PREPPING 201
WATER

WHY IS WATER SO IMPORTANT?

- Water is necessary for:
  - Chemical reactions and processes
  - Transportation of nutrients in the body
  - Transportation of waste products in the body
  - Cell structure

HOW MUCH WATER?

- Each person should have access to one gallon of water each day for drinking.
- Each person should have access to one gallon of water each day for food preparation and sanitation.

WHERE DO YOU GET YOUR WATER?

- Municipal water supply: lake, river, reservoir
- Well
- Lake or pond
- Cistern

IS YOUR WATER SUPPLY AT RISK?

- Electrical dependency (for pumping)
- Natural limitations (quantity, purity, ownership)
- Access limitations or interferences

BACKUP WATER SUPPLIES

- Where could you get water if your current supply was no longer available?
  - Short-term water storage (how much = how long)
  - Long-term water sources (lakes, ponds, rivers, creeks, streams, springs, etc.)
  - Collection water sources (rain, runoff, evaporation, etc.)

HOW TO STORE WATER

- Water does not go bad, but dirty water can become worse over time.
- Storage methods and materials
  - What type of materials to use
  - Where to store water
  - How to get water into and out of containers
  - Accessibility and quantity

WATER STORAGE CONTAINERS

WATER STORAGE WEBSITES

- https://www.familyhandyman.com/list/best-emergency-water-storage-containers/
- https://worldwaterreserve.com/best-water-storage-containers/
- https://www.amazon.com/Emergency-Water-Storage/s?k=Emergency+Water+Storage
- https://www.tractorsupply.com/tsc/catalog/water-storage-tanks

HOW TO COLLECT WATER

- Standing water collection considerations
  - Containers for transportation
  - Transportation method (consider weight!)
  - Transportation distance
  - Permissions

HOW TO COLLECT WATER

- Moving water collection
  - Collecting the best water
    - Depth, rate of flow, bottom and edge condition
  - Containers, transportation, permission

HOW TO COLLECT WATER

- Ground water collection
  - Access (spring, surface well, deep well)
  - Extraction / collection
  - Containers, transportation, permission

HOW TO TRANSPORT WATER

- Water is heavy: 8 pounds per gallon
- Transportation containers must be manageable
- Consider terrain: water must always be transported uphill

EMERGENCY WATER RISKS

- Contamination (dirt) risks: suspensions
  - A heterogeneous mixture of two substances in which one is dispersed into the other, suspensions involve particles larger than those found in solutions, typically over 1,000 nm. The bigger particles of a suspension usually settle or separate out of a mixture upon standing or are able to be filtered out, although not through filter paper. Gravity is able to pull the visible particles in a suspension down if undisturbed, and they will stay that way unless being actively mixed. Examples of suspensions include oil and water, dust or soot in air, sand and water and muddy water.

EMERGENCY WATER RISKS

- Contamination (dirt) risks: colloids
  - A heterogeneous mixture of two substances like suspensions, colloids involve particles from 1-1,000 nm that do not separate upon standing and cannot be separated by filtration. The particles in a colloid land in size between those in a solution and a suspension and may be solid, liquid or gas. The two parts in every colloid mixture are its particles and the dispersing medium, and the particles are spread evenly in in the medium, which can also be solid, liquid or gas. Examples of colloids are foams (shaving cream, Styrofoam), gels (gelatin, jelly), emulsions (mayonnaise, lotion), aerosols (fog, insecticide spray, smoke) and sols (shampoo, gemstones).

EMERGENCY WATER RISKS

- Contamination: biological risks
  - Bacteria
  - Viruses
  - Parasites

EMERGENCY WATER RISKS

- Contamination: chemical risks
  - Medical waste
  - Industrial waste
  - Natural waste

HOW TO MAKE WATER SAFE

- Clarify it
  - Gravity separation: let it sit
  - Centrifuges: special equipment (requires a pump)
  - Hydroclones: special equipment (requires a pump)
  - Filtration: sand, paper, ceramic, diatomaceous earth
  - Coagulation (special materials required)

HOW TO MAKE WATER SAFE

- Remove the biological risks
  - Chemical sanitation (chlorine, iodine, potassium permanganate, ozone)
  - Filtration (ceramic filters, ionizing filters)
  - Distillation

HOW TO MAKE WATER SAFE

- Remove the chemical risks
  - Ultrafiltration
  - Deactivation (need to know what's in there)
  - Distillation (has limits, based on boiling point)
  - Need to know what you are working with

HOW TO MAKE WATER HEALTHY

- Improve the quality
  - Minerals
  - Salts
  - Taste

WATER PURIFICATION OPTIONS

- https://nikusa.myvoffice.com/ShoppingCart/index.cfm?FuseAction=CategoryShop&CategoryID=55&OwnerID=800186500&Country=USA
- https://www.bigberkeywaterfilters.com/
- https://www.extension.purdue.edu/extmedia/wq/wq-12.html
- https://www.amazon.com/water-distillation/s?k=water+distillation

WATER PURIFICATION OPTIONS

- https://www.baycounty-mi.gov/Docs/CitizenCorps/DistillationForHomeWaterTreatment.pdf
- https://advancedwaterinc.com/water-distillation-work/
- https://www.h2olabs.com/

GETTING CREATIVE

- Rainwater collection
  - Needs to have a system to collect, store, and process an adequate amount of water.
    - Roof, permeable pavement, ground runoff
  - Depends upon the amount and timing of precipitation, including seasonality.
  - Must consider the contaminants added by the collecting surface.

GETTING CREATIVE

- Rainwater collection
  - https://www.watercache.com/education/rainwater-harvesting-101
  - https://www.rainharvest.com/shop/
  - https://www.energy.gov/eere/femp/water-efficient-technology-opportunity-rainwater-harvesting-systems
  - https://www.amazon.com/rainwater-collection-system/s?k=rainwater+collection+system

GETTING CREATIVE

- Rainwater collection
  - https://www.thespruce.com/permeable-paving-options-for-driveways-1398073
  - https://www.truegridpaver.com/what-are-permeable-driveways/
  - https://www.thisoldhouse.com/driveways/21015654/prevent-driveway-puddles-with-pervious-paving
  - https://www.buildwithrise.com/stories/permeable-paving

GETTING CREATIVE

- Rainwater collection
  - https://en.wikipedia.org/wiki/Stormwater_harvesting
  - https://agrilifeextension.tamu.edu/library/landscaping/rainwater-harvesting-soil-storage-and-infiltration-system/
  - https://aquariussupply.com/products/stormwater-management-rainwater-harvesting
  - https://extensionpublications.unl.edu/assets/html/g2148/build/g2148.htm

GETTING CREATIVE

- Distillation
  - Heated and powered systems
  - Solar and passive systems
  - Homemade systems

GETTING CREATIVE

- Evaporative collection - atmospheric
  - https://en.wikipedia.org/wiki/Atmospheric_water_generator
  - https://academic.oup.com/ijlct/article/15/2/253/5718410?login=false
  - https://pubs.acs.org/doi/10.1021/acsmaterialslett.1c00850

GETTING CREATIVE

- Evaporative collection - plants
  - https://meche.mit.edu/news-media/vapor-collection-technology-saves-water-while-clearing-air
  - https://www.instructables.com/Extract-Clean-Drinkable-Water-From-Plants/
  - https://www.usgs.gov/special-topics/water-science-school/science/evapotranspiration-and-water-cycle