

Identification_Information:

Citation:

Citation_Information:

Originator: USDA-FSA Aerial Photography Field Office

Title: Indiana NAIP 2012 Imagery

Publication_Date: 20120801

Publication_Information:

Publication_Place: Salt Lake City, Utah

Publisher: USDA FSA Aerial Photography Field Office

Description:

Abstract:

This data set contains imagery from the National Agriculture Imagery Program (NAIP). The NAIP acquires 4-band digital ortho imagery from airborne and/or space based platforms during the agricultural growing seasons in the U.S.. A primary goal of the NAIP program is to enable availability of ortho imagery within sixty days of acquisition. The NAIP provides 1 meter GSD ortho imagery rectified within +/- 6 meters to true ground at a 95% confidence level. The tiling format of NAIP imagery is based on a 3.75' x 3.75' quarter quadrangle with a 300 (plus or minus 30) pixel buffer on all four sides. The NAIP imagery is formatted to the UTM coordinate system using the North American Datum of 1983 (NAD83). The NAIP imagery may contain as much as 10% cloud cover per tile. This file was generated by compressing NAIP imagery that cover the county extent. Two types of compression may be used for NAIP imagery: MrSID and JPEG 2000. Target value for the compression ratio for 1 meter GSD is (15:1).

Purpose:

The NAIP imagery is available for distribution within 60 days of the end of a flying season and is intended to provide current information of agricultural conditions in support of USDA farm programs. For USDA Farm Service Agency, the 1 meter GSD product provides an ortho image base for Common Land Unit boundaries and other data sets. The NAIP imagery is generally acquired in projects covering full states in cooperation with state government and other federal agencies who use the imagery for a variety of purposes including land use planning and natural resource assessment. The NAIP is also often used for disaster response.

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Calendar_Date: 20120606-20120619

Currentness_Reference: Photography Source Image Dates.

Status:

Progress: Complete

Maintenance_and_Update_Frequency: Irregular

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -88.197152

East_Bounding_Coordinate: -84.642394
North_Bounding_Coordinate: 41.837245
South_Bounding_Coordinate: 37.726351

Keywords:

Theme:

Theme_Keyword_Thesaurus: None
Theme_Keyword: farming
Theme_Keyword: Digital Ortho rectified Image
Theme_Keyword: Mosaic
Theme_Keyword: Quarter Quadrangle Centered
Theme_Keyword: Ortho Rectification
Theme_Keyword: Compression
Theme_Keyword: MrSID
Theme_Keyword: JPEG 2000
Theme_Keyword: NAIP
Theme_Keyword: Compliance
Theme_Keyword: Aerial Compliance

Place:

Place_Keyword_Thesaurus: Geographic Names Information System
Place_Keyword: Indiana
Place_Keyword: IN
Place_Keyword: Adams County
Place_Keyword: Allen County
Place_Keyword: Bartholomew County
Place_Keyword: Benton County
Place_Keyword: Blackford County
Place_Keyword: Boone County
Place_Keyword: Brown County
Place_Keyword: Carroll County
Place_Keyword: Cass County
Place_Keyword: Clark County
Place_Keyword: Clay County
Place_Keyword: Clinton County
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Place_Keyword: Washington County
Place_Keyword: Wayne County
Place_Keyword: Wells County
Place_Keyword: White County
Place_Keyword: Whitley County
Access_Constraints: None
Use_Constraints:
None. The USDA-FSA Aerial Photography Field Office asks to
be credited in derived products.
Point_of_Contact:
Contact_Information:
Contact_Organization_Primary:
Contact_Organization: USDA-FSA Aerial Photography Field Office
Contact_Address:
Address_Type: mailing and physical address
Address: 2222 West 2300 South
City: Salt Lake City
State_or_Province: Utah
Postal_Code: 84119-2020
Country: USA
Contact_Voice_Telephone: 801-844-2922
Contact_Facsimile_Telephone: 801-956-3653
Browse_Graphic:
Browse_Graphic_File_Name: None
Browse_Graphic_File_Description: None
Browse_Graphic_File_Type: None
Native_Data_Set_Environment: Microsoft Windows NT 6.1.7601 Service Pack
1F
Data_Quality_Information:
Logical_Consistency_Report:
NAIP 3.75 minute tile file names are based
on the USGS quadrangle naming convention.
Completeness_Report: None
Positional_Accuracy:
Horizontal_Positional_Accuracy:
Horizontal_Positional_Accuracy_Report: Compiled to meet 6 meters
horizontal accuracy at 95 percent confidence level.
Vertical_Positional_Accuracy:
Vertical_Positional_Accuracy_Report: N/A 2d only
Lineage:
Source_Information:
Source_Citation:
Citation_Information:
Originator: USDA-FSA Aerial Photography Field Office
Title: Adams CO, IN
Publication_Date: 20120801
Source_Scale_Denominator: 12000
Type_of_Source_Media: External media types
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 20120801
Source_Currentness_Reference: Majority Aerial Photography Date
Source_Citation_Abbreviation: NAIP

Source_Contribution: Mosaicked County Image

Process_Step:

Process_Description: Flight planning was performed in IGIPlan from IGI over a buffered boundary covering DOQQ extents provided by the USDA. A 500m reduced resolution NED DEM file was used to determine ground heights. A targeted flight altitude of approximately 30,000 feet above ground level was used. A minimum forward overlap of 60% and minimum side overlap of 30% were used. No ground elevation in the project area resulted in source pixel dimensions greater than 1.05m or less than 0.5m. Cessna Conquest aircraft were used for acquisition. Multiple Intergraph Digital Mapping Camera (DMC) systems were utilized in the data capture. The DMC is a digital frame camera that produces a central perspective image with a nominal focal length of 120mm projecting an image on a virtual CCD measuring 13,824 by 7,680 pixels. The pixels are 12um by 12 um. Images from four panchromatic cameras modules, each with a 120mm lens projecting an image on a 7,168 by 4,096 CCD, are assembled to create the virtual frame. Images captured simultaneously from four 3,072 by 2,048 pixel multispectral (MS) cameras with 30mm lenses produce red, green, blue and near infrared images. These MS images are matched to the Pan virtual image using the Post Processing Software from Intergraph. All DMC systems used for capture have been calibrated by the manufacturer. The calibration includes measuring the radiometric and geometric properties of each camera. These data are used in the Post Processing Software to eliminate the radiometric and geometric distortion. The raw captured pixel resolution of the panchromatic virtual frame ranges from 0.60m to 1.04m across the project area depending on terrain height. Each pixel is assigned a 12 bit digital number (DN) by the analog to digital conversion performed after each exposure. Each pixel is resampled during orthorectification to an output resolution of 1m at a bit depth of 8 for each image band. Four bands of data were captured for each image; Blue: 400-580 nm, Green: 500-650 nm, Red: 590-675 nm and near infrared: 675-850 nm. The final product may only include the RGB data. All aerial imagery was collected with associated GPS data. When possible most imagery will also include IMU data collection. GPS/IMU data were captured with either an Applanix POS 510 system or IGI AEROControl. The GPS data was utilized to control the aerial triangulation process. All imagery was processed through an aerial triangulation in which the airborne GPS data was constrained to expected limits. Analysis was performed to assure that all image frames fit within a strip and between strips by evaluating the image and airborne GPS residuals. The final adjustments assure a high quality relative adjustment and a high quality absolute adjustment limited to the airborne GPS data accuracy. This process assures the final absolute accuracy of all geopositioned imagery. Both signalized and photo identified ground control were used to QC and control the IMU/GPS based aerial triangulation bundle block solution. For each project area the latest NED was downloaded from the USGS National Map Seamless Server website in late spring 2012. Thirty Meter NED was used in all cases, and preferred over the available ten meter spacing to minimize image smearing and distortions that are exacerbated by a finer, but not more accurate DEM. A visual inspection of the NED using color cycled classification by elevation and a shaded relief was performed to check for gaps, corruption and gross errors. When available the NED was compared to known higher quality elevation sources to detect flaws. Between 20-60 construction

points per frame derived from conjugant image measurements performed during aerial triangulation were projected to the NED. The predicted horizontal error for each point was added as an attribute in the SURDEX enterprise database. An operator reviews ortho seams in areas these predicted errors indicate horizontal error in excess of the contract specifications. Any imagery errors introduced by source NED required patching from an alternate DEM or frame of photography with a different perspective. Hardware used included the DMC, various brands of survey grade GPS receivers, various brands and models of computers, RAID5/6 storage, calibrated monitors, and various brands of monitor calibration colorimeters. Software included Intergraph Post Processing Software (PPS) to handle camera raw images processed to virtual frame panchromatic images and four band multispectral images. SURDEX software was used to color correct and remove bidirectional reflectance, vignetting and other illumination trends. USDA APFO Image Metrics are measured and images corrected to conform to the Image Metrics using SURDEX software. SURDEX software was then used to fuse the high resolution pan with the lower resolution multispectral image. This image was upsampled to match the pan resolution using bilinear interpolation and converted to a high resolution image via the Brovey Transform. GPS/IMU data was reduced to projected coordinates in the appropriate UTM zone using the Applanix or IGI office software. Aerial Triangulation was performed using Intergraph ImageStation Automatic Triangulation (ISAT), ImageStation Digital Mensuration (ISDM) and Photo-T bundle adjustment. SURDEX software was used to determine the weak points in the AT construction point distribution. SURDEX software was used to orthorectify the images. SURDEX software was used to compare overlapping orthoimages and correct for minor radiometric variation between adjacent images. SURDEX software was used to calculate the optimal seam path, check seam topology and create master tiles. SURDEX ortho software generates occlusion/smear polygons used during seam review to cut in the best view of steep terrain. SURDEX software was used to visually inspect master tiles for seam and image defects. SURDEX software was used to project and cut final DOQQ image files from masters. SURDEX software was used to create CCM metadata. Lizardtech GeoExpress version 8.0.0.3065 was used to create the CCM image file. SURDEX software was used to measure horizontal error in the CCM. SURDEX software was used to perform final formatting, QC and naming of the DOQQ. USGS metadata parser software was used to validate the metadata. Various versions of Microsoft Windows were used in all phases of production. For Radiometry, SURDEX Grouping Tool was used to display large groups of images, display individual and group histograms, and develop color correction parameters to adjust image DN. Grouping Tool provides real-time updates of the USDA APFO Image Metrics. The image technician adjusts image correction parameters to bring the radiometric characteristics of large groups of raw images within the Image Metrics ranges. Grouping Tool was used again after DOQQ and CCM production to provide a quality assurance check. Individual DOQQ and CCM may not meet the USDA APFO Image Metrics ranges due to land cover. The goal is to have the state as a whole meet the Image Metrics. To validate the accuracy of the block adjustment derived from GPS/IMU, camera parameters and conjugate point measurements, approximately 30-40 photo identifiable ground control points were field surveyed within each State. These points were surveyed using GPS techniques to produce coordinates that are accurate to +/- 0.25 meters RMSE in XYZ. The GPS

surveying techniques utilized assured that the coordinates are derived in the required project datum and relative to an approved National Reference System. Each derived control point was surveyed in a static fashion with a minimum of three NGS CORS sites. A constrained least square adjustment was performed holding the CORS sites as control and deriving the final coordinates of the photo identifiable points. The photo identifiable control points were measured on multiple photographs but not constrained in the final AT solution in order for them to be used in an independent final QC of positional accuracy. After the checkpoint run, the residual errors were reviewed to determine the quality of the solution with only GPS and IMU based initial exterior orientation. If the block does not fit the control points within specifications the pass and tie points were reviewed for blunders and weak areas. If, after these corrections were made, the block still does not fit the control well the GPS and IMU processing were reviewed. Once the block has proper statistics and fits the control to specifications, the final bundle adjustment was made. SURDEX software was used to predict the horizontal error that results from DEM error using AT construction points projected to the NED ground elevation. As AT points are frequently on man-made and other vertical features are not included in the DEM, these ortho points can only be used to indicate regions of error by the clusters of points that predict excessive horizontal displacement. SURDEX software was used to measure a minimum of 20 points on the new 2012 CCM and an alternate product obtained from the USDA Data Gateway to determine if there were regions of the CCM which required review to ensure absolute accuracy specifications were met. If these areas were found, the source of the error was corrected and the DOQQ and CCM were recreated. All products are reviewed by independent personnel prior to delivery. The delivery is checked for omissions, commissions, naming, formatting, specification compliance and data integrity.

Process_Date: 20120801
Spatial_Data_Organization_Information:
 Indirect_Spatial_Reference: Indiana
 Direct_Spatial_Reference_Method: Raster
 Raster_Object_Information:
 Raster_Object_Type: Pixel
Spatial_Reference_Information:
 Horizontal_Coordinate_System_Definition:
 Planar:
 Grid_Coordinate_System:
 Grid_Coordinate_System_Name: Universal Transverse Mercator
 Universal_Transverse_Mercator:
 UTM_Zone_Number: 16
 Transverse_Mercator:
 Scale_Factor_at_Central_Meridian: 0.9996
 Longitude_of_Central_Meridian: -87.0
 Latitude_of_Projection_Origin: 0.0
 False_Easting: 500000
 False_Northing: 0.0
 Planar_Coordinate_Information:
 Planar_Coordinate_Encoding_Method: row and column
 Coordinate_Representation:
 Abscissa_Resolution: 1.0
 Ordinate_Resolution: 1.0

Planar_Distance_Units: meters
Geodetic_Model:
Horizontal_Datum_Name: North American Datum of 1983
Ellipsoid_Name: Geodetic Reference System 80
Semi-major_Axis: 6378137
Denominator_of_Flattening_Ratio: 298.257
Entity_and_Attribute_Information:
Overview_Description:
Entity_and_Attribute_Overview: 24-bit pixels, 3 band color(RGB)
values 0 - 255
Entity_and_Attribute_Detail_Citation: None
Distribution_Information:
Distributor:
Contact_Information:
Contact_Person_Primary:
Contact_Person: Supervisor Customer Service Section
Contact_Organization: USDA-FSA Aerial Photography Field Office
Contact_Address:
Address_Type: mailing and physical address
Address: 2222 West 2300 South
City: Salt Lake City
State_or_Province: Utah
Postal_Code: 84119-2020
Country: USA
Contact_Voice_Telephone: 801-844-2922
Contact_Facsimile_Telephone: 801-956-3653
Distribution_Liability:
In no event shall the creators, custodians, or distributors
of this information be liable for any damages arising out
of its use (or the inability to use it).
Standard_Order_Process:
Digital_Form:
Digital_Transfer_Information:
Format_Name: Compressed County Mosaic
Format_Information_Content: Natural Color
Digital_Transfer_Option:
Online_Option:
Computer_Contact_Information:
Network_Address:
Network_Resource_Name: None
Offline_Option:
Offline_Media: CD-ROM
Recording_Format: ISO 9660
Offline_Option:
Offline_Media: DVD-R
Recording_Format: ISO 9660
Offline_Option:
Offline_Media: USB/Firewire/SATA External Hard Drive
Recording_Format: NTFS
Fees:
Contact the USDA-FSA Aerial Photography Field Office
for more information.
Resource_Description: None
Metadata_Reference_Information:

Metadata_Date: 20120801

Metadata_Contact:

Contact_Information:

Contact_Organization_Primary:

Contact_Organization: USDA-FSA Aerial Photography Field Office

Contact_Address:

Address_Type: mailing and physical address

Address: 2222 West 2300 South

City: Salt Lake City

State_or_Province: Utah

Postal_Code: 84119-2020

Country: USA

Contact_Voice_Telephone: 801-844-2922

Metadata_Standard_Name: Content Standard for Digital Geospatial

Metadata

Metadata_Standard_Version: FGDC-STD-001-1998