

Pilot Title: Research & Development of a GIS-Based Wildlife Resource Management & Mitigation Decision Support System Tool

Project Objective:

The overall objective of this pilot study is to develop a standard protocol and methodology for creating, storing, maintaining and disseminating environmental and wildlife data for a collection of data providers while at the same time making available the most current and accurate spatial representations to a wide network of users in an efficient and timely manner. Two key products will be produced to meet this overarching goal: a centralized and highly controlled spatial database environment for housing these data and an Internet-based mapping application providing access to these data. While development of both tasks is technologically straight forward, the success of such an effort will be more dependent on the effectiveness of getting key stakeholder involvement and contribution throughout the process and then maintaining these collaborations long term to insure the maintenance and use of these data in responsible planning and development of not only energy-related projects, but any potential land use decision throughout Wyoming.

State Contacts:

- *Overall Pilot Project Contact* - Kirk Nordyke, GIS Coordinator, Wyoming Game & Fish Department
- *Inter-agency Coordination* - Mary Flanderka, Habitat Protection Coordinator, Office of the Director, Wyoming Game & Fish Department
- *Contractor/Technical Lead* - Jim Oakleaf, Technical Services Coordinator, Wyoming Geographic Information Science Center, University of Wyoming

Secondary State Partners:

Wyoming Game & Fish Department (WGFD) is actively seeking input and interest from the Wyoming Department of Transportation (DOT), Wyoming Office of State Land and Investments (OSLI), Wyoming Department of Environmental Quality (DEQ), Wyoming Natural Diversity Database (WYNDD), Bureau of Land Management (BLM), US Forest Service – Medicine Bow National Forest (MBNF), Natural Resources Conservation Service (NRCS), and US Fish & Wildlife Service (USFWS). A final list of key partners will be made pending mutual evaluation of agency goals and philosophies with respect to sharing geospatial data cross-agency, cross-state, and with the public.

Project Description:

This project will employ a distributed spatial database model to maintain, manage, create and use key wildlife and resource data across Wyoming for decisions related to energy and other long term development activities. This spatial database will contain and provide access to all currently available and future developed Wyoming Tier 1 and Tier 2 data as identified by the WGWC's DSS guidance document. Protocols developed in the database will allow rapid development and maintenance of any ancillary data derived from these data. Database planning, population, maintenance and management will be performed directly by a Database Management Team comprised of key individuals assigned by partnering agencies (primary data providers) in Wyoming such as WGFD, WYNDD, USFWS, and BLM. All spatial data maintained by these groups will be replicated and stored within a centralized and secure spatial database hosted at Wyoming Geographic Information Science Center (WyGIS). Security, standards and generalization protocols will be developed within the database allowing cross agency and multi-state data sharing without jeopardizing the sensitivity of some of these datasets. Decision makers from other key partners such as NRCS, DOT, OSLI, and DEQ will have access to these data or generalized-

derivatives of them via a web-based decision support application. An Application Advisory Group made up of a variety of state, federal, non-profit and industry personnel (primary data users) will guide development of this application. The overall application design will be standard across agencies and will directly access the centralized and current resource database. By designing the application in a modular and an open-architectural method, future development could be accomplished to meet specific needs of any of these groups. In addition, WyGISC will provide the ability for any of these cooperating agencies or identified surrounding state agencies to link directly into the web mapping services, facilitating the development of their own internal decision support system. The overall direction and priorities of this effort will be managed by an Oversight Committee made up of key individuals invested in the success of this endeavor.

Energy Nexus: Wyoming provides a substantial role in meeting the demands of US energy consumption. According to the US Energy Information Administration, Wyoming is the largest coal producing state in the nation, one of the top natural gas-producing states in the nation, has over a dozen of the nation's largest oil and gas producing fields and is rapidly becoming one of the leading states in wind energy. Due mainly to being the least populated state, most of these resources are transported by truck, rail, transmission line and pipeline for distribution and use outside of Wyoming. A small percentage of these resources are currently used within Wyoming to produce electricity, with the State contributing only 1.4% to the total net US electricity consumption. While this percentage is currently low, Wyoming is second only to Arizona in the Rocky Mountain Region for total electricity generation with over four million megawatt-hours produced¹. This number will certainly increase with the eight currently proposed high-voltage transmission lines being studied to originate in Wyoming². The increase in energy transport capacity is occurring in response to development of more electricity-producing facilities in Wyoming, focusing on low or non-carbon producing technologies, such as clean coal and natural gas-fired power plants, and wind farms.

Regardless of the resource developed or type of energy produced, continued growth in the demand for energy will fuel further development and more efficient use and transportation of Wyoming's energy resources. This energy development will increase the amount of land disturbed leading to potential natural resource and wildlife conflicts. In order for companies to plan and mitigate potential conflicts it is necessary for them to have access to the most current and up-to-date information. Since many of these projects have very large footprints across Wyoming, the most advantageous and efficient method of portraying these data are through spatial representation, thus giving companies the ability to overlay development scenarios with environmental and wildlife concerns. Currently many companies are using geospatial technologies such as Geographic Information Systems (GIS), Remote Sensing (RS) and Global Positioning Systems (GPS) to facilitate responsible and environmentally-friendly development. One current limitation in Wyoming to using these technologies is the efficient access to the most current and accurate spatial data representing the State's environmental and wildlife concerns. The development of Wyoming's DSS will eliminate the need for developers and consultants to contact several different agencies and individuals for data and instead provide an efficient one-stop location for their data requests while at the same time giving them the reassurance that their analysis and planning efforts are using Wyoming's definitive data source. This in-turn will allow wildlife concerns and issues to be addressed in the planning process prior to potential conflicts arising from energy development.

¹ Energy Information Administration, State Energy Data System, http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=WY

² Wyoming Infrastructure Authority, <http://wyia.org/>

Additionally, by having access to an online mapping application depicting many of these spatial data, energy developers will have the ability to incorporate wildlife and environmental concerns directly in the conceptual and pre-planning stage of a proposal leading to even fewer issues through planned avoidance of crucial areas.

DSS Advancement: This effort, while Wyoming centric, will also benefit the DSS efforts ongoing at the WGA and the spatial scope for which this group is initiating discussions on Western US policies and decisions. Initially, just providing a standard and centralized repository of all available Tier 1 and 2 spatial data will insure decision makers are using the most up-to-date and accurate resource information concerning any development at both the local level and larger statewide level. Standards and protocols will be developed by the Database Management Team not only insuring both state and federal agency needs here in Wyoming are being met but also through the WGFD that the needs of surrounding states are addressed. This will assist in WGA's goal of providing a seamless wildlife/resource database and mapping protocol across the Western states.

The initial database development will rely on a broad network of identified partners who are creating, maintaining and updating any of the Tier 1 or 2 spatial data and/or any supplemental data critical to the referencing and use of these data. Partners already identified for the Database Management Team include personnel from the WGFD, WYNDD, Wyoming BLM, Wyoming USFWS and WyGIS. Additional groups representing industry and/or non-profits who are identified as producing important data will also be included and asked to participate in contributing to the development and maintenance of this database.

Security will be a key component for facilitating use and participation in the creation and maintenance of this centralized database. Maintaining the security needs of all contributors to the database, while also allowing necessary flow of spatial information to a much larger audience, will be a prerequisite. This will require the development of an approval mechanism for the release of data and/or procedures established to release generalized spatial data to the public to allow use of data without exact locations for sensitive data. It will be the mandate of the Database Management Team to create these protocols and/or standards.

In the development of an online mapping application, Wyoming will work with other WGA DSS efforts to ensure compatibility issues are met with other states. Additionally, due to this application disseminating spatial data to a wide audience of data users, a larger Application Advisory Group will help guide the development of this application. A modular and scalable solution is planned to help facilitate the customization of this application for a diverse user base. The overall goal of this application is to provide the most current and accurate environmental and wildlife spatial data for project planning and decision making.

Federal Agency Coordination: Efforts in Wyoming have already included several federal agencies in the discussion of developing a DSS. Prior to WGA identifying the need of individual state DSSs, Wyoming had initiated discussions among Wyoming USFWS, BLM and NRCS representatives focused on creating something similar to this idea. These agencies have verbally committed to some level of involvement with this effort either directly in data stewardship within the DSS or via participation in the Application Advisory Group and/or Database Management Team. Others such as the US Forest Service, the Bureau of Reclamation, Federal Highway Administration, and the Federal Energy Regulation Commission will be invited to the table to participate in the Database Management Team and/or the Application Advisory Group. Although this funding cannot provide the dollars necessary to meet the needs of every group, it

will allow the initial application to address their top priorities and reporting requirements, while also being scalable enough for agencies needing more to build upon the existing infrastructure.

Stakeholder Involvement: There are two distinct groups of stakeholders involved in this effort: data providers and data users. Both groups must be fully represented in order for this effort to be successful and sustainable for future development. Direct stakeholder involvement of data providers will occur through formal data sharing agreements, resource commitments, or direct financial support from DOE funds for participation of key groups such as WYNDD and WyGIS, and/or requesting participation in the Database Management Team. The data user involvement will come either from participation in the Application Advisory Group or through comments and suggestions solicited during training and outreach activities. Finally, it will be necessary to have an Oversight Committee, comprised of a select few state and federal representatives and also including a representative from both the industry and environmental sectors.

Connectivity: One category of spatial data contained in the database will be current information regarding wildlife migration routes and crucial habitat locations. Part of the maintenance aspect of the database will require adding new and improved spatial data as it becomes available. The goal of the Database Management Team will be to not only maintain Wyoming datasets but also examine crosswalk issues concerning matching these datasets with surrounding states' data. The team will accomplish this through participating fully in regional discussions and meetings regarding this issue, following standards and protocols developed by the WGA in producing spatial data consistent with regional approaches, and by maintaining data at both a regional and landscape scale. Providing a multi-scale database will allow data users access to datasets they may be familiar with from other states while at the same time providing the ability to use more refined and accurate data, which may be developed for part or all of Wyoming. Critical to this will be the documentation and education in regards to the appropriate use of data and applications developed in this effort.

With regards to the connectivity effort established by NatureServe, it is anticipated that WGFD and the Wyoming pilot would mainly participate peripherally by keeping informed about the effort and using any established protocols and/or data analysis techniques created by this effort to help develop similar products. Because this pilot addresses multiple species and includes SWAP data, such as SGCN Priority Areas (Tier 1 data), NatureServe may see a greater role for Wyoming to participate in their efforts. If in the future this is the case, then it will be necessary to look at the financial requirements needed to participate and try to locate the funding to support such an effort here in Wyoming. However, due to our currently limited participation it seems premature to approximate the amount required to accomplish this. Through the WGFD, Wyoming will work directly with NatureServe to assist them in meeting any data needs they may have here in the State.

Climate Change: Although this project is not directly applicable to studying the impacts of climate change on wildlife corridors and crucial habitat, long-term maintenance and archiving of the database will allow changes in these data to be monitored and compared for change detection analysis.

Deliverables and estimated completion time:

1. An initial DSS work plan - month six, or by WGA deadline if earlier
2. A centralized, web-accessible, secure, fully-documented and maintainable spatial database
 - Beta product: month six
 - Final product: month twelve
 - Maintenance and enhancements: continuous throughout project

3. An Internet mapping application supported by accessible web-based and open mapping services
 - Beta product: month twelve
 - Final product: month eighteen
4. Training tutorial and help documents for use and contribution to maintenance of database – month twelve
5. Online help documentation for web application – month nineteen
6. Final pilot assessment – project end date
7. Updated DSS work/maintenance plan – project end date

Outcomes:

1. An overall project Oversight Committee is established
2. A Database Management Team (data providers) is created, with work commitments defined and being performed
3. A fully operational and accessible centralized database is developed, containing the most current and accurate Tier 1 and Tier 2 spatial data with full metadata
4. Protocols and models are identified and documented in relation to the creation of crucial habitat and data modification methods for regional and multi-state use
5. An Application Advisory Group (data users) is formed
6. Full deployment of the Internet-based mapping application is made, providing access to the wildlife database
7. Creation of a series of mapping services following regional standards determined by WGA, Wyoming and surrounding states is developed, allowing for interoperability among other states' DSSs.
8. Development of an Internet mapping module meeting the needs of a partner is accomplished, by which to test and demonstrate the expansion ability of this system

Constraints:

- An important concern focuses on the limitations of technology and the impacts of those limitations, particularly on the speed at which the web application runs (draw times, etc.)

Assumptions:

- Full participation and prioritization is given by identified agencies on the Database Management Team, with knowledgeable individuals in regards to spatial data development and maintenance
- The Oversight Committee defines priorities and guides resource allocation
- WyGIS and WGFD provide co-leadership roles in both database and application development

Contracting:

- Wyoming Geographic Information Science Center, University of Wyoming

Reporting:

- Reports will be submitted directly to WGA by WyGIS, with a copy to WGFD, as frequently as required to comply with DOE's ARRA requirements
- Year one report will be provided to Oversight Committee and WGA
- End of project report will be provided to Oversight Committee and WGA

Budget: See attached Microsoft Excel file named Wy_Pilot_Budget.pdf