



"A HOME IN THE PINES"

Classroom Activity About The RED-COCKADED WOODPECKER AND ITS HABITAT



This classroom activity for grades three to six is best used after students have already become familiar with the Red-cockaded Woodpecker's natural history (see other activities).

HABITAT is defined as the locality in which a plant or animal lives. In other words, it is the arrangement of food, water, shelter or cover, and space suitable to a species needs. Examples of what's included are places to find food throughout the year, places to rest and hide from predators and places to find a mate and raise a family.

WHAT IS YOUR PERSONAL HABITAT? Ask students to define their own personal habitat by identifying what they need to live from day to day. This includes a home, clean water to drink, place to buy food, school, places for entertainment, and medical and dental offices. (The teacher may want to help students draw boundaries of a few habitats on a city or county map).

DISTRIBUTION RANGE is defined as the geographic area in which all members of a species and their habitat are found. The amount of space is highly variable from a few inches (in the case of a bacterium) to most of the land of the planet (the human being).

WHAT IS THE DISTRIBUTION RANGE FOR YOUR SPECIES? All people belong to the species *Homo sapiens* (our scientific name). How many individuals of your species are there in the world? (5.5 billion is the estimated world population). Even though people are often of different sizes and colors, we all belong to the same species. What is the distribution range of your species? Look at a world map and identify where the human species lives. In what areas don't humans live?

An **ENDANGERED SPECIES**, is an animal or plant that is in danger of becoming extinct. The loss of its habitat (living space) is often the reason why there aren't many individuals left.

The **Red-cockaded Woodpecker** has the scientific name *Picoides borealis*. There are probably less than 5,000 members of this species in the entire world. (Write and compare the numbers of humans and Red-cockaded Woodpeckers on the chalk board.) The Red-cockaded Woodpecker's habitat (where it lives) is **PINE WOODLAND**. The Red-cockaded Woodpecker was once found throughout the southeastern United States, including all of the East Texas Pineywoods. This was its **HISTORIC DISTRIBUTION RANGE** or where it used to be found. Today, Red-cockaded Woodpeckers are found in only about half of the area in Texas where they once occurred. Most of the Red-cockaded Woodpeckers in Texas are found on the National Forests, although some private timberlands also have good populations of these woodpeckers. (See diagram of historic and present ranges). Using the diagram, have a student go to the large classroom world and state maps and outline to the class the Red-cockaded Woodpecker's historic and present ranges. How does its present distribution range compare to that of the human species?

Within the Pineywoods region, what are the Red-cockaded Woodpecker's **HABITAT NEEDS**? Based on what you already know about the life history of the woodpecker, what specifically does this endangered species need to survive? Ask students to make a list. The list should include: open pine forests with widely-spaced pine trees; large, old pine trees where they can excavate their cavity holes; and pine forests where they can find food (food is insects).

LOSS OF HABITAT is the most severe threat to the survival of the Red-cockaded Woodpecker. What are some of the reasons habitat is gone? Ask students to think about what kinds of human activities alter natural areas. The following are the most important threats for this species. **LOSS OF OLD, MATURE PINES** due to modern forestry practices which favor smaller, faster-growing pines. **LACK OF PERIODIC FIRES**, which controlled the midstory hardwoods and kept the pinewoods open and suitable for the woodpeckers. Some **LOSS OF NATIVE PINEWOODS** has occurred because the land has been cleared to plant crops or grasses for grazing cattle. And finally, **URBANIZATION**, or the growth of towns and cities, has replaced some habitat with buildings and roads. A very important problem for the Red-cockaded Woodpecker and for most Texas endangered species is **LACK OF AWARENESS** about their natural history and habitat needs. Many people have never heard of the Red-cockaded Woodpecker.

PROBLEM SOLVING ACTIVITY

(This exercise should be done after students have become familiar with the Red-cockaded Woodpecker by completing other activities).

Instructions to the Students: Now that you have completed several activities in this unit you are now ready to be a **RED-COCKADED WOODPECKER BIOLOGIST**. You understand a great deal about the natural history of these woodpeckers and what they need to survive. As a biologist, you must now **MAKE RECOMMENDATIONS** to city, county, state, and federal officials about how to save this endangered species. Let's do an exercise to come up with some ideas.

Instructions to the Teacher: Break the class into groups and instruct them to spend fifteen minutes **BRAINSTORMING** ideas about how to help the Red-cockaded Woodpecker. Appoint a recorder for each group to list the five best ideas the group has. When time is up, reassemble the class and share ideas. As the teacher you may want to lead the student's suggestions toward the following management practices that are being used today to help save the Red-cockaded Woodpecker.

PROTECT EXISTING HABITAT

Red-cockaded Woodpecker habitat is being protected and managed within the National Forests of east Texas. State and federal resource managers are seeking new ways to protect and improve habitat for the woodpeckers.

HABITAT MANAGEMENT AND RESTORATION--WORKING WITH FEDERAL, STATE, AND PRIVATE LANDOWNERS

Some east Texas landowners are doing a good job of protecting Red-cockaded Woodpecker

habitat. State and federal conservation managers are working with landowners to restore habitat, as well as offering landowners a variety of options on how to manage their timber while also providing habitat for Red-cockaded Woodpeckers.

RESEARCH PROGRAMS

Texas Parks and Wildlife and U.S. Forest Service biologists are studying populations of Red-cockaded Woodpeckers in east Texas. Biologists count the woodpeckers and try to find new cavity trees. In an effort to provide more cavities for nesting, biologists insert artificial cavity boxes into pines located in suitable habitat. In just a few moments, the woodpeckers have available to them a cavity that would have taken them a year or more to excavate. In a technique called augmentation, woodpeckers are moved from areas of poor or declining habitat to more suitable habitat in an effort to start new family groups.

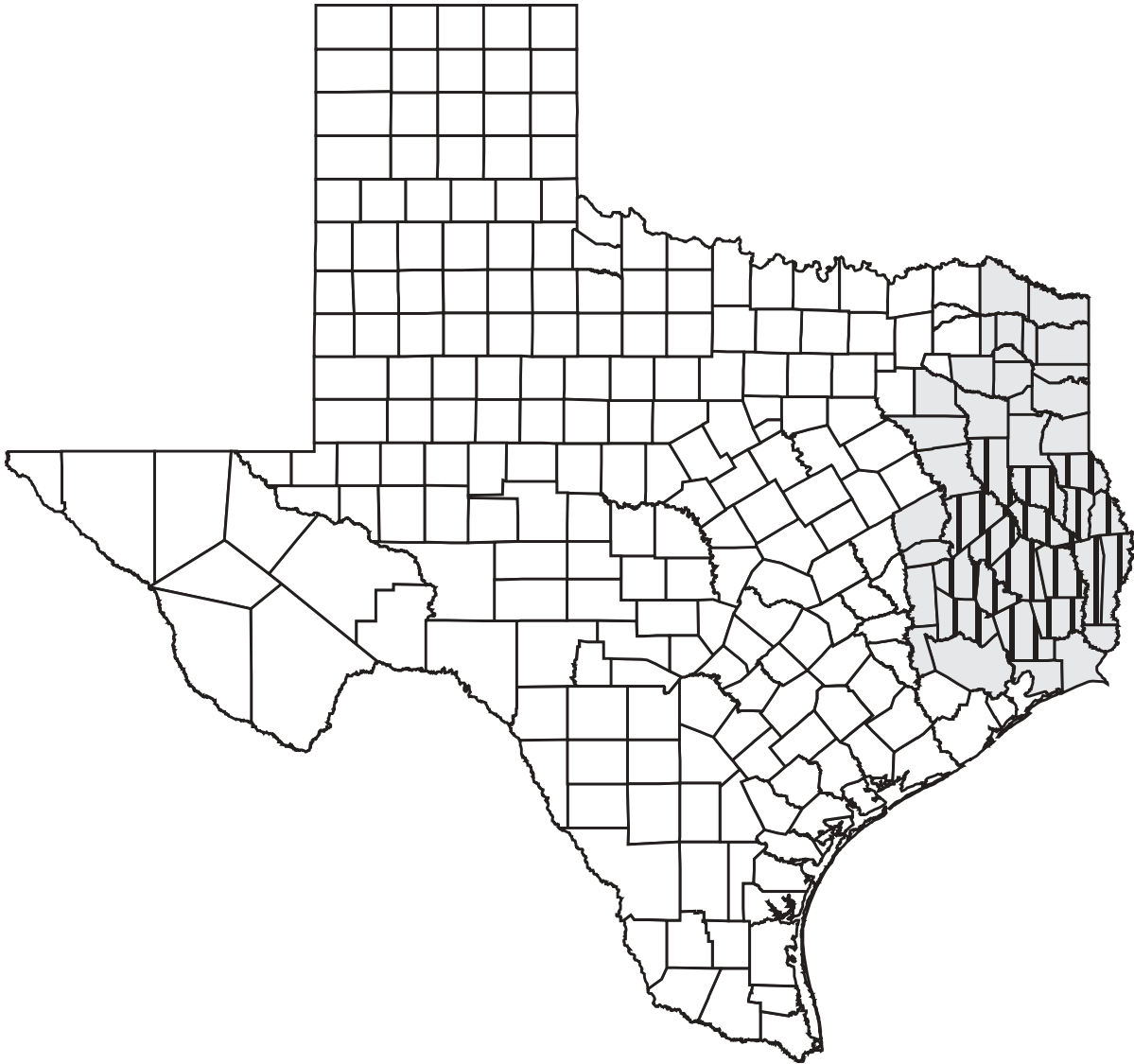
ENVIRONMENTAL EDUCATION

Everyone can help Red-cockaded Woodpeckers by learning about their natural history and conservation needs and sharing this information with others. Well informed students can teach their parents, brothers and sisters, and friends all about this fascinating bird. Understanding the life history of the Red-cockaded Woodpecker will help build support for efforts to help this endangered species survive.

Following the presentation of ideas and subsequent discussion, you may want to have the students **TAKE ACTION** and write to government officials or write a letter to the editor of the newspaper expressing their concerns for the Red-cockaded Woodpecker, along with the recommendations they have for saving this endangered species.

Prepared by
Texas Parks and Wildlife
Wildlife Diversity Program

RED-COCKADED WOODPECKER DISTRIBUTION IN TEXAS



Present Range



Historic Range

Map only shows Texas range

Prescribed Burning for the Red-cockaded Woodpecker

Objective:

Students will be able to identify, describe and evaluate some possible positive and negative effects on wildlife (specifically the Red-cockaded Woodpecker) that result from forest fires.

Method:

Students brainstorm positive and negative effects of forest fires; conduct research; and create murals showing changes from fire in forest ecosystems, focusing on the effect of fires on the habitat of the Pineywood's Red-cockaded Woodpecker. Students may continue the activity by conducting a field investigation.

Background:

In managing public lands, government agencies for many years have been making a slow movement to change their attitudes toward forest and grassland fires. Whereas once all fires were suppressed or vigorously fought, today many fires are allowed to burn as part of a natural cycle within forest and grassland ecosystems. In remote areas, some agencies monitor lightning-ignited wildfires and allow them to burn as long as they stay within "prescribed" limits of fire behavior and location. However, wildfires are still aggressively fought near populated areas. In fact, there has been a movement to "prescribe" fires under some conditions and in some places in an effort to replicate natural cycles that contribute to maintaining healthy ecosystems.

When naturally occurring wildfires are suppressed, a dense hardwood midstory can develop in forests. A midstory of oaks and other hardwoods interrupts the Red-cockaded Woodpecker's line of flight into its nest. Too much brushy growth changes the open habitat conditions favored by the bird. If an area becomes too dense, the woodpecker will abandon its nest. Prescribed burning every 3 - 5 years mimics the natural fire regime and improves habitat for the woodpecker by removing midstory vegetation.

Such "prescribed burns" are planned and tended by qualified resource managers. Prescribed burns are frequently designed to reduce the fuel load in a given area. Reducing the fuel load in a forested area, for example, can prevent fires from getting so hot that they eliminate virtually all life forms and even scorch the soil. That is, fires every five to ten years in some forest types can clear the heavy underbrush without harming the larger trees in the forest. A major fire after a 50 year accumulation of brush and maturing timber, however, can cause intensely hot and destructive fires.

Objectives for use of fire as a management tool are variable. Objectives may include restoring fire's role in the natural cycle within a particular ecosystem; eradicating some plant species; and promoting the stimulation of plant species that are preferred food by some wildlife. In some area, fire is the most cost-effective tool to manage habitats.

Prescribed "burns" are planned and initiated by qualified professionals who are trained in using fire for resource management objectives. Prescribed fires are only employed after burn plans are approved. Those plans must specify objectives for the fire, location, size, type, how the fire will be started and controlled and how the smoke from the fire will be managed. Fire plans set limits for weather parameters which control how hot a fire burns and in which direction smoke dissipates. Fires outside of those limits will not be started. If the fire is started and the weather conditions change to go beyond these limits, plans call for putting out the fire.

Students may ask why- if some fires are helpful- the national symbol of firefighting agencies, Smokey Bear says, "Only you can prevent forest fires."

This message is aimed at humans causing fires by error and accidents, such as carelessness in camping situations. The message also warns us about the terrible destructiveness of arson-intentional fires set by people for malicious and mischievous purposes. Accidental and arson fires are often started near developed areas. They often occur during times of severe drought or high winds. This kind of wildfire can be terribly destructive. On the other hand, prescribed fires are lit under ideal weather conditions. They generally burn much cooler than wildfires that most often occur during extremely hot and dry times. Again, the only people who may be authorized to set prescribed forest and grassland fires are those who are fully qualified professionals, trained in the study of ecological systems to reinstate fire as a natural management tool. It is still correct, of course, that fires can have negative as well as positive effects. Forest products companies, for example, in most cases would rather harvest trees than see them burn.

If a fire is too large, too fast and too hot, wildlife can't easily move to safety. Individual animals may die or be displaced from their habitat. Short-term and long term loss of vegetation can have a variety of effects including loss of food and shelter for wildlife, and increase in silting and sedimentation in the waters.

There are, however, possible benefits as well-particularly in the case of those smaller burns that do not get exceedingly hot. For example, fires can:

- maintain and enhance fire-dependent habitats such as prairies, savannas, chaparral, jackpine forests, southern pine forests, boreal forests;
- provide habitats for species primarily dependent on fire driven ecosystems such as jackpine warbler;
- increase soil productivity by releasing and recycling nutrients in litter and undergrowth;
- prepare soil for germination of some seeds;
- activate heat-dependent seed varieties, such as lodgepole pines, jackpine, black spruce;
- contribute to an "edge effect," providing a greater variety of food and shelter sources for some species of wildlife; and
- open up habitat, generating new growth, diversity and abundance of food plants, such as for large herbivores.

Materials:

For the murals: art supplies, butcher paper for mural display.

For the field investigation: soil analysis equipment (e.g., pH testing paper), containers for soil samples, plant and animal identification guides for fieldwork; OR classroom speaker; OR access to library and other reference materials.

Procedure:

Forest Fire Mural:

1. Begin the activity with a discussion of forest fires. Students' reactions may be negative at first. Point out that while the effects of fire may be detrimental to some wildlife species, fire may benefit other species of wildlife.
2. Brainstorm possible positive and negative effects of forest fires. Keep the list of brainstorm ideas posted for the students' reference.
3. Using the brainstorm list as a beginning point, have the students find out more about forest fires. Possible topics for further investigation include:
 - how fires affect plants (both understory plants and trees)
 - how do fires affect animals (both initially and later)
 - how do weather conditions affect fire behavior
4. Once any necessary research has been done, have the students make a mural. The mural should portray changes from before to during and after a fire. Analyze and discuss positive and negative consequences of forest fires. Discuss what forest fires do for the habitat of the endangered Red-cockaded Woodpecker.

The forest fire mural activity may be followed with this suggested field investigation:

- 1.) Take a field trip to a forest or grassland where it is possible to see areas that have recently been burned, areas burned ten or more years ago, and areas not burned in recorded history. Try to arrange to go with an ecologist or wildlife biologist who can point out and explain some of the similarities and differences among the various areas. (NOTE: If such a trip is not possible, contact a regional forester, state wildlife agency, soil conservation district representative, or other resource person for information on the subject. It may be possible for a representative of the agency to come to the classroom and talk with the students about different circumstances under which fire can be helpful, and harmful, to wildlife-possibly bringing slides or a film on the subject. If neither the field trip nor the visit from a resource person is possible, the students will need to work from library and other reference materials on their own, or agencies may be able to provide you with before and after photographs of such sites.)

2.) If the field trip is possible, prepare students to: a) make and record their observations, e.g., variety and quantity of vegetation, evidence of wildlife, actual sighting or wildlife; and b) with permission of the landholder or manager, take small soil samples in the various areas for testing purposes. Back in class, these soil samples should be tested for structure, organic and inorganic parts, chemical composition, etc.

3.) Ask the students to organize and present the findings of their research. For example, they could chart information including the following:

	Soil Data	Plants	Evidence of Wildlife or Wildlife Observed
Recent Fire Area			
Fire 10-15 Years Ago			
No Recorded Fire			

4.) Ask the students to summarize their findings, including short-term and long-term effects to wildlife in each area, both positive and negative. They should include in their summary an assessment of the importance of fire in natural systems, as well as of its effectiveness as a management tool. In the situations they studied, ask them to evaluate the role of fire, including its positive and negative consequences. Their findings should include a listing of those situations and forest types in which fire is generally most beneficial, those in which it is most harmful, and those where it has little effect. Ask them to address any limitations to their study; that is any aspects of their research which prevent them from generalizing their findings to all fires affecting wildlife.

5.) Back in the classroom, discuss the effects of forest fires on the endangered Red-cockaded Woodpecker. How does the woodpecker benefit from prescribed burning? What are public attitudes toward fires?

What Would You Do?!

Objective:

Students will be able to better understand the conservation challenges involved in protecting endangered species habitat by considering the Red-cockaded Woodpecker, an endangered bird of the east Texas Pineywoods.

Method:

Students make plans to protect the Red-cockaded Woodpecker and its habitat and then compare their plans to actual recovery efforts.

Materials:

markers, paper

Procedure:

1. On the board, hang or draw a picture of the Red-cockaded Woodpecker's habitat. Review its components including the need for mature, old pines and open space free of midstory vegetation. Discuss challenges to the bird and its habitat, including decrease in quality and quantity of mature old pines the bird uses for nesting due to:

- timber rotations of only 30-45 years, while the Red-cockaded Woodpecker nests and roosts in 60-70+ year old pines,
- cutting of trees around cavity trees reduces the area where the birds forage and does not leave trees for cavity replacement,
- surrounding isolated habitat with harvested area reduces foraging area and leaves the woodpecker more susceptible to predators,
- increasing competition for Red-cockaded Woodpecker nest cavities by removing the dead and dying trees that other woodpeckers use for their cavities,
- cutting dominant trees around cavity trees leaves the cavity trees in danger of lightning strikes and wind damage,
- careless use of pesticides that may poison the birds or reduce their food supply below the amount needed for successful reproduction, and
- noise and activity of forestry operations, campers, roads and trails may disrupt nesting success.

2. Divide the students into groups of three or four. Ask them to brainstorm and then outline their best plan on paper to help overcome some of the challenges to the Red-cockaded Woodpecker and its habitat. Remind them that the plan needs to show ways in which the Red-cockaded Woodpecker, other pineywoods animals, and human activities can survive and coexist.

3. The groups should present their plans to the other students. As a class you can discuss why the plans could or could not work. Discuss compromises and combine the best ideas into a class-generated recovery plan.

4. After the activity, the students should better understand the challenge of devising a recovery plan for an endangered species. Discuss some of the recovery efforts that are proceeding for the bird in Texas and compare these to the students' plans.

Currently in Texas, efforts are underway to create corridors of continuous habitat or chains of high quality habitat islands between populations of Red-cockaded Woodpeckers to facilitate exchange of birds and enhance opportunities for reproduction. The bird's populations are increasing as a result of habitat improvements, including **prescribed burning** in areas to remove midstory growth that impedes the birds' line of flight to their nests. **Artificial nest box cavities** are placed on the inside of trees where suitable natural cavities are limited. A plate around the entrance of artificial and natural cavities can prevent the entrance of other cavity-nesters (larger birds can't get in). Finally, in a technique called **augmentation**, young females and males are moved to areas with single birds in an effort to start new clusters of Red-cockaded Woodpeckers. Conservation and habitat management, providing information to landowners and the public, and monitoring woodpecker populations, are all important parts of the recovery process.

Red Cockaded Woodpecker Habitat Lap Sit

Objective:

Students will be able to: 1. identify the components of Red-cockaded Woodpecker habitat, 2. recognize how humans and other animals depend on and affect the habitat.

Method:

Students physically form an interconnected circle to demonstrate components of Red-cockaded Woodpecker habitat.

Background:

People and other animals share some basic needs. Every animal needs a place to live. The environment in which an animal lives is called "habitat." An animal's habitat include **food, water, shelter, and space** in an **arrangement** appropriate to the animal's needs.

In Texas, habitat for the Red-cockaded Woodpecker is found in the eastern Pineywoods. Most woodpeckers make their homes in dead or dying trees, but the Red-cockaded Woodpecker excavates its cavity exclusively in living pines. The cavities are made 20-50 feet above the ground in mature pine trees that are 60 years old or older. The Red-cockaded Woodpecker makes its chamber in the older, non-living heartwood of mature pines. A plate of exposed sapwood (the younger, living portion of the wood) at the cavity's entrance oozes clear, sticky resin that coats the tree and deters snakes and other predators. The heartwood is usually weakened by a heart rot fungus that makes it easier to excavate, but completion of a chamber can still take up to three years.

A cluster site is a stand of trees containing and surrounding the cavity trees where a group of Red-cockaded Woodpeckers nest and roost. A habitat stand is made up of 90 to 145 widely spaced old trees with a grassy understory. The woodpeckers prefer open habitat free of hardwoods and younger pines above 6 feet in height that would impede flight into their homes.

If any components of habitat are missing or are affected significantly, so that the arrangement for the individual animal or population of animals is no longer suitable, there will be an impact. The impact will not necessarily be catastrophic, but it can be. Red-cockaded Woodpeckers and their habitat can be affected by a number of factors. Short timber rotations of 30 to 45 years result in loss of suitable nesting and roosting habitat in mature pines. Cutting in a cluster (leaving only cavity trees) does not allow for cavity tree replacement and leaves the cavity trees susceptible to lightning strikes and weather damage. Removal of dead and dying trees in a cluster area increases competition for Red-cockaded nest cavities by other cavity nesters. Leaving isolated clusters surrounded by harvested areas reduces the area where the bird can forage for insects, seeds, and fruits. The Red-cockaded Woodpecker may abandon cavities where midstory growth impedes the bird's line of flight or where noise and human activity disturb nesting.

The primary objective of this activity is for students to become familiar with the components of Red-cockaded Woodpecker habitat, and to recognize that it is not sufficient for there to be food, water, shelter, and space in order for animals to survive, but that all these components are interrelated and must be in a suitable arrangement.

Materials:

none needed

Procedure:

1. This activity takes very little time-but has a lot of impact! Ask the students to form a circle, holding hands.
2. Walk around the circle, first naming one student as a Red-cockaded Woodpecker. Name the next three students as components of the Red-cockaded Woodpecker's habitat: the first is a mature, old pine; the second is open space; and the third is food (insects, fruits, and seeds).
3. Repeat the process until all the students are involved.
4. When all the students have been designated as a Red-cockaded Woodpecker or as components of the habitat, comment on the fact that they are holding hands. This represents the idea that all things in an ecosystem are interrelated. Briefly discuss the idea of interrelationships.
5. Next, the students should tighten their circle until they are standing shoulder to shoulder facing the inside of the circle.
6. Ask the students to turn toward their right, at the same time taking one step toward the center of the circle. They should be standing close together, with each student looking at the back of the head of the student in front of him or her.
7. Don't panic-this will work! Ask everyone to listen carefully. Students should place their hands on the shoulders of the person in front of them. Students slowly sit down as you count to three. At the point of three, you want the students to sit down - on the knees of the person behind them, keeping their own knees together to support the person in front of them. You then recite the components of the woodpeckers habitat, stressing that all these factors are necessary for the bird to have a suitable habitat.
8. At this point, the students may either fall or sit down. When their laughter has subsided, talk with them about the necessary components of suitable habitat for the Red-cockaded Woodpecker.
9. After the students understand the major point (that specific food, shelter, and space are necessary for the bird's survival, and in the appropriate arrangement, these components comprise a suitable habitat), let them try the circle activity again! This time ask them to hold their lap-sit posture. As the students lap-sit, still representing Red-

cockaded Woodpeckers, pine trees, food, and space in their appropriate arrangement, identify a student who represents a 70 year old pine tree. Say that the tree is cut for lumber. Have the "pine tree" student remove himself or herself from the lap-sit circle, and watch the circle collapse, or at least suffer some disruption in arrangement. You could try this in several ways, removing one or more students from the circle. Conditions could vary; from loss of "space" due to midstory hardwood growth that impedes flight into the nest, to loss of "food" due to competition with other cavity nesters in a limited space. Since the Red-cockaded Woodpecker depends on the availability of old pines, food, and space, in their appropriate arrangement, "removal" of any will have an impact.

10. Ask the students to talk about what this activity means to them. Ask them to summarize the main ideas of the lesson. They could include: a) food (water), shelter, and space, in their appropriate arrangement is called habitat; b) the Red-cockaded Woodpecker depends on its specific habitat in the Texas Pineywoods for survival; and c) loss of any of these elements of habitat will have an impact on the bird.

THE STORY OF THE RED-COCKADED WOODPECKER

Read the following story to learn about the Red-cockaded Woodpecker. The words in black capital letters are hidden in the wordfind. Can you find them? Good luck!

The **RED-COCKADED WOODPECKER** lives in the **PINEYWOODS** of east **TEXAS**. This woodpecker is **SPECIAL** because it is the only woodpecker that makes its home in **LIVING PINE TREES**. The bird chooses areas of **SIXTY** year old and older pines that are **SPACED** far apart. One reason the Red-cockaded Woodpecker is **ENDANGERED** is because these large, **MATURE** pine trees have been cut for **TIMBER**.

It takes one to three years for the woodpecker to make its **NESTING** cavity in the heartwood of mature pines. **HEARTWOOD** is the older, non-living, inner portion of the tree's wood. Heartwood is very **HARD**. **SAPWOOD** is the younger, living wood just under the tree's bark. The woodpecker exposes a **PLATE** of sapwood around the entrance to its **CAVITY**. The sapwood **OOZES** resin that **COATS** the tree around the entrance. The **STICKY RESIN** keeps **PREDATORS**, such as **SNAKES**, away from the woodpecker's home.



WORDFIND



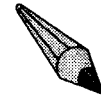
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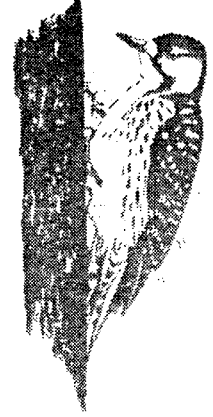
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WORDFIND

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Red-cockaded Woodpecker Math Activity

Table 1. Numbers of Red-cockaded Woodpeckers found during 1982 and in 1990 for each state where Red-cockaded Woodpeckers live.

State	1982	1990	(1) Change	(2) % of total
Florida	3408	3348		
Louisiana	2598	1392		
South Carolina	2583	1845		
North Carolina	2103	1395		
Georgia	1743	1908		
Arkansas	867	396		
Texas	864	795		
Mississippi	690	462		
Alabama	603	471		
Oklahoma	93	45		
Virginia	36	15		
Kentucky	24	12		
Tennessee	18	3		
TOTAL	15,630	12,087		

1. Determine the change in numbers of Red-cockaded Woodpeckers between 1982 and 1990 for each state. Fill in column 1 in the table above.
 - a. Which state had the greatest decline in woodpeckers between 1982 and 1990?
 - b. Did any state have an increase in numbers of Red-cockaded Woodpeckers? If so, which one.
 - c. What was the change in Texas?
 - d. What was the total change in numbers of woodpeckers for all states between 1982 and 1990?

2. Calculate the percent of total birds found in each state during 1990. Fill in column 2 in the table above. Round your numbers to the nearest tenth.
 - a. Which 5 states combined had over 81% of the estimated total U.S. population of Red-cockaded Woodpeckers?
 - b. What percent of the estimated total U.S. population of Red-cockaded Woodpeckers is found in Texas?

Prepared by
Wildlife Diversity Program
Texas Parks and Wildlife

Red-cockaded Woodpecker Math Activity

Answers:

1.	Florida	- 60
	Louisiana	-1206
	South Carolina	- 738
	North Carolina	- 708
	Georgia	+165
	Arkansas	- 471
	Texas	- 69
	Mississippi	- 228
	Alabama	- 132
	Oklahoma	- 48
	Virginia	- 21
	Kentucky	- 12
	Tennessee	- 15
	TOTAL	-3543

- 1a. Louisiana had the greatest decline (-1206) in Red-cockaded Woodpeckers.
1b. Yes, the population in Georgia increased by about 165 birds.
1c. The population in Texas decreased by about 69 birds.
1d. The total numbers of birds for all states decreased by 3543 birds between 1982 and 1990.

2.	Florida	27.7
	Louisiana	11.5
	South Carolina	15.3
	North Carolina	11.5
	Georgia	15.8
	Arkansas	3.3
	Texas	6.6
	Mississippi	3.8
	Alabama	3.9
	Oklahoma	0.4
	Virginia	0.1
	Kentucky	0.1
	Tennessee	<0.1

- 2a. The states of Florida, Louisiana, South Carolina, North Carolina, and Georgia contain over 81% of the known populations of Red-cockaded Woodpeckers.
2b. About 6.6% of the total estimated U.S. population of Red-cockaded Woodpeckers is found in Texas.

Red-cockaded Woodpecker Math Activity

Table 1. Numbers of known clusters of active cavity trees in the early 1980's and in 1990 for each state where Red-cockaded Woodpeckers are found. These are actual numbers based on research data. Active clusters of cavity trees are areas where a number cavity trees near one another are currently being used by Red-cockaded Woodpeckers.

State	Early 1980s	1990	(1) Change	(2) % of change	(3) % of all sites in 1990
Florida	1136	1116			
Louisiana	866	464			
South Carolina	861	615			
North Carolina	701	465			
Georgia	581	636			
Arkansas	289	132			
Texas	288	265			
Mississippi	230	154			
Alabama	201	157			
Oklahoma	31	15			
Virginia	12	5			
Kentucky	8	4			
Tennessee	6	1			
TOTAL	5210	4029			

1. Determine the change in clusters of active cavity trees between the early 1980's and 1990 for each state. Fill in column 1 in the table above.
 - a. Which state had the greatest decline in active clusters between the early 1980's and 1990?
 - b. Did any state have an increase in numbers of active clusters? If so, which one.
 - c. What was the change in Texas?
 - d. What was the total change in active clusters for all states between the early 1980's and 1990?

2. Calculate the percent change in active clusters for each state. Fill in column 2 in the table above.
 - a. Which state had the largest percent decline?
 - b. Which state had the lowest percent decline?
 - c. Did any state have a percent increase? If so, which one.

Suggested for grades 8-10

Red-cockaded Woodpecker Math Activity

3. Using the data for 1990, calculate for each state the percentage of total active cavity tree clusters. Fill in column 3 in the table above.
 - a. Which state has the largest percent of active clusters?
 - b. What percent of all active clusters are found in Texas?
 - c. What is the total percent of active clusters found in the five states with the highest Red-cockaded Woodpecker populations?

4. To determine the numbers of Red-cockaded Woodpeckers, biologists count the number of active clusters of cavity trees and multiply by the average number of Red-cockaded Woodpeckers in a clan or family group. If the average family size is 3, what was the estimated population of Red-cockaded Woodpeckers in Texas in 1990?

Red-cockaded Woodpecker Math Activity

Answers:

1.	Florida	- 20
	Louisiana	-402
	South Carolina	-246
	North Carolina	-236
	Georgia	+ 55
	Arkansas	-157
	Texas	- 23
	Mississippi	- 76
	Alabama	- 44
	Oklahoma	- 16
	Virginia	- 7
	Kentucky	- 4
	Tennessee	- 5
2.	Florida	- 2%
	Louisiana	- 46%
	South Carolina	- 29%
	North Carolina	- 34%
	Georgia	+ 9%
	Arkansas	- 54%
	Texas	- 8%
	Mississippi	- 33%
	Alabama	- 22%
	Oklahoma	- 52%
	Virginia	- 58%
	Kentucky	- 50%
	Tennessee	- 83%
3.	Florida	28
	Louisiana	11
	South Carolina	15
	North Carolina	11
	Georgia	16
	Arkansas	3
	Texas	7
	Mississippi	4
	Alabama	4
	Oklahoma	<1
	Virginia	<1
	Kentucky	<1
	Tennessee	<1

- 1a. Louisiana had the greatest decline in active clusters.
- 1b. Yes, Georgia had an increase in the number of active clusters.
- 1c. Texas had a decrease of 23 active clusters.
- 1d. The total change for all states was -1181.

- 2a. Tennessee had the largest percent decline at -83%.
- 2b. Florida had the lowest percent decline at -2%.
- 2c. Georgia had a 9% increase.

- 3a. Florida has the largest percent of total active clusters for all states.
- 3b. Seven percent of all active clusters are found in Texas.
- 3c. A total of 81% of all active clusters of Red-cockaded Woodpecker cavity trees are found in Florida, Louisiana, South Carolina, North Carolina, and Georgia.

4. For Texas in 1990, the estimated number of active clusters of cavity trees was 265. Therefore, $265 \text{ clusters} \times 3 \text{ birds/family group} = \text{an estimated population of 795 birds.}$