Bush signed into law the Energy Policy Act of 2005. The new law included the first Renewable Fuel Standard, requiring

Foreseeing Potential for Disaster

Included in the 2007 RFS law was a prohibition on fuels derived from crops grown on land that had been converted from non-agricultural land after the law's passage – an important win for conservationists and wildlife enthusiasts. Through this provision, Congress sought to ensure that the large federal mandate for bio-based fuels would not drive farmers to plow up virgin habitat in order to grow crops for these fuels. However, the EPA has chosen not to implement this safeguard, and large-scale conversion is exactly what occurred. **What should have been a critical protection for native lands and prime wildlife habitat has instead been an empty promise.**



RFS Mandated Volumes, Credit: US Dept. of Energy.

the blending of ethanol into gasoline, with the goal of reaching a total of 7.5 billion gallons in 2012. A mere two years later, under new Democratic leadership in both the House and Senate, Congress greatly expanded the RFS, including the new requirements for second-generation fuels – termed advanced and cellulosic biofuels – to eventually surpass production of corn ethanol.

Over 97 percent of biofuels produced in the United States are derived from corn, with little potential for other major new fuel sources in the near future.[1,2] In order to meet this level of production, around 40 percent of the U.S. corn crop is now diverted to biorefineries to meet the mandate, up from just 9 percent in 2001, though it is important to note that the use of dried distillers grain – a byproduct of ethanol production – as livestock feed reduces ethanol's overall impact closer to 25 percent.[3] Corn now dominates the agricultural landscape, being grown on more than 90 million acres of cropland. Increased corn demand also has succeeded in stimulating the rural economy by driving crop prices to historic highs. While these prices have since moderated, at their peaks in 2012, corn and soybean prices had tripled compared to 2002, with wheat, cotton and other row crops also benefiting.[4]

To date, the RFS has successfully integrated corn ethanol into the fuel supply, which today consists mostly of a mixture of about 10 percent ethanol to 90 percent gasoline. The law has not yet succeeded, however, at stimulating the large-scale commercialization of second-generation biofuels, production of which has lagged precipitously below mandated levels. This lack of cellulosic fuel supply led the Environmental Protection Agency to reduce the blending requirements far below those stated in the law every year. With corn reaching its mandated ceiling of 15 billion gallons in 2017, concerns about the so-called "blend wall," or limit of 10 percent ethanol that can be safely added to most gasoline, will again be at the fore. Both this practical limit on ethanol and the ineffectiveness of the RFS in stimulating the growth of the advanced and cellulosic sectors have led many to call for reform or repeal of the law for reasons beyond its environmental impacts.

- *Over 97 percent of domestic biofuels are derived from corn.*
- *40 percent of the U.S. corn crop is sent to ethanol plants.*
- *Corn is grown on 90 million acres, more than any other crop.*

3

Making Way for Energy Crops: The Reality of Land Conversion and Habitat Loss

Eliminating stream buffers and planting right up against water bodies, as on this Iowa farm, greatly increases the risk of erosion and water pollution. Photo Credit: Tim McCabe / NRCS.

High demand for corn, fueled in part by the mandated use of ethanol, may have been a boon to rural economies, but it was a bust for native ecosystems and wildlife habitat.

With more than 40 percent of the domestic corn crop now destined for fuel tanks rather than traditional uses such as food for people and livestock, the inevitable consequence has been a large ramp-up in production to meet the increased demand. This has included a major expansion of cropland into new areas. The first comprehensive nationwide assessment of land use change since the passage of the RFS from researchers at the University of Wisconsin found overall conversion of 7.3 million acres into cropland from 2008 to 2012, the first four years of the expanded mandate.[5] Taking into account other land use fluctuations during that time, the country saw a net expansion of 2.9 million acres of cropland. This represents an area larger than the state of Massachusetts of grassland, wetlands, and forest that had not been cropland for more than 20 years, all of which had been plowed under to make way for the greatest agricultural transformation in at least a generation. Even this very high number is likely a gross underestimate, as the study evaluated only parcels of land 15 acres or greater in size, leaving out many of the smaller changes along the periphery of existing fields. More recently, the World Wildlife Fund, using a slightly different methodology, estimated that from 2009 to 2015 the Great Plains (including a small portion of southwestern Canada) saw conversion of a jarring 53 million acres of grassland into cropland.[6] High demand for corn and the attendant climb in crop prices, fueled in part by the mandated use of ethanol, may have been a boon to rural economies, but it was a bust for native ecosystems and wildlife habitat.

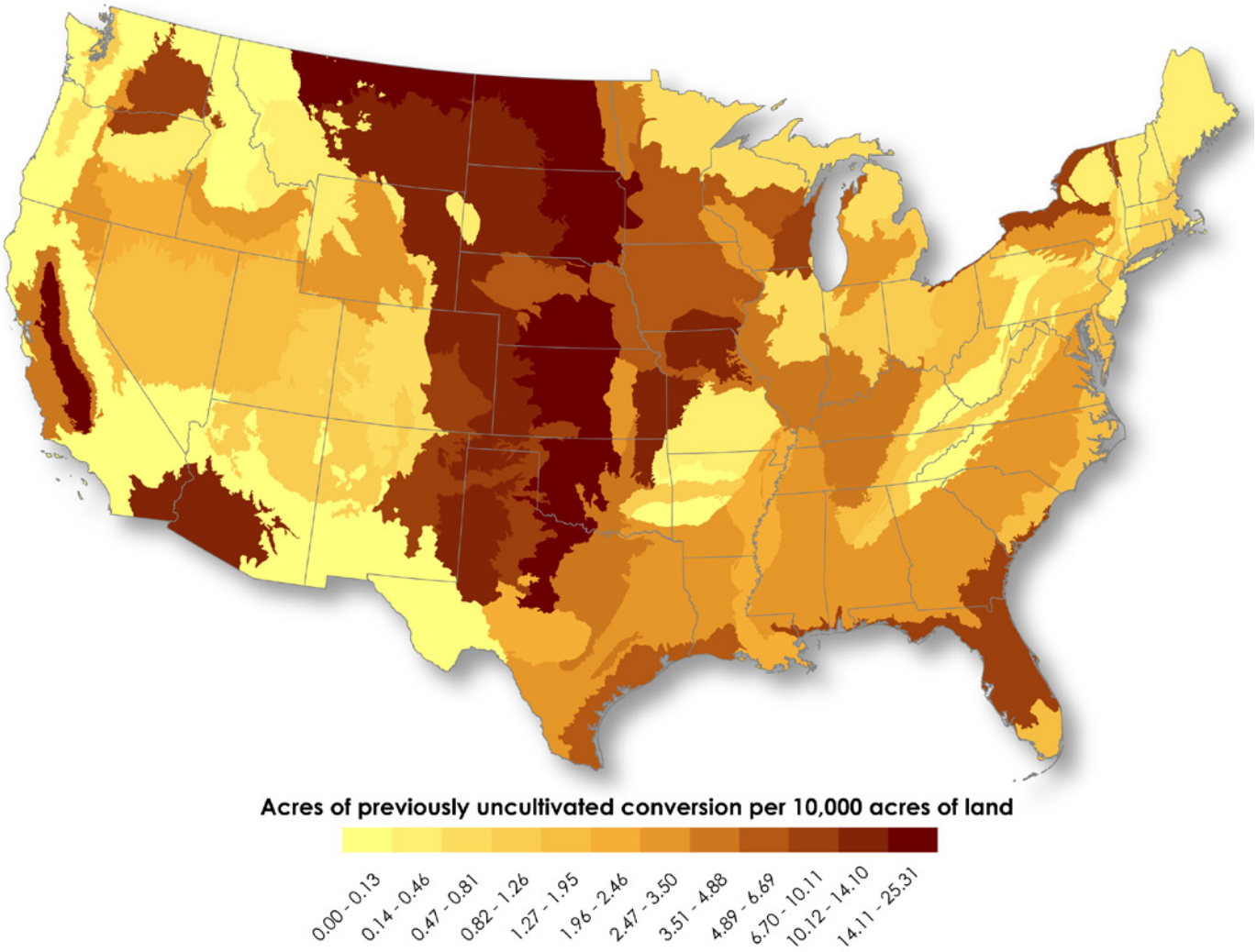


Figure 2: Map depicting trends in conversion to cropland from 2008 to 2012. Credit: Lark, et al, University of Wisconsin, 2015.

Changes in the Heartland and Beyond

The University of Wisconsin study found that some level of conversion had occurred in all regions of the country, but certain areas were identified as "hotspots" of conversion.[5] The greatest total expansion was concentrated in predictable areas in and around the Corn Belt, such as the Dakotas, along the border of Southern Iowa and Northern Missouri, and in the Western parts of Kansas, Oklahoma, and the Texas panhandle. Others were found in "new frontiers of agriculture," including on the Western Plains from South Dakota to New Mexico, along the edge of the forests in northern Minnesota and Wisconsin, in southern Missouri and eastern Oklahoma, and in the eastern and western piedmont of the Appalachians. Crop production expanded in these regions as new technologies made it possible to plant in these areas and the rising price of corn, along with federal crop insurance subsidies, altered the economics of planting there, and as other crops displaced by corn found new outlets elsewhere. While the researchers found the greatest total conversion in the Dakotas, a large portion of the areas of new expansion saw their cropland at least double in size over the period.

Previous studies focused on the greater Corn Belt found similarly troubling results. One zeroed in on the five western Corn Belt states of Iowa, Minnesota, Nebraska, North Dakota, and South Dakota and found conversion of more than 1.3 million acres of grassland into corn/soy crops from 2006-2011.[7] The highest loss rate was found along the western edge of the region, where corn

Farms and wetlands often struggle to coexist in the Prairie Pothole Region. Photo Credit: Laura Hubers / USFWS.

and soy crops expanded into a more difficult climate, and in Southern Iowa where farmers planted on poor quality soils. In these hotspots, the rates of conversion were as high as 30 percent over the timeframe or as much as 5 percent annually. Focusing more closely on the Prairie Pothole Region of the Dakotas, another study found a steady increase in corn/soy acreage from 2006 through 2012, but a major ramp-up occurring at the end of that timeframe. From 2010 to 2012 alone, the region saw an increase in corn and soy acreage of 27 percent, totaling an area larger than the state of Connecticut and half the size of Belgium.[8] The rate of increase over those years was nine times faster than that of the earlier part of the study, occurring alongside the law's implementation and drive to plant in the years following the RFS. Finally, one more recent study from 2016 documented major conversion in the Lake States of Michigan, Minnesota, and Wisconsin, finding that two million acres of non-agricultural open space was converted from 2008 to 2013, a loss of 37 percent.[9] Meanwhile, corn acreage in the states increased by 36 percent.

Expansion Fed Largely on Grassland

As expected, the majority of losses on the landscape over the course of the RFS came from grasslands, which were already the most endangered ecosystem in the United States.[10] The U.S. Department of Agriculture's Economic Research Service in 2011 published a study titled "The Ethanol Decade: An Expansion of U.S. Corn Production, 2000-2009" that attributed one-third of the expansion of corn and soybeans over that timeframe to the conversion of expiring CRP lands, hay fields, or grazing lands.[11] Most of the additional expansion came from farmers' switching to corn from other crops such as soybeans (many farmers have changed from rotating corn and soy into a three-year corn-corn-soy rotation or foregoing soy altogether) or utilizing fallow lands. Another study from USDA focusing on the years immediately following the onset of the ethanol mandate, this time the agency's periodic National Resources Inventory (NRI), also found a net expansion of 2 million acres of new farmland and confirmed that the majority of new lands were being drawn from CRP (54 percent of the new acreage) and pasture (39 percent).[12]

The University of Wisconsin study determined that grasslands of one type or another (native prairie, planted pasture, CRP, etc.) were the largest source for converted cropland, accounting for 77 percent of new farmland. More than a fourth of these grasslands had been in grass for over 20 years, forming what the researchers

Putting Conversion in Context

"Our results show that rates of grassland conversion to corn/soy (1.0–5.4% annually) across a significant portion of the US Western Corn Belt are **comparable to deforestation rates in Brazil, Malaysia, and Indonesia,** countries in which tropical forests were the principal sources of new agricultural land, globally, during the 1980s and 1990s. Historically, comparable grassland conversion rates have not been seen in the Corn Belt since the 1920s and 1930s, the era of rapid mechanization of US agriculture." --Wright et al, 2013

termed “long-term, unimproved grasslands” with the highest value for wildlife and carbon sequestration. Other research determined that the Dakota Prairie Pothole Region lost 6.75 percent of its long term grasslands between 2010 and 2012, which was during the corn/soy ramp-up in the region.[8]

Grasslands, however, were not the only source for new lands to feed agriculture’s expansion. The UW study found, surprisingly, that forested land was the source for about 3 percent of new cropland. In all, 198,000 acres of forests were cleared between 2008 and 2012. Wetlands and their immediate surroundings were also a large contributor to conversion according to the study, particularly in ecologically important areas. Wetlands, which were the source of about 2 percent of new cropland, saw conversions concentrated in the Dakotas and Minnesota, with other concentrations in the lower Mississippi valley, and numerous other states, including California, Florida, Georgia, Nebraska, Washington, and Wisconsin. Another study demonstrated the loss of grasslands immediately surrounding wetlands; these grasslands are just as critical as wetlands in providing habitat and food sources to nesting waterfowl and other animals. South Dakota saw the greatest such loss with nearly 250,000 acres of conversion occurring within 100 meters of surrounding wetlands, and more than 80 percent of all conversion happening within 500 meters.[7]

Considering measures of the quality of newly broken lands other than original land use type, the UW study found that conversions were largely not happening on lands with soil suited for prime, productive farmland, as all the best land had been converted long ago. They were occurring on marginal and sensitive lands not well suited to farming. Wetlands, for instance, do not make ideal natural farmland because they tend to be too wet, so they generally must be drained to be viable, and even then, farmed wetlands are at risk of failure from water. The Lake State study also confirmed that much of the expanded agricultural production occurred on marginal soils not well suited to farming. Other areas, such as wetland and stream buffers, floodplains, and rocky forest soils, are not only prime wildlife habitat, but they are also less productive for agriculture and have higher crop insurance indemnity costs due to the higher potential of crop failure. It is important to note that this expansion into marginal lands was driven not only by the RFS, but also by other market forces and importantly, the availability of robust federal subsidies for crop insurance and other farm commodity programs. Without these programs, it is likely utilizing many of these lands would not be an economic choice for farmers even in the face of high crop prices.[13-15]

A grassland nest in the Prairie Pothole region of South Dakota. Wetlands and grasslands provide habitat for numerous species to hatch and raise their young. Photo Credit: Don Poggensee / NRCS.

Foresight’s Folly

As troubling and disruptive as this transformation has been on the landscape, it was not entirely unforeseen, having been predicted by early modeling forecasts. One of the first major assessments of the 2007 RFS law, published in *Science* magazine in 2008, sounded the alarm bells. The study, led by Princeton researcher Tim Searchinger, estimated that meeting the new targets would lead to conversion of 5.4 million acres of non-cropland into crops in the United States, with a total of 26.7 million new acres globally as producers around the world shifted their production to adjust to new commodity demands.[16] That study, which was focused on GHG emissions, also predicted the inadequacy

Grasslands account for 77 percent of the millions of acres of converted cropland. Forests contributed 3 percent, and wetlands an additional 2 percent.

Not Like Home Anymore

- Julie Sibbing, National Wildlife Federation

During a visit back to my hometown in the Midwest a few years ago, I visited the rural property where I grew up. I was a country kid, running in the woods with my dog and playing in the creek. I spent so many summer days wading in that creek, catching tadpoles, swimming and fishing. I remember catching my first big fish in that creek (probably a carp), only to have my brother accidentally let go of the stringer it was on. I never quite forgave him for that! I had often come back here over the years to revisit this paradise of my youth.

But this time as I rolled up my pant legs and waded into the creek I got a big surprise. Instead of stepping onto the limestone bottom, my feet disappeared into a thick layer of muck. A deep layer of mud covered the entire creek bottom. No fish or tadpoles were visible. I struggled through the boot-sucking muck and came to a place where all the trees lining the adjacent farmland had been bulldozed into the creek and replaced by corn. The unprotected banks were fast eroding away. I felt sick to my stomach. This creek – my creek – was ruined.

That visit to rural Illinois was just a couple of years after Congress passed the Renewable Fuels Standard in 2007. We all know what they say about good intentions. The road to hell is paved with them. Despite the law's good intentions, there have been serious environmental consequences to the increased growth of corn to meet RFS mandates, which I saw firsthand for the first time that day. To take advantage of the increased demand for corn created by the mandate, some farmers increased the intensity of their farming, some brought land back into production that had been set aside as too marginal to farm, and some plowed up field borders and buffer strips along streams to squeeze in a few more rows -- some even plowed right through pioneer cemeteries! This intensive, unsustainable farming has taken a toll, from the degradation of the small creek I used to play in as a child, to feeding algal blooms in lakes and coastal waters and expanding the dead zone in the Gulf of Mexico.

My brothers and I someday stand to inherit the land and the creek where I grew up. I love to think about my great nieces and nephews having the chance to play in the creek, catching tadpoles like their grandfathers and I did. I really hope that they have that chance.

of the law's prohibition on direct land conversion to biofuel crops, stating, "Because emissions from land-use change are likely to occur indirectly, proposed environmental criteria that focus only on direct land-use change would have little effect. Barring biofuels produced directly on forest or grassland would encourage biofuel processors to rely on existing croplands, but farmers would replace crops by plowing up new lands."[16]

Similar predictions followed suit. The government's own Economic Research Service, a division of the U.S. Department of Agriculture (USDA), predicted in 2009 that cropland would expand by 5 million acres to meet the requirements called for in 2015.[17] It noted that the new acres would come from every region in the country, but the largest expansion would occur in the Upper Midwest states of the Dakotas and Minnesota. These states include the majority of the internationally significant waterfowl breeding grounds of the Prairie Pothole Region. Another study published in 2010 estimated that meeting the 2015 mandate would require the conversion of 3.7 million acres into cropland in the United States, and 9.4 million acres globally.[18]

Contrary to these early estimates, the EPA in implementing the new law adopted an upbeat stance on the likelihood of large new conversion to meet the mandate. In its 2010 final rule implementing the RFS provisions of the Energy Independence and Security Act (EISA), EPA stated that the existing baseline of available cropland in 2007 would "at least in the near term, be sufficient to support EISA renewable fuel obligations and other foreseeable demands for crop products, without clearing and cultivating additional land. EPA also believes that economic factors will lead farmers to use the 'agricultural land' available for crop production under EISA rather than bring new land into crop production."[19] The EPA's justification for this assumption relied heavily on expected gains in yield from existing acres. Additionally, the baseline acres included areas like the Conservation Reserve Program which had been cropped in the past but had been placed under contract and reverted back to natural grassland or forest for as much as 20 years by that time, building up significant value as wildlife habitat and storing tremendous amounts of carbon above and below ground. So while putting these lands back under the plow might not have met EPA's definition of conversion, doing so carries tremendous environmental consequences.

Habitat for ducks and other waterfowl is at high risk of conversion to agriculture in the Northern Great Plains. Photo credit: USFWS.

Furthermore, EPA has refused to implement the land conversion protection built into the law. Rather than asking ethanol producers to verify that their feedstocks originated on eligible land, the agency developed an "aggregate compliance" approach. Under this approach, the agency said it would compare the total cropland each year to the total that was available in 2007, and if a certain threshold is exceeded, then the agency would investigate to see if additional measures are necessary. Despite the clear evidence of land clearing that now exists, and despite the fact that USDA has reported an increase in planted acres of commodity crops from 242.6 million in 2007 to 249 million in 2013,[20] and the conversion of almost 400,000 acres of non-cropland to cropland over a single year (2011 to 2012),[21] EPA has never pulled that trigger. Instead, the flow of corn ethanol continues unabated, even as an area twice the size of Delaware has been lost to the plow.

Corn as a Culprit

Numerous studies point to corn expansion as the primary cause of the transformation seen on landscapes around the country, and the RFS was intimately linked to this phenomena as one of the main sources of new demand for corn.[22] The USDA's Economic Research Service had predicted an increase in cropland to meet the needs of the new law, and its subsequent assessment in *The Ethanol Decade* confirmed as much. That paper found that corn acreage had expanded by 10 percent, a full 7.2 million acres over those 10 years, with the majority of expansion occurring between 2006 and 2008, the years immediately following establishment of the RFS.[11]

Other studies have confirmed that a dramatic surge in corn production and attendant land conversion occurred post-RFS. Johnston's study particularly shows this surge, as conversion rates after the RFS passed in 2007 were nine times higher than the years prior.[8] The Wisconsin study attributed more than half of the "responsibility" for the conversion to corn.[5] The Congressional Budget Office also weighed in, attributing 20 percent of the increase in corn prices from 2007 to 2008 to demand for domestic ethanol, and that meeting the increased demand for an escalating mandate will have further upward impact on the price of corn.[23-24]

A 2016 paper modeled the response of landowners to the location of an ethanol plant nearby, and found that the presence of a plant strongly influences increases in both corn acreage specifically and overall agricultural acreage in surrounding areas.[25] It also found that ethanol plants were not only driving crop expansion in existing fields, but also the conversion of new land to meet the local refining needs. Yet another upcoming paper overlays the locations of existing ethanol plants onto the data from the UW study to show that conversion of non-cropland into crops increased steadily with closer proximity to an ethanol plant, with conversion rates on land within 25 miles of a plant more than double the rate that occurred from 75-100 miles out.[26] The study identifies 2.7 million acres of converted lands within 50 miles of an ethanol plant, with corn and soy being planted on the lion's share. Tracking out to the 100-mile radius, the data show an additional 1.5 million acres of conversion, but with corn and soy accounting for less than half of the new production, illustrating the primacy of corn and soy production for biofuels and the displacement of other crops to areas farther away from biofuel production.

With all this information now in hand, it is clear that the mandate to blend biofuels – particularly the first generation fuels of corn-based ethanol and soy-based biodiesel – has had a domino effect, contributing to large scale destruction of natural areas and the ecosystem services they provide.

4

Threats to Wildlife

The Prairie Pothole region provides critical habitat for more than 60 percent of the nation's ducks and other waterfowl. Photo credit: USFWS.

Wetlands and marshes in the Pothole region have been destroyed both by expansion of row crops into these sensitive habitats and by increased drainage of farm fields. This practice, known as tile drainage, helps to improve crop yields by removing excess water from the soil. Draining these wetlands and plowing up the surrounding grasslands puts this "duck factory" at great risk.

The dramatic changes in the landscape that have occurred over the last decade, driven in large part by the ethanol mandate, have had clear impacts on wildlife habitat, and in turn have most certainly affected the many species that depend on those habitats. Globally, land use change has been identified as one of the major drivers of biodiversity loss, and agricultural expansion has been identified as a major threat to birds around the world.[27,28] The expansion of agriculture, particularly into areas that had previously been grasslands, wetlands, or forestland, means that less habitat is available for wildlife populations that depend on these ecosystems for food, shelter, and/or breeding. Some of the initial impacts of conversion on wildlife include loss of year-round habitat, particularly through the conversion of "marginal land" that was previously habitat, direct mortality during harvest, loss of spring nesting or fawning cover, and loss of winter food and cover. Many of the most vulnerable species, including grassland birds and upland-breeding waterfowl, are negatively affected by the loss of nesting, brooding, and winter cover that grasslands provide.

The Prairie Pothole Region (PPR) is an area that has been a hotspot of conversion of non-cropland to corn and other crops. At the same time, the region is particularly important in terms of wildlife and biodiversity. The Prairie Pothole Region contains many shallow wetlands (also called potholes), and is often referred to as the "duck factory" of the country. These wetlands are rich in biodiversity, and together with the grasslands surrounding them, serve as one of the country's most important habitats for breeding waterfowl – producing more than 60 percent of the country's total population.[29] In the North and South Dakota PPR, agriculture, and particularly the expansion of corn and soybeans, has been identified as the greatest source of wetland loss. Wetlands and marshes in this area have been destroyed both by expansion of row crops into these sensitive

habitats and by increased drainage of farm fields.[30] This practice, known as tile drainage, helps to improve crop yields by removing excess water from the soil. Draining these wetlands and plowing up the surrounding grasslands puts this "duck factory" at great risk.

Some of the species that have been most significantly affected by the expansion of monoculture corn agriculture include waterfowl, grassland birds, monarch butterflies, bees, and other native pollinators. There is a large body of research demonstrating the detrimental impact of corn expansion on wildlife biodiversity compared to native grasslands and even (to a lesser extent) perennial biofuel crops, such as grasses. Grassland bird abundance and richness has been found to be much higher in perennial biofuel plantings compared to corn or other annual biofuel plantings.[31-34] A 2011 study found that increased cultivation of four biofuel crops–corn, switchgrass, pine, and poplar–would result in reduced vertebrate diversity and abundance compared to the habitats that the crops replace. These effects were greatest with conversion of habitat to corn. Additionally, the researchers found that birds of conservation concern are affected more by conversion to corn than species of less conservation concern.[35] These results are particularly troubling in light of the fact that grassland birds are among the fastest and most consistently declining groups of birds in the country- with 48 percent of grassland-breeding bird species identified as species of conservation concern.[36]

Land use change and loss of habitat has been cited as a major threat to the survival of the monarch butterfly- a species whose population decline has been well-documented.[37] Monarchs depend on milkweeds for breeding success, and the loss of milkweed-rich prairies, buffer strips, and field borders to agricultural expansion and intensification means a loss of breeding habitat for the species.[38]

Additionally, studies have found that mixed prairie and switchgrass (a cellulosic biofuel feedstock) support much greater abundance and diversity of native bees and other important insect pollinators than corn.[39] With populations of both native and cultivated bees in steep decline, two recent studies have demonstrated that expansion of agricultural production, particularly corn and soybeans, into the western portion of the Dakotas poses a great threat to their continued viability. This region is home to 40 percent of the country's commercial bee colonies, which are critical

Disappearing Wildlife

- George Cunningham, University of Nebraska Omaha

As a biologist in central Knox County, Nebraska, I have witnessed all around me the jarring loss of native habitats as government policies have made it easier for farmers to make a profit farming on poorer soils. Until recently, land in this area was considered marginal for water-intensive crop production and had been used mostly for cattle grazing. Wildlife in the area had always been abundant, with common sightings of Ord's kangaroo rat, ornate box turtle, greater prairie chicken, burrowing owl, and a host of other reptile, amphibian, and bird species.

Over the last 10 years, however, all of this has been changing as thousands of acres of native mixed and tallgrass prairie have disappeared as a result of land conversion to row crop corn and soybeans. Changes to the federal crop insurance program starting in 1997, along with easy access to groundwater (due primarily to Nebraska's loose water management regulations), began a process that has caught fire after the mandate for renewable fuels created a subsidized market for corn. Sadly, the number of greater prairie chicken leks has dropped dramatically, the Ord kangaroo rat that use to run by the hundreds across the county roads at night has vanished, sightings of Burrowing Owls are greatly reduced, and areas that used to be inhabited by toads, snakes, and box turtle have disappeared.

The most dramatic and heart wrenching sight I ever witnessed was the conversion of an especially sandy and hilly parcel of prairie. This area was sprayed with herbicide to chemically burn off the vegetation and followed up with disking. Right after this destruction of grassland, I observed greater prairie chickens and burrowing owls standing in in the same area, now a bare field, totally exposed and looking confused as their once dense prairie vegetation was gone.

Unfortunately, short sighted federal farm and energy policies have made it more profitable to farm corn or soy on marginal land than keeping it in grazing lands, unintentionally encouraging the destruction of many thousands of acres of native prairie. The results have been declines in plant and animal species, depleted groundwater, and a loss of Nebraska's natural prairie heritage.

to pollination of approximately $15 billion in agricultural value. Together these studies show that in the Dakotas, biofuel crop production surrounding commercial bee colony sites increased by nearly three million acres from 2006 to 2014, despite the fact that beekeepers prefer sites far from agricultural fields, and that bees have higher survival rates when their colonies are surrounded by more open space relative to agricultural land.[40,41]

As cultivated crops continue to move into new territory, the list of species impacted will only continue to grow. According to one analysis, expanded production of annual biofuel crops such as corn and soy onto marginal lands will lead to significant declines in bird species richness – between 7 and 65 percent - across 20 percent of the Upper Midwest, and could make managing threatened and endangered species even more challenging.[32] Continued expansion of corn will not only affect birds and pollinators, but mammals may also be at risk. Swift foxes, for instance, have proven to be highly successful in rangelands and limited agricultural landscapes such as fields with winter wheat, but irrigated agriculture is a highly incompatible use for the foxes.[42] Expansion of agriculture has been cited as one of the major potential threats to the fox, which had been considered for listing under the Endangered Species Act.

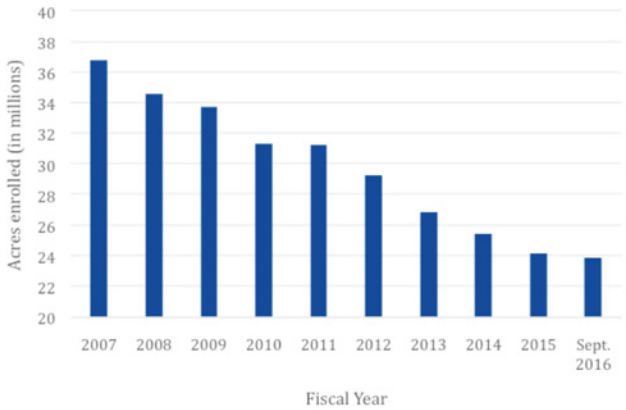
Habitat Loss and Degradation

One of the more diffuse impacts of agricultural expansion is increased habitat fragmentation and reduced habitat buffering of conservation areas. Some grassland species, particularly those of conservation interest, require large tracts of habitat for their survival. For example, the greater prairie chicken requires a large enough expanse of grasslands for the birds' mating, nesting and brood rearing.

In addition to landscape-scale changes, the corn ethanol boom and associated high commodity prices have also led to significantly increased agricultural intensification. This agricultural intensification has led to a simplified environment within fields, as well as across the landscape. Increasingly there have also been fewer rotations between crops and more continuous corn, as well as farmers planting fencerow to fencerow without the buffers that serve as important habitat, particularly for riparian species. Generally, wildlife do best in landscapes with a diversity of vegetative types; providing numerous types of habitat, such as crop fields buffered by trees or grasses, interspersed with prairies, CRP fields, pasture land, wetlands, and/or forests. This kind of landscape diversity allows for a wider variety of wildlife to exist. However, as more and more land is converted to cropland, these landscapes look increasingly homogeneous – intensively managed monocultures of corn, soy, wheat, and other commodity crops with little else on the landscape that does not allow for a lot of habitat for diverse species.

Another important impact of land conversion on wildlife populations stemming from land use change comes from changes in Conservation Reserve Program (CRP) enrollment. In the last 30 years since the program's creation, CRP has proven to be an extremely effective conservation program with significant benefits for soil, water, and wildlife.[43] CRP offers landowners the opportunity to take their marginal lands out of production and into conservation cover in exchange for a small rental payment, and it provides much needed grassland habitat on agricultural landscapes, providing habitat for many species of wildlife that would otherwise likely be threatened or endangered. As explained earlier in this report, over the last decade, corn prices and other commodity prices increased dramatically, driven up in part by the RFS. Increased demand for corn for ethanol and high commodity prices has led to dramatically reduced enrollment in the CRP program, as landowners have been finding it more profitable to farm their land rather than enrolling or re-enrolling it in CRP.[44] Over the course of RFS2 – between 2007 and 2013, CRP enrollment dropped by around 10 million acres.[45]

Figure 3. CRP Enrollment, 2007 - Present



Source: USDA Farm Service Agency Data

5

Impacts of Corn Expansion and Biofuel Production on Water Quality

Beyond the implications for terrestrial wildlife habitat, the growing biofuels industry has had a major impact on water supplies, both in its uptake of large amounts of water during manufacture and in the increase in farm runoff laced with sediment, fertilizer, and pesticides. A few recent studies have tried to account for the impacts of biofuel production on water quality and quantity; surprisingly, the studies predominantly found that ethanol has higher water quality impacts than gasoline, and that ethanol refineries use a significant amount of water, which can have high localized impacts.[46-48]

Intensive row crop agriculture has long been associated with high levels of nutrient loss and soil erosion, leading to contamination of water supplies. Compared to other biofuel crops including soybean and perennial grasses, corn has the highest level of application of nutrients (fertilizer and pesticides) resulting in higher runoff from fields.[49,50] Corn acreage used for ethanol production is mostly centered in the Mississippi River watershed and the Great Lakes Basin; thus, the Great Lakes and the Gulf of Mexico share the greatest burden for potential water quality impacts from the increased demand for corn for ethanol.[11,23] The expansion of corn plantings has come in three forms: converting non-farmland to corn, switching from non-corn crops, and moving from a rotation such as corn-soybean to continuous corn. All of these have impacts on water quality. One recent study modeled the impacts of crop and land switching and came up with dramatic results for water outflows. A model scenario of switching other row crops to continuous corn would result in an increase of sediment yield of 42 percent, and converting pasture to corn would increase sediment yields by up to 127 percent.[51]

Storm runoff erodes stream banks and fills water bodies with sediment, pesticides, and chemical fertilizers. Photo credit: Tim McCabe / NRCS.

Studies predominantly found that ethanol has higher water quality impacts than gasoline.

Lake Erie Algal Bloom in 2014, Credit: NOAA.

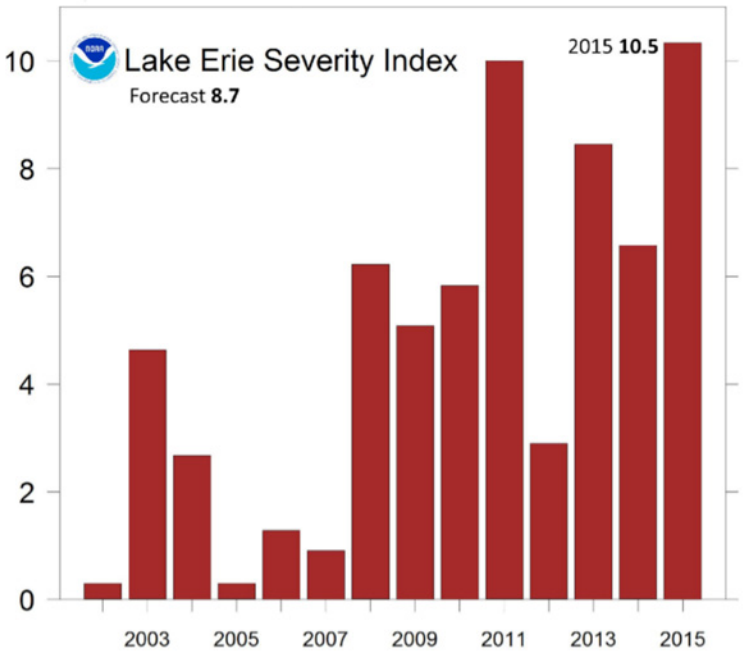


Figure 3. The severity of algal blooms on Lake Erie has risen dramatically following the RFS. Chart Credit: NOAA.

Concurrent to corn's expansion has been an increase in the intensity and occurrence of annual algal blooms in the Great Lakes. Algal blooms are the rapid spread of sometimes toxic algae in a water body, usually as a result of excessive nutrients. In August 2014 the city of Toledo, Ohio suffered a drinking water shortage affecting half a million residents for three days thanks to the largest toxic algal bloom in Lake Erie ever recorded – even worse than the 1960s, when the algal bloom was so bad that Lake Erie was declared "dead."[52,53] The massive growth of toxic mycrosystis algae to levels 1,000 times higher than levels deemed safe for drinking water by the World Health Organization not only shut down Toledo's potable water, but also closed beaches, had dire impacts to the fishing, tourism, and recreation industries all along the lake, and pushed marine life out of its way. This event succeeded a similar incident from 2011 that prompted an intergovernmental review that laid the blame squarely on farm runoffs, particularly phosphorous. "The biggest

contributor of phosphorus to Western Lake Erie is agriculture, and the largest reductions must come from agriculture."[54]

Even when algae is not of the toxic variety, it can cause major ecological and economic problems. The Mississippi River carries runoff from 41 percent of land in the United States and drains into the Gulf of Mexico, contributing to a well-documented annual hypoxic or 'dead' zone for the last three decades.[55] When nitrogen and phosphorous loads from fertilizers from this great expanse of farm land gather in the Gulf, they spur the growth of algae that then dies, and in decay consumes all the available oxygen in the water. Without oxygen, all other marine life perishes or swims elsewhere, thus creating epic dead zones. Researchers have determined that meeting the volume requirements mandated in the RFS by 2022 will make a goal of reduced hypoxia in the Gulf "practically impossible without large shifts in food production and agricultural management."[47]

"...meeting the volume requirements mandated in the RFS by 2022 will make a goal of reduced hypoxia in the Gulf "practically impossible without large shifts in food production and agricultural management."

Finally, water quality impacts are exacerbated by conversion of sensitive land to agriculture. The loss of wetlands in areas such as the Dakotas has a number of water quality impacts, as wetlands are important filters for storm water and snow melt. The converted land is more susceptible to flooding and drainage issues, and this in turn exacerbates surface water quality impacts of nutrient-heavy runoff. Additionally, there can be leaching from agriculture to groundwater supplies with the highest levels predicted in Lakes States.[51] These persistent impacts come with large ecological, public health, and economic costs.

Troubled Waters

- Dave Spangler, Dr Bugs Charters and President, Lake Erie Waterkeeper

As a lifelong fisherman and a charter boat captain on Lake Erie for more than 30 years, I have seen firsthand just how spectacularly rewarding life on the water can be, and I have also seen just how ugly it can get. Sadly, we are seeing more and more of the bad side, as algal blooms are increasingly making the lake inhospitable to fish and other marine life, as well as to the people who make their living or pass their days on and around the lake.

It is heartbreaking to see this reversal in the lake's fortunes. Water quality coming from the surrounding area had improved after the Cuyahoga River's bursting into flames made people take notice. After decades of work to clean it up, the fish population had returned to sustainably high levels, allowing me to make a good living doing what I love.

All of that started to change over the last ten years or so. Algae has now made a comeback instead, producing massive blooms in 2011, 2014, and again last year, which NOAA has said was the worst ever. Due to the algae, the fishing season was cut dramatically in half, and I ran my last walleye trip on July 15 instead of in late October like usual. Charter businesses like mine took a 25 percent hit last year, which is impossible to make up due to the seasonal nature of the work. That hit affected the related businesses as well, like tackle stores, fish cleaning houses, and lodging as people had to go elsewhere for their summer recreation. We just hope they'll come back again next year rather than looking for a new spot to fish.

The Renewable Fuel Standard is driving up corn production here in Ohio and elsewhere, which is helping push algae back up to these historic levels. Beyond that, it has made fueling our boats much more difficult, since boat engines don't stand up to higher ethanol blends, and neither do other parts like fuel hoses and fiberglass tanks. With the corn industry pushing for E15 and the USDA funding blender pumps around the country, those of us who own and operate this country's 16 million boats are very worried we won't be able to find the ethanol-free fuel we prefer, and that will leave many of us stranded in deep water. Fisherman, boaters, and taxpayers – not to mention our fish and other marine life – deserve better.

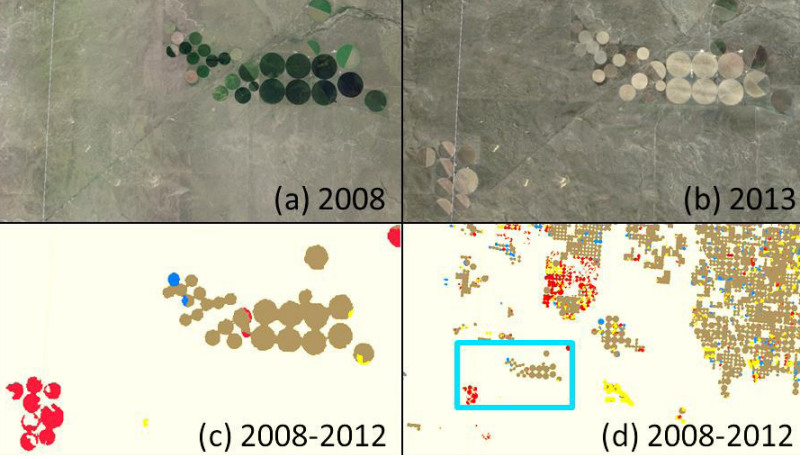


Figure 4. Expansion of center-pivot irrigated cultivation, located along the border of Texas and New Mexico. *Satellite images are of the same location and extent and taken from Google Earth Pro before (a) and after (b) study period. Image (c) is our data for same location and depicts existing cropland (brown), abandonment (blue), and expansion (red). Noticeable expansion of center-pivot irrigated cropland can be seen in the lower left corner of (b) and (c). This pattern, representative of trends in the larger region (d), suggests a heavy reliance on irrigation for the increased crop production. Credit: Lark et al. 2015.*

Ethanol's Contribution to Water Availability: A Race to the Bottom

Water quantity impacts of biofuels mainly come to bear when considering the expansion of corn and other biofuel crops in regions experiencing water stress. Corn is predominantly grown in adequately rain-fed regions, but higher prices improve the economics of growing it in drier climates that require costly irrigation. Irrigation continues to be the largest consumptive use of freshwater resources in the United States.[56] Nonetheless, corn grown in the High Plains, where much of the recent agricultural expansion has occurred, requires groundwater irrigation from the already severely drawn-down Ogalalla aquifer.[57] Demonstrating the potential harm of producing corn-based ethanol in water-strapped regions of the country, corn ethanol produced in Colorado has a lifecycle water use of 42.5 gallons per mile driven, versus gasoline at 0.15 gallons per mile.[58] Moreover, irrigated corn for ethanol has higher average water withdrawals and consumption than oil sand and crude oil conversions to gasoline.[46] Meanwhile, irrigation for row crops continues to increase in the largest corn ethanol producing states.[3]

...ethanol produced in Colorado has a lifecycle water use of 42.5 gallons per mile driven, versus gasoline at 0.15 gallons per mile. Moreover, irrigated corn for ethanol has higher average water withdrawals and consumption than oil sand and crude oil conversions to gasoline.

In addition to these larger water quantity impacts, the location of biorefineries can have severe localized impacts on stream flows. A biorefinery producing 100 million gallons of ethanol a year consumes the equivalent water supply of a town of 5,000 people.[59] Drawing excessive amounts of water can impact minimum stream flows that further affect habitat potential. Low stream flows are associated with lower dissolved oxygen levels, placing greater stress on aquatic species.[60]

Given the scale these impacts to water availability, a shift to second generation biofuels that do not rely on irrigation, along with improved agricultural practices at the watershed level, is needed in order to prevent further disruption of scarce water supplies.[61]

A biorefinery producing 100 million gallons of ethanol a year consumes the equivalent water supply of a town of 5,000 people.

6

Ethanol and Greenhouse Gases: It's Complicated

The extent of corn ethanol's contribution to GHG emission reductions remains murky. Even if the fuel has resulted in slightly lower emissions any small gains have been wrought at a very high environmental cost.

The potential for reductions in greenhouse gas (GHG) emissions was one of the most prominent justifications for passage of the RFS and reasons cited in its ongoing defense. The uncertainty surrounding the extent of these reductions, therefore, is troubling at best. The EPA calculates the lifecycle emissions of biofuels in comparison to those from gasoline since the RFS requires that biofuels have lower emissions (20 percent, 50 percent, and 60 percent for conventional, advanced, and cellulosic biofuels, respectively) relative to fossil fuels. There is considerable disagreement over the accuracy of the methodology of the life cycle assessments (LCAs) used by the EPA, with some researchers arguing that emissions from conventional biofuels can actually be higher than those of gasoline.[62,63] The lifecycle analyses of all fuels consist of a "wells to tank to wheels" approach that includes the production of the fuel base, transportation, processing, and use – with each of these components producing emissions that need to be accounted for by the LCA. Several analyses of the LCAs of corn ethanol provide evidence that intensive nitrogen fertilizer use and land conversion, including deforestation, actually result in greater atmospheric-warming emissions when compared to traditional gasoline in the near to medium term.[58]

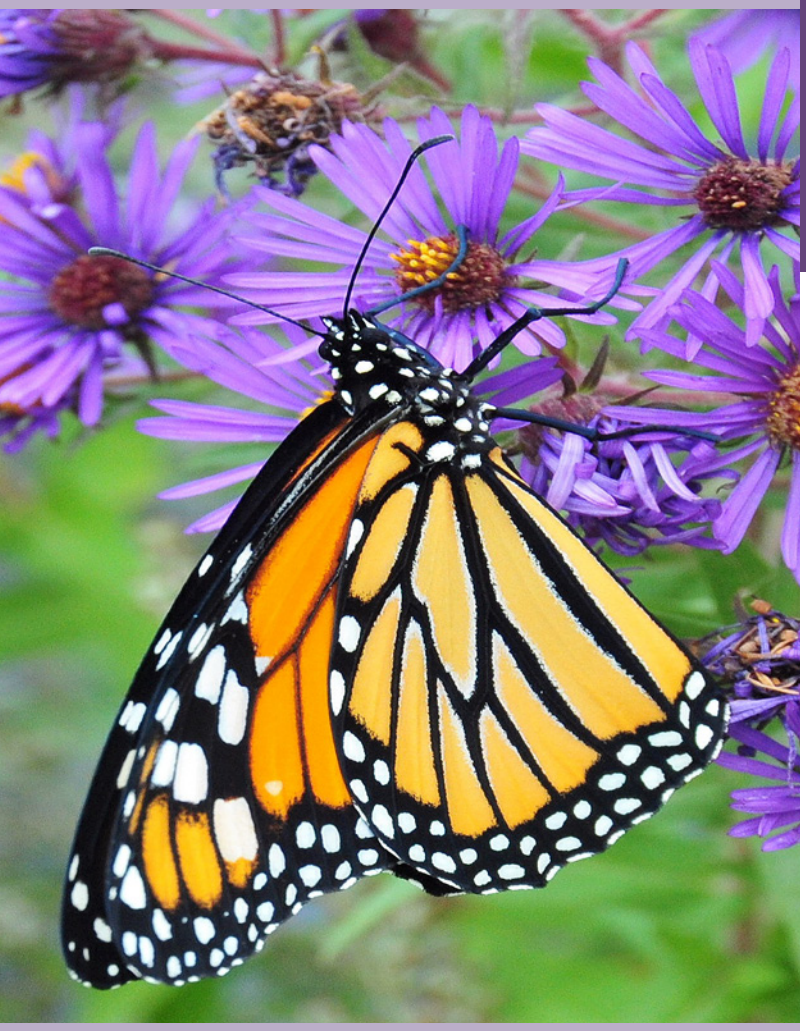
There are many potential ways in which current EPA modeling and assumptions may underestimate the GHG emissions associated with biofuels, particularly corn ethanol. Researchers have raised questions with the EPA's assumption that burning biomass for energy (including biofuels) is inherently carbon-neutral.[64,65] Additionally, existing models typically undervalue or ignore land conversion of various land classes, which we know to be occurring. While the EPA accounts for land use change in its analysis of emissions, its estimates are on the very low end of the results from a number of computational models, making for an optimistic assessment of the emissions reduction potential of biofuels.[66] Others estimate that converting non-cropland into corn and soy production would release the equivalent annual emissions of 34 coal-fired power plants or 28 million additional cars on the road.[5] Additionally, EPA's analysis excludes the emissions from rangelands on the assumption that they will not be converted to biofuel production. However, spring planted barley qualifies as an approved ethanol feedstock that is mainly grown in the Northern Plains, and evidence shows conversion in this region even though rangelands are excluded as eligible cropland under the RFS.[5] The other studies noted earlier in this paper also clearly show that rangeland has contributed to new cropland.

Finally, and most problematic, is the law's exception for emissions requirements for corn ethanol plants that were established prior to its passing in 2007. These grandfathered plants rely on emission-heavy production (such as coal firing rather than natural gas or co-generation) and therefore do not meet the 20 percent GHG reductions required by the RFS. They account for a majority of ethanol plants and therefore the emissions reductions of most corn ethanol is minimal at best.

In summary, the extent of corn ethanol's contribution to GHG emission reductions remains murky. Even if the fuel has resulted in slightly lower emissions any small gains have been wrought at a very high environmental cost.

7

A Call to Action



Monarch butterflies, honey bees, and other pollinators rely on diverse grassland habitats rather than large-scale agriculture to forage. Photo credit: Tom Koerner / USFWS.

All those who care about a future for wildlife can no longer stand aside and watch the devastating impact of this policy on the landscape. For the sake of our wildlife, climate, and clean water, we must now say that enough is enough. Something must be done.

It is unfortunate, to say the least, that one well-intentioned policy has contributed to so much harm on the landscape. Yet the impacts of massive corn production and land conversion have been well documented, and the mandate to turn corn into fuel has contributed to a major disruption of our shared land, water, and wildlife resources. The time has come to put a stop to this destruction.

Since the law's passage and implementation, farmers and ranchers, hunters and anglers, hikers and birders all around the country have been sounding alarm bells. Organizations like the National Wildlife Federation and our state-based affiliates, as well as many others, have weighed in with the EPA, the Obama Administration, and Congress to push for enforcement of the land conversion prohibition within the RFS and for other protections for water, land, and wildlife. Despite these cries for wildlife habitat protection, we have continued to watch as our nation's grasslands and forests are plowed to make way for more corn for ethanol.

Our objections have been made, both in public and in private, with the EPA, the White House, and Congress. We worked to get national land conversion protections in the Farm Bill, resulting in only a regionally applied "Sodsaver" provision that, even where it does apply, does not prohibit conversion and farming of land but only removes a portion of the government subsidies available on converted land. All those who care about a future for wildlife can no longer stand aside and watch the devastating impact of this policy on the landscape. For the sake of our wildlife, climate, and clean water, we must now say that enough is enough. Something must be done.

The RFS as it stands is broken, and it must be fixed.

Sandhill cranes, like these on the Platte River in Nebraska, are another grassland dependent species whose habitat is at risk of conversion. Credit Larry Crist / USFWS.

There is, indeed, a better way. It is time for Congress to take stock of its missed objectives and pass meaningful reform of the Renewable Fuel Standard. There are a variety of ways to improve the law so that it spurs the development and use of truly cleaner, more environmentally sound alternatives to gasoline without incentivizing the destruction of what little native habitat and sensitive land remains. In order to achieve that goal, Congress should:

- **Reduce the Mandate** – We have already seen the disaster 15 billion gallons of corn ethanol have wrought on the landscape, yet the current RFS envisions another 17 billion gallons of advanced and cellulosic ethanol to be produced on top of that existing amount. While there are technical hurdles to actually infusing that much biofuel into the fuel supply, we fear that growing dedicated energy crops to produce that level of advanced and cellulosic biofuels could unleash a second wave of land conversion potentially worse than what has happened thus far. Furthermore, a reduction in the mandate, coupled with additional changes to agriculture policies and incentives and increased conservation funding could reverse the increase in corn plantings – particularly in the most sensitive and ecologically important areas.

- **Enforce the Prohibition on Land Clearing** – Congress must be even clearer in its direction to EPA not to allow fuels from crops grown on newly converted land. A credible, enforceable mechanism for verifying this must be written into the law.

- **Provide the Right Incentives to See Truly Sustainable Second Generation Biofuels Succeed** – Biofuels produced in different ways and from sources other than corn and soybeans hold tremendous potential for cleaner fuels that are vastly better for wildlife, water, and air, and many of them do not require additional land to be produced. The current policy has failed to stimulate the investments necessary to mature the advanced and cellulosic industries. New incentives must be implemented, as well as additional safeguards to ensure that production of these new fuels is truly sustainable – that it is done in a way that improves, rather than degrades biodiversity and water quality across the landscape.

- **Fund Habitat Conservation** – As documented in the previous pages, the nation has lost some of its most vital remaining wildlife habitat, complex native ecosystems, and natural water filtration systems over the course of the RFS. The cost to wildlife, water quality, and our way of life has been tremendous, and Congress must right that wrong. In addition to fully funding existing conservation programs, lawmakers should establish a new fund that will directly conserve and restore habitat in areas threatened by crop expansion, helping to mitigate the impacts of what has already been lost.

These reforms cannot wait. Our wildlife populations are already in decline, our waters are impaired and supplies are dwindling in some regions. For the sake of our country's wildlife, water, and climate, the National Wildlife Federation calls on our leaders in Congress to be bold and to forge a new path forward that will uphold the ideals and traditions all Americans share. The RFS must be reformed.

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