

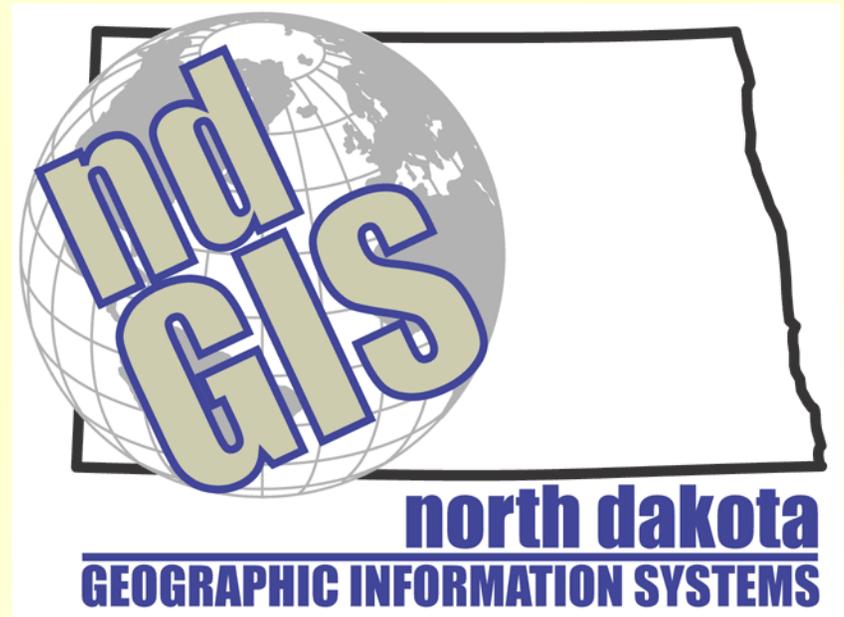


The North Dakota GIS Hub: Sharing data with GIS Web Services

*OSM Western Regional
Technical Team Workshop*

May 24, 2006

*Bob Nutsch
GIS Coordinator
State of North Dakota*



Agenda

- Background & Overview
- Components
- Future Plans
- Summary
- Food for Thought



Historic Camper
Fryburg, Harley Jose

Background & Overview

- The GIS Hub is a database and web infrastructure used for hosting and sharing State agency GIS data and applications, it is located at the Information Technology Department
- General funds pay for data and application hosting, agencies pay for development costs

Background & Overview

- The primary purpose of the GIS Hub is to provide a central database serving state agencies
- Web services are used by agencies and their constituents, the public, consulting firms, and other levels of government
- Web services as used here is a general term for data discovery, data browsing, and data delivery – in a GIS context

GIS Hub Benefits

- Centralized storage - "one stop shopping"
- Reduced costs – agencies not forced to develop their own infrastructure
- Supplies core component for new applications
- Increase access to GIS data – free tools
- Greater re-use of data – different & new uses
- Improve distribution of information to public



Who Developed the GIS Hub?

- GIS Technical Committee & Consultant
- GISTC Membership
 - Game and Fish Department
 - Health Department
 - Information Technology Department
 - Department of Transportation
 - Geological Survey
 - Parks and Recreation
 - State Water Commission

A Brief Timeline

- January 2000 – GIS Technical Committee (GISTC) asks the Information Technology Department (ITD) to conduct a study of building a GIS “hub”
- May 2000 – Based on the study results, GISTC supports building the Hub and elects to request general funding via ITD with support from the Chief Information Officer
- April 2001 – Legislature approves funding

A Brief Timeline

- August 2001 – State coordinator hired
- November 2001 – Kick-off meeting with consultant
- July 2002 – The first GIS Hub database goes to production
- October 2002 – GIS Hub web services go to production

GIS Hub Components

- Database
- Web Services
 - Hub Explorer
 - Metadata Explorer
 - Utility Toolbox
 - Data Streaming



16th hole, Bully Pulpit Golf Course, Medora, Dean Glatt

Components – Database

- Multiple databases are used to organize data
- Over 200 layers (not counting Government Land Office scans and agency-specific data)
- Over 2.3 terabytes
- Databases contain both public and agency-maintained internal data

Components – Database

- Datasets:
 - Communications
 - Elevation
 - Geology
 - Political Boundaries
 - State and Federal Lands
 - Places and Cultural Points
 - Transportation
 - Water Resources
 - Aerial Photography

Data on the GIS Hub comes from a variety of sources:

- State agencies
- Federal agencies
- Local government

Components – Database

- Agency users and their applications directly connect to the databases

County Polygons
SDE Feature Class

Description	Spatial	Attributes
Keywords Theme: County, Counties, boundaries Place: North Dakota		
Description Abstract The North Dakota county coverage was originally created by the North Dakota Geological Survey using US Census Bureau TIGER data in 1994. The source scale on these data was 1:100,000. Since its creation, with USGS Public Land Survey DLG data,		

Metadata!

- + NDHUB.Communications
- + NDHUB.EmergencyServices
- + NDHUB.Environment
- NDHUB.GeoPolBndry
 - + NDHUB.Corporate_Line
 - + NDHUB.Corporate_Poly
 - + NDHUB.Counties_Line
 - + NDHUB.Counties_Poly
 - + NDHUB.Legislative_Poly
 - + NDHUB.PLSSSectCenters_Pts
 - + NDHUB.PLSSSectCorners_Pts
 - + NDHUB.PLSSSections_Line
 - + NDHUB.PLSSSections_Poly
 - + NDHUB.PLSSTownships_Line
 - + NDHUB.PLSSTownships_Poly
 - + NDHUB.State_Line
 - + NDHUB.State_Poly
 - + NDHUB.TribalLands_Line
 - + NDHUB.TribalLands_Poly
 - + NDHUB.VotingPolling_Pts
 - + NDHUB.VotingPrecinct_Poly
 - + NDHUB.ZIP5Centroids_Pts
- + NDHUB.GeoReference
- + NDHUB.LandFederal
- + NDHUB.LandState
- + NDHUB.Places
- + NDHUB.Soils

Components – Web Services

- Why Web Services? You can:
 - Create internet/intranet browser-based applications that:
 - Cost less than deploying desktop tools
 - Are simpler to use
 - Utilize your own and others' data
 - Bring in data from multiple servers all over the world without having to host the data
- Let's look at some examples...

Components – Hub Explorer

- Template used for browser-based application development
- Used by state agencies for interactive mapping
- There are both internal and external Hub Explorer sites
- Includes ability to download vector data



Hub Explorer – Game and Fish

North Dakota nd.gov Official Portal for North Dakota State Government

NORTH DAKOTA GAME AND FISH DEPARTMENT
General Information

OVERVIEW MAP
 ZOOM IN
 ZOOM OUT
 ZOOM FULL
 PAN
 IDENTIFY
 CLEAR SELECT
 WEB LINK
 EXPANDED MENU

LAYERS | LEGEND

GIS HUB - GAME AND FISH

- Administrative Districts
- Hunting/Management Units
- Fisheries
 - Fish Kill
 - Fish Stocking
 - Fishing Facilities
 - Fishing Waters
 - Lake ANS
 - Lake Contours
 - Lake Roads
 - Paddlefish Zones
- Wildlife
- Basedata
 - Lands
 - Geopolitical
 - Places
 - Transportation
 - State and Federal Roads
 - County and City Roads
 - Railroads
 - Water
 - Raster

Help:

- A closed group, click to open.
- An open group, click to close.
- A hidden group/layer, click to make visible.
- A visible group/layer, click to hide.
- A visible layer, but not at this scale.
- A partially visible group, click to make visible.
- An inactive layer, click to make active.
- The active layer.

Auto Refresh
REFRESH MAP

Please provide feedback.



Hub Explorer – Dept. of Ag.

North Dakota nd.gov Official Portal for North Dakota State Government

North Dakota Department of Agriculture

North Dakota Hub Explorer Groundwater Pesticide Sensitivity

OVERVIEW MAP
ZOOM IN
ZOOM OUT
ZOOM FULL
PAN
IDENTIFY
SET PESTICIDE
EXPANDED MENU

Layers | Legend

Legend

- Highlighted Feature
- Towns and Cities
 - Historical/Unincorporated
 - Existing
- County and City Roads
- Graded/Gravel
- Paved
- Trail/Unimproved
- Other
- State and Federal Roads
- Business Loop
- Freeway
- State Road
- Federal Road
- Counties
- High Pesticide
- Low
- Intermediate
- High

Select Pesticide

Pesticide Type: Herbicide
Trade Name / Common Name / Leaching Potential: 2,4-D Amine / 2,4-D / High

[Please provide feedback.](#)

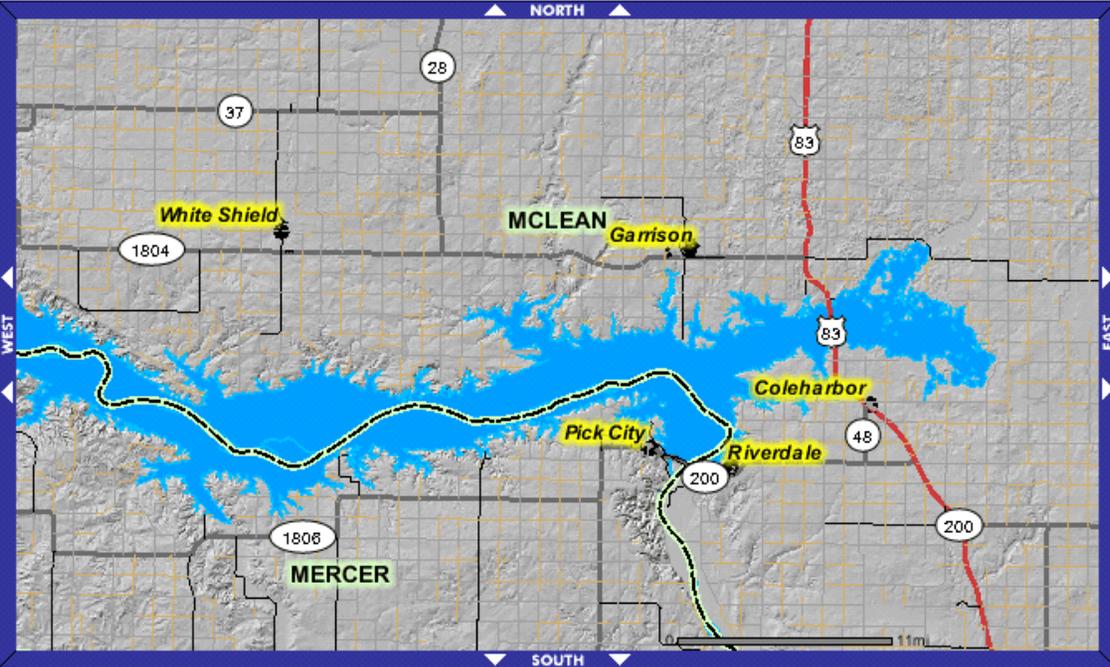
Hub Explorer – Data Download

North Dakota nd.gov Official Portal for North Dakota State Government

North Dakota Hub Explorer
General Information

OVERVIEW MAP

- ZOOM IN
- ZOOM OUT
- ZOOM FULL
- PAN
- IDENTIFY
- COMPLEX QUERY
- SIMPLE QUERY
- FIND WORD
- MEASURE
- SET UNITS
- BUFFER
- SELECT BY RECT.
- SELECT BY LINE
- CLEAR SELECT
- EXTRACT DATA**
- PLOT LAT/LON
- SHORT MENU



LAYERS | LEGEND

ND GIS HUB LAYERS

- All Layers
- Communications
- Emergency
- Environment
- GeoPolitical
- Georeference
- Land
 - State
 - ND Parks and Rec
 - ND Forest Service
 - ND Land Department
 - ND Game and Fish
 - Federal
- Places
- Transportation
- Water
- Imagery

Help:

- A closed group, click to open.
- An open group, click to close.
- A hidden group/layer, click to make visible.
- A visible group/layer, click to hide.

Auto Refresh

REFRESH MAP

[Please provide feedback.](#)

Hub Explorer – Data Download

North Dakota nd.gov Official Portal for North Dakota State Government

north dakota
GEOGRAPHIC INFORMATION SYSTEMS

North Dakota GIS Hub Data Download

Welcome! Please follow the ordered steps to download data from the North Dakota GIS Hub

Step 1: Select Data Extent

Use data within extents of current Hub Explorer window
 Use full extent of data ignoring extents of Hub Explorer window

Step 2: Select Data Format **Step 3: Select Coordinate System**

ESRI Shape State Plane South Zone NAD83

*** Step 4: Select Layers to download (select single layer or select multiple layers using CTRL or Shift)**

- County and City Roads
- State and Federal Roads
- Counties
- Towns and Cities
- Lakes, Ponds, Rivers

Step 5: Enter Your Email Address (mandatory) so that we can contact you when your data is ready to be downloaded

youremail@state.nd.us

Step 6: Click on the button to submit your request for data

Get Data

Subject: ND GIS Hub data extraction results are available!

Congratulations! Your request for North Dakota GIS Hub data has been successful.

The results will be available until Tue-28-Sep-2004 03:42:54 PM Central Daylight Time (CDT) (local server time).

Click on this link to download your results as a ZIP file:

http://discovernd.com/hubdata/FME_b020041021196724.zip

Please do not reply to this email as it will not be answered. Please send an email to gis@state.nd.us if you wish to contact us.

Thank you for using the North Dakota GIS Hub.

Components – Metadata Explorer

- Data browsing and discovery
- Referenced data sets include:
 - GIS Hub web image and feature services
 - Raster data available on FTP
 - In-progress datasets
 - Interactive maps
 - County data
- Includes vector data downloading

Metadata Explorer

North Dakota nd.gov Official Portal for North Dakota State Government

metadata explorer [HELP](#)

SEARCH **BROWSE**

1 Draw search area :



2 Choose content type:
 <All Content Types>
 Choose content theme:
 <All Content Themes>
 Optional Keyword (e.g. river):

 3 **START SEARCH**
 Search NSDI Clearinghouse

Records Found: 57

Currently displaying records 1 - 20 of 57
 Pages: [1](#) [2](#) [3](#)

Content Found by Search

Type of Content Shown on This Page	Records
Live Data and Maps	8
Downloadable Data	12

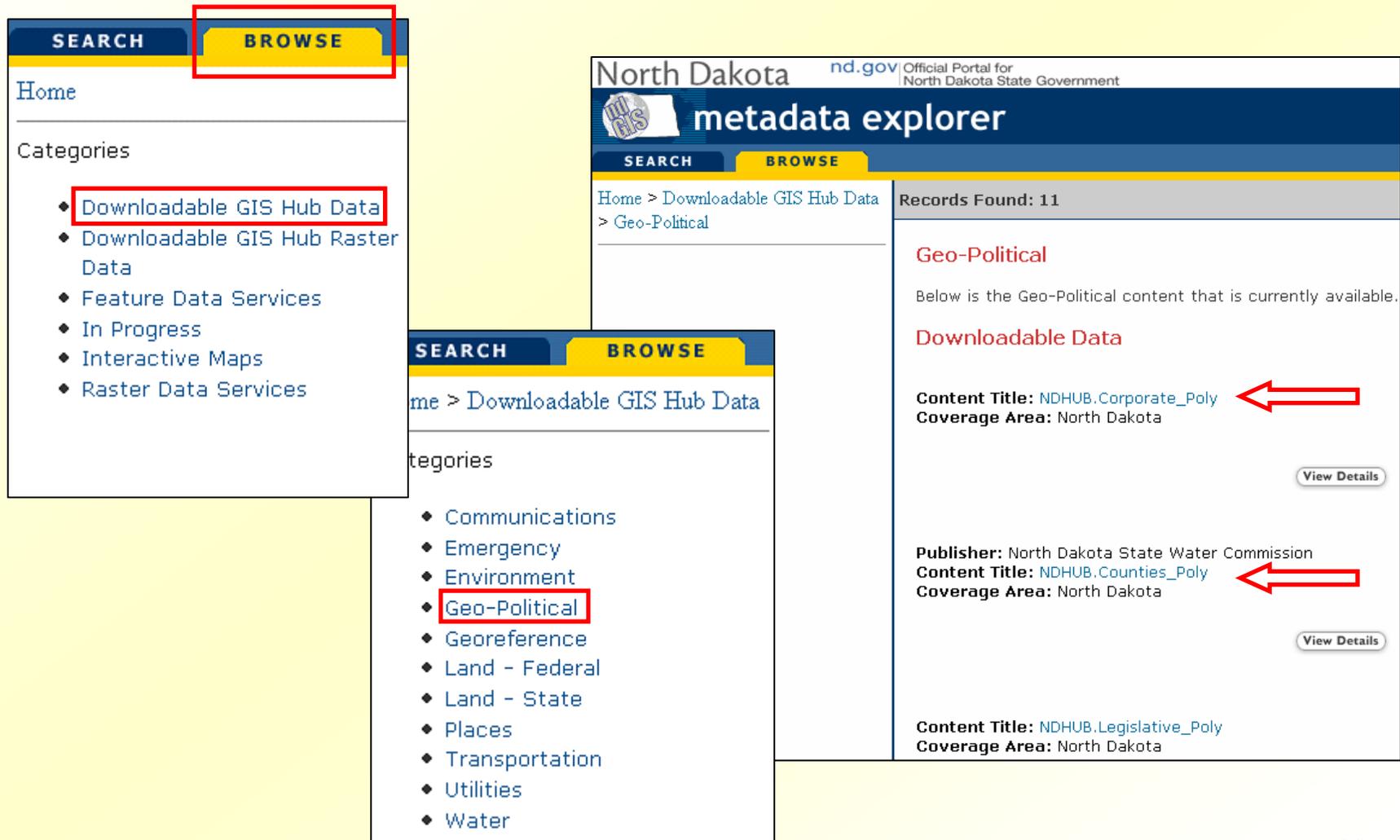
[back to top](#)

Content Title: Bureau of Reclamation
Coverage Area: North Dakota
Map Scale: 1:Lidar; 1:12,000; 1:100,000; 1:126,720

Content Title: Army Corps of Engineers
Coverage Area: North Dakota
Map Scale: 1:1:24,000



Metadata Explorer



The screenshot shows the Metadata Explorer interface with several components:

- Navigation:** A top bar with "SEARCH" and "BROWSE" tabs. The "BROWSE" tab is highlighted with a red box.
- Home Page (Left Panel):**
 - Home
 - Categories:
 - Downloadable GIS Hub Data (highlighted with a red box)
 - Downloadable GIS Hub Raster Data
 - Feature Data Services
 - In Progress
 - Interactive Maps
 - Raster Data Services
- Category Selection (Bottom Panel):**
 - Categories:
 - Communications
 - Emergency
 - Environment
 - Geo-Political (highlighted with a red box)
 - Georeference
 - Land - Federal
 - Land - State
 - Places
 - Transportation
 - Utilities
 - Water
- Main Content Area (Right Panel):**
 - North Dakota nd.gov Official Portal for North Dakota State Government
 - SEARCH BROWSE
 - Home > Downloadable GIS Hub Data > Geo-Political
 - Records Found: 11
 - Geo-Political**
 - Below is the Geo-Political content that is currently available.
 - Downloadable Data**
 - Content Title: [NDHUB.Corporate_Poly](#) (highlighted with a red arrow)
 - Coverage Area: North Dakota
 - [View Details](#)
 - Publisher: North Dakota State Water Commission
 - Content Title: [NDHUB.Counties_Poly](#) (highlighted with a red arrow)
 - Coverage Area: North Dakota
 - [View Details](#)
 - Content Title: [NDHUB.Legislative_Poly](#)
 - Coverage Area: North Dakota

Components – Utility Toolbox

- Used to create agency “static” maps:

The National Weather Service (NWS) issues the North Dakota Rangeland Fire Danger Statement each morning during fire season from April 1 to October 31.

Last Issued - 1115 AM CDT THU APR 13 2006

Low - Weather and fuel indicators show the probability of fire is low.
Medium - Weather and fuel conditions indicate some potential of fire occurrence. Moderate spread rate.
High - Fires are active. Expect moderate and occasional high rates of spread.
Very High - Fires spread rapidly and show erratic behavior. Dangerous burning conditions exist.
Extreme - Potential for large fires exists. Extreme fire behavior is probable. Critical burning conditions exist.

[A Text Version is Available](#) [Fire Weather including Red Flag Warning](#)

NATIONAL WEATHER SERVICE SYNOPSIS...A TROUGH OF LOW PRESSURE OVER CENTRAL NORTH DAKOTA THIS MORNING WILL MOVE EAST INTO WESTERN MINNESOTA BY EVENING. WEST WINDS ARE EXPECTED TO INCREASE TO 15 TO 30 MPH BEHIND THIS TROUGH. TEMPERATURE FORECASTS HAVE BEEN UPDATED TO REFLECT HIGHER MAXIMUM TEMPERATURES...IN THE LOW TO MID 70S OVER THE WESTERN HALF OF THE STATE...AND THIS WILL BRING MINIMUM RELATIVE HUMIDITIES IN THE 15 TO 25 PERCENT RANGE THIS AFTERNOON IN THE WEST HALF OF THE STATE.THESE CONDITIONS WILL RAISE THE FIRE DANGER INDEX INTO THE EXTREME CATEGORY ACROSS THE WESTERN HALF OF THE STATE...AND IN THE HIGH TO VERY HIGH CATEGORY IN THE EAST HALF.

[Print Friendly Version](#)

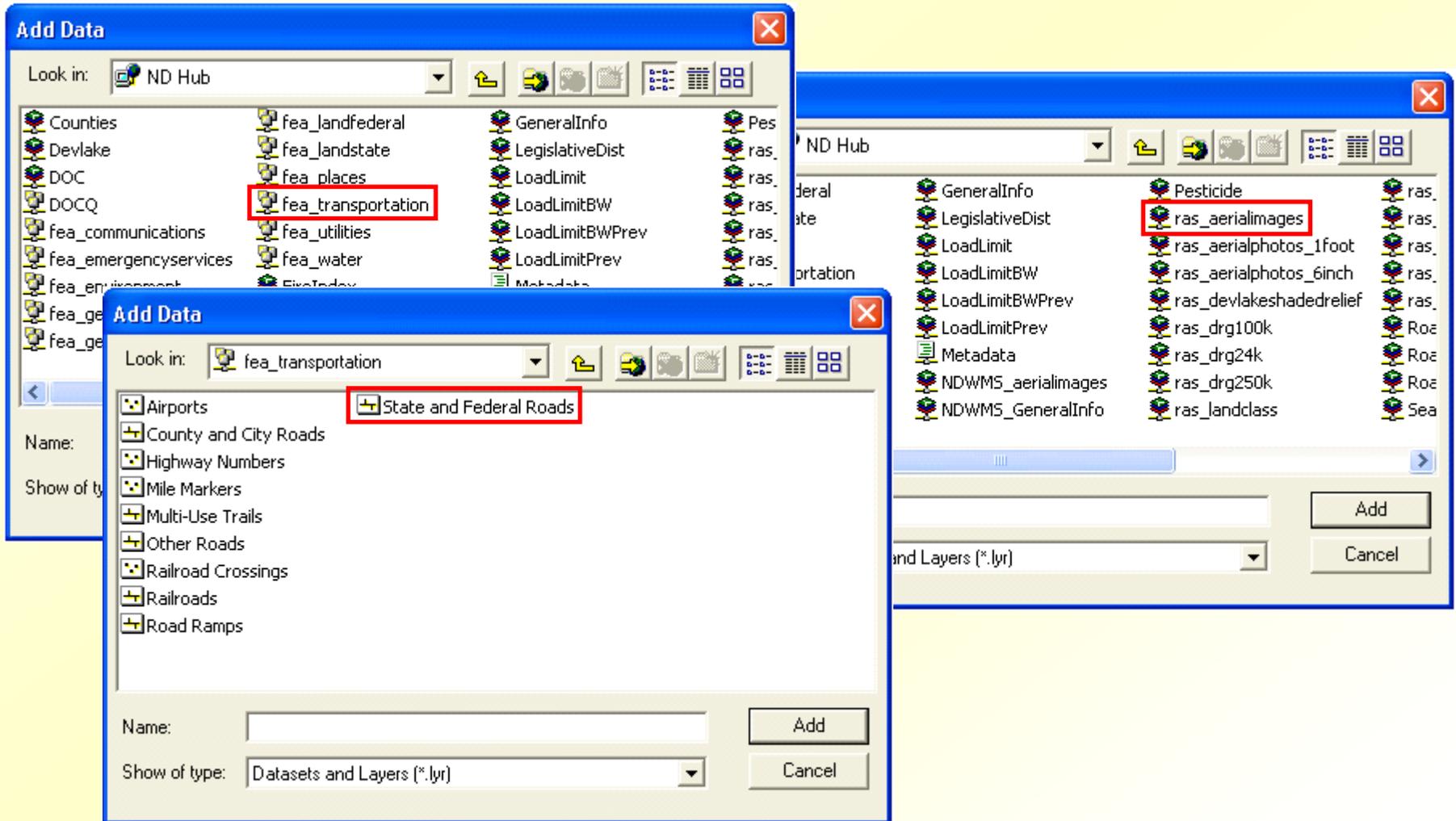
ND Emergency Services
 NDDOT
 rangeland fire index
 road conditions



Components – Data Streaming

- Streaming of image and vector data
- Primarily used by users outside of firewall
- ESRI-centric image and feature services
- OGC-centric Web Map Services (WMS)
- OGC (Open Geospatial Consortium) services work with ESRI and non-ESRI products

Data Streaming - Feature & Image Services

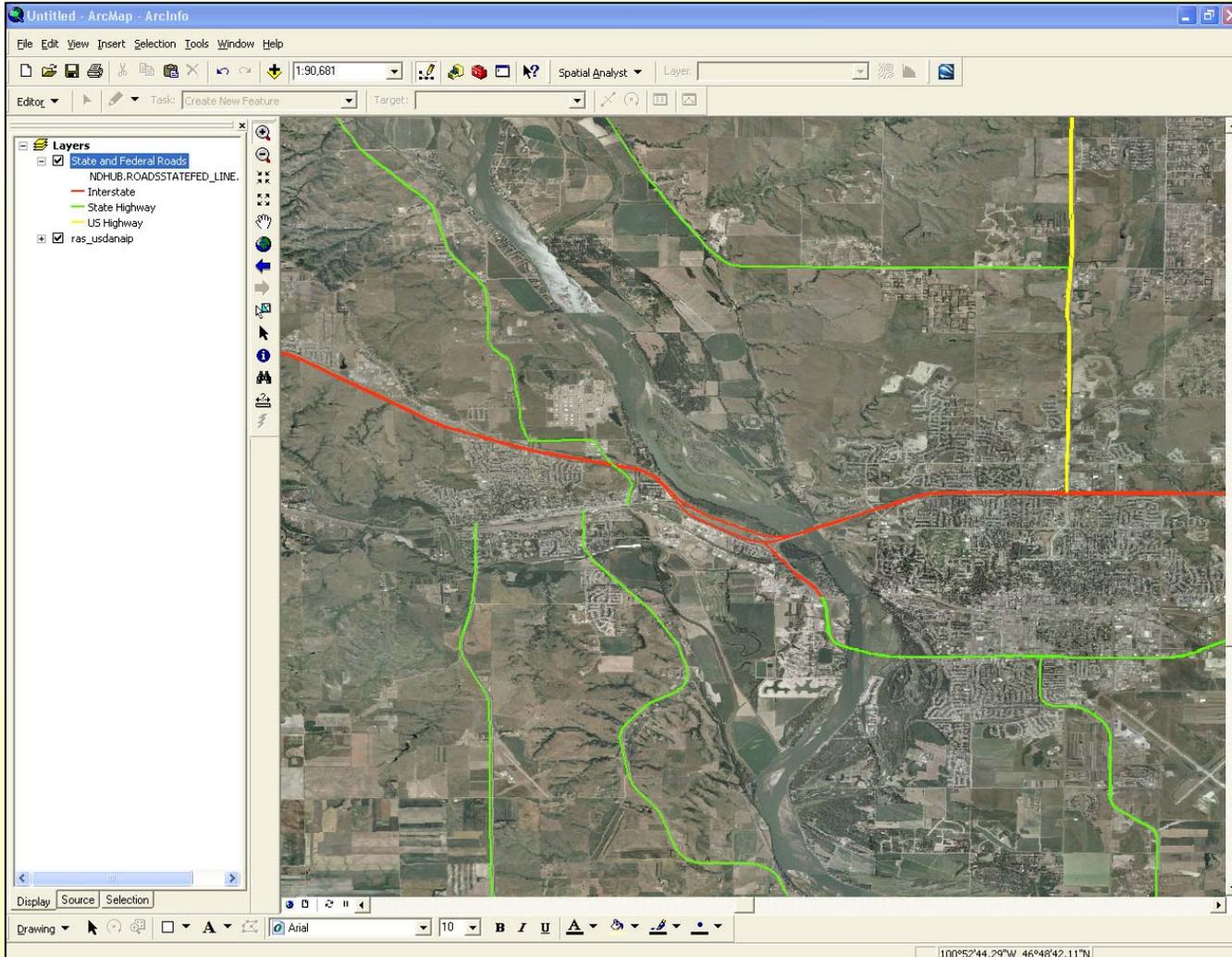


The image displays three overlapping screenshots of the ArcGIS 'Add Data' dialog box, illustrating the steps to add a feature service.

- Top Left Screenshot:** Shows the 'Add Data' dialog with 'Look in:' set to 'ND Hub'. The file list includes various datasets, with 'fea_transportation' highlighted by a red box.
- Top Right Screenshot:** Shows the 'Add Data' dialog with 'Look in:' set to 'fea_transportation'. The file list includes various datasets, with 'ras_aerialimages' highlighted by a red box.
- Bottom Screenshot:** Shows the 'Add Data' dialog with 'Look in:' set to 'fea_transportation'. The file list includes various datasets, with 'State and Federal Roads' highlighted by a red box.

The dialog box includes a 'Look in:' dropdown menu, a file list, a 'Name:' field, a 'Show of type:' dropdown menu, and 'Add' and 'Cancel' buttons.

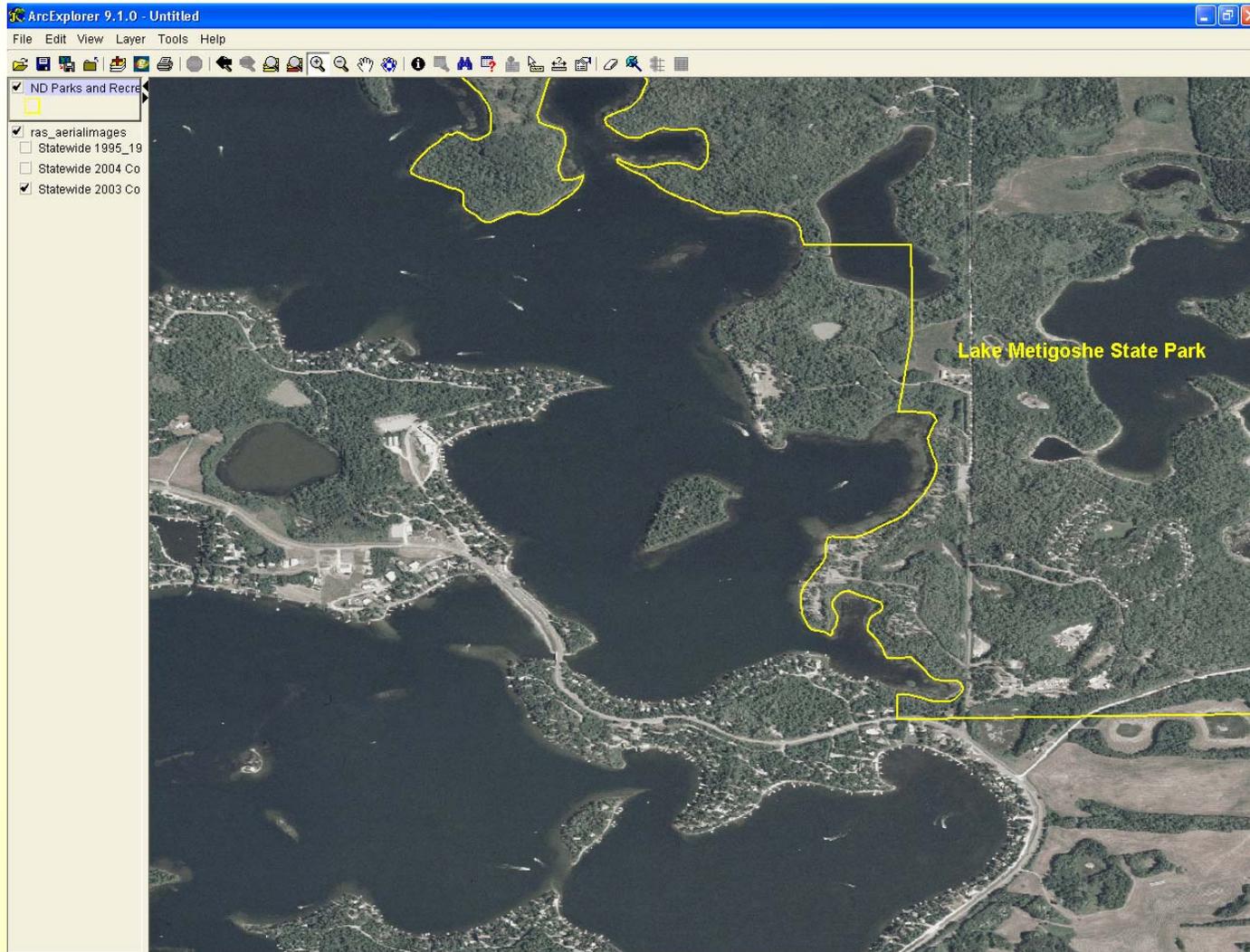
Data Streaming - Feature & Image Services



ArcMap



Data Streaming - Feature & Image Services



ArcExplorer

Data Streaming - WMS



USGS The National Map Viewer

Map Information | Help

Scale

Layers Legend

- Geology
- Hydrography
- Imagery
 - DOQ
 - USGS DOQ 129 (BW)
 - INDEX/STATUS (IMAGERY)
 - NDOP Project Tracking
 - OTHER IMAGERY
 - Bismarck (2001)
 - North Dakota 2003 Color Aerial Photos (USDA-FSA) North
 - Dakota-Bismarck-Mandan Aerial 6-inch Photos
 - TerraServer USA Urban Area
- SATELLITE
 - LANDSAT7
 - LANDSAT7 Index
- SCANNED MAPS
 - No layers available.
- Land Use/Land Cover
- Natural Hazards/Weather
- Other
- Structures
- Topographic Maps
- Transportation

Refresh Map

Partners: North Dakota | U.S. Forest Service | U.S. Fish & Wildlife Service | USGS | TerraServer USA | BTS | UNKNOWN | CENSUS

U.S. Department of the Interior | U.S. Geological Survey | Contact: National Map Team
 URL: <http://nrmview.wco.gov> | Last modification: 09/14/2005
 Privacy Statement | Disclaimer | FOIA | Accessibility

FIRSTGOV
The First Step to the U.S. Government

The
National
Map



Data Streaming - WMS

2273873,924783 1: 31773 Update Resize Refresh

Zoom Out

North Dakota State Water Commission
900 East Boulevard Ave. • Bismarck, ND • 58505-0850 [Tested Browsers](#)
701-328-2750

ND State
Water
Commission
(MapServer)

Web Services – Data Sources

- State and Federal Servers – For example, North Dakota and the U.S. Geological Survey
- A great search tool is Mapdex (www.mapdex.org)
 - Indexes web services from all over the world
 - Provides a toolbar for ArcMap
 - Allows downloading of layers for use with Google Earth



Mapdex – Simple Search



"A global **Index** of 2,054 servers, serving 36,830 map services, containing over 400,000 GIS Layers, covering more than 4,000,000 columns!"

all server service layer column > Address

Search for: showing
eg: photo or aerial or ortho or doqq

city, state / state

-or-

<< Plot the Envelope >>

<< Blog - Advanced Search - API - ArcMap Toolbar - Search Plugin - About >>

See what people are searching for:



Mapdex – Results from Search

all server service layer column [> Address](#)

Search for: showing

-or-

street or intersection [city,state] / state zip

[« Blog](#) - [Advanced Search](#) - [API](#) - [ArcMap Toolbar](#) - [Search Plugin](#) - [About](#) >>

SEARCH RESULTS - ordered by envelope area (smallest first) Displaying 1 - 20 of 198 layers in 27 servers.

[expand all](#) - [collapse all](#)
 [<show layer info](#) < [hide layer info](#) > [more options](#) >>
 [<first](#) < [prev](#) < [next](#) > [>last](#)

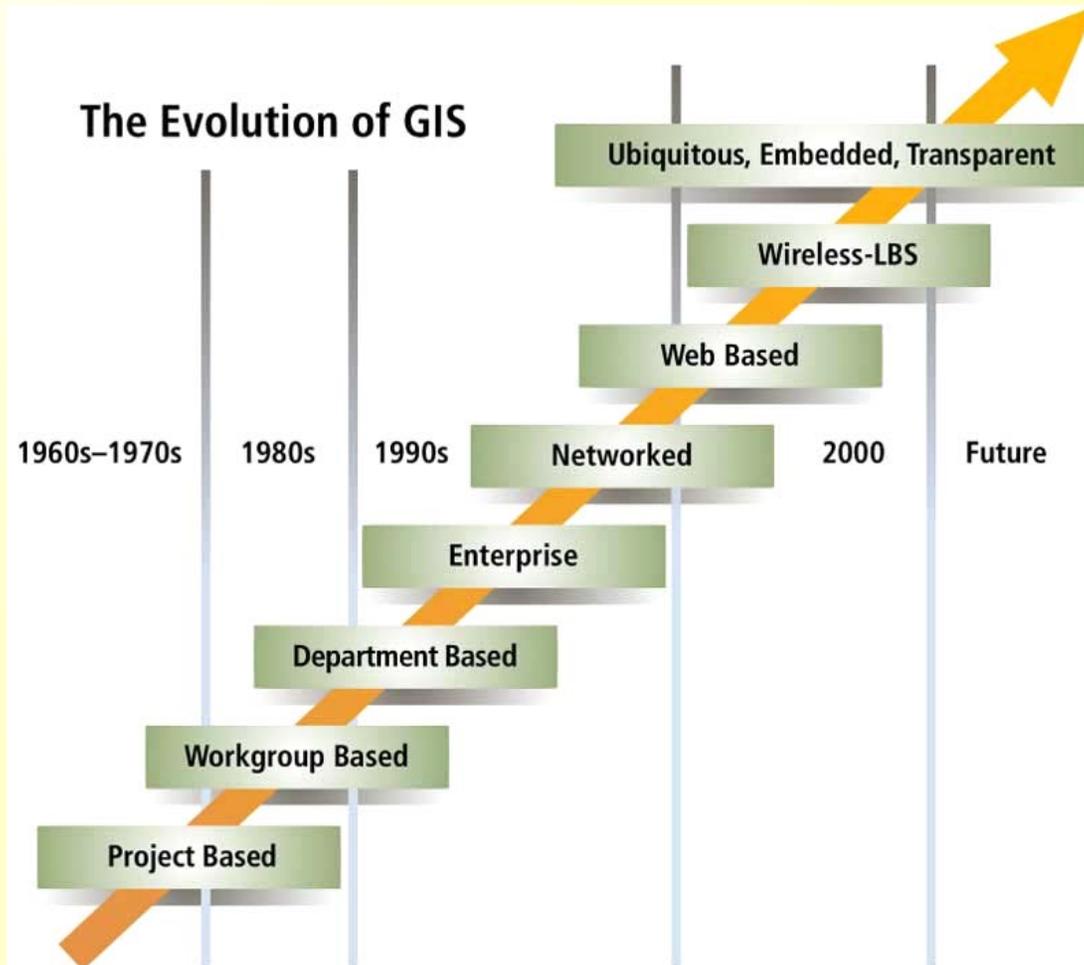
+	LAYER ▲▼	SERVER ▲▼	SERVICE ▲▼	PROJECTION ▲▼	VIEWER
	aerial image bismarck 2001	web.apps.state.nd.us	GameFishInfo	Projection Set	flash - html
	bismarck-mandan 2001 bw 6inch photos	web.apps.state.nd.us	GeneralInfo	Projection Set	flash - html
	bismarck-mandan 2005 color 6inch photos	web.apps.state.nd.us	GeneralInfo	Projection Set	flash - html
	doqq_129_bw	afghanistan.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	edcnts12.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	edcw2ks22.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	edcw2ks40.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	edna.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	gisdata.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	gisdata.usgs.net	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	igskmnngs086.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	ims.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	ortho.cr.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	doqq_129_bw	seamless.usgs.gov	USGS_EDC_Ortho_DOQQ	Projection Set	flash - html
	naip 2003 color aerial 1meter photos	web.apps.state.nd.us	NDWMS_GeneralInfo	Projection Set	flash - html
	usgs 1995_1998 bw aerial 1meter photos	web.apps.state.nd.us	NDWMS_GeneralInfo	Projection Set	flash - html
	usgs doqq	web.apps.state.nd.us	ras_usgsdoqq	Projection Set	flash - html

GIS Hub Future Plans

- Develop additional web services as needed
- Migrate from ESRI-centric web services to OGC-centric web services
- Raster downloading via Hub Explorer and Metadata Explorer
- Continued monitoring of Open Source GIS
- Geodatabase multi-user editing
- Greater “institutionalizing” of GIS – make it more prevalent and more part of the everyday workflow



The Future, Up, Up, and Away!



Summary

- Web services are a mechanism for getting data out to users who would otherwise not have easy access to it
- Web services are method for obtaining data
- It is important to develop and maintain metadata more than ever with web services
- Web services can save:
 - Time – reduce data queries via phone and email
 - Cost – deploy Web applications rather than desktop tools

Food For Thought

- Web services for data loading
 - Products from Safe Software (www.safe.com) allow data/projection conversion and uploading – client data can be uploaded to a central database
 - Web-based editing – in a browser data can be viewed, added, modified then uploaded to a central database
- Use of data standards
 - www.fgdc.gov is a GREAT source of information
 - Metadata, utilities, cartography, MANY others
 - Use OGC wherever possible for web services

Thank You!

For more information, please contact:

Bob Nutsch, GIS Coordinator

701-328-3212

bnutsch@nd.gov

www.nd.gov/gis



Wind Generator Sunset,
South of Minot, Rick Craig