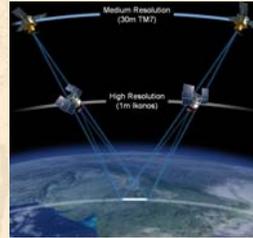




USGS 1:63,360 topographic maps are the only uniform mapping base for most Alaskan Parks. These are based on 1950's photography and often do not accurately reflect significant landscape changes that have occurred over the last 50 years. In addition, with the advent of personal GPS units, the ability of researchers and the public to identify spatial location has exceeded the accuracy of this mapping.

Alaska's National Parks are large and remote. Severe logistical and weather constraints limit opportunities for imaging. Satellite platforms represent an efficient means for imagery collection and subsequent ortho production for Alaska's National Parks.



The Landcover Inventory has developed medium resolution satellite ortho products.

The Basecartographic Inventory is developing high resolution satellite ortho products.

The National Park Service-Alaska Region has developed medium resolution Thematic Mapper (TM) products that are important sources of data for broad areas and are useful at scales to about 1:100,000. These products can be used for interpretation or as a cartographic base. These products are accessible to NPS staff as GIS data layers in ARCGIS through the NPS Theme Manager. Below is an interpretative example from Glacier Bay National Park and Preserve.

Orthos allow direct measurement and accurate orientation from imagery products. Orthos are images that have been turned into maps.

The National Park Service-Alaska Region is working with Geoeye, Inc. to develop high resolution ortho image products. The high orbital altitude of the IKONOS satellite combined with its accurate interior and exterior orientation, allow the IKONOS satellite to record data with high geometric fidelity. The average horizontal error observed in the IKONOS imagery for flat terrain is about 7.2m CE90 (Grodecki, J. and G. Dial, 2002. Ikonos Geometric Accuracy Validation, Pecora 15, FIEOS 2002 Conference Proceedings).

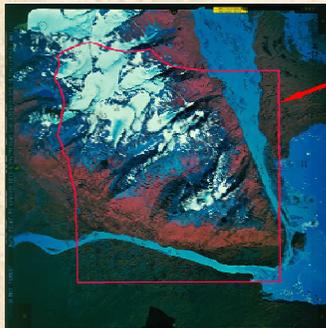
## Lituya Bay - Glacier Bay National Park and Preserve

On August 8, 1988 an orthorectified mosaic of one of our best 1:63,360 maps. The resolution had been degraded to 30m TM resolution. The water and vegetation are clearly visible. The image is not in the TM resolution. The image is not in the TM resolution. The image is not in the TM resolution.



## Alaska Landcover Mapping Image Plot Products

This image is a 30m TM resolution. The water and vegetation are clearly visible. The image is not in the TM resolution. The image is not in the TM resolution. The image is not in the TM resolution.



Rectangular Work Area Over Vertical Relief

**PHOTOS**  
Measurement of distance, angle, position, and area are not accurate.

**ORTHOS**  
Measurement of distance, angle, position, and area are accurate.

The horizontal error (DH) component of an ortho product that is contributed by digital elevation model (DEM) vertical error (DV) can be predicted based on the sensor view angle (SV). This can be expressed as:

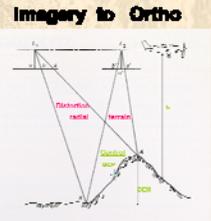
$$DH = DV / \tan(SV)$$

Vertical error of up to 25m in the DEM would allow production of ortho products from IKONOS imagery at an expected accuracy of 12m CE90 (1:24,000 NMAS) with a sensor view angle of 71° and no ground control points.

The National Park Service is currently developing IKONOS imagery coverage for all Alaskan Parks that will be used in production of 1m image products.

The existing Alaska National Elevation Dataset (NED) has vertical error that exceeds 100m in areas of rugged terrain. The National Park Service is working with the USGS and State of Alaska to improve the NED to allow orthophoto production from the IKONOS imagery without ground control points.

Medium resolution ortho products have been developed for all Alaskan NPS areas. These TM ortho image mosaics are being used by NPS to develop a popular poster series of Alaska National Parks.



$$DOQ = \text{Image} + \text{GCP} + \text{DEM} + \text{$$$}$$

GCP - ground control point  
DEM - digital elevation model

Establishing ground control in remote, natural landscapes is logistically difficult. The costs of ortho production can be significantly reduced if ground control points are minimized. Both the high and medium resolution ortho products are designed to provide the best product for the minimum cost.

Vent Mountain in Aniakchak National Monument and Preserve (below left) and the Kennicott Mine area of Wrangell-St. Elias National Park and Preserve overlain with CAD drawing (below right). IKONOS imagery.

