

Idaho Technology Authority (ITA)

ENTERPRISE STANDARDS – S4000 – INFORMATION AND DATA

Category: S4255 – Idaho Digital Orthoimagery and Data Exchange Standard for the National Agriculture Imagery Program (NAIP) Layer

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I. DEFINITION

See ITA Guideline G105 (ITA Glossary of Terms) for definitions.

II. RATIONALE

A statewide Imagery Framework is a critical source of information for many private and public sector entities. The statewide National Agricultural Imagery Program (NAIP) aerial imagery layer is an essential source of information within the state's Imagery Framework. The NAIP layer may be used as a reference for agriculture and precision farming; taxing entities; parcel management, surface water resource management; wildlife and habitat management; land, rangeland, and forest resources management; natural resources conservation; infrastructure and construction management; geologic resource assessment and hazard mitigation; flood risk management; water supply; scholarly research and analysis; homeland security; public safety and disaster response; business, community, and economic development needs; wildfire management, planning, and response; urban and regional planning; and recreation and more. As can be seen from the above examples, many private sector and local, state, and federal government agencies have business needs for NAIP Imagery.

III. APPROVED STANDARD(S)

See Attachment

IV. APPROVED PRODUCTS(S)

Any GIS Software, either desktop or online, capable of ingesting and displaying Open Geospatial Consortium (OGC) Web Map Standard (WMS) services.

V. JUSTIFICATION

A statewide Imagery Framework is a critical source of information for many private and public sector entities.

VI. TECHNICAL AND IMPLEMENTATION CONSIDERATIONS

Any GIS Software, either desktop or online, capable of ingesting and displaying Open Geospatial Consortium (OGC) Web Map Standard (WMS) services.

VII. EMERGING TRENDS AND ARCHITECTURAL DIRECTIONS

Data will be shared in accordance with Enterprise Standard 4250 – Enterprise Geographic Information System (GIS) Data Sharing Standards.

VIII. PROCEDURE REFERENCE

The format, content and development of this standard adhere to Policy P5030 for Framework Standards, S4250 for Data Sharing Standards and S4220 for Geospatial Metadata.

IX. REVIEW CYCLE

Review will occur at least annually.

X. CONTACT INFORMATION

For more information, contact the ITA Staff at (208) 605-4064.

REVISION HISTORY

05/19/2022 – Standard Created and presented to the IGC-EC



STATE OF IDAHO

Idaho Digital Orthoimagery and Data Exchange Standard for the National Agriculture Imagery Program (NAIP) Layer

Part of the Imagery Theme

Version 1

Effective April 6, 2022

Developed by the Imagery Technical Working Group

Revision History

Established by Imagery Technical Working Group

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1. Introduction to the Orthoimagery and Data Exchange Standard

A statewide Imagery Framework is a critical source of information for many private and public sector entities. The statewide National Agricultural Imagery Program (NAIP) aerial imagery layer is an essential source of information within the state's Imagery Framework. The NAIP layer may be used as a reference for agriculture and precision farming; taxing entities; parcel management, surface water resource management; wildlife and habitat management; land, rangeland, and forest resources management; natural resources conservation; infrastructure and construction management; geologic resource assessment and hazard mitigation; flood risk management; water supply; scholarly research and analysis; homeland security; public safety and disaster response; business, community, and economic development needs; wildfire management, planning, and response; urban and regional planning; and recreation and more. As can be seen from the above examples, many private sector and local, state, and federal government agencies have business needs for NAIP Imagery.

The NAIP Imagery Standard is intended to facilitate the integration and sharing of current and historical NAIP data as well as to enhance the dissemination and use of other Idaho Framework datasets along with NAIP information through the NAIP Data Exchange. This standard does not instruct on how NAIP imagery is collected or designed for internal use.

This standard was developed by the Imagery Technical Working Group (TWG), a subgroup of the Idaho Geospatial Council – Executive Committee (IGC-EC). This standard will be reviewed on a regular basis and updated as needed.

1.1. Mission and Goals of the Standard

The Orthoimagery and Data Exchange Standard supports a statewide dataset that is consistent with applicable state and national standards, is regularly updated, seamless, appropriately accessible, and mutually beneficial to both data producers and data consumers. It is designed to be broad enough to support a wide range of functions within the public and private sectors but is sufficiently focused to facilitate and enhance specialized workflows for the individualized business needs of various data producers and users thereby helping to ensure the compatibility of datasets within and between other Idaho framework datasets.

The Orthoimagery and Data Exchange Standard establishes the minimum attributes and geospatial database schema for an Imagery Framework dataset and will communicate with and may have similar attributes to other Idaho Framework data standards. It encourages all Idaho-based agencies with geospatial data to contribute to the Idaho Framework. It will also help to ensure that Framework attribution (including geometry) is as current as possible by

relying on source stewards' expertise and their local mandates for data quality (e.g., completeness, positional accuracy, attribute accuracy). Furthermore, this standard will ensure data consumers are able to acquire and seamlessly integrate data from disparate sources.

A goal of the Orthoimagery and Data Exchange Standard is to ensure that any applications requiring base map imagery are assured that the most current NAIP imagery is available for all applications with readily available metadata. The fields in the NAIP Data Exchange will be general enough to incorporate basic information without requiring major changes in internal data models. This standard allows for expansion to a more complex data structure and schema if needed in the future.

1.2. Relationship to Existing Standards

This Orthoimagery and Data Exchange Standard relates to existing standards as described in the following FGDC guidelines for geospatial accuracy reporting:

- Part 0, Base document, FGDC-STD-014.0-2008
- Part 1, Cadastral, FGDC-STD-014.1-2008
- Part 2, Digital Orthoimagery, FGDC-STD-014.2-2015
- Part 3, Elevation, FGDC-STD-014.3-2008
- Part 4, Geodetic Control, FGDC-STD-014.4-2008
- Part 5, Governmental Unit and Other Geographic Area boundaries, FGDC-STD-014.5-2008
- Part 6, Hydrography, FGDC-STD-014.6-2008
- Part 7, Transportation Base, FGDC-STD-014.7-2008

1.3. Description of the Standard

This standard describes the vision and geospatial data structure of the Imagery Framework in the state of Idaho. This standard is designed to be:

- Simple, easy to understand, and logical
- Uniformly applicable, whenever possible
- Flexible and capable of accommodating future expansions
- Dynamic in terms of continuous review

1.4. Applicability and Intended Uses

This standard applies to the NAIP element of the Imagery theme of The Idaho Map (TIM).

When implemented, it will enable access to both current and historical NAIP imagery for Idaho. It increases interoperability between automated geographic information systems and enables the sharing and efficient transfer of information. Further, it will encourage partnerships between government, the private sector, and the public in order to avoid duplication of effort and ensure effective management of information resources. It will help improve the data quality of NAIP imagery as errors are identified, resolved, and reported to the source stewards.

This standard does not consider data sharing agreements, contracts, transactions, privacy concerns, or any other issues relating to the acquisition and dissemination of NAIP data.

1.5. Standard Development Process

The Imagery Technical Working Group is a voluntary group of private, city, county, tribal, state, and federal representatives. In March 2022 the Imagery TWG Lead began developing the Orthoimagery and Data Exchange Standard for the NAIP Layer using automation tools provided and developed by the IGC-EC to generate a first draft of the Standard. It is written in the format required by the Idaho Technology Authority (ITA) Framework Standards Development Policy (P5030).

The Draft Standard was made available for review to those in the GIS Community who are members of the Geotech Listserv prior to an April 6, 2022 Imagery TWG meeting. Comments, feedback, and discussion of the Draft Standard were recorded at the April 6, 2022 Imagery TWG meeting. Shortly thereafter, the Draft Standard was edited and further reviewed by members of the Imagery Technical Working Group. After incorporating any needed changes, another comment period will be provided.

If there are no objections to the Draft Standard following the review period after the April 6, 2022 Imagery TWG meeting, this draft standard document will be shared with the IGC-EC and IGC in accordance with the review and approval process described in ITA's Framework Standards Development Policy (P5030).

1.6. Maintenance of the Standard

This standard will be revised as needed and in accordance with the ITA Framework Standards Development Policy (P5030).

2. Body of the Standard

2.1. Scope and Content

The scope of the Orthoimagery and Data Exchange Standard is to describe a statewide layer which identifies the physical locations and attributes of NAIP imagery for Idaho.

2.2. Need

NAIP imagery is a key dataset that has been found to be enormously beneficial for many private and public sector entities creating, developing, and serving Imagery Framework data. The statewide NAIP Imagery and NAIP Data Exchange Framework is a critical source of information for agriculture and precision farming; taxing entities; parcel river and stream resource management; wildlife and habitat management; land, rangeland, and forest resources management; natural resources conservation; infrastructure and construction management; geologic resource assessment and hazard mitigation; flood risk management; water supply; scholarly research and analysis; homeland security; public safety and disaster response; business, community, and economic development needs; wildfire management, planning, and response; urban and regional planning; and recreation and more.

This standard provides the foundation to aggregate NAIP data for centralized access and stewardship information.

2.3. Participation in the Standard Development

The development of the Orthoimagery and Data Exchange Standard adheres to the ITA Framework Standards Development Policy (P5030). The NAIP Standard Team tasked with developing this standard represents private, county, state, and federal organizations. As the standard is reviewed in accordance with Policy P5030 requirements, there will be opportunity for broad participation and input by stakeholders in the development of this standard. The process will be equally broad for input on updates and enhancements to the standard. As with all Idaho Framework standards, public review and comments on the Orthoimagery and Data Exchange Standard is encouraged.

2.4. Integration with Other Idaho Framework Standards

The Orthoimagery and Data Exchange Standard follows the same format as other Idaho geospatial framework data standards. The NAIP standard may contain some of the same attributes as other framework standards and may adopt the field name, definition, and domain from the other standards to promote consistency.

2.5. Technical and Operational Context

2.5.1. Data Environment

The data environment is a digital raster with a specific, standardized set of attributes pertinent to the NAIP Framework. NAIP data shared under this standard must be in a format supporting raster.

2.5.2. Spatial Reference Systems

The NAIP imagery is published as an image service in IDTM83. The source data retains its original spatial reference system - UTM Zones 11 and 12 north using the North American Datum of 1983.

2.5.3. Global Navigation Satellite Systems (GNSS)

Some data provided might contain geometry from GNSS (e.g., GPS) methods, and the provided metadata should describe this, if applicable. However, geometry from a GNSS is not required to meet this standard.

2.5.4. Interdependence of Themes

This standard is intended to support a seamless dataset across Idaho. Similar datasets from adjacent states and adjacent mapping areas using the same reference system should merge without gaps. The geometry behind the NAIP Imagery and the Digital Orthoimagery and Data Exchange may be coincident with other Idaho geospatial framework data standards in addition to other FGDC standard datasets such as cadastral data, elevation data, geodetic control data, governmental unit boundary data, hydrographic feature data, and transportation network data. At this time there is no enforcement of coincidence or topology relationships between the NAIP Framework and other Idaho Framework elements.

2.5.5. Encoding

When data is imported into and exported from the Imagery Framework, encoding will take place to convert data formats and attributes.

2.5.6. Resolution

No specific requirements for resolution are specified in this standard. Resolution will be documented in the metadata.

2.5.7. Accuracy

Currently, NAIP imagery is acquired at 60-centimeter ground sample distance (GSD). Earlier years of Idaho NAIP collection were acquired at one meter GSD with two exceptions: 2006 was acquired at 2-meter GSD for agriculture lands only and 2013 was acquired at 50-centimeter GSD as part of a pilot project by the USDA.

All imagery is inspected for horizontal accuracy and tonal quality by the source stewards. NAIP horizontal accuracy specifications have evolved over the life of the NAIP program. From 2003 to 2004 the specifications were as follows: 1-meter GSD imagery was to match within 3-meters, and 2-meter GSD to match within 10 meters of reference imagery. For 2005 the 1-meter GSD specification was changed to 5 meters matching the reference imagery. In 2006 a pilot project was performed using true ground specifications rather than reference imagery. All states used the same specifications as 2005 except Utah, which required a match of +/- 6 meters to true ground. In 2007 all specifications were the same as 2006 except Arizona used true ground specifications and all other states used reference imagery. In 2008 and subsequent years no 2-meter GSD imagery was acquired, and all specifications were the same as 2007 except approximately half of the states acquired used true ground specifications and the other half used reference imagery. The 2008 states that used absolute ground control where; Indiana, Minnesota, New Hampshire, North Carolina, Texas, Vermont, and Virginia. From 2009 to present all NAIP imagery acquisitions used the +/- 6 meters to ground specification.

The default spectral resolution is natural color (Red, Green, and Blue, or RGB) but beginning in 2009, Idaho NAIP imagery has been delivered with four bands of data: RGB and Near Infrared (NIR). Contractually, NAIP vendors make every attempt to comply with the specification of no more than 10% cloud cover per quarter quad tile, weather conditions permitting.

2.5.8. Edge Matching

This standard is intended to support a seamless dataset across Idaho. Similar datasets from adjacent states and adjacent mapping areas using the same reference system should merge without gaps.

2.5.9. Unique Identifier

The tiling format and naming convention of the NAIP imagery follows USGS specifications: 3.75' x 3.75' quarter quadrangle with a 300-pixel buffer on all four sides. For example, Name: m_4111101_ne_12_1_yyyymmdd where:

- m_ = the type of imagery acquired by the sensor. For example, m = 4 band Color Near Infrared (CNIR - Infrared, Red, Green, Blue)
- 2-digits = latitude of SE corner of 1* block
- 3-digits = longitude of SE corner of 1* block
- 2-digits_ = identifies the 7.5* quadrangle within the 1* block (values = 1-64)
- 2-letter designation_ = quarter quad
- 2-digits = UTM Zone
- 1 -digit = version
- yyymmdd = year/month/day of data acquisition

2.5.10. Attributes

Attributes for public and intergovernmental distribution are described in Section 3 of this standard.

2.5.11. Stewardship

Perpetual maintenance and other aspects of lifecycle management are essential to the Imagery Framework. Details of stewards, their roles and responsibilities, and processes will be set forth in a Framework Stewardship Plan and related documents.

2.5.12. Records Management and Archiving

NAIP imagery is served as an Esri Image Service as well as an Open Geospatial Consortium (OGC) Web Map Standard (WMS) service through two end points: INSIDE Idaho, Idaho's Geospatial Data Clearinghouse managed by the University of Idaho Library and Idaho State University's GIS Training and Research Center (GIS TReC). INSIDE provides access and download capability to all years of Idaho NAIP. ISU's GIS TReC provides the most recent year of Idaho NAIP only.

2.5.13. Metadata

The NAIP Framework metadata will describe the methods used to update and aggregate the individual NAIP data contributions, processes or crosswalks performed, definition of attributes, and other required information. This metadata will conform to the metadata

standards as set out in S4220 – GEOSPATIAL METADATA. Geospatial standards-based metadata accompanies each individual image.

3. Data Characteristics

3.1. Minimum Graphic Data Elements

The geometry of the features in the NAIP Framework is raster.

3.2. Optional Graphic Data Elements

Not applicable.

3.3. Standard Attribute Schema

3.3.1. Standard Attribute Schema for the NAIP Data Standard

32-bit pixels, 4 band color(RGBIR) values 0 – 255

3.3.2. Standard Attribute Schema for the NAIP Data Exchange from Idaho State University’s GIS Trec

Field Name	Data Type	Length	Description	Examples
OBJECTID	ObjectID		OBJECTID	
Shape	Geometry		Shape	Polygon
RASTER	Raster		RASTER	
Name	Text	200	Name of GeoTiff	m_4311339_sw_12_1_20170623
MinPS	Double		Minimum Pixel Size (based on overview)	0
MaxPS	Double		Maximum Pixel Size (based on overview)	24
LowPS	Double		Source Pixel Size of the Raster	0.6
HighPS	Double		Maximum Pixel Size of the Pyramid that is used	2.4

Category	Long	Coded Values		Unknown, Primary, Overview, +6 more...
Tag	Text	100		Dataset
GroupName	Text	100		N/A
ProductName	Text	100		N/A
CenterX	Double			2618802.575126
CenterY	Double			1364142.719898
ZOrder	Long			N/A
Thumbnail	Blob			Blob

3.3.3. Standard Attribute Schema for the NAIP Data Exchange from INSIDE Idaho's Geospatial Data Clearinghouse

Field Name	Data Type	Length	Description	Examples
OBJECTID	ObjectID		OBJECTID	
Shape	Geometry		Shape	Polygon
RASTER	Raster		RASTER	
Name	Text	200	Name of GeoTiff	m_4311339_sw_12_1_20170623
Category	Integer	Coded Values	Category	Unknown, Primary, Overview, +6 more...
AcqYearFirst	Small Integer	Coded Values	Acquisition Year First	2017
AcqYearLast	Small Integer	Coded Values	Acquisition Year Last	2017
Resolution	Float		Resolution (cm)	100
Product Definition	Small Integer	Coded Values	Band Combination	Unknown, Natural Color, Natural Color + Infrared, +2 more...
Collection Name	Small Integer	Coded Values	Label that Defines the Collection	Idaho 2017

Rectification	Small Integer	Coded Values	Type of Rectification	Orthorectified
Constraints	Small Integer	Coded Values	Constraints	Public
Source	Small Integer	Coded Values	Imagery Source	USDA-FSA-APFO
AcqDateFirst	Date	8	Acquisition Date First	6/23/2017
AcqDateLast	Date	8	Acquisition Date Last	6/23/2017
DownloadURL	String	256	Download URL	https://www.northwestknowledge.net/data/download.php?uuid=c8aacf49-e484-4068-98c6-9c267bf36fe8/d2393084-b1c3-4072-80e1-18992b10d0f

3.4. Data Quality

Data quality considerations for NAIP imagery include:

- a) All NAIP Geotiffs shall have unique identifiers.
- b) The NAIP acquisition cycle is based on a minimum 3-year refresh of base ortho imagery.
- c) The tiling format of the NAIP imagery is based on a 3.75' x 3.75' quarter quadrangle with a 300-pixel buffer on all four sides.
- d) NAIP quarter quads are formatted to the UTM coordinate system using the North American Datum of 1983.
- e) NAIP imagery may contain as much as 10% cloud cover per tile.

Appendix A: References

Idaho Technology Authority (ITA). *Information and Data Policy P5000, Category: P5030 Framework Standards Development Policy*. <https://ita.idaho.gov/psg/p5030.pdf>

Idaho Technology Authority (ITA). *Enterprise Standards S4000 Geographic Information Systems (GIS) Data, Category: S4220 Geospatial Metadata*. <https://ita.idaho.gov/psg/s4220.pdf>

Geographic information Framework Data Standard Part 0, [Base document, FGDC-STD-014.0-2008](#)

Geographic information Framework Data Standard Part 1, [Cadastral, FGDC-STD-014.1-2008](#)

Geographic information Framework Data Standard Part 2, [Digital Orthoimagery, FGDC-STD-014.2-2015](#)

Geographic information Framework Data Standard Part 3, [Elevation, FGDC-STD-014.3-2008](#)
Geographic information Framework Data Standard Part 4, [Geodetic Control, FGDC-STD-014.4-2008](#)

Geographic information Framework Data Standard Part 5, [Governmental Unit and Other Geographic Area boundaries, FGDC-STD-014.5-2008](#)

Geographic information Framework Data Standard Part 6, [Hydrography, FGDC-STD-014.6-2008](#)

Geographic information Framework Data Standard Part 7: [Transportation Base FGDC-STD-014.7-2008](#)

National Agriculture Imagery Program (NAIP) Data Dictionary ([link](#))

Mosaic Dataset Attribute Table ([link](#))

ITA Enterprise Standards: [S4210](#) – Single Zone Coordinate System for GIS Data

Appendix B: Glossary

See ITA Guideline [G105](#) (ITA Glossary of Terms) for definitions.