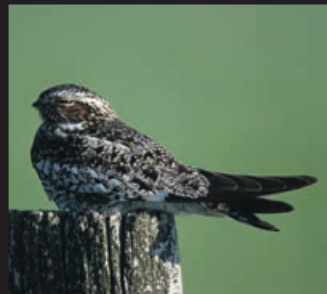
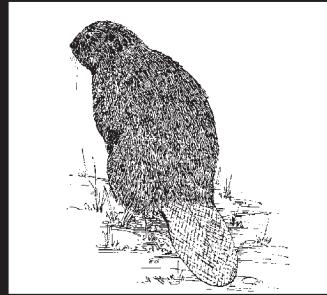
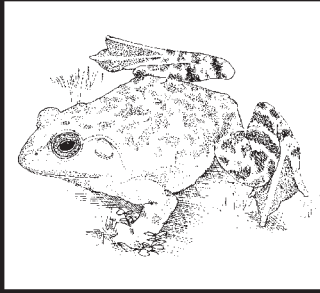
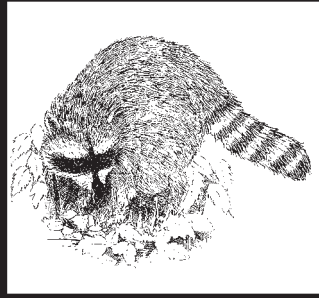
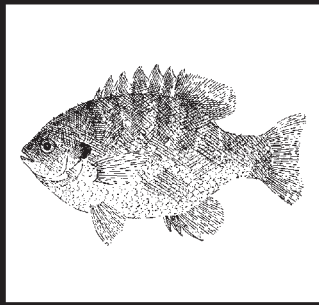
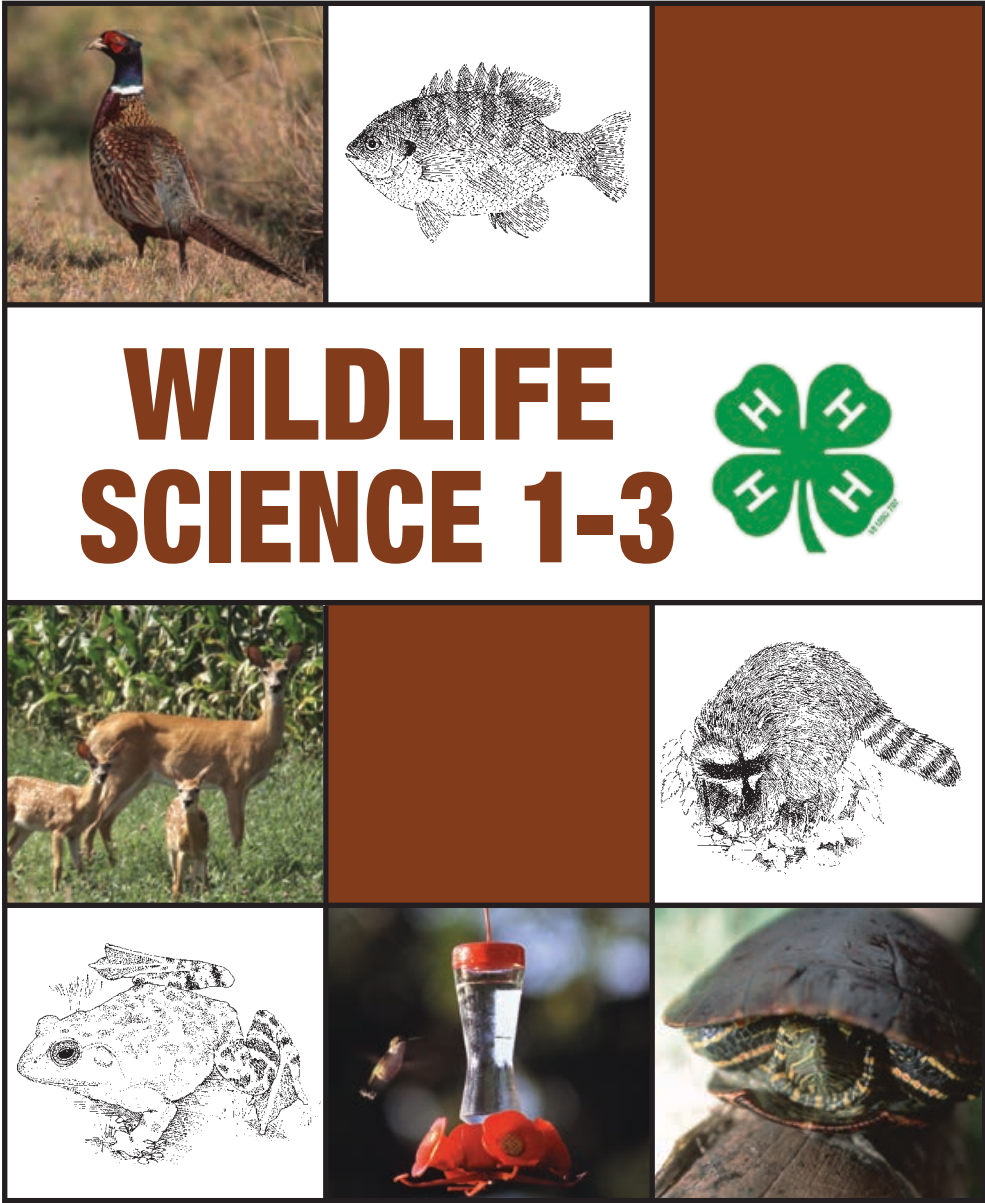


**WILDLIFE SCIENCE
FACILITATOR'S GUIDE**





WILDLIFE SCIENCE 1-3



WILDLIFE SCIENCE FACILITATOR'S GUIDE, GRADES 3-12

NOTE TO 4-H PROJECT FACILITATOR

Thank you for taking the time to help a young person learn more about wildlife.

The 4-H Wildlife Science curriculum is for youth who enjoy learning about wildlife. Level 1 introduces the basic wildlife groups: mammals, birds, fish, and herptiles. Youth learn about the similarities and differences among these groups and then study traits of each group. Level 2 activities help youth use their basic understanding to explore more complex wildlife topics. Level 3 activities are divided into chapters based on how they might use the information they have learned—as a homeowner, resident of a wildlife habitat, food and fiber producer (farmer), mayor, teacher, or legislator. Level 3 delves deeper into the study of wildlife and can prepare youth to be well informed and to study these topics at a college or university.

AUTHORS

Natalie Carroll, professor, Purdue University
Theodore Leuenberger
Kathrine Leuenberger

CONTRIBUTORS

Gretchen Leuenberger
Editor: Nancy Alexander, Noblesville, Indiana
Graphic Designer: Kathi Brethauer, KB Design, Indianapolis, Indiana

Additional Resources

The Department of Forestry and Natural Resources, College of Agriculture, Purdue University, hosts a website, The Nature of Teaching, with teacher resources in three areas: Wildlife, Health and Wellness, and Food Waste. Each provides standards-based lesson plans via a free, downloadable PDF. Lesson plans that are classroom-ready for grades K-5 are available at the website, <https://ag.purdue.edu/extension/nature/Pages/default.aspx>.

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Additional Contributors: The Wildlife Science curriculum (2017) builds upon previous works (Indiana 4-H Wildlife, 1995, revised 2001). The contributions of wildlife biologists, Extension specialists, Extension educators, 4-H members, 4-H parents, FFA coaches, fair judges, teachers, graduate students, and undergraduate students were critical in its development. Topic focus was determined by wildlife biologists. Activities were developed, used, and revised in 4-H clubs, after school programs, and the wildlife habitat evaluation program. Major input to previous works was provided by wildlife biologists Brian Miller, Brian MacGowan, and Rod Williams.

NOTE TO PROJECT FACILITATOR

Thank you for helping a 4-H member learn about Wildlife Science as a project facilitator. This facilitator's guide answers the questions in the youth guides and suggests ways to facilitate the activities. It also gives additional information about working with youth, for those who wish to learn more.

You can help youth get the most out of this project by being enthusiastic and asking thoughtful questions. Team up with youth to help them select goals, identify resources, gain confidence, and evaluate their own progress. The activities are designed so youth have an opportunity to learn by doing with your help and guidance.

Your main role is to provide a safe, supportive environment for youth to practice important life skills as they explore the world of wildlife science through many exciting activities.

SUGGESTIONS

- Gather materials. Youth should collect the materials listed as Gear before doing the activity. All the supplies used in these activities can be found around the home or purchased at minimal cost.
- Read and understand the activity. Each activity is self-contained.
- Encourage youth to try different activities and to enjoy learning.
- Show the relevance of each activity. Explore with youth the interconnectedness of each activity to the real world.
- Emphasize relying on others. Expand the learning activity and get additional supporting information from your Extension office. The internet can provide a wealth of information to enrich learning. Take care to use sites that are supported by educational organizations (*.edu), government agencies (*.gov), professional societies, national organizations, and not-for-profit groups associated with the study of wildlife.
- Keep safety in mind at all times. Some activities are done outdoors where wasps, bees, and other potentially harmful insects might be. Keep a watchful eye on the surroundings, and look out for weather changes.

LEARNING GOALS

4-H Wildlife Science, Level 1

- Begin to learn about wildlife with a focus on the vertebrate groups.
- Learn basic terms and concepts.

4-H Wildlife Science, Level 2

- Learn about wildlife careers, impacts of climate change, and more about vertebrates.
- Develop an understanding of and appreciation for wildlife.

4-H Wildlife Science, Level 3

- Understand why learning about wildlife resources is important.
- Educate others about wildlife science.
- Become a lifelong learner; continue to read and learn about wildlife science.

NGSS indicates the Next Generation Science Standards for activity. See www.nextgenscience.org/next-generation-science-standards for more information.

See Purdue Extension's Education Store, www.the-education-store.com, for additional resources on many of the topics covered in the 4-H manuals.

4-H LIFE SKILLS

4-H programs help youth develop knowledge and skills that help them become caring, competent adults. In "Targeting Life Skills in 4-H" (University of Florida IFAS Extension, 4-H FS 101.9) Norman and Jordan define life skills as competencies that assist people in functioning well in the environments in which they live. 4-H uses the Targeting Life Skills Model (Hendricks, 1998) to identify important assets that youth can learn through 4-H programming. The model uses the 4-H Pledge to categorize various life skills under four general competency areas: Head, Heart, Hands, and Health.

Head: knowledge, reasoning, and creative competencies

- *Thinking* – using one's mind to form ideas and make decisions; to imagine; to examine carefully in the mind; to consider
- *Managing* – using resources to accomplish a purpose

Heart: personal and social competencies

- *Relating* – establishing a mutual or reciprocal connection between two people that is wholesome and meaningful to both.
- *Caring* – showing understanding, kindness, concern, and affection for others

Hands: vocational and citizenship competencies

- *Giving* – providing, supplying, or causing to happen; social responsibility
- *Working* – accomplishing something or earning pay to support oneself through physical or mental effort

Health: health and physical competencies

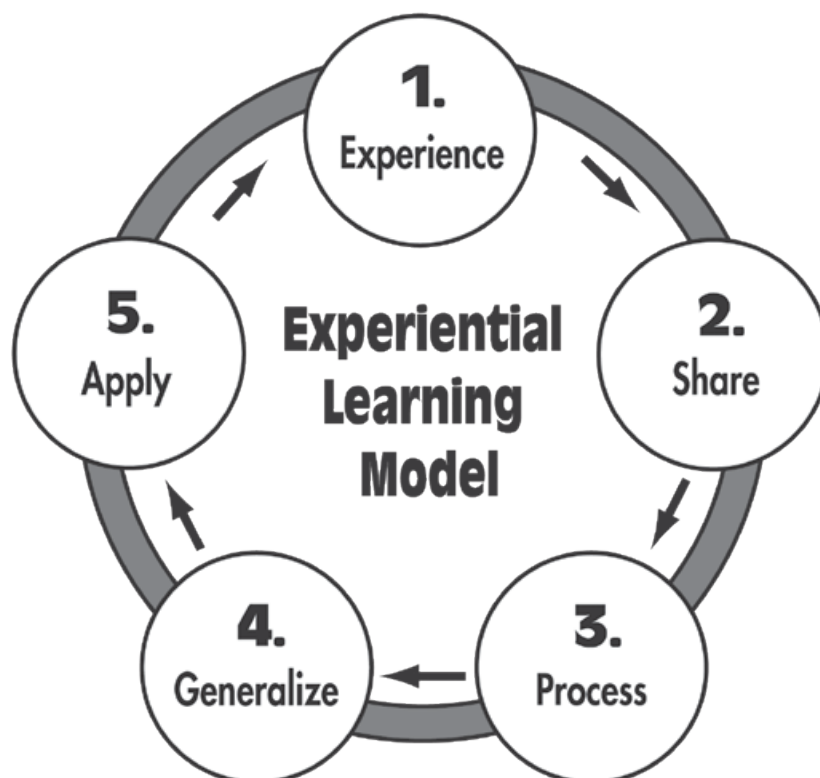
- *Living* – acting or behaving; the manner or style of daily life
- *Being* – living one's life; pursuing one's basic nature; involved in personal development

Targeted life skills are listed for each activity in this curriculum to remind youth that they are learning more than subject matter knowledge. Facilitators should review the life skills to understand the overarching goals of the activity with respect to youth development.

THE EXPERIENTIAL MODEL

The 4-H National Headquarters Fact Sheet explains, "Experiential learning takes place when a youth is involved in an activity, looks back at it critically, determines what was useful or important to remember, and uses this information to perform another activity. 4-H uses this hand-on learning approach to teach new topics and life skills." Experiential Learning Principles, www.4-h.org/resource-library/curriculum/development, July 2014.

The experiential learning model is a way of teaching to help youth make the most of any activity. It distinguishes 4-H activities from many other educational methods. Experiential learning is a process that allows youth to first learn by doing, before being told or shown how, and then to process the experience. Activities are designed so youth **experience** a learning activity; **share** what they did; **process** what they did through discussion, analysis, and reflection; **generalize** what they learned to test their comprehension and appreciation of the activity; and think about how they can **apply** what they learned to other situations.



Pfeiffer, J.W., & Jones, J.E., "Reference Guide to Handbooks and Annuals"
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EVALUATING YOUTH LEARNING

STEP	EXCELLENT	AVERAGE	MINIMAL
Experience			
Share			
Process			
Generalize			
Apply			

Using the experiential learning process in group settings offers these advantages:

- The adult can quickly assess the youth's knowledge of the subject.
- The youth builds on past experience or knowledge.
- The adult acts as coach rather than as teacher.
- The youth relate the experience to their own lives and experiences.
- Mentors may use a variety of methods to involve the youth in the experience.
- Youth with different learning styles can be successful.
- Discussions can move from the concrete to the abstract and analytical, which particularly benefits youth in middle school and high school.
- Youth are stimulated to learn through discovery and to draw meaning from the experience.
- Youth can work together, share information, provide explanations, and evaluate themselves and others.
- Youth take responsibility for their own learning.

Evaluating youth learning using a simple rubric such as the one shown above can help 4-H volunteer leaders assess the effectiveness of their teaching methodology and youth interest. Evaluate each step of the experiential model by indicating what you think the 4-H members learned in a particular activity (your best guess). Work on improving any low scores.

YOUTH DEVELOPMENT STAGES

Understanding the physical, mental, social, and emotional development of youth will help you when working with the 4-H members in your club. No two youth develop at the same rate, and transitions are often gradual. Your teaching and involvement helps 4-H club members grow and mature, and makes 4-H a rewarding and fulfilling experience.

Activities at 4-H club meetings are not always as successful as you, the volunteer leader, hope and plan for. Sometimes youth talk among themselves rather than listening to you; no one comes to a scheduled field trip; or no one speaks up to answer your questions when you are trying to involve the youth in a discussion. If you are working with a broad age range, the activity might be too simple for the older youth and too difficult for the younger ones. This is challenging for the 4-H leader. Keep trying. Some days will go better than others. Giving the older 4-H members leadership opportunities may help.

Youth of the same age can vary greatly in physical, mental, social, and emotional growth and interests. These differences are even more marked between age groups. Research provides some generalities that can help you understand how to plan activities for different age groups.

Early Elementary (Mini 4-H)

This is an active age, so keep these children busy. They are concrete thinkers and need to understand what you want them to do and how to do it. They are generally more interested in making something than in completing a project — process is more interesting than product. Youth in this age group tend to seek adult approval and depend on adults, although their peers' opinions are beginning to be important. They do best in small groups with set rules and rituals. Competition is inappropriate for this age group.

Upper Elementary

This is also a physically active age, so hands-on activities work best. Youth in the upper elementary grades are still fairly concrete thinkers — things are black and white, right or wrong — but are beginning to think logically and symbolically. Because this age group has a strong need to feel accepted, an adult should evaluate each product, rather than encouraging competition among peers with only one winner. This age prefers to know how much they have improved against past efforts and how to improve in the future.

These youth are beginning to identify with peers but continue to value adult guidance. They are also beginning to discover the benefits of making other people happy, but more for the benefits to themselves rather

than the benefit to others. They begin to take responsibility for their actions and to develop increased independence of thought, which might allow them to try new things. Letting this age group help in the decisions of the club helps them start learning about leadership.

Middle School

Middle school youth are beginning to move to more abstract thinking. Justice and equality are important to this age. (Therefore, project judging may now be viewed in terms of what's fair as well as a reflection of self-worth.) They prefer to find their own solutions, rather than adults giving them. Try to provide supervision without interference. Independent thinking and actions begins to emerge. Avoid comparing middle school youth with each other; compare performance with past accomplishments.

Junior volunteer organizations often are popular with teens toward the upper end of this age group, particularly with opportunities for developing leadership.

High School

Most high school-aged teens know their abilities, interests, and talents. They tend to be primarily concerned with themselves and their peer group. While they can understand the feelings of others, they lean toward self-absorption, particularly in the earlier years of high school. Relationship skills are usually fairly well developed. Getting a driver's license increases both independence and dating, so acceptance by members of the opposite sex is important.

High school-aged youth begin to think about the future and make realistic plans. They enjoy career exploration and preparation. Their vocational goals influence the activities they select.

Projects requiring research and creativity give teens an opportunity to demonstrate how much they have learned and what they can accomplish. Teens set goals based on their personal needs and priorities and generally reject goals that others set for them.

As teens master abstract thinking, they might try new ideas in ways that confuse adults. Teens can generally initiate and complete tasks without supervision. A leader can help by arranging new experiences in areas of interest to teens but must be sure to allow them plenty of input. Assume the role of advisor/

coach for independent workers, rather than teacher/lecturer. Club meetings, rituals, and uniforms do not generally appeal to this group. However, many teens enjoy looking back on their achievements in 4-H and appreciate special recognition for leadership activities. By the time they graduate from high school and begin college or a career, youth feel they have reached full maturity and expect to be treated as such.

Some Final Thoughts

These guidelines give only a brief overview of child and youth development as a resource to help you plan your activities as a volunteer leader. The publication "Ages and Stages of Child and Youth Development," * has more in-depth information and is available from your county Purdue Extension office.

You, as the club volunteer, are a valuable asset to your community and to your club's members. The guidelines for the stages of child and youth development, in combination with your special skills and interest in youth, will help you plan and carry out a successful 4-H program and make a positive impact on the lives of young people.

* "Ages and Stages of Child and Youth Development, A Guide for 4-H Leaders," NCR 292, available at Purdue Extension's Education Store, www.the-education-store.com; search NCR-292.

NEXT GENERATION SCIENCE STANDARDS WILDLIFE SCIENCE SUMMARY

The organization of the Next Generation Science Standards is based on the core ideas in the major field of natural science from the *Framework* (pp 139–168). The *Framework* lists 11 core ideas, 4 in life sciences. The core ideas are divided into sub-ideas and each sub-idea is elaborated in a list of what students should understand about that sub-idea at the end of grades 2, 5, 8, and 12. These grade-specific statements are called disciplinary core ideas.

Reference: *Next Generation Science Standards for States, By States, Volume 1, The Standards* (ISBN 13: 978-0-309-27227-8; ISBN 10: 0-309-27227-0; Library of Congress Control Number: 2013939525)

The Wildlife Science activities in these manuals address the Next Generation Science Standard (NGSS) educational Life Science discipline and the Core Ideas:

- LS1** – From molecules to organisms: structures and processes
- LS2** – Ecosystems: interactions, energy, and dynamics
- LS3** – Heredity: inheritance and variation of traits
- LS4** – Biological evolution: unity and diversity

The table below lists Sub Ideas and performance expectation codes, when addressed, for each activity. See the following pages for the activity listing by Sub Idea and performance expectations.

LEVEL 1

ACTIVITY	SUB IDEA	PERFORMANCE EXPECTATION CODE
Chapter 1. Introduction to Wildlife		
Animal Needs	LS2.A, LS4.D	3-LS1-1, 3-LS4-3, 4-LS1-1
Vertebrate Classes	LS1.A, LS2.A, LS4.C	3-LS3-1, 4-LS1-1
Read about Wildlife	LS2.A, LS4.C	3-LS4-3
Chapter 2. Mammals		
Mammal Traits	LS1.A, LS3.B	3-LS3-1, 3-LS4-2
Head, Shoulders, Knees, and Toes	LS1.A, LS4.C, LS2.A	3-LS4-2, 4-LS4-1
Squirrel Feeder Watch	LS2.A	3-LS2-1
Chapter 3. Birds		
Bird Traits	LS1.A, LS3.B	3-LS3-1, 3-LS4-2
Beaks, Legs, and Feet	LS1.A, LS3.B, LS4.C	3-LS3-1, 4-LS1-1
Bird Feeder Watch	LS2.A	3-LS2-1
Birdbath Watch	LS2.A	3-LS2-1
Feeding Hummingbirds	LS2.A	3-LS2-1
Chapter 4. Fish		
Sounds Fishy to Me	LS1.A, LS3.B	3-LS3-1, 4-LS1-1
Adapt Your Fish	LS1.A, LS4.C	3-LS4-2, 3-LS4-3
Chapter 5. Herptiles: Reptiles and Amphibians		
Creeping, Crawling, and Slithering	LS1.A, LS4.C, LS4.D	3-LS3-1, 4-LS1-1
Three Midwest Reptiles	LS1.A, LS4.C	
Egg to Tadpole to Frog	LS1.B	3-LS3-1
How Amphibians Survive	LS1.B	3-LS3-1

LEVEL 2

ACTIVITY	SUB IDEA	PERFORMANCE EXPECTATION CODE
Chapter 1. Wildlife		
Pioneers in Wildlife Conservation	LS2.A	
Signs of Wildlife	LS2.A	MS-LS2-2
Impact of Climate Change	LS4.C, LS4.D	MS-LS4-4
Wildlife Careers	na	
Wildlife Real Estate	LS2.A	MS-LS2-1
Talk to a Professional		
We Don't Live Here Anymore	LS2.A, LS4.C	MS-LS2-1, MS-LS2-2, MS-LS2-4, MS-LS4-4
Chapter 2. Mammals		
Mammal Habitat	LS2.A	MS-LS2-1
To Hibernate, or Not to Hibernate?	LS4.C	
Squirrel Habitat Game	LS2.A, LS2.C	MS-LS2-1, MS-LS2-2
Chapter 3. Birds		
Bird Habitat	LS2.A	MS-LS2-1
To Migrate, or Not to Migrate?	LS4.C	
Chapter 4. Fish		
Fish Habitat	LS2.A	MS-LS2-1
Living in a Lake	LS2.C	MS-LS2-4
Chapter 5. Herptiles		
How Herptiles Survive	LS4.C	
Amphibian Habitat	LS2.A	MS-LS2-1
Reptile Habitat	LS2.A	

LEVEL 3

ACTIVITY	SUB IDEA	PERFORMANCE EXPECTATION CODE
Chapter 1. You Are a Homeowner		
Studying Wildlife Habitat	LS2.A	HS-LS2-1
Creating Wildlife Habitat	LS2.A, LS2.C	
Wildlife Information Online		
City Dwellers, Country Dwellers	LS2.A, LS2.C	HS-LS2-1
Wildlife Pests	LS2.A, LS4.B, LS4.D	HS-LS2-1, HS-LS2-6, HS-LS4-2
Chapter 2. You Live in a Wildlife Habitat		
Local Wildlife Areas	na	
Manage Wildlife	LS2.A, LS2.C, LS4.D	HS-LS2-1, HS-LS2-7, HS-LS4-5, HS-LS4-6
Chapter 3. You Are a Food and Fiber Producer		
Crop Depredation	LS2.A, LS4.D	
Conservation Reserve Program	LS2.A, LS2.C, LS4.D	
Chapter 4. You Are the Mayor		
Talk to a Planner	na	HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-7, HS-LS4-5, HS-LS4-6
Impact of Human Activity	LS2.C, LS4.D	HS-LS2-1, HS-LS2-2, HS-LS2-6, HS-LS2-7, HS-LS4-5, HS-LS4-6
Wildlife in Built Environments	LS2.C, LS4.D	HS-LS2-6, HA-LS2-7
Chapter 5. You Are a Teacher		
Interactive Demonstration	See chosen activity	
Lights, Camera, Learn by Doing!	See chosen activity	
Mentor a 4-H Member	na	
Share Your Knowledge	na	
Chapter 6. You Are a Legislator		
Know the Law	LS2.A, LS2.C, LS4.C	HS-LS2-7, HS-LS4-5, HS-LS4-6
Current Events	na	
Chapter 7. Follow a Path		
Follow a Professional Path	na	
Follow a Well-Traveled Path	na	
Follow an Educational Path	na	

SCIENCE STANDARDS SUMMARY – PERFORMANCE STANDARDS

LISTED BY DISCIPLINE, CORE IDEA

LS1 – FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES

LS1.A. Structure and function – Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Activities

- Level 1, Vertebrate Classes
- Level 1, Mammal Traits
- Level 1, Head, Shoulders, Knees, and Toes
- Level 1, Bird Traits
- Level 1, Beaks, Legs, and Feet
- Level 1, Sounds Fishy to Me
- Level 1, Adapt Your Fish
- Level 1, Creeping, Crawling, and Slithering
- Level 1, Three Midwest Reptiles

LS1.B. Growth and development of organisms

Activities

- Level 1, Egg to Tadpole to Frog
- Level 1, How Amphibians Survive

LS2 – ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS

LS2.A. Interdependent relationships in ecosystems – The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals.... Decomposition eventually restores (recycles) some materials back into the soil. Organism can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

Activities

- Level 1, Animal Needs
- Level 1, Vertebrate Classes
- Level 1, Read about Wildlife
- Level 1, Head, Shoulders, Knees, and Toes
- Level 1, Squirrel Feeder Watch
- Level 1, Bird Feeder Watch

- Level 1, Birdbath Watch
- Level 1, Feeding Hummingbirds
- Level 2, Pioneers in Wildlife Conservation
- Level 2, Signs of Wildlife
- Level 2, Wildlife Real Estate
- Level 2, We Don't Live Here Anymore
- Level 2, Mammal Habitat
- Level 2, Squirrel Habitat Game
- Level 2, Bird Habitat
- Level 2, Fish Habitat
- Level 2, Amphibian Habitat
- Level 2, Reptile Habitat
- Level 3, Studying Wildlife Habitat
- Level 3, Creating Wildlife Habitat
- Level 3, City Dwellers, Country Dwellers
- Level 3, Wildlife Pests
- Level 3, Manage Wildlife
- Level 3, Crop Depredation
- Level 3, Conservation Reserve Program (CRP)
- Level 3, Know the Law

LS2.C. Ecosystems dynamics, functioning, and resilience

Activities

- Level 2, Squirrel Habitat Game
- Level 2, Living in a Lake
- Level 2, Impact of Climate Change
- Level 2, We Don't Live Here Anymore
- Level 2, To Hibernate, or Not to Hibernate?
- Level 2, To Migrate, or Not to Migrate?
- Level 2, How Herptiles Survive
- Level 3, Creating Wildlife Habitat
- Level 3, City Dwellers, Country Dwellers
- Level 3, Manage Wildlife
- Level 3, Conservation Reserve Program (CRP)
- Level 3, Impact of Human Activity
- Level 3, Wildlife in Built Environments
- Level 3, Know the Law

LS3 – HEREDITY: INHERITANCE AND VARIATION OF TRAITS

LS3.B. Variation of traits

Activities

- Level 1, Mammal Traits
- Level 1, Bird Traits
- Level 1, Beaks, Legs, and Feet
- Level 1, Sounds Fishy to Me

LS4 – BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY

LS4.B. Natural Selection – Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Activities

- Level 3, Wildlife Pests

LS4.C. Adaptation – For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Activities

- Level 1, Vertebrate Classes
- Level 1, Read about Wildlife
- Level 1, Head, Shoulders, Knees, and Toes
- Level 1, Beaks, Legs, and Feet
- Level 1, Adapt Your Fish
- Level 1, Creeping, Crawling, and Slithering
- Level 1, Three Midwest Reptiles
- Level 3, Know the Law

LS4.D: Biodiversity and Humans – Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Activities

- Level 1, Animal Needs
- Level 1, Creeping, Crawling, and Slithering
- Level 2, Impact of Climate Change
- Level 3, Wildlife Pests
- Level 3, Manage Wildlife
- Level 3, Crop Depredation
- Level 3, Conservation Reserve Program (CRP)
- Level 3, Impact of Human Activity
- Level 3, Wildlife in Built Environments

LIFE SCIENCE PERFORMANCE EXPECTATIONS

GRADE 3

3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles, but all have in common birth, growth, reproduction, and death.

Examples

- Develop models to describe phenomena.
- Science findings are based on recognizing patterns.
- Reproduction is essential to the continued existence of every kind of organisms.
- Patterns of change can be used to make predictions.

Activities

- Level 1, Vertebrate Classes
- Level 1, Mammal Traits
- Level 1, Bird Traits
- Level 1, Beaks, Legs, and Feet
- Level 1, Sounds Fishy to Me
- Level 1, Creeping, Crawling, and Slithering
- Level 1, Egg to Tadpole to Frog
- Level 1, How Amphibians Survive

3-LS2-1. Construct an argument that some animals form groups that help members survive.

Examples

- Construct an argument with evidence, data, and/or a model.
- Being part of a group helps animals obtain food, defend themselves, and cope with changes.
- Cause-and-effect relationships are routinely identified and used to explain change.

Activities

- Level 1, Squirrel Feeder Watch
- Level 1, Bird Feeder Watch
- Level 1, Birdbath Watch
- Level 1, Feeding Hummingbirds
- Level 1, Animal Needs

3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates and reproducing.

Examples

- Use evidence (e.g., observations, patterns) to construct an explanation.
- Cause and effect relationships are routinely identified and used to explain change.

Activities

- Level 1, Mammal Traits
- Level 1, Head, Shoulders, Knees, and Toes
- Level 1, Bird Traits
- Level 1, Adapt Your Fish

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Examples

- Cause-and-effect relationships are routinely identified and used to explain change.
- Knowledge of relevant scientific concepts and research findings is important in engineering.

Activities

- Level 1, Animal Needs
- Level 1, Read about Wildlife
- Level 1, Adapt Your Fish

GRADE 4

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Examples

- Construct an argument with evidence, data, and/or a model (4-LS1-1)
- Use a model to test interactions concerning the functioning of a natural system.

Activities

- Level 1, Head, Shoulders, Knees, and Toes
- Level 1, Animal Needs
- Level 1, Vertebrate Classes
- Level 1, Beaks, Legs, and Feet
- Level 1, Sounds Fishy to Me
- Level 1, Creeping, Crawling, and Slithering

MIDDLE SCHOOL

In middle school, students should have opportunities to learn standard techniques for displaying, analyzing, and interpreting data; such techniques include different types of graphs, the identification of outliers in the data set, and averaging to reduce the effects of measurement error. Students should also be asked to explain why these techniques are needed.

MS-LS2. Ecosystems: interactions, energy, and dynamics

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms. Emphasis is on cause-and-effect relationships between resources and the growth of individuals and the numbers of organisms during periods of abundant and scarce resources.

- Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving factors.
- In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for

limited resources, which consequently constrains their growth and reproduction.

- Growth of organisms and population increases are limited by access to resources.

Activities

- Level 2, Wildlife Real Estate
- Level 2, We Don't Live Here Anymore
- Level 2, Mammal Habitat
- Level 2, Squirrel Habitat Game
- Level 2, Bird Habitat
- Level 2, Fish Habitat
- Level 2, Amphibian Habitat

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organism across multiple ecosystems.

- Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms.
- Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival.
- Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

Activities

- Level 2, Signs of Wildlife
- Level 2, We Don't Live Here Anymore
- Level 2, Squirrel Habitat Game

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations.

- Ecosystems are dynamic in nature; their characteristics can vary over time.
- Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.

Activities

- Level 2, We Don't Live Here Anymore
- Level 2, Living in a Lake
- Level 2, Impact of Climate Change

HIGH SCHOOL

As students progress through various science classes in high school and their investigations become more complex, they need to develop skill in additional techniques for displaying and analyzing data, such as x-y scatterplots or cross tabulations to express the relationship between two variables. Students should be helped to recognize that they may need to explore more than one way to display their data in order to identify and present significant features. They also need opportunities to use mathematics and statistics to analyze features of data such as covariation. Also at the high school level, students should have the opportunity to use a greater diversity of samples of scientific data and to use computers or other digital tools to support this kind of analysis.

HS-LS2. Ecosystems: interactions, energy, and dynamics

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. Put emphasis on quantitative analysis and comparison of the relationships among interdependent factors, including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.

- Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges as predation, competition, and disease.
- Organisms would have the capacity to produce populations of great size, were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

Activities

- Level 3, Studying Wildlife Habitat
- Level 3, City Dwellers, Country Dwellers
- Level 3, Wildlife Pests
- Level 3, Manage Wildlife
- Level 3, Talk to a Planner
- Level 3, Impact of Human Activity

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.

- Ecosystems have carrying capacities, ... (as above for LS2-1)
- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

Activities

- Level 3, Talk to a Planner
- Level 3, Impact of Human Activity

HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or seasonal flood, and extreme changes such as volcanic eruption or sea-level rise.

- A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions.
- If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

Activities

- Level 3, Wildlife Pests
- Level 3, Talk to a Planner
- Level 3, Impact of Human Activity
- Level 3, Wildlife in Built Environments

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. Examples of human activities can include urbanization, building dams, and dissemination of invasive species.

- Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.
- Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (Secondary to HS-LS2-7)

Activities

- Level 3, Manage Wildlife
- Level 3, Talk to a Planner
- Level 3, Impact of Human Activity
- Level 3, Wildlife in Built Environments
- Level 3, Know the Law

HS-LS4. Biological evolution: unity and diversity

HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: 1) the potential for a species to increase in number, 2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, 3) competition for limited resources, and 4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Activities

- Level 3, Wildlife Pests

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: 1) increases in the number of individuals of some species, 2) the emergence of new species over time, and 3) the extinction of other species.

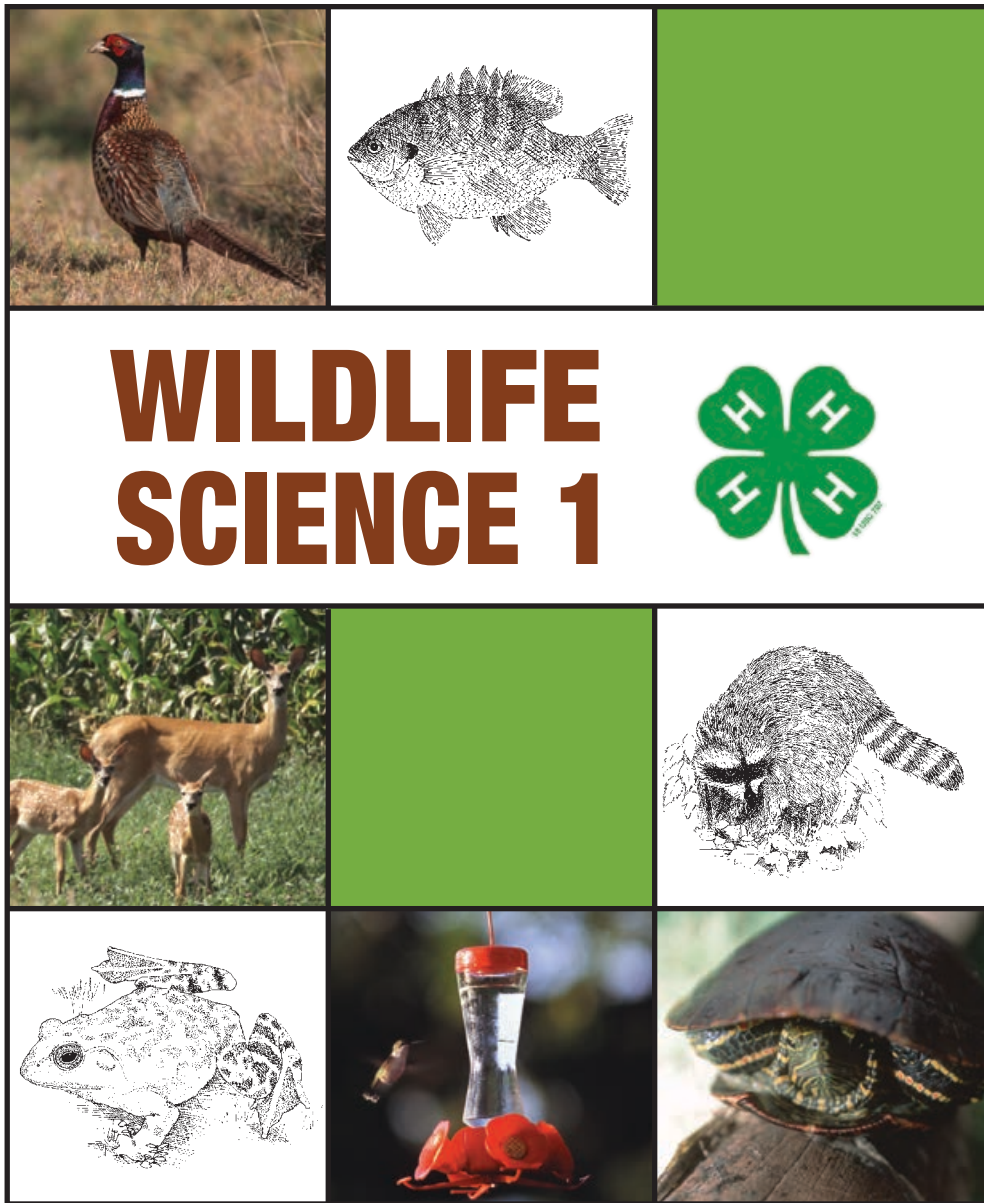
Activities

- Level 3, Manage Wildlife
- Level 3, Talk to a Planner
- Level 3, Impact of Human Activity
- Level 3, Know the Law

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Activities

- Level 3, Manage Wildlife
- Level 3, Talk to a Planner
- Level 3, Impact of Human Activity
- Level 3, Know the Law



WILDLIFE SCIENCE 1



CHAPTER 1: INTRODUCTION TO WILDLIFE SCIENCE 1

ANIMAL NEEDS

BIG PICTURE

Understanding basic animal needs is fundamental knowledge needed to encourage or discourage certain wildlife species at your home, school, or park. While all animals (including humans) need food, shelter, water, and space, how animals meet each need varies widely.

Wildlife biologists call the amount of space a species generally needs its “home range.” Although range is not introduced in this activity, it includes where a species is found. Home range refers to how far an animal will normally travel if its needs are met in its habitat. Examples of home ranges:

- Red fox – about two square miles
- Coyote – about 10 miles but may hunt up to 100 square miles
- Opossum – 15 to 40 acres
- White-tailed deer – less than a square mile

Birds, due to their mobility, have ranges rather than home ranges. Range is the area where birds can be found. Examples:

- Bobwhite quail – Central and Eastern U.S. to Guatemala and Cuba
- Red-tailed hawk – U.S. and most of Canada
- Wild turkey – Eastern and Southwest U.S.

ESSENTIAL CHAT QUESTIONS

Apply: Why does a wildlife biologist need to know basic animal needs? *Wildlife biologists often work to introduce a particular wildlife species to a park or other property. They might also be asked to help discourage problem animals from inhabiting a property. Knowing the basic needs of that species is critical to both these efforts.*

Generalize to Your Life: What do you need to know about bluebirds to create habitat around your house for them? *Eastern bluebird needs:*

Habitat – open farmlands with scattered trees

Range – east of the Rockies from southern Canada to the Gulf of Mexico and as far as the mountains of central Mexico

Nests – in cavities

Food – mostly insects

Water – from prey

FACILITATING THE ACTIVITY

Youth may enjoy discussing what they already know about the animals they listed and figuring out the answers by process of elimination.

Animal Needs table

- Row 1: reptile (Eastern garter snake)
- Row 2: fish (Bluegill)
- Row 3: amphibian (American bullfrog)
- Row 4: bird (Red-tailed hawk)
- Row 5: mammal (Raccoon)

CONNECTIONS

Field guides like Peterson and Audubon have excellent information about ranges, habitats, needs, etc.

LIFE SKILLS

NGSS: LS4.D, 3-LS4-3, LS4.C

Success Indicator: Youth can list the basic animal needs: food, shelter (cover), water, and space.

4-H Life Skills: Decision-making

VERTEBRATE CLASSES

BIG PICTURE

In this activity youth learn about the major vertebrate classes: mammals, birds, fish, reptiles, and amphibians. Vertebrates have a backbone. Invertebrates lack vertebral columns. Vertebrates make up only about 4 percent of animal species but are the species most people refer to when talking about wildlife.

Studying the major traits that define the vertebrate classes helps youth learn generalities about a class. This makes categorizing and learning easier, which is why scientists use taxonomy, the orderly classification of plants and animals, as the identification scheme for all living plants and animals. Vertebrates are a sub-phylum of the phylum chordates in the animal kingdom. Chordates are animals that have a dorsal nerve cord, and vertebrates have a backbone that protects the dorsal nerve cord.

ESSENTIAL CHAT QUESTIONS

Share What Happened: What did you learn in this activity? Can you name the five classes of vertebrates you studied? **amphibians, birds, fish, mammals, reptiles**

Apply: How could being able to talk about a wildlife group be useful? You can discuss the similarities and differences among groups, and can make some inferences about similarities and differences when you see an animal you're not familiar with.

Generalize to Your Life: What other groupings can you think of? Possible answers:

- Trees – deciduous, conifer
- Deciduous trees – maple, oak, ash, sycamore, tulip
- Holidays – Fourth of July, President's Day, Martin Luther King Jr. Day
- Age groups – babies, toddlers, children, youth, adults

FACILITATING THE ACTIVITY

Youth should be able to complete this activity with minimal help, such as identifying and spelling the names of the wildlife shown in the pictures. If they have trouble thinking of similarities and differences, refer to the examples of unique traits of classes in the introduction.

Vertebrate Classes

- Row 1: reptiles
- Row 2: birds
- Row 3: amphibians
- Row 4: fish
- Row 5: mammals
- Answers to the questions about vertebrate traits may be anything that youth want to note – from reading the introduction or their own knowledge. The unique traits of these vertebrates are: **mammals have hair; birds have feathers; fish have fins; reptiles have scales; and amphibians can breathe through their skin.**

CONNECTIONS

- Introduce a taxonomy key to youth who are interested in learning more about categorizations.

LIFE SKILLS

NGSS: LS4.D, 3-LS4-3, LS4.C, LS1.B

Success Indicator: Youth can list and compare

wildlife groups: mammals, birds, fish, reptiles, and amphibians.

4-H Life Skills: Communication / Critical thinking / Self-discipline / Self-motivation

READ ABOUT WILDLIFE

BIG PICTURE

Reading about animals is a good way to learn. Books are great sources of information and encourage youth to read, particularly if they choose the animal they are most interested in. Young children often prefer books that tell a story rather than provide facts.

ESSENTIAL CHAT QUESTIONS

Apply: Could the animal you read about live near your home? The answer depends on the animal's particular habitat needs and where the youth lives.

Generalize to Your Life: What can you learn from reading books? Youth might discuss learning more about wildlife or another interest (examples: cooking, gardening, people in other countries)

FACILITATING THE ACTIVITY

Several sources for nonfiction books about wildlife are available. School and local libraries might have books as part of their leveled collections. Help youth find books appropriate for their reading level. The *National Geographic Kids Reader Series* and the *Amazing Animal Kingdom Series* can be found online for reasonable prices, and some can be downloaded to an e-book reader, if you prefer.

CONNECTIONS

- The PBS series Nature (www.pbs.org/wnet/nature) has many interesting wildlife programs.
- Search for refuges near you at the National Wildlife Refuge System website, www.fws.gov/refuges
- Visit the Urban Wildlife Conservation Program website, www.fws.gov/urban, for information about urban wildlife refuges and standards of excellence.

LIFE SKILLS

NGSS: LS4.D, 3-LS4-3, LS4.C, LS1.B

Success Indicator: Youth can explain the habitat needs of a wildlife species.

4-H Life Skills: Learning to learn