Hawaii - US Pacific Basin Imagery Update

April 2023

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Imagery Discussion Points

- USDA Imagery Goals
- Hawaii NAIP
- Satellite Imagery for Hawaii and US Pacific Basin
- How to access imagery?

USDA-FPAC-BC-GEO Branch

- **GEO Branch's goal is to provide high quality geospatial data for all regions of the United States and affiliated territories.**

- **USDA has collaborated with imagery acquisitions with other Federal Agencies (USGS, USFS etc…) via since the early 1980's.**

- **USDA provided additional funding to allow publishing of the internal ImageServer Service to the general public (Pacific Rim GIS Community).**

- **USDA-FPAC-BC-GEO has the largest civilian imagery program in the Federal Government. Over 350 Million funded via National Agricultural Imagery Program since 2003.**

USDA Offices

Hawaii – US Pacific Basin:

USDA-NRCS/FSA: State Office Plant Materials Center and 12 Service Centers (Hawaii, Guam, CNMI, Palau, American Samoa and Federated States of Micronesia)

Alaska:

USDA-NRCS/FSA: State Offices and 5 Service Centers.

USDA Imagery Acquisitions

Hawaiian Islands

1) 2004-2008
2) 2010-2012 (WV2&3)
3) 2013-2015 (WV2&3)
4) 2016-2018 (WV2&3)
5) 2020 (Maxar Vivid Basemap)
6) 2022 (NAIP, Aerial)

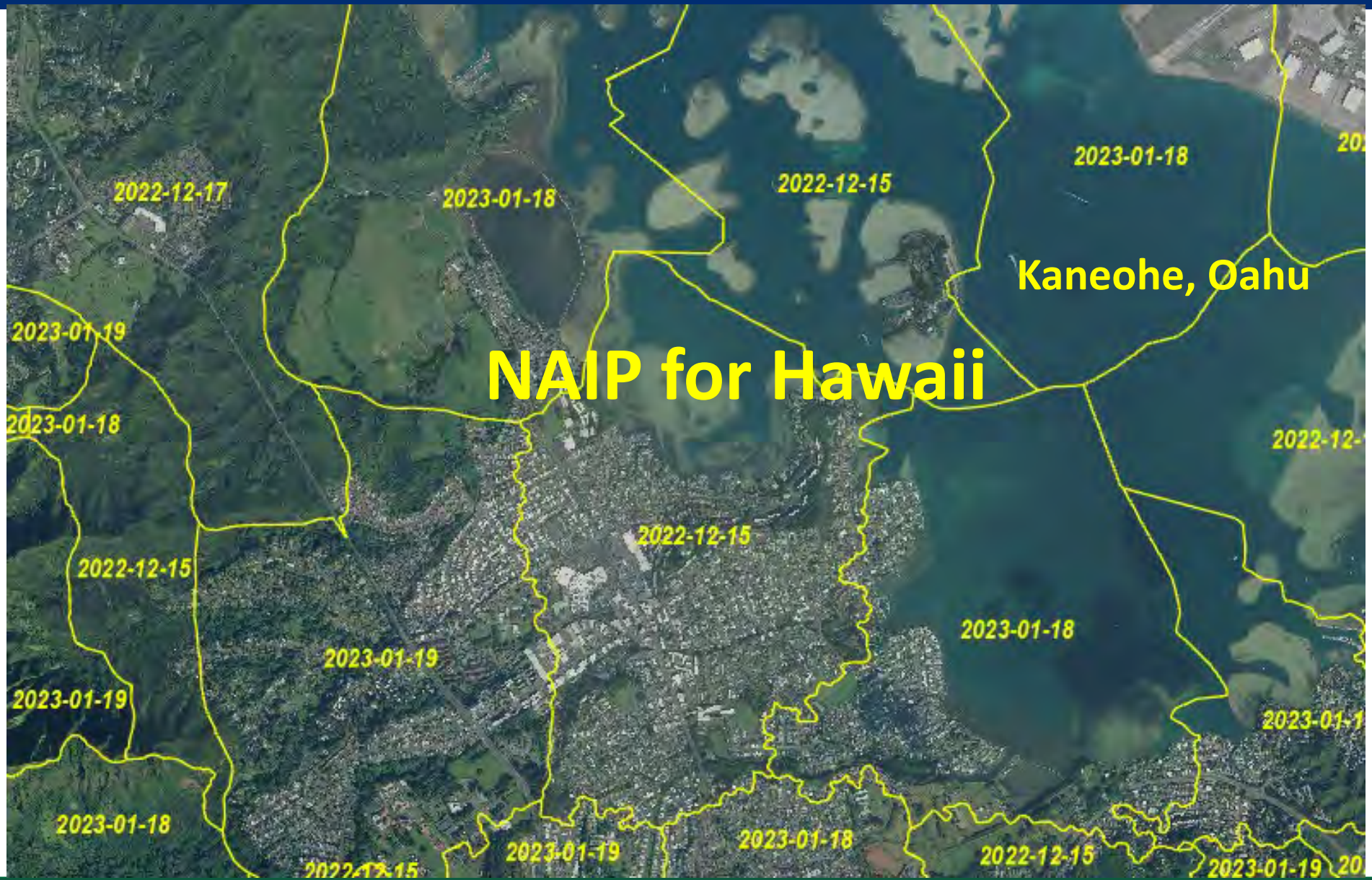
Pacific Basin

1) 2011-2015
2) 2016-2019
3) 2020-2023 (Maxar Vivid Basemap)

Pacific Basin Island Groups

- Guam
- Commonwealth of the Northern Mariana Islands
- American Samoa
- Palau
- Federated States of Micronesia
- Marshall Islands
- NW Hawaiian Islands (2023)

Most of the Hawaiian Islands and Pacific Basin Datasets are available at the USDA Gateway:
https://nrcs.app.box.com/v/gateway/folder/22451256226


2022-12-17
2023-01-18
2022-12-15
2023-01-18
Kaneohe, Oahu
2023-01-19
NAIP for Hawaii
2023-01-18
2022-12-15
2022-12-15
2023-01-19
2023-01-18
2023-01-19
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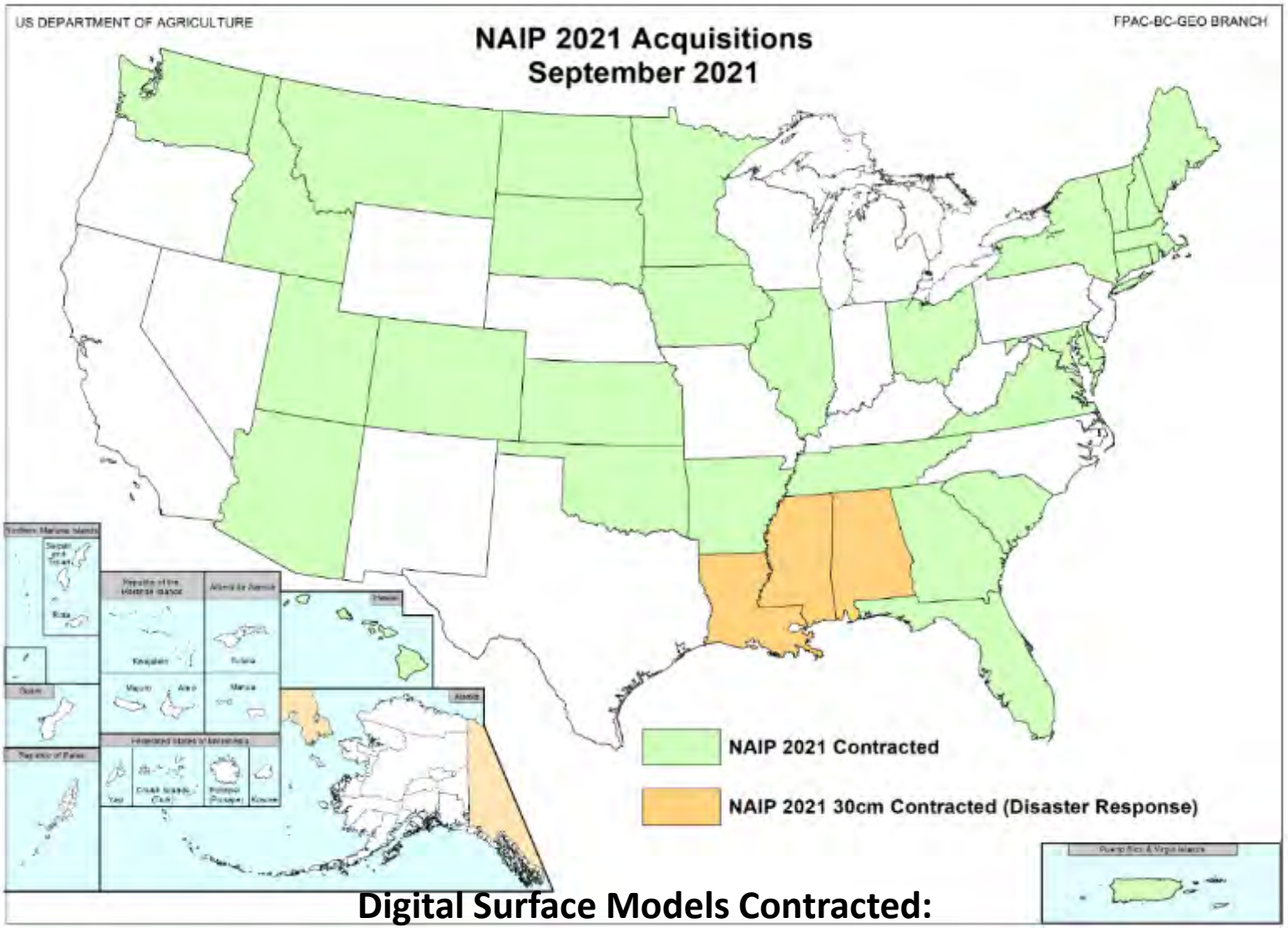
2023-01-18
2022-12-15
2023-01-19

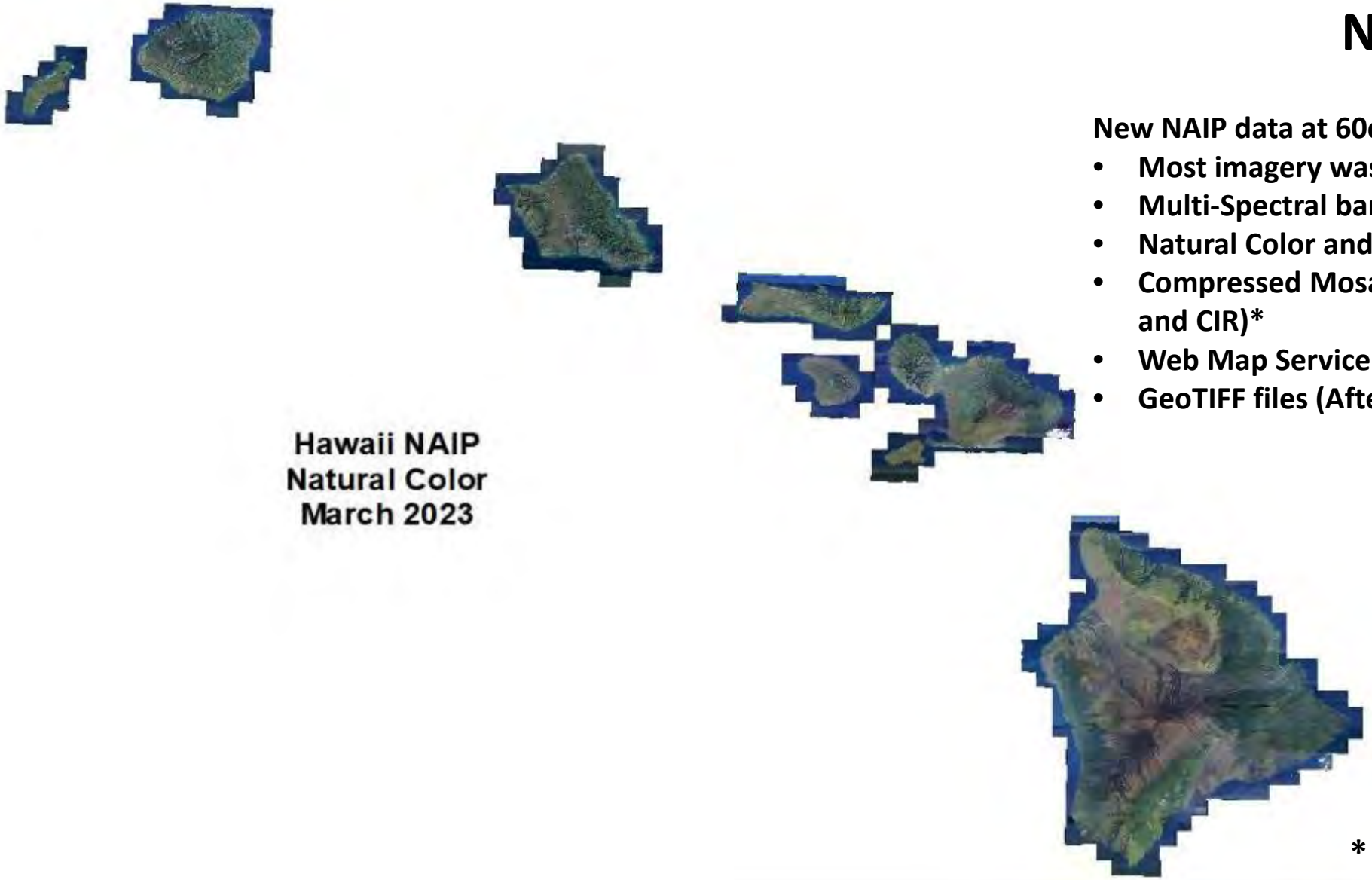
NAIP 2021



Digital Surface Models Contracted:
ME, NH, VT, MA, CT, RI, VA, SC, MN and AR.

- **NAIP funding goal is for a 2-3 year acquisition cycle.**
- **Hawaii and Puerto Rico-US Virgin Islands were being collected for the first time as part of NAIP Program.**
- **Hawaii and Puerto Rico-US Virgin Islands were contracted and collected in late 2021-early 2023.**
- **USDA received March 2023, 60cm Imagery (GeoTIFF, Flight Seamlines and MrSID Mosaics). This dataset is public domain.**

NAIP Hawaii

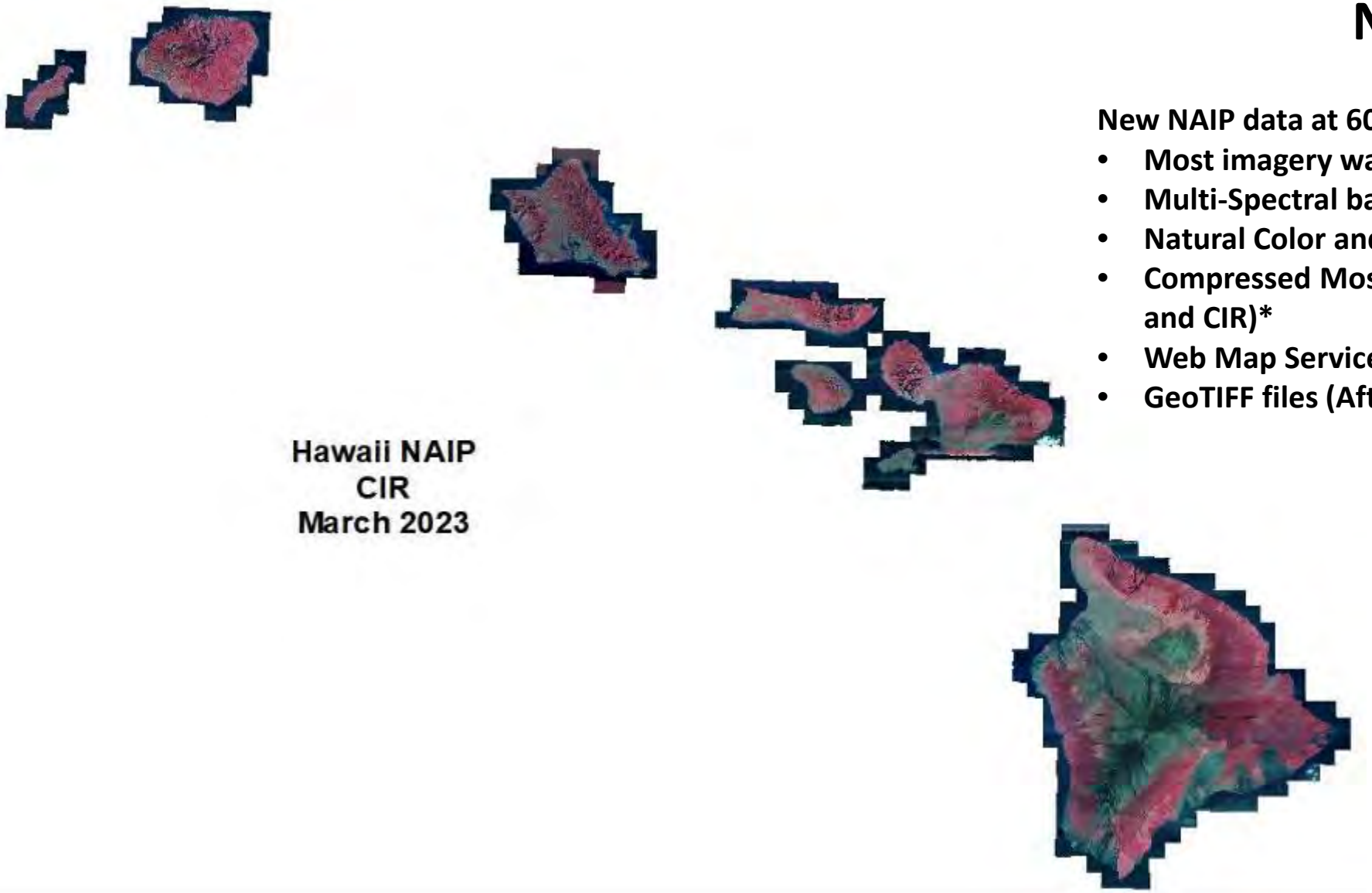


New NAIP data at 60cm is currently available:

- Most imagery was collected in 2022
- Multi-Spectral bands: 4 (R-G-B-NIR)
- Natural Color and Color Infrared Available
- Compressed Mosaics by Island (MrSID in Natural Color and CIR)*
- Web Map Service (After Final QA/QC, ~ June 2023)**
- GeoTIFF files (After Final QA/QC, ~ June 2023)**

* Data available on 3/15/2023

NAIP Hawaii



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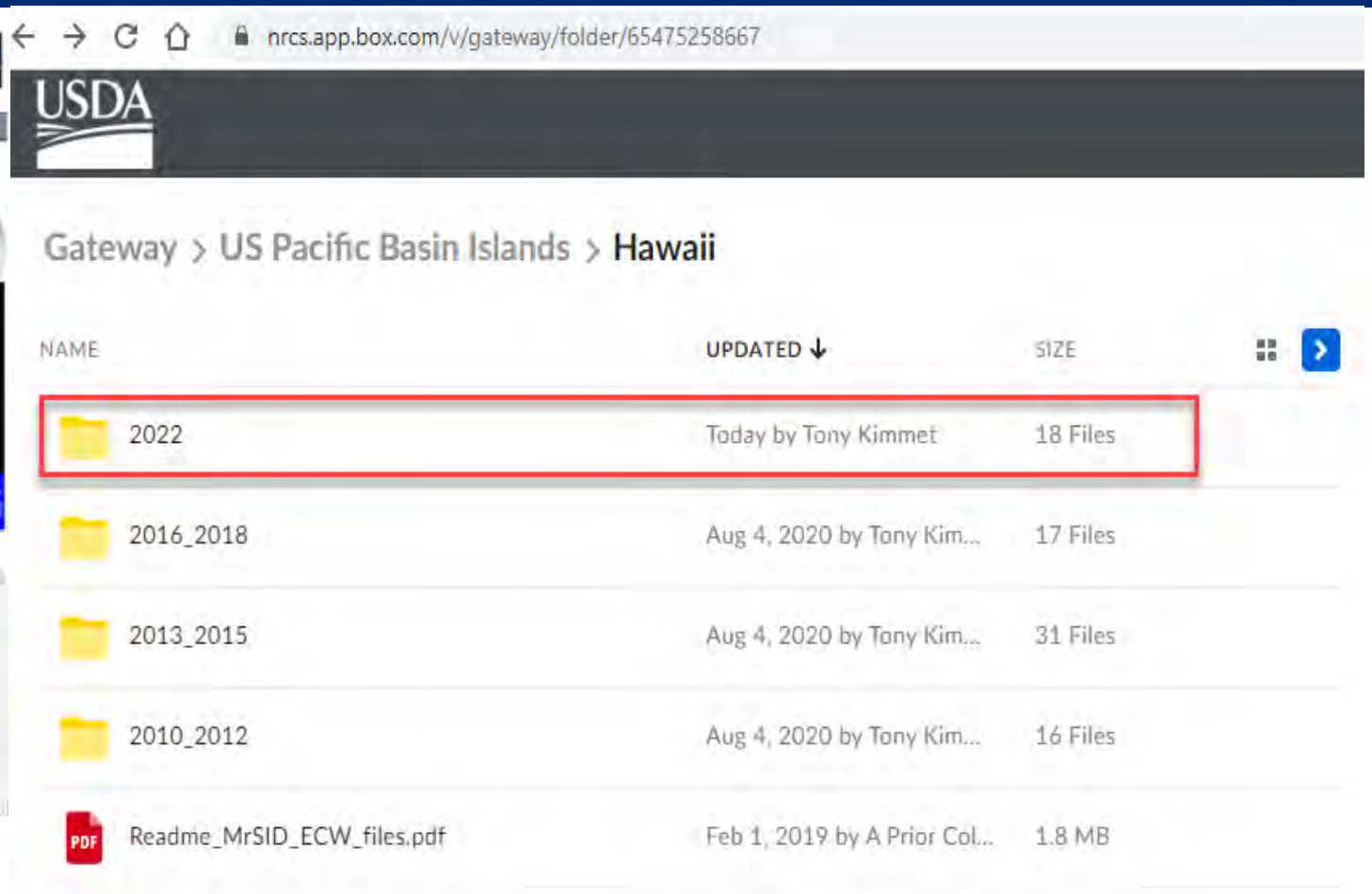
* Data available on 3/15/2023

USDA Compressed County Mosaics



New NAIP Island Mosaics (Natural Color and CIR) are available at the link below.

https://nrcs.app.box.com/v/gateway/folder/65475258667

NAIP Information

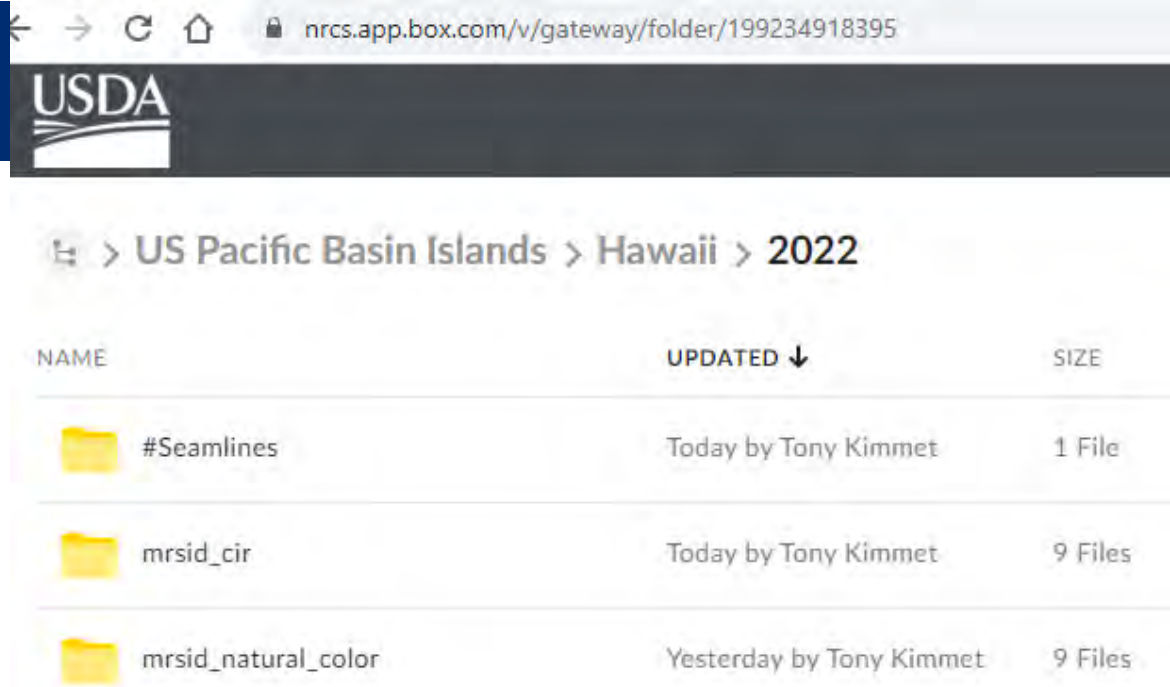
Hawaiian Islands NAIP File Information

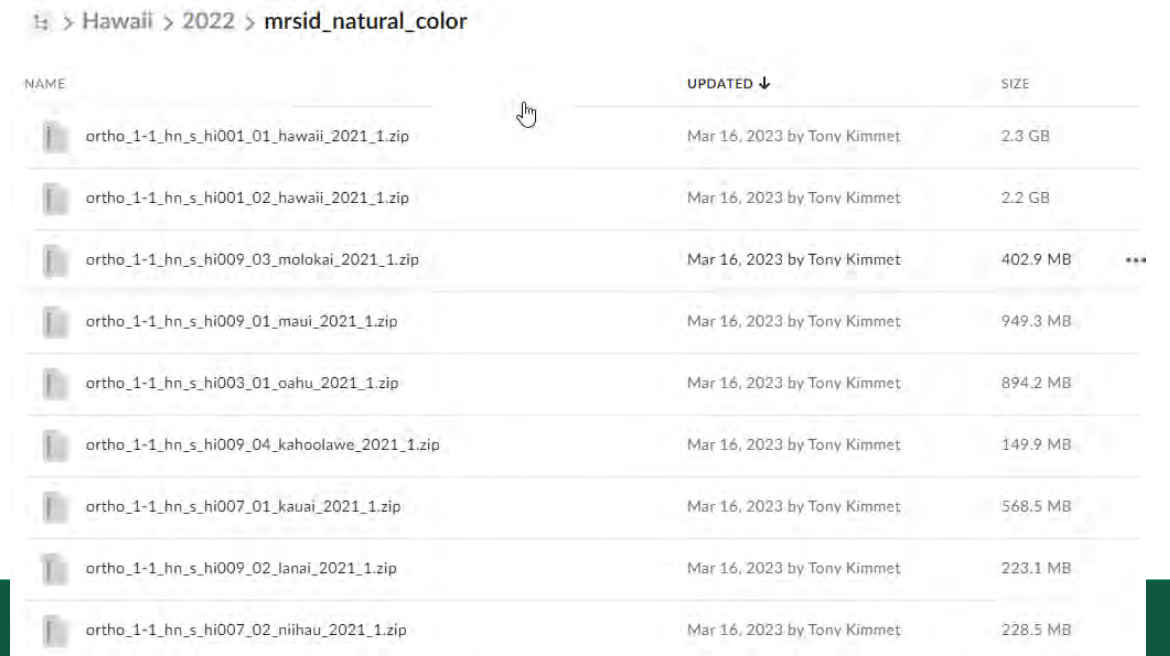
Hawaii FIPS Codes List by Island
HI001_01 - Hawaii Island
HI003_01 - Oahu
HI007_01 - Kauai
HI007_02 - Niihau with Lehua
HI009_01 - Maui with Molokini Crater
HI009_02 - Lanai
HI009_03 - Molokai
HI009_04 - Kahoolawe

Directory Name:
mrsid_cir = Color Infrared Mosaics
mrsid_natural_color = Color Infrared Mosaics

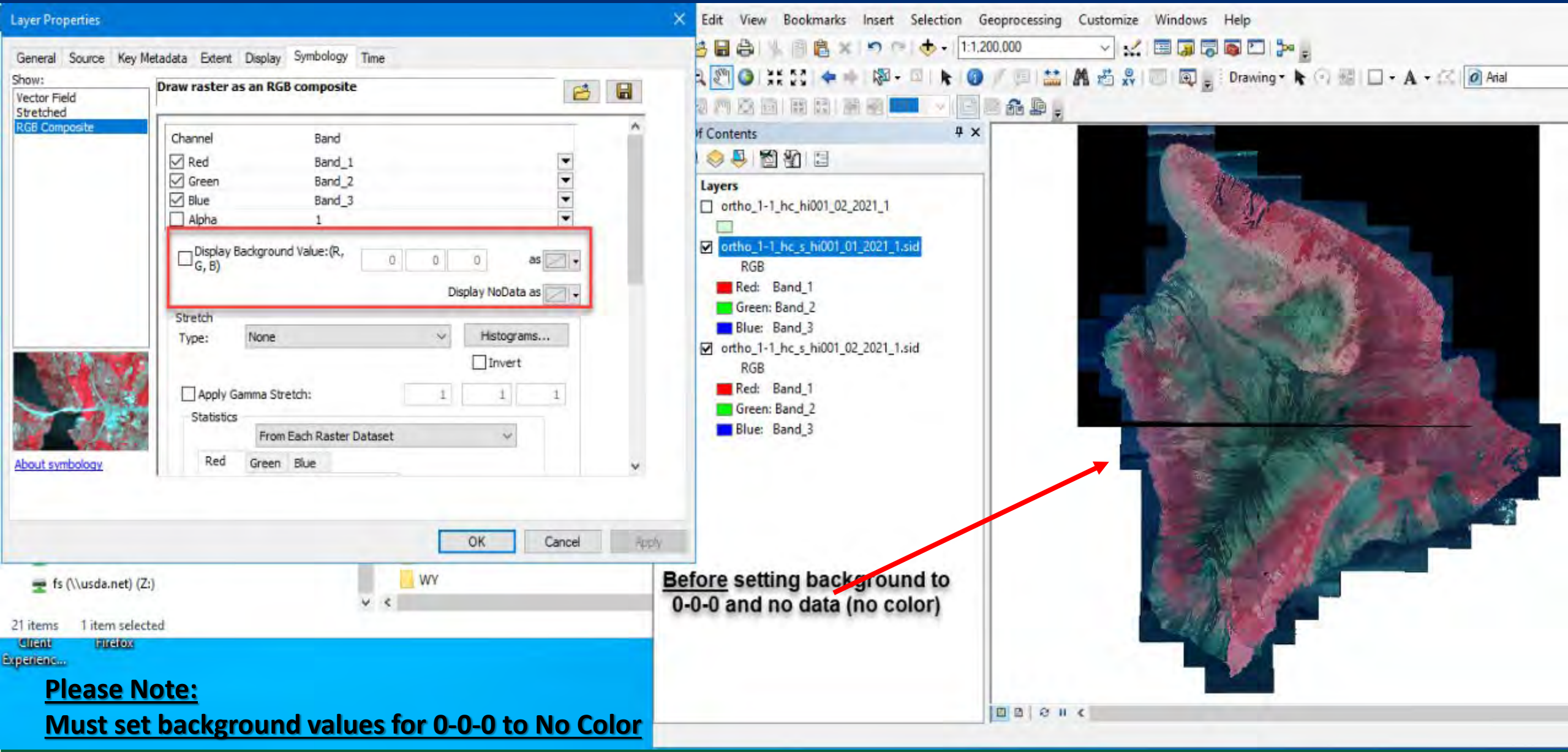
Mosaic Names:
ortho_1-1_hn… = Natural Color Mosaic
ortho_1-1_hc… = Color Infrared (CIR) Mosaic

Seamline:
Complete Shapefile of all aerial acquisitions by flight lines





USDA Compressed County Mosaics

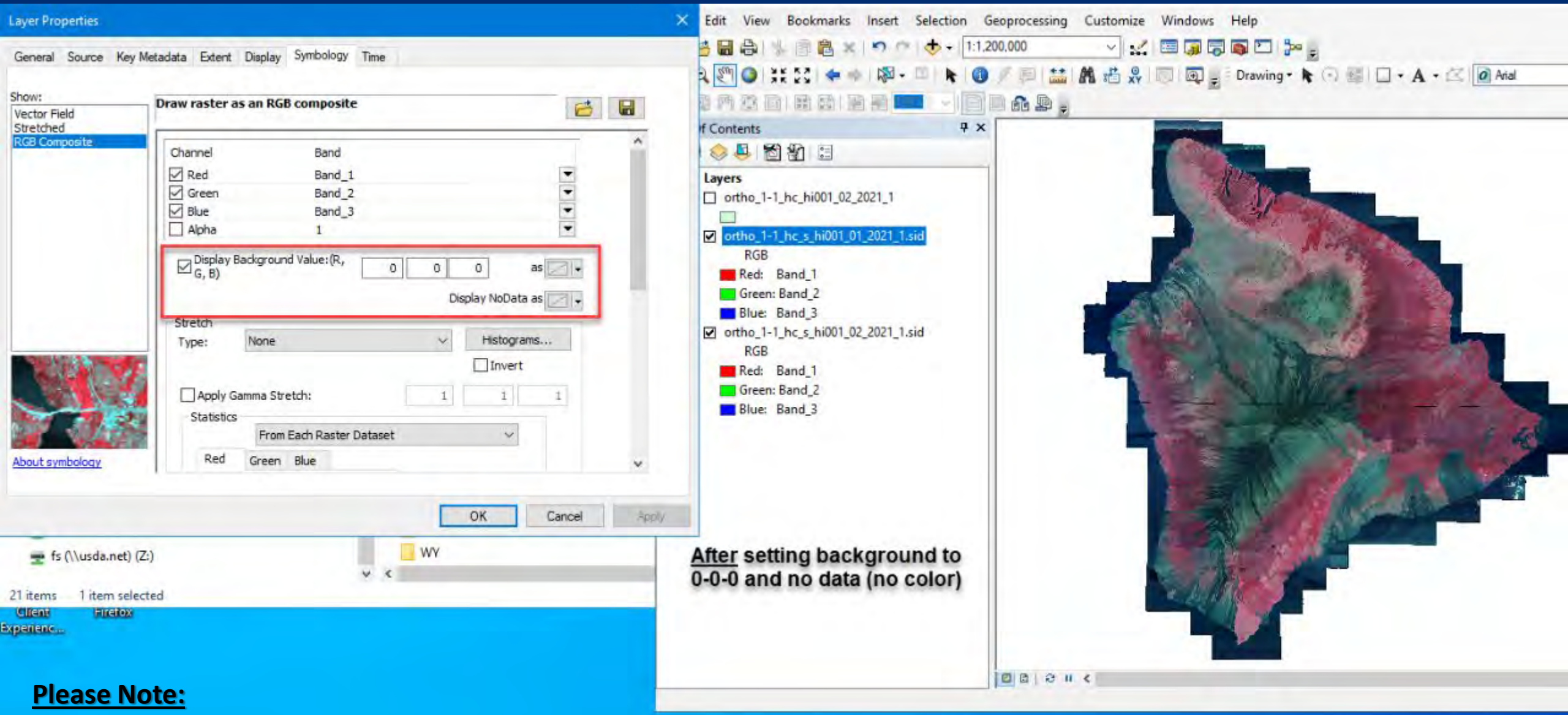


Please Note:

Must set background values for 0-0-0 to No Color

USDA United State Department of Agriculture

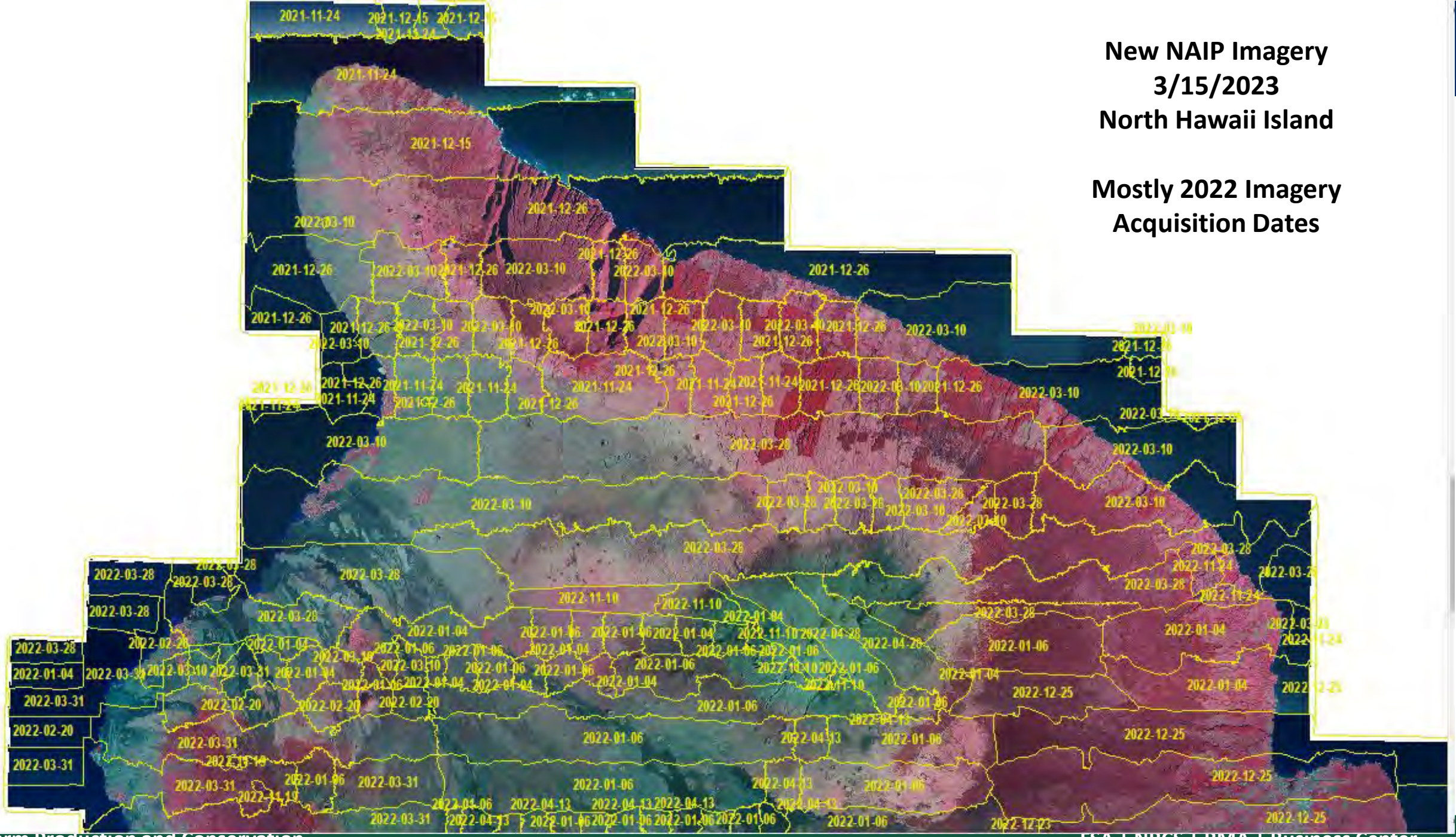
USDA Compressed County Mosaics



After setting background to 0-0-0 and no data (no color)

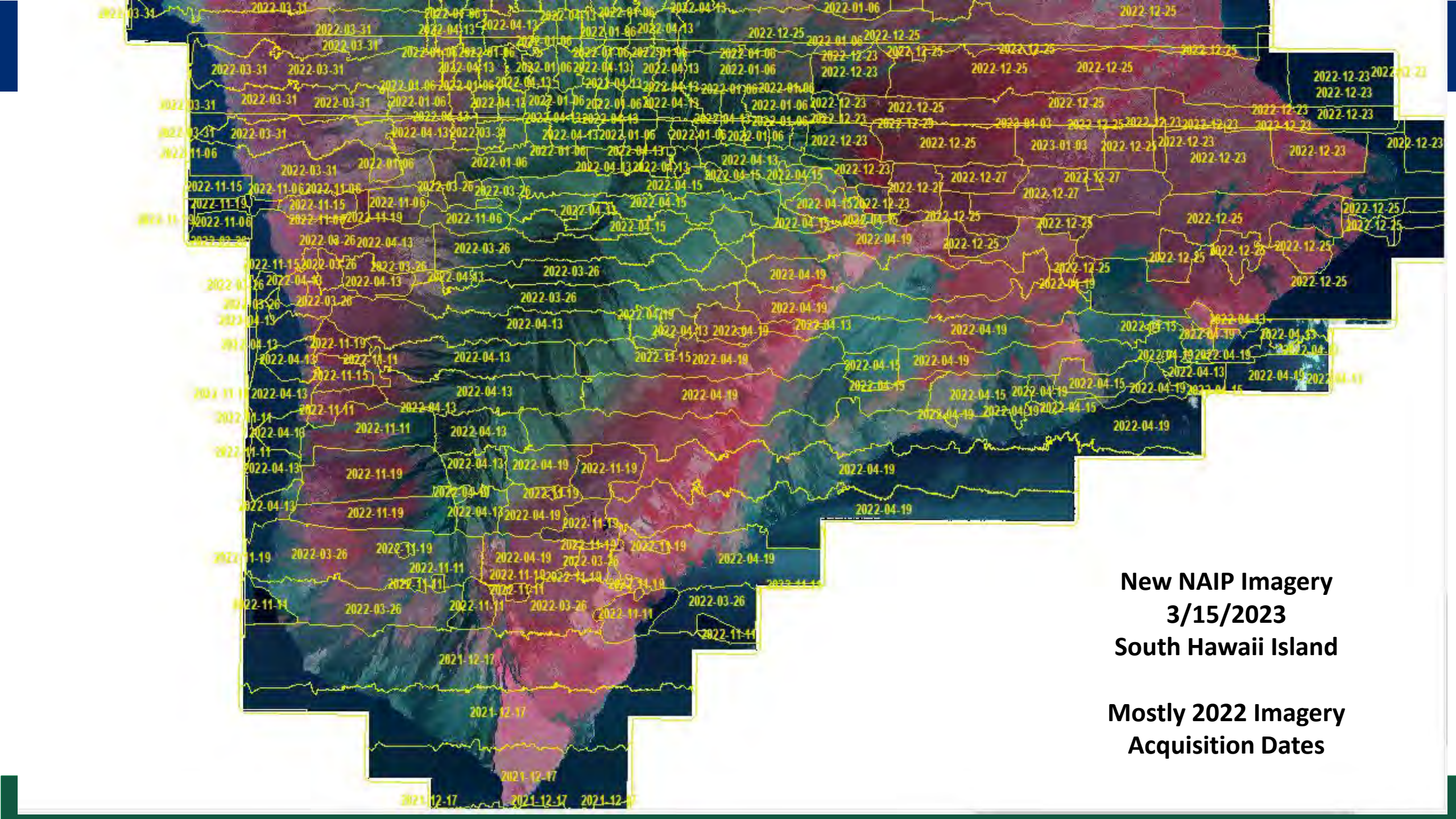
Please Note:

Must set background values for 0-0-0 to No Color



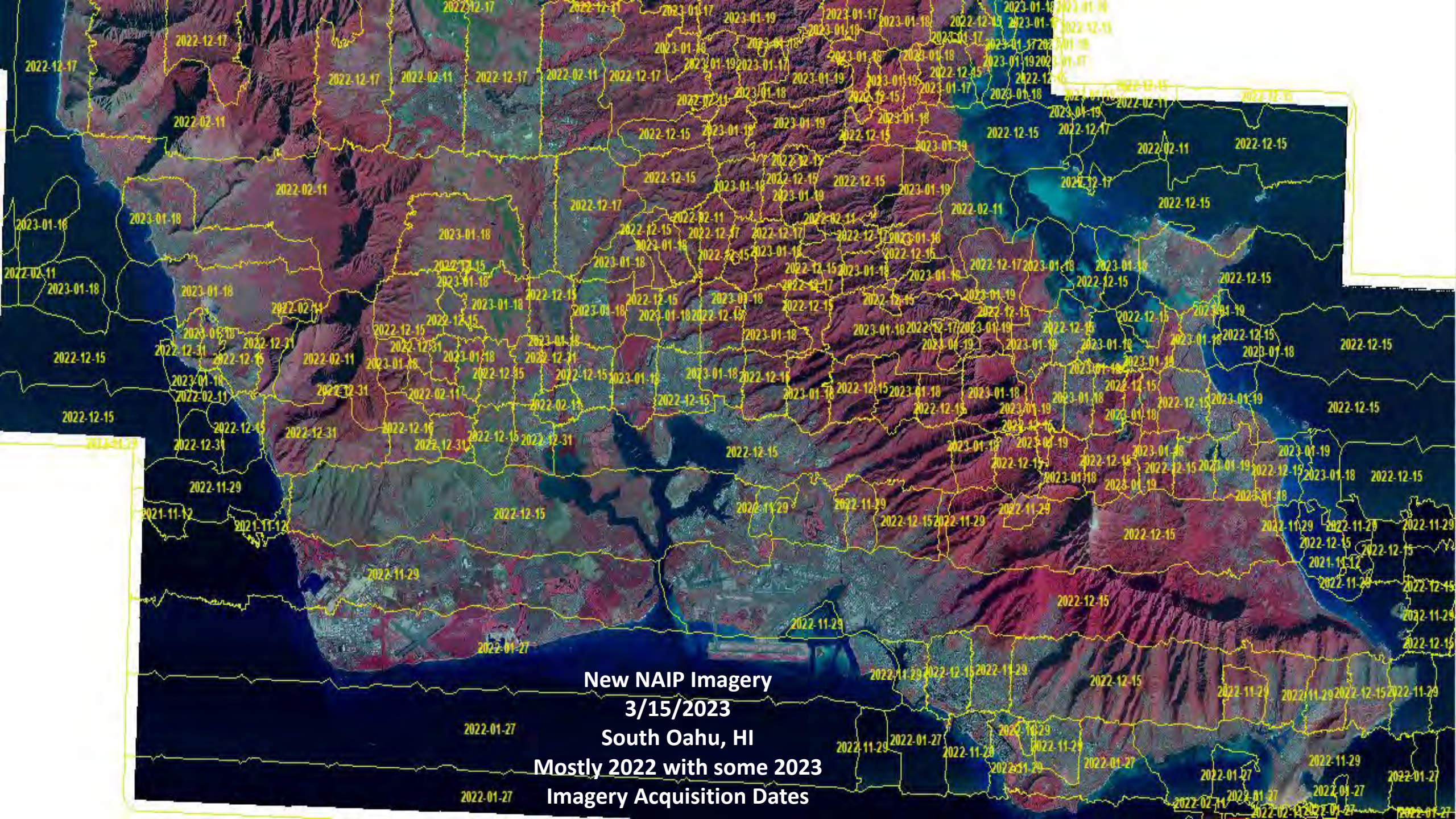
New NAIP Imagery
3/15/2023
North Hawaii Island

Mostly 2022 Imagery
Acquisition Dates

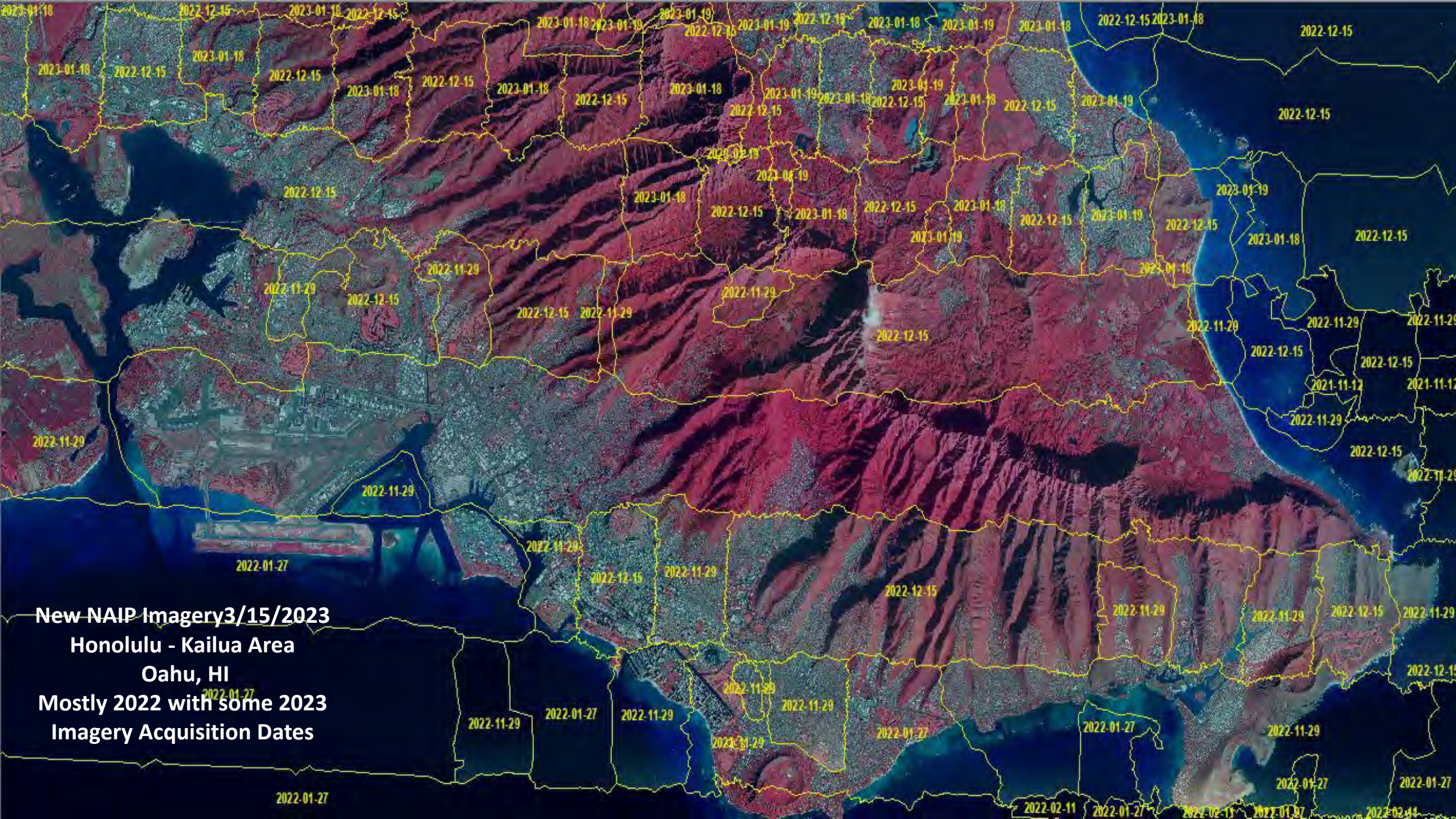

New NAIP Imagery
3/15/2023
South Hawaii Island
Mostly 2022 Imagery
Acquisition Dates

New NAIP Imagery
3/15/2023
North Oahu, HI

Mostly 2022 with some 2023 Imagery Acquisition Dates


New NAIP Imagery
3/15/2023
South Oahu, HI
Mostly 2022 with some 2023
Imagery Acquisition Dates

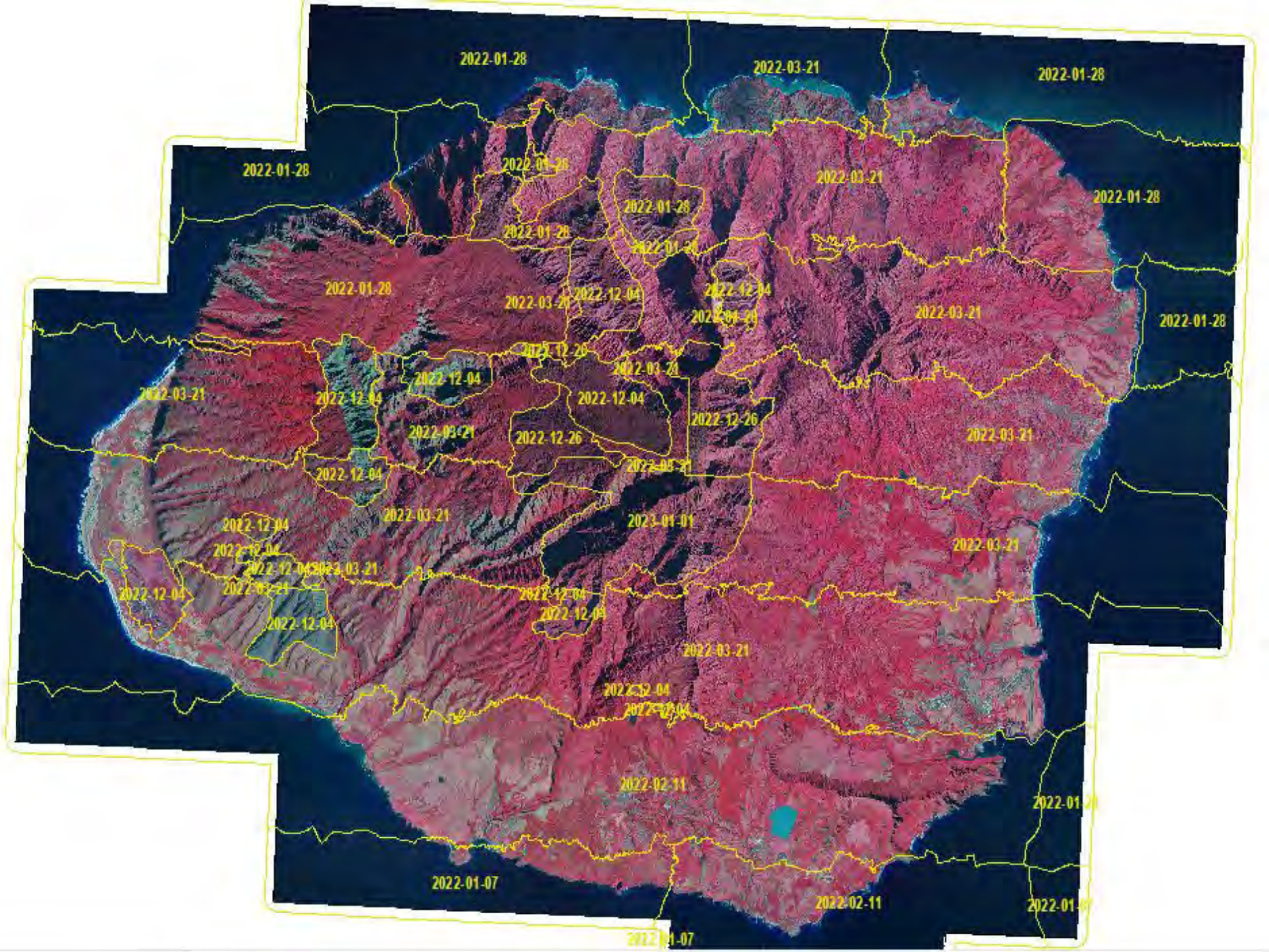

New NAIP Imagery3/15/2023
Honolulu Area
Oahu, HI
Mostly 2022 with some 2023 Imagery Acquisition Dates


New NAIP Imagery3/15/2023
Honolulu - Kailua Area
Oahu, HI
Mostly 2022 with some 2023
Imagery Acquisition Dates

USDA United State Department of Agriculture

New NAIP Imagery
3/15/2023
Kauai, Hawaii

Mostly 2022 with some 2023 Imagery Acquisition Dates



Farm Production and Conservation

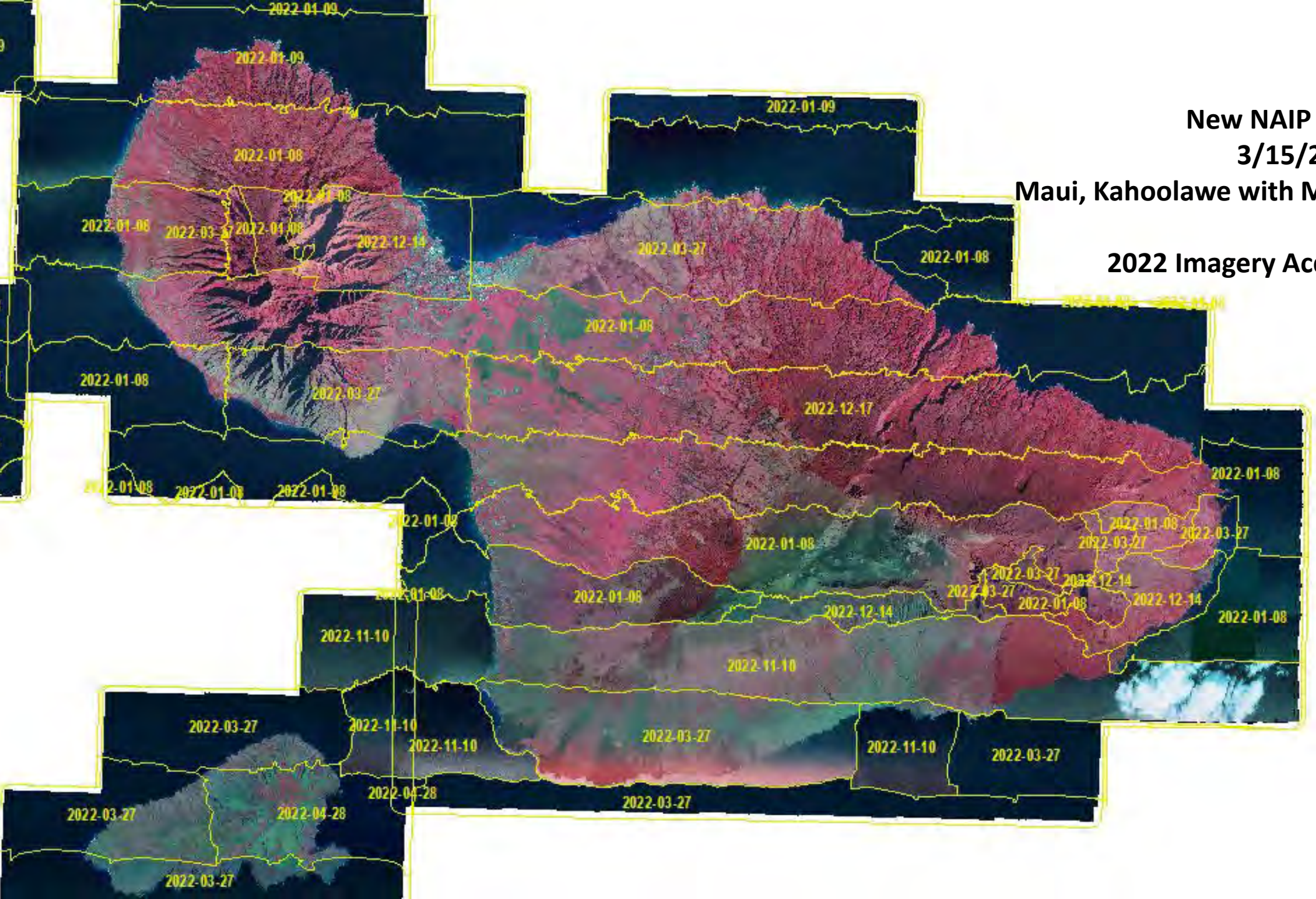
USDA United State Department of Agriculture

New NAIP Imagery
3/15/2023
Niihau with Lehua, Hawaii

2022 Imagery Acquisition Dates

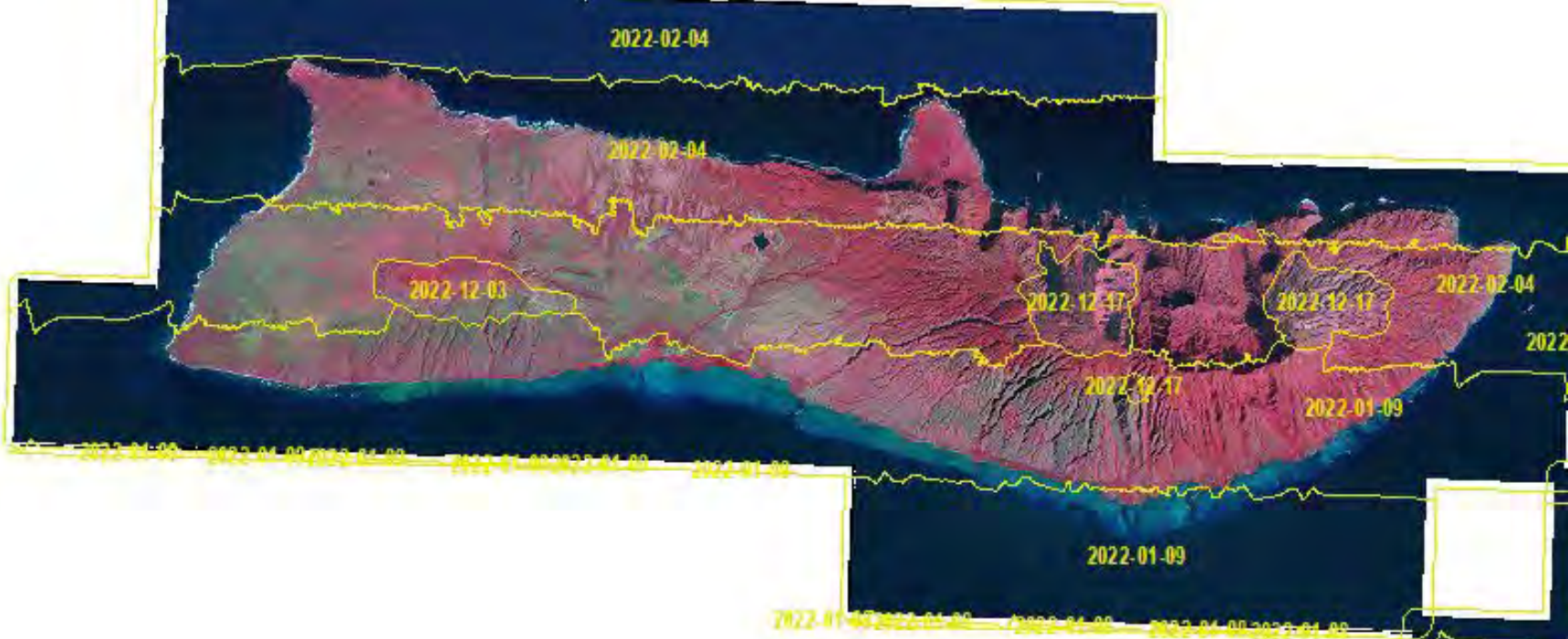
New NAIP Imagery
3/15/2023
Maui, Kahoolawe with Molokini Crater, Hawaii

2022 Imagery Acquisition Dates



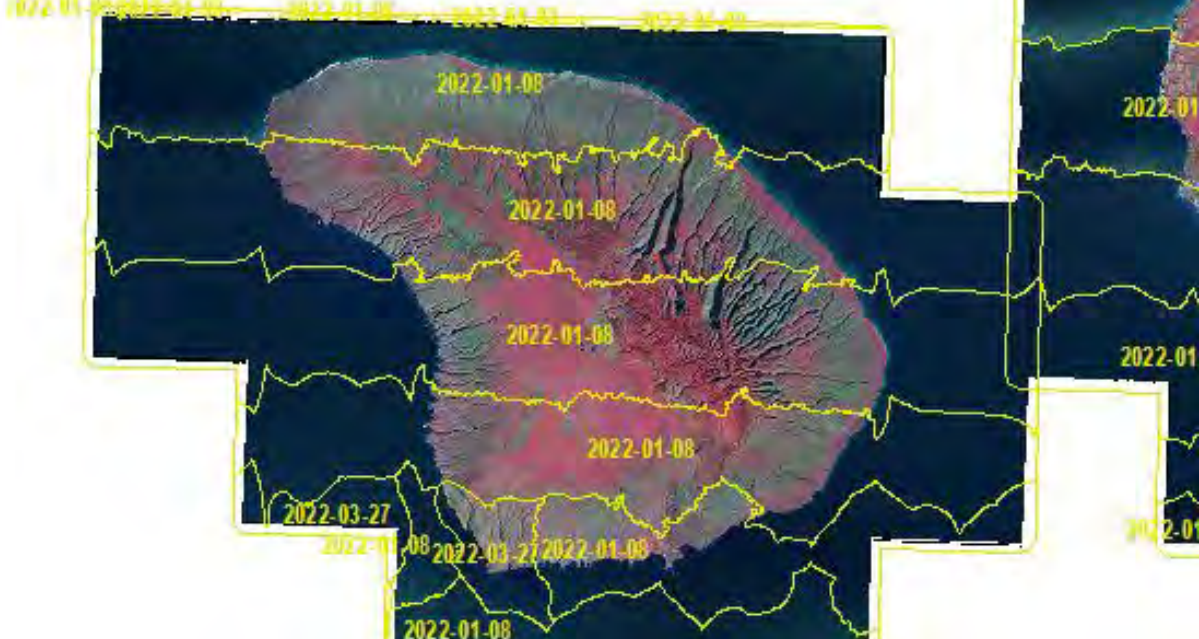

New NAIP Imagery
3/15/2023
Maui, Hawaii
2022 Imagery Acquisition Dates
2022-12-14
2022-03-27
2022-01-08

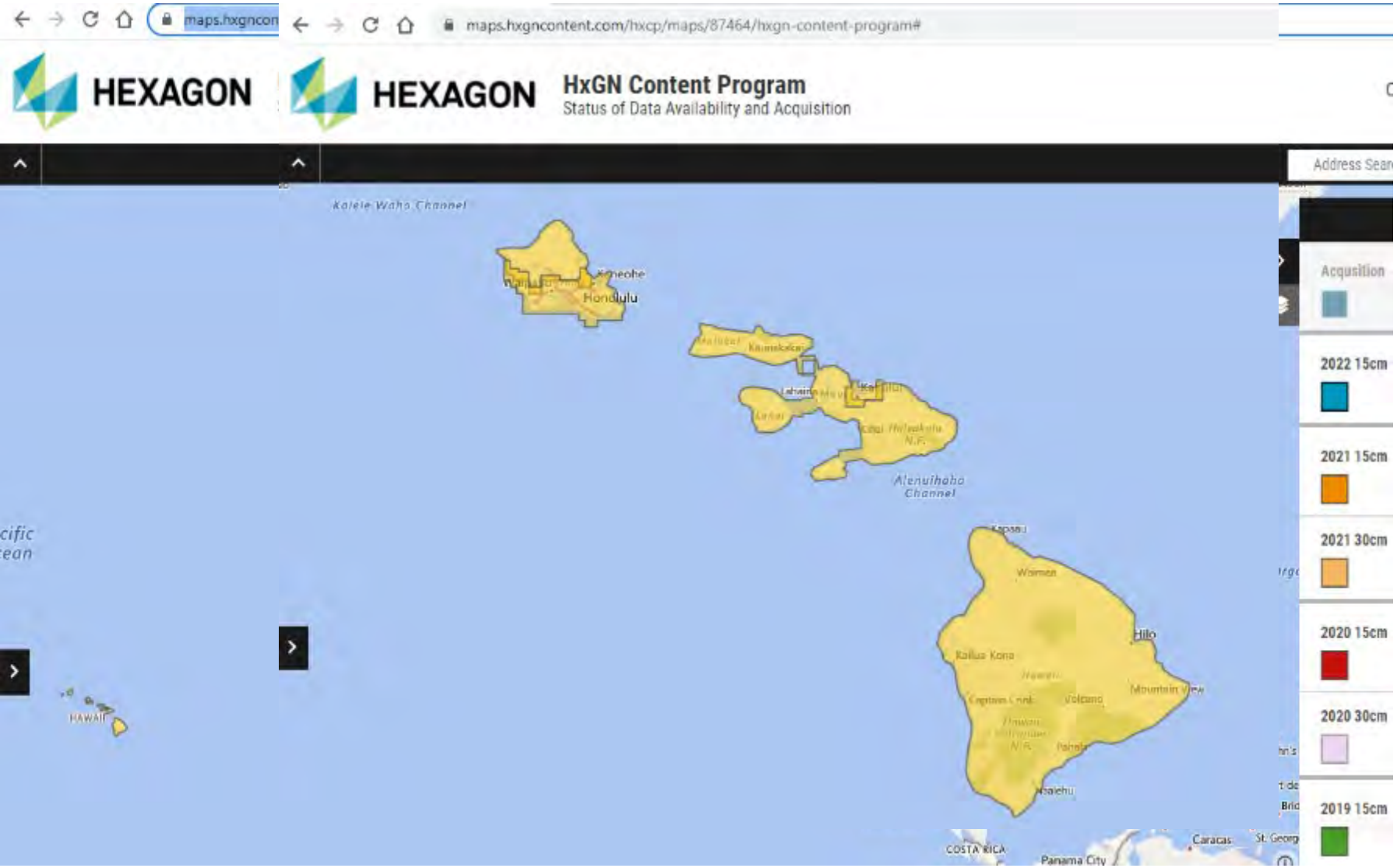
USDA United State Department of Agriculture



New NAIP Imagery
3/15/2023
Molokai and Lanai, Hawaii

2022 Imagery Acquisition Dates





https://maps.hxgncontent.com/hxcp/maps/87464/hxgn-content-program#

Hexagon HxGN

USDA has all NAIP datasets for Hawaii at 60cm resolution.

Hexagon collects NAIP imagery at high resolution and makes it available via subscription service.

Hawaii has been completely collected at 30cm and 15 cm for select areas.

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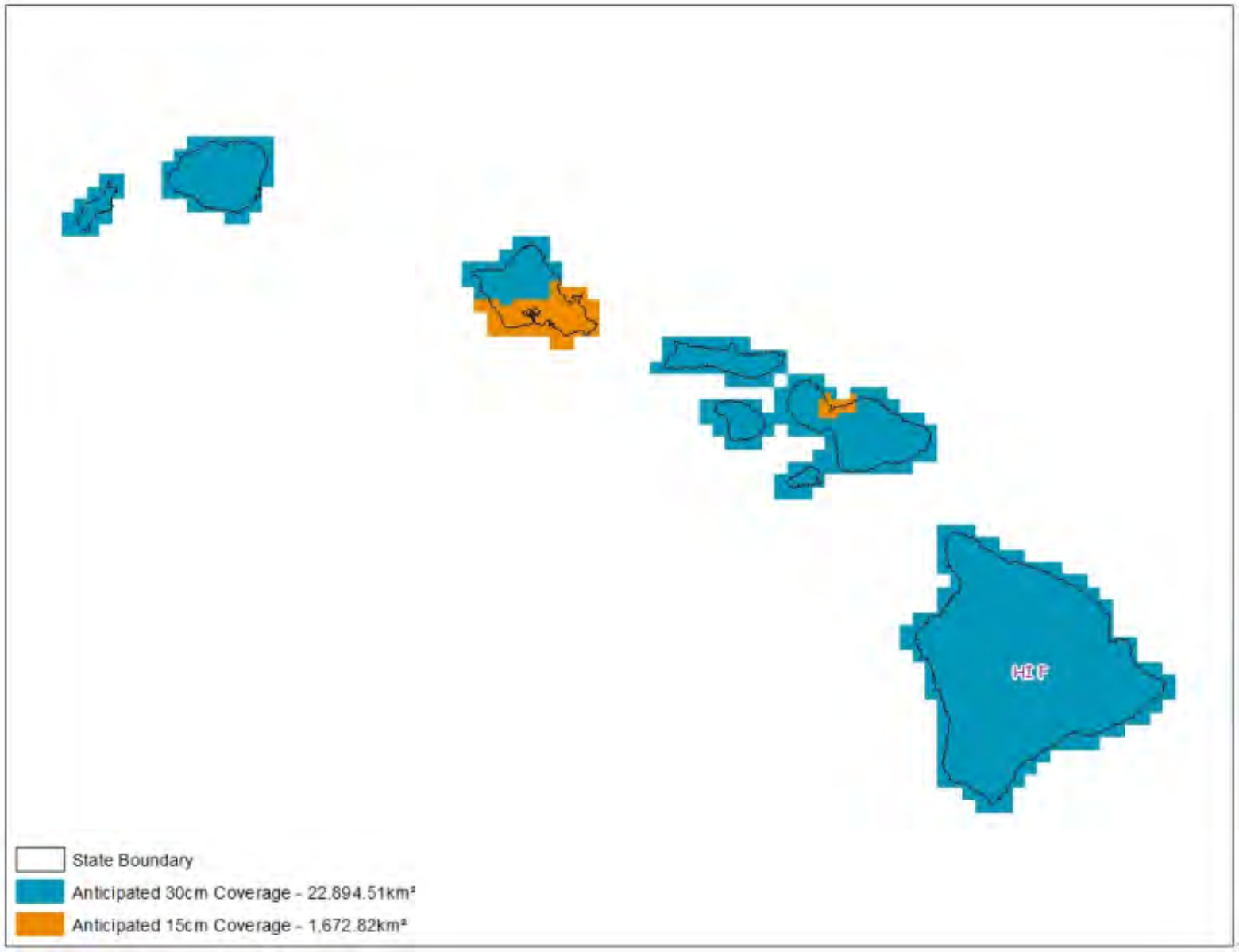

Hexagon HxGN

- Hawaii has been completely collected at 30cm plus at 15 cm for select areas.
- Most imagery was collected in 2022.
- New Hawaii 30/15cm data should be available soon.

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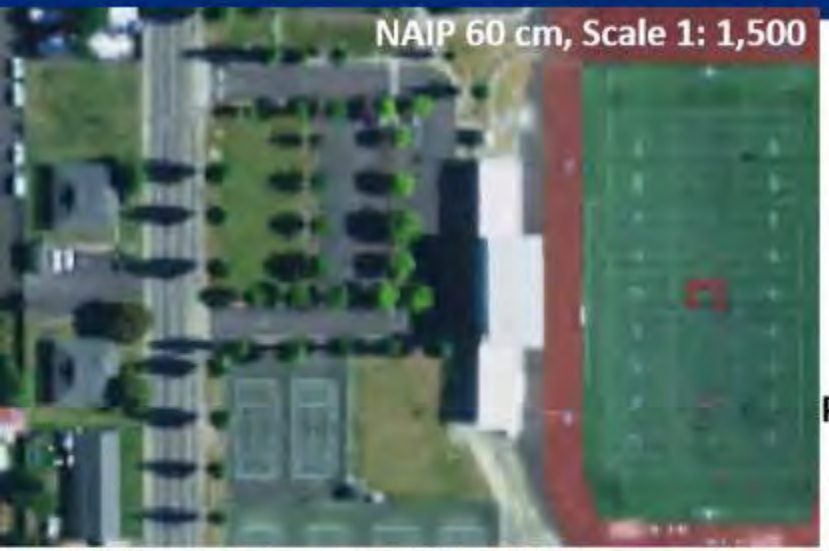
USDA United State Department of Agriculture

NAIP Imagery Resolution Comparison (30cm and 60cm)



Polk County Oregon NAIP 2020

Agricultural and Urban Areas

If your work involves looking at imagery around a scale of 1: 1,500 or below, then you would likely benefit from imagery at 30cm or higher.

What is Hexagon HxGN?

- Hexagon HxGN is a high-resolution aerial imagery, elevation data, 3D models and analytics WMS streaming service. Used in many applications.
- HxGN streaming service uses NAIP as the imagery base (Natural Color, CIR) for most of the United States. Some non-NAIP datasets include such as Urban areas and some leaf-off acquisitions.
- Hexagon has announced that all NAIP 2022-2023 states awarded will be collected at 15cm resolution.
- Hexagon HxGN requires a license to use their datasets. License costs vary depending on products/services.
- NRCS has licensed ~ 70-100 Floating licenses from 2015-2022.
- NRCS Urban Agricultural initiative will increase the number of floating licenses to accommodate more users in FY 2024. Data downloading is available.

USDA United State Department of Agriculture

Hexagon HxGN Samples

Scale of Imagery and Resolution

- If your work involves examining larger areas such as scales of 1: 4,800 to 1:1,000,000 then you will not see little difference between 60cm data and 30-15cm imagery.

- It is if you are using imagery at scale of around 1: 500 - 1:2,400 is where the higher resolution is most noticeable.

2022 Imagery, 60cm Resolution

Queens Medical Center
Honolulu, Hawaii

2016 Imagery, 15cm Resolution

Hawaii, US Pacific Basin and Alaska High Resolution Satellite Imagery

High Resolution Satellite Acquisitions

Acquisition Time to production of Web Map Services

- From 2004-2020 it would take somewhere around 3-5 years to acquire(tasking), process and publish to a Web Map Service for Hawaii and US Pacific Basin.
- We live in a society where GIS users want much more rapid access to imagery updates.
- GEO has changed our imagery acquisition strategy to where we are updating NAIP imagery in the continental US every 2-3 years.
- There is a potential to update the US Insular areas in a similar timeline using both Satellite data and USDA Imagery BPA (NAIP).
- Usage of pre-made mosaics from satellite vendors is critical for faster deployment.

High Resolution Satellite Acquisitions

Maxar offers off the shelf and on-demand imagery basemap products

Vivid

- Product to defined product specifications
- Produced annually on a defined production schedule, aligned with planned collection window
- Available "off the shelf" for defined coverage areas
- Use of Maxar hybrid DTM *(edited blend of SRTM, NED, etc)*

Dynamic

- Produced to defined order parameters
- Produced to defined order schedule
- Available "on demand" for any area of interest
- Use of Maxar DEM coming in 2022

Product	GSD	Accuracy	Currency	Bands	Coverage
Vivid Premium	15cm HD	2m CE90	90%<12mo	3 (RGB)	Defined cities (200)
Vivid Advanced	30cm HD	5m CE90	75%<12mo	3 (RGB)	Defined cities (2,200)
Vivid Standard	30cm HD and 50cm	5m CE90	50M km2 <12mo	3 (RGB) 4 (BGRN)	Global landmass
Vivid Basic	50cm	8.5m CE90	50M km2 <12mo	3 (RGB)	Global landmass

GSD	Accuracy	Currency	Bands	Coverage
30cm HD through 15 meter	5m CE90 or 10m CE90	Best available or Defined start and end dates	3 (RGB) or 4 (BGRN)	Any AOI

MAXAR

Maxar (DigitalGlobe) offers Vivid Basemap updates every 12 months for Vivid Standard.

USDA has invested funding to acquire Vivid Basemap:

Hawaiian Islands (2020/2021)
Guam (2020)
CNMI (2020)
Palau (2020)
American Samoa (2020)
FSM (2021)
Marshall Islands (2021)

USDA upgraded the Vivid Basemap End User License Agreement.

New Imagery Services

- Maxar-DG provided USDA-FPAC a new version of high-resolution satellite imagery Called Vivid Basemap that has more recent imagery and easier to process by USDA.
- Maxar-DG creates updates approximately every year for Vivid Basemap Services.
- USDA has created a new ImageServer Services for the following:
  - Hawaiian Islands
  - Guam
  - Commonwealth of the Northern Mariana Islands
  - American Samoa
  - Palau
  - Federated States of Micronesia
  - Marshall Islands
  - Additional Imagery and Remote Sensing layers

Imagery Specifications

- .5 meter/50 cm Resolution
- Four Bands (Natural Color, Color Infrared)
- Accuracy CE 90 <5-meter
- Image Currency ~ 75% is two years or less

Satellite End User License Agreement

Satellite data is typically licensed for use from private companies. End User License Agreement (EULA) available with the following requirements:

- **Distribute licensed data to all Federal/State/Local/Tribal government, Universities, Non-Profit Organizations, and cooperators.**
- **Contractor grants perpetual license to USDA and the organizations listed above.**
- **Satellite data can be used in all reports, presentations, training materials, books, posters, and blogs.**
- **Available for public websites and social media.**
- **Public facing websites would not allow downloading of the original received licensed imagery data from satellite contractor.**
- **Data will not be provided to third-party resellers.**

Vivid Basemap 2020-2023

- USDA GEO collected all areas of the US Pacific Basin 2020-2022.
- USDA will acquire new updated Maxar-DG Vivid Basemap for the following in US Pacific Basin in FY 2023.
  - Guam
  - Commonwealth of the Northern Mariana Islands
  - American Samoa
  - Palau
  - North West Hawaii Islands (Arrived at GEO in late 2022)
- May have enough funding to acquire new imagery in other locations (Federated States of Micronesia and the Marshall Islands.
- USDA will create new ImageServer services similar too the recently completed Hawaii datasets.
- Likely two satellite versions of Hawaii and US Pacific Basin will be available.
- Maxar End User License Agreement will be uplifted to allow access by the public.

USDA United State Department of Agriculture

Hawaii, US Pacific Basin and Alaska High Resolution Satellite Imagery Data Deployment Information

Eastern Majuro, Marshall Islands

How to Access USDA Web Map Services

United State Department of Agriculture

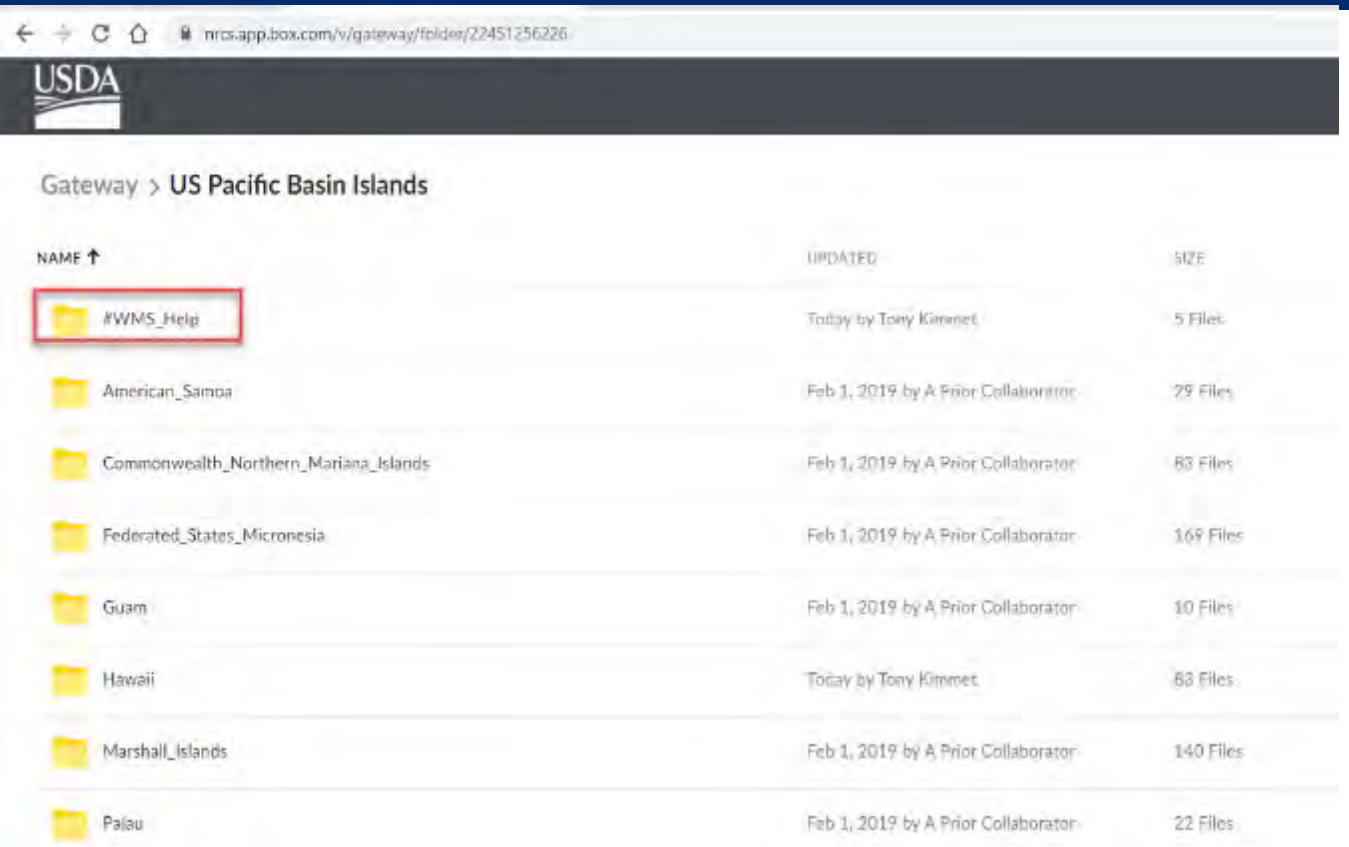
USDA Satellite and other Web Map Services Site

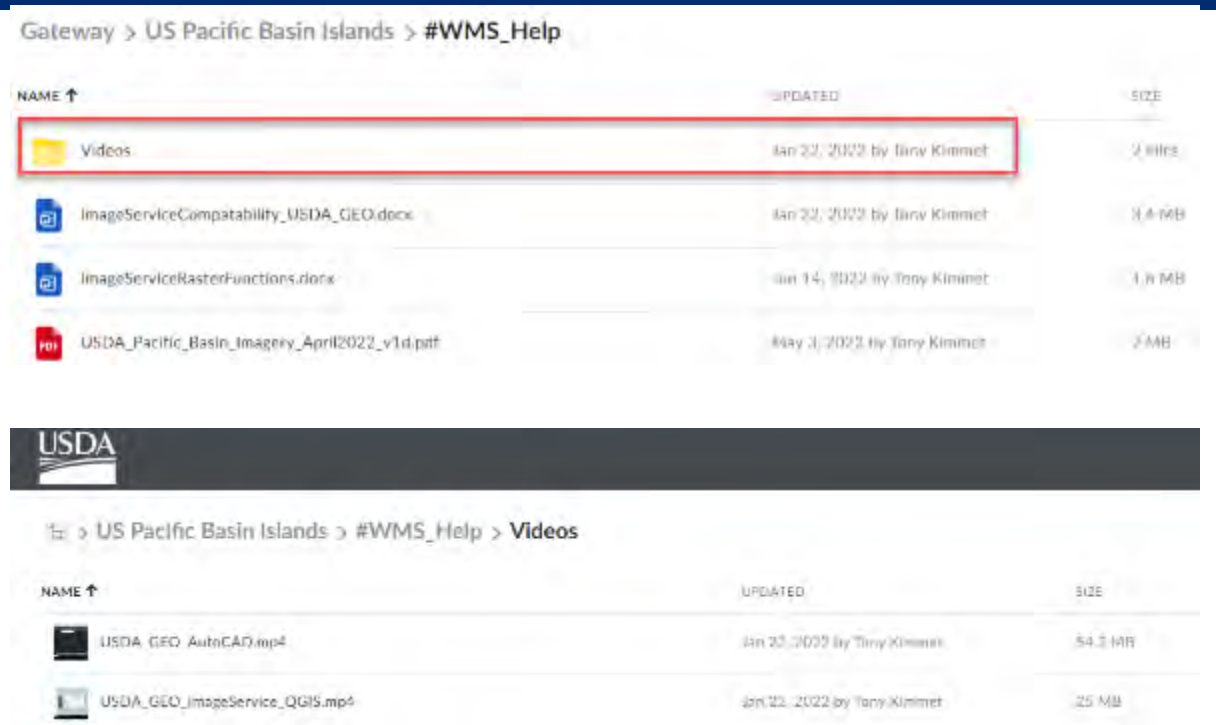
https://nrcsgeoservices.sc.egov.usda.gov/arcgis/rest/services/ortho_imagery

New Imagery Services

- Maxar-DG provided USDA new versions of high-resolution satellite imagery Called Vivid Basemap that has more recent imagery and easier to process by USDA.
- Metadata is available for all Ortho_Imagery layers.
- Maxar-DG creates updates approximately every year for Vivid Basemap Services.
- USDA has created a new ImageServer Services for the following:
  - Hawaiian Islands
  - Guam
  - Commonwealth of the Northern Mariana Islands
  - American Samoa
  - Palau
  - Federated States of Micronesia
  - Marshall Islands
  - Additional Imagery and Remote Sensing layers

Help on Using USDA Web Map Services

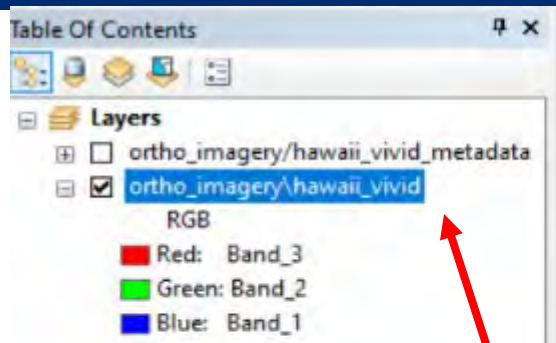


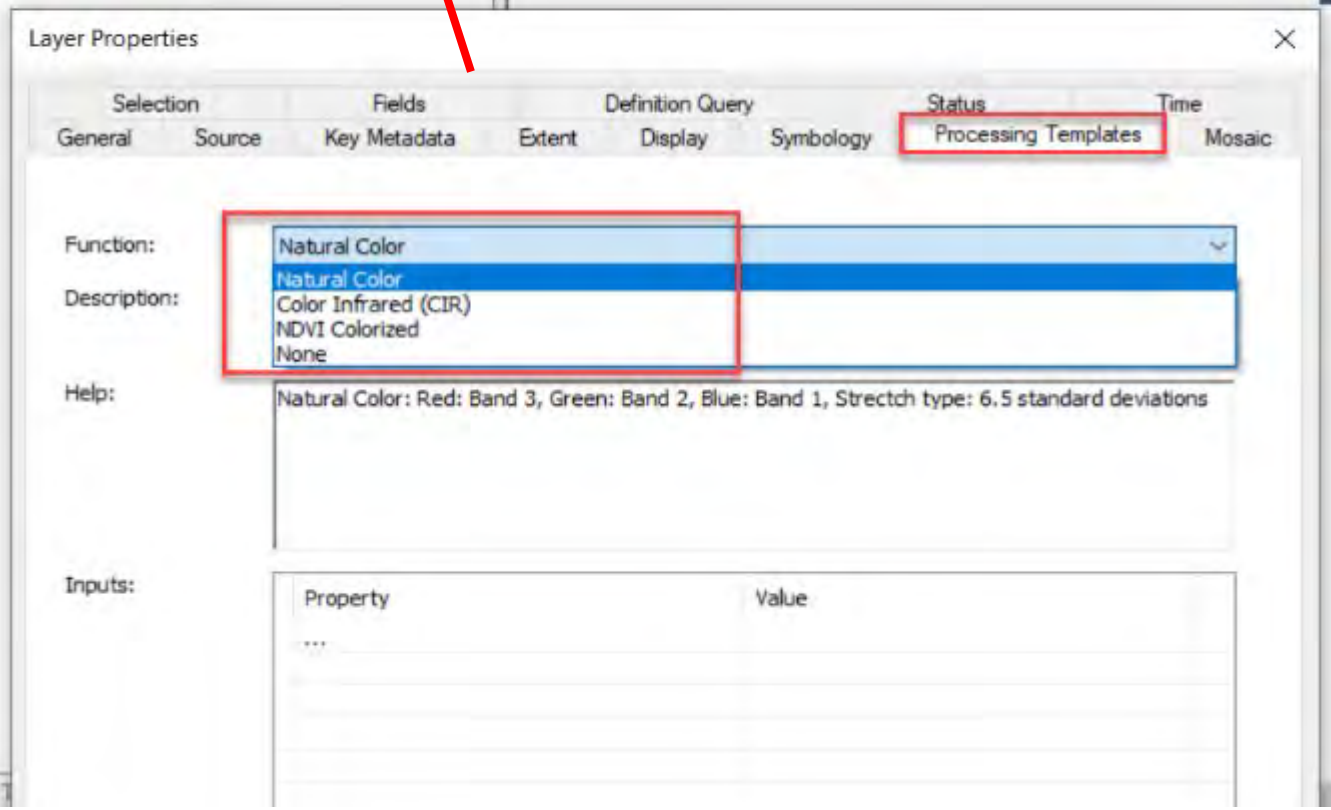


There is helpful documentation and videos on how to use USDA Satellite WMS in ArcMap, ArcPro, QGIS-AutoDesk/AutoCAD.

https://nrcs.app.box.com/v/gateway/folder/154646807634

Satellite Based Hawaii Web Map Services





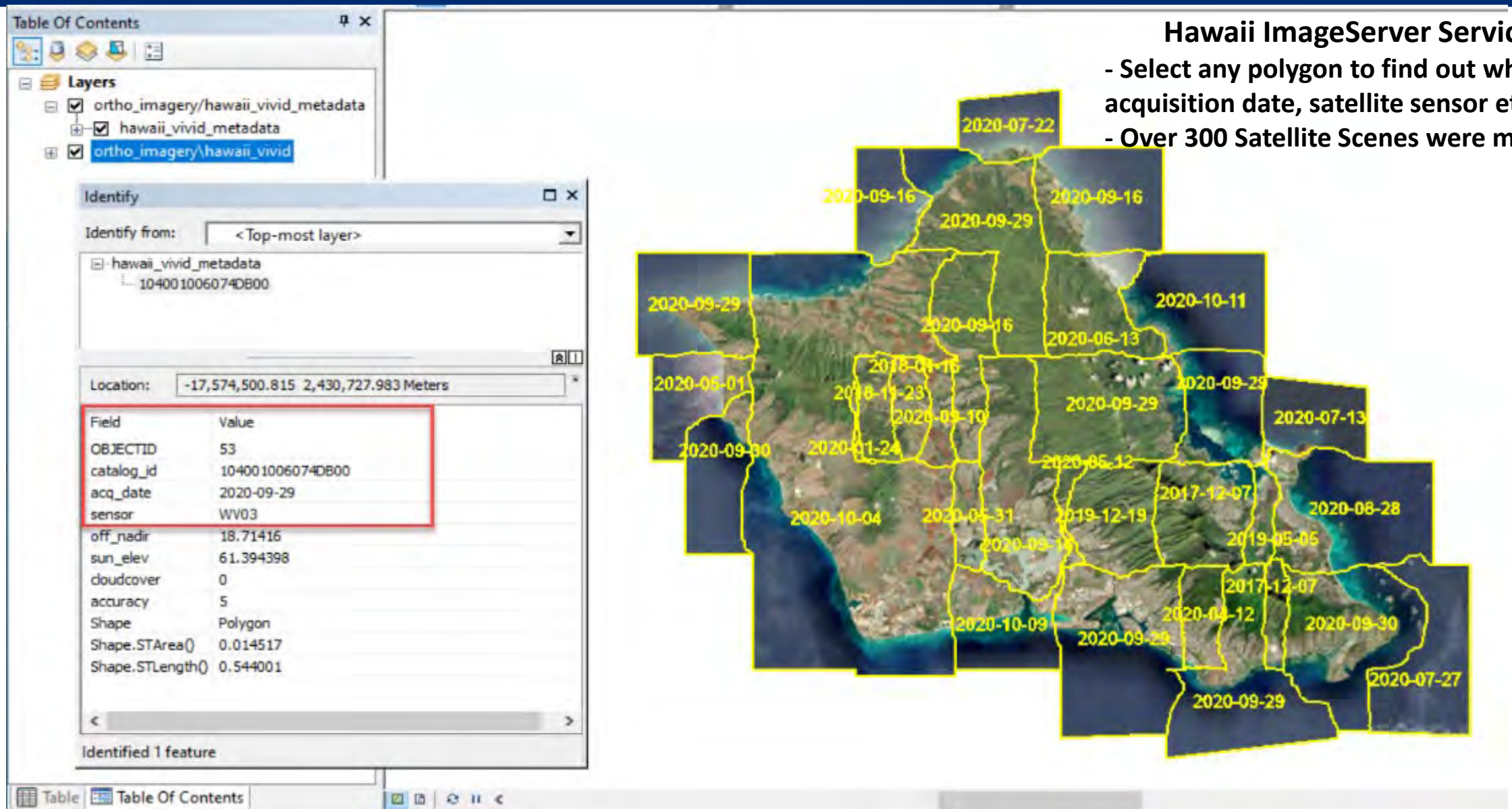
Hawaiian Islands ImageServer Services has three layers

- **Natural Color**
- **Color Infrared**
- **NDVI (Testing Phase)**

- In both ArcMap or ArcPro, select "ortho_imagery\hawaii_vivid" and then layer properties.

- You will see a tab for processing templates. Select this and then the Function (Natural Color, Color Infrared (CIR) and NDVI.

Satellite Based Hawaii Web Map Services - Metadata



Hawaii ImageServer Service Metadata

- Select any polygon to find out what the image acquisition date, satellite sensor etc…
- Over 300 Satellite Scenes were mosaics together.

Vivid Basemap 2021

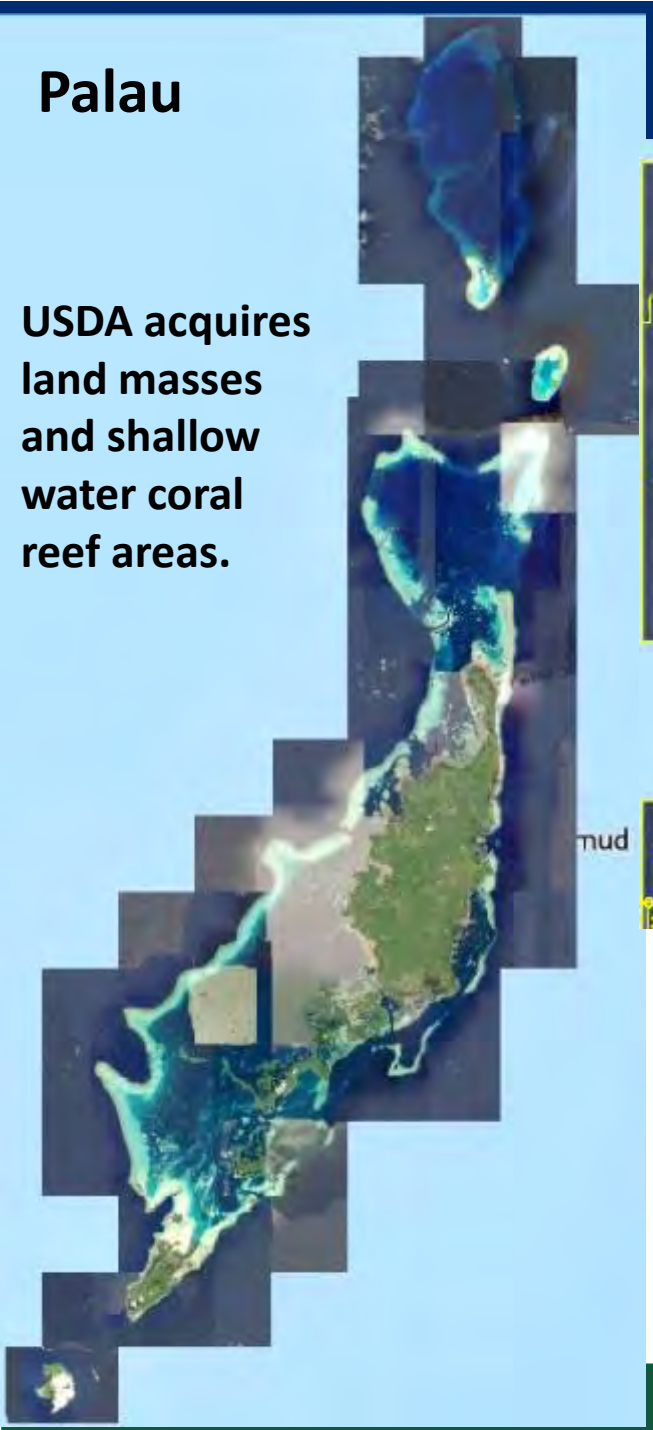
Guam

American Samoa

Palau

Vivid Basemap 2021

USDA acquires land masses and shallow water coral reef areas.



Imagery Acquisitions 2021+
USDA-FPAC-BC-GEO

1) New USDA imagery Blank Purchase Agreement (NAIP) for Hawaii

2) Completed satellite imagery acquisitions (Vivid Basemap for all areas of Hawaii and US Pacific Basin).

3) Potentially new satellite acquisitions for Alaska, Hawaii and US Pacific Basin (2023+).

4) USDA has funded over 2.5 M in new imagery acquisitions 2021-2023 for AK-HI-US Pac Basin

USDA GIS-Imagery Data Availability Links

- **Current Satellite based Web Map Services (Alaska, Hawaii and US Pacific Basin):**

https://nrcsgeoservices.sc.egov.usda.gov/arcgis/rest/services/ortho_imagery

- **Documentation and Videos on loading of the above WMS:**

https://nrcs.app.box.com/v/gateway/folder/154646807634

- **Compressed Mosaics of the Hawaiian Islands and Pacific Basin Datasets are available at the USDA Gateway:**

https://nrcs.app.box.com/v/gateway/folder/22451256226

- **Future NAIP WMS for Hawaii (~June 2023):**

https://gis.apfo.usda.gov/arcgis/rest/services

End of Presentation
Thank You for your time!