

**Geo-Spatial Planning Data for
Wisconsin Waterfowl Production Areas**

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Tim Curtis, Thomas E. Burk, John H. Schomaker, Paul V. Bolstad

Staff Paper Series Number 161

Department of Forest Resources

September 2002

College of Natural Resources
and
Minnesota Agricultural Experiment Station
University of Minnesota
St. Paul, Minnesota

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Geo-Spatial Planning Data for Wisconsin Waterfowl Production Areas

Introduction

The United States Fish and Wildlife Service (FWS) received the responsibility of formulating specified management plans for lands under its administration according to the National Wildlife Refuge System Improvement Act of 1997. In response to this planning requirement, the Region 3 office of the FWS commenced the construction of geographical information systems (GIS) for the lands it manages. For the text of the act passed by 105th Congress and approved by the president on October 9, 1997, refer to "Public Law 105-57"

(<http://www.access.gpo.gov/nara/publaw/105publ.html>). Another page of this U.S. Government Printing Office website provides the language of this act as it is incorporated into 16 USC 668dd(d)(B). Refer to "Sec. 668dd"

(http://www.access.gpo.gov/uscode/title16/chapter5a_subchapteriii_.html). A University of New Mexico website summarizes the National Wildlife Refuge System Administration Act of 1966, and the accompanying modifications of the National Wildlife Refuge System Improvement Act of 1997 (<http://ipl.unm.edu/cwl/fedbook/nwrsact.html>).



Figure 1: Region 3 of the U.S. Fish and Wildlife Service

Background

The purpose of the Wisconsin Waterfowl Production Area (WPA) lands is to provide habitat for waterfowl and other wildlife. They comprise 202 parcels of land, varying from less than 1/8 acre up to 1102 acres in area. These parcels fall in 16 counties and two wetland management districts (WMD), the St. Croix WMD and the Leopold WMD. The St. Croix WMD lies in west central Wisconsin and includes 91 parcels in the counties of Dunn, Polk, and St. Croix. The Leopold WMD lies in southeast Wisconsin and includes 111 parcels in the counties of Adams, Columbia, Dane, Dodge, Fon du Lac, Jefferson, Manitowoc, Marquette, Ozaukee, Rock, Sheboygan, Waushara and Winnebago. Figures 3 and 4 illustrate data for an entire WMD and specific WPA parcels, respectively.



Figure 2: Concentrations of WPAs in Wisconsin

The geo-spatial datasets for the Wisconsin WPAs are a product of the collaborative relationship between the FWS Region 3 office and the Forest Resources Department of the College of Natural Resources, University of Minnesota (UM). The FWS contributes: databases; various maps; digital raster graphics (DRGs) in the 7.5 minute, 1:24,000 scale, series from the U.S. Geological Survey; Wisconsin Department of Transportation geo-spatial data sets including the public land survey system (PLSS); Arc meta-language programs (AMLs); and a staff member to manage communication and coordination between the UM and FWS staff in the field, WMD offices, Realty Division and GIS Services. The UM contributes faculty with expertise in GIS and natural resources; student workers; and a facility with computers, printers, plotters and software.

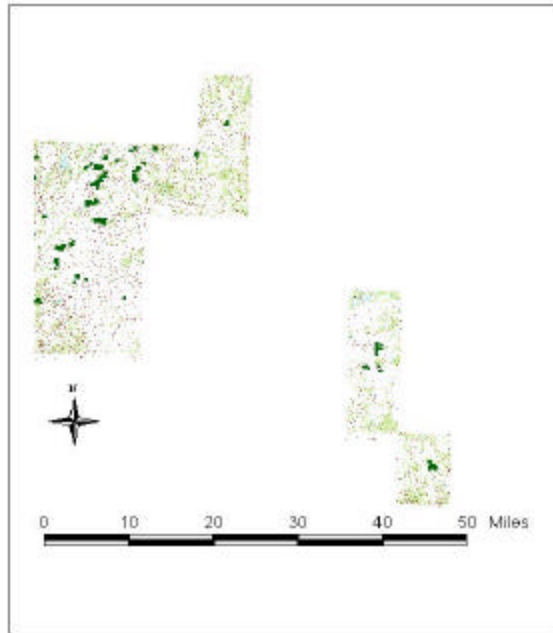


Figure 3: Concentration of WPAs (dark green) in the St. Croix WMD



Figure 4: Detailed view of WPA parcels

The Datasets

The Wisconsin WPA data are produced according to FWS Standard Operating Procedure 71 (See <http://www.fws.gov/data/gissop.html>). The datasets are intended to locate WPAs with reference to DRGs and the PLSS, present the approximate form of WPA tracts, and be used with other datasets in GIS and mapping applications. The finished datasets are not intended for use as a land survey, or representation of land for conveyance or tax purposes. The datasets are available from the FWS Region 3 office in Fort Snelling, MN.

The Wisconsin WPA data have a dual format. In completed form, the 202 parcels are found as a single shapefile, a version referred to as "Public." The notable feature of the Public version is that the WPA parcels appear to conform to the DRGs, rather than the PLSS. (See Appendix A for details on the Public CD). In contrast, the "FWS" version contains a dataset of the 202 parcels in a coverage format that was generated from the PLSS dataset. The FWS CD contains the final shapefile found in the Public CD, but also the intermediate coverages representing individual parcels used in the construction of the GIS. (See Appendix B for details on the FWS CD). The differences between the formats are illustrated in Figure 5.

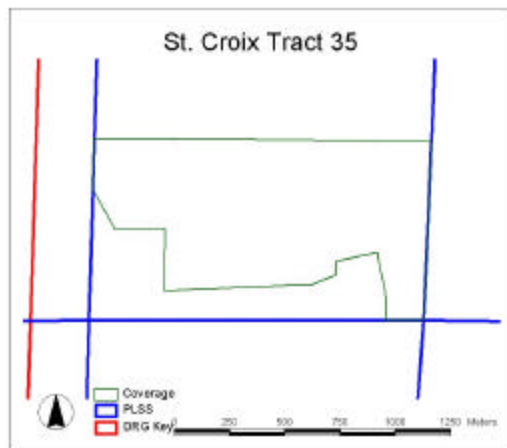
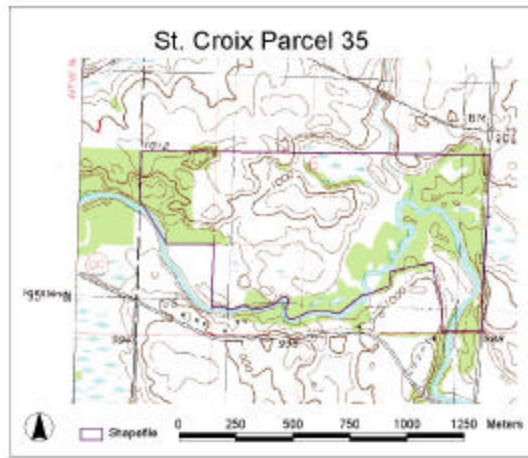
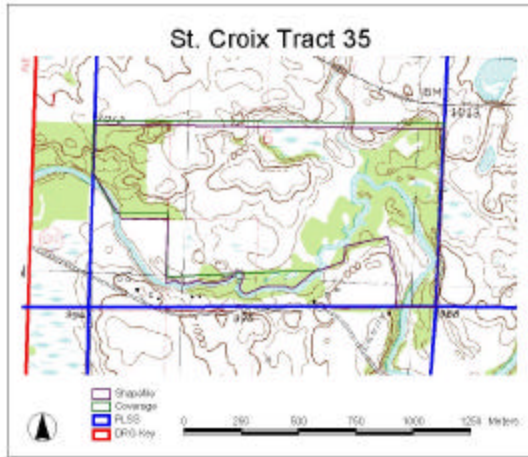


Figure 5: Overlays of shapefiles and coverages, illustrating differences in fit

Some of the individual tract coverages were generated by the ArcInfo 7.2.1 module COGO. COGO is especially suited for generating coverages from legal descriptions based on “point and call” information. For each coverage, COGO generates a .trv file (sometimes referred to as a “trav” file, derived from the traverse of a surveyor). The .trv file details the points and calls used to produce the parcel coverage and can be used to recreate or create an altered version of an existing coverage. FWS personnel can refer to those individual .trv files for later work on a given parcel.

The PLSS shapefile is clipped to the DRGs. This reduces the size of the dataset and limits the PLSS shapefile’s extent to relevant areas and records. The PLSS provides a reference for the framework used to create parcel files.

A DRG key was created to identify DRGs. This is a shapefile digitized to conform to the outline of the DRGs, with one polygon feature delineating each DRG. The resulting grid can be queried with the information tool in ArcView 3.2 to identify the specific DRG in a view. The record has a field that corresponds with the name of the DRG.

Process

1. Overview

The Wisconsin WPA geo-spatial datasets derived from three basic sources: i) coverages created in ArcInfo 7.2.1, ii) shapefiles on-screen digitized in ArcView 3.2, and iii) coverages supplied by FWS Region 3 field staff. In some instances, a mix of these sources were used to create a given parcel in the dataset. Digitizing in either ArcView 3.2 or ArcInfo 7.2.1 required plats and legal descriptions furnished by the FWS Region 3 Realty Division. The characteristics of the tracts, plats and legal descriptions determined whether a tract was digitized in ArcView 3.2 or ArcInfo 7.2.1. A tract or plat with a metes and bounds description, or a legal description based on the PLSS, was done with ArcInfo and its modules, ArcEdit or COGO. A tract with an irregular boundary was completed in ArcView 3.2. If the tract was to be incorporated into the Public CD shapefile, it was fitted to a DRG at a scale of 1:5,000 or less. In contrast, the tract coverages presented on the FWS CD seldom required fitting to a DRG as they were fit to the PLSS. The exceptions were features noted in a legal description found only on a DRG, for example, a boundary defined by a curving stream.

2. Coverages Created in ArcInfo 7.2.1

A coverage of the PLSS section grid for the state of Wisconsin in a Wisconsin Transmercator (WTM) projection was used to generate two copies of the PLSS coverage, one projected into UTM zone 15 and one into zone 16. These coverages were used to generate PLSS section coverages that served as bases for further alterations according to the tracts' boundaries. Tracts based on a legal description referring to the PLSS were developed in the ArcInfo module ArcEdit. The tracts with a metes and bounds description were developed in the COGO module of ArcEdit.

The location of the tract was determined from the township, range and section information in its plat or legal description. Depending on the UTM zone in which the tract fell, its corresponding PLSS coverage was opened in ArcView 3.2. The PLSS coverage's table was queried using the township, range and section information of the tract. When the appropriate section was located, the cursor was placed in the approximate center of the section and its "X" and "Y" coordinates noted. ArcView 3.2 was used to locate coordinates.

In ArcEdit, the appropriate PLSS coverage was opened and the section located using the X and Y coordinates. Using the AML file "MK_SECT", a coverage representing the section was generated.

ArcEdit was used to display the resulting section coverage along with the PLSS as a background. The arcs comprising the section coverage were snapped to the PLSS coverage and vertices added as necessary to insure congruency. If further subdivision of the section was required to render an accurate tract or provide a point of beginning, the AML file "QRT" was used. This AML quartered an area based on four points indicated onscreen by the operator. In this manner a section could be continually quartered into a system of arcs.

If a tract was described using PLSS, an outline of the tract could be selected from this system of arcs. Once the tract's requisite arcs were in place the extraneous arcs were deleted and the "clean" process applied to the coverage.

If the tract was defined by metes and bounds the COGO module of ArcEdit was utilized. A point of beginning was established on the section coverage and the points and calls entered to

generate the tract coverage. Extraneous arcs were deleted and the coverage cleaned. At this point the majority of the 202 total parcels were represented by individual coverages.

3. Shapefiles

The individual coverages were opened in ArcView 3.2 and converted into shapefiles. They were fit to DRGs at a scale of no greater than 1:5,000. The few coverages that required slight changes to conform to an irregular boundary visible on the background DRGs were modified.

4. Existing Coverages

Using ArcInfo 7.2.1 the existing coverages of tracts previously created by USFWS Region 3 field staff were projected into UTM zone 15 or 16 with a spheroid of GRS 1980, a datum as NAD 83 and meters as the unit of distance. Additionally, a shapefile was generated for fitting to the DRG.

5. Attributing

The FWS Region 3 Realty Division database was modified to include a field entitled "Parcel_id". For each Wisconsin WPA, a unique number was entered. This number was generated by using the township, range, section and FWS tract label. For example, Adams County Tract number 10 located in the 4th principal meridian, township 16 north, range 7 east, section 23 would receive the unique number 416072310. The database was copied into the INFO format used by ArcInfo 7.2.1.

Coverages were attributed using ArcInfo 7.2.1's ArcEdit and Tables modules. A "Parcel_id" field was created and joined to its matching record in the INFO database.

Shapefiles were given the attribute "Parcel_id" in ArcView 3.2. The Parcel_id field was populated with its unique number corresponding to its FWS record. The shapefiles were then joined to their respective FWS Region 3 Realty Division database records in ArcView 3.2 to create an attributed version of the shapefiles.

6. Merging and Projecting

The parcel coverages were converted into shapefiles. The converted shapefiles within UTM zone 15 were combined in ArcView 3.2 to create a single shapefile. The process was repeated for

shapefiles in UTM zone 16 to create a single shapefile. For the final projection process the two shapefiles were converted back into two coverages using ArcInfo 7.2.1. ArcInfo 7.2.1 was used to project the two coverages into a common projection, WTM. Once all individual tract coverages were in WTM they were opened in ArcView 3.2. The individual coverages were merged into one shapefile. Fields no longer of interest were deleted from the database. Each of the individual tract polygons within the composite shapefile was checked for location, form and correct attribution, and corrections made as necessary. It was then converted back into a single coverage composed of all 202 Wisconsin WPA parcels.

The parcel shapefiles within UTM zone 15 were combined in ArcView 3.2 to create a single shapefile. The process was repeated for all shapefiles in UTM zone 16. The two shapefiles were converted into two coverages using ArcInfo 7.2.1. ArcInfo 7.2.1 was used to project the two coverages into a common projection the WTM projection. The two coverages were opened in ArcView 3.2 and combined into one shapefile. Unnecessary fields were deleted from the database. Each of the individual tract polygons within the composite shapefile was checked for location, form and correct attribution, and corrections made as necessary.

Metadata

The program Corpsmet95 was used to create metadata files for the shapefiles, coverages, and DRGs. Corpsmet95 is a program developed by the U.S. Army Corps of Engineers (UCOE) and is available through UCOE's website (<http://corpsgeo1.usace.army.mil/>). ArcView 3.2a's metadata extension was used to gather information on the extent of the datasets; these data were then entered into Corpsmet95. Sources for metadata included maps, FWS and UM personnel, and project notes.

The resulting metadata files were checked by use of a U.S. Geological Survey (USGS) program, Metaparser. This program is available through the USGS homepage (<http://www.usgs.gov/>) or more directly from <http://geology.usgs.gov/tools/metadata/>. Metaparser indicated errors that were then corrected.

Quality Assurance/Quality Control

Throughout the Wisconsin WPA project regular meetings between the FWS and UM served in part as a quality control measure. Progress was monitored and work guided as needed. The FWS staff acted as a liaison to obtain field checks of the geo-spatial data by WMD personnel in the field. The resulting products--the Public CD and the FWS CD--were quality checked by student workers at the University of Minnesota. Any errors noted were corrected and the product resubmitted until it was approved. Upon approval, the product was submitted to GIS Services personnel at the FWS for examination. Noted errors were corrected by the UM and the product resubmitted until final approval.

Appendix A: Public CD Description

Text file description of Public CD-Rom for Wisconsin Waterfowl Production Areas (WPA), May 2001.

Documentation:

This CD contains GIS data for the Waterfowl Production Areas (WPA), in Wisconsin.

Overall Description:

This CD contains public land survey system (PLSS) data, digital raster graphics (DRG), a DRG key for identifying DRGs, and a shapefile representing the WPAs in Wisconsin. The various geo-referenced data exist as either ArcView shape files, TIFF files or Arc coverages. All layers are geo-referenced to Wisconsin Trans Mercator with a DATUM of Nad83.

Data Inventory:

/data/drg_key

This shapefile contains a polygon representation of the USGS topographical maps used as a background for the Wisconsin WPAs. Its table lists their names.

/data/wiwpapls

This shapefile contains a polygon representation of the PLSS grid, clipped to fit the outline of the DRGs.

/Drg

This directory contains the DRGs in TIFF format. The black color band is deselected to minimize view obstruction due to overlap of DRGs. The directory contains the following DRGs:

- Avalon
- Baldwin West
- Brooks
- Buckhorn corner
- Busseyville
- Cascades
- Cedar Grove
- Clayton
- Deer Park
- Edgerton
- Endeavor
- Evansville
- Falls City
- Forest
- Graytown
- Jewett
- Lima Center
- Mayville North
- Middleton
- Montello
- Morrisonville
- New Richmond North
- New Richmond South
- Northline
- Oakfield
- Observation Hill

Oregon
Pardeeville
Pickett
Port Washington
Random Lake
Rio
Roberts
Rock Falls
Rockdale
Rush Lake
Rusk
Rutland
Somerset North
Somerset South
Stoughton
Two Rivers
Waupun South
Wautoma
Wyocena

/Metadata

This directory contains four metadata files for the following themes:

 Wiwpadrg.met for the DRGs

 Wiwpakey.met for the DRG key

 Wiwpapls.met for the PLSS

 Wiwpashp.met for the Wisconsin Waterfowl Production Areas shapefile

/shapefile

This directory contains an ArcView Shapefile of the Wisconsin Waterfowl Production Areas.

wpashp.apr

This is a transportable ArcView project file that presents the shapefile, PLS, DRGs and DRG key.

Appendix B: FWS CD Description

Text file description of FWS CD-Rom for Wisconsin Waterfowl Production Areas (WPA), May 2001.

Documentation:

This CD contains GIS data for the Waterfowl Production Areas, in Wisconsin.

Overall Description:

This CD contains public land survey system (PLSS) data, digital raster graphics (DRG), a DRG key for identifying DRGs, original coverages representing individual parcels, and both a shapefile and coverage representing the WPAs in Wisconsin. The various geo-referenced data exists as either ArcView shape files, TIFF files or Arc coverages. All layers are geo-referenced to Wisconsin Trans Mercator with a DATUM of Nad83.

Data Inventory:

```
/coverages/  
  adams/  
    ada_10  
    ada_11  
    adams22  
    adams23  
  columbia/  
    col_10  
    col_11  
    col_12  
    col_12a  
    col_13  
    col_15  
    col_16  
    col_16a  
    col_17  
    col_18  
    col_19  
    col_24  
    col_24a  
    col_24b  
    col_25  
    col_27  
    col_29  
    col_30  
    col_33  
    col16_10  
    col16_13  
    col16_15  
    col16_16  
    col16_16a  
    col16_17  
    col16_18  
    col16_19  
    col16_20  
    col16_21
```


col16_22
col16_24
col16_25
col16_26
col16_27
col16_29
col16_30
col16_31
col16_32
col_13.trav
col_15.trav
col_19.trav
col_24.trav
col_29.trav
col_30.trav
col16_25x.trav

dane/

d10
dan_11dis
dan_11id
dan_11pt1
dan_11pt2
dan_11un
dan_12
dan_14
dan_15
dan_17pt1
dan_17pt2
dan_18
dan_19
dan_21
dan_26
dan_28
dan16_11pt1
dan16_11pt2
dan16_13
dan16_14
dan16_15
dan16_15i
dan16_16
dan16_17pt1
dan16_17pt2
dan16_18
dan16_19
dan16_21
dan16_22
dan16_24
dan16_25
dan16_26
dan1613x
dan_14.trav
dan_15.trav
dan_26.trav

danx_13.trav
dodge/
dod_11
dod_12
dod_13
dod_14
dod_15
dod_16
dod_17
dod_18pt1
dod_18pt2
dod_20
dod_21
dod16_10
dod16_10a
dod16_11
dod16_12
dod16_13
dod16_14
dod16_15
dod16_17
dod16_18pt1
dod16_18pt2
dod16_19
dod16_19c
dod16_20
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dod_12.trav
dod_15.trav
dod_17.trav
dod_18pt2.trav
dunn/
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dun_10
dun_10combo
dun_10fmh
dun_11
dun_12
dun_13
dun_14
dun_14a
dun15_15
done14.trav
done14a.trav
done14aa.trav
done14b.trav
done14c.trav
done14d.trav
done14es.trav
done14es2.trav
nw50.trav
fon_du_lac/

fon_14

jefferson/

jef_10a
jef16_10
jef16_11
jef16_12
jef16_13
jef_11.trav

manitowoc/

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man_10pt2
man_10pt3
man16_10a
man16_pt1
man16_pt2

marquette/

mar_10
mar_11
mar_13
mar_13orig
mar_15
mar_16
mar_17
mar16_10

ozaukee/

oza
oza_10
oza_11
oza_12
oza_14
oza_15
oza16_10
oza16_11
oza16_12
oza16_14
oza16_16
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oza_12.trav

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pol_18.trav
pol_18a.trav
pol_21.trav
pol_22.trav
pol_24.trav

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roc_12
roc_13
roc_14
roc16_11
roc16_12
roc16_13
roc16_14
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northr10s3.trav
r10sect2.trav
r10sect2.trav
roc_11.trav
roc_12.trav
southr10s3.trav

sheboygan/

she_10
she_12

st_croix/

stc_10
stc_10a
stc_10b
stc_11
stc_12
stc_13a
stc_13b
stc_14
stc_14pt1
stc_14pt2
stc_15
stc_15a
stc_16
stc_16a
stc_16b
stc_16c
stc_16d
stc_16e
stc_16f
stc_17

stc_18
stc_19
stc_20
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stc_22
stc_23
stc_24
stc_24a
stc_25
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stc_27
stc_28
stc_29
stc_30
stc_30x
stc_31
stc_32
stc_33pt1
stc_33pt2
stc_34
stc_35
stc_36
stc_37
stc_38
stc_39
stc_40
stc_41
stc_41a
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stc_42pt2
stc_43
stc_44
stc_45
stc_47
stc_48
stc_50
stc_51
stc_52
stc_53
stc_54
stc_55
stc_56
stc_57
stc_mystery
stc_unknown
stc16gen
stc_12.trav
stc_13a.trav
stc_18a.trav
stc_20.trav
stc_22.trav
stc_24.trav
stc_24a.trav

- stc_26.trav
- stc_27x1.trav
- stc_27x2.trav
- stc_28.trav
- stc_32.trav
- stc_34.trav
- stc_34north.trav
- stc_34south.trav
- stc_35.trav
- stc_40.trav
- stc_41a.trav
- stc_44.trav
- stc_45.trav
- stc_47.trav
- stc_52.trav
- stc_53.trav
- stc_mystery.trav
- stc_unknown.trav
- stc44work.trav
- stc57work.trav
- waushara/
 - wau_1
 - wau10exc
- winnebago/
 - win_10
 - win_11
 - win_12
 - win_13
 - win_14
 - win_15
 - win_17
 - win_20
 - win_22
 - win_24
 - win_unknown
 - win13exc
 - win16_22

/data/drg_key

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- Brooks
- Buckhorn corner

Busseyville
Cascades
Cedar Grove
Clayton
Deer Park
Edgerton
Endeavor
Evansville
Falls City
Forest
Graytown
Jewett
Lima Center
Mayville North
Middleton
Montello
Morrisonville
New Richmond North
New Richmond South
Northline
Oakfield
Observation Hill
Oregon
Pardeeville
Pickett
Port Washington
Random Lake
Rio
Roberts
Rock Falls
Rockdale
Rush Lake
Rusk
Rutland
Somerset North
Somerset South
Stoughton
Two Rivers
Waupun South
Wautoma
Wyocena

/Metadata

This directory contains five metadata files for the following themes:

- Wiwpacov.met for the Wisconsin Waterfowl Production Areas coverage
- Wiwpadrg.met for the DRGs
- Wiwpakey.met for the DRG key
- Wiwpapls.met for the PLSS
- Wiwpushp.met for the Wisconsin Waterfowl Production Areas shapefile

/shapefile

This directory contains an ArcView Shapefile of the Wisconsin Waterfowl Production Areas.

/wiwpacov

This directory contains an ArcInfo coverage of the Wisconsin Waterfowl Production Areas.

wpacov.apr

This is a transportable ArcView project file that presents the coverage, PLS, DRGs and DRG key.

wpashp.apr

This is a transportable ArcView project file that presents the shapefile, PLS, DRGs and DRG key.