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# ECO 101

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## Better Safe than Sorry: Planning for Safe and Successful Fieldwork

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### Abstract

Although enjoyable and rewarding, fieldwork has inherent hazards and risks. In this article, we describe five steps to help students plan for safe and successful fieldwork in a variety of study sites. In addition to identifying potential hazards and mitigating them, successful graduate research should include a communications plan, strong leadership and awareness of power relationships among faculty, graduate students and undergraduate student assistants. We provide example scenarios, based on actual student experiences, to “test” if your team is well-prepared for a range of possible situations that may arise in the field. Lastly, we outline a workshop that integrates these steps to facilitate safety planning for graduate students in Forestry at the University of British Columbia.

### Introduction

Fieldwork is one of the most enjoyable aspects of ecological research. It is an integral component of many graduate research projects and often provides valuable research experience for field assistants. Although rewarding, fieldwork is commonly conducted at remote sites with inherent hazards, can be physically challenging, and may require specialized equipment with innate risks. Safety concerns may also vary among individuals based on gender, age, fitness levels, and experience, particularly when research is conducted in remote areas (McGuire et al. 2012). Combined, these factors can increase the chance of a workplace accident.

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In our experience, rarely do workplace accidents result from a single bad decision, but more commonly result from a combination of poor preparation, decision-making, communications or leadership. Careful planning identifies potential hazards, evaluates the risks associated with each hazard, and establishes protocols for safe, efficient, and effective fieldwork. The use of management strategies such as safety plans has been found to be the strongest contributor to safer workplaces (Cigularov et al. 2010). A thorough safety plan also provides a framework for response in the case of an emergency.

While safety procedures or protocols for laboratory research are generally well established, resources and guidelines for field work, when available, are usually limited to very specific protocols (e.g., tree climbing [Houle et al. 2004] and river sampling [Flotemersch et al. 2001]). For students with limited field experience, safety planning can be particularly challenging, since it is difficult to anticipate potential hazards, let alone eliminate or control them.

In the Faculty of Forestry at the University of British Columbia, graduate students develop a safety plan which is approved by their faculty supervisor and submitted to their department chair before conducting field work (e.g., Safety plan protocol in the graduate student handbook [<http://www.forestry.ubc.ca/files/2012/06/Forestry-Gradbook-Sept-2013-edition-v2.pdf>]). Several other universities provide online safety guidelines for field researchers, but to our knowledge, there are no publications that provide a generalized safety planning framework for students engaging in field research. Below, we describe five steps to help students plan for safe and successful fieldwork in a variety of study sites. These steps are used in our field safety workshop, which is provided to graduate and undergraduate students who are engaging in field research in the summer. We hope students can adapt our general suggestions and apply them to improve the safety and success of their own fieldwork.

## 1. Identifying potential hazards

When conducting ecological fieldwork, our workplace environments vary widely. The questionnaire in Table 1 is designed to help identify potential hazards and guide preparation for safe fieldwork. We encourage graduate students to read the questions carefully to identify all topics that apply to their research. By being inclusive, students can prepare for a wide range of possibilities in the field, even if the risk or probability of occurrence is low. Although our list of questions is primarily focused on terrestrial and freshwater research, sections can easily be expanded or added to incorporate other venues such as marine and alpine research, for example.

One of the key aspects of this section is to identify where additional training may be required. Requirements and regulations around workplace safety may vary quite widely depending on the state (or province) and country, and students can be provided with a list of local training resources that are relevant. For example, students in our workshop are provided with a list of website addresses for agencies such as St. John Ambulance (first aid training) and Transport Canada (water craft safety certification).

## 2. Mitigating hazards

Once hazards are identified, you can plan to mitigate them and to be prepared in the case of an

accident in the field. The completed questionnaire (Table 1) can be used to identify the skills, training, and equipment needed to access research sites and complete fieldwork safely. There are multiple, complimentary ways to mitigate hazards:

- develop procedures to deal with hazards
- identify training graduate students and field assistants have received and require
- compile needed safety equipment and ensure it is working properly
- develop an evacuation plan in the case of an emergency, including protocols for contacting the faculty supervisor and a designated family member or friend for each member of the field team.

### 3. Communications

Before you leave for the field, have a clear communication plan in place. Schedule research updates with your faculty supervisor by e-mail or phone. Depending on your research, this may be daily, weekly, or monthly.

Like any wilderness activity, you should have a designated check-in person who knows where you are working each day, the route you are taking, who is with you and when you will return. Your check-in person may be a colleague, friend, family member, or a company that provides a professional check-in service. Check-ins may be accomplished using radios, cellular or satellite phones, commercial satellite tracking services (e.g., SPOT©) or other communication devices. A plan should be in place if you miss your check-in. If you do not return as planned within a defined amount of time (e.g., 1 or 2 or 3 hours), your check-in person will need to give accurate information to the appropriate local authorities and they should know how to contact your academic supervisor. In advance of fieldwork, your check-in person should be given the location and phone numbers of the local emergency services, such as the police or search and rescue whom they should contact if you miss your check-in.

Plan ahead. In the case of an emergency involving you, who do you want contacted? Who do you contact if one of your field assistants is involved in an emergency? Register the names, phone numbers, and e-mails of your emergency contacts with all members of your research team, your academic supervisor, and your check-in person.

### 4. Leadership and power relationships

Graduate students who lead field teams are in the middle of complex power relationships. Like middle managers, they are accountable to their faculty supervisor, but expected to supervise their field assistants. Graduate students also have added the pressure of needing to conduct high-quality research on a limited budget and timeline, often with little leadership training.

It is helpful and sets a positive precedent if faculty supervisors clearly communicate their expectations about fieldwork to their graduate students. Similarly, graduate students need to show leadership and develop strong communications with their field assistants. Suggestions for strong leadership include:

- provide clear instructions and training for field assistants on technical aspects of fieldwork
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- identify individual's strengths and weaknesses and following up to help field assistants improve
  - apply the principle of the “rate limiting step” by never leaving a field assistant behind
  - invite feedback, listen to your field assistants, and develop strategies for group decision-making
  - be aware of exclusive behaviours that may alienate some members of the field team
  - gender awareness is critical
  - develop a plan for conflict resolution, before conflicts arise.

For field teams that share accommodation, living arrangements are critical, especially during prolonged fieldwork. It is important to differentiate roles and responsibilities in the household vs. in the field by clearly dividing tasks among the field team. Provide opportunity for each member of the team to have personal time and space.

#### 5. Field safety scenarios: test your team

Before leaving for fieldwork, ensure you have all needed safety equipment, it is in good working order, and everyone knows how to use it. Graduate students leading a field team and their assistants must be equally aware and prepared. Imagine the situation in which the injured graduate student is the only person on the field team who has first aid training and knows how to drive the vehicle! This may seem unlikely, but it is one of many situations that graduate students have reported to us over the past 20 years.

In Tables 2 and 3, we provide a range of scenarios that can be used by your field team to help prepare for the types of situations that may arise. For each scenario, identify the problem, possible solutions, and the skills and equipment needed to react safely. Consider if and how the situation might have been avoided with careful planning. Test yourself: if your team faced this situation, would you have the appropriate safety equipment on hand, in good working order, and would everyone know how to use it? Can you plan proactively to prevent similar situations during field work?

#### Safety workshops

Each April, we offer a half-day workshop to help graduate students in the Faculty of Forestry at the University of British Columbia develop their required safety plans. The workshop, based on the five steps described above, is designed to help students identify topics to include in their safety plan, guide their preparation, and provide some tools for strong decision-making, communications and leadership. It takes two to four hours, depending on the group size and choice of activities. In addition to the workshop, graduate students need to invest time to prepare their plan, complete required safety courses or certifications, and compile their safety equipment.

Participants have indicated that discussion of the field scenarios is particularly helpful for them to anticipate safety issues. Using a “triage” approach, we have participants consider three questions for each scenario in Tables 2 and 3:

- What are the immediate hazards or problems that need to be resolved?
- How would you react in this situation and who should be a part of the solution?
- What is a proactive way to reduce the chance of this happening during your field season?

Below are two options for examining the scenarios, which can be varied according to comfort level,

time available, and the number of workshop participants.

- a) Think–pair–share. Participants work in groups of 2–3 people (ideally a graduate student and their field assistants) to consider a scenario provided by the facilitator. They have 5–10 minutes to discuss the problem and develop reactive and proactive responses, which they are asked to report to the group. The audience can contribute ideas and feedback as well. Group discussion of each scenario takes about 5 minutes.
- b) Acting it out. Participants work in small groups to prepare (10 minutes), then act out a given scenario (5 minutes). The audience answers and discusses the triage questions for 5–10 minutes.

When discussing leadership, we select scenarios and consider how they might escalate into conflicts that pose a safety concern to the entire field team. We encourage graduate students and their field assistants to develop a plan for addressing conflicts before they arise and ensure they have a way to contact the faculty supervisor if conflict escalates.

Finally, graduate students who supervise field assistants need to be aware of their responsibilities to maintain a work environment that meets their university's requirements. For example, the University of British Columbia has policies on respectful work environments, discrimination, and harassment that apply even when conducting fieldwork off campus (<http://equity.ubc.ca/discrimination/>). Good leadership includes being informed and aware of those requirements.

## Conclusion

Safety planning for ecological research must be adaptable to the varied conditions that may be encountered in the field. The framework provided here is a starting point for considering a broad range of hazards and how to mitigate for different scenarios. Feedback from participants has demonstrated that students felt the workshop helped them consider field work safety in new ways and that upon completion of the workshop, they felt better prepared for their future work. Graduate students in any stage of their career who are preparing for field work can benefit from safety and leadership training that will encourage preparation and planning for a rewarding field season.

## Acknowledgments

Our safety workshops are dedicated to Jarod Connor Stanley (1979–2005), an avid skier and keen scientist who lost his life in January 2005 while backcountry skiing at Mount Seymour near Vancouver, Canada. We thank the many graduate students in Geography and Forestry at the University of British Columbia-Vancouver who have shared their positive field experiences, harrowing stories of near misses, provided feedback to improve our safety workshops, and are dedicated to conducting safe fieldwork.

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TABLE 1. Questionnaire on fieldwork safety. Check all topics that apply to your research. Be inclusive when identifying topics to include in your safety plan.

General Considerations	
	How many assistants are needed to meet your research goals? to be cost effective? for safety?
	Have you organized the fieldwork to ensure that you do not work alone?
	Do you and your field assistants have a checklist for safety equipment to be carried on site?
	Does everyone have a list of required clothing and equipment for the field site?
	What is appropriate footwear and does everyone have it?
	Does everyone carry extra food and water?
	Are you aware of physical hazards on your field sites?
	What is the likelihood that hazards might change during a work day? At what point would fieldwork be too risky and have to be cancelled?
	Do you have a clear route into/out of your field sites?
	For navigation to and at field sites, do you carry topographic maps? a compass (set for magnetic declination)? GPS unit (with extra batteries)?
	Are you and your field assistants trained to use the map and compass or the GPS unit?
	Does anyone on your team have a serious medical condition that might affect them on site?
	Does anyone have allergies? Is anyone diabetic?
Emergency Planning	
	Who is the principal contact regarding safety issues at your university? at your field site?
	How do you communicate from your research sites: cellular phone (with coverage)? radios? satellite phone? SPOT (or other GSP messenger)?
	Do you know how to contact emergency services using your radio or phone?
	Do you have a check-in system at the end of each field day?
	Have you completed a first aid course in the past 24 months?
	Have you been provided a first aid kit to use while conducting your research?
	Are you aware of the contents of your first aid kit?

	Does your first aid kit include an epinephrine pen for treatment of allergic reactions?
	Have you read the epinephrine pen instructions for use?
	Do you know the symptoms and treatment of hypothermia?
	Do you know the symptoms and treatment of heat stroke?
	Do you have a system for monitoring logging trucks or other vehicles on roads?
	For your field sites, do you know the location of the nearest hospital?
	1) Do you know how to get there efficiently?
	2) Do your field assistants know how to get there?
	If someone is injured in the field, what are the protocols for reporting the accident and to whom?
Vehicles and Driving	
	Do all members of the field team have a valid driver's license?
	Do you and all field assistants have adequate training and experience driving the vehicle and road conditions your work will require?
	If your field vehicle has a standard transmission, does everyone know how to drive it?
	Is everyone proficient in driving on access roads (e.g. active logging roads)?
	Do you have a checklist for safety equipment in the field vehicle?
	Do you have an emergency road safety kit in your field vehicle?
	Have you inspected the spare tire and the equipment needed to change a flat tire?
	Is your vehicle equipped with a fire extinguisher? Do you know how to use it?
	Are you familiar with procedures for vehicle to vehicle communication in the area you propose to work in? Do you know how to use a radio for vehicle to vehicle communication?
	Are you aware of the service dates and requirements for your vehicles?
	Will you use any all-terrain vehicles?
	Are you trained and certified to operate all-terrain vehicles?
In Wilderness Areas	
	Have you or your field assistants completed wilderness training courses?
	If you access sites by helicopter, have you learned how to approach/exit a helicopter properly?
	Do you have appropriate boots, field and safety clothes for your field work?
	Do you have the "10 essentials" in your day pack?
	How will you monitor weather conditions? Do you have plans for inclement weather?
	Are you prepared for exposure to animals, insects, plants, or weather you may encounter?
	Do you have any medical conditions that could affect your safety in the field? Have you discussed these with your supervisor and field assistants?

Are you allergic to wasps, bees, other insects? Do you carry medication for this? Do your field assistants know?
Is there risk of exposure to Lyme disease or Hantavirus at your field sites?
Are you aware of the wildlife hazards in your study area?
Do you know proper procedures when you encounter wildlife in the field?
Have you completed a bear/wildlife hazards awareness course?
Do you carry bear spray and/or bear bangers?
1) Have you read the instructions?
2) Attempted to operate your bear spray? Your bear bangers?
Do you carry a firearm?
Have you all the necessary licenses for the firearm, and do you know the requirements for safe transport and storage?
Do you use a chainsaw for your field work?
1) Are you required to and have you completed chainsaw operator training course?
2) Do you need a licensed faller to complete your research?
Are you aware of fire hazards or fire-related work restrictions in your study area?
<b>On the Water</b>
If operating a motorized boat, are you required to have an operator's license?
Are you and your field assistants strong swimmers?
Are there enough life jackets rated for the size/weight of each member of the field team?
Does everyone wear their life jacket?
Do you have a complete set of boat safety equipment (rope, anchor, bailing device etc.)?
Do you have a plan in the case of a boating accident, such as a boat capsizing?
Have you and your assistants completed a swift-water rescue course?
Do you use an electro-fisher for your field work?
Have you completed an electro-fishing operator training course?
<b>In the Snow</b>
Do you access and review avalanche bulletins prior to field work to ensure you avoid areas of high avalanche risk?
Have you completed an avalanche safety course?
Do you carry avalanche transceivers?
Is everyone on your crew able to use avalanche transceivers to locate a buried person?
Does everyone have sufficient and appropriate clothing and safety clothing for cold conditions?
Is everyone familiar with how to check if an ice crossing is safe?



TABLE 2. Field scenarios based on real-life experiences of graduates students. For each scenario, identify the hazard. Consider how you and your field assistants would react in this situation. Can you think of a proactive way to reduce the chance of this scenario happening during your field season?

While hiking to a field site, you cross paths with a large bear that is aggressive. It really scares you, but the field team leader wants to continue....

You are working at a field site in the mountains when the weather conditions dramatically deteriorate. It is raining, cold, windy and you can see lightning down the valley...

Your field site is located on a small island that you access by boat and then hiking. While working on site, you stepped on a wasps nest and were stung. For the first time in your life, you are having a strong allergic reaction. You have only one field assistant and they do not know how to drive the boat or the truck...

Your most remote research site is more than 40 km off the main highway on logging roads that are not being actively used at the moment. On the way, you encounter the scene of a serious accident in which a truck has rolled. For some reason your radio reception is just not working very well...

You have had a long but productive field season. You have accomplished a lot in the last few months. You have one week to go, but 8 sites to finish. If you just work 12 hour days everyday, you will not have to delay returning to the city...

Access to your field sites is by helicopter. It is another beautiful day, with highs of +30C predicted and only a chance of rain this evening. You get dropped off at 8am and pick up is scheduled for 4pm. At 1pm, the weather deteriorates and a storm system with lightning, heavy rain and hail sets in. One of your field assistants does not have rain gear...

One of your undergrad assistants cut their hand badly while changing a flat tire on your field truck. You have been to the hospital and they have had stitches but are otherwise ok. What do you do next?

TABLE 3. Leadership and good communications scenarios based on real-life experiences. For each scenario, identify the problem and discuss with your field assistants how they would react. Can you think of a proactive way to reduce the chance of this scenario happening during your field season?

There are two ways to get to your field site (a) short and steep and (b) long and gentle. Everyone but one person is ok with the short, steep route...

Your field crew leader periodically gets really angry—yelling, calling people names, demoralizing you and others on the crew....

Departure time for field work is 8am, but the assistants are chronically late by 30 minutes because

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someone sleeps in, breakfast takes a long time...

Your work supervisor changes their mind about priority tasks daily, making it impossible to plan ahead for more than one day of work...

The leader of your field team is a workaholic who wants to work every day. They do not think there is any point to days off if the weather is not good, but they want to work whenever the weather is good. They say they will just go to the field on their own if you are going to “slack off”...

Your field season is going really well. Work is on schedule. Everyone on your four-person team is getting along well and you have “hooked up” with one of your field assistants...