

ORTHOPHOTO PROGRAM FREQUENTLY ASKED QUESTIONS

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Document Purpose

The Florida Department of Revenue (DOR) regularly receives questions regarding its orthophoto program. This document answers frequently asked questions and, as much as possible, is non-technical in nature. To obtain detailed technical information on DOR's orthophoto program, contact

Charles Russell, Mapping and GIS Program
Property Tax Oversight
2450 Shumard Oak Blvd.
Tallahassee, FL 32399-0126
850-617-8867
Russellc@DOR.state.fl.us

➤ What is an orthophoto?

An orthophotograph, commonly referred to as an orthophoto, consists of "A photographic copy, prepared from a perspective photograph, in which the displacements of images due to tilt and relief have been removed." (Source: American Congress on Surveying and Mapping and the American Society of Civil Engineers. Definitions of Surveying and Associated Terms. Library of Congress Catalogue Card Number 72-76807. Washington 1972, 1978.)

Photogrammetrists typically create modern orthophotos using digital aerial cameras resulting in a fully digital product. Orthophotos are then tiled together to form an orthophotomosaic, which is a seamless assembly of orthophotographs forming a uniform-scale photographic map, directly compatible with Geographic Information Systems (GIS) software. Because the orthophotomosaic has uniform scale, users can perform accurate measurements of the ground features. These orthophotomosaics often serve as basemaps for creating other GIS layers. Examples include property ownership, census tracts, state lands, land use, wetlands, land cover, transportation networks, and hydrography (lakes and streams).

➤ What are DOR's orthophoto specifications?

DOR has a well-defined orthophoto specification that has become the *de facto* standard in Florida. The basic specifications include:

1. Has 1-foot resolution (upgradeable to 6 inches where appropriate).
2. Cannot exceed a horizontal accuracy of about 5 feet for 1-foot orthophotos and 3 ½ feet for 6-inch orthophotos. Statistical tests have shown that accuracies typically exceed the minimum requirements.
3. Collects color infrared and natural color imagery.
4. Uses the industry standard GeoTIFF format that is compatible with most GIS software packages.
5. Incorporates an image tiling scheme that simplifies creating contiguous mosaics of large areas. The tiling scheme is also compatible with the Florida statewide LiDAR tiling scheme, which simplifies integrating topographic LiDAR data with orthophotos.
6. Has well-defined survey requirements that ensure that the data meet positional accuracy requirements.
7. Has well-defined metadata templates that ensure that users of the orthophotos have a clear understanding of when the imagery was flown and how accurate it is.

8. Yearly collects approximately 1/3 of the state, producing a county orthophoto update every three years.

➤ **How does DOR procure orthophotos?**

In Florida, orthophotos are a type of survey as defined in Chapter 472, F.S., Professional Surveying and Mapping. Therefore, the procurement of professional services to create orthophotos must be in compliance with Chapter 287.055, F.S., Consultants Competitive Negotiation Act. Approximately every five years DOR issues a request for proposals and selects qualified consultants to provide a variety of mapping services that includes orthophoto creation. Pending approval of funding in the legislature’s budget, DOR issues work orders each year to the qualified vendors to create orthophotos. Currently DOR has 14 vendors on contract.

➤ **How does DOR coordinate its orthophoto projects with other agencies?**

DOR works to minimize duplicative orthophoto efforts as follows:

- *State/Federal Coordination.* Since 1988 DOR has participated in quarterly GIS meetings that include representatives from the following agencies:
 - a. All five water management districts (WMD)
 - b. U.S. Geological Survey (Homeland Security)
 - c. Army Corps of Engineers – Jacksonville
 - d. Florida Department of Environmental Protection (DEP)
 - e. Florida Department of Transportation (DOT)
 - f. Florida Fish and Wildlife Conservation Commission (FWCC)

These are the primary state and federal agencies involved in orthophoto production, and each year they hold meetings specifically for coordination purposes.

- *Local Government Coordination.* Every year DOR contacts each county in the schedule to inform them of our orthophoto plans and to invite them to participate in the buy-up program.

➤ **How long has DOR been flying orthophotos?**

Orthophotos are an extension of the much older aerial photography technologies and only became economical over large areas in the mid-1990s. The following table provides a chronology of the aerial photography and orthophotos available in the state.

TABLE 1.1

Dates	Imagery	Resolution	Source	See Note
1940s - 1970s	Aerial Photos	NA	U.S. Dept. of Agriculture Soil Conservation Service, DOT	1
1970s - 1980s	Aerial Photos	NA	USGS, DOT	2
1984-1985	Aerial Photos	NA	DOR, DOT	3
1989-1990	Aerial Photos	NA	DOR, DOT, SWFWMD	4
1994-1995	Orthophotos	3 feet	DOR, DOT, SWFWMD, USGS, DEP	5
1999	Orthophotos	3 feet	DOR, DOT, SWFWMD, USGS, DEP	5
2004	Orthophotos	3 feet	DOR, DOT, SWFWMD, USGS, DEP	6

2005 through 2012	Orthophotos	1 foot	DOR, DOT, SWFWMD, USGS	7
2013	Orthophotos	1 foot	DOR, DOT, SWFWMD	8
2014	Orthophotos	1 foot	DOR, DOT	8

TABLE NOTES:

1. The U.S. Department of Agriculture historically flew black and white aerial photos county-by-county approximately once every ten years to monitor agriculture.
2. USGS, as part of the National High Altitude Aerial Photography Program, flew aerial photography over all of Florida.
3. DOR flew aerial photographs for all 67 counties to support property tax mapping and land use/cover mapping. The WMDs use it for land use/cover identification and the Save Our Rivers Land Acquisition Site Identification Model.
4. In 2005 DOR switched to a higher resolution (more detailed) orthophoto product. This change occurred in response to user requirements.
5. DOR begins offering local governments a buy-up option so they can tailor the imagery to their specific needs. DOR funds the base 1-foot orthophoto data, and the local government pays the upgrade costs.
6. Upgrades typically consist of 6-inch, instead of 1-foot imagery.
7. From 2005 through 2012, USGS has provided grant funding to DOR when Homeland Security requirements coincide with those of DOR. DOR uses these funds to offset expenditures. DOR also occasionally flies some counties in the WMDs, which eliminates the need for the WMDs to fund these overflights.
8. Currently USGS provides quality control (QC) services of the deliverable products. The grant funding is no longer available.

➤ **Who can get copies of DOR orthophotos, and how much do they cost?**

DOR orthophotos are public records as defined in Chapter 119, F.S., Public Records. This means that the data are in the public domain and are available to the public at the cost of reproduction. The leading mapping trade group, Management Association for Private Photogrammetric Surveyors, endorses the concept that taxpayer-funded orthophotos should be in the public domain. The data are available in a number of ways:

- The Land Boundary Information System (LABINS) is a central repository of GIS data that DEP initially developed. The water management districts funded the enhancement of the LABINS website (www.labins.org) to improve public and private entities' ability to obtain copies of orthophotos. This site is particularly useful for ordering large image datasets.
- DOT maintains a website that is particularly useful for downloading small image datasets and historical orthophotos (www.dot.state.fl.us/surveyingandmapping/aerial_main.shtm).
- DOR provides copies of the orthophotos to the U.S. Geological Survey for inclusion in the National Spatial Data Infrastructure. Users can order or download the orthophotos from <http://nationalmap.gov/viewer.html>.

➤ **Why doesn't DOR use commercial off-the-shelf (COTS) aerial imagery such Google Earth or Bing Maps?**

1. Consistent accuracy is necessary for proper use of the imagery by many state agencies. To date, COTS imagery offers no assurances of accuracy. While some of the COTS imagery services include imagery produced for DOR and other Florida agencies, there is no consistent documentation on the processes used to render it. Therefore it loses most of its original reliability and resulting value.
2. Florida has open records policies, so much of what you see of the state on COTS imagery sites and federal agencies like USGS comes from the DOR county mapping program. If you look carefully at the credits on Google Earth and Bing Maps you will see that they say something like "Imagery Courtesy of USGS." In some cases this information is missing. One of the benefits of these other imagery sites hosting DOR imagery is that the public has easy

access to DOR's orthophotos in a user-friendly format.

➤ **How does DOR use orthophotos?**

Orthophotos have become an important data component of almost every program at DOR. The following is a list (far from inclusive) of how DOR uses the data.

1. *GIS Basemap.* Accurate mapping of geographic features (property ownership, sale data, SUT data, buildings, water bodies, wetlands, permits, parcels, etc.) requires an accurate basemap. Orthophotos provide the most economical and accessible basemaps for mapping features of interest to county property appraisers. DOR staff are not the only users of orthophotos as basemaps; external private and public entities, such as property appraisers, power utilities, engineering firms, and county engineering departments, use them as well. These external agencies develop many products that return to DOR as parcel data or spatial application information or in economic studies supporting using mapping/GIS computations.
2. *Reduction in Time Spent on Field Investigations.* DOR field investigations are a key component of appraisal activities, land acquisition and management, planning and monitoring of restoration projects, and field data collection. Field inspections are costly in terms of staff time and equipment. Current, accurate, and high-resolution photos provide the following support for field investigations:
 - a. Replace the need for field investigations. DOR can eliminate many field investigations because staff can view the orthophoto imagery at their desks.
 - b. Prioritize costly field investigations. Orthophotos provide a synoptic view that allows staff to identify the most important areas to visit in the field.
 - c. Supplement field investigations. Staff can take orthophotos in the field in hardcopy formats or on portable devices (laptops, GPS receivers, mobile devices, etc.) and use those to facilitate navigation and document field conditions. The result is a more effective use of staff's field time.
 - d. Identify activities not seen from field visits. Field visits are typically limited to areas that are accessible by vehicles (or short distances from vehicle access points). Orthophotos allow staff to have detailed views of large inaccessible areas.
 - e. Reduce field inspection requirements. The high resolution and accuracy of orthophotos reduce the need for costly field visits. Staff can use orthophotos to map structures, data collection sites, burn units, aquatic plant application areas, impervious surfaces, etc. at a fraction of the costs of ground surveys.
3. *Project Planning.* The ability to accurately measure distances and areas (particularly in areas that are difficult to access) and the synoptic view from orthophotos allow staff to efficiently plan projects and ultimately reduce project implementation costs. Examples include:
 - a. Conduct in-depth appraisal studies.
 - b. Identify access points.
 - c. Monitor trends in sales or land use.
 - d. Identify changes in land use that may require map updates, spatial updates, and cost estimation for models and trends.

➤ **How does DOR review its orthophoto program to ensure that it meets the business needs of internal and external customers?**

As with all its data collection programs, DOR regularly reviews its collection of orthophotos to ensure

that it:

1. Meets internal and external customers' business needs.
2. Is cost efficient.
3. Is securely and efficiently managed within DOR's information systems.

The following is an overview of the review process:

1. *Meeting the customers' needs*
 - a. Identify customers
 - i. DOR staff
 - ii. Partner agencies
 - iii. General public
 - b. Identify customer requirements
 - i. Internal surveys of DOR staff
 - ii. Coordination meetings with partners (federal, state, local governments)
 - c. Turn customer requirements into projects specifications
 - i. How often do we update imagery?
 - ii. How accurate do they need to be?
 - iii. What is the resolution?
 - iv. How do we deliver the data to customers?
2. *Cost-efficient collection*
 - a. Design specifications to meet customer needs.
 - b. Follow technology trends (for example, shift from film to digital cameras) to reduce costs in close coordination with private sector mapping firms.
 - c. Ensure competitive procurement processes are compliant with state law and DOR policies.
 - d. Coordinate with other agencies to minimize duplicated effort.
3. *Data management*
 - a. Monitor information technology image management, computing, and storage trends.

➤ **How much does DOR's orthophotography program cost?**

Several factors determine the annual cost to DOR for collecting orthophotos. They include:

1. *Technology.* Changes in technology have significant potential to lower costs over time. A good example of this is that between 1994 and 2004, increased computing power, digital cameras, and the use of Global Positioning Systems (GPS) reduced the cost of the collection of DOR's 1-meter resolution orthophotos. Since 2005 costs for DOR's 1-foot orthophotos have been fairly stable, primarily because the high cost of first generation digital cameras offset advances in software, GPS, and computing power. We are seeing evidence that this trend is changing and believe that we will see reduced costs for the same product in coming years.
2. *Competition.* Orthophotos were once a specialty product that only a few high-end mapping vendors could supply. With advances in technology, orthophotos seem to be moving toward becoming more of a commodity than a specialty product. This will increase competition and reduce costs.

3. *Coordination with State Agencies.* DOR actively coordinates with other agencies to reduce duplicative efforts. In some years the WMDs fly aerial photos; therefore we do not have to fly those areas. This works well because the WMDs have adopted DOR's orthophoto minimum specifications.
4. *Coordination with Local Governments.* DOR flies a base orthophoto product but has specifically defined both its contracting mechanisms and technical specifications to allow local governments to buy-up to an improved product that is tailored to meet their specifications. The cooperating partner pays buy-up costs in full.
5. *USGS Grants.* DOR actively seeks grants from the U.S. Geological Survey to offset orthophoto costs. These are most commonly from Homeland Security Agency funding sources. In most years DOR has benefitted from this funding source.