



KyFromAbove

Kentucky's Aerial Photography & Elevation Data Program

Background, Overview, & Status

Montana Imagery Summit

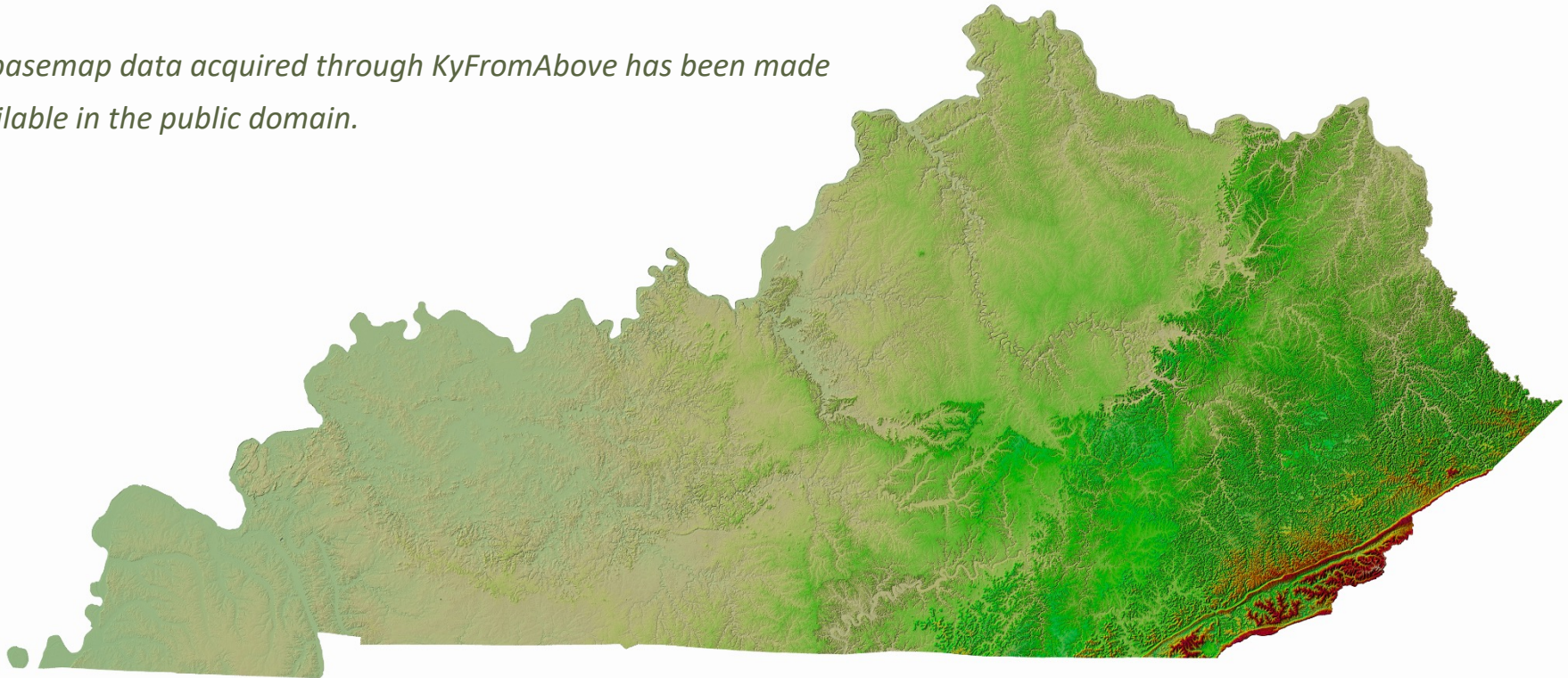
December 12th, 2023

Focus

KyFromAbove is focused on building and maintaining a current basemap for the Commonwealth that can meet the needs of its users at the state, federal, local, and regional level.

A common basemap, including current color leaf-off aerial photography and elevation data (LiDAR), reduces the cost of developing GIS applications, promotes data sharing, and add efficiencies to many state agency business processes.

All basemap data acquired through KyFromAbove has been made available in the public domain.



Background



KyFromAbove awarded its first contract in December 2011

The program's AOI is 40,658.5 square miles (1,000' buffer)

Contiguous areas, county-based acquisition planning

Twenty-five program partners

Acquisitions are prioritized based on partner's needs

Achieved Phase 1 statewide LiDAR coverage in 2017 (5' DEM)

Phase 1 imagery coverage was not achieved (12")

Phase 2 LiDAR is 94.5% complete (2' DEM)

Phase 2 statewide coverage of 6" orthoimagery achieved in 2022

Legislative funding for Phase 3 statewide ortho and oblique imagery (3")

Phase 3 LiDAR is underway

Overall Program Funding

No private sector funding

Imagery – primarily state funding

LiDAR – mix of state and federal funding

Leverage matching funds

Economies of scale pricing

No legislative funding until 22RS

Investment to date: \$24.8 million*



Phase 1 LiDAR Funding: By Year



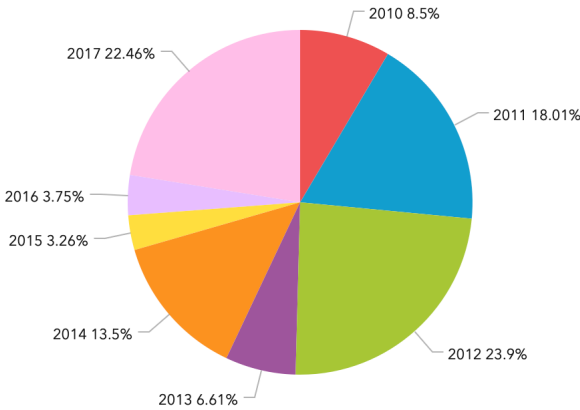
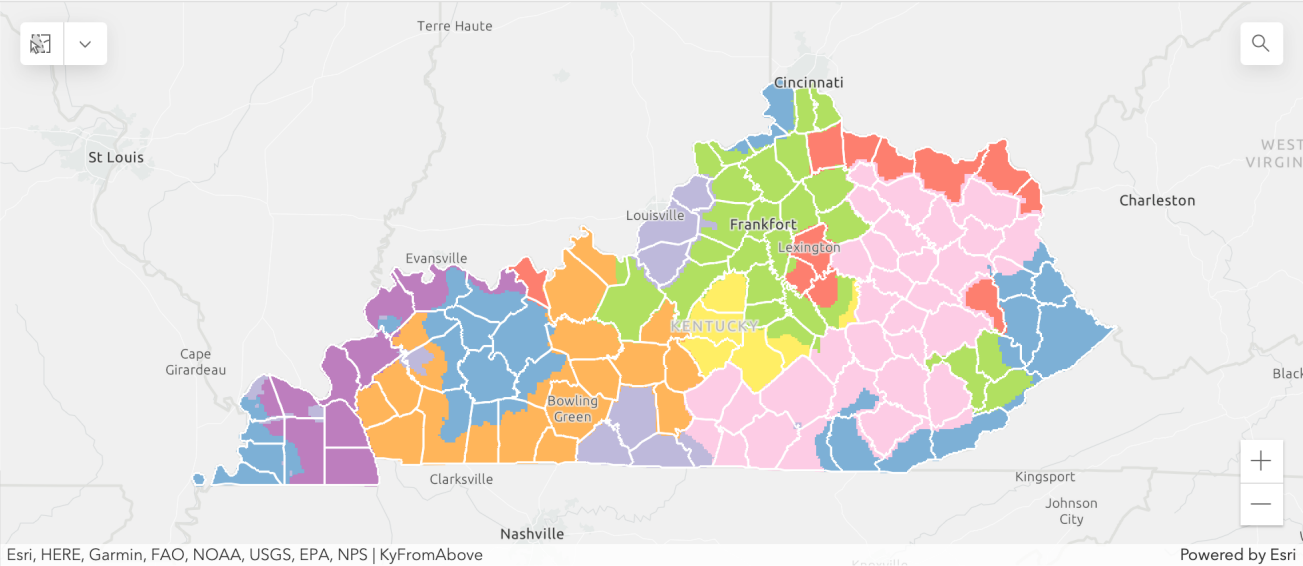
KyFromAbove Phase 1 Elevation Data Funding by Year (2010-2017)

Total Investment:
\$11.7M

This dashboard shows funding for Phase 1 Elevation data. The map shades collection areas by year as listed in the legend below. Each slice of the pie represents a program year. Click on the map or hover over slices in the chart to obtain more information about KyFromAbove

Collection Footprints

- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017



2010 \$995.6k 2011 \$2.1M 2012 \$2.8M 2013 \$774k 2014 \$1.6M 2015 \$381.7k 2016 \$438.7k 2017 \$2.6M

Phase 1 LiDAR Funding: By Partner



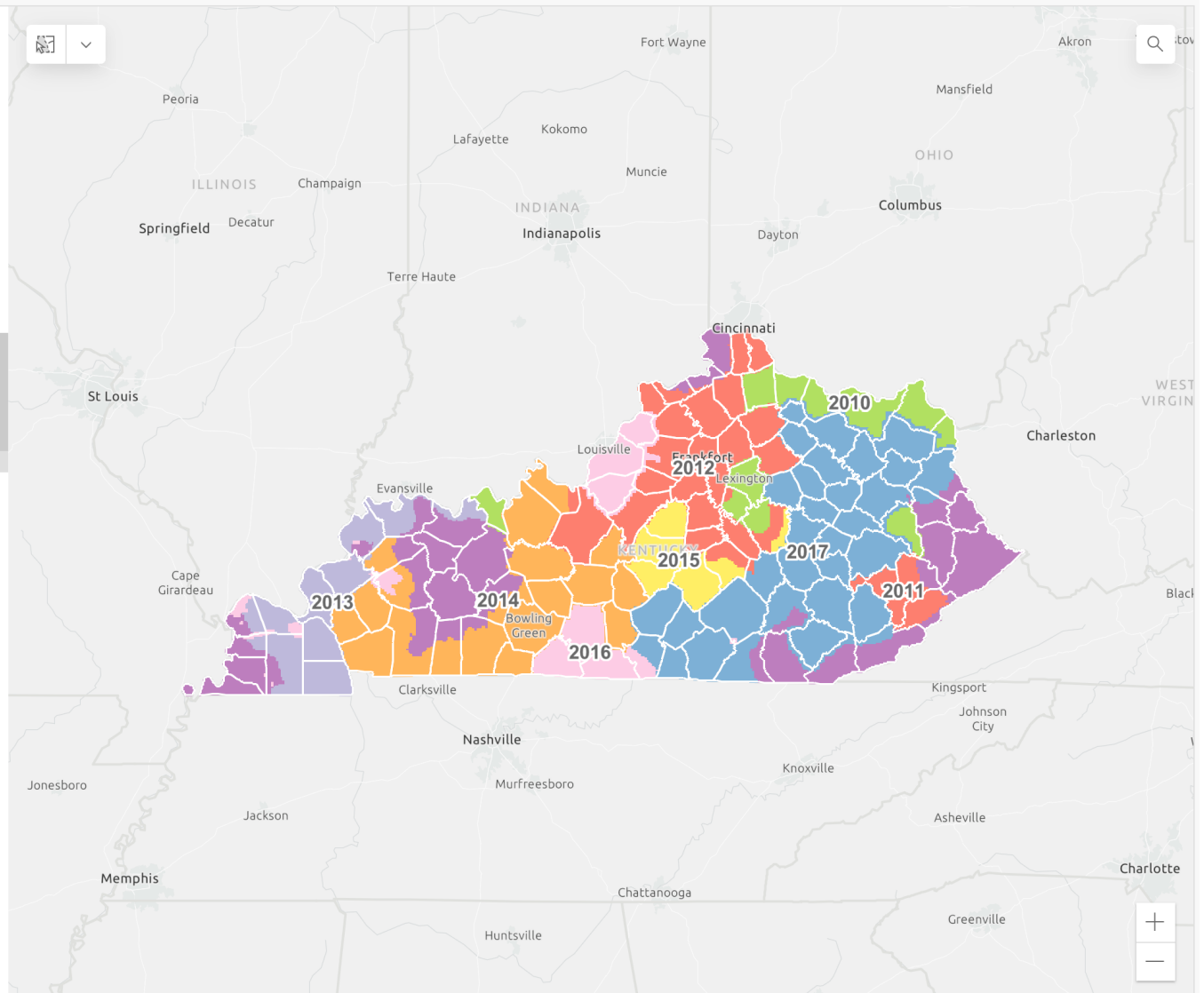
KyFromAbove Phase 1 Elevation Data Program Partners (2010-2017)

Total Investment:
\$11.7M

This dashboard shows Program Partners for Phase 1 Elevation data. The Program Partners for each collection area are listed in the legend below. Click on the map to obtain more information about

Collection Footprints

- AML, Boone County, DOW/FEMA, Frankfort Plant Board, Hardin County, KYTC, LOJIC, NKAPC, USGS
- COT, DLG, DOW/FEMA, KYTC
- DOW/FEMA, DOW/KYTC, KYTC
- DOW/FEMA, DOW/NRCS, NRCS
- Danville, DOW/FEMA, KYTC, NRCS, TVA, USGS
- KYTC, NRCS
- KYTC, Paducah
- LOJIC, KGS, NRCS, TVA

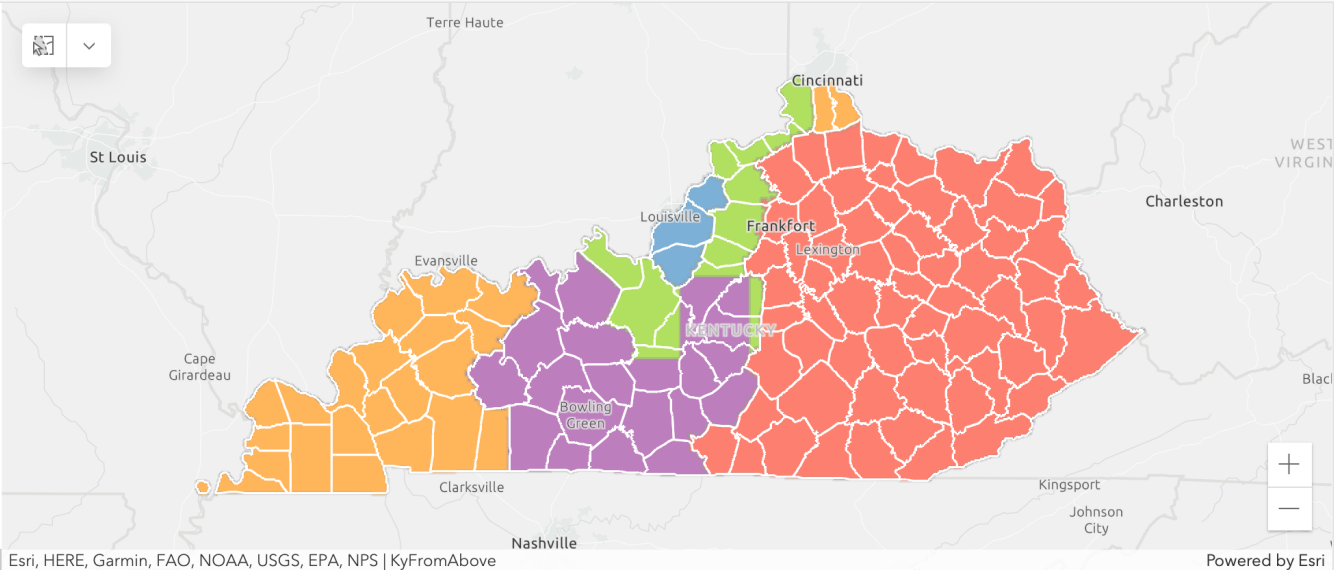


Phase 2 Imagery Funding: By Year



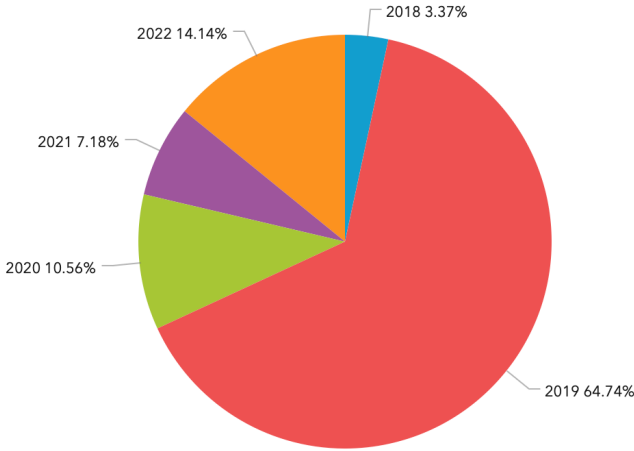
KyFromAbove Phase 2 Aerial Photography Funding Amounts by Year (2018 - 2022)

Total Investment:
\$4.2M



This dashboard shows funding for Phase 2 Aerial photography. The map shades collection areas by year as listed in the legend below. Each slice of the pie represents a program year. Click on the map or hover over slices in the chart to obtain more information about KyFromAbove collection areas.

Collection Footprints



2018 \$140.5k 2019 \$2.7M 2020 \$440.2k 2021 \$299.4k 2022 \$589.4k

Phase 2 Imagery Funding: By Partner



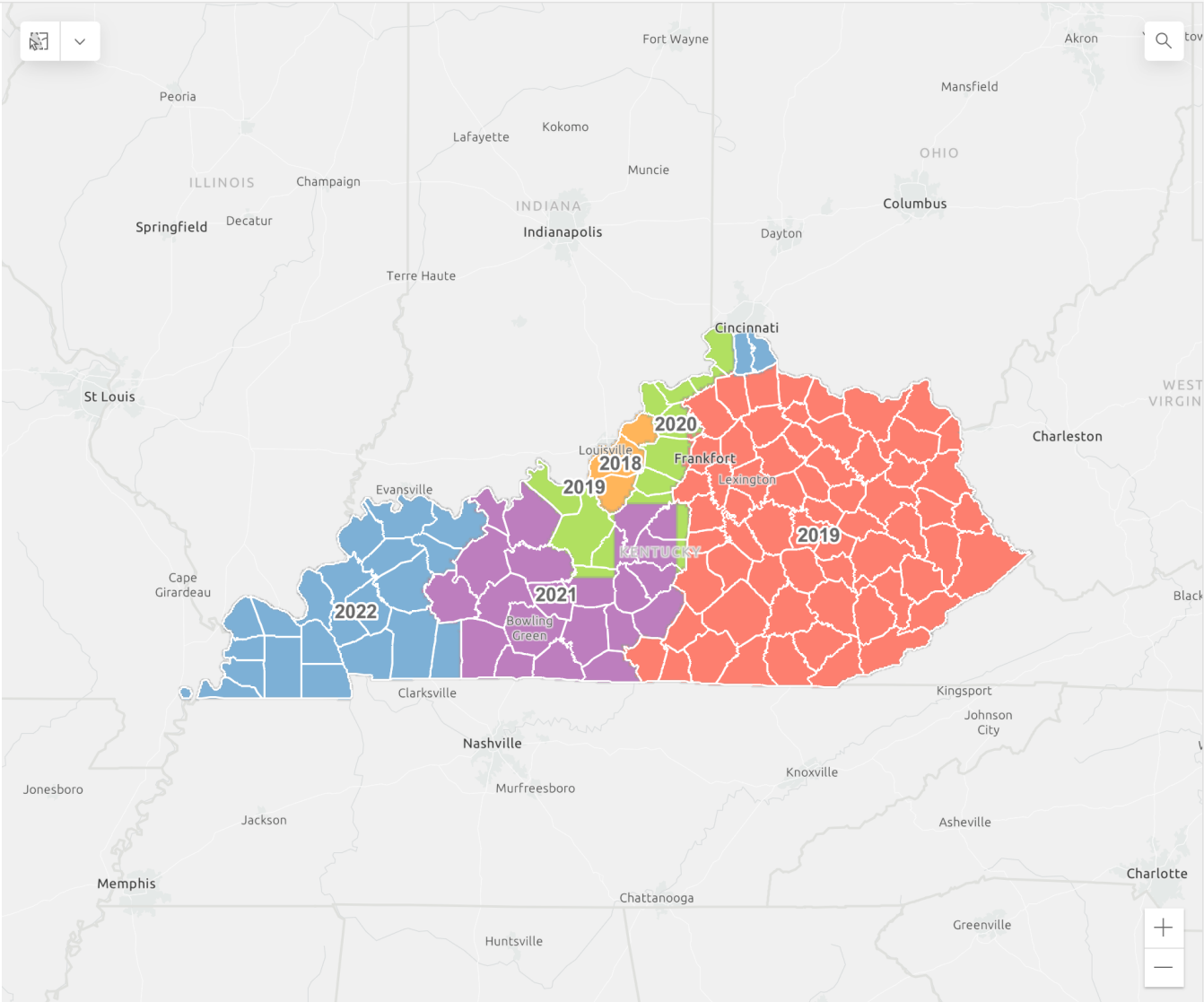
KyFromAbove Phase 2 Aerial Photography Program Partners (2018-2022)

Total Investment:
\$4.2M

This dashboard shows Program Partners for Phase 2 Aerial photography. The Program Partners for each collection area are listed in the legend below. Click on the map to obtain more information about KyFromAbove collection areas.

Collection Footprints

- COT, DLG, Frankfort Plant Board, KYTC
- COT, DLG, Murray
- KYTC
- Kentucky 911 Services Board
- LOJIC



Open Access

Imagery and LiDAR acquired through KyFromAbove is shared freely with all units of government.

As a public domain data asset, all data can be accessed by citizens and the private sector.

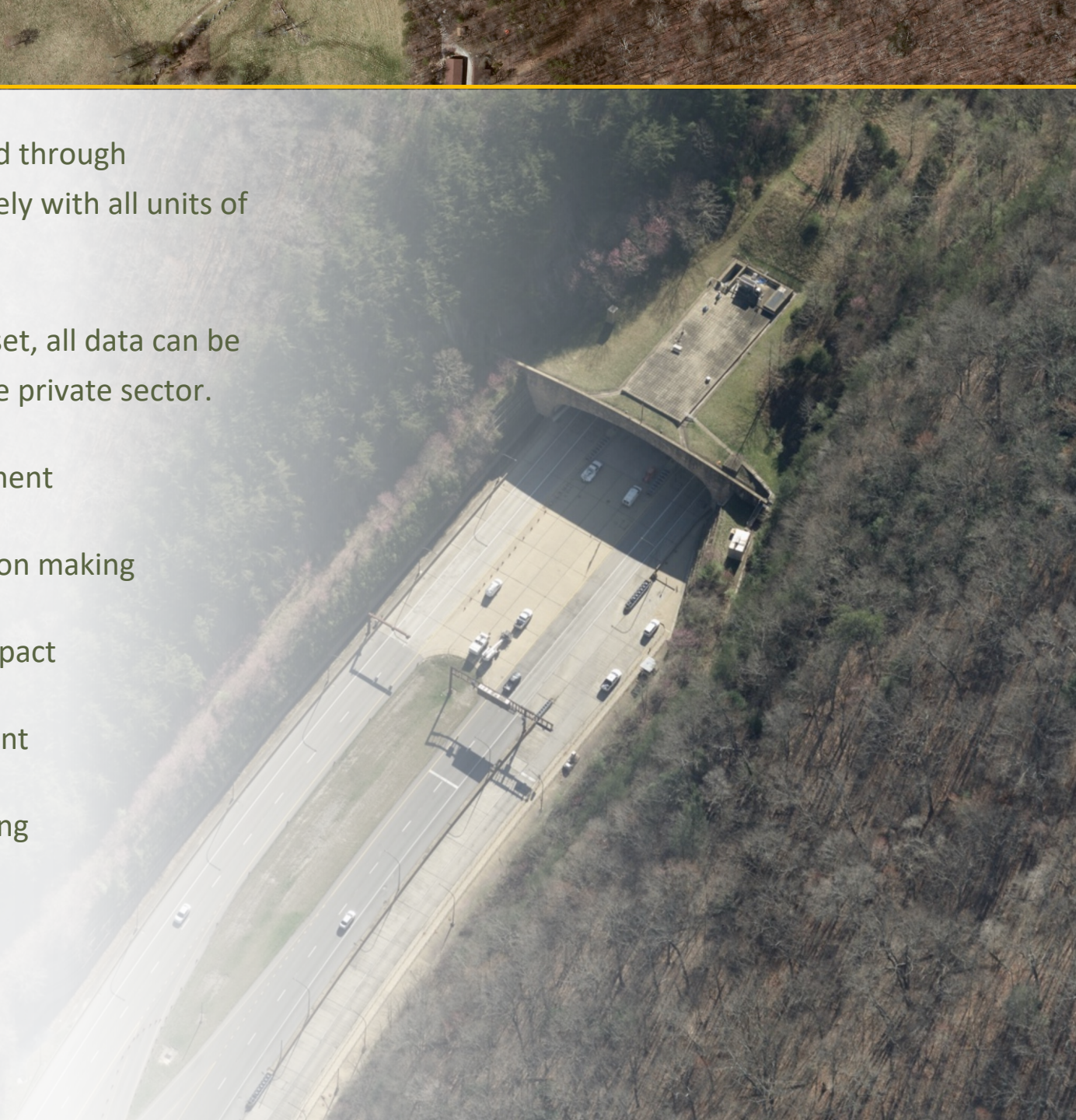
Increases return on investment

Promotes fact-based decision making

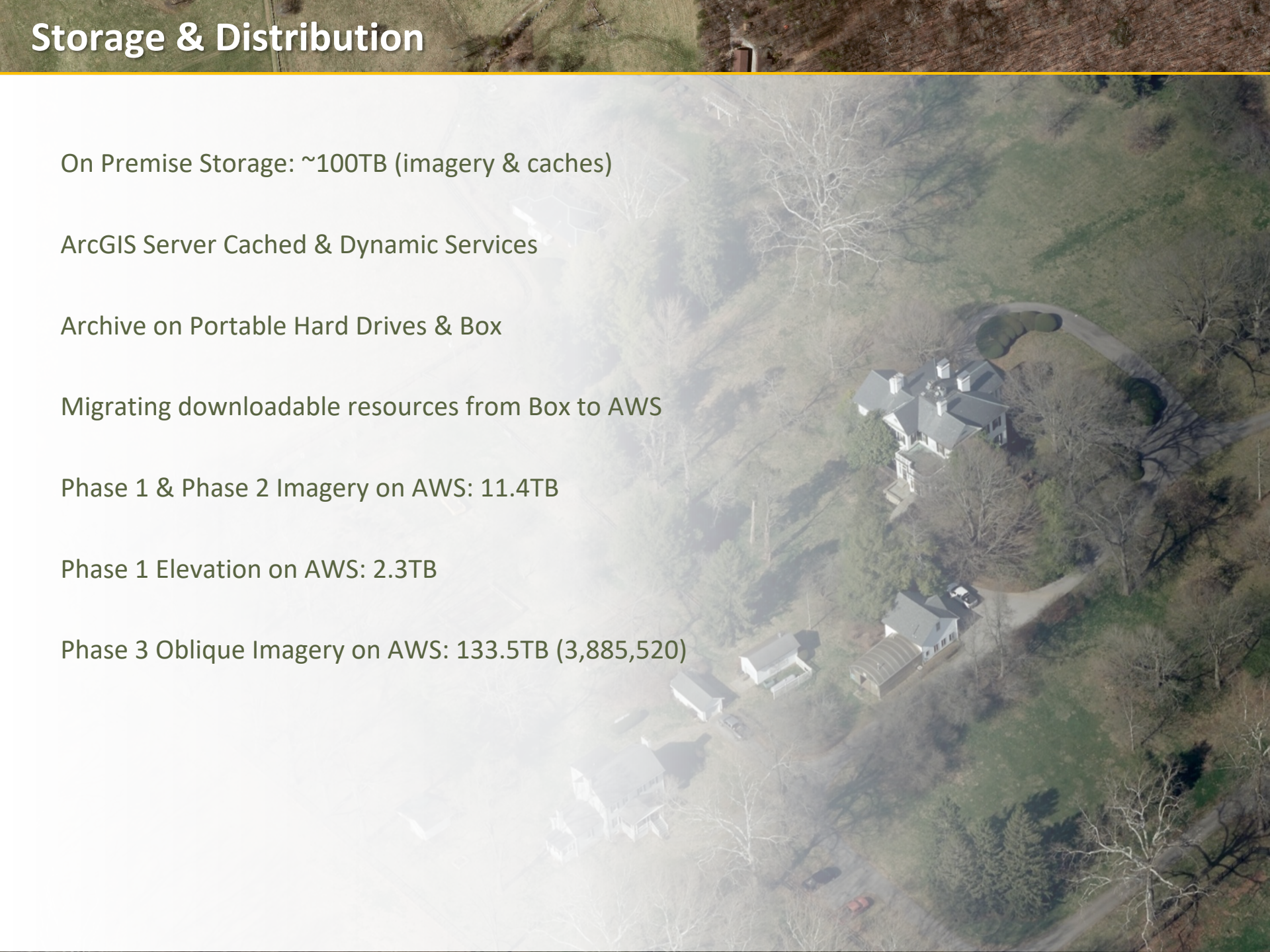
Has a positive economic impact

Encourages civic engagement

Reduces duplicative spending



Storage & Distribution

An aerial photograph of a large estate, likely a golf course clubhouse or resort. The image shows several large, multi-story buildings with light-colored roofs and walls, surrounded by lush green lawns and numerous trees. A winding road or path is visible, and a few cars are parked in a lot. The overall scene is a high-angle view of a well-maintained property.

On Premise Storage: ~100TB (imagery & caches)

ArcGIS Server Cached & Dynamic Services

Archive on Portable Hard Drives & Box

Migrating downloadable resources from Box to AWS

Phase 1 & Phase 2 Imagery on AWS: 11.4TB

Phase 1 Elevation on AWS: 2.3TB

Phase 3 Oblique Imagery on AWS: 133.5TB (3,885,520)

Phase 2 & Phase 3 LiDAR

Phase 2 coverage will be achieved in 2024

Phase 3 LiDAR began with 2023 acquisition
(overlap with Phase 2)

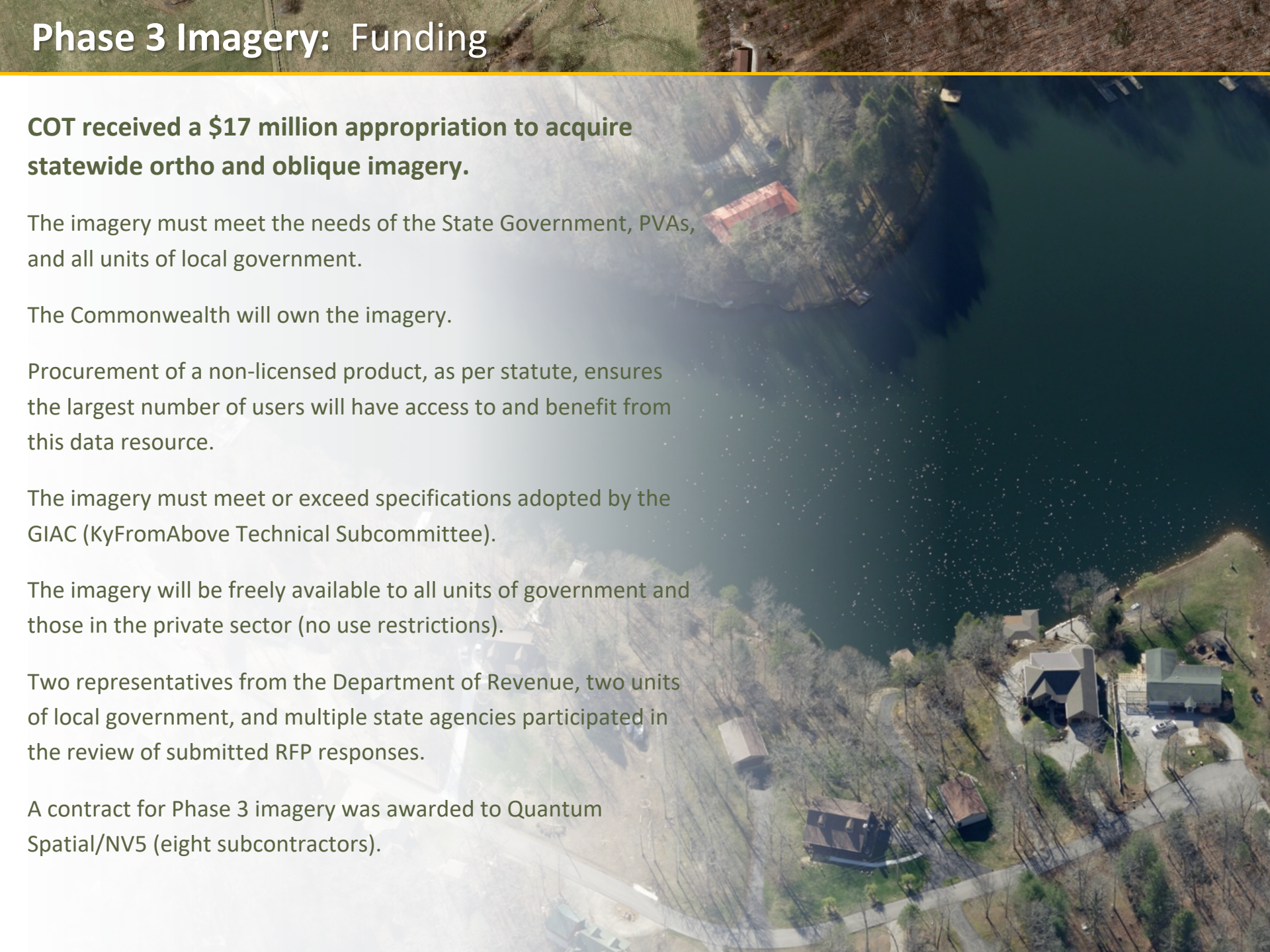
Five Phase 2 counties impacted by flooding were re-acquired in 2023 (Magoffin, Johnson, Martin, Knott, Floyd and Pike).

Phase 3 data will meet or exceed USGS QL2 specs

Standard set of deliverables (2' DEM)

2025 acquisition planning will begin in March

Phase 3 Imagery: Funding

An aerial photograph of a lake with several houses and trees along the shoreline. The water is dark and reflects the sky. The houses are mostly white with dark roofs. There are some bare trees and some green trees. The sky is blue with some white clouds.

COT received a \$17 million appropriation to acquire statewide ortho and oblique imagery.

The imagery must meet the needs of the State Government, PVAs, and all units of local government.

The Commonwealth will own the imagery.

Procurement of a non-licensed product, as per statute, ensures the largest number of users will have access to and benefit from this data resource.

The imagery must meet or exceed specifications adopted by the GIAC (KyFromAbove Technical Subcommittee).

The imagery will be freely available to all units of government and those in the private sector (no use restrictions).

Two representatives from the Department of Revenue, two units of local government, and multiple state agencies participated in the review of submitted RFP responses.

A contract for Phase 3 imagery was awarded to Quantum Spatial/NV5 (eight subcontractors).

Phase 3 Imagery: Acquisition Planning

Completed flight planning for Year 1 in October 2022 (east to west progression)

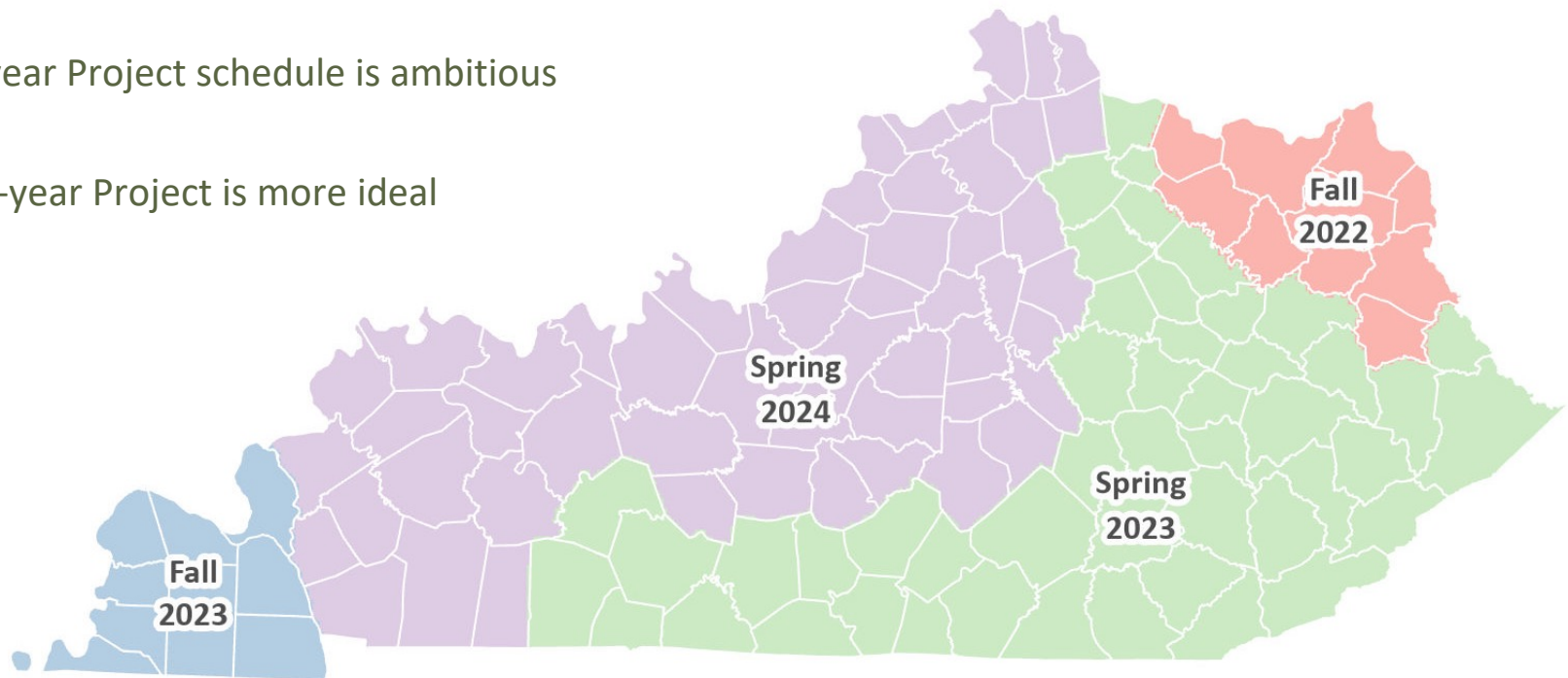
Ten planes and sensors were assigned to the acquisition

Year 1 AOI covered 21,377 square miles (**Fall 2022** & **Spring 2023**)

Flight plan included 1,515 separate flight lines (63,404 miles)

Two-year Project schedule is ambitious

Three-year Project is more ideal



Original 2-year Planning Map

Phase 3 Imagery: Acquisition Conditions

Leaf-off conditions

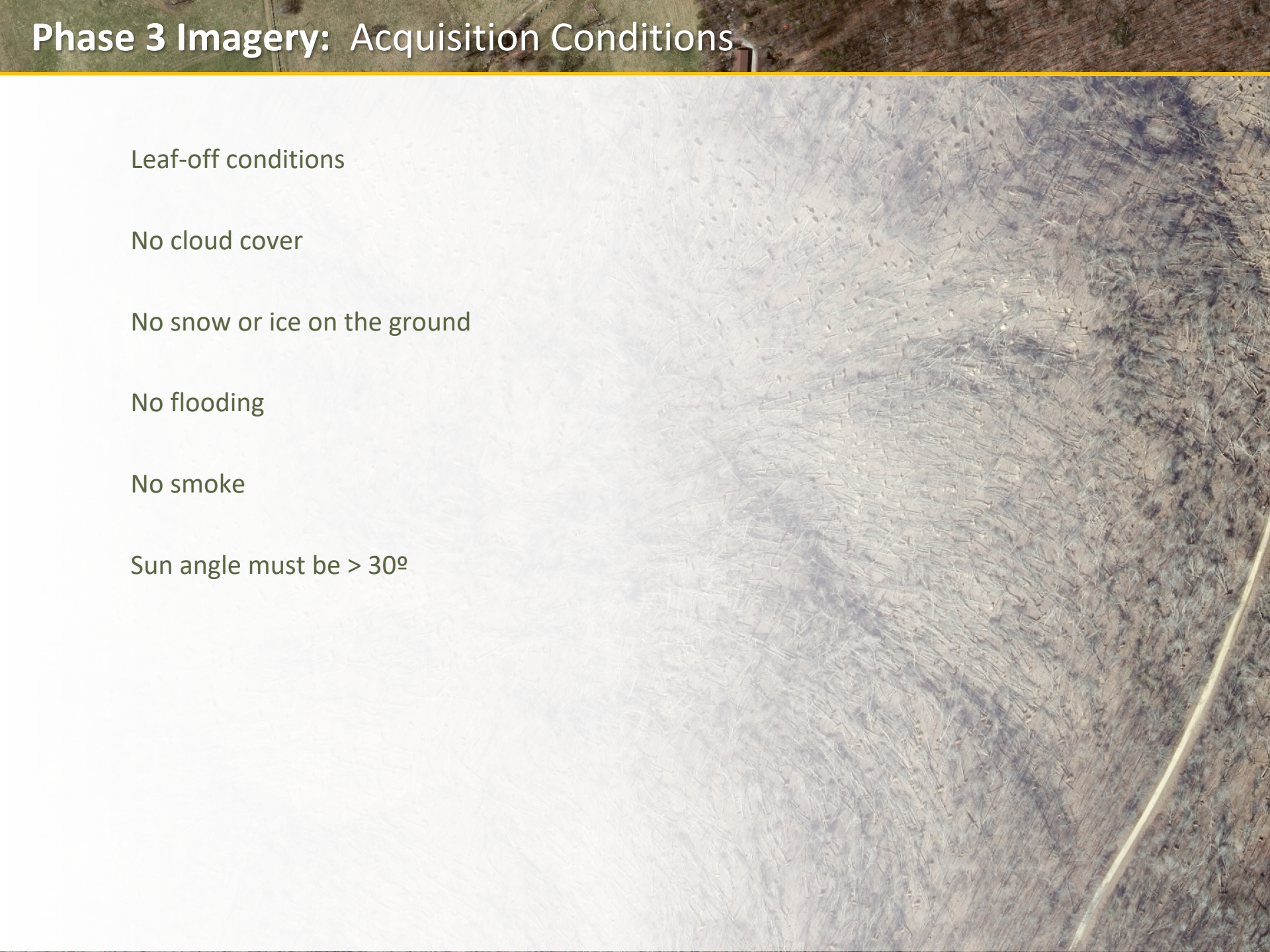
No cloud cover

No snow or ice on the ground

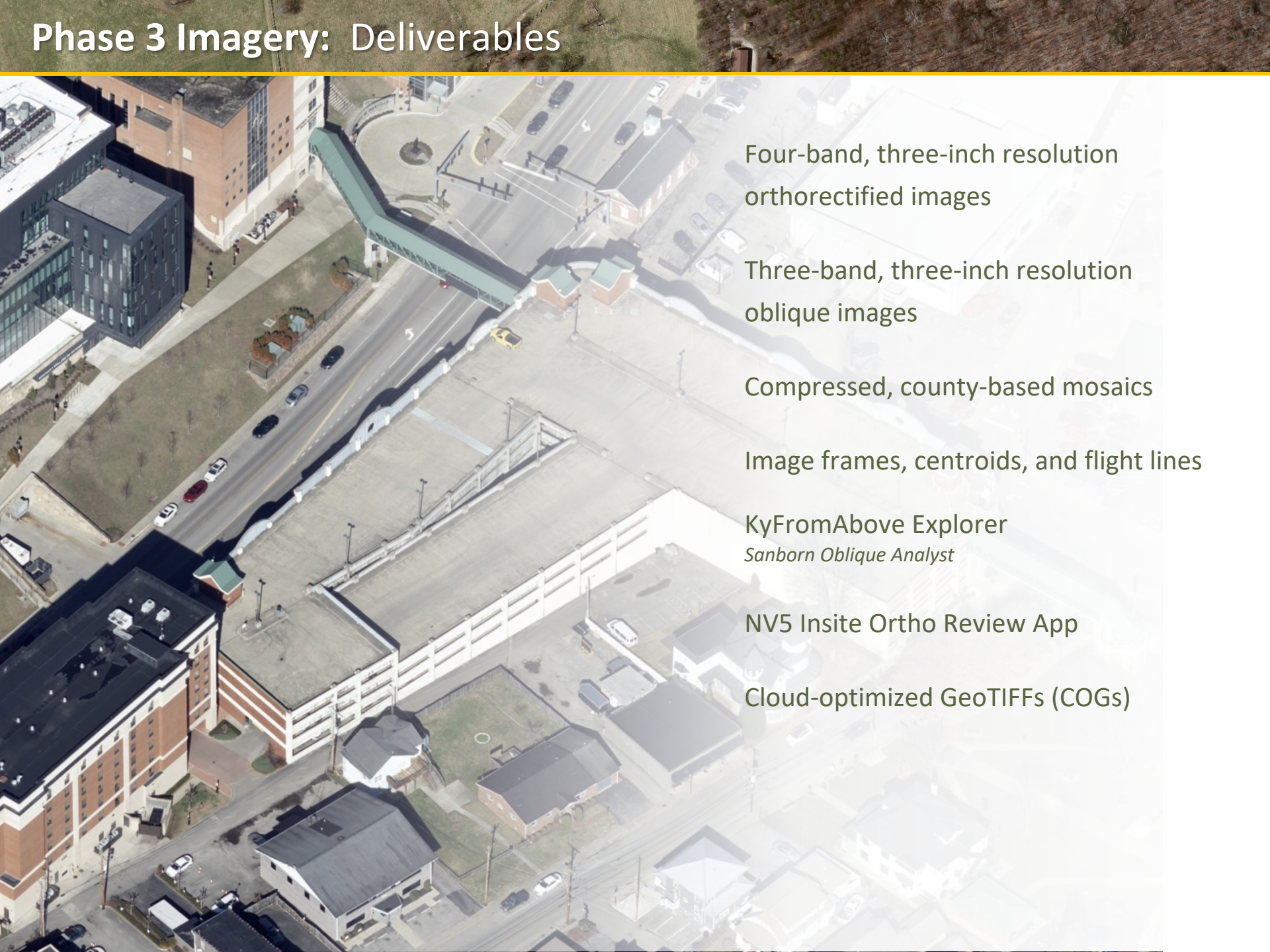
No flooding

No smoke

Sun angle must be $> 30^\circ$



Phase 3 Imagery: Deliverables

An aerial photograph of a city street scene. A multi-lane road runs diagonally from the top left towards the bottom right. A green pedestrian bridge crosses the road. To the left of the road are several buildings, including a large brick building and a modern glass-fronted building. To the right of the road is a large, mostly empty paved area, possibly a parking lot or a construction site. In the background, more buildings and a residential area with houses are visible.

Four-band, three-inch resolution
orthorectified images

Three-band, three-inch resolution
oblique images

Compressed, county-based mosaics

Image frames, centroids, and flight lines

KyFromAbove Explorer
Sanborn Oblique Analyst

NV5 Insite Ortho Review App

Cloud-optimized GeoTIFFs (COGs)

Phase 3 Imagery: Year 1 Acquisition Milestones

Imagery acquisition commenced in mid-November 2022

Sun angle and ground/weather conditions hampered fall acquisition progress

Began again in January 2023 as sun angle conditions improved

83.5% of the AOI was acquired (18,460 mi²)

2,291,450 nadir and oblique frames captured

458,290 nadir image frames captured

Flights occurred on 43 different days

Total of 128 mission were flown

53,204 miles flown

Phase 3 Imagery: Year 1 Acquisition Milestones

Kentucky Statewide Ortho / Oblique Progress 2022 - 2023 Fall / Spring Season



Statistics

Approved Imagery - 18,460 mi²

Total Frame Events - 458,290

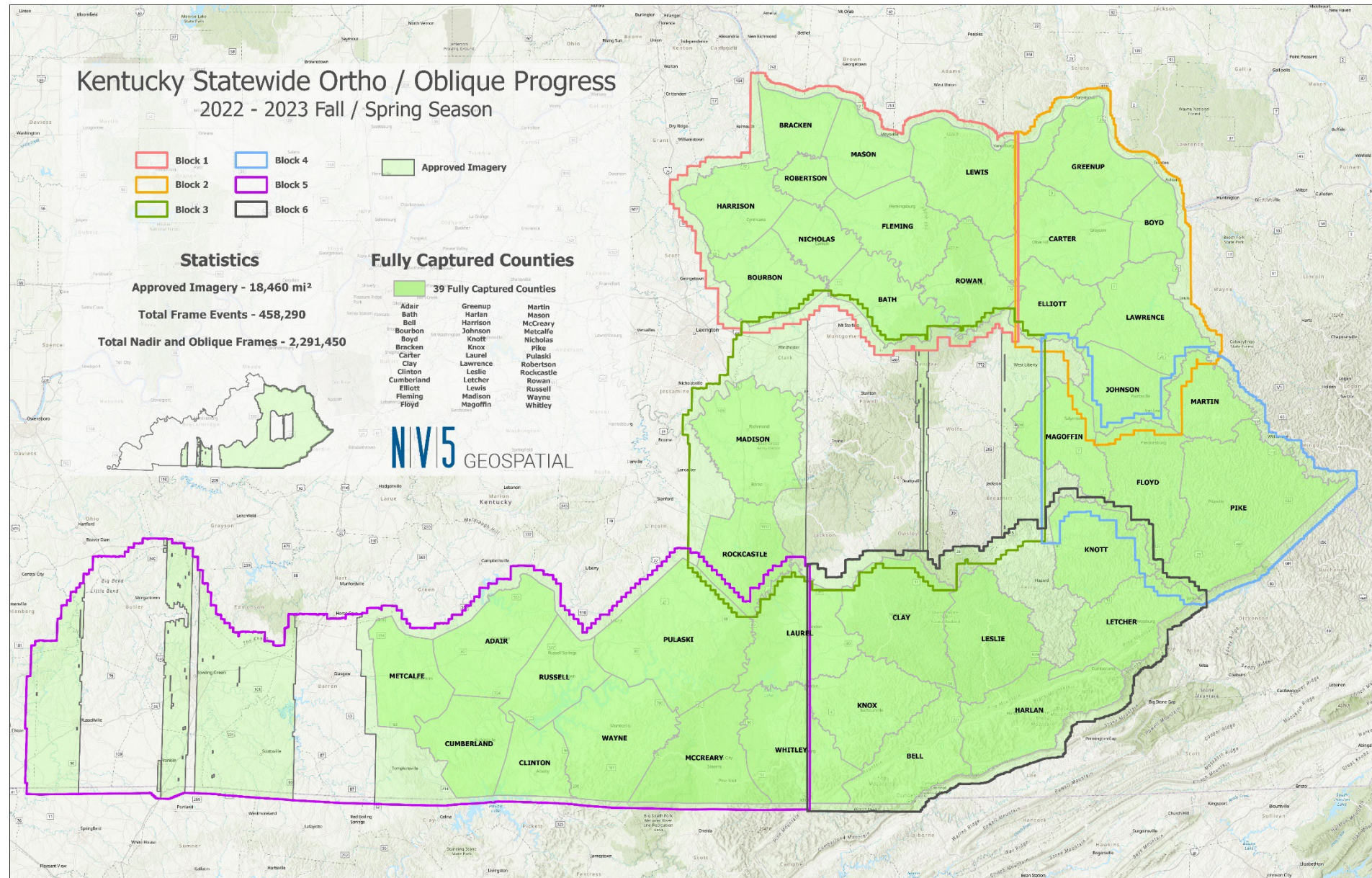
Total Nadir and Oblique Frames - 2,291,450

Fully Captured Counties

39 Fully Captured Counties

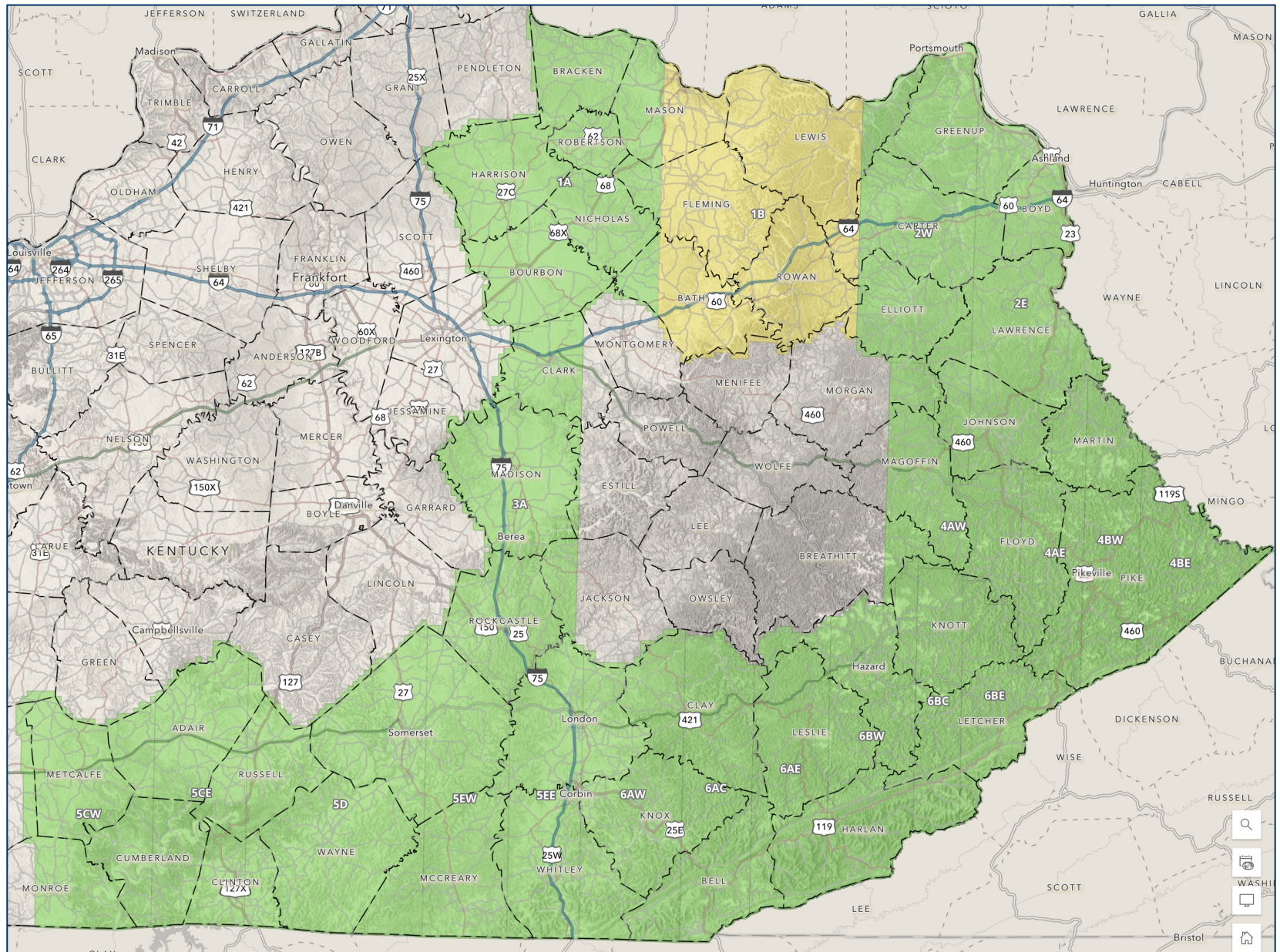
Aldair
Bath
Bell
Bourbon
Boyd
Bracken
Carter
Cay
Clinton
Cumberland
Elliott
Fleming
Floyd
Greenup
Harlan
Harrison
Johnson
Knott
Knox
Laurel
Lawrence
Leslie
Letcher
Lewis
Madison
Magoffin
Martin
Mason
McCreary
Metcalfe
Nicholas
Pike
Pulaski
Robertson
Rockcastle
Rowan
Russell
Wayne
Whitley

NIV5 GEOSPATIAL



An aerial photograph showing a grassy field with a dirt road or path running through it. There are some trees and shrubs scattered across the landscape. The text 'Phase 3 Imagery: Availability Status' is overlaid in white on the left side of the image.

Phase 3 Imagery: Availability Status



Phase 3 Imagery: Timeline

An aerial photograph of a forested hillside. A large, light-colored rock outcrop is visible in the center-right of the image. The surrounding area is covered in dense, leafless trees, suggesting a winter or late autumn setting. The terrain is rugged, with the rock face showing some vertical fissures and ledges.

34+ counties now visible in the KyFromAbove Explorer app

39+ counties available before Christmas

Ortho imagery review will continue until completed

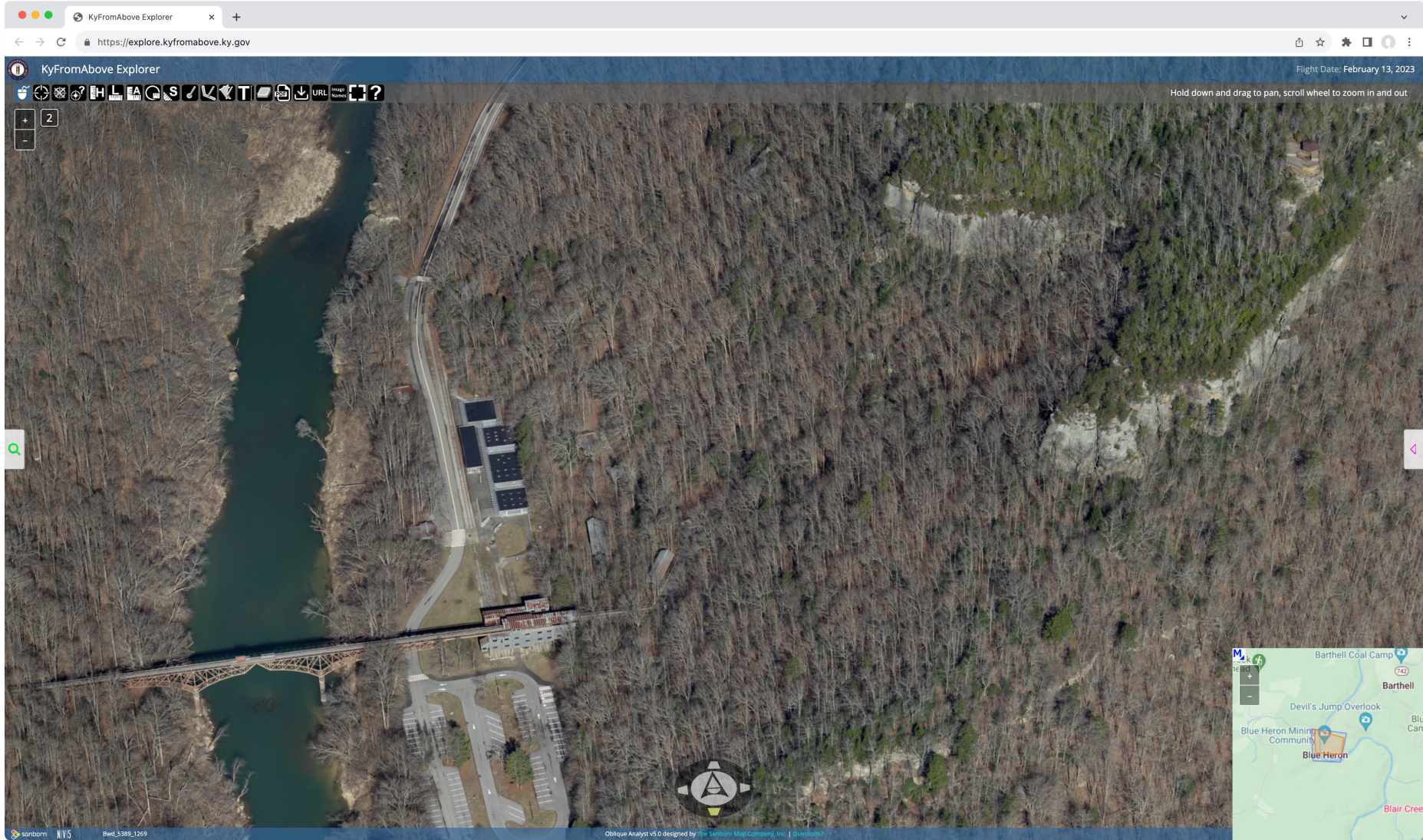
Cached and dynamic services will follow

2023 Fall acquisition – 4,986 square miles acquired

Spring acquisition planning completed

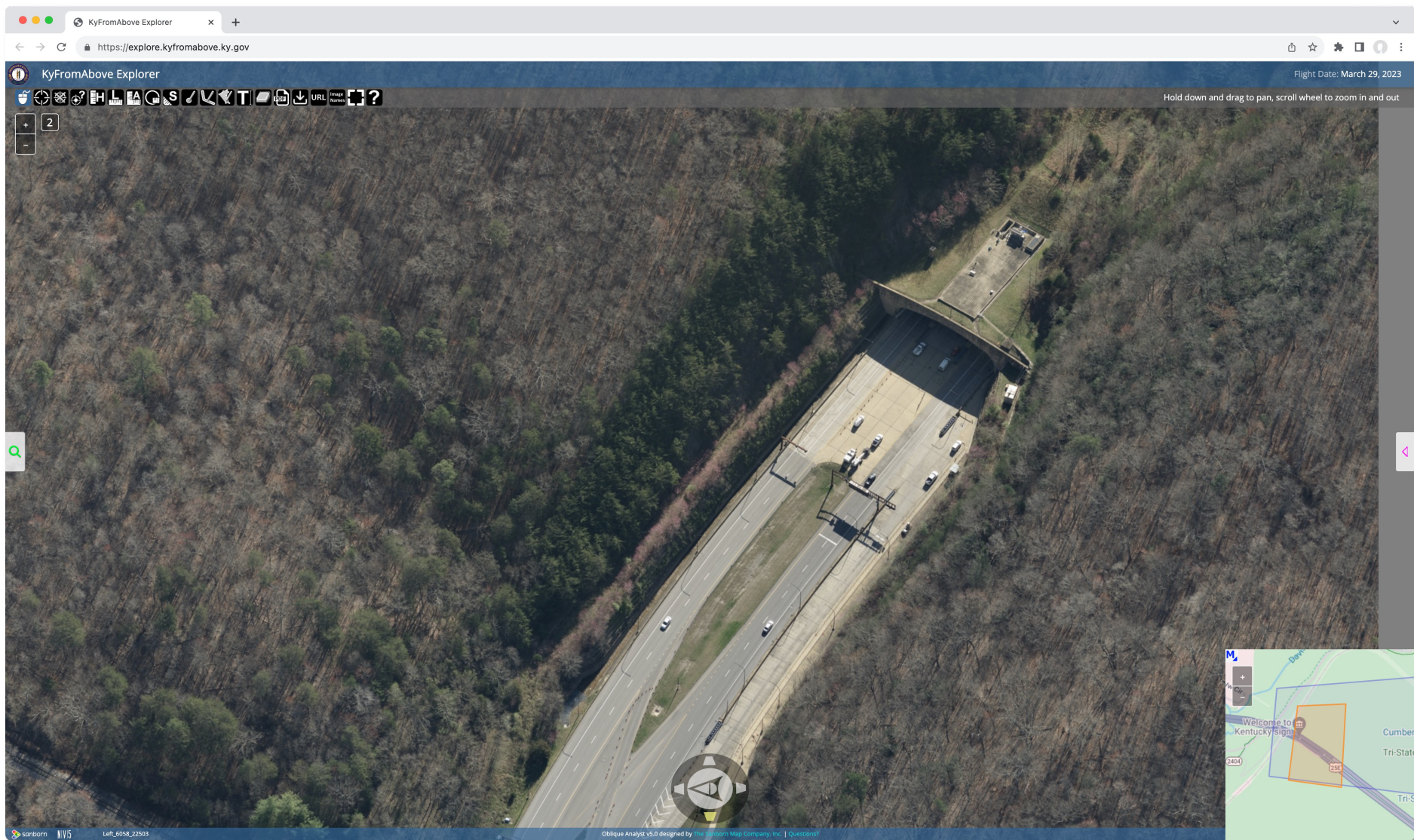
Three-year acquisition cycle is more ideal

Phase 3 Imagery: KyFromAbove Explorer



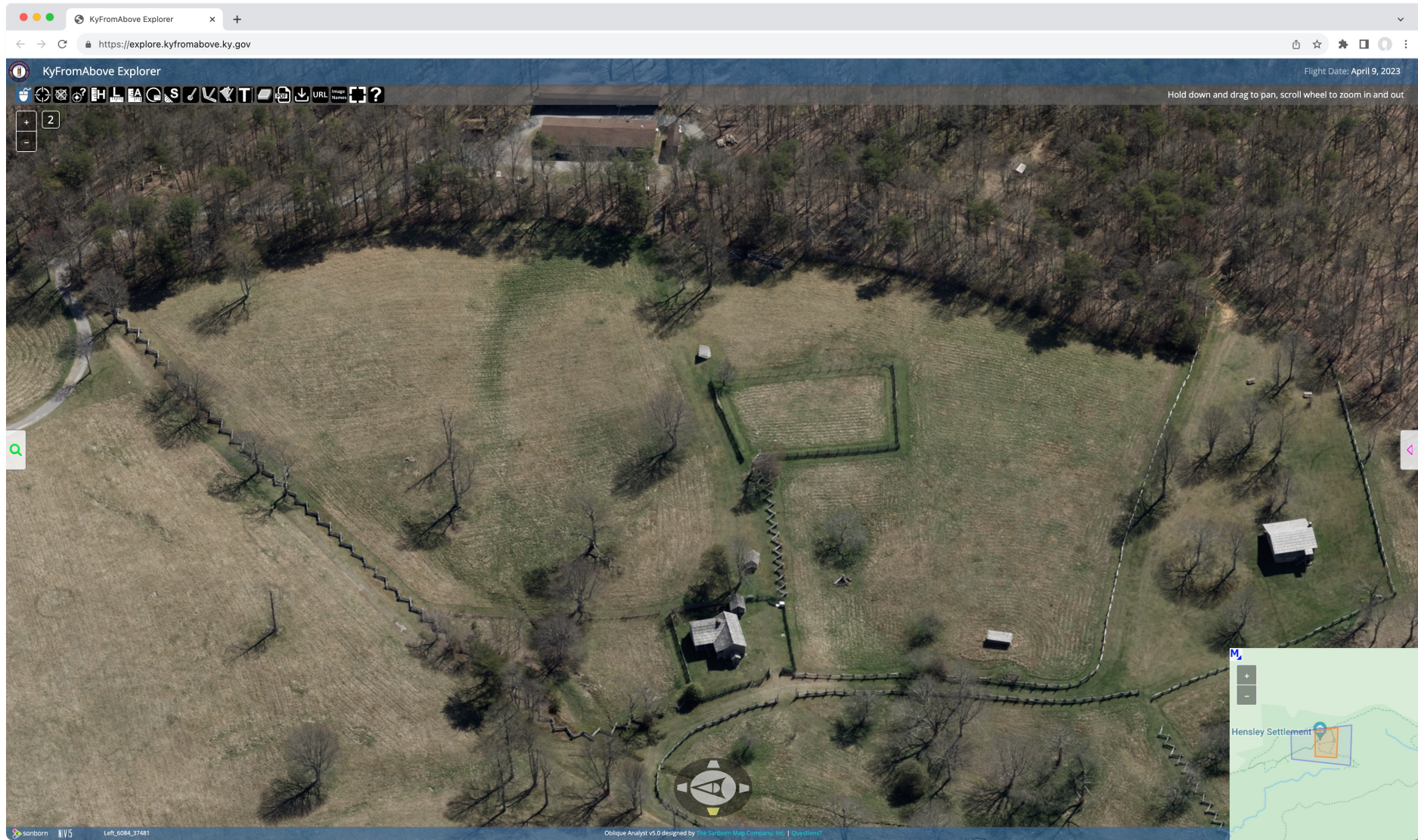
KyFromAbove Explorer – Hosted on AWS EC2

Phase 3 Imagery: KyFromAbove Explorer



KyFromAbove Explorer – Hosted on AWS EC2

Phase 3 Imagery: KyFromAbove Explorer



KyFromAbove Explorer – Hosted on AWS EC2

Phase 3 Imagery: KyFromAbove on AWS

Registry of Open Data on AWS

AWS Open Data Sponsorship Program

Publicly Accessible S3 Bucket

All Phase 1 & Phase 2 imagery and elevation data converted to COGs

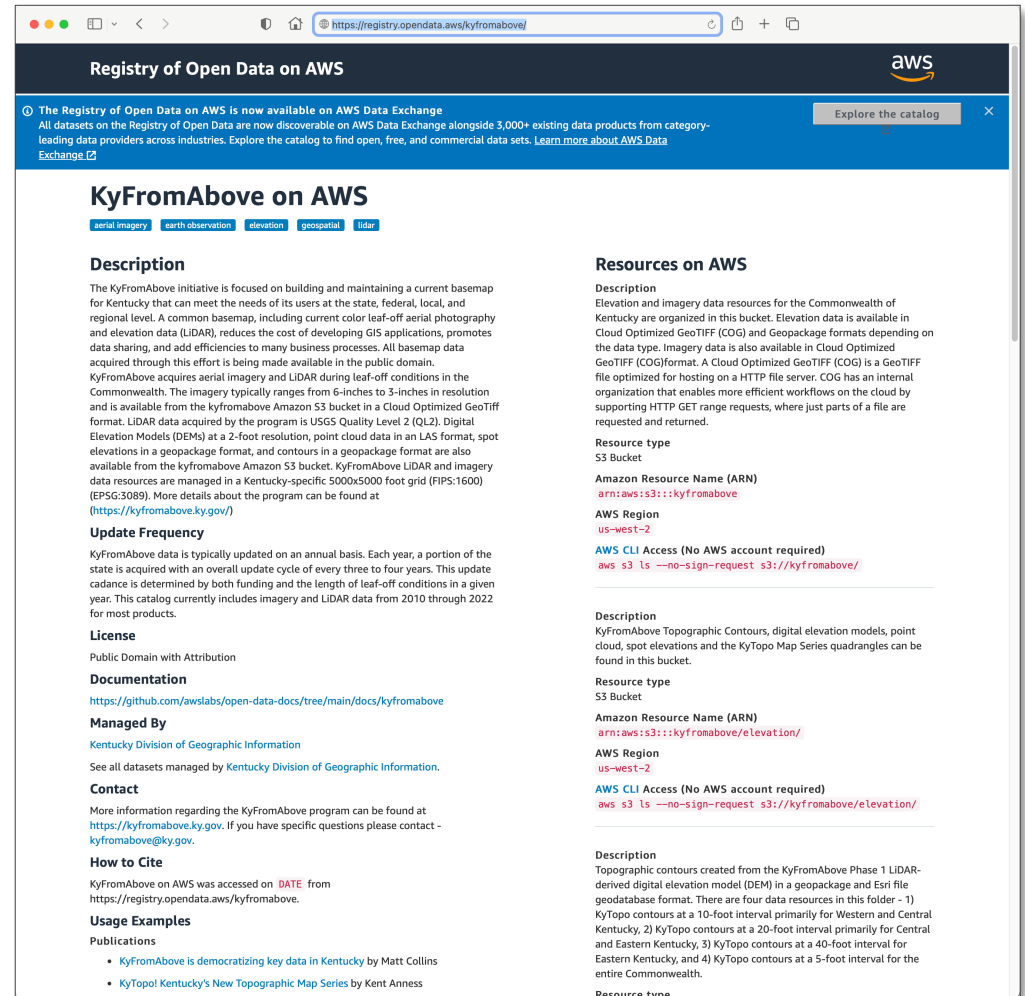
Vector data as Geopackages

Significant cost savings

Increases ROI exponentially

Encourages innovation

Reduces duplicative spending



The screenshot shows the 'Registry of Open Data on AWS' page for 'KyFromAbove on AWS'. The page is titled 'Registry of Open Data on AWS' and features a navigation bar with the AWS logo. Below the navigation bar, there is a section titled 'KyFromAbove on AWS' with tabs for 'aerial imagery', 'earth observation', 'elevation', 'geospatial', and 'lidar'. The main content area is divided into two columns. The left column contains sections for 'Description', 'Update Frequency', 'License', 'Documentation', 'Managed By', 'Contact', and 'How to Cite'. The right column contains sections for 'Resources on AWS', 'Description', 'Resource type', 'Amazon Resource Name (ARN)', 'AWS Region', 'AWS CLI Access (No AWS account required)', and 'Description'. The 'Description' section on the right provides a detailed overview of the data, including its format (GeoTIFF, COG), resolution (6-inches to 3-inches), and the fact that it is publicly accessible. The 'Resources on AWS' section lists the S3 bucket, ARN, and region, along with the CLI access command.

Registry of Open Data on AWS

The Registry of Open Data on AWS is now available on AWS Data Exchange. All datasets on the Registry of Open Data are now discoverable on AWS Data Exchange alongside 3,000+ existing data products from category-leading data providers across industries. Explore the catalog to find open, free, and commercial data sets. [Learn more about AWS Data Exchange](#)

KyFromAbove on AWS

[aerial imagery](#) [earth observation](#) [elevation](#) [geospatial](#) [lidar](#)

Description

The KyFromAbove initiative is focused on building and maintaining a current basemap for Kentucky that can meet the needs of its users at the state, federal, local, and regional level. A common basemap, including current color leaf-off aerial photography and elevation data (LiDAR), reduces the cost of developing GIS applications, promotes data sharing, and add efficiencies to many business processes. All basemap data acquired through this effort is being made available in the public domain.

KyFromAbove acquires aerial imagery and LiDAR during leaf-off conditions in the Commonwealth. The imagery typically ranges from 6-inches to 3-inches in resolution and is available from the kyfromabove Amazon S3 bucket in a Cloud Optimized GeoTiff format. LiDAR data acquired by the program is USGS Quality Level 2 (QL2). Digital Elevation Models (DEMs) at a 2-foot resolution, point cloud data in an LAS format, spot elevations in a geopackage format, and contours in a geopackage format are also available from the kyfromabove Amazon S3 bucket. KyFromAbove LiDAR and imagery data resources are managed in a Kentucky-specific 5000x5000 foot grid (FIPS:1600) (EPSG:3089). More details about the program can be found at (<https://kyfromabove.ky.gov/>)

Update Frequency

KyFromAbove data is typically updated on an annual basis. Each year, a portion of the state is acquired with an overall update cycle of every three to four years. This update cadance is determined by both funding and the length of leaf-off conditions in a given year. This catalog currently includes imagery and LiDAR data from 2010 through 2022 for most products.

License

Public Domain with Attribution

Documentation

<https://github.com/aws-labs/open-data-docs/tree/main/docs/kyfromabove>

Managed By

[Kentucky Division of Geographic Information](#)

See all datasets managed by [Kentucky Division of Geographic Information](#).

Contact

More information regarding the KyFromAbove program can be found at <https://kyfromabove.ky.gov/>. If you have specific questions please contact - kyfromabove@ky.gov.

How to Cite

KyFromAbove on AWS was accessed on **DATE** from <https://registry.opendata.aws/kyfromabove>.

Usage Examples

Publications

- KyFromAbove is democratizing key data in Kentucky by Matt Collins
- KyTopo! Kentucky's New Topographic Map Series by Kent Anness

Resources on AWS

Description

Elevation and imagery data resources for the Commonwealth of Kentucky are organized in this bucket. Elevation data is available in Cloud Optimized GeoTIFF (COG) and Geopackage formats depending on the data type. Imagery data is also available in Cloud Optimized GeoTIFF (COG) format. A Cloud Optimized GeoTIFF (COG) is a GeoTIFF file optimized for hosting on a HTTP file server. COG has an internal organization that enables more efficient workflows on the cloud by supporting HTTP GET range requests, where just parts of a file are requested and returned.

Resource type

S3 Bucket

Amazon Resource Name (ARN)

`arn:aws:s3:::kyfromabove`

AWS Region

`us-west-2`

AWS CLI Access (No AWS account required)

`aws s3 ls --no-sign-request s3://kyfromabove/`

Description

KyFromAbove Topographic Contours, digital elevation models, point cloud, spot elevations and the KyTopo Map Series quadrangles can be found in this bucket.

Resource type

S3 Bucket

Amazon Resource Name (ARN)

`arn:aws:s3:::kyfromabove/elevation/`

AWS Region

`us-west-2`

AWS CLI Access (No AWS account required)

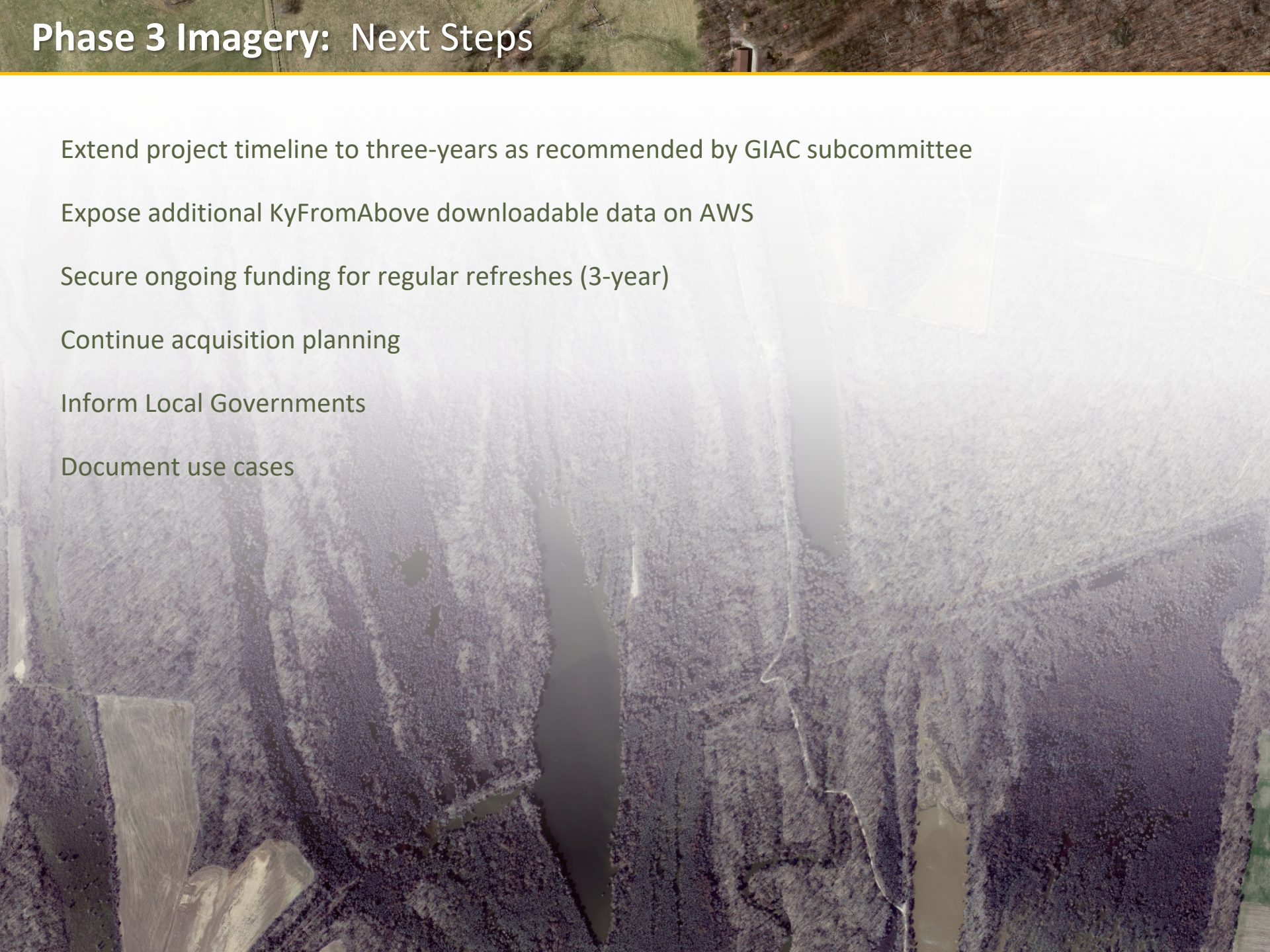
`aws s3 ls --no-sign-request s3://kyfromabove/elevation/`

Description

Topographic contours created from the KyFromAbove Phase 1 LiDAR-derived digital elevation model (DEM) in a geopackage and Esri file geodatabase format. There are four data resources in this folder - 1) KyTopo contours at a 10-foot interval primarily for Western and Central Kentucky, 2) KyTopo contours at a 20-foot interval primarily for Central and Eastern Kentucky, 3) KyTopo contours at a 40-foot interval for Eastern Kentucky, and 4) KyTopo contours at a 5-foot interval for the entire Commonwealth.

Resource type

Phase 3 Imagery: Next Steps

An aerial photograph of a landscape, likely a river valley. A prominent river flows through the center of the image, surrounded by dense vegetation. The river is flanked by fields and some structures, possibly a small town or village. The overall scene is a mix of natural and developed land.

Extend project timeline to three-years as recommended by GIAC subcommittee

Expose additional KyFromAbove downloadable data on AWS

Secure ongoing funding for regular refreshes (3-year)

Continue acquisition planning

Inform Local Governments

Document use cases

Phase 3 Imagery: Impact on Local Governments

Kentucky's cities and counties will benefit from access to this rich data resource.

(The Haves) The units of local government that have been able to afford their own imagery over the years will no longer need to budget for imagery. This will have a positive fiscal impact on their operations.

(The Have Nots) The units of local government that have been unable to afford their own imagery will now have access to 3" leaf-off, ortho and oblique imagery for their jurisdiction. Kentucky's smallest communities will now have access to the same quality of data being used in larger, more populous areas.



Imagery & Elevation Data: Return on Investment

Open access to these critical data resources benefits all governmental entities.

Design and build transportation, water, wastewater, and communication infrastructure

Market the Commonwealth to investors and attract tourists

Improve the situational awareness of our first responders

Prepare for, respond to, and rebuild after disasters

Improve land use and community planning

Assess properties for the purpose of taxation

Manage our public lands

**For every \$1 spent on aerial imagery,
there are \$8.80 in benefits bi-annually.**

**For every \$1 spent on aerial imagery,
there is \$7.35 return on investment
over 6 years.**

*Aerial Imagery Study Research Team – State of Washington
(2023)*

Recommendations

An aerial photograph of a golf course. The image shows a large green fairway, a clubhouse building, and surrounding forested areas. The image is partially obscured by a white semi-transparent rectangle on the right side, which contains a list of recommendations.

Maintain Detailed Specifications

Adopt a Common Tiling Scheme

Highlight Duplicative Spending

Document Use Cases

Use Simple Terminology

Skin in the Game – Imagery Review

Economies of scale pricing

Seek Support from the GIS Community

Understand Funding & Acquisition Cycles

Engage Leadership

Acknowledgements

An aerial photograph of a river winding through a dense, green forest. The river is a light brown color, contrasting with the surrounding greenery. The forest appears to be a mix of deciduous and coniferous trees. The river flows from the top left towards the bottom right of the frame.

**Program Partners
(local/state/federal)**

Leadership

Team Members

Kentucky GIS Community



Questions?

Kent Anness, GIO

Commonwealth of Kentucky

<https://kyfromabove.ky.gov/>

TEAM
KENTUCKY