Indiana Orthoimagery 2024

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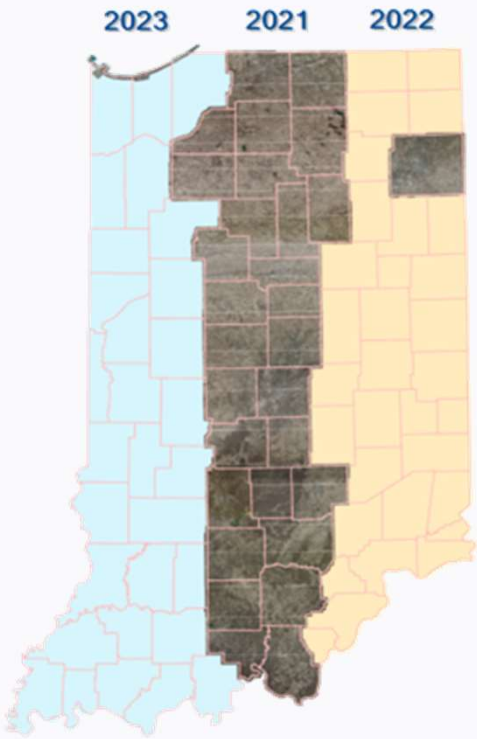
Indiana Statewide Imagery Programs

- **2021-2024 Ortho – 6”**
- 2016-2019 Ortho – 1’
- 2011-2014 Ortho – 1’
- 2005-2006 Ortho - 1’



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Why Statewide Imagery

"State imagery has been invaluable to our organization."

"Having aerial photography available gives police, fire, and EMS people a visual understanding of their surroundings and situational awareness."

"Statewide projects have helped fill in the gaps for years we might have not flown otherwise."

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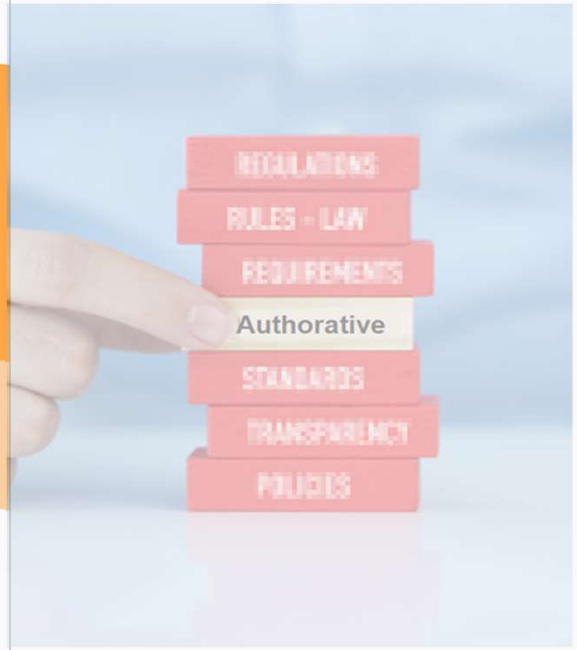
Imagery is Authoritative



- Defined resolution
- Known accuracy
- Known time capture
- Professional-level QC verification meeting State-mandated standards and specifications

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Imagery is Available

- Web map applications
- Image services available to the public
- Imagery via download for government agencies and public

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Imagery is Managed Collectively

Services provided by the GIO

- Contract management
- Procurement
- QC management
- Coordination of collective buying

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Indiana Statewide Program Management

- **Administered through Indiana Geographic Information Office (GIO)**

ALL Inquires

Shaun Scholer

Indiana Geographic Information Office

Sanborn

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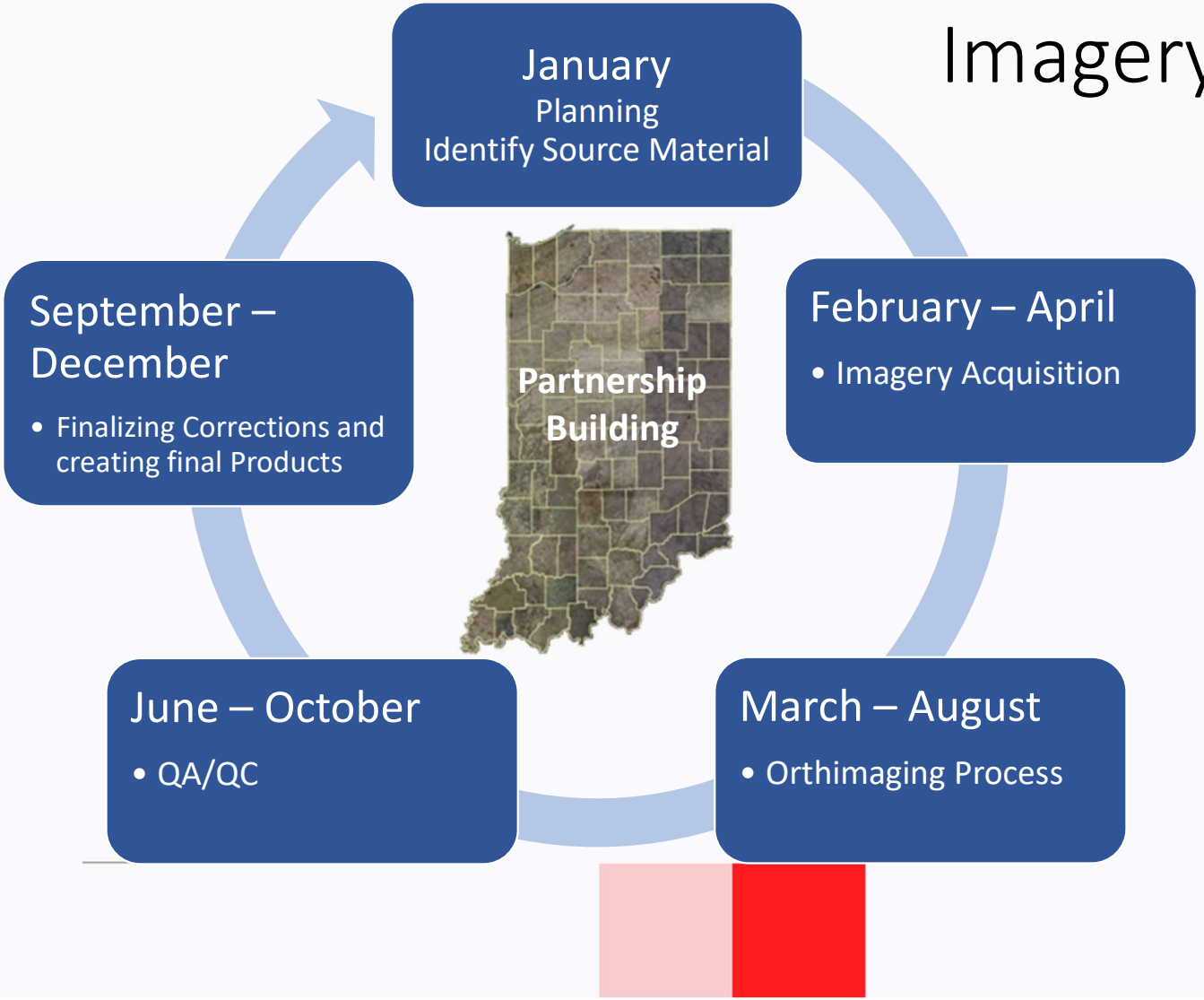
Imagery Program Timeline



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What is the Process?

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Indiana Statewide Program - Specification

- **Base Products**
  - 6-inch (15-cm) pixel resolution
  - Tile 4 -Band (R,G,B, NIR) imagery
    - GeoTIFF uncompressed
    - ECW & MrSID compressed
  - County mosaic MrSID 3-Band

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Buy-Ups

- DNR Lake Michigan Coastal Program
- Monroe County
- Shelbyville and Shelby County Planning
- City of Huntington
- Jefferson County (City of Madison & Town of Hanover)
- Town of Huntingburg
- Vermillion County

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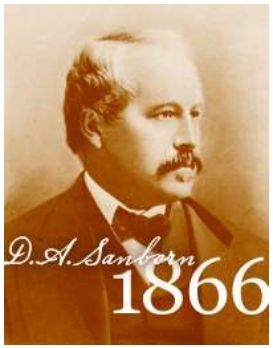
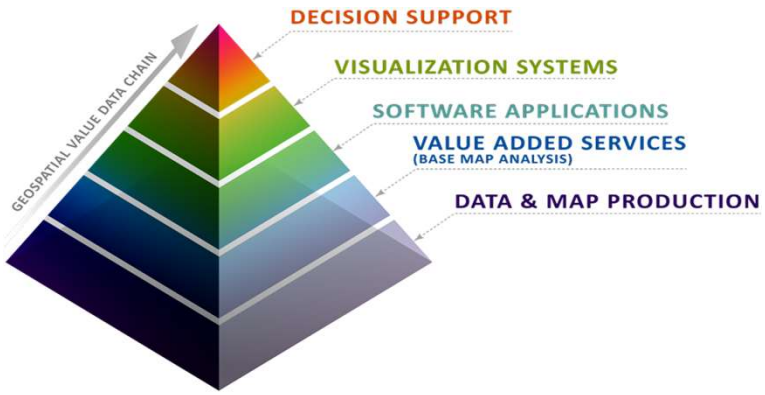
Sanborn Company Overview

- Founded in 1866
- Full service, dedicated geospatial solution provider
- 125 employees in 4 locations nationwide
- Quality-oriented company and culture
  - Corporate Quality Management System derived from ISO principles



Sanborn Overview – Comprehensive Geospatial Solutions

- **Data Map Production**
  - LiDAR, Digital Oblique & Orthoimagery, Photogrammetric, Topographical Maps
- **Value-Added Services**
  - Land use and land cover analyses
  - Change detection
  - Other imagery analysis services/viewers



Decision Support Systems

Wildfire Management

Forestry and Ecosystem Management

Emergency Response

Visualization Systems

2D

3D

Prism 4D

Common Operating Picture

Software Applications

GIS Software Development

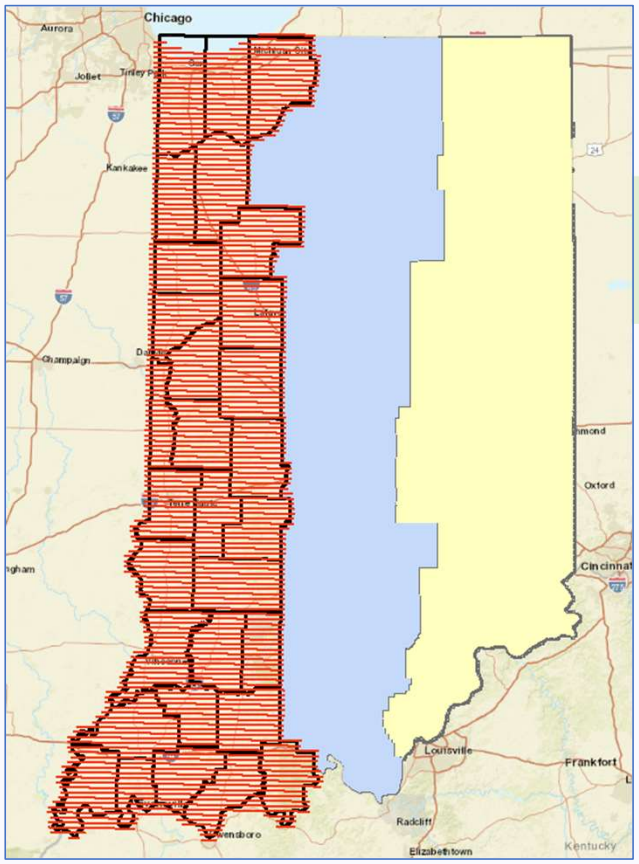
Cloud Services

Portals and Distribution Tools

CERTIFIED ISO 9001:2015 COMPANY

Indiana Statewide Imagery - 2023

- 6in resolution, 4-band, nadir imagery
- Collected leaf-off, snow free, cloud free, with +30 degree sun angle
- Upgraded Vexcel Ultracam Eagle M3 sensors were used for capture
  - 4 sensors owned/operated by Sanborn.
  - Flying Height ~12,300’ AGL
- Reduces flight time needed for capture
- Reduces risk of short weather (snow/leaf season) impacting collection of entire area



DATA ACQUISITION

- **Sanborn owned acquisition resources and data processing throughput, assets included:**
- Multiple single and twin-engine Aircraft
- UltraCam Eagle Digital Camera Systems
- Airborne GPS systems
- Inertial Navigation Systems
- Trimble GPS survey equipment
- **IT Infrastructure:** Over 11 Petabytes of active onsite storage, multi-core distributed processing clusters for both CPU and GPU software packages, networking capabilities up too 100Gbps and multi-host virtual environment

Technical Approach Summary for Imagery

Source Data Review

- Flight Planning
- Control Planning
- Existing State control
- Existing State Lidar DEM

Data Acquisition

- Ground Control
- UltraCam Eagle Large Format Camera
- RGB/NIR Imagery Acquisition
- AGPS/IMU Support
- “Quick View” client

Aerial Triangulation

- Photo matching
- Rigorous least squares adjustment
- Accuracy Verification
- PILOT PROJECT!

DEM Preparation

- Editing/updating of State’s existing LiDAR DEM

Ortho Rectification

- Cubic convolution rectification
- Create seam lines
- Correct bridge distortion
- Color balance
- Deliverables and Metadata
- Rigorous QC with review Indiana DOT. Process any needed corrections

6-inch

3-inch

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Buy-up Overview

- **Options Impacting Spring Airborne Data Acquisition**
  - Higher-resolution orthophotography
  - True orthophotography
  - Airborne LiDAR
  - Oblique Imagery
- **Options with No Impact to Airborne Data Acquisition**
  - Planimetric mapping – New or updating
  - Land cover/land use/impervious surfaces mapping
  - Contours
  - 3D buildings and infrastructure modeling
  - Other derivative data sets

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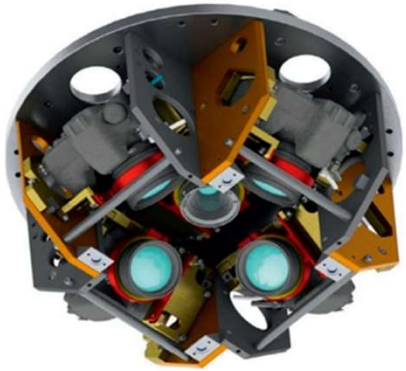
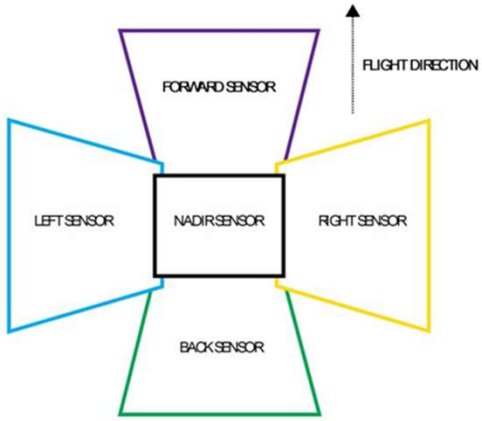
SSN1

Oblique Imagery

- Full-color imagery provides complete 5-view coverage your chosen project area
  - 4 oblique views (45 degrees) + 1 vertical
  - Vertical image is 4-band RGB/NIR
- Available resolutions from 2 inches to 12 inches+
- 2- to 3-pixel accuracy
- Licensed product, but:
  - No usage, sharing or deployment restrictions
  - No “per seat” costs
  - Right to use never expires



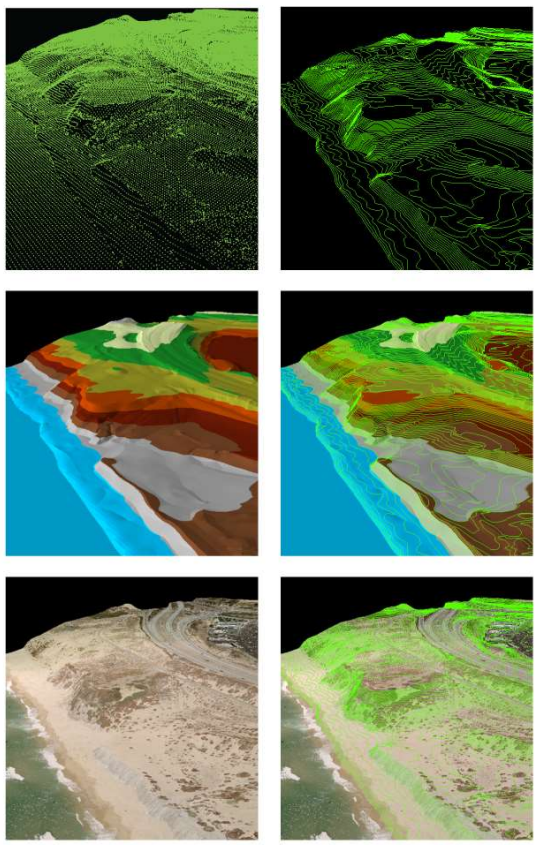


Slide 18

SSN1 I moved the oblue ortho slides up in front of the Lidar slides

Scholer, Shaun N, 12/31/2020

Airborne LiDAR

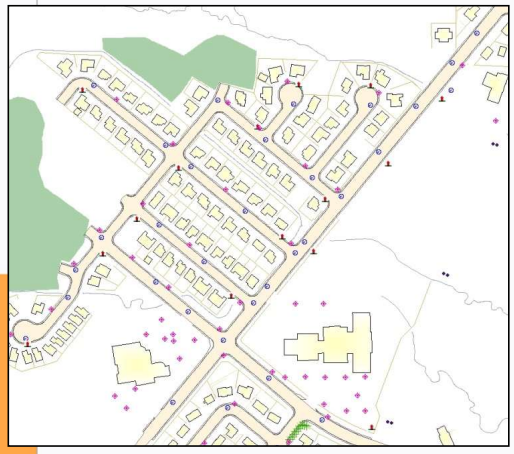


- Fully compliant with USGS-National Geospatial Program (NGP) per current LiDAR Base Specification v2.1
- Quality Level 2 (2 pts/m^2) or Quality Level 1 (8 pts/m^2)
- Note that spatial accuracy of QL-2 and QL-1 lidar is the same.
- Delivery of raw point cloud, classified point cloud, hydro-flattened DEM.
- Supports creation of 1-foot contours
- Other enhancements and derivative data sets can be produced – enhanced classification, hydro-enforcement, DSM's, contours, etc.

High Resolution Orthophotography

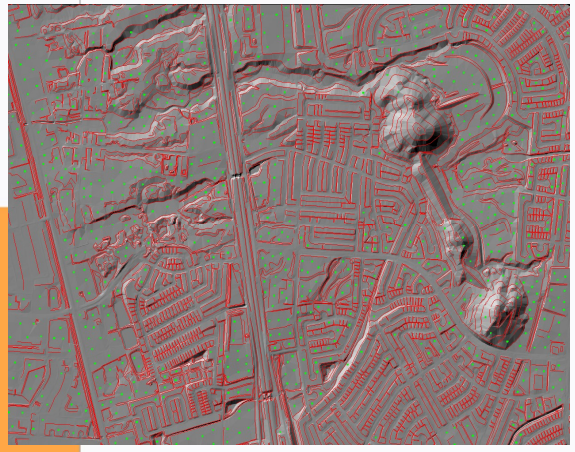
- 3-inch spatial resolution
- 4-band RGB/NIR, 8-bit per channel
- Requires additional flying, control, and enhanced DEM accuracy
- Benefits include:
  - Higher accuracy
  - Ability to see and extract smaller features
  - Ability to support additional applications such as engineering design, traffic & transportation (pavement condition, lane striping, parking studies), utility mapping, vegetation identification, code enforcement, assessment, and logistical planning.

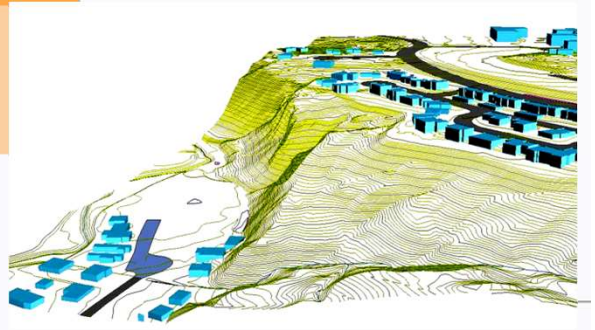
Planimetric Mapping



- Vector mapping of visible features
- Fully customizable data sets – can be complete mapping or selected features only, e.g. buildings
- Formatted to <u>your</u> geodatabase design specifications
- All feature data extraction performed using stereo-photogrammetric techniques – no “heads up digitizing” from orthos
- Additional classification such as pervious/impervious can be performed
- GIS or CAD data formats, 2D or 3D
- Old data sets are often cheaper to replace than to update
  - Searching for changes takes a lot of time
  - Specs of legacy data are often unknown
- Pricing is highly scope and feature density dependent – custom quotes will be provided

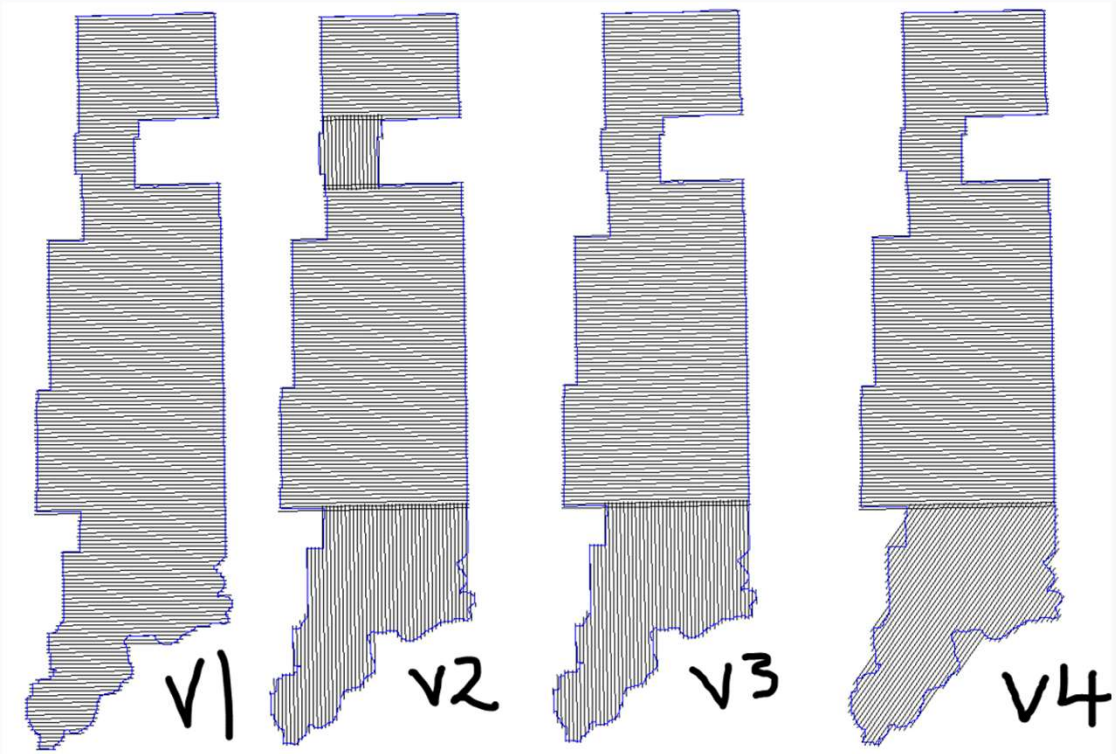
Contour Development





- Can be derived from lidar or imagery-derived DEM's
- Breakline enhancement performed as required
- Created at the desired interval (1-foot, 2-foot)
- ASPRS accuracy
- Fully attributed or layered to discriminate index contour, index depression contour, obscured index contour, obscured index depression contour, intermediate contour, intermediate depression contour, obscured intermediate contour, obscured intermediate depression contour, and hidden contour.
- GIS and CAD data formats

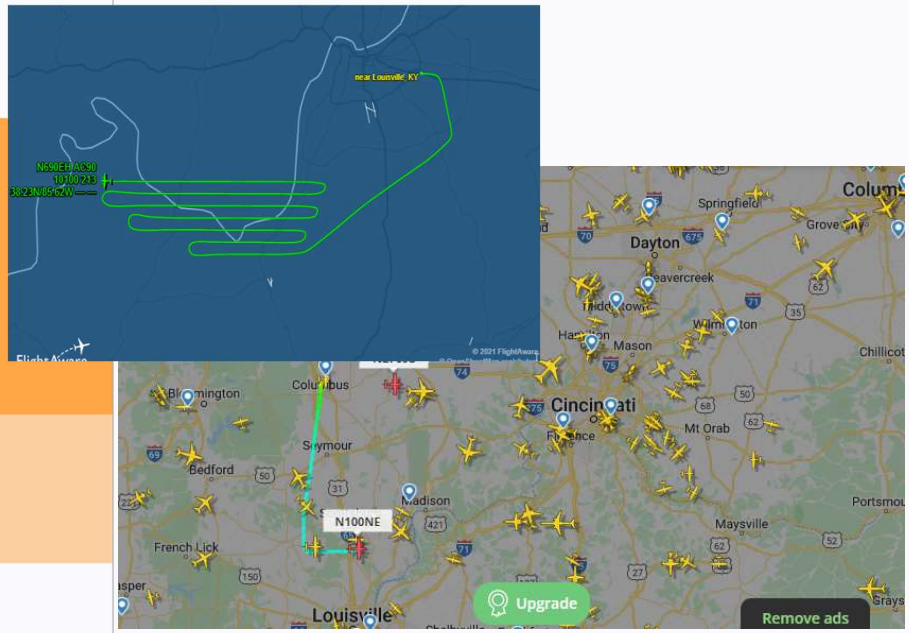
Indiana Image Collection Metric Analysis



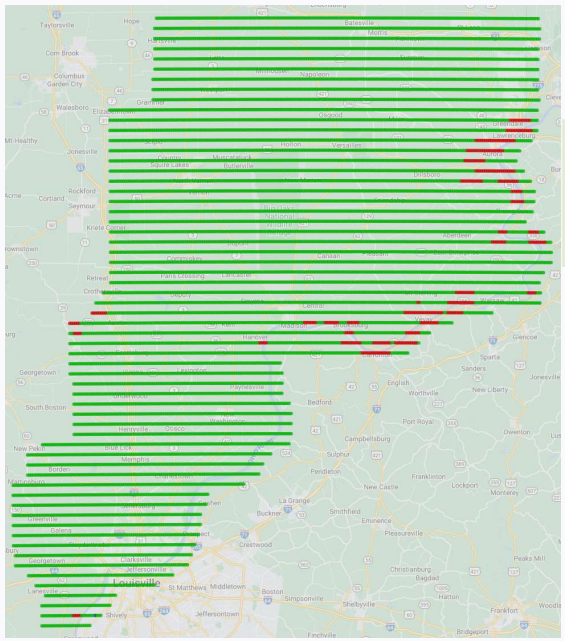
Version	Total Lines	Line Miles	Photos	Acq Hours
1	191	7,959	37,758	56.95
2	185	8,104	38,436	57.36
3	184	8,041	38,139	56.94
4	178	8,131	38,557	57.04

Acquisition Tracking and Reporting

Real-Time Tracking



Status Reporting



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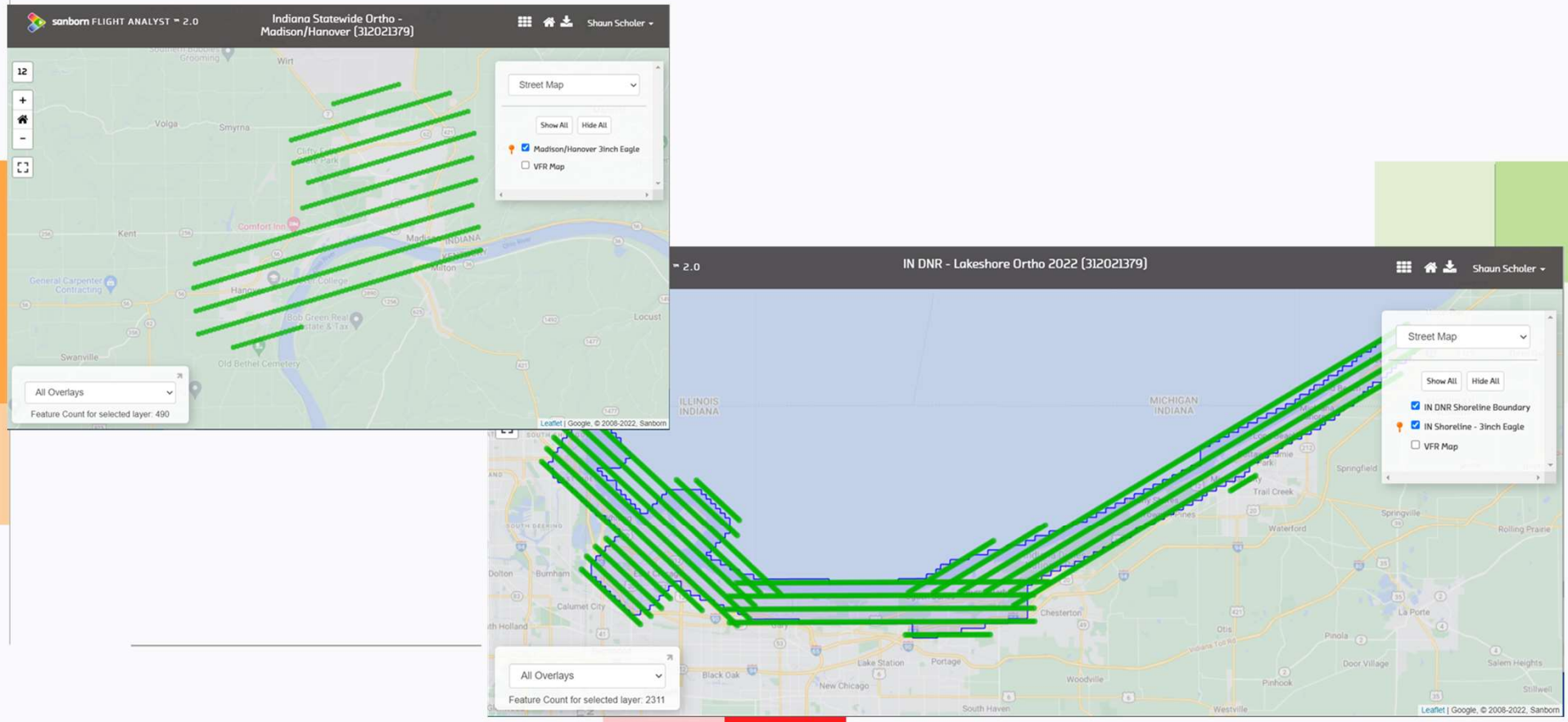
Flight Tracking



Indiana Image Collection Metric Analysis

2023 Tier 3 (West) Collection Details

sq miles	13496
# of missions	23
# Flight Days	15
Date Range	February 11 - April 7

Mission ID	# of photos
20230211_A_ASCA	798
20230211_A_AVCD	2803
20230212_A_AVCD	1513
20230212_B_ASCA	1324
20230213_A_ASCA	1310
20230213_A_AVCD	2406
20230215_A_ASCA	1654
20230215_A_AVCD	341
20230215_B_AVCD	1125
20230218_A_ASCA	1272
20230218_A_AVCD	1544
20230219_A_AVCD	1308
20230220_A_ASCA	852
20230221_A_ASCA	562
20230221_A_AVCD	636
20230224_A_AVCD	297
20230226_A_AVCD	287
20230226_B_AVCD	1863
20230228_A_AVCD	599
20230320_A_AVCD	1099
20230330_A_AMCA	1603
20230402_B_AGCE	463
20230407_A_AMCA	1155
	26,814

# photots by camera		
AVCD	15821	59%
ASCA	7772	29%
AMCA	2758	10%
AGCE	463	2%
	26814	

2022 Tier 2 (East) Collection Details

sq miles	11317
# of missions	31
# Flight Days	17
Date Range	February 19 - May 12

Mission ID	# of photos
20220219_A_ANCA	739
20220220_A_ADCC	821
20220220_A_ANCA	1787
20220227_A_ADCC	1760
20220227_A_ANCA	1195
20220228_A_ADCC	1258
20220228_A_AHCB	2111
20220228_A_ANCA	1520
20220228_B_AHCB	891
20220302_A_ADCC	722
20220302_A_AHCB	2067
20220304_A_AHCB	2126
20220305_A_ADCC	878
20220320_A_AMCA	1024
20220320_B_AMCA	2928
20220321_A_AMCA	1210
20220321_B_AMCA	726
20220327_B_AMCA	61
20220327_C_AMCA	567
20220328_A_AMCA	181
20220405_A_ADCC	1538
20220410_A_ASCB	968
20220410_B_ASCB	968
20220410_C_ASCB	868
20220412_A_ADCC	1982
20220412_A_ASCB	2145
20220414_A_ADCC	1316
20220414_A_ASCB	1565
20220509_B_AGCA	570
20220512_A_AGCA	239
20220512_C_AGCA	910
	37,641

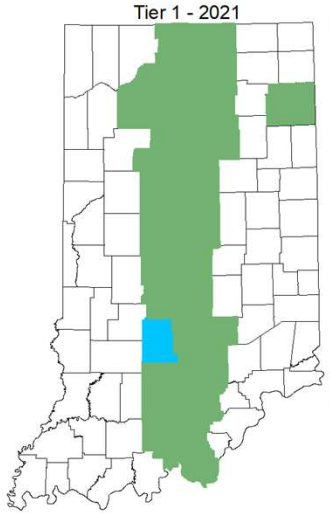
# photots by camera		
ADCC	8957	25%
AMCA	6697	18%
ASCB	6514	18%
AHCB	5567	15%
ANCA	5241	14%
AGCA	3451	9%
	36427	

2021 Tier 1 (Central) Collection Details

sq miles	12976
# of missions	31
# Flight Days	17
Date Range	February 25-April 13

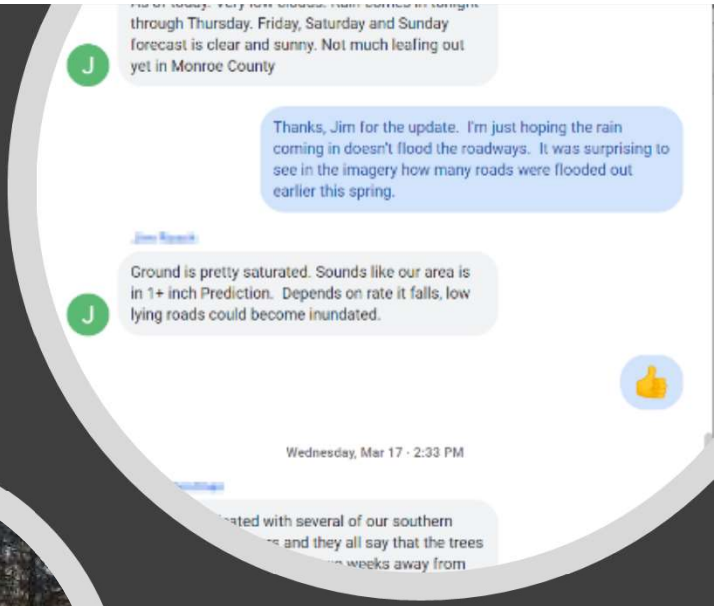
Mission ID	# of photos
20210225_A_AGCC	820
20210302_A_AECB	2919
20210302_A_AGCC	2436
20210303_A_AECB	1413
20210303_A_AGCC	1959
20210304_A_AECB	2421
20210304_A_AGCC	1841
20210305_A_AECB	2190
20210305_A_AGCC	1727
20210305_B_AGCC	668
20210306_A_AECB	81
20210306_A_AGCC	2403
20210307_A_AECB	1179
20210307_A_AGCC	3291
20210308_A_AECB	2423
20210312_B_AGCC	1439
20210313_A_AGCC	350
20210319_A_ADCA	1871
20210319_A_AGCC	2275
20210319_B_AGCC	1687
20210320_A_ADCA	897
20210320_A_AGCC	1735
20210320_B_ADCA	719
20210321_A_AGCC	1329
20210327_A_AGCC	1277
20210327_B_AGCC	194
20210329_A_AGCC	2021
20210329_B_AGCC	2405
20210402_A_AGCC	847
20210402_B_AGCC	1710
20210413_A_ADCA	394
	48,921

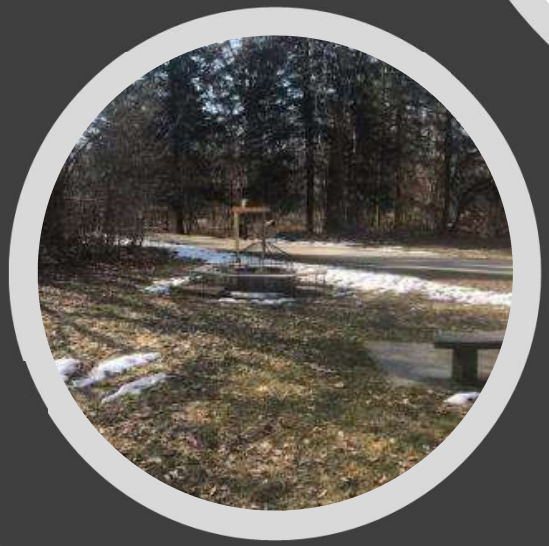
# photots by camera		
AGCC	32414	66%
AECB	12626	26%
ADCA	3881	8%
	48921	

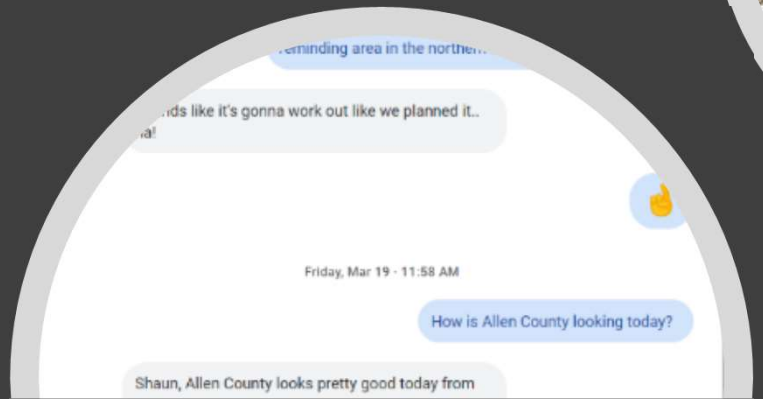


Boots on the Ground

- DNR Employees
- GIS Vendor Employee
- County GIS Managers
- County 911 Director
- County IT Director







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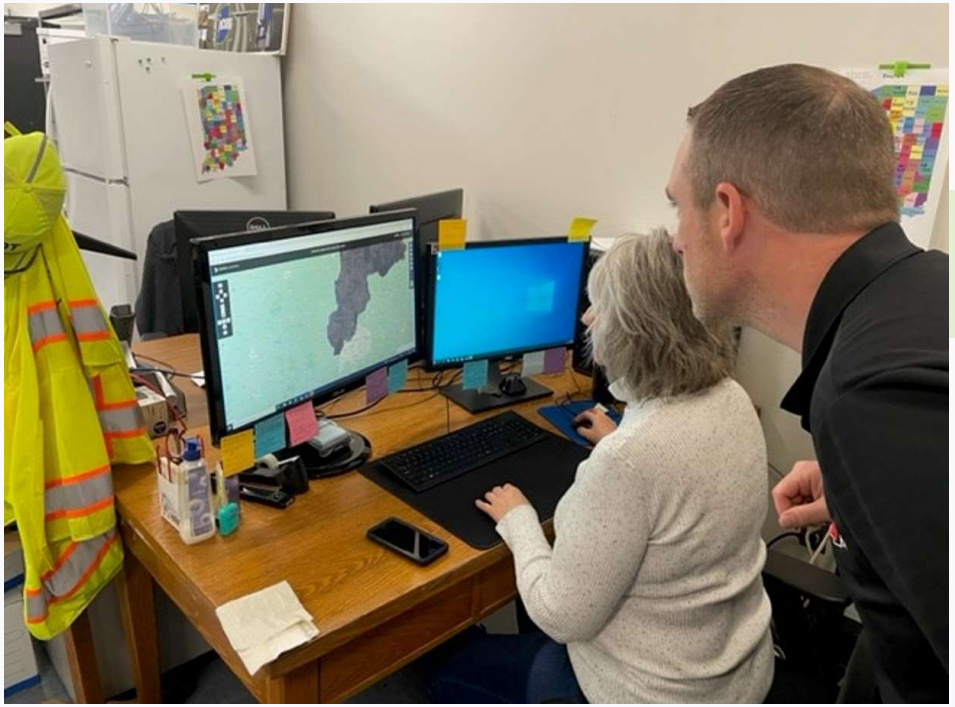
INDOT Aerial Survey's QC Team

- Review seam line
- Bridge decks
- Tonal balance
- Overall image quality



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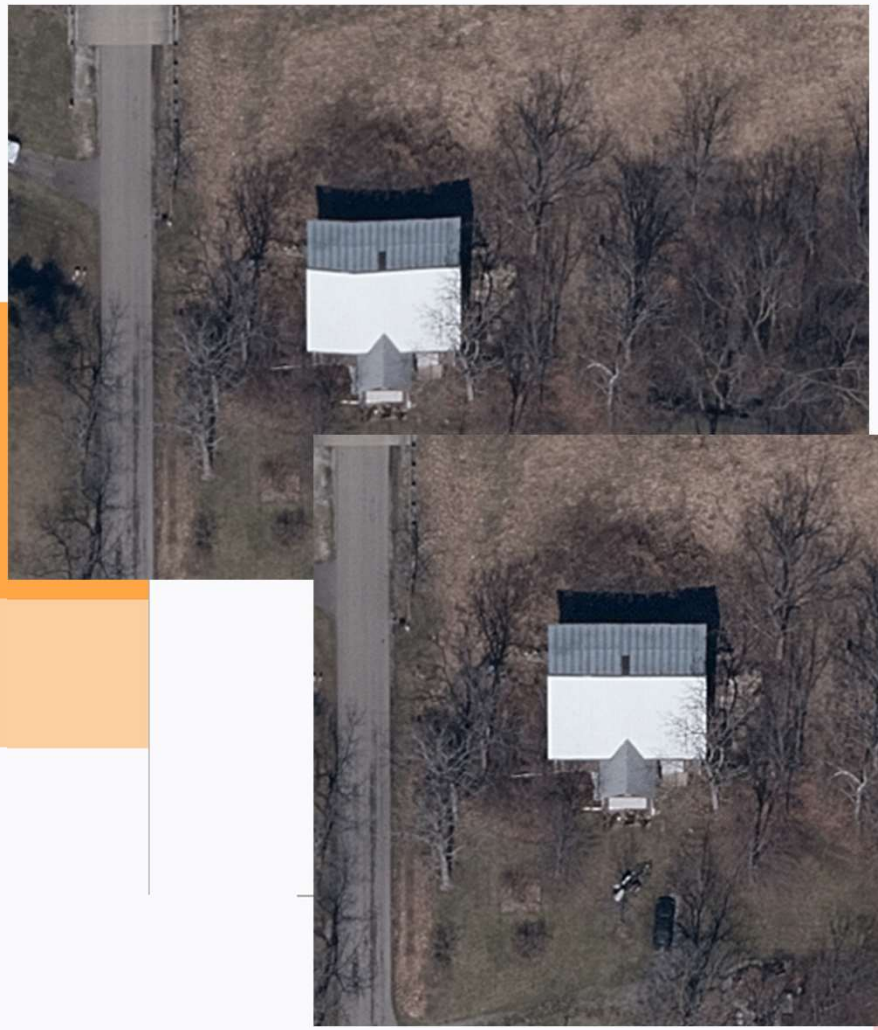
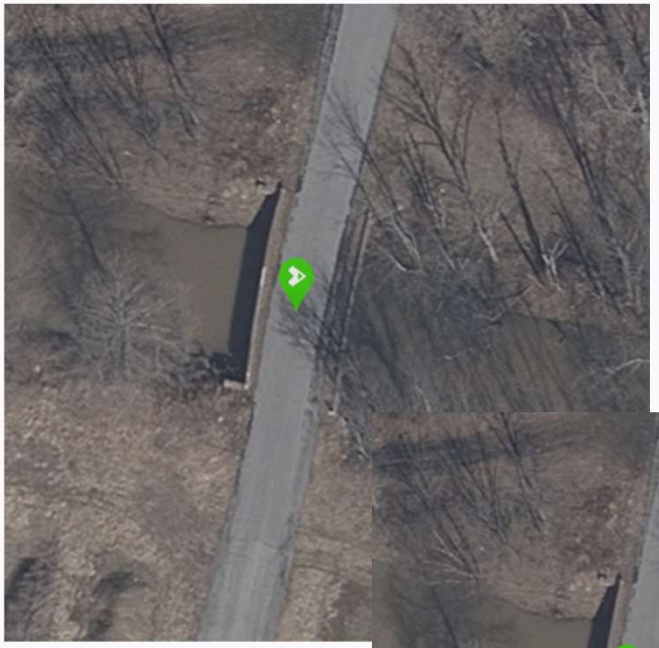
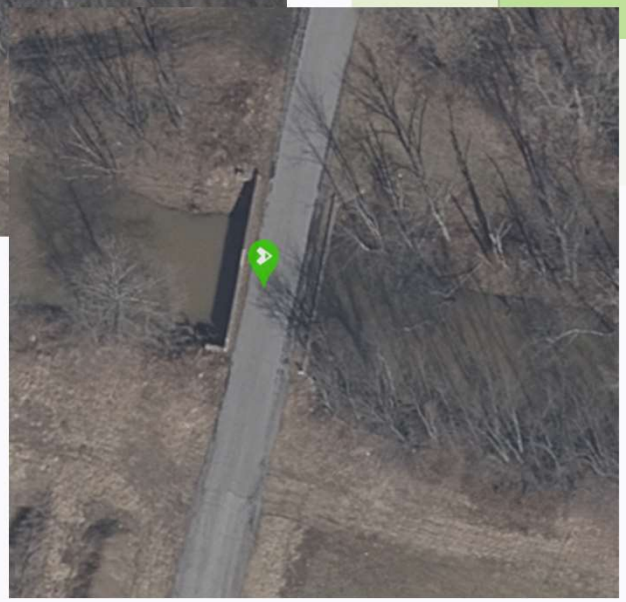
Imagery QC Examples

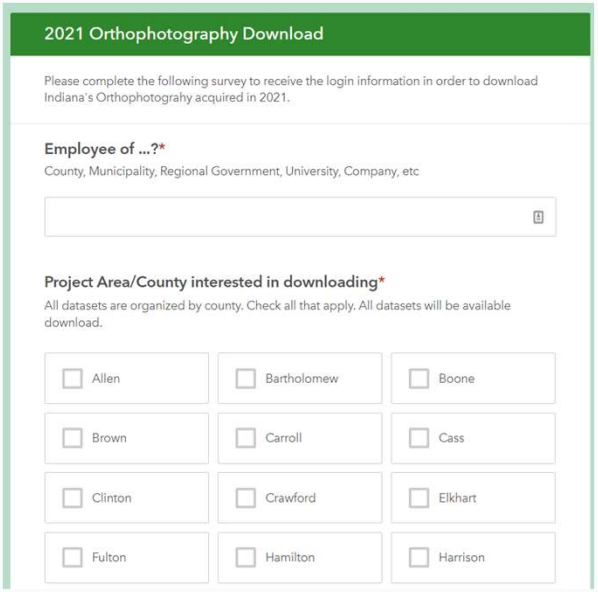




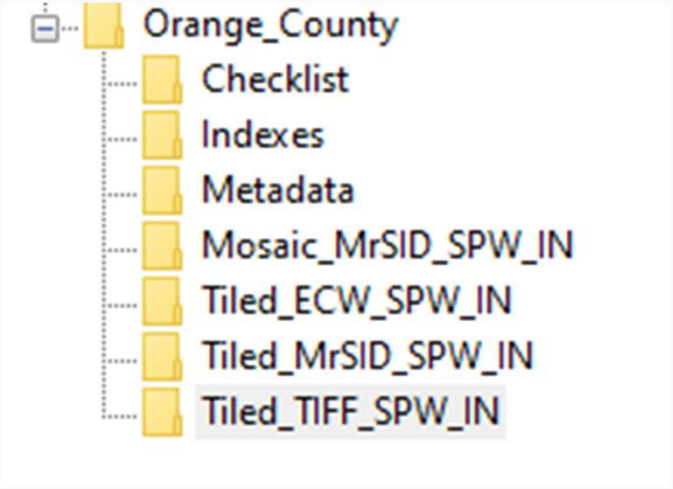


Indiana Statewide Program – Products

Survey



File Structure



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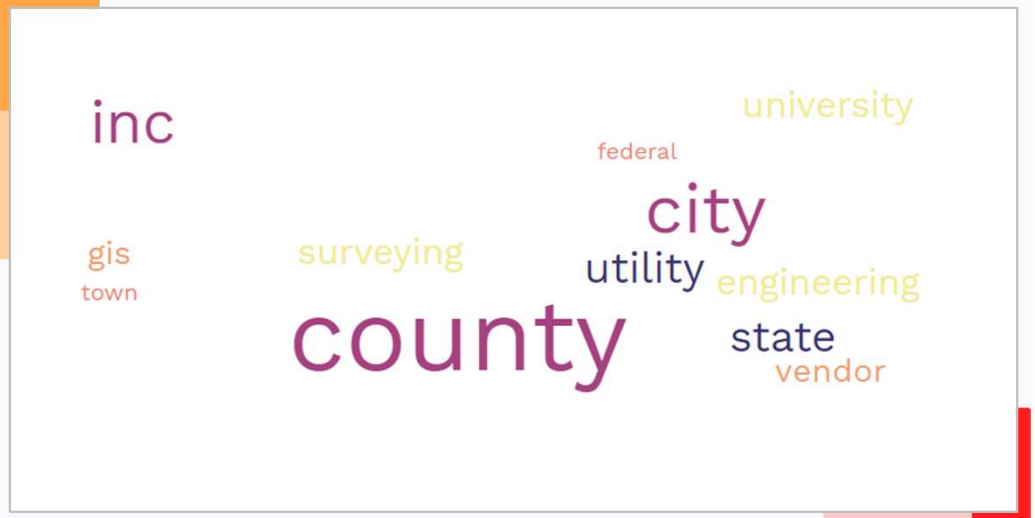
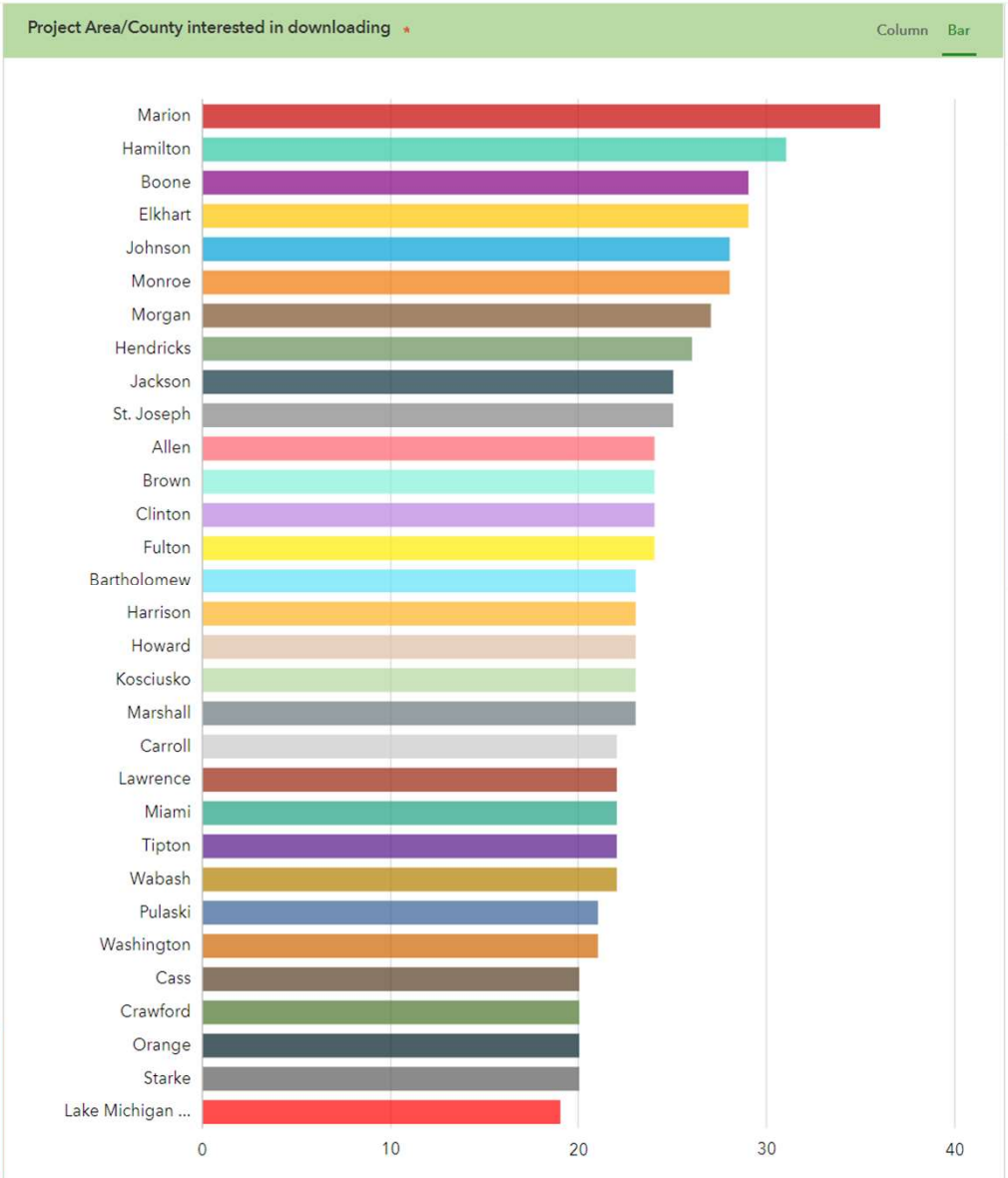
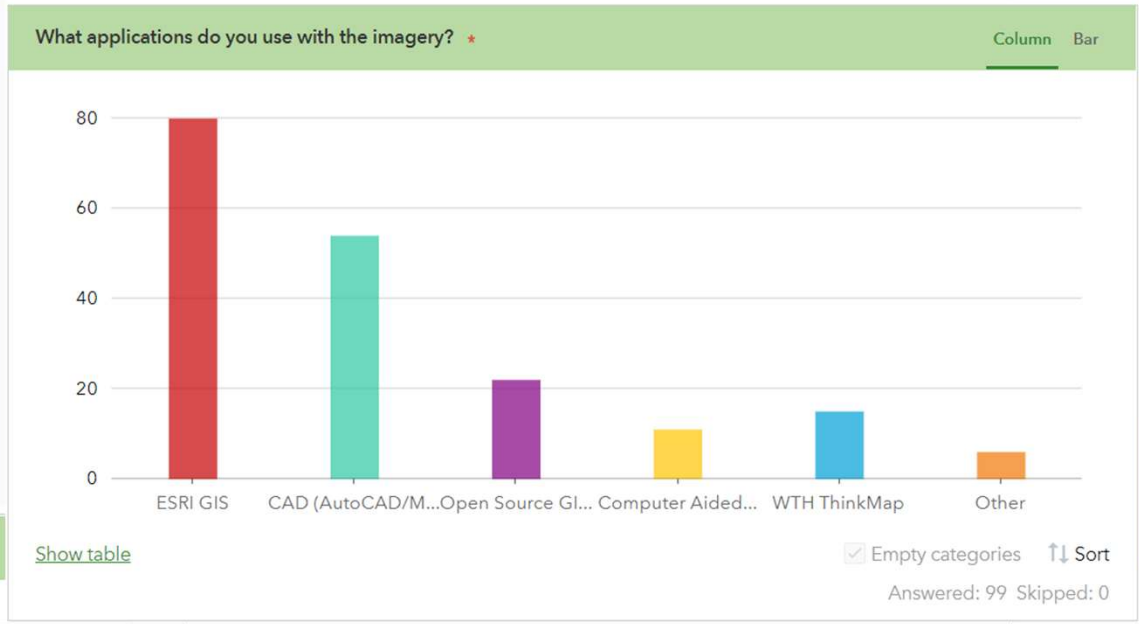
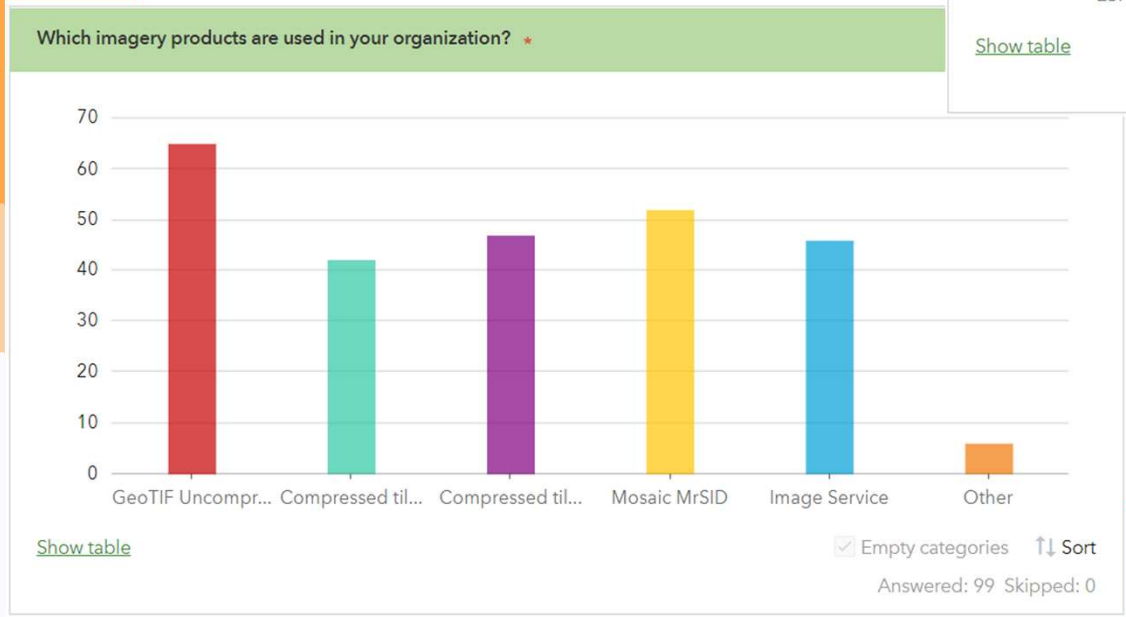
Who Downloaded What





Popular Formats & Application Users





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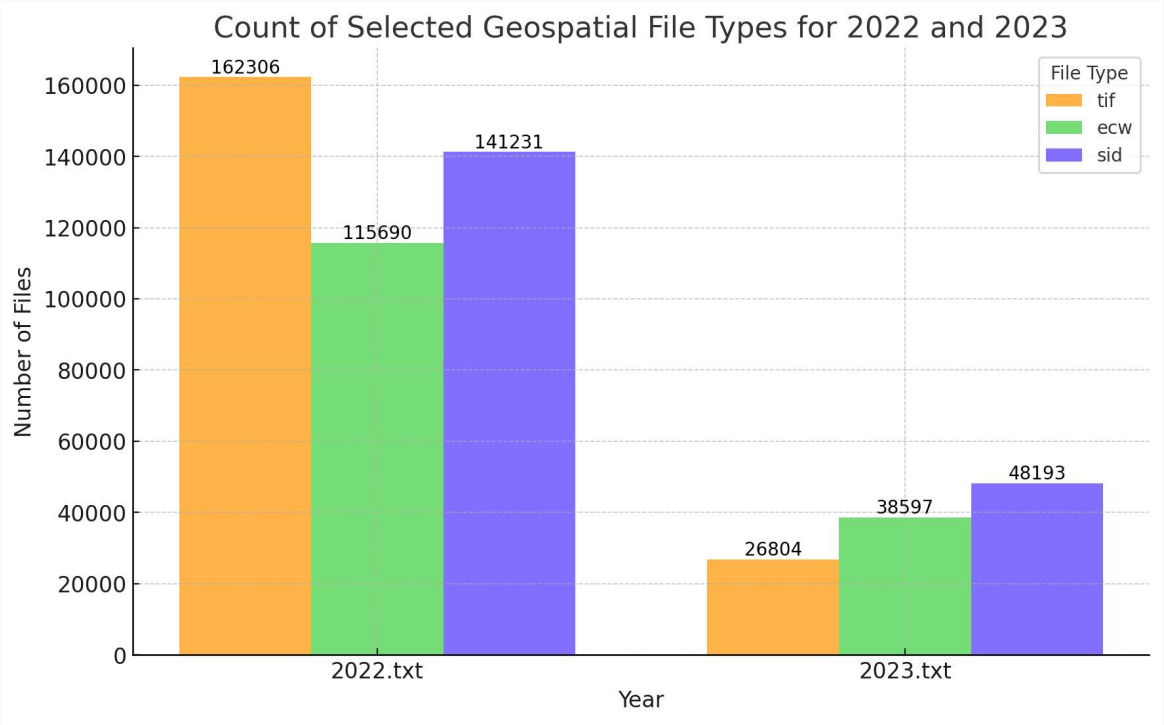
File Download Requests by Image Type



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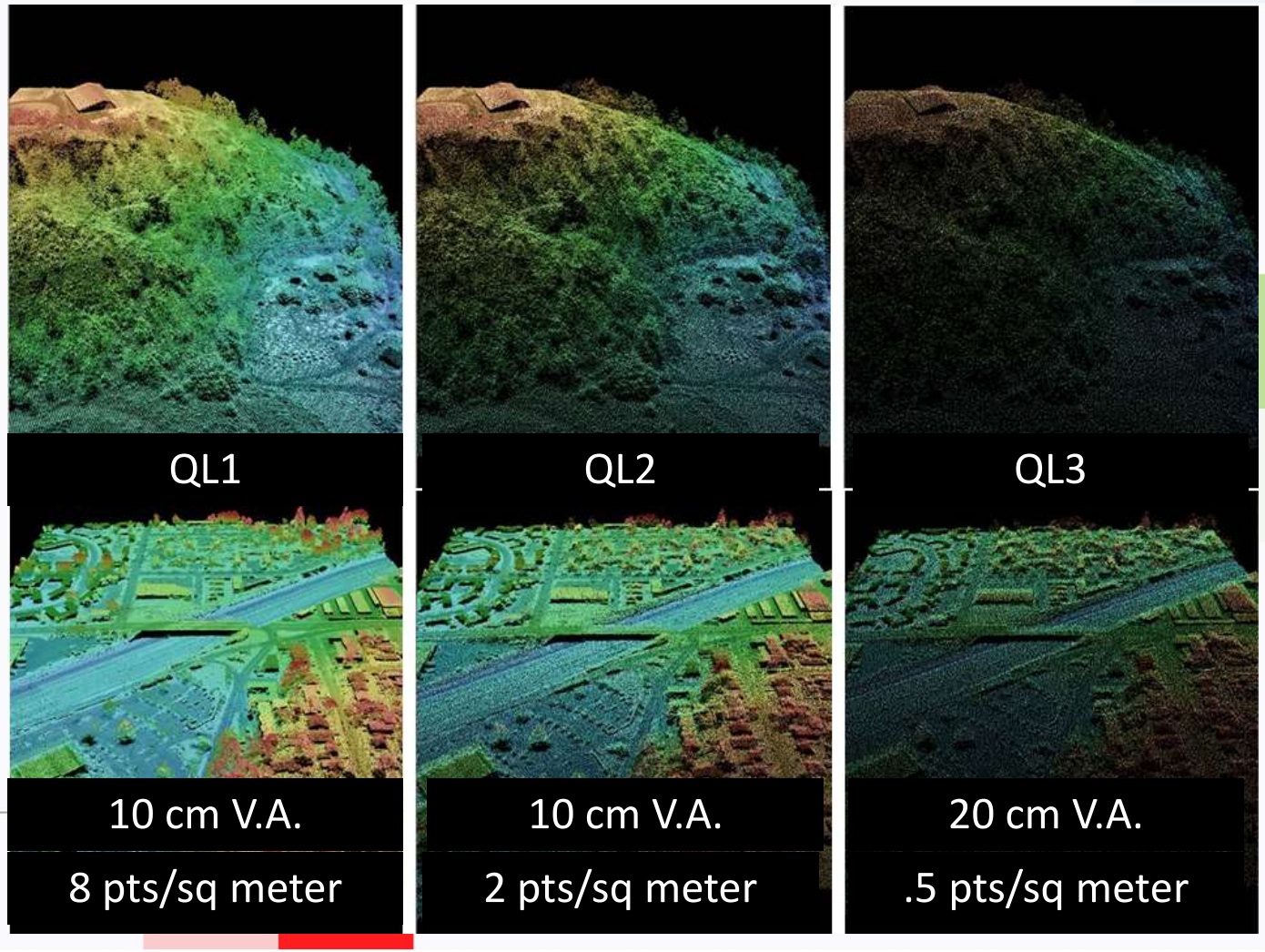
Lidar Program History



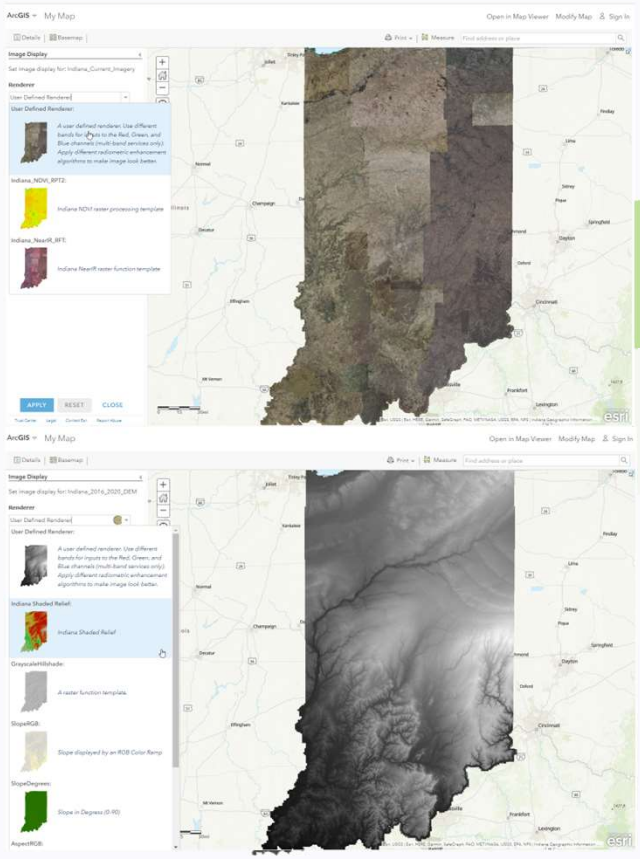
Accessing Dynamic Imagery Services

Access

- IndianaMap
- Custom Web Maps
- GIS Desktop Applications
- Rest Service

Explore Embedded Raster Functions

- Color Infrared
- Shaded Relief
- Hill Shade
- Slope



Accessing Imagery Download

Download Cloud Optimized GeoTIFF (COG)

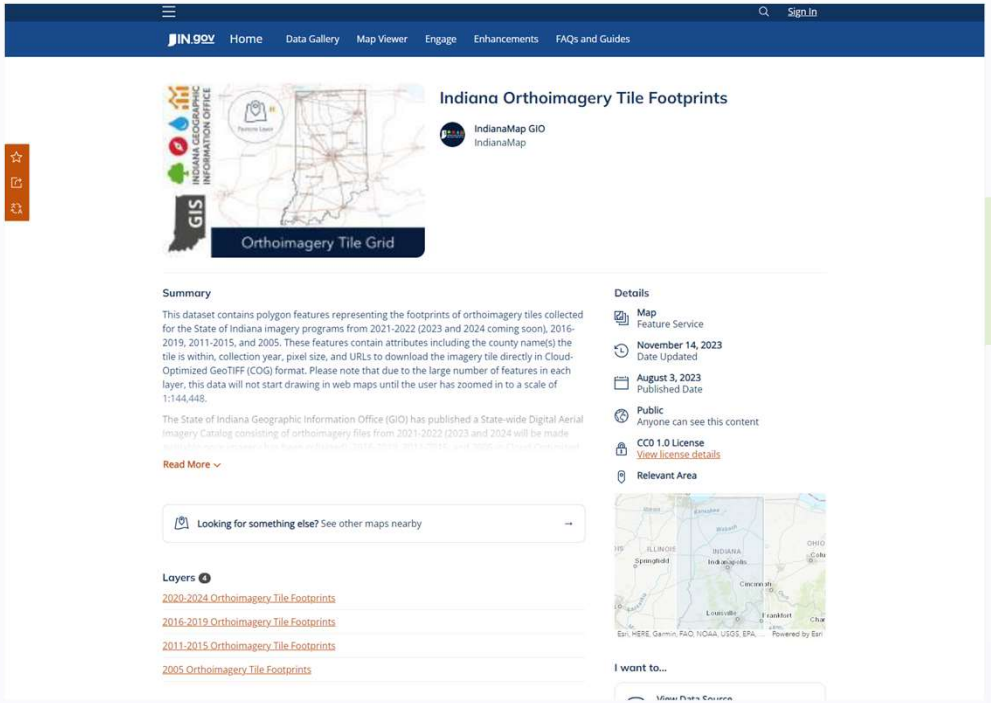
- All years of orthoimagery
- All years of DEM elevation

Using Footprint Feature Service

Filter by

- Year
- Resolution
- County

Imagery tile direct from AWS



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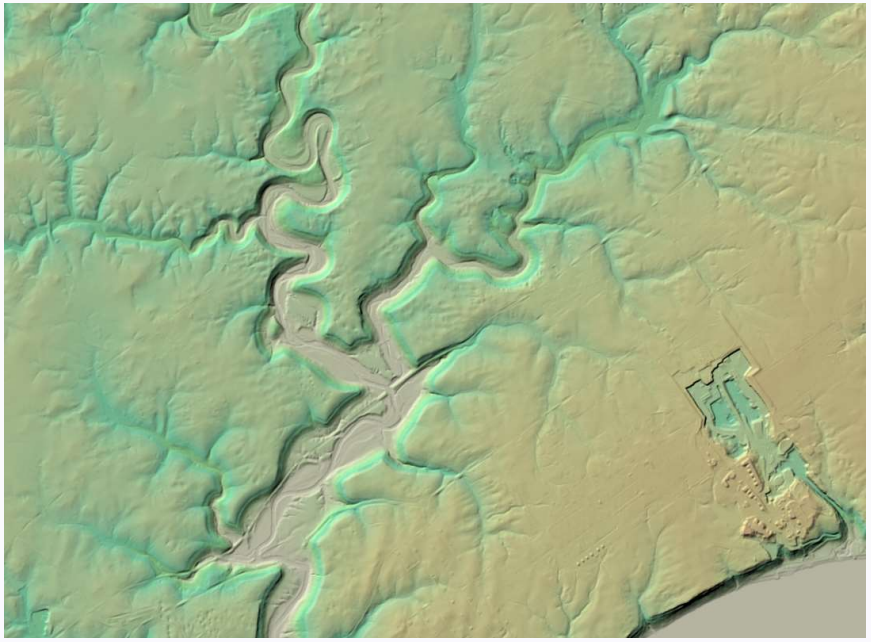
Visual Elevation Products

- Shaded Relief and hill shade



- Contour

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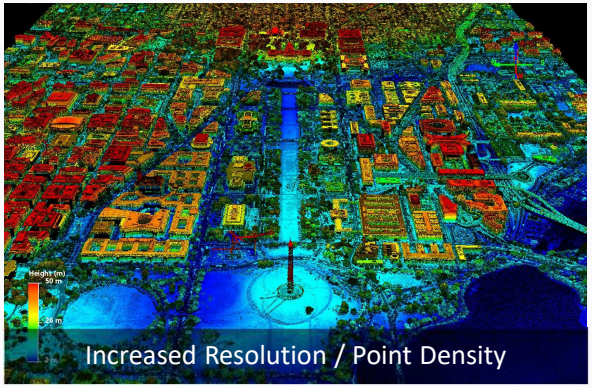
Contract Provisions for Lidar


Point Classification (Vegetation, Buildings)


Increased Resolution / Point Density

Main Classifications

- Bare earth
- Vegetation
- Building
- Water
- Bridge deck

Increased Point Density

- 8 points/meter
- 24 points/meter

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For More Information on Imagery & Elevation

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