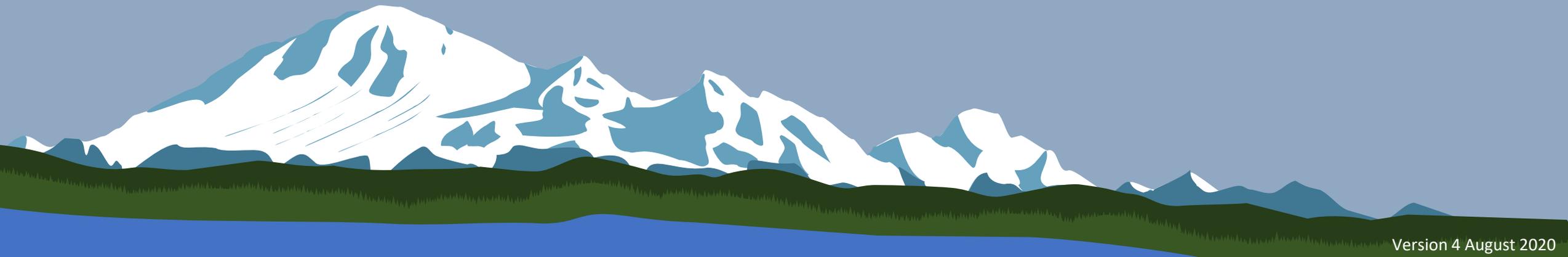
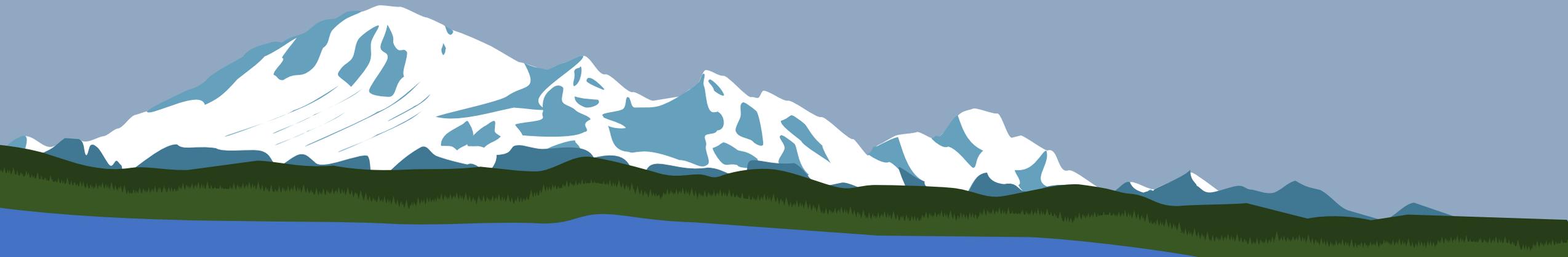


# Backpacking Merit Badge



# Index

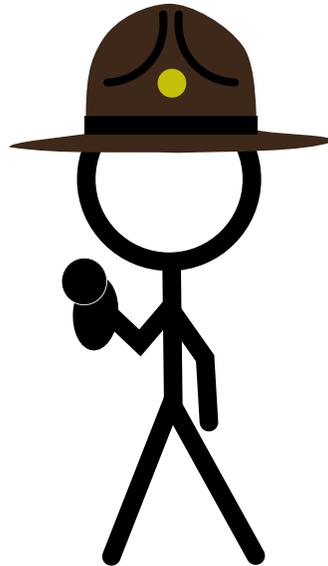
1. [Merit Badge Requirements](#)
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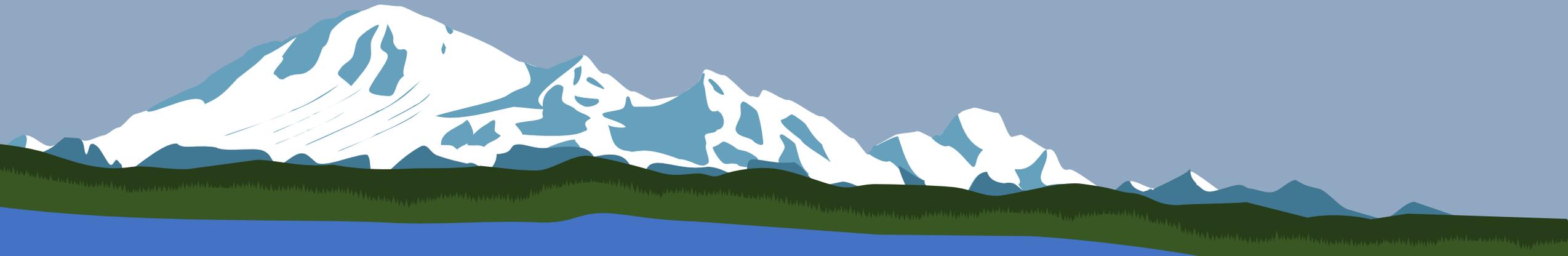
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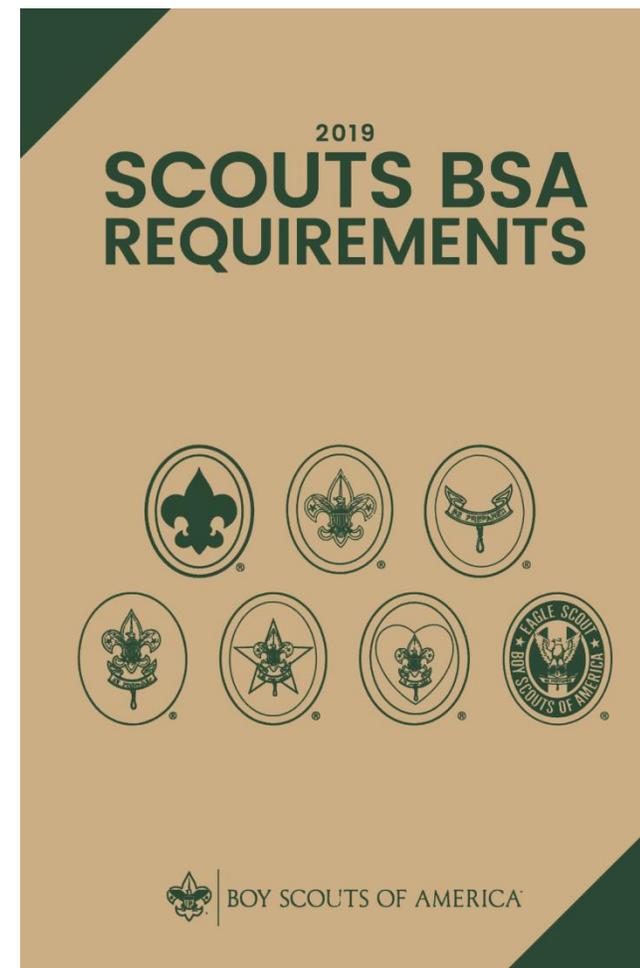
# Merit Badge Requirements



# Requirements

## Requirements

- Merit Badge requirements are taken from:  
2019 Scouts BSA™ Requirements Book



# Requirements

## Requirements

1. Discuss the prevention of and treatment for the health concerns that could occur while backpacking, including hypothermia, heat reactions, frostbite, dehydration, insect stings, tick bites, snakebite, and blisters.
2. Do the following:
  - a. List 10 items that are essential to be carried on any backpacking trek and explain why each item is necessary.
  - b. Describe 10 ways you can limit the weight and bulk to be carried in your pack without jeopardizing your health or safety.
3. Do the following:
  - a. Define limits on the number of backpackers appropriate for a trek crew.
  - b. Describe how a trek crew should be organized.
  - c. Tell how you would minimize risk on a backpacking trek.
  - d. Explain the purpose of an emergency response plan.



# Requirements

## Requirements

4. Do the following:
  - a. Describe the importance of using Leave No Trace principles while backpacking, and at least five ways you can lessen the crew's impact on the environment.
  - b. Describe proper methods of handling human and other wastes while on a backpacking trek. Describe the importance of and means to assure personal cleanliness while on a backpacking trek.
  - c. Tell what factors are important in choosing a campsite.
  
5. Do the following:
  - a. Demonstrate two ways to treat water and tell why water treatment is essential.
  - b. Explain to your counselor the importance of staying well hydrated during a trek.
  
6. Do the following:
  - a. Demonstrate that you can read topographic maps.
  - b. While on a trek, use a map and compass to establish your position on the ground at three different locations, OR use a GPS receiver unit to establish your position on a topographic map and on the ground at three different locations.
  - c. Explain how to stay found, and what to do if you get lost.

SCOUTS BSA  
REQUIREMENTS



# Requirements

## Requirements

7. Tell how to prepare properly for and deal with inclement weather.
8. Do the following:
  - a. Explain the advantages and disadvantages of the different types of backpacking stoves using at least three different types of fuel.
  - b. Demonstrate that you know how to operate a backpacking stove safely and to handle liquid fuel safely.
  - c. Prepare at least three meals using a stove and fuel you can carry in a backpack.
  - d. Demonstrate that you know how to keep cooking and eating gear clean and sanitary, and that you practice proper methods for food storage while on a backpacking trek.
9. Do the following:
  - a. Write a plan that includes a schedule for a patrol/crew backpacking hike of at least 2 miles.
  - b. Conduct a prehike inspection of the patrol and its equipment.
  - c. Show that you know how to properly pack your personal gear and your share of the crew's gear and food.
  - d. Show you can properly shoulder your pack and adjust it for proper wear.
  - e. While using the plan you developed for requirement 9a, carry your fully loaded pack to complete a hike of at least 2 miles.

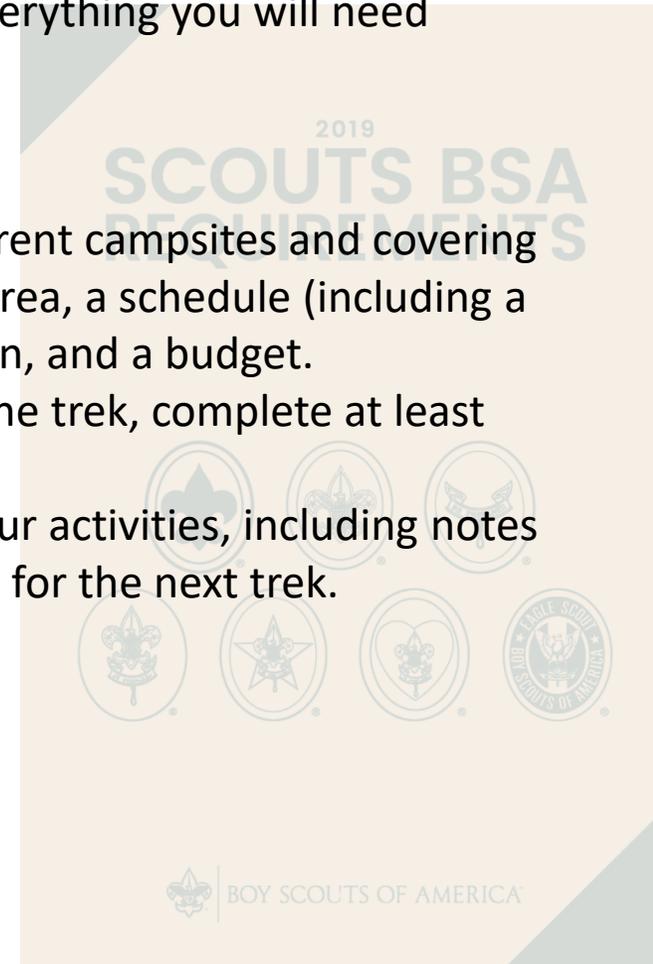
SCOUTS BSA  
REQUIREMENTS



# Requirements

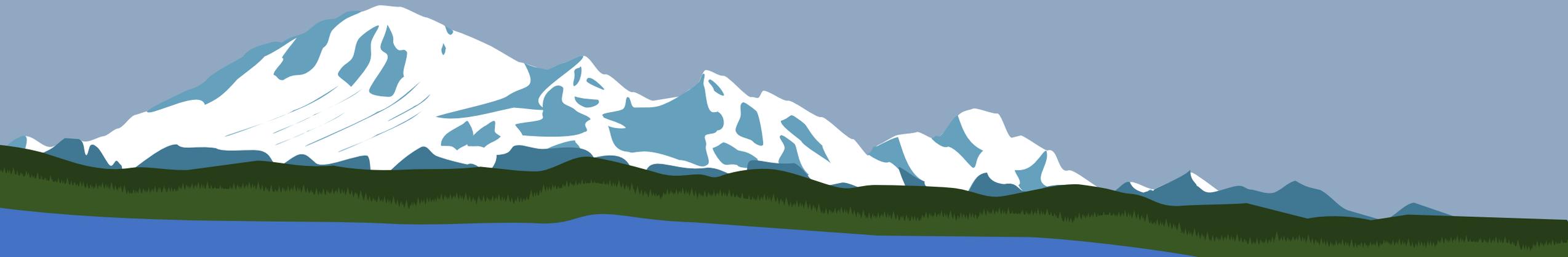
## Requirements

10. Using Leave No Trace principles, participate in at least three backpacking treks of at least three days each and at least 15 miles each, and using at least two different campsites on each trek. Carry everything you will need throughout the trek.
11. Do the following:
  - a. Write a plan for a backpacking trek of at least five days using at least three different campsites and covering at least 30 miles. Your plan must include a description of and route to the trek area, a schedule (including a daily schedule), a list of food and equipment needs, a safety and emergency plan, and a budget.
  - b. Using Leave No Trace principles, take the trek you have planned and, while on the trek, complete at least one service project approved by your merit badge counselor.
  - c. Keep a daily journal during the trek that includes a day-by-day description of your activities, including notes about what worked well and thoughts about improvements that could be made for the next trek.



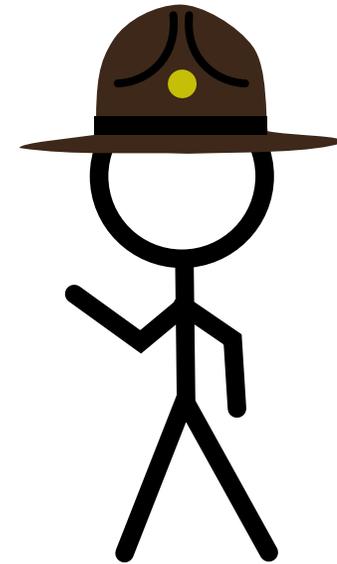


# Merit Badge Intro



# Merit Badge Intro

## Instructor Introduction



# Merit Badge Intro

## Needed for Course

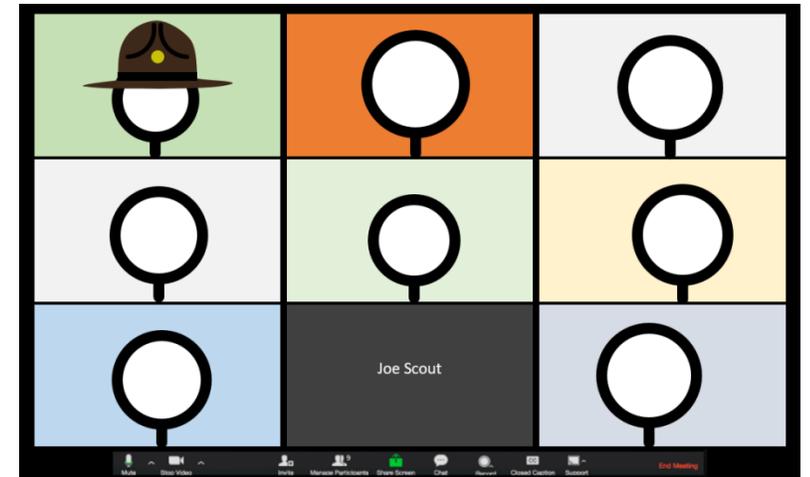
- Merit Badge Blue Card filled out and signed by your Scoutmaster
  - or other virtual agreement
- Merit Badge Pamphlet
- Scout Uniform
- A positive Scouting focus and attitude



# Merit Badge Intro

## Virtual Meetings

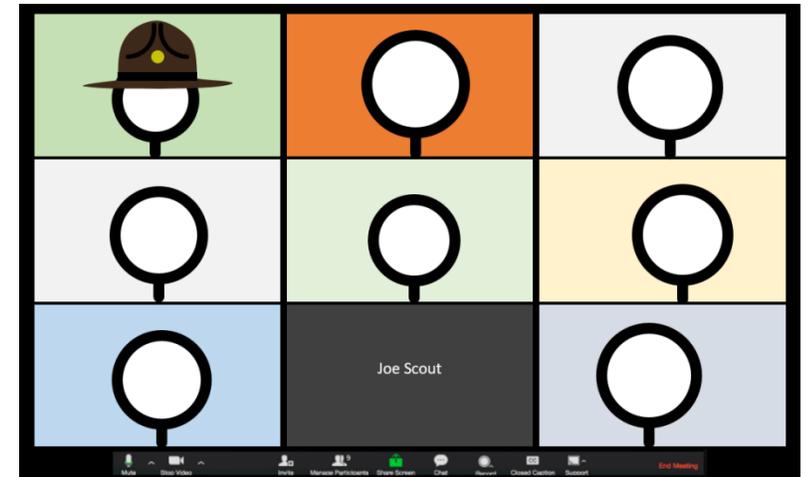
- Use your **REAL Name** and **Troop Number** if you want credit  
This is how we take attendance
- MUTE yourself unless speaking to the group
- Please turn your video on so we can see you
- No Chat SPAMMING
- If you need to go pee, go
- If something isn't working, please let us know!



# Merit Badge Intro

## Virtual Meetings

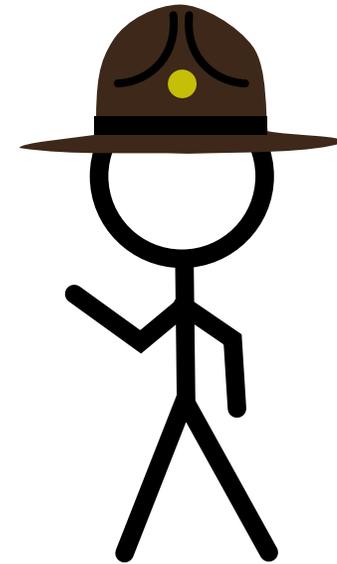
- We can't do ALL the requirements virtually
- Option 1 – Partial Completion
- Option 2 – Completion – need proof
- Please send completed homework **AFTER** the final class
- Tell us who we should CC about completion



# Merit Badge Intro

## Course Overview

- We will cover most of the requirements for this Merit Badge in class
- We need proof that you completed these requirements
  - Please turn in a completed [Workbook](#) if possible  
This makes is easier on the counselor
  - If you can't complete a [Workbook](#), please contact your councilor for alternatives



# Merit Badge Intro

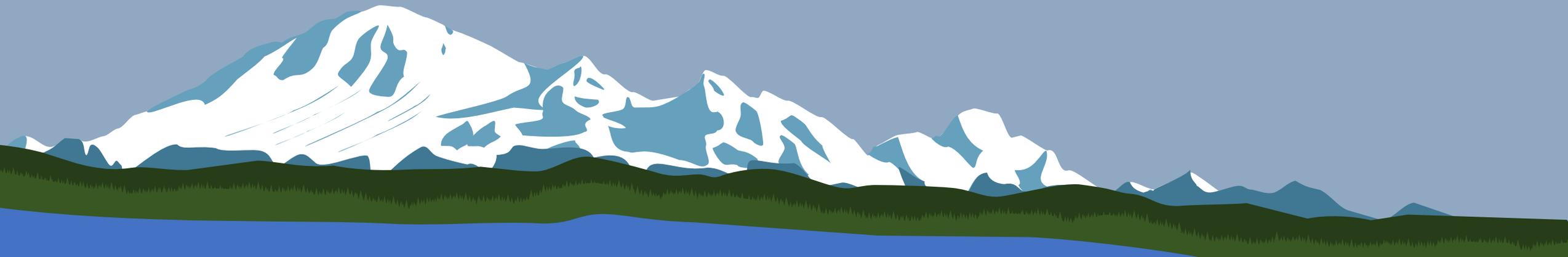
## What is Backpacking

- Basically, Hiking with overnight camping
- It gets you further out there
- See and experience things not able to do in just a day trip
- A wonderful experience that reconnects you with nature

- 1. [Merit Badge Requirements](#)
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# First Aid

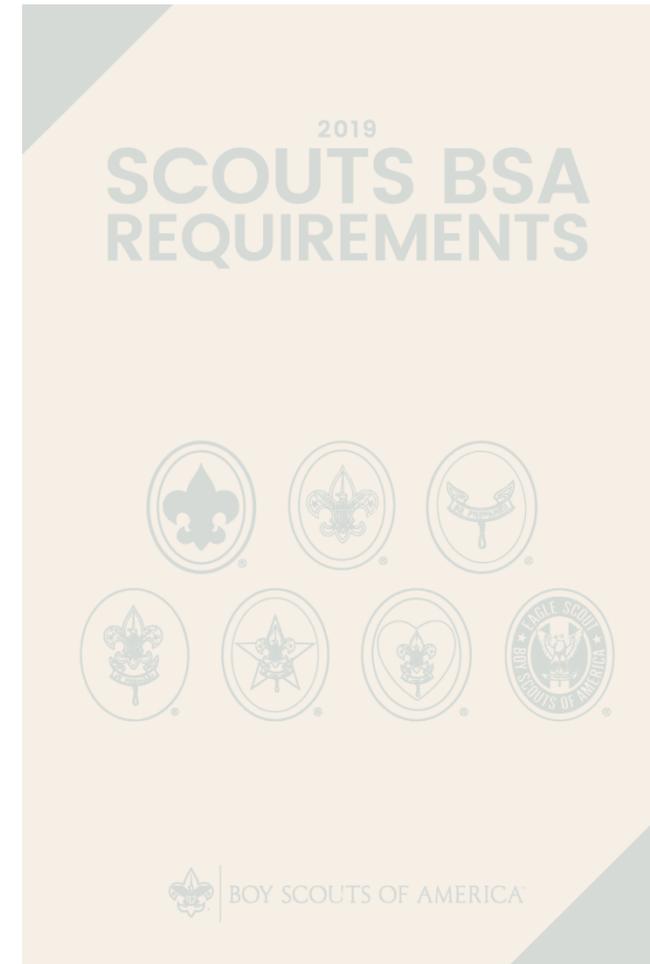


# First Aid

## Requirement 1 – First Aid

Discuss the prevention of and treatment for the health concerns that could occur while backpacking, including:

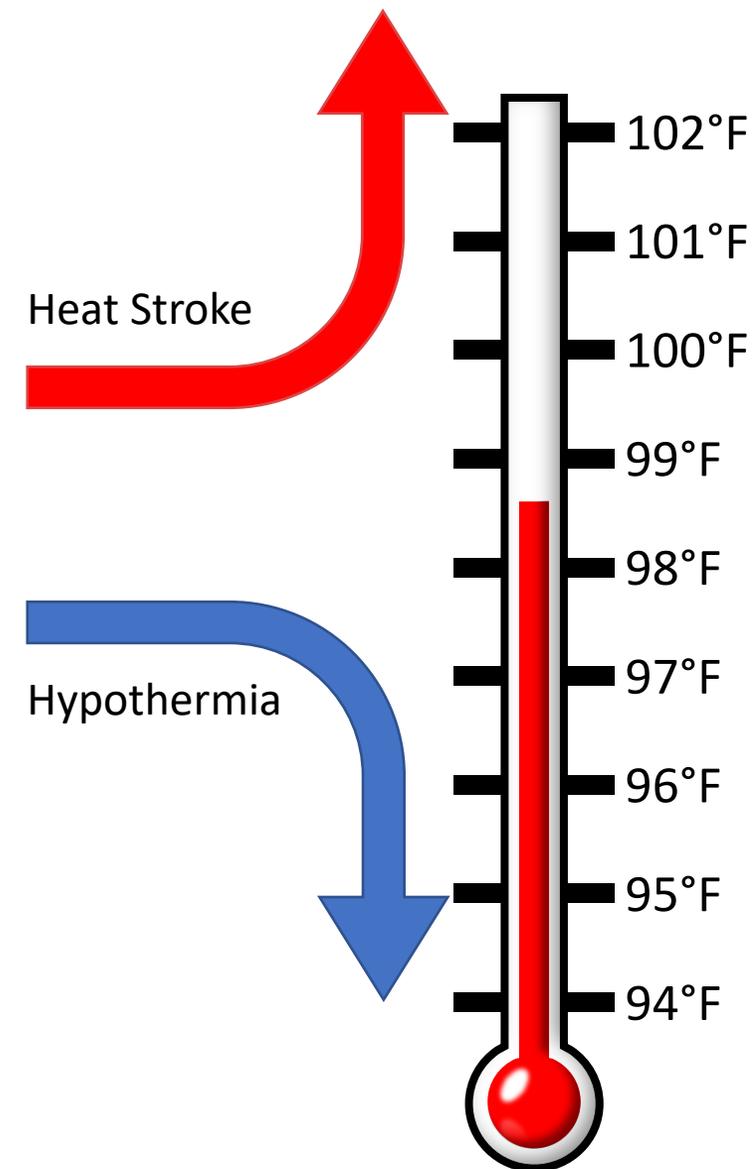
- Hypothermia
- Heat reactions
- Frostbite
- Dehydration
- Insect stings
- Tick bites
- Snakebite
- Blisters



# Cold Weather Injuries

## Body Temperature

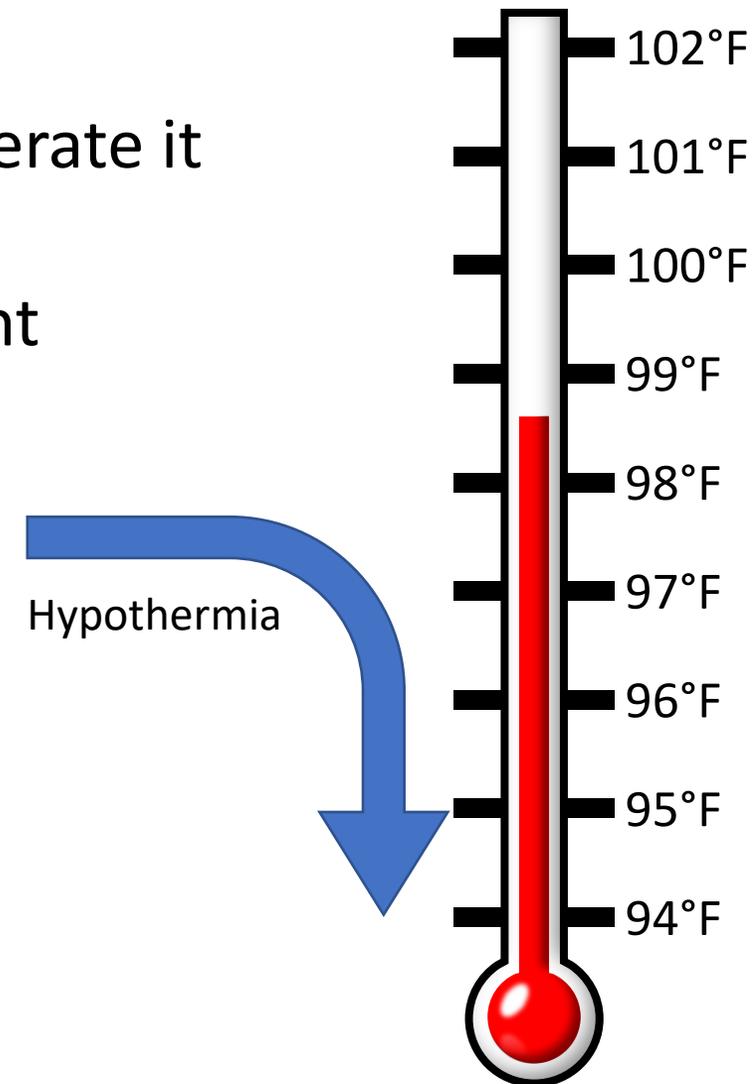
- The human body operates best around 98.6°F
- If body loses heat faster than it can generate it, it will fail to function
- If body overheats and is unable to cool itself, it will fail to function



# Cold Weather Injuries

## Hypothermia

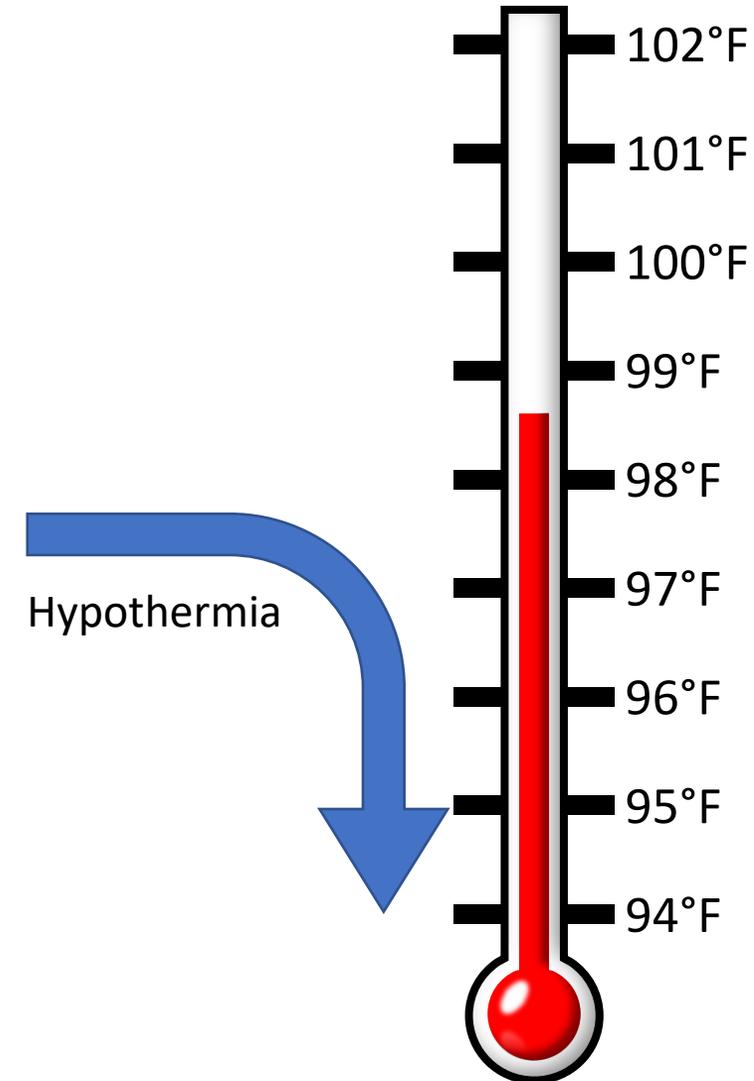
- Occurs when body loses heat faster than it can generate it
- Danger if inadequately dressed for cold environment



# Cold Weather Injuries

## Hypothermia

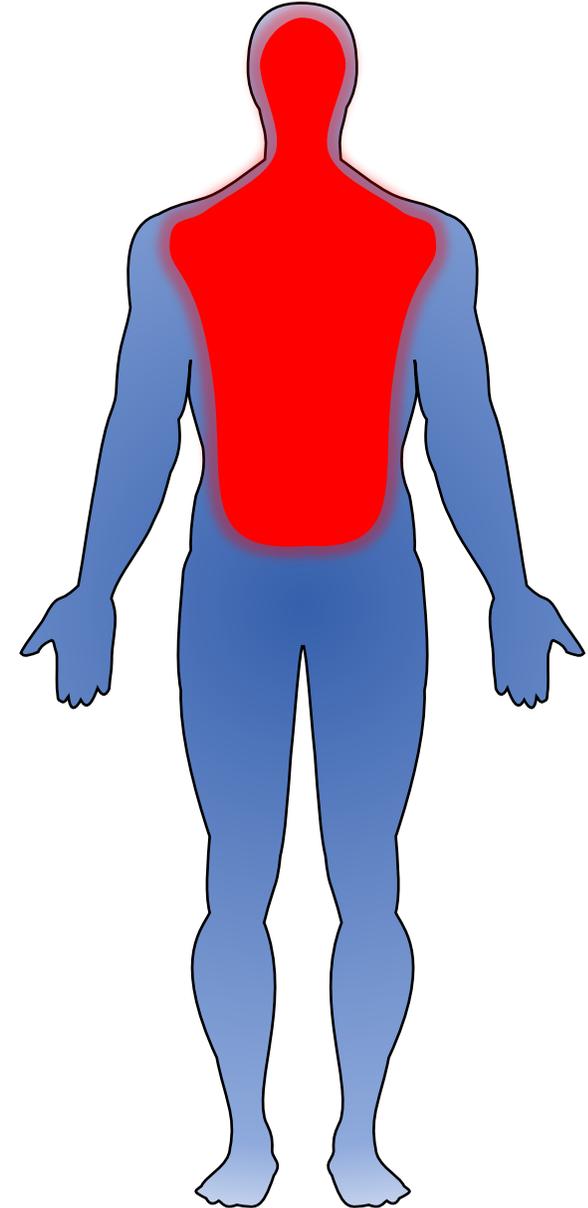
- Danger compounded by:
  - Rain
  - Wind
  - Hunger
  - Exhaustion
  - Dehydration
- Being wet and cold is a dangerous combination



# Cold Weather Injuries

## Hypothermia – Symptoms

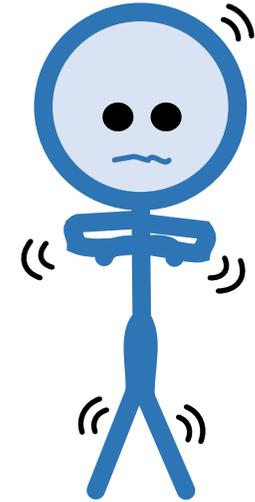
- Numbness
- Fatigue
- Irritability
- Slurred speech
- Uncontrollable shivering
- Poor judgement or decision making



# Cold Weather Injuries

## Hypothermia – First-Aid

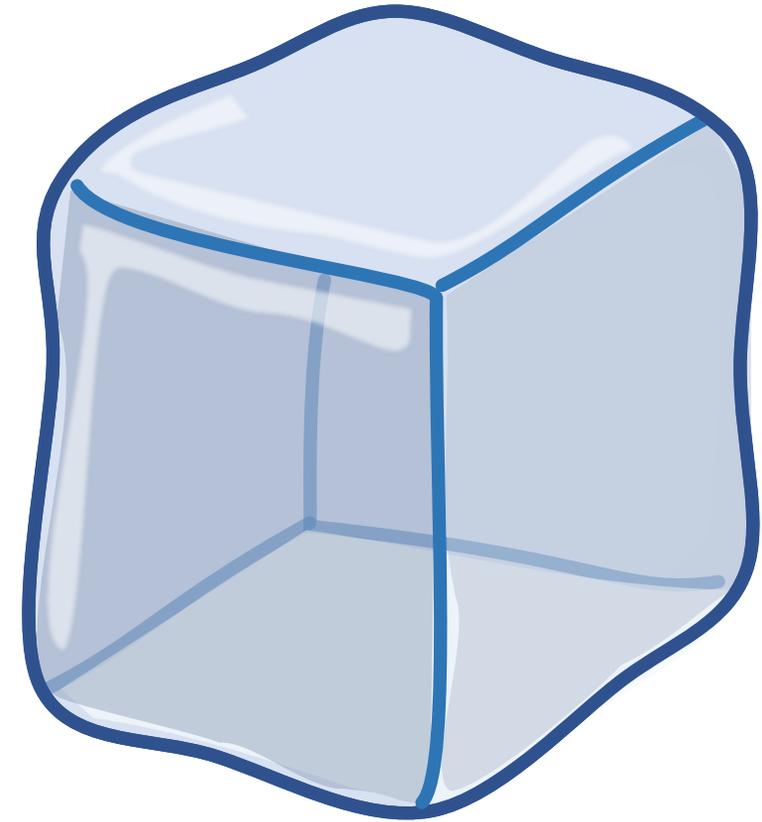
- Get the victim's body warm again!
  - Move to building or tent
    - Remove wet clothing
    - Dry off
    - Warm dry clothes and/or blankets
  - Warm, sweet liquids if conscious
  - Warm water in water bottles, wrapped in towel and place in armpits
  - Observe
- **NEVER Immerse in Warm/Hot Water** – this can be lethal!



# Cold Weather Injuries

## Frostbite

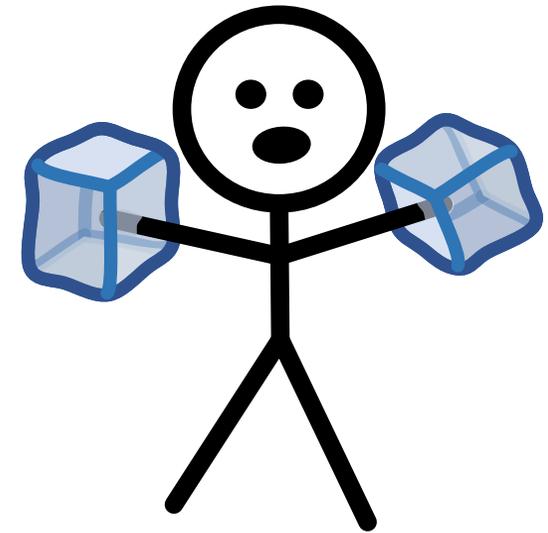
- Frostbite is when skin and tissues freeze and form ice crystals
- Exposed areas at high risk:
  - Ears
  - Nose
  - Cheeks
  - Fingers and hands
  - Toes and feet



# Cold Weather Injuries

## Frostbite

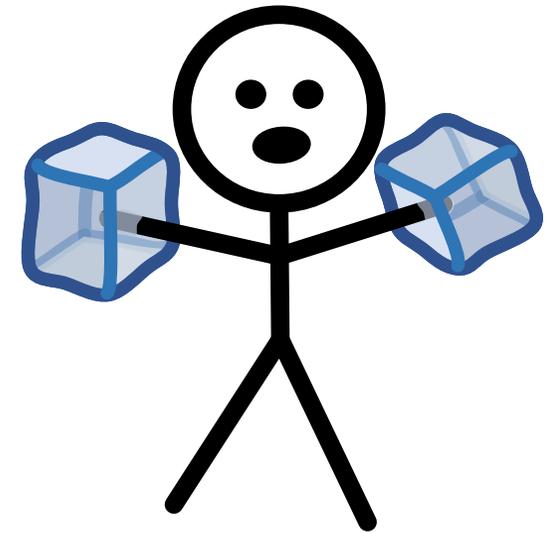
- With continuous exposure, frostbite can freeze deeper tissue
- This causes significant damage and cuts off blood circulation
  - Can lead to:
    - Tissue death
    - Gangrene



# Cold Weather Injuries

## Frostbite – Symptoms

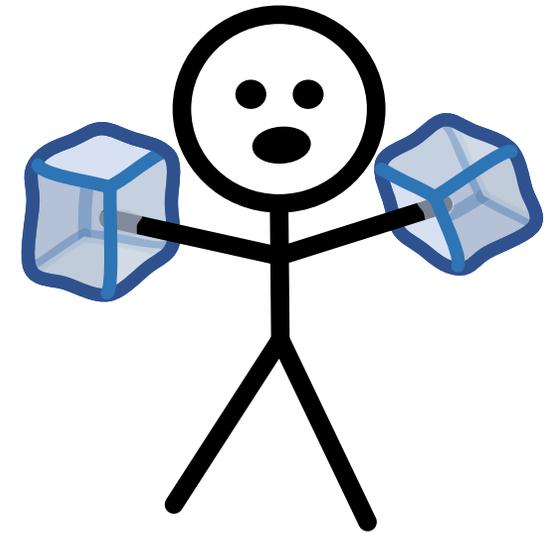
- Victim may **Feel**:
  - Pain then numbness in effected body part
  - May not notice anything



# Cold Weather Injuries

## Frostbite – Symptoms

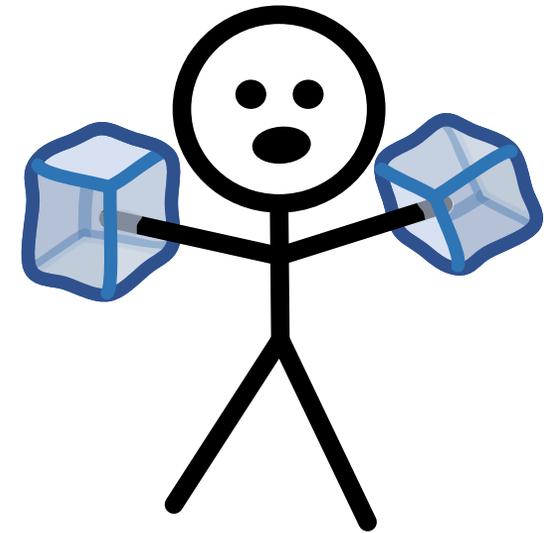
- **May See:**
  - Grayish-white patches on skin
  - Blisters or dark skin suggest severe stages of frostbite



# Cold Weather Injuries

## Frostbite – First-Aid

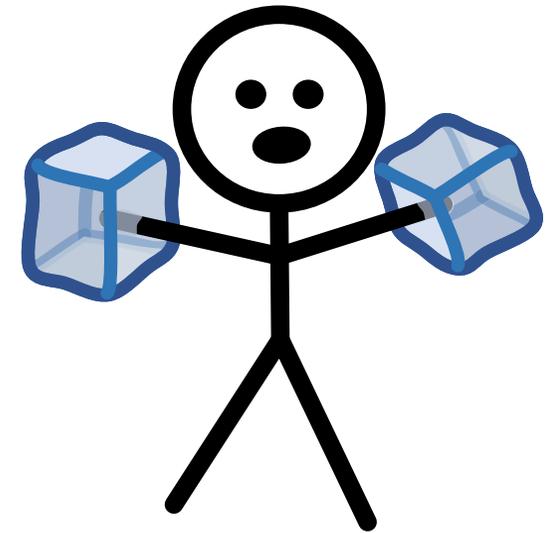
- Best treatment is to **AVOID Getting It** – it is generally preventable
- If you suspect frostbite:
  - Remove wet clothing
  - Wrap injured area in dry blanket
  - Get victim to medical care as soon as possible



# Cold Weather Injuries

## Frostbite – First-Aid

- Rewarming is an option
  - **Do NOT** rewarm if there is risk of refreeze! This is BAD!
  - Place affected area in warm (100-105°F) water
  - Allow affected area to regain color and warmth
  - Dry off and bandage loosely with dry dressing between digits



# Cold Weather Injuries

## Dehydration

- The body is made up of 70% water
- Proper hydration is required for basic body functions
- Dehydration increases the risk of both cold and heat injuries
- Cold and heat both increase the risk of Dehydration



# Cold Weather Injuries

## Dehydration

- Water is lost via:
  - Breathing
  - Sweating
  - Digestion
  - Urination



# Cold Weather Injuries

## Dehydration – Symptoms

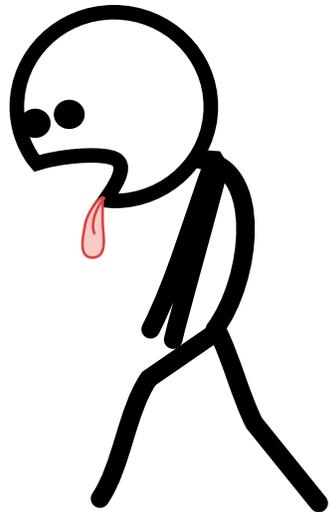
- Signals of **Mild** dehydration
  - Fatigue
  - Increased thirst
  - Dry lips
  - Dark yellow urine



# Cold Weather Injuries

## Dehydration – Symptoms

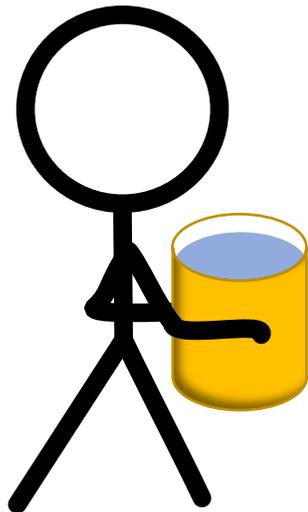
- Signals of **Moderate and Severe** dehydration
  - Dry mouth with little saliva
  - Dry skin
  - Weakness
  - Dizziness
  - Confusion
  - Nausea
  - Fainting
  - Muscle cramps
  - Loss of appetite
  - Decreased sweating
  - Decreased urine production
  - Less frequent urine
  - Dark brown urine



# Cold Weather Injuries

## Dehydration – First-Aid

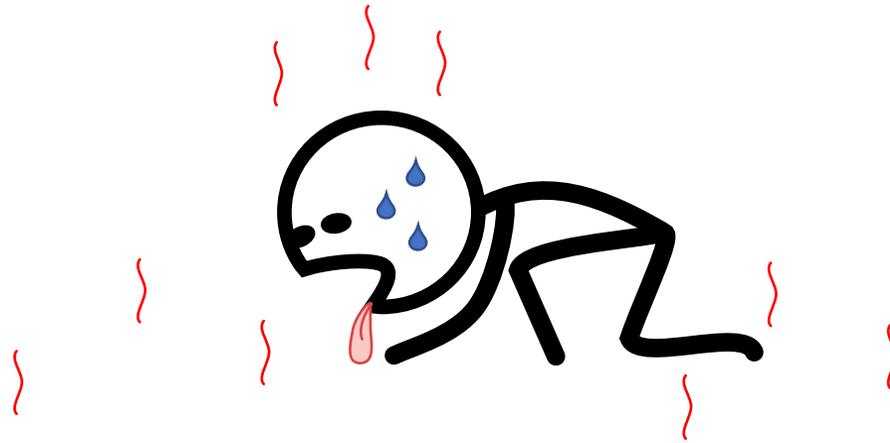
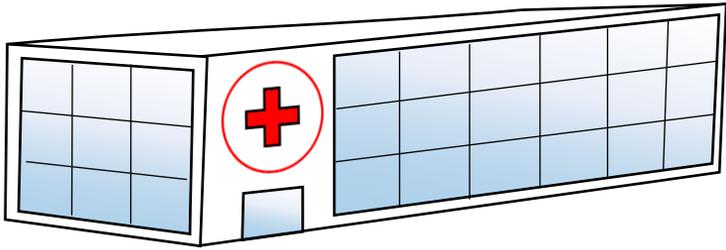
- For **Mild** Dehydration:
  - Drink plenty of water or sports drinks
    - Drink 1-2 quart/liters over 2-4 hours
  - Rest for 24 hours and continue to hydrate
  - Avoid excessive physical activity
  - May take 36 hours to replace lost fluids



# Cold Weather Injuries

## Dehydration – First-Aid

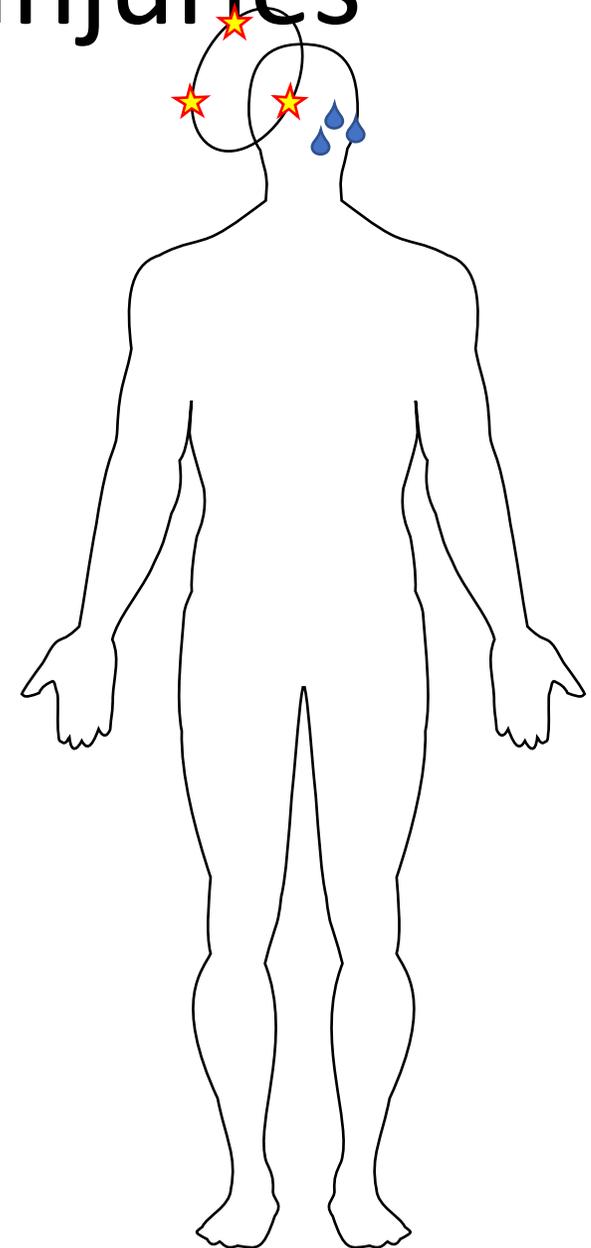
- **Moderate/Severe** dehydration requires Emergency Care
  - Needs to be treated in hospital
  - Needs IV fluids



# Cold & Heat Conditions & Injuries

## Heat Exhaustion

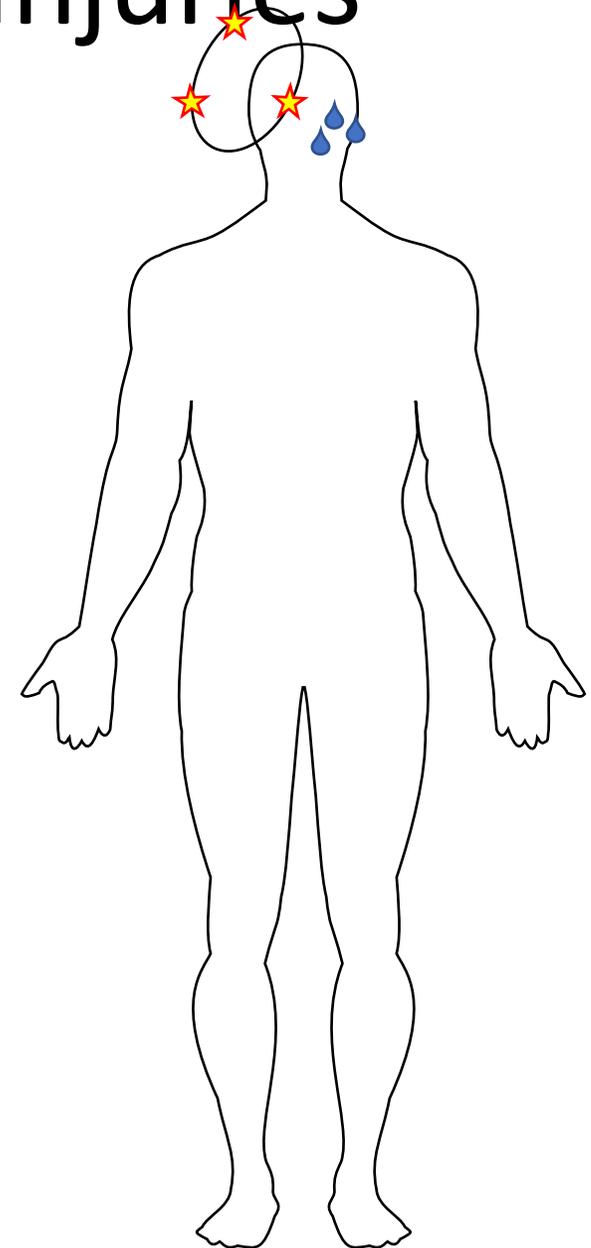
- Brought on by warm weather
- Often associated with dehydration or inadequate acclimation to heat
- Common during outdoor activities in hot environments



# Cold & Heat Conditions & Injuries

## Heat Exhaustion – Symptoms

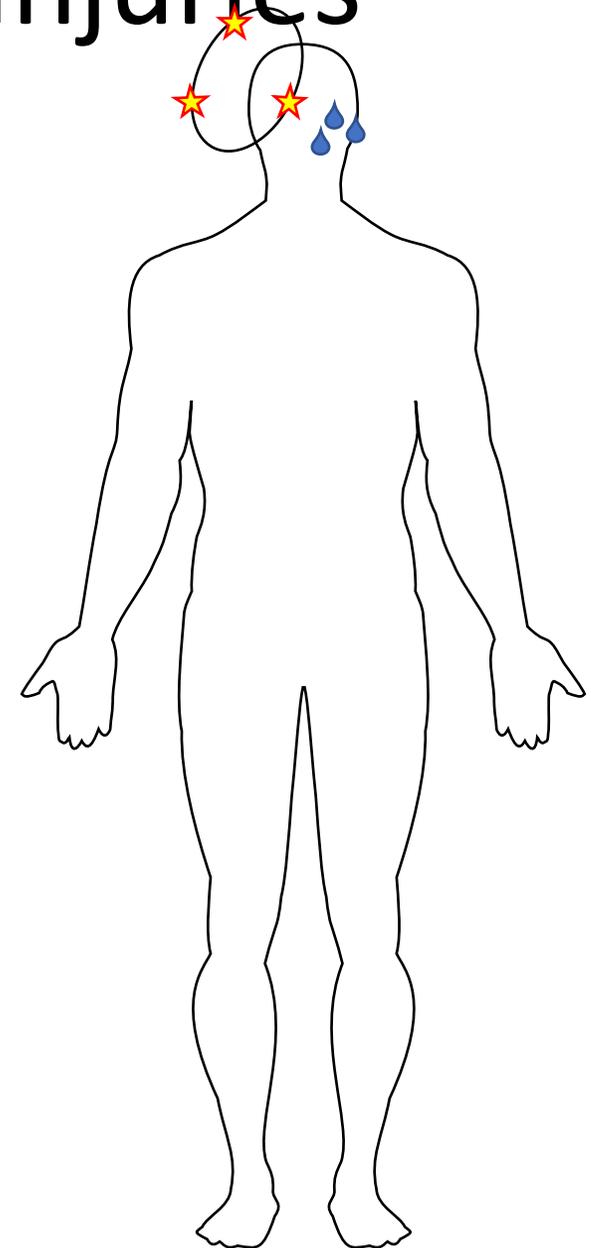
- Symptoms of Heat Exhaustion include:
  - Severe lack of energy
  - General weakness
  - Headache
  - Nausea
  - Faintness
  - Sweating
  - Cool, pale, moist skin
  - Rapid pulse



# Cold & Heat Conditions & Injuries

## Heat Exhaustion – First-Aid

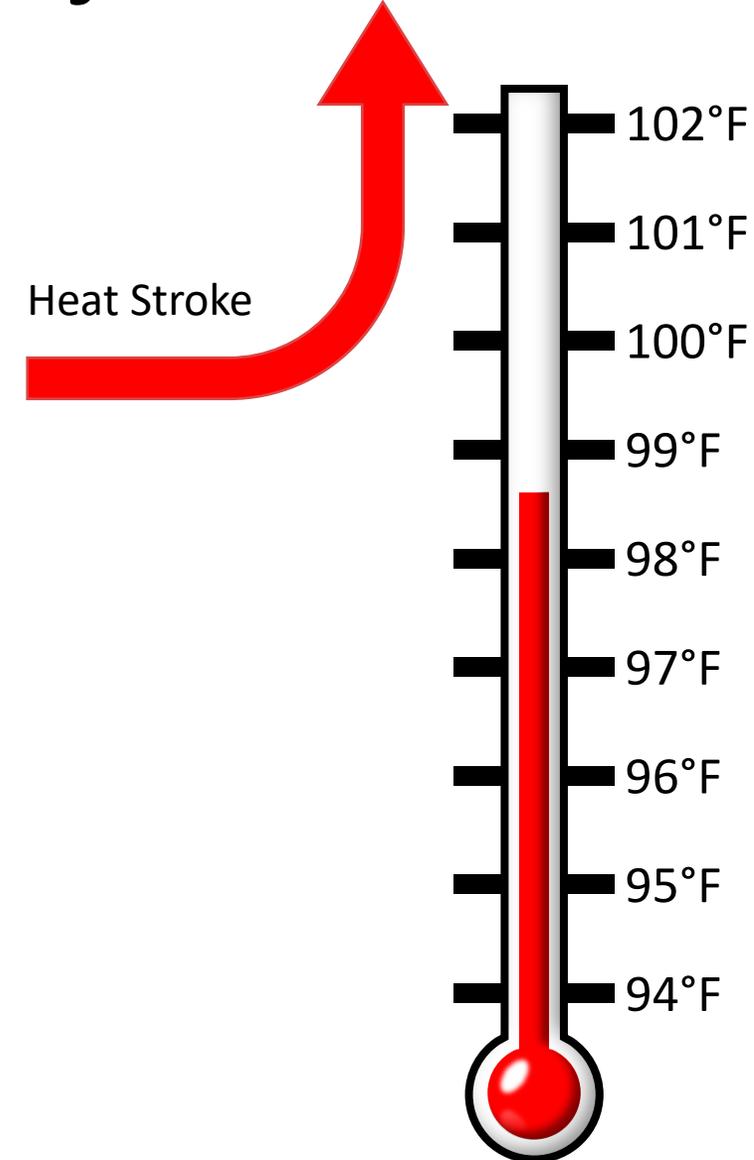
- First-Aid includes:
  - Get victim in Shade
  - Encourage to drink fluids
  - Apply cool, wet towels or cloths to the skin
  - Wet victim's clothing with cool water and fan
  - Raising legs can help them feel better
- Victim should feel better in two or three hours
  - Take it easy the rest of the day



# Cold & Heat Conditions & Injuries

## Heat Stroke

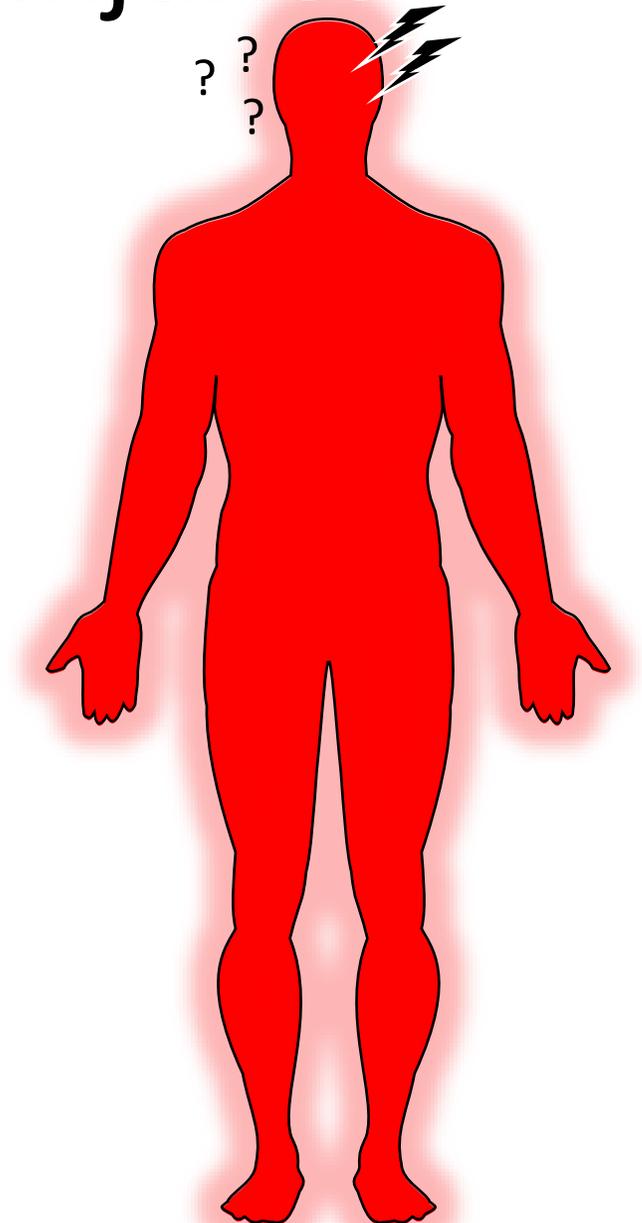
- Body overheats to the point of being life-threatening (105°F)
- Body loses ability to cool itself
- May occur with over-exertion in hot weather
- Also occurs with elderly in hot climates



# Cold & Heat Conditions & Injuries

## Heat Stroke - Symptoms

- Symptoms include:
  - Hot sweaty (but sometimes dry) skin
  - Confusion
  - **Disorientation**
  - Rapid pulse
  - Shallow breathing
  - Vomiting
  - Seizures



# Irritability, Ataxia (balance problems), or Confusion are hallmark signs of Heat Stroke

## Heat Exhaustion

Faint or dizzy

Excessive Sweating



Cool, pale, clammy skin

Nausea or vomiting

Rapid, weak pulse

Muscle cramps

## Heat Stroke

Throbbing Headache

No Sweating

Red, hot dry skin

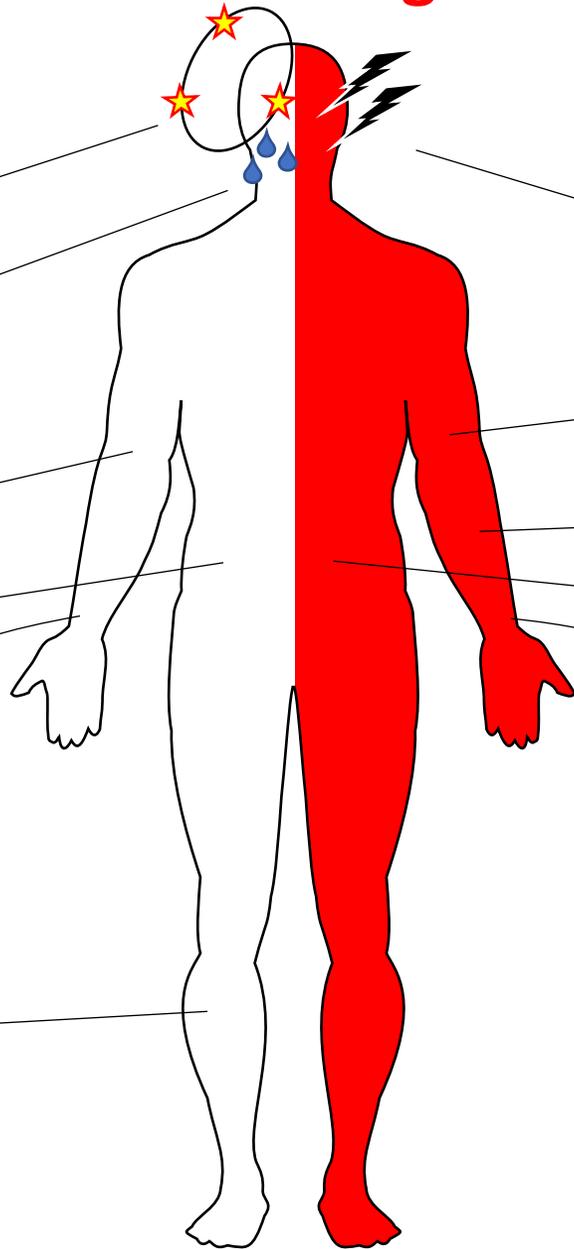


$\geq 104^\circ$

Nausea or vomiting

Rapid, strong pulse

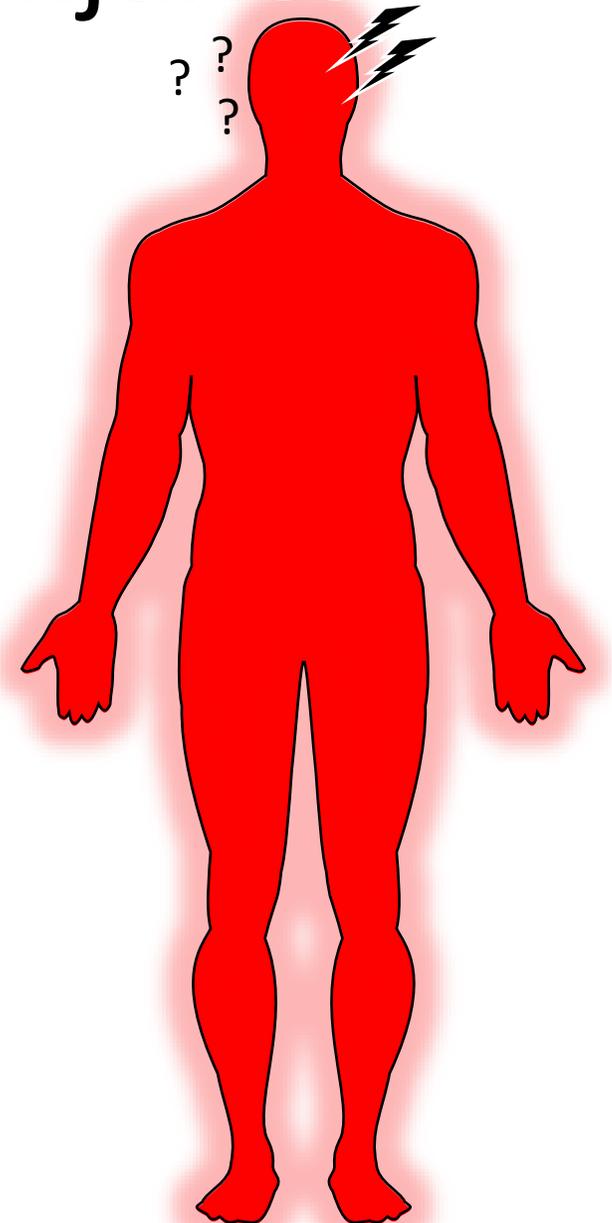
May lose consciousness or have seizures



# Cold & Heat Conditions & Injuries

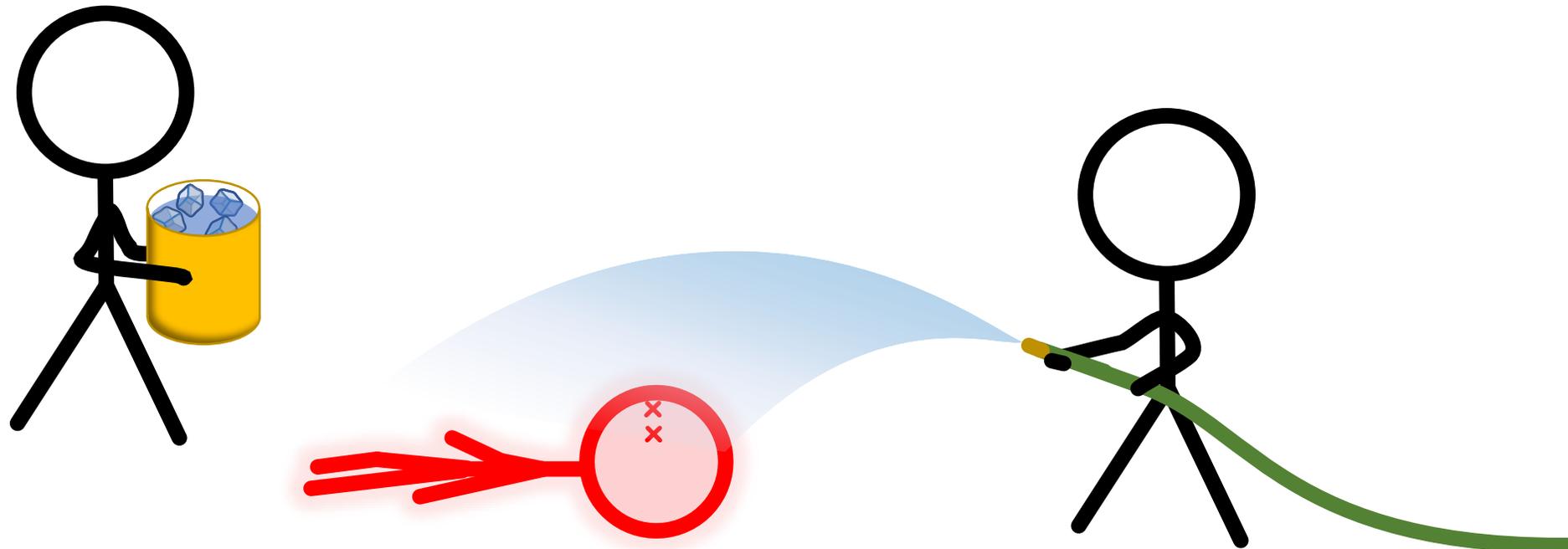
## Heat Stroke – First-Aid

- This is **LIFE-THREATENING**
- Cool immediately!
- Call 911! Do it NOW!
- Cooling includes:
  - Immersion or spray of cold water
  - Ice packs wrapped in cloth in armpits and skin
  - Fanning
  - AC



# Heat Injuries

## Heat Stroke – First-Aid





Fast-food for lunch?



# Bites and Stings

## Bites of Ticks

- Tick bites are irritating and can transmit diseases



# Bites and Stings

## Bites of Ticks

- **Prevention**

- Wear pants and long-sleeved shirts in tick infested areas
- Button up collar
- Tuck pants in boots or socks



# Bites and Stings

## Bites of Ticks

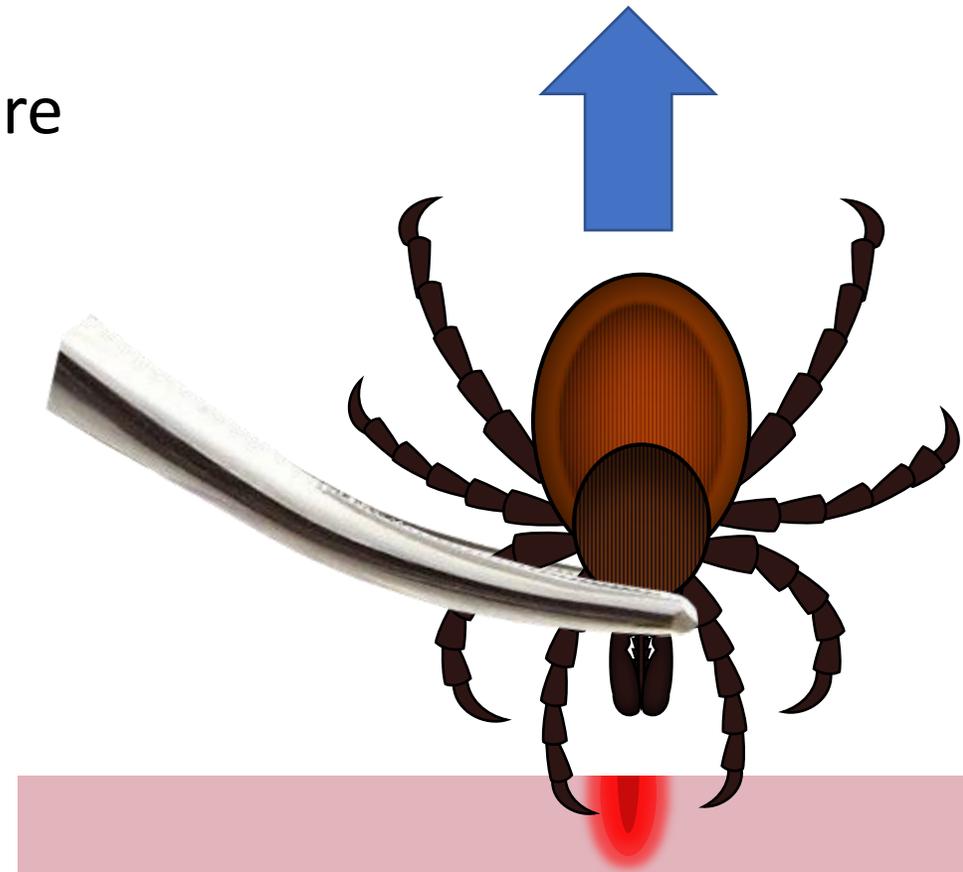
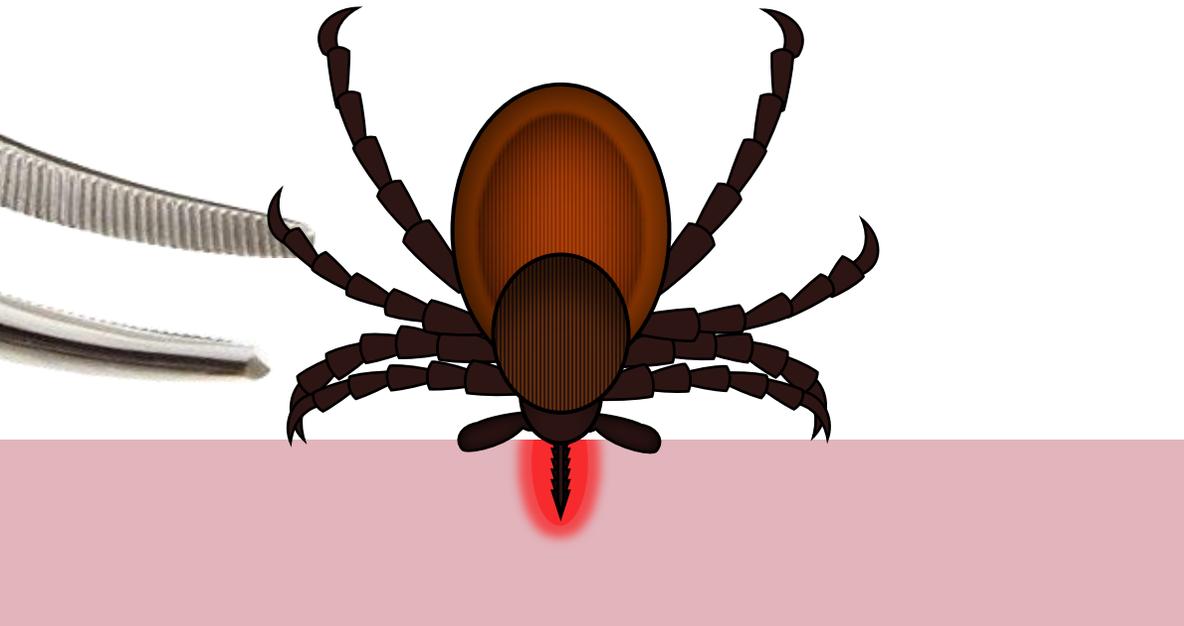
- **First-Aid**
  - Inspect self daily
  - Remove ticks as soon as you find them
  - Wash wound with soap and water
  - Seek medical care if you become sick or develop a rash after bite

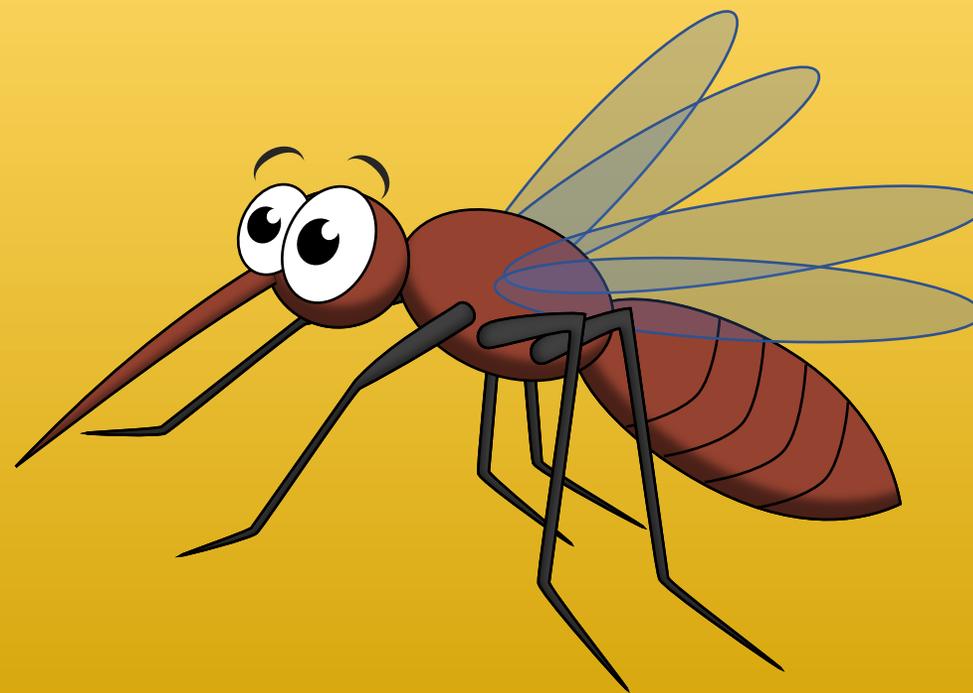
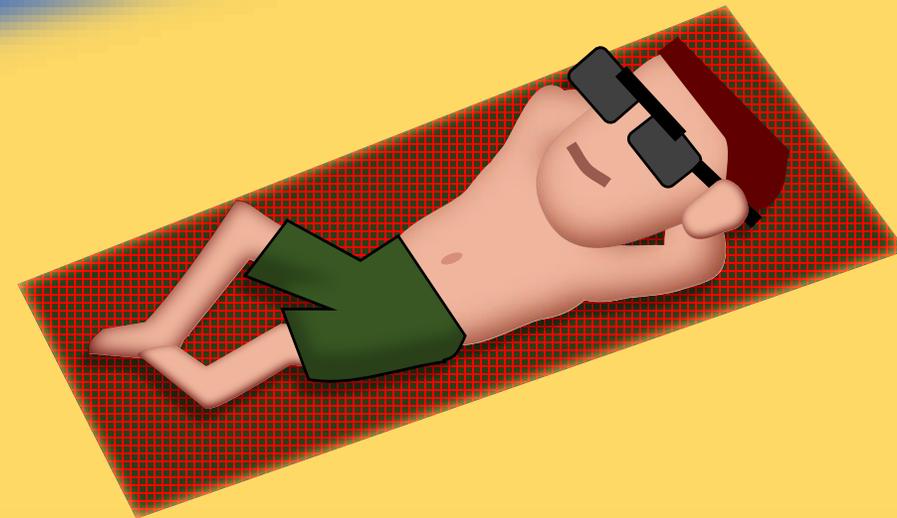
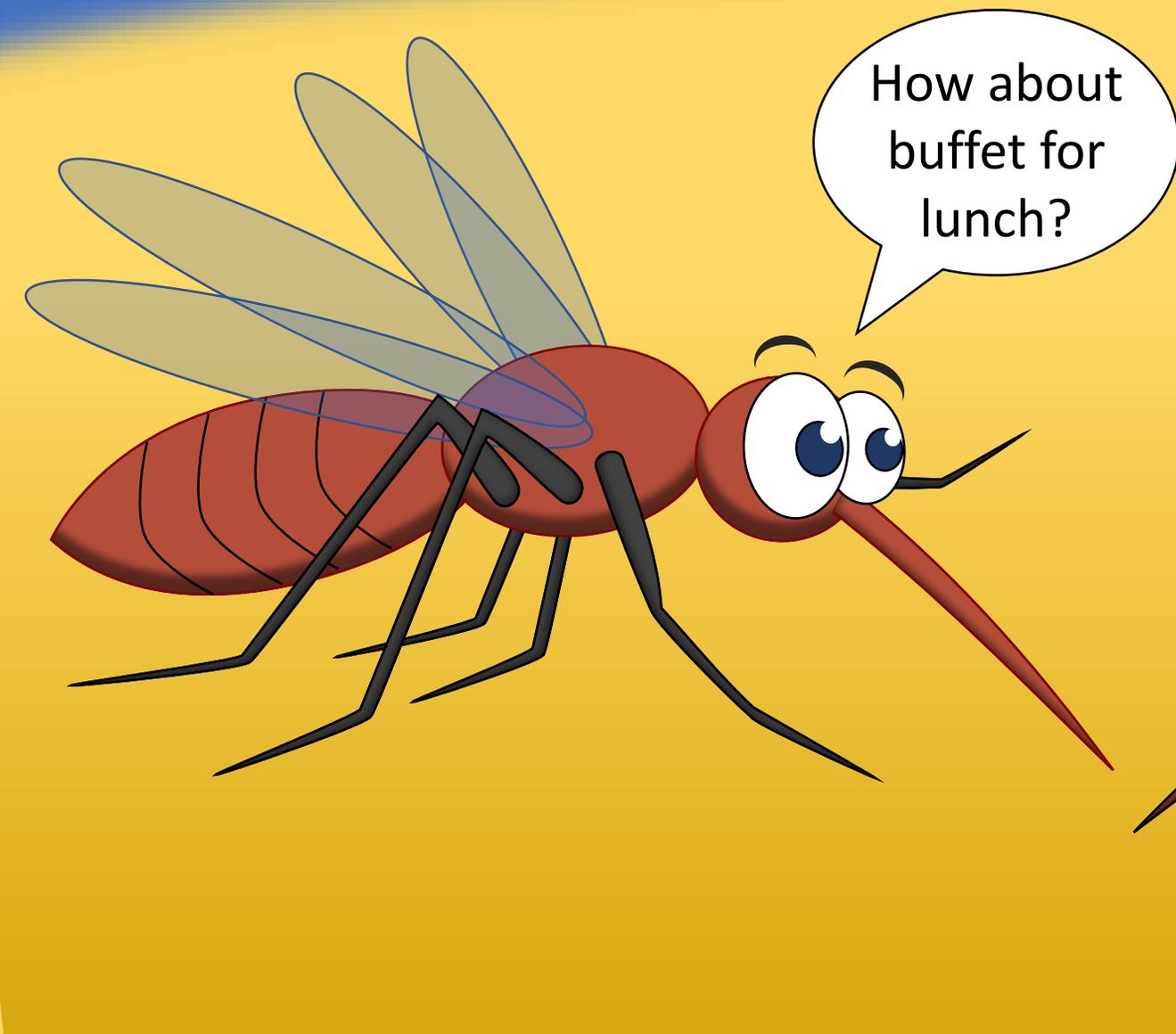


# Bites and Stings

## Ticks – Removal – Tweezers

- Use fine-tipped tweezers to grasp the tick close to the skin's surface
- Don't squeeze body
- Pull upward with steady, even pressure
- Don't twist or jerk the tick or the mouth-parts may break off

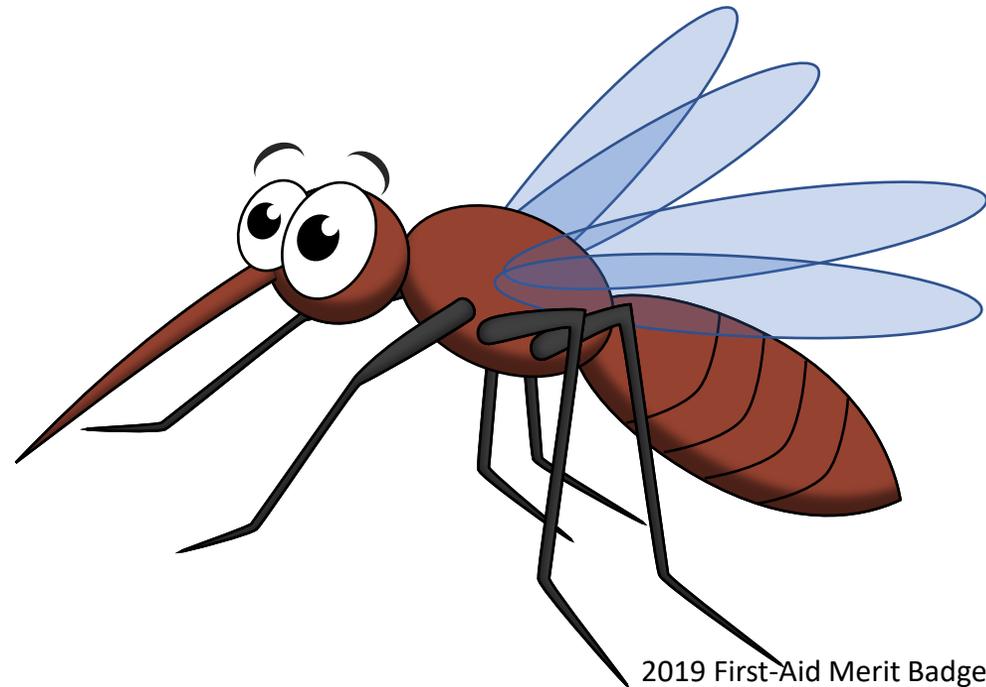




# Bites and Stings

## Bites or Stings of Insects & Things with > 4 Legs

- Bites can itch and irritate
- Some bug bites include venom which cause other problems





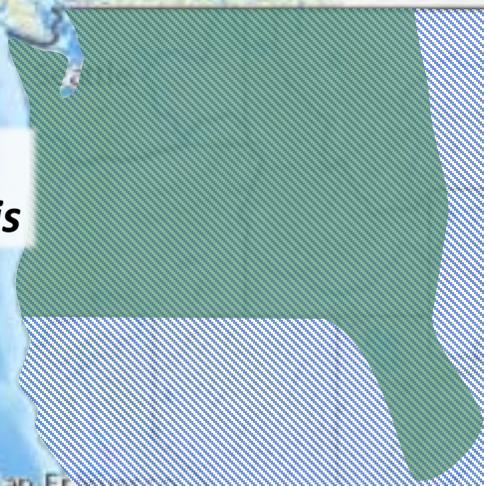
# Fire Ants in the US





# Dangerous Spiders in the US

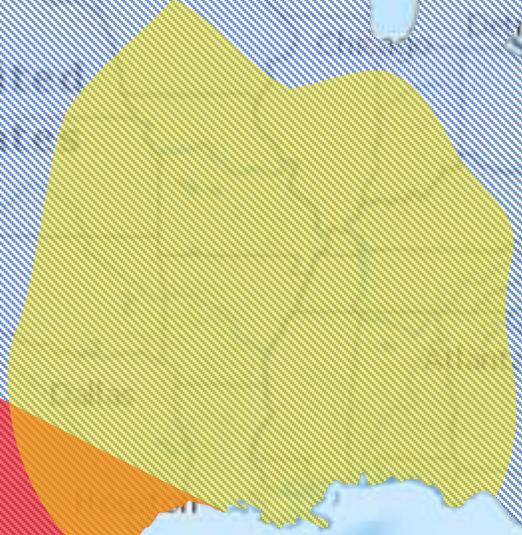
**Hobo Spiders**  
*Tegenaria agrestis*



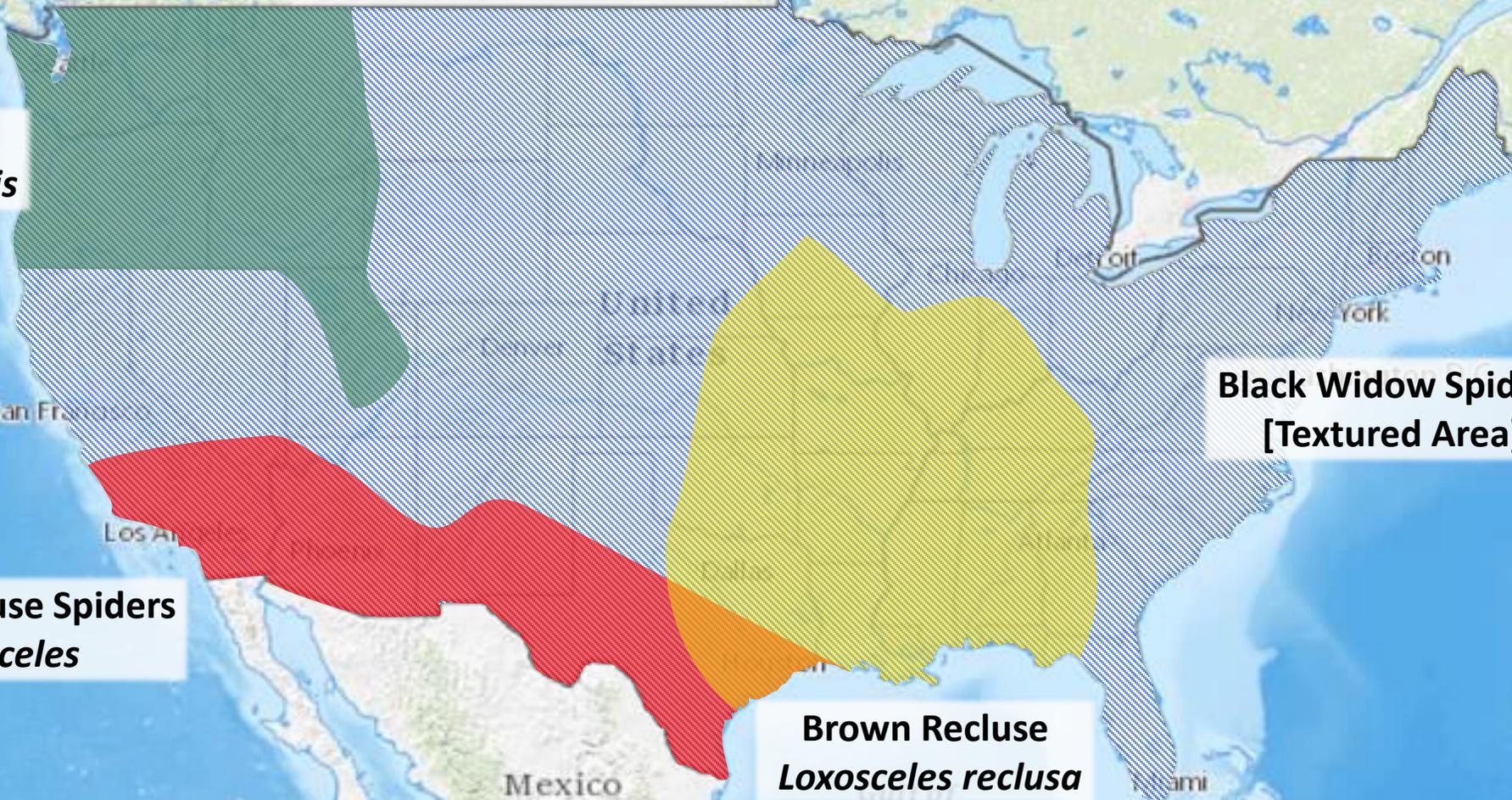
**Other Recluse Spiders**  
*Loxosceles*



**Brown Recluse**  
*Loxosceles reclusa*

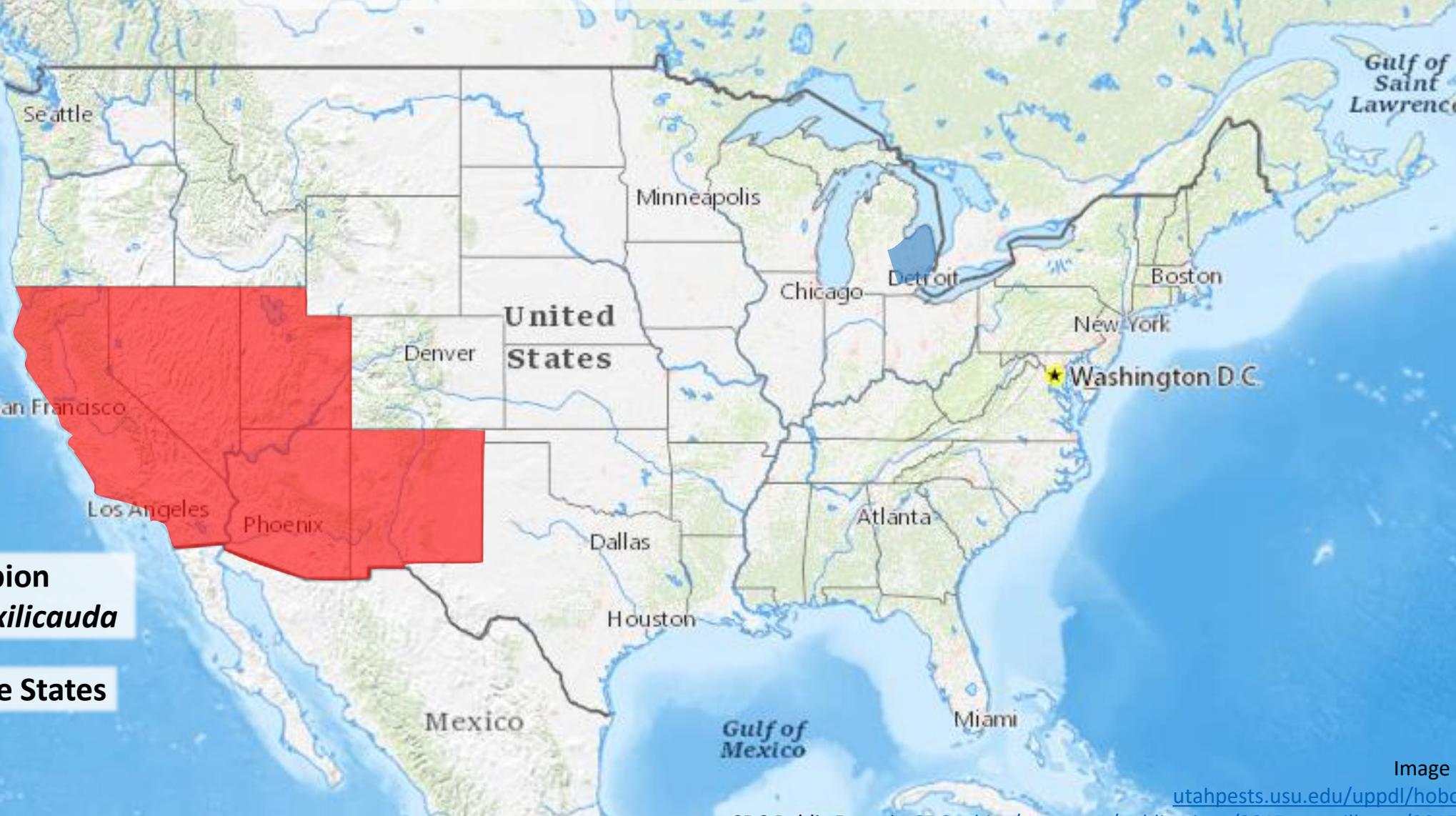


**Black Widow Spiders**  
[Textured Area]





# Bark Scorpion in the US

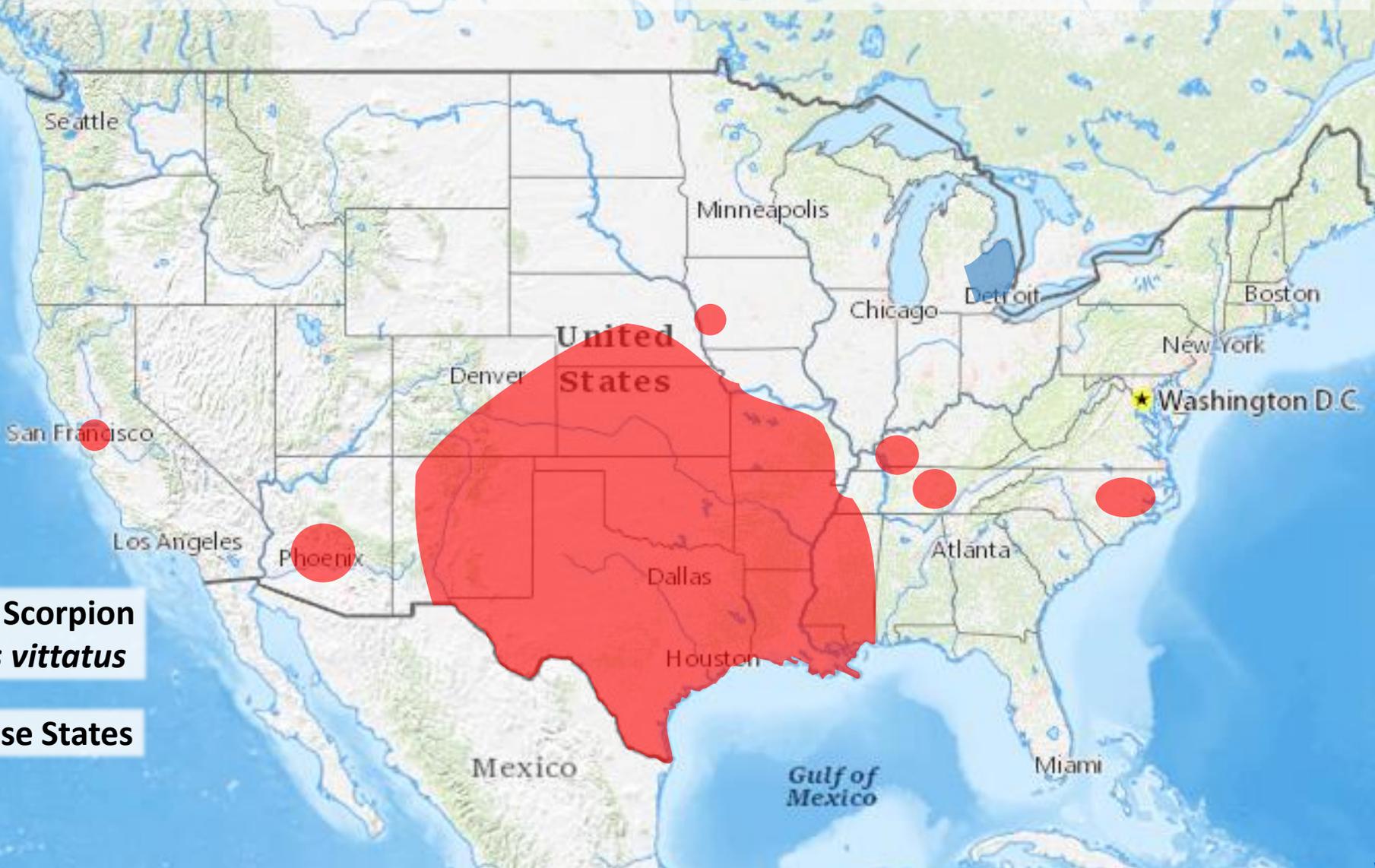


**Bark Scorpion**  
*Centruroides exilicauda*

**Found in these States**



# Stripped Bark Scorpion in the US



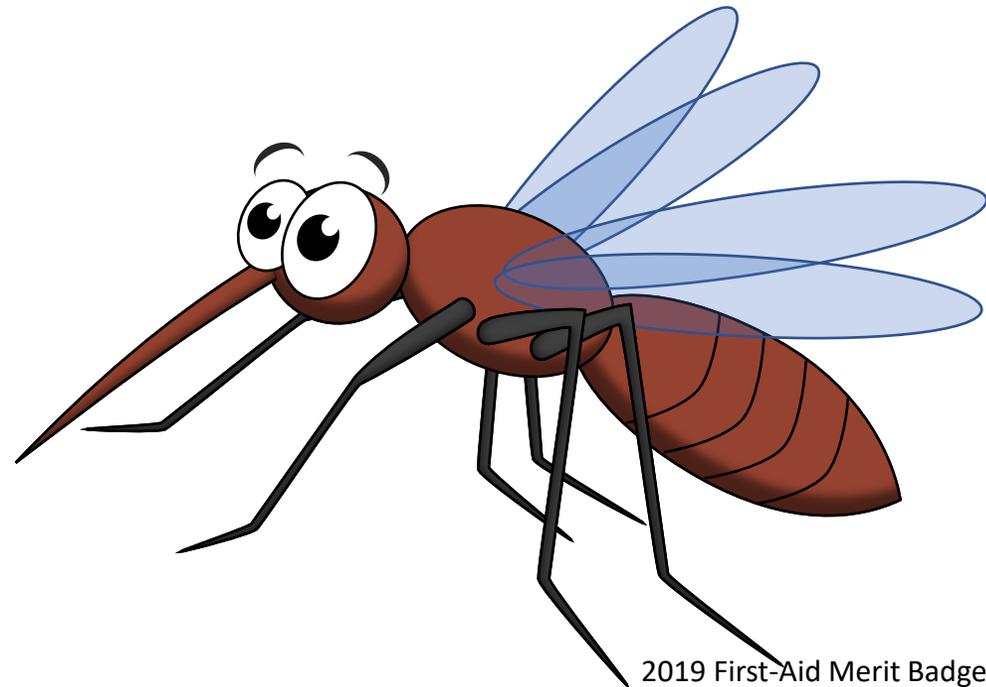
**Striped Bark Scorpion**  
*Centruroides vittatus*

**Found in these States**

# Bites and Stings

## Bites or Stings of Insects & Things with > 4 Legs

- **First-Aid**
  - Wash area with soap and water
  - Watch and treat for Anaphylaxis (discussed later)
  - Avoid scratching bite area
  - Seek medical attention if:
    - Become ill
    - Difficulty breathing
    - Severe pain and swelling



# Bites and Stings

## Bites or Stings of Insects - Bees

- Bees leave a venom sac behind
- Wasps and hornets can inject venom multiple times
- All REALLY hurt!





# Africanized Honey Bees in the US



# Bites and Stings

## Bites or Stings of Insects - Bees

- **First-Aid**
  - If stinger is left behind, brush off with flat-surfaced object
  - Wash area with soap and water
  - Watch and treat for Anaphylaxis (discussed later)
  - An ice pack is nice



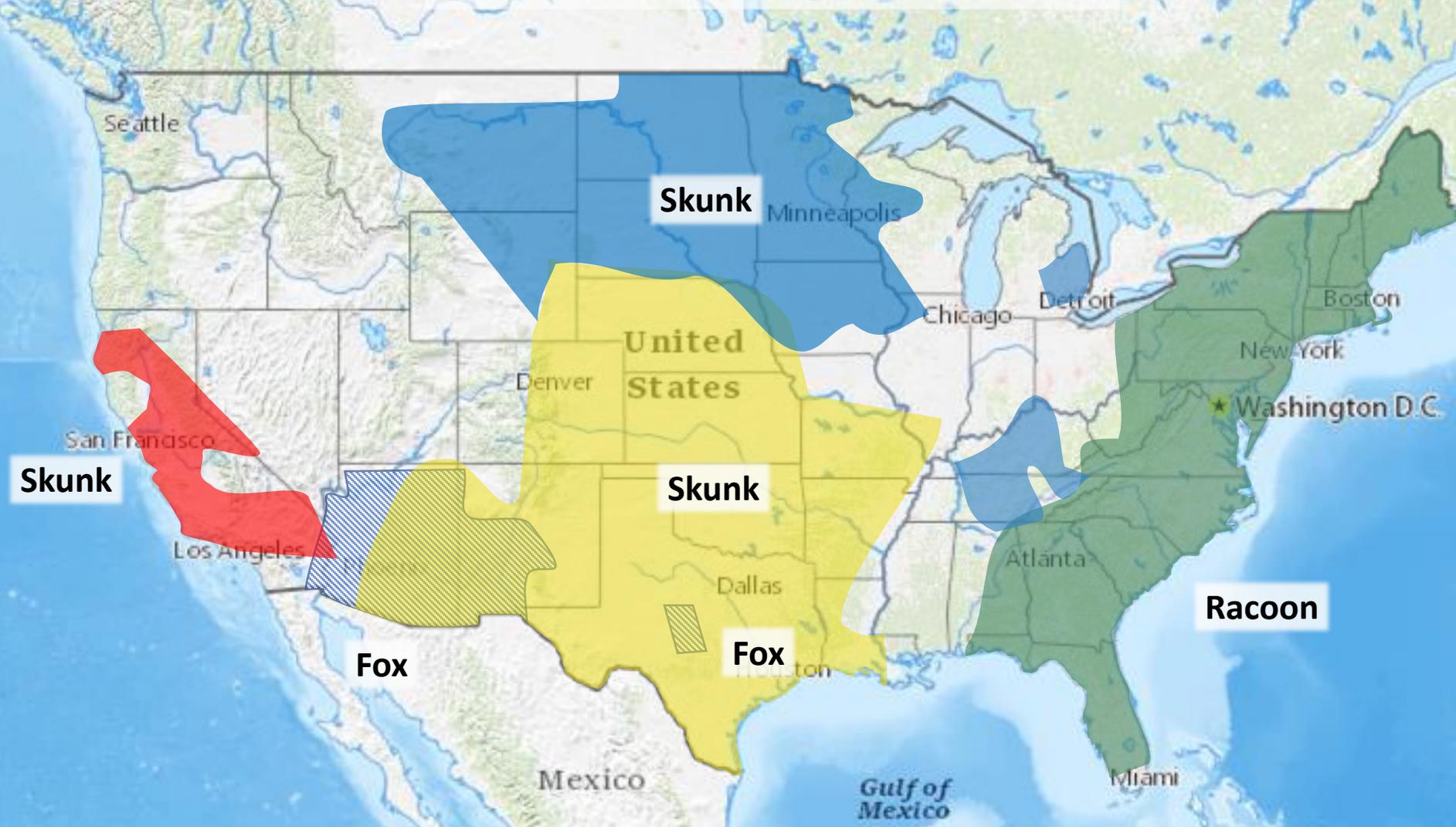
# Bites and Stings

## **Bite of a Suspected Rabid Animal**

- Any bite from an animal will place you at risk of infection
- Some mammals carry Rabies – a lethal disease
- Unprovoked attacks from mammals suggests Rabies



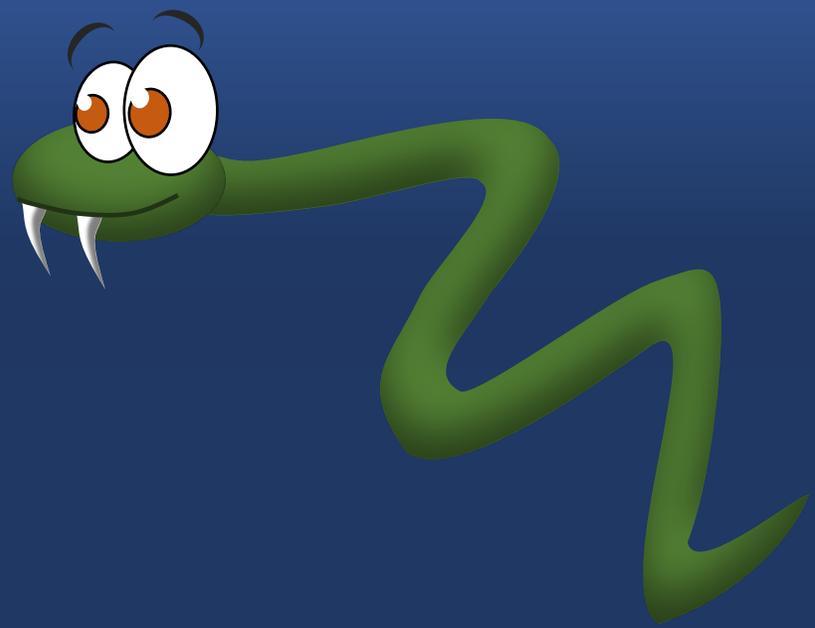
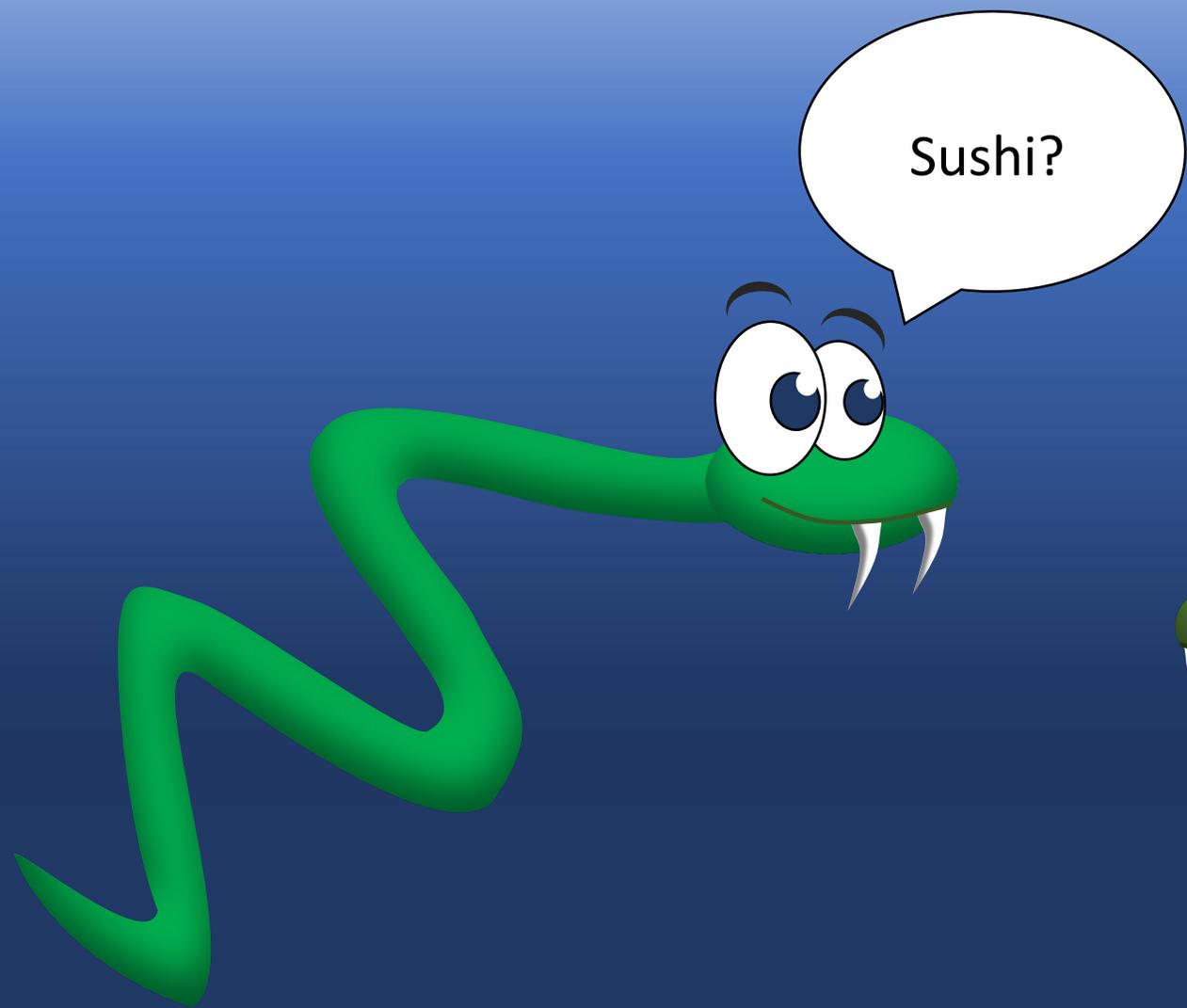
# Rabies in the US



# Bites and Stings

## Bite of a Suspected Rabid Animal

- **First-Aid**
  - Animal needs to be tested for Rabies
    - Report animal bites to police, rangers or animal control
    - Don't try to catch animal yourself, you'll just get bit
  - Scrub area with soap and water for 5 minutes
  - Cover with sterile dressing and bandage
  - Seek medical care to determine if Rabies treatment is needed



# Bites and Stings

## Venomous Snakebite

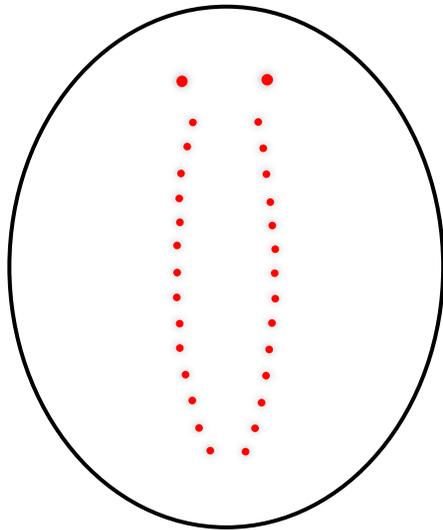
- Venomous snakes in the US come in three basic forms:
  - Pit Vipers
  - Coral Snakes
  - Exotic pet snakes



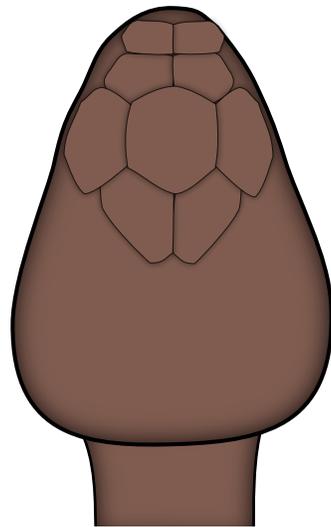
# Bites and Stings

## Venomous Snakebite – Pit Vipers

- Pit Vipers include:
  - Rattlesnakes
  - Copperheads
  - Cottonmouths



Bite Pattern



Triangular  
Head

[commons.wikimedia.org](https://commons.wikimedia.org) Cottonmouth

[commons.wikimedia.org](https://commons.wikimedia.org) Copperhead

[commons.wikimedia.org](https://commons.wikimedia.org) Crotalus cerastes

Image Source: NAVEDTRA 14295 Hospital Corpsman

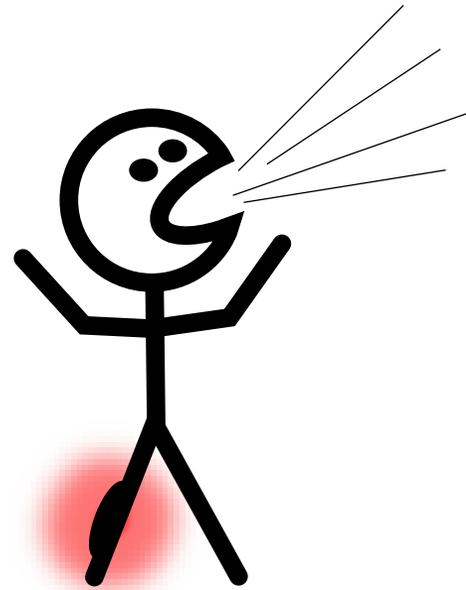
FM 21-11 1988 First Aid

2019 First-Aid Merit Badge Pamphlet Page 77

# Bites and Stings

## Venomous Snakebite – Pit Vipers

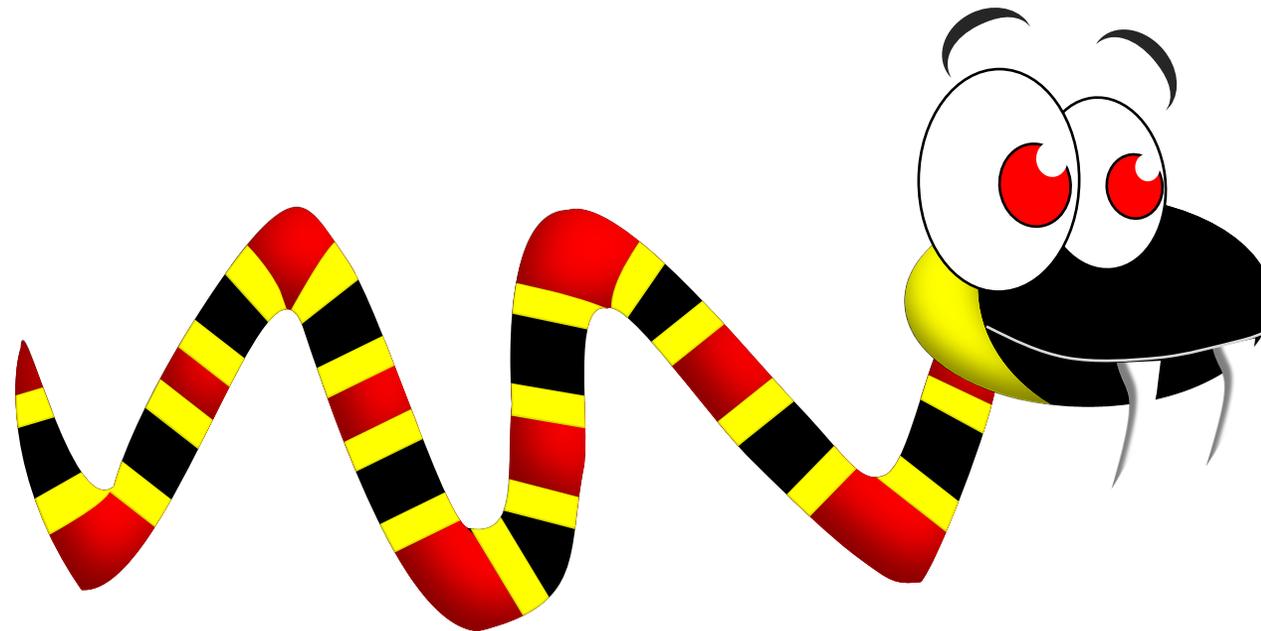
- They inject high volumes of venom that can cause:
  - Extreme pain
  - Swelling
  - Skin discoloration
  - Shock – deadly if not treated



# Bites and Stings

## Venomous Snakebite – Coral Snake

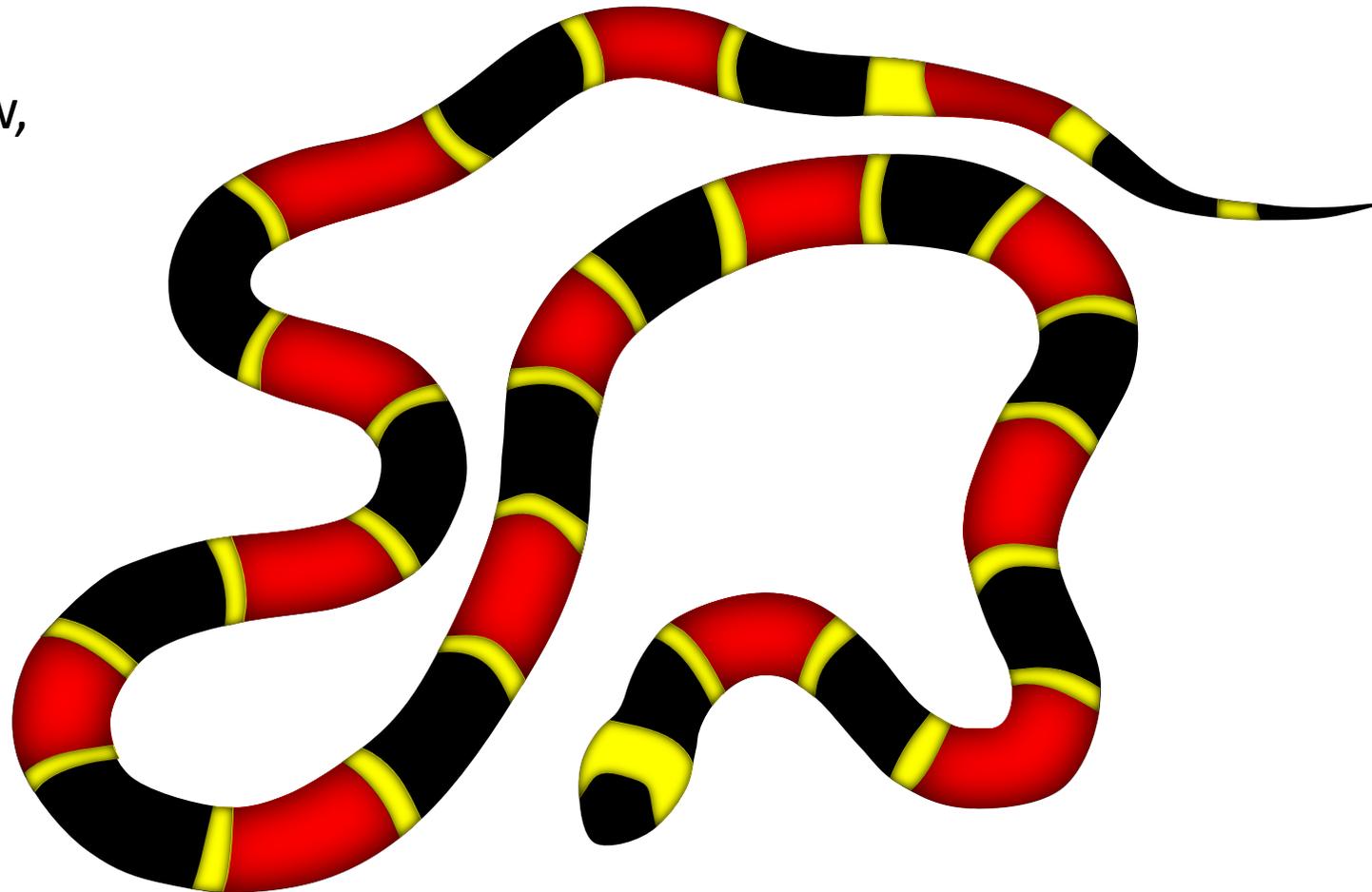
- Coral Snakes are different from Pit Vipers
  - Look very different
    - Smaller with small round head
    - Very colorful – Red, Black and Yellow bands



# Bites and Stings

## Venomous Snakes – Coral Snakes

Red Touch Yellow,  
Kills a Fellow



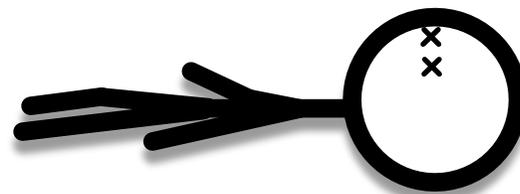
Red Touch Black,  
Friend of Jack  
(US only!)

Color intensity and banding patterns are variable, even in the US.  
In other parts of the Americas, colors can be reversed (red bands adjacent to black bands)!

# Bites and Stings

## Venomous Snakebite – Coral Snake

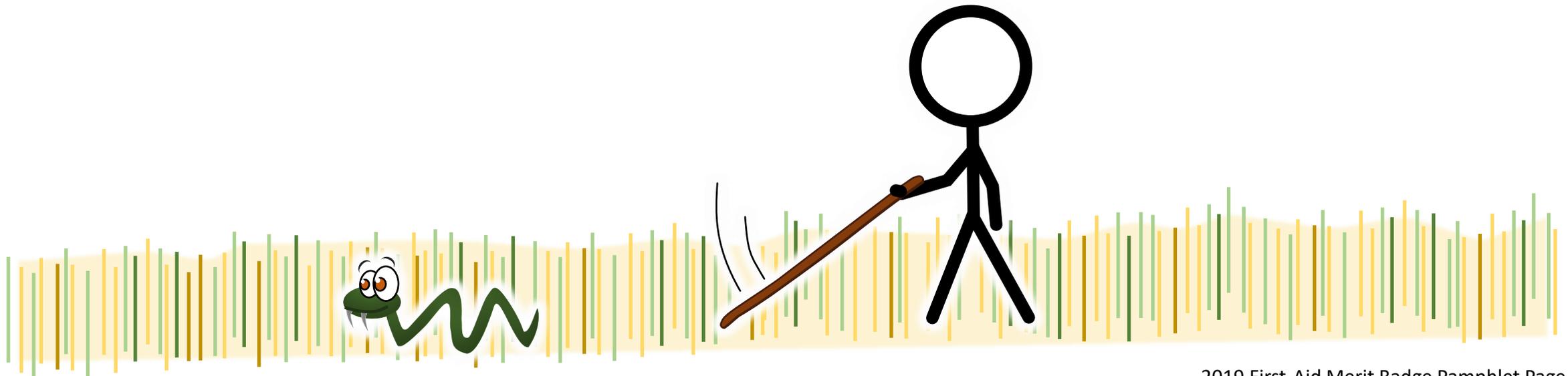
- Coral Snakes are different from Pit Vipers
  - Inject a very different venom
    - Slows physical and mental reactions
    - Sleepiness
    - Nausea
    - Shortness of breath
    - Convulsions
    - Shock
    - Coma



# Bites and Stings

## Venomous Snakebite – Avoidance

- It is better to avoid getting bitten than to deal with a bite
  - Use hiking stick to poke stones and brush ahead of you
  - Watch hands as you collect firewood or climb over rocks



# Bites and Stings

## Venomous Snakebite – First-Aid

- Basics of Snakebite First-Aid

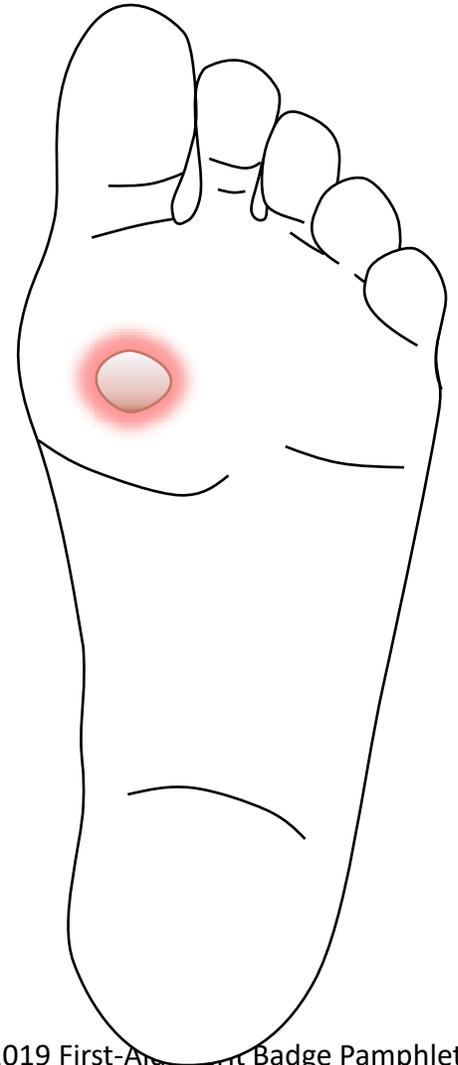
- Step 1** Get victim to hospital AS SOON AS POSSIBLE  
Victim may need antivenom
- Step 2** Remove rings and constrictive jewelry
- Step 3** If you are forced to wait for medical care to arrive  
the go ahead and wash the wound
- Step 4** Have victim lie down  
Position injured area below level of heart  
Keep victim calm
- Step 5** Treat for shock



# Minor Wounds and Injuries

## Blisters on the Hand and Foot

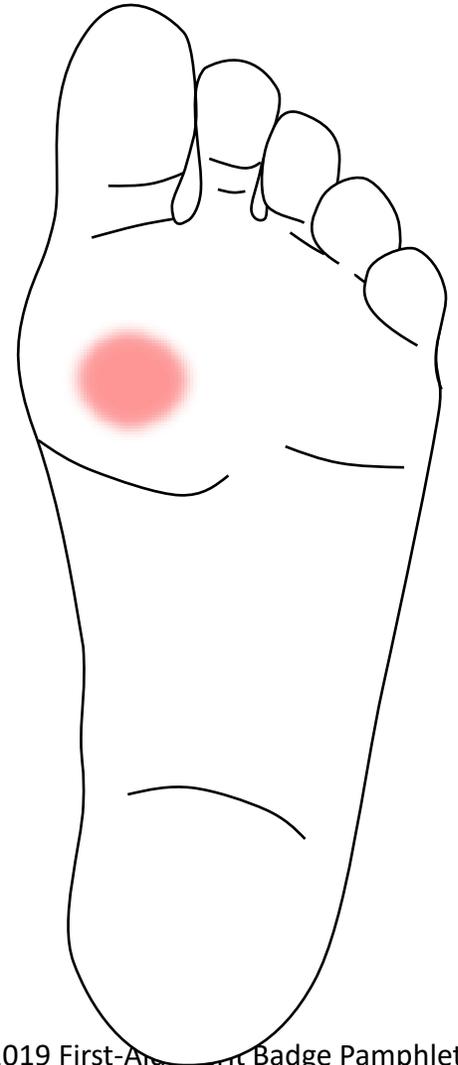
- Often referred to as “Friction Blisters”
- Blisters may form on hands if doing heavy or repetitive work
- Foot blisters are a common backpacking injury



# Minor Wounds and Injuries

## Blisters on the Hand and Foot – Hot Spot

- **Hot Spot** – tender area before blister begins to form
  - Stop immediately!
  - Treat this before it becomes a blister



# Minor Wounds and Injuries

## Blisters on the Hand and Foot – Hot Spot

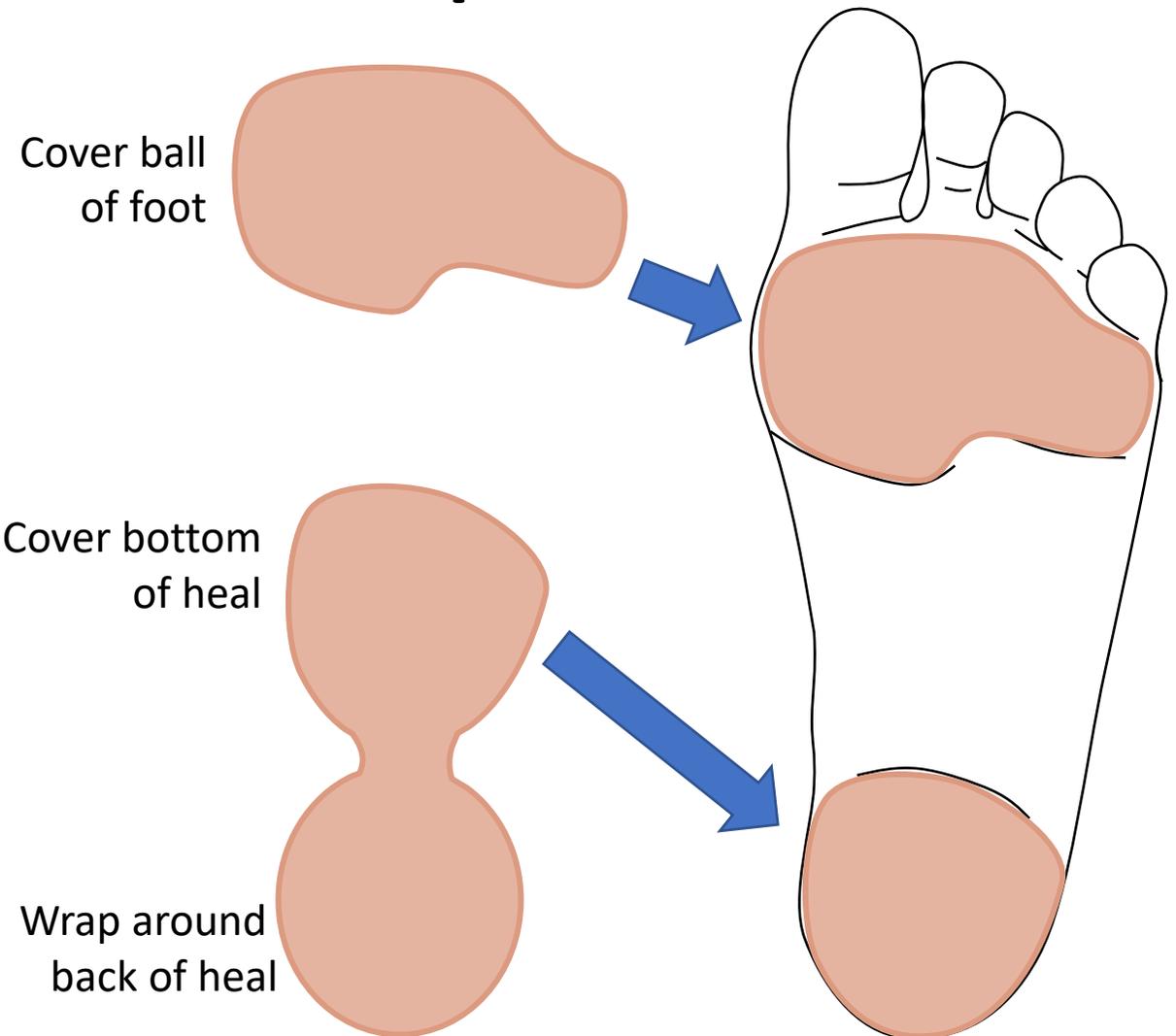
- **Hot Spot First-Aid**

Know your feet

Know your Hot Spots

Moleskin **BEFORE**  
and prevent blisters

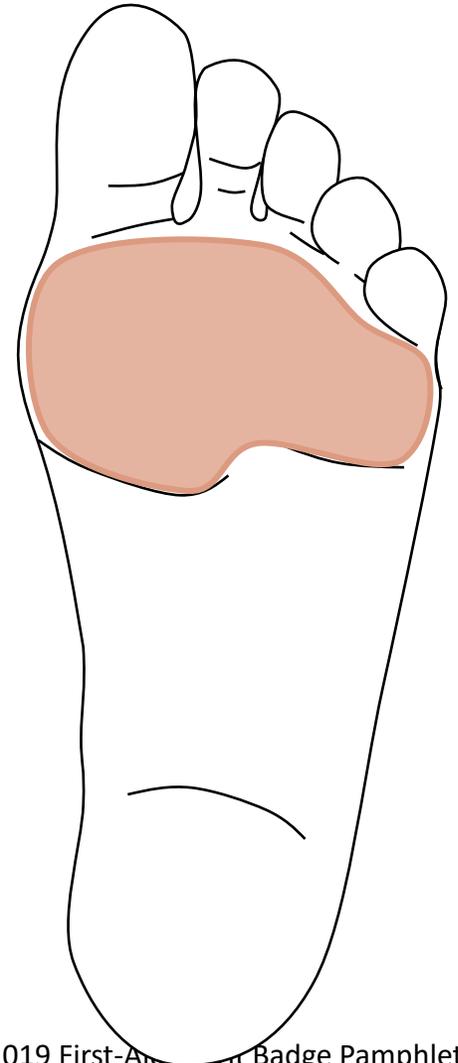
**No Wrinkles!**



# Minor Wounds and Injuries

## Blisters on the Hand and Foot

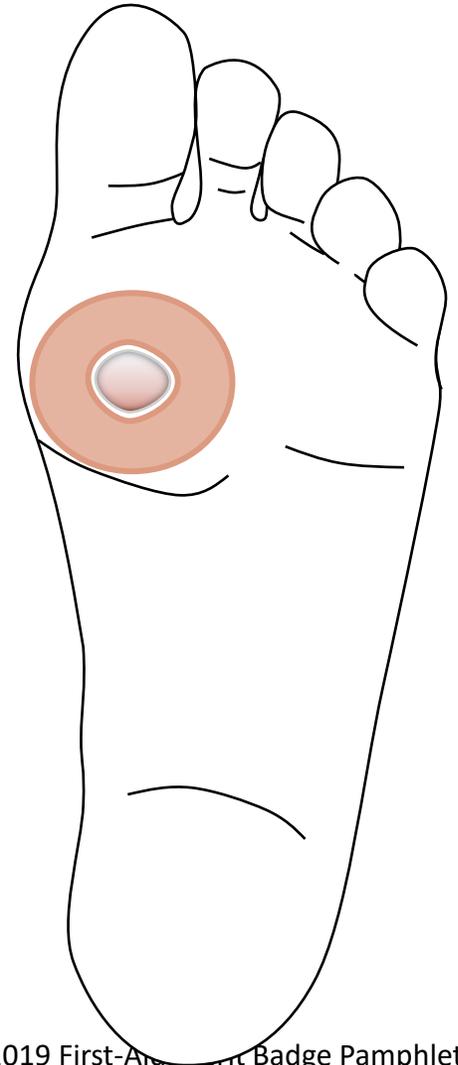
- **Prevention - Hand**
  - Wear gloves when working
- **Prevention - Foot**
  - Wear shoes or boots that fit
  - Change socks if become wet or sweaty
  - Treat Hot Spots early



# Minor Wounds and Injuries

## Blisters on the Hand and Foot

- **First-Aid**
  - Moleskin donut around blister
    - This reduces pressure on blister
  - Special blister products can help
    - SecondSkin
    - Blist-O-Ban





# Minor Wounds and Injuries

## Blisters on the Hand and Foot - Special

- **Expanding Blister**
  - If you must continue to walk with a blister, it may expand or rupture
  - At times, it will be better to preemptively drain it
  - This needs to be done as cleanly as possible
  - There is still a risk of infection as drainage creates an entrance through the skin

# Minor Wounds and Injuries

## Blisters – Drainage

- Clean, Decompress and Dress

### Clean Area

- Soap and water is fine
- Betadine is better
- Wipe with alcohol

### Sterilize Needle

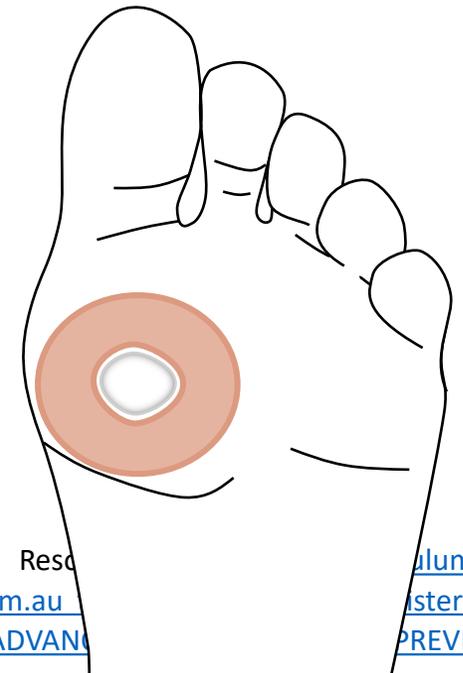
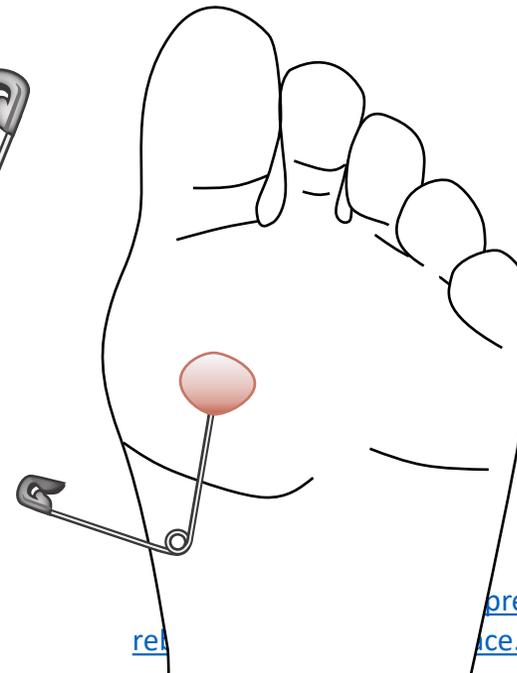
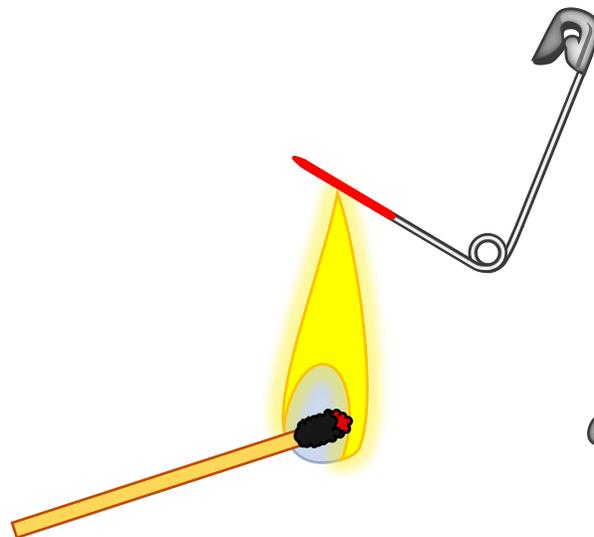
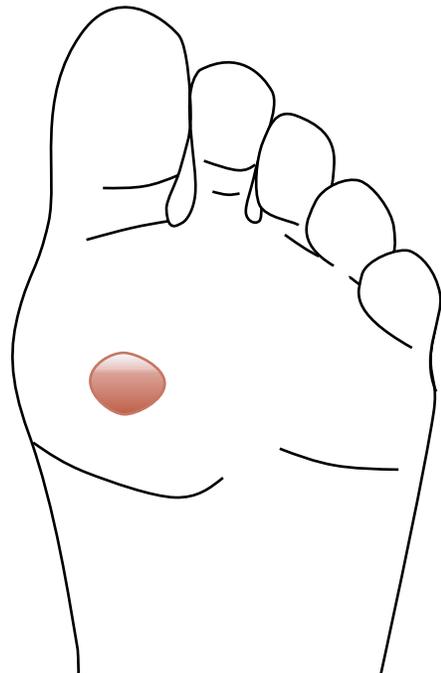
- Heat until red  
(and allow to cool)
- or Use rubbing alcohol

### Pierce Blister

- Pierce base of blister
- Make one or more holes
- Avoid Cutting with knife

### Cover Blister

- Ideally first use Paper Tape
- then Tincture of Benzoin
- then Moleskin or Flex Tape

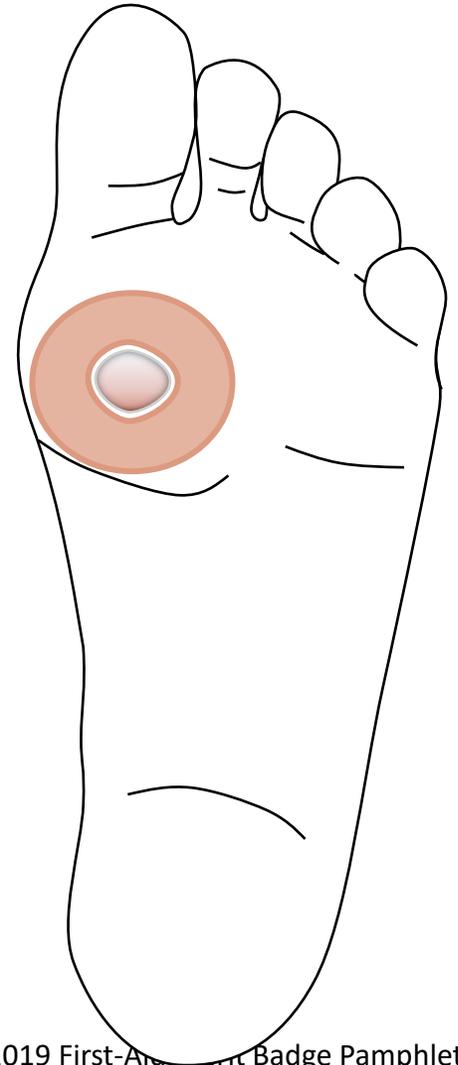




# Minor Wounds and Injuries

## Blisters on the Hand and Foot - Special

- **Ruptured Blisters**
  - Blisters should be kept intact if possible
  - Ruptured blisters are at high risk of infections
  - **First-Aid** – keep them clean and treat as a cut





# Minor Wounds and Injuries

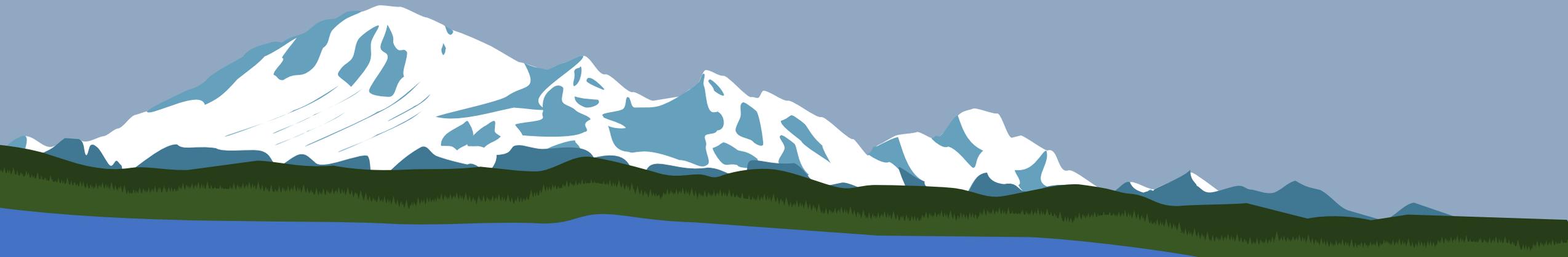
## **Blisters on the Hand and Foot - Special**

- **Blister or open wound of foot and Diabetes**
  - People with diabetes are at risk of severe complications
  - They should follow up with a medical provider if they have a wound on their foot

- 1. [Merit Badge Requirements](#)
- 2. [Merit Badge Intro](#)
- 3. [First Aid](#)
- 4. [Gear](#)
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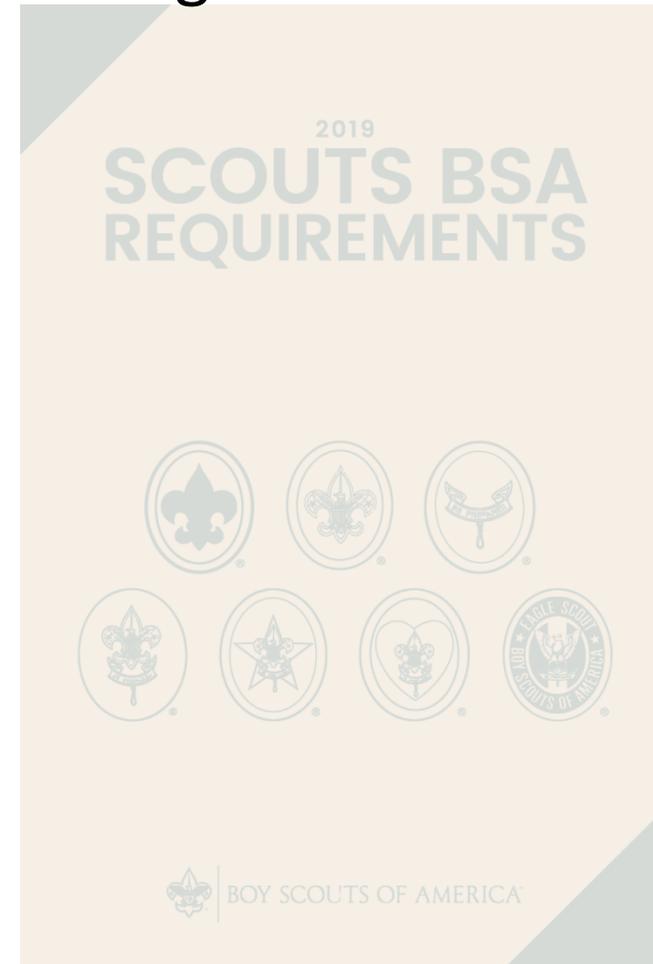
# Gear



# Gear

## Requirement 2a – Outdoor 10-Essentials

List 10 items that are essential to be carried on any backpacking trek and explain why each item is necessary.



# Gear

## **Outdoor 10-Essentials**

- Several different versions
- We use the BSA version

# Gear

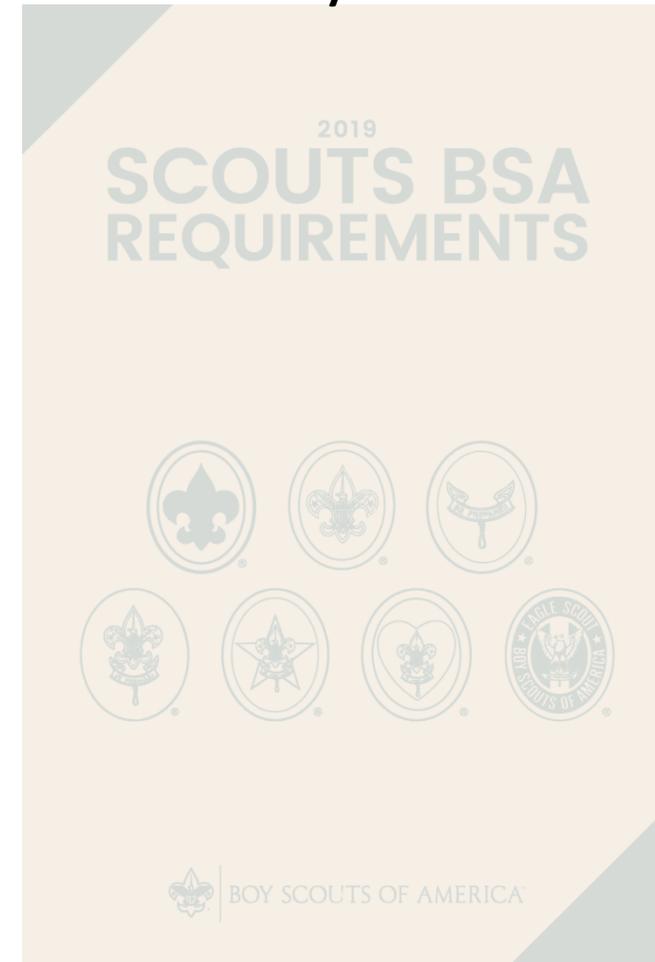
## **Outdoor 10-Essentials**

- Pocketknife
- First-Aid Kit
- Extra Clothing
- Rain Gear
- Water Bottle
- Flashlight
- Trail Food
- Matches and Fire Starters
- Sun Protection
- Map and Compass

# Gear

## Requirement 2b – How/What to Pack

Describe 10 ways you can limit the weight and bulk to be carried in your pack without jeopardizing your health or safety.



# Gear

## What/How to Pack

- Consider what you need
  - Backpack
  - Sleep System
  - Sleeping Pad
  - Shelter
  - Clothing
  - Food and Cooking gear
  - Other gear
  - Toiletry Kit

# Gear

## What/How to Pack – Backpack

- Backpack
  - Needs to carry all of your gear
  - Needs to fit you
    - It doesn't matter how cool it is if it doesn't fit
  - Various types
    - Internal Frame
    - External Frame
    - Trailers, carts and wheeled packs
    - Pulk
    - Travois

# Gear

## What/How to Pack – Backpack

- Backpack – External Frame
  - Comfortably carries heavy loads
  - Lot of pockets
  - Pack stuff outside of pack
  - Can be damaged if thrown
    - Care when unloading gear
    - Checked luggage?
      - Needs special protection



# Gear

## What/How to Pack – Backpack

- Backpack – Internal Frame
  - Uses frame built into pack
  - Easy to pack
    - In a canoe
    - Checked luggage is fine
      - Just protect straps
  - Hugs body – better balance
    - Mountaineering
    - Skiing



# Gear

## What/How to Pack – Backpack

- Backpack weatherproofing
  - Most are not waterproof
    - Use rain cover or
    - Trash bag inside to waterproof gear

# Gear

## What/How to Pack – Backpack

- Backpack Size
  - 2,500-3,000 Cubic Inches
    - Large Daypack
    - Overnight for warm weather
  - 3,000-4,500 Cubic Inches
    - 3 season
    - 2–3-day trip
  - 4,500-6,000 Cubic Inches
    - Trips lasting several days or more

# Gear

## What/How to Pack – Sleep System

- Sleep System
  - Determined by
    - Temperatures
    - Wetness
    - How you like to sleep

# Gear

## What/How to Pack – Sleep System

- Sleep System - Fill
  - Fill and construction will determine temperature rating
    - Rating system is NOT universal
  - **Down**
    - Lightest weight
    - Packs small
    - Expensive
    - Useless if wet
  - **Synthetic**
    - Retains some insulation when wet
    - Dries reasonably fast
    - Preferred in PNW



# Gear

## What/How to Pack – Sleep System

- Sleep System – Alternate
  - Non-sleeping bag systems are available
  - Quilt
    - Only insulated above body
    - Theory – fill under body is crushed and loses insulation value
    - Must be used with sleeping pad
  - Poncho liner or blanket
    - Option in environments that stay reasonable warm/hot at night



# Gear

## **What/How to Pack – Sleep System – Protect it**

- Sleep System - Protection
  - Your sleep system is vital for keeping you alive at night
  - You must protect your system for wetness
  - Waterproof
    - Ideally pack inside pack in a waterproof bag if possible
    - or line stuffsack with garbage bag if storing bag outside of pack

# Gear

## **What/How to Pack – Sleeping Pad**

- Sleeping Pad
  - Insulates you from cold ground
  - Protects you from rocks and bumps

# Gear

## What/How to Pack – Sleeping Pad

- Sleeping Pad - types
  - **Foam**
    - Can be a challenge to pack
    - Durable
    - Cheap
  - **Self-Inflating**
    - Maximum insulation per weight
    - Roll tight to squeeze out air and reduce packed size
    - Allow to self inflate when possible
      - Blowing in mat adds moisture = mildew
    - Can be damaged by sharp sticks
      - Pack an innertube repair kit

# Gear

## **What/How to Pack – Sleeping Pad**

- Sleeping Pad - Pillow
  - Stuff extra clothing in bag

# Gear

## What/How to Pack – Shelter

- Shelter
  - Serves several functions
    - Protects you from wind
    - Protects you from rain and sun
    - Traps in warm air
    - Keeps gear cleaner
    - Privacy
    - Provides some sense of security for those who travel this way

# Gear

## What/How to Pack – Shelter

- Shelter - Types
  - Tarp
    - Lightweight and very packable
    - Requires skill to set up
  - Tents
    - Heaviest option
    - Generally most comfortable
  - Snow Shelters
    - Difficult to setup
    - Often warmest snow camp option
  - Wilderness Shelters
    - Requires resources, time and expertise to setup – results vary

# Gear

## What/How to Pack – Shelter

- Shelter - Tents
  - Tents are the most popular type of shelter
  - Quality and construction varies a LOT
  - Many are designed for car camping
    - Too heavy and bulky for backpacking
  - 3-season tents are usually lighter
    - Ventilated to reduce condensation
    - Cold in winter
  - 4- season tents are usually heavier
    - Better wind protection

# Gear

## What/How to Pack – Clothing

- Pack for the weather
- Pack for night temperatures
  - Mountains and desert get cold at night!
  - Usually not active at night – so need more insulation
- Plan for rain – can be deadly if you are not prepared
  - Wetness can lead to hypothermia
- Synthetics shed water
- Pack layers
  - Several thinner layers are more useful than one heavy layer
  - Can adjust to changing temperature and activity level
- Cotton absorbs 25 times its weight in water
  - Potentially deadly in temperate and cold environments

# Gear

## What/How to Pack – Clothing - Feet

- Backpacker must protect their feet
- Socks
  - Select quality wool or synthetic socks
  - Pack enough for your trip
  - Always have an extra dry pair
  - Wash and dry as needed
- Footwear
  - Must be properly fitted and broken in
  - Suitable footwear is important
    - No open-toed footwear – injuries to feet are trip enders
    - Boots are great but are often overkill

# Gear

## What/How to Pack – Food and Cooking gear

- Food and Cooking gear
  - Food is vital for energy, health and moral
  - You have many choices in what you carry
  - Consider:
    - Easy of use
    - Total weight of food/cooking/fuel combo
    - Packability
    - Cost
      - Brand name, dehydrated meals 3 times a day gets expensive
  - Further discussion in [Food Section](#)

# Gear

## What/How to Pack – Food and Cooking gear

- Water
  - Water is vital to life
  - Further discussion in [Water Section](#)

# Gear

## What/How to Pack – Toiletry Kit

- Toiletry Kit
  - Toothbrush
  - Toothpaste
  - Dental floss
  - Biodegradable soap
  - Waterless hand cleanser
  - Small towel
  - Toilet paper or wet wipes and
    - Trowel or
    - Resealable plastic bag or
    - Poop tube

# Gear

## What/How to Pack – Other Gear

- Other Gear
  - Paracord
  - Insect repellent
  - Notebook and Pen
  - Repair Kit
    - Duct tape
    - Needle and Thread (or dental floss)
  - Trekking poles
  - Whistle
  - Camera
  - Optics
  - Field and scout guides

# Gear

## What/ How to Pack – How to Pack Gear

- Weight distribution
  - Pack heavy stuff higher
  - Center of gravity should be high and close to back
- What will you need quick access to
  - Pack items you need on go so they are easy to get to
    - In outside pockets
    - High in pack
    - This includes
      - Rain gear
      - Water and snacks
      - First-aid kit
  - Pack camp items lower



# Gear

## **What/ How to Pack – What do you really need?**

- Be prepared
  - Not being prepared in the wilderness can be deadly
  - Know what to bring
  - Don't fool around

# Gear

## **What/ How to Pack – What do you really need?**

- You don't need 120 pounds of gear
  - If so, you need an alternate way of transporting it

# Gear

## What/ How to Pack – What do you really need?

- Ultralight-weight backpacking?
  - Option for very experienced backpackers
  - May lead to a miserable night or trip if weather turns
  - May be miserable even if weather is ideal
  - Dangerous technique for those who aren't experienced in technique
    - Must know the minimum you need to stay alive
    - Must know when to cancel trip or turn back
    - Must know wilderness survival techniques
      - Your life may depend on it

# Gear

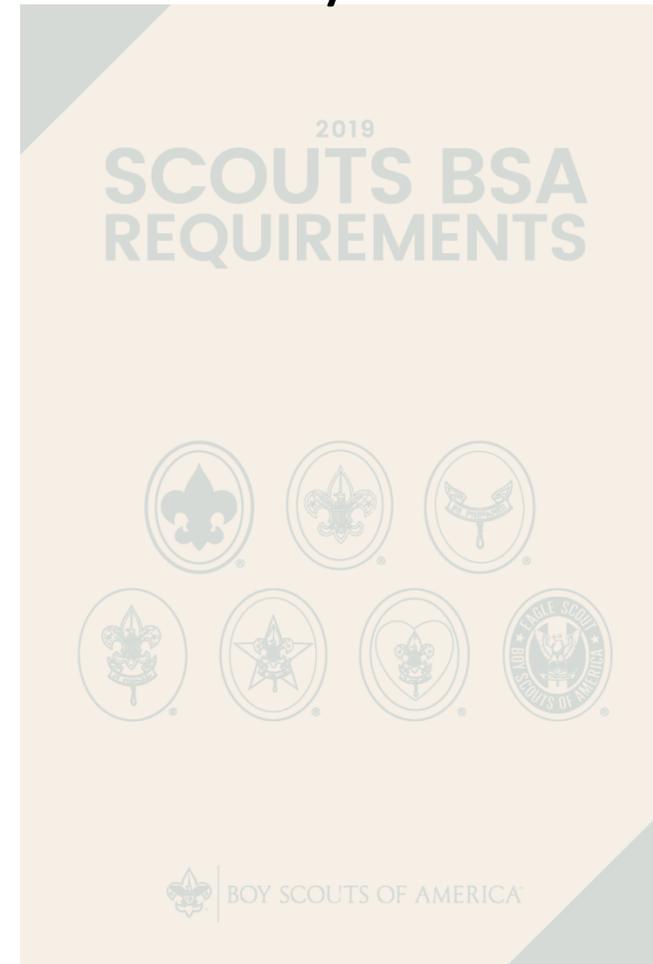
## **What/ How to Pack – What do you really need?**

- You need a balance
  - Figure out what you really need
  - Lay it out
  - Can you safely go lighter?
  - Lay it out
  - Have someone else double check it
  - Try it on a short overnight outing with an emergency backup plan
  - What did you learn?
  - Knowing what to pack comes from experience, not packing lists

# Gear

## Requirement 2b – How/What to Pack

Describe 10 ways you can limit the weight and bulk to be carried in your pack without jeopardizing your health or safety.



# Gear

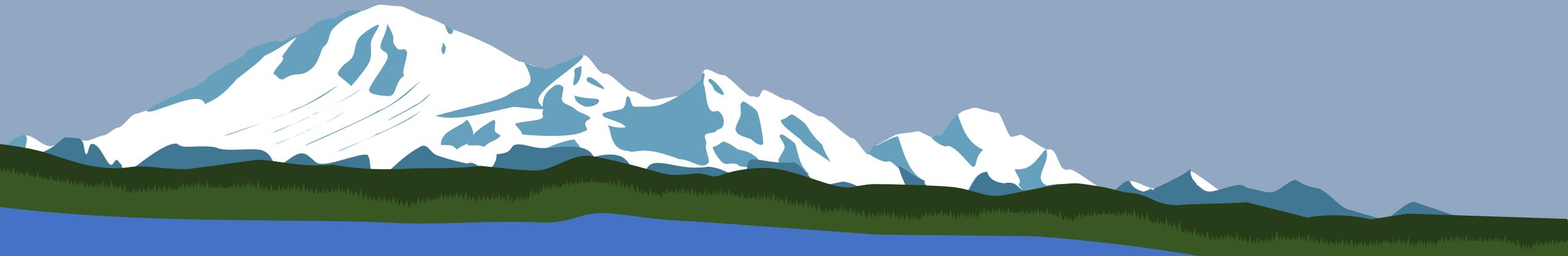
## **What/ How to Pack – Ways to reduce bulk and weight**

1. Use lightest weight tent for weather – or use a tarp
2. Use sleeping system rated for expected weather not the arctic
3. Limit clothing packed – you don't need clean clothes every day
4. Is there a better cook system option – are you carrying too much fuel?
5. Repackage food into ziplock bags – take only what you need
6. Do you need dishes and bowls – eat out of pot or bag
7. Plan to collect water along the way – don't pack water for entire trip
8. Don't pack books – if needed print only what you need
9. Do you need heavy duty boots? – wear what you really need
10. What didn't you use on your last trip – do you really need it next time?

- 1. [Merit Badge Requirements](#)
- 2. [Merit Badge Intro](#)
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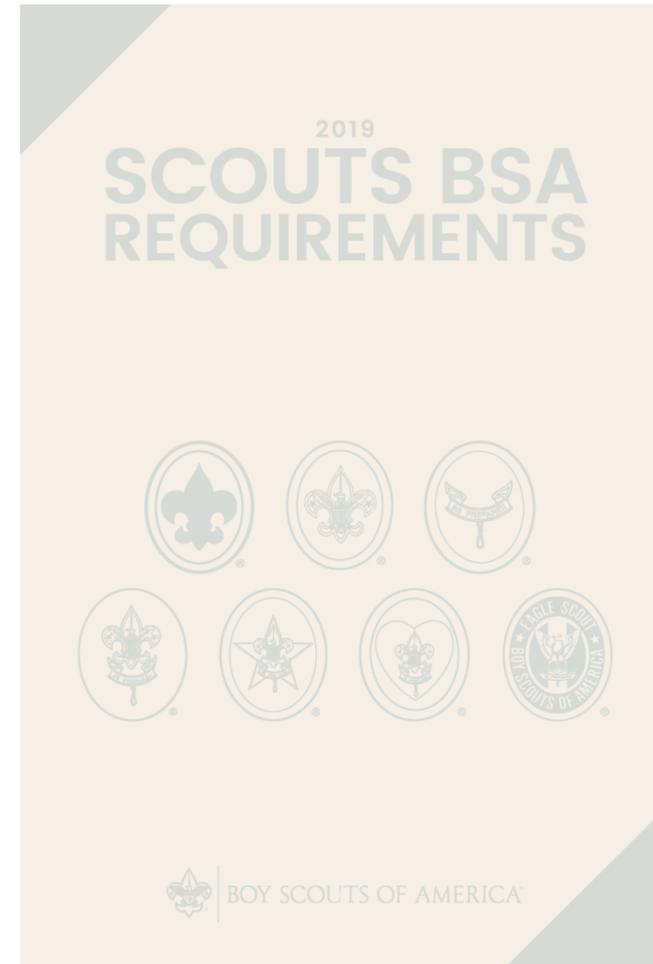
# Water



# Water

## Requirement 5a – Water Treatment

Demonstrate two ways to treat water and tell why water treatment is essential.



# Water Procurement

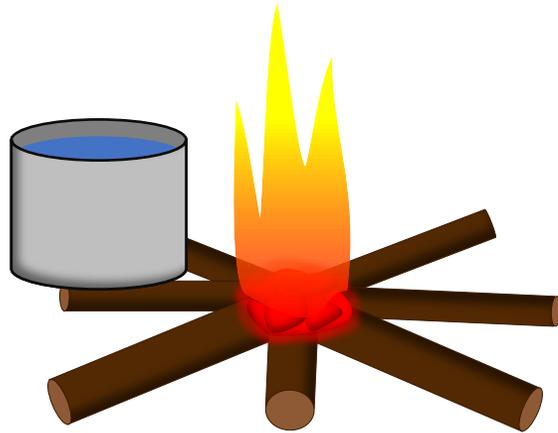
## Water Purification

- Water in the Wilderness may be contaminated with:
  - Viruses
  - Bacteria
  - Protozoa
  - Flukes
  - Leaches
  
  - These can be Deadly!

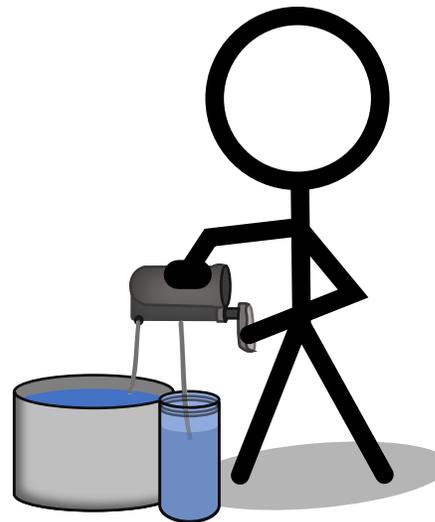
# Water Procurement

## Water Purification

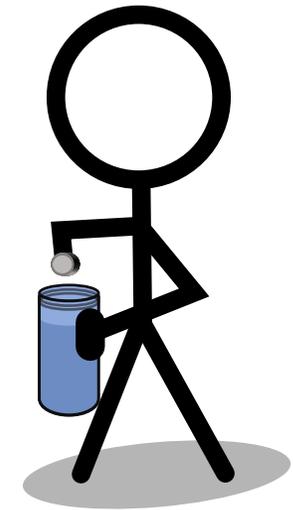
- There are several methods for treating water
  - Boiling
  - Filtering
  - Chemical Treatment



Boil



Filter



Chemical Tabs

# Water Purification

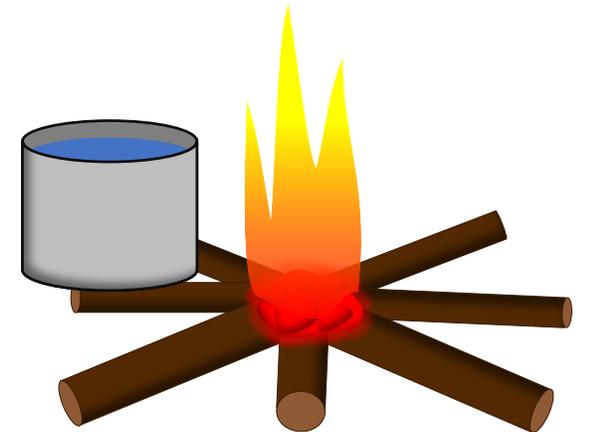
## Water Purification

Organism	Boiling	Filtration	Iodine or Chlorine	Chlorine Dioxide	Filter AND Disinfection
<i>Cryptosporidium</i>	++++	++++ ≤1.0 Micron Filter	—	+ to ++	++++ ≤1.0 Micron Filter
<i>Giardia</i>	++++	++++ ≤1.0 Micron Filter	+ to ++	+++	++++ ≤1.0 Micron Filter
Bacteria	++++	+++ ≤0.3 Micron Filter	+++	+++	+++ ≤0.3 Micron Filter
Viruses	++++	—	+++	+++	+++

# Water Purification

## Water Purification – Boiling

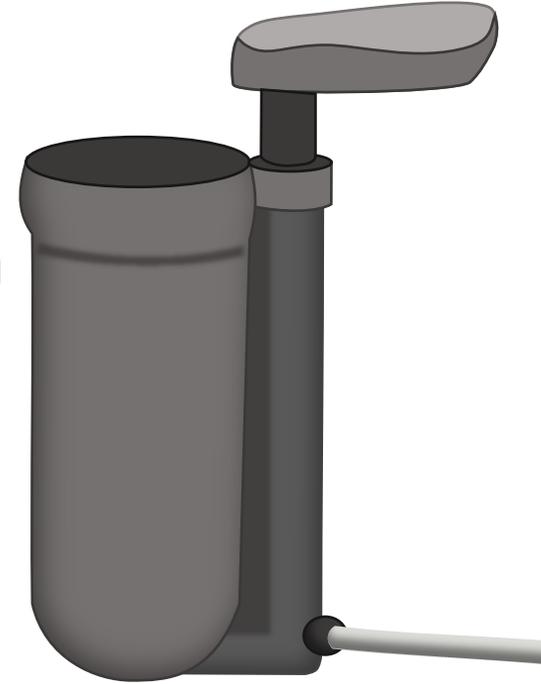
- Boiling is sufficient to kill pathogenic bacteria, viruses and protozoa
- At sea level, pure water boils at 212°F (100°C)
- Summit of Mount Everest, pure water boils at about 154°F (68°C)
- **Disinfection** (inactivate enteric pathogens):
  - Bring water to a rolling boil for at least 1 minute
  - Altitudes > 5,000 feet (1,000 meters), boil water for 3 minutes
- **Sterilization** (inactivate all heat resistant spores)
  - Boil for 10 minutes



# Abdominal Problems

## Water Purification – Filtration

- **High-quality\*** water filtration units are effective for Giardia
- Most quality microfilters are effective for Bacteria
- Few Water filters can safely filter out Viruses
- Filters can clog and/or become contaminated
- Disinfectant treatment can be added to filtered water for better results



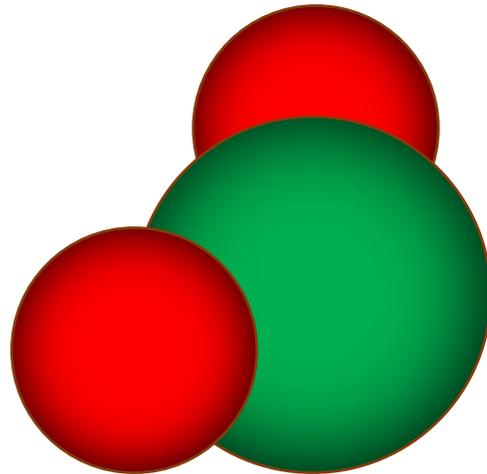
Organism	Examples	General Size	Filter Type	Particle Size Rating
Protozoa	<i>Giardia, Cryptosporidium</i>	5 microns or larger	Water filter	1.0–4.0 microns
Bacteria	<i>Cholera, E. coli, Salmonella</i>	0.2–0.5 microns	Microfilter	0.2–1.0 microns
Viruses	Hepatitis A, rotavirus, Norwalk virus	0.004 microns	Water purifier	to 0.004 microns

\*many Tactical Survival Straws and other snazzy filters are garbage – despite claims they filter out viruses

# Water Purification

## Water Purification – Chlorine Dioxide

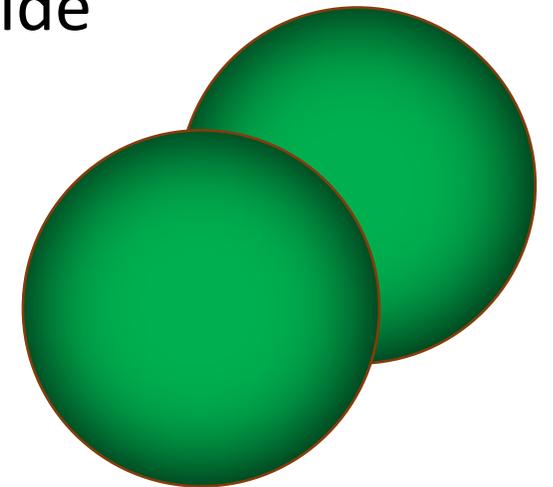
- More effective against viruses than chlorine
- As good or better against bacteria compared to chlorine
- Effective against *Cryptosporidium oocysts* (dose/time dependent)



# Water Purification

## Water Purification – Water Disinfection Tabs

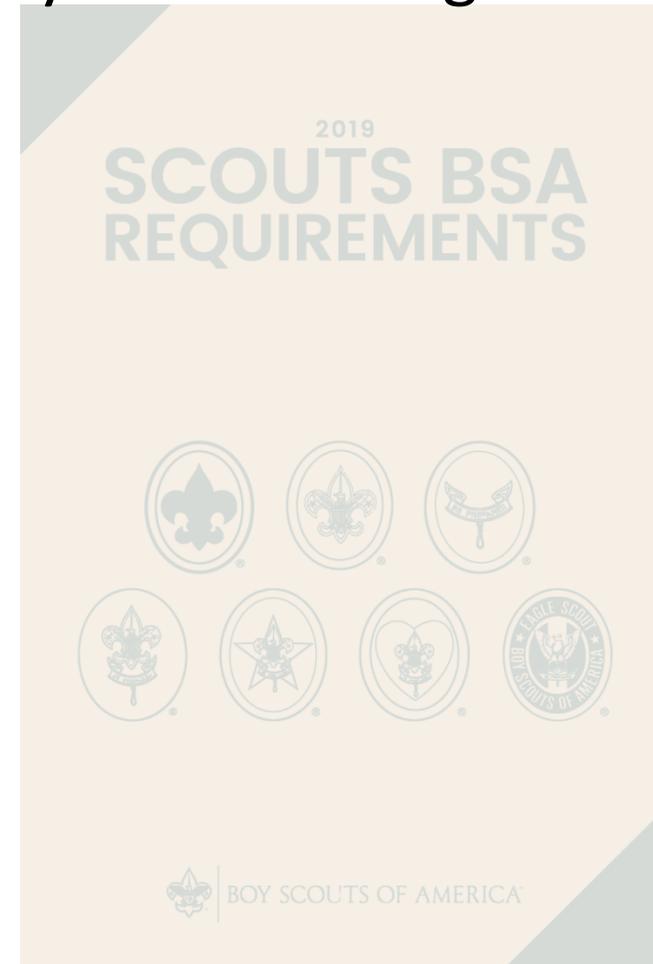
- Chlorine, Iodine, Chlorine Dioxide, Others
- **Katadyn Micropur MP1** - Chlorine Dioxide
  - Bacteria 15min, Giardia in 30min and Cryptosporidium in 4hrs
- **Potable Aqua Chlorine Dioxide**
- **Aquamira Water Purifier Tablets** - Chlorine Dioxide (2-part drops)
- **Potable Aqua with PA+Plus** - Tetraglycine Hydroperiodide
  - NOT effective against Cryptosporidium
- **Aquatabs** - Sodium Dichlorisocyanurate
  - NOT effective against Cryptosporidium
- Follow manufacturer's instructions



# Water

## Requirement 5b – Hydration

Explain to your counselor the importance of staying well hydrated during a trek.



# Water

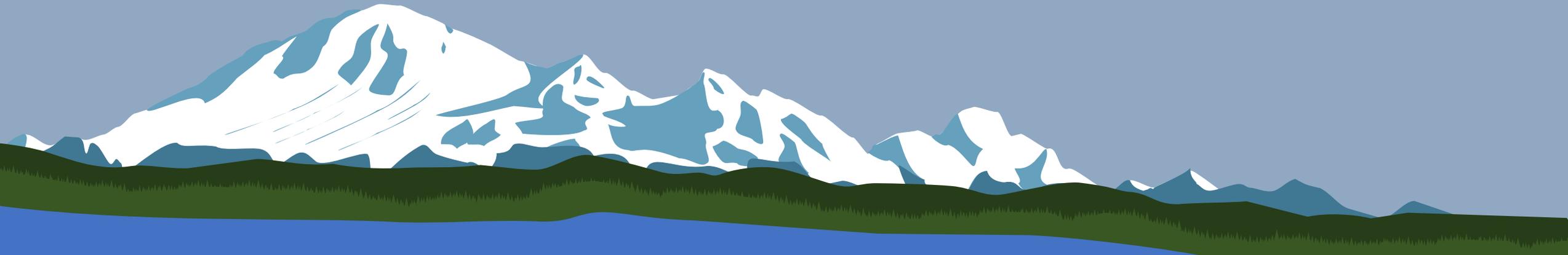
## Hydration

- Don't get dehydrated
- Increase risk of cold and heat injuries
- Consciously remind yourself to drink water
  - Especially important in the cold
  - People forget to drink water when it is cold out and are not thirsty
- If your urine color is dark – you need to drink more water
  - Urine should be clear or very light straw colored

- 1. [Merit Badge Requirements](#)
- 2. [Merit Badge Intro](#)
- 3. [First Aid](#)
- 4. [Gear](#)
- 5. [Water](#)
- 6. [Food](#)
- 7. [Navigation](#)
- 8. [Leave No Trace](#)
- 9. [Preparation](#)
- 10. [Getting Out There](#)
- 11. [First Thoughts](#)
- 12. [Resources](#)
- 13. [Instructor's Corner](#)



# Food



# Food

## Food

- Food vital on a backpacking trip
- Provides energy to complete trip
- Helps keep you healthy and alert – decreasing occurrence of accidents
- Moral booster
  - Some will have significantly reduced performance if eating poorly

# Food

## Food - Options

- Food options come in many varieties
  - Dry Foods
  - Fresh Foods
  - Canned Foods
  - Convenience Foods
  - Dehydrated Foods
  - Seasoning



# Food

## Food – Options - Dry Foods

- **Dry Foods**
  - Excellent bang for buck
  - Reasonable weight
  - Nuts
  - Pasta
  - Biscuit mix
  - Beans
  - Rice
  - Seeds
  - Powdered milk



# Food

## Food – Options - Fresh Foods

- **Fresh Foods**
  - Can be heavy
  - Use them early in trip before they spoil
  - Cheeses and Preserved Meats are excellent



# Food

## Food – Options - Canned Foods

- **Canned Foods**
  - Delicious meal options are available
  - Heavy
  - Some have astronomical amounts of sodium
  - Produces a lot of trash
    - Should be washed out, flattened and packed out



# Food

## Food – Options - Convenience Foods

- **Convenience Foods**
  - Instant meals in a bag
  - Pancake mixes
  - Jerky
  - Energy bars
  - Macaroni and cheese
  - Other mixes



# Food

## Food – Options - Dehydrated Foods

- **Dehydrated Foods**
  - Extremely light weight
  - Easy to prepare - just add water
  - Can be made at home
  - Backpack meals are be purchased – but are expensive



# Food

## Food – Options - Seasoning

- **Seasoning**
  - Don't forget your favorite seasoning
  - Turns any bland meal in to something delicious
  - Repack into small pill bottles



# Food

## **Food – Repackaging**

- Foods can be repackaged into small freezer bags
- Seals and protects food
- Reduces trash
- Can make meals easy if meals are packaged into individual bags

# Food

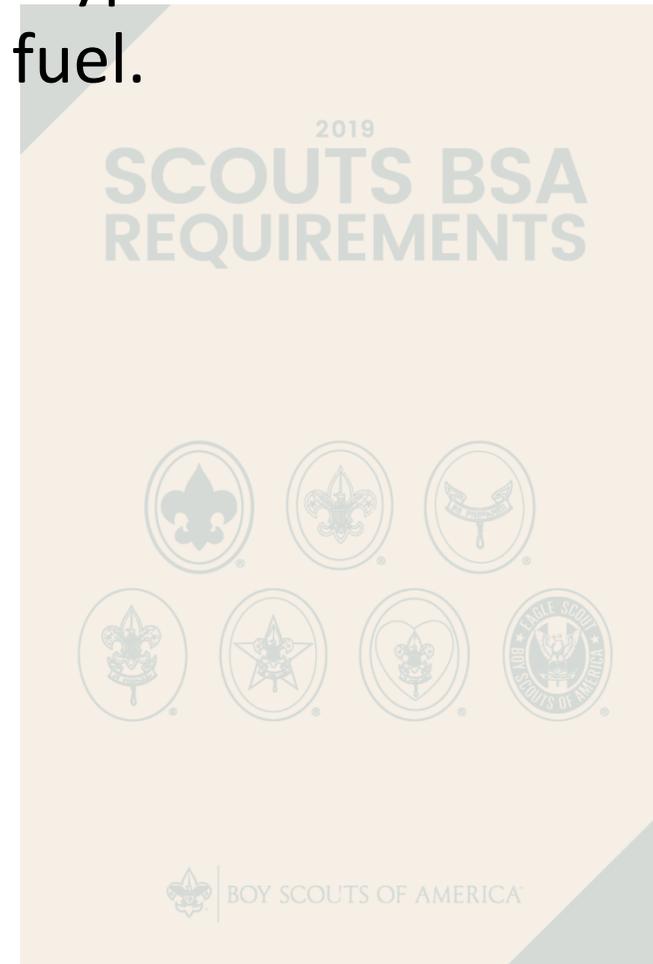
## **Food - Cooking**

- Some foods **MUST** be cooked
- Other are **MUCH** better if cooked

# Food

## Requirement 8a - Stoves

Explain the advantages and disadvantages of the different types of backpacking stoves using at least three different types of fuel.



# Food

## Stoves – BSA Policy

- **Approved chemical-fueled equipment**  
Commercially manufactured equipment, including stoves, grills, burners, heaters, and lanterns that are designed to be used with chemical fuels.
- **Prohibited chemical-fueled equipment**  
Equipment that is handcrafted, homemade, modified, or installed beyond the manufacturer's stated design limitations or use. Examples include alcohol-burning "can" stoves, smudge pots, improperly installed heaters, and propane burners with their regulators removed.

# Food

## Backpacking Stoves – Nitty Gritty

- **Gas Stoves**
  - Easiest to use Stoves for Backpacking
- **Liquid Petroleum Stoves**
  - Most practical for extreme cold weather
- **Wood Stoves**
  - Great if you have available fuel
- **Alcohol Stoves**
  - Not recommended by BSA but used by many ULW backpackers
- **Chemical Fuel Tabs**
  - Light weight with low heat output

# Food

## Gas Stoves – Propane and Butane

- Very popular backpacking stove option
- Use canisters filled with liquified gasses



# Food

## Backpacking Stoves – Fuels – Gas

Fuel	Notes
Gas Fuels	Stoves are very easy to operate Can adjust output from minimal flame to blowtorch This allows for easy snow melt and simmering No flareups Affected by cold temperatures around or below freezing

# Food

## Backpacking Stoves – Fuels – Gas

Fuel	Notes
Gas Fuels	<p>Gas fuel needs to be stored in special canisters</p> <ul style="list-style-type: none"><li>• Butane canisters can be expensive</li><li>• Special blends of gas are even more expensive</li><li>• Difficult to carry, “just enough” fuel<ul style="list-style-type: none"><li>○ Instead – need to round up to next canister</li></ul></li><li>• Propane canisters are large and heavy</li><li>• Canisters produce trash</li><li>• Can be difficult to find Butane canisters in small towns</li></ul>

# Food

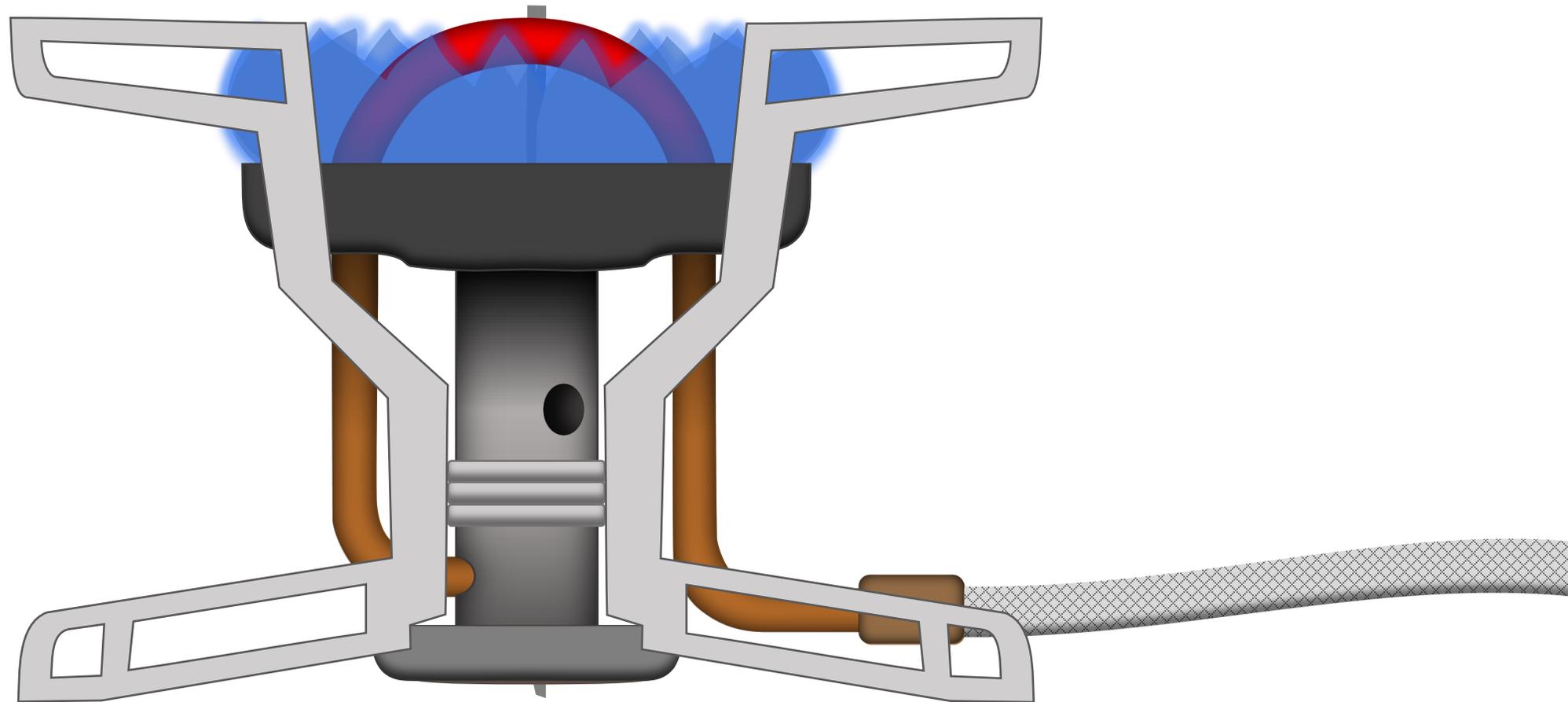
## Backpacking Stoves – Fuels – Gas

Fuel	Notes
Propane	Vaporizes around -43°F (-40°C) at sea level Excellent cold weather fuel Great heat per weight ratio Canisters are large and heavy Stoves also tend to be large and heavy
Butane	Vaporizes around 31°F (-0.5°C) at sea level Use in cold weather requires special techniques Will completely fail to work in low temperatures
Isobutane	Vaporizes around 11°F (-12°C) at sea level Much better fuel for temps around freezing level

# Food

## Liquid Petrol Stoves

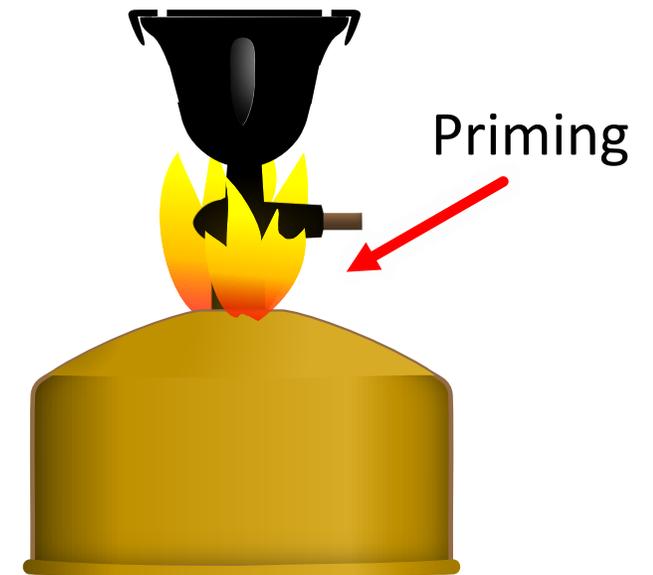
- High performance stoves use liquid petroleum fuels



# Food

## Liquid Petrol Stoves

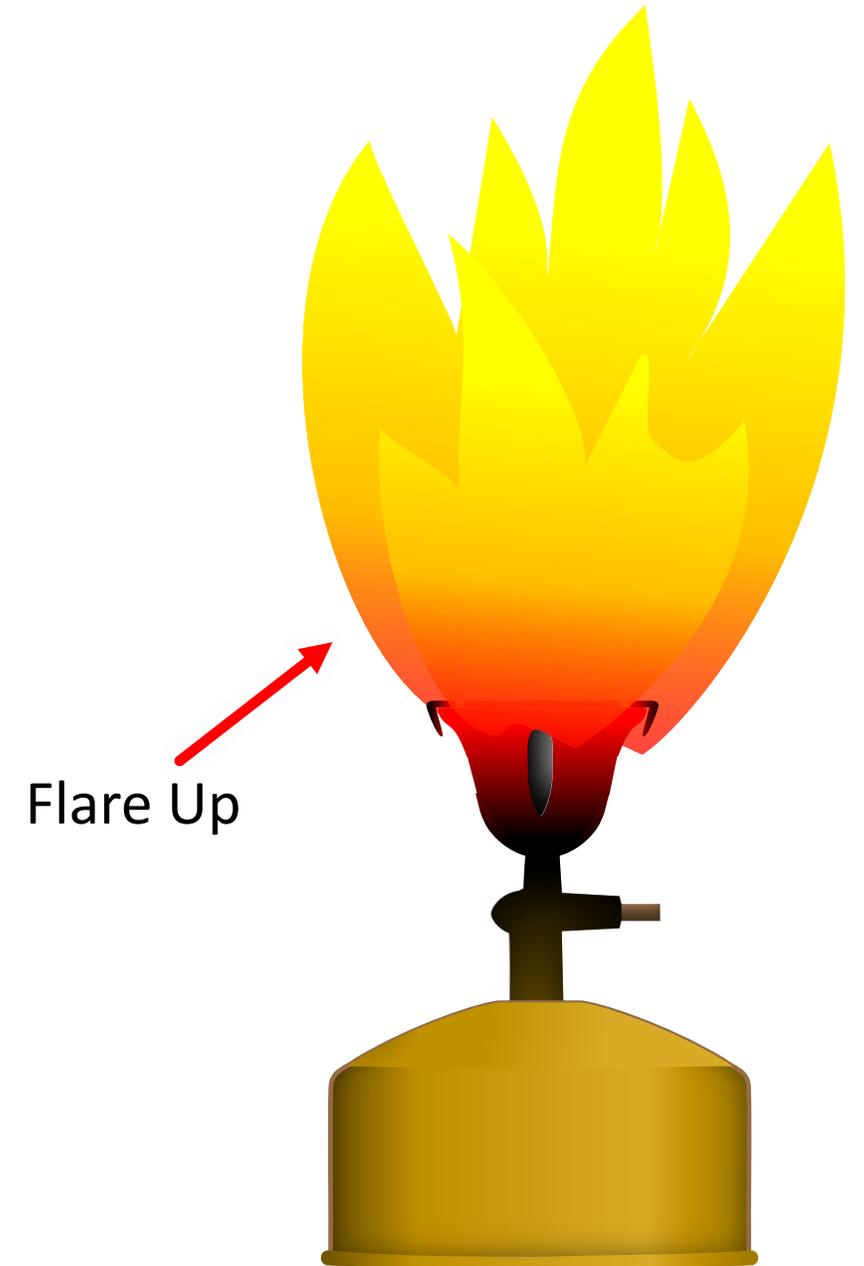
- Petrol stoves need to be primed
  - Priming preheats stove for use



# Food

## Liquid Petrol Stoves

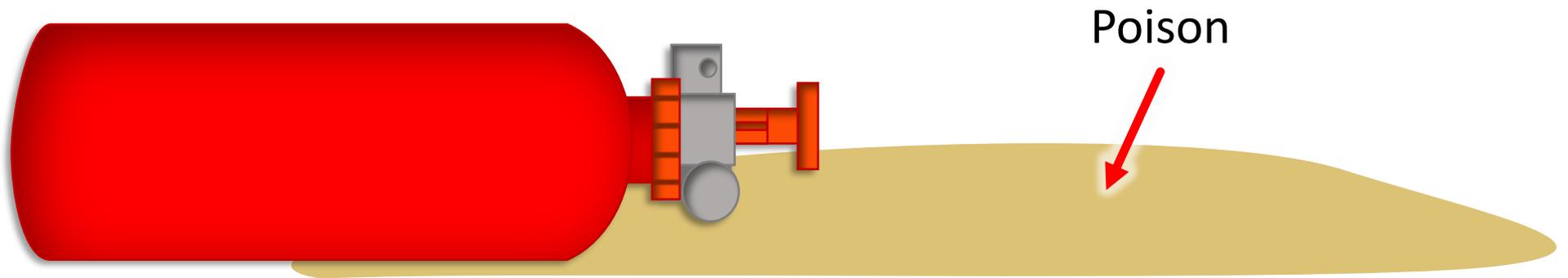
- These tend to flare up
  - Big eyebrow singeing flames
  - Especially as you start up the stove
  - If this happens in a tent, your tent can instantly catch fire



# Food

## Liquid Petrol Stoves – Fuel is Poisonous!

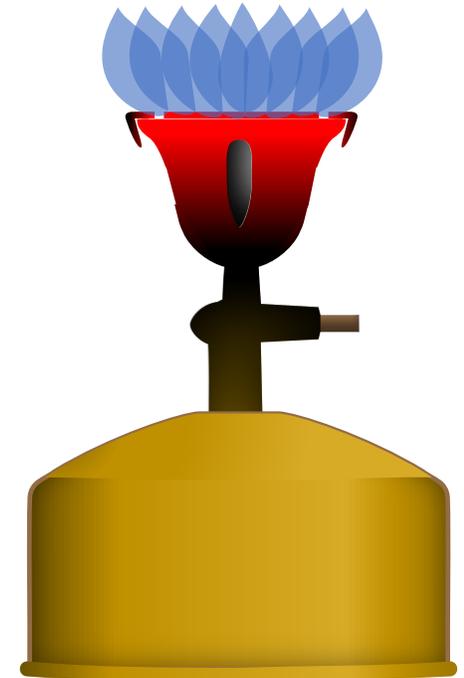
- Store food and fuel in separate places
  - If fuel leaks on food, you will not be able to eat it
  - If fuel leaks on all of your food, you lose all of your food!



# Food

## Liquid Petrol Stoves

- Proper use requires Adult Supervision



# Food

## Backpacking Stoves – Fuels – Petrol

Fuel	Notes
Petrol Fuels	<p>Great heat to weight ratio</p> <p>Can be used in extremely cold environments</p> <p>Requires knowhow to use</p> <p>Risk of flareups – extremely dangerous in tents!</p> <p>Stoves tend to clog over time and require maintenance</p> <p>Difficult to adjust output compared to gas</p> <p>Fuels smell</p> <p>Spilled fuel can damage gear and poison food</p> <p>Sounds like a roaring rocket (pro or con)</p>

# Food

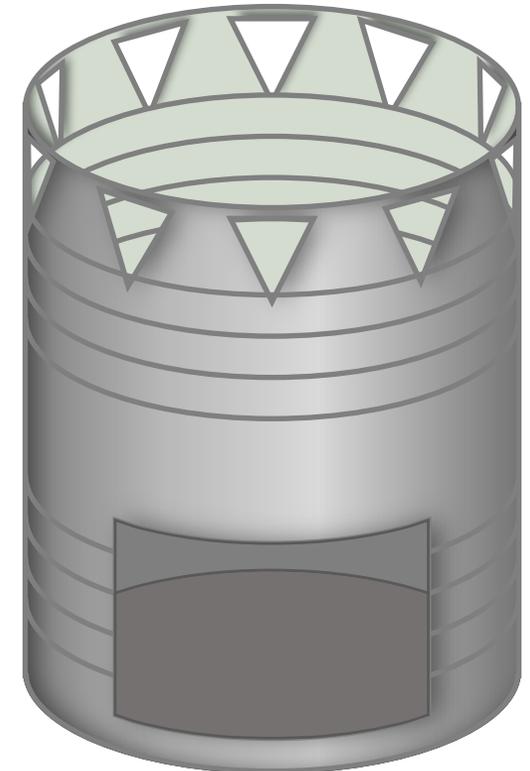
## Backpacking Stoves – Fuels – Petrol

Fuel	Notes
White Gas/ Coleman Fuel	Cheap and available in many big stores Burns relatively clean for a petrol fuel
Kerosene	Available worldwide Smells Smoky
Gasoline	Easy to find worldwide Explosive Contains toxic additives – do not inhale burned fumes <b>Not recommended for stove use by BSA</b>

# Food

## Backpacking Stoves – Wood Stoves

- Wood stoves, small and large, increase efficiency of burning wood
- Compared to cooking with a Campfire:
  - Walls insulate and reflect heat back into fire to keep fuel hot
  - Protects fire from wind
  - Allows for better air flow
  - Allows for better gasification
  - Better ability to burn wet fuels
  - Uses much less fuel
  - Much better focus of heat
    - Faster and easier cooking



Hobo Stove

# Food

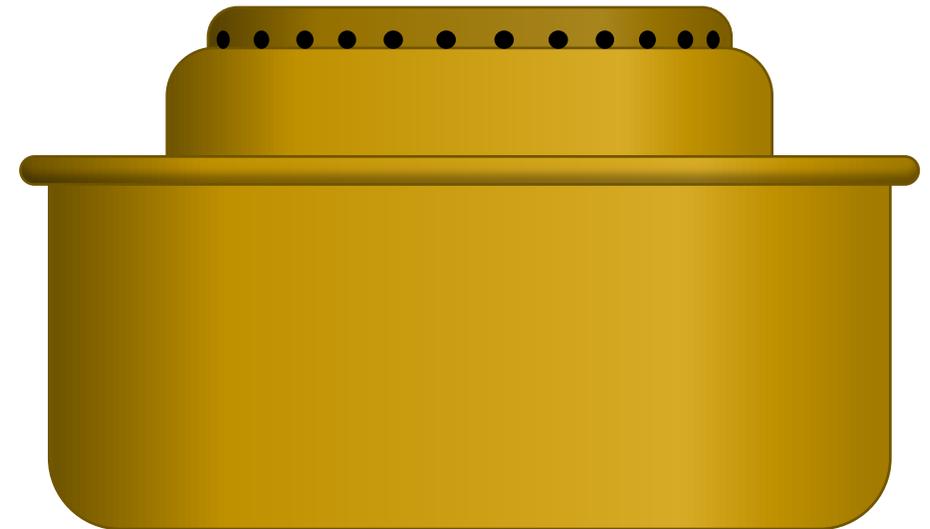
## Backpacking Stoves – Fuels – Natural

Fuel	Notes
Wood	Variable availability -May have plenty -May have none May not be allowed to harvest In an emergency, you can cut up trees Fuel can be packed in, but will be heavy <b>Subject to Burn Bans</b>
Peat	May be available if you know where to look Ireland
Other biofuels	Grasses, pine needles, cow patties, etc.

# Food

## Alcohol Stoves

- Clean renewable fuel has benefits
- Used by military units in Europe
- Very light weight
- Can pack fuel in plastic bottle
- Examples:
  - Trangia Swedish Army Stove
  - Sterno
  - DIY stoves – **PROHIBITED by BSA**



# Food

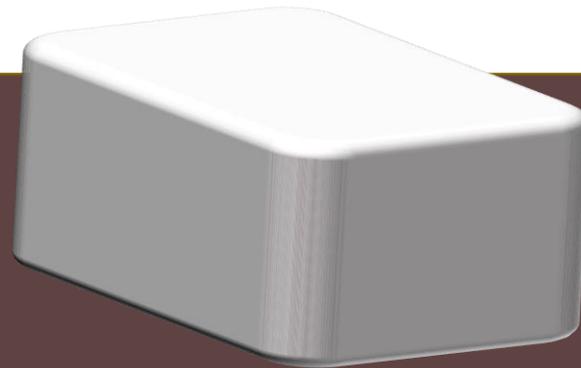
## Backpacking Stoves – Fuels – Alcohol

Fuel	Notes
Alcohol	<p>Available in most hardware stores and some gas stations</p> <ul style="list-style-type: none"><li>• Denatured alcohol – used as paint thinner</li><li>• HEET antifreeze – yellow bottle is methanol</li><li>• Rubbing alcohol – burns dirty in most stoves</li></ul> <p>Poor heat output to weight ratio</p> <p>Spills aren't nasty like petrol spills – but are a fire hazard</p> <p>Used by mushers in Iditarod</p>
Canned Heat	<p>Some have alcohol suspended in mineral matrix</p> <p>Some use a wick to control burn and use poisonous fuel</p> <p>LOW heat output</p>

# Food

## Solid Chemical Fuels

- Single use fuel tabs
- Simple to use
- Very light weight
- Pack what you need
- LOW heat output



# Food

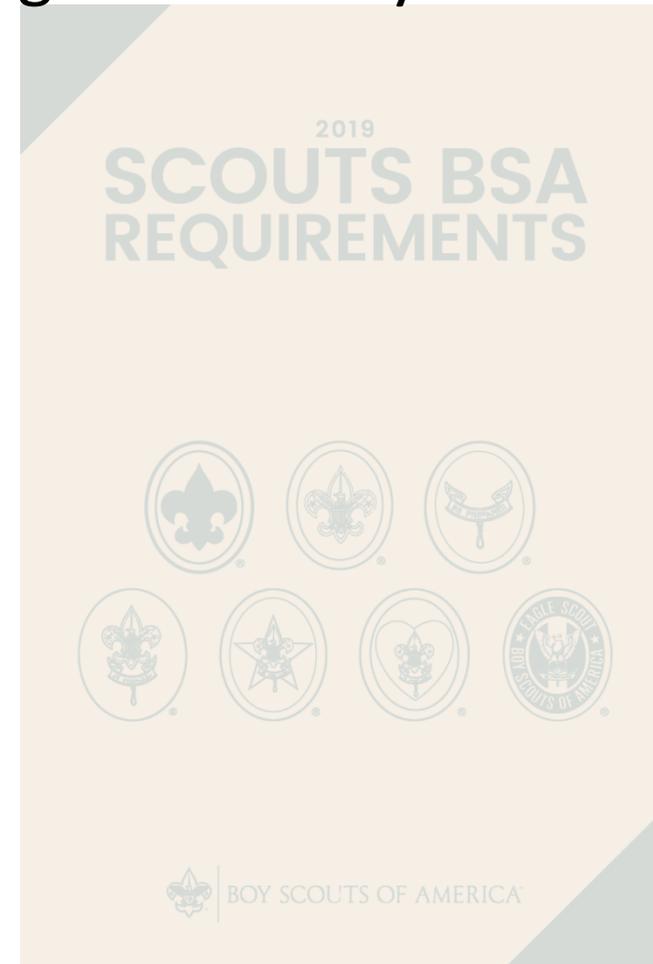
## Backpacking Stoves – Fuels – Solid Chemical Fuels

Fuel	Notes
Heat Tabs Esbit Hexamine	Found only in specialty stores Ultra light weight Simple to use – don't need a stove Low heat output Can be used safely as a Firestarter Smells like fish Blackens pots
Trioxane	Used by US military Don't touch with bare hands and then eat food Not as cheap as they used to be

# Food

## Requirement 8a – Using a Stove

Demonstrate that you know how to operate a backpacking stove safely and to handle liquid fuel safely.



# Food

## Stoves – BSA Policy

- **An adult knowledgeable about chemical fuels and equipment should always supervise youths involved in the storage, handling, and use of chemical fuels and equipment.**
- **No flames in tents. This includes burning any solid, liquid, gel, or gas fuel—including tents or teepees that feature or support stoves or fires; and any chemical-fueled equipment or catalytic heaters.**

# Food

## Gas Stove Use – Butane

- Butane stoves are the most popular style of backpacking stove
- Easy to light, boil and simmer with
  - Hook up canister to stove
  - Open valve
  - Light
  - When done, close valve and remove canister





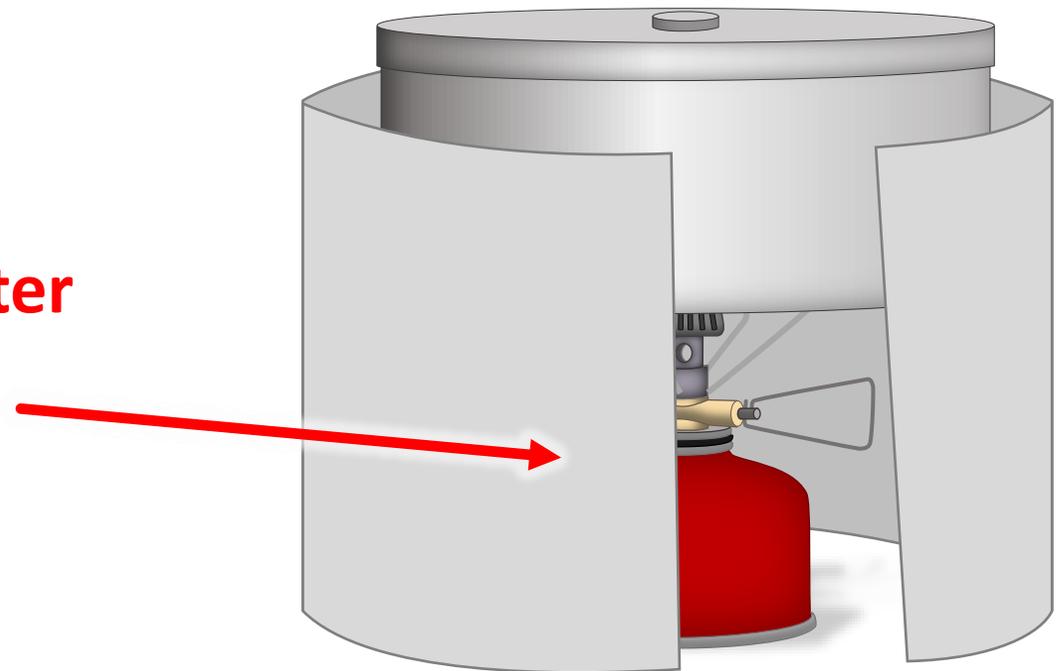
# Food

## Cold Weather Stove Use – Gas Stove Overheating

- Most gas stoves are mounted over the fuel canister
- **Burner over canister stoves can overheat!**
  - **Do NOT use tight fitting windscreen around this type of stove!**
  - Overheating may result in an **EXPLOSION!**

**Heat is reflected  
towards fuel canister  
and is trapped**

**Risk of Explosion!**



# Food

## Gas Stove Use – Propane

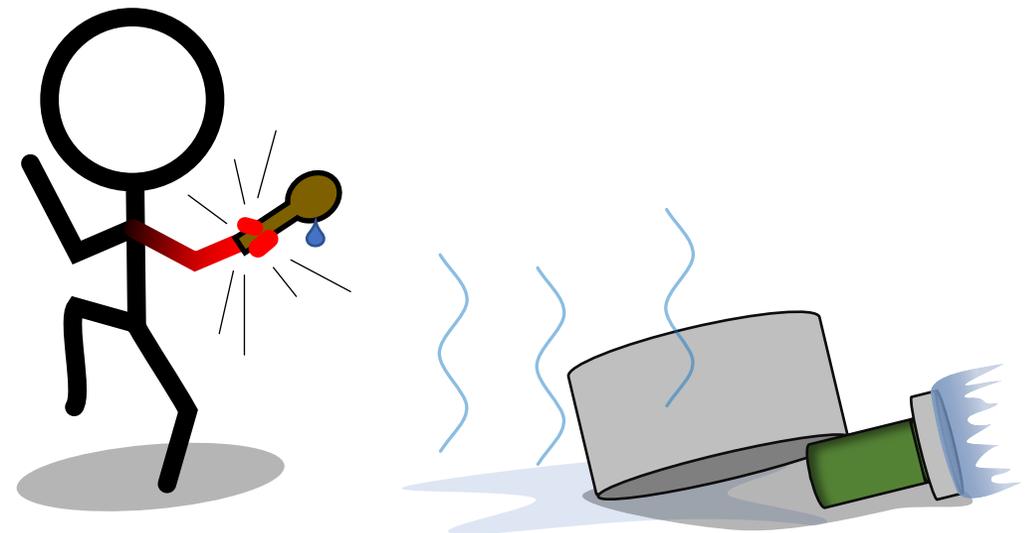
- Propane use is usually pretty straight forward
- Hook up stove to fuel canister
- Open valve
- Light with lighter
- Close valve when done
- Remove canister



# Food

## Gas Stove Use – Propane – Knock over Hazard

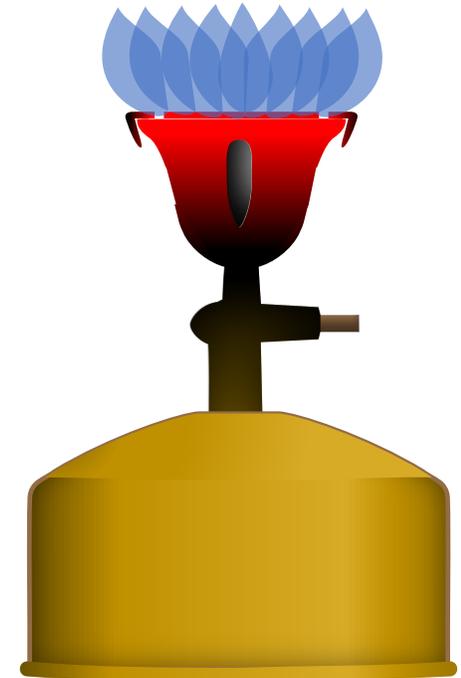
- Stove-over-canister designs are easy to knock over
  - Place on stable surface
  - Be careful to not knock over



# Food

## Liquid Petrol Stove Use

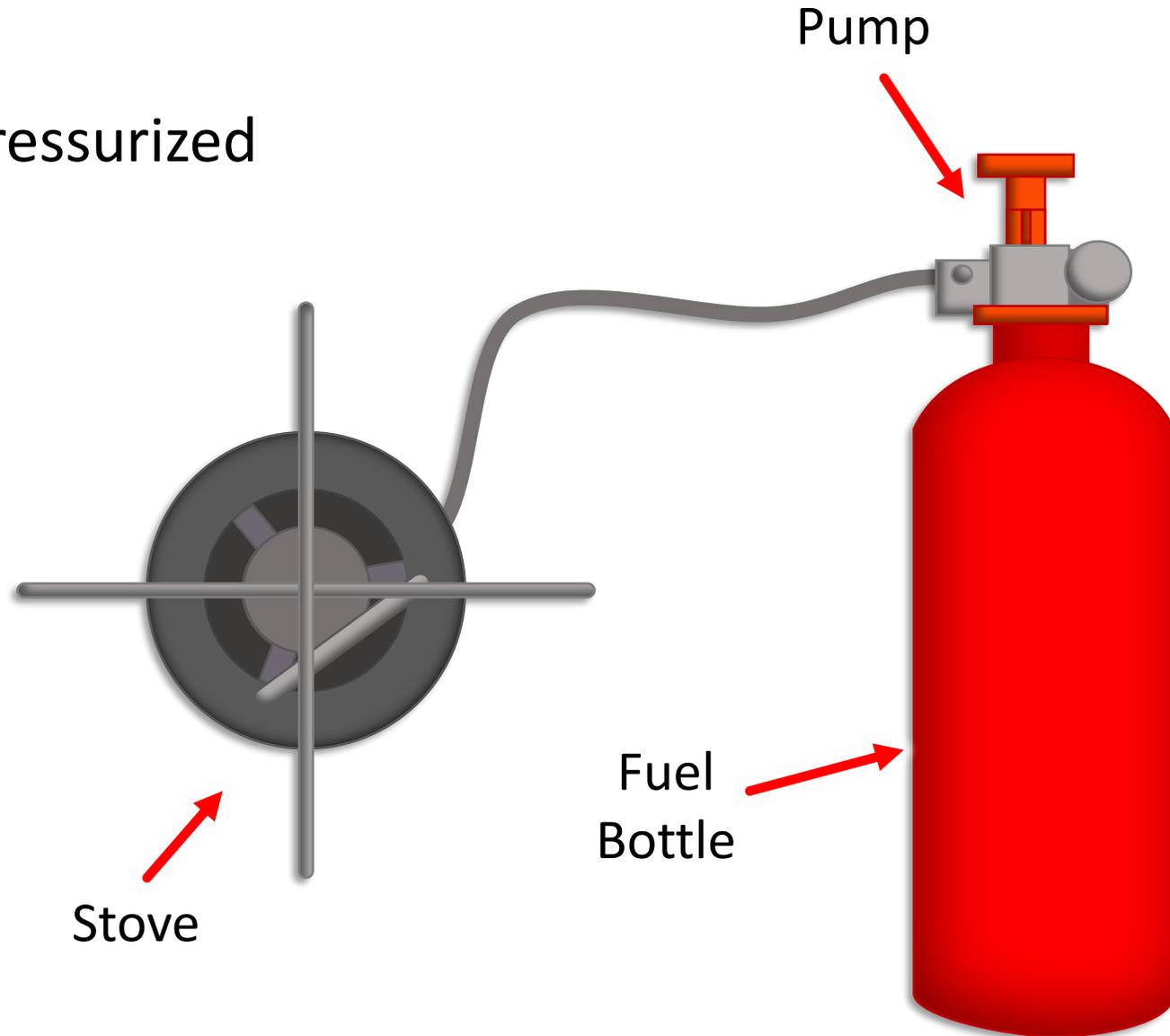
- Use is NOT intuitive
- **Scouts as well as adults need a hands-on class to understand use**
- **Use requires adult supervision**
- **Mistakes can lead to serious burns**



# Food

## Liquid Petrol Stove Use

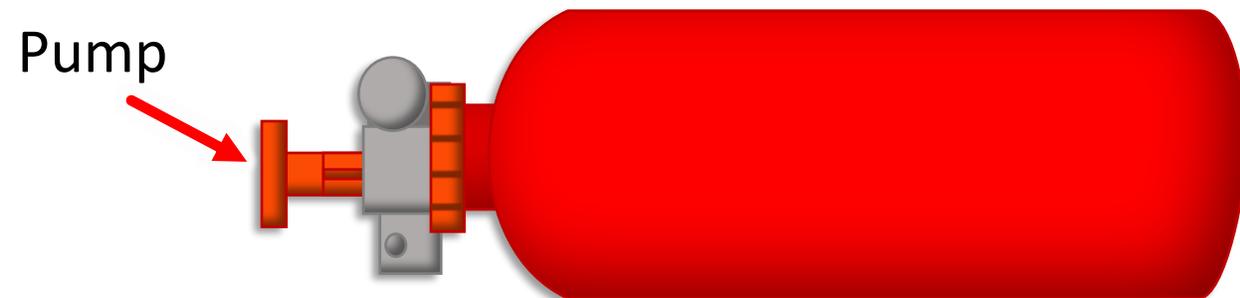
- Most petrol stoves need to be pressurized
  - Examples
    - MSR WhisperLite
    - MSR Dragonfly
    - MSR XGK
    - Primus OmniFuel
    - Optimus Polaris Optifuel



# Food

## Liquid Petrol Stove Use

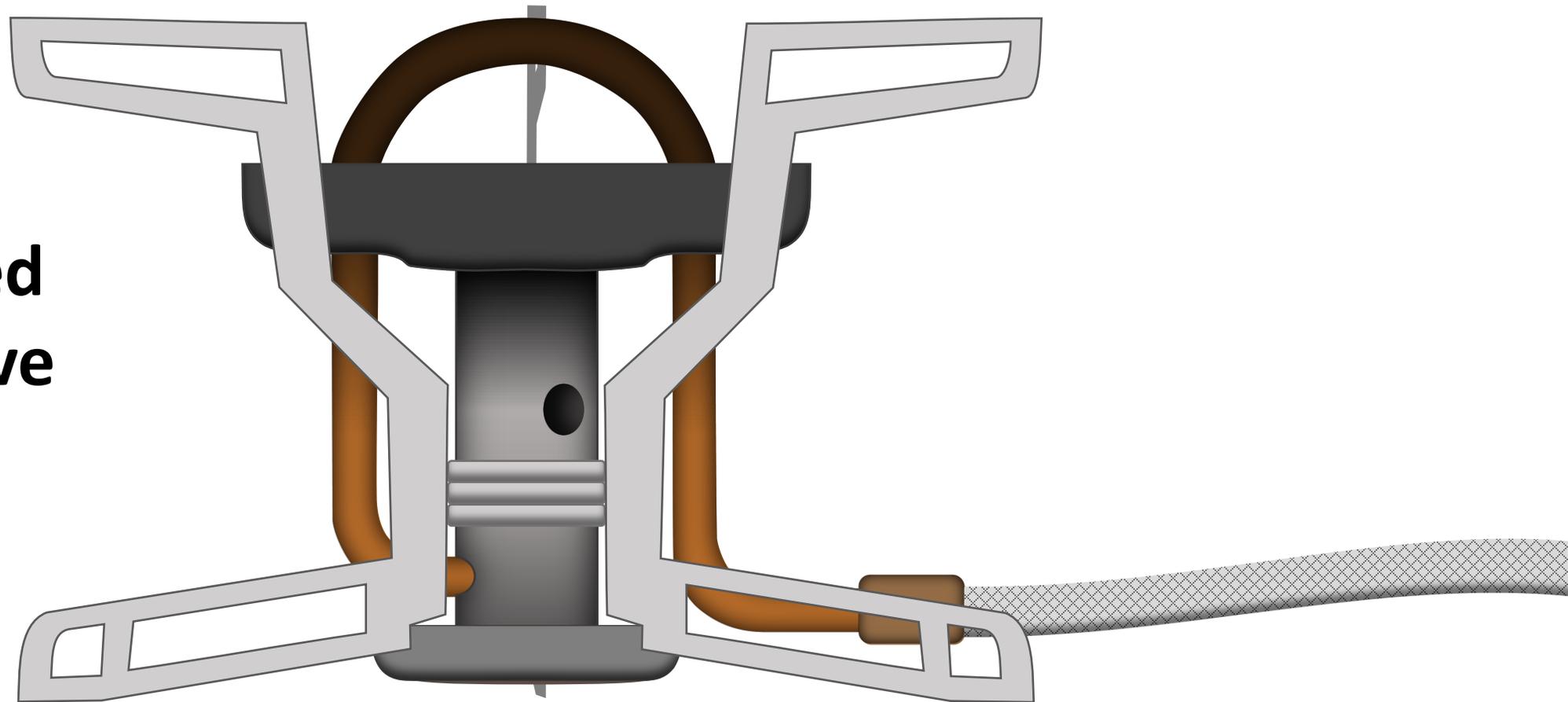
- Most petrol stoves need to be pressurized
  - Pumping pressurizes the fuel bottle
  - This forces liquid fuel in tank to move to generator tube and then jet
  - Fuel in generator tube is super heated
  - Vaporized fuel is shot through a jet into plate or other atomizer
  - Hot gasified fuel mixes with air and ignites



# Food

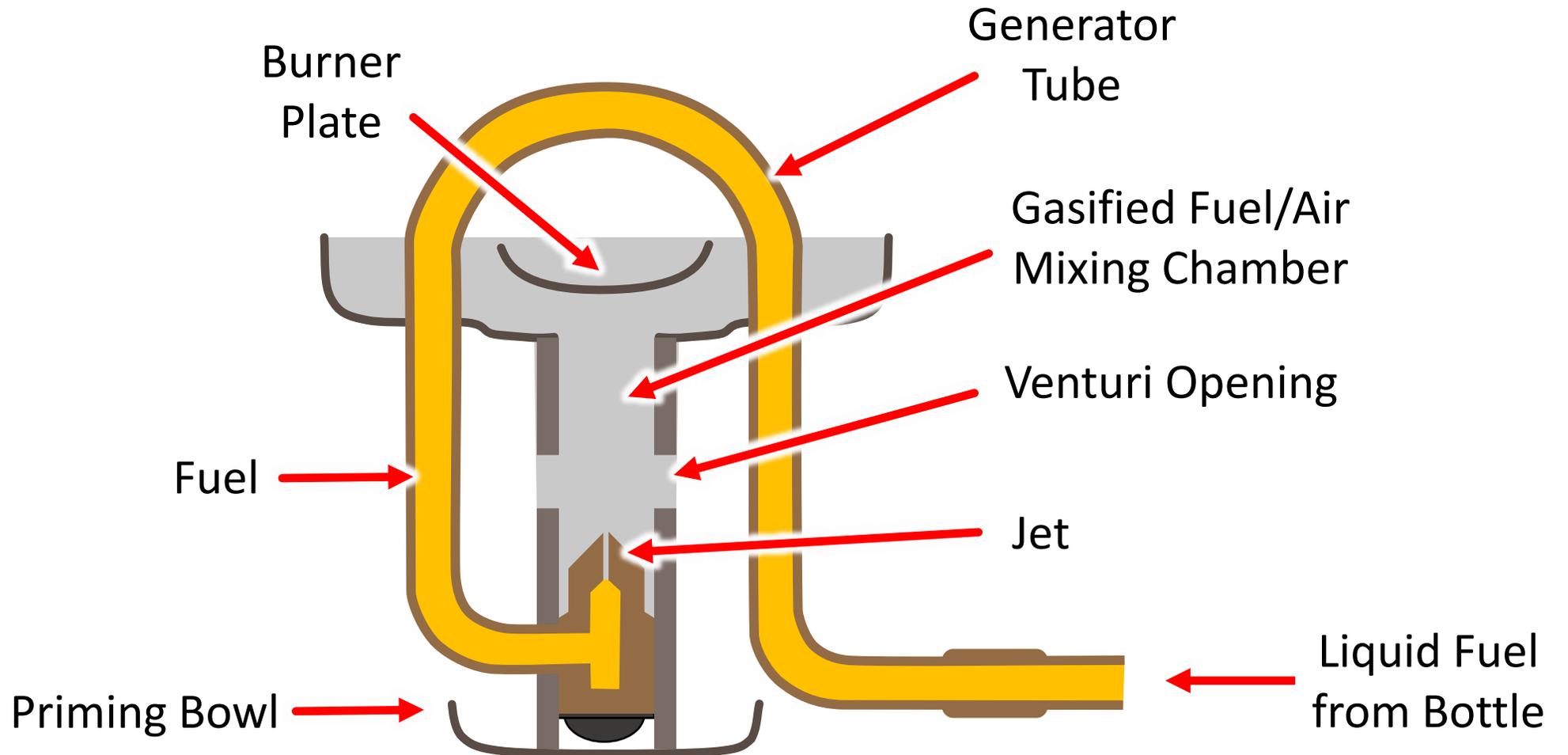
## Liquid Petrol Stove Use

## Pressurized Petrol Stove



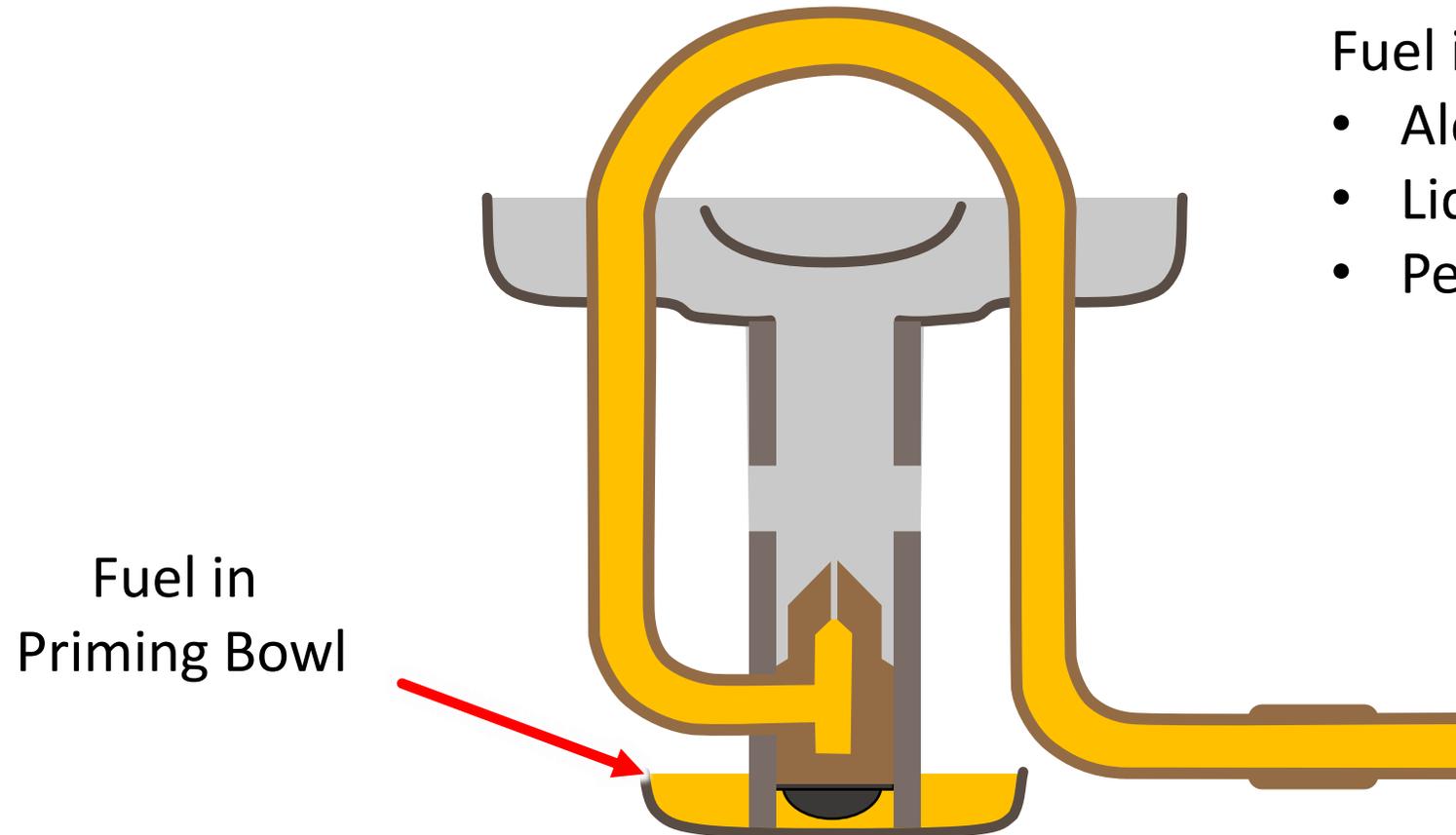
# Food

## Liquid Petrol Stove Use - Anatomy



# Food

## Liquid Petrol Stove Use - Priming

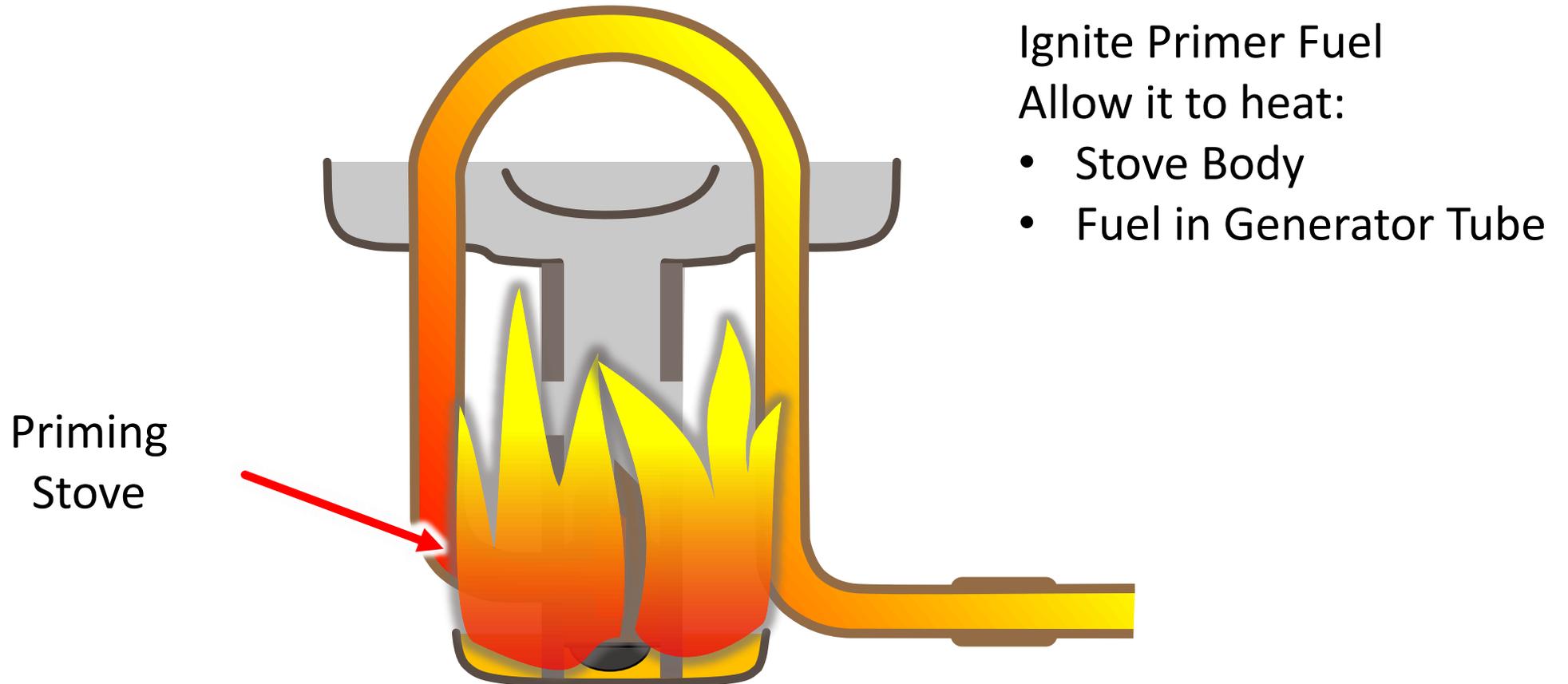


Fuel is added to primer bowl

- Alcohol Paste
- Liquid Alcohol or
- Petrol Fuel leaked from jet

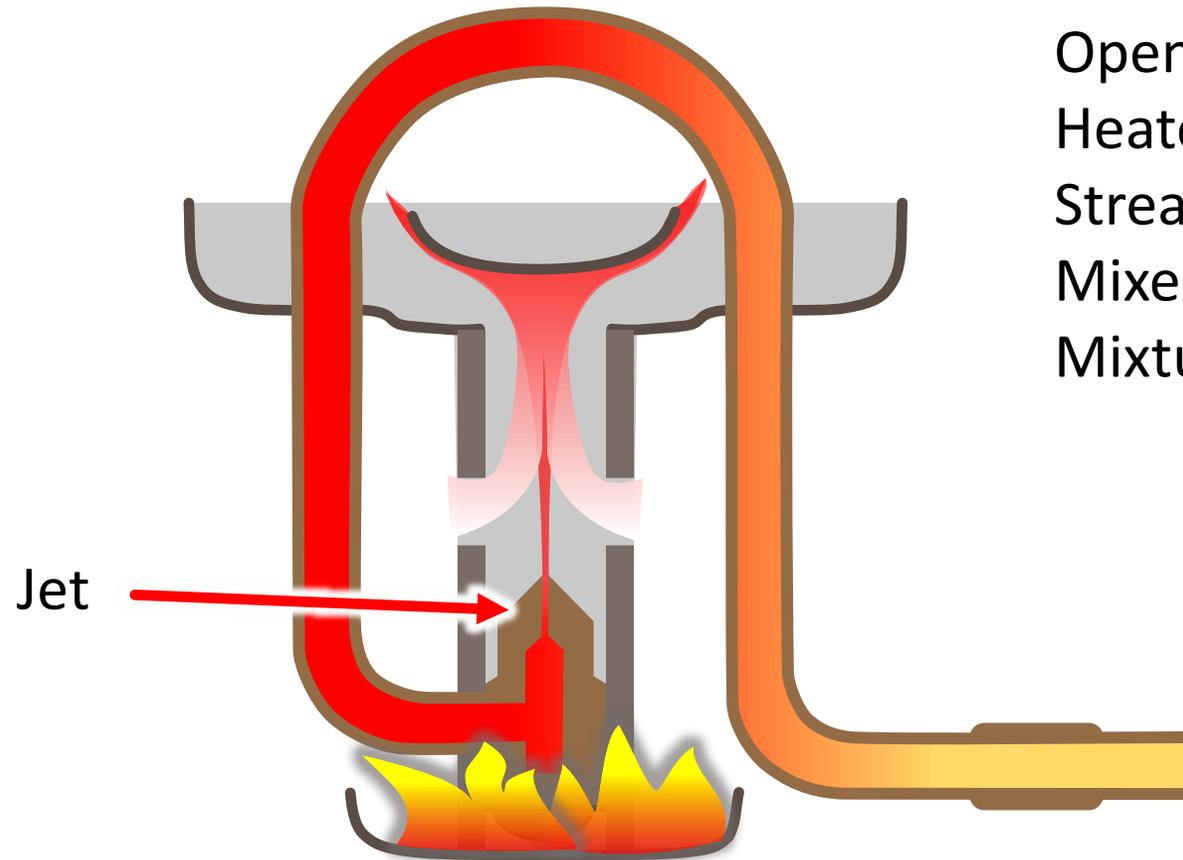
# Food

## Liquid Petrol Stove Use - Priming



# Food

## Liquid Petrol Stove Use – Operation



Open Jet

Heated fuel shoots out of jet

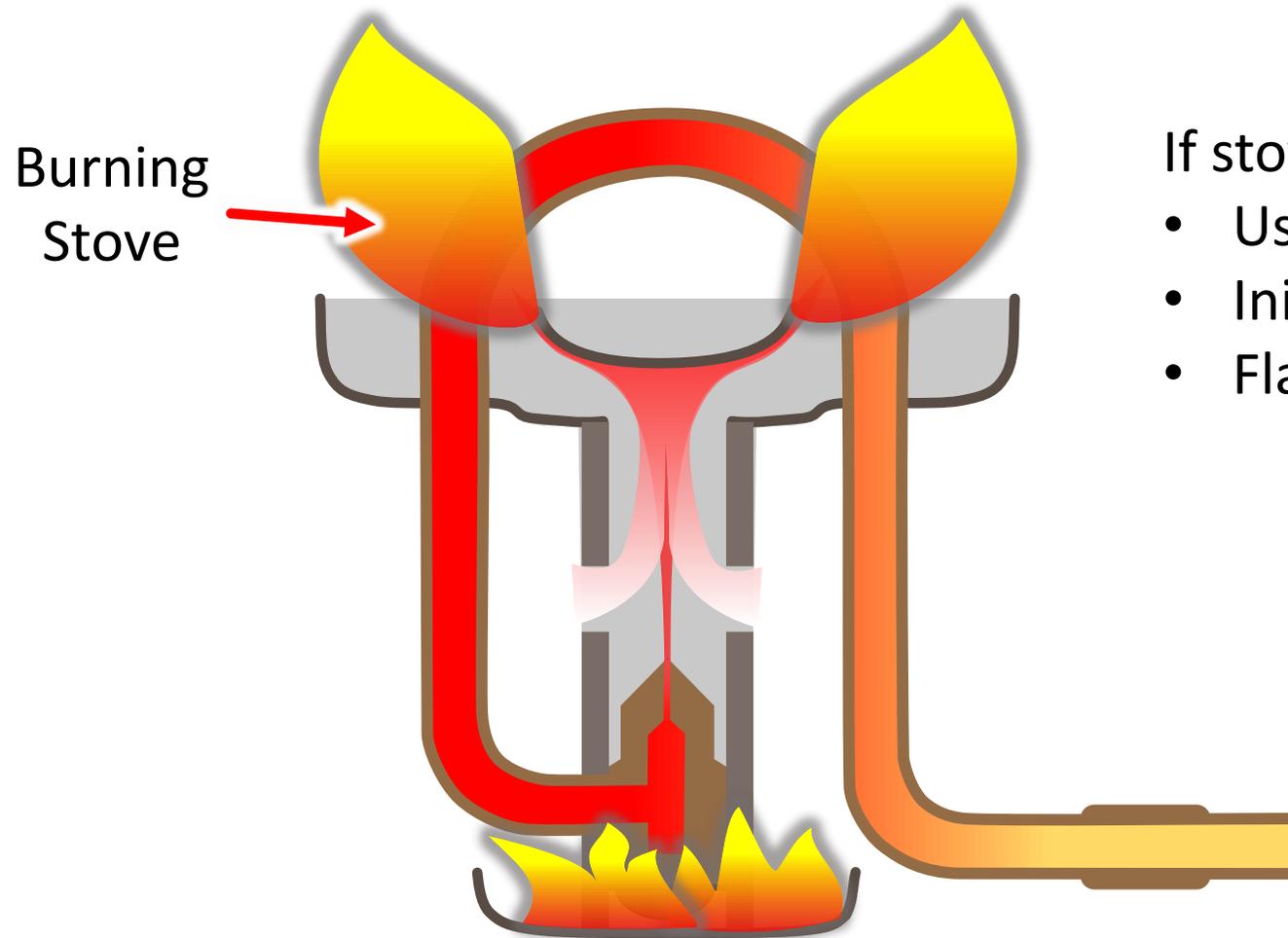
Stream of fuel draws in air

Mixed fuel/air hit burner plate

Mixture is atomized

# Food

## Liquid Petrol Stove Use – Operation

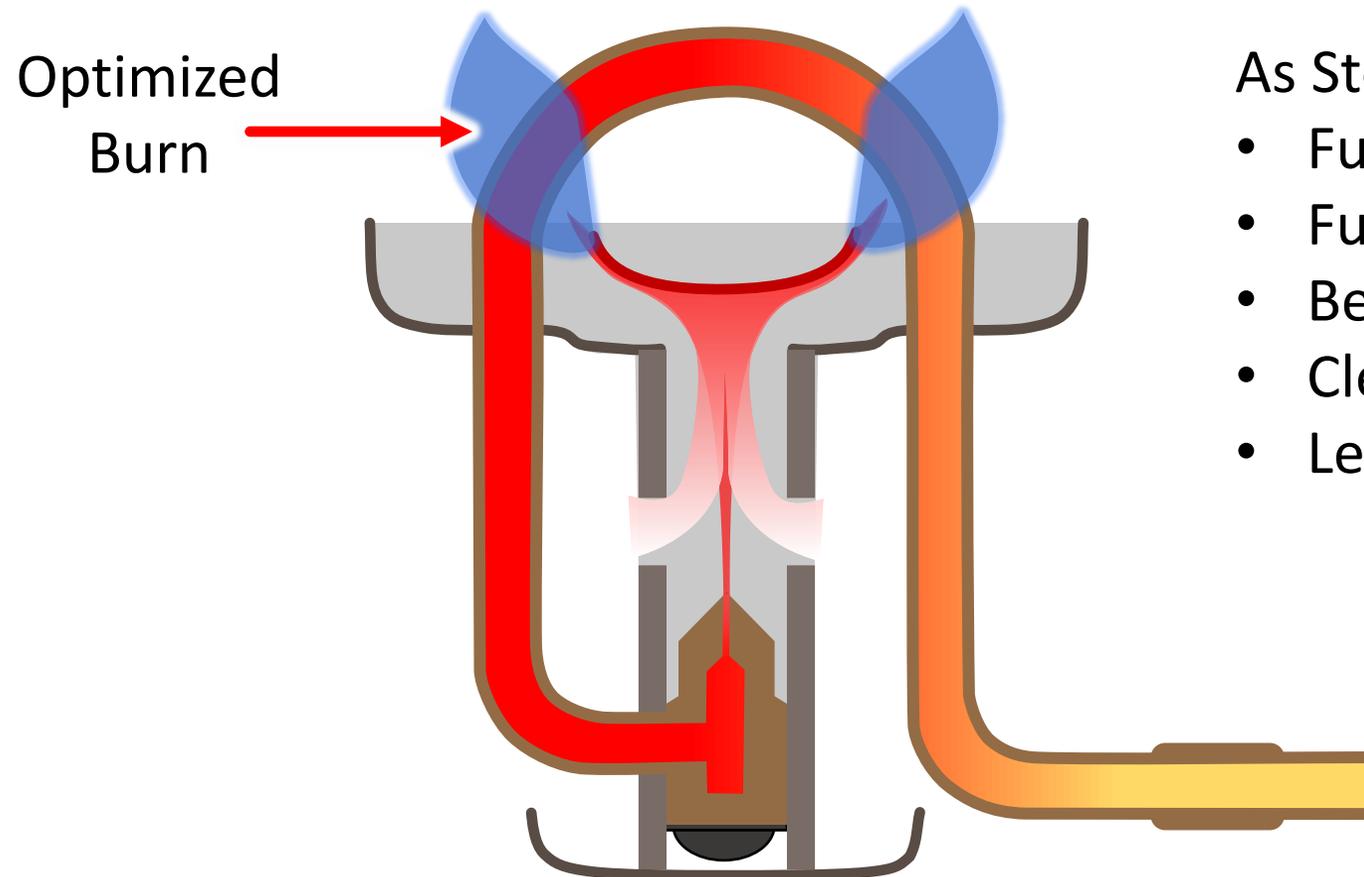


If stove doesn't self-ignite

- Use flame or spark to ignite
- Initial flame may be Yellow
- Flame may flair up a lot

# Food

## Liquid Petrol Stove Use – Operation



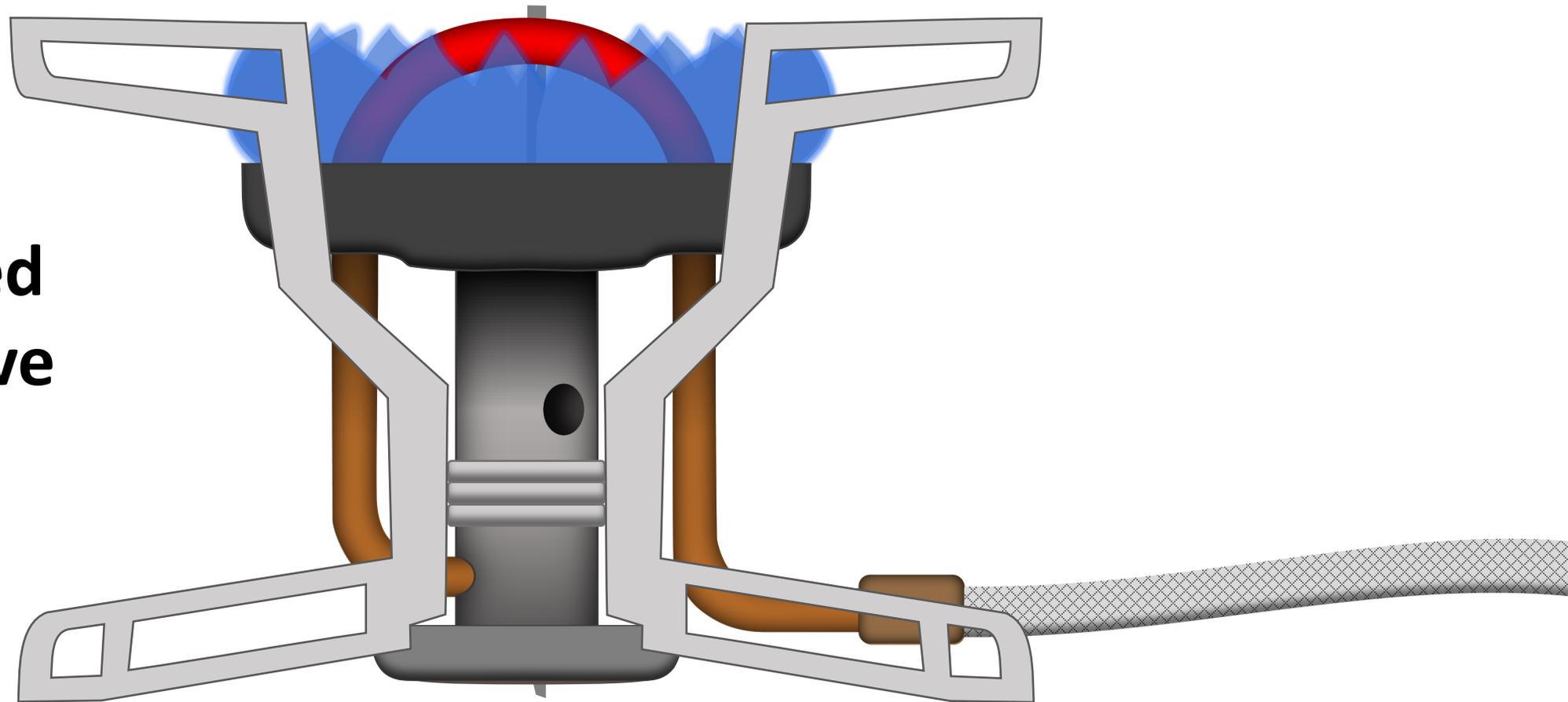
As Stove Heat up

- Fuel is heated in Tubes
- Fuel/Air mix improves
- Better atomization
- Cleaner burn
- Less flareups

# Food

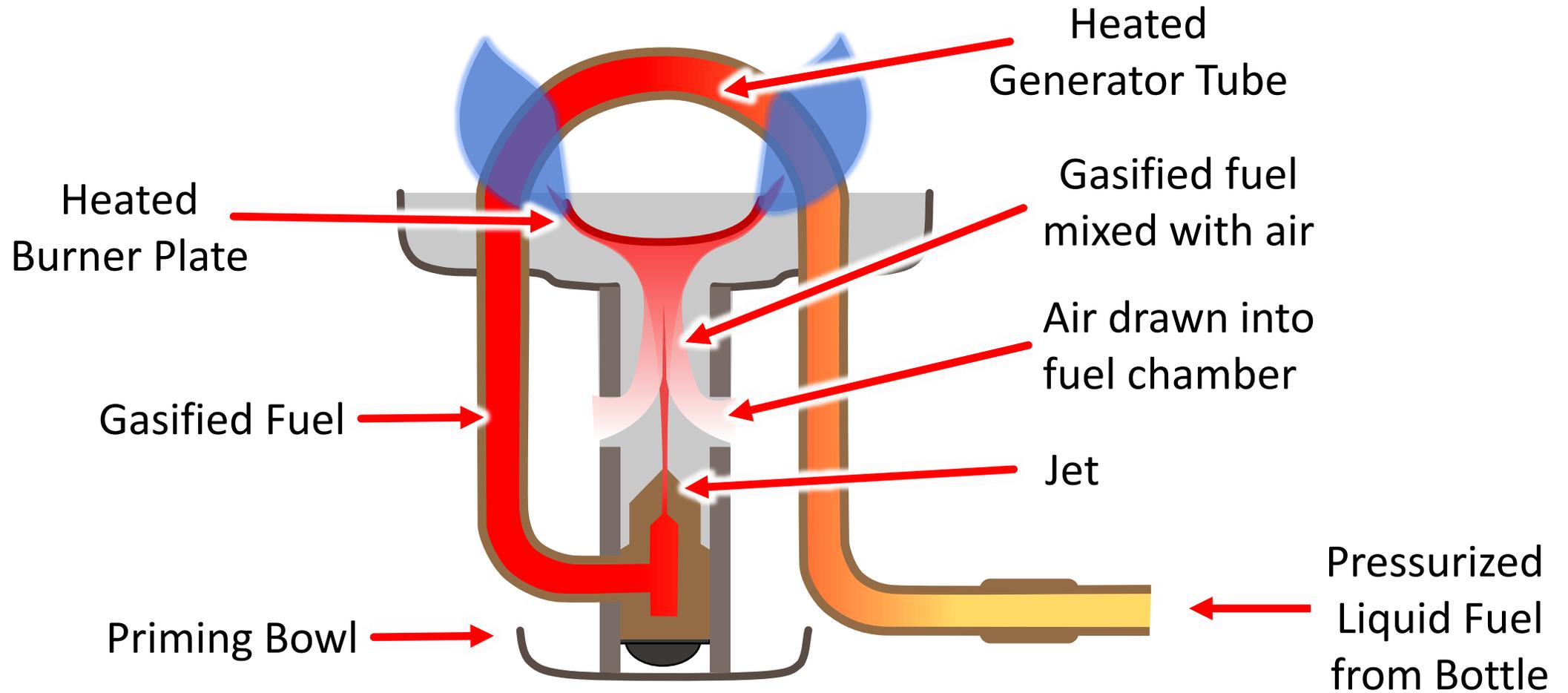
## Liquid Petrol Stove Use

## Pressurized Petrol Stove



# Food

## Liquid Petrol Stove Use - Anatomy





# Food

## Liquid Petrol Stove Use

- A few old school stoves “Self Pressurize”
  - Examples
    - Optimus Svea 123 and 8R
    - Swiss Borde Kocher

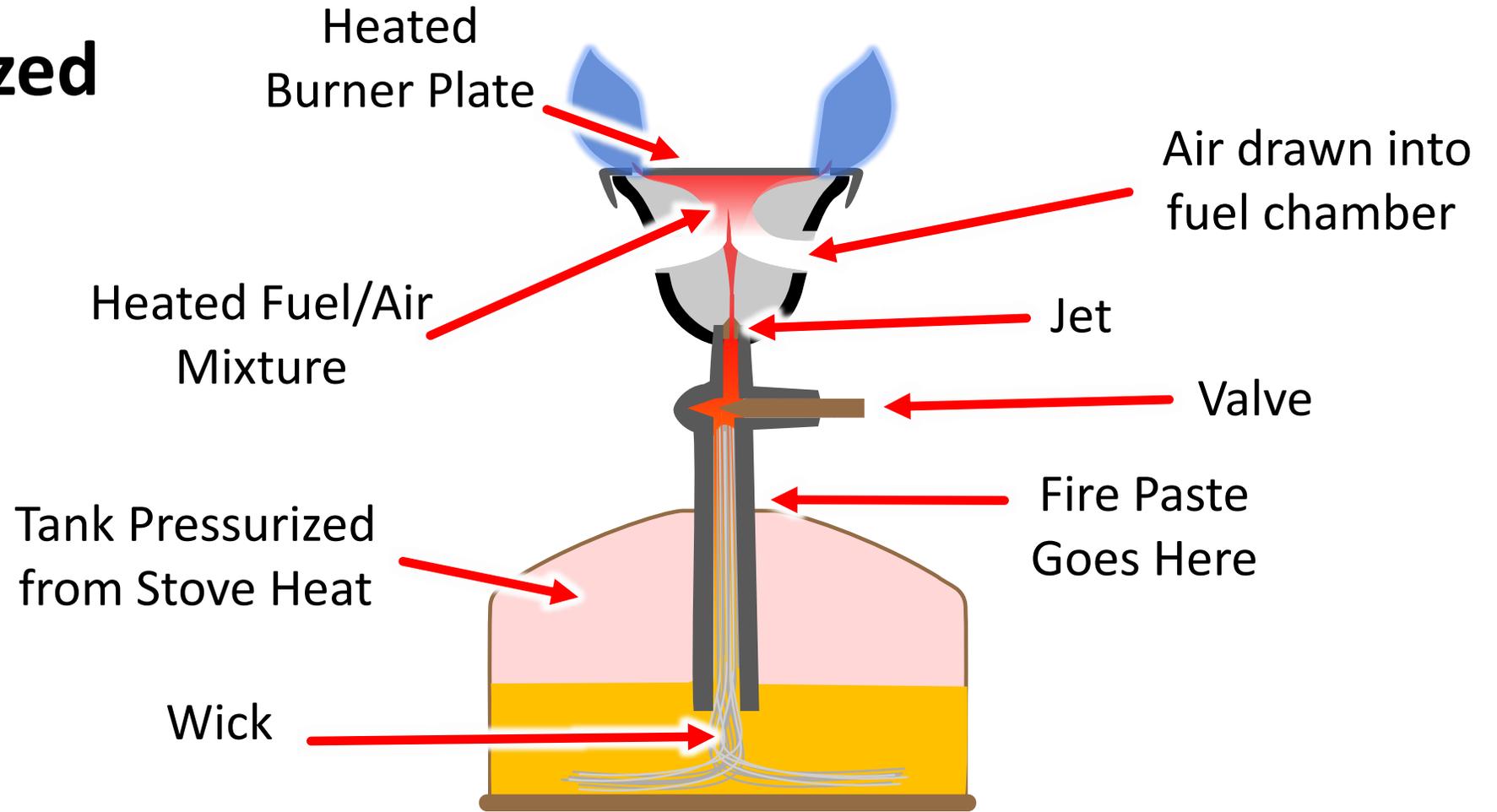




# Food

## Liquid Petrol Stove Use

### Self-Pressurized Stove

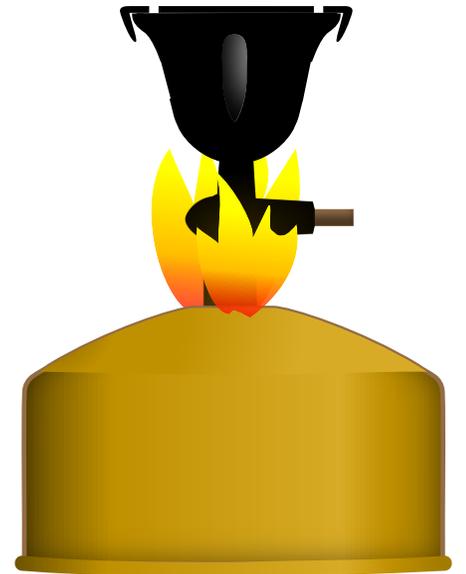




# Food

## Liquid Petrol Stove Use

- A few old school stoves “Self Pressurize”
  - Stove is primed, similar to pump stoves
    - Instead of using a pump to get fuel out for priming:
      - Stove may be warmed with hands to create just enough pressure to leak a small amount of priming fuel
      - NO skin to metal contact if extremely cold!
  - Priming heats up generator tube and fuel tank
  - Heated tank builds up pressure
  - Liquid fuel is forced into generator tubes





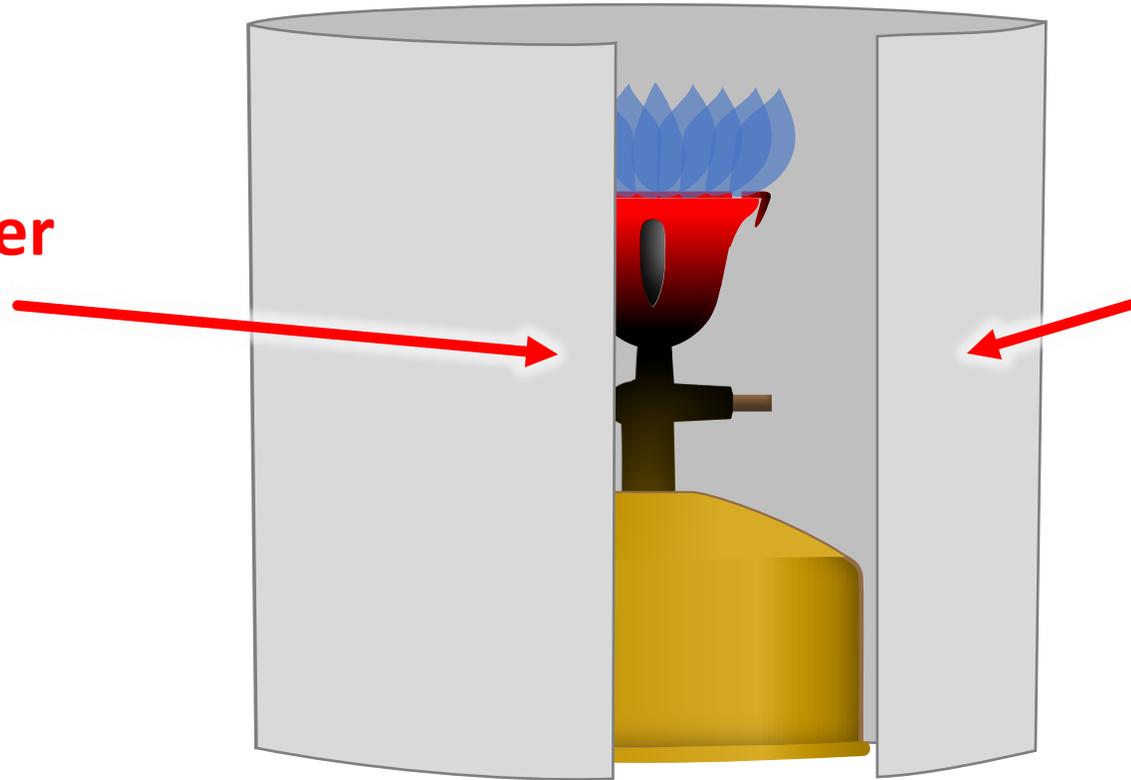
# Food

## Liquid Petrol Stove Use – Overheating

- Placing a tight windscreen around a stove-over-tank stove is Dangerous

**Heat is reflected  
towards fuel canister  
and is trapped**

**Risk of Explosion!**



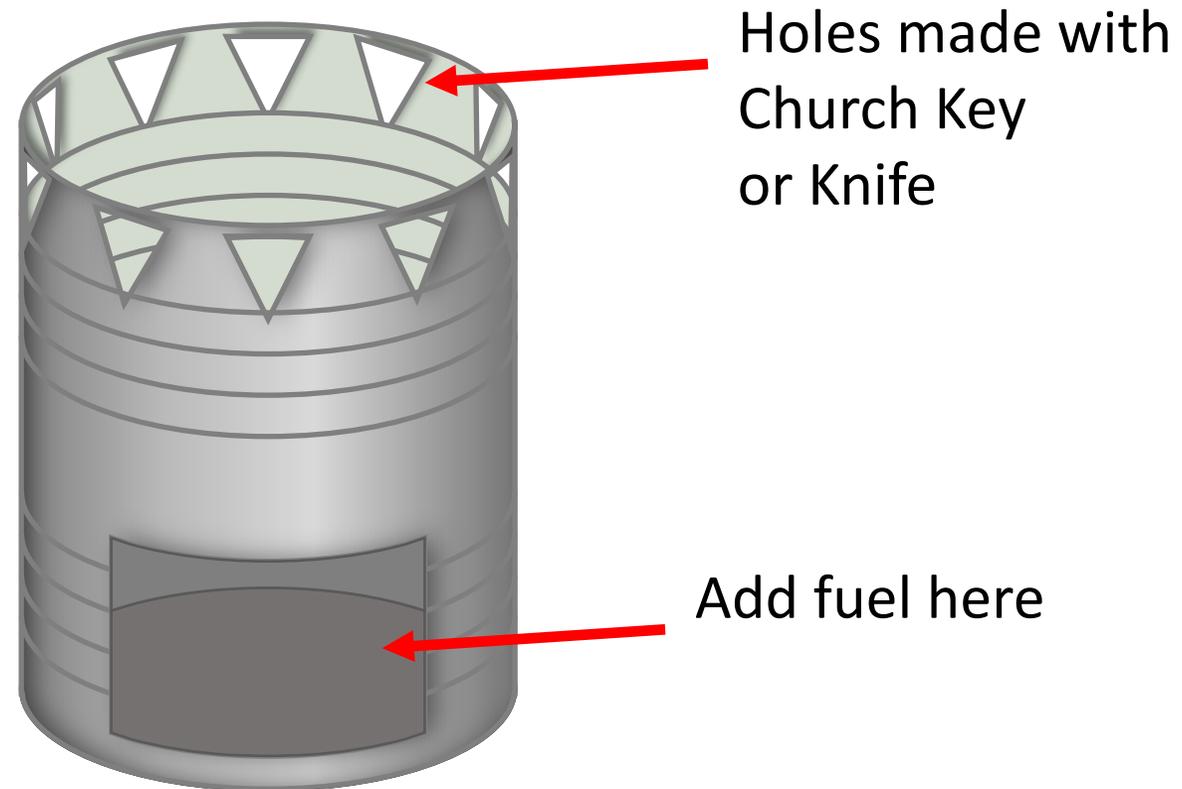
**Do NOT use tight  
fitting windscreen  
around this type  
of stove**

**The ventilated screen that  
came with stove is fine**

# Food

## Backpacking Stove Use – Wood Stoves

- Wood stoves can be as simple as a coffee can with holes in it
- More sophisticated stoves are of course available



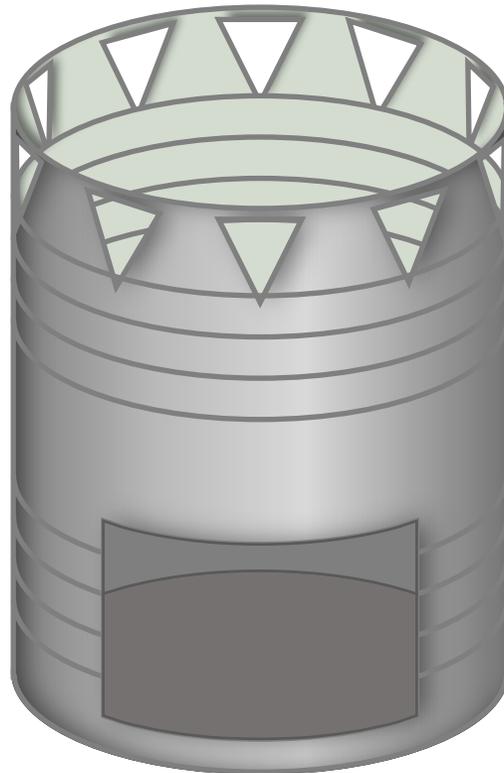
Hobo Stove



# Food

## Backpacking Stove Use – Wood Stoves

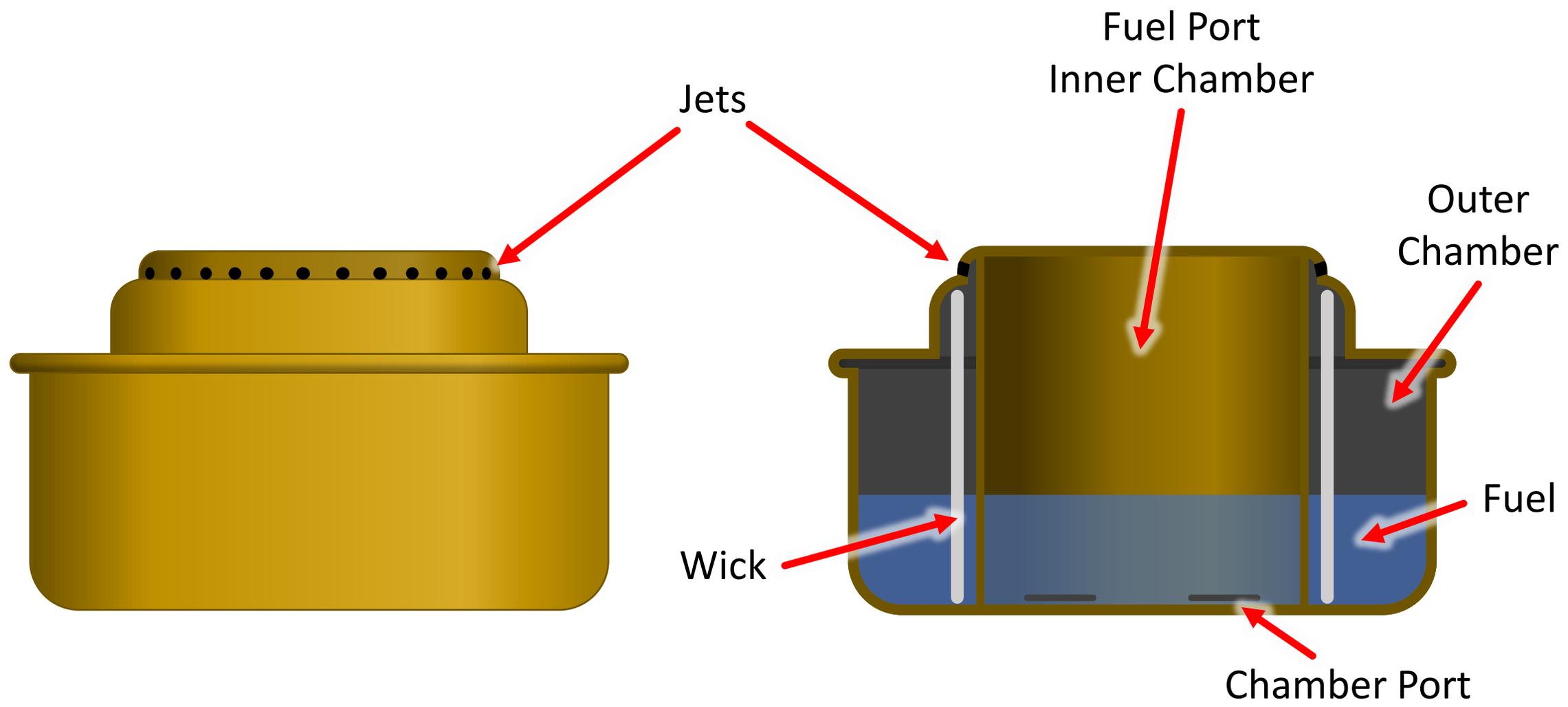
- Requires fuel and fire-starting skills



Hobo Stove

# Food

## Alcohol Stove Use

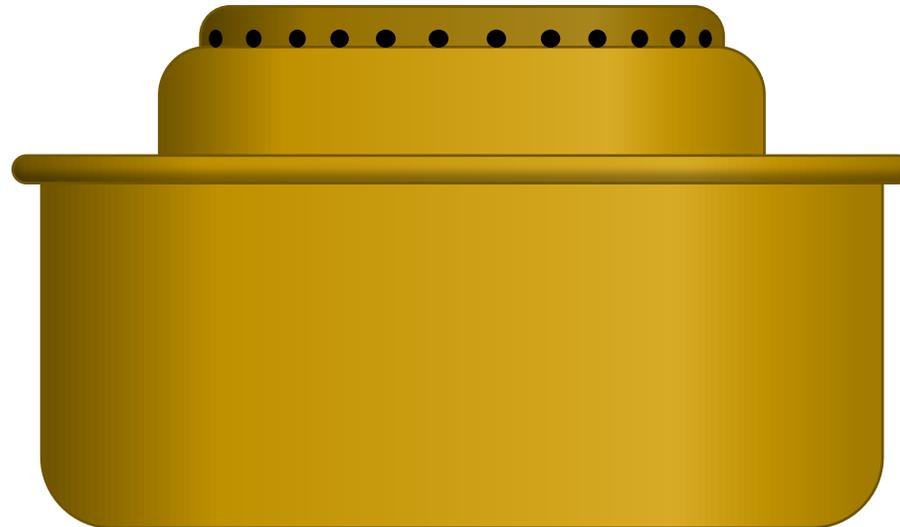


# Food

## Alcohol Stove Use

- Alcohol stove use is usually pretty straight forward
  1. Fill as instructed
  2. Light
  3. If you can't see a flame, check with a pine needle (NOT finger)
  4. When done, snuff or allow to run dry (depending on stove)

It is important to use  
a Windscreen with  
an Alcohol Stove

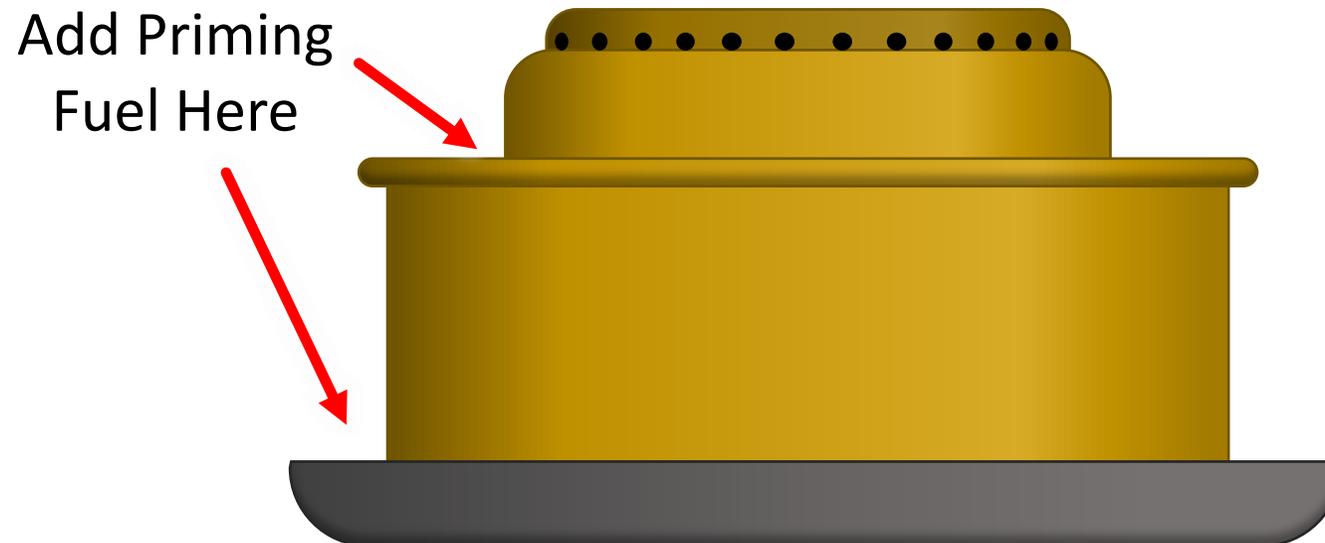




# Food

## Alcohol Stove Use – Priming

- Depending on design, alcohol stoves may need to be primed if cold
  - Pour a little alcohol on stove or in pan under stove and light
  - This will warm stove and fuel within stove – resulting in vaporization for fuel

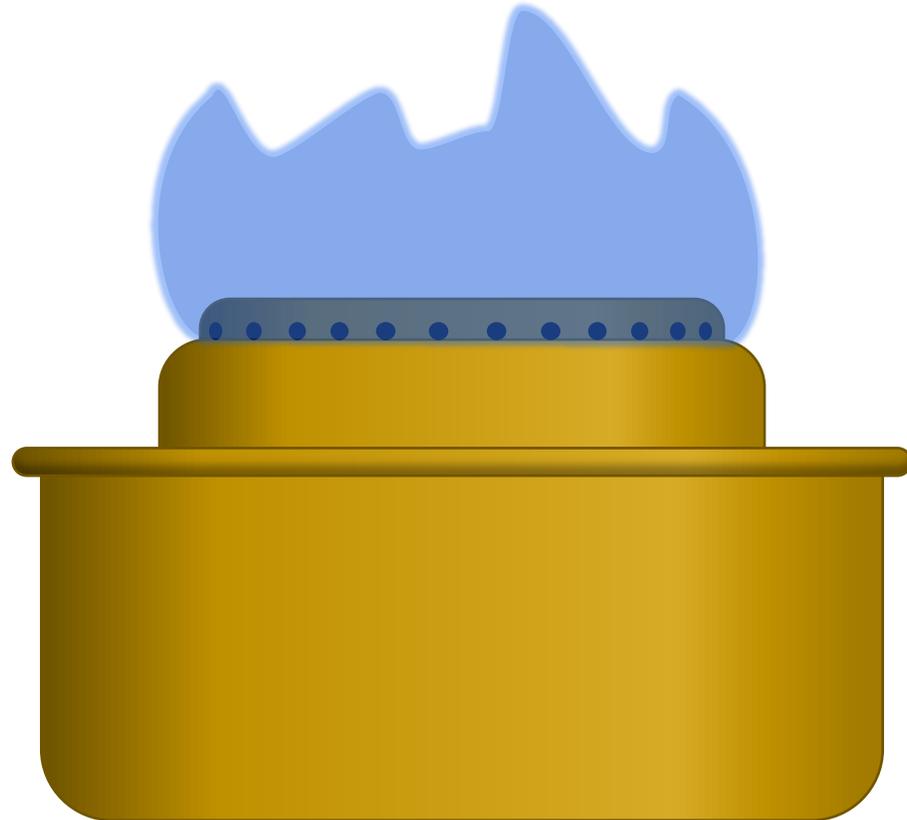




# Food

## Alcohol Stove Use – Not for Everyone

- Although these stoves are a great option
- **There is a reason the BSA recommends against their use**

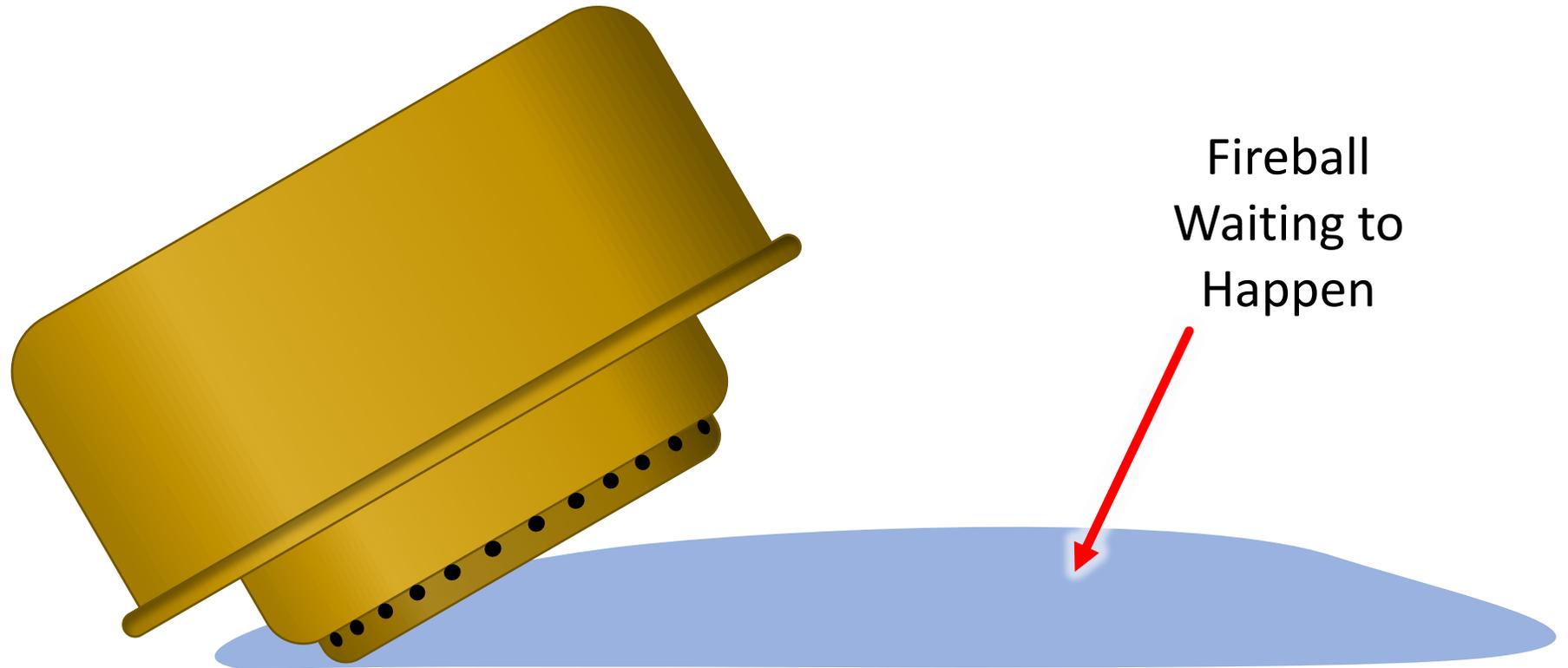




# Food

## Alcohol Stove Use – Spill Hazard

- Many alcohol stoves present a spill hazard
- If you knock over a stove, it can spill fuel everywhere
- Spilled fuel from a burning stove is an obvious burn hazard

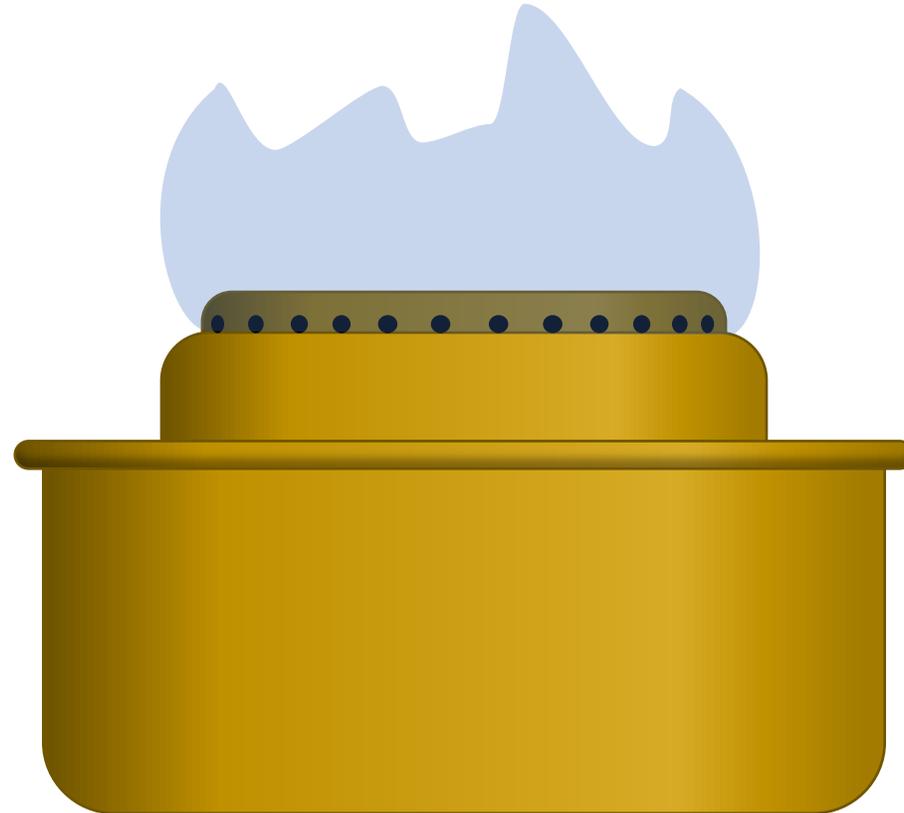




# Food

## Alcohol Stove Use – Hidden Flame

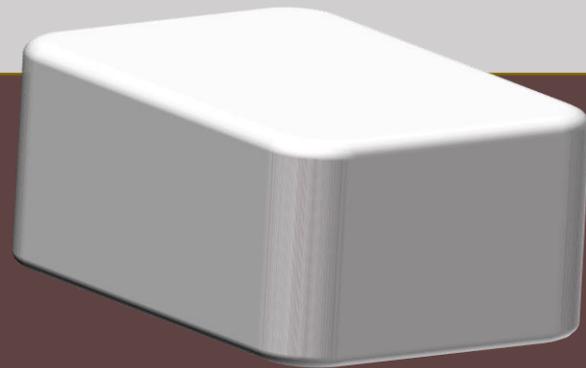
- Flames from burning alcohol is more or less invisible in sunlight
- Don't burn yourself and knock over stove



# Food

## Chemical Stove Use

- Light fuel
- Allow to burn out or blow out

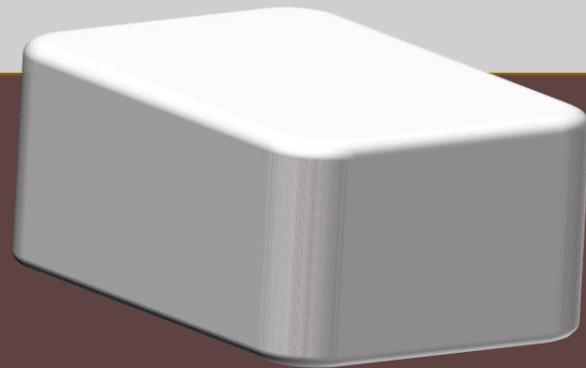




# Food

## Chemical Stove Use

- Tabs can be cut in half for shorter burn times
- More than one tab can be used for heating up larger items

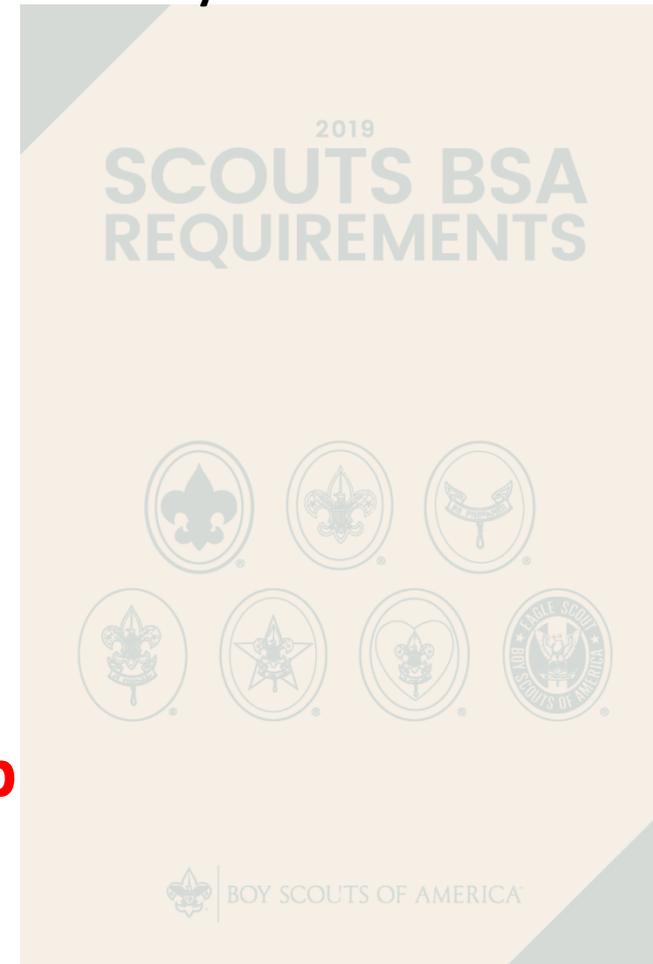


# Food

## Requirement 8c – 3 Meals

Prepare at least three meals using a stove and fuel you can carry in a backpack.

**Ideally complete on a Backpacking Trip**

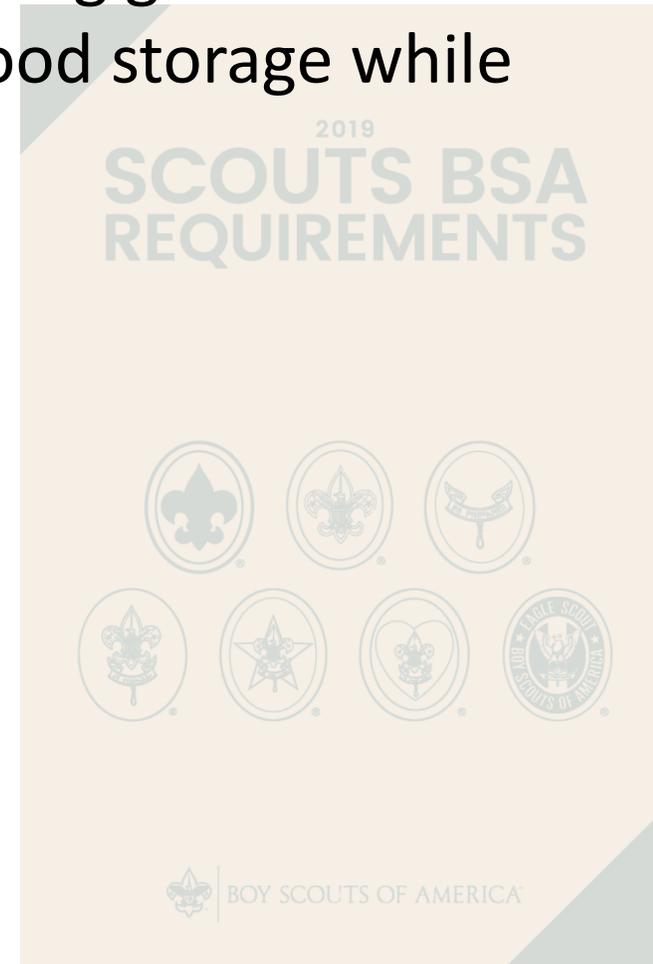


# Food

## Requirement 8b – Food Sanitation

Demonstrate that you know how to keep cooking and eating gear clean and sanitary, and that you practice proper methods for food storage while on a backpacking trek.

**Complete on a Backpacking Trip**



# Food

## **Food Sanitation**

- Food Sanitation is an important topic
- Guidelines are not universally practiced outside of restaurants
- Inadequate water treatment and food sanitation result in sickness

# Food

## **Food Sanitation**

- Crew should use personal utensils and water bottles
- Foods need to be stored appropriately
- Some foods will quickly spoil if not refrigerated
- Some foods need to be cooked to a certain temperature
- Plan to avoid foods that require special storage or preparation

# Food

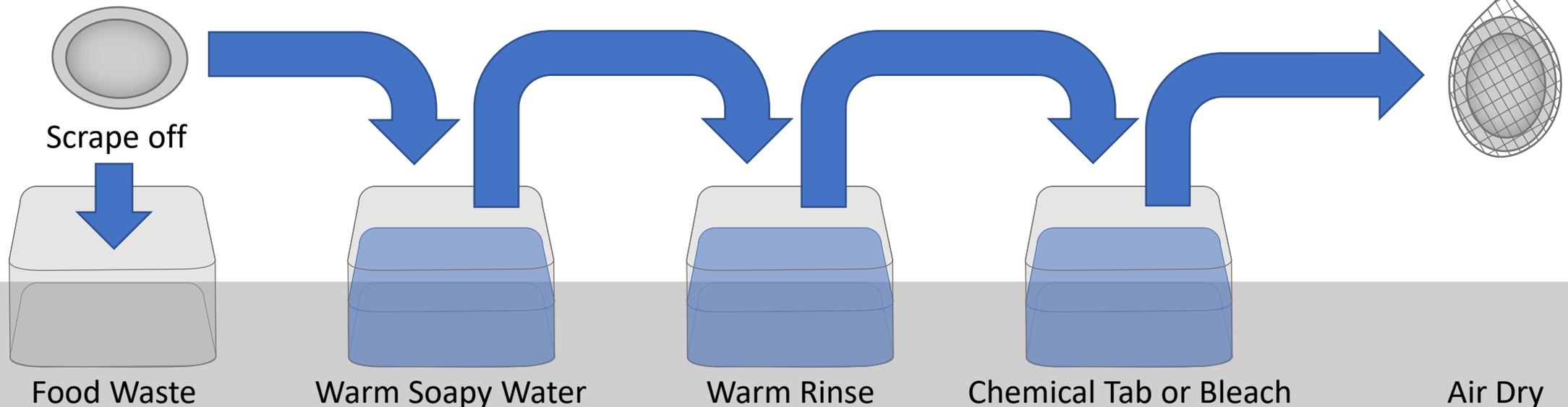
## **Food Sanitation – Cleaning Dishes and Utensils**

- Cooking and Eating utensils need to be cleaned and sanitized
  - Use a few drops of biodegradable soap to wash utensils
  - Rinse them in pot with cold water and sanitation tablet or bleach
    - Ideally use 3 tub/pot method
  - Allow to air dry (don't wipe dry with dirty cloth)

# Food

## Cleaning Dishes and Utensils – Three Tub Method

- Scrape leftover food off dishes and utensils
- Scrub dishes in warm soapy water in 1<sup>st</sup> Tub/Sink
- Rinse dishes in warm, clean water in 2<sup>nd</sup> Tub/Sink
- Soak dishes in chemical sanitizing solution in 3<sup>rd</sup> Tub/Sink
- Air-dry dishes and utensils



# Food

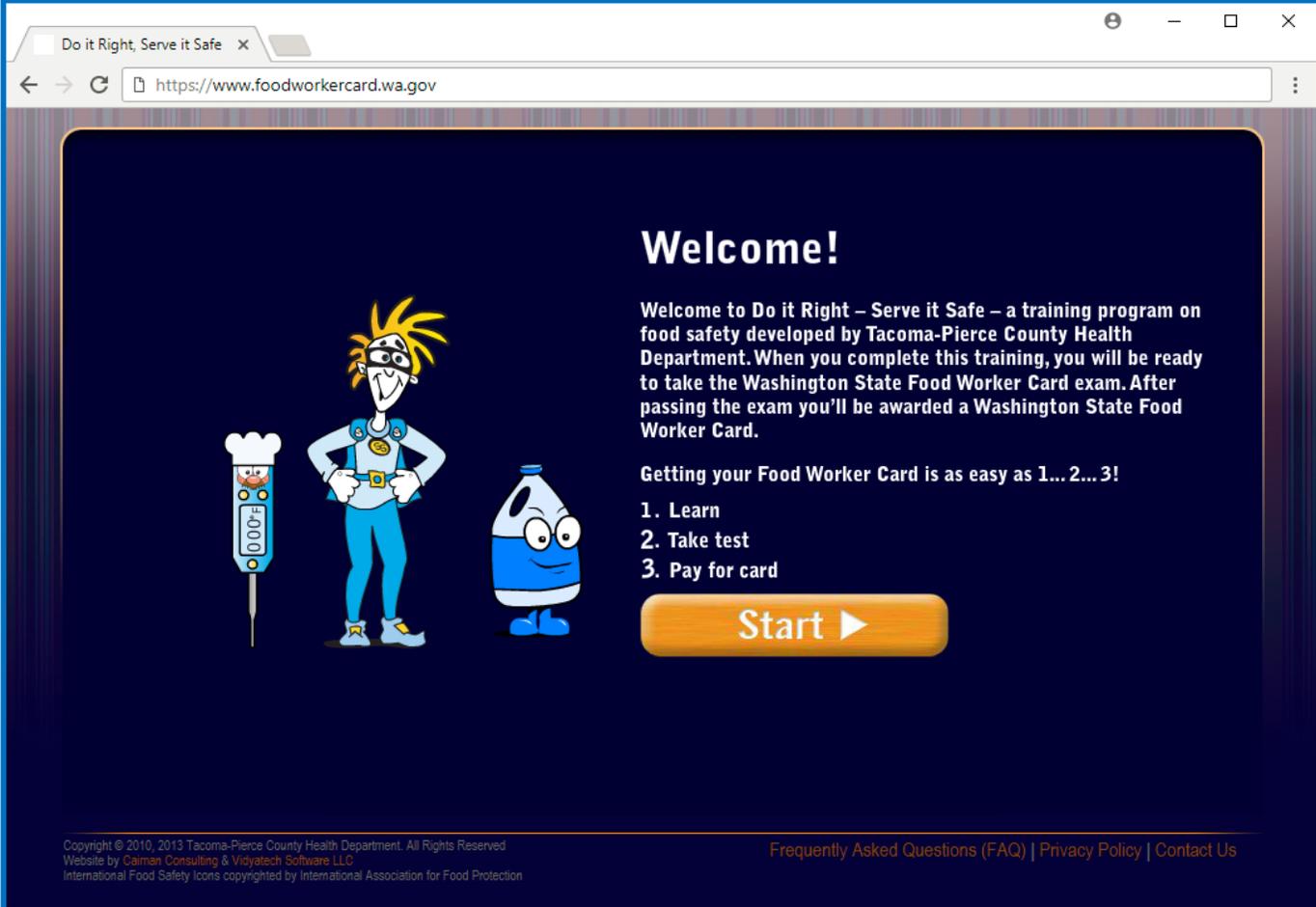
## Food Sanitation

- All foods and smellables (toothpaste) need to be stored appropriately
  - NOT in tent
  - Bear Bag
  - Bear Can

# Food

## Washington State Food Worker Course

- Not a BSA or Merit Badge requirement
- Valuable training for:
  - Wilderness
  - BSA events
  - Social gatherings
  - Family health
- [foodworkercard.wa.gov](https://www.foodworkercard.wa.gov)



Do it Right, Serve it Safe x

https://www.foodworkercard.wa.gov

### Welcome!

Welcome to Do it Right - Serve it Safe - a training program on food safety developed by Tacoma-Pierce County Health Department. When you complete this training, you will be ready to take the Washington State Food Worker Card exam. After passing the exam you'll be awarded a Washington State Food Worker Card.

Getting your Food Worker Card is as easy as 1... 2... 3!

1. Learn
2. Take test
3. Pay for card

[Start ▶](#)

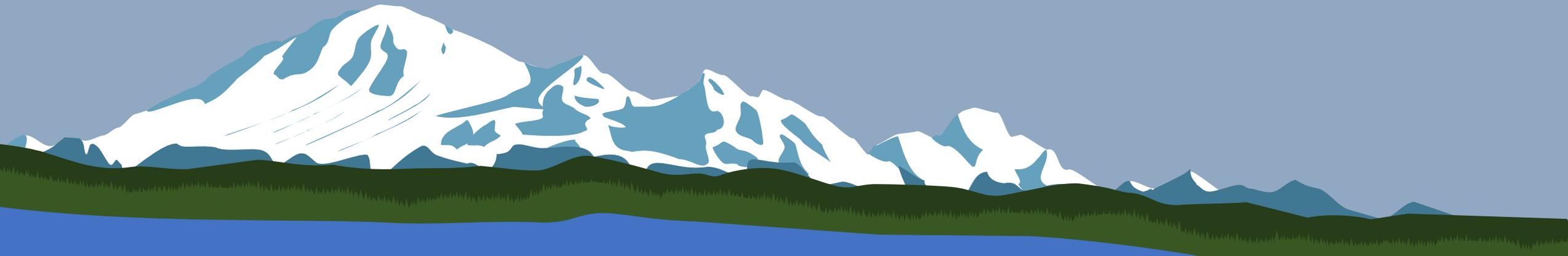
Copyright © 2010, 2013 Tacoma-Pierce County Health Department. All Rights Reserved  
Website by Carman Consulting & Vidiatech Software LLC  
International Food Safety Icons copyrighted by International Association for Food Protection

[Frequently Asked Questions \(FAQ\)](#) | [Privacy Policy](#) | [Contact Us](#)

- 1. [Merit Badge Requirements](#)
- 2. [Merit Badge Intro](#)
- 3. [First Aid](#)
- 4. [Gear](#)
- 5. [Water](#)
- 6. [Food](#)
- 7. [Navigation](#)
- 8. [Leave No Trace](#)
- 9. [Preparation](#)
- 10. [Getting Out There](#)
- 11. [Trail Thoughts](#)
- 12. [Resources](#)
- 13. [Instructor's Corner](#)



# Navigation



# Navigation

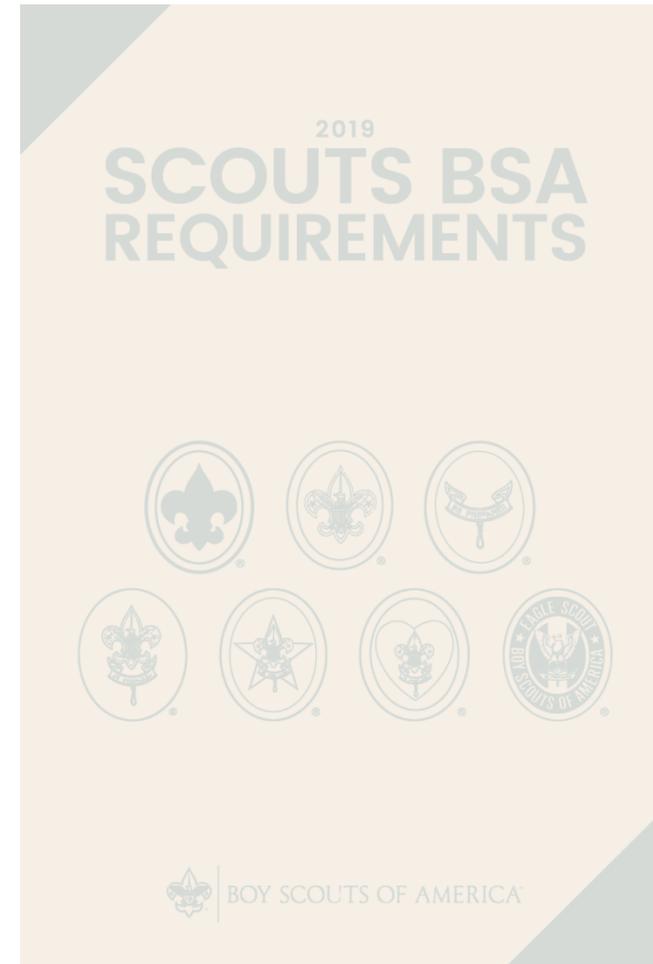
## Map and Compass Skills

- Vital skill set required for backcountry adventures
  - Helps prevent you from getting lost
  - Helps you re-find your location when lost
  - Helps you plan out your trip
    - Good places to sleep
    - Good places for resources such as water and fish
    - Find places to explore or for view
    - Identify places to avoid

# Navigation

## Requirement 6a – Read a Map

Demonstrate that you can read topographic maps.



# USGS Topographical Map

[viewer.nationalmap.gov/basic](http://viewer.nationalmap.gov/basic)

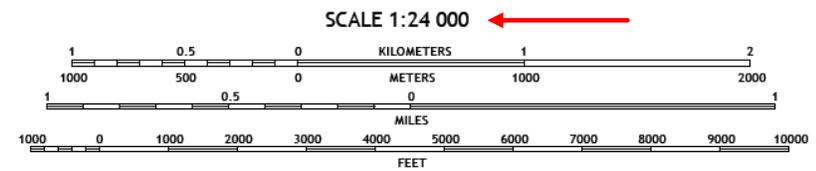
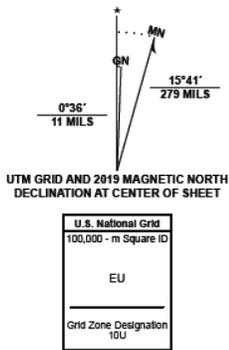


# Map Legend



**Produced by the United States Geological Survey**  
 North American Datum of 1983 (NAD83)  
 World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 10U  
 This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, September 2015 - November 2015  
 Roads.....U.S. Census Bureau, 2016  
 Names.....GNIS, 1979 - 2019  
 Hydrography.....National Hydrography Dataset, 2004 - 2019  
 Contours.....National Elevation Dataset, 2018  
 Boundaries.....Multiple sources; see metadata file 2017 - 2018  
 Public Land Survey System.....BLM, 2019  
 Wetlands.....FWS National Wetlands Inventory 1981



CONTOUR INTERVAL 40 FEET  
 NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.  
 A metadata file associated with this product is draft version 0.6.18



1	2	3
4	5	6
6	7	8

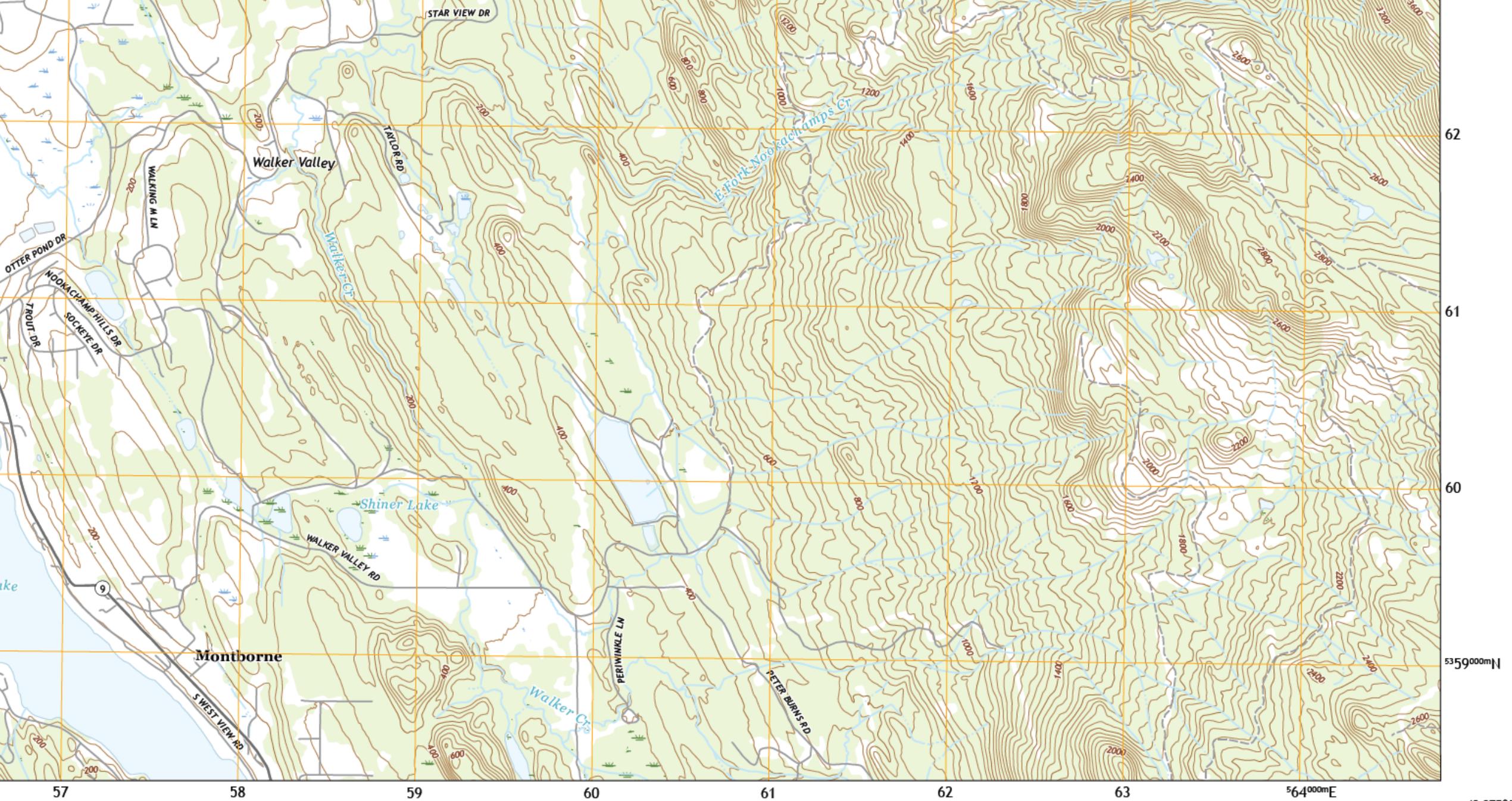
ADJOINING QUADRANGLES

- 1 Alger
- 2 Sedro-Woolley North
- 3 Lyman
- 4 Mount Vernon
- 5 Haystack Mountain
- 6 Conway
- 7 McMurray
- 8 Stimson Hill



SEDRO-WOOLLEY SOUTH, WA

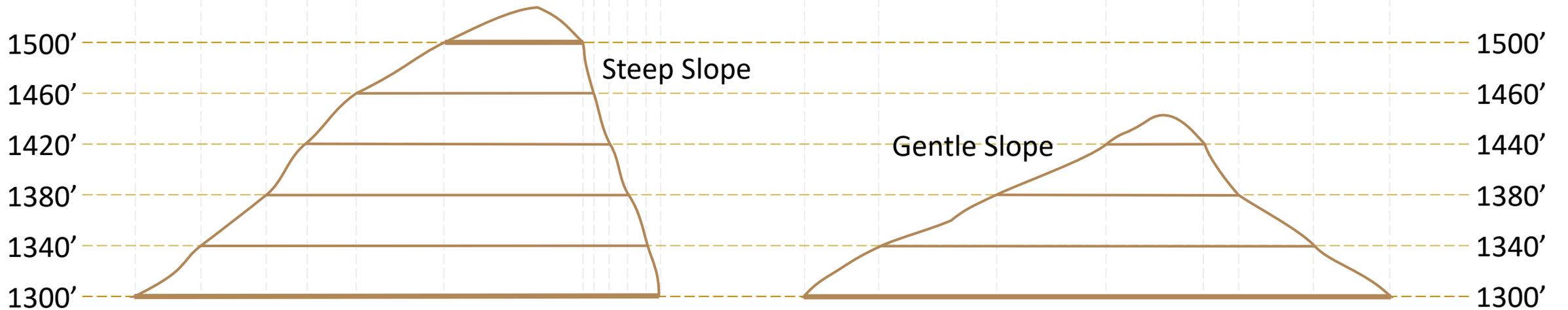
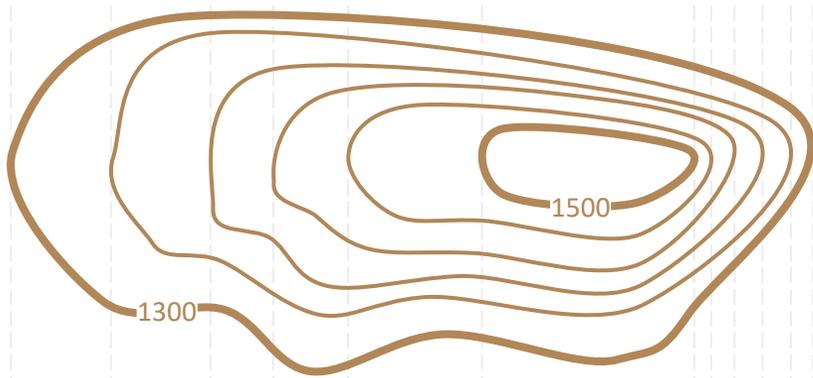
2020

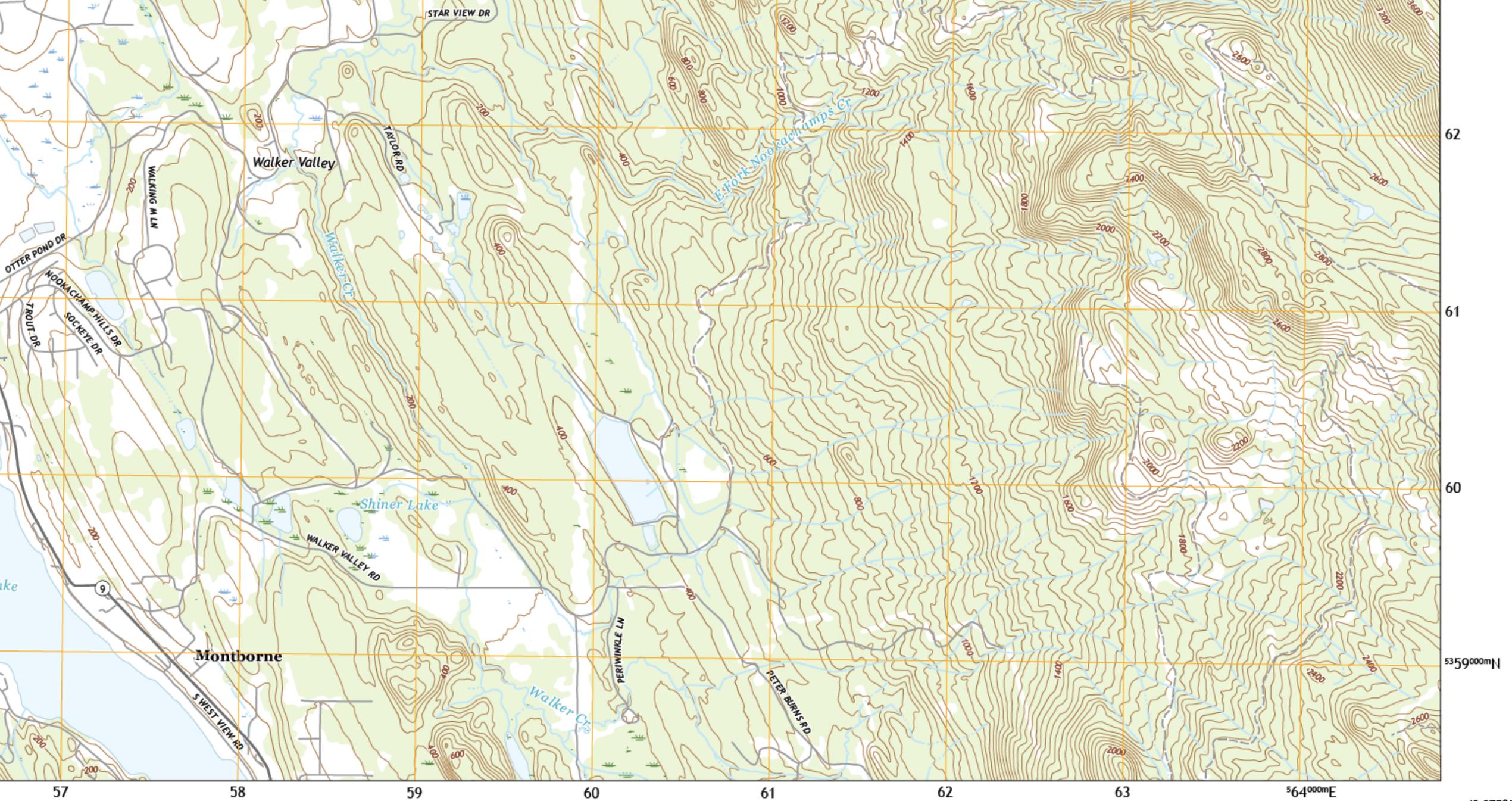


Map Originally 1:24,000 Scale

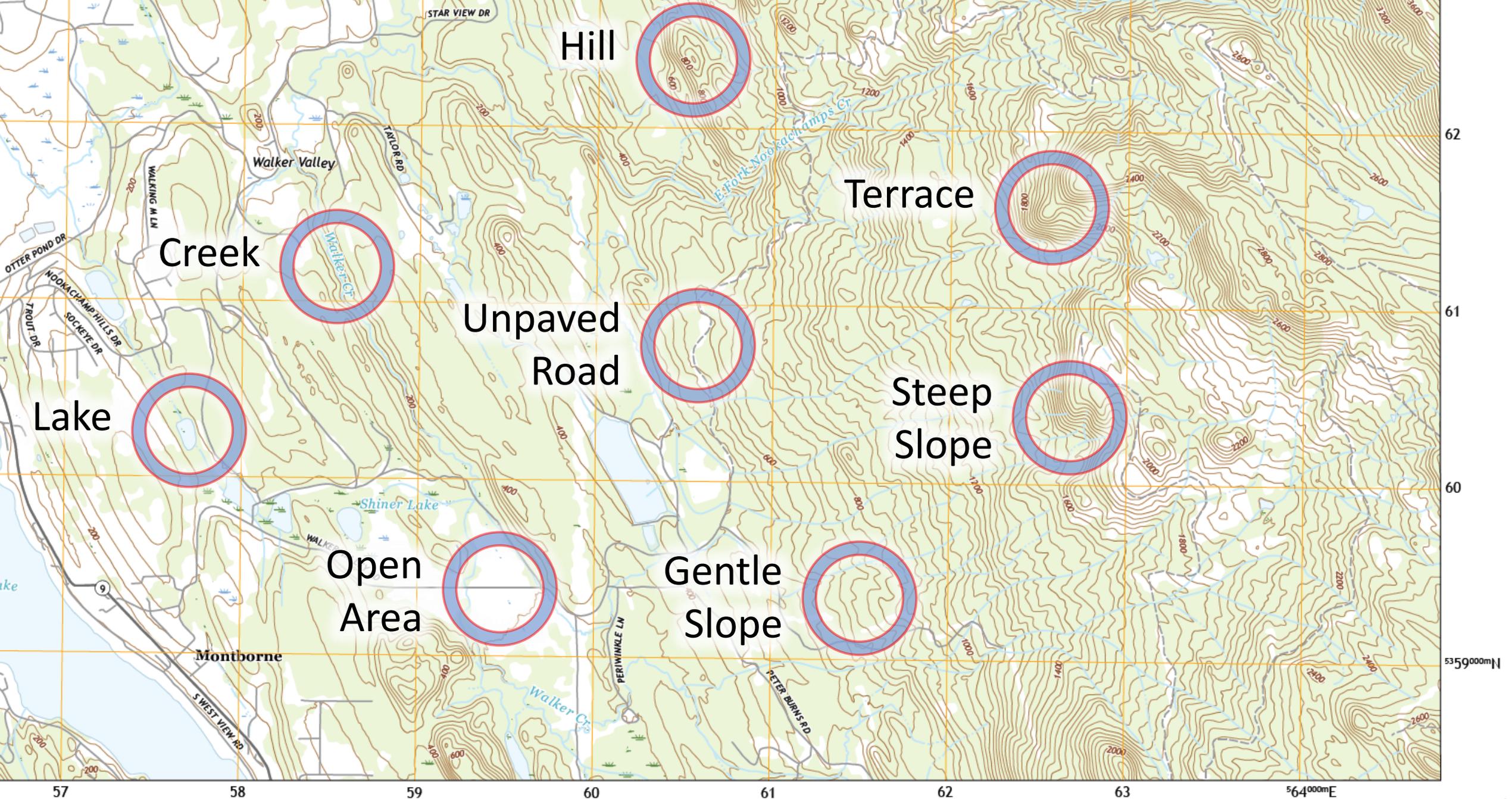
# Topographic Maps

## Contour Lines





Map Originally 1:24,000 Scale



Map Originally 1:24,000 Scale

# USGS Map Symbols

[pubs.usgs.gov](https://pubs.usgs.gov)



## What is a Topographic Map?

A map is a representation of the Earth, or part of it. The distinctive characteristic of a topographic map is that the shape of the Earth's surface is shown by contour lines. Contours are imaginary lines that join points of equal elevation on the surface of the land above or below a reference surface, such as mean sea level. Contours make it possible to measure the height of mountains, depths of the ocean bottom, and steepness of slopes.

A topographic map shows more than contours. The map includes symbols that represent such features as streets, buildings, streams, and vegetation. These symbols are constantly refined to better relate to the features they represent, improve the appearance or readability of the map, or reduce production cost.

Consequently, within the same series, maps may have slightly different symbols for the same feature. Examples of symbols that have changed include built-up areas, roads, intermittent drainage, and some lettering styles. On one type of large-scale topographic map, called provisional, some symbols and lettering are hand-drawn.

# Topographic Map Symbols

## Reading Topographic Maps

Interpreting the colored lines, areas, and other symbols is the first step in using topographic maps. Features are shown as points, lines, or areas, depending on their size and extent. For example, individual houses may be shown as small black squares. For larger buildings, the actual shapes are mapped. In densely built-up areas, most individual buildings are omitted and an area tint is shown. On some maps, post offices, churches, city halls, and other landmark buildings are shown within the tinted area.

The first features usually noticed on a topographic map are the area features, such as vegetation (green), water (blue), and densely built-up areas (gray or red).

Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar classes of information: topographic contours (brown); lakes, streams, irrigation ditches, and other hydrographic features (blue); land grids and important roads (red); and other roads and trails, railroads, boundaries, and other cultural features (black). At one time, purple was used as a revision color to show all feature changes. Currently, purple is not used in our revision program, but purple features are still present on many existing maps.

Various point symbols are used to depict features such as buildings, campgrounds, springs, water tanks, mines, survey control points, and wells. Names of places and features are shown in a color corresponding to the type of feature. Many features are identified by labels, such as "Substation" or "Golf Course."

Topographic contours are shown in brown by lines of different widths. Each contour is a line of equal elevation; therefore, contours never cross. They show the general shape of the terrain. To help the user determine elevations, index contours are wider. Elevation values are printed in several places along these lines. The narrower intermediate and supplementary contours found between the index contours help to show more details of the land surface shape. Contours that are very close together represent steep slopes. Widely spaced contours or an absence of contours means that the ground slope is relatively level. The elevation difference between adjacent contour lines, called the contour interval, is selected to best show the general shape of the terrain. A map of a relatively flat area may have a contour interval of 10 feet or less. Maps in mountainous areas may have contour intervals of 100 feet or more. The contour interval is printed in the margin of each U.S. Geological Survey (USGS) map.

Bathymetric contours are shown in blue or black, depending on their location. They show the shape and slope of the ocean bottom surface. The bathymetric contour interval may vary on each map and is explained in the map margin.

<b>CONTOURS</b>	
<b>Topographic</b>	
Index	
Approximate or indefinite	
Intermediate	
Approximate or indefinite	
Supplementary	
Depression	
Cut	
Fill	
Continental divide	
<b>Bathymetric</b>	
Index***	
Intermediate***	
Index primary***	
Primary***	
Supplementary***	

<b>VEGETATION</b>	
Woodland	
Shrubland	
Orchard	
Vineyard	
Mangrove	

<b>SURFACE FEATURES</b>	
Levee	
Sand or mud	
Disturbed surface	
Gravel beach or glacial moraine	
Tailings pond	

<b>MINES AND CAVES</b>	
Quarry or open pit mine	
Gravel, sand, clay, or borrow pit	
Mine tunnel or cave entrance	
Mine shaft	
Prospect	
Tailings	
Mine dump	
Former disposal site or mine	

### ROADS AND RELATED FEATURES

Please note: Roads on Provisional-edition maps are not classified as primary, secondary, or light duty. These roads are all classified as improved roads and are symbolized the same as light duty roads.

Primary highway	
Secondary highway	
Light duty road	
Light duty road, paved*	
Light duty road, gravel*	
Light duty road, dirt*	
Light duty road, unspecified*	
Unimproved road	
Unimproved road*	
4WD road	
4WD road*	
Trail	
Highway or road with median strip	
Highway or road under construction	
Highway or road underpass; overpass	
Highway or road bridge; drawbridge	
Highway or road tunnel	
Road block, berm, or barrier*	
Gate on road*	
Trailhead*	

### BUILDINGS AND RELATED FEATURES

Building	
School; house of worship	
Athletic field	
Built-up area	
Forest headquarters*	
Ranger district office*	
Guard station or work center*	
Racetrack or raceway	
Airport, paved landing strip, runway, taxiway, or apron	
Unpaved landing strip	
Well (other than water), windmill or wind generator	
Tanks	
Covered reservoir	
Gaging station	
Located or landmark object (feature as labeled)	
Boat ramp or boat access*	
Roadside park or rest area	
Picnic area	
Campground	
Winter recreation area*	
Cemetery	

### TRANSMISSION LINES AND PIPELINES

Power transmission line; pole; tower	
Telephone line	
Aboveground pipeline	
Underground pipeline	

### RAILROADS AND RELATED FEATURES

Standard gauge railroad, single track	
Standard gauge railroad, multiple track	
Narrow gauge railroad, single track	
Narrow gauge railroad, multiple track	
Railroad siding	
Railroad in highway	
Railroad in road	
Railroad in light duty road*	
Railroad underpass; overpass	
Railroad bridge; drawbridge	
Railroad tunnel	
Railroad yard	
Railroad turntable; roundhouse	

**RIVERS, LAKES, AND CANALS**

Perennial stream	
Perennial river	
Intermittent stream	
Intermittent river	
Disappearing stream	
Falls, small	
Falls, large	
Rapids, small	
Rapids, large	
Masonry dam	
Dam with lock	
Dam carrying road	
Perennial lake/pond	
Intermittent lake/pond	
Dry lake/pond	
Narrow wash	
Wide wash	
Canal, flume, or aqueduct with lock	
Elevated aqueduct, flume, or conduit	
Aqueduct tunnel	
Water well, geyser, fumarole, or mud pot	
Spring or seep	

**MARINE SHORELINES**

Shoreline	
Apparent (edge of vegetation)***	
Indefinite or unsurveyed	

**COASTAL FEATURES**

Foreshore flat	
Coral or rock reef	
Rock, bare or awash; dangerous to navigation	
Group of rocks, bare or awash	
Exposed wreck	
Depth curve; sounding	
Breakwater, pier, jetty, or wharf	
Seawall	
Oil or gas well; platform	

**BATHYMETRIC FEATURES**

Area exposed at mean low tide; sounding datum***	
Channel***	
Sunken rock***	

**SUBMERGED AREAS AND BOGS**

Marsh or swamp	
Submerged marsh or swamp	
Wooded marsh or swamp	
Submerged wooded marsh or swamp	
Land subject to inundation	

*Max Pool 43!*

**GLACIERS AND PERMANENT SNOWFIELDS**

Contours and limits	
Formlines	
Glacial advance	
Glacial retreat	

**BOUNDARIES**

National	
State or territorial	
County or equivalent	
Civil township or equivalent	
Incorporated city or equivalent	
Federally administered park, reservation, or monument (external)	
Federally administered park, reservation, or monument (internal)	
State forest, park, reservation, or monument and large county park	
Forest Service administrative area*	
Forest Service ranger district*	
National Forest System land status, Forest Service lands*	
National Forest System land status, non-Forest Service lands*	

**PROJECTION AND GRIDS**

Neatline	
Graticule tick	
Graticule intersection	
Datum shift tick	

**State plane coordinate systems**

Primary zone tick	
Secondary zone tick	
Tertiary zone tick	
Quaternary zone tick	
Quintary zone tick	

**Universal transverse metcator grid**

UTM grid (full grid)	
UTM grid ticks*	

**LAND SURVEYS**

**Public land survey system**

Range or Township line	
Location approximate	
Location doubtful	
Protracted	
Protracted (AK 1:63,360-scale)	
Range or Township labels	
Section line	
Location approximate	
Location doubtful	
Protracted	
Protracted (AK 1:63,360-scale)	
Section numbers	
Found section corner	
Found closing corner	
Witness corner	
Meander corner	
Weak corner*	

**Other land surveys**

Range or Township line	
Section line	
Land grant, mining claim, donation land claim, or tract	
Land grant, homestead, mineral, or other special survey monument	
Fence or field lines	

**CONTROL DATA AND MONUMENTS**

Principal point**	
U.S. mineral or location monument	
River mileage marker	
<b>Boundary monument</b>	
Third-order or better elevation, with tablet	
Third-order or better elevation, recoverable mark, no tablet	
With number and elevation	
<b>Horizontal control</b>	
Third-order or better, permanent mark	
With third-order or better elevation	
With checked spot elevation	
Coincident with found section corner	
Unmonumented**	
<b>Vertical control</b>	
Third-order or better elevation, with tablet	
Third-order or better elevation, recoverable mark, no tablet	
Bench mark coincident with found section corner	
Spot elevation	

# Compass

## Surveying Compass

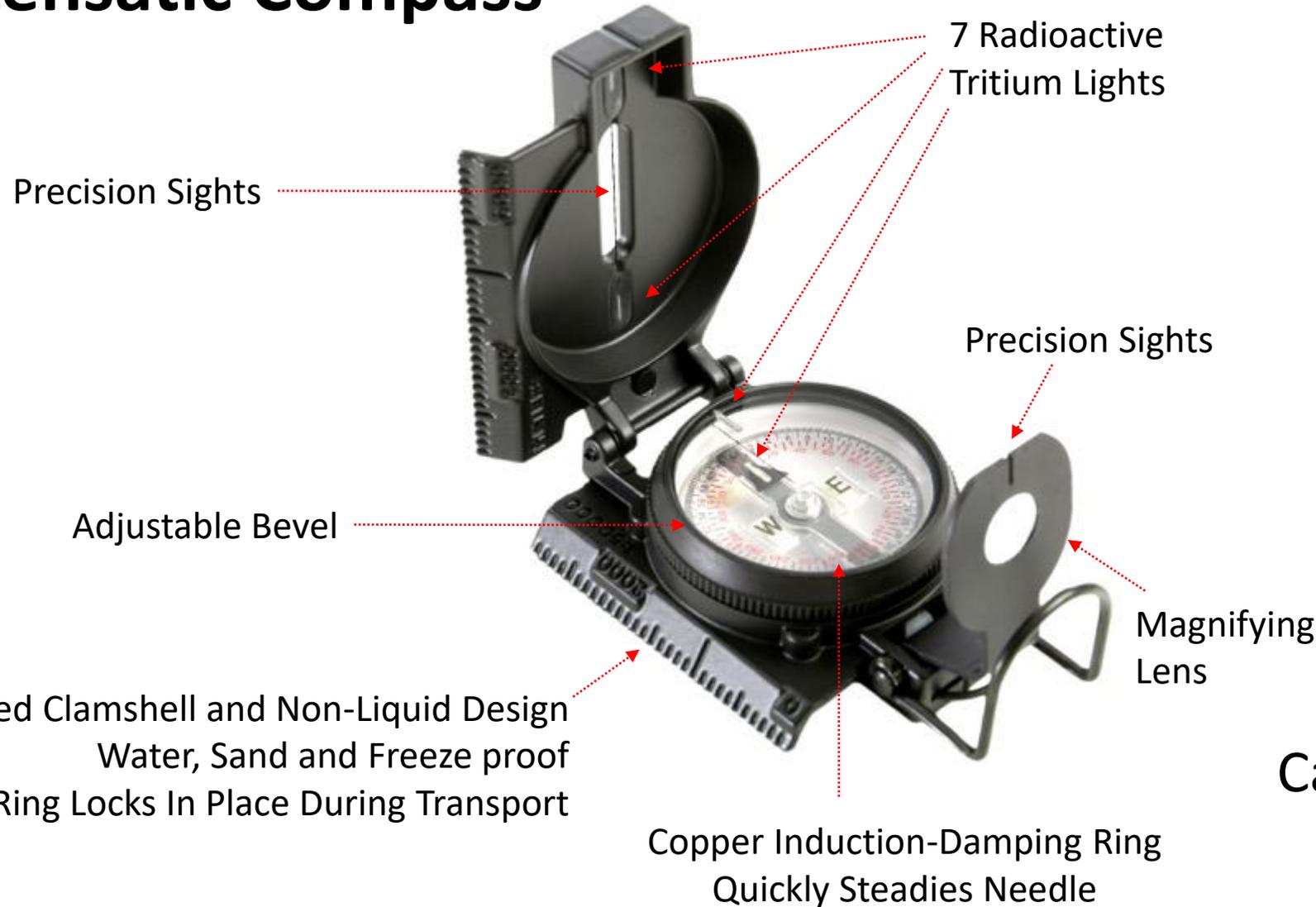


Brunton Transit

- Extremely accurate
  - Engineering
  - Surveying
  - Artillery
  - Caving
- NOT for Orienteering
  - NO Bearing ring
  - Bulky
  - Needs protractor
- Adjustable Declination
- Air filled needle housing
- Expedition Quality
- Needle lock
- Extremely Expensive

# Compass

## Lensatic Compass



- Very accurate for measuring azimuths
- Glows at night
- Expedition durability
- Base NOT transparent
  - Need protractor
- NO declination adjustment
- Expensive
- Bulky

Cammenga Tritium 3H

# Compass

## Mirror Compass

- Excellent compass
  - Adjustable declination
  - Global option
    - Fast jewel bearing
    - Southern hemisphere usable
    - 20° tilt margin
- Mirror
  - Accurate long-range azimuth
  - Signaling device
- Magnifying Glass
  - Fire starter
  - First-aid
- Clinometer
- Made in Finland

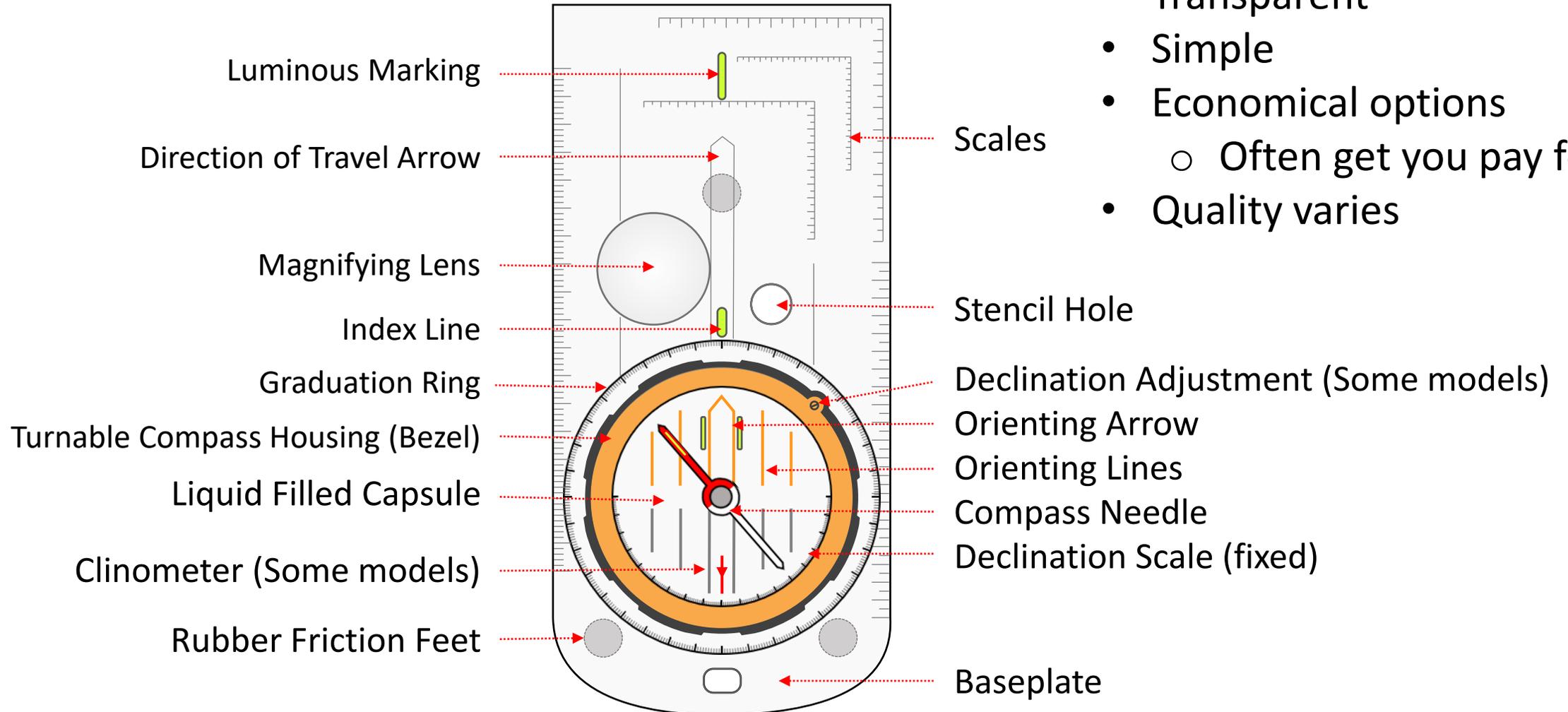


- Excellent Compass
- Expensive
- More than what you need for orienteering

SUUNTO MC-2 G

# Compass

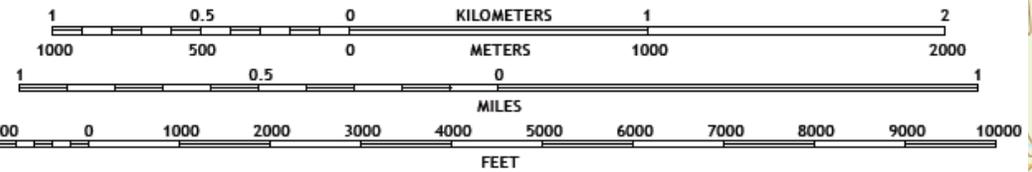
## The Baseplate Compass



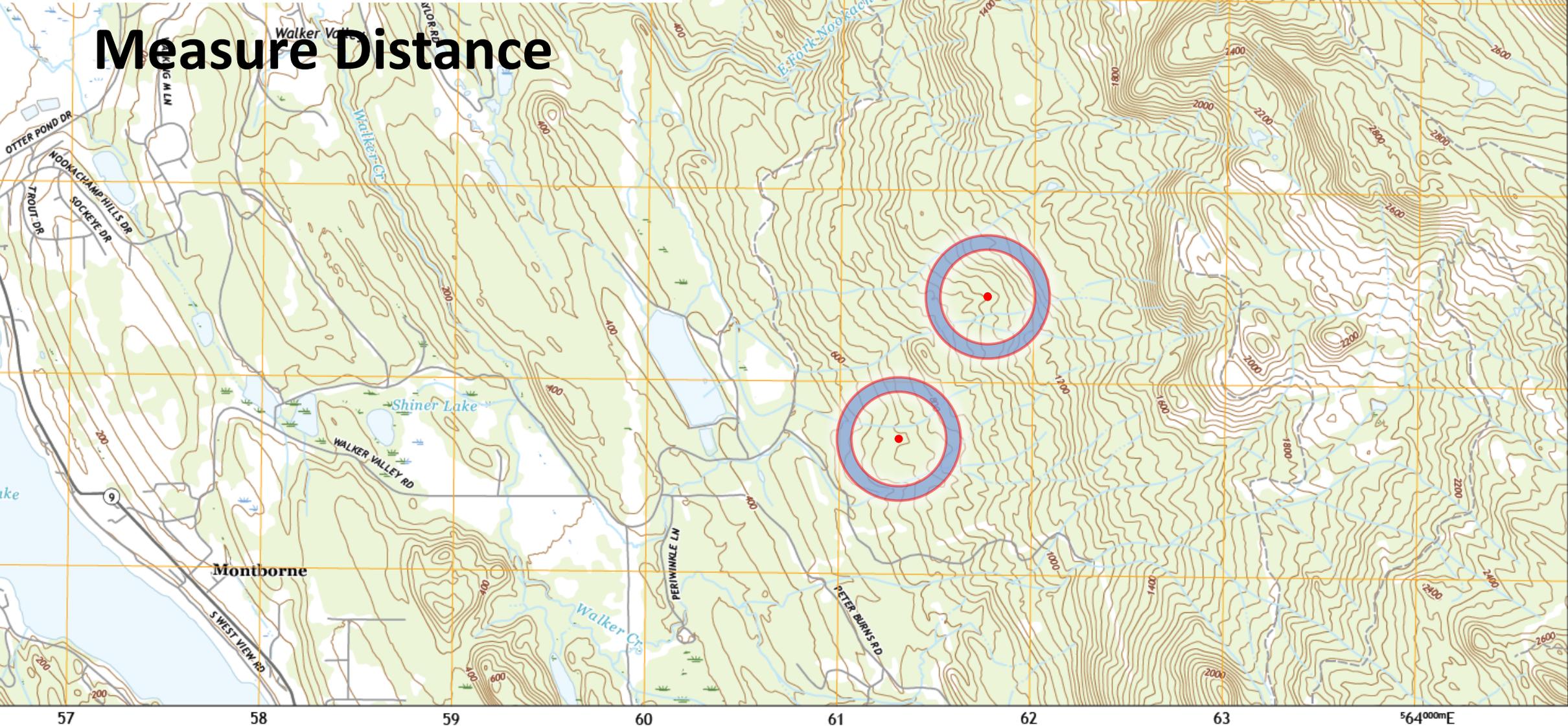
- Very versatile
- Transparent
- Simple
- Economical options
  - Often get you pay for
- Quality varies



SCALE 1:24 000



# Measure Distance



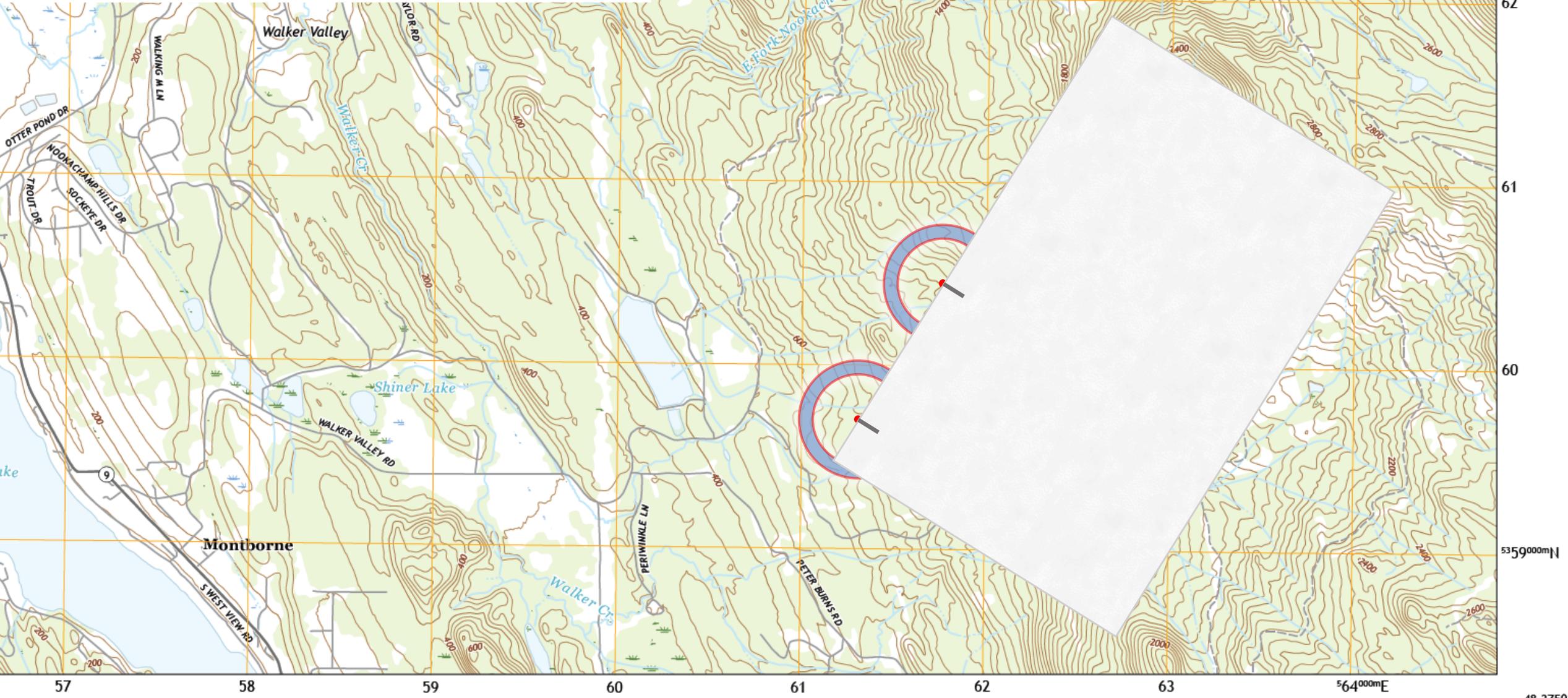
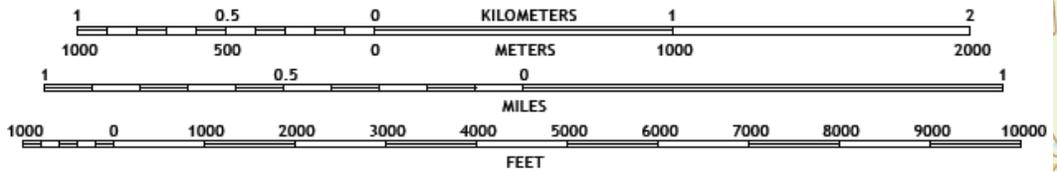
-122.1250° 48.3750°







SCALE 1:24 000

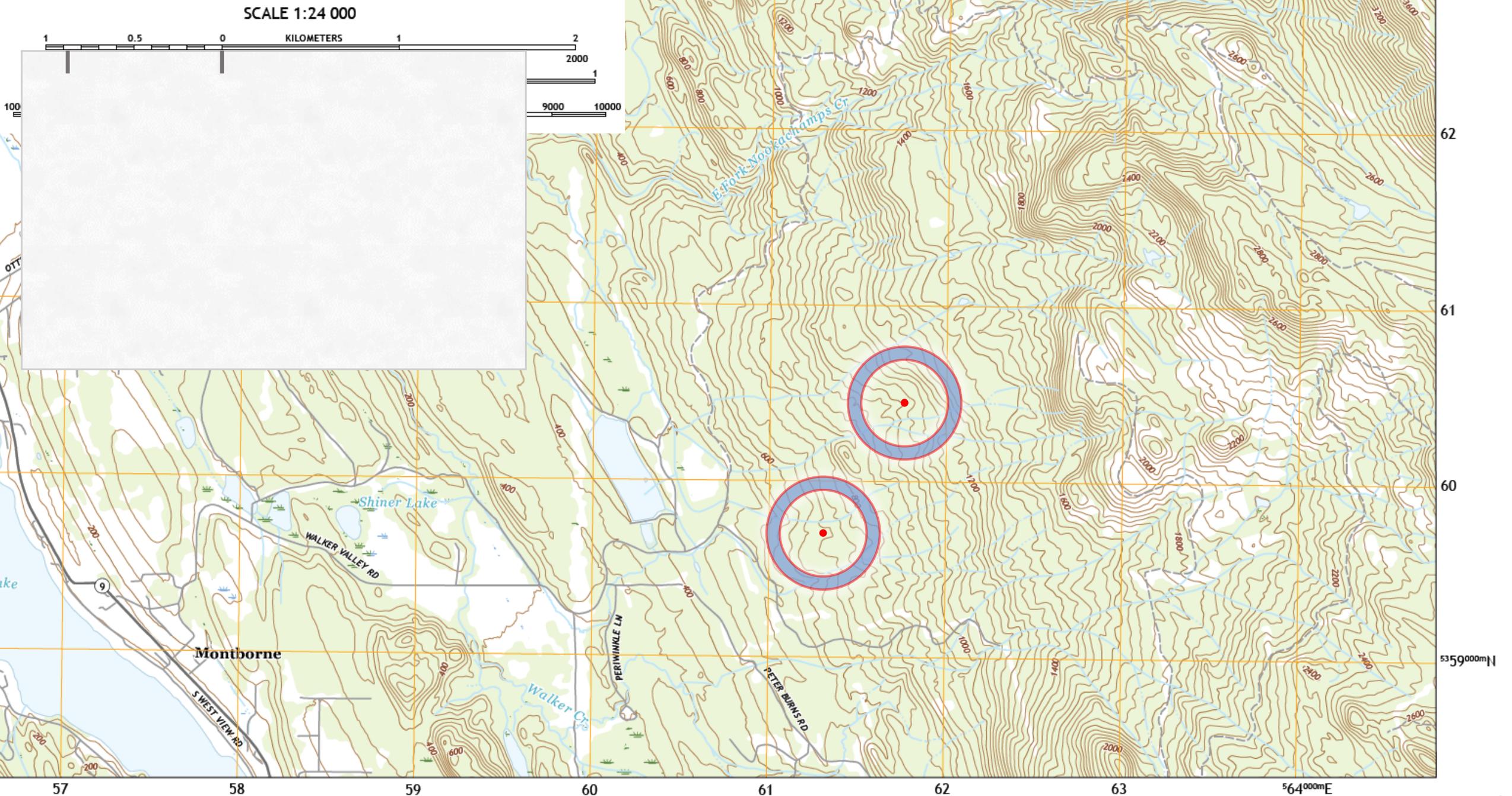


-122.1250° 48.3750°

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2

2000  
1  
9000 10000



-122.1250° 48.3750°

# Compass

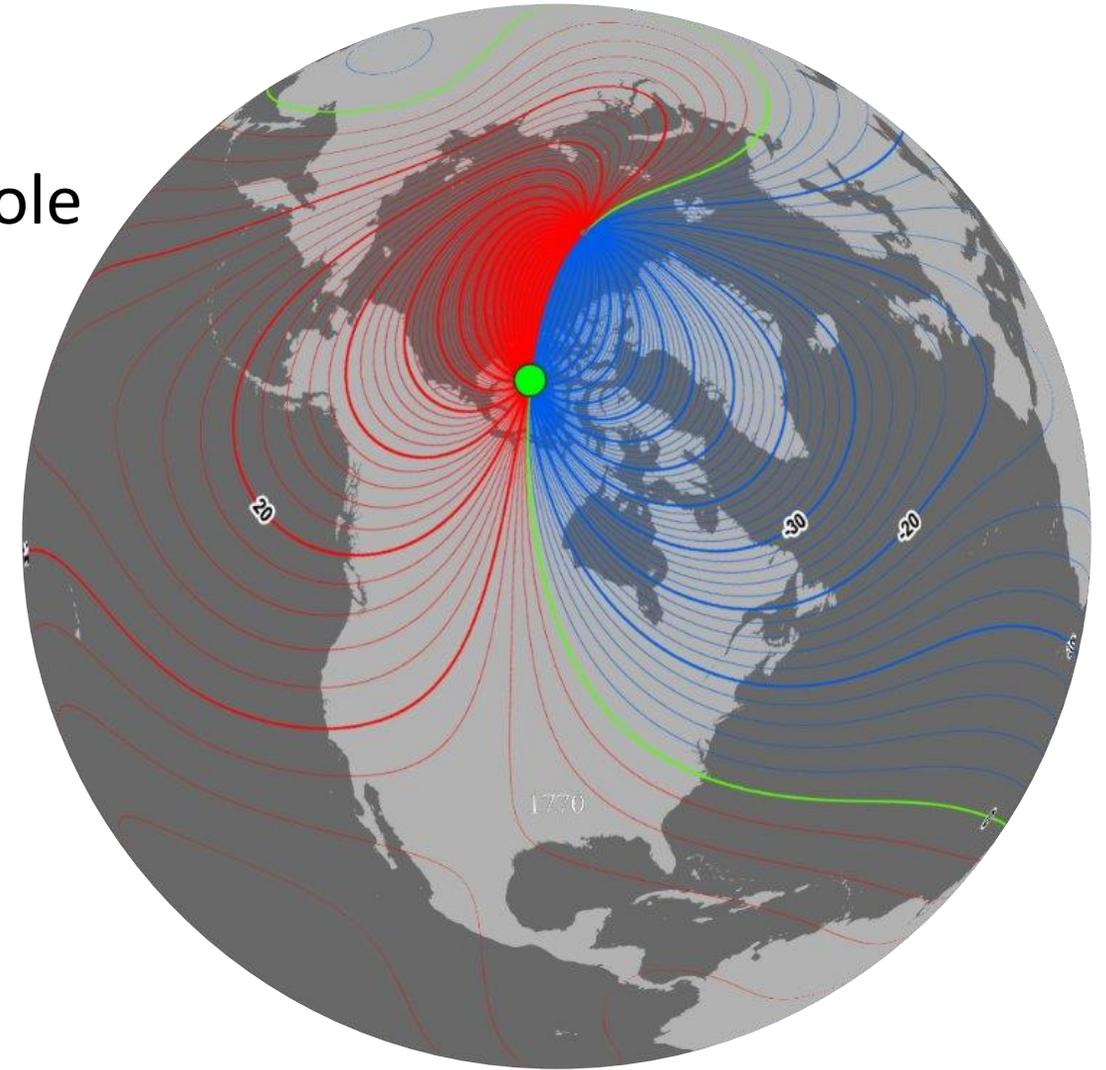
## **Magnetic Declination**

Magnetic declination is an important concept to understand when using a magnetic compass

# Compass

## Magnetic Declination

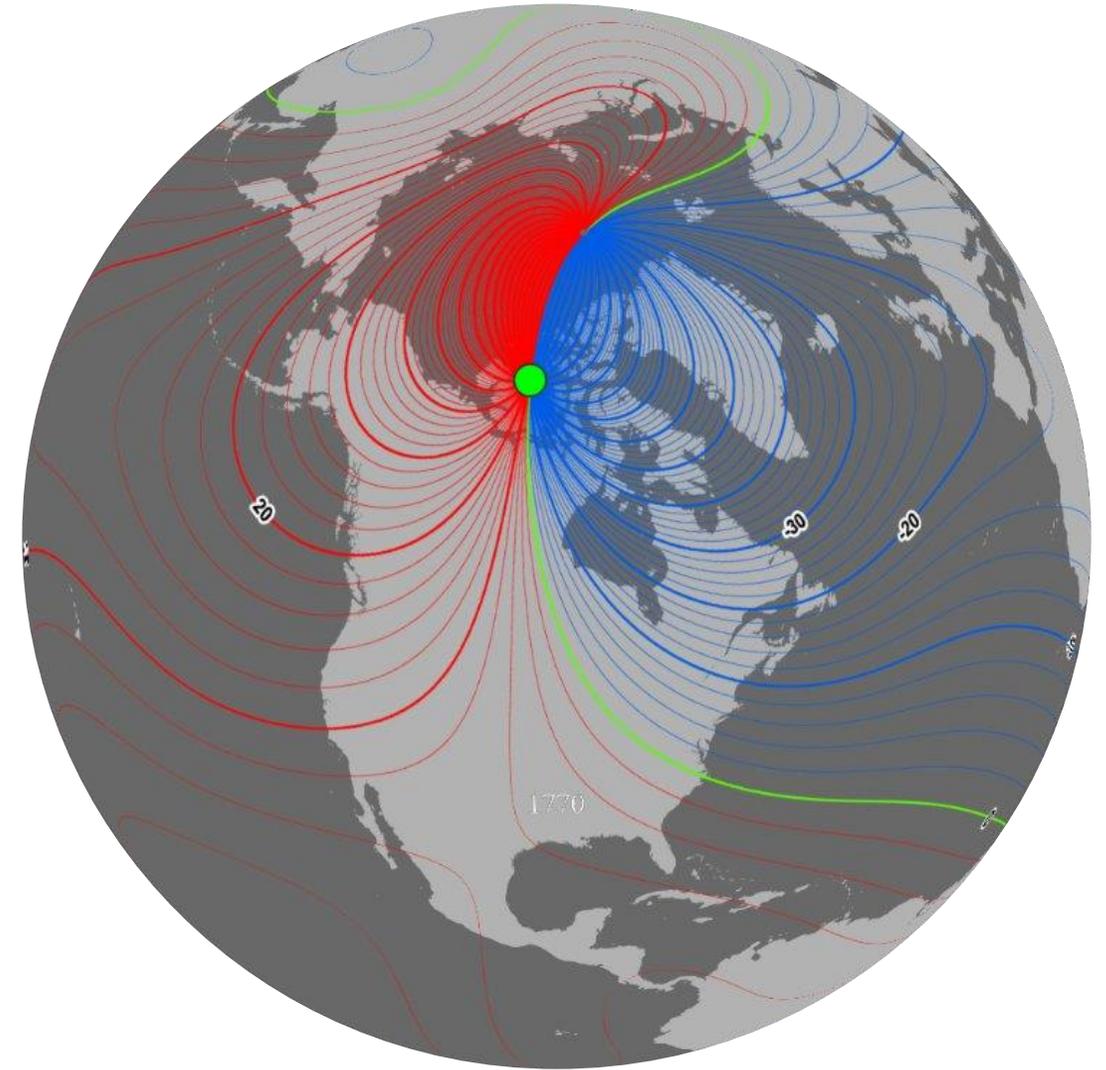
A compass doesn't point at the North Pole



# Compass

## Magnetic Declination

The Earth creates its own magnetic field from the electric currents created in the liquid iron-nickel core.

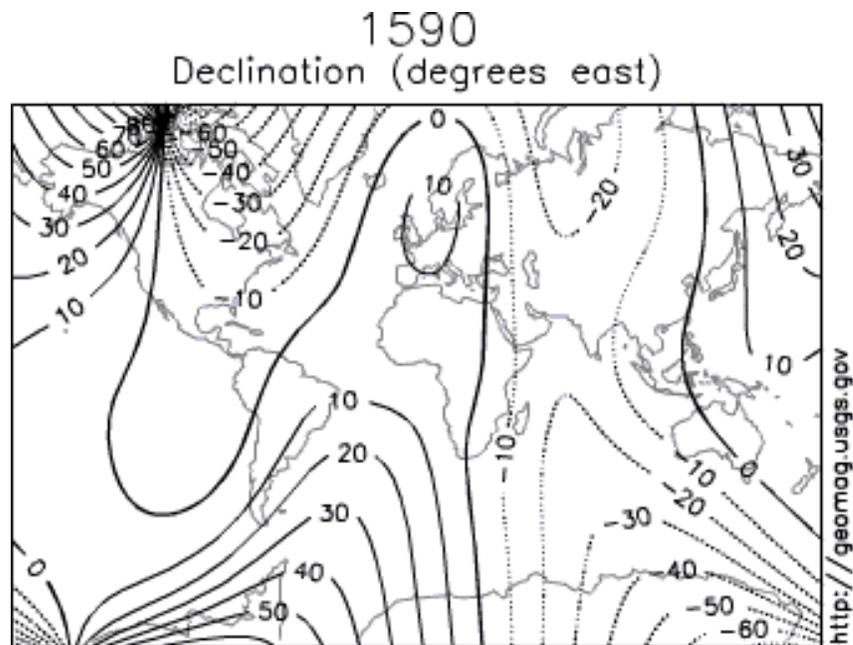


# Compass

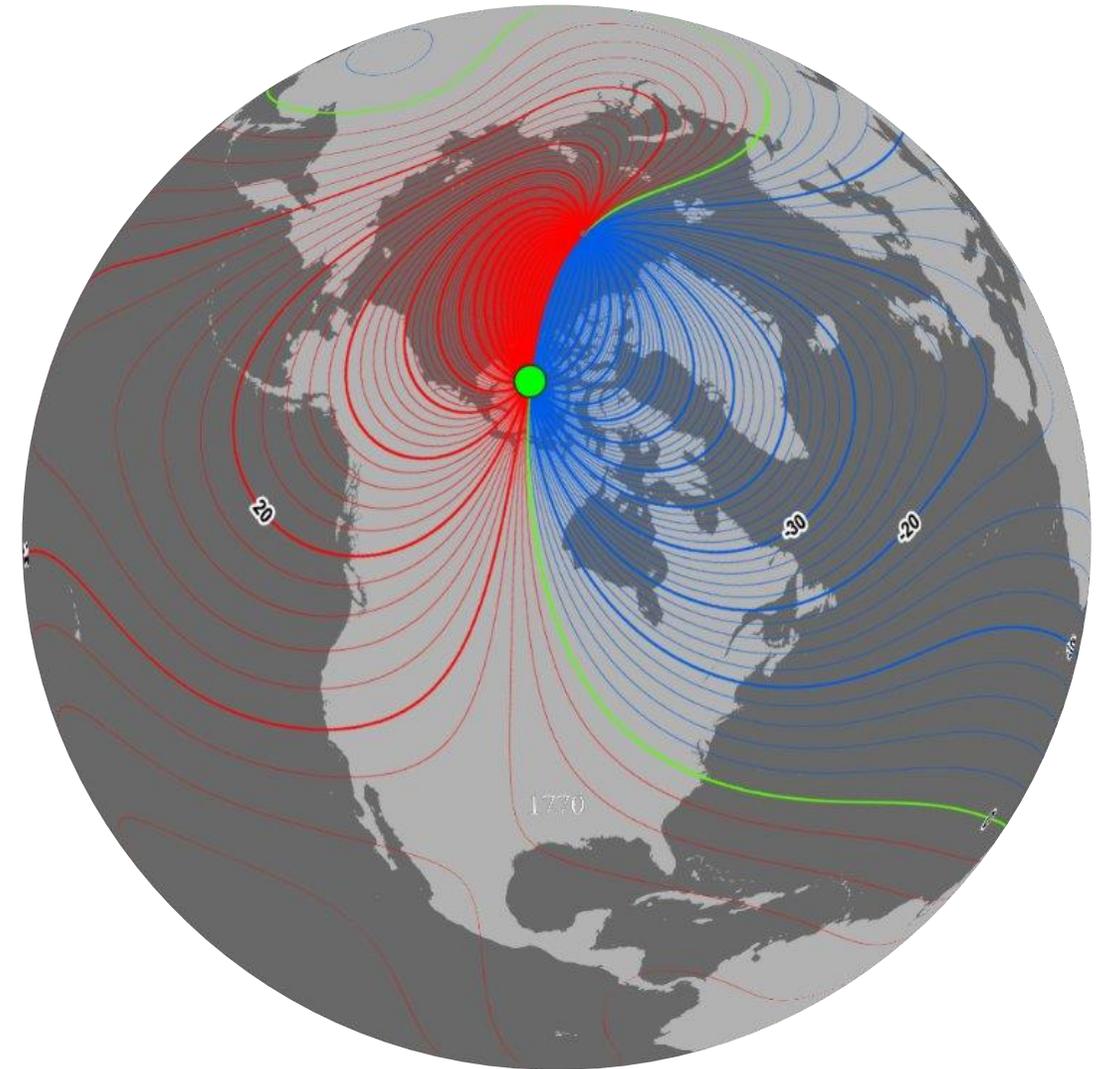
## Magnetic Declination

The poles also slowly move over time...

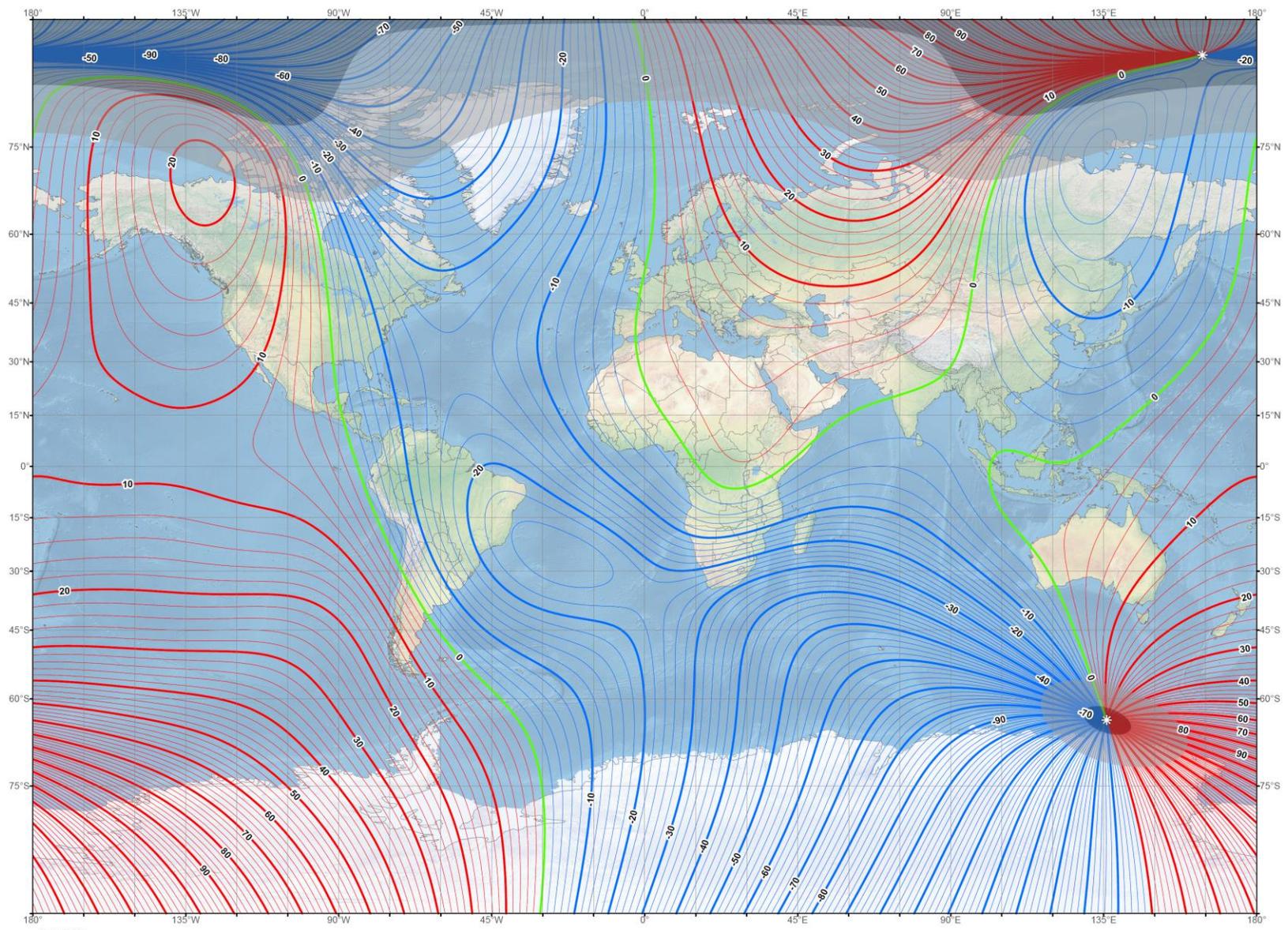
Now more than 30 miles per year



Model by A. Jackson, A. R. T. Jonkers, M. R. Walker,  
Phil. Trans. R. Soc. London A (2000), 358, 957-990.



# US/UK World Magnetic Model - Epoch 2020.0 Main Field Declination (D)



**Main Field Declination (D)**  
 Miller Cylindrical Projection  
 Contour interval: 2 degrees  
 - Positive (east)  
 - Negative (west)  
 - Zero (agonic) line

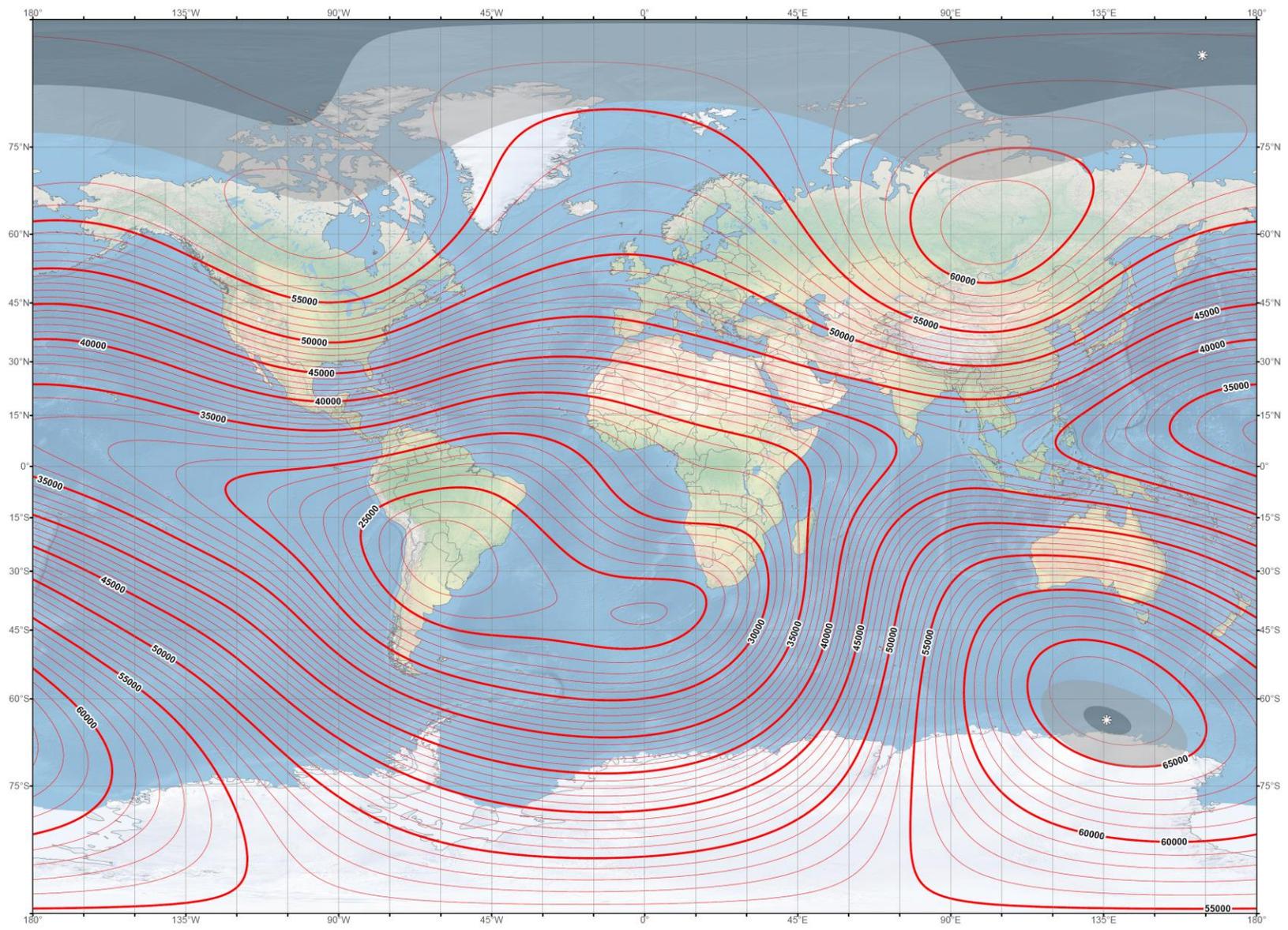
**Position of Dip Poles**

**Blackout Zones**  
 Horizontal Field (H) Strength:  
 - 0-2000 nT (Unreliable Zone)  
 - 2000-6000 nT (Caution Zone)

Map developed by NOAA/NCEI and CIRES  
<https://ngdc.noaa.gov/geomag/WMM>  
 Published December 2019

# US/UK World Magnetic Model - Epoch 2020.0

## Main Field Total Intensity (F)



**Main Field**  
Total Intensity (F)  
Miller Cylindrical Projection  
Contour interval: 1000 nT

Position of Dip Poles

**Blackout Zones**  
Horizontal Field (H) Strength:  
0-2000 nT (Unreliable Zone)  
2000-6000 nT (Caution Zone)

Map developed by NOAA/NCEI and CIRES  
<https://ngdc.noaa.gov/geomag/WMM>  
Published December 2019

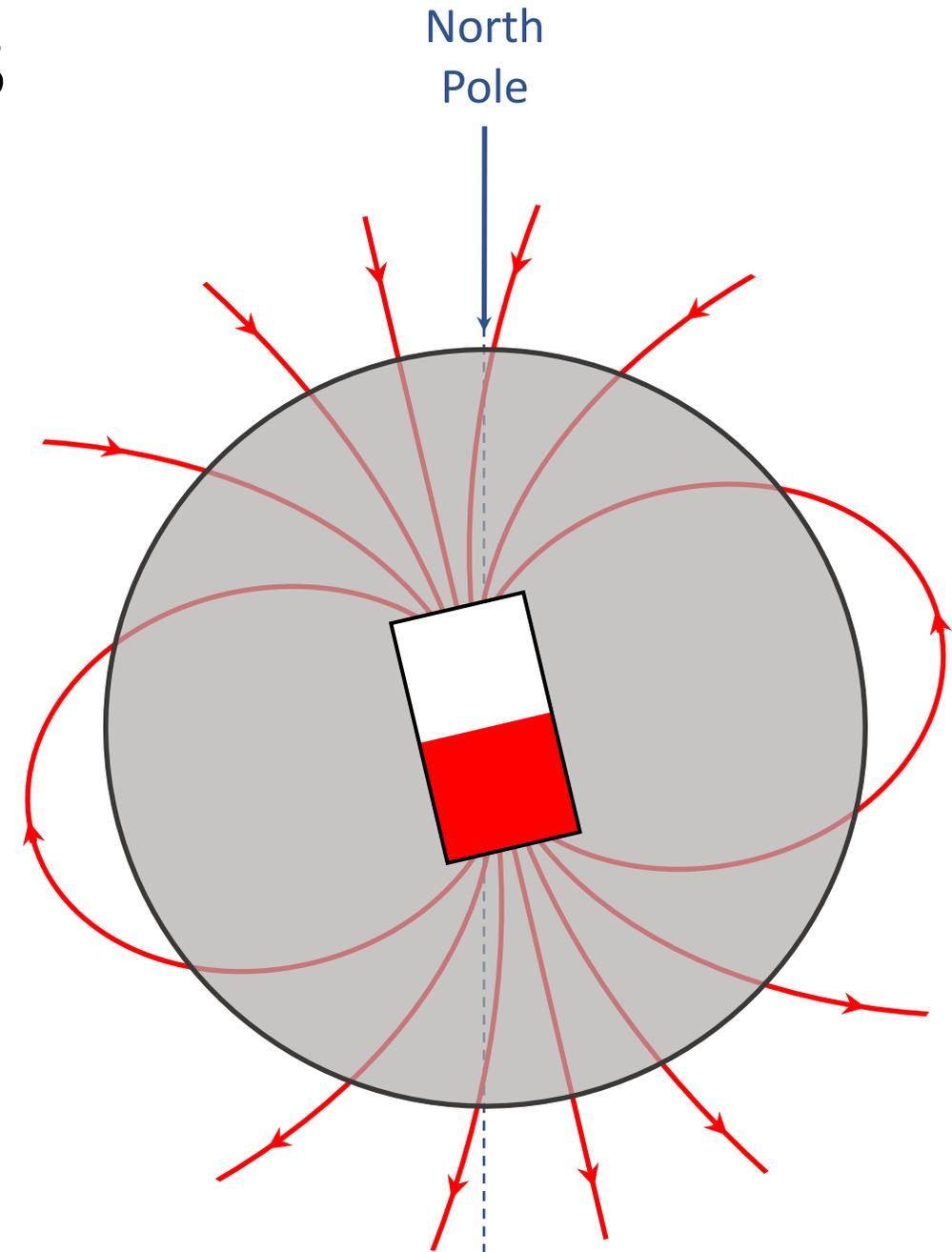


# Compass

## Magnetic Inclination

The earth's magnetic field is 3 dimensional

- Northern Zones – Needle dives
- Magnetic Equator – Needle balanced
- Southern Zones – Needle climbs



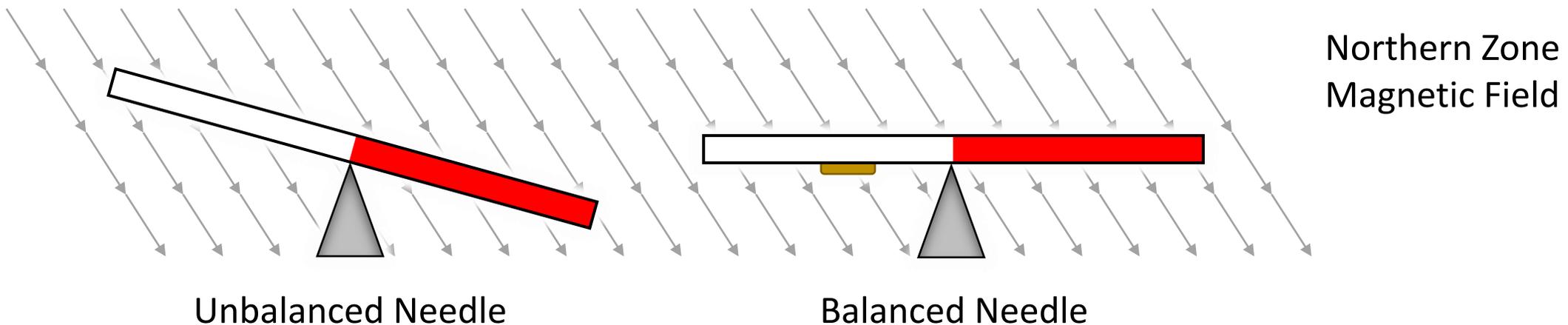


# Compass

## Magnetic Inclination

A needle on a compass will dip and rise with the Earth's magnetic field

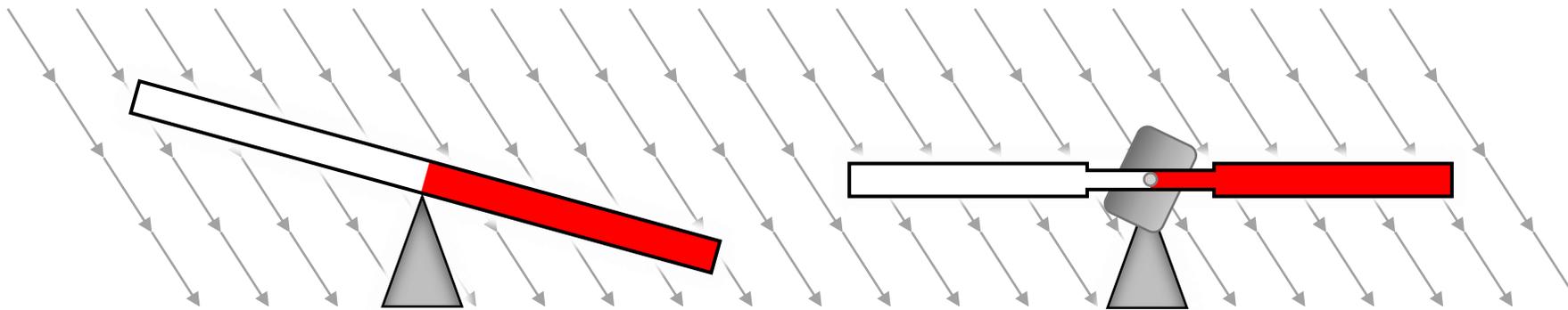
- Most compasses are balanced to compensate for inclination
  - A compass balanced for the USA will drag in Australia
  - A compass balanced for Australia will drag in the USA



# Compass

## “Global” Compass

- RECTA and Suunto Global Needle System
  - Compass needle and magnet are built as separate units
  - Needle fixed at its pivot by means of a double bearing
    - Magnet rotates on a pivot with its own jeweled bearing
    - Needle does NOT dip with magnetic inclination



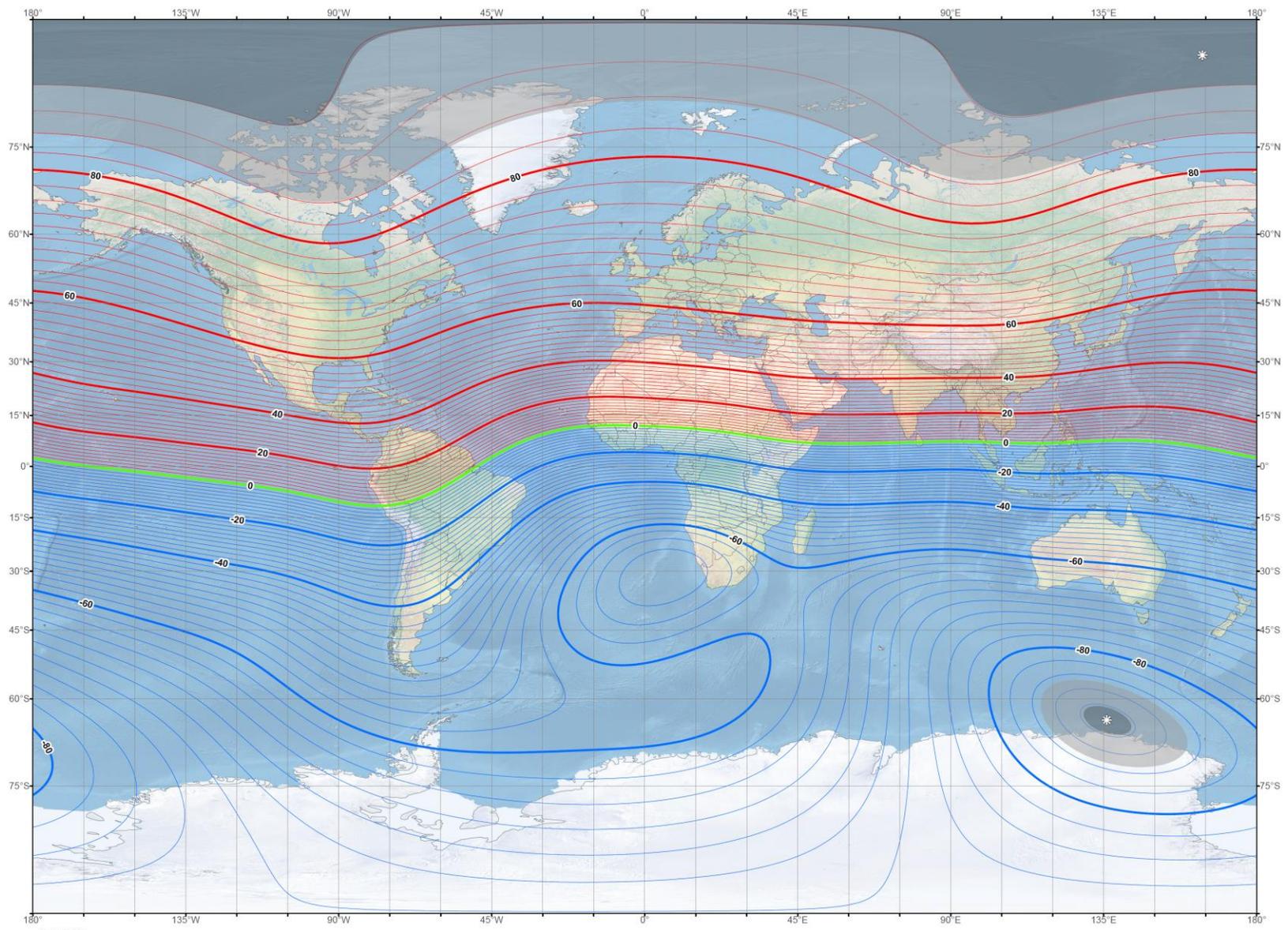
Unbalanced Needle

Global Needle



SUUNTO MC-2 G

# US/UK World Magnetic Model - Epoch 2020.0 Main Field Inclination (I)



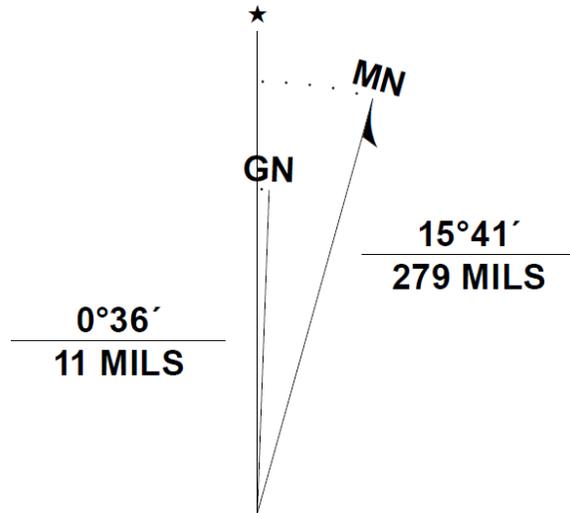
**Main Field Inclination (I)**  
 Miller Cylindrical Projection  
 Contour interval: 2 degrees  
 Positive (down)  
 Negative (up)  
 Zero line

**Position of Dip Poles**

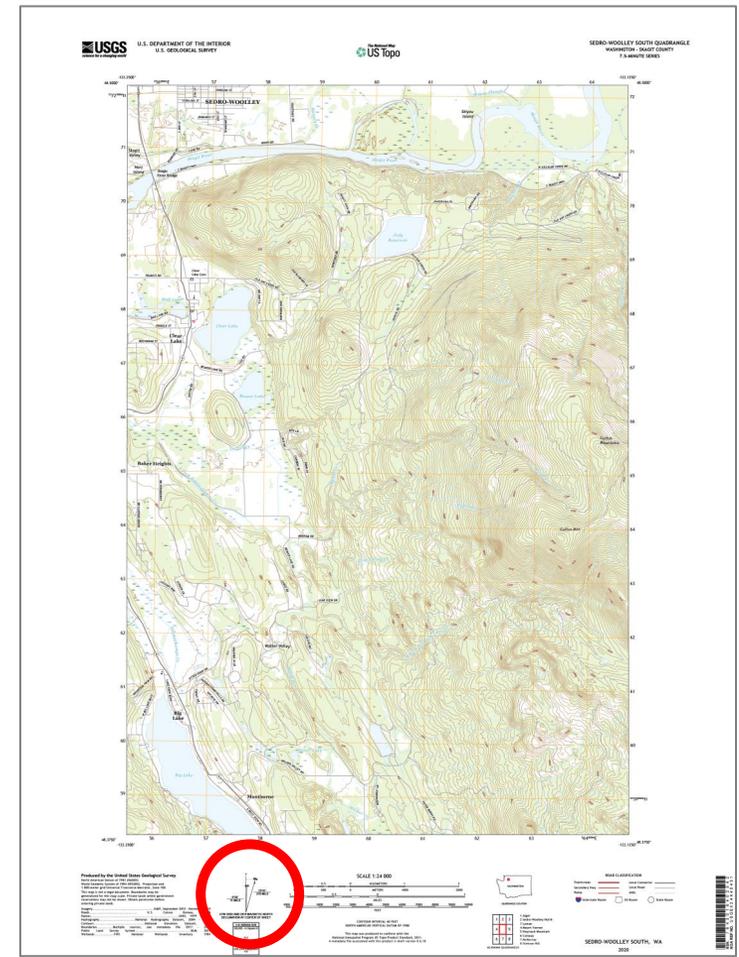
**Blackout Zones**  
 Horizontal Field (H) Strength:  
 0-2000 nT (Unreliable Zone)  
 2000-6000 nT (Caution Zone)

Map developed by NOAA/NCEI and CIRES  
<https://ngdc.noaa.gov/geomag/WMM>  
 Published December 2019

# Magnetic Declination



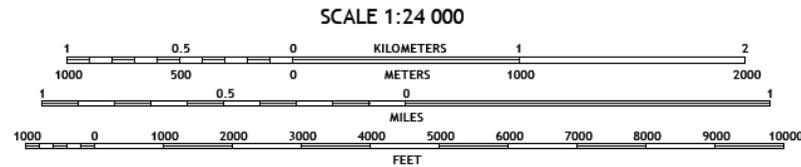
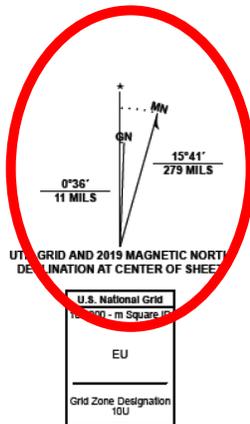
UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



### Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)  
 World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 10U  
 This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, September 2015 - November 2015  
 Roads.....U.S. Census Bureau, 2016  
 Names.....GNIS, 1979 - 2019  
 Hydrography.....National Hydrography Dataset, 2004 - 2019  
 Contours.....National Elevation Dataset, 2018  
 Boundaries.....Multiple sources; see metadata file 2017 - 2018  
 Public Land Survey System.....BLM, 2019  
 Wetlands.....FWS National Wetlands Inventory 1981



SCALE 1:24 000

CONTOUR INTERVAL 40 FEET  
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011. A metadata file associated with this product is draft version 0.6.18



QUADRANGLE LOCATION

1	2	3
4	5	6
7	8	

- 1 Alger
- 2 Sedro-Woolley North
- 3 Lyman
- 4 Mount Vernon
- 5 Haystack Mountain
- 6 Conway
- 7 McMurray
- 8 Stimson Hill

ADJOINING QUADRANGLES

### ROAD CLASSIFICATION

- Expressway
- Secondary Hwy
- Ramp
- Interstate Route
- Local Connector
- Local Road
- 4WD
- US Route
- State Route

SEDRO-WOOLLEY SOUTH, WA

2020

# Magnetic Field Calculators

Declination

U.S. Historic Declination

Magnetic Field

Magnetic Field Component Grid

## Magnetic Declination Estimated Value ⓘ

Declination is calculated using the most recent [World Magnetic Model \(WMM\)](#) or the [International Geomagnetic Reference Field \(IGRF\)](#) model. For 1590 to 1900 the calculator is based on the [gufm1](#) model. A smooth transition from gufm1 to IGRF was imposed from 1890 to 1900. The [Enhanced Magnetic Model \(EMM\)](#) is a research model compiled from satellite, marine, aeromagnetic and ground magnetic surveys which attempts to include crustal variations in the magnetic field too fine to appear in the World Magnetic Model. Declination results are typically accurate to 30 minutes of arc, but environmental factors can cause magnetic field disturbances. The calculator provides an easy way for you to get results in HTML, XML, CSV, or JSON programmatically (API). For more information click the information button above.

### Calculate Declination

Latitude:   S  NLongitude:   W  EModel:  WMM (2019-2024)  IGRF (1590-2024)  
 EMM (2000-2019)Date: Year  Month  Day Result format:  HTML  XML  CSV  JSON  PDF

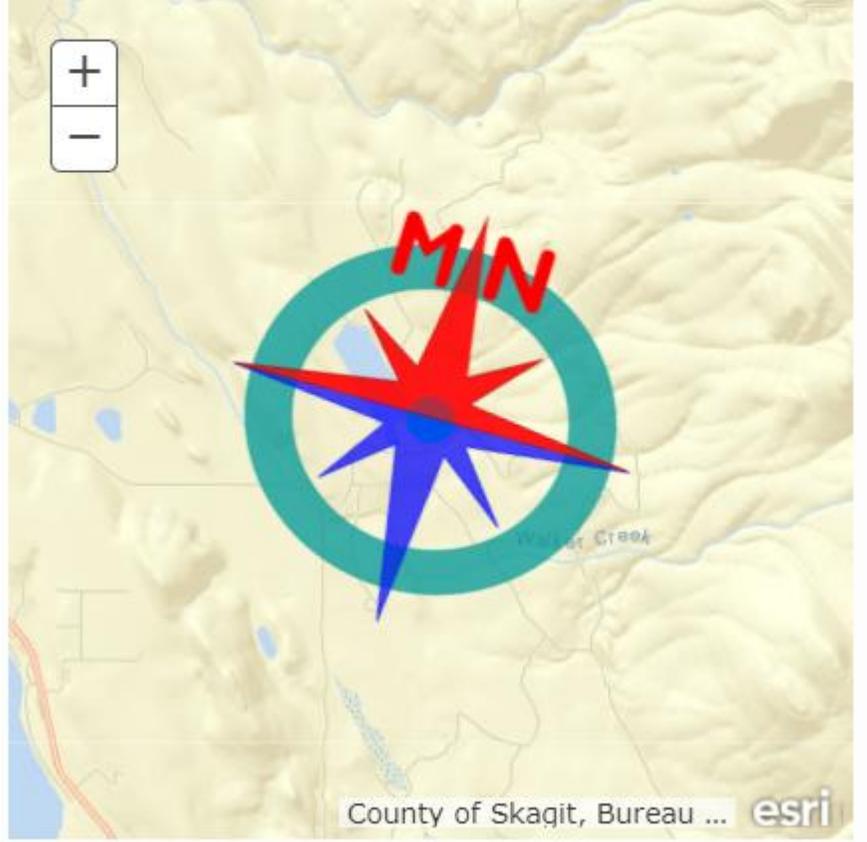
### Lookup Latitude / Longitude

Enter a street address, street name, or street intersection. For best results, include as much location information as possible with the street address in your search, such as city, state, zip code.

Location: 


Declination X

Model Used:	WMM-2020
Latitude:	48° 23' 18" N <span style="float: right; font-size: 0.8em; color: #0072bc;">ⓘ</span>
Longitude:	122° 10' 55" W
Date	Declination
2021-01-09	15° 40' E ± 0° 24' changing by 0° 6' W per year



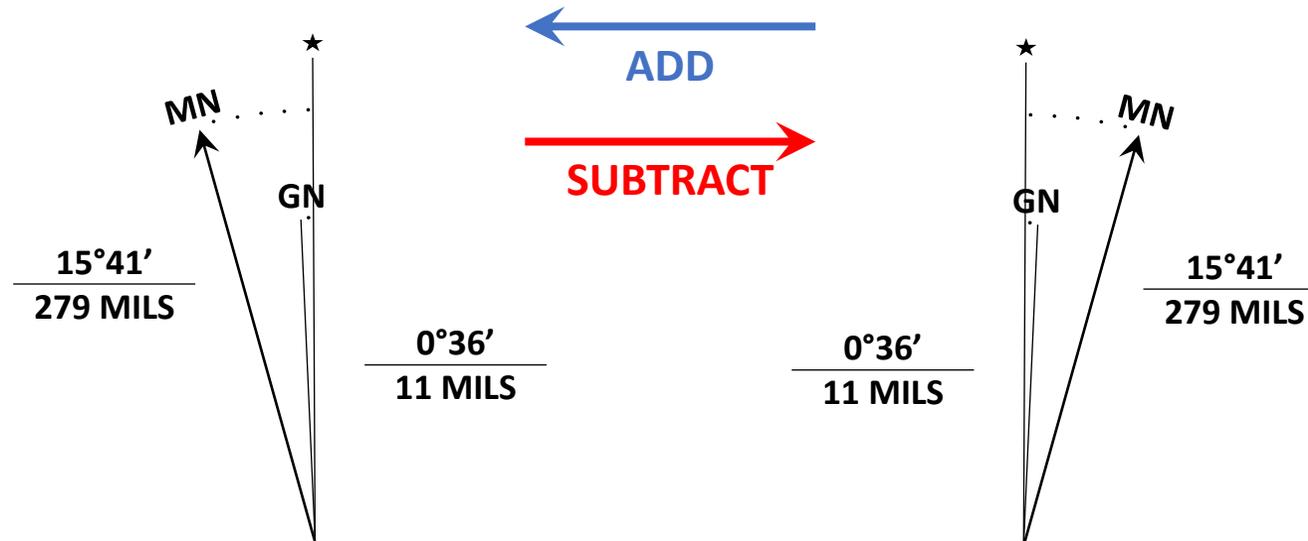
# Compass

## Magnetic Declination – Conversions

Converting between Grid and Magnetic North requires a bit of math

To convert a  
Magnetic Azimuth to a  
Grid Azimuth  
**SUBTRACT** angle

To convert a  
Grid Azimuth to a  
Magnetic Azimuth  
**ADD** angle



West Declination

East Declination

To convert a  
Magnetic Azimuth to a  
Grid Azimuth  
**ADD** angle

To convert a  
Grid Azimuth to a  
Magnetic Azimuth  
**SUBTRACT** angle





# Compass

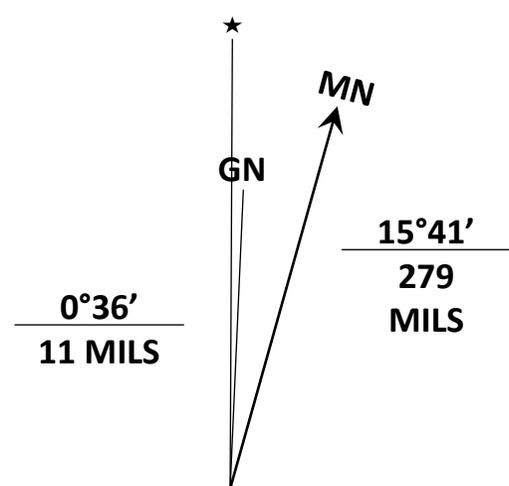
## **Map Orientation**

Show how to orient a map using a compass.

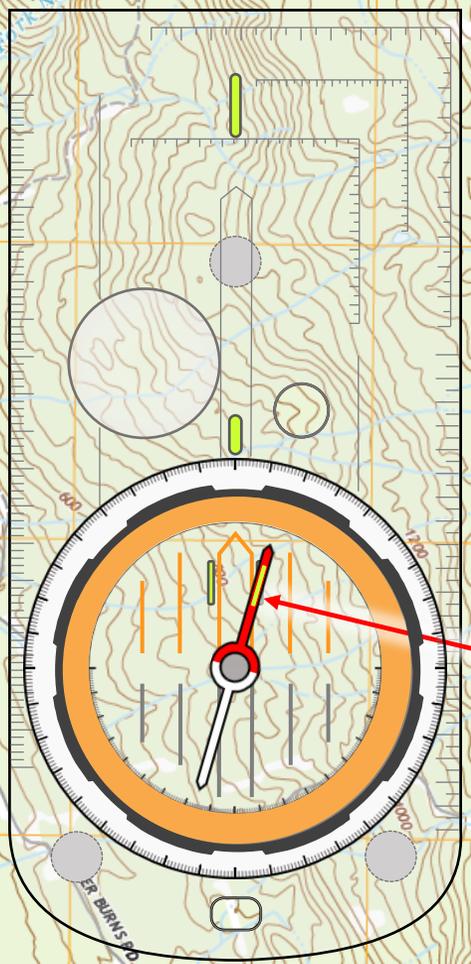
# Compass

## Map Orientation

Line up  
Map and Needle  
Like Declination Diagram



UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET



Line up Needle with  
Orienting Arrow

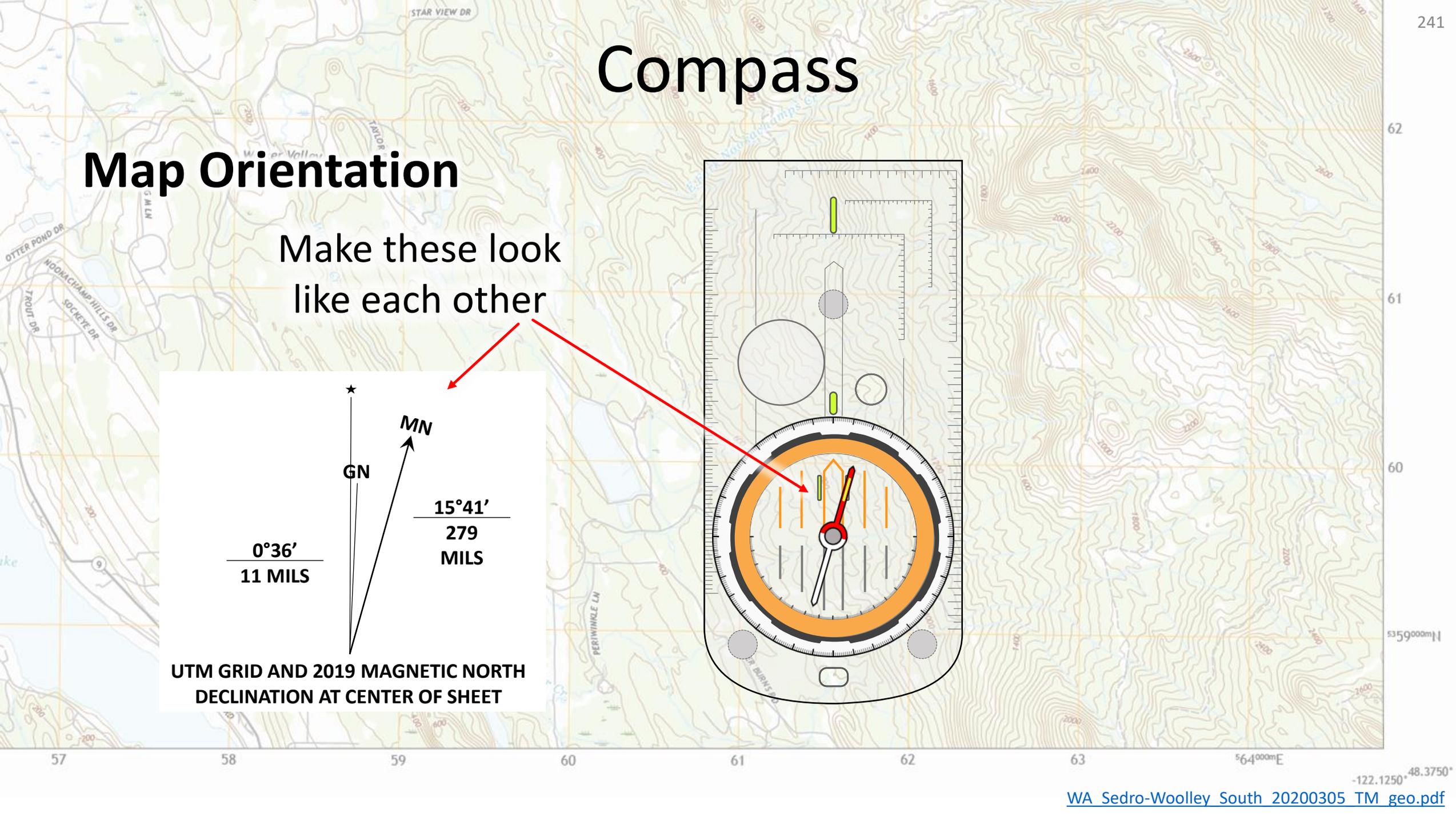
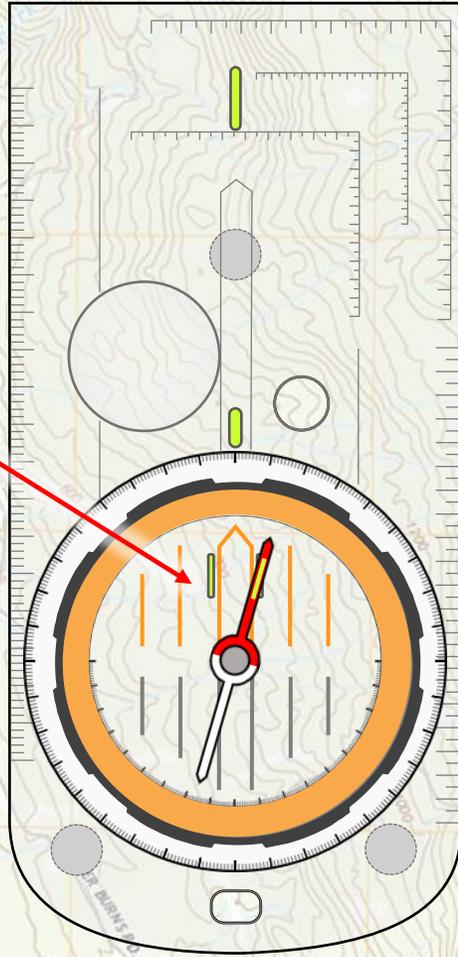
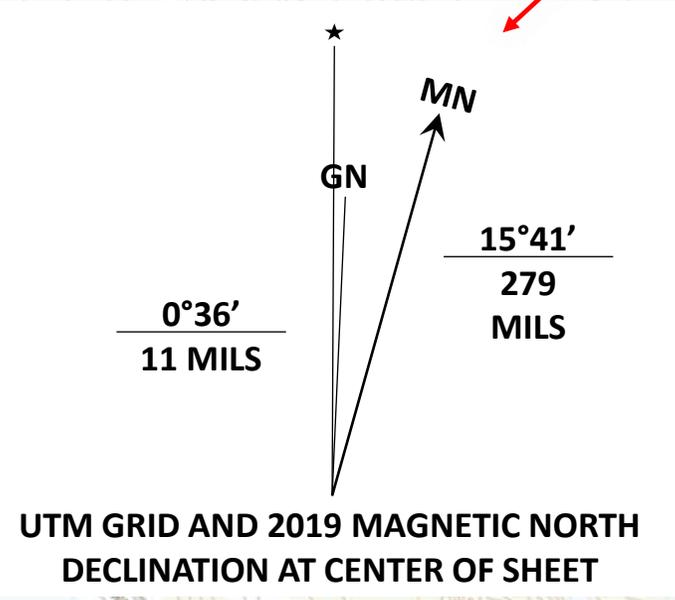
57 58 59 60 61 62 63 564000mE

-122.1250° -48.3750°

# Compass

## Map Orientation

Make these look like each other



# Compass

## Map Orientation

Direction of Travel

Line up Compass with points

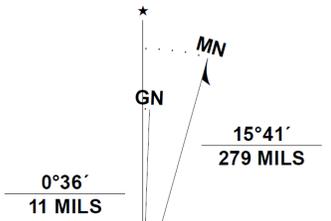
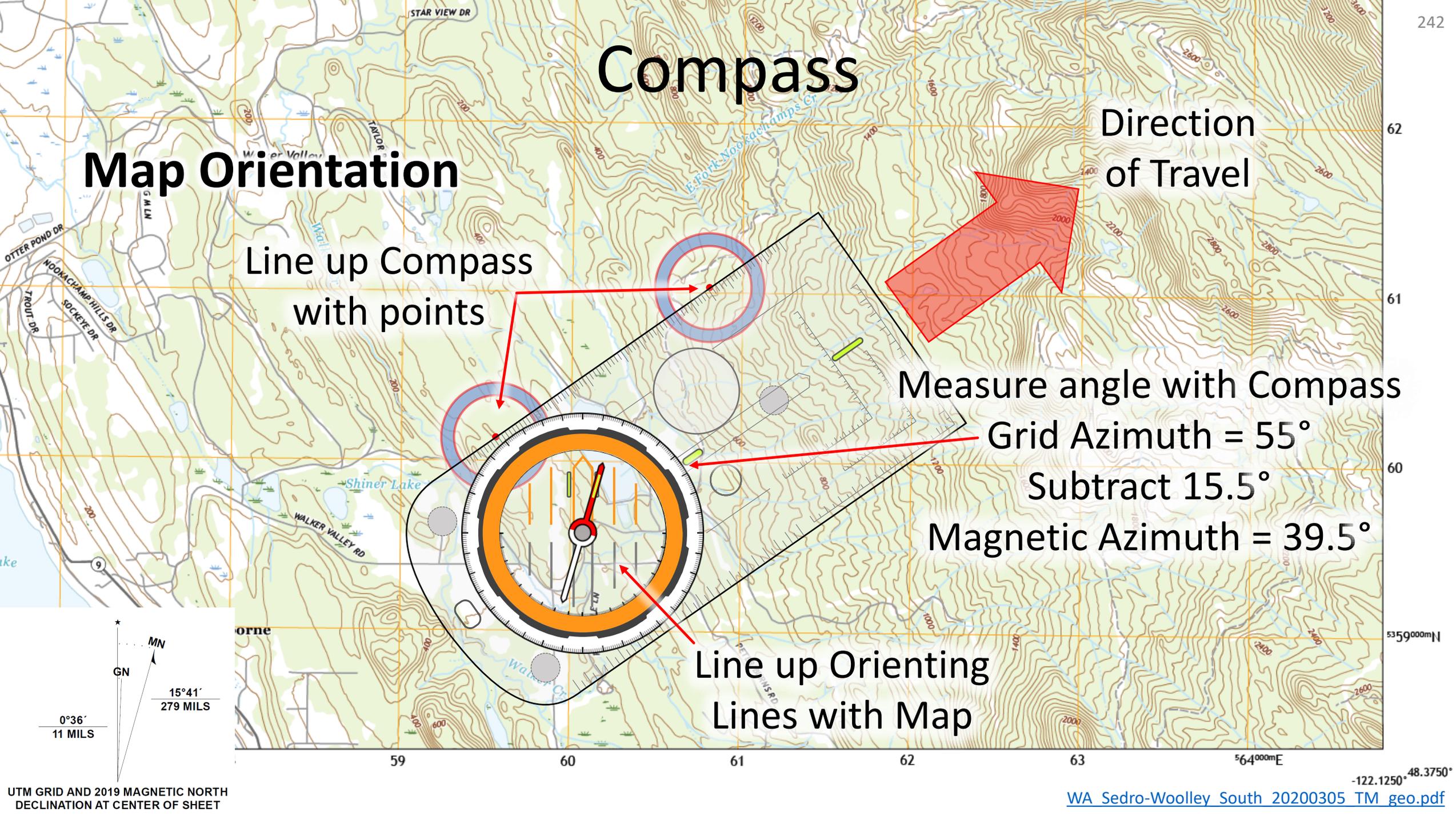
Measure angle with Compass

Grid Azimuth = 55°

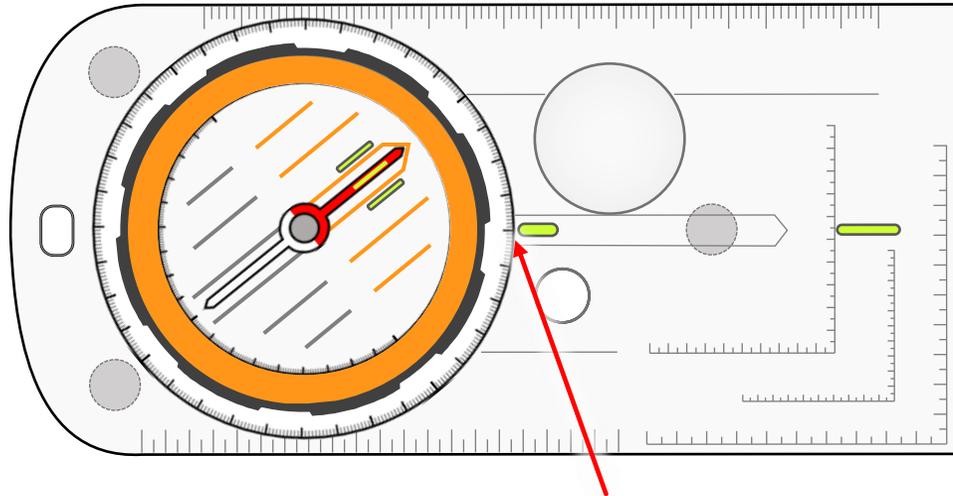
Subtract 15.5°

Magnetic Azimuth = 39.5°

Line up Orienting Lines with Map



# Compass Adjusted for Magnetic Declination

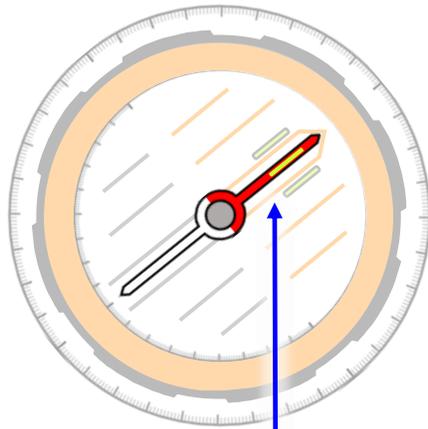


Set Bearing with  
Magnetic Declination  
 $55^\circ - 15.5^\circ = 39.5^\circ$

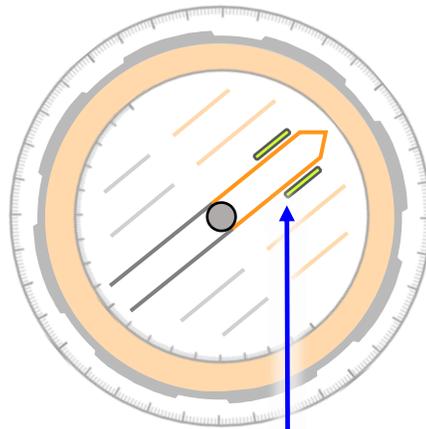
Direction  
of Travel

“Red in the Shed”  
Or  
“Dog in the Doghouse”

# Compass Adjusted for Magnetic Declination



Dog



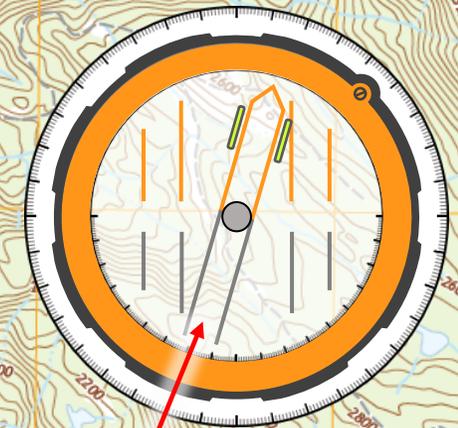
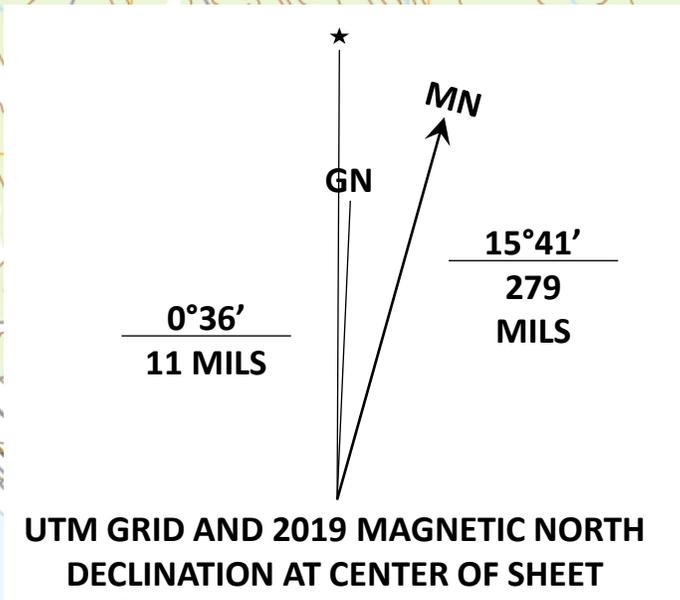
Doghouse

“Red in the Shed”  
Or  
“Dog in the Doghouse”

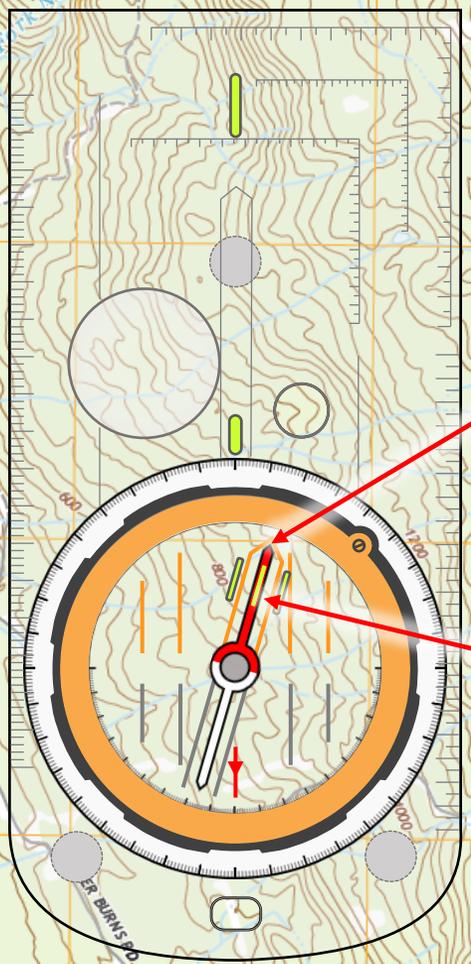
# Compass with Adjustable Declination

## Map Orientation

Line up  
Map and Needle  
Like Declination Diagram



Adjust declination  
if possible  
(Not all Compasses)



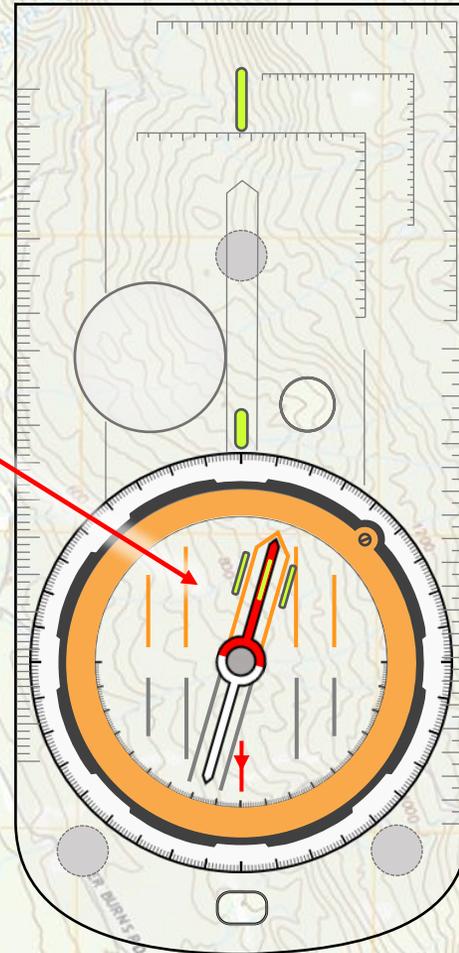
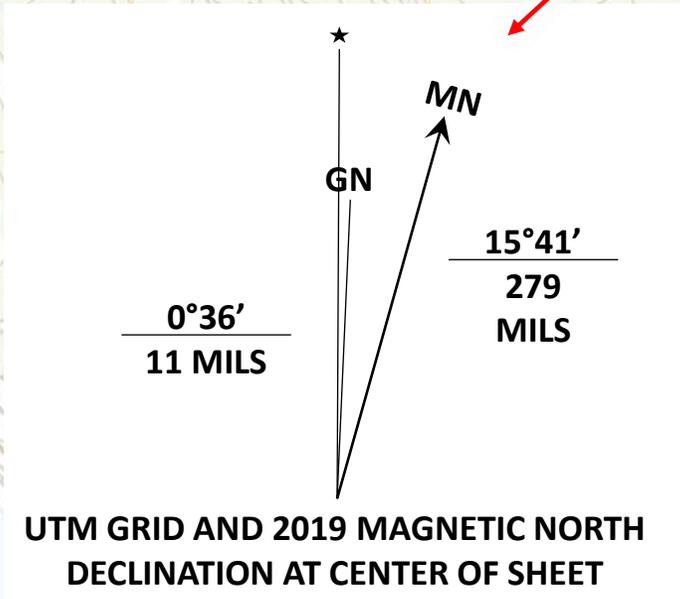
Line up Needle with  
Orienting Arrow

57 58 59 60 61 62 63 564000mE

# Compass with Adjustable Declination

## Map Orientation

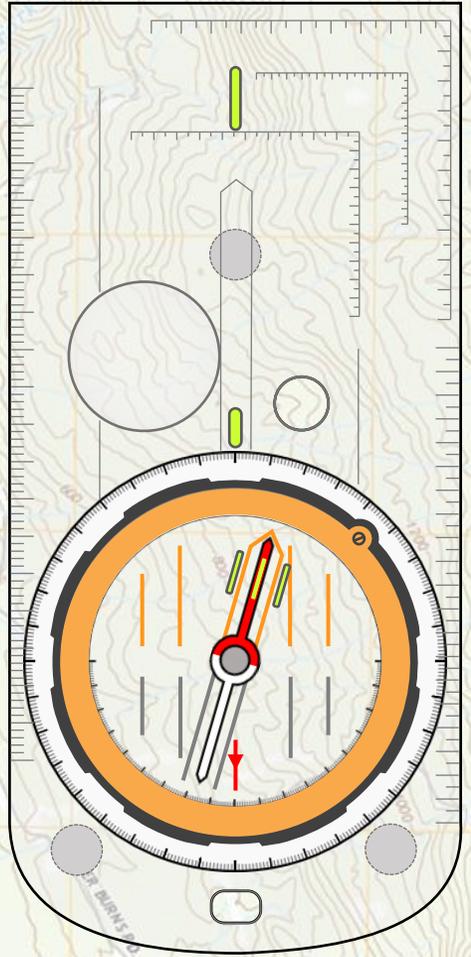
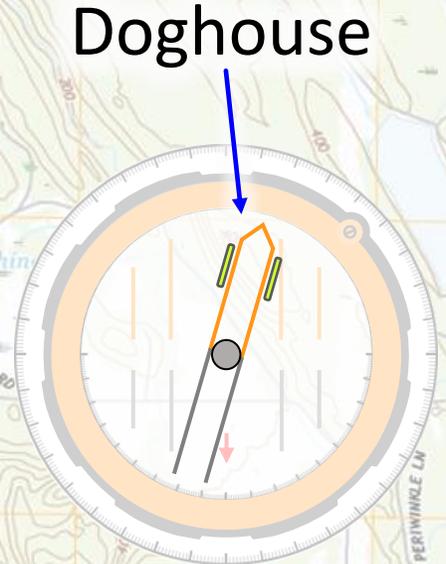
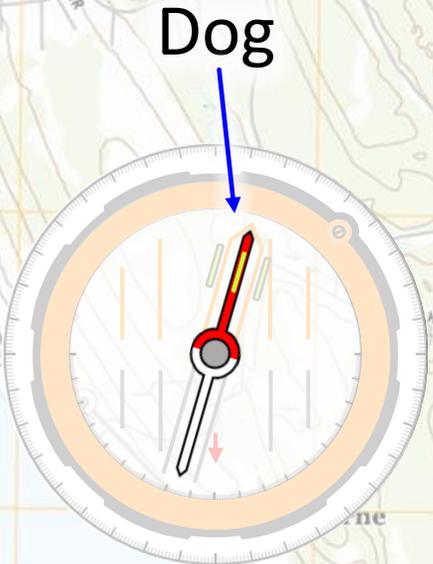
Make these look like each other



57 58 59 60 61 62 63 64<sup>000mE</sup>

# Compass with Adjustable Declination

## Important Terminology



Put the  
 “Dog in the  
 Doghouse”  
 or  
 “Red in the Shed”

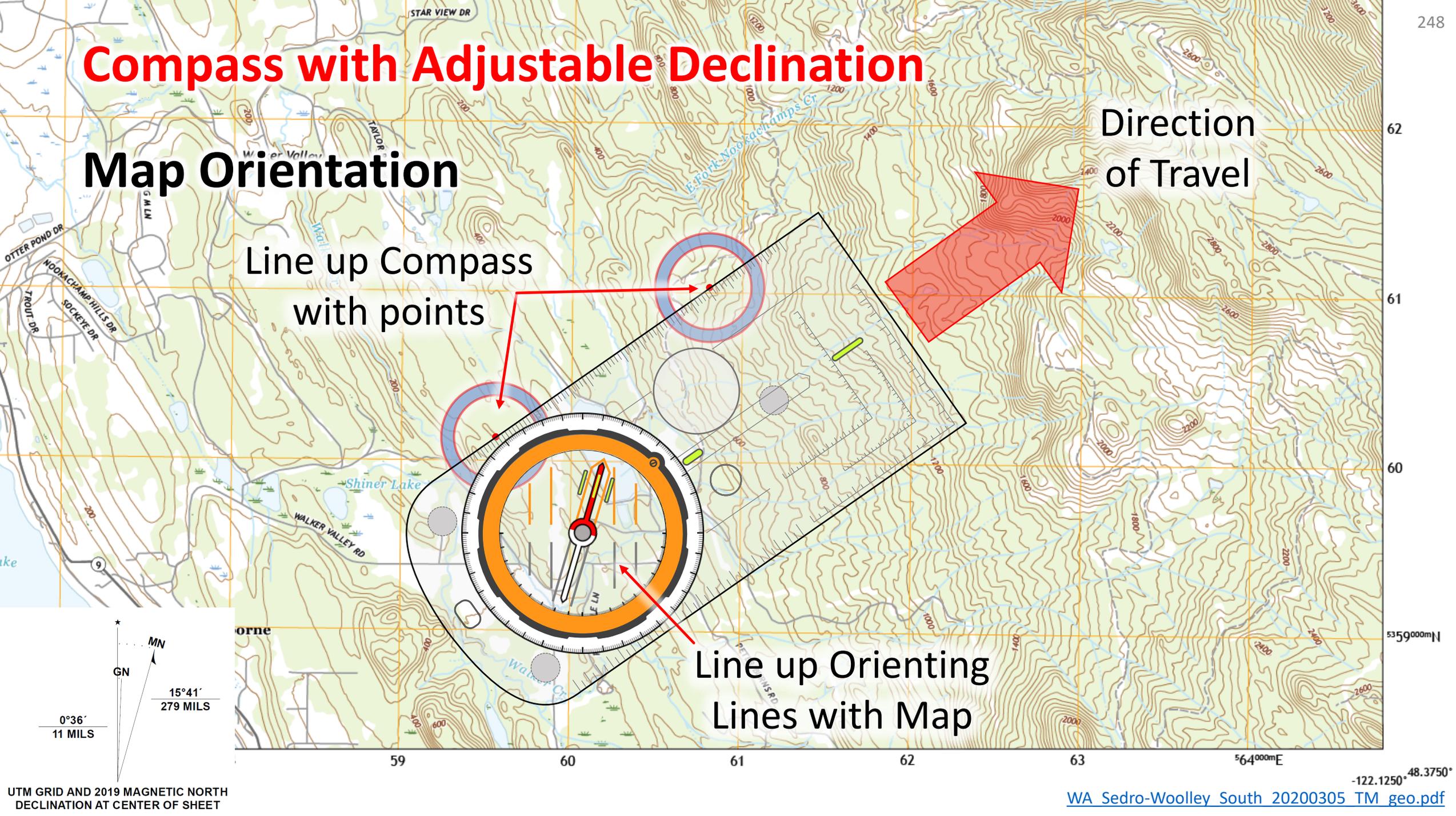
# Compass with Adjustable Declination

## Map Orientation

Line up Compass with points

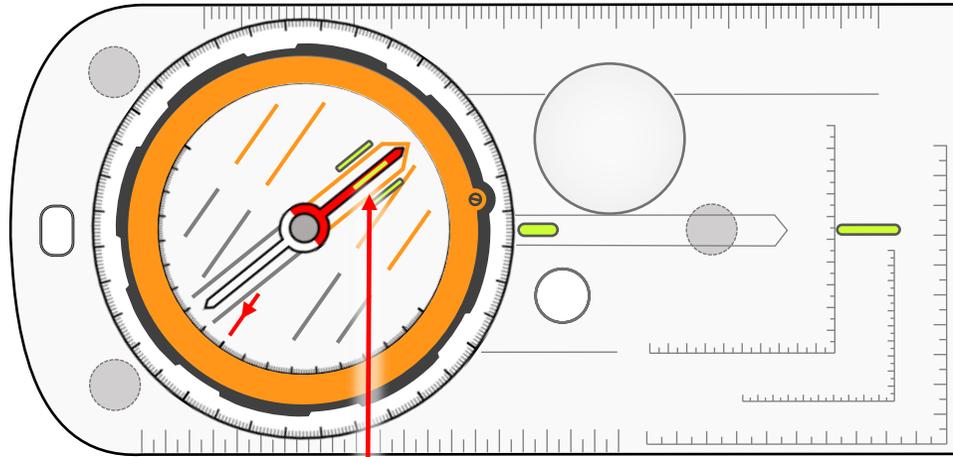
Direction of Travel

Line up Orienting Lines with Map



# Compass with Adjustable Declination

## Compass with Magnetic Declination Adjustment

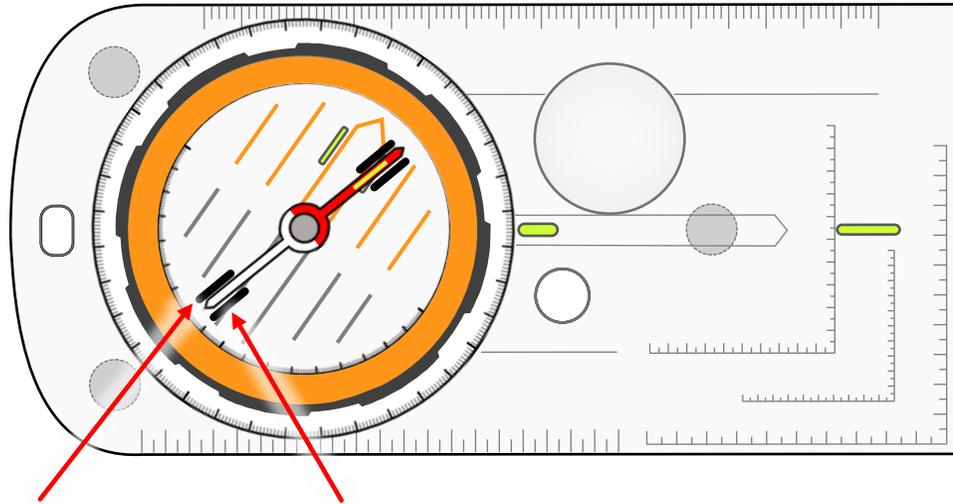


Keep Needle in  
Orienting Arrow

Direction  
of Travel

“Red in the Shed”  
Or  
“Dog in the Doghouse”

# Compass Hack – DIY Magnetic Declination Adjustment



Carefully use a Marker to make a  
“Doghouse”

Problem: angles change each year

Direction  
of Travel

“Red in the Shed”  
Or  
“Dog in the Doghouse”



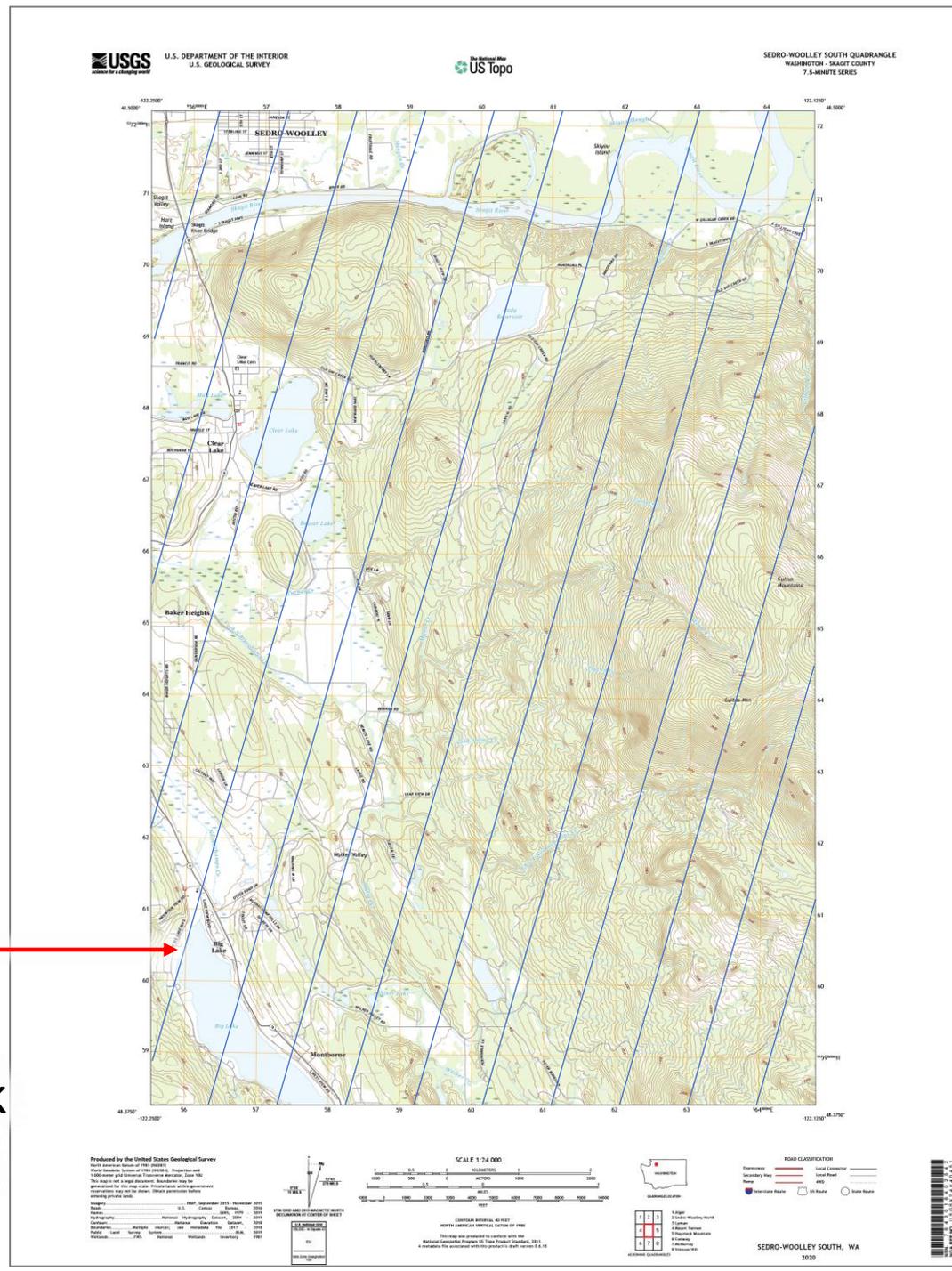
# Topographical Map Hack

Map can be modified with  
Magnetic North Lines

Problem:  
– angles change each year

Magnetic North  
Lines Added

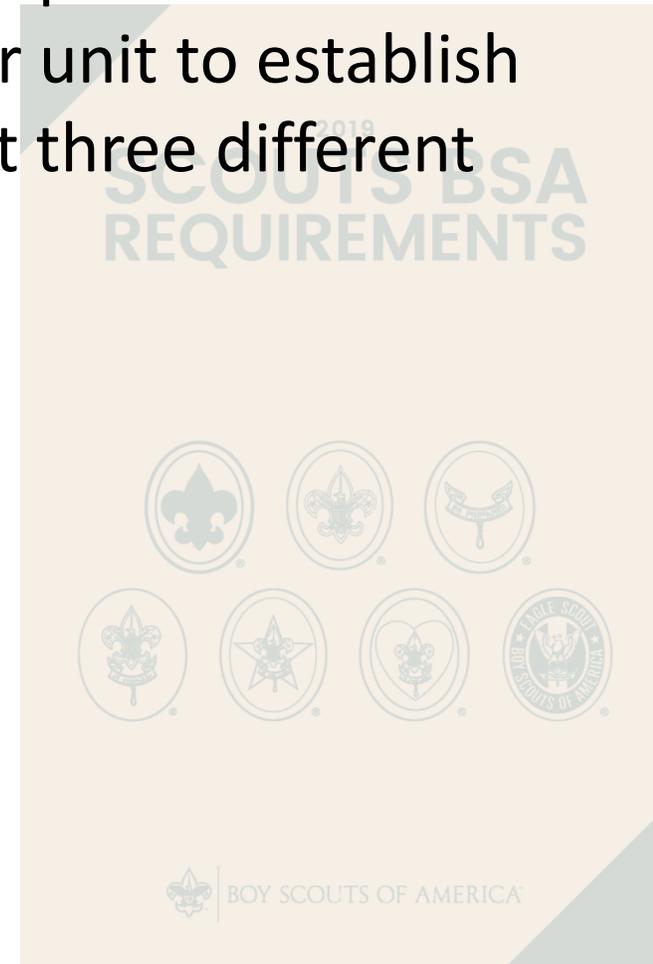
Use metal yardstick  
to copy and space  
out lines



# Navigation

## Requirement 6b – Find your position x 3

While on a trek, use a map and compass to establish your position on the ground at three different locations, OR use a GPS receiver unit to establish your position on a topographic map and on the ground at three different locations.



# Resection

## Establishing Location on a Map

- You should be able to use features on a map to pinpoint your location
  - Terrain features such as hills and lakes
  - Turn angles on paths and roads
  - Intersections between paths and roads and streams
  - Edge of tree lines

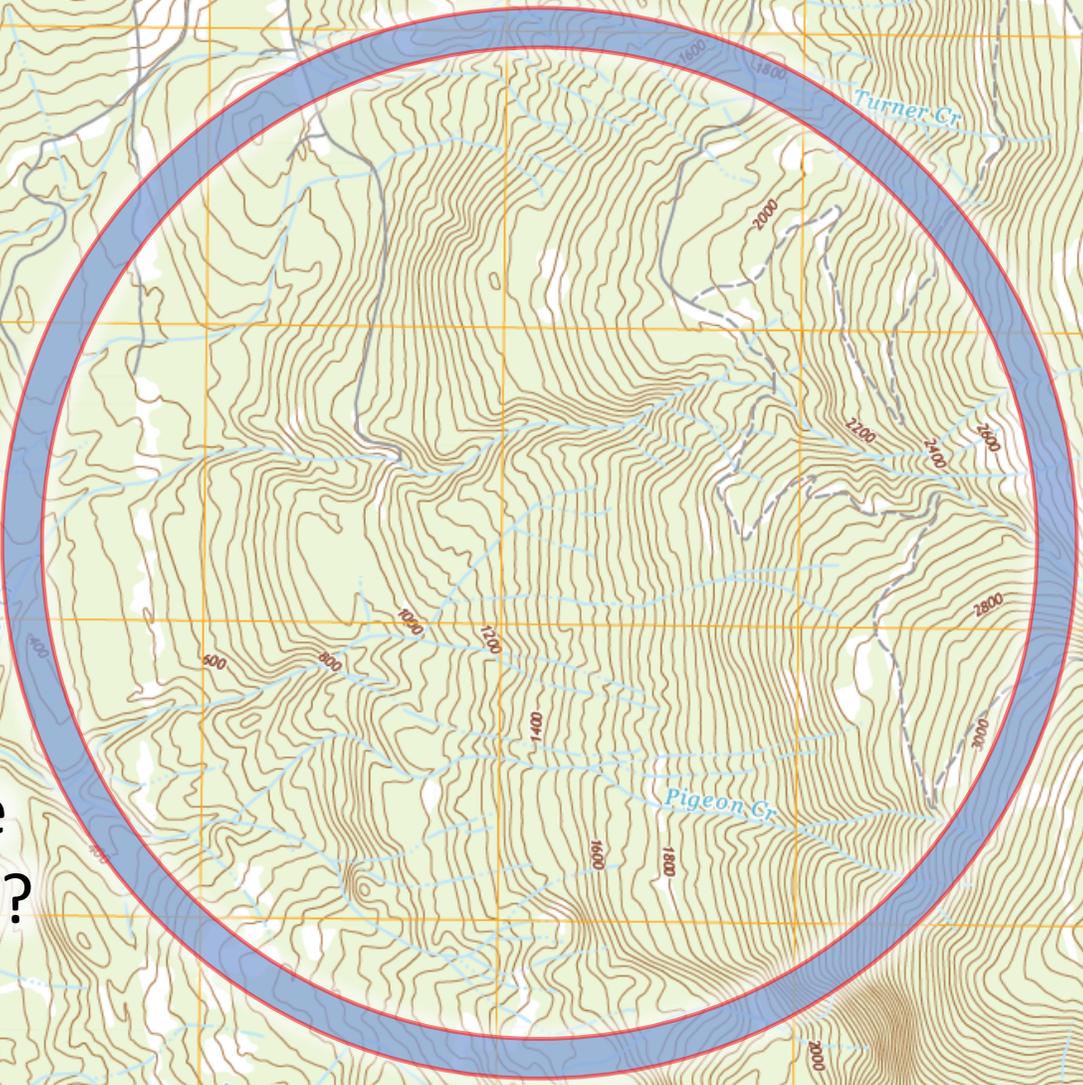
# Resection

## Resection

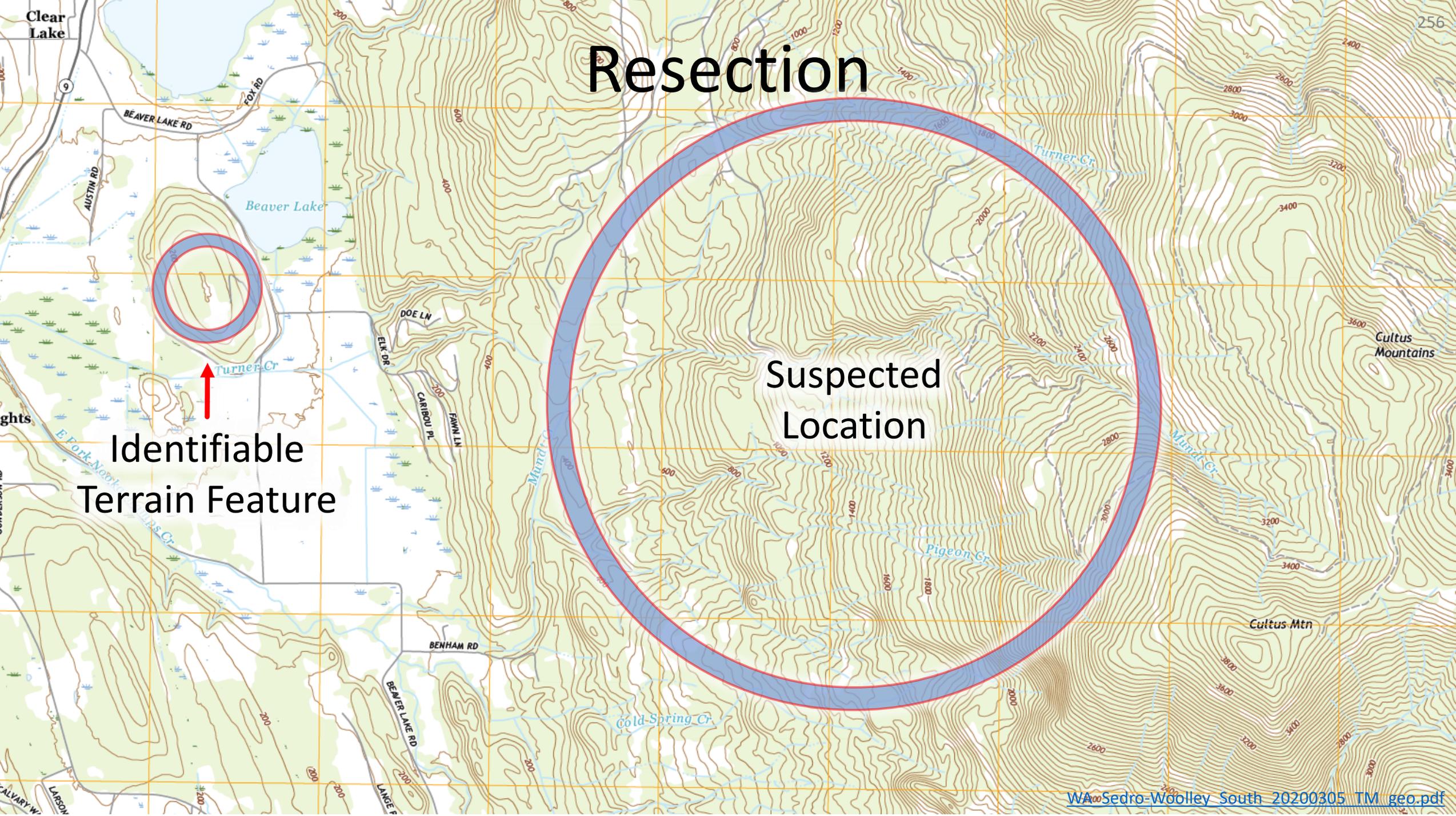
- Resection is a method for determining an unknown geographic position by measuring angles with respect to known position(s)
- The more know positions you have, the more precise your calculation
- Better compass skills = better precision
- Type of compass used also affects your final result

# Resection

Where  
Are We?



# Resection

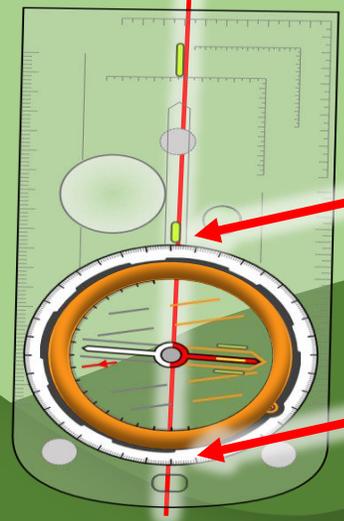
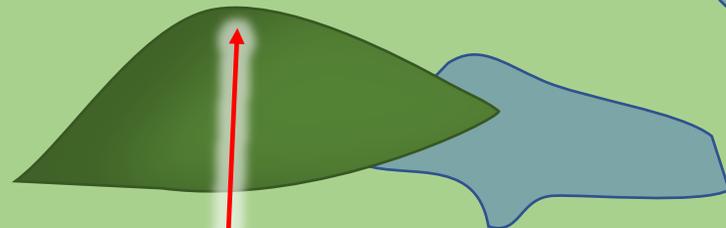


Suspected  
Location

Identifiable  
Terrain Feature

# Resection

Aim at  
Terrain Feature



Azimuth

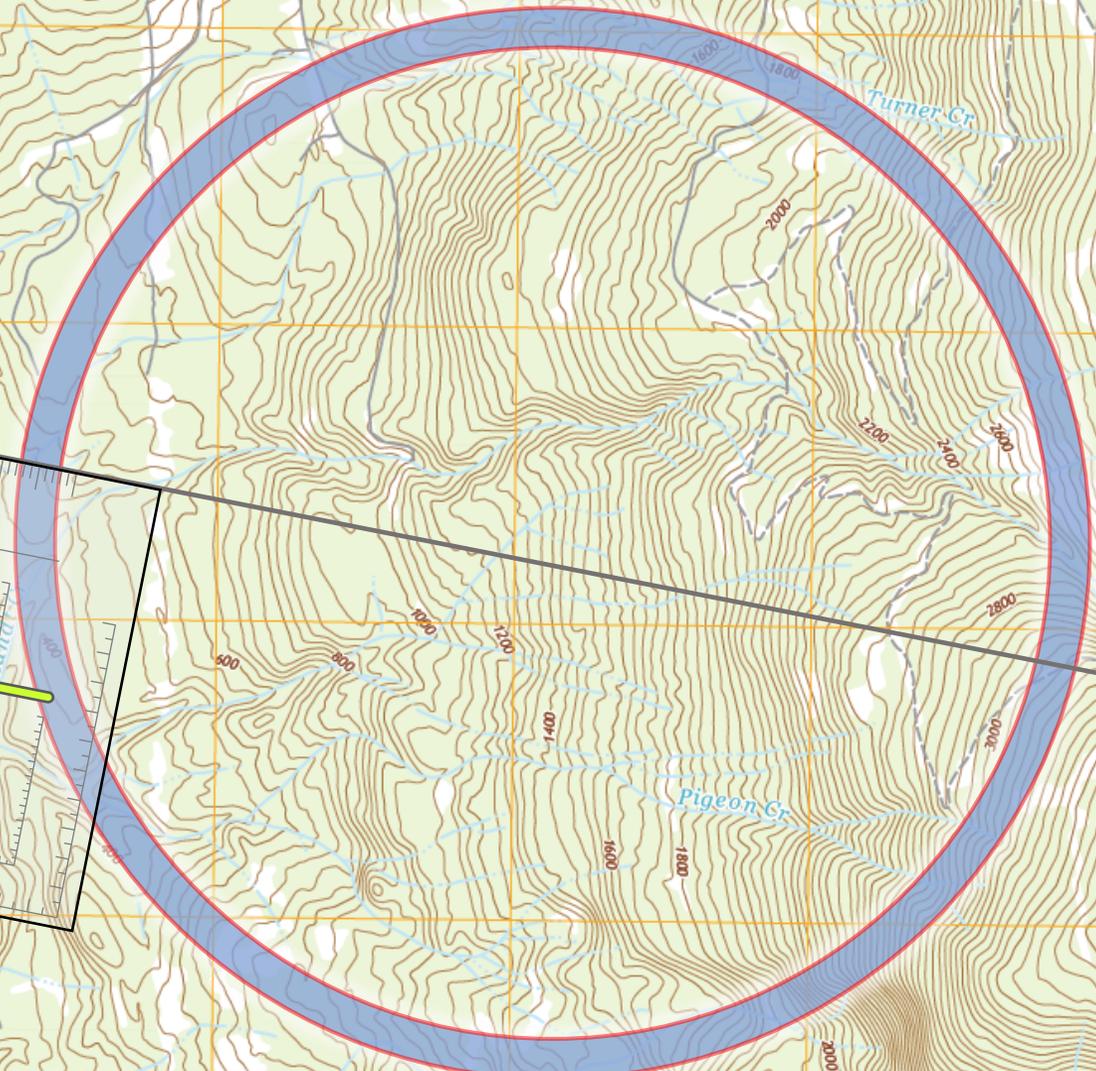
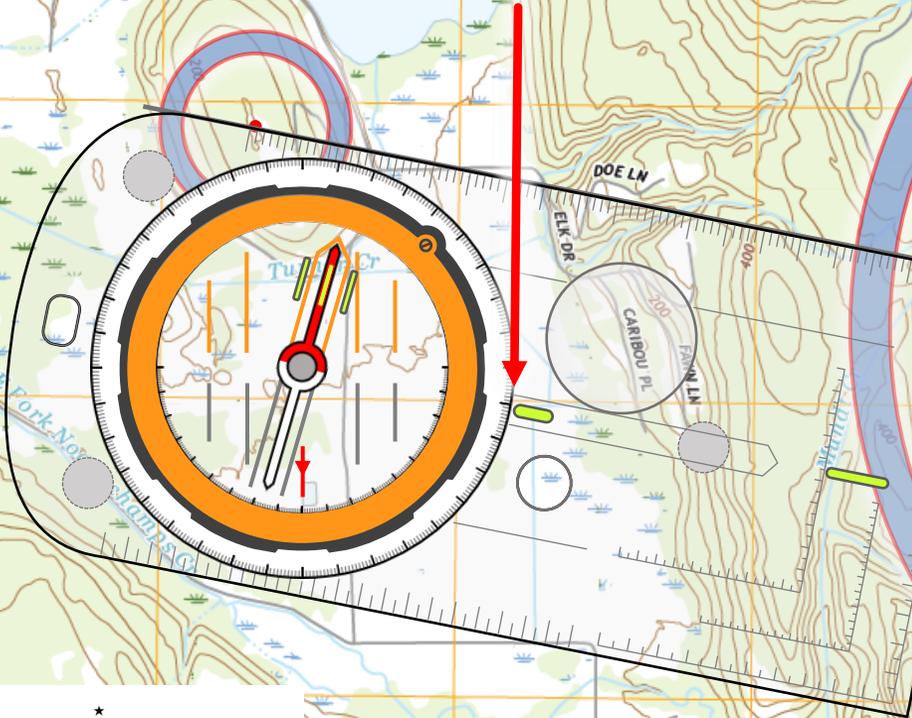


Back Azimuth

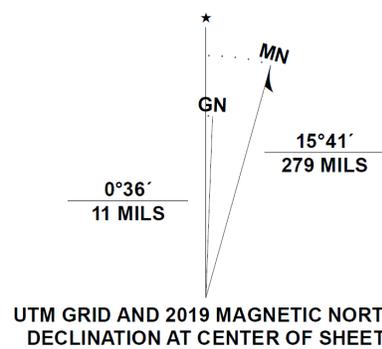


# Resection

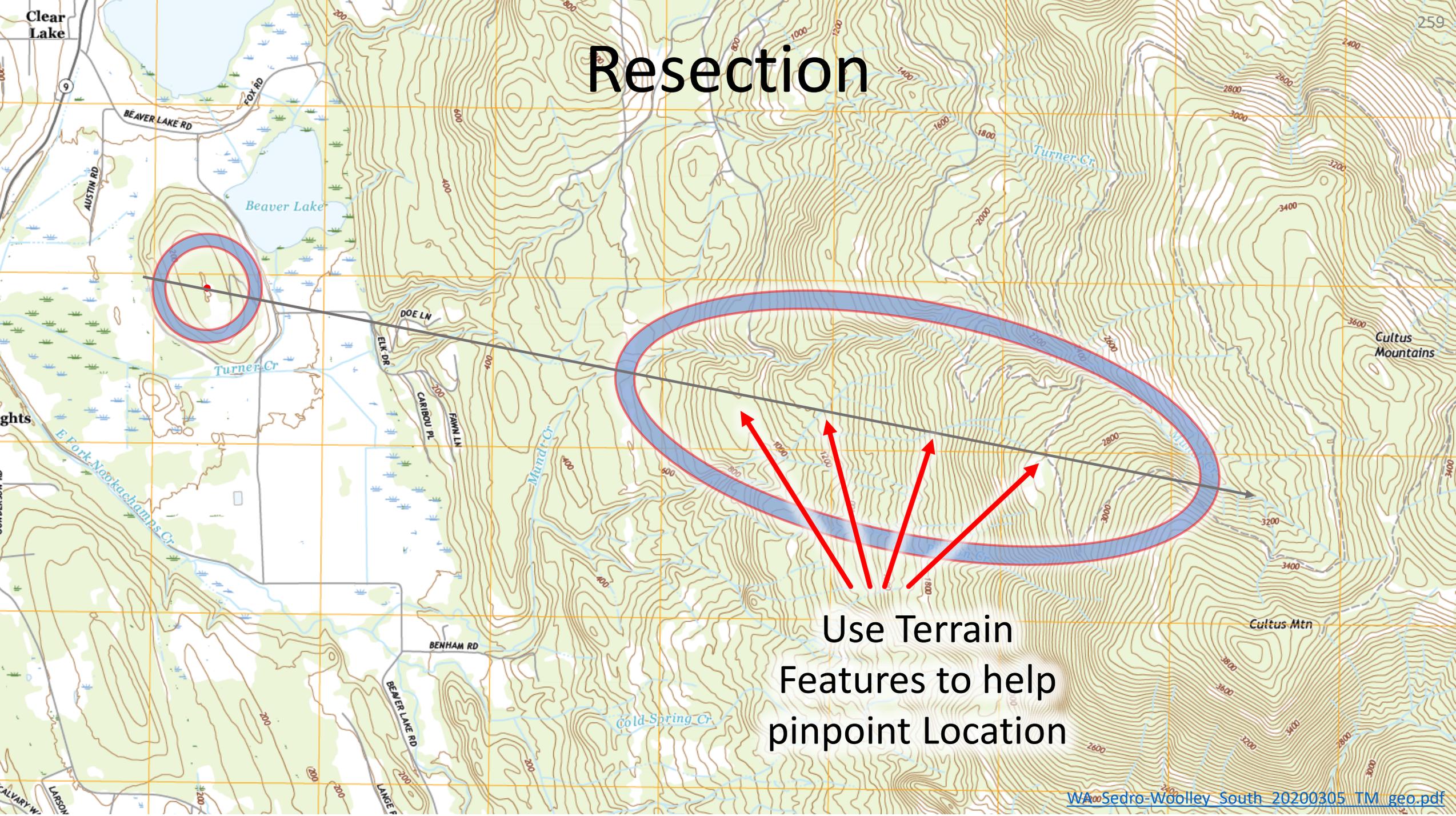
Back Azimuth



Convert Magnetic Azimuth to  
Grid Azimuth as needed

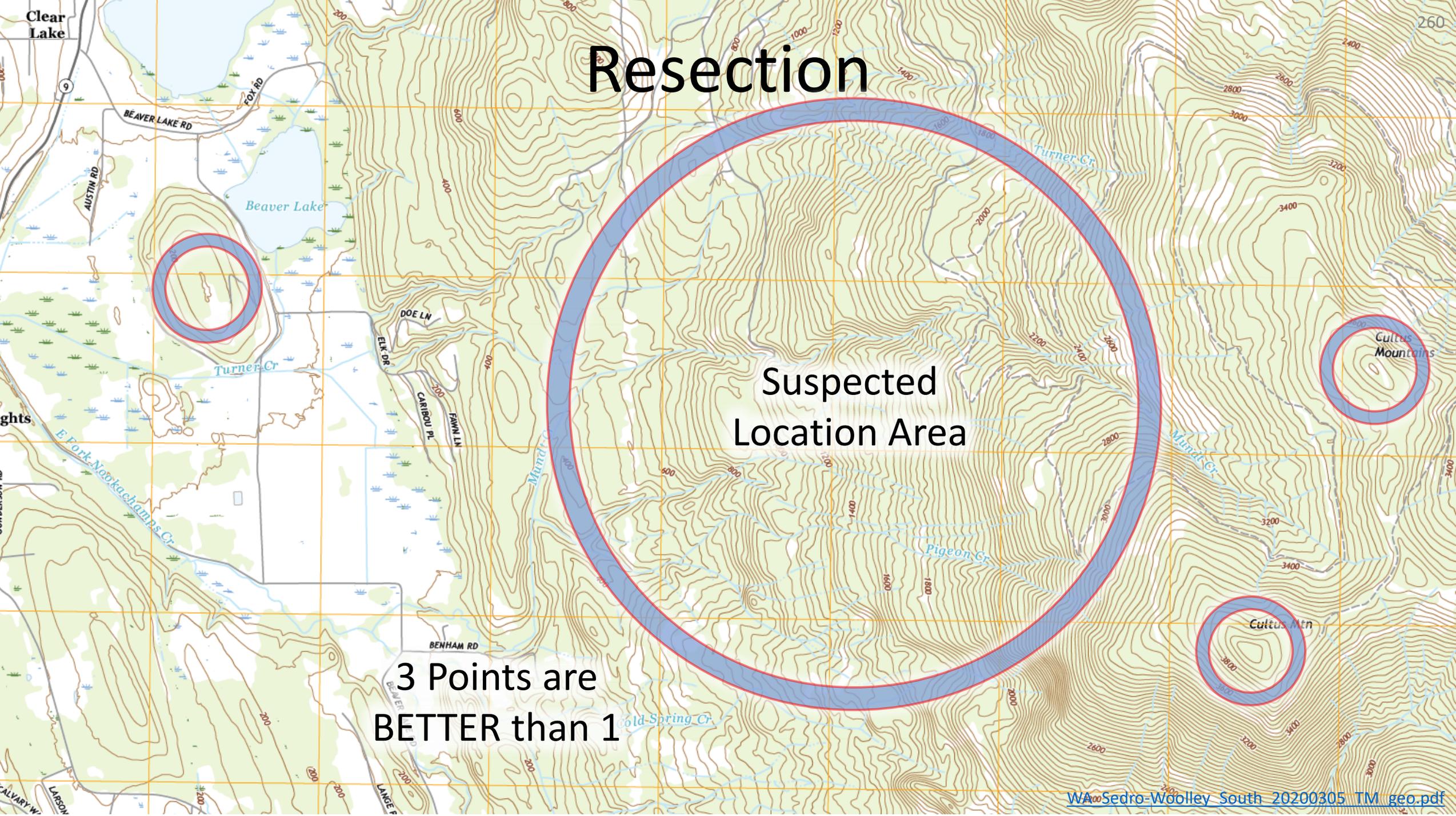


# Resection



Use Terrain  
Features to help  
pinpoint Location

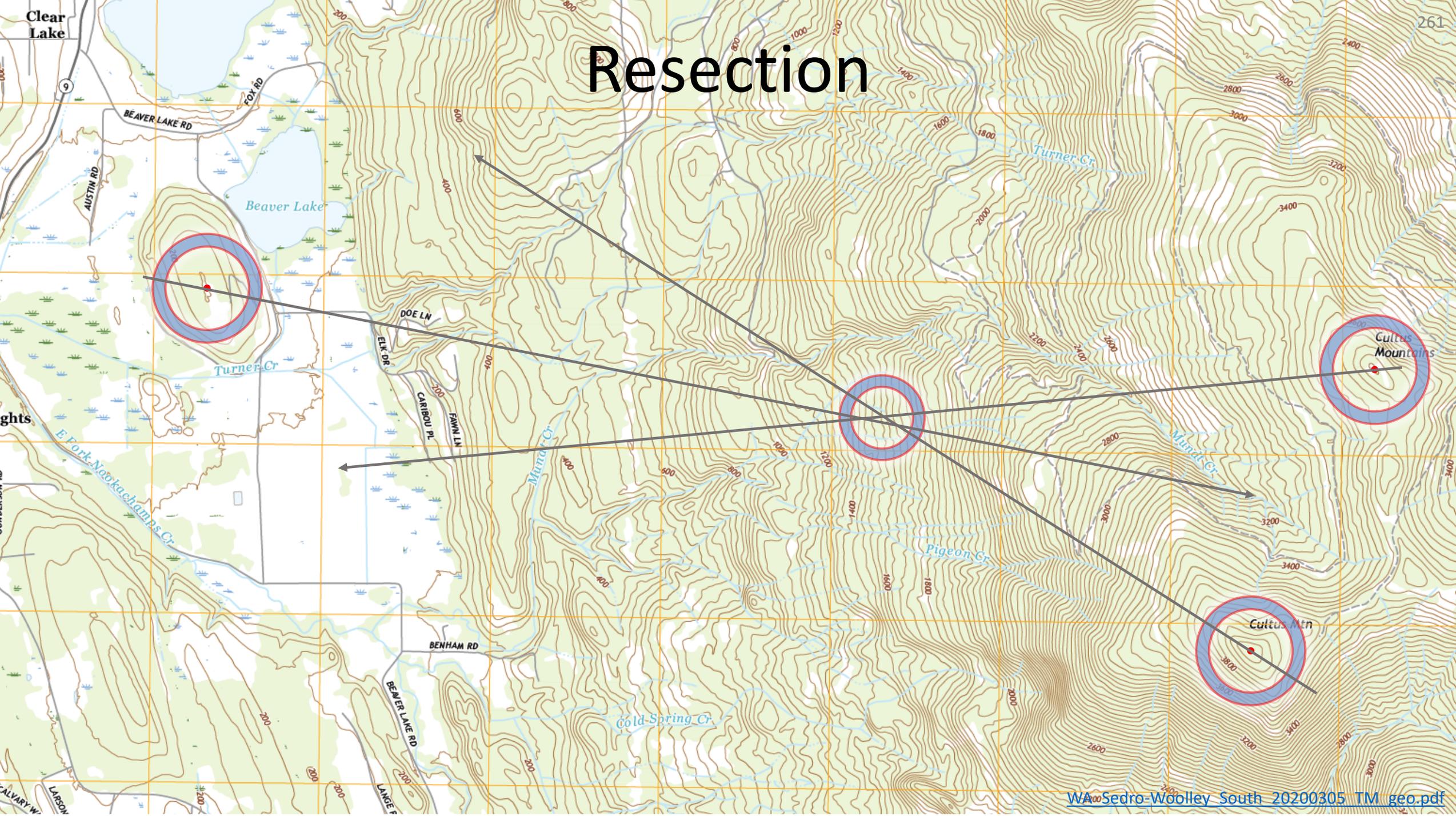
# Resection



Suspected  
Location Area

3 Points are  
BETTER than 1

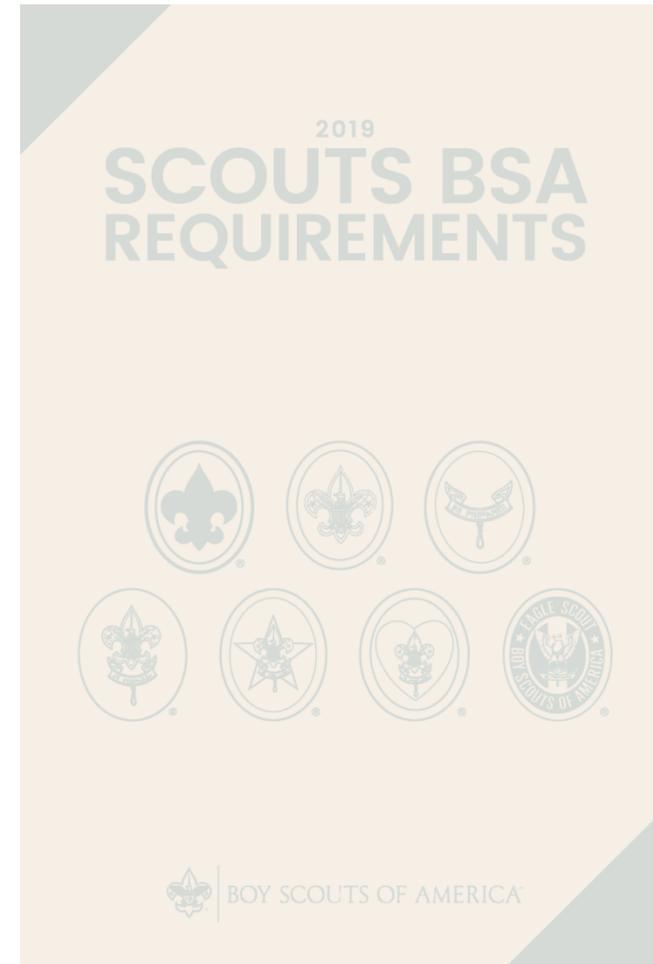
# Resection



# Navigation

## Requirement 6c – Staying Found

Explain how to stay found, and what to do if you get lost.



# Navigation

## **Staying Found – Thumbnail Navigation**

- Keep map in pocket and NOT in backpack
- Refer to map often to keep up with location
- Follow map as you move by placing thumb over location
  - Match features you see on the ground with those on the map
  - This keeps you on route
  - Keeps your map skills sharp
  - Unlikely you are going to get lost or stray too far off course

# Navigation

## **Staying Found – Disorientation**

- If you find you are unsure of your location
  - STOP
  - Pull out map and sit down
  - Study map and look for landmarks
  - Discuss route with crew
  - Where was your last known point?

# Navigation

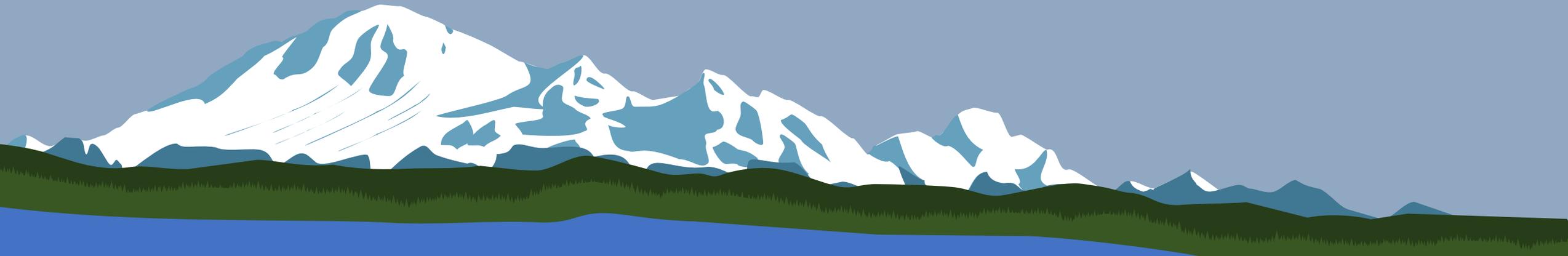
## **Staying Found – Lost**

- If you find you are truly lost
  - Movement will likely move you further off course
  - Set up shelter
  - Wait for search party to find you

- 1. [Merit Badge Requirements](#)
- 2. [Merit Badge Intro](#)
- 3. [First Aid](#)
- 4. [Gear](#)
- 5. [Water](#)
- 6. [Food](#)
- 7. [Navigation](#)
- 8. [Leave No Trace](#)
- 9. [Preparation](#)
- 10. [Getting Out There](#)
- 11. [Trail Thoughts](#)
- 12. [Resources](#)
- 13. [Instructor's Corner](#)



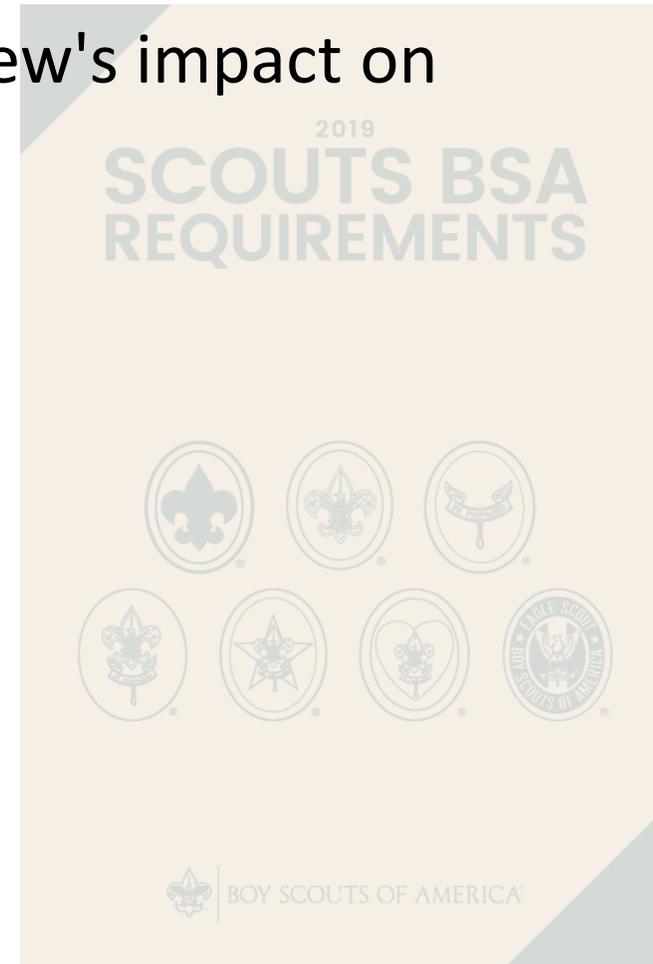
# Leave No Trace



# Leave No Trace

## Requirement 4a - Leave No Trace

Describe the importance of using Leave No Trace principles while backpacking, and at least five ways you can lessen the crew's impact on the environment.



# Leave No Trace

## Leave No Trace

- Plan Ahead and Prepare
- Travel and Camp on Durable Surfaces
- Dispose of Waste Properly
- Leave What You Find
- Minimize Campfire Impacts
- Respect Wildlife
- Be Considerate of Other Visitors

# Leave No Trace

## Leave No Trace - Plan Ahead and Prepare

- Plan Ahead and Prepare
  - Know the regulations and special concerns of area
  - Prepare for weather extremes, hazards and emergencies
  - Avoid high use times
  - Travel in small groups when possible

# Leave No Trace

## Leave No Trace - Travel and Camp on Durable Surfaces

- Travel and Camp on Durable Surfaces
  - Walk single file on durable surfaces
    - Trails
    - Rock
    - Dry grass
    - Snow
  - Choose campsite carefully
    - Ideally on a designated campsite
    - Don't camp on vegetation – you will kill it
    - 200 feet away from water

# Leave No Trace

## Leave No Trace - Dispose of Waste Properly

- Dispose of Waste Properly
  - Pack it in, pack it out
  - Wash site should be 200 feet or more from streams or water
  - Human waste need to be buried or packed out
    - Check with land management agency first for requirements
  - Urinate away from trails and campsites
    - Urinate on rocks instead of plants
    - Don't urinate in small bodies of water
    - Animals will tear up plants to get to salts in urine

# Leave No Trace

## Leave No Trace - Leave What You Find

- Leave What You Find
  - Rocks
  - Leaves
  - Flowers
  - Bird's nest
  - Archaeological and cultural finds such as arrowheads
- Feel free to pack out trash

# Leave No Trace

## Leave No Trace - Minimize Campfire Impacts

- Minimize Campfire Impacts
  - Avoid leaving burn scars and evidence of fire
    - Avoid having a campfire if possible
  - Don't leave partially burned debris
    - Burn wood that is as thick as wrist or smaller
    - Burn to ashes
    - After ashes are cooled, spread them out
  - If you don't completely burn your fire to ashes – put it out
    - Pour on water
    - Stir
    - Feel with hand
    - If hot, repeat

# Leave No Trace

## Leave No Trace - Respect Wildlife

- Respect Wildlife
  - Only observe animals from a distance
  - Don't feed animals
  - Try not to disturb animals
    - It's their home
    - They are trying to survive

# Leave No Trace

## Leave No Trace - Be Considerate of Other Visitors

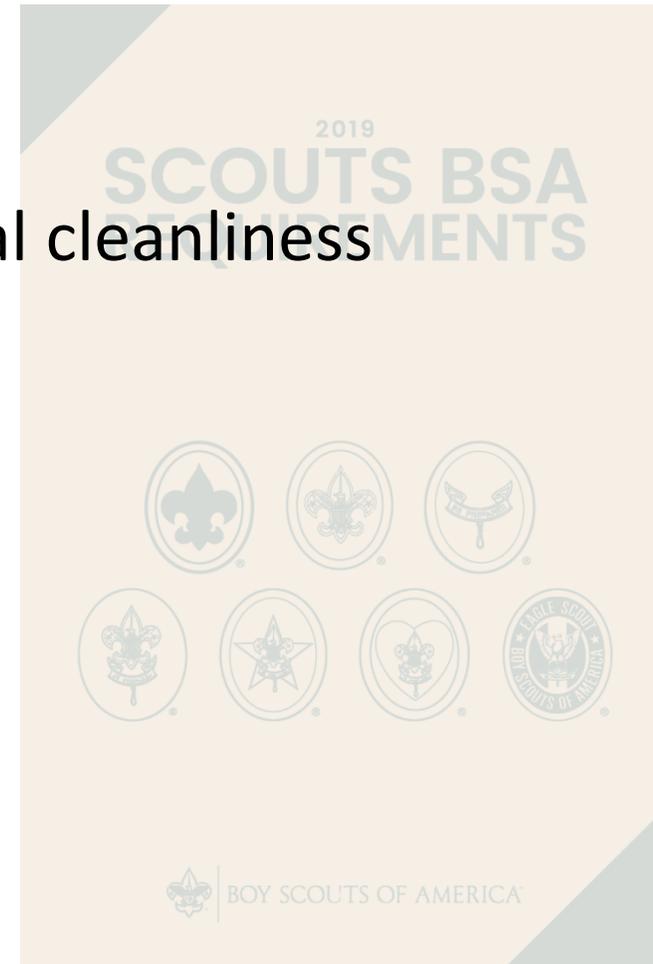
- Be Considerate of Other Visitors
  - Be nice
  - Yield to those going uphill
  - Yield to horse
  - Don't make noise

# Leave No Trace

## Requirement 4b – Human Waste and Sanitation

Describe proper methods of handling human and other wastes while on a backpacking trek.

Describe the importance of and means to assure personal cleanliness while on a backpacking trek.



# Leave No Trace

## Human Waste and Sanitation - Poop

- Human waste is a Leave No Trace issue
  - Don't leave poop for other to find – that's just nasty!
- Also important for health
  - Exposed feces is nasty and spreads disease



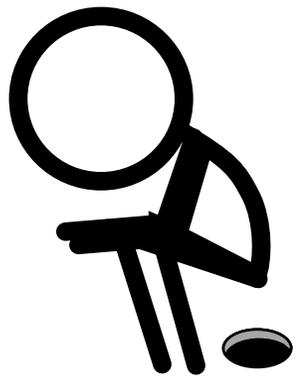
# Leave No Trace

## Pooping in the Woods

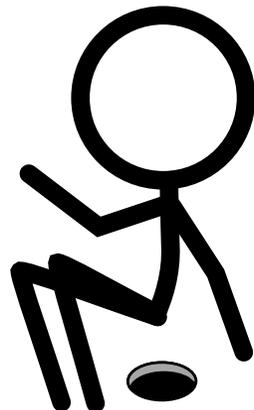
- Maybe your people just don't know how to poop in the woods
  - Dig a hole 6-8 inches deep
  - Poop IN hole – if you miss, use stick
  - Wipe
  - Fill hole

Tools needed:

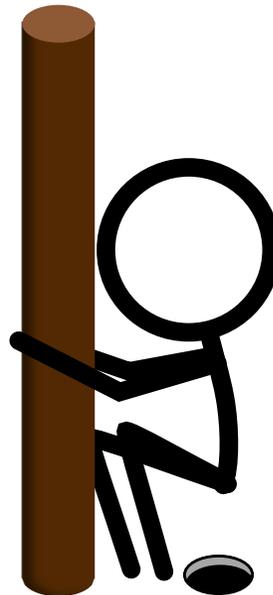
- Trowel
- Toilet Paper
- Stick



The Squat



The Tripod



The Tree Hugger



The Tree Back

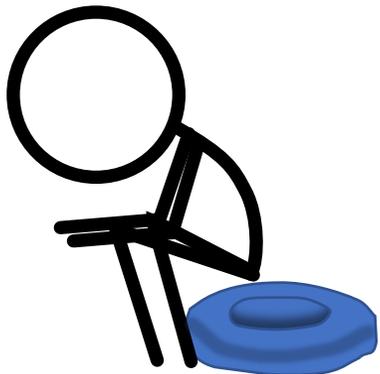
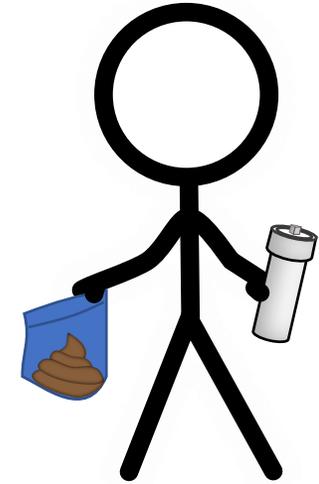


Log Assist

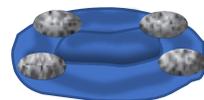
# Leave No Trace

## Pooping in the Woods – Can't Dig

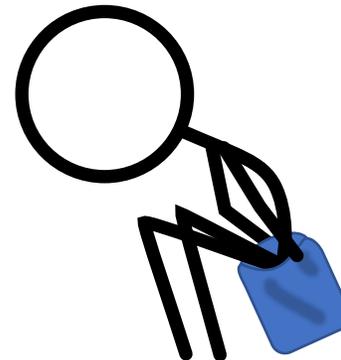
- You may not be able to dig a cathole
  - Deep snow (don't bury for someone to find in spring)
  - Glaciers
  - Narrow river canyons
- Use a sealable bag or Poop Tube to pack out



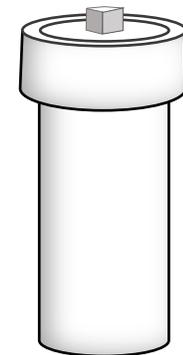
The Wag Bag



Weight Bag for Wind



Butt Bag



Poop Tube

# Leave No Trace

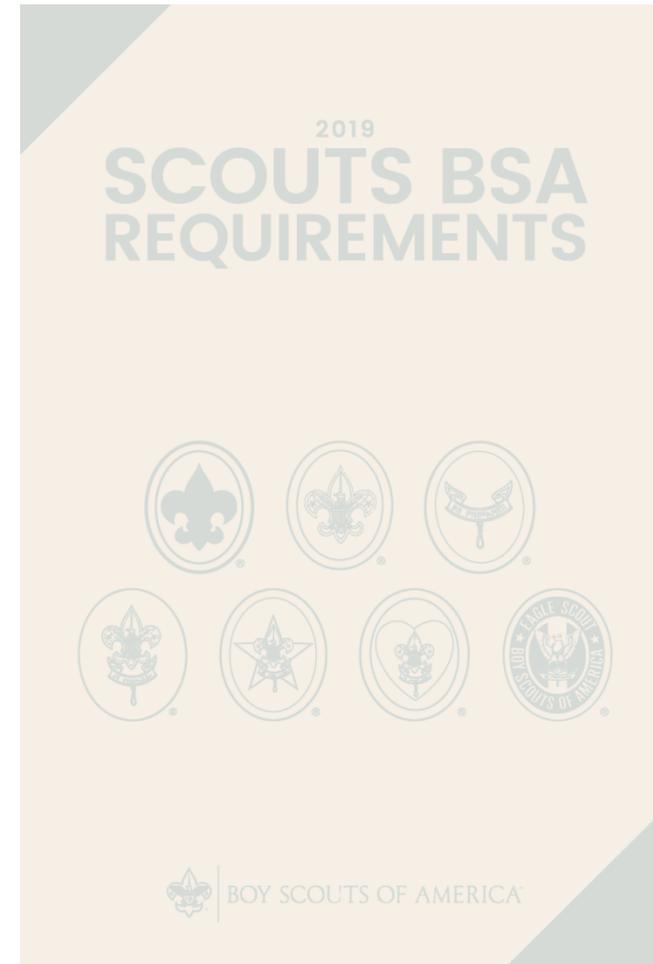
## Human Waste and Sanitation – Sanitation

- It is difficult to stay clean on an outing
- Hands, knife and utensils need to be clean before eating
  - See [Food Section](#)
- Use hand sanitizer
  - After returning from latrine or cathole
  - Before and after handling food
  - Before eating

# Leave No Trace

## Requirement 4c – Campsite Selection

Tell what factors are important in choosing a campsite.



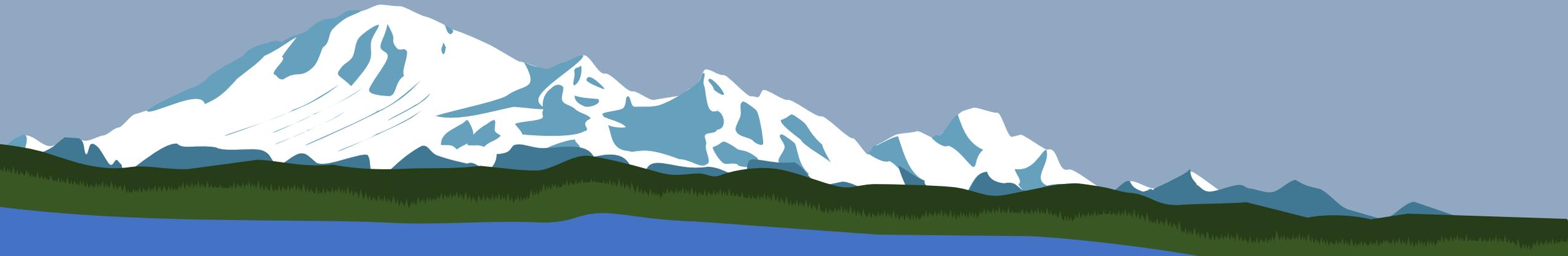
# Leave No Trace

## Campsite Selection

- In part, Leave No Trace concerns, but also a safety issue
- Selection:
  - On durable surface – off vegetation
  - 200 feet away from water
  - Consider exposure to wind and sun
  - Plan for flooding
    - Avoid low areas that will flood
    - Avoid dry stream beds – these can be deadly
  - Lightning?
    - Avoid high exposed areas
    - Avoid solo trees



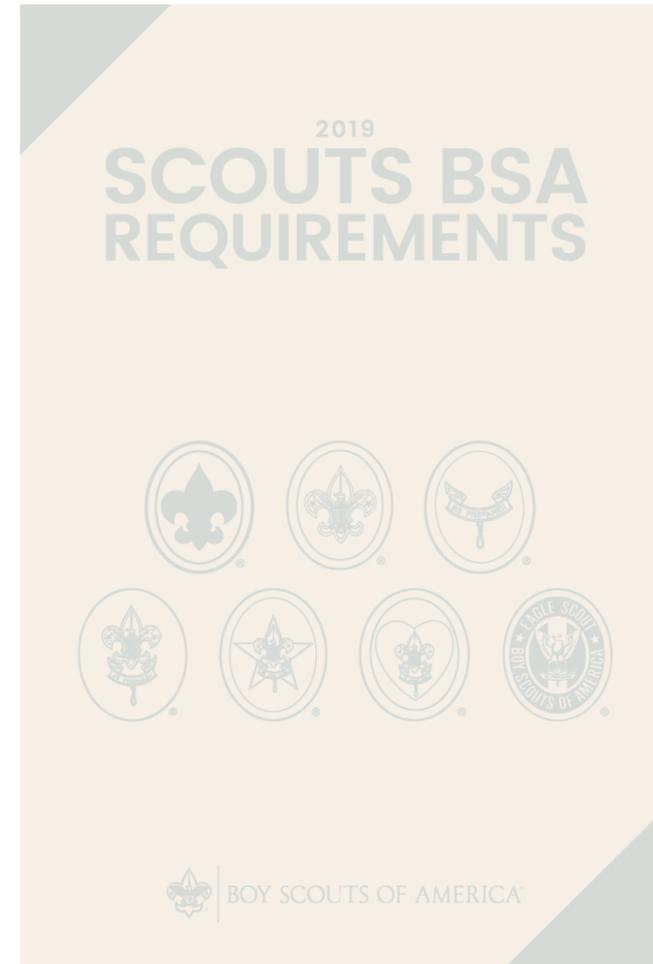
# Planning and Preparation



# Planning and Preparation

## Requirement 3a – Crew Size

Define limits on the number of backpackers appropriate for a trek crew.



# Planning and Preparation

## Crew Size

- Large crew is difficult to manage
  - Large impact on campsites and trails
  - Slow moving
  - Needs large campsites

# Planning and Preparation

## Crew Size

- Small crew is easier to move
  - Less impact on campsites and trails
  - Quick moving
  - Less redundancy of gear and skills
    - What if the one large guy gets hurt – how will we carry out?
    - What if the one Wilderness First-Aid person gets hurt?
    - What if the one group stove breaks?
    - Why is it only one person knows where we are going?
    - How do we send for help with 3 people?

# Planning and Preparation

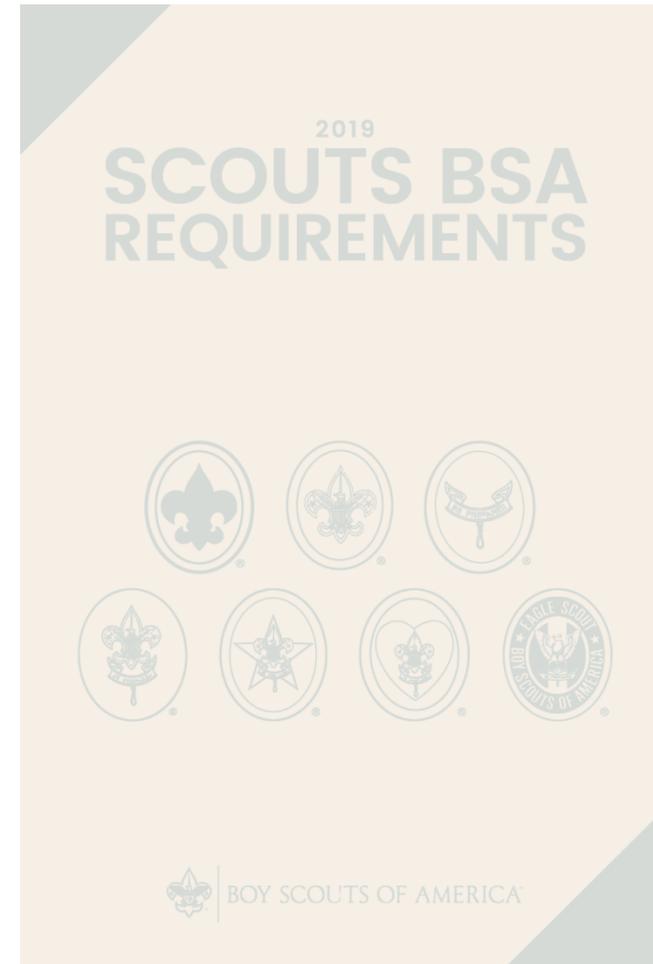
## Crew Size

- Some places have a limit on group sizes
- Wilderness Areas require:
  - Fill out and a copy of a self-issue permit
  - Some places require a special permit
  - Max 12 people per group
  - Larger groups must split up and stay 1 mile apart

# Planning and Preparation

## Requirement 3b – Crew Organization

Describe how a trek crew should be organized.



# Planning and Preparation

## Crew Organization

- Patrol leader has many responsibilities
  - Observes how each member is doing
  - Encourages everyone to participate in route and campsite selection
  - Finds opportunities for others to solve problems
  - Needs to support group and individuals
  - Encourage other to develop their outdoor skills

# Planning and Preparation

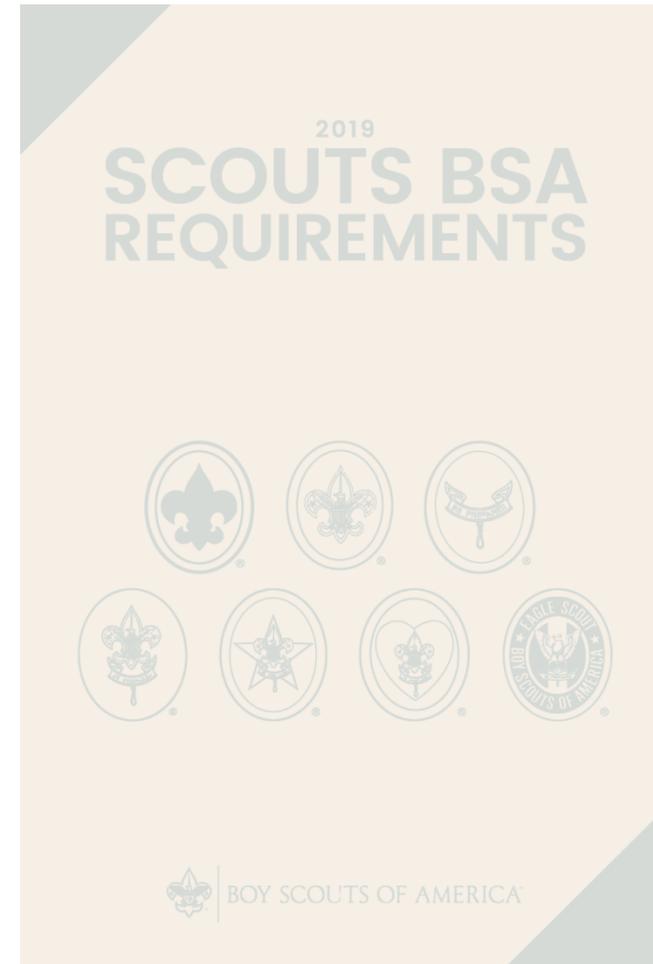
## **Crew Organization – Chore Chart**

- Many trekking groups use a Chore Chart
- Chore Chart
  - Stoves
  - Water
  - Cooking
  - Cleanup
  - Bear Bags

# Planning and Preparation

## Requirement 3c – Minimizing Risk

Tell how you would minimize risk on a backpacking trek.



# Planning and Preparation

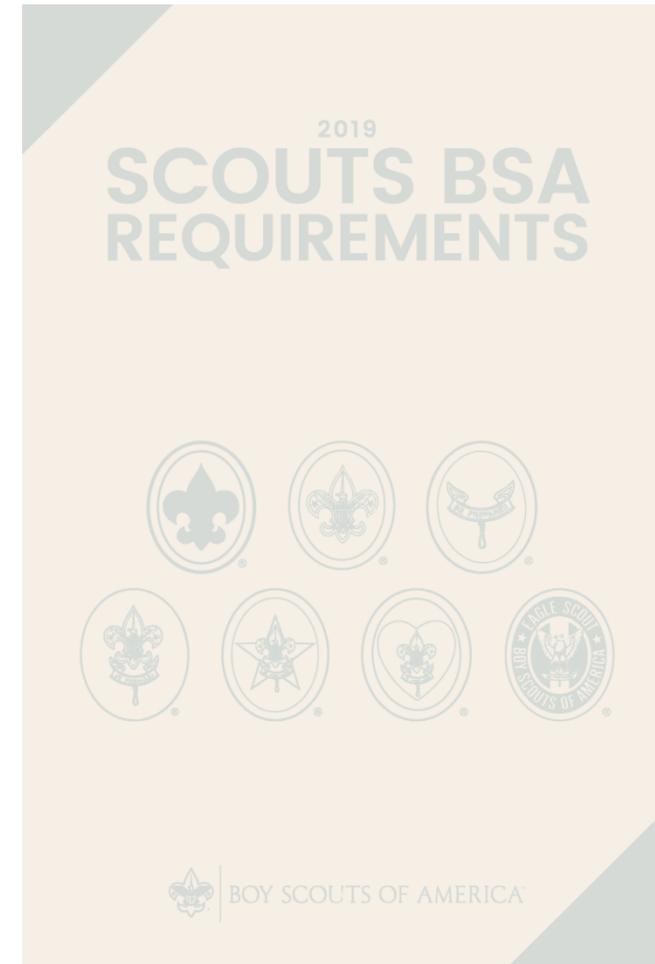
## **Minimizing Risk**

- Check weather and hazards of area
- Know first-aid
- Get in shape
- Pack and adjust clothing as needed
- Stay hydrated
- Pack and care for the correct gear

# Planning and Preparation

## Requirement 3d – Emergency Response Plan

Explain the purpose of an emergency response plan.



# Planning and Preparation

## Emergency Response Plan

- Important is something goes wrong
  - Someone gets hurt
  - Group gets lost
  - Weather halts travel
  
- Provide folks at home with:
  - Trip Plan
  - Emergency Response Plan

### Emergency Response Plan

Dates of trip:

Trip location and description: [See the trip plan.]

Group leader:

Group members:

Medical training level of leaders and members:

Resources:

Location of nearest public telephones:

Group first-aid kit:

Mobile phone number(s):

Emergency contacts:

[Include telephone numbers of land management agencies, BSA council officials, emergency response system, and search-and-rescue alert numbers.]

Conditions for activating an emergency response:

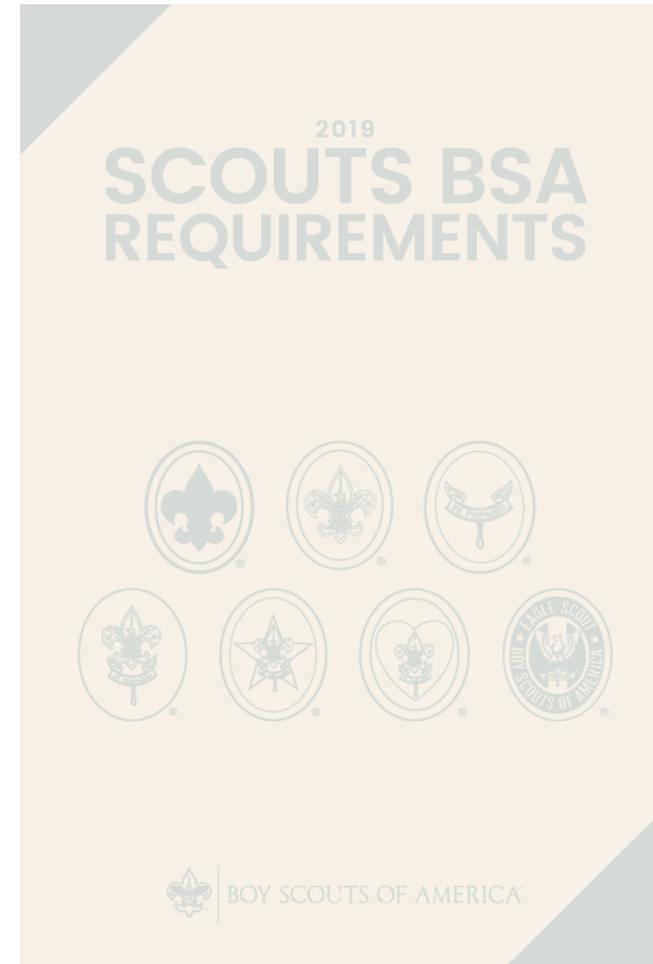
[For instance, if you are a day late.]

Driving instructions to clinics, hospitals, and other health-care facilities:

# Planning and Preparation

## Requirement 7 – Weather

Tell how to prepare properly for and deal with inclement weather.



# Planning and Preparation

## **Weather – Rain**

- Rain, even in the tropics, increases the risk of hypothermia
- Be prepared to possible storms
- Have rain gear readily available
- If the storm is really bad, consider setting up shelters
- Help others in crew get into shelter and get dry

# Planning and Preparation

## **Weather – Snow**

- Snow is fine, but it melts
- Melted snow is dangerous for those who are unprepared
- Pack the proper gear if subfreezing temps are anticipated

# Planning and Preparation

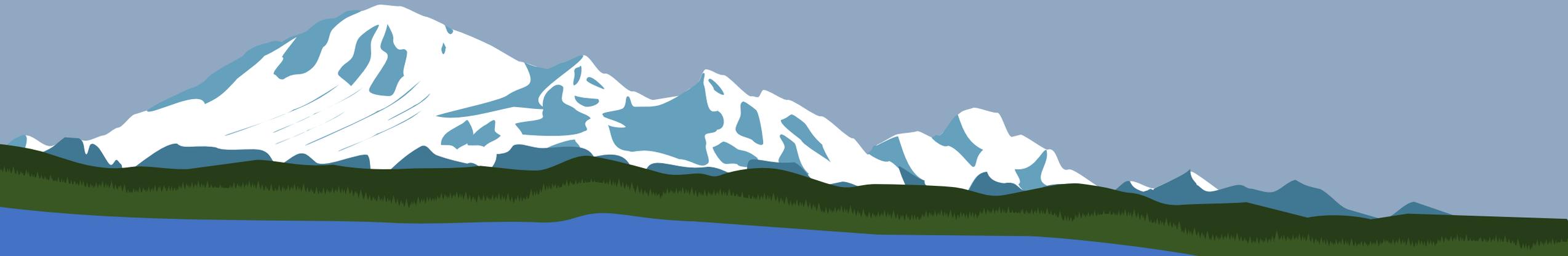
## Weather – Lighting

- Lighting is deadly
- “When Lighting Roars, Go Indoors”
- Tents do NOT protect you from lighting
- Goal:
  - Get into grounded building
  - Get into metal hardtop vehicle
  - If these options not available
    - Get off high ground
    - Open areas





# Getting Out There

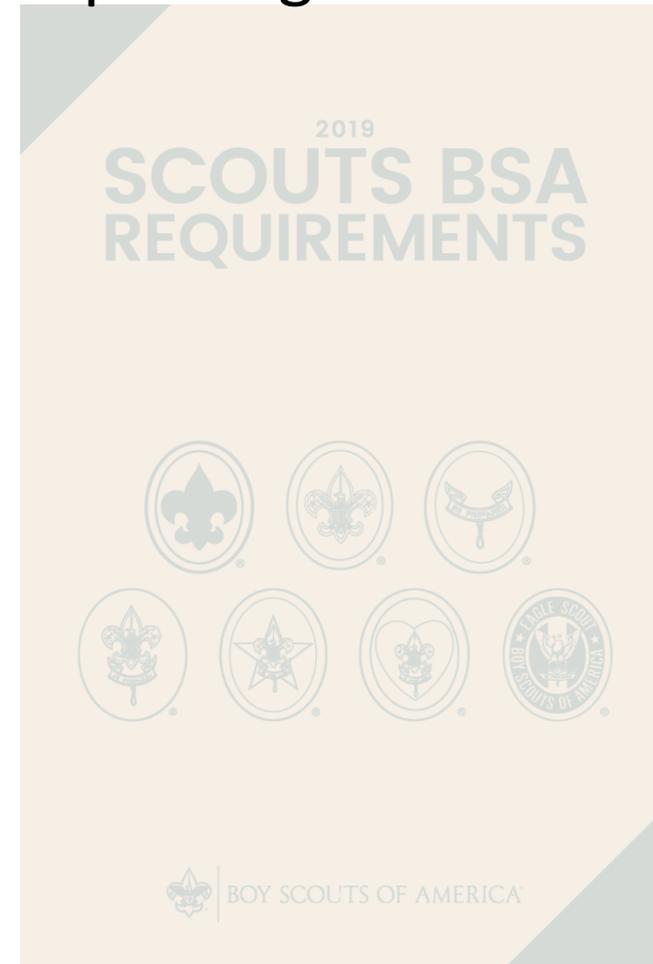


# Getting Out There

## Requirement 9a – 2-Miler Plan

Write a plan that includes a schedule for a patrol/crew backpacking hike of at least 2 miles.

**Complete and log in Workbook**

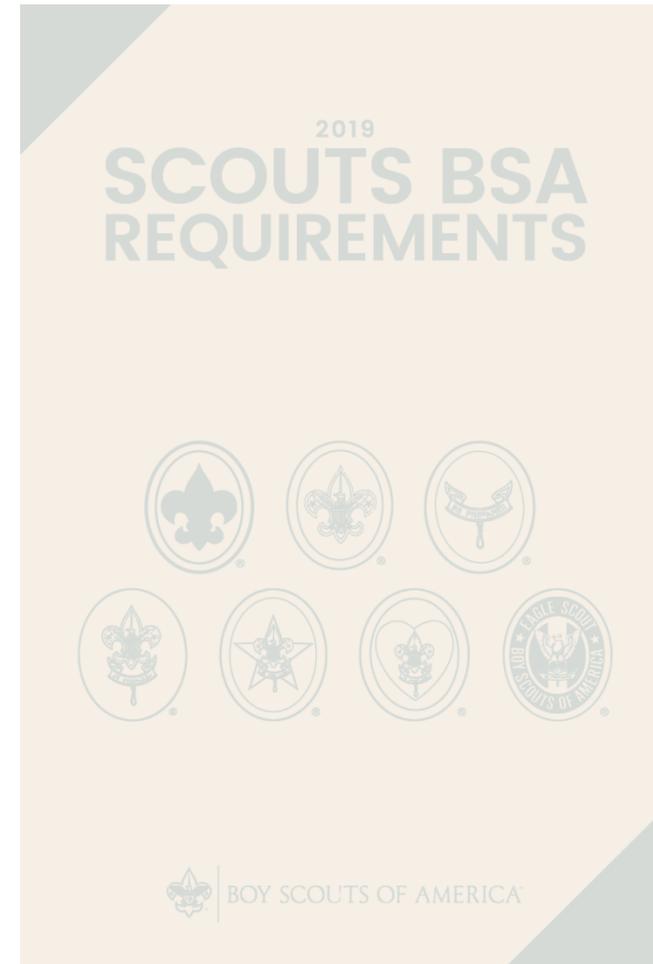


# Getting Out There

## Requirement 9b – 2-Miler – Prehike Inspection

Conduct a prehike inspection of the patrol and its equipment.

**Complete and log in Workbook**

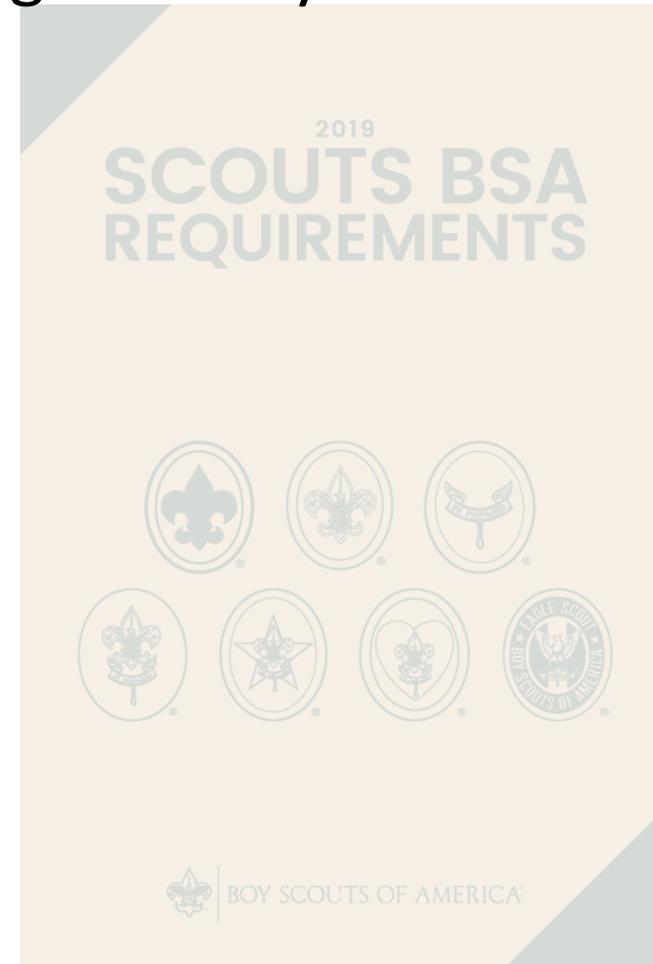


# Getting Out There

## Requirement 9c – 2-Miler – Pack all that Gear

Show that you know how to properly pack your personal gear and your share of the crew's gear and food.

**Complete and log in Workbook**

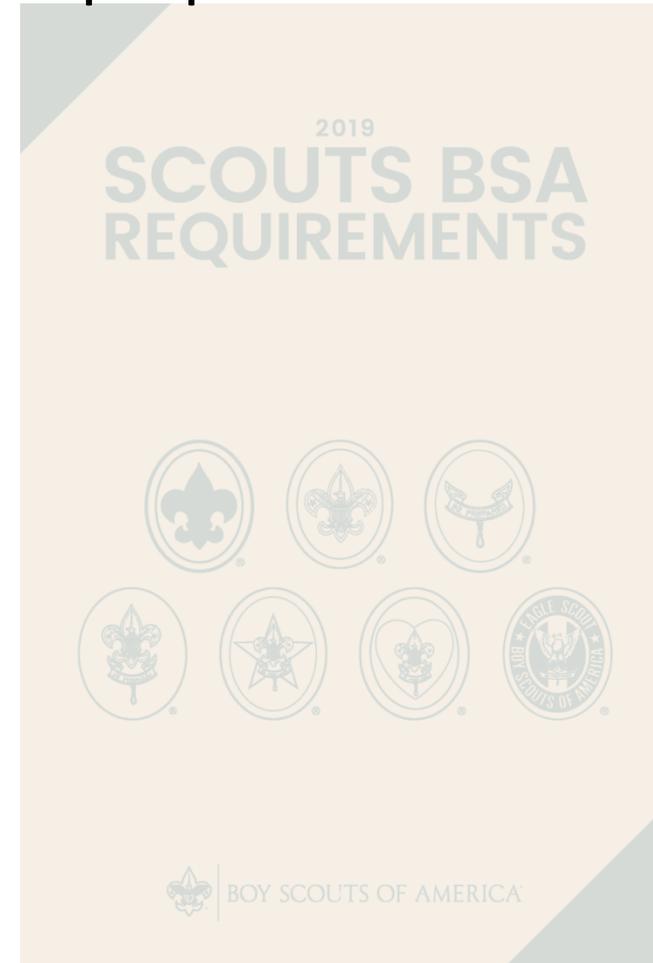


# Getting Out There

## Requirement 9d – 2-Miler – Wear the Pack

Show you can properly shoulder your pack and adjust it for proper wear.

**Complete and log in Workbook**

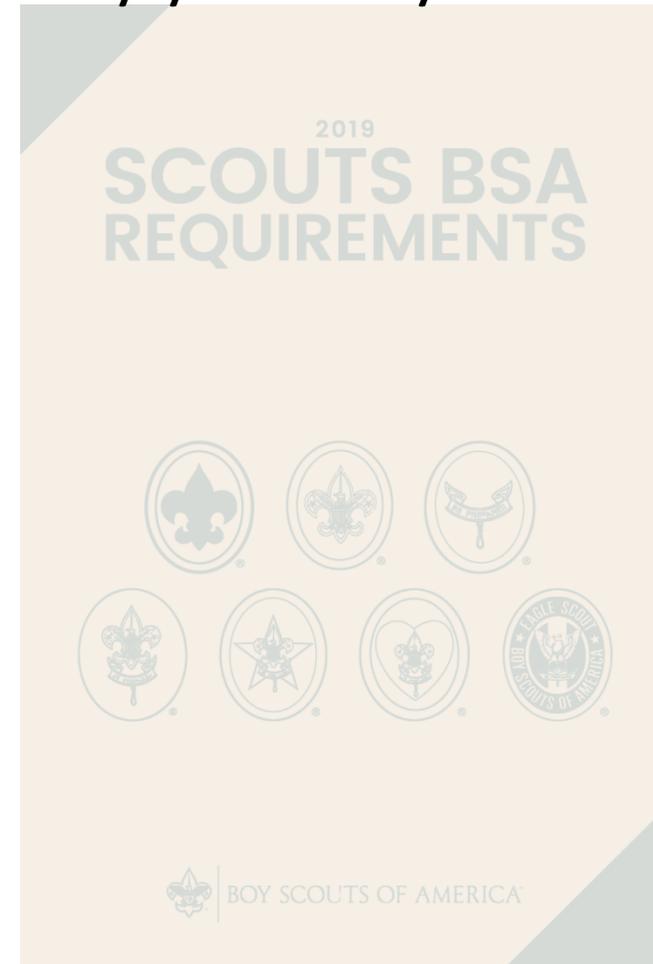


# Getting Out There

## Requirement 9e – 2-Miler

While using the plan you developed for requirement 9a, carry your fully loaded pack to complete a hike of at least 2 miles.

**Complete and log in Workbook**



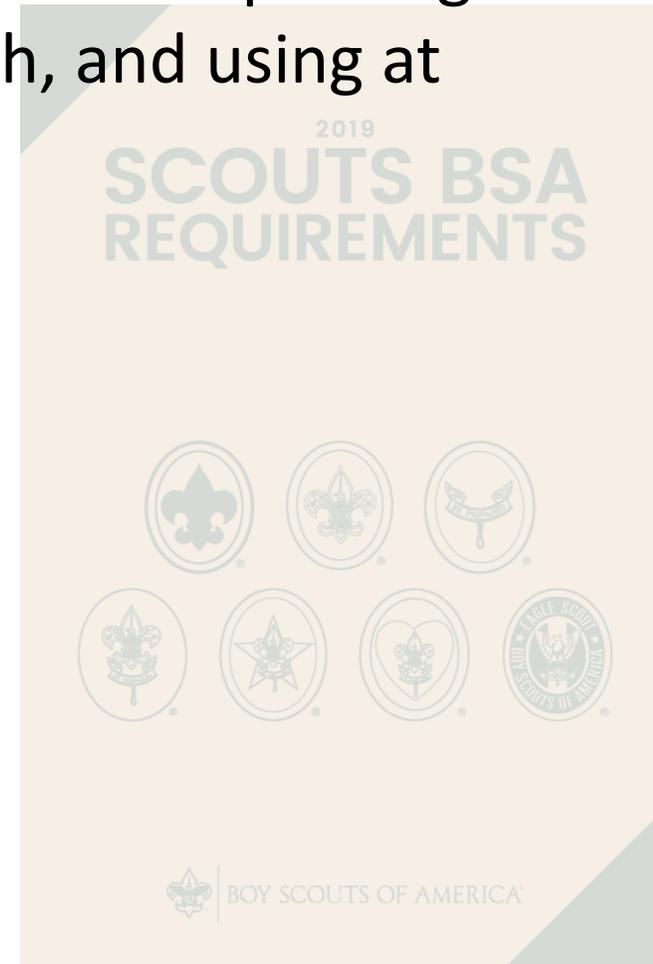
# Getting Out There

## Requirement 10 – 15-Milers x 3

Using Leave No Trace principles, participate in at least three backpacking treks of at least three days each and at least 15 miles each, and using at least two different campsites on each trek.

Carry everything you will need throughout the trek.

**Complete and log in Workbook**



# Getting Out There

## Requirement 11a – 30-Miler Plan

Write a plan for a backpacking trek of at least five days using at least three different campsites and covering at least 30 miles. Your plan must include a description of and route to the trek area, a schedule (including a daily schedule), a list of food and equipment needs, a safety and emergency plan, and a budget.

**Complete and log in Workbook**

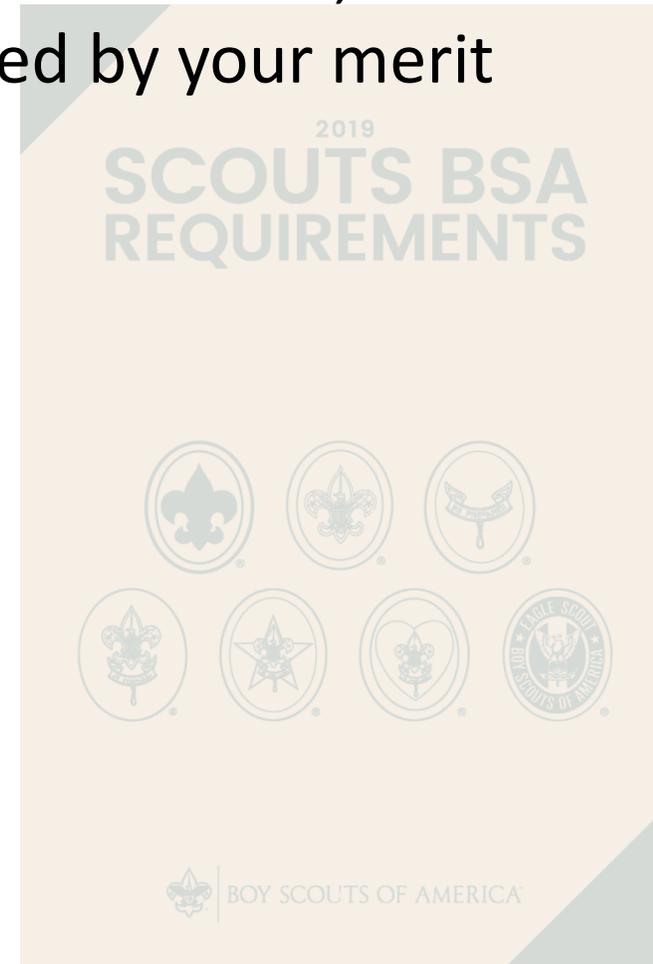


# Getting Out There

## Requirement 11a – 30-Miler Service Project

Using Leave No Trace principles, take the trek you have planned and, while on the trek, complete at least one service project approved by your merit badge counselor.

**Complete and log in Workbook**

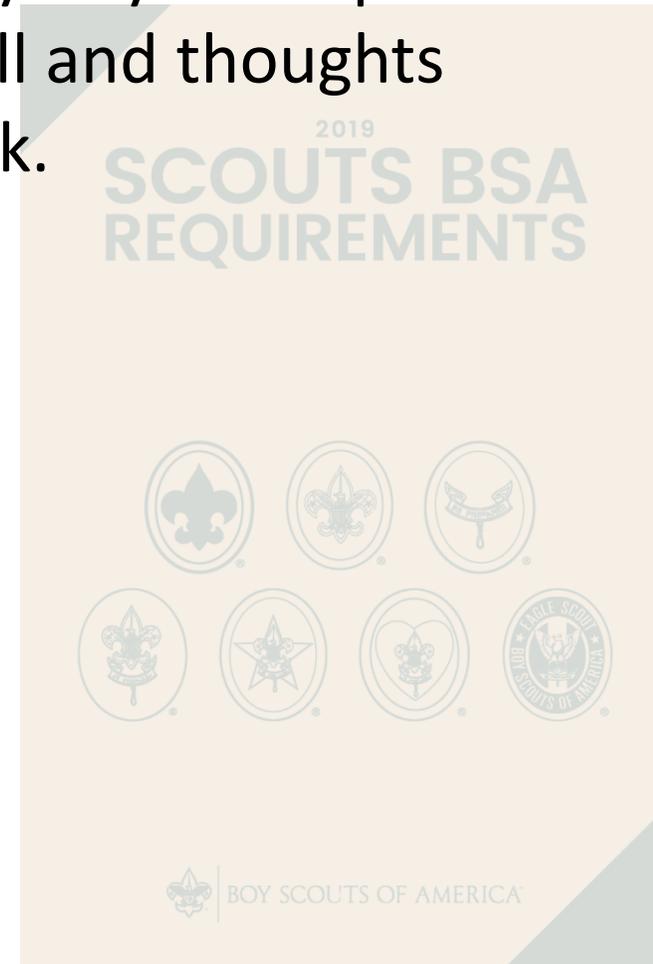


# Getting Out There

## Requirement 11c – 30-Miler Journal

Keep a daily journal during the trek that includes a day-by-day description of your activities, including notes about what worked well and thoughts about improvements that could be made for the next trek.

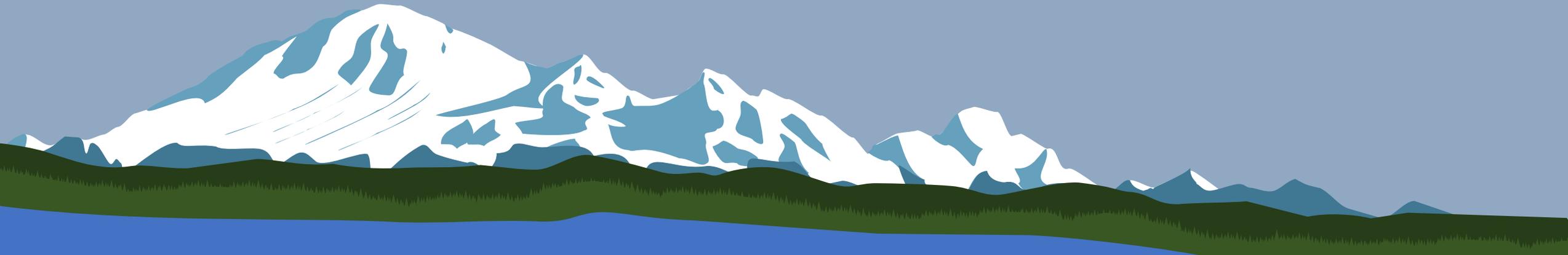
**Complete and log in Workbook**



- 1. [Merit Badge Requirements](#)
- 2. [Merit Badge Intro](#)
- 3. [First Aid](#)
- 4. [Gear](#)
- 5. [Water](#)
- 6. [Food](#)
- 7. [Navigation](#)
- 8. [Leave No Trace](#)
- 9. [Preparation](#)
- 10. [Getting Out There](#)
- 11. [Final Thoughts](#)
- 12. [Resources](#)
- 13. [Instructor's Corner](#)



# Final Thoughts



# Final Thoughts

## Merit Badge Requirement Checklist

- Show completion of work  
Ideally - **Turn in complete [Workbook](#)**
- There are obviously requirements that must be done outdoors  
Complete these can send confirmation of completion



If you are unable to fill out a [Workbook](#)  
Please contact your councilor

# Final Thoughts

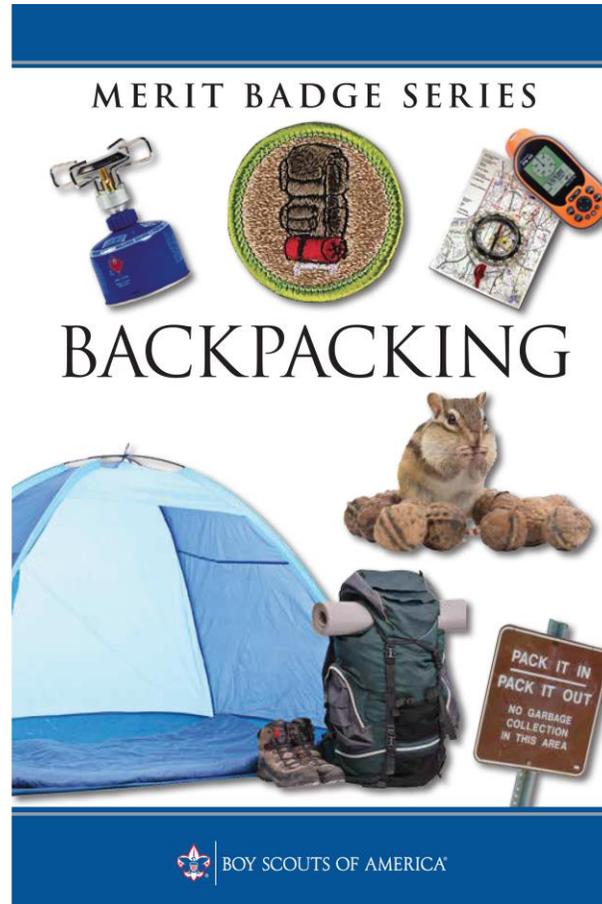
## Final Thoughts

- Backpacking is fun
- Learn how to do it right
- Go out and have some fun

# Final Thoughts

## Looking for More?

- Merit Badge Pamphlet is a great resource



# Final Thoughts

## National Outdoor Awards

100 miles of hiking, backpacking,  
snowshoeing, or cross country skiing



10 3-day 20-mile backpacking trips



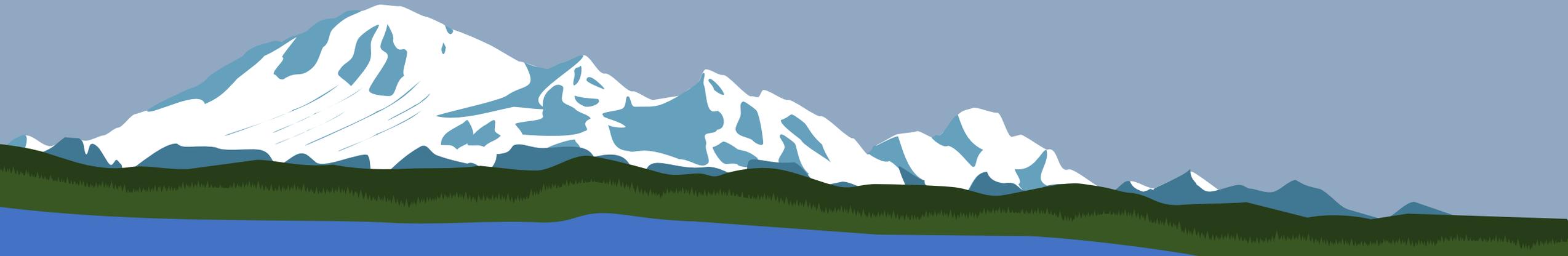
25 days and nights of camping



- 1. [Merit Badge Requirements](#)
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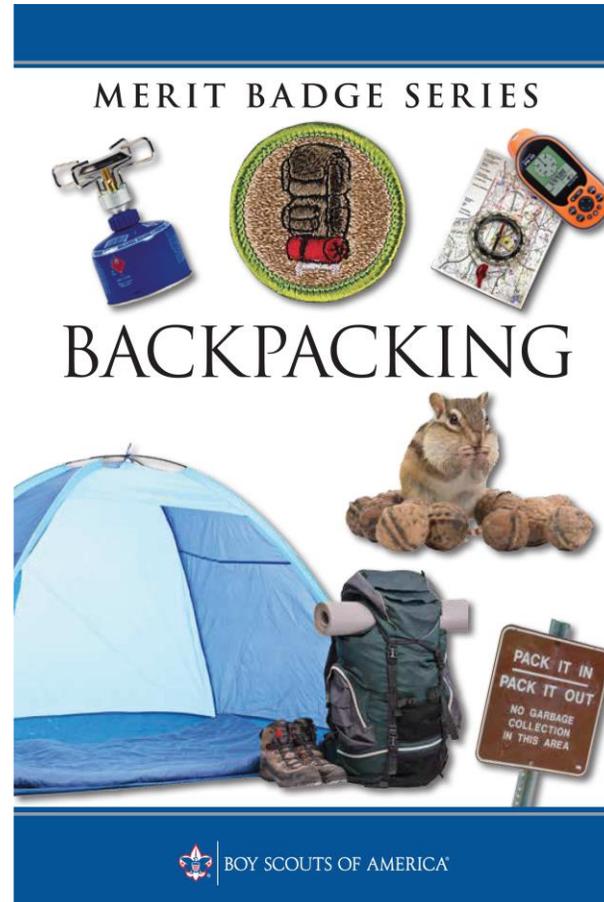
# Resources



# Resources

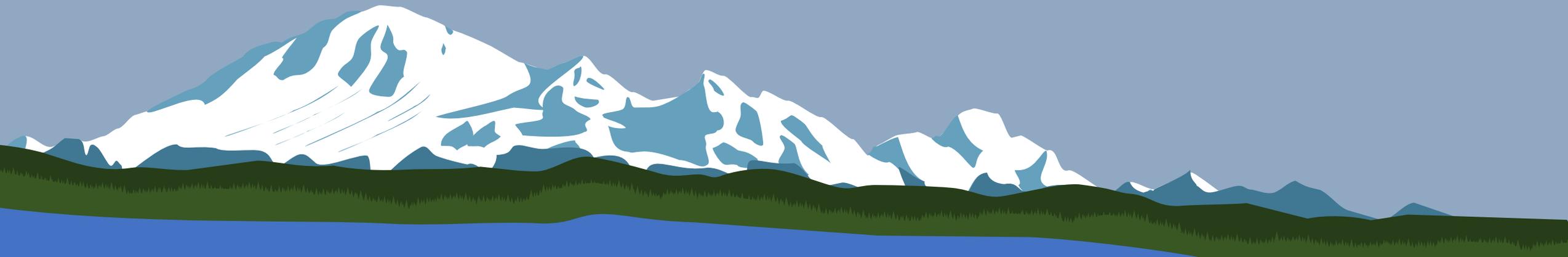
## Resources

- Merit Badge Pamphlet





# Instructor's Corner



# Instructor's Corner

## **Instructor's Corner**

- Thank you for teaching our scouts the Backpacking Merit Badge.