Development of an Inland Sensitivity Atlas for the Missouri River Corridor in Aid of Environmental Planning: Final Report

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Missouri Resource Assessment Partnership (MoRAP) – EPA Region 7

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Introduction

The Missouri River corridor is of special concern to environmental planners because it harbors significant environmental resources such as wetlands, endangered species (e.g. pallid sturgeon, least tern), and adjacent loess hills natural communities. The corridor also serves as a transportation route, both on the river itself and along major highways near the river, and supports large cities such as St. Louis, Kansas City, and Omaha. Fertile croplands usually occupy the floodplain from bluff to bluff. Planners need to have an accurate inventory of the significant natural resources of the corridor as well as the environmental hazards so that risks can be avoided or recognized and mitigated. This should facilitate both development and conservation. Groups such as the Steering Committee of the Missouri Resource Assessment Partnership (MoRAP), which is made up of government agencies and non-government organizations, have recognized these needs. The goals of this project are to (1) identify significant/sensitive natural resources within the Missouri River Corridor, (2) identify selected environmental hazards within the corridor, and (3) compile and present data on significant resources and hazards to develop an elegant, turnkey sensitivity atlas in both hard copy and electronic formats for use by planners at many spatial resolutions. ARC/INFO is used to organize geographic data using a relational and topological model. This facilitates efficient handling of the two generic classes of spatial data: locational data describing the location and topology of point, line, and area features; and attribute data describing the characteristics of these features.

Data Acquisition and Pre-processing

Data layers needed to complete a useful and up-to-date sensitivity atlas for the Missouri River are collected from various state and federal agencies and assembled from the archives at MoRAP. It is critical to have a reliable base map. In this case 1:24,000 United States Geological Survey Digital Raster Graphics are used as a background and for spatial reference. A listing of sensitive species, or Heritage data, is provided by the Missouri Department of Conservation. Point source pollution data layers aid planners. EPA region 7 provided MoRAP with oil storage tank and pipeline locations.

Data are processed before being compiled to create digital and hard copy maps. It is first necessary to assure that all data is in the same projection, in this case Albers Equal Area, North American Datum 83. A data structure is created for easy, common sense access to files on a shared server within the MoRAP network. Shapefiles and coverages are then clipped to the boundaries of the St. Louis and Fulton 1:24,000 DRGs. In the case of the National Hydrography Dataset points, lines, and polygons, it is necessary to first merge data for all catalog units together before clipping to the quadrangle boundaries.

Data is now ready to be assembled in a digital format for ArcReader, and the next step is to cull through attribute files. It is important to determine what attributes can be eliminated and what should be added to present the user with the most relevant and valuable information. An effort is made to keep attributes consistent with the Mississippi River Atlas data, however with the ArcReader format and a variety of new data, differences should be expected. Next, data files are compared between St. Louis and Fulton to ensure consistency between quads.

Map Creation

Using the 1:24,000 DRGs as base maps, shapefiles are brought into ArcReader. Icons and symbolization are selected for each file to represent data in an aesthetically pleasing, and useable format. Creating tiles at 1:24,000 clarifies areas of dense data points. Each of these tiles is included in the hard copy of this atlas and can be viewed in the ArcReader projects by turning on the 1:24,000 tile layer and selecting by map name (see section X for more information on installing and using ArcReader).

Data Limitations

The information represented here was created at different scales of accuracy that can be reviewed in metadata files for each layer. The information here is subject to change, and should not be used in lieu of contacting offices involved for specifics about an area of interest. It is our intention that this atlas will facilitate communication between agencies and will be used as a guideline for planning and first responders in the case of a significant event.

Data Layers

Mapped data layers include the following.

a. Managed Lands

i. Designated Natural Areas (Polygon) – Natural resource areas of particular significance have been classed together as designated natural areas. These areas are not necessarily owned or directly managed by public agencies, but have received a special designation status from public resource agencies and multi-organization commissions. The status of Designated Natural Area may carry with it a high level of legal protection and can include anything from good trout fishing areas to caves and glades to habitat restoration projects. This coverage was created by the Missouri Department of Conservation.

ii. Managed Lands (Polygon) – This data layer includes all public and some private lands, represented as polygons, within the Missouri River basin. Landowners include the Department of Natural Resources (DNR), the Missouri Department of Conservation (MDC), the National Park Service (NPS), Private

land, The Nature Conservancy (TNC), the United States Forest Service (USFS), and the United States Fish and Wildlife Service (USFWS).

b. Natural Resource Data

i. High Resolution 1:24,000 National Hydrography Dataset (NHD) points (Point) – this point file is pulled from the high resolution National Hydrography Dataset for the state of Missouri. Point locations represent gauging stations, sinks, rises, springs, seeps, and wells. These points do not appear on paper copies of the sensitivity atlas as many points are repetitive of the public water source wells and industrial water intakes.

ii. High Resolution 1:24,000 National Hydrography Dataset (NHD) streams (Line)– a line file that represents type of stream (artificial path, stream/river, connector, or canal/ditch). Large rivers are named on hard copy tiles, and by using the "identify" button on stream reaches in the digital ArcReader projects name, level, and reach code can also be displayed.

iii. High Resolution 1:24,000 National Hydrography Dataset (NHD) waterbodies (Polygon) – this is a polygon file delineating the extent and location of lakes, ponds, reservoirs, swamps, marshes, and large streams and rivers. In some cases names of waterbodies are available, and this file is also based on the 1:24,000 USGS DRGs.

iv. Opportunity Areas (Polygon)– Conservation opportunity areas (OAs) are defined as natural and semi-natural land cover patches that are more than 75 m away from any road, and away from patch edges (more than 75 m into the interior of a land cover patch). OAs are modeled by creating distance grids using the National Land Cover Database and the Census Bureau's Tiger roads files. OAs are grouped into three classifications, forest, grassland, and mosaic or interspersed. The darker the shade of green in the digital copies of maps represent a higher ranking based on importance which is determined by landform and size.

v. Sensitive Species (Point)– The Missouri Natural Heritage point shapefile contains information about known locations of species of conservation concern (present and historic) and high-quality natural communities. Certain exotic species, MDC-owned caves, and delisted species are also included. New records and corrections/updates of existing records are entered into the Heritage database daily and subsequently added to this ArcView shapefile quarterly. This data set should not be regarded as definitive as to the presence or absence of species of conservation concern or high-quality natural communities. For this shapefile historic and low ranked (G5) records are removed. Locations are "fuzzed", due to the sensitivity of the data, using a hexagon. Points representing sensitive species sites are located somewhere within the polygon, and the icon has been placed at the center of each hexagon.

c. Toxic Storage Data

i. Pipelines (Line) - The U.S. Department of Transportation (U.S. DOT), Research and Special Projects Administration (RSPA), Office of Pipeline Safety (OPS) is working with other federal and state agencies and the pipeline industry to create a National Pipeline Mapping System (NPMS). The NPMS is a full-featured geographic information system (GIS) containing the location and selected attributes of the major natural gas transmission lines and hazardous liquid trunklines, and liquefied natural gas (LNG) facilities operating in United States and other offshore entities. Source data is contributed voluntarily by pipeline operators to either a state repository or the National Repository. This metadata is for the entire national dataset. Additional metadata for individual pipeline systems are also available. These data sets are for the purpose of tracking all natural gas transmission pipelines, hazardous liquid trunklines, and LNG facilities in the United States. The data will be used to support the assessment risk associated with the Nation's liquid and gas pipeline infrastructure.

ii. Storage Facilities - Facility Response Plan Facilities (FRPs) (Point). According to the Clean Water Act (CWA), as amended by the Oil Pollution Act (OPA), certain facilities that store and use oil are required to prepare and submit plans to respond to a worst case discharge of oil and to a substantial threat of such a discharge. EPA has established regulations that define who must prepare and submit an FRP and what must be included in the plan. An FRP is a plan for responding, to the maximum extent practicable, to a worse case discharge, and to a substantial threat of such a discharge, of oil. The Plan also includes responding to small and medium discharges as appropriate. According to OPA, an owner or operator of a "substantial harm" facility must develop and implement an FRP. A "substantial harm" facility is a facility that, because of its location, could reasonably be expected to cause substantial harm to the environment by discharging oil into or on navigable waters or adjoining shorelines.

d. Other Resource Data

i. Levees (areas behind levees) (Polygon) – This data layer provides information about levees along the upper Mississippi and Missouri river basins. Polygons represent lands directly behind levees, and therefore at potential risk during periods of flooding. On January 10, 1994, the Scientific Assessment and Strategy Team (SAST) joined in the effort to provide scientific advice and assistance to officials responsible for making decisions with respect to the flood recovery in the Upper Mississippi River Basin. The SAST designed the LEVEE layer as a means to locate and access information about levee status using a Geographic Information System (GIS).

ii. Public Water Source Wells (Point) – This point file contains the locations of water withdrawal from ground water sources and was originally developed for use

in the Vulnerability Assessment of Missouri Public Drinking Water to Chemical Contamination project (funded by the Missouri Department of Natural Resources (MDNR)). The layer is also used by MDNR - Public Drinking Water Program (PDWP) for general program needs. The project is designed to determine which, if any, public water supplies are threatened by any chemicals being tested under the Safe Drinking Water Act.

iii. National Register of Historic Places Data (Point - Polygon) - Established under the National Historic Preservation Act of 1966, the National Register has identified and documented, in partnership with state, federal, and tribal preservation programs more than 76,000 districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. Over 1.2 million contributing resources are included in the boundaries of National Register listings. Recognizing a vast and diverse array of historic properties throughout the United States and its territories, the National Register has been a catalyst for preserving communities, maintaining cultural traditions, recognizing community history, and revitalizing cities across the United States. The Register includes landmarks of American achievement as well as properties that reflect the everyday lives of ordinary people in communities across the nation. Areas with high concentrations of historic sites are represented by a polygon with a corresponding table that lists all sites in that polygon.

iv. Boat Access (Point) – Sites with boat ramps may be useful for providing access to the water during a spill response. This file provides name, managing agency, and county within which each access is located.

v. Dams (non-navigational) (Point) – Dams may be used for a variety of purposes, including public water supply, power generation, flood control, and irrigation. Responders should be aware of dam locations because oil recovery becomes more difficult after passage over a dam spillway, even with dams that are smaller and not used as navigational structures.

vi. Industrial Water Intakes (Point) – The industrial water intakes coverage was created using the Public water supply point file and pinpoints intakes used for industrial purposes only. Attributes include the name of the intake, owner, township and range, latitude and longitude of the intake, contact phone, river from which intakes draw, and river mile at which intakes are located.

Quality Assurance

Quality assurance standards provide a guide throughout the process of data collection, compilation, and atlas production. The following ten standards are among the most crucial in shaping the overall product quality, and are followed and completed in the creation of this Atlas.

1) All relevant data themes present in a mapping area are documented (when available) and mapped.

2) Positional accuracy of mapped data are assessed via metadata provided and via on screen displays of mapped data.

3) Feature attributes for each data theme are verified for accurate content, consistency in data entry, and completeness and are presented within the standard project data structures.

4) Feature locations have been mapped accurately to the extent possible.

5) GIS data is clean, i.e., polygons are closed, arcs "snapped" in linear features, polygon overlaps corrected, etc.

6) Spelling and grammar has been checked.

7) Metadata is provided for all data (as available) included in a specific mapping area project, and meet FGDC guidelines.

8) Cartographic standards, including groupings of natural heritage data, will be consistently and correctly applied.

9) Paper atlas products are prepared to include the required elements, and checked against project standards for format consistency.

10) Digital products on CD include all required elements.