Field Work Safety Guidebook

Ecology and Evolutionary Biology

University of Arizona

Adapted from [UTK Field Safety Guidelines](https://eeb.utk.edu/wp-content/uploads/2020/11/EEB-UT-Field-Safety-Manual.pdf)

**CONTENTS (click on section titles to jump)**

I. Introduction 3

II. General Field Safety Guidelines 4

Before you leave 4

While you are working 6

Medical care and first aid 7

Points of contact in case there is an emergency 8

UA Facilities Management: Motor Pool 8

Safe Driving Practices 9

IV. Sexual Harassment & Racism 10

Racism and Title VI 11

Safe fieldwork strategies for at-risk individuals 12

V. Physical and Environmental Hazards 13

VI. Plant Hazards 22

VII. Animal Hazards (including insects) 23

Table 2. Animal Hazards 25

VIII. Diseases 30

IX. Resources 37

A. On Campus 37

B. Off Campus 37

C. North America 38

D. International 39

E. Safety Resources for Specific Areas of Study 39

X. Human and Political Hazards 41

Appendix 1. Sonoran Desert and Borderlands 43

Appendix 2. Field Safety Plan Template 44

Overview 45

Site information 46

Conditions 46

Emergency services and contact info 47

Participant information 47

Equipment & Activities 48

Financial responsibilities 48

Signatures of planning parties 49

Team/Participant Roster and Signatures 50

Appendix 3. Example PI/Supervisor Letter 51

I. Introduction

Field work is an essential component of many aspects of ecological and evolutionary research, and everyone deserves to conduct fieldwork as safely as possible. It is also necessary to have a safe, respectful, inclusive, and equitable research environment to foster all members' well-being and productivity. This document is a guide to many of the possible hazards that may be encountered during field work, and some approaches to reduce those hazards. **This guide will necessarily be incomplete, and is meant only as a starting point** for discussions between supervisors and field researchers about the potential hazards that they may encounter, and how to mitigate those risks.

Below are some additional background readings about safety and field work:

* Woodgate et al. (2018). Preventing Harassment in Fieldwork Situations. Report from the University of Washington’s Respect and Equality in Fieldwork (REIF) 2017 Committee. ([PDF](http://psc.apl.washington.edu/HLD/REIF/RespectandEqualityinFieldwork_RecommendationsandReportUW_Jan2018.pdf))
* Nelson et al. (2017). Signaling Safety: Characterizing Fieldwork Experiences and Their Implications for Career Trajectories. *American Anthropologist*. Vol. 119, No. 4, pp. 710–722. <https://doi.org/10.1111/aman.12929>
* Gibbons, A. (2014). Sexual Harassment is Common in Scientific Fieldwork. *Science Magazine*. <https://www.science.org/content/article/sexual-harassment-common-scientific-fieldwork>
* Demery, A.C. and M. A. Pipkin. 2020. Safe fieldwork strategies for at-risk individuals, their supervisors, and institutions. *Nature Ecology & Evolution*.

<https://doi.org/10.1038/s41559-020-01328-5>

What is considered fieldwork?

Fieldwork is any activity involving locations away from the University of Arizona (UA) campus. Field activities may be local or associated with isolated locales, extreme weather, hazardous terrain, harmful wildlife, or lack of readily accessible emergency services. Even seemingly benign conditions can expose participants to significant health and/or safety risks.

The intent of this guide is to minimize health and safety risks associated with fieldwork by guiding a risk assessment in advance of fieldwork activities and by clearly defining the responsibilities of those involved in planning and carrying out fieldwork activities.

“Fieldwork” consists of activities that are:

* authorized by the University
* conducted for study, research, teaching, or provision of clinical services
* undertaken by faculty, staff, students, and authorized volunteers
* conducted at a location away from UA’s main campus

“Fieldwork” does not include:

* supervised study or work placements at the campus, buildings, or leased offices of other institutions
* travel for conferences, seminars, meetings, or visits to other institutions

 II. General Field Safety Guidelines

## Before you leave

One of the best things you can do to stay safe while conducting fieldwork is to plan and prepare well before you leave. A **field safety plan** should be filled out before your departure. A field safety plan template is provided here as an Appendix. A field safety plan serves as a tool to document your hazard assessment, communication plan, emergency procedures, and training. This plan should identify hazards and the precautions and actions that will be taken to address and mitigate those hazards.

Instructions:

1. Complete the field safety plan: insert specifics for your site and operations, delete irrelevant sections.

2. Complete appropriate training for your site and operations (e.g. first aid, heat illness, task-specific training).

3. Obtain immunizations and prophylaxis for your destination, as applicable (schedule 8 weeks in advance). EpiPens are available from Risk Management with annual training.

4. Hold a pre-trip meeting with your travel group and supervisor to review your field safety plan, travel logistics, pack list (including first aid kit), personal safety, mental health, and security concerns, and any remaining training needs.

5. Complete your UArizona Travel Authorization and International Travel Registry (as appropriate). If you will be traveling repeatedly to the same field site, you can fill out a single Travel Authorization covering a period of time.

Keep in mind when planning: Whenever possible, **you should not work in the field alone. The “buddy system” is the safest way to work.**

**Permits**: Fieldwork on city, state, federal, and tribal land often requires a permit from the local jurisdiction. Permits are likely to be required for collection, activities disturbing resources, leaving field tags, going off trails, etc. Depending on the agency, the process may take several days to several months. Make sure to plan ahead of time.

**First Aid/CPR Training**: The University of Arizona Campus Recreation offers multiple first aid and CPR trainings (<https://rec.arizona.edu/aquatics-safety/certifications/cpr-first-aid>) and Wilderness First Responder and Wilderness First Aid trainings (<https://rec.arizona.edu/outdoor-challenge/wilderness-medicine>).

Outside of our institution, first Aid and CPR training are available from a number of organizations, including the Red Cross, which has classes available in Tucson and online (www.redcross.org/take-a-class).

**Vaccinations**: If your trip involves traveling outside the country, you should contact Campus Health, other medical clinics, or your personal care provider to learn about the required and recommended vaccinations for your location. Travelers’ Health through the CDC is a good resource to check for health advisories by country (https://wwwnc.cdc.gov/travel/). Some countries require proof of vaccinations prior to entry. A travel appointment should be scheduled as far in advance as possible since some vaccines are given as a series over a six-month period.

**Travel advisories**: If your trip involves traveling outside of the country, you should familiarize yourself with travel advisories in the area you are traveling to. More information can be found here: www.travel.state.gov/

**Offline google maps**: Google maps has an offline feature through which you can download maps (for free) over Wi-Fi and your phone will still pick up your satellite location when you are not within cell service. This is primarily useful for navigating on roads or locating nearby services (gas stations, food, etc.). The maps are fairly reliable both within the US and Internationally. More information can be found here: Google Map Support.

**Safety gear to take into the field**:

* First aid kit - you should research complete kits for purchase or lists of items to include tailored to your activities.
* Medication(s) as necessary, taking into account what you might not have access to where you are traveling (anti-biotics, anti-covid such as Paxlovid, etc).
* Allergy treatment (Benadryl is always good to have in case of minor reactions)
	+ If anyone in the group is allergic to bees/wasps they should inform the group and bring an EpiPen into the field. At least one group member should know how to administer the EpiPen. EpiPens are available from Risk Management with required annual training.
	+ If anyone in the group is allergic to poison ivy/oak, TecNu cleanser is a good thing to bring along.
* PPE (personal protective equipment) for the work being conducted. Examples include: long sleeves and pants, sunscreen, insect repellent, hat, boots, gloves, hard hat, safety glasses (or sunglasses), etc.
* Water and water purification tablets or filtering devices (if multi-day in the backcountry), knife, matches, etc.
* Ample food supply for the time you will be out.
* Vehicle emergency kit - you should research complete kits for purchase or lists of items to acquire for the vehicles you will be using.
* Flashlight.
* GPS and/or maps.
* Cell phone and charger (even if you will be out of service, you may need it when you get back into service).
* Make sure you have your photo ID and insurance card with you, in case an accident or injury does arise.
* Carry contact information for nearby/local support. E.g. field station directors, park contacts, land managers, urgent care centers, etc.

## While you are working

* **You should check in regularly with your on-campus supervisor or designated contact in your group** and provide updates about any changes in the original plan, e.g. traveling to a different location than originally planned. Once fieldwork is completed, check-in with your on-campus contact to inform them of your return.
* **Avoid working alone.** The “buddy system” is the safest way to work. If you are working alone, **have a check-in person** for frequent check-ins, and indicate that person on your field safety plan.
	+ Let your check-in contact know where your field sites are located and where you will be located.
	+ Provide a specific timeframe. E.g. “I will be in the field from 8:00 am and should return from the field destination by 2 pm.”
	+ Create a plan for what the check-in person will expect, and what the plan will be if they do not hear from the researcher if they do not respond. E.g. “If you do not hear from me by 2 hours past our check-in time, call my emergency contact (specified in safety plan)”
* **Practice the 7 Leave No Trace principles**

1. plan ahead and prepare

2. travel and camp on durable surfaces

3. dispose of waste properly

4. leave what you find

5. minimize campfire impacts

6. respect wildlife

7. be considerate of other visitors

## Medical care and first aid

* A first aid kit should be maintained at all times during the fieldwork. First aid kits are highly recommended for all off-campus operations. Kits and refills can be ordered from safety supply companies (Adventure Medical Kits make great first aid kits – but many others exist).
* If you take prescription medications, ensure you have enough for the time you will be in the field. If you have an allergy that requires an EpiPen (e.g., bee, wasp, or hornet allergy), pack it. If you have a pre-existing condition and feel that you have a high risk of injury it’s a good rule of thumb to inform the project leader so that someone is aware (e.g., allergies, past injuries such as knee or foot problems, etc.).
* Include preventative supplies like N-95 or KN-95 masks, COVID-19 antigen tests etc. in medical kits - enough supply for all researchers.
* Ideally, have at least one person who is trained and certified in first aid and CPR present.
* In an emergency, always call 9-1-1 before calling a supervisor, family member, etc.
* Everyone on the field team should know the closest hospital and/or urgent care to your field sites in case of an injury or other medical accident.

Mental Health

*Adapted from EMERGE Biological Integration Institute’s Field Safety Handbook:* [https://docs.google.com/document/d/15oH414Fb\_giokbot0PePe7kg-ZBRdhz2/edit#](https://docs.google.com/document/d/15oH414Fb_giokbot0PePe7kg-ZBRdhz2/edit%23)

Fieldwork is often highly stimulating and demanding both physically and mentally, and can be overwhelming. Attention to the mental health of fieldwork participants can be important for achieving effective outcomes, including positive personal growth for fieldwork participants ([John & Khan, 2018](https://www.google.com/url?q=https://doi.org/10.1038/s41561-018-0219-0&sa=D&source=docs&ust=1682715974312046&usg=AOvVaw2ZMZDB_2CG5pO70o9zReai) Nat Geosci). Every individual comes into a fieldwork situation with their own perspective and perceived level of challenge and risk. Those with more fieldwork experience may be better equipped to handle various fieldwork situations, and can contribute to training and mentoring of those with less experience. Field team leaders can mitigate potential negative impacts on mental health though: clear communication with field team members about field plans, creating opportunities for team bonding to reduce feelings of isolation, and ensuring that field team members have the ability to communicate with their support systems at home while away.

 In order to mitigate the negative impacts of fieldwork on mental health, field teams may want, during their pre-trip planning, to include discussion of the potential stressors and difficulties that can arise while engaged in fieldwork, using the Field Safety Plan template section on anticipating physical and mental demands.

## Points of contact in case there is an emergency

**Injuries should be reported as soon as feasible, after all parties are stable and cared for. In case of a medical emergency, first call 911. Seek care first and foremost.**

In the event of a major injury or property loss:

1. Go to <https://risk.arizona.edu/insurance/incident-reporting>
2. Select the appropriate link and complete the steps to report the incident depending on the incident type.
3. Notify RLSS of the incident by emailing rlss-help@email.arizona.edu or calling 520-626-6850.

In the event of a small incident (e.g., a small cut treated by first-aid) or near-miss:

1. Complete the RLSS “Near-Miss” reporting form at <https://uarizona.co1.qualtrics.com/jfe/form/SV_bxPJm4ShokKwzmB>

If you are unsure whether an incident is major or minor, contact Research Laboratory & Safety Services as soon as possible.

 Research Laboratory & Safety Services (RLSS)

 Office Hours 7:30am - 4:00 pm M-F

 Phone: (520) 626-6850

 rlss-help@arizona.edu

**If you are out of the country (international field work)** and are in need of immediate emergency help (arrested, detained internationally, in need of evacuation due to disaster, medical emergency, international border closing etc.), you will want to have the following contact information on hand:

1. Your supervisor (PI) and the Department Head (probably listed [here](https://eeb.arizona.edu/people/faculty)).
2. Office of the Dean of the College of Science (probably listed [here](https://science.arizona.edu/about/contact-us)).
3. Director, Arizona International Travel and Affairs ([here](https://international.arizona.edu/directory)).
4. International field work: the US Embassy in the country where you are located.
5. For difficult international situations, the University of Arizona has a Federal Relations Team. Federal Relations advocates for and represents the University of Arizona’s interests with the federal government, public policymakers and national higher education organizations. They can be contacted here: <https://gcr.arizona.edu/federal>

## UA Facilities Management: Motor Pool

More information on UA vehicles and services: [https://www.fm.arizona.edu/#/department/7](https://www.fm.arizona.edu/%23/department/7)

##

## Safe Driving Practices

**Secure materials for transport.** Tools or equipment should be secured while being transported to prevent the unsafe movement of materials. During a crash or when making sudden maneuvers, loose objects can slide around or become airborne, injuring the driver and any passengers. Objects that could become a hazard should be secured or stored outside the passenger compartment.

**Seat belt use.** Seat belts are the single most effective means of reducing deaths and serious injuries in traffic crashes (and it’s the law). During a crash, anyone not wearing a seat belt will slam into the steering wheel, windshield, or other interior parts, or be ejected from the vehicle (you are 30 times more likely to be ejected if you are not wearing a seatbelt). It is the driver’s responsibility to ensure they and other passengers in the vehicle wear seat belts.

**Distracted driving.** Distracted driving is a factor in 25 to 30 percent of all traffic crashes. With hectic schedules and roadway delays, many people feel pressured to multi-task to keep up with their personal and work-related responsibilities. More time on the road means less time at home or at work, but "drive time" can never mean "down time." Since drivers make more than 200 decisions during every mile traveled, it's critical to stress that safe driving is your primary responsibility when driving for work.

It should go without saying, but NO TEXTING WHILE DRIVING. In Arizona, it is illegal to talk or text on a cell phone while driving unless the device is in a hands-free mode. This law prohibits drivers from using a cell phone or stand-alone electronic device while driving unless used in hands-free mode. This includes but is not limited to, cell phones, tablets, music, and gaming devices.

**Alcohol and drug impaired driving.** Avoid driving under the influence of alcohol or drugs at all times. Alcohol use is involved in 40 percent of all fatal motor vehicle crashes. It is estimated that three in every 10 Americans will be involved in an impaired driving-related crash some time in their life. Alcohol, certain prescription drugs, over-the-counter medications, and illegal drugs can all affect a person's ability to drive safely due to decreased alertness, concentration, coordination, and reaction time. ‘Working while under the influence of alcohol’ is also against the UA Code of Conduct.

**Fatigued driving.** Fatigued or drowsy driving can cause fatal collisions. It is important for employees to be well-rested, alert, and sober on the road to maximize safety even when other drivers do not make the same choice.

**Aggressive driving.** People commuting to and from work and traveling for work purposes often find themselves caught up in bottlenecks and traffic delays, wasting their time and reducing their productivity. These situations create a high level of frustration that can spark aggressive driving behavior. The roadway is one place where being aggressive never pays. Aggressive driving acts include excessive speed, tailgating, failure to signal a lane change, running a red light, and passing on the right. The best advice is to avoid engaging in conflict with other drivers and to allow others to merge.

**More information on general vehicle safety can be found at**

<https://risk.arizona.edu/occupational-safety/fleet-safety>

To access any University vehicle, you must complete driver registration and take the Defensive Driving Training. Link below:

[University’s Defensive Driving course](https://risk.arizona.edu/training/defensive-driving)

Utility Cart: If you are going to be operating a UA utility cart or other nontraditional motor vehicle, you are still required to take the University’s Defensive Driving course. Link with more information: https://risk.arizona.edu/training/utility-cart

Off-roading and low-standard roads: Off-road driving consists of any driving not on a paved, well-maintained road, e.g. gravel forest service roads, 4x4 roads, driving through fields, etc. Driving off road is often necessary for remote fieldwork but inherently risky. If you will be traveling off-road to access field sites, make sure the vehicle operator understands how to use the appropriate Hi/Lo 4WD options. Avoid crossing streams or areas that are exceptionally wet. Always make sure to have a road safety kit with spare tire and jack.

General Vehicle Checklist: Do you have the following:

* Working safety belts for every passenger
* Tire tread, sidewalls and air pressure (how-to)
* Spare tire and jack present and maintained
* Brakes working (including emergency brake)
* Effective windshield wipers
* Fluid levels sufficient with no leaks (washer fluid, oil, etc.)
* Horn working
* Mirrors working, visible

IV. Sexual Harassment & Racism

Further reading:

Gibbons, A. (2014). Sexual Harassment is Common in Scientific Fieldwork. *Science Magazine*. <https://www.science.org/content/article/sexual-harassment-common-scientific-fieldwork>

 **Sexual harassment**

If a researcher is experiencing sexual harassment while in the field they should seek recourse to stop the harassment, and have access to resources to recover from the experience without incurring retaliation or additional burdens. Depending on the affiliations and position of the harasser, this may require a field researcher to discuss the situation with their direct supervisor (e.g. PI), supervising or human resources personnel at a field station, law enforcement (in the case of potential assault), or a neutral third party such as [Research Laboratory & Safety Services](https://research.arizona.edu/compliance/RLSS/field-research-safety) (RLSS).

**University of Arizona sexual harassment policies (under Title IX):**

If a field researcher experiences sexual harassment from another university-associated person they can follow university policies and proceedures for recourse and support.

*The University of Arizona defines sexual harassment* as conduct based on sex that satisfies one or more of the following:

1) An employee of the University conditioning the provision of aid, benefit, or service of the University on an individual’s participation in unwelcome sexual conduct.

2) Unwelcome conduct determined by a reasonable person to be so severe, pervasive, and objectively offensive that it effectively denies a person equal access to the University’s education program or activity.

3) Sexual Assault, Dating Violence, Domestic Violence, and/or Stalking.

University of Arizona’s policy has been merged into the Nondiscrimination and Anti-Harassment policy found here: https://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy

## **Racism and Title VI**

The University of Arizona is committed to providing a work and study environment that is culturally inclusive and free from racial discrimination and harassment. The University encourages research and community service activities that raise awareness and promote cultural diversity and inclusiveness. The University will not tolerate any racial discrimination or harassment under any circumstances.

*Title VI of the Civil Rights Act of 1964* is the federal law that protects individuals from discrimination on the basis of their race, color, or national origin in programs that receive federal assistance. Higher education is included under this act.

*Racism* is defined as: prejudice, discrimination, or antagonism directed against someone of a different race based on the belief that one’s race is superior. Race can be defined as background, family, culture, history, beliefs, a sense of place, and belonging with others who share the same or similar things.

*Racial discrimination* is defined as a person or group being treated less favorably or not given the same opportunities as others in a similar situation because of their race, color, descent, national or ethnic origin, or immigrant status. Examples of discrimination include:

* Denying program services, aids, or benefits
* Providing a different service, aid, or benefit, or providing them in a manner different than they are provided to others
* Segregating or separately treating individuals in any matter related to the receipt of any service, aid, or benefit.

*Harassment* is defined as: unwelcome behavior that makes a person feel belittled, intimidated, offended or apprehensive and, taking into account all the circumstances, could reasonably have been anticipated to have this effect.

The Office of Institutional Equity (OIE) at the University of Arizona’s Office of Equity and Diversity has resources available here:

https://equity.arizona.edu/

**If you believe that you or others protected by Title VI have been discriminated against, you should file a formal complaint with the University of Arizona**. There is a form located on the Institutional Equity’s [webpage](https://equity.arizona.edu/), under ‘Reporting’, you may submit a report or make a referral . You can also contact Mary Beth Tucker (equity@arizona.edu | 520-621-9449), the Associate Vice President of Equity and Title IX Coordinator. All complaints are evaluated and investigated to attempt to resolve any violations found.

## **Safe fieldwork strategies for at-risk individuals**

Field researchers that may be subject to sexual harassment, racism, or other forms of bias and discrimination are at-risk of these experiences in the field. We suggest PIs, students, grad students, and postdocs consult and read Demery et al. 2020

Demery, A.C. and M. A. Pipkin. 2020. Safe fieldwork strategies for at-risk individuals, their supervisors, and institutions. *Nature Ecology & Evolution*. https://doi.org/10.1038/s41559-020-01328-5

Everyone deserves to conduct fieldwork as safely as possible. The above article suggests different tactics to mitigate risk for at-risk individuals working in the field (these guidelines are also good practice for anyone working in the field). Some of the strategies are summarized below.

1. Talk with colleagues and supervisors about the risks and prepare ways to minimize risk.

2. If working internationally (or in a different region) be aware of and abide by any laws and customs of the area (e.g., local foreign laws, current political climate, the actual degree of law enforcement, etc.). Establish an emergency contingency plan with the supervisor prior to traveling to these areas.

3. Contact others (especially those who have an at-risk identity) who have previously used a field site to assess risk.

4. Take advantage of training opportunities to increase field safety (e.g. self-defense courses, first aid, safety aids, and cultural history courses in the area).

5. Know who manages the field site and inform them when and where you will be at the field site.

6. Introduce yourself to neighbors surrounding the field property or leave a short note informing neighbors about the research being conducted. It is advisable to also include contact information, preferably information that clearly demonstrates affiliation with a research institution.

7. Engage in fieldwork with another person. If this is not possible, have a point of contact who is aware of your whereabouts and your plans on returning.

8. Always carry credentials in case someone challenges why you are at a particular site. This includes photo identification (driver’s license, passport, institution ID card) and hard-copies of relevant permits.

9. Suggestion: wear university-affiliated clothing (e.g., university logo or lab/departmental t-shirt), use a university vehicle, or place a university magnet on the vehicle. It can be helpful to have a clear demonstration of your affiliation.

10. If at any time you feel unsafe, contact your supervisor and discuss ways to modify the project. No project is worth you feeling unsafe or worth your life!!

V. Physical and Environmental Hazards

Many general physical and environmental hazards exist in nearly every location worldwide. All field researchers, regardless of the work location, should read through the table below to learn more about some general physical and environmental hazards they may encounter.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Hazard** | **Cause** | **Symptoms** | **First Aid** | **Prevention** |
| Boating accident | Lack of proper training, fatigue, severe weather, alcohol impairment | Various trauma injuries or death | Seek medical attention for serious injuries | Proper training, don’t drive while impaired and don’t speed |
| Burns | Touching a hot surface, especially metal; contact with flames | Pain, redness, swelling, tissue damage, blisters(2°), charring(3°) | Cool burn with cool water, pain reliever, 2/3° burns should seek medical attention | Use gloves when handling hot objects |
| CarbonMonoxide | Running a vehicle or burning a stove in an enclosed space | Severe headaches, disorientation, agitation, lethargy, coma, stupor | Removevictim to fresh air and perform CPR if needed | Keep area adequately ventilated. |
| Decompression sickness (the bends) | Diver surfacing too fast or rapidly changing elevations at high altitudes | Pain around major joints, fatigue, rash, itching, inner ear ringing | Seek medical attention immediately. | Acclimate forrecommendedtimes (e.g. follow dive tablerecommendations) |
| Dehydration | Not enough water intake, diarrhea | Dark urine, lethargy, constipation, light-headedness | Drink plenty of fluids, take rest breaks, minimize caffeine intake, add electrolyte supplements  | Drink plenty of water (at least 2 quarts/day). Drink more if in a warm climate. Take electrolyte supplements. |
| Drowning  | Inhalation of water leading to respiratory impairment.  | Apnea or death | CPR, seek medical attention immediately. | Know how to swim, be aware of water safety, have life preservers (PFDs) and rescue equipment available. |
| Electrical shock | Damagedelectrical cords, improper wiring, improper grounding | Cardiac arrest, shaking,numbness,paralysis, burns, other physical injuries | Provide burn first aid asneeded. Seek medical attention if serious. | Inspect cords for damage, replace or repair ASAP |
| Extreme weather | Snow storms, blizzards, lightening, tornadoes, hurricanes, monsoon, floods | Severe weather could result in physical injury or death | Seek shelter immediately | Be aware of special weather concerns, and changing weather. Bring appropriate equipment. |
| Frostbite | Exposure to extremely cold temperatures, contact with dry ice or liquid nitrogen | Waxy, whitish numb skin, swelling, itching, burning, and deep painas the skin warms | Slowly warm the affected area (DO NOT RUB), seek medical attention. | Dress in layers. Cover your extremities with warm hats, face mask, gloves, socks, and shoes.  |
| HeatExhaustion | 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. Consider bringing a supplemental product like “[Sport Beans](https://www.amazon.com/Jelly-Belly-Energizing-Assorted-Flavors/dp/B004ETD2E4/ref%3Dasc_df_B004ETD2E4?tag=bngsmtphsnus-20&linkCode=df0&hvadid=80676783691988&hvnetw=s&hvqmt=e&hvbmt=be&hvdev=c&hvlocint=&hvlocphy=&hvtargid=pla-4584276309103919&psc=1)” to combat this. | Acclimate to heat gradually. Drink plenty of liquids. Take frequent rest breaks. |
| Heat Stroke | Prolonged physical exertion in a hot environment | Exhaustion, light-headedness,red skin that is warm to the touch | Cool the victim, replenish fluids, and seek medical attention. | Acclimate to heat gradually. Drink plenty of liquids. Take frequent rest breaks. |
| High altitude sickness | Decreased oxygen and increased breathing rate | Headache, nausea, weakness | Use supplemental oxygen and decrease altitude | Allow your body to acclimate to elevation slowly |
| Hunting season | Local hunting seasons and regulation vary, be familiar with local regulations | A hunting accident may result in serious injury or death | Seek medical attention immediately. | Wear appropriate clothing, avoid animal-like behavior, be aware of regulations |
| Hypothermia | Prolonged exposure to cold temperatures | Shivering, numbness, slurred speech, fatigue | Remove cold, wet clothes, put on dry clothes or use a blanket or skin-to-skin contact, drink warm liquids, seek medical attention immediately | Dress in layers, wear appropriate clothing, avoid getting damp from perspiration or water |
| Impure water | Harmful organisms living in “natural” water sources | Gastrointestinal, flu-likesymptoms | Drink clear liquids, slowly introduce mild foods (e.g. rice, bananas). See doctor if no improvement. When doing field work in places where doctors and/or medication isn't available, asking your doctor before you go about a broad-spectrum antibiotic to bring with into the field. | Carry your own water. Treat water before drinking (e.g. purifiers, tablets) |
| Poisonous plants | Exposure to poison ivy, poison oak, or poison sumac plants | Itch rash, red and/or swollen skin | Anti-itch medications, if you have trouble breathing seek medical care immediately | Avoid contact with poisonous plants, wash clothes/skin with TecNu (or soap/water) immediately after exposure. |
| Red/browntides | Algal blooms | Respiratory distress, dead fish, discolored water | Seek medicalattention if you experience respiratory distress | Avoid areas where tides are in bloom |
| Slips, trips, falls | Loose, irregular, or slippery surface, wrong footwear, obstruction, inattention | Strains, fractures, and contusions to the head, wrist, elbow, shoulder, back, hip, or knees | Seek medical attention for serious injuries | Wear appropriate footwear, adequate lighting, be aware of your surroundings |
| Sunburn | Excessive exposure to the sun | Irritated skin, pink/red in color | Apply cool water, aloe, or other cooling lotion to affected area. | Wear long sleeved clothing and a hat. Apply sun screen with at least SPF 30.  |
| Theft |   |   | Report to local authorities | Keep wallet in front pocket (out of sight), carry shoulder bag diagonally and in front of you, under your arm. |
| Vehicle accident | Fatigue, impaired driving, driver error, roadway & vehicle factors | Various trauma injuries or death | Seek medical attention for serious injuries | Obey traffic laws, wear seatbelt, don’t drive impaired, speed, or drive when tired |
| Violence caused by political or military conflict |   |   | LEAVE THEAREA ASSOON ASPOSSIBLE | Be aware of current travel advisories.  |

What to do if you find yourself lost:

The best thing you can do is to prepare in advance and work with/hire a local person/guide who knows the territory. Always expect the unexpected…pack more than enough food/water, have a compass (that you know how to use) or a charged GPS, have a map of your route (and know how to read it), pack layers of clothing, space blanket, flashlight, and matches. Always inform someone of your route and approximate return.

**If someone may be looking for you, or you can contact emergency help, stay where you are, or find shelter as close as possible.**

**If you are lost and on your own… STOP - S(top) T(hink) O(bserve) P(lan)**

**S(top)** – as soon as you realize you may be lost: stop, stay calm, and stay put. Panic is your worst enemy.

**T(hink)** – Go over how you got to where you are. What landmarks can you see? Do not move unless you have a specific reason to move.

**O(bserve)** – Get out your compass and determine the directions based on where you are standing (do not walk around). If you are on a trail, stay on it. As a very last resort, follow a drainage or stream downhill. This is often difficult and could be dangerous, but it could lead to a trail or road.

**P(lan)** – Based on your observations, come up with some possible plans, think them through, then act on one of them. If you are not confident about a route, it’s best to stay put. Stay put if it’s nightfall, you are injured or near exhaustion.

**Self-rescue tips**:

1. **Stop and rest when you start to feel tired.** Don’t wait until you are exhausted.

2. **Your body can’t hike hard and digest food at the same time.** Rest in the shade for at least 30 minutes when you stop to eat. If you are still tired after 30 minutes, continue to rest.

3. **Make sure to drink enough water with electrolytes to avoid dehydration.** Symptoms include headache, irritation and frustration, and more tiredness than warranted.

4. **Stop and fix small problems while they are still small.** If you ignore your body and keep pushing, the pain or illness will only worsen and make recovery more difficult.

5. **Avoid hiking between 10 a.m. and 4 p.m. on hot days.** If you are on a trail between those hours, find a shady spot and stay there until the temperature cools. Adjust your hiking pace to what you can comfortably maintain and rest when you feel the need.

Extreme weather precautions: Always be aware of the weather prior to venturing into the field. In mountainous regions, weather can change rapidly, always be aware of cumulonimbus clouds building or dark clouds moving in. Typically, in the mountains, afternoon is when potentially dangerous storms tend to occur.

**High winds**: High winds can occur during a severe thunderstorm with a strong weather system or can flow down a mountain. Sustained winds of 40-50 mph can result in isolated wind damage. Widespread significant wind damage can occur with higher wind speeds. During strong thunderstorms, straight-line wind speeds can exceed 100 mph. High winds can blow objects around and significantly threaten your safety. If you are driving, keep both hands on the wheel and drive at a reduced speed. If you are outside, take shelter in your car if you are not near a sturdy building. If possible, drive to a nearby sturdy building. Otherwise, move your car to a location where it is less likely to be hit by falling trees or power lines. If no shelter is available, avoid trees, power lines, and the side of the road. Keep in mind that power lines that are laying on the ground may be live. **Do not go near them!** Try to find a place that will block blowing or falling debris. Keep a distance from high-profile vehicles such as trucks, buses, and vehicles towing trailers. One strong gust of wind can be enough to flip one of these trailers onto its side.

**Extreme heat**: Southern Arizona experiences extreme heat much of the year, but heat-related illness can be prevented. When working outdoors in direct sunlight or performing prolonged/strenuous work, the heat index can be up to 15 degrees warmer than the ambient temperature. Make sure to drink plenty of water (CDC recommends 8 oz every 15-20 min you are working outside in heat indices over 100°). Take frequent breaks in the shade, if possible (OSHA recommends a 15-min break every hour when working in heat indices over 100°). Electrolyte replacements are also a good idea 1-2x throughout the day. During hot summer, try to complete as much work as possible before 10 am. More Arizona-specific information on heat and monsoons: [https://www.maricopacountyparks.net/park-locator/heat-safety/#:~:text=During%20the%20warmer%20months%2C%20recreate,Stay%20on%20designated%20trails](https://www.maricopacountyparks.net/park-locator/heat-safety/%23%3A~%3Atext%3DDuring%2520the%2520warmer%2520months%2C%2520recreate%2CStay%2520on%2520designated%2520trails). Keep an eye out for heat exhaustion & heat stroke. Here is information specifically for heat exhaustion:

  **Signs:**

* individual has still-sweats (i.e., sweats when at rest, not during exertion)
* clammy and moist skin
* pale or flushed
* body temperature normal or slightly high
* weakness or exhaustion
* giddiness, nausea, or headache

  **Treatment:**

* Rest in cool place
* Drink water or electrolyte solution
* Severe cases may require longer treatment, medical supervision

 **Prevention:**

* Acclimatize
* Drink lots of fluids before heat stress symptoms appear
* 1 gallon/person/day -- MINIMUM

**Blizzards**: Stay hydrated and as warm as possible. Keep your body covered. Always wear a hat and gloves to reduce heat loss. Melt snow prior to consumption. Exercise to stay warm and maintain circulation, but not hard enough to break a sweat. Stay in one place as long as practical and safe.

**Tornadoes**: Know the signs of a tornado. Strong persistent rotation in the cloud base, whirling debris on the ground under the cloud base, hail or heavy rain followed by either dead calm or a fast, intense wind shift, roar or rumble. If you can take shelter in a sturdy building. If not, lie flat and face-down on low ground (ditch or flat ground), protecting your back and head, with your arms, from flying debris. Get as far away from trees and cars as you can.

**Lightning storm or severe thunderstorm**: Lightning is a prominent concern for field work, especially in the Southwest United States. As soon as you hear thunder, you should seek shelter. A car (not in water) is the safest place to be during lighting.

Lightning can strike as far as 10 miles from the storm. Avoid high exposed ridges, peaks or bodies of water. If you can, take shelter in a sturdy building or your vehicle. If not, find a low spot away from trees, fences, and poles. Lightning is about to strike if your skin tingles and hairs stand on end. Crouch down immediately, balancing on the balls of your feet, placing hands on your knees with head between them. Stay aware of the nearness of strikes: circa 5 seconds per mile – flash-to-thunder. Use the 30 / 30 rule. Lightning can travel 30 miles laterally. If <30 seconds from flash-to-thunder, wait 30 minutes before going into the field.

**Flooding**: Monsoon season in southern Arizona is July, August and September, and often produces significant rainfall and flooding. If caught in a flash flood, DO NOT drive through or over a flooded road or bridge. Six inches of water is enough to stall a car, and one foot of water can float a car. Back up and try a higher route. Do not stay in a flooded car. If your car is being overtaken by water, get out and seek higher ground. If you are stranded in a tree or building, do not leave it to enter flood water. Avoid crossing flooded washes if at all possible. If you must, check water depth and velocity (using a walking stick, range pole) BEFORE

entering the wash. More information for monsoon and flash flooding safety: <https://ein.az.gov/monsoon-awareness>.

**Earthquake**: Do not rush indoors. If you are outside, make your way to an open space away from buildings, trees, and poles. This will help you avoid any falling debris. Once in an open space, remain there until the earth stops shaking. If you are in a moving vehicle, stop the vehicle as soon as you can and remain inside. Do not park near trees, utility lines, overpasses, bridges, or gas stations. Remain calm!

**Wildfire:** The best thing you can do for wildfires is be prepared. If you are working in a wildfire prone area, plan back-up escape routes prior to going out. Monitor the weather conditions frequently, and sign up for emergency alerts if available in the region. Know the difference between different watches and warnings.

● *Red Flag Warning*: Take Action. Be extremely careful with open flames. NWS issues a Red Flag Warning, in conjunction with land management agencies, to alert land managers to an ongoing or imminent critical fire weather pattern. NWS issues a Red Flag Warning when fire conditions are ongoing or expected to occur shortly.

● *Fire Weather Watch*: Be Prepared. A Watch alerts land managers and the public that upcoming weather conditions could result in extensive wildland fire occurrence or extreme fire behavior. A watch means critical fire weather conditions are possible but not imminent or occurring.

● *Extreme Fire Behavior*: This alert implies a wildfire likely to rage out of control. It is often hard to predict these fires because they behave erratically, sometimes dangerously. One or more of the following criteria must be met: moving fast (high rate of spread), prolific crowning and/or spotting, presence of fire whirls, or strong convection column.

If you are ordered to leave an area, **LEAVE**. If you are not ordered to evacuate: Do not light campfires, bonfires, candles or anything else that could blow over and start a fire. If you smoke, extinguish your cigarette or cigar before disposing of it. Never throw a burning item out a window. Bag up trash, clippings and other easily flammable items. Keep your vehicle’s gas tank full in case you need to evacuate.

**Working in a burned areas (wildfire or prescribed)**: Personal protective equipment (PPE) should always be worn. Recommended PPE includes: hard hats, safety glasses, leather gloves, reflective vests, and boots. If performing dust-creating operations (such as shoveling soil), a respirator may need to be worn. Always work in pairs. Be aware of your surroundings and avoid working and taking breaks near snags (standing dead or dying tree), as they are unstable after a fire and may fall. Be observant of the ground, fires can create plenty of tripping hazards (e.g. downed logs, exposed rock).

**Ice safety**: Working on ice and glaciers can be extremely risky. If you break through the ice into several feet of flowing water, it will be very difficult for you to get out and very hazardous for a co-worker to try to rescue you. The same goes for crevasses in glaciers. Use extreme caution and good judgment. PPE should always be worn. Recommended PPE includes: crampons, harnesses, ropes, and warm layers. Carefully evaluate site conditions, including ice strength. If the risk is too great, don’t continue. These two resources provide detailed information about safety measures for working on ice: https://work.alberta.ca/elearning/icesafety/pdfs/ice\_safety\_field\_guide\_2009.pdf https://water.usgs.gov/admin/memo/policy/wrdpolicy00.03.att.htm

**Avalanche safety**: Working in avalanche zones is extremely risky. All that is necessary for an avalanche is a mass of snow and a slope to slide down. If you are planning to work in an avalanche-prone area, it is strongly recommended that you take an avalanche safety course - find courses here: http://avalanche.org/education.php. Know the avalanche dangers/conditions where you will be working. Heed all warnings. Avalanche.org is a good starting point for current avalanche conditions, however, there may be other regional forecasts in the area you are working. Be prepared at all times, carry safety gear with you and know how to use it. You should never venture into avalanche country alone. Your party should have avalanche transceivers, probes, shovels, and backpacks to hold rescue gear, food, water, dry clothes, a first-aid kit, etc.

**Cave and mine safety**: Hazards related to entering confined spaces include: physical hazards from unstable structural integrity and low overhead clearance, respiratory hazards from unsafe environmental conditions, such as hydrogen sulfide gas or lack of oxygen, and increased risk due to access limitations, unreliable communications, and isolated, often dark and rugged/ uneven conditions. It is a standard precaution for workers to wear a hardhat headlamp, and carry a 4-gas meter (that measures hydrogen sulfide, combustible gas, carbon monoxide, and oxygen levels simultaneously) to verify safe conditions and adequate oxygen levels prior to entry into a confined space.

**Boating safety**: To operate a motorized vessel greater than 8 HP in the state of Arizona, you must be over the age of 12. More information can be found here: https://www.azgfd.com/boating/regulations/. Ensure your vessel has enough life jackets people, fire extinguishers, and communication tools (e.g. phone, weather radio, visual distress signals, VHF-FM radio in marine environments, etc.). Hurricanes, fog, thunderstorms, and rapid wind shifts are the most dangerous situations on the water.

*Fog*: Chances are, when you are on the water, you will occasionally encounter fog, making navigation challenging. Fog forms when air over a warm water surface is transported over a colder surface, resulting in cooling and condensation. Fog is usually considered dense if it reduces visibility to less than 1 mile. It can form quickly and catch boaters off guard. Visibility can be reduced to a few feet, disorienting boaters. Learning to navigate through fog (or avoiding it) is critical to safe boating.

● Slow down to avoid collisions.

● Turn on all of your running lights, even in daytime.

● Listen for sounds of other boats that may be near you or for fog horns and bells from nearby buoys.

● VHF NOAA Weather Radio should broadcast important information concerning the formation, movement or dissipation of the fog. Pay close attention.

● If your vessel has radar, use it to help locate dangers that may be around you.

● Use GPS or a navigation chart to help obtain a fix on your location.

● If you are unable to get your bearings, stay put until the fog lifts but make sure you are in a safe location.

● Be familiar with horn and bell sounds you should produce to warn others around you when in dense fog.

● Have a compass available. Even if you don't know where you are in the fog, with a compass you can determine the direction you are navigating.

*Thunderstorms*: Thunderstorms can develop quickly and create dangerous wind and wave conditions for boats. Thunderstorms can bring shifting and gusty winds, lightning, waterspouts, and torrential downpours. There are no specific warnings or advisories for lightning but all thunderstorms produce lightning. A lightning strike to a vessel can be catastrophic, especially if it results in a fire or loss of electronics. If your boat has a cabin, stay inside and avoid touching metal or electrical devices. If your boat doesn't have a cabin, stay as low as you can in the boat. Boaters should use extra caution when thunderstorm conditions exist and have a plan of escape. Mariners are especially vulnerable because you may be unable to reach port quickly. Do not venture out if thunderstorms are a possibility. If you do venture out and recognize thunderstorms nearby, head to port or safe shelter as quickly as possible. Ultimately, boating safety begins ashore with planning and training. Keep in mind that thunderstorms are usually brief, so waiting it out is better than riding it out.

Monitor the weather conditions frequently and know the difference between watches and warnings.

● *Marine Warning*: A warning is issued when dangerous conditions are imminent or occurring.

If you are at sea, take immediate action to protect yourself and your boat.

● *Marine Watch*: A watch is issued when conditions are favorable for a specific hazardous weather event to occur. This is the time to start preparing, not when a warning is issued.

*Inland boating*: If you are caught out in a storm and can't get back in time, here's what do to:

● Divers should get out of the water and get to safety. If that is not possible, dive as deep as possible for the storm's duration or as long as possible.

● Stop all activities when there is lightning or weather conditions look threatening. The first lightning strike can come from a clear blue sky many miles ahead of an approaching thunderstorm cloud.

● If your boat has a cabin, stay in the center of the cabin. If you don't have a completely enclosed cabin, stay low.

● Keep arms and legs in the boat. Do not dangle them in the water. Water conducts electricity from lightning.

● Disconnect electronic equipment, including the radio, throughout the storm.

● Lower, remove or tie down the radio antenna and other protruding devices if they are NOT part of a lightning protection system.

● If someone is struck by lightning, perform CPR immediately if needed. Victims do not carry an electrical charge after being struck. There is no danger to you in offering emergency aid.

● If a boat has been struck by lightning or is suspected of being struck, check the electrical system and the compasses to ensure no damage has occurred.

Diving safety: Scientific diving (defined by OSHA as “diving performed solely for scientific, research, or educational activities by employees whose sole purpose for diving is to perform scientific research tasks”) must be approved by the UA’s Dive Control Board (DCB). Though the DCB primarily reviews and approves SCUBA diving plans, they are also an excellent resource for snorkeling, swimming, and boating safety questions. See this website for scientific diving training and approval procedures:<https://research.arizona.edu/compliance/RLSS/diving-safety>

 VI. Plant Hazards

Poisonous plants: Most of the time, coming in contact with these plants is more of a nuisance than a serious health threat. **Know your plants** and minimize exposure to potentially dangerous ones. Do not eat plants that you are not familiar with. Dress properly, wearing long sleeves and long pants to minimize contact.

**Mitigation**: If you come into contact with a potentially poisonous plant, wash the area of skin or gear that came in contact with it with dish soap or TecNu (specifically designed for removing urushiol). Do not burn unknown plants, as the smoke may contain poisonous compounds.

The most frequently encountered poisonous plants in North America are poison ivy, poison sumac, poison oak, and poisonwood (the latter only in South Florida). The oil produced by this group of plants is **urushiol**. Urushiol can produce an allergic reaction, often resulting in dermatitis (rash) in the area that came in contact with the oil. This rash is typically characterized by itchy bumps and blisters within 24-72 hours of exposure. Eventually, the blisters break and crust over. Sometimes reactions can become systemic (affects other parts of your body). You cannot build immunity to urushiol, the more you are exposed to the oil, the more likely you will develop dermatitis or a systemic response. If you develop severe allergies to urushiol, you may also develop allergies to mango, cashews, and pistachios, which are closely related.

Find information on poisonous plant identification here: poison-ivy.org

**Poison ivy**: Poison ivy leaves are compound and consist of 3 leaflets. The middle leaflet has a longer stem in each set than the two side leaflets. Typically the leaves are mitten-shaped. Poison ivy can grow on the ground or as a vine.

**Poison oak**: Poison oak leaves are compound and consist of 3 leaflets. Often the leaflets resemble white oak leaves (wavy margins), but they can have smoother margins. The growth form is typically a small shrub. The plants produce fuzzy berries.

**Poison sumac**: Poison sumac has pinnately compound leaves, with 6-12 leaflets and an additional leaflet at the tip. The leaflets point upward most of the year. Stems are mostly red. In the winter, they produce white/gray berries. The growth form is a shrub or tree (5’-20’).

**Poisonwood**: Stateside, only located in Florida. Poisonwood is often a shrub in the pinelands and a larger tree in the hammocks. It grows near salt water on shorelines and in sandy dunes, tropical and coastal hammocks, and rockland pinelands The leaves are odd-pinnately compound, alternately arranged, 6" to 10" long, and have 3 to 7, usually 5 leaflets. Each leaflet is 3" to 4" long by 2" to 3" wide and broadest near the base or middle.

Poisonous plants are found throughout the world. Fieldworkers should familiarize themselves with those species they may encounter before engaging in field work. It is important to remember to not eat plants/fruits unless you are 100% certain they are edible and non-toxic.

VII. Animal Hazards (including insects)

Hazardous animals are present worldwide. General familiarity and safety procedures can protect you from these dangers. Regardless of the work location, all field researchers should read through table 2 for some general guidelines to avoid unwanted animals, including insects.

• Wear insect repellent (DEET or Picaridin). **Mosquito-borne illnesses are responsible for more than a million deaths each year**. Tick-borne illnesses are responsible for 60,000+ sicknesses each year in the US alone.

• Treat clothing and gear with permethrin, especially if working in a location with a high tick density.

• Conduct regular tick checks throughout the day, shower when you return from the field to reduce chigger bites, and wash field clothes immediately, if possible to eliminate lingering ticks/chiggers. If you have a tick attached to you, please inform UA Campus Health.

• Wear clothes made of tightly woven materials, and tuck pants into boots.

• Use netting to keep pests away from food and people.

• Keep garbage in rodent-proof containers away from your campsite or work area.

Food crumbs and debris may attract insects and other 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 (wood piles, crevices, etc.).

• Avoid contact with sick or dead animals.

• Minimize the amount of time you use lights after dark as they may attract pests and animals.

• Be aware of the appearance and habitat of pests likely to be found, such as those described in Table 2.

• Carry a first aid 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.

Southern Arizona has some very specific animal hazards. In general, the best practice is to always stay away from animals, and give them as much space as possible and don’t bother them. Below are some of the most important Arizona-specific animals consider.

**Poisonous snakes**: Most snakes avoid contact with humans. They tend to avoid wide open spaces that offer little protection from predators, so they usually spend their time in and under low-growing shrubs, natural and artificial debris, rocks and the like. Some species are more active during evening and night-time hours (especially in summer) so exercise extra caution or avoid shrubby/grassy areas during those times. They are most active in the warmer times of the year spring through early fall and many of them are nocturnal during the summer months. When favorable temperatures occur, many rattlesnakes are marginally active even during the winter. You are most likely to see them when the air temperature is between 70 and 90F (21 to 32C), regardless of the time of day or year. Info from Craig Ivanyi at the Arizona-Sonora Desert Museum (<https://www.desertmuseum.org/books/nhsd_rattlesnakes.php>).

 Make sure you are familiar with the poisonous snakes in your research site location.

If you see a snake, do not panic or throw rocks at it. Distance yourself from it. Warn others on the trail about where you saw the snake. If bitten:

* If bitten, stay calm and call 911 or the Poison Control Centers hotline at 800-222-1222; the less you move the more you isolate the venom in the bite area
* Seek medical attention immediately.
* Carry a permanent marker with you, and circle the bite. Mark on your skin the time of the bite, and circle swelling as it happens and continue to mark with the time.
* Other than getting to a hospital quickly and circling the bite, do nothing else (no tourniquet, do not slice open skin or try to suck out venom).

**Scorpions:** Scorpions are most active during monsoon season. Scorpion stings are super painful but usually don’t require special medical treatment. Washing the sting area, using a cool compress, and over-the-counter pain medication handles the injury. The pain and numbness can last several days. Sometimes a scorpion sting causes severe symptoms that require fast and expert medical care. Symptoms to look for are difficulty breathing, uncontrolled jerking, drooling, and wild eye movements. Be sure to shake clothes and shoes before putting them on.

### Table 2. Animal Hazards

Below are some possible animal hazards a field researcher might encounter. This table is not exhaustive and researchers should discuss possible hazards with their supervisor, using the table to inspire discussion and further research and planning.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type** | **Location** | **Most dangerous species** | **Defensive action** | **First aid**  | **Prevention** |
| Alligators and Crocodiles | Worldwide; tropics and sub-tropics | Americanalligator, estuarine crocodile, Nile crocodile | Do not provokean 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. |
| Ants  | Worldwide | Fire ant, army ant, bullet ant, bulldog ant | Do not disturb ant mounds/nests. | Apply a cold compress to reduce swelling. Apply an anti itch cream. Take antihistamine if needed. | Always wear appropriate footwear, avoid walking around barefoot. Do not disturb known ant beds. |
| Bears | North America | Black bear, grizzly bear, polar bear | Never run.Identify yourself by waving your arms and talking calmly. Make yourself look as large as possible. **Grizzly/Polar bears**: Bear spray. Play dead if attacked, hands clasped behind head to protect. **Black bears**: fight back or escape to a building/car. | Seek medical attention immediately for serious injuries and wounds | Hike/travel in groups. Do not give a bear food. Do not leave a pack behind with scented items. Be cautious when in bear country (noise is a good deterrent – e.g. bells on pack, talking to partner). Carry bear spray if you are in grizzly bear country. Be especially cautious if you see cubs. |
| Bees, wasps, hornets | North America | Aggressive bees or wasps | Do not swat or kill – this may elicit an attack response from other bees/wasps. Leave the area immediately and quickly. If being chased move into a closed area if possible. Be aware of nests/hives and do not disturb them. | Remain calm. Look for signs of allergic reaction, including difficulty breathing, swelling of throat, dizziness etc. (i.e. systemic reaction away from sting wound). Place an ice pack and elevate to heart level. Use an antihistamine if needed. Use EpiPen if allergic to avoid possible death. | Bring medication if you have an allergy (the sting may be fatal). Check open beverages before drinking to avoid swallowing live stinging insects. Wear shoes outside. |
| Chiggers/harvest mites(See Chiggers section below for more detailed information) | Worldwide in forested areas | Main skin irritant:*Eutrombicula alfreddugesi* | Avoid areas where chiggers are common. | Take a shower immediately. Treat areas with anti-itch ointment or antihistamine pills. | Avoid working in tall grasses and weedy areas. Insect repellent (especially on cuffs, neckline, around waistband and bra, and tops of socks). Shower as soon as leaving the field.  |
| Fish | Worldwide; freshwater and marine habitats | Barracuda, piranha, moray eel, stonefish, scorpionfish | Learn how to identify hazardous species. Do not provoke or feed. Worksomewhere else if possible. | Specific to local species. Seek medical attention for serious injury. | Be aware of your surroundings and local species. Wear shoes in the water where this is protective. |
| Fleas and ticks(See “Lyme disease…” section below for more detailed information) | Worldwide | Fleas and ticks can all transmit various diseases (refer to section VIII) | Brush away if not attached. If attached, remove quickly.  | Remove theflea or tick with tissue or tweezers and clean the wound with antiseptic. Inform UA Campus Health and pay attention for signs of illness (see Section IV: 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. Check your body daily for ticks. |
| Flies | Worldwide | Flies can serve as vectors for manydiseases including:conjunctivitis, poliomyelitis, typhoid fever, tuberculosis, anthrax, leprosy, cholera, diarrhea and dysentery | Avoid areas withheavy infestations, remove insects if possible | Use topical ointment for pain relief of biting flies |   |
| Jellyfish and Octopus | Worldwide; especially Australia and tropical/subtropical areas | Blue RingedOctopus, BoxJellyfish,IrukandjiJellyfish | Never touch an unidentified octopus or jellyfish. | Use seawater to remove nematocysts. Pour vinegar on the wound. Seek medical attention immediately. **Blue-ringed octopus bite**: Provide CPR and/or supportive care to the patient and seek medical attentionIMMEDIATELY | Avoid going in waters known to be inhabited by jellyfish and octopus.  |
| Kissing bugs (conenose bugs) | North andSouthAmerica | May cause allergies in some people.In LatinAmerica theysometimes carry a protozoan, *Trypanosoma**cruzi*,which causesChagas’ | Remove the bug from the premises | Use topical ointments to soothe 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. |
| Lions | Africa and Asia | All | Do not provoke. | Seek medical attention immediately for severe injuries and wounds. | Stay inside the vehicle if travelling near lions. Do not camp near areas frequented by lions. |
| Mosquitoes | Worldwide, especially wet areas conductive to breeding | Mosquitoes can carry many diseases (see section VI) | Swat them away | Use topical ointment to relieve itching | Use insect repellent to deter mosquitoes. Don’t leave standing pools of water. |
| Mountainlions | North America | All | NEVER RUN.Fight back. DONOT PLAY DEAD. Protect your head. | Seek medical attention immediately for severe injuries and wounds. | Do not corner it. Make yourself look larger (arms overhead). Use a loud voice. Throw sticks or rocks.Carry pepper spray. |
| Other large land dwellers | NorthAmerica,Africa andAsia | Moose, bison, hippos, elephants, rhinos, buffalo, all tigers | Do not provoke. | Seek medical attention immediately for severe injuries and wounds. | Stay inside the vehicle if traveling near large animals. Do not camp near areas frequented by large animals. Keep a lookout in open spaces. |
| Oysters, shells, corals | Worldwide; freshwater and marine habitats | Dangerous due to the bacteria (Vibrio, staph) which can cause potentially life-threatening infection. Some corals can sting. | Avoid the area if possible.   | Clean and treat any wounds. Seek medical attention immediately. | Wear clothing to avoid getting scratched/stung. Avoid touching or handling |
| Rodents(See “Rabies from mammal bites” below for more detailed information) | Worldwide | Rodents carry many diseases, e.g.hauntavirus, rabies (see section VIII)  | Wear PPE if you must touch a rodent | Clean woundsif bitten or scratched | Keep areas clean to avoid attracting rodents. Keep food stored in sealed containers. |
| Scorpions(see above for more detailed information) | Worldwide in desert and tropical areas | All | Avoid contact with scorpions wheneverpossible. | Clean wound and put a cool pack on the area. Keep area immobilized at heart level. Use painkiller orantihistamine if desired. Take victim to hospital ifhe/she shows no signs ofimprovement. | Always shake out clothingand bedding before use. Avoid lumber piles and old tree stumps. Wear gloves when working outside.  |
| Sharks | Worldwide; shores of oceans | 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 whenbleeding. If diving, keep your head on a swivel. |
| Snakes(See “Poisonous snakes” section above for more detailed information) | Worldwide | Rattlesnakes, copperheads, cottonmouths, coral snakes, vipers, cobras, adders, ferdelance | Do not pick up, disturb, or corner a snake. Move away fromthe 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. |
| Spiders | Worldwide | Black widow, brown recluse, tarantulas, funnel web, redback, and Brazilian wandering spiders | Do not pick up or disturb the 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 (look carefully before putting your body) around rock piles, logs, bark, outdoor privies, and old buildings. Avoid dark locations where spiders may be. Shake out clothing and bedding before use. |
| Sting-rays | Worldwide; freshwater and marine habitats |   | Shuffle feet to let string-rays know you are there. Move to another area. | Irrigatewound 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. | Shuffle in the water or throw stones in before wading to avoid stepping on a stingray. Wear appropriate footwear. |

Proper rodent precautions: Steps can be taken to reduce the risk of rodent-borne diseases.

1. Make the area unattractive to rodents: pick up trash, don’t leave food out, and zip-up backpacks, tents, etc.

2. Cover or repair holes in buildings or tents to prevent unwanted entry.

3. If camping, keep the area clean of trash and properly store food.

4. Don’t camp near rodent burrows.

5. If rodent feces or dead rodents are in the vicinity follow the below instruction to minimize the chance of contracting a disease while cleaning the area.

* Indoors: Do not stir up dust. Ventilate the area by opening the doors and windows for at least 30 minutes to diffuse potentially infectious aerosolized material. Use cross-ventilation and leave the area during the airing-out period.
* Dead Rodent: Using gloves, soak the rodent, droppings and nest with a solution of 1 part bleach to 9 parts water, let soak for at least 5 minutes before picking it up with a plastic bag. Place bag in a second plastic bag.
* Rodent Feces: Don’t sweep or vacuum rodent droppings. Spray the droppings with 1 part bleach to 9 parts water, let soak for at least 5 minutes then wipe up the droppings. If possible, wet mop the area with the bleach solution.

6. Rodents can carry hantavirus and rabies, more detailed information on these diseases can be found in section VIII.

Chiggers: There are more than 3000 species of chigger mites worldwide. The larva of one species, *Eutrombicula alfreddugesi*, is mainly responsible for skin irritations in humans. The larvae are tiny (1/120 inch long). Larvae climb up on vegetation and attach to clothing or skin when a human comes in contact. They do not suck blood or burrow in skin but rather attach their mouthparts to the skin surface and secrete saliva that digests skin cells. This can result in extremely intense itching, redness, and slight swelling at the bite site. People react in varying degrees to chigger bites. Grassy and weedy areas where sunlight does not penetrate are particularly prone to chigger infestation. Sitting or lying in chigger-infested areas should be avoided. Insect repellants and showering or washing as soon as possible after contact with chigger-infested areas is helpful. Anti-itch cream like calamine lotion can be used to soothe itchiness of bites, and/or taking an antihistamine. Chiggers typically bite around snug areas (waistband, top of socks, bra-band, etc.)

VIII. **Diseases**

Diseases are caused by viruses, bacteria, fungi, and parasites in nearly every location worldwide. While the 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 healthcare provider, University Health Services or another travel health clinic before traveling out of the country to learn about specific health risks for the region where you will conduct your research. Researchers should also refer to up-to-date CDC/State Department travel advisories before departure to learn of any local advisories.

Common North American Diseases to consider:

Rabies from mammal bites: Bites that break the skin from any wild or domestic animal should have first aid treatment like any other laceration or puncture wound, especially washing out the wound with plenty of clean water. Any mammal can contract rabies however the common ones are: raccoons, bats, foxes, coyotes, and domestic dogs when traveling abroad**. If you are bitten by a mammal, wild or domestic, with an unknown vaccination status your physician should be consulted for more detailed instructions as well as protective measures against rabies infection. Rabies is fatal, if you are bitten by any mammal, you get a rabies vaccine (or if you work with wild mammals it may be highly advised).**

Lyme disease and other diseases from tick bites: Deer ticks that can carry Lyme disease occur through the eastern US. The best defense against Lyme disease is not allowing ticks to attach to your skin. Insect repellents may be helpful (DEET and Picaridin). Bites from other ticks, such as the lone-star tick or dog tick, can result in other diseases or infections so use precaution to minimize exposure and seek medical treatment as necessary. “Seed ticks” are small, larval ticks that are typically the size of a poppy seed. Luckily, seed ticks most often do not transmit diseases. Because ticks do not usually bite (attach) immediately, a simple body check and removal (shower) as soon as possible after being in the field is recommended.

If you find a tick attached to you, inform UA Campus Health, in case symptoms develop. If within a few days after finding an attached tick, symptoms such as a large reddened area (especially with a bull’s-eye pattern) around the bite, fever, headache, and/or chills occur, **report the incident to your supervisor and consult your physician**.

Valley Fever (coccidioidomycosis): Valley Fever is a fungal infection occurring in southwest North America, contracted from inhaling dust from soil containing the pathogen. It causes respiratory illness such as coughing and chest pain, as well as fever and tiredness. See the [CDC website](https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx%23%3A~%3Atext%3DWhat%2520is%2520Valley%2520fever?,contains%2520the%2520Valley%2520fever%2520fungus.) for Valley Fever for more information about the disease, identifying symptoms, and preventing contracting the infection. ([https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx#:~:text=What%20is%20Valley%20fever?,contains%20the%20Valley%20fever%20fungus](https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Coccidioidomycosis.aspx%23%3A~%3Atext%3DWhat%2520is%2520Valley%2520fever?,contains%2520the%2520Valley%2520fever%2520fungus).)

Covid 19 and other respiratory/flu like diseases (worldwide): *Prevention*: Vaccines against COVID-19 and Influenza are highly recommended. The University of Arizona is not requiring that researchers get vaccinated; however, the University strongly encourages vaccination to protect yourself and the community. [something about checking prevalence of covid and masking appropriately.]

Response: Anyone who develops a respiratory illness or flu-like symptoms during a field *trip* should have the option to rest, and should as best as possible be isolated from others while doing so. (i.e. nobody should be forced to "push through" their symptoms - doing so increases the risk of long-term effects of some diseases like COVID-19.) If symptoms are mild enough (common cold like) such that they wish to continue to work, they should wear an N-95 or KN-95 mask, and/or distance while interacting face to face with others outdoors, and mask if in a shared situation indoors.

Rapid antigen tests for COVID should be available, and symptomatic individuals should test at least twice. If positive, double down on the precautions above, and introduce masking and testing among their close contacts. If negative twice then precautions can be relaxed. If they are categorized as high risk in any way, efforts need to be made to get them Paxlovid or other treatment without delay - it will not be given if >5 days after symptom onset, and earlier treatment is more effective. If fieldwork is international and their risk factors are severe enough, they should ask their doctor about the possibility of obtaining a course of Paxlovid to take along with them.

Finally, for an abundance of caution, masking and other precautionary measures should not be relaxed until the infected person tests negative on an antigen test. Masks and tests need to be part of a fieldwork medical kit. Consider also including a pulse oximeter to monitor infected individuals for hypoxia.

Table 3. Diseases

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Disease Type | Location | Exposure route | Symptoms | First aid | Prevention  |
| Arenavirus (white water arroyo) | North America | Inhalation of dusts or aerosols from infected rodent’s feces, urine, or saliva; Carried by Woodrats (*Neotoma**fuscipes*) and other*Neotoma* spp. | Fever, headache, muscle aches, severe respiratory distress (occasionally)  | Seek medical attention IMMEDIATELY if you suspect WWA. Thelikelihood of survival is greatly increased with early diagnosis and treatment.  | Avoid contact with rodents, especially their feces. See bottom of section on how to clean and dispose of a rodent-infected area.  |
| Campylobacter | Worldwide | Food-borne:poultry products | Diarrhea, gastrointestinal symptoms | Drink plenty of fluids. Seek medical attention if symptoms persist more than 3 days. | Always cook food thoroughly |
| Chikungunya | Worldwide | Infection fromthe 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 tominimize transmission to others |
| Cholera | Africa, Asia, and Latin America | Food-borne: Contaminated food and water | Diarrhea, gastrointestinal symptoms | Drink plenty of fluids. Seek medical attention if symptoms persist more than 3 days. | Always cook food thoroughly. Do not drink contaminated water; always treat water. |
| Coccidiodomycosis “ValleyFever” | N. and S. America; arid regions | Fungus is inhaled whensoil is disturbed. *Coccidioides* spp. | Flu-likesymptoms Occasionally becomes severe lung disease | See a doctor if you suspectValley 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. |
| Dengue Fever | Africa,SoutheastAsia and China, India, the Middle East, South and Central America, Australia and the Pacific Islands | Infection from the bite of an infected mosquito.  | Flu-likesymptoms.Takes up to a month to recover. | See a doctor if you suspectDengue Fever. | Wear long sleeved shirts and long pants. Use repellents. Use a mosquito net.  |
| E. coli | Worldwide | Food-borne: Beef, unpasteurized milk,unwashed raw vegetables, contaminated water | Diarrhea, gastrointestinal symptoms | Drink plenty of fluids. Seek medical attention if symptoms persist more than 3 days. | Always cook food thoroughly. Wash vegetables before consuming. Do not drink contaminated water; always treat water. |
| Ehrlichiosis | United States | Infection through the bite of an infected tick | Flu-likesymptoms(varies from mild body aches to severe fever) within 12 weeks of a tick bite.  | See a doctor if you suspect ehrlichiosis. It can be treated with antibiotics. **Let your doctor know you have been working around ticks.** | Avoid tick infested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks. |
| Encephalitis | N. and S. America | Infection from bite of infected mosquito | Mild: Fever and headache Severe:Headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, very occasionally, death. | See a doctor if you suspectencephalitis. **Let your doctor know you have been working outside****around mosquitoes.** | Use repellents. Wear long pants and long sleeved shirts. Avoid being bit by mosquitoes. Avoid areas ofstanding water Where mosquitoes breed. |
| Giardia(*giardia* spp.) | Worldwide | Found on surfaces or in soil, food, or water that has been contaminated with feces from infected humans or animals. | Diarrhea, gas, greasy stools that float,abdominal cramps, upset stomach, nausea/vomiting, dehydration | Drink plenty of fluids to prevent dehydration, use OTC medicines for diarrhea. Wash hands frequently. Seek medical attention – medications can be prescribed to get rid of the parasite. | Practice good hygiene, avoid drinking unfiltered water, avoid eating possibly contaminated foods, prevent contact with feces during sex. |
| HantavirusPulmonarySyndrome(HPS) | Worldwide | Inhalation of dusts or aerosols from the infected rodent’s feces, urine, or saliva Vector: Rodents; especially *Neotoma* and *Peromyscus* species | Fever, headache, muscle aches Severe respiratory distress (occasionally) | Seek medical attention IMMEDIATELY if you suspect hantavirus. Early treatment greatly increases the odds of survival. | Avoid contact with rodents, especially with their feces. See details in Section VI on how to clean and dispose of a rodent infected area. |
| Heartland virus | Midwest and SoutheastUnitedStates (discovered in 2009 – range is expanding) | Infection through the bite of an infected tick (or lesscommonly mosquitos and sand flies) | Fever, fatigue, decreased appetite, diarrhea, joint pain, headache, nausea within 2 weeks of a tick bite. | See a doctor if you suspect heartland virus. No vaccines or medications exist. **Let your doctor know you have been working around ticks.** | Avoid tick infested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks. |
| Hepatitis A (vaccine available) | Worldwide; underdeveloped countries | Food-borne: Contaminated water,shellfish,unwashed raw vegetables | Diarrhea, gastrointestinal symptoms | Drink plenty of fluids. Seek medical attention if symptoms persist more than 3 days. | Obtain a vaccine at least one month prior to travel. Always cook food thoroughly. Wash vegetables before consuming. Do not drink contaminated water; always treat water. |
| Histoplasmosis | Worldwide; especially Mississippi and Ohio RiverValleys | Inhalation offungus fromsoilcontaminated with bat or bird droppings  | Mild flu-like symptoms. Occasionally can turn into acute pulmonary histoplasmosis. | See a doctor if you suspect histoplasmosis. Typically clears up within 3 weeks.  | Use caution when disturbing dry soils or working near bat or bird droppings. Keep surfaces wet to reduce dust. |
| HIV/AIDS | Worldwide | Being exposed to blood or body fluids infected with HIV. Having sex or sharing needles with someoneinfected with HIV. | May have flu like symptoms 14-60 days post infection. Attacks the immune system, may eventually result in opportunistic infections or cancers. | See a doctor if you suspect you may have contractedHIV/AIDS. | FollowBloodborne Pathogen training when handling any unfixed human blood or tissue. Do not engagein risky activities |
| Influenza (seasonal – vaccine available) | Worldwide | Inhalation of influenza virus. Contact with humans, birds, or other animals infected with influenza. | Fever (usually high), headache, fatigue, dry cough, sore throat, runny or stuffy nose. | See a doctor if you suspect you have the flu. Treat symptomatically. No treatmentexists but Tamiflu may be prescribed to shorten symptoms | Obtain an annual flu vaccine. Wash handsfrequently. Try not to touch your face. Cover your mouth/nose when you sneeze/cough |
| Leptospirosis | Worldwide  | Ingestion, swimming, or other activities in water contaminated with the *Leptospira* bacteria | Flu-likesymptoms. 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. |
| Lyme disease | UnitedStates,Europe, andAsia | Infection through the bite of an infectedtick  | Spreading rash Early: Flu-likesymptomsLater: Arthritis and neurologic problems. | See a doctor if you suspect you have Lyme disease. **Let your doctor know you have been working around ticks.** | Avoid tickinfested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks. |
| Malaria (preventable with Rx drugs) | Central andSouthAmerica,Hispaniola,Africa,India,SoutheastAsia, theMiddle East, and Oceania | Infection from the bite of an infectedmosquito  | May take 10 to 30 days for symptoms toappear. Flu-like symptoms, anemia, jaundice. Can be fatal.  | See a doctor if you suspectMalaria  | Visit doctor 4 to 6 weeks before travel for antimalarial drugs. Wear long pants and long sleeved shirts. Use repellents. Use a mosquito net  |
| NorovirusGastroenteritis | Worldwide | Food-borne: food, water, surfaces or objects contaminated with Norovirus. Direct contact with another person who is infected. | Nausea, vomiting, diarrhea, stomach cramping. Some people also have a lowgrade fever, chills, headache, and muscle aches | See a doctor if you suspect norovirus, however there are no drugs to cure. Symptoms usually last several days. | Wash hands with soap and water frequently. Wash fruits and vegetables, and steam oysters. Clean and disinfect contaminated surfaces immediately after illness using a bleach based cleaner. Remove and wash contaminated clothing or linens. |
| Plague | Worldwide | Infection from flea bite (fleas are infected by rodents) | Flu-likesymptoms; 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 *Lyssavirus* | 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. |
| Red meat allergy | Midwest and East Coast ofUnitedStates | Infection through the bite of an infected tick – can take several weeks to develop symptoms | Vomiting, stomach cramps, indigestion, diarrhea, wheezing, shortness of breath, hives – when eating red meat (and sometimesdairy in severe cases) | See a doctor if you suspect you have developed a red meat allergy. The allergy is best diagnosed with a blood test. **Let your doctor know you have been working around ticks.** | Avoid tickinfested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks. |
| Rocky mountain spotted fever | UnitedStates, S.Canada,Mexico, andCentralAmerica | Infection through the bite of an infectedtick  | Sudden onset of fever, headache, muscle pain, spotty rash, paralysis | See a doctor if you suspect rocky mountain spotted fever. **Let your doctor know you have been working around ticks.** | Avoid tickinfested areas. Wear long pants and long sleeved shirts. Use a repellent. Check clothing and hair for ticks and remove any ticks. |
| Salmonella | Worldwide | Food-borne: beef, poultry, milk, eggs,unwashed raw vegetables | Diarrhea, gastrointestinal symptoms | Drink plenty of fluids. Seek medical attention if symptoms persist more than 3 days. | Always cook food thoroughly. Wash vegetables before consuming. |
| Schistosomiasis (or bilharzias) | Brazil,Egypt, subSaharan Africa, southern China, the Philippines, and SoutheastAsia | Transmitted by swimming in contaminatedfresh 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 schistosomiasis.  | Avoid freshwater wading or swimming in endemic regions.Heat bath water over 50°C for at least 5 minutes before use. |
| Tetanus (vaccine available) | Worldwide | Infection occurs after a wound. *Tetanus bacillus* | Painful muscle contractions | See a doctor if you suspect Tetanus. | Obtain a tetanus shot every 10 years. |
| Tuberculosis (TB) (vaccine available but not widely used in US) | Worldwide | Infection occurs person-to-person in respiratory droplets | Coughing lasting up to 3 or more weeks, coughing up blood, chest pain, weight loss, fatigue, fever, chills. It can also affect your body’s kidneys, spine,and brain if left untreated | If you suspect you may have TB or have come in contact with someone with TB, contact your doctor.  | Wash your hands frequently. Cover your mouth when coughing/sneezing. |
| Typhoid fever (vaccine available) | Worldwide. | Food-borne: contaminated food and water  | Diarrhea, gastrointestinal symptoms | Drink plenty of fluids. Seek medical attention if symptoms persist more than 3 days. | Obtain a vaccine. Always cook food thoroughly. Wash vegetables before consuming. |
| Typhus fever | Worldwide | Infection from bite of lice, fleas, ticks, or mites. *Rickettsiae* spp. | Headache, fever, rash. | See a doctor if you suspectTyphus fever. It is treatable with antibiotics. | Wearrepellents. Wear long sleeved shirts. Tuck pants into boots. |
| West Nile Virus | North America | Mosquitoborne:Infection fromthe bite of a mosquito infected withWest NileVirus | 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 you have contracted the West Nile Virus.  | Use repellents. Wear long pants and long sleeved shirts. Avoid being bit by mosquitoes. Avoid areas of standing water where mosquitoes breed. Many mosquitoes are most active at dusk and dawn, consider staying indoors during these hours. |
| Yellow Fever (vaccine available) | SouthAmerica and Africa | Infection from the bite of an infectedmosquito  | Flu-likesymptoms.Jaundice. Can be fatal.  | See a doctor if you suspectYellow Fever. | Visit a doctor at least 10 days before travel for vaccine. Wear long pants and long sleeved shirts. Use repellents Use a mosquito net. |
| Zika | Worldwide; particularly Central andS America, SE Asia, southern US | Infection fromthe bite of a mosquito carrying the virus; can be transmitted through sexual contact with an infected person. | Many people have no symptoms or only mild symptoms(rash, fever, joint pain, red eyes). **Note: Zika is linked to severe birth defects.** | Treat symptomatically. Consult a doctor if you suspect that you have (or had) Zika.  | Pregnant women: Do not travel to any area with Zika or have unprotected sex with a partner returning from an affected area. If trying tobecome pregnant, consult your doctor about travel plans. Use repellents. Wear long pants & long sleeves. (Treat clothes with permethrin.) Avoid being bit by mosquitoes. Avoid areas of standing water where mosquitoes breed.  |

 IX. Resources

There are many available resources that will add to the information in this guide. Here are some references for more information, and you are encouraged to search for others relevant to your trip:

## **A. On Campus**

Risk Management Services: The Department of Risk Management Services coordinates the university’s risk management and effort through occupational and campus safety programs, environmental compliance, and institutional insurance coverage. More information here:

<https://risk.arizona.edu/>

Worker’s Compensation: More information about UA’s workers’ compensation policies and how to report an incident can be found here: here:

<https://risk.arizona.edu/insurance/workers-compensation>

UA Police: In an emergency: Call 911

If non-emergency: Call (520) 621-8273

More information: <https://uapd.arizona.edu/>

Study abroad: For more information on study abroad programs.

https://global.arizona.edu/study-abroad

Institutional Animal Care and Use Committee (IACUC): Research with animals, including wild animals, must be reviewed and approved by the committee prior to beginning research

Information is available here: <https://rgw.arizona.edu/compliance/IACUC> or call 520-621-9305

Campus Health: Campus Health offers telemedicine, vaccinations, and other health related services.

https://health.arizona.edu/

Call (520)-621-9202

## **B. Off Campus**

CPR/First Aid: First aid and CPR are available through several different outlets. The American

Red Cross courses can be found here: www.redcross.org/training/first-aid-cpr

General health, disease, and travel information: The Centers of Disease Control and Prevention (CDC) offers a website that describes many topics related to health, disease, and travel, both domestic and international: www.cdc.gov

Medical: Information about a variety of diseases and illnesses can be found on their website: www.webmd.com (This resource SHOULD NOT be used to self-diagnose in the place of visiting a doctor)

Poison Control: 1-800-222-1222 (free North American hotline)

Diseases: The CDC offers more detailed information about many diseases related to travel.

https://www.cdc.gov/diseasesconditions/index.html

Arizona Department of Health Services: The Arizona Department of Health offers information regarding a wide variety of services including infectious disease information, health data, and healthcare locations. <https://www.azdhs.gov/>

Weather: More information about current and expected weather conditions can be found at www.weather.gov. More information on weather safety in various scenarios can be found at https://www.weather.gov/safety/.

Impure water: Impure Water: The CDC provides information on waterborne diseases.

http://www.cdc.gov/healthywater/.

Research Vessel Safety: Addresses field operations aboard research vessels or larger watercraft.

https://www.unols.org/document/research-vessel-safety-standards-rvss

### **C. North America**

General safety: For more information on outdoor and recreational safety: https://www.fs.fed.us/safety/outdoor/.

Hunting: 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/.

Hantavirus: The CDC has detailed information about Hantavirus.

https://www.cdc.gov/hantavirus/

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

### **D. International**

Travel Health & Outbreaks: Updated information about disease outbreaks and international travel health can be found from the World Health Organization (WHO). http://www.who.int/ith/en/

Advisories: Travel advisories are announced through the U.S. Department of State. Current travel warnings, public announcements, and consular information sheets can be obtained online at: http://travel.state.gov/

## **E. Safety Resources for Specific Areas of Study**

General:

Research Laboratory & Safety Services (RLSS) resource page - <https://research.arizona.edu/compliance/RLSS/field-research-safety>

Agriculture/Rural Studies: UC Agriculture and Natural Resources (UC ANR) provides excellent “Safety Notes” for a variety of outdoor and field activities.

http://safety.ucanr.edu/Safety\_Notes/

Geology/Earth Sciences:

Safety & Health for Field Operations (USGS) – handbook 445-3-H:

https://www.usgs.gov/about/organization/science-support/survey-manual/handbooks

Polar Sciences:

US Antarctica Program, Arctic Sciences (NSF): https://nsf.gov/geo/plr/pehs/index.jsp

Wildlife Biology:

* Guidelines for use of wild animals in research and teaching (American Society of Mammologists): <https://www.mammalsociety.org/uploads/committee_files/CurrentGuidelines.p>
* Guidelines to the Use of Wild Birds in Research (Ornithological Council):

http://www.ebd.csic.es/documents/240051/0/Guidelines\_to\_the\_use\_of\_wild\_birds\_in\_resear ch.pdf/4080feb3-01f7-48a3-9712-be5c95e9f8e5

* Science Guidelines (American Fisheries Society): https://fisheries.org/policy-media/science-guidelines/
* Resources, Collection & Curation Practices (American Society of Ichthyologists &

Herpetologists): https://asih.org/

* Precautions for Zoonotic Disease Prevention in Veterinary Personnel (National Association of State Public Health Veterinarians):

http://nasphv.org/Documents/VeterinaryStandardPrecautions.pdf

Fish & wildlife training modules (Canadian Council on Animal Care): https://www.ccac.ca/en/training/modules/

* Health Risks for Marine Mammal Works (UC Davis Vet Medicine, 2008): https://www.int-res.com/articles/dao\_oa/d081p081.pdf
* Disease Precautions for Hunters (AVMA): https://www.avma.org/resources/publichealth/disease-precautions-hunters

 X. Human and Political Hazards

*Also see* ***Section IV*** *for more information about sexual harassment and anti-racism*

 Field researchers may face unique human hazards depending on the intersections of their identities, and the social climates of the areas they are conducting research. Though we are not able to provide specific recommendations about how to best navigate social interactions, we will here outline some possible considerations for PI’s and field researchers. **We urge PI’s to consider unique challenges students might face, and listen to the concerns of their researchers about their concerns and needs around safety.**

PIs need to discuss these topics with researchers, as well as listen to and believe in their concerns for their safety without expecting researchers to disclose personal or difficult details about themselves. Additionally, it is important to recognize that stress induced by risk perception is a serious issue. Whether an incident occurs or not, all researchers deserve field work environments where they can feel safe to focus on their research. Not all people will enter all field research situations on the same footing in this regard.

The below considerations may co-occur and interact with one another. For example, an Italian international student may face elevated scrutiny at border checkpoints compared to American students, a Mexican-American student may face elevated scrutiny at border checkpoints compared to Italian-American students, and a Mexican international student may face compounding scrutiny at border checkpoints compared to all above listed students. All of these example situations pose risks to researcher safety. Depending on the researcher and field situation, plans should be made to alleviate these risks and help researchers feel safer while working.

Border/Immigration status - Travel near borders can present situations that may be stressful or risky for researchers, especially researchers that may have their immigration status questioned. Some considerations to discuss/plan for include:

* Political climate of region of research
* Immigration status of researcher(s)
* Possible misperception of immigration status of researchers by local people or authorities

Possible precautions to take may include carrying official documentation at all times, establishing a reliable emergency contact nearby, ensuring researchers with elevated risk are not traveling alone, etc.

Police interactions, Private landowners, etc. - Research in areas monitored by potentially hostile groups may pose a risk or stress to researchers from communities historically targeted by violent policing or other forms of oppression. Such situations may include:

* Areas with heavy police presence, such as urban sites
* Land monitored by authorities, such as military sites
* Private land where locals may have firearms or be prone to hostility

If these factors are present and may cause researchers to feel unsafe or be at risk, plans should be made to buffer them against scrutiny and protect them in emergencies or conflict.

Racism, Sexism, Homophobia/Transphobia - Researchers with one or more historically (or currently) oppressed identities may feel unsafe in some field situations depending on the social climate of the area or other factors. Considering the researcher's need to feel safe in these situations is important, and will vary depending on the researcher and the situation. Field scenarios that did not pose risks for some researchers may be very different environments for others, see above examples. Also see phenomenon such as “sundown towns” [see [this article](https://www.jstor.org/stable/pdf/26214270.pdf), content warning: description of racist history of segregation]

International travel - The intersection of political/social climate and researchers' identities is critical to consider when traveling abroad. Conversations around these scenarios should be informed by other categories in the above areas, such as the immigration status of researchers, gender politics of areas visited, local laws regarding sexuality or religion, etc. Further, it can be helpful to research the political climate in areas or countries where research will be conducted, especially places with a history of violent conflict or persecution of minority groups.

If one or more parties (supervisor, researcher, field tech etc.) are having difficulty discussing or understanding some of these risks, they can seek guidance from Research Laboratory & Safety Services (RLSS) rlss-help@email.arizona.edu or call 520-626-6850. RLSS personnel are happy to help identify further risk assessment resources and services, provide feedback on situational preparedness, and facilitate some conversations around human and political hazards in the field.

Appendix 1. Sonoran Desert and Borderlands

In our local area of the Sonoran Desert, it is essential to be prepared for heat, uneven terrain, sharp rocks and plants, animal bites, and humans involved in border crossing situations. Do not assume there are no/minimal hazards because you are close to home. Hikers require rescue on a regular basis here!

Aim to maximize what you can control, and minimize what you can’t control.

AHEAD of time:

* Identify the nearest hospitals and urgent care facilities to your field sites.
* Avoid going out alone, and make sure everyone on the team knows where emergency services are located.
* Charge cell phones and obtain satellite phones/trackers if you will be out of service (common in our area).
* Identify a chain of command if there is an accident away from cell service. Who will go for help? Who will stay?
* Obtain university-branded clothing and/or car decals from the department.
* Obtain a first-aid kit.

WHEN YOU GO:

* Bring enough water - roughly 1L for every two hours (per person)
* Drink it!!!!!!
* Wear a hat
* Wear closed shoes, preferably boots
* Put on sunscreen and ideally long clothes
* Avoid contact with animals, especially snakes
* Let someone know if you are hurt or don't feel well
* Watch out for each other

DRINK YOUR WATER!!!!! We’re in the desert, folks. ALWAYS bring an excess of water. Train yourself to drink when you are not thirsty. If you are thirsty, you are already dehydrated.

**RECOGNIZING THE SIGNS OF DEHYDRATION / HEAT STRESS**

Heat exhaustion: Fluid loss through sweating.

 • Individual has still-sweats (i.e., sweats at rest, not during exertion), clammy / moist skin

 • Pale or flushed

 • Body temperature normal or slightly high

 • Weakness or exhaustion

 • Giddiness, nausea, or headache

*Treatment*: Rest in cool place, Drink water or electrolyte solution

Heat stroke: More serious!! Failure of the body to regulate core temperature.

 • Sweating stops

 • Mental confusion, delirium

 • Loss of consciousness, convulsions or coma

 • Body temperature of 106°F or higher

 • Hot, dry skin (red, mottled, or bluish)

*Treatment*: Seek immediate medical help, soak clothing with cool water and fan

**BORDER SAFETY**

There are additional potential hazards associated with the US-Mexico Border, including people patrolling the border (US Border Patrol, Military, as well as unaffiliated militia and other unidentified persons), and people crossing the border illegally who may be in hazardous situations. Some considerations to discuss between supervisor and field personnel:

* Will you be crossing Border Patrol or Military checkpoints? There are many on roads throughout the southern portion of the state. International personnel must carry their documentation, including passports and visas, and may be denied passage.
* Will you be in an area where illegal border crossing is happening?

Appendix 2. Field Safety Plan Template

A field safety plan serves as a tool to document your hazard assessment, communication plan, emergency procedures, and training. This plan should identify hazards, as well as precautions and actions taken to address and mitigate those hazards. Instructions:

1: Complete this field safety plan **together** (PI and field researcher): insert specifics for your site and operations, delete irrelevant sections.

 Expect this form to take at ~1 hour of researcher and PI discussing, possibly more if in-depth international plans etc. are involved.

2: Complete appropriate training for your site and operations (e.g. first aid, heat illness, task-specific training).

3: Obtain immunizations and prophylaxis for your destination, if applicable (schedule 8 weeks in advance).

**Hold a pre-trip meeting** with your group and/or supervisor to review your field safety plan, travel logistics, pack list (including first aid kit), personal safety and security concerns, and any remaining training needs.

**Additionally, hold a post-season debrief** to discuss where deviations from the plan happened and why, any incidents that might have occurred.

|  |  |  |  |
| --- | --- | --- | --- |
| Plan created for: |  | Date: |  |
|  | *Name of Research Group / Course / Trip leader* |  | *mm/dd/yyyy* |

## Overview

|  |  |
| --- | --- |
| Field site: |  |
|  | *Descriptive name of research location (e.g. Great Smoky Mountains NP, North Carolina)* |
| Activity description: |  |
|  | Type, length, and purpose of activity (e.g. hiking 3-4 miles/day, collecting specimens etc.) |
| Dates of travel: |  |
|  | Start date, duration, expected return to campus, etc. |
| Detailed itinerary: | * Expanded below
* File attached:
 |

## Site information

|  |  |
| --- | --- |
| Location: |  |
|  | *Latitute/longitude, or link to map location* |
| Site Information: |  |
|  | *Elevation, terrain, environment* |
| Travel to site: |  |
|  | *How will participants get to the field site? Note any dangerous roads, conditions* |
| Site access: |  |
|  | *Restrictions or challenges accessing site, alternate routes or parking areas, gate access codes, etc. note if isolated or remote.* |
| Environmental hazards: |  |
|  | *Dangerous wildlife, insects, endemic diseases, poisonous plants, etc. that participants might encounter. Note intended mitigation measures, discuss prior to trip.* |
| Security/human or political hazards: |  |
|  | *Risks for harassment or violence, etc. See section X of guidebook for more info. Note intended mitigation measures* |

## Conditions

|  |  |
| --- | --- |
| “No go” criteria: |  |
|  | *Conditions under which activity at a site should be stopped or cancelled**e.g. heavy rains, temperature >100 degrees, etc.* |
| Expected weather: |  |
|  | *Note extreme conditions that could impact planning**e.g. high heat, wind, rain, snow, storms etc.* |
| Drinking water availability: |  |
| Access to shade/shelter: |  |

##

## Emergency services and contact info

*(Emergency contacts for all individuals at end)*

|  |  |
| --- | --- |
| Local contact: |  |
|  | *Name, address, phone, (include consulate/embassy if abroad)* |
| University contact: |  |
|  | *Name, number* |
| Lodging location: |  |
|  | *Name, day, location etc.* |
| Check-ins: |  |
|  | *Point person and frequency**e.g. Call PI daily at end of work day, weekly, etc.* |
| Emergency medical services: |  |
|  | *Procedure for contacting EMS, evacuation plan****Identify closest urgent care/emergency room and save in phone or gps*** |
| Cell phone coverage: |  |
|  | *E.g. good, spotty, none. If spotty or none, identify closest location with service**Check: https://fcc.maps.arcgis.com/apps/webappviewer/index.html?id=6c1b2e73d9d749cdb7bc88a0d1bdd25b* |
| Nearby facilities: |  |
|  | *E.g. restrooms, water, gas, stores* |
| Side Trips: |  |
|  | *Are side trips planned or allowed during free time? Before or after planned activities? Restrictions, specific rules, expected conduct etc.* |

##

## Participant information

(Participant emergency contact in roster at the end of this document)

|  |  |
| --- | --- |
| Field team: |  |
|  | *List participants* |
| Group plans: |  |
|  | *If working alone or in smaller groups, note communication plans* |
| Physical demands: |  |
|  | *e.g. swimming, hiking, climbing, altitude, confined spaces etc.* |
| Mental demands: |  |
|  | *e.g. long hours, high stress environments, social risks/stressors etc.* |
| First aid training/supplies: |  |
|  | *First aid and CPR training recommended (see section II of guidebook for more info)**List team members trained, and first aid supplies, plan for where they are stored.* |
| Immunizations/ medical evaluations: |  |
|  | *List required immunizations/prophylaxis or required medical evaluation, if applicable* |

##

## Equipment & Activities

|  |  |
| --- | --- |
| Transportation: |  |
|  | *Vehicles used, backup transportation plans, etc.* |
| Research tools: |  |
|  | *Equipment safety and handling, operating dangerous tools, specialty vehicles, etc.* |
| Other research hazards: |  |
|  | *Hazardous materials, pathogen exposure, high physical exertion demands, etc.* |
| PPE: |  |
|  | *Required PPE (e.g. boots, safety glasses etc.) & recommended PPE (e.g. walking sticks, insect repellant, etc.). Who is expected to source and supply different PPE?* |

##

## Financial responsibilities

**For each of the below fields specify:**

* Purchases that will be made in each category leading up to and during field work
* Payment method(s) that will be used:
	+ Purchasing card (by whom?)
	+ PI’s credit card
	+ Petty cash
	+ Researcher’s funds with reimbursement
	+ Researcher’s financial responsibility - not reimbursed
* Estimated total costs researchers will be expected to front for reimbursement, or spend of their own money

|  |  |
| --- | --- |
| Research supplies: |  |
|  | *E.g. consumable research materials, specialized field clothes, rite-in-the-rain notebooks, etc.* |
| Research equipment: |  |
|  | *Larger purchases (e.g. shovels, tarps, binoculars, computers, etc.)* |
| Travel to field sites: |  |
|  | *Flights, trains, driving in personal vehicles, etc.* |
| Transportation in the field: |  |
|  | *Gas, unexpected vehicle costs, vehicle rentals, etc.* |
| Food: |  |
|  | *Food for research team leader and team members during field work* |
| Lodging: |  |
|  | *E.g. Hotels, campsites, research station dorms, etc.* |
| Other: |  |
|  | *E.g. Field station fees, permits, etc.* |

##

## Signatures of planning parties

I acknowledge this safety plan has been prepared for field work under my supervision together with the research project leader.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *Supervisor/PI Name* | *Supervisor/PI Signature* | *Date* | *Supervisor/PI Phone number* |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| *Project Leader Name* | *Project Leader Signature* | *Date* | *Project Leader Phone number* |

##

## Team/Participant Roster and Signatures

By signing below I verify that I have read this field safety plan and understand its contents, and agree to comply with the above plan.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Phone number | Signature | Date | Emergency contact |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Appendix 3. Example PI/Supervisor Letter

University of Arizona letterhead available for download here: <https://brand.arizona.edu/download/e-letterhead-template-master-brand>.

Date

To Whom It May Concern,

This letter is to document that (*field researcher name*) is a (*graduate student, postdoctoral researcher, etc.*) in the Department of Ecology & Evolutionary Biology at the University of Arizona in Tucson, Arizona. They are conducting research under my supervision. During (*season or timeframe, year*), they will be (*conducting research/other description of type of work)* on (*study organism*) living/growing near (*town/region/national park, etc*). These activities are part of their research in our department, and they have obtained all the appropriate approvals for this work. For any comments, questions, or concerns, please contact (*Supervisor name*) at the email or phone number provided below.

Sincerely,

PI/Supervisor name & signature

Title

Email

Phone number