

## GEOTAGGING PHOTOGRAPHS FOR DISTRIBUTION ON THE WEB

RICHARD, Glenn A., Mineral Physics Institute, Earth and Space Sciences Building, Stony Brook University, Stony Brook, NY 11794-2100. Glenn.Richard@stonybrook.edu

RICHARD, Sandra G.

Over the past several years, interactive online maps have greatly increased the availability of aerial imagery and other geographically-based documentation to the general public. In addition, a number of sites have made it possible for anyone with access to the web to post this type of material, at essentially no cost, to make it widely available. While maps and orthorectified aerial imagery provide a great deal of spatial information about locations of interest, ground and oblique aerial photographs provide other useful perspectives that are not optimized by the top-down orthorectified imagery. Geotagging is the process of digitally labeling documents, including photographs, with location information. This data, if it is specific enough and in a systematic format, enables points on maps to serve as hyperlinks to documents. Some notable examples of sites that make it relatively simple to associate documents with locations are [Google Maps](#), [Google Earth](#), [Yahoo Maps](#), and [Flickr](#).

The main Google Maps web site is designed primarily for finding locations and businesses, and for getting directions. However, the Google Maps API is a publicly available interface that "lets you embed Google Maps in your own web pages with JavaScript. You can add overlays to the map (including markers and polylines) and display shadowed "info windows" just like Google Maps" ([Google Maps API](#)). Along with sidebars that can be created with JavaScript programming, these info windows and markers can serve as links to photographs and other documents.

At <http://calvertonponds.googlepages.com/FieldTrip.html?file=Calverton-Ponds-2007-02-11.xml&zoom=16> (Figure 1) is an example of a Google Maps API-based page that offers geotagged photographs taken by Sandra Richard at the [Calverton Ponds](#) in the Long Island Pine Barrens on February 11, 2007. The page is implemented by JavaScript code that reads an XML data file that consists primarily of GPS output which includes tracks and waypoints. The GPS device used was a [Garmin](#) GPSmap 76CSx. The GPS receiver collected track and waypoint data during the visit to the Calverton Ponds, as photographs were being taken on a Canon G7 digital camera. The GPS data includes time information, which was used to correlate the photographs with the map locations, using the time stamp from each photograph's EXIF metadata header. The original GPS data, which was saved in GPX format, was modified to include information needed to link to each photograph. Clicking on a map marker or an item in the upper sidebar selects a location and highlights it on the map. Thumbnails associated with the selected location appear in the lower sidebar, and serve as links to photographs, which are rendered in a separate browser window. This enables the photographs to be displayed at a high resolution, but the multiple windows could potentially create confusion.

# Data File: Calverton-Ponds-2007-02-11.xml

- [Fungus](#)
- [Lichens](#)
- [Near Block Pond](#)
- [Lichen and Tupelos](#)
- [On Ice at Block Pond](#)
- [Catbrier](#)
- [Edge of Block Pond](#)
- [Oak at Trail Junction](#)
- [Edge of Sandy Pond](#)
- [Inkberry](#)
- [Edge of Fox Pond](#)

Block Pond. Photo by Sandy Richard



[larger photo]

Leatherleaf and Pitch Pine at Block Pond. Photo by Sandy Richard



[larger photo]

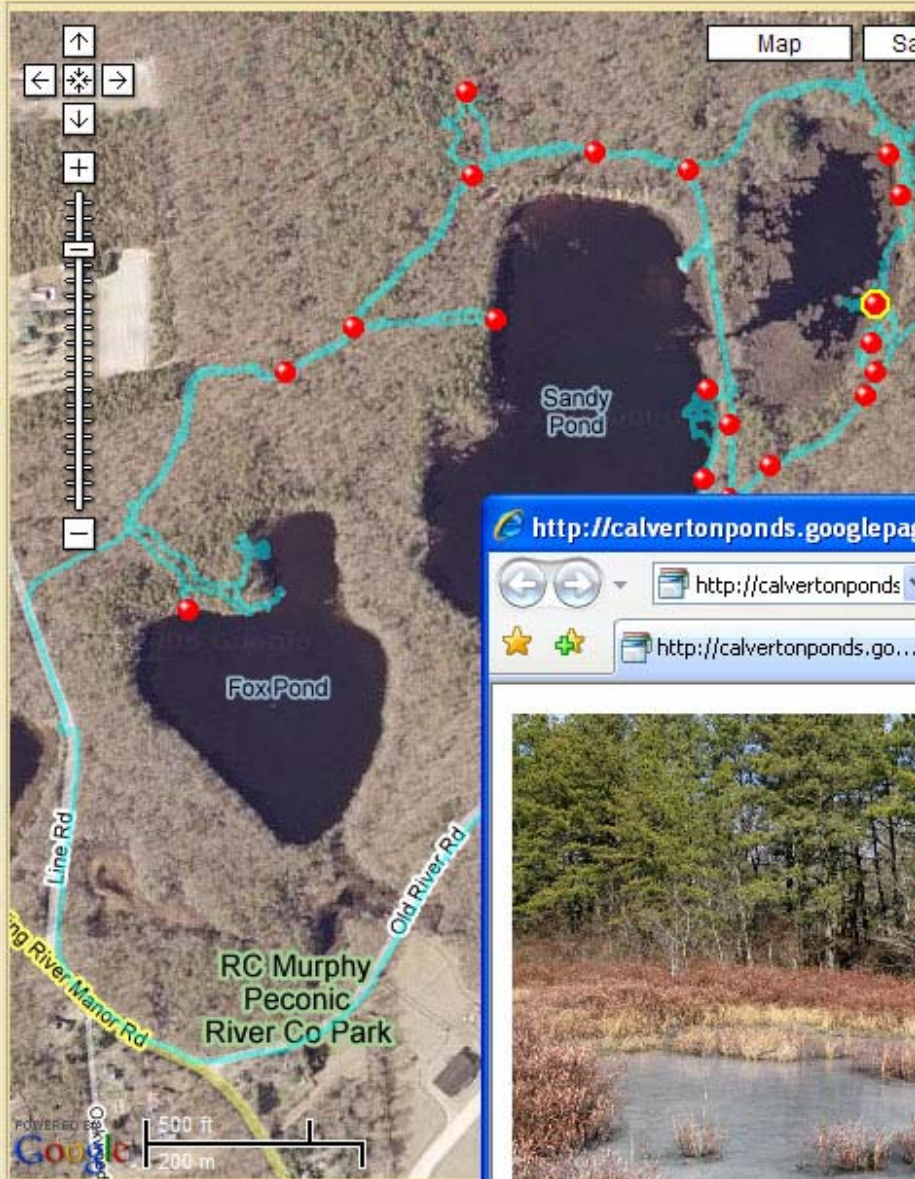


Figure 1. Google Map and photographs from a visit to the Calverton Ponds on February 11, 2007.

An example that displays a map, thumbnails, and photographs all in a single window (<http://calvertonponds.googlepages.com/Places.html?file=Places.xml>) (Figure 2) simplifies the user interface, but necessitates smaller photographs. This map reads data stored in XML format. The map and hyperlinked list of locations are in the left portion of the browser window, while the photographs and text associated with the currently selected location are to the right. For the XML data file, locations of points (in latitude and longitude) were collected from a map at <http://calvertonponds.googlepages.com/MapCenterLatLng.html>.

## Places in the Long Island Pine Barrens

[American Chestnut](#)  
[Calverton Ponds](#)  
[Connetquot River State Park Preserve](#)  
[Cranberry Bog County Park](#)  
[Dwarf Pine Plains](#)  
[Peconic River](#)  
[Ridge Environmental Conservation Area](#)

**Dwarf Pine Plains**  
Latitude, Longitude: 40.8726, -72.6528

The Dwarf Pine Plains is an area where most of the trees are dwarfed, and have serotinous cones that only open after being exposed to the heat of a fire.





**Serotinous cones on Pitch Pine (*Pinus rigida*)**

Figure 2. A Google Map of places in the Long Island Pine Barrens, with links to photographs.

At <http://www.eserc.stonybrook.edu/maps/HelicopterPhotos.html?file=Helicopter-Photos-2006-10-04.xml> (Figure 3) is an example of a map that links to photographs that were taken during a helicopter flight over part of Suffolk County, Long Island on October 4, 2006. The purpose of the flight, which was arranged by Fred Mushacke of the New York State Department of Environmental Conservation, and was performed in a New York State Police helicopter, was to document trends in the aerial extent of vegetated tidal wetlands. The oblique aerial photographs help make distinctions in the type of vegetation cover that exists in particular locations within the wetlands.

# Data File: Helicopter-Photos-2006-10-04.xls

- [IMG\\_8538.JPG](#)
- [IMG\\_8539.JPG](#)
- [IMG\\_8540.JPG](#)
- [IMG\\_8541.JPG](#)
- [IMG\\_8542.JPG](#)
- [IMG\\_8543.JPG](#)
- [IMG\\_8544.JPG](#)
- [IMG\\_8545.JPG](#)
- [IMG\\_8546.JPG](#)
- [IMG\\_8547.JPG](#)

IMG\_8545.JPG  
Latitude, Longitude:  
40.759508, -72.799397



[\[larger photo\]](#)

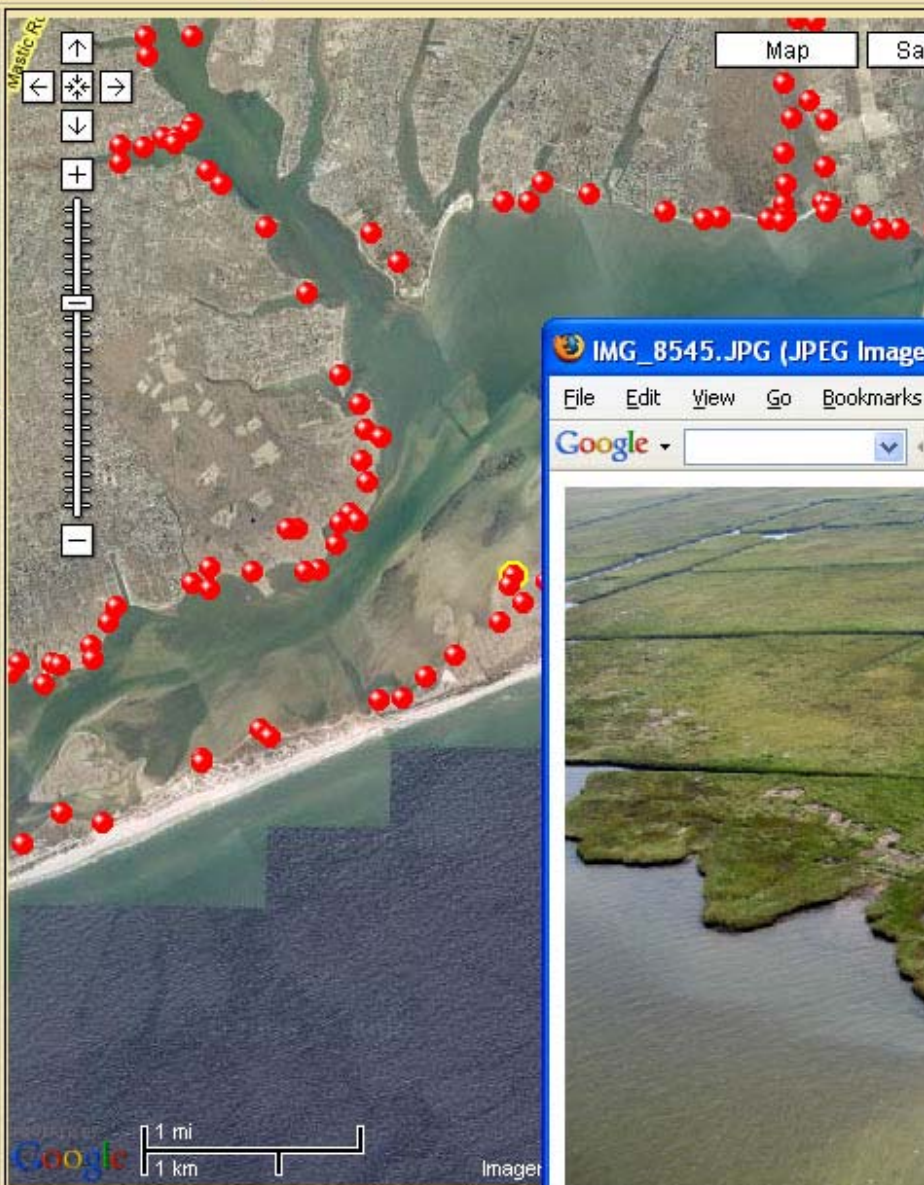


Figure 3. Google Map and photographs from a helicopter flight over Long Island on October 4, 2006.

Points can be represented as placemarks in Google Earth. These placemarks can be stored in KML and KMZ files and displayed as icons on a Google Earth map. The icons respond to mouse-clicks by opening up info windows that display content defined by the placemark's `description` element in the file. Figure 4 illustrates some of the helicopter flight points from October 4, 2006 displayed in Google Earth, with an info window activated, and a photograph displayed in the integrated browser.

Google Earth

File Edit View Tools Add Help

Search

Fly To Find Businesses Directions

e.g., Hotels near JFK

Places

- Green Point Marsh - Freshwater Input  
[IMG]helicopterthumbnails/[G\_8433.JPG/IMG]
- Green Point Marsh - Brackish Water  
[IMG]helicopterthumbnails/[G\_8434.JPG/IMG]
- Green Point Marsh - Salt Water  
[IMG]helicopterthumbnails/[G\_8435.JPG/IMG]
- Green Point Marsh - Edge of Bay  
[IMG]helicopterthumbnails/[G\_8436.JPG/IMG]
- [no name]  
[IMG]helicopterthumbnails/[G\_8437.JPG/IMG]

Layers

View: Core

- Primary Database
  - Terrain
  - Geographic Web
  - Featured Content
  - Global Awareness
  - roads
  - 3D Buildings
  - borders
  - Populated Places
  - Alternative Place Names
  - Dining
  - Lodging
  - Google Earth Community
  - Shopping and Services
  - Transportation

Green Point Marsh - Freshwater Input

Green Point Marsh - Salt Water

Green Point Marsh - [unclear]

Green Point Marsh - Salt Water

Extensive mosquito ditching

Directions: [To here](#) - [From here](#)

Pointer 40°43'36.06" N 73°06'02.20" W elev 7 ft Streaming 100%

URL: G:\GeotaggedPhotos\helicopterphotos\IMG\_8435.jpg

G:\GeotaggedPhotos\helicopterphotos\IMG\_8435.jpg

Figure 4. Google Earth displaying placemarks and an image of Green Point Marsh taken near West Sayville during the helicopter flight of October 4, 2006.

Flickr offers a [Yahoo Map](#) (Figure 5) that links to geotagged photographs that users have uploaded. As of March 23, 2007, the service claimed to offer over 13,460,000 photographs. The map markers on this site are clustered, with markers that appear at zoomed-out levels serving as links to additional markers that appear in smaller groups or individually when the map is zoomed in. Each photograph is represented in an info window with a thumbnail that serves as a link to the photograph in various resolutions.

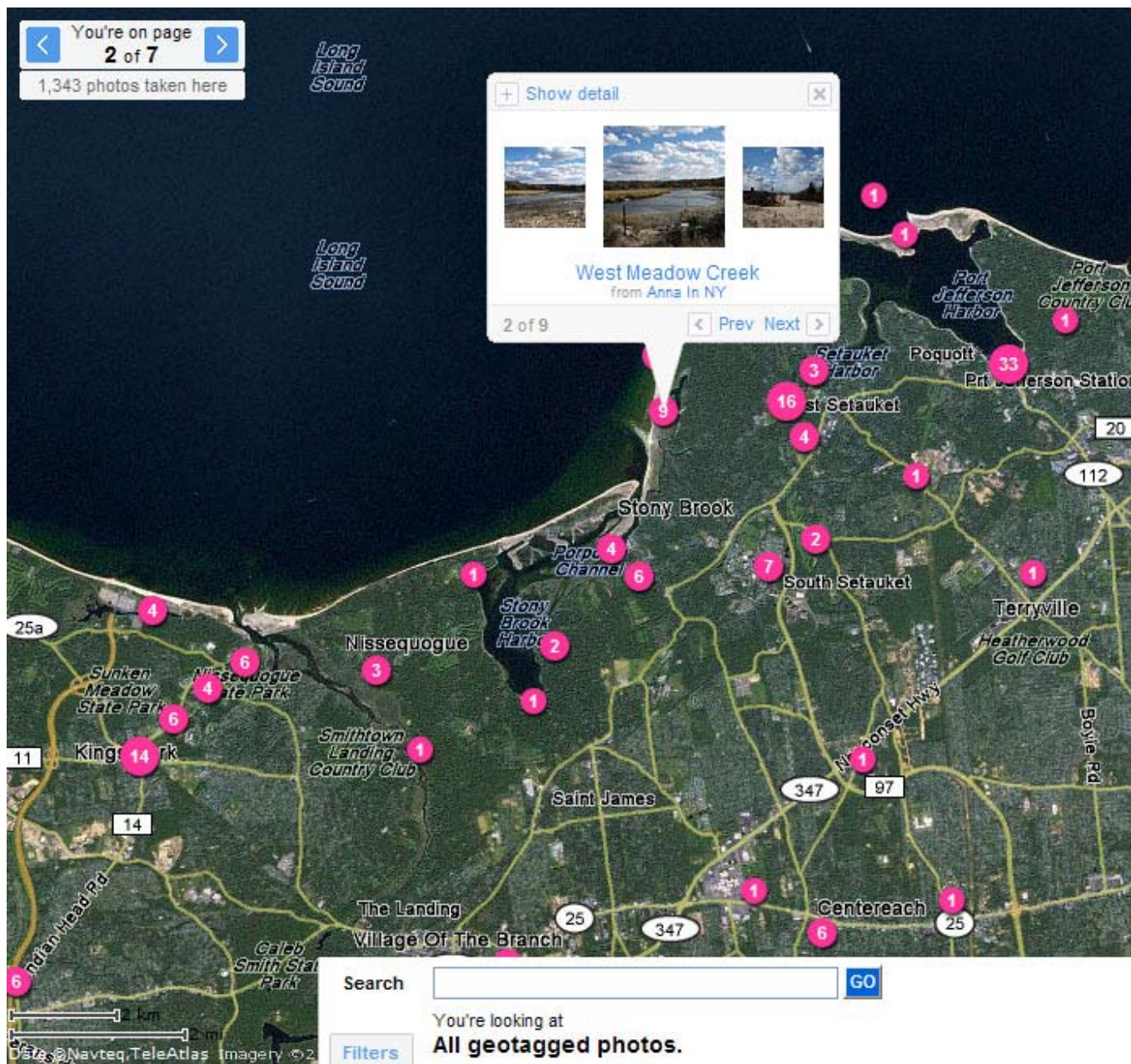




Figure 5. A Yahoo Map by Flickr zoomed to north-central Long Island with an info window that links to a photograph of West Meadow.

On the [GEOsnapper](#) site, "photos and locations unite in a snap". Those with accounts that are available for free can upload and geotag photographs. Visitors to the site can search for photographs with a map, or by specifying criteria through a form.

A variety of software packages can automate the process of geotagging photographs by correlating GPS tracks with EXIF time data. One example is the shareware [OziPhotoTool](#) package, which "combines the technology of a GPS receiver and a digital camera to automatically keep a record of where digital photos were taken".

Cameras with integrated GPS capability, such as the Ricoh Pro G3 GPS Camera are now entering the market. This promises to simplify the task of geotagging photographs, by eliminating the need to correlate times stored in EXIF metadata headers with tracks or waypoints as a separate step.