REMINDERS
NEVER HESITATE TO ASK FOR HELP AND
DON’T FORGET ABOUT THE TUTORIAL VIDEOS!

Knife Safety
1. pay undivided attention to your knife work
2. don’t hold what you are cutting, place it on a solid surface
3. cut away from your body
4. make sure all body parts (yours and others) are out of the way of the blade’s bath
5. DO NOT CUT WITHOUT SUPERVISION
6. there will be ZERO TOLERANCE for unsafe knife use
7. if you do not feel comfortable using a knife, just ask a supervisor
8. always cover the knife after you finish using it
9. don’t leave a unused blade exposed
10. sketch the line of incision before cutting

Field Materials
1. pencil/pen
2. writing surface (binder, clipboard, etc.)
3. materials to take down observations (provided packets, notebook, etc.)
4. Sun protection gear (sunglasses, sunscreen, hat, etc.)
5. refreshments

Camera Materials
1. camera with continuous shot (make sure to test)
2. batteries (and even an extra set)
3. memory card (4GB gives you approx. 35 minutes of continuous shooting)
4. 20 #64 latex free rubber bands to make the rubber band harness
5. camera housing
6. scissors
7. x-acto knife (optional)
8. packing or duct tape (it is helpful if the tape is resealable)
9. permeant marker
10. hot glue (optional)
11. device to watch tutorial videos on (internet is necessary)
12. 2 liter soda bottle

Balloon Materials
1. weather balloon
2. line winder (8” or 9”)
3. work gloves
4. carabiner (minimum of 2)
5. cable ties
6. swivel clips (minimum of 3)
7. attachment ring (1.25”)
8. cable ties
9. helium
10. mooring weight (optional)
11. 1000+ feet of line

Filling the Balloon
1. start inflating slowly
2. close nozzle tightly
3. let the balloon rise as fest as you can

Don’t Forget
4. CHECK ALL KNOTS
5. test camera (check batteries and memory card)
6. check your camera settings (continuous shot and infinity)
7. wear gloves (rope burns are not fun)
8. watch out for hazards (trees, buildings, power lines, etc.)
9. don’t stand still when collecting footage
10. the more you walk around, the larger area you can map
11. a map of the area you're mapping
12. trash bags (2 or more)
13. cotton string (optional)

Finishing Up:
1. knit your images to form a map
2. share your map with the world

MOST OF ALL, HAVE FUN!!!

note: some of the materials and supplies may be included in the provided kit.
An Illustrated Guide to
Grassroots Mapping with
Balloons and Kites v. 2.2

To see all the latest contributions and video instructions, visit
//publiclaboratory.org/tool/balloon-mapping

Do you want to make maps? Do you need satellite images but can’t afford them? Do you want to see your home from above?

Follow these instructions and you can, for as little as $100!

This work is licensed under a Creative Commons Attribution ShareAlike 3.0 License.
Choose and prepare your camera

for all options, see: http://publiclaboratory.org/wiki/camera-trigger

Any digital camera around 2-300 grams that has a 'continuous mode' can work. You can also use a Canon camera with the CHDK to trigger a photo every 5 seconds.

![Camera diagram](image)

In 'Continuous Mode' a camera takes a picture every 1 second if the trigger is held down. Your display will show how many pictures you can take on your card.

Balloons or kites?

Decide whether to use a balloon or kite based on local wind conditions. While kites are cheaper, they're harder to fly, and you may have to prepare for both:

- Balloons:
  - In <10 kph wind.
- Kites:
  - In more than that. Look at flags to decide.

Build a camera capsule

up to date: http://publiclaboratory.org/wiki/pet-bottle-rubber-band-rig

This simple protective cover stops your lens from hitting the ground, and protects your camera from hitting walls and trees.

![Camera capsule diagram](image)

Cut a soda bottle in half and put the camera inside the top with the loop through the bottle neck. Be sure the camera lens is protected even when it's extended!

Use the rest of the bottle to make 'wings' to stabilize it in the wind. Cut strips and crease them to keep them straight.

This will keep your camera from spinning, which blurs the photos.

Fold a 1 meter loop of string and tape it firmly onto your camera. Be sure the tape doesn't stop the lens from extending.

Press the tape down hard - it's the only thing keeping your camera from slipping out of the string at 500 meters high!
Set up your camera to auto-trigger

Set your camera on continuous mode. Wrap a bit of card paper or use a pencil eraser to hold down the camera trigger. A small knot works very well. Use a rubber band to hold it in place and apply pressure. Be sure the button is being pressed - you may have to double or triple the band up.

Move the rubber band to one side until you're ready to start.

You can add a second loop or a rubber band and hook it on the bottom of the bottle to hold the camera firmly against the top.

Even better, put the cap on over the string when the camera is snugly in place, trapping the string.

Prepare and fill your balloon

1.5 meter wide weather balloons work best, but if you can't get one, you can make one from plastic. You can use several giant trash bags, but they won't stay inflated for more than an hour - mylar or PET plastic is far more airtight.

Where available, mylar sleeping bags can be taped shut and will stay filled for several days, unlike weather balloons. Two of these are enough to lift a typical camera.

Test your valve first by letting some helium out with nothing attached. Then put your balloon on and slowly inflate it.

Someone should be in charge of not letting the balloon touch trees, bushes, or the ground.
Balloon Mapping
Quick Start Guide

Filling, closing, and mooring your balloon

1) Tie string to a carabiner with double overhand knot (see upper right box).

2) Tie the other end (5ft or so) to something heavy like a 1 gallon jug full of water -- so your balloon won't fly away as you're working.

3) Tie the clip swivel to the reel of kite string with the same knot.

Fill slowly, gushing helium can rip your balloon and make the tank dangerously cold.

3) When done filling, push helium out of the neck and close with a cable tie just below the balloon.

4) Release nozzle cable tie.

5) Fold the neck over onto itself and around the ring. Attach two more cable ties and pull tight.

6) Attach ring to the mooring point.

Test the valve, and lay the tank on the ground. Attach the regulator if one came with your tank (not pictured).

1) Pull the balloon neck through the ring.

2) Cable tie the balloon to the helium tank. The balloon neck may need to be folded and squeezed tight. Continue holding on to your balloon.
Balloon Mapping Quick Start Guide

Safely launching your balloon and camera

Look around you!
Check tree tops, flag poles, clouds. Which way is the wind going on the ground? At tree level? Above in the sky? What obstacles will come up as you launch? Will the balloon change direction while rising? Check again on your satellite map - how far away are those trees, really?

Be safe and responsible
Check that you are five miles or more away from the nearest airport. Otherwise, speak with the airport about sending a "Notice to Airmen". Print out satellite imagery of where you'll be mapping (Google, USGS, etc) to help in planning.

Do a test flight first, without a camera: reel out, then reel in, with about a hundred feet of string.

Attach your camera
Make a temporary loop by tying an overhand knot on a loop on the string below the balloon:

A. Slacken the line below the balloon & gather a loop in your hand
B. Loop it around & through itself and pull taut; attach your camera!

Be aware of others' privacy
Make sure to talk to your neighbors first. Maybe they'll want to help!

Get to know what time of day it's windy and plan around it!
Stay away from power lines!
Weather balloon

*This drawing is not to scale!
Field Notes: Balloon Mapping
Part 1

Observations on the camera cage?

Observations on the set up?

Critique?
Field Notes: Balloon Mapping
Part 2

Where?

Weather? (temperature, clouds, visibility, etc.)

When?

Observations?
Field Notes: Balloon Mapping
Part 3

Observations?
Field Notes: Balloon Mapping
Looking Back

Thank you for taking part in our workshop! We hope you enjoyed it. Please use the space below for feedback on our program! All thoughts will be graciously accepted! If you do not feel comfortable sharing your name, just scrub it out!

Comment? Compliments? Critique?