

Imagery Guidance for NPS Vegetation Inventories

Revised 17 Aug 2009

The National Park Service (NPS) vegetation inventories apply to 270 parks in the Inventory and Monitoring (I&M) program. This guidance applies to those 250 units outside of Alaska.

Executive Summary

Imagery forms the basis of a vegetation inventory, and the timing and the life cycle of the plants influence the vegetation map for the park(s). Available imagery provides the initial stratification, work planning estimates and sampling planning. Imagery is a resource. It has traits, quality factors, and a usable shelf life depending on the use of the data. To best utilize an imagery source, consideration must be given to a minimum of three factors: scale, resolution, and timing. Additional collection may be warranted, requiring an aerial imagery contract, depending on the date and quality of the existing imagery. Imagery support is available to assist and answer technical questions. The I&M program includes Mike Story as the remote sensing coordinator, Karl Brown as the Vegetation Inventory Program Manager, and David Duran as the NPS Agency remote sensing coordinator. Many experienced remote sensing users are located throughout the NPS.

To determine needs, look at imagery archives, and to learn more about the imaging systems and sources, the NPS maintains several web pages that include a glossary and explanation of concepts. The contacts on the remote sensing website links to many of in-house experts. A “What’s New” section is also maintained for emerging concepts and products.

See: http://www.nps.gov/gis/remote_sensing/

The step by step guidance (12-step) described for the Vegetation Inventories should be referenced for context and the five goals of scoping, taxonomic development, digital mapping, accuracy assessment, and complete product DVD.

See: <http://science.nature.nps.gov/im/inventory/veg/Guidance.cfm>

Step 6 in the 12 Step Guidance document is to “**acquire and prepare imagery.**” The details of this step and helpful links are described in this document.



Acquire and prepare imagery: Step 6 in a Vegetation Inventory

- Imagery may or may not be collected and ready for use, and many other competing or complimentary interests may want imagery. The network and park have a say in the imagery used; however, the use of current existing resources may be the best choice. This team choice is based on merits, cost, availability and suitability.
- Existing imagery may be found at: NPS DataStore, NPS Base Cartography, NAIP, USGS EROS Data Center. This is a few of the more common places where available imagery may be located.
- Decide on type, scale, and timing to obtain the appropriate imagery.
 - a) The type is usually color infrared or CIR.
 - b) The “best practices” include 1:10 or 1:12K scale imagery as the ‘sweet spot’ for vegetation inventories.
 - c) Timing of imagery: Consider desired and optimal plant phenology / seasonal leaf out / color change. The project typically gets one set of imagery; however, free access to NAIP and other datasets provide excellent ancillary data to aid in imagery interpretation. The timing of the imagery controls the final map, so pick the best representation of the resources of interest. This is particularly challenging in grassland ecosystems, as both warm and cool season grasses may be present. Maximum fall color may be best for mixed deciduous forests of the east.
- Depending on contrast, the National Agricultural Imagery Program (NAIP) imagery may be very cost effective. NAIP has been flown every 3-5 years on a state coverage basis. Annual or every other year cycles are becoming more common for NAIP (Figure 1). The NAIP is more frequently including the needed CIR band for vegetation inventory; however, in some cases the project may need to ‘buy up’ to this option. Please contact the program manager for further details.
- Considering the information on imagery sources found, if suitable imagery is not available, initiate imagery acquisition. This may be initiated before classification is complete, but mapping should not proceed until ecological classification is completed. To discuss, contact the Vegetation Inventory Program Manager.
- Imagery contracts should include (in addition to the common set of aerial diapositives in stereo and orthophotos) the delivery of the original roll film and the calibration report to the NPS Vegetation Inventory Program as a final product. The roll film and calibration report will be transferred to the USGS EROS Data Center for the creation of an imagery archive for the vegetation inventory project at the park(s). The roll film can be returned to the park or the imagery vendor within 3 weeks of delivery.
- The vendor must include a Flight Diagram which illustrates the project area outline, flight lines, image identification, and approximate location of image centers. The format should be ArcGIS shapefile.



Contract Specification to Consider:

- a) Specifically define the project area
- b) Data acquisition – defined as high resolution ortho-imagery
- c) Resolution and accuracy – 4-band CIR with sufficient ground resolution to support production of digital orthorectified images to a ground pixel of 0.3 meters (nominal 1 foot)
- d) Define the acquisition window. Example “during peak color and prior to leaf off”. Peak color may be defined by the NPS within 7 days of “peak”.
- e) Time of day: sun angle should be greater than 30 degrees
- f) Acquisition conditions: Should be free of clouds and cloud shadows, smoke, haze, light streaks, snow, flooding or excessive moisture.
- g) Aerial cameras should include a calibration report.
- h) Digital Orthophotos should be created consistent with the resolution and accuracy and should be referenced to North American Datum 1983, UTM, Zone.
- i) Image tile size should be 1500 x 1500 meters with no overlap.
- j) Elevation data used in the creation of the orthophotos shall be delivered.
- k) Flight Diagram – needs to be delivered. This will illustrate the project area, flight lines, image identification and approximate location of the image centers. Format should be shapefile.
- l) Metadata – FGDC compliant.

Digital Sensors: The loss of frame cameras and roll film will lead us to all digital sensors. We have begun to see this transition with vendors. Use of digital sensors is acceptable but the contract should include important specifications.

- Specifications should include 4-band CIR imagery with sufficient resolution to support the production of digital orthorectified images to a ground pixel resolution of 0.3 meters.
- For digital sensors, the vendor must supply a current Product Characterization Report.
- Digital Orthorectified Image format should be uncompressed, untitled, ArcGIS readable, GeoTIFF format with no internal tiling or overviews. Data shall not be compressed.
- Many of the above contract specification still apply to digital sensors.



Figure 1. NAIP Interactive screen shot. The NAIP Interactive display allows the user to rapidly query the year, type, film, etc by hovering over a state of interest. The legend indicates a 4 for 4-band collection to include the Infrared band.

URL: http://www.fsa.usda.gov/Internet/FSA_File/naip_coverage03-09.pdf

