

**Construction of a Geographic Information System
for Wildlife Refuge Planning:
Mingo National Wildlife Refuge¹**

by

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Background

The National Wildlife Refuge System Improvement Act of 1997³ requires the U.S. Fish and Wildlife Service (USFWS) to develop Comprehensive Conservation Plans (CCP) for the management of lands under its jurisdiction. Section 7 of the Committee Report from the Act⁴ describes five areas that must be addressed in each national wildlife refuge CCP:

- The purposes of the refuge
- The fish, wildlife and plant populations, their habitats, and the archaeological and cultural values found on the refuge
- Significant problems that may adversely affect wildlife populations and habitats and ways to correct or mitigate those problems
- Areas suitable for administrative sites or visitor facilities
- Opportunities for fish- and wildlife-dependent recreation

Implementing the 1997 legislation has, in turn, highlighted the need for more complete, geo-referenced digital data coverage for each of the USFWS National Wildlife Refuges. Region 3 of the USFWS, which comprises an eight-state area (Figure 1) and includes approximately fifty refuges, is working cooperatively with the University of Minnesota to acquire and create geographic information system (GIS) data for each of its refuges. The resulting data sets are invaluable for the analysis and visualization of refuge resources and alternative management scenarios.



Figure 1. Region 3 of the USFWS administers 46 refuges and 11 Wetland Management Districts over an eight-state area.

³ <http://refuges.fws.gov/policymakers/mandates/HR1420/index.html>

⁴ <http://refuges.fws.gov/policymakers/mandates/HR1420/Part4.html>

Standard Procedures

Since 1997, the University of Minnesota Department of Forest Resources has worked cooperatively with the USFWS to compile geo-referenced data for each national wildlife refuge in USFWS Region 3. A standardized list of data sets has been developed at three different spatial extents: regional, watershed, and refuge-specific (Appendix A). Not all data sets described on the list are collected for each refuge, as actual refuge needs and data availability vary among refuges.

The regional extent typically covers multiple counties and includes general, small-scale data layers. Regional data layers such as vegetation, lakes, rivers and highways are collected at a scale that place the refuge in human and ecological contexts. Watershed level data typically encompasses the major watershed in which the refuge lies, as well as any major watersheds that impact the refuge and includes more detailed data layers such as streams, wetlands, and roads. Watershed level data is appropriate for map production, spatial reference, and analysis. Finally, refuge-specific layers such as management plans, wildlife habitat, and real property inventory are collected only within the refuge boundaries. The refuge-specific data layers acquired differ between individual refuges depending on availability and the specific needs of the refuge in question (Figure 2).

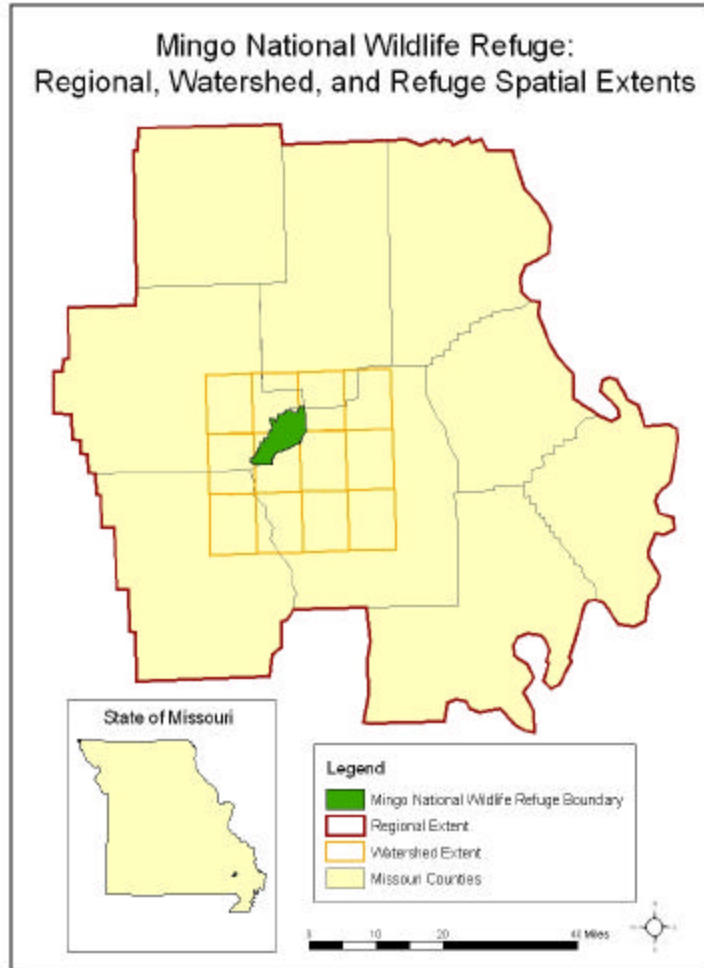


Figure 2. The Regional, Watershed, and Refuge Spatial Extents for Mingo NWR.

Student research assistants collect spatial data from various local, state, and federal agencies, from academic, professional, and government Internet sites, and from some private companies. In some instances, students and/or refuge staff have gathered data using a global positioning system. When possible, data have been collected at no cost; other data have been purchased by the USFWS. Students process the data using GIS and imaging software programs including ESRI's Arc/Info, ArcView, and ArcGIS, and ERDAS Imagine; the work is accomplished on both Windows and Unix workstations.

In addition to the spatial data layers, students also create metadata text files, which describe each data set, its sources, and processing procedures. Metadata files are created using simple text editors or specialized metadata tools like ESRI's ArcCatalog. The final text files are checked for compliance with FGDC standards using the U.S. Geological Survey's MetaParser program⁵. Metadata are provided in both text and XML formats. Projection files (.prj), which detail the projection specifics of the data layer, are also created for each data set.

Final data and corresponding metadata are delivered to the USFWS on CD-ROM. A text file with brief descriptions of the various directories and files is included on each CD. (Sample text descriptions of Mingo National Wildlife Refuge data are provided in Appendix B.)

All of the GIS data layers and metadata files created for the USFWS Region 3 are intended to be operationally useful, and the refuge boundaries adhere to specifications of the U.S. Fish and Wildlife Service Lands Boundary Data Standard Operating Procedures (SOP Number 97-01). Data sets specific to each refuge require field verification by refuge staff familiar with the refuge lands. As noted in the corresponding metadata files, the intended application of the boundary data is to serve as a spatial reference for other data layers in GIS and mapping applications. The boundary data are not intended to be used as a land survey or representation of land for conveyance or tax purposes. The data do not comprise legal documents and are not intended to be used as such. It is the responsibility of the user to use the data appropriately and consistently, recognizing its limitations.

⁵ <http://geology.usgs.gov/tools/metadata/tools/doc/mp.html>

Mingo National Wildlife Refuge

Mingo National Wildlife Refuge⁶ (NWR) is located in southeast Missouri near the town of Puxico (Figure 3). The refuge lies in an area known as Mingo Swamp. This ecosystem was formed about 18,000 years ago when the Mississippi River shifted to the east, leaving a dense swamp to form in its abandoned channel. To the west of the refuge are the foothills of the Ozark uplift and to the east is a terrace called Crowley's Ridge. The State of Missouri Duck Creek Water Management Area (6,190-acres) joins the refuge on the north and east boundaries. The Mingo Job Corps Civilian Conservation Center is located on the southeast corner of the refuge.



Figure 3. The location of Mingo National Wildlife Refuge in Missouri.

⁶ <http://midwest.fws.gov/Mingo/>

In 1945, the USFWS purchased 21,676 acres of the Mingo Swamp and established the Mingo NWR. The refuge contains seven natural areas and 99 archaeological sites. Mingo is the only remaining large tract of bottomland forest (15,000 acres) of the original 2.5 million acres native to the boothill region of Missouri (Figure 4).



Figure 4: Bottomland hardwood forest in Missouri

The refuge provides critical wildlife habitat for the region. Mingo NWR contains a variety of habitats from lowland forests and swamps to upland fields, forests, and rock bluffs (Figure 5). Over 150,000 ducks and 75,000 geese, as well as other waterfowl, rely on this habitat for resting, nesting, and feeding throughout the year. Two hundred-sixty species of bird have been recorded on the refuge, with the most common bird species being green-backed heron, Canada goose, mallard, blue-winged teal, gadwall, American coot, morning dove, yellow-billed cuckoo, red-headed woodpecker, Northern flicker, tree swallow, blue-gray gnatcatcher, European starling, Northern cardinal, indigo bunting, white-throated sparrow, and red-winged blackbird.⁷

⁷ <http://midwest.fws.gov/Mingo/birds4.html>



Figure 5: Some of the habitat types at Mingo NWR

Due to the variety of habitats and the warm, moist climate, reptiles and amphibians are unusually abundant on the refuge. Mingo is especially attractive to salamanders, frogs and toads, turtles, and snakes. Several species of salamander such as marbled and red-backed salamander are found on the refuge. Plentiful habitat exists for both frogs and toads and species include bullfrogs, Northern Spring peepers, and Southern leopard frogs, as well as American toad, Fowler's toad, Eastern spadefoot toad, and Eastern narrow-mouthed toad. Turtles such as the common snapping turtle, three-toed box turtle, and Southern painted turtle can all be seen across the refuge. Both venomous and non-venomous snakes inhabit Mingo. The three venomous species are the Southern copperhead, Western cottonmouth, and timber rattlesnake (Figure 6); non-venomous snakes include the green water snake and Eastern garter snake.



Figure 6: Western cottonmouth snake at Mingo NWR

The Mingo refuge contains several lakes, ditches, and the Mingo River. These bodies of water provide habitat for fish species, such as bass, crappie, bluegill, and catfish. Mammals including squirrels, rabbits, raccoons, and deer take advantage of the diverse landscape and can be seen if you canoe or walk quietly through the refuge. One can find beavers in the waters, deer mice on the forest floors, Eastern gray squirrels in the trees, and woodchucks in the fields, just to name a few.

A wide variety of public use activities take place throughout the refuge. The recreational opportunities include hiking, hunting and fishing, environmental education, and wildlife observation. Mingo also has a visitor center and 25-mile auto tour route. Approximately 113,000 people visit the refuge annually. The management objectives for the refuge are to: 1) Provide breeding and migration habitat for migratory birds, 2) Provide habitat for resident wildlife, 3) Protect endangered and threatened species, 4) Provide for biodiversity, and 5) Provide public opportunities for outdoor recreation and environmental education.

GIS Data Development

The GIS data collected for Mingo NWR span three spatial extents: regional, watershed, and refuge-specific. The regional extent covers 9 counties (Bollinger, Butler, Cape Girardeau, Madison, Mississippi, New Madrid, Scott, Stoddard, and Wayne) and was chosen to show the regional ecological context of the refuge within an area dominated by oak, hickory, and pine forests.

The watershed extent was established by using the boundary of 12 contiguous 7.5-minute quadrangles covering the major watershed in which Mingo lies. Refuge-specific layers lie mainly within the ownership boundaries of the refuge. A list of the data layers that were collected for Mingo NWR can be found in Appendix C, with a brief description of each layer. The data file structure and file names, based on a naming standard developed for this project, are also listed there.

GIS Data Analysis

The data layers collected for Mingo can be combined and analyzed in different ways, which, in turn, greatly enhances the conservation planning process. Managers can use the data to visualize the spatial relationships between refuge resources and the potential effects of different management activities.

To illustrate the potential for using data layers, a few maps of the Mingo NWR data are included here as examples. Figure 7 shows the major hydrologic features of the watershed extent and the locations of the archeological sites within the refuge. Refuge managers can use this map to avoid any management or development practices that could disrupt these important historical sites. The hydrologic data in relation to the refuge boundary layer also provide a spatial perspective for the refuge staff to use to determine which watersheds flow into the refuge. This knowledge may help them better understand what factors may be affecting water levels and quality within the refuge.

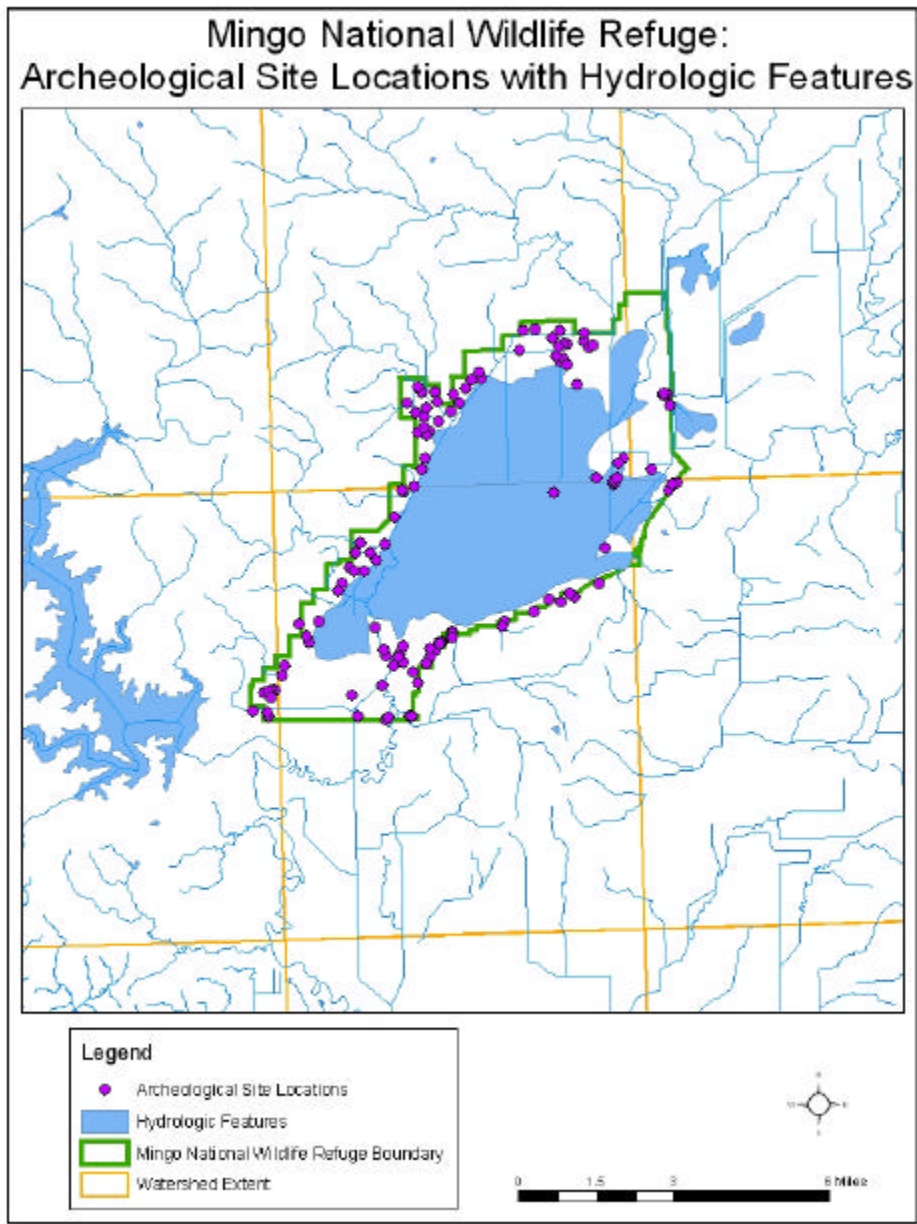


Figure 7: The hydrologic features and cultural sites within Mingo NWR

Photos can be very useful for characterizing the properties of a given area; Figure 8 shows the municipal area boundaries overlaying a digital orthophoto quadrangle mosaic. Analysis of such a map might include determining which municipalities the refuge may want to work with cooperatively on land use issues.

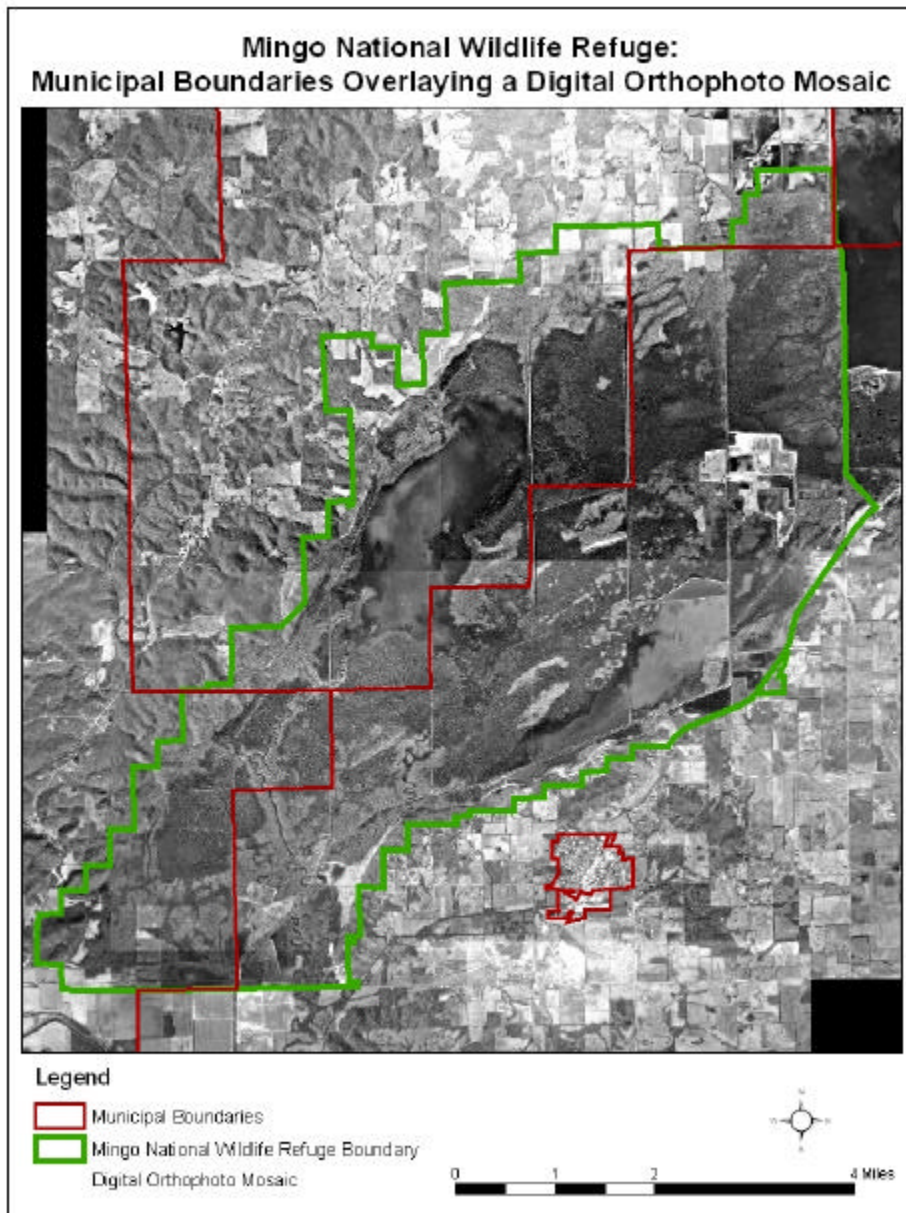


Figure 8: Municipal boundaries overlaying a digital orthophoto mosaic

Other GIS analyses could include studies of various wetland types, sizes, and shapes in and around the refuge, or examining soils and historical vegetation layers to determine appropriate vegetation restoration goals. The Mingo NWR staff can use the GIS data set developed in this project to produce and analyze a wide variety of maps to support their natural resource management goals.

Appendix A:
A National Wildlife Refuge GIS Data Inventory
(November 2003)

Data Set Name	Status / Notes	Source	Resolution	Extent	MetaData
<i>Regional Data</i>					
DRG's 1:250,000					
<i>Hydrography</i>					
Major Lakes					
Major Rivers					
<i>Land Ownership</i>					
Other Public Lands					
Land Use/Land Cover					
<i>Political Boundaries</i>					
Congressional Districts					
Counties					
State					
<i>Transportation</i>					
Roads - major					
<i>Vegetation</i>					
Historical					
Potential (Kuchler)					
<i>Watersheds</i>					
Watersheds - major					
<i>Watershed Data</i>					
Digital Elevation Models (DEMs)					
DRG's 1:24,000					
<i>Floodplains (FEMA)</i>					
100 year boundaries					
500 year boundaries					
<i>Hydrography</i>					
Lakes					
Rivers					
Streams					
Natural Heritage Data					
National Wetlands Inventory (NWI)					
<i>Political Boundaries</i>					

Data Set Name	Status / Notes	Source	Resolution	Extent	MetaData
Cities / Municipal Boundaries					
Civil Townships					
Zoning					
<i>Public Land Survey</i>					
Township/Range					
PLS Sections					
PLS 40's					
<i>Soils</i>					
STATSGO					
<i>Transportation</i>					
Airports					
Railroads					
Roads - minor					
<i>Watersheds</i>					
Watersheds - minor					
<i>Refuge Data</i>					
Digital Orthophoto Quadrangles					
<i>Boundaries</i>					
Easements					
Refuge Legislative Boundary					
Refuge Ownership Boundary					
Tracts (Internal tracts)					
WPAs					
<i>Cultural</i>					
Archeological Sites					
Land Cover					
<i>Management plans</i>					
Burn Units					
Cropland Management Plan					
Future Planning					
<i>Public Recreation</i>					
Boat Access					
Fishing Access					
Hiking Trails					
Parks					
Picnic Areas					
<i>Real Property Inventory</i>					
Dikes					
Ditches					

Data Set Name	Status / Notes	Source	Resolution	Extent	MetaData
Drainage Network					
Signs					
Storm water Sewers					
Structures					
Water Control Structures					
<i>Soils</i>					
SSURGO					
<i>Transportation</i>					
Refuge Roads					
Parking Areas					
<i>Wildlife Habitats</i>					
Critical Habitat					
Eagles, Herons, etc					
Fish Habitat					

Appendix B:

Text file description for Mingo National Wildlife Refuge GIS data

Documentation:

This CD contains GIS data for the Mingo National Wildlife Refuge in southeast Missouri.

Overall Description:

This CD contains basemap layers at regional and watershed extents, and refuge specific layers. The data exist either as ArcView shapefiles, or any of a variety of image files (TIFF, JPG, IMG, or other file types). All spatial data are geo-referenced to UTM Zone 15, using the North American Datum of 1983. There are also metadata .met, and .xml, files with a detailed description of each data layer. These metadata files are found in the same directory and with the same name as the spatial data files. Each data set also has an associated .prj file, which contains detailed projection information for the specific file.

Mingo National Wildlife Refuge Data

/mng/document/

This directory contains the summary document and the filenames document for Mingo National Wildlife Refuge.

/mng/graphics/

This directory contains the Adobe Illustrator files for the CD labels and case inserts for Mingo National Wildlife Refuge.

/mng/regional/drgs/

This directory contains the compressed TIFF file format file **drg250k**, a mosaic of the 1:250,000 scale USGS Digital Raster Graphics (DRG's) for the region surrounding Mingo National Wildlife Refuge.

/mng/regional/easement/

This directory contains the ArcView shapefile **easement**, representing the conservation easement point locations managed by the Mingo National Wildlife Refuge.

/mng/regional/eco_reg/

This directory contains the ArcView shapefile **eco_reg**, representing the Bailey's ecological units for the region surrounding Mingo National Wildlife Refuge.

/mng/regional/hydro/

This directory contains the ArcView shapefiles **lakes**, **streams**, and **wtrshed**. These shapefiles cover the major hydrographic features for the region surrounding Mingo National Wildlife Refuge.

/mng/regional/landown/

This directory contains the ArcView shapefiles **publand** and **dnrparks**, which shows the public lands, and the owners, for the region surrounding Mingo National Wildlife Refuge.

/mng/regional/lulc/

This directory contains a land use and land cover files for the region surrounding Mingo National Wildlife Refuge. The ArcView shapefile **potveg** shows Kuchler's map of

potential natural vegetation of the conterminous United States. This map represents natural vegetation that would occur today if urban, agricultural, and other human influences were removed. The data set **nlcd** is in a raster grid format (30 m resolution), and represents cells classified into one of twenty-one general land cover categories.

[/mng/regional/polbnds/](#)

This directory contains political boundary data. The state (ArcView shapefile **state**) and county (ArcView shapefile **county**) boundaries are given for the state of Missouri, while the congressional district boundaries (ArcView shapefile **congdist**) are given for the region surrounding Mingo National Wildlife Refuge. Also included is the ArcView shapefile **regbnd**, which represents the boundary of the regional area of interest.

[/mng/regional/trans/](#)

This directory contains the ArcView shapefile **hwys**, representing the major highways for the region surrounding Mingo National Wildlife Refuge.

[/mng/wtrshed/dems/](#)

This directory contains the GRID data set **dems**, representing a 30-meter Digital Elevation Model (DEM) for the watershed in which Mingo National Wildlife Refuge lies.

[/mng/wtrshed/drgs/](#)

This directory contains the compressed TIFF file format file **drg100k**, a mosaic of the 1:100,000 scale USGS Digital Raster Graphics (DRG's) for the region surrounding Mingo National Wildlife Refuge

[/mng/wtrshed/geology/](#)

This directory contains the ArcView shapefile **geology**, showing various geological units for the region surrounding Mingo National Wildlife Refuge.

[/mng/wtrshed/hydro/](#)

This directory contains the ArcView shapefiles **lakes**, **streams**, and **wtrshed**, representing 1:100,000 hydrographic data for the watershed in which Mingo National Wildlife Refuge lies.

[/mng/wtrshed/nwi/](#)

This directory contains the ArcView shapfile **nwi**, representing the National Wetland Inventory (NWI) polygon data for the watershed in which Mingo National Wildlife Refuge lies.

[/mng/wtrshed/pls/](#)

This directory contains the ArcView shapefile **pls**, showing Public Land Survey (PLS) township and range, and section boundaries for the watershed in which Mingo National Wildlife Refuge lies.

[/mng/wtrshed/polbnds/](#)

This directory contains political boundaries. The ArcView shapefiles **civtwp** and **munbnd** show civil townships and municipal boundaries for the watershed in which Mingo National Wildlife Refuge lies. Also included is the ArcView shapefile **wtrshed**, which represents the boundary of the watershed area of interest.

/mng/wtrshed/soils/

This directory contains the ArcView shapefile **statsgo**, representing the State Soil Geographic Database (STATSGO) data for the region surrounding Mingo National Wildlife Refuge.

/mng/wtrshed/trans/

This directory contains transportation information for the watershed in which Mingo National Wildlife Refuge lies. The ArcView shapefiles **roads**, **railroad**, and **airport** show roadways, railroad tracks, and airport locations.

/mng/refuge/bound/

This directory contains the ArcView shapefiles **mngbnd**, **mngleg**, **mngwild**, **zipco50m**, and **zipco60m**. **Mng_bnd** contains refuge land ownership status boundaries, **mng_leg** contains refuge legislative boundaries, and **mngwild** contains the wilderness boundaries for the refuge. In addition, **zipco50m**, and **zipco60m** contain the zip codes for the region surrounding Mingo National Wildlife Refuge.

/mng/refuge/cultural/

This directory contains the ArcView shapefile **arch**, representing historic archeological point features of archaeological probability, respectively, for Mingo National Wildlife Refuge.

/mng/refuge/dcreek/

This directory contains the ArcView shapefile, **dcreek**, representing the boundary data of State Duck Creek Water Management Area.

/mng/refuge/doqs/

This directory contains a compressed Digital Orthophoto Quarter Quadrangle (DOQ) mosaic for Mingo National Wildlife Refuge. The image file **doqs**, was compressed using LizardTech MrSID software at a 20:1 compression ratio.

/mng/regional/drgs/

This directory contains the compressed TIFF file format file **drg24k**, a mosaic of the 1:24,000 scale USGS Digital Raster Graphics (DRG's) for the region surrounding Mingo National Wildlife Refuge.

/mng/refuge/facility/

This directory contains the ArcView shapefiles **admnsite**, **bridges**, **carcount**, **fencprop**, **gates**, and **mngsite**, representing a variety of facilities and structures within the boundary of Mingo National Wildlife Refuge.

/mng/refuge/fire/

This directory contains the ArcView shapefile **burnunit**, showing the boundaries of fire management units for Mingo National Wildlife Refuge

/mng/refuge/fish/

This directory contains the ArcView shapefile **fishbnd**, showing the boundaries of fishing areas of Mingo National Wildlife Refuge.

/mng/refuge/hunt/

This directory contains the ArcView shapefiles **huntunit**, and **wtrfowl**, representing hunting areas within the boundary of Mingo National Wildlife Refuge.

/mng/refuge/hydro/

This directory contains the ArcView shapefiles **contrstr**, **hydro**, **hydropnt**, **hydrount** and **netjct** showing the hydrologic features and structures of Mingo National Wildlife Refuge.

/mng/refuge/landcov/

This directory contains the ArcView shapefiles **farmunit**, **natgrass**, and **timber** representing the landcover management units of Mingo National Wildlife Refuge.

/mng/refuge/photos/

This directory contains a readme.txt file that explains that the color infrared aerial photographs of the Mingo National Wildlife Refuge are on a separate CD Rom.

/mng/refuge/pubrec/

This directory contains the ArcView shapefiles **pubuse**, and **trails** showing public recreation opportunities in and around Mingo National Wildlife Refuge.

/mng/refuge/struct/

This directory contains the ArcView shapefile **refstruc**, showing point features of the locations of buildings and structures within the boundary of Mingo National Wildlife Refuge.

/mng/refuge/tables/

This directory contains the ArcView dbf tables **MNG_All**, **Sum_Output**, **Sum_Output_2**, **Sum_Output_3**, and **Water_Net_BUILDERR**, containing tabular information for Mingo National Wildlife Refuge.

/mng/refuge/trans/

This directory contains the ArcView shapefile **mngroads**, showing the roads network within the boundary of Mingo National Wildlife Refuge.

Appendix C:
**Summary list of data layers for Mingo National Wildlife Refuge, with data
file structure and names**

Dataset Name	Directory Name	Data File Name	Description
Regional Level			
	<i>/regional</i>		
Digital Raster Graphics	/drgs	drg250k	Image - mosaic of 1:250,000 scale USGS topographic maps
Conservation Easements	/easement	easement	Points - locations of conservation easements
Ecological Regions	/eco_reg	eco_reg	Polygons - ecological characterization boundaries
Hydrography	/hydro		
Lakes - major		lakes	Polygons - major lake boundaries
Streams - major		streams	Lines - major stream features
Watersheds - major		wtrshed	Polygons - major watershed boundaries
Land Ownership	/landown	publand	Polygons - land ownership info for other public lands
Land Use/Land Cover	/lulc		
National Land Cover Data		nlcd	
Potential Vegetation		potveg	Polygons - Kuchler's map of potential natural vegetation
Political Boundaries	/polbnds		
Congressional Districts		congdist	Polygons - congressional districts for the region
County		county	Polygons - county boundaries for the state of Missouri
Regional Extent		regbnd	Polygons - county boundaries for the regional extent
State		state	Polygons - Missouri state boundary
Transportation - major roads	/trans	hwys	Lines - major roads of the region
Watershed Level			
	<i>/wtrshed</i>		
Digital Elevation Models	/dems	dems	Raster - 30 meter DEM mosaic
Shaded Relief		relief	Image - relief map created from DEM data
Digital Raster Graphics	/drgs	drg100k	Image - mosaic of 1:100,000 scale USGS topographic maps
Geology	/geology	geology	Polygons - the geologic features within the watershed extent
Hydrography	/hydro		
Lakes		lakes	Polygons - 1:100,000 scale NHD lake boundaries

Dataset Name	Directory Name	Data File Name	Description
Streams		streams	Lines - 1:100,000 scale NHD stream data
Watersheds - minor		wtrshed	Polygons - minor watershed boundaries
National Wetlands Inventory	/nwi	nwi	Polygons - NWI data obtained from the GIS Data Depot
Political Boundaries	/polbnds		
Municipal Boundaries		munbnd	Polygons - municipal boundaries
Civil Townships		civtwp	Polygons - civil township boundaries
Watershed Extent		wtrbnd	Polygons - USGS 7.5 minute quadrangle boundaries for the watershed extent
Public Land Survey	/pls		
PLS Sections		pls	Polygons - public land survey section boundaries
Soils	/soils	statsgo	Polygons - boundaries of general soil associations
Transportation	/trans		
Airports		airport	Points - data from MSDIS of airport locations
Railroads		railroad	Lines - data from MSDIS of railroad lines
Roads - minor		roads	Lines - data from MSDIS of Missouri roads
<i>Refuge Specific</i>	<i>/refuge</i>		
Boundaries	/bound		
Refuge Boundary		mngleg	Polygons - legal boundary of refuge
Refuge Ownership		mngbnd	Polygons - boundary of USFWS ownership
Wilderness Areas		mngwild	Polygons - boundaries of wilderness areas
Zip codes		zipco50m	Polygons - zip codes within 50 m
		Zipco60m	Polygons - zip codes within 60 m
Cultural Resources	/cultural		
Archaeological Sites		arch	Points - locations of historic archaeological resources
Digital Orthophoto Quadrangles	/doqs	doqs	Image - mosaic of digital orthophoto quadrangles
Digital Raster Graphics	/drgs	drg24k	Image - mosaic of USGS 7.5 minute topographic maps
Duck Creek Boundary	/d_creek	dcreek	Polygons - boundary of the Duck Creek Water Management Area

Dataset Name	Directory Name	Data File Name	Description
Refuge Facilities	/facility		
		admnsite	Points - locations of administration buildings on the refuge
		bridges	Points - locations of bridges on the refuge
		carcount	Points - locations of car counting equipment on the refuge
		fencprop	Lines - location of fence property lines on the refuge
		gates	Points - locations of gate features on the refuge
		mngsite	Points - locations of structures and features on the refuge
Refuge Fire Management Units	/fire	burnunit	Polygons - burn unit boundaries on the refuge
Refuge Fishing Areas	/fish	fishbnd	Polygons - fishing area boundaries on the refuge
Refuge	/hunt		
		huntunit	Polygons - hunting unit boundaries on the refuge
		wtrfowl	Polygons - waterfowl hunting area boundaries on the refuge
Refuge Hydrology	/hydro		
		constrstr	Points - locations of hydrologic control structure on the refuge
		hydro	Lines - location of hydrology network on the refuge
		hydropnt	Points - locations of hydrologic points on the refuge
		hydrount	Polygons - hydrology boundaries on the refuge
		netjuct	Points - locations of hydrologic network junction points on the refuge
Refuge Landcover	/landcov		
		farmunit	Polygons - farm unit boundaries on the refuge
		natgrass	Polygons – natural prairie grass boundaries on the refuge
		timber	Polygons - timber unit boundaries on the refuge
Refuge Public Recreation	/pubrec		
		pubuse	Points - locations of public recreational features and structures on the refuge
		trails	Lines - location of trail network on the refuge

Dataset Name	Directory Name	Data File Name	Description
Structures	/struct	refstruc	Points - locations of structures and features on the refuge
Tables	/tables		Table - dbf tables for geodatabase
Transportation	/trans	mngroads	Lines - location of roads network on the refuge