

## Color Spectra Comparison

### Natural Color vs. False Color (Color Infrared)

Color Infrared (CIR) imagery is used in some wetland mapping methodologies due to the distinctive color signatures of wetland vegetation. This image comparison shows WRMP mapping overlaid on NAIP natural color imagery (left) and on NAIP color infrared imagery (right). Natural color imagery calibration and QAQC coupled with mapping experience allows the WRMP team to clearly identify wetland features in the NAIP imagery as well as could usually be accomplished using color infrared imagery. However, NAIP CIR imagery will be used as ancillary data to help interpret the natural color images.



The Base Map is a product of the Wetland Regional Monitoring Project (WRMP) at the San Francisco Estuary Institute. This Prop 50-funded project is an effort to monitor and track changes in Bay Area wetland condition using the EPA's three-level monitoring framework. Level 1 is assessment at the landscape scale assessment using GIS, remote sensing, and historical ecology; Level 2 is cost-effective, rapid assessment of condition via the California Rapid Assessment Method (CRAM); and Level 3 is intensive assessment of ecological function.

For more info on Level 1-2-3, the Base Map, Wetland tracker, California Rapid Assessment Method or WRMP visit the following websites:

- ▶ [www.wrmp.org](http://www.wrmp.org)
- ▶ [www.wetlandtracker.org](http://www.wetlandtracker.org)
- ▶ [www.cramwetlands.org](http://www.cramwetlands.org)

**wrmp.org**  
WETLANDS SCIENCE PROGRAM  
of the San Francisco Estuary Institute



SFEI is a 501(c)(3) non-profit organization conducting research and monitoring of San Francisco Bay.

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# BAY AREA BASE MAP

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## What is being mapped and not mapped?

### Image, Resolution, and Scale Comparison

#### Introduction

Successful mapping from aerial imagery involves critical decisions regarding the necessary resolution and spectra of base imagery, what gets mapped, the optimal mapping scales, and the minimum mapping units. These decisions must be based on clearly defined purposes for the maps, and are key to making sure the maps fulfill their purposes.

The Bay Area Base Map of aquatic areas has two immediate purposes. It is intended to foster the development of protocols for statewide mapping of the extent of deepwater, wetlands, and riparian habitats. The map is also intended to serve as the Bay Area regional base map for displaying many kinds of spatial data. The Base Map must meet the needs of local agencies for detail and accuracy while complying with federal and state mapping standards.

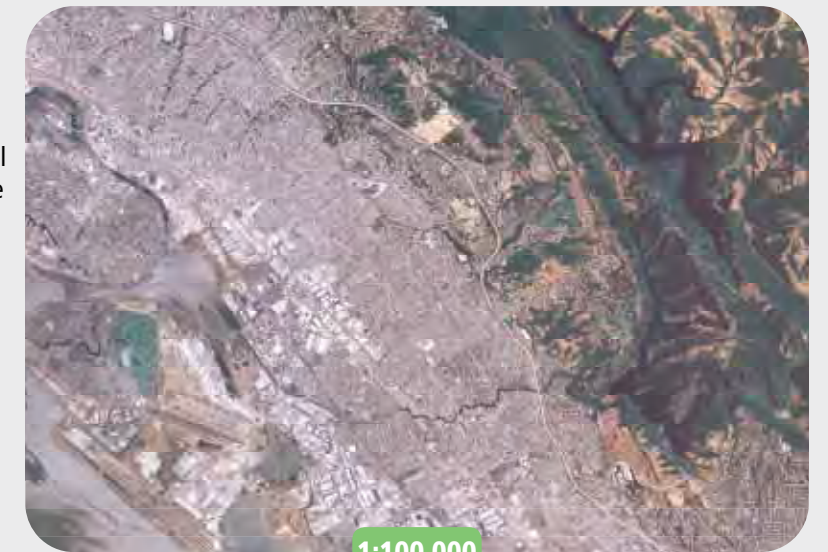
Detailed protocols for mapping and QAQC were developed based on the following fundamental questions:

- What feature types must be mapped, and what should their minimum mapping units be?
- What specifications define the ideal base imagery, what other data are needed, what imagery and other data are available statewide, and how do the available data compare to the ideal data sets?
- What mapping scale is optimal for the target feature types?

The brief answer to these questions is that the maps need to depict the natural and artificial surface channels and surface water storage areas that are readily discernable in standard 1 m pixel resolution NAIP imagery when viewed at scales no greater than 1:2,500. This includes, but is not limited to, agricultural and roadside ditches, natural tidal and fluvial channels, and other kinds of wetlands, stock ponds, tidal marsh pannes, lakes, and reservoirs. The map must support the addition of drainage details, such as stormdrains, agricultural tiles, and even roof drains and street gutters that cannot be comprehensively mapped by this project but may be essential to map in the future for planning low-impact development, reuse of urban and agricultural runoff, etc.

#### Base Imagery

To be a viable demonstration of possible statewide mapping methods, the imagery must be public, available statewide, and affordable to state agencies. These criteria led to the selection of the National Agricultural Imagery Program (NAIP) aerial photograph mosaics as the base imagery. The statewide dataset is free and available to the public from the US Department of Agriculture. The State Natural Resources Agency has partnered with federal agencies to help acquire NAIP imagery for California. It has a 1 m pixel resolution which has been deemed adequate for mapping the level of detail needed to inform local land use planning and management at this time. Other datasets with higher resolution are available for portions of the study area and are used here to illustrate the kind of detail that is not evident in the NAIP imagery.



## Scale Comparison of NAIP Imagery in non-tidal habitat

### Why did we map at 1:5,000?

After testing various scales, the project team determined that a 1:5,000 scale would meet our established goals, producing the best product in a cost-effective manner, given the selection of NAIP imagery as the base imagery for the project.

In these examples, the same area has been shown at three different spatial scales. At the 1:1,000 scale, you begin to see intense pixilation (blurring of the image) due to the limits of the NAIP image resolution, or the distance on the ground represented in each pixel, which degrades the photo limiting interpretation.

At the 1:2,500 scale, pixilation is less pronounced. However, at this zoom level the image lacks sufficient landscape context, limiting the interpretation of targeted features in relation to their surroundings. At the 1:5,000 scale no pixilation is visible and there is sufficient landscape context to increase confidence in feature interpretation and mapping.

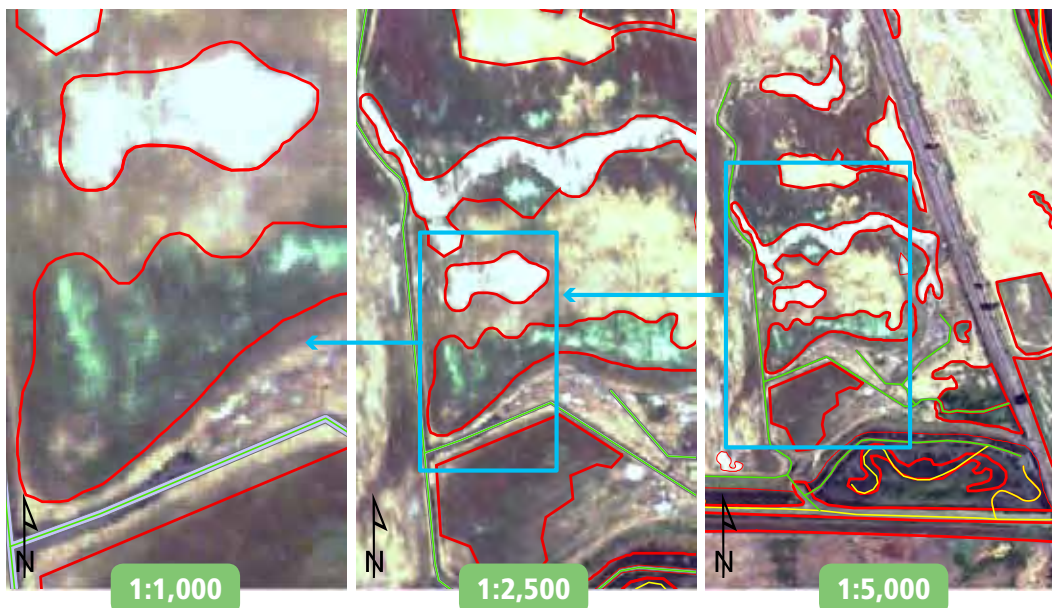


## Scale Comparison of NAIP Imagery in tidal habitat

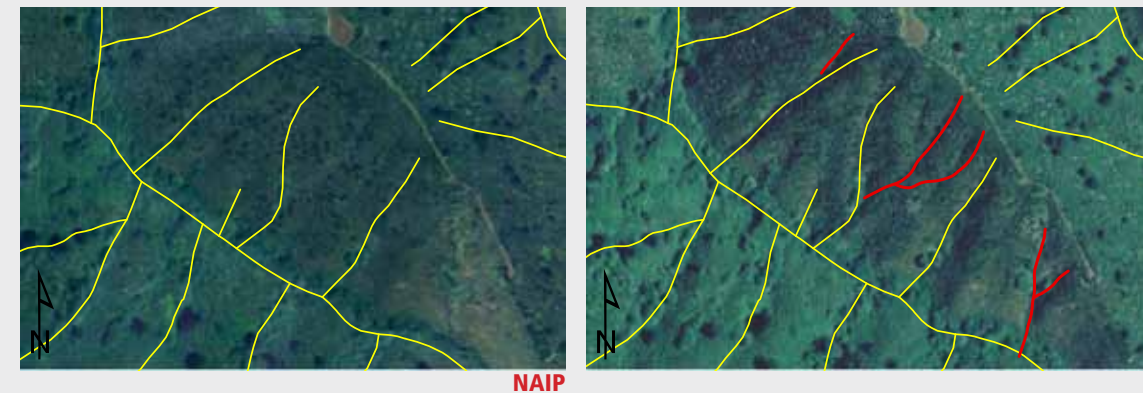
### Why did we map tidal habitat at 1:2,500?

Mapping tidal marsh channels, pannes, and tidal flats is important to local scientists and resource managers. The level of detail evident in the NAIP imagery supports this user community.

The Base Map identifies tidal habitats at a 1:2,500 scale to capture tidal habitat elements with a minimum mapping unit (MMU) of 0.05 ha or 50 m<sup>2</sup> with an 85% spatial accuracy. The surrounding landscape is reviewed at 1:5,000 to identify features before mapping at 1:2,500. As in the previous example, the 1:1,000 image is heavily pixelated and not suitable.

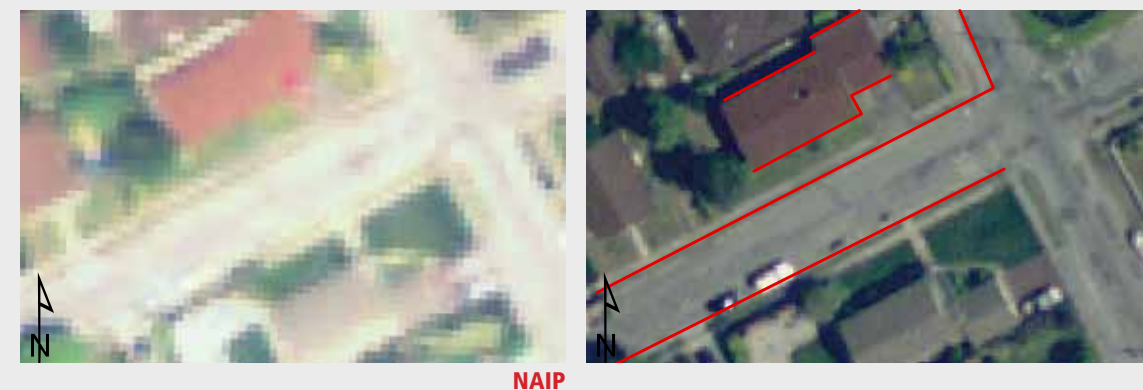


## Resolution Comparison; Forested, Urban, Urban-Wildland Interface



### Forested Landscape

In the forested example shown here, the image on the left is NAIP and that on the right is a higher resolution image at the same scale. The red lines indicate features that can be seen in the hi-res imagery but not in the NAIP imagery. The Base Map omits some small channels.



### Urban Landscape

In urban areas, man-made structures contributing to increased drainage density such as the roof and street gutters shown here, cannot be included in the Base Map because of resolution limitations in NAIP. The Base Map supports the addition of this detail as needed, but hi-res imagery will be required to identify these features.

### Urban-Wildland Interface

Drainage features influence the exchange of materials and energy across the urban-wildland interface. Maps of these features can aid interface planning and management. Typical features include seasonal wetlands, roadside ditches, settling basins, and seeps and springs. In this example, mapping based on the NAIP imagery (left side) is compared to high resolution imagery. No additional drainage features are evident in the hi-res imagery while mapping at the chosen scale of 1:5,000.

