

# Neal Smith National Wildlife Refuge

## Project Bluestem: A Prairie and Savanna Curriculum

This CD not only provides you with 200 activities to do with your students it also provides you with great resources and an introduction to the refuge. As an added bonus you will receive several Junior Duck Stamp Conservation and Design Programs.

**Summary of Activities:** Elementary School Middle School High School Pre and Post Visit

### *Prairie Soils:*

**Soil Builders** - Students participate in a group play in which they act out the components of soil formation.

### *Prairie Plants:*

**Sticky Situations** - The students collect different types of seeds by hiking through the prairie, during hikes, games, or stewardship activities. The seeds stick to leggings made of different types of furs. The seeds will be collected from the leggings and grouped by type. The students will use a bar graph, to graph and discuss what the information could mean to scientists studying animals. (Note: This is best done in the fall.)

**Seed Olympics** - Using a variety of materials, the students will develop a seed dispersal device. The travel of the seed will be measured by distance and accuracy.

**Prairie Explorers Kit** - This is an activity that will help students sharpen their observational skills and serve as a simple introduction to the term properties in relationship to science, as well as introduce them to plants on the prairie. (Pre-work is involved in this activity.)

**What Is the "Wheel" Identity of This Plant?** - Students use an identification wheel to help them recognize prairie plants.

**Prairies Have A Lot of Gall . . .** - Students will search and count goldenrod galls in an area of the prairie. A count will be taken. The students will then predict how many goldenrod plants with galls will be found in a larger prairie area by extrapolating. (This is best done in the fall or winter.)

**Prairie Plants Change** - Through seasonal visits to the prairie students will observe and record the various changes that prairie plants go through each season.

**Outstanding Oaks – A Living History** - This activity will reinforce the idea that an oak tree is a living history. It will also show students how to use the technique of cross-dating to determine the age of a tree.

***Prairie Wildlife:***

**Going Batty** - Students will learn about the types of bats that live in Iowa, what they eat and how they hunt. Myths about bats will be explored and the truth uncovered.

**Birds Schmirds** - Students will understand what makes birds different from other animals, learn some common bird sounds, where to find birds, and what birds eat based on the type of beak they have.

**You Animal!** - The students listen to a presenter speak about the animals of the area, what they eat, and some general facts about the animal. Skins will be presented for the students to touch. Skulls will be presented for the students to view.

**Give Me a Home Where the Buffalo Roam** - Students will learn about the American buffalo and the tallgrass prairie. The activity also covers how the Plains Indians used the bison and the bison's family structure.

**Buffalo Hoops** - Students will learn about what happened to the bison in North America by playing a game similar to musical chairs. (Ties in very well with "Give me a Home Where the Buffalo Roam").

**Buffalo Hunt** - Students will learn the four components of habitat and how they affect animals. They will learn the importance of having the habitat components in correct proportions. They will learn what "limiting factors" are and how they affect animal populations.

**Keep on Trackin'** - Students will become sufficiently familiar with evidence of wildlife to be able to identify and collect a few animal tracks common to prairie wildlife. This is best done in winter with snow or in other times of the year after rainfall or along a creek or pond.

**Camouflage Game** - The students will play a game (outside in the tallgrass) that will help them understand how camouflage helps animals to survive.

**Create-an-Animal** - Students will learn about the adaptations animals need to have to survive on the prairie. They will then draw their own animal, thinking about where the animal lives, how it eats, and how it escapes predators.

**Identify-an-Invertebrate** – Students will learn the difference between insects, spiders, and other invertebrates.

**Prairie Acrobats** - Students learn about spiders and other arachnids - characteristics, habits, and habitats through discussion and observation of spiders and harvestmen (daddy-longlegs which are not actually spiders) on the prairie.

**Birds and Worms** – Students will understand how camouflage works by hunting for “worms” of different colors that are hiding on different color backgrounds, collecting data, and then comparing the numbers “worms” caught of different colors.

***Human/Prairie Interactions:***

**Prairie Artistry** - Students look for elements of design on the prairie and create an art work emphasizing one of these elements.

**Prairie Celebrations** - Following the reading of Byrd Baylor’s, *I’m in Charge of Celebrations*, students develop celebrations of their own centering on the prairie.

**Pretty Prairie** - During a walk on the prairie, students will collect a variety of interesting prairie objects. They will use these to create a prairie picture using sunlight to make a sun print.

**Prairie Poetry** - Students will experience a walk on the prairie and use their observations as the inspiration for a poem to be written in one of the forms presented by the teacher.

**Myth Making** - Students will observe constellations (or cloud formations) and interpret them into their own myths.

**Dreamweavers** - Students listen to the story of the dream catcher, then design a dream catcher of their own out of willow branches, imitation sinew, feathers, and beads.

**Prairie Smoke** - Students listen to legends about prairie plants or animals and then create stories of their own based on observations of characteristics of the plants or animals.

**Bison / Elk Department Store** - The students will study the importance of bison and elk to the prairie ecosystem and human inhabitants through: (1) observation of their use and impact on the prairie, (2) study of related literature and (3) knowledge gained and experiences with construction of useful items from bison and elk contributions (elements).

**As The Wheel Turns** - While walking in the prairie, the students will keep track of how far they have traveled by using a trundle wheel.

**Prairie Playtime** - Students will work in small groups to create games using the resources available on the prairie. They will share the games with the rest of the group.

**What’s That?** - The students will examine and try to identify the use of different objects found in a trunk which may have been used by an early pioneer on the prairie.

**So, You Want to be a Prairie Partner** - Through an interview session with a Neal Smith NWR biologist, students will become aware of the various job responsibilities and the importance of the National Wildlife Refuge in relationship to restoration and preservation of habitats with emphasis on prairie.

**From Trash to Treasure** - Students will learn about how litter affects wildlife and how recycling helps reduce waste.

***Prairie Ecosystem:***

**Food Web** - Students will look for signs of animal and plant life on the prairie. They will then construct food chains or webs with those species.

**There Goes the Neighborhood** - A new species is introduced into the prairie ecosystem. Students determine whether or not that species would be able to survive and/or adapt, as well as the effect it could have on native species.

**Web of Life** - Using a ball of string and labeled cards of certain animals, students will be able to set-up a “web of life”.

**Curious About Clouds** - Students will use their knowledge of the various types of clouds to construct a cloud diagram. They will also use their knowledge of clouds to forecast weather and infer how different types of weather effected pioneers, Indians, and animals on the prairie.

[MIDDLE SCHOOL](#) (top)

***Prairie Soil***

**Soil Profiles** - Students will take soil probes in a variety of locations, measure and observe the horizon coloration and texture differences of each probe.

***Prairie Water***

**Wet and Wild at Walnut Creek** - This activity allows students to investigate the life in a pond with hands-on netting and identification of aquatic life. The students will determine how these animals fit into a food web.

**Water-Logged** - Your class will soon be taking a field trip to study the watershed of a small prairie lake, pond, or stream. On your field trip you will be measuring certain chemical aspects of the water to determine if the water is polluted or pure. These are: (1) the oxygen dissolved in the water, (2) the pH of the water and (3) the temperature of the water.

**Down the Stream** - This activity leads students to calculate stream flow and to speculate how it might affect life downstream.

### *Prairie Plants*

**Sticky Situations** - The students collect different types of seeds by hiking through the prairie, during hikes, games, or stewardship activities. The seeds stick to leggings made of different types of furs. The seeds will be collected from the leggings and grouped by type. The students will use a bar graph, to graph and discuss what the information could mean to scientists studying animals. (Note: This is best done in the fall.)

**Seed Olympics** - Using a variety of materials, the students will develop a seed dispersal device. The travel of the seed will be measured by distance and accuracy.

**Hoopin' It Up on the Prairie** - Cooperative groups of students will randomly select a small area of prairie by throwing a hula hoop on the ground and then categorizing the number of plant and animal species found in the study plot formed by the hoop.

**Plant Galls** – Students will search the prairie and savanna for different types of plant galls. Galls can be sketched and with special permission may be collected and taken back to school to watch for emerging insects. (This is an inquiry, science-based activity where the students will collect field data for refuge scientists, a classroom visit may be required over the winter to help students sample and preserve specimens. This is a fall or winter activity.) This is a new program and only one school will help out with the pilot program in 2006.

**Biodiversity on the Slope** - Each student will make simple clinometers to be used to determine if various elevations are related to specific forms of prairie life.

**Gold Dust** - Participants will become aware of sources of pollen, its different sizes, shapes and colors and will note how pollen is transferred. They will view various structures of pollen transporters.

**What Is the "Wheel" Identity of This Plant?** - Students use an identification wheel to help them recognize prairie plants.

**The Write Stuff** - Students will practice field observations and record keeping.

**Patterns on the Prairie** - Through a walk on the prairie, students will develop an awareness of patterns found in various prairie plants. They will investigate and record observations as they look for patterns in nature.

### *Prairie Animals*

**Going Batty** - Students will learn about the types of bats that live in Iowa, what they eat and how they hunt. Myths about bats will be explored and the truth uncovered.

**Give Me a Home Where the Buffalo Roam** - Students will learn about the American buffalo and the tallgrass prairie. The activity also covers how the Plains Indians used the bison and the bison's family structure.

**Buffalo Hoops** - Students will learn about what happened to the bison in North America by playing a game similar to musical chairs. (Ties in very well with "Give me a Home Where the Buffalo Roam").

**Buffalo Hunt** - Students will learn the four components of habitat and how they affect animals. They will learn the importance of having the habitat components in correct proportions. They will learn what "limiting factors" are and how they affect animal populations.

**Prairie Birds - Sights and Songs** - Students will tour the refuge observing birds. They will practice bird watching techniques (binocular skills, visual and sound identification, behavior and habitat associations). NOTE: Early morning is best for this activity.

**Signs of Life** - This activity allows students to see the signs made by animals on the prairie that may not be active at the time of their visit. These animals can then be categorized into habitat types and classified by the diet they eat.

**What's Bugging You?** - The students will use sweep nets to collect various species of insects from five specific habitat areas on the Refuge. The areas are: open prairie, near the creek, near a pond, a marshy area, and the area near a savanna.

**Web Weaving** - Students will locate and observe spiders, their webs and feeding habits in a prairie setting.

**Home is Where You Hang Your Habitat** - Students become another animal and search for their ideal habitat.

**Prairie Pantry** - Actions of prairie critters will be observed and related to food chains. The interactions of food chains will show the interconnectedness of prairie animals.

### *Prairie/Human Interactions*

**Mapping the Prairie** - Students will map a study site of the prairie and will become familiar with using and reading map symbols.

**Old Bones in the Prairie** - The students will excavate a buried skeleton from a sand pit. They will learn about archeological techniques, skeletal articulation, and skeletal anatomy. They will also learn more about the bison that inhabited Iowa's prairies. Upper grade classes may choose to measure bone locations while excavating. Archeozoology is the study of animals in an archeological context.

**Come and Live in the Beautiful Prairie** - After reading or hearing selected readings about prairie, and taking a guided hike through the prairie, the students will use writing skills, art, role play, or group discussion to imagine a little of what the pioneers experienced in traveling across the Iowa prairies.

**Bur Oak of the Savanna** - Students will write an essay from the tree's perspective and what the tree may have experienced in the past and/or is experiencing in the present.

**Prairie Propaganda** - Students will design an advertisement for some aspect of the prairie (i.e. prairie plants, oak trees, rich soils, animal life, virtues of homesteading). Then create a commercial that will sell your product to other audiences.

**I Can Make the Difference** - Prairie participants will actively participate in a stewardship project.

**Prairie Rock Art** – Students will use rocks or hammers to pound leaf stains into pieces of cotton fabric.

### *Prairie Ecosystem*

**Prairie Scavengers** - The students will participate in a scavenger hunt in which they will be placing colored flags along the trail where they have found actual objects or processes naturally occurring in nature.

**Border Disputes** - Students will explore the prairie and investigate the environmental factors that affect and determine community. They will look for differences in plant and animal communities where different environmental factors exist.

**Succession Procession** - A hike along a prairie savanna trail will provide participants the opportunity to observe successional changes.

**Burning Questions** - Participants will recognize some of the effects of fire on the prairie. They will explore the vegetation, wildlife and soil of burned and non-burned areas.

**Deadly Prairie Links** - Participants simulate a food chain where human interference through use of pesticides affects the continuation of the food chain. High physical involvement.

**Prairie Ramble** - Participants will have the opportunity to observe the prairie from a variety of perspectives and note inter-relationships of plants and animals.

### *Prairie Night Sky*

**Adopt-a-Star** - Students observe the sky and choose a star that becomes their own personal star. Students write a brief description of their star and make a map of its location in the sky and follow it from night to night in the sky.

**Starlight, Starbright: Estimating Star Brightness** - This activity will allow students to observe the stars of the big dipper and notice that each has a different brightness or magnitude, enabling them to make more detailed observations of stars and notice subtle differences in their brightness.

**How Many Stars?** - Students take a star census using a mathematical estimating method. Most of them will be surprised to discover that there are fewer stars visible than they think!

**Shooting the Moon** - Students use binoculars and their unaided eyes to complete a simple map of the moon.

**Sky Watching** - Students learn how to use the SKY CALENDAR published by the Abrams Planetarium in Michigan to observe the night sky. Students will then keep a journal or diary of their observations when they return home.

**Sky Lights** - Students will learn how to use a planisphere (star wheel) to learn which stars and constellations are visible in the night sky on any night of the year and at any time at night. By using the star wheel, students will become familiar with the bright stars and common constellations in the sky.

[HIGH SCHOOL](#) (top)

### *Prairie Soils*

**Profiles of Soil** - Using exposed areas along creek beds, hillsides or a soil pit (or the remains of a soil probe test), students will determine the physical characteristics of soil in a given area [prairie (remnant or restored), disturbed area, savanna or woodlot].

**Splish Splash** - Students observe erosive effects of artificial rain (falling water) upon soil of various sites: prairie remnants/restored, woodlot/savanna, disturbed/agriculture land.

**Plants' Lunch** - Students collect topsoil and /or subsoil and analyze soil samples from disturbed, prairie (remnant and / or restored), and savanna or woodlot.

**Soil Texture Analysis and Physical Properties** - Students will gain a better working understanding of soil types and related physical properties which affect the growth of prairie species through a hands on series of mini activities. Students will determine various soil's textures by using the textural triangle and ribbon testing.

**Estimating Soil Erosion** - Students will travel to specific spots on the refuge (row crop, prairie, etc.) And collect data such as slope length and gradient. They will then return to a computer to calculate soil erosion using the Jasper county soil survey report and the Universal Soil Loss Equation.

## *Prairie Water*

**Walnut Creek Stream Quality - Physical and Chemical Analysis** - Students survey a stream's physical features, including: color, turbidity, width, depth, velocity, and temperature. They'll also compare water tests at two different sites as Walnut Creek enters and leaves the Refuge and record the results on the Refuge database.

**Walnut Creek Stream Quality - Creatures of the Creek** - Data about the following physical features will be gathered: color, turbidity, width, depth, velocity, and temperature. Investigators will collect organisms from Walnut Creek and identify the aquatic life to determine the condition of the creek using the types of organisms found as an indication of the quality of the water.

**Wetlands – Nature's Water Treatment Plant - Physical and Chemical Analysis** - Test the quality of the water that enters the wetland to compare with the quality of the water that leaves the wetland and enters the creek.

**Wetlands – Nature's Water Treatment Plant - Aquatic Invertebrates** - Test the quality of the water that enters the wetland to compare with the quality of the water that leaves the wetland and enters the creek by collecting and identifying aquatic invertebrates.

## *Prairie Plants*

**Transect Search** - A look at vegetative groups found within a range of selected sites: prairie (remnant / restored), savanna, woodlot or disturbed / agriculture land.

**Tree Core Samples** – Comparison of trees found in a savanna, creek bottom or near an old homestead.

**Wildflower Identification** - Students observe seasonal wildflowers of the Refuge. The wildflowers found will indicate the quality and quantity of life and the diversity of habitats.

**Bur Oak Nursery Seeding** - Students will collect bur oak acorns near their home or the oak savanna prairie and plant them in a raised bed tree seedling nursery. As follow-up stewardship activity, students may be able to transplant seedlings from the nursery to an oak savanna prairie area on the Refuge.

**Propagation and Research in Outdoor Nurseries** - Students will have the opportunity to practice identification of prairie seeds, seedlings, and mature dried plant specimens. In addition, they will be able to propagate prairie seeds in a greenhouse. The major activity will involve students designing an outdoor research nursery bed (6' x 30') experimenting with cover crops, planting density, soil types, spring versus fall seeding, mulching, depth, fertilizer rates, seeding dates, etc., as they work to establish prairie by direct seed

planting, greenhouse transplanting, and transplanting starts from established prairies found within or outside the Refuge.

**Prairie Seed Germination Experiments** - Students will propagate native prairie plants, processing the seeds by four methods to determine which method is the most successful.

### *Prairie Animals*

**Give Me a Home Where the Buffalo Roam** - Students will learn about the American buffalo and the tallgrass prairie. The activity also covers how the Plains Indians used the bison and the bison's family structure.

**Buffalo Hoops** - Students will learn about what happened to the bison in North America by playing a game similar to musical chairs. (Ties in very well with "Give me a Home Where the Buffalo Roam").

**Buffalo Hunt** - Students will learn the four components of habitat and how they affect animals. They will learn the importance of having the habitat components in correct proportions. They will learn what "limiting factors" are and how they affect animal populations.

**Who Lives There?** - Organisms are identified in a soil community through observation of several soil samples from different plant communities.

**Catch-and-Release Insects** - Students observe insect groups found within various plant communities.

**Grazing and Insect Population Research** - Students will carry out grazing research using American Bison herd enclosure and exclosure areas to calculate grazing area needs and the effects of grazing on insect populations.

**Bluebird Nesting Box Trail Management** - This activity will give students the opportunity to design a bluebird nesting trail, select sites in which to place bluebird nest boxes, mount the boxes, collect and enter data on each individually coded nest box for entry into a computer database, and to learn more about the behavior and management of the Eastern Bluebird. The best time for this activity would be from March 1 to the end of October. Early sunrise and after sunset would be the best times of day to conduct this activity, though any time during the day will be rewarding.

### *Prairie/Human Interactions*

**Life on the 1800's Iowa Prairie** - Through reading personal and other accounts and visiting the Prairie Learning Center, students compose a journal or a diary that could have been written by a young person in Iowa in the 1800's.

**Artist's Eye on the Prairie** - Students will visit a prairie area at Neal Smith National wildlife Refuge, and paint and/or photograph a natural prairie scene.

### ***Prairie Ecosystem***

**Comparing Prairie and Savanna Communities** - Part A: Students will perform a survey of a prairie reconstruction area that is in the early stages of succession (or development into a stable ecosystem) - young prairie and old prairie. Part B: Students conduct two transects on a well established prairie - upland and lowland. Part C: Students conduct two transects through a savanna area.

**Seasonal Changes on the Prairie - A Visual Account** - Students will use photography or video-taping skills to illustrate the changing images of a natural habitat at different times of the year. They will use the Prairie Learning Center to discover the main characteristics of their particular habitat.

**Endangered Species of Today's Prairies** - Students will tour areas evaluating habitat and research endangered and threatened species in Iowa.

### **[PRE- AND POST- VISIT](#)** (top)

**Pop Bottle Pots** (Target Grades 3-6) The students will plant various prairie species in 2 liter plastic bottles (one species per bottle) early in the fall. These plants will grow during the year, giving students the opportunity to observe the above and below ground growth of the plants. In the spring, the students will visit the Refuge or other natural area and plant their plants.

**Here Come the Sunflowers** (Target Grades K – 1) Students will have an opportunity to learn about sunflowers, a native plant of the North American Prairie, and plant sunflower seeds.

**What's the Use?** (Target Grades 3 and up) Students learn some of the historical uses of prairie plants and do one or more activities based on these uses.

**Endangered Prairie Animals** (Target Grades K-5) This activity should take place before or after a visit to the prairie. Students will become familiar with animals of the tallgrass prairie which are endangered or extinct at this time. Through discussion and activities, students will share their knowledge with others to arouse awareness of the importance of these animals.

**Worm Watching** (Target Grades K – 1) Over a period of a week to ten days, students will have the opportunity to observe the unique role earthworms play in building soils.

**Traveling Trunks** (Target Grades K-5) Use this activity pre-prairie and post-prairie. Or, parts of the activity could be used in the Visitor Center with objects available here. Through this activity, students will be able to visualize the hardships experienced by pioneer children and be able to make choices regarding items needed to make a cross-prairie trip.

**Human Prairie Homes** (Target Grades 2-6) Students will design a dwelling which would be at home on the prairie. They will study the attributes of the prairie and make their designs in harmony with those attributes.

**Agriculture in Your Life** (Target Grades K – 5) Students will learn the importance of farmland to the world and match everyday products to agricultural sources.

**Blowing in the Wind** (Target Grades 2-6) The students will construct and fly kites on the prairie.

**Draw Me a Prairie** (Target Grades 2-6) While listening to the description of the prairie in the *Little House on the Prairie*, the students will draw a picture of what they are hearing.

**Prairie Patchwork** (Target Grades 3-6) Students listen to a story about quilts and quilting (see Appendix B) and create a paper quilt with a prairie theme.

**Stewardship is for Everyone!** (Target Grades K-6) The students will search out the needs of their school, community, and area and take action to make their world a little better. They will then be ready to continue that action by using the Stewardship Board at the Refuge.

**At Home in the Savanna** (Target Grades 4-6) By constructing a bulletin board of the layers in a woodland or savanna, the students will learn about the interrelationships of plants and animals of wooded areas. Students will research a particular species to be included on the bulletin board and share this information with the rest of the class.

**Iowa's Rich Heritage** (Target Grades 7-8) This pre-field trip activity explores Iowa's past natural and human history. Students investigate their own family history and relate this genealogy to the use of Iowa's natural resources, past and present. Students will also make a connection between Iowa's productive (rich) soil and the pioneers that came to Iowa because of its soil and bountiful resources.

**Losing Ground** (Target Grades 2 – 5) This lesson presents the story of the Dust Bowl and two activities which demonstrate how the effects of farming practices in the early 20th century contributed to severe soil erosion in a large portion of the North American prairies.

**2, 4, 6, 8 . . . What do they Regurgitate?** (Target Grades 6-9) Students will explore owl pellets to recognize interdependence in ecological systems and create a method for comparing similarities and differences.

**Where's the Beef/Bison?** (Target Grades 6 – 8) This lesson focuses on the many products that are derived from beef cattle and buffalo or bison beyond just meat and meat products. Students will see that animal agriculture is an important part of their everyday lives just as the bison was a part of every day life for Native American plains tribes.

**What is Important?** (Target Grades 6-9) Students will discuss and evaluate the needs of wildlife versus human wants and needs. They will research, interview, and in other ways collect information which helps them decide whether the human needs or the wildlife needs take precedence over the other.

**Environmental Problems in Iowa** (Target Grades 7-8) This activity investigates some of Iowa's environmental problems as they relate to Neal Smith National Wildlife Refuge and the surrounding land, watersheds, and communities. The major goal of this activity is to develop positive values and a sense of responsibility toward the land, wildlife, and the environment. This unit stresses active involvement and participation by the learner in both cognitive and affective domains.

**You Be the Judge** (Target Grades 6-10) Students will use this post-field trip activity to compile the overall information that was learned on the field trip. By using data and information from the field trip, students will write a management report to the U.S. Fish & Wildlife Service, evaluating all or part of the resources at Neal Smith National Wildlife Refuge.

**Environmental Valuing** (Target Grades 6-9) This post-field trip activity helps students to think and react to how they feel about environmental problems and about what they can do about these problems as individuals, or as a class. By the use of environmental cartoons, students will write appropriate captions with environmental themes.

**To Restore or Not to Restore . . .** (Target Grades 6-9) In this simulation, students will have the opportunity to explore and understand varying points of view on land use.

**I Care** (Target Grades 6-9) Students will be given the opportunity to take action to show their care and commitment to society. They will participate in a service project.

**Prairie Post** (Target Grades 4 - 12) Students will create a newspaper about the prairie that includes the main sections of the newspaper.

**Habitat Connections** (Target Grades 6-9) This activity emphasizes the common needs of all living creatures for food, water, shelter, and space. Students will note the interdependence of the characteristics of an animal's habitat. This activity helps students recognize the appropriate arrangement of these habitat components.

**Whence the Watershed?** (Target Grades 6-9) One way to study a problem of land use and conservation is to look at all of the land in a *watershed*. To protect the water and soil, all of the land in the watershed must have good conservation and land use practices on it. This pre-visit activity helps students understand that.

**Striking a Balance** (Target 6 – 8) The sun’s energy is captured by individual plants and transferred to animals through food chains. Students will participate in an activity that demonstrates the principles and dynamics of food chains.

**Just Passing Through** (Target Grades 6 – 12) Students will investigate soils and observe how water moves through soil and how soil properties affect flow rate and water holding capacity. Students time the flow of water through different soils and measure the amount of water held in these soils. They will also observe the filtering ability of soils by noting the clarity of the water before and after it passes through the soil.

**Make Your Own Dip or Plankton Net** (Target Grades 9-12) Using some very simple materials, students will construct a net to collect aquatic invertebrates or plankton.

**Make Your Own Secchi Disk** (Target Grades 9-12) Using some very simple materials, students will construct a secchi disk to determine the turbidity (suspended solids) of the water.

**Measuring Dissolved Oxygen** (Target Grades 9-12) Students will practice using dissolved oxygen test kits, using tap water, an aquarium plant, and a small goldfish.

**Water Analysis - So What Does It Mean?** (Target Grades 9-12) During this post-activity the students analyze the data collected during the water testing activities at the Neal Smith National Wildlife Refuge by comparing their data with information in the *Water Quality Factors Reference Unit*, available from Hach Chemical Company. They present an oral report about some aspect of this comparison.

**Scarify, Stratify, Germini** (Target Grades 8-12) Students harvest prairie grass seed in the fall from local road ditches or other known locations, strip and store the seed, cold or hot stratify the seed, and propagate seed in a school greenhouse or under grow lights. They will be able to identify plants of the prairie and collect seeds from these remnants in a local ecotype.

**Trees of the Prairie** (Target Grades 8-12) Students will identify deciduous trees in the fall using a tree key.

**A Weed Feed** (Target Grades 9-12) As a follow-up to a visit to the Refuge, students create a variety of salads from some of the plants pulled from the prairie in their stewardship activities.

**Eastern Bluebird Nest Box Construction and Placement** (Target Grades 8-12)

Students will assemble Peterson bluebird nesting structures and place them properly to help develop a bluebird nesting trail at a class adopted site.

**Farmers and the Prairie** (Target Grades 8-12) As a competition, students are asked to develop a list or bring products from home to school that are made from crops and livestock and in another category, those derived from prairies of today or the past.

Emphasis will be placed on how society has called on farmers to plow the sod and grow crops and livestock for a rapidly growing nation.

**Adopt-an-Acre** (Target Grades 8-12) This activity is designed to have students (a class or youth group) organize and adopt-a-plot of land to manage as a prairie reconstruction or restoration in cooperation with other conservation groups or agencies.

**Seasonal Changes on the Prairie** (Target Grades 9-12) After students have recorded the seasonal changes of habitats at the Neal Smith National Wildlife Refuge, they will share their new knowledge of prairie and their artistic views of the prairie by organizing a presentation, and inviting members of the school community to view their work.

**Estimating Carrying Capacity** (Target Grades 9-12) Students will estimate carrying capacities and current populations of wildlife species on the Refuge with a biologist.