The Practice of GIS in Indiana

Indy Py

April 10, 2018

Jim Sparks & Kavya Ravichandra

The Polis Center

The Polis Center

Jim Sparks

- County gov: 2 yrs.
- State gov: 3 + 10 yrs.
- University: 3 yrs.
- Private sector: 25 yrs.

- B.S. in Business Administration
- M.S. in Management

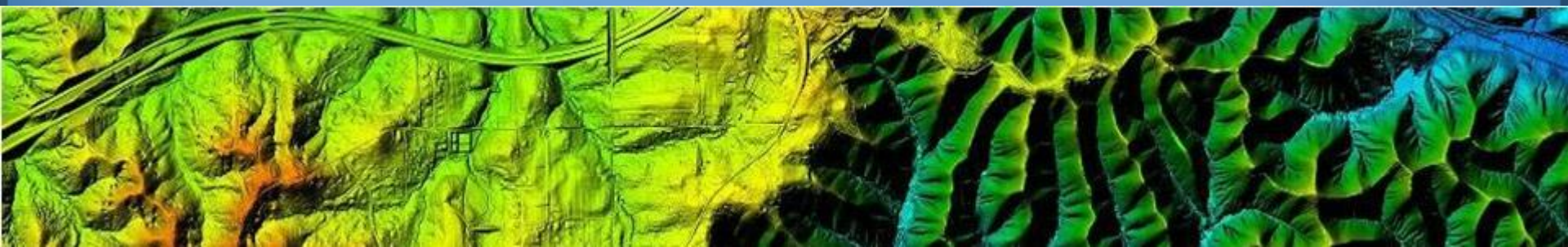
- Survey crew rodman
- Civil engineering draftsman
- County cartographer
- Computer aided mapper
- GIS Administrator
- Project manager
- GIS consultant
- GIO

AGENDA

- Governance
- Projects
- The Benefits of GIS
- Lessons Learned
- Values and Observations
- Python and GIS
- Questions and Discussion

- ✓Facilitate GIS data cooperation
- ✓Integrate GIS data into the statewide base map
- ✓Develop and maintain statewide data layers
- ✓Provide public access to GIS data

GOVERNANCE



I.C. 4-23-7.3 Indiana GIS Mapping Standards

IC 4-23-7.3-13 (7/1/2007)

State GIS officer; appointment; qualifications

(a) The governor shall appoint an individual as the state GIS officer.

(b) The individual appointed by the governor must be an experienced geography and mapping professional who has:

(1) extensive knowledge of the principles, practices, terminology, and trends in GIS, spatial data, analysis, and related technology; and

(2) experience in administration, project management, policy development, coordination of services, and planning.

I.C. 4-23-7.3 Indiana GIS Mapping Standards

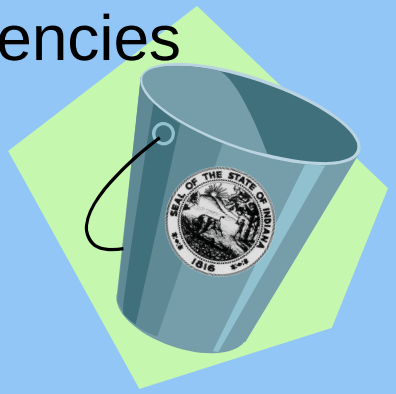
Coordinate GIS Efforts

Integrate Data

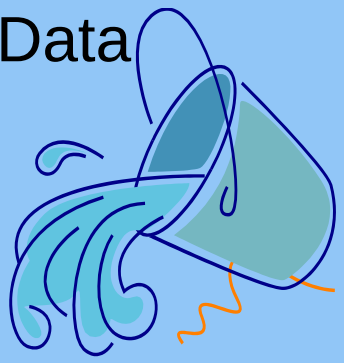
GIO Responsibilities

Create New Data

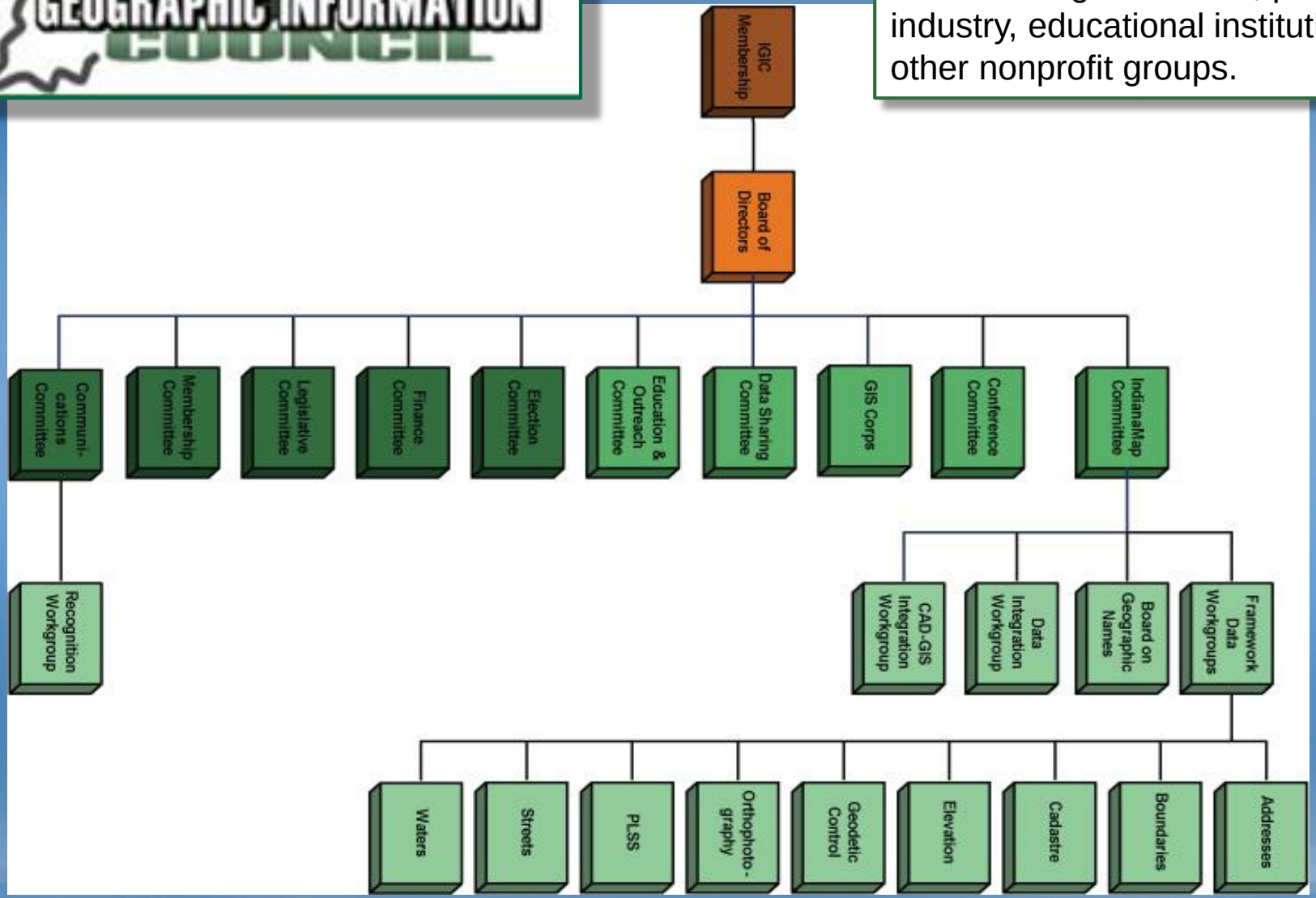
Serve as GIO for State Agencies



Distribute Data



The Indiana Geographic Information Council (IGIC) is a nonprofit membership organization of GIS users, professionals and educators. Its membership includes individuals from all levels of government, private industry, educational institutions and other nonprofit groups.



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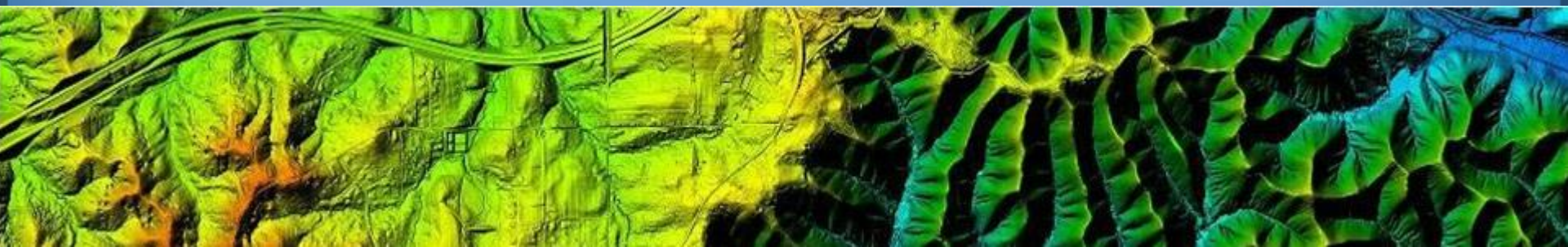
INDIANA STATEWIDE IMAGERY & ELEVATION PROGRAM

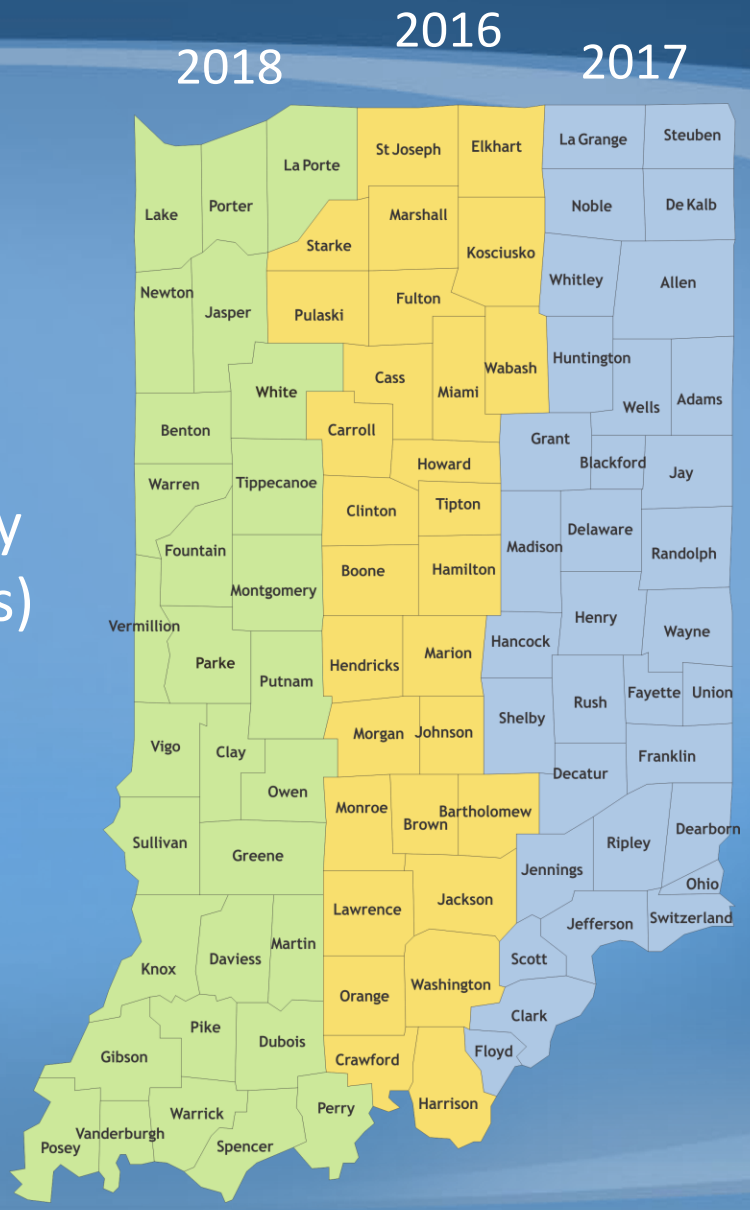


Indiana Statewide Program

First Statewide Orthoimagery Project: 2005 (9-11 Funds)

Second Statewide Orthoimagery Project: 2011-2013 (DREF Funds)

Third Statewide Orthoimagery Project: 2016-2018 (Indiana Modernization Fund)



2016-2018 Indiana Statewide Program

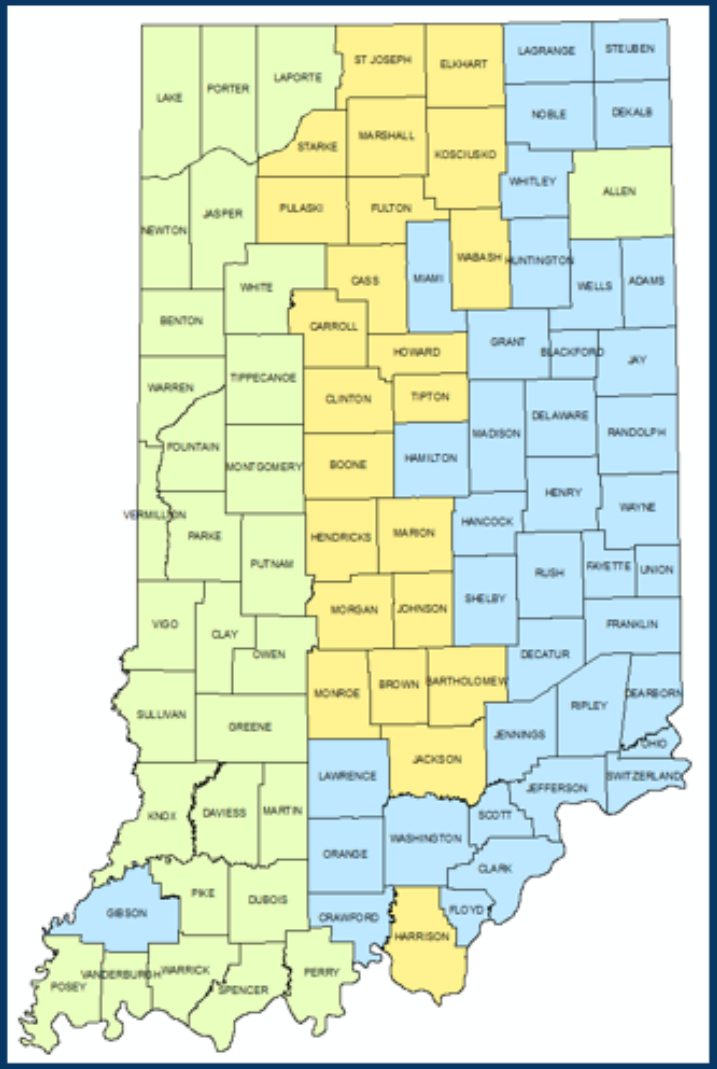
- Administered through Geographic Information Office, Indiana Office of Technology.
- The IGIC's Orthophotography workgroup will assist with the preparation of a new RFP.
- Base Products
  - Leaf-off, 1-foot (30-cm) Pixel Resolution
  - 4-Band Imagery (R,G,B, NIR)
  - Seamless GeoTIFF Tiles

2016-2018 Indiana Statewide Program

- The orthoimagery products will be reviewed by the photogrammetry team from INDOT prior to final delivery.
- Buy-up options will be available to Indiana counties and cities

Indiana Imagery Project Buy-ups

2018 *2016* *2017*



2016 Buy-ups

Fulton Co (6-inch ortho)
Harrison Co (6-inch ortho)
Jackson Co (6-inch ortho)
Kosciusko Co (6-inch ortho)
Monroe Co (6-inch ortho)
Morgan Co (6-inch ortho)
Wabash Co (6-inch ortho)

2017 Buy-ups

Dearborn Co (6-inch ortho)
DeKalb Co (6-inch ortho)
Gibson Co (6-inch ortho)
Shelby Co (6-inch ortho)
Steuben Co (6-inch ortho)
Wayne Co (6-inch ortho)
Wells Co (6-inch ortho)
Hamilton Co (3-inch ortho)
City Shelbyville (3-inch ortho)

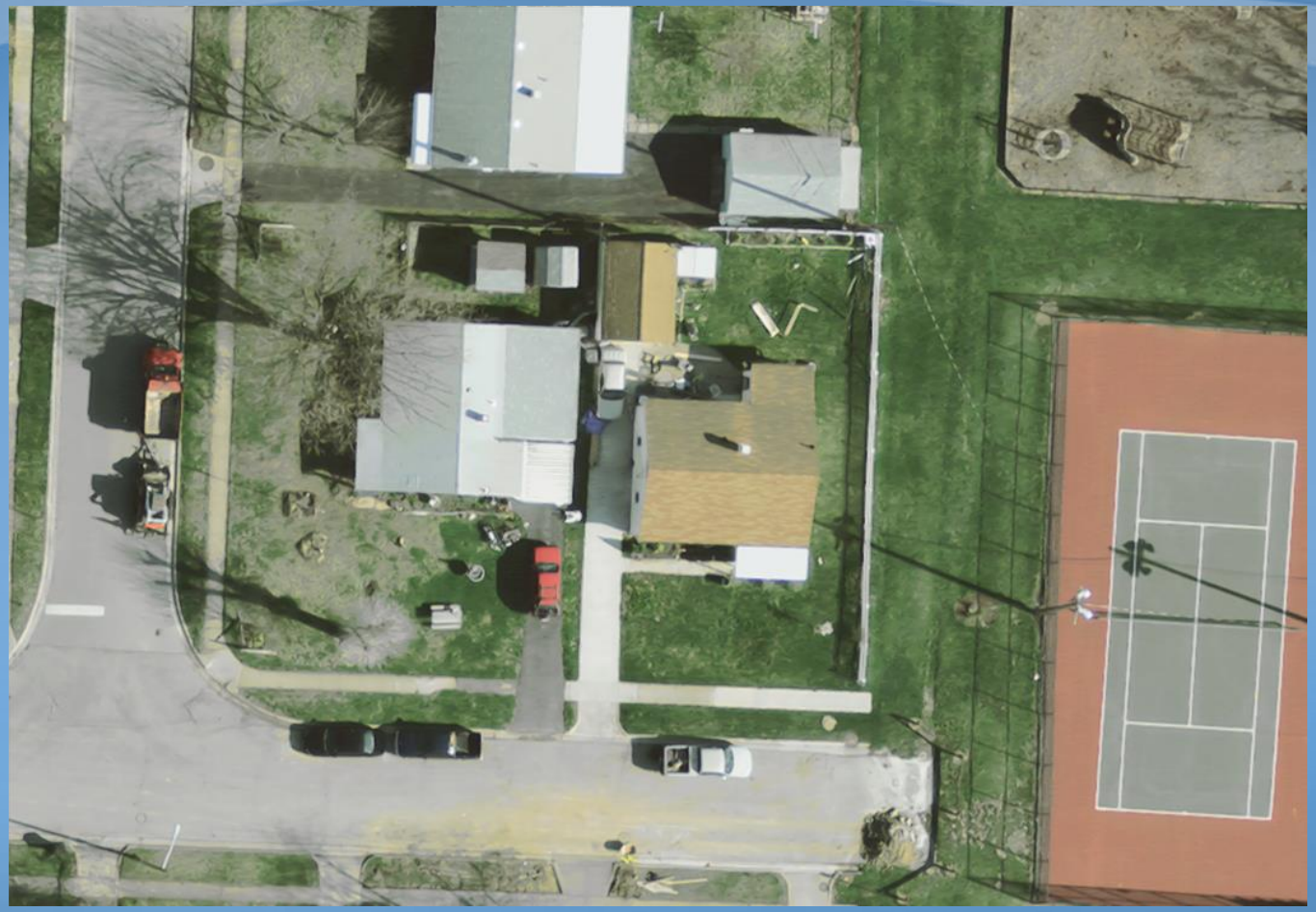
2018 Buy-ups

Allen Co (6-inch ortho & building outlines
Dubois Co (6-inch ortho)
Hancock Co (2’ Contours)
Huntingburg (3-inch ortho)
Lake Co (6-inch ortho)
Porter Co (6-inch ortho)
Putnam Co (6-inch ortho)
Vanderburgh Co (3-inch ortho)

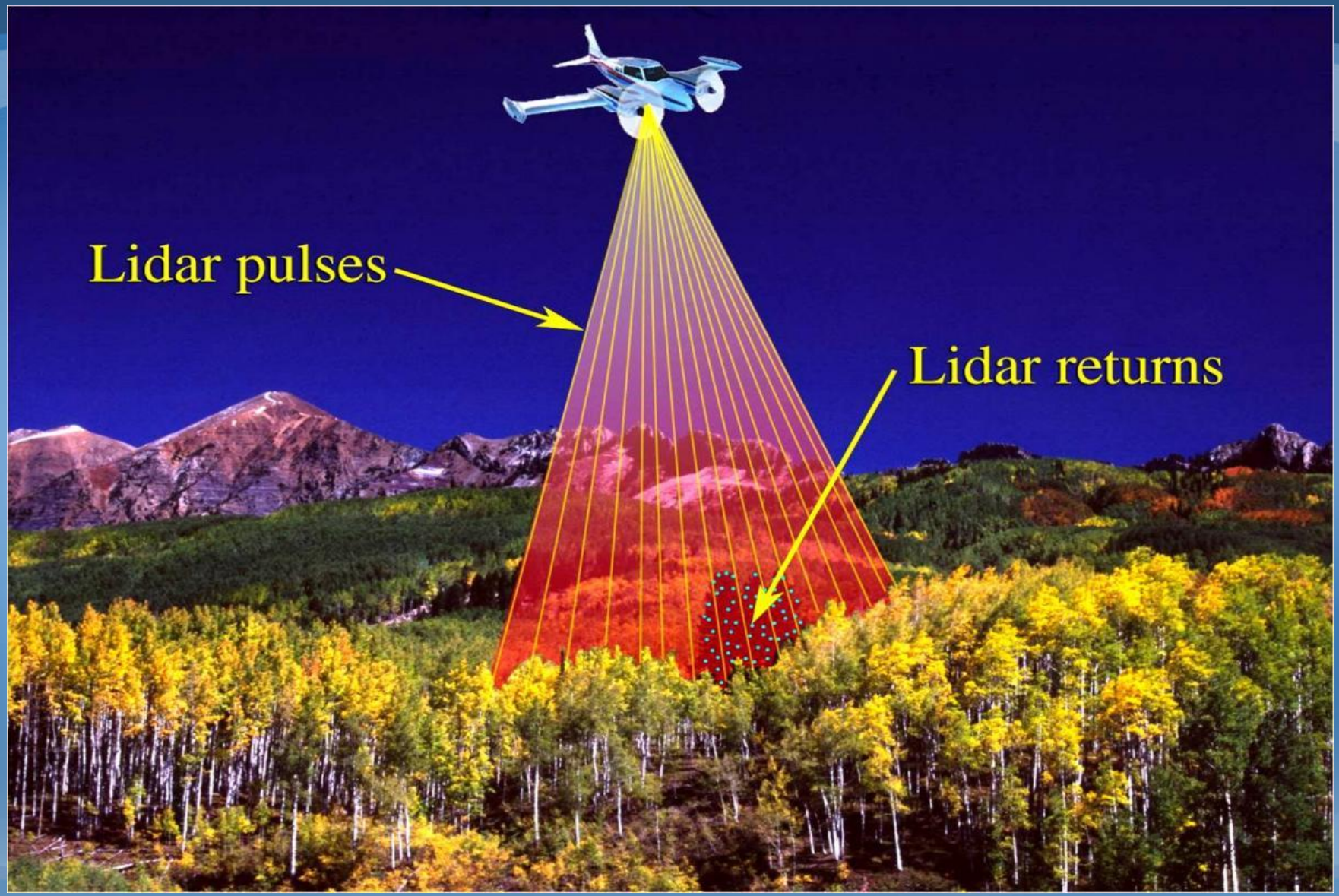
2016-2018 Indiana Statewide Program

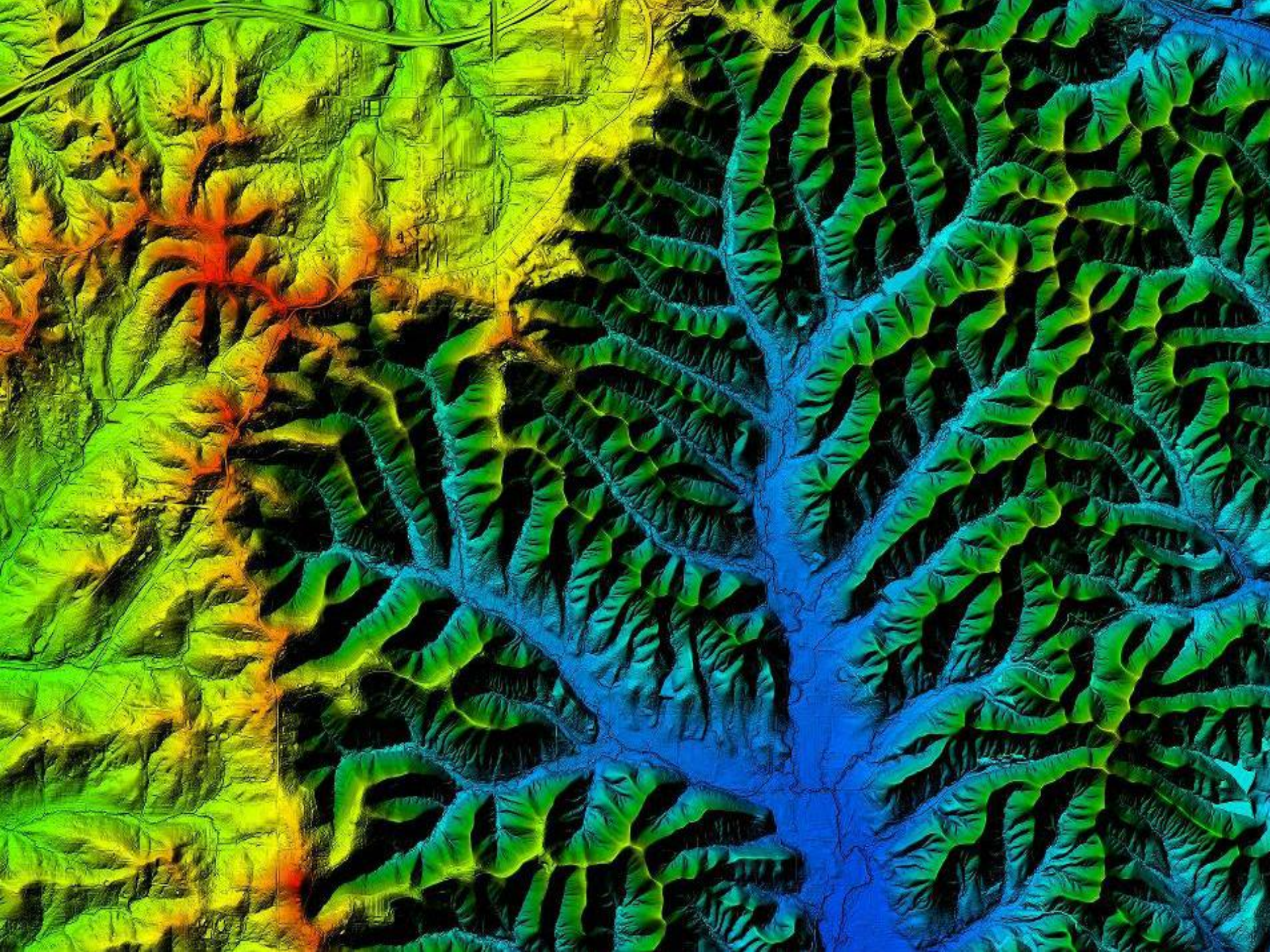
- The Indiana Geographic Information Office will receive a copy of all products purchased from this contract and will make these products available to the public.

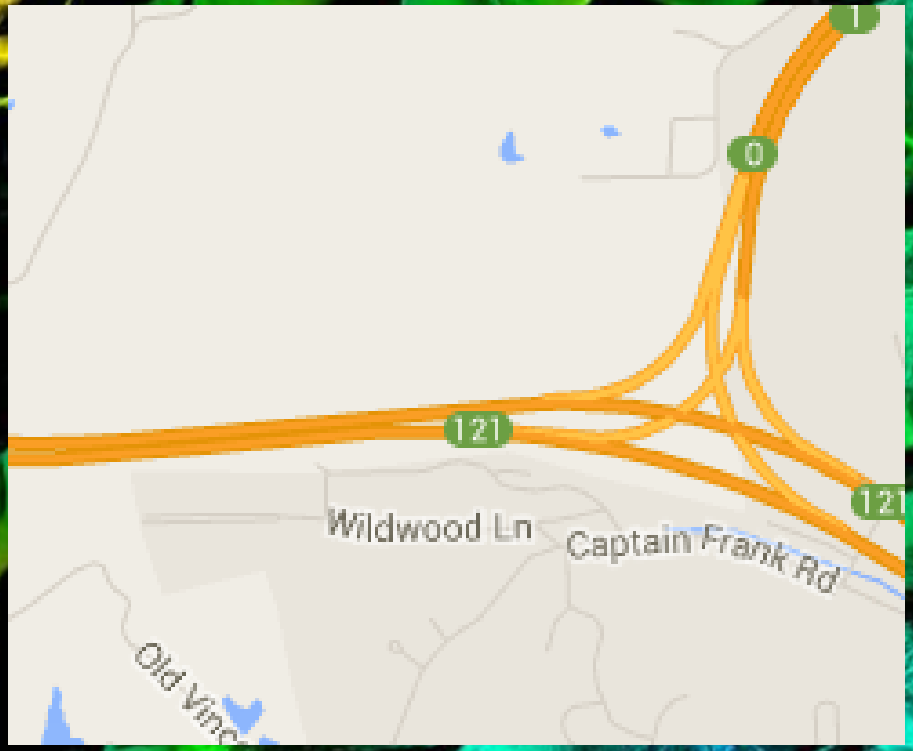
Orthoimagery: Optional Resolution 3-inch



LiDAR (Elevation Data)







Redline Markups
Hydro Lines
Hydro Polygons
Floyd County
Floyd LiDAR IMG

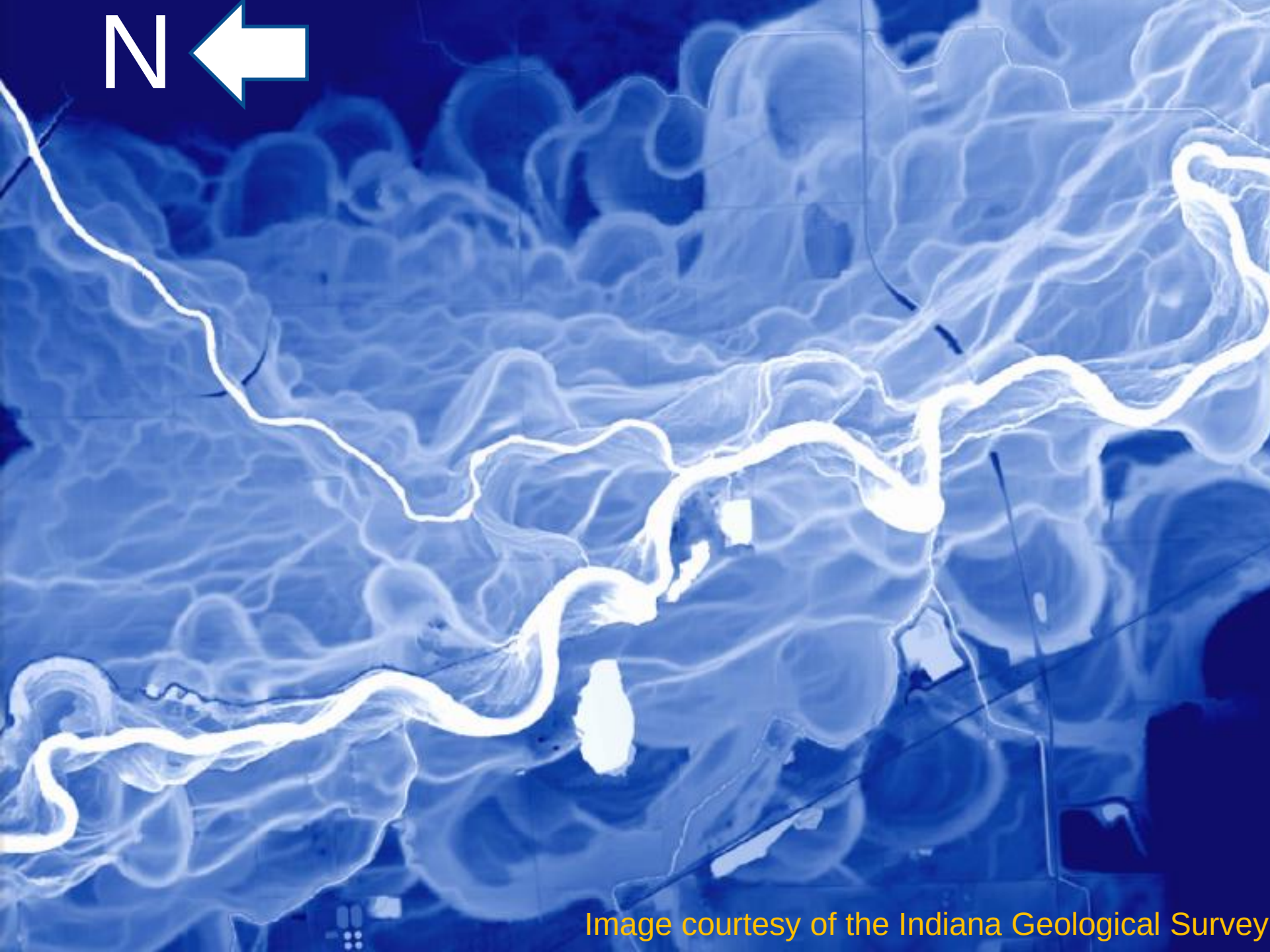
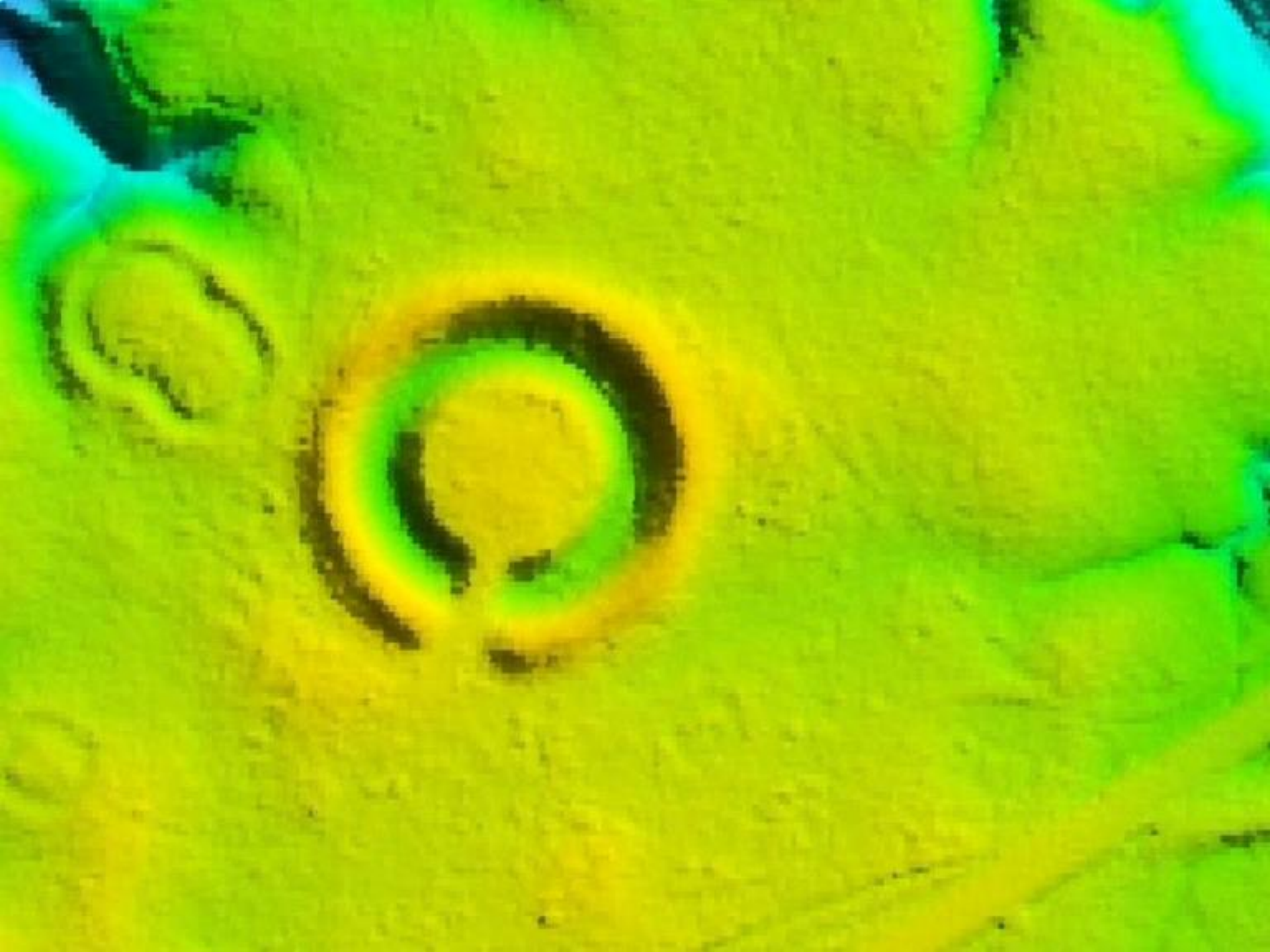


Image courtesy of the Indiana Geological Survey



Mobile Terrestrial LiDAR

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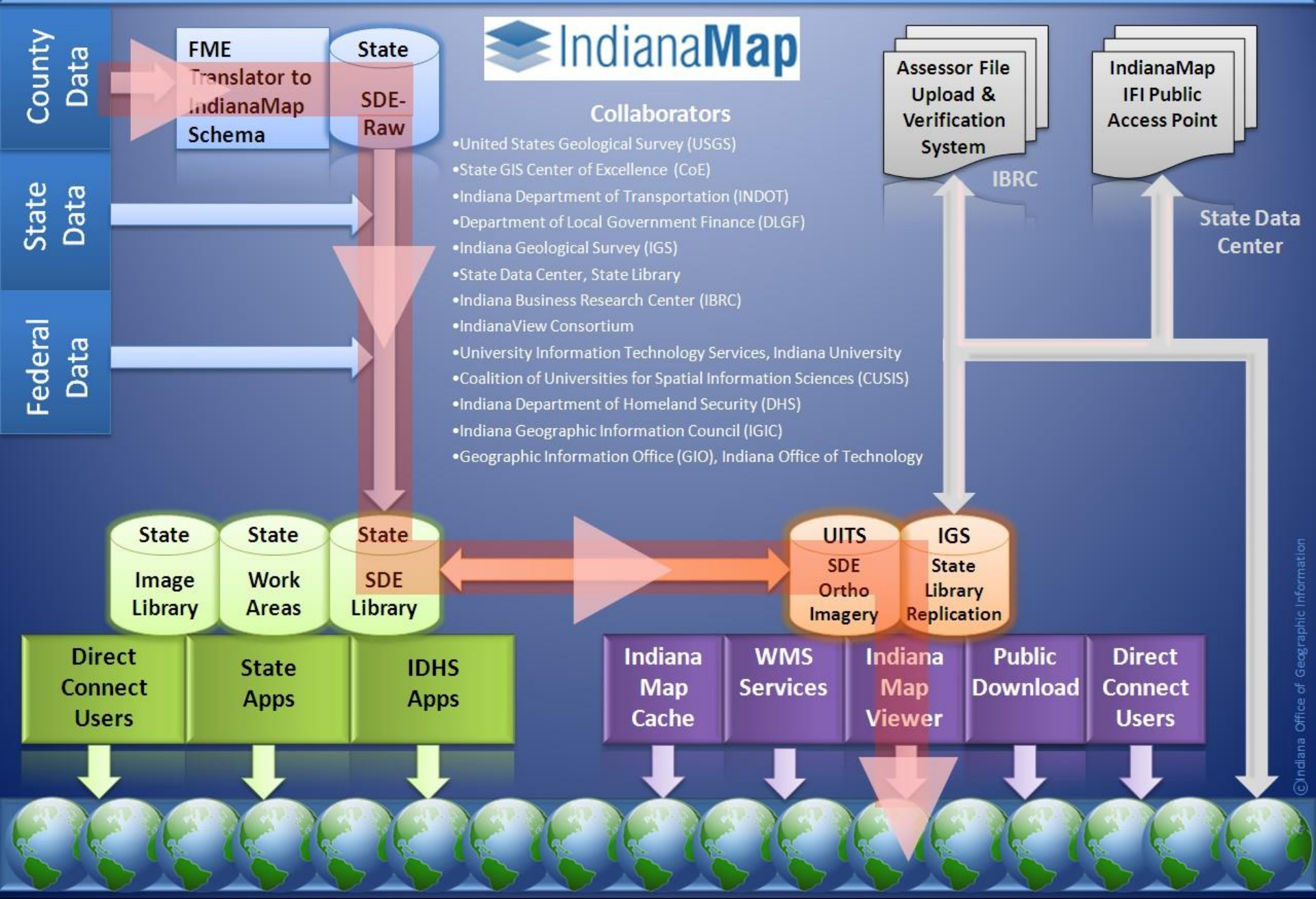
DATA SHARING INITIATIVE

IndianaMap Integration & Distribution



Indiana Geospatial Data Sharing

- Letters were sent to all Indiana County Commissioners 7/2008 inviting county participation to create statewide layers for:
  - Land Parcels
  - Point addresses
  - Road Centerlines with address ranges
  - Local Administrative Boundaries
- First county agreed to participate 8/2008
- 92nd (last county) agreed to participate 4/2014

Indiana Geospatial Data Sharing

Color Code:

 Undecided

 Agreed to participate

 Decided not to participate

IndianaMap Data Sharing Initiative

July 14, 2008

01

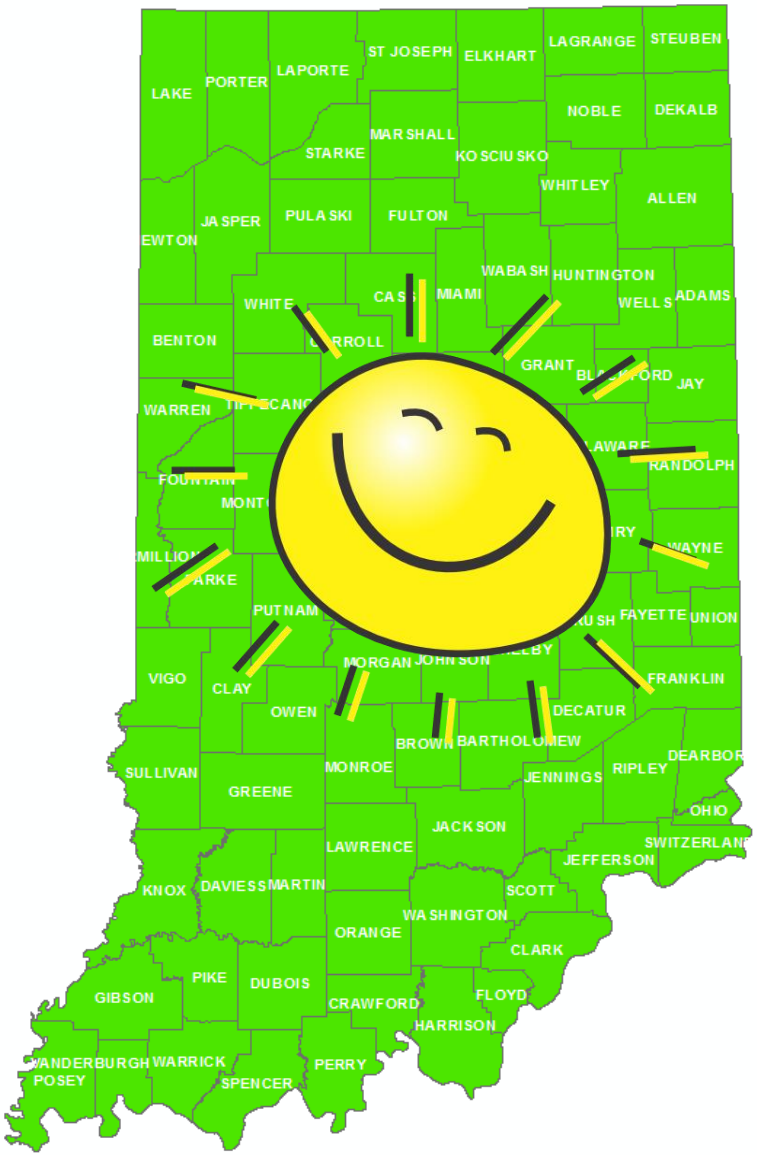
IndianaMap Data Sharing Initiative

10/20/2014

91

Dare To Dream!

April 6, 2015



92

Dare To Dream!

Data Sharing Initiative Status

- 92 Counties have shared GIS data
- 6,725 Jurisdictional Boundaries
- 599,436 Street Centerlines Segments
- 2,952,065 Address Points
- 3,158,230 Land Parcels

Can be viewed or downloaded from the IndianaMap

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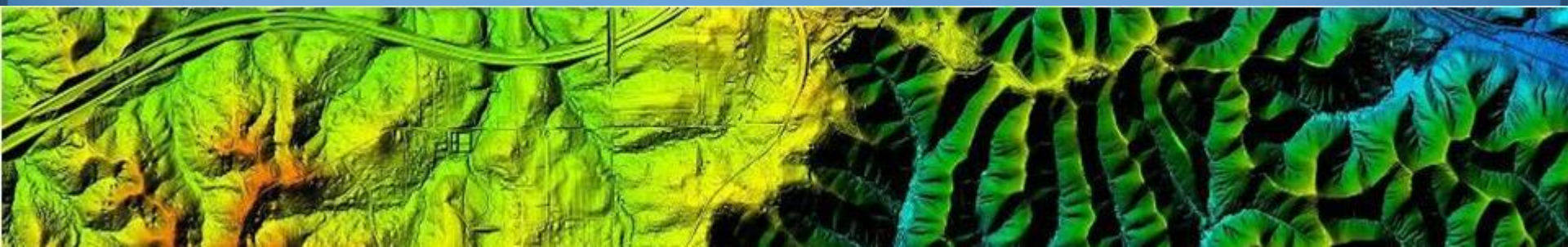
BENEFITS



The Benefits of Sharing "Where"

The realization is growing that almost everything that happens in a public policy context also happens in a geographic one: transportation planners, water resources studies, education subcommittees, redistricting boards, planning commissions and crime task forces all must consider questions of ***where****, along with the usual ones of* ***how****, and* ***why****, and how much will it cost.* ***GIS, by answering the first question, helps to answer the others.***

-R.W. Greene, GIS in Public Policy ESRI Press, Redlands, CA. June 2000. p. xii.

Benefits Related to Public Health and Safety

When agencies share data, lives are saved and public offices become more efficient. Sharing data encourages collaboration among agencies, provides for informed decision-making and reduces redundancy of data production. Further, planning and policy groups become better informed, particularly in terms of emergency calls and disaster response. We can be proud that all 92 counties are now sharing their map data, a major milestone that will benefit all Indiana taxpayers. - David Vice, Executive Director of the Indiana Integrated Public Safety Commission

Access to reliable local GIS data is vital to helping us understand how our communities and economy are growing and changing and enable us to make more informed decisions in our economic development strategy and efforts.

-Tim Monger President/CEO
Hamilton County Economic Development Corporation

Benefits of Open Data

Recent Deloitte study:

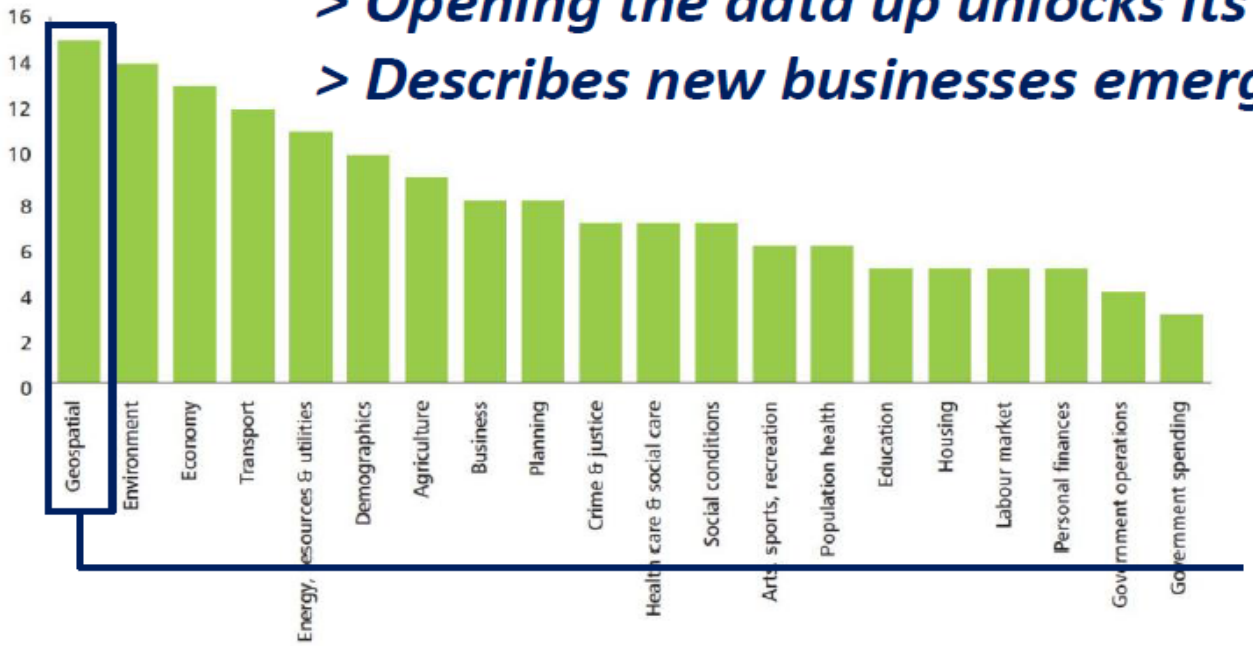
Open Growth:

"Stimulating Demand for Open Data in the UK"

> Data is the 'raw material' of the 21st Century;

> Opening the data up unlocks its full potential;

> Describes new businesses emerging;



Which categories of open data are most widely applicable to the most sectors?

#1 Geospatial data

Source: Deloitte LLP/ODI analysis


Consulting
Boundaries
Local Government
Economic Development
Surface Waters
Assessment
Survey
Topo
Parcels
Economic¬ Development
Public Works
Mapping
State Government
Tree Canopy
Utilities
Steel Mills
Lake Michigan
Biology
Refineries
Planning
Erosion
Forestry
Modeling
Resources
Public Safety
County
Natural Habitat
Soils
Parks
Archaeology
City
Tribal Land
Shovel Ready
Public Health
Pollution
Land Survey
Grant Funding
Habitat
Dams
Oil
Landscape Architect
Military
Land Use
Outdoor Recreation
Land Cover
Dispatch
Research
Sewer Utilities
Water Resources
Geology
Impervious Surfaces
Coastal
Mining
Super Bowl
Shoreline
Public Information
GPS
Inventory
Education
Field Inventory
Rescue
Planimetrics
Town
Bathymetry
Art
Water
Airports
Drainage
Redevelopment
Judicial
Canine
Federal Government
Conservation
Flooding
Hydrology
Water Quality
Fertilizer
Water Wells
Environment
Contours
Wind
Surface Water
Real Estate
Consultant
Endangered Species
Storm Water
Wetlands
Models
Modernization
Design
Site Development
Watersheds
Field Verification
Transportation
Energy
Emergency Response
Development
Natural Resources
Engineering
Agriculture

Return on Investment

"86% of users stating they could not do their projects without it."

TOP 10 SECTORS USING THE INDIANAMAP

Mapping departments within local and state government, education, non-profits and private industry use geographic information systems map data every day. In a survey of the Economic Benefits of the IndianaMap, 312 respondents told how they use it. Here are the top ten use-areas among the public and private sector—

01 TRANSPORTATION

For trains, planes and automobiles there are numerous government agencies, surveying and engineering firms, and community organizations who use the IndianaMap for proposed transportation routes, environmental assessments, infrastructure management, airport and roadway improvements, maintenance, accident locations, new facilities, emergency response and evacuation, state and federal reporting requirements, and system-wide transportation management

02 UTILITIES

Public and private utilities use the IndianaMap in their customer billing systems, routing meter-reading and inspections, lead-testing, infrastructure planning and improvement, "call before you dig" locations, and emergency response

03 NATURAL RESOURCES

Public, private, and non-profit organizations use the IndianaMap on a daily basis to protect endangered species and habitat, manage natural resource exploration and exploitation, protect the public from natural hazards such as flooding and earthquakes, manage wildlife for hunting and fishing, maintain parks and facilities, and manage forests, fish and wildlife for the benefit of all Hoosiers

04 ECONOMIC DEVELOPMENT

We may not know when the next major corporation is looking at Indiana for their new home, but with the IndianaMap they can quickly see why the Hoosier state stands out; Indiana's economic developers use the IndianaMap to locate sites for potential development, plan tax incentive zones, clear regulatory requirements, help existing businesses, and attract new business for a growing economy

05 ENGINEERING/SURVEYING

Whether used for preliminary survey work, evaluating impacts to home owners, or managing construction phases, the IndianaMap saves hundreds of thousands of dollars when new developments are planned, bridges built, levees are constructed, pipelines are routed, and much, much more

06 PLANNING/LAND USE

Communities and planning organizations use the IndianaMap to visualize land use patterns and trends, zoning, plan developments, acquire state and federal grants, and improve quality of life factors as part of "smart growth" initiatives; developers, assessors, and real estate professionals use it to look at current the landscape and changes over time

07 INFRASTRUCTURE

From bridges to telecommunications, communities use the IndianaMap to assess and maintain their infrastructure, including Governmental Accounting Standards Board (GASB) reporting requirements

08 ENVIRONMENTAL

Government agencies entrusted with the responsibility of protecting our environment use the IndianaMap to track and manage regulated facilities and on-the-ground hazards, improve the environment through remediation, conservation, and preservation, and to communicate with citizens; private and non-profit organizations use the same consistent map information for conservation and preservation, and to assure environmental compliance within areas of new development, existing sites, and areas of concern

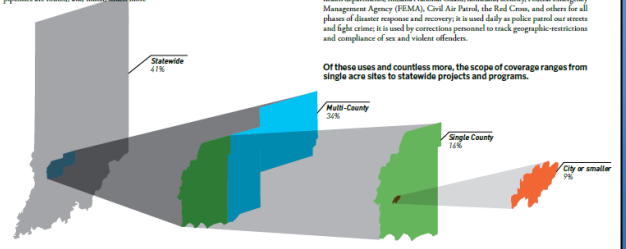
09 WASTEWATER/STORMWATER

From flooding, to community growth, to modernizing outdated sewer overflows and protecting public health, utilities and communities use the IndianaMap to see where the water goes and manage the impact of that flow

10 PUBLIC SAFETY

The IndianaMap saves lives—it helps quickly get emergency responders to where they need to go; as an interoperable communications tool it is used for community preparedness, examining locations of shelters, warning sirens, population concentrations, critical infrastructure, and local resources; it is used by police, fire, hospital, health departments, Indiana National Guard, homeland security, Federal Emergency Management Agency (FEMA), Civil Air Patrol, the Red Cross, and others for all phases of disaster response and recovery; it is used daily as police patrol our streets and fight crime; it is used by corrections personnel to track geographic-restrictions and compliance of sex and violent offenders.

Of these uses and countless more, the scope of coverage ranges from single acre sites to statewide projects and programs.



$1.7 BILLION SUPPORTED BY THE INDIANAMAP

Hoosiers Stand to Gain

by JILL SALIGOE-SIMMEL, PH.D.

POSITIVE RETURN REALIZED IN UNDER 3 YEARS

34:1 RETURN ON INVESTMENT

IndianaMap Orthophotography Proves Its Worth As Good Investment of Public Funds

by JILL SALIGOE-SIMMEL, PH.D.

http://www.igic.org/projects/indianamap/IndianaMapNews.pdf

IndianaMAP

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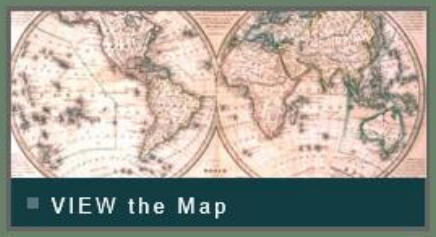
THE INDIANAMAP



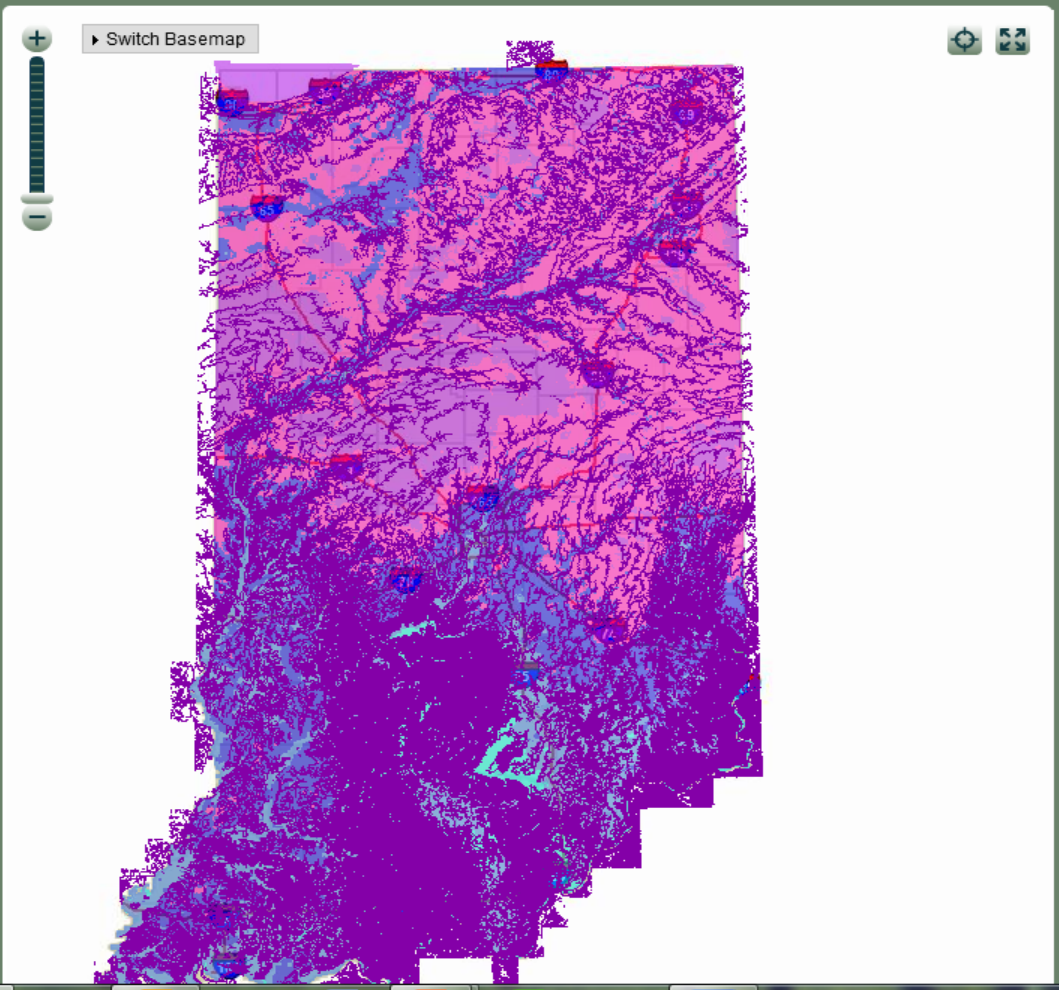
The IndianaMap

- maps.indiana.edu
- 270 Data Layers about Indiana
- Can be downloaded, most can be streamed as services
- Each layer has associated metadata
- A built in viewer is also available

Indiana Wind Speed and Power Map

Map showing elevation contours and wind speed and power at 50 and 100 meters above the ground

Locate an address



Legend | About

Layers

- [x] Elevation_Contours_24k_USGS
- [x] Wind_Speed_50m
- [ ] Wind_Speed_100m
- [ ] Wind_Power_50m
- [ ] Wind_Power_100m

Legend

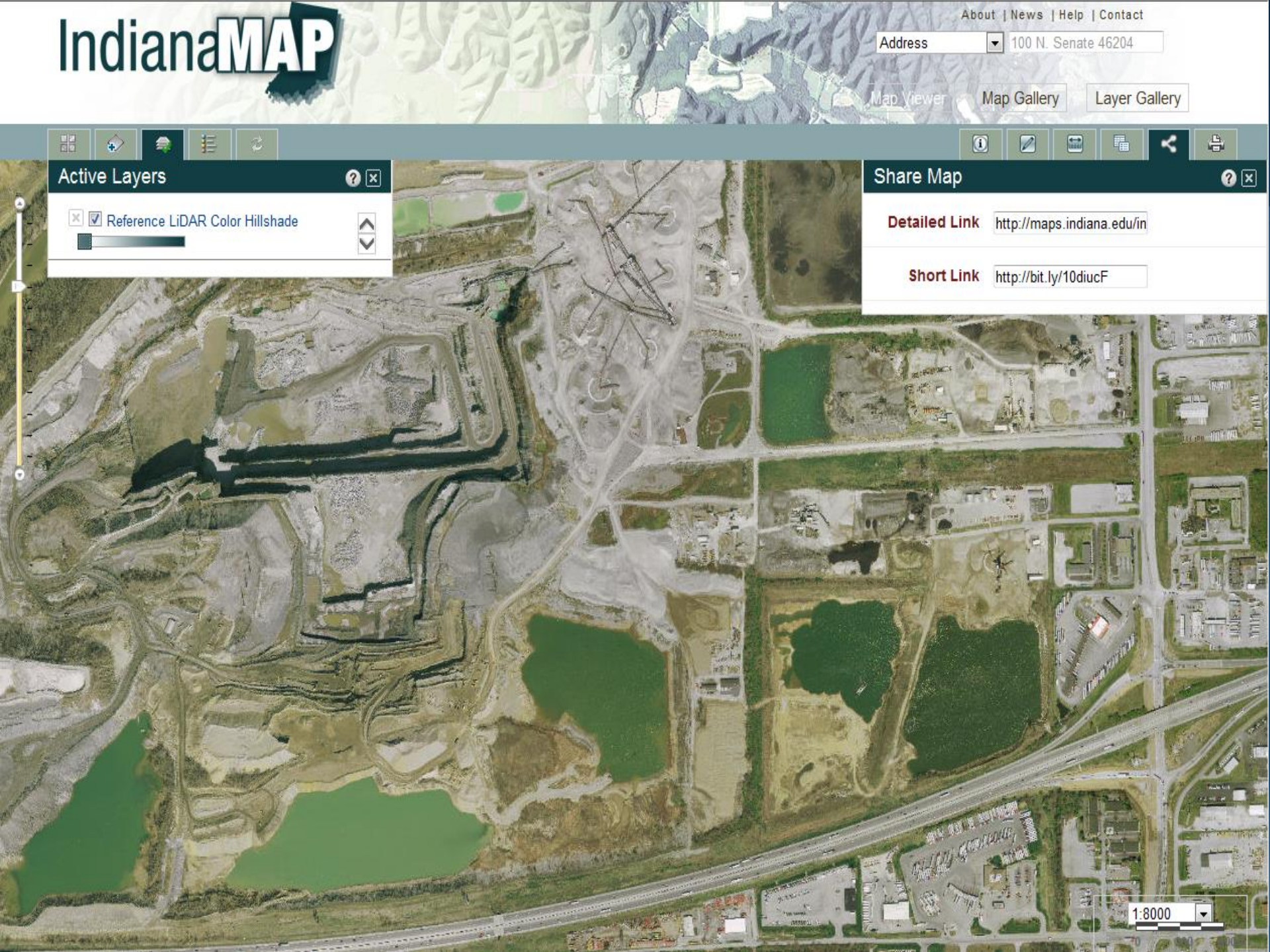
Elevation_Contours_24k_USGS

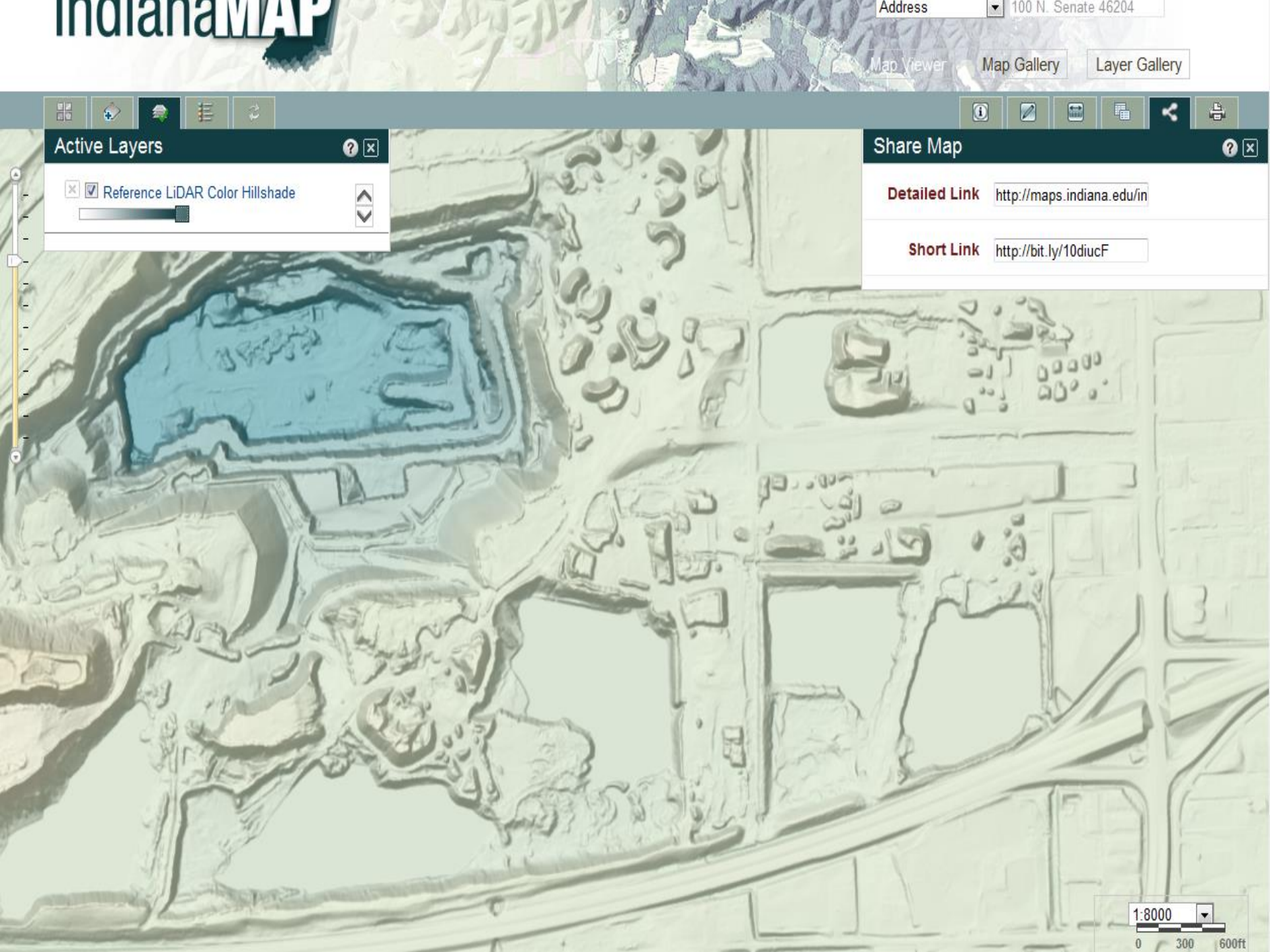
Elevation Contours

Wind_Speed_50m

Wind Speed at 50 m

3.46 - 4.88


IndianaMAP
About | News | Help | Contact
Address
100 N. Senate 46204
Map Viewer
Map Gallery
Layer Gallery
Active Layers
Reference LiDAR Color Hillshade
Share Map
Detailed Link
http://maps.indiana.edu/in
Short Link
http://bit.ly/10diucF
1:8000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http://bit.ly/10diucF
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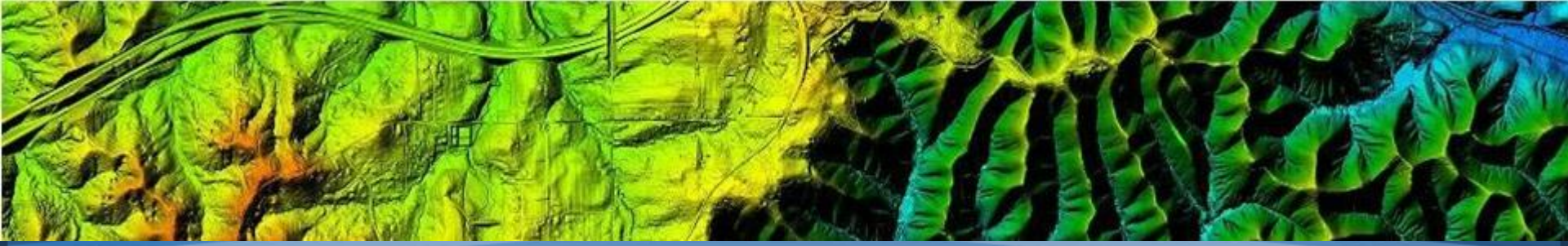
600ft



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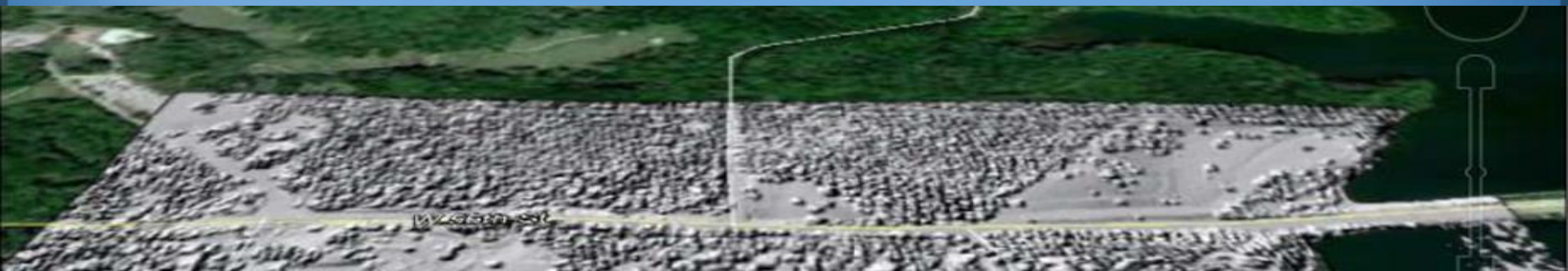
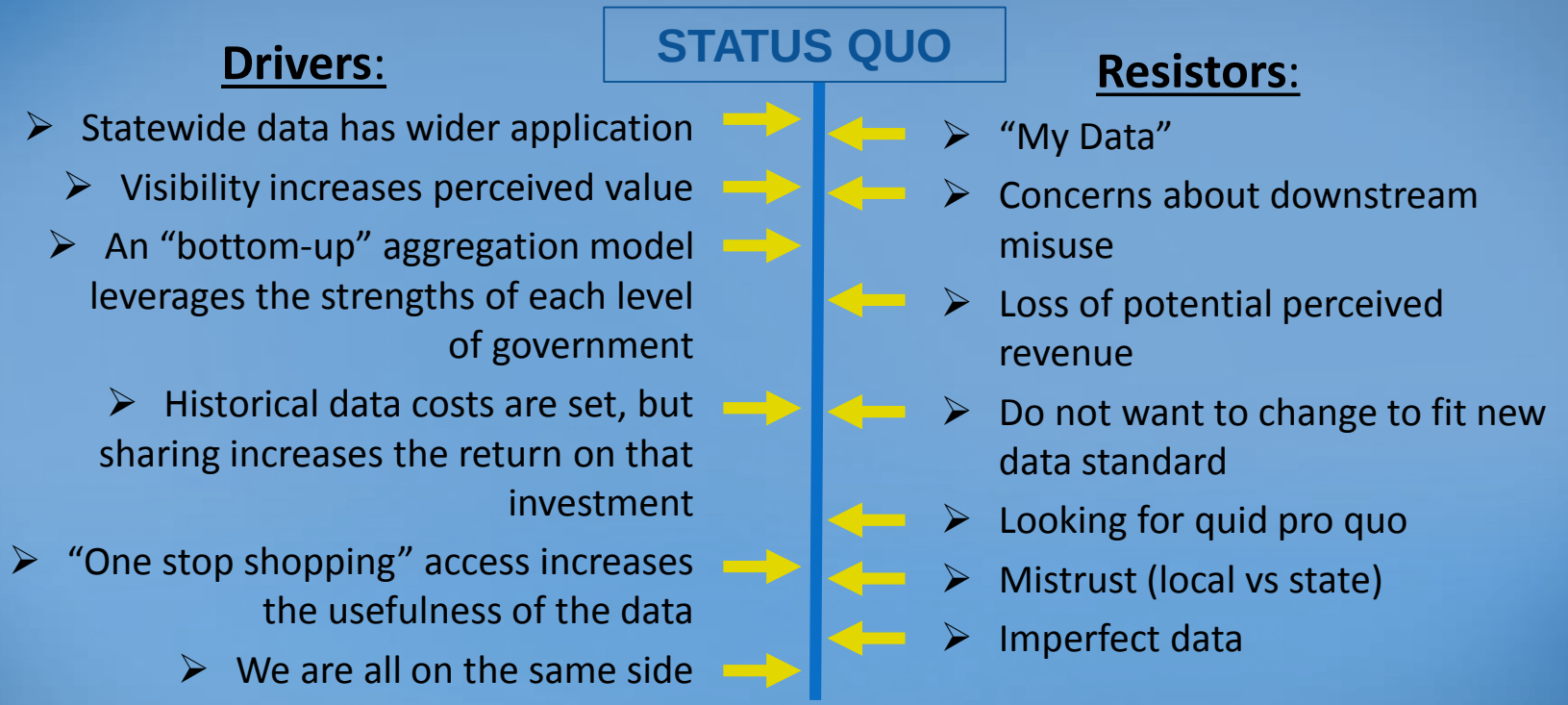
LESSONS LEARNED



Lessons Learned

MANAGE CHANGE

Change Model: Indiana Data Sharing



Reducing Resistors is more effective than adding Drivers*

*See Kurt Lewin's Theory of Change Management

Reducing Resistance

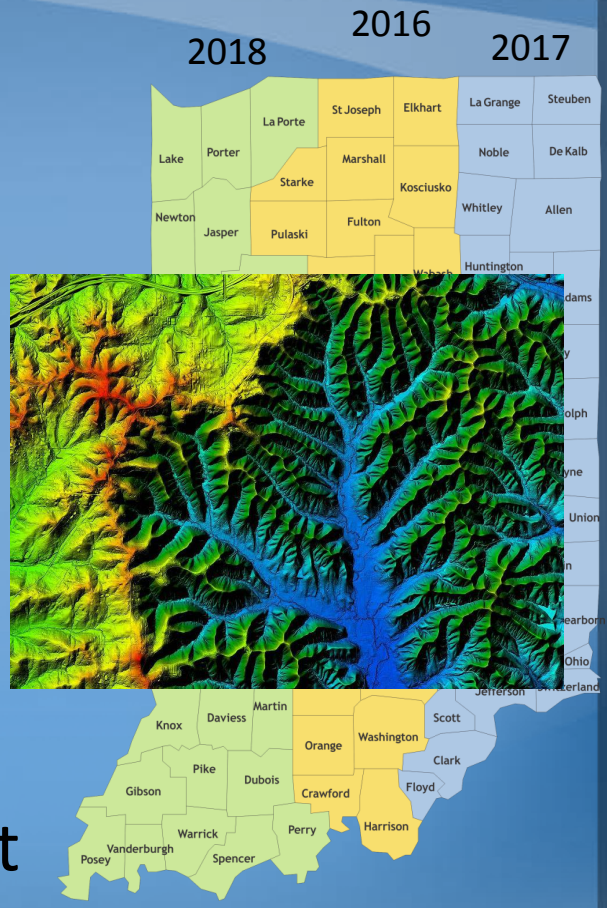
- Resistor: “My Data” caused by:
  - The desire to sell data which would be impacted by giving it to the GIO
  - Concerns about privacy, downstream use, businesses making a profit from gov data
- Removing or reducing resistor:
  - Request small subset of data
  - Reminders that this is public data governed by Indiana APRA

Reducing Resistance

- Resistor: Counties don't want to change format of data
  - Recognize that counties have invested in their creation/maintenance process
  - Their process grew out of their business case
- Removing or reducing resistor:
  - We (state) change format on the back end so counties do not need to change.

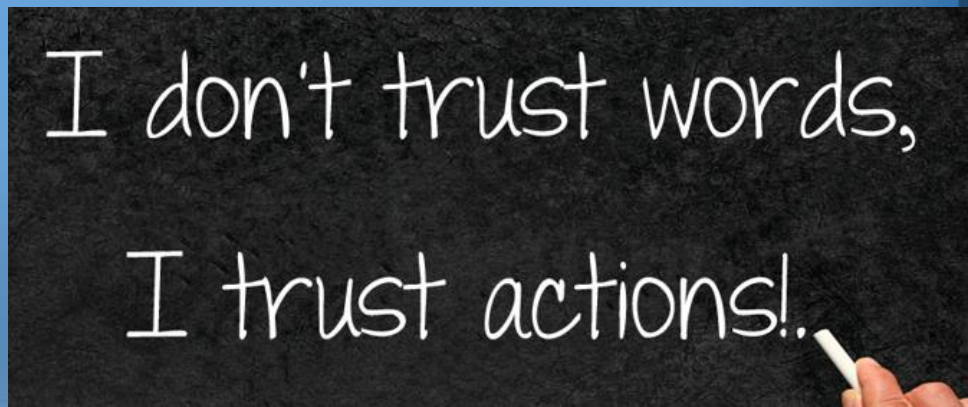
Reducing Resistance

- Resistor: Counties want something in exchange for their data
- Removing or reducing resistor:
  - State initially provided a modest amount of funding to cover vendor cost of hosting and transferring data
  - State has provided ortho (x2) and LiDAR data, or financial equivalent, to counties. Working on 3rd ortho project now. Working on 2nd LiDAR update now.



Reducing Resistance

- Resistor: Mistrust between county and state
- Removing or reducing resistor:
  - Develop relationship over time
  - Meet face-to-face to reduce misunderstandings



Drivers

- Communicate the importance and benefit of project often and in varied ways and venues
- Celebrate successes
- Share ownership of change process and success

TRENDS, VALUES, AND OBSERVATIONS

Guiding Observations and Values

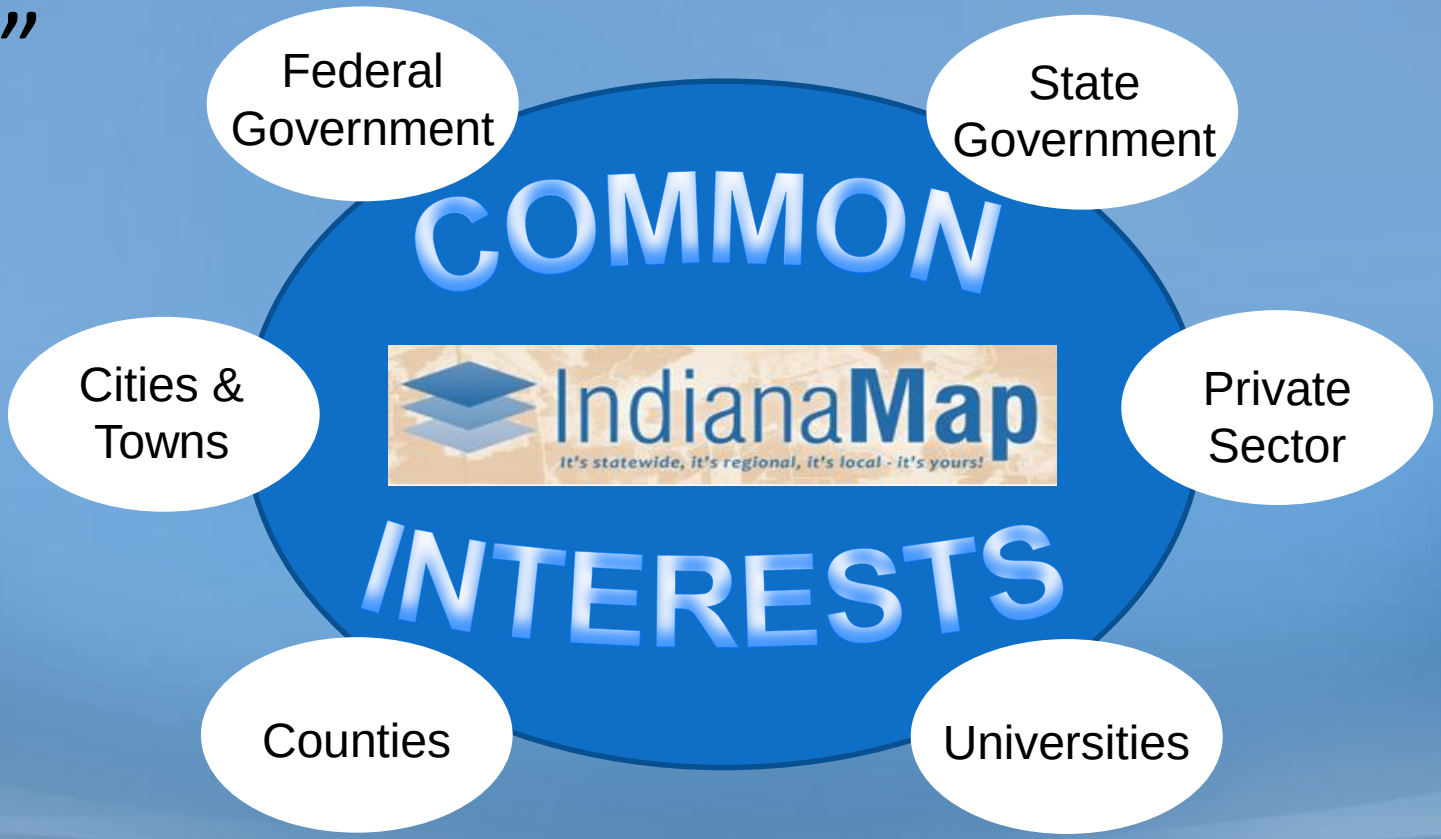
- "Luck is what happens when preparation meets opportunity." – *Seneca*
- "The secret to getting ahead is getting started." – *Mark Twain*
- "The moment one definitely commits oneself, then Providence moves too." – *William H. Murray*

Guiding Observations and Values

- “The best time to make friends is before you need them.” – Ethel Barrymore
- "In the confrontation between the stream and the rock, the stream always wins - not through strength but by perseverance." – *H. Jackson Brown, Jr.*

Guiding Observations and Values

- "We must begin an endeavor by focusing on what we can do, not what we can't do."



National Broadband Map
A New Formula For Success

$5.5 million per state (average grant)

+

1 year

=

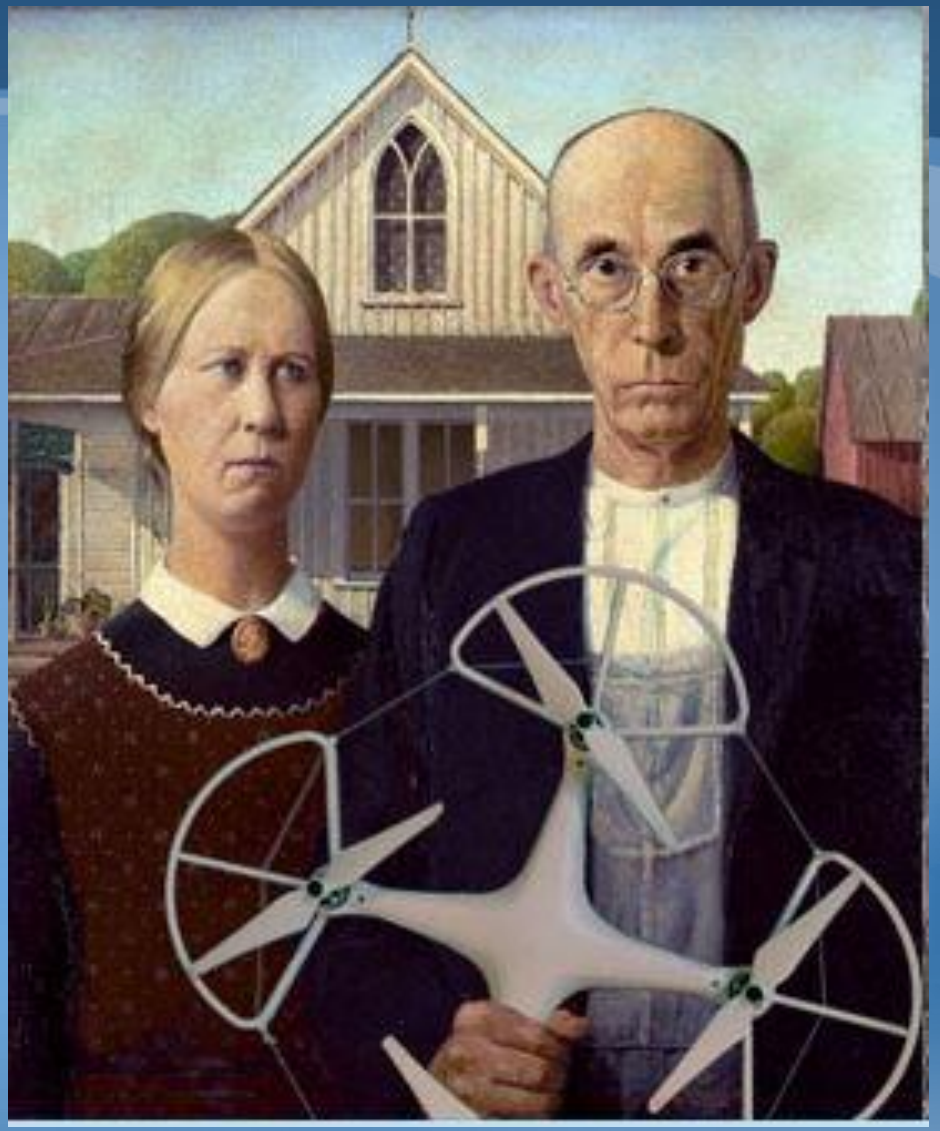
National Broadband Map

- Federal: Supply clear picture of target, provide funding, disseminate end product
- State: Organize, orchestrate and aggregate
- Local: Cooperate, create, maintain

What else is possible?

- National Parcel Map
- National Street Centerline Map
- National Point Address Map

Change is the only constant.
- Heraclitus

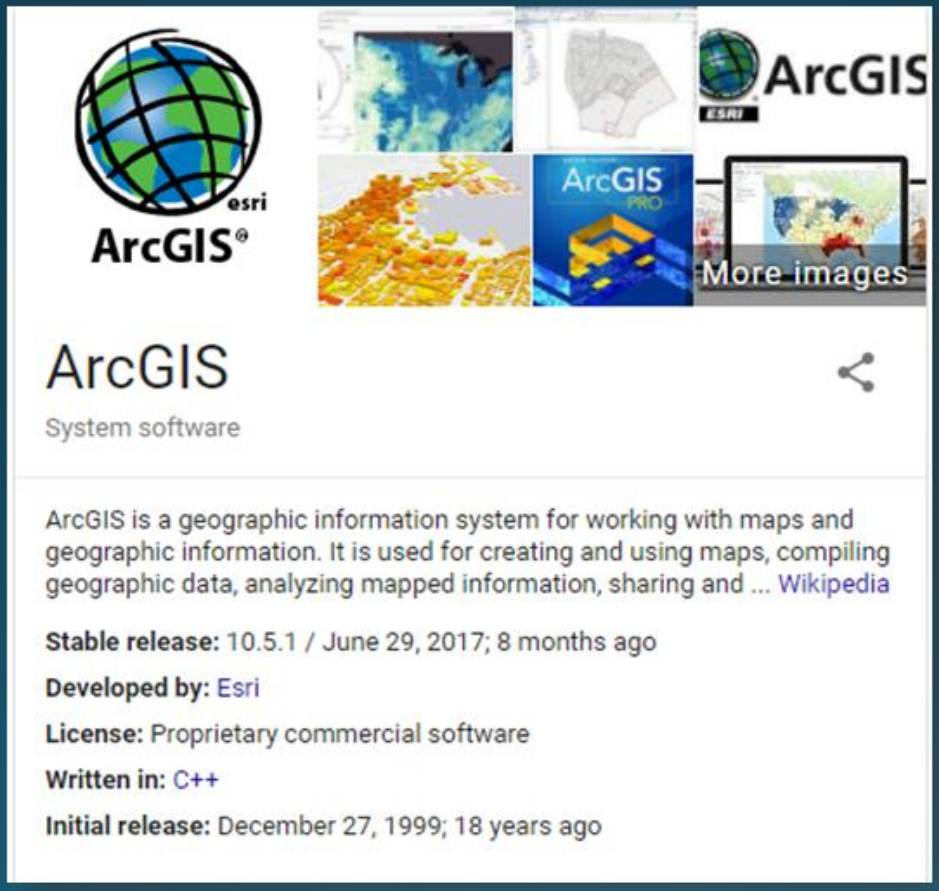



SPARKS CIRCUS
FEROCIOUS POLAR BEARS, GREAT DANE DOGS AND LITTLE SHETLAND PONIES HERE SHOWN WORKING IN PERFECT HARMONY.

PYTHON IN ARCGIS

```
import arcpy
```

Python 2.7



ArcGIS

System software

ArcGIS is a geographic information system for working with maps and geographic information. It is used for creating and using maps, compiling geographic data, analyzing mapped information, sharing and ... Wikipedia

Stable release: 10.5.1 / June 29, 2017; 8 months ago

Developed by: Esri

License: Proprietary commercial software

Written in: C++

Initial release: December 27, 1999; 18 years ago

Site package-
perform geographic data analysis, data management, map automation.

Scripting module-
Provides access to geoprocessing tools
To create
simple/complex workflows.

ArcPy

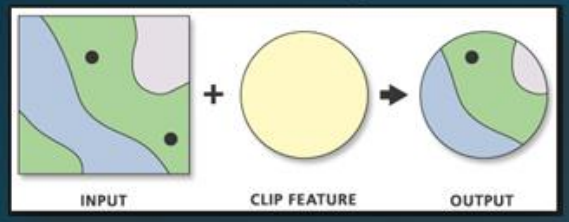
Automate complex or repetitive tasks to derive values from multiple inputs & process data in several steps

Basic Geoprocessing Functions

CLIP

Python

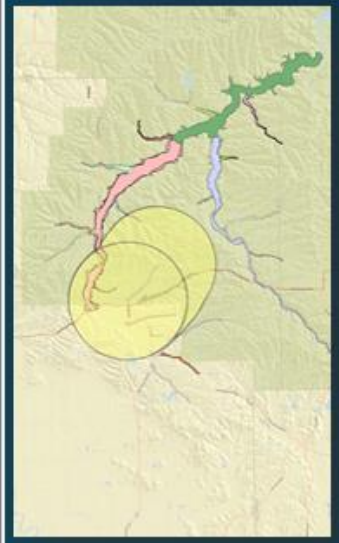
```
>>> # Name: Clip_Example2.py
... # Description: Clip major roads that fall within
 the study area.
...
... # Import system modules
... import arcpy
... from arcpy import env
...
... # Set workspace
... env.workspace = "C:/data"
...
... # Set local variables
... in_features = "majorrds.shp"
... clip_features = "study_quads.shp"
... out_feature_class = "C:/output/studyarea.shp"
... xy_tolerance = ""
...
... # Execute Clip
... arcpy.Clip_analysis(in_features, clip_features,
 out_feature_class, xy_tolerance)
```



Python

```
... # Set environment settings
... env.workspace = "C:/data/Habitat_Analysis.gdb"
...
... # Select suitable vegetation patches from all
 vegetation
... veg = "vegtype"
... suitableVeg =
 "C:/output/Output.gdb/suitable_vegetation"
... whereClause = "HABITAT = 1"
... arcpy.Select_analysis(veg, suitableVeg,
 whereClause)
...
... # Buffer areas of impact around major roads
... roads = "majorrds"
... roadsBuffer =
 "C:/output/Output.gdb/buffer_output"
... distanceField = "Distance"
... sideType = "FULL"
... endType = "ROUND"
... dissolveType = "LIST"
... dissolveField = "Distance"
... arcpy.Buffer_analysis(roads, roadsBuffer,
 distanceField, sideType, endType, dissolveType,
 dissolveField)
...
... # Erase areas of impact around major roads from
 the suitable vegetation patches
... eraseOutput =
 "C:/output/Output.gdb/suitable_vegetation_minus_road
 s"
... xyTol = "1 Meters"
... arcpy.Erase_analysis(suitableVeg, roadsBuffer,
 eraseOutput, xyTol)
```

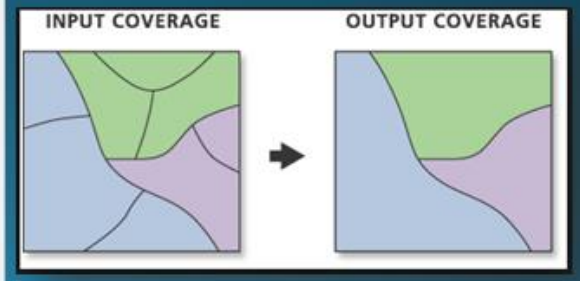
BUFFER

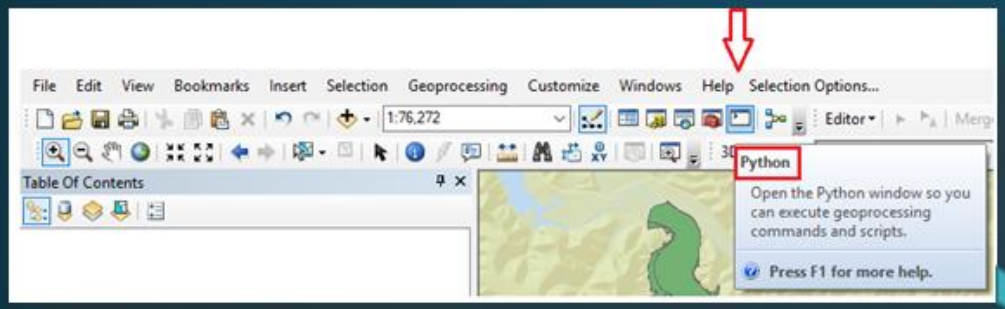


Python

```
>>> # Name: Dissolve_Example.py
... # Description: Dissolves polygons
 into larger sections
... # Requirements: ArcInfo Workstation
...
... # Import system modules
... import arcpy
... from arcpy import env
...
... # Set environment settings
... env.workspace = "C:/data"
...
... # Set local variables
... inCover = "tra_airport"
... outCover = "C:/output/airport_sect"
... dissolveItem = "section"
... featureType = "POLY"
...
... # Execute Dissolve
... arcpy.Dissolve_arc(inCover,
 outCover, dissolveItem, featureType)
```

DISSOLVE





Python

```
# Set Top Environment
arcpy.env.workspace = topDir
print "Environment set to:", topDir
arcpy.AddMessage("Environment Set")

arcpy.env.overwriteOutput = True
print "Overwrite Outputs = True"
arcpy.AddMessage("Overwrite Outputs = True")

# Create FEP_XS_Working Folder in topDir
arcpy.CreateFolder_management(topDir, workingFldr)
print "Created FEP_XS_Working Folder"
arcpy.AddMessage("Created FEP_XS_Working Folder")

# Create IDNR_FEP_XS_MonthYear.gdb in FEP_XS_Working folder
arcpy.CreateFileGDB_management(os.path.join(topDir, os.path.basename
 (workingFldr)), "IDNR_FEP_XS_" + MonthYear + ".gdb")
workDB = os.path.join(topDir, os.path.basename
 (workingFldr),"IDNR_FEP_XS_" + MonthYear + ".gdb")
print "Created Database:", workDB
arcpy.AddMessage("Created Database")

# List folders in topDir
for basinfolder in os.listdir(topDir):
    if basinfolder.startswith('0'):
        print "Found Basin:", basinfolder
        arcpy.AddMessage("Found Basin")

        # Create Feature Dataset
        cs = arcpy.SpatialReference('NAD 1983 UTM Zone 16N')
        arcpy.CreateFeatureDataset_management(workDB, "HUC10
_"+basinfolder, cs)
        featureDS = os.path.join(workDB, "HUC10_"+os.path.basename
(basinfolder))
        print "Created Feature Dataset:", featureDS
        arcpy.AddMessage("Created Feature Dataset")

        ############ START FEP MERGE #################

        # Create List of S_FEP layers
        FEPMergeLst = []
        for dirpath, dirnames, filenames in arcpy.da.Walk
(os.path.join(topDir, basinfolder)):
            for filename in fnmatch.filter(filenames, 'S_FEP'):
                FEPMergeLst.append(os.path.join(dirpath,filename))


        # Merge all FEP layers into a single layer
        if FEPMergeLst:
            FEPoutDir = featureDS
            FEPoutNm =
"Flood_Elevation_Pts_DNR_Water_"+os.path.basename(basinfolder)
```

Python window

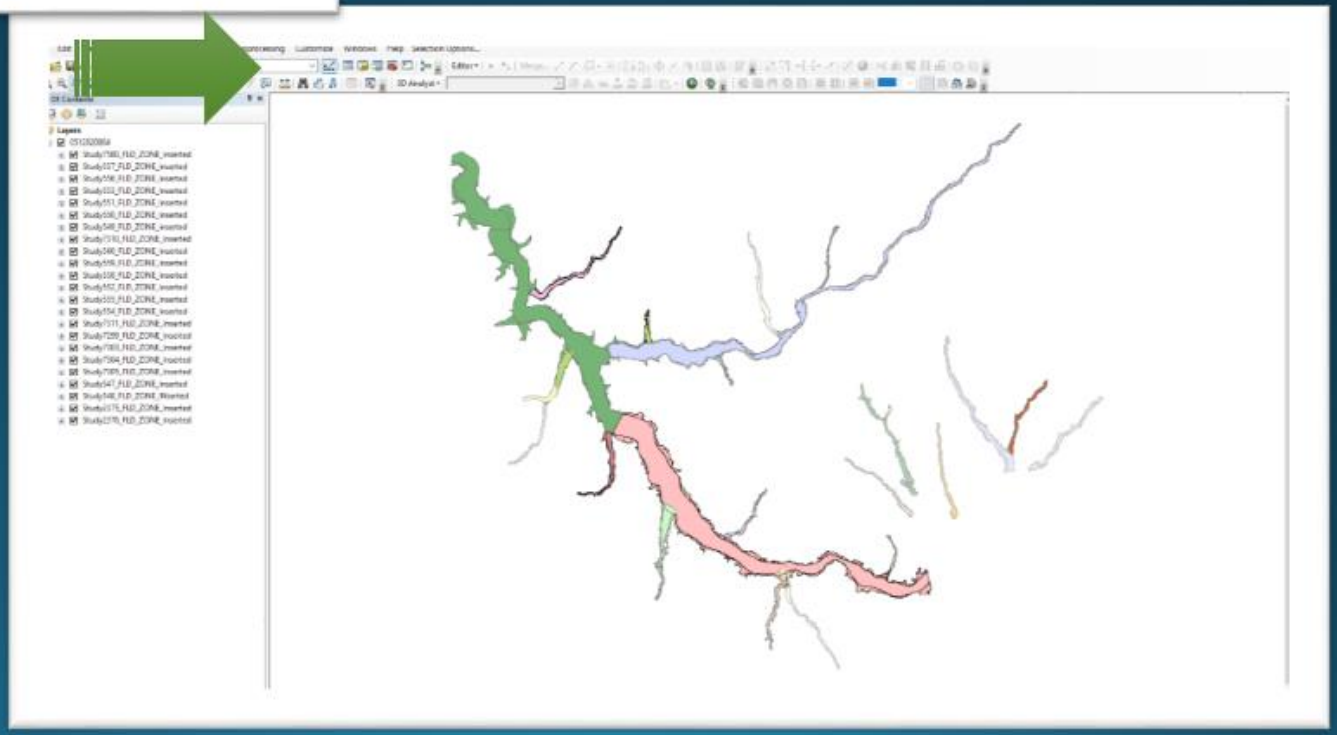
- Directory Setup- create folders and subfolders
- Merge or Append data layers- merge layers with their attributes
- Create map document -layers from a directory to ArcMap
- Convert to different formats- table to excel
- ....

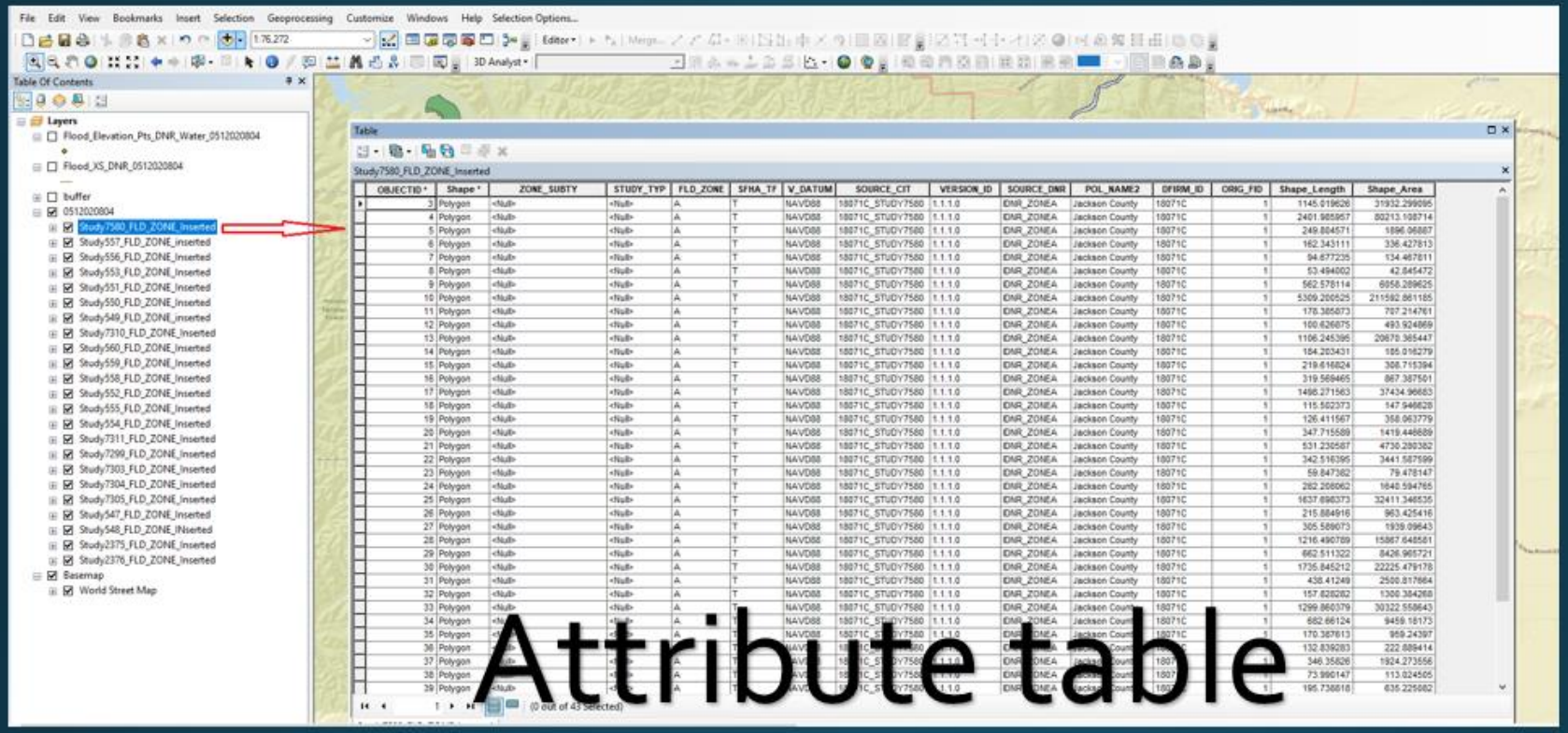
Name	Date modified	Type	Size
For_Polis	4/6/2018 1:29 PM	File folder	
Study547	3/19/2018 8:53 AM	File folder	
Study548	3/20/2018 2:12 PM	File folder	
Study549	3/19/2018 8:53 AM	File folder	
Study550	3/19/2018 8:53 AM	File folder	
Study551	3/19/2018 8:53 AM	File folder	
Study552	3/19/2018 8:53 AM	File folder	
Study553	3/19/2018 8:54 AM	File folder	
Study554	3/19/2018 8:54 AM	File folder	
Study555	3/19/2018 8:54 AM	File folder	
Study556	3/19/2018 8:54 AM	File folder	
Study557	3/19/2018 8:54 AM	File folder	
Study558	3/19/2018 8:54 AM	File folder	
Study559	3/19/2018 8:54 AM	File folder	
Study560	3/19/2018 8:54 AM	File folder	
Study2375	3/19/2018 8:53 AM	File folder	
Study2376	3/19/2018 8:53 AM	File folder	
Study7299	3/19/2018 8:54 AM	File folder	
Study7303	3/19/2018 8:54 AM	File folder	
Study7304	3/19/2018 8:54 AM	File folder	
Study7305	3/19/2018 8:54 AM	File folder	
Study7310	3/19/2018 8:54 AM	File folder	
Study7311	3/19/2018 8:54 AM	File folder	
Study7580	3/19/2018 8:54 AM	File folder	

ArcMap application

↓

Display layers in ArcMap



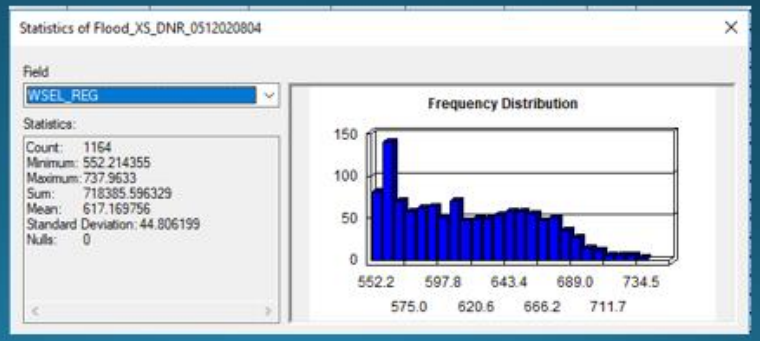


Attribute table

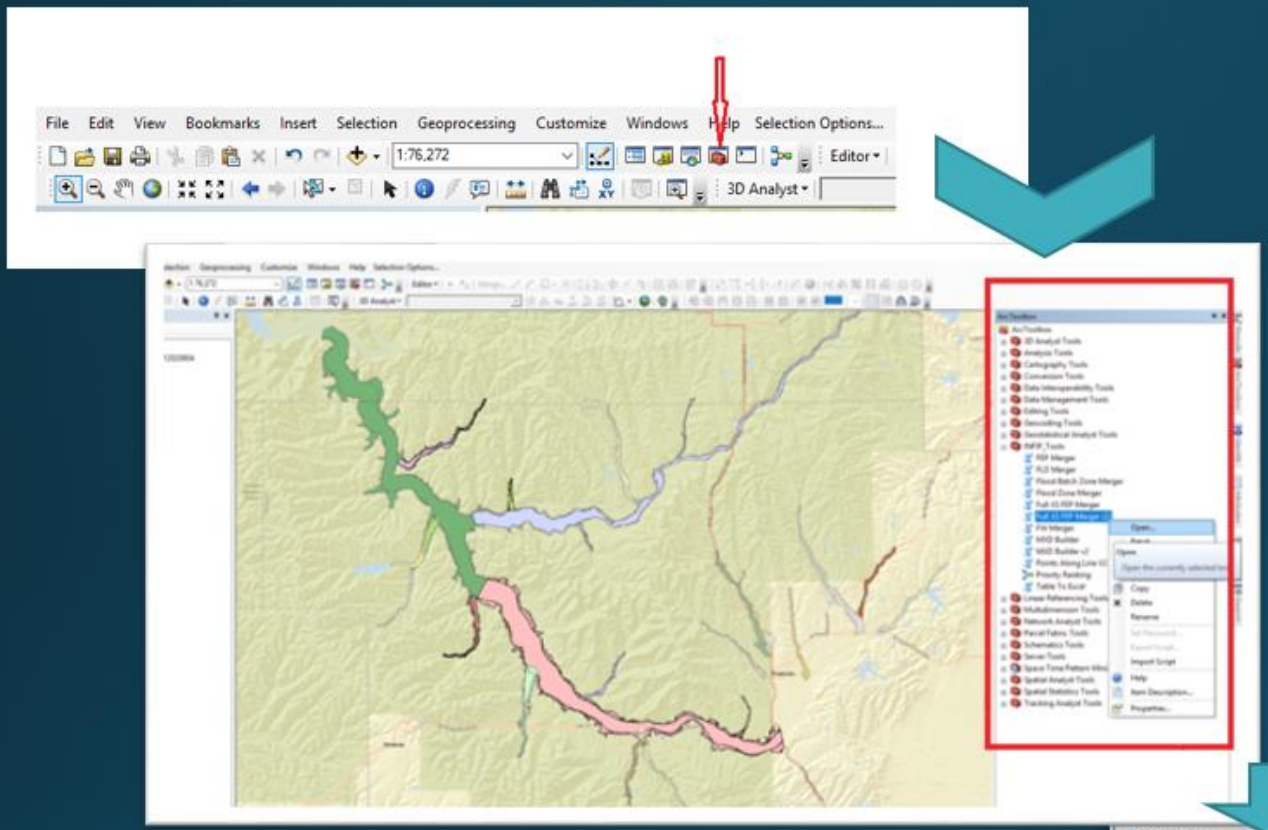
Merge tables

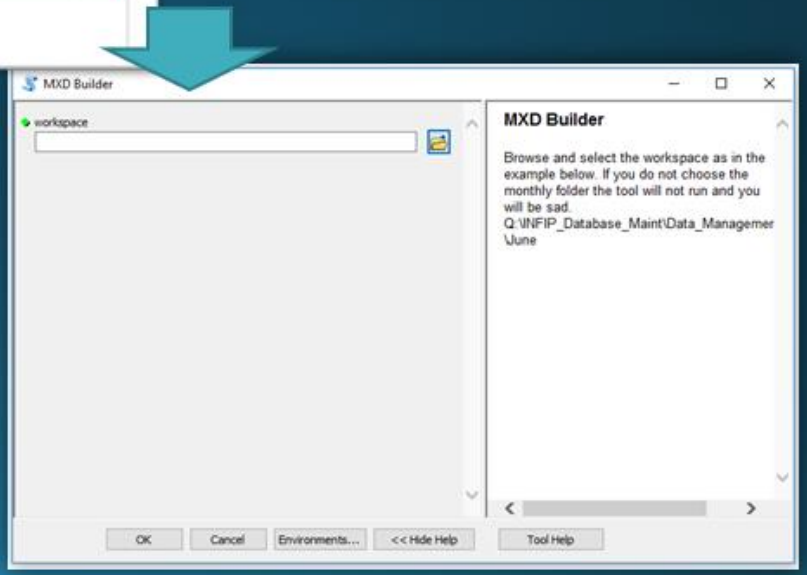
Join layers

Statistical calculations



Arc Toolbox


File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help Selection Options...
1:76,272
Editor
3D Analyst


MXD Builder
workspace
MXD Builder
Browse and select the workspace as in the example below. If you do not choose the monthly folder the tool will not run and you will be sad.
Q:\INFIP_Database_Maint\Data_Management\June
OK
Cancel
Environments...
<< Hide Help
Tool Help

More information:

resources.arcgis.com

Kavya Ravichandra

317 278-4928

kavbeerv@Indiana.edu

The Polis Center

Jim Sparks

317 278-2433

jisparks@iupui.edu