

This resource concept was originally developed by the College View "Trailblazers"

Instructor: Help us improve this resource by sending your feedback to:

Lonny Nelson  
lonny@adventsource.org  
402-802-8131

Dunes Honor



# INSTRUCTOR BOOK

## **Dune Blowout Demonstration:**

### **Materials Needed:**

Large shoe Box            4-5 Lbs. Sugar  
Lime Jello powder        Water  
Misting Spray Bottle

### **Directions:**

Just before lunch add the sand (sugar) to the box. Then gather your Pathfinders that are working on Dunes. Have the Pathfinders gather close but make sure they can all see. Ask them what they think a dune blowout is and what they think causes it.

Ask them to shape a dune for you in the box. Let them feel and experience moving the sand in the box. If they have not already done so, ask them to form a Linear or Longitudinal Dune.

Once the dune is formed, sprinkle some “magic Pioneer Plant Seeds” (lime Jello Powder) on the top of their dune.

A healthy misting of water will slightly dissolve the sugar and the Jello will turn a bright green (wow factor) in the areas it was sprinkled.

Allow the water to evaporate for 15-20 minutes leaving a firm crust on the surface. This is how we visualize dune stabilization.

After lunch gather the Pathfinders again. Now use your fingers to break the crust across the center while talking about how man sometimes will cross a dune killing the pioneer plant life. Talk about foot traffic and 4 wheeler traffic as well as larger animals like deer. Mention how the roots holding the sand together die and the sand is free to be removed by the wind – tip the box a bit for effect! Use your hand to demonstrate the wind moving the loose sand.

11. Tell a story about sand and draw a spiritual lesson.

1 Kings 4:29

Have you ever tried counting a handful of sand, or even a pinch of sand? Imagine trying to count the sand in a sand box or at a beach! It is nearly or totally impossible, even with a microscope, not to mention how much time it would take! However, in observing sand grains up close, you can see that they have different shapes, colors, sizes and textures. Rub it between your fingers and it feels smooth, yet rough. Sand is so much fun to play and dig in, make sand castles, bury your hands and feet. Sand is used to make glass, bricks, in landscaping, the abrasiveness used for polishing and sand blasting, dump trucks spread sand on icy roads to improve wheel traction, sand bags ward off rising waters and floods, mix it with cement and water to make concrete for sidewalks and buildings. Sand grains do not weigh very much, but a bucket full can be very heavy. Lots of sand in big piles is called dunes with the wind as an essential part in forming the shape and type of dune.

Life is like a sand dune. The sand grains are our daily activities, how we treat each other, what we watch and listen to, what we put into our minds and even how we take care of ourselves. The winds (problems) will come and go and be very strong at times. The shape and strength of stability in your dune will be determined by how your relationship with Jesus is. Just like the pioneer plants and forests of dunes stabilize the sand, our spirituality and faith with stabilize us for eternity.

12. Discover an early pioneer of dunes management and conservation within your conference, union, or division. Share your discovery with an instructor or group.

1. What are dunes and what is the primary ingredient?

Dunes are unstable hill or mountain size formations composed entirely of sand. Dunes come in many shapes, occur in a variety of climates and are constantly changing. The sand types and colors also vary with the geographic location and geologic history. Sand dunes are found along sea-coasts, lakeshores, deserts and river valleys.

2. Name 4 items needed for dune formation.

1. Sand and lots of it
2. Space to put the sand
3. Wind from predominately one direction
4. Water and wave action (coastal areas)

3. Explain the following three ways that wind moves sand.

a) Surface Creep

Dunes are formed by surface creep by particles of sand rolling along on the ground. This is the slowest method of dune formation.

b) Saltation

Dunes are formed by particles of sand jumping along at regular intervals. This method of dune formation is faster than surface creep, but slower than suspension.

c) Suspension

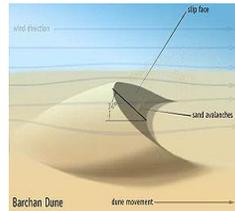
Dunes are formed by particles of sand, fully airborne, and can traveling a long distance before landing. This is the fastest method of dune formation.

4. Explain the following dune formations: barchans, star dunes, linear or longitudinal dunes, parabolic

There are five general categories and within each category are simple, compound and complex.

#### Barchans

Barchans are the most mobile of all dune types, migrating many feet every year. They have what are called tips or horns pointing downwind and are wider than they are long.



Star Dunes are the least mobile of all dune types due to changing wind patterns that keep it basically in one place. The ridges are in the shape of a star. Formed by wind blowing from several directions, the sand is pushed up.



Linear or Longitudinal Dunes are long, deep troughs forming many straight rows, all due to strong winds that always blow in one direction.



Parabolic dunes are transitional between transverse and longitudinal. They feature U-shaped depressions and slip faces on the outer edges and over the top. Also called blow-out, winds come from one direction only and the structure is stabilized by vegetation on both sides. Common in coastal areas.



#### Dome

Dome dunes are circular or oval mounds with no slipface.



In ecology, the term **Dune Community** is used to express a biological community of plants, animals, and fungi.



#### Horned Viper

This snake is a sidewinder, meaning it uses its head and tail to move their body sideways. It uses camouflage so that it is the same color as its surroundings, usually sand. It lives in northern Africa deserts.



#### Camel

Camels have the ability to close their nostrils against blowing sand and can eat hard, thorny vegetation. They store energy in their hump(s) and can tolerate water loss equivalent to over 1/3 of their body weight. All of these characteristics combined

with their two toed feet with webbing make them great animals for crossing deserts and climbing over immense sand dunes. They can drink over 20 gallons of water in a very short time.



#### Atlantic Ghost Crab

A crab that feeds at night, also digs burrows up to 4 feet deep and to ¼ mile from the shore. They are scavengers and have a fantastic ability to live away from the water, only returning to wet its gills (can also do this in wet sand) and reproduce.

10 a. Visit a zoo where there are desert animals, especially those that might live in dunes.

10 b. Watch a video about dunes or plants or animals that live in dunes.

9. Give five examples of animal species in dune environments. How are they unique for living in dune communities?

Reptiles, amphibians, birds, spiders, insects, crustaceans and mammals can survive in the dunes. Just like plants; geography, amount of moisture and climate have everything to do with what animal species are found and how they are adapted to their environment.



#### **Antlion**

An antlion is an insect that makes funnel shaped craters in very soft sand, about 2 cm across and 2 cm deep. The ferocious looking larvae hide in sand at the bottom and then wait patiently for something to walk past and fall in to be

ambushed. The Antlion larvae react very well to false stimulation that there has been a capture, coming out into full view. They are common in the Great Lakes dunes and throughout the United States.



#### **Western Snowy Plover**

A shorebird about the size of a sparrow, found on coastal beaches, dunes and near stream inlets in California and Oregon. They make their nests on the open sand, coming back to the same area year after year. Due to habitat loss,

disturbance and predation these birds are federally threatened. Several organizations are working together to ensure this species survival.



The process of **Ecological Succession** is the development of Dune Communities in an area over time toward a stable state.

5. What is Ecological Succession and how is this demonstrated in dune communities?

Succession is where one community naturally changes overtime and finally is replaced by a different community.



#### **1<sup>st</sup> Beach**

There is little or no time for plants to take hold. Plants and animals that live here must be able to grow in sand, desert like conditions, relentless wind, extreme temperatures and intense sunlight. Scavengers of all levels of the food chain visit regularly to eat remnants of washed ashore fish, birds, animals and insects. The beach is generally divided into lower, middle and upper sections.



#### **2<sup>nd</sup> Foredune**

The dunes closest to the beach and water. They receive direct impact of storms. This level has some plant species, which slow the wind-driven sand and allow dunes to form. Open sand is pretty much covered, yet very sensitive to human disturbance. Sometimes storms can send waves or spray up into this zone.



#### **3<sup>rd</sup> Interdunal Wetland**

These form in a valley or trough between dunes. Frequently this is at the water table and is often host to wetlands and small inland lakes, also home to unique and rare or endangered species.



#### **4<sup>th</sup> Dune Forest**

These are found several hundred meters from shore and left undisturbed can produce a sufficient layer of topsoil to support climax species such as large trees and a large variety of plant and animal species. Equilibrium has been established, no new species are set to come in.

6. What is dune blowout and how does it relate to succession? If possible demonstrate a blow out (see last page for instructions).

Blowouts are open sand areas that are trough or saucer shaped in otherwise stable, plant covered dunes. The wind combined with vegetation instability is to blame. Blowouts can be caused by fires, plant diseases, wind storms, grazing of animals, human disturbances such as hiking off marked trails, off road vehicles, and clearing the area to build homes. Blowouts eventually stabilize. The farther from the coast, the faster the recovery due to lessened wind speeds; pioneer plants first, then shrubs and trees. Blowouts cause a complete reversal of succession back to stage one. The best way to help a dune is to stay on the trails!

7a. What are Pioneer Plants & What is their purpose in dune communities?

Pioneer plants are fast growing and are responsible for initial dune stabilization. Dune stability would be literally impossible without these pioneer plants. They must be able to withstand very harsh conditions; water spray, blowing and drifting of sand, low nutrient levels, flooding, extreme temperature changes, high wind for long periods of time, desert like dryness and high salt levels. Fast reproduction and colonization are a must. The root system is uniquely specialized to grow both down and across very quickly with new shoots popping out at regular intervals. This allows large areas of sand to be stabilized in a short period of time. The purpose is to trap blowing and drifting sand. These plants are all about business; long roots (increase moisture absorption), often covered in waxy coatings (retain water), smaller or rolled leaves (reduce surface area exposure), unpleasant taste to herbivores (longevity) and have thick, scaly stems or bark (stability). Some have pretty flowers, others do not.

7b. Discover two examples of Pioneer Plants. Read out loud From Students book

8. Discover three examples of plants in dune environments. How are they adapted for survival?



### **Cottonwood Tree**

This tree has the ability to grow roots at any point of its buried trunk, grows rapidly from the top. It is very difficult to determine the true height of the tree(s) due to what is buried below the dune! Only the top might be exposed of a large,

mature tree. Commonly found in Lake Michigan sand dune environments.



### **Shore Pine**

Native to the western United States, this tree is often found in sandy environments and coastal sand dunes of the Pacific Ocean. This tree is most often found with strange forms, stunted growth and deformities all a result of unidirectional, strong

winds.



### **Century plant**

Native to the southwestern United States and northern Mexico, this plant easily keeps up with the constant blowing and drifting of sand. They thrive on sandy slopes and dry, rocky environments. Their root system is a widespread, dense mass just

below the surface as to absorb any moisture. This plant can grow 2 inches per day; the flowering stock can grow 1 foot per day.