Wilderness First Aid Reference Cards

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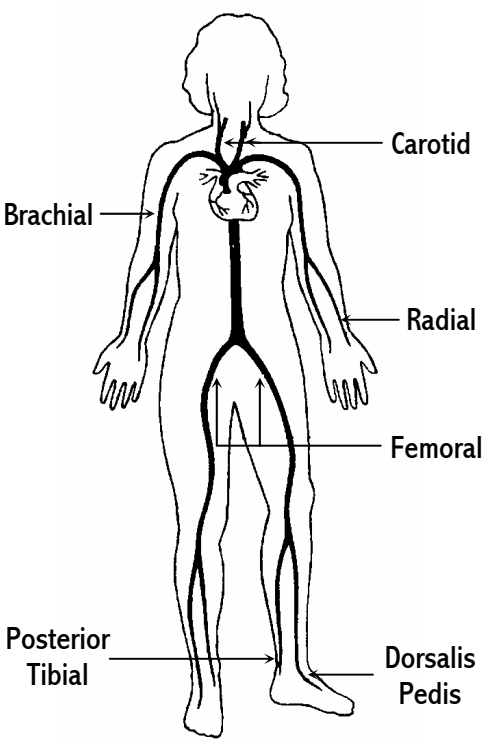
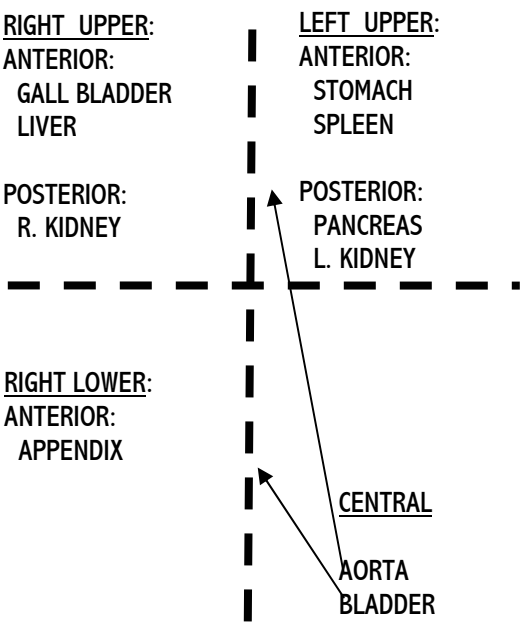
Pulse/Pressure Points

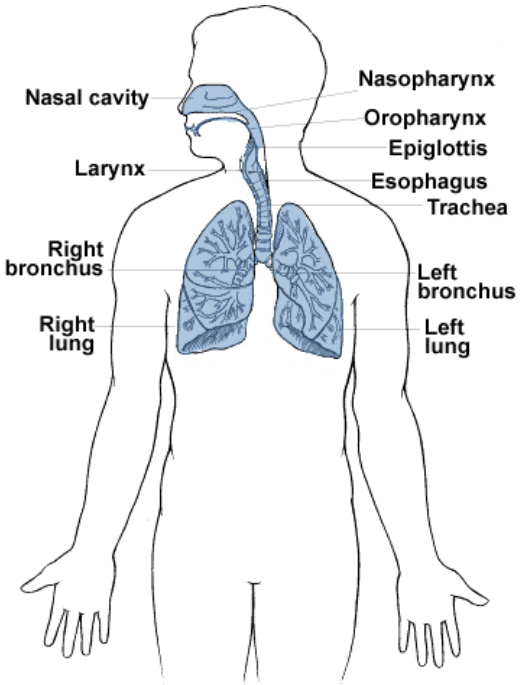


Abdominal Quadrants
(Looking at Patient)



Tenderness in a quadrant suggests potential injury to the organ indicated in the chart.

Airway Anatomy



Patient Assessment System

Scene Size-up
MOI
- Major trauma
- Environmental
- Medical

Safety/Danger
- Move/rescue patient
- Body substance isolation
- Remove from heat/cold exposure
- Consider safety of rescuers

Resources
- # Patients
- # Trained rescuers
- Available equipment (incl. Pt's)

BLS
Respiratory
- Air in and out
- Adequate

Nervous
- AVPU
- Protect spine/C-collar

Circulatory
- Pulse
- Check for and Stop Severe Bleeding

STOP → THINK:
A – Continue with detailed exam
VPU_ EVAC NOW

SOAP Note Information (Focused Exam)

Pt. Information
MOI
Environmental conditions
Position pt. found
Initial Px: ABCs, AVPU
Initial Tx

SAMPLE
Symptoms
Allergies
Medications
Past/pertinent Hx
Last oral intake
Event leading to incident

Physical (head to toe) exam: DCAP-BTLS, OPQRST

Normal Vitals
Pulse: 60-90
Respiration: 12-20, easy
Skin: Pink, warm, dry
LOC: alert and oriented

Possible Px: Trauma, Environmental, Medical
Current Px
Anticipated Px
Field Tx
S/Sx to monitor
Evac level

Patient Level of Consciousness (LOC)

Reliable Pt:
Calm
Cooperative
Sober
Alert

Causes of Abnormal Consciousness:
Sugar
Temperature
Oxygen
Pressure
Electricity
Altitude
Toxins

AVPU
A+ Awake and Cooperative
A- Awake and lethargic or combative
V+ Responds with sound to verbal stimuli
V- Obeys simple commands with verbal stimuli
P+ Pulls away from source of pain
P- Moves toward source of pain
U Totally unresponsive

Shock Assessment

Hypovolemic – Low fluid (Tank)
Cardiogenic – heart problem (Pump)
Vascular – vessel problem (Hose)

Volume Shock (VS) early/compensated
- ↑pulse
- Pale skin
- ↑respiration rate
- Normal AVPU

Volume Shock late/decompensated
- ↑↑↑pulse
- Pale skin
- ↑↑↑respiration rate
- ↓AVPU

Comment:
If a pulse drops but does not return to 'normal' (60-90 bpm) within 5-25 minutes, an elevated pulse is likely caused by VS and not ASR.

Tx: Stop visable bleeding, elevate legs, keep warm, manage psychological factors, ventilate if respirations are inadequate, give O_2 and IV fluids if available and appropriately trained.

Acute Stress Reaction

Sympathetic (fight or flight)
- ↑pulse
- Pale skin
- ↑respiration rate
- Normal AVPU
- Pain masking
- Looks like early VS

(neumonic = SASR = Spin up)

Parasympathetic (rest and digest)
- ↓pulse
- Pale skin
- ↓respiration rate
- May feel light headed, dizzy, nauseous, faint, anxious

(neumonic = PASR = passout)

Tx: For either condition, calm patient and remove stressors as much as possible

Head Injuries

Concussion:
Patient must be awake, cooperative, improving, and have amnesia.

S/Sx
- Patient is awake now
- Amnesia
- Can't have S/Sx of ↑ICP
- Nausea/vomiting (once) 2° to P-ASR
- Headache
- Tired

↑ICP:
S/Sx – early
- Patient is A- or lower
- C/O headache
- Persistent vomiting
- Ataxia

S/Sx – late
- Patient is VPU
- Vomiting persists
- Seizure
- Coma
- Cardiac and respiratory arrest

Spine Ruling Out Process (WFR or WEMT)

Patient must:
- Be reliable
- Report no pain when focused on spine
- Report no tenderness when spine palpated
- Have normal motor exam
- Have normal sensory exam
- Report no shooting, tingling or electric "pain" radiating from extremities

Motor Exam: Compare strength in both hands and feet. Have pt. resist:
- finger squeeze; pushing down on hand
- push 'gas pedal'; pull up on foot

Sensory Exam: compare pt's ability to distinguish between pin prick and soft touch on back of hand and shin
- Use pin to prick
- Use cloth for soft touch

In cases where the spine can't be ruled out but the injury can be localized to the lumbar area, consult medical direction regarding need to continue c-spine stabilization.

Wound Cleaning

Partial thickness:
- Soap and water wash
- Scrub to remove particles
- 10% P.I.
- Keep moist
- Dress lightly

Full thickness, low to moderate risk:
- Clean w/in 2 hours of bleeding end
- Clean around area with 10% P.I.
- Pressure flush with drinkable water in short bursts along axis
- Bring edges toward (not touching) each other and hold in place with an occlusive dressing and/or steri-strips etc.

Full thickness, high risk:
Clean as previous, PLUS:
- Remove dead skin and tissue
- Remove foreign material
- Finish flushing process with 1% P.I. solution (strong tea or amber beer)
- Do not close in field
- Pack with thin layers of gauze soaked in 1% P.I. Remove and repack bid
- Dress with several layers of gauze. May place 10% P.I. between layers, but not directly on wound
- Consider splinting if wound is over a joint.

Common Causes of Pulse Changes

Strong, Slow:
- Normal sleep
- Simple fainting
- Early ↑ICP
- Well-conditioned athlete
- Hypothyroid

Weak, slow:
- Hypothermia
- Late ↑ICP

Irregular:
- Sinus arrhythmia
- Heart disease

Strong, fast:
- Early heat stroke
- Fever
- Hyperthyroid
- Early shock
- ASR
- Strenuous physical activity

Weak, fast:
- Overwhelming infection
- Late heat stroke
- Late shock
- Diabetic coma
- Some types of heart disease

Focused Survey Acronyms

From Patient:

SAMPLE = Signs/Symptoms, Allergies, Medications, Previous Injury, Last Meal/Drink, Events

Pt = Patient
Hx = History
Px = Problem
S/Sx = Signs/Symptoms
Tx = Treatment

Observed by Rescuer:

CMS = Circulation, Motion, Sensation

OPQRST = Onset, Provocation, Quality (dull, sharp), Radiation, Severity (1-10), Time

DCAP-BTLS = Deformities, Contusions, Abrasions, Punctures/Penetrations, Burns/Bleeding, Tenderness, Lacerations, Swelling

Hypothermia

98.6° to 90°:
Pt will be A to A-, shivering, have ↑urine output, ↓coordination and dexterity

Tx:
Active rewarming – give food (carbs first), liquids, remove from elements, exercise, shelter, layers, add external heat (heat packs or hot water bottles)

<90°:
Pt will be V, P or U; shivering will stop; HR and respirations will decrease; Pt may appear dead

Tx:
Passive rewarming – add insulating layers (hypowrap), handle with care, no rapid warming or movement, no CPR (AED may be used). PPVs may be given.

Heat Related Symptoms

If heat is identified as a potential MOI and patient exhibits irrational behavior:

1) ALWAYS COOL PATIENT FIRST
2) Assess hydration status
   - If dehydration is established, hydrate with electrolyte solution
   - If hx includes copious H_2O, give electrolytes only
3) Complete focused survey
4) Treat symptoms as indicated by survey; continue to support cooling mechanisms

Heat exhaustion:
A-(irritable), temp. 99°-104°, pale

Heat stroke (early):
A- (irritable, combative), temp. >105°, pale if dehydrated, flushed if hydrated

Heat stroke (late):
V,P or U, seizures, coma, death

Electrolyte Sickness:
A-, V, P or U; Hx of H_2O but no food; can rapidly progress to ↑ICP

Patient SOAP Note

Patient Information	Name:	Rescuer:	
Age:	Weight:	Male	Female
Address:		Phone:	
		Date:	
		Time:	
Contact:		Phone:	

Scene Size-Up: Major Trauma Environmental Medical

Describe MOI

Describe Environmental Conditions

Position Patient Found		Initial Px	A V P U on arrival	
R / L side	Front / back	No respirations	No pulse	Unstable spine
Laying / Sitting / Standing		Severe Bleeding	Vomiting	Blocked Airway

Initial Tx

Subjective Information = What the patient tells you

Symptoms = Describe onset, cause & severity (1-10) of chief complaints

Time

Allergies = Local or systemic, cause, severity & Tx

Medications = Rx, OTC, herbal, homeopathic & recreational

Drug	Reason	Dose	Current
			Yes / No
			Yes / No

Notes

Past relevant medical Hx = relate to MOI

Last food & fluids = intake & output

H_2O	Calorie	Electrolyte
Urine color	Urine output	Stool

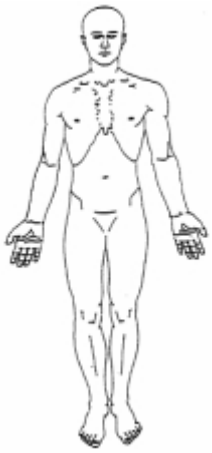
Events = Patient's description of what happened

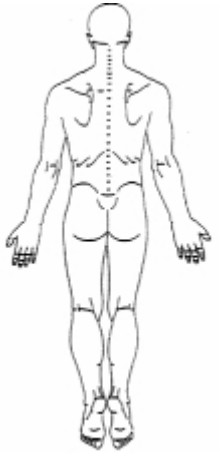
Amnesia Yes / No

Objective Information = What you see

Physical Exam = look for discoloration, swelling, abnormal fluid loss & deformity. Feel for tenderness, crepitus & instability. Check ROM and CSM.

Time





Vital Signs = get a baseline, then record changes

Time	Pulse	Resp	BP	Skin	Temp	AVPU

Assessment = What you think is wrong

Possible Px	Time	Current Px	Anticipated Px
Trauma			
UP ICP / Concussion			
Respiratory Distress			
Volume Shock			
Unstable Spine			
Trunk Injury			
Unstable Extremity Injury			
Stable Extremity Injury			
Wounds			
Environmental			
Dehydration / Low Na			
Hypothermia / Cold			
Heat Stroke / Exhaustion			
Frostbite / Burns			
Local / Systemic Toxin			
Local / Systemic Allergy			
Near Drowning			
Acute Mountain Sickness			
Lightning Injuries			
SCUBA / Free Diving			
Medical S/Sx			
Circulatory			
Respiratory			
Nervous			
Endocrine			
Genitourinary			
Musculoskeletal			
Skin / Soft Tissue			
Ears/Eyes/Nose/Throat			
Teeth / Gums			

Plan = what you are going to do

Field Tx	Monitor

Evacuation

Level 1 2 3 4
GPS / Grid Coordinates
Request ALS: Yes / No

Additional Notes

Additional vitals

Time	Pulse	Resp	BP	Skin	Temp	AVPU

Radio Report

Base, this is_____with _____
I have a _____ year old male/female whose chief complaint is:_____
_____
_____
as a result of:_____
_____
Patient is currently A V P U and was found Laying/Sitting/Standing on R/L/Front/Back side. Patient exam revealed _____
_____
_____
Spinal assessment revealed_____
Patient states _____
_____
Initial vitals were: HR:_____ RR:_____ Skin:_____ BP:_____
Current vitals are: HR:_____ RR:_____ Skin:_____ BP:_____
Treatments given are:_____
_____
_____
Anticipated problems during transport are:_____
_____
_____
Evacuation priority is: 1 2 3 4
We require: Litter / More People / Helicopter / ALS / _____
Our evacuation plan is _____
_____
Our GPS coordinates are:_____
LZ GPS coordinates are:_____

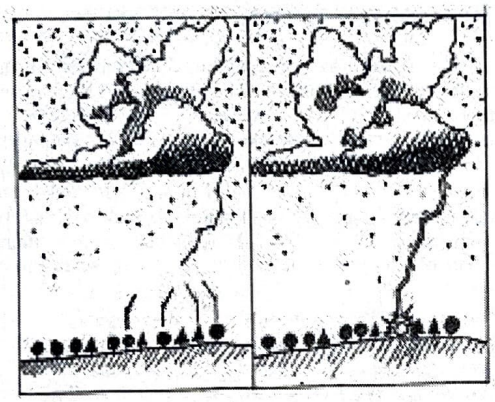
NOLS Backcountry Lightning Safety Guidelines

John Gookin,, NOLS Curriculum Manager

This paper discusses the phenomenon of lightning as it typically happens; how to seek relative safety when caught in a backcountry lightning storm; typical lightning injuries; some tips on teaching lightning risk management in the backcountry; an overview of first aid, and incident reporting guidelines. It can not be emphasized enough, that **being outdoors exposes us to random lightning hazard, no matter what actions we take.**

How Does Lightning Strike?

Lightning strikes fast: the whole process usually takes a few milliseconds. Stepped leaders leave a cumulonimbus cloud and some leaders move toward the ground. They appear as many branches, but only 1-2 branches will reach the ground. Approximately every 50 meters[1] a new step leaves each leader and heads in a fairly random direction. If a leader gets 100m from the ground, positively charged streamers start rising from the closest grounded objects towards the negatively charged leader. As soon as the leader is close enough to a streamer[2], it shoots directly to that streamer and "blazes a trail" for a significant charge (a return stroke) to shoot from the ground to the cloud[3]. This leader search distance concept is important to understand to avoid direct strikes.



Illustrations by Rob MacLean

Figure 1 Left: a stepped leader moves down in 50 m steps and multiple streamers rise from tall objects near the leader.
Right: a single return stroke from a tree is the most obvious part we see.
Note the leader connected with the streamer that happened to be closest to it during the final step.

Most ground strikes occur immediately below a cumulonimbus cloud. Rarely, a bolt of lightning can move horizontally and strike somewhere "out of the blue" (out of the blue sky) as far as 10 miles (16km) away. These horizontal strikes are rare and unpredictable, so they shouldn't affect our decisions.

Using the 50 m search distance of stepped leaders (see above) lightning tends to hit the closest object within range at the end of the last step. Lightning tends to hit elevated sharp terrain features like mountain tops. Lightning tends to hit tall trees in open areas, with objects twice as high receiving roughly 4X the strikes[4]. Lightning tends to hit bushes in the desert if the bush is sticking up higher than the flat ground around it. Lightning tends to hit a boat on the water, especially if it has a tall mast. Lightning can still hit flat ground or water, but more randomly than it hits elevated objects.

Even a few less feet of height can make a difference in improving your odds of NOT being the struck object. This is why the first part of getting into the lightning position is lowering yourself down to decrease your height.

Lightning tends to hit long electrical conductors. Metal fences, power lines, phone lines, handrails, measuring tapes, bridges and other long metallic objects can concentrate currents. Wet ropes also conduct current and should be treated with the same respect as wires. Longer objects tend to concentrate more current and reach more strike points.

How Can Lightning Hurt Us?

Lightning throws an ensemble of deadly and injurious threats our way. All of these effects happen in the same few milliseconds, but none of the threats linger after each strike.

Direct strike: this means the stepped leader connected with a streamer coming out of your body, then the return stroke passed through you or over your body's surface. The return stroke is the most significant electrical event of a lightning strike and has a typical current of 30,000 amps[5] (household current is 15 amps). You greatly reduce the chances of receiving a direct strike by being inside a substantial building or a metal-topped vehicle. In the backcountry you should avoid high places and open ground and assume the lightning position[6] to decrease risk.

Streamer Currents: fast high current pulses are launched from the tops of many elevated objects near each leader as it approaches the ground (see Fig.1.) These are launched in response to the tremendously high electric field that exists, momentarily under each tip of the stepped leader. Since the tips of several or many leaders may approach the ground at about the same time, you do not have to be very near the actual ground strike point to be involved in a streamer current. Streamer currents, while much smaller than the return stroke current, are still large enough to cause injury or death to humans. You suppress the tendency to launch streamer currents from your person by crouching into a tight ball as close to the ground as possible. You avoid this possibility by avoiding high locations.

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[1] Yards and meters can be used interchangeably. One meter = 1.1 yards.
[2] This "strike distance" can vary by 10X according to Uman in The Lightning Discharge, 1987.
[3] Return strokes of the opposite polarity tend to occur at the end of storms and under collapsed anvils. In some areas, multiple ground strike points in the same flash are common.
[4] "Towers, Lightning & Human Affairs." LG Byerley 3rd, WA Brooks, RC Noggle & KL Cummins. 11th Intl Conf on Atmospheric Electricity. 1999.
[5] Figures vary from 1-200kA, with most strikes in the 10-50kA range.
[6] This has formerly been called the lightning "safety" position and is explained later in this paper.

Ground Currents: ground currents occur with each strike and cause roughly half of all lightning injuries. Ground currents are driven by the enormous potential differences[7] that appear in the Earth near the ground strike point. Typical lightning-to-ground strikes inject roughly 30,000 amps into the Earth: since the Earth resists electrical flow, large potential differences will appear in the ground all around the strike point. How far the current flows varies wildly since strike current and ground conductance easily vary by orders of magnitude. But the closer you are to the direct strike, the stronger the ground current. If you are standing with your legs separated, if you are on all fours, if you are in a prone position on the ground, or if you are touching a long metallic object, you maximize your exposure to potential differences that arise from ground currents. The potential difference that appears between your legs or across your prone body can drive significant currents through and over your body. You can minimize your exposure to ground potential differences and ground currents by: keeping your feet close together, by NOT getting in a prone position, by assuming the lightning position on additional insulation such as a foam pad, and by not removing your shoes with thick rubber soles. These actions can help minimize the amount of ground current going through your body, but some experts think these efforts are moot compared to getting to a safer location. We need to be careful that we don't give students a false sense of security by getting in this defensive position.

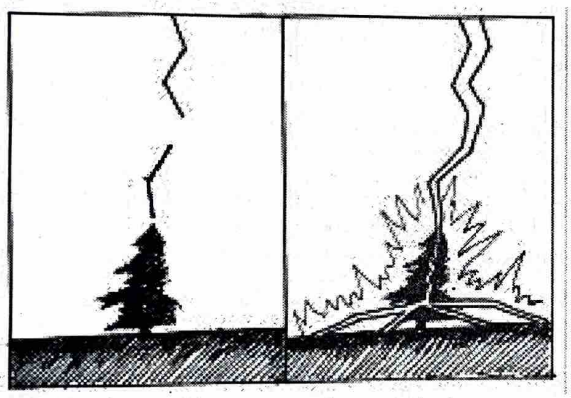

Figure 2: Left: tree with a streamer and a stepped leader.
Right: tree with return stroke, surface arcs, and electrostatic field.

Surface Arcs: high current surface arcs appear to be associated with some fraction of all cloud-to-ground discharges, during the return stroke. They appear in photographs as bright arcs of light radiating from a strike point like spokes of a wheel, in the air just above the ground's surface. (See figure 2.) These long hot horizontal currents have been measured up to 20 meters in length and may get longer. If you are in the path of a surface arc you are likely to conduct some of the surface arc current through or over your body. Since surface arcs emanate from the base of trees struck by lightning, **never seek shelter near a tree.**

[7] Potential difference: if your feet are touching the ground in two different spots, each has a certain electrical **potential** based on the current flowing there. But it is the **difference** between these potentials that will drive current in one foot and out the other.

Radiation: the visible, infrared and ultraviolet radiation near the strike point can damage your vision.

Sound: the thunder pulse can damage hearing temporarily and possibly permanently.

Electrostatic Field Changes: there is a large change in the electrostatic field out to 30m from the ground strike point. If you are standing, then you maximize the voltage across your body, which in turn maximizes currents that pass through and over your body. It takes very little current to interrupt heart function. Minimizing your height by assuming the lightning position is one way to minimize the field change across the length of your body.

Corona: During any stage of a thunderstorm, the electrostatic field can be enhanced enough around grounded objects to cause brush or point discharge (corona). At night, you may be able to see corona as a faint glow from sharp rock outcrops or the tops of bushes or trees — sometimes even from the fingers of your outstretched hand. You may hear corona as a sizzling or buzzing sound. Even if you can't see or hear corona, you might smell ozone, one of the chemical products of point discharge in air. Ozone has an irritating, acrid "swimming pool" smell.

On land it is unusual to have optimum conditions for sensing corona. If you feel hairs on your head, leg or arms tingling and standing on end, you are in an extremely high electric field. If you or any member of your group experiences any of these signs, it should be taken as an indication of immediate and severe danger. The response to any of these signs should be to instantly (seconds matter) drop and move away from all packs, remove metal shoe fittings, spread out, and adopt the lightning position. Do not ignore these signs and do not try to run to safety, unless safety is literally seconds away. If any of these signs are detected, the probability of a close discharge is high and every effort should be made to minimize injuries and the number of injured.

How Can We Reduce Lightning Risk In The Backcountry?

Backcountry lightning safety data is sparse, so these suggestions are "best hunches" by experts who study lightning safety. Random circumstance is a significant factor in where lightning might strike, meaning that these behaviors help reduce your "Las Vegas" odds of lightning injury, but can never make you safe. If you need to stay safe, you need to remain indoors in well protected buildings.

There are things you can do to reduce risk during a thunderstorm, but you can never get as safe as you could be in town. Ron Holle of the National Severe Storm Lab uses a 10-scale for lightning safety. (Going into a modern building and avoiding metal is as safe as it gets at 10, being in a hard-topped car is a 5, sitting on a steel tower on a mountaintop is a 0.) Ron thinks backcountry precautions only move you up .1 on this scale. Other scientists say they think these precautions move you up 4 points on Ron's 10-scale. Some risk reduction factors, like taking off a metallic belt buckle, might reduce burns but have little to do with avoiding becoming a fatality from a direct strike or ground currents. But there are five actions that can reduce your risk, in order:

- **time visits to high risk areas with weather patterns**

- **find safer terrain if you hear thunder**
- **avoid trees**
- **avoid long conductors**
- **get in the lightning position.**

Timing activities with safe weather requires knowledge of typical and recent local weather patterns. There is no such thing as a surprise storm. You need to set turnaround times that will get you off of exposed terrain before storms hit. You need to observe the changing weather and discuss its status with your group. Logistical problems en route should alter whether you complete the paddle or the climb, not whether you get exposed during a storm.

Begin your turnaround if you hear thunder (which means lightning is one to ten miles away.) In calm air you can hear thunder for about ten miles. In turbulent air you can hear the thunder for about five miles[8]. In a driving storm you may only hear it out to one mile. Some parties in rain storms have been struck before they heard any thunder at all.

Safer terrain in the backcountry can decrease your chances of being struck. High pointed terrain attracts lightning to the high points, and even to the terrain around it. Avoid peaks, ridges, and significantly higher ground during an electrical storm. If you have a choice, descend a mountain on the side that has no clouds over it, since strikes will be rare on that side until the clouds move over it. Once you get down to low rolling terrain, strikes are so random you shouldn't worry about terrain as much. If you are exposed to lightning, you need to get in the lightning position as soon as possible, which obviously means you stop moving to safer terrain at that point. Many people have died while upright and walking to safer terrain, but no one has died while stopped in the lightning position. Move to safer terrain as soon as you hear thunder, not when the storm is upon you.

Tents may actually increase the likelihood of lightning hitting that spot if they are higher than nearby objects. Metal tent poles conduct ground current and may generate streamers. Use your understanding of terrain and lightning to select tent sites that may reduce your chances of being struck or affected by ground current. If you are in a tent in "safer terrain" and you hear thunder, you at least need to be in the lightning position. But if your tent is in an exposed location, such as on a ridge, in a broad open area, or near a tall tree, you need to get out of the tent and get into the lightning position before the storm starts, and stay out until it has passed. It would be wise to anticipate additional hazards of getting out of tents in the dark of night during a storm. Determine a meeting spot, have rain gear and flashlights accessible, and have a plan for managing the group during this time.

In **gently rolling hills** the lower flat areas are probably not safer than the higher flat areas because none of the gentle terrain attracts leaders. Strikes are random in this terrain. Look for a dry ravine or other significant depression to reduce risk.

Wide open ground offers high exposure during an electrical storm. Avoid trees and bushes that raise above the others, since the highest objects around tend to generate streamers. Your best bet is to look for an obvious ravine or depression before the storm hits, but when the cloud is over you, spread out your group at 50' intervals to reduce multiple injuries and assume the lightning position.

Naturally wet ground, like damp ground next to a stream, isn't any more dangerous than dry ground, so don't worry about this. It used to be said that wet ground was more dangerous, because it conducted more ground current, but wet ground actually dissipates ground current faster. Neither wet nor dry is considered more dangerous than the other. Standing *in* water should be avoided.

Dry **snow** is an insulator, but wet snow is a conductor. This should make travel on dry snow safer than on bare ground, because it will be harder for a person to generate streamers or conduct ground current.

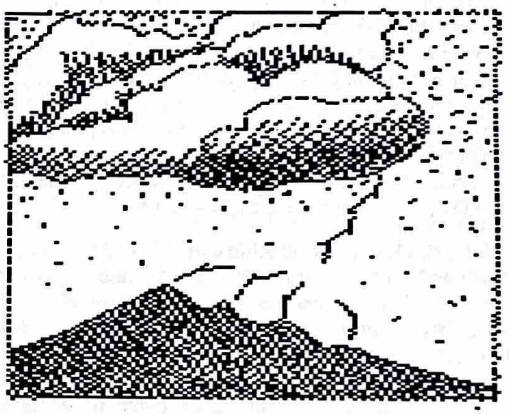

Figure 3: terrain with streamers and a stepped leader. Where do you think the strike will occur?

Avoid **cave entrances**. Small overhangs can allow arcs to cross the gap. Natural caves that go well into the ground can be struck, either via the entrance or through the ground: cavers should avoid being inside a cave, near an entrance, during a thunderstorm[9]. You should never be anywhere near any metal handrail, wire or cable during a storm. People who have been shocked standing in water deep inside caves cite weak charges, indicating that deep within a cave is safer than being on the surface. If you are near an entrance during electrical activity, don't stand in water, avoid metal conductors, and avoid bridging the gap between ceiling and floor. Move quickly through the entrance (in or out) to minimize the time of your exposure. If you are stopped waiting for others near an entrance area, assume the lightning position.

Boaters should start to get off of the water as soon as they hear thunder. There are no reported incidents of lightning accidents on rivers in canyons, probably because the higher terrain above the canyon attracts the leaders. But there is ample lightning injury data for boaters on rivers in flat terrain, on lakes, and on the ocean. When you get to shore, look for protective terrain to wait out the storm. Be especially cautious of trees at the edge of the water because they might be the tallest objects around the body of water. Boats that can't get off the water in lightning-

[8] Use the 5 sec/ mile (3sec/km) flash-bang rule to measure the distance in ideal conditions, but this can distract people from the big picture.

[9] This is anecdotal data from Cavers' Digest.

prone areas should have lightning protection: see this website http://www.cdc.gov/niosh/nasd/docs/as04800.html

Avoid trees because they are taller than their surroundings. Tall trees are especially adept at generating streamers that attract strikes. If you need to move through a forest while seeking safer terrain, stay away from the tree trunks as you move. You should also avoid open areas that are 100 m wide or wider. Lone trees are especially dangerous: the laws of probability say you are hundreds of times safer in a forest with hundreds of trees than you are near a lone tree in an open space.

"Cone of protection" from trees and cliffs is an arguable concept and has no place in lightning safety education anymore. Lightning has been photographed striking 100 m from 200 m towers, and surface arcs have been photographed exactly where "cones of protection" inferred we were all safe. Instead we need to teach the 50 m leader search distance concept (see the first paragraph of this paper.) If someone is within 50 m of a significantly higher object, they have a greatly reduced chance of being struck directly. You can still be struck, especially indirectly, but the chances are reduced. The 50 m concept works best with cliffs and other steep terrain that provide protection without directing the strike toward you. The 50 m concept does not work well for trees because the base of the tree may send out surface arcs. (see figure 2)

Avoid long conductors. Lightning currents tend to pass in long electrical conductors — particularly ones that are on or near the surface of the Earth. Metal fences, power lines, phone lines, railway tracks, handrails, measuring tapes, bridges, and other metal objects can carry significant lightning current even if these objects are at some distance from the lightning ground strike point. Near the ground strike point of a lightning discharge, wet ropes can conduct lethal currents. During a thunderstorm, wet, extended ropes should be regarded as equivalent in risk and danger to metal wires.

Assume the lightning position[10] when at risk. This will reduce the chances of getting a direct strike and it may reduce the other effects of lightning, but it offers no guarantees. Some scientists argue that it only moves you up to 0.1 on the 10-scale; others argue that it is much more valuable because the data says that no one in this position has ever been hurt. This position includes squatting (or sitting) and balling up so you are as low as possible without getting prone. Wrap your arms around your legs, both to offer a safer path than your torso for electrons to flow from the ground, and to add enough comfort that you will choose to hold the position longer. Close your eyes.

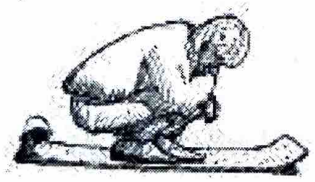

Figure 4: The lightning position: squat or sit, ball up, put feet together, wrap arms around legs.

While the prone position is lower, being spread out increases potential for ground current to flow through or across you. Keep your feet together so you don't create potential for current to flow in one foot and out the other. If you have any insulated objects handy, like a foam pad or a soft pack full of clothes, sit on them. Avoid backpacks with frames since the frame may concentrate current. Don't touch metallic objects like ice axes, crampons, tent poles or even jewelry. You won't get a warning that a strike is imminent because the lightning event from cloud to ground and back occurs faster than you can blink an eye, so stay in the lightning position until the storm passes. The lightning position reduces the chances of lightning injuring you as badly as if you were standing, but is no substitute for getting to safer terrain or structure if it is immediately available. A dangerously close strike actually offers a moment of opportunity to move, while the electrical field rebuilds itself. But in wide open country or gentle rolling terrain there are no simple terrain advantages, so use this position to reduce exposure. If you are concerned enough to assume the lightning position, you should have your group dispersed at least 50' apart to reduce the chances of multiple injuries.

Ground current may spontaneously trigger your leg muscles to jump while in the lightning position, so take care to avoid being near hazards when you drop into this position.

Anecdotal injury data shows that persons with metal cleats on their shoes are more prone to injury. So take crampons off while in the lightning position. But if taking crampons off will slow your descent from a hazardous spot, leave them on to reach safer terrain faster, since terrain is a much better protector than the lightning position is.

The Effects Of Lightning Strikes On Humans

There are three ways lightning hurts us:

1. Electrical shock
2. Secondary heat production
3. Explosive force[11].

Neuro-electrical Damage: Current through the torso or brain can stop the heart or stop breathing. Hearts often restart themselves quickly, but it can take the breathing control center longer to recover. Cardiac or respiratory arrest that isn't restarted quickly will eventually cause anaerobic conditions that make recovery problematic. Current through the tissues can also lead to numbness, paralysis or other nervous system dysfunction.

Burns: Lightning victims can get burned from the high current electricity that turns into heat in conductors that resist its flow. Strike victims can get linear burns from head to feet along the skin, punctate (spotted) burns, or feathering skin marks (not really burns) from the charge flowing over their skin. They can get secondary burns from metallic objects like belt buckles and jewelry that heat up from the current. Burns can also occur from lightning-ignited clothing.

[10] We used to call this the lightning SAFETY position, but this name easily allows the illusion of safety.

[11] Cooper, Mary Ann, MD. Ch 7: Lightning Injuries. In Paul Auerbach MD's Wilderness Medicine: Management Of Wilderness And Environmental Emergencies, 3rd ed. 1995.

Large entry and exit burn wounds from lightning strikes are rare. Most victims have a flashover effect (current travels over their skin) that saves them from the more severe wounds: these people can get linear or punctate burns or feathering patterns. But flashover can also travel into orifices, which may explain the many ear and eye problems that result from lightning strikes.

Wet people may carry more current over their skin, instead of through their bodies, reducing their injuries. It is not suggested that you intentionally get wet in case you are struck, but it does mean you shouldn't be scared that being wet will increase the risk for you.

Trauma: The explosive force of lightning can result in direct or indirect trauma resulting in fractures or soft tissue injuries. Watch for explosive injuries at the feet. The high current can also trigger significant muscle spasms that can fracture bones.

Psychological Effects: Electrical injury can injure the brain. Immediate problems may include altered consciousness, confusion, disorientation or amnesia. Long term problems may include anything from headaches and distractibility to persistent psychiatric disorders and dementia[12].

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First Aid For Lightning Victims

Medical aspects of lightning injury are covered in "NOLS Field Medical And Drug Protocols 2000" and in Ch 4 of the NOLS Wilderness First Aid[13] text 3rd ed. The following overview does not supercede those documents.

All patients require a complete body survey and careful evaluation for head, spinal, long bone, or cardiac injuries; peripheral pulses and sensory and motor status should be assessed. Check the skin for small hidden burns. The patient in cardiopulmonary arrest may require prolonged CPR, especially **respiratory support** if spontaneous pulse and blood pressure return. *Unlike normal triage protocols*, first attention and resources should be directed to those who appear dead and those requiring immediate support of airway and breathing. Any patient who has shown any signs and symptoms of lightning injury should be evacuated for further evaluation and treatment.

Teaching Lightning Risk Management

Teaching backcountry lightning safety has the risk that our students will defer to these techniques when civilization offers significantly better options. There are two things we can do to mitigate this possibility.

1) When we are in town, if lightning hazards present themselves, it is important that we model the reaction to seek safety in buildings or vehicles[14]. Once inside, we need to avoid pipes, wires and other metallic objects that could conduct a strike. If you aren't sure whether to "do the drill," err on the side of caution for the sake of having your students practice the routine. Just like CPR, emergency actions are best learned in the kinesthetic mode rather than an intellectual one, so they will be more memorable in times of stress.

2) We can easily teach non-wilderness lightning safety techniques during a wilderness program, since the intown choices are so simple and so effective. Getting in a modern building or inside a car during an electrical storm are the only reasonable options when they are available. Indeed, we can use the relative ease of good choices while in town, and the comparatively high risk of backcountry options, to help our backcountry students default on the side of conservatism when it comes to getting up peaks by noon, getting off the water, choosing safe campsites and generally avoiding exposed terrain when storms threaten us.

Record Keeping For Lightning Incidents

Normal near-miss forms need to be completed quickly to accurately document any near miss. Near misses are used to inform others what hazards to be careful of, and to help predict accident types. Any lightning incident also needs a record of actions taken to avoid the hazard before the incident, weather observations, and thunder and lightning observations before the incident. You should sketch who was where relative to surrounding terrain and vegetation, with estimated distances, heights and elevations, a North arrow, and at least one definitive landmark. If you have time for a detailed sketch, measure using paces that you can convert to meters later. Be sure to record people who were and were not injured by the strike. A precise record of the time[15] and location of the ground strike may help lightning scientists give you some data about that actual strike[16].

Thank you to Mary Ann Cooper MD, Ron Holle, Martin Uman and others for their tremendous contributions to the field and to this collection of information. Lightning scientists do not all agree on these adaptations of their careful scientific studies. Any misrepresentation or maladaptation of their material is my fault, not theirs. JTG

[12] "Behavioral Consequences of Lightning and Electrical Injury". Margaret Primeau, Ph.D., Gerolf H. Engelstatter, Ph.D. and Kimberly K Bares, M.S. Seminars in Neurology, V15, N3, Sept 1995.

[13] Schimelpfenig & Lindsey, NOLS Wilderness First Aid, 3rd ed, Stackpole, 2000.

[14] See http://www.uic.edu/~macooper/faq1.htm for recommendations of the Lightning Safety Group.

[15] Check watches to the nearest second, then calibrate them with an atomic clock, available at any Radio Shack.

[16] The National Lightning Data System records most strikes in the continental US. Buy data at www.lightningstorm.com

DEPARTMENT OF FORESTRY

NEW MEXICO HIGHLANDS UNIVERSITY

GENERAL FIELD SAFETY PROTOCOL

Purpose

This Department of Forestry document provides field safety information to Forestry faculty, students, and others who conduct work outdoors.

Scope

This document applies to all Forestry faculty, affiliates, students, and others associated with the Forestry conducting activities that meet the definition of field work. This document describes the procedure for mitigating general hazards associated with field work.

In this document

Signatures

Prepared by: _____ Dr. James Biggs, Dept. of Forestry	Date: _____
Approved by: _____ Dr. Blanca Cespedes Chair, Dept. of Forestry	Date: _____
Approved by: _____ Other	Date: _____
Approved by: _____ Other	Date: _____

General information about this document

Attachments

There are no attachments to this document.

History of revision

This table lists the revision history and effective dates of this document.

Revision	Date	Description Of Changes
0	10/06	New document to address common field hazards and procedures for the Dept. of Forestry.
1	11/15	Revised document based on input from Forestry faculty.

Who requires training in accordance with this document?

The following personnel require training in accordance with this document: All Forestry faculty, affiliates, students, and others who perform field work.

Training method

The training method for this document is "**self-study**" (reading) and is documented by signature. Annual retraining is required.

Definition

Field Work: The performance of field-related activities in areas that are removed or isolated from an established base of operations (that is, where emergency support and medical assistance are not readily available).

Field work notification requirements

Buddy System Rule

When performing field work as part of a class, students must implement the buddy system rule (at least two people working together) unless prior permission from the instructor has been granted. Graduate students are expected to also implement the buddy system rule. However, it is acceptable for one graduate student to perform field work independently, provided that an enhanced communication protocol is followed (a **cellular phone** or **radio** must accompany field team members and a point-of-contact [POC] must be established). The individual must inform the POC with regard to where they will be performing field work and at what time they will return from the field.

Work in Special Designated Lands

Permits must be obtained for field work performed in areas requiring research or access permits from the appropriate land steward (e.g. USFWS, USFS). All requirements stipulated under those permits must be adhered to, including all safety procedures.

Logging out

It is required that someone in the department know when and where personnel are working in the field during normal business hours. When departing for field work (even with more than one person), **field team members** will:

- Ensure they have a radio or cell phone, as needed.
- Inform POC of intended location of work and cell phone number(s).
- Notify their POC who will:
  a) be in communication with you past your planned return time and
  b) follow up when you are past your planned return time.

Field work notification requirements, continued

Logging in

After returning, **field team members** will:

- Notify POC of arrival back to the office.
- If for some reason the POC can not be reached, notify the appropriate faculty member and leave a written note for POC.

WARNING: Failure to notify your POC could result in an unnecessary search.

Work outside normal operation hours and after dark

If field work is performed outside normal business hours, **field team members** will notify the appropriate faculty member or other individual to ensure a POC has been established.

Appropriate safety gear for after-dark work must be on-hand (flashlights, etc.).

Missing or late field workers

If a **field team member** is more than <u>one hour</u> late from the established return time, the **POC** will perform the following steps:

Step	Action
1	Contact field worker on status of work and establish time of return. If unable to contact, perform next step.
3	Contact the appropriate faculty member.
4	Attempt to contact field members by radio or cellular phone again.
5	If unsuccessful, verify that the field team member is not at home; verify, insofar as possible, the known circumstances and conditions of the field member's absence; or conduct a search of the destination by at least two appropriately trained and prepared people.

If the above steps are unsuccessful, the **faculty member or other responsible party** will make a recommendation of the action to be taken.

Field work notification requirements, continued

Injury in the field

In case of injury while in the field, the **field worker** will perform the following steps:

Step	Action
1	Safety First. Make sure the area is safe.
2	Administer first aid if trained and equipped with first aid kit.
3	Notify the POC and appropriate faculty member.
4	If injuries allow safe transport, aid in transport of injured person to nearest hospital.

To reach emergency facilities directly, use the following phone numbers:

Emergency Facility	Phone Number

NOTE: When dialing 911 on a cellular phone, remember that the call **may not** reach the nearest emergency dispatch. Be sure to provide detailed information on your location. Regardless of the severity of injury, report the injury to the appropriate faculty member for further investigation and reporting to NMHU Human Resources.

Field work general hazards

Don't do work you consider unsafe

<u>DO NOT</u> perform work under conditions you consider unsafe. Before beginning any work, review safety needs and requirements, identify hazards, and develop hazard mitigation measures. Be aware that environmental conditions and hazards may change between visits.

Tripping hazards, uneven ground

Be aware of uneven ground and natural trip hazards while walking. Be prepared for unstable ground around holes, downed woody debris, rocks, and other natural hazards. Wear appropriate footwear for the field. Many fieldwork activities require field boots. Consult with the appropriate faculty member for specific requirements.

Floods

Check meteorological data (on the web and by looking outside) and with POC for current and projected conditions and watch and listen for signs of rain in the area. If there are rain indications, stay out of low areas. During the rainy season, try to conduct field work in early morning hours.

In case of flood:

- Move to high ground.
- Abandon vehicle if necessary.
- DO NOT attempt to drive across running water – less than a foot of rushing water may be sufficient to push a vehicle.
- Contact the POC to apprise them of the situation.
- Contact 911if emergency assistance in the field is needed.

Falls from cliff edges

If doing field work near cliff edges or steep declines, prevent injuries and mishaps by using the following prudent fall protection measures.

- Maintain a safe distance from the edge on flat or low slopes (six feet).
- Use co-workers as safety monitors.
- Use fall protection equipment (safety harness, lanyard) on steep slopes if deemed necessary.

Field work general hazards, continued

Rock slides and steep slopes

Rock slides can present a hazard to field workers. When working in areas with known potential for rock slides such as talus slopes and canyon edges, operate under the 2-person rule (at least 2 people) and have a lookout present to watch for changing conditions. When ascending or descending a slope, do not follow directly behind one another but spread across the slope or leave adequate space between coworkers to eliminate the risk of injury from dislodged rocks. In the event a field member dislodges a rock and other field members are below, immediately inform them of the moving rock.

Work near burned, dead, or dying trees

Extra caution must be taken when working in areas burned by fire and areas with drought- or insect-killed trees. While working under the forest canopy, pay attention to your surroundings, "look up, look down, look around". A hazard tree is one with an obvious defect that makes it a hazard. However, any dead or even live tree can be an unidentified hazard.

- Conduct a pre-assessment survey of the work area to determine if the potential exists for falling trees. If the potential for falling trees exist then do the following:
    - Determine if work can be conducted safely outside the fall perimeter of the hazard tree(s).
    - Maintain at least 1 lookout at all times; stop work if winds increase above 10 mph or if trees appear to be swaying. Identify possible escape routes and areas that you can safely reach quickly (i.e., within 100 yards) if winds become problematic.
    - If a hazard tree can be safely approached, flag the tree so that personnel are aware of the danger.
    - When traveling by foot through burned areas, use green belts (live trees) or areas without standing dead trees whenever possible. Identify possible escape routes and areas that you can safely reach quickly (i.e., within 100 yards) if winds become problematic.
- Note that trees and branches can fall at any time, even with no wind.
- It is recommended that a hard hat be worn while working under the forest canopy, especially in burned areas.
- Downed logs may be hollow. Burned-out root holes may be obscured by grass and other vegetation.
- Other specific personal protective clothing or equipment may be needed at some sites and for certain field activities. Be sure to adequately assess potential hazards before beginning field activities.

Field work general hazards, continued

Eye protection

When walking in forested areas with branches at eye level, it is recommended that some type of glasses (sunglasses, eyeglasses, or safety glasses) be worn.

Sun exposure

Use sunscreen. Sun at this elevation can quickly cause bad sunburns – in as little as ½ hour for sensitive individuals. Reapply sunscreen after heavy perspiration every four hours. Sleeved shirts and long pants are strongly recommended and may be required by the faculty member in some situations. It is recommended to wear a hat as a sun screen to avoid exposure to the skin.

Fire danger

Due to the potential for extreme wildland fire conditions during the spring, summer, and occasionally the fall, field personnel must be aware of existing wildfire conditions. Prior to entering the field, check the local fire danger rating (low, moderate, high, very high, extreme) for the area in which you are working. Fire conditions change daily so you must be aware of the conditions on a daily basis. Daily fire danger ratings are provided by local fire agencies as well as federal agencies.

Follow all requirements set forth by the relevant land management agency (USFS, USFWS, State, etc.) regarding current fire conditions. Have an evacuation plan when working in remote areas (including evacuation routes and safe zones). In the event of a wildfire starting in your work area, move to a safe zone and contact emergency personnel immediately. Notify your POC so that they know your situation.

When working on certain agency properties such as USFS land, permits may also be required. Follow all road restrictions in "extreme" conditions and know when a "Spark and Flame Permit" is required.

Smoking is not allowed in the field. Also, note that sparks can be ignited when driving off-road or on roads with high vegetation. Vehicles are not to be driven or parked in vegetated areas when fire danger is moderate or higher.

Field work general hazards, continued

Heat

If working in hot weather, be aware of the signs and symptoms of hyperthermia and heat stroke. To avoid dehydration in the summer, drink 3/4-1 quart of fluid every hour during periods of exertion in a hot environment. Be aware of the dangers of heat exhaustion. If heat exhaustion is allowed to progress, the individual may develop heat stroke.

Cold

In the winter, wear insulated dry clothing, warm boots, and gloves to avoid getting chilled when conducting work. Have sufficient supplies to allow for rescue wait-time, if necessary, in the cold or in an inoperable vehicle. If a field team member is not adequately dressed to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is used or until weather conditions improve. Know the warning signs of hypothermia and frostbite – get medical attention immediately:

- Hypothermia: shivering and chills, or unable to think or speak clearly. You may lose your coordination and quite possibly your consciousness.
- Frostbite: numbness and a white and waxy appearance to your skin.

Hunters

If conducting field work in or near hunting areas during hunting season (typically September-December and early spring), wear bright colored clothing (e.g., hunting orange).

Field work general hazards, continued

Power lines

Avoid working or parking under power lines. If necessary to do so:

- Do not perform work on the ground or in an elevated position near or beneath uninsulated overhead (transmission or distribution) power lines, unless you and the longest conductive object you might contact cannot come closer than
  - 10 ft for 13.8-kV distribution lines or
  - 12 ft 2 in. for 115-kV transmission lines.

Personal Protective Equipment

Minimum field PPE

The minimum personal protective equipment (PPE) for all field work is:

- Long pants
- Sturdy field shoes/boots.
- Long or short sleeve shirt.
- Eye protection as needed by type of work
- Work gloves, as needed

Hearing protection

Hearing protection will be provided at or above 82 dB. Protect your hearing: if high levels are suspected, use ear protection (e.g., when operating chainsaws, motorized equipment, other).

Lightning Hazards

Background

The weather before a thunderstorm is often hot and humid. In the mid-afternoon or sometimes earlier, huge anvil-shaped clouds develop rapidly.

The time of formation will vary between one and four hours depending on how vigorous the convectional uplift is. Thunder can often be heard and lightning seen well before the storm arrives, with increases in frequency and intensity as the storm approaches. HOWEVER, be aware that a storm might be developing directly overhead and there may be no warning from nearby lightning. Be especially aware if you do not have clear view of the horizon (i.e., when working in canyons) as storms can develop nearby without being observed.

Storms will move horizontally at speeds between 12 and 30 miles per hour and consequently will be impossible to outdistance on foot.

How far away is the lightning?

When in the field and a storm is approaching, time the interval between lightning and the thunder by counting the seconds.

To obtain the distance in miles, divide by five; to obtain the distance in kilometers, divide by three.

When lightning is close

Follow the "30-30 rule": When lightning is determined to be less than 30 seconds (six miles) away, seek shelter for at least 30 minutes after the last thunder is heard, in one of the following locations, given in order of preference:

- Steel-framed building
- Enclosed vehicle with a steel roof
- Low ground away from solitary trees and below and away from high points.

Individuals should disperse to reduce the possibility of multiple casualties.

Place any metal objects away from your position.

On open ground, adopt a crouched position with the hands off the ground and the feet close together on some dry insulation such as sleeping pad, rope, or pack (not metal-framed).

Stay away from streams and fences.

Don't use a wired telephone during a lightning storm.

Biohazards

Known allergic reactions

Notify faculty member and project or team leader of any know allergic reactions to animal bites, stings, or wild plants before entering the field. Personnel with known allergies to known agents must carry required medication in the field and inform fellow field team members.

Insect and spider bites

Bee stings and other insect bites can turn deadly if there is an allergic reaction or if the bite becomes infected. Take all bites seriously and have them checked immediately if swelling occurs.

The bites of some spiders, such as the black widow and the brown recluse, are particularly dangerous because they affect the entire body. Bites from either spider can cause fever, nausea, and pain in addition to the skin reactions at the site of the bite.

Look for spider webs and other signs of spider or insect activity before reaching into dark corners.

If a bite occurs, apply first aid treatment if trained to do so. If symptoms of infection develop or if wound worsens, seek medical attention.

Rocky Mountain Spotted Tick Fever

If the following symptoms of tick fever appear during the typical non-flu season or, if they appear following field work where potential susceptibility exists, seek medical attention:

- Fever
- Bone and muscle pain
- Headache or
- Rash

Biohazards, continued

West Nile Virus

Most people bitten by an infected mosquito do not develop any symptoms. When symptoms do occur, they usually appear about 3 to 14 days after being bitten. The disease may be mild or serious. Mild illness includes fever, headache, rash, and body aches. In a small number of cases, particularly among the elderly, the disease can affect the central nervous system causing high fever, stiff neck, muscle weakness, disorientation, brain inflammation (encephalitis), coma, and rarely, death.

For the longest lasting protection from mosquito bites, use insect repellent products with no more than 50% DEET for adults. If you choose not to use DEET, products containing soybean oil or eucalyptus oil have been found to be effective, but must be applied more often because they do not repel mosquitoes for as long as DEET.

Venomous Snakes

Avoiding snakebites

Snakebites usually occur to the hands and feet. Wear field boots and avoid placing hands and feet where you cannot see. Rattlesnakes may be found anywhere work is conducted in New Mexico. It is best to avoid the snake and let it go on its way.

Treatment of snakebites

If a venomous snake bite occurs, seek medical attention immediately. Apply first aid treatment, if trained to do so. Report all bites to the appropriate faculty member.

Large Animals

Overview of large animals in New Mexico

Large predators (animals that eat other animals), including mountain lions, black bears, bobcats, and coyotes, are found throughout most of New Mexico. These large, powerful predators have always lived here, feeding on prey species and playing an important role in the ecosystem. Large animals such as deer and elk can also pose a significant risk if confronted.

What to do if you meet a large animal

There are no definite rules about what to do if you meet a large predator or other large animal, although relatively effective guidelines are available. In most cases, the animal will detect you first and will leave the area. Attacks are rare compared to the number of encounters. However, if you do run into one before it has had time to leave an area, here are some recommendations. Remember that every situation is different with respect to the animal, the terrain, the people, and their activity.

- **STAY CALM**. If you see a predator that hasn't seen you, calmly leave the area. If the animal has seen you, identify yourself as human (i.e., raise your arms) and talk in a calm low voice to reassure yourself and the animal that you are not a threat; calmly move away from the animal. Back away slowly while facing the predator if you can do so safely, while avoiding direct eye contact. Don't run as this might stimulate its instinct to chase and attack. Give it plenty of room to escape.
- **NEVER APPROACH**. Wild animals are unpredictable; however, they will usually avoid a confrontation unless pushed into one.
- **WATCH FOR YOUNG**. Coming between a female and her young can be dangerous. If a young animal is nearby, try to move away from it, being alert for others that might be around.
- **IF APPROACHED BY THE ANIMAL, DO ALL YOU CAN TO APPEAR LARGER**. If a physical encounter is probable, raise your arms and open your jacket if you are wearing one. Continue doing this while you back away.
- **CONVINCE IT YOU'RE NOT PREY**. If the animal approaches closer or behaves aggressively, arm yourself with a large stick, throw rocks or sticks at it, speak louder and more firmly to it. Convince the predator that you are dominant and a danger to it.
- **DO NOT BEND OVER OR CROUCH TO PICK SOMETHING UP**. This can appear as a prelude to an attack on the animal.
- **FIGHT BACK**. If the predator does attack, fight back. Use any possible objects (rocks, sticks, backpacks, caps, jackets and even your bare hands) as a weapon.

Plague and Hantavirus Infection

Background

Plague is a wild rodent disease in the western states, although domestic rats may rarely be involved. A complex rodent/flea cycle enables the plague bacteria to exist in certain resistant species of rodents, only to erupt periodically in other susceptible species. Certain species of mice serve as reservoirs for the disease and are relatively resistant to its effects. Plague-infected fleas spread the bacteria to less-resistant species such as rock squirrels, chipmunks, and prairie dogs. These animals usually die from the disease in a few days and thus release their own plague-infected fleas to seek new hosts.

Hantavirus can cause a potentially fatal respiratory disease. The virus is carried in the urine, saliva, and feces of rodents, particularly deer mice. The greatest risk of exposure is from breathing aerosolized urine or feces containing the virus.

Preventing and avoiding exposure

When in the field, avoid fleas by leaving sick or dead animals and their feces alone. When not part of the actual field work, avoid animal burrows, rock outcrops, and rock walls where infected rodent fleas may be hiding.

Repellent may be used on the legs to reduce the chance of being bitten by fleas.

Prevent exposure to hantavirus by observing the following precautions:

- Avoid areas where rodents frequent, especially nests.
- Do not disturb such areas by brushing, sweeping, or vacuuming.

Prevention of Plague and Hantavirus Infection, continued

Symptoms of plague

If the following symptoms of plague appear during the non-flu season or, if they appear following field work where potential susceptibility exists , seek medical attention:

- High fever
- General malaise
- Vomiting
- Diarrhea
- Sometimes a headache.

Muscles in the arm, legs, or back may become sore. A swollen lymph gland, or bubo, may or may not appear nearest the site of infection after a couple of days.

Very few people die from plague infections; in most deaths, delay in seeking medical attention contributed.

Symptoms of hantavirus

If the following symptoms of hantavirus infection appear and you think you were exposed to hantavirus within the past 5 weeks, seek medical attention right away:

- Cold-like symptoms (runny nose and muscle ache) that are accompanied by a high fever.
- Respiratory difficulties

Field Safety Plan Template

Field site location:	
Plan created for (project, course, or trip leader):	
Participants:	
Dates of travel:	
Plan developed by:	
Supervisor:	
Date of revision:	

Copies of this plan will be shared with (List names and/or roles. Recommended: All participants in field work, supervisor, a department contact back on campus.):

Brief description of field activities:

Site Information

Site location (Street address, GPS coordinates, or clear driving/hiking directions from a major landmark. This should be information that you could relay to emergency services over the phone):

Site description, access notes, and modes of travel:

Weather and physical or mental demands:

Nearby facilities or services (restrooms, water, fuel, public telephone, stores):

Communication and Emergency Plans

Local contact(s) at research site (Include names and contact information. Examples: a reserve or field station steward or manager, collaborator at the destination, local USFS office, host or lodging provider):

NMHU contact(s) not in the field (PI and/or supervisor back on campus). Name, phone, email:

Check-in plan (Schedule, method, who will receive check-in messages, emergency protocol for late or missed check-ins, other relevant contacts):

Nearest hospital with Emergency Department (Include address, phone number; attach a map with driving directions from field site):

How to summon emergency medical services (Does the U.S. 911 system work reliably in this area, or is it better to directly call the nearest fire department, park ranger station, etc.? If traveling outside the U.S., look up the country-specific emergency numbers. Some countries have separate numbers for police, fire, and ambulance.):

Communication devices and notes (Is cell phone coverage reliable, patchy, or non-existent? Where is the nearest spot with reliable service? Will you carry a radio or satellite communication device?):

Injury reporting: Notify your supervisor/PI of any injuries or incidents as soon as practicable after obtaining emergency medical care. A supervisor will need to complete an Employer's First Report (EFR).

For a *potentially serious injury/illness or death* (inpatient hospitalization, amputation, loss of an eye, or serious permanent disfigurement), call EH&S immediately to report, any time, day or night.

Other emergency procedures:

Drinking water: If forecast exceeds 80° F, OSHA requires access to at least one quart (4 cups) per person per hour for the entire shift, i.e., an 8 hour shift of strenuous work requires access to 2 gallons per person. Water must be fresh and suitably cool.

___ Plumbed water available
___ Cooler with ice
___ Bottled water provided
___ Natural water source and treatment methods (filtration, boiling, chemical treatment, etc.)
___ Other/notes: _____ .

Shade: If forecast exceeds 80° F, shade must be provided by any natural or artificial means for rest breaks. Shade is not considered adequate when heat in the area does not allow the body to cool (e.g., sitting in a hot car).

___ Building structures
___ Trees
___ Temporary canopy/tarp
___ Vehicle with air conditioning
___ Other/notes: _____ .

High heat procedures (required when temperature is expected to exceed 95°F). If possible, limit strenuous tasks to morning or late afternoon hours. Rest breaks in shade must be provided at least 10 minutes every 2 hours (or more if needed). Effective means of communication, observation and monitoring for signs of heat illness are required at all times. Pre-shift meeting required.

Details:

Location of first aid kit:

Team members with first aid training:

First Aid Reference – Signs & Symptoms of Heat Illness

Signs & Symptoms	**Treatment**	**Response Action:**
HEAT EXHAUSTION • Dizziness, headache • Rapid heart rate • Pale, cool, clammy or flushed skin • Nausea and/or vomiting • Fatigue, thirst, muscle cramps	1.Stop all exertion. 2.Move to a cool shaded place. 3.Hydrate with cool water.	Heat exhaustion is the most common type of heat illness. Initiate treatment. If no improvement, call 911 or seek medical help. Do not return to work in the sun. Heat exhaustion can progress to heat stroke.
HEAT STROKE • Disoriented, irritable, combative, unconscious • Hallucinations, seizures, poor balance • Rapid heart rate • Hot, dry and red skin • Fever, body temperature above 104° F	1.Move (gently) to a cooler spot in shade. 2.Loosen clothing and spray clothes and exposed skin with water and fan. 3.Cool by placing ice or cold packs along neck, chest, armpits and groin (Do not place ice directly on skin)	Call 911 or seek medical help immediately. Heat stroke is a life-threatening medical emergency. A victim can die within minutes if not properly treated. Efforts to reduce body temperature must begin immediately!

Hazards and Safe Work Procedures

Hazard	**Safe Work Procedures, Training, PPE**
Example: Poison oak is common at this site and will cause a skin reaction in most people.	*Example:* Learn how to identify the plant, and avoid touching any part of it. Avoid walking through dense brush when possible. Wear long pants, long sleeves, and sturdy boots. Carry Tecnu Original cleanser or other strong soap, with extra water and paper towels for hand-washing. In case of accidental contact, wash hands before touching your face, using the restroom, or touching another person or animal. Wash skin, clothing, and equipment thoroughly to remove the irritant urushiol oil. Avoid second-hand exposure through contaminated objects. Skin reactions may be delayed by a number of days. Contact Occupational Health or Student Health Services if you experience a reaction.
(add more rows as needed, or	

refer to separate documents)	

Go/No-go Conditions: Are there any "No-Go" situations that would require stopping work, leaving the site, or cancelling a trip? (For example: Certain weather conditions or other environmental hazards, personal safety concerns, equipment issues, political unrest.)

Special Considerations:

Contact Safety Services for guidance. Additional training, permits, or precautions may be required. Check all that apply.

___ One or more of the following will be handled/transported: hazardous biological, chemical, or radioactive materials, pesticides, animals, or fireworks. Describe: _____.

___ Activities are to involve one of the following: ATVs, snow mobiles, tractors or other motorized vehicles; rigging, climbing, fall protection; shoring/trenching, digging/excavations, caves, other confined spaces or egress/access limitations; chainsaws, hand held power tools; explosives or fire arms; lasers, portable welding/soldering devices; other hazardous equipment or tools. Describe: _____ .

___ Modes of transportation other than regularly scheduled commercial carriers (e.g. chartering a boat, plane) will be used. Describe: _____ .

___ Boating, diving, or snorkeling. Describe: _____.

___ The campus auto policy and auto insurance article for university vehicles, personal vehicles, and rental vehicles has been reviewed.

___ Visas, permits, finances, import/export controls, transportation of specialized equipment, and data security have been considered.
Notes: _____ .

___ Personal safety risks during free time have been considered or discussed, e.g., alcohol or drug use, leaving the group, situational awareness, sexual harassment, or local crime/security concerns.
Notes: _____ .

Campus Contacts:

Campus Health Services: Campus Police:

Additional Information and Notes

(For example: Code of conduct or community agreement, itinerary details, international travel resources, links to online resources, additional important contacts, location of other important documents or equipment on campus. Take notes here to debrief after the trip and plan for future trips.):

Participant Information and Training Documentation

Sign here to verify that you read this Field Safety Plan, understand its contents, and agree to comply with its requirements.

Name/contact information	Signature	Date	Personal emergency contact(s)