HANDBOOK FOR PREPARING ELEMENTARY SCHOOL STUDENTS
FOR OUTDOOR EDUCATION

MASTER'S PROJECT

Submitted to the School of Education,
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Master of Science in Education

by

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We would also like to thank Dr. Bernie Cellar for his guidance in helping us to establish Outdoor Education in our school. It was his suggestion that an Outdoor Education Handbook would be helpful in implementing new programs in schools.
DEDICATION

We would like to dedicate this work to our fathers, Abe Bloom and Lynn Sloan, who encouraged us in this endeavor.

We also want to thank and include our husbands, Jack Castle and Tim Sainey, for all the outside help and understanding they gave us during this time.

We would also like to thank the rest of our families for their support and understanding.
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CHAPTER I

INTRODUCTION

Background

Many elementary and middle schools are faced with implementing outdoor education programs. Most teachers have not had previous experience in this curriculum.

The research shows that outdoor education is beneficial in teaching children many valuable skills. These include intellectual, social, and motivational skills as well as teaching values, responsibility, and positive attitudes. This method of learning induces a positive climate and teaches students to work together meeting a common goal by working cooperatively.

Johnson and Johnson (1989, 1990) stated working together will produce children who trust one another, communicate accurately, support one another, and resolve conflicts constructively.

It is also important for teachers to assign responsibilities and to be enthusiastic about what they are doing, as reported by Ellsworth and Monahan (1989). The teacher should also stress good behavior by establishing rules leading to success in the outdoor education program.
Problem Statement

The purpose of this project was to implement strategies and activities for elementary students and teachers in outdoor education through a handbook.

Procedure

Subjects

The handbook can be used by teachers and counselors to help assist in interpreting the operation of outdoor education.

This is a guide for elementary and middle school children. It can also be adapted to children with special needs.

Setting

The main setting will be the campsite used for the outdoor education experience. However, the skills will be applied in the classroom before and after the experience.

Data Collection

The authors’ information was obtained from research of various sources and the authors’ personal files of material collected during fifteen years of experience. Also included are curriculum guides and literature from the various campsites the authors have attended.

Design

The methods the authors present will teach many things. The lessons will present ways to teach subject matter from the curriculum. They will also reinforce life skills and aid in building self-esteem.
Results

The result of this study is a handbook to be used in the curriculum of elementary schools for the improvement of outdoor education.
CHAPTER II
REVIEW OF LITERATURE

Outdoor Education is an important area of the curriculum.

The authors' philosophy of Outdoor Education is the development of understanding of man's interrelationship with nature. Teachers ask that their students become aware of protecting their environment and to encourage good use and storage of resources. By gaining a first-rate experience in Outdoor Education, their students can be taught subject matter from all areas, obtain values, beliefs, and attitudes that reflect the positive aspects of living in harmony with nature and life itself.

Intellectual Skills

The main idea for developing an Outdoor Education program is to develop intellectual skills in the out-of-doors that may not be available to teachers in the daily classroom setting. Teachers want their students to have experiences to further develop their skills in connection with related curriculum in the classroom.

According to John Dewey:

Experience is not primarily a process in which a detached spectator passively beholds an external world; it is rather an active process of providing for interests through creative interaction with life surroundings. (Childs, 1959)
In the area of geology, students can visit places of unusual geological formations and point out firsthand how these things were formed. Students can actually see and touch things that will possibly be studied later in the textbook. At this point, they can remember what they saw and it becomes a more meaningful situation. This can also work in reverse.

Many camps or field trips contribute to learning about history firsthand. The students may view places where something of historical value took place and the remains of it would be there to see. This would also be true in the subject of archaeology. They would be able to view firsthand something that occurred thousands of years ago. They can even participate in some of the activities that went on in that time period in the same exact location. Once this is studied in class, the students have a feel of having been there. Also, being at the site enables the student to see real artifacts that have been found. They may also see how the dig is carried out or maybe even participate in one of their own.

Math can figure into almost any experience in the out-of-doors. Students can measure tree trunks, lake or pond depths, calculate mileage, or figure out behavior schedules of species in the environment. Some form of math could correlate with any subject being studied at Outdoor Education.

Writing can be used effectively in this program. Out-of-doors writing can enhance the child's senses and, in turn, can be used for more effective writing. They could brainstorm with each of their senses: sight, hearing, touch, taste, and smell. The student can then implement these experiences into some creative writing pieces.
One of the most important experiences would be in the environmental science. No matter what activity is being done in the Outdoor Education program, teachers and students would always be referring to environmental concerns.

Arts and crafts can be very interesting in nature. Many creative and imaginative projects can be created in the out-of-doors with nature’s own materials.

Weather is another subject that is always a part of the experience. Weather is a factor in planning activities regardless of the time of year which you attend camp.

Map skills can also be an integral part of the camping experience. This may include just finding the way around the large camp area or it could be in connection with a class on orienteering.

The most fascinating part of the outdoor experience has to do with the animals. This seems to be a favorite, as many forms of animal life can been seen and observed. The students can see animals in their natural habitats. They can observe both land and water animals. Some camps provide nature centers where animals native to the camp may be seen in captivity. Probably a close second is the firsthand observation of plant life. This may vary as to the time of year but, regardless, much can be learned about trees, wildflowers, weeds, and other plants. This can be correlated with how animals and man in some cases can acquire a knowledge of food sources or medicine sources. They can also learn about poisons in plants.
All of these many facts that would be learned during an experience in the out-of-doors could be correlated throughout the year in classroom science and other curriculum subjects.

Outdoor education thus becomes an important set of stimuli for learning and growth. The learner can observe, search, study, and compare, trying new theories. At the same time he can acquire skills and perceptions that contribute to his personal happiness and satisfaction. (Smith, Carlson, Donaldson, Masters, 1972)

**Motivational Skills**

Outdoor Education is so valuable in sparking enthusiasm about science. It can help to promote and stimulate interest in the classroom science projects throughout the year. The students also enjoy the freedom of being outside in the natural environment learning about new things. Many experience an appreciation for food as they work up a good appetite and they may try new kinds of food as choices are not common. They learn many new songs and sing constantly. Songs are learned at the table, in the woods, or at campfire. They learn to enjoy camp songs that are creative or may be just silly songs. They enjoy planned recreational activities, most of which are out-of-doors. These may include such things as canoeing, hiking, and horseback riding. Other games and interests are enjoyed outdoors and also some indoors such as square dancing. They appreciate the freedom of being with friends and many times new friends are made because the situation is different from the school and classroom setting.

The teachers also play a role in motivation. The teacher can motivate by being there to listen if a child has a problem but must also motivate by encouraging independence in the form of praise and positive suggestions. (Hamachek, 1990)
Nature's classroom presents a cheerful, inviting, motivating and purposeful setting in which to learn. It is like a huge spectacular outdoor classroom. (Charles, 1983)

Cooperative Learning

Cooperative learning is an important part of the Outdoor Education program. With cooperative learning students are encouraged to work together with peers instead of alone; thus the end product resulting in students feeling the need for each other to complete the assignment. With this type of learning, the program cannot be successful until all students have learned and helped each other to understand the material.

Social skills can be gained from cooperative learning. Students must get to know and trust one another, they should be able to communicate accurately, accept and support one another and resolve conflicts constructively. (Johnson and Johnson, 1989-90)

Outdoor Education and cooperative learning go hand-in-hand. Working together to create a positive learning experience and the gaining of knowledge is what Outdoor Education is about.

Implementation can begin once the students understand the social skills. The students are arranged into small groups and given an assignment. Each student needs a responsibility and to be able to understand the concept being learned. Encouraging responsibility is important. Brainstorming can also be used in the groups. It produces many ideas without taking great risks for individuals. (Edwards and Stout, 1989-90)

Peer pressure from a wrong answer in a small group as opposed to a large classroom is less likely to inhibit future participation.

Some significant advantages in the Outdoor Education cooperative learning process are that students gain a sense of belonging, enhance their self-esteem,
promote critical thinking, and all students with any type of ability will benefit in a positive way.

**Social Skills**

The most rewarding experiences in Outdoor Education come from peer and teacher interaction. In this area the students learn that their teachers are really human beings after all and not much different from themselves. They also interact with one another as well as with the camp staff. New relationships are formed through interaction of these groups. These interactions include: student to student, student to teacher, student to camp staff, teacher to teacher, and teacher to camp staff.

When a group is out in a natural setting, an appreciation of nature becomes evident. A closeness within the group also becomes evident. This is a new experience for most of the students as well as for teachers.

In the development of social skills, the student is possibly for the first time away from home. They, themselves, are responsible for being places on time, keeping their apparel together, and remembering all of his or her own personal needs, activities, classes, and assigned chores.

The student will learn about group table manners and management. They will learn how to operate as part of a group and how they must manage in order for their group to succeed. They will learn to be more respectful and caring of others rather than thinking of themselves first. They will learn to be flexible and to go with the flow of activities. Sometimes this is necessary and better than
being constantly on a rigid schedule. There are deadlines to meet but there are also choices within the schedules for oneself.

A student must interact and be a social being in this type of camp whether he wants to be or not. This is established by class meetings and discussions previous to the experience. (Glasser, 1969)

Values

Living together with others is a major benefit of Outdoor Education.

Planning, working, learning, and living with one's peers appear to help a child adjust more readily to his social environment. (Gabrielson, Holtzer, 1965)

Family groups are a large part of the program in which students eat, play, and work together. The students must learn to respect one another. Whether it be eating as a family, completing a chore, assembling a skit or just sitting and sharing the day's events, all students must give their full attention and respect for one another.

Students learn the value of caring and tolerance. Tolerance means accepting people even if the beliefs are different from the students' own. This, in turn, teaches respect, sharing, and empathy.

While participating in recreation, students must practice sportsmanship or the program will fail and lack the enthusiasm and fun everyone wants. Each one must respect the right of others. They must be fair and honest during recreation. The students will learn that playing the game is a give and take situation. Learning these values through these experiences are important factors in Outdoor Education.
Responsibility

One of the most critical skills to be learned through Outdoor Education is that of responsibility. The students will learn to be responsible for personal tasks. This would include such things as taking care of their own space (bunk area) and their gear and supplies. They also learn to be responsible for their own personal hygiene (cleanliness).

They will learn to be responsible for their time. The students will arrive and prepare for their responsibilities at an allotted time. They will learn to be prepared for their classes. Preparation, consisting of consulting their schedules and listening to directions as to where they are to meet and what they need to wear or bring with them. They will need to plan ahead if they have a duty or chore and know what time they are expected and what they need to do to prepare. Here the student will develop an understanding that each one must share chores. They also will learn that many times they need to just pitch in and help others out on the spur of the moment. This might be the Camp Staff, teachers, or maybe some of their peers.

Students will learn to respect and obey rules that are made in order to make their camping experience a pleasant one. These rules would be rules of safety to keep serious or minor injuries at a minimum. The outcome will be a pleasant camp experience.

Other rules of responsibility would relate to consideration of fellow campers and counselors in all activities such as classes, recreation, dining room, or
dormitories. The camp staff and teachers will make it clear in advance as to what might happen if rules are broken.

They make sure reasonable consequences follow the behavior chosen by the student and have the student make restitution for wrongs and accept the responsibility for them. (Hogue, 1989)

The most important responsibility the student will learn is that of respect for the environment. The students will gain this knowledge by the environmental studies conducted in the out-of-doors. This will be accomplished through classes and rules pertaining to the environment. Students may see examples of the balance of nature and how this can be disrupted by man. They will see evidence of the food chain and how it adapts into nature’s balance. They will observe creatures in their habitats. Students will see how these conform into ecology of the area being studied.

Attitudes

Outdoor Education helps the students to know their peers. Students can satisfy some of their needs for fellowship and fun and gain a significant improvement in the attitudes towards learning. (Schultz, 1989-90)

This could be developed in the forms of cooperative learning and small group instruction. They will also get to know their teachers better with more time for one-to-one learning and small group instruction. Here they will discover that teachers are real people.

The use of the out-of-doors as a classroom science laboratory through observation, investigation, and problem solving are strategies used to promote good attitudes about learning. Some students who are bored and uninterested in
the ordinary classroom are stimulated and motivated to learn in the out-of-doors. Implementing cooperative learning in this same atmosphere changed the perception of teaching and learning. We now expect to see students in small heterogeneous groups discussing topics, using effective social skills, and — what's more important — caring about each other's learning.

If educators believe as we do that higher achievement increases acceptance of differences, improves attitudes toward school and enhances self-esteem are valuable goals for all children, then we all need to promote the continued use of cooperative learning as it applies to camp. (Augustine, Gruber, and Hanson, 1989-90)

In the same frame students develop an appreciation of nature and the out-of-doors. Their sensory skills are sharpened and those that may have been fearful of camp or the out-of-doors usually put aside their fears through this unique experience. Acute sensory perception of the environment leads to a deeper awareness such as listening intently to sounds in the out-of-doors. This would also include listening to the sound of the wind in the trees or the sound of running water. Students can inhale and smell the odors of the fields and woods. They become more involved in what they are seeing.

Perceiving the environment with all senses alert implies inward consciousness. One must be acutely sensitive to incoming signals and aware of relations to them. (Kendall, 1977)

Good teaching outdoors develops good attitudes about learning through the senses: sight, hearing, taste, touch, and smell.

In summary, Outdoor Education can teach students many things. It will teach curriculum from many areas. It will teach attitudes and skills for learning. It will help build the self-esteem of students. Many valuable outcomes are
attained in human relations. The outdoor laboratory encourages a break from the classroom routine to a freer atmosphere. Students see their peers and teachers on a more human level. Students will also be observed by teachers in many situations that would not be seen in a conventional classroom.
CHAPTER III

HANDBOOK FOR PREPARING ELEMENTARY SCHOOL STUDENTS
FOR OUTDOOR EDUCATION
PREPARATION

Camp Site Selection

Camp shall be selected by staff according to its advantages for environmental study areas and physical facilities that adapt to the particular needs of the group.

Listed below are some selected camps available in Ohio:

- Camp Kern near Oregonia
- Camp Kerkmont near Zanesfield
- Camp Akita near Sugar Grove
- Camp Wilson near Bellefontaine
- Geneva Hills near Lancaster
- Glen Helen near Yellow Spring

When selection of camp site has been made, dates need to be confirmed with the camp director and a program guide obtained.

Staff Selection

All teachers whose students are attending camp are expected to be present at the camp for the duration of the program. Exceptions should be cleared with permission of the school principal and superintendent prior to the camping experience.

Other personnel from the school system may be recruited as needed.

Proposal to the Board of Education

A letter of request shall be submitted to the Board of Education for the selection of camp sites, dates, and staff members for Outdoor Education.
DATE

Parents of Fifth and Sixth Grades:

The ________ is offering the ________ year of school camping to the fifth and sixth grades of the ________ School. The ________

Camp is in the Snowy Range is a different type of classroom--an outdoor laboratory where boys and girls learn readily through direct experiences with the basic sciences, conservation of natural and human resources and group living. We know that students learn more quickly, understand better, and retain longer, those things acquired through such a direct experience. The school camp is a continuous part of the child's education, rather than a separate institution. To develop into a well-rounded, well-balanced person, educators feel a child needs experiences which are most available when a group lives together in the out-of-doors. The child takes classroom acquired experiences and skills to camp. He applies them to problems and real life situations which are challenging both because they are new and because they involve the fundamentals of living. Both teachers and pupils share in this out-of-door life. First hand experiences can thus be woven into classroom activities when they return. Knowledge acquired in camp becomes more meaningful, is better understood, and enriches that which is learned from books. The artificial barriers between learning and recreation and schooling and living are in part broken down when a child begins to understand that a person who gains the most from life learns continuously in all situations.

A child goes to camp as a member of a community group. Through democratic processes of discussion and planning, sharing responsibilities, working and playing with others, he begins to feel a real part of a social group. The camp situation affords an opportunity for developing a better understanding of the importance of personal health, camp sanitation, and individual and group sanitation. In natural outdoor surroundings the study of science takes on real meaning. The lessons in conservation, animal and plant study, weather, etc. become more vital. Through sharing in the serving of food, the washing of dishes, and keeping the camp clean, a child learns to care for his camp--to feel it is "his camp" and not "a camp". As would be expected, the entire camp program is fun, and recreational possibilities are a part of every activity--the excursion to study the trees and to find the trees best suited to whittling and fire building, the evening campfire to study the stars, the exploring of a creek to find water and plant life for aquariums, the trip to explore a beaver dam, the measuring of distances in order to draw a map of camp, the writing of articles, for the camp newspaper, the outdoor meal planned and cooked over special fires in handmade utensils. Perhaps the most lasting memories of camp are the intangible spiritual outcomes which a child cannot explain. The beauty of the mountains in the early morning; the cool dampness of a secluded nook; the clear, shining sky at night; the murmur of the wind in the tree tops; all leave impressions which cannot be erased. As a child sings with a group in an evening gathering, he acquires a feeling of personal security or oneness with the group.

The school camp will be held the ________ week in ________ at the ________

_________ Camp. The ________ Camp consists of CCC barracks, recreation rooms, kitchen, dining room, and sanitary facilities. The buildings are heated, hot water is available at all times, the drinking water is chlorinated, fresh fruits, vegetables and milk are in the daily menu, and every safety and health precaution is made to make the camp a safe and healthy community. Every child will have a physical examination before going to camp and a graduate nurse will be part of the camp personnel. An experienced cook will carry the major cooking responsibilities. Children will leave the school by school bus Sunday afternoon and return late Friday afternoon. The cost will be $12.50 for the five days. It is fortunate that we are able to hold the expenses of the camp to this cost.
Ordinarily, the cost of using this camp is several dollars more. Parents will be invited to visit the camp on an afternoon during the week, if they so desire. They are requested to write frequent letters to their children. An equipment list, set up by the children in school after careful study, will be available soon.

The Camp Director and teachers are members of the school faculty. Regular student teachers and specially trained physical education students will act as Camp Counselors. They will have had training in science, crafts, recreation, and camp crafts.

When your child returns from camp, you have only to listen to relive the experiences he has had. Camping education is training for life—and what your child has learned about living, he has learned to put to use.

Yours truly,

___________________ Camp Director

___________________ Principal

___________________ School
**Teacher's Guide**

**Getting ready for camp!!!**

- Your school has been assigned a coordinator from camp (see your cover letter). Your coordinator will work with you throughout your planning.

- Phone 6 to 8 weeks before camp to set up a teachers meeting and/or slide presentation at school. Meetings can be either during the day or in the evening. We prefer to have meetings and slide shows back-to-back to save time and gas.

- Acquire responsible high school counselors or arrange for parent chaperones. Try to meet with them before camp and give each a copy of the Counselor's Guide (found in your Program Guide). Arranging for alternates can be a big help if someone doesn't show.

- Divide the students into table groups of 8-10 students each. Some schools eat by trail groups if they are small enough. Assign two KP's per meal from each table group. Counselors or chaperones supervise the dining tables.

- If at all possible, have no more than 12 and no less than 6 students in each trail group. Figure out how many trail groups you will need to divide your students into. (Ex.: 60 students > 5 or 6 trail groups.) It has been our experience that trail groups which contain boys and girls are best.

- Kern naturalists are available to lead 3 trails and enrichments. Teachers will be needed to lead the remaining trails and enrichments. (Additional staff are available to winter schools). In the example above, this would mean 2 or 3 teachers would need to lead trails and enrichments. To make things less stressful for first time teachers, you can (1) obtain trail guides for them to read through ahead of time, (2) have them attend the annual Teacher Workshop in late January, and (3) ask to have a Kern staff lead it the first time through, with the teacher observing. (Kern naturalists are assigned to each teacher-led trail to answer your questions once you arrive.)

- Use the Curriculum List and Schedule to select trail studies, enrichments, and evening activities. (If a Special Option is chosen, it will replace the morning trail time.) If you prefer, you can wait until your meeting with your coordinator to finalize trail enrichment, and evening activity selections and fill out your Request Form. WE NEED ALL INFORMATION ASKED FOR ON THE REQUEST FORM A FULL TWO WEEKS BEFORE YOUR VISIT.

- Enrichment choices are usually made by the children at camp. You will, however, need to select the Enrichments from which the students will choose.

- Make a chart of trail groups, trail names and trail times. Such as:

<table>
<thead>
<tr>
<th>GROUP</th>
<th>MON. AM</th>
<th>TUE. AM</th>
<th>TUE. PM</th>
<th>In Cold Blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardinals</td>
<td>Deep Woods</td>
<td>Stones &amp; Bones</td>
<td>Deep Woods</td>
<td>Stones &amp; Bones</td>
</tr>
</tbody>
</table>
  | Chipmunks | Trail of Time | Stones & Bones | Trail of Time | etc...
  | Eagles | Stones & Bones | Deep Woods | In Cold Blood | etc...

  Bring extra copies to camp to post on your bulletin board.

- Teachers are required to lead the first evening activity on day one. It is helpful to have teachers present at other evening activities but this is not required. Teacher help is also needed during any Special Option.

- Kern staff are not allowed to dispense medicine. A first aid kit is available. A phone with direct lines to Dayton and Cincinnati is located in the Elk Lodge kitchen.
Counselor's Guide

Welcome to Camp Kern!! We are glad you are here! You hold a very important job during your stay here - you'll be filling the shoes of parent, friend and guidance counselor. This means a 24-hour commitment in which your cabin group's needs are your primary obligation. We expect you to be able to put the kids' needs above your own.

Your relationship with these students can be one of the most important experiences of their lives (and maybe yours too!). Just be fair and show them you care about them, and they'll think you're the greatest! Remember, your attitude will have a direct affect on theirs. Strive to instill respect for property, nature, and other people.

Your responsibilities are many. Some of the main ones include:

being sure your group is:
1. on time.
2. properly dressed for the weather.
3. acceptably clean.
4. listening when they should.
5. having a good time.

This guide is designed to make your stay here as pleasant and memorable as possible. If you have any questions, feel free to ask a naturalist or teacher - they expect you to come to them if you need help.

Introductions & Names

Learn your students names as soon as possible! It is very hard to show you care about someone if you don't know their name.

Something about Kids: You are automatically cool in their eyes because you're in high school. Don't worry about them liking you. Work at getting them to respect you. You are a model, your kids will look up to you and react to the entire Kern experience in whatever way you do.

Cabin Rules

We recommend you go over the "5 Rules to Make Life Easier" posted in each cabin. The rules are:
1. Speak for yourself, not for anyone else.
2. Listen to others, then they will listen to you.
3. Avoid "put downs" - all they do is hurt feelings.
4. Take charge of yourself - you are responsible for you.
5. Show respect - every person is important.

Mistakes Counselors Often Make:
1. Use and threat of physical punishment.
2. Choosing favorites.
3. Not helping in situations where other counselor's kids are involved.
4. Not using common sense (i.e., allowing cabin raids, pillow fights, rough play, etc.)
5. Not seeking help with serious discipline problems.

Respect for Property

All the buildings here at Camp Kern have been donated by concerned people who ask only that children enjoy themselves and allow others to do the same. Try to instill into your students that thousands of other students come here and use these same facilities. Guard as strongly as possible against any writing or defacing of cabin walls. This camp is probably one of the most litter-free places that these children have ever been. Children from the city are often very careless about littering if it is not brought to their attention. It is not that they don't respect the environment, they just need some encouragement to break a bad habit.
ADDITIONAL CAMP RULES
Please go over these rules with your group as soon as possible.
1. No rock or stick throwing.
2. No tree climbing.
3. Stay away from propane tanks.
4. Stay on the trails - respect all life...take nothing but memories.
5. Ravines are off limits without Kern staff.
6. Bathrooms and cabins must be kept clean.
7. No running or use of balls in the lodge or other buildings.
8. Girls cabins and showers are off limits to Boys, and vice versa.
9. Students will be charged for any damage they cause.
10. Do not move bunks. See Kern staff if there is a problem.

[Please Note: Counselors who drink alcohol, smoke, or take illegal drugs will be dismissed and/or prosecuted.]

THE DINING HALL AND YOU
Over the years, we have found enforcing the following rules at your table will make life easier for you and your kids.
1. Only KPs are allowed up from the table. Encourage your kids to use the time before meals to use the restrooms.
   If necessary, you may dismiss one person at a time during meals to use the restroom.
2. You are responsible for keeping the noise level at your table under control.
3. You should sit in the middle, not at the ends, of your table. This will help you control your table.
4. Limit portions to reasonable sizes so everyone gets served once before the KP returns for seconds.
5. Initiate a positive table conversation. Ask them about their reactions to what they’ve done at camp, etc.

HOW TO MAKE CABIN TIME A GOOD TIME
Cabin time will find you walking back to your cabin with about 45 minutes to fill with 10 kids who might, or might not, want to rest. If any of them want to rest, make sure they are allowed to. If they do not, this is a great time for you as a counselor to get to know your kids as a cabin group.

It’s essential that your group stays together in whatever they do. Inside (knots, Smaug’s jewels, rock pass, etc.) and outside (football, soccer, basketball, tag, etc.) games are both possible. Equipment (balls, etc.) is available, but must be signed out by you. You are also responsible for making sure it gets returned.

When evening falls and it’s just you...and 10 kids!!
Your first evening before bedtime may find you with this...
Problem: Your kids do not want to go to sleep.
Result: Laughter, jokes, noise, etc.
Solution: Replace uncontrolled chaos with a planned activity. Try a "rap session" by bringing the kids into a circle on the floor to discuss issues of interest to them. Movies, high school, sports, etc. are good topics. Avoid controversial issues where your opinions are not the same as the elementary school you represent. Give everyone a chance to participate, but allow them to go to sleep as soon as they want.

If you have a particularly active group, you might be more appalled at the hour they awake then the time they finally go to sleep. To discourage this, emphasize before they go to bed that everyone is to remain quiet until the alarm goes off, or until an agreed upon time.

Remember: be friendly, have fun, but be in control of your group also. Safety is always the top priority. Good luck!!
APPLICATION AND REGISTRATION BLANK

REGISTRATION AND PERMISSION FORM

________________________________________________

To be returned by __________________________ , 19___:

We would like to register__________________________________________ for the five day experience in school camping at the__________________________________________

School Camp. We understand the cost to parents will be $________________________ for the period from ____________, 19___ to ____________, 19___, payable on or before ____________, 19___ to the __________________________ School

Signed: ___________________________ day of _________________, 19___.

(Signature of Parent or Guardian) ___________________________ (Address) ___________________________ (Phone)
Staff:

Please check the things that you are interested in doing. I will try to give everyone some free time. I will also be planning things so that at least two of us will be together to teach a trail.

Trails (There will be a total of 4.)

Do you want to ride (Horse Sense) $7.00? _________
Star Ways __________ Stones & Bones __________
In Cold Blood/Kern Kritters __________
Deep Woods __________

Enrichments (a total of 2)

Canoe __________ Pioneer Cooking __________
Star Ways __________ Archery __________
Stones & Bones __________
Candle Making (Please don't all volunteer for this) __________

Other Tasks

Bus Duty __________ Shower Duty __________
Night Duty __________

Please return to me ASAP (Friday, please!). Janet

Camp Staff does: Horse Sense, Ft. Ancient, Trail of Time
OUTDOOR EDUCATION STAFF GUIDE

1. Report to your assigned area in the sixth grade wing with your Family Group and their baggage, too.

2. Pass out and review schedules.

3. Assign KP duties — 2 KPs set-up and 2 KPs for clean-up. Have them write this on their schedule with times of reporting for duty. Also mention hand washing before duty.

4. Talk about dining room procedures and manners. Hand washing needs to be mentioned as well as food portions to be put on plates (remember, they weigh the garbage).

5. Go over list of rules (entire group) and about going home, if broken, etc. A few people will be called to visit with HM about rules about 8:50 or so.

6. Bus Riders — Kelly, Mary, Kathy, Maryann
   Night and Shower
      Girls — Janet, Gretchen, Sandy, Norma
      Boys — Mike B., Don
Staff Responsibilities

Staff will:

- Take part in camp planning
- Collect material and supplies
- Plan for recreational and social activities
- Be responsible for small group of students (family groups)
- Help with bus, dining hall, and dormitory duties
- Help administer camp rules and regulations
INTRODUCTION

Class Meetings

Information will be given about:

• dates and camp site
• camp activities
• rules, regulations, and behavior (student responsibility forms signed)
• health forms
• equipment and supplies
• family group assignments
• final preparations

Video and slides are shown to students. Pictures and brochures of the camp are displayed.
LETTER TO PARENT-MEETING

Dear Parent:

The sixth grade Outdoor Education program is now in the early planning stages. The following information is being sent to you to assist in our planning. The site this year will be Geneva Hills, a church campground about five miles south of Lancaster, Ohio on Route 33. We have selected May 22, 23 and 24, staying overnight on Monday and Tuesday. We will return to school on Wednesday at approximately 2:30 P.M.

Students and equipment will be transported both ways by school bus and classes will be conducted by regular staff members.

A parent meeting is being planned for the near future.

Medical care will be provided by the school nurse twenty-four hours per day and there will be hospital services available in Lancaster.

A minimum personal expense will be asked to help defray expenses.

Housing will consist of both indoor and outside facilities with proper and ample rest room facilities provided.

Please discuss this program with your child and if you have any pressing questions or concerns, please contact the school office at your convenience.

Sincerely,

Sixth Grade Staff
PARENT'S GUIDE

KERN OUTDOOR EDUCATION CENTER

WE ARE EXCITED THAT YOUR CHILD WILL SOON BE PARTICIPATING IN OUR OUTDOOR EDUCATION PROGRAM. OUR GOAL IS TO INSTALL A DEEPER RESPECT FOR THE NATURAL WORLD AS WELL AS FOR OTHER PEOPLE, WHILE HAVING FUN AT THE SAME TIME. HOPEFULLY, THIS SHEET WILL ANSWER SOME OF YOUR QUESTIONS, BUT IF YOU HAVE OTHERS, FEEL FREE TO CALL ANYTIME.

PROGRAM

Your child will be participating in a highly-organized learning experience. We teach about the outdoors by being outdoors. He or she may go on a fossil hunt, meet costumed "pioneers" from the year 1810, walk through our peaceful 200-year old Beech forest, and/or collect and study critters from our ponds. Evenings conclude with songs and stories around a campfire or a quiet and safe hike to experience nature at night.

FACILITIES

Camp Kern is accredited by the American Camping Association, having met high standards of excellence in staff, administration, program, health, and safety. The facilities are completely winterized and kept in excellent condition by our maintenance staff.

SUPERVISION

The camp naturalists and school teachers combine for a ratio of about one adult leader to every 10-12 students. The students are actively involved in supervised programs the entire day. Teachers and counselors or parent chaperones provide night supervision.

FOOD

The wholesome meals, served family-style, have earned Camp Kern's kitchen an enviable reputation among camps coast to coast. Designated students act as "hoppers", setting the tables and keeping the platters full.

MEDICAL

Minor health problems are taken care of by the Kern staff or teachers in the camp Health Center. The Bethesda Care Center is located just 6 miles from camp and is open 24 hours to handle any possible emergencies. Parents are immediately notified of any necessary care. CAMP KERN PROVIDES SECONDARY GROUP MEDICAL INSURANCE FOR ALL SCHOOLS. This coverage applies to all students, counselors, parents and teachers staying at camp, and serves as either the next $2500 after their insurance ends or the first $2500 if they have no insurance.

CLOTHING

It is very important that your child has clothing that will suit whatever weather may occur (see "Equipment List"). We will do indoor activities if it is bitterly cold or a thunderstorm, but will venture out in "normal" amounts of wind, rain, snow, or cold. A second problem with clothing is all the articles that get left here when the group leaves. If your child should happen to leave anything here (and if we find it), we will keep it for one full week.

LOCATION

Camp Kern is located six miles east of Lebanon, Ohio, on State Route 350 (about ten minutes north of King's Island, off I-71). Our phone numbers are: 932-3756, Dayton: 885-3807, or Cinti: 241-0012. Feel free to call during office hours if you have any questions (or anytime if it is an emergency).
Dear Parents,

As you undoubtedly know by now, Beechwood School is planning a three-day outdoor education trip for sixth grade students. It is hoped that all of our students can participate. Basically, our plans are as follows:

**Site** - Camp Kern at Oregonia, Ohio--near St. Ancient (Lebanon Exit I-71)

**Dates** - September 18, 19 and 20

**Transportation** - Students will be taken to Camp Kern on Wednesday, and returned to school on Friday afternoon via school buses.

**Classes** - Students will be in outdoor class sessions with Whitehall teachers and Camp Kern Naturalists in charge at all times.

**Medical Care** - An emergency squad and hospital care will be available.

**Housing** - A large lodge with dormitories and bunk beds

You are invited to attend an informational meeting in the gymnasium at Beechwood School on Thursday, September 12, at 7:30 p.m. We will attempt to answer any questions you might have at this meeting. A representative from Camp Kern will be present to acquaint you with the camp and answer any questions you might have.

Please discuss this program with your youngsters in detail, and help them plan accordingly. It can be a very happy and exciting experience for them and us! Please call 237-3184 if you have any further questions.

Sincerely yours,

WHITEHALL CITY SCHOOLS

Howard D. Martin, Principal
Beechwood Elementary School
Dear Parent,

Camp Kern offers a horseback riding experience. This program is entitled "Horse Sense." "Horse Sense" prepares the child for a trail ride. It includes safety, grooming and saddling before the ride. Safety precautions are used, and there will be excellent supervision. In case of rain, an indoor arena will be used.

This activity requires a charge of $7.00 per student, and is to be paid by the student. This fee must be in by Tuesday, March 26, in order for the student to be scheduled for this activity.

Also, we need a permission slip signed by a parent...if you would like your child to go horseback riding, please sign the form below and return it to school, along with $7.00, no later than March 26.

My child, _________________________, has my permission to take part in the horseback riding activity at Camp Kern.

I understand that all activities will be strictly supervised, and that safety precautions will be taken.

I have included the $7.00 fee for my child to participate.

Parent's signature________________________

I will obey all the instructions and safety rules to make this a safe and enjoyable experience for all.

Student's signature________________________
PARENT PERMISSION FORM

Dear Parent:

Outdoor education this year will be held at Camp _______________. All students must secure written parent permission to attend our outdoor education program. Your signature serves the same purpose of any scheduled school related field trip. Other forms including health, equipment and visiting procedures will follow. We also hope to have a parent meeting to inform you of our curriculum, transportation, camp facilities, restrictions, and overall academic relationships to our regular school program.

CANOEING PERMISSION

Dear Parent:

Camp Akita has, among other lovely spots, a large lake complete with canoes. We will be offering a chance to go canoeing to those students who would like to be involved in this activity. We're fortunate to have on our staff a man who is an accomplished and experienced canoeist. He will supervise all canoeing groups. Of course, life jackets will be worn by all participants and the depth of the water will be under the height of each participant.

If you would like your child to go canoeing while at camp, please sign the form below and return it to school immediately.

_________________________ has my permission to take part in canoeing at Camp Akita. I understand that all canoeing will be strictly supervised and that life jackets will be worn at all times.

_________________________ (Parent or guardian)
STUDENT RESPONSIBILITY FORM

I hereby agree to accompany my classmates and teachers on the sixth grade outdoor education trip. Realizing the success of this program is dependent on the cooperation and reliance one to another, I do here state my intention to accept the responsibility and privileges of such a trip. By here signing my name, I state that I will strive to be a worthy camper and citizen so that only the best reflects on me, my school and my parents.

__________________________
Student Signature
STUDENT RESPONSIBILITY FORM

I hereby agree to accompany my classmates and teachers on the sixth-grade outdoor education trip. Realizing the success of this program depends on cooperation and reliance one to another, I will accept the responsibility and privileges of such a trip. By signing my name, I will strive to be a worthy camper and citizen so that only the best reflects on me, my school and parents. I will obey and follow the above rules; if not, I understand I will be sent home.

Student’s signature
BEECHWOOD SCHOOL OUTDOOR EDUCATION REGISTRATION FORM

We, the parents of ____________________________, would like to register our child for the Outdoor Education Program to be held at Camp Kern on April 8, 9 and 10, 1991.

We understand that we will be contacted immediately if a discipline problem arises, and that we will be responsible for providing transportation from the campsite if our child is excluded from the Outdoor Education Program as a result of such a problem.

Parent's signature ____________________________
Dear Students,

Hi! We are glad that you will soon be coming to Camp Kern for an outdoor education experience. We hope that you are excited and looking forward to it. We are! You will find that outdoor education is both fun and a good way to learn a lot of new things. Here are the answers to some of the questions you may have:

**HOW WILL IT BE DIFFERENT FROM SCHOOL?**

Except that you will still be learning things and will be expected to obey the rules, it will be VERY different from school. You will be in a 420-acre classroom without walls! You will learn about nature, Ohio history, group cooperation, as well as playing games, singing songs, and having fun!

**WHAT IS THE FOOD LIKE?**

Camp Kern is known for its fine food. It will be served "family style" with seconds and even thirds if you wish. You will be very active here, so we will expect you to get hungry. But you will also learn about the "One Pound Club" which will challenge you to not waste food.

**WHO WILL BE TEACHING US?**

Your teachers will do some of the teaching, but mostly you will be taught by our staff of naturalists who live right here at Camp Kern. YOU will be encouraged to share what you know also! We call our activities "trails" and "enrichments" and there will usually be about 10-12 students in a group.

**WHERE WILL WE STAY?**

You will either be staying in a cabin with 8-10 other students from your school or in one of the rooms of our Elk Lodge facility. (Ask your teachers if you will be at Main Camp or Elk Lodge.) There is a bathhouse near the cabins at Main Camp. At Elk Lodge, the bathrooms are next to your room.

**WILL THERE BE MUCH FREE TIME?**

To be honest, no! You will pretty much go straight from one activity to another and not have much free time.

**WHAT SHOULD I BRING?**

This is OUTDOOR education, so be ready to be outside, even if it's cold or rainy! Your "Equipment List" will tell you what items to bring (and NOT to bring). But you should also bring your enthusiasm and curiosity.

**WHAT OTHER RULES WILL I NEED TO OBEY?**

You will get an orientation talk soon after you arrive that will include a lot of "do's and don'ts". Of course you should listen to this very carefully and follow all the rules, but for now all you need to know is that if you use common sense, show respect for nature, property and people, your Camp Kern experience will be one of the best times of your life!

See you soon!

The Kern Staff
HEALTH FORM
YMCA Camp Kern
A Tradition of Excellence Since 1910

YMCA Mission: To put Christian principles into practice through programs that build healthy body, mind, and spirit for all.

Camper's Name ___________________________ Birthdate ________ Sex ________ Age at Camp start ________

Parents/Guardians Name ___________________________ Day Phone (____) ________________

Home Address ____________________________________________ Night Phone (____) ________________
Street ___________________________ City, State Zip Code ________________

If Parents/Guardians not available in an emergency, notify (must be completed)
First Contact-Name ___________________________ Relationship ________ Phone (____) ________________
Address ____________________________________________ Alternate Phone (____) ________________
Street ___________________________ City, State Zip Code ________________

Second Contact-Name ___________________________ Relationship ________ Phone (____) ________________
Address ____________________________________________ Alternate Phone (____) ________________
Street ___________________________ City, State Zip Code ________________

Names of persons other than Parent to whom child may be released:
1. Name ___________________________ Relationship ________________
2. Name ___________________________ Relationship ________________
3. Name ___________________________ Relationship ________________
4. Name ___________________________ Relationship ________________

Health history (check and give approximate dates of last occurrence where appropriate)

<table>
<thead>
<tr>
<th>Allergies</th>
<th>NO</th>
<th>YES</th>
<th>Date</th>
<th></th>
<th>NO</th>
<th>YES</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
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<td>Hay Fever</td>
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<td>Ivy Poisoning, etc.</td>
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<td>Insect Slings</td>
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<td>Aspirin</td>
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<td>Foods</td>
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<td>Other Drugs:</td>
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</table>

Other diseases or details of above: ____________________________________________________________

Operations/Serious Injuries and dates __________________________________________________________
Chronic or Recurring Illness _________________________________________________________________

Additional Suggestions/Information from Parents ________________________________________________

Important: Please notify the Camp if camper is exposed to any communicable disease within 3 weeks prior to Camp start

(PLEASE COMPLETE OTHER SIDE)
Immunization history (Required Immunizations/boosters must be determined locally. This is a record of the most recent applicable dates.)

<table>
<thead>
<tr>
<th>DTP Series</th>
<th>Polio OPV (Sabin)</th>
<th>Measles (live vac.)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTP Booster</td>
<td>Polio Booster</td>
<td>Mumps (live vac.)</td>
<td></td>
</tr>
<tr>
<td>Tuberculin Test</td>
<td>Tetanus Booster</td>
<td>Typhoid</td>
<td></td>
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</tbody>
</table>

Recommendations/Requests/Restrictions while at Camp □ None

Special Diet:

Swimming, diving:

Strenuous activity:

Other:

Pertinent to lady campers only

Has this person menstruated? □ Yes □ No
If so, is her menstrual history normal? □ Yes □ No
If not, has she been told about it? □ Yes □ No

Special considerations:

Professional references

<table>
<thead>
<tr>
<th>Family/Camper’s Physician</th>
<th>Other Physician(s)/Dentist/Specialist (if applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Name</td>
</tr>
<tr>
<td>Address</td>
<td>Address</td>
</tr>
<tr>
<td>Phone ( )</td>
<td>Phone ( )</td>
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</tbody>
</table>

This health history is correct and complete so far as I (the undersigned) know, and the person herein described as the camper has permission to engage in all prescribed camp activities, except as noted by me on this health form.

Parental and promotional consent

I, _____________________________, the parent/legal guardian of _____________________________, give YMCA Camp Kern permission to:

1. Dispense □ Aspirin or □ Acetaminophen (Tylenol) to camper (please check preference)
2. Dispense Antihistamine (Benadryl) for bug bites, rashes, colds.
3. I hereby give permission (standing orders) to: YMCA Camp Kern’s Medical personnel to dispense medication(s) brought to Camp by parent or guardian, or prescribed by the Camp’s physician while in attendance.
4. Use any photographs taken of my child at Camp Kern for the sole purpose of promoting the camp and its program.
5. Agree to indemnity and hold YMCA Camp Kern harmless from any claims for accident or injury sustained by the camper while attending or participating in any Camp Kern program on or off the Camp Kern premises.
6. Camp Kern provides a $2,500.00 accidental insurance coverage, which is in excess to the participant’s primary insurance coverage. Please give Insurance Company:
   Policy #:
   Address: _____________________________ Phone: ( )

Parent or Guardian signature _____________________________ Date _____________________________

Notary Consent:

Signature _____________________________ Date _____________________________

Sworn to me and subscribed this _____________________________ day of _____________________________, 19________

Notary _____________________________

Please note: ALL HEALTH FORMS MUST BE NOTARIZED.
OUTDOOR EDUCATION
HEALTH FORM

Student Name __________________________

In order that we can be as fully prepared as possible to handle health problems of your child at camp, during our Outdoor Education, please offer the following information about your child. (Please fill out the entire form)

<table>
<thead>
<tr>
<th>Problem</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convulsions</td>
<td></td>
<td></td>
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<tr>
<td>Diabetes</td>
<td></td>
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<tr>
<td>Insect Stings</td>
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<tr>
<td>Penicillin</td>
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<td></td>
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</tbody>
</table>

Check proper blank.

Please list date of last tetanus shot __________________________

Has your child been under the care of a physician recently? ___ No ___ Yes

If yes, please explain ______________________________________________________________________

Name any medicine being sent with your child and when it should be taken.

__________________________________________________________________________________________

Please list anything else about your child's health which would pertain to his or her welfare or activity while on Outdoor Education.

__________________________________________________________________________________________

Please list your name and four (4) telephone numbers where you can be reached in case of emergency:

<table>
<thead>
<tr>
<th>NAME</th>
<th>DAY PHONE #</th>
<th>NIGHT PHONE</th>
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<tbody>
<tr>
<td>1.</td>
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<td>4.</td>
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</table>

May we have permission to take your child to a hospital emergency room if necessary? ___ Yes ___ No

Other comments about your child's health _________________________________________________________
BEECHWOOD SCHOOL OUTDOOR EDUCATION HEALTH FORM

STUDENT'S NAME________________________________

In order that we can be as fully prepared as possible to handle any health problems that your youngster may have now, or may contact during Outdoor Education, we need the following information about your child. (PLEASE FILL OUT THIS ENTIRE FORM.)

Does your child have any problems with the following? Please check:

<table>
<thead>
<tr>
<th>Convulsions</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
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<tr>
<td>Insect stings</td>
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<tr>
<td>Penicillin</td>
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</tbody>
</table>

Other (please explain) ____________________________________________

Please list the date of your child's last tetanus shot here. ____________________________

Has your child been under a physician's care recently? Yes____ No____
If yes, please explain ______________________________________________________

Please do not send any medication with your child unless absolutely needed. If necessary, list the medicine being sent and when it should be taken. This medicine should be labeled with name and directions, and kept in a ziplock bag.

Please list anything else about your child's health which would pertain to his/her welfare or activity while at Outdoor Education. __________________________________________________________

Please write below, your name and four emergency telephone numbers where you may be reached if necessary. (Please fill in all lines.)

<table>
<thead>
<tr>
<th>NAME</th>
<th>DAY PHONE NO.</th>
<th>NIGHT PHONE NO.</th>
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</table>

(Teachers... please check to see that each child has four emergency numbers.)

May we have permission to take your child to the hospital emergency room at the nearest hospital, if necessary? ______

For emergencies, list... Parent's insurance company __________________
Group No. _______________ Policy No. _______________
If this insurance information is not furnished, the parents will be billed directly from the hospital and/or doctor, if necessary. We do, as a matter of policy, call parents any time a child is injured and needs to be taken to the hospital or doctor. In most cases, the parents are again called by the hospital when the child arrives.

Parent’s signature ________________________________

(PLEASE RETURN THIS FORM TO SCHOOL AS SOON AS POSSIBLE. WE'RE SURE YOUR CHILD WILL ENJOY HIS/HER OUTDOOR EDUCATION EXPERIENCE. THANKS!)

NOTE...a physical is not required; however, if you have any concern about your child’s health or physical condition, you may wish to have a physical prior to camp. Camp Kern is not liable!
LIST OF EQUIPMENT THAT BEECHWOOD STUDENTS WILL NEED FOR OUTDOOR EDUCATION FIELD TRIP ON APRIL 8, 9 AND 10, 1991.

Please check the following list carefully. Plan ahead and have all items ready by April 7. Bring your supplies to school the morning of April 8.

Sweatshirt and heavy sweater
Four changes of clothing (long pants, shirts)
Four changes of underwear (don’t forget socks)
*Warm jacket
*Poncho (or raincoat)
Bedroll or sleeping bag, and one blanket and pillow
*Boots are an absolute must!
*Extra pair of shoes (hard-soled shoes or hiking boots are most helpful--soggy tennis shoes are miserable)
Washcloth and towel--toilet articles such as soap, tissues, toothbrush, toothpaste, comb, deodorant, etc.
Hat or scarf
One gym bag (or backpack) or bag that is the size of a gym bag
Clipboard, pencil (tied to clipboard)
Pajamas
*Tennis shoes (two pair, if you have them)
Extra large plastic bag (for wet clothing)
Laundry bag (old pillowcase is okay)

IT WOULD BE NICE TO HAVE...a flashlight and a camera (not an expensive one, and student is responsible for his own camera)

DO NOT BRING...absolutely no money, candy, gum, food, radios, knives, books, electronic games, curling irons, hair dryers or electric appliances of any kind

*OUTSIDE ACTIVITIES WILL GO ON EVEN IN THE RAIN

YOUR CAREFUL PLANNING WILL INSURE A GREAT CAMP EXPERIENCE!

PLEASE PUT YOUR NAME ON EVERYTHING!

PLEASE DETACH HERE AND RETURN BOTTOM PORTION TO CLASSROOM TEACHER

CANOEING PERMISSION SLIP

Dear Parent,

Camp Kern has, among other lovely spots, a small lake, complete with canoes. We will be offering a chance to go canoeing to those students who would like to be involved in this activity. Of course, life jackets will be worn by all participants, and all canoeing activities will be carefully supervised.

If you would like your child to go canoeing while at camp, please sign this form and return it to school immediately.

My child, ____________________, has my permission to take part in canoeing at Camp Kern. I understand that all canoeing will be strictly supervised, and that life jackets will be worn at all times.

Parent’s signature ____________________
CAMP KERN OUTDOOR EDUCATION PACKING LIST
(based on 2 1/2 days at camp)

Essential Clothing (we will be outside rain, mud or shine!)
___ 1 pair of rubber boots or waterproof boots.
___ Waterproof raincoat or poncho.

Other Clothing
___ 2 pair of jeans/old pants.
___ 1 pair of sneakers.
___ 2 changes of underwear.
___ 3 pair of heavy socks.
___ Sweater or sweatshirt.
___ Pajamas.
___ Laundry bag or pillowcase.
___ Jacket.
___ 2 shirts (one long-sleeved).

Extra Cold Weather Clothing
(plan to dress in layers)
___ Stocking cap
___ 3 more pair of socks (wool if possible!)
___ 2 pair of gloves or mittens.
___ Heavy coat or several light weight coats to be worn together.
___ Long underwear.
___ 1 more pair of pants.
___ 1 more pair of shoes.

Equipment
___ Toothbrush and toothpaste.
___ Sleeping bag or 2 sheets and 2 blankets (cabins are heated).
___ Pillow.
___ 1 washcloth and towel.
___ Comb and brush.
___ 2 pencils and a notebook.
___ Soap and shampoo
___ Plastic bag for wet items

Extras If you Wish!
___ Binoculars.
___ Camera and film.
___ Shorts if its hot.
___ Magnifying lens.
___ Reading materials.

Please do not Bring
___ Spray insect repellent.
___ Snacks, gum or food.
___ Money.
___ Hatchets/knives.
___ Radios/ or headsets.

Don't be sorry - put your name on everything !!!
SAMPLE EQUIPMENT LIST

Bedding
Bath Towels
Wash Cloth

Personal
Toothpaste
Soap and Soap Box
Chapstick
Comb and Brush
Tissues or handkerchief
Note paper and pencil

Clothing
Heavy Jacket or Coat
Heavy sweater or sweatshirt
Shoes, no open-toed
Raincoat
Galoshes or boots
Sportshirt
Underpants
Socks
Hat, Stocking Cap or Scarf
Gloves
Pajamas
Tough trousers or jeans

Recreation
Fishing pole and gear
Swimming gear

ITEMS NOT PERMITTED

Radios
Candy - gum
Mony

PRIMITIVE CAMPING PERMIT

One phase of the resident outdoor education program may include very primitive facilities. Although closely supervised, the undersigned does grant school authorities permission of roughing-it in the out of doors. This may pertain to sleeping facilities, hiking, food preparation, etc. This will be outlined in detail during our meeting prior to attending camp.

Name of Student  Parent
Parent Meeting with Staff

Parents are invited to an evening meeting with camp and school staff. Slides are shown about camp activities. Details on the camp experience are explained. Parental questions are answered.

Camp Experience

Family Group Meeting

Teachers are assigned a small group of students called Family Groups. The purpose of this group is to serve as a family unit at camp. If problems arise, the student may seek help from this teacher. The meeting will establish guides for the children to follow and materials needed will be distributed.

The meeting will include:

- Distribution of name tags, schedules, and maps
- Duties are assigned
- Rules are reviewed
- Bus loading procedures are discussed
## FAMILY GROUPS

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<tr>
<th>TEACHER</th>
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OUTDOOR EDUCATION RULES (PLEASE POST THIS ON YOUR REFRIGERATOR)
THESE RULES WILL BE STRICTLY ENFORCED--ANYONE BREAKING THEM WILL BE SENT HOME.

GENERAL: 1. There will be no running, pushing, shoving, tackling, or rough play at any time.
2. No matches, lighters or any other dangerous objects will be permitted.
3. There will be no foul language, "back talk" or arguing with teachers or camp staff.
4. Any injury is to be reported immediately.
5. Do not bring money, knives, radios or toys.
6. Disrespect to anyone will not be tolerated.
7. We expect directions to be followed immediately for the sake of safety and the enjoyment of all.

CAMPSITE: 1. Do not bring any food or snacks; this is strictly enforced!
2. If you are assigned to be in a particular place, you are expected to be there.
3. Each person is responsible for cleaning up his or her area.
4. Individuals will be assigned a task for which they will be responsible.
5. All scraps or garbage will be put in trash containers.
6. Students will wash their hands as directed.

TRAIL: 1. Do not throw any objects.
2. When you are on the trail, you are to stay with your guide or teacher. There will be no going ahead or lagging behind.
3. There will be no collecting of samples or picking of flowers unless permitted by staff.
4. When on the trail, stay several steps behind the person in charge. Do not crowd those ahead.
5. Stay on the trail, and respect all forms of wildlife.

Please return the attached form to the classroom teacher.
SAMPLE SCHEDULE

NAME
1991 Outdoor Education Schedule
Elk Lodge — Camp Kern

Wednesday, September 18

8:30 — 9:00 At Beechwood — Meet with Family Groups
9:00 — 10:30 Load buses — ride to Camp Kern
10:30 — 11:00 Arrive at CK, unload, wait in lodge with your Family Group
11:00 — 11:45 Rooms assigned, unpack, relax
11:45 — 12:00 KPs report to Dining Hall
12:00 — 1:00 Lunch, Songs, Announcements (about your Trails, etc.), Clean-up
1:00 — 3:00 Trails Class #1
3:00 — 3:15 Rest break — get ready for next Trail
3:15 — 5:00 Trails Class #2
5:00 — 5:15 KPs on duty
5:15 — 6:15 Dinner, Songs, Announcements, Clean-up
6:15 — to Walking hike to the Nature Center around 7:30
7:30 — 8:45 Pioneer Campfire (Mr. Music in charge)
8:45 — 10:15 Snacks, Movie, Announcements
10:15 — 10:45 Showers, etc.
10:45 — 11:00 Lights Out! and Z-Z-Z-Z

Thursday, September 19

7:30 Rise and Shine!
8:00 KPs report
8:15 Breakfast, Announcements (about your Trails, etc.), Clean-up
9:00 — 11:00 Trails Class #3
11:00 — 11:45 Pioneer — (half of group)/Hoedown (half of group)
(or 12:00) Indian Game — 30 min. each
11:45 KPs report
12:00 — 1:00  Lunch, Songs, Announcements (about your Trails, etc.), Clean-up
1:00 — 3:00  Trails Class #4
3:00 — 3:15  Rest break — get ready for next activity
3:15 — 5:00  Enrichment and Trails #5
   *When your activity is over, you may rest in your bunk or relax just outside the lodge — do not go anywhere else!
5:00         KPs report
5:15 — 6:15  Dinner, Songs, Announcements, Clean-up
6:15 — 7:45  Hayride/Shirt Project (45 min. each activity and then trade off)
7:45 — 8:45  Night Hike (Kern Staff)
8:45 — 10:15 Snacks, Movie, Announcements
10:15 — 10:45 Showers, etc.
10:45 — 11:00 Lights out! Z-Z-z-z

Friday, September 20

7:15         Rise and Shine — start packing and cleaning up
8:00         KPs report
8:15         Breakfast, Announcements (about your Trails and after), Clean-up
9:00 — 10:45 Trails Class #6
10:45 — 11:00 KPs report — others clean rooms and rest rooms
11:00 — 12:00 Lunch, Songs, Announcements, Clean up
12:00 — 12:30 Load and board your buses by Family Group
12:30 — 2:15  Homeward bound! I hope you have made your arrangements to take your "weary bones" on home as soon as you arrive at Beechwood.

<table>
<thead>
<tr>
<th>KP Duty</th>
<th>Be there!</th>
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<td>Other Info</td>
<td>Name of Trail Group</td>
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<td>— Note any changes</td>
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KERN OUTDOOR EDUCATION
Spring Schedule — Elk Lodge

DAY ONE
Arrive, Unpack, Orientation
(Suggested arrival time: 10:00-10:30)
11:45 KPs report/games
12:00 Lunch
1:00 Trail
3:15 Trail or Enrichment
4:55 Weather
5:00 KPs report
5:15 Dinner
6:30 Teacher-led Activity
7:45 Campfire
9:00 Snack
10:00 Lights Out

DAY TWO
7:15 Rise and Shine!!
7:55 Weather
8:00 KPs report
8:15 Breakfast
9:00 Special Option* (9-11:30**)
or Trail (9:00) and Group Activity*
(11:00)
11:45 KPs report
12:00 Lunch
1:00 Trail
3:15 Enrichment
4:55 Weather
5:00 KPs report
5:15 Dinner
6:30 Hayride/Canoeing*** or Group Activity*
8:00 Night Hikes (before April 29)
Group Activity* (after April 29)
9:00 Snack
10:00 Lights Out

DAY THREE
7:15 Rise and Shine!!
7:30 Pack-up and Clean Cabins
8:00 KPs report
8:15 Breakfast
9:00 Trail
10:45 KPs report
11:00 Lunch
11:45 Load buses/Goodbye!!
DINING HALL PROCEDURE

1. Meals will be served promptly (see schedule).

2. The KPs from each Family Group will report 15 minutes before meal is served with hands washed.

3. Each Family Group sits together at a table (same one each time). You will have from 7-9 people at your table.

4. Two people from each Family Group will be assigned to the job of setting up and errands during the meal. See #2.

5. Two people from each Family Group will be assigned to the clean-up job. Everyone at the table will help, but the clean-up KPs will carry food to the kitchen and dishes, etc. to that area. They will also clean the tables. Each person puts up his chair (after the announcements).

6. Hints for clean-up —
   - Food scraps put into one large container
   - All napkins and paper on one plate
   - All silverware on one plate or platter
   - All liquids poured into 1 or 2 glasses
   - Leftovers returned to kitchen
SPRING CURRICULUM — 1991
KERN OUTDOOR EDUCATION — ELK LODGE

********** TRAILS **********

NATURAL HISTORY
TRAIL OF TIME .................. Fossil-hunting and exploring our ever-changing earth.
FEATHERED FRIENDS ............... An encounter with the world of birds: stuffed birds, a game of "Tweety Smash," and a bird hike using binoculars.
DEEP WOODS ..................... Ecology and interdependence are taught on a hike through Kern's 200-year-old beech forest.
KERN.KRITTERS ................ An exploration of the critters struggling to survive in and around a pond.
IN.COLD BLOOD ................ A close encounter with the cold-blood animals: fish, amphibians, and reptiles. Meet a snake!

EARLY OHIO
PIioneer.HOMESTEADING ......... An authentic pioneer cabin (under construction) and pioneer tools help students learn about life on the Ohio frontier.
ON NATIVE GROUND ............. A study of native Americans through sign language, games, and a council meeting in a wégwiwa.
FORT ANCIENT ................ An interpretive van trip to this famous nearby earthworks built by the Hopewell Indians 2000 years ago.

COOPERATION AND SKILLS
STAR WAYS ..................... A group cooperation and obstacle course set in a theme of an enchanted pyramid.
HORSE.SENSE .................... Safety, grooming, and saddling before a trail ride. FEE: $7/student.
SURVIVAL ....................... A "plane crash" challenges the students to build a fire, a shelter, and work cooperatively.
BRAMBLE SCRAMBLE ............. Follow the trail of the mystery animal while learning to use map and compass.
SENSORY.AWARENESS .......... A series of activities designed to unite child and nature by utilizing all the senses.

********** SPECIAL OPTIONS **********

LIVING HISTORY ....... Spend the morning in the year 1810! Your students will encounter our costumed staff in and around the Cross Keys Tavern and experience life on the Ohio frontier firsthand. An informative wrap-up session will conclude the activity. (See your coordinator about scheduling a pre-activity teacher's hike, if needed.)

INDIAN DAY ....... Students become Indians (face paint and all) and take part in a series of Indian lifestyle activities (games, sign language, the "Hoop of Life"), followed by a reenactment of the Greenville Treaty of 1795. (If you select this Special Option, do not select the "On Native Ground" trail.)

FT. ANCIENT HIKE .... A hike through the scenic Little Miami River Valley, tours of the earthworks, and even lunch at Ft. Ancient, if you wish. Your coordinator will attempt to arrange for the museum to be opened if you ask, but we can make no promises due to limitations on availability. (Note: Some schools have found that hiking to Ft. Ancient on the first afternoon is a successful outlet for the students' energy.)
ENRICHMENTS

(Max. # of students)
(12) CANDLE-MAKING ............... "Pioneer lightbulbs" and wooden holders to take home.
(Please bring old wax to melt down.)
(15) FISHING ....................... Relax and try your luck angling! (Note: students must bring
their own poles and bait.)
(12) ARCHERY ....................... Students are taught the skill and safety of this ancient art.
(12) PIONEER COOKING ............ Old-fashioned cooking (and eating!) at hearthside.
(10) WEAVING ....................... Easily hand-made belts, headbands, and/or bookmarks.
(12) TRACKING ..................... Learn the Indian art of laying and following a secret trail.
(Note: two adults are needed to lead this activity.)
(12) DISCOVERY HIKE ............. A hike for the adventurous (led by Kern staff).
(25) RIVER HIKE .................... Visit the seven wonders of Kern on this challenging hike for
happy feet.
(12) STONES AND BONES ........... Explore the legends and lifestyles of Ohio's early settlers at
the pioneer cemetery.
(30) CANOEING ..................... After a short lesson, students practice their paddling skills on
Elk Lake. See your coordinator about when canoeing will
become available (mid-April?).

GROUP ACTIVITIES

THE DUTCH AUCTION .............. An easily-led and zany game that teaches the value of owning
a yellow toothbrush.
THOSE WHO DARED ............... A slide show and game in which students journey to Ohio in
pioneer times. Students purchase supplies and their success
is determined by their choices.
CREATIVE DRAMATICS .......... Teams of students receive an Indian legend they must explain
via a skit they design and act out in front of the rest of the
group.
WIZ QUIZ .......................... Teams (table groups) test their knowledge and luck in this
Kern-style game show.
PIONEER-INDIAN GAME .......... A very active outdoor game with "pioneers" trying to get
supplies past a roving band of "Indians."
HOEDOWN .......................... Square dancing Kern-style.
CANOEING .......................... Students team up to ply the waters of Elk Lake (maximum #
—— 30). We ask that your school provide two adults to help
supervise. See your coordinator about when canoeing will
become available (mid-April?).
<table>
<thead>
<tr>
<th>Trail #1 — Monday at 1:00</th>
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<tbody>
<tr>
<td>Horse Sense — #2 Indians</td>
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<td>Trail of Time — #3 Pirates</td>
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<td>Ft. Ancient — #4 Tigers</td>
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<tr>
<td>Kern Kritters/Cold Blood — #5 Cardinals</td>
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<td>Star Ways — #1 Braves</td>
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<th>Trail #4 — Tuesday at 1:00</th>
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<td>Horse Sense — #5 Cardinals</td>
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<td>Trail of Time — #1 Braves</td>
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<td>Ft. Ancient — #2 Indians</td>
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<td>Kern Kritters/Cold Blood — #3 Pirates</td>
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<td>Star Ways — #4 Tigers</td>
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<th>Trail #2 — Monday at 3:15</th>
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<tr>
<td>Horse Sense — #3 Pirates</td>
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<td>Trail of Time — #4 Tigers</td>
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<td>Ft. Ancient — #5 Cardinals</td>
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<td>Stones/Bones — #1 Braves</td>
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<td>Kern Kritters/Cold Blood — #2 Indians</td>
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<tr>
<th>Enrichments — Tuesday at 3:15</th>
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<td>Candle Making — #1 Braves</td>
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<td>Archery — #3 Pirates</td>
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<td>Pioneer Cooking — #4 Tigers</td>
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<th>Trail #3 — Tuesday at 9:00</th>
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<td>Horse Sense — #4 Tigers</td>
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<td>Ft. Ancient — #1 Braves</td>
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<td>Star Ways — #2 Indians</td>
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<tr>
<th>Trail #5 — Wednesday at 9:00</th>
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<td>Horse Sense — #1 Braves (those doing HBR)</td>
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<td>*Braves not doing HBR will do Kern Kritters.</td>
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<td>Trail of Time — #2 Indians</td>
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<td>Ft. Ancient — #3 Pirates</td>
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<td>Kern Kritters/Cold Blood — #4 Tigers + #1 some Braves not HB</td>
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<td>Stones/Bones — #5 Cardinals</td>
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STAFF SCHEDULE
(Changes can be made)

Key
HS = Horse Sense         KK = Kern Kritters
TT = Trail of Time       SW = Star Ways
FA = Fort Ancient       SB = Stones & Bones
RH = River Hike

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<td>TT  10</td>
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<td>FA  11</td>
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<td>KK  11</td>
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<td>SB  20</td>
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<td>HS  11</td>
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<td>TT  15</td>
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<td>FA  10</td>
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<tr>
<td>KK  11</td>
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<td>SW  11</td>
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<th>Trail #3 — Thursday at 9:00</th>
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<td>HS  11</td>
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<td>TT  11</td>
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<td>FA  15</td>
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<tr>
<td>KK  10</td>
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<tr>
<td>SB  11</td>
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## STAFF SCHEDULE (cont.)

### Trail #4 — Thursday at 1:00

| HS  | 11  | Indians — Staff |
| TT  | 11  | Pirates — Staff |
| FA  | 11  | Tigers — Staff  |
| KK  | 15  | Cardinals — Mike, Gretchen, Sandy |
| SW  | 10  | Braves — Mary, Don |
|     |     | Off Kelly, Norma, Maryann, Janet, Kathy |

### Trail #5 and Enrichment — Thursday at 3:15

| HS  | 9   | Cardinals — Staff, Mary, Janet |
| SW  | 11  | Tigers — Kelly, Norma |
| SB  | 11  | Pirates — Don, Kathy, Maryann |
| RH  | 27  | Cardinals (6), Indians (11), Braves (10) — Staff, Mike |
|     |     | Off Sandy, Gretchen |

### Trail #6 — Friday at 9:00

| TT  | 11  | Indians — Staff |
| FA  | 11  | Pirates — Staff |
| KK  | 11  | Tigers — Staff, Kathy, Kelly |
| SW  | 15  | Cardinals — Janet, Sandy, Don |
| SB  | 10  | Braves — Gretchen, Norma, Mary |
|     |     | Off Maryann, Mike |
Camp Kern
1. Gatehouse
2. Garage
3. Game Field
4. Lake Picnic Circle
5. Pond
6. Boathouse
7. Picnic Shelter
8. Recreation
9. Dunaway Lodge
10. Swimming Pool
11. Goodrich Lodge
12. Miami Shower House
13. Worship Picnic Circle
14. Sewage Filter System
15. Cliffs
Camp Site

Upon arrival, the camp staff introduces themselves and discusses specific camp rules. This applies to dining hall procedure, bunk areas, and care and respect of the camp grounds.

An explanation of the curriculum is given. The curriculum will include activities that center on various trails, group activities, recreation, and enrichments. Class or trail schedules are distributed at this time.

Introduction

Outdoor Education Curriculum

Curriculum will include studies of animals, plants, geology, archeology, ecology, natural history, and other related experiences.
Imagine that you are an animal and that you are hungry.
Write down those things that you think should be here in these woods for you to eat. **THEN**, circle the ones you actually find in your two square yard area.

***REMEMBER,*** whenever you investigate your environment, leave it like you found it as far as is possible! **DO NOT UPSET** the balance of nature!
ECOLOGY

Things in our world that MOVE.

Stop, stand, or sit quietly and observe all the things you can which are moving during a two minute period.

*When this two minute period is up, then you may record below everything you can recall which moved in any way.

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<th>1. Homes</th>
<th>2. Tracks</th>
<th>3. Homemaking</th>
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<td>4. Plants — 1&quot; or less</td>
<td>5. Sign of Man</td>
<td>6. Under Dead Wood</td>
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<tr>
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<td></td>
<td>a) tree with thorns</td>
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<td></td>
<td></td>
<td>b) dead tree</td>
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<td></td>
<td></td>
<td>c) trees that are dying</td>
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NUMBER NAME OF COMMUNITY DRAWING
Nature's Dump, 
Man's Dump

Follow the map to the small sign behind cabin 5 that marks "Nature's Dump". Explain to your kids not to be "grossed out" by the dump as you approach it. Ask them if it smells. "Does it look ugly?" "Is it dangerous?" Explain that these decaying logs are being recycled into soil by bacteria. Challenge them to see two other agents in "Nature's Dump" that are breaking down the logs: (1) fungus (2) insects - point out the tunnels in the logs. Every natural object on earth dies and is recycled into something else. Only man's "unnatural" objects such as glass and nuclear waste don't fit very well into nature's plan.

On your way to "Man's Dump" explain that Camp Kern dumped there from 1945 - 1965 and thought no one would ever use this area. As you enter the dump warn everyone about sharp glass. Stop at the "Man's Dump" sign and begin the two minute ugly activity. Give everyone two minutes to find the ugliest object they can and have a few kids explain what's so ugly about their object. Next, see if they can place their objects on the ground in the order they will decompose. (leather - tin - china - glass)

While leather may decompose here in fifty years, glass takes many thousands. Tin may also decompose in fifty years but aluminum takes thousands. "Are we being responsible earthkeepers by producing, and not recycling, such things as aluminum, plastic and styrofoam?" "What problems are we leaving for the future?" "Did you know that solid waste accumulates in the United States each year at the rate of one ton per person!"

Camp Kern's trash is now picked up in trucks and taken to a landfill near Cincinnati. Some cities have built ski hills on top of dirt piled on their dumps! Now that's creative recycling. (20 minutes)
Return the box and walk to the bath house. Check to clear the restroom and enter with your kids. Dramatically ask for silence and flush a toilet. Ask your kids where it goes after the flush. Does it go away? NOTHING EVER JUST GOES AWAY. Follow the pipes from the bath house directly to the sewage treatment plant. This is where it goes.

Use this diagram to explain to your kids how water is recycled in this plant to be used again.

Fill a plastic glass with water to show how clear it is, do not drink it as occasionally the system breaks down. Emphasize to your kids that the water released from Camp Kern will be used "down stream" as drinking water by others. Each of us has a responsibility as an earthkeeper if we are going to share the earth with each other. (15 minutes)
Waste: what to do with it

Walk over to the "Is this junk worth manufacturing" pile. This creative art piece contains many nonreusable items such as Big Mac boxes and pop bottles. The questions written near it should spark a good discussion on America's "throw-away society". Try not to preach to the kids - just try to get them to think about what America is doing.

One of the biggest waste problems America has is what to do with hazardous chemical wastes that seep into the ground water and contaminate the water that people drink. The problem occurs when a factory dumps toxic waste chemicals into barrels that are then buried. The chemicals seep out into underground water that eventually pours into people's sinks and bathtubs! Cincinnati has the nation's first hazardous waste incinerator which effectively destroys these chemicals through extreme heat.

To illustrate the problem of dealing with hazardous wastes show your kids the mock hazardous waste container and ask them how safe it makes them feel. Divide your kids into groups: Executives for Acme Acids Corporation, and activists for Glop Stoppers, a concerned citizens group. Acme Acids has two minutes to hide the hazardous waste box so the Glop Stoppers can't find it. If this is done it will prove that there is no danger with their waste products in the ground. The Glop Stoppers wait inside while the box is hidden. After the two minutes they have one minute to find the waste. The boundaries are marked by traffic cones.
THE FOREST AS A HOTEL

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Diagram:

- **Canopy** (Penthouse)
- **Understory** (Upper floors)
- **Trunks & Stems** (Stairways)
- **Shrub Layer** (Resident floors)
- **Herb Layer** (First floor)
- **Soil** (Basement)
ECOLOGY

GOAL
To develop an increased understanding and appreciation of beauty, complexity, and ecology of our natural resources. To observe the system of ecological relationships in which life of any group of living organisms is based. These would include such things as food supply, weather, and natural enemies.

GENERAL OBJECTIVES
The student through verbal, written or art form and personal actions will express his attitude toward man's relationship with the environment in a natural setting. He will do this by 1) observing the food chain of consumers, producers, and decomposers and 2) observing the causes of air, water, and land pollution.

SPECIFIC OBJECTIVES
The student will learn that:

1) soil is a mixture of rocks and organic matter
2) the earth's cover of soil consists of layers
3) rocks wear away and become part of the soil
4) earthworms turn soil and make it arable
5) erosion of wind and water carries away topsoil
6) topsoil is protected through soil conservations practices
7) water is a natural resource
8) water is not evenly distributed over the earth
9) wise use of the forest is closely related to wise use of soil and water.
10) trees are used for food, shelter, and clothing-how they are important to people and animals-uses
11) insects, fires, and wasteful lumbering are a threat to our forests
ECOLOGY (cont'd)

12) various animals have disappeared from the earth
13) animals should be protected to help maintain the balance in nature
14) minerals are non-renewable resources.
15) minerals are not evenly distributed over the earth's surface—use of them should be done wisely
GEOLOGY / ARCHEOLOGY
PURPOSE

The Fort Ancient Adventure involves a 1 1/2 mile van trip to a large prehistoric Indian earthworks built 2,000 years ago. Points of interest within the walls as well as a tour of the museum are included. Emphasis is placed on the archaeological process of piecing together the Hopewell culture from the fragmented evidence left behind.

1. Rivers and Peoples  
2. The Fort Ancient Indians  
3. Respect for a Site  
4. Hopewell Indians  
5. A Mystery  
6. The Stone Pavement  
7. Flint Knapping (Optional)  
8. The Lookout  
9. Museum (Optional)

MATERIALS LIST

Tool Pictures  
Coke Bottle  
Ft. Ancient Artifacts  
Raw Materials  
Skeleton Pictures  
"Talking Bones" sheets  
Hopewell Artifacts  
Burial Scripts  
"Raiders of the Temple"  
Gate Key and Pass
THE FORT ANCIENT ADVENTURE
(PEOPLES DRIFTING IN TIME)

TIME LINE

Paleo
9000 BC - 6000 BC
*fluted points, Mastodon, followed melting glaciers North

Archaic
6000 BC - 1500 BC
*hunted post-glacier small game, spears, adults buried in middens (garbage hills), children buried with dogs

Glacial Kame
2500 BC - 1000 BC
*burials in glacial deposits, used annealed copper, some ceremonialism

Adena
1000 BC - 700 AD
*named by archaeologist Mills in 1902 after the governors' estate, more sedentary lifestyle, tablets with symbols

Hopewell
300 BC - 500 AD
*named after Captain M.C. Hopewell's farm in 1920, stratified society, hilltop enclosures and geometric earthworks, great ceremonialism, trade bladelets - obsidian - copper - mica

FORT ANCIENT
(Woodland)
1000 AD - 1700 AD
*hunting, fishing, bow and arrow, cultivation of corn - beans - squash, rattles - flutes, extended or flexed flesh burials, possibly pre-Shawnee

NOTES TO THE INTERPRETER:
Keep in mind that interpretation of the past is basically an extrapolation of our present society. Do not assume peculiar explanations for past events. Remember, Christianity has remained basically unchanged for 1800 years; Begin by assuming that prehistoric Indian practices are similar to those practices observed at white contact in the 1600's.

GOOD ATMOSPHERE = SUCCESS
The van is a "time machine", and students are famous archaeologists. "Dr. Jim, would you define prehistoric for us?" (before written histories). No screaming, standing, or pushing in the "time machine", and watch out for finger-eating doors.
STOP 1 - RIVERS AND PEOPLES

In the van at the river ask "What does modern America use its rivers for?" (waste, drinking, transportation, food, recreation) "Where are the world's greatest cities?" (at waters edge, L.A., N.Y., London, Dayton, Hong Kong) "Where would you expect to find the "cities" the Indians built?"

STOP 2 - THE FORT ANCIENT INDIANS

Cross the Rte. 350 bridge, turn left at the old railroad tracks and park the van. Hike to the river to visit a great city of the past. Pick a spot overlooking the river at the Ft. Anderson Village site and sit in a circle.

A. Archaeologists and Artifacts

1. Ask "What is an archaeologist?" An archaeologist is a detective who takes clues from the past and tries to figure out what people were doing long ago. The clues are artifacts which are anything made or used by man.

2. Pass out pictures of tools and explain the excavation of a site. The key concept here is that the evidence (the actual site) is destroyed by digging! Therefore the scientist is extremely cautious - he/she gets but one chance.

3. Have the children jump into an imaginary time machine and become archaeologists from the year 2500. Imagine carefully unearthing an artifact of exquisite design from the 1900's. NO ONE MAY SPEAK. Now dramatically remove the Coke bottle from the bag and solicit hypotheses concerning its use. Archaeologists must determine its function after considering SHAPE, MATERIAL, AND MARKINGS. "Extremely rare, held a precious fluid, possibly used in religious ceremonies, belonged to a priest named Coca Cola."

4. Now pass around artifacts of the prehistoric (which means before written history) Fort Ancient culture. You are sitting on their home! Let the children guess how the artifacts were once used. It's a very special feeling to hold something made by skilled indians so long ago.
B. Raw Materials - Us versus Them
Mix up and pass out the raw materials, both Indian and American. Have the children match the modern material with the ancient one it replaced. Draw analogies. Flint replaced by steel; Oil and coal replace wood. Pills replace plants. Plastic replaces skins. "Which is better?"

THE ANDERSON VILLAGE SITE

STOP 3 - RESPECT FOR A SITE

A. Test Pits - An artifact of digging
1. Walk over to the test pit shown on the map. On the way over note the topography of the area. This high ground protected from floods, bounded by streams and adjacent to the river made a perfect home. Clams, fish and transportation were always nearby.
2. At this pit which was dug to determine if further excavations should be made, reinforce the concept that digging is destructive. Therefore, the archaeologist digs only part of each site, leaving a portion intact for the future when archaeologists will have better and less destructive ways of "seeing" under the soil. Notice how the river has already eroded much of the original village. (a skeleton eroded out of the hill in the summer of 1982)
Examples of site damage: While building the road at Fort Ancient by the great gateway, the workmen were allowed to take home skeletons they dug up before they were even studied. Now we don't even know whether they were Fort Ancient or Hopewell peoples. Examples: Early archaeologists were mainly interested in bones and fancy artifacts. Whole villages were torn apart looking for these kinds. Now we have no way of knowing where the original buildings were or why they were built in a particular way. In some mounds holes were dug straight down the center from the top destroying the clues so necessary for archaeology. Example: Today in Arizona and New Mexico treasure hunters in 4-wheel drives and with backhoes are digging up the villages of the Anasazi Indians. This is against the law but America still not set aside enough money to hire police to protect the sites. The villages are being ruined and it is permanent. This practice is called "potholing" or "potting" a site and you have an obligation to teach your students how ruinous this practice is.

3. Now pass out the pictures of the Fort Ancient skeleton which was found eroding from the earthen walls on the hilltop by kids from Kern in 1981. They could have dug it up using shovels, but instead archaeologists were called in to do careful excavations.

B. Pass out the "talking bones". Use the information on the back to point out the clues found in the bones.

Scientists can tell how good a person's diet was by the structure and mineral content of the bones. Teeth tell the age as do bone growth and bone sutures. Pelvis shape and ridges on the bones help distinguish male from female, males have larger muscles and therefore larger ridges. The
Skull shape can denote tribe or culture - as can deformation of the remains. Carbon dating, soil layering, and sometimes the order of annual rings in tree wood (called dendrochronology) can help determine the date BP of the site. Corelation of artifacts with other known sites is also helpful in determining time and culture.

Carbon dating uses the relative percentage of C\(^{14}/\)C\(^{12}\) in organic matter to determine material age. Radioactive C\(^{14}\) decays to C\(^{12}\) at a given known rate, the half-life of C\(^{14}\). Since living things incorporate both of the carbons in their bodies while alive we can take the C\(^{14}/\)C\(^{12}\) ratio at excavation and compare it to the known ratio at time of death. The difference will be due to C\(^{14}\) decay and a simple ratio then gives the time since death within a certain range of error.

STOP 4 - THE HOPEWELL INDIANS

Enter Ft. Ancient by the parallel wall mounds, park, and walk behind the large mound.

A. Sit down and pass around the Hopewell artifacts. Point out the artists skill and the time required to make these things. Hopewell society was stratified and specialized. Note the difference between Hopewell and Fort Ancient artifacts.

B. Show the students the large map of the Fort. Point out the holes in the three and one-half mile long walls. How did they ever build this place? How many years? Why? Demand silence and ask this question, "If America, with all its men, women and machines tried, what could we build between now and the year 2300?" (some we've heard; underwater cities, railroad to the moon, cities on Mars). Some scientists estimate it took the Hopewell people 500 years to build this place!

C. Now perform the burial scene using the Hopewell Funeral Script! Choose a member of your group to be a great dead chief or princess and lay them out. Be sure to pick a good actor for the part of Shaman (medicine man).
Mounds found in the big woods south of this point and outside the walls held burials of this type. The actual village where the Indians lived has not been found. It is likely that the spot on which we're standing was a preparation area for burial, although no burials were discovered in the two large mounds.

Often, the articles found in mounds have been ceremonially killed (broken spear point) so that they too might go to the afterlife with their owner.

This type of cremation and dismemberment is very different from the Fort Ancient's whole shallow burials. It is good to point out how Americans prepare their people for the afterlife as a comparison (embalming, coffin, gravestone, priest, church, etc.). Is this place a fort? NO! It a great 126 acre ceremonial ground from the past.

STOP 5 - A MYSTERY

Drive to the museum area, park the van and examine the four mounds nearby.
These mounds formed a perfect 510' square before they were excavated and disturbed. Look, the land between them is almost perfectly flat and was very clean with few artifacts. What happened here? Note the holes in the 23' high walls nearby. How did the Indians move this much earth? Was this a great pageant area or just a large soccer field?

HOPEWELL INDIANS KNEW MATH AND GEOMETRY! Marshall has analyzed Hopewell sites and found that many distances were either 51 meters or a multiple of 51m. This unit of measure was also used in ancient Rome and in ancient Mexico! A possible connection? Essentially the Hopewell had the ability to draw blueprints of a site and then work on it for hundreds of years.

On these particular mounds archaeologists found small stone "piles" (would have been platforms before they collapsed) and evidence of burning. Fire sites? Altars?

Although Hopewell culture had isolated burials in mounds which they constructed, the Glacial Kame culture used existing glacial deposits as burial mounds. The Adena culture used the same mound over an extended period of time, burying in layers. Miamisburg mound is a large Adena mound where burials have not yet been found. Cultural and physical changes in the people can sometimes be observed over time through burial practices.

The Liberty Square
Ross County, OH
6x57m on a side
Drive down and park in the "middle fort", then hike over to the base of the walls (please do not climb and cause further erosion).

A. An Indian Amphitheatre. Set your group together at the base of the wall of this earth alcove and explain that on these walls might once have sat countless Hopewells observing sacred ceremonies below. Two thousand years ago these walls were covered with stone (like the lip of a bowl), and some can still be seen behind the gateway down over the hill. Also, the ground in front was covered with stone paving rocks and might have been a focal point of ceremonies. The stone has been covered with earth to prevent theft by souvenir hunters.

A fun activity involves testing the acoustics of the amphitheatre. Face your group and walk backwards toward the road giving instructions as you go like, "Put your right hand on your head". The group should be able to hear you speaking in a normal tone of voice all the way to the road. Your last command might be to have everyone race to you. When your group is together again explain that the amphitheatre was built similar to the Music Hall in Cincinnati and catches sound waves.

B. Pass out the "Raiders of the Temple Treasures" guides. Explain that students in teams will visit as many places as time allows. Obey park rules, stay in sight and establish a return signal. Everyone will have to be silent so the amphitheatre will work.

As you leave the middle fort and van through the great gateway you'll pass over hundreds of Indian bones. Why were they buried here?
STOP 7 - FLINT KNAPPING

Van down to the road end and park the van at the loop.

A. The grassy area next to the road towards the middle of Fort Ancient was another village of the Fort Ancient people. The early archaeologists mis-named this place thinking that these Indians had built the wall and mounds. We now know that the Hopewells built their "temple" almost 900 years before the Fort Ancient Indians were even here! Many shallow, (not mounded), whole (not cremated), Ft. Ancient burials were found near this spot.

B. Turn away from the village and walk to the walls. Talk about the daily life of the Indians and the incredible skill of the Hopewell ceremonial artists and the arrowhead-makers of the Fort Ancient people. (Hopewells had no arrowheads). Pass around a flint chip once held by a prehistoric Indian near this great place. Explain how flint cores were carried miles to this place for the flint knappers to use. Have students spread out on the wall and look carefully for flint pieces. NO DIGGING! Set a time limit and head for the lookout. Point out the spot where kids from Camp Kern found a Fort Ancient skeleton buried in the Hopewell wall.
A. Notice the large borrow pit from which dirt was taken to build the wall. Also, to the right as you look over the valley is a graded ramp which leads to a terrace where many burials were discovered.

As you look out, share the view Hopewell warriors had when Christ walked the earth. Ask your group why the Indians came to this spot and took so long to build one of the greatest temples ever discovered. Even today some of man's greatest structures are churches to his God. The Hopewell people believed in an "up there".

Be sure to point out the remains of the town of Fort Ancient built in the 1820's (the white buildings). The Anderson Village built by the Fort Ancient Indians can also be seen just right of the small bridge (our first stop today). The large bridge on I71 is the highest bridge in Ohio.

B. Where are the Hopewell Indians today? What do you think must assuredly happen to America?

1. One legend told about the area is the "curse of the valley". According to this story the Hopewells offended their gods who, in turn destroyed them and cursed the valley along the Little Miami so no other people could ever live here in peace. It is interesting to note that the Fort Ancient Indians who moved into the valley after the Hopewell, and the first settlers who built the town, both disappeared. No one knows the Indians fate, and the town washed away in 1913's great flood.

All civilizations begin and end. The Hopewell's ceremonialism (the great difference between them and the contemporaneous Adena) disappeared with them about 600 AD. Did they die of disease? War?

Probably, the adoption of maize agriculture and the resulting change in economy contributed to their decline.
One theory is that a general disturbance across all of North America disrupted trade and stopped the flow of the special materials the priests and artists required for their religion. The people just split up and joined other Indian groups around them. We'll probably never know.

2. Have your students sit or stand silently overlooking the valley and read this poem. The original written by archaeologist Clifford Anderson is in the Camp Kern lodge. Today archaeologists John White and Pat Essenpries continue explorations to solve the mysteries of these two cultures.

THE MOUND BUILDERS OF FORT ANCIENT

WE ARE THE MOUNDED DEAD - In ages past when Life was ours, we saw sunshine and starlight, felt wind and rain and heard the roar of rushing waters.

Our campfires gleamed bright where our wigwams nested safely below the Fort-crowned hills.

Our canoes were swift upon the river, our hunters roamed the forest, our warriors returned from victory rich with spoils and many captives. We were a ruling race famed and feared - The Monarchs of the Mounds -

Still swings the Sun upon his course, still shine the silent stars upon the homes of men, but our fires have died out forever and the ashes have long been cold.

Our Fortress walls are crumbling, the winter snows are drifting where our vanished wigwams stood, and beneath the rivers shifting sands our crushed canoes lie deep.

Beside the hidden trails our hunters sleep, the fallen forest mingles with our moldering dead, and Death has stilled the voice of Victory where our warriors lie in huddled heaps.

For us the circling ends of Destiny have met and the Earth from which we came has claimed its own again.

Another Race has crossed the Seas and strange feet tread o'er our resting place.

Riches and power and Fame are theirs today but they too shall come and dwell with us through the silence of the centuries.
9. THE MUSEUM
(Two Cultures of Old)

The museum tour should take about 20 minutes. The displays are self-guided, but by explaining them to the kids you can make the whole tour more interesting.

The model of Fort Ancient on the right just as you enter the museum illustrates the shape and helps the kids put the temple in perspective. You might try to have the students locate camp on the display.

Keep to the right and walk to the charnal house. Review the steps of a Hopewell burial. Next to the charnal house is the shaman who was thought to have been in touch with the spirit world. The obsidian knife in his hand was probably used in the dismemberment ceremonies of many Hopewells. The obsidian had to be carried all the way from the Rocky Mountains.

At the end of this display is a cross section of an Indian Mound. Note the evidence of the charnal house and the artifacts buried with the Indian to be taken to the land of the dead also. Hopewell treasures can be seen above, made from materials traded for from coast to coast. The extensive trading of the Hopewells helped create their high level of culture.

Circle your kids around the village site display and see if they can determine if it is Hopewell or Fort Ancient. (Ft. Ancient, by the burial technique). Once the kids understand this is a Fort Ancient village the display can be used to teach much about the everyday life of this culture. Point out food gathering methods, house construction etc.
Located on the walls around the village display are several scenes further depicting Fort Ancient life. Of particular interest to kids is the arrowhead-making display. From here you might want to walk to the center of the room where artifacts from many cultures can be seen. Several beautiful points are on show which make an interesting follow-up to the arrowhead-making display. Emphasize that it took more than an ignorant savage to hand-craft something of such beauty and precision.

The last guided stop in the museum is the display case of Fort Ancient skeletons dug up at the Anderson Village Site. The age and sex of each skeleton is labelled. Point this out and explain that age is determined by teeth and sex by the ridges on bones which hold the tendons. Males have larger ridges. Be sure to point out the skeleton of the medicine man who died in the winter and was stuffed, half-in and half-out, into a storage pit because the hard ground made digging too difficult. Another point of interest is the skeleton with spinal arthritis. Disease was common among the Fort Ancients and the average life span was 31 yrs. Before you leave the museum, let everyone explore on their own for a while. PLEASE DON'T TOUCH THE GLASS
INTRODUCTION

While you are still in the lodge explain that the Trail of Time is a geology trail about how time and water have drastically changed the face of Ohio.

Most people don’t think of water as an earth changer, but it has changed Ohio in three important ways.

1. Ancient seas once covered Camp Kern and the animal remains settled to the bottom and became the limestone bedrock of Camp Kern.

2. Huge glaciers moved across Ohio from the North carving the Great Lakes and changing the course of great rivers like the Ohio.

3. Raindrops pounding soil and feeding rivers that carve valleys have been shaping Ohio for millions of years.

Explain to your kids that moving water is the main force changing the earth now, but in years past other amazing changes have occurred. Emphasize that the earth has looked like it does today for a very short time. There have been oceans, swamps and arctic-like landscapes right at this very spot!

THE TIME STICK

Ask the kids how old the earth is and take out the time stick. Scientists think the earth is about 4.5 billion years old. The time stick will help to give the meaning of this number. Start with the bottom of the stick when the earth began as molten rock 4.5 billion years ago and work your way up explaining the major changes illustrated on the stick. The point of using the time stick is to teach the basic concept of the earth as a changing process and the immense amount of time involved in these changes.
THE TIME PICTURES

These large color photographs illustrate the major changes in our earth that many scientists believe happened. Emphasize to your kids that scientists do not fully understand the history of the earth. Science itself, is a process too, and some of the secrets about the earth's history are not yet known.

Have the kids work together to arrange the photographs in chronological order on the table. By using the information learned from the time stick and careful reasoning, the kids usually come very close to a perfect arrangement. Use the following information to check their results and to comment on the important points of each picture.

One theory about the beginning of the earth is the big bang theory. It states that the earth began with a huge explosion that sent planets and stars into space. Radioactive elements in the material that glopped together to form the earth made it very hot after the "bang". The earth was a molten ball of rocks and gases.

As the radioactivity burned itself out, the earth cooled and waters condensed from the skies and fell upon the earth as rain.

What many scientists believe to be the oldest life known are one-celled creatures called protozoans. These creatures lived in a sea, but just how living material was made from non-living elements is a great
Scientists known as creationists believe life was formed by an act from God.

Evolutionists believe the simple one-celled creatures developed into more advanced sea creatures. These creatures lived about 450 million years ago and formed the fossils found at Camp Kern. Geologists call this time period the Ordovician.

Oceans began to recede and swamps formed on the wet land. Land plants appeared which much later formed the coal beds and natural gas that we use today to generate electricity and heat homes. There are no coal beds in this part of Ohio because they have all eroded away.

The land became warmer and drier. It was the habitat for giant reptiles called dinosaurs who lived for millions of years before they disappeared. No one knows for sure what caused their extinction but it might have been due to a cooling trend on the earth.

Mammals, who have fur and warm blood, were better suited for the cooler weather. Mammals are still dominant on the earth although many, like mammoths and saber-toothed tigers, have become extinct. Scientists classify humans as mammals.

Although change is happening all the time on earth, the last drastic event to happen was the Ice Age. In fact, we are still in an Ice Age! At least 4 different glaciers moved through Ohio grinding up stone, plants, and anything else in their way. These ice sheets were one mile high in some places over Ohio!

**An Important Question**

Point to the time picture of the Ordovician sea creatures and ask why we find fossils of these creatures at Camp Kern and not the dinosaurs or mammoths that came later. This is an essential question and must be discussed for the kids to really understand the geology of Ohio. Ordovician fossils are found here because erosion had eroded away all the rocks on top.

Explain that this erosion took place before the Ice Age, so remove the glacier picture. To illustrate how Ordovician rocks are exposed at camp, remove each picture down to the Ordovician sea. Finally add the glacier picture explaining that evidence of the Ice Age, like boulders carried by moving glaciers, are found at Camp Kern on top of Ordovician rocks. Rocks of the millions of years between have all been eroded away.

Place the example fossils in the middle of the table where the kids are sitting and explain that these are the types of fossils they will soon be finding in Fossil Ravine. How these creatures looked alive is represented by a large Ordovician sea picture. Chose a few kids one at a time to try to match a fossil you point to with its counterpart in the picture. Horn corals are not pictured.

Next, ask a few questions to sharpen their understanding of the fossils.
WERE THESE FOSSILS PLANTS OR ANIMALS?

Even though they look like plants, they were animals. Some, like the cephalopod, hunted by prowling the ocean floor. Others like horn corals simply stayed put and waved tentacles into the water to capture small animals.

POINT OUT THE COMPOUND EYE OF A TRILOBITE AND ASK WHAT THE PRESENCE OF AN EYE TELLS US ABOUT HOW DEEP THE ORDOVICIAN SEA WAS.

It must have been shallow because light filtered through or the trilobite would not need an eye. In deep oceans there is no light and eyes are of no use. The sunlight filtering through this ancient sea was the energy source necessary to support the vast amount of creatures that we find today in fossil rocks of the Ordovician sea.

FOSSIL MAKING

Fossils are formed by several methods. Many of the Ordovician fossils were formed when the animal died and sank into the mud of the sea floor. The hard parts of the animals, such as the shells of shellfish, decayed slowly and were replaced by minerals that hardened into the forms left by the decayed animal.

This process can be illustrated by using the fossils, clay, and plaster of paris provided for this purpose. Explain that a fossil pressed against the clay to form a mold represents the sea creature dying and sinking into the soft ocean bottom. The plaster of paris filled into the mold represents minerals replacing the hard parts of the animal.

Each student should choose a fossil from the tray and a lump of clay. The plaster should be mixed in the paper cup with the plastic knife and spread into the clay depression. The "fossils" can be obtained when they harden after the hike.
WALK THROUGH TIME

Explain to your kids that they are now going on a hike to a fossil ravine full of Ordovician Fossils and a beautiful point of land overlooking an immense gorge.

Follow the map to the bridge in Hickory Hog Woods. Point out the little gulley under the bridge and tell your kids to keep their eyes on it to notice any changes as they follow it. Turn left at the trail here and follow it to the tunnel under Route 350. Your kids will want to walk through the tunnel - you might want to walk over it! When the kids emerge to the other side they will suddenly find themselves back in time 450 million years! Explain that the limestone rocks were laid down as mud in the Ordovician Sea and were compressed into rocks.

The Fossil Ravine

Most of your time in the ravine will be spent looking for fossils. Here are some tips about finding fossils and seeing other interesting features in the ravine.

The best way to find fossils is to stay in one place that looks good for a while. Each child should carefully examine a certain area. Often, small whole fossil shells can be found on the banks in mud.

Keep everyone together in the ravine between you and the counselor who should be at the rear.

See if the kids can identify what they find when you show them pictures in this guide.

Point out the smaller ravines feeding into this ravine as you walk along. Little ravines lead to big ravines - big ravines lead to creeks, creeks lead to rivers, and rivers dump waters that might have rained down in Ohio into oceans hundreds of miles away.
You will cross a waterfall just after passing a side ravine on the right with a rope "handrail." Waterfalls, like this one and Niagara, are formed when a soft layer of rock meets a hard layer. Water flowing over the rocks erodes the soft layer faster than the hard layer and forms a ledge or waterfall.

Lock under the waterfall at the blue clay. Clay is eroded shale and shale is softer than the limestone on top. Look for mud slides where clay has slipped down the steep sides of the ravine. Indians came to ravines like this to gather clay for pots.

Ask your kids why fossils are found here and not at ELK Lodge. (water has not eroded down to bedrock fossils back at camp.) You are actually about 100 feet lower that ELK Lodge at the waterfall.

About 50 yards beyond the waterfall the ravine becomes choked with fallen trees. Work through this "tanglewoods" and continue on to the boulder on the left just before a small waterfall. This is a boulder carried here by a glacier thousands of years ago from the Canadian Rockies! Boulders carried by glaciers and deposited like this are called erratics. At this point head back up the ravine to the side ravine above the waterfall and follow the rope up to the top.

At the top of the hill turn left behind the cemetery and walk straight to the trail leading to the point of land high above the valleys surrounding it. On either side of this ridge are deep valleys but the distant valley directly in front of the point is the most awesome. Gather everyone together facing the distant valley and tell the spectacular story of how this gorge was formed by one of nature's most powerful forces, moving water.

1. Only about 30 thousand years ago, which is not a long time geologically, the gorge was not here. Instead, this ridge extended straight across to where the other side of the valley is today. The big valleys on either side of the point were not here either.
2. Then, about 20 thousand years ago the last glacier to invade Ohio stopped just a mile from here and dumped a huge mound of crushed rock, called a moraine, directly across the path of a river.

3. The river flowed around the moraine, and flooded by waters from the melting glacier, cut this immense gorge as its new channel. This is the Little Miami River. The valleys to the sides of the point were then formed by water flowing downhill to the new river. The valley to the left is Fossil Ravine.

Before you head back to camp emphasize to your kids that this point of land clearly shows how powerful moving water is in shaping the land. Change is happening all the time to land - in fact, scientists say we are still in the Ice Age. Although it could not happen for thousands of years, ice may once again invade Ohio grinding up everything in its path and forming new rivers!
Brachiopods lived on the ocean bottom like most other Ordovician animals. They were very abundant and their fossils are found today in almost any limestone rock in the ravine. Brachiopods attached themselves to the ocean floor with fleshy stalks that have not fossilized.

Brachiopods formed large colonies like the coral reefs of today's oceans. Each fossil is actually hundreds of tiny houses built on top of each other. The animals that lived inside captured microscopic lifeforms for food as water flowed through the tiny holes still visible in the "apartment house" fossils.

Bryozoans were animals that looked like "sea flowers". The fossils found today were part of the stem that was attached to the ocean floor. The "flower head" portion of this animal was fleshy and did not normally fossilize. It contained tentacles that waved in the currents capturing food. The cross-section of one crinoid "button" often reveals a beautiful star. Crinoids are related to starfish.

Crinoids were animals that looked like "sea flowers". The fossils found today were part of the stem that was attached to the ocean floor. The "flower head" portion of this animal was fleshy and did not normally fossilize. It contained tentacles that waved in the currents capturing food. The cross-section of one crinoid "button" often reveals a beautiful star. Crinoids are related to starfish.

Pelecypods were clams similar to the clams of today. They can be distinguished from brachiopods by the following method: if a line is drawn from the hinge to the top of the shell, the two sides will not be the exact same shape. Pelecypods are also usually more elongated than brachiopods. The most common fossil is an indentation in a rock known as a mold.
Horn Corals were attached to the ocean floor on the pointed end. A number of tentacles protruded out from the wide end. These tentacles waved in the currents to capture food. Horn Corals are now extinct but they are related to modern corals and sea anemones.

Cephalopod fossils were squid-like animals that were probably the largest and most common predators of the Ordovician sea. They had tentacles like a squid or octopus that protruded from their heads located at the wide end of the shell. By releasing compressed water from their chambered shells, cephalopods were capable of fast motion on the same principle as jet propulsion.

Gastropod fossils are snails. These snails closely resembled the snails of today. The land snails of today evolved from these aquatic snails who lived in an ocean 450 million years ago.

Trilobites are considered to be the great granddaddys of today's insects. They are not common in the ravine and make an exciting discovery when found. Trilobites were predators whose tracks are sometimes fossilized in shale. They patrolled the ocean floor and are often found as a fossil in a rolled-up position. Like the modern pill bugs they are related to.
THE ROCK CYCLE

(A Tool for Teaching Beginning Geology)

Rocks in their various forms provide a foundation for all life. The earth is composed of rock; soil from which our vegetation grows is largely rock material. The desks of wood and metal, the clear glass windows in our classrooms, the plastic which holds our eye glasses in place; the warmth and the artificial light in each room are traced without question to the natural resources contained within the earth's crust.

Man in his relatively few years on earth has changed much in his environment. But since the world itself was born constant change has been going on in a process geologists have come to call the rock cycle. A model of the processes and materials represents the continuous alterations rocks undergo as a result of the changes constantly occurring at and within the earth's surface. Deep crustal movements tend to raise segments of the crust on which we live; other forces strive incessantly to wear it away. Even a brief introduction of these processes and the associated earth materials in the early school years (if not before) makes the story of geology comprehensible and intriguing.

Thirteen rock specimens as shown on the rock cycle diagram should be assembled for each student. The teacher may wish to procure a sample set accurately identified by a geologist to get the project underway. Students may then collect their own sets in further preparation. The igneous and metamorphic rocks are available in stream beds and soils of regions which lie within the boundaries of glaciation. Sedimentary rocks are often in hillsides and ravines. Freshly broken specimens are advisable but during the process of breaking them, eyes must be shielded with protective glasses.

When the teacher and students are ready for the rock story the rocks are placed in sets on each desk. As the teacher presents the rock cycle with the materials and processes shown on the diagram, each specimen is described in detail, the students selecting the one which answers the description and placing it in its proper position on a rock cycle which he, himself, creates.

At the top of the cycle are the igneous rocks, one of the three great classes. The name means "fire rocks" and these were formed from a hot and fluid magma originating in the earth's interior. Minerals which form from the chemical composition of the magma crystallized slowly as the magma cooled below the surface. Here the crystals had time to grow in the confined magma chamber, and thus the rocks which they formed, classified by the amount and kind of mineral composition, are coarse-grained; the individual minerals are observable with the naked eye. Intruded, coarse-grained igneous rocks are granite and gabbro. Granite may be described as light in color and weight, composed primarily of glassy quartz grains and pink or light orthoclase feldspar which shows shiny faces; at times granite also contains a dash of dark hornblende or flakes of thin-faced mica.

Gabbro is a coarse-grained intrusive (cooled within) igneous rock which is heavier and contains another feldspar with shiny faces as well as several dark minerals rich in iron and magnesium. These make the specimen dark and the iron accounts for the heaviness.
In between granite and gabbro, which represent the lightest and darkest kinds of igneous rocks, are several others. These grade from light to dark in appearance as the mineral composition changes from a large percentage of quartz grains and orthoclase feldspar to the darker and heavier minerals. Diorite is a common rock in this intermediate zone.

Rhyolite and basalt are fine-grained equivalents of granite and gabbro. These rocks are extrusive, meaning that they have cooled rapidly at or close to the earth's surface as lava flowed from an opening in the crust. Obsidian, too, is a familiar volcanic rock forming on surfaces of lava flow where it cooled so rapidly that it is glassy. The crystals in these rocks cannot be distinguished with the naked eye.

The original igneous rocks which formed from the magma welling up from within the earth's crust have been exposed to a process known as weathering. The presence of water and differences in temperature on the earth's surface make changes in the rocks. Different minerals expand and contract at different rates. This causes the rock to crumble. Water seeps into cracks and when it freezes, the cracks widen. Water also dissolves certain minerals acting as a solvent when it enters into a chemical reaction. Thus in time, some fragments are broken off; others are dissolved, and some, like quartz minerals in granite, are carried away by rain and wind to streams and rivers which transport them from the mountain top to the sea. These broken-down materials are called sediments and result from the process of weathering and erosion.

Sedimentary rocks, the second major classification, formed when these sediments, carried by water or wind, are deposited at the base of mountains, on river flood plains, shores or on the sea floor where the waves drop the coarsest material. Sandstone, a sedimentary rock made up of grains of quartz, originates in masses of weathered granite. Sometimes it is loosely cemented, the fragments breaking off easily; frequently it is a hard rock, resistant to weathering. The grains of sand can be seen with the naked eye and the rock can be used to file one's fingernails. Shales form from mud particles of feldspar carried by suspension into the sea. The material is compacted on the sea floor in layers. When one breathes on shale, it smells like mud, a test children like to perform.

Limestone, often containing fossils, is a sedimentary rock composed largely of the mineral calcite carried in solution into the sea. If the body of water is warm and quiet and endures for a long period of time, animals use the dissolved calcite for their protective shells. Millions of these small organisms live and die and rain down upon the sea floor where they are compacted to form layers of limestone. Sometimes waters are so rich in calcite that the minerals precipitate to the bottom to add a crystalline mass to the deposit of shells. Under some circumstances, magnesium, derived from the original igneous rocks by replacement or concentration, change the limestone to dolomite. To demonstrate to students the chemicals contained in these rocks, drop a small drop of 10% diluted hydrochloric acid on them. A considerable effervescence indicates limestone; warm acid may be required to get a reaction on dolomite.

The normal cycle continues to the third major rock type called metamorphic or "rocks in changed form." These were formerly igneous, sedimentary, or other metamorphic rocks which have been altered because they were subjected to tremendous heat, pressure, recrystallization, and cementation. The changes occur when such
rocks are intruded by hot igneous masses along the line of contact or far below the earth's surface. As some of the rock mass cools again and recrystallizes, the minerals align themselves to form bands. Cementation as a metamorphic process changes sandstone and conglomerate to quartzite or metaconglomerate both of which are so densely cemented that the rock breaks across the original grains. Shale turns to slate by compaction and recrystallization, limestone to marble by recrystallization. The igneous rocks, as well as the sedimentary rocks are metamorphosed, changing to gneisses and schists depending on the mineral composition and the intensity of the metamorphic processes. Banding is produced forming gneiss if the bands are coarse, or schist if the banding is fine.

As noted in the cycle, all the rocks can break down from the same processes of weathering and erosion; so, as time goes on, any of them may become sediments and end up in the same way.

In theory and reputedly observable in the rocks, the sequence can continue to a remelting of rocks in the cycle to form a magma from which new rocks are crystallized, indistinguishable from the original igneous rocks. This seems to be in accord with the theory of plate tectonics which postulates that plates on the earth's crust plunge beneath the continental shelves, presumably granitized in the process.

Thus, the cycle is complete. The larger part of all the earth's materials are recycled and ready for the process to begin again.

By means of careful descriptions on the part of the teacher, many students from the fourth grade and up have successfully completed the "game" of making a rock cycle and placing the specimens in the correct place. The project is particularly intriguing for students who have completed a rock unit in the fourth grade or above.

(This material developed by Ruth Melvin of the Ohio Academy of Science.)
ANIMALS
On warm nights, almost every lawn, field, and pond's edge teem with active creatures: spiders, frogs, toads, mice, opossums, raccoons, moths, owls, and other nocturnal (night active) creatures. Because humans have relatively poor night vision, spotting and identifying animals after dark require special techniques. Night Eyes introduces youngsters to the technique of using *eye-shine* — the light reflected from the eyes of nocturnal creatures — to spot animals after dark.

Many night creatures have eyes that reflect certain colors of light. For example, a wolf spider's eyes reflect brilliant, tiny specks of white or greenish-white light, while a bull frog's eyes appear a bright, opalescent green. Certain moths' eyes shine orange at night. Most mammals and night-active birds also have eyes that reflect light: orange, yellow, or white, depending on the species.

With practice, youngsters can learn to tentatively identify many night animals on the basis of the color, size, and position of light spots that the animals' eyes reflect from a flashlight beam. In this activity, your youngsters spot eye-shine, and predict the identity of the source. They then stalk the creatures to confirm their predictions and to spy on the animals' activities.
CHALLENGE: INVESTIGATE MYSTERIOUS EYES IN THE NIGHT

MATERIALS

For the Night-Eyes Simulation:
For each team of two:
2 flashlights with fresh batteries

For the group:
1 15-cm length of reflective tape
1 red-orange crayon or red grading pencil
• black construction paper
1 pair of scissors
1 hole punch (optional)
1 6- to 8-meter piece of flagging or rope
1 data board
• carpet tacks or other dark-headed tacks

For the Mystery-Eyes Hunt:
For each team of two:
1 tablet or small data board
1 pencil or other marker
2 flashlights

PREPARATION

Night Eyes is most suitable for small groups. If you have more than twelve youngsters, you should form two equal groups, each with its own leader and site.

Selecting a site. Choose an open field or a large clearing that borders on a forest or pond for the Mystery-Eyes hunting site. In addition, select a smaller area (or one corner of the larger site) at which to set up the Night-Eyes Simulation. Avoid lighted areas and areas that could be dangerous after dark (e.g., areas with obstacles, steep grades).

Choosing a time. Schedule the activity to begin at least one hour after sunset. Wait for a warm night when many insects or other small animals are about.

Practicing the Mystery-Eyes Technique
At the site, hold a flashlight at eye level and sweep the beam slowly over the grass, bushes, and trees at various distances. Look closely for sharp points of light that might be reflected from animals' eyes. Eye-shine may be discernable across amazingly long distances. When you see small specks of green, white, or orange light, keep your flashlight beam on the source as you approach the specks to get a better look. Watch carefully. Larger animals will run or hide as you approach. However, you can often get a good look at spiders, moths, and some birds.

Setting up the Night-Eyes Simulation
1. Choose one or two code words that contain about twelve letters. "Wolf Spiders" (common sources of eye-shine in fields) is a possible choice.
2. Write a sentence containing the code word on the data board, but leave numbered blanks in place of the code-word's letters.
3. Cut "eyes" about one-half centimeter in diameter out of the reflective tape. You can also use a standard hole punch to cut out the circles. Cut one pair of eyes for each letter in your code word.

4. Cut 5 cm x 7 cm rectangles from black construction paper. On one side of each rectangle stick a pair of "eyes." On the other side of the cards, write one letter of the code word with a red-orange crayon or red grading pencil. Then number the cards in sequence. When placed in numerical order, the cards should spell out the code word.

5. Make a rope or flagging circle 2 to 2½ meters in diameter in the middle of the site.

6. Set the paper rectangles all around the circle at least five meters from its perimeter. Place the rectangles in a variety of locations: far in the distance, in the grass, on bushes, and on trees. Use tacks where necessary. Make sure that all the "eyes" are visible from the circle when a flashlight held at eye level shines on them.

ACTION

THE NIGHT-EYES SIMULATION

1. Stand with the youngsters in the circle. Tell them that they are going to play a night game in which they find animals by spotting their eyes. Show the kids the data board and tell them that they are going to fill in the missing letters by finding the "eyes" you have set out around the circle.

2. Give each of the youngsters a flashlight, and suggest that they work in pairs. Challenge them to spot a pair of eyes by shining the light around them. When they have spotted some eyes from the circle, show them how to hold the flashlight near their eyes to get the brightest, sharpest reflections.

3. As each team spots a pair of "eyes" from the circle, they should walk out carefully to collect them. Caution each team to keep one of the flashlights trained on the ground before them as they walk.

4. When a team returns to the circle with a night-eyes card, have them write the letter from the back of the card in the appropriate blank on the data board. The team may then retrieve another card. The group continues spotting and collecting "eyes" until they find all the letters.
Wolves, foxes, badgers, weasels, and many other mammals are scent trackers, i.e., they track their prey by following the prey’s scent. These animals have extremely sensitive senses of smell. Biologists have discovered that the sense of smell in wolves and other members of the dog family is at least a million times more sensitive than man’s. Trained bloodhounds can even distinguish between the odors of different people.
Humans and other animals leave their "odor signatures" everywhere they go. An animal's odor lingers on everything that the animal touches long after the animal has gone. In addition, urine and feces are concentrated sources of animal scents that convey information about the size, age, condition, and sex of the animal that deposits them. Skunks, goats, deer, house mice, and a few other mammals have specialized scent glands, which produce substances that allow these animals to mark their territories and defend themselves.

Animals use their senses of smell to locate food, track prey, find mates, sense approaching predators, and keep track of their young. In this activity, the kids assume the roles of deer and of wolves that track the deer by scent. The simulation is followed by a search for animal tracks and scents.

**MATERIALS**

For each team of four:
1. plastic sprayer (or "plant mister," available at hardware and grocery stores)
2. 20 strips of flagging
3. 1 small paper cup
4. 1 20-ml bottle of liquid flavoring extract
   (See the "Preparation" section.)

For the group:
1. bottle of yellow food coloring

**CHALLENGE: LOCATE YOUR PREY BY FOLLOWING ITS SCENT.**

**PREPARATION**

**Site.** Select an untrampled, snow-covered area about 50 to 100 meters on a side. A moderately wooded area works best. Try to locate a site that contains animal tracks and urine or feces deposits. You can also conduct this activity on a beach or in other areas that are covered with light-colored sand.

**Group size.** Scent Tracking works best with three to four teams of four kids. If you have more than sixteen participants, divide them into two equal groups, and use a different site for each group.

**Materials**

1. **Scents.** Use a different liquid flavoring extract (no oils, please!) for each team. Peppermint, anise, coconut, and almond are good choices. Pour half a bottle of extract and about 150 ml of water into a plastic sprayer. Then add enough yellow food coloring to make the solution bright yellow. (Use red food coloring for sandy sites.) Set the plastic sprayers to produce streams of liquid (as opposed to sprays).
2. **Flagging.** Cut or tear twenty cloth strips 40 to 50 cm long for each team. Use a different color for each team.
3. **Cups.** Fill a cup with snow for each team, and liberally spray each cup of snow with a different scent.
ACTION

1. Tell the kids that many animals have a much keener sense of smell than people have. As an example, you might mention that bloodhounds can track a person by following the odor that the person leaves behind on the ground and on other objects. Add that animals such as wolves, foxes, and weasels often track their prey by following the prey’s scent.

2. Inform the youngsters that some of them are going to pretend to be deer and the others are going to pretend to be wolves. The “wolves” are going to “sniff” the tracks of the “deer.”

3. Tell the kids that the deer will use scented water to represent the odor they leave on anything that they touch. Hold up a plastic sprayer and squirt a couple streams of scented water onto the snow near your feet to show the youngsters how to use the sprayer.

4. Divide the group into teams of four, and select one person from each team to be a deer.

5. Mark a starting line in the snow. Tell the deer that they will each make a scent trail by squirting a scent next to their tracks every ten paces. Add that since the deer live in a fairly small area, their tracks should cross each other’s several times. The deer should stick fairly close together and move in the same general direction. Each deer should end her trail in a concealed place (e.g., behind a tree or snow drift). Indicate the general limits of the site.

6. Give one plastic sprayer to each of the deer and challenge each of them to make a trail about twenty scent marks long. Turn the wolves around so that they can’t watch the prey, and send the deer off to make their scent trails. Give them ten minutes.

7. While the deer are making tracks, give each team of wolves one of the cups of scented snow. Although a keen-nosed predator can usually keep track of a particular odor when other odors are present, suggest that the “wolves” carry their prey’s scent with them to use as a reference.

8. Inform the wolves that each team will track a particular deer by following its scent. For example, the wolf pack with the peppermint-scented snow will track the deer that sprays peppermint. Each time the team finds their deer’s scent, they should mark the spot with a piece of flagging. (They can either lay the flag on the snow or tie it to a bush.) If a team comes to a scent spot left by another deer, the whole team must back-track to the last recognizable scent spot of their deer and find the trail’s continuation from there. The team must smell the scent spots without disturbing them; i.e., they should not pick up the scented snow to smell it. Emphasize that this is not a race! The team members must walk together to prevent the prey’s scent spots from being trampled.

9. After ten minutes (or after the prey are all concealed), challenge the wolves to find their deer by following its scent. Join a team and follow the scent!

10. When all of the teams have located their prey, have the youngsters retrace their steps, pick up their flags, and regroup at the starting line.
HOW MANY BEARS CAN LIVE IN THIS FOREST?

Objectives Students will be able to
1) define a major component of habitat; and
2) identify a limiting factor.

Method Students become "bears" to look for one or more components of habitat during this physically involving activity.

Background It is recommended that this activity be preceded by one or more activities on adaptation: basic survival needs; components of habitat; crowding; carrying capacity; habitat loss; habitat improvement; herbivores, carnivores, and omnivores; and limiting factors. See the cross references for suggestions. For additional information about black bears, see "Bearly Born."

In this activity, black bears are the focus in order to illustrate the importance of suitable habitat for wildlife. One or more components of habitat—food, water, shelter, and space in a suitable arrangement—are emphasized as one way to convey the concept of "limiting factors."

Black bear habitat limits black bear populations, especially through the influences of shelter, food supply, and the social tolerances or territoriality of the animal. Shelter or cover is a prime factor. Black bears need cover—for feeding, hiding, bedding, traveling, raising cubs, and for denning. With limits of space, adult bears will kill young bears or run them out of the area. These young bears must keep moving around either until they die or find an area vacated by the death of an adult.

When food supplies are reduced by factors such as climatic fluctuations, competition becomes more intense. Some adult bears might temporarily move to seldom-used areas of their home range, sometimes many miles away. They must live on what food is available in the area. These individuals may become thin and in poor condition for winter hibernation or, in the case of young bears, be forced from the area by more aggressive adults.

All components of habitat are important. Food, water, shelter, and space must not only be available—but must be available in an arrangement suitable to meet the animals' needs. For black bears, shelter is especially important.

All possible conditions are not covered by the design of the activity. However, by this simple illustration, it is possible for students quickly to grasp the essential nature of the concept of limiting factors.
The major purpose of this activity is for students to recognize the importance of suitable habitat, adequate food and/or shelter are two examples of what is called a limiting factor—something which affects the survival of an animal or a population of animals.

Materials

five colors of construction paper (two to three sheets of each color) or an equal amount of light poster board; one black felt pen: envelopes (one per student); pencils; one blindfold; five sheets green construction paper (for extension).

Procedure

1. Make up a set of 2" x 2" cards. For a classroom of 30 students, make 30 cards of each of five colors to represent food as follows:

   orange—nuts (acorns, pecans, walnuts, hickory nuts); mark five pieces N-20; mark 25 pieces N-10.

   blue—berries and fruit (blackberries, elderberries, raspberries, wild cherries); mark five pieces B-20; mark 25 pieces B-10.

   yellow—inserts (grub worms, larvae, ants, termites); mark five pieces Y-12; mark 25 pieces Y-6.

   red—meat (mice, rodents, peccaries, beaver, muskrats, young deer); mark five pieces R-8; mark 25 pieces R-4.

   green—plants (leaves, grasses, herbs); mark five pieces P-20; mark 25 pieces P-10.

The following estimates of total pounds of food for one bear in ten days are used for this activity:

   nuts — 20 pounds = 25%

   berries and fruit — 20 pounds = 25%

   insects — 12 pounds = 15%

   meat — 8 pounds = 10%

   plants — 20 pounds = 25%

   80 pounds = 100%

NOTE. These figures represent a typical bear's food. The components of an actual bear's diet will vary between areas, seasons, and years. For example, a bear in the state of Alaska would likely eat more meat (fish) and fewer nuts than a bear in Arizona. One similarity among black bears everywhere is that the majority of their diet is normally made up of vegetative material.

Keeping these figures in mind, make and distribute the appropriate number of food cards for your size group of students. There should be less than 80 pounds of food per student so that there is not actually enough food in the area for all the "bears" to survive.

If you want, you can also include "water" by making an additional 50 squares of light blue paper. Mark each stack of ten cards with one of these letters: R, L, ST, SP, and M (representing rivers, lakes, streams, springs, and marshes—all places where a bear could find water).

2. In a fairly large open area (eg., 50' x 50'), scatter the colored pieces of paper.

3. Have each student write his or her name on an envelope. This will represent the student's "den site" and should be left on the ground (perhaps anchored with a rock) at the starting line on the perimeter of the field area.

4. Have the students line up on the starting line, leaving their envelopes between their feet on the ground. Give them the following instructions: "You are now all black bears. All bears are not alike, just as you and I are not exactly alike. Among you is a young male bear who has not yet found his own territory. Last week he met up with a larger male bear in the big bear's territory, and before he could get away, he was hurt. He has a broken leg. (Assign one student as the crippled bear. He must hunt by hopping on one leg.) Another bear is a young female who investigated a porcupine too closely and was blinded by the quills. (Assign one student as the blind bear. She must hunt blindfolded.) The third special bear is a mother bear with two fairly small cubs. She must gather twice as much food as the other bears. (Assign one student as the mother bear.)"

5. Do not tell the students what the colors, initials, and numbers on pieces of paper represent. Tell them only that the pieces of paper represent various kinds of bear food; since bears are omnivores, they like a wide assortment of food, so they should gather different colored squares to represent a variety of food.

6. Students must walk into the "forest." Bears do not run down their food; they gather it. When students find a colored square, they should pick it up (one at a time) and return it to their "den" before picking up another colored square. (Bears would not actually return to their den to eat; they would eat food as they find it.)

7. When all the colored squares have been picked up, the food gathering is over. Have students pick up their den envelopes containing the food they gathered, and return to class.

8. Explain what the colors and numbers represent. Ask each student to add up the total number of pounds of food he or she gathered—whether it is nuts, meat, insects, berries, or plant materials. Each should write the total weight on the outside of his or her envelope.
9. Using a chalkboard, list "blind," "crippled," and "mother." Ask the blind bear how much food she got. Write the amount after the word "blind." Ask the crippled bear and the mother bear how much they got and record the information. Ask each of the other students to tell how much food they found, record each response on the chalkboard. Tell the students each bear needs 80 pounds to survive. Which bears survived? Is there enough to feed all the bears? How many pounds did the blind bear collect? Will she survive? What about the mother bear? Did she get twice the amount needed to survive? What will happen to her cubs? Will she feed her cubs first, or herself? Why? What would happen to her if she fed the cubs? What if she ate first? If the cubs die, can she have more cubs in the future, and perhaps richer years? (The mother bear will eat first and the cubs will get whatever, if any, is left. The mother must survive; she is the hope for a continued bear population. She can have more cubs in her life: only one needs to survive in order for the population to remain static.)

10. If you included the water squares, each student should have picked up at least one square representing a water source, or he or she does not survive. Water can be a limiting factor and is an essential component of habitat.

11. Ask each student to record how many pounds of each of the five categories of food he or she gathered. Ask each student next to convert these numbers into percentages of the total poundage of food each gathered. Provide the students with the background information about black bears so that they can compare their percentages with what are typical percentages eaten by black bears in Arizona. Ask each student to attempt to guess how healthy their bear would be. How do the bears' requirements for a diet seem to compare with the needs of humans for a balanced and nutritious diet?

12. Ask the students to arrive at a class total for all the pounds of food they gathered as bears. Divide the total by the 80 pounds needed by an individual bear (approximately) in order to survive in a ten day period. How many bears could the habitat support? Why then did only ___ bears survive when your class did this activity? Is that realistic? What percentage of the bears survived? What percentage would have survived if the food been evenly divided? In each case, what percentage would not survive? What limiting factors, cultural and natural, would be likely to actually influence the survival of individual bears and populations of bears in an area?

Extensions
1. Cut the paper or posterboard into 2" x 2" squares. For a class of 30 students, make 150 squares. Make five piles of 30 squares each. Mark each set of 30 cards with one of these letters: B, T, H, F. These represent B = bedding sites, T = travelways, D = dens, H = hiding cover, and F = feeding sites. For purposes of this activity, these are defined as follows:

   - **Bedding Sites**—Black bears are usually active in early morning and late evening, and bedded most of the rest of the day and night. Bedding sites are usually in areas of dense vegetation, steep topography, and/or large trees where the bears feel secure.
   - **Travelways**—Bears require corridors of cover (made up of thick vegetation and/or steep topography) to enable them to travel between areas of food, water, and shelter within their home range.
   - **Dens**—Black bears use dens as shelter for hibernation from November to April in each year. Bears have been found denning in hollow logs, caves, holes dug into hillsides, under buildings, and even in culvert pipes. Bears often prepare and may use more than one den, and may change dens during the winter because of disturbance or if the den leaks. Bears seldom re-use dens from one year to the next.
   - **Hiding Cover**—Black bears evolved as animals that escape danger from predators and other bears by hiding in thick cover.
   - **Feeding Sites**—Bears will often use areas with less cover than hiding areas or bedding sites for feeding. Feeding sites are, however, often found close to thick hiding cover to allow the bear to quickly escape danger if necessary.

   **Note:** This information is based on actual research data from a study in Arizona. These components of shelter may vary slightly in different parts of North America.

2. In a fairly large open area (e.g., 50' x 50'), scatter the colored pieces of paper.

3. Have the students line up along one side of the area. Tell them that they are to become "bears" for the purposes of this activity. Review the concept of habitat—that a bear would need shelter, food, water, and space in a suitable arrangement in order to survive. Do not tell the students what the letters on the squares of paper represent. Tell them only that they represent one element or component of bear habitat.
4. Direct the students to move as individual "bears" into the area. Each bear must pick up as many of the components of habitat as possible. Some competitive activity is acceptable as long as it is under control. Bears are territorial. Remember that if bears fight, which they seldom do, they can become injured and unable to successfully meet their needs for survival.  

5. When the students have picked up all of the squares of paper in the area, have them return to the classroom or be seated in any comfortable area. Ask the students to separate their squares of paper into piles according to the letter on each. Using a chalkboard or large pad for a visual reference, ask the students to guess what the letters on the green cards represent—giving them the clue that each is an element of cover or shelter for a black bear. What kinds of shelter would a bear need? What do these initials represent? Record how many bears got at least one of each kind of shelter. How many got only four kinds? Three? Two? How many got only one kind of shelter? For the purposes of this activity, only those bears with at least one of each kind of necessary shelter can survive through one year. Ask students what would happen if a bear has all types of shelter except a den? (The bear could live from April through October, but would not have a secure place to hibernate and might not survive the winter.) Ask the students what would happen if a bear did not have travelways? (Without travelways, home ranges become fragmented and bears are not able to reach needed food, water, or other shelter.) Suggesting that the students need one of each kind of shelter represents the importance of appropriate shelter as a necessary component of an animal's habitat. Shelter is a very important part of a bear's habitat. A bear needs shelter in which to search for food and water. Bears also need shelter for traveling through their home range; and shelter for bedding, hiding, and denning. In this activity, how many bears survived? What was a "limiting factor" for this population of bears? (Shelter.) What other things possibly could become limiting factors? (Water and space, or territory, are two examples.) Would food be a limiting factor for bears? (Yes, however bears are omnivores and can utilize many sources of food.)

6. Ask the students to summarize what they have learned about the importance of suitable habitat for bears' survival. How is this similar and different to the needs of other animals?

Evaluation

Define "limiting factor." Describe some of the factors which may limit the survival of an animal that lives in your area.
IN COLD BLOOD

This trail is an investigation of the cold-blooded animals. It will include a general overview of invertebrates and a closer examination of the cold-blooded vertebrates (fish, amphibians and reptiles).

OUTLINE

I. Introduction (15 minutes)

II. Oregonian Safari - "Bring 'Em Back Alive!" (25 minutes)

III. Vertebrates - A closer look at some captive critters (20 min.)

IV. In Search Of: Cold Blooded Critters (Hike) (1 hour)

Materials needed: Word cards (hibernation/vertebrate/cold-blooded), Picture/info cards (Warm-blooded Vertebrates, Cold-blooded Vertebrates, Arthropods, Insects, Arachnids, Crustaceans, Millipedes, Centipedes, Fish, Amphibians, Salamanders, Frogs, Toads, Reptiles, Snakes, Turtles, Lizards), Cold-Blooded Keys, Collecting bottles, Magnifiers, Large plastic container, Captive animals, Booklets: Ohio's Reptiles, Ohio's Amphibians, Extra Invertebrate Pictures (Mite, Slug, Leech, etc.)

Trail Concept and Text by Gary Saxton, 1987
I. INTRODUCTION (15 Minutes)

Begin the trail by drawing information from the students with the following questions:

What does cold-blooded mean?
What does vertebrate mean?
What does hibernation mean?

Use the word cards to discuss these terms as well as the information on the back of the picture cards ("Warm-blooded Vertebrates" & "Cold-blooded Vertebrates"). After you feel confident the group understands these terms, introduce the "Oregonian Safari".

II. OREGONIAN SAFARI - "BRING 'EM BACK ALIVE!" (25 Minutes)

Explain to the group that they are going on a safari to bring back some "wild animals". The animals they will encounter will almost certainly be invertebrates, and should be handled with care. Give each student a collecting bottle.

Take your group outside and gather somewhere near the woodpile area. Describe the boundaries within which they may search for critters. They each need to return to the meeting area with one critter, alive and unharmed in their bottle. When everyone has something (hopefully a variety), return to the inside meeting area. With your group sitting at tables, give each person a "Cold-blooded Key" and go through how to use it. You might want to refresh them on such terms as "invertebrate", "segmented", "antennae", etc.

Spread the magnifiers out on the tables. Tell them they each must find out, by using the keys, which group their critter belongs to. As they come to their decisions, check in with them to see if they understood the process and came to the proper conclusion. If they did not, backtrack and help them understand where they erred.
Make sure all the critters are safely released where they were found and all the bottles and magnifiers emptied and ready for the next group. You might want to take a minute to review information on Invertebrates using the picture cards/info on "Invertebrates", "Arthropods", "Insects", "Arachnids", "Crustaceans", "Millepeds" & "Centipedes". There is more information on the back of the cards than you need to discuss with the students. When you feel they have gained a basic grasp of the different types of invertebrates, it is time to move on to the world of vertebrates.

III. VERTEBRATES - A CLOSER LOOK AT SOME CAPTIVE ANIMALS

Gather your group together to discuss the three classes of cold-blooded vertebrates: Fish, Amphibians, and Reptiles. Again, there is more information on the backs of the cards ("Fish", "Amphibians", "Frogs", "Toads", "Salamanders", "Reptiles", "Turtles", "Lizards" and "Snakes") than you need to cover with the students.

Depending on what captive animals are on hand, use the cards and/or the animals to discuss the different characteristics of these groups. Most likely there will be a captive snake. There is hardly a more effective way of getting the students attention and teaching them about snakes (or turtles, etc.) than in handling one as you talk. You may let them touch the animals but, except for turtles, do not let them handle them by themselves.
IV. IN SEARCH OF: COLD-BLOODED CRITTERS
(Hike – one hour)

It is recommended that you take your group
to a ravine to search for critters underneath
rocks, etc. If the van is available, use it to
drive to the Staff Cabin area and hike the
ravine next to it. (Or if the Trail of Time is
not being offered, to the cemetery and hike that
ravine). If no van is available, allow enough
time to hike to one of the ravines. If you find
that time will not allow this, hike through a
wooded area and encourage the students to ex-
perience the forest floor (under logs, leaves,
rocks, etc.) for critters.

Bring along a plastic container for any
critter you might want to hold temporarily or
bring back.

Things you might look for or discuss on the
hike:

(1) Why do animals live under rocks?
(To avoid predators and shelter
themselves from the weather).
(2) How do insects survive the winter?
(Adults generally die off, but
leave eggs or pupa in sheltered
spots for next spring.)
(3) Look for: leaf-miners, goldenrod
galls, crayfish mounds, tent
caterpillars, spider webs, mite
galls (on maple leaves), etc.
(4) Why are salamanders common under
rocks in the ravine? (They
are nocturnal and also need wet
areas to lay their eggs).

Gather the group together (either on the
trail or back at Elk Lodge) to wrap things up.
You might want to review with them what cold-
bloodedness means, what the three groups of
cold-blooded vertebrates are, etc.
The following pages include some natural history information on cold-blooded animals. (It is the same information as is on the backs of the picture cards). This information is intended to give you background knowledge so you can better answer questions and be more spontaneous in your discussion-leading. Pick out what you feel is worth telling the kids - but do not attempt to cover it all.

WARM-BLOODED VERTEBRATES

★ There are two groups (classes) of warm-blooded animals. Being warm-blooded means being able to maintain a constant body temperature. This is a great advantage for staying active and coping with cold weather, but requires a lot of energy input (food).

★ All mammals have fur and nurse their young on milk. Almost all give birth to live young (a few primitive types lay eggs). We are mammals. Mammals evolved from reptiles about 200 million years ago.

★ Birds can be identified by their feathers. Almost all birds can fly, but some primitive types do not. Birds evolved from reptiles, and many scientists believe they evolved from a type of dinosaur, about 140 million years ago.

COLD-BLOODED VERTEBRATES

★ There are three groups (Classes) of cold-blooded vertebrates: fish, amphibians, and reptiles.

★ Cold-blooded does not mean that the animals' blood is always cold. It refers to the fact that the animals' body temperature is not constant, but changes with the temperature of the air.

★ Animals that are "cold-blooded" are generally less-active than warm-blooded ones, and require much less food to fuel their bodies.

FISH

★ Fish are the most ancient form of vertebrates, first appearing about 500 million years ago.

★ All other forms of vertebrates are descendant from fish. (Amphibians evolved from fish, reptiles from amphibians, and birds and mammals both evolved from reptiles.)

★ Fish breathe with gills, obtaining their oxygen from the water. They move by using their fins. (A few fish can also breathe via lungs and are capable of crawling on land using strong fins.)

★ Most fish have a bony skeleton, but some primitive types (such as sharks) have a cartilaginous skeleton.
AMPHIBIANS

*Amphibians evolved from fish about 350 million years ago. The term *amphibian* comes from the Greek *amphi* = two, and *bios* = life. Most amphibians live part of their life in the water and part of it on land.

*Legs and lungs allowed amphibians to become the first vertebrates to invade land. However, they retained the habit of laying their eggs in water, and it would not be until the appearance of the reptiles that true freedom from the water would be won.

*Unlike reptiles, amphibians do not have scales or claws on their toes. They must lay their eggs in water.

*Most amphibians are nocturnal (active at night) and secretive, and hence are seldom seen.

*The three most common types of amphibians are: salamanders, frogs, and toads.

SALAMANDERS

*Salamanders are like the other Amphibians in needing to lay their eggs in water.

*They differ from the frogs and toads in the following ways:

1. They have 4 digits (not 5) on their front legs.
2. They retain their tail all their life.
3. They are voiceless and shy. (Being secretive and nocturnal, they are seldom seen.
4. Some adults breathe without lungs (through their skin).

TOADS

*Toads differ from frogs in having a dry, warty skin. They are more terrestrial than frogs and have hind legs less well developed.

*Toads have a bump behind each eye (the parotoid gland) which secretes a toxic liquid when it is disturbed.

*Although they can stay away from water without their skin drying up (as would happen to frogs and salamanders), they are like all amphibians and must lay their eggs in water.

*Toads, like frogs, begin life as tadpoles, but eventually lose their gills and tail, develop legs and lungs and move to land. They are also like frogs in having 5 digits on each leg.

*Toads do not cause warts, but will secrete a liquid harmless to people.

FROGS

*Frogs, like all amphibians are capable of living out of water, but must lay their eggs in water.

*Frogs have a smooth, moist skin, and are more aquatic than toads. They also have stronger hind legs and can leap better than toads.

*Frogs are like toads in that they begin life as gill-breathing tadpoles and eventually lose their tail, grow legs and become lung-breathers. Another similarity is that they have 5 digits on all legs. (This is different than salamanders who normally have 4 digits on their front legs and 5 on the back legs.)
REPTILES

*Reptiles evolved from Amphibians about 300 million years ago. Two main factors have allowed reptiles to invade the land as amphibians were not able to:
  (1) reptiles have scales covering their body which helps prevent water-loss, and
  (2) reptiles lay eggs with hard shells which can be laid on land without drying out as amphibian eggs would.

*Reptiles were the dominant form of animal life on earth for nearly 200 million years. Whatever wiped out the dinosaurs about 65 million years ago allowed the birds and mammals to flourish and become the dominant animals today.

*Examples of reptiles include: snakes, lizards, turtles, crocodiles, etc.

LIZARDS

*Lizards are very closely related to snakes, in fact scientists place them in the same Order within the Class Reptilia.

*It is usually safe to say snakes do not have legs and lizards do, but this is not always true. Some lizards do not have legs.

*Lizards can be distinguished from snakes by the following factors:
  (1) Lizards have fused jaws, snakes can separate theirs.
  (2) Lizards have movable eyelids, and can blink.
  (3) Lizards have external ear holes, snakes do not.
  (4) Lizards usually do not have forked tongues.

*The only lizard likely to be seen around Camp Kern is the Five-Lined Skink. This lizard has a blue tail when young which serves as a defense mechanism. A predator will often grab the tail, which will then break off and the skink goes free, and will later grow another tail.

SNakes

*Snakes are closely related to lizards. Two factors which distinguish snakes from lizards: snakes can separate their jaws, and do not have movable eyelids. (Note: usually lizards have legs, but some are like snakes and do not.)

*Snakes do not have legs, but some primitive snakes (like boas and pythons) retain vestiges of hind legs.

*Separating the jaws allows snakes to swallow prey larger than themselves.

*The tongue is deeply forked and used to pick up scents from the air.

*Snakes have powerful gastric juices which allow them to digest bones, teeth, egg shells, etc.

*Snakes are predators and kill in one of three ways: biting/swallowing, constriction, or venom.

*Some snakes lay eggs, some give live birth. None build nests.

*Ohio has three poisonous snakes: Timber rattler, Eastern Massusauga, and Northern Copperhead. None of these live in Warren County.
**TURTLES**
*Turtles, like all reptiles, have scales, breathe with lungs, and have eggs that are hard-shelled and hence can be laid on land. It might be considered ironic that many turtles, freed from the bonds of the water by their shelled eggs, have reverted to a largely aquatic lifestyle.*

*Turtles are more closely related to crocodiles than to snakes and lizards.*

*Turtles have a firm shell covering their body. The upper part is called the carapace and the lower part is called the plastron.*

*Turtles hibernate in northern climates (including Ohio), but will not in warmer lands.*

*Some of the turtles that might possibly be seen around Camp Kern include the Snapping Turtle, the Box Turtle, the Painted Turtle, and the Eastern Spiny Soft Shell Turtle.*

**ARTHROPODS**
*Arthropods are the most numerous and widespread group (Phylum) of animals in the world. About 90% of all animals are Arthropods.*

*Arthropods are characterized by an external skeleton and paired and jointed limbs.*

*Arthropods are comprised of 3 main groups: the Insects, the Arachnids, and the Crustaceans. (Other minor groups include the Millipedes and Centipedes).*

*The exoskeleton of the Arthropods helped allow them to survive on land (it prevents water loss), but it has also limited their size. The exoskeleton is shed periodically.*

*The first true Arthropods were Trilobites, which lived from 600-300 million years ago, and have left fossils right here at Camp Kern.*

**CENTIPEDES**
*Centipedes are unlike Millipedes in being active and predaceous. They have fangs and a poisonous bite. They prey on insects, slugs, earthworms, and even other centipedes.*

*Another difference from Millipedes is the fact that Centipedes have only one pair of legs per body segment, and their legs protrude to the side of their body.*

*One Central American species of Centipede is 10.5" long and eats lizards, mice and large insects.*

*Centipedes are nocturnal and usually hide during the day in damp places.*

*Although the name means "Hundred-legs", they actually have about 40.*
MILLIPEDES

Millipedes have a long, segmented, worm-like body.

Millipedes can be distinguished from Centipedes by the fact that, except for the first four, all of their body segments have two pair of legs which are directly beneath their body. (Centipedes have one pair per segment, protruding from the side of their body.)

When disturbed they will coil in a spiral and often secrete an odor from their stink glands.

All Millipedes are vegetarians, feeding mainly on decaying plant material. They live among leaf litter, under logs, in the soil, etc.

Although their name means 'Thousand-legs', they actually have 200 or less.

INSECTS

Insects are the most numerous group (Class) of Animals in the world. Over half of all the world's animals are Insects. The most numerous of the Insects are the Beetles.

Insects can be identified by their 6 legs, 3 body parts, 2 antennae, and (usually) 4 wings.

Insects live in all parts of the world, except the sea.

Many insects go through a dramatic metamorphosis.

ARACHNIDS

Arachnids can be distinguished from the Insects by their 8 legs, no wings or antennae, two body parts (sometimes fused), and no compound eyes.

Examples of Arachnids include: Spiders, Scorpions, Ticks, Mites, and Daddy-long-legs.

All spiders are predaceous and poisonous (though only rarely to man).

Daddy-long-legs (also called Harvestmen) are not true spiders and can be distinguished by their fused body. (True spiders have two distinct body parts.)

CRUSTACEANS

Crustaceans like all other Arthropods have a segmented body, an exoskeleton, paired and jointed limbs, but unlike Insects and Arachnids have two pair of antennae. Also, their number of legs varies, often totalling 10 or more.

Examples of Crustaceans include: crayfish, lobsters, crabs, shrimp, pillbugs, etc.
COLD-BLOODED KEY

1. **ANIMALS**
   b. Does not have backbone. **INVERTEBRATE**, go to 3.

2. **VERTEBRATES**
   a. Has scales, fins, no legs, lives in water. **FISH**.
   b. Moist skin, adults have legs, no scales. **AMPHIBIANS**.
   c. Scales, claws, eggs with hard shells. **REPTILES**.

3. **INVERTEBRATES**
   a. Adult has no legs. **go to 4**.
   b. Adult has jointed legs. **ARTHROPOD**, go to 5.

4. a. Soft-bodied, segmented. **ANNELID** (worms, leeches, etc.)
    b. Soft-bodied but usually covered by shell. **MOLLUSC** (snail, slug, etc.)
    c. Not Annelid or Mollusc. **STRANGE CRITTER.!!**

5. **ARTHROPODS**
   a. Adult has 6 legs and 3 body parts. **INSECT** (ant, beetle, etc.)
   b. Adult has 8 legs, no wings, no antennae. **ARACHNID** (spiders, daddy-long legs, ticks, mites).
   c. Adult has 4 antennae, usually aquatic, often 10 or more legs. **CRUSTACEAN** (crayfish, pillbugs, etc.)
   d. Adult has many legs, two per segment, beneath body. **MILLIPEDE**.
   e. Adult has many legs, one per segment, on side of body. **CENTIPEDE**.
Salamander Migration

Birds are not the only animals that migrate. During the early spring, even the secretive, hard-to-find salamanders migrate short distances from their wintering places to shallow temporary ponds, where they breed and lay their eggs.

Many species of salamanders, especially those known as mole salamanders, spend most of their lives underground, where they feed on worms and other invertebrates. Only in spring do they desert their holes to migrate above ground.

Salamanders migrate only on warm rainy nights. They are amphibians and must keep their skin moist.

Salamanders spend only a week or two in their breeding pools. The eggs hatch two or three weeks after they are laid, depending on the species. The larvae look like frog tadpoles.
SPOTTING MAMMALS

The best way to find mammals is to set up a blind on a known mammal trail and wait for them to come to you.

You can make a blind from an old tent, camouflaged with brush and branches. Or simply pick a spot with good cover.

The important thing is to locate a well-used mammal trail. Look for droppings, a worn path through the grass, or footprints. Dawn and dusk are the best times to watch. Get to the blind early, and be prepared to wait. Mammal watching requires patience.
Early spring is a good time to watch for muskrats. Look for them on top of their lodges and on logs in the water. Sometimes in spring muskrats migrate from one area to another, so you may see them on roadsides and in fields, too.

Muskrats eat aquatic plants and sometimes freshwater shellfish.

Muskrats mate in April or May. The young are born one month later. Usually, there are seven to eight in a litter. After two or three weeks, they can swim and dive.

Muskrat houses are built from heaps of mud and aquatic vegetation. On the inside, they are hollowed-out above the water line. The entrance is underwater.
**THE GRAY TREE FROG**

Eggs are laid singly on aquatic plant stems in May or June. Tadpoles usually leave the ponds about seven weeks later.

The gray tree frog is one of the most beautiful frogs in the Northeast. Its grayish body is splotted with dark starlike patterns, and its legs are marked with dark stripes.

Young gray tree frogs spend much of their early life on the ground, in grassy areas. They are bright green in color.

Gray tree frogs can change color to match their surroundings, so the gray may vary from green to brown or light gray. They are very common, but very secretive. Watch for them on tree branches and shrubs from late May to September.

**CALL**

Listen for the call of the gray tree frog on sultry days in early summer. The call is a resonant trill that lasts two or three seconds. It sounds more like a bird call.
I. INTRODUCTION/ADAPTATIONS

All animals have basic needs which are used to survive. The various structures and behaviors used to meet these needs are called adaptations.

Start out the trail by asking "What are some of the things animals must do to survive?" They must be able to obtain food (water and air included), avoid predators, find shelter or avoid cold, and reproduce.

Now hold up the adaptation picture cards (found in trail bag) one at a time and read the questions on the back of each. Each card also contains information that will help the students better understand the way animals use their own specific adaptations to obtain their basic needs. Be sure to save the picture of man for last.

II. THE SPIDER WEB

The relationship between the predator and it's prey is an important concept, in that it demonstrates one of the basic patterns of survival in the wild. Animals are constantly being hunted and consumed. A good way to see the relationship between a predator and it's prey is through the use of the "spider web" which is located on the northwest side of Elk Lake.

Most people know that a spider uses it's web as a strategy to catch it's prey. However, the question often arises, "How are they able to do this without being caught in their own web?" At the web, point to the strands that radiate back toward the web's center. These are the strands that the spider walks on and they are made of non-sticky material. Only the circular strands are sticky. Now we can see how the spider may walk on it's web and not get itself stuck.
Female spiders, who are the bosses of the spider world, eat and respin their web almost every day in order to repair damage. When they spin webs they are sure to make the radial set of strands non-sticky. Male spiders hang around for breeding purposes and usually subsist on "leftovers" the female leaves.

To use the web, choose one student to be the spider and have him/her stand blindfolded (this simulates the spiders reliance on the sense of touch) in the center circle of the web. The other students circle the outside of the web without touching it. Point to one student to be the prey, a juicy grasshopper. He/she must pluck the ray strand nearest to where they are standing. The spider now feels all the ray strands in the center to locate the prey. Once the spider has chosen the ray they feel the prey is on, they simply follow beneath the web to the prey.

If the correct ray was chosen the spider paralyzes the grasshopper's hand with two fingers (these simulate a real spider's jaws). The spider now finds the victim's neck with their fingers and slurps out the juices, just as a real spider would do. Have several students take turns playing a spider.

III. BAT/MOTH (OPTIONAL)

Another predator/prey game is Bat/Moth. To play, have the students stand in a circle that has a diameter of about 15 feet. Choose one student to be the "bat" and have him/her stand in the center of the circle with a blindfold on. Choose another student to be the "moth". The "bat" person calls out the word "bat", and the moth immediately answers back with the word "moth". The bat person listens for the call and must simply try to tag the moth to get a tasty meal. The moth must remain within the circle.

This calling out and answering helps to show how bats uses an adaptation called echolocation. Bats send out a high frequency sound that hits the prey insect and then bounces back to the bat. This sound tells the bat where the prey is located.
THE CARCASS

Located on the southeast side of Elk Lake, within Sugar Woods (look for the marker), a carcass of a wild animal. At the carcass, the students, "What happens to an animal when it dies?" Many forms of life help decompose dead animals like the one found in Sugar Woods.

Decomposition is the process whereby organic matter is broken down and returned to the soil as usable nutrients. This carcass is being broken down and its stored nutrients are being returned to the soil where they are needed.

The decomposition process is usually started by scavengers, such as vultures, owls and many insects, but ultimately, it is bacteria that finish the job of returning the animal to the soil. These stored nutrients can once again be used by green plants. Green plants, in turn, are food for many animals. You can see how the cycle of life materials would be complete once an animal has eaten a green plant and then dies. Decomposition is the renewal of life!
V. THE LAKE
A. WATER TESTING (OPTIONAL)

If desired, the students can perform some simple scientific tests that show the physical factors that can affect the animals that live in Elk Lake. To do this, divide the students into four groups and give each group one of the test cards and any testing equipment they need. All the necessary materials they will use for the tests can be found with the trail sack. Each card will also explain what materials (if any) are needed, how to do the test, and how that factor effects the animals that live in the lake. The students may need some supervision during the testing period. It might prove helpful to go over the tests before each group begins. Give the students about five minutes to do their test. Then call everyone together to give their results and explain to the group how their factor effects the animals in the lake.

Tests will include:
1. Water Clarity
2. Temperature
3. Amount of plants present
4. PH

Make sure to point out to the students the lake is a fragile system and that they should not disturb anything any more than necessary.
Each student will now have a chance to search the lake for the many creatures that live there. Divide your group into teams of 2 or 3 students each and give each team one of the Critter Charts found in the trail sack. Explain that you are going to have a critter collecting contest. The team that can collect and correctly categorize the most critters will win. Each category is worth one point and there are seven points possible. In the event of a tie, the team with the most species (kinds) will be the winner.

Before you begin the contest you may want to spend a few minutes going over the seven categories of animals. Then give the teams 20 minutes or so before gathering everyone together in order to congratulate the winners and check the results. BE SURE TO RETURN ALL CRITTERS BACK TO ELK LAKE WHEN THROUGH.

Each group should have:
1. a magnifying lens
2. 1 strainer per student
3. 1 collecting pan
4. 1 Critter Chart
5. 1 grease pencil
6. 1 pond guide (optional)
VI. THE WEB OF LIFE

In each community, plants and animals are dependent upon one another for survival. This relationship of organisms dependent upon other organisms for survival is termed interdependence. As the students will see this need goes far beyond simply obtaining food.

A good way of seeing interdependence in a lake community is by making the Web of Life. To do this, start by giving each student one of the web of life cards found in the trail sack. Sit in a circle and have each student tell a little about the plant or animal that they will now represent. Information about each organism is on the back of the card.

Explain that plants and animals in the lake provide needs to each other, other than food. For example, plants can provide a place to hide from predators or can be used in building shelters. Green plants also provide oxygen that animals use. Listed below are some other examples.

<table>
<thead>
<tr>
<th>Animal/plant</th>
<th>Need</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>bass</td>
<td>dragonfly</td>
<td>food</td>
</tr>
<tr>
<td>bass</td>
<td>pondweed</td>
<td>hide from osprey</td>
</tr>
<tr>
<td>snake</td>
<td>frog</td>
<td>food</td>
</tr>
<tr>
<td>red-winged blackbird</td>
<td>cattail</td>
<td>shelter (nest material)</td>
</tr>
<tr>
<td>pondweed</td>
<td>bass</td>
<td>CO2 (Air)</td>
</tr>
<tr>
<td>bacteria</td>
<td>dead frog</td>
<td>food (decompose)</td>
</tr>
</tbody>
</table>

Tell the students that they will be showing in their circle exactly what happens in the lake community. Now hand the ball of string in the trail bag to one of the students and tell him/her to hold onto the end of the string with one hand and the rest of the ball with the other. Explain that each of them should pass the ball of string to another plant or animal in the circle that can provide them with one of their needs to survive (make sure they give a good reason).
They should try each time to pass the ball to a plant or animal that has not yet had the string passed to them. Each person should always hold onto the string in one hand and pass the ball with their other. If a student has trouble passing the string be sure to give suggestions. The passing of the string is helping to show how organisms are closely related.

Once everyone has had their turn show the students what might occur if a group of organisms in the lake was suddenly removed. Tell them you are going to add a chemical to the lake which will kill all the bass. Have the bass die by having that student drop the string. Anyone who is holding onto the string that the bass is connected to is effected and must also drop their string. This will continue until everyone has dropped their string. In this way the students can see how each organism is dependent on other organisms to survive.

VII. WILDLIFE SIGNS (Optional)

It is not always easy to see all the animals that inhabit Camp Kern because many are good hiders or only come out at night. A good wildlife detective, however, can always find "clues" that show that these animals are still around. In between each of the planned activities you can have the students be detectives by searching for different signs of wildlife.

Some examples are listed below:

1. Wildlife tracks—look in muddy areas.
2. Body parts—skeletons, feathers, fur, snake skins.
3. Homes—nests, holes, galls, burrows.
5. Scot—Name given to animal droppings.
7. Leftovers—half eaten seeds, cut grasses, removed bark, chewed stems.
CONCLUSION

Hopefully during the Kern Critters Trail your students were able to see how, in a variety of ways, animals meet their basic needs for survival in the natural world.

If there is time left, spend a few minutes reviewing some of the concepts covered during the trail such as: adaptation, decomposition, predator/prey relationships and the basic needs of organisms.
I. SURFACE LIFE
A. 1. Standing emergent aquatics. Cat-tail (Typha)
B. 2. Rooted aquatics with floating leaves. Water lily (Castalia)
C. 3. Animals which walk on the surface. Water Striders (Gerris)
D. 4. Animals which lie on the surface. Whirl-i-gig Beetles (Gyrinus)
E. Animals which live below and get oxygen from the surface
5. Beetle larva
6. Back swimmers (Notonecta)
7. Water Boatman (Corixa)
8. Mosquito larva (Culex)
9. Giant Water Bug (Benacus)
10. Diving Beetle (Dytiscus)

II. SUBMERGED VEGETATION
A. Animals which breathe through gills on the thorax
11. Mayfly (Ephemerida)
12. Stonefly (Plecoptera)
B. 13. Animals which breathe with 3 caudal gill plates. Damselfly (Odonata)
C. 14. Animals which breathe with internal anal chamber. Dragon Fly. (Odonata)

III. LIFE ON THE BOTTOM
A. 15. Crayfish (a Crustacean - Decapoda)
B. 16. Mollusc
C. 17. Caddis Fly (Limnophilus)
Shown above is a diagrammatic sketch of an aquatic food chain. This sketch is by no means complete, for it would be impossible to show the intricacies of a natural balance in an aquatic habitat by a simple sketch. The chain may be fairly complete, or have several links missing. For instance, a diatom may be eaten by a protozoon, which in turn may be devoured by a crustacean. The crustacean may then be eaten by an insect, the insect by a bluegill, and the bluegill by a bass. On the other hand a sucker may eat plants directly, omitting the other steps. In any case, a "balance" between prey and predator, or food and consumer, is sure to exist in a healthy aquatic habitat. The saying that "a chain is no stronger than its weakest link" applies to food chains as well. If one link is weakened, succeeding links will also suffer. If a pond lacks the fertility necessary to support large numbers of microscopic plants, the numbers of protozoans, worms, crustaceans, amphibians, and fish will be correspondingly reduced.

The food chain must also be considered in control of water pollution. Although a pollutant may not be present in sufficient concentration to affect fish directly, there may be enough present to be toxic to crustaceans, larval insects, or other links in the food chain. This may enable fish like suckers or carp, which have a less complex food chain, to be more successful than game fish, and to crowd them out.

People who do not understand the principles of food chains and natural balance are apt to be puzzled by the things which happen in a pond or stream. They can't understand why small fish returned to an overcrowded, infertile pond to "grow up" never get any larger, or why this same pond, frequently stocked with small bass, never produces any large bass. These people can't see why a pond, uncared-for and covered with green "scum," produces more fish than their own nice, clean, clear ponds.

A better concept of the things which go on under water and of the principles which control them helps us to understand these and other problems. We must learn to consider every body of water as an aquatic "pasture"
STONEFLY ADULT

STONEFLY NYMPH

UNDERSIDE OF A STONEFLY NYMPH, SHOWING GILLS ON THE THORAX AND FIRST TWO ABDOMINAL SEGMENTS.

DORSOFLY (ADULT STAGE OF HELLCRAGHnite)

ELLICRAGHnite LARVA

ALDIFLY ADULT

ALDIFLY LARVA

CADDISFLY ADULT

CADDISFLY LARVA

SOME CADDISFLY CASES
<table>
<thead>
<tr>
<th>Opossum</th>
<th>Muskrat</th>
<th>Cat</th>
<th>Crow</th>
<th>Turtle</th>
<th>Frog</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Opossum Tracks" /></td>
<td><img src="image2" alt="Muskrat Tracks" /></td>
<td><img src="image3" alt="Cat Tracks" /></td>
<td><img src="image4" alt="Crow Tracks" /></td>
<td><img src="image5" alt="Turtle Tracks" /></td>
<td><img src="image6" alt="Frog Tracks" /></td>
</tr>
<tr>
<td>Fore Paw</td>
<td>Fore Paw</td>
<td>Fore Paw</td>
<td>Fore Foot</td>
<td>Hind Foot (15 shorter)</td>
<td>9. Front Foot</td>
</tr>
<tr>
<td><img src="image7" alt="Chimp Tracks" /></td>
<td><img src="image8" alt="White Tailed Deer Tracks" /></td>
<td><img src="image9" alt="Raccoon Tracks" /></td>
<td><img src="image10" alt="Pigeon Tracks" /></td>
<td><img src="image11" alt="Skunk Tracks" /></td>
<td><img src="image12" alt="Red Fox Tracks" /></td>
</tr>
<tr>
<td>Fore Paw</td>
<td>Fore Paw</td>
<td>Fore Paw</td>
<td>Right Foot</td>
<td>Fore</td>
<td>Fore Paw</td>
</tr>
<tr>
<td>Hind Paw</td>
<td>Hind Paw</td>
<td>Hind Paw</td>
<td>Hind Foot (3&quot;)</td>
<td>Hind</td>
<td>Hind Paw</td>
</tr>
</tbody>
</table>
HAVE YOU SEEN AN ANIMAL IN ITS NATURAL HABITAT LATELY?

1. Walk through the woods or field or by a stream, or sit quietly in one location. Find at least three animals that you can identify by name. What animals did you see? (List below.)

2. Look up pictures of these animals to share with members of your group. Describe some interesting habits of this animal that you observed.

3. From research about one of these animals, report on:

   Name of animal ________________________________

   Descriptive name of its home ________________________________

   Describe its habitat:
   - Sunlight available ________________________________
   - Slope of land ________________________________ Water available ________________________________
   - Type of food(s) it eats ________________________________
   - Type of ground cover in habitat ________________________________
   - Soil quality ________________________________ Factors sheltering animal ________________________________

   List the living environmental factors that you think affect your animal:
<table>
<thead>
<tr>
<th>Living Factors</th>
<th>Effect on your animal</th>
</tr>
</thead>
</table>

   List the non-living environmental factors that affect your animal:
<table>
<thead>
<tr>
<th>Non-living Factors</th>
<th>Effect on your animal</th>
</tr>
</thead>
</table>
4. Why is it important to have this kind of animal living in this habitat? What would happen if this animal were to become extinct in this area?

5. Is your animal a producer, consumer, or scavenger or combination of these? Explain.

6. How does man's activities affect your animal?
LEARNING BIRD SHAPES HELPS IN IDENTIFICATION

Birds have certain characteristics that aid you in "learning the birds". Being able to recognize the characteristic shapes of birds in flight or perching is an easy method of identification. Here are some bird shapes that may be seen in this area; learn them and they will help you.

1
2
3
4
5
6
7
8
9
10
11
12
DIFFERENCES IN BIRDS

If you look closely at the beaks of birds you will notice that there is a great difference in the size and shape of their beaks. Some birds have rounded, blunt beaks, while others have slender pointed beaks. These differences in birds are called adaptive features. Thousands of years ago birds began to spread out as they moved from place to place in search of new kinds of food.

Gradually, they developed physical characteristics best suited to obtain the food found in their new home sites. The strong hooked beak of the parrot family is an adaptive feature which these birds use to get at the grubs and fruit which make up their diet.

The downy woodpecker has a sharp pointed beak that is used much like a chisel or ice pick in searching out insects in the bark of trees. The red-tailed hawk has the heavy beak of a bird of prey. Its razor-sharp point can easily rip through the hide of an animal and tear out pieces of flesh. Some water fowl have wide flat bills used for gathering aquatic plant materials and insects. Other water birds have long pointed beaks for spearing fish.

Some of the birds found in your back yard have heavy beaks for crushing seeds, while others have modified beaks used for seed and insect eating. At least one bird has an elongated beak used for siphoning nectar out of flowers. Some birds have wide trap-like beaks for catching insects in flight.

Pictured on this page are several types of beaks which you probably have observed on birds in your area. Try to match the type of beak to the bird. Place the number of the beak type after the name of the bird.

Example: Robin 9

1. Wood Thrush
2. Mallard Duck
3. Nighthawk
4. Canada Goose
5. Kingfisher
6. Martin
7. Barn Owl
8. Cardinal
9. Vulture
10. Coopers Hawk
11. Great Blue Heron
12. Pileated Woodpecker
13. Hummingbird
14. English Sparrow
15. Yellow-Throat
DIFFERENCES IN BIRDS

If you were to see only the feet of a bird, could you identify the type of birds that possess such feet? There are differences in the feet of birds, which serve the birds for specialized use. Birds of prey have feet that are used for seizing and holding their prey. Birds of prey do not always kill with their beaks. Hawks pierce the heart or lungs of their prey with their sharp heavy claws, and usually kill instantly. Their legs are so strong that they can fly miles to their nests with an animal as large as a young rabbit clutched in their claws.

The duck-hawk will dive upon ducks in flight. Striking with extended legs and closed talons, the ducks are instantly killed or knocked unconscious by the force of the blow.

Water birds that dive have developed webbed feet for paddling under the water. Their legs are set further back on their bodies than the legs of most land birds. This enables them to tip their bodies forward into the water easily. This unusual leg structure is the reason for the various waddling walk of ducks.

A modified web-foot is possessed by some water birds. They may run along the mud or swim in the water with equal ease.

There are many other examples of the use of specialized feet in the bird world. Look at the different types of feet pictured on this page. You will probably be familiar with all types with the exception of one. With this one, the SNOWSHOE, you will have to do a little detective work.

Listed below are the names of several birds which have different types of feet. Write the number of the foot type after the bird named, and see if you can fit the foot!

Example: Robin

1. Perching
   4. Swimming
5. Grasping
6. Climbing
7. Wading
8. Swimming and Walking

Mailard duck
Red-Tailed Hawk
Coot
Cardinal

Downy Woodpecker
Bob White Quail
Great Blue Heron
Canada Goose

Flicker
Sparrow
Ptarmigan
Barn Owl
### LET'S VISIT THE BIRDS

1. Birds that I now can identify from the chart from previous experience or knowledge:
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

2. Birds that I can name from research from the material provided here:
   - 1
   - 2
   - 3
   - 4
   - 5
   - 6
   - 7
   - 8
   - 9
   - 10

### What characteristics do you need to know to learn how to identify birds? List these characteristics at the top of each column and describe the characteristics of several birds you know:

<table>
<thead>
<tr>
<th>Name of bird</th>
<th>Size (robin, sparrow, crow)</th>
<th>Feet</th>
<th>Beak</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cardinal</td>
<td>robin size</td>
<td>perching</td>
<td>thick; can crack sunflower seeds</td>
<td>Red, with black and brown beak</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>3</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>4</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>5</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>6</th>
</tr>
</thead>
</table>
### STREAK EXPLORATION

#### What Might We Find In A "Stream Bike?"

1. **A study of a stream bank.** Check any of the following seen:

<table>
<thead>
<tr>
<th><strong>Flowers (plants)</strong></th>
<th><strong>Trees and Shrubs</strong></th>
<th><strong>Birds</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>violets</td>
<td>willow</td>
<td>red-winged blackbird</td>
</tr>
<tr>
<td>ferns</td>
<td>firethorn</td>
<td>catbird</td>
</tr>
<tr>
<td>moss</td>
<td>ironwood</td>
<td>wren</td>
</tr>
<tr>
<td>cinquefoil</td>
<td>spicewhite</td>
<td>cowbird</td>
</tr>
<tr>
<td>Jack-in-the-pulpit</td>
<td>witch hazel</td>
<td>wood duck</td>
</tr>
<tr>
<td>buttercups</td>
<td>elai</td>
<td>Hallard duck</td>
</tr>
</tbody>
</table>

2. **What insects can be found?** Check those seen:

   On the water surface — Flying over the water surface —
   
   | water strider        | dragonfly            |
   | Whirlygig beetle     | damselfly            |
   | hair snakes          | mayflies             |
   | water beetles        | gnats                |

3. **What other animals did you see?** Check those seen:

   | snakes                | crayfish             | fish |
   | toads                 | turtles              | mud puppies |
   | frogs                 | newts                |      |
   | salamander            | minnows              |      |
   | muskrat               | slugs                |      |

4. **What other things did you find in or along the stream?**

   | bird nests            | chains of eggs       | animal paths from the creek |
   | mass of eggs          | man's refuse         |      |
   | clam shells           | fish jumping         | sounds of frogs |
   | animal tracks         | birds fishing        | sounds of birds |
   |                       |                      | signs of erosion |
5. What is the temperature of the stream?

____ water in the sunlight
____ water in shallow area
____ water in the shade
____ water in deep pool near bottom of pool.

6. What is the color of the water?

____ cloudy  Can you account for its color?
____ clear

Collect a jar of the stream water and let it settle out during the class period. Check it for sediment and pollution.

7. List signs which tell you of the changing level of this stream:

____ debris above stream level piled up against trees
____ flood plain of the creek
____ debris (cans, bottles, etc.) found at higher levels
____ soil eroded away from roots or bare soil left

8. What is the source of this stream?

____ from farmer's fields  ____ from other streams
____ from the forest
____ from road run-off

9. Special project which you may wish to do (select from below):

(a) Make a map of the stream within the campground.
(b) Collect (and then return) frog eggs or other eggs.
(c) See how many different kinds of salamanders you can find.
(d) Catch a tadpole or two and compare them. (Then return.)
(e) Figure, using math, how many gallons per minute flow past any given point in this stream.
(f) Study the bottom of the creek, and report if it is of gravel, big rocks, mud, slate, algae, weeds, etc.
(g) Sit in a quiet spot, watch the water, and write your thoughts in a story or poem.
FEATHERED FRIENDS

Place: Elk Lodge, Woodpecker Woods, Elk Lake area
Goal: To gain an appreciation for the diversity and beauty of birds while learning about some of their specific adaptations for survival.

OUTLINE

I. Introduction
II. The Stuffed Birds
   A. Adapted to Fly
   B. Guess Who's Coming to Dinner
III. Coloration
    A. Colored Feathers
    B. Hide and Seek
IV. Bird Bash
V. Birds at the Feeders
VI. Binoculars
VII. Habitat Hike
     A. Intro to Hiking
     B. The Blind
     C. The Lake
     D. The Forest
     E. The Field
VIII. Bicycle Spokes (optional)
     Bird Detectives (opposite trail map)
     Trail Map (back cover)

TRAIL MATERIALS

Bird specimens  Game board & answer card
Pick-up sticks   Bird bash cards & score sheet
Bird bash questions  Binoculars
Lens cleaning material  Rain ponchos (2) at blind
Birds of Kern chart  Field guide to birds
I. INTRODUCTION

Begin your discussion about birds in Elk Lodge by asking your students "What are birds good for?" Hopefully their responses will include insect population control, food for man and wildlife, feathers for clothing, seed dispersal and visual beauty. More importantly, we should remember that birds are valuable not only because of what they can do for man but because they exist, like man, in the great scheme of life.

II. THE STUFFED BIRDS

A. Adapted to fly

Show the students one of the bird mounts provided. Mounts like these have all the insides removed and true guts are replaced by wire mesh or plastic guts. The eyes have also been removed and replaced by glass eyes. Ask "What kind of animals are birds?" Birds are warm-blooded, egg-laying, feathered vertebrates with forelimbs modified to form wings. With only a few exceptions most adult birds can fly. As you carefully pass the bird around (very fragile!!) ask "What is an adaptation?" and "What adaptations does a bird have to make it possible for it to fly?" An adaptation is any structural modification that helps an animal survive. Some adaptations for flying are listed below:

1. Wings with feathers. These are superb flying materials, lightweight, durable and good wind-catchers.
2. Powerful breast muscles provide excellent motors for flying.
3. Hollow bones are lightweight yet durable enough for flight.
4. Birds store very little water in their bodies. It is too heavy for efficient flight.
5. Streamlined, aerodynamic body shape allows the bird to "cut" through the air.
III. COLORATION

A. Colored feathers

Before the following discussion on color adaptation try playing "Colored Feathers." To play, take the students outside and have them each choose a partner. Give each pair one pick-up stick (represents a feather) and tell them that they will now have a chance to hide their stick from their partner. Set up boundaries and do not make them too large (a thirty-foot square is about right). One-half of the stick should be showing at all times, no burying! They have one minute to hide the stick before their partner begins the search. Have each student try being both hider and seeker.

B. Hide and seek

Now, have your group sit in a circle and discuss coloration. Coloration is very important to many birds. One use of color is camouflage. Ask, "What is camouflage?" Camouflage means to conceal. Any coloration which hides the animal in its environment causing it to "blend into" the background is camouflage. Remind them of the "Colored Feathers" game and ask them which colors were easiest to hide from their partners. Why would camouflage be important to an animal? It allows the predator (or hunter) to sneak up on its prey (the hunted) unseen, and makes the prey more difficult to find.

Quite opposite from this protective coloration is conspicuous coloration like that of the male Cardinal. His bright red color stands out against the green trees in his habitat. Ask, "How does easy visibility help the male cardinal?" One reason is to help in attracting a mate. Another is to lure predators away from a threatened nest to protect the young and the female.
IV. BIRD BASH

A fun way to learn about the birds that may be seen at Kern is by playing "Bird Bash". A set of bird information cards can be found in the trail sack for the game. Choose about ten of the cards and discuss some of each bird's more important characteristics. This information is found on the back of each card. Divide the students into two groups and have them line up single file facing the table where you are going to place the cards of the birds you discussed, picture side up. Call off the name of a bird on the table or some other information about it. Once you say "go" the first person in each line runs up to find the correct bird card and then "bashes" it with an open palm. Each person gets only get two chances to score a point for their team per question. They then return to the end of the line. A person may go back and get help from a teammate in line before bashing if they wish. The first team to score ten points wins. Be sure to review characteristics between questions. A set of general questions is listed below, and a score sheet is included in the trail sack.

**BIRD BASH QUESTIONS**

Bash a predator !! **hawk or owl**
Bash a bird that calls its name !! **chickadee, bluejay, or bobwhite**
Bash a bird with a beak adapted for digging bugs out of trees !! **woodpeckers**
Bash a bird with adaptations for living in the water !! **Canada goose, duck, heron**
Bash our national bird !! **bald eagle**
Bash Ohio's state bird !! **cardinal**
Bash a bird that hunts at night !! **owls**
Bash a bird that eats carrion !! **vulture**
Why do hummingbirds hum? **They don't know the words!!**
V. BIRDS AT THE FEEDER

Begin your visual study of birds by looking out at the feeders located in the courtyard. Birds will often gather here looking for food and shelter, especially in the winter. “Why is this?” Food is much harder to find in the winter and shelter from the cold is important to conserve energy supplies. Look for different kinds of birds and watch closely where they seek shelter and how they feed. For example, some birds are strictly ground feeders while others will easily “tie” on a feeder to enjoy a meal or snack.

To get an idea of the birds that can be seen at the feeders look on the wall at the ‘Birds of Kern’ chart. Have a field guide handy to identify unknown species. The lodge in an excellent place from which to watch since the birds may be viewed without disturbance.

VI. BINOCULARS

Binoculars are provided for “close-up” viewing by the students. You'll need to teach proper use and care of these instruments for both successful viewing and for protection of Camp Kern's binoculars. Be sure that the binocular's strap is securely about each student's neck before you begin explaining.

1. Binoculars adjust for the distance between each person's eyes. Look through the binocular and bend them at the center until there is only one field of vision.

2. Although you may wish to adjust the right ocular lens to compensate for the differences in your eyes, this is not usually necessary for the students.

3. Point out the location of the center focusing wheel (or lever) and then have each student try to sight and focus on a fixed object at least forty feet away. When using binoculars in the field you must first find the bird with your naked eye and then bring the binoculars into place without moving your head or eyes.
4. If lenses are dirty do not use shirts or towels to clean them. These materials scratch the lenses and ruin the binoculars. Use the lens cleaning tissues provided or have a naturalist clean them for you.

5. Binoculars should never be banged or jarred. This knocks the lenses out of alignment and ruins the binoculars.

6. Don't take binoculars out in the rain.
VII. THE HABITAT HIKE

A. Intro to hiking

The proper habitat is essential for all wildlife since it provides them with the basic needs for survival. The map at the end of the guide will take you to three specific habitats and a bird blind. Try to note how the birds found in each of the three habitats (field, forest, and lake) are specially adapted to fit into their environment. Use the BIRD DETECTIVES section next to the map to turn your group into investigators seeking clues left by our feathered friends along your path.

B. The blind

Follow the trail through Woodpecker Woods until you come to the bird blind. This area has been modified to better observe bird life. Food, one of the basic needs for survival, has been provided and the area has been cleared to make viewing easier. Have the students fill the feeders from the can as soon as you arrive. It's interesting to take a close look at the ingredients of the birds' "dinner!"

A way to get a real "birds eye" view of our feathered friends is by becoming one of the Bird People of Kern. To become a Bird Person choose one or two students to put on the rain ponchos (stored in the cans in the blind) and then sneak out to sit motionless by the feeders. If ponchos are already out, replacing them with the Bird People will fool the birds who will already be accustomed to the ponchos. Only eyes should be peeping out of the ponchos and if everyone is quiet enough birds will land to feed just inches from the Bird Peoples noses! Try this for five minutes before moving on since it sometimes takes the birds a while to recover from all the commotion.

C. The lake

Journey to the northwest side of Elk Lake just above the bridge walkway. Ask your students "What kinds of birds may be found here at the lake?" (Birds that are specifically adapted to living on or near the water). Most will answer with "ducks" but remind them that other water birds may
also live here such as herons and rails. Ask, "What are some adaptations of birds that live on the lake?" Some adaptations are: webbed feet for swimming, special bills to sift food, long legs to hold them high above the water (herons), oil glands (in ducks) to make their feathers waterproof and long fish-catching bills. Look around for the duck nesting boxes which Kern has set out to help increase the waterfowl population.

D. The forest

At the southeast edge of Elk Lake is the entrance to Sugar Woods. This area has trees much older than those in Woodpecker Woods. Forests like this are excellent habitat for many birds since they provide a large amount of protective cover, good nest sites and good food supplies. Have your students look for examples of food, cover and nest sites that birds might utilize. Examples might include: seeds, berries, insects, dead stumps, thickets and the tree canopy (cover). Ask, "What adaptations do birds have for living in the forest?" Some of these are: legs designed for perching, special bills for chiseling wood or cracking seeds, feet with claws for climbing and coloration (valuable in any habitat). Ask, "What do you think happens to bird populations in woods where people cut down all the dead trees for firewood?" (no nests, no birds). Try to spot the nesting platform Kern built to provide a home for a hawk or owl.
E. The field

While returning to Elk Lodge cross the field that leads to the horse barn. Stop and have the students observe the field closely, looking for types of food and cover down in the grass. Ask, "What food and shelter does the field offer to help a bird survive?" At first, fields do not appear to offer much. However, recall the chirping and jumping of the summer grasshoppers and crickets. These two insects are the staple diet of many of the field-dwelling birds. The field supports tremendous numbers of insects. Mice and voles, also abundant in the field, provide food for the predatory hawks and owls which live in the woods nearby. Grasses and other plants produce amazing numbers of seeds to feed both birds and the mice, and insects eat the plants’ leaves. Altogether, a complex food web which supports our feathered friends.

If you haven’t had much luck with your binoculars, pause near the barns and try to get a look at the swallows, rock doves and sparrows which live there.

Be sure to stop at the bird box shown on the map. Keep your distance and disturb the box as little as possible. This is a bluebird box and it and others like it have been set up to provide nesting sites and increase the numbers of the insect-eating bluebirds. Ask, "What do you suppose happens to bird populations in the field when farmers spray insecticides to kill insects?" (no insects, no birds).

VIII. BICYCLE SPOKES (optional)

This is a good sensory activity to try with your group along the trail. It is designed to help students become more aware of the birds around them. To do “bicycle spokes” first have everyone lie down on the ground in a circle so that each person has their feet placed in the circle’s center. The object now is for everyone to lie perfectly still and listen to the bird calls. Have each person keep count of all the different calls s/he hears. After a few minutes have everyone sit up and discuss some of the calls.
Birds sing for two primary reasons: one, to stake out territories (thereby limiting local population and food consumption); and two, to seek mates. Singing is common in the Spring as returning migrants quickly set up territories which they then defend from intruders and use as singing perches to attract mates. Birds also have alarm calls, signifying danger, and other communicative calls. Even woodpeckers get into the act hammering noisy hollow trees to set up their territories and attract mates.

**BIRD DETECTIVES**

A good ornithology "detective" can tell birds are around not only by seeing and hearing them, but also by the "clues" they leave behind. Look and listen for these clues:

1. Feathers on the ground.
2. Other bird parts such as bones, bills, feet, etc.
3. Droppings, sometimes so abundant in areas as to be called whitewash.
4. Listen for calls and songs.
5. Nests and other bird homes.
6. Footprints in sand, mud or snow.
7. "Leftovers" like seed cases and carcasses.
8. Owl pellets, usually found beneath large trees adjacent to fields.
9. Eggs or egg shell pieces.
10. Woodpecker holes.

**NOTES/BIRD LIST:**
When you see animals that live on the land, you can usually see the entire animal, from its head to its feet. But when you look at a plant that lives on the land, how much of it can you really see? Above ground, a typical flowering plant has a shoot consisting of a stem with branches, leaves, and flowers. But hidden below the ground are the roots, which consist of "branches" and fine root hairs which are firmly embedded in the soil.

Some functions of roots are:
1. Anchoring the plant in the soil.
2. Absorbing water and dissolved mineral salts from the soil and conducting them to other parts of the plant.
3. Serving as a storage place for food products made by the shoot of the plant.
Different types of plants have different patterns of root growth. Grasses, including cereals such as wheat, oats, corn, and rice, usually have slender, fibrous roots with no one root more prominent than others. This type of root structure is fibrous root system. Other plants, such as the dandelion (a weed) or food crops such as carrots, beets, and radishes, have one large main root, called a tap root. A tap root plant can store large amounts of food in this large root. Roots also inhibit soil erosion caused by wind and water.

The same type of plant growing under different environmental conditions (such as different soil texture or amount of moisture in the soil) often shows variation in its root system. For example, a plant growing at the edge of a pond may have a shorter root system than the same plant growing in drier soil. Near the pond, water is available much closer to the soil surface and the root has little stimulus to grow further.

**FIND PLANTS WITH ROOTS LIKE THOSE OF TWO MYSTERY PLANTS.**

*Roots and Shoots* is a weed activity designed to motivate youngsters to investigate roots. Using the roots as their only clues, the teams seek to identify two mystery plants by digging and uncovering roots that match those of the mystery plants.

**MATERIALS**

For each team of two:

- 1 trowel
- 1 milk-carton half
  (cut lengthwise)

Optional:

- 1 hand lens*

For the group:

- 2 large brown paper bags
- Tape or string
  (to close the bags)
- 1 bucket of water
- 1 set of Action Cards

*Available from the Lawrence Hall of Science. See the “Equipment Order Form” in the OBIS Toolbox folio.

**PREPARATION**

The best site for this activity is a weedy lot, lawn, garden, or an old field. Be sure to obtain permission, if necessary, to dig up the weeds in your study site.
Dig up two plants, one with fibrous roots (a grass plant) and one with a tap root (dandelion, carrot). Place a brown bag over each plant shoot so that only the roots are exposed. Secure the bag tightly with tape or string. The fibrous-root plant will be Mystery Plant #1; the tap-root plant, Mystery Plant #2.

ACTION

1. Explain to the youngsters that they will investigate the weeds in their study site, particularly that part of the plant they rarely see, the roots. Tell them that the above-ground part of the plant is the shoot, which consists of the stem, branches, leaves, and flowers.
2. Introduce Mystery Plant #1 to the group. Explain that the shoot is inside the bag; only the roots are exposed. Ask the group for a descriptive name to use when referring to the plant's roots.
3. Define the limits of the study area and point out the plants, if any, that should not be disturbed. Divide the group into teams of two. Challenge each team to find several different plants with root systems like that of the Mystery Plant. Encourage the teams to bring back for comparison all the plants they dig up. Distribute a trowel to each team and let the digging begin.
4. Wander from team to team, encouraging the youngsters to take the time to get all the roots with the shoot. You might want to ask some questions as you visit the teams. Does the soil cling to some types of roots more than to others? Do your plant's roots look like the Mystery Plant's roots? If not, how do they differ? Do you think your plant is the same kind as the Mystery Plant? (Washing the roots in a bucket of water to remove soil makes closer examination possible.)
5. When all the youngsters have washed and compared their roots, have them form a root "lineup," grouping those plants with roots similar to Mystery Plant #1.
6. Introduce Mystery Plant #2. Ask the group for a descriptive name for these roots and challenge the teams to find plants with similar roots. Have the teams follow the same procedure of investigation they used with Mystery Plant #1, ending with another root lineup.
7. Ask the youngsters to guess the identity of the two Mystery Plants. Can the kids tell what the shoot looks like when they can only see the roots? Let the suspense build as they guess; then uncover the mystery shoots. Who was correct?
8. One final challenge. To each team, distribute one action card and milk-carton half. Have each team bring back the plants described on its card.
9. Optional. Have each team explain how its plants fit the challenge on the card. Point out some of the more unusual roots found. Provide hand lenses for observation.
ROOTS AND SHOOTS
Action Card #1

FIND:

a plant with a new type of root system, one that has not been found.

ROOTS AND SHOOTS
Action Card #3

FIND:

a plant with a wider root system than shoot system, and a plant with a wider shoot system than root system.
ROOTS AND SHOOTS
Action Card #2

FIND:

a plant with a thicker main shoot than main root, and a plant with a thicker main root than main shoot.

ROOTS AND SHOOTS
Action Card #4

FIND:

a plant with longer roots than shoot, and a plant with a longer shoot than roots.
Seed dispersal is dependent on many agents.

Most plants produce seeds which may grow into new plants. In order to survive, these plants require such raw materials as minerals, air, and water. A seed dispersal mechanism may be more favorable. This seed dispersal mechanism is one type of adaptation. An adaptation is any special feature of an organism that improves its chances of surviving and reproducing.
<table>
<thead>
<tr>
<th>MODIFY DRIED BEANS OR PEAS SO THAT THEY MAY BE DISPERSED BY VARIOUS NATURAL FORCES.</th>
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<tbody>
<tr>
<td>MATERIALS</td>
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<tr>
<td>For the Group:</td>
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<tr>
<td>bag of dried beans or peas</td>
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<td>(seeds of any kind will do)</td>
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<tr>
<td>balsa wood and/or</td>
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<tr>
<td>construction paper</td>
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<td>tape</td>
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<td>paste or glue</td>
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<td>rubber bands</td>
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<td>toothpicks</td>
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<td>red tempera</td>
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<td>balloons *</td>
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<td>scissors</td>
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<td>pencil</td>
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<td>plastic bag *</td>
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<tr>
<td>pieces of cork</td>
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<tr>
<td>cotton and/or feathers</td>
</tr>
<tr>
<td>small metal springs *</td>
</tr>
<tr>
<td>duplicated Action Cards</td>
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<td>any other useful materials</td>
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<tr>
<td>* optional materials</td>
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</tbody>
</table>
**ACTIONS**

1. Tell the group that not all seeds can grow where they fall and that some seeds are dispersed (carried, blown, or pushed away).
2. Distribute the Action Cards.
3. Introduce the challenge, and give everyone a bean seed to be dispersed.

**WHAT DO YOU THINK?**

1. Can you find plants that actually have features like the seed dispersal mechanism you constructed?
2. What might happen if seed dispersal mechanisms did not exist?

<table>
<thead>
<tr>
<th>ACTION</th>
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<tbody>
<tr>
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<tr>
<td>2. Distribute the Action Cards.</td>
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<tr>
<td>3. Introduce the challenge, and give everyone a bean seed to be dispersed.</td>
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<table>
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<tr>
<th>WHAT DO YOU THINK?</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>2. What might happen if seed dispersal mechanisms did not exist?</td>
</tr>
</tbody>
</table>

1. **Action Cards**
   - Modify your seed to float on water at least five minutes. Hint: air bubble, raft.
   - Modify your seed with a mechanism that will throw the seed two feet away from the parent plant. Hint: burst, split.
   - Modify your seed to attract a bird or other animal. Hint: Bright, tasty fruits with seeds inside.
   - Modify your seed to hitchhike on an animal or man for twenty feet.
   - Modify your seed to fly at least three feet.
   - Blank cards may be used to add other modifications you or the youngsters think seeds have.

4. Provide the group with materials for modifying their seeds for dispersion. Allow time for construction of the "adaptations."

5. When everyone is finished, call upon each person (or team) to read his card and demonstrate his dispersal invention. You may have to provide a bucket of water for testing floating seeds if a pond or stream is not available.

6. Have the youngsters search the study site for seeds which seem to be adapted for dispersal.
SEED-GO

SEED DISPERsal

Look carefully at the plants in your surroundings. Decide how each plant disperses seeds and glue or tape a sample of its seed in the proper box. Some seeds may be dispersed in more than one way. The first person with five seeds in a row, in any direction, wins (same as Bingo).

<table>
<thead>
<tr>
<th></th>
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REMEMBER:
In order to win, you may have to convince others that you are correct.
Action Card
SEED DISPERSAL

Modify your seed to float on water at least five minutes.
Hint: air bubble, raft.

Action Card
SEED DISPERSAL

Modify your seed to attract a bird or other animal.
Hint: bright, tasty fruits with seeds inside.
Action Card
SEED DISPERSAL

Modify your seed with a mechanism that will throw the seed two feet away from the parent plant.
Hint: burst, split.

Action Card
SEED DISPERSAL

Modify your seed to hitchhike on an animal or man for twenty feet.
For many plants, the production of seeds that will grow depends on the transfer of pollen from one flower to other flowers of the same kind. In many cases, wind or animals move the pollen.

Animals such as bees, hummingbirds, and moths visit flowers to collect nectar or pollen for food. In the course of gathering their food, these animals brush against the specialized structures in the flower where pollen is found, and become agents in the transfer of pollen. For example, a bee lands on a flower to gather food, and pollen sticks to its legs, body, or head. When the bee goes to another flower for more food, pollen from the first flower falls onto the second flower. Pollen from the second flower may then stick to a part of the bee's body to be carried to yet another flower.

In this activity, your youngsters investigate pollen-moving agents and the pollen-covered structures of flowers. The youngsters first search for pollen on a variety of flowers. Then, with the aid of artificial bees and paper flowers, they find out how pollen is transferred.

**CHALLENGE:** USE PAPER MODELS OF FLOWERS IN YOUR AREA TO FIND OUT HOW ANIMALS MOVE POLLEN FROM ONE FLOWER TO ANOTHER.

**MATERIALS**

For each team of two:
1 pollen board (See the "Pollen Collectors", Equipment Card.)
2 artificial bees (See the equipment card.)
1 set of paper flower shapes (See the Flower Powder "Shapes" Card.)

For the group:
- tape
- cotton swabs
- pipe cleaners cut into various lengths
- cotton balls
- yarn
- glue
- clay
- scissors
- popsicle sticks
3 small containers of "Pollen" (one of cornstarch and one each of two colors of tempera paint powder)
1 "Pollen Collectors" Equipment Card
1 Flower Powder "Shapes" Card

**PREPARATION**

This activity works best with ten to twelve youngsters. If your group is larger, divide it into two smaller groups with separate leaders.
Materials
1. Flowers. Trace one set of paper flower patterns on construction paper for each team of two and cut out the disk and cone shapes. Tape the cone sides together as illustrated.
2. Pollen collectors. Make one pollen board and two artificial bees for each team.

Selecting a site. Choose a site with at least three kinds of flowering plants. Test several flowers with a pollen board to make sure the flowers have pollen. Select one plant with a lot of pollen and flag it for use in your demonstration at the beginning of the activity.

Safety. Before starting the activity, caution any youngsters who are allergic to bee stings against working near flowers with bees on them.

ACTION
1. Gather the youngsters around the flagged plant. Gently press one of its flowers against the pollen board, and show the group the results. Ask them what the dust on the board could be. If no one suggests pollen, tell them the powder is pollen and that flowers need pollen to make seeds. Add that, for many plants, the pollen from one flower must be moved to another flower of the same kind to make seeds that will grow.
2. Show the youngsters how to use the pollen board. Tell them the flowers are not to be picked for collecting the pollen. Have the group pair up.
3. Explain that flowers have pollen at certain times, and that some flowers in the area may not contain pollen. Hand out one pollen board and three or four pieces of flagging to each team. Challenge them to find pollen with the pollen boards and to flag those plants that have pollen on them. Encourage them to collect as many different kinds of pollen as they can.
4. After about five minutes, call the group together. Ask the teams to display their pollen boards and point out different colors and textures of pollen.
5. Show the group the paper flower shapes (cone, disk, and 3-oz. paper cup) and ask them to describe the differences in shapes. Tell the youngsters to pretend the paper forms are flowers and ask if they saw any real flowers that resembled those shapes.
6. Challenge the teams to find flagged plants with flowers that resemble any two of the different paper shapes. Then tell them to look very closely at the flowers to see what parts or structures in the flower have pollen on them. Give each team one magnifying lens and one set of shapes. Send the teams out to hunt.
7. After five minutes, call the group together. Spread out the craft materials. Challenge each youngster to construct the pollen-bearing structures observed on one of the real flowers and then make a model of the flower by attaching the structures to the appropriate paper shape. Tell the youngsters you will add the "pollen" to the paper flowers after they are completed.

8. Allow at least twenty minutes for the teams to make their pollen-bearing structures and to attach them to the forms.
9. As the youngsters complete their flower models, ask them to point out the
parts of the model that correspond to the real flower parts that held pollen. Carefully add “pollen” (tempera paint powder or cornstarch) with a popsicle stick to each paper flower at those places. Use a different color of “pollen” in each of the different shapes. Display the finished paper flowers in one area.

10. Mention that bees visit flowers to collect pollen and sweet juices (nectar) for food. Hand out one artificial bee to each team and tell the kids to “buzz” or visit several of the paper flowers as if the “bees” were collecting food.

11. Ask the kids to describe what happens to the “bees” when they visit the paper flowers. (The “pollen” sticks to the bee’s body.) Then have the kids describe what happens to the pollen in the flowers as the “bees” move from flower to flower. (The “pollen” gets mixed up.) Tell the youngsters that flowers must have pollen from the same kind of flower to make seeds.

12. Now challenge the teams to take their “bees” to real flowers. Tell them to notice where the pollen sticks to their “bee” bodies as they visit different kinds of flowers. Also ask them to look for insects other than bees visiting the flowers. Give each team a paper cup for collecting other pollinators and a clean artificial bee. Send the teams out to hunt.

13. After the teams have had a chance to work with real flowers, call them together to share their discoveries.

14. Collect the flagging.

MORE BUZZING

1. What kinds of insects other than bees visit the flowers? Let the group pass around any insects they brought back.

2. Besides insects, what other agents could move pollen from one flower to another? (Wind, water, larger animals.)

3. What might happen to plants if we killed all the insects with sprays or poisons? How would we be affected?

4. Could we artificially pollinate flowers? What problems might we have?

FOLLOW THROUGH

1. Some flowers have shapes that are adapted to the feeding parts of certain animals. Let each youngster use a 5-cm piece of pipe cleaner to represent an animal, such as a butterfly or hummingbird, with a long, thin mouth part. Challenge the team to take their “bee” and the pipe cleaner to different flowers to see which one seems better suited for gathering food from the flowers.

2. Some animals have certain color preferences. Challenge the kids to observe the different animals visiting flowers. See if your youngsters can discover any color preferences.
Creeping, climbing, and trailing vines often grow in forests where sunlight is limited. Vines have specialized structures and growth patterns that enable them to compete for sunlight. The modified stems or leaves (tendrils) of some vines coil tightly around objects enabling the plant to compete. Vines with tendrils include the garden pea, vetch, and clematis.

Other climbers such as English ivy and poison ivy have roots that sprout along the stem and anchor the plant firmly to tree trunks, walls, and other supporting structures. Many other vines, such as honeysuckle and morning glory, have stems that coil or twine around supporting plants.

In this activity, the youngsters locate and examine different kinds of vines. They discover and compare structures that twine, such as tendrils, modified roots, and stems. Action Cards encourage the youngsters to further explore the variety of vine structures and growth patterns found at the site.

**CHALLENGE:** INVESTIGATE THE SPECIALIZED STRUCTURES AND GROWTH PATTERNS OF DIFFERENT VINES.
MATERIALS

For each team of two:
2 Action Cards
1 pair of scissors

For the group:
1 data board
1 marking pen
• cloth or plastic strips to be used as flagging
2 sheets of Action Cards

PREPARATION

Selecting a site. Choose a site with a minimum of five kinds of vines. Check densely vegetated areas such as thick forests (particularly in the southern states), stream margins, and parks. If necessary, obtain permission to collect small samples of the vines growing at the site.

Precautions. Search the site carefully for poison ivy, poison oak, or other dangerous plants. Place flags next to any dangerous plants and caution the youngsters before they go into the area to avoid these plants.

Taking a sample. As you check over the site, take a sample of a vine to use when you introduce the activity. The sample should be twelve to thirty centimeters long and have several leaves, tendrils, roots, or coiling stems.

ACTION

1. Introduce Creepers and Climbers by asking the participants to describe some vines. Show them the sample vine. Point out the long stem, leaves, and the special parts used for support.

2. Show the youngsters how to use the scissors to cut a small sample (12 to 30 cm) from the growing tip of a vine branch.

3. Encourage the participants to look carefully before reaching or stepping into thickets or bushes. Point out the poisonous plants you have flagged and caution the youngsters to avoid touching them. Tell them how to recognize other dangerous plants that you may have missed when you looked over the site earlier.

4. Divide the group into teams of two. Challenge the teams to find as many different vines as they can and to bring back small samples of each kind. Those vines that cannot be cut should be marked with a flag.

5. Distribute flagging and scissors, and let the youngsters begin. If necessary, establish site boundaries.

6. After about fifteen minutes, call the teams together. Ask one member of each team to show the group one of the vines she collected and to describe how it was growing. Ask what structures held the vines to their supports.
7. As each of the three main modifications (tendrils, modified roots, and twining stems) is shown for the first time, introduce the term for that modification and write it on the data board. Ask other participants to show vines they have collected that have the same modification.

8. Give each of the team members an Action Card and a piece of flagging. Challenge the kids to find and flag the vine described on the card. Circulate among the youngsters as they work to offer help or encouragement. Offer another card to those kids who complete their challenges early.

9. When most of the youngsters have completed their challenges, call the group together and ask the participants to read their challenges and show the group their flagged vines. Encourage the youngsters with similar Action Cards to compare results.

10. Have the teams collect all the flagging.

WHAT DO YOU THINK?

1. What do vines have in common with other green plants?
2. How are vines different from other kinds of green plants?
3. Many plants must compete with other plants for sunlight — especially in forests. How do vines compete for sunlight? How do trees compete?

MORE VINEY

1. If the youngsters discovered several twining vines at the site, challenge them to find out if all the vines twine or twist around their supports in the same direction (clockwise or counterclockwise). If the students discover more than one twining direction, have them investigate whether a particular kind of vine (for instance, honeysuckle) always twines in the same direction.

2. Can a twining vine be trained to twine in a new direction? Challenge the teams to reverse the direction of a growing tip of a twining vine by rewinding it around a branch or stick. Some teams may wish to tape the tip into position. Make observations first after several hours, and then after a day or two to see if the vine begins to grow in the new direction.

3. Suggest that the youngsters investigate tendrils to see how they grow. Can their growing direction be changed?
CREEPERS AND CLIMBERS
Action Card

Travelers

Find a vine that starts growing on one support plant (a tree, bush, or smaller plant) and travels to one or more other plants.

Which vine is the Champion Traveler at your site?

---

CREEPERS AND CLIMBERS
Action Card

Shady Characters

Some vines may grow so densely that they cut out most sunlight beneath them. Find a place made very dark by vines.

Find evidence that a plant on which a vine is growing has been harmed by the vine. (Hint: Look under the thickest vines to see if you can find green leaves on the supporting plant.)
Trailers

Some vines don’t grow by climbing, but instead trail or creep along the ground. Find a vine trailing completely on the ground.

Fine Vine

Find the vine that has the most attractive or most unusual flowers or fruits.
LEARNING TO KNOW THE TREES

THIS KEY IS EASY ---- TRY IT!
Here's all you have to know to use it.

If the leaves have lobes

See SECTION A.

If the leaves do not have lobes

See SECTION B.

If the leaves are compound

See SECTION C.

Look at a leaf. Decide whether it is lobed, not lobed, or compound. Now turn to the indicated section. Remember that leaves on any one tree of any species vary in size and shape, and from tree to tree. The leaf forms used in this key can be regarded only as indicating the typical character of the leaves of any species.

NOTE: To help decide whether a leaf is compound or not, one must know that a leaf is that structure which occurs past the axillary bud.

SECTION A. - LEAVES WITH LOBES:

1. OAKS - If the leaf looks like either of the following it is an oak.

   a. White Oak Group

   b. Red Oak Group

Oaks are found on moist rich soils and on dry slopes. They are usually a medium sized tree about 60 to 80 feet high. The nut from an oak is called an acorn. Acorns are eaten by many wild animals such as turkeys, grouse and squirrels. Wood from oak trees is one of the best for building purposes. In colonial times it was used extensively for ship-building. The bark of the oak contains tannin which is used in the tanning industry.
2. TULIPTREE - If the leaf looks like this, it is a Tuliptree.

Tuliptrees grow best on moist rich soils and therefore are often found on such sites. This tree is the tallest of the eastern hardwoods reaching heights of 100 feet. There is but one kind of tuliptree in North America. The only other kind occurring in the entire world is found in China. The tuliptree is an important lumber tree especially for veneer. From the inner bark of the roots chemists make hydrochlorate of tulipterene, a heart stimulant. The Indians called this a "canoe tree" because they made dugouts from it.

3. MULBERRY - If the leaf looks like this, it is a Mulberry.

This tree is found on bottom lands or moist hillsides. The fruit of this tree resembles a blackberry and is sweet and edible. This is a good tree to plant if one wishes to attract birds and small animals. The bark of this tree is fibrous and some Indians wove cloth from these fibers. The wood is durable and was used for fence posts and wooden pins. The leaves of the white mulberry are used as food for silkworms.

4. SASSAFRAS - If the leaf looks like this, it is a Sassafras.

This is a widespread and aggressive weed tree often found growing along the edge of a woods. The wood of the sassafras is soft and was used by American Indians to make dugout canoes. Sassafras has been famous since pioneer days as a tea which is made by boiling the bark of the roots. Some pioneers mixed sassafras tea with molasses and allowed the liquid to ferment; this was then drunk as beer.

5. SWEETGUM - If the leaf looks like this, it is a Sweetgum.

This common bottomland tree also grows on dry soils. Resin obtained from this tree is used in the perfume industry. The seeds are eaten by a variety of wildlife. This tree is often grown as an ornamental and is quite beautiful in the autumn when leaves turn a bright scarlet.

6. SYCAMORE - If the leaf looks like this, it is a Sycamore.

The wood from this tree is very tough and is used for such items as butcher's blocks where wood difficult to split is used. This tree is one of the commonest stream-bank trees in Ohio. It grows best on moist sites. When the reddish-brown bark of this tree peels away, a creamy gray color is revealed. This tree also was used to make canoes.
7. HAWTHORN - If the leaf looks like this, it is a Hawthorn.

There are some 600 different varieties of this tree in North America. These trees often invade pastures and are a constant headache to farmers. On the other hand, the fruits are eaten by many wild animals including songbirds and game animals. Many of these are planted as ornamentals because of their abundant flowers and bright red fruit. When identifying hawthorns be careful of the thorns.

8. MAPLE - If the leaf looks like this, it is a Maple.

Maples usually occupy moist sites. The best known is the sugar maple which is probably the commonest and most important of the maples. When settlers arrived in America, the Indians taught them how to make sugar and syrup from the spring sap. Hence, an entire industry was built because of this tree. We, in Ohio, have an enjoyable maple sugar festival at the town of Chardon.

SECTION B. - LEAVES WITHOUT LOBES

1. BEECH - If the leaf looks like this, it is a Beech.

This tree is probably more easily identified by its smooth gray bark. In the Ohio Valley, during pioneer days, beech leaves were used to stuff mattresses. They were preferred to straw because the dried leaves didn’t get musty. Ashes from the burned wood were used in soapmaking. This tree is very shade tolerant and has the same life requirements as the maple. Hence, they are often found growing together. It has been said that beech trees are never struck by lightning.

2. WILLOW - If the leaf looks like this, it is a Willow.

Willow wood is soft and of little commerical value. But this long slender leafed tree is important in other ways. For example, it preserves stream banks by anchoring the soil and not allowing the stream to wash it away. The willows found along a stream are usually Black Willows. Weeping willows are beautiful as ornamentals. American Indians used to make fishing lines from the inner bark of the willows.

3. COTTONWOOD - If the leaf looks like this, it is a Cottonwood.

This is a common stream-bank tree in Ohio, although it can be found on drier sites. An old Indian legend has it that one day a chief discovered the design for a tepee by rolling a cottonwood leaf in his fingers, producing a small cone-shaped pattern. Indian children still fashion toy tepees in this way. When this tree is in bloom the "cotton", when blown by the wind, can produce a summer "snow storm".
4. **ELMS** - If the leaf looks like this, it is an *Elm*.

   This is one of the best known and widespread of our native trees in the eastern United States. This tree, in prior years, was preferred by many for shade tree planting. Today it is threatened with extinction because of a fungus disease called Dutch elm disease. This disease came from Europe and is carried by a small beetle which lives under the bark of trees. The American Indians used the inner bark of elms to make ropes.

5. **BLACK CHERRY** - If the leaf looks like this, it is a *Black Cherry*.

   This is another tree perhaps more easily identified by its bark. The bark is black in color and made up of rough, scaly plates, perhaps better described as "chinky-chunky" bark. Black Cherry is one of the most valuable trees found in Ohio. The hard wood is used for furniture and interior finish. I have read that the fruit is sometimes used to flavor rum and brandy.

6. **REDBUD** - If the leaf looks like this, it is a *Redbud*.

   This tree, because of its beautiful red bloom, is often planted as an ornamental. In Asia this tree is called a Judas Tree. According to an old myth it was this tree on which Judas hanged himself. When this happened, the white bloom of the tree turned red, because in shame, the tree blushed.

7. **BASSWOOD** - If the leaf looks like this, it is a *Basswood*.

   The wood of this tree is soft. The Iroquois used this wood to carve faceplates. They made ropes and fishing line out of the inner bark. The Indians also used the fresh bark as a bandage for wounds. In Europe, this tree is called Linden.

8. **DOGWOOD** - If the leaf looks like this, it is a *Dogwood*.

   This is a common understory tree in moist hardwood forests. Because of its beautiful bloom, Flowering Dogwood is often planted as an ornamental. This tree holds its fruit well into winter serving as a storehouse for wild animals. The ends of the small branches, if split, can be used as a toothbrush and it is said that they whiten the teeth.
SECTI0N C. - COMPOUND LEAVES

1. HICKORY - If the leaves look like this, it is a Hickory.

Hickory wood is noted for its toughness and ability to stand up under sudden shocks. Because of this, it is the best wood to use for axe handles. Hickory is probably the best firewood obtainable. It makes an excellent campfire, burning down to a hot bed of coals suitable for broiling. Squirrels feed heavily on the nuts.

2. WALNUT - If the leaves look like this, it is a Walnut.

Walnut is a valuable hardwood widely used for furniture. It is an exceptionally fine wood for gunstocks. The fruit husks contain a yellow dye which was used by the pioneers to stain cloth. It has been said that the roots of the Black Walnut give off a substance poisonous to certain plants such as tomatoes.

3. HONEY LOCUST - If the leaves look like this, it is a Honey Locust.

This typically is a bottomland tree. The wood is hard and durable, being used for fence posts and railroad ties. The thorns of the honey locust are usually three branched. The flowers of this tree furnish nectar for honeybees. The seeds are borne in a pod.

4. BLACK LOCUST - If the leaves look like this, it is a Black Locust.

This tree grows best moist on soils of limestone origin. It has been said that the young shoots are poisonous to livestock. The wood is hard and durable and is used by farmers as fence posts. The roots of this tree enrich the soil with nitrogen. The seeds and leaves of this tree are said to be poisonous to humans.

5. SUMAC - If the leaves look like this, it is a Sumac.

This is a shrub-sized tree. Its male and female flowers are borne on separate trees, hence fruit is found only on the female plants. The bright red fruit clusters are very conspicuous. The fruit tastes like sour apples when the juice is sucked from it. The fruit does not fall off in the winter and therefore is available to a great number of wild animals.
6. BOXELDER - If the leaf looks like this, it is a Boxelder.

This smallish maple tree grows to a normal height of about 40 feet. This tree grows best on moist sites but is very hardy and can stand extremes of temperature and dry soils. This tree has been much planted throughout the mid-west. This is the only maple with a compound leaf. It is also called an "Ash-leaved Maple".

7. BUCKEYE - If the leaf looks like this, it is a Buckeye.

This medium sized tree is found on the west slopes of the Appalachians and through the Ohio Valley. The flowers, borne in showy clusters, produce large brown seeds (buckeyes). The fresh seeds of this tree are very poisonous to eat and should not be bitten into. Buckeyes strung together make a very attractive necklace, or if hollowed out and a hollow reed inserted, they make good bubble pipes.

8. ASH - If the leaf looks like this, it is an Ash.

In general, ashes produce hard durable wood especially useful in making tool handles and baseball bats. The wood of the ash is desirable for campfires because it produces a hot bed of coals. At least one man says that a leaf of white ash rubbed on a mosquito bite relieves the itching at once.

NOTE: To distinguish between evergreen trees (trees with needle-like leaves) one must know:

1. PINE - needles occur in bundles.

2. FIR - needles are flat.

3. SPRUCE - needles are angular. (Hint: roll needles between fingers.) These needles also are single and do not occur in bundles.
THE TREE

LEAVES MAKE FOOD

OUTER BARK
FOR PROTECTION

ANNUAL RINGS
TELL AGE

HEARTWOOD
FOR STRENGTH

SAPWOOD
CARRIES SAP

INNER BARK
CARRIES FOOD

ROOTS HOLD TREE,
CONDUCT WATER
Some TREES common to this area:

<table>
<thead>
<tr>
<th>Name of tree</th>
<th>Sketch of leaf</th>
<th>notes concerning this tree</th>
</tr>
</thead>
<tbody>
<tr>
<td>white oak</td>
<td>white ash</td>
<td>dogwood</td>
</tr>
<tr>
<td>red oak</td>
<td>poplar</td>
<td>sassafras</td>
</tr>
<tr>
<td>black oak</td>
<td>shagbark hickory</td>
<td>staghorn sumac</td>
</tr>
<tr>
<td>chestnut oak</td>
<td>hawthorn</td>
<td>redbud</td>
</tr>
<tr>
<td>red maple</td>
<td>white pine</td>
<td>tuliptree</td>
</tr>
<tr>
<td>sugar maple</td>
<td>pitch pine</td>
<td>maple-leafed viburnum</td>
</tr>
<tr>
<td>wild cherry</td>
<td>red pine</td>
<td>willow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virginia creeper</td>
</tr>
</tbody>
</table>

and some SHRUBS

<table>
<thead>
<tr>
<th>Name of tree</th>
<th>Sketch of leaf</th>
<th>notes concerning this tree</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Virginia creeper</td>
</tr>
</tbody>
</table>
CROSS-SECTION OF TREE TRUNK

The trunk of a tree performs two simple functions, it holds the crown or top of the tree erect in the sunlight and it acts as a giant pipeline to transport the food and water between the roots and the crown. There are several important parts of a tree trunk and they are located as shown in the cross-section sketch.

OUTER BARK - This rough, corky surface acts as the skin to protect the tree from diseases and insect damage. Bark grows from the inside out, the oldest is on the outside, the youngest is next to the wood. Annual growth rings are formed in the bark much the same as in the wood, but usually the older outside rings are pushed off or have cracked into a rough surface by the inner pressure of the growing tree.

INNER BARK - This thin inner layer may sometimes be called part of the cambium, for it is through this thin ring of tubes that the "prepared food" from the leaves is carried to the cambium and down to the roots. To kill a tree by girdling; a ring of bark through the inner bark and cambium is removed. This cuts off the downward movement of food to the roots and prevents sprouting of new growth from the stump and the roots.

CAMBIUM - in this microscopic ring the new growth takes place. The cells in the cambium keep dividing and thus add new cells to the outer ring of sapwood and to the inner layer of bark. While wood is always oldest at the inner-ring, and youngest at the outer-ring, the bark is oldest at the outer layer and youngest at the inner-ring. The bark, inner bark, and cambium together comprise a very thin layer from 1/8" to 2" thick depending on the age and type of the tree.

SAPWOOD - This light colored outer-ring of wood, surrounding the heart wood, is the part of the tree that carries the "sap" or water from the roots to the various parts of the tree. The "sap" flows through the sapwood by inter-cellular action. Sapwood may be very thin, containing only one or two annual rings, or very thick containing up to 100 rings.

HEARTWOOD - The sapwood over a period of time slowly ceases to be part of the active or living part of the tree. This comes about by the continual formation of new sapwood forming in the outer rings. In other words it changes from living or "sap" wood into dead or "heart" wood. Heartwood, the innermost section of the tree, is usually darker in color and denser, and is the storehouse for the various gums, resins, and deposits which are responsible for its being more durable. A good example of heartwood is found in black-locust, red cedar, black walnut and white oak.

PITH RAYS - The lines that seem to run across the trunk section from the bark to the heartwood are in reality plates or sheets of plant tissues that bind the rings together and serve as pipe lines to transfer foods laterally to the stems.

Various things can be learned from the cross-section of a tree. Age can be determined by the number of growth rings. The distance between rings is an index to the weather conditions of the past.
LESSON PLAN
PLANTS
"LEAF STUDY"

OBJECTIVE: Students will become aware of the similarities and differences of several characteristics of leaves. They will also become aware of the leaf's function and value.

TIME: 2 hours

MATERIALS: microscope, hand lens, clear plastic bag, string, kleenex, crayons, pencil, paper, water color paints, brushes

ACTIVITIES: 1) Sit in a circle. Student's eyes should be closed with their hands behind their back. Give each person a different leaf to explore without looking at it. After a few minutes collect the leaves and put them in the middle of the circle. Now everyone opens their eyes and must find their own leaf in the pile.
2) Find a leaf. Make a crayon print of it.
3) Find a group of colorful leaves. Take your paints and try to blend your colors together to get the same shade.
4) What makes leaves change color in the fall? (Creative writing could be used at this point.) The two legends could be used at this point:
   a. Jack Frost
   b. Indians

Hunters - The two great Indians hunted the Great Bear. His blood drippings turned the leaves red. Others turned yellow by the fat that splattered out of the kettle as they were cooking him.

The true explanation is then given. In spring and summer leaves make food. Explain the process of making this food (chlorophyll). The green chlorophyll overpowers the reds and yellows that are in the leaf. Due to the shorter days, longer evenings and colder nights in fall the chlorophyll breaks down.
5) Just like fingerprints, there are no two leaves the same. Gather some leaves from the same tree. Examine them using the microscope and hand lens.
6) a. Choose a leaf. Write down all the words or adjectives describing your leaf (clean, oily, dry, soft, dirty).
   b. Take a kleenex and rub your leaf. Does anything come off? If so, what is it?
   c. Are there any holes in the leaf? What caused them?
   d. Do you see any insects or diseases on your leaf? (galls, etc.)
   e. Draw a picture of your leaf.
7) Tie a plastic bag around some leaves on a branch. With the string seal it shut for two hours. Why do drops of water form on the bag? Explain process of transpiration. Discuss the other functions of leaves (produce food, oxygen, affect soil, temperature, etc.).
Social and Group Living

Many students may feel less confident away from the classroom, but working in a group situation can provide a support system.

In the whole group, all involved have one collective goal to accomplish during recreational, enrichment activities and special events.

Recreational activities may include:

- canoeing
- horseback riding
- square dancing
- planned games (indoor and outdoor)

Enrichment activities include:

- candle dipping
- plant dyes
- natural art
- wind hunt
- free salad making
- cemetery exploration
- the zodiac observation at night
- sharpening senses
- scavenger hunt
- obstacle course
- orienteering
- hikes
- archeological digs
- Indian tracking
NATURE SCAVENGER HUNT I

This scavenger hunt will help you to identify many different things found in nature. Each family group will work together in collecting the materials on the list. You will have only 45 minutes, so work as a team. At the end of the time period, the group with the most items on their list will be the winners and receive prizes.

1. Acorns
2. Something out of place in nature
3. A round stone
4. A dandelion leaf
5. A piece of dead grapevine
6. A dead oak leaf
7. Any other kind of leaf
8. An animal other than an insect
9. A thorn
10. A fruit
11. A pine cone
12. Some type of seed
13. Some type of burr or "sticker"
NATURE SCAVENGER HUNT II

This scavenger hunt will help you to identify many different things found in nature. Each family group will work together in collecting the materials on the list. You will have only 45 minutes, so work as a team. At the end of the time period, the group with the most items on their list will be the winners and receive prizes.

1. A stick with fungus on it
2. A smooth, flat stone
3. A colored stone
4. A snail shell
5. A piece of shale
6. A dead maple leaf
7. An insect
8. A dead piece of bark
9. A piece of moss
10. A thistle leaf
11. A feather
12. Evidence of an animal other than a feather
13. Man-made material (glass, plastic, tin, cloth, etc.)
**CANDLE-DIPPING**

**Introduction:**
Ask your kids what pioneers would have made candles from in the Ohio country. Bee's wax was used for wax and strips of cloth, or whatever could be improvised, was used as a wick. Emphasize that early pioneers had to make the most of what they found in the forest where they lived. Making candles the old time way using frontier tools will give the kids a better understanding of the skills necessary to survive the wilderness of Ohio.

There are two steps to this activity; making the candles and making the holders. It is usually best to divide your kids into two groups and start them both at once. The kids who make their candles first move over to the holders second.

To make the candles, or pioneer lightbulbs, you will be provided with melted wax, wicking and wood for the holders. It adds to the atmosphere if you build a fire and keep the extra wax melted in a double boiler can so you can refill the dipping can as the level drops.

**PREPARATION:**

1) Fill the crockpot with wax and plug in 2 hours before enrichment, or talk to the Naturalists about melting wax over a fire in a double boiler.
2) When wax is ready pour it into a can. (If it is cold outside, the wax can be placed inside another can filled with hot water.)
3) Fill another can with cold water and set it beside the wax can.
4) Unless the weather is impossible, ALWAYS dip the candles outside.
5) Be extra careful with the wax. If inside always cover the floor with newspaper.

**CANDLE-DIPPING PROCEDURE:**

1) Using scissors, cut the wicks to about 6" lengths.
2) Divide the group into a rotating circle, with only one person dipping at a time.
3) As the circles rotate, the students dip their wicks quickly into the wax, then into the water to harden the wax. Omit water in cool weather.
4) Continue this process until the candles are big enough to fit into the holders. This usually takes about 25 minutes.
5) The candles should be **hard** before placing into the holders.
6) Pour any wax that is **leftover** into the crock-pot.

**HOLDER-MAKING PROCEDURE:**

*1) Cut off one four inch wide piece of candle-wood with the two-man saw. (bow saws may also be used)
2) Split the 4" piece of wood into 2 equal halves lengthwise using the maul and froe.***

3) Each piece is then placed in the auger-jig flat side down. Auger a one inch hole in the center of the piece of wood. Please take care of all tools; never let them touch the ground and oil after use.

* Divide students into pairs for these steps.

**TIPS:**

1) If the candles are too big for the holder, pinch the base before it's hard.
2) For a tighter fit, pour a little wax into the holder before inserting candle.
Plant Dyes

OBJECTIVE

Students will be able to use plant materials to create various colored dyes and will be able to use these dyes to create a painting and/or dye cloth.

ACTIVITY

This is an activity designed to have students collect plant materials to make plant dyes. The students can use these dyes to paint pictures of the things they saw while they collected the materials or to dye cloth for later use in art projects.

Make use of the collecting time to teach conservation practices in collecting. The materials collected should not noticeably change the environment of the area in which they were found. In some parts of the country and in national parks, it is against the law to pick wild flowers and plants. Find out if this is the case in your area. Also investigate to avoid any poisonous plants. Be sure to supervise carefully your students throughout this activity. Make sure no students attempt to taste any of the plants or berries they collect.

The plant materials below may be available in your area:

<table>
<thead>
<tr>
<th>Color</th>
<th>Plant Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue-violet</td>
<td>Cherry roots</td>
</tr>
<tr>
<td>Purple</td>
<td>Elderberries, black raspberries</td>
</tr>
<tr>
<td>Reddish-purple</td>
<td>Pokeweed berries</td>
</tr>
<tr>
<td>Red-pink</td>
<td>Dandelion roots, cherries, strawberries, red raspberries, cardinal flowers, sorrel roots and bark, red oak bark, hemlock bark</td>
</tr>
<tr>
<td>Violet</td>
<td>Grapes</td>
</tr>
<tr>
<td>Blue</td>
<td>Blueberries (boiled)</td>
</tr>
<tr>
<td>Dark brown</td>
<td>Walnut husks (boiled)</td>
</tr>
<tr>
<td>Reddish brown</td>
<td>Buckeye husks</td>
</tr>
<tr>
<td>Yellow</td>
<td>Goldenrod (boiled), willow leaves, March marigolds, ash (inner bark), St. Johnswort flowers (boiled), onion skin, tulip trees' leaves, ragweed, burdock, Osage orange roots and bark (boiled)</td>
</tr>
<tr>
<td>Rose tan</td>
<td>Birch bark, willow bark, sassafras roots</td>
</tr>
<tr>
<td>Green</td>
<td>Plantain leaves and roots (boiled), nettle (roots, stalk, leaves), lily of the valley leaves</td>
</tr>
<tr>
<td>Yellow-orange</td>
<td>Bloodroot (boiled)</td>
</tr>
<tr>
<td>Salmon</td>
<td>Cherry bark</td>
</tr>
<tr>
<td>Black</td>
<td>Walnut husks, sumac leaves</td>
</tr>
</tbody>
</table>
Procedure:
Chop all materials. Boil each kind of material separately. Strain. Add alum – \(\frac{1}{4}\) to \(\frac{1}{2}\) teaspoon (1 to 2 milliliters) to 2 cups (473 milliliters) of liquid. (Alum helps to make the dye colorfast.) If curdling occurs, add cream of tartar in the same amount.

Use these materials to paint with or to dye cloth. 100% wool is one of the best fabric materials to use for dyeing since it takes the dye easily. Your fabric should be simmered in the dye for at least 30 minutes. Wring out the dyed fabric. Wash repeatedly in baths of cold water; repeat until the water is clear. Hang the fabric to dry.

This activity could be valuable as a portion of a unit on early life in the United States.

EXTENSIONS

1. Make a color wheel using dyed material and indicating the plant sources of the colors represented.
2. Get some raw wool or unravel some wool yarn. Make a simple spindle. Spin the wool. Make a weaving.
Natural Art

OBJECTIVE

Students will be able to discuss nature as a source of art materials and inspiration for people.

ACTIVITY

Help your students make a large wheel of colors they think they can find outside in nature, including browns, tans, and grays. Then take the class on a short hike outside and ask the students to try to match objects in nature with sections of the color wheel. Discuss with the students the concept of nature as a source of art materials and inspiration for people. Also discuss with them such things as the potential impact of use of the environment for art materials including negative effects through misuse.

The following activities suggest the use of materials gathered from the natural world. Before participating in this activity, please talk with your students about the importance of taking care not to do damage to the environment in the process of gathering the materials to be used.

VARIATIONS

1. Find natural materials in a variety of colors and display them on a large bulletin board. If the students gather these during a class walk, use this opportunity to discuss conservation practices in collecting. Help students develop some classifications, classify the materials, and explain why they placed each material in a certain category.
2. Use natural materials to create a mobile, collage, or scene.
3. Make crayon rubbings or charcoal rubbings (with burnt wood) using various textured natural materials such as bark, leaves, seeds, rocks, and sand. Simply place a piece of paper on the object with the texture you find interesting and then rub the crayon or charcoal on top of the piece of paper, pressing firmly.
4. Use leaves, dried seeds, ferns, and other natural materials to create forest creatures (real or imaginary) and then name them. For example, glue acorns, nuts, cones, and similar materials together to make "seed" people or animals.

5. Use natural materials dipped in paint to make designs. For instance, roll paint-covered pine cones over paper to make prints.
6. Make a design on dark paper. First apply glue to paper, then shake on sand, soil, or crushed materials. Allow to dry completely before displaying.

EXTENSION

Using paints or other art materials, help your students make a second color wheel representing colors found within the classroom. Compare the two color wheels. If the class decides some colors from "outside" are missing from the classroom, you and they can invent some ways to bring the colors inside.
Wind Hunt

Making and Reading an Anemometer

Materials
1 table-tennis ball
protractor
cellophane tape
scissors
1 small fishing sinker or weight
2 pieces heavy thread 20 cm (8 in.) long

Steps
1. Tie the sinker onto one piece of thread. On one side of the protractor’s straight edge, tape the thread exactly on the vertical line, making sure that the sinker hangs down just to the zero angle mark. Do not let the sinker hang below the bottom of the protractor. Cut off any extra thread above the tape on the straight edge.

2. Tape one end of the second piece of thread onto the table-tennis ball. Tape the other end of the string to the vertical line on the opposite side of the protractor from the thread holding the sinker. The ball should hang 3 to 5 cm (1 to 2 in.) below the bottom of the protractor. Your anemometer is finished.

3. To measure wind speed using the anemometer, read the angle made by the table-tennis ball thread and the sinker thread. Then use the table below to find the wind speed.

<table>
<thead>
<tr>
<th>Wind Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>95</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>105</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>115</td>
</tr>
<tr>
<td>120</td>
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**FREE SALAD**

The first appearance of fresh greens in open areas in spring was an event that the Indians and early pioneers waited for expectantly. The greens are still there, but hardly anyone bothers to eat them anymore.

**Winter Cress:**
This plant stays green until early winter and is the first green plant to appear in spring.

**Mustard:**
Still a favorite of recent immigrants. Be sure to pick it while it's still young.

**Dandelion:**
Dandelion is one of the staples of winemakers and people who eat wild greens. It is also the best known of the greens. Wild greens have a strong, somewhat bitter taste. For finer palates, they are best when mixed with lettuce.

**Shepherd's-purse:**
Another common garden weed. Leaves have a peppery taste.

**Lamb's-quarters:**
A common weed in gardens. Let it grow along with lettuce and spinach. It is a crop that never fails.
History is learned in many ways. Fossils, artifacts, ruins and writings help us to learn about our past. We can learn about how people and life have changed from time to time through the study of a cemetery.

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<th>1800 - 1899 (____ Century)</th>
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<tr>
<td>NAME</td>
<td>BORN</td>
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Group the ages of the people whose names you recorded. What was the age group most people died? What could be a possible reason for this? Could you tell how they died? (fire, disease, epidemic, war, accidents)
Epitaphs are sayings cut in the stone in memory of the dead person. Find and list some below.

1. 

2. 

3. 

4. 

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<th>sphere</th>
<th>pyramid</th>
<th>cone</th>
<th>cube</th>
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What types of rocks were used for tombstones? (marble, granite, limestone, cement) Why not wood?
PLAN YOUR OWN BURIAL SERVICE

1. Who would you want to attend?

________________________________________________________________________
________________________________________________________________________

What would you want it to be like?

________________________________________________________________________

2. Write an epitaph for your headstone, grave marker

________________________________________________________________________

3. Design your own marker. What would you want it to tell someone 50-100-150 years from now?

________________________________________________________________________

4. Write your own obituary. You may use any or all of the following suggestions or any others you may wish.

__________________________, age ___ died yesterday from...

He was a member
He is survived by...
At the time of his death he was working on becoming....
He will be mourned by....because....
The world will suffer the loss of his contributions in the areas of....
He always wanted but never got to....
The body will be....
Flowers may be sent....
In lieu of flowers....
The zodiac is a belt of twelve constellations on the apparent path of the sun as it moves through the sky during the year.

Spring is a season in the sky as much as it is on earth.

Ancient astronomers were especially aware of the changing patterns of stars in the night sky. They used the stars to predict seasonal changes and to mark important religious days.

From earth, it seems that the sun is moving against this backdrop of stars. In fact, it is the earth that is moving, not the sun.
QUESTIONS FOR SHARPENING THE SENSES

When leading a group on a hike, these questions will help the group to become more aware of their surroundings:

1. How many homes can you find? (rabbit log, bird's nest, gopher hole, cave, ant hill)
2. How many tracks, signs or traces of animals can you find? (raccoon footprints, deer tracks or leavings, rabbit scat, etc.)
3. How many signs of home-making can you find? (spider web, bird nest, ant hill, muskrat den, etc.)
4. How many plants can you find 1-inch high or less?
5. How many signs of man can you find? (rubbish, fences, telephone poles, roads)
6. What can you find under dead wood, dead bark, rocks?
7. What can you find in a stream or lake?
8. How many forms of life would not be here if it weren't for the constant water supply?
9. Find the following: a tree that has thorns — one that is dead — one that is dying — one that has dancing leaves.
10. What signs can you find that once there was nothing green living in this area? (fossils or sea shells)
11. How many different feels can you find? (smooth leaves, rough bark, sharp leaf edges)
12. How many smells can you find in your immediate area? (crushed leaves, wild flowers, sage, mint, damp places)
13. How many sounds do you hear in one minute? (wind in trees, rustle of leaves, running water, crickets, bird songs, mosquitoes)
14. How many colors can you find? (blue sky, green leaves, pink flowers, yellow flowers, etc., birds, clouds)
15. Can you find any pitfalls for the unwary? (spider web, stinkbug, stinging insects, beetles, poison ivy, sharp thorns)
16. Can you find any signs of accidents or untimely deaths?  
(tree burned, branch broken, dead insect or bird or animal)

17. How many discards can you find? (insect shells, snail shells, snake skins)

18. What do you see moving? (clouds, bird, leaves, dandelion seed, etc.)

19. What means for planting seeds can you see or do you already know? (squirrels, acorns, birds, grass and flower seeds)

20. How many parasites can you find? (living at the expense of another such as fungi, insects or man or other animals, etc.)

21. How many evidences of erosion, soil misuse, or old fires are there? (new forest growths such as poplar, ditcher, slides, etc.)

22. How many different kinds of trees are there in your camp? (sycamore, oaks, maples, elm, willow, fruit, pine, cedar, wild cherry, etc.)
Special Events may include:

- campfire
- hayrides
- special interest activities
- pioneer homesteading
- field trips to nearby points of interest
Evaluations

The purpose of evaluations is to secure input of the various groups involved. These groups would include teachers, parents, and students. Through the use of this information we would hope to improve upon future camp experiences.
October 8, 1991

Dear Staff,

Thanks to all of you once again for all your help and enthusiasm that made Outdoor Education another great one. We really appreciate your hard work and dedication. We know it is difficult to leave your own classes (well, maybe not in some cases) and your own families to join us.

We felt that this year's camp was one of the best we've had. The success of this was because you guys are so good at your jobs. You were able to jump in and take over several times when the Camp Staff let us down (I put this on the evaluation).

I hope that all of you can join us again next year. The dates are Sept. 16-18. I believe it is the 4th week of school — same as this year.

Sincerely,

Janet

I plan to go next year. _________

Suggestions and Comments ____________________________________________________________

Name ____________________________
TEACHER EVALUATION GUIDE

Please use the following outline as a guide in evaluating the outdoor education program. Please respond to each sub-topic, your comments need not be restricted to those items listed.

Your hard work and investment of time and energy is greatly appreciated. So are your candid comments and suggestions of this evaluation.

Please complete this evaluation as soon as possible and submit it no later than after ____________.

1. Resource personnel
   a. Appropriateness of presentation to sixth grade level.
   b. Attitude and rapport with students.
   c. Ability to communicate effectively.

2. Units of study
   a. Which seemed most valuable?
   b. Which seemed least valuable?
   c. Your reaction to the overall outdoor education curriculum.
   d. Suggestions for improvement, criticisms, etc.

3. Counselors
   a. Their assistance during class periods.
   b. Overall performance in working with students.
   c. Specific examples, good, bad.

4. Special areas
   a. Evening activities
   b. Teacher class activity periods
   c. Inclement weather schedule
   d. Suggestions for others

5. Physical facilities
   a. Classroom locations
   b. Sleeping quarters, students, staff
   c. General maintenance, building and grounds
   d. Other comments

6. Miscellaneous observations and suggestions
PARENT EVALUATION FORM

1. Would you endorse a resident outdoor education experience for all children at some time during their school career?
   ______ YES ______ NO

2. Was the length of the camp time ______ about right ______ too long ______ too short?

3. What immediate values did you observe at camp? ________________________________

4. What lasting values were noted? _____________________________________________

5. Did your child appear to display organizational skills during his or her preparation for camp? ______ YES ______ NO Comments ________________________________

6. What follow-up comments or ideas mentioned by your child might reflect on this experience, if any? ________________________________

7. What academic experiences were most beneficial in your opinion? ______________

8. Did you observe any social growth, individual or large group? Please mention.
   ______________________________________________________________________;

9. How would you provide for any camp expansion? _____________________________

10. What, in your opinion, could be deleted? ________________________________

(Signature - not required)
1. Name something that plants have in common with animals.

2. How is water important to plants?

3. How is water important to animals?

4. What evidence did you find that animals,
   a) eat or have eaten plants for food
   b) use plants for shelter

5. Name and tell about a plant that you learned about at camp.

6. Name and tell about a bird that you learned about at camp.

7. What new animal habitats did you observe?

8. Give two reasons why you should practice conservation.
   a) 
   b)
Outdoor Education Questionnaire Cont'd  (2)

9. **Name** four trees you learned about at camp. 1. __________________________  
    2. __________________________ 3. __________________________  
    4. __________________________  

10. Tell about any evidence you found that animals prey upon one another.  
    ____________________________________________________________________  

11. Tell about evidence of erosion of rocks or soil that you observed.  
    ____________________________________________________________________  

12. List three science lessons that you have studied in your classroom that  
    you have observed or had experience with while at camp: (Please list)  
    a) ____________________________________________________________________  
    b) ____________________________________________________________________  
    c) ____________________________________________________________________  

13. Have you developed a stronger appreciation of the beauty of nature?  
    Yes____ No____  

14. **CAMPING EXPERIENCE** (Check one)  
    _____a) This is my first group camping experience.  
    _____b) I have camped more than one time before.  
    _____c) I have camped many times before.
1. Did you enjoy this type learning experience? ____YES ____NO
   Why? ____________________________________________

2. Will this kind of experience help to reflect on your regular school
   work? ____Yes ____No. To what extent? __________________________

3. Did you make many new friends during this time ____YES ____NO

   a table waiter? Making your bed? Comment on any or all chores _______  
   ____________________________________________

5. Do you feel you know and understand your teacher better? ____YES ____NO
   If yes, in what way? __________________________________________
   ____________________________________________

6. What one activity did you take part in that you would choose as a
   favorite? ____________________________________________

7. What other activities of the curriculum did you enjoy most? _______
   ____________________________________________

8. Was there any activity you did not like? _________________________
   ____________________________________________

9. What should we do to help make next year's program even better? _______
   ____________________________________________

10. On the back of this paper, please write a short paragraph telling about
    the outdoor education program; be as honest and forward as you like.
CHAPTER IV
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this handbook is to help teachers become more familiar with learning experiences that will be gained by students in an outdoor setting. Here in this setting, many things will be taught from the school district’s course of study. It will also teach attitudes and skills for learning as well as help students build self-esteem.

Outdoor education activities invite the students to observe and analyze science and other curriculum in their surroundings. Through hands-on experiences they can develop skills of observation, inquiry, and problem solving. They will synthesize observations, form their own questions, and conclude their own answer. They will be taking responsibility for learning themselves. It is also well suited for meeting the needs of all students regardless of ability, handicaps, or age levels.

Conclusions

Outdoor experiences can have a freer atmosphere for learning as we let go of the more formal atmosphere of the classroom. The out-of-doors becomes a learning laboratory. The students see each other and teachers on a more human
level. Teachers will also observe students in many learning and social situations that would not be seen in the classroom.

Recommendations

The authors hope this guide will be helpful to teachers as they lead an outdoor experience with a group. Included are samples of lesson plans and forms that will give teachers ideas in developing and meeting the needs of their own programs.
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