GO FURTHER!
Ruling the Sky Once More
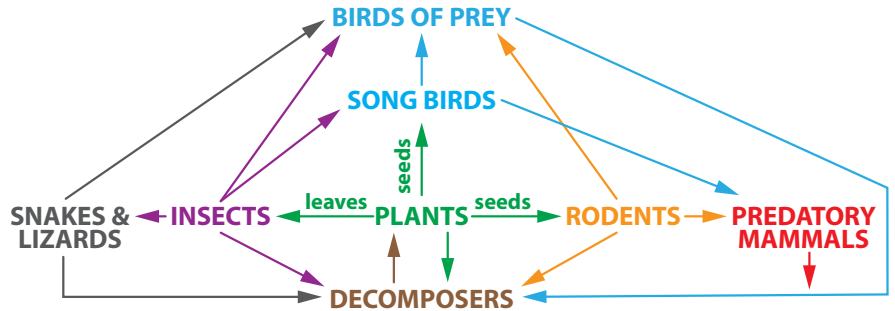
Bald Eagles

Birds of prey (sometimes called raptors) are flesh-eating predators. Most have talons, sharp beaks and good eyesight.

Bald eagles (Haliaeetus leucocephalus) are large raptors. They aren't really bald, but their white-feathered head might appear that way from a distance.

The bald eagle has been our national emblem since 1782. It is also a spiritual symbol for many native Americans. They can have a wingspan of 8 feet and weigh as much as 14 pounds.

Bald eagle nests are very large (as heavy as two tons!), and are usually built at the top of tall trees (70 to 90 feet high) in old growth forests.

Because bald eagles are at the top of the food chain in their habitat, they have an important role in maintaining biodiversity and the health of the environment.

Food web diagram: BIRDS OF PREY, SONG BIRDS, SNAKES & LIZARDS, INSECTS, PLANTS (leaves, seeds), RODENTS, PREDATORY MAMMALS, DECOMPOSERS.

Raptors like bald eagles are at the top of the food web in their habitats. They eat small prey like snakes and lizards, songbirds and small mammals. Those animals, in turn, eat smaller animals and plants. They require large spaces and protected places to thrive.
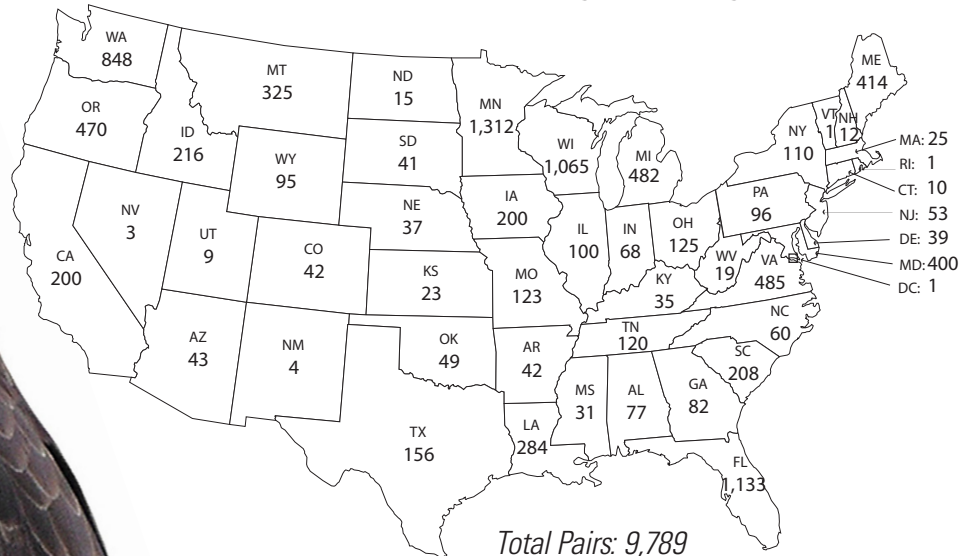
Once common all across North America, the Bald Eagle was almost lost (extinct) in the 1940s. Because they need very tall trees to nest, bald eagles suffered when our nation's old growth forests were cleared. Some animals that they eat (like pigeons, ducks and rabbits) went down because of hunting, and some hunters killed them because they thought they would eat their farm animals. But the biggest threat to the bald eagle was the use of chemicals like DDT that were used to kill insects. Read the box on page 2 to learn more about DDT.

Scientists recognized the threat to raptors like the bald eagle in the 1940s, and became very concerned in the 1960s when the effects of DDT were better known. Laws banned killing of eagles, and eventually the use of DDT. Water quality was improved and nesting sites protected.

### Estimated Number of Bald Eagle Breeding Pairs

State	Pairs
WA	848
OR	470
CA	200
NV	3
ID	216
UT	9
AZ	43
MT	325
WY	95
CO	42
NM	4
ND	15
SD	41
NE	37
KS	23
OK	49
TX	156
MN	1,312
IA	200
MO	123
AR	42
LA	284
WI	1,065
IL	100
MI	482
IN	68
OH	125
KY	35
TN	120
MS	31
AL	77
GA	82
FL	1,133
SC	208
NC	60
VA	485
WV	19
PA	96
NY	110
ME	414
VT	1
NH	12
MA	25
RI	1
CT	10
NJ	53
DE	39
MD	400
DC	1

Total Pairs: 9,789

Bald Eagle Breeding Pairs—1963 to 2006—Data Table

Year	Number of Pairs	Year	Number of Pairs
1963	487	1993	4015
1974	791	1994	4449
1981	1188	1995	4712
1984	1757	1996	5094
1986	1875	1997	5295
1987	2238	1998	5748
1988	2475	1999	6404
1989	2680	2000	6471
1990	3035	2005	7066
1991	3399	2006	9789
1992	3749		

Graph the data on the chart above. Then write an article for your school paper called "The Bald Eagle Returns." Include the actions that helped the eagle's numbers increase.
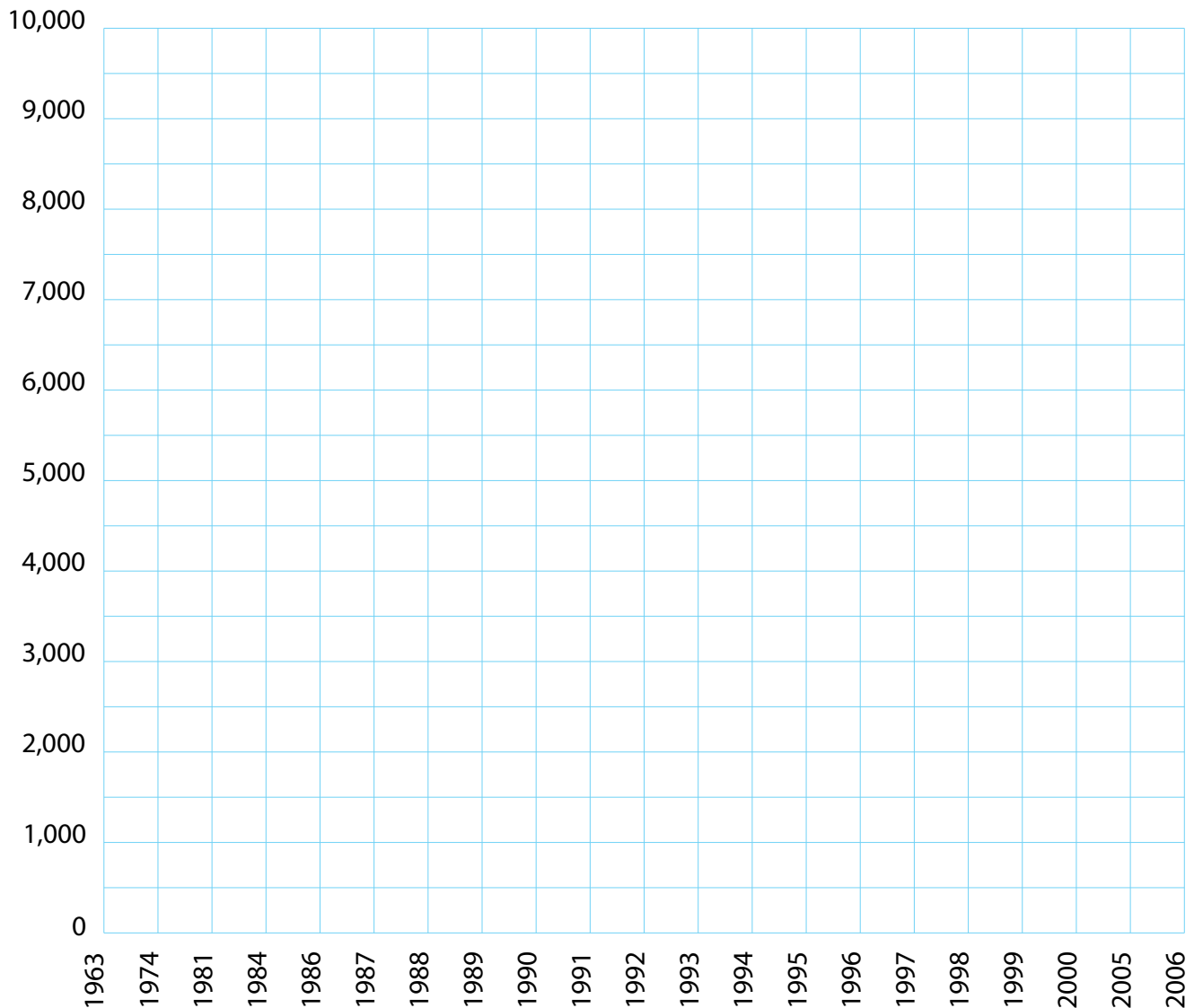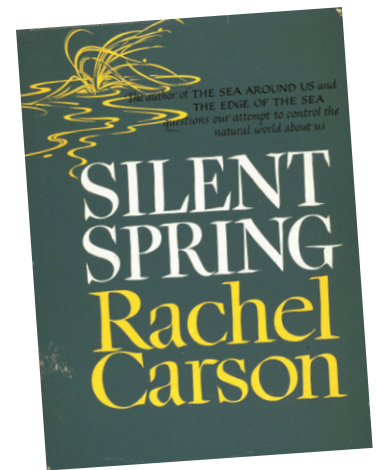
RACHEL CARSON

Rachel Carson was an American biologist and conservationist who lived from 1807 until 1964. She was already a well-known author (for books like The Sea Around Us) when she began to research a problem that many people did not want to believe. Carson believed that the chemicals we used to kill insects (called pesticides) were preventing birds from reproducing.

To understand her hypothesis, you have to know a bit about reproduction. To make eggs and sperm, animals produce chemicals called hormones. An organism's body wants to stay in balance, and so it knows how much hormone is needed. But some chemicals that humans make, like pesticides, are very similar to hormones. They don't work the same way, but the animal's body thinks they are hormones and stops making its own.

That's what was happening to the birds. Because the chemicals last for very long times, birds at the top of the food chain (predators) were hurt the most. A little pesticide in each bug meant more pesticide in each mouse or toad, and lots of pesticides in the birds that eat the mice and toads—like Bald Eagles.

Carson wrote a famous book, "Silent Spring," in which she predicted that if we did not stop using these pesticides one day we might not hear birds any more. Eventually some of the worst pesticides were banned. You can see the results of her work in the population graph you make.

THINK!

Look again at the food web on the first page.

Because a chemical like DDT lasts for many years, it is passed from prey to predator. The chemicals don't dissolve in water, so the animal's body cannot wash them out. They stay in an organ like the liver.

☑ Each predator eats many prey during its lifetime. Do a "thought experiment." If there were 1000 particles of a chemical in each prey that a predator ate, and the predator ate 1000 prey each year, how many particles of the chemical would be in its system?

_____

☑ This damaging cycle is called "biomagnification." Describe how it might add to the problems of pesticides in the environment. You can use the diagram on page 1 or your own food web to illustrate.

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Teacher Page

About the activities

Summary:
After watching the video about wildlife biologist Jim Siegel studying nesting and feeding behavior of the bald eagle, students use the data provided to answer questions, create an article supporting eagle conservation, determine how the use, and banning of, DDT led to breeding failure and nest success, respectively.

Learning Objective(s): After completing "Ruling the Sky Once More" core activities, students will be able to

1) Evaluate data sets and food webs, 2) graph data to examine patterns in population success, 3) extrapolate data to write a supportive essay on wildlife conservation.

Method:
The core activities center on students watching the video episode and completing the activities: 1) evaluate graph data 2.) write a supportive essay on wildlife conservation

Considerations:
Student access to library/websites or other resources to conduct the research on biomagnification and pesticides in the environment.

Possible Answers

1. Graph...Guide learners to put every year on the X axis of the graph, not just the years that counts were taken. In their articles, students can mention banning of hunting and pesticides, protection of nests and habitats. They might also recognize that learning more about eagles is a factor in protecting them.

2. Thought Experiment: While the numbers of "particles" are not realistic, students should recognize that the predator in this model would accumulate a million particles of the pesticide each year.

3. Biomagnification: Since the "half-life" of DDT is over 25 years, very little would leave the predator's body and the concentration would increase each year. This causes the suppression of reproductive hormones. The most evident results in eagles is fragile eggs that break before hatching.

Integrate!

Integrating literature with math and science lessons enhances academic achievement in all areas. The National Science Teachers Association (NSTA) Recommends review team identifies great books to use, and provides a searchable database for K-12 educators. The system includes Outstanding Science Trade Books. Educators may choose these or other related materials to supplement the episodes to deepen the learning experience for students. Learn more about wildlife species and habitats using keyword searches in the NSTA Recommends database, which has more than 10,000 reviews, at http://www.nsta.org/recommends/. Use the key word "eagle" in the "word in title" to find content that relates to this educational resource.

Common Core Mathematics

CSS Math Content 6.NS.C.8

Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Next Generation Science Standards

Students who demonstrate understanding can:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

Common Core Language Arts

CCSS.ELA-Literacy.RST.6-8.7

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).