PLJV SAT RESEARCH PRIORITIES
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INTRODUCTION

"Results from research programs contribute to the biological foundation for bird conservation activities, and are necessary to accomplish defensible biological planning. For example, research results are used to determine factors limiting populations of declining birds, to develop management actions to reverse those factors, and to develop habitat conservation objectives. Research in the PLJV region has been supported and conducted by many agencies, organizations, and universities, several of which are PLJV partners. However, research has not always been coordinated among agencies or directed toward the highest priorities of the PLJV. Funding has limited the number and scope of projects."

The paragraph above is from the PLJV Master Plan. The Master Plan further states that In order to be sure that PLJV science and biological planning objectives are being met; a priority research list should be created. In 2009, the PLJV Science Advisory Team (SAT) met and reviewed the first PLJV Science Priority list that was first created in 200X. After reviewing the list the SAT determined that many of the research priorities had been addressed or were no longer a priority to the PLJV. The SAT then began the process of creating a new science priorities list. This document is the result of that process.

The PLJV has a number of broad-scale, broad-effect processes at work in the region. A number of interesting science questions can be addressed with regards to these processes but not all questions that can be asked will directly inform PLJV biological planning. To better formulate and understand the questions that directly relate to PLJV biological planning a conceptual model diagram was created to guide research question development (Figure 1). The result of following the conceptual diagram will be a priority research question that addresses key assumptions in the PLJV biological planning process.

One key aspect of PLJV biological planning is the increasing importance placed on planning at the landscape scale. Therefore, the theme of landscape scale research questions and planning runs throughout the sections in the document. In addition, an emphasis on climate change research is becoming increasingly important to PLJV partners and many of the funding agencies that provide money for research. Thus, while climate change warrants its own section, the questions and results of the research should be interpreted within a climate change context.

The following is a description of research priorities for the PLJV. Each environmental or social challenge is described separately regarding how each concern is related to PLJV planning.

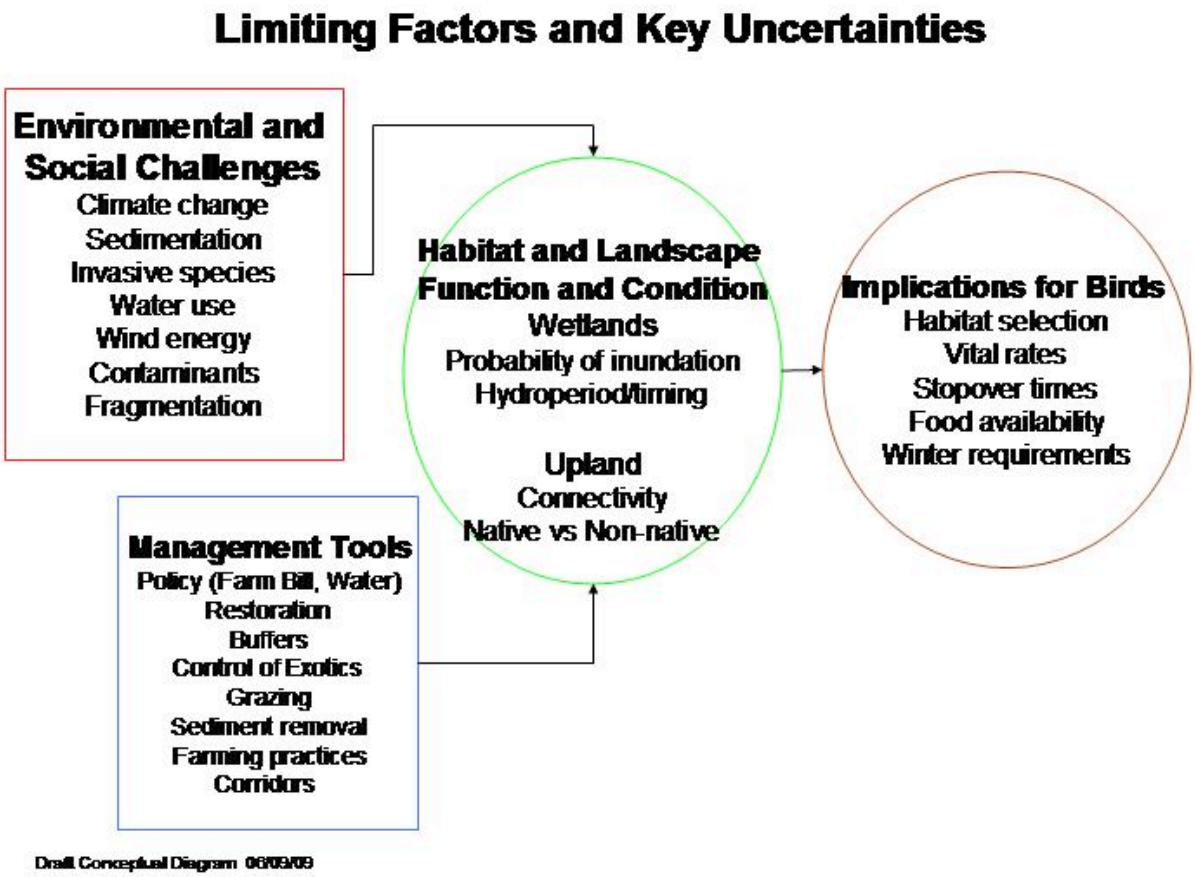

Figure 1: Conceptual model diagram used to develop PLJV science priorities. The diagram is meant to be followed left to right. Such that each environmental or social concern is stepped down to address impacts of birds and/or their habitats.

SEDIMENTATION

Sedimentation of playas is a major conservation concern in the PLJV. Playas provide important wetland habitat with high nutritional resources that many wetland bird species use during the winter and migration.

- How does sedimentation affect playa function, with special emphasis on hydroperiod and plant community composition? Does the removal of sediment from a playa restore these functions?
- How will future climate change scenarios impact sedimentation rates?
- What is the impact of increased sedimentation on the production and availability of nutritional resources for birds – both seed- and insect-eating birds?
- How do buffers affect sedimentation rates and hydroperiods of playas?
- Are there methods that will improve buffer function (e.g. allow water to flow and inundate playas and still catch sediment)?
- Are there methods other than traditional buffers immediately surrounding a playa that can be used to reduce sediment inputs? An example would be to identify where in the watershed of a playa that sediment is most likely coming from and then giving priority to treating the sediment source area (e.g., planting it to grass, implementing conservation tillage, etc.). This may allow the playa to be protected from sediment and allow water to reach the playa.
- How do restored playas function in relation to intact playas? Are there restoration techniques that cause restored playas to function more like intact playas?

CLIMATE CHANGE

Climate change models predict that temperatures will increase by approximately 0.6 °C (1°F) per decade during the 21st century and precipitation patterns across the region will change in intensity and timing by the end of the century (Karl et al. 2009). Furthermore, the effects of climate change may not be consistent across the PLJV region. We recognize that climate change is an on-going process and not a punctuated one (i.e., we won't wake up one day "post-climate change"). Therefore climate change is affecting the PLJV region now. However, for the purpose of this document, the topic 'climate change' and the research questions herein are meant to refer to future conditions (i.e., predicted conditions in ~ 50 yrs)[1]. Predictive modeling will allow the PLJV to implement proactive conservation practices to better adapt to the effects of climate change.

- What are the predicted effects of climate change on function, hydroperiod, and ecology of wetlands?
- How will climate change impact vegetation communities and their suitability as habitat for bird species in the season in which they are most abundant in the PLJV region? (For

[1] All PLJV science should be interpreted in the context of a changing climate. Even though the following topic areas do not necessarily expressly investigate climate change, all studies should provide context to a changing climate.

example, is wetland foraging habitat available during the fall (mid August – mid-December) and spring (early February – mid-May) when waterfowl are present and are there any affects of available wetland foraging habitat on waterfowl survival?) Are there management techniques that can be used to ameliorate these impacts?

- Will current management tools (e.g. planting and maintaining buffers and restoring wetlands) ameliorate the effects of climate change on habitat and species at the 1) local scale and 2) PLJV regional scale (e.g. perhaps through creating corridors through which species can migrate to new habitat)?
- What existing management tools can/need to be modified to moderate the impact of climate change?

ALTERNATIVE ENERGY DEVELOPMENT

Alternative energy development in the PLJV region is a concern because of the great energy potential in the form of wind, solar and biofuels production. All six of the PLJV states are in the top 12 for wind energy development (American Wind Energy Association 2009). Only Texas has >6% of its potential wind energy capacity installed, the remaining PLJV states have 2% or less of their potential capacity installed (American Wind Energy Association 2009). Wind energy development in the PLJV region is a cause for concern because of the potential for 1) direct mortality of birds through collisions and 2) loss of habitat due to avoidance of structures and fragmentation of the landscape.

Most of the PLJV region ranks high in solar energy resource potential. Currently (July 2009), the demand for wind energy development overshadows the solar energy industry. There is no doubt that solar will eventually become a priority for alternative energy development. Concerns about the impacts of solar energy developments on wildlife resources are along the same lines as those for wind energy. In addition, solar energy requires large amounts of water for operation, potentially adding additional water stress to a region already experiencing considerable water stress.

The 2007 Energy Independence and Security Act mandated the quadrupling of biofuel production between 2008 and 2022. The PLJV region, an important agricultural region in the U.S. today and in the future, will likely contribute large amounts of biomass for biofuel production. First generation biofuels will require large amounts of grain to meet biofuel needs. Second generation (cellulosic) biofuels may relieve some stress from grain production but may still impact the landscape.

- What are the direct (e.g., mortality) and indirect (e.g., habitat availability) impacts of wind farms on birds in the PLJV region? Species for which questions have been raised are: Burrowing Owl, raptors, Greater Prairie-Chicken, Lesser Prairie-Chicken, Long-Billed Curlew, Mountain Plover, Plains Sharp-Tailed Grouse, Prairie Falcon, Sandhill Cranes, and Whooping Cranes. This is only a partial list, created with current knowledge, therefore more species may be added.

- What are the cumulative impacts of alternative energy developments on the landscape? What spatial arrangement of facilities will reduce the overall fragmentation of the landscape?
- Alternative energy developments come with a host of infrastructure (e.g. roads, transmission lines), how do these infrastructure items contribute to landscape fragmentation? What are their effects on birds (e.g., habitat selection, nest success, etc.)?
- What are the potential habitat impacts from large-scale solar energy development?
- What are the economic/social factors that will influence the decision of producers to maintain or establish wildlife habitat (e.g. continue enrollment in CRP, enroll in various EQIP practices) given crop price increases due to high interest in biofuels?
- What are the impacts on the landscape of increased crop production to landbirds and wetland dependent birds?

WATER USE

Currently, the water is drawn from many parts of the Ogallala aquifer faster than it can be recharged through natural mechanisms. At its current rate of use, the aquifer in many places will be "dry" by the end of the century; its rate of drying dependent upon the region and level of water usage. Water is also withdrawn for agriculture and human use from streams and rivers in the region, and these withdrawls impact stream flow and riparian habitats. In addition, climate change predictions indicate that precipitation will decrease in the region, especially the southwest. The precipitation may come in fewer events, so even less water will be available throughout the season. The predicted increased temperatures will increase transpiration and evaporation reducing soil moisture and surface water availability. It is important to understand how the current and future changes in water use may impact habitat conservation in the PLJV region. Many of these questions will have a social science perspective.

- How do/will changes in water availability – either through less rainfall, fewer but more intense rainfall events, or decreased output from the aquifer – impact producer choices for farming techniques and enrollment in farm bill programs to protect wildlife habitat?
- What scientific data are needed to inform or support public policy to conserve industrial, residential and agricultural water use?
- Are there conservation tools currently available or that can be created to conserve water in a changing climate? Examples include but are not limited to: buffers around playas, dry land farming, cisterns or other water collection devices, grey water systems, more efficient irrigation techniques and possible changes in crop selection.
- What are the impacts of declining groundwater levels on stream flows and the riparian habitats that depend on these flows?

FRAGMENTATION

Fragmentation of vegetation communities has been implicated in the decline of many wildlife species, especially in grasslands. Prairie landscapes have been altered extensively for agricultural

production and are among the least protected ecosystems in the world. The prairies of the PLJV region are no exception. The ability of producers to extract water from the aquifer has allowed extensive fragmentation of the prairie for row-crop production. Concerns about fragmentation will continue to be a priority in this landscape due to increased pressures for alternative energy development (e.g. biofuels production, wind and solar). Federal farm bill programs, such as CRP, provide a tool for increasing the amount of prairie in the landscape. However, spatial modeling and landscape-scale studies will be required to understand the dynamics of fragmentation and to properly target areas for conservation.

- What are the area/spatial requirements of breeding and non-breeding resident grassland birds in relation to patch size/fragmentation and other grassland habitat characteristics in the PLJV. – Literature review.
- What characteristics of playas or playa complexes attract high densities of bird use? Do these characteristics vary seasonally?
- Are there thresholds of habitat availability below which bird population numbers begin to decline precipitously? Are there common life history characteristics among the bird species that show threshold effects at different amounts of habitat loss?

INVASIVE PLANT SPECIES

Invasive species can be native or exotic. Invasive plant species have been shown to alter ecosystem functions (e.g., alter nutrient regimes, alter hydrological cycles). In addition, these species may change the physical structure of the habitat rendering it unsuitable for the species that depend on that habitat.

- What impact do invasive species[2] (e.g. tamarisk, Russian olive, eastern red cedar) have on playas, other wetlands and riparian areas, including the probability of inundation, hydroperiod and evapotranspiration rates?
- What impact do invasive species have on the ability of wetlands to provide suitable breeding, wintering, or migrating habitat for birds? What do they replace and what depends on the displaced species?
- What impact do invasive species have on the ability of uplands to provide suitable breeding, wintering, or migrating habitat for birds?
- Are there specific mitigation practices (e.g. removal of eastern red cedar) that provide more benefits to bird conservation (measured in local population increases, higher vital rates) than others?
- What are the best management practices to control invasive species?

[2] In this context, we do not include exotic grasses used in CRP or other farm bill program plantings (e.g. old world bluestem). These species, while exotic and in many cases invasive, are included in questions relating to effectiveness of farm bill programs and by evaluating buffers.

CONTAMINANTS

In many areas of the PLJV region the dominant land use is cropland. The pesticides and fertilizers applied as part of the farming operations have the potential to impact wildlife and their habitats. In addition, an increasing number of producers are using Genetically Modified (GM) crop seeds. Some of the most popular types of GM crops are those that are resistant to herbicides (e.g. "round-up ready"). The use of these crop types is cause for concern for two reasons: 1) potential increased use of herbicides, or use of more potent herbicides, due to developed resistance in "weedy" plants and 2) potential for broad-scale application of the herbicide over sensitive areas in crop fields (e.g. playas) both of which may reduce food availability by killing desirable food producing annual plants (e.g., smartweed and barnyard grass) and contaminate wetlands. Other localized sources of contaminants are the presence of confined animal feeding operations (CAFOs) in the landscape. These operations produce enormous quantities of manure that is rich in N and P and can potentially contaminate wetlands, including playas, and groundwater. Because playas are the primary recharge point to the Ogallala aquifer, which provides drinking and irrigation water to millions of people in the Great Plains, contamination of wetlands is of utmost concern. Finally, contamination of surface water in wetlands may impact availability of fresh water, vegetation, invertebrate production and presence/absence, which may ultimately impact water birds that rely on these wetland services.

- What is the impact of CAFOs on playas and upland habitat in the PLJV region?
- Is there an increase in pesticide residue in playas due to increased use of GM crop types?
- Are there impacts of pesticides and other contaminants (e.g. N or P) to birds nesting, migrating or wintering in the PLJV?
- Are there impacts of pesticides and other contaminants (e.g. N or P) to food that birds use (e.g., invertebrates, moist-soil seeds)?
- What effect do increased nutrient concentrations in the wetlands have on invasive species?

BASIC NATURAL HISTORY INFORMATION

Basic research is important to the PLJV because it contributes to our general knowledge of the birds and habitats in the region. However, research of this nature will directly lead to or provide information about habitat management in the PLJV. This information will allow us to refine the information used in models and management recommendations.

- Wintering and migrating habitats for many avian species are largely unknown. This is especially problematic for species of conservation concern, e.g. Lesser Prairie-Chicken, Long-Billed Curlew, and many shorebird species.
- Monitoring/density information should be collected that can be included in the HABS database to refine density estimates.
- What is the nutritional value of food types available in the croplands to waterfowl and upland birds (e.g., Lesser Prairie-Chicken, Ring-Necked Pheasant)? Do all croplands have the same

nutritional value (e.g. is there a spatial component to nutritional quality of croplands; Are croplands closer to wetlands more "valuable" than croplands farther away)?

- What is the impact of sustainable farming techniques (e.g., conservation tillage, low water use irrigation, dryland farming) on food availability to waterfowl and upland birds (e.g., Lesser Prairie-Chicken, Ring-Necked Pheasant)?
- What is the effect of different grazing intensities, duration, timing, or practices on food (e.g., seeds, invertebrates) availability in playas?
- What is the average and range of stopover duration of waterfowl, shorebirds and waterbirds migrating through the PLJV? Is residency period influenced by weather, food availability, or habitat quality?
- Are populations of priority bird species being limited by their tenure in the PLJV region?
- Develop models (based on current data) that describe probability of playas being wet in certain weather conditions during certain seasons. If current data are inadequate, then identify the data needed. Can playa hydrologic conditions be predicted from local precipitation data?
- How do soil types and underlying stratigraphy influence infiltration, duration of inundation, and aquifer recharge rates of playas?
- How is playa hydroperiod affected by surrounding land use (cropland vs. rangeland vs. CRP) and soil texture?

LITERATURE CITED

American Wind Energy Association. 2009. http://www.awea.org/projects/

American Wind Energy Association. 2009. Fact Sheet: Top 20 States with Wind Energy Resource Potential. http://www.awea.org/pubs/factsheets/Top_20_States.pdf.

Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). 2009. Global Climate Change Impacts in the United States. Cambridge University Press.

U.S. Solar Industry Year in Review 2008. http://www.seia.org/galleries/pdf/2008_Year_in_Review-small.pdf