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MINNESOTA
NATURAL RESOURCES TEACHING GUIDE

ELEMENTARY SCHOOL ACTIVITIES

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NATURAL RESOURCES TEACHING GUIDE

FORESTRY AND RECREATION

OBJECTIVES: We must understand how plants live and how they function with other plants, animals, and nonliving things so we can develop an appreciation and an awareness of the out-of-doors and our natural resources.

We must understand the forest community, the tangible and intangible products derived from it, and the proper management of our forests and other natural resources for the welfare of our present and future generations.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
1	I. THERE ARE MANY KINDS OF PLANTS. 1. Have children bring seed catalogs. 2. Identify different plants in the schoolyard. 3. Display different specimens in test tubes in slab of wood.	F.A., Sc., S.S.
1, 2	II. PLANTS SERVE MAN IN MANY WAYS. Plants give us all our food either directly or by providing food for the animals we eat. Plants provide most of the material for our shelter, and plants supply much of the material for our clothing. Plants serve man by holding the soil in place and preventing rapid water runoff. Look at plants around us. Make a list of those we use for beauty, food, utility.	S.S., L.A.
1, 2,	III. SOME PLANTS SHOULD BE LEFT FOR US TO ENJOY. 1. Observe local housing projects where trees have been removed and places they have not been removed. 2. Relate family outings where plants have provided shade and recreation.	F.A., S.S.
1, 2, 3	IV. PLANTS HAVE MANY ENEMIES (MAN, ANIMALS, FIRE, DISEASE, INSECTS, WEATHER). 1. Display plants destroyed by fire, beaver, bark beetles, fungus. 2. Show pictures of trees damaged in storms. 3. Discuss vandalism.	Sc., S.S.
1, 2, 3	V. ALL ANIMAL LIFE IS DEPENDENT UPON THE EXISTENCE OF PLANTS. Refer to Soil Concepts (Food Chain).	Sc.
2, 3	VI. PLANTS HAVE DIFFERENT NEEDS AND GROWTH HABITS WHICH DETERMINE WHERE THEY LIVE. Some plants, like the balsam fir, grow best in the shade. The Norway pine needs a great deal of sunlight. Most oak trees grow on dry places. 1. Compare cactus garden to wet terrarium; measure amounts of water. 2. Visit nursery to note plants under cover and those not. 3. Have aquarium plants growing completely under water.	Sc., S.S., Math.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
2, 3	VII. EACH PART OF A PLANT HAS A PARTICULAR FUNCTION. The leaves or crown manufacture food so the tree can live; the stem or trunk holds the plant upright and serves as the transportation system for supplying moisture and nutrients to the leaves; the roots anchor the plant in place and deliver the soil moisture to the transportation system. 1. Draw a picture of a tree; label parts of the tree and discuss function of each. 2. Plant bean seed against glass to see parts of plants.	F.A., Sc.
3	VIII. PLANTS HELP BUILD AND HOLD THE SOIL IN PLACE. In addition to anchoring the plant, roots hold the soil in place and the plant leaves (or canopy) reduce the velocity of the raindrops and retards soil erosion. The dead leaves and limbs that fall to the forest floor decompose producing humus to cover the soil and further reduce soil erosion. 1. Illustrate how decayed material builds soil after examining compost while on field trip. 2. Refer to soil concept V.	Sc., S.S.
3	IX. IF WE USE AND MANAGE PLANTS CORRECTLY THEY CAN BE RENEWABLE. Plants can be harvested and replenished by us so new plants will always be available for us. Trees can be harvested for wood products and then new trees will be planted to grow a new crop. If mature seed-producing trees are left, young seedlings will grow if managed properly. 1. Discuss planting trees and garden flowers. 2. Have students plant trees on schoolground, if possible.	Sc., S.S.
3	X. PLANTS ARE THE MAJOR SOURCE OF ALL FOOD AND THE MOST IMPORTANT SOURCE OF CLOTHING, SHELTER, AND WARMTH FOR MAN. Plants are the only living things that can convert the sun's energy into life-giving food. In addition to this they provide a source for our clothing and shelter. 1. Make scrapbook of pictures of clothing, shelter, fuel, and food.	S.S., L.A.

BIBLIOGRAPHY OF REFERENCES FOR THIS SECTION

"Little Smokey" - Film -- U.S. Forest Service, 633 West Wisconsin Ave.
Milwaukee, Wis. 53203

"Our Magic Land" - Film - U.S. Forest Service, 633 West Wisconsin Ave.
Milwaukee, Wis. 53203

"The President Plants a Tree" - Film)
"The Forest Grows" - Film)
"The Changing Forest" - Film)
"Patterns of the Wild" - Film)

Visual Aids
Agricultural Extension Service
University of Minnesota
St. Paul, Minn. 55101

Teaching Aids: Timber Producers' Association
203 Beal Building
Duluth, Minn. 55802

American Forest Products Industries, Inc.
332 South Michigan Ave.
Chicago, Ill. 60604

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
4	XI. MANY PLANTS ARE USEFUL; SOME ARE HARMFUL. NEW USES FOR PLANTS ARE BEING DISCOVERED ALL THE TIME. Plants give us many items to make our lives more pleasant. Some plants such as poison ivy or nettles can harm us. New medicines and products such as plastics, nylons, etc. are being derived from plants. 1. Research and draw pictures of harmful plants. Learn to recognize them. 2. Chart new uses for plants.	F.A., S.S., L.A.
4	XII. THE ENEMIES OF PLANTS (MAN, ANIMALS, FIRE, DISEASE, INSECTS) AFFECT THEM IN DIFFERENT WAYS. Nine out of 10 fires are still caused by man; he disfigures trees in parks and campgrounds. Animals chew and disfigure trees and girdle trees. Lightning fires burn many acres of forest each year; disease decays wood. Insects bore into trees and disfigure the wood and girdle the growth layer, killing the tree or eating the leaves so they can't manufacture food. 1. Make a chart of enemies of plants in Minnesota and classify these enemies. List how they affect the plant. 2. Conduct a local project - Work with county agent to discover a specimen of a diseased or insect-infested plant. 3. Define a forest-community.	Sc., S.S., L.A.
4, 5	XIII. PLANTS HELP BUILD AND HOLD THE SOIL IN PLACE. In addition to anchoring the plant, roots hold the soil in place. The plant leaves (canopy) reduce the velocity of the raindrops and retard soil erosion. The dead leaves and limbs that fall to the forest floor decompose, producing humus to cover the soil and further reduce soil erosion. 1. On a field trip show how plants build and hold the soil in place. 2. Write report on how the soils differ. Tell where plants grow and where they don't.	Sc., S.S.
4, 5, 6	XIV. ALL ANIMAL LIFE IS DEPENDENT UPON THE EXISTENCE OF PLANTS. Make diagram showing food chain. Emphasize how most life is dependent upon plants.	Sc.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
4, 5, 6	XV. FORESTS ARE COMMUNITIES OF PLANTS, ANIMALS, AND NONLIVING THINGS JUST AS A TOWN OR CITY IS A COMMUNITY OF PEOPLE, PLANTS, AND NONLIVING THINGS. Cooperation and competition are ever-present activities in the community. 1. Show how people compete and cooperate. Compare with competition in the forest. 2. Assign a lesson on the life history of lichens.	Sc., S.S.
4, 5, 6	XVI. IF WE USE AND MANAGE PLANTS CORRECTLY THEY CAN BE RENEWABLE. Plants can be harvested and replenished by us so new plants will always be available. Trees can be harvested for wood products, and then new trees will be planted to grow a new crop. If mature seed-producing trees are left, young seedlings will grow themselves. Grass can be grazed and new grass will grow if managed properly. Illustrate how plants renew themselves if man takes care of the land. Contrast this with an explanation of why plants do not renew themselves where man neglects the land.	Sc., S.S.
5	XVII. IT OFTEN TAKES MORE THAN THE LIFETIME OF ONE PERSON TO GROW TREES FROM SEEDLINGS TO MERCHANTABLE TIMBER. A tree usually puts on one growth ring of wood a year. Norway pine matures in about 120 years. The virgin timber stands are often made up of trees 300 years old. These trees are considered overmature. 1. Compare the growth of a Norway pine to the growth of a person by listing the ages when a tree and a person are young, mature, and old. 2. Plant seedlings or seeds of trees.	Sc., S.S., L.A., Math.
5	XVIII. TREES AND TREE PRODUCTS ARE IMPORTANT TO THE ECONOMY OF THE STATE AND NATION. The nation's economy is based on a flow of raw materials. 1. Discuss importance of the industry to the state and nation. 2. Graph various comparisons. Example: job situation in state and nation (percentages).	L.A., Math.

Suggested Grade Level for Teaching		Concept	Curriculum Areas of Concentration
5	XIX.	THE CHARACTER OF THE SOIL AND THE CLIMATE HELPS DETERMINE THE KINDS OF PLANTS THAT WILL GROW. Soil acidity, soil texture, slope of the land, amount of soil moisture, temperature, rainfall, aspect of slope all affect the type of plants that can grow in a certain place. Discuss and list the different soil and climatic conditions that control most plant life in Minnesota.	Sc., S.S.
5	XX.	PLANTS GROWING TOGETHER FORM COMMUNITIES, EACH MEMBER INFLUENCING ITS NEIGHBORS. All plants need light, soil moisture, nutrients, and minerals to grow. Competition of all plants determines which plants will live and which plants will die in this struggle for survival. Balsam fir, for example, can grow in dense shade; Norway pine needs open sunlight and mineral soil to survive. 1. Take a field trip to a forest area to observe communities. 2. Plant seeds in room planters. Vary as to size, space, etc.	Sc., S.S.
5	XXI.	PLANTS PRODUCE HUMUS. All plants germinate, live, and die. When plants die they fall to the forest floor and finally decay into soil producing organic decomposed material called humus. 1. Have compost located on schoolground. 2. Refer to soil concepts. 3. Put sample of moist soil with dead leaves in jar. Children observe decomposition (leaf mold or humus).	Sc.
5	XXII.	EACH SPECIES HAS DIFFERENT REQUIREMENTS FOR AIR, LIGHT, MINERALS, MOISTURE, AND TEMPERATURE. Plants have adapted themselves to thrive in their environment. Some trees like wet sites, some dry sites. The tropical rain forests have entirely different conditions than the temperate rain forests. 1. Chart different types of plants on Minnesota map and state how they have adapted to their environment. 2. Discuss difference between tolerant and intolerant plants.	F.A., Sc., S.S., L.A.

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5	XXIII.	PLANTS HAVE PLAYED AN IMPORTANT PART IN OUR HISTORY AND THE DEVELOPMENT OF OUR COUNTRY. Trees were often a nuisance to the pioneers; grasslands provided a resource for vast herds of cattle and sheep. Compare plants of prairie, mountain, and seacoast areas of our country and show how each contributed to our development.	Sc., S.S.
5	XXIV.	ABOUT ONE-FOURTH OF THE UNITED STATES IS NOW FORESTED AS COMPARED WITH TWO-FIFTHS AT THE TIME OF SETTLEMENT. Because of an expanding population that needs living space and other commodities, forest land is being developed for new uses. Discuss why there is less forested land now than in the past and relate to above concept.	S.S.
5, 6	XXV.	TREES GROW BY PRODUCING BUDS. Some of these buds have a special function and become flowers. Flowers are fertilized and become the fruit. Seeds are borne in the fruit. These seeds may germinate and grow into trees. Study the parts of a tree. Diagram the development of buds, flowers, fruit, and seeds.	Sc.
5, 6	XXVI.	SOME TREES MAY GROW FROM SPROUTS OR SUCKERS FROM STUMPS, ROOTS, OR AT THE BASE OF AN ALREADY GROWING TREE. Basswood is a good example of this, and a basswood clump may represent several generations of trees growing in the same place. On a field trip or trip around the schoolyard look for clumps of trees or sprouts from a standing tree or fallen tree.	Sc.
5, 6	XXVII.	PLANT COMMUNITIES RESPOND TO TREATMENT BY MAN IN A FAIRLY PREDICTABLE MANNER. Norway pine, for example, needs mineral soil and sunlight in order to germinate and grow. By harvesting this species in clear-cut harvest units and burning or disturbing the needle mold and humus we can predict that Norway pine will reforest itself on the area. 1. Compare plant communities on well-managed land with unmanaged area. 2. Take a field trip, preferably with a forestry expert.	Sc., S.S.

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5, 6	XXVIII.	PLANTS INFLUENCE EACH OTHER AND ALSO THEIR ENVIRONMENT BY COMPETITION FOR LIGHT, MINERALS, AND MOISTURE. There is only so much soil moisture available for plant growth. The plants that can utilize this moisture best and first will be the dominant trees. See above field trip.	S.S.
6	XXIX.	DOMESTIC PLANTS ORIGINATE FROM NATURAL SPECIES BY SELECTION AND EXPERIMENTATION. All of our domestic plants were once natural wild species. 1. Discuss and list domestic plants and their ancestors. 2. Plant wild plants to note changes under cultivation. 3. Discuss hazelnut, filbert, and maize corn.	Sc., S.S., L.A.
6	XXX.	IN DEVELOPING OUR CULTURE SOME OF OUR ORIGINAL FOREST LAND HAS BEEN REMOVED. MUCH OF THE REMAINING FOREST IS ON THE MORE MOUNTAINOUS AND LEAST PRODUCTIVE LAND NOT SUITABLE FOR AGRICULTURE. 1. Show pictures 2. Take a field trip to a forest. Have pupils relate observations.	F.A., Sc., S.S.
6	XXXI.	THE PRINCIPAL FACTORS REDUCING FOREST PRODUCTION ARE POOR CUTTING PRACTICES, INSECTS, DISEASE, AND FIRE. THE PRINCIPAL FACTOR REDUCING GRASSLAND PRODUCTION IS OVERGRAZING. 1. Design posters for fire prevention. 2. Discuss first how these factors affect forest production. 3. Classify and identify six major harmful insects in Minnesota.	F.A., Sc., S.S., L.A.
6	XXXII.	CULTURE THROUGHOUT THE WORLD IS INFLUENCED BY THE KINDS OF PLANTS AN AREA CAN PRODUCE. FORESTS, NATIVE GRASSLANDS, AND CULTIVATED CROPS OF MANY KINDS ARE THE PLANTS OF MOST IMPORTANCE IN THE WORLD. Trace the history of the development of areas in South America. (pampa, rain forest, etc.)	S.S.

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"A Tree Grows for Christmas" - Film)
"Rainbow Valley" - Film)
"The Forest" - Film)
"Fire Called Jeremiah" - Film) Visual Aids
"Fire on the Land" - Film) Agricultural Extension Service
"The Forest Produces" - Film) University of Minnesota
"Tomorrow's Trees" - Film) St. Paul, Minn. 55101
"Trees -- How We Identify Them" - Film)
"Wilderness Day" - Film

Teaching Aids:

American Forest Products Industries
332 West Michigan Ave.
Chicago, Ill. 60604

Soil Conservation Service
Federal Courts Building
St. Paul, Minn. 55101

U.S. Forest Service
Division of Information and Education
633 West Wisconsin Ave.
Milwaukee, Wis. 53203

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1, 2, 3	I. THE BEST WAY TO ENJOY NATURE IS TO OBSERVE NATURE 1. Take a nature walk. Chart stories and pictures. 2. Adopt a tree and make an experience chart during the different seasons.	Sc., S.S.
1, 2, 3	II. GOOD HABITS IN THE USE OF OUTDOOR RECREATIONAL AREAS ARE IMPORTANT. FOR EXAMPLE, WILDFLOWERS SHOULD BE LEFT FOR OTHERS TO ENJOY. 1. Learn the names of wild flowers from pictures. 2. Collect wild flowers (press).	Sc.
1, 2, 3	III. WE SHOULD NOT HARM OUR FORESTS BY LITTERING, VANDALISM, OR IMPROPER USE OF FIRE. 1. Smokey The Bear -- songs, pictures, dramatizations. 2. Have children draw pictures of litter prevention. Place in hall, cafeterias, etc. 3. Pick up litter on a field trip and display in showcase. 4. Make a "litterbug" from litter and display.	F.A., Sc., S.S.
1, 2, 3	IV. WE CAN IMPROVE THE BEAUTY OF OUR HOMES AND SCHOOLYARDS BY TAKING CARE OF OUR TREES AND SHRUBS. 1. Conduct a class project of planting a small area and caring for it throughout the year. Landscape around the building. 2. Help younger brothers and sisters not to trample flowers and to respect people's property.	F.A., S.S.
1, 2, 3	V. WE SHOULD WEAR THE PROPER CLOTHING SO WE CAN PLAY SAFELY OUTSIDE. 1. Prepare posters showing proper clothing 2. Emphasize proper clothing for different seasons.	F.A., S.S., L.A.
2, 3	VI. THERE ARE MANY KINDS OF FOREST RECREATION FOR PEOPLE TO ENJOY. These include picnicking, camping, hiking, swimming, skiing, boating, fishing, hunting, and looking at the scenery. 1. Parks, lakes, trail hiking, camping. 2. List all activities students have done with their families.	S.S.

BIBLIOGRAPHY OF REFERENCES FOR THIS SECTION

"Woodland Manners" - Film -- A.E.S.

"Little Smokey" - Film -- U. S. Forest Service

Suggested

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4	VII.	THERE ARE MANY DIFFERENT KINDS OF RECREATIONAL OPPORTUNITIES IN THE STATE. These include picnicking, camping, hiking, swimming, skiing, boating, fishing, hunting, and looking at the scenery. 1. List and discuss recreational opportunities in Minnesota. 2. Have students discuss recreational areas they have visited. Help students make bulletin board of postcards, etc.	F.A., S.S., L.A.
4, 5, 6	VIII.	WE SHOULD WEAR THE PROPER CLOTHING SO WE CAN PLAY SAFELY OUTSIDE. Discuss special clothing needed for various sports and activities.	S.S.
4, 5, 6	IX.	WE CAN LEARN TO SHARE AND LIVE WITH EACH OTHER OUTSIDE. HABITS OF COURTESY, SAFETY, AND SANITATION ARE ESSENTIAL IN OUTDOOR LIVING. THE OUT-OF-DOORS CAN BE A SOURCE OF ENJOYMENT AND A FACTOR IN HEALTHFUL LIVING. 1. Relate sportsmanship rules at school with outdoor camping responsibilities. 2. Discuss sanitation and water pollution. 3. Stress personal pride in self and environment.	Sc., S.S.
4, 5, 6	X.	WE CAN IMPROVE THE BEAUTY OF OUR HOMES AND SCHOOLYARDS BY TAKING CARE OF OUR TREES, SHRUBS, AND GROUNDS. 1. Conduct planting projects at home and at school. 2. Help custodian care for grounds. 3. Organize litter patrols.	Sc., S.S.
4, 5, 6	XI.	THE USE OF SCHOOL FORESTS AND OUTDOOR SCHOOLS IS AN IMPORTANT PART OF OUR EDUCATIONAL PROGRAM. 1. Conduct a field trip to forest areas or participate in other districts' outdoor schools. 2. See and discuss areas which cannot be covered in classroom.	F.A., Sc., S.S., L.A., Math.
4, 5, 6	XII.	THERE ARE MANY RECREATIONAL AREAS CONSTRUCTED AND MANAGED BY MAN ON PRIVATE, STATE, AND FEDERAL LANDS. 1. Map federal, state, and private lands used for recreation. Contact organizations concerned. 2. List types of recreation and area.	F.A., S.S., L.A.

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6	XIII. AN OUTDOOR AREA TO BE USED FOR RECREATIONAL OR EDUCATIONAL PURPOSES SHOULD BE SAFE AND SANITARY. 1. It should have fire protection. We should be careful where we place toilet facilities. 2. Relate from personal experience where these things were placed. (How far from streams? Why fireplaces, etc.)	S.S., L.A.
6	XIV. A SCHOOL ARBORETUM CAN HELP US LEARN AND APPRECIATE THE DIFFERENT TREES AND ADD BEAUTY TO OUR SCHOOL. Develop a school arboretum.	Sc.

BIBLIOGRAPHY OF REFERENCES FOR THIS SECTION

"Wilderness Encampment" - Film)
"Out of the Frying Pan Into the Fire" - Film)
"Winter Olympics" - Film

U. S. Forest Service
633 West Wisconsin Ave.
Milwaukee, Wis. 53203

"Introduction to Forest Adventuring" - Film)
"The Lost Hunter" - Film)
"Wilderness Day" - Film)
"Wilderness Trail" - Film)

Visual Aids
Agricultural Extension Service
University of Minnesota
St. Paul, Minn. 55101

Teaching Aids: U.S. Forest Service
State Game Commission
Bureau of Information
Department of Conservation

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1, 2, 3	I. WATER MUST BE REUSED MANY TIMES IF THERE IS TO BE ENOUGH FOR EVERYONE. We waste water if we pollute it so it cannot be cleaned and reused. We waste water if we do not use it for a beneficial purpose. 1. Discuss good uses for water. 2. Discuss how we can waste water. 3. Discuss how some rivers and lakes become polluted.	S.S.
1, 2, 3	II. SNOW IS WATER IN SOLID FORM. There is about 1 inch of water in 10-12 inches of freshly fallen snow. 1. Take a deep pan and fill with snow. Measure the depth of the snow in the pan. 2. Allow the snow to melt in a warm room. 3. Measure the depth of water. 4. Discuss how much water was in the snow. Why is the snow deeper than the water?	Sc.
1, 2, 3	III. OUR COMMUNITY HAS MANY OTHER NEEDS FOR WATER. Some uses are industry, irrigation, waste disposal, navigation, hydroelectric power, fisheries, aquatic habitat, and domestic purposes. 1. List the needs we have for water. 2. Bring pictures for bulletin board display showing how water is used.	S.S., L.A.
1, 2, 3	IV. THE WATER THAT WE USE COMES FROM STREAMS, RESERVOIRS, LAKES, WELLS, AND SPRINGS. It is brought to our homes by pipes and pumps. 1. Visit your city's waterworks. 2. Discuss where the water in your home comes from.	S.S., L.A.
1, 2, 3	V. THE PRIMARY SOURCES OF PURE FRESH WATER ARE RAIN, SNOW, SLEET, OR HAIL. Melt ice, snow, or hail to make water.	Sc.
1, 2, 3	VI. WATER HAS THREE FORMS: SOLID-ICE, LIQUID-WATER, GAS-STEAM AND WATER VAPOR. 1. Melt an ice cube. 2. Boil water to make steam. 3. Catch water vapor on a pane of glass. Watch water form.	Sc.

Suggested Grade Level for Teaching		Concept	Curriculum Areas of Concentration
1, 2, 3	VII.	PLANTS NEED WATER TO GROW. 1. Slice the tops from two carrots. Place one in a glass of water and watch the green top grow. 2. Place an acorn in a glass of water and watch roots grow.	Sc.
1, 2, 3	VIII.	CLEAN WATER IS NECESSARY FOR GOOD HEALTH. Dirty water may make you very ill if it contains harmful bacteria, viruses, or poisonous chemicals. Since water may be used several times, it must be kept clean. 1. Examine pond water under a microscope. 2. Run some of the pond water through a clean sand filter and examine under the microscope. 3. Discuss what you would do if you had only half the water you now have.	Sc., S.S., L.A.
1, 2, 3	IX.	WATER IS USEFUL FOR PLEASURE. Recreation uses include fishing, boating, water skiing, swimming, or enjoyment of its beauty. 1. List activities that take place on, in, or near the water. 2. Bring pictures for bulletin board display. 3. Show color of water in pictures. Write sentences and make pictures showing the beauty of water.	F.A., S.S., L.A.
4, 5, 6	X.	WATER MOVES IN A CYCLE FROM CLOUDS TO EARTH AND BACK AGAIN. THIS IS CALLED THE WATER OR HYDROLOGIC CYCLE. Water is indestructible, though it may change from liquid to solid to vapor. Water supplies are also constantly being renewed. 1. Illustrate evaporation by boiling water and plant transpiration with a plant terrarium. Measure relative humidity. 2. Discuss and construct chart showing the water cycle.	S.S., Sc., L.A.
4, 5, 6	XI.	WATER IS NEEDED FOR MANY USES. Water must be used again and again because there isn't enough for every purpose if it is used only once. Some uses consume water while others do not. Pollution of water should be avoided if water is to be reused. 1. List on a chart ways in which water is consumed when used. 2. List on a chart ways in which water can be used but not consumed. 3. Ask a government official who is responsible for water use to visit class and tell about water needs (industrial, domestic, irrigation, etc.)	S.S.

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4, 5, 6	XII.	WATER IS OUR MOST ABUNDANT RESOURCE. Clean, pure, fresh water is not always available to us because it may have been used by others first. We must take care of our water to keep it clean and pure so it is available for reuse. Water is constantly being renewed for us by precipitation but the distribution is often not adequate to meet man's needs. 1. On a world map compare the size of water areas to land areas. 2. Discuss the water cycle and relate this to water abundance.	S.S., L.A.
4, 5, 6	XIII.	ALL LIFE DEPENDS ON WATER. Our total body weight is about 71 percent water. Water is used in metabolism, regulating temperature, and nourishing the tissues. Plants use water to carry nutrients from the soil and for transpiration. 1. How much water do you drink daily? 2. How much water is in foods such as milk, etc.? 3. How does a plant use water?	Sc.
4, 5, 6	XIV.	WATER HAS THE ABILITY TO RISE IN SMALL TUBES. This is known as capillarity, or wick action. It is important in the use of water by plants and the retention of water in soils. 1. Place the edge of a dry blotter in water. Watch the water wet the blotter. 2. Place a flowerpot containing dry soil in a shallow pan with water in it. Note the condition of the soil after a day. How did the soil get wet? 3. Take a growing plant in a pot and add water at the bottom using a saucer or shallow pan. Where does the water go? How does the plant get the water? 4. Place a piece of dry string so that one end is in a pan of water and the other end hangs over the side with its tip lower than the level of water in the pan. Watch the water drip from the end of the string.	Sc.
4, 5, 6	XV.	WATERSHEDS DIRECT THE FLOW OF WATER TO THE OCEAN. They are separated by divides and may have names. 1. Discuss the idea of a watershed. 2. What is the name of the smallest watershed you are in? Does it flow into a larger watershed? 3. What is the name of the major watershed you are in?	S.S.

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4, 5, 6	XVI. STREAM FLOW RECORDS ARE KEPT BY THE UNITED STATES GEOLOGICAL SURVEY (USGS). 1. Contact the USGS and ask to visit a stream gauging station. 2. Find out how long the gauging station has been operating. 3. Discuss why stream flow records are important.	S.S.
4, 5, 6	XVII. AGRICULTURAL SOILS MUST HAVE THE PROPER AMOUNT OF WATER. A soil with too much water is called saturated and may be poorly drained. A soil with too little water cannot support plant growth. 1. Take a common flowerpot and fill to within 1 inch of the top with soil from a garden. 2. Plug the bottom hole of the pot securely with a cork. 3. Add water slowly to the soil. Make a slight indentation with the thumb in the top of the soil. Keep adding water until the indentation stays full of water. Now smooth out the soil so that no free water appears. This soil is saturated. Plants cannot grow in it, soil organisms cannot grow in it. 4. Take an empty beaker, remove the plug from the bottom of the pot and catch the water that drains off. This is free or gravitational water.	Sc.
4, 5, 6	XVIII. PLANTS CANNOT LIVE WITH TOO LITTLE OR TOO MUCH WATER. 1. Obtain three healthy tomato plants from the greenhouse 2. Plant one in a pot with very dry soil. 3. Plant one in a pot with the bottom hole plugged and add water so the soil is always saturated. 4. Plant one in well-drained soil and add water every few days. 5. Note the condition of the plants after several days. 6. Discuss why the plants react as they do.	Sc.
4, 5, 6	XIX. WATER IS USED BY PLANTS IN MAKING FOOD. Plants take moisture from the soil and use it in the leaves in the process of food making. Plants such as rice and cranberries grow in the water. 1. Place the stem end of a freshly cut plant with a blossom into water colored with vegetable dye. 2. Note that the color shows up in the blossom and leaves. (You may have to cut the leaves to see the color.) 3. Discuss how the water travels from the soil to the plant leaves.	Sc.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
4, 5, 6	XX. WATER IS A BYPRODUCT OF THE COMBUSTION PROCESS. 1. Take a shiny, cool piece of metal and hold above a bunsen burner or other gas flame for a very short time. Do not allow metal to get warm. The "cloudy" appearance is condensed water. 2. Water is composed of two atoms of hydrogen and one of oxygen. 3. What is the chemical formula for water? 4. Where does the hydrogen come from? Where does the oxygen come from?	Sc.
4, 5, 6	XXI. WATER MUST BE STORED. To have adequate water when we need it, there must be reservoirs either above or below ground. The reservoirs below ground are called aquifers, and we get their water from wells or springs. Above-ground storage reservoirs are streams and lakes, either natural or manmade. 1. Contact your local Soil Conservation Service or Geological Survey Office and ask to see natural and manmade storage areas. 2. Contact your city officials and have them explain their water supply. Where is their water supply stored before they use it? How does it get there?	Sc., S.S.
4, 5, 6	XXII. NATURAL RESOURCE MANAGEMENT AFFECTS WATER STORAGE. If precipitation runs quickly off the land it will fill surface storage reservoirs and may cause flooding. Land treatment measures on farm and forest will allow more precipitation to enter the ground and the reservoirs below ground. 1. Ask your local Soil Conservation Service Office to explain land treatment methods. 2. Discuss how the land treatment methods affect runoff and water storage.	S.S.
4, 5, 6	XXIII. WATER IS A TRANSPORTER AND CARRIER OF DISEASE AND OTHER IMPURITIES. Typhoid, intestinal flu, toxins, sediment are examples of diseases carried by water. Water can clean itself of some impurities, but treatment is needed for domestic supplies and for some industrial uses. 1. Visit a water treatment plant. Discuss chlorination of water for treatment of impurities. 2. Be able to list six diseases and impurities carried by water. Relate to immunization shots.	Sc., S.S.

Suggested Grade Level for Teaching		Concept	Curriculum Areas of Concentration
4, 5, 6	XXIV.	POLLUTION IS THE PRINCIPAL WAY BY WHICH OUR WATER RESOURCE IS WASTED OR MADE UNFIT FOR USE. Pollution occurs by chemicals (nutrients, toxins, detergents, oils); physical (sediment, radioactivity, temperature); biological (disease organisms such as viruses, bacteria algae, worms, snails, birds). Other sources of pollution include domestic wastes (sewage, garbage, kitchen and laundry); industrial (toxic materials, heat, mining, agriculture, roads, dams); fallout from smoke particles; agriculture (animal and crop wastes, farmstead drainage, pesticides); forest use (timber harvest, recreation, gas and oil from boats, body contact from swimming); accidental spills (oils, toxic materials, nutrient materials). 1. Discuss and list principal ways water is polluted. 2. Collect and test samples of water for purity (using swimming pool test kit). 3. Discuss water pollution laws and measures needed to keep water clean.	S.S., Sc.
5, 6	XXV.	WATER SHORTAGES MAY BE NATURAL OR MANMADE. The natural supply of water varies greatly from place to place and season to season. To have adequate water when needed, man must transport or store water. Reuse of water may be prevented by pollution. 1. Discuss how water may be stored and transported. 2. Discuss natural conditions that may cause water shortages. 3. Discuss how water may be polluted so it cannot be reused.	
5, 6	XXVI.	WATER PROBLEMS ARE A RESULT OF MAN'S NEEDS. Water is short whenever there is less clean water than someone needs. Many of man's water problems are a result of human pollution. Pollutants are domestic sewage, garbage disposal, industrial wastes of many kinds, accidental spillage of chemicals, erosion of denuded or disturbed soil from agricultural land or construction projects, oil washed from streets or highway surfaces, mine drainage, smoke particle fallout, and many others. 1. Discuss man's increased water use over the past two decades. 2. Discuss how man could modify these uses to have more water available for reuse.	S.S.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
1, 2, 3	I. THERE ARE MANY DIFFERENT KINDS OF ANIMALS. Some are so tiny we cannot see them without a microscope. Others are identifiable as worms, insects, amphibians, reptiles, fish, birds, and mammals. 1. Take a field trip to the zoo. 2. Get pictures of different kinds for bulletin board. 3. Make a bird calendar with pictures giving dates when birds are observed.	S.S.
1, 2, 3	II. ALL ANIMALS MUST HAVE FOOD, WATER, AND A PLACE TO LIVE. Each kind needs different food and shelter. Some live in water; others absorb it or drink it. Some live in the ground, on the ground, in grass, in shrubs, in trees, or in the air. Each animal must have sufficient food, water, and shelter throughout the year. Man has changed the environment. This sometimes has forced animals to move from good habitat to that which is less desirable. 1. Have a pet in the room and observe its specific living requirements. 2. Adopt an animal. Check its requirements; build a model of the animal. Build a model home.	Sc., S.S.
1, 2, 3	III. SOME ANIMALS ARE TAME OR DOMESTICATED AND CAN LIVE WITH OR CLOSE TO PEOPLE. OTHER ANIMALS ARE WILD AND CAN LIVE ONLY IN PLACES WHERE THERE ARE NO PEOPLE AND HOUSES. WILD ANIMALS SUCH AS INSECTS MAY LIVE CLOSE TO PEOPLE. 1. Discuss and list pets. 2. Discuss and list wild animals. 3. Discuss and list domesticated farm animals.	Sc., L.A.
1, 2, 3	IV. MANY BIRDS AND ANIMALS ARE HELPFUL TO MAN AND SHOULD BE ATTRACTED AND PROTECTED BY MAN. They help keep insects and destructive animals in check. 1. Make mobiles of birds or animals. 2. Make bird houses. 3. List ways that birds and animals are helpful to man. 4. Discuss: When might an animal be both desirable and undesirable or at one time be desirable and another undesirable?	F.A., S.S., L.A.

Suggested Grade Level for Teaching		Concept	Curriculum Areas of Concentration
1, 2, 3	V.	ALL ANIMALS ARE IMPORTANT TO MAN OR TO OTHER ANIMALS. SOME ARE USEFUL TO MAN IN HIS WORK: OTHERS PROVIDE FOOD AND CLOTHING. SOME ANIMALS ARE IMPORTANT BECAUSE OF THE DAMAGE THEY DO. WILD ANIMALS PROVIDE HUNTING, FISHING, AND OTHER TYPES OF RECREATION. Man uses horses for pulling loads or carrying. He kills pigs, cows, sheep, chickens, and other animals for food. He must sometimes destroy skunks, raccoons, and weasels which raid his poultry yard. Deer, moose, pheasants, and others provide recreation. 1. Make a scrapbook of animals which help man, those which do damage. 2. Show and tell about hunting and fishing episodes. 3. Observe articles of clothing made from fur and animal hides.	S.S.
1, 2, 3	VI.	SOME ANIMALS EAT LEAVES, FRUITS, SEEDS, OR NUTS PRODUCED BY PLANTS THAT LIVE ON LAND OR IN THE WATER. OTHER ANIMALS EAT MEAT THEY OBTAIN BY KILLING OTHER ANIMALS. SOME ANIMALS EAT BOTH. List food necessary for different kinds of animals.	Sc., S.S.
2, 3	VII.	ANIMALS HAVE DIFFERENT NEEDS AND HABITS THAT DETERMINE THE PLACES WHERE THEY LIVE. ANIMALS ARE PART OF THE COMMUNITIES OF LIVING THINGS. Most animals establish a "home range" and live out their entire lives there. Have a bird's nest in your room. Discuss characteristics of materials: shape, size, etc. Explain how nests are designed to protect small birds from weather, predators, gravity.	Sc., S.S.
3	VIII.	WILDLIFE IS FOUND EVERYWHERE; SCHOOLGROUNDS, YARDS, PARKS, FARMS, FIELDS, FORESTS, ARID LANDS, SWAMPS, STREAMS, LAKES, AND OCEANS. See how many different kinds of animals you can find in one small area of your school yard. Post pictures they draw of animals inhabiting each environment. (Mural)	F.A., S.S.
3	IX.	SOME ANIMALS HAVE BECOME EXTINCT BECAUSE OF MAN'S CHANGING THE ENVIRONMENT. OTHER ANIMALS MAY BE IN DANGER OF EXTINCTION. Example: Koala bear Egret Trumpeter Swan Timber Wolf	F.A., S.S. WILDLIFE

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Agricultural Extension Service
University of Minnesota
St. Paul, Minn. 55101

Teaching Aids:

State Game Commission
U.S. Forest Service
Soil Conservation Service

WILDLIFE

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
4	I. ALL ANIMALS ARE IMPORTANT TO MAN OR TO OTHER ANIMALS. SOME ARE USEFUL TO MAN IN HIS WORK; OTHERS PROVIDE FOOD. SOME ANIMALS ARE IMPORTANT BECAUSE OF THE DAMAGE THEY DO. WILD ANIMALS PROVIDE HUNTING, FISHING, AND OTHER TYPES OF RECREATION. 1. Relate to animals of Minnesota. 2. See primary grade concepts.	Sc., S.S.
4	II. ANIMALS HAVE DIFFERENT NEEDS AND HABITS THAT DETERMINE THE PLACES WHERE THEY LIVE. ANIMALS ARE PART OF THE COMMUNITIES OF LIVING THINGS. 1. Discuss and list ways in which animals of similar habitats are alike and how they differ. (Deer and moose; brush and timber wolf). 2. Discuss how animals have changed their habitats and how these changes may have affected other animal habitat.	Sc., S.S., L.A.
4, 5, 6	III. WILDLIFE IS FOUND EVERYWHERE--SCHOOLGROUNDS, YARDS, PARKS, FARMS, FIELDS, FORESTS, ARID LANDS, SWAMPS, STREAMS, LAKES, AND OCEANS. 1. List types of wildlife found on schoolground and at home. 2. Examine wildlife in 1 square mile of ground and list plants and animals.	Sc., S.S., L.A.
4, 5, 6	IV. ANIMALS ARE CREATURES OF HABIT, USUALLY SPENDING THEIR ENTIRE LIFE WITHIN A SPECIFIC AREA KNOWN AS A "HOME RANGE". Within this area each inhabitant must find sufficient food, water, and shelter. Map of area being studied. Locate herd areas and patterns of migration.	S.S.
4, 5, 6	V. ANIMALS USUALLY PRODUCE FAR MORE YOUNG THAN THE ENVIRONMENT CAN SUPPORT. This is nature's way of insuring the survival of each species. Starvation, disease parasites, predators, accidents, natural deaths, and man help to reduce the numbers. Use aquariums and guppies to observe how quickly an environment can become overstocked. What happens to the fish? Might they be slower or weaker? What happens if man helps protect the young? Do the fish multiply faster?	Sc., S.S.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
5, 6	X. MANAGEMENT OF WILDLIFE POPULATIONS MUST BE APPLIED IF WE ARE TO CONTINUE TO ENJOY THE BENEFITS WHICH WE NOW RECEIVE FROM THE ANIMALS ABOUT US. This includes the regulated harvest of surpluses, and also the improvement of habitat. 1. Draw pictures or write stories showing examples of management practices. 2. Give report on Passenger Pigeon. 3. List animals which are extinct or nearly so and determine why they are so.	F.A., Sc., S.S., L.A.
5, 6	XI. MANAGEMENT IS AN ATTEMPT BY MAN TO BRING ABOUT A BALANCE BETWEEN NUMBERS AND THE CAPACITY OF THE ENVIRONMENT TO SUPPORT THEM. AMOUNT OF FOOD, WATER, SHELTER — ANIMAL POPULATIONS MANAGEMENT Discuss how man has upset the balance and how the harvesting of the surplus is essential. Some animals are moved to a new location where they are needed (beaver).	Sc., S.S.
5, 6	XII. SCIENTIFIC MANAGEMENT OF WILDLIFE RESOURCES IS BASED UPON FACTUAL INFORMATION CONCERNING ALL FORMS OF WILDLIFE, THEIR INTERRELATIONSHIPS WITH THE ENVIRONMENT AND WITH OTHER ANIMALS. Biologists gather scientific facts about wildlife resources which can be used in management. Resource management agencies for soil, water, minerals, and plant life also provide information and point out problems. Citizens should try to learn about such problems to determine which possible solutions are best. 1. Discuss what the job of wildlife manager personnel requires. 2. Use resource person.	S.S., L.A.

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St. Paul, Minn. 55101

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633 West Wisconsin Avenue
Milwaukee, Wisc. 53203

Teaching Aids: State Bureau of Information

U.S. Bureau of Sport Fisheries and Wildlife

Soil Conservation Service

PRIMARY GRADES (1-2-3)

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
1, 2, 3	I. SOIL GIVES US FOOD, CLOTHING, SHELTER. From the soil comes food, such as potatoes or fruit, fiber, such as cotton, and shelter, such as wood from trees. 1. Plant vegetable seeds at school and harvest the products. 2. Make a picture display of shelters made from plants grown in the soil. 3. Draw a picture display of clothing that comes from plants.	F.A., Sc., S.S., L.A., Math
1, 2, 3	II. THERE ARE MANY KINDS OF SOILS. Soils contain different sized particles. These particles range in size from very small clay particles that cannot be seen by the naked eye to large particles such as sand and gravel that are easily seen. Soils are formed under very different climatic conditions and under different types of vegetation. For example, some soils have formed under prairie grass while others are formed under forest cover. Differences in topography, or the lay of the land, also cause differences in the soil formed. 1. Bring soil samples from home and other areas; feel and see the differences. 2. Rub soft rocks together to demonstrate early stage of soil formation. 3. Examine a state soils map and note the many types of soil present.	Sc.
2, 3	III. SOIL IS A BASIC RESOURCE. All living things depend on soil directly or indirectly. Soil provides the nutrients, minerals, and moisture that plants need to live. Animals need plants for food. 1. Study and draw food chain (elementary version). 2. Relate planting of seeds to plants' soil requirements.	Sc., S.S.
2, 3	IV. SOIL IS THE HOME OF MANY LIVING THINGS. Millions of living things, such as bacteria, fungi, insects, earthworms, and other animals and plants live in the soil. Because of these living things, the soil is dynamic and ever-changing. 1. Bring topsoil to class and investigate the living organisms in it. Use hand lens, microscope, and naked eye. 2. Place earthworm in jar of soil and make daily observations of habits.	Sc., S.S.
3	V. SOIL CAN BE SAVED FROM WASHING AND BLOWING AWAY. Most erosion is caused by wind or water motion. Erosion has completely ruined some land for use in raising crops. Erosion can be prevented or controlled by protecting soil with plant cover or other suitable practices. 1. Pour water over bare soil and soil with sod on it, as a project in the classroom to watch effects of soil erosion from water. 2. Germinate seeds on a sponge to show root matting. This leads to an understanding of how roots can anchor soil.	Sc., S.S.

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Soil Resources

(Fourth, Fifth, and Sixth Grades)

Objective - Develop an awareness and appreciation of the importance of our soil resources and their use.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
4, 5, 6	I. WHY IS THE SOIL IMPORTANT? Soil is a basic resource. All living things depend on soil directly or indirectly. Most plants depend on the soil directly for moisture, nutrients, and anchorage. Animals depend on plants, which depend on the soil for food. 1. Trace the food chain of an animal back to its basic food supply, the soil. 2. Write a paper on how plants depend on the soil.	Sc., S.S., L.A.
4, 5, 6	II. HOW CAN WE INCREASE FOOD PRODUCTION TO FEED OUR INCREASING POPULATION? Irrigation and drainage can bring additional lands into useful production. By removing excess water from some soils and adding water through irrigation to droughty soils we can bring more land into the production of food and fiber and increase production on soils of this type which are already formed. 1. Study supplemental irrigation in central Minnesota and Wisconsin and drainage in southern Minnesota. 2. Field trip to local irrigation farm.	Sc., S.S.
	III. IMPROVED MANAGEMENT AND CULTURAL PRACTICES CAN GREATLY INCREASE FOOD AND FIBER PRODUCTION. The use of chemical fertilizers, improved crop varieties, chemical weed, insect, and disease control, and improved practices and equipment have resulted in tremendous increases in yields in many crops. 1. Compare state average corn yields over the past 30 years. 2. List the chemical elements essential for plant growth. 3. Tour a large farm and observe modern farm equipment and cultural practices.	
4, 5, 6	IV. WHAT IS THE SOIL MADE OF? Soil is composed of mineral matter, organic matter, air, and water. 1. Examine a sandy soil and note the small mineral soil particles. 2. Compare the color of a dark surface and light subsoil. The difference in color is due primarily to organic matter. 3. Discuss the role of the soil in the hydrologic cycle. 4. SIXTH GRADE. Determine the maximum amount of water a soil can hold after excess water has drained away. Fill a small measuring glass (100 ml. volumetric cylinder will do) with screened air dry soil. Run a plastic tube to the bottom of the cylinder to remove entrapped air. Add a measured depth of water from another cylinder of the same size. Add enough water to wet about one-half to three-fourths of the depth of soil. Measure the depth of wet soil and the depth of water added. The depth of water added was held in the depth of the wetted soil. From this you can calculate how many inches of water could be held in a foot of this soil.	Sc.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
4, 5, 6	V. HOW DO SOILS DIFFER? Soils differ in many important ways. Soils are made up of different layers. Soils differ in the amount of organic matter they have, the size of soil particles, how these particles are arranged or attached to other particles, color, depth of the different layers, slope of the soil surface, drainage, amount of water which the soil can hold, fertility, and how easily the soil will erode. The soil is a thin skin over the surface of the earth. Soils, like people, go through a change from youth to old age. These changes are predictable and the extent of change is influenced by the parent material, environmental factors, and the use to which the soil has been put during its lifetime. 1. Study different layers of soil in bank cut or at a new basement excavation. 2. Experiment with organic matter and water holding capacity of different soils; plant seeds in different soils. 3. Sixth grade. Make a soil chart from soil pit and label the soil layers (called soil horizons). 4. Contrast the colors found in a well-drained and poorly-drained subsoil. 5. Fill a jar with dry sand and another jar with dry fine-textured soil, and add a small, equal amount of water to each. Let the soil stand until water stops moving downward. In which soil did the water sink lowest? Which soil would store the most water? 6. Examine pictures of prairie and forest soils and contrast the soil layers found under a prairie and forest soil. Why has more organic matter accumulated to a much greater depth in prairie soil than in the surface of forest soils? 7. Study a state soils map showing different kinds of soil.	Sc.
4, 5, 6	VI. HOW ARE SOILS FORMED? Soil is made first from rocks by physical and chemical processes which are slow and continuous. The small mineral soil particles come from a rock material. The process of breaking down from rock to soil is lengthy. Soils are still being formed but only very slowly, dependent on variables such as temperature, moisture, freezing, thawing, and other factors. 1. Rub soft rocks together to make rock powder. 2. Look at soil through a microscope and notice different size particles. 3. Discuss the five major steps of soil formation. 4. Heat rocks and drop into ice water to observe cracking.	Sc.

Suggested Grade Level for Teaching		Concept	Curriculum Areas of Concentration
4, 5, 6	VII.	WHAT ORGANISMS LIVE IN THE SOIL? Soil is the home of many living things. Bacteria, fungi, earthworms, bugs, and many living plants and animals make their homes in the soil. They help to break down the soil particles and the organic matter and change the structure of the soil. 1. List all animals that we know live in the ground. 2. Bring samples of topsoil to class and investigate for living organisms. 3. Find and read stories and poems about animals that live in the soil.	Sc., F.A., L.A.
4, 5, 6	VIII.	WHAT IS THE DIFFERENCE BETWEEN NATURAL GEOLOGIC EROSION AND ACCELERATED EROSION? Soil is eroded by wind and water. Plant cover can protect the soil from washing or blowing away. The processes of soil formation and erosion have been going on since time began. This is natural geologic erosion. Man's use and misuse of the soil has in some cases caused accelerated unnatural erosion. 1. Make displays of differences of wind and water erosion. 2. Explore differences between natural and man-caused erosion. 3. Blow air from fan across boxes containing dry bare soil and soil with vegetation on it.	Sc., S.S.
4, 5, 6	IX.	HOW CAN WE MAKE THE BEST USE OF OUR SOIL? Soil can be kept productive by proper use and management. If we cultivate only lands suitable for cultivation and use proper land management techniques (contour plowing, terracing, minimum tillage, and fertilizer) we can use our soils without damaging them. 1. Visit farm to view different techniques used to keep soil in place. 2. Use pans of soil and contour vertically and horizontally; add water from a sprinkling can and describe the result.	Sc., S.S., Math
5, 6	X.	WHO TAKES CARE OF OUR SOILS? Soil management is everyone's responsibility. The soil must be protected and conserved for use by future generations. As long as human beings need food, clothing, and shelter, they are dependent on the continued productivity of the soil. 1. Discuss ways we can help conserve soil at home, camping, etc. 2. Have students write essays on their responsibilities toward soil conservation.	S.S., L.A.
	XI.	GOVERNMENT AGENCIES AND PRIVATE LANDOWNERS ARE WORKING TO CONSERVE OUR SOILS. These people are concerning themselves with the soil conservation problems by giving educational technical and financial assistance to landowners. Government agencies and landowners have soil conservation programs on the lands they administer. Study cooperative program and technical advice available.	

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
6	XII. WHAT PLACE DO FERTILIZERS HAVE IN TODAY'S AGRICULTURE? Large amounts of plant food are required to produce today's high yields. Large amounts of commercial fertilizers are used by today's farmers to supply plant food to the soil. 1. Tour a local Bulk Blending or other local fertilizer plant. 2. Review amounts of N, P, K required to grow 100 bushels corn, 6 tons of hay, alfalfa, etc. 3. Draw a chart of fertilizer use in Minnesota for the past 20 years.	Sc.
6	XIII. HOW DO DIFFERENCES IN SOILS AFFECT THE USE OF LAND IN THE CITY? Let's look at the three major ways soils differ: slope, particle size (fine or coarse), and drainage. Railroads are usually located on well-drained nearly level areas. The size of soil particles determines how much weight the soil can carry, which is important in the construction of foundations for houses and roadbeds. If the soil is poorly drained, basements have to be protected against seepage. 1. Observe a highway cut or building site and determine the drainage of the area by observing the color of the subsoil. 2. Discuss the soil types and their uses shown on the Twin City area soil map.	S.S.

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