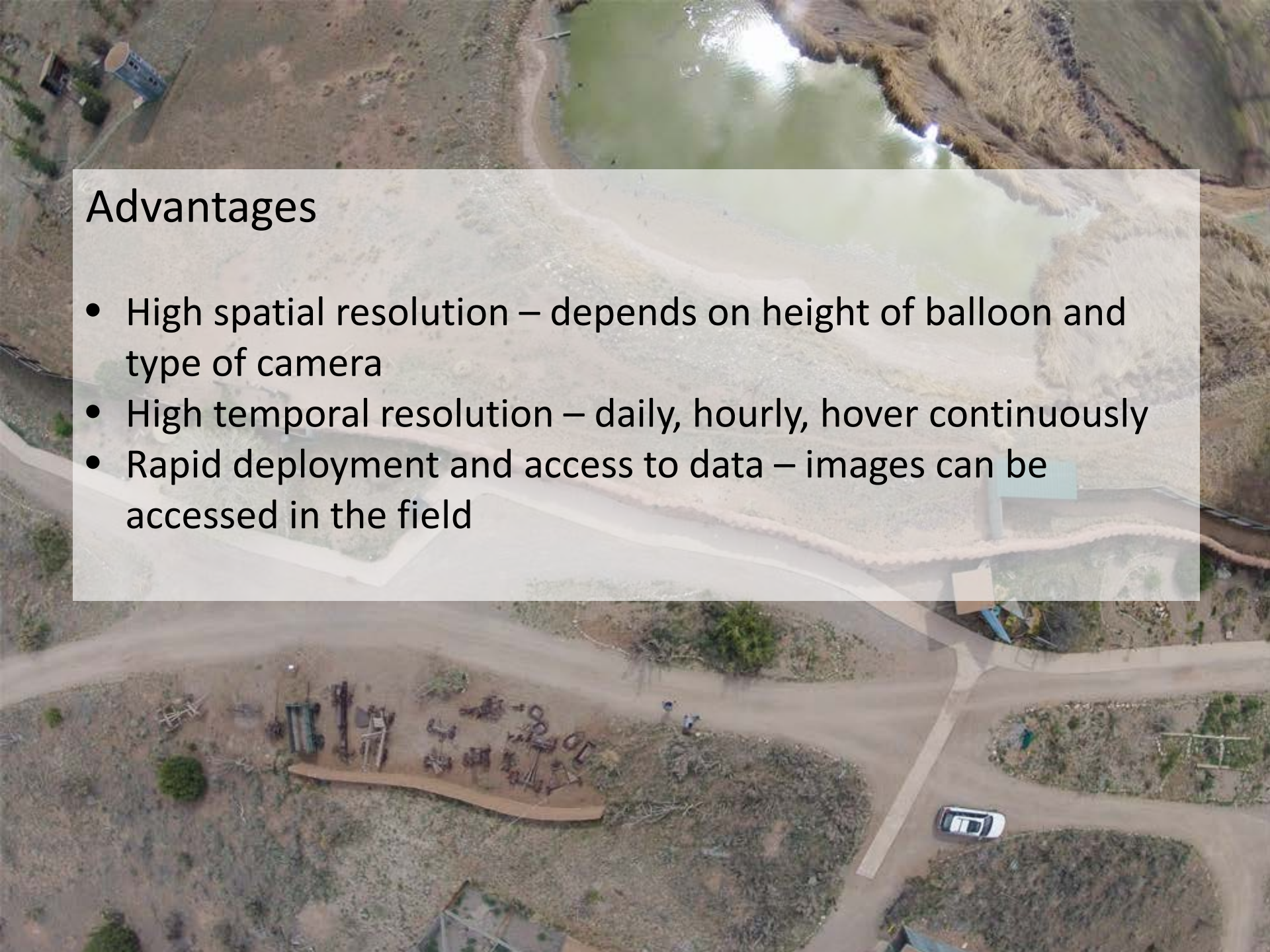


# Balloon Mapping

by Larry Heard





An aerial photograph of a water treatment facility. A large, circular, light-colored tank is the central feature. To its left, there's a smaller structure with a blue roof. Below the tank, a dirt road leads to a parking area with a white car. Further down, there's a large pile of debris and equipment. The surrounding area is dry and dusty with some sparse vegetation.

## Advantages

- High spatial resolution – depends on height of balloon and type of camera
- High temporal resolution – daily, hourly, hover continuously
- Rapid deployment and access to data – images can be accessed in the field

# Publiclaboratory.org 2010 - present

Firefox

The Public Laboratory | publiclaboratory... +

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Following up on Deepwater...  
Passing along in relation to Public Labs' and the Louisiana Bucket Brigade <[link]>'s work  
Link: [more »](#)

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Hey - a group called Water Canary has proposed an open source spectrometer for the Knight News  
Link: [more »](#)

Costa Rica is suffering...  
Hi dear Ecologist friends: From the beautiful and part virgin Costa Rica i wanna make a call to  
Link: [more »](#)

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Hello all! The signup drive for the CERN Open Hardware License is going very well! Although we  
Link: [more »](#)

---

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for Open Technology and Science



Balloon mapping kits are now available:

[Purchase a kit »](#)

**Support PLOTS programs »**




# Grassrootsmapping.org

Firefox

Grassroots Mapping

grassrootsmapping.org

WinZipBar Customized Web



## Grassroots Mapping

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### PLOTS adoption of the CERN Open Hardware License

March 9th, 2012 by [warren](#)

Hello Public Labbers and Grassroots Mappers!

To date, the documentation and open science literature we've made as a community has been published under a Creative Commons ShareAlike license, allowing anyone to reuse, remix, adapt, improve, and redistribute our works. Today, the PLOTS Web working group would like to propose that we as a community adopt a separate license for our hardware designs, and after much consultation, we'd like to adopt the [CERN Open Hardware License](#).

[read more](#)

Tags: [balloon mapping](#), [GrassrootsMapping](#)

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»

### Do you need maps?

Are you embroiled in an cartographic dispute? Do you disagree with the official version of your geography? Contact us through the [public mailing list](#) or get in [direct touch with our team](#) to start a grassroots mapping project today!

**Grassroots Mapping** is part of the [Public Laboratory for Open Technology and Science](#), founded by a group of activists, educators, technologists, and community organizers interested in new ways to promote action, intervention, and awareness through a participatory research model.

We're now trying to learn from our balloon mapping experiences to develop [new DIY tools](#) with [a variety of local communities](#). This is an open community and you are [welcome to join](#), and encouraged to



# Thousands of images created by the public of the Gulf Coast



New images and ideas on a wide range of topics are shared daily.



Mississippi River levee flood damage, April 7, 2012



# Tutorials, Software and Mapping Kits

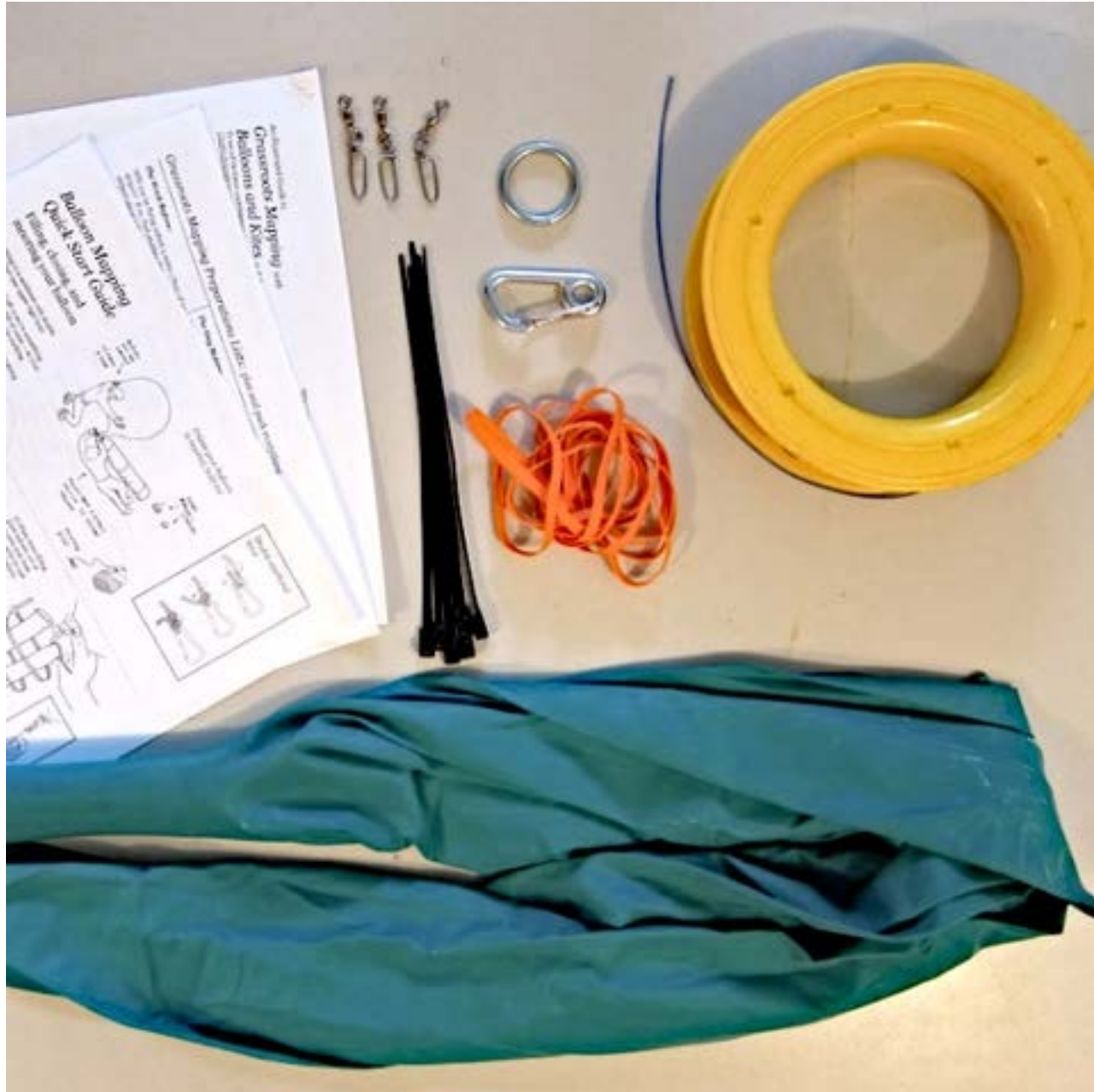
Make an infrared camera:



NDVI example:



# Paul purchased the Balloon Mapping Kit





# Balloon Mapping Kit

- A 5.5 foot (170cm) reusable balloon made of a latex/chloroprene (neoprene) mix
- 1000 feet (305m) of 110lb test (55 kilo) Dacron line, pre-wound on an 8" hoop winder
- Protective **rubberized cotton gloves** for handling the line. Thin line can cause burns to unprotected hands.
- Three high-strength swivel clips
- 10 rubber bands for making a camera cradle
- 10 **reversible** zip ties for closing the balloon
- One 1" ring for attaching the balloon to the line
- Instructions

# Cameras

- Continuous shooting mode
- Cannon Powershot – most popular
- GoPro Hero - action sports camera

## Available camera modifications

- Cannon Powershot modified for near infrared
- Program for customizing the continuous mode option





# Plastic Bottle Camera Rig

**bottle for impact resistance,  
rubber bands for shock resistance**

**wrist strap clipped  
for redundant  
safety**

With the GoPro, edges of the Coke bottle were visible in the picture frame due to the fisheye lens.

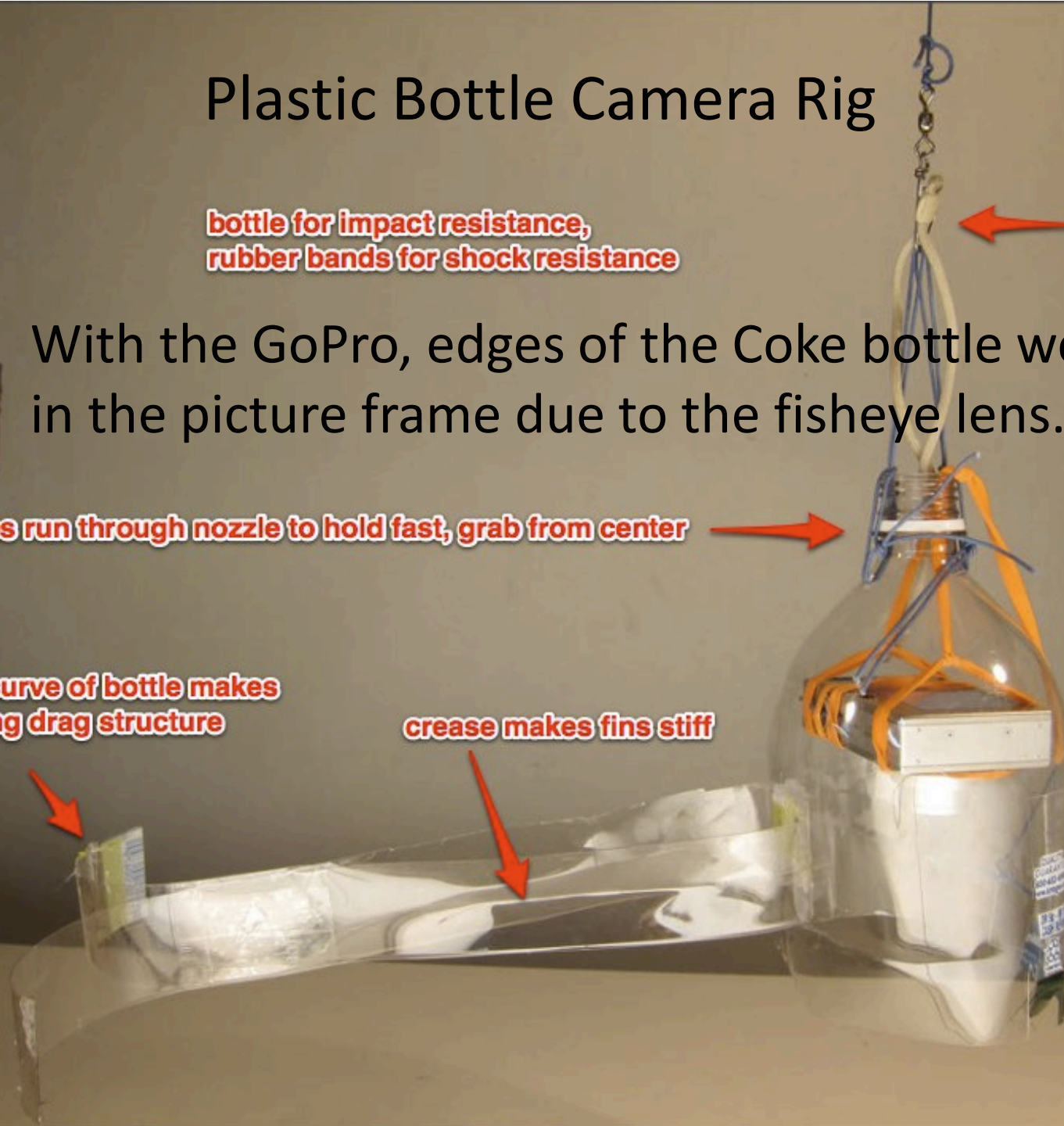
**2 loops run through nozzle to hold fast, grab from center**

**natural curve of bottle makes  
stabilizing drag structure**

**crease makes fins stiff**

**string loop  
prevents  
rubber band  
wear**

66



# Camera Rigs

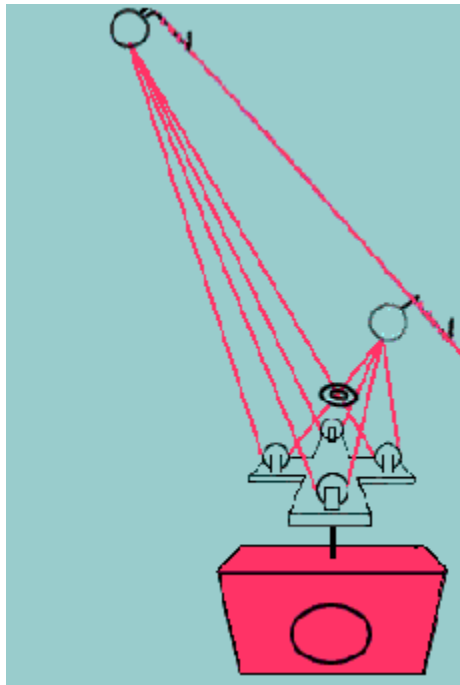
## My GoPro camera rig

- 2 1.5 inch carabiner style keychain clips
- Nylon String
- The GoPro camera waterproof housing
- 2 pieces of cardboard to level the camera housing
- 2 rubber bands

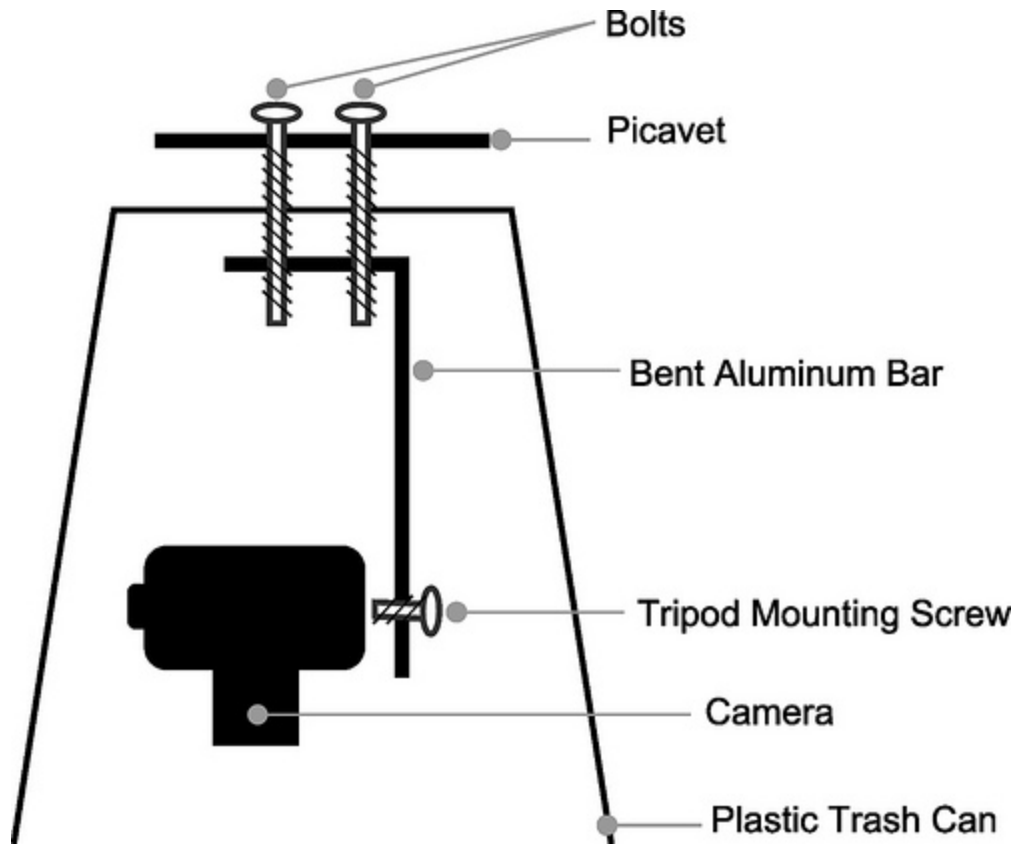




# Picavet Camera Rig – for camera stability



# Picavet Camera Rig – for large or multiple cameras





# Balloon Alternatives

## Balloons

- Weather balloon
- Party balloons
- Emergency mylar sleeping bags
- Trash bags taped together

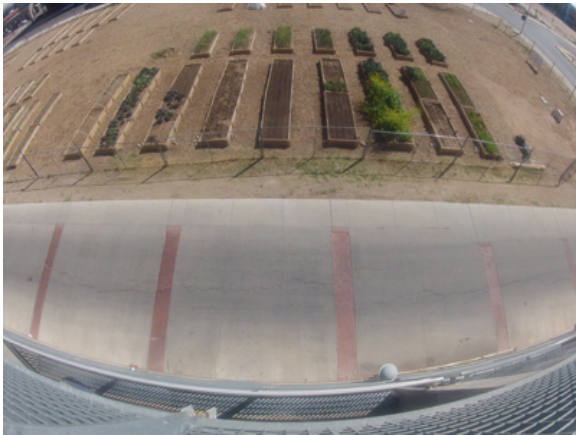
## Lifting Gas

- Helium – large heavy tank, expensive
- Hot Air - hair dryer and mylar bags?



# GoPro Hero 2 2.5 mm fisheye lens

- Challenges in dealing with distortion
- GoPro field of view = 170 degrees (180 degrees would make a circular image)
- Advantages in ground coverage and dealing with movement in the air



No correction



Photoshop Custom Correction



PTL Lens



# First Launch at Wildlife West near Edgewood, NM



The image displays a website layout for Wildlife West Nature Park. At the top, the title "Wildlife West Nature Park" is rendered in large, 3D, wood-textured letters. The "WTW" logo, featuring a stylized animal silhouette, is positioned on both the left and right sides. A vertical navigation menu on the left lists various site sections. A central photograph shows a dirt path leading through a natural landscape with a wooden signpost. To the right of the path, a large photograph of a buck with impressive antlers stands in a field of yellow wildflowers. Below the path photo, a small box lists "Golden Eagle" and "Crested Caracaras". Further down, a "Sustainable Design" section is introduced with a paragraph about the park's commitment to eco-friendly practices. A small photograph of a coyote is visible in the bottom right corner.

**WTW** **Wildlife West** **Nature Park** **WTW**

- Home
- About Wildlife West
- Animals
  - Animal Enrichment
  - New Animal Announcement
- Chuckwagon Suppers
- Music Festival
- Camping
- Events & Entertainment
- Education
- Facility Rental
- Map & Directions
- Support
- Links
- Contact Us

**Golden Eagle**  
**Crested Caracaras**

## Sustainable Design

**W**ILDLIFE WEST IS DEDICATED TO SUSTAINABLE DESIGN AND construction practices. Unlike many conventional zoos, we have made a concerted effort to minimize our disturbance of the ecosystem to the maximum extent possible, preferring to seek harmony between our designs and the environment in which they are placed. Wildlife West has a certain advantage to this; since all our captive species are native to the Southwest, they are generally already well-adapted to the environment in which they





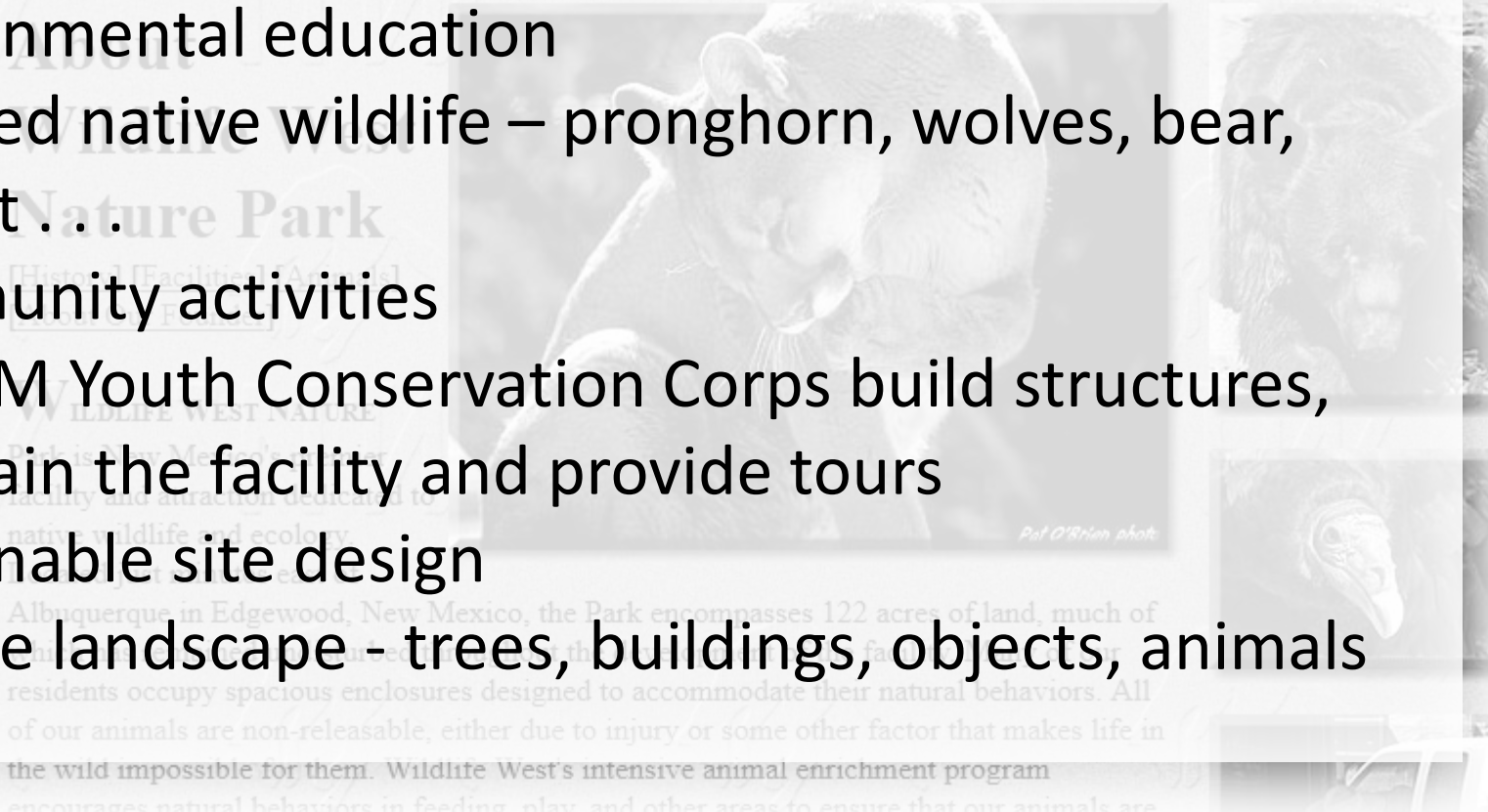


# Wildlife West Nature Park



- Home
- Environmental education
- Rescued native wildlife – pronghorn, wolves, bear, bobcat . . .
- Community activities
- The NM Youth Conservation Corps build structures, maintain the facility and provide tours
- Sustainable site design
- Diverse landscape - trees, buildings, objects, animals

- About Wildlife
- Wild
- Animals
- Chuck
- Suppers
- Music
- Festival
- Compi
- Events &
- Entert
- Education
- Facilit
- Rental
- Mo &
- Directions
- Support
- Links



# Launch Day

- Windy, partly cloudy
- The camera bounced and twisted more than anticipated
- First launch 3-4 ft. diameter balloon – little control of height and position, balloon drifted out more than up
- Second launch 5 ft. diameter – significantly stronger lift





# Photo Processing

- Over 1000 images - need to develop process for sorting and organizing images
- Deleted images with sky visible or extreme blurring
- Color balance shifting occurred in some images

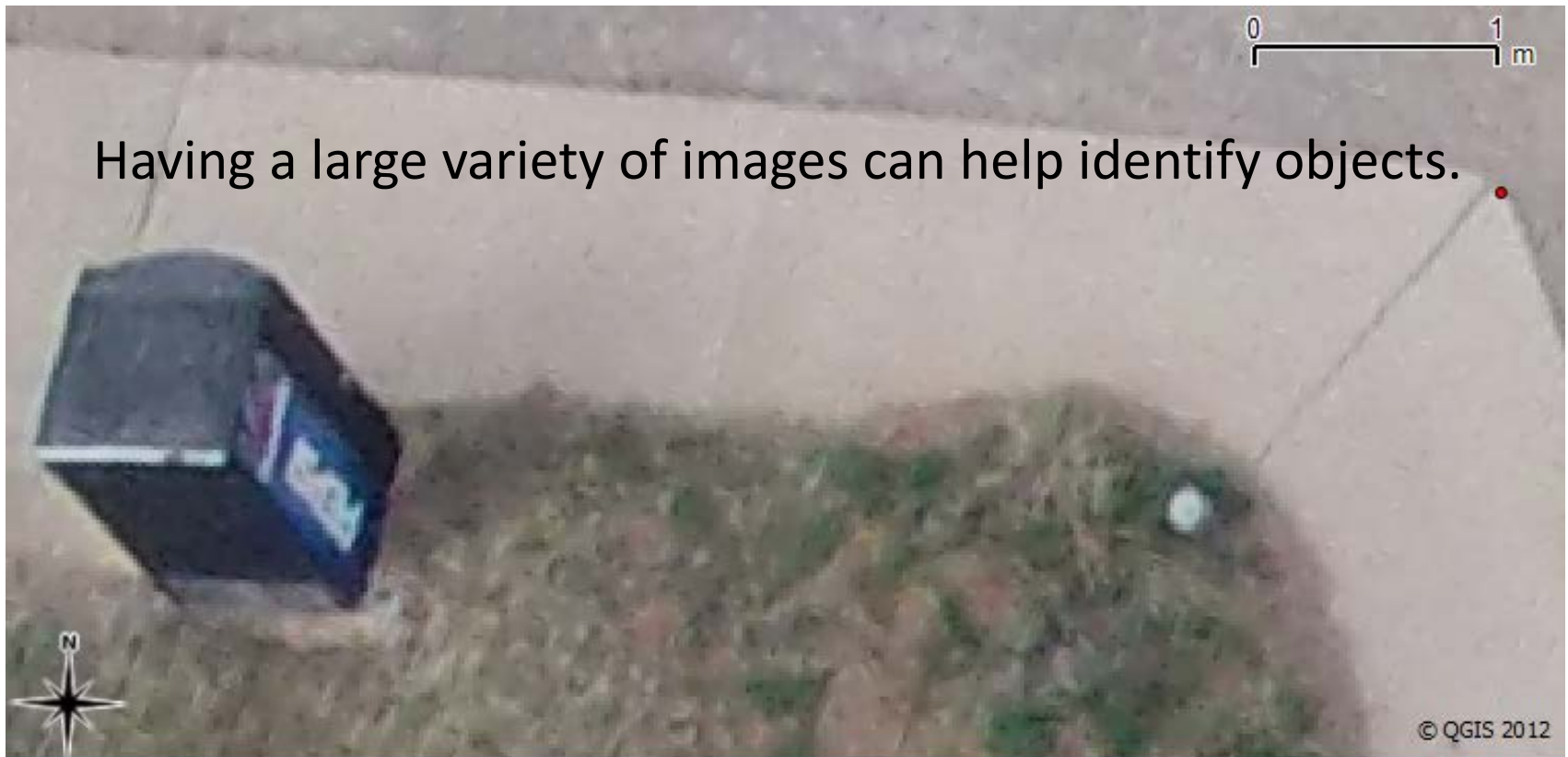
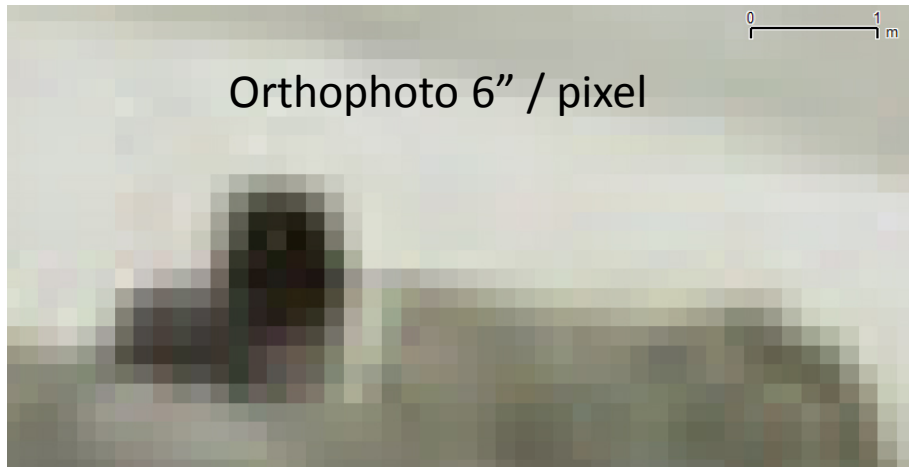








# Spatial Resolution






# Photo Processing

## 1. Fisheye lens correction using PTL Lens

PTLens 8.7.8 - 64-bit

File Tools Help



GoPro  
HD2  
2.5mm  
1/842.6 s at f/2.8, ISO 100  
2011:03:11 14:39:21

Camera has not been calibrated

Vignetting Perspective Chromatic Aberration

Amount 0

Midpoint 50

Reset

Grid  Reset All

Fisheye

Distortion 100

Crop 0 Rotate 0.0

Horiz. 0.0 Vert. 0.0

Reset

Barrel-Pincushion

Make

Model

Lens

focal length

Correct

Preview

Rotate-90°

Distortion

Barrel-Pincushion

Fisheye

Disable

Directory...

- GOPR0790.JPG
- GOPR0791.JPG
- GOPR0792.JPG
- GOPR0793.JPG
- GOPR0793\_pt.JPG
- GOPR0794.JPG
- GOPR0794\_pt.JPG
- GOPR0795.JPG
- GOPR0796.JPG
- GOPR0797.JPG
- GOPR0797\_pt.JPG
- GOPR0798.JPG
- GOPR0799.JPG
- GOPR0800.JPG
- GOPR0801.JPG**
- GOPR0801\_pt.JPG
- GOPR0802.JPG
- GOPR0803.JPG
- GOPR0803\_pt.JPG
- GOPR0804.JPG
- GOPR0805.JPG
- GOPR0805\_pt.JPG
- GOPR0807.JPG
- GOPR0808.JPG
- GOPR0808\_pt.JPG
- GOPR0809.JPG
- GOPR0810.JPG
- GOPR0814.JPG
- GOPR0815.JPG
- GOPR0816.JPG
- GOPR0816\_pt.JPG
- GOPR0818.JPG
- GOPR0818\_pt.JPG
- GOPR0821.JPG
- GOPR0821\_pt.JPG
- GOPR0823.JPG
- GOPR0823\_nt.JPG

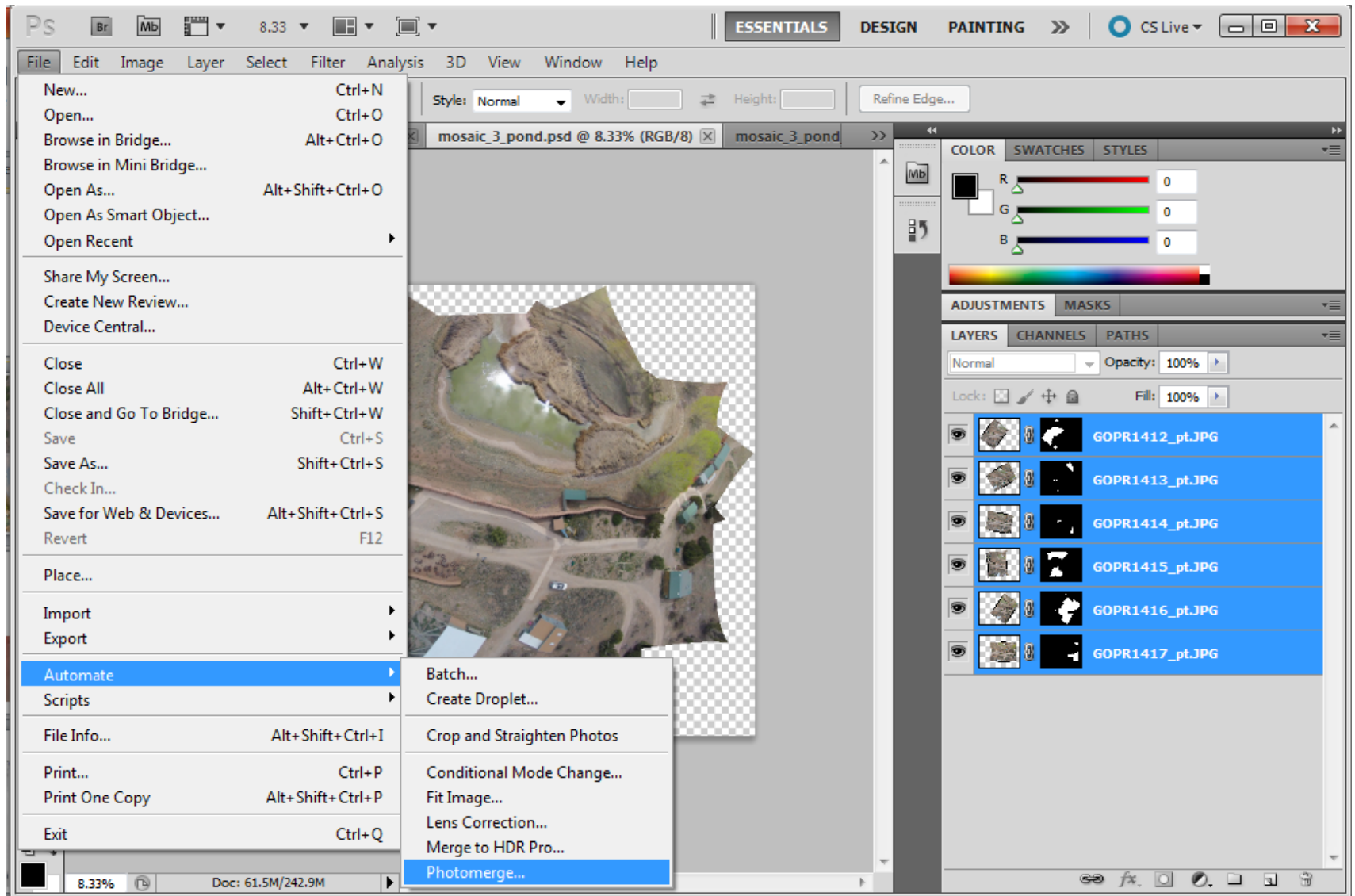
Apply

Delete

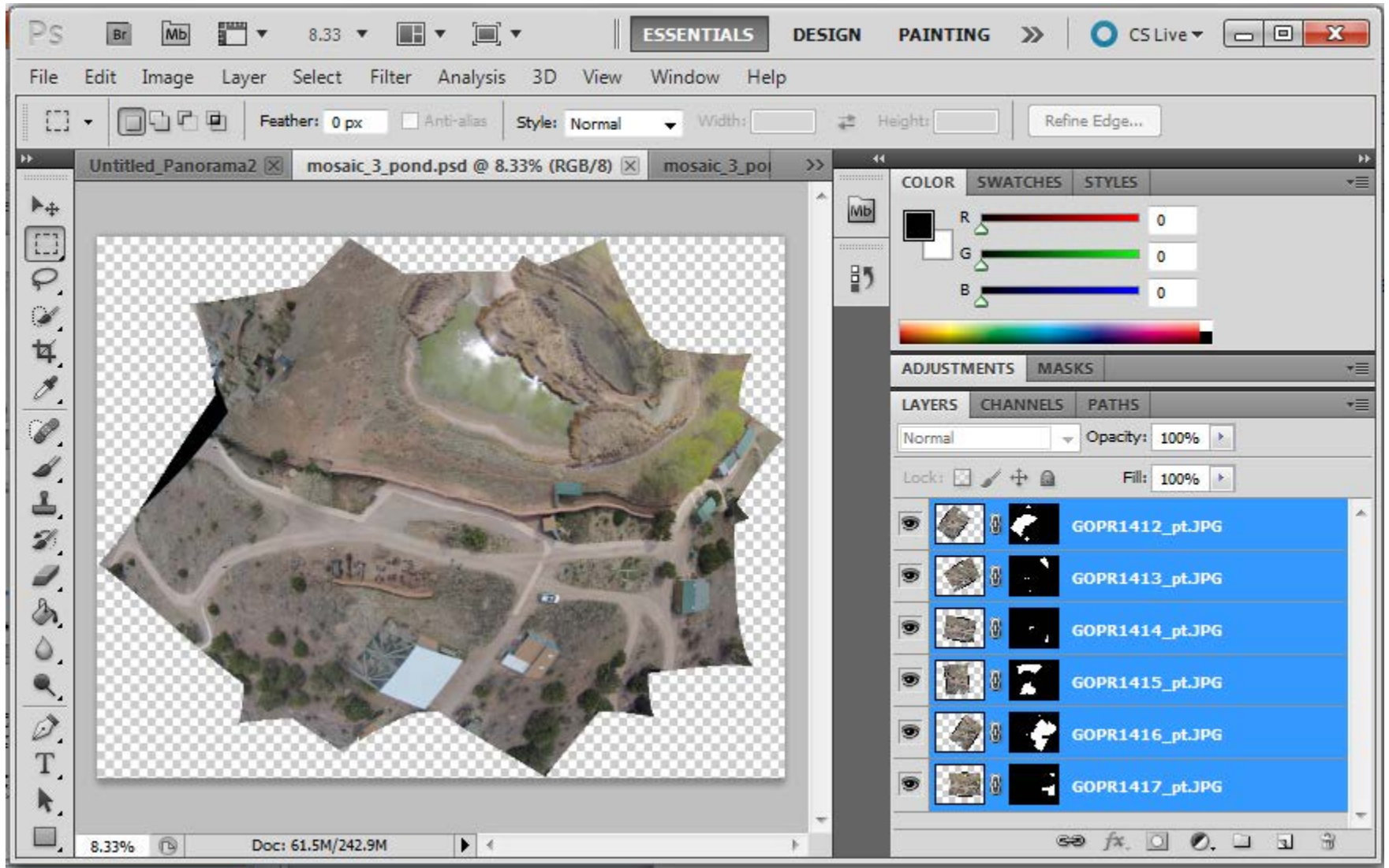
Exit



## 2. Photographs were stitched together in Adobe Photoshop

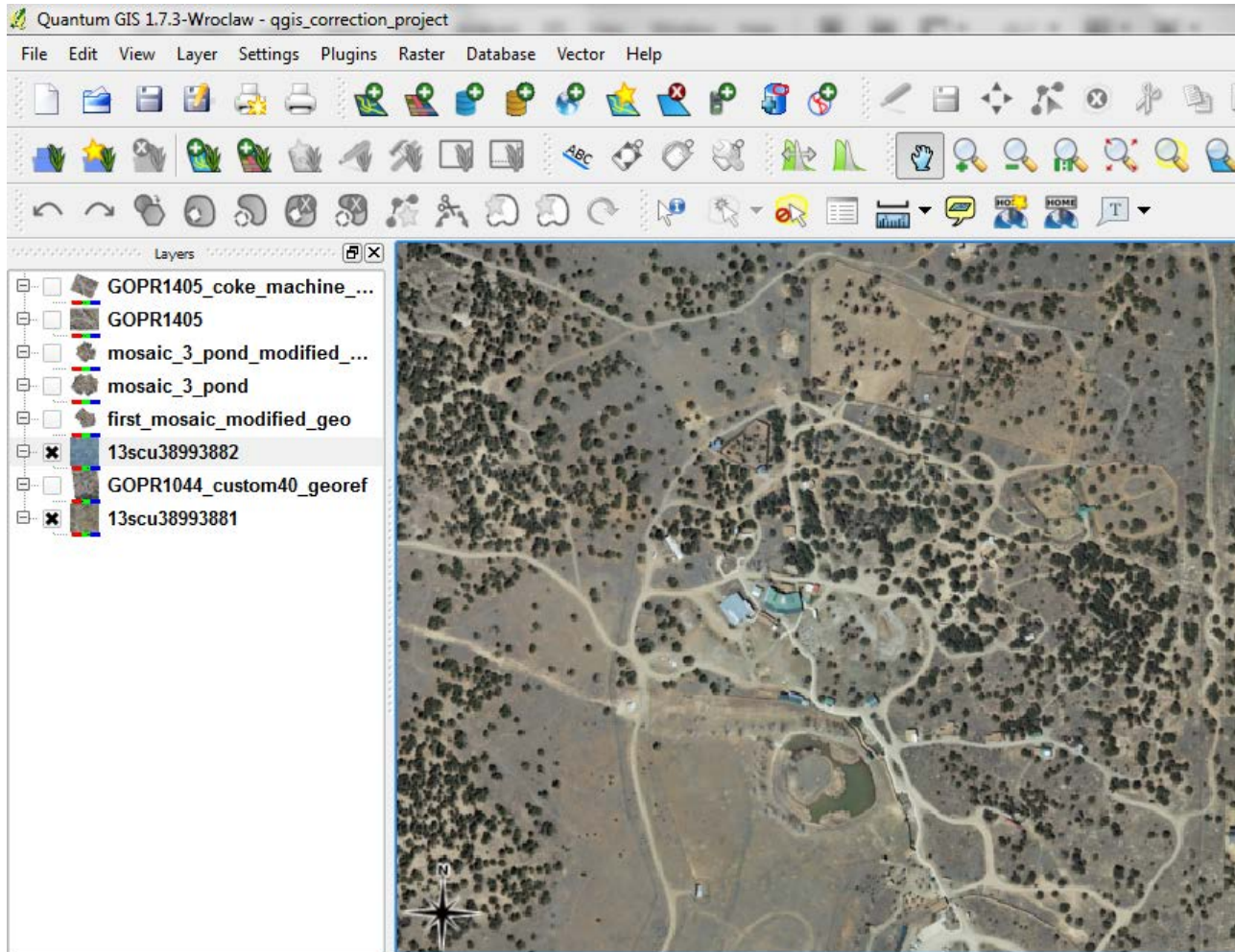


# 6 pictures merged in Photoshop



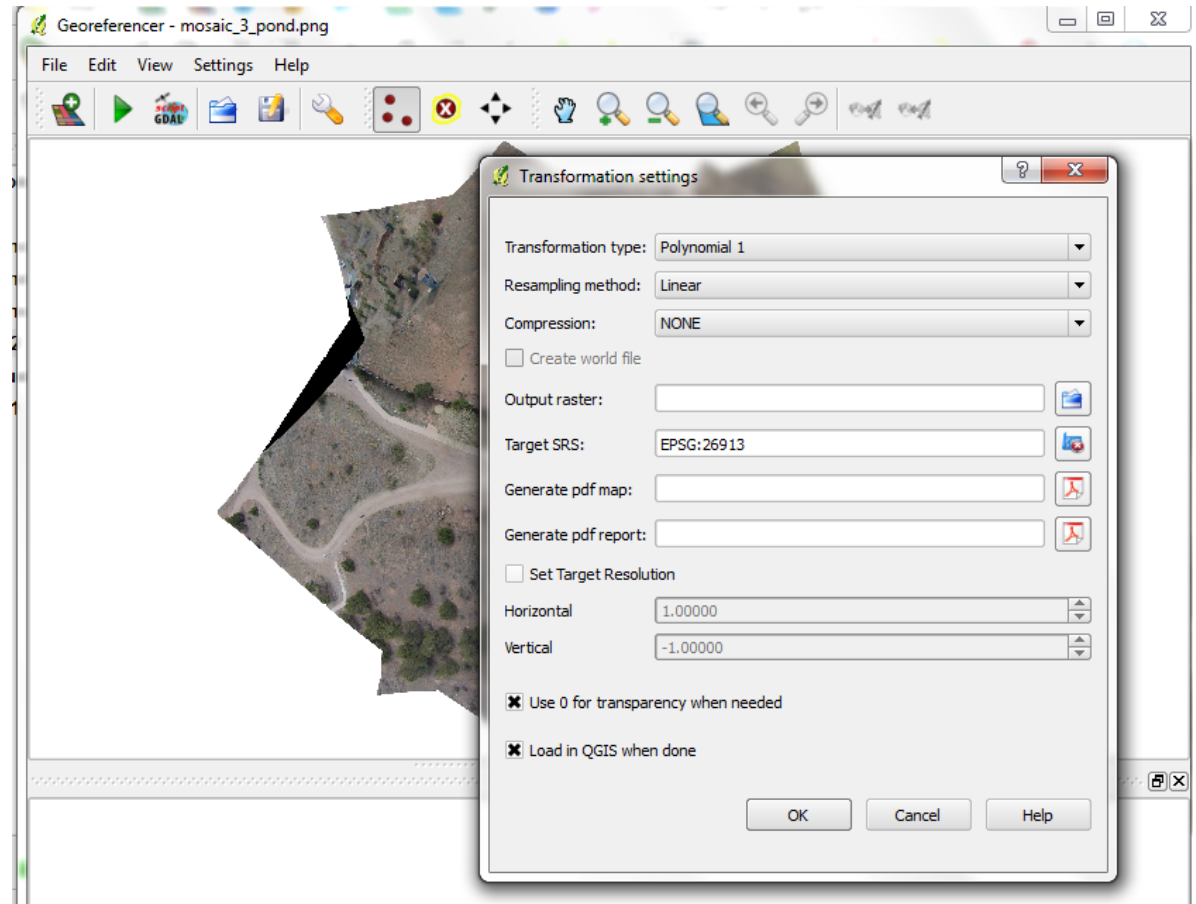
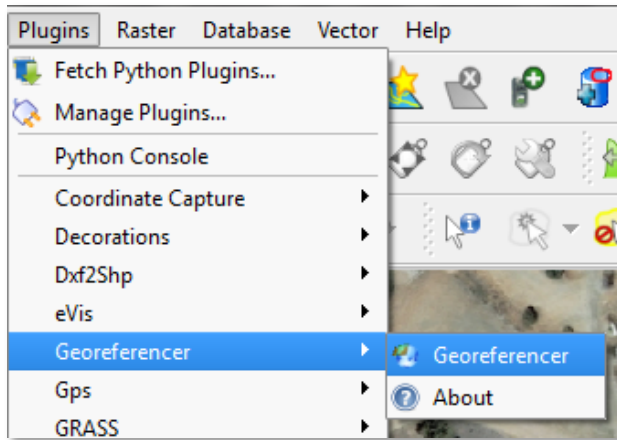
### 3. Quantum GIS was used to georeference the mosaic

- Obtained high resolution orthoimagery of the area from the USGS website





# Georeference plugin in Quantum GIS



I selected 3 or 4 control points to locate, rotate and size (approximate scale) the image.

The screenshot shows the Georeferencer software interface. The main window displays a mosaic image of a pond area with three red control points (GCPs) marked. A tooltip 'Add point' is visible over the image. The GCP table below the image shows the following data:

on/off	id	srcX	srcY	dstX	dstY	dX[pixels]	dY[pixels]	res
<input checked="" type="checkbox"/>	0	2002.33	2176.37	390355.01	3881753.24	0.00	-0.00	
<input checked="" type="checkbox"/>	1	2204.88	1865.43	390345.46	3881752.90	-0.00	-0.00	
<input checked="" type="checkbox"/>	2	1416.59	1887.33	390358.13	3881735.08	-0.00	-0.00	

The status bar at the bottom indicates the transform used is 'Polynomial 1' with a mean error of 0 and a resolution of 2049,-1556.

April 22, 2012

March 2010



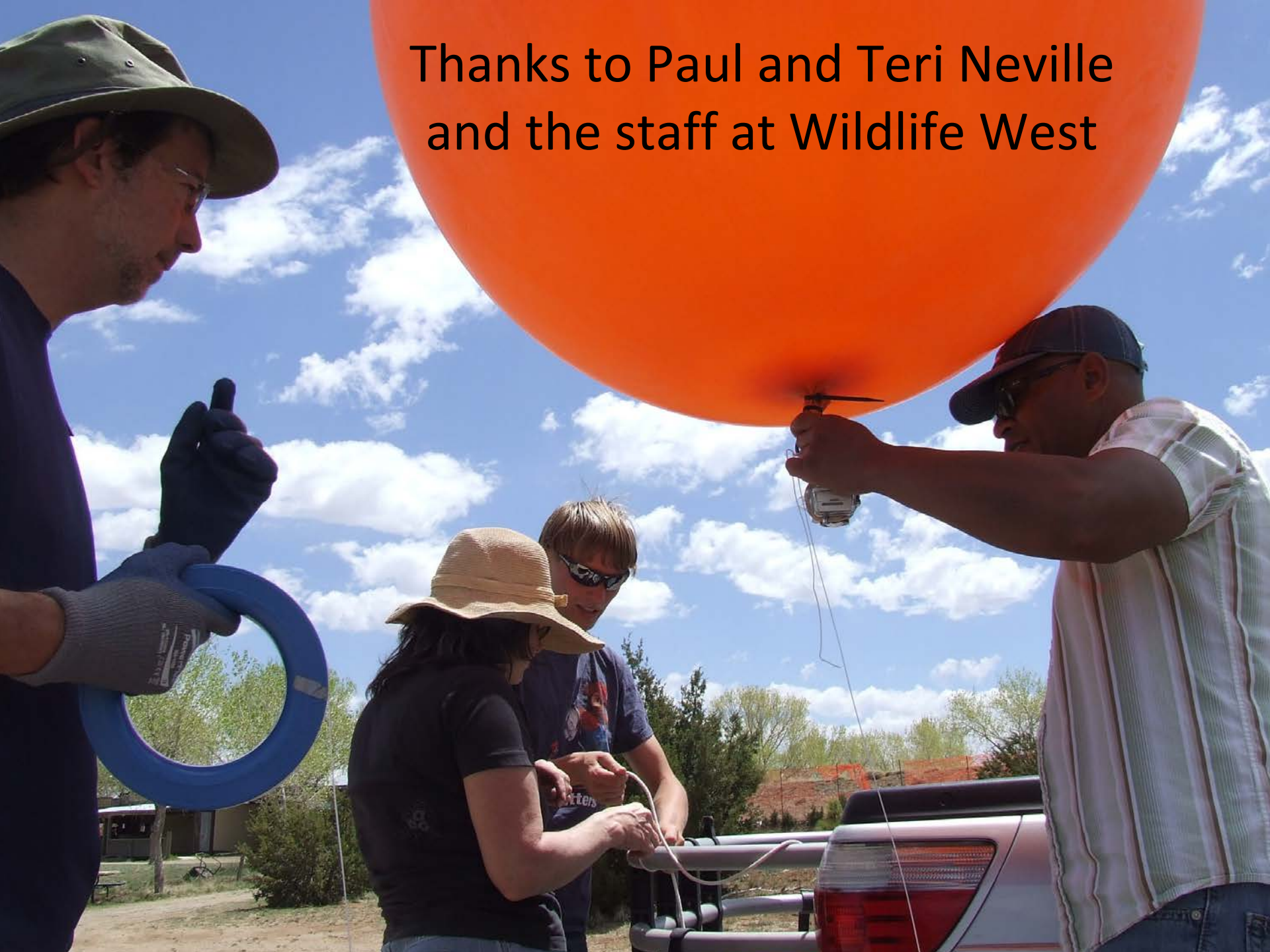




This mosaic was geocorrected in Quantum GIS without lens correction in PTL Lens.



Thanks to Paul and Teri Neville  
and the staff at Wildlife West





# Questions





