BIOMASS CROP ASSISTANCE PROGRAM

Environmental Assessment

Proposed BCAP Giant Miscanthus (*Miscanthus X giganteus*) Establishment and Production in Arkansas, Missouri, Ohio, and Pennsylvania

Sponsored by Aloterra Energy LLC and MFA Oil Biomass LLC

United States Department of Agriculture

Farm Service Agency

USDA

April 2011

DRAFT

NOTICE OF AVAILABILITY

DRAFT ENVIRONMENTAL ASSESSMENT

Proposed BCAP Giant Miscanthus Establishment and Production in Arkansas, Missouri, Ohio and Pennsylvania

Farm Service Agency

U.S. Department of Agriculture

This notice announces the availability of a Draft Environmental Assessment (EA) for the proposed establishment and production of giant miscanthus (*Miscanthus X giganteus*) as a dedicated energy crop for energy production to be grown in the Aloterra Energy and MFA Oil Biomass Company (Project Sponsors) proposed project areas in Arkansas, Missouri, Ohio, and Pennsylvania under the Biomass Crop Assistance Program (BCAP). This EA is being prepared in accordance with the National Environmental Policy Act (NEPA) (Public Law [PL] 91-190, 42 U.S. Code [USC] 4321 et seq.); implementing regulations adopted by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] 1500-1508); and FSA implementing regulations, Environmental Quality and Related Environmental Concerns – Compliance with NEPA (7 CFR 799). According to CEQ guidance, an EA is a "concise document for which a Federal agency is responsible that serves to (1) briefly 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 1508.9)." Additionally, since this document falls under the guidance of the BCAP Final Programmatic EIS (PEIS), which was a broad national-level program document, CEQ guidance allows for "tiering." CEQ guidance defines tiering as, "the coverage of general matters in broader EIS with subsequent narrower statements or environmental analyses incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared (40 CFR 1508.28). The Draft EA provides a means for the public to voice any concerns they may have about the proposed BCAP project area.

The Farm Service Agency (FSA), on behalf of the Commodity Credit Corporation (CCC), invites comments on the Draft EA. We will consider comments that we receive by **09 May 2011**. Comments submitted after this date will be considered to the extent possible.

To comment on this Draft EA, please use one of the following methods:

- **Federal eRulemaking Portal**: Go to *http://www.regulations.gov*. Follow the online instructions for submitting comments.
- **E-Mail**: *GiantMiscanthusEAComments@intenvsol.com*.
- **Fax**: 972-562-7673 ATTN: Giant Miscanthus EA Comments.
- **Mail**: Giant Miscanthus EA Comments
  Integrated Environmental Solutions, LLC
  2150 S Central Expy Ste 110
  McKinney, TX 75070
- **Hand Delivery or Courier**: Deliver comments to the above address.

Comments may be inspected in the Office of the Director, CEPD, FSA, USDA, Room 4709 South Building, Washington, D.C., between 8:00 a.m. and 4:30 p.m., Monday through Friday, except holidays. A copy of this notice is available through the FSA home page at *http://www.fsa.usda.gov/*.

For additional information, please contact:

USDA/FSA/CEPD
Matthew T. Ponish
National Environmental Compliance Manager
1400 Independence Ave. SW
Mail Stop 0513
Washington, D.C. 20250
(202) 720-6853
matthew.ponish@wdc.usda.gov

EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

The United States Department of Agriculture (USDA) Commodity Credit Corporation (CCC) implements the Biomass Crop Assistance Program (BCAP) authorized by the Food, Conservation, and Energy Act of 2008 (the 2008 Farm Bill). On October 27, 2010, the CCC published the Record of Decision (ROD) for the BCAP Final Programmatic Environmental Impact Statement (PEIS) and the BCAP Final Rule (7 Code of Federal Regulations [CFR] Part 1450) in the Federal Register (FR 75:207, 65995-66007; 66202-66243). As part of the mitigation measures detailed in the ROD, each project proposal is subject to a National Environmental Policy Act (NEPA) (Public Law [PL] 91-190, 42 U.S. Code [USC] 4321 *et seq*.) analysis prior to approval of the project area proposal. The initial environmental evaluation of a project area proposal is developed through the completion of Forms BCAP-19, BCAP-20, BCAP-21, and BCAP-22 and supporting information. After this initial evaluation FSA can conclude that no additional environmental analyses are applicable due to no potential for the proposed BCAP activity to significantly impact the environment or that additional environmental analyses in the form of an environmental assessment (EA) or environmental impact statement (EIS) are necessary, depending upon the potential level of significance.

This Environmental Assessment (EA) analyzes the proposed establishment of BCAP project areas supporting the proposed establishment and production of giant miscanthus hybrid (*Miscanthus X giganteus)* by the Aloterra Energy LLC and MFA Oil Biomass Company LLC (Project Sponsors) in Arkansas, Missouri, Ohio, and Pennsylvania, which is being completed to meet the requirements of the NEPA environmental evaluation of the BCAP or to determine if an EIS would be required.

PURPOSE AND NEED

The primary purpose of BCAP is to promote the cultivation of perennial bioenergy crops and annual bioenergy crops that show exceptional promise for producing bioenergy or biofuels that preserve natural resources and that are not primarily grown for food or animal feed. The purpose of the Proposed Action is to support the establishment and production of giant miscanthus as a crop for energy production to be grown by BCAP participants in the project areas proposed in Arkansas, Missouri, Ohio, and Pennsylvania. The need for the Proposed

Action is to provide renewable biomass feedstock to a Biomass Conversion Facility (BCF) for use in energy production with and potentially outside the immediate region(s).

ALTERNATIVES

As part of the BCAP Project Area Selection Process, the Project Sponsors develop a proposal application for submittal to FSA. Prior to this submittal, the Project Sponsors have likely determined the economic feasibility of their proposal, including developing alternatives for location and crop species. The Project Sponsors developed selection criteria to meet the overall purpose and need for the Proposed Action, the establishment and production of giant miscanthus as a dedicated energy crop for energy production under the incentives of the BCAP. As part of the alternatives development process the Project Sponsors analyzed both alternative crops and alternative locations for the proposed project areas; however, each of these was determined not to be feasible. As such, this EA is analyzing the implementation of the Proposed Action or the selection of the No Action Alternative, that FSA would not establish the proposed project areas supporting the establishment and production of giant miscanthus.

PROPOSED ACTION

Aloterra Energy LLC and MFA Oil Biomass LLC (Project Sponsors) are proposing that FSA establish BCAP project areas that support the establishment and production of giant miscanthus on 50,000 acres per proposed project area (200,000 total acres) by 2014, with crop longevity of 20 to 30 years. The acreage projected to be enrolled within the proposed project areas are marginal croplands and pastureland. The proposed project areas are located in four states in four distinct proposed project areas. Missouri contains two proposed project areas; Columbia and Aurora. Arkansas contains one proposed project area Paragould. Ohio and Pennsylvania contain the final proposed project area, Ashtabula. Each proposed project area is named for the approximate location of the BCF that will be utilized to process the giant miscanthus biomass into pellets to be shipped to other facilities or users for use in bioenergy products. Each proposed project area was developed as an approximate 50-mile radius from the approximate location of each BCF. The establishment and production of giant miscanthus would begin with centralized propagation acres on each farm, which would be distributed to plantation acres during the next growing season. During this planting season (2011), this initial establishment would require a centralized location within each proposed project area with center-pivot irrigation due to the timing of planting and current climatic conditions occurring during this growing season. This centralized propagation area for the entire proposed project area would only occur the 2011 planting season; all other planting season would follow the on-farm model with the initial establishment of propagation acres, followed by plantation acres the following growing season. Equipment to be used to establish giant miscanthus would be modified equipment from existing perennial grass industries. Equipment used to harvest and bale giant miscanthus would be similar to existing types of agricultural machinery used for hay crops; however, they would need to be more heavy-duty due to the increased biomass amounts being harvested and baled. **Table ES-1** lists the proposed propagation and planting schedule within each of the proposed project areas, totaling 50,000 acres per proposed project area by 2014, which is the maximum planting goal under this action.

Table ES-1. Proposed Giant Miscanthus Acres Added by Growing Season 2011-2014

Project Area	2011 Propagation Acres Range	2012	2013	2014	Total Acres 2011-2014
		Total Giant Miscanthus Acres Added			
Ashtabula	50-300	2,275	13,500	35,000	50,000
Aurora	100-400	7,950	13,500	31,000	50,000
Columbia	100-300	6,450	13,500	33,000	50,000
Paragould	100-600	10,850	13,500	28,400	50,000

NOTE: 2011 is the only year that will have only propagation acres planted, total additional acreage per year includes both propagation acres and plantation acres (2012-2014)

ENVIRONMENTAL CONSEQUENCES

Table ES-2 provides a tabular summary of the potential effects from both the Proposed Action and No Action Alternative. Implementing the Proposed Action would result in minor positive and negative effects to the local and regional area; however, many of these effects would be minimized through the use of the Mitigation and Monitoring Plan (MMP). FSA has a framework for defining the components of the MMP that will be required for this project, but has not yet finalized the plan to consider all public input on the draft EA prior to making a final plan recommendation.

The Proposed Action would result in additional diversified income for a participating producers, as well as technical assistance from the Project Sponsors in the production and harvesting of giant miscanthus. The Project Sponsors have proposed a BCF in each of the proposed project areas ensuring that producers will have a demand for their products. Also, ancillary agricultural services should expect an increase due to the Project Sponsors goal of primarily contracting idle acres and not active cropland. The Proposed Action would result in a changed local landscape with the addition of the giant miscanthus fields; however, most

Table ES-2. Comparison of the Alternatives

Resource Area	Proposed Action	No Action Alternative
Socioeconomics	+ minor	0
Land Use	- minor	0
Biological Resources		
Vegetation	- minor	0
Wildlife	- minor	0
Protected Species	0	0
Soil Resources	+ minor (primarily during establishment)	0/- minor
Water Quality/Quantity		
Water Quality	+ minor	0
Water Quantity	+/- minor	0

Note: +=positive -=negative 0=neutral

contract acreage would range in size between 38 to 100 acres. The MMP would be used to ensure that adverse effects from this new crop are minimized or avoided. Similarly, minor negative effects would be anticipated for biological diversity as pastureland is converted into giant miscanthus croplands. The MMP would be essential to provide mechanisms such as reasonable and economically feasible buffers and field edges to provide for continued wildlife and vegetative diversity in these areas. Recent research has indicated that giant miscanthus is susceptible to some plant pests; the MMP monitoring and buffer efforts would be essential to ensure that any occurrence is identified and treated early to avoid transmission to local croplands, such as corn. Giant miscanthus, which has an extensive perennial root system, would be anticipated to have positive effects on soil retention, soil organic matter, and soil carbon sequestration, as well as increased water quality related to nutrient leaching and transported sediments. Also, due to its growth patterns, giant miscanthus would be anticipated to require more water than annual crops, such as corn; however, giant miscanthus has much higher water use efficiency, generating high amounts of biomass per volume of water consumed.

The No Action Alternative would result in no adverse effects to the local and regional area since there would be no giant miscanthus planted in any of the proposed project areas as described in this BCAP Project Proposal. However, the No Action Alternative would not assist in meeting the overall goal of BCAP, which is to develop dedicated energy crops for conversion to bioenergy.

DATA GAPS IN CURRENT UNITED STATES ESTABLISHMENT AND PRODUCTION

Giant miscanthus is a new agronomic crop species in the United States, and also still relatively new in Europe, where the oldest cultivation areas are approximately 30 years old or less. The *Miscanthus* genus was introduced to the United States over 100 years ago in ornamental plantings. Several universities (i.e., University of Illinois, Mississippi State University, University of Wisconsin, Michigan State University, and the University of Georgia) in the United States are currently cultivating giant miscanthus on a trial basis or conducting research on giant miscanthus or the *Miscanthus* genus. Additionally, large-scale acreages of giant miscanthus have not been cultivated in the United States; although commercial production of giant miscanthus for bioenergy production in co-fired systems are in the beginning stages in the United Kingdom. Given, that giant miscanthus has only been grown in large-scale trials in Europe the data on giant miscanthus planting in the United States is more limited in scope.

In light of the lack of data applicable to the proposed project areas, an adaptive MMP is being developed, which will include best management practices (BMP) for the establishment and production of giant miscanthus to ensure avoidance and minimization of potential effects to the immediate environment and the larger landscape. The MMP will be a living document that is highly dependent on routine monitoring of the fields to determine the success of giant miscanthus plantings, its overall effects to the immediate environment, and any potential effects to the larger landscape based on observation and measurement. This document would contain information on appropriate and effective eradication methods that would develop over time as new data become available. Likewise, other metrics or observable measurements would adapt over time based on past observations, new research findings, and new regulations.

The following information has been found to lack complete detail in relation to growth and production of giant miscanthus in the United States.

- Potential effects to socioeconomics focused on the information provided in the pro forma analyses of the Project Sponsors. Data from Europe indicates a high cost of establishment due to the vegetative propagation of the species; however, the BCAP combined with the model undertaken by the Project Sponsors addresses most of these concerns, along with technical assistance to be provided to producers.

- Landscape scale analyses of giant miscanthus are generally lacking since there have not been any commercial-scale field trials in the United States.
- Literature documenting the potential for invasiveness of the fertile species of the *Miscanthus* genus has been discussed along with documentation supporting that giant miscanthus should not be considered invasive due to its sterility and slow rhizome spread within the United States.
- Literature discussing potential plant pests has been recently published relating to the western corn root worm, several species, of aphids, and rust; those studies along with recommendations have been included.
- There is little peer-reviewed literature concerning the effects of giant miscanthus plantings on biological diversity in the United States; however, some specific studies have been published in Europe. These studies primarily focused on bird species with some small mammal observations. These studies also looked at young-aged giant miscanthus stands, so there was little information available on biodiversity found in mature stands.
- Information concerning the nutrient uptake, nutrient addition trials, and root structure has been included to discuss the potential for soil erosion, soil organic matter, and soil carbon sequestration based on the available literature.
- Literature concerning nutrient uptake, water use efficiency, and irrigation needs during establishment has been discussed based on the available literature.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AHIS	Animal and Plant Health Inspection Service
AOSCA	Association of Seed Certifying Agencies
ARS	Agricultural Research Service
BCAP	Biomass Crop Assistance Program
BCF	biomass conversion facilities
BMP	best management practice
C	carbon
CAA	Clean Air Act
CCC	Commodity Credit Corporation
CEQ	Council on Environmental Quality
cm	centimeter
CO	carbon monoxide
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
EA	environmental assessment
EIA	Economic Impact Analysis
EIS	environmental impact statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ERS	Economic Research Service
FONSI	finding of no significant impact
FSA	Farm Service Agency
g	gram
GHG	greenhouse gases
HEL	highly erodible lands
HILD	high-input low diversity
HUC	hydrologic unit
IPM	integrated pest management
kg	kilograms
kPA	kilo Pascal
LIHD	low-input high diversity

LMM	Lower Missouri-Moreau
$\mu g/m^3$	micrograms per cubic meter
m	meter
m^2	square meter
MDNRAPCD	Missouri Department of Natural Resources Air Pollution Control Division
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_2	nitrogen dioxide
NRCS	Natural Resource Conservation Service
OEPA	Ohio Environmental Protection Agency
OSIA	Ohio Seed Improvement Association
Pb	lead
PEIS	Programmatic Environmental Impact Statement
$PM_{2.5}$	particulate matter of less than 2.5 microns
PM_{10}	particulate matter of less than 10 microns
PPA	Plant Protection Act
QAP	Quality Assurance Program
RES	Renewable Energy Standard
ROD	Record of Decision
ROI	Region of Influence
SHPO	State Historical Preservation Offices
SO_2	sulfur dioxide
TSP	Technical Service Providers
USACE	United States Army Corp of Engineers
USCB	U.S. Census Bureau
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WRA	Weed Risk Assessment
WRP	Wetland Reserve Program

1 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION AND BACKGROUND

The United States Department of Agriculture (USDA) Commodity Credit Corporation (CCC) implements the Biomass Crop Assistance Program (BCAP) authorized by the Food, Conservation, and Energy Act of 2008 (the 2008 Farm Bill). This legislation, which was passed into law on June 18, 2008, creates the BCAP and authorizes the program through September 30, 2012. BCAP is intended to assist agricultural and forest land owners and operators with the establishment and production of eligible crops including woody biomass in selected project areas for conversion to bioenergy, and the collection, harvest, storage, and transportation of eligible material to designated biomass conversion facilities (BCF) that produce or intending to produce heat, power, biobased products, or advanced biofuels. The BCAP is administered by the Deputy Administrator for Farm Programs of the Farm Service Agency (FSA) on behalf of the CCC with the support of other Federal and local agencies. On October 27, 2010, the CCC published the Record of Decision (ROD) for the BCAP Final Programmatic Environmental Impact Statement (PEIS) and the BCAP Final Rule (7 Code of Federal Regulations [CFR] Part 1450) in the Federal Register (FR 75:207, 65995-66007; 66202-66243).

As part of the mitigation measures detailed in the ROD, each project proposal is subject to a National Environmental Policy Act (NEPA) (Public Law [PL] 91-190, 42 U.S. Code [USC] 4321 *et seq*.) analysis prior to approval of the project area proposal. The initial environmental evaluation of a project area proposal is developed through the completion of Forms BCAP-19, BCAP-20, BCAP-21, and BCAP-22 and supporting information. After this initial evaluation FSA can conclude that no additional environmental analyses are applicable due to no potential for the proposed BCAP activity to significantly impact the environment or that additional environmental analyses in the form of an environmental assessment (EA) or environmental impact statement (EIS) are necessary, depending upon the potential level of significance.

This Environmental Assessment (EA) analyzes the proposed establishment of BCAP project areas supporting the proposed establishment and production of giant miscanthus hybrid (*Miscanthus X giganteus)* by the Aloterra Energy LLC and MFA Oil Biomass Company LLC (Project Sponsors) in Arkansas, Missouri, Ohio, and Pennsylvania, which is being completed to meet the requirements of the NEPA environmental evaluation of the BCAP or to determine if an EIS would be required.

In 2008, the owners of Aloterra Energy LLC began laying the groundwork to expand their fuel marketing, distribution, and logistics operations into the emerging biomass renewable energy market. In 2010, Aloterra Energy's owners purchased a farm in Conneaut, Ohio and, with the help of an enthusiastic community, planted stock giant miscanthus. During this same period, Aloterra Energy secured the largest stock of giant miscanthus rhizomes in the United States and combined that with specialized giant miscanthus rhizome harvesting and planting equipment manufactured in the United States. Aloterra Energy's owners are now leveraging four decades of commodities and energy experience to form a vertically integrated energy supply chain, focused on giant miscanthus. Aloterra Energy's proposed project area will provide farmers an energy crop rhizome source, harvesting and planting equipment for the crop's rhizomes, specialty harvesting for the mature cane, processing technology, and marketing services for the cooperative's biomass fuel.

Formed in 1929, MFA Oil Company is the largest farmer owned energy cooperative in the State of Missouri. In 2008, MFA Oil began laying the groundwork to expand its energy services into the emerging biomass renewable energy market. That initiative came to fruition in 2010 as MFA Oil teamed up with Aloterra Energy LLC to form MFA Oil Biomass LLC to lead the cooperative into the biomass energy field. MFA is leveraging its knowledge in farming and in the energy markets to form a vertically integrated renewable energy supply chain. MFA's proposed project area will provide farmers an energy crop source, harvesting and planting equipment for the crop's rhizomes, specialty harvesting for the mature cane, processing technology, and marketing services for the cooperative's biomass fuel.

1.2 USDA NEPA GUIDANCE / AUTHORITY

This EA is being prepared in accordance with the NEPA (PL 91-190, 42 USC 4321 *et seq*.); implementing regulations adopted by the Council on Environmental Quality (CEQ) (40 CFR 1500-1508); and FSA implementing regulations, Environmental Quality and Related Environmental Concerns – Compliance with NEPA (7 CFR 799). According to CEQ guidance, an EA is a "concise document for which a Federal agency is responsible that serves to (1) briefly provide sufficient evidence and analysis for determining whether to prepare an EIS or a finding of no significant impact (FONSI) (40 CFR 1508.9)." Additionally, since this document falls under the guidance of the BCAP Final PEIS, which was a broad national-level program document, CEQ guidance allows for "tiering." CEQ guidance defines tiering as, “the coverage of general matters in broader EIS with subsequent narrower statements or environmental analyses incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared (40CFR 1508.28).

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The primary purpose of BCAP is to promote the cultivation of perennial bioenergy crops and annual bioenergy crops that show exceptional promise for producing bioenergy or biofuels that preserve natural resources and that are not primarily grown for food or animal feed. The purpose of the Proposed Action is to support the establishment and production of giant miscanthus as a crop for energy production to be grown by BCAP participants in the project areas proposed in Arkansas, Missouri, Ohio, and Pennsylvania. The need for the Proposed Action is to provide renewable biomass feedstock to a Biomass Conversion Facility (BCF) for use in energy production with and potentially outside the immediate region(s).

1.4 ORGANIZATION OF THE DOCUMENT

This EA assesses the potential impacts of the Proposed Action and No Action Alternatives on the potentially affected environmental and socioeconomic resources.

- **Section 1** provides background information relevant to the Proposed Action, and discusses its purpose and need.
- **Section 2** describes the alternatives, including the Proposed Action, and compares the alternatives.
- **Section 3** describes the baseline conditions (i.e., the conditions against which potential impacts of the Proposed Action and alternatives are measured) for each of the potentially affected resources.
- **Section 4** describes potential environmental consequences on these resources.
- **Section 5** includes analysis of cumulative impacts and irreversible and irretrievable resource commitments.
- **Section 6** discusses mitigation measures.
- **Section 7** is a list of references cited in the EA.
- **Section 8** lists the preparers of this document.
- **Section 9** contains a list of persons and agencies receiving this document and contacted during the preparation of this document.

This Page Intentionally Left Blank

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 ALTERNATIVES DEVELOPMENT

As part of the BCAP Project Area Selection Process, the Project Sponsors develop a proposal application for submittal to FSA. Prior to this submittal, the Project Sponsors have likely determined the economic feasibility of their proposal, including developing alternatives for location and crop species. The Project Sponsors developed selection criteria to meet the overall purpose and need for the Proposed Action, the establishment and production of giant miscanthus as a dedicated energy crop for energy production under the incentives of the BCAP. As part of the alternatives development process the Project Sponsors analyzed both alternative crops and alternative locations for the proposed project areas. The following sections describe each of these processes that were under taken by the Project Sponsors during their planning phases and why certain aspects were eliminated as unfeasible alternatives.

2.1.1 Proposed Crop Alternatives – Alternatives Analyzed and Eliminated

The Project Sponsors utilized two primary criteria to determine the proposed crop alternatives within the proposed project areas. These selection criteria included:

(1) **Potential Biomass Yield in Tonnage Produced per Acre** – This selection criterion was closely tied to economic feasibility because obtaining a sufficient annual harvest is necessary to make the proposed project economically viable for the Project Sponsors. Prior to the passage of the 2008 Farm Bill, the Project Sponsors were considering the results of a three-year study conducted by the Ohio Seed Improvement Association (OSIA). When the 2008 Farm Bill was authorized, the Project Sponsors felt the economic feasibility for United States markets had reached the threshold necessary to make the proposed project viable. The Project Sponsors were also concurrently reviewing data from the OSIA study that evaluated the annual tonnage yield for the perennial grass giant reed (*Arundo donax*) that is a native of Europe, several varieties of the perennial native switchgrass (*Panicum virgatum* varieties), and the perennial hybrid grass native to Asia, giant miscanthus. The results of the three-year study with harvesting conducted between 2007 and 2010 indicated that giant miscanthus was the superior biomass producer of the eight crops or varieties tested and provided approximately 1.5 to two times more annual tonnage of biomass than switchgrass;

(2) Potential for Invasiveness – The Project Sponsors subsequently became a member of the OSIA and worked with them as an independent, third party, to develop a voluntary Quality Assurance Program (QAP) that included site visits at their propagation locations, genetic tracing of their stock, and a records audit. In their letter to the Project Sponsors dated March 4, 2010 that was submitted as part of their BCAP application, OSIA concluded that the Project Sponsors proposed giant miscanthus was a sterile triploid hybrid producing no viable seed at the Conneaut, Ohio and Kansas propagation locations inspected. Furthermore, the Project Sponsors' QAP was submitted to the Association of Official Seed Certifying Agencies (AOSCA), which is the national authority for seed certification for additional verification.

Other crop types were eliminated from detailed study within this EA due to the increased potential for environmental impacts associated with additional land use or conversion for less efficient species or hybrids, potential additional water supply or demand requirements for propagation and planting purposes, potential impacts on water quantity due to continual irrigation needs, potential water quality impacts due to higher nutrient requirements, potentially higher air emissions of criteria pollutants and greenhouse gases (GHG) due to additional transportation, harvesting (e.g., ethanol production typically uses multiple harvest passes per field), and feedstock drying (e.g., associated with crop choices with more moisture content when harvested) sources.

The Project Sponsors also considered the use of corn stover or residuals, which are heavily used in the production of corn ethanol-based biofuels (e.g. included in the BCAP, but not as an advanced biofuel). However, this option was not considered economically viable because of the infrastructure required and time to acquire and construct this infrastructure, which the Project Sponsors are not well positioned to obtain on an economically viable basis. The presence of other established market competitors already producing corn ethanol-based biofuels in the Midwest with multiple harvest passes per planted field that have this infrastructure in place, is another reason that the corn option was considered but not pursued.

2.1.2 Proposed Project Area Locations – Alternatives Analyzed and Eliminated

The Project Sponsors utilized several criteria to determine the proposed project locations. These selection criteria included:

(1) **Regional Location** - The Midwest was selected because the growing requirements of giant miscanthus include rainfall of generally more than 30 inches per year and winter conditions that would trigger plant dormancy, generally less than 32°F, usually associated with adequate snow cover to protect the rhizomes. Additionally, the Project Sponsors also have a history within this region, which provided familiarity with the region and the conditions, including climatic, agricultural economy, use of renewable energy or the desire for the use of renewable energy, and willingness to participate in the BCAP. Therefore, the Project Sponsors considered Midwestern locations because this region provided the only suitable match for the growing requirements of the proposed advanced biofuels feedstock in the United States;

(2) **Availability of Adequate Rainfall to Support Planting Propagation Acres** – More specific locations within the Midwest were selected through the second selection criterion, adequate rainfall to primarily support planting of propagation acres, but also to support the longer term growth of planted giant miscanthus after propagation. As indicated above, a minimum of 30 inches per year of rainfall is considered the minimum along with adequate snow cover to support this species. Within the Midwest, the Project Sponsors selected the proposed project areas because they all receive the minimum amount of rainfall;

(3) **Proximity of Infrastructure for Market Transportation** - The proposed project areas adopted the model that the outside borders of the proposed project area should be located no further than 50 miles from the BCF to reduce emissions and transportation costs to make the effort economically feasible for the producers. Therefore, the BCF locations were carefully chosen to be the center point of the 50-mile radius within each proposed project area and the BCF location must include access to rail, highway, and be within reasonable distance of ports for water connection. The proposed Ashtabula project area was selected due to the established Aloterra Energy farm in Conneaut, Ashtabula County, Ohio which was in proximity of the Port of Ashtabula and rail connections to local pellet markets. The other proposed project areas were selected for their proximity to current highway and rail transportation to support existing agricultural transport mechanisms from cotton, corn, beans, and poultry farming;

(4) **Economic Feasibility** - The Project Sponsors used economic feasibility based on the current dominant agricultural land use in the region and the value of that land use in relation to potential yields for giant miscanthus payments under the BCAP. For example, throughout large parts of all four states corn, beans, beef, and poultry are the dominant agricultural products based on the return price for individual producers.

As a result, the Project Sponsors selected individual proposed project areas in those states where there was a large amount of marginal land not currently under production in any of the dominant agricultural products to avoid competition between a potentially more economically feasible option (e.g. the current agricultural use) and what the Project Sponsors are proposing. Due to the higher return on more arable land in conventional crops or livestock, the Project Sponsors recognized the importance of targeting marginal croplands and current pastureland where returns for participating producers would be higher than the existing land use, which could encourage greater participation. Additionally, based on existing research and internal economic analyses the Project Sponsors determined that giant miscanthus could economically produce on smaller acreages, potentially benefitting a larger group of producers.

In Arkansas, however; in response to specific requests from local participating farmers, the Project Sponsors are proposing to use some lands that are currently used for corn or beef but are more marginally productive. The request to plant giant miscanthus is associated with the desire to reduce runoff from high input food crops and to mitigate the unsustainable depletion of groundwater from current farming practices, which could be creating additional costs to these producers;

(5) **Access to Local Markets** – The Project Sponsors decided that access to local markets was key for developing relationships that would meet the need for future renewable energy feedstocks. For example, the proposed Ashtabula project area is within close proximity to the Port of Ashtabula and rail where the Project Sponsors anticipate meeting the significant needs of the energy industry in Ohio triggered by Renewable Energy Standard (RES) mandates. However, the transporting of pellets to both the Canadian and European markets is a viable economic option should biomass supplies exceed regional needs. In central Missouri, the Project Sponsors anticipate providing their anticipated supply to the City of Columbia, which passed a local RES for city-owned utilities, and the University of Missouri, which is in the process of converting their coal-fired power plant to either a partial co-firing or complete co-firing based on advanced biofuels feedstocks. In southwestern Missouri, the Project Sponsors anticipate selling the bulk of their pellet supply to regional poultry producers who primarily rely on propane gas to heat their poultry producing facilities, but often alter their operations if the price of propane gas rises beyond economic feasibility thresholds.

Other alternative locations were eliminated from detailed study within this EA due to the increased potential for environmental impacts associated with increased transportation and infrastructure impacts, increased air emissions including GHG and other criteria pollutants regulated under the Clean Air Act (CAA), additional water demand requirements if a suboptimal climate were chosen with insufficient water supply, additional water quality impacts if a suboptimal site was chosen with additional nutrient demand that may affect impaired waters under the Clean Water Act (CWA) in the region, and potential socioeconomic impacts if a region with an economically superior crop alternative was selected.

2.2 ALTERNATIVES TO BE ANALYZED

Alternatives considered to be reasonably expected to meet the purpose and need for action include the Proposed Action. Even though the No Action Alternative would not meet the purpose and need for the proposed action, it is included as the baseline for which the Proposed Action is compared to determine the potential effects to the human and natural environment and the potential significance of those effects, both positive and negative.

2.2.1 No Action Alternative

Under the No Action Alternative, that FSA would not establish the proposed project areas supporting the establishment and production of giant miscanthus. This alternative would leave existing agricultural production practices in place in the proposed project areas. This alternative would not meet the goals and objectives of the BCAP, as these Project Sponsors would not enter the voluntary program for the incentive to produce dedicated bioenergy crops. Also, the No Action Alternative would not meet the purpose and need for the Action as described in Section 1.3.

2.2.2 Proposed Action

Aloterra Energy LLC and MFA Oil Biomass LLC (Project Sponsors) are proposing that FSA establish four separate BCAP project areas to establish and produce giant miscanthus on 50,000 acres per proposed project area (200,000 total acres) over the life of the project (20 years or longer). The acreage targeted for enrollment into the proposed project areas are marginal croplands and current pastureland. The Project Sponsor defines marginal and idle lands as the following:

- Marginal – This refers to the productivity status of the land due to economics, geographic locations, topography, or other site conditions that render production of high value food crops such as corn and soybeans not viable.
- Idle – Land not currently being cropped.

The proposed project areas are located in four states in four distinct proposed project areas (**Figure 2-1**). Missouri contains two proposed project areas; Columbia and Aurora. Arkansas contains one proposed project area Paragould. Ohio and Pennsylvania contain the final proposed project area, Ashtabula. The Project Sponsors have been in discussions with producers to ensure the economic feasibility of the project proposal to FSA; however, no producers have been asked to provide commitments to the Project Sponsors or have entered into a discussion with the FSA to become BCAP participating producers. As such, the proposed project areas have some approximate locations of acreage to be included within the first growing season, but those acres are not committed; therefore, the level on analysis for this EA is based at the combined county proposed project area level. Each proposed project area is named for the approximate location of the BCF that will be utilized to process the giant miscanthus biomass into pellets to be shipped to other facilities or users for use in bioenergy products. Each proposed project area was developed as an approximate 50-mile radius from the approximate location of each BCF. This 50-mile radius was developed based on the generalized research findings (as detailed in the BCAP Final PEIS) that 50-miles was generally considered to be the maximum distance biomass feedstocks could be transported to a BCF and make the BCF economically viable. Project acres have been determined to be potentially located anywhere within the 50-mile radius developed from the proposed BCF located city.

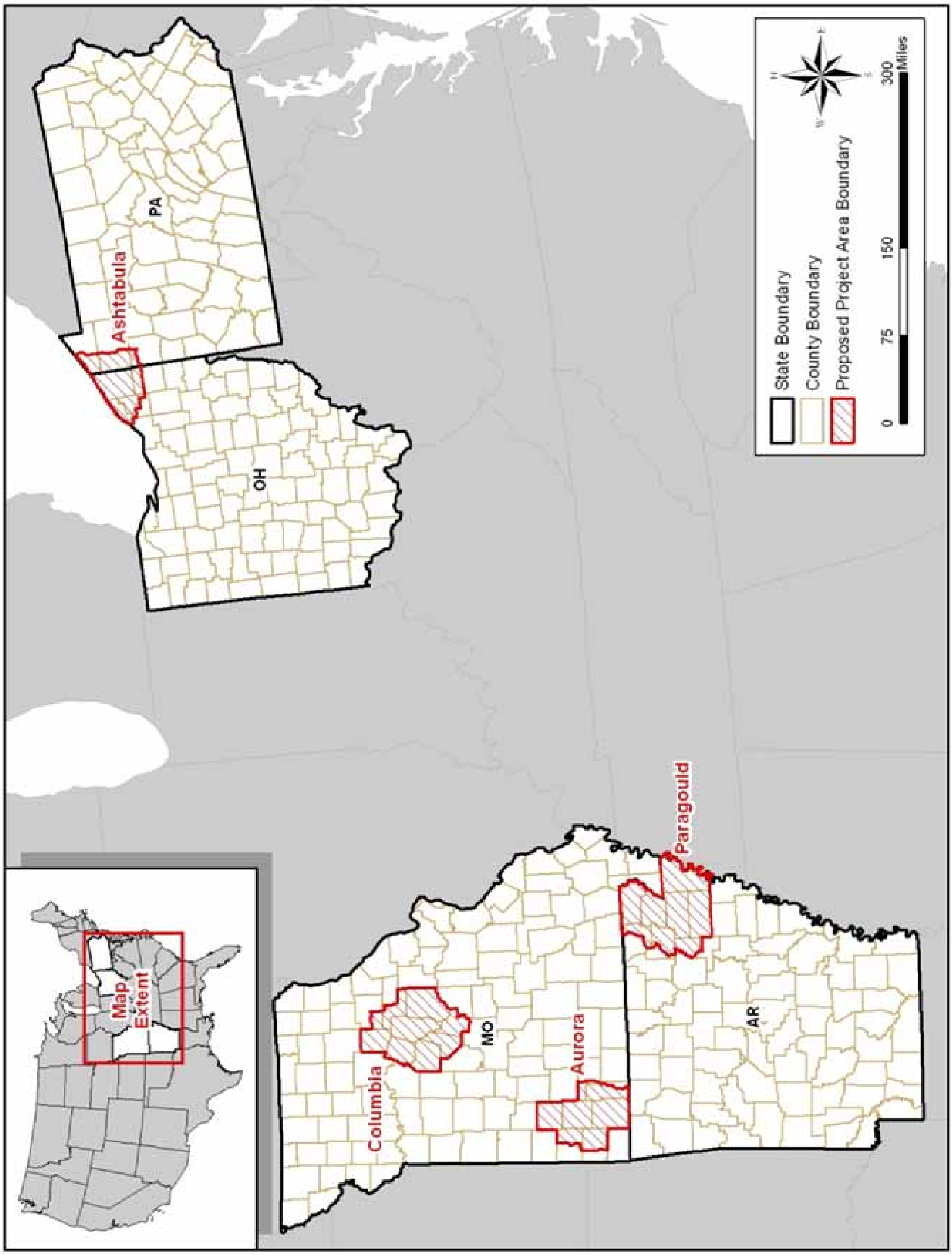


Figure 2-1. Proposed Project Area Locations.

The Project Sponsors reserve the right to decline any acres within the eligible project area that the Project Sponsors, the FSA, or the FSA technical partners' determine cannot produce giant miscanthus effectively without substantial environmental effects. This would be determined through one of the following: the Project Sponsors' initial site evaluations, the environmental screening process for each participating contract, or through the conservation or forest stewardship planning processes. The environmental screening process for each project proposal begins with the completion of Form BCAP-22 Environmental Screening for the Project Proposal. The conservation planning process for each participating producer includes the completion of the Natural Resources Conservation Service (NRCS) Form CPA-052 with the assistance of either NRCS field personnel or a certified technical service provider (TSP).

Additionally, per the BCAP Final PEIS and BCAP Final Rule, the collection, harvest, storage, and transportation of biomass from the proposed project areas to the BCF are included within the provisions of the BCAP Matching Payments Program; therefore, those activities are not being analyzed as part of the Proposed Action (BCAP Final PEIS Chapter 1.3.2, page 1-6). The Matching Payment Program was determined not to be a major Federal action per the NEPA definition since (1) there was no discretionary authority to implement the program terms; it was implemented per the direct language of the 2008 Farm Bill and (2) that the materials collected during the Matching Payment Program were currently being utilized in the marketplace for a similar, if not the same, purpose.

2.2.2.1 Methods for Establishment and Production of Giant Miscanthus

The establishment and production of giant miscanthus (**Figure 2-2**) would begin with centralized propagation acres on each farm. Rhizomes from the propagation acres would be distributed to plantation acres during the next growing season. During this planting season (2011) only, this initial establishment would require a centralized location within each proposed project area with center-pivot irrigation due to the timing of late in the growing season. This centralized propagation area for the entire proposed project area would only occur this planting season; all other planting seasons would follow the on-farm model with the initial establishment of propagation acres, followed by plantation acres the following growing season, both without subsequent irrigation beyond 2011.

Figure 2-2. Giant Miscanthus.

Giant miscanthus is a triploid hybrid perennial warm-season grass developed through the crossing of *Miscanthus sinensis* (diploid species) with *M. sacchiflorus* (tetraploid species), both of which are native to Southeast Asia. One species, *Miscanthus sinensis* was introduced to the United States, as an ornamental; other species are not frequently being used, including varieties of giant miscanthus, which is currently being developed as a biofuel feedstock. Yields in North American research trials have reached 17 dry tons per acre per year with minimal inputs. The species is a sterile hybrid which does not produce viable seed and is therefore propagated vegetatively by rhizome division. Planting equipment for Bermudagrass (*Cynodon* spp) or specialty vegetable crops has been used to successfully establish giant miscanthus in Midwestern United States. Harvesting is done in a manner similar to traditional hay crops, but the equipment must be able to handle high-yield crops. **Table 2-1** summarizes best practices for the establishment and management of giant miscanthus.

At the time of planting, rhizomes should be dormant. Viable rhizomes are firm, tan in color, weigh 1.0 to 1.5 ounces, and have at least one visible bud. Soil moisture is a key to establishment and supplemental irrigation in the first growing season is encouraged, but not required. Fertilizer should not be applied in the first two growing seasons, unless planted on in very poor soil, indicating one that lacks sufficient soil nutrients for crop growth or is a soil type that readily leaches nutrients (e.g., high sand content). In research trials, giant miscanthus has shown tolerance to common maize (corn) herbicides, Harness (Acteochlor) and Harness XTRA (Acteochlor + Atrazine) are currently the only herbicides labeled for use in giant miscanthus. A complete kill of any existing vegetation must be completed before the establishment of the crop. Stems of giant miscanthus can be ½-inch in diameter, 12 feet tall and as dense as 10 stems per square foot.

Table 2-1. Proposed Establishment and Production Methods for Giant Miscanthus

Former Land Use: Traditional Crops	Former Land Use: Currently Idle or Pasture
Crop Establishment Year One	
Deep tillage in Fall or early Spring with chisel plow.	Perform burn-down using one application of non-selective herbicide.
Tillage immediately prior to planting with disk or soil finisher to ensure fine seedbed.	Deep tillage in Fall or early Spring with chisel plow. Tillage with disk to break soil clods.
Plant rhizomes at depth of 4 inches and density of 6,000 per acre. A post-planting roller may be required to ensure solid contact between soil and rhizome.	Tillage immediately prior to planting with disk or soil finisher to ensure fine seedbed.
Apply Harness© or Harness XTRA© herbicide at label rate, prior to emergence of weeds. A second application may be made if weeds emerge.	Plant rhizomes at depth of 4 inches and density of 6,000 per acre. A post-planting roller may be required to ensure solid contact between soil and rhizome.
Mow biomass in late winter/early spring.	Apply Harness© or Harness XTRA© herbicide at label rate, prior to emergence of weeds. A second application may be made if weeds emerge.
	Mow biomass in late winter/early spring.
Crop Establishment Year Two	
Apply Harness© or Harness XTRA© herbicide at label rate, prior to emergence of weeds. A second application may be made if weeds emerge.	
Mow, rake, and bale biomass in late Fall/early Spring, prior to emergence of new shoots.	
Crop Maintenance (Years 3-15)	
Fertilize with Nitrogen (8 lbs. per dry ton of biomass), Phosphorus (1.5 lbs. per dry ton of biomass), and Potassium (8 lbs. per dry ton of biomass)	
Harvest annually, from December to March, using equipment such as a mower/conditioner and large square baler.	
Crop Removal	
Following final biomass harvest, deep tillage with plow to break apart rhizome mass. Tillage, as necessary, to break rhizomes and soil clods.	
Plant glyphosate tolerant crop and apply glyphosate during growing season when giant miscanthus shoots appear.	

Harvesting equipment must be able to handle this high yield crop. Biomass harvest should not occur until after first frost when nutrients have been translocated from the stem to rhizome. For the 2012 growing season, live rhizomes would be transported from the centralized propagation acres to the plantation acres within each proposed project area in bags on pallets contained within enclosed, refrigerated trucks similar to the standard process used to transport live plant materials long distances. For the 2013 growing, live rhizomes would be transported from on-farm propagation acres to on-farm plantation acres, there would not be any long distance transport of live plant materials off farms.

Glyphosate and traditional tillage have been found to be effect eradication methods for giant miscanthus though it may require more than one growing season for complete eradication (Caslin et al. 2010, Anderson et al. 2009, Anderson et al. 2011). Caslin et al. (2010) recommend an application of glyphosate after emergence followed by tillage. Anderson et al. (2009) recommend a tillage depth of at least 10 centimeters to remove any living rhizomes after herbicide treatment.

2.2.2.2 Ashtabula Proposed Project Area

For the spring of 2011, the Project Sponsors have obtained initial commitments from farmers to plant between 50 to 300 propagation acres of giant miscanthus, which will be replanted into plantation acres in 2012. A *propagation* acre is planted densely in order to quickly generate rhizomes the following year which are then spread to cover additional acres. A *plantation* acre is planted less densely and is intended to be used to harvest giant miscanthus for biomass. The Project Sponsors will scale up to 50,000 acres of giant miscanthus by 2014, which will enable the Project Sponsors' conversion facility to process 600,000 tons of biomass each year (**Tables 2-2 and 2-3**). The Project Sponsors have a small scale pellet mill in operation. This conversion facility has existing pelletizing technology that is energy efficient, mobile, easy to maintain, and able to be scaled up by combining smaller units using one conveyor and control system. As the economic feasibility establishes, scalability greatly increases the probability of success as expenditures will meet developing tonnage needs. Pellet markets are diverse and are strong both inside and outside of the United States. To that point; the Project Sponsors have giant miscanthus contracts with a large biomass aggregator and a local residential pellet distributor.

Table 2-2. Proposed Giant Miscanthus Acres Added by Growing Season 2011-2014

Project Area	2011	2012	2013	2014	Total Acres 2011-2014
	Propagation Acres Range	Total Giant Miscanthus Acres Added			
Ashtabula	50-300	2,275	13,500	35,000	50,000
Aurora	100-400	7,950	13,500	31,000	50,000
Columbia	100-300	6,450	13,500	33,000	50,000
Paragould	100-600	10,850	13,500	28,400	50,000

NOTE: 2011 is the only year that will have only propagation acres planted, total additional acreage per year includes both propagation acres and plantation acres (2012-2014).

Source: Confidential Application for Proposed BCAP Project Areas, 2011

Table 2-3. Estimated Biomass Tonnage by Production Year 2013-2017

Project Area	2013-2014	2014-2015	2015-2016	2016-2017
	Total Biomass Tonnage Processed			
Ashtabula	12,000	102,000	309,000	600,000
Aurora	42,000	156,000	414,000	600,000
Columbia	32,000	132,000	402,000	600,000
Paragould	57,600	187,200	429,600	600,000

Source: Confidential Application for Proposed BCAP Project Areas, 2011

2.2.2.3 Aurora Proposed Project Area

In the spring of 2011, the Project Sponsors have obtained initial commitments from farmers to plant between 100 to 400 propagation acres of giant miscanthus, which will be replanted into plantation acres in 2012. MFA Oil Biomass will utilize its 40,000 cooperative members to scale up to 50,000 acres of giant miscanthus by 2014, which will enable the Project Sponsors' conversion facility to process 600,000 tons of biomass each year. The Project Sponsors' conversion facility is utilizing existing pelletizing technology that is energy efficient, mobile, flexible in maintenance and product, and able to be scaled by combining smaller units using one conveyor and control system. As the economic feasibility establishes, scalability greatly increases the probability of success as expenditures will meet developing tonnage needs and pellet markets already exist, are diverse, and are inside and outside of the United States. To that point, the Project Sponsors have giant miscanthus tonnage contracts with farmers with commercial heating needs, and large scale aggregators of biomass.

2.2.2.4 Columbia Proposed Project Area

For the spring of 2011, the Project Sponsors have obtained initial commitments from farmers to plant between 100 to 300 propagation acres of giant miscanthus, which will be replanted into plantation acres in 2012. MFA Oil Biomass will utilize its 40,000 cooperative members to scale up to 50,000 acres of giant miscanthus by 2014, which will enable the Project Sponsors' conversion facility to process 600,000 tons of biomass each year. The Project Sponsors' conversion facility is utilizing existing pelletizing technology that is energy efficient, mobile, flexible in maintenance and product, and able to be scaled by combining smaller units using one conveyor and control system. As the economic feasibility establishes, scalability greatly increases the probability of success as expenditures will meet developing tonnage needs and pellet markets already exist, are diverse, and are inside and outside of the United States. To that point, the Project Sponsors have giant miscanthus tonnage contracts with farmers with commercial heating needs, and large scale aggregators of biomass.

2.2.2.5 Paragould Proposed Project Area

In the spring of 2011, the Project Sponsors have obtained initial commitments from farmers to plant between 100 to 600 propagation acres of giant miscanthus, which will be replanted into plantation acres in 2012. MFA Oil Biomass will utilize its 40,000 cooperative members to scale up to 50,000 acres of miscanthus by 2014, which will enable the Project Sponsors' conversion facility to process 600,000 tons of biomass each year. The Project Sponsors' conversion facility is utilizing existing pelletizing technology that is energy efficient, mobile, flexible in maintenance and product, and able to be scaled by combining smaller units using one conveyor and control system. As the economic feasibility establishes, scalability greatly increases the probability of success as expenditures will meet developing tonnage needs and pellet markets already exist, are diverse, and are inside and outside of the United States. To that point, the Project Sponsors have giant miscanthus tonnage contracts with farmers with commercial heating needs, and large scale aggregators of biomass.

2.3 RESOURCES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

As mentioned previously, this EA is being tiered from the BCAP Final PEIS, as such certain resource areas are being excluded from this analysis consistent with the BCAP Final PEIS, due to little or no affects to these resource areas due to their absence within the proposed project areas or limitations on effects by program guidelines. Those resources areas being excluded from this analysis include:

- **Wetlands** – were eliminated from detailed analysis in this EA since the conversion of wetland is prohibited under BCAP;
- **Floodplains** – were eliminated from detailed analysis in this EA, since there is little potential for effect from agricultural production in floodplains;
- **Regulated Coastal Zones** – were eliminated from detailed analysis in this EA, since the proposed project areas are not located within any coastal areas or managed coastal zones;
- **Prime and Unique Farmland** – were eliminated from detailed analysis in this EA, since they are exempt from coordination with the NRCS due to the continued agricultural production of these areas rather than conversion into other land uses;
- **Environmental Justice** – was eliminated from detailed analysis in this EA, since a determination at the programmatic level was undertaken in the BCAP Final PEIS and it was found to not result in any disproportionate effects to minority or low-income populations;
- **Cultural Resources** – was eliminated from detailed analysis in this EA, since this is a site specific issue and will be addressed during the completion of the

environmental evaluation as part of the conservation or forest stewardship planning requirement for each individual producer BCAP contract;

- **Noise** – was eliminated from detailed analysis in this EA, since the effects would be minor, only temporarily occurring during activities, and would be similar to agricultural activities currently taking place within the proposed project areas.

Additionally, other resources that were analyzed within the BCAP Final PEIS and are being eliminated in this EA due to the minor and insubstantial effects that could occur from the implementation of the Proposed Action or No Action Alternative include:

- **Air Quality** – was eliminated from detailed analysis in this EA due to the similarity between the proposed activities within each of the proposed project areas and existing agricultural activities within those areas. All counties located within the proposed project areas are rural or semi-rural and the majority of the land use in these counties in agriculture. As such, the additional agricultural use anticipated to be produced should not introduce any additional significant emissions. As such, the project is not expected to significantly impact the air quality in the proposed project areas. However, a quick analysis of the attainment status based on the National Ambient Air Quality Standards (NAAQS) was conducted for each county within the proposed project areas. Pennsylvania has designations for the following criteria pollutants: carbon monoxide (CO), particulate matter (PM_{10}, $PM_{2.5}$,) 1-hour ozone, 8-hour ozone, and sulfur dioxide (SO_2). All counties in the proposed project area are designated as in attainment for all criteria pollutants. Missouri has designations for the following criteria pollutants: lead (Pb), 8-hour ozone, and $PM_{2.5.}$ According to Missouri Department of Natural Resources Air Pollution Control Division (MDNRAPCD), SO_2 designations are being released within the next month. All counties in the proposed project areas are designated as in attainment for all criteria pollutants including SO_2. Arkansas has designations for the following criteria pollutants: Pb, SO_2, (nitrogen dioxide) NO_2, CO, PM_{10}, and $PM_{2.5.}$ All counties in the proposed project area are designated as in attainment for all criteria pollutants.

  Ohio has designations for the following criteria pollutants: CO, Pb, NO_2, PM_{10} and $PM_{2.5}$, 1-hour ozone, and 8-hour ozone. All Ohio counties in the proposed project area were designated as in attainment for 1-hour and 8-hour ozone, PM_{10}, Pb, NO_2, and CO. Geauga and Trumbell counties are designated as in attainment for $PM_{2.5}$. However, Lake County is designated as in full non-attainment for $PM_{2.5}$ and

Ashtabula County as partial non-attainment for $PM_{2.5}$. Lake County and Ashtabula County are part of the Cleveland-Akron-Lorain Air Quality Control Region (AQCR) 174. $PM_{2.5}$ pollutants are considered fine particles being less than 2.5 micrometers in diameter. These particles are so small they can be detected only with an electron microscope. Sources of fine particles include all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes (U.S. Environmental Protection Agency [EPA] 2011). The 2005 Emissions Inventory for Ohio (EPA 2006) indicates that Lake County had 3,310 tons per year (tpy) of $PM_{2.5}$ emissions with electric generating units accounting for greater than 80 percent of the pollutant load, non-road emissions (e.g., diesel engines from construction and agricultural equipment) accounted for approximately 6.6 percent of pollutant load. In Ashtabula County 1,407 tpy were monitored in 2005, with 27.1 percent generated from non-road emissions, other stationary sources accounted for 62 percent of the pollutant load. The Ohio Environmental Protection Agency (OEPA) has requested a Clean Data assessment from the EPA to remove the 1997 $PM_{2.5}$ nonattainment status for counties in Ohio (OEPA 2010). The OEPA provided monitoring data from the Lake County air quality monitoring station that indicated that the three-year average was 11.9 micrograms per cubic meter of air ($\mu g/m^3$), which is below the 15 $\mu g/m^3$ primary NAAQS standard. There are no monitoring stations located in Ashtabula County. Overall, it would be anticipated that agricultural equipment necessary for the establishment, harvesting, and transportation of giant miscanthus would provide a minimum amount of the $PM_{2.5}$ particulate load within these two counties based on the high level of electric generating units in Lake County and the proximity to the Cleveland, Ohio metropolitan area.

- **Recreation** – was eliminated from detailed analysis in this EA, since the effect to outdoor recreation was determined to be minor, on the whole, from the BCAP Final PEIS and would be site-specific based on the practices of the individual BCAP contract producers.

2.4 COMPARISONS OF THE ALTERNATIVES

Table 2-4 provides a tabular summary of the potential effects from both the Proposed Action and No Action Alternative. As described previously, the No Action Alternative would not meet the purpose and need as described, but is the baseline to which the Proposed Action is compared to determine effects to the analyzed environmental resource areas.

Table 2-4. Comparison of the Alternatives

Resource Area	Proposed Action	No Action Alternative
Socioeconomics	+ minor	0
Land Use	- minor	0
Biological Resources		
Vegetation	- minor	0
Wildlife	- minor	0
Protected Species	0	0
Soil Resources	+ minor (primarily during establishment)	0/- minor
Water Quality/Quantity		
Water Quality	+ minor	0
Water Quantity	+/- minor	0

Note:
+ =positive - =negative 0 =neutral

3 AFFECTED ENVIRONMENT (BY RESOURCE AREA)

3.1 SOCIOECONOMICS

3.1.1 Definition of the Resource

Socioeconomic analyses generally include detailed investigations of the prevailing population, income, employment, and housing conditions of a community or Region of Influence (ROI). The socioeconomic conditions of a ROI could be affected by changes in the rate of population growth, changes in the demographic characteristics of a ROI, or changes in employment within the ROI caused by the implementation of the proposed action.

Socioeconomic resources within this document include general agricultural characteristics associated with number of farms, acres of primary field crops, and revenues generated from primary field crops. Additionally, a brief analysis of rural population trends is discussed.

3.1.2 Existing Conditions

3.1.2.1 Number of Farms and Land in Farms

From 1997 to 2007, the number of farms in the United States declined 0.5 percent (USDA 2009b). Most farm categories declined from 1997 to 2007, with the number of acres in farms declining 3.4 percent, the average size of farms declining by 3.0 percent, the amount of cropland declining by 8.7 percent, and the amount of harvested cropland acreage declining by 2.9 percent (*Ibid*). The average market value of land and buildings increased approximately 90.2 percent for the average farm and approximately 95.7 for the average acre (*Ibid*). Farm production expenses also showed an increase of approximately 52.8 percent over the decade. When compared by type of farm, the largest number of farms in the United States falls within the small family farm – residential or lifestyle farm. For the majority, the largest number of farms in the proposed project areas fall within the small family farm – residential or lifestyle farm (**Table 3-1**).

Table 3-1. Number of Farms by Farm Typology, 2007

Location	Item	Total	Small Family Farms					Large family	Very large family	Non-family
			Limited resource	Retirement	Residential/ lifestyle	Farming occupation/ lower sales	Farming occupation/ higher sales			
Arkansas										
Arkansas	Number	49,346	7,581	9,932	18,434	4,797	953	1,727	4,135	1,787
	%	100	15	20	37	10	2	3	8	4
Clay	Number	731	104	127	208	78	54	37	88	35
	%	100	14	17	28	11	7	5	12	5
Craighead	Number	1,191	56	253	111	34	38	545	110	44
	%	100	5	21	9	3	3	46	9	4
Greene	Number	770	93	164	290	79	26	34	63	21
	%	100	12	21	38	10	3	4	8	3
Jackson	Number	445	34	59	134	43	39	50	49	37
	%	100	8	13	30	10	9	11	11	8
Lawrence	Number	592	67	102	195	74	29	39	58	28
	%	100	11	17	33	13	5	7	10	5
Mississippi	Number	369	25	31	78	36	15	43	121	20
	%	100	7	8	21	10	4	12	33	5
Poinsett	Number	418	27	40	88	43	11	62	102	45
	%	100	6	10	21	10	3	15	24	11
Randolph	Number	766	149	135	340	69	8	12	42	11
	%	100	19	18	44	9	1	2	5	1
Missouri										
Missouri	Number	108,098	15,785	23,491	42,987	12,525	3,931	2,810	2,861	3,708
	%	100	15	22	40	12	4	3	3	3
Boone	Number	1,322	180	264	648	112	20	23	12	63
	%	100	14	20	49	8	2	2	1	5
Callaway	Number	1,503	198	374	642	158	29	22	25	55
	%		13	25	43	11	2	1	2	4
Cole	Number	1,103	163	287	503	95	20	11	7	17
	%	100	15	26	46	9	2	1	1	2
Cooper	Number	942	110	175	363	114	40	53	34	53
	%	100	12	19	39	12	4	6	4	6
Howard	Number	867	101	175	373	100	46	26	13	33
	%	100	12	20	43	12	5	3	1	4
Moniteau	Number	1,138	136	242	477	130	44	25	47	37
	%	100	12	21	42	11	4	2	4	3
Randolph	Number	1,000	161	232	448	82	23	7	14	33
	%	100	16	23	45	8	2	1	1	3
Audrain	Number	1,102	96	198	386	157	89	80	57	39
	%	100	9	18	35	14	8	7	5	4
Monroe	Number	1,036	126	236	402	117	43	28	34	50
	%	100	12	23	39	11	4	3	3	5
Barry	Number	1,606	239	303	620	174	32	22	165	51
	%	100	15	19	39	11	2	1	10	3
Christian	Number	1,265	236	311	541	106	22	10	7	32
	%	100	19	25	43	8	2	1	1	3
Dade	Number	883	124	195	343	129	31	17	21	23
	%	100	14	22	39	15	4	2	2	3
Jasper	Number	1,369	207	302	546	177	48	14	35	40
	%	100	15	22	40	13	4	1	3	3
Lawrence	Number	1,873	275	343	802	261	60	24	48	60
	%	100	15	18	43	14	3	1	3	3
Newton	Number	1,590	244	378	643	168	26	12	84	35
	%	100	15	24	40	11	2	1	5	2
Stone	Number	753	125	147	349	90	10	8	8	16

Location	Item	Total	Small Family Farms: Limited resource	Small Family Farms: Retirement	Small Family Farms: Residential/ lifestyle	Small Family Farms: Farming occupation/ lower sales	Small Family Farms: Farming occupation/ higher sales	Large family	Very large family	Non-family
	%	100	17	20	46	12	1	1	1	2
Ohio										
Ohio	Number	75,861	9,670	15,071	30,434	8,989	3,556	3,087	2,781	2,273
	%	100	13	20	40	12	5	4	4	3
Ashtabula	Number	1,127	193	258	381	182	43	27	19	24
	%	100	17	23	34	16	4	2	2	2
Geauga	Number	888	152	142	326	202	16	14	7	29
	%	100	17	16	37	23	2	2	1	3
Lake	Number	259	47	47	78	33	11	7	12	24
	%	100	18	18	30	13	4	3	5	9
Trumbull	Number	970	170	232	348	127	33	22	9	29
	%	100	18	24	36	13	3	2	1	3
Pennsylvania										
Pennsylvania	Number	63,163	10,230	11,755	22,563	7,533	4,644	2,589	2,003	1,846
	%	100	16	19	36	12	7	4	3	3
Crawford	Number	1,468	274	249	514	231	90	65	17	28
	%	100	19	17	35	16	6	4	1	2
Erie	Number	1,609	278	386	604	158	84	38	18	43
	%	100	17	24	38	10	5	2	1	3
Mercer	Number	1,210	216	253	421	166	76	33	20	25
	%	100	18	21	35	14	6	3	2	2

Source: USDA, 2009

3.1.2.2 Primary Field Crops

The 2003 National Resources Inventory indicates that approximately 368 million acres within the United States is cultivated cropland and 58 million acres is uncultivated cropland. In 1992, those figures were 334 million acres of cultivated cropland and 47 million acres of uncultivated cropland. **Table 3-2** illustrates the amount of acreage planted of select primary field crops in 2010, along with harvested acres of those crops, and total production of the crops (USDA 2009). As shown in the table, a majority of the counties had corn (grain) and soybean planted, harvested and production in 2010.

Table 3-2. Planted Acres, Harvested Acres, and Production of Select Field Crops in the Project Counties (2010).

Area	Crop Type	Planted Acres	Harvested Acres	Production
Arkansas				
Arkansas State Totals	Corn (Grain)	390,000	380,000	57,000,000
	Cotton, Upland (2008)	620,000	615,000	1,296,000
	Sorghum (Grain)	40,000	35,000	2,695,000
	Rice All (2008)	1,401,000	1,395,000	92,938,000
	Soybeans	3,190,000	3,150,000	110,250,000
	Wheat All (2008)	1,070,000	980,000	55,860,000
Clay	Corn (Grain)	23,600	23,500	3,666,000
	Cotton Upland, All (2008)	28,500	28,400	60,500
	Rice All (2008)	76,200	75,300	5,208,100
	Soybeans	103,500	103,000	3,900,000
	Wheat, All (2008)	20,000	17,000	765,000
Craighead	Corn (Grain)	20,200	20,200	3,426,000
	Cotton, Upland (2008)	73,200	72,900	154,000
	Rice All (2008)	79,000	78,500	5,385,100
	Soybeans	105,500	102,700	3,976,000
	Wheat All (2008)	25,000	23,000	1,220,000
Greene	Corn (Grain)	11,100	11,000	1,749,000
	Cotton, Upland (2008)	8,500	8,400	17,500
	Rice All (2008)	80,500	79,900	5,446,300
	Soybeans	76,400	75,400	2,405,000
	Wheat All (2008)	19,000	18,000	850,000
Jackson	Corn (Grain)	7,900	7,800	1,170,000
	Rice All (2008)	95,000	93,600	6,229,800
	Soybeans	129,000	124,500	3,104,000
	Wheat All (2008)	57,000	52,000	2,330,000
Lawrence	Corn (Grain)	1,800	1,800	288,000
	Sorghum (Grain)	1,200	1,000	30,000
	Rice All (2008)	99,000	98,500	6,08,7,300
	Soybeans	65,100	63,900	1,815,000
Mississippi	Corn (Grain)	19,300	18,900	3,137,000
	Cotton, Upland (2008)	179,500	177,800	371,200
	Sorghum (Grain)	1,200	1,100	62,000
	Rice All (2008)	44,300	44,000	3,115,200
	Soybeans	255,500	254,700	8,820,000
	Wheat All (2008)	44,000	36,000	2,160,000
Poinsett	Corn (Grain)	10,100	9,800	1,499,000
	Cotton, Upland (2008)	39,800	39,600	88,000
	Rice All (2008)	120,000	119,000	8,278,400
	Soybeans	170,800	166,900	5,875,000
	Wheat All (2008)	38,000	35,000	1,860,000
Randolph	Corn (Grain)	4,900	4,900	637,000
	Rice All (2008)	33,500	33,400	2,237,800
	Soybeans	31,600	31,200	1,063,000
Missouri				
Missouri State Totals	Corn (Grain)	3,150,000	3,000,000	369,000,000
	Hay All (Dry) (2008)		4,200,000	8,820,000
	Sorghum (Grain)	40,000	33,000	2,574,000
	Soybeans	5,150,000	5,070,000	210,405,000
	Wheat All (2008)	1,250,000	1,160,000	55,680,000
Boone	Corn (Grain)	25,700	24,400	2,806,000
	Hay All (Dry) (2008)		44,000	86,000
	Sorghum (Grain)	1,000	900	64,800
	Soybeans	40,500	39,900	1,643,000
	Wheat All (2008)	12,400	12,200	569,600

Area	Crop Type	Planted Acres	Harvested Acres	Production
Callaway	Corn (Grain)	30,600	29,800	4,052,000
	Hay All (Dry) (2008)		49,000	99,000
	Sorghum (Grain)	1,700	1,500	133,000
	Soybeans	58,400	57,600	2,588,000
	Wheat All (2008)	14,300	13,300	568,100
Cole	Corn (Grain)	5,100	4,600	608,000
	Hay All (Dry) (2008)		41,000	95,000
	Soybeans	10,000	9,800	440,000
Cooper	Corn (Grain)	48,600	47,800	6,231,000
	Hay All (Dry) (2008)		34,000	70,000
	Soybeans	70,800	70,400	3,177,000
	Wheat All (2008)	20,900	20,400	1,120,000
Howard	Corn (Grain)	34,700	33,700	4,157,000
	Hay All (Dry) (2008)		28,000	59,000
	Soybeans	41,900	41,600	1,839,000
	Wheat All (2008)	10,500	10,300	453,800
Moniteau	Corn (Grain)	11,300	10,800	1,198,000
	Hay All (Dry) (2008)		52,000	112,000
	Soybeans	21,200	21,100	981,000
	Wheat All (2008)	7,400	7,000	298,500
Randolph	Corn (Grain)	16,800	14,500	1,403,000
	Hay All (Dry) (2008)		36,000	76,000
	Soybeans	45,600	45,200	1,735,000
	Wheat All (2008)	10,300	9,500	453,100
Audrain	Corn (Grain)	94,800	91,500	11,186,000
	Hay All (Dry) (2008)		25,000	57,000
	Sorghum (Grain)	4,200	3,900	302,000
	Soybeans	167,000	164,900	7,451,000
	Wheat All (2008)	37,400	36,300	1,785,000
Monroe	Corn (Grain)	56,100	53,500	5,485,000
	Hay All (Dry) (2008)		33,000	72,000
	Sorghum (Grain)	1,600	1,400	142,000
	Soybeans	86,800	86,000	3,745,000
	Wheat All (2008)	15,500	15,200	649,100
Barry	Corn (Grain)	3,600	3,000	333,000
	Hay All (Dry) (2008)		72,000	176,000
	Soybeans	2,000	1,900	58,000
	Wheat All (2008)	1,300	1,000	38,700
Christian	Corn (Grain)	700	600	59,900
	Hay All (Dry) (2008)		46,000	111,000
Dade	Corn (Grain)	15,300	14,400	1,552,000
	Hay All (Dry) (2008)		64,000	114,000
	Sorghum (Grain)	1,000	900	80,400
	Soybeans	26,800	26,600	918,000
	Wheat All (2008)	26,500	24,800	1,049,000
Jasper	Corn (Grain)	29,000	28,100	3,615,000
	Hay All (Dry) (2008)		58,000	109,000
	Sorghum (Grain)	700	500	38,900
	Soybeans	45,900	45,400	1,532,000
	Wheat All (2008)	28,500	27,500	1,154,000
Lawrence	Corn (Grain)	9,400	8,400	778,000
	Hay All (Dry) (2008)		88,000	202,000
	Soybeans	9,400	9,300	278,000
	Wheat All (2008)	6,600	5,100	219,500
Newton	Hay All (Dry) (2008)		87,000	204,000
	Soybeans	5,100	5,000	137,000
	Wheat All (2008)	4,200	3,100	129,600

Area	Crop Type	Planted Acres	Harvested Acres	Production
Stone	Corn (Grain)	500	300	26,800
	Hay All (Dry) (2008)		19,000	34,000
Ohio				
Ohio State Totals	Corn (Grain)	3,450,000	3,270,000	533,010,000
	Hay All (Dry) (2008)		1,140,000	2,802,000
	Oats	65,000	50,000	3,500,000
	Soybeans	4,600,000	4,590,000	220,320,000
	Wheat All (2008)	1,120,000	1,090,000	74,120,000
Ashtabula	Corn (Grain)	20,200	19,200	2,965,000
	Hay All (Dry) (2008)		27,000	71,700
	Soybeans	32,000	31,800	1,588,000
Geauga	Corn (Grain)	3,100	2,800	396,000
	Hay All (Dry) (2008)		12,600	31,700
	Oats	900	850	68,700
Lake	Hay All (Dry) (2008)		3,200	5,800
Trumbull	Corn (Grain)	19,900	18,600	2,974,000
	Hay All (Dry) (2008)		15,200	36,300
	Oats	2,100	2,020	165,000
	Soybeans	26,300	26,200	1,220,000
	Wheat All (2008)	6,000	5,800	400,200
Pennsylvania				
Pennsylvania State Totals	Corn (Grain)	1,350,000	910,000	116,480,000
	Hay, All (Dry) (2008)		1,750,000	3,810,000
	Oats	110,000	80,000	4,720,000
	Soybeans	500,000	495,000	20,790,000
	Wheat All (2008)	195,000	185,000	11,840,000
Crawford	Corn (Grain)	35,000	25,600	3,529,000
	Hay All (Dry) (2008)		48,300	116,400
	Oats	5,600	4,300	264,000
	Soybeans	20,000	19,900	896,000
Erie	Corn (Grain)	22,000	18,500	2,536,000
	Oats	3,000	2,500	158,000
	Soybeans	10,500	10,400	441,000
	Wheat All (2008)	3,600	3,400	168,000
Mercer	Corn (Grain)	38,000	32,000	4,677,000
	Hay All (Dry) (2008)		35,700	88,400
	Oats	4,300	3,500	208,000
	Soybeans	17,700	17,600	825,000
	Wheat All (2008)	4,200	4,100	214,000

Source: USDA 2009

3.1.2.3 Primary Livestock Industries

The primary livestock industries across the proposed project areas are cattle for all states in addition to sheep in Ohio and Pennsylvania. **Table 3-3** lists the most recent data on livestock numbers by type and by county. Only Lake County, Ohio did not contain any reportable or discloseable level of cattle. The Aurora and Columbia proposed project areas contributed approximately 19.5 percent of all cattle in Missouri. Both the Paragould and Ashtabula proposed project areas accounted for five percent or less for their state totals. The Ashtabula proposed project area accounted for approximately three percent of the sheep in Ohio and Pennsylvania.

Table 3-3. Primary Livestock Activities by County within the Proposed Project Areas

Area	Livestock	Number of Head
Arkansas		
Arkansas State Totals	Cattle All (2010)	1,890,000
Clay	Cattle All (2010)	8,200
Craighead	Cattle All (2010)	12,300
Greene	Cattle All (2010)	7,400
Jackson	Cattle All (2010)	10,500
Lawrence	Cattle All (2010)	18,200
Mississippi	Cattle All (2010)	1,700
Poinsett	Cattle All (2010)	2,000
Randolph	Cattle All (2010)	35,500
Missouri		
Missouri State Totals	Cattle All (2010)	4,150,000
Boone	Cattle All (2010)	30,500
Callaway	Cattle All (2010)	39,000
Cole	Cattle All (2010)	42,500
Cooper	Cattle All (2010)	55,000
Howard	Cattle All (2010)	25,500
Moniteau	Cattle All (2010)	75,000
Randolph	Cattle All (2010)	30,500
Audrain	Cattle All (2010)	39,000
Monroe	Cattle All (2010)	28,500
Barry	Cattle All (2010)	83,000
Christian	Cattle All (2010)	49,500
Dade	Cattle All (2010)	60,000
Jasper	Cattle All (2010)	51,000
Lawrence	Cattle All (2010)	100,000
Newton	Cattle All (2010)	74,000
Stone	Cattle All (2010)	26,500
Ohio		
Ohio State Totals	Cattle All (2010)	1,280,000
	Sheep and Lambs (2008)	125,000
Ashtabula	Cattle All (2010)	18,700
	Sheep and Lambs (2008)	600
Geauga	Cattle All (2010)	7,800
	Sheep and Lambs (2008)	1,300
Lake	Sheep and Lambs (2008)	200
Trumbull	Cattle All (2010)	11,800
	Sheep and Lambs (2008)	200
Pennsylvania		
Pennsylvania State Totals	Cattle All (2010)	1,620,000
	Sheep and Lambs (2008)	98,000
Crawford	Cattle All (2010)	42,500
	Sheep and Lambs (2008)	2,000
Erie	Cattle All (2010)	14,200
	Sheep and Lambs (2008)	600
Mercer	Cattle All (2010)	28,500
	Sheep and Lambs (2008)	2,500

Source: USDA NASS 2011.

3.1.2.4 Rural Population Trends

The USDA Economic Research Service (ERS) found that by 2006 non-metro counties in the United States accounted for a population of approximately 50.2 million persons, which is approximately 16.8 percent of the total United States population (ERS 2008; U.S. Census Bureau [USCB] 2008). The general trend in these counties was a decline in the population with over 51 percent of the non-metro counties experiencing population declines of approximately 0.5 percent per year from 2000 to 2006.

3.1.2.5 Farm Income and Cost

The ERS (USDA 2011c) indicated that net farm income in 2011 is projected to be above the 2010 forecast by 19.8 percent. Net farm income was estimated to be approximately $94.1 billion in 2011 with net cash income of $98.6 billion. Total expenses in the agricultural sector are anticipated to increase by $20.2 billion, exceeding $300 billion for the first time. Crop receipts were estimated to increase to $24.1 billion.

At the household level, the average family farm household income for 2010 was estimated to be $83,021, an increase of 7.6 percent from 2009. The ERS anticipates that in 2011 approximately 12.9 percent of average family farm household income was generated from on-farm sources with an average of approximately $75,178 of household income generated from off-farm sources (*Ibid*).

3.2 LAND USE

3.2.1 Definition of the Resource

Land use analysis primarily details the interactions of humans and their environment, both natural and human-induced. Such analyses address how different land uses currently interact and if there would be conflict between new and existing land uses. In urban areas, land uses are primarily controlled for public health and safety concerns through land use zoning mechanisms. In rural areas, land use restrictions may be developed at a county or regional scale, or land use restrictions may not exist or be limited to special public health and safety concerns. Land use within this document is being described as the acreage within cropland and permanent pasture since these lands uses are being proposed for conversion into a dedicated energy crop land use.

3.2.2 Existing Conditions

The 2007 Agricultural Census estimates the amount of land in agricultural land uses in the United States. **Tables 3-4** through **3-7** illustrate the agricultural lands defined by land use categories and sub-categories in the proposed project area counties. From land use categories, harvested cropland as a percentage of total land in farms can be derived; indicating harvested cropland is a dominant land use in the Ashtabula (52.5 percent) and Paragould (81.7 percent) proposed project areas. In the Aurora (32.9 percent) and Columbia (44.9 percent) proposed project areas, harvested cropland is a prominent land use category; however, pastureland, of all types (cropland, pastureland; woodland, pastured; and permanent pasture and rangeland) account for 55.4 percent and 29.3 percent of the proposed project areas, respectively.

Figure 3-1 provides an illustration of percentage of total farmland in each of the proposed project areas, while **Figure 3-2** illustrates the percentage of cropland and pastureland within each proposed project area.

Table 3-4. Farmland Land Use Categories and Sub-Categories for the Ashtabula Proposed Project Area

Land Use Type	Ohio	Ashtabula	Geauga	Lake	Trumbull	Pennsylvania	Crawford	Erie	Mercer
	(Acres 2007)								
Approximate land area	26,149,825	449,244	256,106	146,267	395,084	28,631,687	648,136	509,921	429,980
Land in farms	13,956,563	161,698	56,558	16,065	125,136	7,809,244	232,093	173,125	171,860
Total cropland	10,832,772	106,255	29,541	10,126	87,440	4,870,287	139,526	101,698	111,556
Total woodland	1,473,638	34,898	14,389	2,931	21,631	1,717,791	55,047	41,485	32,028
Permanent pasture and rangeland, other than cropland and woodland pastured	1,046,728	10,461	7,768	1,012	8,962	732,275	21,614	15,495	17,130
Land in farmsteads, buildings, livestock facilities, ponds, roads, wasteland, etc.	603,425	10,084	4,860	1,996	7,103	488,891	15,906	14,447	11,146
Total Cropland									
Harvested cropland	9,991,007	93,639	23,413	7,316	80,484	3,942,079	114,671	77,909	94,618
Cropland used only for pasture or grazing	348,923	4,173	2,913	364	2,416	397,131	10,575	7,769	7,174
Other cropland	492,842	8,443	3,215	2,446	4,540	531,077	14,280	16,020	9,764
Cropland on which all crops failed	42,855	1,252	705	179	576	51,177	1,441	1,691	1,259
Cropland idle or used for cover crops or soil improvement, but not harvested and not pastured or grazed	449,987	7,191	2,510	2,267	3,964	443,785	9,550	13,449	7,404
Cropland in cultivated summer fallow	-	-	-	-	-	36,115	3,289	880	1,101
Total Woodland									
Woodland not pastured	1,194,513	32,299	12,072	2,772	18,603	1,567,607	49,293	37,227	28,084
Woodland pastured	279,125	2,599	2,317	159	3,028	150,184	5,754	4,258	3,944
Pastureland, All Types	1,674,776	17,233	12,998	1,535	14,406	1,279,590	37,943	27,522	28,248
Permanent pasture and rangeland, other than cropland and woodland pastured	1,046,728	10,461	7,768	1,012	8,962	732,275	21,614	15,495	17,130
Cropland used only for pasture or grazing	348,923	4,173	2,913	364	2,416	397,131	10,575	7,769	7,174
Woodland pastured	279,125	2,599	2,317	159	3,028	150,184	5,754	4,258	3,944
Conservation Acres - CRP, WRP, Farmable Wetlands, and CREP	385,442	2,181	196	-	1,113	232,543	4,792	3,478	2,036

Source: Adapted from USDA NASS 2007

Table 3-5. Farmland Land Use Categories and Sub-Categories for the Aurora Proposed Project Area (2007)

Land Use Type	Missouri	Barry	Christian	Dade	Jasper	Lawrence	Newton	Stone
	Acres (2007)							
Approximate land area	43,974,665	498,075	360,110	313,616	408,645	391,510	399,846	296,980
Land in farms	29,026,573	289,626	189,177	276,229	258,815	322,822	245,892	121,792
Total cropland	16,405,595	114,244	76,040	127,080	135,730	150,703	107,943	36,790
Total woodland	4,414,396	51,481	33,465	28,031	21,199	33,879	33,989	28,625
Permanent pasture and rangeland, other than cropland and woodland pastured	6,864,391	113,402	71,100	114,815	88,631	126,177	93,902	53,240
Land in farmsteads, buildings, livestock facilities, ponds, roads, wasteland, etc.	1,342,191	10,499	8,572	6,303	13,255	12,063	10,058	3,137
Total Cropland								
Harvested cropland	12,980,113	77,319	52,185	105,106	110,017	112,839	81,364	22,203
Cropland used only for pasture or grazing	1,858,684	31,869	21,001	15,136	14,855	30,001	19,908	12,860
Other cropland	1,566,798	5,056	2,854	6,838	10,858	7,863	6,671	1,727
Cropland on which all crops failed	118,387	526	(D)	721	2,039	364	961	224
Cropland idle or used for cover crops or soil improvement, but not harvested and not pastured or grazed	1,374,183	4,212	2,213	5,571	8,421	6,779	5,540	1,503
Cropland in cultivated summer fallow	74,228	318	-	546	398	720	170	-
Total Woodland								
Woodland not pastured	2,548,059	20,690	14,363	7,466	9,159	15,156	14,288	12,122
Woodland pastured	1,866,337	30,791	19,102	20,565	12,040	18,723	19,701	16,503
Pastureland, All Types	10,589,412	176,062	111,203	150,516	115,526	174,901	133,511	82,603
Permanent pasture and rangeland, other than cropland and woodland pastured	6,864,391	113,402	71,100	114,815	88,631	126,177	93,902	53,240
Cropland used only for pasture or grazing	1,858,684	31,869	21,001	15,136	14,855	30,001	19,908	12,860
Woodland pastured	1,866,337	30,791	19,102	20,565	12,040	18,723	19,701	16,503
Conservation Acres - CRP, WRP, Farmable Wetlands, and CREP	1,691,694	978	855	5,902	12,551	7,968	3,955	-

Source: Adapted from USDA NASS 2007

Table 3-6. Farmland Land Use Categories and Sub-Categories for the Columbia Proposed Project Area (2007)

Land Use Type	Missouri	Audrain	Boone	Callaway	Cole	Cooper	Howard	Moniteau	Monroe	Randolph
	(Acres 2007)									
Approximate land area	43,974,665	443,029	438,428	534,121	250,525	360,999	296,862	265,616	414,507	308,737
Land in farms	29,026,573	424,880	258,734	322,929	180,840	302,429	276,590	242,946	288,293	221,647
Total cropland	16,405,595	337,854	152,527	166,339	79,523	189,065	172,316	122,630	183,346	119,856
Total woodland	4,414,396	26,308	38,532	63,853	42,655	39,984	38,944	37,496	44,391	37,022
Permanent pasture and rangeland, other than cropland and woodland pastured	6,864,391	42,271	54,510	77,798	50,769	62,895	49,924	69,372	44,555	51,331
Land in farmsteads, buildings, livestock facilities, ponds, roads, wasteland, etc.	1,342,191	18,447	13,165	14,939	7,893	10,485	15,406	13,448	16,001	13,438
Total Cropland										
Harvested cropland	12,980,113	308,285	121,717	135,285	59,816	151,755	131,709	89,403	142,075	86,479
Cropland used only for pasture or grazing	1,858,684	11,727	17,088	16,106	15,319	19,234	17,289	22,918	15,445	11,727
Other cropland	1,566,798	17,842	13,722	14,948	4,388	18,076	23,318	10,309	25,826	21,650
Cropland on which all crops failed	118,387	498	3,150	711	276	580	290	1,308	723	495
Cropland idle or used for cover crops or soil improvement, but not harvested and not pastured or grazed	1,374,183	16,053	9,865	13,287	3,346	15,641	22,468	8,634	24,016	20,626
Cropland in cultivated summer fallow	74,228	1,291	707	950	766	1,855	560	367	1,087	529
Total Woodland										
Woodland not pastured	2,548,059	18,201	25,395	42,574	16,492	21,187	26,166	14,153	30,449	25,164
Woodland pastured	1,866,337	8,107	13,137	21,279	26,163	18,797	12,778	23,343	13,942	11,858
Pastureland, All Types	10,589,412	62,105	84,735	115,183	92,251	100,926	79,991	115,633	73,942	74,916
Permanent pasture and rangeland, other than cropland and woodland pastured	6,864,391	42,271	54,510	77,798	50,769	62,895	49,924	69,372	44,555	51,331
Cropland used only for pasture or grazing	1,858,684	11,727	17,088	16,106	15,319	19,234	17,289	22,918	15,445	11,727
Woodland pastured	1,866,337	8,107	13,137	21,279	26,163	18,797	12,778	23,343	13,942	11,858
Conservation Acres - CRP, WRP, Farmable Wetlands, and CREP	1,691,694	18,310	9,958	15,199	3,367	19,998	25,125	11,486	34,628	30,192

Source: Adapted from USDA NASS 2007

Table 3-7. Farmland Land Use Categories and Sub-Categories for the Paragould Proposed Project Area (2007)

Land Use Type	Arkansas	Clay	Craighead	Greene	Jackson	Lawrence	Mississippi	Poinsett	Randolph
	(acres, 2007)								
Approximate land area	33,287,812	409,126	452,604	369,640	405,455	375,429	575,122	484,998	417,184
Land in farms	13,872,862	330,464	336,919	267,263	302,125	263,615	461,328	340,704	252,325
Total cropland	8,432,221	293,353	301,734	229,272	266,354	200,765	451,917	322,991	135,019
Total woodland	2,239,119	17,234	15,163	13,945	18,399	27,534	3,742	6,470	52,971
Permanent pasture and rangeland, other than cropland and woodland pastured	2,637,556	13,236	12,381	14,053	12,563	30,408	3,332	4,537	59,884
Land in farmsteads, buildings, livestock facilities, ponds, roads, wasteland, etc.	563,966	6,641	7,641	9,993	4,809	4,908	2,337	6,706	4,451
Total Cropland									
Harvested cropland	7,367,068	279,480	290,968	215,891	250,327	184,410	440,967	316,213	109,715
Cropland used only for pasture or grazing	724,044	4,331	4,046	4,649	5,964	10,727	5,288	4,005	21,438
Other cropland	341,109	9,542	6,720	8,732	10,063	5,628	5,662	2,773	3,866
Cropland on which all crops failed	47,770	935	1,296	849	1,699	785	1,812	568	217
Cropland idle or used for cover crops or soil improvement, but not harvested and not pastured or grazed	259,318	8,478	4,135	6,058	6,769	3,963	1,843	1,484	3,431
Cropland in cultivated summer fallow	34,021	129	1,289	1,825	1,595	880	2,007	721	218
Total Woodland									
Woodland not pastured	1,496,471	13,107	12,879	9,153	15,092	16,614	3,657	5,068	29,190
Woodland pastured	742,648	4,127	2,284	4,792	3,307	10,920	85	1,402	23,781
Pastureland, All Types	4,104,248	21,694	18,711	23,494	21,834	52,055	8,705	9,944	105,103
Permanent pasture and rangeland, other than cropland and woodland pastured	2,637,556	13,236	12,381	14,053	12,563	30,408	3,332	4,537	59,884
Cropland used only for pasture or grazing	724,044	4,331	4,046	4,649	5,964	10,727	5,288	4,005	21,438
Woodland pastured	742,648	4,127	2,284	4,792	3,307	10,920	85	1,402	23,781
Conservation Acres - CRP, WRP, Farmable Wetlands, and CREP	441,655	11,054	2,647	3,366	6,575	4,389	14,477	1,810	10,273

Source: Adapted from USDA NASS 2007

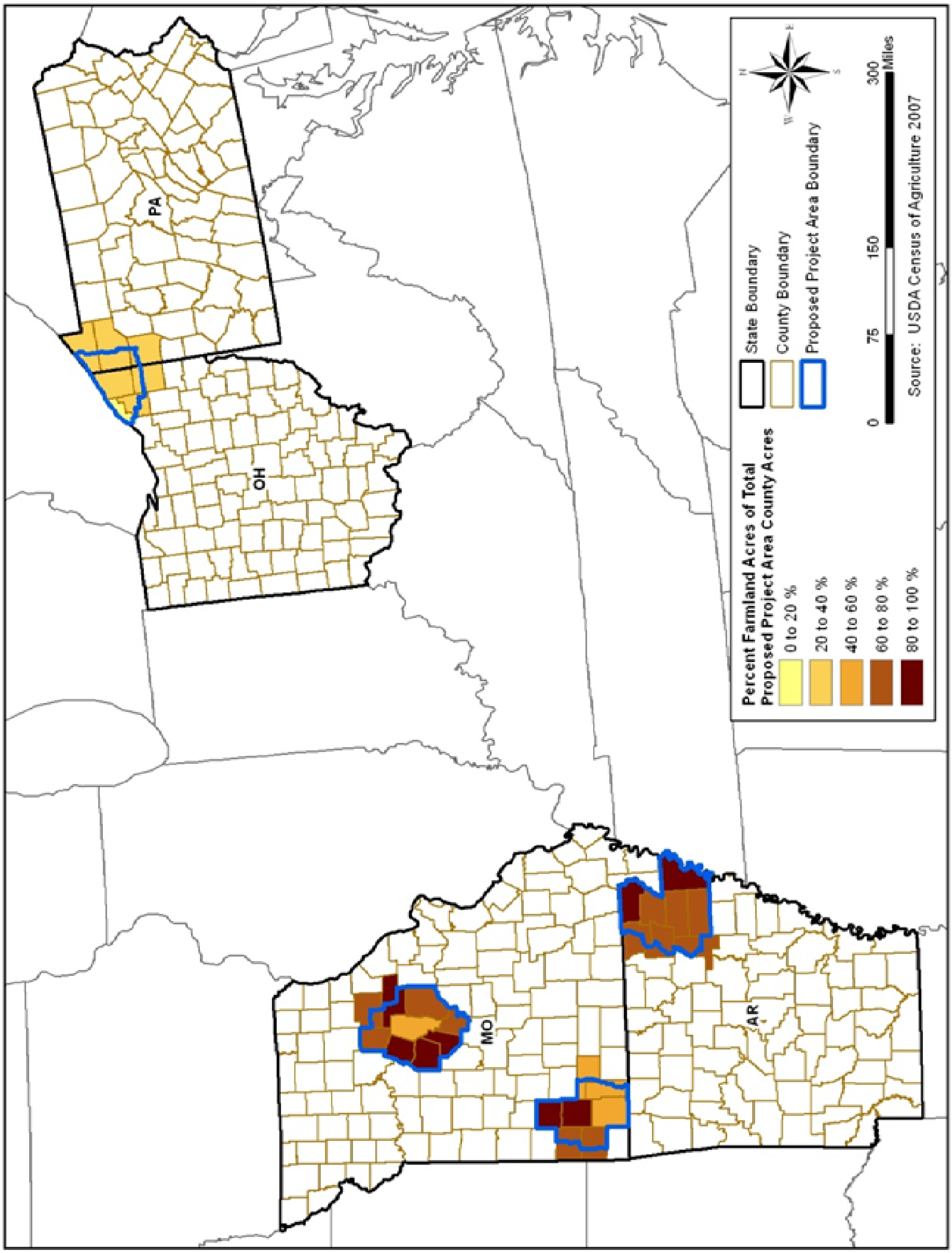


Figure 3-1. Percent of Farmland Acres by County in the Proposed Project Areas.

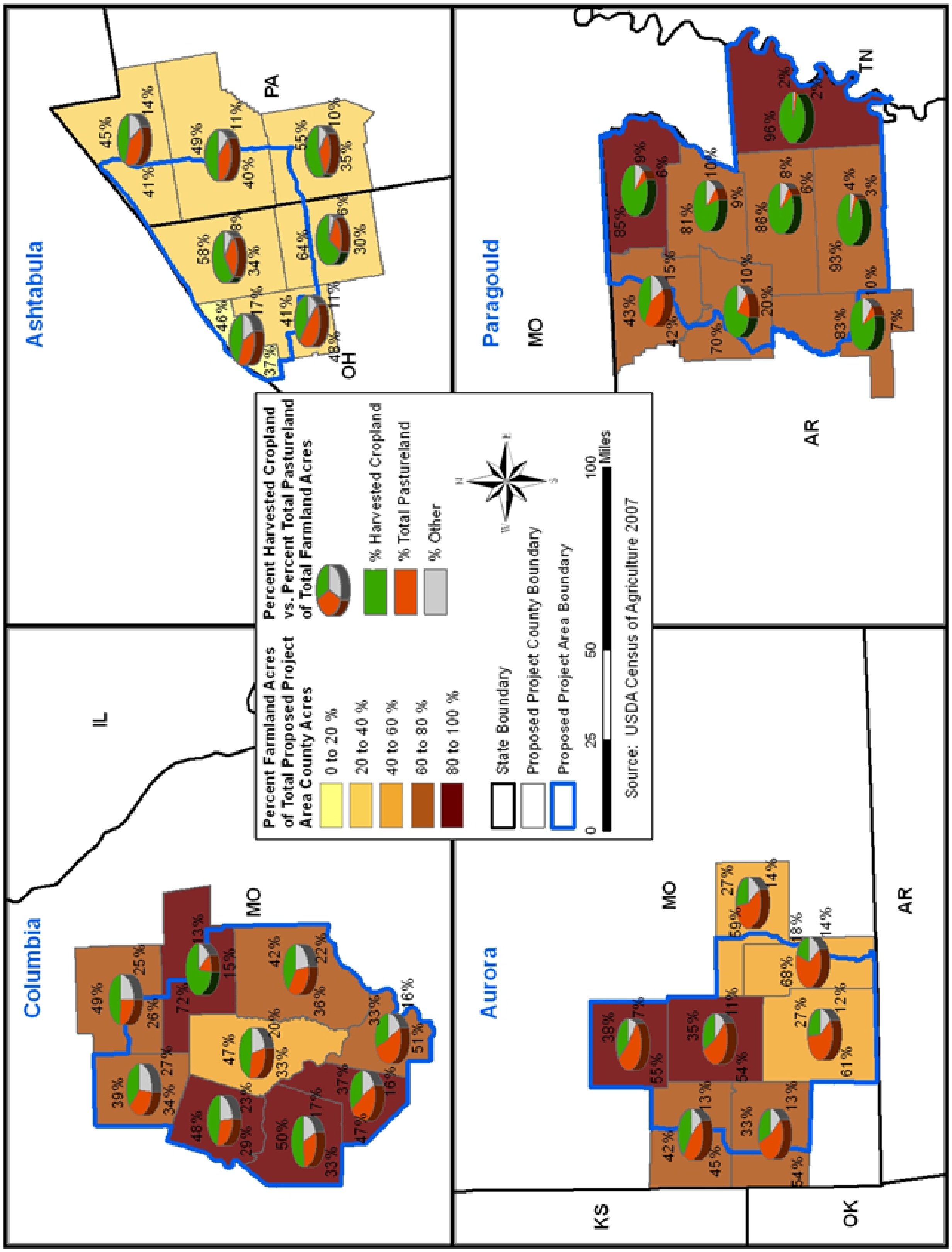


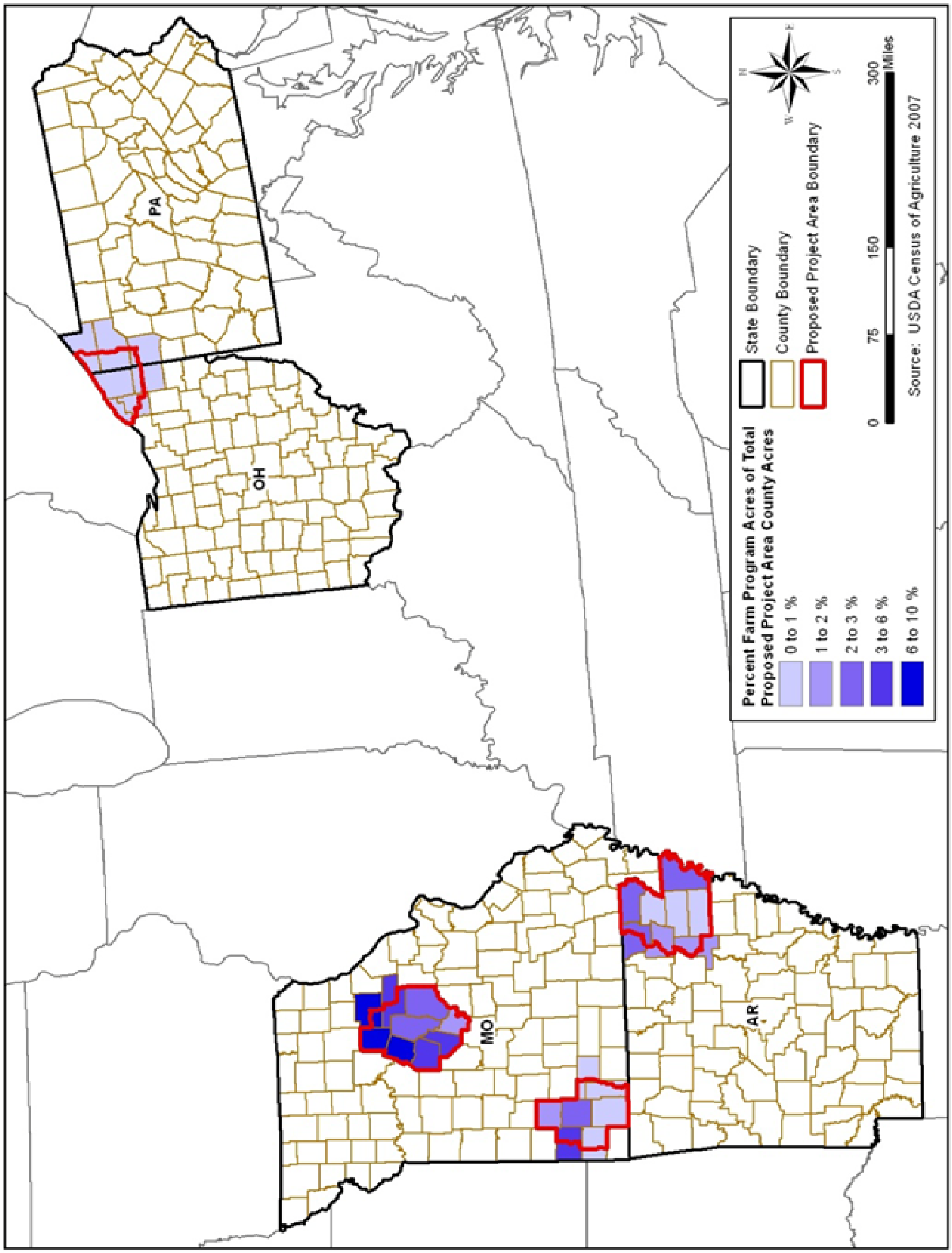
Figure 3-2. Comparison of the Percentage of Harvested Cropland and Total Pastureland in the Proposed Project Areas.

Table 3-8 and **Figure 3-3** illustrates the farmland Enrolled in Conservation Reserve Program (CRP), Wetland Reserve Program (WRP), Farmable Wetlands, or Conservation Reserve Enhancement Programs (CREP) in the proposed project areas. There was approximately 54,591 acres enrolled into conservation programs within the Paragould proposed project area, 168,263 acres within the Columbia proposed project area, 32,209 acres within the Aurora proposed project area, and 13,796 acres within the Ashtabula proposed project area.

Table 3-8. Farmland Enrolled in CRP, WRP, Farmable Wetlands, or CREP in the proposed project areas.

County	Acres enrolled in Conservation Practices	Percent of total acres
Arkansas		
Clay	11,054	2.7
Craighead	2,647	0.6
Greene	3,366	0.9
Jackson	6,575	1.6
Lawrence	4,389	1.2
Mississippi	14,477	2.5
Poinsett	1,810	0.4
Randolph	10,273	2.5
Missouri		
Audrain	18,310	4.1
Boone	9,958	2.3
Callaway	15,199	2.8
Cole	3,367	1.3
Cooper	19,998	5.5
Howard	25,125	8.4
Moniteau	11,486	4.3
Monroe	34,628	8.4
Randolph	30,192	9.8
Barry	978	0.2
Christian	855	0.2
Dade	5,902	1.9
Jasper	12,551	3.1
Lawrence	7,968	2.0
Newton	3,955	1.0
Stone	0	0.0
Ohio		
Ashtabula	2,181	0.5
Geauga	196	0.1
Lake	0	0.0
Trumbull	1,113	0.3
Pennsylvania		
Crawford	4,792	0.7
Erie	3,478	0.7
Mercer	2,036	0.5

Source: Adapted from PAPO 2011a, PAPO 2011b, PAPO 2011c, PAPO 2011d



1 **Figure 3-3. Percent of Total Acres Enrolled in Conservation Programs, 2007.**

3.3 BIOLOGICAL RESOURCES

3.3.1 Vegetation

3.3.1.1 Definition of the Resource

Vegetation refers to the plants, both native and introduced, of a specific region.

3.3.1.2 Existing Conditions

3.3.1.2.1 Ecoregions

For this project, the Level III Ecoregions will be used to illustrate the natural vegetation of each proposed project area. **Figure 3-4** illustrates the ecoregions within and adjacent to the proposed project areas.

3.3.1.2.1.1 Ashtabula Proposed Project Area

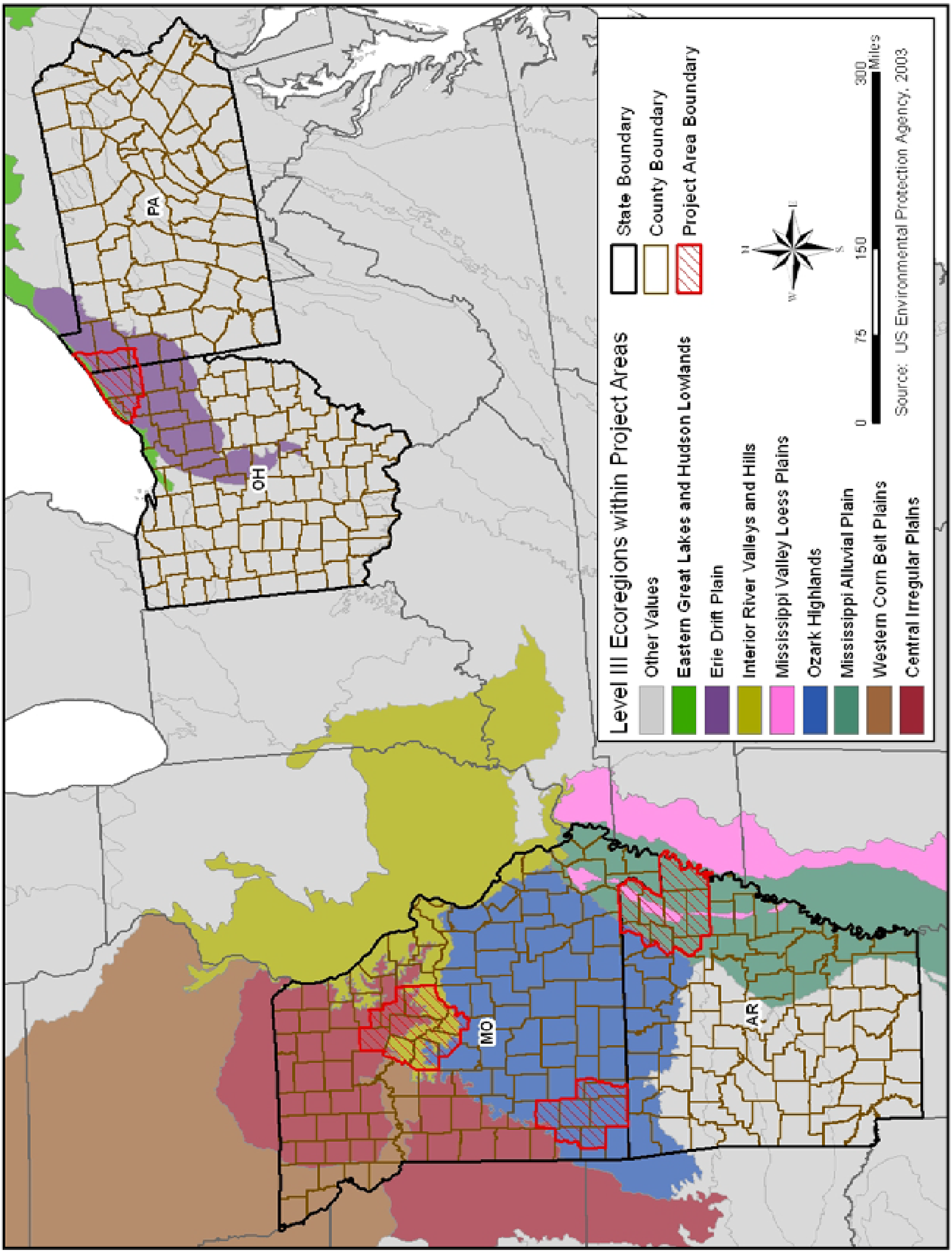
This proposed project area is dominated by the Erie Drift Ecoregion, characterized by low rounded hills, scattered end moraines and areas of wetlands. The area was historically covered by maple-beech-birch forests but much of the area has been converted to farms. A small portion of this proposed project area is also covered by the Eastern Great Lakes and Hudson Lowlands Ecoregion. This region is a coastal strip of beach ridges and swales. This area has also been converted to farming, with a large percentage of agriculture associated with dairy operations (EPA 2011).

3.3.1.2.1.2 Aurora Proposed Project Area

This proposed project area is located within the Ozark Highlands Ecoregion. Topography varies from steep slopes near the large streams to moderate relief hills on the broad plateaus or inter-stream areas. The majority of the region is open forest or woodlands, dominated by oak or mixed stands of oak and pine. Cleared upland areas are used for pasture and livestock (EPA 2011).

3.3.1.2.1.3 Columbia Proposed Project Area

This proposed project area is covered by three Ecoregions, Central Irregular Plains, Interior River Valleys and Hills, and Ozark Highlands. The Central Irregular Plains have a mix of land uses. The potential natural vegetation is a grassland/woodland mosaic with wider wooded strips along the streams. The grasslands are dominated mostly by tallgrass prairies. This area has now been converted to extensive cropland and pastureland. The



1 **Figure 3-4. Level III Ecoregions within and adjacent to the Proposed Project Areas.**

Interior River Valleys and Hills Ecoregion is made up of many wide, flat-bottomed, terraced valleys, forested valley slopes, and dissected glacial-till plains. This region is generally a transitional area between the more forested areas in the Ozarks, and the flatter plains and more extensive cropland of regions to the north. The Ozarks Highlands are covered by forest or woodlands, dominated by oak or mixed stands of oak and pine (EPA 2011).

3.3.1.2.1.4 Paragould Proposed Project Area

The proposed project area is dominated by the Mississippi Alluvial Plain Ecoregion, and to a lesser extent the Mississippi Valley Loess Plain. The Mississippi Alluvial Plain is located along the Mississippi River from the confluence of the Ohio and Mississippi rivers southward to the Gulf of Mexico. This area is a broad, nearly level, agriculturally-dominated plain that provides important habitat for fish and wildlife, and includes the largest continuous system of wetlands in North America. The Mississippi Alluvial Plains is also a major bird migration corridor used in fall and spring migrations. Historically, the vegetation in this area is bottomland hardwood forest and woodlands. Today many parts of the Mississippi Alluvial Plains have been cleared for cropland.

The Mississippi Valley Loess Plain is a small area in eastern Arkansas is composed of a small series of loess-capped hills surrounded by the Mississippi Plain. The area is made up of woodland and pastureland dominated by post oak–blackjack oak forest, southern red oak–white oak forest and beech–maple forest (EPA 2011).

3.3.1.2.1 Invasive and Noxious Plant Species

Current agricultural and conservation practices include the planting of native and introduced species and control or eradication of invasive or noxious species. The Executive Order (EO) 13112, Invasive Species, directs Federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause unless the benefits of the introduction or spread of the invasive species clearly outweigh potential harms. In addition, the Plant Protection Act (PPA), which became law in June 2000 as part of the Agricultural Risk Protection Act, consolidated all or part of 10 existing laws, applicable to USDA activities, into one comprehensive law, including the authority to regulate plants, plant products, certain biological control organisms, noxious weeds, and plant pests (APHIS 2002). EO 13112 defines native species as a species that, with respect to a particular ecosystem, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem. An alien or non-native species is any species, with respect to a particular ecosystem, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem; an invasive species is a nonnative "species whose introduction does or is likely to cause economic or environmental harm or harm to human health" (EO 13112). The PPA defines a noxious weed as any plant or plant product that can directly or indirectly bring harm to agriculture, the public health, navigation, irrigation, natural resources, or the environment; this Act expands the definition of noxious weed from the definition in the 1974 Federal Noxious Weed Act, which included only weeds that were of foreign origin, new to, or not widely prevalent in the United States (APHIS 2002). Noxious weeds are identified and listed on State and Federal lists.

Invasive plant species can have significant negative impacts on biological resources including decreases in native wildlife and plant species populations, alterations to rare plant communities, or changing ecological processes that native plant species and other desirable plants and wildlife depend on for survival (including impacts upon native pollinators) (NISC 2008). Invasive plant species could potentially cause or vector decimating plant diseases, prevent native and agricultural species from reproducing, suppress the growth of neighboring plants, out-compete desirable species for nutrients, light, moisture or other vital resources; and adversely impact erosion rates, hydrologic regimes and soil chemistry such as pH and nutrient availability. Natural wildfire cycles could also be altered; invasions by fire-promoting grasses could alter entire plant communities, eliminating or sharply reducing populations of many native plant species (*Ibid*).

Eradication or control of invasive and noxious species can be an arduous task often including multiple methods of treatment to be effective. The application of herbicide, grazing, burning, mechanical or manual control (cutting, excavating), and mowing are all methods that can be used to control and eradicate invasive species. While it may not be possible to fully eradicate an invasive plant species, management activities can control further spread or takeover. Some species of invasive plants require timed treatment for eradication or control such as when the plant is dormant, young, or prior to flowering/seeding. Additionally, vegetation may become accustomed to certain methods of control and other methods may be required to aid in management (NRCS Practice Standard 595, Pest Management).

Giant miscanthus is not listed on any of the proposed project areas State (Arkansas, Missouri, Ohio, or Pennsylvania) list of noxious weeds as of March 2011, this may be partially due to the fact that this species has not had widespread distribution in a localized or regional level; however, this is the most recent listing for these states. This species is also not listed on the Federal Noxious Weed List as of March 2011. Two species of *Miscanthus (M. floridulus* and *M. sinensis*), one of which is a parent species of the hybrid being proposed by the Project Sponsors, are listed on the Federal Invasive species list as of March 2011.

3.3.2 Wildlife

3.3.2.1 Definition of the Resource

Wildlife refers to the animal species (mammals, birds, amphibians, reptiles, invertebrates, and fish/shellfish), both native and introduced, which characterize a region.

3.3.2.2 Existing Conditions

3.3.2.2.1 Ashtabula Proposed Project Area

Major wildlife species in this area include muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), least shrew (*Cryptotis parva*), least weasel (*Mustela nivalis*), mink (*Mustela vison*), southern bog lemming (*Synaptomys cooperi*), Virginia opossum (*Didelphis virginiana*), white tailed deer (*Odocoileus virginianus*), striped skunk (*Mephitis mephitis*), American bittern (*Botaurus lentiginosus*), alder flycatcher (*Empidonax alnorum*), American black duck (*Anas rubripes*), Canada goose (*Branta canadensis*), great egret (*Ardea alba*), least bittern (*Ixobrychus exilis*), and least sandpiper (*Calidris minutilla*). Fish of importance, including common game fish, across the area include smallmouth bass (*Micropterus dolomieu*), common carp (*Cyprinus carpio*), white sucker (*Catostomus commersonii*), and stonecat madtom (*Noturus flavus*) (ODNR 2011a).

3.3.2.2.2 Aurora Proposed Project Area

Major wildlife species in the area include white-tailed deer, eastern cottontail (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), wood duck (*Aix sponsa*), wild turkey (*Meleagris gallopavo*), smallmouth bass, and largemouth bass (*Micropterus salmoides salmoides*). Several prairie species, such as black-tailed jackrabbits (*Lepus californicus*) and prairie chickens (*Tympanuchus cupido*), inhabit small areas of the original tall grass prairie Confidential Application for Proposed BCAP Project Areas, 2011).

3.3.2.2.3 Columbia Proposed Project Area

Major wildlife species in this Area include white-tailed deer, coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), beaver, raccoon, skunk, muskrat, opossum, mink, rabbit, fox squirrel (*Sciurus niger*), gray squirrel (*Sciurus carolinensis*), Canada goose, bald eagle (*Haliaeetus leucocephalus*), turkey vulture (*Cathartes aura*), turkey, woodcock (*Scolopax minor*), great horned owl (*Bubo virginianus*), wood duck, pileated woodpecker (*Dryocopus pileatus*), red-bellied woodpecker (*Melanerpes carolinus*), ring-necked pheasant (*Phasianus colchicus*), and bobwhite quail (*Colinus virginianus*). Fish of importance, including common game fish, across the area include carp (*Cyprinus carpio*), catfish, largemouth bass, smallmouth bass, bluegill (*Lepomis macrochirus*), crappie (*Pomoxis* sp.), and sunfish (Confidential Application for Proposed BCAP Project Areas, 2011).

3.3.2.2.4 Paragould Proposed Project Area

Across this are, major wildlife species in this Area include white-tailed deer, coyote, gray fox, red fox, raccoon, skunk, muskrat, cottontail rabbit, fox squirrel, bobwhite quail and mourning dove. Fish of importance, including common game fish, across the Area include carp, bullhead, largemouth bass, smallmouth bass, bluegill, and crappie (Confidential Application for Proposed BCAP Project Areas, 2011).

3.3.3 Protected Species

3.3.3.1 Definition of the Resource

Protected species are those Federally designated as threatened or endangered under the ESA or species that are considered candidates for being listed as threatened or endangered. Critical habitat is defined as: (1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation (USFWS 2008a).

3.3.3.2 Existing Conditions

Table 3-9 lists the Federally-listed threatened and/or endangered species that could be present in the proposed project area counties. **Figures 3-5** through **3-7** illustrate the potential ranges of Federally-listed species within the proposed project areas.

Table 3-9. Federally-Listed Threatened and/or Endangered Species that Could Potentially occur within the Proposed Project Areas

Category	Species – Common Name (Scientific Name)	T/E	Counties
	Aurora		
Fishes / Clams	Ozark cavefish (*Amblyopsis rosae*)	T	Barry, Jasper, Lawrence, Newton, Stone
	Neosho madtom (*Noturus placidus*)	T	Jasper
Plants	Missouri bladderpod (*Physaria filiformis*)	T	Christian, Dade, Lawrence
	Mead's milkweed (*Asclepias meadii*)	T	Dade
	No common name (*Geocarpon minimum*)	T	Dade, Jasper, Lawrence
	Western prairie fringed Orchid (*Plantanthera praeclara*)	T	Jasper, Lawrence
	Running buffalo clover (*Trifolium stoloniferum*)	E	Barry, Christian, Dade, Jasper
Mammals	Ozark big-eared bat (*Corynorhinus(=Plecotus) townsendii ingens*)	E	Barry, Stone
	Indiana bat (*Myotis sodalis*)	E	Barry, Christian, Stone
	Gray bat (*Myotis grisescens*)	E	Barry, Christian, Dade, Jasper, Lawrence, Newton, Stone
Insects	American burying beetle (*Nicrophorus americanus*)	E	Newton
	Columbia		
Fishes / Clams	Pallid sturgeon (*Scaphirhynchus albus*)	E	Boone, Cole, Cooper, Moniteau
	Topeka shiner (*Notropis topeka* (=*tristis*))	E	Boone, Cole, Cooper, Moniteau, Randolph
	Pink mucket (pearly mussel) (*Lampsilis abrupta*)	E	Cole
Plants	Virginia sneezeweed (*Helenium virginicum*)	T	Boone
	Running buffalo clover (*Trifolium stoloniferum*)	E	Boone, Cole, Cooper, Moniteau
Mammals	Indiana bat (*Myotis sodalis*)	E	Audrain, Boone, Cooper, Monroe, Randolph
	Gray bat (*Myotis grisescens*)	E	Boone, Cole
	Paragould		
Birds	Interior Least Tern (*Sterna antillarum athalassos*)	E	Mississippi
Fishes / Clams	Pink mucket (pearly mussel) (*Lampsilis abrupta*)	E	Clay, Randolph, Lawrence, Jackson
	Fat pocketbook (*Potamilus capax*)	E	Craighead, Mississippi, Poinsett
	Curtis pearlymussel (*Epioblasma florentina curtisii*)	E	Lawrence
	Scaleshell mussel (*Leptodea leptodon*)	E	Lawrence
	Pallid sturgeon (*Scaphirhynchus albus*)	E	Mississippi
Plants	Pondberry (*Lindera melissifolia*)	E	Lawrence
Mammals	Gray bat (Myotis *grisescens*)	E	Lawrence
	Ashtabula		
Birds	Kirtland's Warbler (*Dendroica kirtlandii*)	E	Ashtabula, Lake, Crawford, Erie
	Piping Plover (*Charadrius melodus*)	E	Ashtabula, Lake, Erie
Fishes / Clams	Clubshell mussel (*Pleurobema clava*)	E	Ashtabula, Trumbull, Crawford, Erie, Mercer
	Northern riffeshell mussel (*Epioblasma torulosa rangiana*)	E	Crawford, Erie, Mercer
Mammals	Indiana bat (*Myotis sodalis*)	E	Ashtabula, Geauga, Lake, Trumbull, Crawford, Erie, Mercer

Source: Adapted from PAPO 2011a, PAPO 2011b, PAPO 2011c, PAPO 2011d

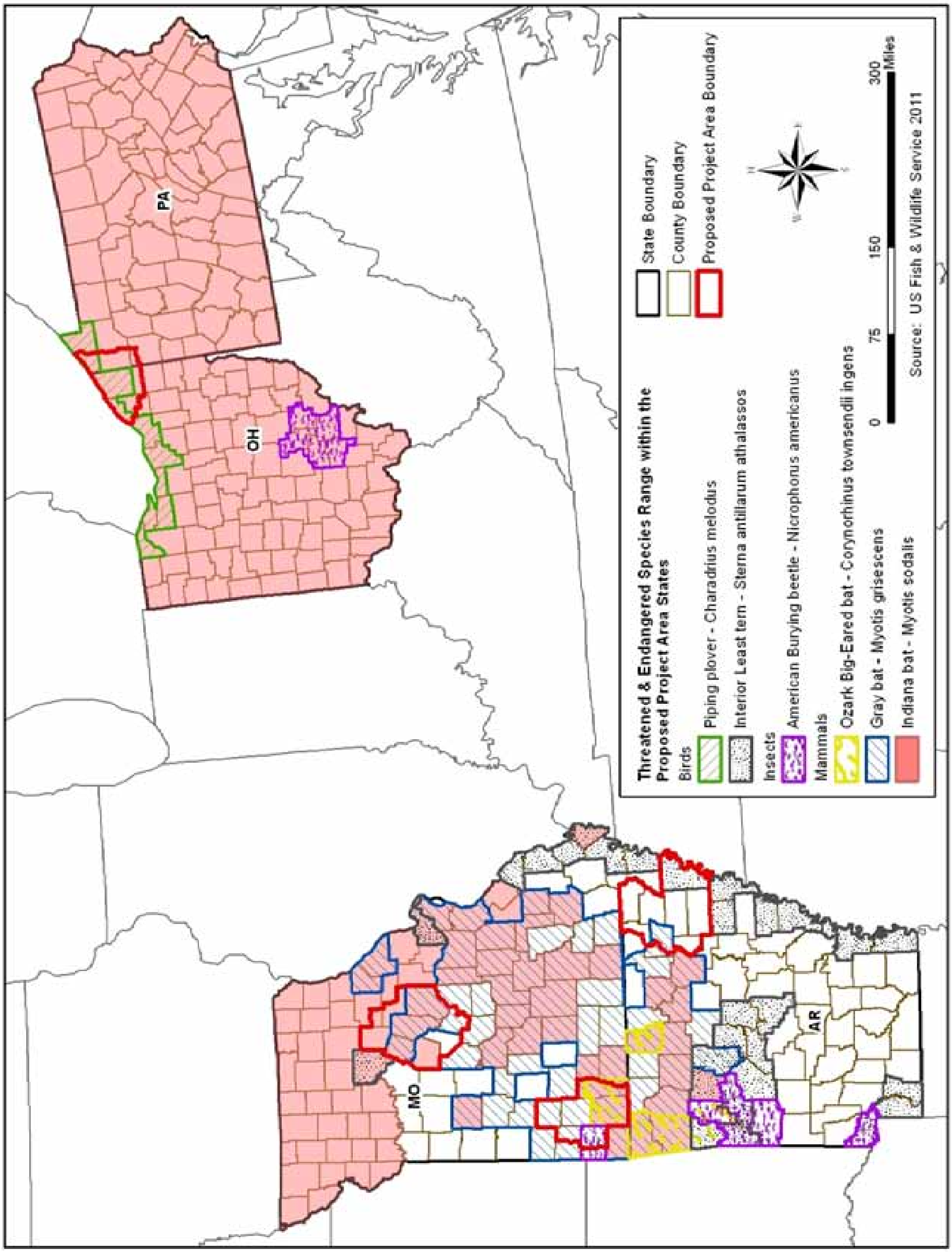


Figure 3-5. Potential Ranges of Federally-listed Threatened and/or Endangered Birds, Insects and Mammals within and adjacent to the Proposed Project Areas.

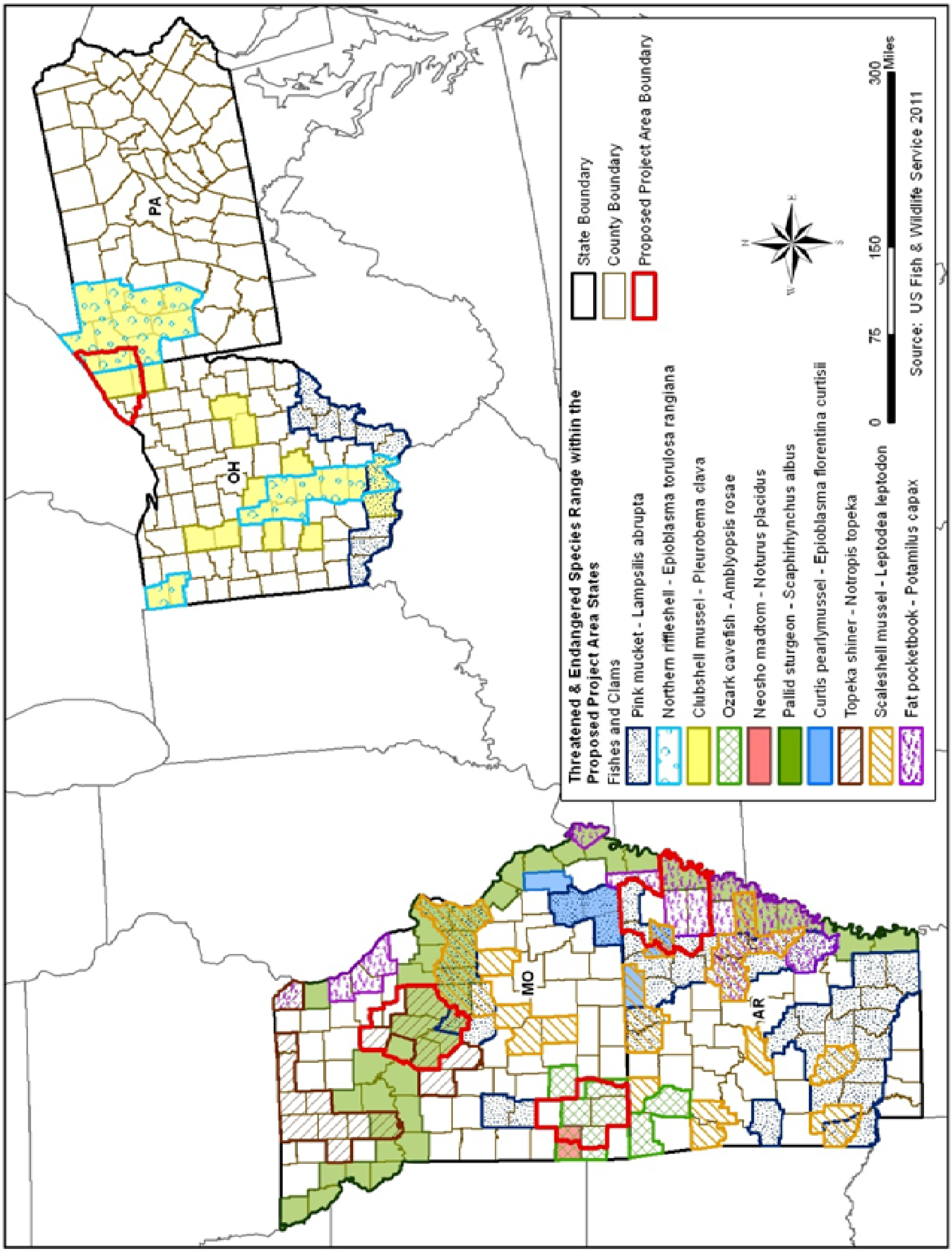
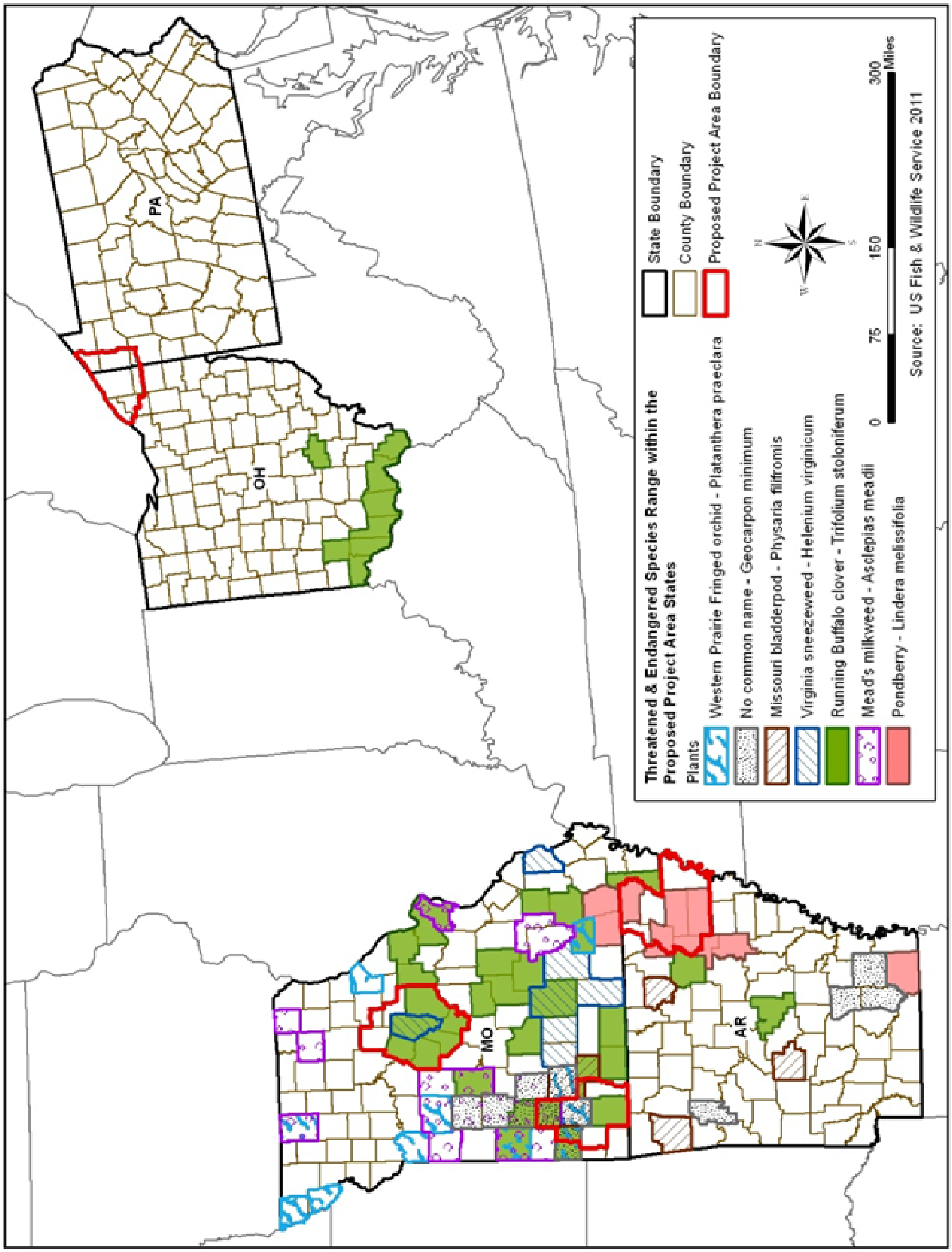


Figure 3-6. Potential Ranges of Federally-listed Threatened and/or Endangered Fishes and Clams within and adjacent to the Proposed Project Areas.



1 **Figure 3-7. Potential Ranges of Federally-listed Threatened and/or Endangered**
2 **Plants within and adjacent to the Proposed Project Areas.**

3.3.3.2.1 Ashtabula Proposed Project Area

A review of Federally-listed protected (threatened and/or endangered) species based on the U.S. Fish and Wildlife Service (USFWS) data indicate that four Federally-listed endangered species have the potential to occur in Ohio counties within the proposed project area. The Clubshell mussel (*Pleurobema clava*) has the potential to occur in Ashtabula and Trumbull Counties; the Kirtland's warbler (*Dendroica kirtlandii*) and Piping plover (*Charadrius melodus*) have the potential to occur in Ashtabula and Lake Counties; and the Indiana bat (*Myotis sodalis*) has the potential to occur in Ashtabula, Geauga, Lake, and Trumbull counties.

The Clubshell mussel is known from Pymatunig Creek in Ashtabula County, Ohio, but no other counties within the proposed project area in Ohio. Kirtland's warblers are not currently known from any of the counties within the proposed project area in Ohio. The Great Lakes population of Piping plovers is only known from the Headland Dunes area of coastal Lake County, but no other counties within the proposed project area in Ohio. According to the Draft Recovery Plan (USFWS 2007) for Indiana bats, there are known summer roosts in Ashtabula County in Ohio. Of those Federally-listed species with the potential to occur within the proposed project area, only the Federally endangered Piping plover has designated Critical Habitat in Ohio in Lake County. However, this Critical Habitat is designated within the Headland Dunes Nature Preserve and not in any areas that will be used for agricultural purposes. No other Federally-listed endangered species with the potential to occur in the Ohio portion of the proposed project areas have designated Critical Habitat in these counties (Confidential Application for Proposed BCAP Project Areas, 2011).

3.3.3.2.2 Aurora Proposed Project Area

Three plants on the Federal list of threatened and endangered species are identified within grasslands in the proposed project areas. The Missouri bladder pod (*Physaria filiformis*) has been found in glades and pastureland, and the Mead's milkweed (*Asclepias meadii*) is found in association with tallgrass prairie lands. Western prairie fringed orchid (*Platanthera praeclara*) is also associated with grasslands, specifically damp, tallgrass prairies. Geocarpon (*Geocarpon minimum*) is also associated with glades. Many listed plants thrive on periodic disturbance, including mowing and burning.

Mammals associated with this proposed project area include three bat species. Both Indiana and gray bats forage over bodies of water and use wooded corridors adjacent to water as roosting sites. The Ozark big-eared bat (*Corynorhinus townsendii ingens*) may no longer exist in Missouri. However, the other bat species have been known to overwinter in limestone caves (Confidential Application for Proposed BCAP Project Areas, 2011).

3.3.3.2.3 Columbia Proposed Project Area

Fishes and clams are associated with water and require high water quality. Plants listed in association with the Columbia proposed project area are primarily associated with mesic areas. Mammals associated with this proposed project area include two bat species, the Indiana bat and the Gray bat (*Myotis grisescens*). Both species forage over bodies of water and use wooded corridors adjacent to water as roosting sites. Indiana bat may also overwinter in limestone caves (Confidential Application for Proposed BCAP Project Areas, 2011).

3.3.3.2.4 Paragould Proposed Project Area

The listed bird species prefers habitat adjacent to bodies of water that have sandbars or sand/gravel pit areas. Listed fishes/clams are associated with water and water quality. The Gray bat will forage over bodies of water and use wooded corridors adjacent to water as roosting sites (Confidential Application for Proposed BCAP Project Areas, 2011).

3.4 SOIL RESOURCES

3.4.1 Definition of the Resource

Soils are a natural body made up of weathered minerals, organic matter, air and water. Soils are formed mainly by the weathering of rocks, the decaying of plant matter, and the deposition of materials such as chemical and biological fertilizers that are derived from other origins. Soils are differentiated based on characteristics such as particle size, texture and color, and classified taxonomically into soil orders based on observable properties such as organic matter content and degree of soil profile development (Brady and Weil 1996). Soil taxonomy was established to classify soils according to the relationship between soils and the factors responsible for their character (NRCS 1999). For the purpose of this project, the soil resources will be discussed based on the soil classification in the particular proposed project area.

Soil erosion is a naturally occurring event and the erosion rates are relatively slow; however, human activity can greatly accelerate the rate of erosion. Poor farming practices, loss of vegetation through deforestation, overgrazing and the maintenance of agricultural land are some of the factors that make soils more susceptible to erosion. For the purpose of this document, highly erodible lands (HEL) were used to evaluate the potential for erosion within the proposed project areas (**Figure 3-8**). For more information about HEL, refer to the BCAP Final PEIS (Chapter 3.4).

3.4.2 Existing Conditions

3.4.2.1 Ashtabula Proposed Project Area

In general, soils across this region favor agriculture. The soils in this region are often very deep, gently sloping and poorly drained, depending on specific soil type. The soils in this area were formed in different textures of glacial till (USDA 2007).

There was approximately 193,410 acres of HEL within the counties of the Ashtabula proposed project area (Taylor 2011). Within this proposed project area, Mercer County had the highest amount of HEL, covering 11 percent of the county.

3.4.2.2 Aurora Proposed Project Area

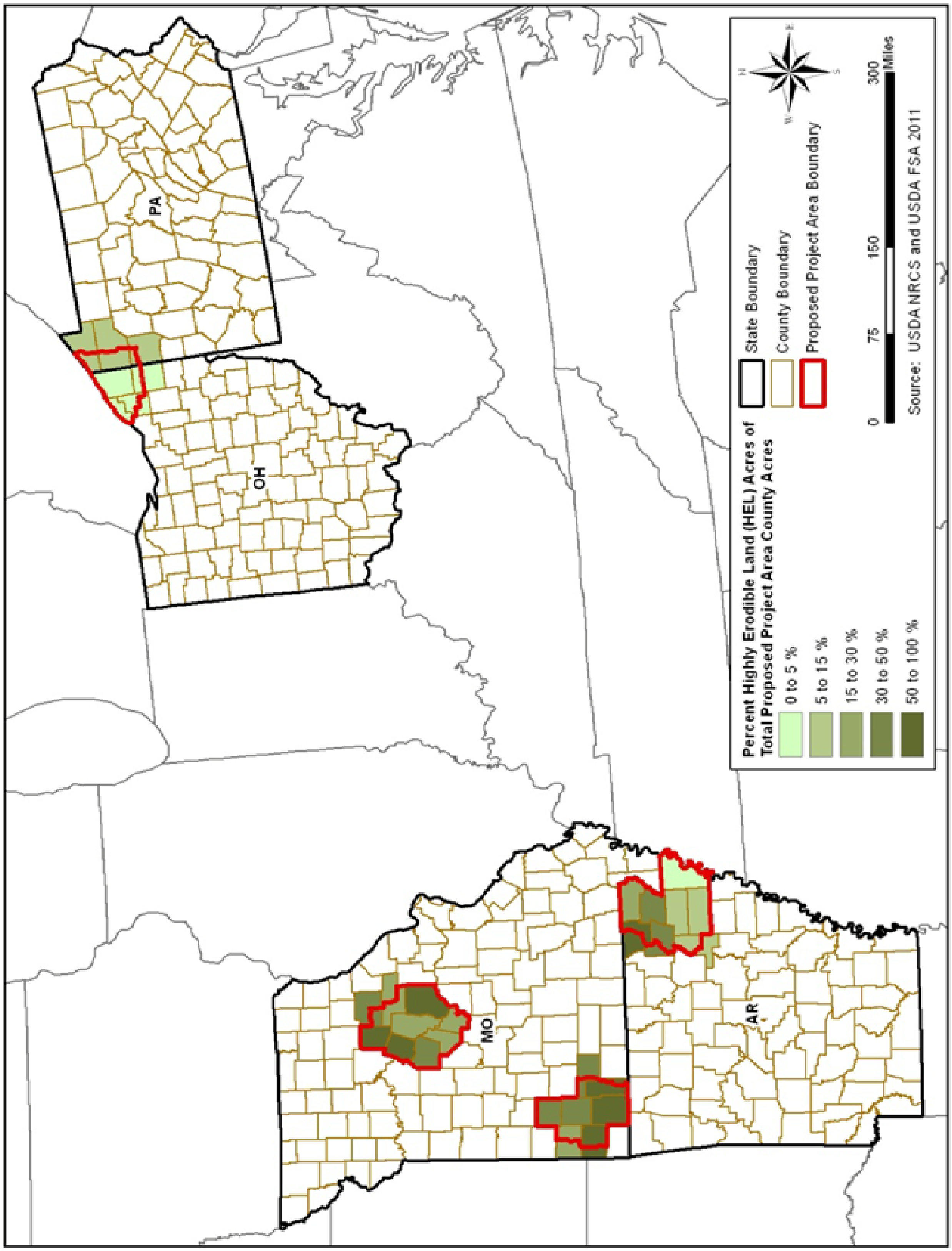
Soils across this region favor agriculture, including corn, soybean and grains. Soils range from well-drained to poorly-drained, depending on specific soil type, land features, and slope position. Upland sites are typically better drained than lowlands. At times, clay and silt content can create drainage problems (Confidential Application for Proposed BCAP Project Areas, 2011).

There was approximately 1,338,641 acres of HEL within the counties of the Aurora proposed project area, with an average of 51 percent of the land being HEL (Confidential Application for Proposed BCAP Project Areas, 2011). Within this proposed project area, Stone County had the highest amount of HEL, covering 93 percent of the county.

3.4.2.3 Columbia Proposed Project Area

In general, soils across this region favor agriculture, including corn, soybean and grains. Soils range from well-drained to poorly-drained, depending on specific soil type, land features, and slope position. At times, clay content can create drainage problems (Confidential Application for Proposed BCAP Project Areas, 2011).

There was approximately 1,266,771 acres of HEL within the counties of the Columbia proposed project area, with an average of 37 percent of the land being HEL (Confidential Application for Proposed BCAP Project Areas, 2011). Within this proposed project area, Callaway County had the highest amount of HEL, covering 61 percent of the county.



1 **Figure 3-8. Percent of Total Land Classified as Highly Erodible by County within the**
2 **Proposed Project Areas.**

3.4.2.4 Paragould Proposed Project Area

Soils range from well-drained to poorly-drained, depending on specific soil type, land features, and slope position. Upland sites are typically better drained than lowlands. At times, clay and silt content can create drainage problems (Confidential Application for Proposed BCAP Project Areas, 2011).

There was approximately 710,118 acres of HEL within the counties of the Paragould proposed project area, with an average of 25 percent of the land being HEL (Confidential Application for Proposed BCAP Project Areas, 2011). Within this proposed project area, Randolph County had the highest amount of HEL, covering 61 percent of the county. Mississippi County contains no soil classified as HEL.

3.5 WATER QUALITY AND QUANTITY

3.5.1 Water Quality

3.5.1.1 Definition of the Resource

Freshwater is necessary for the survival of most terrestrial organisms, and is required by humans for drinking and agriculture, among other uses; however, less than one percent of Earth's water is in the form of freshwater that is not bound in ice caps or glaciers. The Water Pollution Control Act of 1972, or CWA, Safe Drinking Water Act, and the Water Quality Act are the primary Federal laws that protect the nation's waters. The principal law governing pollution of the nation's surface water resources is the CWA. The Act utilizes water quality standards, permitting requirements, and monitoring to protect water quality. The EPA sets the standards for water pollution abatement for all waters of the United States under the programs contained in the CWA but, in most cases, delegates the authority to issue and enforce permits to qualified States. For this analysis, water resources include surface water quality (including lakes, rivers and associated tributaries, and estuaries), groundwater quality, and water use/quantity of both surface and groundwater.

Surface water, as defined by the EPA, are waters of the United States, such as rivers, streams, creeks, lakes, and reservoirs, supporting everyday life through uses such as drinking water and other public uses, irrigation, and industrial uses. Surface runoff from rain, snow melt, or irrigation water, can affect surface water quality by depositing sediment, minerals, or contaminants into surface water bodies. Surface runoff is influenced by meteorological factors such as rainfall intensity and duration, and physical factors such as vegetation, soil type, and topography.

The 303(d) List of Waters reports on streams and lakes identified as impaired for one or more pollutants and do not meet one or more water quality standards. The term, "303(d) list," is short for the list of impaired waters (stream segments, lakes) that the Clean Water Act requires all states to submit for EPA approval every two years. The states identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards and rank the waters taking into account the uses of the water and severity of the pollution problem (EPA 2008). **Figure 3-9** illustrates the impaired streams and water bodies within each state containing the proposed project areas.

Groundwater is the water that flows underground and is stored in natural geologic formations called aquifers. It is ecologically important because it sustains ecosystems by releasing a constant supply of water into wetlands and contributes a sizeable amount of flow to permanent streams and rivers (FSA 2003).

3.5.1.2 Existing Conditions

3.5.1.2.1 Ashtabula Proposed Project Area

According to the 303(d) list, there are 1,868 impaired stream segments within the Ashtabula proposed project area for a total of 3,711.34 miles of impaired streams. There is also a total of 56.87 square miles of impaired lakes and reservoirs (EPA 2010).

3.5.1.2.2 Aurora Proposed Project Area

According to the 303(d) list, there are 328 impaired stream segments within the Aurora proposed project area for a total of 557.40 miles of impaired streams (EPA 2010).

3.5.1.2.3 Columbia Proposed Project Area

According to the 303(d) list, there are 314 impaired stream segments within the Columbus Project Area for a total of 388.63 miles of impaired streams. There is also a total of 0.30 square miles of impaired lakes and reservoirs (EPA 2010).

3.5.1.2.4 Paragould Proposed Project Area

According to the 303(d) list, there are 335 impaired stream segments within the Paragould Project Area for a total of 581.71 miles of impaired streams. There is also a total of 5.2 square miles of impaired lakes and reservoirs (EPA 2010). A majority of the water use relies on surface water sources. However, counties closer to the Mississippi River are more likely to use groundwater sources. Uses of groundwater include domestic, industry, and irrigation.

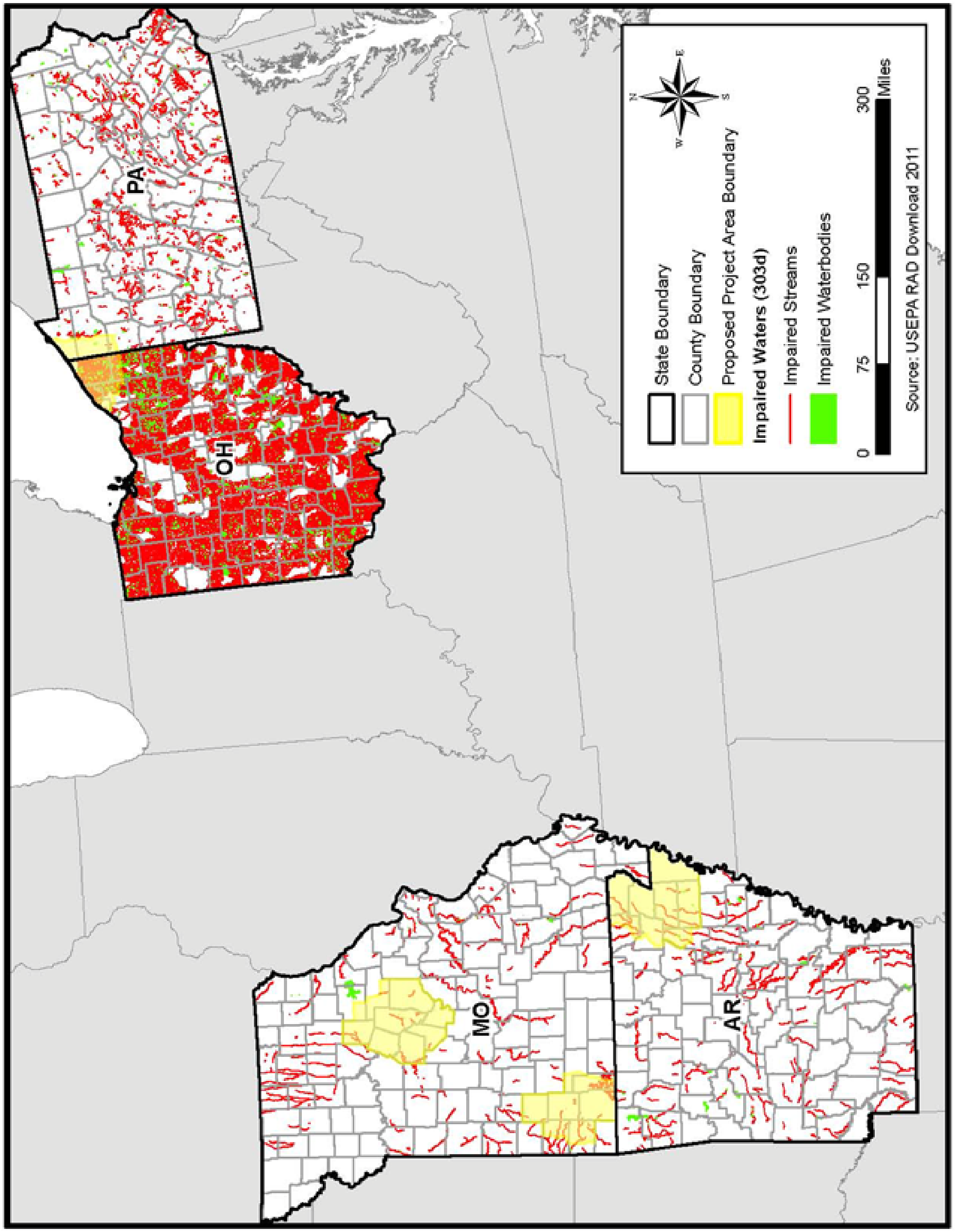


Figure 3-9. Waters Listed on the State 303(d) Lists for Impaired Waters

3.5.2 Water Quantity

3.5.2.1 Definition of the Resource

Water use/quantity is the specific amount of water used for a given task, such as the production of dedicated bioenergy crops. Three types are distinguished: *withdrawal*, where water is taken from a river, or surface or underground reservoir, and after use returned to a natural water body; *consumptive*, which starts with withdrawal but without any return (e.g. irrigation) and is no longer available directly for subsequent uses; *non-withdrawal*, the *in situ* use of a water body for, e.g. navigation, fishing, recreation, effluent disposal and power generation. (FAO 2005).

3.5.2.2 Existing Conditions

Table 3-9 illustrates the amount of acres of the cropland that are irrigated. The table also illustrates the water withdrawals by source for each county within the proposed project area. The EPA defines a watershed as the area of land where all of the water that is under it or drains off of it goes into the same place (EPA 2009). Further, the USGS defines a watershed as the divide separating one drainage basin from another. The USGS has divided and sub-divided the United States using hydrologic units (HUC). The hydrologic unit system has four levels of classification (USGS 2011). For this project the fourth level of classification, the 8-digit HUC codes, were used to classify the watersheds within the proposed project area.

3.5.2.2.1 Ashtabula Proposed Project Area

Within the counties in Ashtabula proposed project area, three of the four Ohio counties had less than 400 acres of irrigated cropland with the exception of Lake County, Ohio that had a total of 2,180 acres of irrigated land (**Table 3-10**). There was a total of 7.28 million gallons of water withdrawn per day in the proposed project area, with an average of 66 percent from surface water and 34 percent from groundwater sources (USGS 2010b).

Eight different watersheds are located within the counties in the Ashtabula proposed project area, with the dominate watersheds being Ashtabula-Chagrin and Grand. These eight watersheds cover 5,218,511 acres of land in Ohio and Pennsylvania with 26 percent within the proposed project area (Seaber 2007). There were approximately 3,600 miles of streams and rivers within the Ohio proposed project area and 1,700 miles of streams and rivers

Table 3-10. Acres of Irrigated Land and Water Withdrawals by County within Each Proposed Project Area

County	Total Cropland	Irrigated Land	Percent Irrigated Acres	Withdrawals (in million gallons per day)		
	(acres)			By source		Total
				Ground-water	Surface water	
Arkansas						
Arkansas	8,432,221	4,460,682	52.9	7,020	1,510	8,530
Clay	293,353	227,000	77.4	466.08	9.36	475.44
Craighead	301,734	244,365	81.0	350.76	44.61	395.37
Greene	229,272	164,615	71.8	206.17	3.81	209.98
Jackson	266,354	178,101	66.9	378.04	22.54	400.58
Lawrence	200,765	130,983	65.2	220.99	24.21	245.20
Mississippi	451,917	269,564	59.6	270.57	2.12	272.69
Poinsett	322,991	262,180	81.2	672.02	90.36	762.38
Randolph	135,019	67,301	49.8	101.46	37.38	138.84
Missouri						
Missouri	16,405,595	1,199,981	7.3	1,340	38.9	1,370
Audrain	337,854	15,462	4.6	2.27	7.86	10.13
Boone	152,527	3,596	2.4	0.99	0.61	1.60
Callaway	166,339	4,025	2.4	2.67	2.26	4.93
Cole	79,523	448	0.6	0.00	0.06	0.06
Cooper	189,065	393	0.2	0.15	0.00	0.15
Howard	172,316	12,049	7.0	1.90	0.00	1.90
Moniteau	122,630	160	0.1	0.28	0.00	0.28
Monroe	183,346	1,473	0.8	0.00	0.81	0.81
Randolph	119,856	738	0.6	0.29	0.00	0.29
Barry	114,244	416	0.4	0.06	0.00	0.06
Christian	76,040	158	0.2	0.04	0.00	0.04
Dade	127,080	8,621	6.8	3.03	0.73	3.76
Jasper	135,730	5,169	3.8	2.33	1.65	3.98
Lawrence	150,703	2,416	1.6	0.19	0.70	0.89
Newton	107,943	1,150	1.1	1.93	0.00	1.93
Stone	36,790	74	0.2	0.02	0.00	0.02
Ohio						
Ohio	10,832,772	37,959	0.4	17.7	24.9	42.6
Ashtabula	106,255	352	0.3	0.01	0.10	0.11
Geauga	29,541	355	1.2	0.04	0.29	0.33
Lake	10,126	2,180	21.5	0.38	4.43	4.81
Trumbull	87,440	152	0.2	0.16	0.54	0.70
Pennsylvania						
Pennsylvania	4,870,287	37,786	0.8	8.29	16	24.3
Crawford	139,526	564	0.4	0.07	0.09	0.16
Erie	101,698	1,397	1.4	0.30	0.69	0.99
Mercer	111,556	195	0.2	0.08	0.10	0.18

Source: USDA 2009; USGS 2010b.

within the Pennsylvania proposed project area. There were approximately 13,800 acres of lakes, ponds and reservoirs within the Ohio proposed project area and 16,200 acres within the Pennsylvania proposed project area (USGS 2010a).

3.5.2.2.2 Aurora Proposed Project Area

Within the Aurora proposed project area, there was an average of 2,572 acres of irrigated land within the proposed project area. Overall, Missouri had a total of 1.19 million acres of irrigated land. There was a total of 10.68 million gallons of water withdrawn per day in the proposed project area, with an average of 29 percent from surface water and 71 percent from groundwater sources (USGS 2010b).

Seven different watersheds impact counties within the Aurora proposed project area; however, the Sac, Spring, and James watersheds cover most of the area. These three watersheds cover 2,567,536 acres of land in Missouri (Confidential Application for Proposed BCAP Project Areas, 2011). There were approximately 7,500 miles of streams and rivers within this proposed project area. There were approximately 37,600 acres of ponds, lakes and reservoirs within this proposed project area (USGS 2010a). Springs are numerous and often contribute to the base flow of many area streams.

3.5.2.2.3 Columbia Proposed Project Area

Within the Columbia proposed project area, there was an average of 4,260 acres of irrigated land within the proposed project area. Overall, Missouri had a total of 1.19 million acres of irrigated land. There was a total of 20.15 million gallons of water withdrawn per day in the proposed project area, with an average of 58 percent from surface water and 42 percent from groundwater sources (USGS 2010b).

While Columbia proposed project area includes land area in 13 different watersheds, the broadest is the Lower Missouri – Moreau (LMM). The Lower Missouri Moreau contacts every county in the Project Area, except for Monroe County. It represents land area encompassing 2,175,934 acres (Confidential Application for Proposed BCAP Project Areas, 2011). There were approximately 11,900 miles of streams and rivers within this proposed project area. There were approximately 11,900 acres of ponds, lakes and reservoirs within this proposed project area (USGS 2010a).

3.5.2.2.4 Paragould Proposed Project Area

Within the Paragould proposed project area, there was an average of 193,014 acres of irrigated land (69 percent of the total acres) which is slightly above the state total of 52.9

percent of the acres being irrigated. There was an average of 362.56 million gallons of water withdrawn per day in the proposed project area, with an average of eight percent from surface water and 92 percent from groundwater sources (USGS 2010b).

While Paragould proposed project area includes land area in 11 different watersheds, the greatest land area is represented by three of those 11. The Lower St. Francis, Little River Ditches, and Cache watersheds encompass a total of 3,471,360 acres and impact all counties represented in this proposed project area. The western-most counties, Randolph, Jackson, and Lawrence, are impacted by an additional seven watersheds, inclusive. However, these watersheds represent a much smaller portion of the proposed project area (PAPO 2011d). There were approximately 14,000 miles of streams and rivers within this proposed project area. There were approximately 20,600 acres of ponds, lakes and reservoirs within this proposed project area (USGS 2010a).

4 ENVIRONMENTAL CONSEQUENCES

4.1 DATA GAPS

Giant miscanthus is a new agronomic crop species in the United States, and also still relatively new in Europe, where the oldest cultivation areas are approximately 30 years old or less. The *Miscanthus* genus was introduced to the United States over 100 years ago in ornamental plantings. Several universities (i.e., University of Illinois, Mississippi State University, University of Wisconsin, Michigan State University, and the University of Georgia) in the United States are currently cultivating giant miscanthus on a trial basis or conducting research on giant miscanthus or the *Miscanthus* genus. Additionally, large-scale acreages of giant miscanthus have not been cultivated in the United States; although commercial production of giant miscanthus for bioenergy production in co-fired systems are in the beginning stages in the United Kingdom. Given, that giant miscanthus has only been grown in large-scale trials in Europe the data on giant miscanthus planting in the United States is more limited in scope.

In light of the lack of data applicable to the proposed project areas, an adaptive Mitigation and Monitoring Plan (MMP) is being developed, which will include best management practices (BMP) for the establishment and production of giant miscanthus to ensure avoidance and minimization of potential effects to the immediate environment and the larger landscape. The framework for the MMP is included in **Section 6**. The MMP will be a living document that is highly dependent on routine monitoring of the fields to determine the success of giant miscanthus plantings, its overall effects to the immediate environment, and any potential effects to the larger landscape based on observation and measurement. This document would contain information on appropriate and effective eradication methods that would develop over time as new data became available. Likewise, other metrics or observable measurements would adapt over time based on past observations, new research finding, and new regulations.

The following information has been found to lack complete detail in relation to growth and production of giant miscanthus in the United States.

- Potential effects to socioeconomics focused on the information provided in the pro forma analyses of the Project Sponsors. Data from Europe indicates a high cost of establishment due to the vegetative propagation of the species; however, the BCAP combined with the model undertaken by the Project Sponsors addresses most of these concerns, along with technical assistance to be provided to producers.

- Landscape scale analyses of giant miscanthus are generally lacking since there have not been any commercial-scale field trials in the United States.
- Literature documenting the potential for invasiveness of the fertile species of the *Miscanthus* genus has been discussed along with documentation supporting that giant miscanthus should not be considered invasive due to its sterility and slow rhizome spread within the United States.
- Literature discussing potential plant pests has been recently published relating to the western corn root worm, several species, of aphids, and rust; those studies along with recommendations have been included.
- There is little peer-reviewed literature concerning the effects of giant miscanthus plantings on biological diversity in the United States; however, some specific studies have been published in Europe. These studies primarily focused on bird species with some small mammal observations. These studies also looked at young-aged giant miscanthus stands, so there was little information available on biodiversity found in mature stands. Also, the literature is lacking on the potential effects to larger species in either young or mature stands of giant miscanthus.
- Information concerning the nutrient uptake, nutrient addition trials, and root structure has been included to discuss the potential for soil erosion, soil organic matter, and soil carbon sequestration based on the available literature.
- Literature concerning nutrient uptake, water use efficiency, and irrigation needs during establishment has been discussed based on the available literature.

4.2 SOCIOECONOMICS

4.2.1 Significance Threshold

For socioeconomics the significance thresholds include a substantial change in farm income, which could lead to wider community effects such as employment loss and population declines.

4.2.2 Proposed Action

Implementing the Proposed Action would not result in significant adverse effects to the socioeconomic conditions of any of the proposed project areas. The Proposed Action would provide a positive cash-flow stream to producers and an economically viable product through the BCF to local, regional, and potentially out of region sales according to the BCAP project area application documents. Giant miscanthus would require some level of inputs (e.g., herbicides) during the establishment phases, with minimal fertilizer inputs annually beginning in year three of the maintenance period to replace nutrients lost through biomass production; thereby, maintaining the existing agricultural products stream, with the potential for creating new markets for more species-specific agricultural chemicals. Agricultural services would be maintained in the short-term, with the potential creation of new services streams for heavier-duty equipment manufacture and contract farming for harvesting, baling, and transportation of baled products to the BCF. Overall, the maintenance of existing higher value cropland acres with the inclusion of smaller dedicated energy crop production should maintain or enhance farm household and agricultural services-related household incomes.

BCAP was developed to provide assistance to participating producer to offset a portion of the costs associated with establishing and producing dedicated energy crops. **Table 4.1** lists the estimated establishment and production costs for giant miscanthus with a comparison of the BCAP payments to participating producers. In considering the value of BCAP to participating producers within the proposed project areas a crop budget analysis with information from the Michigan State University (MSU) Extension miscanthus estimated budgets was conducted. The MSU miscanthus budgets provide an analysis of both 'cheap' and market rate rhizomes. Under MSU's analysis with "market rhizomes" after 10 years the producer is still cash flow negative over $6,000 on each acre planted. If the rhizome costs were reduced to only 25 percent of MSU's estimate, the producer would still need 10 years to break even. Under MSU's analysis, producers would have little incentive to establish energy crops. However, with "cheap rhizomes," the producer is cash flow positive after the third year. BCAP provides enough incentive, per the MSU cost and revenue values, that a producer would begin realizing a profit in year nine or in year eight, if the matching payment were delayed until a full harvest was collected.

Table 4-1. Cost Comparison for Participating Versus Non-Participating Producers for the Establishment and Production of Giant Miscanthus

Item	Giant Miscanthus Establishment without BCAP	Giant Miscanthus Establishment with BCAP
	Per Acre (all values rounded to the next whole $)	
Crop Establishment		
Rhizomes ($1.80 ea)	$7,290	$7,290
Soil Amendments	$0	$0
Pest Control	$18	$18
Machinery Cost	$67	$67
Labor	$3	$3
Total Establishment Cost	$7,378	$7,378
BCAP Establishment Payment	$0	$5,534
BCAP Annual Payment	$0	$89
Revised Establishment Cost	*$7,378*	*$1,755*
Year 2 Production		
Annual Costs – Year 2	$1,133	$1,133
Estimated Revenue – Year 2 (5 tons @ $60/ton)	$300	$300
BCAP Annual Payment	$0	$67
BCAP Matching Payment – Year 1	$0	$225
Profit/Loss Continual	*-$8,211*	*-$2,296*
Year 3 Production		
Annual Costs – Year 3	$343	$343
Estimated Revenue – Year 3	$600	$600
BCAP Annual Payment	$0	$67
BCAP Matching Payment – Year 2	$0	$450
Profit/Loss Continual	*-$7,954*	*-$1,522*
Year 4 Production		
Annual Costs – Year 4	$343	$343
Estimated Revenue – Year 4	$600	$600
BCAP Annual Payment	$0	$67
Profit/Loss Continual	*-$7,697*	*-$1,198*
Year 5 Production		
Annual Costs – Year 4	$343	$343
Estimated Revenue – Year 4	$600	$600
BCAP Annual Payment	$0	$67
Profit/Loss Continual	*-$7,440*	*-$874*

Notes:

- All cost estimates derived from MSU miscanthus budget (James et al. 2009)
- The average rental rate for CRP as of February 2011 in each state containing proposed project areas are: Arkansas = $59.53/acre; Missouri = $74.16/acre; Ohio = $118.87/acre; Pennsylvania = $102.85/acre. The average rental rate for these four states = $88.85 (USDA FSA 2011a)
- A reduction in the annual BCAP payment was estimated at 25 percent for biomass sold for heat, power, or biobased products (USDA FSA 2011b).

The Project Sponsors have been very successful in finding producers willing to plant energy crops on less productive land when shown BCAP incentives that create positive cash flows in comparison to establishment without BCAP. Importantly, producer commitments are contingent upon BCAP funding, which indicates that the short term incentives provided by BCAP create a viable energy crop market. MSU's research supports the Project Sponsors' experience with actual producers in proposed project areas that without BCAP incentives in an approved project area, producer interest under current market conditions declines dramatically.

Under the Proposed Action, the Project Sponsors propose to establish and produce giant miscanthus in the proposed project areas with a maximum acreage of 50,000 acres per project area by 2014. The Project Sponsors estimate that approximately 20 percent of the total acreage in the proposed project areas for Aurora, Columbia, and Paragould would be marginal cropland with the remainder being non-cropland, such as pastureland. In the Ashtabula proposed project area, 10 percent of the total acreage would be marginal cropland. The Project Sponsors have a goal of minimizing the amount of arable cropland to be included in the contract acreage, thereby maximizing producer incomes through diversification of a small amount of marginal croplands or idle lands, such as pastureland. On average, contract acreage would be estimated to be in a range between 38 to 100 acres per contract. The BCAP Final PEIS (Table 3.1-5) lists the national average farm size for different farm types; overall the majority of farms within the United States are considered small family farms with average farm size between 137 acres (Limited Resource) to 1,040 acres (Farming Occupation/Higher Sales). In each of the states included within the proposed project areas, greater than 84 percent of the farms would be considered small family farms. The Project Sponsors, through small acreage enrollments, would provide an incentive for small farms to enter a BCAP contract, especially with the producer assistance to be provided as part of the proposed project area models.

To determine the economic viability of the Proposed Action, the Project Sponsors developed an Economic Impact Analysis (EIA) for each proposed project area. For each proposed project area region, the 20 year project time-frame from the giant miscanthus acres produced under BCAP, the anticipated economic impact to the region would total more than $750 million (US$2011). The EIA estimated the annual value to the producers in each proposed project area to be approximately $33 million for the approximately 600,000 tons anticipated to be produced annually at full production (2017). The Project Sponsors' BCF would be estimated to directly create six positions in 2014, 78 positions in 2016, and 114 positions in 2017.

4.2.2.1 Ashtabula Proposed Project Area

In Ashtabula, at full scale production in 2017 the local BCF developed by the Project Sponsors would create 1,210 new positions (i.e., direct, indirect, and induced across all related economic sectors) and bring approximately $49.9 million into the region annually. Economic modeling was performed to analysis the contribution of the Proposed Action for each proposed project area as part of the Project Sponsors' confidential project area application.

4.2.2.2 Aurora Proposed Project Area

In Aurora, at full scale production in 2017 the local BCF developed by the Project Sponsors would create 960 new positions (i.e., direct, indirect, and induced across all related economic sectors) and bring approximately $49.2 million into the region annually. Economic modeling was performed to analysis the contribution of the Proposed Action for each proposed project area as part of the Project Sponsors' confidential project area application.

4.2.2.3 Columbia Proposed Project Area

In Columbia, at full scale production in 2017 the local BCF developed by the Project Sponsors would create 980 new positions (i.e., direct, indirect, and induced across all related economic sectors) and bring approximately $50.9 million into the region annually. Economic modeling was performed to analysis the contribution of the Proposed Action for each proposed project area as part of the Project Sponsors' confidential project area application.

4.2.2.4 Paragould Proposed Project Area

In Paragould, at full scale production in 2017 the local BCF developed by the Project Sponsors would create 750 new positions (i.e., direct, indirect, and induced across all related economic sectors) and bring approximately $50.0 million into the region annually. Economic modeling was performed to analysis the contribution of the Proposed Action for each proposed project area as part of the Project Sponsors' confidential project area application.

4.2.3 No Action Alternative

The selection of the No Action Alternative would not result in significant adverse effects to the socioeconomic conditions of the proposed project areas. Under this alternative, the Project Sponsors would not undertake the establishment and production of giant miscanthus in the proposed project areas. The agricultural conditions would remain as described in Section 3.1 and would follow projected demand and production aspects. This alternative would not create a small acreage diversification into dedicated energy crops, nor would a new services market be developed for heavy-duty machinery associated with high-yielding biomass crops, such as giant miscanthus.

4.3 LAND USE

4.3.1 Significance Threshold

For land use the significance thresholds include a substantial change in land use type that could trigger the development of agricultural lands into other non-agricultural land use types within the region or adjacent to the region.

4.3.2 Proposed Action

Implementing the Proposed Action would not result in significant changes in land use types that could trigger development of agricultural lands into other non-agricultural land use types nor would it create a substantial loss of arable cropland within the proposed project areas. Under the Proposed Action, the Project Sponsors propose to establish and produce giant miscanthus in the proposed project areas with a maximum total acreage of 50,000 acres per project area by 2014. The Project Sponsors estimate that approximately 20 percent of the total acreage in the proposed project areas for Aurora, Columbia, and Paragould would be marginal or cropland with the remainder being non-cropland, such as pastureland (Confidential Application for Proposed BCAP Project Areas, 2011). In the Ashtabula proposed project area, 10 percent of the total acreage would be marginal cropland (Confidential Application for Proposed BCAP Project Areas, 2011). On average, contract acreage would be estimated to be in a range between 38 to 100 acres.

Table 4-2 lists the estimated total acres that could be planted by each land use type, cropland (harvested cropland and other cropland) or pastureland (pastureland, all types) by proposed project area and that estimated percentage by either cropland or pastureland.

Table 4-2. Estimated Acres to be Planted by 2014 to Giant Miscanthus by Proposed Project Area and Percent of Land Use Type.

Proposed Project Area	Harvested Cropland	Other Cropland	Cropland – Giant Miscanthus	Percent of Other Cropland	Pastureland All Types	Pastureland – Giant Miscanthus	Percent of Pastureland All Types
Ashtabula	492,050	58,708	5,000	8.5	139,885	45,000	32.2
Aurora	561,033	41,867	10,000	23.9	944,322	40,000	4.2
Columbia	1,226,524	150,079	10,000	6.7	799,682	40,000	5.0
Paragould	2,087,971	52,986	10,000	18.9	261,540	40,000	15.3

Source: Adapted from USDA NASS 2007, Confidential Application for Proposed BCAP Project Areas, 2011

The Project Sponsors have a priority of using marginal or idle croplands in place of higher-value harvested croplands and pasturelands. The Ashtabula proposed project area would include the greatest percentage of giant miscanthus plantings in the combined acreage of the pastureland and other cropland land use types (25.2 percent) due to the smaller area in other cropland and pastureland land use types, when compared to the other proposed project areas. The Paragould proposed project area would be anticipated to have approximately 15.9 percent of combined pastureland and other cropland planted in giant miscanthus; however, due to issues related to nutrient use and leaching, water use, and soil erosion, more acres of productive cropland could be utilized for giant miscanthus production; thereby lowering the percentage of marginal lands used. In the Aurora and Columbia proposed project areas, the percentage of marginal land (other cropland and pastureland) anticipated to be planted into giant miscanthus is slightly over five percent for both areas.

4.3.3 No Action Alternative

The selection of the No Action Alternative would not result in significant adverse effects to the land use within the proposed project areas. Under this alternative, the Project Sponsors would not undertake the establishment and production of giant miscanthus in the proposed project areas. The agricultural conditions would remain as described in Section 3.1 and would follow projected demand and production aspects. This alternative would not create a small acreage diversification into dedicated energy crops.

4.4 BIOLOGICAL RESOURCES

4.4.1 Vegetation

4.4.1.1 Significance Threshold

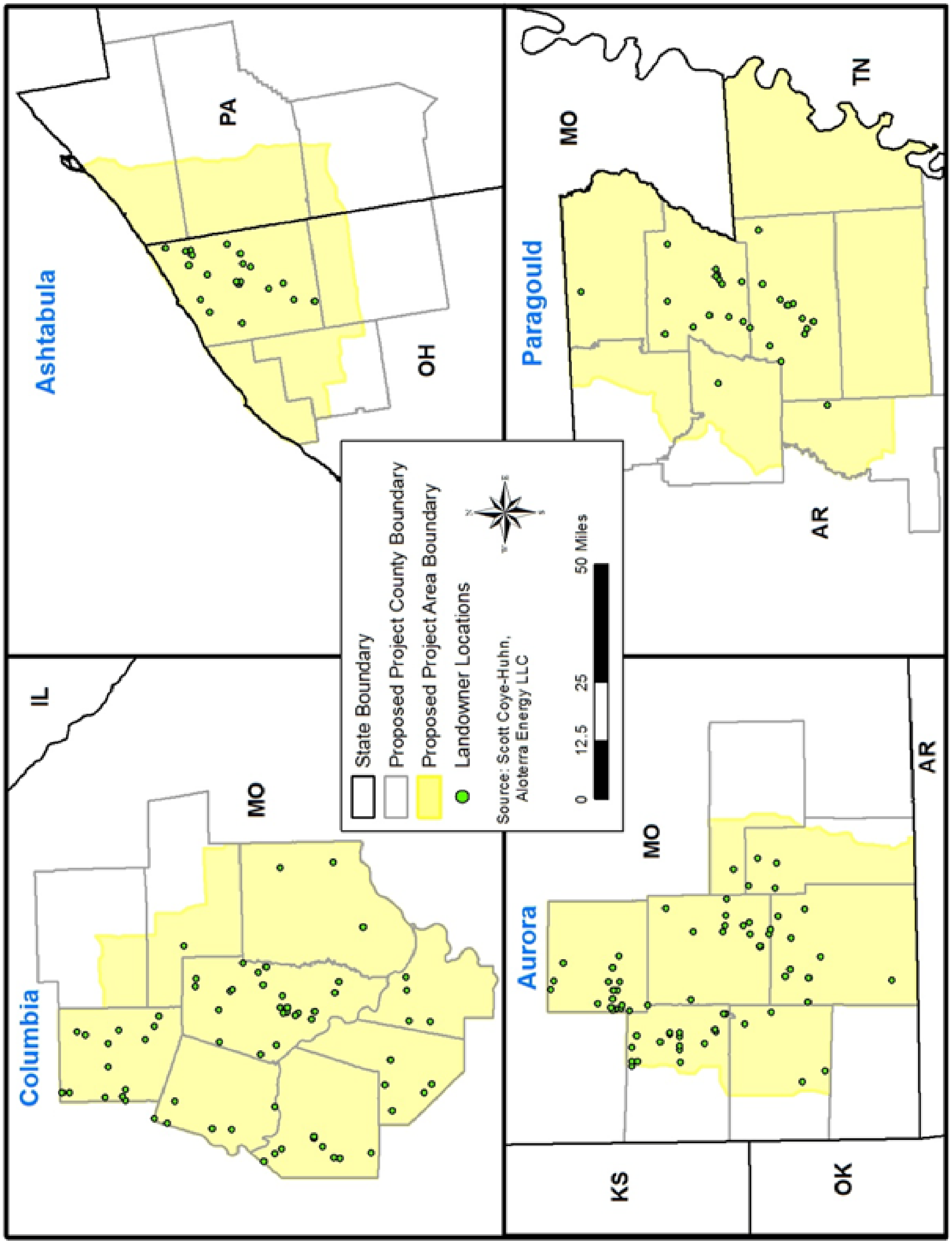
For vegetation, a significant effect would be a finding of invasiveness for the species, that it had a high likelihood of being a vector for a plant pathogen or insect harmful to native species, or that it was extremely difficult to eradicate once established.

4.4.1.2 Proposed Action

Implementing the Proposed Action, in association with the MMP, (**Section 6**) would be anticipated to result in minor effects to local and regional vegetation due to the change in vegetation from the existing cover to giant miscanthus. As the MMP, is developed based on comments received on this document and from exploring the BMPs associated with production of giant miscanthus and associated large-stature perennial grasses, additional measures to avoid and minimize effects to vegetation would be detailed. Some of these measures could include exclusions from planting within 100-year floodplains and floodways, to minimize the potential for vegetative spread through rhizome or active stalks transported via stormwater flows or wind and active management to provide eradication in adjacent areas, if necessary.

As mentioned previously, the Project Sponsors anticipated that most of the acreage for giant miscanthus would be idle lands, which are being considered as pastureland for this analysis. The data from land use types as reported in the Agricultural Census are from 2007, more complete data could be collected by the Project Sponsors that indicate a higher percentage of croplands have been idled or left fallow since 2007, which would alter the percent by land type included within the project acres. Pasturelands throughout the proposed project areas could be in fallow agricultural fields with annual vegetation or a mix of annual and perennial vegetation, in permanent improved pasture, or rangeland. Twenty percent or less of the giant miscanthus acreage is anticipated to be marginal cropland, which could be currently fallow or in traditional row crops. Vegetation species diversity is highly site specific and part of the larger local landscape. **Figure 4-1** provides the approximate locations of the anticipated current producers, which are spread throughout the proposed project areas. Also, the Project Sponsors have estimated that individual contracts for giant miscanthus production would range between 38 to 100 acres, with the minimum acreage being what is considered by the Project Sponsors to be economically viable for the producer. These small patches of fields should assist in the minimization of the loss of landscape level vegetation biodiversity and richness along with anticipated buffers to riparian areas and wildlife corridors through the MMP.

Two components of concern associated with giant miscanthus include its potential for invasiveness and as a vector for disease or plant pests. The following sections detail each of these areas.



1 **Figure 4-1. Approximate Locations of**
2 **Anticipated Producers within the Proposed Project Areas**

4.4.1.2.1 Invasiveness

Overall, the literature concerning giant miscanthus as a potential invasive species indicates a low likelihood; however, a lack of commercial scale field–sized trials has not occurred in the United States. The very components that make a species ideal for a biomass feedstock are often the same characteristics that are described of weedy invasive species (**Table 4-3**). Giant miscanthus is a naturally occurring hybrid species that is vegetatively propagated and does not produce viable seeds with one of the parent species being *Miscanthus sinensis*, which is considered an invasive species in the United States; the other parent species (*M. sacchariflorus*) is not included on any Federal or State lists of noxious or invasive species.

Table 4-3. Characteristics of Ideal Biomass Crop/Weeds

Type of Characteristic	Ideal Biomass Crop	Ideal Weedy Characteristics
Life History	Perennial	Perennial
	High Aboveground Biomass Production	High Aboveground Biomass Production
	Flowers Late Or Little Allocation to Seed Production	
Physiology	Drought Tolerant	Drought Tolerant
	Tolerates Low Fertility Soils	Tolerates Low Fertility Soils
	Tolerates Saline Soils	Tolerates Saline Soils
	C4 Photosynthetic Pathway	C4 Photosynthetic Pathway
	High Water/Nutrient Efficiency	High Water/Nutrient Efficiency
Other	Highly Competitive – Reduces Herbicide Use	Highly Competitive – Reduces Herbicide Use
	Few Resident Pests – Reduces Pesticide Use	Few Resident Pests – Reduces Pesticide Use
	Allelopathic	Allelopathic
	Re-allocates Nutrients to Roots in Fall	

Source: Raghu et al. 2006

Raghu et al. (2006) indicated that aspects of the genetics (i.e., the parent species) associated with giant miscanthus could indicate the potential for this species to be invasive, such as the ability to resprout from belowground, rapid growth, efficient photosynthetic pathways. JØrgensen (2011) indicates that rhizome spread of giant miscanthus occurs only at about 10 centimeters (cm) per year from observation of intentionally planted areas, which is relatively slow. However, there have been no documented unintentionally spreading of giant miscanthus in Europe, where the species has been studied for over 30 years. In the event that giant miscanthus rhizomes in intentionally planted areas spread beyond the planted fields, JØrgensen (2011) indicates that rhizomes transported accidentally by man, soil erosion, or flooding could be easily eradicated using commercially available herbicides (see Section 2.2.2.1) that are shown effective with this strategy. In contrast, JØrgensen (2011) indicates that *M. sacchariflorus* (i.e., a parent species of giant miscanthus) has creeping rhizomes that spread several meters (m) in a few years with high adaptability to riparian areas, which has a higher potential for translocation via erosion and water transport.

Gordon et al (2011) assessed the potential invasiveness of several potential dedicated energy crop species using the Australian Weed Risk Assessment (WRA). The WRA is a tool that has been used in Australia and New Zealand for over a decade to determine if plant species should be considered for use in those countries. The WRA has been shown to be 90 percent accurate in indentifying invasive species, 70 percent accurate in non-invaders, with approximately 10 percent of non-invaders incorrectly predicted to be invasive (Gordon et al. 2011). Gordon et al (2011) performed the WRA on 12 potential dedicated energy crops, not native to Florida, for Florida and the United States. They found that only four species (giant miscanthus, plume grass, sugarcane, and sweet sorghum) should be accepted as potential dedicated energy crops based on the WRA results, one species (cabbage gum) should be further evaluated, and the remainder rejected (giant reed, Red River gum, rose gum, jatropha, leadtree, elephantgrass, and castor bean). Gordon et al. (2011) did indicate that since both giant miscanthus and sweet sorghum had parent genetics from documented invasive species, production should be carefully monitored for changes in fertility or other traits. Barney and DiTomaso (2008) also performed a WRA on giant miscanthus and found it to be acceptable for a dedicated energy crop.

Davis et al. (2010) suggests that using the WRA may not be sufficient as a stand-alone tool provided that the chance of an inadvertent approval of an invasive species could be 1:10 or 1:20. Davis et al. (2010) suggest a nested approach where an initial screen, such as WRA, is used to determine if a pre-entry evaluation of a species is warranted. This evaluation would analyze data from the species home range for its potential for invasiveness; if approved after this step, and then a post-entry evaluation would be conducted. The post-entry evaluation would include quarantined field trials to determine if release of a species is appropriate.

4.4.1.2.2 Disease Vector, Host for Plant Pathogens, Host for Plant Pests

Another potential for vegetative effects is the movement of diseases and plant pests from one species to another, such as from giant miscanthus to corn. Recently published literature in the United States does indicate that giant miscanthus could provide a refuge or reservoir for plant pests, especially for corn. JØrgensen (2011) indicates that the western corn rootworm has been found in giant miscanthus, while Stewart and Cromey (2011) indicated that reports of diseases such as barley yellow dwarf virus, rust (*Puccinia emaculata*) and smut (*Tilletia maclaganii*) in miscanthus and switchgrass. Additionally, Spenser and Raghu (2009) found that in greenhouse and field studies there was significant emergence of western corn rootworm from giant miscanthus placed near corn fields. Bradshaw et al. (2010) found two species of aphids (yellow sugarcane aphid and corn leaf aphid) in samples taken from giant miscanthus fields in four states with stands ranging from one year to 21-years old. The yellow sugarcane aphid was located in seven samples across the four states and the corn lead aphid was located in four samples in four states. According to Bradshaw et al. (2010) the presence of aphids in giant miscanthus is of concern since aphids can transmit plant viruses. The research in this area is somewhat lacking as these are new reports and steps should be taken to monitor for any plant diseases or pests within established stands of giant miscanthus. Future directions to be included in the MMP may include integrated pest management (IPM) programs associated with dedicated energy crops or buffers away from existing corn crops.

4.4.1.3 No Action Alternative

Selecting the No Action Alternative would not result in significant effects to the local or regional vegetation within the proposed project areas, as the Project Sponsors would not establish and produce giant miscanthus in those areas. Current agricultural activities would remain similar or along the current projected trends for those regions.

4.4.2 Wildlife

4.4.2.1 Significance Threshold

For wildlife, a significant effect would be a finding of substantial decline in biodiversity or species richness for the local area or the region.

4.4.2.2 Proposed Action

Implementing the Proposed Action, in association with the MMP, would be anticipated to results in minor negative effects to wildlife diversity. Wildlife diversity effects would be contingent upon the type of previous land use the acreage was in prior to conversion into giant miscanthus stands. There could be adverse effects to larger wildlife as giant miscanthus stands mature when compared to pasturelands; however, data related to larger species is lacking; therefore, the implementation of appropriate BMPs, as developed in the MMP would be essential to gauge short and longer-term effects on local larger wildlife.

Field margins and wildlife buffers would provide continued access in areas where larger wildlife are known to occur. Studies from Europe indicate a neutral to positive effect for young-aged stands of giant miscanthus on bird species richness depending upon the previous vegetation cover. Fernando et al (2010) indicates that monocultures are not generally as diverse, but that biodiversity levels depend on the crop and the environmental setting. They also indicate that perennial rhizomatous grasses require less tillage, lower agrochemicals and high above- and below-ground biomass, which are beneficial for soil microfauna and provide cover to invertebrates and birds. Fernando et al (2010) indicate that according to their weighted-model, no significant differences related to a suite of environmental impacts was observed for the perennial species supported for dedicated energy crops. They suggested that compared to cultivated fields (e.g., potato and wheat), all perennial dedicated energy crops had fewer environmental impacts; however, they had greater impacts that fallow fields when considered on the whole.

Bellamy et al (2009) indicated that a comparison of giant miscanthus to winter wheat in the United Kingdom provided some preliminary information on abundance and diversity of birds. They found that in fields (study field size of three hectare = 7.41 acres) with giant miscanthus aged between one to three years, they found a greater abundance and diversity of birds than in the control wheat fields. Bellamy et al. (2009) hypothesized that the reasons for this could have been contributed to the shelter provided by giant miscanthus during the winter and the abundance of non-crop plants in these early stage giant miscanthus fields. Bellamy et al (2009) surmised that on-going management for wildlife would be necessary to ensure continued biodiversity as the giant miscanthus plants matured and the crop structure developed. Similarly, Semere and Slater (2007) found that young giant miscanthus fields in Herefordshire, England have a greater variety and abundance of open-ground bird than reed canary grass fields; however, the abundance and diversity of birds and small mammals was higher at the edges of both type of perennial biomass fields than in the fields themselves. Semere and Slater (2007) indicate that perennial biomass grasses could provide improved wildlife habitat due to the lower input in relation to traditionally managed row crops. Sage et al. (2010) found that miscanthus grown in southwestern England was approximately neutral when compared to grasslands in the number of birds. They found bird use to be variable and dependent on many factors such as region, weediness, crop structure, and patchiness. Fargione (2010) indicated that researchers found potential for a loss of bird biodiversity in high-input low diversity (HILD) bioenergy crops, such as corn soybeans, while in low-input high diversity (LIHD) bioenergy crops such as native prairie, bird species richness increased. They also found that for species of concern the magnitude of changes was more than double generalist species. Fargione (2010) indicates a lack of specific data availability for crops such as giant miscanthus, which has a different structure than native prairie grass species in the United States, indicating a need for more research on these species. JØrgensen (2011) indicates that very few species directly feed on miscanthus so diversity indicators are due in part to the lack of continual tilling, reduced pesticide levels, and provision of cover. At maturity, these stands could have a decline in biodiversity if field margins shrink as the fields become fully mature.

4.4.2.3 No Action Alternative

Selecting the No Action Alternative would not result in significant effects to the local or regional wildlife within the proposed project areas, as the Project Sponsors would not establish and produce giant miscanthus in those areas. Current agricultural activities would remain similar or along the current projected trends for those regions.

4.4.3 Protected Species

4.4.3.1 Significance Threshold

For protected species, both for vegetation and wildlife, a significant effect would be a finding of substantial decline in the number or range of species for the local area or the region directly attributable to the Proposed Action.

4.4.3.2 Proposed Action

Implementing the Proposed Action would not result in significant effects to any protected species, Federally-listed as threatened and/or endangered, primarily due to the lack of those species within the proposed project areas. Some species, such as the Indiana bat, may occur while commuting or migrating along waterways that serve as corridors between roost areas and other habitats, but existing crop and idle lands do not provide suitable habitat within the proposed project areas. Other concerns would be for fish, clams, and invertebrates located in streams near giant miscanthus plantings. The MMP would develop an appropriate buffer to ensure that effects to any species that could be located near giant miscanthus fields would be avoided through BMPs, such as buffer distances to riparian areas.

4.4.3.3 No Action Alternative

Selecting the No Action Alternative would not result in significant effects to the local or regional protected species within the proposed project areas, as the Project Sponsors would not establish and produce giant miscanthus in those areas. Current agricultural activities would remain similar or along the current projected trends for those regions.

4.5 SOIL RESOURCES

4.5.1 Significance Threshold

Impacts to soil resources would be considered significant if implementation of an action resulted in permanently increasing erosion, altered soil characteristics that threaten the viability of the cover, or affected unique soil conditions.

4.5.2 Proposed Action

Implementing the Proposed Action would result in a positive reduction in the soil erosion through abundant below ground biomass with soil retaining abilities. Giant miscanthus produces abundant above and below ground biomass. The top soil layer (0 to 30 cm) contains around 28 percent of the root biomass, while nearly half of the total roots were present in the deeper soils layers (below 90 cm) (Neukirchen et al 1999). The extensive deep root system can improve soil qualities by improving water storage, microbial process, and soil organic carbon storage (Blanco-Canqui 2010). Davis et al. (2010) found that over a 10-year study of giant miscanthus in Illinois, giant miscanthus produced greater above ground carbon (C) (1,606 to 2,426 grams [g] C/ square meter [m^2]) when compared to switchgrass, native prairie, (344 to 705 g C/m^2) and corn (405 to 717 g C/m^2). Davis et al. (2010) also indicated that giant miscanthus could produce soil C at a faster rate due in part to greater litter fall and below ground plant production (root system). Hansen et al. (2004) indicated that in soil samples taken from 9-year old and 16-year old giant miscanthus plants in Denmark that it was estimated that between 26 to 29 percent of accumulated C input was retained in the soil. The combined root system and high litter accumulation on the soil surface would reduce the wind and water soil erosion.

Initial preparation of land for giant miscanthus established could result in the soil disturbance similar to traditional tillage of commodity crops. The preparation process could cause an increase risk of erosion following rainfall events until the giant miscanthus could have time to establish (Donnelly et al 2010). The soil tillage for giant miscanthus establishment can redistribute the organic matter and nutrients that accumulate at the surface of soils and create beneficial effects for the soil quality by mixing the soils and organic matter (Donnelly et al 2010). First-year harvesting of rhizomes would have similar soil disturbances as the initial planting; however, later year's harvesting would be similar to activities for hay production that only minimally effect soil layers. Likewise, the eradication of the crop would result in additional tillage, similar to the establishment phase and traditional row crop tillage, which would redistribute soil organic matter, but would leave the soil bare until a new cover crop was established. To off-set short-term soil erosion potential associated with propagation and harvest of rhizome, fields with HEL would be avoided, if possible and other BMPs per the MMP would be incorporated into this phase.

Overall, there could be a positive result of soil quality and reduction of soil erosion for the Proposed Action. Giant miscanthus can produce an ample amount of above and below ground biomass allowing for reduction in soil loss which would reduce the potential for sediment to move from fields carrying pesticides and nutrients to the surface water bodies. This could also reduce the sediments being deposited off-site and reduce suspended sediments that could move with runoff water directly into water bodies.

4.5.3 No Action Alternative

Selecting the No Action Alternative would be unlikely to change current practices. Under this alternative, the Project Sponsors would not undertake the establishment and production of giant miscanthus in the proposed project areas. The proposed project areas would not receive the potential soil benefits that could be provided by giant miscanthus and could potentially receive negative effects to soil quality through continued traditional crop management.

4.6 WATER QUALITY AND QUANTITY

4.6.1 Water Quality

4.6.1.1 Significance Threshold

An accounting of increases or reductions in input use such as fertilizer, herbicides, and pesticides is performed to evaluate potential changes in water quality.

4.6.1.2 Proposed Action

Implementing the Proposed Action would not result in a significant decline in surface water quality or groundwater quality within the proposed project areas. Over the productive life of the plantation acres, inputs of fertilizer, herbicides, and pesticides would be anticipated to be lower when compared to inputs for traditional row crops; however, since the majority of acres proposed for plantation acres would be marginal and idle lands there could be an increase in inputs over the existing vegetation on those areas.

Since giant miscanthus is expected to be an excellent nutrient scavenger and recycles nutrients back to the root system, and results in excellent soil surface cover to prevent erosion losses, off-site movement of nitrogen and phosphorus would be expected to be low. Research also suggests that once established giant miscanthus can lead to low levels of nitrate leaching and as a result improving groundwater quality when compared to other crops (Christian and Riche 1998). The conversion of unused acres to giant miscanthus production would likely reduce runoff, sediment loss, and nutrient loss due to the high ground cover provided by the plant. This reduction in sediment and nutrient loss in runoff could enhance water bodies and water quality, especially in sensitive watersheds.

4.6.1.3 No Action Alternative

Selecting the No Action Alternative, would not produce a significant change in water quality, unless there was a substantial increase in land use toward traditional commodity crops. Based on agricultural crop production projections, planted corn acreage is anticipated to increase by approximately 5.4 percent between 2008 and 2017; however, all other primary field crop planted acreage is anticipated to decline. Overall, the change in land use through the selection of the No Action Alternative would not indicate increased acreage with a need for increased agricultural chemicals.

4.6.2 Water Quantity

4.6.2.1 Significance Threshold

Water quantity changes could result in positive or negative effects on total water use in the short-term and over the life of the crop compared to other cropping systems depending on the regional climate. Land use and water use changes would affect hydrology relative to runoff and stream flow.

4.6.2.2 Proposed Action

The water use relative to total quantity would be affected by this action only in areas where there is a high irrigation used to water cropland, where a large amount of acreage may be converted from irrigated cropland to non-irrigated giant miscanthus, or where short-term irrigation would be required during this planting season (2011) if irrigation to those propagation acres does not currently exist. The Ashtabula, Aurora and Columbia proposed project areas have less than 10 percent irrigated lands (USDA 2009). The Paragould proposed project area irrigates a much larger percentage of the cropland; an average of 70.1 percent of the cropland is irrigated. This proposed project area is also a much larger area, with over 2.5 million acres of farmland. Under the Proposed Action the implementation schedule would plant propagation acres in 2011 that would produce 9,600 propagation acres in 2012, with the goal to have 50,000 acres total per proposed project area, accounting for around 2.0 percent of the total acres of farmland in the Paragould proposed project area by 2014.

Miscanthus has a high efficiency of water use to biomass yield when compared to corn or sorghum crops. Typically, giant miscanthus required between 100 to 300 liters of water to produce one kilogram (kg) of biomass (Heaton et al 2010). For comparison, typically a corn or sorghum crop requires 300 liters per kg of biomass.

The proposed project would only require irrigation in this first year (2011) due to late planting of the crop and would not require irrigation after the first propagation year. Therefore, the Proposed Action would be likely to transfer some irrigated cropland to irrigated giant miscanthus propagation acres during 2011, resulting in irrigation use approximately equal to previous years within the proposed project areas. Additionally, the Proposed Action would result in some unirrigated pastureland acres converted into cropland that would require no irrigation; therefore, impacts to water quantity would be minimal, in relation to existing irrigation use within the proposed project areas.

The other issue that should be mentioned in relation to water use by the giant miscanthus is the annual water use and water losses associated with evapotranspiration (ET) when compared to annual row crops. Giant miscanthus does have higher ET losses when compared to corn or corn mixes and switchgrass (McIsaac et al. 2010; VanLoocke et al. 2010; Heaton et al. 2010). Giant miscanthus is a perennial plant which leads to a longer active growing season. VanLoocke et al. (2010) indicated that the growing season for giant miscanthus with emergence in mid- to late-April continuing into September or October may explain a portion of the increased ET over annual row crop production. Also, giant miscanthus has a faster growth rate, larger leaf area, and deep root system when compared to annual crops, thereby having higher ET rates (Smeets 2008). Rainfall interception is relatively high for giant miscanthus, as well (Donnelly 2010).

VanLoocke et al. (2010) also indicate that past studies have shown that conversion to annual crop dominated cover could have reduced ET in Corn Belt of the United States by approximately 75 millimeters (mm) per year, indicating that giant miscanthus could have ET rates more in line with past vegetative cover in prime farming areas than current crop cover. Beale et al. (1999) indicated that water use efficiency for giant miscanthus, when normalized by the daily maximum vapor pressure deficit, were within the range of C_4 crops over several environments (7.3 grams per kiloPascal per kilogram [g kPA/kg] – 9.4 g kPA/kg) and based on literature would be similar to corn (8.2 to 12.0 g kPA/kg) and pearl millet (8.4 to 10.6 g kPA/kg). The annual water use of giant miscanthus may be higher than corn or sorghum due to the rainfall interception and transpiration rates. However, as mentioned earlier, the yield per unit of water produced by giant miscanthus is anticipated to be higher than the biomass produced by other crops, such as annual crops. Also as a result of the deep root system and large leaf area, there are higher infiltration rates during rain events allowing for a reduced run-off and the reduced peak flows (Smeets 2008).

Although, there could be an increased annual water use by the planting of giant miscanthus, due to the small production area and the overall improvement of infiltration impacts should be minimal to water quantity from the Proposed Action.

4.6.2.3 No Action Alternative

The selection of the No Action Alternative would not result in significant adverse effects to the water quantity within the proposed project areas. Under this alternative, the Project Sponsors would not undertake the establishment and production of giant miscanthus in the proposed project areas. The change in land use through the selection of the No Action Alternative would not indicate increased acreage with a need for increased agricultural irrigation.

4.7 ALTERNATIVES COMPARISON

This section of the EA provides a brief comparison for the potential effects associated with both the Proposed Action and the No Action Alternative. **Table 4-4** lists the qualitative comparison of the alternatives.

Table 4-4. Comparison of the Alternatives

Resource Area	Proposed Action	No Action Alternative
Socioeconomics	+ minor	0
Land Use	- minor	0
Biological Resources		
Vegetation	- minor	0
Wildlife	- minor	0
Protected Species	0	0
Soil Resources	+ minor (primarily during establishment)	0/- minor
Water Quality/Quantity		
Water Quality	+ minor	0
Water Quantity	+/- minor	0

Note:
+ =positive - =negative 0 =neutral

4.7.1 Proposed Action

Implementing the Proposed Action would result in minor positive and negative effects to the local and regional area; however, many of these effects would be minimized through the use of the MMP. The Proposed Action could result in additional diversified income for the contract producer, as well as technical assistance from the Project Sponsors in the production and harvesting of giant miscanthus. The Project Sponsors have a proposed BCF in each of the proposed project areas ensuring that producers will have a demand for their products. Also, ancillary agricultural services should expect an increase due to the Project Sponsors goal of primarily contracting idle acres and not active cropland. The Proposed Action would result in a changed local landscape with the addition of the giant miscanthus fields; however, most contract acreage would be small between 38 to 100 acres. The MMP would be used to ensure that adverse effects from this new crop are minimized or avoided. Similarly, minor negative effects would be anticipated for biological diversity as pastureland is converted in giant miscanthus croplands. The MMP would be essential to provide mechanisms such as buffers and field edges to provide for continued wildlife and vegetative diversity in these areas and control of rhizome and vegetative spread. Recent research has indicated that giant miscanthus can function as a source of plant pests to conventional crops; the MMP monitoring and buffer would be essential to ensure that any infestation are identified and treated early to avoid transmission to local croplands, such as corn. Giant miscanthus, which has an extensive perennial root system, would be anticipated to have positive effects on soil retention, soil organic matter, and conversion to soil carbon, as well as increased water quality related to nutrient leaching and transported sediments. Also, due to its growth patterns, giant miscanthus would be anticipated to require more water than annual crops, such as corn; however, giant miscanthus has much higher water use efficiency, generating high amounts of biomass per volume of water consumed.

4.7.2 No Action

The No Action Alternative would result in no adverse effects to the local and regional area since there would be no giant miscanthus planted in any of the proposed project areas as described in this BCAP Project Proposal. However, the No Action Alternative would not assist in meeting the overall goal of BCAP, which is to develop dedicated energy crops for use into the conversion of bioenergy.

5 CUMULATIVE IMPACTS ASSESSMENT

5.1 DEFINITION

The CEQ regulations stipulate that cumulative effects analysis consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present and reasonably foreseeable actions regardless of what agency or person undertakes such other actions." Cumulative effects most likely arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in proximity to the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, actions that coincide, even partially, in time tend to have potential for cumulative effects.

The Proposed Action is to establish BCAP project areas supporting the establishment and production of giant miscanthus as a dedicated energy crops for bioenergy production. The scale of this action is regional and includes counties within Arkansas, Missouri, Ohio, and Pennsylvania. Given the action is to produce an alternative crop on existing agricultural lands, identifying past, present, and reasonably foreseeable future actions is based on existing cropland production, projected future cropland production, existing CRP acres within each county, future expirations of CRP acres within each county, and the potential for additional BCAP project acres within these proposed project areas.

5.2 CUMULATIVE IMPACTS ANALYSIS BY RESOURCE AREA

5.2.1 Socioeconomics

In the United States, average farm operator household income from 2007 to 2009 has been consistently higher than the average United States household income; however, the percentage difference has been declining from a high of 31.1 percent higher to 13.5 percent higher (USDA Economic Research Service [ERS] 2011). Farming activities have contributed approximately 11.3 percent to household income, with the projected average being 12.5 percent in 2010 (*Ibid*). After two declining years of total household income of farm operators, the forecast for 2010 and 2011 indicate an increase, which will be record levels (*Ibid*). Traditional commodity crops continue to be high-value for associated land production capabilities providing a substantial proportion of farm operator household income for many areas. Combined with the foreseeable high commodity prices associated with recent natural occurrences that have impacted food crops globally and the driver for alternative fuels and energy sources from renewable resources, traditional crops such as corn and soybean would be anticipated to continue as the dominant agricultural land uses within these proposed project areas.

Under the Proposed Action, contract producers would be creating a diversified crop profile with the inclusion of giant miscanthus on their marginal or idle lands. Given the infancy of industry for biomass feedstock production, large acreages are not anticipated to be converted into dedicated biomass crops with the short-time frame associated with BCAP. The Project Sponsors are anticipating a total combined acreage across all proposed project areas to be 200,000 acres by 2014. The potential for dedicated energy crops exists through many regions of the United States; however, one of the primary limiting factors is accessibility to a BCF that (1) provides a market to producers for their biomass feedstock and (2) has a market for sale of the bioenergy product produced at that facility. Overall, the cumulative effects to socioeconomics associated with the Proposed Action and No Action Alternative would be minor, given the high commodity prices associated with traditional crops and the lack of adequate BCF with enough demand in the region to convert more than a modest amount of agricultural lands to dedicated energy crop production away from traditional crops.

5.2.2 Land Use

The combined proposed project areas include approximately 6.5 million acres of cropland and pastureland with varying degrees of activity (**Table 5-1**). Overall, soybeans are the most cultivated crop accounting for less than 1.7 million acres within the combined proposed project areas. Corn followed with 0.6 million planted acres in the combined proposed project areas. Projections from the *USDA Agricultural Projections to 2020* indicate that increased United States planted acres of soybeans and corn would, on average, remain relatively flat, with some short-term increase in corn (USDA World Agricultural Outlook Board 2011).

Of the land in farms, approximately 191,000 acres are in CRP as of 2010 (13.7 percent of permanent pasture or rangeland), with approximately 66,500 acres expiring from CRP between 2012 to 2014. Currently there are approximately 31.2 million acres enrolled in CRP practices in the United States, with 4.4 million expiring at the end of Fiscal Year 2011 (14 percent). Overall, the cumulative effects to land use associated with the Proposed

Table 5-1. Land Use by Proposed Project Area with Planted Acres in Crops

Proposed Project Area	Harvested Cropland (2007)	Total CRP Acres (2010)	Total Pasture (2007)	Planted Acres (2010)				Percent of Planted Acres within the State(s)			
				Corn	Sorghum	Oats	Soy-beans	Corn	Sorghum	Oats	Soy-beans
Ashtabula	492,050	8,732	139,885	138,200	0	15,900	106,500	2.9%	0.0%	9.1%	2.1%
Aurora	561,033	20,241	944,322	58,500	1,700	0	89,200	1.9%	4.3%	0.0%	1.7%
Columbia	1,226,524	131,336	799,682	323,700	8,500	0	542,200	10.3%	21.3%	0.0%	10.5%
Paragould	2,087,971	31,505	261,540	98,900	2,400	0	937,400	25.4%	6.0%	0.0%	29.4%

Source: USDA NASS 2009, 2011

Action and No Action Alternative would be minor, given the high commodity prices associated with traditional crops and the lack of adequate BCF with enough demand in the region to convert more than a modest amount of agricultural lands to dedicated energy crop production away from traditional crops.

5.2.3 Biological Resources

Cumulative effects from the Proposed Action would be minimized through the use of the MMP to ensure that overall biodiversity would be maintained and the potential for plant pests would be minimized. The potential cumulative effects of establishment of a biomass crop would impact wildlife as habitats are fragmented, degraded, or destroyed from dedicated energy crop establishment; however, the amount of acreage within any of the proposed project areas would be minor and would be mitigated through the MMP. The establishment of new dedicated energy crops in areas previously fallow or cropped for a different style of agriculture may itself cause some direct mortality and range shifting at the local scale of wildlife. Direct effects are likely to occur during the establishment phase, but would be similar to traditional agricultural cropping of fallowed or idle lands. During the short term, species using pastureland could relocate to marginal areas or wildlife corridors. Overall, the cumulative effects to biological resources associated with the Proposed Action and No Action Alternative would be minor, given the high commodity prices associated with traditional crops and the lack of adequate BCF with enough demand in the region to convert more than a modest amount of agricultural lands to dedicated energy crop production away from traditional crops. The use of the MMP for the Proposed Action would also minimize effects to biological resources and provide mechanisms for adaptive management should the need arise based on crop monitoring.

5.2.4 Soil Resources

The Proposed Action would be anticipated to create positive effects to soils at multiple levels, including a reduction of soil erosion, and increase in soil organic matter, and soil carbon deposition, when compared to traditional crops or fallowed land under annual species. Overall, the cumulative effects to soils resources associated with the Proposed Action and No Action Alternative would be minor, given the high commodity prices associated with traditional crops and the lack of adequate BCF with enough demand in the region to convert more than a modest amount of agricultural lands to dedicated energy crop production away from traditional crops.

5.2.5 Water Quality and Quantity

The conversion to a perennial dedicated energy crop provides greater water use efficiency than traditional row crops such as corn, thereby indicating a more productive choice for biomass production. Giant miscanthus would be anticipated to use more water than fallowed or idle lands with permanent pasture, rangeland, or annual species. Taken in combination with traditional crops in the proposed project areas, there could be greater use of groundwater supplies or effects on groundwater recharge. However, these effects would be mitigated through monitoring and BMPs associated with the MMP. The conversion from traditional crops to dedicated energy crops would be anticipated to limit runoff from agricultural fields and potential need for irrigation past the initial establishment period. Potential plant pests newly associated with giant miscanthus could require more pesticide use or greater IPM than potentially anticipated based on existing literature from Europe, but should be less than traditional row crops. Overall, the cumulative effects to water quality and quantity associated with the Proposed Action and No Action Alternative would be minor, given the high commodity prices associated with traditional crops and the lack of adequate BCF with enough demand in the region to convert more than a modest amount of agricultural lands to dedicated energy crop production away from traditional crops.

6 MITIGATION AND MONITORING

6.1 INTRODUCTION

The CEQ issued revised guidance for mitigation and monitoring to be included in NEPA decision documents that include three general types of scenarios including: (1) mitigation incorporated into project design; (2) mitigation alternatives for NEPA decision documents (i.e., EA and EIS); and (3) mitigation commitments analyzed in EAs to support a Mitigated FONSI (CEQ 2011). The purpose of mitigation in this Draft EA is the first type, which is incorporation into project design following the original intent of the definition of mitigation provided by CEQ that includes:

- Avoiding an impact by not taking a certain action or parts of an action;
- Minimizing the impact by limiting the degree or magnitude of the action and its implementation;
- Rectifying an impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating an impact over time, through preservation and maintenance operations during the life of the action; and
- Compensating for an impact by replacing or providing substitute resources or environments.

The recently revised CEQ guidance also explicitly specifies that adaptive management, or the potential for the lead agency under NEPA to take corrective action if the originally committed mitigation measures fail to address the target potential impacts, is allowable and desirable to both protect the environment and help a Federal agency meet their stated goals.

6.2 ROLES AND RESPONSIBILITIES

The revised CEQ guidance on mitigation and monitoring explicitly requires each federal lead agency under NEPA, or FSA in this case, to identify mitigation tracking mechanisms, commitments for any mitigation proposed; responsibility for implementation particularly if shared, reasonably foreseeable circumstances regarding anticipated or projected funding availability to implement mitigation commitments; and the identification of any outside entities that may be responsible for assisting the lead agency through financial or other means to implement the committed mitigations. In BCAP, the lead agency under NEPA is FSA and the cooperating agencies include the USDA Rural Development, Animal and Plant Health Inspection Service (APHIS), the USDA United States Forest Service (USFS), and the NRCS, as described in the Final PEIS (USDA FSA 2010). FSA is expected to have primary responsibility for implementation and tracking of the mitigation and monitoring program. FSA is currently developing a Memorandum of Understanding with the NRCS to have NRCS provide technical support as TSPs on an individual contract basis to ensure each producer complies with existing requirements of BCAP including completion of the Environmental Screening worksheet, completion of a Conservation Plan, and compliance with all existing rules and regulations following BMPs outlined in NRCS Conservation Practice Standards. The role of the Project Sponsors, are expected to include potential financial assistance with implementation of the monitoring program to assess the effectiveness of mitigation and financial assistance for any eradication efforts outside of the intentionally planted areas.

FSA has a framework for defining the components of the MMP that will be required for this project, but has not yet finalized the plan to consider all public input on the draft EA prior to making a final plan recommendation. Additionally, FSA is aware of on-going research for giant miscanthus; however, publication of those results has not yet been provided. FSA will provide review and monitoring of newly developed and available data for inclusion within this project and for projects of similar nature for BCAP, as it becomes available.

6.3 MITIGATION AND MONITORING RECOMMENDATIONS

General mitigation and monitoring recommendations for BCAP, as a national program with numerous feedstock options, were detailed in the Final PEIS including common BMPs to address potential adverse impacts of energy crop establishment. Examples of the common BMPs include conservation buffers strips, no-till or reduced till planting methods, avoiding the primary nesting season to protect grassland bird populations, and work window avoidance for energy crop establishment to avoid establishment during high precipitation or rainfall events.

The purpose of this mitigation and monitoring plan is to provide project-specific mitigation measures for the project that FSA is proposing to approve under BCAP. An inherent part of that process includes site-specific review by TSPs using the Environmental Screening worksheet to determine whether environmentally sensitive resources such as federally threatened or endangered species or wetlands are present and could be potentially affected. Where possible, implementation of BMPs through Conservation Plan development would mitigation any potential environmental impacts on key resources addressed within the scope of this EA. In the event sensitive resources have the potential to be present, FSA or their partners will assist each participating producer at the contract level to conduct any and all appropriate consultations with resource agencies such as the USFWS, U.S. Army Corps of Engineers (USACE), and State Historic Preservation Offices (SHPO).

In general, potential environmental impacts associated with establishment and cultivation of giant miscanthus as proposed by the Project Sponsors are likely to be temporary in nature and variable in scale from local to regional depending on existing characteristics of the individual producer's total land acreage being enrolled, their current land use, the surrounding mix of agricultural uses in each of the four project areas, and the year in the growth cycle (i.e., establishment in year one or two or maintenance in years three to 15). Potential impacts are more likely to be localized in areas where average farm size or the portion of total land holdings an individual producer is enrolling is small compared to areas with large farm sizes and land holdings where impacts could be more regional in nature. Potential impacts are also likely to vary by current land use with reduced environmental impacts on lands currently enrolled in traditional row crops compared to larger potential impacts on lands currently idle or in pastureland when converted to giant miscanthus. Potential impacts are also likely to vary depending on the surrounding character of farmland such that areas dominated by a single agricultural use (e.g., corn or beans) that have a large proportion of land converted to BCAP may have larger impacts that regions dominated by a variety of agricultural uses such that any land conversions to BCAP are relatively diluted. Finally, impacts are likely to vary by phases of the growth cycle such that establishment in year one (propagation) and year two (plantation planting) cycle may have larger impacts than maintenance (years 3 to 15) related to soil erosion and loss, water quality and quantity impacts, and herbicide application for weed control.

All proposed site-specific mitigation measures will rely on adaptive management and monitoring to ensure that proposed mitigation commitments are met, and that in the event they do not prevent the intended potential impacts, that additional corrective measures are implemented to rectify the situation as required by the recent CEQ guidance (CEQ 2011). Adaptive management and monitoring is also useful for assessing the effectiveness of particular mitigations and addressing any uncertainty regarding whether a proposed method of mitigation is likely to address the intended potential environmental impact.

6.3.1 Socioeconomics

The proposed project has the potential to impact socioeconomics by converting land currently enrolled in food crops to energy crops. However, this potential impact is primarily expected to be localized to the Paragould proposed project area associated with sustainability issues regarding current agricultural row crop use raised by producers who have expressed interest in enrolling in BCAP with the more marginally productive areas currently in corn or beans. Potential impacts are expected to be potentially mitigated by minimizing the conversion of food to energy crops and when that conversion does occur, focusing only on the marginally productive lands currently enrolled in food crops. The project sponsors are currently working with FSA, the USDA, Agricultural Research Service (ARS), and NRCS to develop appropriate metrics for tracking conversion of lands currently enrolled in food production and tracking documentation of their productive status.

6.3.2 Land Use

Potential impacts on land use may include conversion of land use types such as the conversion from traditional row crops to giant miscanthus as discussed above or the conversion of idle land, pastureland, or hayland into giant miscanthus. Potential mitigation measures as discussed above for tracking the conversion of land types and their productive status are also expected to mitigate potential adverse impacts on land change. If adaptive monitoring indicates large-scale or regional land use conversions are occurring, then additional restrictions on land use conversion may be necessary.

6.3.3 Biological Resources

6.3.3.1 Vegetation

The primary potential impacts of giant miscanthus establishment are expected to be the potential for the hybrid to produce fertile seed and thus spread beyond the extent of the propagation or planting acres. Based on third-party independent verification by the OSIA (OSIA 2010), the likelihood of giant miscanthus producing fertile seed and spreading beyond the enrolled fields is expected to be low. The OSIA has been monitoring the flower unit of OSIA's giant miscanthus selection for pollen and seed production by observation and microscopic examination (Armstrong 2011 – Appendix A). Accordingly, neither pollen nor seed has been produced (*Ibid*). The extruded anthers of the flower unit have been shriveled in appearance and similar to what we see with male sterile seed corn inbred lines (*Ibid*). In addition, there have been no observed volunteer seedlings emerging in observation plot areas adjacent to the giant miscanthus selection (*Ibid*).

Additional weed risk assessments conducted on giant miscanthus compared to other potential bioenergy crops such as giant reed, switchgrass, *Eucalyptus* species, and *Jatropha* (i.e., a deciduous succulent plant) have concluded the risk of invasiveness in the United States is low (Barney and DiTomaso 2008, Gordon et al. 2011). In the event, giant miscanthus does escape, eradication studies indicate spring tillage followed by glyphosate application was successful in eliminating 95 percent of aboveground biomass after the first application (Anderson et al. 2011).

Mitigation is expected to include development of a monitoring protocol on an appropriate frequency and scale to facilitate early detection and eradication. This mitigation measure is under development with the project sponsors in conjunction with FSA, ARS, and NRCS, and may ultimately include integration in national invasive species risk assessments being conducted by APHIS and USDA. Adaptive monitoring of the potential for escape is anticipated followed by inclusion of corrective measures involving eradication as described above, if necessary, may be included.

6.3.3.2 Wildlife

Potential impacts on wildlife and biodiversity may include habitat loss associated with conversion of lands currently idle, in pasture, or in hay, to giant miscanthus; reduced winter cover and food supplies on lands currently enrolled in row crops; impacts on nesting grassland bird populations; and additional habitat fragmentation in areas where field sizes are larger and more contiguous. Potential impacts due to habitat loss are expected to be mitigated using similar measures as described above to assess land use change to track and document the current status of any land converted to giant miscanthus under BCAP. The relatively low residual height left after harvesting giant miscanthus may reduce winter cover and affect nesting conditions for grassland birds such as northern bobwhites (*Colinus virginianus*), eastern meadowlarks (*Sturnella magna*), and grasshopper sparrows (*Ammodramus savannarum*). Finally, conversion of larger areas dominated by a single land use type (i.e., idle land, pastureland, or hayland) may have proportionally larger impacts on habitat fragmentation in project areas.

Mitigation measures are under development with the project sponsors, FSA, ARS, and NRCS and may include harvesting windows to avoid impacts on nesting grassland birds, regional tracking of grassland bird populations, installation of conservation buffer strips for overwinter habitat, and monitoring land use conversions as described above. Existing sources of data such as the Breeding Bird Survey and other annual surveys conducted by state wildlife resource agencies (e.g., bobwhite quail counts) may be used to track wildlife population trends in each project area. Adaptive monitoring is anticipated to be used to monitor regional wildlife population trends and if necessary, implement corrective measures to alter land use conversion requirements or other measures to rectify any potentially unaddressed impacts resulting from the proposed project.

6.3.3.3 Protected Species

Potential impacts on protected species, such as Federally threatened or endangered species are possible in those areas where Critical Habitat has been designated, suitable habitat exists within the documented range of the species, or known records have been documented. Compliance with existing regulations, including the Endangered Species Act, will be accomplished with the assistance of TSPs through the Environmental Screening worksheet and subsequent resource agency consultation if deemed necessary.

Mitigation is under development with the project sponsors, FSA, ARS, and NRCS and is expected to include a tiered structure whereby individual producers who enroll land in close proximity to sensitive habitat such as streams, wetlands, or riparian zones are required to implement additional BMPs as part of their Conservation Plan and potentially work with TSPs to complete appropriate resource agency consultations if necessary. Such a tiered approach is expected to be used throughout the monitoring program to make sure additional measures are taken when sensitive resources are present or in close proximity. Potential examples of BMPs in close proximity to such sensitive habitats include buffers to maintain specific planting distances, conservation buffer strips or plantings, silt fencing, potential application of no tilling establishment methods to address sedimentation impacts, and use of appropriately labeled herbicides to protect aquatic species.

6.3.4 Soil Resources

Potential impacts on soil resources may include soil erosion and loss as a result of field preparation and planting in giant miscanthus. Compared to land currently in traditional row crops, potential soil erosion and loss is expected to be temporary and short-term, primarily associated with the establishment phase compared to more intensive annually tilled crops. Compared to land currently idle or in pasture or hay, potential soil erosion and loss may be slightly higher but still temporary and short-term associated with establishment. Regardless of current land use, long-term benefits of soil retention with established rhizomes and carbon soil sequestration towards the middle of the 15-year maintenance period on enrolled fields are expected to off-set temporary and short-term increases in soil erosion and loss that may also be associated with reduced carbon sequestration.

Mitigation is under development with the project sponsors, FSA, ARS, and NRCS and may include a tiered structure as described above in Section 6.3.3 that uses BMPs associated with no-till planting methods for project areas in close proximity to sensitive habitats such as streams, wetlands, or other water bodies. Adaptive monitoring is expected to be used to track the effectiveness of carbon sequestration over the life of a given giant miscanthus planting (i.e., up to 15 years) compared to short-term and temporary soil losses associated with tilling and field preparation. In addition, the project sponsors anticipate selling carbon credits, or similar type credits, from the sequestration benefits in markets such as the European Exchange, which will require independent, third-party verification and data collection for verification.

6.3.5 Water Quality and Quantity

6.3.5.1 Water Quality

Potential impacts on water quality include short-term and temporary increases in nutrient and fertilizer runoff during establishment and monitoring. Compared to land currently in traditional row crops, conversion to giant miscanthus is expected to result in less nutrient and fertilizer runoff. Compared to land currently idle or in pasture or hay, conversion to giant miscanthus may result in slight but short-term and temporary increases in nutrient and fertilizer runoff. However, long-term declines in nutrient loss (i.e., phosphorus and nitrogen) during the maintenance period (years 3 to 15) are likely to off-set temporary and short-term increases in nutrient leaching or runoff. The anticipated fertilizer application rate is also expected to be substantially lower compared to traditional row crops, but may be higher than idle or pasture or hay land.

Mitigation is being developed with the project sponsors, FSA, ARS, and NRCS and may include numerous BMPs for integration with the Conservation Plans specifically designed to address potential short-term and temporary impacts on water quality more likely associated with conversion of idle or pasture or hayland to giant miscanthus. Adaptive monitoring may include methods to measure local water quality associated with potential nutrient leaching or fertilizer runoff such as lysimeter installation below the root growth zone to address field-scale water balances.

6.3.5.2 Water Quantity

Potential impacts on water quantity may arise from surface or groundwater supply depletion as giant miscanthus may increase the amount of withdrawals compared to current land uses such as traditional row crops or idle, pasture, or hayland. This potential impact is likely to be greatest in the Paragould proposed project area where participating producers report interest in enrolling due to unsustainable water demands due to current agricultural practices dominated by traditional row crops (e.g., corn and beans).

Mitigation is under development with the project sponsors, FSA, ARS, and NRCS and may include BMPs as part of the Conservation Plan to address potential water quantity impacts associated with surface or groundwater supply depletion. Potential mitigation may also include using existing measures of surface and groundwater flow from United State Geological Survey (USGS) stream gauges or other local monitoring methods. Adaptive monitoring is expected to be used to determine whether any surface or groundwater supplies are being affected and if so, implement corrective measures.

7 REFERENCES

Acroglu, M., and A.S. Aksoy, 2005. The Cultivation and Energy Balance of *Miscanthus x giganteus* Production in Turkey. Biomass and Bioenergy Vol. 29, pp. 42-48.

Aloterra Energy LLC. 2011 Confidential Project Area Proposal, Ashtabula, Ohio and Pennsylvania.

Anderson, E.K., T.B. Voigt, G.A. Bollero, and A.G. Hager. 2011. Controlling *Miscanthus x giganteus*. *Miscanthus x giganteus* response to tillage and glyphosate. In Preparation for Weed Technology.

Anderson, E.K., A.G. Hager, T.B. Voigt, and G.A. Bollero, 2009. Herbicide Phytotoxicity and Eradication Studies in Miscanthus x giganteus. University of Illinois at Urbana-Champaign, Illinois Council on Food, and Agricultural Research Special Research Initiative. January.

Animal and Plant Health Inspection Service (APHIS). 2002. Factsheet: The Plant Protection Act. U.S. Department of Agriculture/Animal Plant Health Inspection Service. http://www.aphis.usda.gov/publications/plant_health/content/printable_version/fs_phproact.pdf. Accessed July 2009.

Angelini, L.G., L. Ceccarini, N.N. Di Nasso, and E. Bonari, 2009. Comparison of *Arundo donax* L. and *Miscanthus x giganteus* in a Long-Term Field Experiment in Central Italy: Analysis of Productive Characteristics and Energy Balance. Biomass and Bioenergy Vol. 33, pp. 635-643.

Arkansas Department of Environmental Quality (ADEQ). 2011. Air Division. http://www.adeq.state.ar.us/air/default.htm. Accessed 31 March 31.

Armstrong, J. 2011. Personal Communication with Scott Coye-Huhn, Aloterra Energy LLC. Ohio Seed Improvement Association. 04 April.

Barney, J.N., and J.M. DiTomaso, 2008. Nonnative Species and Bioenergy: Are We Cultivating the Next Invader? BioScience Vol. 58, No. 1, pp. 64-70. January.

Barney, Jacob. Identifying the invasive potential of biofuel crops. University of California – Davis.

Beale, C.V., and S.P. Long, 1997. Seasonal Dynamics of Nutrient Accumulation and Partitioning in the Perennial C_4-Grasses *Miscanthus x giganteus* and *Spartina cynosuroides*. Biomass and Bioenergy Vol. 12, No. 6, pp. 419-428.

Beale, C.V., J.I.L. Morison, and S.P. Long, 1999. Water Use Efficiency of C_4 Perennial Grasses in a Temperate Climate. Agricultural and Forest Meteorology Vol. 96, pp. 103-115.

Bellamy, P.E., P.J. Croxton, M.S. Heard, S.A. Hinsley, L. Hulmes, S. Hulmes, P. Nuttall, R.F. Pywell, and P. Rothery, 2009. The Impact of Growing *Miscanthus* for Biomass on Farmland Bird Populations. Biomass and Bioenergy Vol. 33, pp. 191-199.

Beuch, S., B. Boelcke, and L. Belau, 2000. Effect of the Organic Residues of *Miscanthus x giganteus* on the Soil Organic Matter Level of Arable Soils. J. Agronomy & Crop Science Vol. 183, pp. 111-119.

Blanco-Canqui, H., 2010. Energy Crops and Their Implications on Soil and Environment. Agronomy Journal Vol. 102, pp.403-419. January.

Bradshaw, J.D., J.R. Prasifka, K.L. Steffey, and M.E. Gray, 2010. First report of field populations of two potential aphid pests of the bioenergy crop miscanthus x giganteus. Florida Entomologist Vol. 93(1), pp. 135-137.

Brady, N. and R. Weil. 1996. The Nature and Properties of Soils, 11th ed. Prentice-Hall, Inc., Upper Saddle River, NJ.

Burner, D.M., T.L. Tew, J.J. Harvey, and D.P. Belesky, 2009. Dry Matter Partitioning and Quality of *Miscanthus*, *Panicum*, and *Saccarum* genotypes in Arkansas, USA. Biomass and Bioenergy Vol. 33, pp. 610-619.

Cadoux, S., A.B. Riche, N.E. Yates, and J.M. Machet, 2011. Nutrient Requirements of *Miscanthus x giganteus*: Conclusions from a Review of Published Studies. Biomass and Bioenergy pp.1-9.

Caslin, B., J. Finnan, and L. Easson, 2010. Miscanthus Best Practice Guidelines. Agriculture and Food Development Authority, Teagasc, and Agri-Food and Bioscience Institute.

Christian, D.G., A.B. Riche, and N.E. Yates, 2008. Growth, Yield and Mineral Content of *Miscanthus x giganteus* Grown as a Biofuel for 14 Successive Harvests. Industrial Crops and Products Vol. 28, pp. 320-327.

Christian, D.G., M.J. Bullard, and C. Wilkins, 1997. The Agronomy of Some Herbaceous Crops Grown for Energy in Southern England. Aspects of Applied Biology Vol. 49, pp.41-51.

Christian, D.G., and A.B. Riche, 1998. Nitrate Leaching Losses Under *Miscanthus* Grass Planted on a Silty Clay Loam Soil. Soil Use and Management Vol. 14, pp. 131-135.

Clifton-Brown, J.C., and I. Lewandowski, 2000. Overwintering Problems of Newly Established Miscanthus Plantations can be Overcome by Identifying Genotypes with Improved Rhizome Cold Tolerance. New Phytologist Vol. 148, No. 2, pp. 287-294. November.

Clifton-Brown, J.C., and I. Lewandowski, 2002. Screening *Miscanthus* Genotypes in Field Trials to Optimise Biomass Yield and Quality in Southern Germany. European Journal of Agronomy Vol. 16, pp. 97-110.

Clifton-Brown, J.C., P.F. Stampfl, and M.B. Jones, 2004. *Miscanthus* Biomass Production for Energy in Europe and its Potential Contribution to Decreasing Fossil Fuel Carbon Emissions. Global Change Biology Vol. 10, pp. 509-518.

Clifton-Brown, J.C., J. Breuer, and M.B. Jones, 2007. Carbon Mitigation by the Energy Crop, *Miscanthus*. Global Change Biology Vol. 13, pp. 2296-2307.

Clifton-Brown, J.C., and I. Lewandowski, 2002. Screening Miscanthus Genotypes in Field Trials to Optimize Biomass Yield and Quality in Southern Germany. European Journal of Agronomy Vol. 16, pp. 97-110.

Cosentino, S.L., C. Patanè, E. Sanzone, V. Copani, and S. Foti, 2007. Effects of Soil Water Content and Nitrogen Supply on the Productivity of *Miscanthus x giganteus* Greef ef Deu. In a Mediterranean Environment. Industrial Crops and Products Vol. 25, pp. 75-88.

Danalatos, N.G., S.V. Archontoulis, and I. Mitsios, 2007. Potential Growth and Biomass Productivity of *Miscanthus x giganteus* as Affected by Plant Density and N-Fertilization in Central Greece. Biomass and Bioenergy Vol. 31, pp. 145-152.

Davis, A.S, R.D. Cousens, J. Hill, R.N. Mack, D. Simberloff, and S. Raghu. 2010. Screening bioenergy feedstock crops to mitigate invasion risk. Frontiers in Ecology and the Environment; 8(10): 533-539.

Davis, S.C., W. J. Parton, F.G. Dohleman, C.M. Smith, S. Del Grosso, A.D. Kent, and E.H. DeLucia, 2010. Comparative Biogeochemical Cycles of Bioenergy Crops Reveal Nitrogen-Fixation and Low Greenhouse Gas Emissions in a *Miscanthus x giganteus* Agro-Ecosystem. Ecosystems Vol. 13, pp. 144-156.

Davis, T. 2011. Personal Communication. Arkansas Department of Environmental Quality. Air Division. Air Quality Planning. Telephone Interview. March 31.

DiTomaso, J.M., J.N. Barney, and A.M. Fox, 2007. Biofuel Feedstocks: The risk of future invasions. CAST Commentary, QTA2007-1, November 2007.

Dohleman, F.G., and S.P. Long, 2009. More Productive Than Maize in the Midwest: How Does Miscanthus Do It? Plant Physiology Vol 150, pp. 2104-2115. August.

Donnelly, A., D. Styles, J. Fitzgerald, and J. Finnan, 2010. A Proposed Framework for Determining the Environmental Impact of Replacing Agricultural Grassland with *Miscanthus* in Ireland. Global Change Biology Bioenergy pp. 1-17.

Downs, J. 2011. Personal Communication. Missouri Department of Natural Resources. Air Pollution Control Program. Monitoring. Telephone Interview. March 31.

Environmental Protection Agency (EPA). 2011. Level III Ecoregions of the Continental United Sates. National Health and Environmental Effects Research Laboratory. January.

Environmental Protection Agency (EPA). 2011. The Green Book Nonattainment Areas of Criteria Pollutants. Pennsylvania. http://www.epa.gov/oar/oaqps/greenbk/ancl.html#PENNSYLVANIA. Accessed 01 April.

Environmental Protection Agency (EPA). 2006. 2005 Emission Inventory for Ohio. http://www.epa.gov/ttnnaaqs/pm/docs/2005_ei_ohio.xls. Accessed 05 April 2011.

Environmental Protection Agency (EPA). 2010. EPA Office of Water: 303(d) Listed Impaired Waters NHD Dataset. http://www.epa.gov/waters/data/downloads.html#303(d) Listed Impaired Waters. Accessed March 2011.

Environmental Protection Agency (EPA). 2009. What is a Watershed? Watersheds. http://water.epa.gov/type/watersheds/whatis.cfm. Accessed March 2011.

Environmental Protection Agency (EPA). 2008. 303(d) List. http://www.epa.gov/reg3wapd/tmdl/303d.htm Accessed Mach 2011.

Ercoli, L., M. Mariotti, A. Masoni, and E. Bonari, 1999. Effect of Irrigation and Nitrogen Fertilization on Biomass Yield and Efficiency of Energy Use in Crop Production of *Miscanthus*. Field Crops Research Vol. 63, pp.3-11.

Fargione, Joe, 2010. Is bioenergy for the birds? An evaluation of alternative future bioenergy landscapes. PNAS Vol. 107 (44), pp. 18745-18746.

Fernado, A.L, Duarte, M.P, Boleo, S. and Mendes, B., 2010. Environmental impact assessment of energy crops cultivation in Europe. Biofuels, Bioprod. Bioref. Vol. 4, pp. 594-604.

Fernando, A.L., V. Godovikova, and J.F.S. Oliveira, 2004. *Miscanthus x giganteus*: Contribution to a Sustainable Agriculture of a Future/Present. Oriented Biomaterial Materials Science Forum Vol. 455-456, pp. 437-441.

Food and Agriculture Organization of the United Nations. 2009. Algae-Based Biofuels: A Review of Challenges and Opportunities for Developing Countries. http://www.fao.org/fileadmin/templates/aquaticbiofuels/docs/0905_FAO_Review_Paper_on_Algae-based_Biofuels.pdf. Accessed January 2010.

Gordon, D.R., K.J. Tancig, D.A. Onderdonk, and C.A. Gantz, 2011. Assessing the Invasive Potential of biofuel Species Proposed for Florida and the United States Using the Australian Weed Risk Assessment. Biomass and Bioenergy Vol. 35, pp. 74-79.

Hansen, E.M., B.T. Christensen, L.S. Jensen, and K. Kristensen, 2004. Carbon Sequestration in Soil Beneath Long-Term *Miscanthus* Plantations as Determined by ^{13}C Abundance. Biomass and Bioenergy Vol. 26, pp. 97-105.

Heaton, E.A., F.G. Dohleman, A.F. Miguez, J.A. Juvik, V. Lozovaya, J. Widholm, O.A. Zabotina, G.F. Mcisac, M.B. David, T.B. Voigt, N.N. Boersma, and S.P. Long, 2010. Miscanthus: A Promising Biomass Crop. Advances in Botanical Research Vol. 56, pp. 75-137.

Heaton, E.A., J. Clifton-Brown, B. Voigt, B. Jones, and S.P. Long, 2004. *Miscanthus* for Renewable Energy Generation: European Union Experience and Projections for Illinois. Mitigation and Adaptation Strategies for Global Change Vol. 9, pp. 433-451.

Hodkinson, T.R., and S. Renvoize, 2001. Nomenclature of *Miscanthus x giganteus* (*Poaceae*). Kew Bulletin Vol. 56, No. 3, pp. 759-760.

James, L.K., S.M. Swinton, and D. Pennington. 2009. Profitability of Converting to Biofuel Crops. Michigan State University Extension. Extension Bulletin E-3084. December. http://bioenergy.msu.edu/economics/E3084.pdf, and http://bioenergy.msu.edu/economics/miscanthus.xls. Accessed 06 March 2011.

Jezkowski, S., K. Glowacka, Z. Kaczmarek, 2011. Variation on Biomass Yield and Morphological Traits of Energy Grasses from the Genus *Miscanthus* During the First Years of Crop Establishment. Biomass and Bioenergy Vol. 35, pp. 814-821.

Jodl, S., A. Eppel-Htz, and K. Marzini, 1998. Examination of the Ecological Value of *Miscanthus* Expanses-Faunistic studies. Biomass for Energy and Industry; Proc 10th EU Bioenergy Conference, Wuzbury, Germany Carmen Publishers, Rimpar, Germany pp. 48-53.

Jørgensen, U., 2011. Benefits Versus Risks of Growing Biofuel Crops: the Case of *Miscanthus*. Current Opinion in Environmental Sustainability pp. 324-330.

Jørgensen, U., and H.-J. Muhs. *Miscanthus* Breeding and Improvement. pp. 68-85.

Kahle, P., S. Beuch, B. Boelcke, P. Leinweber, and H.R. Schulten, 2001. Cropping of Miscanthus in Central Europe: Biomass Production and Influence on Nutrient and Soil Organic Matter. European Journal of Agronomy Vol. 15, pp. 171-184.

Lewandowski, I., J.C. Clifton-Brown, J.M.O. Scurlock, and W. Huisman, 2000. Miscanthus: European Experience with a Novel Energy Crop. Biomass and Bioenergy Vol. 19, pp. 209-227.

Lewandowski, I., and A. Heinz, 2003. Delayed Harvest of *Miscanthus*-Influences on Biomass Quantity and Quality and Environmental Impacts of Energy Production. European Journal of Agronomy Vol. 19, pp. 45-63.

Lewandowski, I., J.M.O. Scurlock, E. Lindvall, and M. Christou, 2003. The Development and Current Status of Perennial Rhizomatous Grasses as Energy Crops in the US and Europe. Biomass and Bioenergy Vol. 25, pp. 335-361.

Linde-Laursen, I.B., 1993. Cytogenetic Analysis of *Miscanthus* 'Giganteus', an Interspecific Hybrid. Hereditas Vol. 119, pp. 297-300. June.

Love, B.J., and A.P. Nejadhashemi, 2011. Water Quality Impact Assessment of Large-Scale Biofuel Crops Expansion in Agricultural Regions of Michigan. Biomass and Bioenergy pp. 1-17.

Low, T., and C. Booth, 2007. The Weedy Truth About Biofuels. Invasive Species Council. October.

McIsaac, G.F., M.B. David, and C.A. Mitchell, 2010. Miscanthus and Switchgrass Production in Central Illinois: Impacts on Hydrology and Inorganic Nitrogen Leaching. Journal of Environmental Quality Vol. 39, pp. 1790-1799.

MFA Oil Biomass LLC. 2011. Confidential Project Area Proposal Aurora, Missouri.

MFA Oil Biomass LLC. 2011. Confidential Project Area Proposal Columbia, Missouri.

MFA Oil Biomass LLC. 2011. Confidential Project Area Proposal Paragould, Arkansas.

Missouri Department of Natural Resources. 2011. Air Pollution Control Program. National Ambient Air Quality Standard Area Boundary Designations. http://www.dnr.mo.gov/env/apcp/naaqsboundarydesignations.htm. Accessed 31 March 31.

Natural Resources Conservation Service (NRCS). 1999. Grassland Birds NRCS Fish and Wildlife Habitat Management Leaflet No. 8. ftp://ftp-fc.egov.usda.gov/WHMI/WEB/pdf/GRASS1.pdf. Accessed 6 October 2008.

Neukirchen, D., M. Himken, J. Lammel, U. Czypionka-Krause, and H.W. Olfs, 1999. Spatial and Temporal Distribution of the Root System and Root Nutrient Content of an Established *Miscanthus* Crop. European Journal of Agronomy Vol. 11, pp. 301-309.

Ng, T.L., J.W. Eheart, X. Cai, and F. Miguez, 2010. Modeling Miscanthus in the Soil and Water Assessment Tool 9SWAT) to Stimulate Its Water Quality Effects As a Bioenergy Crop. Environmental Science Technology Vol. 44, pp. 7138-7144.

Ohio Department of Natural Resources (ODNR). 2011a Species A to Z Guide. Ohio Department of Natural Resources Division of Wildlife. http://www.dnr.state.oh.us/Home/species_a_to_z/SpeciesGuideIndex/tabid/6491/Default.aspx. Accessed 28 March 2011.

Ohio Department of Natural Resources (ODNR). 2011b. Wetland History. Department of Natural Resources. http://www.ohiodnr.com/dnap/wetlands/history/tabid/1001/Default.aspx.

Ohio Environmental Protection Agency (OEPA). 2011. Division of Air Pollution Control. NAAQS Attainment Status. http://www.epa.state.oh.us/dapc/general/naaqs.aspx on. Accessed 01 April.

Ohio Environmental Protection Agency (OEPA). 2010. Clean Data Request. 01 April. http://www.epa.state.oh.us/dapc/SIP/annual.aspx. Accessed 05 April 2011.

Pimentel, D., and J. Krummel, 1987. Biomass Energy and Soil Erosion: Assessment of Resource Costs. Biomass Vol. 14, pp. 15-38.

Raghu, S., R.C. Anderson, C.C. Daehler, A.S. Davis, R.N. Wiedenmann, D. Simberloff, and R.N. Mack, 2006. Adding Biofuels to the Invasive Species Fire? Science Vol. 313, pp. 1742. September.

Ramsey, J., and D.W. Schemske, 1998. Pathways, Mechanisms, and Rates of Polyploid Formation in Flowering Plants. Annu. Rev. Ecol. Syst. Vol. 29, pp.467-501.

Richter, G.M., A.B. Riche, A.G. Dailey, S.A. Gezan, and D.S. Powlson, 2008. Is UK Biofuel Supply from *Miscanthus* Water-Limited? Soil Use Management Vol. 24, pp. 235-245.

Sage, R., M. Cunningham, A.J. Haughton, M.D. Mallott, D. Bohan, A. Riche, and A. Karp, 2010. The environmental impacts of biomass crops: use by birds of miscanthus in summer and winter in southwestern England. The International Journal of Avian Science. Vol. 152, pp. 487-499.

Schwarz, H., P. Liebhard, K. Ehrendorfer, and P. Ruckenbauer, 1994. The Effect of Fertilization on Yield and Quality of *Miscanthus sinensis* 'Giganteus'. Industrial Crops and Products Vol. 2, pp. 153-159.

Seaber, P. R., F.P. Kapinos, and G.L. Knapp, 2007. Hydrologic Unit Maps. U.S. Geological Survey, Water Supply Paper 2294. March. http://pubs.usgs.gov/wsp/wsp2294/. Accessed March 2011.

Smeets, E.M.W., I.M. Lewandowski, and A.P.C. Faaij, 2009. The Economical and Environmental Performance of Miscanthus and Switchgrass Production and Supply Chains in a European Setting. Renewable and Sustainable Energy Reviews Vol. 13, pp. 1230-1245.

Somerville, C., H. Youngs, C. Taylor, S.C. Davis, and S.P. Long, 2010. Feedstocks for Lignocellulosic Biofuels. Science Vol. 329, pp. 790-792. August.

Spencer, J.L., and S. Raghu, 2009. Refuge or Reservoir? The Potential Impacts of the Biofuel Crop *Miscanthus x giganteus* on a Major Pest of Maize. PLoS One Vol. 4, No. 12, pp. 8336.

Stullu, L., S. Cadoux, M. Preughomme, M-H. Jeuffroy, and N. Beaudoin, 2011. Biomass Production and Nitrogen Accumulation and Remobilisation by *Miscanthus x giganteus* as Influenced by Nitrogen Stocks in Belowground Organs. Field Crops Research Vol. 121, pp. 381-391.

Styles, D., and M.B. Jones, 2007. Energy Crops in Ireland: Quantifying the Potential Life-Cycle greenhouse Gas Reductions of Energy-Crop Electricity. Biomass and Bioenergy Vol. 31, pp. 759-772.

Taylor, David, "Re: Need HEL data for OH and PA." 29 March 2011. Email

U.S. Census Bureau. 2008. National Population Estimates. http://www.census.gov/popest/national/national.html. Accessed May 2009

U. S. of Agriculture (USDA), 2011e. USDA Agricultural Projections to 2010. Office of the Chief Economist, Long term-Projections Report OCE-2011-1. February 2011.

U. S. Department of Agriculture (USDA), Economic Research Service (ERS), 2011. Farm Household Economics and Well-Being: Farm Household Income. February.

U. S. Department of Agriculture (USDA). Economic Research Service (ERS). 2011. Farm Income and Costs: 2011 Farm Sector Income Forecast. February. http://www.ers.usda.gov/Briefing/FarmIncome/nationalestimates.htm. Accessed March 2011.

U. S. Department of Agriculture (USDA) Economic Research Service (ERS). 2008. Rural America at a Glance, 2008 edition, Economic Information Bulletin 40. http://www.ers.usda.gov/Publications/EIB40/EIB40.pdf. Accessed July 2009.

U. S. Department of Agriculture (USDA). Farm Service Agency (FSA). 2011. Conservation Program. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=rns-css. Accessed March 2011.

U.S. Department of Agriculture (USDA). Farm Services Agency (FSA). 2011a. Conservation Reserve Program Monthly Summary, February. Washington, D.C. http://www.fsa.usda.gov/Internet/FSA_File/feb2011crpstat.pdf.

U.S. Department of Agriculture (USDA). Farm Services Agency (FSA). 2011b. Biomass Crop Assistance Program (BCAP) Final Rule Provisions. Washington, D.C. http://www.fsa.usda.gov/Internet/FSA_File/bcapoctrules.pdf.

U.S. Department of Agriculture (USDA). Farm Services Agency (FSA). 2010. Final Programmatic Environmental Impact Statement for the Biomass Crop Assistance Program (BCAP). Washington, D.C.

U. S. Department of Agriculture (USDA). Farm Service Agency (FSA). 2003. Final Programmatic Environmental Impact Statement for the Conservation Reserve Program (CRP). Washington, D.C.

U. S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS). 2009. 2007 Census of Agriculture. United States Summary and State Data Vol. 1, Geographic Area Series, Part 51, pp. 1-739.

U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2011b. Ohio 11-Digit Watershed Boundaries.

U. S. Department of Agriculture (USDA), Ohio. Natural Resources Conservation Service. 2007. Soil Survey of Ashtabula County, http://soildatamart.nrcs.usda.gov/Manuscripts/OH007/0/Ashtabula.pdf. Accessed March 2011.

U. S. Department of the Interior (DOI). 2011. Water Resources of the United States, Hydrologic Unit Maps. United States Geological Survey. http://water.usgs.gov/GIS/huc.html. Accessed March 2011.

U. S. Geological Survey (USGS), 2011. Hydrologic Unit Maps. Water Resources of the United States. http://water.usgs.gov/GIS/huc.html Accessed March 2011.

U. S. Geological Survey (USGS), 2010a. National Hydrography Dataset. ftp://nhdftp.usgs.gov/DataSets/Staged/States/. Accessed March 2011.

U. S. Geological Survey (USGS), 2010b. Estimated Use of Water in the United States, 2005. http://water.usgs.gov/watuse/data/2005/index.html. Accessed March 2011.

Vanloocke, A., C.J. Bernacchi, and T.E. Twines, 2010. The Impacts of *Miscanthus x giganteus* Production on the Midwest US Hydrologic Cycle. Global Change Biology Bioenergy Vol. 2, pp. 180-191.

Zub, H.W., S. Arnoult, M. Brancourt-Hulmel, 2011. Key Traits for Biomass Production Identified in Different *Miscanthus* Species at Two Harvest Dates. Biomass and Bioenergy Vol. 35, pp. 637-651.

8 PREPARERS

Name	Organization	Experience	Project Role
Rae Lynn Schneider M.P.P, Public Policy, Harvard University, 2001 B.S., Rangeland Ecology & Management, Texas A&M University, 1997	Integrated Environmental Solutions, LLC	10 years	Project Management, Project Review
Katelyn Kowalczyk B.S., Environmental Science, Stephen F. Austin State University, 2008	Integrated Environmental Solutions, LLC	2.5 years	Affected Environment, Environmental Consequences
Ransley Welch M.S., Geoarchaeology and GIS, University of North Texas, 2008 B.A., Anthropology, University of North Texas, 2002	Integrated Environmental Solutions, LLC	6 years	GIS Analysis and Map Generation
Kimberly Suedkamp Wells Ph.D., Fisheries and Wildlife Sciences, University of Missouri, 2005 M.S., Fisheries and Wildlife Ecology, Oklahoma State University, 2000 B.S., Renewable Natural Resources, University of Arizona, 1998	ENVIRON	10 years	Mitigation and Monitoring Plan
Heather Smith B.S. Natural Resource Management, Grand Valley State University, 2007	ENVIRON	4 years	GIS support

Name	Organization	Experience	Project Role
Scott Coye-Huhn J.D. Environmental Law, University of Cincinnati Law School, 2004 M.S. W. Social Work, St. Louis University, 1998 S.W. Social Work, Xavier University, 1992	Aloterra Energy LLC	16 years	Project Sponsor, Mitigation and Monitoring Plan, Environmental Consequences
Gene Garrett Ph.D., Forest Ecology, University of Missouri, 1970 M.S., Forest Silviculture, Southern Illinois University, 1966 B.S., Forestry, Southern Illinois University, 1965	University of Missouri	30 years	Environmental Consequences
Rich Pyter M.S., University of Illinois at Champaign-Urbana, Natural Resources and Environmental Sciences, 2007 B.S., University of Illinois at Champaign-Urbana, Environmental Geology, 2003	Consultant for Aloterra Energy LLC	8 years	Environmental Consequences

9 PERSONS AND AGENCIES CONTACTED

Name	Organization/Agency
Responsible Agency Officials	
Brandon Willis	Deputy Administrator for Farm Programs, U.S. Department of Agriculture, Farm Service Agency, Conservation and Environmental Programs Division, Washington D.C.
Martin Lowenfish	Associate Director, U.S. Department of Agriculture, Farm Service Agency, Conservation and Environmental Programs Division, Washington D.C.
Matthew Ponish	National Environmental Compliance Manager , U.S. Department of Agriculture, Farm Service Agency, Conservation and Environmental Programs Division, Washington D.C.
Federal Agencies Contacted	
USDA, Agricultural Research Service	· Adam Davis, Ecologist, Global Change and Photosynthesis Research Unit, IL · Seth Dabney · Richard Lowrance, Research Ecologist, GA · John Sadler, Research Leader,, Cropping Systems and Water Quality Research Unit, MO
USDA, Animal Plant Health Inspection Service	· Neil Hoffman, Special Assistant to the Deputy Administrator
USDA, Forest Service	· Joseph Carbone, Assistant Director, Ecosystem Management Coordination - NEPA
USDA, Natural Resources Conservation Service	· Philip Barbour, PhD, Wildlife Biologist · Steve Brady, PhD, Team Leader, National Wildlife Technology Development Team · John Englert, National Plants Materials Specialist · Matt Harrington, National Environmental Coordinator · C. Wayne Honeycutt, PhD, Deputy Chief for Science and Technology · Norm Widman, National Agronomist
USDA, Rural Development	· Linda Rogers, Deputy Director, Program Support Staff
U.S. Environmental Protection Agency	Washington, D.C.
Region 1	Boston, MA
Region 2	New York, NY
Region 3	Philadelphia, PA
Region 4	Atlanta, GA
Region 5	Chicago, IL
Region 6	Dallas, TX
Region 7	Kansas City, KS
Region 8	Denver, CO
Region 9	San Francisco, CA
Region 10	Seattle, WA

Name	Organization/Agency
U.S. Fish and Wildlife Service	
Region 1	Portland, OR
Region 2	Albuquerque, NM
Region 3	Fort Snelling, MN
Region 4	Atlanta, GA
Region 5	Hadley, MA
Region 6	Denver, CO
Region 7	Anchorage, AK
Region 9	Washington, D.C.
State Agencies Contacted	
State of Arkansas	· Terry Griffin, Assistant Professor, University of Arkansas · Randy Young, Director, Arkansas Natural Resources Commission
State of Missouri	· Dennis Baird, Deputy Director of Agriculture · Don Day, University of Missouri Extension · Cerry Klein, Sustainable Advantage Director, University of Missouri · Sara Parker Pauley, Director, Department of Natural Resources · Steve Wyatt, Vice Provost for Economic Development, University of Missouri
State of Ohio	· David Marrison, County Extension Director, Ohio State University Extension – Ashtabula County
Local Officials and Interested Parties	
	· Brian Anderson, Executive Director, Growth Partnership of Ashtabula County, OH · John Armstrong, Manager, Ohio Seed Improvement Association, OH · Dale Arnold, Director, Energy Policy of Ohio Farm Bureau Federation, OH · J. Mike Brooks, President, Regional Economic Development, Inc. MO · Paula Hertwig Hopkins, Assistant City Manager, City of Columbia, MO · Blake Hurst, President, Missouri Farm Bureau Federation, MO · Tad Johnson, Director, Columbia Water and Light, Columbia, MO · Bob McDavid, Mayor, City of Columbia, MO · Sue McGowan, Director, Paragould Regional Chamber of Commerce, Paragould, AR · John Palo, Director, Conneaut Port Authority, OH · Sean Ratican, Executive Director, Ashtabula County Port Authority, OH · Jeff Roskam, Kansas Alliance for Biorefining and Bioenergy, KS · Tony Stonecypher, City Manager, City of Aurora, MO · Shannon Walker, Director Aurora Chamber of Commerce, Aurora, MO

Name	Organization/Agency
	· Randy Zook, CEO, Arkansas State Chamber of Commerce, AR
Political Officials	
	· Senator Roy Blunt · Senator John Boozman · Senator Sherrod Brown · Representative Rick Crawford · Representative Steven C. LaTourette · Senator Claire McCaskill · Senator Mark Pryor

This Page Intentionally Left Blank

APPENDICES

This Page Intentionally Left Blank

APPENDIX A – Ohio Seed Improvement Association Data Summary for Giant Miscanthus

This Page Intentionally Left Blank

OHIO SEED Improvement ASSOCIATION

6150 Avery Road, Box 477 Dublin, Ohio 43017-0477
OFFICE HOURS: MON-FRI 7:30 AM - 4:00 PM

E-Mail osia@ohseed.org
Web Site http://www.ohseed.org/

Telephone 614-889-1136 Fax 614-889-8979

March 4, 2011

Mr. Scott Coye-Huhn
Director of Business Development
Aloterra Energy, LLC
8000 Research Forest Drive Suite 115-176
The Woodlands
Texas 77382

Dear Mr. Coye-Huhn:

By way of this communiqué, I wanted to summarize the current status of Aloterra Energy's, LLC comprehensive and innovative biomass program for generating renewable fuels by way of their Miscanthus giganteus production program. Your firm has provided important leadership in moving forward with a project to create a production system for energy independence in the United States.

In 2010, the Ohio Seed Improvement Association (OSIA), admitted Aloterra Energy, LLC as a Limited member and developed a custom Quality Assurance (QA) third party program specifically for Miscanthus giganteus. The QA program involves plant material field and site inspections, genetic traceability of plant materials, record audits and use of a trademarked product logo. Furthermore, this new QA program has been submitted to the national seed certification designated authority, AOSCA (Association of Official Seed Certifying Agencies) for approval as an interim QA program. Miscanthus giganteus plant propagule production acreage in Ohio and Kansas passed QA standards in 2010 and forms the basis of a significant planting stock inventory for launching biomass production in the Midwest region.

Furthermore, from a technical standpoint it is important for all involved in biomass production to recognize that Miscanthus giganteus is a sterile triploid species that produces no viable seed. The plant is commercially grown in Europe for combustion and has been grown several years in the U.S. as an ornamental. University of Illinois, United States Department of Agriculture and independent research firms has categorized Miscanthus giganteus as having no weed or invasive risks. The species is controlled with Glyphosate herbicide.

Lastly, farmers and the energy consuming public will benefit from the efforts of Aloterra Energy, LLC to launch innovative renewable biomass projects. Support from the BCAP government program is essential to realize the important goal of providing renewable fuel and energy independence in the U.S. Best regards.

Sincerely,

John Armstrong, Sec./Mgr.

John Armstrong
Secretary/Manager

File:AloterraMar.3.11

From: John Armstrong [mailto:armstrong@ohseed.org]
Sent: Monday, April 04, 2011 8:17 AM
To: Scott Coye-Huhn
Subject: RE: IMPORTANT -please read and respond/call

Dear Scott:

Your statement below is correct. More specifically, what I have done is to monitor the flower unit of OSIA's M. x giganteus selection for pollen and seed production by observation and microscopic examination. To date neither pollen or seed has been produced. The extruded anthers of the flower unit have been shriveled in appearance and similar to what we see with male sterile seed corn inbred lines. In addition, I have observed no volunteer seedlings emerging in observation plot areas adjacent to the M. x giganteus selection.

Furthermore, the following technical references provide additional comment regarding the invasive issue:

1. CAST Commentary, QTA2007-1, November 2007, "Biofuel Feedstocks: The Risk of Future Invasions", p. 5.

2. Lewandowski, I., J. C. Clifton-Brown, J.M.O. Scurlock, and W. Huisman. 2000. Miscanthus: European experience with a novel energy crop. *Biomass Bioenergy* 19:209-227.

Best regards.

John Armstrong, Sec./Mgr.
Ohio Seed Improvement Association
61650 Avery Road P.O. 477
Dublin, Ohio 43017
Ph. 614-889-1136
Fax: 614-889-8979
Email: armstrong@ohseed.org

****

From: Scott Coye-Huhn [mailto:scoyehuhn@aloterraenergy.com]
Sent: Saturday, April 02, 2011 11:25 AM
To: John Armstrong
Subject: IMPORTANT -please read and respond/call
Importance: High

Are you comfortable with the statement below? They are basing that on your observations in your 3 year study.

The primary potential impacts of giant miscanthus establishment are expected to be the potential for the hybrid to produce fertile seed and thus spread beyond the extent of the propagation or planting acres. Based on third-party independent verification by the OSIA (OSIA

2010), the likelihood of giant miscanthus producing fertile seed and spreading beyond the enrolled fields is expected to be low. Additional weed risk assessments conducted on giant miscanthus compared to other potential bioenergy crops such as giant reed, switchgrass (*Panicum virgatum*), *Eucalyptus* species, and *Jatropha* (i.e., a deciduous succulent plant) have concluded the risk of invasiveness in the United State is low (Barney and DiTomaso 2008, Gordon et al. 2011). In the event, giant miscanthus does escape, eradication studies indicate spring tillage followed by glyphosate application was successful in eliminating 95 percent of aboveground biomass after the first application (Anderson et al. 2011).

Scott Coye-Huhn
Director of Business Development
Aloterra Energy LLC
8000 Research Forest Drive, Suite 115-176
The Woodlands, Texas 77382
713-412-5311