INTRODUCTION

Sand dunes are mounds of loose sand grains heaped by the wind. Regarded by some as little more than expansive sand boxes for recreation and exploitation, dunes are complex and beautiful structures formed over many years. Yet while they are the product of many years, dunes are constantly changing as the blowing winds rearrange their basic structural unit — sand.

Dunes are most likely to develop where strong winds blow in the same direction. Generally they are associated with deserts or beaches. Extensive fields of dunes occur on some of the world's deserts such as the Sahara of Africa. Patches of dunes are found scattered throughout the deserts of the southwest United States. Dunes are also commonly found just landward of beaches, where sand is blown inland by sea or lake breezes.

In the next several hours you will explore not only the structure of sand dunes, but also the dynamic factors that make dunes and the dune ecosystem so varied and interesting. We hope when you have finished this unit, you will view the dune ecosystem as beautiful as it is unique and as fragile as it is complex.

THE ACTIVITIES	TIME REQUIRED
Sand Exploration	2.5 - 3.5 hours
Dune Shapes	45 minutes
Dune Migration	20 minutes
Dune Habitat Transect	90-120 minutes

COMBINING THE ACTIVITIES

The activities in this unit are displayed singly. Depending upon the time available, and the skill of the participants, you may choose to do only one activity or the entire series. For maximum learning, the activities should be experienced in the order listed in the unit. However, other suggestions are:

Title: Sand Exploration/Dune Shape/Dune Habitat Transect

Introduction: Sand dunes are a laboratory for the scientist, an inspiration for the artist, and a recreational haven for many. Participants in this unit will investigate the complex relationships found in the dune ecosystem.

Activity: Sand Exploration

Introduction to the First Activity: Because sand is the basic structural unit of dunes, the first activity focuses on the composition of sand. Students identify a variety of common minerals that comprise sand and estimate the percentages of each in a given sand sample.

Transition: Now that we have looked at the composition of sand, let's look at dunes to learn how to identify the common dune types.

Activity: Dune Shape

Transition: Now that we have looked at dune types, let's see how the wind works to rearrange sand and create the various dune types.

Activity: Dune Habitat Transect

Transition: How has this unit changed your thinking about dunes?

CURRICULUM RELATIONSHIPS

Social Studies

1. Prepare a map showing, and/or write a short paper describing the dune areas of the world. Be sure to include the reason dunes are there.
2. Compile a list of the native people/cultures in the world who are associated with dune areas. Choose one. Research the culture. In what ways does their particular dune habitat influence their culture?

Science

1. "Invent" a plant (with adaptations) that is suitable for the dune ecosystem.
2. Using the kangaroo rat as an example, write a paper discussing the pressures placed on animals that live in arid climates and what adaptations enable them to survive in this harsh environment.
3. Report on the insect, bird or reptile/amphibian life of a sand dune ecosystem.

Mathematics

1. Calculate the volume of a dune.
2. Estimate the amount of sand found on earth, assuming the average depth of sand where it is found is 1 m. (Do not include the sand found on ocean bottoms or under water)

Language Arts

1. Write a short story about a day in your life, assuming you are someone who lives (in the past or present) in the coastal dunes.
2. Write poems or essays about some aspect(s) of dunes.

Creative Arts

1. Using charcoal and white paper, sketch several dunes.
2. Using glue and sand, make dunes on construction paper. Additional material may also be applied, if desired. Or, construct models of the different dune types.

ACTIVITY I: SAND EXPLORATION

CONCEPT Quantification, Fundamental Entities, Invariance

PRINCIPLE Participants will classify sand particles based upon observable characteristics.

OBJECTIVE
- Using previously acquired knowledge, the student will be able to identify as well as determine the relative percentage of the minerals that make up the particles of sand in a given sample.

PREPARATION The student should know how to identify minerals to successfully perform this activity. A mineral identification book may be useful. The teacher will need to obtain 30-40 grams of coarse-grained sand from the same source for each group..

MATERIALS USED
- Activity Sheet A: Sand Exploration
- Hand lens
- Magnet
- Tweezers, forceps, or toothpicks
- Sand
- 1 cm grid graph paper
- Mineral Reference guide
- Tubs/containers to put sand in
- Dissecting microscope (optional)
- Calculator
- Samples of mineral types (optional)
- Overhead, flipchart, chalkboard, or enlarged copy of Activity Sheet A

PROCESSES USED
- Classify
- Predict
- Interpret data
- Observe
- Measure
- Communicate
- Use numbers

TIME 2 1/2 to 3 1/2 hours.

DOING THE ACTIVITY (indoors)

A. Set Stage:

The mineral composition of the sand grains in sand dunes depends on both the character of the original sand source and the intensity of chemical weathering in the region. In this activity students will examine individual sand particles to identify their mineral make-up.

Before beginning the activity, review the names and characteristics of the minerals you expect to find in your sand sample. Some common minerals seen will be:

quartz — colorless or light colored
biotite mica — blackish, shiny, flat
muscovite mica — white or clear, shiny and flat
pyrite — light yellow and brassy
feldspar — white, gray, or red
hornblende — dull green or black
calcite — clear or nearly so; blockish

ACTIVITY A: Sand Exploration 45 min. groups

1. Spread sand sample in a single layer onto graph paper so that it covers a single square (one square cm.).
2. Remove all the sand except the sand covering the square cm. to be used.
3. Using a hand lens or dissecting microscope, use a thin toothpick or tweezers to sort the sand in the remaining square cm. into piles based on the color and size.
4. Now that you have observed your sand sample, estimate the percentage of various minerals you expect to find in your sample. Record this estimate in column 1.
5. Identify each pile of minerals and count the number of grains of each. Record data in left side of column 2.
6. Next calculate the total number of sandgrains, and the percentage of each mineral type in the total sample, using the formula below. Record calculations in left side of column

Mineral Name	Estimated # of Grains	Actual # of Grains		Percentage of total*	
		group data	class data	group data	class data
Quartz: colorless or light colored					
Biotite: blackish, shiny, flat					
Muscovite: white or clear, shiny and flat					
Pyrite: light yellow and brassy					
Feldspar: white, gray or red					
Hornblende: dull green or black					
Calcite: clear or nearly so; blockish					
Other					

*To calculate the percentage of each mineral type in the whole sample, use the following formula:

$$\text{Number of Grains of Any Mineral Type} \div \text{Total Number of Grains Counted}$$

Investigating Your Environment Dunes

B. Procedure:

1. Divide the class into groups and distribute materials.
2. Spread sand sample in a single layer onto graph paper so that it covers a single square (one square cm).
3. Remove all the sand **except** the sand covering the square cm to be used.
4. Using a hand lens or dissecting microscope, use a thin toothpick or tweezers to sort the sand in the remaining square cm into piles based on color.
5. Now that you have observed your sand sample, estimate the percentage of various minerals you expect to find in your sample. Record this estimate on Activity Sheet A.
6. Identify each pile of minerals and count the number of grains of each. Record data in Activity Sheet A.
7. Next calculate the total number of sand grains, and the percentage of each mineral type in the total sample, using the formulas on Activity Sheet A.

C. Retrieve Data:

Within their groups have students answer the following questions:

1. What does the mineral composition tell you about the sand's history?
2. If you were asked to estimate the amount of sand grains in a given dune, briefly describe how you would do this.
3. Why is it important to know the composition of sand?
4. Where do you think the minerals that are found in sand come from?
5. What do we use sand for?
6. Have students prepare a bar graph or pie chart displaying their results, or use a computer program to display the data in different formats.

Now combine the data from all students. (Increase the size of the sample.) Add the data for each mineral type and have students calculate the percentage of each mineral in the class data. Show this data on overhead, flip chart, chalkboard, or enlarged copy of Activity Sheet A. Have students add class data to appropriate columns on Activity Sheet A.

Now have students answer the following:

1. How did the data from the whole class compare to the data in your individual sample? What could account for the differences found?
2. Which data is probably more representative of the composition of the area where the sand was collected?
3. What does this tell you about the size or number of samples that should be obtained in scientific experiments?

CLOSURE What did we find out about sand? What did we learn about the size of samples desired in an investigation?

TRANSITION Now that you have taken a close look at the composition of sand, let's look at the arrangement of sand into dunes.

ACTIVITY II: DUNE SHAPES

CONCEPT Change, Symmetry, Perception, Cause/Effect, Interaction, Order Invariance

PRINCIPLE Sand dunes vary in shape and structure due to external environmental forces.

OBJECTIVE
- The student will be able to demonstrate knowledge about dune shape by correctly identifying various dune structures.

PREPARATION Select an appropriate site which has several different examples of dune shapes.

MATERIALS USED
- Activity Sheet B: Dune Shapes
- Pen/pencil

PROCESSES USED
- Observe
- Classify
- Communicate
- Infer
- Hypothesize

TIME 45 minutes

DOING THE ACTIVITY (outdoors)

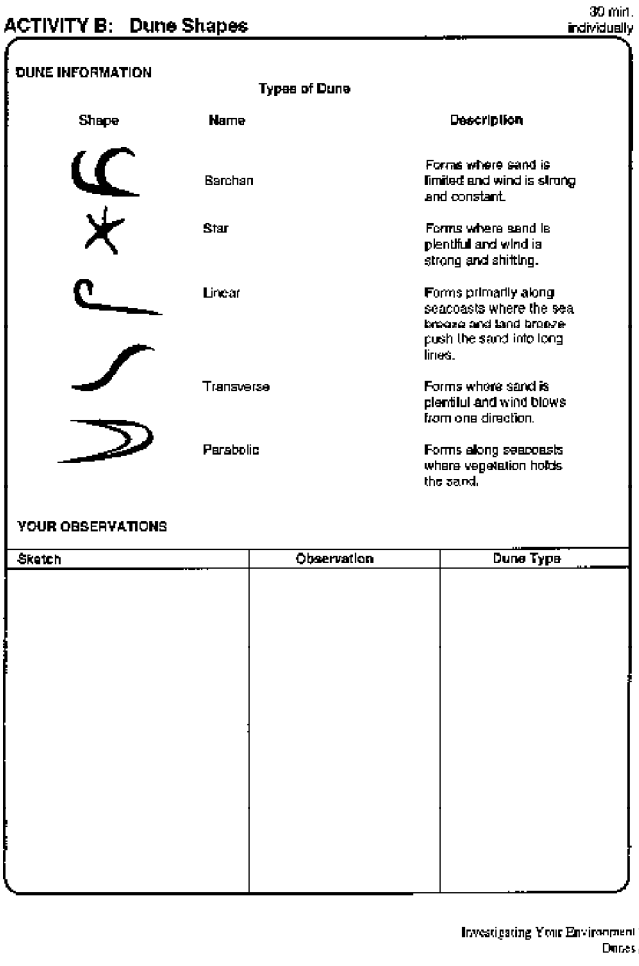
A. Set Stage:

Sand dunes tend to develop certain characteristic shapes, depending on wind velocity, direction, sand supply, and how the vegetation cover, if any, is distributed.

Some dunes are difficult to identify because they are irregular and have no recognizable shape, while others are easy to identify and exhibit "typical" patterns. The side of a dune that faces into the wind is called the **windward** side. The side of the dune away from the wind is called the **leeward** side. Which side of the dune do you think is steeper and why?

B. Procedure:

1. Distribute Activity Sheet B



ACTIVITY B: Dune Shapes

30 min. individually

DUNE INFORMATION

Types of Dune

Shape	Name	Description
	Barchan	Forms where sand is limited and wind is strong and constant.
	Star	Forms where sand is plentiful and wind is strong and shifting.
	Linear	Forms primarily along seacoasts where the sea breeze and land breeze push the sand into long lines.
	Transverse	Forms where sand is plentiful and wind blows from one direction.
	Parabolic	Forms along seacoasts where vegetation holds the sand.

YOUR OBSERVATIONS

Sketch	Observation	Dune Type

Investigating Your Environment
Dunes

2. Work individually for 30 minutes to observe and sketch as many dune shapes as you can on the back or bottom of Activity Sheet B.
3. Using the information and data table at the top of Activity Sheet B, identify as many of the dune shapes you have sketched as quickly as possible. (10 minutes) Note: Facilitator should let students know when to start and end step #3.

C. Retrieve Data:

Gather the group together and discuss the following questions:

1. What were some of the dune shapes that you found?
2. Which of these shapes were most common?
3. What made some easier to identify than others.
4. Chose one dune that you sketched and identified. Think about how this dune will change over time. How will it be different in one week? One month? One year?

CLOSURE As you have just seen, sand dunes are dynamic structures that come in many shapes and sizes. Take a moment to think of ways that dunes may change over time:

1. What are some environmental factors that may cause these changes?
2. What have we found out about dunes so far?

TRANSITION Change in sand dunes often occurs slowly and is difficult to observe. In the next activity you will speed up the dune formation process as you experiment with one environmental factor and see how this can drastically change the size and shape of a dune.

ACTIVITY III: DUNE MIGRATION

CONCEPT Cause/Effect, Model, Change, Force, Interaction, Order, Replication

PRINCIPLE Participants make a dune and analyze its movement.

OBJECTIVE The student will demonstrate how the changes in wind direction affect the shape of sand dunes.

PREPARATION The teacher needs to obtain several hair dryers with low-cool settings.

MATERIALS USED
- Fine, dry sand
- Hair dryer
- Tray with low sides
- Goggles

PROCESSES USED
- Observe
- Infer
- Predict
- Define operationally
- Control variables
- Communicate

TIME 20 minutes

DOING THE ACTIVITY (indoors)

A. Set Stage:

Sand dunes differ in shape according to environmental conditions. In this next activity you will be influencing dune shape by one environmental factor--wind. The side of the dune that faces the wind is called the windward side. The side of the dune away from the wind is called the leeward side. Before beginning this activity, discuss safety and hair dryers.

B. Procedure:

1. Divide the class into groups of three or four.
2. Groups pour sand into the tray and manually construct a barchan-shaped dune.
3. Put on goggles. Turn the dryer on a low, cool setting and direct the air at a low angle toward the dune. Experiment with the dryer to determine how close you should be to the dune to make sand grains roll up the side of the dune.
4. Hold the dryer in a fixed position and study the way in which the dune slowly travels or migrates across the tray.
5. Shift the dryer about 10 cm to one side of your original position to change the wind direction. Study the way in which this change in wind direction causes the dune to change shape.

C. Retrieve Data:

Discuss the following questions with the class:

1. Explain the differences in appearance between the two sides of a sand dune.
2. Why is the leeward side not absolutely vertical?
3. What happens to the dune when you shift the wind direction?
4. Describe the sequence of events that occur as the dune migrates.
5. Under what conditions could we repeat this experiment and expect to get the same results? Where in nature do the conditions compare (basically) to our experimental conditions?
6. What other factors influence the formation of dunes in natural areas?

CLOSURE Discuss with the class how dune formation using hair dryers compares to dune formation in the natural environment.

TRANSITION In the next activity you will be gathering data about the entire dune area. Remember, the dune ecosystem is fairly unique, and it may contain a variety of rare, threatened or endangered organisms.

ACTIVITY IV: DUNE HABITAT TRANSECT

CONCEPT Population, System, Organism, Interaction, Order, Invariance

PRINCIPLE Participants will record landforms, dune types, and plant communities encountered along a beach/dune transect.

OBJECTIVE Students will be able to:

- Identify and record major physical and biological changes along a transect.
- Describe the effects of wind and water on dunes and plant communities.

PREPARATION Facilitator needs to select a suitable beach area for this activity. Ideally students would encounter most of the landforms and plant communities that are on Activity Sheet C as they walk away from the ocean beach into the uplands.

For this activity, it is acceptable to walk in a course that is **generally** perpendicular to the shore, rather than follow a specific, linear transect line. The length of the "transect" will vary based on the site. (It needs to be long enough to encompass the desired landforms/dunes and vegetative features. Because of this, transect lines **do not** need to be established prior to the activity.

Students should have a basic understanding of dune formation and vocabulary prior to the activity as well as the basis of "transects."

If students are to identify plant species, some advance training in this is required, and reference materials should be provided. Two pages of plants commonly found in the Oregon Dunes are included in this activity. Otherwise, identifying general plant **types** (e.g., grasses, shrubs, pines) will probably yield satisfactory data.

Note: Since European Beach Grass has been planted in many areas to stabilize dune slope, it is recommended that students learn this large grass species, since it allows the group to discuss the important subject of introduced species — and learn about how plants help prevent erosion.

MATERIALS USED

- Activity Sheet C: Beach Dune Transect and Teacher's Guide
- Pens or pencils
- Reference materials
- Overhead projector or flip chart

PROCESSES USED

- Classify
- Observe
- Infer
- Interpret Data

TIME 90-120 Minutes

(**Note to instructor**: You may break into two 45-60 minute classes. Conduct this exploration and observation in one period, then finish up in the second period.)

DOING THE ACTIVITY

A. Set Stage:

As you walk away from the ocean shore into the uplands, you are likely to encounter a variety of landforms and plant communities — as well as evidence of animals that either visit or depend upon those habitats.

In this activity students will record their findings on Activity Sheet C as they work their way from the beach, into the dune areas and finally arrive at the forested uplands.

B. Procedure:

1. Distribute Activity Sheet C and appropriate reference materials.
2. Working in small groups, take 45-60 minutes to hike from the beach to the dune areas, to the forested uplands. While on your hike, record your observations on Activity Sheet C.

C. Retrieve Data:

Once students have completed the "transect" hike, group them together, and using an overhead projector or flip- chart, complete Activity Sheet C using information provided by students.
(Note: A completed Activity Sheet C is included for instructor's use.)

Discuss the following questions:

1. What were some of the things you found?
2. How closely did the field observations match the activity sheet? Were extra habitats/landforms encountered, or were some missing?
3. Some species of wildlife are classified as rare or peripheral in certain areas. Did your group encounter any of these? If so, where? *__Note to instructor__: ***This information varies from region to region; the sheets and the information below are specific to the Washington and Oregon coastal dune areas. Use animal keys and contact your local wildlife (state or federal) office to get information on which species of birds, mammals, reptiles, insects, etc. are rare or peripheral or common in your study area***

   Brown Pelican (June - Oct.)
   Common Egret (Aug - April)
   Bald Eagle (all year)
   Osprey (April - Oct.)
   Peregrine Falcon (late summer - Feb.)
   Snowy Plover (all year)
   Caspian Tern (spring, fall)
   Purple Martin (April - Sept.)
   White-footed Vole (all year)
   Elephant Seal (all year)

4. Many species of birds and mammals depend on snags for nesting or den sites. Did the group observe any snag use during the transect hike?
5. The foredune in many areas has been built up largely because of the introduction of the European Beach Grass. How has it helped to form the foredune? What problems, if any, can arise due to importing a new species to an area?

CLOSURE

1. What is a dune? Discuss the factors responsible for forming and maintaining them, their composition and their role in providing essential habitat for plants and animals.
2. From our investigations, what can we say are some values of dunes?
3. Some people feel that dunes are little more than the world's largest sandbox. After examining the nature of sand dunes how would you respond to these people?
4. Dunes are extremely fragile ecosystems. Which human activities are detrimental to dunes? What strategies can you recommend for protecting the dunes from these activities?
5. Has this unit changed your thinking in any way(s) about dunes? if so, how? If not, why not?

ACTIVITY A: Sand Exploration

45 min.
groups

1. Spread sand sample in a single layer onto graph paper so that it covers a single square (one square cm.).

2. Remove all the sand except the sand covering the square cm. to be used.

3. Using a hand lens or dissecting microscope, use a thin toothpick or tweezers to sort the sand in the remaining square cm. into piles based on the color and size.

4. Now that you have observed your sand sample, estimate the percentage of various minerals you expect to find in your sample. Record this estimate in column 1.

5. Identify each pile of minerals and count the number of grains of each. Record data in left side of column 2.

6. Next calculate the total number of sandgrains, and the percentage of each mineral type in the total sample, using the formula below. Record calculations in left side of column

Mineral Name	**Estimated # of Grains**	**Actual # of Grains**		**Percentage of total***	
		group data	class data	group data	class data
Quartz: colorless or light colored					
Biotite: blackish, shiny, flat					
Muscovite: white or clear, shiny and flat					
Pyrite: light yellow and brassy					
Feldspar: white, gray or red					
Hornblende: dull green or black					
Calcite: clear or nearly so; blockish					
Other					

*To calculate the percentage of each mineral type in the whole sample, use the following formula:

Number of Grains of Any Mineral Type / Total Number of Grains Counted

ACTIVITY B: Dune Shapes

30 min.
individually

DUNE INFORMATION

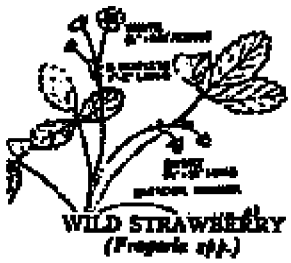
Types of Dune

Shape	Name	Description
	Barchan	Forms where sand is limited and wind is strong and constant.
	Star	Forms where sand is plentiful and wind is strong and shifting.
	Linear	Forms primarily along seacoasts where the sea breeze and land breeze push the sand into long lines.
	Transverse	Forms where sand is plentiful and wind blows from one direction.
	Parabolic	Forms along seacoasts where vegetation holds the sand.

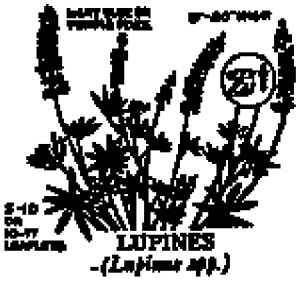
YOUR OBSERVATIONS

Sketch	Observation	Dune Type

ACTIVITY C: Plants of the Dune Community in Oregon (1)



WILD STRAWBERRY
(Fragaria spp.)

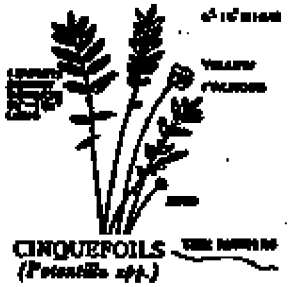


LUPINES
(Lupinus spp.)

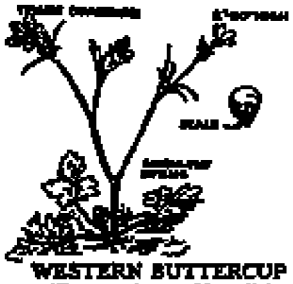
YELLOW MONKEY FLOWER
(Mimulus langsdorfii)

SKUNK CABBAGE
(Lysichiton kamtschatcense)

TANSY
(Tanacetum vulgare)

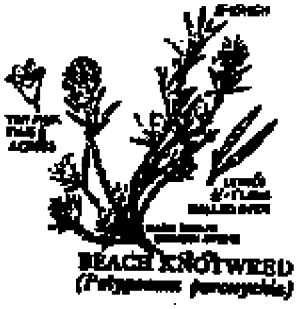


CINQUEFOILS
(Potentilla spp.)



WESTERN BUTTERCUP
(Ranunculus occidentalis)

YARROW
(Achillea millefolium)

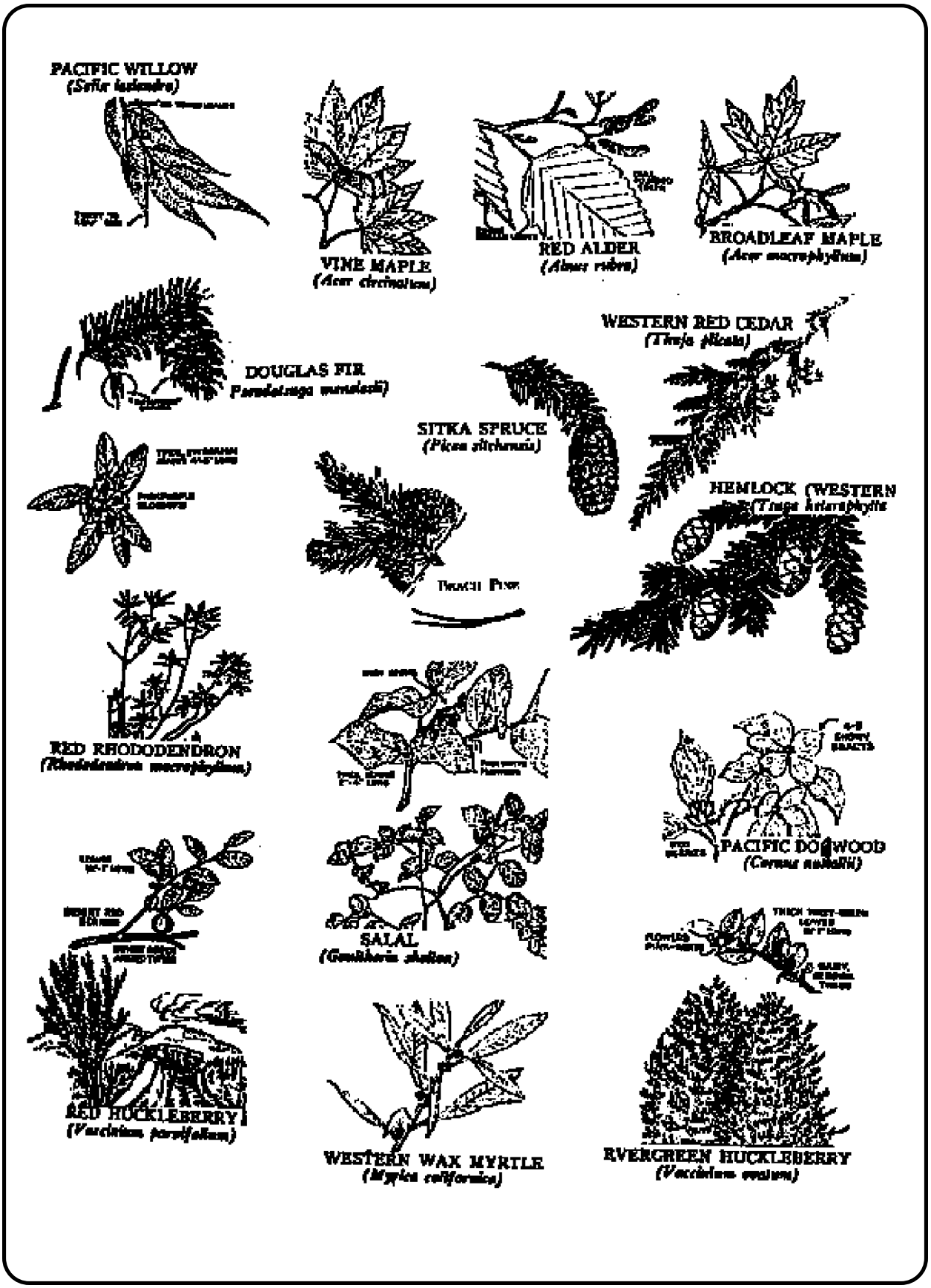


BEACH KNOTWEED
(Polygonum paronychia)

BROOM
(Cytisus scoparius)

HAIRY MANZANITA
(Arctostaphylos columbiana)

ACTIVITY C: Plants of the Dune Community in Oregon (2)



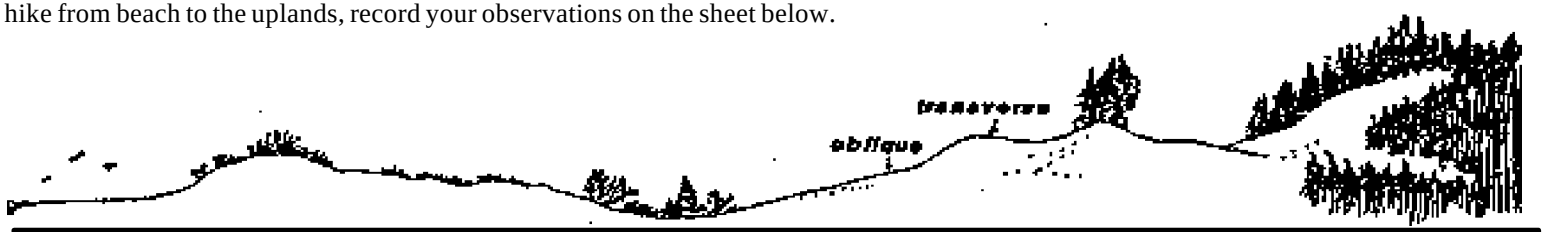
ACTIVITY C: Critical Habitats At The Dunes Data

HABITAT	DESCRIPTION, CHARACTERISTICS OF HABITAT	DEPENDENT SPECIES
Beach	**Driftwood tangle on beach**	**Snowy Plover Preferred-Nesting Site**
Old Growth Forest	Large trees-Roosting Sites Snags, Nesting, Food Sites	Birds Prey-Roosting, Perching Bald Eagle Red Tailed Hawk Osprey Great Blue Heron Great Horned Owl Cavity Nesting Birds-Snags Mammals-Dens
Estuaries Salt Marsh Meadows	Most Fertile, Naturally Occurring Areas in World -Nutrients produced by decaying Vegetation or Plankton Invertebrates (Basic Food Organisms)	116 Species Fish-Spawning, Feeding, Nurseries Waterfowl Feeding Shorebirds Osprey Bald Eagle-Feeding (Fish) Mammals-Feeding (Fish) Birds-Feeding, Shelter, Nesting
Marsh	Marshy Valley Fill Shoreline Marshes Nutrients-Organic Matter Growth Plankton-Invertebrate-Organisms	85 Species Aquatic Mammals-Otter, Beaver, Muskrat Salamanders, Frogs Water Fowl, Shorebirds, Wading Birds Feeding, Shelter, Nesting
Riparian & Lakeside Vegetation	Vegetation Strip Provides Filtration for Water Quality	74 Species Wildlife-Prefer Vegetation Near Water Waterfowl, Shorebirds-Nesting, Food, Shelter Terrestrial-Concentrate Activities by Water Mink, Mice, Warbler, Vole, Osprey, Bald Eagle, Amphibians Fish-Spawn
Snags	Dead Large Trees in Forest	6 Species-Mammals-Nesting, Den Sites 24 Species-Birds-Perching, Feeding Sites

ACTIVITY C: TEACHER'S GUIDE Beach/Dune Transect (1)

45-60 minutes
work in small groups

During your hike from beach to the uplands, record your observations on the sheet below.

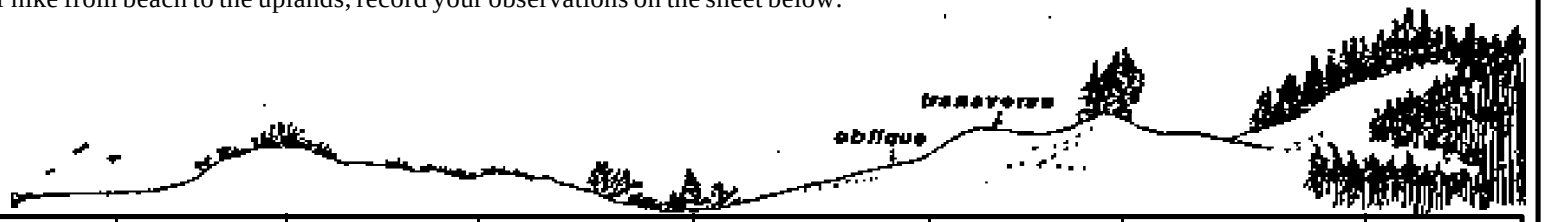


	BEACH	FOREDUNE	HUMMOCKS (wet-dry)	DEFLATION PLAN	OPEN SAND Transverse & Oblique Dunes	TREE ISLAND	PARABOLA DUNES	FORESTS
LAND-FORMS	Flat Ocean Tides Cover	First Hill From Beach	Occur Behind Foredune	Product of Wind Scouring Down to Water Table Quick Sand Where High Water Table	**Transverse** Broad Sloping Ridge & Slip Face Product of Summer Winds 5-20' high **Oblique** Broad Long Sloping Ridges with Slip Faces 180' high	Island of Mature Trees Surrounded by Sand. Caused by Opening in Forest	Open Sand with Veg. on 3 Sides 4th Side Joins Oblique Dune Caused By Opening Edge of Forest	
VEGETA-TION	None	Dense Stand of Beach Grass	50-75% Cover with Veg. Beach Grass Lupine Bluegrass Morning Glory Knotweed Pea Silvertop	40 Plant Species Fescue Dandelion Strawberry Rushes Buttercup Willow Wax Mytle Shore Pine Sitka Spruce	No Plants	Shore Pine Hemlock Sitka Spruce Dense Understory Rhododendron Huckleberry Salal	No Plants	East Edge Of Dunes Shore Pine Sitka Spruce Hemlock Dense-Rhododendron Huckleberry, Salal

ACTIVITY C: TEACHER'S GUIDE Beach/Dune Transect (2)

45-60 minutes
work in small groups

During your hike from beach to the uplands, record your observations on the sheet below.

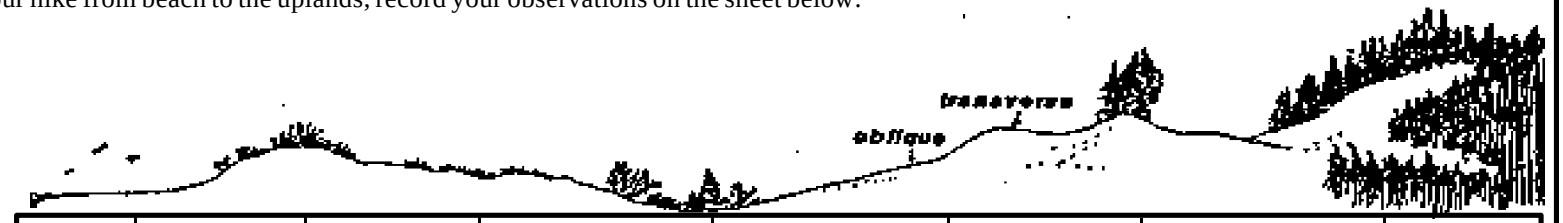


	BEACH	FOREDUNE	HUMMOCKS (wet-dry)	DEFLATION PLAN	OPEN SAND Transverse & Oblique Dunes	TREE ISLAND	PARABOLA DUNES	FORESTS
ANIMALS	Gulls Clams Sand Fleas Shells Nesting Site in Driftwood for Snowy Plover	21 Species Use But Not Depend On It	54 Species Wildlife 37 Birds Northern Alligator Lizard Skunk Sparrows Kestrel	92 species Whistling swan Meadowlark Marsh Hawk Vole Treefrog Deer Ducks Raccoon Squirrell Garter Snake	Only Use Is For Travel	Isolated Population of Small Mammals Deer, Mouse, etc. Used by Birds	Only Use Is For Travel	Greatest No. Species & Diversity Wildlife 145 Species Song Birds Cavity Nesting Birds & Hawks Use Snags Mammals Use Snags too. Racoon, Bear, Deer, Skunk
VISUAL UNIQUE-NESS		Barrier to Ocean Waving Grass In Wind Covered With Driftwood	Curious formations Inviting to Explore Quicksand in Low Areas in Winter	Sheltered from wind Variety of plant life Diversity of Wildlife Habitat & Species Sporadic Use Short Stays Curiosity	Extremely Inviting To Pedestrians & Vehicles Spectacular Slip Faces Will Be Gone in 75 Yrs.	Like Island at Sea Inviting to Explore	Use As Travel Route	Contrast Between Dark Dense Forest & White Sand Protection For Animals

ACTIVITY C: Beach/Dune Transect (1)

45-60 minutes
work in small groups

During your hike from beach to the uplands, record your observations on the sheet below.

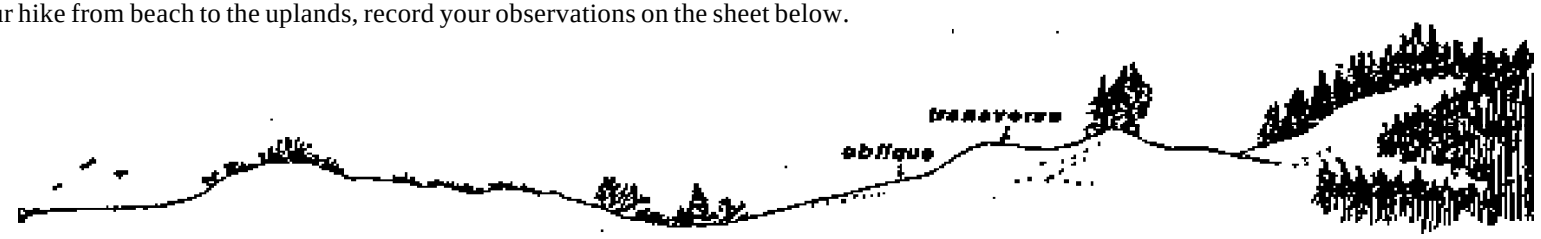


	BEACH	FOREDUNE	HUMMOCKS (wet-dry)	DEFLATION PLAN	OPEN SAND Transverse & Oblique Dunes	TREE ISLAND	PARABOLA DUNES	FORESTS
LAND-FORMS								
VEGETA-TION								

ACTIVITY C: Beach/Dune Transect (2)

45-60 minutes
work in small groups

During your hike from beach to the uplands, record your observations on the sheet below.



	BEACH	FOREDUNE	HUMMOCKS (wet-dry)	DEFLATION PLAN	OPEN SAND Transverse & Oblique Dunes	TREE ISLAND	PARABOLA DUNES	FORESTS
ANIMALS								
VISUAL UNIQUE-NESS								