ENVIRONMENTAL PROTECTION

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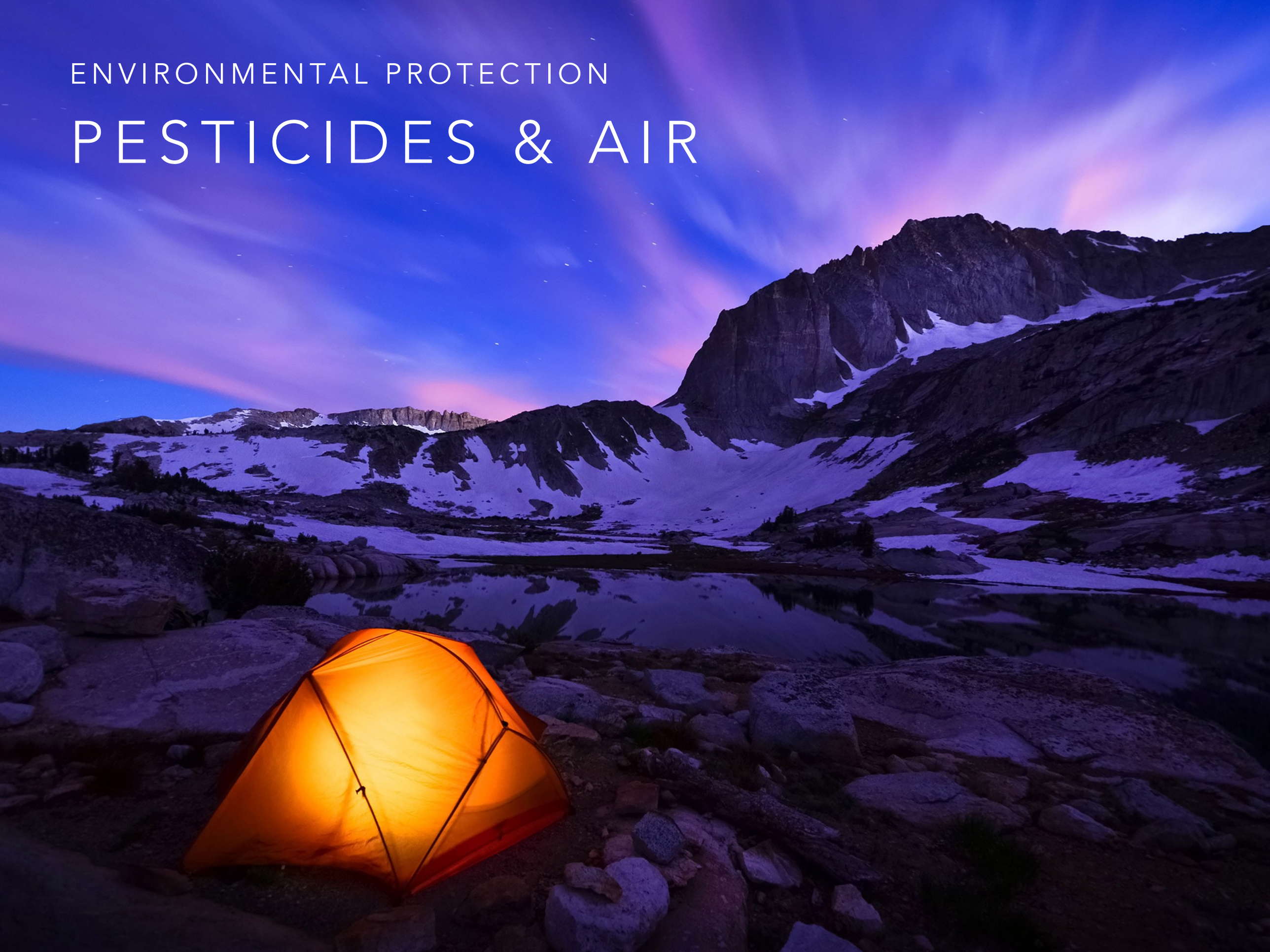
PESTICIDES & AIR



PESTICIDES & AIR

- Pesticides are capable of traveling large distances from their application site.

- Pesticide Drift - the movement of spray particles or droplets in the air away from the site of application.

- Pesticide that drifts off-site may injure people, pets, wildlife and the environment and poorly timed pesticide applications can kill bees, other pollinators beneficial parasites and predators.

VAPOR DRIFT

- A pesticide that vaporizes easily is said to be volatile.
- Pesticides that vaporize easily are prone to moving off-site.
- One should avoid using a volatile pesticide when conditions such as low humidity and high temperature favor vapor formation.

PARTICLE DRIFT

- **Particle and Droplet Size** - Smaller particles and droplets have a greater chance of drifting.

- **Nozzle Type & Orientation** - To minimize drift, choose a nozzle that produces a larger droplet size.

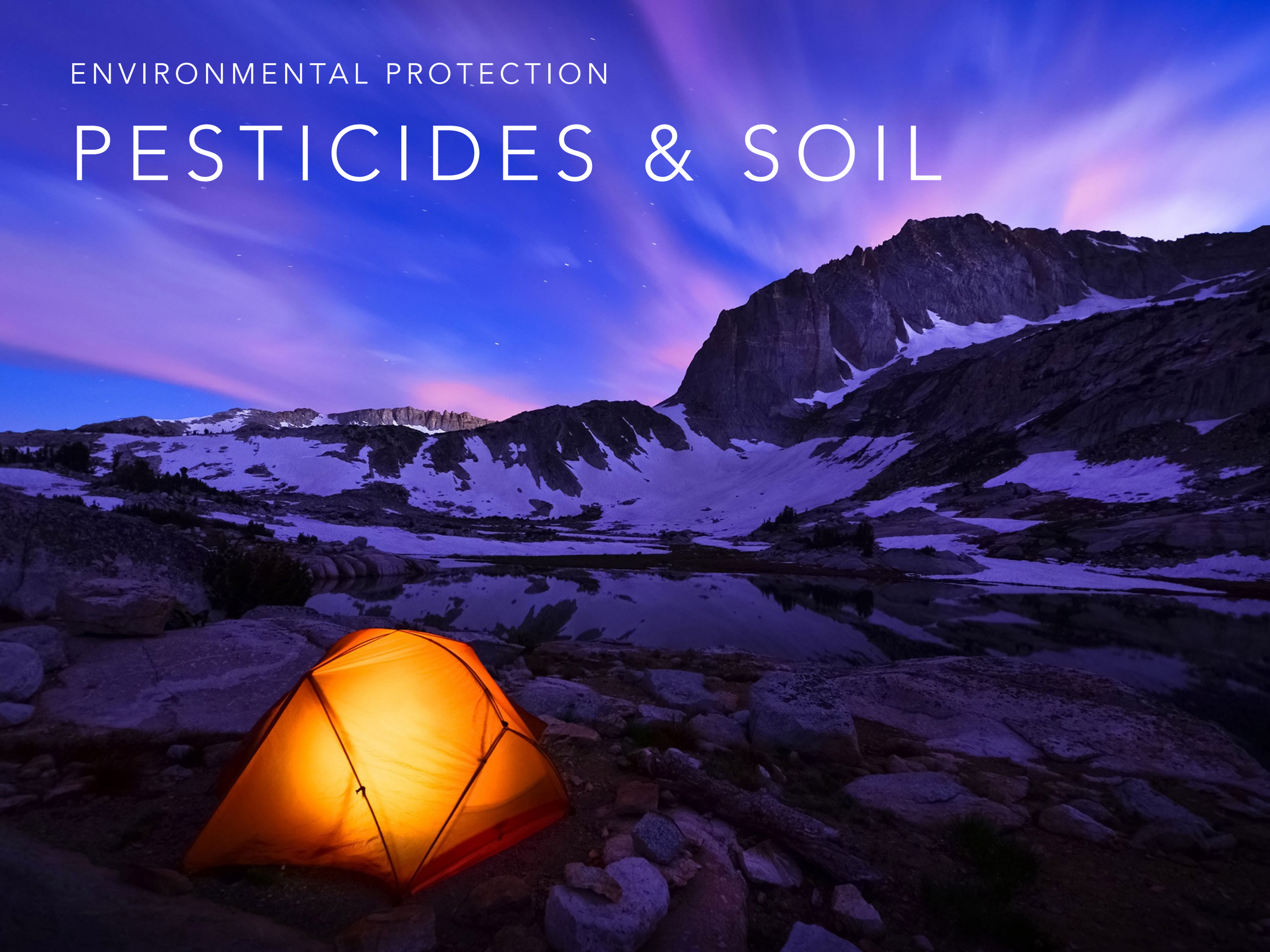
- **Pressure** - Lower pressures produce larger droplet sizes.

- **Height of Release** - Nozzles that are are positioned at a lower height are less prone to generating droplets that drift. To compensate for a lower height setting, a nozzle with a wider angle may need to be chosen.

- **Air Movement and Weather** - Wind direction and speed directly affect how much pesticide drifts and in what direction.

ENVIRONMENTAL PROTECTION

PESTICIDES & SOIL

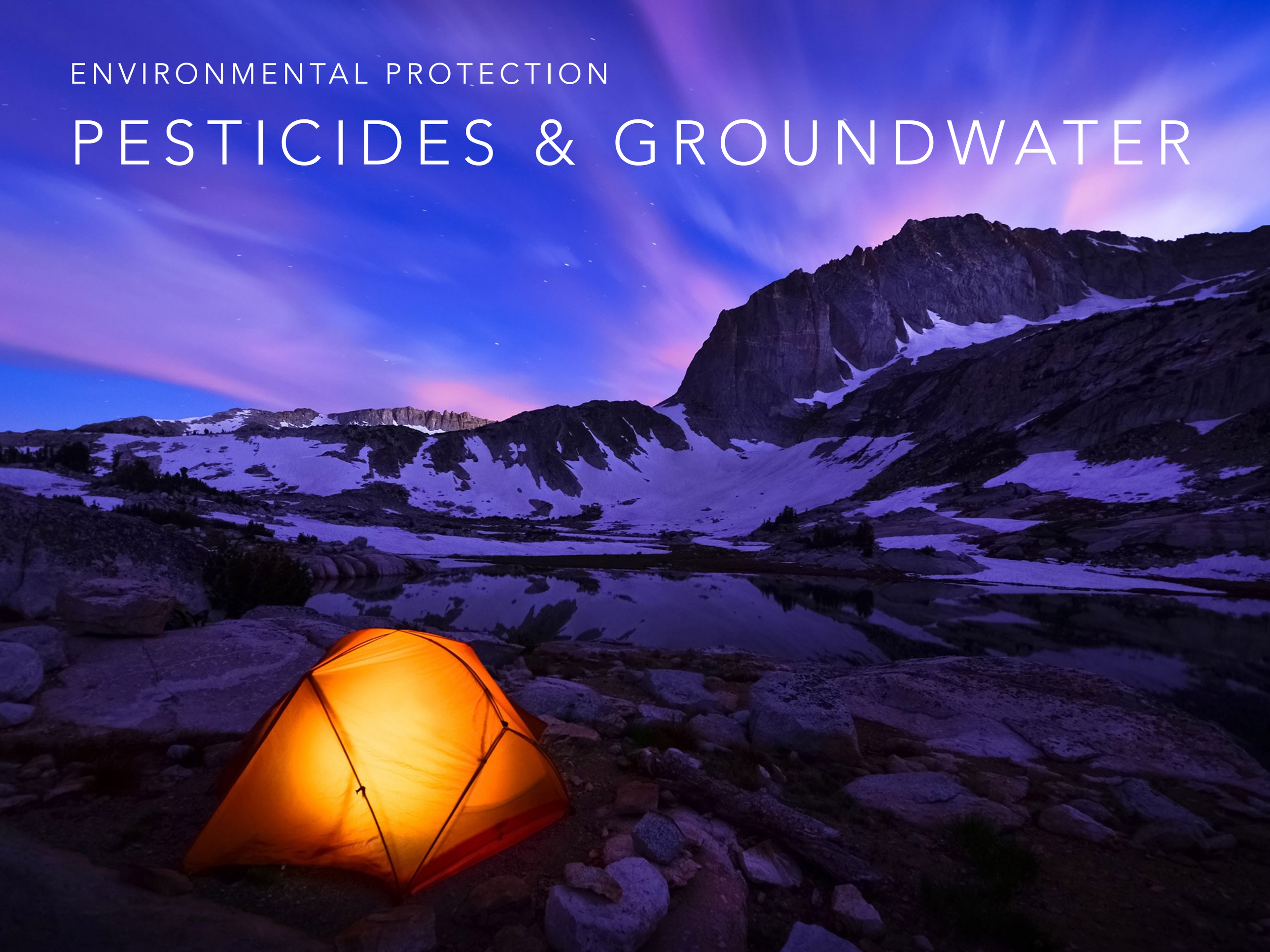


PESTICIDES & SOIL

- Pesticides applied to the soil are often times held tightly by the finer soil particles.
- With some pesticides, the attachment to the soil is so strong that there is little risk of the pesticide reaching the groundwater.
- At other times the pesticide is less tightly held to the soil and poses a significant threat to groundwater resources.

ENVIRONMENTAL PROTECTION

PESTICIDES & GROUNDWATER



PESTICIDES & GROUNDWATER

- Less than 1% of the water on the planet is available for use.
- Two-thirds of this freshwater is groundwater.
- The best protection against groundwater pollution is prevention.
- Pesticides that reach the groundwater are not detected until the pollution is widespread.

PESTICIDES & GROUNDWATER

- Man-made cleaning processes are expensive, and once polluted, the water may not be drinkable for years or even decades.
- Pesticides can enter into groundwater by two routes. The first is by leaching through the soil and into groundwater. The second route is by entering through sink holes, wells or other structures in direct contact with the groundwater.

GROUNDWATER POLLUTION: NONPOINT SOURCE VS. POINT SOURCE

- Pesticides that are applied properly and then leach downward through the soil are said to come from a *nonpoint source*.

- Pesticides that reach the groundwater as a result of being beck-siphoned into a well or due to pesticide being spilled in large amounts is said to arise from a *point source*.

PESTICIDE CHARACTERISTICS

- A pesticide that is tightly bound to the soil is less likely to reach the groundwater.
- Pesticides that decompose quickly are less likely to reach the groundwater.
- A pesticide that is more persistent in the environment, however, has more time to reach the groundwater before breaking down and thus, is more likely to be found in groundwater.
- Pesticides used in the past included many chlorinated hydrocarbons. Chlorinated hydrocarbons are very persistent in the environment but also bind tightly to the soil. As a result, they usually are not found in groundwater.

FACTORS AFFECTING PESTICIDES

- **Adsorption** - A pesticide with a high partition coefficient (KoC) is tightly bound to the soil and thus, is less likely to leach into groundwater.

- **Volatilization** - Some pesticides are very volatile and turn into gas quite easily. When this happens, there is little chance of the pesticide reaching the groundwater.

- **Runoff** - There are times when a pesticide is transported by surface waters and moves off-site. This contaminated surface water may pollute a lake or river.

- **Leaching** - Pesticides leach through sandy soils more easily than clay soils.

GROUNDWATER PROTECTION

The following steps should be followed to minimize the pollution of groundwater.

1. Read the pesticide label for warnings and follow the directions.
2. Use alternative approaches to pest management.
3. Educate yourself about the leaching potential of the site and pesticide you are working with.
4. Don’t mix or load pesticides around sinkholes and old wells.
5. Avoid handling and using pesticides close to wells.
6. Choose pesticides having the least potential to leach into groundwater.
7. Apply pesticides at an appropriate time.

GROUNDWATER PROTECTION

- 8. Measure pesticides properly and carefully and calibrate equipment often and accurately.
- 9. Avoid spills and back-siphoning.
- 10. Accurately apply pesticides.
- 11. Dispose of pesticide containers properly.
- 12. Store pesticides safely.
- 13. Maintain records of pesticide use.
- 14. Comply with pesticide certification requirements.

WILDLIFE AND ENDANGERED SPECIES

- Before applying a pesticide, read the pesticide label for any precautions designed to protect endangered or threatened species and areas where pesticide use is restricted.

HONEYBEES

- Avoid using pesticides that are toxic to bees while crops are in bloom.

- If weeds are to be sprayed, mow the blooms off first to reduce their attractiveness to bees.

- Do not apply pesticides close to a bee hive.

- Make pesticide applications late in the afternoon with a product that breaks down within hours. Evening applications generally pose the least chance of harming bees.

HONEYBEES

- Granular formulations are generally safer for bees.
- Microencapsulated insecticides are the most harmful to honeybees.
- Dusts are generally more hazardous to bees than sprays.
- Wettable powders are usually more hazardous that emulsifiable concentrates or water soluble mixtures.
- Ultra-low-volume applications are sometimes more toxic to bees than regular sprays.

PESTICIDE PERSISTENCE

- Pesticides that are introduced into the environment eventually break down over time due to three primary processes. These are 1. Microbial degradation; 2. Chemical degradation; 3. Photodecomposition.

- Some pesticides break down in a few hours or days. Others break down more slowly and tend to persist in the environment.

- The speed at which a pesticide breaks down depends on environmental conditions. These conditions include temperature, level of sunlight, air and location.

- Most of the breakdown of pesticides is due to the actions of microorganisms.

PESTICIDE PERSISTENCE: MICROBIAL DEGRADATION

- Microbial degradation refers to the breakdown of pesticides in the soil or water due to the actions of soil fungi or bacteria.
- Most pesticides break down into simpler chemicals via this route.

PESTICIDE PERSISTENCE:
CHEMICAL DEGRADATION

- This is where a pesticide breaks down due to one or more chemical reactions.

- Many pesticides break down at a faster rate due to hydrolysis in high pH soils and spray mixes. This is especially true for organophosphates.

- An elevated pH environment may reduce the effectiveness of a pesticide and make it less persistent within the environment.

Definition: Hydrolysis is a type of decomposition reaction where one reactant is water.

The general formula of a hydrolysis reaction is:

$AB + H_2O \rightarrow AH + BOH$

PESTICIDE PERSISTENCE: PHOTODEGRADATION

- Photodegradation refers to the breakdown of pesticides due to the action of light. Some of the pesticide that is broken down in the environment is attributable to this process.

PESTICIDES & FOOD:
THE FOOD CHAIN

- Sometimes an animal ingests a pesticide when it eats a plant treat with a pesticide.

- At other times, the pesticides is consumed when one animal eats another animal that has a pesticide within its body.

PESTICIDES & FOOD:
ACCUMULATIVE PESTICIDES

- Those animals higher in the food chain tend to accumulate greater amounts of a pesticides in their bodies.

- Meat eaters, including humans, may consume high doses of a pesticide by eating animals that have the pesticide within their bodies.

- Most of the pesticides that are persistent and tend to accumulate in animals in greater amounts have been banned from use.

PESTICIDES & FOOD: NONACCUMULATIVE PESTICIDES

- Nonaccumulative pesticides break down rather fast.
- Pesticides that break down rather quickly are generally less harmful to the environment.

PEST RESISTANCE TO PESTICIDES

- Over 50 insect species have developed resistance to one or more insecticides.
- More than 175 weed species have been reported to be resistant to one or more herbicides.
- One-hundred plant pathogens and 3 nematode species have been identified as being resistant to pesticides.

PEST RESISTANCE TO PESTICIDES

Scientists generally agree that the over use of a pesticide will accelerate the development of resistance within a pest species. With this is mind, six suggestions for reducing chemical resistance are:

1. Use pesticides only on an as-needed basis.

2. Rotate the pesticides used.

3. Utilize cultural practices that reduce the numbers of a pest while at the same time, reducing the need to use a pesticide.

4. Monitor pest numbers indoors and outdoors so problems can be detected early and try other methods of managing a pest before resorting to applying a pesticide.

5. Use resistant crop varieties.

6. Educate oneself about the pests you are managing and keep up to date on the latest research.

WHAT PESTICIDE APPLICATORS CAN DO TO PROTECT THE ENVIRONMENT

When it becomes necessary to apply a pesticide, there are a number of procedures one can follow to prevent damage to the environment. These are listed below.

1. Read and follow the label and laws on the use of the pesticide.

2. Properly calibrate spray equipment.

3. Spray the pesticide where required and nowhere else and avoid spraying pesticide into bodies of water.

4. Mix pesticides at the proper rate.

5. Do not spray an area while watering or just before watering an area.

WHAT PESTICIDE APPLICATORS CAN DO TO PROTECT THE ENVIRONMENT

6. Use chemigation only with approved pesticides.

7. Do not spray on windy days.

8. Learn how the pesticides being used might affect fish and wildlife.

9. Use alternatives to chemical pest control whenever possible.

10. Have a responsible midst towards the environment.