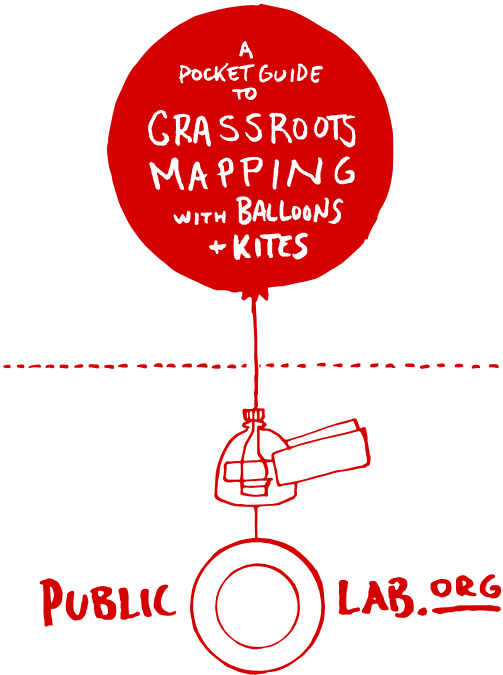


stamp
here

Public Lab
55 Cromwell St 1D
Providence, RI 029
USA



<i>Date:</i>	<i>Location:</i>
	<i>Lat:</i> <i>Lon:</i>
<i>Collaborators:</i>	<i>Conditions:</i>
	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: center;"> $\begin{matrix} N \\ W & E \\ S \end{matrix}$ </div> <div><i>Windspeed:</i></div> </div>
<i>Question you hope to answer:</i>	
<i>What went wrong:</i>	
<i>What went right:</i>	
<i>No. times flown:</i>	<i>Est. flight altitude:</i>

Choose a launch site

When selecting a place to fly from, you'll have to be upwind of the site you want to map.

With your group, look over a map or drawing of your site, and visit the site ahead of time to scout for power lines, trees, or other obstacles, and get a sense of the wind.

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" or NOTAM. Bring an existing map, and/or print out satellite imagery of where you'll be mapping (Google, USGS, etc) to help in planning.

Consider privacy and safety

With a kite or balloon, you're going to meet people where you're mapping. If it's your own neighborhood, great -- you'll meet your neighbors. Either way, expect to talk with people about what you're doing. If you're mapping a pollution site, you may meet the people responsible for polluting. Be prepared and be thoughtful!

by the Public Lab community

Help write this booklet

*This book is a working draft; **we invite you to help expand it, add to it, bring it up to date.***

Let's try to keep it focused on "for first timers" -- but we can link to lots of activities on the website for more advanced techniques!

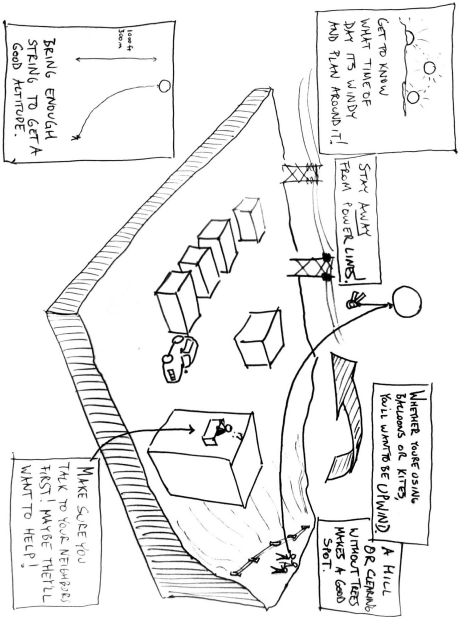
We welcome:

- 1. Corrections and edits
- 2. Additions: provide new text suggestions in comments, for either (please specify)
 - a. Guidance and support for new mappers
 - b. Advanced tips and tricks
- 3. New diagrams or requests for diagrams (line drawings only)
- 4. New sections (thought we may run a subset in print depending on costs)

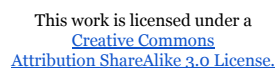
Give it a read over and add your stuff! The layout and design will change.

Improve this guide!

Proposed change to improve this booklet! Cut out this page and mail it.	Your name/attribution line:
Page # or section:	[] addition [] correction [] change/update
Changes/proposed text/drawings:	



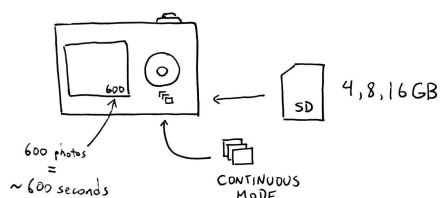
Logbook



To edit this booklet for the next printing, see:

Add your name here

<i>Date:</i>	<i>Location:</i>
	<i>Lat:</i> <i>Lon:</i>
<i>Collaborators:</i>	<i>Conditions:</i>
	$\begin{matrix} & N \\ W & E \\ & S \end{matrix}$ <i>Windspeed:</i>
<i>Question you hope to answer:</i>	
<i>What went wrong:</i>	
<i>What went right:</i>	
<i>No. times flown:</i>	<i>Est. flight altitude:</i>



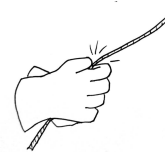
Any digital camera around 2-300 grams that has a 'continuous shooting mode' can work. You can also use a Canon camera with the CHDK to trigger a photo every 5 seconds.

To fly longer, you may need a newer battery, a larger memory card, or you can set your camera to a lower resolution. An 8 GB card fills up in about 45 minutes, depending on how fast your camera is shooting (every 2-5 seconds is ideal).



Wind the string carefully - don't let it tangle! If it's bad enough you'll have to throw it out.

A second person just to wind the string can be very helpful.

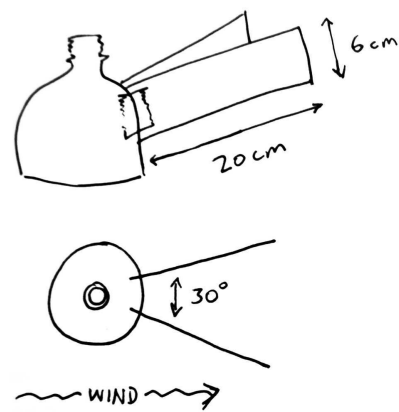


Always wear gloves to prevent string burns!

Don't fly near power lines or in thunderstorms.

Table of Contents

Checklist for a day of mapping	4
Materials list	5
What to do in different wind conditions	6
Working with a group	7
Mapping together	8
Balancing learning with getting images	8
Choosing your launch site and time	8
Choose a launch site	9
Be safe and responsible	9
Consider privacy and safety	9
Rigging a camera & preparing to fly	10
Choose and prepare your camera	10
Build a camera capsule	11
Set up your camera to auto-trigger	12
Build a string or rubber band harness	12
Choose and prepare a balloon	14
Preparing to launch	14
Check the local wind conditions	15
Balloons or kites?	15
Filling, closing, and mooring your balloon	16
Build a mooring weight	16

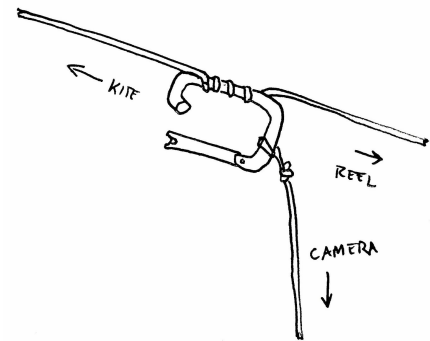


Use the rest of the bottle to make 'wings' to stabilize it in the wind. Cut strips and crease them to keep them straight.

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

Date:	Location:
	Lat: Lon:
Collaborators:	Conditions:
	N W E Windspeed: S
Question you hope to answer:	
What went wrong:	
What went right:	
No. times flown:	Est. flight altitude:

you loop the string around it 5 times or more:



Checklist for a day of mapping

- ☐ invite people to join in!
- ☐ kite or balloon
- ☐ string
- ☐ camera
- ☐ gloves
- ☐ water
- ☐ sunscreen and/or hat if it's sunny out
- ☐ charge your camera batteries the night before
- ☐ memory cards + readers
- ☐ bag to carry everything

Also useful:

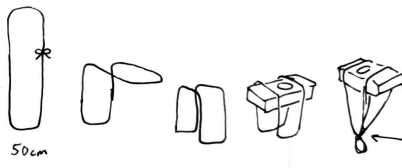
- ☐ 2nd camera to document your process
- ☐ printed out map of your site
- ☐ laptop to look at images
- ☐ snacks

Date:	Location:	
	Lat:	Lon:
Collaborators:	Conditions:	
	<div style="display: flex; justify-content: space-around;"> <div> <i>N</i> <i>W</i> <i>E</i> <i>S</i> </div> <div>Windspeed:</div> </div>	
Question you hope to answer:		
What went wrong:		
What went right:		
No. times flown:	Est. flight altitude:	

Build a string or rubber band harness

Smaller Go-Pro type cameras are light enough that this full harness may not be as necessary, but the design is adaptable to a range of cameras, large and small.

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.

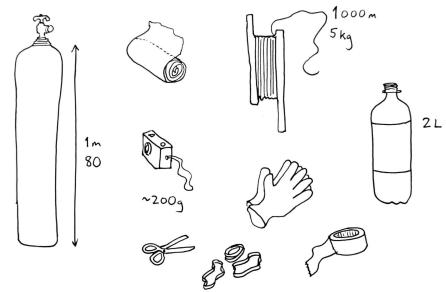


Press the tape down hard - it's the only thing keeping your camera from slipping out of the string at 500 meters high!

Attach the string

Use a fishing swivel clip or a small carabiner to attach your string to your balloon or kite so it can be unclipped quickly. A swivel, which lets the string twist freely, can be really important to prevent your string from twisting too much -- especially with kites, where this can make your kite dip to one side.

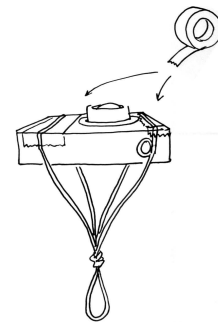
<i>Date:</i>	<i>Location:</i>	
	<i>Lat:</i>	<i>Lon:</i>
<i>Collaborators:</i>	<i>Conditions:</i>	
	<div style="display: flex; justify-content: space-around;"> <div> <i>N</i> <i>W</i> <i>E</i> <i>S</i> </div> <div> <i>Windspeed:</i> </div> </div>	
<i>Question you hope to answer:</i>		
<i>What went wrong:</i>		
<i>What went right:</i>		
<i>No. times flown:</i>	<i>Est. flight altitude:</i>	



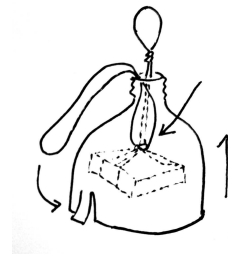
Materials list

- Plastic soda bottle
- Scissors
- <300g digital camera with continuous shooting mode (such as a Canon PowerShot)
- 4GB or larger memory card
- Cloth or leather work gloves
- Duct or gaffers tape
- Rubber bands, carabiner, velcro strip

Flying your balloon or kite



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.



Balloon Mapping

- 300-1000m 50lb/25kg strength nylon string for balloons (or dacron kite string)
- One 2 meter-wide weather balloon or 5.5ft chloroprene "cloudbuster" balloon. (Chloroprene is more durable) OR or 2-3 x 84" mylar sleeping bags
- 80 cubic feet or 1.5 cu. meters of helium

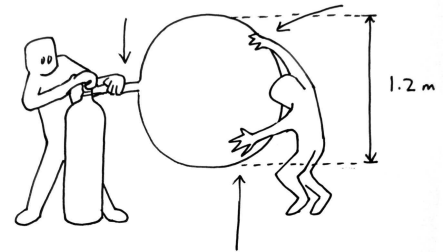
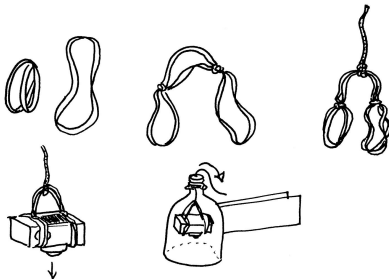
Kite Mapping

- a large kite - 1 square meter or more
- 100lb/50kg+ strength nylon/polyester string for kites
- a kite tail - 10-20ft/3-6m
- earplugs may help in higher wind!

Date:	Location:	
	Lat:	Lon:
Collaborators:	Conditions:	
	N W E S	Windspeed:
Question you hope to answer:		
What went wrong:		
What went right:		
No. times flown:	Est. flight altitude:	

If you're using string, you can put the cap on over the string when the camera is snugly in place, trapping the string.

Rubber band harnesses can help reduce tape, which gums up your camera, and are a bit more flexible. Chaining rubber bands and doubling them up lets you build flexible harness that'll fit different cameras and bottles. They also hold the camera snugly against the bottle.



Someone should be in charge of not letting the balloon touch trees, bushes, or the ground. Three people (two for the balloon, one for the tank) makes a good team!

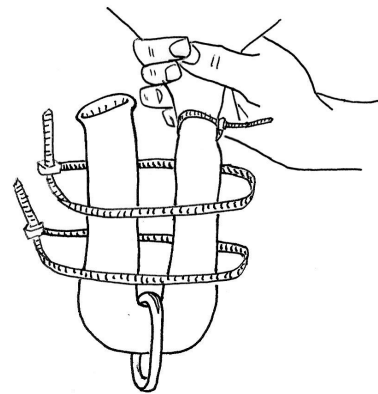
What to do in different wind conditions

Wind speed	How to tell from your surroundings	How to fly a camera in these conditions
0-3 mph / 0-5kph	Flags hang limp; leaves on tops of trees are still	Mini balloons (36 inch mylar, mylar sleeping bag) or 5.5 foot rubber balloons
3-5 mph / 5-8kph	Flags flutter but do not fully extend, treetops and leaves stir	Rokaku and large (9 foot) delta (basic triangular) kites. 5.5 foot rubber balloons, or mini balloons if doubled/tripled, but balloons increasingly difficult to fly..

Date:	Location:	
	Lat:	Lon:
Collaborators:	Conditions:	
	N W E S	Windspeed:
Question you hope to answer:		
What went wrong:		
What went right:		
No. times flown:	Est. flight altitude:	

Preparing to launch

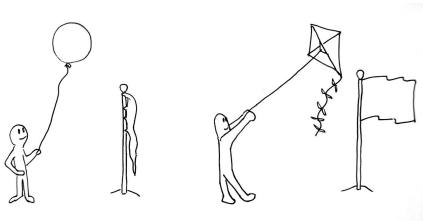
4. Remove the balloon neck from the helium tank, but BE CAREFUL not to release it -- it'll fly away!



5. Fold the neck over onto itself (twisting it twice) and around the ring. Tightly wrap with a velcro strip or two zip ties and pull tight.

Working with a group

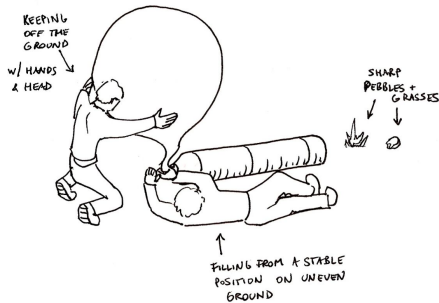
Date:	Location:
	Lat: Lon:
Collaborators:	Conditions:
	N W E Windspeed: S
Question you hope to answer:	
What went wrong:	
What went right:	
No. times flown:	Est. flight altitude:



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 <10kph wind; kites in more than that. Look at flags to decide. Also see the **Wind Conditions** section for more.



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

Fill your balloon

If you're having trouble keeping the tank stable, lay the tank on the ground (upright is fine on pavement or even ground).

For larger rubber balloons, a large rubber O-ring or large carabiner can make a good clipping point for your string, so we'll seal the balloon and wrap the neck around this ring.

1. Pull the balloon neck through the ring.

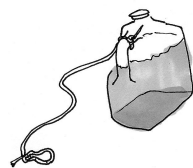
Choosing your launch site and time

Date:	Location:	
	Lat:	Lon:
Collaborators:	Conditions:	
	<div>N</div> <div>W E</div> <div>S</div>	Windspeed:
Question you hope to answer:		
<div>What went wrong:</div> <div>What went right:</div>		
No. times flown:	Est. flight altitude:	

Build a mooring weight

A mooring weight can help you set aside a filled balloon in a safe place while you get other things ready.

1. Tie string to a carabiner with double overhand knot (see diagram).
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.



Use a bottle as a mooring point

Double overhand knot

