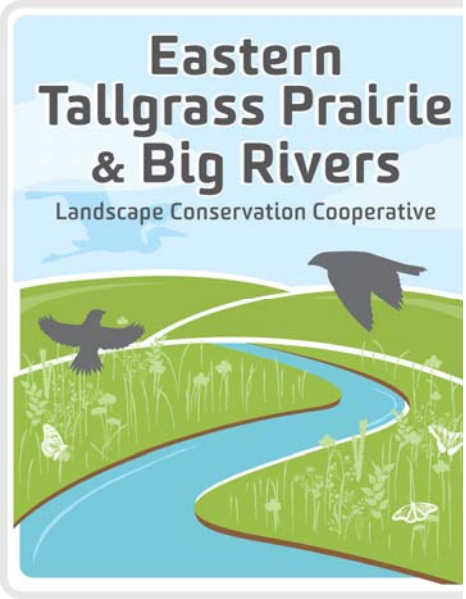
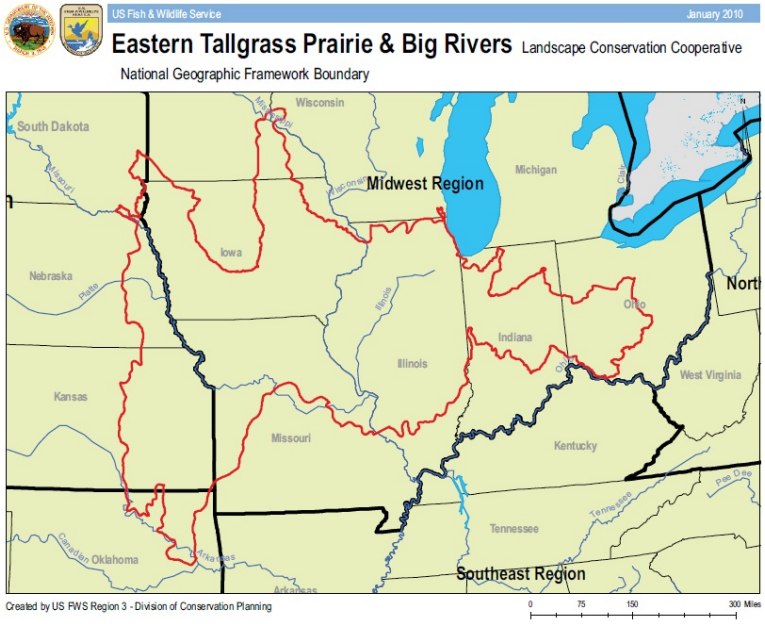
Operations & Strategic Plan: 2013-2020

Revised November 2015





Steering Committee Co-Chairs:
Kelley Myers, Iowa DNR
Charlie Wooley, US FWS Region 3

Prepared by:
Glen Salmon, LCC Coordinator, glen_salmon@fws.gov, 812-334-4261 x1212
Gwen White, Science Coordinator, gwen_white@fws.gov, 812-212-7455

NOTE TO REVIEWERS: *The DRAFT goals, objectives and preliminary strategies herein are based on continuous input from the Steering Committee and stakeholders. This section will remain dynamically updated based on dialogue with stakeholders. The four Focal Area Technical Advisory Groups (TAGs) and Steering Committee will refine and prioritize these items as decision-making opportunities arise. We welcome <u>your</u> <u>input</u> on priority Science Needs to guide research for advancing conservation management in the context of landscape-scale changes.*

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Executive Summary – ETPBR LCC Operations & Strategic Plan

LCC Description and History

Tallgrass prairie once covered 170 million acres of North America. Within a generation the vast majority was developed and plowed under. Today less than 4% remains. This region also bisects the largest river system in the U.S.—the Mississippi River basin, which in total encompasses nearly 300,000 acres of lands predominantly in private ownership. Runoff from agricultural and urban land use in the basin impairs wildlife habitat and water quality within the region as well as contributing significantly to the Gulf of Mexico hypoxic zone downriver.

Agricultural crop and livestock production are the predominant uses of this area, but many acres in small and large plots provide habitat for a wide variety of aquatic and terrestrial wildlife on both public and private lands. Most of the larger cities were founded on rivers, which provided water, transportation, recreation, and other benefits.

Climate controls extremes of temperature, drought and flooding that affect human and wildlife survival. How these future conditions will change, limit natural resources and what needs to be done to promote adaptation requires additional examination, conservation design and implementation.

LCCs collectively form a national network of land, water, wildlife, and cultural resource managers, scientists, and interested public and private organizations—within the U.S. and across our international borders—that share a common need for applied research to inform conservation management decisions. Collaboration can produce bottom-line benefits, including:

1. Better problem solving;
2. Greater productivity; and
3. More effective use of resources.

LCCs are true cooperatives that ensure partners have shared access to science, data, expertise and resources. Working together through the LCC structure helps to limit duplication of effort, and provide scientific and technical support to inform landscape-scale conservation using adaptive management principles (known as Strategic Habitat Conservation in the USFWS). LCCs do not deliver on-the-ground conservation. That's up to the States, the federal agencies and other partners.

The Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative (LCC) is dedicated to addressing the conservation challenges of a heavily agricultural landscape that stretches across the nation's heartland from southwest Ohio westward across to parts of eastern Kansas, Oklahoma and Nebraska and northward into segments of Iowa, South Dakota and Minnesota.

In December 2012, the LCC Steering Committee began drafting a strategic plan to provide a foundation and structure to carry out the mission and vision of the LCC and its partners. This strategic plan positions LCC members as leaders for regional conservation, identifies the natural resources challenges we are up against, and sets forth a vision, mission and guiding principles to encourage growth and maturity for the partnership.

The strategic plan also identifies habitats, focal areas and subregional differences capturing the cultural, social and ecological significance of natural resources across the landscape. These focal areas—and goals, objectives and strategies developed around them—were generated through discussion by steering committee members in September 2012 followed by further refinement in conference calls, informed by discussions with stakeholders.

Steering Committee

The following individuals provide leadership as the ETPBR LCC Steering Committee. Representatives from South Dakota, Minnesota, Wisconsin and Oklahoma are also invited to participate as small portions of the LCC geography extend into those states.

ETPBR LCC Steering Committee gathered for winter retreat in Dubuque, IA, January 2013

Co-Chairs:

- Kelley Myers, Iowa DNR, Co-Chair ETPBR LCC SC
- Charles Wooley, FWS Region 3, Co-Chair ETPBR LCC SC

NGO:

- Brian Anderson, Illinois Natural History Survey
- Paul Botts, Chicago Wilderness
- David Brakhage, Ducks Unlimited
- Dan Cornelius, Intertribal Agriculture Council
- Aaron Kuehl, Pheasants Forever
- Joe Larscheid, Fish Habitat Partnerships
- John Shuey, The Nature Conservancy
- John Silovsky, Upper Mississippi River and Great Lakes Joint Venture

State:

- Jeff Burris, Ohio Division of Wildlife
- Jim Gillespie, Iowa Department of Agriculture and Land Stewardship
- Richard Hatcher, Oklahoma
- Greg Hoch, Minnesota Department of Natural Resources
- David Kohler, Ohio Division of Wildlife
- Mark Reiter, Indiana Division of Fish and Wildlife
- Wayne Rosenthal, Illinois Department of Natural Resources
- Janet Sternburg, Missouri Department of Conservation
- Roger Wolfe, Kansas Department of Parks, Wildlife and Tourism

Federal:

- Ken Barr, US Army Corps of Engineers
- Bob Clevenstine, FWS National Wildlife Refuges
- Ivan Dozier, Natural Resources Conservation Service
- Chris Holbeck, National Park Service
- Skip Hyberg, USDA Farm Services Agency
- Ted Lagrange, Nebraska Game and Parks Commission

Michael Langston, USGS South Central Climate Science Center
Alan Lewitus, NOAA
Janette Marsh, US Environmental Protection Agency
Jeffrey Morisette, USGS North Central Climate Science Center
Jeremy Peichel, US Forest Service
Robert Swanson, US Geological Survey
Michelle Staudinger, USGS Northeast Climate Science Center
Steve Torbit / Will Meeks, FWS Region 6

Science Team

How can the LCC flourish in an era of rapid change? Build a strategy network (Kotter, 2012) that brings vision, opportunity, agility and inspired action from the community with this strategic approach:

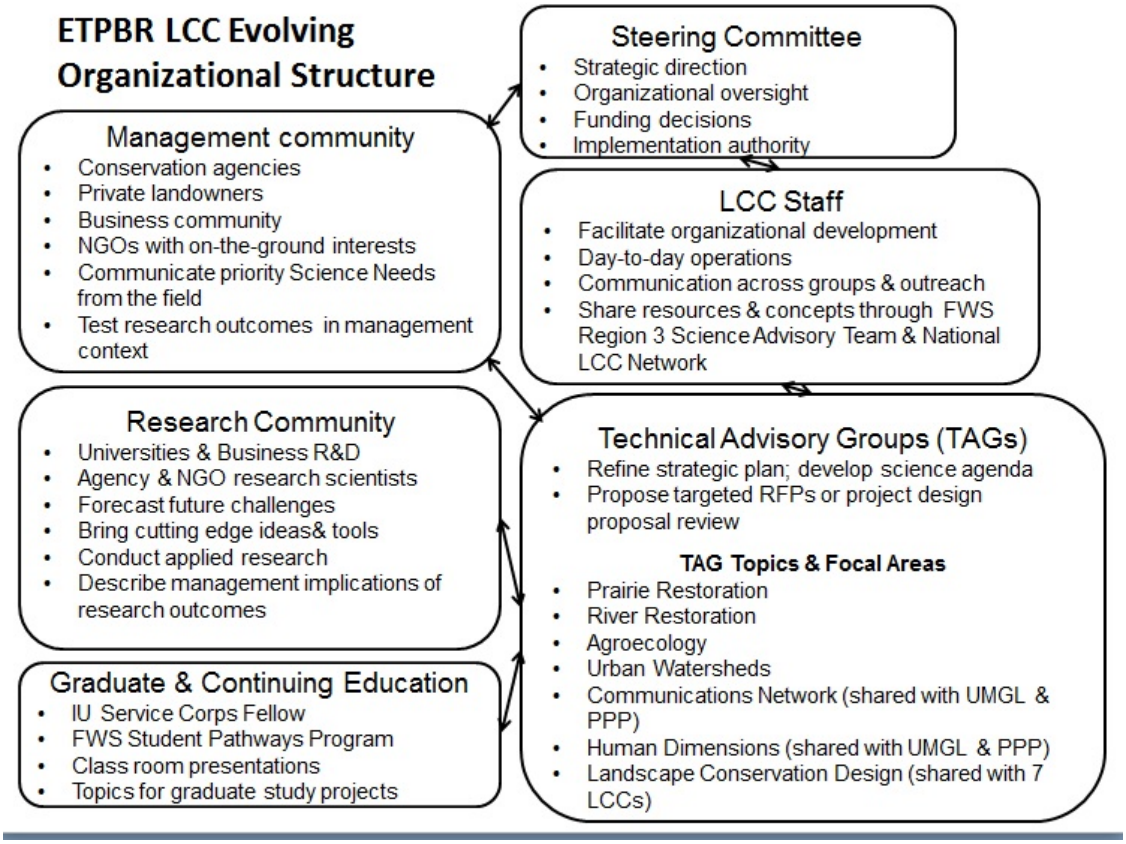
- Convene many change agents from within the ranks.
- Draw attention to front-line concerns.
- View the future from multiple angles.
- Focus passion and intelligence on the biggest opportunities.
- Think creatively to solve wicked problems.
- Eliminate collaborative barriers between organizations.
- Promote a useful flow of information and activity.

Four focal area Technical Advisory Groups (TAGs), supported by a Communications Network and a Human Dimensions TAG, together form a "Science Team" community to provide strategic networking and to recommend priority science needs to the Steering Committee for the LCC to pursue (Figure 1). Other focal areas and project teams may be created as needed, some of which may be shared with other LCCs.

Staff:

Glen Salmon	ETPBR LCC Coordinator, USFWS
Gwen White	ETPBR Science Coordinator, USFWS
Georgia Parham	External Affairs, USFWS
Bob Clevenstine	Advisory Committee Representative, USFWS Refuges
John Rogner	UMGL LCC Coordinator, USFWS
Jamie Ellis	Prairie TAG Coordinator, INHS
Lama BouFajreldin	River TAG Coordinator, INHS
Andrew Stephenson	Agroecology TAG Coordinator, Univ Northern Iowa
Craig Miller	Human Dimensions Network Coordinator, INHS
Megan Cross	Human Dimensions Research, US FWS Pathways Student
Kristin Shaw	Ecological Places in Cities: EPIC, US FWS Pathways Student
Jorgen Rose	Mississippi Basin / Gulf Hypoxia Initiative, IU Service Corps Fellow

Figure 1. Organizational structure for community participation in the ETPBR LCC.



Vision of the Eastern Tallgrass Prairie & Big Rivers LCC

Functional tallgrass prairie and big rivers natural communities embedded in a healthy and productive agricultural and urban landscape—ecologically connected lands and waters, managed cooperatively for current and future generations.

Vision description:

- Sustain interconnected human and wildlife communities supported by the productive soils of the eastern tallgrass prairie and wealth of big river ecosystems across the region through:

    - Healthy tallgrass prairie and big river ecosystems that sustain a full complement of species, habitats and community processes for their intrinsic worth and for services they provide to current and future generations.
    - Effectively address the intensifying threats that lead to landscape degradation.
    - Protect water quality from here to the Gulf of Mexico.
    - Use best management practices on agricultural and urban working lands that contribute to the viability of natural and cultural resources within a functional landscape.
    - Engage landowners and the public in a balanced appreciation for and understanding of their responsibility for cooperatively managing interconnected ecosystems.

Mission of the Eastern Tallgrass Prairie & Big Rivers LCC

The ETPBR LCC coordinates among many partners across the eastern tallgrass prairie and big river ecosystems in portions of 11 states (eastern Nebraska, Kansas, Oklahoma, and South Dakota, central portions of Iowa, Missouri, Illinois, Indiana, western Ohio, along with small southern sections in Minnesota and Wisconsin) to:

1) Understand the consequences of landscape-scale change;
2) Develop common landscape-level conservation objectives and strategies; and
3) Produce pragmatic science that addresses current and future environmental stressors.

Guiding principles

Work supported by the ETPBR LCC will be conducted according to the following principles:

- Regional / scalable
- Pragmatic
- Collaborative
- Consistent
- Science-based
- Transparent

Challenges

- *Characterized by:* extreme stress, dynamic economics, intensive agricultural and urban land use
- *Desired qualities:* adaptable, sustainable, resilient
- *Landscape stressors*
    - Climate change
    - Invasive species and diseases
    - Cropping changes
    - Declining upland grasslands
    - Urbanization
    - Lack of large restorations
    - Agriculture nutrient and sediment runoff (Gulf of Mexico hypoxia)
    - Demand for water
    - Altered streams, rivers and wetlands
- *Social drivers*
    - Land use
    - Economics (food, fiber, fuel)
    - Organizational relationships

Functional Landscapes

Functional landscapes may be defined as lands and waters with the properties and elements required to support desirable populations of fish and wildlife, while also providing human society with desired goods and services, including food, fiber, water, energy, and living space (FWS Surrogate Species Technical Guidance, page 10).

Vistas *– Expansive restoration sites and big river systems that represent the iconic and historic landscapes of the region.*

Gems *– Scattered pockets of biodiversity that remain tucked among the working lands of a region largely dominated by agriculture and urbanization.*

The LCC has identified key habitats that support a functional landscape for fish and wildlife species in the ETPBR. The ETPBR LCC will focus on a specialized niche of tallgrass prairie and big river ecosystem management, while adapting approaches from other LCCs as appropriate for associated wetland and woodland habitats in this region.

Key Habitats

- *Tallgrass Prairie* – emphasis on upland grasslands, including associated wetlands and woodlands.
- *Big Rivers* – emphasis on floodplain and channel connections, including watershed impacts.
- *Associated habitats* – adapt approaches from adjoining LCCs as appropriate.
    - Adapt wetland science from Plains & Prairie Potholes LCC, Upper Mississippi/Great Lakes Joint Venture, and Playa Joint Venture, especially for western portions of the ETPBR LCC.
    - Adapt woodland science from Appalachian LCC and Gulf Coastal Plains & Ozarks LCC, especially for Eastern hardwood tillplain forest in Indiana and Ohio

Focal Area descriptions:

To conserve tallgrass prairie and river habitats, the LCC will also focus on large and small-scale restoration within the dominant land uses in the region—both agricultural and urban. The four focal areas and supporting technical expertise include:

1) **Prairie Restoration Techniques** – Develop and connect functional tallgrass prairie ecosystems.
2) **River Restoration Techniques** – Develop and connect functional big river ecosystems.
3) **Agroecology Conservation Practices** – Use economics and incentives to influence best management practices for habitat conservation on agricultural working lands, particularly as they affect the Gulf of Mexico hypoxic zone.
4) **Urban (Ecological Places in Cities: EPIC)** – Promote big river systems as a resource for green infrastructure and human connection to waterways and wildlife habitats in cities, suburbs and small towns.
5) **Communications Network** – Marketing, public relations, and outreach in support of Midwest landscape conservation issues.
6) **Human Dimensions Network** – Research, management and policy implications of social sciences in support of the four focal areas.

Operational Frameworks for Collaboration and Decision-Making

The Steering Committee has adopted a set of systematic frameworks for collaboration and decision-making, including Collective Impact, Strategic Habitat Conservation (SHC), Structured Decision Making (SDM) and preliminary criteria for project selection.

Collective Impact Across the Landscape

Collective Impact (Kania and Kramer, 2011) is more rigorous and specific than collaboration among organizations and may present a very applicable model for LCC partner relationships.

There are five conditions that, together, lead to meaningful results from Collective Impact:

1. *Common Agenda* - All participants have a shared vision for change including a common understanding of the problem and a joint approach to solving it through agreed upon actions.

2. *Shared Measurement* - Collecting data and measuring results consistently across all participants ensures efforts remain aligned and participants hold each other accountable.

3. *Mutually Reinforcing Activities* - Participant activities must be differentiated while still being coordinated through a mutually reinforcing plan of action.

4. *Continuous Communication* - Consistent and open communication is needed across the many players to build trust, assure mutual objectives, and appreciate common motivation.

5. *Backbone Organization* - Creating and managing collective impact requires a separate organization(s) with staff and a specific set of skills to serve as the backbone for the entire initiative and coordinate participating organizations and agencies.

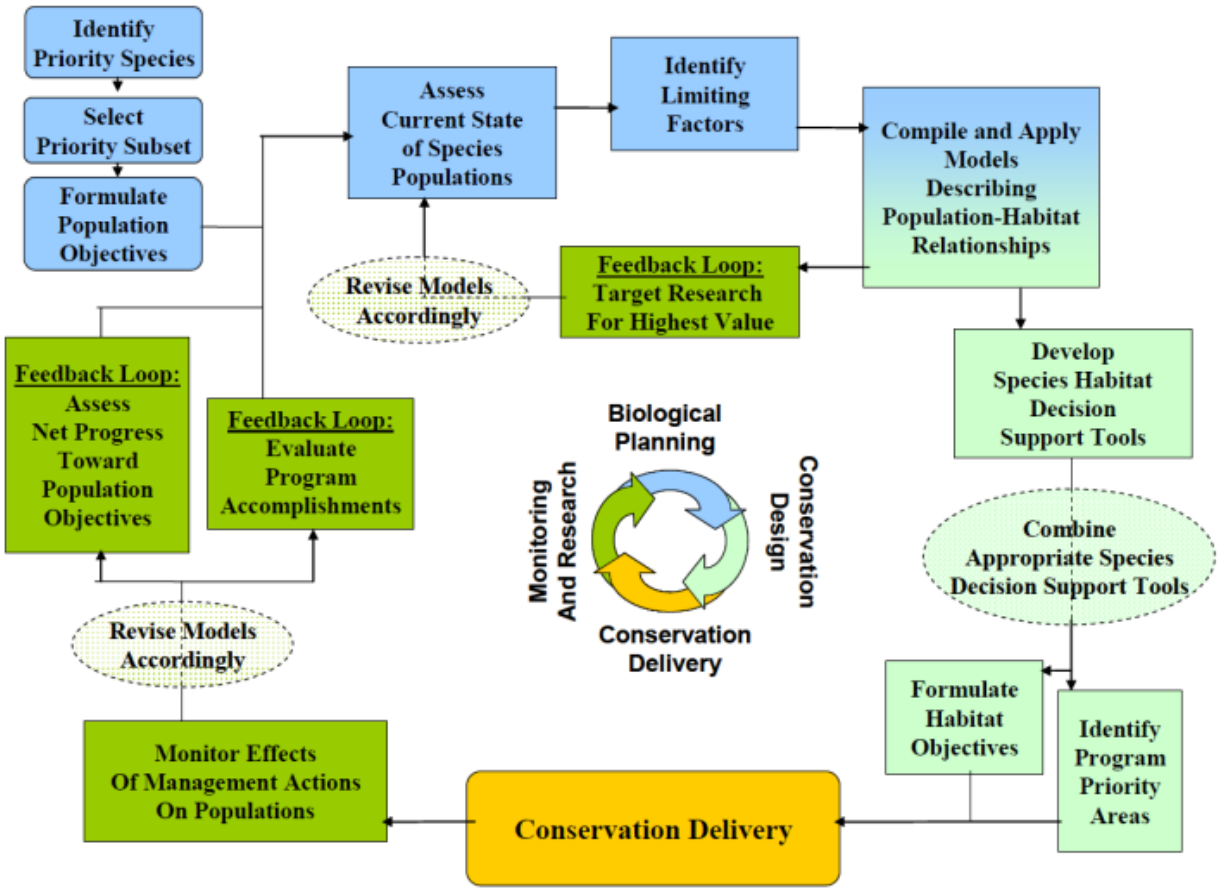
Strategic Habitat Conservation (SHC)

Strategic Habitat Conservation provides an iterative process of adaptive management supported by information management. Therefore, the strategies within the ETPBR LCC strategic plan are categorized according to the following SHC framework components:

1) Biological planning guided by assumption-driven research through assessment (AS) and goal setting (GS) to identify and prioritize problems that will guide targeted conservation design solutions;
2) Program delivery (DE) of conservation actions that implement solutions;
3) Outcome-based monitoring (MO) to evaluate outcomes through research that will guide iterative improvement; and
4) Information management (IM) using data, models and communications to track and support performance.

Agencies and organizations use representative species to iteratively evaluate the effectiveness of conservation actions in an adaptive management context. The US FWS is working with stakeholders to explore the development of a surrogate species approach to provide a consistent and efficient regional mechanism for biological planning and monitoring across the LCC.

Figure 2. Model for identifying research needs for natural resource management (Science Needs) within the context of Strategic Habitat Conservation.



Baseline information and periodic re-evaluation is essential for adaptive management. The ETPBR LCC will need to evaluate and use the information available for developing models for conservation planning, delivery and evaluation, which may include:

1) Identification of species of interest in the LCC, key habitats supporting those species, the condition of components within those habitats (quantity, quality, and distribution), and alternative actions that may influence habitat condition as a baseline for measuring change due to the influence of LCC efforts;
2) Population objectives (e.g., surrogate species) translated into habitat objectives and/or other metric(s) to measure LCC success in an SHC context; and
3) A retrospective landscape-change assessment to help LCC partners determine cover species and habitat trends, set realistic conservation objectives, and more effectively allocate limited resources when targeting conservation actions.

As this information is refined through evaluation, that data will feed iteratively improved models for decision-making within the focal areas selected by the LCC.

Structured Decision Making (SDM)

The LCC TAGs and Steering Committee may use Structured Decision Making (SDM) as a framework to guide rapid prototyping and further refinement of models that guide conservation design and implementation when a complex decision must be made with incomplete information. SDM consists of the following steps (abbreviated with the mnemonic "ProACT"):

1) Defining the **Pr**oblem – Describe the desired outcome (Functional Landscape) across the ETPBR LCC region.
2) **O**bjectives – Outline and prioritize Conservation Objectives (Values) for each stakeholder.
3) **A**lternatives – Identify Alternative Management Actions that meet operational Constraints (e.g., budget, legal, socioeconomic).
4) **C**onsequences – Use models (Consequence Table) to evaluate the predicted effect of each management alternative on stakeholder objectives.
5) **T**rade-offs and Optimization – Conduct a sensitivity analysis to determine how uncertainties affect decisions and select the portfolio of actions that best addresses high priority objectives within the constraints.

SDM supports decisions that are transparent, explicit, deliberative, documented, and replicable where inadequate information is available to make a perfect choice. Therefore, the LCC may use this framework to identify Science Needs that address key uncertainties or which measure impacts of actions to iteratively improve the selection and delivery of effective conservation actions.

Preliminary Criteria for ETPBR LCC Science Needs Priorities

The LCC Steering Committee developed a preliminary list of criteria for identifying Science Priorities that are appropriate for ETPBR LCC projects.

NOTE: *This list will be further refined by a Criteria Subteam to guide science needs recommendations from the four Technical Advisory Groups.*

Priorities for ETPBR LCC Science Needs (draft)

Project selection may meet the following criteria. We reorganized the preliminary list of bullets within the Guiding Principles established by the ETPBR LCC Steering Committee.

- **Regional/Scalable**
  - **Geographic basis in watersheds -** Has a geographic basis in watersheds identified as high priority for Gulf hypoxia nutrient management.
  - **Crosses multiple focal areas -** Crosses multiple focal areas (prairie, river, agroecology, urban).
  - **Demonstrations with broad application -** Demonstrations that can be applied more broadly across the region.
- **Pragmatic & Science-based**
  - **Focuses on feasible solutions** - Focuses on solutions, including what kind of cumulative management action is "enough" to solve wildlife problems.
  - **Addresses uncertainty in decision-making -** Addresses uncertainty in management decision framework.

- **Recognizes both wildlife and intensive uses** - Recognizes the need for both wildlife and agriculture—not just preservation but also accommodating intensive uses by agriculture and urbanization.
- **Connects people to nature** - Enhances connectivity to communities by restoring connection between people and wildlife/habitat.

- **Collaborative**
  - **Locally supported** - Has local support for advocacy and ownership.
  - **Leverages resources** – Leverages resources for broader partnerships, filling the gaps in knowledge and resources without supplementing federal budgets or duplicating federal programs.
  - **Builds on success of existing programs** - Builds on and supports success of existing programs by influencing policy over the long-term, addressing program restrictions with creative approaches and/or extending participation to more landowners.
- **Transparent**
  - **Evaluates effectiveness** - Actions are measured to evaluate effectiveness.
  - **Articulates results simply** - Results can be articulated simply for key LCC audiences.

Goals, Primary Objectives & Preliminary Strategies

Within each Focal Area and for each aspect of the Conservation Framework, where can the LCC add value? What needs to happen to get there?

NOTE: *These DRAFT goals, objectives and preliminary strategies are based on continuous input from the Steering Committee and stakeholders. Over the next several months, this section will remain dynamically updated based on dialogue with stakeholders. The four Focal Area Technical Advisory Groups (TAGs) and Steering Committee will refine and prioritize these items as decision-making opportunities arise.*

We welcome <u>your input</u> on priority Science Needs to guide research for advancing conservation management in the context of landscape-scale changes.

For more details on the strategies, see the full version of the Strategic Plan.

Inventory of Stakeholder Priorities (overview)

Focal Area #1: Prairie Restoration Techniques

Prairie Restoration Goal:

Determine where and how to focus prairie restoration for biodiversity conservation, taking advantage of both large-scale and small-scale opportunities (vistas and gems).

Prairie Restoration Objectives:

- Restore large areas of prairie ecosystems that provide wildlife habitat, particularly to reverse the decline in grassland birds (vistas).
- Protect, connect and expand remnant prairies to increase genetic diversity in local ecotypes (gems).
- Promote landowner appreciation for and management of native prairie ecosystems.

Prairie Restoration Strategies:

What are the current and future conditions for prairie restoration? How do we set common goals?

- **Inventory existing prairie restoration efforts -** Increase organizational capacity and knowledge about existing prairie restoration efforts and opportunities, including an inventory of existing prairie restoration assessment models, a database of existing conservation lands, identification of priority sites, and enhanced organizational capacity by developing a community of practice.
- **Regional conservation planning** – Refine the inputs and expand conservation plans to a regional multi-state scale that addresses climate adaptation and other landscape-scale stressors by adopting existing applicable goals, updating spatial data, and linking restoration plans at a regional scale, based on:
    - **Prairie conservation design principles** - Develop a set of tallgrass prairie conservation design principles that incorporates variations in practice, wildlife objectives, land use context, shape and size, synergism among organizational priorities, and adaptation to climate change.
    - **Targeting conservation for critical guilds and species** – Compile and select guilds of greatest concern to target prairie conservation, possibly using grassland bird communities as surrogate species, to include some less mobile species (not just birds) and recognizing that some bird populations operate at very large scales that are difficult to manage alone as a region.
    - **Decision-making models to reverse decline in grassland birds with targeted conservation actions** - Build strategic decision-making models to prioritize actions to reverse the declining trend in grassland birds, as a surrogate for other prairie species.
- **Project tracking system** – Develop a standardized project record form, complete and compile information through an online database to track prairie reconstruction projects conducted by any organization or individual, including initial conditions, practices, and outcomes.

How can prairie restoration techniques improve?

- **Improve restoration techniques** – Improve restoration techniques where uncertainty limits management techniques, such as targeting critical guilds/species, improving establishment methods including seed mix and site preparation, increasing availability of local ecotype plants, considering influence of soils on success, tracking wildlife response, and improving post-planting management including communication with operations staff.

What will motivate effective implementation of conservation practices?

- **Prairie Restoration BMP Handbook** - Develop and promote use of a Handbook of Prairie Restoration Best Management Practices (BMPs).
- **Simulation tools for prairie restoration** – Develop simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations <u>at scales from the regional to the local level</u> for prairie restoration

that show scenario-based outcomes for wildlife habitat and water quality benefits, similar to tools under development for wetlands.

- **Education on native prairie landscaping** – Educate property managers to the benefits of landscaping with native prairie plants, especially under extremes of drought and flooding due to climate shifts, including landscaping design guidelines, listing of local sources of plant material, and curriculum for outdoor learning school programs.

Focal Area #2: River Restoration Techniques

River Restoration Goal:

Determine where and how to focus big river ecosystem restoration for biodiversity conservation, taking advantage of both large-scale and small-scale opportunities (vistas and gems).

River Restoration Objectives:

- Restore long stretches of free-flowing and interconnected big river ecosystems (vistas).
- Protect, connect and expand existing intact free-flowing and interconnected short segments of large rivers and small headwaters (gems).
- Enhance connectivity between upland and lowland habitats along big river corridors.
- Promote appreciation among water users for design and management of functional riverine ecosystems.

River Restoration Strategies:

What are the current and future conditions for river restoration? How do we set common goals?

- **Inventory existing river restoration efforts -** Increase organizational capacity and knowledge about existing big river ecosystem restoration efforts and opportunities, including an inventory of existing river restoration goals and assessment models, a database of existing conservation lands, identification of priority sites, and enhanced organizational capacity by developing a community of practice.
- **Regional conservation planning** – Refine the inputs and expand river corridor conservation plans to a regional multi-state scale that addresses climate adaptation and other landscape-scale stressors by adopting existing applicable goals, updating spatial data, and linking restoration plans across the region, based on:
    - **River conservation design principles** - Develop a set of river conservation design principles that incorporates variations in practice, wildlife objectives, land use context, shape and size, synergism among organizational priorities, and adaptation to climate change.
    - **Targeting conservation for critical guilds and species** – Compile and select sensitive species guilds of imperiled populations of federally- and state-listed species (SGCN) for big river ecosystems to include some less mobile species and recognizing that some migratory populations operate at very large scales that are difficult to manage as a region (e.g., waterfowl, shorebirds, pallid sturgeon).
    - **Decision-making models to control invasive species in rivers** - Build strategic decision-making models to prioritize actions to control aquatic and riparian invasive species, such as Asian carp and Asian bush honeysuckle.
- **Project tracking system** – Develop a standardized project record form, complete and compile information through an online database to track river reconstruction projects conducted by any organization or individual, including initial conditions, practices, and outcomes.

How can big river restoration techniques improve?

- **Improve river restoration techniques** – Improve restoration techniques where uncertainty limits management techniques, such as targeting critical guilds/species (e.g., waterfowl, shorebirds, mussels, pallid sturgeon), restoring aquatic habitats (e.g., shallow water habitat, chute design, flow regulation, and early life history of pallid sturgeon) and mitigating human impacts (e.g., shoreline erosion, energy development, intake diversion dams for irrigation, fish bypass, water withdrawal intake, improve water quality to better support habitat for sensitive species).

What will motivate effective implementation of big river conservation practices?

- **Simulation tools for river restoration** – Develop simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations at scales from the regional to the local level for river restoration that show scenario-based outcomes for wildlife habitat and water quality benefits, similar to tools under development for wetlands.
- **River Restoration BMP Clearinghouse** - Develop and promote use of a clearinghouse of River Restoration Best Management Practices (BMPs) for mitigating negative impacts of water withdrawal, drainage and flood control infrastructure, along with increased connectivity at large scales and adapting to climate change and other large-scale stressors.

Focal Area #3: Agroecology Conservation Practices

Agroecology Goal:

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

Agroecology Objectives:

- 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 and riverine communities as an integral part of food, fiber and fuel production systems.
- 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 hypoxic zone.

Agroecology Strategies:

What to do and where to do it?

- **Relate wildlife habitat to nutrient runoff budgets** – Provide guidance for strategies that can be implemented at a scale that will produce meaningful improvements in water quality as well as produce significant improvements in wildlife habitat for aquatic and terrestrial species, including:
    - **Benefits of prairie grasses** – Conduct field-based studies to quantify comparative benefits of conservation practices such as grassed waterways, buffer strips or water and sediment control basins planted with cool season grasses (fescue) compared to warm season grasses (native prairie) to calibrate models for the lower Midwest, possibly working with the NRCS Conservation Effects Assessment Project (CEAP), with particular attention to:

    a) Assist landowners who have remnant prairies with management practices to provide local ecotype seed sources;
    b) Modify grassland plantings for grazing to include native prairie species; and
    c) Support roadside ditches for native prairie that attracts pollinators and grassland birds.
  - **Benefits of drainage design** – Promote non-point source reduction strategies that address instream habitat quality and can reduce peak flows from agricultural drainage systems that degrade downstream habitats and increase flood damage to urban and rural landscapes.
- **Effects of climate change on agricultural conservation** – Determine potential effects of climate change on agricultural production (shifts in crops, livestock and conservation practices), growing seasons, water availability and storm flow, water quality and nutrient transport, and capacity for creating and distributing predictive information.
- **Map high priority agricultural conservation areas** – Map existing participation of landowners in Farm Bill wildlife habitat programs relative to the location of major contributing areas for Gulf hypoxia (e.g., outputs of SPARROW models) and identify high priority hot spots for wildlife habitat conservation practices that reduce nutrient loading.
  - Work with USGS, NRCS and the Mississippi River Basin Initiative (MRBI) to identify watersheds that contribute high volumes of nitrogen, phosphorus and sediment to the Gulf.
  - Target these watersheds using the full set of traditional and new conservation practices.
  - In targeted watersheds, pay particular attention to installing water control structures, constructed wetlands, saturated buffers, and bioreactors on tile drainage systems where practices are appropriate and will provide reduced nutrient loads.
- **Utilize simulation tools for siting agroecology BMPs –** Develop and utilize simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations at scales from the regional to the local level for implementing conservation BMPs or acquiring existing habitat by showing scenario-based predicted outcomes for wildlife habitat and water quality benefits.

What will motivate agricultural producers to implement conservation practices?

- **Boost economic drivers for wildlife habitat conservation -** Determine incremental cost/benefits and provide strategies that would give an economic edge to implementation of effective non-point source abatement conservation practices, especially those that also enhance upland grasslands and riverine, floodplain and wetland ecosystems.
  - **Systematic conservation stewardship recognition** - Develop a rating system, similar to LEED certification, that functions as a sustainability market driver for agriculture that builds on pride in visible signs of good farming (e.g., traditionally straight rows and no weeds) by recognizing land stewards who implement wildlife-friendly conservation practices that improve water quality.
  - **Production protocols for grassland bird conservation –** Develop incentives and promote grassland bird conservation in agricultural systems, especially for grazing practices with livestock producers.
- **Promote the most effective wildlife habitat and water quality practices** – Accelerate marketing of a "top 10" list of wildlife habitat conservation practices that are most effective in reducing nutrient loading to landowners and agriculture-related industries in key physical, economic and social positions for improving water quality.

- **Values of wildlife for landowners –** Enhance marketing capacity to:
  a) Promote the value of wildlife conservation practices for landowners using the existing Whole Farm Conservation Planning process, peer-to-peer on-farm networks, and other trusted information conduits; and
  b) Reduce noncompliance with Farm Bill wildlife habitat conservation practices.
- **Values of conservation for agricultural industries -** Market wildlife habitat conservation benefits to large agricultural industries (e.g., agrochemical and precision farm equipment companies) through data on impacts of wildlife conservation practices on soil health and water quality.
- **Enhanced technical assistance** - Utilize enhanced technical assistance to:
  a) Evaluate specific agricultural conditions and improve techniques to keep fertilizer on the field through practices such as timing of application, form used and placement of the product.
  b) Work with agricultural drainage specialists with USDA technical service provider certification to identify willing participants.

Focal Area #4: Urban Conservation Practices (Ecological Places in Cities: EPIC)

Urban Watersheds Goal:

Integrate urban land development and wildlife conservation in an interconnected river system in small towns, suburbs and large cities.

Urban Watersheds Objectives:

- Build on re-orientation of cities to their waterfronts to promote local wildlife habitat and outdoor recreation.
- Utilize river systems as the foundation for incorporating functional wildlife corridors in green infrastructure plans.
- Design urban, suburban and small estate developments to accommodate conservation of prairie and river systems in urban green spaces.
- Enhance viability of small towns by attracting tourists and businesses to areas to recreational activities at local prairie and river restoration sites.

Urban Watersheds Strategies:

What are the ecological and economic benefits of river corridors?

- **Water resource demands** – Determine ecological and economic value of water resources, including current and future availability and demands for wildlife and human use (e.g., tourism, quality of life, attractiveness for employees and business relocation) as well as potential impacts of shifts and extreme events due to climate change projections.
- **Ecological and economic benefits of urban river restoration** – Quantify the ecological and economic benefits of restored riverine ecosystems for recreation and business development, water availability during peak demand in droughts, including accommodating wildlife habitat in riparian, floodplain and off-channel areas, within levee systems and in storm water management practices.
- **Stream classification and channel dynamics** – Improve recommendations for best management practices and identify opportunities to incorporate habitat for wetland and stream-dependent fish and wildlife that reflect principles of stream channel dynamics in land use planning, given implications of extreme weather events for protection of human structures and wildlife habitat.

How can we conserve riverine habitat in the built environment?

- **Regional green infrastructure planning** – Encourage development of green infrastructure plans that incorporate protection of water quality and quantity for wildlife conservation and human use**.**
- **Conservation design for urban developments** – Design suburban commercial and small estate developments to accommodate enhanced wildlife habitat in prairie and river systems, particularly by adjusting planting and management of green space to attract pollinators and grassland birds (e.g., LID principles), including wildlife habitat in riparian, floodplain and off-channel areas and within levee systems.
- **Utilize simulation tools for protection of riverine systems –** Develop and utilize simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations at scales from the regional to the local level for implementing floodplain protection BMPs or acquiring existing habitat by showing scenario-based predicted outcomes for wildlife habitat and water quality benefits, similar to tools under development for wetlands.
- **Education on urban protection of riverine systems** – Use best available science and social policy to convey to land use decision-makers (e.g., county surveyors, drainage boards, mayors, town councils) the significance of natural patterns of stream channel dynamics, floodplain setback standards, demands on water resources, extreme events, volunteer efforts, and collaboration among metropolitan areas linked within major river basins, using communications tools such as a web-based clearinghouse of existing programs.

Annual Action Plan

As part of the strategic planning process, the Steering Committee will put forth the first annual action plan for the LCC, outlining goals for steering committee structure, growth and interaction, development of a strategic communications plan to assist in LCC information dissemination, and preparation of an initial science needs assessment.

This Science Needs Assessment will:

1) Set fundamental objectives and strategies for action within the focal areas of prairie restoration techniques, river restoration techniques, agroecology conservation practices, and Urban Watershed Conservation practices;
2) Identify key uncertainties that limit conservation ability or management decision-making; and
3) Guide solicitation of research proposals and related activities.

Technical Advisory Groups (TAGs) will be formed as needed to address different disciplines within four focus areas: prairie restoration, river restoration, agroecology, and urban watersheds. Tasks for the TAGs may involve soliciting input from stakeholders, refining the list of potential strategies (Science Needs), reviewing project proposals based on Project Criteria set by the Steering Committee, and recommending projects for Steering Committee approval and funding.

ETPBR LCC Operations Plan

Who we are: Introduction to the ETPBR LCC organization

Conservation challenges facing today's natural and cultural heritage, including the impacts of climate change, are enormous. They represent a force of change more consequential than any previously encountered. The magnitude of the challenge is so unprecedented that it requires us to come together, harness our collective power, and approach conservation in ways we never have before. Individually, governance structures struggle with landscape-scale management and the multiple scales of collaboration and coordination required.

Landscape Conservation Cooperatives (LCCs) operate as public-private partnerships that can provide the expertise needed to support conservation planning, implementation, and evaluation at landscape scales. Taken together, and working within the larger conservation community, LCCs will focus on improved levels of collaboration that enable a region's private, state, federal, and tribal conservation infrastructure to operate as a networked, leveraged system.

International LCC Network Structure

Landscape Conservation Cooperatives (LCC) were established as a network of 22 ecoregion-based self-directed partnerships to collaboratively address conservation at a landscape-scale across North America, the Caribbean, and U.S. affiliated Pacific Islands to help address these complex scientific and institutional challenges. This network is working across geographies and jurisdictions to deliver unprecedented collaboration across jurisdictional boundaries.

Each LCC is guided by a steering committee with participants from agencies, organizations and Tribes having their own inherent authorities. The LCC National Council will provide national level coordination to identify opportunities that reduce duplication, leverage resources and capacities, and improve efficiencies and conservation outcomes across the LCCs.

Specifically, within any given ecological region, entities comprising the private, state, federal, and tribal conservation infrastructure must interact as a system if they are to expect system-level impacts. Organizations and agencies recognize the need for "functional connectivity" and are developing ways to integrate their otherwise independent capacity for conservation planning and design, conservation delivery, as well as monitoring and evaluation. They acknowledge that the goals and objectives expressed at landscape scales exceed the grasp of any one organization.

Collective Impact Across the Landscape

Collective Impact (Kania and Kramer, 2011) is a more rigorous and specific approach than collaboration among organizations and may present a very applicable model for LCC partner relationships.

There are five conditions that, together, lead to meaningful results from Collective Impact:

1. *Common Agenda* - All participants have a shared vision for change including a common understanding of the problem and a joint approach to solving it through agreed upon actions.

2. *Shared Measurement* - Collecting data and measuring results consistently across all participants ensures efforts remain aligned and participants hold each other accountable.

3. *Mutually Reinforcing Activities* - Participant activities must be differentiated while still being coordinated through a mutually reinforcing plan of action.

4. *Continuous Communication* - Consistent and open communication is needed across the many players to build trust, assure mutual objectives, and appreciate common motivation.

5. *Backbone Organization* - Creating and managing collective impact requires a separate organization(s) with staff and a specific set of skills to serve as the backbone for the entire initiative and coordinate participating organizations and agencies.

How are other regional partnerships involved?
Science teams or coordinators from other regional initiatives affected by actions are LCC stakeholders and are invited to coordinate efforts through representation on the LCC Steering Committees, Science Teams and in other ways. For the ETPBR LCC, some of these partners may be:

- Areas affected due to migration and water flow
  - Upper Mississippi River Great Lakes Joint Venture – Barbara Pardo
  - Lower Mississippi Valley Joint Venture – Keith McNight
  - Central Hardwoods Joint Venture – Jane Fitzgerald
  - Prairie Potholes Joint Venture – Casey Stemler
  - Rainwater Basin Joint Venture- Andy Bishop
  - Playa Lakes Joint Venture- Mike Carter
  - East Gulf Coastal Plain Joint Venture – Catherine Rideout
  - Gulf Coast Joint Venture – Barry Wilson
  - Plains & Prairie Potholes LCC – Rick Nelson, Mike Olson
  - Upper Midwest & Great Lakes LCC – Jana Stewart, Brad Potter
  - Great Plains LCC – Heather Whitlaw, James Broska
  - Appalachian LCC – Jean Brennan, Bridget Costanzo
  - Gulf Coastal Plains & Ozarks LCC – Greg Wathen, John Tirpak
- Flyways
  - Central Flyway Council (KS, NE, OK)
  - Mississippi Flyway Council (IA, IL, IN, MN, MO, OH)
- Fish Habitat Partnerships (FHP)
  - Reservoir FHP
  - Driftless Area Restoration Effort
  - Fishers and Farmers FHP
  - Ohio River Basin FHP
  - Great Plains FHP
  - Southeast Aquatic Resources Partnership
- MAFWA Committees
  - Private Lands Working Group – Chuck Correll, IA
  - Public Lands Working Group – Mark Reiter, IN
  - Climate Change – Kathy Doncarlos, MN

What about the DOI Climate Science Centers (CSC)?
Climate Science Centers will provide the latest climate science information and data and help LCCs develop modeling tools and conduct site-specific studies of climate impacts on natural resources. While the ETPBR LCC is primarily served by the research interests of the Northeast Climate Science Center, the

Southeast, North Central and South Central also overlap with the geography of our LCC. Staff of the ETPBR LCC sit on the advisory

ETPBR LCC Structure

We are leaders in the conservation community. But we are not just biologists. We are also economists, social scientists, and communicators. We come from federal and state governments, not-for-profit and private organizations, tribal groups, and pre-existing partnerships. We see beyond agency lines and authorities, to identify what is in the best interest of our collective community, both within the LCC and outside of the LCC, to benefit fish, wildlife, habitat and people.

How is the ETPBR LCC organized?

LCCs were developed to address large scale natural resource issues that cannot be effectively solved by any single agency or organization. These challenges transcend political and jurisdictional boundaries and require a networked approach to conservation—holistic, collaborative, and grounded in science – to ensure the sustainability of America's land, water, wildlife and cultural resources. In practice, the success of the LCC will hinge, like the ecosystems we seek to conserve, on the sum parts of the whole – most assuredly the cooperation and collaboration of state and federal agencies, NGOs, researchers, managers, and private landowners alike.

The current ETPBR structure consists of a Steering Committee supported by four Technical Advisory Groups (TAGs) with additional input from the US FWS Prairie-Big Rivers LCC Advisory Team (P-BRAT). The TAGs and the P-BRAT are led by co-chairs who are liaisons to the Steering Committee.

Steering Committee

Our Steering Committee (SC) membership represents over two dozen agencies and organizations across jurisdictional boundaries that are committed to economic and ecosystem health for current and future generations within the ETPBR LCC region. This steering committee is led by two co-chairs and supported by staff including an LCC Coordinator, Science Coordinator and Communications Coordinator.

When the Steering Committee has identified a high-priority issue, action, or product, they may refer it to a Technical Advisory Group (TAG) to conduct discussions and prepare recommendations for consideration by the committee. Additional workgroups may be permanent or non-permanent and may disassemble when an issue is resolved or a product completed.

Selection Criteria - The following are characteristics the LCC seeks in all members. Individuals selected for the SC will be collectively evaluated relative to these required characteristics:

- Be an active participant and an advocate for the LCC mission.
- Have a commitment and willingness to collaborate.
- Have experience in collaborative processes at different scales.
- Be able to represent a broad array of natural and cultural resources within the ETPBR LCC geography.
- Have decision-making authority/influence within their agency, organization, or Tribe.
- Be able to think beyond the boundaries of his/her agency, organization, or Tribe.
- Be committed to soliciting input from and reporting back to their agencies, organizations, Tribes, and colleagues.
- Be involved with an agency, organization, or Tribe that:
    - Is engaged in the LCC enterprise.

- Has resources and/or a mission that aligns with the LCC network.
- Has science/knowledge capacity and/or is actively engaged in resource management activities and/or communications.

Composition - The following individuals on the Steering Committee contributed directly to development of this operations and strategic plan. Representatives from South Dakota, Wisconsin and Oklahoma are also invited to participate as small portions of the LCC geography extend into those states.

Co-Chairs:

Kelley Myers, Iowa DNR, Co-Chair ETPBR LCC SC
Charles Wooley, FWS Region 3, Co-Chair ETPBR LCC SC

NGO:

Brian Anderson, Illinois Natural History Survey
Paul Botts, Chicago Wilderness
David Brakhage, Ducks Unlimited
Dan Cornelius, Intertribal Agriculture Council
Aaron Kuehl, Pheasants Forever
Joe Larscheid, Fish Habitat Partnerships
John Shuey, The Nature Conservancy
John Silovsky, Upper Mississippi River and Great Lakes Joint Venture

State:

Jeff Burris, Ohio Division of Wildlife
Jim Gillespie, Iowa Department of Agriculture and Land Stewardship
Richard Hatcher, Oklahoma
Greg Hoch, Minnesota Department of Natural Resources
David Kohler, Ohio Division of Wildlife
Mark Reiter, Indiana Division of Fish and Wildlife
Wayne Rosenthal, Illinois Department of Natural Resources
Janet Sternburg, Missouri Department of Conservation
Roger Wolfe, Kansas Department of Parks, Wildlife and Tourism

Federal:

Ken Barr, US Army Corps of Engineers
Bob Clevenstine, FWS National Wildlife Refuges
Ivan Dozier, Natural Resources Conservation Service
Chris Holbeck, National Park Service
Skip Hyberg, USDA Farm Services Agency
Ted Lagrange, Nebraska Game and Parks Commission
Michael Langston, USGS South Central Climate Science Center
Alan Lewitus, NOAA
Janette Marsh, US Environmental Protection Agency
Jeffrey Morisette, USGS North Central Climate Science Center
Jeremy Peichel, US Forest Service
Robert Swanson, US Geological Survey
Michelle Staudinger, USGS Northeast Climate Science Center
Steve Torbit / Will Meeks, FWS Region 6

Science Team: Technical Advisory Groups (TAGs)

How can the LCC flourish in an era of rapid change? Build a strategy network (Kotter, 2012) that brings vision, opportunity, agility and inspired action from the community with this strategic approach:

- Convene many change agents from within the ranks.
- Draw attention to front-line concerns.
- View the future from multiple angles.
- Focus passion and intelligence on the biggest opportunities.
- Think creatively to solve wicked problems.
- Eliminate collaborative barriers between organizations.
- Promote a useful flow of information and activity.

Four focal area Technical Advisory Groups (TAGs) and a technical expertise Human Dimensions TAG have been created as a "Science Team" consortium to provide strategic networking and to recommend priority science needs to the Steering Committee for the LCC to pursue (Figure 1).

Technical Advisory Groups (TAGs) represent different disciplines within four focal areas, each including communications and human dimensions components: 1) Prairie Restoration; 2) River Restoration; 3) Agroecology; and 4) Urban Watersheds.

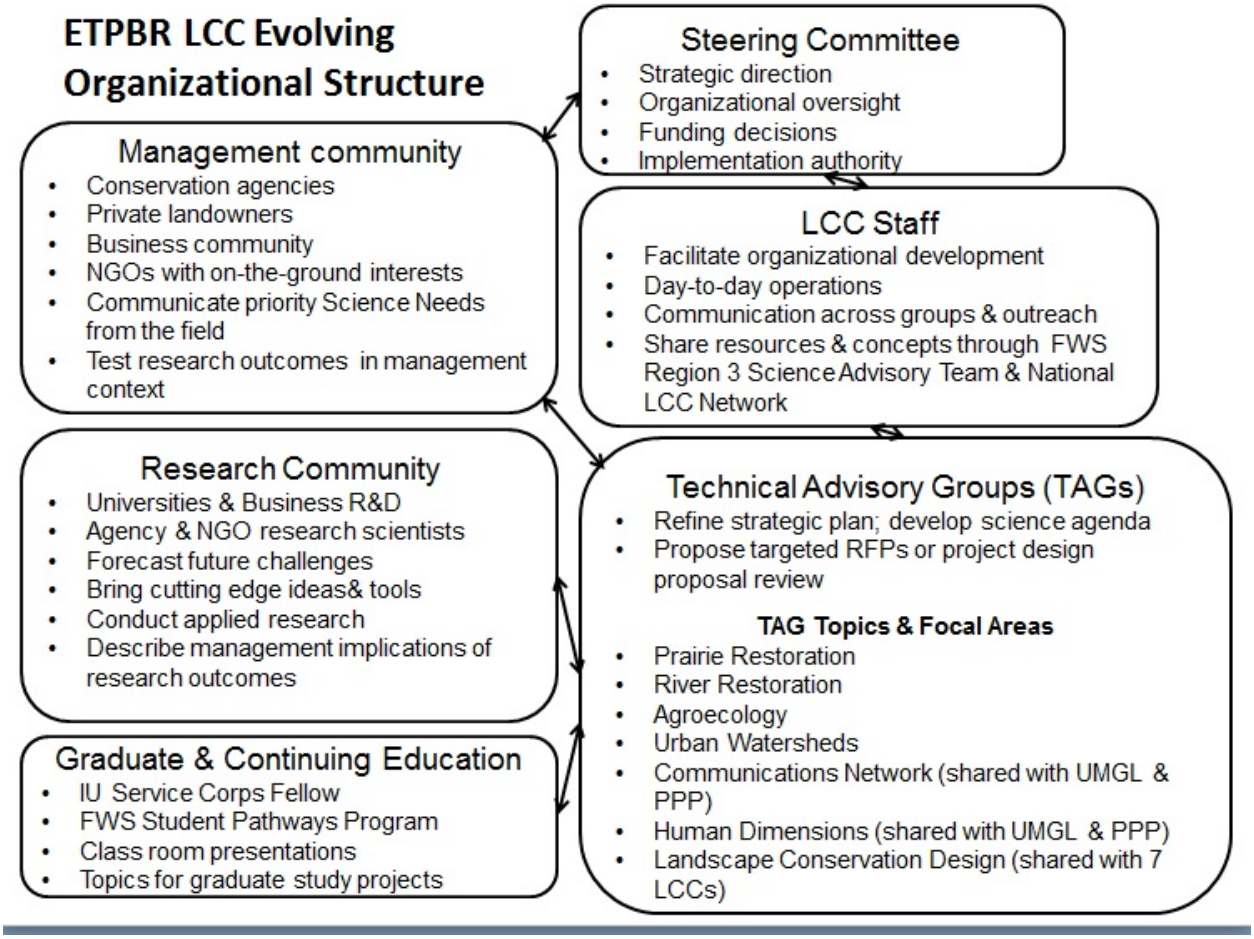
Where advisable, the ETPBR LCC will coordinate closely with existing working groups that are willing to identify science needs and other recommendations for LCC efforts in these focal areas.

Areas of responsibility and tasks of the TAGs are:

- Identify organizations that can provide input for the direction and actions of the LCC
- Develop mechanism for obtaining input from stakeholders (e.g., questionnaire, workshop, presentation at meetings)
- Expand list of potential strategies (Science Needs)
- TAGs will use an SDM process to recommend list of prioritized strategies
- Steering Committee will review and refine strategies
- Staff will develop RFPs for project areas or specific projects
- TAG may review project proposals based on Project Criteria
- TAG may recommend projects for Steering Committee approval and funding

Note: Membership on the TAGs is under development (see TAG Member Contact List).

Figure 1. Organizational structure for community participation in the ETPBR LCC.



US FWS Prairie - Big Rivers LCC Advisory Team (P-BRAT)

Representatives of FWS agency programs will serve as an internal FWS Advisory Committee for each of the LCCs in Region 3. The Prairie-Big Rivers LCC Advisory Team (P-BRAT) provides input and communications with the ETPBR LCC.

Assignment: Strategically select FWS employees that understand/appreciate the importance of the LCC initiative to advise the ETPBR LCC Steering Committee Co-Chair (DRD Charlie Wooley) on current conditions/events/opportunities prior to each SC meetings. Additionally, these program representatives will serve as ambassadors for the ETPBR LCC back to their respective programs on events and progress the LCC is making to help answer the internal FWS question of; "What have the LCCs done for me lately?"

Membership: The ETPBR LCC Coordinator, Glen Salmon will be a standing member of the P-BRAT, with Science Coordinator Gwen White as the alternate. Membership in the P-BRAT will be primarily from R3 with representation (1 or 2 members) from R6. The ETPBR LCC geography for R6 is comparatively small. Kansas and Nebraska are very active members and South Dakota has not chosen to participate on the SC. The ETPBR LCC geography does extend down into R4 via the State of Oklahoma, but they have declined invitations to become an active member of the ETPBR LCC SC.

One member, and one alternate, will be selected from each of the R3 programs. Prior to each ETPBR LCC SC meeting the program representative will be responsible to reach out to canvas their respective programs via phone calls, e-mail, or at their regular face to face meetings, to solicit topics, ideas, identify issues, possible partnerships and projects. The P-BRAT will gather and compile the input from the program representatives into a format to be reviewed and eventually delivered to the DRD. Assembling the input could be done in a variety of ways- through a P-BRAT face to face meeting, via e-mail or conference call or additional venues as deemed appropriate by the P-BRAT leader. After the input is assembled, the DRD will be briefed. The briefing format could be done through a document, or as the DRD's time allows, a conference call or face to face meeting with the P-BRAT leader or entire team.

The P-BRAT leader will attend ETPBR LCC SC meetings (as a non-voting member) in order to hear firsthand the discussions, deliberations and decisions made at the meetings and to better be able to accurately convey SC events back to the P-BRAT and ultimately back to the various FWS Programs. Following each ETPBR SC meeting, the P-BRAT leader will work with ETPBR LCC staff (Glen Salmon, Gwen White, Ashley Spratt) to prepare in internal FWS report to disseminate back to the programs- this document will be in addition to the minutes of the ETPBR LCC SC meeting.

Program Representation:

R3 Program	Potential member	Current Members
Endangered Species	Field Office biologist	Kraig McPeek
External Affairs	Regional Office (RO)	Ashley Spratt
Fisheries	Project Leader	Maureen Gallagher
Migratory Birds	Regional Office (RO)	Andrew Forbes
Private Lands	State Coordinator	Jeff Kiefer
Refuges	Refuge biologist	Robert Clevenstine, Chair
R-6 Representatives	(1 or 2) to be selected by the R6 ARD-SA	

Time requirement for P-BRAT members: Two meetings per year, with the possibility that each representative may want to provide a progress report back to their program at their normal gatherings/trainings or meetings.

Terms of Service:

1. Region 3 P-Brat representatives shall serve for one-year, with the option that the representative and/or alternate choose to serve an additional one year term. The representative is responsible for finding their own replacement on the P-BRAT and informing the P-BRAT leader and the LCC Coordinator of their selection.

2. P-BRAT leadership position shall rotate annually between the R3 programs alphabetically.

3. Region 6 P-BRAT representatives will serve at the discretion of the R6 ARD-SA.

Proposed Timeline: With the understanding that, throughout the year, each P-BRAT program representative will stay informed of topics and areas of interest where the ETPBR LCC could be involved or supportive of an ongoing FWS effort that fits the mission and vision of the LCC.

- Two months prior to an LCC Steering Committee (SC) meeting, each Advisory Team representative will solicit input and comments or areas of interest from their peers.

- One month prior to SC meeting, Bob and Glen will gather input from the program representatives via email, face to face meeting, virtual meeting or conference call. Information gathered will help the team generate a short, concise briefing document.
- As schedules permit, but at least two weeks prior to the LCC SC meeting, Bob and Glen will meet with Charlie Wooley in person or via conference call.

- Post SC meeting, Bob and Glen will debrief the P-BRAT.

- Notes from the SS meeting will be distributed to the P-BRAT as soon as they are available for use in discussing SC events with peers.

<u>ETPBR LCC Staff</u>

Glen Salmon	ETPBR LCC Coordinator, USFWS
Gwen White	ETPBR Science Coordinator, USFWS
Georgia Parham	External Affairs, USFWS
Bob Clevenstine	Advisory Committee Representative, USFWS Refuges
John Rogner	UMGL LCC Coordinator, USFWS
Jamie Ellis	Prairie TAG Coordinator, INHS
Lama BouFajreldin	River TAG Coordinator, INHS
Andrew Stephenson	Agroecology TAG Coordinator, Univ Northern Iowa
Craig Miller	Human Dimensions Network Coordinator, INHS
Megan Cross	Human Dimensions Research, US FWS Pathways Student
Kristin Shaw	Ecological Places in Cities: EPIC, US FWS Pathways Student
Jorgen Rose	Mississippi Basin / Gulf Hypoxia Initiative, IU Service Corps Fellow

How does the ETPBR LCC communicate?

A critical function of the Eastern Tallgrass Prairie and Big Rivers LCC is to bridge science and natural resource management by facilitating the flow of information between federal, state, non-governmental, and private entities vested in natural resource conservation. Further information about the LCC outreach mechanisms is in the *ETPBR LCC Communications Plan*.

Web Site - The LCC Web site serves as the main communication tool of the LCC with both internal and external audiences. The Web site will convey information to the general public, scientific communities, legislators, conservation partners, and internal members. In addition to providing a broad-brush overview of the LCC mission, goals, and activities, the Web site will also host research project updates and feature stories. The Web site's Newsroom section will be updated with news articles, press releases, partnership updates related to landscape conservation challenges, research, and solutions. A multimedia section will provide access to videos and images housed on separate digital media Web sites, including Youtube and Flickr.

Research Progress and Results - Should the ETPBR LCC utilize a Request for Proposals (RFP) process as part of our operational plan, each successful funding recipient will be required to submit a communications plan. This communications plan should identify key audiences, messages and outreach products that will supplement research progress and findings. The funding recipient must identify key subject matter expert(s), identify internal and external audiences/stakeholders, and outline proposed delivery methods for research progress and results. Narratives and images will also be required by the subject matter expert throughout the research period to be used by the LCC and partners for outreach purposes.

Annual Report - An annual report for the ETPBR LCC is drafted by the LCC/Science Coordinator each fiscal year ending in September/October. In addition to a comprehensive annual report detailing research progress and activities, the LCC Coordinator and Science Coordinator will work with the Communications Coordinator to develop a condensed general purpose report that will be distributed to target audiences. Research accomplishment summaries described above may also be used in the development of this report.

In-person meetings and presentations - LCC/Science Coordinator are responsible for presenting information on LCC activities to internal and external scientific/natural resource/conservation agencies at relevant workshops, meetings and conferences. This includes presentations directed toward project leaders, program heads, Regional Director Team members.

Webinars - LCC Coordinators and Science Coordinator will host regularly scheduled webinars to engage technical and steering committee members in relevant updates/activities. Webinars are also a tool that may be used to reach a broader range of external stakeholders. At the request of the LCC/Science Coordinator, Webinars may be recorded by the communications coordinator and houses on the LCCs Web site or YouTube channel.

Structure and Governance (Adopted by ISC May 2012)

Introduction

The Eastern Tallgrass Prairie LCC (ETPBR LCC) is a broad-based, regional partnership of Federal, State, Tribal and Non-government organizations working to conserve, and protect natural and cultural resources, including fish, wildlife, plants and their habitats, and broad ecosystems within the Midwest.

The ETPBR LCC recognizes that all agency partners within the ETPBR LCC will have different missions and conservation objectives, but all are affected by large-scale, landscape level stressors, such as climate change. In the face of broad-scale environmental challenges the goal of the ETPBR LCC will be to provide applied science and decision support to increase the effectiveness and efficiency of conservation delivery for shared conservation priorities. Specifically, the ETPBR LCC represents a self-directed, non-regulatory alliance that provides scientific and technical support for conservation efforts to secure landscapes that sustain priority fish, wildlife, and plants and key cultural resources. By taking into account landscape perspectives via an adaptive management framework, LCC products inform and assist decision makers and conservation deliverers. Specifically, the LCC will:

- support biological planning and conservation design,
- prioritize and coordinate applied research that informs conservation delivery,
- support the design of inventory and monitoring programs
- support the development of scientific analysis that informs and empowers land managers to link actions at project sites to outcomes on broader scales

The ETPBR LCC recognizes the variety of missions and objectives across the conservation community, but also the need work interdependently on the potential impacts of large-scale landscape level stressors, such as climate change, on the resources each are charged to protect.

Core Assumptions

- Contemporary stressors to fish and wildlife and plants are broad based and numerous, including habitat fragmentation, invasive species, contaminants, etc.
- Global changes in ecosystem processes, such as climate change, represent overarching threats to fish and wildlife resources and interact with existing threats at local and regional scales.
- Current conservation strategies, programs and organizations do not fully account for the kind of accelerating and unavoidable changes in the global environmental system that will occur with climate change.
- Because uncertainties about the specific local and regional impacts of climate change make conservation planning and implementation inherently more challenging, successful long-term natural resource management and conservation require adaptive management strategies that incorporate models of future change.
- Successful conservation in the context of current threats and global and regional ecosystem changes requires the understanding, support, and meaningful participation of Eastern Tallgrass Prairie interests. LCC work and conservation delivery must draw upon local knowledge and participation.

Biological Scope

All terrestrial and aquatic ecosystems and their constituent species that are native to landscapes and waters of the Eastern Tallgrass Prairie are potential targets for conservation planning and decision support tools. OR

All terrestrial and aquatic ecosystems and their constituent species that are native to landscapes and waters of the Easter Tallgrass Prairie are fertile ground for conservation planning and decision support tools, and as a result, potential LCC deliberation. Collaborative work must result in effective application and efficient and effective conservation delivery.

Operational Scope

The operational scope of the ETPBR LCC is to provide scientific and technical support for landscape-scale conservation in an adaptive management framework by supporting: 1) biological planning, 2) conservation design, 3) prioritization and coordination of research, and 4) inventory and monitoring program design. These will be accomplished by a core LCC staff working at the direction of a steering committee, and interacting at multiple levels with the technical and executive staffs of the member organizations.

Overall Structure

The ETPBR LCC is governed by a Steering Committee that is administratively and logistically supported by a Technical Committee appointed by the Steering Committee. The Technical Committee may establish *ad hoc* Subcommittees to assist with specific issues to facilitate decision making by the Steering Committee. For example, *ad hoc* subcommittees sub-regions or topics within the ETPBR LCC may be created.

Steering Committee

Membership and Organization

1. ETPBR LCC Steering Committee consists of representatives from agencies and organizations that collectively have the following characteristics:
    a. jurisdictional responsibility for natural resource management
    b. ability to impact landscapes via programs and activities
    c. significant capacity for furthering the purpose of the ETPBR LCC
    d. addressing significant natural resource management issues
    e. provide direct links and communication with other entities, conservation organizations or land (owners)managers involved in conservation delivery at local levels

    The composition of the Steering Committee includes senior leadership from Federal, State, Tribes, and Non-Governmental Organizations with large-scale resource management activities in the Eastern Tallgrass Prairie Big Rivers region. Steering Committee members represent as high an administrative level as possible in order to commit financial, staff, or other resources. OR Steering Committee members are able to make decisions regarding financial, staff, or other resources.)
2. Additional membership on the Steering Committee, if needed, will be accommodated by invitation from the Steering Committee. Additional members must be approved by a majority vote of current Steering committee members. Membership is by invitation from the Steering Committee. Charter members are listed in Table 1)
3. Removal of Steering Committee members is determined by the majority vote of the Steering Committee.
4. Activities of the Steering Committee are administered by the Co-Chairs. One of the Co-Chairs is the Deputy Regional Director of the U.S. Fish and Wildlife Service's Midwest Region. The other Co-Chair is elected by the Steering Committee for a two-year term.

5. Steering Committee members that are unable to attend a meeting or teleconference, must delegate an individual from their organization with full decision-making authority. A current Steering Committee member from another organization cannot serve as the alternate, or carry the proxy for the absent member.

Responsibilities
The Steering Committee of the ETPBR LCC has the following responsibilities:

1. Serves as the executive body for decision making
2. Provides guidance on policy and develops operational and strategic plans.
3. Promotes cooperation, coordination, consolidation of information, and collaboration among partner organizations to support the goals and objectives of the ETPBR LCC.
4. Prioritizes projects and related activities recommended by the Technical Committee for implementation and funding.
5. Reviews prioritized projects and related activities recommended by the Technical Committee for development and dissemination.
6. Identifies funding opportunities and other available resources (e.g., staff, in-kind services) for supporting ETPBR LCC priority projects and activities.

Procedures
The Steering Committee will meet at least twice per year. Additional meetings may be called by the Co-Chairs, and additional business will be conducted by e-mail, teleconference and web conference. Meetings will normally be scheduled for January and May. This allows the Steering Committee to review the LCC's progress, approve project funding and help formulate annual work plans. Formal meetings will be announced at least one month in advance and will require that a written agenda be distributed at least two weeks prior to the meeting. The Eastern Tallgrass Prairie and Big Rivers LCC Coordinator will serve as the liaison between the Technical Committee and the Steering Committee, assist the Co-Chairs in coordinating, administering, and facilitating Steering Committee meetings, ensure information is communicated to all members, and will maintain Steering Committee records.

Steering Committee decisions and recommendations will normally be reached through consensus and every effort will be made to reach consensus by discussing issues thoroughly. The ETPBR LCC Coordinator will provide the Steering Committee with critical information in the form of written briefing statements, reports, and/or oral presentations. This information will include the recommendations that the Technical Committee has made, including any viable alternatives they may have explored. If necessary, issues will be resolved by vote carried by a simple majority. A quorum of voting members of the Steering Committee or their alternates is necessary for a vote. All Steering Committee discussions and decisions will be documented by the ETPBR LCC Coordinator (or designee) and kept as official minutes to be distributed to all members within two weeks of each meeting. The minutes will be adopted following review and approval by all Steering Committee members. The ETPBR LCC Coordinator will maintain all Steering Committee files, track deadlines, and ensure decisions are implemented.

Technical Committee (Science Teams)
Membership and Organization

1. The ETPBR LCC Science Coordinator will chair the Technical Committee.

2. Technical Committee members can be appointed by any of the existing Steering Committee members
3. Additional members may be appointed by mutual agreement of the LCC and Science Coordinators.
4. Technical Committee members should be knowledgeable about landscape perspectives relating to conservation and climate change.

Responsibilities

1. Facilitates a blind peer review process to rank proposals for Steering Committee decisions. Guidance on ranking factors is provided to peer reviewers by the Technical Committee after approval by the Steering Committee. The Technical Committee then uses a common set of final ranking factors to evaluate project proposals Provides recommendations to the Steering Committee on coordination, planning, staffing and science activities for the ETPBR LCC.
2. Develops appropriate mechanisms for communicating with and receiving input from organizations not represented on the Steering Committee regarding science needs and capacity for science delivery.
3. Establishes *ad-hoc* Subcommittees to carry out the purpose and function of the ETPBR LCC.
4. Maintains regular, clear and transparent communication with and among existing conservation partnerships, other interested or contributory organizations, the LCCs and the Department of Interior's Climate Science Center.

Procedures

The Technical Committee will meet at least twice per year or as determined necessary by the LCC Coordinators. Any member who cannot attend, or otherwise participate in a meeting may assign an alternate. The Steering Committee will be notified of the time, place and agenda of Technical Committee meetings, and such meetings will be open to all Steering Committee executives. Conference calls or on-line conferencing may be used in lieu of face-to-face meetings if jointly determined to be useful and prudent.

Technical Committee decisions and recommendations will normally be reached through consensus. If necessary, issues will be resolved by a vote carried by a simple majority. A quorum of voting members of the Technical Committee or their alternates is necessary for a vote. A current Technical Committee member cannot serve as an alternate for an absent member, or carry the proxy for the absent member.

All Technical Committee discussions and recommendations will be documented by the ETPBR LCC Coordinator (or designee), and distributed to all Technical Committee members for review and adoption as official minutes. The ETPBR LCC Coordinator will maintain the files, track deadlines, and ensure recommendations are brought forward to the ETPBR LCC Coordinator and Steering Committee in a timely manner.

Staffing

The ETPBR LCC initially will have a dedicated coordinator and science coordinator. These positions will be funded by the U.S. Fish and Wildlife Service. The coordinator serves as the LCC's operations manager with direction from the Steering Committee. Additional staff capacity will be added strategically over

time to enhance the ETPBR LCC's capability for additional products and services with the approval of the Steering Committee

ETPBR LCC Strategic Plan – 2013-2020

The Risk: Case for Action (Challenges)

What are the physical and social science challenges that present a case for action in this LCC?

Characterized by: extreme stress, dynamic economics, intensive agricultural, urban land use

Desired qualities: adaptable, sustainable, and resilient

Landscape-level stressors:

- Climate change
- Invasive species and diseases
- Cropping changes
- Declining upland grasslands
- Urbanization
- Lack of large restorations
- Agriculture nutrient and sediment runoff
- Demand for water
- Altered streams, rivers, and wetlands

Social drivers:

- Land use
    - Revitalization of interest in local foods and outdoor recreation in larger cities
    - Depopulation of small towns
    - Land ownership – large farms focused exclusively on monotypic agricultural production to the detriment of conservation on marginal lands
    - Social connection to resource use (e.g., recreation, food systems, ethanol, energy production)

- Economics
    - Viability of small towns (depopulation in rural areas)
    - Highest value farmland creates pressures
    - Acceptable messages and incentives for agriculture

- Organizational relationships
    - Generational transition among staff
    - Coordination across state lines
    - Share lessons learned from model programs
    - Map assets and connectivity
    - Prioritize the most valuable areas to conserve
    - Emphasize the economic benefit of restored ecosystems
    - Long-term improvements in the Farm Bill with an interim approach

What decisions made by LCC partners could benefit from landscape-level coordination?

- Land acquisition (siting and design)
- Allocation of resources (funding, effort, projects)
- Access and effective responses to immediate project opportunities

- Ability to deliver conservation actions linked to science that addresses management challenges
- Actions that provide multiple benefits (e.g., sequestration, hydrology, denitrification, water quality, wildlife habitat, recreation)
- Communication with land managers and broader audiences

The Solution: Vision

Vividly describe the ideal future state for the ETPBR LCC. Be audacious, inspiring and motivating, based on our core competencies.

LCC Network Vision: Landscapes capable of sustaining natural and cultural resources for current and future generations.

ETPBR LCC Vision statement:
Functional tallgrass prairie and big rivers natural communities embedded in a healthy and productive agricultural and urban landscape—ecologically connected lands and waters, managed cooperatively for current and future generations.

Vision description:
Sustain interconnected human and wildlife communities supported by the productive soils of the eastern tallgrass prairie and wealth of big river ecosystems across the region through:

- Healthy tallgrass prairie and big river ecosystems that sustain a full complement of species, habitats and community processes for their intrinsic worth and for services they provide to current and future generations.
- Effectively address the intensifying threats that lead to landscape degradation.
- Protect water quality from here to the Gulf of Mexico.
- Use best management practices on agricultural and urban working lands that contribute to the viability of natural and cultural resources within a functional landscape.
- Engage landowners and the public in a balanced appreciation for and understanding of their responsibility for cooperatively managing interconnected ecosystems.

***Vistas** – Expansive restoration sites and big river systems that represent the iconic and historic landscapes of the region.*

***Gems** – Scattered pockets of biodiversity that remain tucked among the working lands of a region largely dominated by agriculture and urbanization.*

The Asset: Mission

What do we do, for whom and why to achieve the Vision? Who are we? What resources are primary?

What should be done, for whom, and what the benefits would be:

- Coordinate among multiple partners to fill gaps and leverage experience and funds
- Identify common conservation objectives
- Understand consequences of landscape-scale change
- Produce pragmatic science for on-the-ground managers
- Convey relevance to the American public (connecting people to their land and water resources)
- Integrate resource management across disciplines and at large scales

Primary roles of the ETPBR LCC are to:

- Translate and implement the science we already have but which is not fully understood
- Develop program models
- Develop practical tools
- Examine, respond to or develop policy (e.g., Farm Bill programs, urban land use planning)

The ETPBR LCC stakeholders benefit from participation in the LCC by integrating issues and actions across the region, such as:

- Landscape-scale focus
- Climate change impacts
- Convening and linking groups
- Identifying common pragmatic science needs
- Sharing information to mobilize working together
- Consistency across plans and approaches
- High level view of strategies
- Systematic leveraging of funding and resources
- Measures of success that roll up local efforts to the landscape scale
- Communications through trusted conduits

Mission Statements

Mission of the Landscape Conservation Cooperatives – The 22 LCCs span the continent and extend into the Pacific and Caribbean to address large scale natural resource challenges that transcend political and jurisdictional boundaries and require a networked approach to conservation—holistic, collaborative, and grounded in science—to ensure the sustainability of America's land, water, wildlife and cultural resources.

This network of 22 cooperatives depends on LCCs to:

- Develop and provide integrated science-based information about the implications of climate change and other stressors for the sustainability of natural and cultural resources;
- Develop shared, landscape-level, conservation goals, objectives, and strategies that are based on a shared scientific understanding about the landscape, including the implications of current and future environmental stressors;
- Facilitate the exchange of applied science in the implementation of conservation strategies and products developed by the LCCs or their partners;
- Monitor and evaluate the effectiveness of LCC conservation strategies in meeting shared objectives;
- Develop appropriate linkages that connect LCCs to ensure an effective network.

Mission of the Eastern Tallgrass Prairie & Big Rivers LCC
The ETPBR LCC coordinates among many partners to address the conservation challenges of a predominantly agricultural landscape that stretches across 11 states in the nation's heartland from eastern Nebraska to western Ohio to:

1) Understand the consequences of landscape-scale change;
2) Develop common landscape-level conservation objectives and strategies; and

3) Produce pragmatic science that addresses current and future environmental stressors.

The Scope: Focal Areas & Geography

What are the primary focal areas for the ETPBR LCC? Are there distinct subregions or resource types to categorize conservation approaches?

The cultural, social and ecological significance of natural resources in the ETPBR may be characterized as follows:

- **Connection with nature**
  - The vastness of the original tallgrass prairie vista
  - High value for smaller special places that remain
  - The intuitive draw of large rivers as a tremendous resource with many uses

- **A heavily modified, fragmented and sometimes mismanaged ecosystem**
  - High productivity of soils can support biodiversity and agriculture
  - Recent losses in agricultural conservation due to rapidly increasing commodity prices
  - Urban sprawl in cities and more rural areas
  - Sedimentation, channelization and flow alterations of large river systems
  - The ecological significance of incremental changes may not be fully recognized

- **Resilient return of habitats and species**
  - Working together across watersheds and interests
  - Implementing the science of reclamation, mitigation and conservation
  - Restoration on a large scale is very gratifying at a visceral level
  - Species support economically significant recreation and tourism

<u>Functional Landscapes – Subregional Differences</u>

Functional landscapes may be defined as lands and waters with the properties and elements required to support desirable populations of fish and wildlife, while also providing human society with desired goods and services, including food, fiber, water, energy, and living space (FWS Surrogate Species Technical Guidance, page 10).

While the landscape at the regional level is largely homogenous, some subregions or gradients may influence management strategies, such as:

- **Climate**
  - Dryer to wetter from west to east
  - Greater potential impacts of climate change for exacerbating storm events from south to north (Figure 2)
- **Hydrology**
  - Variations in water use and water laws among jurisdictions

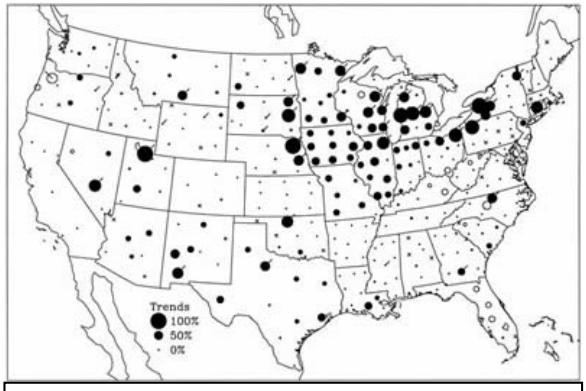


Figure 2. Changes in 7-day storm events exceeding a 1-yr recurrence intervals for 1931–96. Shaded circles indicate upward trends while open circles indicate downward trends. The magnitude of the trend is given in terms of the percent increase or decrease over the period 1931–96, relative to the mean. The magnitude of the trend is linearly proportional to the radius of the circle (Kunkel et al., 1999).

  - Large rivers present a unique situation as public trust resources and with bluff and floodplain components
- **Migration routes**
  - Both native and invasive species (largely north to south for terrestrial and aquatic)
- **Human population**
  - Density ranges from larger cities in the east to more rural small towns in the west
- **Agricultural commodities**
  - Primarily dominated by corn belt agriculture with mostly row crops in the east and more livestock grazing (hogs/beef) in the west

Prairie and River Systems and Management Focus may vary across the LCC

Eastern portions of the ETPBR (Illinois, Indiana and Ohio) had less tallgrass prairie historically and are more densely populated than farther west in this LCC. For example, very few native remnant prairies exist in Ohio and those that remain are very small (cemeteries, right-of-ways, etc). Wildlife habitat is comprised mainly of small forest patches in the northern part of the landscape, with larger patches or more proportion of forest cover in southern unglaciated areas with significant relief. Many of the major streams and rivers in the landscape do not have forested riparian buffers along most of their length.

The majority of the eastern landscape is intensively farmed, but also includes several large metropolitan communities, such as Chicago, Columbus, and Indianapolis. Suburban sprawl associated with these communities continues to push outward into rural areas.

Protected lands in rural and urban areas throughout the LCC include multiple State Wildlife Areas, National Wildlife Refuges, State Parks, and large park districts such as the Metro Parks in Ohio, and the Chicago Park District. Research on prairie plants and river species is conducted at world class arboreta and aquaria including the Chicago Botanic Garden, Shedd Aquarium, Missouri Botanical Garden in St. Louis, and smaller institutions, such as the Dyck Arboretum of the Plains. These facilities serve their communities by allowing visitors to experience the wonder of prairie and river ecosystems.

The different ecosystems and more dense human population may affect management focus in eastern portions of the LCC. For example, within the portion of the ETPBR LCC in Ohio, the following types of projects provide a focus:

1. Residential/commercial development, especially in the greater Cincinnati, Columbus, and Dayton areas
2. Wind power projects—construction and operation. The western portion of Ohio is the area within which most of the new wind power projects are being planned. These projects may impacts bats and migratory birds.
3. Endangered freshwater mussels—rayed bean, clubshell, fanshell (OH River), Northern riffleshell, pink mucket (OH River), rabbitsfoot, sheepnose (OH River), snuffbox. Several of the most important mussel streams are in this portion of the state.
4. Indiana bat—most of the newest Indiana bat maternity colony records are in this portion of the state, as is our largest hibernaculum. Bats in this area are significantly limited by habitat availability and are now being affected by white-nose syndrome.
5. Private lands conservation programs, such as Partners for Fish & Wildlife—restoration of prairie, oak savannah, and riparian areas.

6. Invasive species (terrestrial) are a significant habitat issue in this part of the state. Various species of bush honeysuckle dominate the understory of forests and degrade habitat quality throughout the LCC.

Subdivision classifications of the LCC Geography

For purposes of addressing particular taxa or habitats, the ETPBR LCC geography may be subdivided in any of the following ways:

Bailey Ecological Units 1994 (Figure 3):

- 251 Prairie Parkland (Temperate Province) – west and central ETPBR LCC
- 222 Ozark Broadleaf Forest – Meadow Province – east ETPBR LCC (IN, OH)

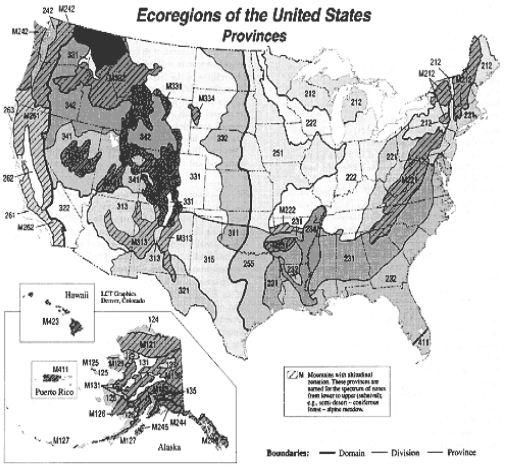


Figure 3. Bailey Ecological Units showing 251 and 222 in ETPBR.

Bird Conservation Regions (BCR22) Physiographic Areas (Figure 4):

- 31 Prairie Peninsula
- 32 Dissected Till Plains
- 33 Osage Plains

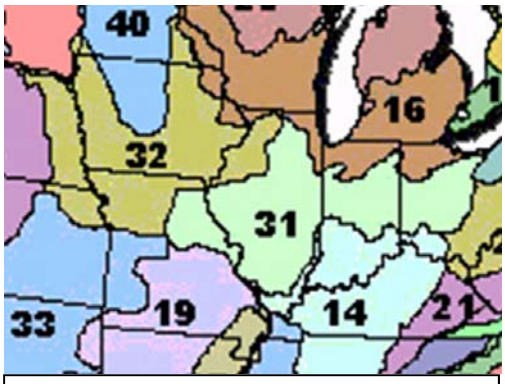


Figure 4. Bird Conservation Regions with 33, 32, 31 in ETPBR.

Omernik Ecoregions Level III (Figure 5):

- 47 Western Cornbelt Plains (NE/IA/KS/MO)
- 40 Central Irregular Plains (KS/OK/MO)
- 72 Interior River Valleys and Hills (MO/IL)
- 54 Central Corn Belt Plains (IL/IN)
- 55 Eastern Corn Belt Plains (IN/OH)

Watersheds HUC2 (Figure 6):

- 10 Missouri River Basin (NE, IA, KS, MO)
- 11 Arkansas River Basin (KS, OK, MO)
- 07 Upper Mississippi Basin (IA, MO, IL)
- 05 Ohio River Basin (IL, IN, OH)

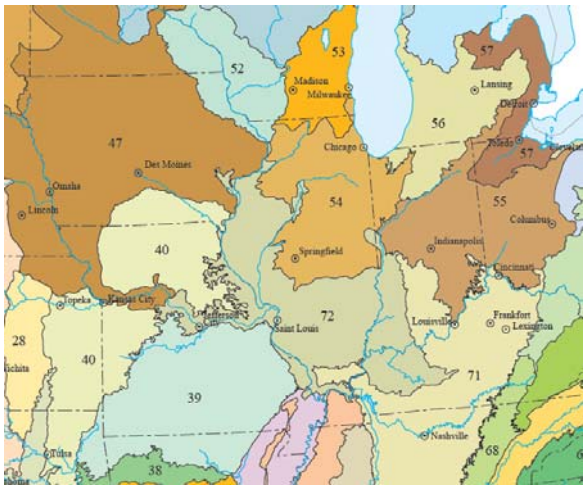


Figure 5. Omernik Ecoregions with 47, 40, 72, 54, 55 primarily in ETPBR.

Key Habitats

The LCC has identified key habitats that support a functional landscape for fish and wildlife species in the ETPBR. The ETPBR LCC will focus on a specialized niche of tallgrass prairie and big river ecosystem management, while adapting approaches from other LCCs as appropriate for associated wetland and woodland habitats in this region.

- **Tallgrass Prairie** – emphasis on upland grasslands, including associated wetlands and woodlands.
- **Big Rivers** – emphasis on floodplain and channel connections, including watershed impacts.
- **Associated habitats** – adapt approaches from adjoining

LCCs as appropriate.

- Adapt wetland science from Plains & Prairie Potholes LCC, Upper Mississippi/Great Lakes Joint Venture, and Playa Joint Venture, especially for western portions of the ETPBR LCC.
- Adapt woodland science from Appalachian LCC and Gulf Coastal Plains & Ozarks LCC, especially for Eastern hardwood tillplain forest in Indiana and Ohio

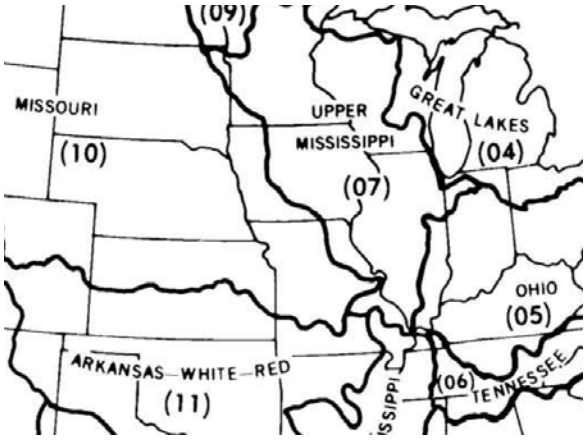


Figure 6. Major river basins (HUC2 watersheds) in ETPBR – Missouri, Arkansas, Upper Mississippi, Ohio.

To conserve tallgrass prairie and river habitats, the LCC will also focus on dominant land uses in the region, both agricultural and urban.

Focal Area descriptions:

1) **Prairie Restoration Techniques** – Develop and connect functional tallgrass prairie ecosystems.
2) **River Restoration Techniques** – Develop and connect functional big river ecosystems.
3) **Agroecology Conservation Practices** – Use economics and incentives to influence best management practices for habitat conservation on agricultural working lands, particularly as they affect the Gulf of Mexico hypoxic zone.
4) **Urban Watershed Management** – Promote big river systems as a resource for green infrastructure and human connection to waterways and wildlife habitats in cities, suburbs and small towns.

Guiding Principles

What overarching factors guide project priorities and determine strategic approach?

Work supported by the ETPBR LCC will be conducted according to the following principles:

- **Regional / Scalable**
  - We work across landscapes and across boundaries of all types.
  - Find good models at the local level that can be scaled up to the region:
    - Broad spectrum. Applied locally. Evaluate progress at meaningful scales.
    - Postage stamps and mega-complex refuges.
    - While fixing long-term, large scale (e.g., Farm Bill), need intermediate vision.
  - Identify and fill gaps and avoid redundancies across LCCs and other partnerships and organizations.
  - Identify and connect priorities across state lines at large scale (fusion of state action plans, TNC plans, etc).

- **Pragmatic**
  - Set and meet reasonable expectations.
  - Focus resources where they make the biggest difference.
  - Understand and leverage socioeconomic patterns and incentives.
  - Develop explicit linkages and approaches to ensure products are available in a form that is usable by on-the-ground partners for conservation delivery.

- Understand and leverage socioeconomic patterns.

- **Collaborative**
  - We are a conservation community and collaboration is how we accomplish our work.
  - Conduct open and frequent communications within the LCC network and among vested stakeholders and be transparent in deliberations and decision-making.
  - Consider and respect each participating organization's unique mandates and jurisdictions.
  - Streamline and connect authorities.
  - Be integrated into other successful regional partnerships (e.g., Joint Ventures, Fish Habitat Partnerships).
  - Draw from other landscape-level plans, including the four National Bird Plans, the recently updated North American Waterfowl Management Plan and the companion Action Plan.
  - Draw from and help to implement the State Wildlife Action Plans and State Forest Action Plans.
  - Integrate ourselves into the larger network of LCC's.

- **Consistent**
  - Focus on developing shared landscape-level priorities that lead to strategies that can be implemented.
  - Focus on the same projects, the same way.
  - Continuity across limited administrative terms.

- **Science-based**
  - Develop and rely upon best available science.
  - Use a scientifically objective adaptive management approach.
  - Develop explicit linkages and approaches to ensure products are available in a form that is usable by partners delivering conservation.

- **Transparent**
  - Evaluate the effectiveness of our shared strategies and progress at meaningful scales with metrics that are easily understood.
  - Conduct open and frequent communications within the LCC network and among vested stakeholders and be transparent in deliberations and decision-making.

How can the LCC be most useful to policy makers?
What do policy makers need from the design, implementation and communication of applied research for more effective natural resource management? Mark Gorman, Policy Analyst, Northeast-Midwest Institute, framed the needs of policy makers as follows:

Policy makers are one of the key 'clients' of our analytical science and they need research that:

1) Provides quantitative analyses that can be further applied in valuation and policy analyses.
2) Develops risk management and probability-based outputs to support risk and benefit analyses (i.e. avoided impacts and risks) of potential future action (or "no action") options.
3) Allows for clear and simple communication of changes in risk, including confidence.

4) In other words, over all, policy makers want to be able to estimate the degree to which risks and damages might increase or may be lowered across multiple impact sectors under various future scenarios, and then to clearly communicate projected risks and damages, or potential benefits, and key sources of uncertainty to diverse audiences. Policy makers will want to focus on "impact sectors" that affect people and that people care about, such as: health, agriculture, forestry, water resources, energy, infrastructure, coastal systems and ecosystems.

The science information needs (questions to be answered) to support evolving policy and programmatic decisions are:

1) How do we assess, manage, avoid, and adapt to threats?
2) How do we measure the benefits (i.e. avoided impacts and risks) of potential future mitigation and adaptation (or no action) alternatives?
    a. Probability-based metrics can be used to quantify and communicate changes in risk under different future scenarios
    b. Probabilistic outputs allow for clear and simple communication of uncertainty and confidence
    c. Development of models that estimate the specific benefits of future actions is needed to inform mitigation policies
3) How do we improve current tools and develop metrics to best inform a wide audience consisting of (a) the analytic and scientific communities, (b) the public and (c) policy makers (speakers suggested that developing physical metrics that supplement economic benefits estimates will allow for better communication of risk to policymakers and the public).

Policy makers need:

1) Peer-reviewed, comprehensive assessments of the state of the science.
2) <u>Quantitative</u> assessments of health and economic impacts of risks (i.e., risk management and probability-based outputs). Quantitative studies are crucial to the development of policy analyses. The speakers very much stressed the need for quantitative metrics and analysis. Quantitative research that produces impact metrics will allow them to potentially monetize and therefore compare impacts across various impact sectors (see above). Risk communication is critical since decision-makers need to understand the implications of policies in place already and under consideration.
3) To be able to understand future changes in risk, particularly for vulnerable populations (i.e., clear and simple communication of risk, including confidence) under future mitigation or no-action scenarios. They suggest identifying opportunities to better communicate such changes in risk (see the next main item, below).

Effective communication from the scientists to the policy makers and then from the policy makers to the public will:

1) Use indicators to communicate the causes and effects in an easy-to-understand way
2) Communicate what the current situation “looks like” and how that might change
3) Explain why the current or projected future state of the conditions matters to people
4) Rely on quantitative data of health and environmental impacts

Operational Frameworks for Decision-Making

The Steering Committee has adopted a set of systematic frameworks for collaboration and decision-making, including Collective Impact, Strategic Habitat Conservation (SHC), Structured Decision Making (SDM) and preliminary criteria for project selection.

Strategic Habitat Conservation (SHC)

Strategic Habitat Conservation provides an iterative process of adaptive management supported by information management.

Therefore, the strategies within the ETPBR LCC strategic plan are categorized according to the following SHC framework components (Figure 7):

- ***Assessment (AS) - Identify and prioritize problems***
  - *Biological assessment* – What do we know about status of priority wildlife?
  - *Triage* – Which issues demand immediate attention (e.g., SGCN, invasives)?
- ***Goal setting (GS) - Conservation planning to target solutions***
  - *Goal setting* – Which species/habitats should we conserve?
  - *Conservation design* – Where are the best places to conserve the most species? When and how much to conserve? Who are the stakeholders? What do they need to implement solutions within their specific context?
- ***Conservation Delivery (DE) - Actions to implement solutions***
  - *Science translation* – How do we maximize utility of science?
  - *Action delivery* – How do we design and scale for efficient on-the-ground conservation actions?
  - *Conservation adoption* – How do we get the right people in right places to adopt effective conservation actions?
- ***Monitoring (MO) – Evaluation and research to guide iterative improvement***
  - What new information is needed to support conservation solutions?
- ***Information management (IM) – Data, models and communications to support performance***
  - How will we manage the demand for and creation of data, models and communications to support information sharing, learning and performance tracking?

Agencies and organizations use representative species to iteratively evaluate the effectiveness of conservation actions in an adaptive management context. The US FWS is working with stakeholders to explore the development of a surrogate species approach to provide a regional mechanism for biological planning and monitoring across the LCC.

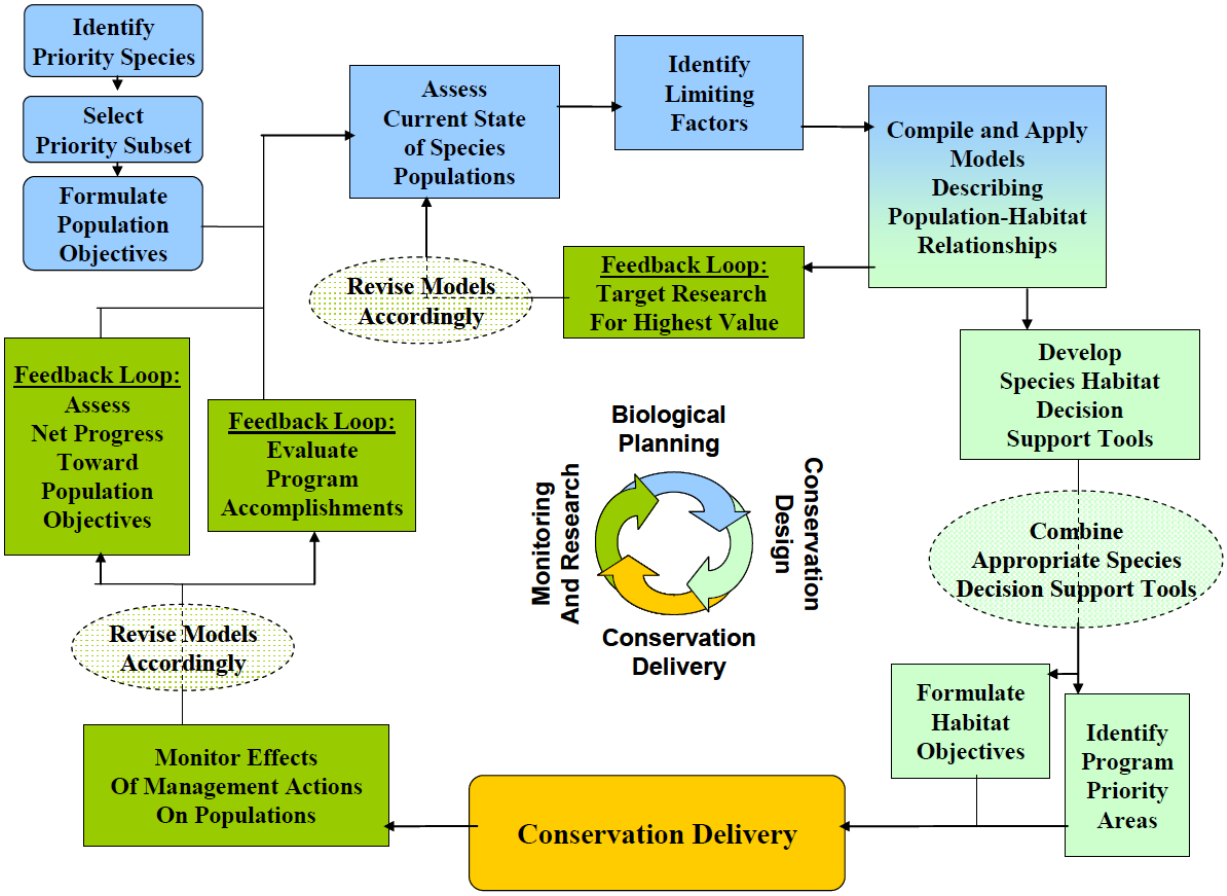


Figure 7. Adaptive management model for identifying research needs for natural resource management and applied research (science needs) within the context of Strategic Habitat Conservation (SHC).

Baseline information and periodic re-evaluation is essential for adaptive management. The ETPBR LCC will need to evaluate and use the information available for developing models for conservation planning, delivery and evaluation, which may include:

1) Identification of species of interest in the LCC, key habitats supporting those species, the condition of components within those habitats (quantity, quality, and distribution), and alternative actions that may influence habitat condition as a baseline for measuring change due to the influence of LCC efforts;
2) Population objectives (e.g., surrogate species) translated into habitat objectives and/or other metric(s) to measure LCC success in an SHC context; and
3) A retrospective landscape-change assessment to help LCC partners determine cover species and habitat trends, set realistic conservation objectives, and more effectively allocate limited resources when targeting conservation actions.

As this information is refined through evaluation, that data will feed iteratively improved models for decision-making within the focal areas selected by the LCC.

Structured Decision Making (SDM)

The LCC TAGs and Steering Committee may use Structured Decision Making (SDM) as a framework to guide rapid prototyping and further refinement of models that guide conservation planning and implementation. SDM supports decisions that are transparent, explicit, deliberative, documented, and replicable where inadequate information is available to make a perfect choice.

Therefore, the LCC may use this framework to identify Science Needs that address key uncertainties or which measure impacts of actions to iteratively improve the selection and delivery of effective conservation actions.

SDM consists of the following steps (abbreviated with the mnemonic "ProACT"):

1) Defining the **Pr**oblem – Describe the desired outcome (Functional Landscape) across the ETPBR LCC region.
2) **O**bjectives – Outline and prioritize Conservation Objectives (Values) for each stakeholder.
3) **A**lternatives – Identify Alternative Management Actions that meet operational Constraints (e.g., budget, legal, socioeconomic).
4) **C**onsequences – Use models (Consequence Table) to evaluate the predicted effect of each management alternative on stakeholder objectives.
5) **T**rade-offs and Optimization – Conduct a sensitivity analysis to determine how uncertainties affect decisions and select the portfolio of actions that best addresses high priority objectives within the constraints.

SDM supports decisions that are transparent, explicit, deliberative, documented, and replicable where inadequate information is available to make a perfect choice. Therefore, the LCC may use this framework to identify Science Needs that address key uncertainties or which measure impacts of actions to iteratively improve the selection and delivery of effective conservation actions.

Preliminary Criteria for ETPBR LCC Science Needs Priorities

The LCC Steering Committee developed a preliminary list of criteria for identifying Science Priorities that are appropriate for ETPBR LCC projects.

NOTE: *This list will be further refined by a Criteria Subteam to guide science needs recommendations from the four Technical Advisory Groups.*

Criteria for Selection of ETPBR LCC Science Needs (draft)

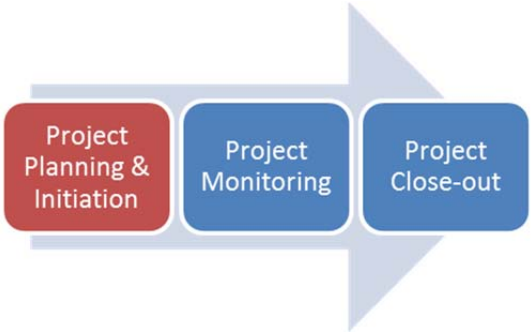
Project selection may meet the following criteria. We reorganized the preliminary list of bullets within the Guiding Principles established by the ETPBR LCC Steering Committee.

- **Regional/Scalable**
  - **Geographic basis in watersheds -** Has a geographic basis in watersheds identified as high priority for Gulf hypoxia nutrient management.
  - **Crosses multiple focal areas -** Crosses multiple focal areas (prairie, river, agroecology, urban).
  - **Demonstrations with broad application -** Demonstrations that can be applied more broadly across the region.

- **Pragmatic & Science-based**
  - **Focuses on feasible solutions** - Focuses on solutions, including what kind of cumulative management action is "enough" to solve wildlife problems.
  - **Addresses uncertainty in decision-making -** Addresses uncertainty in management decision framework.
  - **Recognizes both wildlife and intensive uses** - Recognizes the need for both wildlife and agriculture—not just preservation but also accommodating intensive uses by agriculture and urbanization.
  - **Connects people to nature** - Enhances connectivity to communities by restoring connection between people and wildlife/habitat.
- **Collaborative**
  - **Locally supported** - Has local support for advocacy and ownership.
  - **Leverages resources** – Leverages resources for broader partnerships, filling the gaps in knowledge and resources without supplementing federal budgets or duplicating federal programs.
  - **Builds on success of existing programs** - Builds on and supports success of existing programs by influencing policy over the long-term, addressing program restrictions with creative approaches and/or extending participation to more landowners.
- **Transparent**
  - **Evaluates effectiveness** - Actions are measured to evaluate effectiveness.
  - **Articulates results simply** - Results can be articulated clearly for key LCC audiences.

Project Planning and Initiation Process (LCC / US FWS WSFR)

The purpose of this section is for guidance on the only; refer to the signed memorandum of understanding (MOU) for the detailed agreement between Region 3 Wildlife and Sport Fish Restoration (R3 WSFR) and Region 3 Science Applications Program (R3 SA).



Funding for Support

Per the MOU, R3 SA will provide R3 WSFR funding for one FTE staff person for each fiscal year, throughout the life of the MOU, with the possibility of changes each fiscal year. WSFR staff will assist the LCC by:

- Participating in the proposal scoring team to provide council on issues related to federal grant management
- Reviewing detailed work plans for awarded projects
- Counseling successful applicants on payment mechanisms
- Review and approval of necessary compliance documents and realty grants
- Review of performance and financial interim and final reports
- Programmatic and fiscal close-out, response to audit requests, requirements of grants.gov, and transactions in FBMS system

Project Planning and Initiation

There are three parts to the Project Planning and Initiation step: Project Identification, Project Award Process, and PMP Development.

Project Identification

- Work with technical committee to identify research needs based on LCC priorities

- Determine & refine project scope - Identify assumptions & constraints
- Determine funding mechanism (Grant, Coop Agreement or IAA) & approximate funding capacity (Annual Budget)
- Develop detailed RFP/SOW

Project Award Process

- WSFR will post RFP/SOW on Grants.gov and submitted through USGS/ETPBR LCC RFP Manager
- Proposals will be considered & scored by a Review Committee
- Funding decisions will be made by the Steering Committee
- Proposals will go to the WSFR programmatic officer for eligibility & compliance review
- Award letters will be sent to selected recipients
- Notify SA Budget Officer to complete an office fund target (OFT) to fund each of the projects - notify WSFR and LCC when completed
- WSFR Fiscal officer will work with award recipient to register DUNS/CCR/ASAP for account set-up and will create PR to obligate funds
- WSFR will draft the final Grant award documents and obtain signatures from award recipients; WSFR will send a copy of the final agreement to the LCC staff

PMP Development

- Draft the PMP for each selected project using information from recipients proposal
- Determine project oversight & change control procedures
- Schedule kick-off meetings with each award recipient
- Finalize PMP and distribute to PI's and WSFR

Project Monitoring

- Enter Schedule & Milestones (from completed PMP) into project tracker
- Monitor schedule for upcoming fiscal & deliverable requirements
- Follow up with PI's, if necessary
- Review milestone reports for adequacy and to determine performance acceptance
- LCC send performance and financial reports to WSFR
- Attend milestone meetings (if applicable) to discuss project achievements and/or issues
- Upload all financial & milestone reports into project tracker
- Continually update PMP throughout the life of the project

Project Close-out

- Schedule close-out meeting in which PIs present final project results
- Conduct performance review
- WSFR de-obligates any remaining funds and closes out project award file
- Archive project records
- Share data and communicate with conservation community

Goals, Primary Objectives & Preliminary Strategies

Within each Focal Area and for each aspect of the Conservation Framework, where can the LCC add value? What needs to happen to get there?

NOTE: *These DRAFT goals, objectives and preliminary strategies are based on continuous input from the Steering Committee and stakeholders. Over the next several months, this section will remain dynamically updated based on dialogue with stakeholders. The four Focal Area Technical Advisory Groups (TAGs) and Steering Committee will refine and prioritize these items as decision-making opportunities arise.*

We welcome your input on priority Science Needs to guide research for advancing conservation management in the context of landscape-scale changes.

For more details on the strategies, see the full version of the Strategic Plan.

Timeframe: outcomes in 10 years, based on 30-year predictions

For each of the four focal areas (Prairie Restoration; River Restoration; Agroecology; Urban Watersheds), the following information is provided:

1) Situation analysis – What is the current status of the practice that provides a context for science needs?
2) Stakeholder input process – How and by whom were the strategies and science needs identified?
3) Goal, Objectives and Strategies – What is the overall goal, preliminary objectives and short-term strategies for achieving the goal through ETPBR LCC activities?

At the end of this Strategic Plan is an Action Plan for immediate implementation over the upcoming year.

Focal Area #1: Prairie Restoration Techniques - *Where and how should we focus restoration (or reconstruction) of prairie ecosystems, including associated wetlands and woodlands, for biodiversity conservation, taking advantage of large-scale and small-scale opportunities?*

Note: *This section contains preliminary material that will be refined by the Prairie Restoration Technical Advisory Group (PTAG).*

Situation analysis

Tallgrass prairie originally covered approximately 240 million acres. Only 3% of the original tallgrass prairie remains, as most of the prairie has been converted to agriculture during the last 60-70 years of the 19th Century (Smith 1990). The vast majority of the acres lost were in the eastern portion of the tallgrass region. States exhibiting major losses include Minnesota, Illinois, Missouri, and portions of Wisconsin and Indiana. Tallgrass prairie is now meeting its demise in the Dakotas, Nebraska, Kansas, and Oklahoma (Faber et al. 2012). Virtually all tallgrass prairie in Iowa is gone, with less than 0.1% remaining (Smith 1990). From 2006 to 2011, soaring crop prices and biofuel mandates were among factors that prompted conversion of 1.3 million acres of grassland to corn and soybeans in five states

with rates of loss as high as 30% percent in parts of Iowa and Nebraska—rates not seen since the Dust Bowl Era of the 1930s (Wright and Wimberly, 2013).

Similarly imperiled are oak savanna, black oak barrens, sand prairies, forested wetland, and wet prairie communities that were historically more common in eastern portions of the LCC, such as Indiana and Ohio.

Because land use in the ETPBR LCC is largely dominated by working lands used for agriculture and urban development, the ETPBR will focus on restoration (or reconstruction) of tallgrass prairies and big river ecosystems. Focusing on the diversity of pollinators (e.g., butterflies) and birds that can be attracted to native prairies could encourage more restoration, as this would appeal to a range of rural and urban landowners and could attract visitors to the area. Where applicable, the ETPBR LCC will adapt management techniques for protecting and enhancing existing remnant prairie, most likely from the work of the Plains and Prairie Potholes LCC or the Great Plains LCC.

Reconstructing prairie is more critical today than ever, in light of recent trends in habitat loss across the upper Midwest. Reconstructing prairies is a goal for many Refuges and Districts in Regions 3 and 6 as identified in Comprehensive Conservation Plans (CCPs) and Habitat Management Plans (HMPs) and supported by the Biological Integrity, Diversity, and Environmental Health (BIDEH) Policy (601 FW3). The Joint Ventures, State Wildlife Action Plans and State Forest Action Plans also address reconstruction of native tallgrass prairie and managing those lands for grassland-dependent birds and other wildlife.

However, managers and biologists have many questions on the most cost-effective ways to establish and manage prairie reconstructions for the greatest wildlife benefit. When asked, managers and biologists stated some of the greatest uncertainties related to prairie reconstruction included: influence of soils/other abiotic factors, best seed mix/rate, seeding methods/timing, weed management/timing, and triggers for moving the reconstruction from establishment to maintenance phase.

Not only are there many uncertainties related to reconstructing prairies, there are many limitations to implementing or expanding a prairie reconstruction program, as well. The number one limitation agreed upon by most was money, followed by the staff-time needed to implement follow-up management. Additional limitations included accessibility of equipment that fit station needs, the availability of a local seed source, and inadequate training of staff and volunteers. Given the vast number of uncertainties, compounded by resource limitations, cost-optimization must be at the forefront of any decisions made related to reconstructing prairies. The LCC will continue to inventory plans and partners to find common science research needs.

Currently, we are not being effective in meeting our prairie reconstruction goals; uncertainties associated with climate change and land use context introduce even more concern about the survival of prairie ecosystems. In order to remove these concerns, we must reduce uncertainty in our reconstruction actions. As manager and biologists, we can learn more quickly rather than separately by pooling information and ideas, assembling the facts, using science to drive our decisions, and combining our monitoring resources, thus

reducing the burden of work for an individual Refuge, District or nongovernmental organization (NGO).

The need to learn more about the effectiveness of the practices used to establish and manage prairies has been identified as a high priority by U.S. Fish and Wildlife Service (USFWS) Refuges, Wetland Management Districts, and the Partners for Fish and Wildlife Program in Regions 3 and 6. Federal, state and non-government partners spend many hours and many dollars each year planting and managing prairies. Research is underway in agencies, universities, arboreta, aquaria, land trusts, and other nongovernmental institutions.

The successful collaborative management and monitoring approach fostered by existing adaptive management projects (Native Prairie Adaptive Management Project, Grassland Monitoring Team, Wetland Restoration Project) have prompted us to take the next step and focus on the methods to establish and maintain prairie plant communities—in this LCC geography, usually on former crop fields. The LCC partners can actively collaborate to set an applied research agenda and conservation strategies for the tallgrass prairie ecosystem.

Stakeholder Input Process

River restoration goals, objectives and strategies are based on workshop outcomes from the September 2012 ETPBR LCC Steering Committee retreat.

Outcomes from a structured decision making (SDM) workshop on Prairie Restoration hosted by the FWS at the Neal Smith NWR on November 27-30, 2012, an SDM workshop on Landscape Scale Framework for Cooperative Grassland Bird Restoration hosted by NCTC in September 2011, and additional interviews with individuals from agencies and NGOs provided a significant lead in identifying science needs that practitioners perceive as high priority for prairie and river restoration. The FWS Ecological Services Field Offices in Columbus, Ohio, and Columbia, MO, USGS staff from several offices, and individuals from other agencies and organizations also submitted extensive comments.

The ETPBR LCC Steering Committee will reconvene in January 2013 to review progress on the strategic plan.

Further refinement of the strategic plan for restoration may involve continued work of the existing Prairie Restoration Working Group and the Fish Habitat Partnerships (FHPs) supplemented with additional in-person or online/phone interviews during February to April 2013 to acquire input from a geographically broader set of practitioners in 11 states with particular emphasis on expanding the participation from the southern and eastern portions of the LCC for prairies and from the entire region for rivers.

Prairie Restoration Goal (PRG)

PRG 1. Determine where and how to focus restoration for biodiversity conservation, taking advantage of both large-scale and small-scale opportunities (vistas and gems).

Prairie Restoration Objectives (PRO)

PRO 1.1 Create functional large-scale prairie ecosystems that provide wildlife habitat, particularly for declining species such as pollinators and grassland birds.

PRO 1.2 Protect, connect, expand, and manage remnant prairies to preserve genetic diversity and local ecotypes.

PRO 1.3 Promote the values and management of prairie ecosystems among communities and landowners.

Prairie Restoration Strategies (PRS) – identification of Science Needs to support management decisions, organized by stage in the conservation framework (assessment, goal setting, delivery, monitoring, and information management).

Science Needs for Assessment (PRS AS)

PRS AS 1. Inventory existing prairie restoration goals and assessment models – Inventory existing prairie restoration goals and assessment models, including State Wildlife Action Plans, State Forest Action Plans, The Nature Conservancy Ecoregional plans, Fish Habitat Partnerships, and other related restoration models.

PRS AS 2. **Inventory existing prairie assets as a baseline** – Conduct an initial inventory of prairie conservation / landscape assets, primarily the community types identified as key habitats, including:

1) Build a database to inventory current quantity, quality, and distribution of conservation lands with a GIS layer of Federal-owned, state-owned, easements, etc., including Farm Bill programs, possibly by expanding GIS data management systems from the UMGL Joint Venture and/or UMGL LCC, to detect influence of LCC partner efforts.
2) Set population objectives for species of interest translated into habitat objectives or some other metric(s) linked to this inventory to measure LCC success in an SHC context.
3) Conduct a retrospective landscape-change assessment to determine trends in habitat types, set realistic conservation objectives, and more effectively allocate limited resources when targeting conservation.
4) Evaluate and compare the landscape-scale conservation benefits of implementing either large-scale restoration approaches compared to small-scale conservation practices.

PRS AS 3. Project tracking system – Develop a standardized project record form, complete and compile information through an online database to track prairie reconstruction projects conducted by any organization or individual, including initial conditions, practices, and outcomes, possibly based on the RLGIS (Refuge Habitat Management Database).

PRS AS 4. Prioritize restoration sites - Identify priorities for reconstruction and protection, including: 1) high quality remnant prairie sites or watersheds associated with unmodified river segments (gems); and 2) areas with high potential for small- and large-scale prairies, floodplain and wetland restoration (vistas and gems).

PRS AS 5. **Vulnerability assessments** - Develop climate change and other vulnerability assessments for prairies and grassland birds.

1) Develop a climate change and land use vulnerability assessment for grassland birds across the region.
2) Expand/maintain a database of grassland bird distribution, to help connect/consolidate separate conservation efforts, and to systematically assess/manage risk to endangered grassland bird recovery.

PRS AS 6. Organizational capacity - Enhance organizational capacity for prairie reconstruction by preparing a directory of collaborators/expertise (end users and

developers of prairie reconstruction projects) and using the contacts to develop a community of practice (group to lead project development and implementation).

Science Needs for Goal Setting (PRS GS)

PRS GS 1. Regional conservation planning – Refine the inputs and expand conservation plans to a regional multi-state scale that addresses climate adaptation and other landscape-scale stressors to:

1) Review existing goals and adopt those that would be applicable, including: a) compiling prairie reconstruction habitat management objectives from Fish Habitat Partnerships, State Wildlife Action Plans, State Forest Action Plans The Nature Conservancy Ecoregional Plans (e.g. Osage Plains/Flint Hills), and other related plans; b) conducting a literature search to inventory current science and research projects; and c) preparing a retrospective study of existing reconstructions (e.g., site location, practices, outcomes, cost);
2) Update land use/land cover shape files to produce more fine-grained spatial data in algorithms with improved accuracy of GIS data layers (e.g., distinguish neighborhood tree canopy from forest, expand the definition of "road" beyond paved surface to any hard surface that interferes with buffers to reduce edge effect): and
3) Expand the scale to link multiple State Wildlife Action Plans and city green infrastructure plans at a regional multi-state scale to identify and addresses landscape-scale stressors, such as using downscaled climate models to guide design of species range adaptation corridors across the region.

PRS GS 2. **Prairie conservation design principles** - Develop a set of tallgrass prairie conservation design principles that incorporate:

1) *Variations in practice* - Accounts for regional/geographic variations in practice.
2) *Wildlife objectives* - Incorporates wildlife objectives, especially for species that operate at larger spatial scales (BCA), such as reversing the trend in declining grassland bird populations and encouraging pollinators (leaf hoppers genera-specific on prairie plants, possibly losing an entire group of insects because of limited planting choices).
3) *Land use context* – Based on the land use context, reflecting how surrounding land use influences decisions (e.g., social and physical expectations for weeds and flowering, history of land use).
4) *Shape and size* – Accounts for size, connectivity/corridors, and location in the watershed, particularly in upper/first order streams where better control over hydrology is possible and the site provides downstream ecosystem services. Focus on larger restoration areas if possible – whether they are river, prairie, urban, or agricultural. Their value is greater due to the fact that they are rarer in the landscape.
5) *Synergistic organizational priorities* - Where there is overlap of priority areas among organizations (e.g., wetland management districts, refuges, private lands).
6) *Climate change* - Accounts for greater variability anticipated with climate change by incorporating the appropriate cool season component in seed mixes that may be more resilient to climate shifts by incorporating "future" prairie species, based on identifying which model predictions are most appropriate to

use and the implications of uncertainty on conservation design (temperature, precipitation patterns).

PRS GS 3. Target conservation for critical guilds and species - Compile conservation guilds of greatest concern for tallgrass prairies, possibly using grassland bird communities as surrogate species, to include some less mobile species (not just birds) and recognizing that some bird populations operate at very large scales that are difficult to manage as a region.

PRS GS 4. Decision models to reverse decline in grassland birds - Build strategic decision-making models to prioritize actions to reverse the declining trend in grassland birds including:

1) Inventory existing information;
2) Improve information from non-breeding periods for focal grassland birds that breed in the Upper Midwest landscape to help determine where populations are most limited and to ensure strategic investment of conservation resources;
3) Prepare high resolution landscape characterization to assist with conservation planning and tracking implementation (i.e., remote sensing of grassland quality and quantity);
4) Develop a coordinated evaluation approach for grassland BCAs to track change at local and regional scales, inform planning and identify best management practices;
5) Identify factors related to decline (e.g., habitat, pesticide use) and target conservation actions to address key causes,
6) Integrate knowledge about socio- and agro-economics into grassland bird conservation planning;
7) Determine benefits of grassland bird conservation for other physical and socio-economic needs across the LCC;
8) Design grassland size and configuration across the landscape that most efficiently achieved population objectives of target species; and
9) Identify a number of Grassland Bird Conservation Areas (GBCAs) capable of sustaining grassland bird populations.

<u>Science Needs for Delivery (PRS DE)</u>

PRS DE 1. **Establishment methods (seed mix selection, site preparation)** – Evaluate practices to establish diverse reconstructions most quickly and at lowest cost that meets objectives through practices that optimize input/long-term cost during site preparation, based on site conditions (e.g., soils) and seed mix tailored to the site, objectives, and funds including factors that will stimulate community vigor, suppress exotics and increase adaptability to climate change such as:

1) Minimum sample size for PLS – species list, purity, viability of native harvest seed.
2) Grass to forb ratio.
3) Cool season component.
4) Specialized site preparation equipment such as the stump grinder, a rubber-tracked flail that removes understory facilitating creation of bur oak savannah.
5) Consider the use of mosaic plantings; as well as staged/phased prairie restoration and proper seed mixes.

PRS DE 2. **Availability of local ecotype plant material** – Increase availability of some species that are:

1) Hard to acquire because they are not propagated due to a traditional emphasis on warm-season species; and
2) Increase sources of local ecotype seed and cultivars.

PRS DE 3. Factors for success (e.g., soils) - Identify factors related to soils that influence success of prairie reconstruction, including: 1) how soil characteristics (abiotic & biotic) influence reconstruction; 2) soil testing methods (nutrients, chemistry, texture, seed bank, biota, aeration carbon deficit); and 3) influence of soils on establishment and management decisions.

PRS DE 4. Wildlife response – Identify factors related to wildlife response to prairie reconstruction, including:

1) Selection and propagation of critical plant species (e.g., hemiparasites);
2) Other characteristics that increase wildlife response to plant community restoration (e.g., invertebrates, soil biota, birds);
3) Impacts of invasive species (e.g., feral hogs may cause ecological damage to wet prairies and depredation on ground nesting wildlife with relatively slow mobility that occur 18 inches either side of the soil surface); and
4) Setting of realistic objectives for restoration or reconstruction relative to climate change impacts (e.g., restore prairie to historic conditions or just ensure that good habitat is present across current and anticipated species ranges).

PRS DE 5. **Post-planting management** – Determine the most effective balance of high input of seed mix cost compared to post-planting management labor at beginning to address the effects of climate and site conditions, including weed control by identifying and suppressing highly aggressive weeds that will have the greatest influence on success, such as:

1) Treatment of Canada thistle treatment in early years (e.g., herbicides, mowing);
2) Use of forbs (spring ephemerals) to compete with weeds (e.g., competitive native forbs including Alexanders, Meadow Rue, Prairie Smoke, Pasque flower, Shooting Star).
3) Using management techniques such as properly-timed mowing to drive plant community outcomes.
4) Support the use of prescribed burning in particular more frequent early spring burns depending on the ecological setting.

PRS DE 6. Communication with operations staff - Improve communication between managers, biologists, and operations staff to explain when details of management are important and where there is flexibility in conducting maintenance actions on the prairie (e.g., timing of mowing).

<u>Science Needs for Monitoring (PRS MO)</u>

PRS MO 1. **Prairie type classification system** – Define eastern tallgrass prairie types, similar to the Cowardin, et. al 1979 classification system for wetlands and deepwater habitats, to include characteristics such as soils, hydrology, plants, wildlife, including conservatism and functional groups, perhaps based on species lists in the *Field Guide to Native Plant Communities of Minnesota* or Michigan Natural Features Inventory.

PRS MO 2. Quantitative measures of success – Develop a system for measuring quantitative parameters that indicate success as efficient, effective ways of doing reconstruction.

PRS MO 3. **Cost of prairie restoration** – Determine and track the cost of losing and reconstructing prairie (value), including carbon sequestration benefits of keeping grasslands intact.

PRS MO 4. Prairie restoration process characteristics – Characterize the process of prairie restoration, including:

1) Identifying the amount of variability in response to management actions; and
2) Defining the end of establishment phase, intermediate and maintenance phase in order to determine what triggers next set of management actions.

Science Needs for Information Management (PRS IM)

PRS IM 1. Prairie Restoration BMP Handbook - Develop and promote use of a Handbook of Prairie Restoration Best Management Practices (BMPs) by:

1) Survey managers to describe process from site assessment to management;
2) Describe scenarios of objectives, site conditions, actions, and outcomes;
3) Prepare an influence diagram of ecological function and BMP decisions (e.g., pre-screening site conditions, existing and desired ecological functions;
4) Determine best seed mix and site preparation methods, based on soils, seed bank, and other factors presented in a plant species list/spreadsheet with bloom time, geography, pollinator value, allelopathy and other components necessary for desired wildlife response; and
5) Present recommendations for post-planting phase management, including a list of early detection rapid response aggressive invaders and when to use techniques such as mowing, herbicide treatment and prescribed burns.

PRS IM 2. **Simulation tools for siting prairie restoration** – Develop simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations at scales from the regional to the local level for prairie restoration that show scenario-based outcomes for wildlife habitat and water quality benefits, similar to decision support tools under development for wetlands in the Playa Lakes of Nebraska and farms in the Upper White River Watershed in Indiana.

PRS IM 3. **Education on native prairie landscaping** – Educate property managers to the benefits of landscaping with native prairie plants, especially under extremes of drought and flooding due to climate shifts, by:

1) Identifying factors that will motivate implementation of conservation practices, such as focusing on the diversity of pollinators (e.g., butterflies) and birds that can be attracted to native prairies restorations, as this could encourage landowners to plant prairies on private lands and attract visitors to public lands.
2) Providing landscaping design guidelines and local listings of sources of plant material for private property owners in rural and urban contexts through the nursery trade.
3) Developing, delivering and evaluating curriculum guidelines for school programs to create and use prairie outdoor learning environments (for an example, see Prairie Restoration for Wisconsin Schools, University of Wisconsin-Madison Arboretum).

- **Priority focal species (Prairie Restoration)**
  [Note to reviewers: These species are identified by other stakeholders. The LCC has not picked focal species at this time, but may do so in the future.]

  Grassland birds may not be the best surrogate species because they are mainly "generalist" with vegetation structure as their key habitat component. Many key factors that reflect restoration success, such as floristic diversity, insect diversity, and soil integrity, may not be represented by using birds as surrogates. The FWS Surrogate Species process and other considerations by the LCC may expand this list to include non-bird species.

  FWS Surrogate Species (draft list TBD)

  Upper Mississippi River and Great Lakes Region Joint Venture (* denotes species with population trend estimates)
  - Landbirds
    - Grassland
      - Greater prairie chicken
      - Henslow's sparrow
      - Eastern meadowlark
      - Upland sandpiper
    - Shrubland / Scrub / Bog
      - American woodcock
      - Olive-sided flycatcher
      - Willow flycatcher
      - Blue-winged warbler
      - Golden-winged warbler
      - Connecticut warbler (forested wetland)
      - Yellow-breasted chat
    - Forest
      - Whip-poor-will
      - Cerulean warbler
      - Chimney swift
      - Prothonotary warbler
      - Veery
      - Wood thrush
      - Black-throated blue warbler
      - Louisiana waterthrush
      - Kentucky warbler
  - Shorebirds
    - American golden-plover
    - American woodcock*
    - Dunlin
    - Killdeer*
    - Prothonotary warbler (forested wetland)
    - Piping plover
    - Sanderling
    - Short-billed dowitcher

        - Upland sandpiper*
        - Wilson's phalarope*
        - Wilson's snipe*
    - Waterfowl
        - Wood duck (breeding)*
        - Mallard (breeding)*
        - Blue-winged teal (breeding)*
        - Canvasback
        - Lesser Scaup
    - Waterbirds
        - King rail*
        - Black tern*
        - Common tern*
        - Black-crowned night heron*

Partners in Flight Bird Conservation Plans - Priority Bird Populations & Habitats from for Bird Conservation Region 22 with Breeding Bird Survey state distribution.

- **Prairie Peninsula (Physiographic Area 31)** - *Conservation issues and recommendations* - Soon after European settlement, the vast majority of grassland, savannah, and forest were converted to pasture, hayfield, and cropland. Some agricultural habitats served as surrogate grasslands, contributing to range expansion by a few species such as the Dickcissel and Horned Lark. Over the past 30 years, however, these and other grassland birds have declined as the amount of land in pasture decreased, and hayfields shifted to earlier maturing forage crops. Birds that nest in crops harvested during the breeding season suffer an almost absolute loss of eggs and nestlings. It may be impossible to recoup losses from conversion to more extensive and cleaner agriculture in recent decades, but PIF encourages maintenance or restoration of high quality grassland habitat in patches of sufficient size to support viable populations of high priority species. Remaining forest habitat generally exists as small blocks in which nesting individuals typically have low rates of nest success. Nevertheless, individuals in these areas may produce some offspring and small patches can provide habitat for in-transit migrants. PIF recommends retaining and, where possible, expanding these patches to sizes at which brood parasitism and predation rates are significantly decreased. Areas of savannah, also badly degraded, are optimal for some species such as the Red-headed Woodpecker. Savannah restoration and management can provide significant benefits to some birds, even in moderate-sized patches (up to 800 ha).

    - Grassland
        - Greater Prairie Chicken (KS, MO) - This bird formerly was common in this physiographic area but is now extirpated in Ohio and Indiana. It occurs in low numbers in Illinois and Missouri, and is subject to the negative biological effects linked to small isolated populations. Loss of grassland acreage as well as fragmentation and deterioration of grassland landscapes are to blame.
        - Henslow's Sparrow (KS, MO, IN, OH)

        - Dickcissel (KS, NE, OK , MO, IA , IL, IN, OH)
    - Shrubland / Scrub / Bog
        - Bell's Vireo (KS, NE, OK , MO , IA, IL)
    - Wetlands
        - Black Rail (CA on CBC map??)
    - Deciduous Forest
        - Cerulean Warbler (MO, IN, OH)
        - Red-headed Woodpecker (KS, NE, OK , MO, IA , IL, IN, OH) - This is one of the most conspicuous avifaunal elements of the savanna habitat that has all but disappeared from this area.
        - Eastern Wood-Pewee (KS, NE, OK , MO, IA , IL, IN, OH) - All forest birds presumably underwent their greatest declines here well before the BBS began. Populations appear to be low and studies show that reproductive success is below that needed to sustain populations. The appearance of stability results from immigration of birds from source populations in more heavily forested physiographic areas.

- **Dissected Till Plains (PA 32)** - *Conservation issues and recommendations* - This former upland prairie/savannah/forest complex is now one of the most heavily altered physiographic areas in the country. Agriculture dominates the uplands, fire suppression and urbanization encourage trees where there was once prairie, and reservoirs have flooded many of the more extensively wooded bottomlands. About half of the agricultural lands are hay field or pasture which offer some potential for use by priority grassland birds. Dominance of fescue and early mowing for hay, however, greatly reduces much of the area's value. Protection or restoration of a series of grassland Bird Conservation Areas each consisting of a 2000-acre core surrounded by a mile-wide matrix containing at least 2000 additional acres of grassland may be the best hope for perpetuation of the grassland species suite. Where prairie-chickens are not an issue, such a large central core may not be necessary as long as patch sizes exceed minimum area requirements of other priority birds and the percentage of grassland in the Bird Conservation Area remains 40% or greater. Smaller grasslands specially managed or enrolled under the Conservation Reserve Program may support one or a few priority species, especially if they help bring the total amount of grassland in a landscape above some critical threshold. Restoration of riverine corridors offers promise for forest birds if patches are large enough that predation and parasitism rates are minimized. PIF suggests management of small upland woodlots for in-transit migrants.

    - Grasslands
        - Greater Prairie Chicken (KS, MO) - This bird requires a large heterogeneous area of grassland; its area demands exceed those of other grassland birds in this area.
        - Henslow's Sparrow (KS, MO, IN, OH) - Breeds in late successional grassland (about 3-8 years post- disturbance) with standing dead vegetation and a well-developed litter layer.
        - Bobolink (KS, NE, IA, MO, IL, IN, OH – more northern)

- Field Sparrow (KS, NE, OK , MO, IA , IL, IN, OH)
- Loggerhead Shrike (NE, KS, OK, IA, MO, IL, IN – more southern)

- **Osage Plains (PA 33)** - Conservation recommendations and needs - About 70% of this physiographic area and almost all of the Flint Hills subregion were tallgrass prairie prior to European settlement. Conversion of land to agriculture and the increase in woodland following fire suppression has greatly diminished the percentage of grass in the Osage Plain and Blackland Prairie and Crosstimber subregions. However, some high quality landscapes supporting relatively large populations of Prairie-Chickens and/or Henslow's Sparrows remain. In fragmented landscapes, PIF suggests consideration of a series of Bird Conservation Areas designed to perpetuate the highest priority birds. The Flint Hills have been dominated by livestock ranching rather than rowcrops, and grassland landscapes remain largely unfragmented. Because lack of fragmentation often is associated with low levels of nest predation and brood parasitism, breeding birds may produce an abundance of offspring able to re-colonize grasslands in the fragmented areas of the Midwest. Although light livestock grazing can result in habitat structure that is attractive to some high priority birds, annual spring burns and overgrazing can result in landscapes that are too homogeneous to meet the needs of all priority species. Nevertheless, PIF supports ranching and good range management as a means of accomplishing bird conservation objectives. Indeed, any other likely use of the land could be disastrous for birds. Because priority shrub birds may be able to prosper in relatively small patches of quality habitat, PIF suggests that small wildlife areas that cannot be part of a productive grassland system be managed as shrub habitat for Bell's Vireo and other shrub birds. Riparian forest birds are largely peripheral in this area, but some suitable sites on the eastern fringes could be managed for this suite. A variety of wetland habitats should be maintained primarily for high priority in-transit migratory shorebirds. In addition, PIF recommends maintenance of riparian strips for in-transit migratory landbirds.

  - Grasslands
    - Greater Prairie Chicken (KS, MO) - This species has the greatest demands of all the grassland birds in terms of area and heterogeneity of habitat. The Osage Plains remain the core of the global population of this species.
    - Henslow's Sparrow (KS, MO, IN, OH) - A few areas with the highest densities and perhaps healthiest populations of this globally imperiled species are in southwestern Missouri and the Flint Hills of Oklahoma. These birds are most abundant in grasslands 3 to 4 years or more after disturbance, with standing dead vegetation and a well-developed litter layer.
    - Dickcissel (KS, NE, OK , MO, IA , IL, IN, OH)
  - Grasslands/shrubs or scattered trees
    - Field Sparrow (KS, NE, OK , MO, IA , IL, IN, OH)
    - Loggerhead Shrike (NE, KS, OK, IA, MO, IL, IN – more southern)
    - Scissor-tailed Flycatcher (KS, OK, MO – more south central)

        - Shrub/brush
            - Bell's Vireo (KS, NE, OK , MO , IA, IL)
            - Painted Bunting (KS, OK – very south central)
            - Harris's Sparrow (NE, KS, IA, OK, MO on CBC map)

- **Communications (Prairie Restoration):** *What do target audiences need to know, feel or do?*
    - Objectives
        - Clearly communicate complex regulations to encourage contributions by landowners and managers
        - Increase the "share" of conservation and influence behavior
        - Land use planners and city managers feel they can contribute, be part of something larger
    - Strategic approach
        - Build devotion to interconnected river systems through stories (historic).
        - Capitalize on the instinctive attraction to water.
        - Convey economic benefits of habitat restoration for green infrastructure, recreation and tourism.
    - Resources
        - America's Lost Landscape: The Tallgrass Prairie (documentary film)
        - The Dust Bowl (Ken Burns film)

- **Stakeholders & Resources** (initial list)
    - *End users*
        - Land and water conservation groups
            - Illinois: Chicago Wilderness, Midewin National Tallgrass Prairie; Nachusa Grasslands (TNC) – endangered regal fritillary butterfly successfully breeding in what were corn fields restored by connecting cemetery remnants over 10 years.
            - Indiana: Central Indiana Land Trust, Goose Pond
            - Iowa: Friends of the Prairie Learning Center
            - University of Northern Iowa Tallgrass Prairie Center
            - Kansas: Tallgrass Prairie National Preserve, Town of Cassoday ("prairie chicken capital of the world")
            - Oklahoma: Tallgrass Prairie Preserve (TNC)
            - Grassland Restoration Network (Bill Kleiman, Chris Helzer, TNC; Elizabeth Middelton, MDC)
            - Great Plains Nature Center
            - American Association of Botanical Gardens
            - Grow Native – Missouri Prairie Foundation
            - University of Wisconsin-Madison Arboretum
        - Private landowners
            - Prairie Landowner Network (Dyck Arboretum, KS)
    - *Management (technical assistance)*
        - State and federal agencies (public land managers)
            - IA DNR Prairie Resource Center (Bill Johnson)
            - Elsberry Plant Materials Center
            - Transportation departments

        - Parks departments
    - Public land managers (NWRs, state park properties)
        - Leopold Wetland Management District (Paul Charland, USFWS)
        - Wisconsin Bird Conservation Coordinator (Andy Paulios)
        - Grassland Bird Conservation Area (Chris Trosen, USFWS)
    - Midwest Conservation Biomass Initiative (Carol Williams, UW-Madison)
    - Flyway partners
    - Private lands extension agents and contractors
        - Applied Ecological Services (Steve Apfelbaum)
        - Cardno-JFNew (Chris Kline)
        - Spence Restoration (Kevin Tungesvick)
- *Research*
    - Illinois: Midewin National Grassland (US Forest Service)
    - Indiana: West Fork White River invasive plant removal and migratory corridor demonstration (Cliff Chapman, Central Indiana Land Trust)
    - Iowa: Tallgrass Prairie Center (University of Northern Iowa)
    - Kansas: Konza Prairie Biological Station (Kansas State University); The Land Institute; Dyck Arboretum of the Plains
    - Oklahoma: Tallgrass Prairie Ecological Research Station (TNC)
    - Grassland Restoration Network – practitioners from agencies, nonprofits, etc (NE, IA, IL, WI); 3-4 planners with TNC lead; annual workshop to share information about large reconstructions.
    - Native Seed Producers – informal group of seed/nursery producers.
        - University of Northern Iowa Tallgrass Prairie Center
    - Prairie insects (Jim Bess) - 149 species of bees at Bill Barnes Nature Preserve, northern Indiana
    - USGS Northern Prairie
        - University of Minnesota (Diane Larson)
        - Modeling contractor (Jill Gannon)
        - Iowa State University (Lisa Schulte Moore)
- *Partner plans and programs* - inventory of documents and interpreter (contacts)
    - State Wildlife Action Plans (SWAPs)
    - Upper Mississippi River System Ecosystem Restoration (Ken Barr)
    - Upper Mississippi River Conservation Committee (Janet Sternberg)
    - Mississippi River Network (Botts)
    - TNC Ecoregional Plans (John Shuey)
    - Prairie Reconstruction Work Group (Jessica Dowler)
    - Midwest Grassland Bird Working Group (Katie Koch)
    - Midwest Grassland Bird Conservation Area Subcommittee (Ken Duren, Ohio DNR)
    - Wisconsin Strategic Grassland Bird Conservation Plan
    - Minnesota Prairie Conservation Plan
    - Adjacent LCCs
    - Joint Ventures
    - Fish Habitat Partnerships
        - Fishers & Farmers FHP (IA, IL, MO)
        - Driftless Area Restoration (MN, WI, IA, IL)

            - Great Plains FHP (NE, KS, OK)
        - LCC Maps (http://www.fws.gov/gis/data/national/index.html)
    - *Climate models and databases* – inventory
        - Northeast Climate Science Center (NE CSC)
        - Universities (UW Madison)
            - University of Wisconsin-Madison (Benjamin Zuckerberg)
        - Combining Radio Telemetry and Ground Technologies to Evaluate Landbird Migration and Identify Stopover Locations along the Upper Mississippi River System – proposed study (Pat Heglund)
        - Playa Decision Support Tools for Nebraska (Playa Lakes Joint Venture; http://www.pljv.org/playa-dss/nebraska)
    - *Events*
        - Natural Areas Conference – Oct 2013 in Chicago; 600 people for outreach with on-the-ground managers.
        - Society for Ecological Restoration – Oct 2013 in Madison; a lot of overlap with NAC, particularly among researchers and administrators.
        - Grasslands Restoration Network, University of Missouri Columbia, July 16-18, 2013.

- **LCC Funded Projects** (FY11-FY12)
    - *Relocation of Eastern box turtles* – Relocate and monitor turtles to gather data on behavior, survival and reproduction of the translocated turtles during the captive phase of the new home-range adoptive process. (Patoka River National Wildlife Refuge).
    - *Aviation and remote sensing programs* – Improve efficiency and effectiveness of aerial photography by the Midwest Aviation Program with upgraded components for the Applanix DSS 439 Camera System including a 60 mm lens and a gyro-stabilization mount (U.S. Fish & Wildlife Service).

- **Proposed (unfunded/partially funded) Gulf Coast Prairie LCC projects:**
    - Prairie Pilot Project - Extension of "Common Ground" Project ($75,000)
    - Prairie Conservation Opportunity areas: grassland species (TX, LA, OK) ($40,000)
    - Prairie Inventory Project (GMIT) (partially funded)
    - Landscape features (TX, LA, OK): surface geology, soils analysis, micro-topography ($60,000)
    - LA land cover – Chenier Plain ($30,000)

Focal Area #2: River Restoration Techniques - *Where and how should we focus restoration (or reconstruction) of big river ecosystems, including associated wetlands and floodplain forest, for biodiversity conservation, taking advantage of large-scale and small-scale opportunities?*

Note: *This section contains preliminary material that will be refined by the River Restoration Technical Advisory Group (RTAG).*

Situation analysis

Several big river ecosystems traverse the Lower Midwest, including the Lower Missouri River and Middle Mississippi River and their major tributaries such as the Platte River, Illinois River, Arkansas River, Wabash River, among others. The channels, floodplains, headwaters and associated watersheds of these major river systems provide stop-over points for migratory waterfowl and shorebirds. They sustain populations of diverse and ancient species of fish, mollusks, aquatic insects, reptiles, amphibians, and other wildlife that are dependent on interconnected channels and backwaters.

Dam removal, re-establishing forested riparian areas, floodplain connectivity, and managing flow regimes are key to restoring big river habitat in the Midwest.

Dam removal projects can be extremely complex, expensive, and time consuming to plan and implement. For example, there may be contaminant issues, historic preservation issues, flooding issues, or community concern. In order for wide-scale dam removal to be a more manageable goal, the process for planning dam removals needs to be simplified and made less expensive. For example the removal of the Main Street Dam (lowhead) on the Scioto River in Columbus is projected to cost $35 million and has been in the works for multiple years. Removal of the 5th Avenue dam (lowhead) on the Olentangy River in Columbus cost $6 million and took 6 years to plan and implement. These two recent examples showcase that, unless ample funding and dedicated people are available, dam removals may be cost and time prohibitive. The USFWS Fisheries division created a geospatial database of dams in the U.S., and how much river habitat could be reconnected if various dams were removed (http://ecos.fws.gov/geofin/). Individuals at Ohio State University and ODNR are trying to prioritize dams in proximity to high quality aquatic communities for removal. If these approaches could be paired with a method of analyzing the costs and significant issues with removing specific high-priority dams, this could help to prioritize the least expensive projects with the greatest fisheries benefit.

As noted above, the majority of big rivers in this landscape do not have forested riparian zones, or existing riparian areas are very narrow. Grass buffers are present in some areas. Restoration of forested riparian zones could contribute significantly towards water quality, habitat improvement, and flood mitigation. Further, re-connecting big rivers with their floodplains and restoring/maintaining the floodplains in forested or wetland conditions would significantly improve water quality, habitat, and flood mitigation. It would take a significant outreach effort to spread the word to local landowners across the landscape that streams are supposed to have trees along the banks, and even more effort to get landowners to actually plant trees. Targeting local governments and zoning boards (counties, townships) and providing them with information and tools to promote preservation and restoration of forested riparian zones and floodplains would be the best way to potentially reach a wide audience that has the ability to influence local land use.

This action ties in with the priority of federally listed freshwater mussels. Watershed supporting federally-listed mussels could be prioritized for restoration/enhancement activities. In Ohio, these include the following streams: Little and Big Darby; Great and Little Miami; Scioto Brush Creek; Scioto; Olentangy; Salt; Walnut; and Ohio River. Mussels would benefit from both dam removal and floodplain restoration.

Alteration of flow regimes is one of the most serious threats to the ecological integrity of rivers (Jones 2013 citing Bunn and Arthington 2002). Storage in large dams and hydropower power peaking represent ways a natural hydrograph can be altered. Jones (2013) references two approaches in determining environmental flows to minimize anthropogenic effects: 1) species specific approach, and 2) normative flow regime approach. For example, the Independent Scientific Advisory Committee to the Platte River Recovery Implementation Program recommended a hybrid approach to determining environmental flows. The LCCs are positioning themselves for a similar hybrid approach by reconciling the status of surrogate species (i.e., species specific) within broader landscape level processes (i.e., normative flow regime).

Dams and diversions not only affect natural hydrology but can also severely impact sediment transport. For many river processes and services, sediment concentrations and transport are as important as the quantity and flow of water (National Research Council 2011). Schmidt and Wilcock (2008) characterized more than 60% of the 4,000 km of regulated rivers evaluated in their paper as having a sediment deficit and thereby in a state of degradation. Most of the rivers studied were western rivers, but they did include a large portion of the Missouri River. Sediment transport issues also represent a major problem for the Platte. Recognizing the extreme costs in fixing sediment deficient rivers, Schmidt and Wilcock (2008) concluded that United States is a wealthy country with many magnificent rivers worthy of focused environmental management, but there are not sufficient funds nor political consensus to fully restore every river. The scientific community is obligated to present a template for regional prioritization and tradeoffs if limited resources are to be expended wisely.

Because land use in the ETPBR LCC is largely dominated by working lands used for agriculture and urban development, restoration in the ETPBR region will depend largely on connecting the channels and floodplains of big river ecosystems, along with watershed management practices. Actions such as chute or backwater construction minimize impacts of degradation by creating local habitat but do not restore riverine processes at the larger scale where chutes, backwaters, and oxbows are regenerated. Where applicable, the ETPBR LCC will coordinate with research conducted by the upper river systems of the Plains and Prairie Potholes LCC and Great Plains LCC along with the downstream impacts to the Lower Mississippi River systems of the Gulf Coastal Plains and Ozarks LCC to address these landscape scale dynamics.

River restoration can be complex due to the wide range of uses and expectations for aquatic systems, including flood control, navigation, water withdrawal, recreation, and wildlife habitat. Restoring river ecosystems is a goal for many Refuges and Districts in FWS Regions 3 and 6 as identified in Comprehensive Conservation Plans (CCPs) and Habitat Management Plans (HMPs) and supported by the Biological Integrity, Diversity, and Environmental Health Policy (BIDEH 601 FW3). The Joint Ventures, Fish Habitat Partnerships and State Wildlife Action Plans and State Forest Action Plans also address reconstruction of river ecosystems for water-dependent migratory waterfowl, shorebirds, fish, and other wildlife.

However, managers and biologists have many questions on the most cost-effective ways to establish and manage river habitat for the greatest wildlife benefit. Given the vast number of uncertainties, compounded by resource limitations, cost-optimization must be at the

forefront of any decisions made related to restoring functional river ecosystems. The LCC will continue to inventory plans and partners to find common science research needs.

As manager and biologists, we can learn more quickly rather than separately by pooling information and ideas, assembling the facts, using science to drive our decisions, and combining our monitoring resources, thus reducing the burden of work for an individual Refuge, District or nongovernmental organizations (NGOs). Currently, we are not being effective in meeting our river reconstruction goals. In order to remove these concerns, we must reduce uncertainty in our reconstruction actions.

Stakeholder Input Process

River restoration goals, objectives and strategies are based on workshop outcomes from the September 2012 ETPBR LCC Steering Committee retreat.

A Missouri River Work Group meeting hosted by the FWS field office in Columbia, MO, on January 9-11, 2013, Hydrogeomorphic (HGM) project meetings in Kansas City and Omaha in December 2012 - January 2013, and additional interviews with individuals from agencies and NGOs provided a significant lead in identifying science needs that practitioners perceive as high priority for river restoration. The USGS Fort Collins Science Center provided outcomes from a stakeholder workshop on Climate Change and Riparian Forests in the upper South Platte River Basin held on March 7, 2013. The FWS Ecological Services Field Offices in Columbus, Ohio, and Columbia, MO, USGS staff from several offices, and individuals from other agencies and organizations also submitted extensive comments.

Further refinement of the strategic plan for restoration may involve continued work of the existing Fish Habitat Partnerships (FHPs) supplemented with additional in-person or online/phone interviews during February to April 2013 to acquire input from a geographically broader set of practitioners in 11 states with particular emphasis on expanding participation from the middle and eastern portions of the LCC for rivers.

River Restoration Goal (RRG)

RRG 1. Determine where and how to focus big river ecosystem restoration for biodiversity conservation, taking advantage of both large-scale and small-scale opportunities (vistas and gems).

River Restoration Objectives (RRO)

RRO 2.1 Restore long stretches of free-flowing and interconnected big river ecosystems through large-scale restoration processes.

RRO 2.2 Protect, connect and expand existing intact free-flowing mainstem channels and segments of large rivers that retain connection with their headwaters.

RRO 2.3 Enhance connectivity between upland and lowland terrestrial habitats along big river corridors.

PRO 2.4 Promote appreciation among water users for functional riverine ecosystems.

River Restoration Strategies (RRS) – identification of Science Needs to support management decisions, organized by stage in the conservation framework (assessment, goal setting, delivery, monitoring, and information management)

Science Needs for Assessment (RRS AS)

RRS AS 1. Inventory existing goals and assessment models for river restoration – Inventory existing river restoration goals and assessment models from programs, including Fish Habitat Partnerships, State Wildlife Action Plans, The Nature Conservancy Ecoregional plans, and other related restoration models.

RRS AS 2. Inventory river conservation assets as a baseline – Conduct an initial inventory of river conservation / landscape assets, primarily the community types identified as key habitats.

1) Build a database to inventory current quantity, quality, and distribution of conservation lands with a GIS layer of Federal-owned, state-owned, easements, etc., including Farm Bill programs, possibly by expanding GIS data management systems from the UMGL Joint Venture and/or UMGL LCC, to detect influence of LCC partner efforts.
2) Set population objectives for species of interest translated into habitat objectives or some other metric(s) linked to this inventory to measure LCC success in an SHC context.
3) Conduct a retrospective landscape-change assessment to determine trends in habitat types, set realistic conservation objectives, and more effectively allocate limited resources when targeting conservation.
4) Evaluate and compare the landscape-scale conservation benefits of implementing either large-scale restoration approaches compared to small-scale conservation practices.

RRS AS 3. Project tracking system – Develop, complete and compile information from a standardized project record form to track river reconstruction region-wide including initial conditions, practices, and outcomes, possibly based on the structure of the Refuge Habitat Management Database (RLGIS).

RRS AS 4. Prioritize restoration sites - Identify priorities for reconstruction, including:

1) High quality remnant headwater streams or unmodified river segments to protect (gems).
2) Areas with high potential for small- and large-scale river channel, floodplain and wetland restoration (vistas and gems).
3) Pairing a geospatial database of dams and length of fragmented river habitat with a method of analyzing the costs and significant issues with removing specific high-priority dams to prioritize the least expensive dam removal projects with the greatest fisheries benefit.

RRS AS 5. **Vulnerability assessments** - Develop climate change and other vulnerability assessments for stream ecosystems.

1) Develop a climate change vulnerability assessment for stream fish communities.
2) Expand/maintain the Mussel Threats Database, to help connect/consolidate separate mussel conservation efforts, and to systematically assess/manage risk to endangered mussel recovery.

RRS AS 6. Organizational capacity - Enhance organizational capacity for river reconstruction by preparing a directory of collaborators/expertise (end users and developers of river reconstruction projects) and using the contacts to develop a community of practice (i.e., group to lead project development and implementation).

Science Needs for Goal Setting (RS GS)

RRS GS 1. Regional conservation planning – Refine the inputs and expand river corridor conservation plans to a regional multi-state scale that addresses climate adaptation and other landscape-scale stressors to:

1) Review existing goals and adopt those that would be applicable to the ETPBR LCC goal setting framework, including:
    a. Compiling river reconstruction habitat management objectives from HMPs, SWAPs, TNC, and other plans, particularly for sensitive species guilds (imperiled populations like state- and federally-listed species);
    b. Conducting a literature search to inventory current science and research projects; and
    c. Preparing a retrospective study of existing reconstructions (e.g., site location, practices, outcomes, cost).
2) Update land use/land cover shape files to produce more fine-grained spatial data in algorithms with improved accuracy of GIS data layers.
3) Expand the scale to link multiple State Wildlife Action Plans and city Green Infrastructure plans at a regional multi-state scale to identify and addresses landscape-scale stressors, including using downscaled climate models to guide design of species range adaptation corridors across the region.

RRS GS 2. **River conservation design principles** - Develop river system conservation design principles that incorporate:

1) *Variations in practice* - Accounts for regional/geographic variations in practice;
2) *Wildlife objectives* - Incorporates wildlife objectives, especially for species that operate at larger spatial scales (e.g., migratory waterfowl, pallid sturgeon) and especially sensitive species (e.g., imperiled species) that are impacted by landscape-scale stressors (climate change and contaminants).
3) *Land use context* - Is based on the land use context, reflecting how surrounding land use influences decisions (e.g., social and physical expectations, history of land use).
4) *Shape and size* – Accounts for size of reconstruction, connectivity/corridors, and location in the watershed, particularly in upper/first order streams where better control over hydrology is possible and the site provides downstream ecosystem services and determine whether additional effort focused on location of conservation practices or on enhancing existing areas will be cost-effective in a relatively homogeneous landscape. Focus on larger restoration areas if possible – whether they are river, prairie, urban, or agricultural. Their value is greater due to the fact that they are rarer in the landscape.
5) *Synergistic institutional priorities* - Where there is overlap of priority areas among organizations (e.g., wetland management districts, refuges, private lands).
6) *Climate change* - Accounts for greater variability anticipated with climate change by incorporating the appropriate cool season component in seed mixes that may be more resilient to climate shifts and incorporating "future" river species, based on identifying which model predictions are most appropriate to use and the implications of uncertainty on conservation design (temperature, precipitation patterns).

a. Use GIS tools to identify riparian areas that have the most favorable circumstances and conditions for restoration of early-successional riparian habitat.
b. Use a spatially-explicit forest dynamics model, coupled with a hydrological model, to examine how climate change and future land use change might affect the abundance and connectivity of different riparian habitat types.

RRS GS 3. Target conservation for critical guilds and species - Compile conservation guilds of greatest concern for big river ecosystems to include some less mobile species, sensitive species (e.g., imperiled species) that are impacted by landscape-scale stressors (climate change and contaminants), sedentary species that are especially vulnerable and cannot escape from stressors, and recognizing that some migratory populations operate at very large scales that are difficult to manage as a region (e.g., waterfowl, shorebirds, mussels, pallid sturgeon).

RRS GS 4. Simulation tools for river restoration – Develop simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations <u>at scales from the regional to the local level</u> for river restoration that show scenario-based outcomes for wildlife habitat and water quality benefits of functional riverine ecosystems, similar to tools under development for wetlands.

<u>Science Needs for Delivery (RRS DE)</u>

RRS DE 1. **Restore native aquatic species habitat and ecological processes** - Relationship of habitat (acreage) to population objectives for pallid sturgeon, chubs, migratory birds, shorebirds, and water birds to:

1) Reconstruct aquatic habitats, including:
    a. Shallow water habitat (within river channel) – define functional characteristics; quantify and determine optimal distribution; engineering of wing dike notch.
    b. Chute design (off main channel) – engineering of connection to main channel through levees.
    c. Flow regulation (timing & quantity) – spring rise and summer low flow.
    d. Early life history requirements of pallid sturgeon (larval drift) compared to shovelnose sturgeon as a surrogate for monitoring and conservation.
2) Mitigate human impacts on habitat, including:
    a. Shoreline erosion impacts to endangered species;
    b. Energy development (hydrokinetic turbines on riverbeds) impacts to endangered species;
    c. Intake Diversion Dam (structure for irrigation) - fish passage design & sturgeon reproduction;
    d. Fish bypass relative to channel slope & velocity; and
    e. Water withdrawal intake parameters for sturgeon.
    f. Improve water quality to better support habitat for sensitive species.
3) Use opportunities and authorities in federal water resources project planning to advance restoration of hydrologic functions and processes that restore environmental flows through a combination of species specific and normative

flow regime approaches to address broader landscape level hydrology and long-term river dynamics that form and maintain habitat, by:

a. Working with the Corps on flood risk reduction projects to reinforce principles of sound floodplain management and the important functions and processes that floodplains and off-channel habitats provide, including nutrient cycling.
b. Evaluate flood zone qualities (biological communities and ecological processes), such as:
    i. How much productivity does an open (connected) floodplain add to a river;
    ii. What ecological services (in addition to productivity) are lost when the flood shrinks or is removed; and
    iii. How much a river system's biodiversity will change if the duration or timing of flood inundation changes as a result of climate change.
c. Working with the US Army Corps of Engineers to promote alternative river regulation that expands navigation pool drawdowns for migratory bird benefits.
d. Build on efforts of regional coordination groups that have introduced alternative river regulation (drawdowns) in several navigation pools on the upper Mississippi River and continue to seek additional alternative regulation opportunities with Corps partners.
e. Continue work of the FWS, US Army Corps of Engineers and local interests in the New Madrid Floodway to balance flood risk reduction and maintenance of floodplain ecosystem services.

RRS DE 2. Factors for success - Identify factors that influence success of river reconstruction, including: 1) abiotic characteristics (e.g., temperature); 2) hydrology; and 3) invasive species.

RRS DE 3. Wildlife response – Identify factors related to wildlife response to river reconstruction, including:

1) Hydrology;
2) Other characteristics that increase wildlife response to restoration of hydrology (e.g., invertebrates, soil biota, birds);
3) Impacts of invasive species (e.g., feral hogs thrive in wet areas with cooler summer temperatures and protective cover, such as riparian zones, and cause depredation on ground nesting wildlife with relatively slow mobility that occur 18 inches either side of the soil surface); and
4) Setting of realistic objectives for restoration or reconstruction in anticipation of climate change (e.g., restore rivers to historic conditions or just ensure that good habitat is present across current and anticipated species ranges).

RRS DE 4. **Decision models to control invasive species in rivers** – Support efforts to develop effective controls for:

1) Asian carp; and
2) Asian bush honeysuckle on highly erosive river banks followed by seeding with native grasses, sedges and wild rye along with use of erosion control fiber blankets, willow stakes and live plantings to establish a native forested corridor for migratory wildlife.

Science Needs for Monitoring (RRS MO)

RRS MO 1. Quantitative measures of success – Develop a system for measuring quantitative parameters that indicate success as efficient, effective ways of doing river reconstruction.

RRS MO 2. **Cost of river restoration** – Determine and track the cost of losing and reconstructing river ecosystems (value).

PRS MO 4. River restoration process characteristics – Characterize the process of constructing and managing river restorations, including:

1) Identifying the amount of variability in response to management actions; and
2) Defining the end of establishment phase, intermediate and maintenance phase in order to determine what triggers next set of management actions.

Science Needs for Information Management (RRS IM)

RRS IM 1. **Clearinghouse of River Restoration BMPs** - Develop and promote use of a clearinghouse of River Restoration Best Management Practices (BMPs).

1) Survey managers to describe river management processes from site assessment to application of practices.
2) Describe scenarios with objectives, site conditions, actions, and outcomes including current and possible future conditions.
3) Prepare an influence diagram of ecological function and BMP decisions (e.g., pre-screening site conditions, existing and desired ecological functions) to assess impacts of water withdrawal, drainage and flood control infrastructure and improve water resource management decisions at large scales in the face of climate change and other landscape-level challenges.
4) Identify uncertainties in management that may be addressed by applied research.
5) Promote appreciation among water users for design and management of functional riverine ecosystems.

RRS IM 2. **Education on river restoration** – Educate property managers on the benefits of river restoration, especially under extremes of drought and flooding due to climate shifts, by:

1) Implementing a significant outreach effort among local landowners regarding the value of retaining and planting trees along stream banks.
2) Providing local governments and zoning boards (counties, townships) with information and tools to promote preservation and restoration of forested riparian zones and floodplains to influence local land use.

- **Priority focal species (River Restoration)**

[Note to reviewers: These species are identified by other stakeholders. The LCC has not picked focal species at this time, but may do so in the future.]

FWS Surrogate Species (draft list TBD)

TAG Member suggestions:

- Arkansas River (HUC 11)
  - Information needed

- Missouri River (HUC 10)
    - Pallid sturgeon
    - Chubs
    - Interior Least Terns
    - Piping Plover
    - Freshwater mussels
- Upper Mississippi River (HUC 07)
    - Migratory birds, water birds
    - Shorebirds (focal species for BCR22 in Upper Miss JV Plan)
        - American golden-plover
        - Piping plover
        - Killdeer
        - Upland sandpiper
        - Sanderling
        - Dunlin
        - Short-billed dowitcher
        - Wilson's snipe
        - American woodcock
        - Wilson's phalarope
    - Freshwater mussels
- Ohio River (HUC 05)
    - Freshwater mussels (46 species) - rayed bean, clubshell, fanshell (OH River), Northern riffleshell, pink mucket (OH River), rabbitsfoot, sheepnose (OH River), snuffbox.
    - Invasive species (terrestrial) are a significant habitat issue in this part of the state. Various species of bush honeysuckle dominate the understory of forests and degrade habitat quality throughout the LCC.

- **Communications (River Restoration):** *What do target audiences need to know, feel or do?*
    - Objectives
        - Clearly communicate complex regulations to encourage contributions by landowners and managers
        - Increase the "share" of conservation and influence behavior
        - Land use planners and city managers feel they can contribute, be part of something larger
    - Strategic approach
        - Build devotion to interconnected river systems through stories (historic).
        - Capitalize on the instinctive attraction to water.
        - Convey economic benefits of habitat restoration for green infrastructure, recreation and tourism.
    - Resources
        - Everglades of the North: Grand Kankakee Marsh (Lakeshore Public Television, Chicago)
        - Compiled list of conservation programs, strategies, and actions in the Platte River basin along with species list for overlapping programs (Jeff Runge, FWS)

- **Stakeholders & Resources** (initial list)
  - *End users*
    - Land and water conservation groups
      - Indiana: Central Indiana Land Trust, Goose Pond Fish and Wildlife Area
      - Illinois: Emiquon National Wildlife Refuge
    - Private landowners
  - *Management (technical assistance)*
    - State and federal agencies (public land managers)
      - Transportation departments
      - Parks departments
    - Flyway partners
    - Private lands extension agents
  - *Research*
    - Indiana: Upper White River Watershed Alliance (Jill Hoffmann, Empower Results)
    - NOAA Mussel Watch Program (http://ccma.nos.noaa.gov/about/coast/nsandt/musselwatch.aspx).
  - *Partner plans and programs* - inventory of documents and interpreter (contacts)
    - Ducks Unlimited Big Rivers Initiative
    - Fish Habitat Partnerships (Larscheid)
      - Great Plains FHP (NE, KS, MO)
      - Southeast Aquatic Resources Partnership (MO)
      - Fishers & Farmers FHP (IA, IL, MO)
      - Driftless Area Restoration (MN, WI, IA, IL)
      - Ohio River Basin FHP (IL, IN, OH)
    - Floodplain Science Network (http://floodplainsciencenetwork.org)
    - Floodplains by Design, Great Rivers Partnership, The Nature Conservancy
    - Healthy Rivers INitiative (HRI)
    - Illinois River Basin Restoration Authority (IL-519)
    - Joint Ventures
    - Middle Mississippi River Partnership (midmiss.org)
    - Midwest Natural Resources Group
    - Mississippi River Cities and Towns Initiative (Walton Family Foundation funding) and Mississippi River Caucus (Congressional)
    - Mississippi River Network (Botts)
    - Niobrara Confluence Conservation Area and Ponca Bluffs Conservation Area in northeast Nebraska and southeast South Dakota sets a goal of protecting 140,000 acres through the purchase of conservation easements (NPS, FWS Wayne Nelson-Stastny).
    - Ohio: Wildlife habitat is comprised mainly of small forest patches in the northern part of the landscape, with larger patches or more proportion of forest cover along the Bellefontaine Ridge in Logan County; the southern edges of the LCC boundary in Hamilton, Clermont, and Brown counties that are not urban (Cincinnati), have significant relief and are primarily forested. Narrow forested riparian corridors exist along rivers such as Stillwater, Great Miami, Laramie, Greenville, Sevenmile, Mad, Little Miami, Caesar,

Indian Creek, Todd Fork, Rattlesnake, White Oak, and Straight Creeks. More notable forested areas exist along Big and Little Darby Creeks, and southern portion of Little Miami.
        - State Wildlife Action Plans (SWAPs)
        - TNC Ecoregional Plans (John Shuey)
        - Upper Mississippi Environmental Management Program
        - Upper Mississippi River Conservation Committee (UMRCC)
        - Upper Mississippi River Conservation Committee (Janet Sternberg)
        - Upper Mississippi River Restoration (UMRR) Environmental Management Program (EMP)
            - 2012 UMRR EMP Environmental Design Handbook (online)
        - Adjacent LCCs
            - LCC Maps (http://www.fws.gov/gis/data/national/index.html)
    - *Climate models and other databases* – inventory
        - Climate centers (USGS, NOAA, NWS)
        - Universities (UW Madison)
        - Combining Radio Telemetry and Ground Technologies to Evaluate Landbird Migration and Identify Stopover Locations along the Upper Mississippi River System – proposed study (Pat Heglund)
        - Mussel Threats Database (Elissa Buttermore)
        - Federal Support Toolbox, Integrated Water Resources Management, US Army Corps of Engineers (www.watertoolbox.us)
        - Climate Modeling and Stakeholder Engagement to Support Adaptation in the Iowa-Cedar Watershed – Draft Final Report, March 2013
    - *Events*

- **LCC Funded Projects** (FY11-FY12)
    - *Mobile streamside mussel rearing trailer* - Evaluate how different water sources support growth and survival of young rare and endangered freshwater mussels (Genoa National Fish Hatchery).
    - *Mississippi River remote sensing* – Collect infra-red digital imagery during periods of peak vegetative growth to develop a cover map for the Mississippi River flood plain from Minneapolis, Minn. to the Ohio River confluence.
    - *Missouri River hydrogeomorphic characterization (HGM)* - Analyze both historic and contemporary information about physical features to inform more effective conservation and management across 670 miles of the Missouri River from Decatur, Nebraska to St. Louis, Missouri (U.S. Fish & Wildlife Service).

Focal Area #3: Agroecology Conservation Practices - *How do we integrate functional natural communities with food, fiber and fuel production in agricultural working lands?*

Note: *This section contains preliminary material that will be refined by the Agroecology Technical Advisory Group (ATAG).*

Situation analysis

The Mississippi River and associated watersheds encompass more than 30 states and 1.25 million square miles, providing vital water resources critical to navigation, commercial

fisheries, recreational fishing and boating, and agriculture. An estimated 18 million people, including populations from 50 major U.S. cities, rely on the Mississippi River for their daily water supply. The basin also provides important habitat for more than 500 wildlife species including mammals, amphibians and reptiles, and birds, including up to 60 percent of all North American birds during migration.

Agricultural interests - The Midwest is the agricultural heartland of America with one of the largest agricultural economies in the world (Kunkel et al. 2013). The region has over 400,000 farms and is a major producer of corn, soybeans, fruits, vegetables and livestock. Agricultural interests reliant on the Mississippi River basin generate up to $54 million dollars annually in economic contributions, as estimated by the U.S. Department of Agriculture. This production is critically dependent on weather due to rainfall, heat stress, pests, ozone levels and extreme events such as heavy precipitation, flooding, drought, freeze timing, and damaging storms.

Agricultural chemicals - Emerging agricultural chemicals may damage wildlife and habitat. For example, a recent publication described how the expansive use of the herbicide glyphosate in conjunction with genetically modified glyphosate-tolerant corn and soybean seeds has significantly decreased the availability of milkweed plants in the Midwest, and this is positively correlated with the decline of monarch butterfly population declines (Pleasants and Oberhauser 2012). High levels of miticides and agrochemicals have been found in apiaries and could be associated with colony collapse disorder among honey bees (Mullin et al. 2010). Conclusive cause-effect relationships between agrochemicals and impacts on important insect and bird pollinator populations can rarely be documented. Herbicide and pesticide research and development continues to change the type, scope, and magnitude of chemicals put into the environment each year, and research on wildlife impacts can't keep up.

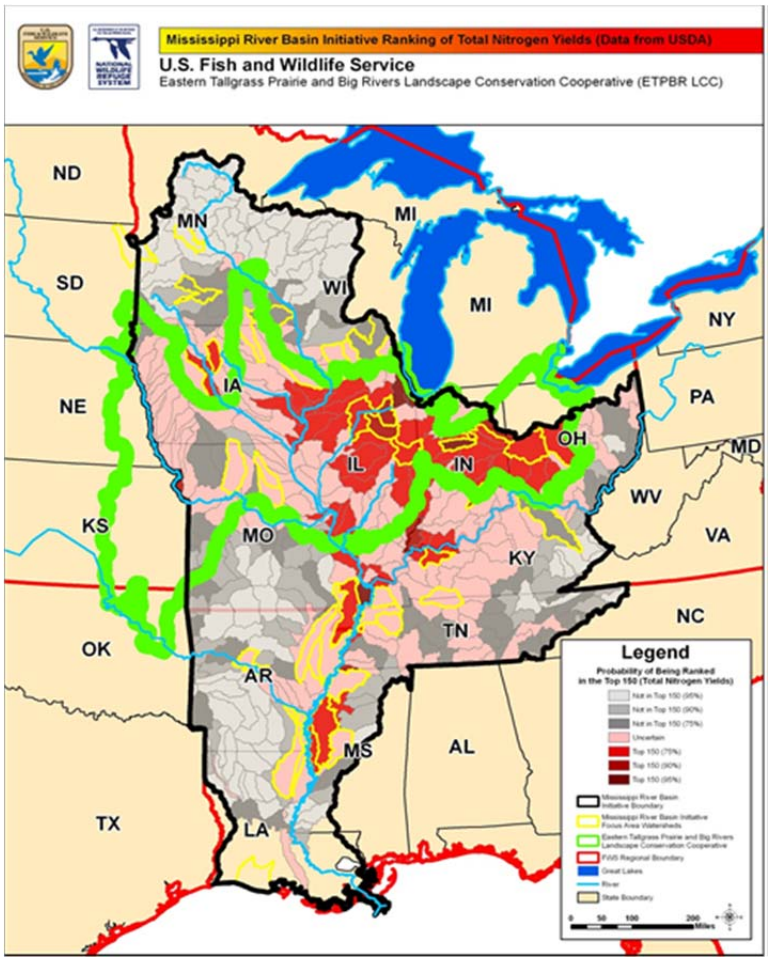


Figure 8. Outline of ETPBR LCC (green) over MRBI ranking of total nitrogen yields (data from USDA).

Wind power projects — The western portion of Ohio is the area within which most of the new wind power projects are being planned. Construction and operation these projects may impacts bats and migratory birds.

Gulf hypoxia - Among other threats to the ecological health of

the Missouri River Basin, nutrient run-off from row-crop agriculture is a major contributor to negative impacts on water quality, wildlife habitat, and the development of a hypoxic zone in the Gulf of Mexico (Figure 8). Otherwise known as "dead zones," areas of hypoxia occur where the concentration of dissolved oxygen in the water column decreases to a level that can no longer support fish and other aquatic organisms.

The hypoxia zone in the Gulf of Mexico is the largest hypoxic zone affecting the United States, and the second largest hypoxic zone worldwide. The Gulf hypoxia zone significantly impacts the economic viability of Gulf coast fisheries, while threatening the broader ecological integrity of the region. Nine states account for 75 percent of the nitrates flowing into the Gulf. Over 11 percent of that comes from Iowa, making it and Illinois, which contributes more than 16 percent, the two largest sources. Row crops constitute the primary source of nitrogen delivery to the Gulf (Figure 9).

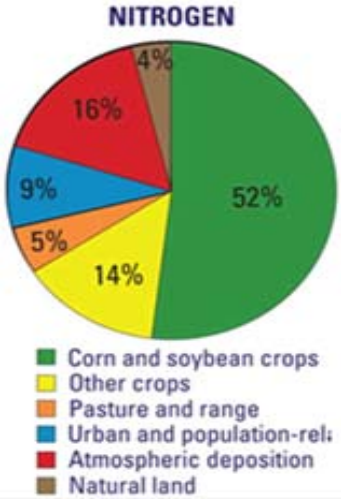


Figure 9. Sources of nitrogen delivered to the Gulf of Mexico.

Effects on the Gulf are directly related to precipitation and runoff patterns in the Midwest. As a result of a prolonged drought that gripped nearly all of the Midwest, flow in the Mississippi and Missouri rivers dropped considerably. As a result, the 2012 dead zone was the fourth-smallest on record. Conversely, the poorest catches in the Gulf of Mexico during the past two decades occurred when record floods in 1993 pushed the dead zone across a larger area.

Drainage - Tile drainage complicates nutrient runoff pathways but also provides an opportunity to control water levels and delivery (Figure 10); recent data on tile drainage is needed (Sugg, 2007). Effects of hydrology in Minnesota watersheds with large land-use changes showed increases in seasonal and annual water yields of >50% since 1940 (Schottler 2013). On average, changes in precipitation and crop evapotranspiration explained less than one-half of the increase, with the remainder highly correlated with artificial drainage and loss of depressional areas. Rivers with increased flow have experienced channel widening of 10–40% highlighting a source of sediment seldom addressed by agricultural best management practices.

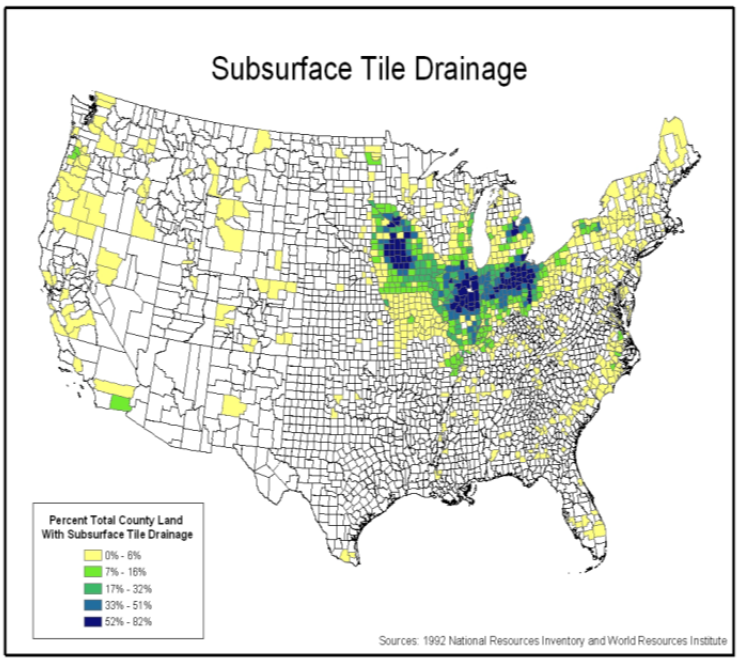


Figure 10. Percent of total county land with subsurface tile drainage (1992 Natural Resources Inventory and World Resources Institute).

Local impacts - Nutrient runoff not only damages waters far downstream from the Midwest; excess nutrients impair use of local waters as well. For example, Grand Lake St. Mary's in northwestern Ohio has experienced toxic algal blooms for the past few years due to excess phosphorus entering the watershed from the heavily agricultural surroundings. This has resulted in loss of millions of dollars from the summer tourism industry, sickened humans, and killed pets. It is likely that fish and wildlife populations were also impacted by the blooms. Installation of more stream buffers would help to ameliorate this threat.

As part of the overall Gulf restoration effort, a combined multi-agency, multi-state, landscape scale effort could reduce the nutrient loading into the Mississippi River drainage. The agencies and organizations represented by the ETPBR LCC currently have trained and experienced staff working cooperatively with agricultural producers on a daily basis to implement proven conservation practices and they have the infrastructure and programs in place to combat the GHZ problem, if provided with some additional resources. We fully appreciate the importance of these economically vibrant agricultural lands, and see a real opportunity to work cooperatively to both help solve the GHZ problem and enhance habitat for wildlife—particularly for imperiled grassland birds and pollinators associated with prairies.

Tallgrass prairie, grassland birds and pollinators - Prior to European settlement, tallgrass prairie covered 140 million acres from Canada to South Texas. The deep roots of many prairie plants held the soil and filtered runoff. Today only fragments of these habitats remain—less than 1% of the original coverage in lower Midwest states such as Iowa and Missouri. Remaining remnants are threatened by an increased conversion for crop production, dominance of woody vegetation, and encroachment by invasive plant species.

Grassland birds, as a group, have suffered the most severe population declines of any other North American birds due to the enormous loss and fragmentation of their required habitat. The 2010 State of the Birds Report found a high probability that declines in grassland birds will be exacerbated by climate change with more than half of grassland birds expected to face additional pressures. Analyses of Christmas Bird Count data found that grassland birds were the only group of birds that failed to shift north during the past 40 years in response to warmer winters (La Sorte and Thompson 2007), most likely due to lack of quality grassland habitat. Today, working agricultural lands such as hayfields, pasturelands and old fields comprise a significant portion of the remaining grassland bird habitat. Modifications to traditional management practices can increase suitable nesting habitat and avoid the killing of birds and loss of nests in these agricultural systems (Hyde and Campbell, 2012).

Prairie and grasslands now rival wetlands as our most imperiled habitat, in turn imperiling migratory birds and other priority resources. These two concerns (rivers and prairies) can be addressed together in the agricultural context, as the deep-rooted prairie grass systems can simultaneously provide significant wildlife habitat and water quality benefits for river ecosystems and the Gulf of Mexico marine resources. As an example, the proposed Grand Kankakee Marsh NWR would support UMRGL Joint Venture all-bird goals, provide a complex of wetland, wet prairie, and prairie habitats, as well as reducing nutrient loss to the Illinois and Mississippi Rivers, achieving goals of FWS Refuges, Migratory Birds and Joint Ventures.

Conservation practices - CRP and CREP lands comprise a significant quantity of wildlife (particularly grassland or "prairie") habitat within the LCC. These lands are intended to provide conservation benefit, and therefore their benefit to wildlife should be maximized. Ensuring that the appropriate seed mix and management regime is used to promote habitat and wildlife diversity is critical.

There seems to be a disconnect between critical habitat and species BMPs and agricultural practices on the ground. There may be a lack of communication between farmers and conservation organizations regarding farming practices that could minimize wildlife and habitat impact. SWCD and NRCS can provide connections between these groups on the ground, but as family farming transitions to industrial farming, it seems that implementation of conservation practices may be more difficult to implement. Coupled with the intensive marketing of agro-chemical companies and the increased crop yields obtained with uses of chemicals and exclusions of certain conservation practices (e.g., buffer strips), it seems that wildlife is fighting a losing battle against technological developments in agriculture.

Although a wide array of USDA conservation practices are available to State and Federal natural resource agencies to address the GHZ problem, insufficient funding to provide adequate incentives to implement practices on the most critical farmland, or enroll those key parcels into conservation programs or easements, have hampered the overall effort. Additionally, today's high commodity prices make it challenging to make a business case to convince producers to enroll the lands contributing the most to the GHZ problem into existing conservation programs.

Biomass/Biofuels - In contrast, diverse prairie plantings for cellulosic biofuels could have market value and multiple benefits for imperiled wildlife such as grassland birds and pollinators, water quality, climate mitigation, and renewable energy production—all on marginal or abandoned agricultural land (Burkhalter 2013). A large-scale modeling study that examined the effect of different biofuel crops on future avian communities showed that usage of primarily corn or soybeans could result in a decline in current avian richness of 7–65% across 20% of the upper Midwest region (MN, WI, IA, IN, IL, OH, MI), while the usage of perennial feedstocks (such as mixed grasses and forbs) could result in increases in current avian richness of 12–207% across 20% of the upper Midwest region (Meehan et al. 2010). There are formidable—but not insurmountable—technical and economic barriers to overcome before perennial biomass crops are likely to be widely adopted in prime corn-growing areas. One of the main economic barriers is the need for mechanisms to capture the value of environmental benefits associated with biomass crops through governmental programs or the private and nonprofit sectors. If the technical barriers can be overcome and policies to support multifunctional agro-ecosystems can be put in place, perennial biomass crops, including native grassland polycultures, can play a major role in reducing nutrient export from the Corn Belt to the Gulf, enhancing the biodiversity of intensively cropped landscapes, and providing sustainable feedstock for renewable energy.

While farmland in a significant portion of the ETPBR geographic area has been dominated by corn and soybeans since about 1970, grain-only farming is a relatively new paradigm made possible by inorganic fertilizer production and high dependence on fossil fuels. Strategies to address Gulf hypoxia, habitat loss, and climate change should include a vision of integrating traditional row crops with perennial cropping systems to create a more sustainable and

profitable farm economy, meet human needs for agricultural products, and improve environmental outcomes of agricultural land use.

In many cases, existing conservation practices are placed on agricultural lands owned by producers that already have a strong conservation ethic and are willing to give up some revenue to do what they believe is the right thing for wildlife and clean water. While putting any of these lands into conservation programs is beneficial, they may not be the most strategic areas to target to combat the GHZ problem.

Targeted sustainable agriculture - The LCC and its partners must use the best science available to identify the specific agricultural lands that contribute the most towards the GHZ problem. Existing computer programs (such at the USGS SPARROW models) are able to identify the agricultural lands, down to specific watersheds, that are the highest contributors of nutrients feeding the GHZ. Additional models may be needed to identify which are the best candidates to produce multiple benefits related to wildlife habitat and which have the social capacity to adopt and install the most effective conservation practices.

Those lands would then be ranked and the ETPBR LCC will oversee a coordinated multi-agency effort to target additional financial incentives to make it economically feasible for those producers to enroll those lands into existing conservation programs and practices. The funds would be used to incentivize current conservation practices and programs. This proposal seeks to create a Gulf Hypoxia Incentive Program to provide additional incentives in a strategically targeted manner to further encourage landowner adoption of proven conservation practices and programs in GHZ contributing watersheds.

Monitoring - U.S. Department of Agriculture, Environmental Protection Agency and U.S. Geological Survey formed the Mississippi River Monitoring workgroup to look for opportunities to significantly increase long-term water-quality and ecological monitoring at multiple scales across these targeted watersheds. Because nitrate moves slowly through groundwater to rivers, the full effect of management strategies designed to reduce nitrate movement to these rivers may not be seen for many years (Tesoriero et al. 2013). About 15 of the 640 watersheds identified by the Mississippi River Basin Healthy Watershed Initiative are being considered to further enhance targeting and assessment of conservation activities. The Mississippi River Monitoring workgroup can facilitate identification of conservation and monitoring needs in these 15 focus watersheds and target other key watersheds within the basin.

Many non-governmental and partner organizations including The Nature Conservancy, Iowa Soybean Association, Delta Farms, and the Fishers and Farmer Fish Habitat Partnership also are actively engaged in conservation and monitoring efforts and offer additional opportunities to expand conservation and monitoring activities in selected watersheds.

The LCC and partners proposes long-term and multi-scale river health assessments to assess the impacts of conservation practices that are implemented on site, up and down stream, and at river scales. Coordination of long-term and multi-scale river health assessments will allow for measurable observations of progress over time and space, and transferrable recommendations for continued improvement of natural resources management efforts.

Stakeholder Input Process

Agroecology goals, objectives and strategies are based on workshop outcomes from the September 2012 ETPBR LCC Steering Committee retreat.

Interviews with individuals in state and federal agriculture agencies provided a significant lead in identifying science needs that practitioners perceive as high priority for agroecology systems. The FWS Ecological Services Field Offices in Columbus, Ohio, and Columbia, MO, USGS staff from several offices, and individuals from other agencies and organizations also submitted extensive comments.

The ETPBR LCC Steering Committee will reconvene in January 2013 to review progress on the strategic plan.

Further refinement of the strategic plan for restoration may involve additional in-person presentations to NRCS State Technical Committees, the USGS Hypoxia Work Group, MAFWA Private Lands Committee, and Mississippi River Basin Initiative state teams supplemented with online/phone interviews during February to April 2013 to acquire input from a geographically broader set of practitioners in all 11 states.

Agroecology Goal (AEG)

AEG 1. Integrate functional natural communities within food, fiber and fuel production systems to provide wildlife habitat and protect water quality both locally and downstream.

Agroecology Objectives (AEO)

AEO 3.1 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 and riverine communities as an integral part of food, fiber and fuel production systems.

AEO 3.2 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 hypoxic zone.

Agroecology Strategies (AES) – identification of Science Needs to support management decisions, organized by stage in the conservation framework.

<u>Science Needs for Assessment (AES AS)</u>

AES AS 1. Map high priority agricultural conservation areas – Focus conservation delivery programs and landscape restoration where the greatest potential exists to achieve multiple benefits. We feel that the greatest potential exists in those watersheds identified and ranked by the NRCS Mississippi River Basin Healthy Watersheds Initiative (MRBI). The National Fish Habitat Partnership Fishers and Farmers team on the Boone River in Iowa is an example that could be emulated on other MRBI watersheds such as the Vermillion River in Illinois or the Upper Wabash in Indiana. Map existing participation in Farm Bill wildlife habitat programs and identify high priority hot spots for agricultural conservation by developing a master plan—a Habitat Action Plan GIS—using Midwest data to determine where to spend resources for conservation returns (e.g., grasslands, habitat, water quality) by:

1) Identifying priority areas and species;

2) Surveying agricultural producers to evaluate the driving factors motivating enrollment of farmers in wildlife habitat and water quality protection programs;
3) Determining the most cost-effective and receptive places to target financial resources for conservation, such as the intersection in watersheds where each of the following factors is high:
    a. Nutrient export to the Gulf;
    b. Wildlife habitat value, particularly for grassland birds;
    c. Social capacity to network and provide extension; and
    d. Visibility of the project to propagate adoption and promotion of the practices.
4) Tracking the cost and value of implementing conservation plans.
5) Evaluate and compare the landscape-scale conservation benefits of large-scale restorations and small-scale conservation practices.

AES AS 2. Economic drivers for prairie wildlife conservation - Determine the economic effects on conservation practices that motivate increased crop production and reduced habitat conservation, especially for upland grasslands including:

1) Tenant farmers losing leases;
2) Farmers divesting in animal agriculture;
3) Price of agricultural lands; and
4) Other pertinent economic drivers.

AES AS 3. Biofuel production to motivate prairie restoration - Determine the economic and ecological viability of biofuel production (biomass crops), including:

1) Environmental response to native biofuel crop systems.
    a. Research and on-farm demonstrations at a watershed scale, including establishment of a regional network of experimental watersheds in the Upper Midwest in which perennial biomass crops (and other types of continuous living cover) can be demonstrated and synergies and trade-offs among multiple objectives can be studied.
2) Competitive valuation of products in markets.
    a. Experimental watersheds as laboratories for testing green payments or other incentives to promote adoption of perennial biomass crops grown for multiple purposes.
3) Conservation benefits for habitat, soils, carbon sequestration, water quality and quantity, and wildlife—particularly grassland birds and pollinators (Burkhalter 2013), including:
    a. Understanding survival and fecundity of birds in areas used solely for biofuel production, as opposed to mixed use areas that may be used for biofuel production and/or haying for livestock forage, and how bird populations respond to these mixed-use grasslands.
    b. Understanding seasonal and among-year optimal harvesting practices over the long term, timing of harvest (e.g., every year or every other year), and which harvesting practices benefits both birds and biofuel production.
    c. Assessing multi-trophic interactions between birds, insects and other wildlife in restored grasslands utilized for biofuel production and how food webs change in grasslands utilized for biofuel production and what

effects might these changes have on long-term grassland bird population viability.

4) Techniques for biofuel production and processing.

AES AS 4. Drainage design impacts - Address impacts of water control systems on water tables, agricultural production, and the benefits, especially of drainage water management with respect to shallow (crop usable) groundwater recharge and wildlife in depressions, especially during and following drought conditions, including:

1) New tile installation which is increasing in some areas;
2) Relationship to downstream wetlands;
3) Condition and function of open water systems and related scale issues; and
4) Reduction in sedimentation produced by head cuts and bank sloughing.

AES AS 5. Fertilizer impacts – As new methods for agricultural fertilizer application are developed, we need to understand how all the factors involved (e.g., liquid vs. pellet phosphorus application, season of year of application, plowing cycle, presence/lack of buffers) combine to influence the impact on the environment.

AES AS 6. Agrochemical impacts - Conclusive cause-effect relationships between agrochemicals and impacts on important insect and bird pollinator populations have been rarely documented. Herbicide and pesticide research and development continues to change the type, scope, and magnitude of chemicals put into the environment each year, and research on wildlife impacts can't keep up.

<u>Science Needs for Goal Setting (AS GS)</u>

AES GS 1. Promote the most effective wildlife habitat and water quality practices - Develop and promote to landowners a "top 10" list of wildlife habitat conservation practices that are most effective in reducing nutrient loading, which may include:

1) *Drainage Water Management System* (NHCP Practice Standard 554) which is effective on 1-2% slopes to manipulate water table elevation below the root zone and reduce nitrogen by 40-60%;
2) *Constructed Wetlands* (NHCP Practice Standards 656 with other wetlands 658, 659, 657, 644) which provides wetland buffer to remove 40-80% of nitrogen but may have some implications for elevated concentration of chemicals negatively affecting amphibians;
3) *Denitrifying Bioreactor* (NHCP Practice Standard 747 - interim) which removes nitrogen, requiring less land out of production but with limited benefits for wildlife habitat or water management; and possibly
4) *Saturated Buffer* (NHCP Practice Standard not yet developed) which provides 50-100% nitrogen removal by retrofitting tile drain with a control structure and shallow lateral line parallel to vegetated buffer, holding water in the root zone for 50% nitrogen removal.

AES GS 2. Relate wildlife habitat to nutrient export and Gulf hypoxia – Describe the relationships between wildlife habitat conservation and nutrient runoff budgets in the lower Midwest states that contribute the most to Gulf hypoxia that each state can use to meet the unofficial goal of a 45% reduction in nutrient load for phosphorus and nitrogen leaving the state by collaborating with organizations such as the nutrient management planning groups that are formed in each state of the Mississippi and Missouri River basins (e.g., state Departments of Agriculture, Farm Bureau).

AES GS 3. Effects of climate change on agricultural conservation – Determine potential effects of climate change on agricultural production (shifts in crops, livestock and conservation practices), growing seasons, water availability and storm flow, water quality and nutrient transport, and capacity for creating and distributing predictive information.

1) A review of existing and current research activities on the relationship between changes in climate and changes in nutrient and sediment inputs into surface waters;
2) Current and recent investigations on best management practices in agriculture that will maintain resilience of agricultural landscapes with anticipated changes in climate with a focus on how changes in precipitation and the hydrology of watersheds may effect water quality;
3) Available networks for gathering data, models and forecasting tools being developed by research agencies and organizations or being applied by the agricultural sector;
4) Information on long-term trends in agricultural practices and production and possible relationships between changes in agricultural land use patterns and practices may be related to changes in water quality;
5) The effects of agricultural impacts on water quality on aquatic biological communities, such as invertebrates, fishes, amphibians and aquatic plants.
6) Current experimental farming activities and research sites that can be a resource for looking at more local effects of specific agricultural land use practices;
7) Identifying organizations that are communicating with the agricultural community and related sectors to improve farm practices maintain agricultural productivity and efficiency and reduce adverse effects of farming activities on water resources such as drinking water and recreational fisheries.

<u>Science Needs for Delivery (AS DE)</u>

AES DE 1. Wildlife conservation methods - Develop wildlife conservation-friendly methods of agricultural production, including:

1) Work within Farm Bill requirements to implement wildlife-friendly conservation practices such as cover crops – hardy winter wheat, conservation tillage, pest management, diverse cropping systems, rice rollers instead of burning, nutrient application.
2) Work with partners to look at existing CRP and CREP lands during mid-contract monitoring, to see if the seed mix, management regime, treatment schedule, etc. used on these lands is providing suitable habitat for the intended species (grassland birds). If grassland bird species diversity/density is not as expected, changes could be made in future years. Additional focus could be given to using native seed stock, local ecotypes, and promoting pollinator habitat as well.
3) Develop farming practices that are more compatible with small scale areas protected for wildlife habitat.
4) Determine where marginal farm lands provide the greatest opportunity for conservation incentives and how these areas align with wildlife habitat priorities.
5) Determine how roadside ditches can be improved to encourage development of native prairie as an extensive, long-distance corridor system by modifying ditch

management practices of transportation agencies such as mowing, herbicide use and planting to attract pollinators and birds, rather than deer.

6) Reduce impacts of invasive species such as:
    a. Management of feral hogs including:
        i. Conservation practices such as WRP areas, brushy filter strips, dense herbaceous cover may increase cover for destructive feral hogs and put them in proximity to agricultural foods or food sources such as corn, clover/alfalfa/pasture/hay fields in addition to requiring "bio-hazard" safeguards sufficient to reduce wild pig-domestic animal contact.
        ii. Direct increased USDA funds for wild hog control/management to the Midwest corn belt and central hardwoods where there is still a chance to contain/control an emerging problem.
        iii. Modify control techniques that were developed in the south to be more applicable to the Midwest.
    b. Prairie plant invasives (see Prairie Restoration).
7) Identify regional and generational differences in adoption of practices; and
8) Offer options to farmers to reduce or eliminate out-of-pocket landowner expenses to install BMPs and encourage using a suite of practices rather than relying on a single fix.

AES DE 2. Extension to landowners - Market wildlife conservation practices using the existing Whole Farm Conservation Planning process, peer-to-peer on-farm networks, and with entertaining, emotionally connected messages using respected actors or other trusted information conduits to inform landowners of conservation strategies for wildlife and water quality that increase agricultural productivity and reduce negative upstream effects of runoff.

1) Support innovative approaches using agro-ecology especially if we can use science/research to understand the behavior of those who seek livelihoods from farm-based operations.
2) Where applicable, describe wildlife and water quality impacts as a "takings" issue for landowners who are downstream and along migratory flyways.
3) Provide soil testing services, share results, and discuss wildlife habitat management strategies that contribute to soil health on priority lands for Farm Bill programs that are not competitive with agricultural production or landowner rights, building on existing examples such as Ducks Unlimited's program for protecting grasslands and wetlands, by promoting benefits such as:
    a. Promoting healthy and productive characteristics of soils;
    b. Holding water and nitrogen on the land; and
    c. Providing benefits to wildlife.
4) Utilize enhanced technical assistance to:
    a. Evaluate specific agricultural conditions and improve techniques to keep fertilizer on the field through practices such as timing of application, form used and placement of the product.
    b. Work with agricultural drainage specialists with USDA technical service provider (TSP) certification to identify participants willing to promote practices that benefit wildlife habitat and water quality.
    c. Position conservation extension to create the biggest return on investment by identifying the segment of landowners whose management actions

contribute significantly to wildlife habitat impairment and develop strategies to motivate participation among these landowners.

AES DE 3. Land steward recognition - Develop a rating system (similar to LEED certification) that functions as a sustainability market driver for agriculture that builds on pride in visible signs of good farming (e.g., traditionally straight rows and no weeds) by recognizing land stewards who implement wildlife-friendly conservation practices that improve water quality, using motivations such as:

1) Recognize farming is important and we want to help do it better;
2) Capitalize on sentiments such as pride in Centennial Farms to promote wildlife habitat in a program similar to the National Wildlife Federation's backyard habitat program; and
3) Incorporating flat black 80 criteria [Editor's note: Refers to roof reflectance / thermal emittance characteristics?].

AES DE 4. Value of wildlife conservation to agriculture-related industries - Market wildlife conservation benefits to large agriculture-related industries (e.g., chemical companies) through data on impacts of wildlife conservation practices (e.g., no till, cover crops) on soil health).

AES DE 5. Remnant prairie extension to landowners – Identify landowners who have remnant prairies on their property within a radius suitable for obtaining local ecotype seeds, seek permission to harvest seed by hand or baling, and provide assistance on proper prairie management.

AES DE 6. Grazing lands plantings - Modify grassland plantings for grazing to include native prairie species:

1) Identify social factors affecting changes in grassland management; and
2) Determine and disseminate establishment methods and timetables for native grasses in grazing conditions, including through recommendations in the NRCS Field Office Technical Guide, Section 2 List of Conservation Practices.

AES DE 7. Protocols and incentives for grassland bird conservation – Incentivize grassland bird conservation in agricultural systems, including support of efforts such as the Prairie Bird Initiative of The National Audubon Society and target land acquisition to increase the network of conservation hubs for all-bird JV Plan implementation in coordination with the Upper Mississippi Joint Venture by:

1) Developing production protocols that include input from both producers and bird conservationists.
    a) Initial protocols have been drafted and over the winter reviewed and discussed more comprehensively with producers.
    b) Cost estimates for ranchers to implement have been generated and preliminarily discussed with rancher cooperators.
2) Implementing Bird-Friendly Beef protocols at pilot sites and with private landowner partners within these geographies totaling at least 15,000 acres.
    a) The first year of baseline data has been collected on ranches in MO, KS and at our Spring Creek Prairie Audubon Center in NE.
    b) Patch-burn grazing is being implemented at two pilot sites with more traditional approaches at the rest of the ranches.
3) Working with conservation partner agencies, NGOs, and private landowners in target watersheds through Partners for Fish & Wildlife, FWS Fisheries, National Fish Habitat Partnerships and others to restore native grass landcover types and

prairie hydrology to promote recovery of grassland birds and reduction of nutrient transport to the mainstem Mississippi River.

4) Prioritizing development of FWS Refuges and other protected lands in the former tallgrass prairie areas of Bird Conservation Region 22.
5) Monitoring progress on private lands at targeted sites to capture relative abundance of focal species during the breeding season, most likely utilizing line transects with distance estimates and mapping of exact locations of target species.
    a) Adjustments will be made to the first year of monitoring that might better support data collection (expanding field season, adding visits, supplemental data like lek counts).
    b) An accounting of the number of skilled citizen scientists recruited and trained to conduct bird monitoring at collaborator sites, creating increased capacity for future monitoring and prairie advocates for broader grassland conservation goals.

<u>Science Needs for Monitoring (AS MO)</u>

AES MO 1. Evaluate targeted conservation actions – Development of comprehensive watershed assessments that combine monitoring and modeling with organized conservation efforts can provide good examples to follow in other high-priority watershed that have yet to invest in significant conservation efforts to improve stream and down river health. A better understanding how and where landscape management activities and conservation practices are occurring within the watershed can explain changes observed in water quality and ecology in small watersheds. Detailed landscape and river monitoring assessments at multiple scales can be used to inform existing water quality models, including field-, regional- and basin-scale models.

1) Choose general area for sites using model predictions, including U.S. Geological Survey SPARROW model;
2) Target key nutrient hotspots using existing knowledge, supplementary partnership efforts, and potential for conservation practice implementation;
3) LCC coordination with related ongoing research;
4) Leverage opportunities with existing conservation practices;
5) Identify small watersheds with available monitoring networks in place at the finest scale possible and acknowledge in nested-scale design variation of lag time for water chemistry and biology to respond to conservation practices; and
6) Identify small watersheds with available models that can guide implementation and future assessment.

AES MO 2. Conservation compliance - Identify weak spots in consistency and incentives for compliance with wildlife habitat conservation practices in the next Farm Bill (e.g., not everything covered by compliance, “T” factor, equivalency issues, price of practices).

AES MO 3. **Sustainability qualities** - Determine what components represent farming sustainability for small and large producers by characterizing the mindset of land as a commodity rather than as a resource, recognizing that farmers need certainty and incentives, and adapting models from other sources (e.g., EPA helps drive the water quality discussion, FSA in partnership with Google Earth, watershed approach drives

funding in the European Union, water quality trading system with American Farmland Trust).

AES MO 4. **Benefits of prairie grasses to water quality** – Conduct field-based studies to quantify comparative benefits of conservation practices such as grassed waterways, buffer strips or water and sediment control basins planted with cool season grasses (fescue) compared to warm season grasses (native prairie) to calibrate models for the lower Midwest, possibly working with the NRCS Conservation Effects Assessment Project (CEAP).

AES MO 5. **Roadside ditch prairies** – Analyze the contribution of roadside ditches managed for native prairie to attract pollinators and grassland birds while not increasing traffic accidents due to collisions with deer or other vehicles.

Science Needs for Information Management (AS IM)

AES IM 1. **Simulation tools for siting agroecology BMPs** – Develop simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations at the local level for implementing BMPs or acquiring existing habitat by showing scenario-based predicted outcomes for wildlife habitat and water quality benefits, similar to tools under development for wetlands.

- **Priority focal species (Agroecology)**

[Note to reviewers: These species are identified by other stakeholders. The LCC has not picked focal species at this time, but may do so in the future.]

FWS Surrogate Species (draft list TBD)

TAG Member suggestions:

- Pollinators (bees)
- Predators
- Pests
- Soil microbes
- Game species (hunting values)
- Grassland birds
- Floristic diversity

- **Communications (Agroecology):** *What do target audiences need to know, feel or do?*
  - Objectives
    - Clearly communicate complex regulations to encourage contributions by landowners and managers
    - Increase the "share" of conservation and influence behavior
    - Extension agents feel they can contribute, be part of something larger
  - Strategic approach
    - Economic benefits of habitat restoration for recreation and tourism
    - Build devotion to integrated prairies and rivers through stories (stewardship)

- **Stakeholders & Resources**
  - *End users*
    - Agricultural producers (farmers, commodity groups, Farm Bureau, state Soybean Growers, Corn Growers Associations)
      - On-Farm Networks (Jordan Segar, State Department of Agriculture)
      - Agricultural Drainage Management Coalition
    - Watershed management groups
    - Private landowners (non-farming rural estates)
    - American Farmland Trust (Mike Baise)
    - Midwest Conservation Biomass Initiative (Carol Williams, UW-Madison)
  - *Management (technical assistance)*
    - State Departments of Agriculture
      - Agricultural Practices That Conserve Grassland Birds, Publication No. E3190, Michigan State University Extension, September 2012, 22 pp.
    - NRCS
      - State Technical Committees
        - Indiana (Jill Reinhart, Shannon Zezula)
      - Regional Conservationists (Tom Christenson, serving on UMGL LCC Steering Committee)
      - National (Ray Archuletta, soil health expert)
    - National and State Associations of Soil & Water Conservation Districts (SWCDs)
    - Prairie Bird Initiative (Justin Pepper, The National Audobon Society; Andrew Forbes, Upper Mississippi River / Great Lakes Joint Venture)
  - *Research*
    - Agricultural Drainage Management Coalition
    - USDA Partnership Management Team - Drainage Water Management Systems Task Force
    - The Earth Partners LP
    - Wildlands Network – Wildways (landscape connectivity)
    - Flyway partners
    - Social indicators survey (Little Calumet/Galien watershed, IN, Linda Prokopy, Purdue University)
    - Leopold Center for Sustainable Agriculture, National Laboratory for Agriculture and the Environment (Mark Tomer)
    - Hydroponic nutrient abatement (Charles Theiling, Great River IWRM)
    - TNC Mackinaw River Program (Maria Lemke et al., 2010 JSWC 65:304-315; 2011 JEQ 40:1215-1228) – landowner motivation; tile routing through wetlands
    - Tile water control structures (Jane Frankenberger, Purdue University)
    - Illinois State Water Survey (Bekele et al., 2010) – siting of wetlands in watershed
    - Using Native Grasses for Livestock (Patrick Keyser, University of Tennessee)
    - Biotic Indicators for Biodiversity and Sustainable Agriculture, edited by W. Buchs
    - Wetlands as potential mitigators of climate change (Judy Drexler)

- *Partner plans and programs* - inventory of documents and interpreter (contacts)
  - NRCS & FSA (Farm Bill)
    - Agricultural Water Enhancement Program (AWEP) - administered through EQIP
    - Conservation Effects Assessment Project (CEAP)
    - Conservation Innovation Grants (CIG) - grants awarded under EQIP authority
    - Conservation Stewardship Program (CSP)
    - Conservation Technical Assistance (CTA) - for staff and partnership agreements
    - Cooperative Conservation Partnership Initiative (CCPI) - administered through EQIP, WHIP, CSP
    - Environmental Quality Incentives Program (EQIP)
    - Floodplain Easement Program (FEP)
    - Mississippi River Basin Healthy Watershed Initiative (MRBI) - administered through CCPI, WREP, CIG (Hyberg)
    - National Water Quality Initiative (NWQI) - administered through EQIP
    - Western Lake Erie Basin - administered through EQIP
    - Wetlands Reserve Enhancement Program - administered through WRP
    - Wildlife Habitat Incentive Program (WHIP)
    - Sustainable Agriculture Research Education (SARE) – research and small grants for agroecology
  - Fish Habitat Partnerships
  - Great Lakes Restoration Initiative (GLRI)
  - Hypoxia Work Group (Mike Woodside, USGS)
  - Joint Ventures
  - US Army Corps of Engineers (Chuck Theiling)
  - Mississippi River Network (Botts)
  - MAFWA Private Lands Working Group (Chuck Corell, IA)
  - State Wildlife Action Plans (SWAPs)
  - TNC Ecoregional Plans (Shuey)
  - FWS Climate Change Strategic Plan
  - National Fish, Wildlife, and Plants Climate Adaptation Strategy (AFWA)
  - Upper Mississippi River System Ecosystem Restoration (Barr)
  - Upper Mississippi River Conservation Committee (Sternberg)
  - Adjacent LCCs (maps http://www.fws.gov/gis/data/national/index.html)
- *Climate models and databases* – inventory
  - Climate centers (USGS, NOAA, NWS)
  - Universities (UW Madison)
  - ForWarn: Satellite-Based Forest Disturbance Monitoring System (http://forwarn.forestthreats.org/)
  - USDA Useful to Usable (U2U): Transforming Climate Variability and Change Information for Cereal Crop Producers (http://drinet.hubzero.org/u2uproject)

- Events
  - 2013 Water for Food Conference, "Too Hot, Too Wet, Too Dry: Building Resilient Agroecosystems," May 5-8, Lincoln, Nebraska.

- **LCC Supported Projects** (FY11-FY12)
  - *Searchable natural resources database* – Provides online information related to agricultural practices, climate change, and water quality across the Midwest. This library is currently available online (http://tinyurl.com/ETPBRLibrary). (U.S. Geological Survey Water Science Centers in Iowa, Kansas and Massachusetts, the Northeast Climate Science Center, and the Upper Midwest and Great Lakes LCC)
  - *Climate change and Farm Bill program* – Predict relationships between climate change and long-term trends in agricultural practices and related sediment and nutrient impacts on water quality (Northeast Climate Science Center).
  - *River sediment and nutrient monitoring* – evaluate effects of best management practices (BMPs) on sediment and nutrient delivery at multiple scales in time and space and assess UV nitrate and optical turbidity as surrogates for nitrogen, phosphorus, and suspended sediment. (US Geological Survey, Iowa Department of Natural Resources, and other partners)
  - *Agricultural landowner motivations for implementing wildlife conservation programs* - Prepare a synthesis of research on the human dimensions of Gulf Hypoxia. Evaluate factors influencing landowners' enrollment in USDA programs that improve water quality by reducing sedimentation and nutrient loading and landowner incentives to enter into sustainable agricultural systems. Initial results are anticipated in 2014. (University of Minnesota).
  - *Expansion of the STRIPS: Science-based Trials of Row crops Integrated with Prairie Strips* – Assess the impacts on water quality and pollinator habitat of planting prairie species in contour buffer and filter strips. (U.S. Department of Agriculture Farm Service Agency, Iowa State University, Neal Smith National Wildlife Refuge)
  - Examine impacts of climate change on landowner preferences for agricultural best management practices. (South Central and Northeast Climate Science Centers)

Focal Area #4: Urban Watersheds Conservation Practices (Ecological Places in Cities: EPIC) - *How do we integrate urban land development and wildlife conservation with an interconnected river system?*

Note: *This section contains preliminary material that will be refined by the Urban Watersheds Technical Advisory Group (UTAG).*

Situation analysis

Many Midwestern big cities and small towns were founded on rivers which provided natural infrastructure for transportation, water use, flood control, and recreation. Residential and commercial development can be damaging to wildlife habitat; quality of aquatic communities is tightly correlated with impervious surface in urban areas.

As defined here, "urban" means not rural and includes large metropolitan areas, suburbs and small towns.

As cities rediscover the value of their river systems, urban planners are using green infrastructure for water quality, quantity and flood

control as well as connecting people to nature through trail systems. With some modifications, these structures could provide core habitat and corridors for wildlife in an otherwise highly fragmented system.

Climate can have dramatic effects on Midwest cities (Kunkel et al. 2013). Major urban centers in the region, ranked in the top 30 by population according to the U.S. Census Bureau 2011 include Chicago (rank #3), Indianapolis (#12), Detroit (#13), Minneapolis-St Paul (#16), St. Louis (#19), Cincinnati (#27), and Kansas City (#29). Extreme temperatures and dewpoints can have large impacts on human health. Heat absorption by hard surfaces elevates summer afternoon temperatures and lessens night-time cooling, affecting air and water temperatures. Extreme rainfall can overload storm sewer overflows, flood homes and roadways, and contaminate water supplies. Climate can modulate occurrence of vector-borne diseases for humans, livestock and wildlife. Water levels and ice cover affect barge and ship traffic on the Mississippi and Ohio River. Recreational activities and tourism are a major player in the Midwest economy and are very sensitive to change in snowfall, storms and temperature. All of these impacts also affect wildlife and plant communities through the abiotic factors characterizing habitats.

The 1993 Mississippi River flood was the 2nd costliest in modern times, after Hurricane Katrina, with most of the losses occurring in the Midwest (Changnon et al. 2001). Massive flooding in Cedar Rapids, IA, in 2008 was not as damaging overall with records exceeded by more than 11 feet. The city responded by creating an award-winning redevelopment plan to mitigate against future floods (City of Cedar Rapids, 2012).

Restoration and enhancement of forested connections along stream corridors would benefit fish and wildlife resources, including federally-protected mussels and bats, and could keep development pressure from encroaching on the floodplain in some areas.

Developing a green-infrastructure network based on river corridors could also be marketed as a great recreational opportunity to local communities. Partnering with local park districts and other interested entities on developing trails as part of the green infrastructure initiative would promote local participation/support, outdoor recreation, leverage funding opportunities, connect communities, improve quality of life, etc.

Development pressure exists in the rural areas surrounding Midwestern metropolitan centers and often results in impacts to streams and riparian areas. Establishing a green-infrastructure network could help to protect smaller streams, floodplain areas, etc. from development. Getting buy-in from local zoning boards (county, township, etc.) is critical for success because in many cases they are the only entity that can control impacts within the riparian zone/floodplain. For example, multiple communities in northwest Ohio's Chagrin River Watershed have implemented a mandatory setback from streams for development projects, and this could be used as a model approach.

Coupling the urban river green infrastructure approach with the big river restoration (improving riparian areas, reconnecting floodplains, and removing dams) and agroecology conservation practices (buffers on streams), would significantly improve stream habitat, supporting high priority species such as listed mussels and bats in this portion of Ohio.

Stakeholder Input Process

Urban Watersheds goals, objectives and strategies are based on workshop outcomes from the September 2012 ETPBR LCC Steering Committee retreat and follow-up conference call.

Interviews with individuals in NGOs and state agencies provided a significant lead in identifying science needs that practitioners perceive as high priority for urban rivers systems. The FWS Ecological Services Field Offices in Columbus, Ohio, and Columbia, MO, USGS staff from several offices, and individuals from other agencies and organizations also submitted extensive comments.

Further refinement of the strategic plan for Urban Watersheds may involve additional online/phone interviews during February to April 2013 in preparation for a workshop attended by 20-30 participants invited from major river-based cities across the LCC to be held in a central location in Spring 2013 to share experiences and acquire input on Science Needs from a geographically broader set of practitioners in all 11 states.

Ecological Places in Cities (EPIC) began in 2014 with a multi-LCC urban conservation workshop conducted by the ETPBR and UMGL LCCs. The resulting working group is using "Collective Impact" principles to create a practitioner network for planning and action that reconnects people and nature in Midwestern cities, surrounding working landscapes and natural areas. The list of interested contacts has grown rapidly to over 195 researchers, ecologists and urban program managers.

The Core Team is currently developing goals, objectives, and outreach specific to urban conservation across the Midwest.

Urban Watersheds Goal (UWG)

UWG 1. Integrate urban land development and wildlife conservation in an interconnected river system in small towns, suburbs and large cities.

Urban Watersheds Objectives (UWO)

UWO 4.1 Build on re-orientation of cities to their waterfronts to promote local wildlife habitat and outdoor recreation.
UWO 4.2 Utilize river systems as the foundation for incorporating functional wildlife corridors in green infrastructure plans.
UWO 4.3 Design urban, suburban and small estate developments to accommodate conservation of prairie and river systems in urban green spaces.
UWO 4.4 Enhance viability of small towns in rural areas by attracting tourists and businesses to areas to recreational activities at local prairie and river restoration sites.

Urban Watersheds Strategies (UWS) – identification of Science Needs to support management decisions, organized by stage in the conservation framework (assessment, goal setting, delivery, monitoring, and information management)

<u>Science Needs for Assessment (UWS AS)</u>

UWS AS 1. Water resource demands – Determine ecological and economic value of water resources, including current and future availability and demands for wildlife and human use (e.g., tourism, quality of life, attractiveness for employees and

business relocation) as well as potential impacts of shifts and extreme events due to climate change projections.

UWS AS 2. **Economic benefits of urban habitat restoration** – Quantify the ecological and economic benefit of restored riverine ecosystems such as:

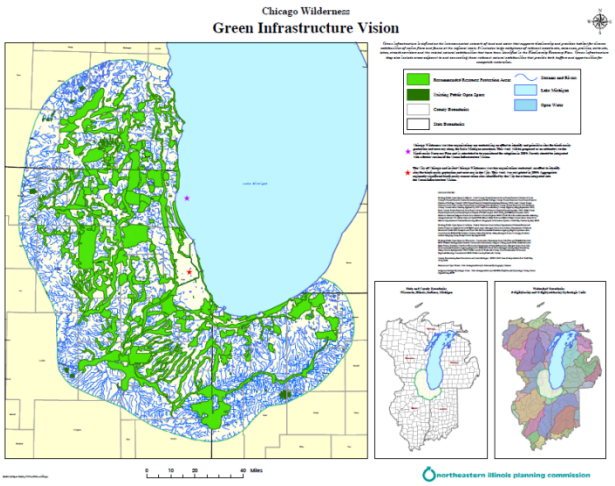
1) Evaluate return on investment (ROI) or community growth due to attraction of business in areas with local wildlife/natural recreational activities at large habitat restoration sites, particularly for enhancing the viability of small towns that have been negatively affected by rural depopulation trends.
1) Evaluate the contribution of wildlife habitat restoration on water availability during peak demand in droughts due to infiltration and groundwater recharge.
2) Evaluate and compare the landscape-scale conservation and economic benefits of large-scale restorations and small-scale conservation practices.

UWS AS 3. Stream classification and channel dynamics – Improve recommendations for best management practices and identify opportunities to incorporate habitat for wetland and stream-dependent fish and wildlife that:

1) Build on studies of hydrogeomorphology and stream classification (channel typing) principles;
2) Predict changes in stream channel shape due to extreme weather events and climate shifts;
3) Incorporate prairie plantings and aquatic habitat that also support stormwater management;
4) Develop guidelines for planning and zoning that recognize opportunities to reserve land for stream dynamics in flexible land uses such as green space or agricultural land uses instead of hardscape uses;
5) Predicts future impacts of extreme weather events (flooding and drought) on channel conveyance and design; and
6) Explain the implications for water resource availability and protection of human structures and wildlife habitat.

<u>Science Needs for Goal-setting (UWS GS)</u>

UWS GS 1. Regional green infrastructure planning – Encourage development of green infrastructure plans that incorporate protection of water quality and quantity for wildlife conservation and human use based on the riverine system in each of the metropolitan areas, paying particular attention to upstream and downstream connections along the major river basins of the LCC region.



<u>Science Needs for Delivery (UWS DE)</u>

UWS DE 1. Conservation design for urban developments – Design suburban commercial and small estate developments to accommodate enhanced wildlife habitat in prairie and river systems, particularly by adjusting planting and management of green space to attract pollinators and grassland birds.

UWS DE 2. BMPs for riparian, floodplain and off-channel habitat – Improve recommendations for best management practices and identify opportunities to incorporate riparian, floodplain and off-channel habitat into riverbanks and flood control systems, including:

1) More plantings of native wet prairie and floodplain savannah with recommendations based on site conditions, land use context and wildlife conservation goals;
2) Connection with upland grasslands along river corridors;
3) Invasive species control methods on river banks using effective erosion control methods, particularly:
    a. Removal of Asian bush honeysuckle followed by use of core fiber blankets and replanting of native grasses, shrubs and trees; and
    b. Control of feral hogs that gravitate to wet areas, can be carriers of human diseases, and may damage dams, levees, dikes and other earthen retaining structures because of their rooting/grubbing/wallowing activities.
4) Use of two-stage ditch design or similar floodway design practices in small streams;
5) Use self-forming channel best management practices to address impacts of climate change on stream systems (see Ohio DNR examples); and
6) Provision of public access to and association with wildlife habitat along recreational greenways.

UWS DE 3. **BMPs for levee systems** – Improve recommendations for best management practices and identify opportunities to incorporate more warm-season native prairie and possibly savanna tree plantings on or within levee systems in place of existing use of mowed turf grass or concrete without compromising flood control function.

<u>Science Needs for Monitoring (UWS MO)</u>

UWS MO 1. Benefits within riparian, floodplain and off-channel habitat – Analyze benefits for human water use related to water quality and groundwater recharge of incorporating riparian, floodplain and off-channel wildlife habitat.

UWS MO 2. **Benefits within levee systems** – Determine engineering concerns and ecological, water resource, and social benefits of incorporating more warm-season native prairie and possibly savanna tree plantings on or within levee systems without compromising flood control function. Analyze and communicate water quality and quantity (e.g., flood control, infiltration and groundwater recharge), wildlife and social benefits relative to existing use of turf grass or concrete.

UWS MO 3. Benefits within storm water management – Analyze wildlife and water quality benefits of incorporating prairie plantings and aquatic habitat into stormwater management practices (e.g., sediment and nutrient runoff, flood control, infiltration, groundwater recharge) including size, location, rate of pollutant removal, and installation cost over different site conditions (e.g., soil type, topography, presence of species of greatest conservation need).

<u>Science Needs for Information management (UWS IM)</u>

UWS IM 1. Web-based clearinghouse of existing programs – Inventory and clearinghouse of existing programs and initiatives in cities and organizations across the region to identify gaps and communicate between groups.

UWS IM 2. **Planning and zoning** – Improve applicability of green infrastructure plans (that incorporate wildlife habitat and corridors) for use as a base layer in metropolitan comprehensive planning and zoning.

UWS IM 3. **Simulation tools for protection of riverine systems** – Develop simulation tools that solicit user input on social values (e.g., interest in BMPs, concern about downstream impacts, drought protection) and physical site conditions (e.g., soils, digital elevation models, crops, location in the watershed) to weigh locations for implementing floodplain protection BMPs or land acquisition that show scenario-based outcomes for wildlife habitat and water quality benefits, similar to tools under development for wetlands.

UWS IM 4. **Education on urban protection of riverine systems** – Use best available science and social policy to convey to land use decision-makers (e.g., county surveyors, drainage boards, mayors, town councils) the significance of:

1) Managing floodways and riverbank armoring to allow natural patterns of stream channel dynamics;
2) Implementing floodplain setback standards that protect human structures and wildlife habitat during floods;
3) Recognizing demands on water resources during droughts for human and wildlife viability; and
4) Anticipating increases in extreme events due to climate change;
5) Focusing philanthropic and volunteer efforts to produce collective impact; and
6) Collaborating among metropolitan areas linked within a major river basin.

- **Priority focal species (Urban Watersheds)**
  [Note to reviewers: These species are identified by other stakeholders. The LCC has not picked focal species at this time, but may do so in the future.]
  - Pollution sensitive (ex. pharmaceuticals)
  - Feeder birds, water birds, nesting birds
  - Floristic diversity – raingardens, street trees
  - Zoonotic diseases & pests
  - Amphibians/reptiles
  - Butterflies
  - Predators
  - Endangered freshwater mussels—rayed bean, clubshell, fanshell (OH River), Northern riffleshell, pink mucket (OH River), rabbitsfoot, sheepnose (OH River), snuffbox. Several of Ohio's most important mussel streams are in the ETPBR portion of the state.
  - Indiana bat—most of Ohio's newest Indiana bat maternity colony records are in the ETPBR portion of the state, as is the largest hibernaculum. Bats in this area are significantly limited by habitat availability and are now being affected by white-nose syndrome.

- **Communications (Urban Watersheds):** *What do target audiences need to know, feel or do?*
  - Objectives
    - Incorporate conservation design into land use planning and regulation.
    - Increase the "share" of conservation and influence the conservation behavior of land managers.

        - Land use planners and city managers feel they can contribute, be part of something larger.
    - Strategic approach
        - Build devotion to interconnected river systems through stories (historic)
        - Capitalize on the instinctive attraction to water
        - Economic benefits of habitat restoration for green infrastructure, recreation and tourism

- **Stakeholders & Resources**
    - *End users*
        - Urban land use planners
        - Landscape architects
        - Watershed management groups
        - Private landowners
        - River cities in the region (grouped by a primary use of the waterway):
            - Riverfront development & recreation
                - Ann Arbor, MI (Huron River)
                - Dayton, OH (Great Miami River – Five Rivers MetroParks)
                - Davenport, IA (Mississippi River – Quad Cities)
                - Des Moines, IA (Des Moines River)
                - Detroit, MI (Detroit River)
                - El Dorado, KS (Walnut River)
                - Elkhart, IN (Elkhart River)
                - Ft. Wayne, IN (St Joseph River/Maumee - Three Rivers Festival)
                - South Bend/Mishawaka, IN (St Joseph River/Lake Michigan)
                - Minneapolis, MN (Mississippi River)
                - Muskogee, OK (Arkansas River – River Country Family Water Park, Three Rivers Museum)
                - Peoria, IL (Illinois River)
                - Rockford, IL (Rock River - On the Waterfront Festival)
                - South Bend, IN (Elkhart River)
                - Ohio: large park districts exist within the landscape including Columbus and Franklin County Metro Parks, Five Rivers Metroparks (Dayton area), and Hamilton County Park District (Cincinnati). The presence of these major park systems presents a great opportunity to partner on shared objectives.
            - Navigation
                - Chicago, IL (Illinois River)
                - Detroit, MI (Detroit River)
                - Kansas City, KS/MO (Missouri River)
                - Omaha, NE (Missouri River)
                - St. Louis, MO (Missouri / Mississippi Rivers - confluence)
                - Tulsa, OK (Arkansas River – most inland river port in US)
            - Flood control (year of most recent extensive flooding)
                - Cedar Rapids, IA (Cedar River – 2008)

        - Dayton, OH (Great Miami River – 1913)
        - Ft. Wayne, IN (St Joseph River – 1982)
        - Indianapolis (West Fork White River – 1913)
        - Iowa City, IA (Iowa River – 2008)
        - Kansas City, KS/MO (Missouri River – 1993)
        - Manhattan, KS (Kansas / Big Blue Rivers - 1993)
        - St. Louis, MO (Missouri / Mississippi Rivers - 1993)
        - Milwaukee, WI (County Grounds, Hart Park, Greenseams® - 2008-2010)
    - Species conservation & green infrastructure
        - Cincinnati, OH (Ohio River - mussels)
        - Columbus, OH (Scioto River – Central Ohio River Pride)
        - Indianapolis, IN (White River – Greening the Crossroads; Upper White River Watershed Alliance)
        - Lincoln, NE (Salt Creek – endangered Salt Creek Tiger Beetle)
        - Lafayette, IN (Wabash River – sturgeon, paddlefish)
        - Tulsa, OK (Arkansas River – endangered bird nesting)
- *Management (technical assistance)*
    - State and federal agencies (public land managers)
        - Big Muddy National Fish & Wildlife Refuge
    - Cornell Lab of Ornithology yardmap online conservation mapping tool for urban residential property owners
    - American Forest Foundation myLandPlan online management tool for forest property owners
- *Research*
    - Illinois River Biological Station (Illinois Natural History Survey)
    - Development of urban bird indicators using data from monitoring schemes in two large European cities. S. Herrando, et al.
    - USGS with IUPUI - flood inundation models and fluvial erosion hazard assessments that may feed into your vision of riparian restoration in urban watersheds.
    - Google Map of channelized stream projects (http://goo.gl/maps/MZntc) that have been completed in Ohio and monitored by Dan Mecklenburg, Ohio DNR. The green placemark sites have been monitored with longitudinal and cross section surveys with “time-lapse” photography to show development of the sites. Click on a green placemark you will get a new page that gives stream data. Click on the photo link under MORE INFORMATION for photos.
- *Partner plans* - inventory of documents and interpreter (contacts)
    - EPA Urban Waters Small Grants Program & Urban Waters Network (http://www.epa.gov/urbanwaters/)
    - Urban Waters Federal Partnership (http://www.urbanwaters.gov/)
    - America's Great Watershed Initiative - Mississippi River Basin (Great Rivers Partnership)
    - America’s Great Outdoors Initiative (US Department of Interior)
    - State Wildlife Action Plans (SWAPs)

        - Midwest Wind MSHCP Project – Green Infrastructure Network Design for FWS Region 3 (Tom Magnusen)
        - *Upper Mississippi River System Ecosystem Restoration* - report which presents stakeholder vision, goals and Objectives for the Upper Mississippi River System. The objectives were established for the 1200 miles of River from Chicago to St Louis on the Illinois River and from St. Paul to Cairo IL on the Mississippi River. Conceptual models were also developed. The project area includes the 2.5 million acres of floodplain associated with the big rivers. The report was developed in cooperation with the FWS, USGS and the states of Iowa, Illinois, Minnesota, Wisconsin and Missouri. Chuck Theiling or Ken Barr can be POCs for additional information. Janet Sternberg (MO) from the LCC group was also involved in developing the report. Ken Barr (309-794-5349; Kenneth.A.Barr@usace.army.mil)
            - http://www2.mvr.usace.army.mil/UMRS/NESP/Documents/UMRS%20Ecosystem%20Restoration%20Objectives%202009%20Main%20Report%20(1-20-2011).pdf
        - Upper Mississippi River Conservation Committee (Sternberg)
        - Mississippi River Network (Botts)
        - NRCS Mississippi River Basin initiative (Hyberg)
        - TNC Ecoregional Plans (Shuey)
        - Adjacent LCCs
        - Fish Habitat Partnerships
        - Upper Mississippi River and Great Lakes Region Joint Venture
        - LCC Maps (http://www.fws.gov/gis/data/national/index.html)
    - *Climate models* – inventory
        - Security & Sustainability Forum - webinar archive
        - Climate centers (USGS, NOAA, NWS)
        - Universities (UW Madison)

- **LCC Funded Projects** (FY11-FY12)
    - *Missouri River hydrogeomorphic characterization (HGM)* - Analyze historic and contemporary information about physical features to inform more effective conservation and management across 670 miles of the Missouri River including urban sections through Omaha, Kansas City, and St. Louis (U.S. Fish & Wildlife Service).

Program performance measures: Science Investment and Accountability (SIAS)

The U.S. Fish & Wildlife Service (FWS) Science Investment and Accountability Schedule (SIAS) will help guide agency support for individual Landscape Conservation Cooperatives (LCCs) and the National LCC Network. In pursuit of the agency's mission and vision for science, the following Activity Areas and associated Benchmarks will help specify investment and participation in the LCC network to ensure effectiveness, efficiency, and support for achieving conservation at landscape scales.

SIAS is comprised of nine interrelated Conservation Activity Areas and associated benchmarks that are guided by the Strategic Habitat Conservation (SHC) framework. The SIAS is based on the "Core Activities and Benchmarks" developed in 2011 and applied to FY12 LCC allocations. The SIAS was developed by a team of OSA and Regional staff to improve and expand on the FY12 activities and benchmarks, reflecting the additional experience and perspectives of the evolving National LCC Network.

Activity Area 1	**Organizational Operations** – Addresses fundamental organizational and administrative components necessary to establish and maintain an LCC as part of the National Network.
Activity Area 2	**Landscape Conservation Planning Foundation** – Defines the foundation upon which an LCC builds an integrated landscape conservation planning, design, and delivery process.
Activity Area 3	**Landscape Conservation Design** – Integrates the biological, ecological, and cultural goals and objectives that support priority resources defined by an LCC.
Activity Area 4	**Informing Conservation Delivery** – Communicates and delivers science and technology products and tools for decision making and on-the-ground actions so as to influence current and future landscape conditions.
Activity Area 5	**Decision-based Monitoring** – Tracks status and trajectory of priority resources and changes in landscape conditions and conservation objectives.
Activity Area 6	**Assumption-driven Research** - Evaluates key uncertainties and assumptions through targeted research to help guide improvements for biological planning conservation design, delivery, inventory and monitoring, and operational evaluations.
Activity Area 7	**Data Management and Integration** – Facilitates information discovery, sharing, and collaboration.
Activity Area 8	**Science and Conservation Community Integration** - Engages with the key science consortia and conservation partnerships within the geography.
Activity Area 9	**Conservation Science and Adaptation Strategy** – Provides context and strategies for LCC actions and identifies processes for sharing information, knowledge, products, tools, and strategies that benefit the LCC Network's vision, mission, and guiding principles.

Each benchmark reflects an expected progression of development and achievement for LCCs. By Activity Area, these benchmarks will help guide and assess the development of individual LCCs and the LCC Network and may inform allocation of funding appropriated by Congress to the Fish and Wildlife Service.

In addition to the SIAS as a program-level set of performance measures, the ETPBR LCC will establish performance measures for each of the objectives to determine progress towards achieving the ETPBR goals.

EASTERN TALLGRASS PRAIRIE & BIG RIVERS
LANDSCAPE CONSERVATION COOPERATIVES

Action Plan – Year 1

What actions need to be taken in the immediate future to initiate implementation of the Strategic Plan?

The following outline describes immediate actions within the next 6 months to work with the ETPBR community to establish detailed work plans and guidance for future project support. This action plan will continue to evolve.

- **Steering Committee (Coordinator: Glen Salmon)**
  - The Steering Committee (SC) meets twice/year in person (next meeting: January 23-24 in Dubuque, IA) and as needed by online or telephone conference.

  - Determine who serves on Science Core Team (SCT) and Topical Advisory Groups (TAGs)
    - LCC Stakeholders/Partners - Identify and invite representatives of:
      - Agencies/organizations with responsibility for natural resource management
      - Progressive farm organizations as design and implementation partners, possibly through university extension, producers groups and state departments of agriculture, Intertribal Agricultural Council

  - Participate in Surrogate Species process
    - Review Draft Guidance for Selecting Surrogate Species - online comment closes January 31, 2013.
      - *For more information:* http://www.fws.gov/landscape-conservation/draft-guidance.html
      - *External Partners input:* http://www.fws.gov/landscape-conservation/public-comments.cfm
    - Determine how the ETPBR LCC will be involved in the selection and implementation of Surrogate Species in the region.

  - Review and revise draft Strategic Plan
    - Authorize actions
    - Budget and RFPs for projects

- **Develop Communications Plan (Communications Coordinator: Ashley Spratt)**
  - In process with Ashley Spratt leading
  - Develop objectives to create awareness among audiences

- **Inventory existing plans and organizational process models (Science Coordinator: Gwen White)**
  - Examples of processes from other LCCs
  - Inventory goals/priorities in existing plans across the region
    - Inventory partner plans with a contact who can interpret potential relationships to the LCC
    - Inventory climate models and resources

- **Prepare Initial Science Needs Assessment (Science Coordinator: Gwen White)**
  - Assemble teams
    - Outline the expertise and proposed individuals for four Technical Advisory Groups (TAGs)

    - The Steering Committee created subteams to develop the structure for Technical Advisory Groups (TAGs) in each of the four focal areas and for developing an initial list of criteria to prioritize projects. A list of subteam members and draft description of process and products is provided below.

Criteria Subteam

- *Subteam members:* Chuck Corell, Dan Cornelius, Ivan Dozier, Jim Gillespie, Skip Hyberg, Ted Lagrange, John Shuey, Charlie Wooley
- Products
  - Refine draft list of criteria for ETPBR LCC project selection for both:
    - Short-term immediate projects, such as FY13 project selection and if settlement funds or other sources were available
    - Long-term LCC criteria for FY14 RFP project funds
  - Recommend criteria for review and approval of the entire Steering Committee

4 Focal Area Technical Advisory Group (TAGs) Planning Subteams

- Subteam members
  - *Prairie Restoration:* Jim Herkert, John Rogner, John Shuey, Rick Young
  - *River Restoration:* Ken Barr, David Brakhage, Joe Larscheid, Mark Reiter, Janet Sternburg, Charlie Wooley
  - *Agroecology:* Bob Clevenstine, Chuck Corell, Dan Cornelius, Tom Davenport, Ivan Dozier, Skip Hyberg, Janette Marsh, Randy See
  - *Urban Watersheds:* Paul Botts, Janette Marsh, Mark Reiter, Randy See, Barb Tormoehlen

- Products of subteam
  - Review compilation of strategies in section of strategic plan to identify necessary areas of expertise on TAG
  - Outline TAG activities (see below)
  - Determine types of representation needed on TAG
  - Request Steering Committee member volunteers to co-chair each TAG
  - Recommend individuals to serve on the TAG

- Next steps (led by LCC staff under direction of the subteam)
  - Review and approval of representatives by entire Steering Committee
  - Staff contacts recommended individuals to request their participation
  - Set up meeting schedule and venues for TAGs

- TAG Activities (draft for subteam review and development)
  - Identify organizations that the TAG should contact
  - Develop mechanism for obtaining input from stakeholders (e.g., questionnaire, workshop, presentation at meetings)

        - Expand list of potential strategies (Science Needs)
        - TAGs will use an SDM process to recommend a list of prioritized strategies, along with a lead/cooperators and time frames for implementation
        - Steering Committee will review and refine strategies
        - Staff will develop RFPs for project areas or specific projects
        - TAG may review project proposals based on Project Criteria
        - TAG may recommend projects for Steering Committee approval and funding, either through the LCC or identify other resources for implementation

- Stakeholder Science Needs Identification (draft process)
    - Overall discussion, possibly using SDM process
        - Set fundamental objectives (outcomes) within the four focus areas identified by the SC (Prairie Restoration, River Restoration, Agroecology, Urban Watersheds)
        - Develop conceptual models relating decisions to objectives, portraying impacts and trade-offs
        - Identify stakeholders, decision-makers and types of decisions affecting these resources
        - Identify key uncertainties (Science Needs) that limit decision-making, sorted by relevant decision and fundamental objectives
        - Recommend criteria for initial prioritization of Science Needs for use in soliciting or evaluating project proposals
        - Describe any additional guidance for project evaluation
        - Develop a portfolio of desired science projects

    - Next overall focal area steps
        - Further development of SCT and TAGs – participation and actions
        - Inventory of current interests and activities
        - Participate in interim project proposal and funding recommendations to SC, as needed

    - Prairie Restoration Techniques
        - *Methods:*
            - Prairie Reconstruction Workshop (Nov 27-30)
            - Prairie Reconstruction Work Group – continuing efforts
            - Fish Habitat Partnerships - Steering Committees
            - Online/phone surveys (Feb - May)
        - *Audience*: Geographically broad set of practitioners in 11 states, emphasizing the southern and eastern portions of the region.

    - River Restoration Techniques
        - *Methods:*
            - Prairie Reconstruction Workshop (Nov 27-30)
            - Prairie Reconstruction Work Group – continuing efforts
            - Fish Habitat Partnerships - Steering Committees
            - Online/phone surveys (Feb - May)
        - *Audience*: Geographically broad set of practitioners in 11 states, emphasizing the southern and eastern portions of the region.

- Agroecology Conservation Practices
  - *Methods:* Presentations followed by online/phone survey (January – May)
  - *Audience*: State Technical Committees (8 - NE, IA, KS, IL, OK, IN, MN, OH); USGS Hypoxia Work Group; MAFWA Private Lands Working Group

- Urban Watersheds Conservation Practices
  - *Methods:* Inventory of activities and Workshop in a central location (Summer or Fall 2013)

- Urban Watersheds Science Needs Workshop – *Draft Agenda* (facilitated)
  - Preparation
    - Conduct an inventory of interest and activities in urban, suburban and small town areas related to urban watersheds and revitalization of river corridors.
  - Presentations
    - Climate Science Center research (downscale climate models)
    - Vulnerability assessments (threats to at-risk species and habitats)
    - Surrogate species (based on LCC geography)
    - Guidance from the Steering Committee and Strategic Plan
    - Input from 3 theme-based processes
  - *Audience*: 20-30 participants (draft list of invitees):

    <u>Management / Urban Land Use Planning (possible invitees)</u>

    1. IL Chicago Wilderness
    2. IL Peoria
    3. IN Central Indiana Land Trust
    4. IN Upper White River Watershed Alliance
    5. IA Des Moines
    6. IA Coon Rapids (Whiterock Conservancy)
    7. NE Lincoln
    8. NE Omaha
    9. KS Wichita
    10. KS Manhattan
    11. KS/MO Kansas City
    12. MO St Louis
    13. OK Tulsa
    14. OK Muskogee
    15. OH Cincinnati
    16. OH Columbus
    17. MI Ann Arbor
    18. MI Detroit
    19. WI Milwaukee (Greenseams® Program)
    20. TN Nashville

    <u>Research / Agencies (possible invitees)</u>

    21. INHS Illinois River Biological Station (Brian Anderson; researcher)
    22. IUPUI Center for Earth & Environmental Studies (Bob Barr)
    23. Missouri River HGM (Mickey Heitmeyer)

24. Big Muddy NWR
25. US Army Corps of Engineers (Ken Barr / Dan Pridal)
26. US Geological Survey (Randy See)
27. Regional Refuge Hydrologist (Josh Eash)
28. Large River Fisheries Biologist
29. The Nature Conservancy (John Shuey)

What new LCC-sponsored projects have been funded or proposed recently?

- ***USGS GAP Analysis*** $42,500 (USGS funds awarded) – A spatial decision support system to identify appropriate conservation practices to be implemented and to quantify potential benefits for both nutrient export and riparian and grassland bird habitat as a result of implementing these practices.

- ***Mississippi Basin Hypoxia Corridor Workshop*** $84,000 (FWS multi-LCC funds awarded) – Convene landscape conservation design experts and natural resource policy leaders located along the Mississippi, Missouri and Ohio Rivers to outline the actions necessary to allow fish and wildlife in the center of the North American continent to adapt to a changing world. Our aim will be to define, design and deliver a sustainable interdisciplinary approach to conservation of fish, wildlife and water quality along America's mid-continent River – the Mississippi.

- ***NCTC Landscape Conservation Toolbox Workshops*** $122,500 (FWS multi-LCC funds awarded) - Addressing the complexity of decision-making related to landscape scale ecosystem stressors and multi-jurisdictional, interdisciplinary conservation efforts across and within LCCs requires the regional skills for applying tools such as Climate Change Modeling/Scenario Planning; Climate Change Adaptation Planning/Vulnerability Assessment; Structured Decision Making/Adaptive Management; and Collaboration Tools.

- ***Incorporating social drivers to optimize the location of conservation practices that address both the Gulf hypoxia problem and declining wildlife populations as impacted by extreme climate events*** $172,220 (proposal submitted for Northeast & South Central Climate Science Center funds) - Development and testing of pilot web-based decision support tools to optimize selection and siting of conservation practices, using stakeholder feedback in response to model estimates of water quality, economic, and ecological impacts and comparing landowner preferences for water quality and wildlife habitat BMPs under extreme climate conditions of drought and flooding (see WRESTORE online at http://wrestore.iupui.edu/).

TAG Work Streams Update (July 2015)

A brief outline of progress and current research projects are listed below for each TAG, organized in the following action areas as appropriate.

1) Shared goals, objectives and priorities – What are the primary areas of focus?
2) Landscape conservation design – How are we determining what and where to align actions?
3) Conservation delivery – How are we informing on-the-ground management?
4) Large-scale monitoring – How are we using species/habitats to measure progress?
5) Communications / outreach – How are we transferring products to managers?

For further details, all projects are described in the USGS Science Base online catalog at: https://www.sciencebase.gov/catalog/item/513f899ce4b0dcc733969431?view=folder

FOCAL AREA 1: Prairie Restoration – TAG Coordinator Jamie Ellis, Univ Illinois / INHS

1) Shared goals, objectives, priorities
   - Prairie Reconstruction Initiative Advisory Team - PRIAT (Greg Hoch, MN DNR)
2) Landscape conservation design
   - Fitting the Climate Lens to Grassland Bird Conservation: Assessing Climate Change Vulnerability Using Demographically-Informed Species Distribution Models (*FY13 NE CSC* Zuckerberg, Univ WI)
   - Use of climate and land cover to predict avian abundance across the Midwestern United States (*FY14 NE CSC* Thompson, Univ MO)
   - Development of a spatially explicit models and decision support tools for Henslow's sparrows and other priority birds in the Flint Hills in (*FY14 Multi-LCC Funded Research* FWS Region 6 / ETPBR LCC)
3) Conservation delivery – How are we informing on-the-ground management?
   - Prairie STRIPs for wildlife and water quality (*FY13 USDA FSA* Iowa State Univ, Neal Smith NWR)
4) Large-scale monitoring – How are we using species/habitats to measure progress?
   - Developing a Framework for Evaluating Tallgrass Prairie Reconstruction Methods and Management (*FY14 ETPBR* Diane Larson, USGS, Glacial Ridge NWR, Neal Smith NWR, Shiawassee NWR)
   - Building a science- and outcome-based monitoring framework for measuring the effectiveness of prairie restoration and management efforts (*delay requested for FY14 ETPBR* Hoch, MN DNR)
5) Communications / outreach / science transfer
   - *Cross-TAGs Topic:* Climate Change Vulnerability Assessment training for partners, Sept 30 – Oct 2, 2014, La Crosse, WI (*FY13 Multi-LCC* NCTC)
   - Produce online videos to illustrate savanna restoration (*proposed FY16* Pauline Drobney, Neal Smith NWR)

- Produce online videos to capture field days discussion on prairie reconstruction techniques (*proposed FY16* PRIAT)

FOCAL AREA 2: River Restoration – TAG Coordinator Lama BouFajreldin, Univ Illinois / INHS

1) Shared goals, objectives, priorities
   - Floodplain Science Network FpSN (Carrie Davis, Univ Iowa; Andy Casper, INHS)
   - Maquoketa/Mississippi Confluence Workshop, June 17-18, 2014, Bellevue, IA
2) Landscape conservation design
   - A hydrogeomorphic approach to evaluate ecosystem restoration and habitat management for the Lower Missouri River (*FY14 ETPBR* Josh Eash, FWS)
   - Decision Support Mapper for Conserving Stream Fish Habitats of the Northeast Region (*FY15 NE CSC* Paukert, Univ MO)
3) Conservation delivery
   - Science to Inform Management of Floodplain Conservation Lands under Non-Stationary Conditions (*FY14 NE CSC* Jacobsen, Univ MO)
4) Large-scale monitoring
   - Quantifying ecosystem processes in support of river restoration and nutrient reduction: effects of increased river-floodplain connectivity in the Maquoketa River (*FY14 ETPBR* Bill Richardson, USGS)
5) Communications / outreach / science transfer
   - *Cross-TAGs Topic:* Climate Change Vulnerability Assessment training for partners, Sept 30 – Oct 2, 2014, La Crosse, WI (*FY13 Multi-LCC* NCTC)
   - Floodplain Conceptual Modeling Workshop, July 29-31, 2014, Alton, IL (*FY13 ETPBR* Ken Lubinski, USGS)
   - Floodplain Forest Workshop, Sept 15-17, 2015, Dubuque, IA (*FY15 ETPBR* Tim Schlagenhaft, Minnesota Audubon; Jeremy Peichel, US Forest Service)

FOCAL AREA 3: Agroecology - TAG Coordinator Andrew Stephenson, Univ of Northern Iowa

1) Shared goals, objectives, priorities
   - MRB/Gulf Hypoxia Initiative SDM Workshop, Aug 12-14, 2014, Memphis, TN, developed a stakeholder-driven framework for agricultural conservation (*FY13 Multi-LCC* facilitator: Max Post van der Burg, USGS)
2) Landscape conservation design
   - National GAP Analysis to identify conservation opportunity areas in the Mississippi/Gulf hypoxia zone for grassland, wetland and riparian birds (*FY13 ETPBR & USGS* Waide, USGS)
   - Mississippi Basin / Gulf Hypoxia Initiative spatial analysis to identify conservation opportunity areas in high nutrient loading areas (*FY15 ETPBR* Michael Schwartz, The Conservation Fund)
   - Scaled-down LCD for 4 Refuges along the Illinois River (Clevenstine, FWS)
   - Scaled-down LCD for Lower Wabash River (Bill McCoy, Patoka NWR; Bradley Smith, TNC)
3) Conservation delivery – How are we informing on-the-ground management?

- Assessing Landowner's/Producer's attitude toward and motivations for participating in conservation programs beneficial to wildlife (*FY12 ETPBR LCC Funded Research* Megan Cross, Univ MN)
- Incorporating Social Drivers to Optimize Conservation Practices that Address Gulf Hypoxia and Declining Wildlife Populations Impacted by Extreme Climate Events (*FY14 NE CSC* Waide, USGS)
- Toward a Comparative Understanding of Agriculture Producers and Non-producers Perceptions of Ecosystem Services and Gulf Hypoxia (*FY14 ETPBR* Craig Miller, Univ Illinois / INHS)
- Value-added conservation: Optimizing landscapes for ecosystem services (*FY14 ETPBR* Bonnie Keeler, Univ MN)

4) Large-scale monitoring
   - Surrogate Species as biological objectives for landscape design (FY14 FWS Region 3)
5) Communications / outreach / science transfer
   - *Cross-TAGs Topic:* Climate Change Vulnerability Assessment training for partners, Sept 30 – Oct 2, 2014, La Crosse, WI (*FY13 Multi-LCC* NCTC)
   - Gulf Hypoxia Initiative Work Teams associating practices with species and programs for use in targeted communications (*FY15 ETPBR* 66 volunteers)

FOCAL AREA 4: Urban / Ecological Places in Cities – TAG Coordinator Kristin Shaw, Ind Univ

1) Shared goals, objectives, priorities
   - EPIC Business Planning Meeting, Aug 31-Sept 1, Chicago *(FY15 ETPBR* Core Team*)*
2) Landscape conservation design
   - Urban Monarch Landscape Conservation Design (*FY15 Multi-LCC* Chicago Field Museum)
3) Conservation delivery
   - Milkweed for Monarchs Education & Outreach (*FY15 FWS Directorate* City of St Louis)
4) Large-scale monitoring
   - Milkweed for Monarchs Gardens & Urban Prairie Research (*FY15 ETPBR* City of St Louis)
5) Communications / outreach / science transfer
   - Midwest Urban Conservation Workshop, April 29-May 1, 2014, St Louis, MO
   - Urban Monarch Conservation Workshop, Spring 2016 (*FY15 Multi-LCC* EPIC)

Invitation to serve on a Technical Advisory Group (TAG) for the Eastern Tallgrass Prairie & Big Rivers Landscape Conservation Cooperative (ETPBR LCC) and List of Potential TAG Members

You have been nominated to serve on an ETPBR LCC Technical Advisory Group (TAG). The LCC Steering Committee is forming TAGs to represent disciplines within 4 focal areas, supported by technical expertise in specific areas such as communications and human dimensions:

1) ***Prairie Restoration Techniques*** – Develop and connect functional large-scale tallgrass prairie ecosystems.
2) ***River Restoration Techniques*** – Develop and connect functional big river and floodplain ecosystems.
3) ***Agroecology Conservation Practices*** – Use economics and incentives to influence best management practices for habitat conservation on agricultural working lands, particularly as they affect Gulf hypoxia.
4) ***Urban Watershed Management*** – Promote river corridors as a backbone for green infrastructure and human connection to waterways and wildlife habitats in cities, suburbs and small towns.
5) ***Communications Network*** – Marketing, public relations, and outreach in support of Midwest landscape conservation issues.
6) ***Human Dimensions*** – Research, management and policy implications of social sciences in support of the four focal areas.

Please review the attached list of potential members and let us know if you or others would like to participate in other TAGs (or if you want to be removed from the lists). We are not restricting participation to our LCC geography as several people have expressed interest from the other LCCs from across the Mississippi River Basin.

Where do I go for further information and to volunteer as a TAG member?
Review notes from the first TAG conference calls during which we discussed preliminary input. After August 2, we will conduct a more complete thematic analysis on the input received to date and send that to TAG members for further prioritization.

Also, visit the ETPBR LCC website to download the draft Strategic Plan at:
http://www.tallgrassprairielcc.org/category/partnership-documents/

Sign up online as a TAG member - One of the new functions of our web site expansion has been the development of an online workspace for LCC working groups, including the TAGs. This online workspace will facilitate document sharing, online discussion forums, media and event sharing, and the sharing of messages within and outside of your own working group. In these tough budgetary times, it's more important than ever to capitalize on virtual networks and online spaces to facilitate communication and stay connected!

REGISTER NOW TO BEGIN USING THE ONLINE WORKSPACE - Visit the website (TallgrassPrairieLCC.org) and click on the blue "Register" button in the top right hand corner of the home page. Fill in your information to get started! IMPORTANT NOTE: Once you have registered and joined the workspace, you will need to request to JOIN the groups in which you are a member, i.e. UW - Urban Watersheds; AE -

Agroecology, and so on and so forth. Also be sure to JOIN the group titled "Everyone" to ensure you receive updates that pertain to the entire LCC community.

To get started, review the brief overview of the online workspace functionality, in addition to some tips on how to start using the site to stay connected with the ETPBR LCC community.

Please don't hesitate to contact Ashley Spratt, LCC communications coordinator at ashley_spratt@fws.gov or 573-234-2312 ext. 104 if you have any questions.

What is the mission of the LCC?
The ETPBR LCC coordinates among many partners to address the landscape-level conservation challenges of a predominantly agricultural landscape across 11 corn-belt states in the nation's heartland to:

1) Understand the consequences of landscape-scale change;
2) Develop common landscape-level conservation objectives and strategies; and
3) Produce pragmatic science that addresses current and future environmental stressors.

Why should I get involved?
The LCC is expanding resources for your program by providing access to external funds, information sharing and collaborative partnerships that will fill your needs for coordinated action and pragmatic landscape-level research.

Through the LCC, you can improve your on-the-ground management by:

1) *Describing the consequences* of landscape-scale change for your program;
2) *Aligning your program* with common conservation objectives and strategies at the regional level to address large-scale landscape stressors, and
3) *Implementing the results of pragmatic science* that addresses current and future environmental stressors that are holding back the success of conservation within the larger context—but only if you tell us what you need.

What will we do on the TAG?
We anticipate that the TAG will meet mostly by webinar or conference call approximately 4-6 times per year. Primary tasks of the TAG will be to:

- Refine problem statement for the Focal Area in the *ETPBR LCC Strategic Plan*
- Identify organizations that the TAG should contact as interested stakeholders
- Identify and share resources (models, databases, documents)
- Develop mechanism for obtaining input from contacts (e.g., questionnaire, workshop, webinar)
- Expand list of potential LCC Objectives and Strategies (Science Needs) in Strategic Plan
- Use an SDM process to recommend a prioritized list of strategies for review by the Steering Committee
- Develop RFPs for strategy areas or for specific projects
- Review and rank project proposals for Steering Committee approval and funding
- Review progress by funded projects in process
- Communicate about and use results of completed projects

How is the ETPBR LCC organized?

In December 2012, the LCC Steering Committee began drafting a strategic plan to provide a foundation and structure to carry out the mission and vision of the LCC and its partners. This strategic plan positions LCC members as leaders for regional conservation, identifies the natural resources challenges we are up against, and sets forth a vision, mission and guiding principles to encourage growth and maturity for the partnership.

The strategic plan also identifies habitats, focal areas and subregional differences capturing the cultural, social and ecological significance of natural resources across the landscape. These focal areas—and goals, objectives and strategies developed around them—were generated through discussion by steering committee members in September 2012 followed by further refinement in conference calls, informed by discussions with stakeholders.

The DRAFT goals, objectives and preliminary strategies in the ETPBR LCC Operations & Strategic Plan are based on continuous input from the Steering Committee and stakeholders. Over the next several months, this section will remain dynamically updated based on dialogue with anyone who has an interest in landscape conservation in the lower Midwest cornbelt. Over the next few months, the TAGs and Steering Committee will refine these items in a more immediate ***TAG Business Plan*** to guide opportunities for action in the near future.

Steering Committee - The following individuals provide leadership as the ETPBR LCC Steering Committee. Representatives from South Dakota, Minnesota, Wisconsin and Oklahoma are also invited to participate as small portions of the LCC geography extend into those states.

Co-Chairs:

Kelley Myers, Iowa DNR, Co-Chair ETPBR LCC SC
Charles Wooley, FWS Region 3, Co-Chair ETPBR LCC SC

NGO:

Brian Anderson, Illinois Natural History Survey
Paul Botts, Chicago Wilderness
David Brakhage, Ducks Unlimited
Dan Cornelius, Intertribal Agriculture Council
Aaron Kuehl, Pheasants Forever
Joe Larscheid, Fish Habitat Partnerships
John Shuey, The Nature Conservancy
John Silovsky, Upper Mississippi River and Great Lakes Joint Venture

State:

Jeff Burris, Ohio Division of Wildlife
Jim Gillespie, Iowa Department of Agriculture and Land Stewardship
Richard Hatcher, Oklahoma
Greg Hoch, Minnesota Department of Natural Resources
David Kohler, Ohio Division of Wildlife
Mark Reiter, Indiana Division of Fish and Wildlife
Wayne Rosenthal, Illinois Department of Natural Resources
Janet Sternburg, Missouri Department of Conservation
Roger Wolfe, Kansas Department of Parks, Wildlife and Tourism

Federal:

Ken Barr, US Army Corps of Engineers
Bob Clevenstine, FWS National Wildlife Refuges
Ivan Dozier, Natural Resources Conservation Service
Chris Holbeck, National Park Service
Skip Hyberg, USDA Farm Services Agency
Ted Lagrange, Nebraska Game and Parks Commission

Michael Langston, USGS South Central Climate Science Center
Alan Lewitus, NOAA
Janette Marsh, US Environmental Protection Agency
Jeffrey Morisette, USGS North Central Climate Science Center
Jeremy Peichel, US Forest Service
Robert Swanson, US Geological Survey
Michelle Staudinger, USGS Northeast Climate Science Center
Steve Torbit / Will Meeks, FWS Region 6

Science Team - To conserve tallgrass prairie and river habitats, the LCC will also focus on dominant land uses in the region, both agricultural and urban by organizing Technical Advisory Groups (TAGs) around four focal areas, supported by technical expertise in specific areas such as communications and human dimensions.

Building a Strategy Network for Landscape Conservation

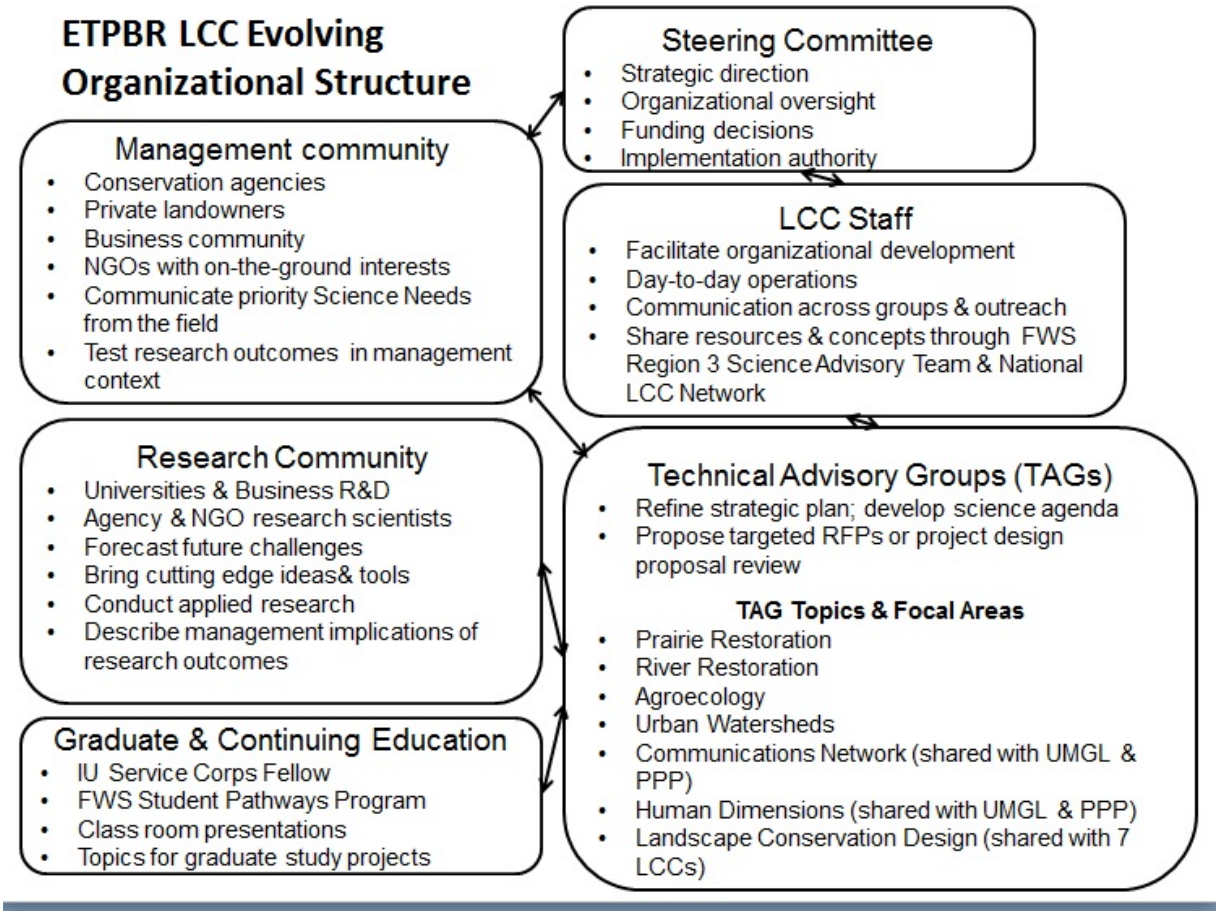
How can the LCC flourish in an era of rapid change? Build a strategy network (Kotter, 2012) that brings vision, opportunity, agility and inspired action from the community with this strategic approach:

- Convene many change agents from within the ranks.
- Draw attention to front-line concerns.
- View the future from multiple angles.
- Focus passion and intelligence on the biggest opportunities.
- Think creatively to solve wicked problems.
- Eliminate collaborative barriers between organizations.
- Promote a useful flow of information and activity.

Four focal area Technical Advisory Groups (TAGs) and a Human Dimensions TAG are being created as a "Science Team" consortium to provide strategic networking and to recommend priority science needs to the Steering Committee for the LCC to pursue (Figure 1).

Please contact Gwen White, ETPBR LCC Science Coordinator, to express your interest in serving on any of these TAGs at 812-212-7455 or gwen_white@fws.gov. Also, visit the LCC online at: http://www.tallgrassprairielcc.org/ and review the evolving Strategic Plan under the "Partnership Documents" tab. Thank you for your interest in landscape conservation!

Figure 1. Organizational structure for community participation in the ETPBR LCC.



Contact Lists for TAGs (as of Nov 2014)

The following individuals or organizations that have been recommended or have indicated interest in receiving information or serving as members of the following TAGs. LCC staff are actively soliciting additional contacts and providing the draft Strategic Plan for interim input to all of these individuals.

Prairie Restoration TAG

Expertise/Program	First	Last	Organization/Location
Prairie TAG Coordinator	Jamie	Ellis	Illinois Natural History Survey
SDM Advisor	Max	Post van der Berg	Northern Prairie Wildlife Research Center
Climate Advisor			
ETPBR Steering Committee	Jim	Herkert	Illinois Department of Natural Resources
ETPBR Steering Committee / UMGL LCC Coordinator	John	Rogner	UMGL LCC
ETPBR Steering Committee	John	Shuey	The Nature Conservancy
ETPBR Steering Committee	Rick	Young	Pheasants Forever
River ecological restoration	Roger	Anderson	Midwest – Great Lakes Chapter of the Society of Ecological Restoration
Watershed planning, prairie restoration	Steve	Apfelbaum	Applied Ecological Services
Prairie NGO - TNC, MO, burying beetle reintroduction	Randy	Arndt	TNC Missouri, Grand River Grasslands, Hatfield, MO
Watershed planning, integrated modeling, optimization, WRESTORE	Meghna	Babbar-Sebens	School of Civil and Construction Engineering, Oregon State University, Corvallis, OR
Prairie restoration	Jim	Bever	IU-Biology
Native prairie	Marlin	Bowles	Morton Arboretum, Lisle, IL
Prairie, grassland birds	Shana	Byrd	Restoration Ecology Dept, The Wilds, OH (with Columbus Zoo & Muskingum University)
Large River food webs, floodplain-natural hydrograph influences on productivity, river restoration	Andy	Casper	Illinois River Biological Station, INHS, Havana, IL
Biofuels/biomass	Paul	Charland	Leopold Wetland Management District
WRP Program, Missouri River	Don	Doty	USDA NRCS, Blair, NE
Geneticist, Climate Change	Marlise	Douglas	INHS Affiliate – U of Arkansas
Prairie Reconstruction Advisory Team	Jessica	Dowler	Glacial Ridge & Rydell NWRs, Erskine, MN
Prairie restoration, STRIPS project	Pauline	Drobney	Neal Smith National Wildlife Refuge

Midwest Grassland Bird Conservation Area Subcommittee	Ken	Duren	Olentangy Wildlife Research Station, ODNR, Division of Wildlife, Ashley, OH
Botanist/Prairie Restoration	Jamie	Ellis	IL Natural History Survey
Upper Mississippi/Great Lakes Joint Venture	Andrew	Forbes	US FWS, Bloomington, MN
Migratory birds - waterfowl, upland	Robert	Gates	Ohio State University
Prairie ecology	Bill	Glass	Midewin National Tallgrass Prairie, Wilmington, IL
NRDA Prairie Restoration	Scott	Hamilton	Columbia, MO
Seed bank, genetics & climate, citizen monitoring, native bees	Kay	Havens-Young	Dixon National Tallgrass Prairie Seed Bank, Chicago Botanic Garden, Glencoe, IL
Biological monitoring	Pat	Heglund	Upper Midwest Environmental Sciences Center
Grassland Restoration Network	Chris	Helzer	TNC Nebraska, Eastern Nebraska Project Office
Prairie habitat evaluation	Greg	Hoch	Farmland Wildlife Research Unit, Minnesota DNR, Madelia, MN
University research - seed production	Greg	Houseal	Tallgrass Prairie Center, University of Northern Iowa
Prairie seed production	Bill	Johnson	Iowa DNR Prairie Resource Center, Lehigh, IA
Plant materials	Jerry	Kaiser	Plant Materials Center Kirksville
Iowa Wildlife Diversity	Karen	Kinkead	Iowa DNR
Grassland Restoration Network	Bill	Kleiman	Nachusa Grasslands, The Nature Conservancy, Franklin Grove, IL
Prairie restoration, nursery	Chris	Kline	Cardno/JFNew, Walkerton, IN
Midwest Coordinated Bird Monitoring Partnership	Katie	Koch	FWS
Contaminants, amphibians	Mike	Lannoo	Dept Anatomy & Cell Biology, IU School of Medicine, Terre Haute, IN
Plant-animal interactions, pollination, seed disperson	Diane	Larson	USGS Northern Prairie Wildlife Research Center
Prairie restoration	Quinn	Long	Missouri Botanic Garden
Invasive species control, native plants, restoration planning	Brian	Majka	Cardno/JFNew, West Olive, MI
Endangered species	Paul	McKenzie	FWS R3 Columbia, MO ES Field Office
Human Dimensions	Craig	Miller	IL Natural History Survey
Grand River Grasslands	Jim	Miller	Urbana, IL
Plant Ecology, Climate Change	Brenda	Molano-Flores	IL Natural History Survey
Private lands - habitat specialist	Matt	O'Connor	Pheasants Forever, Hopkinton, IA
Migratory birds	Barb	Pardo	Upper Mississippi River JV

Wisconsin Bird Conservation Coordinator	Andy	Paulios	Wisconsin DNR, Madison, WI
Upland game birds - OH	Charlie	Payne	Pheasants Forever
Iowa DNR	John	Pearson	Iowa DNR
Prairie Bird Initiative	Justin	Pepper	National Audubon Society
CenUSA, Environmental Resources Center	Pam	Porter	University of Wisconsin-Madison
Iowa State Wildlife Action Plan Manager	Katy	Reeder	IA DNR, Des Moines, IA
Prairie restoration	Heather	Reynolds	IU-Biology
Grassland vertebrates in ag, climate change	Christine	Ribic	USGS/UW-Madison
Landscape design, biofuels	Susan	Rupp	Enviroscapes Ecological Consulting, Brookings, SD
Grassland birds, habitat management	Dave	Sample	Wisconsin DNR
Pollinator Work Group	Dolores	Savignano	Arlington, VA
Land use, sustainable ag, grasslands restoration	Lisa	Schulte Moore	Iowa State University
Wildlife Biologist, Federal Projects	Megan	Seymour	FWS R3 Columbus, OH ES Field Office, Columbus, OH
Prairie restoration, STRIPS project	Christy	Smith	Neal Smith National Wildlife Refuge
University research - community analysis, roadside veg	Daryl	Smith	Tallgrass Prairie Center, University of Northern Iowa
Botany	Gerry	Steinauer	Nebraska Game & Parks Commission, Lincoln, NE
Grassland birds, private lands	Nathan	Stricker	Olentangy Wildlife Research Station, Ohio DNR
Ecological processes	Rob	Swihart	Purdue University
Grassland Bird Conservation Area	Chris	Trosen	US FWS
Prairie restoration, nursery	Kevin	Tungesvick	Spence Restoration Nursery, Muncie, IN
Grassland Restoration Network	Malissa	Underwood	Jefferson City, MO
Pollinator Work Group - FWS Region 3	Wedge	Watkins	FWS R3 Big Muddy NFWR
Midwest Conservation Biomass Alliance	Carol	Williams	University of Wisconsin-Madison

River Restoration TAG

Expertise/Program	First	Last	Organization/Location
River TAG Coordinator	Lama	BouFajreldin	Illinois Natural History Survey
SDM Advisor	Brian	Gray	USGS UMESC
Climate Advisor			
ETPBR Steering Committee	Ken	Barr	US ACOE
ETPBR Steering Committee	Dave	Brakhage	Ducks Unlimited
ETPBR Steering Committee	Joe	Larscheid	Fish Habitat Partnerships
ETPBR Steering Committee	Mark	Reiter	Indiana DNR

ETPBR Steering Committee	John	Shuey	The Nature Conservancy
ETPBR Steering Committee	Janet	Sternburg	Missouri DOC
ETPBR Steering Committee	Charlie	Wooley	FWS Region 3
Trout Unlimited watersheds (Mad River)	Tom	Allen	Trout Unlimited
River ecological restoration	Roger	Anderson	Midwest – Great Lakes Chapter of the Society of Ecological Restoration
Fisheries on DoD property	Steven	Andrews	Naval Surface Warfare Center, Crane, IN
Stream monitoring, macroinvertebrate index	Jeromy	Applegate	FWS OH FO
Watershed planning, integrated modeling, optimization, WRESTORE	Meghna	Babbar-Sebens	School of Civil and Construction Engineering, Oregon State University, Corvallis, OR
Feral hog control	Steve	Backs	Indiana DNR
Floodplains by Design, Great Rivers Partnership	Gretchen	Benjamin	The Nature Conservancy, La Crosse, WI
River conservation	Doug	Blodgett	TNC Illinois Chapter, Emiquon, Lewistown, IL
Upper Mississippi River	Dru	Buntin	Upper Mississippi River Basin Association
Mussels, contaminants	Elissa	Buttermore	FWS Twin Cities Field Office, Bloomington, IN
Fisheries - OH	Rich	Carter	Ohio DNR DOW Fisheries
Large River food webs, floodplain-natural hydrograph influences on productivity, river restoration	Andy	Casper	Illinois River Biological Station, INHS, Havana, IL
Urban/rural interface floodplain watersheds of large rivers	Dan	Crigler	FWS R3 Missouri PLO, St. Charles, MO
Human Dimensions of the Environment	Bethany	Cutts	University of Illinois at Urbana-Champaign
Floodplain Science Network (FpSn)	Caroline	Davis	LACMRERS - Lucille A. Carver Mississippi Riverside Environmental Research Station, Muscatine, IA
Upper Mississippi floodplains, nutrients	Nathan	De Jager	USGS-Upper Midwest Environmental Sciences Center
Bottomland restoration - US Forest Service	Chad	Deaton	Shawnee National Forest
WRP Program, Missouri River	Don	Doty	USDA NRCS, Blair, NE
Geneticist, Climate Change	Marlise	Douglas	INHS Affiliate – U of Arkansas
Missouri River	Josh	Eash	US FWS
Platte River Recovery Implementation	Tom	Econopouly	US FWS, Lakewood, CO
Denver Div of Water Resources (Platte River)	Meg	Estep	US FWS, Denver, CO
Fish habitat - Midwest	Maureen	Gallagher	Midwest Regional NFHAP Coordinator
Migratory birds - waterfowl, upland	Robert	Gates	Ohio State University

Grand Island	Mike	George	US FWS
Floodplain forest ecology	Lyle	Guyon	National Great Rivers Research and Education Center, Lewis and Clark Community College
Ohio Water Resource Council	Brian	Hall	Ohio EPA Div. of Surface Water
Fish habitat - IA, MO, IL	Jeff	Hastings	Driftless Area Restoration Effort
Fish habitat - IL, IN, OH	Donovan	Henry	Ohio River Basin FHP, Carterville Fish and Wildlife Conservation Office, Marion, IL
Fisheries MICRA	Patricia	Herman	FWS Fisheries
Aquatic Ecologist, Climate Change	Leon	Hinz	IL Natural History Survey
Upper White River Watershed Association (UWRA)	Jill	Hoffmann	Empower Results, Indianapolis, IN
Ohio River POC - USACE	Hank	Jarboe	US Army Corps of Engineers
Fish habitat - MN, WI, IL, IA, MO	Heidi	Keuler	Fishers & Farmers Fish Habitat Partnership, Onalaska, WI
Iowa Wildlife Diversity	Karen	Kinkead	Coordinator
River restoration ecology	Bob	Kirschner	Chicago Botanic Garden
Upper Mississippi, Illinois & Missouri Rivers Association	Mike	Klinger	Quincy, IL
Fish habitat - KS, NE, MO, IA, MN, SD	Steven	Krentz	Great Plains Fish Habitat Partnership
McKnight Foundation - Mississippi River	Ron	Kroese	McKnight Foundation
Missouri River agency coordination	Casey	Kruse	FWS
Contaminants, amphibians	Mike	Lannoo	Dept Anatomy & Cell Biology, IU School of Medicine, Terre Haute, IN
Floodplain forest management	Matthew	Lechner	Shawnee National Forest
Endangered Species	Jane	Ledwin	FWS R3 Columbia, MO ES Field Office
Blufflands Alliance	Kerry	Leigh	Natural Land Institute, Rockford, IL
Ag Conservation in Mackinaw River, Emiquon	Maria	Lemke	The Nature Conservancy, Illinois
River Ecology Branch	Ken	Lubinski	Upper Midwest Environmental Sciences Center
Missouri River recovery, advisory to US ACOE	Mike	Mac	Missouri River Recovery Implementation Committee
Fish habitat - IA, MO, IL	Louise	Mauldin	Driftless Area Restoration Effort
Big River Specialist	Joe	McMullen	Missouri Department of Conservation, Shaw Nature Reserve, Villa Ridge, MO
Upper Mississippi, Illinois & Missouri Rivers Association	Dave	McMurray	Burlington, IA
Fisheries	Kraig	McPeek	FWS Rock Island ES FO, Moline, IL
Stream restoration, ecological engineering,	Dan	Mecklenburg	Ohio DNR

OH			
Aquatic/Big River Ecology	Nerissa	Michaels	IL Natural History Survey
Risk assessment, water quality, contaminants	Deb	Millsap	Columbus OH FO
Risk assessment, water quality, contaminants	Dave	Mosby	Columbia MO FO
Stream restoration, OH	John	Navarro	Ohio DNR
Migratory birds	Barb	Pardo	Upper Mississippi River JV
Fish vulnerability assessments	Craig	Paukert	University of Missouri
MICRA Univ Wisconsin	Brenda	Pracheil	University of Wisconsin
Iowa State Wildlife Action Plan Manager	Katy	Reeder	IA DNR, Des Moines, IA
Fish habitat - MO, OK	Scott	Robinson	Southeast Aquatic Resources Partnership
FWS Nebraska Field Office	Jeff	Runge	US FWS
Ducks Unlimited	Eric	Schenck	Canton, IL
Stream restoration, OH	Ethan	Simmons	Ohio DNR
Upper Mississippi River & Great Lakes Region Joint Venture	Greg	Soulliere	East Lansing, MI
Risk assessment, water quality, contaminants	Dan	Sparks	Bloomington IN FO
Contaminants, amphibians	Don	Sparling	Springfield, Illinois
Private lands	Kelly	Srigley Werner	FWS R3 Missouri Private Lands Office, Columbia, MO
Civil engineering, hydraulics	Wayne	Stancill	US FWS, Pierre, SD
Geomorphology, shoreline stabilization, habitat enchancement	Aaron	Steber	Cardno/JFNew, Madison, WI
Big rivers fisheries	Tom	Stefanavage	Sugar Ridge FWA, Indiana DNR, Winslow, IN
Middle Mississippi River Partnership - TNC Great Rivers Partnership	Todd	Strolle	The Nature Conservancy, St Louis, MO
Aquatic and riparian ecosystem, dam removal research	Mazeika	Sullivan	Ohio State University
regional nutrient credit market	Chuck	Theiling	US Army Corps of Engineers
Missouri River POC - USACE	Brad	Thompson	US Army Corps of Engineers
Indiana Healthy Rivers INitiative	Angie	Tilton	Indiana DNR
Watershed Management & Monitoring	Bruce	Vondracek	Dept Fisheries & Wildlife, University of Minnesota
Upper Mississippi River Restoration (UMRR) Environmental Management Program Coordinating Committee	Timothy	Yager	US FWS, Upper Mississippi NWFR, Winona, MN
Middle Mississippi River Partnership	Steve	Widowski	HeartLands Conservancy
Lower Platte River project	Ron	Zelt	U.S. Geological Survey, Nebraska Water Science Center
Mussel reintroduction - OH	TBD	TBD	The Wilds, Cumberland, OH (with Columbus Zoo, Ohio DNR)

Agroecology Conservation Practices TAG

Expertise/Program	First	Last	Organization/Location
Agroecology TAG Coordinator	Andrew	Stephenson	University of Northern Iowa
SDM Advisor			
Climate Advisor			
Nutrient & Wildlife Modeling Advisor	Jack	Waide	USGS
Human Dimensions Advisor	Linda	Prokopy	Purdue University
ETPBR Steering Committee	Chuck	Corell	Iowa DNR
ETPBR Steering Committee	Dan	Cornelius	Intertribal Agriculture Council
ETPBR Steering Committee	Ivan	Dozier	NRCS
ETPBR Steering Committee	Janette	Marsh	EPA
ETPBR Steering Committee	Randy	See	USGS
ETPBR Steering Committee	Bob	Clevenstine	FWS Refuges
NRCS Farm Bill - IA	Martin	Adkins	NRCS State Office - IA
NWQI State water quality - MN	Wayne	Anderson	Minnesota Pollution Control Agency
Watershed planning, integrated modeling, optimization, WRESTORE	Meghna	Babbar-Sebens	School of Civil and Construction Engineering, Oregon State University, Corvallis, OR
Indian Creek Watershed Project	Terry	Bachtold	Indian Creek Watershed Project
Feral hog control, upland game birds	Steve	Backs	Indiana DNR, Indianapolis, IN
NWQI State water quality - WI	Jim	Baumann	WI DNR
Sustainable Agriculture, Botany/Plant Pathology	Tamara	Benjamin	Purdue University, West Lafayette, IN
Birds	Andy	Bishop	Rainwater Basin Joint Venture, Grand Island, NE
Farm Bill	Todd	Bogenschutz	Iowa DNR
Private Lands Biologists - OH	Jeff	Burris	Ohio DNR/DOW
Center for Integrated Natural Resource and Agricultural Management	Dean	Current	Dept of Forest Resources, University of Minnesota
Human Dimensions of the Environment	Bethany	Cutts	University of Illinois at Urbana-Champaign
EPA Watersheds Section 319	Tom	Davenport	EPA, Chicago, IL
Upper Mississippi floodplains, nutrients	Nathan	De Jager	USGS-Upper Midwest Environmental Sciences Center
NRCS State Biologist - OH	Mark	Debrock	Ohio NRCS
Prairie restoration, STRIPS project	Pauline	Drobney	US FWS, Neal Smith NWR
NWQI State water quality - OH	Dan	Dudley	Ohio EPA Division of Surface Water
Midwest Grassland Bird Conservation Area Subcommittee	Ken	Duren	Olentangy Wildlife Research Station, ODNR, Division of Wildlife, Ashley, OH

Farm management online tools	Amos	Eno	Private Landowners Network, Resources First Foundation, Yarmouth, ME
Watershed groups, SWCDs - OH	Laura	Fay	ODNR Div. of Soil and Water Conservation
Ag Drainage Practices Advisor	Jane	Frankenberger	Purdue University
Fish habitat - Midwest	Maureen	Gallagher	Midwest Regional NFHAP Coordinator
NWQI State water quality - IN	Logan	Garner	Indiana State Department of Agriculture
Economic drivers	William (Billy)	Gascoigne	USGS, Ft Collins, CO
Endangered Species	Rick	Hansen	FWS R3 Columbia, MO ES Field Office
Fish habitat - IA, MO, IL	Jeff	Hastings	Driftless Area Restoration Effort
Insects, agricultural pests, pollinators	Mary	Harris	Iowa State University
Drainage, water quality, modeling	Matt	Helmers	Iowa State University
Fish habitat - IL, IN, OH	Donovan	Henry	Ohio River Basin FHP, Carterville Fish and Wildlife Conservation Office, Marion, IL
Urban Connections, youth programs	Teri	Heyer	US Forest Service, Minneapolis
NRCS Farm Bill - IL	Paula	Hingson	NRCS State Office - IL
Upper White River Watershed Association (UWRA)	Jill	Hoffmann	Empower Results, Indianapolis, IN
NRCS Farm Bill - WI	Ron	Howard	NRCS State Office - WI
Farm Bill programs, CRP	Rich	Iovanna	USDA FSA, Washington, DC
Soil and environmental quality	Dan	Jaynes	USDA/ARS - National Laboratory for Agriculture and the Environment, Ames, IA
Biomass/biofuels, multifunctional agriculture	Steve	John	Agricultural Watershed Institute, Decatur, IL
Agroecosystems Biodiversity Research	Nicholas	Jordan	Dept Agronomy & Plant Genetics, University of Minnesota
Agroforestry, woody biomass	Shibu	Jose	University of Missouri
Fish habitat - MN, WI, IL, IA, MO	Heidi	Keuler	Fishers & Farmers Fish Habitat Partnership, Onalaska, WI
Partners for Fish & Wildlife - IN	Jeff	Kiefer	Bloomington, IN FWS FO
Partners for Fish & Wildlife - OH	Donald	Knight Jr	Columbus, Ohio FWS FO
Midwest Coordinated Bird Monitoring Partnership	Katie	Koch	US FWS, Marquette, MI
Economic drivers	Lynne	Koontz	USGS, Ft Collins, CO
Fish habitat - KS, NE, MO, IA, MN, SD	Steven	Krentz	Great Plains Fish Habitat Partnership
Indiana DNR Private Lands	Gary	Langell	Indiana DNR

Contaminants, amphibians	Mike	Lannoo	Dept Anatomy & Cell Biology, IU School of Medicine, Terre Haute, IN
Floodplain forest management	Matthew	Lechner	Shawnee National Forest
Iowa State Water Quality Initiative	Matt	Lechtenberg	Iowa Dept Ag & Land Stewardship
Blufflands Alliance	Kerry	Leigh	Natural Land Institute, Rockford, IL
Ag Conservation in Mackinaw River, Emiquon	Maria	Lemke	The Nature Conservancy, Illinois
NWQI State water quality - IA	Dean	Lemke	Iowa Dept Ag & Land Stewardship, Div of Soil Cons
Gulf Hypoxia Task Force	Alan	Lewitus	NOAA
Biofuels	Mark	Lindquist	Minnesota Department of Natural Resources
NRCS Farm Bill - OH	Michelle	Lohstroh	NRCS State Office - OH
Plant Ecology/Wildlife	Susan	McIntyre	IL Natural History Survey
Fish habitat - IA, MO, IL	Louise	Mauldin	Driftless Area Restoration Effort
Nutrient cycling and hydrologic transport	Greg	McIsaac	University of Illinois at Urbana-Champaign
Gulf Hypoxia	Eileen	McLellan	Environmental Defense Fund
Fisheries	Kraig	McPeek	FWS Rock Island ES FO, Moline, IL
Landscape conservation, ecosystems, adaptive management	Vicky	Meretsky	Indiana University, Bloomington
Human Dimensions	Craig	Miller	IL Natural History Survey
MAFWA Private Lands Working Group	Mike	Mitchener	MAFWA/Indiana DNR
Watershed groups, SWCDs - OH	Greg	Nageotte	ODNR Div. of Soil and Water Conservation
Trees, stormwater engineering	Randy	Neprash	Minnesota Cities Stormwater Coalition / Stantec
Human Dimensions in Ag & Urban Ecosystems	Kristen	Nelson	Dept Forest Resources, Dept Fisheries & Wildlife, University of Minnesota
Migratory birds	Barb	Pardo	Upper Mississippi River JV
Pheasants Forever	Charlie	Payne	Ohio
Agriculture, grazing, soil health	Doug	Peterson	USDA NRCS, Missouri
Environmental Resources Center, Univ of Wisconsin	Pam	Porter	University of Wisconsin-Madison
Iowa State Wildlife Action Plan Manager	Katy	Reeder	IA DNR, Des Moines, IA
Agricultural Drainage Management Coalition	Harold	Reetz	Agricultural Drainage Management Coalition
NRCS Farm Bill - IN	Jill	Reinhart	NRCS, Indianapolis, IN
NWQI State water quality - IN	Marylou	Renshaw	Indiana Department of Environmental Management
Grassland vertebrates in ag, climate change	Christine	Ribic	USGS/UW-Madison
Fish habitat - MO, OK	Scott	Robinson	Southeast Aquatic Resources

			Partnership
Biogeochemistry, nutrient and carbon cycling	Todd	Royer	IU SPEA
Landscape design, biofuels	Susan	Rupp	Enviroscapes Ecological Consulting, Brookings, SD
Freshwater conservation	Anthony	Sasson	The Nature Conservancy, Ohio
Insect Ecologist	Raghu	Sathyamurthy	INHS Affiliate – U of Arkansas
Pollinator Work Group	Dolores	Savignano	FWS, Arlington, VA
Land use, sustainable ag, grasslands restoration	Lisa	Schulte Moore	Iowa State University
Agricultural and natural resource economics; economic valuation of natural resource and recreation	Sabina	Shaikh	Cardno/JFNew, Chicago, IL
Upper Mississippi River & Great Lakes Region Joint Venture	Greg	Soulliere	East Lansing, MI
Contaminants, amphibians	Don	Sparling	SIU Coop
Private lands	Kelly	Srigley Werner	FWS R3 Missouri Private Lands Office, Columbia, MO
Grassland birds, private lands	Nathan	Stricker	Olentangy Wildlife Research Station, Ohio DNR
Economist	Dave	Swensen	Iowa State University
Ecological processes	Rob	Swihart	Purdue University
Watershed BMP models	Mark	Tomer	USDA/ARS - National Laboratory for Agriculture and the Environment, Ames, IA
Economics	Sreedhar	Upendram	MO DNR, Jefferson City, MO
Watershed Management & Monitoring	Bruce	Vondracek	Dept Fisheries & Wildlife, University of Minnesota
NWQI State water quality - MO	Steven	Walker	DNR Soil & Water Conservation Program
Green Lands Blue Waters	Richard	Warner	Dept Agronomy and Plant Genetics, University of Minnesota
Pollinator Work Group - FWS Region 3	Wedge	Watkins	FWS R3 Big Muddy NFWR
Information on sustainable ag technology	Chad	Watts	Conservation Technology Information Center (CTIC)
Midwest Conservation Biomass Alliance	Carol	Williams	University of Wisconsin-Madison
NWQI State water quality - IL	Marcia	Willhite	Illinois Environmental Protection Agency
Gulf Hypoxia Task Force	Mike	Woodside	NAWQA, Nashville, TN
Midwest Conservation Biomass Alliance	Chris	Woodson	FWS R3 Missouri Private Lands Office, Columbia, MO
NRCS Farm Bill - MO	Katura	Wright	NRCS State Office - MO
Hydrology and water quality	Doug	Yeskis	USGS, Illinois Water Science Center
NRCS Farm Bill - IN	Shannon	Zezula	NRCS, Indianapolis, IN

Urban Watershed Management TAG

Expertise/Program	First	Last	Organization/Location
Urban TAG Coordinator	Kristin	Shaw	Indiana University
SDM Advisor			
Climate Advisor			
Landscape Conservation Specialist		TBD	Indiana University
ETPBR Steering Committee	Paul	Botts	Chicago Wilderness
ETPBR Steering Committee	Janette	Marsh	EPA
ETPBR Steering Committee	Mark	Reiter	Indiana DNR
ETPBR Steering Committee	Randy	See	USGS
ETPBR Steering Committee	Barb	Tormoehlen	US Forest Service
Economics of water resources	Jeff	Adkins	NOAA Coastal Services Center
The Conservation Fund	Will	Allen	Chapel Hill, NC
Trout Unlimited watersheds (Mad River)	Tom	Allen	Trout Unlimited
Stream monitoring, macroinvertebrate index	Jeromy	Applegate	FWS OH FO
Watershed planning, integrated modeling, optimization, WRESTORE	Meghna	Babbar-Sebens	School of Civil and Construction Engineering, Oregon State University, Corvallis, OR
Indianapolis - Green infrastructure plan	Heather	Bacher	Central Indiana Land Trust, Indianapolis, IN
Feral hog control	Steve	Backs	Indiana DNR
Green Infrastructure, conservation planning, prescribed fire (burn boss)	Steve	Barker	Cardno/JFNew, Walkerton, IN
Watershed groups - OH	Joe	Bonnell	OSU Extension Service, Ohio Watershed Network
Cincinnati, OH - parks	Tom	Borgman	Hamilton County Park District
Hydrology, geochemistry	Paul	Buszka	USGS IN Water Science Center
Habitat on corporate facilities	Shelley	Cabrera	Wildlife Habitat Council, Chicago
Aquatic Ecology/Modeling, Climate Change	Yong	Cao	IL Natural History Survey
Urban ecosystems	Tim	Carter	Center for Urban Ecology, Butler University, Indianapolis, IN
Large River food webs, floodplain-natural hydrograph influences on productivity, river restoration	Andy	Casper	Illinois River Biological Station, INHS, Havana, IL
Urban/rural interface floodplain watersheds of large rivers	Dan	Crigler	FWS R3 Missouri Private Lands Office, St. Charles, MO
Urban waters	Peggy	Donnelly	EPA Urban Waters Program
Watershed groups, SWCDs - OH	Laura	Fay	ODNR Div. of Soil and Water Conservation
Scenic Rivers - OH	Bob	Gable	ODNR Div. of Watercraft
City of Columbus, OH - Utilities	Elayna	Grody	City of Columbus, Department of

			Public Utilities
Urban ecosystems	Kelly	Harris	Center for Urban Ecology, Butler University, Indianapolis, IN
Urban forestry	Andrew	Hart	Keep Indianapolis Beautiful, Indianapolis, IN
Balanced Growth Program	Gail	Hesse	Ohio Lake Erie Commission, Sandusky, Ohio
Watershed partnerships - Dayton, OH	Sarah	Hippensteel	Miami Conservancy
Indianapolis - Upper White River Watershed Association (UWRA)	Jill	Hoffmann	Indianapolis, IN
Regional sustainability	Abbe	Hohmann	Urban Land Institute - Indiana District Council
Water quality	Bob	Hughes	US EPA, Oregon
River restoration ecology	Bob	Kirschner	Chicago Botanic Garden
Dayton, OH - parks	Mary	Klunk	Five Rivers Metroparks
Endangered Species / Ecological Services	Mary	Knapp	Ohio FWS ES Field Office, Columbus, OH
Recreation, health, tourism	Ivan	Levin	Outdoor Nation, Radford University, Fairfax, VA
Stream restoration, OH	Dan	Mecklenburg	Ohio DNR
Human Dimensions	Craig	Miller	IL Natural History Survey
City of Columbus, OH - Parks	Tina	Mohn	City of Columbus Recreation and Parks Department
Watershed groups, SWCDs - OH	Greg	Nageotte	ODNR Div. of Soil and Water Conservation
Stream restoration, OH	John	Navarro	Ohio DNR
Human Dimensions in Ag & Urban Ecosystems	Kristen	Nelson	Dept Forest Resources, Dept Fisheries & Wildlife, University of Minnesota
Dayton, OH - parks	Dave	Nolin	Five Rivers Metroparks
Urban policy	Jamie	Palmer	IUPUI-SPEA
Research Ecologist (river focus)	Barry	Poulton	Columbia Environmental Research Center
Sustainable communities	Kara	Salazar	Purdue University
Freshwater conservation	Anthony	Sasson	The Nature Conservancy, Ohio
Wildlife Biologist, Federal Projects	Megan	Seymour	FWS R3 Columbus, OH ES Field Office, Columbus, OH
Stormwater, flood control, green infrastructure	Kevin	Shafer	City of Milwaukee, WI
Stream restoration, OH	Ethan	Simmons	Ohio DNR
Wildlife Friendly Certification Programs	Barbara	Simpson	Indiana Wildlife Federation
Rivers, Trails, Great Rivers Confluence	Randy	Thoreson	National Park Service, St Paul, MN
Watershed Management & Monitoring	Bruce	Vondracek	Dept Fisheries & Wildlife, University of Minnesota

City of Columbus, OH - parks	John	Watts	Franklin Co/Columbus OH Metro Parks, Battelle Darby Creek Metropark
Mississippi River Cities & Towns Initiative	Colin	Wellenkamp	Northeast-Midwest Institute
Stream and wetland setback initiative - NE Ohio	Christina	Znidarsic	Chagrin River Watershed, OH

Human Dimensions Network

Expertise/Program	First	Last	Organization
HD TAG Coordinator	Craig	Miller	Illinois Natural History Survey
			AFS Socioeconomics Section (identify members in NCD)
			TWS Human Dimensions Working Group (identify members in the Midwest)
			MAFWA Private Lands Committee and others (HD expertise)
Climate Community-based risk & vulnerability assessments	Tashy	Allen	The Baldwin Group, NOAA Coastal Services Center, Charleston, SC
Social networks	Ryan	Atwell	St. Olaf College
Satershed planning, integrated modeling, optimization, WRESTORE	Meghna	Babbar-Sebens	School of Civil and Construction Engineering, Oregon State University, Rm 211, Owen Hall, Corvallis, OR 97331
Sustainable agriculture	Tamara	Benjamin	Purdue University
Farm Bill	Todd	Bogenschutz	Iowa DNR
Private landowner outreach	George	Boody	The Land Stewardship Project
	Lama	BouFajreldin	Illinois Natural History Survey
	Shorna	Broussard Allred	Cornell University, Human Dimensions Research Unit
	Jeremy	Bruskotter	Ohio State University, Associate Professor
Tribal interests	Chris	Caldwell	College of Menominee Nation, Sustainable Development Institute
Climate GIS and social media for communities	Lori	Cary-Kothera	NOAA Coastal Services Center
Climate Resilience planning, geospatial decision-making	Nancy	Cofer-Shabica	NOAA Coastal Services Center
	Megan	Cross	University of Minnesota

	Dean	Current	University of Minnesota, Center for Integrated Natural Resource and Agricultural Management, Dept of Forest Resources
	Bethany	Cutts	University of Illinois at Urbana-Champaign
	Mae	Davenport	University of Minnesota
	Dan	Decker	Cornell University, Human Dimensions Research Unit
Online landowner tools	Amos	Eno	Private Landowners Network, Resources First Foundation
	Laura	Fay	Ohio DNR Div. of Soil and Water Conservation
	David	Fulton	USGS Coop, University of Minnesota
Economic drivers	William (Billy)	Gascoigne	USGS
	Larry	Gigliotti	SD State, Co-op with USGS
Statistician, Upper Misssissippi River LTM	Brian	Gray	USGS UMESC
	David	Hanselmann	Ohio State University, Environmental Professionals Network
Information Transfer	David	Hanselmann	Ohio State University, Environmental Professionals Network
Agricultural economics, Farm Bill	Skip	Hyberg	USDA Farm Service Agency
Climate Change Outreach Team	Jill	Jentes Banicki	Ohio Sea Grant, Ohio State University
Private landowner outreach	Jerry	Kaiser	Plant Materials Specialist, Elsberry Plant Materials Center
Economic drivers	Lynne	Koontz	USGS
	Kristin	Kordecki	Gulf Coast Prairie LCC
Biological Resource Management	Kirsten	Leong	National Park Service
	Susan	McIntyre	INHS
	Craig	Miller	INHS
Agricultural and urban	Kristen	Nelson	University of Minnesota, Dept Forest Resources, Dept Fisheries & Wildlife
	Mike	Olson	PPP LCC
SDM, Spatial modeling, grassland birds	Max	Post Van der Burg	USGS Northern Prairie Wildlife Research Center
	Linda	Prokopy	Purdue University, Department of Forestry & Natural Resources

	Andy	Raedeke	Missouri Dept of Conservation
HD of Wildlife Management	Shawn	Riley	Michigan State University
	Kara	Salazar	Purdue University - sustainable communities extension
	Natalie	Sexton	NWR System, Human Dimensions Branch, Chief
Agricultural and natural resource economics; economic valuation of natural resource and recreation	Sabina	Shaikh	Cardno/JFNew
Economics	Dave	Swensen	Iowa State University
	Tara	Teal	Colorado State University, Associate Professor
Climate Statistician (wildlife focus)	Wayne	Thogmartin	UMESC
	John	Tirpak	Gulf Coastal Plains & Ozarks LCC
SDM, Structured Decision Making	Drew	Tyre	University of Nebraska-Lincoln
Economics	Sreedhar	Upendram	MO DNR
	Sarah	Vacek	Morris WMD
Spatial decision support systems	Jack	Waide	Deputy Center Director/Wildlife Ecology Branch Chief
Education & outreach	Ginny	Wallace	Missouri Dept of Natural Resources
	Chad	Watts	Conservation Technology Information Center (CTIC)
	Gwen	White	ETPBR LCC
Tribal interests	Kyle	Whyte	Michigan State University
	Robin	Wilson	Ohio State University, Associate Professor
Market Research	Dan	Witter	DJ Case & Associates

Other Expertise Needed by TAGs

Expertise/Program	First	Last	Organization/Location
Community-based risk & vulnerability assessments	Tashy	Allen	The Baldwin Group, NOAA Coastal Services Center, Charleston, SC
GIS and social media for communities	Lori	Cary-Kothera	NOAA Coastal Services Center
Resilience planning, geospatial decision-making	Nancy	Cofer-Shabica	NOAA Coastal Services Center
Agricultural Climate Science - Northern Plains	Justin	Derner	Cheyenne, WY - Regional Hubs for

			Risk Adaptation and Mitigation to Climate Change
American Association of State Climatologists	Stuart	Foster	Kentucky Climate Center, Western Kentucky University
Midwest Regional Climate Center	Beth	Hall	Midwest Regional Climate Center, IL State Water Survey, NOAA
Agricultural Climate Science - Lower Midwest	Jerry	Hatfield	Ames, IA - USDA Regional Hubs for Risk Adaptation and Mitigation to Climate Change, National Laboratory for Agriculture and the Environment
Climate Change Outreach Team	Jill	Jentes Banicki	Ohio Sea Grant, Ohio State University
NOAA Central Region Climate Services	Doug	Kluck	NOAA Central Region Climate Services, Kansas City, MO
Ecological drought	Abigail	Lynch	USGS National Climate Change and Wildlife Science Center
DOI Northeast Climate Science Center	Mary	Ratnaswamy	University of Massachusetts, Amherst, MA
Iowa State Wildlife Action Plan Manager	Katy	Reeder	IA DNR, Des Moines, IA
DOI Northeast Climate Science Center	Michelle	Staudinger	University of Massachusetts, Amherst, MA
Agricultural Climate Science - Upper Midwest	Chris	Swanston	Houghton, MI - USDA Regional SubHub for Risk Adaptation and Mitigation to Climate Change
Statistician, Upper Mississippi River LTM	Brian	Gray	USGS UMESC
Structured Decision Making	Drew	Tyre	University of Nebraska-Lincoln
Structured Decision Making	Kirk	Stodola	IL Natural History Survey
Spatial modeling, grassland birds	Max	Post Van der Burg	USGS Northern Prairie Wildlife Research Center
Environmental Professionals Network	David	Hanselmann	Ohio State University
Habitat and Population Evaluation Team (HAPET)	Ryan	Drum	US FWS Region 3, Bloomington, MN
Habitat and Population Evaluation Team (HAPET)	Mike	Estey	US FWS Region 6, Hartford, KS

Literature Cited

Bunn, SE and AH, Arthington. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. Environmental Management 30: 492–507.

Burkhalter, J. C. 2013. The potential of restored grasslands for conservating wildlife and fuel production. Ecological Restoration 3192):124-126.

Changnon, S.A., K.E. Kunkel, and K. Andsager. 2001. Causes for record high flood losses in the central United States. J. Appl. Meteorol. Climatol. 45:1141-1155.

City of Cedar Rapids. Cited 2012. Climate Trends. [Available online at http://www.cedarrapids.org/city-news/flood-recovery-progress/floodrecoveryplans/pages/default.aspx.]

Faber, S., S. Rundquist, and T. Male. 2012. Plowed under: How crop subsidies contribute to massive habitat losses. Environmental Working Group Report.

Hyde, D., and S. Campbell, 2012. Agricultural practices that conserve grassland birds. Publication No. E3190. Michigan State University Extension.

Jones, N. E. 2013. The dual nature of hydropeaking rivers: is ecopeaking possible? River Research and Applications 1535-1467.

Kania, J. and M. Kramer. 2011. Collective Impact. Stanford Social Innovation Review. Winter 2011, 36-41.

Kotter, J.P. Accelerate! How the most innovative companies capitalize on today's rapid-fire strategic challenges—and still make their numbers. Harvard Business Review Reprint R1211B, November 2012.

Kunkel, K.E., K. Adsager, and D.R. Easterling. 1999. Long-Term Trends in Extreme Precipitation Events over the Conterminous United States and Canada, Journal of Climate 12: 2515-2527.

Kunkel, K.E., L.E. Stevens, S.E. Stevens, L. Sun, E. Janssen, D. Wuebbles, S.D. Hilberg, M.S. Timlin, L. Stoecker, N.E. Westcott, and J.G. Dobson. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. Part 3. Climate of the Midwest U.S. NOAA Technical Report NESDIS 142-3.

La Sorte, F. A. and F. R. Thompson. 2007. Poleward shifts in winter ranges of North American birds. Ecology 88:1803-1812.

Meehan, T.D., A.H. Hurlbert and C. Gratton. 2010. Bird communities in future bioenergy landscapes of the Upper Midwest. Proceedings of the National Academy of Sciences 107:18533–18538.

National Research Council. 2011. Missouri River planning: Recognizing and incorporating sediment management: Washington, D.C., The National Academies Press, 164 p.

Robertson, D.M., G.E. Schwarz, D.A. Saad, R.B. Alexander. 2009. Incorporating Uncertainty Into the Ranking of SPARROW Model Nutrient Yields From Mississippi/Atchafalaya River Basin Watersheds. J. Am. Water Resour. Assoc. April 2009; 45(2):534-549.

Schmidt, J.C., and P.R.Wilcock. 2008. Metrics for assessing downstream effects of dams. Water Resources Research: 44. 19 pages.

Schottler, S.P., J. Ulrich, P. Belmont, R. Moore, J.W. Lauer, D.R. Engstrom and J.E. Almendinger. 2013. Twentieth century agricultural drainage creates more erosive rivers. Hydrological Processes. Wiley Online Library. DOI: 10.1002/hyp.9738.

Tesoriero, A. J., J. H. Duff, D. A. Saad, N. E. Spahr, and D. M. Wolock. 2013. Vulnerability of Streams to Legacy Nitrate Sources. Environmental Science & Technology 47(8):3623–3629.

Smith, D.D. 1990. Tallgrass prairie settlement; prelude to demise of the tallgrass ecosystem. Pp. 195-199 in D.D. Smith and C.A. Jacobs, eds., Proceedings of the Twelfth Northern Illinois Prairie Workshop. University of Northern Iowa, Cedar Rapids.

Sugg, Z. 2007. Assessing U.S. Farm Drainage: Can GIS Lead to Better Estimates of Subsurface Drainage Extent? World Resources Institute, Washington, DC.

Wright, C.K., and M.C. Wimberly. 2013. Recent land use change in the Western Corn Belt threatens grasslands and wetlands. PNAS Early Edition (online).