Homeschool Education Guide

A Supplement to the Educator Guide

Federal Junior Duck Stamp Program

Connecting Youth with Nature Through Science and Art!

An opportunity to investigate what is fun, unique, and mysterious about waterfowl and wetlands in North America and in your community.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.

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Acknowledgments

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Spread your wings, create a splash, make a difference.

– Allison Armstrong, 2011 Junior Duck Stamp Contest conservation message winner from Russellville, Arkansas

Have you ever wondered what makes you look up whenever you hear or see a V-shaped flock of geese flying north or south? Is it just the sight or sound, or is it a deeper feeling about the changing seasons? Or why do people like to watch ducks or swans swimming in city parks? Is it their graceful swimming and diving, or just the kaleidoscope of color and movement that fascinate? And why do people "ooh" and "aah" over little duckling fuzzballs following their mothers?

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There is something magnetic about waterfowl that draws the attention and imagination of both city dwellers and country dwellers, young and old. You can use this supplement to the Junior Duck Stamp curriculum to encourage your homeschooled student(s) to explore and investigate waterfowl and wetlands through fun activities they choose. Students will use this new knowledge base to develop and implement a conservation service project in their community. **So if your homeschool student…**

IS CURIOUS – There are countless questions to be asked, such as: Were there ducks when the dinosaurs were alive? Why did the Labrador Duck become extinct? Do all waterfowl look alike? Do all ducks quack?

LIKES TO DISCOVER NEW THINGS – There are plenty of things and places to explore, such as: How many duck decoys are needed to attract ducks? Do the same ducks live in your community all the time or do duck populations change with the seasons?

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LIKES TO DRAW AND/OR WRITE – The Junior Duck Stamp curriculum activities, participating in the Junior Duck Stamp Art Contest, and/or creating a service project all are great ways to express creativity.

WANTS TO MAKE A DIFFERENCE – Students can share what they've learned by developing a science, stewardship, or education/communication project for your community.

Photo courtesy of Victoria Rydberg

If your student answers "yes" to any or all of these questions, dive right in! The *Homeschool Guide* is one of several guides in the Junior Duck Stamp program providing activities, tips, and ideas to inspire your homeschool student.

GETTING STARTED

From a single idea grew a program poised to rejuvenate the nation's passion and commitment to preserving the outdoors. The Junior Duck Stamp Program provides opportunities for hundreds of thousands of youth each year to investigate what is fun, unique, and mysterious about waterfowl and their wetland habitats. What is a Duck Stamp? How can your family benefit from participating in Junior Duck Stamp activities and Art Contest? How can you use this supplement to help meet your homeschool goals? This Junior Duck Stamp *Homeschool Guide* is designed to help you find the answers to these questions and more!

The U.S. Fish and Wildlife Service (FWS) recognizes that homeschoolers don't all follow the same approach to selecting a plan of study. Some families may choose a traditional K-12 curriculum. Some may prefer to design their own curriculum, using traditional school subjects that are modified to reflect the needs of their families. Finally, some parents may choose not to pursue a traditional curriculum, letting life experience and personal interests drive learning. Whatever your style, this *Homeschool Guide* will provide guidance and support for you and your children to get the most out of wetland and waterfowl experiences and/or Junior Duck Stamp Art Contest participation. The Junior Duck Stamp curriculum was written for youth in grades 5 through 8. Students at any age will get the most out of the curriculum if they have an active voice in choosing what they will do and how to proceed.

The Junior Duck Stamp Program *Homeschool Guide* recommends selected *Youth Guide* activities to help youth build awareness and skills needed to develop a waterfowl or wetland project with an emphasis on science, stewardship, or education/communication. See below and page 8 for more information on the *Youth Guide*.

What is the Junior Duck Stamp Program?

The Junior Duck Stamp Conservation & Design Program provides a science-based arts curriculum emphasizing conservation of waterfowl (ducks, geese, and swans) and wetlands. It is designed to complement the Junior Duck Stamp Art Contest and to spark youth interest in habitat conservation through a variety of complementary academic disciplines: science, art, math, and technology. Students are encouraged to explore, investigate, and express what they've learned through science and the arts, and then share their thoughts and feelings with members of their communities.

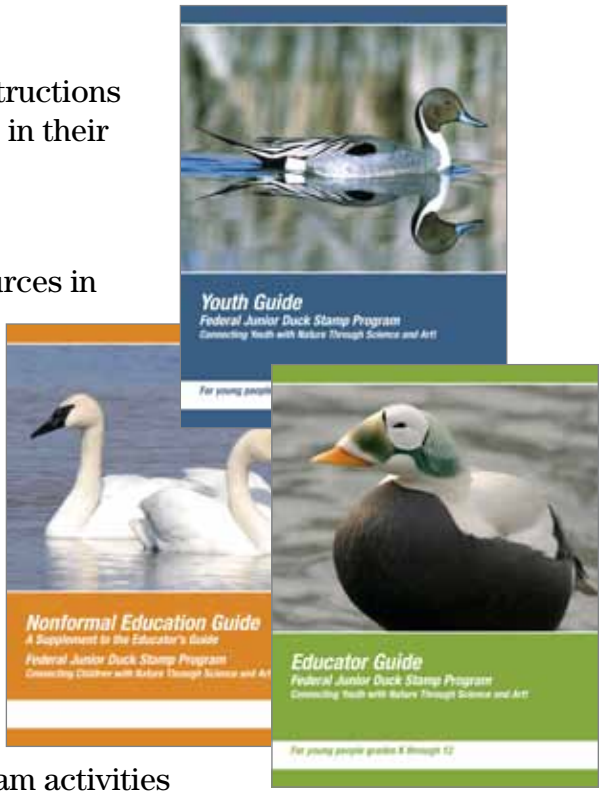
The Junior Duck Stamp *Youth Guide* and *Educator Guide* are rich sources of meaningful activities for young people. The *Youth Guide* includes all the instructions and materials that youth need to study waterfowl and to build skills for competing in the Junior Duck Stamp Art Contest, if they so choose. The *Educator Guide* provides additional background materials and tips for incorporating waterfowl conservation education into an ongoing curriculum as well as for facilitating youth involvement.

Each of the learning units in the program combines information on biological and ecological sciences, conservation science careers, and math, as well as a variety of visual and language arts. This multidisciplinary structure provides multiple entry points for students, depending

on their interest, and allows educators from a variety of academic areas to combine efforts to make an even greater impact on student achievement and engagement. In addition, the unit activities encourage the realization of common goals among community partners (schools, scientists, land managers, other community members).

Find more information about FWS conservation programs, and the Junior Duck Stamp Art Contest and Curriculum Guides (described below) at www.fws.gov/juniorduck/.

Curriculum Guides and the Junior Duck Stamp Art Contest



Junior Duck Stamp *Youth Guide*

The *Youth Guide* includes all the information and instructions learners will need to explore waterfowl and wetlands in their communities.

Junior Duck Stamp *Educator Guide*

Educators will find a variety of information and resources in the *Educator Guide* to take the guesswork out of designing a Junior Duck Stamp program or to enhance an existing program. Resources from general waterfowl and wetlands information to standards correlations will help meet educator and student needs. Suggestions for adapting content to lower or higher grades are provided in the *Educator Guide*, page 25.

Junior Duck Stamp *Nonformal Education Guide*

The *Nonformal Education Guide* is a supplement designed to be used with the Junior Duck Stamp *Educator Guide* and *Youth Guide*. It highlights program activities that are appropriate for educational experiences outside of the formal school setting, and particularly for settings that are close to waterfowl habitat. Homeschool programs may find this guide to be a useful resource for fieldtrip ideas and activities.

Junior Duck Stamp Art Contest

Encouraging students to participate in the Junior Duck Stamp Art Contest can spark enthusiasm for learning. The Junior Duck Stamp Art Contest begins each spring, when students submit their artwork to a state or territory contest. Students at the state level are judged in four groups according to grade level: Group I: K – 3, Group II: 4 – 6, Group III: 7 – 9, and Group IV: 10 – 12. Three 1st, three 2nd, and three 3rd-place entries, as well as 25 "Honorable Mentions" are selected for each group. A "Best of Show" is selected by the judges from the 12 first-place winners regardless of their grade group. Each state or territory Best of Show is then submitted to the federal Duck Stamp office and entered into the national Junior Duck Stamp Art Contest. The first place design from the national contest is used to create a Junior Duck Stamp for the following year.

To further the interdisciplinary underpinnings of the program, students are now encouraged (but not required) to include a conservation message on their entry form with their art design. The conservation message is judged in some states and at the national level for Best of Show winners. The message should explain something the student has learned about wetlands habitat, conservation, or waterfowl. It may also be a statement used to encourage others to participate in conservation. See Appendix A (page 43) for more on the Junior Duck Stamp Art Contest and how your students can participate, or visit the Junior Duck Stamp website: www.fws.gov/juniorduck/.

How is the *Homeschool Guide* Organized?

The focus of the *Homeschool Guide* is to help students expand their interests in waterfowl and wetlands in North America and in your community. The guide is organized around the idea that students will develop and implement a project that addresses their interests, builds their science and literacy skills, and applies information they learn by trying Junior Duck Stamp activities.

The Junior Duck Stamp *Homeschool Guide* will help you introduce waterfowl and wetland topics to your children through a variety of activities. These activities, in turn, will help homeschooled students build skills needed to plan related service or stewardship projects.

The *Homeschool Guide* builds on content provided in each of the six units outlined in the Junior Duck Stamp *Youth Guide*.

Youth Guide Units

Introduction: The Call of the Wild Duck
Unit 1: What is …a Waterfowl
Unit 2: A Day in the Life: Preening, Dabbling, and Other Unusual Behaviors
Unit 3: Raising a Family in a Wetland
Unit 4: Going the Distance: Migrating Across Continents
Unit 5: Learning from the Past; Taking Action for the Future

Each *Youth Guide* unit is organized according to the following four sections. Activities in these sections will help students build skills needed for project-based learning.

- **Explore** – Students discover places where waterfowl live, observe waterfowl and other creatures that share wetland habitats, and learn about some of the challenges to waterfowl survival.
- **Investigate** – Students learn questions that scientists are asking about waterfowl and see how they go about trying to answer those questions. They ask their own questions and devise plans to find the answers.
- **Express** – Students see how artists, past and present, have expressed the beauty and uniqueness of waterfowl. They write, draw, paint, and use some more unusual forms of art to express thoughts and feeling about what they've learned.
- **Share** – Students reflect on their Junior Duck Stamp activities and share what they've learned through art, writing, and taking action to improve waterfowl habitat.

The *Youth Guide* and *Educator Guide* offer additional information that provides a context for activities as well as additional activities and educator resources for exploring a particular theme.

In The *Homeschool Guide*

Using the Homeschool Guide (beginning on page 10) introduces project themes – citizen science, stewardship, environmental education/communication.

Project Planning (beginning on page 13) provides tips for how to facilitate your child's exploration of the Junior Duck Stamp material when developing a project, and provides detailed project resources for each of the three project themes.

Building Skills Unit By Unit (beginning on page 15) identifies which *Youth Guide* activities correlate to each of these four concepts, what skills students will learn, and where you can find more information about each activity in the *Youth Guide* and *Educator Guide*.

Getting Ready to Do a Project (beginning on page 29) provides a project checklist, project ideas, and background information about projects.

Using the *Homeschool Guide*

Learning and the Junior Duck Stamp *Homeschool Guide*

The Junior Duck Stamp *Homeschool Guide* is written for the homeschool educator, as a supplement to the Junior Duck Stamp *Educator Guide* and *Youth Guide*. It is designed to help families take advantage of the flexibility of the learning environment in the homeschool setting to enhance the quality of learning about the environment as well as teach skills that students will use for the rest of their lives. This guide makes it easy for families to select activities that best match their interests and their educational goals. *Youth Guide* activities build the skills students need to successfully engage in a wetland or waterfowl project. Project-based learning allows students to apply and practice skills in multiple disciplines as they pursue their goal. Find more about project-based learning in Appendix B.

Why Waterfowl and Wetlands for Homeschoolers?

Homeschool families are in unique positions to get the most out of their Junior Duck Stamp experiences. Homeschool youth have much more freedom to explore connections to the natural world because they are not limited to a particular setting or time frame, as many formal and even nonformal educational experiences usually are. Waterfowl, as subjects, are beautiful and fun to watch; amazing flyers, divers, and swimmers; and closely connected to not only wetland habitats, but also to human history and culture. Exploring waterfowl and wetlands is something that family members all can enjoy together or as part of their larger community.

The *Homeschool Guide* is designed to encourage families to take advantage of community outdoor classrooms such as wildlife refuges, nature centers, or national, state, county and municipal parks and forests. Natural history, science, and children's museums, as well as zoos, can also play a big role in learning about wetlands and waterfowl for students in urban or suburban settings.

Project Themes

The *Homeschool Guide* provides project ideas for three learning themes:

- citizen science,
- stewardship, and
- education/communication.

Students, with adult guidance as needed, construct their own outdoor learning by combining what they learn from the *Youth Guide* with project suggestions from this guide, along with the advice of community experts.

Project example: Unit 2 in the *Youth Guide* suggests that students build a blind for wetland bird observation, a stewardship project. Information for how to carry out the project is provided in Unit 2 of the *Youth Guide* and *Educator Guide*.

> To build a blind, a student would need to read about bird blinds and study illustrations (reading, art, design); interview people who have built and used blinds (communication, social studies); study and implement plans for building and locating a blind (math, reading, science, engineering, following directions); and use the blind to make observations or collect data (science, math, art). Above all, the student gains skills in thinking through the steps of a project and direct experience in evaluating whether his/her plan was workable. The student learns to be flexible in approaching a learning situation and adapting the approach to address new problems and opportunities as they arise.

Project Themes Defined

What Is Citizen Science? Citizen scientists, often with the guidance of natural resource professionals and researchers, voluntarily engage in data collection to further knowledge of ecological or other systems.

> Skills featured in carrying out a citizen science project include: analyzing, comparing, computing, describing, diagramming, explaining, gathering evidence, identifying, inferring, investigating, listening, map reading, measuring, observing, planning, predicting, questioning, recording, researching, and sketching.

What Is Environmental Stewardship? The vision of the U.S. Fish and Wildlife Service is that the Junior Duck Stamp program activities will create long-term youth stewards to help preserve wetlands and waterfowl. A steward is someone entrusted to maintain and manage a resource—such as wildlife food or habitat—for others. Stewards of natural resources protect, restore, or preserve a resource for themselves and for their communities. A variety of plants and animals within the community may benefit from stewardship actions; evidence indicates that restoring wetlands benefits waterfowl and other wildlife. Restoring degraded streams or wetland habitats can benefit people as well by helping to protect drinking water sources and by dissipating the power of flood waters.

Skills featured in carrying out an environmental stewardship project include: comparing, developing visual ideas, describing, diagramming, explaining, gathering evidence, identifying, journaling, listening, map reading, measuring, modeling, observing, planning, predicting, recording, and sketching.

What Do We Mean by "Environmental Education/Communication"? An important component of learning about the environment is to reflect on the educational experience by creating a way to communicate what you've learned with others. Having to create a message to tell others what you've learned tends to make what you've learned more concrete and more memorable.

Skills featured in carrying out an environmental education/communication project include: analyzing, comparing, computing, communicating, connecting art to other subjects, critical thinking, developing visual ideas, describing, explaining, gathering evidence, identifying, listening, modeling, observing, planning, recording, and sketching.

Choosing a Project

Encourage your child to read through the topics and activities in the *Youth Guide*. Which ones spark his or her interest? Your child's interest should form the foundation for generating project ideas. Allow your child to choose and plan the Junior Duck Stamp activity as well as choosing the activity site, for the best learning outcomes.

Project Planning (beginning on page 13) provides a step-by-step guide to how to help your child choose, prepare, and implement a project.

Looking for more choices? You may be able to help by becoming familiar with the *Youth Guide* as well. Some activity choices might be driven by factors such as the time required, the specific habitat at a nearby natural area, and/or the time of year. Also consider reviewing other resources specifically designed to help young people choose and carry out a project. For example, *Give Water a Hand*, a youth water and service-learning curriculum, provides youth with tips on identifying a service project and leaders with ideas on how to facilitate youth as they carry out a project. For materials see http://www.uwex.edu/erc/gwah/.

Notes:

Project Planning

The Junior Duck Stamp *Homeschool Guide* will help you introduce waterfowl and wetland topics to your student through a variety of activities. These activities, in turn, will help students build interest and skills needed to plan and carry out a project.

Let's Get Started

1. Download copies of the Junior Duck Stamp *Youth Guide* and *Educator Guide* from www.fws.gov/juniorduck. Encourage your student to read through the *Youth Guide* to spark curiosity about wetlands and waterfowl, and to learn what the guide has to offer. At the same time, you can examine the *Educator Guide*.
2. Encourage your student to complete the activities in the Introduction: The Call of the Wild Duck (pages 11-23 of the *Youth Guide*). This will prepare students by allowing them to practice observation and journaling skills needed throughout their Junior Duck Stamp adventure.
3. Explore other Unit activities. Building Your Skills: Unit by Unit, in the next section (beginning on page 15), provides a short summary of *Youth Guide* content and ideas for how you might use unit content to create a project. Help your students discover which activities they would be interested in completing. Students should have the opportunity to choose what interests them. Be prepared to take them to local parks, zoos, natural history museums, and/or local nature centers or refuges to see waterfowl and explore their habitats. Encourage them to speak to the scientists and other natural resources professionals at these facilities to ask questions and to learn more about waterfowl-related topics and projects of interest.
4. Nurture your students' curiosity by building on their interests. Are they always asking questions? Maybe they would be most interested in activities that involve collecting data to learn more about waterfowl, in which case science-based project opportunities might be appealing. Maybe they are more interested physical challenges. Stewardship project opportunities can involve youth in varying levels of physical activity. Maybe they are more interested in using their creative skills to promote awareness of waterfowl and wetlands by developing conservation messages to share within your community or beyond.
5. Together with your student(s), read through information provided for each of the three project themes outlined in this *Homeschool Guide*: science, stewardship, and education/communication.
6. Use the information provided in the Theme Tables for each unit to find *Youth Guide* activities that will support your students' project plans. The table highlights which activities provide information and skill-building ideas to help students create a more educational and personally meaningful project experience.

Activity Materials

The most important material for your child's project is the field site itself. But beyond that, the activities in this guide are more effective if students have the necessary tools and equipment, such as data gathering equipment, maps, photos of birds, field guides, and binoculars. Check the Unit-by-Unit Guide section of the *Educator Guide* (page 32) for lists of materials needed for each Unit activity. If you find it difficult to gather required materials, don't give up; it may be time to establish a relationship with a partner as described below.

Optimize Learning

How can you help optimize outdoor learning experiences for your child? The *Educator Guide* provides quick tips on effective teaching techniques on pages 26-27. Your student's activities will, for the most part, be self-directed. You, as a facilitator of the learning process, can be helpful in introducing your student to the learning opportunities and resources in your community, and in encouraging learners to reflect on their activities. What was accomplished? What's next?

Your guidance will also be needed as your students build a project plan. Help them consider questions itemized in Getting Ready to Do a Project (beginning on page 29) as they make their plans. Discuss safety with your children and have them speak with a natural resources professional or staff person at the outdoor area where the project will occur about possible risks such as poison ivy, fast moving waters, or biting insects.

Note: See Appendix B for background information on nurturing your students' learning using inquiry-based learning and project-based learning.

Place-based Learning

The *Youth Guide* encourages learning at outdoor sites where waterfowl are present. Once your student(s) have determined which site(s) they may want to visit to develop or carry out their project, an introduction to the site will be helpful. Check with site staff members or volunteers about programs, special events, and print materials offered to answer questions such as: Why is this place special? Why is it important to waterfowl? What is the history of this piece of land? What are some current threats or opportunities? How are people helping to manage this land for waterfowl/wildlife? How does this information relate to the activity topic you've chosen? The Junior Duck Stamp activities are more meaningful if you use examples of species, habitats, and conservation issues specific to your site.

Working with Partners

Projects that engage students in "real world" experiences such as restoration and citizen science often require a partnership with a group or organization. Many conservation organizations have volunteer and citizen science opportunities in which youth can participate. Others may have ideas for projects that would be beneficial to waterfowl in your area. These organizations may be interested in collaborating with you to provide your child or a group of homeschooled children with authentic experiences. The *Educator Guide*, page 24, provides additional ideas on potential partners.

Building Skills Unit By Unit

INTRODUCTION: THE CALL OF THE WILD DUCK

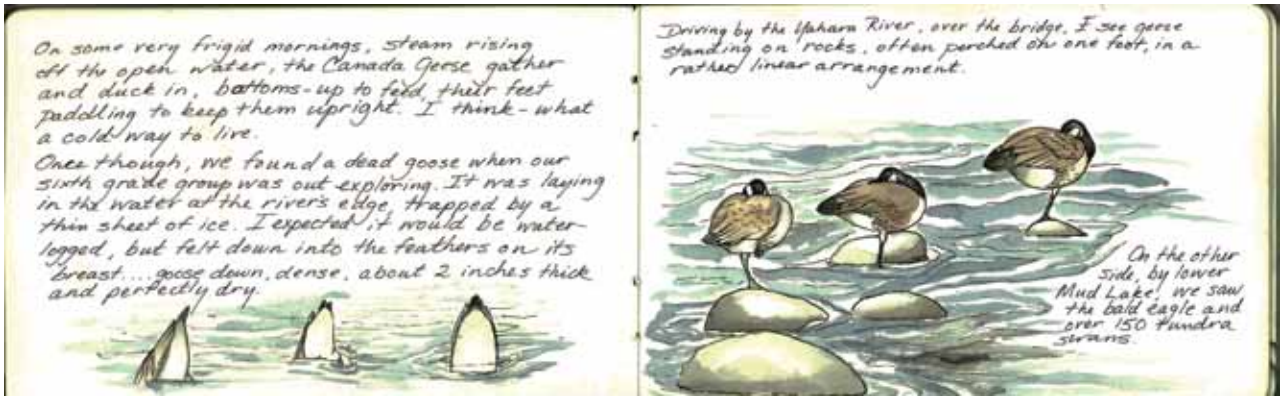
(Youth Guide, page 7, Educator Guide, page 33)

Lesson Focus

Your student prepares for fun outdoor experiences, and for collecting and interpreting outdoor observation about waterfowl and wetland habitats.

Background

One way for students to record their observations throughout their study of waterfowl and connect their experiences is by keeping a journal. The Junior Duck Stamp materials refer to this journal as a Nature Notebook. Nature Notebooks are used in many of the lesson activities in this guide. Before your student starts a study of waterfowl using lessons 1-5, provide time for him or her to learn to use a Nature Notebook.



Sample Nature Notebook entry by Janet Moore

Many famous naturalists, from Charles Darwin to Meriwether Lewis, kept nature journals, describing and drawing their observations and experiences. Comparing his drawings and observations of birds living on different islands helped Darwin develop his theories of evolution. Lewis's journals, written during the Lewis and Clark Expedition, illustrated new species of plants and animals that had never been recorded. There is so much we still don't know about nature. By keeping a Nature Notebook, students can make their own important discoveries!

At a Glance

The At a Glance box on page 33 of the *Educator Guide* offers a quick look at learning objectives, academic disciplines addressed in the lessons, process skills, conservation concepts, and vocabulary for the Introduction.

Building Project Skills

Activities in this introductory unit will help build skills that your student might need if pursuing a citizen science, stewardship, or environmental education project. All activities in the Introduction are recommended to help students use the Junior Duck Stamp *Youth Guide*

effectively, to give them practice in wildlife observation and journaling, and to get them focused on wetland habitat and waterfowl characteristics through field sketching. Skills are outlined in Table 1 on page 17.

Related Resources

Journaling

There are a number of how-to guides available on the Internet for learning how to keep a Nature Notebook. Here a few examples:

- (K–12) *Smithsonian Education in your Classroom*, *Introduction to the Nature Journal*. http://www.smithsonianeducation.org/educators/lesson_plans/journals/smithsonian_siyc_fall06.pdf
- (5–12) *Take Note!*, *All About Birds*, Cornell Lab of Ornithology. http://www.allaboutbirds.org/NetCommunity/Page.aspx?pid=1852

Finding natural areas and natural resource professional partners

- See the *Contact for Ideas* list on page 20 of the *Youth Guide*. Check *Potential Partners* on page 24 of the *Educator Guide* for suggestions for creating partnerships with natural resource experts.
- Many states have a statewide environmental education (EE) association. Environmental education association memberships are made up of EE or nature centers, museums, zoos, and a variety of other non-profit organizations. They often have natural areas and public EE programs, and are good sources of resources to find people, places, and programs on wetlands and/or waterfowl in your area. For information about the North American Association of Environmental Education, go to: http://www.naaee.org/about-naaee/affiliates/.
- Find public lands:
  U.S. Fish and Wildlife Service, National Wildlife Refuge System locator map
  http://www.fws.gov/refuges/
  Find a Forest by State, USDA Forest Service
  http://www.fs.fed.us/recreation/map/state_list.shtml
  Find a National Park, U.S. National Park Service
  http://www.nps.gov/findapark/index.htm
  Public Lands Information Center: Your One-Stop Source for Recreation Information, Public Lands Interpretive Association
  http://www.publiclands.org/home.php

Table 1. List of Introduction skill-building activities and the project themes they support

	INTRODUCTION	GUIDE LOCATION		SKILL BUILDING FOR PROJECT THEMES		
Section	Skill-Building Activities	*Youth Guide*	*Educator Guide*	Citizen Science	Conservation Stewardship	Environmental Education/ Communication
Explore	Start a Nature Notebook	p. 16	p. 35	X	X	X
	Make a Plan	p. 16	p. 35	X	X	X
	Find Waterfowl Where You Live	p. 16	p. 36	X	X	X
Investigate	Observe a Duck, a Goose, and a Swan	p. 17	p. 36	X	X	X
	Visit a Natural Area, Park, or Zoo and Make Nature Observations	p. 18	p. 36	X	X	X
Express & Share	Use Your Nature Notebook	p. 19	p. 37	X	X	X
	Tell Someone, Show Someone, or Take a Friend with You	p. 19	p. 37	X	X	X

Notes:

Notes:

UNIT 1. WHAT IS …A WATERFOWL?

(Youth Guide, page 25, Educator Guide, page 39)

Lesson Focus

Your student explores external waterfowl characteristics and the relationships they have to the habitats where waterfowl live.

Background

Birds are warm-blooded vertebrates. They have three characteristics which distinguish them from other animals: feathers, hard-shelled eggs, and hollow bones. Waterfowl can be distinguished from other birds by their characteristics that maximize the ability to survive in a wet environment. For example, waterfowl have a specialized feather structure including waterproof external feathers, a body shape designed for swimming, feet and foot webbing that is distinctive as compared to other water birds, unique positioning of feet and legs on the body in a way that is adapted to food gathering and other life activities, shapes of the bill that are adapted to food gathering and eating, and characteristics pertaining to the way they fly. Understanding how waterfowl are adapted to their environment helps people protect or manage the special habitats they need to thrive.

Laura Maloney, DJ Case & Associates

At a Glance

The Unit 1 At a Glance box on page 39 of the *Educator Guide* offers a quick look at learning objectives, academic disciplines addressed in the lessons, process skills, conservation concepts, and vocabulary.

Building Project Skills

Activities in Unit 1 will help students build waterfowl identification skills, which are particularly helpful in citizen science activities, such as bird counts or nesting observations that require bird identification skills. Developing communication skills through language and visual arts will help students share their new knowledge with others more effectively. Skills are outlined in Table 2 on page 20.

Related Resources

See page 53 of the *Educator Guide* to find additional resources related to Unit 1 topics.

Table 2. List of Unit 1 skill-building activities and the project themes they support

	UNIT 1	GUIDE LOCATION		SKILL BUILDING FOR PROJECT THEMES		
Section	Skill-Building Activities	*Youth Guide*	*Educator Guide*	Citizen Science	Conservation Stewardship	Environmental Education/ Communication
Explore	What Traits Do Birds Share?	p. 31	p. 45	Comparing Describing Observing Listening		Communicating Connecting art to other subjects Describing Developing visual ideas Explaining
	What Shape Is a Waterfowl?	p. 33	p. 45			
	Telling the Difference by Shape	p. 34	p. 45			
	Which of these Feet Belong to a Duck, Goose, or Swan?	p. 34	p. 45			
	Bird Songs	p. 35	p. 45			
Investigate	Feathers	p. 37	p. 46	Comparing Describing Gathering evidence Identifying Measuring Recording Researching	Identifying Measuring Researching	Connecting art to other subjects Describing Identifying
	Water Off a Duck's Back?	p. 38	p. 47			
	The Right Bill for the Job	p. 40	p. 47			
	The Winner by a Foot	p. 41	p. 47			
	True Colors	p. 42	p. 47			
	More Exploring and Investigation	p. 44	p. 48			
	Investigate Your Question	p. 45	p. 48			
	Telling the Difference	p. 46	p. 48			
Express	Simple Shapes	p. 48	p. 48	Describing Identifying Journaling Observing Sketching	Identifying Sketching	Describing Identifying Journaling Modeling Sculpture techniques Sketching Writing
	Shape Sculpture	p. 50	p. 49			
	What's in a Name?	p. 50	p. 49			
	Scientists or Artists or Writers?	p. 51	p. 49			
	Artist's Techniques and You	p. 53	p. 49			
	Waterfowl in the Arts	p. 54	p. 50			
Share	Biomimicry	p. 55	p. 50	Describing		Communicating Connecting art to other subjects Developing visual ideas Modeling
	Dressed for Work!	p. 55	p. 50			

Unit 2. A DAY IN THE LIFE – PREENING, DABBLING, AND OTHER UNUSUAL BEHAVIORS

(Youth Guide, page 59, Educator Guide, page 57)

Lesson Focus

Your student observes waterfowl behaviors and discovers where these behaviors take place in waterfowl habitat at a local field site.

Background

While all waterfowl perform the same general selection of behaviors, such as feeding, resting, flying, and mating, the way they perform each behavior is often unique to the species. These behaviors provide ways of distinguishing one species from another. They also provide humans with insights about habitat needs specific to each species. Look at how ducks fly, for example. Consider how they maneuver as part of a flock, and how each individual takes off and lands on water. How do they get their food? Do they "tip up" and feed in shallow water, or dive deep, surfacing many feet away? Do the birds stay with their mates, or take off on their own? Do mates care for their young together or are ducklings or goslings usually accompanied by only one parent as they grow? There are hundreds of questions your students can consider about how these birds survive in their environment. Help build curiosity among your students about these fascinating aspects of our natural world.

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At a Glance

The Unit 2 At a Glance box on page 57 of the *Educator Guide* offers a quick look at learning objectives, academic disciplines addressed in the lessons, process skills, conservation concepts, and vocabulary.

Building Project Skills

Activities in Unit 2 help students become familiar with some distinctive behavioral traits of waterfowl, which help them survive in wetland habitats. Familiarity with unique behaviors of waterfowl species helps students identify waterfowl with more confidence. Knowing what plants a particular duck species uses for nesting might be the basis for planning a stewardship project to restore native wetland plants. Teaching young children about the interesting behaviors of dabbling ducks in a nearby pond has the potential for a fun and rewarding education project. Skills are outlined in Table 3 on page 22.

Related Resources

See page 69 of the *Educator Guide* to find additional resources related to Unit 2 topics.

Table 3. List of Unit 2 skill-building activities and the project themes they support

	UNIT 2	GUIDE LOCATION		SKILL BUILDING FOR PROJECT THEMES		
Section	**Skill-Building Activities**	***Youth Guide***	***Educator Guide***	**Citizen Science**	**Conservation Stewardship**	**Environmental Education/ Communication**
Explore	Right Out of the Egg! Precocial Youngsters!	p. 65	p. 62	Analyzing Describing		Communicating Developing visual ideas Explaining
	Parenting Tricks?	p. 66	p. 62			
Investigate	Identifying Birds by Their Behavior	p. 67	p. 63	Comparing Creating evaluative strategies Describing Developing research capabilities Identifying Planning Recording	Comparing Evaluating Identifying Planning Recording	Communicating Connecting art to other subjects Describing Developing visual ideas Identifying Observing Planning
	Observing Behavior of Birds	p. 69	p. 63			
	Animal Behavior Research	p. 71	p. 63			
	Investigate Your Question	p. 72	p. 63			
	Fact or Fantasy	p. 74	p. 64			
	Native American Stories about Waterfowl	p. 75	p. 64			
Express	What Does Behavior Look Like?	p. 48	p. 48	Describing Journaling Listening Recording Researching	Journaling Recording	Describing Identifying Journaling Modeling Sculpture techniques Sketching Writing
	Take Your Own Photos	p. 50	p. 49			
	The World from the Point of View of a Dabbling Duck	p. 50	p. 49			
	Observe and Study Waterfowl – A Blind to Help You See	p. 51	p. 49			
	Observe and Study Waterfowl – Make a Decoy	p. 53	p. 49			
	Observe and Study Waterfowl – Duck Calls	p. 54	p. 50			
Share	Create a Mural with Your Group	p. 83	p. 66	Describing	Describing	Communicating Connecting art to other subjects Describing Developing visual ideas
	Play Waterfowl Charades					
	Make Greeting Cards					

UNIT 3. RAISING A FAMILY IN A WETLAND

(Youth Guide, page 87, Educator Guide, page 75)

Lesson Focus

Your student examines waterfowl food, shelter, and reproduction needs, in the context of their homes—wetlands and the surrounding upland habitats.

USFWS photo by Tim Bowman

Background

Waterfowl are normally solitary nesters. That is, they don't nest in large groups or colonies. The size of the nesting territory that is defended by a particular hen or mated pair is determined by the aggressiveness of those particular birds. Pair formation in geese and swans tends to be permanent until one of the pair dies. If a mate dies, the remaining bird will often re-mate. Ducks tend to seek new mates each year.

Waterfowl breed in wetlands and the surrounding upland areas. Habitat is critical for nesting—providing food and shelter, as well as nest-building materials. The U.S. Fish and Wildlife Service Small Wetlands Program[1] uses funds from the sale of federal Duck Stamps to permanently protect some of the most threatened and productive migratory bird habitat in the U.S. Learn more about the federal Duck Stamp on page 162 of the *Youth Guide*.

Note: This lesson is ideal for a spring field trip to a location where you might see waterfowl nesting, or at least see the habitat components important to nesting waterfowl.

© Alan Vernon

At a Glance

The Unit 3 At a Glance box on page 75 of the *Educator Guide* offers a quick look at learning objectives, academic disciplines addressed in the lessons, process skills, conservation concepts, and vocabulary.

Building Project Skills

Activities in Unit 3 help students build skills for a project related to waterfowl reproduction and survival, such as conducting nest counts, building nest boxes, or creating a community campaign on the importance of wetland conservation to maintain waterfowl breeding areas. Skills are outlined in Table 4 on page 24.

Related Resources

See page 95 of the *Educator Guide* to find additional resources related to Unit 3 topics.

[1] http://www.fws.gov/refuges/smallWetlands/

Table 4. List of Unit 3 skill-building activities and the project themes they support

	UNIT 3	GUIDE LOCATION		SKILL BUILDING FOR PROJECT THEMES		
Section	**Skill-Building Activities**	***Youth Guide***	***Educator Guide***	**Citizen Science**	**Conservation Stewardship**	**Environmental Education/ Communication**
Explore	How Do Waterfowl Find Mates?	p. 94	p. 87	Comparing Describing Developing research skills Investigating Planning Observing Recording Researching	Comparing Planning Recording	Comparing Modeling Observing Planning Recording
	Mating for Life	p. 95	p.88			
	The World's Largest Nursery	p. 97	p. 88			
	Where to Build a Nest?	p. 98	p. 88			
	How to Build a Nest?	p. 99	p. 88			
	Transformation	p. 100	p. 89			
Investigate	True Colors	p. 102	p. 89	Comparing Describing Developing research capabilities Diagramming Evaluating Gathering evidence Identifying Investigating Observing Planning Questioning Recording	Comparing Diagramming Evaluating Identifying Planning Recording	Communicating Describing Diagramming Identifying Observing Planning Recording
	Visit a Waterfowl Nest Site	p. 103	p. 89			
	Food for a Growing Family	p. 105	p. 90			
	Find Some Duck Food Yourself	p. 107	p. 90			
	The Food that Grows on the Water	p. 108	p. 91			
	Buy a Duck Stamp – Save Some Habitat	p. 109	p. 91			
	Investigate Your Question	p. 110	p. 91			
Express	Practice Drawing Waterfowl Behaviors	p. 112	p. 92	Describing Observing Sketching	Observing Sketching	Communicating Connecting art to other subjects Describing Developing visual ideas Observing Sketching
Share	Who Took My Home?	p. 113	p. 92	Describing Developing research capabilities	Describing Developing visual ideas Modeling Planning	Communicating Describing Developing visual ideas Modeling Planning
	Build a Nesting Structure	p. 114	p. 93			

UNIT 4. GOING THE DISTANCE – MIGRATING ACROSS CONTINENTS

(Youth Guide, page 122, Educator Guide, page 99)

Lesson Focus

Your student investigates waterfowl migration and its implications for conservation management.

Background

One of the first things waterfowl managers learned from early waterfowl banding efforts was that waterfowl follow distinct, traditional migration corridors or flyways in their annual travels between breeding and wintering areas. Birds use several visual and non-visual orientation mechanisms to navigate. Some of the visual cues include the sun, polarized light, the stars, and landmarks on the Earth. The female duck always makes the choice for the breeding area because she is homing to the site where she was hatched or a site where she successfully hatched a clutch of eggs before.

In most duck species, males and females will go their separate ways after the breeding season, each returning to their respective wintering sites from the previous year. Female ducks tend to winter farther south, and those that were successful at raising young arrive there much later than the males.

USFWS photo by George Gentry

The large body sizes of waterfowl enable them to store nutrients as energy reserves. In some cases, nutrients for an upcoming stage in the life cycle are acquired at a distant wetland and transported as body fat reserves. The protection of natural systems and the restoration and management of degraded systems increases choices of habitats and foods available to waterfowl. Where natural wetlands remain intact, they should be conserved as unique components of the ecosystem. Likewise, the provision of adequate refuge areas where birds are protected from disturbance is an essential ingredient to ensure that food resources are available to waterfowl and can be used efficiently during important times in the birds' life cycle.

Note: It is best to do this activity in fall or spring, when waterfowl are migrating through your area.

At a Glance

The Unit 4 At a Glance box on page 99 of the *Educator Guide* offers a quick look at learning objectives, academic disciplines addressed in the lessons, process skills, conservation concepts, and vocabulary.

Building Project Skills

Activities in Unit 4 are particularly good for building skills in collecting and analyzing data, which are helpful for those wanting to start a phenology project related to migrating waterfowl. Skills are outlined in Table 5 on page 26.

Related Resources

See page 114 of the *Educator Guide* to find additional resources related to Unit 4 topics.

Table 5. List of Unit 4 skill-building activities and the project themes they support

	UNIT 3	GUIDE LOCATION		SKILL BUILDING FOR PROJECT THEMES		
Section	**Skill-Building Activities**	***Youth Guide***	***Educator Guide***	**Citizen Science**	**Conservation Stewardship**	**Environmental Education/ Communication**
Explore	Why Do Waterfowl Migrate?	p. 128	p. 108	Computing Connecting math with other subjects Describing Developing research skills Evaluating Explaining Inferring Measuring Predicting Questioning Recording Thinking critically Using maps	Measuring Recording Using maps	Explaining Observing Recording Thinking critically
	How Do Waterfowl Know Where to Go?	p. 128	p.108			
	Where Do Different Species of Waterfowl Go and What Pathways Do They Take?	p. 129	p. 108			
	Migration Math	p. 130	p. 109			
	How Do Waterfowl Survive the Journey?	p. 132	p. 109			
Investigate	Featured Investigator, You	p. 136	p. 110	Analyzing data Computing Connecting math with other subjects Creating evaluation strategies Describing Explaining Inferring Interpreting Investigating Observing Predicting Questioning Recording	Recording	Describing Explaining Inferring Interpreting Investigating Observing Recording
	Meet a Waterfowl Ecologist	p. 137	p. 110			
	What Do You Think Would Cause Mallards to Migrate?	p. 140	p. 110			
	Looking at the Past to Understand the Future	p. 143	p. 110			
	You Too Can Be a Phenologist!	p. 145	p. 111			
Express	Visit Your Favorite Bird	p. 147	p. 111	Describing Developing research skills Gathering evidence Observing Sketching Using maps	Observing Sketching Using maps	Applying knowledge to art Applying knowledge to language Connecting art to other subjects Describing Designing Developing visual ideas Experimenting Modeling Observing Sketching Using maps Writing
	Draw It Yourself	p. 148	p. 111			
Share	What Could You Share?	p. 149	p. 112	Describing Developing research skills Gathering evidence	Describing Developing visual ideas Modeling Planning	Applying knowledge to art Communicating Connecting art to other subjects Describing Designing Developing visual ideas Experimenting Modeling Sketching Writing Modeling Planning
	Reflection on Waterfowl Migration	p. 150	p. 112			

UNIT 5. LEARNING FROM THE PAST; TAKING ACTION FOR THE FUTURE

(Youth Guide, page 153, Educator Guide, page 117)

Lesson Focus

Your student examines the past and present human influences on waterfowl populations and habitat from a variety of perspectives.

Background

Human activities have impacted waterfowl populations and habitat for many years, both negatively and positively. Sometimes there is conflict between the needs of people and stewardship of the environment. Examples include:

- Habitat loss
- Invasive species
- Overpopulation of urban waterfowl
- Species in decline
- Climate change
- Oil spills

People can also make decisions and take actions that help waterfowl and protect or restore their habitat. For each of the negative impacts listed above, people can take positive action to help waterfowl populations and their habitats. Your student's Junior Duck Stamp project, whether a science, stewardship, or education/communication project, is a positive conservation action he/she should take pride in completing.

USFWS photo

At a Glance

The Unit 5 At a Glance box on page 117 of the *Educator Guide* offers a quick look at learning objectives, academic disciplines addressed in the lessons, process skills, conservation concepts, and vocabulary.

Building Project Skills

Unit 5 activities cover a broad range of waterfowl-related themes (urban waterfowl, species in decline, climate change, and habitat gain/habitat loss), which offer students many opportunities to build science, stewardship, and education/communication skills for projects focused on the relationships between human activities and waterfowl conservation. Skills are outlined in Table 6 on page 28.

Related Resources

See page 137 of the *Educator Guide* to find additional resources related to Unit 5 topics.

Table 6. List of Unit 5 skill-building activities and the project themes they support

	UNIT 1	GUIDE LOCATION		SKILL BUILDING FOR PROJECT THEMES		
Section	**Skill-Building Activities**	***Youth Guide***	***Educator Guide***	**Citizen Science**	**Conservation Stewardship**	**Environmental Education/ Communication**
Explore	Urban Waterfowl – Make Way for Ducklings and Goslings!	p. 166	p. 130	Analyzing Comparing Describing Developing research skills Evaluating Gathering evidence Identifying Inferring Interpreting Measuring Questioning Reflecting Thinking critically Using geographic tools	Comparing Identifying Measuring Reflecting	Analyzing Applying knowledge to language Communicating Comparing Describing Questioning Reading for perspective Reflecting Thinking critically
	Species in Decline: Scaup, Pintail, and Common Eider	p. 171	p. 130			
	How Do You Know What to Think about Climate Change?	p. 182	p. 131			
	Habitat Gain and Habitat Loss	p. 186	p. 132			
	Invasive Species	p. 187	p. 132			
	Oil Spills	p. 189	p. 133			
	Access to History	p. 190	p. 133			
Investigate	Urban Waterfowl	p. 167	p. 130	Analyzing Describing Evaluating Gathering evidence Interpreting data Measuring Participating in society Questioning Thinking critically	Participating in society	Communicating Participating in society Reading for perspective Thinking critically
	Species in Decline	p. 178	p. 131			
	Using Data to Learn about Climate Change	p. 185	p. 132			
	Oil Spill in the Gulf: People Making a Difference	p. 191	p. 133			
Express	Write	p. 198	p. 133	Describing Developing research skills Interpreting Observing Participating in society Sketching	Describing Participating in society Working independently and collaboratively	Communicating Connecting art to other subjects Describing Developing visual ideas Participating in society Working independently and collaboratively Sculpture techniques Sketching Writing
	Draw	p. 198	p. 134			
	Restore	p. 201	p. 134			
Share	An Art Contest of Your Own	p. 202	p. 134	Describing Participating in society Working independently and collaboratively	Describing Participating in society Working independently and collaboratively	Communicating Connecting art to other subjects Describing Developing visual ideas Participating in society Working independently and collaboratively

Getting Ready to do a Project

Making a Plan of Action

Encourage your student to think about the following suggestions and questions as he/she chooses and organizes a project.

Prepare

- Pick a waterfowl or wetlands topic that interests you.
- Read and do *Youth Guide* activities on that topic to learn more.
- Study project ideas in this guide (beginning on page 30).
- Find out what's going on in your area on that topic, by searching the Internet and checking with family friends.
- Visit a local refuge, nature center, or park. After exploring the area, ask a natural resources professional or educator there to check your idea and to help you identify a project related to your topic of interest.
- Ask questions: Is there an existing project you can join? What are the costs and benefits of joining this project? Who is the contact person for the existing project?

Plan

- Who will participate in your project?
- What will you do?
- When will you start and finish?
- Where will you conduct the activity?
- Always remember that safety is your first project priority if you're working in the field. Create a safety checklist of things to bring, such as sunscreen, water, and insect repellent.

How?

- Who can help you do the project?
- Who should review your project before you carry it out?
- What resources will you need?
- How many hours can you devote to this project?
- What is your experience with doing a project on this topic?
- What skills will you need to carry out your project? Which of these are strong skills for you? What skills are weak? What can you do to strengthen your skills?
- What project equipment and supplies do you need?
  - Food, water.
  - Bug spray, sun screen.
  - Appropriate clothing such as sturdy shoes or boots, long pants, hats, rain gear, cold weather gear.
  - Equipment such as binoculars, clipboard, pen or pencil, and camera.
- What funds are needed?
- What resources might be loaned or donated to you (e.g., water tests, erosion control material, storm-drain stenciling kits)?
- What transportation is available?
- What rules or laws must you follow?

Share

- Who will you tell about your project – as you go along, and once you've completed the project?

Getting Ready for a Citizen Science Project Involving Waterfowl and Wetlands

From city streets to remote forests, citizen scientists make up the world's largest research teams, gathering data to better understand and conserve biological diversity. Citizen science is a partnership between the public and professional scientists around the world, who cooperate to conduct large-scale research.[2]

Your homeschool student may be particularly interested in developing a wetlands or wildlife-related project that would involve working with a natural resource partner to learn a protocol for data collection, to collect data, and to combine his/her data with that of others to provide scientific evidence about a topic of interest. Activities in this section focus on building nature observation skills, an important aspect of many citizen science endeavors.

Citizen Science Opportunities

Citizen science projects help conservation agencies, institutions, and organizations that study and protect a variety of natural resources including wildlife, plants, water resources, and rare and endangered species. Projects may be as simple as "when you see something rare, report it!". Others ask for monitoring seasonally, such as when flowers bloom or migrating birds arrive. These take very little to no extra time—you just need to know what to look for. Still other projects, such as stream monitoring, may require more time, more skills, and specialized equipment. Your homeschool student might want to design his/her own project or may choose to join an existing project.

Each state conservation agency offers a number of projects where citizens can help collect and analyze data. Examples include water quality monitoring, bird banding, locating frog populations and documenting species, or locating and documenting invasive species populations. Suggest that your student look at the state conservation agency website, or call the local office of a conservation organization, such as the Audubon Society, for ideas about what they could do.

Examples of Established National Projects

Here are a few examples of national projects your child might want to explore. With help from your state conservation agency or U.S. Fish and Wildlife Service refuge staff person, your student can find out how to help collect data for your state to contribute to one of these national projects.

Project BudBurst

http://neoninc.org/budburst/

BudBurst is a project of the National Center for Atmospheric Research in Boulder, CO, and the Chicago Botanic Garden that tracks the budding and flowering of selected plants; Project BudBurst engages the public in making careful observations

[2] From Conservation Programs, Habitat, Creation, Protection and Restoration, USFWS: http://www.fws.gov/birds/uctmbga/programs.html

of the "phenophases" (such as first leafing, first flower, and first fruit ripening) of a diverse list of trees, shrubs, flowers, and grasses in local areas.

Project FeederWatch
http://www.birds.cornell.edu/pfw/

Project FeederWatch is a winter-long survey of birds that visit feeders at backyards, nature centers, community areas, and other locales in North America. FeederWatchers periodically count the birds they see at their feeders from November through early April and send their counts to Project FeederWatch. FeederWatch data help scientists track broadscale movements of winter bird populations and long-term trends in bird distribution and abundance.

Nestwatch
http://watch.birds.cornell.edu/nest/home/index

The Cornell Lab of Ornithology established the Nestwatch Program as a way for people to monitor nests—it's a rewarding way to spend time outdoors, participate in science, and enjoy watching baby and adult birds at the same time.

Linking Landscapes for Massachusetts Wildlife
http://linkinglandscapes.info/roads/home.html
The Massachusetts Department of Transportation, the Massachusetts Natural Heritage and Endangered Species Program, and the Vernal Pool Association have launched a long-term and multifaceted effort to minimize the impact of the existing road network on rare and nongame wildlife, while improving highway safety. This effort is specifically looking at three main impacts: 1) general wildlife roadkills, 2) vernal pool salamander migration, and 3) turtle crossing hotspots.

Citizen Science and the National Wildlife Refuges

An urgent need for data on plant and animal behavior is outstripping scientists' ability to collect it, so experts are recruiting thousands of ordinary citizens to help. And where are these volunteer "citizen scientists" going to count critters, record the dates that buds open and birds nest, and document other possible indicators of climate change? More and more, the answer is national wildlife refuges.

No wonder. The country's more than 550 national wildlife refuges are oases of natural habitat in increasingly urban landscapes. That makes them the perfect places for anyone interested in phenology—the study of cyclic natural phenomena, such as flowering, migration and breeding.

Among the "citizen science" programs conducted in partnership with many refuges are:

BioBlitzes
http://www.nationalgeographic.com/field/projects/bioblitz/

The BioBlitzes, organized by National Geographic, are 24-hour inventories of anything that swims, walks, flies, crawls, or grows, organized by several wildlife refuges across the country. One year, for example, citizen scientists counted 413 species during a BioBlitz at Lee Metcalf National Wildlife Refuge in Montana.

Project BudBurst
http://neoninc.org/budburst/

This phenology project, as described above, is being offered at some national wildlife refuges. Project BudBurst director Sandra Henderson says the data gathered on refuges will be "a tremendous boon to phenologists."

The Big Sit!
http://www.birdwatchersdigest.com/bwdsite/connect/bigsit/index.php

This one-day international bird tally is sponsored by Bird Watcher's Digest and is held each fall. The Big Sit is a bird-a-thon where the object is to tally as many bird species as can be seen or heard from one location—17 feet in diameter—in one 24-hour period. In 2009, more than 40 refuges took part in the Big Sit.

The Christmas Bird Count
http://birds.audubon.org/christmas-bird-count

This bird count is a winter bird survey directed by the National Audubon Society. More than 70 refuges took part in the 109th Christmas Bird Count. From December 14 through January 5, tens of thousands of volunteers armed with binoculars, bird guides, and checklists go afield to count birds in a 24-hour period. Volunteers follow specified routes, counting every bird they see or hear all day. The data collected by observers over the past century allow researchers, conservation biologists, and interested individuals to study the long-term health and status of bird populations across North America.

Related Resources

- Citizen Science and Education, National Phenology Network: http://www.usanpn.org/working-groups?q=node/12
- Citizen Science Projects, Cornell Lab of Ornithology: http://www.birds.cornell.edu/citsci/projects
- Scistarter – Science we can do together: http://scistarter.com
- Volunteer Water Quality Monitoring, National Water Quality Program: http://www.usawaterquality.org/volunteer/

A Citizen Science Project Success Story

Kodiak, Alaska | Surveying Birds Off Afognak and Sea Duck Banding[3]

In August 2010, Kodiak National Wildlife Refuge staff and volunteers surveyed waters along the coast of Afognak Island and captured and banded molting sea ducks from Afognak Island southwest to Uyak Bay on Kodiak Island.

© Will Deacy

Biologists conducted skiff-based surveys of most of the coastline from Foul to Blue Fox Bays, including the entire shoreline of Ban Island as part of a long-term waterbird monitoring program. The refuge research vessel, the *Ursa Major II*, was used as the base of operations for both the surveys and the duck banding. During surveys, all birds seen within 200m of shore were counted, and additional randomly selected off-shore transects were surveyed as well. Refuge biologist Robin Corcoran observed that Marbled Murrelets were one of the most commonly seen species; the largest flock was almost 200 birds near the Southeast corner of Ban Island. The other most commonly counted species included Glaucous-winged Gulls, Black-legged Kittiwakes, Harlequin Ducks, and Pigeon Guillemots.

In addition, refuge biologists have been banding Harlequin Ducks around the island since the mid-1990s. The sea duck banding program is expanding to include Barrow's Goldeneye. The 15 species of sea ducks are the most poorly understood group of waterfowl in North America because of the remoteness of their northern breeding and wintering sites. For most species, basic information on natural history, population indices, and estimates of annual survival is lacking. Through the banding program, the refuge hopes to gather information on migratory patterns and harvest rates.

The 2011 crew consisted of refuge staff and U.S. Department of Agriculture biologists and volunteers. Members of the Kodiak Refuge Youth Conservation Corps (YCC) joined the group for a day of duck captures. The YCC participants were Kodiak High School students who got to spend a night aboard the refuge research vessel and were given an opportunity to learn how to handle, measure, and band ducks.

[3] Adapted from KODIAK: Survey Birds off Afognak and Sea Duck Banding, U.S. FWS – Journal Entry, http://www.fws.gov/FWSJournal/print/print_report.cfm?arskey=28892

Getting Ready for a Stewardship Project Involving Waterfowl and Wetlands

> Environmental stewardship is the responsibility for environmental quality shared by all those whose actions affect the environment.[4]

Highly active students may be particularly drawn to stewardship projects because they often involve physical activity such as cleaning litter/trash from roadways or streams, replanting streamside vegetation lost during a flood event, and removing invasive species in a marsh.

Planning a stewardship project is a way to extend the Junior Duck Stamp activities into a multidisciplinary experience. Encourage your child to plan a stewardship project related to the Junior Duck Stamp activities they studied. Also consider that one family's service contribution can be more meaningful if it is part of a long-term project that involves many families or youth groups (scouts, YMCA, 4-H, religious organization, or others). For example, your family might clear invasive species from a small area, but twenty families or groups, over an entire season, may be able to clear several acres.

Middle school class installing Wood Duck boxes that they've built. Photos courtesy of Victoria Rydberg (Madison, WI)

If students have already learned skills, such as recording data or identifying invasive plants, have them use those skills in their stewardship experience. You can also teach these skills and suggest projects that students can continue in their schoolyard, church property, or neighborhood to use their new skills in a meaningful community project.

Work with a Natural Resources Professional

When developing or conducting a stewardship project it is particularly important to work with a natural resource professional. Care for natural resources is a scientific endeavor. On publicly owned lands, a team of professionals has developed a management plan. The same is true for many private lands maintained as conservation areas or habitat. And carrying out the plan requires observing well-established management protocols.

[4] From Environmental Stewardship, U.S. EPA, http://www.epa.gov/stewardship/

A local natural resource expert may be able to offer conservation equipment or supplies, ideas for service projects, technical assistance in planning and completing a project, or informational resources. The natural resource professional should also review the student's plan to assure that it supports good science and management. A partnership could also include an introduction to a career possibility.

Environmental Stewardship Project Ideas

- Construct and install nesting boxes and feeders.
- Stabilize threatened stream banks with riprap (rock used to stabilize stream banks), revetments (materials—such as gravel, concrete blocks, or tree stumps—used to line water edges to reduce impacts from wave action), and gabions (wire fabric containers, filled with stone at the site of use, to form structures for earth retention).
- Plant vegetation to control erosion, produce shade, and provide food and shelter for wildlife.
- Remove invasive plants and restore native vegetation.
- Build fences to prevent the overgrazing of riparian areas.
- Clean up urban waterways.
- Build observation decks and blinds in a wildlife refuge.

Examples of Established Stewardship Opportunities

The Earth Team

http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/people/volunteers

The Natural Resources Conservation Service (NRCS), part of the U.S. Department of Agriculture, partners with conservation groups and others to ensure private lands are conserved, restored, and made more resilient to environmental challenges like climate change. Earth Team members work side-by-side with farmers and ranchers to identify natural resource concerns, and are able to develop unique conservation plans for restoring and protecting resources. Anyone 14 years or older can become a volunteer.

Five Star Restoration Grant Program[5]

http://www.epa.gov/owow/wetlands/restore/5star/

The National Fish and Wildlife Foundation's Five Star Restoration Program brings together students, conservation corps, other youth groups, citizen groups, corporations, landowners, and government agencies to provide environmental education and training through projects that restore wetlands and streams. The program provides challenge grants, technical support, and opportunities for information exchange to enable community-based restoration projects. Funding levels range from $10,000 to $40,000, with $20,000 as the average amount awarded per project. When combined with the contributions of other partners, projects that make a meaningful contribution to communities become possible. At the completion of Five Star projects, each partnership will have experience and a demonstrated record of accomplishment, and will be well positioned to take on other projects. Aggregating

[5] Adapted from the Five Star Restoration Grant Program, EPA and The National Fish and Wildlife Foundation, http://www.epa.gov/owow/wetlands/restore/5star/.

over time and space, these grassroots efforts will make a significant contribution to our environmental landscape and to the understanding of the importance of healthy wetlands and streams in our communities.

Volunteer.gov/gov: America's Natural and Cultural Resources Volunteer Portal
http://volunteer.gov/gov/index.cfm

This portal, supported by a variety of land and water resource management agencies such as the Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Forest Service, assists in searching for and applying for volunteer opportunities that suit your family's interests and availability.

Stewardship and the National Wildlife Refuges

The Nature of Learning: Promoting Education and Stewardship in the Community[6]
http://www.fws.gov/refuges/education/natureOfLearning.html

The Nature of Learning is a community-based National Wildlife Refuge System conservation education program that uses national wildlife refuges as outdoor classrooms and seeks to promote a greater understanding of conservation issues while enhancing student academic achievement. The Nature of Learning:

- Utilizes field experiences and student-led stewardship projects to connect classroom lessons to real world issues; and
- Involves a partnership among local schools, community groups, natural resource professionals, and local businesses.

For information on developing a stewardship project in a refuge, see this Nature of Learning web page:
http://www.fws.gov/refuges/education/natureOfLearning/stewardshipProj.html

Check the National Wildlife Refuge System website for events at a refuge near you:
http://www.fws.gov/refuges/SpecialEvents/FWS_SpecialEventsCalendar.cfm

Related Resources

- An Introduction to Wetland Restoration, Creation, and Enhancement. http://www.epa.gov/owow/wetlands/restore/finalinfo.html
- Principles for the Ecological Restoration of Aquatic Resource, River Corridor and Wetland Restoration, U.S. EPA. http://www.epa.gov/owow/wetlands/restore/principles.html
- Wetlands Restoration Links by State and Local Governments, River Corridor and Wetland Restoration, U.S. EPA. http://www.epa.gov/owow/wetlands/restore/links/
- Private Organizations, River Corridor and Wetland Restoration, U.S. EPA. http://www.epa.gov/owow/wetlands/restore/privlinks.html
- Stream and Wetland Restoration, Adopt a Stream Foundation. http://www.streamkeeper.org/aasf/ST_%26_WL_RESTORATION.html

[6] From *The Nature of Learning*, U.S. FWS: http://www.fws.gov/refuges/education/natureOfLearning/intro.html

Two Environmental Stewardship Success Stories

Earth Team New Jersey Project[7]

Earth Team volunteers helped North Jersey Resource Conservation and Development (NJRC&D) restore a wetland, stabilize a stream bank, and plant a riparian buffer. Their work helped win environmental awards and get the project featured in a conservation magazine.

The winning project rehabilitated a portion of Walnut Brook in west central New Jersey. NJRC&D and several partners constructed three acres of forested wetlands, installed bioengineering practices, and restored a riparian buffer. The stream and buffer work was designed to improve water quality in Walnut Brook and the wetland to provide wildlife habitat and a functioning floodplain to provide storm water storage and reduce the potential of downstream flooding. Over 80 Earth Team volunteers planted 1,500 native trees and shrubs in 2009 and 2010.

Earth Team volunteers plant trees in a riparian buffer along a stream in western New Jersey. © North Jersey RC&D

The $690,000 project was awarded a New Jersey Section, American Water Resources Association "Excellence in Water Resources Protection and Planning Award" and the 2010 New Jersey Governor's Environmental Excellence Award for Healthy Ecosystems.

During the summer of 2010, when drought and heat threatened to kill their plantings, Earth Team volunteers went back and watered and mulched the plantings to protect them.

Notes:

[7] Adapted from 2011 NRCS Earth Team Connection newsletter: Earth Team Help RC & D Implement Award Winning Project, http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1041973.pdf.

Ranching Family Adopts Environmentally Friendly Agricultural Practices[8]

Leavitt Lake Ranches, owned by Darrell and Callie Wood, who have run cattle in Northern California for 150 years, runs about 600 mother cows and 400 yearlings on some 50,000 acres of land.

The Woods, along with their son Ramsey and daughter Dallice, have frequently been recognized for implementing practices aimed at protecting and improving their land. The operation received the National Environmental Stewardship Award from the National Cattlemen's Beef Association in 2009, as well as other environmental stewardship awards.

NRCS Photo

The family most recently worked with conservation partners on a restoration plan for vernal pools (temporary pools of water), provided an abundance of wildlife habitat, decreased stream bank erosion, and improved riparian conditions.

The upland ranch consists of 1,200 acres of wet meadows, wetlands, riparian habitats, and sagebrush surrounding Pete's Creek. Since the mid-1940s, the ranch was managed as a cow/calf operation with season-long grazing that led to heavy use of wetland and riparian areas by livestock. Loss of willows and a lack of sedges and other streamside vegetation resulted in substantial erosion and down-cutting of the creek that lowered the water table in adjacent meadows. As a result, sagebrush encroached and meadows dried up early in the year. Two dams had been placed in the channel to divert water out of Pete's Creek, degrading its value for fish.

The conservation-minded owners were disturbed at how fish and wildlife habitats in the creek, uplands, and wet meadows were in serious decline, and decided to seek financial and technical assistance for a project to restore the damaged lands.

Pete's Creek and a riparian buffer were fenced, which permanently excluded cattle from fragile streambanks. Dams were removed from the creek to return historic flows, and 120 acres of upland that had been invaded by dense sagebrush was restored.

In the five years since, a dense riparian growth of sedges, forbs, grasses, and willows have returned to provide foraging and breeding habitat for migratory songbirds, and mallards nest in dense cover along the channel. Pronghorn are abundant and have access to the improved forage along the creek through the wildlife-friendly fence. A greater sage grouse "lek" (breeding ground) is present on the ranch and as many as 100 sage grouse have been seen on the property at one time.

[8] Adapted from *A California ranching family illustrates benefits of environmentally-friendly agricultural practices*, Pacific Southwest Region, U.S. FWS: http://www.fws.gov/cno/conservation/ranchingpartner.html

Getting Ready for an Environmental Education/Communication Project Involving Waterfowl and Wetlands

> Environmental education (EE) teaches children and adults how to learn about and investigate their environment, and to make intelligent, informed decisions about how they can take care of it.[9]

The Junior Duck Stamp curriculum offers the guidelines for homeschool educators to provide an environmental education experience for their children. Environmental educators teach children and adults how to learn about and investigate their environment, and to make intelligent, informed decisions about how they can take care of it. Environmental education is a formalized learning process, which has a clear purpose and learning objectives. Environmental education takes place in traditional classrooms, in communities, and in settings like nature centers, museums, parks, and zoos. Learning about the environment involves many subjects—earth science, biology, chemistry, social studies, even math and language arts—because understanding how the environment works, and keeping it healthy, involves knowledge and skills from many disciplines.

An important component of environmental education learning is to reflect on the educational experience by creating a way to communicate what you've learned with others. Having to create a message to tell others what you've learned tends to make what you've learned more concrete and more memorable. Your homeschool student may want to create an environmental education experience for younger siblings, the local elementary school, or community group, or he/she may only be interested in creating a communication piece.

Share

The activities in the "Share" section of each *Youth Guide* unit are designed to build skills for communicating information about waterfowl and wetlands to others; these sections provide good ideas for environmental education/communication projects. Building Skills Unit by Unit (beginning on page 15) makes it easy for you to find the *Youth Guide* activities that emphasize education or communication.

Environmental Education/Communication Project Ideas

- Prepare and install educational signs at natural areas and at historic sites.
- Develop interpretive materials, demonstrations, and tours.
- Offer waterfowl- or wetland-related presentations to schools, youth organizations, and civic groups.
- Prepare informational brochures to distribute at visitor centers in natural areas.
- Make an informational poster.
- Write a story and share your story with others.

[9] Adapted from What Is Environmental Education, North American Association for Environmental Education: http://www.naaee.net/what-is-ee, and EETAP3, EPA's National Environmental Education Training Program, 2005-2011.

Examples of Established Education/Communication Opportunities

Junior Duck Stamp Art Contest
http://www.fws.gov/juniorduck/

The Junior Duck Stamp Design Contest is the culmination of the Junior Duck Stamp educational program. After studying waterfowl anatomy and habitat, students may articulate their newfound knowledge by drawing, painting, or sketching a picture of an eligible North American waterfowl species. See Appendix A for more on the Junior Duck Stamp Art Contest.

Nature Rocks[10]
http://www.naturerocks.org/

The U.S. Fish and Wildlife Service (FWS) partners with conservation organizations to offer a program called "Nature Rocks." The partners share common goals of getting kids outdoors, engaging parents, and building support for healthy ecosystems. The Nature Rocks website is a communication tool developed to help families connect with nature. The FWS invites families to visit and enjoy over 550 national wildlife refuges across the country for memorable outdoor adventures.

The Nature of Learning: Promoting Education and Stewardship in the Community[11]

The Nature of Learning is a community-based National Wildlife Refuge System conservation education program that uses national wildlife refuges as outdoor classrooms and seeks to promote a greater understanding of conservation issues while enhancing student academic achievement. The Nature of Learning:

- Utilizes field experiences and student-led stewardship projects to connect classroom lessons to real world issues; and
- Involves a partnership among local schools, community groups, natural resource professionals, and local businesses.

Newsletters about National Wildlife Refuges Projects and Opportunities
http://www.fws.gov/refuges/

See the homepage of the FWS National Wildlife Refuge System to find links to two publications that are intended to inform the general public about refuge education and stewardship opportunities: *Refuge Update* and *Friends Forward*.

River of Words
http://www.riverofwords.org/index.html

River of Words trains natural resource professionals, educators, and youth leaders to combine nature and the arts in their educational endeavors. See their website for entries of poetry and art from children around the world.

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[10] Adapted from Nature Rocks website, http://www.naturerocks.org/

[11] From *The Nature of Learning*, U.S. FWS: http://www.fws.gov/refuges/education/natureOfLearning/intro.html

Related Resource

Student Programs, North American Association of Environmental Education. http://eelinked.naaee.net/n/eelinked/topics/Student-Programs

A Communication Success Story

The participants in the Junior Duck Stamp Art Contest communicate their interest and knowledge about waterfowl through their stamp entries at the local, state, and sometimes national levels. Through their participation, they inspire other students to learn more about waterfowl and their wetland habitats. The winning entry each year is made into a stamp that generates funds for waterfowl and wetlands conservation. A Junior Duck Stamp Art Contest entry could, therefore, be considered a stewardship activity as well.

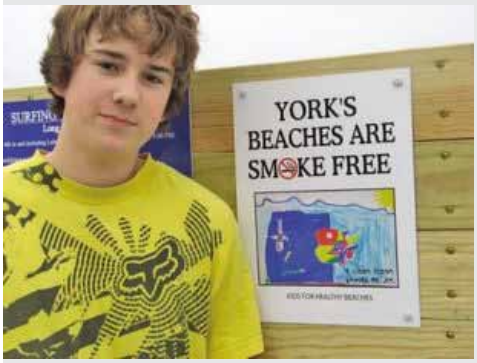
Photo courtesy of The Toledo Blade

Meet Lily Spang, 2009 Duck Stamp Winner

Lily first entered the Junior Duck Stamp competition when she was nine. She had always loved nature, wildlife, and art. She realized this was a way to combine her interests. In 2008, at 16, she won the Ohio Junior Duck Stamp Contest and placed in the top 10 at the national level. Then in 2009, Lily won the national competition with her colorful Wood Duck. She loved the variety of colors in the drake and the iridescence of the blues and greens. Lily likes to paint portraits of animals: "I like to meet animals to get to know them. That's when I do my best work," she said. "Since entries are judged by anatomical correctness as well as artistic value, I found that to progress in the contest each year I had to learn more about waterfowl as well as improve artistically. I began to research waterfowl, and the more I learned the more I became interested in conservation. To learn more, I started by finding lots of great books on waterfowl. I also bought a camera and went out to find and photograph the actual birds, whether in the zoo, on the river nearby, or in a private aviary." Lily gets to know waterfowl while kayaking with her father on the Maumee River, catching glimpses of ducks in their natural habitat, and paying close attention to detail. While perfecting paintings she has observed dead ducks from friends' freezers to make sure her details are accurate. "Local decoy carvers and wildlife artists were incredibly helpful to me, generously sharing their time and knowledge of waterfowl and art." Artist Greg Clair worked with Lily and encouraged her to select the Wood Duck for her entry. Sadly, Mr. Clair died while Lily was working on her entry. Harold Roe, a former winner of the Ohio Duck Stamp contest and one of the top 10 in the Federal Duck Stamp competition, stepped in and advised Lily on her entry. Mr. Roe thought that a strength of Lily's painting was that it was simple and uncomplicated. He said: "I would encourage students participating in the contest to observe waterfowl firsthand and to learn all they can about them. Since a contest like this is subjective, it helps to set specific artistic goals for each entry and focus on personal improvement from year to year. Also, it's important to find people knowledgeable about waterfowl, conservation, and art and ask them to review your work, explain a duck's wing, lend a mount or decoy, etc. So many people are more than happy to help a young artist."

Here is the stamp created with Lily's winning artwork. To see all the Junior Duck Stamps from 1994-2011, go to page 164 of the *Youth Guide*.

An Environmental Education Success Story[12]



Courtesy of: Andrew Hayford

Andrew Hayford from Cape Neddick, Maine, decided to create a project to prevent ocean pollution by increasing awareness and education programs that would teach his community and tourists about the threats of garbage. He had learned that garbage in the ocean is unsafe for humans, costly to cleanup, and hazardous to marine life. Although this story focuses on the impacts of pollution on marine life, it's not hard to imagine the focus being waterfowl and the effects of pollutants, discarded fishing lines, plastic bags, and other garbage on the well-being of waterfowl.

With the help of a community partner, Andrew presented a program on ocean pollution to four elementary school classes. His partner, the director of Blue Ocean Society for Marine Conservation, presented information about whales. She brought a 60-foot inflatable whale to the presentations (kids can go inside the whale). Students learned a great deal about whales, such as what they eat, the different sounds they make, and their size and anatomy.

Andrew also created an ocean-themed art contest for kindergarteners and a second grade class. He made decals using the seven best pictures, to which he added clean water slogans. He then distributed the decals to area businesses. The decals remind visitors to not litter and to keep our beaches clean. Businesses chose which elementary picture they would like to put on their window or door. Andrew said it was really fun for the kids to see which businesses posted their decals.

Courtesy of: Andrew Hayford

Andrew encouraged businesses to participate even further by pledging to be an ocean-friendly business by creating the "ocean-friendly business checklist." The checklist asks businesses to do five things out of a list of 20 ideas for being ocean friendly, such as limiting the use of straws and stirrers, providing bottles with environmentally friendly caps (e.g., caps that are attached to the bottles), and using biodegradable takeout containers.

Andrew's town also used the artwork on permanent signs on public beaches to remind people that community beaches are smoke-free. This also makes beach cleanups easier and there are fewer cigarette butts disintegrating in the ocean.

Andrew has half of his town's businesses that attract tourists signed up for the campaign. His goal is to have all of the businesses in town be environmentally friendly to set an example for other oceanfront towns.

[12] This story is adapted from a success story that Andrew Hayford submitted to the Planet Connect website at http://planet-connect.org/success_stories/blue-ocean

APPENDIX A | More on the Junior Duck Stamp Art Contest

The Junior Duck Stamp Art Contest is the culmination of the Junior Duck Stamp educational program. After studying waterfowl anatomy and habitat, students may articulate their newfound knowledge by drawing, painting, or sketching a picture of an eligible North American waterfowl species.

Students from around the United States submit drawings to their state, territory, or district competition. Winners from these competitions, called the "Best of Show," are then submitted to the Federal Junior Duck Stamp Art Contest. One image from the 53 Best of Show entries will become the next Junior Duck Stamp.

Junior Duck Stamps are sold for $5 each by the U.S. Postal Service, Amplex Corporation, and various national wildlife refuges. Proceeds from the sale of Junior Duck Stamps are returned to states for environmental and conservation education programs.

Information about the Junior Duck Stamp Art Contest is available online at: http://www.fws.gov/juniorduck/.

History of the Junior Duck Stamp Program

In 1989, with a grant from the National Fish and Wildlife Foundation (NFWF), the first curriculum was developed for the Federal Junior Duck Stamp Conservation and Design Program. This arts curriculum taught wetlands and waterfowl conservation to students in kindergarten through high school. The program incorporates scientific and wildlife management principles into a visual arts curriculum.

The Junior Duck Stamp curriculum made its debut as part of a pilot program in California; in 1990, 3,000 students in public and private schools were the first to participate in the Junior Duck Stamp Program curriculum and art contest. Florida and Illinois were added in 1991, while Arkansas, Kansas, and Vermont entered the program in 1992. At that time, a state stamp sheet was developed using the "Best of Show" winners from each participating state from 1991 and 1992. This $10 stamp sheet included nine state Junior Duck Stamp designs. It was determined that a national competition, using the "Best of Show" winning designs from each state, would be held to select a design for the Federal Junior Duck Stamp.

Maryland and South Dakota entered the program in 1993. With eight states competing, the first national competition was held to select only one stamp design to become the first Federal Junior Duck Stamp. On June 30, during the First Day of Sale Ceremony for the Federal Duck Stamp, judges selected the national first, second, and third place Junior Duck Stamp winning designs. The first Federal Junior Duck Stamp design winner was Jason Parsons from Canton, Illinois. His design titled "Ruffling Redhead" was used to create the first junior stamps which sold for $5.00 each.

All 50 states eventually joined the program. The U.S. Fish and Wildlife Service supported legislation to gain Congressional authorization for the Federal Junior Duck Stamp Program and to direct the proceeds from stamp sales to support conservation education in the form of awards and scholarships for the participants. The Junior Duck Stamp Conservation and Design Act of 1994 directed the Secretary of the Interior to create a Junior Duck Stamp as well as to license and market the stamp and stamp design.

In 2010, Congress reauthorized the Junior Duck Stamp Conservation and Design Program Act for an additional five years. The Program continues to expand the use of its conservation education curriculum throughout the U.S. and its territories. Today, all 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands have joined the program and each year more than 27,000 students submit entries to state or territorial Junior Duck Stamp contests.

As part of the program, students are invited to create a North American waterfowl art piece and write a conservation message for submission to their state contest. First place winners from all 50 U.S. states and territories advance to the national contest, where one entry is chosen to be the next Junior Duck Stamp design. At the national level, first, second, and third place winning entries receive cash prizes. In 2012, the program celebrated its 20-year anniversary. All of the funds from the sale of Junior Duck Stamps go to support the program for the next year.

APPENDIX B | Essential Features of Classroom Inquiry and Their Variations

Project-Based Learning at Home

The *Homeschool Guide* is designed to help homeschoolers construct a series of learning opportunities based on developing and implementing a project. Project-based learning allows students to build skills in multiple disciplines as they pursue their goal, rather than work on one specific skill, such as learning how to add or how to construct a sentence.

According to PBLonline.org:

> A project-based learning approach emphasizes learning that motivates the learner to build curiosity and excitement about solving a problem, while also learning and using new academic skills. It is an instructional approach built upon authentic learning activities that engage student interest and motivation. These activities are designed to answer a question or solve a problem and generally reflect the types of learning and work people do in the everyday world outside the classroom.[13]

Among other features, successful project-based learning provides learning activities that are relevant to children's lives, are sustained over a long period of time, have real-world connections, are student driven, are interdisciplinary, and involve collaboration and partnerships in the community. These are features incorporated in Junior Duck Stamp curriculum activities as well.

Youth and Science Inquiry

The key to successful youth science education and service projects is to involve young people in developing, planning, organizing, and evaluating activities and projects. When youth lead the project, they gain a sense of ownership of the results. Some learners, however, are not able to work as independently as others for a number of reasons, including age and maturity. How you approach lessons based on science inquiry might change according to your child's abilities to work in a self-directed manner.

Your learner may get more out of his/her Junior Duck Stamp activities or project if the features of inquiry illustrated in Table 7 (Essential Features of Classroom Inquiry and Their Variations) are considered in the planning process.

[13] http://pbl-online.org/About/whatisPBL.htm

*Table 7. Essential Features of **Classroom Inquiry** and Their Variations, taken from Inquiry and the National Science Education Standards: A Guide for Teaching and Learning.*[14]

Essential Feature	Variations			
1. Learner engages in scientifically oriented questions	Learner poses a question	Learner selects among questions, poses new questions	Learner sharpens or clarifies question provided by teacher, materials, or other source	Learner engages in question provided by teacher, materials, or other source
2. Learner gives priority to **evidence** in responding to questions	Learner determines what constitutes evidence and collects it	Learner directed to collect certain data	Learner given data and asked to analyze	Learner given data and told how to analyze
3. Learner formulate **explanations** from evidence	Learner formulates explanation after summarizing evidence	Learner guided in process of formulating explanations from evidence	Learner given possible ways to use evidence to formulate explanation	Learner provided with evidence and how to use evidence to formulate explanation
4. Learner connects explanations to scientific knowledge	Learner indepently examines other resources and forms the links to explanations	Learner directed toward areas and sources of scientific knowledge	Learner given possible connections	
5. Learner communicates and justifies explanations	Learner forms reasonable and logical argument to communicate explanations	Learner coached in development of communication	Learner provided broad guidelines to use sharpen communication	Learner given steps and procedures for communication

More ← — — — — Amount of Learner Self-Direction — — — — → Less

Less ← — — — Amount of Direction from Teacher or Material — — — → More

Optimizing learning

For more information and tools to improve the quality of outdoor classroom learning see the following resources:

Carlson. S. P., Heimlich, J. E., Storksdieck, M. (2011). Validating an Environmental Education Field Day Observation Tool. International Electronic Journal of Environmental Education, Vol. 1, Issue 3.

University of Minnesota Extension guides: Best Practices for Field Days; Best Practice: Develop and implement program evaluation.

US Department of the Interior, Bureau of Land Management. Holding Onto the Green Zone Leader Guide p. 11, http://www.uwex.edu/erc/youth/riparian.html

[14] Reprinted with permission from the National Academies Press, Copyright 2000, National Academy of Sciences.