

Photo Point Monitoring

Using Technology in Field Investigations
to Monitor Change Over Time



A Project of the Association of Fish and Wildlife Agencies'
North American Conservation Education Strategy;
Developed by the Pacific Education Institute

Funded by a Multistate Grant of the
Sport Fish and Wildlife Restoration Program

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Photo Point Monitoring: Using Technology in Field Investigations to Monitor Change Over Time



Developed By
Pacific Education Institute
Margaret Tudor, Ph.D.
Lynne Ferguson
Co-Executive Directors



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North American
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Strategy



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Author - 2015

Kristen Bates, Science Cadre Member
North Central Educational Service District, Wenatchee, WA

Preface

The “Photo Point Monitoring: Using Technology in Field Investigations to Monitor Change Over Time” guide is intended to provide formal and informal educators a tool to bring technology into outdoor experiences and field investigations. This technological component provides youth with opportunities to enhance their experiences outdoors by providing tools to explore, gather information and communicate/share with their school and communities. In addition, it provides students’ experience with a tool that is frequently used by natural resource professionals to describe current conditions, monitor the effectiveness of management practices, document abnormal events and investigate perceived problems.

The Association of Fish and Wildlife Agencies (AFWA) engaged the Pacific Education Institute (PEI) to provide this guide to meet the specific objectives of the overall Conservation Education Strategy which focuses on the “Expansion and Coordination of State Agencies’ Fish and Wildlife-related Recreation Initiation Programs Using Community-based, Crossover Outdoor Skills Models”. This guide is in support of AFWA’s ongoing efforts to keep fish and wildlife science and natural resource management on the leading edge of the national Science, Technology, Engineering and Math (STEM) focus.

Margaret Tudor, Ph.D.
Executive Director
Pacific Education Institute

Acknowledgements

Education should prepare both students and the public to understand the natural resources on which we all depend. It should also provide opportunities for students and other citizen scientists to investigate natural resource concerns and make meaningful contributions to our understanding of the natural environment. For its creation and publication, we would like to acknowledge the North Central Education Service District located in Wenatchee, Washington for the expertise of their staff and the Washington State Department of Fish and Wildlife, Lands Division for their support and advice.



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Introduction

Photo Point Monitoring: Using Technology in Field Investigations to Monitor Change Over Time

About This Document

We live in an ever changing world where balancing natural, political and industrial needs is delicate but necessary. Monitoring change helps us to formulate hypotheses to solve difficult answers in a complex world. It allows us to look back in time to see our successes, where we might have done better, and how far we have come.

The authors hope that through this document formal and informal educators will find value in integrating technology with scientific, conservation and observation skills learned through tracking, recording and evaluating change over time through the years, thus creating a history that will be useful to future citizens.

The sites below provide additional information on photo point monitoring procedures.

http://www.fs.fed.us/eng/rsac/invasivespecies/documents/Photopoint_monitoring.pdf

http://www.oregon.gov/oweb/docs/pubs/photopoint_monitoring_doc_july2007.pdf

<http://www.bia.gov/cs/groups/xnifc/documents/text/idc012476.pdf>

http://www.blm.gov/pgdata/etc/medialib/blm/id/rangeland_management.Par.91560.File.dat/ISDA%20BLM%20Monitoring%20MOU.pdf

<https://extension.usu.edu/utahwaterwatch/htm/tier-1/photo-point-monitoring/>

http://wdfw.wa.gov/conservation/research/projects/wla_monitoring/scatter_creek/

Learning Objectives

Within the framework of this document you will be able to:

1. Establish and record photo points for repeat photography
2. Use GPS, compass, Apps and digital camera to perform repeat photography
3. Have two options for storing and sharing photograph comparisons
4. Plan and implement a safe, high quality field project

Educator information:

Educators both formal (certificated) and informal (natural resource community education) learn the skills needed to establish, conduct, and instruct in photo point monitoring using different types of technology. Those skills can be transferred to citizen science projects with a Natural Resource or Fish and Wildlife Agency. These projects provide students with Science, Technology, Engineering, and Math (STEM) experiences in the natural world using a Project Based Learning model. They will also have the skills to establish and carry out their own photo point monitoring.

Citizen Scientist information:

Citizen Scientists learn skills they can use to contribute to the knowledge base of state fish and wildlife agencies, natural resource agencies, non-governmental conservation organizations, national projects such as i-Naturalist, Bumble Bee Watch, Monarch Butterfly monitoring, and Bird Watch.

Some agencies require additional protocol-specific training while others work through apps on your smart phone. All information if acquired and reported accurately is valuable and adds another dimension to classes as well as week-end hikes and camping trips:

Standards Addressed

NGSS (Next Generation Science Standards)

Science and Engineering Practices, “8. Obtaining, evaluating, and communicating information” (National Research Council, 2012 p 84)

Photo Point monitoring and field investigations can utilize any or all of the crosscutting concepts addressed both in the Framework document as well as the Next Generation Science Standards.

How are field investigations different from controlled laboratory experiments?

Classroom science often overemphasizes experimental investigation in which students actively manipulate variables and control conditions. Experiments begin with a hypothesis regarding links between variables in a system followed by identifying those variables of interest and designing a “fair test” where the variables are manipulated, controlled and measured to gather evidence to construct an explanation or solve a problem.

Investigations in the natural world where it is difficult to manipulate variables and maintain “control” and “experimental” groups scientists look for descriptive, comparative, or correlative trends in events. Many field investigations begin with gathering baseline data followed by measurements intentionally taken in various locations (e.g. urban and rural, or where some natural phenomenon has created different plot conditions) because of a prediction that differences will occur.

SEVEN CROSSCUTTING CONCEPTS OF THE FRAMEWORK

The committee identified seven crosscutting scientific and engineering concepts:

1. Patterns. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.
2. Cause and effect: Mechanism and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.
3. Scale, proportion, and quantity. In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance.
4. Systems and system models. Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.
5. Energy and matter: Flows, cycles, and conservation. Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems’ possibilities and limitations.
6. Structure and function. The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.
7. Stability and change. For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.

For additional information and a free download of the entire book:

<http://www.nap.edu/catalog/13165/a-framework-for-k-12-science-education-practices-crosscutting-concepts>



Incorporate technology in multiple ways with photo point monitoring

Just like comparing school pictures taken every year we can observe changes in a child's features. Dentists assess yearly x-rays of teeth to evaluate any changes to the health of teeth, doctors request blood tests routinely to compare body chemistry for early identification of health problems not seen with the human eye. Likewise, fish and wildlife professionals use repeat photography to compare and identify changes in an ecosystem over spans of time, e.g. annually or bi-annually.

The practice of taking pictures in the same location at about the same time of day, at regular intervals (days, weeks, months, years...) is known as photo point monitoring or repeat photography. Photo point monitoring is a fairly simple way to track changes but utilizes a variety of technology in the performance and recording.

See examples of photos below and compare. Although information can be gleaned from close observation of photos notice the quality and view differences of area and horizon line. The baseline photo was taken by a fish and wildlife scientist while subsequent ones were taken by middle school students with i-Pads and cameras.

Repeat pictures should be as near duplicating the original photograph as possible.



See complete burn of area with surviving Ponderosa Pine trees. Baseline Photo-2010.



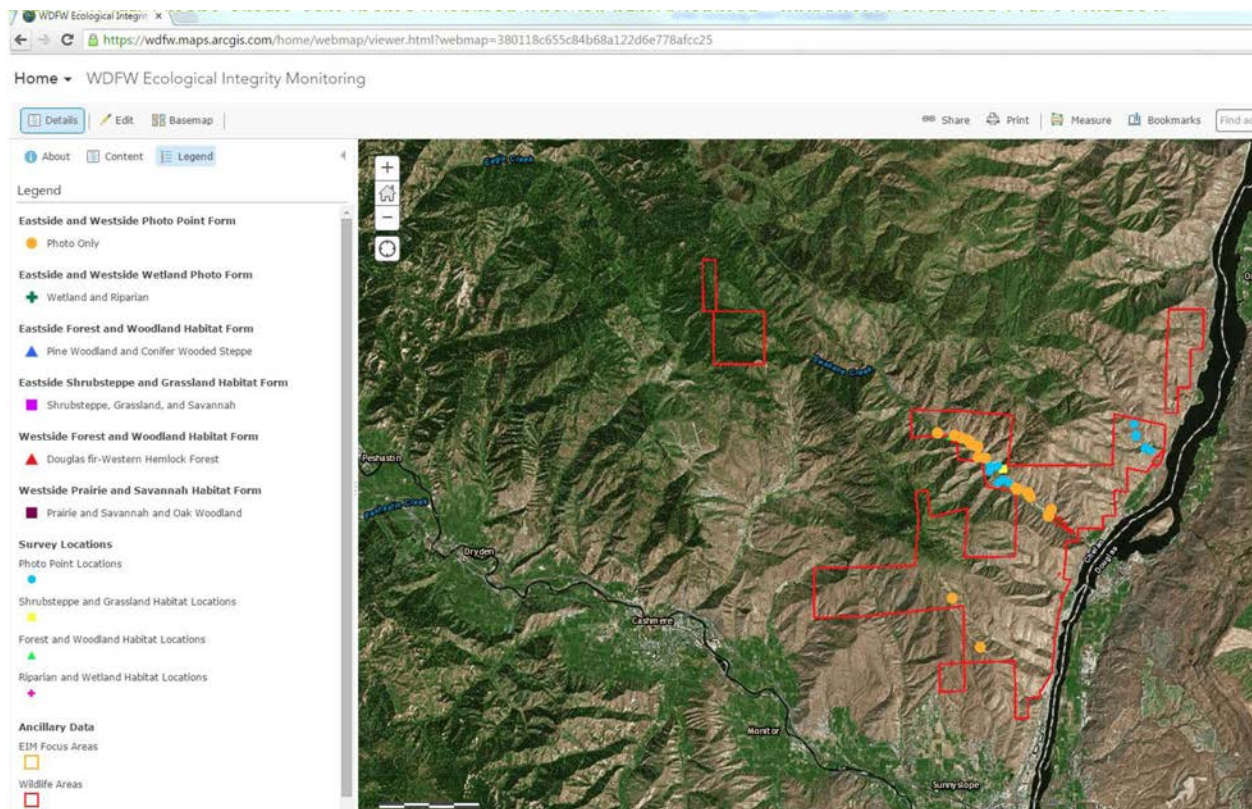
Notice the tree in drainage area, photo taken in May 2014



Compare photographs of same location and see that the same tree has fallen since the 2014 picture. Photo taken in May 2015.



Overview of Monitoring Area



Chapter 1

Become Familiar Using Technology: GPS, Compass, APP, and Digital Camera

Technology is a boon to Natural Resource professionals and amateurs with GPS units and APPs for smart phones but the final word on digital is to always back it up with analog (map and compass) Satellites may not always be visible to your devices due to trees, big rocks, or buildings but a magnetic compass is nearly always reliable.



GPS (Global Positioning System)

“...is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use.”

<http://www8.garmin.com/aboutGPS/>

GPS units are ground receivers for satellite signals and can provide Latitude and Longitude or Universal Transverse Mercator projection (UTM) coordinates depending on how you have set your unit or app. UTM coordinates provide a more precise location due the grid established. UTM coordinates are read in Easting and Northing. We will use a Garmin eTrex 20 as a typical GPS unit.



Step 1. Power on by pressing light key then wait for satellites to triangulate with unit. This can take several minutes if unit has not been on for some time. You can look through main menu and select “Satellite” option to see how many satellites are picking up your unit. (Figure 1).

Step 2. Mark Waypoints to establish your own Photo Points. Select “Mark Waypoint” by using Thumb Stick to navigate the menu then press straight down to select option. A form will appear with a default way point number and a location. You can change the number by selecting the box next to the flag in upper left hand corner of form and add any notes in the “Note” box. (Figure 2).



Figure 2

Figure 3

Step 3. Scroll through list to find your **waypoint**, select with thumb stick to see details or select “Go” to see navigation. (Figure 3).

Step 4. Follow route to photo point or use description depending on your location and terrain.

Many videos and websites are available for greater in-depth information on using GPS units. Some are listed below and many more can found through a simple web search or reading your owner’s manual.

http://your state agencies and non-profit organizations.wa.gov/conservation/research/projects/wla_monitoring/resourc es/20140502-LoadingGPXFiles_Garmin_eTrex20.pdf

http://www.lowergear.com/advice.php/content/how_to_use_gps-enter_coordinate

<http://www.rei.com/learn/expert-advice/gps-receiver-howto.html#>



Compass

Main use to align repeat photos with baseline photographs.
(Figure 4). Front of compass.

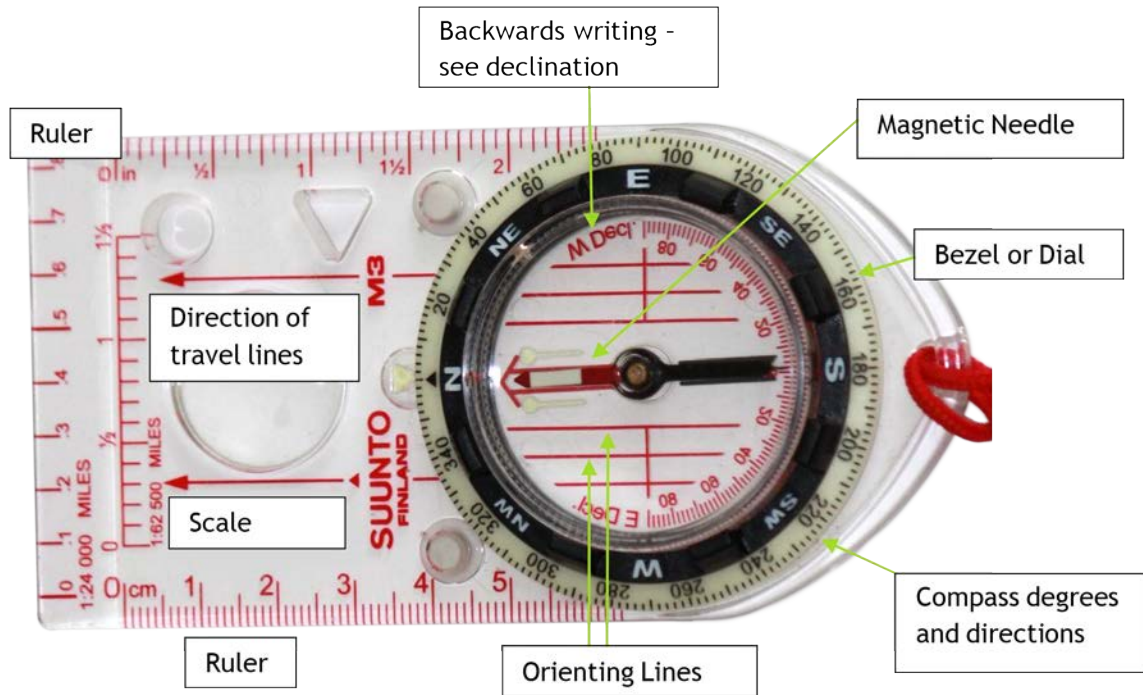


Figure 4

True North vs. Magnetic North

“What is North?”

No, this is not a silly question, there are two types of north.

True North: (also known as Geographic North or Map North - marked as H on a topographic map) is the geographic North Pole where all longitude lines meet. All maps are laid out with true north directly at the top. Unfortunately for the wilderness traveler, true north is not at the same point on the earth as the magnetic North Pole which is where your compass points.

Magnetic North: Think of the earth as a giant magnet (it is actually). The shape of the earth's magnetic field is roughly the same shape as the field of a bar magnet.

However, the earth's magnetic field is inclined at about 11° from the axis of rotation of the earth, so this means that the earth's magnetic pole doesn't correspond to the Geographic North Pole and because the earth's core is molten, the magnetic field is always shifting slightly. The red end of your compass needle is magnetized and wherever you are, the earth's magnetic field causes the needle to rotate until it lies in the same direction as the earth's magnetic field. This is magnetic north (marked as MN on a topographic map). If you locate yourself at any point in the U.S., your compass will orient itself parallel to the lines of magnetic force in that area.” <http://www.bsatroop780.org/skills/Orienteering.html>

In North Central Washington we are currently 15.34 degrees east of true north which means we either do the math or adjust the declination on our compasses. In order to find your declination use this link to www.ngdc.noaa.gov or web search “calculate declination.” NOAA simply needs a location in the form of zip code or community to find your approximate Longitude/Latitude then select calculate and you will have current declination for your area with a map.

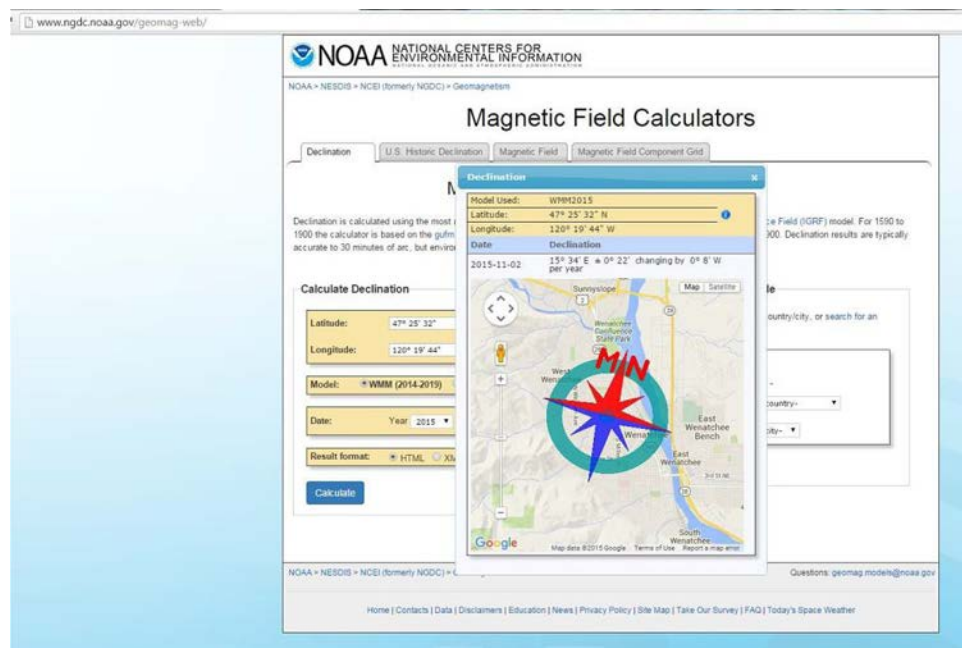
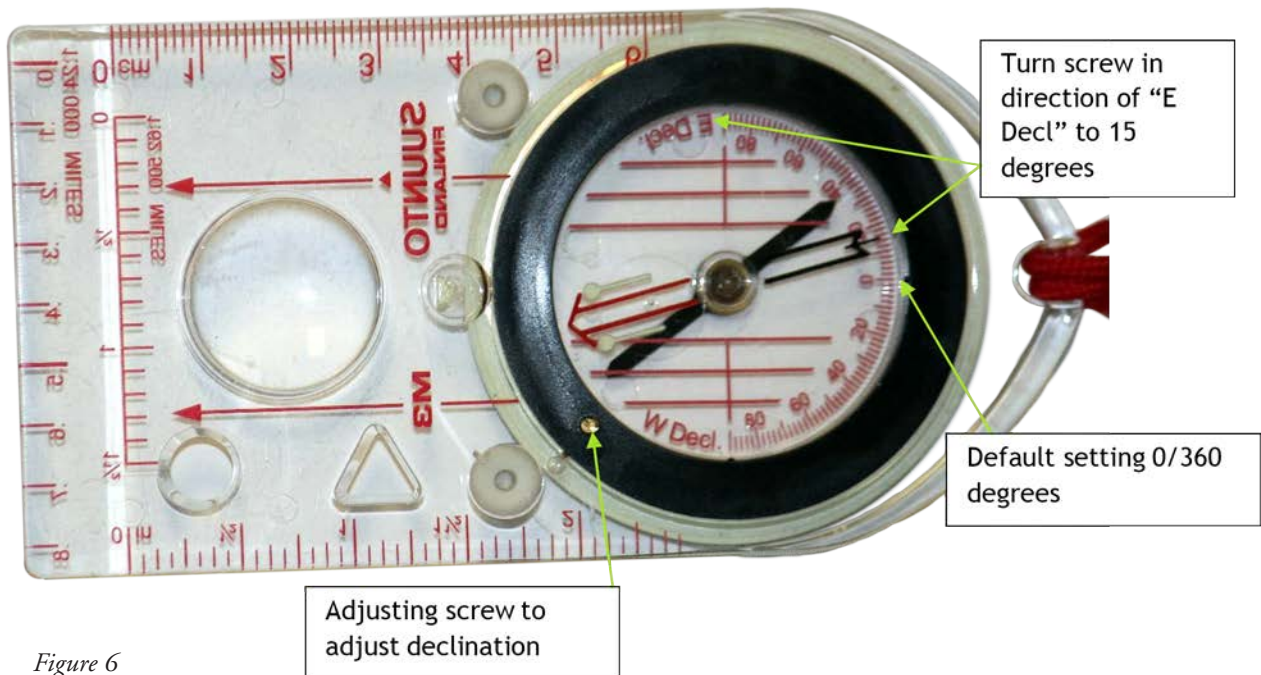


Figure 5

- You can “do the math.”

If the declination is 15.34 East you would subtract 15ish from your compass angle. A baseline photo taken at a 90/degree compass direction or due east from true north, would be $90 - 15 = 75$ from magnetic north. This is very helpful in aligning geographic landmarks to the original photo especially if the terrain does not have significant features.

- **The other option** is resetting the declination if you have a compass with adjustable declination. (Figure 6). Back of compass.



See any of the following websites for more information on “compass how to.”

<http://www.bsatroop780.org/skills/files/Orienteering.pdf>

<http://www.bsatroop780.org/skills/Orienteering.html>

<http://www.compassdude.com/compass-reading.php>

Smart Phone Apps

Because there are many varieties of smart phones and even more types of apps for them the focus here is to show one with links to their web site and to some of their “how to” videos. GPS Essentials is for Android phones and includes a dashboard that you can build to fit your own needs. (Figure 7)

<https://www.youtube.com/watch?v=oNJJPeoG8lQ>

<https://www.youtube.com/user/GpsEssentialsApp>

<http://www.gpsessentials.com/>



Figure 7

This app will also take photos with identifying data. Select the “camera” option (binocular icon) and take photo. Find your photo under “pictures,” scroll to select the photo you want then select the edit icon (pencil) to view full screen. (Figure 8).

Swipe to the left to see data for photo. (Figure 9). You will also have an option to place a marker on a map then tap on icon to see information from the map. Double tapping on map will zoom in to the photo location.



Figure 8

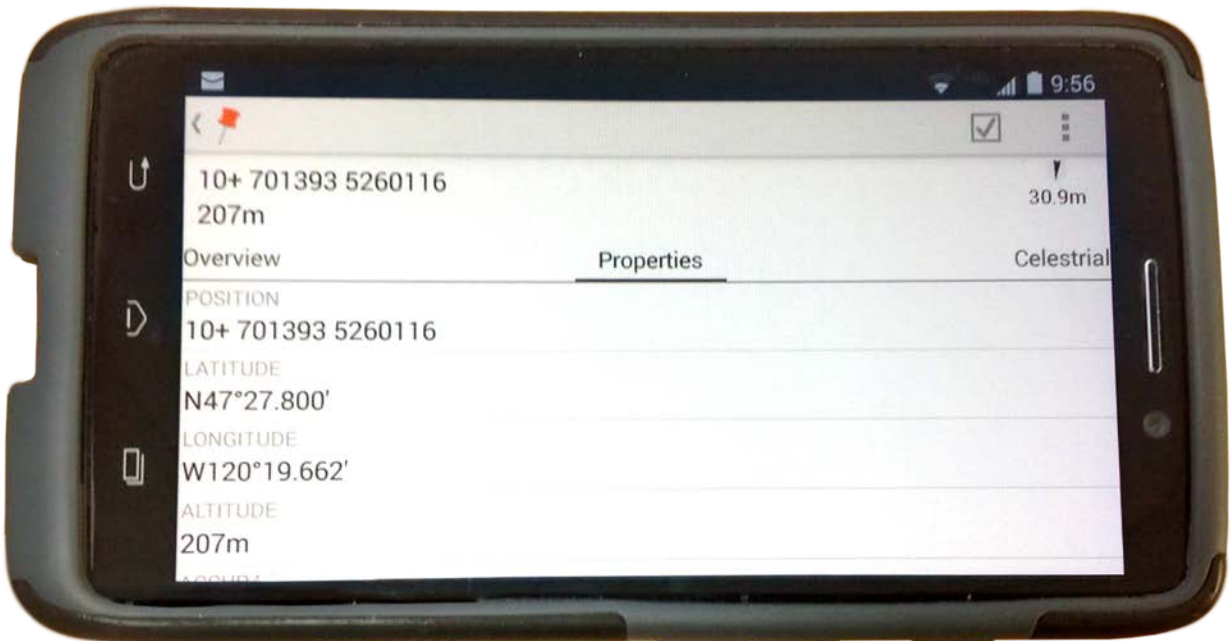


Figure 9

This app will also take photos with identifying data. Select the “camera” option (binocular icon) and take photo. Find your photo under “pictures,”

Cameras

Cameras may be a good option if you do not have smart technology available. The things to look for in a camera are the quality of photo (5mb) you can find this by looking in your owner's manual. Nearly all owner's manuals are available free online, search for the model and make of your camera. High quality photos are desirable because you can look more closely and identify plants and animals better. A wide angle will cover a larger area for your photograph but in any case make sure that it can encompass the baseline photo.

Holding your camera steady and level will produce more defined photo so having a means to support the camera can be most helpful. If nothing is available hold arms as close to the body as possible for support.



Chapter 2

Establishing a Photo Point Location and Creating a Baseline Photo

As you know by now, a photo point is a location where you want to take repeat photos over time. A baseline photo is the original image that you want your students to take repeat photos of over time. Here are the steps you need to take to establish your own photo point location and create a baseline photo:

1. To start, get the right equipment and materials together.

Equipment needed:

- Camera, smart phone, or tablet capable of taking HDR photos [4 to 5 megabytes (mb) size photos are desired] and wide angle photos (landscape)
- Hand-held compass set to correct declination according to True North, or a compass app on smart phone (be sure it is set according to True North)
- GPS unit or smart phone with GPS app

Materials needed:

- Clipboard
- Pencil
- Photo Point Data Form
- Aerial photo of photo point area

Table 1. Photo Point Data Form – School

Photo Point Data Form					
Observer:				Email:	
Phone:					
Additional observers: (first and last names in first form)					
Day:	Month:	Year:		Time: (military)	
Wildlife Area:			Point#:	Accuracy feet/meters if point is unmarked.	
Did you find exact point? (yes / no)			How is point marked?		
Zone:	UTM-E/Latitude			UTM-N/Latitude	
Photo 1 direction (use compass):			Photo 2 direction (use compass):		
Photo 3 direction (use compass):			Photo 4 direction (use compass):		
Other photo:			Other photo:		
Additional notes or details (note if baseline photo):					
Remember these steps: <ol style="list-style-type: none"> 1. Use the widest camera angle possible. 2. Camera set to HDR for each photo (some require resetting for each photo). 3. Take photo of form before EIM photo (<i>remember 1 form for each direction</i>). 4. Check compass direction and compare view to baseline; be sure to observe correct declination for location. 5. Take photo. 6. You and a team member compare photo to baseline photo are they identical? 7. If not delete photo and try again until successful. 					

- Now you need to find a suitable photo point location on your school grounds. Access either Google Earth or ArcGIS via the Internet, and zoom into your school property. You can do this by typing in the school address; then use the “Snipping Tool” to crop out and copy the aerial view. Paste it into a blank document, save, and print a copy to take outside with you on the clipboard.

Go outside and walk around your school grounds to look for an interesting location. You may see new plantings that you could photograph several times a year to observe seasonal changes and compare annual growth. There may be a new building going up across the street that could be included. It may seem that nothing ever changes as your school, but you may be surprised when comparing the repeat photos over time.

Select the location for your photo point. Mark the location on your aerial map and give it a unique number. Figure 10 presents an example showing an aerial map and unique identification given to each photo point location (P001, P002 and P003); this naming convention is a unique name in an established format that you choose. Examples can be seen at in 6. Below.

If and when possible, permanently mark the location of the photo point or use an existing feature as a reference that identifies the photo point location, so other photographers will know precisely where to stand to take repeat photos. Consider a visit with your school district metal shop teacher and ask him/her to build a marker for you with camera shelf 5 feet (1.5 meters) that can be permanently installed on the site. If not, a dot of paint, refreshed as needed, might suffice until the next photo.

“Snipped” photo of an aerial map of the ESD Building (*Figure 10*).



- Fill out the following information on the Photo Point Data Form; this includes observer information as well as date and time. Use the GPS unit or a GPS phone app to retrieve locational data for your photo point and record this on the Photo Point Form on your clipboard. Make sure the GPS unit has the correct settings: NAD 83, Zone 10 or 11 (depends on your location), and coordinates in UTM's (easting and northing) or in latitude and longitude.

Regarding the Photo Point Data Form, when recording baseline photo information, be sure to write ‘baseline photo’ in the ‘Additional notes or details’ section of the form. This form will now serve as your ‘baseline record’ hardcopy (original or master document).

4. Determine a direction that you want to take your baseline photo and use a compass to get the compass bearing in degrees (0 to 360) of that direction. Write that on the form under Photo 1 direction, which denotes your first photo direction for your photo point; if you want to take baseline photos in more than one direction (up to four) be sure to write the correct photo direction to correspond to the baseline photo you take.

Just before snapping your picture, it is highly advisable to take a photo of your photo point information form. This provides a digital means of keeping track of the photos; it is especially important when taking multiple repeat photos on the school grounds or at field locations. See below

Ecological Integrity Monitoring: Photo Point Data Form revised 3 April 2015			
Observer: Celestine		Phone 1 (509) 784-1911	
e-mail:		Phone 2:	
Additional observers: Gracie C. Kymari			
Day: 28 th	Month: April	Year: 2015	Time: 11:00
Wildlife area: SWA		Point #: P003	Accuracy (meters): 3
Did you find exact point? Yes		How is the point marked? Post with sign	
Location (NAD83)	Zone: 10	UTM-E: 0701326	UTM-N: 5270946
Photo 1 direction (use compass): 219°		Photo 2 direction (use compass): 153°	
Photo 3 direction (use compass):		Photo 4 direction (use compass):	
Other photo:		Other photo:	
Additional notes or details: none			

5. Okay! Here are steps in sequential order for taking a quality baseline photo at your school photo point location:
 - a. Make sure the camera/device is set at HDR to shoot the highest quality photo (minimum 4-5 MB size .jpg image is desired).
 - b. Keep the view setting as wide as possible on the landscape setting.
 - c. Photos are taken at 5 feet above the ground (1.5 meters). Consider using a PVC pipe cut at 5 feet to serve as a reference.
 - d. Hold the camera/device very still; this is accomplished most easily by setting the camera/device on a stationary surface (i.e., tripod at designated height) or other supporting structure, like the 5-foot PVC pipe.

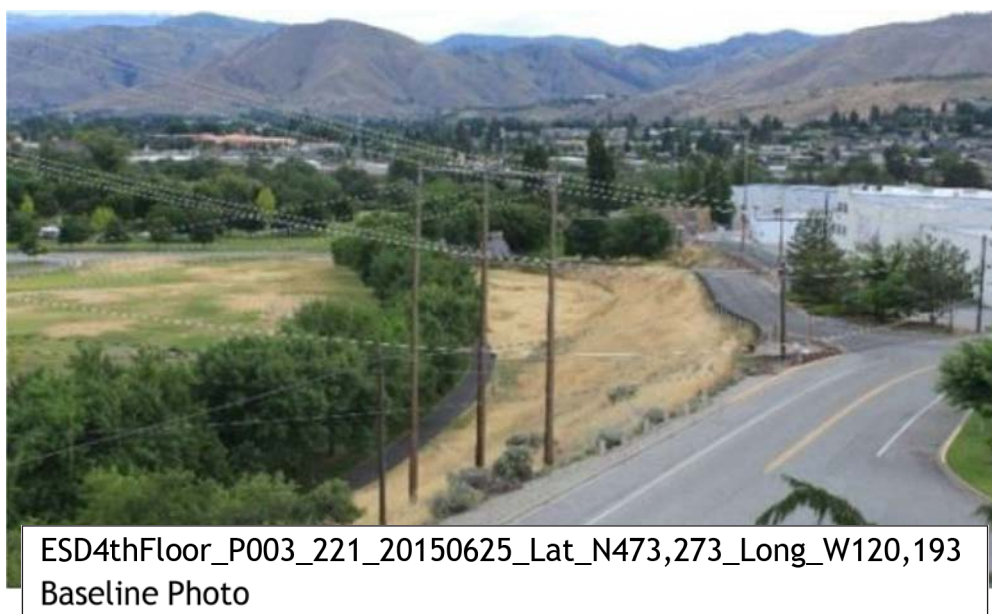
6. Upon completing your baseline photograph(s), upload and save the photo(s) to a folder in your pictures file on your computer. We suggest observing labeling convention for your school baseline and repeat photos. A good label should have a location name, photo point ID, photo direction, date (YYYYMMDD), and locational information: NAD38, Zone, easting and northing coordinates or Latitude and Longitude. Example:

ESD4thFloor_P003_221_20150425_NAD83_Z10_701572E_5260212N.jpg. or

ESD4thFloor_P003_221_20150425_Lat_N473273783_Long_W120.19.3652.jpg

Print a hardcopy of the photo and attach it to the hardcopy of the Photo Point Form in case the photo gets detached from the form, we suggest writing the label information on the photo.

Below is an example of a baseline photo taken from the ESD building and a second one taken 2 months later after the hills in upper right area had burned and the valley was smoke filled from fires over 100 miles away.



Note different cameras produce different quality and extents of photo though both are set at widest angle settings available.

Conducting Repeat Photography at Your Photo Points

The following steps will guide you through taking a repeat photo at your school photo point and recommendations for storing/filing it.

1. Select a date for repeating photographs at your photo point locations, using, if possible, the same equipment and materials that you did the first time. Also be sure to have a copy of your baseline record and baseline photo.
2. Remember! Before you take a repeat photo, it is advisable to complete the Photo Point Data Form for your photo point location, and then take a photo of the form.
3. When taking a repeat photo at your photo point, you need to align your camera/device so that the view in the camera/device viewfinder captures the same photo direction and major features as seen in the baseline photo. Look for visual references such as rocks, trees, mountains, fences, school building corners or flag poles. These same items should be used for field photo point monitoring.
4. Take a few moments and compare the baseline photo to the photo in your view finder. If it does not match the baseline photo, keep trying until you obtain a photo that does. Remember, due to seasonal differences and natural vegetation changes, your photo will look somewhat different but the landmarks should all line up.
5. Upon completing your repeat photograph(s), upload and save the photo(s) to a folder in your pictures file on your computer.

Just like with baseline photos, you should also print a hardcopy of the photo and attach it to the hardcopy of the Photo Point Data Form – School. In case the photo gets detached from the form, write the label information on the photo.

6. Compare new photos to previous ones and identify differences with your students. Look for changes. You may be surprised!



Photograph by Kristen Bates, 2015

Chapter 3

Preparing for a trip to the field

After establishing and practicing photo point monitoring at your location you will be ready to plan and implement a trip to the field for repeat photography.

******If you are wondering how to contact an agency or land owner about needs they may have that would fit with photo point monitoring. State Natural Resource agencies have some programs. Look on their website for Citizen Science opportunities and make contact with their representative. Another option is to contact a Soil Conservation District, a local land trust non-profit, a city building or updating a park or perhaps a private citizen developing their property. The benefit of retaining a history and knowing you are a part of it gives pride to the project, provides opportunities to explore future career paths and become familiar with community members. Start a conversation and someone will be interested or knows someone else who will be.

The information provides guidelines to assist anyone in preparing for or taking others to field sites for repeat photography.

Schools have established procedures for field trips involving students. It is not our intent to interfere with that process, but to provide additional information as it pertains to field experience in more remote areas where cell service may not be available. A pre-trip checklist for photo point monitoring appears as Table 2.

Table 2. Pre-trip checklist for photo point monitoring

Pre-trip Checklist - Photo Point Monitoring			
Who?	TASK	Date to Complete	Actual Date Completed
4-12 months prior to Field Date			
	CPR - First Aid Training (1 adult minimum)		
2-6 months prior to Field Date			
	Establish school photo point for practice		
	Verify equipment available for training		
	Photo Point protocol training and practice		
	GPS training and practice		
	Compass training and practice		
	Camera/Tablet settings train and practice		
	Data Entry and photo uploads to YOUR STATE AGENCIES AND NON-PROFIT ORGANIZATIONS EIM site training and practice		
	Arrange for transportation		
4-6 weeks prior to Actual Field Date			
	Field Date Established		
	Number of Students		
	Number of Adult Group Leaders		
	Estimate: Actual time available to spend in monitoring (less lunch and travel)		
	Number of vehicles needing "Agency Business Passes"		
	CPR - First Aid Training (1 adult minimum)		
2-6 weeks prior to Field Date			
	CPR - First Aid Training (1 adult minimum)		



With respect to pre-trip planning tasks above, the following presents greater detail regarding some of these tasks:

- Trip date/alternate dates. Remember, dates for site visits are typically best during plant blooming times to aid in identification of flora, and in spring either prepare for rain or plan an alternate date.
- The number of adult volunteer mentors and students participating in the field trip.

1. Photo Permission Forms

Most schools acquire permission to photograph their students at the beginning of the school year. If your agency or organization wants to be able to use photos of the student for displays and exhibits, print media, video, or Internet publications or products it is wise

2. Field Equipment and Supplies

Verify that monitoring equipment (GPS units, compasses, cameras and baseline photos) are available, both for training prior to and on the day of the field trip.

3. Transportation

Arrange for round-trip transportation to and from your location to your field location. Verify beforehand that roads will accommodate full size school buses or if they require smaller vehicles. If you are going to be accessing public lands check to make sure you have a special access permit if required for each vehicle or special group permit.

4. Leave no Trace Behind

Litter – Please do not throw, drop, or leave any discarded object, garbage, trash or rubbish, upon any department lands except into a litter or garbage receptacle or container installed for that purpose on such property.

5. Don't Take it with You

It is typically unlawful to remove petrified wood, minerals, fossils, or plants (flowers) from public lands.

6. Hygiene Considerations in Remote Areas

“You are about to take a step beyond civilization...” you may “be without the modern conveniences to which you are accustomed.” It behooves each person to make use of restroom facilities whenever they are readily available: just prior to departure and upon arrival at any available outdoor area facilities before heading out to monitoring locations.

Keep in mind that if no sanitation facilities are available there are no doors to close so make best use of available cover (bushes or trees) and remember your manners by being sensitive to others. We want to keep natural areas as pristine as possible. Keep waste at least 50 feet from any open water.

On a one day trip to the field plan ahead as much as possible to be near sanitation facilities regularly. If a toilet is needed look for a sheltered location or ask a buddy stand guard as an indication to others that they should give a wide berth and avert their eyes.

Still thinking of “leaving no trace,” field etiquette reminds us to pack out waste, tissues, and hygiene products in a plastic bags (think dog poo bag or plastic grocery bag) for disposal in a main garbage bag, trash receptacle, or back home. Come equipped with a bag and tissue.

- To pick up waste, place the plastic bag over your hand and pick it up along with tissue into the bag with your covered hand; then pull bag over your hand to encapsulate the waste. Tie the top of the bag in a knot to keep the contents inside.

Remember we want to keep “the land clean and attractive for ourselves and others to enjoy.”

- FS-66 GPO 988-164 United States Department of Agriculture Forest Service

7. Dress Code

Spending time in a natural area includes exposure to ticks, mosquitos, snakes, and uneven and steep terrain. A “dress code” happily helps prevent many of the undesirable consequences of coming in contact with them. All participants should wear appropriate attire for field work to ensure the protection of all. Comfort and happy memories are more likely to occur when you are properly dressed for a day out in nature.

- *Layers.* Dressing in layers can keep you comfortable if the weather changes, as layers can be removed or added. A long-sleeved shirt over a t-shirt is recommended.
- *Long Pants.* Long pants discourage unwanted “friends” such as ticks from hitching a ride home with you or finding exposed skin. Insect repellent is also useful.
- *Long sleeves.* Long sleeves also serve discourage unwanted wildlife from hitching a ride and protecting from sunburn.
- *Sturdy, well fitting, enclosed shoes.* Field locations can be hilly and rocky. Sturdy well-fitting shoes will help you efficiently walk between photo points.

Enclosed shoes will protect toes and feet from unwanted scrapes and pokes from unplanned contact with trees, branches, rocks and ground.

- *Socks.* Socks that cover feet and ankles cushion feet on uneven rocky terrain and will protect legs from unwanted scrapes and pokes.
- *Hat or visor.* Hats and visors in conjunction with sun screen will help keep those intense sunrays from scorching tender skin.

8. Safety Planning: First Aid and Emergency Communications

Field location can be remote enough to have little or no cell service available and are more than 20 minutes to one hour away from first responders. Observe your pre-determined safety plan for field trips and ensure you bring copies for each group on the trip. A safety plan should include first aid training, wilderness first aid training, first aid kits, and safety equipment such as whistles, maps and locations of all groups during time in field. A sample safety plan is provided below.

Large groups may need special attention when they split into smaller student groups to do work separately. Whenever possible, the smaller groups should work within line of sight of one another. Due to topography or forested areas, this may not be possible. Bright plastic flagging may help mark a temporary trail between groups; be sure to remove the flagging before leaving the area and reuse again another time. Consider furnishing bright-colored vests or daypacks to increase visibility of participants.

Running in the wild compares to “running with scissors,” in that uneven ground and slippery slopes create a hazardous situation; therefore, walking is always the rule of the day when traveling off road.



Emphasize to students that they need to listen to their leader and be ready to lend a hand to a teammate, and that they should never leave any member of their group behind.

Stress that it is important to respond to any emergency signal as they have been trained to do. Make sure that safety whistles signals are understood; for example, a repeated series of 3 loud toots could signal an emergency meaning participants need to regroup at an agreed-upon meeting place.

If possible, assign an adult who can function as a 'point person' to move between groups in order to: ensure they are completing tasks on time, provide additional mentoring, and help groups assemble at the designated meeting place in case of emergency or for other re-grouping needs, like getting everyone ready for lunchtime.

Table 3. Photo Point Monitoring Safety Plan

Table 3 - Photo Point Monitoring Safety Plan (Provide copy to each adult on field trip Review with trip participants)	
School Name Class (Teacher	
Date of Trip Departure & Return Times	
Attach list of all participant names on all plans by group/ buddy-up students	
Trip Location –address, road or coordinates	
Attach map of work site locations	
Emergency Communication Equipment (cell phones, whistles, fog horns, etc. – and Phone Numbers for locale	
Identify First Aid trained adults and students	
Simple First Aid Kit for each group. Full First Aid Kit for entire group.	
Personal Medication Provisions – Participants with health issues: asthma, food allergies, diabetic, seizures, etc. *	
On site: Establish a meeting place in case of emergency.	

*Students with medication needs or health problems should be assigned to their teacher's group



9. Buddy System

Ensure that within student groups, students are partnered with a buddy in advance of the field trip. The buddy system is another way to keep participants safe.

Students who are ‘buddied up’ by keep an eye out for each other throughout the day, help each other keep up with the rest of their group, help each other over rough terrain, and notify leaders in case of an accident. If a student needs to leave the group with their buddy, they need to let their leader know.

10. Student Group Size and Group Leaders

Organize students into groups of 4-6; assign one leader per student group. Students will be responsible for carrying equipment and conducting monitoring under the guidance of their group leader.

Each student group will need the following equipment and supplies (one of each item except for batteries as needed):

- camera/tablet for taking photos;
- GPS unit with photo point locations loaded as a way point;
- extra batteries for electronic devices;
- clipboard with a pencil attached by a string, with extra photo point forms;
- compass with declination set for area;
- safety whistle;
- small portable first aid kit and accident forms;
- copy of baseline photo point album images for assigned photo point locations;
- copy of area map of general location with photo points; and
- medical forms and drugs as needed for participants.

11. Food and Drink

Field work requires food and water so ensure that each student and adult has a sufficient supply lunch, water and snacks.

ARE WE THERE YET?

As you have learned, there are multiple tasks that need to be accomplished prior to a field trip to your field area. These tasks are aimed at making the field trip a more efficient and enjoyable experience for one and all. As the trip day draws closer, it is advisable to review the Pre-Trip section to ensure that all preparations are in place and the trip is ready to proceed. A checklist for this stage and trip day is below to help with this process.

Table 4. Pre-trip checklist for photo point monitoring

Day Before and Day of Field Trip Checklist – Photo Point Monitoring		
Who?	TASK	Date Completed
Prior to bus leaving		
	All medical forms and medicine with correct group leader	
	Adults have emergency protocol and procedures card	
	All Students and Adults meet dress code	
	Groups have been assigned to leaders (4-6)	
	Buddies have been selected from within groups	
	Adults have mini first aid kits to carry and emergency whistle	
	Check of all Equipment per team (GPS, Camera/Tablet, Compass, Whistle, Clipboard, Pencil)	
	Lunches, water and snacks loaded up for all participants	
	First-AID Kit is loaded (Group Emergency) and with group first responder	
	Provide alternate phone number (cell) for trip coordinator	
Same Day at End of Field Work		
	All Photos have been copied to thumb drive or other device for backup.	



Tasks for the Day before and the Day of the Field Trip

It is important to review the following items with trip participants (consider handouts as reminders):

Prior to Traveling to Field Site

1. Field Equipment and Supplies

Double-check that the following field equipment and supplies needed for each student group to do photo point monitoring are packed on the bus or will be otherwise transported to the wildlife area:

- cameras/tablets for taking photos;
- GPS units with photo point locations loaded as way points;
- extra batteries for electronic devices;
- clipboards with a pencil attached by a string, with extra photo point forms;
- compasses with declination set for area;
- copies of baseline photo point album images for assigned photo point locations;
- copies of area maps of general location with photo points.

Verify that all electronics are charged and functioning.

2. Review of Rules and Etiquette while on site

Make the trip more enjoyable by outlining basic rules of conduct for all participants.

3. Hygiene Considerations in Remote Places

Ensure participants understand hygiene responsibilities and have plastic bags and tissue; and they understand how to properly dispose of human waste and soiled tissue.

4. Dress Code

Verify that participants are attired appropriately.

5. Safety Planning: First Aid and Emergency Communications

Verify that:

- All medical forms and medicine necessary to support the health and well-being of participants are in the possession of the student group leader (teacher/adult volunteer mentor); Safety plans, emergency protocols and emergency procedures card are in the possession of the student group leaders (teachers and adult volunteer mentors); *Students with special medication needs or health problems should be assigned to a group leader aware of needs and able properly respond.

- First-aid response and emergency plans are understood by all participants;
- First-aid kits are distributed to the student group leaders (teachers/adult volunteer mentors);
- A safety whistle is in the possession of each student group leader;
- Sufficient water is packed for hydration/first aid needs (all student group leaders should know how to recognize and respond to the signs of heat-related illness).

6. Buddy System

Field work requires food and water so ensure that each student and adult has a sufficient supply lunch, water and snacks.

7. Participant Group Size and Leaders

Field work requires food and water so ensure that each student and adult has a sufficient supply lunch, water and snacks.

8. Food and Drink

Ensure lunches and snacks are loaded on the bus or other applicable vehicles for all participants.

Onsite and Prior to Field Work

1. Safety Planning: First Aid and Emergency Communications

Confirm safety plan details are understood on site with all participants (teachers/adult volunteer mentors/students and select a meeting location in the event of an emergency.

2. Food and Drink

Confirm water is available as needed to keep all participants hydrated.

3. Student Group Size and Leaders

Confirm each group leader receives a copy of the master roster and each knows which students are assigned to them.



Same Day at End of the Field Work

1. Accident Reporting

In the event of an accident, teachers must follow the required procedures for their school. Non-school reporting follow procedure provided by the public or private landowner.

2. Backing Up Data - Digital Image Storage

In case original digital photos are lost, all images taken at photo point locations plus their associated Photo Point Data forms should to be electronically copied to a thumb drive or posted to a Google.doc within 1 or 2 days of trip. Happy is the person with a back-up.

3. Re-grouping

Use the original roster (master) to ensure that all participants are present in the returning group.

4. Field Equipment and Supplies

Account for all equipment and supplies when leaving the field. Return any borrowed equipment per your agreement.



Photograph by Kristen Bates, 2015

Chapter 4

Data Entry and Quality Assurance

By this time you have been through pre-trip training, practice, and planning, your adult volunteer mentors and students have traversed the terrain taking photos at photo points on your day trip to photo point sites at a natural area. Now it is time to publish the fruits of everyone's labor: it is time to ensure that the data is entered correctly into the online database or printed and placed in a permanent record notebook:

Method 1 - Notebook

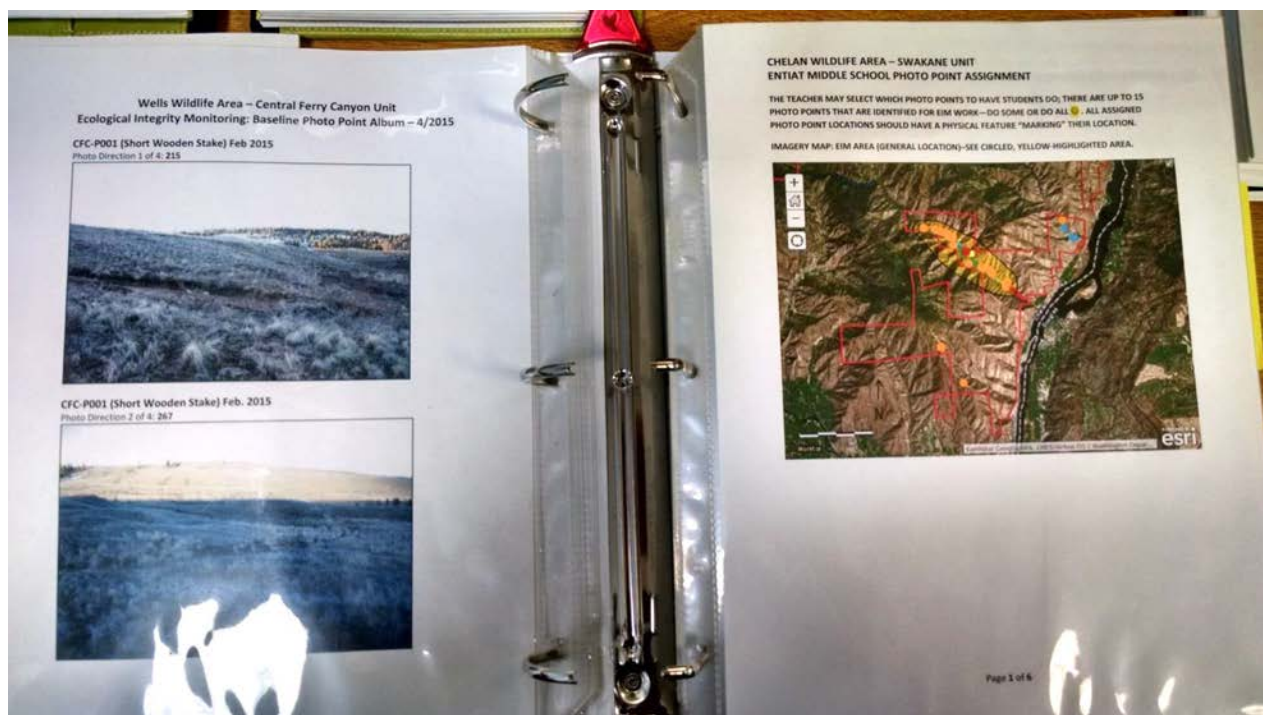
1. File Organization

Create a folder on your desktop titled "EIM Photos." Transfer files of photos and photos of corresponding field forms to that folder. Create additional folders for each photo point number (P001, P002, etc.). Move the photo file and the photo of the form to their file, then you can safely keep the files together when renaming the photo file into the correct labeling format.

2. Quality Assurance Process

- Participants should verify 100% of other students' data records and uploaded photos for accuracy (check if they match the baseline photo) and make corrections in consultation with teacher or leader.
- If you are a teacher, do a quality check of 100% of students' work. You may want to consider coordinating this task with a Computer Tech class and/or adult volunteer mentors.

Example below

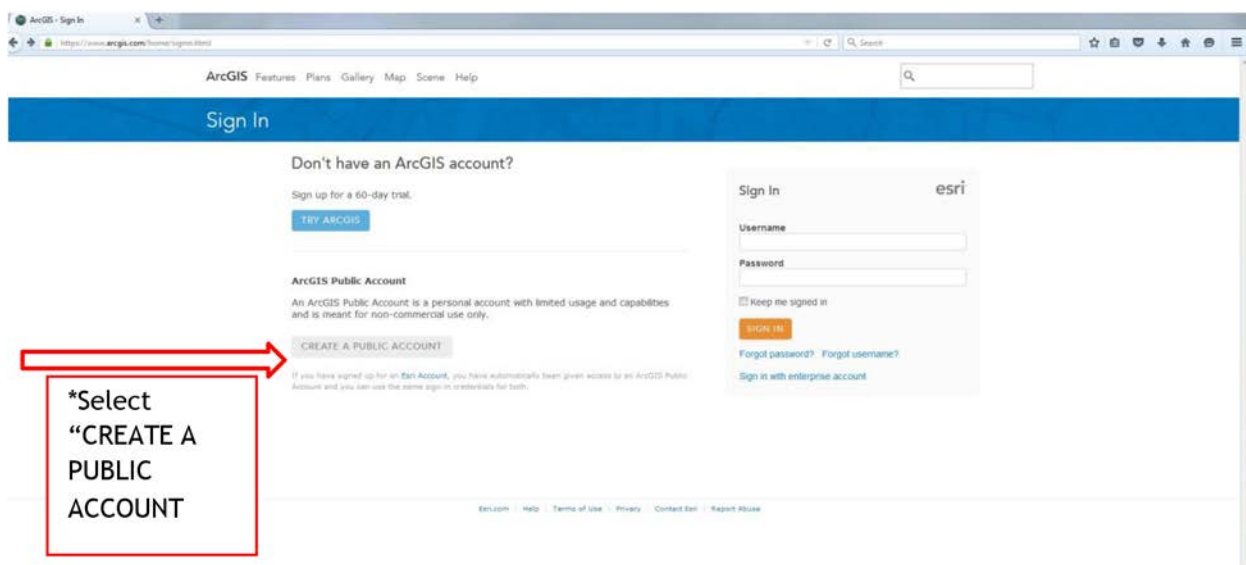
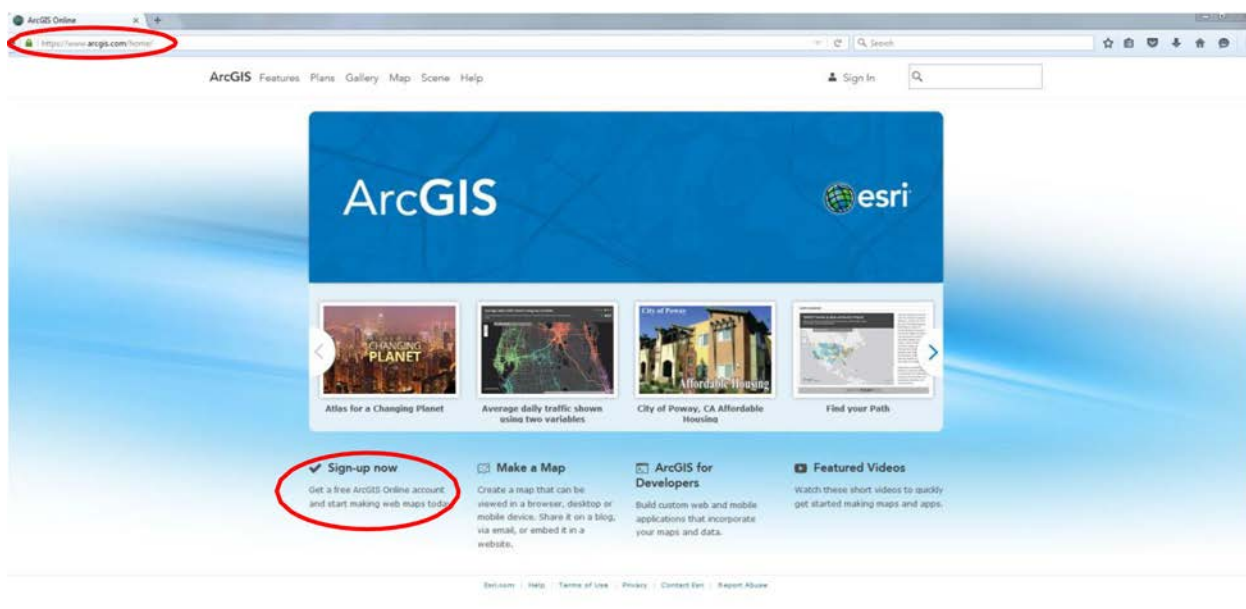


Method 2 - Online

Posting a photo record to ArcGIS Online. This format is available to the general public and can be used at no cost. Additionally, “ArcGIS Online is a mapping platform freely available to U.S. public, private, and home schools as a part of the White House ConnectED Initiative. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <http://connected.esri.com>.” Many resources and free online classes are available for all users. <http://www.esri.com/connected#Human> Geography GeoInquiries

Step 1

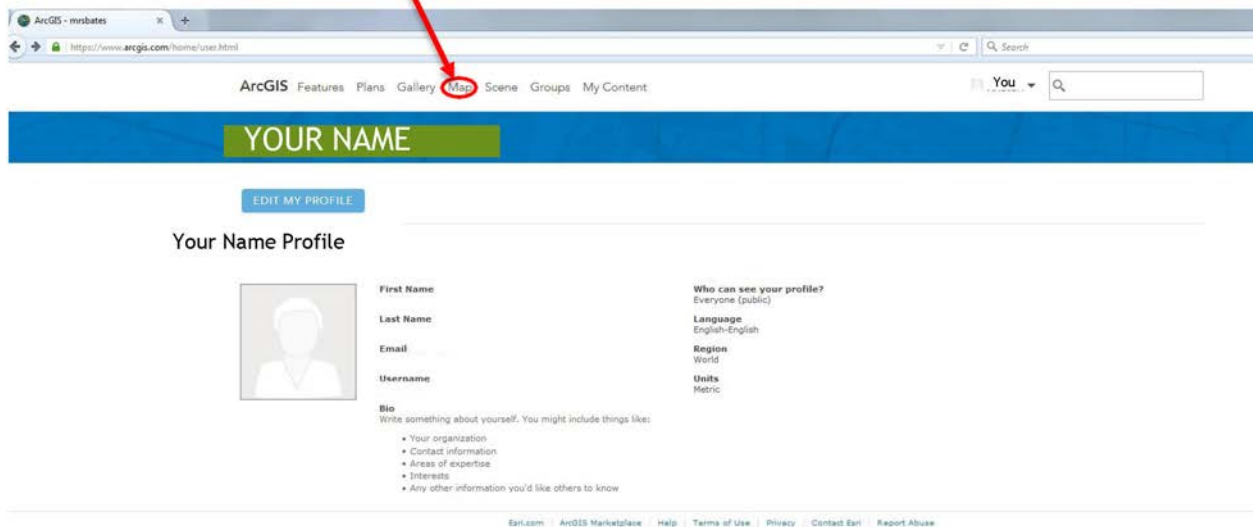
- Access website: <https://www.arcgis.com/home/>
- Sign up for new account.



- Fill out required information.
- Update bio if desired
- SAVE

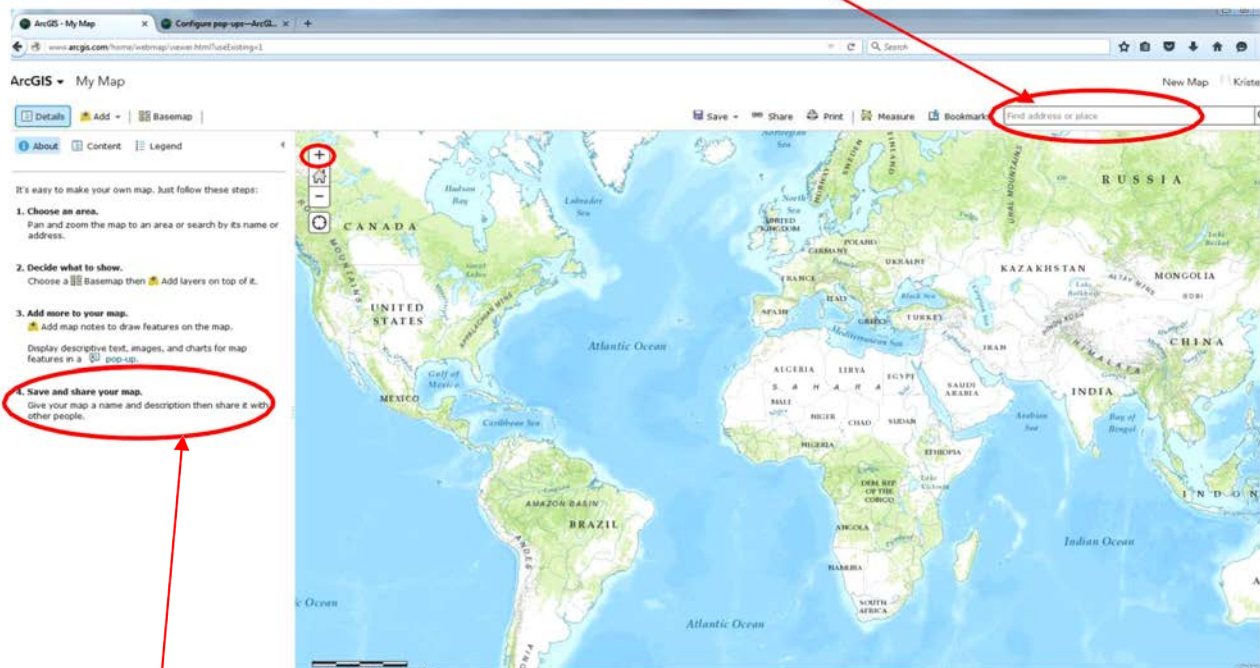
Step 2

- Select Map



Step 3

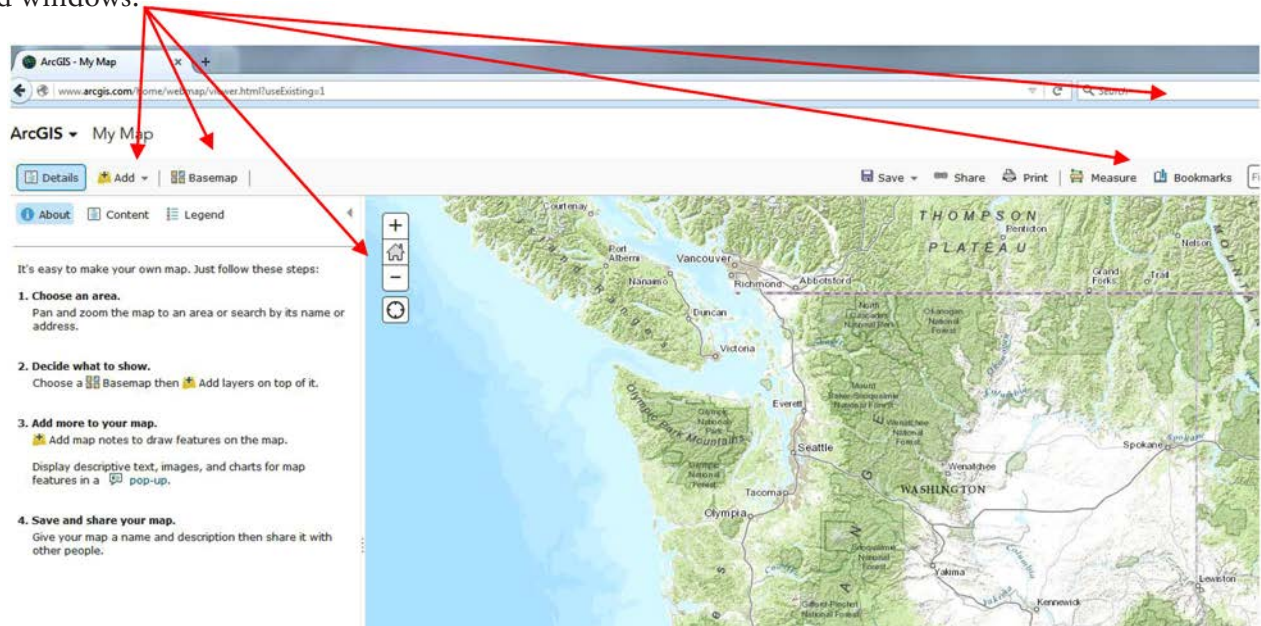
- Select the area of the map in which you will be working and zoom into that location by zooming in using the + on map, using the scroll wheel on a mouse, or keying in a location here.



WARNING: Take a few moments after finding your map area to save your map using “save as.” Exiting a map without saving will result in loss of work.

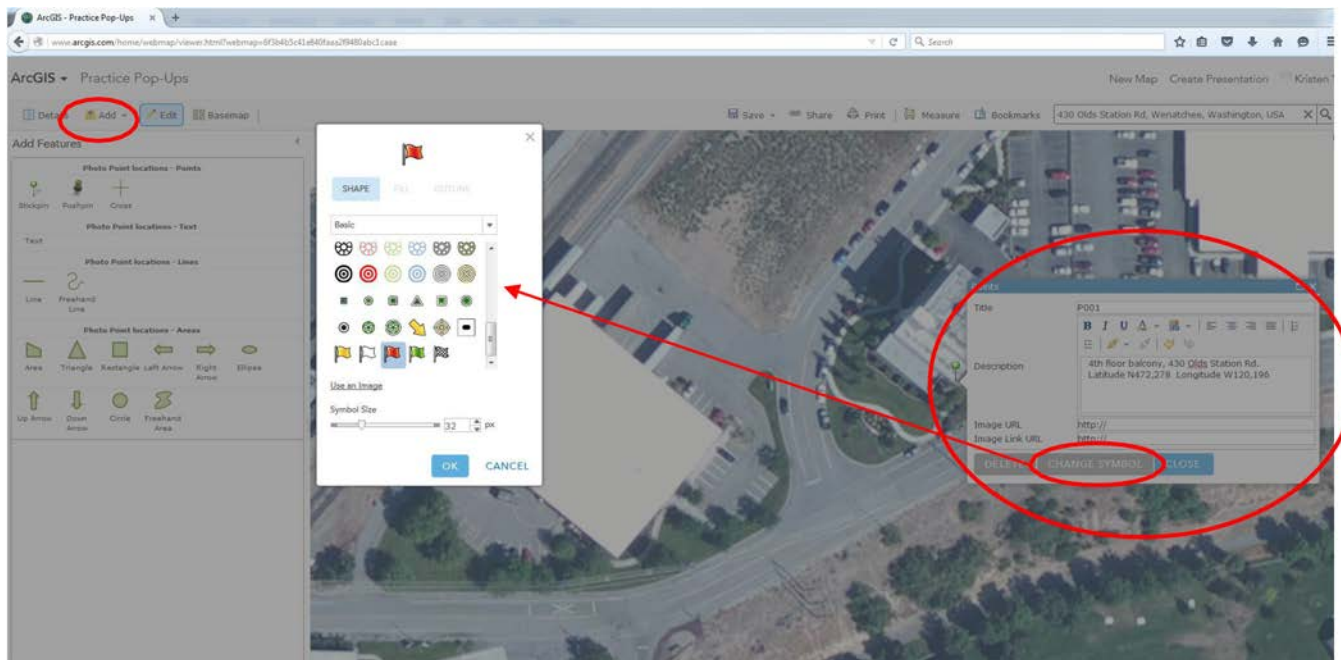


Continue to explore map features to become familiar with the commands and windows.



Step 4

- Select “Add” then, “Map Notes.”
- Pop up will appear to configure, fill in the blanks.
- Change symbol if desired.
- To see photo in map be sure to provide URL information.



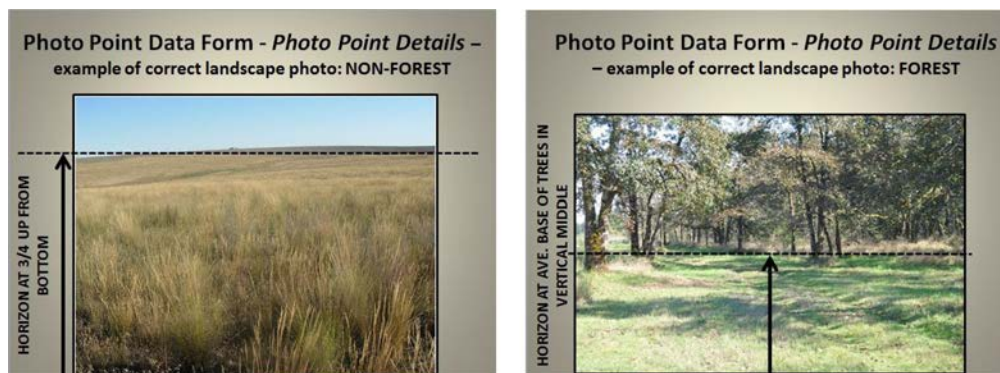
Continue to add more Photo Points in the same way. Adding any documentation you desire to create a simple digital record of your work.

Appendices

Appendix 1. Photo Point Data Form – School

Photo Point Data Form - School				
Observer:			School Name:	
Teacher email:			School Phone:	
Additional observers: (first and last names in first form)				
Day:	Month:	Year:	Time: (military)	
Wildlife Area:		Point#:	Accuracy feet/meters if point is unmarked.	
Did you find exact point? (yes / no)			How is point marked? (if unmarked, note Zone/UTMs)	
Zone:	UTM-E:		UTM-N:	
Photo 1 direction (use compass):		Photo 2 direction (use compass):		
Photo 3 direction (use compass):		Photo 4 direction (use compass):		
Other photo:		Other photo:		
Additional notes or details (note if baseline photo):				
<p>Remember these steps:</p> <ol style="list-style-type: none"> 1. Use the widest camera angle possible. 2. Camera set to HDR for each photo (some require resetting for each photo). 3. Take photo of form before EIM photo (<i>remember 1 form for each direction</i>). 4. Check compass direction and compare view to baseline; be sure to observe correct declination for location. 5. Take photo. 6. You and a team member compare photo to baseline photo are they identical? 7. If not delete photo and try again until successful. 				

Example: Non-Forest and Forest Ecosystem Photo Point Landscape Photos



General header information

Observer: The primary observer should be identified by full name E-mail: Provide the observer's e-mail address.

Phone 1: Provide the observer's phone number.

Phone 2: Provide a second number for the observer, if there is one. Additional observers: List the names of additional observers.

Day: List the day of the month.

Month: List the number for the month of the survey. Year: List the year (full 4 digits).

Time: List the time with a 24-hour clock (e.g., 13:30 = 1:30 PM).

Location details

Wildlife area: Provide the name of the wildlife area; include unit if applicable. Point #: List the number of the photo point station;

Accuracy (meters): Provide the estimated GPS (+/-) receiver accuracy in meters.

Did you find exact point? Answer "yes", "no", or "maybe" depending on your certainty of finding the exact point. This certainty will be enhanced if the point is specifically marked and/or tagged.

How is the point marked? Provide a general description of the marker (i.e., wooden fence post, wind-mill, glacial erratic, etc.).

Location (NAD83): NAD83 = North American Datum of 1983. A datum is a model of the earth; map projections are based on these. Be sure your GPS is set to this datum. The Zone is 11 in most of eastern Washington, 10 or 11 in central Washington, and 10 in western Washington. Record the UTM-E as the 6-digit easting number (it might be 7 digits if the first number is zero). Record the UTM- N as the 7-digit northing number: or Latitude and Longitude.

Additional notes

Record other items that did not fit in specific categories. This is also an opportunity to mention specific issues related to the photo point. For example, it would be useful to mention unusual aspects of the year or the sources of disturbance such as the presence of livestock.

Appendix 2. Sample “Opt Out” Permission Form – Photography Media (English/Spanish)

OPT OUT PERMISSION FORM PHOTOGRAPHY / MEDIA

I do not give permission for the (NAME OF ORGANIZATION) and/or local news media to use pictures of, or articles about myself and/or my child in order to educate the public about the programs and services of (NAME OF ORGANIZATION).

First Name (s)

Last Name (s)

Date

Description of Program/Event/Class: _____

Authorization of Individual or Signature of parent/guardian (in the case of a child) to opt out of photography/media

Signature and

Date: _____

Opción de No. Permiso de Publicaciones a Medios de Comunicación y Fotos

Yo no doy mi permiso a (NAME OF ORGANIZATION) y/a las estaciones de noticias (periódico, radio, y televisión) de usar fotos o artículos acerca de mí y/o de mi hijo/hija para educar al público según programas y servicios del (NAME OF ORGANIZATION).

(Nombre(s) /

Apellido(s)

Fecha

Descripción del Programa/Actividad/Escuela: _____

Autorización de la persona o firma del padre/guardian (de un niño) Opción de No. Para los Medios de comunicación y fotos

Firma y

Fecha: _____

Return this form to:

Phone:

E-mail:

Fax:



NOTES:

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

