



Hubbard Brook Research Foundation's
Migratory Bird Science and Math Lessons

Where Have All the Songbirds Gone?





This slide show investigates the challenges that migratory birds face and possible reasons for the decline in migratory bird populations.

Also included in this set:

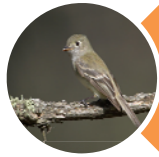
- *Introduction to Migratory Birds*
- *Methods of Bird Research*



Migratory Bird Science and Math Lessons were developed in partnership between the Hubbard Brook Research Foundation and the U.S. Forest Service/Northern Research Station. Funding was also provided by the Long Term Ecological Research (LTER) Network's Schoolyard Program.

Unless otherwise noted, all photos and images are courtesy of the scientific community of the Hubbard Brook Ecosystem Study (www.hubbardbrook.org).





I. Numbers of birds have declined at the Hubbard Brook Experimental Forest, NH



II. Problems during part of the year

- Summer: breeding grounds
- Winter: non-breeding grounds
- Spring and fall: migration



III. Constant problems: Atmospheric pollution

- Mercury
- Acid rain
- Climate change
- the problem with a shifting habitat



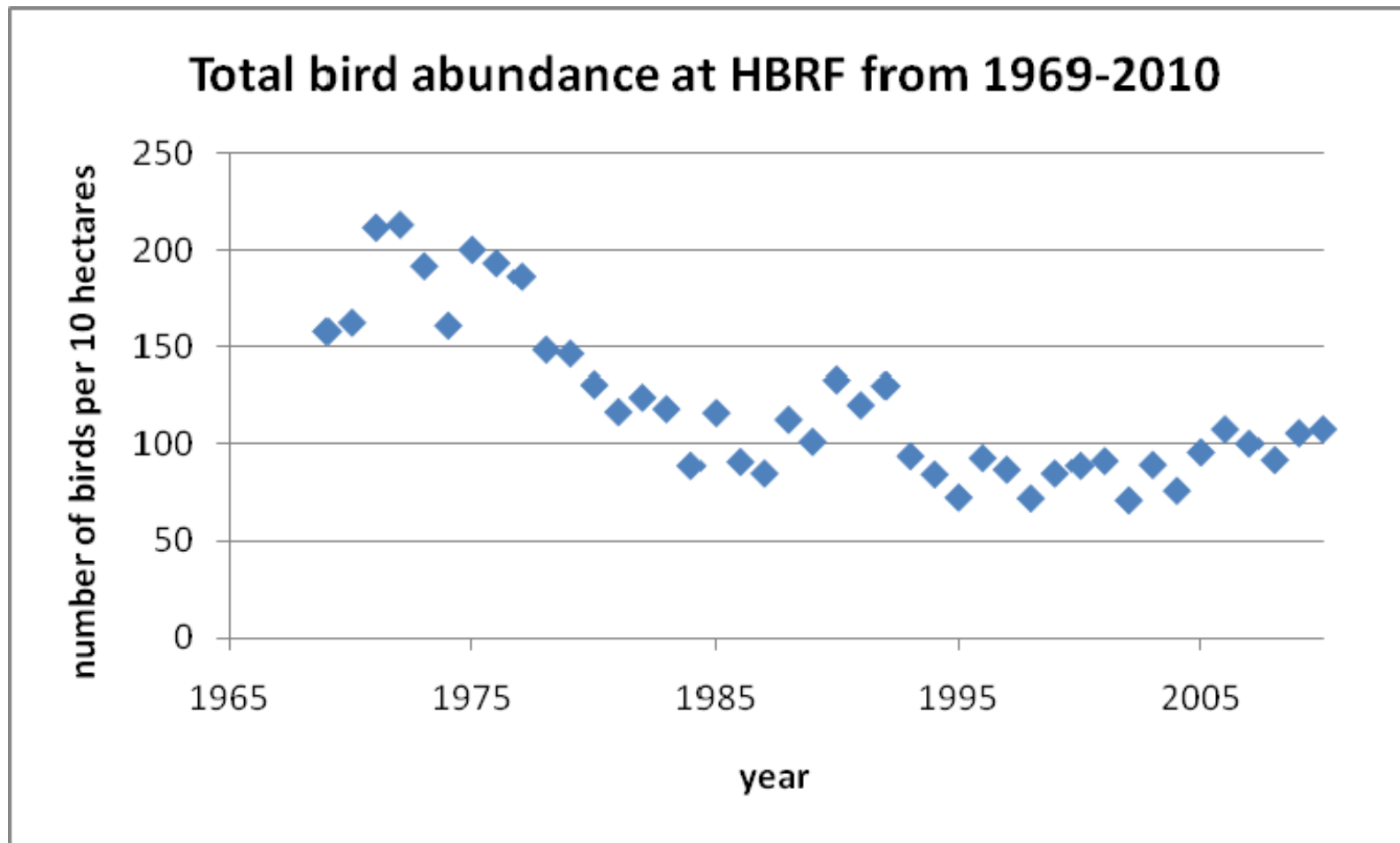
IV. A closer look at a bird of special concern- the Bicknell's Thrush



V. What can we do to help?

Numbers of migratory birds have declined.

The number of Neotropical migratory birds at the Hubbard Brook Experimental Forest in Woodstock, NH has declined over the past 40 years.



Numbers of migratory birds have declined.

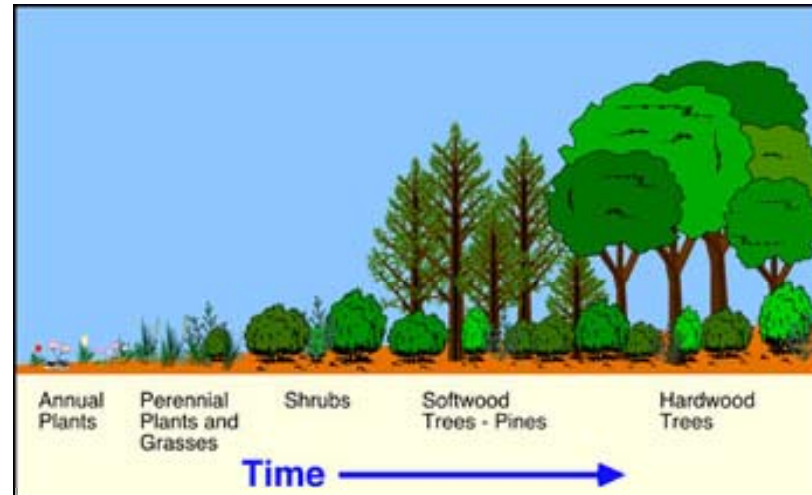
Data from the North American Breeding Bird Survey also indicates that there are less migratory birds today than there were 30 years ago.



According to this survey, there has been approximately a 10% decline in birds per year between 1980 – 1994.

Numbers of migratory birds have declined.

Part of the reason might be due to natural causes, such as natural changes in vegetation as forests grow older. Or perhaps bird populations were unnaturally high when they first started to be measured in 1969.



But there is reason to think that birds are up against human-caused problems, as well.

Numbers of migratory birds have declined.

Neotropical migratory birds are in our forests for only
one part of the year:

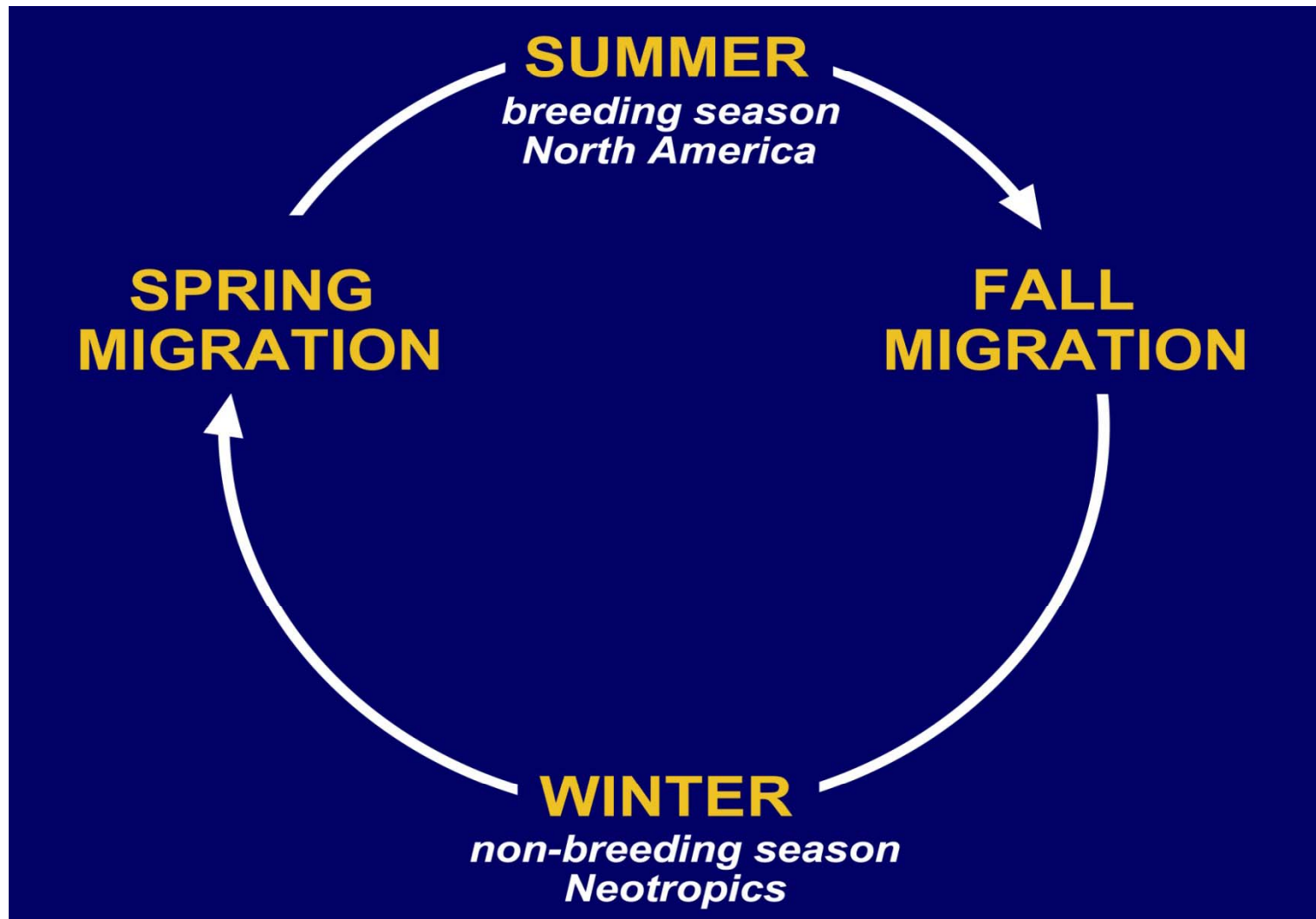
Numbers of migratory birds have declined.

Neotropical migratory birds are in our forests for only one part of the year:



Numbers of migratory birds have declined.

For the full story, we must think about what the birds experience during the entire year:





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V. What can we do to help?

Problems in summer grounds (breeding season)

Bird habitat is lost or fragmented in the temperate breeding grounds due to development of towns and homes.



Problems in wintering grounds (non-breeding season)

Bird habitat is lost in the tropical wintering grounds due to clearing of trees for agriculture, charcoal, firewood and lumber.



Problems in wintering grounds (non-breeding season)

Compare this relatively intact forest in the Dominican Republic, an important wintering ground for many migratory birds...



Problems in wintering grounds (non-breeding season)

...with this forest, also in the Dominican Republic, where trees have been cleared for various human needs.





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Problems during migration

Half of all migrants heading south for the winter will not make it back to breed in the spring.



Problems during migration

Natural problems



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graph LR; A[Natural problems] --- B[ ]; C[Human-caused problems] --- D[ ]
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Human-caused problems

Problems during migration

Natural problems

- Bad weather

Human-caused problems

Problems during migration

Natural problems

- Bad weather
- Predation by wild animals

Human-caused problems

Problems during migration

Natural problems

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Human-caused problems

- Collisions with buildings, windows

Problems during migration

Natural problems

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Human-caused problems

- Collisions with buildings, windows
- Shot or trapped by hunters

Problems during migration

Natural problems

- Bad weather
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Human-caused problems

- Collisions with buildings, windows
- Shot or trapped by hunters
- Hit by automobiles

Problems during migration

Natural problems

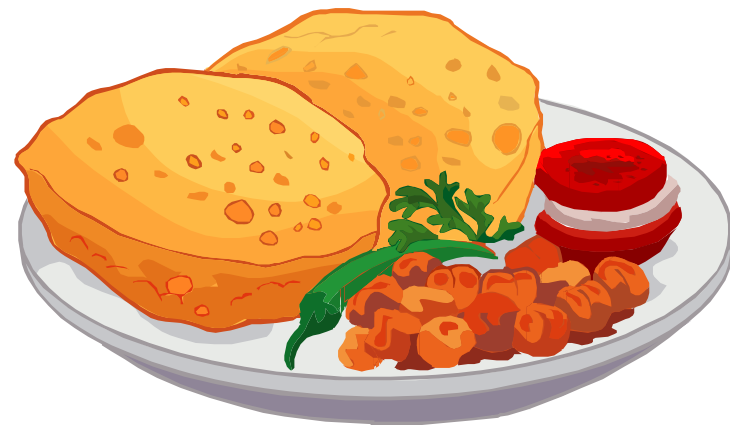
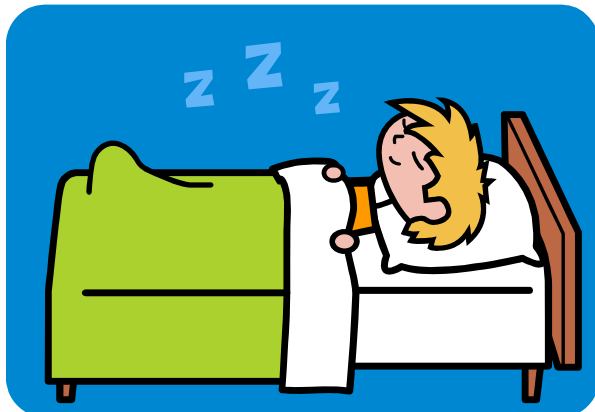
- Bad weather
- Predation by wild animals

Human-caused problems

- Collisions with buildings, windows
- Shot or trapped by hunters
- Hit by automobiles
- Degradation of *stopover sites*

What is a *stopover site*?

- Places where birds rest and refuel along their migratory routes.



- Without places along the way to replenish food and water, and safely rest from predators, these travelers are doomed!

Why has the quality of stopover sites decreased?

DEVELOPMENT

INLAND



- Homes
- Ranching
- Oil exploration
- Agriculture
- Forestry

COAST



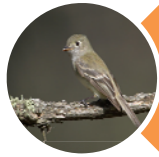
- Homes
- Oil exploration

Problems during migration

Obstacles are even encountered mid-flight.



Cell towers and wind turbines are hazards for Neotropical songbirds, most of whom migrate at night.



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Constant problems

Certain problems may affect birds, no matter where they are or what time of the year it is:

Constant problems

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Atmospheric
pollution



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Constant problems

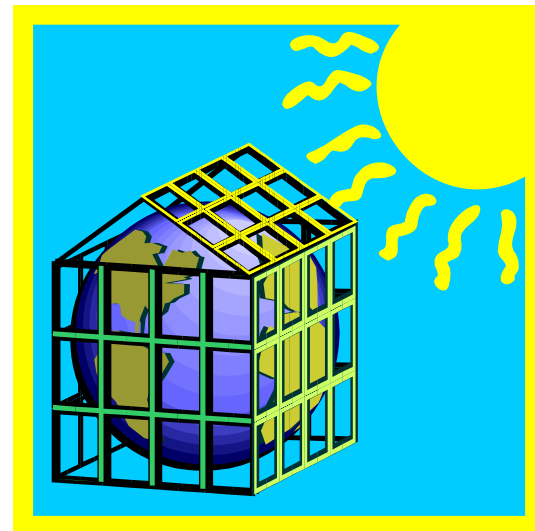
Certain problems may affect birds, no matter where they are or what time of the year it is:

Atmospheric
pollution



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Climate change



Atmospheric pollution



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Atmospheric pollution- MERCURY

- Mercury is emitted during fossil fuel combustion and waste incineration.
- In the Northeast, mercury levels are 2–5 times higher in mountainous ecosystems.
- Mercury gets changed to methylmercury, which is highly toxic, by specialized bacteria.
- Elevated levels of methylmercury have been found in birds like the Bicknell's Thrush.



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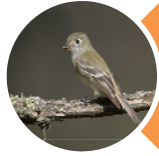
Atmospheric pollution- ACID RAIN

- Acid rain results from emissions of sulfur dioxide, nitrogen oxides and ammonia from factories, power plants, automobiles and agriculture.
- The effects on soil, water and plants and animals are complicated. One result is that calcium has been lost from many ecosystems.
- This affects birds because as calcium is depleted from the food chain, less is available to building strong eggshells and bones.



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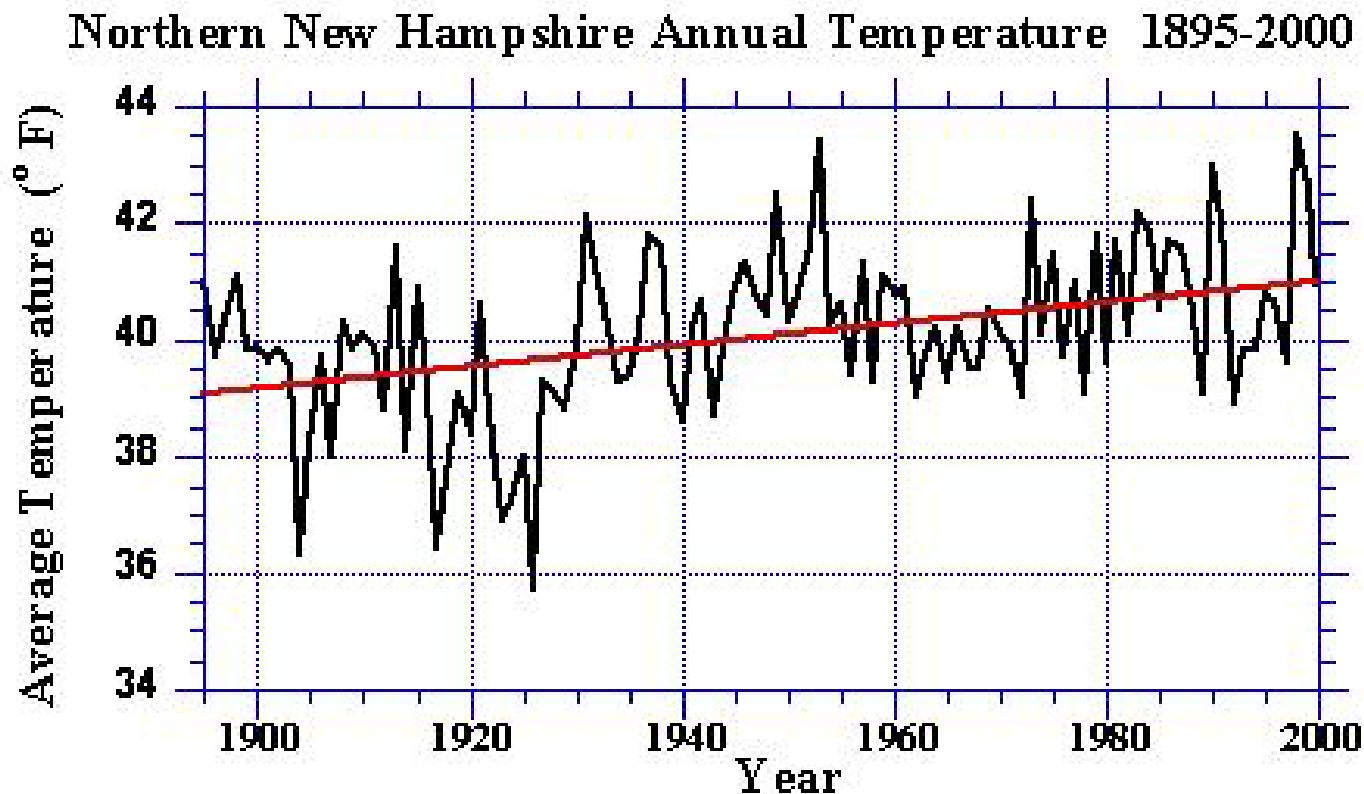
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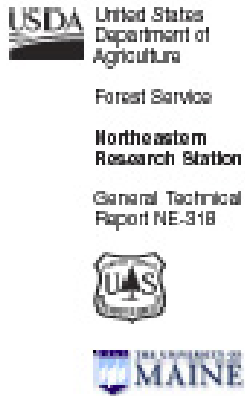
V. What can we do to help?

Atmospheric pollution- CLIMATE CHANGE

As the atmospheric concentration of greenhouse gases continues to rise, warming will continue in the Northeast.



Graphic courtesy of Dr. N. Rodenhouse, Wellesley College



Atlas of Climate Change Effects in 150 Bird Species of the Eastern United States

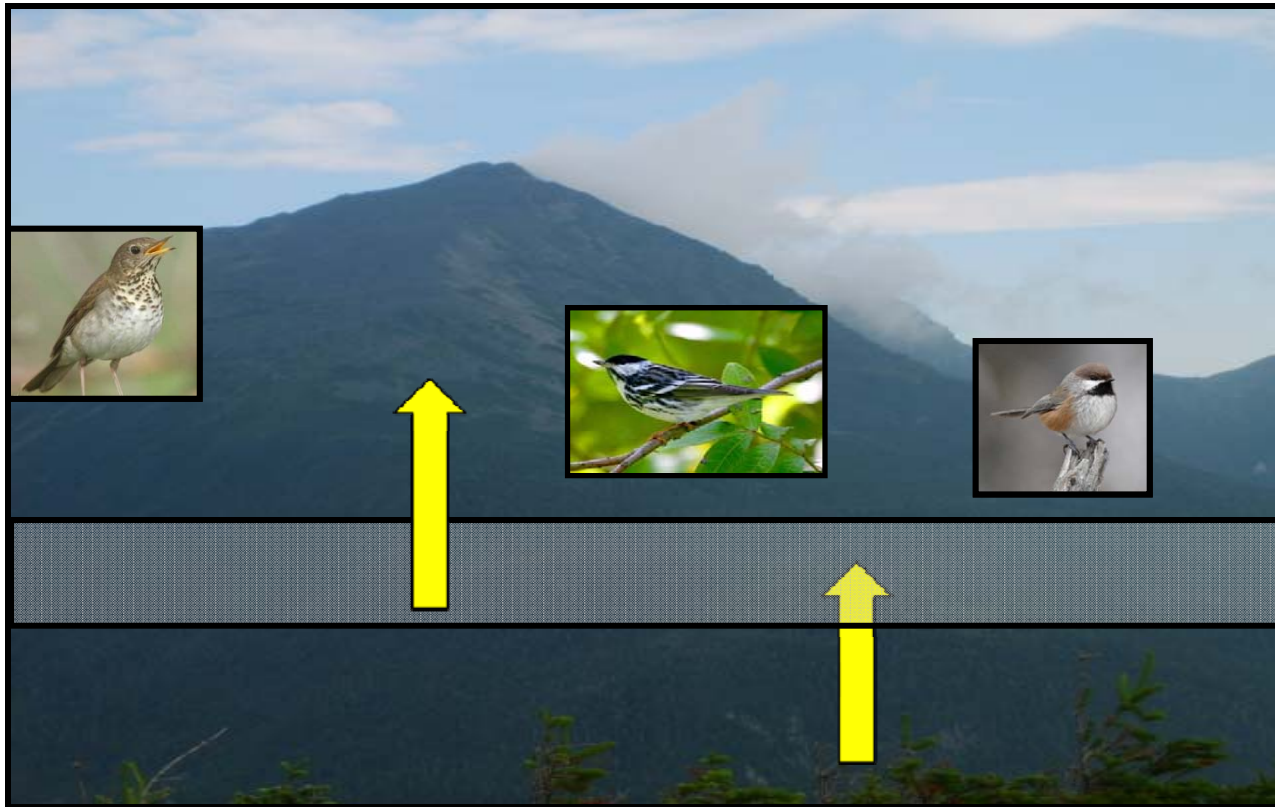
Stephen N. Matthews
Raymond J. O'Connor
Louis R. Iverson
Anantha M. Prasad

This paper, published in 2004, predicts the range and abundance of birds once climate and tree species have shifted.



Atmospheric pollution- CLIMATE CHANGE

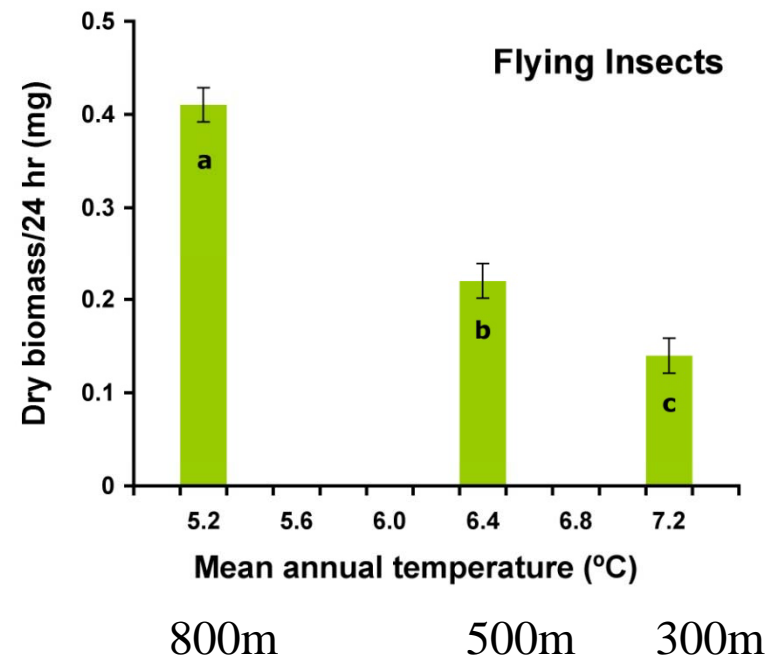
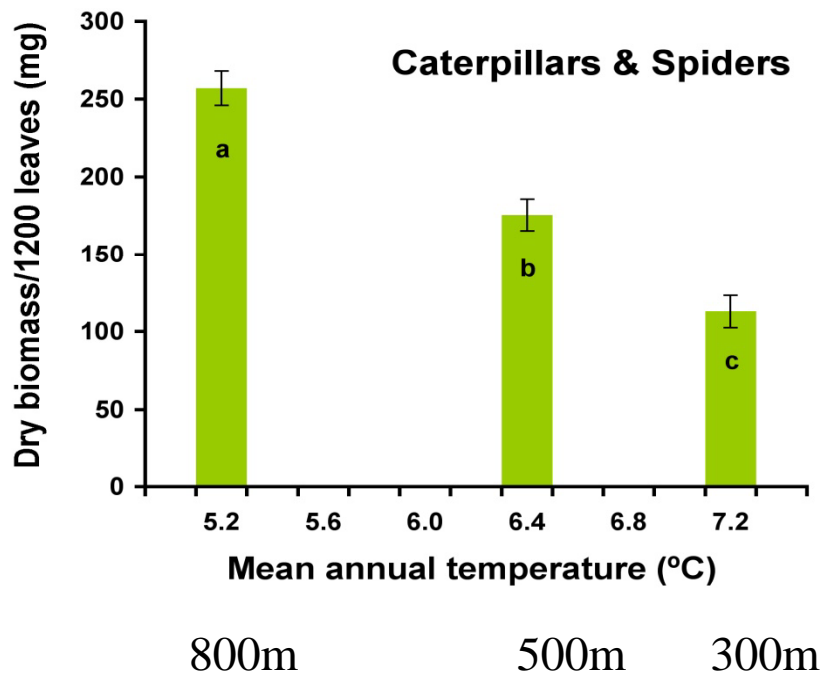
It is predicted that birds will shift their habitats to higher elevations.



Why?

Climate change may cause a shift in habitat to higher elevations.

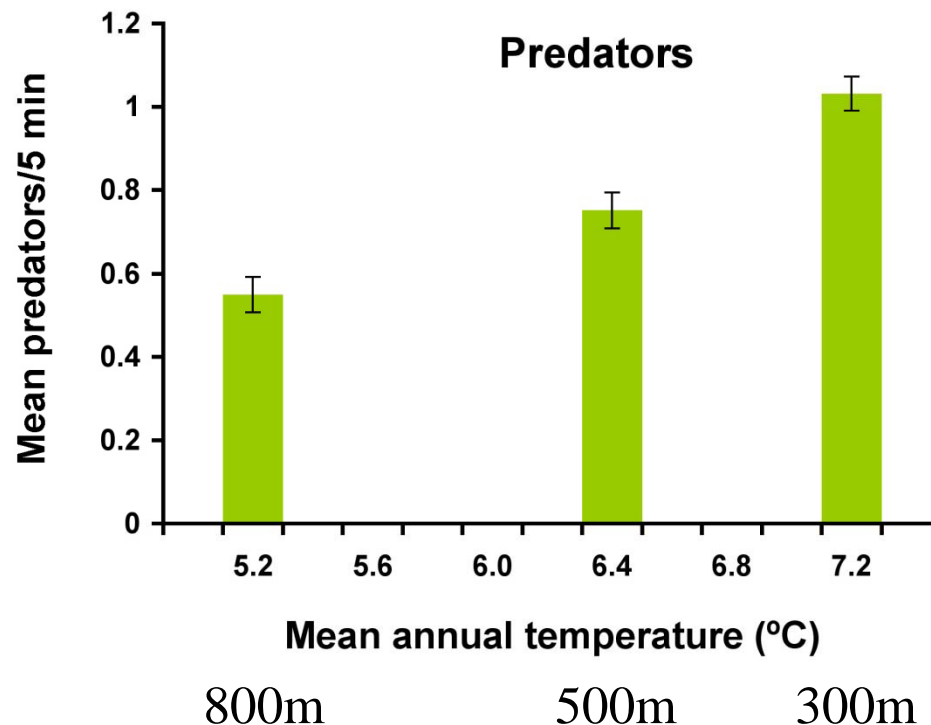
More food is available for birds at higher elevations (up to a point) because it's cooler upslope: more spiders, caterpillars, and flying insects are found at 800 meters than at 300 or 500 meters.



Data and graphics courtesy of Dr. N. Rodenhouse, Wellesley College

Climate change may cause a shift in habitat to higher elevations.

Fewer predators nest predators, such as the chipmunk and squirrel, are found at higher elevations.



Data and graphics courtesy of Dr. N. Rodenhouse, Wellesley College

Climate change may cause a shift in habitat to higher elevations.



With more food and less predators, habitat quality seems to be better higher up.

Why might this present a problem to forest songbirds?



Climate change may cause a shift in habitat to higher elevations.

Mountains taper at the top, so less area is available than at lower elevations. Thus the amount of high-quality habitat available shrinks.

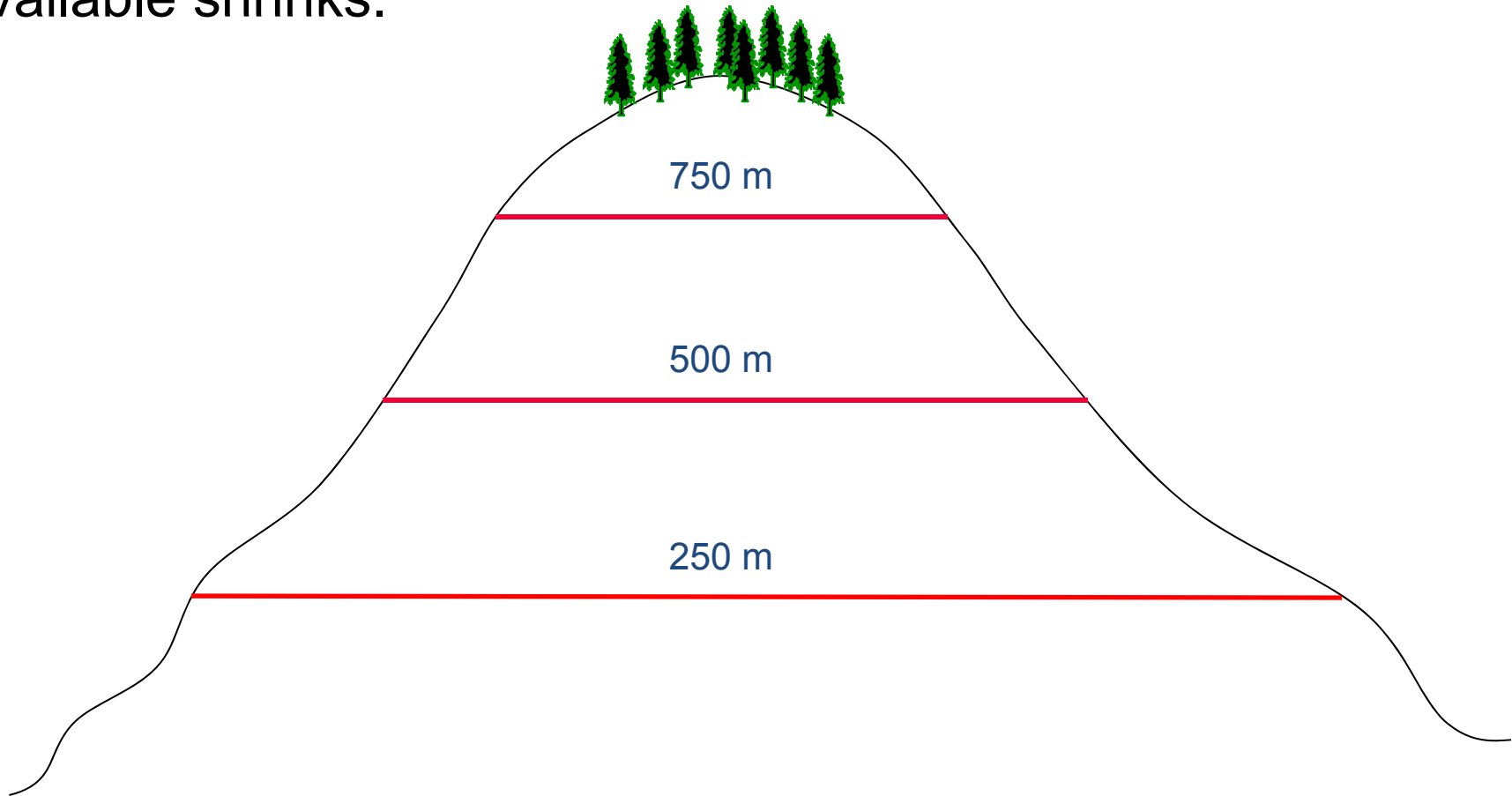


Fig. after J. D. Lambert & K. P. McFarland, VCFE, Woodstock, VT

Climate change may cause a shift in habitat to higher elevations.

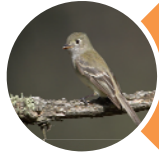
Birds that already live at high-elevation areas are likely to be among the most affected by climate change.



Blackpoll warbler



Yellow-bellied flycatcher



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V. What can we do to help?

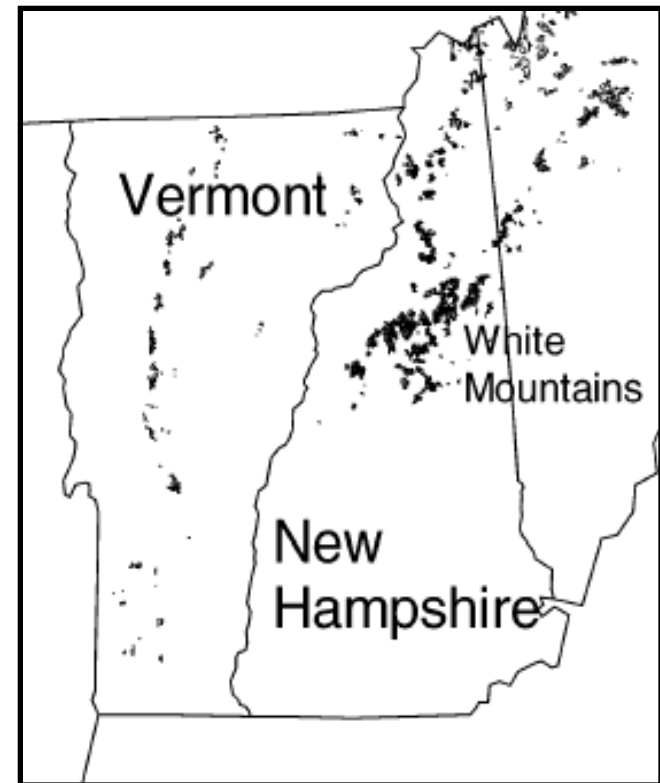
Bicknell's Thrush: A species of concern



Over 90% of the world's nesting habitat for Bicknell's Thrush occurs in the Northeastern United States.

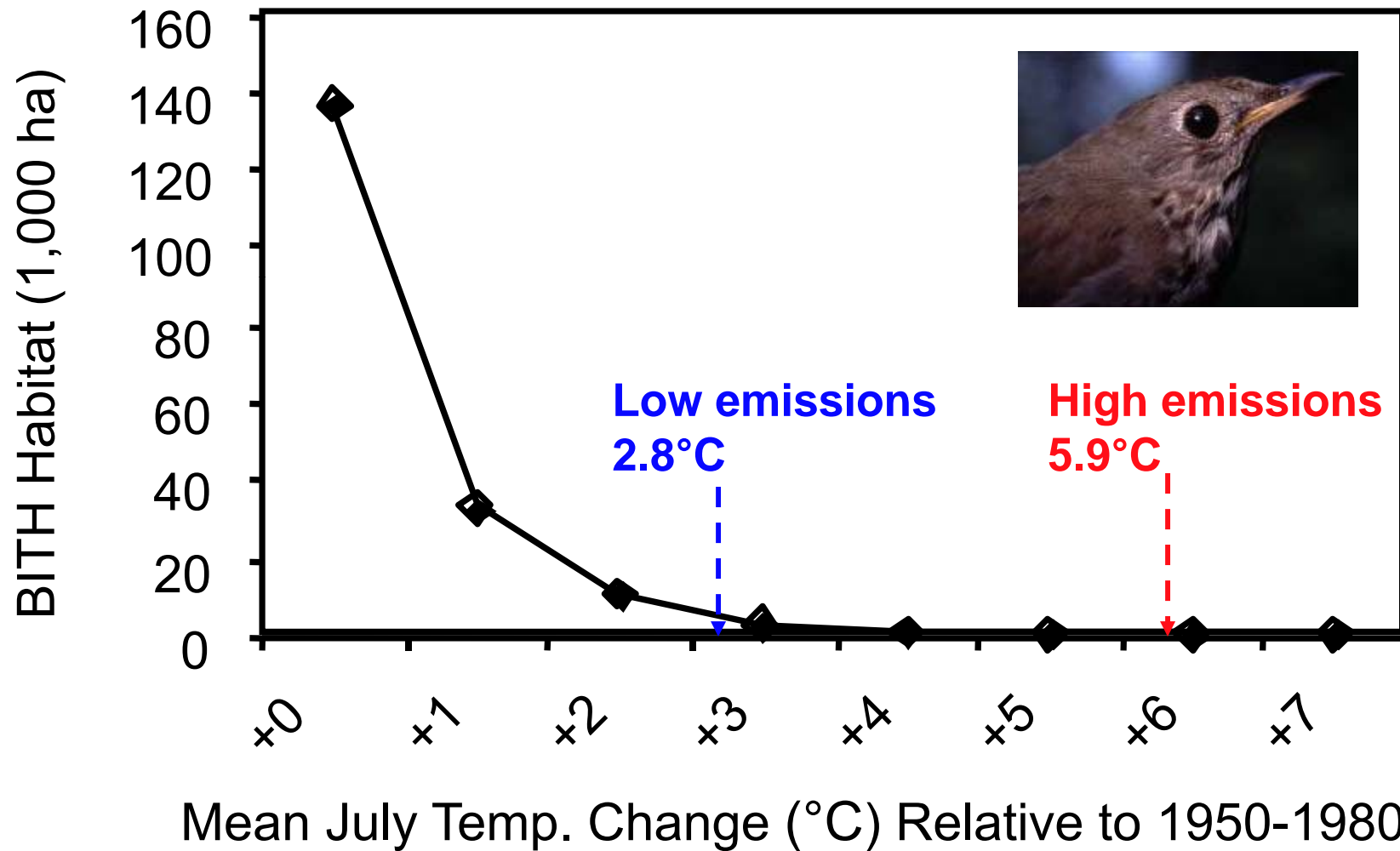
Bicknell's Thrush: A species of concern

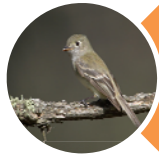
The Bicknell's Thrush lives only in montane forests. These are forests > 900m elevation and comprise $\approx 2\%$ of New Hampshire's land area.



From: Atwood et al. 1996

The amount of habitat available to Bicknell's Thrush in the Northeast is predicted to decline rapidly with rising temperature





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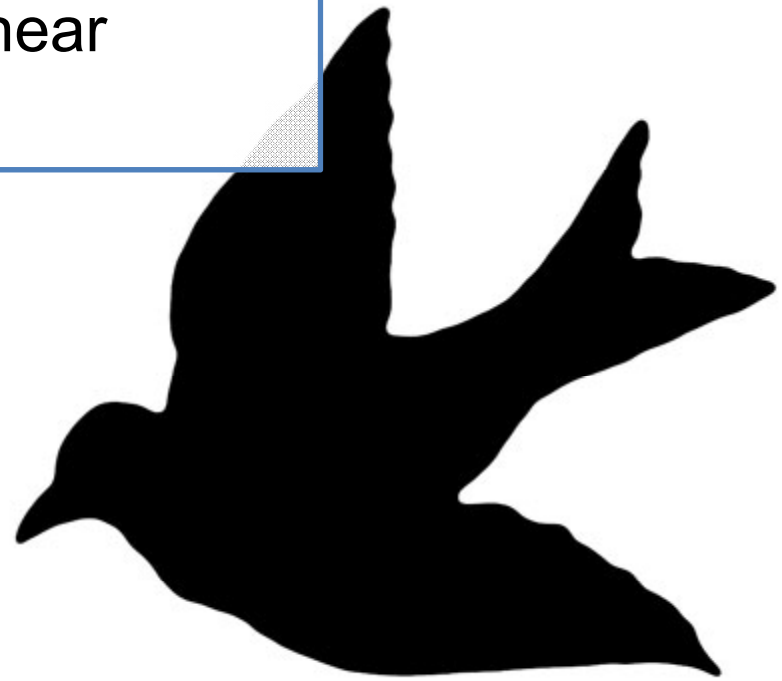


V. What can we do to help?

What can we do to help migratory birds?

Make your windows bird-safe

- by hanging silhouettes in or near windows to avoid collisions.



What can we do to help migratory birds?

Avoid using fertilizers, insecticides or herbicides

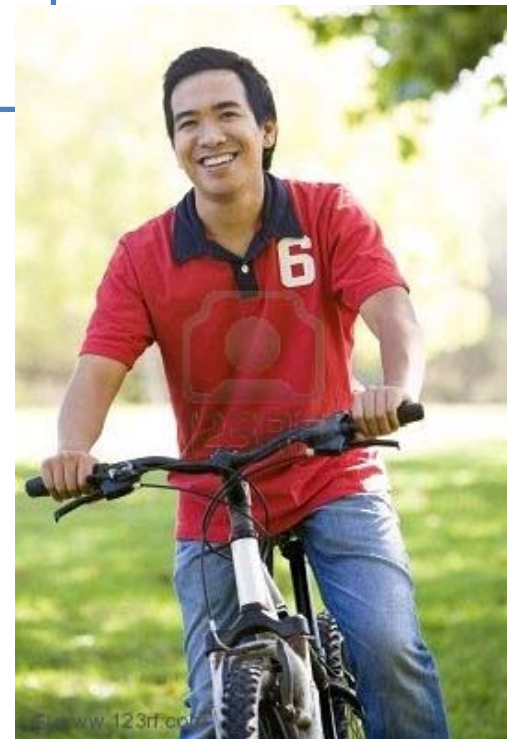
- 7 million birds die each year from exposure to chemicals.



What can we do to help migratory birds?

Reduce pollution and avoid collisions with birds

- Ride your bike, walk, or take the bus



What can we do to help migratory birds?

Protect birds from predation by pets

- Put bells on your cats or keep them indoors so they can't kill birds



What can we do to help migratory birds?

Plant native shrubs, trees and flowers around your school yard or home

- to provide shelter and food for birds.



What can we do to help migratory birds?

Purchase shade-grown coffee

- Shade-grown coffee plantations support higher numbers of birds than full-sun plantations.





For more information, view the additional slide shows included within this lesson set:

- *Introduction to Migratory Birds*

and

- *Methods of Bird Research*



The Hubbard Brook Research Foundation gratefully acknowledges the following people for their assistance in the development of this slideshow:

- Dr. Scott Sillett, Smithsonian Migratory Bird Center
- Dr. Nick Rodenhouse, Wellesley College
- Dr. Chris Rimmer, Vermont Center for Ecostudies
- Dr. Scott Schwenk, University of Vermont
- Dr. Pamela Hunt, NH Audubon
- Dr. Len Reitsma, Plymouth State University
- Bill DeLuca, Ph.D. candidate, University of Massachusetts
- Robert Royse, bird photographer