



**Państwowe Gospodarstwo Leśne
Lasy Państwowe**

50 lat zmian ekosystemów leśnych Puszczy Białowieskiej na zobrazowaniach satelitarnych

Konferencja Środowisko Informacji
Centrum Nauki Kopernik
Warszawa, 22 listopada 2018

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**ŚRODOWISKO
INFORMACJI**



**CENTRUM NAUKI
KOPERNIK**

www.lasy.gov.pl

Plan referatu

- Czy obrazy satelitarne mogą nam pomóc zrozumieć zmiany jakie zachodzą w ekosystemach leśnych Puszczy Białowieskiej?
- Na jakie pytania możemy odpowiedzieć obserwując las z pułapu satelitarnego?
- Czym są szeregi czasowe (*timelapse*) obrazów satelitarnych?
- Jak dotrzeć z wiarygodną i obiektywną informacją do społeczeństwa?

CO TO JEST PUSZCZA BIAŁOWIESKA

NADLEŚNICTWO BROWSK

pow. leśna - 19 392 ha

pow. rezerwatów - 1911 ha

NADLEŚNICTWO BIAŁOWIEŻA

pow. leśna - 12 144 ha

pow. rezerwatów - 4216 ha

NADLEŚNICTWO HAJNÓWKA

pow. leśna - 19 026 ha


pow. rezerwatów - 5252 ha

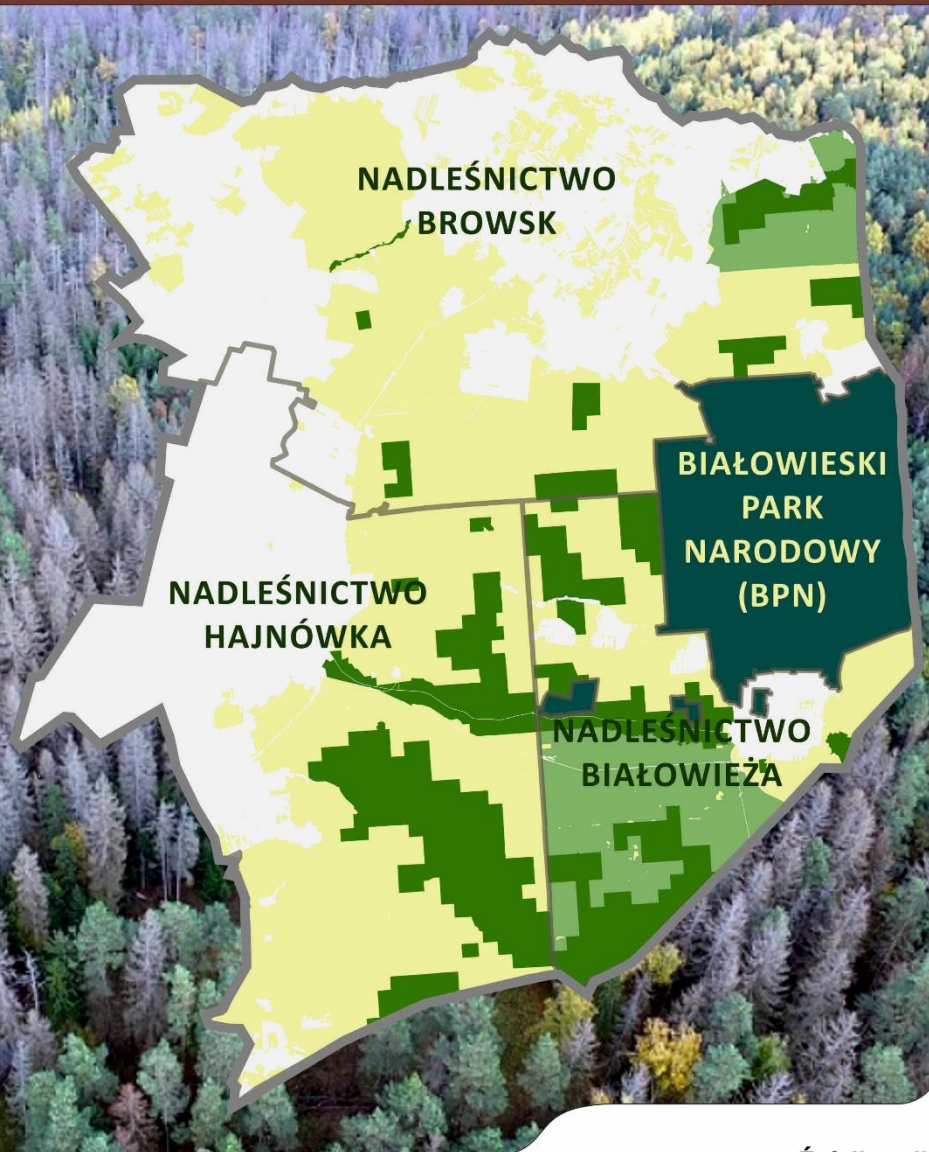
RAZEM REZERWATY W LP

11 379 ha

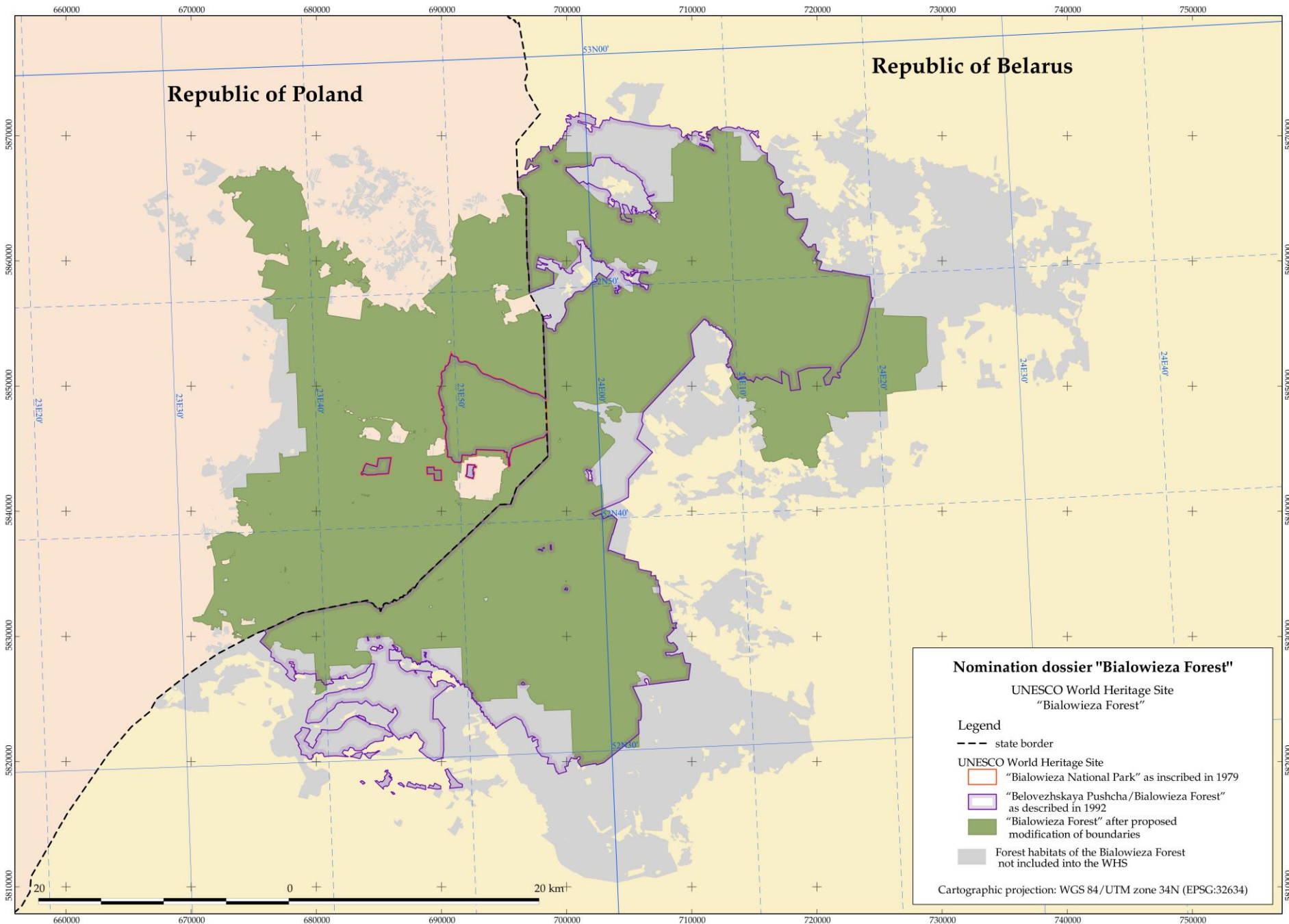
BIAŁOWIESKI PARK NARODOWY

pow. leśna - 9783 ha

-  Granice Nadleśnictw
-  Powierzchnie referencyjne
-  Rezerwaty przyrody w LP
-  Białowieski Park Narodowy
-  Lasy Państwowe LP



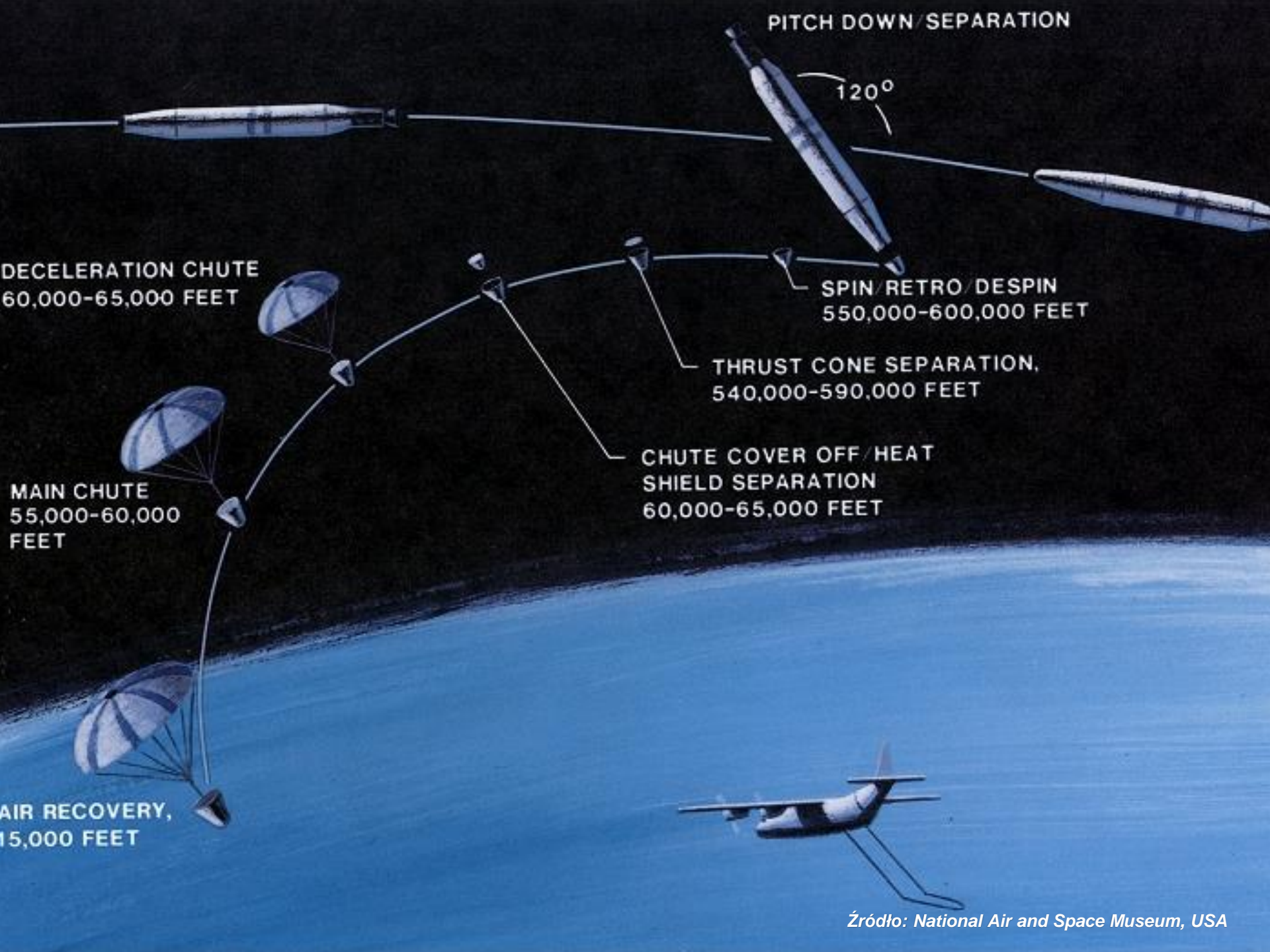
Źródło: cilp.lasy.gov.pl



Program CORONA



- **CORONA** – amerykański program satelitów wywiadowczych, działający w latach **1959 – 1972**
- Programem zarządzała Centralna Agencja Wywiadowcza – CIA (*Central Intelligence Agency*)
- Satelity Corony były wykorzystywane do rozpoznania obrazowego Związku Sowieckiego (ZSRR), Chińskiej Republiki Ludowej (i innych państw, min. Polski)
- CORONA i powiązane misje otrzymały od społeczności wywiadowczej oznaczenie "**Keyhole**" (KH)
- Odtajnione obrazy (od 1996) można pobrać za pośrednictwem serwisu dystrybucji danych USGS **EarthExplorer**





Źródło: National Air and Space Museum, USA



Źródło: National Air and Space Museum, USA



Źródło: National Air and Space Museum, USA



Źródło danych: earthexplorer.usgs.gov

Obrazy
panchromatyczne

Corona KH-3

Data: 1961-12-12

DS009029056DV040

DS009029056DV041

9029 12 12 61



USGS
science for a changing world

EarthExplorer - Home

Home | New System Message | Save Criteria | Load Favorite | Manage Criteria

Search Criteria | Data Sets | Additional Criteria | **Results**

4. Search Results
If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.

Show Result Controls

Data Set [Click here to export your results](#)

Declass 1 (1996)

« First » Previous 1 Next » Last »

Displaying 1 - 2 of 2

1
Entity ID:DS009029056DV040
Coordinates:52.53, 21.542
Camera Resolution:Vertical Medium
Acquisition Date:12-DEC-61

2
Entity ID:DS009029056DV041
Coordinates:52.34, 21.609
Camera Resolution:Vertical Medium
Acquisition Date:12-DEC-61

« First » Previous 1 Next » Last »

View Item Basket » Submit Standing Request »

Start

Search Criteria Summary (Show)

Mapa | Satelita

The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only.

Źródło danych: earthexplorer.usgs.gov

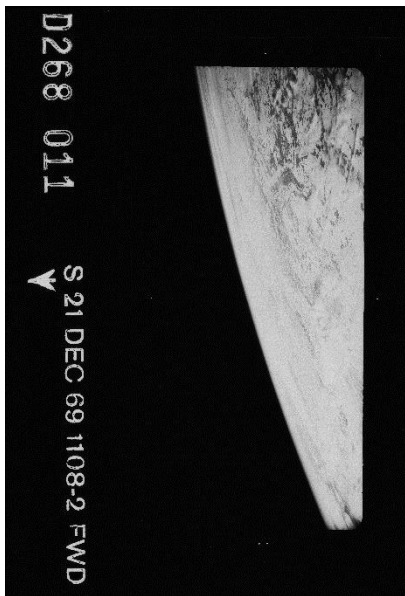
Obrazy
panchromatyczne
Corona KH-4B

Data: 1969-12-21

DS1108-2268DF010

DS1108-2268DF011

DS1108-2268DF012



USGS
science for a changing world

EarthExplorer - Home

Home 1 New System Message Save Criteria Load Favorite Manage Criteria

Search Criteria Data Sets Additional Criteria **Results**

4. Search Results
If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.

Show Result Controls

Data Set [Click here to export your results »](#)

Declass 1 (1996)

« First Previous 1 Next Last »

Displaying 1 - 3 of 3

1	Entity ID:DS1108-2268DF010 Coordinates:52.94 , 24.275 Camera Resolution:Stereo High Acquisition Date:21-DEC-69
2	Entity ID:DS1108-2268DF011 Coordinates:52.79 , 24.333 Camera Resolution:Stereo High Acquisition Date:21-DEC-69
3	Entity ID:DS1108-2268DF012 Coordinates:52.63 , 24.392 Camera Resolution:Stereo High Acquisition Date:21-DEC-69

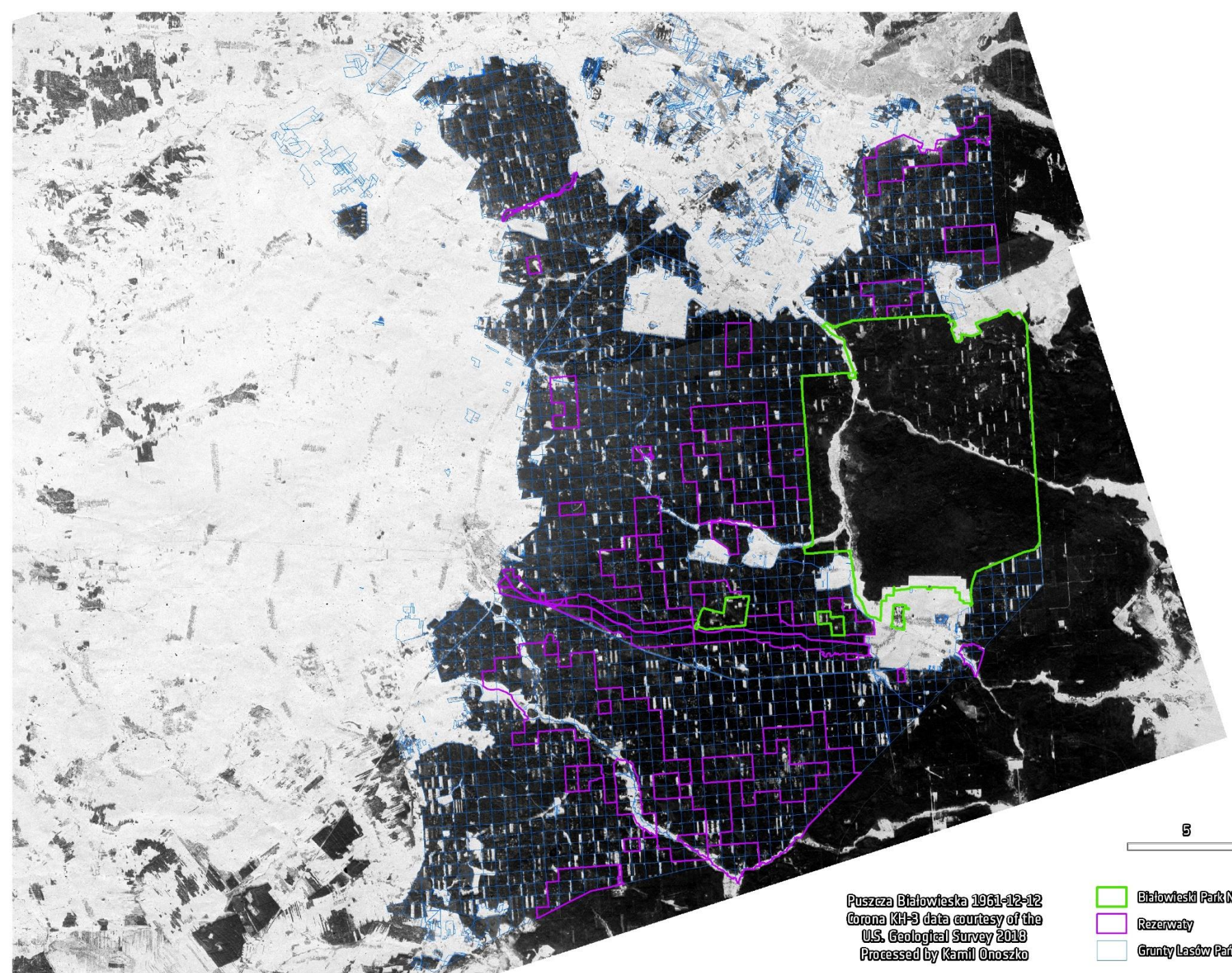
« First Previous 1 Next Last »

[View Item Basket »](#) [Submit Standing Request »](#)

Search Criteria Summary (Show)

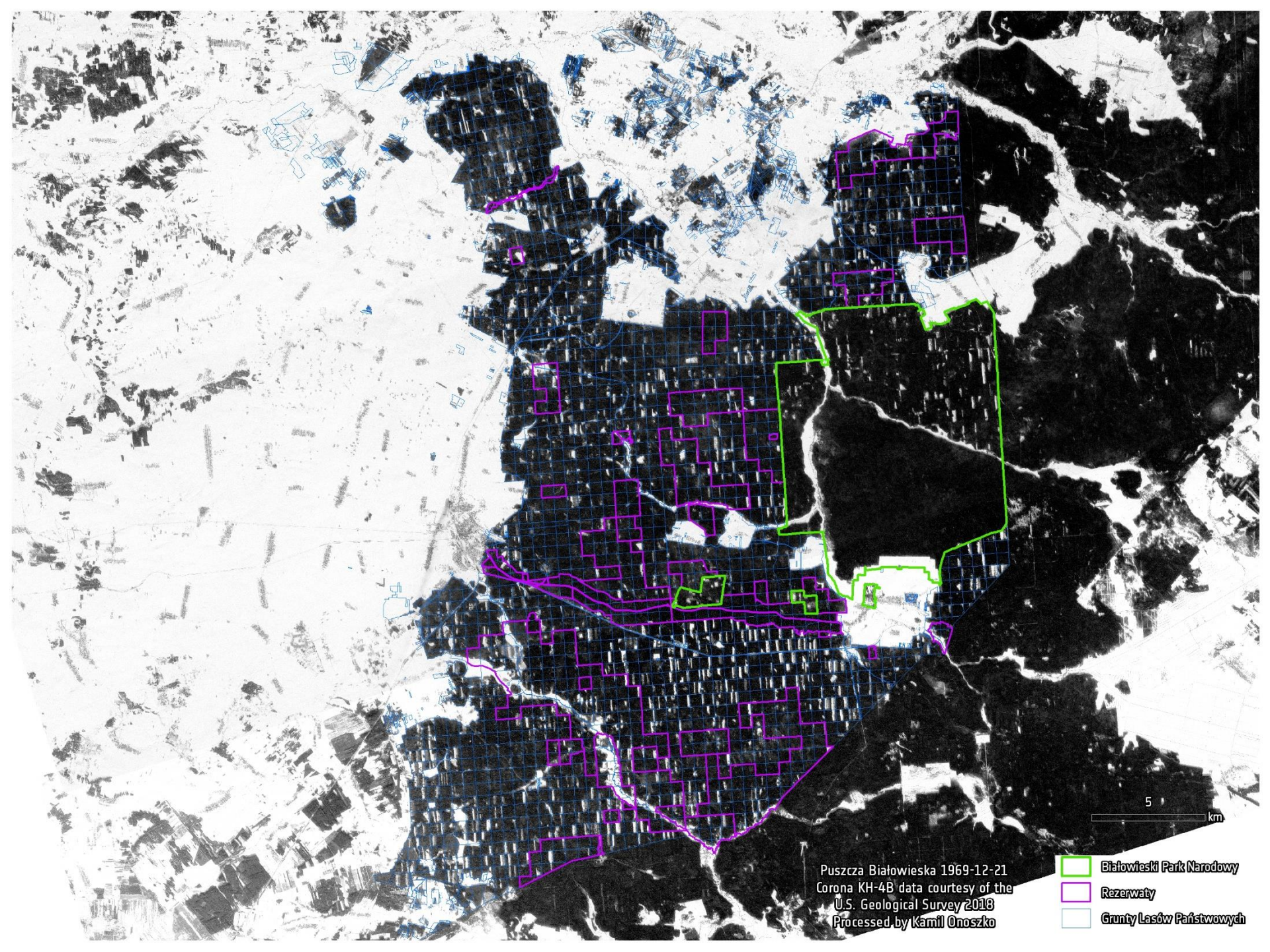
Mapa Satelita

The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only.



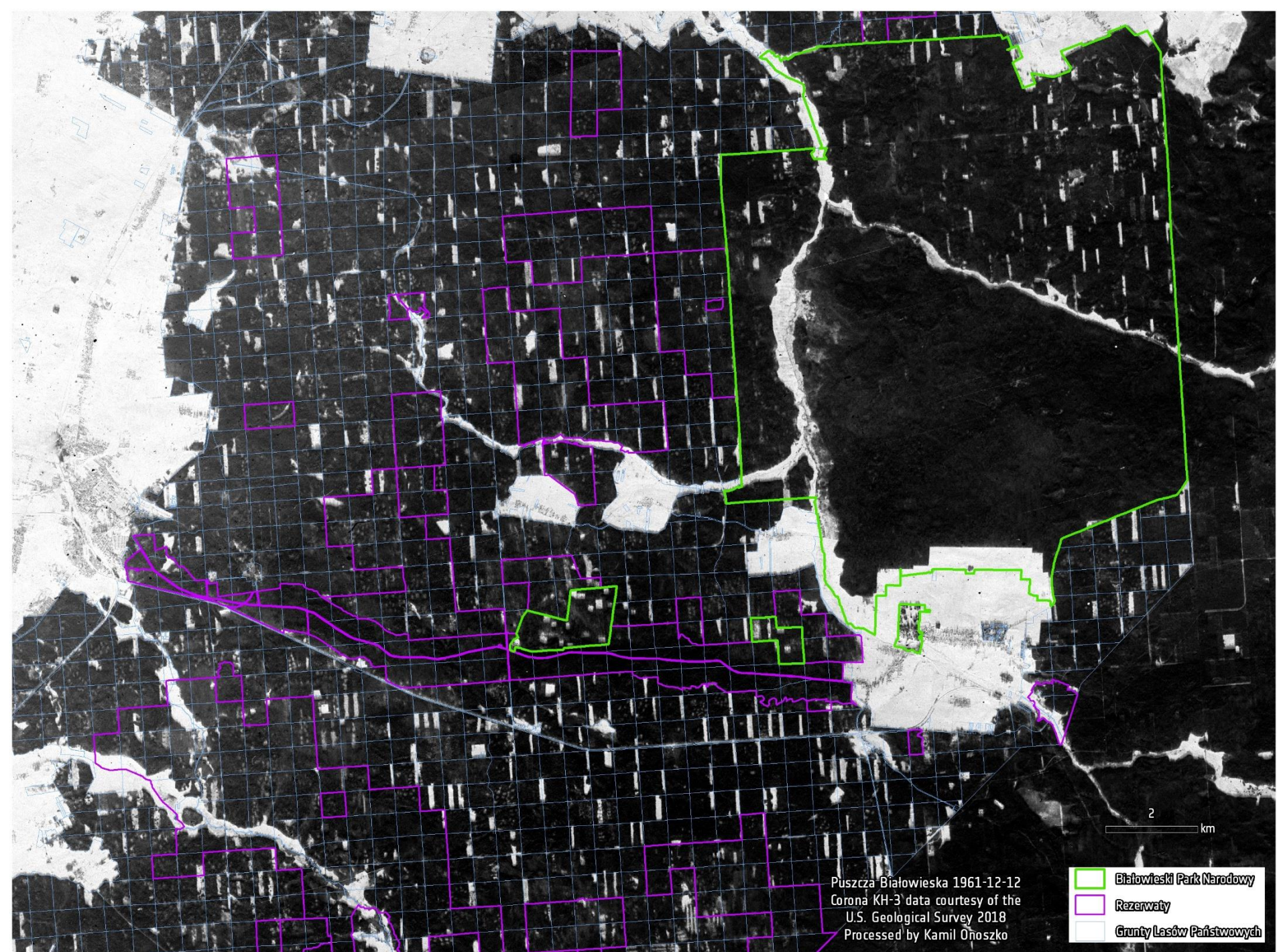
Puszcza Białowieża 1961-12-12
Corona KH-3 data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

-  Białowieży Park Narodowy
-  Rezerваты
-  Grunty Lasów Państwowych






Puszcza Białowieża 1969-12-21
Corona KH-4B data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

-  Białowieżski Park Narodowy
-  Rezerваты
-  Grunty Lasów Państwowych

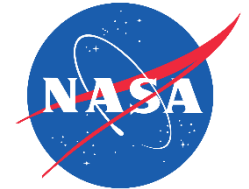




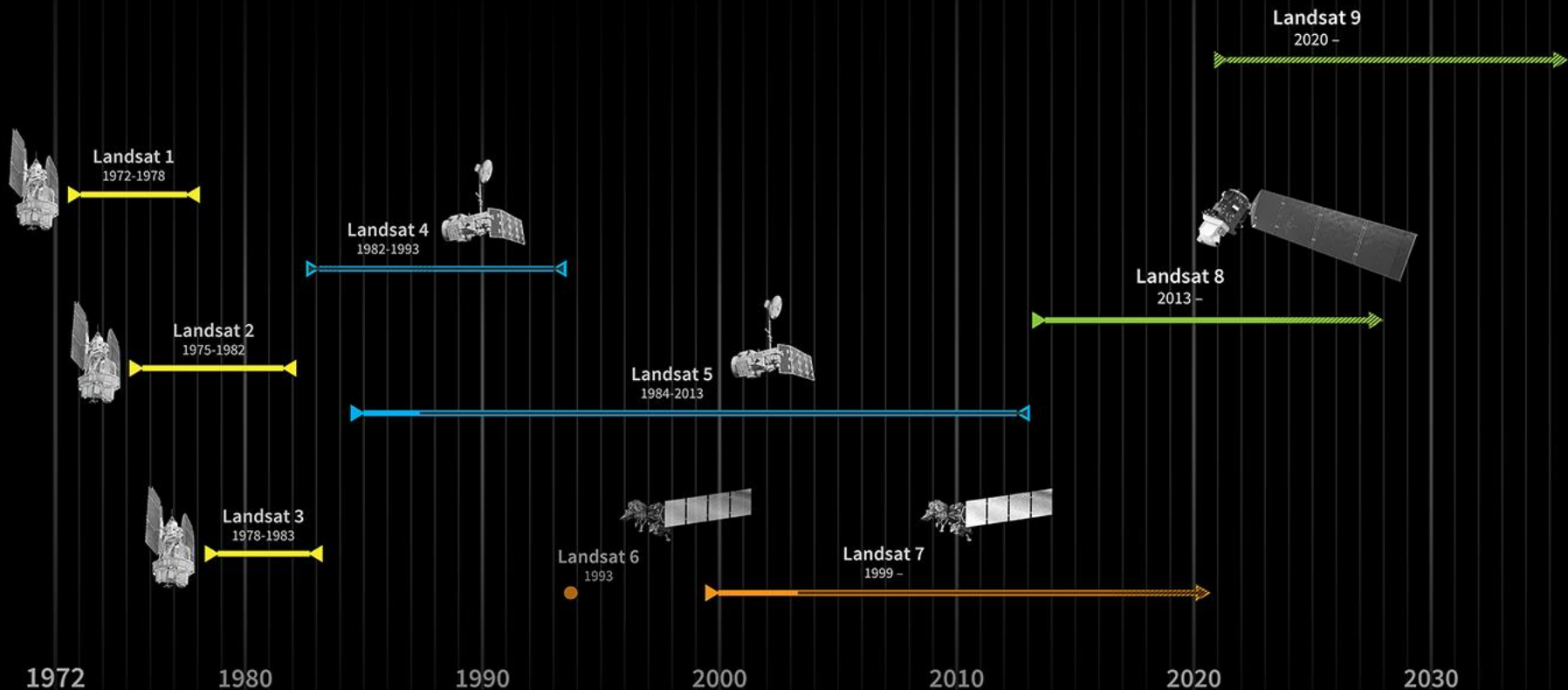
Puszcza Białowieża 1969-12-21
Corona KH-4B data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

-  Białowieżski Park Narodowy
-  Rezerваты
-  Grunty Lasów Państwowych

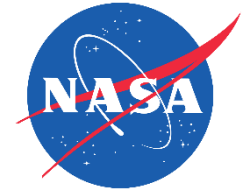
Program LANDSAT



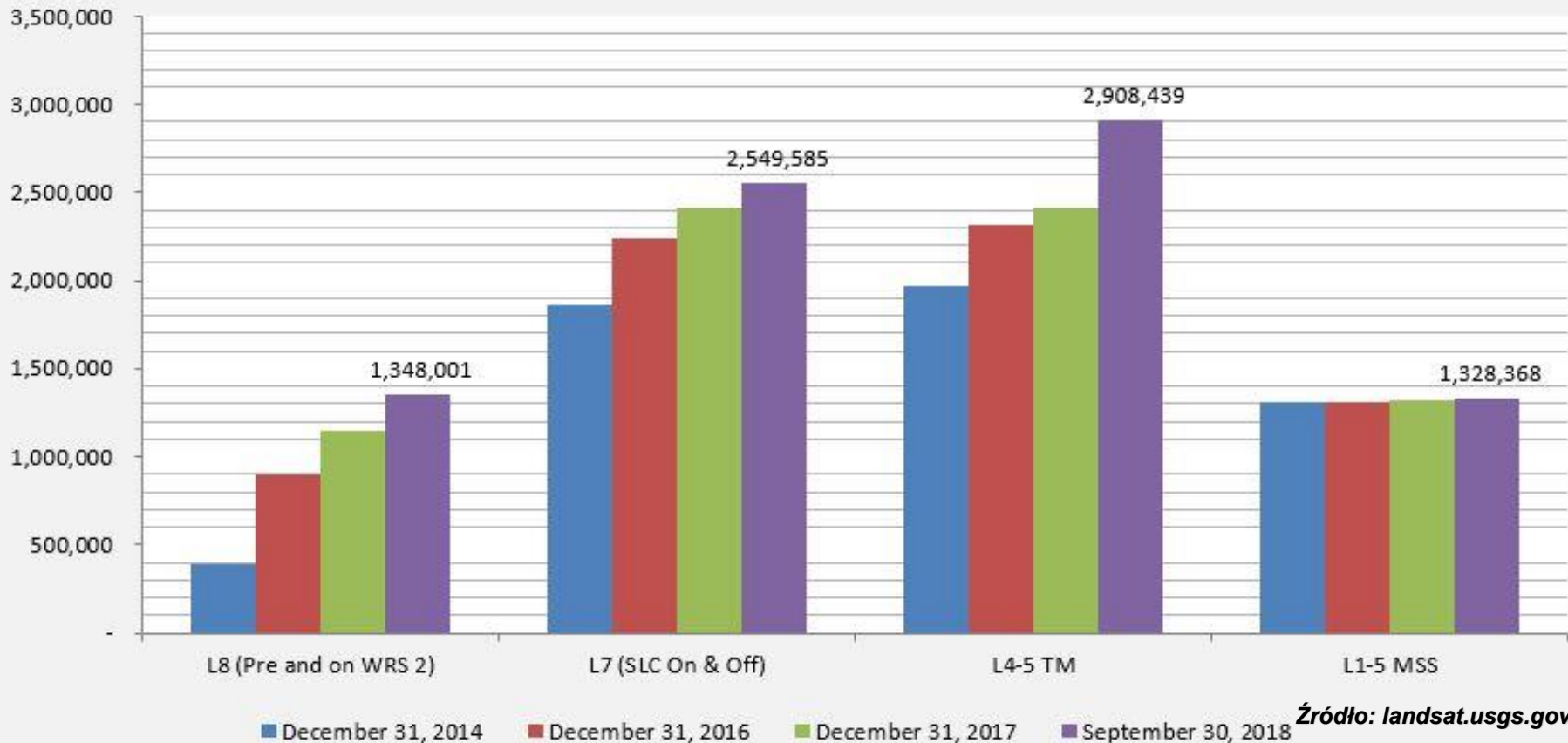
BUILDING ON THE LANDSAT LEGACY



Program LANDSAT

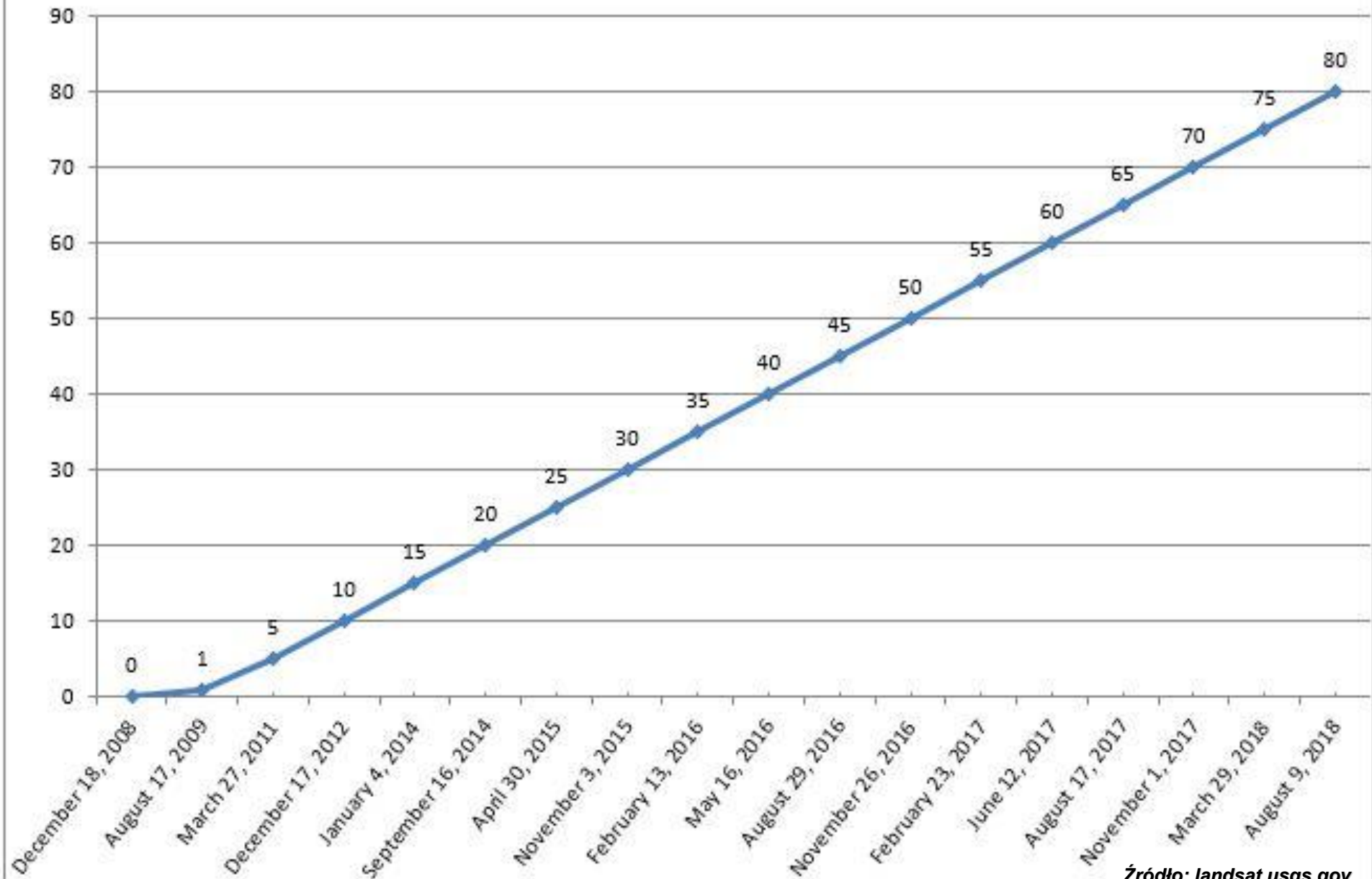


Landsat Scenes Visible in EarthExplorer



Źródło: landsat.usgs.gov

Millions of Landsat Scenes Downloaded since December 2008



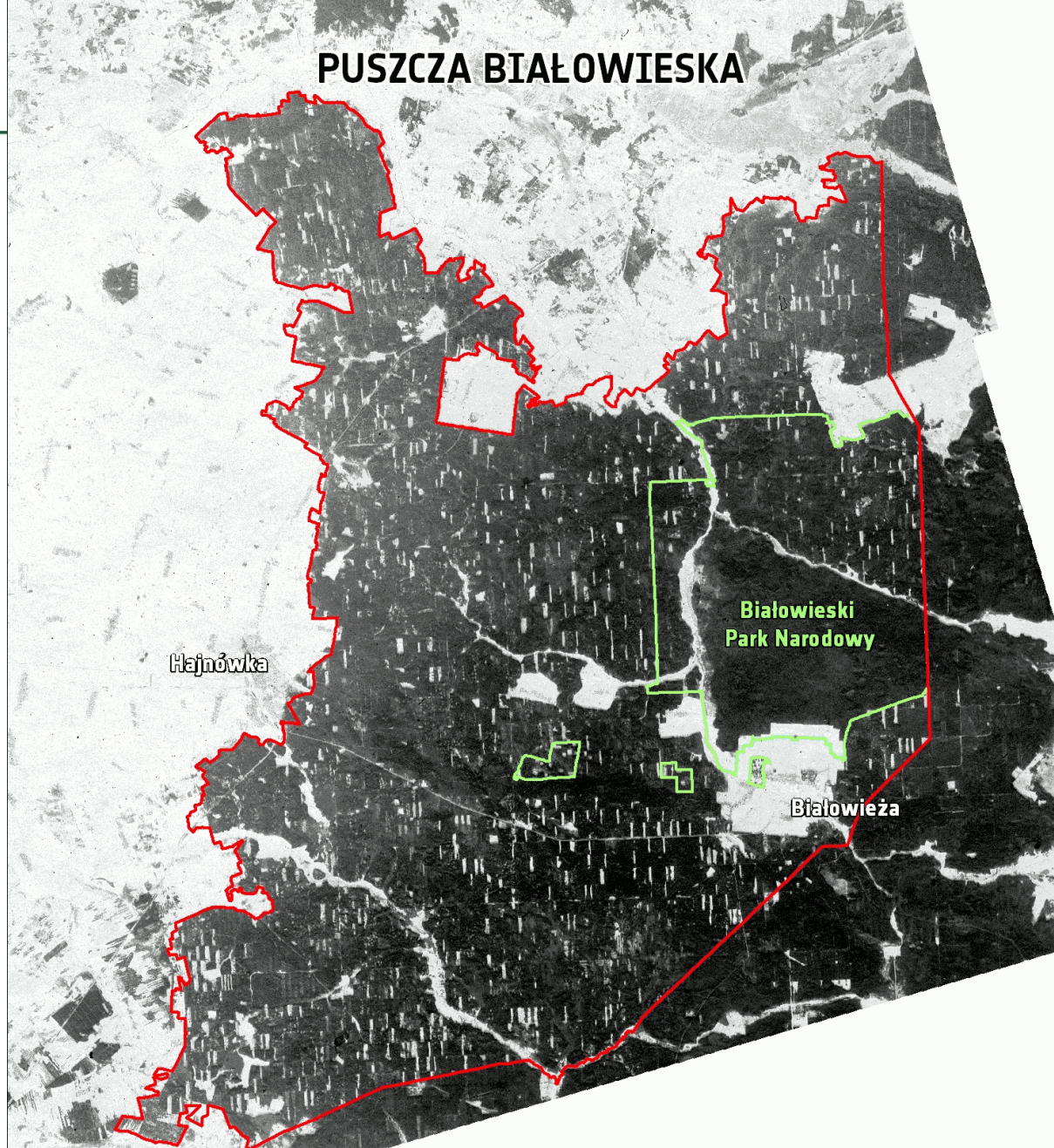
TimeLapse Puszczy Białowieskiej 1961 – 2018

Systemy satelitarne
CORONA [KH-3; KH-4B]
ASTER [L1T]
LANDSAT [2-8]



<https://youtu.be/zQTvdjLVn80>

PUSZCZA BIAŁOWIESKA



Corona KH-3 data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

0 2 4 8
km

Data: 1961-12-12
Corona KH-3





Źródło: cilp.lasy.gov.pl

2010

PUSZCZA BIAŁOWIESKA

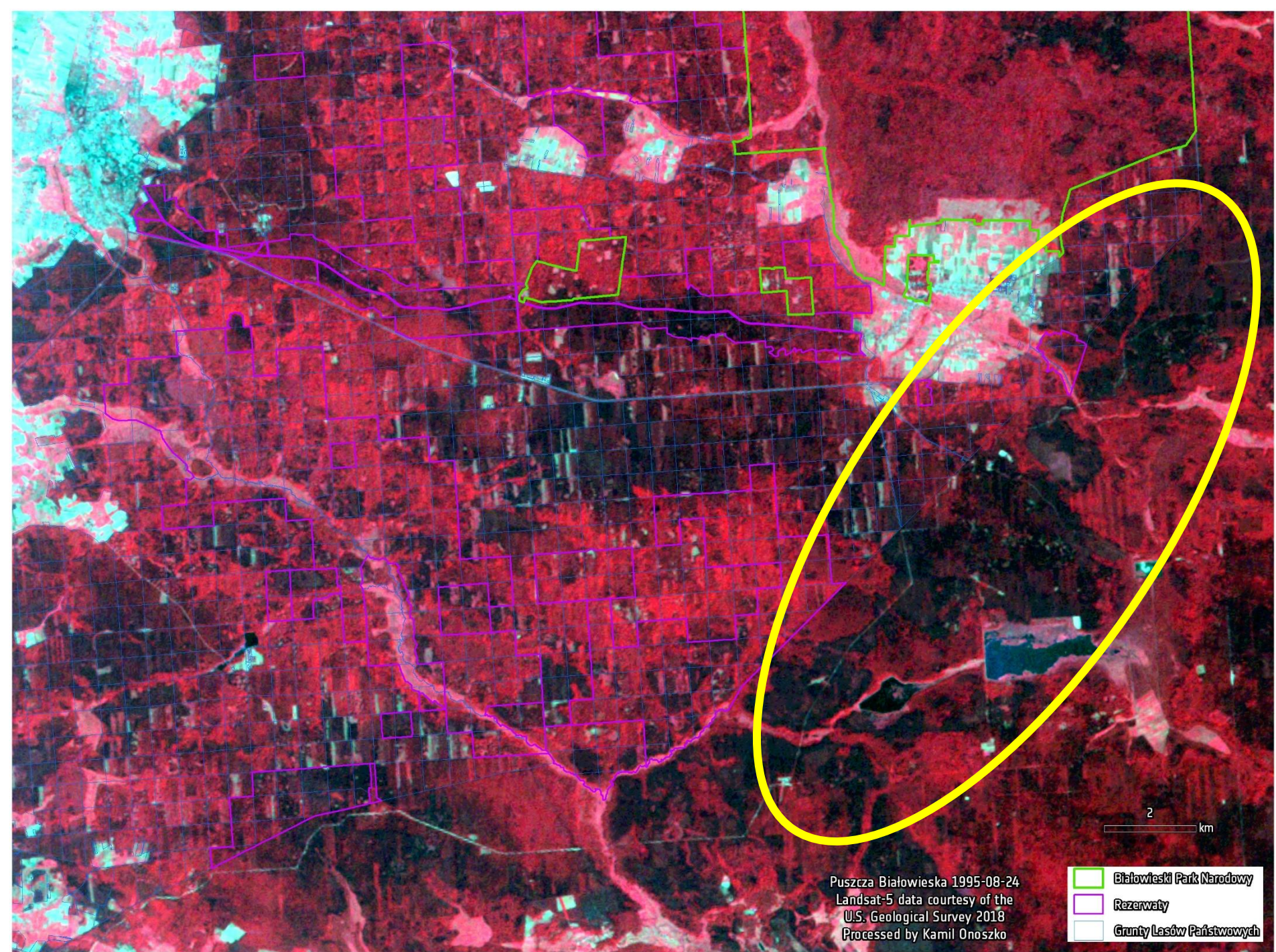
Białowieża

Sensor: Aster
Product: Color infrared [CIR]
Resolution: 15 m
Data source: LP DAAC/USGS




2

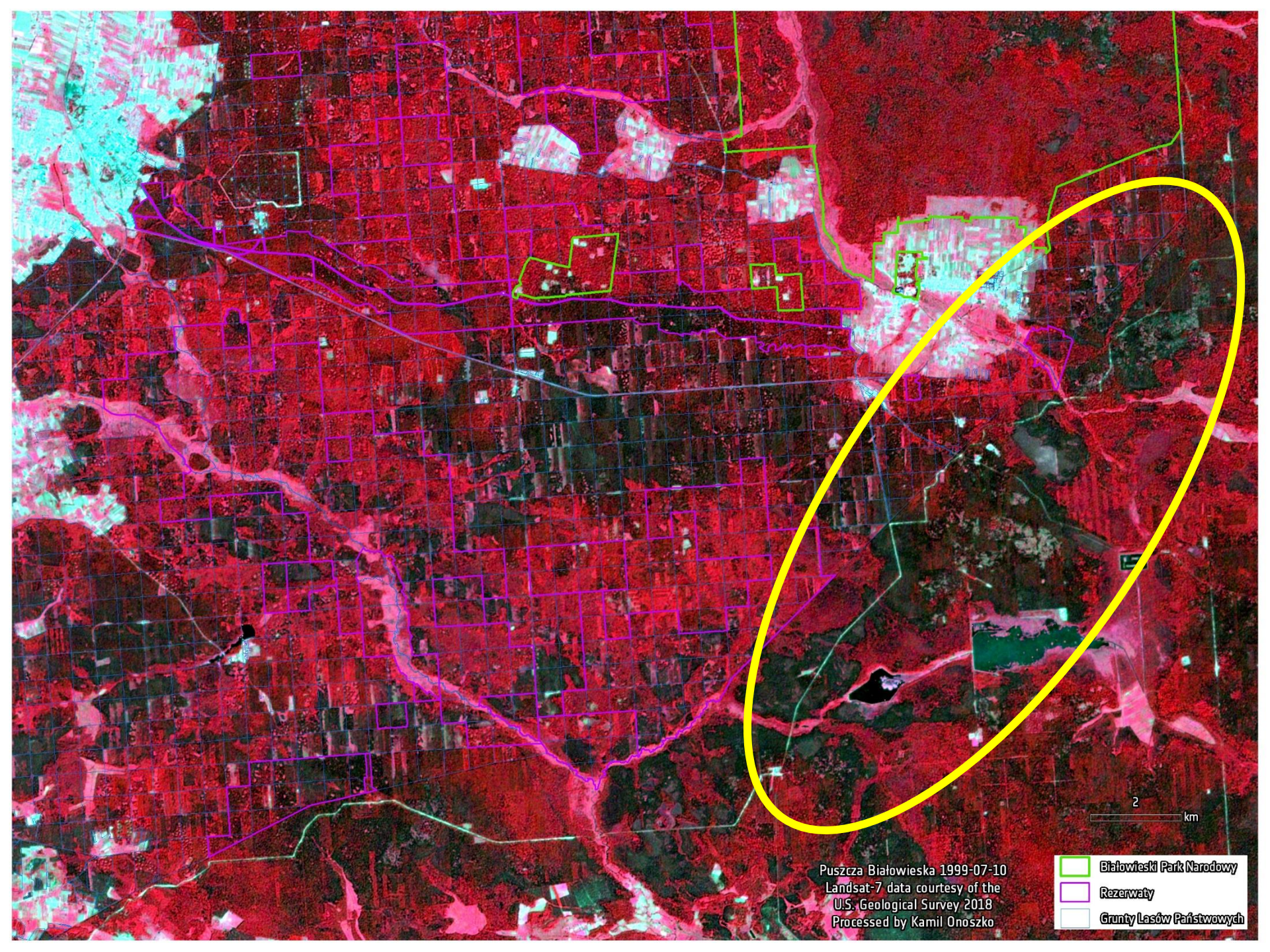
km

Aster data courtesy of the
LP DAAC/USGS 2018
Processed by Kamil Onoszko




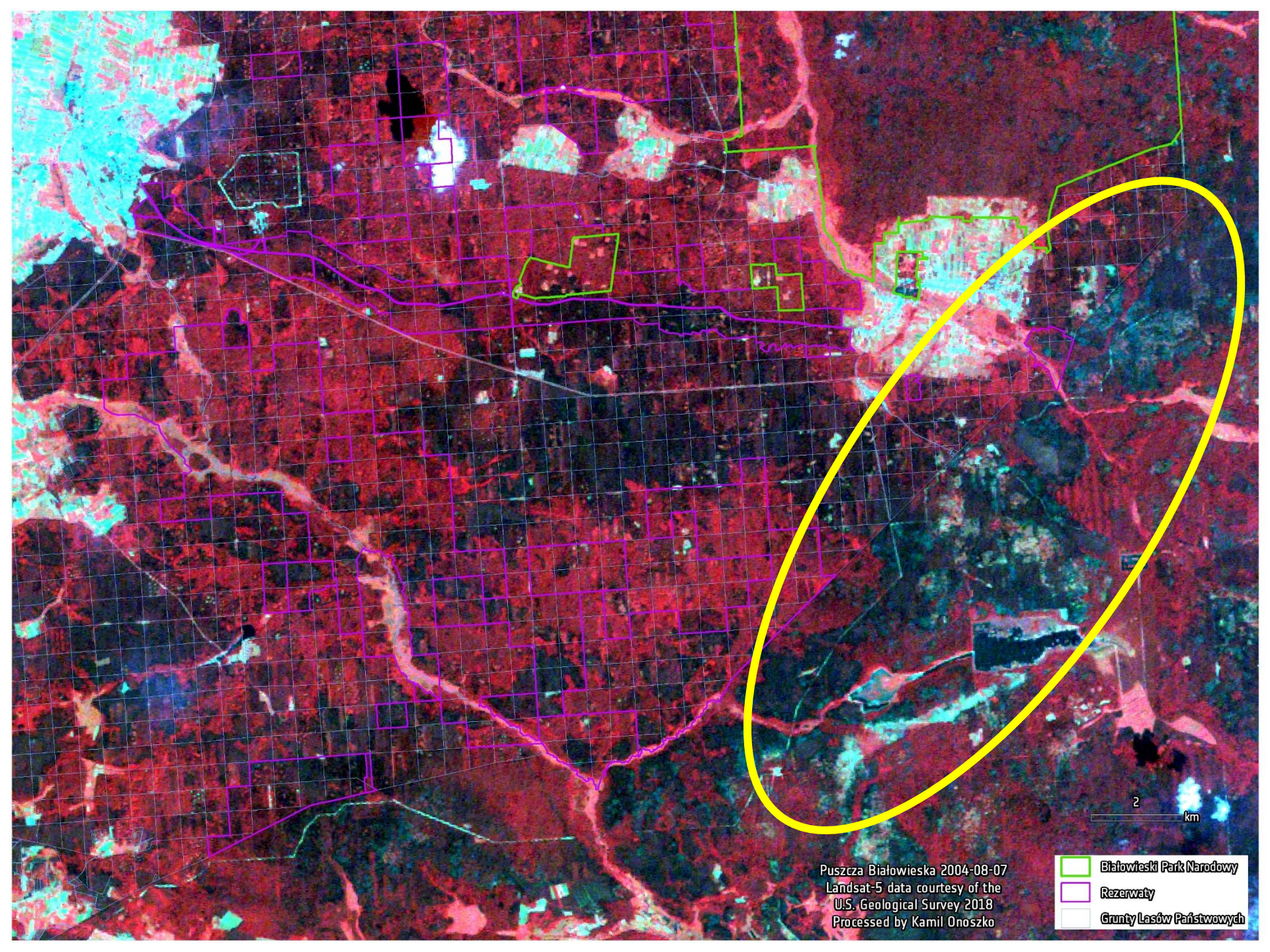
Puszcza Białowieża 1995-08-24
Landsat-5 data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

-  Białowieżski Park Narodowy
-  Rezerваты
-  Grunty Lasów Państwowych



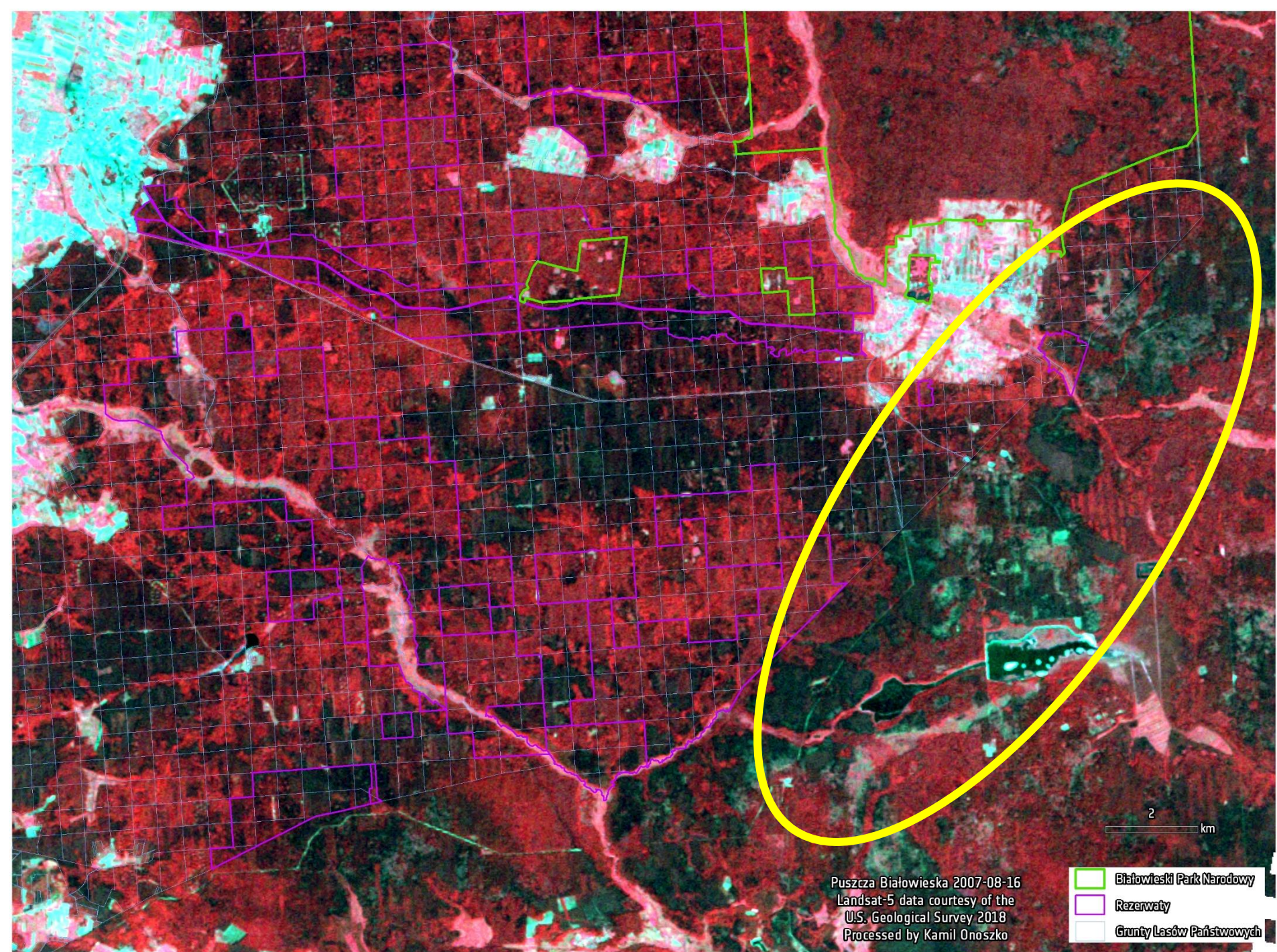
Puszcza Białowieża 1999-07-10
Landsat-7 data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

-  Białowieżski Park Narodowy
-  Rezerваты
-  Grunty Lasów Państwowych



Puszcza Białowieża 2004-08-07
Landsat-5 data courtesy of the
U.S. Geological Survey 2018
Processed by Kamil Onoszko

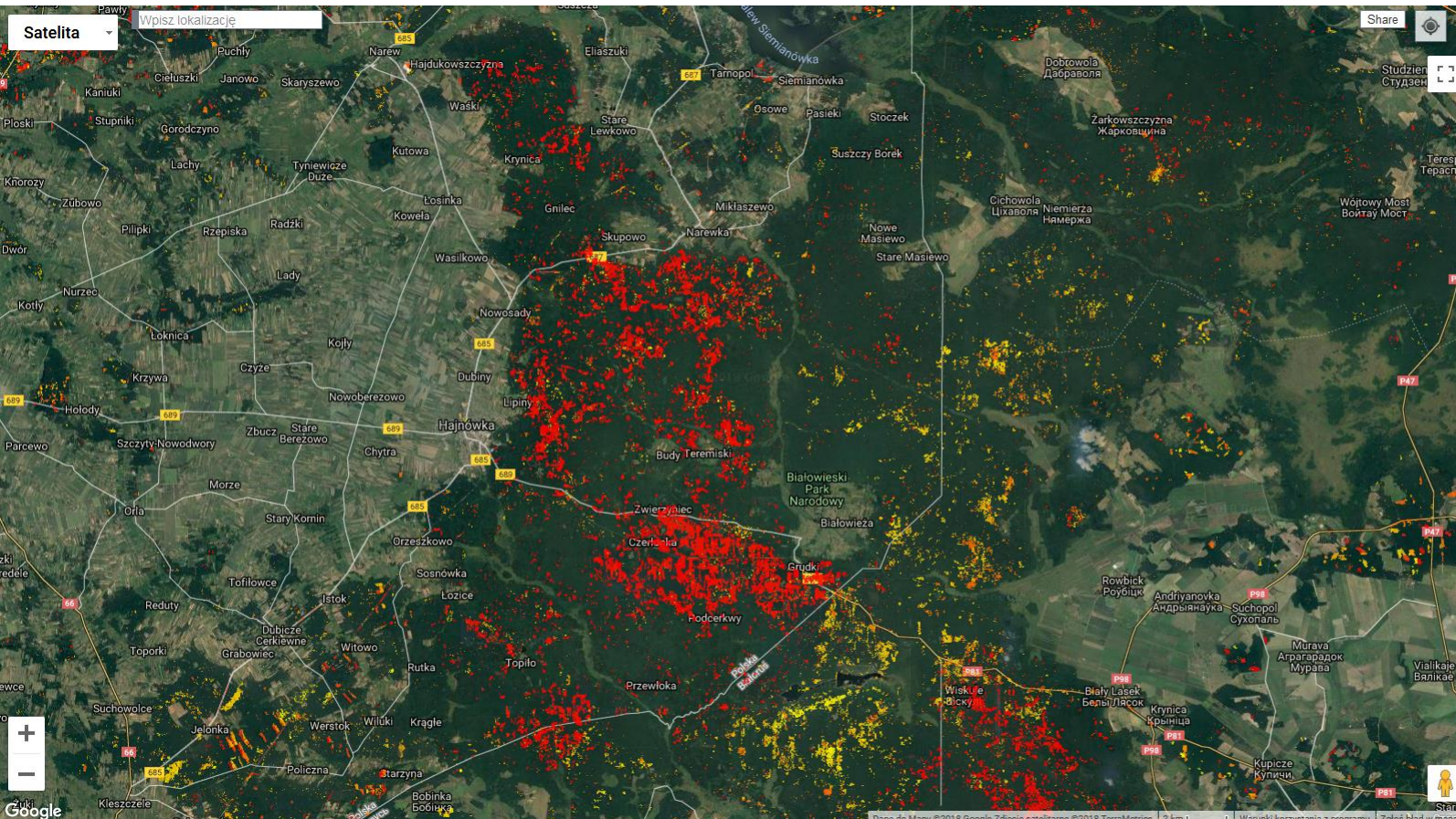
-  Białowieżski Park Narodowy
-  Rezerваты
-  Grunty Lasów Państwowych



GLOBAL FOREST CHANGE



UNIVERSITY OF MARYLAND



Global Forest Change
Published by Hansen, Potapov, Moore, Hancher et al.

DEPARTMENT OF GEOGRAPHICAL SCIENCES

Results from time-series analysis of Landsat images characterizing forest extent and change.

Trees are defined as vegetation taller than 5m in height and are expressed as a percentage per output grid cell as '2000 Percent Tree Cover'. 'Forest Cover Loss' is defined as a stand-replacement disturbance, or a change from a forest to non-forest state, during the period 2000-2017. 'Forest Cover Gain' is defined as the inverse of loss, or a non-forest to forest change entirely within the period 2000-2012. 'Forest Loss Year' is a disaggregation of total Forest Loss to annual time scales.

Reference 2000 and 2017 imagery are median observations from a set of quality assessment-passed growing season observations.

[Download the data.](#)

[Reset to default view](#)

Data Products

Forest Loss Year (Transparent)

Legend

- 2017
- 2000

Other Data Layers

Tropical Hinterland Forests

Background Imagery

Year 2000 Bands 5/4/3

Example Locations

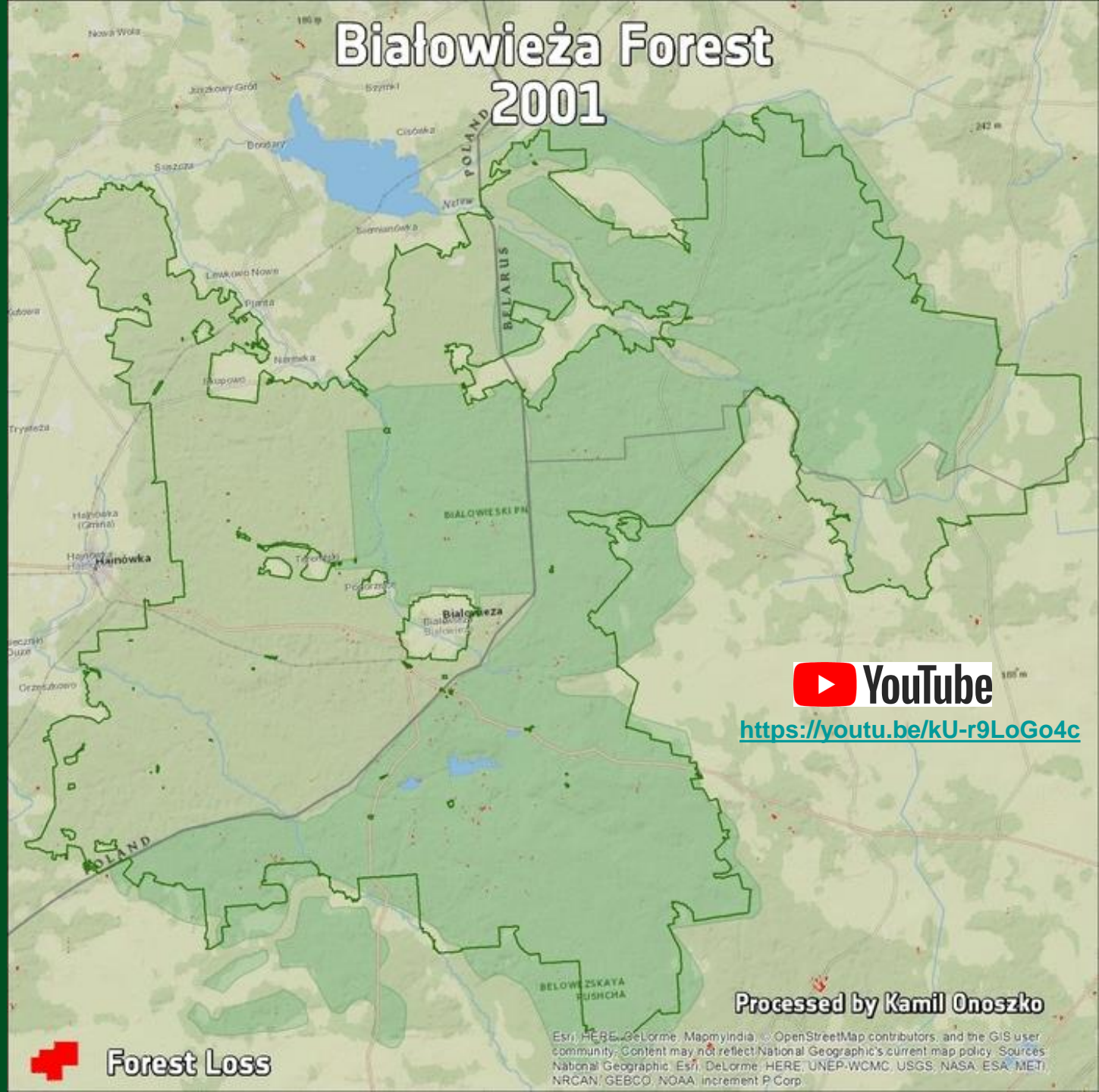
Forestry and Tornado in Alabama

[Zoom to area](#)

The trail of destruction from the April 27 2011 Tuscaloosa-Birmingham tornado is clearly visible in this location. This was one of 358 recorded tornadoes during the April 25-28, 2011 tornado outbreak, the most severe in US history.

[Zoom out to spot tracks from other tornadoes nearby.](#)

Białowieża Forest 2001



<https://youtu.be/kU-r9LoGo4c>

Processed by Kamil Onoszko

Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community. Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, Increment P Corp.



EO Browser

The screenshot displays the EO Browser web application. The main view is a satellite image of a forested region with agricultural fields and a river. The left sidebar contains the following elements:

- EO Browser logo and user name: Kamil Onoszko
- Navigation tabs: Search, Results, Visualization (active), Pins
- Dataset: SENTINEL-2 L2A with a SHOW L1C button
- Date: 2018-06-09
- Rendering options:
 - Custom: Create custom rendering
 - True color: Based on bands 4,3,2
 - Scene classification map: Classification of Sentinel2 data as result of ESA's Scene classification algorithm.
 - False color: Based on bands 8,4,3
 - NDVI: Based on combination of bands (B8 - B4)/(B8 + B4)
- Footer: Powered by SinerGISE with contributions from the European Space Agency v2.16.3

The right side of the interface includes a search bar with the text "Białowieża", a map navigation toolbar with zoom in (+) and zoom out (-) buttons, and a scale bar at the bottom right showing 3 km. The map shows labels for "Hajnowka" and "Kleszczelze".

1985-04-06

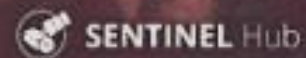
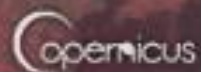


**Zalew
Siemianówka
TimeLapse
Landsat-5
1985-1995**

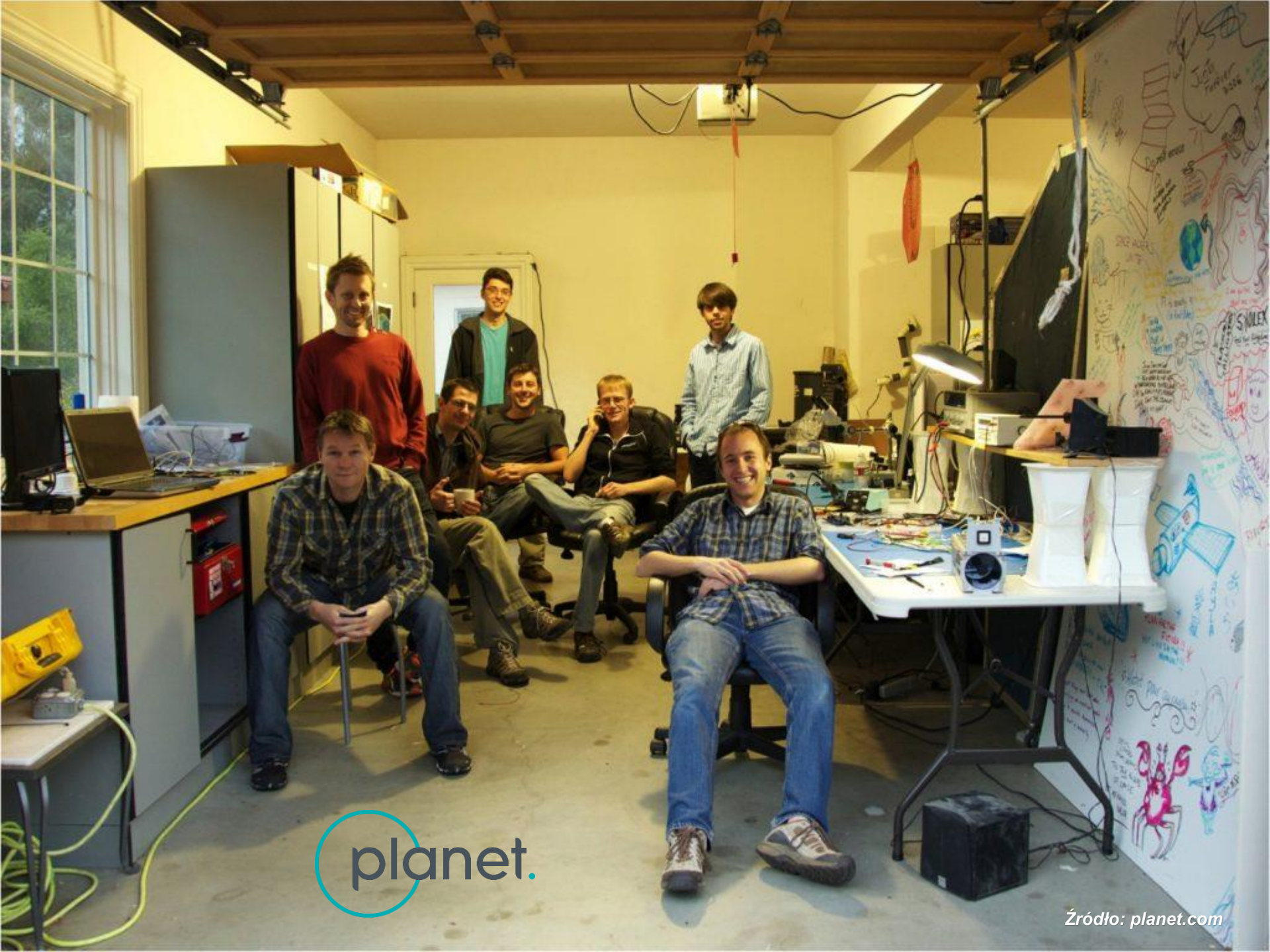


<https://youtu.be/uUhdGtpWOpA>

1 km



www.lasy.gov.pl



planet.





Planet Labs



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Źródło: planet.com

Planet Explorer



Białowieża X

2018/04/01 - 2018/11/12 Save search

Browse Compare Stories

Daily Imagery

Cloud cover 0 - 100% Area coverage 0 - 100% Source 1 source All filters >

- 4-band PlanetScope Scene
- 3-band PlanetScope Scene
- RapidEye Ortho Tile
- SkySat Collect
- Landsat 8 Scene
- SkySat Scene
- RapidEye Basic Scene
- Sentinel-2 Tile
- PlanetScope Ortho Tile

99 of many > Most recent v

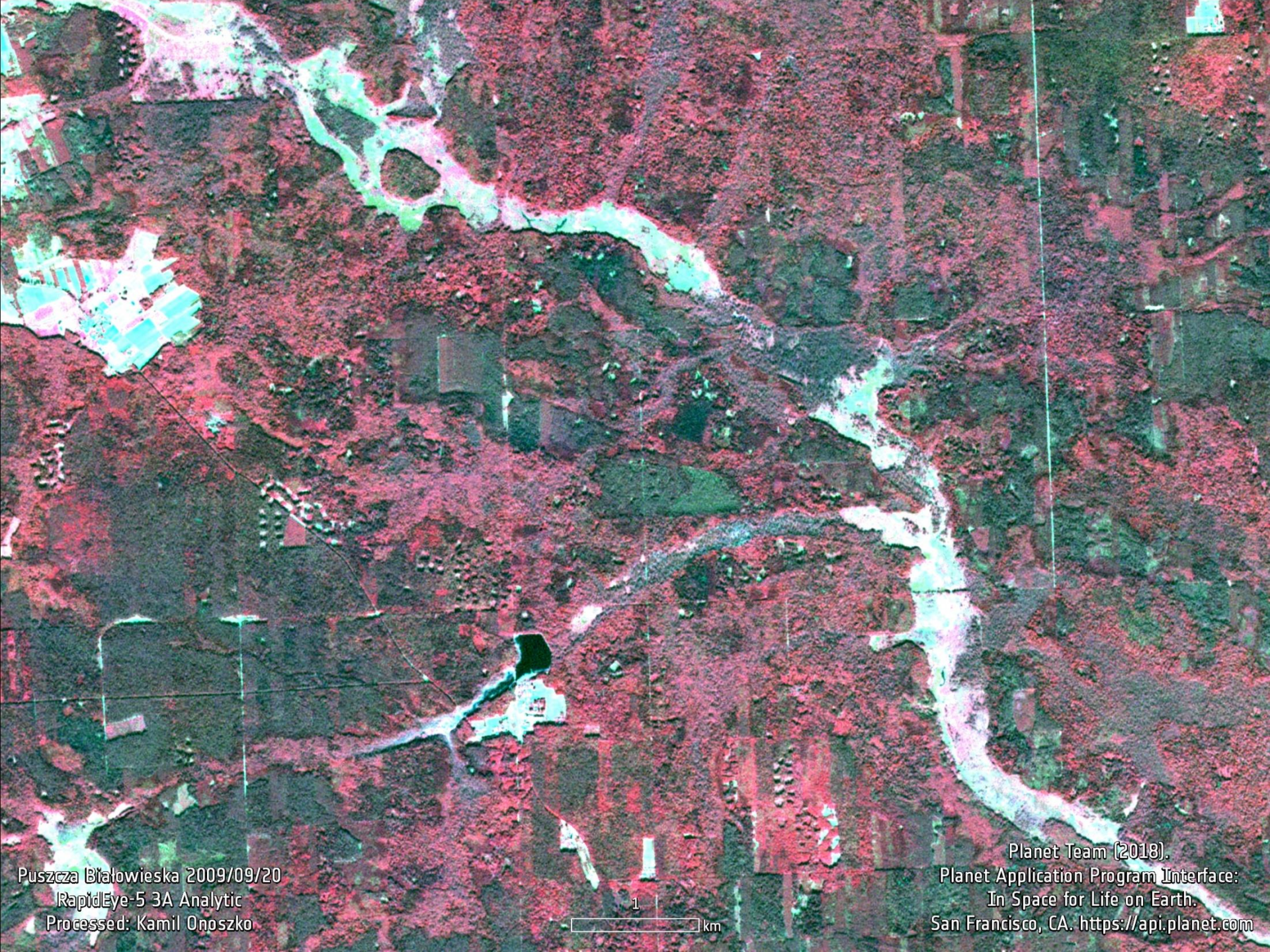
Date	Time (UTC)	Scene	Coverage	Images
Aug 10, 2018	09:00:03	4-band PlanetScope Scene (3 m)	90 % area coverage	40 images
Aug 9, 2018	08:59:04	4-band PlanetScope Scene (3 m)	94 % area coverage	34 images
Aug 8, 2018	08:56:53	4-band PlanetScope Scene (3 m)	98 % area coverage	32 images
Aug 7, 2018	08:56:35	4-band PlanetScope Scene (3 m)	55 % area coverage	18 images
Aug 6, 2018	08:59:13	4-band PlanetScope Scene (3 m)	50 % area coverage	25 images
Aug 5, 2018	08:59:40	4-band PlanetScope Scene (3 m)	60 % area coverage	30 images

API (3) Order items (17)

1-Month Mosaic Daily Imagery

52.98° N, 23.58° E 10 km

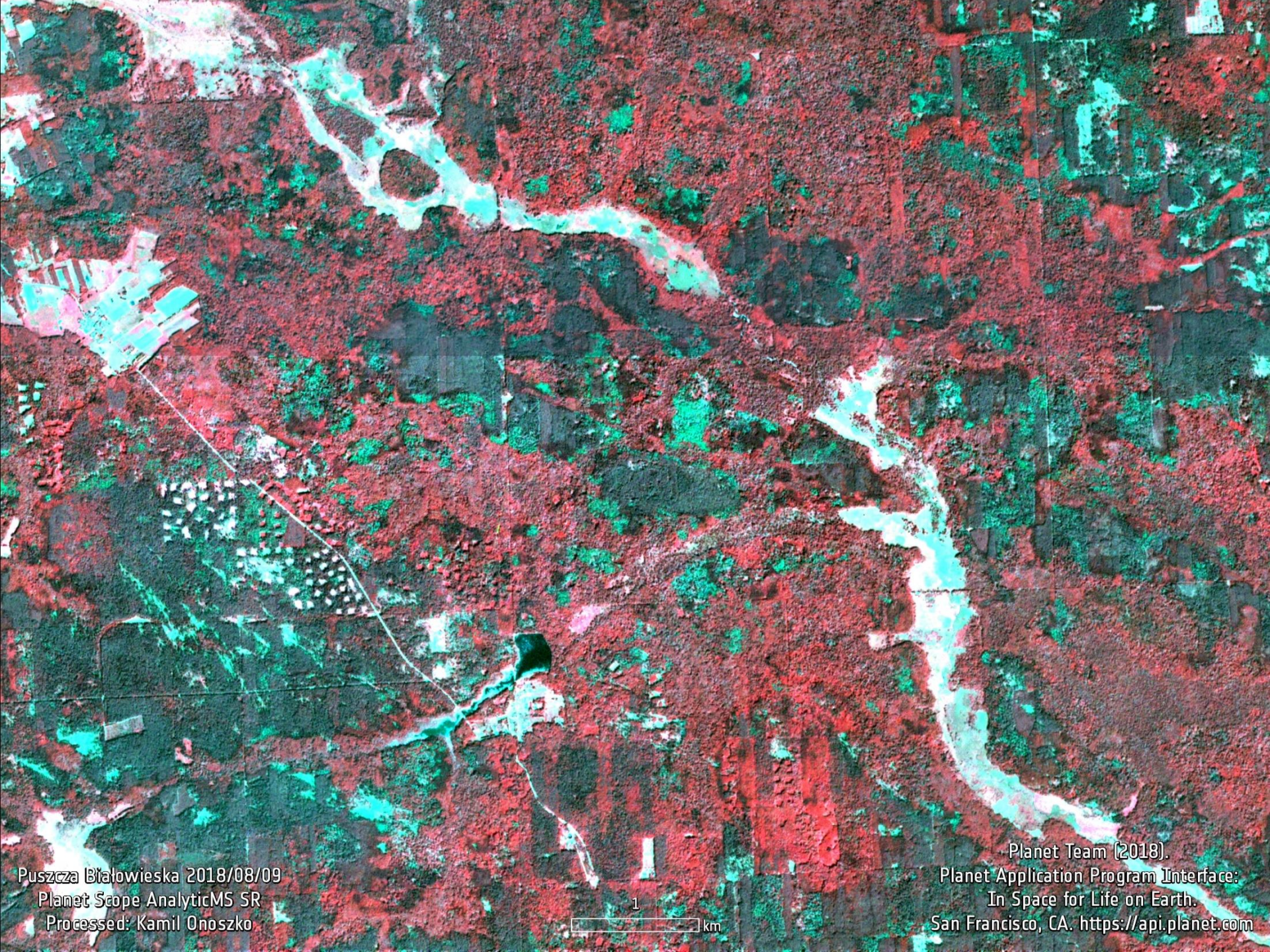
Zródło: planet.com



Puszcza Białowieska 2009/09/20
RapidEye-5 3A Analytic
Processed: Kamil Onoszko

1
km

Planet Team (2018).
Planet Application Program Interface:
In Space for Life on Earth.
San Francisco, CA. <https://api.planet.com>



Puszcza Białowieska 2018/08/09
Planet Scope AnalyticMS SR
Processed: Kamil Onoszko

1
km

Planet Team (2018).
Planet Application Program Interface:
In Space for Life on Earth.
San Francisco, CA. <https://api.planet.com>

Dziękuję za uwagę



**Państwowe Gospodarstwo Leśne
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INFORMACJI



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