



# Wisconsin State Cartographer's Office



Your resource for mapping and geographic information in the state of Wisconsin

March 2010

## Digital Orthophotos

### Introduction

A digital orthophoto is an aerial photograph that has been digitally processed to remove distortions due to camera tilt and terrain relief. Orthophotos are useful because they combine the image characteristics of an aerial photograph with the geometric qualities of a map.

Orthophotos are most commonly described by their resolution. Resolution refers to the linear ground distance represented by a single pixel in the digital image. For example, in a 1-meter resolution orthophoto image, each pixel represents a 1-meter by 1-meter square cell on the ground.

### Applications

Orthophotos are used extensively as a base layer in geographic information systems (GIS) because of the visual information naturally conveyed by an aerial photograph. Unlike regular aerial photographs, orthophotos have the positional accuracy of a map.

In addition, orthophotos are commonly used to derive other datasets such as transportation routes, water features, field boundaries, and building outlines. They also serve as a base map for other data themes such as wetlands, soils, and forest inventories.

### History

As a technology development, digital orthophotos began to appear in the late 1980s. The concept of a National Digital Orthophoto Program (NDOP)<sup>1</sup> was proposed in 1990 by the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS), USDA-Farm Service Agency (USDA-FSA) and the U.S. Geological Survey (USGS). Technical specifications (quarter-quadrangle format, black & white images, 1-meter resolution) were soon established, and the NDOP began producing digital orthophotos in 1993 using National Aerial Photography Program (NAPP) imagery. The NDOP facilitated virtual nationwide coverage of the lower 48 states by 2002.

In the mid-1990s, counties in Wisconsin began to acquire their own digital orthophotos, usually at a resolution finer than 1 meter. Wisconsin Land Information Program funding supported many of these projects.

Today, most of the state's counties have acquired their own digital orthophotography at resolutions ranging from 6 to 18 inches.

### Current Status

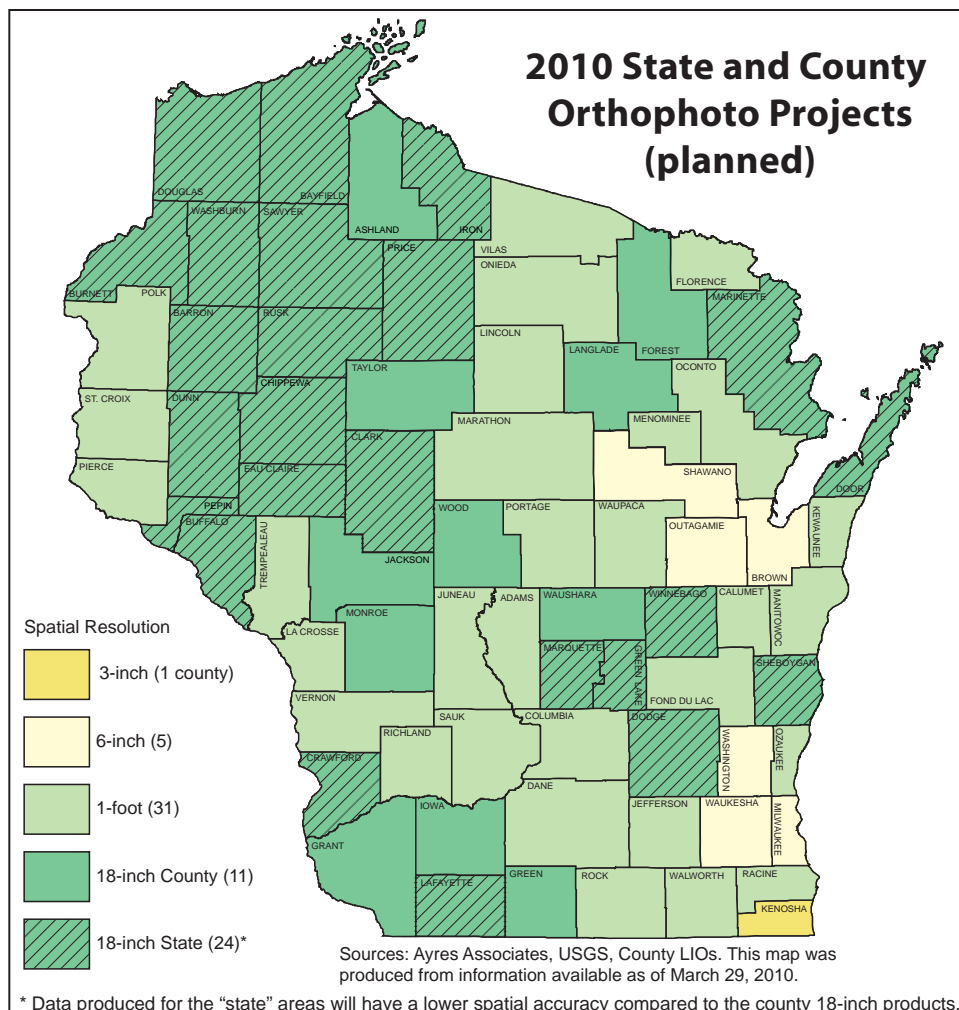
The Wisconsin Regional Orthophotography Consortium (WROC)<sup>2</sup> is the focus of most imagery acquisition activities planned in the state during 2010. Developed by several Regional Planning Commissions in 2008, the consortium seeks to reduce costs by offering members better unit pricing for products. In addition, the consortium released a single Request for Qualifications (RFQ), which saved members additional time and resources.

As of March 2010, 45 Wisconsin counties are participating in WROC. A yet-to-be-named number of municipalities and private companies are also acquiring products through WROC.

All WROC flights planned for 2010 will be captured in natural color. With advances in digital sensors and increased computing capabilities, color imagery has largely replaced panchromatic (black and white) as the *de facto* orthophoto product type in Wisconsin.

### Partners on board for statewide imagery

State and federal partners have pledged over \$1.1 million toward WROC for orthophotography acquisitions during 2010. In addition to a \$700,000 U.S. Department of Homeland Security grant awarded to the state of Wisconsin in August 2009, other state and federal agencies have pledged an additional \$465,000 to WROC.



Funds contributed by partners will be used to create a statewide, color, leaf-off product with a spatial resolution of 18 inches. The statewide dataset will be in the public domain. The partner funding will have the added benefit of offsetting a portion of the acquisition costs for local governments participating in the WROC project.

To avoid duplicate flights, the North Central Wisconsin Regional Planning Commission is working with the WROC contractor team (Ayes Associates and Aero-Metric) on a plan to resample high-resolution, high-accuracy imagery acquired over WROC member counties into the 18-inch statewide product. The remaining areas (shown as "state" on the State and County Orthophoto Projects map on page one) will also be acquired digitally, but the final products will have a lower spatial accuracy (+/- 30 to 40 feet) compared to the 18-inch county products (+/- 10 feet). Details and

specifications for the different statewide product "levels" are described in a [partnership FAQ published by WROC](#).<sup>3</sup>

**NGA funding urban areas in 2010**

The National Geospatial-Intelligence Agency (NGA), working in conjunction with the U.S. Geological Survey, is infusing approximately \$250,000 into Wisconsin through their Urban Areas Imagery Program. Under this program, select metropolitan areas receive funding towards color, leaf-off, 1-foot resolution imagery. Eligible areas in Wisconsin include Green Bay, the Fox Valley, and the Madison and Milwaukee metro areas. Imagery funded by NGA will be made available in the public domain at the 12-inch resolution, and will also be resampled and integrated into the statewide 18-inch product.

**More NAIP in 2010**

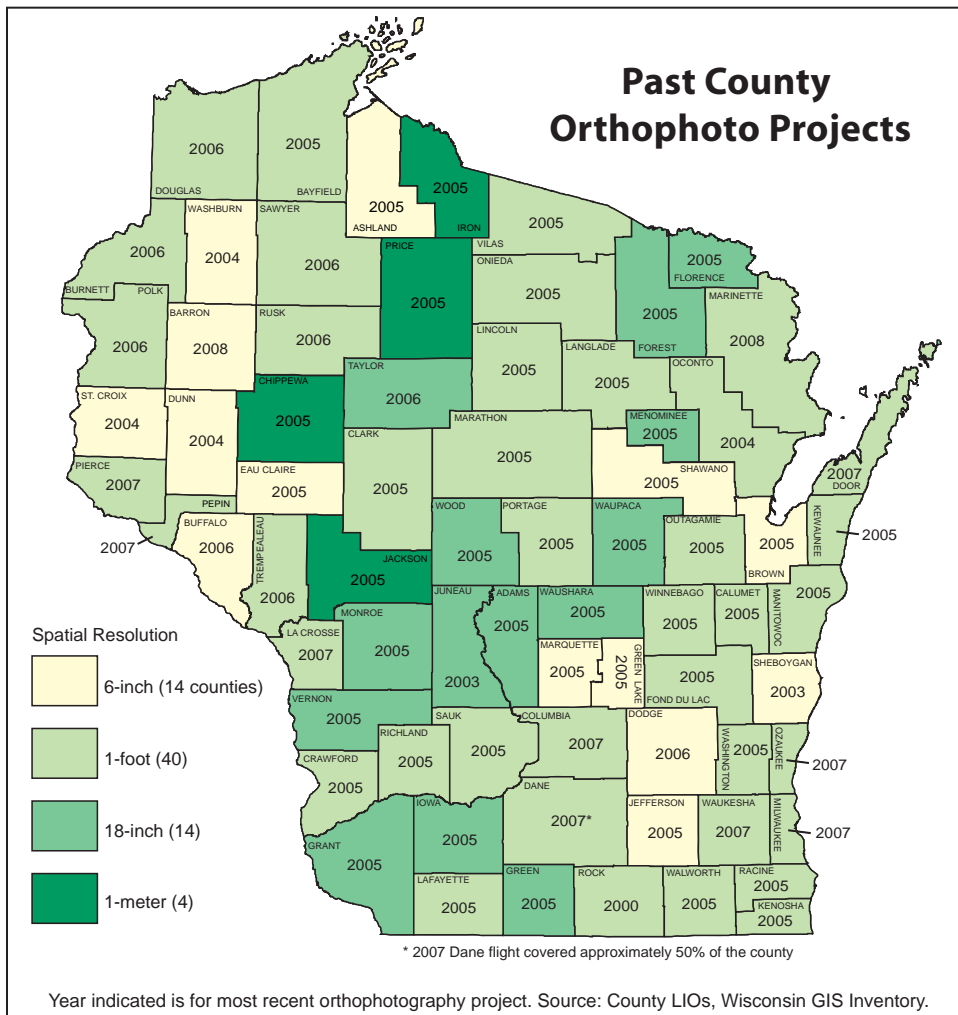
The USDA-Farm Service Agency will again

acquire 1-meter resolution color imagery over the entire state during the summer of 2010. In Wisconsin, the National Agriculture Imagery Program (NAIP) flights were originally planned for the summer of 2011, but USDA decided to accelerate the program.

Nationally, NAIP imagery is flown almost exclusively with 4-band digital sensors by the federal contractors, but the near-infrared (IR) band is not a standard product delivered to end-users. For Wisconsin, the additional cost to process and receive the IR band is approximately \$96,000. At this time, no state partners have stepped forward and expressed interest in covering that cost.

**Where to obtain**

Orthophotos generated as part of a high-resolution county project are typically obtained directly from the county [Land Information Office](#).<sup>4</sup> For municipal projects, contact the local planning or engineering office. Cost and distribution policies vary significantly between jurisdictions. Check the [SCO Catalog of Aerial Photography](#)<sup>5</sup> for listings of both historic and current imagery. All Wisconsin NAIP imagery is available from the [WisconsinView Data Portal](#)<sup>6</sup> for free.



[www.sco.wisc.edu](http://www.sco.wisc.edu)

The State Cartographer's Office has been Wisconsin's source for information about maps and geographic data for over 30 years. Located in Science Hall on the UW-Madison campus, the SCO maintains a large and diverse Web site including an online newsletter, catalogs, calendar, contact lists, and background information on mapping topics. Our staff presents educational programs and workshops, and participates in a wide range of organizations.

**Web References**

1. National Digital Orthophoto Program [www.ndop.gov](http://www.ndop.gov)
2. Wisconsin Regional Orthophoto Consortium [www.ncwrpc.org/WROC/](http://www.ncwrpc.org/WROC/)
3. WROC Partner Funding [www.tinyurl.com/wroc-partners](http://www.tinyurl.com/wroc-partners)
4. Wisconsin County Land Information Officers [www.wlion.org/lios.asp](http://www.wlion.org/lios.asp)
5. SCO Catalog of Aerial Photography [www.sco.wisc.edu/apcat/apcat.php](http://www.sco.wisc.edu/apcat/apcat.php)
6. WisconsinView Data Portal [www.wisconsinview.org/form.php](http://www.wisconsinview.org/form.php)

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