

Off-Campus Work Safety

University of Tennessee Safety Guide GS-006

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Purpose

This guide serves to assist those planning off-campus work to identify safety and health concerns for individuals or groups representing the University of Tennessee, Knoxville.

Scope and Applicability

This document has been designed as a non-mandatory guide to assist individuals and groups who are traveling off campus and may encounter unexpected hazards. Fieldwork or offsite-work is an extraordinarily diverse area of consideration, however the same principles of safety one would use on campus apply.

- **Anticipate and identify hazards**
- **Control hazards**
 - Elimination
 - Substitution
 - Engineering Controls
 - Administrative Controls
 - Personal Protective Equipment (PPE)
- **Prepare for and Mitigate the Consequences of Accidents**

If you are addressing your fieldwork with the above concepts, informing and training your personnel, providing appropriate resources (such as PPE) and managing practices in the field to adhere to a safety plan then you are on the right track.

Although this is a guide, please note there are some sections of this document that may point to **specific regulatory requirements**. Where such a requirement may be present, such as excavations greater than four feet deep, they may be emphasized

Abbreviations and Definitions

Fieldwork: activities authorized by the University, conducted for the purpose of study, research, recreation, or teaching which are undertaken by faculty, staff, students, and authorized volunteers of the University at a location outside the geographical boundaries of the University campuses.

Remote Areas: Areas of the world, including the United States, that are generally uninhabited and are many miles from potable water, electricity, communication, businesses, residential, medical, and other services.

Roles and Responsibilities

Supervisors are encouraged to:

- Use this document as a guide for individuals or groups who are traveling off-site from campus.
- Consult with EHS if there are any questions relative to this guide.
- Make suggestions for improving this guide.
- Encourage student and employee questions, dialogue, and engagement with safety concepts related to field work.

Environmental Health and Safety shall:

- Maintain this guide in the safety manual online.
- Update the guide as necessary.
- Interpret the intent of the procedure where the meaning may not be clear.
- Assist departments and individuals to the extent feasible with hazard identification, training, and suggestions of appropriate controls.
- Add appendices as needed.

Students and Employees shall:

- Follow directions as specified.
- Not engage in horseplay or other disruptive actions that could lead to an accident.
- Ask questions if uncertain of directions or safety protocol.
- Report hazards or near-misses that occur.
- Report any accidents, damaged equipment/property or other losses to the supervisor.
- Use personal protective equipment when necessary and as instructed.
- Only undertake activities for which they are
 - Properly trained
 - Familiar or understand
 - Physically capable of performing

Guidance and Considerations

General Considerations for Advanced Planning

If you perform field work studies, you need to know and understand the potential hazards (**common and unusual**) presented by the area in which you will do field work. For example, there may be predatory animals (e.g., bears), venomous reptiles, amphibians, or toxic plants. You should ensure that you know what the precautions are for each potentially hazardous situation, and that you have received appropriate training to mitigate these situations. Accidents are always possible when working outdoors – cuts, sprains, falls, insect bites, sunburn, and dehydration are not uncommon. Consequently, it is vital that you follow the direction of your supervisor in the field at all times. Do not engage in horseplay.

Prepare a Safety Plan

Prepare a written Safety Plan of your trip. Provide a copy to each member of your team and leave a copy with a responsible party. Include the following:

Your information and itinerary

Locations, arrival and departure dates, names, addresses and phone numbers of all fieldwork participants.

Activities

General nature of activities being conducted

Possible Risks

Potentially hazardous plants, animals, terrain and weather conditions where you plan to work.

Controls

- Elimination
- Substitution
- Engineering Controls
- Administrative Controls
- Personal Protective Equipment (PPE)

Emergency Plans

Address the basics, safety and security, medical, fire, and weather. Then address specific plans for specific risks.

Contact person

Name and phone number of a person to contact in case of emergency- a spouse, parent or friend, as well as a campus contact.

Local contacts

Names of people at or near your fieldwork site who can reach you if necessary, as well as your check-in/check-out arrangements

Local Authorities

It is advisable to contact local authorities to alert them to your presence before performing work. Consider this from several perspectives.

- If you require assistance, they will already have some awareness of your presence and activities and can render faster assistance.
- It is respectful and professional
- Unusual field activities may be seen by local residents as suspicious. Prevent causing alarm by respectful and professional contact with authorities. They may advise methods to prevent alarm.

Medical Care and First Aid

The following guidelines apply to all off-campus operations including field stations, academic field trips, field research, excursions, etc. that involve employees and students:

- A first aid kit should be maintained at all times during the operation or exercise. First aid kits are highly recommended for all off-campus operations. Departments must purchase and maintain first aid kits including any special equipment or medication that is needed. Kits and refills may be ordered from safety supply companies. EHS can assist with identifying vendors.
- At least one employee who is trained and certified in first aid and CPR should be present during operations.
- At permanent university field stations, written arrangements should be made in advance with local facilities for emergency medical treatment. If you are working from a field station you should find out what the arrangements are for emergency care.

Job Related Injuries or Illnesses

If a university employee suffers a job-related injury or illness, he/she must notify his/her supervisor within 24 hours. The employee's department/supervisor must complete the Report of Incident through [UT Risk Management](#). If the injury is "serious" (amputation, permanent disfigurement, overnight hospital stay, fatality) notify your supervisor immediately. Furthermore, serious accidents must be reported to the [UTK Safety Officer \(EHS\)](#) immediately. [International SOS](#) can assist with emergency medical evacuation to the nearest hospital meeting international standards of care and repatriation of mortal remains.

International Considerations

If you are involved in international research, it is important to obtain your passport and visas well in advance of your travel. Ensure that you have appropriate health insurance coverage. Obtain any recommended vaccinations and make sure that you are aware of any health concerns and what food and water is safe to consume in the country and region of the country in which you will be working.

The dangers may also be human, as the area in which you work may be an area in which there has been past/present civil or political unrest. Check with the State Department so you know if there are any travel warnings or restrictions.

Recordkeeping

Appendix A (Offsite Safety Checklist) should be kept by the department until the trip is complete. The record (Appendix B: UTK Field Work Safety Planning Record) must be kept longer if there are any of the following.

- **Injuries**
- **Damages or loss to equipment or property**
- **Anticipated legal or regulatory actions**

In these cases the length of retention shall be based on the nature of the event.

In addition, departments may consider keeping completed copies of **Appendix B** as reference for future similar trips.

References

OSHA General Industry Standards 29 CFR 1910.

See appendices. Several relevant references are noted within.

Appendices

These appendices are not exhaustive of all situations. Please consider other health and safety programs for the [EHS Safety Manual](#) as they apply.

Appendix A: Offsite Safety Checklist

Appendix B: UTK Field Work Safety Planning Record

Appendix C: Field Research Safety

Appendix D: Physical and Environmental Hazards

Appendix E: Animals and Pests

Appendix F: Diseases

Appendix G: Vehicle Safety

Appendix H: Basic Water Safety

Appendix I: Cold Stress Prevention

Appendix J: Dehydration and Heat Stress Prevention

Appendix K: Safety Hazards of Batteries

Appendix L: Water Sampling Safety Water-Qualities Activities

Appendix M: [reserved for Transporting Chemicals in the Field]

Appendix N: [reserved for Roadside Safety]

Disclaimer

The information provided in these guidelines is designed for educational use only and is not a substitute for specific training or experience.

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Appendix A

Offsite Safety Checklist

The following list of questions has been developed to assist those individuals or groups who are traveling to remote areas in an attempt to identify potential safety and health hazards. Not all questions are applicable to every trip. Please contact campus Environmental Health and Safety (EHS) at 865-974-5084 if you have any questions about this list or if you have a suggestion to improve this document. In addition, EHS is available to the extent feasible to assist with training, procedures, and other aspects related to safety.

Communication and Accountability

- Have plans been made to notify others of the following:
 - Anticipated departure and arrival time at the destination?
 - Destination address?
 - Return date and time?
 - Periodic check in during the trip?
 - Contact information at the site, phone #, e-mail, etc.?
 - Emergency contact information for members of the group?
- Is there a backup plan for communication?
- What process will be used to account for individuals who become separated from the group?
- Will language be a barrier?
- If cell phones are being used, do all members of the group have a list of needed phone numbers?

Personal Protective Equipment (PPE) and Clothing

- Will any of the following PPE be necessary during the trip?
 - Gloves?
 - Protective footwear?
 - Hard hats?
 - Protective suits?
 - Hearing protection?
 - Respiratory protection?
 - Eye protection?
 - Other _____
- Have individuals been appropriately trained in the use of the PPE?
- Has a written PPE assessment form been completed?
- Are individuals in the group familiar with the appropriate clothing for the trip?

Health

- Are there any special immunizations necessary when traveling to the area?
- Are there any individuals in the group who have special health conditions?
- How will minor injuries be handled?
- There are endemic diseases in the area that require special precautions?
- Are there any zoonotic diseases specific to the area?
- How will medical emergencies be handled?
- Where are the nearest medical facilities?

- Will there be the need for individuals who are trained in CPR, First Aid or use of an automated external defibrillator?
- Will any human tissue or fluid samples be taken during the trip?
- Will any prolonged high levels of noise, capable of causing hearing loss be encountered during the trip?
- Do all members of the group have health insurance?
- Will a safe source of food and drinking water be available?
- Are all members of the group physically fit for their anticipated tasks including
 - Physical fitness?
 - Acclimated to heat environments?
 - Altitude?
 - Strength?

Transportation

- Will reliable transportation be used to access the area?
- Is there a backup plan if the primary means of transportation fails?
- Will any members of the group from UT be operating a motor vehicle, motorcycle, 4-wheeler, ATV or other vehicle?

Weather Conditions

- Are extreme weather conditions likely to be encountered including
 - Temperature extremes
 - Tornadoes
 - Hurricanes
 - Lightning
 - Drought
 - High winds
 - Heavy Snow
 - Wild fires
 - Ice
 - Heavy Rain and/or Flooding
 - Other

Insurance

- Is special insurance needed for this trip?
 - If so, has the [Risk Management Office](#) been contacted?

Hazardous Substances

- Will hazardous substances be taken to or from the site?
- Are individuals in the group familiar with proper handling of these materials?
- How will hazardous substances be handled as a waste product?
- Will any chemical or biological samples be sent back to the University?
 - If so, have appropriate permits been obtained?
 - Are any of the materials prohibited from entry into the US?

Biological Hazard

- Are any of the following likely to be encountered

- Venomous spiders, snakes, and alike
- Poisonous plants
- Large mammals (elephants, rhinos, lions, bear, tigers)
- Dangerous fish (sharks, killer whales,)
- Dangerous reptiles

Potential Violence and Crime

- Will any part of the trip involve an area where there is:
 - Civil unrest
 - High crime rates – including theft
 - Potential violence, including kidnapping, rape, assaults, etc.
- How will valuable equipment and personal effects be protected from theft or vandalism?
- How will acts of crime against the group be reported and documented?

Equipment

- Will any powered (electric, propane, gas) equipment be used on the trip?
 - If so, are individual familiar with the proper use of the equipment?
- Will any heavy equipment (forklifts, backhoes, bulldozers, etc.) be used by the individual or group?
- Will equipment checks be made for proper guarding, electrical safety and proper use?
- Will there be the need for specific equipment training?

Cultural and Laws

- Are there any cultural aspects or customs that must be observed?
- Will work involve any culturally significant areas, buildings, or artifacts?
- Are there any special laws or regulations that must be observed?

Other Activities that Require Review

- Spelunking
- Underwater work (SCUBA)
- Working at elevated heights without fall protection (barriers or personal fall arrest system)
- Parachuting
- Excavation over 4 feet in depth with vertical walls
- Potential avalanche
- Horseback riding
- Work at elevations above 12,000 feet
- Work near active volcanoes
- Work in the polar regions
- Work at sea or on ships, boats or alike.
- Construction sites
- Carrying fire arms

Physical Demands

What physical demands will the fieldwork entail?

<input type="checkbox"/> Climbing	<input type="checkbox"/> Extreme Heat	<input type="checkbox"/> Manual lifting, carrying or handling heavy loads
<input type="checkbox"/> High Altitude	<input type="checkbox"/> Extreme Cold	<input type="checkbox"/> Working on, near, or over water
<input type="checkbox"/> Hiking	<input type="checkbox"/> Sun Exposure	<input type="checkbox"/> Other

General

Yes No N/A

			Have arrangements been made to provide participants with: <input type="checkbox"/> Potable water <input type="checkbox"/> Personal washing/hygiene <input type="checkbox"/> Toilet facilities or procedures
			Are participants aware of suitable clothing, footwear and personal supplies required (e.g. boots, hat, raingear, sunglasses, sunscreen, insect repellent)? List required personal supplies and attach to form.
			Have arrangements been made to provide participants with, and train them in the safe use of, appropriate personal protective equipment such as: <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Respiratory Protection <input type="checkbox"/> Coveralls <input type="checkbox"/> Protective Footwear <input type="checkbox"/> Protective Headwear <input type="checkbox"/> Hearing Protection <input type="checkbox"/> Gloves <input type="checkbox"/> Face Shield <input type="checkbox"/> Waders (Hip, Chest) <input type="checkbox"/> Knee/shin Guards <input type="checkbox"/> Flame Retardant Clothing <input type="checkbox"/> Other:

Other Hazards/Protective Measures/Comments: _____

Working Alone

Yes No N/A

			Will any participant be working alone?
			Has an effective communications system been established (e.g. radio, walkie-talkies, phones, whistles, air horns, flares, frequent and scheduled contact)? Describe system:

What other means can be employed to reduce the risk to a participant when working alone? _____

Yes No N/A

			Limitations or prohibitions on certain activities while alone
			Provision of emergency supplies
			Establishment of minimum training or experience or other standards of competency before working alone
			Other:

Other Hazards/Protective Measures/Comments: _____

Remote Areas

What communication systems will be employed?

- Cell Phones
- Leaving itinerary at Base Camp
- Whistles/Air Horns
- Radio or Walkie-Talkies
- Scheduled contacts
- Satellite Phone
- Other:

How will participants remain orientated to their location?

- Maps
- Compass
- Identification of safest route
- GPS (spare batteries)
- Local Guides
- Area familiarization trips
- Arial Photo
- Other:

What procedures have been established in the case participants become lost?

- Participant training on remaining at location, use of emergency signals, and use of emergency survival
- Provision of survival gear
- Procedure for organized search
- Precautions against fire
- Precautions in the event of extreme weather conditions
- Other Hazards/Protective Measures/Comments:

Wildlife

Yes No N/A

			Have participants been adequately trained in the handling, capture and restraint of study species?
			Will participants be administering drugs/anesthetics or obtaining biological samples? If so, have they been trained in techniques appropriate to the species and in how to manage disposal of waste or surplus materials?

Yes No N/A

			Have participants been instructed on techniques to avoid unexpected encounters with potentially dangerous wildlife?
			Are participants familiar with the methods of contraction of disease from wildlife in the area?
			Have participants been made aware of the signs/ symptoms of potential zoonosis that may be present in wildlife in the study area?
			Have participants been made aware of potential vegetation hazards and the identification of toxic plants such as Poison Oak / Poison Ivy?

Other Hazards/Protective Measures/Comments: _____

Chemicals and Hazardous Materials

Yes No N/A

			Is each hazardous properly identified with a supplier or label?
			Will hazardous material be transported to and from the site?
			Will Safety Data Sheets for each hazardous material used be readily available to participants?
			Will samples be collected, preserved in hazardous material (ethanol, formalin)?
			Will appropriate materials be available to adequately handle hazardous materials, spills, leaks or releases? Describe materials and attach to form.

Other Hazards/Protective Measures/Comments: _____

Safe Use of Equipment and Work Processes

Some equipment and activities to which specific training or certification is required include:

- Chain Saws
- Compressed Gases
- Confined Spaces
- Diving (Free, SCUBA, Line, NITROX, Tri-Gas)
- Excavation/Trenching/Tunneling
- Noise exposure above 85 dBA
- Powered saws, grinders, and planers
- Firearms
- Fire Extinguishers
- Powered Mobile Equipment (forklift, tractor, heavy equipment)
- Minimum distances from exposed energized conductors (e.g. power lines)
- Explosives
- Fall Protection above 6 feet
- Hazardous Materials
- Ladders
- Lifting Devices and Hoists
- Scaffolds
- Travel on Un-improved Roads
- ATV, PWC, or other Water Craft
- Climbing, Rappelling, Rope work

Yes No N/A

			Are participants trained to operate the equipment safely and in compliance with regulatory standards?
			Have employees been trained in safe work procedures?

List Powered or Hazardous Equipment

List Hazardous Procedures

Requirements

Equipment

All equipment to be taken on a field trip must be checked by a qualified person to ensure that it is in good condition, complete and safe (before removal from the campus). Documentation of this pre-trip assessment of the equipment is advised. Individuals operating the equipment must be trained in the proper use of the equipment.

Clothing

Fieldwork participants should be informed of the appropriate clothing to be worn while conducting their work. The appropriate clothing may have to be provided by the University or the worker may have to provide his or her own clothing, depending on requirements.

It should be identified whether or not there is special protective gear to be used while conducting the particular fieldwork and where necessary, this protective clothing must be used and the appropriate training provided in the proper use and maintenance of the personal protective equipment.

When extreme weather conditions can be anticipated or are known, clothing appropriate to the situation should be taken on the fieldwork excursion.

Fieldwork participants must employ common sense in terms of clothing worn on the fieldwork excursion. Participants inappropriately attired or without the correct PPE will not be allowed to participate in the Fieldwork.

Immunizations, Emergency Preparedness and First Aid

First-Aid Kits

First-aid kits are required for all off-campus operations. It is the responsibility of the Primary Investigator to provide and ensure that the kit is maintained. Prior to the departure for fieldwork the Primary Investigator is responsible to document the presence of a first-aid kit for the trip and any other required first-aid supplies.

Travel Immunization/Prophylaxis Requirements

See Center or Disease Control and Prevention (CDC) recommendations:

<https://www.cdc.gov/vaccines/acip/recs/index.html>

- | | | |
|------------------------------------------------|---------------------------------------|-------------------------------------------|
| <input type="checkbox"/> Diphtheria | <input type="checkbox"/> Polio | <input type="checkbox"/> Other (specify): |
| <input type="checkbox"/> Hepatitis A | <input type="checkbox"/> Rabies | |
| <input type="checkbox"/> Hepatitis B | <input type="checkbox"/> Rubella | |
| <input type="checkbox"/> Japanese Encephalitis | <input type="checkbox"/> Tetanus | |
| <input type="checkbox"/> Malaria | <input type="checkbox"/> Typhoid | |
| <input type="checkbox"/> Measles | <input type="checkbox"/> Yellow Fever | |

Yes No N/A

			Has itinerary been left with responsible person at the University?
			Will itinerary be left with responsible local authority?
			Are emergency contact numbers for local emergency assistance known?
			Are emergency contact numbers for each participant known? Attach list or describe location of list:
			Are Student Health or Primary Health Insurance Numbers (or equivalent) for each participant available? Attach list or describe location of list:
			Is first aid kit complete?
			Are all participants familiar with the location of first aid kit and its contents?
			Has nearest medical facility been identified? Include Name, Location, & Distance from fieldwork site:
			Is a first aid attendant required? Name(s) of attendant(s):
			Are additional first aid supplies required? List:
			Is there means to summon assistance in case of emergency? Describe:
			Are participants familiar with the UTK Offsite Safety Guidelines?
			Are Student Health or Primary Health Insurance Numbers (or equivalent) for each participant available? Attach list or describe location of list:

Other Hazards/Protective Measures/Comments: _____

Emergency Procedures

Emergency Plan for Research Location: include information on communication, equipment; local emergency contacts, emergency contacts, etc. **(attach copy to form)**

<i>University Contact and Phone #</i>	<i>Local Contact and Phone #</i>
1.	1.
2.	2.
3.	3.
4.	4.

Equipment Checklist

<input type="checkbox"/>	Specialized Clothing – describe
<input type="checkbox"/>	PPE (respirator, eye/face protection, head protection, footwear, high-visibility clothing) – describe:
<input type="checkbox"/>	Training on safe use procedure for power equipment
<input type="checkbox"/>	Other training
<input type="checkbox"/>	Communication devices (e.g. whistles, 2-way radios)
<input type="checkbox"/>	First Aid Kit
<input type="checkbox"/>	Additional First Aid or medical supplies
<input type="checkbox"/>	Emergency supplies
<input type="checkbox"/>	First Aid attendant
<input type="checkbox"/>	Vehicle/travel survival kit
<input type="checkbox"/>	Safety Data Sheets
<input type="checkbox"/>	Licenses (e.g. vehicle, boat, diving equipment)
<input type="checkbox"/>	Maps
<input type="checkbox"/>	Other:

Risk Assessment

List identified hazards related to activities or environment (i.e. extreme heat or cold, wild animals, endemic disease, firearms, explosives, violence), and chosen available measures for eliminating or reducing risks to acceptable levels:

<i>Risk</i>	<i>Precautions to be implemented</i>
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Notes:

I, the undersigned, acknowledge that, in keeping with the UT's Offsite Work Safety Guidelines:

- a. I have been fully informed of the risks of this fieldwork and that I accept them;
- b. I am aware of and will comply with the established safety procedures and my duties as a participant, including my duty to take reasonable care for my health and safety and the health and safety of others who may be affected by my actions;
- c. I have received all of the recommended immunizations;
- d. I am aware of limitations of insurance coverage.
- e. For specific requirements reference the UTK Offsite Safety Guidelines.

Acknowledgment of participants:		
<i>Name (print)</i>	<i>Signature</i>	<i>Date</i>
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Signature of Principal Investigator

I acknowledge that this safety plan has been prepared in keeping with the requirements of UT's procedures for safety in fieldwork:

<i>Name (print)</i>	<i>Signature</i>	<i>Date</i>

For questions on this form, please contact [EHS](#) at 865-974-5084.

Appendix C

Field Research Safety

All science, whether conducted in a controlled indoor laboratory or in an outdoor field setting, requires regular safety training and thorough consideration of safety issues specific to individual research projects. The office of Environmental Health and Safety exists as a safety consulting resource for all university departments and personnel. Also available are several examples of safety protocols, guidelines and procedures developed by various units within the college to help in the formation of safety protocols for particular projects or activities. Ultimately, safety rests with each individual. Individuals are responsible for their own safety and, through their actions, the safety of those around them.

Field research is defined here as comprising work activities conducted primarily for the purpose of research, undertaken by employees or students of the university outside of an office or research laboratory. Ultimately, field research involves some risk from both the research activities and chance events that are unpredictable and unavoidable. Part of the risk can be greatly reduced by awareness of hazards and exercising good judgment. Risk in field research may include, but is not limited to, the risk to physical health, emotional well-being and personal safety. The risks may arise because of the nature of the research itself, from the physical climate, or from the political, social, economic and cultural environment of the field work location. For these guidelines, the following definitions are employed:

- A **principal investigator (PI)** is a faculty member who assembles a team to carry out field research.
- A **field supervisor** is a person appointed by a principal investigator to directly oversee field research on location. A field supervisor is expected to have a safety plan and all of the suitable training for conducting field research. Field supervisors should have the following training: general safety orientation, CPR, wilderness first aid, and general knowledge of all first aid equipment. The following safety factors should be considered when developing the safety plan.
- A **field worker** is a person who carries out research under the direction of a field supervisor.

Scheduling

To the extent possible, field research should be planned in advance. The PI should know when and where field research is being conducted. If the PI is away, then department staff should be advised of pending research.

Protective Equipment

A properly equipped first aid kit, a cell phone, and extra water are required on all field excursions. Appropriate personal protective clothing and equipment are required to the field workers.

Contacts

The home phone number of all field workers and supervisors, as well as phone numbers of emergency contacts, should be included in the safety plan maintained by the supervisor. The home and work numbers of the PI needs to be kept in the plan in case field researchers need to contact PI during an emergency.

Medical Facilities

The telephone number, location and directions to a medical facility in the vicinity of the field site should be written into the safety plan maintained by the field supervisor.

Vehicles

All state and local laws, rules and regulations must be followed.

Every field researcher has the right, at any time, to refuse to participate in any activity that they feel may endanger their health or safety or that of another person.

Safety Issues for Principal Investigators

- When in the field, the PI has the same responsibilities as a field worker and may take on the responsibility of being field supervisor, or may designate that responsibility to the field supervisor in charge. When not in the field, the PI should make an effort to ensure that field work is performed in compliance with the safety plan, that all personnel are provided the necessary safety training and equipment.
- The PI is responsible for:
 - Facilitating the field supervisor with determining the specific health and safety risks and level of risk associated with the particular field project.
 - Assembling a field team and establishing a clear chain of command, which is understood by all team participants
 - Participate in pre-trip planning specific to the trip, including a review of the safety plan.
 - Documenting that each field worker is aware of the provisions of the safety plan, the risks associated with the project, training, and verifying that all safety procedures are in place.
 - Ensuring that appropriate controls and safety procedures are in place to deal with the risks reasonably expected to be associated with the field research, as well as provision of appropriate protective equipment and training.

Solitary field research activities in remote areas are strongly discouraged. Field research involving particularly hazardous locations or activities should be conducted by two or more people and only after full assessment of the risks and available controls and safety procedures has been made. In circumstances where solitary field research is necessary, the solitary field worker assumes the responsibilities of field supervisor. A method of regular communication should be implemented, including steps to follow if a scheduled contact is not made.

Basic preparations that should become routine before every sampling activity

- Use safety checklists when preparing for a field trip. Develop your checklists from existing site safety information and site reconnaissance (job hazard analysis or site safety plan).
- Keep a field folder for each surface-water and ground-water site at which water-quality data will be collected. The safety related contents of a field folder include:
 - Copies of the checklists mentioned above.
 - Site type (hazardous waste, confined space, cableway, wading site, bridge site, boat site) and site description.
 - Site location (include map, site sketch, and description).
 - Locations and phone numbers of emergency facilities, such as a hospital or first aid station, police and fire departments, utility companies.
- Additional information specific to the site: for example, if it is open to hunting, and season dates; appropriate clothing (such as orange safety vests).
- Make an itinerary for every field trip and leave a copy at the office and with family or colleagues. Schedule times to check in at work and with family or colleagues when field trips require overnight stays. Follow the established schedule. Notify all concerned parties if your schedule changes.
- Obtain or reserve communication equipment, such as a cellular phone or two-way radio.

Training

Awareness is the most basic and most important step in preparing to work in the field. To adequately prepare for field research, the worker needs to understand what the specific field research project entails and what safety concerns may arise. Field workers should be aware of the locations of emergency equipment, as well as basic emergency procedures. This is analogous to “site-specific” training in laboratories. CPR and Wilderness First Aid training is highly recommended.

All field research workers should be informed of the potential physical and environmental hazards in the area such as poisonous plants, animals, insects, terrain, biological hazards, weather conditions, crime, and disease. The PI and/or field supervisor shall maintain completed medical history forms for each field researcher consisting of emergency contact information.

Advanced Planning

If you are involved in international research, it is important to obtain your passport and visas in order well in advance. Make sure that you have health insurance coverage. Obtain any recommended vaccinations and make sure that you are aware of any health concerns and what food is safe to eat in the country and region of the country in which you will be working. Check with the State Department so you know if there are any travel warnings or restrictions.

If you perform field work studies, you need to know and understand the potential hazards presented by the area in which you will do field work. For example, there may be predatory animals (e.g., bears), venomous amphibians, or toxic plants. The dangers may also be human as the area in which you work may be an area in which there has been past/present civil or political unrest. You should make sure that you know what the precautions are for each potentially hazardous situation and that you have received the training to handle these situations. Accidents are always possible when working outdoors – cuts, sprains, falls, insect bites, sunburn, and dehydration are not uncommon. Consequently it is vital that you follow the direction of your supervisor in the field at all times. Do not engage in horseplay.

Appendix D: Physical and Environmental Hazards

Many general physical and environmental hazards exist in nearly every location worldwide. All field team members, regardless of the work location, should read through table 1 to learn more about some general and physical and environmental hazards. If your work is in North America, please read table D-2. If your work will take you out of North America, please read table D-3 about international hazards.

Table D-1: Physical and Environmental Hazards Found Worldwide					
<i>Hazard</i>	<i>Location</i>	<i>Cause</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Dehydration	Worldwide	Not enough water intake	Dark urine, Lethargy Constipation, Light-headedness	Drink plenty of fluids, take frequent rest breaks, and minimize intake of beverages containing caffeine.	Drink plenty of water (at least 2 quarts of water per day). Drink more if working strenuously or in a warm climate.
Impure Water	Worldwide	Harmful organisms and pathogens living in “natural” water sources	Gastrointestinal illness, Flu-like symptoms	Drink clear liquids. Slowly introduce mild foods, such as rice, toast, crackers, bananas, or applesauce. See a doctor if there is no improvement.	Carry your own water. Treat water before use with tablets, purifiers, or by boiling for more than 3 minutes.
Sunburn	Worldwide	Excessive exposure to the sun	Irritated skin, pink or red in color	Apply cool water, aloe, or other cooling lotion to affected area.	Wear long sleeved clothing and a hat. Apply sun protection factor (SPF) of 30.
Heat Exhaustion	Worldwide: hot climates	Prolonged physical exertion in a hot environment	Fatigue, Excessive thirst, Heavy sweating, Cool and clammy skin	Cool the victim, treat for shock, and slowly give water or electrolyte replacer.	Acclimate to heat gradually. Drink plenty of liquids. Take frequent rest breaks.

Table D-1: Physical and Environmental Hazards Found Worldwide

<i>Hazard</i>	<i>Location</i>	<i>Cause</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Heat Stroke	Worldwide: hot climates	Prolonged physical exertion in a hot environment	Exhaustion Light-headedness Bright red skin which is warm to the touch	Cool the victim at once, replenish fluids, and seek medical attention immediately.	Acclimate to heat gradually. Drink plenty of liquids. Take frequent rest breaks.
Frostbite	Worldwide: cold climates	Exposure to cold temperatures	Waxy, whitish numb skin, Swelling, itching, burning, and deep pain as the skin warms	Slowly warm the affected areas (do NOT rub area) and seek medical attention as soon as possible.	Dress in layers. Cover your extremities with warm hats, face mask, gloves, socks, and shoes.
Hypothermia	Worldwide: cold climates	Prolonged exposure to cold temperatures	Shivering, Numbness, Slurred speech, Excessive fatigue	Remove cold, wet clothes. Put on dry clothes or use a blanket or skin-to-skin contact to warm up. Drink warm liquids and seek medical attention as soon as possible.	Dress in layers. Wear appropriate clothing. Avoid getting damp from perspiration.
Carbon Monoxide	Worldwide	Running a vehicle or burning a fuel stove in an enclosed space	Severe headaches, Disorientation, Agitation, Lethargy, Stupor, Coma	Remove the victim to fresh air immediately and perform CPR if needed.	Keep areas adequately ventilated when burning fuel. Ensure that vehicle tailpipe is not covered by snow.

Table D-1: Physical and Environmental Hazards Found Worldwide

<i>Hazard</i>	<i>Location</i>	<i>Cause</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Extreme Weather	Worldwide	Snow squalls, blizzards, lightning, tornadoes, hurricanes, monsoon rains, floods	Severe weather can result in physical injury and/or death.	Seek shelter immediately.	Be aware of special weather concerns. Bring appropriate equipment to deal with severe weather.
High Altitude Illness	Worldwide: high altitudes	Decreased oxygen and increased breathing rate	Headache Nausea Weakness	Use supplemental oxygen and decrease altitude.	Allow your body to acclimatize by gaining elevation slowly.
Hazardous terrain	Worldwide	Walking or hiking in steep or rocky areas	Physical injury or death	Perform CPR and/or seek medical attention if needed.	Wear appropriate shoes. Carry needed items in a well- balanced pack. Use rappelling equipment for climbing. Use hiking poles if needed.
Drowning	Worldwide	Inhalation of water leading to respiratory impairment	Apnea (suspension of breathing) Death	Take victim out of water. Turn head to side to allow water to drain out. Perform CPR if needed. Seek medical attention as soon as possible.	Know how to swim before performing field activities in water or on boats. Be aware of water safety recommendations for swimming in strong currents if necessary. Have life preservers and rescue equipment available.

Table D-1: Physical and Environmental Hazards Found Worldwide					
<i>Hazard</i>	<i>Location</i>	<i>Cause</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Travel-related accidents	Worldwide	Injury associated with vehicle, boat, aircraft, or other means of travel	Physical injury and/or death	Perform CPR if needed. Seek medical attention as soon as possible.	Be familiar with safe operation of the vehicle or craft you will operate; use licensed pilots or drivers.
Assault	Worldwide	Criminal activity; robbery may be the motivation.	Physical injury	Remove victim to safe location if possible; seek medical attention if needed. (Also, report assault immediately to local authorities.)	Be aware of your surroundings. When possible, avoid being alone after dark, especially in high-crime areas. If assaulted, run away if possible, or make noise to attract help.
Electrical shock	Worldwide, particularly temporary structures, and in areas without strong building	Damaged electrical cords, improper electrical wiring, improper grounding	Cardiac arrest, muscle contraction/ shaking, numbness, paralysis, or other neurological symptoms, burns, other physical injuries	Provide burn first aid as needed. Go to the nearest emergency room for physical injuries, severe burns, or cardiac arrest.	Inspect cords for damage and replace damaged cords or have them repaired by a qualified person.

Table D-1: Physical and Environmental Hazards Found Worldwide

<i>Hazard</i>	<i>Location</i>	<i>Cause</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Burns	Worldwide, particularly if using thermal equipment or if working in very hot locations	Touching a hot surface of equipment or sun-warmed surface, especially metal; contact with flames.	Pain, redness, swelling, tissue damage, blisters (2nd degree), charring (3rd degree)	Cool the burn with cool water (<i>not</i> ice); cover with sterile bandage, take pain-reliever. For large 2nd or 3rd degree burns, seek emergency medical treatment. Don't immerse burned areas in water. When possible, elevate the burned body part. Cover the area with a cool moist sterile bandage or cloth. Get a tetanus shot if your last shot was > 5 years ago.	Use gloves when handling hot objects.

Table D-2: Physical and Environmental Hazards Found in North America

<i>Hazard</i>	<i>Location</i>	<i>Cause</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Hunting Season	United States	Local hunting seasons and regulations vary.	A hunting accident may result in serious injury or death.	Seek medical attention for serious injuries or wounds.	Wear appropriately colored safety clothing. Avoid animal like behavior (e.g., hiding in thickets).
Poison Plants	North America	Exposure to poison ivy, poison oak, or poison sumac plants	Itchy rash Red, swollen skin	Apply a wet compress with baking soda or vinegar or use a topical ointment. Avoid scratching the rash.	Avoid contact with poison plants. Wash clothes and skin with soap and water after exposure. If sensitive, use Tecnu or similar product to help remove rash-causing oil if exposure occurs.

Table D-3: Physical and Environmental Hazards Found Outside of North America

<i>Hazard</i>	<i>Location</i>	<i>Defensive Action</i>	<i>Prevention</i>
Violence caused by political unrest or military conflict	International	Leave the area as soon as it is safe to do so.	Be aware of current travel advisories (see Section V).

Appendix E: Animals and Pests

Dangerous animals and other pests are present worldwide. General safety rules can help protect you from these hazards. All field researchers, regardless of the work location, should read through table E-1 for some general guidelines to avoid unwanted animals and pests. If your research is in North America, please also read table E-2. If your research will take you out of North America, please also read table E-3 about international animals.

A number of animals and pests may be encountered in fieldwork. Follow these general guidelines to prevent close encounters of the painful kind:

- Keep garbage in rodent-proof containers and stored away from your campsite or work area. Food crumbs and debris may attract insects and animals.
- Thoroughly shake all clothing and bedding before use.
- Do not camp or sleep near obvious animal nests or burrows.
- Carefully look for pests before placing your hands, feet, or body in areas where pests live or hide (e.g., woodpiles or crevices).
- Avoid contact with sick or dead animals.
- Wear clothes made of tightly woven materials and tuck pants into boots.
- Wear insect repellent.
- Minimize the amount of time you use lights after dark in your camp or work site because they may attract pests and animals.
- Use netting to keep pests away from food and people.
- Carry a first aid manual and kit with you on any excursion so you can treat bites or stings. If the pest is poisonous or if the bite does not appear to heal properly, seek medical attention immediately.
- Be aware of the appearance and habitat of likely pests, such as those described in the following pages.

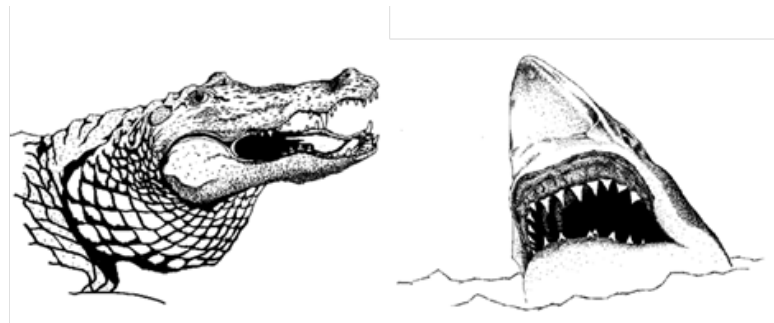


Table E-1: Animals and Pests Found Worldwide					
Type	Location	Most Dangerous Species	Defensive Action	First Aid	Prevention
Sharks	Worldwide: Shores of oceans, including the U.S., Africa, Central and South America, Australia, and the Pacific Islands	Great White, Bull, Tiger, Oceanic Whitetip	Call for help; swim towards safety. Punch or kick the shark if necessary.	Seek medical attention for serious injuries or wounds.	Never swim alone. Don't wear sparkling jewelry. Don't enter the water when bleeding.
Crocodiles and Alligators	Worldwide: Tropics and subtropics of North America, Australia, Eastern China, and Africa	American Alligator (North America), Estuarine Crocodile (Australia), Nile Crocodile (Africa)	Do not provoke an alligator or crocodile.	Seek medical attention for serious injuries or wounds.	Avoid waters known to be home to crocodiles or alligators. Keep at least 30 feet away from any crocodile or alligator.
Rodents	Worldwide	Refer to Section on Diseases	Wear appropriate personal protective equipment (gloves) if you must touch a rodent.	Clean wounds thoroughly if bitten or scratched.	Keep areas clean to avoid attracting rodents. Keep food stored in sealed containers.
Conenose Bugs	North and South America	May cause allergies in some people. Refer to Section on Diseases		Use topical ointments to sooth itching. Take victim to the hospital in case of anaphylactic shock.	Use caution when working near nests and wood rat dens. Use extra caution when working near rock shelters.
Mosquitoes	Worldwide, especially wet areas conducive to breeding	Refer to Section on Diseases		Use topical ointment to relieve itching.	Use insect repellent to deter mosquitoes. Don't leave standing pools of water.

Table E-1: Animals and Pests Found Worldwide					
<i>Type</i>	<i>Location</i>	<i>Most Dangerous Species</i>	<i>Defensive Action</i>	<i>First Aid</i>	<i>Prevention</i>
Water Dwellers	Worldwide, especially Australia, also in other tropical and subtropical areas	Blue Ringed Octopus, Box Jellyfish, and Irukandji Jellyfish (Australia); Stonefish – worldwide	Never touch an unidentified octopus or jellyfish. Avoid stepping on stingrays.	Jellyfish/ Octopus sting: Use seawater to remove nematocysts. Pour vinegar on the wound. Seek medical attention immediately. Stonefish sting: Rinse in hot water (45° C or 113° F) and seek medical attention. Blue-ringed octopus sting: Provide CPR and/or supportive care to the patient and seek medical attention IMMEDIATELY. Stingray sting: irrigate wound to remove spine fragments; apply pressure to stop bleeding; soak wound in hot water or apply heat pack; remove sting pieces if injury is on extremities, then clean wound; seek emergency medical attention.	Avoid going in waters known to be inhabited by jellyfish and octopus. Wear sandals in the water to avoid stepping on a stonefish. Shuffle in the water or throw stones in before wading to avoid stepping on a stingray.

Table E-2: Animals and Pests Found in North America

<i>Type</i>	<i>Location</i>	<i>Most Dangerous Species</i>	<i>Defensive Action</i>	<i>First Aid</i>	<i>Prevention</i>
Bears	North America	Black Bear (North America), Grizzly Bear (Alaska, Western Canada, Pacific Northwest), Polar Bear (Arctic)	Never run. Move slowly and speak in a low soft voice. If attacked, lay in the fetal position and protect head. Play dead. Use Bear Spray (see https://www.nps.gov/subjects/bears/safety.htm for more information).	Seek medical attention for serious injuries or wounds.	Keep food out of sleeping areas. Never approach a bear or bear cub. Wear a bell or other noisemaker. Stay away from the bear's food supply.
Mountain Lions	North America : Western Canada, south into Wyoming, California, parts of Texas, Florida Everglades (few)	All	Do NOT run. Fight back. Protect your neck and head. Don't play dead.	Seek medical attention for serious injuries or wounds.	Do not corner it. Make yourself look larger (arms overhead). Use loud voice. Throw sticks or rocks. Carry pepper spray.
Snakes	North America	Rattlesnakes, Cottonmouths, Coral Snakes, Moccasins, and Copperheads	Do not pick up, disturb, or corner a snake. Move away from the snake.	Let the wound bleed freely for 30 seconds. Apply a cold pack. Keep area immobilized at heart level. Take victim to hospital (alert ahead if possible).	Walk in open areas. Wear heavy boots. Use a stick to disturb the brush in front of you.

Table E-2: Animals and Pests Found in North America

<i>Type</i>	<i>Location</i>	<i>Most Dangerous Species</i>	<i>Defensive Action</i>	<i>First Aid</i>	<i>Prevention</i>
Spiders	North America	Black Widow and Brown Recluse	Do not pick up or disturb a spider.	Clean wound and put a cool pack on the area. Keep area immobilized at heart level. Take victim to hospital (alert ahead if possible).	Use care around rock piles, logs, bark, outdoor privies, and old buildings. Shake out clothing and bedding before use.
Scorpions	North America, especially Mexico, Arizona, southeastern California, and Utah	All	Avoid contact with scorpions whenever possible.	Clean wound and put a cool pack on the area. Keep area immobilized at heart level. Use painkiller or antihistamine if desired. Take victim to hospital if he or she shows no signs of improvement.	Always shake out clothing and bedding before use. Avoid lumber piles and old tree stumps.
Bees, Wasps	North America	Bees, wasps, hornets, and yellow jackets, Africanized Keller Bess (southeastern U.S.)	Avoid contact with these insects whenever possible.	Remove the stinger quickly. Place an ice pack and elevate to heart level. Use an antihistamine if needed.	Bring medication if you have an allergy (the sting may be fatal). Keep scented foods and meats covered.

Table E-2: Animals and Pests Found in North America

<i>Type</i>	<i>Location</i>	<i>Most Dangerous Species</i>	<i>Defensive Action</i>	<i>First Aid</i>	<i>Prevention</i>
Fleas and Ticks	North America	Refer to Section on Diseases	Avoid contact with animals or areas where fleas and ticks might be found.	Remove the flea or tick with tissue or tweezers and clean wound with antiseptic. Pay attention for signs of illness (see Section on Diseases) and seek medical attention if needed.	Wear clothing of tightly woven material. Wear insect repellent. Tuck pants into boots. Stay on widest part of path. Drag cloth across campsite to check for fleas or ticks.

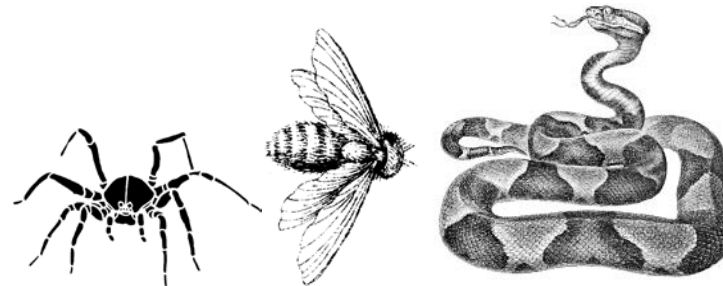


Table E-3: Animals and Pests Found Outside of North America

<i>Type</i>	<i>Location</i>	<i>Most Dangerous</i>	<i>Defensive Action</i>	<i>First Aid</i>	<i>Prevention</i>
Bears	Worldwide: Arctic, South America, Asia	Polar Bears (Greenland and N. Russia), Spectacled Bears (N. and W. South America), Asiatic Black Bears (S. and E. Asia)	Never run. Move slowly and speak in a low soft voice. If attacked, lay in the fetal position and protect head. Play dead.	Seek medical attention for serious injuries or wounds.	Keep your camp area free of garbage and food waste. Never feed or approach a bear, especially a cub. Stay away from the bear's food.
Lions	Africa and Asia	All	Do not provoke a lion.	Seek medical attention for serious injuries or wounds.	Stay inside the vehicle if travelling near lions. Do not camp near areas frequented by lions.
Other Large Land Dwellers	Africa, Asia	Hippos, African Elephant, Rhinos, and Buffalo (Africa); Asian Elephants and Bengal Tigers (SE Asia); Siberian Tigers (N. and E. Asia)	Do not provoke these large animals.	Seek medical attention for serious injuries or wounds.	Stay inside the vehicle if travelling near large animals. Do not camp near areas frequented by large animals. Keep a lookout in open spaces.

Table E-3: Animals and Pests Found Outside of North America

<i>Type</i>	<i>Location</i>	<i>Most Dangerous</i>	<i>Defensive Action</i>	<i>First Aid</i>	<i>Prevention</i>
Snakes	Worldwide	Russel's Viper and Indian Cobra (India); Tiger, Black, Brown and Sea Snakes (Australia); Egyptian Cobra, Puff Adder, and Saw Scaled Viper (Africa); Ferdelance (Central and South America)	Do not pick up, disturb, or corner a snake. Move away from the snake.	Let the wound bleed freely for 30 seconds. Apply a cold pack sparingly. Do NOT tourniquet. Keep area immobilized at heart level. Take victim to hospital (alert ahead if possible).	Walk in open areas. Wear heavy boots. Use a stick to disturb the brush in front of you.
Spiders	Worldwide	Funnel Web and Redback Spiders (Australia); Brazilian Wandering Spider, Brown Recluse, and Tarantula (South America)	Do not pick up or disturb a spider.	Clean wound and put a cool pack on the area. Keep area immobilized at heart level. Take victim to hospital (alert them first). Kill spider for positive ID (if possible).	Use care around rock piles, logs, bark, outdoor privies, and old buildings. Shake out clothing and bedding before use.
Scorpions	Worldwide, especially North Africa, the Middle East, South America, and India	All	Avoid contact with scorpions whenever possible.	Clean wound and put a cool pack on the area. Keep area immobilized at heart level. Use painkiller or antihistamine if desired. Take victim to hospital if he or she shows no signs of improvement.	Always shake out clothing and bedding before use. Avoid lumber piles and old tree stumps.

Appendix F: Diseases

Viruses, bacteria, fungi, and parasites cause diseases in nearly every location worldwide. Some diseases, which are carried or transmitted by an animal, are known as “vector-borne” diseases. Where appropriate, the scientific name of the disease organism, or vector, is included in italics in tables F-1 and F-2.

This guide is not intended to cover every health risk in every location, but it provides information about some common diseases. Always check with your health care provider before travelling out of the country to learn about specific health risks for the region in which you will conduct your research.

All field researchers, regardless of the work location, should read through table F-1 to learn more about some general diseases that exist worldwide. If your research is in North America, please also read table F-2. If your research will take you out of North America, also read table F-3.

Table F-1: Diseases Found Worldwide					
<i>Type</i>	<i>Location</i>	<i>Exposure Route</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Food-borne Diseases: <i>Campylobacter</i>	Worldwide	Poultry Products	Diarrhea Gastrointestinal symptoms	Drink plenty of fluids. Seek medical attention if symptoms persist for longer than 3 days.	Always cook food thoroughly.
Food-borne Diseases: <i>Cholera</i>	Africa, Asia, Latin America	Contaminated food and water	Diarrhea Gastrointestinal symptoms	Drink plenty of fluids. Seek medical attention if symptoms persist for longer than 3 days.	Always cook food thoroughly. Do not drink impure water.

Table F-1: Diseases Found Worldwide					
<i>Type</i>	<i>Location</i>	<i>Exposure Route</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Foodborne Diseases: E. Coli	Worldwide	Beef, unpasteurized milk, unwashed raw vegetables, contaminated water	Diarrhea Gastrointestinal symptoms	Drink plenty of fluids. Seek medical attention if symptoms persist for longer than 3 days.	Always cook food thoroughly. Wash vegetables before consuming. Do not drink impure water.
Foodborne Diseases: Hepatitis A (vaccine available)	Worldwide (underdeveloped countries)	Contaminated water, shellfish, unwashed raw vegetables	Diarrhea, Gastrointestinal symptoms	Drink plenty of fluids. Seek medical attention if symptoms persist for longer than 3 days.	Obtain a vaccine. Consult with your doctor at least 1 month before departing. Always cook food thoroughly. Wash vegetables before eating. Do not drink impure water.
Foodborne Diseases: Salmonella	Worldwide	Beef, poultry, milk, eggs, unwashed raw vegetables	Diarrhea, Gastrointestinal symptoms	Drink plenty of fluids. Seek medical attention if symptoms persist for longer than 3 days.	Obtain a vaccine. Consult with your doctor at least 1 month prior to departure. Always cook food thoroughly. Wash vegetables before consuming.
Foodborne Diseases: Typhoid Fever (Vaccine Available)	Worldwide	Contaminated food and water	Diarrhea, Gastrointestinal symptoms	Drink plenty of fluids. Seek medical attention if symptoms persist for longer than 3 days.	Obtain a vaccine. Always cook food thoroughly. Never drink water from an impure source.

Table F-1: Diseases Found Worldwide					
Type	Location	Exposure Route	Symptoms	First Aid	Prevention
Chikungunya	Worldwide	Infection from the bite of a mosquito carrying the virus	Fever, Joint pain Headache, muscle pain, joint swelling or rash	Treat symptomatically.	Use repellents. Wear long pants & long sleeves. (Treat clothes with permethrin.) Avoid being bit by mosquitoes. Avoid areas of standing water where mosquitoes breed. People with virus should avoid mosquito bites during the first week of illness to minimize transmission to others.
Histoplasmosis	Worldwide (especially Mississippi & Ohio River Valleys)	Inhalation of fungus from soil contaminated with bat or bird droppings <i>Histoplasma capsulatum</i>	Mild flu-like symptoms Occasionally can turn into acute pulmonary histoplasmosis	See a doctor if you suspect histoplasmosis. Typically clears up in 3 weeks.	Use caution when disturbing dry soils or working near bat or bird droppings. Keep surfaces wet to reduce dust.
Leptospirosis	Worldwide	Ingestion, swimming, or other activities in water that is contaminated with the <i>Leptospira</i> bacteria	Flu-like symptoms Occasionally more serious symptoms	See a doctor if you suspect leptospirosis.	Use care when working in the water, especially after a flooding event. Avoid entering the water with open wounds.

Table F-1: Diseases Found Worldwide					
Type	Location	Exposure Route	Symptoms	First Aid	Prevention
Plague	Worldwide	Infection from flea bite (Fleas are infected by rodents.) <i>Yersinia pestis</i>	Flu-like symptoms; nonspecific symptoms; swollen and painful lymph nodes	See a doctor if you suspect plague.	Use care when working in areas where plague is found. Use caution when working with wild rodents. Wear gloves and wash hands frequently
Rabies (vaccine available)	Worldwide	Infection from bite of animal infected with <i>Lyssavirus</i>	Spasms Paralysis Fatal, without immediate treatment	See a doctor IMMEDIATELY if bitten by a rabies-carrying species (e.g. bats, carnivores).	Obtain the vaccine series if you will be working with bats or other carnivores. Use extreme caution handling these animals.
Tetanus (vaccine available)	Worldwide	Infection occurs after a wound. <i>Tetanus bacillus</i>	Painful muscle contractions	See a doctor if you suspect tetanus.	Obtain a tetanus shot every 10 years.
Typhus Fever	Worldwide	Infection from bite of lice, fleas, ticks, or mites <i>Rickettsiae</i> species	Headache Fever Rash	See a doctor if you suspect typhus fever. Treatable with antibiotics	Wear repellents. Wear long sleeved shirts. Tuck pants into boots.

Table F-2: Diseases Found in North America					
Type	Location	Exposure Route	Symptoms	First Aid	Prevention
Coccidiomycosis "Valley Fever"	North and South America: arid regions	Fungus is inhaled when soil is disturbed. <i>Coccidioides</i>	Flu-like symptoms Occasionally becomes severe lung disease	See a doctor if you suspect Valley Fever.	Use caution when in close contact with soil or dust and keep surfaces wet to reduce dust. African Americans, Filipinos, and immunocompromised are at greater risk than others.
Encephalitis	North and South America (St. Louis Encephalitis) and the U.S. (West Nile Virus)	Infection from bite of an infected mosquito	Mild: Fever and headache Severe: Headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, very occasionally, death	Seek medical attention immediately if you suspect encephalitis.	Use repellents. Wear long pants and long sleeved shirts. Avoid being bit by mosquitoes. Avoid areas of standing water where mosquitoes breed.
Lyme Disease	United States, Europe, and Asia	Infection through the bite of an infected tick <i>Borrelia burgdorferi</i>	Spreading rash Early: Flu-like symptoms Later: Arthritis and neurologic problems	See a doctor if you suspect Lyme Disease.	Avoid tick-infested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks.

Table F-2: Diseases Found in North America					
Type	Location	Exposure Route	Symptoms	First Aid	Prevention
Rocky Mountain Spotted Fever	United States, southern Canada, Mexico, and Central America	Infection through the bite of an infected tick <i>Rickettsia rickettsii</i>	Sudden onset of fever, headache, muscle pain, spotty rash	See a doctor if you suspect Rocky Mountain Spotted Fever.	Avoid tick-infested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks.
Hantavirus Pulmonary Syndrome (HPS)/Sin Nombre Virus	North America	Inhalation of dusts or aerosols from the infected rodent's feces, urine, or saliva Vector: Deer mouse (<i>Peromyscus maniculatus</i>)	Early (1 to 5 weeks): Fatigue, fever, muscle aches, and sometimes headaches, dizziness, chills, and abdominal problems. Late (4 to 10 days after early symptoms): Coughing, shortness of breath	Seek medical attention IMMEDIATELY if you suspect HPS. The likelihood of survival is greatly increased with early diagnosis and treatment.	Avoid contact with rodents, especially their feces. See below for details on how to clean and dispose of a rodent infected area.
Arenavirus (White Water Arroyo— WWA)	North America	Inhalation of dusts or aerosols from infected rodent's feces, urine, or saliva; Carried by Woodrats (<i>Neotoma fuscipes</i>) and other <i>Neotoma</i> species	Fever Headache Muscle aches Severe respiratory distress (occasionally)	Seek medical attention IMMEDIATELY if you suspect WWA. The likelihood of survival is greatly increased with early diagnosis and treatment.	Avoid contact with rodents, especially their feces. See next page for details on how to clean and dispose of a rodent-infected area.

Table F-3 Diseases found primarily Outside of North America

<i>Type</i>	<i>Location</i>	<i>Exposure Route</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Dengue Fever	Africa, Southeast Asia and China, India, the Middle East, South and Central America, Australia and the Pacific Islands	Infection from the bite of an infected mosquito	Flu-like symptoms, Rash, Takes up to 1 month to recover.	See a doctor if you suspect Dengue Fever.	Wear long sleeved shirts and long pants. Use repellents. Use a mosquito net.
Malaria (Preventable with Drugs)	Central and South America, Hispaniola, Africa, India, Southeast Asia, the Middle East, and Oceania	Infection from the bite of an infected mosquito	May take 10 to 30 days for symptoms to appear. Flu-like symptoms Anemia Jaundice Can be fatal.	See a doctor if you suspect Malaria	Visit doctor 4 to 6 weeks before travel for anti-malarial drugs. Wear long pants and long sleeved shirts. Use repellents. Use a mosquito net.
Yellow Fever (Vaccine Available)	South America and Africa	Infection from the bite of an infected mosquito	Flu-like symptoms Jaundice Can be fatal.	See a doctor if you suspect Yellow Fever.	Visit doctor at least 10 days before travel for vaccine. Wear long pants and long sleeved shirts. Use repellents Use a mosquito net.

Table F-3 Diseases found primarily Outside of North America

<i>Type</i>	<i>Location</i>	<i>Exposure Route</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Hantavirus and Arenavirus	Central and South America and Asia	Inhalation of dusts or aerosols from the infected rodent's feces, urine, or saliva Vector: Rodents; especially <i>Neotoma</i> and <i>Peromyscus</i> species	Fever Headache Muscle aches. Severe respiratory distress (occasionally)	Seek medical attention IMMEDIATELY if you suspect hanta or arenavirus. Early treatment greatly increases the odds of survival.	Avoid contact with rodents, especially with their feces. See above for details on how to clean and dispose of a rodent infected area.
Schistomiasis	Brazil, Egypt, sub-Saharan Africa, southern China, the Philippines, and Southeast Asia	Transmitted by swimming in contaminated fresh water	Can be asymptomatic. Acute: (2 to 3 weeks) Fever, lack of appetite, weight loss, abdominal pain, weakness, headaches, joint and muscle pain, diarrhea, nausea, and cough Chronic: Disease in the lungs, liver, intestines, or bladder	See a doctor if you suspect schistomiasis.	Avoid freshwater wading or swimming in endemic regions. Heat bath water over 50°C for at least 5 minutes before use.

Table F-3 Diseases found primarily Outside of North America

<i>Type</i>	<i>Location</i>	<i>Exposure Route</i>	<i>Symptoms</i>	<i>First Aid</i>	<i>Prevention</i>
Ebola	Primarily Africa, but could spread to other areas.	Direct contact (via broken skin or mucous membranes) with blood or body fluids of a person who is sick with or has died from Ebola, objects contaminated with blood or body fluids from a sick person, or infected fruit bats or primates.	Fever, severe headache, muscle pain, weakness, fatigue, diarrhea, vomiting, abdominal pain, unexplained bleeding or bruising. May occur 2 – 21 days after exposure; average is 8 – 10 days.	Seek medical attention IMMEDIATELY. Early treatment greatly increases the odds of survival.	Avoid contact with persons sick with Ebola. Staff caring for Ebola patients must follow prevention advice from the WHO and CDC.

Table F-3 Diseases found primarily Outside of North America					
Type	Location	Exposure Route	Symptoms	First Aid	Prevention
<p>Zika Virus http://www.cdc.gov/zika/index.html</p>	<p>Prior to 2015, Zika virus outbreaks occurred in areas of Africa, Southeast Asia, and the Pacific Islands. In May 2015, the Pan American Health Organization (PAHO) issued an alert regarding the first confirmed Zika virus infections in Brazil. Currently, outbreaks are occurring in many countries. Zika virus will continue to spread and it will be difficult to determine how and where the virus will spread over time. For the latest Travel Notice Information</p>	<p>Through mosquito bites</p> <p>From Mother to child</p> <p>Through sexual contact</p> <p>Through blood transfusion</p>	<p>Most people infected with Zika virus won't even know they have the disease because they won't have symptoms. The most common symptoms of Zika are fever, rash, joint pain, or conjunctivitis (red eyes). Other common symptoms include muscle pain and headache. The incubation period (the time from exposure to symptoms) for Zika virus disease is not known, but is likely to be a few days to a week.</p>	<p>There is no vaccine to prevent or medicine to treat Zika virus. Treat the symptoms: Get plenty of rest. Drink fluids to prevent dehydration. Take medicine such as acetaminophen (Tylenol®) or paracetamol to reduce fever and pain. Do not take aspirin and other non-steroidal anti-inflammatory drugs (NSAIDS) until dengue can be ruled out to reduce the risk of bleeding. If you are taking medicine for another medical condition, talk to your healthcare provider before taking additional medication.</p>	<p>No vaccine exists to prevent Zika virus disease (Zika).</p> <p>Prevent Zika by avoiding mosquito bites (see below).</p> <p>Mosquitoes that spread Zika virus bite mostly during the daytime.</p> <p>Mosquitoes that spread Zika virus also spread dengue and chikungunya viruses.</p> <p>Prevent sexual transmission of Zika by using condoms or not having sex</p>

Waterborne Diseases

Waterborne diseases are caused by [pathogenic microorganisms](#) which are directly transmitted when contaminated fresh water is consumed.

Waterborne disease can be caused by [protozoa](#), [viruses](#), or [bacteria](#), many of which are [intestinal parasites](#).

Protozoal Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Amoebiasis (hand-to-mouth)	Protozoan (Entamoeba histolytica) (Cyst-like appearance)	Sewage , non-treated drinking water , flies in water supply	Abdominal discomfort, fatigue , weight loss, diarrhea , bloating , fever
Balantidiasis , also Balantidosis	Balantidium coli	fecally contaminated water	Diarrhea or constipation
Cryptosporidiosis (oral)	Protozoan (Cryptosporidium parvum)	Collects on water filters and membranes that cannot be disinfected , animal manure , seasonal runoff of water.	Flu-like symptoms , watery diarrhea, loss of appetite, substantial loss of weight, bloating , increased gas, nausea
Cyclosporiasis	Protozoan parasite (Cyclospora cayetanensis)	Sewage , non-treated drinking water	cramps , nausea, vomiting , muscle aches, fever, and fatigue
Giardiasis (oral-fecal) (hand-to-mouth)	Protozoan (Giardia lamblia) Most common intestinal parasite	Untreated water, poor disinfection, pipe breaks, leaks, groundwater contamination, campgrounds where humans and wildlife use same source of water. Beavers and muskrats create ponds that act as reservoirs for Giardia.	Diarrhea, abdominal discomfort, bloating , and flatulence

Protozoal Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Meningoencephalitis (primary amoebic)	Protozoan (Naegleria fowleri)	warm stagnant fresh water	olfactory dysfunction , eventually inability to smell and taste , nausea, rigidity of the neck, vomiting, delirium, seizures, and eventually irreversible coma
Microsporidiosis	Protozoan phylum (Microsporidia), but closely related to fungi	The genera of Encephalitozoon intestinalis has been detected in groundwater , the origin of drinking water ^[3]	Diarrhea and wasting in immunocompromised individuals
Toxoplasmosis	Protozoan (Toxoplasma gondii)	faecally contaminated water	when acute: flu-like symptoms , swollen lymph nodes, or muscle aches or pains

Parasitic Infections (Kingdom Animalia)			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Schistosomiasis (immersion)	Members of the genus Schistosoma	Fresh water contaminated with certain types of snails that carry schistosomes	Rash or itchy skin. Fever, chills, cough, and muscle aches
Dracunculiasis (Guinea Worm Disease)	Dracunculus medinensis	Stagnant water containing larvae	Allergic reaction, urticaria rash, nausea, vomiting, diarrhea, asthmatic attack.
Taeniasis	Tapeworms of the genus Taenia	Drinking water contaminated with eggs	Intestinal disturbances, neurologic manifestations, loss of weight, cysticercosis

Parasitic Infections (Kingdom Animalia)			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Fasciolopsiasis	Fasciolopsis buski	Drinking water contaminated with encysted metacercaria	GIT disturbance, diarrhea, liver enlargement, cholangitis, cholecystitis, obstructive jaundice.
Hymenolepiasis (Dwarf Tapeworm Infection)	Hymenolepis nana	Drinking water contaminated with eggs	Abdominal pain, anorexia, itching around the anus, nervous manifestation
Echinococcosis (Hydatid disease)	Echinococcus granulosus	Drinking water contaminated with feces (usually canid) containing eggs	Liver enlargement, hydatid cysts press on bile duct and blood vessels; if cysts rupture they can cause anaphylactic shock
coenurosis	multiceps multiceps	contaminated drinking water with eggs	increases intracranial tension
Ascariasis	Ascaris lumbricoides	Drinking water contaminated with feces (usually canid) containing eggs	Mostly, disease is asymptomatic or accompanied by inflammation , fever, and diarrhea. Severe cases involve Löffler's syndrome in lungs, nausea, vomiting, malnutrition , and underdevelopment .
Enterobiasis	Enterobius vermicularis	Drinking water contaminated with eggs	Peri-anal itch, nervous irritability, hyperactivity and insomnia

Bacterial Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Botulism	Clostridium botulinum	Bacteria can enter a wound from contaminated water sources. Can enter the gastrointestinal tract by consuming contaminated drinking water or (more commonly) food	Dry mouth, blurred and/or double vision , difficulty swallowing, muscle weakness, difficulty breathing, slurred speech, vomiting and sometimes diarrhea . Death is usually caused by respiratory failure .
Campylobacteriosis	Most commonly caused by Campylobacter jejuni	Drinking water contaminated with feces	Produces dysentery like symptoms along with a high fever . Usually lasts 2–10 days.
Cholera	Spread by the bacterium Vibrio cholerae	Drinking water contaminated with the bacterium	In severe forms it is known to be one of the most rapidly fatal illnesses known. Symptoms include very watery diarrhea, nausea , cramps , nosebleed , rapid pulse , vomiting, and hypovolemic shock (in severe cases), at which point death can occur in 12–18 hours.
E. coli Infection	Certain strains of Escherichia coli (commonly <i>E. coli</i>)	Water contaminated with the bacteria	Mostly diarrhea. Can cause death in immunocompromised individuals, the very young, and the elderly due to dehydration from prolonged illness.
M. marinum infection	Mycobacterium marinum	Naturally occurs in water, most cases from exposure in swimming pools or more frequently aquariums ; rare infection since it mostly infects immunocompromised individuals	Symptoms include lesions typically located on the elbows, knees, and feet (from swimming pools) or lesions on the hands (aquariums). Lesions may be painless or painful.

Bacterial Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
<u>Dysentery</u>	Caused by a number of species in the genera <u>Shigella</u> and <u>Salmonella</u> with the most common being <u>Shigella dysenteriae</u>	Water contaminated with the bacterium	Frequent passage of <u>feces</u> with <u>blood</u> and/or <u>mucus</u> and in some cases vomiting of blood.
<u>Legionellosis</u> (two distinct forms: Legionnaires' disease and Pontiac fever)	Caused by bacteria belonging to genus <u>Legionella</u> (90% of cases caused by <u>Legionella pneumophila</u>)	Contaminated water: the organism thrives in warm aquatic environments.	Pontiac fever produces milder symptoms resembling acute <u>influenza</u> without <u>pneumonia</u> . Legionnaires' disease has severe symptoms such as <u>fever</u> , <u>chills</u> , pneumonia (with cough that sometimes produces <u>sputum</u>), <u>ataxia</u> , <u>anorexia</u> , muscle aches, <u>malaise</u> and occasionally diarrhea and vomiting
<u>Leptospirosis</u>	Caused by bacterium of genus <u>Leptospira</u>	Water contaminated by the animal urine carrying the bacteria	Begins with <u>flu-like symptoms</u> then resolves. The second phase then occurs involving <u>meningitis</u> , <u>liver</u> damage (causes <u>jaundice</u>), and <u>renal failure</u>
<u>Otitis Externa</u> (swimmer's ear)	Caused by a number of <u>bacterial</u> and <u>fungal</u> species.	Swimming in water contaminated by the responsible pathogens	<u>Ear canal</u> swells causing pain and tenderness to the touch
<u>Salmonellosis</u>	Caused by many bacteria of genus <u>Salmonella</u>	Drinking water contaminated with the bacteria. More common as a <u>food borne illness</u> .	Symptoms include <u>diarrhea</u> , <u>fever</u> , vomiting, and abdominal cramps

Bacterial Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Typhoid fever	Salmonella typhi	Ingestion of water contaminated with feces of an infected person	Characterized by sustained fever up to 40°C (104°F), profuse sweating , diarrhea, less commonly a rash may occur. Symptoms progress to delirium and the spleen and liver enlarge if untreated. In this case it can last up to four weeks and cause death.
Vibrio Illness	Vibrio vulnificus , Vibrio alginolyticus , and Vibrio parahaemolyticus	Can enter wounds from contaminated water. Also got by drinking contaminated water or eating undercooked oysters .	Symptoms include explosive, watery diarrhea, nausea, vomiting, abdominal cramps, and occasionally fever.

Viral Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
Adenovirus infection	Adenovirus	Manifests itself in improperly treated water	Symptoms include common cold symptoms , pneumonia , croup , and bronchitis
Gastroenteritis	Astrovirus , Calicivirus , Enteric Adenovirus , and Parvovirus	Manifests itself in improperly treated water	Symptoms include diarrhea , nausea , vomiting , fever , malaise , and abdominal pain

Viral Infections			
<i>Disease and Transmission</i>	<i>Microbial Agent</i>	<i>Sources of Agent in Water Supply</i>	<i>General Symptoms</i>
<u>SARS</u> (Severe Acute Respiratory Syndrome)	<u>Coronavirus</u>	Manifests itself in improperly treated water	Symptoms include <u>fever</u> , <u>myalgia</u> , <u>lethargy</u> , <u>gastrointestinal</u> symptoms, <u>cough</u> , and sore throat
<u>Hepatitis A</u>	Hepatitis A virus (HAV)	Can manifest itself in water (and food)	Symptoms are only <u>acute</u> (no <u>chronic</u> stage to the virus) and include <u>Fatigue</u> , fever, abdominal pain, nausea, diarrhea, weight loss, itching, <u>jaundice</u> and <u>depression</u> .
<u>Poliomyelitis</u> (Polio)	<u>Poliovirus</u>	Enters water through the <u>feces</u> of infected individuals	90-95% of patients show no symptoms, 4-8% have minor symptoms (comparatively) with <u>delirium</u> , <u>headache</u> , <u>fever</u> , and occasional <u>seizures</u> , and <u>spastic paralysis</u> , 1% have symptoms of non-paralytic <u>aseptic meningitis</u> . The rest have serious symptoms resulting in <u>paralysis</u> or death
<u>Polyomavirus infection</u>	Two of <u>Polyomavirus</u> : <u>JC virus</u> and <u>BK virus</u>	Very widespread, can manifest itself in water, 80% of the population has <u>antibodies</u> to Polyomavirus	BK virus produces a mild <u>respiratory infection</u> and can infect the <u>kidneys</u> of <u>immunosuppressed transplant</u> patients. JC virus infects the <u>respiratory system</u> , kidneys or can cause <u>progressive multifocal leukoencephalopathy</u> in the <u>brain</u> (which is fatal).

Other Diseases (Vector-Borne)

Many other vector-borne diseases may pose a problem when travelling out of the country. Always check with a physician to learn the specific threats in your location of study. Some other vector-borne diseases include:

- African Sleeping Sickness: carried by the tsetse fly in Africa
- Chagas Disease: transmitted by the Conenose bug in South America
- Encephalitis: carried by mosquitoes in Asia and eastern Russia
- Leishmaniasis: transmitted by sand flies in the tropics and subtropics
- Filariasis: carried by mosquitoes in the tropics
- Onchocerciasis causes “river blindness” and is carried by black flies in Africa, Arabia, and Central and South America.

Other Diseases (General)

There are other diseases to be aware of when travelling outside the United States. While risk of infection is generally low, it is important to be aware of them and take appropriate precautions to guard against diseases such as tuberculosis, HIV/AIDS, SARS, and viral hemorrhagic fevers. Always check with your health care provider to learn more about specific diseases that exist in the region where you will be conducting your research.

Proper Rodent Handling

Steps can be taken to reduce the risk of rodent-borne diseases. Most important: Make the area unattractive to rodents. Cover or repair holes into a building to prevent unwanted rodents. If camping, keep the area clean of trash and store food carefully to prevent attracting rodents. Don't camp near rodent burrows. Please refer to “Animals and Pests: General” for further tips on how to prevent rodent infestations.

If rodent feces or dead rodents are discovered, some precautions will help reduce the risk of exposure to rodent-borne diseases when cleaning the area:

Dead Rodent: Using gloves, spray the dead rodent with a solution of 1.5 cups bleach to 1 gallon of water.

Rodent Feces: Don't sweep or vacuum rodent droppings. Spray the droppings first with a bleach solution (1.5 cups bleach to 1 gallon of water). Then wipe up the droppings. If possible, wet mop the area with the bleach solution.



Resources

Many available resources may provide more in-depth information regarding your work environment.

Centers for Disease Control and Prevention Travel Information

<http://www.cdc.gov/travel/travel.html>

U.S. State Department/ Bureau of Consular Affairs (list of US Embassies & Consulates)

<http://travel.state.gov/>

U.S. State Department Travel Warnings

http://travel.state.gov/travel_warnings.html

CDC Guidelines for Outdoor Workers

<http://www.cdc.gov/niosh/topics/outdoor/>

Medical Information about a variety of illnesses, including dehydration, carbon monoxide poisoning, sunburn, excessive heat, hypothermia, and high altitude sicknesses, can be found on-line at <http://www.webmd.com>.

Diseases: The CDC offers more detailed information about many diseases on their web site at <http://www.cdc.gov/travel/diseases.htm>.

Weather: More information on extreme weather and how to protect yourself can be found from the National Weather Service at

<http://weather.gov/safety.html>.

Impure Water: For more information about water-borne diseases, the CDC provides information on-line at

<http://www.cdc.gov/healthywater/disease/>.

Hantavirus: The CDC has detailed information about Hantavirus available at

<http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/generalinfoindex.htm>.

Hunting Season: To get more information concerning hunting seasons and regulations, contact the U.S. Forest Service on-line at

<http://www.fs.fed.us/>.

Lyme Disease: The American Lyme Disease Foundation provides information about the disease at <http://www.aldf.com/>.

Poisonous Plants: More information about poison plants, including photos, can be found at <http://poisonivy.aesir.com/>.

Appendix G

Vehicle Safety

The following sections provide vehicle safety guidelines and procedures. This section covers the following topics:

- **General Vehicle Safety**
- **Defensive Driving**
- **Backing Large Vehicles**
- **Accidents**
- **Mobile Phones and Radios**
- **Railroad Crossings**
- **Passengers**

General Vehicle Safety

Motor vehicle accidents are the leading cause of death and crippling injury in the United States. Traffic safety laws are important components of vehicle safety, but the most important aspect of vehicle safety is the driver.

Important (Driver's License Requirement): All UT employees who operate a motor vehicle for university business (whether a university, rental vehicle, or personal vehicle) must possess a valid state of Tennessee driver's license for their vehicle's class.

To ensure driving safely, follow these driving practices:

- Driving while under the influence of alcohol or drugs is strictly prohibited.
- Obey all traffic laws, signs, and signals.
- Respond to dangerous driving conditions, as appropriate.
- Maintain a safe distance between your car and any car in front of you. Allow at least one car length for each 10 MPH (e.g., three car lengths if you are driving 30 MPH).
- Keep your eyes moving to avoid fatigue, especially if you plan on driving for a long period.
- Always use your turn signal to indicate your intended action.
- Leave yourself an "out" by either driving in the lane with a shoulder, driving in the middle lane of a multi-lane road or following other vehicles at a safe distance.

Defensive Driving

The principles of defensive driving include the following:

- **Knowledge:** Know your vehicle and know the law.
- **Control:** Always maintain control of your vehicle. To improve your control, perform routine vehicle maintenance and respond to road conditions, as appropriate.
- **Attitude:** Be willing to obey all laws and be willing to yield to all other vehicles and pedestrians.
- **Reaction:** Respond to driving conditions appropriately. Do not impede your reaction time by driving when tired or under the influence of alcohol or drugs.
- **Observation:** Be aware of potential accidents and take preventive measures. Always try to anticipate the actions of other drivers.



- **Common Sense:** Do not risk your safety to save time. Avoid "Road Rage" - Do not respond to rude or obnoxious drivers.

Backing Large Vehicles

Backing a large vehicle can be very difficult. Try to avoid backing whenever possible. If you must back a vehicle, follow these guidelines:

- Before you enter the vehicle, inspect the area you want to back into.
- If possible, have someone outside help guide your vehicle into position.
- If your vehicle does not automatically sound a warning horn or beeper when in reverse, sound the horn once before moving backwards.
- Back slowly and check your mirrors often.

Accidents

If you are ever involved in a vehicle accident, follow these guidelines:

- Check for injuries. If anyone is injured, immediately call EMS (911).
- Call the police and obtain an accident report from the police department for each and every accident involving a vehicle on official university business.
- If there are no injuries, you are blocking traffic, and your car can be driven, move the car to a safe location nearby. (If the accident occurs on a freeway lane, ramp, shoulder, median, or busy metropolitan street, you must move your car if it is safe and possible to do so.)
- If you cannot move your car, try to give warning to oncoming traffic to prevent other accidents by raising your hood, turning on your hazard lights, or lighting flares.
- Exchange the following information with other drivers involved in the accident:
 - Name, address, and phone number
 - Vehicle identification number, license number, and description
 - Insurance information
 - Driver's license number

Mobile Phones and Radios

Whether hand-held or "hands-free," mobile phones and CB radios are not to be used, and should be switched off if possible, when driving on the open roads. They can be used freely when the vehicle is parked.

This guideline applies when university vehicles are driven off UT property, rental vehicles are used on UT business, or personal vehicles are driven for UT business.

Railroad Crossings

Compared with other types of collisions, train/motor vehicle crashes are 11 times more likely to result in a fatal injury. On the average, there are more train-car fatalities each year than airplane crashes. Unfortunately, driver error is the principal cause of most RR crossing accidents. Many drivers ignore the familiar tracks they cross each day, and some drivers disregard train warning signals and gates.

All public highway-rail crossings are marked with one or more of the following warning devices:

- **Advance Warning Signs:** Advance warning signs indicate that a railroad crossing is ahead. These signs are positioned to allow enough room to stop before the train tracks.



- **Pavement Markings:** Pavement markings may be painted on the pavement in front of a crossing. Always stay behind the stop line when waiting for a passing train.
- **Crossbuck Signs:** Railroad crossbuck signs are found at most public crossings. Treat these signs as a yield sign. If there is more than one track, a sign below the crossbuck will indicate the number of tracks at the crossing.
- **Flashing Lights and Gates:** Flashing lights are commonly used with crossbucks and gates. Stop when the lights begin to flash and the gate starts to lower across your lane. Do not attempt to go around the gates. Do not attempt to cross the tracks until the gate is raised and the lights stop flashing.



Important: Stopping Requirements: You must stop at least 15 feet from a train track when: (1) warning lights flash; (2) a crossing gate or flag-person signals an approaching train; (3) a train is within 1500 feet of the crossing; or (4) an approaching train is plainly visible and in hazardous proximity.

Follow these guidelines when you encounter a railroad crossing:

- Always expect a train.
- When approaching a crossing, **Look, Listen, and Live.**
- Be sure all tracks are clear before you proceed. Remember, due to their large size, it is easy to misjudge the speed and distance of an oncoming train. If you have any doubts, stop and wait for the train to pass.
- Watch for vehicles, such as school buses, that must stop before train tracks.
- Never race a train to a crossing.
- Always stop for flashing lights, bells, and gates. Never drive around a gate. (State law also requires pedestrians to stop when a railroad crossing gate is down.)
- Do not allow yourself to be boxed in on a track with cars in front and behind you.
- Never stop on train tracks. If your car stalls on train tracks, call 911 immediately. If a train approaches, abandon the car and run away from the tracks.
- When driving at night, look low to the ground for moving trains. (one third of all train-car collisions occur at night when cars run into moving trains.)
- Watch out for a second oncoming train after the first train has passed.

Passengers

Only UT employees or persons on official business for the University of Tennessee are allowed to be transported by UT vehicles. The University of Tennessee cannot and will not accept the liability for any other persons in UT vehicles

Boating

When boats are used, the PI in charge must be familiar with relevant state and federal boating laws. Personnel in charge of boats are responsible for ensuring that the appropriate licenses and any appropriate boat registrations are obtained.

Boats should be well-maintained and equipped with adequate spare parts and tools, according to the area worked and the length of the trip. Care must be taken when loading boats. The maximum capacity that the boat can carry must be displayed on the boat and must not be exceeded. Boats must contain adequate safety devices such as distress flares, personal flotation devices, etc.



Only licensed and appropriately trained personnel should be in charge of boats. Boats must be driven with caution and attention to prevailing conditions. Only those personnel necessary and trained for the fieldwork may be carried in boats. No one may go out boating alone.

Before setting out on boating trips, check prevailing and predicted weather conditions. Boat trips should not be undertaken in poor weather (e.g. high winds, rough seas) or when poor weather is predicted over the period of the planned trip. Even when good weather is predicted, changing weather should be anticipated in planning the trip.

Prior to setting out, check the vessel for safety equipment, personal flotation devices, fully charged battery, fuel, spare plugs, cotter pins, anchor and small bucket for bailing.



Appendix H

Basic Water Safety

Field activities related to working near deep streams, rivers, lakes, and other water bodies:

Water Depth Limits

Before entering a water body, test the depth with a long pole or stick. Never enter water deeper than three feet or within six inches of the top of your waders.

Safe Swimming

Working around water requires the ability to swim. Listed below are basic safety rules to ensure a safe swim.

- **Learn to swim.** The best thing anyone can do to stay safe in and around the water is to learn to swim.
- **Always swim with a buddy;** never swim alone.
- **Know your swimming limits** and stay within them. Don't try to keep up with a stronger, skilled swimmer or encourage others to keep up with you.
- **Swim in supervised areas only.**
- **Diving:** Obey "No Diving" signs that indicate the area is unsafe for headfirst entries. Enter feet-first into water rather than head first if you don't know the depth. In addition, learn the correct way to dive from a qualified instructor.
- **Watch out for the "dangerous too's"** -- too tired, too cold, too far from safety, too much sun, too much strenuous activity.
- **Do not chew gum or eat** while you swim; you could easily choke.
- **Use common sense** about swimming after eating. In general, you do not have to wait an hour after eating before you may safely swim. However, if you have had a large meal, it is wise to let digestion get started before doing strenuous activity such as swimming.
- **Alcohol and swimming don't mix.** Alcohol impairs your judgment, balance, and coordination, especially in the water. It affects your swimming and diving skills and reduces your body's ability to stay warm.
- **Always wear a Coast Guard-approved life jacket** when boating and fishing.
- **Know local weather conditions** and prepare for electrical storms. Because water conducts electricity, it is wise to stop swimming or boating as soon as you see or hear a storm.



Safe Wading Tips That Could Save Your Life

And at the very least make your fishing a lot more fun
-by Mac Huff-

Following are a Baker's Dozen of suggestions to make wading safer and your days in the rivers more enjoyable.

Minimum beginnings.

Felt soles are minimum wading equipment on your shoes in rocky rivers. Studs and cleats will increase the security of your shoes on rocky surfaces.

Tri it!

A wading staff is an indispensable piece of equipment when wading conditions are difficult, giving you a vital, third point of support. The third point of support will make all wading easier by letting you maintain two points of contact while one foot is making a stride. A wading staff may make the difference between staying dry and falling in, and lowers your anxiety level during difficult wading.

Give 'em a belt.

A wading belt is mandatory when using waders. It will slow the flow of water into the legs and boots of your waders and make escape from the river easier. When I fall in, my legs and feet usually remain dry until I get into shallow water and stand up to walk out. I have learned, even as uncomfortable as it is in icy water, to stay horizontal as I approach shore and drain the water out of the tops of my waders before I stand up. My arms are already soaked and will probably require dry garments, but if I drain the water out of the waders and keep my pants and socks dry I can finish my day of fishing in comfort.

Go slow

This has broader implications than you may think. It obviously includes being careful while wading, but also encompasses taking time to evaluate current conditions and particularly to evaluate conditions when you are visiting unfamiliar rivers or locations. When entering the river and moving through the water, make your moves slow and controlled to minimize the risk of falling. With experience "slow" will become much quicker, but wading is always slower than traveling on dry land and as the hazards become greater your approach demands greater caution.

Stand firm

Create a wide base to stand on when you are on a slippery surface. Widen your stance so your feet are shoulder-width apart; flex your knees to lower your center of gravity. When I enter a river or stream I automatically shift into a stance with my feet slightly wider than my hips and with my knees flexed. As the wading gets deeper and more difficult, my knee flex increases just as athletes sink deeper into their stances to achieve greater agility. Learn to slide your feet and, as with other athletic activities, never cross your feet. This stance will seem foreign and awkward in the beginning, but practice will make it feel natural - besides, you will have great reinforcement to use this advice when you fall in because your feet are close together or you lose your balance with your feet crossed.

The mechanism that usually makes you fall is having your foot slip under you, or toward the center of your body. By having your feet wide apart your slipping foot tends to shift your center of balance to the opposite foot. With wading experience and practice you will probably find that you are able to wade faster by taking



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advantage of this phenomenon. In "easy" wading situations you will, in effect, "skate" across the bottom, allowing your boot to slide into a secure position by sliding outward and forcing your weight onto your other, secure foot, followed, at roughly a slow walking speed, by the next successive step.

Foot placement and balance are other important and critical elements of safe wading. Typically, your foothold will not be flat and uniform, like a floor, so you must adjust your foot position. Your foot must be turned inward or outward, as well as up or down, to fit the foothold. Precise foot placement is essential to safe wading. Most of the time the foot must be placed precisely in a small area.

In addition, I find that placing my foot in a secure foothold among cobbles or boulders is most secure when I stand on my arch, rather than the ball of my foot. Visualize that you are securing your foot in the junction between rocks so the boot heel holds the foot from sliding forward and the curve of the arch holds the foot from sliding back.

If you are constantly searching for your balance or your foot is constantly slipping from your chosen foothold, then you should evaluate your foot placement and determine whether you are fitting the terrain or hoping that the terrain is fitting your step. Only experience can teach you to recognize the feel of secure footholds and the more you practice wading the easier wading will become.



Find the low places

In the water, when you can't see where your feet are landing let gravity help. Slide your feet into position and work them into the valleys between rocks and cobbles, rather than standing on rounded top of slippery rocks.

Step sideways

In shallow water, less than knee deep, you may be able to walk "normally" with a modified, wide stance. As water gets deeper and footing becomes obscured by water depth or turbidity sidestepping will maintain a wide, stable base. NEVER cross your feet while stepping! When I am exploring the bottom with this sidestep method, most of my weight is on my stationary foot, which helps prevent me from falling by either tripping forward over a high rock or slipping spread-eagle over the far edge of a smooth rock ahead of me. The idea is to not commit to the moving foot until you know you can stand on it. Typically, when I'm using this stride I'm in fishing water, so it is an easy method to move and cover water. In these difficult conditions if my next move is 30 feet or more I will wade back to shore, walk down the bank, and then back out into the water.

Go with the flow

This recommendation is aimed primarily at efforts to cross a stream. It's easier and safer to move at a slight downstream angle with the current than move directly across or against the current. There is often a trick to finding the balance between shallow water with fast current and deeper water with a slower current. Either situation can be disastrous, knocking you down and sweeping you into faster, deeper water, so test the current as you proceed. This is the perfect place to use a wading staff. If you don't carry one, it might be worthwhile to use a streamside stick.

While fishing you will often want to move upstream. Take advantage of slower current while fishing upstream. Move through shallower water or use current breaks behind boulders.

There will be times when you must move against the current to cross or get out of your location. Don't let yourself wade down a gravel bar above deep water to discover that you have to wade back against a current that is too strong to move against! Sometimes apparently moderate currents can be treacherous when the water gets well above your knees, and wading that was easy with the current becomes seemingly impossible when trying to move back against it. Always approach moving water with a great deal of caution until you know your capabilities.

Move ahead

Try to make your movements sideways or forward. Your balance and recovery are better in these directions, where you can see well. If you hook your heel while backing up, your chance of falling increases dramatically. If you must back up, rather than turn around, feel behind you with the lead foot (usually your downstream foot), set it securely and bring the other foot into position. Hooking your heel is often the problem that tips you over while backing up in a stream, but any slip is more hazardous while trying to move backwards. Getting into a predicament that requires you to back up is a situation where you would trade your fly rod and all your flies for a wading staff.

Choose your substrate

Sand and gravel bottoms are usually secure and safe bottoms to wade on. Wade here when you can. Cobbles are more difficult because there are irregular surfaces to deal with and the surface of each cobble is an algae-covered, zero-friction trap looking for a victim. Why hasn't NASA discovered this stuff? Next up the difficulty list is boulders. These add the problem of navigating among large obstacles to the slippery problems of cobbles, and, there are more "tall" rocks to trip you than you find on a cobble beach. The same "tall" rocks that may trip you may provide relief from the current and make wading easier by moving into the slipstreams of upstream boulders. Boulders also will hold pockets of sand and gravel, which cobbles don't, and you may find secure footholds amidst treacherous footing. Once you learn to recognize these substrates they may give you an opportunity to move aggressively from a tenuous position to absolute security.

Mud bottoms may seem safe, but they also hold many pitfalls. Firm mud or clay bottoms are very slippery with felt soles. If the bottom is flat, you probably won't fall, but be careful that you don't get stuck and have difficulty climbing out of the stream. Mud accumulates in slow-current areas, and logs and sticks left by floods may trip you, and the silt you stir up will continue to obscure your vision. Finally, the erosion that occurs in muddy backwaters may create unexpected and slippery drop-offs.

The most treacherous bottom type is bedrock. These are areas with large surfaces of solid rock that have been polished smooth by eons of water erosion. The obvious problem is the large slippery surface. While cobbles are equally slippery, your foot can soon find a joint between rocks for a foothold, but on the large, flat surface of polished bedrock there is no redemption for a misplaced step. Even with careful sidesteps, if your foot slips it may skate so far out that you lose your balance and fall

Are you ready to move up?

It's often tempting to fish from the top of a midstream boulder. The problem comes when it's time to get back down. Be sure you have a safe route back down before you climb up.

Plan your escape

This starts before you even enter the river. Should you even be wading here? What will you do if you fall in?



Final safety considerations

A personal floatation device is necessary for waders that can't swim and may be a good investment for anyone in big rivers and cold water. Both CO2 inflatable suspenders and solid, kapok-filled vests can be found in stores selling whitewater gear. A whistle is one of a mountaineer's 10 essentials and is an excellent safety item for waders to carry for emergency location.

Mac's Choice of Waders

Decades ago when I unloaded my one and only pair of stocking-foot waders, I swore I would never own anything except boot foot waders again. My dissatisfactions with stocking foot waders were twofold. First, they were slow to put on. With my boot foot waders I was often in the river fishing while my buddies were still at the car dressing. Second, they were too cold. In the inland Pacific Northwest a great deal of our fall, winter and spring fishing is in water with temperatures in the 30s. The fit and constriction of wading shoes over stocking foot waders caused cold feet in the icy winter waters.

I recently acquired a pair of Orvis' Tailwaters XT waders and now I'm ready to retire my trusty boot foot waders. Orvis raised the bar with their Tailwaters XT waders, giving anglers the benefits of both stocking foot and boot foot waders.

Last December I made steelhead fishing trips to local rivers where water temperatures were in the mid-30s, and was pleasantly surprised at the warmth of the Tailwaters XT boot's insulation. On my first trip I hurriedly packed and forgot the second pair of socks that I wear with my waders. With the water at 35 degrees I was dismayed, but it was an hour's drive back home, so the only choice was to wear just my light liner socks. To my surprise my feet remained warm all day and were warmer than with my trusty neoprene boot foot waders on trips earlier that week.

Additional surprises were the extra support and foot protection that the wading shoes of the Tailwaters XT waders provided. I had long since forgotten how nice firm ankle support could be when wading through boulders and cobbles. Boot foot waders offer no lateral support, and as the boot material wears it creases and rubs my ankles while hiking between drifts. I've fortunate to have sturdy ankles and didn't think about it, but was very pleased with the greater comfort and strength of the Tailwaters XT boot. This feature alone makes wading safer and more comfortable. But I also discovered that the Tailwaters XT wader boots have a hard sole that protects the soles of my feet while walking over the hard, uneven surface of a river bed. I have had stone bruises on my feet through the years of wading with conventional boot foot waders, but I saw few alternatives and walked gently over the cobbles while the bruises healed.

Orvis has given anglers an option that will allow warm feet with all of the support and protection of conventional wading shoes. The boots may be laced firmly for longer hikes and then loosened slightly if you are wading in cold water and your feet begin to chill.

Mac Huff has lived in and fished northeast Oregon for the last 28 years. He received a degree in Wildlife Biology in 1976, worked as a biological technician for Oregon Department of Fish and Wildlife that summer, and continues to contract biological work for the U.S. Forest Service. He operated a sporting goods store in Enterprise, Ore. for 13 years before selling the business to devote his energy to Eagle Cap Fishing Guides, a business he started in 1994 with partner Frank Conley. Mac has fly fished since childhood, guided for the last 15 years, and is an FFF certified fly casting instructor.

River fishing is the emphasis in northeast Oregon and the three rivers that he spends most of his time fishing are the Grande Ronde, Willowa, and Imnaha rivers. Most of his guided trips are float-fishing trips, using

either a Clackacraft drift boat or a 14-foot cataraft. Each craft easily accommodates two anglers and can transport up to three anglers. His fishing seasons begin in late May, usually Memorial weekend, when trout season opens, and continues through the summer and winter until April 15, when steelhead season closes. Early season trout fishing is usually good, but trout fishing improves later in the season when water levels drop and continues to be good through Oct. 31 when trout season closes. Steelhead season opens Sept. 1, and a few steelhead are available then, but fishing improves each week through November. Winter fishing depends on the weather, but by late February ice is reliably melted and fishing is fair to fabulous through April 15, depending on water level.

Mac Huff
Eagle Cap Fishing Guides
Orvis Endorsed Fly Fishing Guide
P.O. Box 865
Joseph, Oregon 97846

Appendix I

Cold Stress Prevention

Seven Safety Tips to Prevent Hypothermia and Frostbite

Cold stress can be a fatal threat to every worker or researcher. Once exposed to cold or freezing temperature for long periods of time, they risk losing a serious amount of body heat. If not treated immediately this could lead to brain damage and even death.

Here are safety tips to prevent cold stress or cold-induced illnesses or injuries:

1) Train employees for the cold and changing weather.

Training sure is a timeless necessity in the workplace. Workers must be trained not only about cold-induced illnesses and injuries, but also to determine environmental or work site conditions that may cause cold stress. They should be especially trained to recognize the signs and symptoms of cold stress or cold-induced injuries like hypothermia and frostbite.

Signs and Symptoms

Hypothermia

- Cool skin
- Slower, irregular breathing
- Slower heartbeat
- Weak pulse
- Uncontrollable shivering
- Severe shaking
- Rigid muscles
- Drowsiness
- Exhaustion
- Slurred Speech
- Memory lapses

Frostbite

- Paleness of the skin
- Sensation of coldness or pain
- Pain disappears after a while with the freezing of tissues
- Tissues become increasingly whiter and harder

2) Use a buddy system.

Sure, you may want to be left to yourself while working. But believe me, this is not the time to enjoy solitude while accomplishing your tasks outdoors. You don't want to be working one minute and thawing your fingers the next.

So get a partner and work on monitoring each other for signs of cold stress. Don't be stubborn because most of the time, it's just difficult to determine danger signs when you only have yourself to rely on.

3) Adjust your work schedule to the cold or changing weather.

Don't punish yourself too much. Just because you have to work outside and it feels like stepping into a walk-in freezer, it doesn't mean you have to bask in the frigid winds all day.

Schedule work during the warmest part of the day. Break a task into shifts so you can take frequent, short breaks in warm dry shelters.

4) Layer clothing.

At this time of the year, the saying “less is more” surely does not hold true. Well, maybe partly true since wearing less clothes means getting exposed to more cold-stress-related threats.

Remember that it’s better to go for several thin layers of clothing instead of wearing just a couple of thick layers. For clothes next to the skin, choose those with synthetic fabrics to avoid absorption of sweat. An ideal choice is polypropylene. For your outer layer, choose fabrics made of waterproof and wind-resistant material.

5) Wear complete PPE (personal protective equipment).

You know you need it. Wear warm gloves, hats and hoods. In extreme conditions, don a warm woolen hood that covers your neck, head and ears. If you get hot while working, just open your jacket. Don’t remove your hat and gloves. The key is in wearing clothing that can be adjusted to changing conditions.

Avoid wearing tight-fitting footwear as this restricts blood flow. Your shoes or boots should allow you to wear either one thick or two thin pairs of socks.

6) Eat and drink hot or warm foods and liquids.

You might have to say goodbye to hot coffee and chocolate for a while. Drinking caffeinated and alcoholic beverages is not recommended while working in cold weather. Instead, go for warm, sweet beverages like sports drinks and sugar water. Keep in mind that you are also at risk of dehydration under cold weather so make it a habit to drink up.

Good news, though. You can feast on hot pasta dishes, soups and other foods rich in calories. Remember, though, that if you’re sick or under medication, you are more at risk to get cold stress. This is especially true if you have hypertension, diabetes or a cardiovascular disease.

7) Wear eye protection.

Ice or snow + excessive ultraviolet rays = eye injury. Yes, this is one proven equation. Before working outside, check first if you may be exposed to glare or, worse, blowing ice crystals. If conditions point to the affirmative, then go wear the right kind of eye protection.

Appendix J

Dehydration and Heat Stress Prevention

Dehydration

The following tips may help you prevent dehydration.

- Drink plenty of water before, while, and after you are active. This is very important when it is hot out and when you do intense exertion. You can drink water or rehydration drinks.
- Take a container of water or sports drink with you, and try to drink at least every 15 to 20 minutes.
- Use a sports drink if you will be active for longer than one hour.
- Do not drink coffee, soft drinks, or other drinks that contain caffeine. They increase urine output and make you dehydrate faster.
- Avoid high-protein diets. If you are on a high-protein diet, make sure that you drink at least 8 to 12 glasses of water each day.
- Avoid alcohol, including beer and wine. They increase dehydration.
- Do not take salt tablets. Most people get plenty of salt in their diets. Use a sports drink if you are worried about replacing electrolytes lost through sweating.
- Stop working if you feel dizzy, lightheaded, or very tired.
- Wear one layer of lightweight, light-colored clothing when you are working or working outdoors. Change into dry clothing as soon as you can if your clothes get soaked with sweat.

Heat Stress

Heat related illnesses are influenced by several factors, such as: climate and environmental conditions, demands of the work, clothing and personal characteristics. Environmental factors include air temperature, air movement, humidity and radiant heat. Personal characteristics include such factors as age, weight, gender, fitness level, medical condition(s), metabolic heat, diseases, water and salt balance, and medication the employees are taking. A study conducted by NIOSH links the signs of heat stress to an increase in workplace accidents.

The human body regulates high temperatures by two primary mechanisms: blood flow and sweating. Blood is circulated to the skin, increasing the skin temperature and allowing the body to give off the excess heat through the skin. Sweating occurs when the body senses the heat loss due to increased blood circulation is not enough to cool the body. Evaporation of the sweat cools the skin and eliminates large quantities of heat from the body. If the body is unable to release excess heat, it will store it. When this happens, the body's core temperature rises and the heart rate increases. If the body continues to store heat the person may begin to have difficulty concentrating, may become irritable and lose the desire to drink. The next stage is often fainting which would signal a medical emergency. Refer to the [EHS Heat Stress Program](#) for details on common heat disorders with the accompanying symptoms and appropriate first aid measures.

Appendix K

Working Safely with Lithium-Ion Batteries

Field and Offsite work may often include mobile power sources such as lithium-ion batteries. This guide will address some basic battery safety principles and is adopted from guidance created by the National Renewable Energy Laboratory (NREL).

Battery technology is at the heart of much of our technological revolution. One of the most prevalent rechargeable batteries in use today is the Lithium-ion battery. Cell phones, laptop computers, GPS systems, mobile devices, and even cars are now using lithium-ion rechargeable battery technology. In fact, you probably have a lithium-ion battery in your pocket or purse right now!

Although lithium-ion batteries are very common there are some inherent dangers when using ANY battery. Lithium cells are like any other technology—if they are abused and not used for their intended purpose catastrophic results may occur, such as: first-, second-, and third-degree burns, respiratory problems, fires, explosions, and even death. Please handle the lithium-ion batteries with care and respect.

User Safety Precautions

Short-Circuiting

- When the battery is not in use, you **MUST** disconnect the battery from the battery connector. When the battery is connected to the battery connector, do not leave unattended since the two wires with the alligator clips can touch which will heat up the battery. Short circuiting will damage the battery and generate heat that can cause burns.
- Don't leave the battery in the charger once it is fully charged. The battery charger will flash on and off with a red indicator light every 20 seconds when the battery is fully charged. Overcharging the batteries will not increase the performance and could lead to damage.

Disassembly

- Never disassemble a battery as the materials inside may be toxic and may damage skin and clothes.
- **DO NOT** place a battery in fire; this may cause the battery to rupture. The electrolyte is very flammable and if an ignition source exists, then fire and even an explosion could result.
- **NEVER** place batteries in water, as this may cause the battery to rupture and release poisonous gasses. Furthermore, when the electrolyte is combined with water, there is the potential for hydrofluoric acid to form – an extremely toxic and corrosive substance. To learn more about hydrofluoric acid, visit the following link to the Centers for Disease Control's website:
<https://emergency.cdc.gov/agent/hydrofluoricacid/basics/facts.asp>

Soldering

- Never solder anything directly to a battery. This can destroy the safety features of the battery by damaging the safety vent inside the cap.



Charging

- Never charge with an unspecified charger or specified charger that has been modified. This can cause breakdown of the battery or swelling and rupturing.
- Never attempt to charge a battery which has been physically damaged.
- Avoid designing airtight battery compartments. In some cases, gases (oxygen, hydrogen) may be given off, and there is a danger of a battery bursting or rupturing if ignited by sparks.
- Do not use a battery in an appliance or purpose for which it was not intended.

Other Safety Procedures

- If the foil packaging on a battery does break, vent the room and leave area.
- If a fire starts, call the fire department immediately. The only extinguisher that will work on a Lithium-ion Battery fire is a Class D Fire Extinguisher, Dry Sand, or Dry Table Salt.

Battery Disposal

Lithium-ion batteries are found in many electronics like laptops, digital cameras, power tools, and cordless phones. These batteries are very popular because they can be recharged and because they are able to supply power for a long period of time. However, even lithium-ion batteries reach a point where they can no longer hold a charge and need to be disposed of. When this time comes, it is important to know how to recycle the battery, and not simply put it in a trash can. Determine your states recycling policy.

There are many reasons to recycle these batteries rather than throw them away where they may end up in a regular landfill. This is because they enter the solid waste stream and can contaminate soil and water. Please check with your school on their policy of recycling of batteries.

Appendix L

Water Sampling Safety

This guide describes safe practices for Water-Quality Activities with known hazards such as:

- Collecting Samples from Streams, Rivers, and Lakes
- Sampling Wells
- Sample Preservation and Shipment
- Operating Field Parameter Meters
- Installing and Operating Water-Quality Monitors

Introduction

Water samples are collected under a wide range of conditions and the work can be dangerous. A knowledge of the hazards involved and means by which they can be minimized should be helpful in preventing accidents and in providing greater safety for sample collectors. It is the responsibility of every field person to take proper precautions to insure their own safety and the safety of others while collecting water samples. Follow normal field safety precautions regarding weather, insects, heat, dehydration, etc., and follow the recommended procedures and precautions for wading, boat, bridge, cableway, or ice measurements. Especially, pay attention to dangers present in the vicinity of the sampling site. List all specific instructions in field files for safety procedures according to TWRI's or established standards.

Collecting Samples from Streams, Rivers, and Lakes

Taking samples from streams, rivers, and lakes for water-quality analysis has unique safety risks. The inability to swim and difficulty in freeing oneself of burdensome equipment or waders if suddenly plunged into deep water are perhaps the most serious risks in taking samples. Remember to always wear your PFD and make sure it is in good condition. Keep your feet spread apart and body aligned parallel to the flow and don't fight the water. At cableways, remember to inspect anchorages at both banks, if possible, and look for signs of excessive wear, vandalism, or accidental damage to the equipment. At bridge sites, follow all State laws for blocking traffic, wear high visibility vests with reflective strips, post appropriate signs at each end of the bridge, and be alert for wide loads and large trucks which may extend over the walkway. Develop a plan for each bridge site for placing traffic control devices. When working on ice, there is no substitute for experience. When possible, work with someone who is experienced working on ice. Be aware of the temperature, whether the stage is rising or falling, and whether the ice is strong enough to support your body and equipment.

Water is a carrier for many disease-producing organisms. Appearance alone is no way to judge the safety of the water. Water-borne hazards may come from material dissolved in the water, suspended in the water, or in sediment of the stream bottom. Infections or disease can enter the body through accidental ingestion by mouth or through skin broken by injury or another infection. The following guidelines must be used for protection of personnel working around polluted water:

- Assume the water is polluted.
- Wear rubber gloves to avoid contact with water, especially if it is suspected of being contaminated.
- Obtain immunizations for known hazards.
- Equipment for each personnel should include separate supplies of drinking water, wash water, soap, and a disinfectant.

- Wash water, soap, and disinfectant should be used after all sampling even if the sampled water appears to be uncontaminated.
- Protect feet with waders while in mud or water. Remove waders before washing hands; remember, they may be more contaminated than the current meter or sampler.
- Protect wounds on hands with rubber or plastic gloves.
- Avoid contamination of water, places, or people with your equipment or waders.
- Avoid carrying a pencil in the mouth while sampling or stream gaging.
- Avoid rubbing eyes.

Sampling Wells

There is no single sampling method that will work best for all wells. A number of methods are currently in use for sampling wells. The equipment ranges from simple to refined, including bailers, gas-driven samplers, bladder pumps, syringe devices, electric submersible pumps, suction-lift pumps, air-lift samplers, and gas-driven piston pumps. In selecting a sampling method for a well, a number of details must be considered. Among the considerations are the portability of the equipment, depth to water, well diameter, water volume, ease of cleaning the equipment, method by which the sampling device brings the water to the surface, and reliability of the equipment.

Due to the great variety of physical equipment and field situations in well water sampling, it is impracticable to list a detailed set of safety rules and standards applicable to this activity. Collecting ground-water samples has its own special risks. Follow normal field-safety precautions and procedures for ground-water activities.

General guidelines to follow are:

- All routine field safety and equipment and procedures must be followed at all times.
- Know as much as possible about the types of pumps you will be working with.
- Follow specific instructions on instrument operations provided by the manufacturer.
- Make sure all equipment is in good operating condition. Check all equipment and power sources prior to leaving the office.
- Before using any pump, be familiar with its operation, and for installed pumps, review procedures in the field folder for the site.
- Electrical sources are potential hazards. Electrical sources, batteries, generators, or existing AC can cause shocks. Respect the energy source and properly ground all instruments.
- Gasoline is a source of potential contamination, fire, and fumes; gasoline must be stored in approved containers. Pumps and generators must be fueled and oiled away from the area of operation.
- If the site is in a well house or spring house, watch for low doorways and beams inside.
- As you enter, check for rotten or loose floor boards, slippery floors, snakes, and biting or stinging insects.
- Check for exposed wiring, open electrical panels, and any other possible electrical hazards which might be encountered while working near the pump.

Sample Preservation and Shipment

Chemicals, supplies, and equipment used in the collection and preservation of water-quality samples may be dangerous to both field personnel and to passers-by if precautions are not followed. Most preservatives are either corrosive or poisonous and contact with them must be avoided. Buffers, standards, and filling solutions also are potentially harmful and it is a good general rule to also avoid contact with them. The following safety rules must be practiced when handling preservatives:



- Protective gloves, clothing, and eye wear must be worn when handling hazardous chemicals.
- Carry a sufficient volume of water and antiseptic washes to rinse any accidental spills. Baking soda is a good all-purpose substance to absorb acid spills in trucks.
- Avoid spillage and personal contact and have appropriate clean-up kits.
- Wash gloved hands thoroughly with disinfectant soap after sampling and discard gloves properly.
- Be careful when handling acid ampoules to avoid cuts splashes, and breathing fumes. Wear eye protection devices (goggles or face shield).
- Dispose of each empty ampoule and tip immediately following use and before filling a bottle for the next sample. It is recommended that the two parts of the ampoule be placed in either a wide-mouth glass screw jar or a steel disposal can. The disposal container should be filled to 1/4 volume with tap water to minimize shock breakage to the used ampoule.
- Concentrated acid used to preserve samples should be carried in the smallest volumes possible and practicable.
- If ampoules are used, they should be carried in their original shipping container.
- If a larger volume of acid is needed, it should be carried in a container with non-flammable packing which will absorb spills. The container must be secured in the vehicle so that even if the vehicle is involved in an accident or upset, the acid will not leak out of the container and packaging.
- Avoid rapid heating and cooling of glassware, because it can cause breakage. Do not pick up broken glass with hands. Sweep or scoop the glass up.
- Avoid contact with contaminated water. If contact is unavoidable, wash hands and equipment frequently.
- Special care must be used with syringes. The used syringe must be packaged for disposal so that no one handling the wastes will be cut or gouged.
- Alcohol or other flammable chemicals must be transported in the smallest practical volumes and in closed containers that are secured in the vehicles so they will not leak or break.
- Cylinders of compressed gasses must always be tightly secured in a vehicle and while in use. Gas cylinders must never be allowed to stand upright without being secured.

Follow established procedures for shipping samples to the laboratory and observe proper lifting procedures when transporting water and ice-filled coolers. It is recommended that shipping containers be lined with appropriate water-proof materials to prevent water leakage from melting ice. Use sufficient packing material in containers to avoid breakage of sample bottles.

Operating Field Parameter Meters

A wide variety of meters are commercially available for measuring water-quality field parameters. Parameters commonly measured in the field include alkalinity, dissolved oxygen, pH, specific conductance, and temperature. A less commonly measured parameter is RP (redox potential). Usually parameters are measured independently using separate meters. However, multi-parameter meters also are available.

Standards are used to calibrate the meters both in the office and in the field. All meters must be recalibrated at each site. This means, if the meter is packed up and moved, it must be recalibrated.

Standards should be at ambient water temperatures for accurate calibration. When the air temperature is radically different from water temperature, standards should be placed in a circulating bath of sample water until they are close to the water temperature. Remember, good field data depends on proper care, calibration, and maintenance of field equipment.

The operation of field meters is generally a relatively safe activity. A few reminders that may prevent accidents or damage to the equipment are:

- Keep meters in good operating condition and routinely clean, repair, or replace dirty or corroded connections, cells, probes, or sensors.
- Read and follow instrument manual and become familiar with its operation.
- Protect yourself from electrical shock. Replace or repair any broke, weak, exposed, or frayed wiring. Replace batteries that show any unusual wear or cracks in housing.
- Store and transport meters, probes, and sensors carefully. Equipment and tools should be kept separate as much as possible and carried in such a manner as to minimize damage from vibrations and jostling.
- Meters and probes should not be stored in vehicle overnight, if possible. Return meters and probes to the office or lab at the end of each field day.

Installing and Operating Water-Quality Monitors

In recent years, equipment to record measurements of various water-quality parameters every few minutes has been developed and can be installed on stream banks, bridges, or wells. These data are often needed to determine short term and in some cases real time fluctuations in the concentration of these water quality parameters. In many cases, data are needed at remote sites, which have no electrical utilities.

Personnel who install and operate water-quality monitors must have a thorough understanding of the equipment and its operation. General guidelines to follow are:

- Follow all instructions when operating the equipment.
- Make sure all equipment is in good operating condition. Check all equipment and power sources prior to leaving the office.
- When working on bridges, follow the safety procedures discussed in the section on surface-water procedures.
- Follow all safety precautions in the construction and repair of gage structures that may house the equipment.

The above guide is adapted from portions of:

A Guide to Safe Field Operations

U.S. Geological Survey Open-File Report 95-777

http://water.er.usgs.gov/pubs/ofr/ofr95777/wq_act.html

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For additional information please visit: <http://water.USGS.gov/owq/FieldManual/Chap9/chap9.pdf>

