Environmental Assessment

Use of Genetically Modified, Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain–Prairie Region (Region 6)

April 2011

Prepared by

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U.S. FISH AND WILDLIFE SERVICE
Region 6
National Wildlife Refuge System

ENVIRONMENTAL ACTION STATEMENT

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record for use of genetically-modified, glyphosate-tolerant soybeans and corn for habitat restoration and management purposes on National Wildlife Refuge System (System) owned and administered lands:

_____ is a categorical exclusion as provided by 516 DM 2, Appendix I and 516 DM 6, Appendix 1. No further NEPA documentation will therefore be made.

_✓_ is found not to have significant environmental effects as determined by the attached environmental assessment and finding of no significant impact.

_____ is found to have significant effects and, therefore, further consideration of this action will require a notice of intent to be published in the *Federal Register* announcing the decision to prepare an environmental impact statement.

_____ is not approved because of unacceptable environmental damage, or violation of U.S. Fish and Wildlife Service mandates, policy, regulations, or procedures.

_____ is an emergency action within the context of 40 CFR 1506.11. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to NEPA review.

Other supporting documents:

Environmental Assessment: Use of Genetically-Modified, Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain-Prairie Region (Region 6)

Signature Approval:

Richard R Coleman — 4/19/11

Assistant Regional Director — Date
National Wildlife Refuge System, Region 6.

Noreen E Walsh — 4/19/11

Regional Director, Region 6 — Date
U.S. Fish and Wildlife Service

U.S. FISH AND WILDLIFE SERVICE
National Wildlife Refuge System
Region 6

FINDING OF NO SIGNIFICANT IMPACT

Use of Genetically Modified Glyphosate-Tolerant Soybeans and Corn for Habitat Restoration and Management Purposes

Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, Wyoming

BACKGROUND

The Mountain–Prairie Region (Region 6) of the U.S. Fish and Wildlife Service uses row crop farming as a management tool to meet conservation goals within the National Wildlife Refuge System (System). Farming is primarily used to restore current or former farm land to grassland habitats. Genetically modified, glyphosate-tolerant soybeans and corn have been available to U.S. farmers since regulatory approval was first granted by the U.S. Department of Agriculture Animal and Plant Health Inspection Service ((USDA-APHIS) in 1994 and 1997, respectively. Since then widespread adoption of these crop varieties has occurred.

An environmental assessment evaluated two alternatives related to the use of glyphosate-tolerant soybeans and corn. Alternative A—the no-action alternative—would continue to allow the use of glyphosate-tolerant soybeans and corn on national wildlife refuges for habitat restoration and management purposes; Alternative B —would disallow use of glyphosate-tolerant soybeans and corn and require the use traditional varieties in refuge farming programs. Two other alternatives were considered but determined not feasible in meeting habitat restoration objectives: 1) the “go-back” alternative – which would allow former farm land to naturally succeed to whatever seed source exists in the soil; 2) the organic only farming alternative—which would allow only organic farming techniques.

Alternative A, the preferred alternative, was selected for implementation because it provides the Service an effective and environmentally-friendly method to convert current and former farm land into native, beneficial habitats for wildlife, and the American public that enjoy wildlife-dependent recreation on System lands. Implementing the preferred alternative will directly support and contribute to long-term habitat restoration goals and objectives specified in approved refuge comprehensive conservation plans. The environmental assessment, which took a hard look at the environmental impacts associated with using these crop types, was coordinated with the Midwest Region of the Service, as well as the Office of Science and Technology Policy, Executive Office of the President.

ANTICIPATED ENVIRONMENTAL EFFECTS

Under the preferred alternative, the Service would have the option to use glyphosate-tolerant soybeans and corn for habitat restoration and management purposes. The following is a summary of anticipated environmental effects from the implementation of the preferred alternative:

1. We do not expect farmed acres or the number of cooperative farmer agreements on national wildlife refuges to increase significantly as a result of implementing the preferred alternative. Restoring grassland habitat is costly for individual field stations as native grass and forb seeds can be very expensive. Refuge managers annually assess station budgets and expected seed costs before decisions are made regarding future restoration activities.

2. Use of glyphosate-tolerant soybeans and corn will occur only on current or previously farmed sites. A Section 7 Intra-Service Biological Evaluation was completed, and we anticipate there

will be no effect on any threatened, endangered, or candidate species or their critical habitats in Region 6 by implementing the preferred alternative.

3. Use of glyphosate-tolerant soybeans and corn will be accompanied by the increased use of glyphosate. However, the total acres planted at any one time on System lands in Region 6 is a tiny fraction of the farming landscape planted with these same crop varieties. In addition, USDA-APHIS has repeatedly concluded through their regulatory review and analysis that planting glyphosate-tolerant soybean[1] (1994, 2006) and corn (1997, 2000) and the expected increased use of glyphosate will not have a significant impact on the quality of the human environment.

4. As with all application of herbicides on national wildlife refuges in Region 6, the Service will continue to apply best management practices, and follow all guidelines and label restrictions outlined in approved Pesticide Use Proposals and approved Integrated Management Plans.

5. We expect reduced potential for soil erosion as conservation tillage practices, such as no-till and reduced-till, are incorporated with planting of glyphosate-tolerant soybeans and corn.

6. We expect short-term disturbance to wildlife in fields farmed for restoration purposes. Typically 2–4 years is needed to fully control invasive plants and prepare a seed bed for native seeding. After farming is complete, however, we expect native grass and forb species to be more robust and subject to less overall disturbance in the future. We expect the initial use of glyphosate to result in reduced risk to wildlife compared with other approved herbicides typically used for weed control under farming practices using traditional seed varieties.

7. We expect no impacts on cultural and historic resources by implementing the preferred alternative as farm fields have been already greatly altered by past farming activities.

8. We expect no impacts to organic soybean and corn farmers. However, if refuge managers are made aware of concerns organic farmers adjacent to a refuge may have, precautions such as suitable buffers (in the case of corn) may be considered and implemented, as appropriate.

CONTEXT AND INTENSITY

In determining whether this project is a major action significantly[2] affecting the quality of the human environment, both the context and intensity of the action (40 CFR § 1508.27, 40 CFR § 1508.14) as required by NEPA were considered. In terms of context, preferred alternative is currently being implemented on less than 0.4 percent of the total fee-title acres within the System in Region 6. We do not expect this percentage to increase significantly in the foreseeable future. In addition, these crops types have been part of the farming landscape since their approval in the mid to late 1990s. In terms of intensity, implementing the preferred alternative will apply to a minuscule amount of the total acres of glyphosate-tolerant soybeans and corn acres planted each year in the eight states composing Region 6.

PUBLIC PARTICIPATION

Public scoping was an important component of the development of the environmental assessment. An internal and external public scoping period was held from April 22, 2010, through July 9, 2010. This scoping period allowed a thorough review of available research and reviews related to the use of glyphosate-tolerant soybeans and corn.

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[1] NEPA documents for GT soybeans: www.aphis.usda.gov/brs/aphisdocs2/93_25801p_com.pdf; and 06_17801p_com.pdf. NEPA documents for GT corn:www.aphis.usda.gov/brs/aphisdocs2/97_09901p_com.pdf; and 00_01101p_com.pdf.

[2] 40 CFR § 1508.27 "Significantly," as used in NEPA, requires considerations of both context and intensity. *Context* means that the significance of an action must be analyzed in several contexts such as a society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. *Intensity* refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action.

News releases were sent to 1,290 news outlets across 16 states announcing the Service's intent to review the use of glyphosate-tolerant soybeans and corn on System lands. News releases were posted on bulletin boards of Refuge Headquarter Offices in Region 6 during the scoping period. In addition, an announcement with a link on how to comment was posted on the Region 6 website.

Public open houses were held in Fergus Falls, Minnesota (June 17, 2010); Aberdeen, South Dakota (June 22, 2010); and Hartford, Kansas (June 24, 2010). Ten individuals attended, all in Hartford, Kansas. More than 30 written comments and emails were received during the scoping period from local refuge farming cooperators, neighboring landowners, private citizens, agricultural organizations, nongovernmental organizations, nonprofit organizations, and the biotechnology industry.

The environmental assessment was released to the public for review and comment on February 3, 2011, for a 30-day comment period which ended on March 4, 2011. The Service received 11 individual comments. The Service responded to all substantive comments and included the comments and responses in the final environment assessment.

FINDING OF NO SIGNFICANT IMPACT

On the basis of information contained in the environmental assessment, and other information available to me, my determination is that the selected alternative (Alternative A), which allows for the use of glyphosate- tolerant soybeans and corn for the purposes of habitat restoration and management on System lands, is not a federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969. Primary to this decision is: 1) use of glyphosate-tolerant soybeans and corn on System lands is insignificant when compared with the long-standing use of these crops on surrounding private lands throughout Region 6; 2) repeated and consistent determinations by USDA-APHIS state that planting these crops and the resulting use of glyphosate will not significantly impact the quality of the human environment; and 3) use of glyphosate reduces risk to wildlife and the environment compared with other herbicides it replaces approved under farming practices utilizing traditional seed types.

The Finding of No Significant Impact (FONSI) and supporting environmental assessment will be made available to the public on the Service's Region 6 refuge planning website. Copies of this FONSI and the associated environmental assessment are available upon request.

SUPPORTING REFERENCE

U.S. Fish and Wildlife Service. 2011. *Environmental Assessment Use of Genetically-Modified Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain-Prairie Region (Region 6)* April, 2011.

Regional Director, Region 6
U.S. Fish and Wildlife Service

4/19/11
Date

U.S. FISH AND WILDLIFE SERVICE

ENVIRONMENTAL COMPLIANCE CERTIFICATE

PROJECT: Use of Genetically-Modified Glyphosate-Tolerant Soybeans and Corn for Habitat Restoration and Management on National Wildlife Refuge System Lands in Region 6

STATE: Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, Wyoming

ACTION (indicate if not applicable)	**DATE**
National Environmental Policy Act of 1969, as amended	
Categorical Exclusion	N/A
Environmental Assessment/Finding of No Significant Impact	4/18/2011
Environmental Impact Statement/Record of Decision	N/A
Endangered Species Act, Section 7	2/11/2011
National Historic Preservation Act of 1966, as amended	4/18/2011
Wilderness Act of 1964	N/A
National Wildlife Refuge System Administration Act of 1966, as amended	4/18/2011
Executive Order 11593, Protection of Historical, Archaeological, and Scientific Properties	4/18/2011
Executive Order 11988, Floodplain Management	4/18/2011
Executive Order 11990, Protection of Wetlands	4/18/2011
Executive Order 12372, Intergovernmental Review of Federal Programs	4/18/2011
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations	4/18/2011
Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System	4/18/2011
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds	4/18/2011

I hereby certify that all requirements of the law, rules, and Service regulations or policies applicable to the terms and conditions as described in the proposed action have met with compliance. On the basis of information contained in the environmental assessment, and other information available to me, the activities described in the selected alternative would not significantly affect the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969.

4/18/11

Regional Director, Region 6
U.S. Fish and Wildlife Service

Date

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Summary

Environmental Assessment

Use of Genetically Modified, Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain–Prairie Region (Region 6)

Abstract. The Mountain–Prairie Region of the U.S. Fish and Wildlife Service currently uses row crop farming on lands within the National Wildlife Refuge System to achieve a variety of management objectives. Genetically modified, glyphosate-tolerant soybeans and corn are regularly used under this practice. The increased use of glyphosate-tolerant soybeans and corn and revised Service policies regarding the use of genetically modified organisms warrants an evaluation of their use. This environmental assessment evaluates the impacts of allowing and disallowing the use of glyphosate-tolerant soybeans and corn on System-managed lands in Region 6. The analysis is based on issues and concerns identified during the planning process; a proposed action is identified on the basis of this analysis.

Executive Summary. Managed by the U.S. Fish and Wildlife Service (Service), the National Wildlife Refuge System (System) administers a national network of lands and waters for the conservation, management, and—where appropriate—restoration of fish, wildlife, and plant resources. Although Service policy calls for using the most natural means available to meet management objectives, policy does allow for the use of row crop farming where objectives cannot be met through maintenance of more natural ecosystems (USFWS 1985). In Region 6—which encompasses Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming—10,756 acres of the Service's total 2,462,987 fee title acres were farmed in 2009. Of the acres farmed in 2009, approximately 6,175 acres were genetically modified (GM) varieties of soybeans and corn.

GM crops, specifically glyphosate-tolerant soybeans and corn, have been used as part of farming programs on System lands in Region 6 to manage and restore habitats on previously farmed sites. The increased use of glyphosate-tolerant crops as well as revised Service policy on the use of GM organisms warrants an evaluation of their continued use on System lands in Region 6. This environmental assessment (EA) is the instrument of that evaluation.

Chapter 1 describes the purpose and need for this EA, provides background on the history and purpose of farming on System lands in Region 6, summarizes applicable laws and policies, describes public outreach efforts for this EA, and lists issues that were identified during the public scoping period. Chapter 2 describes the alternatives that are evaluated in this EA as well as alternatives that were considered but not evaluated. Chapter 3 describes the physical environment and socioeconomic character of the portions of Region 6 that could be affected by the alternatives. Chapter 4 presents the evaluation of the alternatives, using the issues identified during scoping as the framework for analysis, and identifies a proposed action. Chapter 5 lists Service staff who prepared this EA as well as agencies consulted in its development.

The proposed action is Alternative A: Continue using glyphosate-tolerant soybeans and corn for habitat restoration and management on System-managed lands in Region 6 (No Action). This action was selected based on its conformance to the establishing purposes of the System and the desire to have the least impact on the environment.

Abbreviations

Administration Act	National Wildlife Refuge System Administration Act of 1966, as amended
APHIS	Animal and Plant Health Inspection Service
Appropriate Uses Policy	Appropriate Refuge Uses Policy
EA	environmental assessment
FONSI	finding of no significant impact
GM	genetically modified
Improvement Act	National Wildlife Refuge System Improvement Act of 1997
IPM	integrated pest management
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
P.L.	Public Law
PUP	Pesticide Use Proposal
Region 6	U.S. Fish and Wildlife Service Mountain–Prairie Region
Service	U.S. Fish and Wildlife Service
System	National Wildlife Refuge System
U.S.	United States
U.S.C.	United States Code
USDA	U.S. Department of Agriculture

CHAPTER 1—Purpose, Need, and Background Information

1.1 Purpose

The U.S. Fish and Wildlife Service (Service) has prepared this environmental assessment (EA) to review and evaluate current and alternative actions that use glyphosate-tolerant soybeans and corn on National Wildlife Refuge System (System) lands in the Mountain–Prairie Region (Region 6) and to identify a preferred alternative. Each alternative was evaluated based on its environmental consequences, including biological and socioeconomic impacts, in accordance with the National Environmental Policy Act (NEPA). This EA will form the basis for selecting a preferred alternative for implementation and for determining if the alternative requires an environmental impact statement.

1.2 Need for Action

The increased use of glyphosate-tolerant soybeans and corn, along with revised Service policies regarding the use of genetically modified (GM) organisms, warrants an evaluation of their use on System-managed lands in Region 6.

1.3 Decision Framework

Based on this EA, the Regional Director for Region 6 will make two decisions:

- Select an alternative regarding use of glyphosate-tolerant soybeans and corn on System lands in Region 6.
- Determine if the selected alternative is a federal action significantly affecting the quality of the human environment, thus requiring preparation of an environmental impact statement.

The proposed action recommended to the Regional Director is Alternative A: Continue using glyphosate-tolerant soybeans and corn for habitat restoration and management on System-managed lands in Region 6 (No Action).

1.4 Background

For more than a century the Service (and its predecessors) has been acquiring lands and entering into agreements to manage lands for the purposes of protecting, restoring, and maintaining fish and wildlife habitat. A number of habitat management techniques are currently employed throughout Region 6. Prescribed fire, prescribed grazing, and water level manipulations may be used alone or in combination to simulate historical ecological processes that shaped native plant communities. However, where native plant communities have been removed or significantly altered, the management tools of haying, herbicide application, and farming may also be needed to meet management objectives.

In Region 6, System lands have regularly included units where native plant communities were eliminated through years of tillage and farming. In many cases, some or all of the upland acres of newly acquired units are existing farmlands; other units have previously been planted to nonnative species and have since deteriorated. Current management plans call for renovation of habitat or restoration of native plant communities, reflecting a general trend on all System lands in Region 6 of converting farmland to natural habitats, as natural habitats have greater value for wildlife (Tilman et al. 2001). In particular, there has been an emphasis on providing high-quality nesting cover for grassland-dependent migratory bird populations. To this end, former cropland has been seeded to grassland nesting cover.

In Region 6, prairie restoration techniques have evolved over the last 10 years. Many System grassland acres were seeded to dense nesting cover, which included a mix of smooth bromegrass (*Bromus inermis*), intermediate and tall wheatgrass (*Thinopyrum* spp.), and alfalfa (*Medicago sativa*) or sweetclover (*Melilotus* spp.). All of these species are nonnative species and require reseeding every 10–15 years as they decline over time and are eventually dominated by monotypic stands of smooth bromegrass and Canada thistle (*Cirsium arvense*). While early dense nesting cover is very attractive to waterfowl and other grassland birds, it is not a long-term solution for providing permanent grassland nesting habitat that maintains diversity over time.

The other mix frequently seeded was a combination of native warm season grasses, including big and little bluestem (*Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), and a few other native grass species. These seedlings were successfully established and could be managed through prescribed grazing and prescribed burning; however, they lack diversity. In particular, native wildflowers were rarely included due to the prohibitive cost, the inability to control broadleaved weeds such as Canada thistle after seeding, and the lack of local seed sources that were commercially available.

Native prairie restoration has rapidly expanded in Minnesota, Iowa, Wisconsin, Nebraska, and other states over the last 10 years. These same techniques are more recently being employed across Region 6 on a larger scale. Land managers have learned through trial and error that first controlling noxious and invasive species is critical for the successful restoration of native grasses and forbs that will remain as permanent grassland nesting cover. Controlling these weed species has proven to be the greatest challenge to successfully meeting restoration objectives.

Despite this trend of converting farmlands to natural habitats, current budget levels make it unlikely that the Service could immediately address all System lands requiring renovation or restoration. Compared to the cost of restoring land, farming is an effective management tool for preparing sites for restoration and managing invasive species until restoration can begin.

Farming as a management tool is conducted in several ways. One method is to work with a neighboring farmer—referred to as a *cooperator*—to plant a crop using cooperator-provided seed, labor, equipment, and other supplies in exchange for a portion of the crop. Under another method, a cooperator rents the land and harvests the entire crop. A third method entails System staff preparing the ground and planting a crop with System-provided equipment, operator(s), and supplies. Most farming in Region 6 is undertaken through agreements with cooperators.

Within the last decade, GM crops have become widely available to the System's cooperative farmers. GM crop plants contain a gene (or genes) that has been inserted artificially rather than acquired naturally by the plant through pollination. The majority of GM crops in use today are glyphosate-tolerant, where a transgene has been inserted that enables the crop to tolerate and survive an application of an herbicide containing glyphosate. When applied to nearly all other species of growing plants, glyphosate kills the plant. Other GM crops include varieties with insect-resistance traits. In 2010, GM crops were planted on 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 86 percent of corn acres (USDA-ERS 2010b). Of the corn acres, however, 23 percent were glyphosate-tolerant variety only (USDA-ERS 2010b).

The number of units and acres cooperatively farmed on System lands in Region 6 in any one season varies. In 2009, 10,756 acres of System lands were farmed in Region 6, constituting 0.4 percent of its total 2,462,987 fee title acres (figure 1). However, only 6,175 acres were planted with glyphosate-tolerant soybeans and corn. These GM crops were grown on eight wetland management districts in North Dakota, South Dakota, and Nebraska, and on eight national wildlife refuges located in North Dakota, South Dakota, Nebraska, and Kansas. The average acres per wetland management district was 325, while the average acres per refuge was 445.

This EA specifically addresses the following Federal Action:

> The use of glyphosate-tolerant soybeans and corn for habitat restoration and management purposes on lands owned and/or managed by the System within Region 6 of the U.S. Fish and Wildlife Service in the states of Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming.

Three federal agencies—the U.S. Environmental Protection Agency, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS), and the Department of Health and Human Services' Food and Drug Administration—share regulatory oversight for agricultural biotechnology in the U.S. These agencies work together under the 1986 Coordinated Framework of Regulation of Biotechnology to ensure the safety of genetically-engineered biotechnology. USDA-APHIS has jurisdiction over the planting of GM plants, while the Environmental Protection Agency has jurisdiction over planting and food and feed uses of pesticides engineered into plants (e.g., *Bacillus thuringiensis* corn [Bt-corn]). Lastly, the Food and Drug Administration has jurisdiction over food and feed uses of all foods from plants (NBII 2011).

1.5 Authority, Legal Compliance, and Compatibility

System lands are managed consistent with a number of federal statutes, regulations, policies, and other guidance. The National Wildlife Refuge System Administration Act of 1966, as amended (16 United States Code [U.S.C.] 668dd–668ee) (Administration Act) is the core statute guiding management of the System. The National Wildlife Refuge System Improvement Act of 1997 (Public Law [P.L.] 105-57) (Improvement

Figure 1. Fee-title lands within the National Wildlife Refuge System in Region 6.

Act) made important amendments to the Administration Act, one of which was the mandate that a comprehensive conservation plan be completed for every unit of the System. Among other things, comprehensive conservation planning has required field stations to assess their current farming program and establish objectives for the future.

A list of other laws, regulations, policies, and executive orders that influence the System can be found in appendix A.

1.6 Coordination with Other Regions and Agencies

Preparation of this EA was coordinated with a similar effort undertaken by the Service's Midwest Region (Region 3). In addition, internal comments were solicited from the Office of Science and Technology Policy in Washington, D.C., USDA-APHIS Biotechnology Regulatory Services, U.S. Environmental Protection Agency Biopesticides and Pollution Prevention Division, and the U.S. Food and Drug Administration's Center for Food Safety and Applied Nutrition.

1.7 Public Outreach and Comment

An internal and external public scoping period was held beginning on April 22, 2010, and ending on July 9, 2010. This scoping period allowed for a thorough review of available research and reviews related to the use of glyphosate-tolerant soybeans and corn prior to the development of this EA. Scoping was coordinated between Regions 3 and 6, because both regions are currently evaluating the use of GM crops on System lands. However, Region 3 in its EA is reviewing farming as a management tool in addition to reviewing the use of glyphosate-tolerant soybeans and corn.

A total of 1,290 news outlets across 16 states received news releases announcing the Service's intent to review the use of glyphosate-tolerant soybeans and corn on System lands. News releases were posted on bulletin boards of Refuge Headquarters Offices in Region 6 during this scoping period. In addition, an announcement with a link on how to comment was posted on Region 3 and Region 6 Web sites.

Public open houses were held in Fergus Falls, Minnesota (June 17, 2010); Aberdeen, South Dakota (June 22, 2010); and Hartford, Kansas (June 24, 2010). A total of 10 individuals attended, all in Hartford, Kansas.

More than 30 written comments and emails were received from participants in the System farming program, neighboring landowners, private citizens, agricultural organizations, nongovernmental organizations, nonprofit organizations, the biotechnology industry, and herbicide manufacturers. All comments were reviewed and considered before writing this EA. Comments were summarized and grouped into one of three categories—wildlife issues, habitat issues, and socioeconomic issues—as listed below.

Wildlife issues

1. Using glyphosate-tolerant soybeans and corn could provide an alternative for farming that poses less risk to wildlife.
2. Agricultural herbicides could be toxic to wildlife.

Habitat issues

3. Using glyphosate-tolerant soybeans and corn could make habitat restoration and management more efficient and economical; increased costs associated with discontinuing the use of these crops could impede the progress of restoration efforts.
4. Farming combined with using glyphosate-tolerant soybeans and corn could be an effective way to control invasive plants, especially smooth brome and other cool-season exotic grasses.
5. Conservation tillage practices could be used by the Service to minimize soil erosion on cultivated lands.
6. Using glyphosate-tolerant soybeans and corn could result in the development of herbicide-resistant weeds on System lands.

Socioeconomic issues

7. Conventional (not glyphosate-tolerant) soybean and corn seeds may be more difficult to obtain in local communities.
8. Not using glyphosate-tolerant soybeans and corn could make farming more costly for cooperators; local farming cooperators could lose income if farming is reduced or eliminated.
9. Using glyphosate-tolerant soybeans and corn could affect certified organic farmers.

1.8 Issues beyond the Scope of This Environmental Assessment

This EA is focused on the use of glyphosate-tolerant soybeans and corn for habitat restoration and management on System-owned or -managed lands in Region 6. It does not evaluate GM organisms other than glyphosate-tolerant soybeans and corn.

Other issues regarding glyphosate-tolerant soybeans and corn were previously evaluated by USDA-APHIS through NEPA review prior to general release of these organisms for use. These EAs did not find significant impacts regarding inadvertent crop-to-weed gene flow, significant impacts on human health and safety, impacts on non-target species, impacts on agricultural practices, potential impacts on organic farmers, potential weediness of genetically modified crops, or impacts on soil microorganisms. Two recent, relevant documents from USDA-APHIS can be found at the following Web addresses:

- www.aphis.usda.gov/brs/aphisdocs2/06_17801p_com.pdf (USDA-APHIS 2007)
- www.aphis.usda.gov/brs/aphisdocs2/00_01101p_com.pdf (USDA-APHIS 2000)

Of the two relevant documents listed above, the first is an EA and finding of no significant impact (FONSI) for the Glycine Max soybean line completed in 2007. The second document, completed in 2000, is an EA, FONSI, and Federal Register notice for an extension on glyphosate-tolerant corn (NK603 corn line).

Prior to these lines of soybeans and corn being approved, USDA-APHIS reviewed and approved the first-generation of glyphosate-tolerant soybeans in 1994 (USDA-APHIS 1994), and glyphosate-tolerant corn in 1997 (USDA-APHIS 1997).

CHAPTER 2—Alternatives

2.1 Introduction

This chapter describes how alternatives were formulated, describes those alternatives carried through for further analysis, describes elements common to all alternatives, and describes those alternatives eliminated from further study.

Specifically, this chapter describes the two alternatives identified for analysis:

- Alternative A, the no-action alternative and proposed action, to continue using glyphosate-tolerant soybeans and corn for habitat restoration and management of System-managed lands in Region 6
- Alternative B, to disallow the use of glyphosate-tolerant soybeans and corn on System-managed lands in Region 6

This chapter also includes two alternatives considered but eliminated from further study:

- Go-Back Alternative
- Organic Only Farming Alternative

2.2 Formulation of Alternatives

The Service reviewed the authorities, policies, and existing research and information on the topic of using glyphosate-tolerant soybeans and corn on System lands in Region 6. Discussions were held with refuge managers concerning current management activities, as well as regional and national office staff. In addition, comments received during the public scoping period were reviewed and discussed. Factors considered in the development of alternatives were as follows:

- the Improvement Act
- refuge or wetland management district establishing purposes
- 15-year comprehensive conservation plans
- the availability and effectiveness of alternative management tools
- benefits to and impacts on wildlife and the habitat needed to support wildlife

Four alternatives were preliminarily identified, but through this process only two were selected for further development.

2.3 Description of Developed Alternatives

ALTERNATIVE A: CONTINUE USING GLYPHOSATE-TOLERANT SOYBEANS AND CORN FOR HABITAT RESTORATION AND MANAGEMENT ON SYSTEM-MANAGED LANDS IN REGION 6 (NO ACTION)

Under this alternative, the System in Region 6 would continue to follow existing policy on Biological Integrity, Diversity, and Environmental Health (601 FW 3 of the Service Manual, 2001; Amendment 1, 2006); the use of glyphosate-tolerant soybeans and corn, when essential, would continue to be one tool the Service could use to achieve habitat restoration and management objectives. The Service would continue to have the option to use conventional soybeans and corn along with other conventional crops in a crop rotation, provided adequate cooperators using these methods are available who can meet habitat restoration and management goals.

If glyphosate-tolerant corn or soybeans are used, refuge managers would be required to complete and submit to the Regional Chief the Genetically Modified Crop Eligibility Questionnaire for approval. In addition, appropriate use and compatibility determinations would be prepared to address the use of glyphosate-tolerant soybeans and corn. Pesticides used, including (but not limited to) glyphosate, would need to be approved through the Service's Pesticide Use Proposal (PUP) process and applied following all label specifications.

Habitat restoration under this alternative may take a variety of forms, including restoring croplands or lands previously tilled and infested with invasive species to grasslands, wetlands, brushlands, or timbered habitats. A typical scenario would involve newly acquired lands with long farming histories. These acres would be farmed under a cash rent or sharecrop agreement. This farming rotation normally takes 2–5 years, but it can take up to 7 years depending on crop history, past pesticide use, invasive species present,

and overall seedbed condition. The crop rotation may include soybeans, corn, wheat, or other crops and end with glyphosate-tolerant soybeans or another crop with light crop residue. These soybeans may be treated with glyphosate twice during the final cropping season, with a final application early the following growing season to eradicate any newly germinated invasive species. These croplands are then seeded to the desired native species by the Service or cooperator. These fields may be clipped or mowed 2–3 times per year for 1–2 years after seeding. Prescribed fire, prescribed grazing, haying, or herbicide application may be used alone or in combination to suppress any invasive species and stimulate the desired species.

Another common scenario in Region 6 would involve historic croplands within dry reservoir bottoms or areas subject to flooding where the normal hydrology has been altered. In such areas, the tillage and altered hydrology enabled invasive species such as Johnson grass (*Sorghum halepense*), salt cedar (*Tamarix* spp.), Canada thistle, Russian olive (*Elaeagnus angustifolia*), Phragmites (*Phragmites australis*), cattail (*typha* spp.), and others to dominate the site. Native plant communities that thrive in temporarily or seasonally flooded wetlands have been eliminated. Historically, these bottomlands flooded seasonally, providing resting and feeding sites for a variety of wetland-dependent wildlife. Many were farmed during dry periods but are still subject to unpredictable flooding events. Left unmanaged, these fields would behave similarly to the go-back sites described in Section 2.5. However, under Alternative A, these tracts would be cultivated and planted in a crop rotation that includes glyphosate-tolerant soybeans and corn as well as conventional soybeans, corn, sorghum, wheat, alfalfa, or another suitable crop. The goal of this habitat restoration would be to control invasive species, provide food for wildlife, and maintain the open aspect of the habitat until it refloods, providing wetland habitat. Although unpredictable, these sites may reflood every 3–7 years.

Alternative B: Disallow the Use of Glyphosate-Tolerant Soybeans and Corn for Habitat Restoration and Management on System-Managed Lands in Region 6

This option would be the same as Alternative A, except that glyphosate-tolerant soybeans and corn would not be allowed as part of the farming operations related to habitat restoration and management. Under this alternative, if soybeans and corn are part of a farming operation, these crops would be conventional. Under this scenario it is possible—and likely—that a wide array of other pre-plant and postemergent herbicides, including glyphosate, would be applied as appropriate to control invasive species. As under Alternative A, appropriate use findings and compatibility determinations would need to be prepared. Pesticides used would need to be approved through the official Service PUP process and applied following all label specifications.

As in Alternative A, a typical scenario would involve newly acquired lands with long farming histories. These croplands would be rotationally farmed under a cash rent or sharecrop agreement as site preparation for habitat restoration. This rotation normally takes 2–5 years but can take up to 7 years depending upon crop history, pesticide use, invasive species present, availability of desired seeds for restoration, and seedbed condition. Herbicides used would include pre-plant chemicals prior to seeding or in the first 4 weeks followed by 1–3 applications of postemergent chemicals to target a variety of invasive species. Growing conventional soybeans and corn may require higher levels of tillage for weed control purposes (Brookes and Barfoot 2010). The crop rotation would normally end with soybeans or other crop with light crop residue. Subsequently, the croplands would be seeded to the desired native species by the Service or cooperator. These fields may be clipped or mowed 2–3 times per year for 1–2 years after seeding. Prescribed fire, prescribed grazing, haying, or herbicide application may be used alone or in combination to suppress any invasive species and stimulate the desired species.

2.4 Elements Common to All Alternatives

Adherence to the National Wildlife Refuge System Administration Act, as Amended by the National Wildlife Refuge System Improvement Act of 1997

All alternatives evaluated in this EA are consistent with the main points of the Improvement Act, as summarized below:

- Wildlife conservation comes first on refuges.
- The Service will adhere to biological integrity, diversity, and environmental health of the System.
- Compatibility determinations will guide uses of System lands.
- Six wildlife-dependent recreational uses are legitimate and appropriate public uses of the System: hunting, fishing, wildlife observation, wildlife photography, environmental education, and environmental interpretation.
- A comprehensive conservation plan will be prepared for every refuge and wetland management district.

ADHERENCE TO SERVICE'S APPROPRIATE USES AND COMPATIBILITY POLICIES

All alternatives evaluated in this EA would adhere to two policies set forth in the Service Manual that guide decisions on activities allowed on lands managed by the System: the Appropriate Refuge Uses Policy (603 FW 1 of the Service Manual) (Appropriate Uses Policy) and the Compatibility Policy (603 FW 2 of the Service Manual).

The Appropriate Uses Policy describes the initial decision process a refuge or wetland management district manager follows when considering whether or not to allow a proposed use. The manager must find a use appropriate before undertaking a compatibility review of the use. An *appropriate use*, as defined by the Appropriate Uses Policy, is a proposed or existing use on a refuge or wetland management district that meets at least one of the following four conditions: (1) the use is a wildlife-dependent recreational use as identified in the Improvement Act; (2) the use contributes to the fulfilling of the refuge purpose(s), the Refuge System mission, or goals or objectives described in a refuge management plan approved after October 9, 1997, the date the Improvement Act was signed into law; (3) the use involves the take of fish and wildlife under state regulations; or (4) the use has been found to be appropriate as specified in section 1.11 (603 FW 1 of the Service Manual). Lands within refuges are different from other multiple use public lands in that they are closed to all public uses unless specifically and legally opened. Unlike refuges, the waterfowl production areas that make up wetland management districts are considered open to hunting unless posted as closed. The Improvement Act states ". . . the Secretary [of the Interior] shall not initiate or permit a new use of a refuge or expand, renew, or extend an existing use of a refuge, unless the Secretary has determined that the use is a compatible use and that the use is not inconsistent with public safety." The Improvement Act also states that ". . . compatible wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, or environmental education and interpretation) are the priority general public uses of the System and shall receive priority consideration in refuge planning and management."

In accordance with the Improvement Act, the Service has adopted the Compatibility Policy, which includes guidelines for determining if a use proposed on a refuge or wetland management district is compatible with the purposes for which the refuge or wetland management district was established. A *compatible use* is defined in the policy as a proposed or existing wildlife-dependent recreational use or any other use of System lands that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the System mission or the purposes of the refuge. The policy also includes procedures for documentation and periodic review of existing refuge uses. A *compatibility determination* is a document that evaluates a proposed use and states whether it has been determined to be compatible or not compatible. The public has an opportunity to review and comment on draft compatibility determinations, often during the comprehensive conservation planning process. The compatibility determination for this EA is in appendix D.

ADHERENCE TO THE SERVICE'S PROCEDURES AND LIMITS ON HERBICIDE USE

Under all of the alternatives evaluated in this EA, protective measures would be taken to ensure the proper use of herbicides on Service lands. Such measures would be identified in a PUP, as Service policy requires a land manager to complete a PUP before applying herbicide on Service land. Each PUP must be approved by environmental contaminant staff or System staff at the field, regional, or national levels, depending on the pesticide proposed. Requiring PUPs helps ensure that product label instructions are followed, that pesticides are used effectively and safely, that the lowest risk products are selected, and that buffers are maintained.

ADHERENCE TO THE SERVICE'S GUIDANCE ON INTEGRATED PEST MANAGEMENT

All alternatives considered would adhere to the Service's policy on integrated pest management (IPM) (569 FW 1 of Service Manual). IPM coordinates the use of pest biology, environmental information, and available technology in a sustainable approach to prevent unacceptable levels of pest damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment.

ADHERENCE TO THE SERVICE'S GENETICALLY MODIFIED ORGANISM AND FARMING POLICY

All alternatives evaluated in this EA would adhere to national and Region 6 policy concerning GM organisms and farming on System lands. Nationally, the Service policy on Biological Integrity, Diversity, and Environmental Health (601 FW 3 of the Service Manual, 2001; Amendment 1, 2006) states:

> We do not allow Refuge System uses or management practices that result in the maintenance of non-native plant communities unless we determine there is no feasible alternative for accomplishing refuge purposes(s). For example, where we do not require farming to accomplish refuge purpose(s), we cease farming and strive to restore natural habitat. Where feasible and consistent with refuge purpose(s), we restore degraded or modified habitats in the pursuit of biological integrity,

diversity, and environmental health. We use native seed sources in ecological restoration. We do not use genetically modified organisms in refuge management unless we determine their use is essential to accomplishing refuge purpose(s) and the Regional Chief, National Wildlife Refuge System, approves the use.

Decades of refuge manager experience combined with published literature indicates that use of glyphosate-tolerant soybeans and corn, which allows for an application of an herbicide containing the active ingredient glyphosate during the growing season, is very effective at killing invasive cool-season grasses and other invasive plant species. Farming with these methods results in a weed-free seedbed ready for habitat restoration. This increases the probability of successful habitat restoration efforts on System lands. Because of the success that can be achieved in controlling invasive plants, refuge managers believe that using these crop types meets the essentiality criterion within Service policy regarding the use of GM crops and follows the guiding principles within the Biological Integrity, Diversity, and Environmental Health policy.

2.5 Alternatives Considered but Not Developed

Two alternatives were considered but not developed. The two alternatives and the rationale for not developing them are listed below.

Go-back alternative

The first alternative eliminated was to restore habitat without additional cropping by allowing the field to return—or *go-back*—to whatever species exist in the soil seedbank that may germinate and grow to maturity. Under this alternative, lands could be grazed, hayed, mowed, or burned in an attempt to enhance the possibility of restoring habitat and reaching objectives.

This alternative was eliminated because the number and diversity of native species necessary to restore habitats are not found in the soil seedbank after years of farming. Refuge managers' experience and research confirms that repeated tillage and farming eliminates most perennial native plant species from the seedbank (Apfelbaum and Haney 2010, Zylka et al. 2010). In addition, a variety of invasive annual and perennial species often remains in the seedbank and will out-compete any remaining native species, resulting in unsuccessful habitat restorations. Past experience with this go-back method has shown that these fields require long-term invasive species control and that few native species become established. The end result has been that habitat objectives are not achieved. For these reasons, this alternative was not considered for further analysis.

Organic farming only alternative

The second alternative eliminated was to use only organic farming methods where conventional crops would be planted; no synthetic pesticides, fertilizers, or plant growth regulators would be applied.

This alternative was eliminated because an inadequate number of organic farmers are operating in reasonable proximity to System lands in Region 6 to complete the necessary habitat restoration. A review of USDA data for Minnesota, Indiana, Missouri, Kansas, South Dakota, and Wyoming shows the cumulative acreage totals for organic soybeans and organic corn in these states are 0.13 percent and 0.18 percent, respectively. In addition, organic farming regulations require land to be certified chemical-free for a period of 3 years prior to crop production, and this increases the timeframe required for habitat restorations. Furthermore, organic farming methods often tolerate invasive species; this practice can limit the success of habitat restoration efforts in subsequent years. For these reasons, it was determined that requiring organic-only farming would not meet habitat restorations goals and objectives and thus was not considered for additional analysis.

CHAPTER 3—Affected Environment

3.1 Introduction

This EA addresses the lands owned or administered by the System in Region 6. The nature of this programmatic EA is to address a use across similar habitats, in similar climates, for similar purposes.

The affected environment describes those portions of the natural and human environment that could be affected by implementing each alternative. A complete description of Region 6 refuge and wetland management district resources may be found in their individual comprehensive conservation plans at www.fws.gov/mountain-prairie/planning/ccp.htm.

3.2 Regional Setting

Region 6 encompasses the states of Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming. The current landcover in this region is shown in figure 2.

The climate varies from north to south and east to west. In general, maximum summer temperatures increase to the south and east; minimum winter temperatures decrease to the north. The mean January temperature in North Dakota is 8 °F, while in Kansas the January mean is 29 °F. The mean summer temperature in North Dakota is 69 °F, while in Kansas the mean is 78° F. Precipitation varies widely; however, in general it increases from west to east. The average annual precipitation in Montana is 11 inches, and in Nebraska the average annual precipitation is 30 inches. Precipitation averages within states follow the same pattern. For example, in Nebraska the average annual precipitation is 14 inches in the west and 32 inches in the southeast. All refuge lands experience dramatic climatic changes through the year and have spring, summer, fall, and winter seasons.

Soils vary from refuge to refuge and even within refuges. They reflect the local climate, parent material, and erosional processes that shaped the formation of these soils. Soils included in this review are suitable for conventional farming and in a typical year would support adequate growth of soybeans and corn.

Tallgrass and mixed-grass prairie were the dominant plant communities found on the farmable acres suitable for growing soybeans and corn throughout the eight states of Region 6. Only very small remnants of tallgrass prairie escaped the plow before acquisition by the System. More acres of mixed-grass prairie remain; however, significant acres of mixed-grass prairie were plowed and/or sprayed and replanted to exotic grasses or farmed prior to acquisition. Some locations along rivers and tributaries may have contained bottomland forests subject to seasonal flooding.

Water resources vary widely. Many miles of rivers and acres of lakes and wetlands exist within the boundaries of these refuge and wetland management district lands. Groundwater irrigation is commonly used for farming on adjacent private lands where adequate groundwater resources can be tapped and economics of development are profitable. Where possible, additional wetlands were created or restored after acquisition. These wetlands are currently managed through a variety of methods, including prescribed burning, prescribed grazing, and manipulation of water levels. In some locations, aggressive trees and shrubs may become established in wetland units that have previously been farmed. The practice of farming these wetlands when they are drawn down helps keep habitat available to migratory bird species such as shorebirds and waterfowl. Concentrations of temporary and seasonal wetlands are embedded in cropped sites in the Prairie Pothole Region of Montana, North Dakota, and South Dakota and in the Rainwater Basin of Nebraska. Prior to acquisition, many of these wetlands were farmed when dry.

3.3 Wildlife Resources

A wide array of wildlife occurs on System lands and waters in Region 6. Listings of documented bird species for many refuges and wetland management districts can be downloaded at www.npwrc.usgs.gov/resource/birds/chekbird/. Other plant and wildlife species lists can be obtained by contacting individual refuges and wetland management districts or by searching online at www.fws.gov/mountain-prairie/refuges/.

Typically, areas suitable for farming historically contained tallgrass prairie, mixed-grass prairie, wet prairie, and wet meadow habitats. On System lands in Region 6, there has been an emphasis in restoring farmlands to grasslands and wetland habitats for migratory birds.

3.4 Invasive Species

Invasive species are defined by Presidential Executive Order 13112 (February 3, 1999), Invasive Species, as "an alien species whose introduction does, or is likely to cause economic or environmental harm or harm to human health." Invasive species are a growing issue on System lands. They spread quickly, displace native species, and create significant change in the natural environments. Some invasive species can affect the severity and frequency of wildfire. Some interfere with water flow, and others can alter nutrient availability and water quality (National Invasive Species Council 2008).

System lands may contain units dominated by nonnative, and often invasive, plant species. In most cases, the historical ecological processes of fire and grazing were significantly altered. In addition, many areas that were tillable were farmed prior to acquisition or after the System acquired them. The practice of converting native plant communities to agricultural uses was halted in the 1970s. Exotic and invasive species such as smooth brome, Kentucky bluegrass (*Poa pratensis*), crested wheatgrass (*Agropyron cristatum*), and reed canary grass (*Phalaris arundinacea*) were planted and may have spread through long periods of non-management. In addition, numerous species of noxious and invasive forbs have found their way onto the landscape. Some of the worst include Canada thistle and leafy spurge (*Euphorbia esula*). Newly establishing invasive species appear on the landscape regularly. These simple plant communities are not as resilient as diverse native plant communities and are more easily invaded by noxious weeds (Apfelbaum and Haney 2010, Helzer 2010).

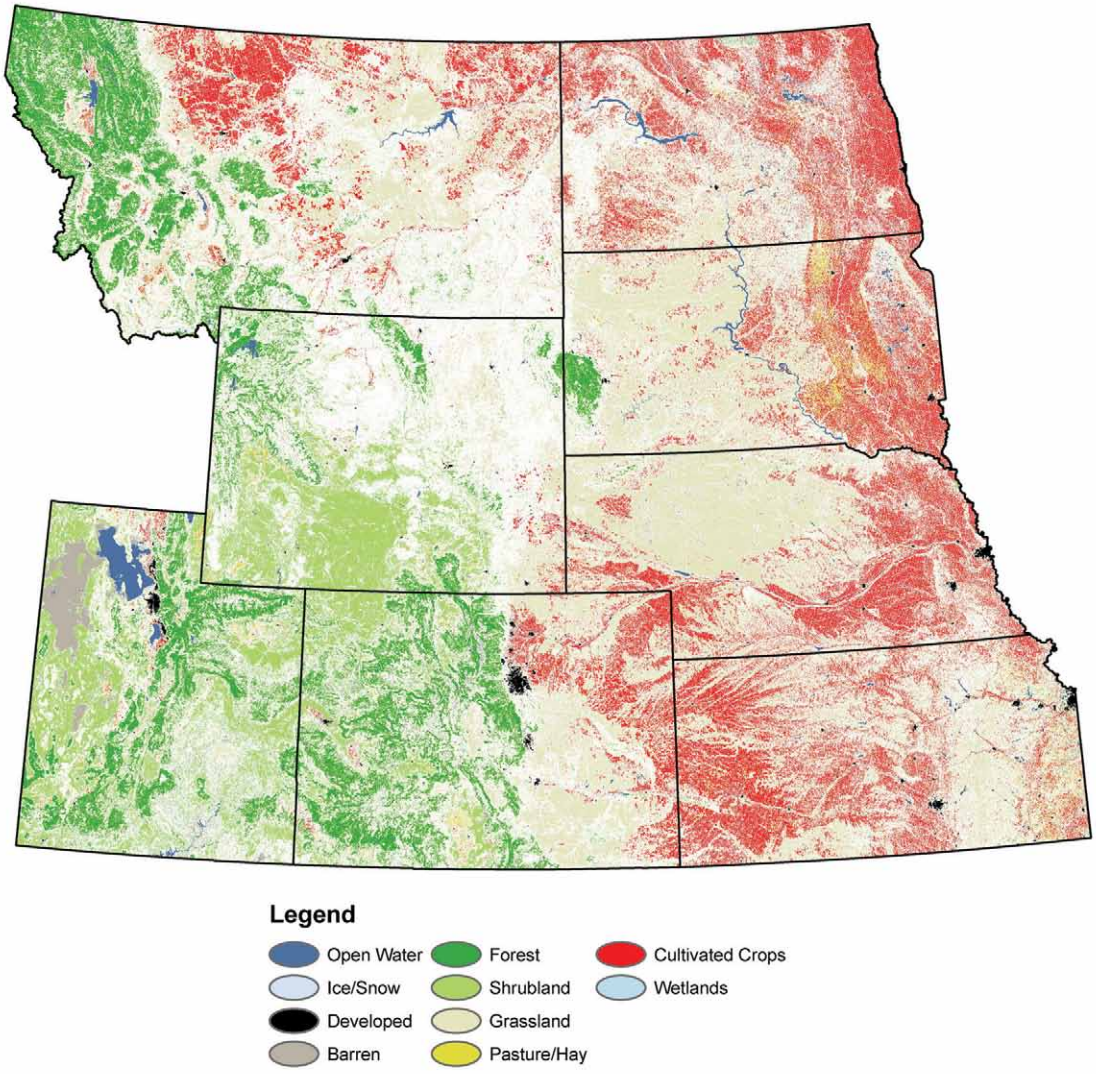

Figure 2. National landcover map for Region 6.

3.5 Threatened and Endangered Species

Threatened and endangered species, as well as candidate species, known to occur in Region 6 are listed in appendix C. In general, the majority of these species are found in more natural habitats rather than on farmed lands. Occasionally, some species may visit agricultural fields for incidental feeding during migratory periods.

3.6 Cultural Resources

Both prehistoric and historic cultural resources are distributed throughout Region 6. Formal consultation with regional archeologists is required for any activities that may affect these resources or whenever the effect is unknown. Units considered in this review have been previously farmed, reducing the likelihood that impacts on cultural resources will occur.

CHAPTER 4—Environmental Consequences

4.1 Effects Common to Developed Alternatives

Threatened and Endangered Species

All of the threatened and endangered species listed in appendix C, with the exception of whooping crane (*Grus americana*), piping plover (*Charadrius melodus*), interior least tern (*Sterna antillarum*), and Sprague's pipit (*Anthus spragueii*), do not occur in farmed sites. These four bird species may visit corn and soybean fields during migratory periods but normally would not be present during normal farming operations. A review was conducted of any known impacts of the glyphosate-tolerant soybean and corn seed, pollen, and/or other growing or residue plant parts for impacts on threatened and endangered species and their habitats listed in appendix C. None was found.

USDA-APHIS completed EAs of the use of glyphosate-tolerant soybeans and corn (USDA-APHIS 2000, 2007) prior to general release and found the following:

1. There are no significant differences between the chemical compositions of glyphosate-tolerant soybeans and corn and conventional (glyphosate-intolerant) soybeans and corn. Contact with or ingestion of glyphosate-tolerant soybeans and corn is very unlikely to have any effect on any plant and animal.
2. Feeding experiments with chickens failed to detect any differences between glyphosate-tolerant soybeans and corn and conventional (glyphosate-intolerant) soybeans and corn regarding mortality rates, weight gain, and reproductive rates.
3. Corn and soybeans are not sexually compatible with any listed threatened or endangered plant species in Region 6; accordingly, there is no likelihood that there can be an unintended transfer of genes to a threatened or endangered species.
4. Glyphosate-tolerant corn and soybeans are very unlikely to escape into natural habitats because corn and soybeans can only persist with intensive human management; accordingly, there is no chance they will escape into native habitats occupied by threatened or endangered species.
5. In its final EAs for both crops, USDA-APHIS included an evaluation of the effects of glyphosate-tolerant corn and soybeans on threatened and endangered species. The final EAs concluded that no effect is expected on federally listed threatened and endangered species, species proposed for listing, or their proposed or designated critical habitats from exposure to glyphosate-tolerant soybeans and corn or from exposure to label rates of glyphosate expected to be used in conjunction with glyphosate-tolerant soybeans and corn.

Based on past reviews as well as a current Section 7 evaluation for species occurring in Region 6, it was determined that there would be no effect on threatened and endangered species and their habitats listed in appendix C.

Cultural Resources

The consequences of the planned management on cultural resources are the same for both alternatives. Agricultural activities associated with farming and planting glyphosate-tolerant soybeans and corn have resulted in ongoing ground disturbance. Any additional effects on cultural or historic resources will be minor or non-existent. Any management actions with the potential to affect cultural resources require refuge or district manager review, as well as review by the Service's regional archeologist in consultation with the State Historic Preservation Office as mandated by Section 106 of the National Historic Preservation Act. Areas considered in this review have been previously farmed or disturbed, reducing the likelihood that impacts on cultural resources will occur.

4.2 Effects of Developed Alternatives

This analysis of effects compares how the two developed alternatives adhere to Service policy and how they affect the wildlife, habitat, and socioeconomic issues developed during public outreach, as listed below:

1. Using glyphosate-tolerant soybeans and corn could provide an alternative for farming that poses less risk to wildlife.
2. Agricultural herbicides could be toxic to wildlife.
3. Use of glyphosate-tolerant soybeans and corn could make habitat restoration and management

more efficient and economical; increased costs associated with discontinuing the use of these crops could impede the progress of restoration efforts.

4. Farming combined with using of glyphosate-tolerant soybeans and corn is an effective way to control invasive plants, especially smooth brome and other cool-season exotic grasses.
5. Conservation tillage practices could be used by the Service to minimize soil erosion on cultivated lands.
6. Using glyphosate-tolerant soybeans and corn could result in the development of herbicide-resistant weeds on System lands.
7. Conventional (not glyphosate-tolerant) soybean and corn seeds may be more difficult to obtain in local communities.
8. Not using glyphosate-tolerant soybeans and corn could make farming more costly for cooperators; local farming cooperators could lose income if farming is reduced or eliminated.
9. Using glyphosate-tolerant soybeans and corn could affect certified organic farmers.

Alternative A: Continue Using Glyphosate-Tolerant Soybeans and Corn for Habitat Restoration and Management on System-Managed Lands in Region 6 (No Action)

Summary of Alternative A Effects

Alternative A allows for the use of conventional crops as well as glyphosate-tolerant soybeans and corn in a cropping sequence. Alternative A allows for repeated use of glyphosate to control invasive species before, during, and after the cropping season, thereby eliminating or greatly reducing invasive species during all their growth stages. This treatment regime is particularly effective for elimination of smooth brome, which is the single greatest cause of native prairie seeding failures in Region 6. Farming, combined with the use of a wide-spectrum herbicide such as glyphosate, has been demonstrated to be very effective in controlling these nonnative and invasive plant species (Apfelbaum and Haney 2010, Helzer 2010, Smith et al. 2010). Experience has also shown this alternative to be the most successful in preparing a seedbed for prairie habitat restoration (Apfelbaum and Haney 2010, Smith et al. 2010).

Alternative A would result in timely and cost-effective restoration of habitat, as the associated seed and herbicides are readily available (Brookes and Barfoot 2010, Helzer 2010) and cooperative farmers can be readily located. Under this alternative, herbicide use would primarily be glyphosate, which has a relatively low toxicity (Brookes and Barfoot 2010, Cerdeira and Duke 2006, COBFLES 2010, Ferry and Anghaard 2008). When applied according to label specifications, glyphosate is rain fast in a matter of hours, adheres closely to soil particles, and breaks down to inert substances in a matter of days, significantly reducing the potential to leach into groundwater or move into surface waters.

Although physical and chemical properties of glyphosate reduce the potential for movement of glyphosate and its metabolite aminomethyl phosphonic acid into groundwater and surface waters, some translocation can occur. Based on a U.S. Geological Survey 5-year study conducted from 2001 to 2006, both glyphosate and aminomethyl phosphonic acid were detected in low amounts in surface water, groundwater, and soil samples (Scribner et al. 2007). However, because of the strong adsorption and microbial breakdown that does occur, concentrations tend to be low (Borggaard and Gimsing 2008).

Under Alternative A, using glyphosate-tolerant corn or soybeans would have no effect on non-target or federally listed endangered or threatened species.

Additionally, impacts on the local economy and cooperative farmers would not change because the majority of farming operations currently use glyphosate-tolerant soybeans and corn (COBFLES 2010); glyphosate-tolerant soybeans and corn were planted on 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 23 percent of U.S. corn acres in 2010 (86 percent of corn crops were a GM variety) (USDA-ERS 2010b).

Wildlife Issues

Issue 1. Using Glyphosate-Tolerant Soybeans and Corn Could Provide an Alternative for Farming That Poses Less Risk to Wildlife. Growing glyphosate-tolerant soybeans and corn has some conservation advantages over growing non-GM varieties. The use of glyphosate-tolerant crops increases the chances that conservation tillage (no-till) can be successfully used (Towery and Werblow 2010). Conservation tillage results in reduced soil disturbance and increased crop residue, which both decrease soil erosion, which in turn results in more productive land and cleaner water. Glyphosate is also fairly environmentally benign, especially when compared to most other herbicides (Apfelbaum and Haney 2010, Duke and Powles 2008). Field and laboratory studies show it does not leach appreciably, has low potential for runoff (Shipitalo et al. 2008), is nontoxic to honeybees, is practically nontoxic to fish, may be slightly toxic to aquatic invertebrates, is slightly toxic to wild birds, and has no significant potential to accumulate in animal tissue (Oregon State University 1996).

Commercial formulations of glyphosate may contain additional chemicals (surfactants) to increase effectiveness. Some research indicates that there are commercial formulations of glyphosate that can negatively affect amphibians (Dinehart et al. 2010) and aquatic communities in general (Relyea 2005, Vera et al. 2010), and it is likely that these additional chemicals cause the toxicity (Mann et al. 2009). These impacts

can be minimized by applying glyphosate following label restrictions, including those directing that the chemical should not be applied directly to water or to areas where surface water is present. Because there is a wide range of toxicity exhibited by different formulations of glyphosate (Langeland 2006), these impacts can also be managed by using less toxic formulations.

Issue 2. Agricultural Herbicides Could Be Toxic to Wildlife. Herbicides vary greatly in toxicity, and some have been banned by the U.S. Environmental Protection Agency (Buffington and McDonald 2006).

Through its PUP program, the Service requires approval of a pesticide before it is applied on System-managed land (USFWS 1982, 2005). In Region 6, refuge managers are annually provided a limited list of herbicides that they may review and approve for use on the System lands they manage. If the refuge manager wishes to use an herbicide not on the list, the pesticide must first be approved at the regional or national level.

Using herbicides will not affect wildlife if the following actions are taken:

1. Herbicides are applied following label restrictions. These restrictions include information regarding the use of a particular herbicide around water, near sensitive habitats, and near threatened and endangered species. (For a list of restrictions, see www.cdms.net/LabelsMsds/LMDefault.aspx?pd=6935&t=1,2,3,4.)
2. Conditions outlined in the Service's cooperative farming agreement are followed. Many of these conditions relate to best management practices to protect soil and water and to manage pests and nutrients. (For a list of agricultural best management practices followed by the Service, see www.epa.gov/owow/watershed/wacademy/acad2000/agmodule/.)
3. PUPs are completed. PUPs are required before the application of pesticides on System lands. Impacts on threatened or endangered species are considered during this annual review (USFWS 1982, 2005).
4. IPM plans and comprehensive conservation plans that analyze the potential environmental impacts of herbicide use are completed for each System unit (USFWS 2010).

Habitat Issues

Issue 3. Using Glyphosate-Tolerant Soybeans and Corn Could Make Habitat Restoration and Management More Efficient and Economical; Increased Costs Associated with Discontinuing the Use of These Crops Could Impede the Progress of Restoration Efforts. The effects under this alternative are the same as the effects under Alternative B, except that ultimately, more acres will be restored to natural habitat under this alternative. Restoration of natural habitats is a Service priority. As stated in the Improvement Act, "[w]here feasible and consistent with refuge purpose(s), we restore degraded or modified habitats in the pursuit of biological integrity, diversity, and environmental health." In Region 6, this means converting farmland or sites dominated by invasive species to tall and mixed-grass native prairie. As mentioned in Section 2.5 above, farmland left to grow unmanaged would result in vegetation that does not meet habitat objectives on System lands. The typical restoration technique includes the continuation of farming and herbicide use until just before restoration planting occurs. Continued farming and herbicide use minimizes the number of residual weeds and weed seeds that will compete with the native vegetation to be planted. The use of glyphosate-tolerant soybeans and corn results in timely and cost-effective restoration of habitat as the associated seed and herbicides are readily available (Apfelbaum and Haney 2010, Brookes and Barfoot 2010, Helzer 2010). Certain herbicides that have commonly been used for weed control in corn, such as atrazine, remain active for up to 5 years in the soil and prevent many native grass and forb species from establishing (Smith et al. 2010). By contrast, glyphosate breaks down quickly to inert substances and does not prevent establishment of native grass and forb species (Duke and Powles 2008). Excess residual vegetation can also make it difficult or impossible to operate the equipment used to plant native vegetation. Lastly, using farming to maintain sites in good condition makes restoration more economically feasible, resulting in more acres of restored prairie over the long term.

Issue 4. Farming Combined with Using Glyphosate-Tolerant Soybeans and Corn Could Be an Effective Way to Control Invasive Plants, Especially Smooth Brome and Other Cool-Season Exotic Grasses. Invasive species of plants and animals is a growing problem on a global, national, and regional scale (Pimentel et al. 2005). Invasive species are a threat to agricultural and native habitats (USFWS 2009). To discourage invasive plants, the Service often continues farming land until just before restoration. It will be most cost-effective to prevent invasive plants from becoming established in areas that will be restored to native habitat by using glyphosate-tolerant soybeans and corn.

Issue 5. Conservation Tillage Practices Could Be Used by the Service to Minimize Soil Erosion on Cultivated Lands. Conservation tillage results in reduced soil disturbance and increased crop residue, which together decrease soil erosion and maintain soil structure and diversity, which in turn results in more productive land and cleaner water. The use of glyphosate-tolerant soybeans and corn increases the chances that conservation tillage can be successfully used (Towery and Werblow 2010).

Issue 6. Using Glyphosate-Tolerant Soybeans and Corn Could Result in the Development of Herbicide-Resistant Weeds on System Lands. There are almost 200 species of herbicide-resistant plants worldwide (Heap 2010). Herbicide resistance is a predictable and growing problem. For example, glyphosate tolerance in horseweed (*Conyza canadensis*) was first identified in Maryland in 2001 (VanGessel 2001) and has been documented in Nebraska, Kansas, as well as a number of states adjacent to Region 6 (Heap 2010). Almost 90 percent of all herbicide-tolerant crops are glyphosate-tolerant. The use of glyphosate is being threatened by the evolution of glyphosate-tolerance in weeds (Duke and Powles 2008). Glyphosate-tolerant soybeans and corn were planted on 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 23 percent of U.S. corn acres in 2010 (86 percent of corn crops were a GM variety) (USDA-ERS 2010b). Regular, widespread use of the same herbicide increases the risk of developing herbicide tolerance. IPM techniques minimize the likelihood of herbicide resistance by regularly changing the active ingredient in the herbicide as well as the mode of action. In addition, IPM techniques used by the Service incorporate rotating the type of herbicide used, rotating the crop planted, and using mechanical and biological control methods to achieve control. Using glyphosate-tolerant soybeans and corn would help manage herbicide resistance of weeds on System lands because it would be an additional technique to use in weed management. On private lands where IPM may not be used, glyphosate-tolerant soybeans and corn are so widely and regularly used that their use encourages herbicide resistance (Duke and Powles 2008). Effective use of IPM will help manage herbicide resistance (USFWS 2004).

Concern for glyphosate-tolerant weeds becoming established in System lands planned for habitat restoration is also minimized by the fact that once the native species are planted, glyphosate will likely never be sprayed on the field in the future. Not only would managers kill the targeted weeds, but they would also kill the very expensive native grasses and forbs that had recently been planted with an application of the wide spectrum herbicide glyphosate. In addition, the documented glyphosate tolerance in the U.S. is for annual agricultural weeds. These annual weeds will fade and disappear within 3–5 years from the prairie seeding, as perennial native grasses and forbs become established and out-compete the annual weeds. More selective herbicides, other than glyphosate, would be used to control any invasive weeds in new prairie seedings.

Socioeconomic Issues

Issue 7. Conventional (Not Glyphosate-Tolerant) Soybean and Corn Seeds May Be More Difficult to Obtain in Local Communities. Glyphosate-tolerant soybeans and corn were planted on 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 23 percent of U.S. corn acres in 2010 (86 percent of corn crops were a GM variety) (USDA-ERS 2010b). Under Alternative A, both glyphosate-tolerant soybeans and corn as well as non-GM seeds could still be used in System farming operations. The availability of traditional seed and the cost for traditional seed can vary widely among locations (Mike Brown; USFWS; personal communications; 2010).

Issue 8. Not Using Glyphosate-Tolerant Soybeans and Corn Could Make Farming More Costly for Cooperators; Local Farming Cooperators Could Lose Income if Farming Is Reduced or Eliminated. According to Brookes and Barfoot (2010), the overall cost of planting glyphosate-tolerant soybeans results in a cost savings of between $30 and $85 per hectare. This savings is attributable to reduced fuel costs (less tilling required) and reduced herbicide costs. Overall costs for glyphosate are cheaper than other herbicides used in conventional soybean fields. For glyphosate-tolerant corn, the savings are approximately $17 per hectare (Brookes and Barfoot 2010). Therefore overall, farm income is increased through the use of glyphosate-tolerant varieties compared with conventional varieties.

In general, farming practices would continue unchanged under Alternative A. As existing farmland on System lands is seeded back to native prairie, fewer acres of farmland on System lands will exist. However, such decreases in currently farmed acres will be offset through additional farming in preparation for prairie restoration of deteriorated fields of exotic grasses or areas that were managed through the go-back method. Newly acquired fee title lands will also likely contain existing farmland that requires prairie restoration. In most situations, the acres of System lands farmed by an individual cooperator make up a small percentage of the cooperator's entire farming operation, limiting the economic impact on individuals if farming operations are scaled back. Cooperative farming agreements and special use permits used to authorize farming on System lands in Region 6 are limited to a maximum of 5 years, with many covering only 3 or 4. There are no guarantees for future farming given or implied beyond these specified timeframes. Such limits allow cooperators to plan accordingly and reduce any potential economic impact.

Issue 9. Using Glyphosate-Tolerant Soybeans and Corn Could Affect Certified Organic Farmers. A review of potential impacts of glyphosate-tolerant soybeans and corn on organic farmers was completed by USDA-APHIS prior to its general release (2000, 2007). The conclusion of these reviews was that for soybeans, there should be no apparent potential for significant impact on organic farming through deregulation and general release. Soybeans are highly self-pollinated with large, heavy seeds that are not easily dispersed.

Consequently, minimal buffer zones are needed to prevent cross-pollination to other soybeans or contamination of adjacent agricultural land (USDA-APHIS 2007). The conclusion made for corn was that all corn, whether genetically modified or not, can transmit pollen to nearby corn fields. A small influx of pollen originating from a given corn variety does not appreciably change the characteristics of corn in adjacent fields. The frequency of occurrence decreases with increasing distance from the pollen source such that it is negligible by 660 feet, the isolation distance considered safe for certified corn seeds (USDA-APHIS 2000). Typically, organic farmers provide their own buffers to ensure that they meet organic farming standards. If refuge or wetland management district managers are made aware of adjacent certified organic farm acres for soybeans or corn, measures may be taken to address neighboring landowner concerns and provide a buffer if warranted.

ALTERNATIVE B: DISALLOW THE USE OF GLYPHOSATE-TOLERANT SOYBEANS AND CORN FOR HABITAT RESTORATION AND MANAGEMENT ON SYSTEM-MANAGED LANDS IN REGION 6

Summary of Alternative B Effects

Alternative B would disallow the use of glyphosate-tolerant corn and soybeans as part of a restoration program on System lands in Region 6. Conventional crops would still be allowed. Alternative B would result in reduced control of invasive plants. Control measures in conventional fields would typically include applying an array of pre-emergent and post-emergent herbicides that are more toxic than glyphosate (Cerdeira and Duke 2006, COBFLES 2010). The control of cool-season exotic grasses—especially smooth brome—would be limited because glyphosate would not be applied during the growing season. In addition, some herbicides applied under this alternative may persist in the soil for up to 5 years, which would inhibit the germination and growth of native grasses and forbs (Smith et al. 2010). Under Alternative B, herbicide use would include an array of pesticides, including glyphosate. Available pesticides that are typically used with conventional soybeans and corn generally have more potential to move offsite, leach into groundwater, and take much longer to break down to inert substances (Brookes and Barfoot 2010, Cerdeira and Duke 2006, COBFLES 2010, Ferry and Anghaard 2008).

Alternatives A and B are both viable options in current farming operations. However, glyphosate-tolerant crops are widespread within the U.S., accounting for 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 23 percent of U.S. corn acres in 2010 (86 percent of corn crops were a GM variety) (USDA-ERS 2010b). Under Alternative B, it may be more difficult to find cooperators willing to farm conventional crops only.

Under Alternative B, using conventional corn, soybeans, and other crops on currently farmed or previously tilled System lands would have no effect on federally listed endangered or threatened species. All of the threatened and endangered species listed in appendix C, with the exception of whooping crane, piping plover, interior least tern, and Sprague's pipit, do not occur in cropped sites. These four bird species may visit corn, soybean, and other crop fields during migratory periods but would not be present during normal farming operations.

Under Alternative B, impacts on non-target native plant species may occur, particularly from carryover of certain herbicides; this could affect native plant species seeded during habitat restoration (Smith et al. 2010).

Under Alternative B, farm income would be reduced due to higher production costs (Brookes and Barfoot 2010).

Wildlife Issues

Issue 1. Using Glyphosate-Tolerant Soybeans and Corn Could Provide an Alternative for Farming That Poses Less Risk to Wildlife. Growing glyphosate-tolerant soybeans and corn has some conservation advantages over growing non-GM varieties. The use of glyphosate-tolerant crops increases the chances that conservation tillage can be successfully used (Towery and Werblow 2010). Conservation tillage results in reduced soil disturbance and increased crop residue, which both decrease soil erosion, which in turn results in more productive land and cleaner water. Under Alternative B, traditional farming practices such as complete tillage at the end of the growing season, and partial tillage during the growing season (in corn fields), would increase the disturbance of the soil and decrease the amount of crop residue. Both of these have the potential to increase soil erosion.

Glyphosate is also fairly environmentally benign, especially when compared to most other herbicides used in conventional farming (Duke and Powles 2008). Field and laboratory studies show it does not leach appreciably, has low potential for runoff (Shipitalo et al. 2006), is nontoxic to honeybees, is practically nontoxic to fish, may be slightly toxic to aquatic invertebrates, is only slightly toxic to wild birds, and has no significant potential to accumulate in animal tissue (Oregon State University 1996).

Alternative B would include applying an array of pre-emergent and post-emergent herbicides that are more toxic to wildlife, fish, and other aquatic organisms; may move in surface waters more readily; and take longer to break down to inert substances than glyphosate (Cerdeira and Duke 2006, COBFLES 2010).

Issue 2. Agricultural Herbicides Could Be Toxic to Wildlife. Herbicides vary greatly in toxicity, and some have been banned by the U.S. Environmental Protection

Agency (Buffington and McDonald 2006). In general, most herbicides used in conventional farming practices to control weeds are more toxic to wildlife (Cerdeira and Duke 2006, COBFLES 2010).

Through its PUP program, the Service requires approval of a pesticide before it is applied on System-managed land (USFWS 1982, 2005). In Region 6, refuge managers are annually provided a limited list of herbicides that they may review and approve for use on the System lands they manage. If the refuge manager wishes to use an herbicide not on the list, the pesticide must first be approved at the regional or national level.

Using herbicides will not affect wildlife if the following actions are taken:

1. Herbicides are applied following label restrictions. These restrictions include information regarding the use of a particular herbicide around water, near sensitive habitats, and near threatened and endangered species. (For a list of restrictions, see www.cdms.net/LabelsMsds/LMDefault.aspx?pd=6935&t=1,2,3,4.)
2. Conditions outlined in the Service's cooperative farming agreement are followed. Many of these conditions relate to best management practices to protect soil and water and to manage pest and nutrients. (For a list of agricultural best management practices followed by the Service, see www.epa.gov/owow/watershed/wacademy/acad2000/agmodule/.)
3. PUPs are completed. PUPs are required before the application of pesticides on System lands. Impacts on threatened or endangered species are considered during this annual review (USFWS 1982, 2005).
4. IPM plans and comprehensive conservation plans that analyze the potential environmental impacts of herbicide use are completed for each System unit (USFWS 2010).

Habitat Issues

Issue 3. Using Glyphosate-Tolerant Soybeans and Corn Could Make Habitat Restoration and Management More Efficient and Economical; Increased Costs Associated with Discontinuing the Use of These Crops Could Impede the Progress of Restoration Efforts. Restoration of natural habitats is a Service priority. As stated in the Improvement Act, "[w]here feasible and consistent with refuge purpose(s), we restore degraded or modified habitats in the pursuit of biological integrity, diversity, and environmental health." In Region 6, this usually means converting farmland to tall and mixed-grass prairie on fields capable of growing corn or soybeans. As mentioned in Section 2.5 above, farmland left to grow unmanaged would result in vegetation that does not meet the purposes of System lands. The typical restoration technique includes the continuation of farming and herbicide use until just before restoration planting occurs. Continued farming and herbicide use minimizes the number of residual weeds and weed seeds that will compete with the native vegetation to be planted. The control of cool-season exotic grasses—especially smooth brome—would be limited because glyphosate would not be applied during the growing season. In addition, some herbicides applied under this alternative may persist in the soil for up to 5 years, which would inhibit the germination and growth of native grasses and forbs (Smith et al. 2010). By contrast, glyphosate breaks down quickly to inert substances and does not prevent establishment of native grass and forb species (Duke and Powles 2008).

The use of glyphosate-tolerant soybeans and corn results in timely and cost-effective restoration of habitat because the associated seed and herbicides are readily available (Brookes and Barfoot 2010, Helzer 2010). Because glyphosate-tolerant varieties of soybeans and corn are now dominant in Region 6, it would be less cost-effective to prepare farmland for conversion to native habitats without the use of glyphosate-tolerant soybeans and corn.

Issue 4. Farming Combined with Using Glyphosate-Tolerant Soybeans and Corn Could Be an Effective Way to Control Invasive Plants, Especially Smooth Brome and Other Cool-Season Exotic Grasses. Invasive species of plants and animals are a growing problem on a global, national, and regional scale (Pimentel et al. 2005). Invasive species are a threat to agricultural and native habitats (USFWS 2009). To discourage invasive plants, the Service often continues farming land until just before restoration. Under Alternative B, the control of cool-season exotic grasses—especially smooth brome—would be limited because glyphosate would not be applied during the growing season. In addition, some herbicides applied under this alternative may persist in the soil for up to 5 years, which would inhibit the germination and growth of native grasses and forbs (Smith et al. 2010).

Issue 5. Conservation Tillage Practices Could Be Used by the Service to Minimize Soil Erosion on Cultivated Lands. Conservation tillage results in reduced soil disturbance and increased crop residue, which decrease the potential for soil erosion. Reduced soil erosion results in more productive land and cleaner water. Under Alternative B, the likelihood that conservation tillage could be used successfully would be decreased because glyphosate would not be applied during the growing season (Towery and Werblow 2010).

Issue 6. Using Glyphosate-Tolerant Soybeans and Corn Could Result in the Development of Herbicide-Resistant Weeds on System Lands. Under Alternative B, the use of glyphosate-tolerant soybeans and corn for habitat restoration and management would no longer be allowed. However, the herbicide glyphosate may still be

used. A typical scenario would be to use glyphosate to kill all growing plants in fields dominated by exotic grasses and invasive species prior to farming. The field would then be farmed using traditional soybeans, corn, or other crops. In the final year of farming, glyphosate may be applied after harvest and again the following spring, prior to seeding native species.

There are almost 200 species of herbicide-resistant plants worldwide (Heap 2010). Herbicide resistance is a predictable and growing problem. For example, glyphosate tolerance in horseweed was first identified in Maryland in 2001 (VanGessel 2001) and has now been documented in Nebraska, Kansas, as well as a number of states adjacent to Region 6 (Heap 2010). Almost 90 percent of all herbicide-tolerant crops are glyphosate-tolerant. The use of glyphosate is being threatened by the evolution of glyphosate tolerance in weeds (Duke and Powles 2008). Glyphosate-tolerant soybeans and corn were planted on 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 23 percent of U.S. corn acres in 2010 (86 percent of corn crops were a GM variety) (USDA-ERS 2010b). Regular, widespread use of the same herbicide increases the risk of developing herbicide tolerance. IPM techniques minimize the likelihood of herbicide resistance by regularly changing the active ingredient in the herbicide as well as the mode of action. In addition, IPM calls for rotating herbicides, rotating crops, and using mechanical and biological control methods to achieve pest control. Using glyphosate-tolerant soybeans and corn would help manage herbicide resistance of weeds on System lands because it would be an additional weed management technique. On private lands where IPM may not be used, glyphosate-tolerant soybeans and corn are so widely and regularly used that their use actually encourages herbicide resistance (Duke and Powles 2008). Effective use of IPM will help manage herbicide resistance (USFWS 2004).

Socioeconomic Issues

Issue 7. Conventional (Not Glyphosate-Tolerant) Soybean and Corn Seeds May Be More Difficult to Obtain in Local Communities. Glyphosate-tolerant soybeans and corn were planted on 93 percent of U.S. soybean acres (USDA-ERS 2010a) and 23 percent of U.S. corn acres in 2010 (and 86 percent of corn crops were a GM variety) (USDA-ERS 2010b). Under Alternative B, only conventional soybeans and corn seeds would be used in System farming operations in Region 6. Conventional seeds are still available commercially; however, advanced planning by cooperators would be needed as distribution of conventional seed can be limited.

Issue 8. Not Using Glyphosate-Tolerant Soybeans and Corn Could Make Farming More Costly for Cooperators; Local Farming Cooperators Could Lose Income if Farming Is Reduced or Eliminated. Under Alternative B, production costs associated with planting conventional soybeans and corn are higher due to increased costs for fuel (more tilling required) and due to more costly herbicides used to control weeds (Brookes and Barfoot 2010). This would result in decreased farm revenue for System cooperative farmers. This coupled with the difficulty in finding conventional seed varieties may result in fewer farmers willing to participate in refuge farming programs. As a result, fewer acres of current or former cropland would be available for native prairie restoration as the Service does not have the equipment nor the financial resources to implement an active prairie restoration program within existing budget limitations.

As in Alternative A, as existing farmland on System lands is seeded back to native prairie, fewer acres of farmland on System lands will exist. However, such decreases will be offset through additional farming (although reduced) in preparation for prairie restoration of deteriorated fields of exotic grasses or areas that were managed through the go-back method. Newly acquired fee title lands will also likely contain existing farmland that requires prairie restoration. In most situations, the acres of System lands farmed by an individual cooperator make up a small percentage of the cooperator's entire farming operation, limiting the economic impact on individuals. Cooperative farming agreements and special use permits used to authorize farming on System lands in Region 6 are limited to a maximum of 5 years, with many covering only 3 or 4. There are no guarantees for future farming given or implied beyond these specified timeframes. Such limits allow cooperators to plan accordingly and reduce any potential economic impact.

Issue 9. Using Glyphosate-Tolerant Soybeans and Corn Could Affect Certified Organic Farmers. Under Alternative B, glyphosate-tolerant soybeans and corn would not be used on System lands for habitat restoration and management purposes. Consequently, there would be no potential impacts on adjacent organic farmers.

4.3 Comparison of Alternatives

A comparison of Alternatives A and B is shown in table 1.

4.4 Environmental Justice

Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed by

Table 1. Comparison of Alternatives A and B.

Issue	*Alternative A: Continue using glyphosate-tolerant soybeans and corn for habitat restoration and management on System-managed lands in Region 6 (No Action)*	*Alternative B: Disallow the use of glyphosate-tolerant soybeans and corn for habitat restoration and management on System-managed lands in Region 6*
Wildlife Issues		
1. Using glyphosate-tolerant soybeans and corn could provide an alternative for farming that poses less risk to wildlife.	Increased use of conservation tillage and reduced overall toxicity to wildlife species would be expected.	Decreased use of conservation tillage would be expected, and an increased use of herbicides that, in general, are more toxic to wildlife than glyphosate.
2. Agricultural herbicides could be toxic to wildlife.	Glyphosate is less toxic to fish and wildlife than other commonly used agricultural herbicides.	Varies; however, most other commonly used herbicides are more toxic to fish and wildlife.
Habitat Issues		
3. Use of glyphosate-tolerant soybeans and corn could make habitat restoration and management more efficient and economical; the increased costs associated with discontinuing the use of these crops could impede the progress of restoration efforts.	Restoration of prairie is more effective and less costly.	Restoration of prairie is less effective and more costly.
4. Farming combined with using glyphosate-tolerant soybeans and corn could be an effective way to control invasive plants, especially smooth brome and other cool-season exotic grasses.	More effective control of invasive plants due to more timely application of glyphosate during the growing season.	Less effective control of invasive plants.
5. Conservation tillage practices could be used by the Service to minimize soil erosion on cultivated lands.	Increased use of conservation tillage would be expected.	Decreased use of conservation tillage would be expected.
6. Using glyphosate-tolerant soybeans and corn could result in the development of herbicide-resistant weeds on System lands.	Lower risk of developing glyphosate-resistant weeds due to IPM practices, as well as the fact that glyphosate would not be used once a field as been restored to prevent damage to native vegetation.	Less risk of developing glyphosate-resistant weeds due to the reduced amount of glyphosate used in conventional fields.
Socioeconomic Issues		
7. Conventional (not glyphosate-tolerant) soybean and corn seeds may be more difficult to obtain in local communities.	Readily available seed.	Limited availability in some local communities; may be more costly due to limited supplies.
8. Not using glyphosate-tolerant soybeans and corn could make farming more costly for cooperators; local farming cooperators could lose income if farming is reduced or eliminated.	No change from current costs because cooperators have the choice of crop varieties to be used in restoration program.	Reduced profitability based on higher costs associated with growing conventional soybeans and corn.
9. Using glyphosate-tolerant soybeans and corn could affect certified organic farmers.	No effect on organic soybeans; no effect on organic corn with buffer.	No effect on organic soybeans or organic corn.

President Clinton on February 11, 1994. Its purpose was to focus the attention of federal agencies on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low income populations. The order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities with access to public information and participation in matters relating to human health or the environment. Neither management alternative described in this EA would disproportionately place any adverse environmental, economic, social, or health impact on minority and low-income populations.

4.5 Cumulative Impacts

Cumulative impacts are effects on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Potential cumulative impacts for the alternatives are described in this section. The discussion considers the interaction of activities on System lands in Region 6 with other actions occurring over a larger spatial and temporal frame of reference.

As set forth in the Service Manual, Service policy states: "[w]e do not allow refuge uses or management practices that result in the maintenance of nonnative plant communities unless we determine there is no feasible alternative for accomplishing refuge purpose(s)" (601 FW 3 of the Service Manual).

This policy and trends in land management practices indicate that future actions will result in more restoration of cropland to natural habitats on System lands. Conversion of farmland to natural habitats is likely to have little impact on the System on a regional scale, as farmland currently makes up only 0.4 percent of the total fee title acres in Region 6. Restoration to natural habitats could play a larger role in the future as new land is added to the system. An estimated 25 percent of the land that could be purchased in Region 6 is currently farmed. However, given the high cost of prairie restoration activities, refuge managers will remain limited in the number of new acres that can be farmed and subsequently planted back to native grass. Thus in the foreseeable future, we don't expect to see a significant increase in the total number of acres farmed at one time throughout the region. In addition, existing fee title acres that are composed of exotic grasses and other invasive species and that have been previously farmed may be converted to native grass and forb species. The effective restoration of additional mixed-grass and tallgrass prairie habitats using glyphosate-tolerant soybeans and corn will improve the available habitat on individual refuges and waterfowl production areas for grassland-dependent migratory birds, grassland-dependent insects, and grassland-dependent resident wildlife species.

The effective restoration of degraded and weed-infested habitats on System lands to native mixed-grass and tallgrass prairie that can be managed through prescribed fire and prescribed grazing would cumulatively reduce needed expenditures of labor and funds for weed control efforts on System lands in Region 6.

4.6 Proposed Action

Based on the analysis above, the proposed action is Alternative A: Continue using glyphosate-tolerant soybeans and corn for habitat restoration and management on System-managed lands in Region 6 (No Action).

CHAPTER 5—Consultation and Coordination

5.1 Planning Team and Contributors

The Planning Team was made up of representatives from both Regions 3 and 6 and included Kevin Brennan and Doug Wells from Fergus Falls Wetland Management District, Sandra Siekaniec from Region 3 regional office, Mike Brown from Cypress Creek National Wildlife Refuge, Mike Artmann from Region 6 regional office, and Tom Koerner from Sand Lake National Wildlife Refuge Complex.

All members of the Planning Team contributed to the development of this EA. Activities included public scoping, reviewing comments, researching and reading literature, interviewing refuge managers, producing maps, and writing and editing the EA.

5.2 Agencies Consulted

The following agencies were consulted during the development of this EA:

- USDA-APHIS Biotechnology Regulatory Services
- U.S. Environmental Protection Agency, Biopesticides and Pollution Prevention Division
- U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition
- Executive Office of the President, Office of Science and Technology Policy

5.3 Document Availability

Additional copies of this EA are available from the following offices and Web sites.

U.S. Fish and Wildlife Service
Sand Lake National Wildlife Refuge
39650 Sand Lake Drive
Columbia, South Dakota 57433
605/885 6320
www.fws.gov/sandlake/

U.S. Fish and Wildlife Service
Region 6, Division of Refuge Planning
134 Union Blvd., Suite 300
Lakewood, Colorado 80228
303/236 4381
www.fws.gov/mountain-prairie/

Appendix A

Authority

This appendix contains a list of additional laws, regulations, policies, and executive orders that influence the National Wildlife Refuge System (System) beyond those discussed in Section 1.5 of the *Draft Environmental Assessment: Use of Genetically Modified, Glyphosate-Tolerant Soybeans and Corn on National Refuges in the Mountain–Prairie Region*, as completed by the U.S. Fish and Wildlife Service (Service).

The National Wildlife Refuge System Improvement Act of 1997 (Public Law [P.L.] 105-57) indicates in Section 4, Mission of the System, that "the mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate restoration of the fish, wildlife, and plant resources and their habitats with the United States for the benefit of present and future generations of Americans." Section 5, Administration of the System, states that "in administering the System, the Secretary shall— (A) provide for the conservation of fish, wildlife, and plants, and their habitats within the System; (B) ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans." This direction was clarified in 601 FW 3 of the Service Manual, as discussed below.

The Service's Biological Integrity, Diversity, and Environmental Health Policy (601 FW 3 of the Service Manual) directs refuges to "prevent the introduction of invasive species, detect and control populations of invasive species, and provide for restoration of native species and habitat conditions in invaded ecosystems." This policy further directs refuge managers to "develop integrated pest management strategies that incorporate the most effective combination of mechanical, chemical, biological, and cultural controls while considering the effects on environmental health."

Presidential Executive Order 12996 (March 25, 1996), Management and General Public Use of the National Wildlife Refuge System, provides guidance to the Service relative to management of the System. Section 2(b) states "[f]ish and wildlife will not prosper without high-quality habitat, and without fish and wildlife, traditional uses of refuges cannot be sustained. The Refuge System will continue to conserve and enhance the quality and diversity of fish and wildlife habitat within refuges."

The Fish and Wildlife Act of 1956 (16 United States Code [U.S.C.] 742a–742j), as amended, provides general guidance which can be interpreted to include habitat management and restoration that requires the Secretary of the Interior to take steps "required for the development, management, advancement, conservation, and protection of fish and wildlife resources" (742f.a.4).

Presidential Executive Order 13112 (February 3, 1999), Invasive Species, provides general guidance to federal agencies relative to invasive species. Section 2(a)(2), states: "Each federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law, subject to the availability of appropriations, and within Administration budgetary limits, use relevant programs and authorities to: (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them."

Appendix B

List of Preparers and Reviewers[1]

Name	*Title*	*Organization and Location*
Tom Koerner	Deputy Project Leader	USFWS, Sand Lake National Wildlife Refuge Complex, Columbia, South Dakota
Mike Artmann	Wildlife Biologist	USFWS, Region 6, Planning Division, Lakewood, Colorado
David Lucas	Chief of Planning	USFWS, Region 6, Planning Division, Lakewood, Colorado
Kevin Brennan	*Retired*, Project Leader	USFWS, Fergus Falls Wetland Management District, Fergus Falls, Minnesota
Doug Wells	Wildlife Refuge Specialist	USFWS, Fergus Falls Wetland Management District, Fergus Falls, Minnesota
Sandra Siekaniec	Deputy Refuge Supervisor	USFWS, Region 3, Refuges, Minneapolis, Minnesota
Mike Brown	Wildlife Refuge Manager	Cypress Creek National Wildlife Refuge, Ullin, Illinois
Paul Cornes	Refuge Supervisor	USFWS, Division of Refuges, Lakewood, Colorado
Noreen Walsh	Deputy Regional Director	USFWS, Region 6, Lakewood, Colorado

[1] *Additional review provided by ICF International, Sacramento, California.*

Appendix C

Section 7 Intra-Service Biological Evaluation

Intra-Service Section 7 Biological Evaluation Form - Region 6

Originating Person: Tom Koerner/Sand Lake NWRC Date Submitted: 01/24/2011

Telephone Number: 605-885-6320 ext 12

I. **Service Program and Geographic Area or Station Name**: All lands owned in fee title or managed through agreement by the National Wildlife Refuge System (NWRS) in Region 6

II. **Flexible Funding Program** (e.g. Joint Venture, etc) if applicable: NA

III. **Location**: Location of the project including County, State and TSR (township, section & range): All lands owned in fee title or managed through agreement by the National Wildlife Refuge System in Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming which have a previous cropping history and contain soils and receive average precipitation to support growth of corn and soybeans.

IV **Species/Critical Habitat**: List federally endangered, threatened, proposed, and candidate species or designated or proposed critical habitat that may occur within the action area. To obtain species lists by state and county: **http://www.fws.gov/mountain-prairie/endspp/name_county_search.htm**

This Section 7 consultation is programmatic for all NWRS owned and managed lands in Region 6 which have a farming history and contain soils and receive average precipitation to support growth of corn and soybeans. As such, all endangered, threatened, proposed, and candidate species found to occur in Region 6 were reviewed:

Table 1. Endangered, Threatened, Proposed, and Candidate Species listed and which occur in Region 6 (http://www.fws.gov/mountain-prairie/endspp/)

COMMON NAME	SCIENTIFIC NAME	FEDERAL STATUS
Colorado		
Uncompahgre fritillary	*Boloria acrocnema*	E
Bonytail chub	*Gila elegans*	E
Humpback chub	*Gila cypha*	E
Whooping crane	*Grus americana*	E
Black footed ferret	*Mustela nigripes*	E
Southwester willow flycatcher	*Empidonax traillii extimus)*	E
Canada lynx	*Lynx canadensis*	T
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	T
Mexican spotted owl	*Strix occidentalis lucida*	T
Colorado pikeminnow	*Ptychocheilus lucius*	E
Piping plover	*Charadrius melodus*	T
Pawnee montane skipper	*Hesperia leonardus montana*	T
Razorback sucker	*Xyrauchen texanus*	E
Interior least tern	*Sterna antillarum*	E
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	T
Gray wolf	*Canis lupus*	E

Colorado butterfly plant	*Gaura neomexicana spp. coloradensis*	T
Ute ladies'-tresses orchid	*Spiranthes diluvialis*	T
Western prairie fringed orchid	*Platanthera praeclara*	T
North Park phacelia	*Phacelia formosula*	E
Penland alpine fen mustard	*Eutrema penlandii*	T
Penland beardtongue	*Penstemon penlandii*	E
Colorado Basin hookless cactus	*Sclerocactus glaucus*	T
Clay-loving wild buckwheat	*Eriogonum pelinophilum*	E
Dudley Bluffs bladderpod	*Lesquerella congesta*	T
Knowlton cactus	*Pediocactus knowltonii*	E
Mesa Verde cactus	*Sclerocactus mesaeverdae*	T
Mancos milk-vetch	*Astragalus humillimus*	E
Osterhout milk-vetch	*Astragalus osterhoutii*	E
Dudley Bluffs twinpod	*Physaria obcordata*	T
Parachute beardtongue	*Penstemon debilis*	PT
DeBeque phacelia	*Phacelia submutica*	PT
Pagosa skyrocket	*Ipomopsis polyantha*	PE
Yellow-billed cuckoo	*Coccyzus americanus*	C
Arkansas darter	*Etheostoma cragini*	C
Sprague's pipit	*Anthus spragueii*	C
Gunnison's prairie dog	*Cynomys gunnisoni*	C
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	C
Greater sage grouse	*Centrocercus minimus*	C
Rio Grande cutthroat trout	*Oncorhynchus claki virginalis*	C
North American wolverine	*Gulo gulo luscus*	C
White River beardtongue	*Penstemon scariosus albifluvis*	C
Schmoll milk-vetch	*Astragalus schmolliae*	C
Sleeping Ute milk-vetch	*Astragalus tortipes*	C
Milk-vetch (unnamed)	*Astragalus microcymbus*	C
Kansas		
Gray bat	*Myotis grisescens*	E
American burying beetle	*Nicrophorus americanus*	E
Whooping crane	*Grus americana*	E
Neosho madtom	*Noturus placidus*	T
Piping plover	*Charadrius melodus*	T
Arkansas River shiner	*Notropis girardi*	T
Topeka shiner	*Notropis Topeka (=tristis)*	E
Pallid sturgeon	*Scaphirhynchus albus*	E
Interior least tern	*Sterna antillarum*	E
Mead's Milkweed	*Asclepias meadii*	T
Western prairie fringed orchid	*Platanthera praeclara*	T
Sheepnose mussel	*Plethobascus cyphyus*	PE
Snuffbox mussel	*Epioblasma triquetra*	PE
Spectaclecase (mussel)	*Cumberlandia monodonta*	PE
Arkansas Darter	*Etheostoma cragini*	C
Neosho mucket	*Lampsilis rafinesqueana*	C
Sprague's pipit	*Anthus spragueii*	C
Lesser prairie-chicken	*Tympanuchus pallidicinctus*	C
Gunnison sage-grouse	*Centrocercus minimus*	C
Montana		
Grizzly bear	*Ursus arctos horribilis*	E
Whooping crane	*Grus americana*	E

Black footed ferret	*Mustela nigripes*	E
Canada lynx	*Lynx canadensis*	T
Piping plover	*Charadrius melodus*	T
Pallid sturgeon	*Scaphirhynchus albus*	E
White sturgeon	*Acipenser transmontanus*	E
Interior least tern	*Sterna antillarum*	E
Bull trout	*Salvelinus confluentus*	T
Water Howellia	*Howellia aquatilis*	T
Ute Ladies'-tresses	*Spiranthes diluvialis*	T
Spalding's Campion (or "catchfly")	*Silene spaldingii*	T
Yellow-billed cuckoo	*Coccyzus americanus*	C
Arctic grayling	*Thymallus arcticus*	C
Sprague's pipit	*Anthus spragueii*	C
Greater sage grouse	*Centrocercus urophasianus*	C
North American wolverine	*Gulo gulo luscus*	C
Nebraska		
American burying beetle	*Nicrophorus americanus*	E
Whooping crane	*Grus americana*	E
Piping plover	*Charadrius melodus*	T
Topeka shiner	*Notropis topeka (=tristis)*	E
Pallid sturgeon	*Scaphirhynchus albus*	E
Interior least tern	*Sterna antillarum*	E
Salt Creek tiger beetle	*Cicindela nevadica lincolniana*	E
Blowout Penstemon	*Penstemon haydenii*	E
Western prairie fringed orchid	*Platanthera praeclara*	T
Spectaclecase (mussel)	*Cumberlandia monodonta*	PE
Sprague's pipit	*Anthus spragueii*	C
Greater sage grouse	*Centrocercus urophasianus*	C
North Dakota		
Whooping crane	*Grus Americana*	E
Black footed ferret	*Mustela nigripes*	E
Piping plover	*Charadrius melodus*	T
Pallid sturgeon	*Scaphirhynchus albus*	E
Least tern, interior population	*Sterna antillarum*	E
Gray wolf, Lower 48 States	*Canis lupus*	E
Western prairie fringed orchid	*Platanthera praeclara*	T
Sprague's pipit	*Anthus spragueii*	C
Greater sage grouse	*Centrocercus urophasianus*	C
Dakota skipper	*Hesperia dacotae*	C
North American wolverine	*Gulo gulo luscus*	C
South Dakota		
American burying beetle	*Nicrophorus americanus*	E
Whooping crane	*Grus americana*	E
Black footed ferret	*Mustela nigripes*	E
Scaleshell mussel	*Leptodea leptodon*	E
Piping plover	*Charadrius melodus*	T
Topeka shiner	*Notropis topeka (=tristis)*	E
Pallid sturgeon	*Scaphirhynchus albus*	E
Interior least tern	*Sterna antillarum*	E
Gray wolf	*Canis lupus*	E
Western prairie fringed orchid	*Platanthera praeclara*	T
Sprague's pipit	*Anthus spragueii*	C

Greater sage grouse	*Centrocercus urophasianus*	C
Dakota skipper	*Hesperia dacotae*	C
	Utah	
Kenab ambersnail	*Oxyloma haydeni kanabensis*	E
Bonytail chub	*Gila elegans*	E
Humpback chub	*Gila cypha*	E
Virgin River chub	*Gila seminuda (=robusta)*	E
Black footed ferret	*Mustela nigripes*	E
Southwestern willow flycatcher	*Empidonax traillii extimus*	E
Canada lynx	*Lynx canadensis*	T
Mexican spotted owl	*Strix occidentalis lucida*	T
Colorado pikeminnow	*Ptychocheilus lucius*	E
Utah prairie dog	*Cynomys parvidens*	T
June sucker	*Chasmistes liorus*	E
Razorback sucker	*Xyrauchen texanus*	E
Desert tortoise	*Gopherus agassizii*	T
Lahontan cutthroat trout	*Onocorhynchus clarki henshawi*	T
Gray wolf	*Canis lupus*	E
Woundfin	*Plagopterus argentissimus*	E
Ute ladies'-tresses	*Spiranthes diluvialis*	T
Uinta Basin hookless cactus	*Sclerocactus wetlandicus*	T
Barneby ridge-cress	*Lepidium barnebyanum*	E
Pariette cactus	*Sclerocactus brevispinus*	T
Shrubby reed-mustard	*Schoenocrambe suffrutescens*	E
Jones cycladenia	*Cycladenia humilis* var. *jonesii*	T
Last Chance townsendia	*Townsendia aprica*	T
Maguire daisy	*Erigeron maguirei*	T
San Rafael Cactus	*Pediocactus despainii*	E
Winkler cactus	*Pediocactus winkleri*	T
Wright fishhook cactus	*Sclerocactus wrightiae*	E
Autumn buttercup	*Ranunculus aestivalis*	E
Kodachrome bladderpod	*Lesquerella tumulosa*	E
Siler pincushion cactus	*Pediocactus sileri*	T
Welsh's milkweed	*Asclepias welshii*	T
Navajo sedge	*Carex specuicola*	T
Heliotrope milkvetch	*Astragalus montii*	T
Clay reed-mustard	*Schoenocrambe argillacea*	T
Deseret milkvetch	*Astragalus desereticus*	T
Dwarf bear-poppy	*Arctomecon humilis*	E
Holmgren milkvetch	*Astragalus holmgreniorum*	E
Shivwits milkvetch	*Astragalus ampullarioides*	E
Barneby reed-mustard	*Schoenocrambe barnebyi*	E
Least chub	*Iotichthys phlegethontis*	C
Yellow-billed cuckoo	*Coccyzus americanus*	C
Relict leopard frog	*Lithobates onca*	C
Gunnison's prairie dog	*Cynomys gunnisoni*	C
Greater sage grouse	*Centrocercus urophasianus*	C
Coral pink sand dunes tiger beetle	*Cicindela albissima*	C
North American wolverine	*Gulo gulo luscus*	C
White River beardtongue	*Penstemon scariosus albifluvis*	C
Gierisch mallow	*Sphaeralcea gierischii*	C

Goose Creek milkvetch	*Astragalus anserinus*	C
	WYOMING	
Grizzly bear	*Ursus arctos horribilis*	T
Kendall Warm Springs Dace	*Rhinichthys osculus thermalis*	E
Black footed ferret	*Mustela nigripes*	E
Canda lynx	*Lynx canadensis*	T
Razorback sucker	*Xyrauchen texanus*	E
Wyoming toad	*Bufo baxteri (=hemiophrys)*	E
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	T
Colorado butterfly plant	*Gaura neomexicana var. coloradensis*	T
Ute Ladies tresses	*Spiranthes diluvialis*	T
Blowout Penstemon	*Penstemon haydenii*	E
Desert yellowhead	*Yermo xanthocephalus*	T
Yellow-billed cuckoo	*Coccyzus americanus*	C
Arctic grayling	*Thymallus arcticus*	C
North American wolverine	*Gulo gulo luscus*	C

V. **Project Description:** Describe proposed project or action or, if referencing other documents, prepare an executive summary (attach additional pages as needed):
Use of glyphosate tolerant corn and soybeans for habitat restoration and management purposes on lands owned in fee title or managed through agreement by the National Wildlife Refuge System in Region 6. Primary use will be to prepare a seedbed on previously or currently cropped sites for prairie reconstruction purposes. An additional use would include incorporation into a Station's Integrated Pest Management Program for the control of invasive and noxious plant species. An example would be use on NWRS managed lands behind flood control dams where prairie restoration would not be warranted due to the likelihood of future flooding.

VI. **Determination of Effects:**
(A) Description of Effects: Describe the action(s) that may affect the species and critical habitats listed in item IV. Your rationale for the Section 7 determinations made below (B) should be fully described here.

The USDA Animal Plant Health Inspection Service (APHIS) completed a thorough review of impacts of glyphosate tolerant corn and soybeans on threatened and endangered species through Environmental Assessment's (EA) prior to their general release to the public. The final EA's for both concluded that no effect is expected on federally listed threatened and endangered species, species proposed for listing, or their proposed or designated critical habitats from exposure to glyphosate tolerant corn or soybeans or from exposure to label rates of glyphosate expected to be used in conjunction with glyphosate tolerant corn and soybeans. In addition, the Environmental Protection Agency had not received any reported adverse effects on threatened or endangered species or their habitats from exposure to glyphosate or glyphosate tolerant corn and soybeans.

Glyphosate and glyphosate tolerant corn and soybeans have been used previously on NWRS owned and managed lands in Region 6. Prior to use, each individual Refuge completes an annual Pesticide Use Proposal for glyphosate and evaluates any potential impacts of glyphosate use on threatened, endangered, proposed, or candidate species known to occur or likely to occur on that Refuge. Glyphosate is applied only to upland sites, and when used according to label is rain fast in a matter of

hours. Glyphosate breaks down to inert substances within days and adheres closely to soil particles, significantly reducing the opportunity for it to move in to surface or groundwater. It has one of the lowest toxicity level ratings for herbicides currently in use. These factors result in no effects on all of the aquatic endangered, threatened, proposed and candidate species listed in Table 1.

All of the endangered, threatened, proposed and candidate species listed in Table 1, with the exception of whooping crane, piping plover, interior least tern, and Sprague's pipit, do not occur in cropped sites. These four bird species may visit corn and soybean fields during migratory periods, but would not be present when glyphosate was applied. There is no evidence that eating glyphosate tolerant corn or soybeans would adversely affect these species (USDA 2007, USDA 2000). Endangered, threatened, proposed and candidate mammal species listed in Table 1. are unlikely to occur in cropped sites, however if they were exposed to glyphosate tolerant corn or soybeans or to glyphosate, there is no evidence they would be adversely affected (USDA 2007, USDA 2000). Endangered, threatened, proposed and candidate plant species listed in Table 1. would be negatively affected if exposed to glyphosate during the growing season. All Refuges which have documented threatened or endangered plant species listed in Table 1., or the likelihood of these species occurring have completed plant surveys. In addition, all of the plant species listed in Table 1. do not occur in previously cropped sites, eliminating the possibility that threatened or endangered plant species could be accidentally sprayed with glyphosate.

A thorough review of the available literature related to the use of glyphosate tolerant corn and soybeans has been completed. There is no credible evidence in the literature that the use of glyphosate tolerant corn and soybeans or the use of glyphosate poses any risk to endangered, threatened, proposed, or candidate species or their habitats or proposed critical habitats.

The proposed use of glyphosate tolerant corn and soybeans on NWRS owned and managed lands for the purposes of habitat restoration and management will have no adverse effect on endangered, threatened, proposed, or candidate species or their habitats or proposed critical habitats in Region 6.

(B) Determination: Determine the anticipated effects of the proposed project on species and critical habitats listed in item IV. Check all applicable boxes and list the species (or attach a list) associated with each determination.

	Determination
No Effect: This determination is appropriate when the proposed project will not directly or indirectly affect (neither negatively nor beneficially) individuals of listed/proposed/candidate species or designated/proposed critical habitat of such species. **No concurrence from ESFO required.**	XXX
May Affect but Not Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to cause insignificant, discountable, or wholly beneficial effects to individuals of listed species and/or designated critical habitat. **Concurrence from ESFO required.**	_____
May Affect and Likely to Adversely Affect: This determination is appropriate when the proposed project is likely to adversely impact individuals of listed species and/or designated critical habitat. **Formal consultation with ESFO required.**	_____
May affect but Not Likely to Jeopardize candidate or proposed species/critical habitat: This determination is appropriate when the proposed project may affect, but is not expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Concurrence from ESFO optional.**	_____
Likely to Jeopardize candidate or proposed species/critical habitat: This determination is appropriate when the proposed project is reasonably expected to jeopardize the continued existence of a species proposed for listing or a candidate species, or adversely modify an area proposed for designation as critical habitat. **Conferencing with ESFO required.**	_____

Signature Richard A Coleman Date 2/11/11
[Supervisor at originating station]

Reviewing Ecological Services Office Evaluation (check all that apply):

A. **Concurrence** _____ **Nonconcurrence** _____

Explanation for nonconcurrence:

B. Formal consultation required _____

List species or critical habitat unit

C. Conference required _____

List species or critical habitat unit

Name of Reviewing ES Office _____

Signature

Date

_____ _____

REFERENCES

http://www.fws.gov/mountain-prairie/endspp/

USDA-APHIS. 2007. Environmental Assessment and FONSI in response to petition 06-178-01p soybean line MON 89788. http://www.aphis.usda.gov/brs/aphisdocs2/06_17801p_com.pdf

USDA-APHIS. 2000. Environmental Assessment and FONSI in response to petition 00-011-01p corn line NK603. http://www.aphis.usda.gov/brs/aphisdocs2/00_01101p_com.pdf

Appendix D

Compatibility Determination

D.1 Use

Use of glyphosate-tolerant soybeans and corn for habitat restoration and management on National Wildlife Refuge System (System) owned or managed lands in Region 6.

D.2 Refuge Name

- Arrowwood Complex
- Audubon Complex
- Devils Lake Complex
- Flint Hills National Wildlife Refuge
- Huron Wetland Management District
- Kirwin National Wildlife Refuge
- Kulm Wetland Management District
- Lake Andes Complex
- Long Lake Complex
- Madison Wetland Management District
- Marais des Cygnes National Wildlife Refuge
- Quivira National Wildlife Refuge
- Rainwater Basin Wetland Management District
- Souris River Basin Complex
- Sand Lake Complex
- Tewaukon Complex
- Waubay Complex

D.3 County

All counties within National Wildlife Refuges and Wetland Management Districts listed above in Region 6.

D.4 Establishing and Acquisition Authority(ies)

System lands are managed consistent with a number of federal statutes, regulations, policies, and other guidance. The National Wildlife Refuge System Administration Act of 1966, as amended (16 United States Code [U.S.C.] 668dd–668ee) (Administration Act) is the core statute guiding management of the System.

The National Wildlife Refuge System Improvement Act of 1997 (Public Law [P.L.] 105-57) made important amendments to the Administration Act, one of which was the mandate that a comprehensive conservation plan be completed for every unit of the System. Among other things, comprehensive conservation planning has required field stations to assess their current farming program and establish objectives for the future.

The Migratory Bird Hunting Stamp Act of March 16, 1934, as amended by section 3 of the Act of August 1, 1958 (72 Stat. 486, 16 U.S.C. sec. 716 d[c]), authorized the Secretary of Interior to acquire small wetland or pothole areas suitable as Waterfowl Production Areas.

Additional Authorities include the following: Consolidated Farm and Rural Development Act, Migratory Bird Conservation Act, North American Wetlands Conservation Act, and the Emergency Wetlands Resources Act.

D.5 Refuge Purpose(s)

- As "a refuge and breeding ground for migratory birds and other wildlife, for use as an inviolate sanctuary, or for any other management purpose for migratory birds." *Migratory Bird Conservation Act*
- As "Waterfowl Production Areas" subject to "*[...]* all of the provisions of such Act *[Migratory Bird Conservation Act] [...]* except the inviolate sanctuary provisions." *16 U.S.C. 718(c) Migratory Bird Hunting and Conservation Stamp*
- For "any other management purpose, for migratory birds." *16 U.S.C. sec. 715d Migratory Bird Conservation Act*
- For "conservation purposes *[...]*" *7 U.S.C. sec. 2002 Consolidated Farm and Rural Development Act*

Establishing Authorities and Refuge Purposes for individual Units may be obtained online at www.fws.gov/refuges/policiesandbudget/purposes/Purposes_Search.cfm.

D.6 National Wildlife Refuge System Mission

The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

D.7 Description of Use

What is the use? Is the use a wildlife-dependent public use? The use is as follows: use of glyphosate-tolerant corn and soybeans for habitat restoration and management purposes on lands owned in fee title or managed through agreement by the National Wildlife Refuge System in Region 6. The primary use will be to prepare a seedbed on previously or currently cropped sites for prairie reconstruction purposes. An additional use would include incorporation into a station's integrated pest management program for the control of invasive and noxious plant species. An example would be use on System-managed lands behind flood control dams where prairie restoration would not be warranted due to the likelihood of future flooding.

The use is not a wildlife-dependent public use.

Where would the use be conducted? The use would be conducted on lands owned in fee title or managed through agreement by the System in Region 6, in Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming, that are currently farmed or have previously been farmed and contain soils and receive average precipitation to support growth of agricultural soybeans and corn.

When would the use be conducted? Use would be ongoing. The use of glyphosate-tolerant soybeans and corn would be allowed as part of an integrated pest management program used to prepare a seedbed for habitat restoration and management and/or to control noxious and invasive vegetation.

How would the use be conducted? Use would be conducted by cooperative farmers through a cooperative farming agreement or by special use permit.

Why is this use being proposed? Refuge managers' experience combined with published literature indicates that use of glyphosate-tolerant soybeans and corn—which allows for the application of an herbicide containing the active ingredient glyphosate during the growing season—is very effective at killing invasive cool season grasses and other noxious and invasive species. This results in a weed-free seedbed used for habitat restoration purposes, which increases the possibility of successful habitat reconstruction efforts on System-managed and -owned lands.

D.8 Availability of Resources

Resources involved in the administration and management of the use:

- No additional management or administrative costs will be associated with this activity.
- Special equipment, facilities, or improvements necessary to support the use: none
- Maintenance costs: none
- Monitoring costs: none
- Offsetting revenues: none

D.9 Anticipated Impacts of the Use

Short-term impacts

The use of glyphosate-tolerant soybeans and corn will increase the likelihood that conservation tillage can be successfully conducted, reducing soil erosion.

Long-term impacts

The effective reconstruction of degraded and weed-infested habitats on System lands to native mixed-grass and tallgrass prairie which can be managed through the historical ecological processes of prescribed fire and prescribed grazing, will cumulatively reduce needed expenditures of labor and funds for weed control efforts on System lands in Region 6 over the long term.

D.10 Stipulations Necessary to Ensure Compatibility

1. Refuge managers will comply with all existing and current policies regarding the use of genetically modified crops (glyphosate-tolerant soybeans and corn).
2. Activity will occur only on currently farmed or previously farmed System-owned or -managed lands.

D.11 Public Review and Comment

The period of public review and comment was held from February 2, 2011 through March 4, 2011. A total of eleven written comments were received. Responses to substantive comments can be found in appendix F.

Why was this level of public review and comment selected? It is appropriate to provide opportunity to comment on this compatibility determination at the same time as the draft environmental assessment. The proposed activity has a national as well as local level of interest, and it was felt that a full month with wide distribution should be given to review.

Signature: Refuge Manager

3/27/11

Kim Hanson, Arrowwood Complex (Signature) (Date)

3/28/11

Lloyd Jones, Audubon Complex (Signature) (Date)

3/30/11

Roger Hollevoet, Devils Lake Complex (Signature) (Date)

3/24/11

Mike Rich, Flint Hills National Wildlife Refuge (Signature) (Date)

3/25/2011

Clarke Dirks, Huron Wetland Management District (Signature) (Date)

3-28-11

Craig Mowry, Kirwin National Wildlife Refuge (Signature) (Date)

3/29/2011

Mick Erickson, Kulm Wetland Management District (Signature) (Date)

3-31-11

Brian DeVries, Lacreek National Wildlife Refuge (Signature) (Date)

3/25/2011

Mike Bryant, Lake Andes Complex (Signature) (Date)

3/25/2011

Paul VanNingen, Long Lake Complex (Signature) (Date)

3-25-11

Tom Turnow, Madison Wetland Management District (Signature) (Date)

3/28/2011

Patrick Martin, Marais des Cygnes National Wildlife Refuge (Signature) (Date)

Dan Severson 4/6/2011

Dan Severson, Quivira National Wildlife Refuge (Signature) (Date)

Gene D Mack 3-29-11

Gene Mack, Rainwater Basin Wetland Management District (Signature) (Date)

Harris Hoistad 3-28-11

Harris Hoistad, Sand Lake Complex (Signature) (Date)

Kelly M. Hogan 3/25/11

Kelly Hogan, Souris River Basin Complex (Signature) (Date)

3/25/11

Rob Bundy, Tewaukon Complex (Signature) (Date)

Larry D Martin 29 March 2

Larry Martin, Waubay Complex (Signature) (Date)

Review: Regional Compatibility Coordinator Lloyd Jones 3/28/11

Lloyd Jones (Date)

Review: Zone Supervisor J. Paul Cornes 4-8-11

Paul Cornes (Date)

Review: Zone Supervisor Barbara Boyle 4-18-11

Concurrence: Regional Chief Richard A Coleman 4/18/11

Rick Coleman (Date)

Mandatory 10- or 15-year Re-Evaluation Date: 2021

Appendix E

Response to Comments

Letter 1. Northwest Environmental Defense Center (page 1 of 13).

No.	*Letter*	*Response*
1-1	**NORTHWEST ENVIRONMENTAL DEFENSE CENTER** 10015 SW Terwilliger Blvd, Portland, Oregon 97219 Phone: (503) 768-6673 / Fax: (503) 768-6671 www.nedc.org To: Tom Koerner c/o Sand Lake National Wildlife Refuge Complex 39650 Sand Lake Drive, Columbia SD 57433 r6gmcomments@fws.gov March 3, 2011 Re: Comment on Draft Environmental Assessment Addressing Use of Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge System Lands. Mr. Koerner, The Northwest Environmental Defense Center (NEDC) submits these comments on the Draft Environmental Assessment (EA) Addressing Use of Glyphosate-Tolerant (GT) Soybeans and Corn on National Wildlife Refuge (NWR) System Lands. The Fish and Wildlife Service (FWS) should not continue to use transgenic GT crops on NWR lands due to the potential risks to wildlife and the ecosystem from transgenic crops and the attendant herbicide use. FWS should either choose Alternative B, eliminating the use of GT corn and soy on Refuge lands, or complete a full Environment Impact Statement (EIS) addressing the effects of agriculture using transgenic crops and herbicide on NWR lands, and reasonable alternatives to this practice. NEDC questions the practice of using herbicide-agriculture on NWR lands at all, and would like to see the agency re-think this practice and consider reasonable alternatives, in addition to discontinuing the use of transgenic crops on Refuges. According to FWS's own policy, it may "not use genetically modified organisms in refuge management unless [FWS] determine[s] their use is essential to accomplishing refuge purpose(s)." 601 FW 3.15C (amended 7/31/2006). This EA has failed to show either that transgenic crops will not significantly affect the environment or that they are essential to accomplishing refuge purposes. Thus, FWS should either discontinue use of transgenic crops (Alternative B) and reconsider herbicide-agriculture as a refuge management tool, or complete a full EIS to comply with the National Environmental Policy Act (NEPA) before continuing GT crop use under Alternative A. NEDC is an independent, non-profit organization with a mission to preserve and protect the environment and natural resources of the Pacific Northwest. NEDC provides legal support to individuals and grassroots organizations with environmental concerns, and engages in litigation independently or in conjunction with other environmental groups. NEDC was established by a group of professors, law students and attorney alumni at Lewis and Clark Law School in 1969. NEDC's members are concerned about the management of national public resources such as Wildlife Refuges and pesticide use in general. NEDC's members recreate in and enjoy many 1	1-1. Thank you for your comments. The U.S. Fish and Wildlife Service (Service) has developed a ranged of alternatives for this environmental assessment (EA) necessary to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a Finding of No Significant Impact (FONSI) (40 CFR 1508). The purpose of this EA was specifically to address whether or not the use of two genetically modified (GM) crop varieties on limited refuge lands within Region 6 constituted a major federal action requiring the development of an EIS. The purpose was not intended to evaluate all alternatives available to refuge managers to restore grassland habitats. Other National Environmental Policy Act (NEPA) documents such as comprehensive conservation plans and habitat management plans specifically look at a range of alternatives to restore habitats, among others things, on individual refuges.

Letter 1. Northwest Environmental Defense Center (page 2 of 13).

No.	Letter	Response
	National Wildlife Refuges and are concerned about the wildlife, ecosystem, and biodiversity of NWRs. Thank you for the opportunity to comment.	
1-2	I. REASONABLE RANGE OF ALTERNATIVES. A. **Stated "Purpose and Need" is Too Narrow and Insufficient to Meet the Requirements of NEPA and the Purpose of NWRs.** *1. Chapter 1 Fails to Set Out the FWS' Purpose of the Proposed Action.* According to CEQ, the "NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." 40 C.F.R. §1500.1.The Purpose and Need section of an EA or EIS determines the scope of the reasonable alternatives and may not be so narrowly construed as to limit the range of alternatives considered. Recent case law makes this point clear. *See Nat'l Parks and Conservation Ass'n v. BLM*, 606 F.3d 1058, 1070-72 (9th Cir. 2010) (BLM may not define the purpose and need so narrowly that is forecloses a consideration of a reasonable range of alternatives, nor in such a way that only one alternative would accomplish the goals of the agency action); *Davis v. Mineta*, 302 F.3d 1104, 1119–20 (10th Cir. 2002) (reasoning that although an agency may reject alternatives that do not meet the purpose and need of a project, it may not define the project so narrowly that it foreclosed a reasonable consideration of alternatives); *Simmons v. U.S. Army Corp* 120 F.3d 664, 669 (7th Cir. 1997) (an agency cannot narrowly write the purpose and need so as to define away competing reasonable alternatives). The Purpose and Need section makes no mention of the Conceptual Management Plans (CMP) or Comprehensive Conservation Plans (CCP) for the NWRs involved in the proposed action. Without consideration of the specific purposes laid out within the affected NWR's, officials will not have a sufficient basis to make a decision regarding the action.	1-2. The purpose of this document was clearly laid out in the EA. This EA is not specifically addressing all alternatives available to refuge managers to restore habitats on national wildlife refuges in Region 6. Rather it is very focused on whether the action of allowing two varieties of GM crop types on refuges is a major federal action significantly affecting the human environment. This EA provides sufficient evidence and analysis for determining whether to prepare an EIS (40 CFR 1508.9).
1-3	Although the Decision Framework section mentions management plans focused on "emphasis on providing high-quality nesting cover for grassland-dependent migratory bird populations" within Region 6, there is no consideration made within the context of this EA's purpose. EA at 1. The Purpose section does not specifically set out any goals to be achieved through the proposed action.	1-3. The National Wildlife Refuge Improvement Act of 1997 required all units of the National Wildlife Refuge System (System) to be managed with a 15-year comprehensive conservation plan. This is mentioned in the EA. If a refuge had an existing farming program when a CCP was completed, then a review was completed during the NEPA process. Compatibility determinations, which are required for all refuge uses, are also completed.
	2. The "Need for Action" Identified in Chapter 1 is Too Narrowly Construed Because it Fails to Address Conventional Agricultural Practices on NWR Land in General.	
1-4	As illustrated by the recent case enjoining Region 5 from further GMO planting without an EA or EIS, allowing GMO crops within NWRs is clearly a major federal action affecting the environment. *Delaware Autobahn Society v. Secretary, U.S. Dept. of the Interior*, 2007 WL 4426024, 451 (D. Del.). In that case, the court determined all actions involving GMO crops within the System require as EA or EIS. *Id.* Here, the EA's Purpose too narrowly focuses on glyphosate-tolerant soybean and corn crops without considering the general implications of planting GMO crops within the System.	1-4. See comment 1-2.
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	CEQ regulations require that agencies adopt procedures "to ensure that decisions are made in accordance with the policies and purposes of the Act." 40 C.F.R. §1505.1. The act was established to ensure that federal agencies carefully consider the environmental impacts of their projects and that information about those impacts be made available to the public. *Delaware,* 2007 WL 4426024, 450 citing *Spiller v. White,* 352 F.3d 235, 237 (5th Cir. 2004). As recognized by Region 5's Prime Hook National Wildlife Refuge Biological Profile "genetically engineered crops disrupt soil micro-food webs, disrupt the natural biological process that shape genomes, organisms, and communities of soil organisms to insects and other wildlife species." The FWS did not contest these findings. *Delaware,* 2007 WL 4426024, 451. An increase in GE usage, in general, gives rise to a need to reassess agricultural uses of NWR lands within the framework of NEPA and CEQ regulations. "The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." 601 FW 1.6. Given the EA's finding that GMO soy and corn is the norm in conventional agriculture, the Need for Action would be better framed to address whether agricultural use of NWR land is a proper means of meeting the System's mission and goals.	
1-5	**B. The Range of Alternatives and Analysis of Possible Alternatives is Too Limited to Meet NEPA Requirements.** *1. The FWS Does Not "Study, Develop, and Describe" the Alternatives of "Go-Back" and "Organic Farming Alternatives" as Required by CEQ Regulations.*	1-5. See comment 1-1.
1.6	CEQ regulations require that agencies adopt procedures "to ensure that decisions are made in accordance with the policies and purposes of the Act." 40 C.F.R. §1505.1. NEPA "was established to ensure that federal agencies carefully consider the environmental impacts of their projects and that information about those impacts be made available to the public." *Delaware,* 2007 WL 4426024, 450 citing *Spiller v. White,* 352 F.3d 235, 237 (5th Cir. 2004). NEPA requires agencies to identify and develop a reasonable range of alternatives to the proposed action. A reasonable range of alternatives is the "heart" of the NEPA analysis. 40 C.F.R. § 1502.14. A failure to develop all possible alternatives prevents officials from being able to properly consider alternative actions. In this EA, officials are left with two options, both of which involve conventional agricultural practices that require repeated herbicide application on NWR land. Without developing additional alternatives, officials are left with a narrow range of alternatives that focuses solely on mitigating the amount of herbicide used, to reduce environmental impacts. Alternatives that eliminate the introduction of any herbicides, and the subsequent environmental consequences of that herbicide use, should be given additional weight and fully developed in light of NEPA's stated purpose and the purpose of NWRs.	1-6. Nothing in the EA mandates or directs refuge managers to use farming (conventional or GM crops) to meet habitat restoration objectives. Rather, farming is a tool which can be used, when appropriate, to restore grassland habitats within the context of an overall refuge-specific habitat management plan and direction within a CCP document. Herbicide use on refuges is governed by approved integrated pest management (IPM) plans (569 FW 1) and Pesticide Use Proposals (PUPs), and applied following all label guidelines and restrictions.

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	2. The Two Alternatives of "No Action" and "Disallow Use" Do Not Provide a Sufficient Range of Alternatives.	
1-7	NEPA requires that "all agencies of the Federal Government" "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 U.S.C. § 4332. Other possible alternatives were considered by an EA for the agricultural program in the Cibola NWR in Region 2. Draft Environmental Assessment: Cibola National Wildlife Refuge Agricultural Program, *available at* http://www.fws.gov/southwest/refuges/plan/PDFs/Cibola%20Draft%20EA.pdf. Such alternatives not considered in this Region 6 EA include: • Moist-soil management; • A reduction of farmed acres in combination with some habitat restoration to address budgetary concerns and minimize herbicide use; • Use of volunteers for manual removal of invasive species. *Id.*	1-7. Individual regions have each chosen their own approaches to evaluating the role of farming and use of GM crop types on refuge lands. In many cases this is due to differing management goals for habitats (e.g., wintering habitat versus breeding habitat). Region 6, in collaboration with Region 3, specifically evaluated the use of two GM crops as part of a grassland restoration program. Many techniques exist to restore or enhance habitats (e.g., prescribed fire and prescribed grazing) depending on site-specific conditions and goals and objectives stated in approved management plans including comprehensive conservation plans and more detailed habitat management plans.
1-8	In this EA, the FWS has failed to develop a sufficient range of appropriate alternatives. The System's Biological Integrity, Diversity and Environmental Health Policy states that the System does "not allow refuge uses or management practices that result in the maintenance of non-native plant communities unless we determine there is no feasible alternative for accomplishing refuge purposes." 601 FW 3 Part 3.15C. Given this policy and the EA's lack of consideration of additional alternatives mentioned above, the FWS has fallen short of fulfilling its duties under NEPA as well as its duties to support the System's mission and policies. By failing to consider all appropriate alternatives, the FWS will not be able to fulfill its NEPA mandate to make a decision that is "based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." 40 C.F.R. §1500.1.	1-8. The excerpt of the System's Biological Integrity, Diversity, and Environmental Health policy is stated correctly. In Region 6, farming is conducted almost exclusively on a short-term basis as part of a grassland restoration strategy. Typically after 2–5 years, cropped fields are restored to native vegetation, thus improving the biological integrity and wildlife value of a degraded farm field. The exception is refuges that are managed as overlay refuges, where the Bureau of Reclamation or U.S. Army Corps of Engineers manage flood retention or irrigation reservoirs. In these cases, upland habitat that is farmed may be periodically inundated by flood events, thus it makes little sense to restore grassland habitats. See comment 1-5 for range of alternatives response.
	II. DIRECT, INDIRECT, AND CUMULATIVE IMPACTS.	
1-9	Despite claims in the EA to the contrary, several scientific studies illustrate that there are negative direct, indirect and cumulative impacts on the environment through the cultivation of genetically modified (GE) glyphosate-tolerant soybean and corn crops. Wildlife and human populations can be harmed and there is considerable concern regarding both non-GE crop contamination and the spread of glyphosate-tolerant "super weeds." These discrepancies make it imperative that a full-scale EIS be completed to address the impacts on both the wildlife refuges in which the crops are grown, as well as the surrounding areas. FWS appears to write-off these potential effects by pointing to past flawed analyses by USDA/APHIS concerning the effects of two specific transgenic varieties of soy and corn. EA at 4. FWS ignores the fact that APHIS' NEPA analyses of transgenic crops are often inadequate, as determined by several court decisions. Geertson Seed Farms v. Johanns, C 06-01075 CRB, 2007 WL 518624 (N.D. Cal. 2007), considered APHIS' deregulation of transgenic alfalfa and found that "APHIS's reasons for concluding that the potential for the transmission of the genetically engineered gene is not significant are not 'convincing' and do not demonstrate the 'hard look' that NEPA requires." Potential harm from the release of transgenic alfalfa was recognized by the Supreme Court in Monsanto Co. v. Geertson Seed Farms, 130 S. Ct. 2743, 2754-55 (2010) (recognizing potential	1-9. The three federal agencies—the U.S. Food and Drug Administration, U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS), and the U.S. Environmental Protection Agency—that oversee the regulation and approval of these two GM crops have all concluded that these products are safe and that the use of glyphosate is more environmentally benign than many other herbicides it replaces. The Service does not view the NEPA analysis and federal reviews related to glyphosate-tolerant soybeans (USDA-APHIS 2007) and glyphosate-tolerant corn (USDA-APHIS 2000) as inadequate, as these crop types have been safely and successfully used since their introduction in the mid-1990s.

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1-10	gene flow as a cognizable injury adequate to show Article III standing). Similarly, the proposed deregulation of transgenic sugar beets is facing successful court challenges due to inadequate environmental assessment under NEPA. Center for Food Safety v. Vilsack, 734 F.Supp.2d 948, 955 (N.D. Cal. 2010) (vacating decision by APHIS to deregulate transgenic sugar beets without proper NEPA analysis and preparation of an EIS). FWS should not rely on APHIS' inadequate analysis of the effects of commercial release of transgenic crops for its analysis of potential effects from growing transgenic crops within NWRs. FWS must conduct a proper analysis under NEPA, including direct, indirect, and cumulative effects from the proposed decision. Under NEPA, relevant effects are defined as: (a) Direct effects, which are caused by the action and occur at the same time and place. (b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. 40 C.F.R. § 1508.8.	1-10. The Service did rely on the three federal agencies mandated to review, evaluate, and ensure the safety of these products. These agencies and their scientific staffs are experts in this field. Our requirements under NEPA are to evaluate the impacts of growing GM soybeans and GM corn on refuge lands and to determine whether or not a major federal action significantly affecting the human environment exists. This EA serves this purpose.
1-11	Cumulative impacts are "impact[s] on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency…or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." 40 C.F.R. § 1508.7. Cumulative impacts should be analyzed in environmental assessments. *See e.g.* Soda Mountain Wilderness Council v. Norton, 424 F.Supp.2d 1241 (E.D. Cal. 2006) (holding that agency's EA was inadequate partly due to lack of proper cumulative impacts analysis, including whether the action is related to other actions with individually insignificant but cumulatively significant impacts). The following are potential effects that FWS failed to adequately consider in its draft EA.	1-11. Our analysis reviewed direct, indirect, and cumulative effects related to planting these two GM varieties on refuge lands in Region 6 as part of a grassland restoration program. In 2010 in the U.S., nearly 93 percent of the soybean crop was a GM variety (essentially all glyphosate-tolerant), and 86 percent of the corn crop was a GM variety (23 percent of corn was glyphosate-tolerant only) (USDA-ERS 2010a, 2010b). On refuge lands in 2009, approximately 6,175 acres, or less than 0.4 percent of the managed fee-titled fees, were planted to these two varieties. We have added text to the EA describing the number of wetland management districts and refuges growing these GM crops in 2009. We do not expect the total number of acres under farming agreements to increase significantly in the foreseeable future as a result of implementing the preferred alternative. This is largely due to the fact that prairie restoration is expensive and refuge staff budgets are limited. Any new lands considered from farming and future restoration would be done so with limited budgets in mind.
	A. GE Crops Can Be Poisonous to Beneficial Insects and Soil Microorganisms.	
1-12	In a controversial 1999 Cornell University study, researchers found that pollen from genetically engineered corn killed Monarch butterfly larvae. Henke, Christopher. "The Place of Research in the Monarch Butterfly Controversy" *Paper presented at the annual meeting of the American Sociological Association, Atlanta Hilton Hotel, Atlanta, GA,* Aug 16, 2003 <Not Available>. 2009-05-26 http://www.allacademic.com/meta/p106450_index.html. The study	1-12. The two varieties of GM crops evaluated in this EA are unrelated to the GM varieties with insecticidal properties such as those engineered with the *Bacillus thuringiensis* toxin to target European corn borer and other root borer insects. The proteins in glyphosate-tolerant soybeans and glyphosate-tolerant corn that allow glyphosate resistance have no direct impacts on non-target species (USDA-APHIS 2000, 2007).

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1-13	contributed to a growing body of evidence that GE crops can have adverse affects on numerous beneficial insects, as well as beneficial soil microorganisms, and potentially birds. These species would potentially be at risk simply by having GE crops in the areas in which they inhabit, and this is not adequately addressed in the EA.	1-13. While we reviewed other applicable research studies, we relied heavily on analyses presented in regulatory documents conducted by USDA-APHIS that concluded there is no unreasonable impact on non-target species including beneficial insects and soil microorganisms as a result of growing these crops.
	B. The Application of GE Crop Herbicides That Include Glyphosate Can Have Negative Impacts on the Wildlife Refuges, Critical Wildlife Habitats, Migratory Bird Populations, and Humans.	
1-14	As per the EA, herbicides that contain glyphosate will be used as part of the cultivation of the GE corn and soy crops that will be planted in the wildlife refuge lands. The use of herbicides that contain glyphosate has been documented as posing significant risks, including increased threats to the environment under (1) the Clean Water Act through the contamination of navigable waters, (2) the Endangered Species Act (ESA), in areas where listed species and critical habitat could be harmed, and (3) health regulations protecting the human population. Under NEPA, FWS should discuss the compliance of its proposal with other relevant environmental statutes. A case in Idaho demonstrates the necessity of taking extreme precaution when dealing with herbicide use. In August 2009, a "jury in U.S. District Court in Boise . . . found the BLM [Idaho] and chemical manufacturer E.I. DuPont de Nemours & Co. negligent in four sample cases of the lawsuit filed by a coalition of farmers." Laurie Welch, *Idaho Farmers Regroup After Oust Chemical Disaster*, Idaho Statesman, September 23, 2009 [hereinafter Welch]. In 2000, Idaho BLM began to use the powerful herbicide sulfometuron methyl ("Oust") on "wildfire scored public lands to control weeds." *Id.* Due to unanticipated weather conditions and misapplication of Oust, the herbicide spread and caused irreparable damage to thousands of acres of private as well as public BLM land. *Id.* BLM was declared 40% responsible due to its "negligen[ce] with respect to the selection of Oust and/or the application sites." Adams v. United States, 2009 WL 2823665 (2009). The damages in that case could exceed $200 million. *See* Welch.	1-14. The U.S. Environmental Protection Agency is mandated to review all pesticides proposed for commercial use in the U.S. before approval. Glyphosate has been well studied since its introduction in 1974. As stated in the EA, glyphosate is considered more environmental and toxicologically benign than nearly all of the all herbicides it replaces (Cerdeira and Duke 2006). We acknowledged in the EA that certain formulations of glyphosate (typically those with surfactants) are slightly more toxic to aquatic organisms, including amphibians. Glyphosate formulations with surfactants are not approved for use near or over water. Refuge managers follow Service policy on pesticide use through the PUP process.
1-15	The FWS must be cognizant of the risks inherent in the use and application of herbicides in wildlife refuges. The herbicides could have devastating effects on water, wildlife, and humans comparable to those suffered in Idaho.	1-15. The Service is very cognizant of risks associated with herbicides used on national wildlife refuges. PUPs and IPM plans outline guidelines and strategies involving the use of herbicides to manage invasive plants on refuges.
	1. The Proposed Increase in Herbicide Use May Harm Waterways and Puts the FWS at Risk of Violating the Clean Water Act.	
	According to the Chapter 3.2 of the EA, water resources in the area vary widely and "many miles of rivers and acres of lakes and wetlands exist within the boundaries of these refuge and wetland management district lands." EA at 9. The Clean Water Act declares a national goal that the "discharge of *pollutants* into the *navigable waters* be eliminated." 33 U.S.C.A. § 1251 (1)(a) (emphasis added). The Act defines pollutants as "chemical waste [and] biological materials," which stands to include all pesticides and, thus, herbicides. The Supreme Court has held that this definition of should be interpreted broadly. Rapanos v. United States, 547 U.S. 715, 724 (2006). In a recent decision, the U.S. Court of Appeals for the Sixth Circuit determined that EPA's designation of pesticides as non-	

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1-16	pollutants to be arbitrary and capricious. National Council of America v. U.S. E.P.A., 553 F.3d 927 (6th Cir. 2009). Due to this decision, regulation of pesticide applications (including herbicide) under the NPDES program of the CWA is imminent. In light of this, FWS should wait until EPA and the various state environmental agencies promulgate the new pesticide permit requirements before adopting a new herbicide application plan. Furthermore, "navigable waters" has also been interpreted broadly under the Clean Water Act, so any unpermitted discharge into the "waters of the United States," of herbicides, if deemed pollutants under EPA's pending regulations, would be a violation of the Clean Water Act.	1-16. The Service is monitoring the situation with the U.S. Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES) permitting process. The states in Region 6 have all been granted authority of distribution and oversight of these permits. The Service will continue to comply with applicable state laws for all aspects of our management actions, including application of herbicide in, on, or near navigable waters. Currently, the unsettled action of courts and Congress has led to NPDES permits not being required at this time. The 6th Circuit Court granted an extension of the deadline by which an NPDES permit will be required: the deadline was April 9, 2011, but is now October 31, 2011. Thus, no Clean Water Act NPDES permit will be required until October 31. There is also current action in Congress to pass a bill that amends the Federal Insecticide, Fungicide, and Rodenticide Act and the Federal Water Pollution Control Act to clarify Congressional intent regarding the regulation of the use of pesticides in or near navigable waters (i.e., no NPDES permit would be required). If H.R. 872 becomes law, no NPDES will be required after October 31. Upon settlement of these actions, the Service will continue to comply with applicable all state and federal law requirements for management actions.
1-17	If the application of the herbicides will be aerial, the probability of unanticipated drift reaching navigable waters grows with each herbicide added and the amount of acreage sprayed. See Caroline Cox, Indiscriminately from the Skies, Journal of Pesticide Reform, 4 (1995). In an attempt to reduce drift damage, regulatory agencies often "mandate protection zones around bodies of water larger than the buffer zones called for on herbicide labels," which can be an arduous and inexact process. Ebbetts Pass Forest Watch v. California Dept. of Forestry and Fire Protection, 43 Cal.4th 936, 954 (Cal, 2008). Hence, even if the aerial application of the herbicides is in compliance with the labels, it runs the risk of acting in a negligent manner by failing to designate a sufficiently large buffer zone around navigable waters. Considering the high density of adjacent waters to some of the areas where application is proposed, the probability of herbicide drift entering navigable waters increases significantly.	1-17. Aerial application of herbicides is rarely conducted on refuges in Region 6 and typically only after national office approval is granted. Impacts resulting from drift are managed by applying glyphosate (or any herbicide) only when environmental conditions permit following all label restrictions and best management practices.
	2. The EA Fails to Adequately Address the Effects on Species Particularly Vulnerable to Herbicides Such as Amphibians.	
	Chapter 4.2 of the EA discusses that herbicides could be toxic to wildlife stating that glyphosate "is practically nontoxic to fish, may be slightly toxic to aquatic invertebrates, is slightly toxic to wild birds," but concludes that it "has no significant potential to accumulate in animal tissue" citing a study done by Oregon State University, 1996. EA at 14. The EA further mentions that there are commercial formulations that can negatively impact amphibians (Dinehart et al. 2010) and aquatic communities in general (Relyea 2005, Vera et al. 2010), and it is likely that the additional chemicals in the commercial formulations cause the toxicity (Mann et al. 2009). *Id.*	
1-18	However, the EA does not detail if the most dangerous commercial formulations would be avoided or that proper application of the safest formulations, which can mitigate their effects, would be enforced. Further research is needed to determine exactly what herbicides are being used, in what amount and how they are being applied in order to properly assess the risk to the wildlife in the proposed refuges.	1-18. Refuge managers are responsible for enforcing stipulations within cooperative farming agreements including the timing and application of specific herbicides. The PUP process directs which herbicides can be used (if applicable given local site-specific conditions) and which chemicals are not allowed.
1-19	If toxic herbicides are being sprayed indiscriminately in areas were amphibians live, amphibians' reproductive functions and future breeding could be affected. Rick A. Relyea, *The Lethal Impact of Roundup on Aquatic and Terrestrial Amphibians*, Ecological Applications, Vol. 15, No. 4, at 1118, 2005. More importantly, because amphibians breed in bodies of water—including temporary wetlands that may be dry at certain times of the year—it is crucial that herbicides not be applied in these locations at breeding times. *Id.* The EA fails to discuss the potential direct and cumulative impacts to amphibians.	1-19. The Service relied on previous analyses and conclusions by USDA-APHIS (2000, 2007), and other studies, to inform our determination of the effects on aquatic organisms. EPA has concluded that glyphosate use on these crops, when applied accordingly to application rates and other restrictions, does not pose any unreasonable risks to wildlife and the environment.

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1-20	*3. Impacts on Threatened and Endangered Species.* Section 7 of the Endangered Species Act (ESA) requires all federal agencies to ensure, in consultation with the federal fish and wildlife agencies, that "any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modifications of [critical] habitat of such species." 16 U.S.C. § 1536(a)(2). Further, under Executive Order 13816, all federal agencies are required to take into consideration the impacts of action on migratory birds prior to undertaking federal actions and other activities.	1-20. The Service completed a Section 7 intra-service consultation and included it in this EA. Nothing in this EA relieves refuge managers of their responsibilities under the Endangered Species Act to conduct site-specific analysis of impacts resulting from management actions on threatened and endangered species.
1-21	Chapter 4.1 of the EA states that endangered migratory birds, the Whooping crane (*Grus Americana*), the piping plover (*Charadrius melodus*), the interior least tern (*Sterna antillarum*), and the Sprague's pipit (*Anthus spragueii*) may visit corn and soybean fields during migratory periods. EA at 12. While the EA does state that glyphosate can be toxic to wild birds, it does not detail—and downplays—these effects. EA at 14. Nor does it discuss the effects that the migratory birds could experience as a result of eating amphibians or other prey in the area, which may have been exposed to pesticides. The FWS needs to address these discrepancies and determine precisely what herbicides would be used to be able to better analyze the impacts that they would have on the wildlife, especially the threatened and endangered species, in the proposed areas.	1-21. The PUP is the formal process that evaluates use of all pesticides in national wildlife refuges. Restrictions, guidelines, and best management practices are articulated in PUPs.
1-22	*4. Impacts on Human Health and Safety.* In addition to the farmers and herbicide applicators that will have a presence in the refuges, it is possible that members of the public will also have access to the lands. Chapter 2.4 of the EA discusses that as per the National Wildlife Refuge System Administration Act, recreational uses are legitimate and appropriate public uses of the System and could include hunting, fishing, wildlife observation, wildlife photography, environmental education, and environmental interpretation. EA at 6. Members of the public who come to enjoy such uses could be exposed to glyphosate, yet the EA fails to mention the potential effects that glyphosate application on GE crops can have on human populations, which is egregious in itself but also violates NEPA. A paper by V.F. Garry, et al., entitled "Birth defects, season of conception, and sex of children born to pesticide applicators living in the Red River Valley of Minnesota, USA" is a key epidemiological study showing a link between glyphosate use and neurobehavioral birth defects in the offspring of farmers who apply it. *Environmental Health Perspectives*, June 3, 2002, vol. 110 supp. (the National Institute of Health's peer-reviewed environmental health journal). The paper states: "No other commonly used pesticide [besides glyphosate and phosine, a fumigant] compared by major organ and/or functional system was uniquely associated with specific adverse birth or developmental effects." *Id.* at 445. 8	1-22. In section 1.8 of the EA we acknowledge that certain issues were beyond the scope of this document such as the effect of glyphosate on the human population. However, we referenced the relevant NEPA documents completed by USDA-APHIS (2000, 2007) that concluded no significant effect on the human population was expected as a result of growing these crops and the subsequent use of glyphosate. We stressed in section 2.4 that approved PUPs would be followed and all label guidelines and restrictions adhered to regarding the application of pesticides.

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	The paper's findings are labeled "tentative," and the authors conclude that "further detailed neurodevelopmental studies are required to resolve these issues." *Id.* at 447. Further, a paper by L.P. Walsh et al., entitled, "Roundup inhibits steroidogenisis by disrupting steroidogenic acute regulatory protein expression" reports on an *in vitro* study showing glyphosate inhibits certain hormones involved in human reproduction. *Environmental Health Perspectives*, Aug., 2000, vol. 108. Another paper reportedly showed that glyphosate exposure nearly doubled the risk of late spontaneous abortion in Ontario farm populations. Arbuckel, T., et al. 2001. An exploratory analysis of the effect of pesticide exposure on the risk of spontaneous abortion in an Ontario farm population. *Environmental Health Perspectives* 109: 851-60. According to Toxicology Review, dermal exposure to ready-to-use glyphosate formulations can cause irritation and photo-contact dermatitis has been reported occasionally; these effects are probably due to the preservative Proxel (benzisothiazolin-3-one). Severe skin burns are very rare. Inhalation is a minor route of exposure but spray mist may cause oral or nasal discomfort, an unpleasant taste in the mouth, tingling and throat irritation. Eye exposure may lead to mild conjunctivitis, and superficial corneal injury is possible if irrigation is delayed or inadequate. Management is symptomatic and supportive, and skin decontamination with soap and water after removal of contaminated clothing should be undertaken in cases of dermal exposure. Toxicol Rev. 2004; 23(3): 159-67, *available at* http://www.mcbi.nlm.nih.gov/pubmed/15862083. **C. The Rise of Super Weeds and Conventional and Organic Crop Contamination as a Result of Glyphosate Application.** According to the Center for Food Safety (CFS), the use of genetic engineering in agriculture will lead to uncontrolled biological pollution, threatening numerous microbial, plant and animal species with extinction, and the potential contamination of all non-genetically engineered life forms with novel and possibly hazardous genetic material. Press Release of CFS Re: GE Crops in Northeast Refuges, Jan. 10, 2011, *available at* http://www.centerforfoodsafety.org/2011/01/10/feds-yank-ge-crops-from-all-northeast-refuges/. Not only is gene flow from transgenic crops a concern, but the increase in herbicide use associated with transgenic crops is potentially hazardous to NWR lands and purposes. Clearly herbicides have substantial documented environmental impacts, and therefore these impacts must be considered. There is no doubt that glyphosate resistance or tolerance can occur. Hundreds of herbicide-resistant weeds exist worldwide, and this problem is both foreseeable and growing. EA at 15. For example, there are now seven known glyphosate resistant weeds, and at least one other with significant tolerance, and several more that are problematic and may be developing resistance or tolerance. Most of these tolerant or resistant weeds have developed in just the last four years. Weed Science Society of America, International Survey of Herbicide Resistant Weeds, http://www.weedscience.org/summary/MOASummary.asp. Glyphosate-tolerant morning glory has been identified in Georgia in 2004. Baucom RS and Mauricio R, (2004) Fairness costs and benefits of novel herbicide tolerance in a noxious weed, Proceedings of the National Academy of Sciences, 101(36):13386-13390. And most recently, glyphosate-resistant ragweed was confirmed in Missouri in December 2004. Johnston J., "Investigation identifies glyphosate-resistant ragweed in Missouri," Pro Farmer, Dec. 15, 2004. In the U.S., glyphosate-	
1-23		1-23. The EA acknowledges the fact that glyphosate resistance in weed species common in agriculture fields is increasing across the nation. Given the limited time (typically less than 4 years) a particular field is subject to applications of glyphosate, and the fact that in many cases, refuge managers rotate between non-GM crops and GM crops before planting native vegetation, the Service does not view the relatively small number of acres planted on national wildlife refuges as significantly contributing to the issue.

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	resistant horseweed (*Conyza Canadensis*) was first reported in Delaware in 2001 in continuously grown RR (Roundup Ready) crops. In the four years since it was identified, glyphosate resistant horseweed has reportedly spread to over 1,500,000 acres in Tennessee along, has moved westward at least to Indiana and Arkansas, and is now found in 12 states. Boerboom, C. et al. (2004) *Selection of glyphosate resistant weeds*, Wisconsin Weed Manager, Vol. 11, No. 28, http://ipcm.wisc.edu/wcm/pdfs/2004/04-28weeds2.html. CFS has regularly expressed concern about farmers' use of proprietary corn and soy seeds, designed by the biotechnology giant Monsanto that resist the company's herbicide Roundup. CFS predicts that the planting of "Roundup Ready" crops will also lead weeds to develop a resistance, in turn increasing the use of pesticides and undermining the habitat and the health of the animals on the refuge. A further concern is that Roundup-resistant "super weeds" may spread to other areas. Researchers at the University of Delaware say they have already discovered evidence of mutant forms of marestail or horseweed elsewhere in the state. Press Release of CFS Re: USDA Decision on GE Alfalfa, Jan. 27, 2011, available at http://www.centerforfoodsafety.org/2011/01/27/usda-decision-on-ge-alfalfa-leaves-door-open-for-contamination-rise-of-superweeds/. There have been numerous instances where organic or conventional crops have been contaminated by GE crops. This contamination can happen in the field or in processing facilities. For example, StarLink corn was not effectively separated from corn approved for human consumption, and this improper handling resulted in a massive recall of corn and corn products. Brandner, "Detection of Genetically Modified Food: Has Your Food Been Genetically Modified?" 64 The American Biology Teacher, 433, 435 (2002). StarLink, which was never approved for human consumption, created significant effects in the environment, for the farmers who suffered market instability despite never choosing to grow this GE variety, and for consumers who were exposed to an unsafe product that they expected would not enter the human food chain. Indeed, the StarLink contamination incident is a perfect example of an instance where contamination from a GE corn variety caused significant effects. Press Release of CFS Re: GE Crops in Northeast Refuges, Jan. 10, 2011, available at http://www.centerforfoodsafety.org/2011/01/10/feds-yank-ge-crops-from-all-northeast-refuges/.	
1-24	CFS is also greatly concerned that RR alfalfa would exacerbate the ongoing epidemic of glyphosate-resistant weeds, which have emerged over the past decade in response to massive use of glyphosate with Roundup Ready soybeans, cotton and corn. FWS, R.F. (2007). "A growing threat down on the farm," Science 316: 1114-1117. Eminent weed scientist Dr. Stephen B. Powles is quoted as follows in this 2007 article: "There is going to be an epidemic of glyphosate-resistant weeds. In 3 to 4 years, it will be a major problem." The future is now. Glyphosate resistant (GR) weeds presently infest over 10 million acres of U.S. cropland, with projections of 38 million acres, or one in every four-row crop acres, by 2013. *See* "WSSA supports NRC Findings on Weed Control," Weed Science Society of America, 5/27/10. Weed scientist Dr. Ian Heap, who runs the International Survey of Herbicide-Resistant Weeds is cited for the statement that 6% of the total area planted to corn, soybean and cotton in the U.S. [which is 173 million acres] is infested with GR weeds, http://www.wssa.net/WSSA/Information/WSSA%20position%20paper%20on%20herbicide%20resistance%205-27-2010.pdf. *See also* Syngenta (2009) "Leading the Fight against Glyphosate Resistance," quoting Chuck Foresman, manager of weed resistance strategies,	1-24. Thank you for your comments. The Service is concerned about the spread of glyphosate resistant weeds. Managing invasive plants is a priority on national wildlife refuges in Region 6.

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	http://www.syngentaebiz.com/DotNetEBiz/ImageLIbrary/WR%203%20Leading%20the%20Fight.pdf. The many costs imposed by RR crop systems via evolution of GR weeds include increased pesticide pollution of the environment, increased soil erosion from tillage, and reduced farmer income from increased weed control costs. Letter of CFS to Tom Vilsack Re: GE Roundup Ready Alfalfa, available at http://www.centerforfoodsafety.org/campaign/genetically-engineered-food/crops/policy-comments/. Theses studies indicate that the use of glyphosate in wildlife refuge lands is not as safe as FWS is conveying it to be in the EA and therefore, a full-scale EIS is needed in order to clarify the potential hazards, or Alternative B should be chosen to disallow GT crops on Refuge lands.	
1-25	III. POTENTIALLY SIGNIFICANT EFFECTS REQUIRE THE PREPARATION OF AN EIS AND APPROPRIATE MITIGATION MEASURES. Not only does this EA fail to discuss relevant potential adverse impacts, it similarly fails to provide for any mitigation of those impacts. For this reason, in addition to the reasons stated above, FWS should prepare an EIS for the proposed action, and include in that document a discussion of mitigation measures that shall be taken to avoid, minimize, rectify, reduce, or compensate for the impact that would result from proceeding with Alternative A. *See* 40 C.F.R. § 1508.20. An agency may issue a FONSI and decline to prepare an EIS only when the agency has presented reasons why the proposed action will not have a significant effect on the human environment. 40 C.F.R. § 1508.13. It is evident from the EA that there are potentially significant effects to the human environment as a result of proceeding with Alternative A. It is also evident that certain mitigation measures will be necessary, if FWS ultimately decides to proceed with that alternative. First and foremost, mitigation measures are necessary in order for FWS to be in compliance with the Administration Act. 16 U.S.C. §§ 668dd et seq. Each refuge must be managed in accordance with the mission of the System, which is "to administer a network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife, and plant resources." *See* 16 U.S.C. §§ 668dd (2) – (3)(a). The EA states that FWS has chosen Alternative A "based on its conformance to the establishing purposes of the System and the desire to have the least impact on the environment." EA at § III. This statement is misleading. Although FWS purports to have selected Alternative A in order to comply with the Administration Act and in order to have the least possible impact on the environment, the EA fails to adequately explain how the use of glyphosate-tolerant soybeans and corn will result in conservation. Rather, the EA simply describes how the use of genetically modified soy and corn will be less expensive and quicker than other methods of farming as a management tool to convert farmlands to natural habitat, and suggests that somewhere down the road, conservation will be achieved. Not only is this discussion inadequate to establish that there will be no significant impact on the environment, but it also suffers from a lack of consideration for mitigation measures that will ensure that the purpose and mission of the Administration Act are complied with. Furthermore, in addition to conservation, the Administration Act affords significant emphasis to biological integrity. *See* 16 U.S.C. § 668dd (4)(b). Again, the EA fails	1-25. The Service disagrees with this conclusion. The Service developed a range of alternatives necessary to provide sufficient evidence and analysis for determining whether planting two varieties of glyphosate-tolerant corn and soybeans on a limited basis within national wildlife refuges in Region 6 required the preparation an EIS. Through this EA we concluded that this federal action did not meet the requirements of an EIS thus we have prepared a FONSI (40 CFR 1508). When considering the petitions to approve GM corn (2000) and GM soybeans (2007), USDA-APHIS extensively reviewed the impacts of these crops and concluded that an EA was the appropriate level of review and that a FONSI was warranted. As stated in our FONSI, we do not believe an EIS is necessary because this federal action does not satisfy the requirements under NEPA as a major federal action significantly affecting the human environment.

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1-26	to adequately explain how the use of genetically modified soy and corn will assist FWS in ensuring the biological integrity of Region 6 System lands. In fact the opposite is true, in that the EA explains how genetically modified soy and corn will be used for the foreseeable future on those lands, and such use obviously does not contribute to the biological integrity of the natural habitat. Accordingly, FWS should prepare an EIS in order to sufficiently address the impacts to the environment that will result from proceeding with Alternative A, as well as mitigation measures that will be taken to avoid, minimize, rectify, reduce, or compensate for that impact. *See* 40 C.F.R. § 1508.20.	1-26. We disagree with this conclusion. Utilizing these two GM crops will, in the medium to long-term, result in grasslands that are healthy and more resilient to invasion by invasive plants. Not only will vigorous grasslands require few herbicide treatments in the future, but they will provide high-quality habitat for grassland-dependent wildlife that significantly increases the biological integrity of the habitat.
1-27	Additionally, as described in the EA, Alternative A represents a false promise. FWS asserts that when essential, the use of glyphosate-tolerant soybeans and corn would continue to be just one tool that FWS could use to achieve habitat restoration and management objectives. EA at § 2.3. FWS goes on to explain that it would continue to have "the option to use conventional soybeans and corn along with other conventional crops in a crop rotation, provided adequate cooperators using these methods are available who can meet habitat restoration and management goals." *Id.* The later part of this statement is an escape hatch that renders the former part effectively void. FWS itself admits several times in the EA that there is an inadequate supply of conventional farmers to serve as cooperators for Region 6 System lands. *See* EA at §§ 2.3 and 4.2. Given the limited availability of such cooperators, it is unlikely that the use of glyphosate-tolerant soybeans and corn will be anything but the *only* tool used by FWS to achieve habitat restoration and management objectives. If FWS truly intends to maintain a range of options as it suggests, it must prepare an EIS and include in that document a discussion of mitigation measures that will be used to ensure the availability of conventional farming cooperators on Region 6 System lands.	1-27. Implementing Alternative A is not a false promise. Nothing in this EA precludes refuge managers from seeking other options to satisfy grassland restoration goals and objectives. However, clearly the trend in farming in the U.S. has shifted toward crops that possess specific traits (in this case, some form of glyphosate-tolerance) as reflected by that fact that 93 percent of soybean farmers and 86 percent of corn farmers in the U.S. use these products (USDA-ERS 2010a, 2010b).
1-28	Another deficiency of the EA is that it seems to rely on but fails to explain how certain control measures will be carried out. For example, FWS states that Alternative A will adhere to FWS' procedures and limits regarding herbicide use, EA at § 2.4., but the EA does not set forth what measures will be taken to ensure that this is the case. Similarly, FWS states that Alternative A will adhere to FWS' guidance on integrated pest management, but the EA fails to explain how, exactly, this will be achieved. *Id.* In yet another empty promise, FWS states that Alternative A will adhere to FWS' genetically modified organism and farming policy, but the EA does not describe how this will be guaranteed. *Id.* These failures warrant both preparation of an EIS to adequately address impacts to the environment that may result from proceeding with Alternative A, but also a discussion therein of mitigation measures that will be employed to ensure that FWS' assumptions are satisfactorily supported.	1-28. Refuge managers are required to follow all applicable laws, policies, and regulations including state laws and regulations. Pesticide use on refuge is governed through the PUP process.
1-29	Finally, the EA is problematic in that it does not provide adequate assurance that proceeding with Alternative A will not result in adverse impacts to migratory birds and to threatened and endangered species. FWS suggests that proceeding with Alternative A will not have any significant impact on migratory birds, because no effects to migratory birds have so far been discovered, and because those birds exist mostly on natural lands nearby and only occasionally visit the agriculturally developed fields. EA at § 4.2. FWS also states that, according to recent studies, there will be no effect on migratory birds or their habitat from using glyphosate-tolerant soy beans and corn on Region 6 System lands. *Id.* However, FWS itself admits in the EA that some commercial formulations of glyphosate may contain additional chemicals to increase effectiveness. *Id.* The EA fails to clarify whether such additions were	1-29. See comment 1-20.

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1-30	taken into account in the research on impacts to migratory birds cited by FWS, and FWS does not set forth what measures will be taken to control for any impacts not yet accounted for. Further, FWS admits that some commercial formulations of glyphosate can negatively affect amphibians. *Id.* Although FWS states in the EA that certain measures can be taken to minimize those effects, the agency does not set forth those measures in any detail, or guarantee that they will be taken. Additionally, FWS admits in the EA that glyphosate may be slightly toxic to aquatic invertebrates and wild birds. *Id.* This is the very kind of potentiality that NEPA aims to guard against by requiring federal agencies to prepare an EIS before proceeding with a proposed action. See, e.g., 40 C.F.R. § 1502.1. If a federal action *could* significantly affect the quality of the human environment, the agency must prepare an EIS. 40 C.F.R. § 1502.4(3) (emphasis added). Such is the case here, because it remains unclear whether or not the use of glyphosate-tolerant soybeans and corn will adversely impact migratory birds and other threatened and endangered species. Given that there is a potential for such impacts, FWS must prepare an EIS, and in that document the FWS must provide for mitigation measures that will be taken to avoid, minimize, rectify, reduce, or compensate any adverse impacts. See 40 C.F.R. § 1508.20. CONCLUSION The ability of FWS to effectively manage Refuges is important, however transgenic crops have no place in NWRs. GT crops are expressly designed to allow for glyphosate formulations to be sprayed on the crop during its growth, thereby exposing any wildlife consuming or using the plants as cover or for nesting to potentially dangerous chemicals. These commercial glyphosate formulations are not just glyphosate, they also contain other unknown adjuvants and "inert" ingredients. There are many documented, and as yet unknown, detrimental effects to wildlife, water, soils, and humans from GT crops and their attendant herbicide use. FWS should not allow this management practice to continue, in accordance with both the FWS GMO policy and with the purposes for which NWRs were created. Herbicide-based agriculture in general doe not comport with NWR management objectives and the entire practice should be reexamined. Due to the foregoing, NEDC urges FWS to choose Alternative B, to disallow the use of GT corn and soy on NWR lands and to additionally reconsider the use of any agriculture on NWR lands. Further, if FWS chooses to continue use under Alternative A, NEDC believes that FWS must prepare a full EIS to adequately comply with NEPA. Sincerely, Amy van Saun, *Project Coordinator*, Sustainable Agriculture and Pesticide Policy (SAPP) Group, NEDC Amy Wong, *Volunteer*, SAPP Jeffrey Van Name, *Volunteer*, SAPP Rochelle Martinson, *Volunteer*, SAPP Jenny Loda, *Project Coordinator*, Lands and Wildlife Group, NEDC 13	1-30. The purpose of this EA was focused on whether the action of allowing two varieties of GM crop types on refuges is a major federal action significantly affecting the human environment. This EA provides sufficient evidence and analysis for determining whether to prepare an EIS (40 CFR 1508.9). As stated in our FONSI, we have concluded that this federal action does not significantly affect the human environment, thus preparation of an EIS is not warranted.

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No.	Letter	Response
2-1	THE CENTER FOR FOOD SAFETY Tom Koerne Attn: Draft EA for the use of glyphosate-tolerant soybeans and cor Sand Lak National Wildlife Refuge Complex 39650 Sand Lake Dri Columbia, SD 5743 ***Center for Food Safety*- Science Comments on Draft Environmental Assessment: Use of Genetically Modified, Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain–Prairie Region (Region 6** Submitted electronically to r6gmcomments@fws.gov on 4 March 201 Thank yo for the opportunity to comment on US Fish and Wildlife Service (FWS) Draf Environmental Assessment (DEA). Today wildlife refuges and wetlands are more important than ever for sustaining the diversity of species required for functioning of complex ecosystems. In the Mountain-Prairie Region recent incentives for farmers to increase corn and soybean row cropping have resulted in less habitat for wildlife, making every non-corn-and-soybean acre in the refuge system more valuable. For example, a recent report from the National Wildlife Federation (NWF) examined the role of ethanol production in loss of wildlife habit "Government incentives have led to skyrocketing growth in the U.S. corn ethanol industr over th past five years. This has contributed to major increases in corn prices and corn demand, ultimately resulting in increased corn plantings across the country. Total U.S. corn acreage increased 19 percent between 2006 and 2007, to a level not seen since the Dust Bowl. About one-third of the nation's corn crop is now diverted to ethanol plants. Farmers have shifted land into corn production from other crops, idle agricultural land, and native prairie, thereby causing wildlife habitat loss and degradation. Given that current legislation mandates increases in corn ethanol production through 2015, these patterns are likely to continue." [Brooke et al. 2009] The WF report focused on the Prairie Pothole Region, most of which is included in the FW Mountain-Prairie Region, but the phenomenon of increasing row crop acreage is region-wide. Even aside from biofuels' support programs, corn and soybean cultivation have long been favored by federal government subsidies, unlike fruits and vegetables, fo instance. In this context of shrinking natural landscapes with concomitant increases in corn and soybean acreage, i is appropriate tha the Service has been scaling bac are devoted to crops for the benefit of wildlife: "Current management plans call for renovation of habitat Main Office: 660 Pennsylvania Ave., S.E., Suite 302, Washington, D.C. 20003 • Phone: 202-547-9359 • Fax: 202-547-9429 California Office: 2601 Mission Street, Suite 803, San Francisco, CA 94110 • Phone: 415-826-2770 • Fax: 415-826-0507 Email: info@centerforfoodsafety.org • www.centerforfoodsafety.org • www.foodsafetynow.org	2-1. Thank you for your comments.

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	Center for Food Safety – Science Comments, 2 or restoration of native plant communities, reflecting a general trend on all System lands in Region 6 of converting farmland to natural habitats, as natural habitats have greater value for wildlife (Tilman et al. 2001). In particular, there has been an emphasis on providing high-quality nesting cover for grassland-dependent migratory bird populations. T thi end, forme cropland has been seeded to grassland nesting cover." [DEA, p. 1]	
2-2	Although according to FWS row crop farming has been practiced on refuges for decades, it is only within the last 15 years that genetically-modified, glyphosate-tolerant (GMGT) corn and soybeans have been available, and thus have been used by some cooperator farmers. In 2009, for example, 57% of farmed acres within System lands of Region 6 were planted to glyphosate-resistan cor and soybeans [DEA, p.2]. The official FWS policy on farming states: "We do not use genetically modified organisms in refuge management unless we determine their use is essential to accomplishing refuge purpose(s) and the Regional Chief, National Wildlife Refuge System, approves the use." [Service policy on Biological Integrity, Diversity, and Environmental Health (601 FW 3 of the Service Manual, 2001; Amendmen 1, 2006), DEA, p. 8] Since GMGT corn and soybeans have already been planted on refuges, apparently the Chief of Refuges for Region 6 has approved GMGT corn and soybeans on many occasions, perhaps for every request, but the policy has not been gone through th NEPA proces until now. This timing is in response to a recent court ruling at the Prime Hook NWR requiring NEPA compliance for GM crops that has prompted other Regions to come into compliance as wel	2-2. The Chief of Refuges at the regional level has been delegated the authority from the Director to approve the use of GM crops when it is deemed their use is essential in achieving refuge purposes (601 FW 3-15C, see amendment). As of 2009, eight wetland management districts and eight refuges had been granted approval to plant GM soybeans and GM corn for habitat restoration purposes only.
	A major purpose of this DEA, then, is to assess the impacts of continuing to allow GMGT corn and soybeans on refuge land	
	The FWS for Region 6 evaluated two alternative scenarios in the DEA for farming on refuge lands, based on scoping comments and on a review of authorities, policies, and regulation [DEA, p. 5]. These are: ▪ Alternative A, the no-action alternative and proposed action, to continue using glyphosate-tolerant soybeans and corn for habitat restoration and management o System-managed lands in Region 6 ▪ Alternative B, to disallow the use of glyphosate- tolerant soybeans and corn on System-managed lands in Region	
	The scie tific analyses in the DEA that led to the choice of Alternative A are inadequate	
2-3	Briefly, here is synopsis of some of the problems of the DEA, with details following	2-3. The Service has developed a ranged of alternatives for this EA necessary to provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI (40 CFR 1508). The purpose of this EA was specifically to address whether or not the use of two GM crop varieties on limited refuge lands within Region 6 constituted a major federal action requiring the development of an EIS. The purpose was not intended to evaluate all alternatives available to refuge managers to restore grassland habitats. Other NEPA documents such as comprehensive conservation plans and habitat management plans specifically look at a range of alternatives to restore habitats, among others things, on individual refuges. We disagree that the no-farming alternative was brushed aside. It was looked at extensively and dismissed because refuge objectives could not be met.
	First, regarding farming of corn and soybeans in general, alternatives that did not involve corn and soybeans but would fulfill the management objectives of the FWS were not elaborated. Thus GMGT corn and soybeans were compared to conventional corn an soybeans for multiple uses, but the use of cover crops, other grains, sunflowers, and so on, either grown using conventional or organic methods, was not examined. Also, corn and soybeans produced using organic methods were eliminated from consideration without full analysis. The "no farming" alternative was brushed aside, as well. By limiting the 2	

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	Center for Food Safety – Science Comments, 3	2-4. Nothing in this EA requires refuge managers to use these two GM crop types to achieve grassland restoration objectives. Rather this EA addresses two GM crop types and evaluates their use. If managers, in their sound professional judgment, decide other options are available, they are free to pursue those options.
2-4	alternatives – excluding "non-corn-and-soybean alternatives", "organic methods only alternatives", and "non-herbicide conservation tillage alternatives", for exampl - farming options with fewer negative impacts than either alternative were excluded from consideration, thus making the choice of GMGT crops by the FWS more likel	2-5. We disagree with this statement. The Service completed a Section 7 intra-service consultation as required by the Endangered Species Act. We determined a No Effect designation was warranted based on listed species present within Region 6 and their propensity to utilize agricultural fields. Both NEPA documents prepared by APHIS prior to approval of these crops reached the same conclusion (USDA-APHIS 2000, 2007). Glyphosate applied according to label restrictions is not expected to have any effect on listed species in Region 6.
2-5	Second, the potential for negative direc and indirect impacts from increased use of glyphosate in GMGT crop systems was dismissed without carefully examining the body of scientific wor on non-target organisms, including threatened and endangered species, thus not complying with the Endangered Species Act. Partly, FWS justified lack of non-target impacts by deferring to the EPA, stating that the registration process for glyphosat assured that it would be safe for listed species when used as directed, but the EPA recently denied this claim. The FWS also relied on asking farmers to adhere to a series of regulation to keep glyphosate and other pesticides away from non-target organisms as a form of mitigation, but the regulations are based on assumptions about glyphosate use that do not hold up in the variable conditions of the real world. Given the importance of wetlands and water resources of all kinds in the refuge system, it is especially problematic that the DEA did no take into accoun recen studies showing glyphosate contamination of water in situations similar to those on refuge lands. Also, the implications of toxicity of formulation vs. the active ingredient were not fully explored	2-6. The Service disagrees with this comment. The authority to manage refuge lands is derived from the National Wildlife Refuge Administration Act of 1966 (16 U.S.C 668dd–668ee) (Administration Act). The act clearly states, "Sec. (4)(c) No person shall knowingly disturb, injure, cut, burn, remove, destroy or possess any real or personal property of the United States, including natural growth, in any area of the System;… unless such activities are performed by persons authorized to manage such area, or such activities are permitted under subsection (d)…" Farming is a recognized Refuge Management Economic Use (50 CFR 25.12) that is regulated by the refuge manager. Permits for economic uses will contain such terms and conditions that we determine to be necessary for the proper administration of the resources (50 CFR 29.1). Therefore, the refuge manager has full authority to stipulate conditions, locations, and activities under which glyphosate crop systems can be utilized. Failure to follow permit stipulations may be pursued as a violation of the Administration Act.
2-6		
2-7		2-7. We disagree that toxicity of formulations versus active ingredient was not fully explored. We acknowledged the fact that most research has shown that certain formulations, especially those including surfactants, are more toxic to aquatic species than the active ingredients of glyphosate (e.g., Cerdeira and Duke 2006). None of the glyphosate formulations that contain surfactants are allowed near or over water. The Service, though its PUP process, outlines which pesticides may be used, where approved pesticides can be used, and which are not allowed, among other things.
	Based on these and other inadequacies of th DEA, and our analyses of the scientific literature, we urge the FWS to not allow GMGT corn and soybeans on refuge lands, and t examine more diverse farming systems other than corn and soybeans, or innovative non-farming restoration alternatives, to meet the Service's objectives with respect to farming, even as land is converted to natural habitat as quickly as possible	
	Farming issues in general: corn and soybeans are the only alternatives presented i the DEA for meeting management objectives. Other alternatives should be seriously considered.	
2-8	Managing invasive species has become a high priority in most refuges, and is a major objective described in the DEA [e.g., pp. 10, 17]. However, neithe corn nor soybean provides as good weed suppression as some cover crops, for example. The DEA does not compare different crops for their ability to keep down weeds and deplete the weed see bank with minimal herbicide use	2-8. The purpose of this EA was not to describe which techniques could be used by refuge managers to control invasive species. There are many techniques available based on scientific studies and refuge manager experience to control invasive plants. Many of these are incorporated into refuge-specific IPM plans.
	Another objective for farming is to prepare land for restoration to natural habitat. "The typical restoration technique includes the continuation of farming and herbicide use until just before restoration and planting occurs. Continued farming and herbicide use minimizes the number of residual weeds and weed seeds that will compete with the native vegetation to be planted…. The use of herbicide-resistant genetically modified crops results in timely and cost-effective restoration of habitat as the associated seed and herbicides are readily available (Brookes and Barfoot 2010, Helzer 2010)…" [DE, p. 23]. Setting aside the GMGT issue for the moment, are corn and soybean row crops the best option for "cleaning up" a piece of land before restoration? Not only does the suppression of weeds and the	
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2-9	weed seed bank need to be considered, but also soil and water quality as a result of the farming practices For example, perennial and annual cover crops grown without or with organic practice (even if not certified) will likely be more effective than conventional corn and soybeans. Alfalfa, for instance, is known to suppress weeds while improving soil quality and providing habitat and food for wildlife – and these benefits are usually achieved without any herbicide use at all, since 93% of alfalfa acreage is grown without herbicides [NASS 1999	2-9. Soil and water quality impacts were briefly described in the EA under Issue 5. Increased use of conservation tillage compared with conventional agriculture utilized with GM crop types reduces soil erosion, helps protect water quality, and improves soil structure.
2-10	Conventional corn and soybeans can be grown using conservation tillage methods based on herbicide use, such as no-till. Growing cover crops like rye or hairy vetch from fall to spring reduces soi erosion and suppresses weeds in the follow-on main crop, and would represent a good option to reduce the use of herbicides associated with conventional corn or soybean cultivation. Over the long term, organic agriculture results in better soil than no-till, storing more carbon and nitrogen [Teasdale et al. 2007]. USDA-ARS researcher conducted a 9-year study at the USDA experimental farm in Beltsville, MD to compare soil fertility and yields of corn, soybeans and whea grown in either standard no-till system, a living- mulch no-till system or a plow-based organic system. They found that even though the organic fields were tilled they contained more carbon and nitrogen at all depths (down to 30 cm) than the no-till plots. This was attributed to incorporation into the soil of bot manure (organic fertilizer) and cover crops Yields of corn and soybeans, but not wheat, were lower in the organic plots, though, because weeds were not adequately controlled b the particular organic methods they used. Further experiments showed that use of certain crop rotations in the organic system could control weeds and restore the lost yields, an that the stored nutrients in the organic soils were able to boost corn yields for subsequent crops relative to the soils that had been managed using no-till methods [Comis 2007]	2-10. Thank you for your comments.
2-11	Organic methods as mitigation of adverse effects of row cropping that could compromis restoration were not compared to conventional or GMGT corn and soybean systems in the DEA.	2-11. We considered but rejected the organic farming only alternative based on sound professional judgment gained from decades of work by refuge managers trying to restore grassland ecosystems across the Great Plains. Refuges in Region 6 use farming as a step in restoring grassland habitat for wildlife. Invasive plants are widespread and must be controlled during the farming process in order to successfully achieve restoration objectives. We believe organic-only farming methods allow for minimal to no control of invasive species.
2-12	Although not discussed as an objective for corn and soybeans in Region 6, wildlife do use agricultural crops for supplemental feed, so their value as such should be considered. Unprocessed soybeans are not a good choice for most wild animals, and particularly not for most waterfowl and migratory bird species. They contain anti-nutritional components that interfere with growth and development [e.g. Dabbert et al. 1996, Ringelman 1990]. Plans that include rotations with soybeans decrease opportunities to feed wildlife relative t other rotation crops. In general, corn is a better food for wildlife, but is so widely available outside refuges – in fact, corn is probably the most abundant food source along the entire flyway for most birds – that other cultivated seeds and grains would be a better use o farmed land within refuges [Dabbert and Martin 2000, Ringelman 1990]. The DEA does not provide a good comparison of nutritional consequences of different crops for various types of wildlif	2-12. We agree that there are more nutritious agricultural foods for birds, particularly waterfowl. However, soybeans in general are not considered harmful to waterfowl and do provide nutritional value to many species of wildlife including upland birds and mammals that seek out waste grain.
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	GMGT corn and soybeans specifically: positive impacts are unsupported by evidence, and negative impacts of the GMGT system are not adequately considered in the DEA	
	A common thread running through the arguments in favor of allowing GMGT corn and soybean crops is that they are the most commonly grown varieties by farmers in the region, and thus will be easiest for farmers to grow and the most cost-effective farming option for the refuges. For example, regarding habitat restoration: "Because glyphosate-tolerant varieties of soybeans and corn are now dominant in Region 6, it would be less cost-effective to prepare farmland for conversion to native habitats without the use of glyphosate-tolerant soybeans and corn." [DEA, p. 18	
2-13	For corn single trai glyphosate-tolerant varieties are not, in fact, the most common type grown. In 2010 only 23% of corn acres in the US were planted with seeds containing herbicide tolerance traits alone, and most but not all of these were glyphosate-resistan varieties (small but unknown percentage of GM herbicide-resistant corn is glufosinate-tolerant). Most corn varieties contained insect-resistance traits either alone (16%) or stacked with herbicide-tolerant traits (47%), none of which are being considered in th DEA. Doing the math, 14% of corn is still conventional [http://www.ers.usda.gov/Data/BiotechCrops/ExtentofAdoptionTable1.htm]	2-13. Thank you for your comment. The language in the text has been updated to reflect 2010 numbers. Brookes and Barfoot (2010) reported all glyphosate-tolerant corn varieties.
2-14	As for cost-effectiveness, GM corn and soybean varieties in general are significantly more expensive than conventional seed varieties, as shown by Agricultural Prices data from USDA's National Agricultural Statistics Service In 2009, GM corn seed prices averaged $235/unit, versus just $139/unit for conventional corn seed;[1] while GM soybean seed prices (virtually all glyphosate-resistant Roundu Ready averaged $49.60 versus jus $33.70 for conventional soybeans [USDA NASS 2009]. GM corn and soybeans are thus on average 69% and 47% more expensive than conventional seeds, respectively. As fo productivity, GMGT varieties are not engineered for increased yield potential In any case, the "dominance" of GMGT varieties in the seed marketplace is no argument against seeking out other seed varieties that better meet FWS's farming objectives in the refuges	2-14. While the cost for GM corn seed may be higher, we referenced that the total cost to farmers to grow and harvest the crop (increased fuel costs, and other herbicide costs) can be lower for GM varieties (Brookes and Barfoot 2010).
2-15	S considers GMGT corn and soybeans to have mostly neutral or positive impacts relative to conventional corn and soybeans as far as their management objectives for farming are concerned, without taking into account relevant scientific studies to the contrary. For food quality, they refer to the assessments by USDA APHIS that show "no significan differences between the chemical compositions of GMGT and non-GMGT corn and soybeans" to deduce that there would be no effects of eating them, for any animals, including threatened and endangered species [DEA, p. 13] However, they did not discus the likelihood that seeds and other plant parts of GMGT crops will have higher glyphosat residues, or the impacts of higher glyphosate residues on animal health [Arregui et al. 2003]. Also, there are studies that show lower levels of some mineral nutrients in GT soybeans grown with glyphosate, under some conditions [Zobiole et al. 2010]. Whethe	2-15. We disagree with this statement. We reviewed applicable studies and previous work (EAs and subsequent FONSIs) conducted by USDA-APHIS prior the general release of these two GM crop types (USDA-APHIS 2000, 2007). These studies evaluated all of the mentioned concerns and concluded that FONSIs were warranted.

[1] One unit = 80.000 kernels

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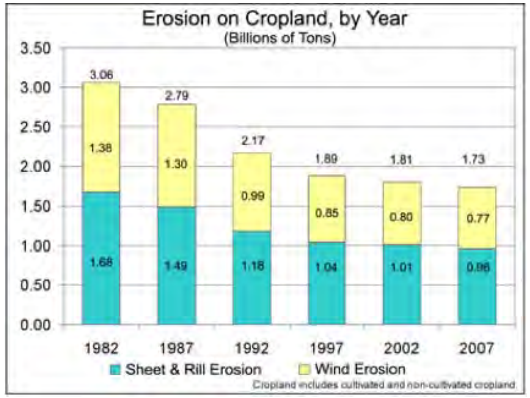
2-16	these differences would affect wildlife, including threatened and endangered species should be discusse For managing invasive species, and for preparing land to be restored, GMGT corn and soybeans are described as having advantages over conventional corn and soybeans, mainly because FWS claims that no-till methods are more likely to be used successfully [e.g. DEA, p. 23], reducing soil erosion and resulting in cleaner water, while depleting the weed seed bank with repeated herbicide applications. FWS also says that glyphosate-treate fields will be able to be planted sooner than those treated with most other herbicides because of the low residual activity of glyphosate, making restoration easier [DEA, p. 15]	2-16. See comment 2-5.
2-17	However, adoption of GMGT varieties has not meaningfully increased use of conservatio tillage techniques; in fact, the big increase in acres under conservation tillage took place in the 1980s and early 1990s before Roundup Ready soybeans and corn were introduced in 1996 and 1998, respectively. Soi erosion rates have tracked adoption of conservation tillage, with the big decreases in the 1980s and early 1990s flattening out in the decade o glyphosate-resistant crop adoption from 1997 to 2007. It is thus erroneous to credit GMG varieties with reductions in soil erosi  NRCS (2010). "2007 Natural Resources Inventory: Soil Erosion on Cropland," Natural Resource Conservation Service, U.S. Dept. of Agriculture, April 2010 http://www.nrcs.usda.gov/technical/NRI/2007/2007_NRI_Soil_Erosion.pdf No til and conservation tillage practices are often facilitated by chemical use, as herbicides replace tillage for weed control. However, while herbicide-facilitated no-till methods may	2-17. We did not credit glyphosate-tolerant crops with reductions in soil erosion. Rather we pointed out that conservation tillage, which tends to reduce soil erosion, is more likely to be used successfully in fields planted with glyphosate-tolerant crops.

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2-18	*Center for Food Safety – Science Comments*, 7 decrease soil erosion, they do not always reduce water pollution, and under some conditions actually increase agrichemical runoff, degrading water quality No-till and other conservation-tillage systems discourage the disturbance of the soil, which can lead to over-compaction [Fabrizzi et al. 2005, Tebrugge 1999]. In the absence of soil disturbance, some studies have shown that fertilizers broadcast on the soil surface are washed off the field by rain, thus polluting waterways as well as lowering nutrient-use efficiency [Mahli et al. 1996]. Pesticides also can end up at higher concentrations in runof from field in conservation tillage, but for a more complex reason. Crop residues are lef on the surface in these systems, and surface residues intercept sprayed pesticides. A 30 residue cover would resul i abou 30% o broadcast-sprayed pesticide being found on the crop residue rather than the soil after application. Washoff studies for commonly used herbicides applied to corn residue have shown little interaction between the herbicide and corn residue, resulting in up to 50% of the intercepted herbicide washing off in the firs centimeter of rain [Baker and Shiers 1989, Martin et al. 1978]. "If this washoff wate becomes a part of surface runoff, herbicide concentrations can be quite high." [Mickelson et al. 2001]. Research conducted on corn herbicides confirmed these conclusions. While no-till systems had the lowest volume of runoff, the concentrations of atrazine an cyanazine in runoff water were always greater (statistically significant in most cases) in no-till systems than for the other tillage regimes [Mickelson et al. 2001]. Another surprising contributor to fertilizer and pesticide runoff from no-till fields is th non-native, invasiv common earthworm. Earthworms can cause a rapid increase in the amount of manure and chemical runoff from no-till fields into drainage ditches and thus into the watershed. This was reported first in Finland [Shipitalo et al. 2004], and then in Ohio [Comis 2005]. "No-till fields in poorly drained areas of the United States, such a northwestern Ohio—and fertilized with liquid manure—are especially conducive t worms. Nightcrawlers (*Lumbricus terrestris*) especially like the combination of no-till drainage pipes, and manure." They preferentially dig their burrows over the drainage pipes, and their deep, wide burrows "...can become a shortcut for conducting pesticides or manure or surplus fertilizers to groundwater or streams."[Comis 2005]. Earthworms have also been shown to influence the rate of degradation of herbicides and other pesticides. While some research suggests that the presence of earthworms can enhance the rate of pesticide degradation, other studies sho tha they slo the rate of degradation and increase the likelihood that a toxic chemical will end up in the watershed [Binet et al. 2006 The potential for increased runoff of fertilizers and pesticides from herbicide-facilitated no-till agriculture (such as GMGT corn and soybeans) to degrade water quality should be compared to other farming methods and alternatives in the DEA. Another main advantage given in the DEA to GMGT corn and soybeans relative to thei conventional counterparts is the increased use of glyphosate instead of other herbicides. FWS states that: "Glyphosate is also relatively environmentally benign, especially when compared to most other herbicides (Duke and Powles 2008). Field and laboratory studie show it does not leach appreciably, has low potential for runoff (Shipitalo et al. 2006), i 7	2-18. Although glyphosate is not a low use rate herbicide, it is considered a low risk herbicide in terms of toxicity and environmental effects, especially when compared with the herbicides it replaces (Cerdeira and Duke 2006). As stated in the EA, characteristics of glyphosate that reduce potential for movement into groundwater or surface waters include the following: rapid absorption by plants, residue strongly adheres to soil particles, and residue degrades rapidly by soil microbes.

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	nontoxic to honeybees, practically nontoxic to fish, may be slightly toxic to aquatic invertebrates, is slightly toxic to wild birds, and has no significant potential to accumulat in animal tissue." [DEA, p. 14]. They go on to briefly discuss some of the negative impacts of glyphosate formulations to amphibians and aquatic communities, but conclude that when "applied according to label instructions, there is a reasonable certainty that no harm to the environment will occur". [DEA, p. 14]	
	Harm from glyphosate to threatened and endangered species is of particular concern, and is addressed, inadequately, on p. 13 of the DEA.	
2-19	FWS did not comply with the Endangered Species Act in the DEA. Threatened and endangered species for the states of Region 6 are listed by state in Appendix C, but whic species ar present on particular refuges is not noted FWS simply states that none of these species occur on farmed sites, except for visits to corn and soybean fields by four migratory birds (whooping crane, piping plover, interior leas tern, and Sprague's pipit). No studies are cited to support their contention that none of the other threatened and endangered species visit farm fields within the refuge, nor are effects of farming practices on threatened and endangere species near bu no in the fields considered. Most of the liste species are plants, and plants are a particular ris from off-site glyphosate movement (discussed below). Also, there is one listed endangered amphibian, the Wyoming toad, and a candidate for listing, the Relict leopard frog; and given the sensitivity of amphibians to glyphosate, impacts to these species should be discussed in detail	2-19. We disagree with this comment. See response in comment 2-16.
2-20	FW relies o the EAs prepared by APHIS that "concluded that no effect is expected on federally listed threatened and endangered species, species proposed for listing, or their proposed or designated critical habitats from exposure to glyphosate-tolerant soybean and corn or from exposure to label rates of glyphosate expected to be used in conjunctio wit glyphosate-tolerant soybeans and corn."	2-20. The Service consulted with the Office of Science and Technology Policy throughout the development of this EA. Guidance provided from this office was to coordinate with applicable federal agencies responsible with GM crop approvals (i.e., the U.S. Environmental Protection Agency, the U.S. Food and Drug Administration, and USDA-APHIS).
	However, USDA has mischaracterized the EPA's evaluation of glyphosate's safety for wildlife. For example, in the final Environmental Impact Statement (EIS) for "Glyphosate-Tolerant (GT) Alfalfa Events J101 and J163: Request for Nonregulated Status", APHIS claimed that by registering glyphosate under FIFRA, EPA had determined that "glyphosate products pose no unreasonable risk to federally listed threatened and endangered specie if the user adheres to the labeled directions	
	In comments on the EIS, EPA set the record straight: "This is an erroneous assumptio because EPA has not completed an assessment of the effect of glyphosate on threatened and endangered species….EPA intends to conduct a national-level Endangered Specie Assessment a part of its registration review for glyphosate….with a final registratio revie decisio i 2015." [Letter from S.E. Bromm, Director, Office of Federal Activities, USEPA, to R.L.S. Gabel, Biotechnology Regulatory Services, USDA; 25 January 2011	
2-21	As far as CFS can determine, no studies have been done in the field to assess the actual impacts on non-target threatened and endangered species of increased glyphosate us associated with GMGT crops. Such studies should be done, because there is a growing body	2-21. As far as we know, no field studies have been conducted on threatened or endangered species in Region 6 that may be affected by glyphosate applications in a cropland setting. However, all USDA-APHIS NEPA documents for these crops have concluded that no significant effect on threatened and endangered species is expected as a result of using glyphosate-tolerant soybeans and corn.
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	of scientific work showing that glyphosate-based herbicides have the potential to harm non-target plants, amphibians, and fish and tha they can be exposed from direct spray, drift, and movement of contaminated water and soil off-site. (Note that most wild species have not been tested for potential harm from glyphosate or its formulations	
2-22	Increased use of glyphosate-based herbicides with GMGT corn and soybeans carries risk t plants, amphibians and fis that were not adequately assessed in th DEA.	2-22. The Service did not conclude "no harm" to wildlife species. Rather we stated that based on recent analyses conducted by USDA-APHIS prior to release of these two GM varieties, no significant impacts on non-target species, including aquatic organisms, was expected by using these varieties and following all applicable restrictions. In addition, in 2010, USDA-APHIS released its analysis and draft EIS for glyphosate-tolerant alfalfa and concluded that "all of the common alfalfa herbicides pose a higher risk to the environment than glyphosate" and "it is clear that use trends (for glyphosate) are increasing and that glyphosate is more toxicologically and environmentally benign than the pesticides glyphosate may be replacing" (USDA-APHIS 2010, p. N-121).
	Contrary to the FWS conclusion of no harm from glyphosate formulations, there is a growing body of scientific work showing that glyphosate-based herbicides have the potential to harm non-target plants, amphibians, and some other animals including fish, and that they can be exposed from direc spray, drift, and movement of contaminate water and soil off-site. Therefore, impacts from glyphosate-based herbicide need t be more fully addressed in the DEA because alternatives that include GMGT crops will result in more glyphosate use and thus greater exposure. With GMGT crops, not only would th total amoun of glyphosate used per acre per year increase relative to conventiona crops, i will be applied post-emergence, through a much greater part of the crop's growing season. Instead of a single glyphosate application occurring mainly for pre-planting burndown, or spot treatments during the season, glyphosate would be applied to the entire field an additional one or more times during the growing season and, thus, potentially come into contact with different animals, plants, and microorganisms at different stages in their lifecycles, resulting in more detrimental impacts to ecosystems. We note that the average number of glyphosate applications made to all soybeans and cotton has risen from 1.1 and 1.0 in 1996, respectively, to 1.7 and 2.4 in 2006 (soybeans) and 2007 (cotton), respectively [USDA NASS Agricultural Chemical Use data for respective years].	
2-23	Water contamination by glyphosate-based products is of particular concern in refuge because high-quality wetlands and other water resources are important for wildlife and are abundant on refuge lands. [DEA, p. 13-15]	2-23. Thank you for your comment. We have added additional text in the document that addresses offsite movement of glyphosate.
	FWS does not adequately consider the possibility that glyphosate formulations will move off-site vi contaminated soi and water, even if farmers follow guidelines for safe use. They mention the tight binding of glyphosate to soil particles, and also state that conservation tillage, increased by GMGT crop adoption, will further reduce the movement of glyphosate off-site vi soil-particle-laden water runoff. Thus, they conclude that wild animals and plants outside of farm fields will have little contact with glyphosat	
	We refuted the fallacy that GMGT crops increase adoption of conservation tillage above. This common mistake is based on confusion of correlation with causation. While farmers who have adopted conservation tillage are somewhat more likely to adopt GMGT varieties, the adoption of the latter does not drive increased use of conservation tillage practices [Fernandez-Cornejo & McBride 2002].	
	As for glyphosate's soil-binding properties, FWS does not adequately consider the many studies (recently reviewed by Borggaard and Gimsing 2007) concluding that glyphosate behavior in soi and water is quite varied, depending on soi type and structure (including	
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	Center for Food Safety – Science Comments, 10 worm holes, discussed earlier), weather conditions before and after glyphosate application, extent of vegetation, previous management of the land (amount of phosphate fertilization, for example), water table, and other factors.	
2-24	Real world studies show that glyphosate does end up in water. In 2002, the USGS began a monitoring program for glyphosate and its main degradation product, AMPA, in Midwestern streams [Battaglin et al. 2005], because "…the use of glyphosate is increasing rapidly, and there is limited understanding of its environmental fate". Indeed, the USDA recently estimated overall agricultural use of glyphosate at 233 million lbs. per year [USDA APHIS 2010]. This represents an astounding 33-fold more glyphosate than was used agriculturally in 1987 (7 million lbs.); and over 6-fold more glyphosate than was used in 1997, the year after GMGT crops were first introduced (36 million lbs.) [EPA 1997, EPA 2004]. This makes glyphosate by far the most heavily used chemical pesticide in the history of agriculture. Battaglin et al (2005) detected glyphosate in about a third of the streams sampled in 2002, after rain events following pre-emergence, post-emergence and harvest seasons. The highest measurement in these streams was 8.7 ug/l in a harvest-season sample. The authors encouraged further study of glyphosate in water: "However, it also appears that glyphosate and AMPA are more mobile or persistent in aquatic environments than earlier research and monitoring suggested (Giesy et al., 2000). Additional monitoring for glyphosate to include summer low flow and wintertime samples could provide the information needed to determine which use, fate, and transport factors have the most influence on their environmental occurrence. Additional monitoring will be needed to determine if the increasing use of glyphosate results in increasing glyphosate and AMPA concentrations in Midwestern streams." In follow-up studies, Battaglin and his colleagues observed vernal pools and streams near herbicide application sites in National Parks (Battaglin et al. 2009): "Vernal pools are sensitive environments that provide critical habitat for many species, including amphibians. These small water bodies are not always protected by pesticide label requirements for no-spray buffer zones, and the occurrence of pesticides in them is poorly documented… Glyphosate was measured at the highest concentration (328 ug/l) in a sample from Riley Spring Pond in Rock Creek National Park. This concentration exceeded the freshwater aquatic life standard for glyphosate of 65 ug/l." (Abstract) Some of the concentrations in these vernal pools were high enough to be toxic to amphibians, assuming that the glyphosate levels reflect application of common formulations. This study in National Parks is relevant for National Wildlife Refuges. 10	2-24. We have added additional language in the text of the EA.

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	Center for Food Safety – Science Comments, 11 Amphibians, officially listed as endangered or not, should be of special concern in our wildlife refuges. They are in decline worldwide, and habitat loss, much of it to agriculture, is a major cause. [Mann et al. 2009] Their natural habitat gone, amphibians do use land and water in and near farming operations: "The fact that many species have been able to persist in agricultural landscapes is testimony to the one saving grace of agriculture… – the near permanent availability of water. Extraction of groundwater and the establishment of weirs, irrigation channels and dams has, in the case of some species, inadvertently provided breeding habitat where otherwise habitat has been destroyed." [Mann et al. 2009] Amphibians pay a price for living with farming, though: "…agricultural practice changes continuously. In particular, chemicals in the form of pesticides and fertilizers are being applied in greater varieties, combinations, and to a greater extent than ever before, and represent a significant suite of pollutants. Data collated on the IUCN Red List of Endangered Species website for 2008 indicate that after habitat loss, pollution is the next major threatening process to amphibian populations (Fig. 1)." [Mann et al. 2009] The very water resources provided by agriculture, and also maintained on refuge lands, can harbor pesticide pollution that negatively impacts the amphibian populations there: "A large proportion of the amphibian life cycle occurs in ponds, streams, and temporary pools that are often associated with agricultural areas receiving pesticides…. breeding and larval development of amphibians occurs in spring and summer and coincides with the application of pesticides and fertilizers on agricultural lands. When considering these factors in addition to the large quantities of various herbicides, insecticides and fungicides presently used in agricultural production the resulting impacts on anurans have the potential to be significant." [Mann et al. 2009] Of animals tested so far, amphibians of many species are more sensitive to glyphosate-based herbicides than other taxa [review: Mann et al. 2009; Dinehart et al. 2010; Relyea 2005a, 2005b, 2006; Relyea and Jones 2009; Bernal et al. 2009a, 2009b, 2010]. Amphibians are poisoned by glyphosate-containing herbicides at larval and adult stages, so could be exposed via water or contact with sprayed foliage. They could also ingest insects that had eaten glyphosate-treated plants, and thus be exposed to glyphosate and perhaps some adjuvants via food, and indirect impact of GMGT cropping systems not considered in the DEA. On average, most of the studies of glyphosate-based herbicide toxicity to larval amphibians found that half of them died within 4 days at between 0.8 and 3.2 mg a.e./liter of glyphosate. Formulations with different adjuvants gave similar results [Relyea 2006, 2010; Bernal et al. 2009a; Dinehart et al. 2010]. To protect most larval amphibians from harm, the 11	

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	Center for Food Safety – Science Comments, 12 concentration of glyphosate would have to be much lower, which would be in the range of concentrations found in some vernal pools [Battaglin et al. 2009, Relyea 2010]. Adult or terrestrial frogs that are directly over-sprayed have LC50 4-day values of 4.5 to 22.8 kg a.e./ha [Bernal et al. 2009b], which means that spray rates must be much lower than that to protect most frogs from harm. If the amounts were lowered by an order of magnitude to provide a margin of safety, the rates allowed in single applications on GMGT corn and soybeans [Monsanto Technology Use Guide 2011], would be in the toxic range [Relyea 2010]. Sub-lethal effect of glyphosate-based herbicides are perhaps more important than lethality, given that they are likely to occur at concentrations encountered more often in nature, and there are now several studies showing sub-lethal impacts: > "At sub-lethal concentrations, exposure to POEA [a common surfactant in glyphosate-based herbicides] or glyphosate/ POEA formulations has been variously reported to result in delayed development (Howe et al., 2004), accelerated development (Cauble and Wagner, 2005), reduced size at metamorphosis (Howe et al., 2004; Cauble and Wagner, 2005), developmental malformations of the tail, mouth, eye and head (Lajmanovich et al., 2003; Howe et al., 2004), histological indications of intersex (Howe et al., 2004) and symptoms of oxidative stress (Costa et al., 2008)." [Mann et al. 2009] Results from various labs differ in the degree to which formulations versus glyphosate itself cause problems, which is not surprising. Studies using commercial formulations are difficult to compare because adjuvant mixes differ over time and between brands. Often researchers are unable to find out what components are present because of trade secret protections. Therefore, they are seldom able to include formulation-minus-active-ingredient controls in experiments. Difficulties notwithstanding, testing formulations for health and environmental consequences is important. Most tests done for regulatory approval involve the active ingredient alone, or include studies on one common surfactant alone [Cox and Surgan 2006, Williams et al. 2000]. According to Cox and Surgan (2006), testing the active ingredient is insufficient for gauging toxicity of a formulation. In some cases, increased toxicity in formulations results from interactions between the active ingredient and adjuvants, in other cases increased toxicity is primarily due to adjuvants alone. They conclude that inert "ingredients can increase the ability of pesticide formulations to affect significant toxicological end points, including developmental neurotoxicity, genotoxicity, and disruption of hormone function. They can also increase exposure by increasing dermal absorption, decreasing the efficacy of protective clothing, and increasing environmental mobility and persistence. Inert ingredients can increase the phytotoxicity of pesticide formulations as well as the toxicity to fish, amphibians, and microorganisms." FWS does concede that the surfactants used in some glyphosate-based herbicides are toxic, and could harm amphibians when used in refuges on GMGT corn and soybeans, but also 12	

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	maintains that injury can be managed by choosing the right formulations and then following directions [DEA, p. 14]: > "Commercial formulations of glyphosate may contain additional chemicals (surfactants) to increase effectiveness. Some research indicates that there are commercial formulations of glyphosate that can negatively affect amphibians (Dinehart et al. 2010) and aquatic communities in general (Relyea 2005, Vera et al. 2010), and it is likely that these additional chemicals cause the toxicity (Mann et al. 2009). These impacts can be minimized by applying glyphosate following label restrictions, including those directing that the chemical should not be applied directly to water or to areas where surface water is present. Because there is a wide range of toxicity exhibited by different formulations of glyphosate (Langeland 2006), these impacts can also be managed by using less toxic formulations."	
2-25	Leaving it up to the FWS managers to select formulations is an unreliable mitigation measure for protecting amphibians. The FWS does not say which formulations they would choose to minimize toxicity to amphibians. First, choices are limited by the Monsanto Technology Use Guide that mandates which formulations can be used on GMGT crops. [Monsanto TUG 2011]. For Monsanto brands, only WeatherMAX and PowerMAX formulations are allowed. WeatherMAX has been shown to be toxic to amphibians. CFS has found no published studies examining this question with the newer PowerMAX formulation. When using other brands with GMGT crops, the formulation must be labeled for use with the trait, and only some are. Second, the EPA recently stated that there have been "only a few ecological effects studies" using glyphosate formulations with non-POEA surfactants, and that "there are some non-POEA formulations that appear to be quite a bit more toxic than the technical material. For most formulations, we have no data. There is an uncertainty associated with formulations registered for aquatic uses and whether or not they contain POEA-type surfactants or other surfactants that are more toxic than technical glyphosate." (EPA Ecological Risk background document, p. 19).	2-25. Refuge managers are mandated and responsible to ensure refuge purposes and the mission of the System is the focus of management actions. While refuge managers have management authority over a refuge, they require specific approvals for pesticide use on refuges. The PUP process is reviewed by regional and national office staff prior to approval.
2-26	Telling farmers to follow directions and not to apply glyphosate-based herbicides over water is an unreliable mitigation measure, too. It is true that many glyphosate-based herbicide formulations are not approved for use over water, and probably none of the formulations labeled for use on GMGT crops are approved for use over water. However, many studies have now shown that glyphosate and formulation components get into water bodies via known and unknown routes even when being used according to directions, and that vernal pools, so important for amphibian reproduction, often escape regulation [Relyea 2006, 2010]. As just discussed, Battaglin et al. (2009) showed that water bodies adjacent to glyphosate-treated fields can also be contaminated at levels toxic to amphibians, even though the farmers were most likely following label instructions, so FWS needs to reconsider the impacts of GMGT crop systems in light of real-world practices and outcomes.	2-26. On the contrary, refuge managers have the authority of the law to enforce cooperative farming agreements and special use permits. See comment 2-6.
	There is one more issue related to glyphosate vs. glyphosate-based formulations, and that has to do with differences in how glyphosate and the surfactants act in the environment.	
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	Center for Food Safety – Science Comments, 14 Some surfactants, including the POEA known to be toxic to amphibians, do not break down as rapidly as glyphosate. This results in an underestimate of environmental risks: "… All the studies mentioned above expressed the toxicity of glyphosate/POEA formulations in terms of glyphosate concentration, which can be deceptive considering the toxicity is allegedly as a consequence of exposure to the formulation surfactants. This situation arises because surfactants in general, including POEA, are typically a mixture of closely related oligomers (e.g. Mann and Boddy, 2000) and measuring surfactants as discrete compounds is difficult. However, if the quantities of surfactant used in a formulation varies, then the toxicity data will also vary because it is dependent on the ratio of glyphosate to surfactant. Furthermore, analysis of water samples for glyphosate as a proximate measurement of the concentrations of associated surfactants is likely to underestimate the risk because the environmental persistence of surfactants may be higher than the active ingredient. Glyphosate has an aquatic half-life ranging from 2 to 14 days, whereas that of the associated POEA surfactant (Monsanto's MON 0818) in the environment has been conservatively estimated at 21–41 days (Giesy et al., 2000)". There are also indirect impacts of glyphosate-based herbicide use on amphibians. For aquatic organisms, effects of glyphosate on water quality, including types and amounts of algae and microorganisms, may be as important in the long run as direct toxicity. This was shown in a study cited in the DEA, but not discussed in detail. Vera et al. [2010] looked at the effects of Roundup on algae and microorganisms that attach to surfaces, called periphyton, a favorite food of tadpoles. They showed that even a single glyphosate application to water is able to change the balance of algae and other microbes. The changes may be mediated by the phosphate contribution made by glyphosate itself, as well as by the direct toxicity of glyphosate to some microorganisms, and its stimulating effects on others. The abstract provides a summary of their findings: "Abstract: Argentina is the second largest world producer of soybeans (after the USA) and along with the increase in planted surface and production in the country, glyphosate consumption has grown in the same way. We investigated the effects of Roundup (glyphosate formulation) on the periphyton colonization. The experiment was carried out over 42 days in ten outdoor mesocosms of different typology: ''clear'' waters with aquatic macrophytes and/or metaphyton and ''turbid'' waters with great occurrence of phytoplankton or suspended inorganic matter. The herbicide was added at 8 mg L-1 of the active ingredient (glyphosate) in five mesocosms while five were left as controls (without Roundup addition). The estimate of the dissipation rate (k) of glyphosate showed a half-life value of 4.2 days. Total phosphorus significantly increased in treated mesocosms due to Roundup̀ degradation what [sic] favored eutrophication process. Roundup̀ produced a clear delay in periphytic colonization in treated mesocosms and values of the periphytic mass variables (dry weight, ash-free dry weight and chlorophyll a) were always higher in control mesocosms. Despite the mortality of algae, mainly diatoms, cyanobacteria were favored in treated mesocosms. It was observed that glyphosate 14	

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2-27	*Center for Food Safety – Science Comments*, 15 > produced a long term shift in the typology of mesocosms, ''clear'' turning to ''turbid'', which is consistent with the regional trend in shallow lakes in the Pampa plain of Argentina. Based on our findings it is clear that agricultural practices that involve the use of herbicides such as Roundup affect non-target organisms and the water quality, modifying the structure and functionality of freshwater ecosystems." [Vera et al. 2010] This team noticed that there were lingering effects of earlier Roundup treatments in some of the mesocosms: > "Since the glyphosate half-life was no longer than 1 week it was assumed that no long term effect could be attained, and that after a year of recovery it would be safe to start a new experiment in the same mesocosms. However, most of the ''turbid'' mesocosms in the present experiment were those treated with glyphosate in the previous experiment and the mesocosms used as controls in the first experiment remained ''clear'' at present. Unexpectedly, we detected that a single application of glyphosate in 2005 shifted the mesocosms from a ''clear'' to a ''turbid'' state which remained until the next year. As was discussed above, the glyphosate may be adsorbed to sediments and a slow later desorption might produce a long turn effect suppressing growth of the most sensitive groups and favoring the abilities to compete of the more resistant algae. This trend in long term effect was suggested by Holtby and Baillie (1989) who reported an enhancement of periphytic production as a response to increased levels of phosphorus produced by a unique application of Roundup done 1 year before their experiment, carried out in natural streams." [Vera et al. 2010] And they conclude: "Based on the findings obtained in our work as well as those obtained in previous researches, it is clear that agricultural practices that involve the use of herbicides such as Roundup affect non-target organisms and water quality, modifying the structure and functionality of freshwater ecosystems." [Vera et al. 2010] After reviewing these and other studies of glyphosate-based herbicide toxicity to amphibians, Mann and his colleagues [2009] summed up their own conclusions that "…. amphibians may be particularly susceptible to the toxic effects of these pesticides because their preferred breeding habitats are often shallow, lentic or ephemeral pools that do not necessarily constitute formal water-bodies, and which can contain higher concentrations when compared to larger water-bodies (NRA, 1996; Mann et al., 2003; Howe et al., 2004; Relyea, 2005a,b,c, 2006)." [Mann et al. 2009] The FSW cites this review in the DEA, but few of the primary studies, and then does not incorporate the findings in its analysis, thus failing to base their conclusions on relevant science. 15	2-27. We agree on the need to protect aquatic organisms, especially amphibians. All efforts are made at the refuge level to ensure that protective measures are employed to minimize risk. These measures include clear stipulations within Special Use Permits and strict adherence to Service policy on PUPs.

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	Center for Food Safety – Science Comments, 16 Studies have also shown that some species of fish are sensitive to glyphosate-based herbicides, both from the active ingredient glyphosate alone and from surfactants. Sub-lethal effects are possible at concentrations observed in nature, so should be considered in the DEA. The most recent study was by Jaensson (2010), and includes a review of relevant literature on glyphosate toxicity to fish in general. In Jaensson's study, glyphosate (active ingredient alone), in common with some other pesticides tested, affected the endocrine system of male Atlantic salmon by suppressing 11-ketotestosterone levels (11KT), and that there were also effects on brown trout. She concluded: "It appears the synthesis of 11-KT in the salmonid parr is affected by pesticide interference with the olfactory and endocrine system. Production of 11-KT was significantly altered by exposure to cypermethrin and glyphosate, both during priming and behavioural studies. Cypermethrin appears to decrease reproductive behavioural responses as well as sex hormone level implying that there may be an effect in the olfactory system. The effects described from copper exposure seem to be from mechanisms acting upon both the olfactory system and the endocrine system as there was a reduction in spawning behaviour and milt production, but not in sex hormones. However, glyphosate did not cause observable behavioural changes and only lowered 11-KT indicating that any effects were acting directly upon the endocrine system and not via olfactory regulation. "Our results demonstrate that there is a possibility of environmentally relevant pesticide concentrations being capable of suppressing the brown trout and Atlantic salmon male endocrine response, including spawning behaviour, to female pheromones. Detected levels in natural water ways of …glyphosate can range from 328 µg L-1 to 0.02 µg L- 1(Scribner, et al. 2003; Battaglin et al. 2008; Struger et al. 2008). The levels of exposure in the current study are, therefore environmentally relevant (… glyphosate 150 µg L-1). Investigating the effects of relevant levels of exposure is imperative to understanding what is happening in the environment. It is seldom that these animals actually come in contact with acute levels of pesticides. However, their environments are inundated with low levels of pesticides, and more research will need to be done using environmentally relevant exposures."	
2-28	Given the large number of fish species listed in Appendix C of the DEA as threatened or endangered in Region 6; including Greenback cutthroat trout, Lahontan cutthroat trout, and Rio Grande cutthroat trout; FWS should carefully assess potential risks to fish from increased glyphosate use, and they did not.	2-28. We completed a Section 7 intra-service consultation for this EA. We expect no effect on these species due to the implementation of the preferred alternative.
2-29	<u>FWS did not take into account possible negative consequences of increased glyphosate use on non-target plants.</u> Plants are, of course, sensitive to the herbicide glyphosate, so non-target plants including threatened and endangered species are inherently at risk from inadvertent exposure. Drift is unavoidable in many situations, even when directions are followed, and occurs with both ground and air spraying equipment, but drift was not discussed in the DEA.	2-29. We agree that non-target plants may be negatively affected by glyphosate applications caused by drift. Refuge staff minimizes this risk by applying herbicides when conditions are suitable for spraying (low wind) and by following all label guidelines and restrictions. Farmers operating under a Special Use Permit on a refuge are just as liable for applying herbicides as they would be on their own lands if drift results in harm to non-target plant species. Refuge managers are authorized to take legal action under the authority of the Administration Act for any violations.
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In fact, there are well-known sub-lethal effects of glyphosate on wild plant populations. The data regarding sub-lethal glyphosate effects on plant reproductive success are reviewed, and supplemented by original research, in a key peer-reviewed scientific paper that is not cited in the DEA [Blackburn and Boutin 2003].

This research specifically addresses risk to the success of wild plants from drift levels of glyphosate related to increased use of glyphosate associated with Roundup Ready crops, such as GMGT corn and soybeans. The authors state:

> "The use of these new crops has raised concern about an increase in reliance on glyphosate for weed control with detrimental consequences on nontarget plants and habitats due largely to the broad spectrum nature of this herbicide. The objective of this paper is twofold: (1) to review the literature on the effect of glyphosate on seed germination and early seedling growth, and (2) to present the results of a new experiment with several crop and noncrop species. The attempt was made to build on past findings and to add to the knowledge base in an effort to move away from studies on crop plants such as soybean and grain by focusing mainly on noncrop plant species." [Blackburn and Boutin 2003, p. 272].

Past findings are that sometimes plants that have not suffered mortality after contact with glyphosate, and in fact may not have exhibited visible symptoms of injury at all, nevertheless produce fewer seeds or seeds that have problems with germination or vigor [references cited in Blackburn and Boutin 2003]. Also, plants that reproduce vegetatively from tubers or rhizomes sometimes show injury in the generation subsequent to actual glyphosate application or contact [Viator et al. 2008, Dalley and Richard 2010].

Specific, unique properties of glyphosate explain how it can affect subsequent plant generations. Glyphosate applied to leaves and stems translocates with photosynthates to the most rapidly growing tissues and organs of plants, such as developing flowers and seeds [Feng et al. 2003, Feng and Chiu 2005]. In most plant species glyphosate is not metabolized, and these plant parts not only accumulate the glyphosate but also are particularly sensitive to it [Feng et al. 2003, Chen et al. 2006]. Therefore, glyphosate can cause pollen sterility [Chen et al. 2006, US Patent 4,735,649], potentially resulting in fewer seeds; or can cause seeds that form to be less viable and vigorous [Thomas et al. 2005, Walker and Oliver 2008]. Different species of plants are more or less sensitive to glyphosate's sexual and vegetative reproductive effects, and the stage of development at which the plant is exposed to glyphosate influences the response, as well [Blackburn and Boutin 2003]. In many cases, drift levels of glyphosate have been shown to cause these effects [Blackburn and Boutin 2003]. Thus, sub-lethal doses of glyphosate can reduce the fitness of an affected plant species, reducing population levels in subsequent generations. Because other herbicides have different basic properties – for example, less efficient or no translocation to reproductive tissues, or metabolism within the plant resulting in less accumulation and persistence – the substitution of other herbicides by glyphosate is likely to have unique effects on plants, and preferentially affecting reproductive success at low rates may be one of these.

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	Center for Food Safety – Science Comments, 18 Another factor FWS did not consider is the impact of being able to apply glyphosate to whole fields during the entire growing season – the so-called post-emergence use of glyphosate that is unique to glyphosate-resistant crops. It is certain that use of glyphosate-resistant corn and soybean systems in refuges will result in wild plants being exposed to this potent broad-spectrum herbicide during more of their growth phases, including closer to or during reproduction, making them more vulnerable to adverse reproductive outcomes than would be the case with traditional pre-emergence use of glyphosate with conventional corn or soybeans. In their discussion, Blackburn and Boutin say this: "It is difficult to predict how glyphosate exposure will change a plant community due mainly to the wide variation in maturation and growth patterns of the species present at the time of application. Noncrop species growing within crops or along field margins where they may be exposed to glyphosate through overspray or spray drift may be at different phenological stages than the crop in which or near which they are growing (Shuma et al.,1995). Some species may have mature seeds while others may have immature seeds and still others may not be reproducing yet. The future of the seeds could be affected, while in the cases where plants are not at a stage of reproduction, the death or declined vigour of the plant could result in no input of seeds for the next generation. Herbicide applications may reduce the production of viable seeds and thus reduce the establishment or replenishment of noncrop seed reserves in the soil (Baskin and Baskin, 1998)." Again, post-emergence use of glyphosate with GMGT crops greatly increases the likelihood that wild plants will be exposed to glyphosate at more mature life stages than would be the case with pre-emergence glyphosate with conventional crops. Glyphosate drift in this situation is common, and will cause a varied and perhaps cryptic injury pattern, not seen until the next generation. This type of injury will be difficult to monitor and mitigate given its cryptic nature. Changes in plant populations due to glyphosate injury can lead to indirect impacts on animals, including threatened and endangered species, and these indirect impacts were not considered in the DEA. FWS did not consider other types of sub-lethal effects of glyphosate. For example, there has been recent interest in the non-herbicidal effects of glyphosate, some of which obtain at very low levels typical of drift exposure [Duke and Dayan 2010]. Sub-lethal glyphosate injuries are of particular importance for populations of threatened and endangered species. FWS is in a better position than most farmers to know what endangered plants are present near their agricultural fields and to influence pesticide regulations specifically for those areas, as they propose in the DEA [p. 19-20]. Relying on the FWS to mitigate the effects of off-site glyphosate movement on threatened and endangered plants is an unreliable mitigation strategy. Given the cryptic nature of important sub-lethal glyphosate effects, such measures may not be adequate to protect the 18	

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	plants, even if the refuge managers do know that there are such species nearby. In other words, the regulatory approach to managing pesticides is inadequate.	
	Cumulative impacts are not taken into account appropriately.	
2-30	In the DEA, "Cumulative Impacts" are discussed on p. 21, but FWS limits the definition of cumulative impacts to future land management trends within refuges. They foresee an increase in restoration and decrease in farmed acreage as land is returned to native species, and claim that use of GMGT corn and soybeans will facilitate this shift; and this is the only cumulative impact considered. However, cumulative impacts include the effects of approving GMGT corn and soybeans on refuges across the whole region, and throughout the country. Cumulative impacts also involve the combined effects on local ecosystems of using GMGT corn and soybeans on refuges in addition to similar cropping systems on nearby non-refuge lands. These cumulative impacts must be considered and compared among alternatives.	2-30. Additional language has been added to the EA regarding cumulative impacts in relation to anticipated future restoration activities within Region 6.
2-31	**Conclusion: FWS should withdraw the current DEA and prepare a full EIS.** Center for Food Safety urges the Fish and Wildlife Service to postpone any decision on the use of GMGT crop systems in wildlife refuges until a fuller examination of the issues discussed above are undertaken in the context of an Environmental Impact Statement (EIS). Issues that should be addressed in an EIS include an analysis of the pros and cons of an array of alternatives, such as organic or conventional perennial and cover crops vs. the corn and soybean-based alternatives considered in the DEA. Alfalfa, in particular, offers many benefits that may well prove to be greater than corn and/or soybeans, whether glyphosate-resistant or not. Conventional corn and soybeans should be assessed in conjunction with annual cover crops, which offer advantages such as weed suppression in the follow-on crop, uptake of unused nutrients (e.g. nitrogen fertilizer) and reduced soil erosion. The "no farming" alternative should also be seriously considered.	2-31. We disagree with this conclusion. When considering the petitions to approve GM corn (2000) and GM soybeans (2007), USDA-APHIS extensively reviewed the impacts of these crops and concluded that an EA was the appropriate level of review and that a FONSI was warranted. These documents (EAs and FONSIs) had the potential to affect millions of acres of farmland across the U.S., a vastly larger scope than short duration farming on several thousand acres of refuge lands across eight states. As stated in our FONSI, we do not believe an EIS is necessary because this federal action does not satisfy the requirements under NEPA as a major federal action significantly affecting the human environment.
	FWS should also examine the adverse impacts of glyphosate and glyphosate-based formulations, as discussed above, particularly the large and growing body of literature on the toxicity of glyphosate-based formulations to amphibians and fish, both lethal and sub-lethal effects. Other areas that demand assessment prior to any decision include the impacts of glyphosate formulations on aquatic microorganisms and of glyphosate drift on wild plants. Also, the Endangered Species Act must be complied with fully. Cumulative impacts must be considered, as well.	
	Such an analysis may well demonstrate that wildlife refuges should be a refuge from the GMGT corn and soybean lands that surround them.	
	Sincerely,	
	Martha L. Crouch, Ph. D Science Consultant, Center for Food Safety	
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No.	Letter	Response
	ORIGINAL VIA U.S. MAIL March 3, 2011 Tom Koerner Sand Lake National Wildlife Refuge U.S. Fish and Wildlife Service 39650 Sand Lake Drive Columbia, SD 57433 **RE: Comments on Draft Environmental Assessment and Draft Compatibility Determination on Use of Genetically-modified, Glyphosate-tolerant Corn and Soybeans on National Wildlife Refuge System Lands in the Mountain-Prairie Region** Dear Mr. Koerner:	
3-1	On behalf of Public Employees for Environmental Responsibility (PEER) and the Center for Food Safety (CFS), I am submitting the following comments on the U.S. Fish and Wildlife Service (FWS) Draft Environmental Assessment (EA) and Draft Compatibility Determination (CD) evaluating the use of genetically-modified, glyphosate-tolerant corn and soybeans on lands managed by the National Wildlife Refuge System in the eight-state Mountain-Prairie Region (Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah and Wyoming).	3-1. Thank you for your comments.
3-2	The preferred alternative would allow continued use of genetically modified or genetically engineered (GE) crops. The EA states that currently 6, 175 acres are under GE-crop cultivation yet does not specify where these acres are located. For purposes of these comments, we will presume that these acres are located in the 17 refuge system units listed in the CD. It is not clear how long these acres will remain under GE cultivation or whether the number of acres could increase over time. Apparently under the preferred alternative, refuge officials would have discretion to approve cultivation of GE crops as they deemed fit.	3-2. This is a correct assumption, however the scope of this programmatic EA is throughout the entire region where soils, precipitation, and prior farming would support growing soybeans and corn. Additional language has been added to the EA describing the location of GM crop usage in Region 6. As stated in the EA, farm fields are usually cropped 2–4 years and then planted back to native vegetation. Which fields will be planted to glyphosate-tolerant corn and soybeans each year will vary, based on a number of factors determined by the refuge manager. Glyphosate-tolerant soybeans and corn, along with conventional spring wheat, winter wheat, sorghum, canola, corn, soybeans, or other crops may also be rotated to control weeds before restoration occurs. In each year, some fields are restored to native prairie species while others are farmed again to further control weeds and prepare the seedbed.
3-3	By way of overview, it should be noted that cultivation of GE crops has been taking place for years in the Mountain-Prairie Region without compliance with the National Environmental Policy Act (NEPA). Ironically, FWS states that this EA was itself prompted by the "increased use" of GE corn and soybean crops on refuge lands. Thus, this EA is the first, albeit after-the-fact, effort by the Region to comply with NEPA.	3-3. The Chief of Refuges has been delegated the authority from the Director to approve the use of GM crops when he/she deems their use is essential in achieving refuge purposes (601 FW 3-15C, see amendment).

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	While we support efforts of the FWS to comply with NEPA, for reasons outlined below PEER and CFS believe that this EA is flawed, as is the accompanying less than 3-page Draft Compatibility Determination, and that FWS is undertaking this assessment in order to extend a legal fig-leaf over its past practices and help insulate it from future legal challenges. Most notably, the practices identified in the FWS preferred alternative violate the agency's own policies and are counterproductive to refuge purposes. Moreover, the EA does not comport with NEPA, as it fails to analyze alternatives or fully assess likely impacts. Finally, it appears that with respect to approval for GE crops FWS is improperly placing the profitability of, and convenience to, local cooperating farmers over the refuge values it is supposed to place paramount.	
3-4	**I. Preferred Alternative Violates FWS Ecological Integrity Policy.** The Fish and Wildlife Service's own policy on Biological Integrity, Diversity and Environmental Health for the National Wildlife Refuge System (NWRS) prohibits the use of GE crops unless use of GE crops are "essential" to the refuge: "We do not use genetically modified organisms in refuge management unless we determine their use is essential to accomplishing refuge purpose(s)…" 601 FW 3.1.5C	3-4. Additional language has been added to the EA describing the "essentiality" of utilizing GM crops for restoration purposes.
3-5	The *Merriam-Webster* dictionary defines essential as "necessary" or indispensable." The EA claims that GE crops may have certain advantages over non-GE crops but nowhere contends that GE crops are necessary or indispensable to accomplishing a legitimate refuge purpose that could not be accomplished by other means. Significantly, the EA contends that the primary use of GE crops is in restoring former farmlands to natural habitats but concedes that – "Despite this trend of converting farmlands to natural habitats, current budget levels make it unlikely that the Service could immediately address all System lands requiring renovation or restoration." Thus, taking this un-attributed conclusion at face value, the FWS justification for GE crops is not necessity but cheapness – hardly a sufficient justification for subverting the biological integrity of refuges or agency policy. Notwithstanding regional certification of need, the EA makes clear that reliance on GE crops is due to administrative convenience, not necessity.	3-5. We disagree with this statement. Glyphosate-tolerant corn and soybeans would be one of the crops used for seedbed preparation whether refuge staff or a cooperative farmer conducted the work. However, the reality is that refuge budgets are finite and limited. Without the use of local farmers, refuge staff would not be able to effective or efficiently restore current agricultural fields or previously farmed fields dominated by nonnative species to native vegetation, since most refuges do not have the necessary equipment to conduct farming. It does not make economic sense to acquire equipment when local cooperators have all the necessary equipment and expertise and are refuge neighbors.
3-6	**II. Preferred Alternative Too Vague to Gauge Environmental Impacts** The preferred alternative covers a wide range of agricultural practices which may vary widely over time. The EA asserts that the 'number of units and acres cooperatively farmed on System lands in Region 6 in any one season varies." Yet, certain agricultural practices will have corresponding impacts in different places. Despite varying effects, this EA takes a one-size-fits-all approach in which all the effects of all GE crops are analyzed in a blanket fashion, regardless of quantities or setting.	3-6. The preferred alternative is actually quite limited. If a refuge manager, using his or her sound professional judgment, views the use of GM soybeans and corn as the best means necessary to achieve refuge purposes and restore degrade farm fields, he or she may do so.

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3-7	The open-ended scope of the preferred alternative makes it impossible for FWS to prepare just one NEPA document or one CD that covers the impact of an unknown number of possible farming arrangements in 17 (or more) different refuge units across 8 states.	3-7. The preferred alternative is not open-ended. It evaluates the use of two varieties of GM crops for use in habitat restoration activities. Farming programs, if applicable at a refuge, are evaluated during the development of 15-year management plans called comprehensive conservation plans. The development of a comprehensive conservation plan is a public process that follows the NEPA process. Compatibility determinations are completed for each refuge with a farming program.
3-8	The stated use by the EA for GE crops is "renovation of habitat or restoration of native plant communities" but nowhere states exactly where this function is needed. Unless the Mountain-Prairie Region is planning to go on a real estate buying spree, one would expect GE cultivation to decrease or disappear over time as its restoration function is fulfilled. This EA, however, contains no such analysis or assessment. In fact, it is quite possible that GE cultivation will increase in Mountain-Prairie refuges, as there is no policy requiring abatement of agricultural activity on refuges. As noted above, concerns about future FWS "budget levels" may induce FWS to turn over more refuge acreage for agricultural management. Nonetheless, this EA seeks to assess impacts from potential cultivation of thousands of additional refuge acres that are yet to be determined.	3-8. Farming is used as a tool on refuges to target habitat restoration activities. Even refuges that have been part of the System for decades may need restoration activities to improve habitat for wildlife, in addition to newly acquired lands. We noted in the cumulative impacts section that we did not believe that the number of acres farmed (with GM or conventional crops) would increase significantly in the foreseeable future.
3-9	Since this is not a programmatic EA, in order to comply with NEPA, FWS must do a refuge-by-refuge review for each farming program. With respect to a region-wide policy, FWS is legally required to prepare a full Environmental Impact Statement (EIS). Similarly, FWS may not do a region-wide CD but must do a separate determination for GE cultivation on each refuge.	3-9. This document is a programmatic EA for the use of glyphosate-tolerant corn and soybeans for restoration purposes. Individual farming programs, if applicable, are assessed during the comprehensive conservation plan process.
3-10	**III. Improper Exclusion of No-Farming Alternatives** Two alternatives excluded from consideration by the EA are "Go-Back" (i.e., unmanaged succession) and Organic Farming. Go-back was excluded because "past experience with this go-back method has shown that these fields require long-term invasive species control and that few native species become established. The end result has been habitat objectives are not achieved." Yet the EA gives no examples of this past experience, no explanation of why invasive species control requires GE crops, or which	3-10. The Service has developed a ranged of alternatives for this EA necessary to provide sufficient evidence and analysis for determining whether to prepare an EIS or a FONSI (40 CFR 1508). The purpose of this EA was specifically to address whether or not the use of two GM crop varieties on limited refuge lands within Region 6 constituted a major federal action requiring the development of an EIS. The purpose was not intended to evaluate all alternatives available to refuge managers to restore grassland habitats.
3-11	refuge objectives could not be achieved. The EA offers only a bald, unsupported assertion that natural succession is infeasible. In addition, the EA appears to blindly assume that introducing genetically engineered plants is superior for refuge to other immigrant non-native plants.	3-11. The EA correctly cites several studies that show that repeated tilling through long-term farming (some fields have been farmed for upward of 80–90 years) reduces desirable seed reserves for native vegetation to near zero. Many refuge managers in Region 6 have more than 20 years of experience assessing the success and failure of grassland restoration techniques.
3-12	The organic farming alternative was rejected "because an inadequate number of organic farmers are operating in reasonable proximity to System lands" – another unsupported assertion. The EA does not cite any effort by FWS to locate or recruit organic farmers, a fast growing segment of the domestic agricultural industry. Yet the EA points out that approximately 37% of U.S. corn acres and 9 % of U.S. soybean acres were planted in non-GE crops, suggesting that alternatives to GE crops are readily available.	3-12. The numbers regarding the percentage of GM soybeans and corn grow in the U.S. has been updated in the EA. In 2010, 23 percent of corn acres where glyphosate-tolerant varieties only, while 86 percent of the total corn crop were some form of GM variety (USDA-ERS 2010a, 2010b). We agree that other non-GM crop types are available is reflected by over 40 percent of the crops grown on refuges in 2009 were non-GM crops.

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3-13	The EA also notes that organic farming could increase "the timeframe required for habitat restorations" but does not explain why this is such an onerous barrier as to completely exclude this option from any consideration.	3-13. Organic farming methods increase the time needed before native vegetation could be restored due to requirements of land to be chemically free for a period of time. Control of invasive species would be more limited by utilizing organic methods. These facts reduce the effectiveness of organic farming as a tool to restore grasslands. With that said, nothing in this EA precludes refuge managers, using their professional judgment, from working with neighboring organic farmers if they can meet habitat restoration and management objectives.
3-14	Again, the EA concludes that "requiring organic-only farming would not meet habitat restoration goals and objectives" but does not explain which goals and objectives. It appears that the sole purpose of the EA is to reach the pre-determined conclusion that GE crops will continue to be grown throughout the region. Finally, the EA leaves unanswered the unstated question of how National Wildlife Refuges were able to meet their objectives and goals before the relatively recent introduction of GE crops.	3-14. Thanks for the comment. Additional text has been added Section 1.4 of the EA describing how former croplands were restored prior to the advent of GM varieties.
	IV. EA Inaccurately Minimizes Harm to Refuge Wildlife	
3-15	The EA concedes that use of GE crops may have detrimental effects on wildlife but paradoxically concludes that the preferred alternative "would have no effect on non-target or federally listed endangered or threatened species". The most common pesticide formula used with GE crops (glyphosate, sold by Monsanto under the trade name Roundup) harms and kills amphibians. Studies show that certain amphibian populations exposed to low, field-relevant usage rates of Roundup herbicide experience much higher mortality than unexposed amphibians. Such impacts will only increase with the dramatically rising use of glyphosate associated with Roundup Ready crops. From 1994 to 2005, for instance, USDA data demonstrate that aggregate use of glyphosate on soybeans, corn and cotton has risen from 7.9 million lbs. to 119.1 million lbs. – a 15-fold increase. Thus, alone, this dramatically increased herbicide exposure to wildlife and the ecosystem contravenes the purpose of the refuge system to protect the ecosystem. Studies also indicate an adverse effect of GE crops on birds because the farming system associated with herbicide tolerant GE crops alters the plant and weed communities in farmed areas, thus affecting the diets of birds. But the EA rationales, "Glyphosate is less toxic to fish and wildlife than other commonly used agricultural herbicides" – a conclusion that wrongly assumes that toxicity to wildlife is ever a compatible refuge use.	3-15. The Service relied on previous analyses and conclusions by USDA-APHIS (2000, 2007), and other studies, to inform our determination on the effects on aquatic organisms. The Environmental Protection Agency has concluded that glyphosate use on these crops, when applied accordingly to application rates and other restrictions, does not pose any unreasonable risks to wildlife and the environment (USEPA 1993).
3-16	While admitting that herbicides can be toxic to wildlife, especially if applied on waters, the EA makes three arguments asserting that these harms will not occur. First, it cites an EA by the U.S. Department of Agriculture (USDA) but does not explain how this assessment of impacts on agricultural lands would apply to a national wildlife refuge. Moreover, the validity of USDA claims of no biological impact is under ongoing legal challenge. Second, the EA claims that full compliance with pesticide use protocols and other protective procedures will eliminate all risks to threatened and endangered species. Refuge wildlife is not confined to threatened and endangered species nor does the EA provide any evidence that compliance with these protocols eliminates harm. Further, as elaborated on below (see VIII), FWS has no reason to assume full compliance with these protocols is guaranteed.	3-16. Refuge managers are responsible for enforcing all laws, regulations, and policies applicable to national wildlife refuges. It is impossible to eliminate all harm to wildlife; however, regulations and policies are in place to minimize and reduce harm from management actions.

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	Third, if cultivated lands were suitable wildlife habitat, we would not need refuges. In fact, and particularly in the 8-state Mountain-Prairie Region, refuges are often biological islands surrounded by row crop agriculture. Providing natural habitat is the reason for the refuges' existence.	
	V. EA Inadequately Considers Harm to Refuge Plants, Insects and Soil	
3-17	GE crops also harm beneficial insects, increase weeds and alter soil ecology – impacts not analyzed in the EA. For example, FWS biologists have found that GE crops can harm soils. A primary justification for farming on refuges is the preparation of soil for the planting of native grasses, and many refuges plan to convert existing croplands into native grassland in the future. Using GE crops contradicts this purpose by damaging the very soil that farming is intended to improve.	3-17. Implications that GM crops may harm soil micro-organisms has centered on GM crops that contain natural pesticides, such as corn containing *Bacillus thuringiensis*. This EA is not analyzing the use of this corn.
3-18	Studies have shown that cultivation of herbicide-tolerant GE crops dramatically increases the use of herbicides (see VI, below). Herbicides degrade the soil ecosystem and pollute nearby wetlands, streams, lakes, and rivers.	3-18. The Service is very concerned about the health and safety of wetlands and streams on and adjacent to refuges. All precautions and best management practices within approved PUPs and IPM plans are followed. Refuge managers are responsible for ensuring proper use of all herbicides applied on refuge lands, whether by local farmers or refuge employees.
	VI. Preferred Alternative Fosters Evolution of Resistant Weeds and Increased Use of Pesticides	
	Currently, the major use of genetic engineering in agriculture is to make crops herbicide-tolerant (HT), primarily to the weed-killing chemical glyphosate or Roundup. Extensive evidence, including warnings from FWS biologists, demonstrates that greatly increased reliance on glyphosate associated with Roundup Ready crops has fostered a dramatic increase in acreage infested with glyphosate-resistant and glyphosate-tolerant weeds. Many experts in the field recognize the escalating problem of weed resistance, and at least nine different weed species have been confirmed as glyphosate-resistant in 20 states. For example, glyphosate-tolerant horseweed has been reported in annual row crops in 13 states.	
3-19	The EA admits this risk and outlines some practices that may minimize this risk. For example, the EA claims that effective integrated pest management (IPM) will "help manage herbicide resistance of weeds on System lands because it would be an additional technique to use in weed management" – a nonsensical claim that overlooks the fact that the GE cultivation practices are the prime contributor to herbicide resistance. Even taking the outlandish claim of the EA at face value, IPM will certainly not eliminate this risk that is aggravated by the preferred alternative.	3-19. The Service acknowledged in the EA that resistance to glyphosate among common agricultural weeds is increasing in many areas. IPM strategies are effective at reducing risk of refuge lands contributing to the problem. Short-term use of glyphosate (2–4 years) as part of a farming rotation for grassland restoration efforts on limited acres throughout the region is not expected to significantly increase the likelihood of weed resistance. Once farm fields are restored, glyphosate use ceases.
	Thus, the EA preferred alternative would unquestionably add to this mounting problem by allowing blanket approval of Roundup Ready glyphosate-tolerant GE crops. Weed resistance to glyphosate in turn leads to increasing use of harsher, more toxic herbicides. The most comprehensive, independent study of GE crops and pesticide use to date demonstrates that adoption of HT crops resulted in 138 million pounds more herbicide use than would have been used in their absence over the nine years from 1996 to 2004. Having to resort to more toxic pesticides certainly conflicts with the purpose of the refuge system because they pose significant toxicity risks to wildlife.	

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3-20	**VII. Risks of Biological Contamination Are Not Properly Analyzed** Biological contamination is a critical risk arising from GE crops that FWS biologists have acknowledged may adversely affect refuges, and two federal courts have found to be a legally cognizable and significant environmental risk. Biological contamination refers to the unintended co-mingling of GE crops with non-GE crops and can occur through pollination of non-genetically engineered plants by genetically engineered plants or by the mixing of genetically engineered seed with natural or non-genetically engineered seed. Biological contamination is the worst form of environmental contamination, because unlike standard chemical pollution, this is living pollution that can be spread through pollen flow. Once the gene transmission occurs there is no way for the farmer to remove the gene from the crop or control its further spread.	3-20. In USDA-APHIS's most recent regulatory NEPA documents in 2007 for the Glycine max line, they state that there should be no significant environmental impact as a result of gene flow or gene introgression from this soybean line. This is based on the fact that G. max does not cross with any other species other than G. soja, which does not occur in the U.S. outside several research plots. G. max has never been found in the wild. (USDA-APHIS 2007)
3-21	GE crops contaminate neighboring fields and seed stocks through pollen drift, seed mixing, and human error, and once the seed is contaminated, the harms associated with GE crops become unavoidable and virtually irremediable. The EA addresses this effect by stating: > "If refuge or wetland management district managers are made aware of adjacent certified organic farm acres for soybeans or corn, measures may be taken to address neighboring landowner concerns and provide a buffer if warranted." Discretionary steps by refuge managers to monitor their neighbors' crop rotation are a thin reed upon which to hang a mitigation strategy. It appears that the EA improperly minimizes this direct effect of the preferred alternative.	3-21. We acknowledged in the EA that corn is open-pollinated and that there is a possibility of transferring pollen between glyphosate-tolerant corn and conventional corn varieties. USDA-APHIS in its deregulation of glyphosate-tolerant corn in 2000 recommended a buffer of 660 feet beyond which transfer of pollen is negligible. Certification programs for organic farmers such as the Identity Preserved for corn require that non-GM identity preserved corn be planted at least 660 feet (200 meters) from any GM corn varieties. (Thomison 2004). As noted in the EA, if refuge or wetland management district managers are made aware of adjacent certified organic corn farmers, measures may be taken to address any concerns, including providing a reasonable buffer if warranted.
3-22	**VIII. EA Imprudently Premised on Complete Compliance and Lack of Human Error** The principal mitigation offered by the EA against the array of harms catalogued above is that the cooperative farmers on the refuge follow pesticide label instructions to the letter and obey all conditions laid out in the FWS cooperative farming agreement, that FWS Pesticide Use Proposals are faithfully executed and that IPM Plans are designed and implemented for each NWRS unit.	3-22. Refuge managers are responsible for ensuring cooperative farmers follow all stipulations outlined in cooperative farming agreements, including application of any herbicides. In addition, refuge managers use sound professional judgment when designing restoration management plans, and ensuring that work is completed according to all applicable laws, regulations, and policies.
3-23	The EA presupposes that this complete array of requirements and protocols will be carried out on every unit without a lapse. This presupposition is not backed by any information about whether these measures are currently being implemented as envisioned. In addition, neither the EA nor FWS policy lays out clear enforcement mechanisms to make sure that safeguards in cooperative agreements, IPM plans or refuge Pesticide Use Proposals are enforced. Without enforcement, the confidence claimed by the EA in compliance may be misplaced.	3-23. The purpose of the EA is not to describe how refuge managers enforce cooperative agreements or Service policy. Refuge managers establish cooperative agreements to achieve habitat restoration objectives and must conduct their work according to all applicable laws, regulations, and policies.

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3-24	In addition, the EA assumes that a thoughtful Pesticide Use Proposal is designed in each refuge with a farming program, yet FWS cannot be bothered to prepare a separate EA or CD for each refuge program. Instead of analyzing the potential environmental effects of each refuge's farming program, FWS lumps them all together in one short, sweeping but vague EA (see II, above). If refuges cannot prepare detailed EAs or CDs for their farming program, it is questionable that these units will prepare detailed, thoughtful Pesticide Use proposals for that aspect of their farming programs.	3-24. Refuges in Region 6 have analyzed (or are analyzing) individual farming programs to comply with the NEPA process during the comprehensive conservation plan development process, which outlines a vision, goals, and objectives for the refuge for the ensuing 15 years. Refuges with a farming program also have completed a compatibility determination.
3-25	Finally, the EA Summary concedes that the Mountain-Prairie Region has been ignoring NEPA requirements for years as this EA is the first one it has conducted. Similarly, the Mountain-Prairie Region has also violated the Refuge Improvement Act by failing to complete a CD for this non-wildlife dependent use of the refuge. If the Mountain-Prairie Region can flout these basic environmental statutes, why would it be reasonable to assume 100% with FWS policies? In short, the EA does not provide a realistic assessment of environmental impacts but rather analyzes a theoretical model based upon ideal conditions.	3-25. Restoration of degraded habitats (farm fields) to native grasslands, and the control of invasive species, is a primary management goal for all refuges in Region 6. By reducing invasive species prior to restoration activities, we increase the likelihood of being successful in meeting restoration objectives and increase the resiliency of the grasslands to future encroachment of invasive plants.
	IX. No Legitimate Refuge Purpose Requires GE Crops The only refuge purposes purportedly served by agriculture, according to the EA, are habitat restoration and management, such as control of invasive plants. The EA maintains that GE crops can ease the restoration and maintenance of new refuge lands – which are principally farmed lands when added to the NWRS.	
3-26	The EA suggests that the transitional role is from three to five years. Yet, the EA concedes that GE cultivation has been taking place for years on refuge units – and implies that it will likely take place for many more years to come. This posture belies the EA premise that the purpose of GE crops is as a restoration agent for disturbed natural habitat. Nowhere does the EA explain precisely why GE cultivation in a national wildlife refuge for more than five years is needed yet the EA purports to assess impacts of GE cultivation for an unlimited time frame. Further, it is all the more questionable that the EA failed to analyze natural succession as an alternative; especially when part of the rationale offered by the EA was that unmanaged succession takes more time when compared to active management when the preferred alternative appears to take years and years, perhaps a generation.	3-26. Years of experience by refuge managers in Region 6 has shown that degraded habitats with extensive invasive species issues take more than 2 years of farming to prepare the field for planting native grasses and forbs. As fields are restored, use of glyphosate ceases in those fields.
3-27	As noted, the EA does not explain how refuges restored and maintained lands before the relatively recent advent of GE crops or why those older methods are less cost effective than GE cultivation. Nor does it provide a measure of cost effectiveness or suggest how big the margin is between GE agriculture and other discarded methods. While invasive plants can impact wildlife, it should be noted that the crops themselves are invasive plants (GE crops are artificial invasive crops). The EA does not (but should) weigh the relative impacts on wildlife from agriculture versus invasive weeds which immigrate to fill the void after cultivation has ceased.	3-27. Additional text was added to the text in section 1.4.

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	In short, the EA and CD claims of serving legitimate refuge needs are specious.	
	X. Refuges Crops May Illegally Bait Wild Birds	
3-28	An effect that the EA and CD ignore is that the cooperative farming practices condition ducks and other waterfowl to feed on the bait of waste crops and then allow hunters to shoot them. Hunters refer to birds exposed to bait as "daffy ducks," so blinded by the quest for food that these wild creatures ignore instinct by acting tame. Ducks have been known to fly into buckshot to reach grain to which they have become hooked. Under the Migratory Bird Treaty Act, baiting is the illegal practice of using feed to attract game. A baited area is essentially no different than a bird feeder. As hunting is allowed in virtually all of the Mountain-Prairie refuges using agriculture, the EA and CD should analyze the impact on migratory birds which become hooked on "high-calorie" crops in the range of refuge-based hunters.	3-28. Refuge managers are well aware of baiting restrictions as they relate to waterfowl hunting. Under no circumstances do refuge managers or the System support management that would artificially place or manipulate bait to attract migratory birds that are then allowed to be hunted, in violation of federal regulations. Standard harvesting techniques do not constitute baiting.
	XI. EA Places Profitability above Refuge Protection	
3-29	The point repeatedly made by the EA is that GE crops are used because non-GE seed is becoming more difficult to find and farming without it is less profitable or attractive to cooperative farmers. The increased profitability or utility of GE seed to farmers is never quantified. Moreover, the profitability to local farmers should not be a guiding concern for refuge managers. Most importantly, the profitability to private operators should not trump protection for refuge resources. In other words, the convenience of finding GE seeds does not make it essential to accomplishing a refuge purpose. Under the cooperative farming agreements obtained and reviewed by PEER and the Center under the Freedom of Information Act, the refuge provides the cooperating farmer free use of public land and water. In return, the farmer leaves some portion of the crop un-harvested. For soybeans, the agreement typically gives the farmer 100% of that harvest. These cooperative agreements appear to be quite popular with local farmers, who have been known to contact their Congressional representatives to pressure FWS when cooperative farming opportunities are reduced or eliminated. The EA offers not a shred of evidence that farmers would balk at cooperative agreements premised on non-GE cultivation.	3-29. Farming, first to control invasive species prior to conducting prairie restoration activities, is a proven technique used by nearly all land management agencies, including nongovernmental, state, and federal agencies in the Great Plains. Refuge managers often work with neighboring farmers to control invasive plants. For this practice to be sustainable, the agreement must meet the refuge's objectives as well as the farmers. There are few farmers that would continue to farm at a loss. Refuge managers must keep this in mind when negotiating these agreements.
	Conclusion:	
	On September 29, 2010, Interior Secretary Ken Salazar issued an order on scientific integrity which, among other things, provided that throughout the Department of Interior, "when scientific or technological information is considered in decision making, the information must be robust, of the highest quality, and the result of the most rigorous scientific processes as can be achieved within the available time-frame."	

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3-30	This EA and CD are exercises in science-based decision making yet these documents fall well short of these standards imposed by Secretary Salazar. Rather than robust information and rigorous scientific review, the EA and CD start from the premise that FWS wants to allow GE cultivation and then constructs a structure of unrealistic assumptions, incomplete analysis and logical leaps to support that foreordained conclusion. PEER and CFS strongly urge FWS to withdraw this EA and CD. The agency should sincerely and thoroughly rethink the role of agriculture in managing national wildlife refuges before preparing successor documents. Respectfully submitted, Jeff Ruch Executive Director Public Employees for Environmental Responsibility (PEER) 2000 P Street, NW Suite 240 Washington, DC 20036 Tel: (202) 265-7337; Fax: (202) 265-4192 Website: www.peer.org	3-30. We disagree with this statement. In conducting this EA, we reviewed relevant studies, solicited refuge manager professional experience, and coordinated with the three federal agencies charged with overseeing the regulation of genetically-modified crops: the Environmental Protection Agency, USDA-APHIS, and the U.S. Food and Drug Administration.

Letter 4. Biotechnology Industry Organization (page 1 of 3).

No.	Letter	Response
4-1	Bio BIOTECHNOLOGY INDUSTRY ORGANIZATION March 4, 2011 Submitted Via Electronic Mail and First Class Mail r6gmcomments@fws.gov Draft EA for Use of Glyphosate-Tolerant Soybeans and Corn Mr. Tom Koerner Deputy Project Leader c/o Sand Lake National Wildlife Refuge Complex 39650 Sand Lake Drive Columbia, SD 57433 Re: Draft Environmental Assessment: *Use of Genetically Modified, Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain-Prairie Region (Region 6)*[1] Dear Colleague: These comments are submitted by the Biotechnology Industry Organization (BIO) in response to the February 2, 2011, release by the Mountain-Prairie Region of the U.S. Fish and Wildlife Service (the Service) of its draft Environmental Assessment (EA) evaluating the use of glyphosate-tolerant corn and soybeans on lands within the region's National Wildlife Refuge System (NWRS). BIO appreciates the opportunity to submit comments in support of the Service's Preferred Alternative: *Continue Using Glyphosate-Tolerant Soybeans and Corn for Habitat Restoration and Management on System-Managed Lands in Region 6 (No Action).* BIO is the world's largest biotechnology organization, providing advocacy, business development and communications services for more than 1,200 members worldwide. BIO members are involved in the research and development of innovative healthcare, agricultural, industrial and environmental applications of biotechnology. Corporate members range from entrepreneurial companies developing their first product to Fortune 100 multinationals. We also represent state and regional biotechnology-derived associations, service providers to the industry, and academic centers. BIO appreciates the Service's acknowledgement throughout the draft EA of the extensive analyses conducted on genetically engineered (GE)[2] crops by the U.S. Department of Agriculture [1] Available at http://www.fws.gov/sandlake/web-gmo-draftea-02-01-11.pdf . [2] The Mountain-Prairie region's Draft Environmental Assessment uses the term "genetically modified" to discuss these crops. While this phrase has been used in the popular literature to describe these crops, the term is neither scientifically nor legally descriptive. All plants have been "genetically modified" since the dawn of human agriculture. The term used by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), which regulates all of these plants, is "genetically engineered" and that is the term used throughout this letter. *See* 7 C.F.R. Part 340. BIO encourages the Service to use the legal term for these crops throughout the draft EA. PRINTED ON RECYCLED PAPER 1201 Maryland Avenue, SW • Suite 900 • Washington, DC 20024-2149 • 202.962.9200 • Fax 202.488.6301 • www.bio.org	4-1. Thank you for your comment. Although the term genetically engineered is technically correct, we chose to use genetically modified (GM) to match existing Service policy.

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	(USDA), U.S. Food and Drug Administration, and, where appropriate, the U.S. Environmental Protection Agency to verify their safety to humans and the environment before these products enter the marketplace. In keeping with the requirements of the National Environmental Policy Act (NEPA), the USDA deregulation process for GE crops includes a NEPA review that analyzes many of the same issues the Service addressed in its draft EA. We are also pleased that the Mountain-Prairie region's Planning Team consulted with scientists at these agencies who, collectively, have many decades of experience assessing GE crops both before and after they are commercialized. The working relationship you have developed in preparing this draft EA should prove useful as new GE crops are placed on the market and adopted by growers. BIO applauds the Service's conscientious work in considering a number of comments and alternatives, deciding which alternatives to develop further, and addressing each sufficiently in the draft EA. Your methodical approach and thorough analyses of the alternatives and attendant issues provide a model for other FWS regions that might be embarking on a similar evaluation of the potential environmental impacts and appropriateness of using GE crops to meet refuge goals. We agree with the Service's rationale that the Mountain-Prairie region's continued allowance of the use of GE, glyphosate-tolerant corn and soybeans is in "conformance to the establishing purposes of the System and the desire to have the least impact on the environment."[3]	
4-2	We believe the same statement could be made for other GE, herbicide-tolerant crops that have successfully completed a safety review by USDA and other federal agencies. These crops allow the use of broad-spectrum herbicides that, like glyphosate, "provide an alternative for farming that poses less risk to wildlife" (page 14 – Issue 1) and allow the use of "conservation tillage practices used by the Service to minimize soil erosion on cultivated lands" (page 15 - Issue 5) within the National Wildlife Refuge System. The use of additional types of herbicide-tolerant corn and soybeans can be another means to reduce the potential for the development of herbicide resistant weeds identified in the draft EA (page 15 – Issue 6). Virtually all conventionally bred corn and soybeans grown in the United States have been treated with herbicides since the 1970's. Not unexpectedly, some populations of some weed species that are found in corn and soybean fields have evolved resistance to some of those herbicides.	4-2. Discussions with refuge managers who use corn and soybeans for prairie restoration and management revealed that use of glyphosate-tolerant corn and soybeans is an essential tool needed to meet management objectives. We concentrated on these two GM crops, as they are what the managers believed from their sound professional judgment to be essential. As the technology continues to advance, refuge managers will likely have future discussions about the use of additional GM crops.
4-3	Growers with a population of resistant weeds in their fields need to utilize a herbicide with a different mode of action, and/or other weed management practices, in order to control resistant weeds. One strategy to minimize the development of herbicide resistant weeds is to provide growers with crops that are tolerant to herbicides with various modes of action. This would allow growers to rotate herbicides with different modes of action, providing a useful tool for controlling weeds that have become resistant to a herbicide. Rotating herbicide modes of action also helps to delay the development of herbicide resistant weeds.[4]	4-3. Thank you for your comment. We agree that rotating crop types and other action techniques as part of an IPM plan is important in managing to reduce glyphosate resistance in weeds.

[3] Draft Environmental Assessment - *Use of Genetically Modified, Glyphosate-Tolerant Soybeans and Corn on National Wildlife Refuge Lands in the Mountain-Prairie Region (Region 6)*, Summary
[4] http://www.extension.uidaho.edu/forage/Proceedings/2004%20Proceedings%20pdf/shuster.pdf

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4-4	Allowing the use of additional GE herbicide-tolerant crops will maximize the many benefits of glyphosate-tolerant corn and soybeans, which the draft EA lists and elaborates, while lessening the risk described in Issue 6. Therefore, we encourage the Service to consider mechanisms that would broaden the scope of the EA, either now or in the future, to accommodate GE corn or soybean varieties that have been deregulated by the USDA and are tolerant to herbicides approved for use on NWRS lands in the Mountain-Prairie region. BIO appreciates the opportunity to provide comments in response to the Mountain-Prairie region's draft Environmental Assessment. Sincerely, Adrianne Massey Adrianne Massey, PhD Managing Director, Science and Regulatory Affairs Food and Agriculture 3	4-4. Thank you for submitting comments.

Letter 5. Monsanto (page 1 of 3).

No.	*Letter*	*Response*

MONSANTO

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March 4, 2011

Submitted Via Electronic Mail: r6gmcomments@fws.gov

Tom Koerner, Deputy Project Leader
c/o Sand Lake National Wildlife Refuge Complex
39650 Sand Lake Drive
Columbia, SD 57433

Subject: Draft Environmental Assessment of Farming Operations and Use of Genetically Engineered Corn and Soybean on National Wildlife Refuges in the Mountain-Prairie Region

Mr. Koerner,

Please find below comments submitted by Monsanto Company in response to the recent release of a draft environmental assessment (EA) prepared by the Mountain-Prairie Region of the U.S. Fish and Wildlife Service (FWS) to address (a) the use of farming as a management tool on national wildlife refuges in Region 6 and (b) the use of glyphosate-tolerant (GT) corn and soybeans for habitat management purposes on National Wildlife Refuge System (NWRS) lands in the Mountain-Prairie Region.

Monsanto Company is a leading provider of agricultural products that provide solutions to growers worldwide. We produce leading seed brands and develop biotechnology traits and herbicides that can be combined to offer farmers cost-effective and integrated management solutions for a variety of agricultural challenges. Our firm is well known within the wildlife community as an organization with a distinguished conservation history and has been a leader in the conservation field, pioneering invasive weed control methods and promoting conservation tillage. We appreciate this opportunity to comment on the draft EA prepared to evaluate potential impacts of the continued use of farming as a management practice on refuge lands and the use of GT corn and soybean in support of meeting refuge goals.

We concur with the selection of the No Action Alternative as the Preferred Alternative:
We agree with the Service's conclusion that the "no action" alternative will best meet the Service's purpose and needs. As stated in the draft EA, under this alternative "the use of glyphosate-tolerant soybeans and corn, when essential, would continue to be one tool the Service could use to achieve habitat restoration and management objectives." Genetically-engineered (GE) crops, including GT corn and soybeans, have a demonstrated track record of safety and performance[1] and their use is fully compatible with the use of crop cultivation as a management tool to meet NWRS goals. The use of

[1] Brookes, G., and P.Barfoot, 2010. GM Crops: global socio-economic and environmental impacts 1996-2008. PG Economics Ltd, Dorchester, UK

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	GT corn and soybean along with Roundup®[2] agricultural herbicides increase the probability that crops intended for wildlife consumption and habitat restoration will be established successfully. Without effective weed control, those wildlife food plots may be poorly established and the desired grain and cover needed for wildlife to thrive will not be achieved.	
5-1	**FWS Regions Should Work Cooperatively to Prepare Environmental Assessments:** We strongly support the efforts by the Mountain-Prairie Region, along with the Midwest Region, to prepare EAs to evaluate the potential environmental impacts of the use of genetically-engineered corn and soybean on FWS refuges. As noted in our previous comments to the regions, dated July 9, 2010, the Service should work cooperatively on a national level to complete Regional EAs assessing the potential impacts of the use of GE crops and thereby, reduce duplicative effort in the preparation of these EAs. Thus, we continue to encourage the Mountain-Prairie and Midwest Regions to work cooperatively and share their experience and expertise with the broader NWRS and other FWS Regions where similar EAs are also under development or may have been prepared previously.	5-1. The Service has worked in concert with our colleagues in the Great Lakes–Midwest Region (Region 3) in the preparation of this document. We agree on the benefits of working cooperatively among regions; however, differences were large enough between regions to warrant separate planning documents.
5-2	**FWS Regions Should Continue to Utilize Reviews Conducted Within the Coordinated Framework:** This draft EA appropriately recognizes (pp. 4 and 13) that genetically-engineered corn and soybean that may be utilized on FWS refuges are regulated by the USDA. In meeting its obligations under the National Environmental Policy Act (NEPA), the USDA's review and deregulation process includes development of an EA, which analyzes many of the same issues the Service addressed in its draft EA. It would be valuable to add that two other agencies, namely the EPA and FDA, work with USDA in an established, coordinated, science-based framework of regulation (commonly referred to as the Coordinated Framework) to regulate and evaluate GE crops. FDA is the lead agency responsible for assessing the food and feed safety of new GE crops, while EPA has authority to regulate GE plants with pesticidal properties and the use of herbicides associated with herbicide tolerant plants. We applaud the Region for consulting with these lead agencies that have been reviewing GE crops for decades and getting their input in the preparation of the draft EA.	5-2. Thank you for your comment. Additional language has been added to the text in the final EA describing the coordinated framework and the roles of the three federal agencies overseeing GM agricultural products: the U.S. Environmental Protection Agency, USDA-APHIS, and the U.S. Food and Drug Administration.
5-3	We encourage the Mountain-Prairie Region and other FWS regions to consider that other current and future GE corn and soybean approved products may also be appropriate for use in refuge areas. These other GE corn and soybean products could be used to support the same management and conservation benefits that have been realized from the use of glyphosate tolerant corn and soybean. Genetically-engineered crops can be managed as part of an Integrated Pest Management (IPM) system to support greater biodiversity than might be possible with conventional crops utilizing standard weed and insect control measures[3]. Thus, the Service should consider amending its Regional EAs in the future to evaluate and include other GE crop products that have gone through review and authorization by the three aforementioned agencies that have primary regulatory authority under the Coordinated Framework.	5-3. Refuge managers follow an IPM strategy that includes rotating crops, using herbicides, and using methods of control. These actions are taken to minimize the potential for development of resistance in weeds. As new GM crops are developed and become available for use, refuge managers may consider whether these new crops are essential to achieving refuge purposes.
	Genetically-Engineered Crops Pose Negligible Environmental Risk in Refuge Scenarios: The draft EA raises several potential issues that have been addressed previously by the primary regulatory agencies during reviews of currently commercial, genetically-engineered crops. We would like to specifically comment on the discussion regarding the development of herbicide-resistant weeds in relation to crop use on refuge lands.	

[2] Roundup and Roundup Ready are registered trademarks of Monsanto Technology LLC

[3] Amman, K. 2005. Effects of biotechnology on biodiversity: herbicide-tolerant and insect-resistant GM crops. TRENDS in Biotechnology 23(8): 388-394

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No.	*Letter*	*Response*
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	The draft EA appropriately notes (Issue 6, pg. 16) that "Regular, widespread use of the same herbicide increases the risk of developing herbicide resistance." In practice, however, genetically-engineered crops planted on national wildlife refuges are rotated, often with fallow systems that serve as early-successional habitat for various wildlife species. In refuges that maintain rotations that do not rely upon the use of glyphosate or includes a diversified weed management program, the probability of glyphosate use on glyphosate tolerant crops resulting in the development of glyphosate-tolerant weed populations is low. EPA is the federal regulatory agency that administers the federal laws governing pesticide sale and use. EPA encourages pesticide manufacturers to provide growers with information regarding a herbicide's mode of action to aid growers in planning herbicide use practices and to foster the adoption of effective weed-resistance management practices as specified by EPA in PR Notice 2001-5. In that document EPA states that "this approach to resistance management is sound and would be highly beneficial to pesticide manufacturers and pesticide users"[4]. EPA approves all pesticide label use instructions based on the agency's evaluation of supporting data supplied by the pesticide registrant or manufacturer. After EPA approves a pesticide label, it is a violation of federal law to use the pesticide for a use or in a manner not in accordance with the label directions. Monsanto and other herbicide manufacturers have adopted and abide by EPA guidance in PR Notice 2001-5 that recommends inclusion of information on herbicide mode of action and best management practices on Roundup product labels. In conclusion, we support the Mountain-Prairie Region's assessment that genetically-engineered corn and soybean and associated herbicides are effective tools to support habitat restoration and provide measureable wildlife and water quality benefits on refuges. It is clear that row crop farming and use of genetically-engineered corn and soybean: (a) provide a viable vegetation and wildlife management tool, (b) are historical components of many refuge ecosystems, (c) represent reduced environmental risk relative to Alternative B which relies upon conventional cropping practices, (d) can contribute to refuge cost management and (e) help refuge managers meet refuge purposes. The utilization of genetically-engineered crops has strengthened the ability of cooperative farming to contribute to FWS wildlife management objectives.	
5-4	Monsanto Company would again, like to express its appreciation for the opportunity to provide comments to the Mountain-Prairie Region regarding its draft EA prepared to assess the potential environmental impacts associated with farming and the use of genetically-engineered corn and soybean on national wildlife refuges in the Service's Mountain-Prairie Region. /signed Raymond C. Dobert, Ph.D. US Biotech Regulatory Policy Lead 314-694-3202 [4] EPA PR Notice 2001-5 at http://www.epa.gov/opppmsd1/PR_Notices/pr2001-5.pdf	5-4. Thank you for your comments.

Letter 6. Individual (page 1 of 1).

No.	*Letter*	*Response*
	Hello,	
6-1	I am writing this email to express my absolute astonishment at the US Fish and Wildlife Service's desire to plant GMO corn and soybeans on national land to eradicate non native species. GMO foods are known to cause DNA mutations, infertility, increased damage to cells of all types and so many more unknown factors.	6-1. The Service is not authorized to review the safety of GM corn and soybean products. Rather, three federal agencies—the U.S. Environmental Protection Agency, USDA-APHIS, and the U.S. Food and Drug Administration—have all independently reviewed the safety of these GM crops prior to release.
6-2	"The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people." Your stated mission is to conserve, protect and enhance the land. Planting non native GMO corn and soy to eradicate non native species is a horrible idea.	6-2. The use of targeted farming has been shown to be a very effective tool in restoring degraded former cropland. Once farming activities are complete and invasive species are reduced or eliminated, native seeding will restore health and resiliency back to the land.
6-3	Using natural plants such as lupine to eradicate these unwanted species would be much more beneficial. As a culture we have continually poisoned our waters, land and air. The long term effects of bringing these dangerously modified foods into the direct cycle of life of the natural wildlife refugees is a disaster waiting to unfold. Please stop this cycle of chemically altering nature to suit corporate gains. I am 100% opposed to this idea of the US Fish and Wildlife Service.	6-3. The Service is not aware of any ecological properties of lupine (*Lupinus* spp.) in controlling invasive plant species. In fact, lupines, in general, are poor competitors of weeds and rarely become established in fields with excessive weed seed in the soil (Putnam et al. 1989). In addition, lupine is not a native species commonly found in mixed and tallgrass prairie in Region 6.
6-4	We all have earth in common. Lets find solutions instead of creating more problems for future generations. Sincerely, [redacted]	6-4. Thank you for your comments.

Letter 7. Individual (page 1 of 1).

No.	*Letter*	*Response*
7-1	If your mission is as stated below, then planting of genetically modified seed of any kind should not be allowed on any public land and should be banned in the United States. Further research is needed to determine the effect of the chemicals involved with these modified seeds on the bee population and other beneficial insects and the animals that feed on them (ie, bats). We cannot risk further destruction of these important life forms or the potential to produce harmful effects on humans. The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals and commitment to public service.	7-1. Research conducted by USDA-APHIS and others, with both glyphosate-tolerant soybeans and corn did not show adverse effects from the protein engineered into these crops (to make it glyphosate-tolerant) in relation to bees, bats, or any other target organisms (Cerdeira and Duke 2006; USDA-APHIS 2000, 2007).
7-2	Thank you for the opportunity to comment and including this comment in your assessment. [redacted]	7-2. Thank you for your comments.

Letter 8. Individual (page 1 of 1).

No.	*Letter*	*Response*
8-1	Dear Sir or Madam, I am pleased to comment on the draft EA on glyphosate tolerant crops. During the early 1980s, while serving on the Refuges Division staff in Region 6, I reviewed all PUPs and started the organic farming movement in Region 6. This evolved into a Service-wide effort on sustainable agriculture. In the decade prior to my retirement, I managed all pesticide use in the National Park Service. So, I have had a long-standing interest in the use of pesticides on croplands. I believe the draft EA has done a good job of disclosing and evaluating the issue of glyphosate-tolerant crops. I agree that use of glyphosate-tolerant crops and this one herbicide are preferable to the cocktail of more dangerous herbicides that are required to produce conventional crops. I support the adoption of Alternative A and hope that can be done without further formal review. Sincerely, [redacted] Ph.D. Wildlife Biologist (Retired)	8-1. Thank you for your review of the document and your comments.

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