EASTERN TALLGRASS PRAIRIE & BIG RIVERS
LANDSCAPE CONSERVATION COOPERATIVES

FY16 BUSINESS PLAN

Focal Area: Agroecology

Conservation in Agricultural Working Lands – Integrating functional natural communities within food, fiber, and fuel production systems to provide wildlife habitat and protect water quality both locally and downstream.

A strategy prepared by LCC Technical Advisory Groups to guide immediate conservation actions to restore and connect wildlife with people on the rich soils of a functional working landscape.

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An Agricultural Heartland: Conservation in the working lands of the Midwest

The Midwest is the agricultural heartland of America with one of the largest agricultural economies in the world. Agriculture is strongly connected to the environment. Agricultural production (e.g., crop production, livestock production, agroforestry, biomass production, horticulture, aquaculture, polyculture) is critically dependent on and subject to a variety of environmental factors – rainfall, heat, pests, ozone levels and extreme events such as flooding, drought, freezing, and damaging storms. There is great interest in potential impacts of climate change on these agricultural stressors and their effects on crop production. Application of *agroecology* principles, the study of ecological processes that operate in agricultural production systems, can improve agricultural resilience to environmental stressors while increasing ecosystem service provision.

Agricultural production systems and surrounding areas provide many ecosystem services, including habitat for wildlife; however, the level of benefit is determined by management practices. Intensive activities such as tillage, drainage, irrigation, intensive grazing, and fertilizer and pesticide use have had considerable impact on the surrounding environment. Fertilizer runoff in particular has been linked to local algal blooms and to the expansion of the hypoxic zone in the Gulf of Mexico. Water management is another major conservation concern. Tens of thousands of miles of tile drainage shunt chemical, sediment, and nutrient-laden water from millions of acres of cropland and pastureland directly into incised, channelized streams that lead to the region's major rivers. During times of drought, farms may use irrigation to replace the water that was purposely removed in response to past flooding conditions. Irrigation taps into surface and underground aquifers during times when they are already taxed and slow to recover. As management intensity increases and untilled areas shrink, the value of agricultural land for plant diversity, wildlife habitat, water quality protection, and other ecosystem services decreases.

Identifying Research Needs: What do we need to know?

Economic drivers for crop production, grazing, and agroforestry opportunities provide one of the greatest hurdles for conservation on agricultural lands. Significant economic and political influence is held by agricultural interests, including farmers, land managers, technical consultants, equipment manufacturers, seed companies, chemical companies, and grain processers. Increased demand for biofuels such as ethanol has inadvertently but predictably driven fragmentation and loss of ecosystem services as even the most marginal land is converted to crop production. Political and financial constraints do not permit implementation of conservation practices on all agricultural land in the Midwest; therefore prioritization of activities and efficient allocation of resources is imperative.

To prioritize conservation efforts and allocate resources most efficiently, three major research needs must be met:

- Understand what practices return the greatest conservation value.
- Understand which physical (e.g., watersheds) and managerial (e.g., cultural practices) areas have the greatest potential for improvement.
- Understand what resources are available to support and leverage conservation efforts.

Outcomes: Why implement an integrated conservation model on working lands?

Anticipated outcomes and benefits will be quantified more precisely as the needed knowledge is secured. However, some general outcomes can be expected:

- Increased amount and quality of wildlife habitat integrated into farmland, including tallgrass prairie habitat, particularly for grassland birds and riparian species, as well as provision of migratory corridors for birds and fish passage within the Mississippi River basin.
- Water quality protection for 18 million people in the Mississippi River watershed, as well as adjacent watersheds. Reduction of contributions to the Gulf of Mexico Hypoxic Zone and improvement of the Gulf ecology and economy.
- Economically viable agriculture, increased food security, and preparedness and flexibility in the face of climate change. Engagement among producers to implement the best management practices for their fields.

The overarching strategy is to use economics and incentives to influence best management practices for habitat conservation on agricultural working lands. Traditionally, the strategy has been opportunistic – based primarily on landowner willingness to participate. Recent efforts, such as the Mississippi River Basin Healthy Watersheds Initiative (MRBI) through the Natural Resources Conservation Service and the multi-LCC Mississippi River Basin / Gulf Hypoxia Initiative, have targeted watersheds in which water quality is significantly impaired and have the greatest potential for improvement. The Agroecology TAG plans to build on the effort to prioritize resource allocation by supporting research to identify priority conservation areas and activities that will provide the greatest improvement to wildlife habitat and water quality.

Goal

Integrate functional natural communities within food, fiber, and fuel production systems to provide wildlife habitat and protect water quality both locally and downstream.

Objectives

1. Develop and promote wildlife conservation practices that: a) improve connectivity among uplands, floodplains and channels; b) enhance viability of functional ecological processes; and c) restore native prairie, oak savanna, and riverine communities as an integral part of food, fiber, and fuel production systems.
2. Develop and promote conservation practices that improve water quality and wildlife habitat within the Midwest as well as reducing downstream nutrient export to the Gulf of Mexico.

To begin to address these primary objectives, the Agroecology TAG has also identified a series of immediate strategies to be implemented.

Immediate Strategies

Agroecology Strategy 1: *Quantify the impacts of existing and emerging conservation practices and design effective strategies at multiple scales*

Assess impacts of existing and emerging agricultural technologies on multiple spatial and temporal scales and use the information to design effective conservation practices.

(a) Evaluate the environmental, social and economic impacts of existing practices as well as new technologies such as drainage management systems and alternative crops (e.g., perennial grains, biomass/biofuels).

(b) Design and promote agricultural conservation practices with multiple benefits including wildlife, water quality, and agricultural production.

Agroecology Strategy 2: *Assess and model impacts of changing land use, management practices, and climate shifts on agricultural conservation*

Collect and organize data to model impacts of changing land use, management practices, and climate shifts on agricultural conservation policies and practices at multiple landscape scales.

(a) Identify and map indicators of social capacity to motivate adoption of practices with multiple benefits through networking and extension.
(b) Use economic modeling and cost-benefit analysis to evaluate and improve incentive programs and policies that support focused conservation efforts.
(c) Expand pilot decision support tools that optimize siting of conservation practices at the local level by assessing and incorporating stakeholder perspectives.
(d) Target conservation programs spatially by using simulation tools to map and prioritize watersheds.
(e) Incorporate existing land-use change models and climate shift predictions into pilot decision support tools.

Agroecology Strategy 3: ***Promote adoption of conservation friendly farming practices and alternative land use systems.***

Understand and encourage conservation friendly farming practices and alternative land use systems by understanding and employing social and economic incentives.

(a) Determine landowner and land manager motivations and incentives or policy that influence land management decisions.
(b) Identify social indicators that reveal the capacity to network and provide extension to motivate adoption of practices with multiple benefits.
(c) Develop and promote outreach methods to assist conservation practitioners' engagement with landowners and land managers.
(d) Develop partnerships and communication systems between researchers, conservation organizations, extension services, land managers, agricultural organizations, policy makers, and others to identify barriers and promote conservation practices.

Proposed Projects: The next steps towards working lands conservation

Bio Midwest Native Prairie Biomass Initiative - A developing Midwestern initiative seeks to combine sustainably harvested biomass from native grasslands and cover crops with livestock manure and waste material from food production to produce biogas by way of anaerobic digestion. This approach has potential to establish landscape scale native prairie habitat in northern Missouri with guiding input from the conservation community on approximately 18,000 acres by 2023.

Context - The overall goal is to enhance and conserve 30 million acres in the Midwest by way of restoration of prairie cover on marginally productive cropland and exotic-grass pasture/hayland that provides little in the way of wildlife, pollinator or other ecological benefits such as water quality. Roeslein Alternative Energy (RAE) has shepherded this concept and in 2013 secured an agreement with the Missouri operations of Smithfield Foods Hog Production Division (then known as Murphy Brown-Missouri) to develop, install, own, and operate processing facilities. These facilities would capture, purify, and sell the biogas produced from the anaerobic conversion of manure generated from one of the largest hog feeding operations in North America as well as supplement the manure feedstock with biomass harvested from restored prairie grasslands.

Notably, such an effort is of national interest. The United States Department of Agriculture (USDA), Environmental Protection Agency (EPA) and United States Department of Energy (DoE) already

recognize the potential of biogas production through anaerobic digestion and their support is illuminated in the joint-agency Biogas Opportunities Roadmap Progress Report dated December 2015.

Project Details - A native grass/forb field trial/research planting to identify the best mixture of native grasses and forbs that optimize native plant diversity, ecological benefits, and biomass yield for anaerobic digestion is necessary as a proof-of-concept. This planting would also serve as a demonstration project for outreach and education targeted at interested landowners, the bioenergy industry, prospective non-governmental partners, and policymakers to better understand the potential and benefits of biogas and biomass production.

This initial demonstration project would include restoring 500 acres of cool season exotic grasses on Smithfield properties in Northwest Missouri to diverse native grasses/forbs to provide preferred nesting/brood rearing habitat, affordable energy biomass, and set the stage for a sea of land cover/management change in the Midwest.

Estimated Cost - Total project cost is estimated at $180,000 to $200,000. The Eastern Tallgrass Prairie and Big Rivers LCC would provide approximately **$90,000 - $100,000** to offset approximately 50% the total cost of establishing the field trial/research/demonstration native prairie planting. A match provided by the Missouri Department of Conservation, the National Wild Turkey Federation and other partners would provide the remainder of the required funding.

Scaling Down: The Lower Wabash Landscape Conservation Design Partnership – The Lower Wabash Landscape Conservation Design (LCD) Partnership is a group of federal, state, local, NGO, and private entities in Indiana and Illinois that self-organized to protect and conserve the natural resources and watershed of the Lower Wabash River. An application of the Conservation Blueprint being developed by seven Landscape Conservation Cooperatives (LCC) across the Mississippi River Basin would further enable this unique partnership to strategically target and invest resources to promote conservation for multiple benefits (water, agriculture, and wildlife) at multiple scales.

Context - The Lower Wabash River is one of the few remaining riverine systems in North America with a relatively natural hydrograph and hydrology. It is also responsible for approximately 11% of the total nutrient loading to the Gulf of Mexico. Nestled in the heart of a major migratory flyway and providing critical habitat for multiple species of fish and wildlife, the watershed of the Lower Wabash provides an extraordinary opportunity to implement conservation that will have a beneficial impact on wildlife and water quality while increasing agricultural resiliency and sustainability in the region.

The multi-LCC Conservation Blueprint is a spatial analysis tool created by The Conservation Fund to identify opportunities for conservation in the Mississippi River Basin. The primary goal of this tool is to enable agencies and organizations to invest resources in areas and practices that will provide multiple benefits for agriculture, water quality, and wildlife. This tool has gone through approximately a year of development, including input from hundreds of stakeholders and experts. The next step is to implement this tool on a relatively small scale (e.g., the Lower Wabash watershed); such a field trial will serve both as a demonstration of the tool's capabilities as well as a learning opportunity that will inform the future design of the Blueprint.

Cost – To be determined with guidance from stakeholders.

ETPBR LCC Agroecology Outcomes & Performance Metrics

Performance metrics reflect the outcome-based approach that LCCs are taking to produce landscapes capable of sustaining natural and cultural resources. Examples of possible landscape-scale performance metrics for the ETPBR LCC are based on the current objectives for each Focal Area, informed by the US FWS Region 3 Surrogate Species created for the ETPBR LCC and associated research (**Error! Reference source not found.**). These metrics will continue to be refined with input from Technical Advisory Groups.

Potential opportunities for collaboration with existing or emerging monitoring networks include:

- Agroecology – National Ecological Observatory Network (NEON) http://www.sciencemag.org/news/2012/09/usda-announces-long-term-agro-ecology-network

Table 1: Examples of agroecology resources with measurable goals, objectives and performance metrics.

Focal Area	Performance Metrics	Measurable Objectives
Agroecology	In addition to species listed for prairie and riverine systems, support wetland species such as Pectoral sandpiper (increase by 10% to 528,000); Marsh wren (increase by 50% to 7,500)	Develop and promote wildlife conservation practices that: a) improve connectivity among uplands, floodplains and channels; b) enhance viability of functional ecological processes; and c) restore native prairie, oak savanna, and riverine communities as an integral part of food, fiber, and fuel production systems.
Agroecology	Double proportion of farmers adopting conservation practices in locations critical for water quality and agricultural productivity (e.g., double native grass stream buffers in Illinois to 56%, C Miller 2016).	Develop and promote conservation practices that improve water quality and wildlife habitat within the Midwest as well as reducing downstream nutrient export to the Gulf of Mexico.

Focal species from the Mississippi River Basin / Gulf Hypoxia Initiative may also be appropriate indicators for the Agroecology TAG's broader efforts. They are listed below as developed in the Memphis stakeholder workshop in August 2014 with additional Work Team revision (Table 2). Further refinement is underway in that effort.

Table 2. Focal species from the Mississippi River Basin / Gulf Hypoxia Initiative as developed in the Memphis stakeholder workshop in August 2014 with additional Work Team revision.

Modified Headwaters (Row Crop Fields)	Prairie (Grazing Lands)	Forested Riparian (Mid-Sized Streams)	Mainstem Floodplains
American golden plover	Blue-winged teal	American woodcock	Acadian flycatcher
Blue-winged teal	Bobolink	American redstart	Alligator gar
Blackside darter	Dickcissel	Belted kingfisher	Cerulean warbler
Brown trout	Gadwall	Black redhorse	Kentucky warbler
Crawfish frog	Grasshopper sparrow	Blue-gray gnatcatcher	Mudpuppy

Creek chub Johnny darter Leopard frog Monarch butterfly Pollinators (native bees) Sculpin Topeka shiner Wild rice Fish IBI Macroinvertebrate IBI	Henslow's sparrow Horned lark Killdeer Loggerhead shrike Meadowlarks Monarch butterfly Plains pocket gopher Prairie vole Upland sandpiper Topeka shiner Floristic Quality Index	Copper-bellied watersnake Cyanobacteria Mussels Pugnose minnow Red-eyed vireo River redhorse Shovelnose sturgeon Smallmouth bass Fish IBI Macroinvertebrate IBI	Mussels Palaemonetes shrimp Prothonotary warbler Red-headed woodpecker Swainson's warbler Swallow-tailed kite Tree or Barn swallows Wood duck Wood thrush Forest breeding songbirds Wintering waterfowl