

An Update on the Midcontinent Interactive Digital Carbon Atlas and Relational dataBase (MIDCARB) and its Future



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Brandon Nuttall, John A. Rupp, Beverly Seyler,
Ernie Slucher, and Joe Wells*

www.midcarb.org

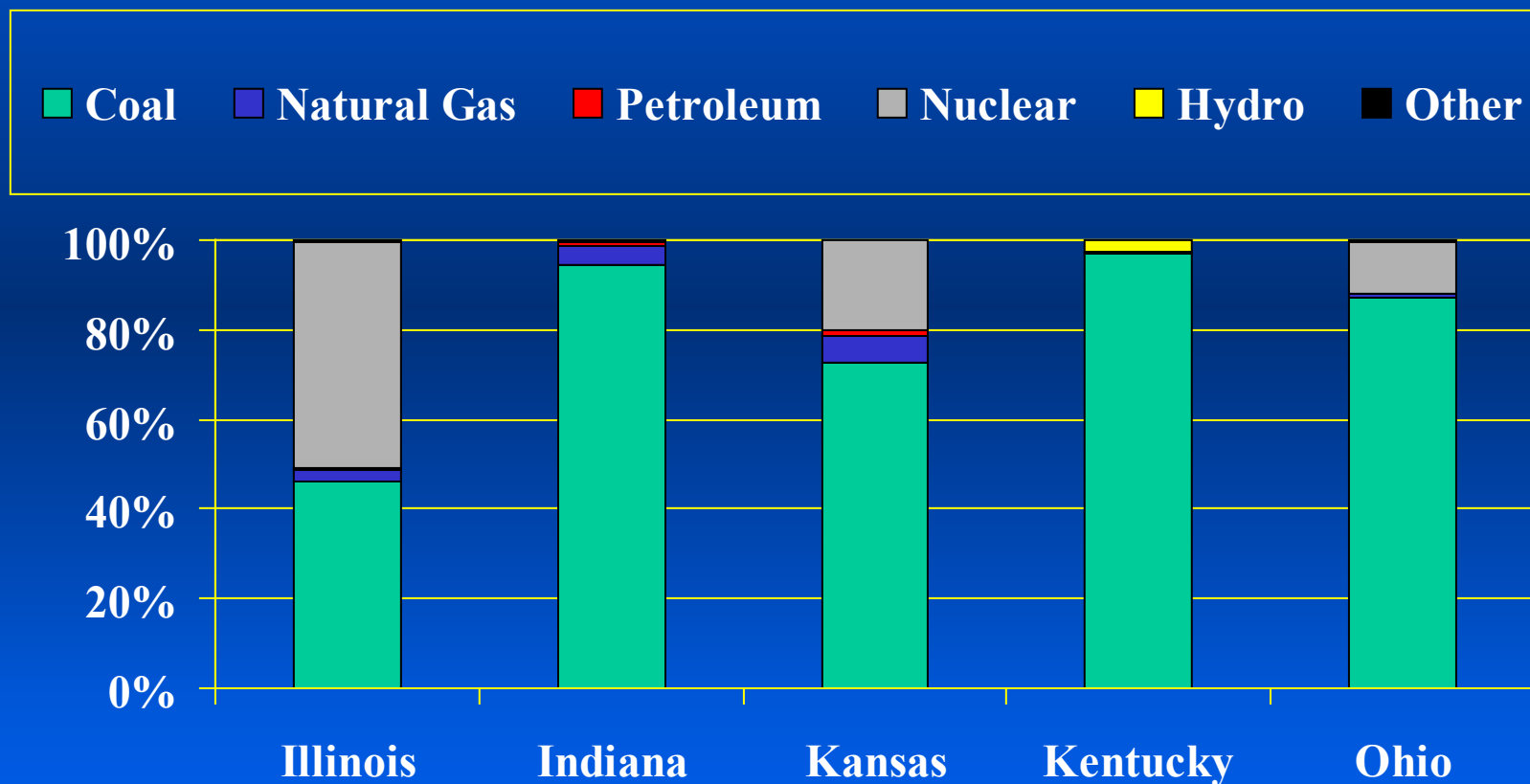


The MIDCARB states have solid fossil energy industries with varying production amounts in each state.

	Coal	Natural Gas	Petroleum
State	Thousand Short Tons	Million Cubic Feet	Thousand Barrels
Illinois	33,783	185	10,092
Indiana	36,738	1,064	2,022
Kansas	176	481,445	33,942
Kentucky	133,834	81,723	2,970
Ohio	25,400	100,107	6,050

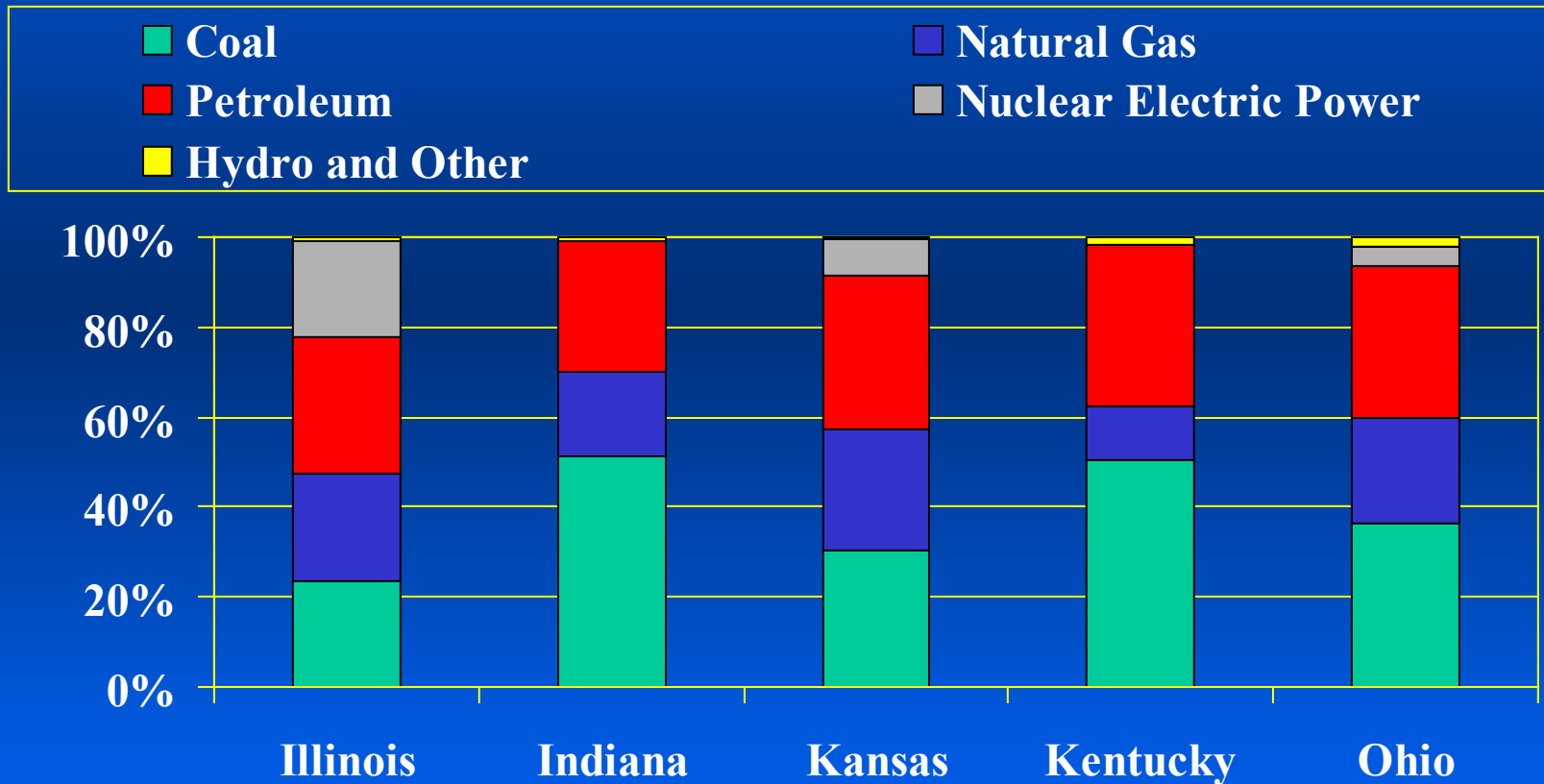
Source: DOE/EIA, Annual Coal Report 2001, Natural Gas Annual 2001, Petroleum Supply Annual 2001.

Fuel Mix for Electricity Production Varies Widely in MIDCARB States (2001)



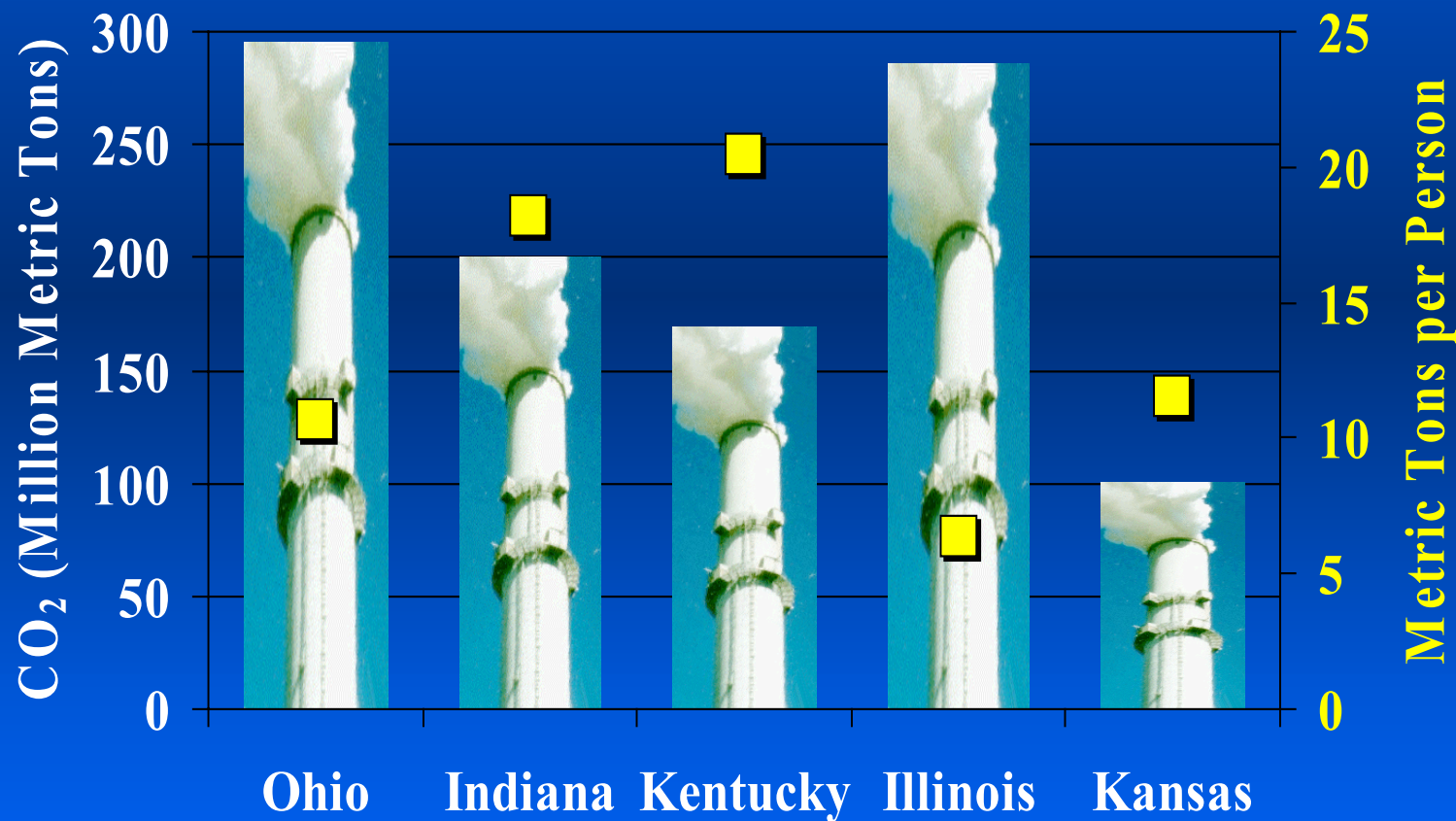
Source: 2001 DOE/EIA data.

Total Energy Consumed in MIDCARB States (2001)



Source: 2001 DOE/EIA data.

Total CO₂ Emissions in MIDCARB States, 2000



2000 US Census Bureau and 2000 DOE/EIA data

Geologic Sequestration Potential

- Active and Depleted Oil and Gas Reservoirs
 - Value-Added Sequestration from High Quality Sources
 - Dubois and Nuttall have presentations at this conference
- Saline Aquifers
- Deep and non-economical Coal Beds
 - Value-Added Sequestration
- Unconventional Gas Reservoirs
 - Devonian Black Shale
 - Tight gas sands

Industrial Sources of CO₂

- Power Plants – Coal, Oil and Natural Gas
- Ethanol Plants
- Cement Plants
- Fertilizer Plants
- Solid Waste Landfills
- Other industrial plants that burn fossil fuels

Carbon Management Data Online

- **Data is Maintained at Local Level**
 - Current
 - Detailed
 - Accurate
- **Online Access**
 - Users Driven
 - Flexible Query and Display
 - Access to Products and Data

Midcarb Maps

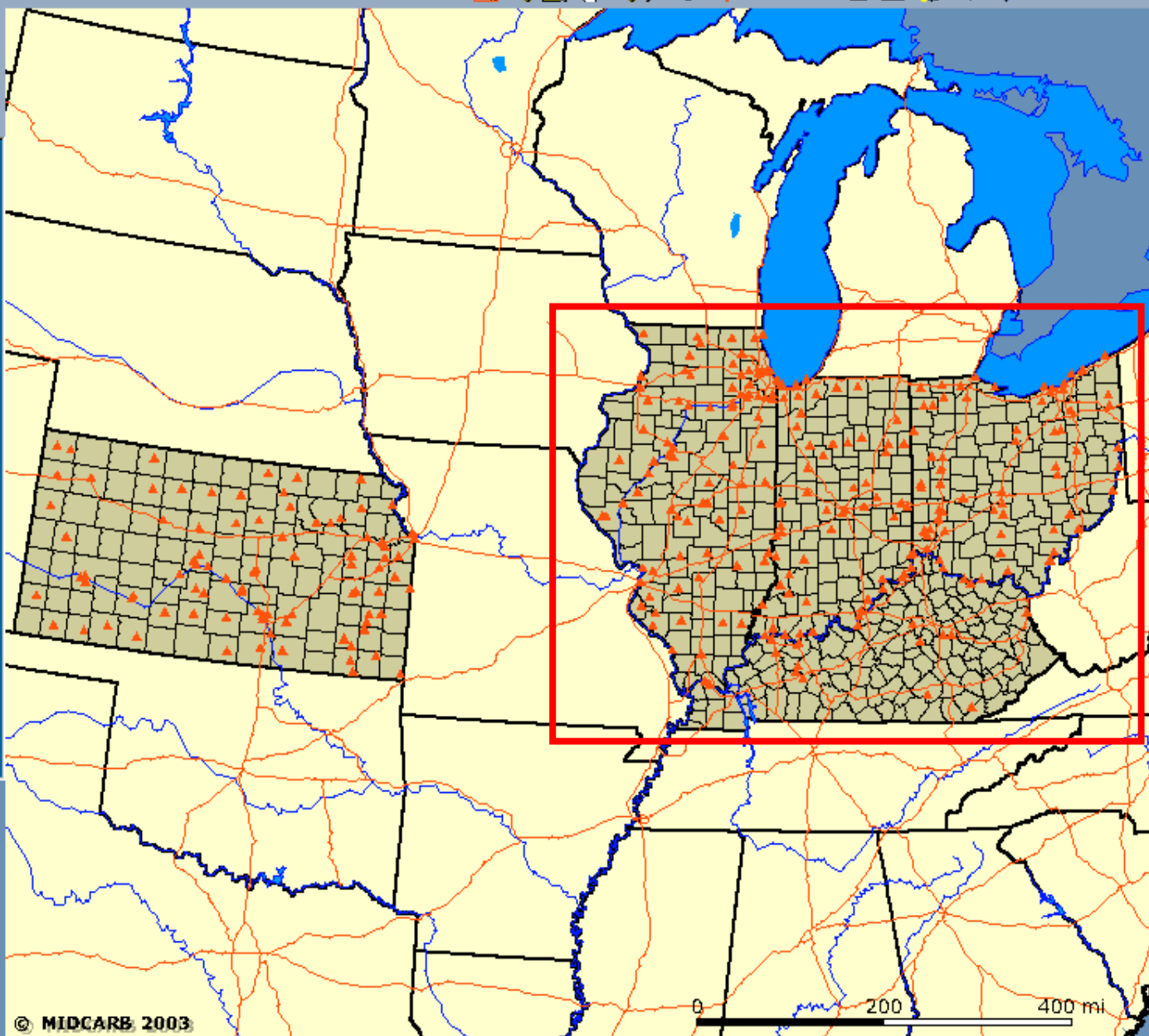
A Five State GIS Compilation [Guided Tour](#)

Map Layers

Select Active Layer

IL - CO2 Sources

- ☐ CO2 Sources
- ☐ Infrastructure
- ☐ Base
- ☐ Petroleum
- ☐ Coal
- ☐ Geology
- ☐ Aquifer
- ☐ Non-Conventional

☒ AutoRefresh MapTool mode: **Zoom In**
Active layer: **IL - CO2 Sources**

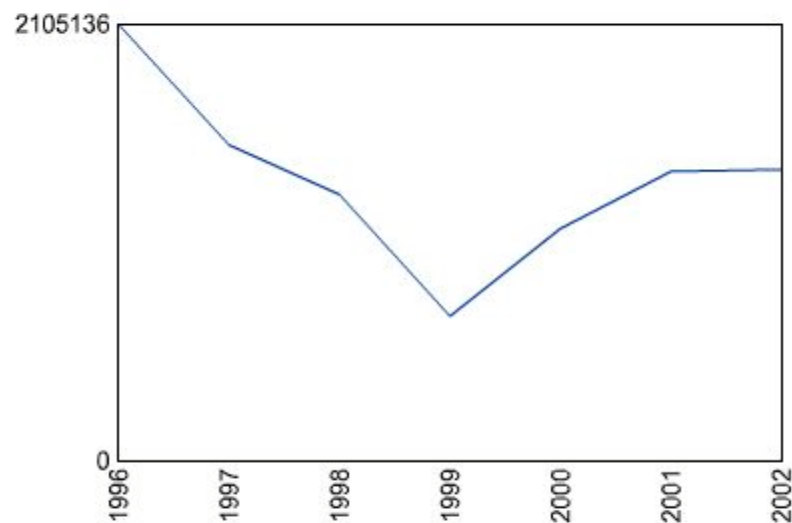
© MIDCARB 2003

Ohio ASHTABULA

Facility is a UT owned by CLEVELAND ELECTRIC ILLUM CO

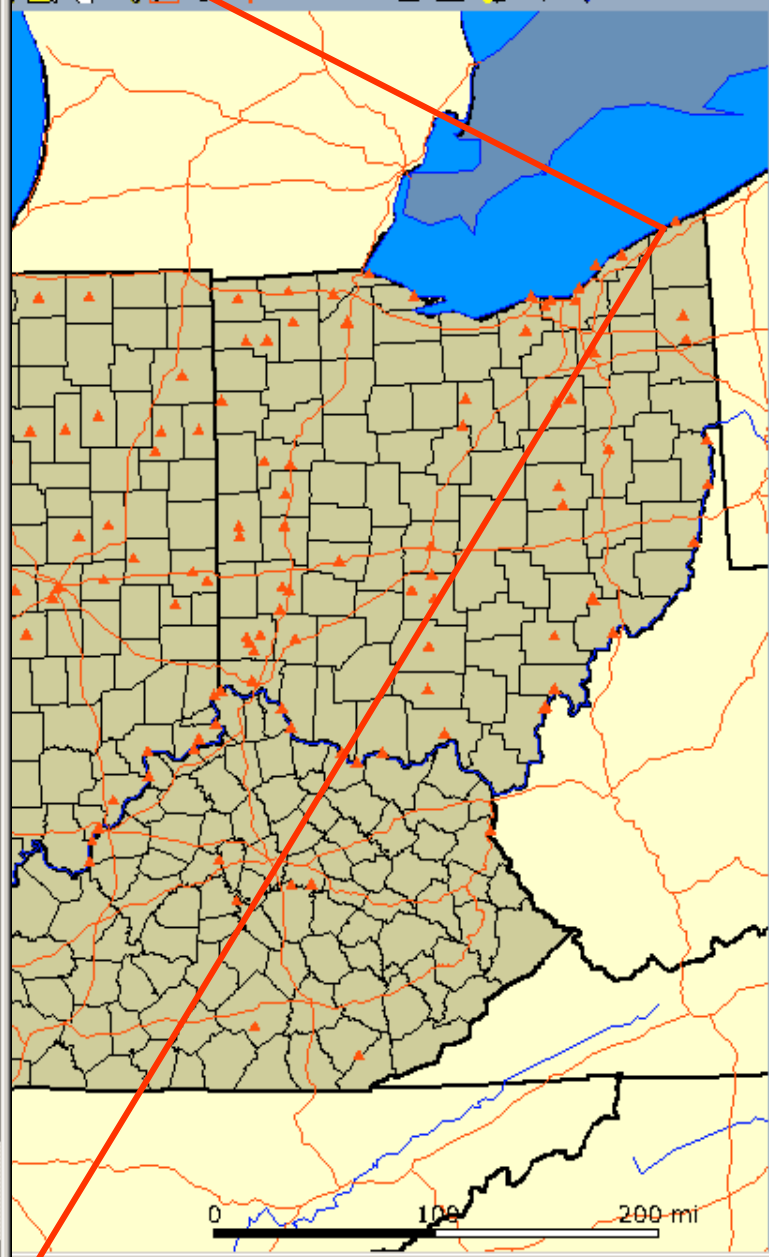
Select chart desired: [CO2](#) || [SO2](#) || [NOX](#) || [Mercury](#)

CO2 Tons



Data Type	Last year reported: 2002
CO2 (Tons)	1,404,020.70
SO2 (Tons)	4,153.40
NOX (Tons)	1.43
Mercury (lbs)	0.00

Part of the [MIDCARB](#) project
Programs Feb. 2003

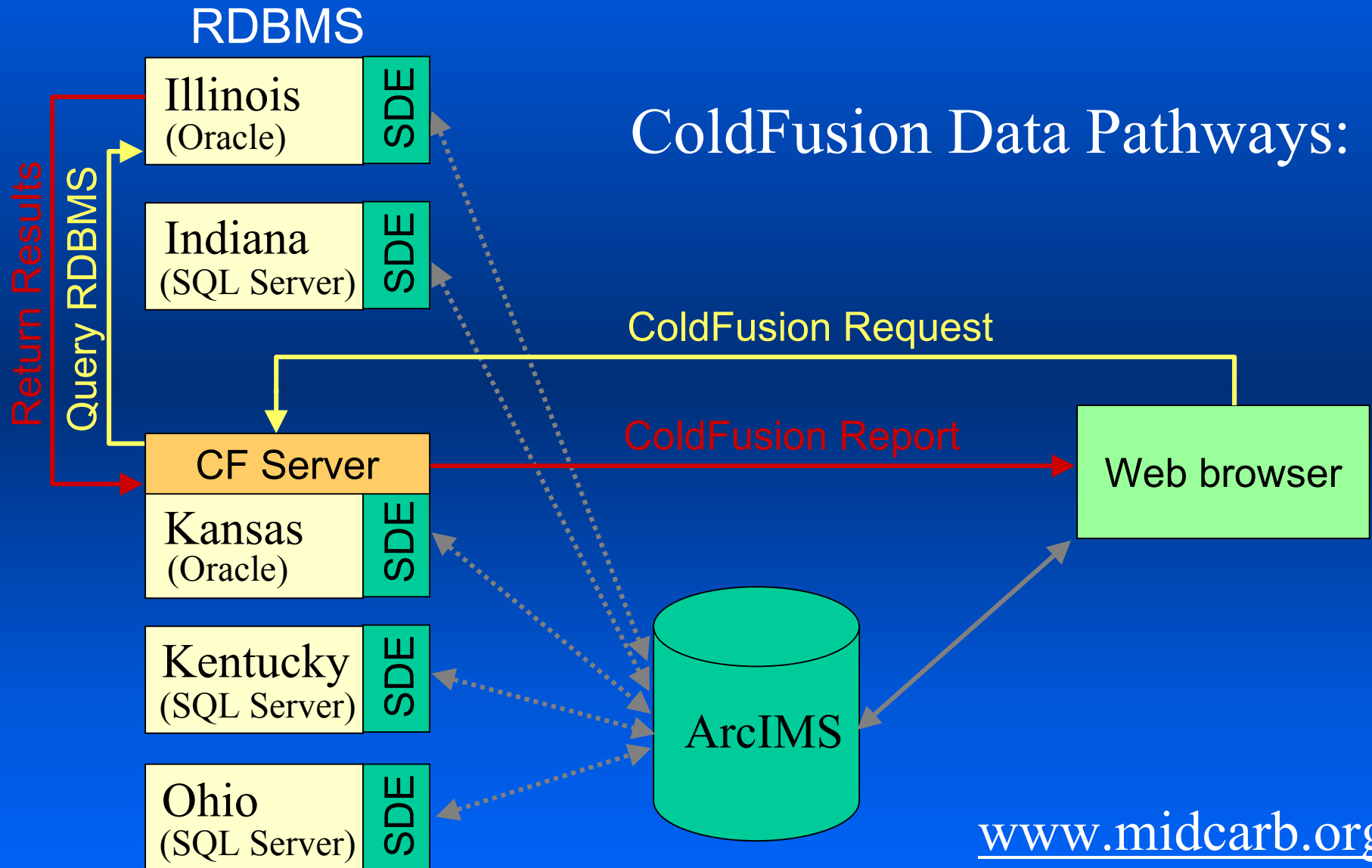


Home

Downloads

Data Integration

ColdFusion Data Pathways:



Midcarb Maps

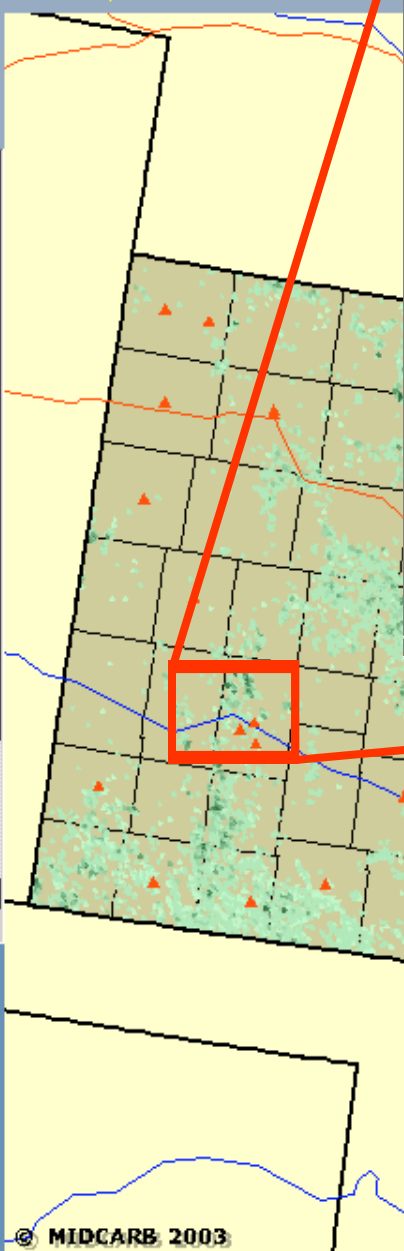
A Five State GIS Compilation

Map Layers

Select Active Layer

KS - CO2 Sources

- ☒ CO2 Sources
- ☐ Infrastructure
- ☐ Base
- ☒ Petroleum
 - ☐ IN - Petroleum Wells
 - ☐ KY - Petroleum Wells
 - ☐ KY - Petroleum Fields
 - ☐ IL - Oil and Gas Fields
 - ☐ IN - Oil and Gas Fields
 - ☐ OH - Oil and Gas Fields
 - ☐ KS - Oil and Gas Wells
 - ☐ KS OIL-GAS FIELD BOUNDARY
 - ☒ KS Cumulative Oil Product
 - ☐ KS Cumulative Gas Product

Tool mode: Zoom In
Active layer: IL - CO2 Sources

© MIDCARB 2003

Midcarb Maps

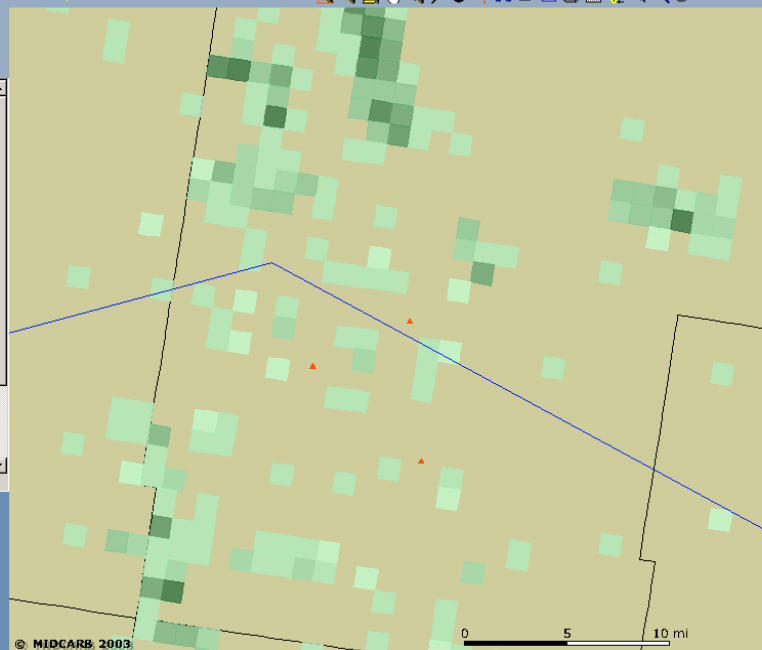
A Five State GIS Compilation

Map Layers

Select Active Layer

KS Cumulative Oil Pr...

- ☐ CO2 Sources
- ☐ Infrastructure
- ☐ Base
- ☒ Petroleum
 - ☐ IN - Petroleum Wells
 - ☐ KY - Petroleum Wells
 - ☐ KY - Petroleum Fields
 - ☐ IL - Oil and Gas Fields
 - ☐ IN - Oil and Gas Fields
 - ☐ OH - Oil and Gas Fields
 - ☐ KS - Oil and Gas Wells
 - ☐ KS OIL-GAS FIELD BOUNDARY
 - ☒ KS Cumulative Oil Product
 - ☐ KS Cumulative Gas Product

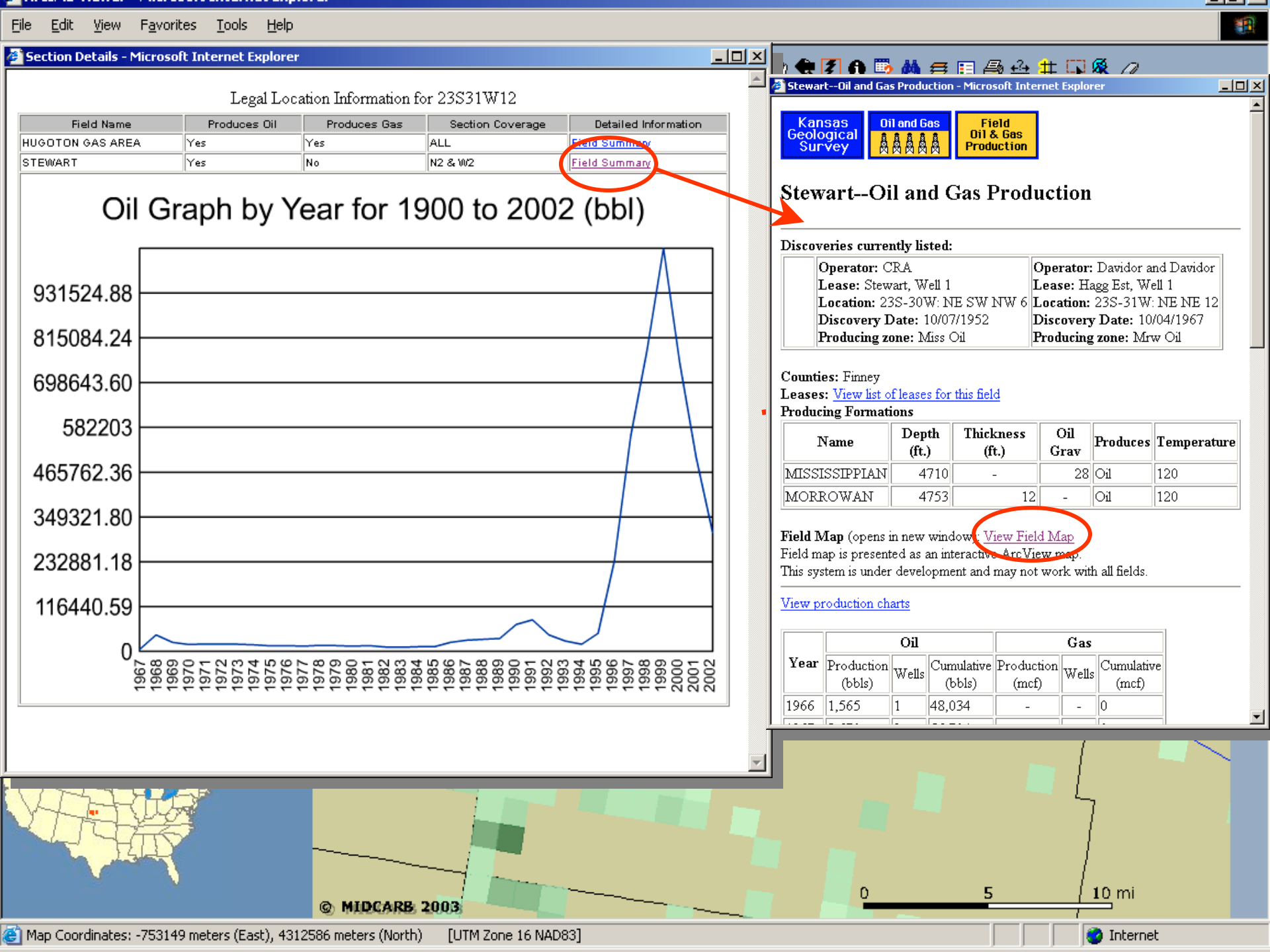
Tool mode: Zoom In
Active layer: IL - CO2 Sources

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Home

Downloads

Downloads



Oil and Gas



State of Kansas Geographic Information Systems Policy Board, Data Access and Support Center, and the Kansas Geological Survey.
Please email questions and comments on the field viewer to [Jeremy Bartley](#)



Kansas Oil and Gas Field Viewer

help

Overview Map



STEWART
MISSISSIPPIAN & MORROWAN
Produces Oil
Active
Legal Field Definition

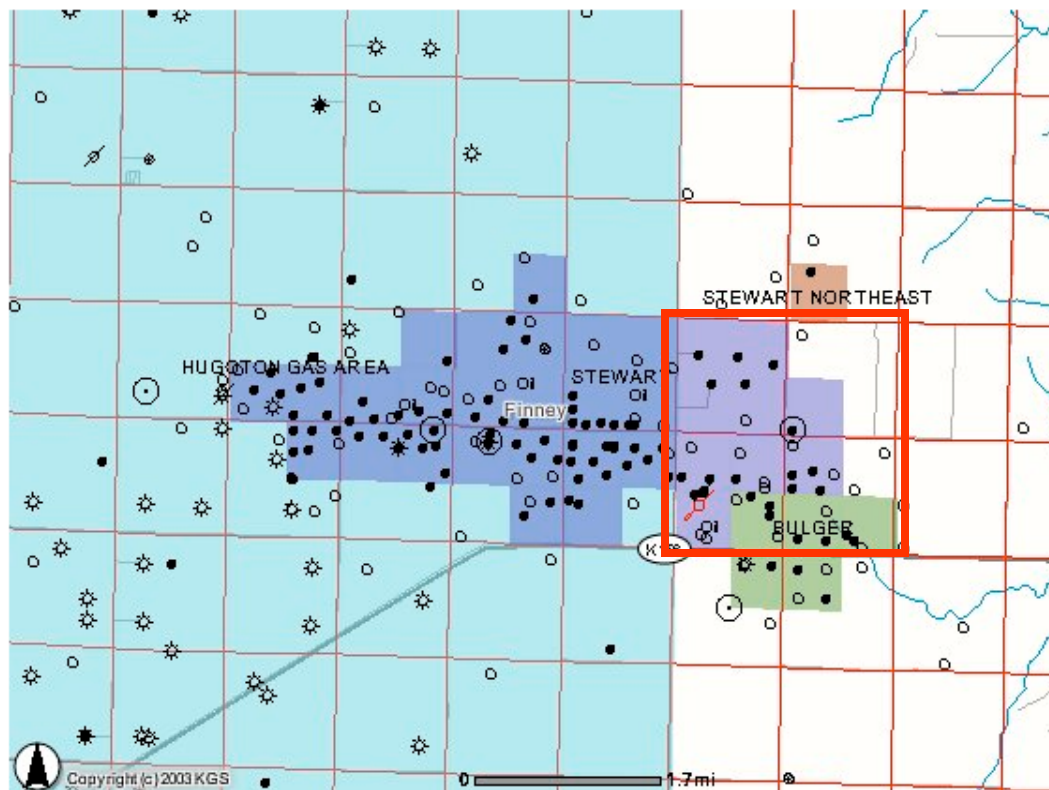


Legend

- PLSS
- Highways
- Interstate
- US Highway
- KS Highway
- Roads
- Rivers and Streams
- County Boundary



Zoom Level: ☒ Zoom In ☐ Zoom Out ☐ Pan
☐ Identify Field ☐ Identify Well | **Full Field Extent**



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Table of Contents

Visible

- ☐ Current Oil & Gas Wells (STEWART)
[Download Wells](#)
- ☒ Current Field (STEWART)
- ☐ Other Fields in Same Formation(s)
- ☒ All Fields in Area
- ☒ All Wells in Area
- ☒ PLSS
- ☒ Highways
- ☒ Roads
- ☒ Rivers and Streams
- ☐ Major Streams
- ☐ Water Bodies
- ☐ City Boundary
- ☒ County Boundary
- ☐ View Aerials
- ☐ View Topo

update map

Kansas Image Viewer - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Oil and Gas

State of Kansas Geographic Information Systems Policy

Kansas Oil and Gas Field Viewer

Overview Map

Zoom Level: 2

Identify Field

STEWART
MISSISSIPPIAN & MORROWAN
Produces Oil
Active
Legal Field Definition

Legend

- PLSS
- Highways
- Interstate
- US Highway

KGS--Oil and Gas Wells--Specific Well--15-055-20879 - Microsoft Internet Explorer

Address: http://abyss.kgs.ku.edu/pls/abyss/qualified.well_page.DisplayWell?_id=1006052757

KGS

Oil and Gas Well Database

Specific Well--15-055-20879

All Well Data

API: 15-055-20879
Operator: NORTH AMERICAN RES
Field: Stewart
Lease: WYLIE Well 5-1

Location: T23S R30W, Sec. 5, SW SW SW, 330 North, 4950 West, from SE corner
Longitude: -100.64468
Latitude: 38.07572
County: Finney

Spud Date: 26-SEP-1989
Completion Date: 23-NOV-1989
Plugging Date:
Status: OIL

Total Depth: 4950
Elevation: 2853 GL
Formation: ST. LOUIS LIMESTONE

Tops Data

Form.	Top	Base	Source	Updated
HEEBNER SHALE	4000		ACO-1	22-FEB-2000
HEEBNER SHALE	4000		ELOG-MM	06-SEP-2000
LANSING GROUP	4085		ACO-1	22-FEB-2000
LANSING GROUP	4085		ELOG-MM	06-SEP-2000
MARMATON GROUP	4515		ACO-1	22-FEB-2000
MARMATON GROUP	4515		ELOG-MM	06-SEP-2000
CHEROKEE GROUP	4620		ACO-1	22-FEB-2000
CHEROKEE GROUP	4620		ELOG-MM	06-SEP-2000
BASAL PENNSYLVANIAN LIMESTONE	4772		ACO-1	22-FEB-2000
MISSISSIPPIAN	4772		ELOG-MM	06-SEP-2000

Selected Wells - Microsoft Internet Explorer

Identify Results - Number of Records Found: 2

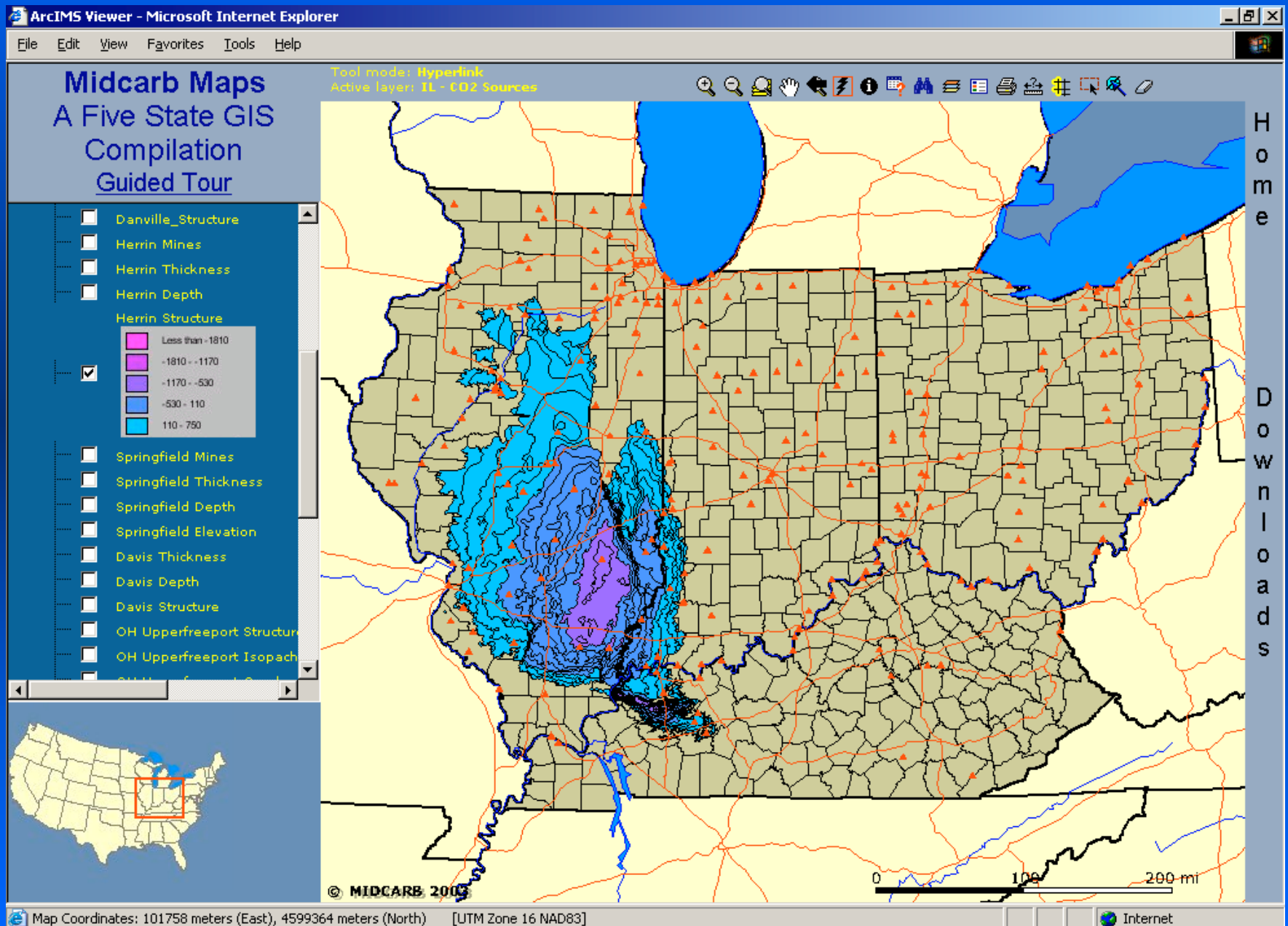
WELL KID	API NUMBER	LONGITUDE	LATITUDE	USPLS	STATUS	DETAIL INFO
1006052757	15-055-20879	-100.644680	38.075720	SWSWSWSW523S30W	OIL	WELL INFO
1027706181	15-055-20871	-100.644680	38.075720	SWSWSWSW523S30W		WELL INFO

Legend

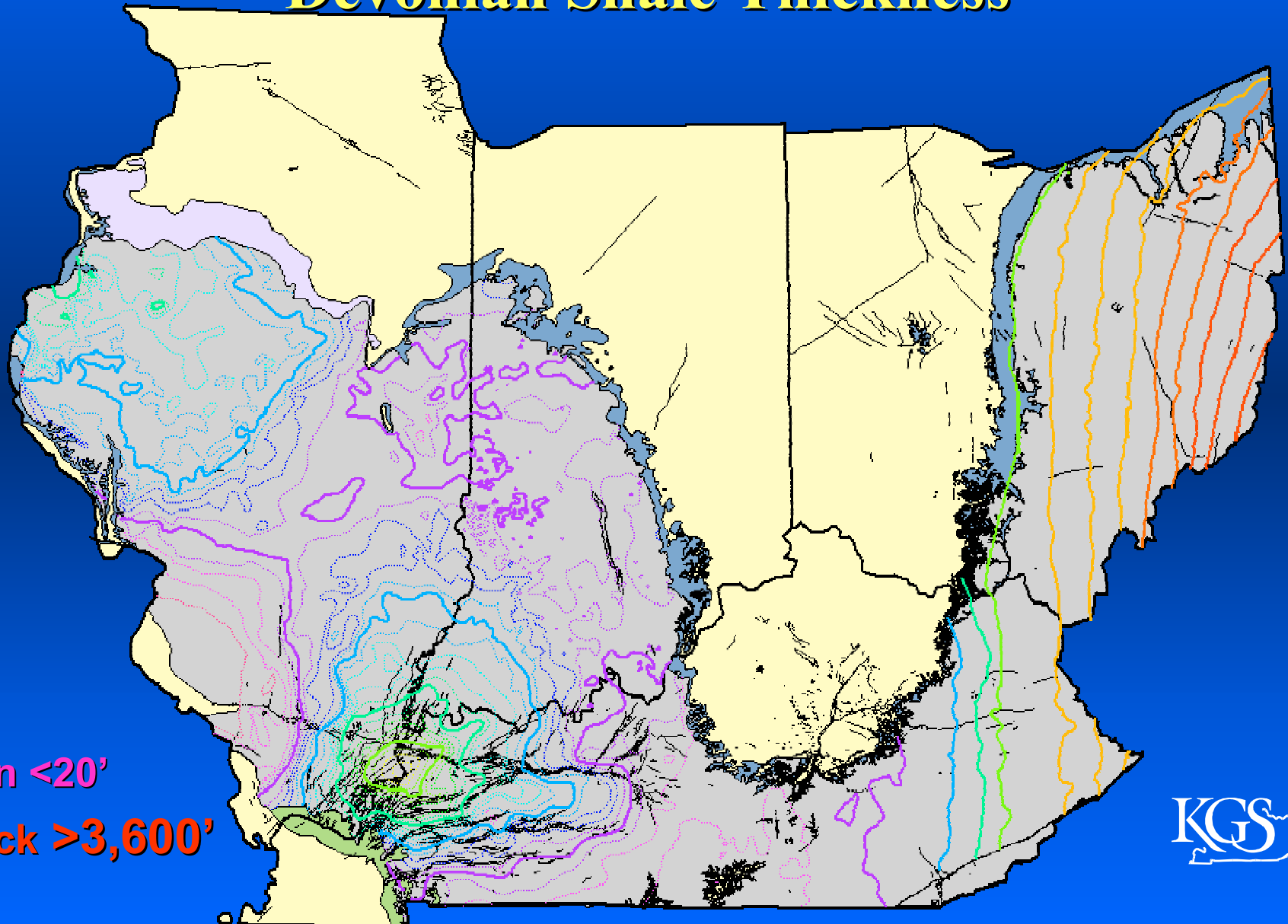
- ☒ Rivers and Streams
- ☒ Major Streams
- ☐ Water Bodies
- ☐ City Boundary
- ☒ County Boundary
- ☒ View Aerials
- ☐ View Topo

update map

Coalbed Structure Over Multiple States: Herrin



Unconventional Reservoir: Mississippian-Devonian Shale Thickness



Distributed Management

KGS IMS Basic Viewer - Microsoft Internet Explorer

Back Forward Stop Home Search Favorites History Print Copy Paste Help

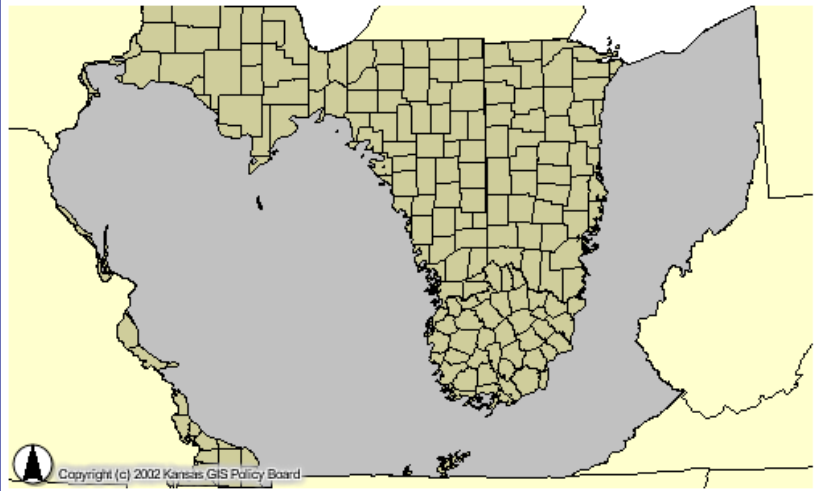
Midcarb ARCIMS Layer Manager

KarView MIDCARB_DYNAMIC MapService on neutrino [help](#) [reset](#) [more info](#)

Legend ?

- Devonian Shale Subsurface
- USA - States
- MIDCARB - Counties
- USA - Base

Zoom Level: 1.5 [?](#) ☒ Zoom In ☐ Zoom Out ☐ Pan
☐ Identify
☐ Full Extent



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Table of Contents ?

Visible

- ☒ USA_ESRIDASH_States
- ☒ MIDCARB_ESRIDASH_Counties
- ☒ USA_ESRIDASH_Base

Active Layer ?

USA_ESRIDASH_States

This Map Contains Data that is Scale Dependent.
Some data will not appear on the map until the User is zoomed in.

MIDCARB calculators

- CO₂ Properties
- Power Plant Locator
 - By State
 - By Facility type
 - By Air Emissions
- Sequestration Potential
 - In Oil Reservoirs
 - In Aquifers

CO2 Properties - Microsoft Internet Explorer

File Edit View Favorites Tools Help

MIDCARB Calculators

CO2 Properties

Click on "Update" button to refresh the calculations

Modify Reservoir Temperature and Pressure as required

Reservoir Temperature	120	°F
Reservoir Pressure	2000	psia
<input type="button" value="Update"/>		
Density	42.29	lb/ft ³
Compressibility Factor	.3345	
Sonic Velocity	1046.2	ft/s
Viscosity	.05169	cP
Volume Factor	.4885	bbl/scf
Phase	Dense Vapor	

Data on CO2 Properties from
Practical Aspects of CO2 Flooding, SPE Monograph
Appendix F

Kansas Geological Survey
Comments to webadmin@kgs.ku.edu
URL=<http://www.kgs.ku.edu/Magellan/Midcarb/cc>
Programs Updated April 21, 2003

Done

Sequestration Volume in Metric Tonnes and MCF - Microsoft Internet Explorer

File Edit View Favorites Tools Help

MIDCARB Calculators

Sequestration Volume in Metric Tonnes and MCF

Click on **any** "Update" button to refresh all of the calculations.

Step 1--Modify Reservoir Temperature and Pressure as required.

Reservoir Temperature	120	Degrees F
Reservoir Pressure	2000	psia
<input type="button" value="Update"/>		

Step 2--Reservoir Volumetrics.
Enter reservoir parameters or skip to step 2a.

Reservoir Thickness	10	feet
Reservoir Area	640	acres
Porosity	10	%
Sequestration Volume	535,899	metric tonnes
<input type="button" value="Update"/>		

Step 2a--Replacement of Produced Fluid (Oil).
Enter produced fluid.

Barrels Produced	1000	MBO
CO2 Sequestered	108.0	tonnes*1000
	2.0	MMCF

Internet

Future of MIDCARB

- Improve Data and Coverages
- Move to support
 - Open GIS Consortium/Web Map Service (OGC/WMS)
 - XML and other open access tools
- Improve Distributed Management Tools
 - Multiple Servers (Hand-Off to Local Server)
- Modify the current MIDCARB Internet Map Server to support additional states.

Future of MIDCARB?

