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ACTIVITIES FOR MARINE & AQUATIC EDUCATION

Reprinted from

Middle Sea

Rosanne Fortner, Editor

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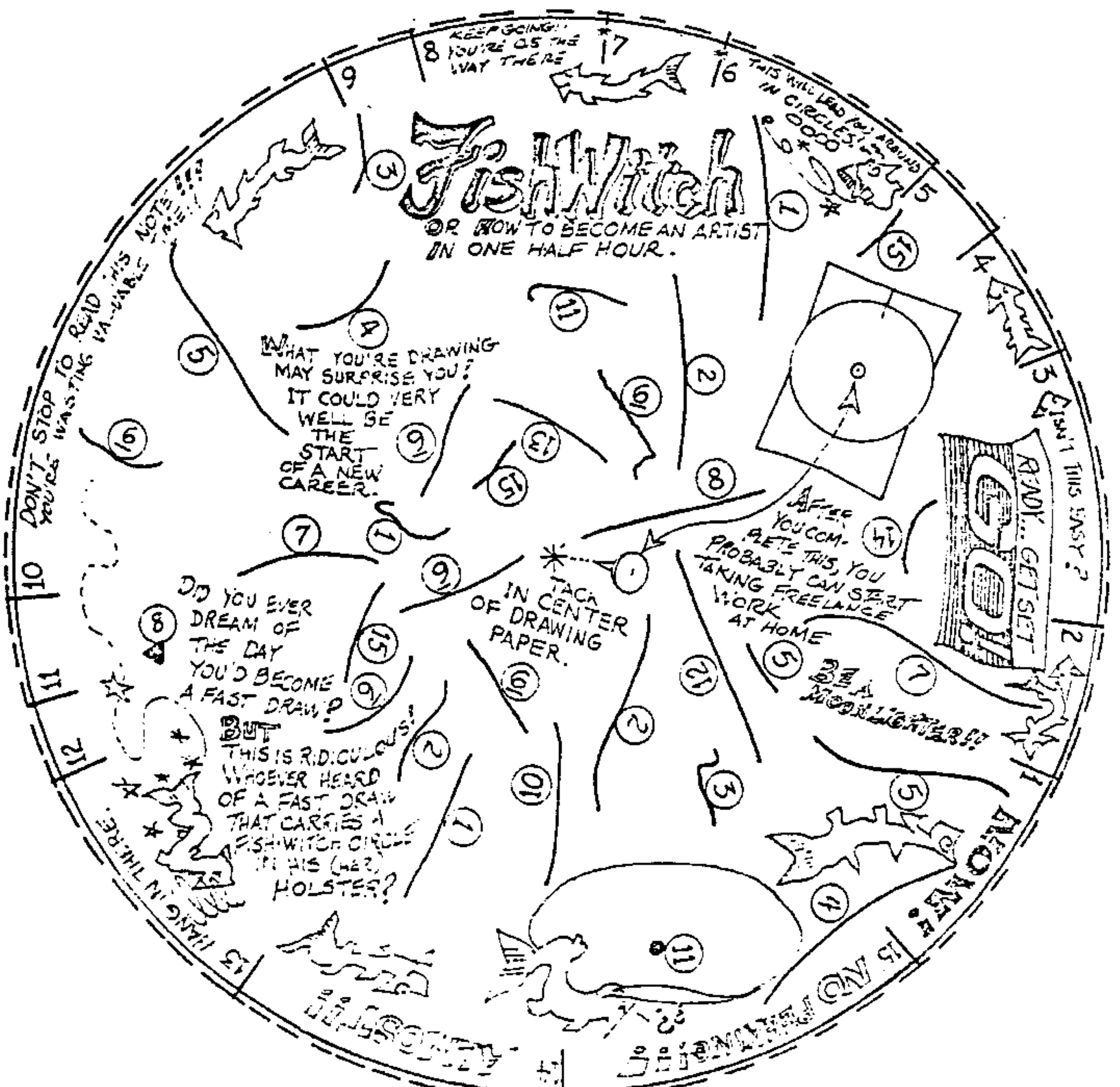
ACTIVITY OF THE MONTH

This activity was developed by the Los Angeles County Marine Science Program. They guarantee it for overcoming the "But I can't draw...," "What is this, an art class?" syndrome.

DIRECTIONS

1. Cut out the circular 'FISHWITCH' along the dotted outer line.
2. Place a piece of carbon paper about the size of the 'FISHWITCH' face down on your drawing paper.
3. Place a tack in the center of the 'FISHWITCH' pinning it to the carbon and the drawing paper.
4. Make a reference mark anywhere on the drawing paper just outside the 'FISHWITCH.'
5. Line up point 1 on the 'FISHWITCH' with your reference mark and trace each dark line numbered 1 on the 'FISHWITCH.'
6. Rotate the 'FISHWITCH' to point 2. Trace all lines numbered 2. Repeat for marks 3-15.



We anticipate the development of a question-and-answer column as a means of responding to your requests for information. To start you thinking about what you might need to know regarding the ocean or the Great Lakes, this time we will ask the questions and you try to answer them. In case you begin to "flounder," we've put the answers on page 7.

Test your own maritime heritage I.Q.

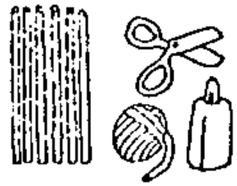
1. What percentage of the earth's surface is covered by water? ______
2. What is the number of miles of navigable (depth of 9 feet) waterways in the U.S. (including the Inter-coastal Waterway)? ______
3. Name three expressions that have become part of our language because of the nation's nautical tradition:
   a) ______
   b) ______
   c) ______
4. Name three museums that treat the maritime aspect of the nation's development:
   a) ______
   b) ______
   c) ______
5. What canal (located in the upper Mid-west) by 1930 was handling twice the tonnage of the Panama and Suez combined? ______
6. What is the present number of U.S. Naval vessels? ______
7. What percent of American trade is carried in U.S. flag ships? ______
8. What North American body of water holds the greatest promise of providing energy from tidal power? ______
9. What is the origin of the name of the following towns?
   a) Ship Bottom (N.J.) ______
   b) Nags Head (N.C.) ______
10. What American lakes also boast about a sea monster similar to Loch Ness?
    a) ______
    b) ______
11. Where could one find a map of sunken treasure ships? ______
12. What percent of coastal trade is inland waters trade? ______
13. What is an inexpensive source of prints of ships? ______
14. What percent of the nation's energy is supplied by hydroelectric power? ______
15. Name three peacetime contributions to American society developed by the U.S. Navy ______

______

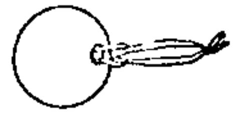
______

*Developed by Dr. Wm. Ray Heitzmann, Villanova University
Ohio Sea Grant Education Program Middle Sea Vol. 1 No. 1

Mother Nature's interacting eat-em-all meal mobile



MATERIALS: 6 soda straws (plastic are best), some light cardboard, glue, scissors, 7 strings (8" long), and 1 string [illegible] long), one long straw, or two taped together in [illegible]



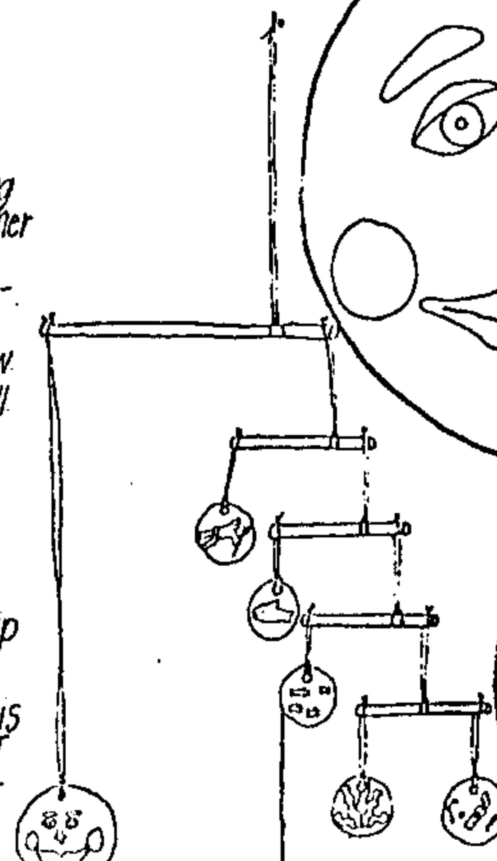
GET READY: (1) Cut out circles and color. Glue them to cardboards. Punch out holes and tie a string through each one.
(2) (For a less sturdy mobile, you can leave out the cardboard step)

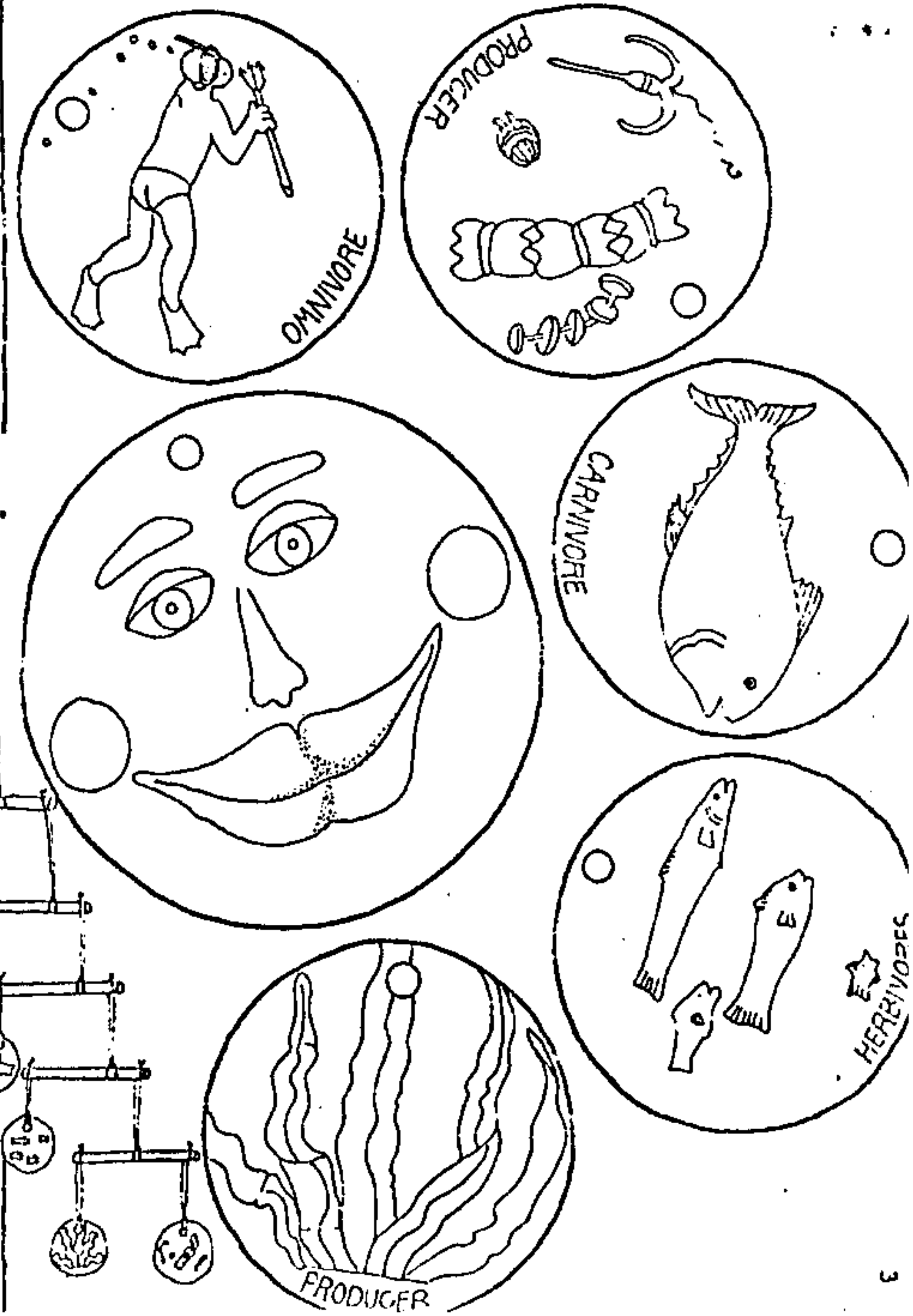
ASSEMBLE (3) A meal mobile works from the bottom up. Start by tying producers on to the ends of a straw. Loop another string around the center. Put it in balance.
(4) Now balance the producers with the herbivores, carnivores, and omnivores.
(5) Tie the food chain to one side of the big straw.
(6) Tie the sun on the other side, to balance it all.
(7) Hang it all.

TAKE away a plant, a herbivore, the sun. Who gets upset, who doesn't? Who eats who and why?

DRAW more critters in the right places on the flip sides.

REMEMBER: The live world size meal mobile is much more complex because it includes jillions of things. Factories, flowers,— and the future all hang in the balance. And [illegible] [illegible]?



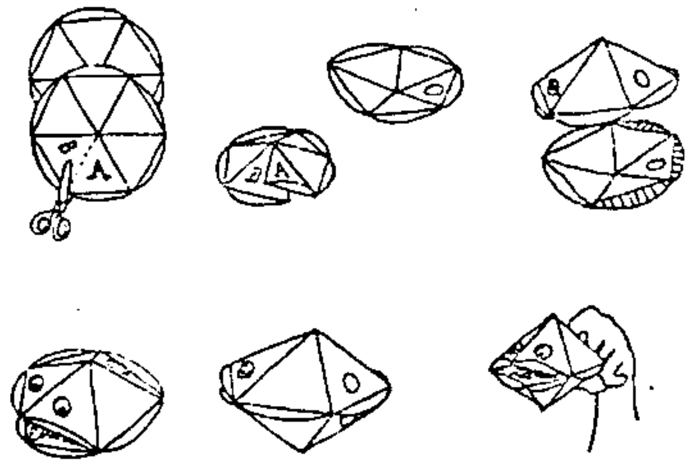


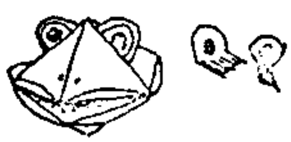
The Japanese art of paper-folding, <u>origami</u>, has an interesting adaptation in the use of circles folded into six uniform sections. These are marketed commercially by Spaceforms, Inc., of Auburndale, Massachusetts.

To make a hexigomi circle, draw a circle with a diameter of six inches. Divide it into six wedges, each 60° wide. Draw lines connecting the corners of the wedges as shown at the top of the page. Use this as a pattern to make as many hexis as needed.

The CLAM Puppet (and others): each requires two hexis.

1. Cut into the center of two HEXIS and glue the "A" sections over the "B"s to make the top and the bottom of your clam.
2. Cut a round hole in the double sections of the top and bottom, just big enough to fit your thumb and finger.
3. Glue the top and bottom together at the shaded flaps. Leave the front two open for the mouth.

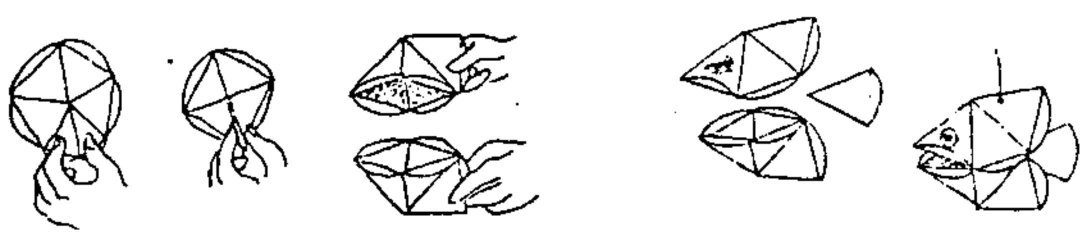




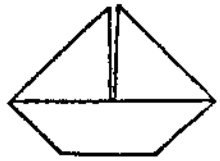
For a frog, glue on eye tabs.

Crabs get paper strip legs and pinchers.

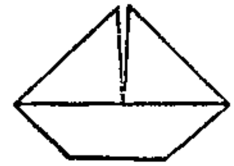
The FISH (Two hexis plus one extra triangle section).



Squeeze two triangles together and glue them to make a fin. Make two of these, then glue them together (top and bottom) at the sides. Leave the mouth open. Finally, add on the tail and decorate.



FOLD A BOAT



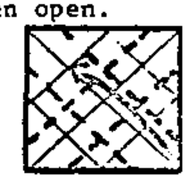
Spring is on its way (honest!), and the rushing creeks will draw our students like magnets. Wet sneakers and sleeves will attest to the interest generated by flowing water. Why not use this as a teachable moment? Here are some ways to learn from creek play.

As part of its July 4, 1976 program, the Smithsonian Institution conducted a workshop for children on how to make paper boats. Here are instructions for a fairly simple one that starts with a square of paper.

1. Fold along dotted lines shown, then open flat.

2. Fold each corner to center. Open flat.

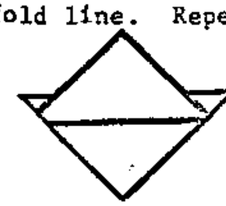
3. Fold each corner to opposite outer fold, then open.



4. Fold along dotted lines. Open.

5. Bring 2 opposite corners together. Fold. Do not open.

6. Fold point of upper layer upward along fold line. Repeat.



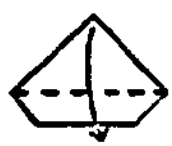
7. Hold center with fingers. Push downward inside fold closest to center.

8. At same time, pull right corner upward to meet top corners.

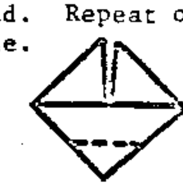
9. Repeat with left side.

10. Flatten to this shape:

11. Fold upper point of top layer down along dotted line. Repeat on other side.

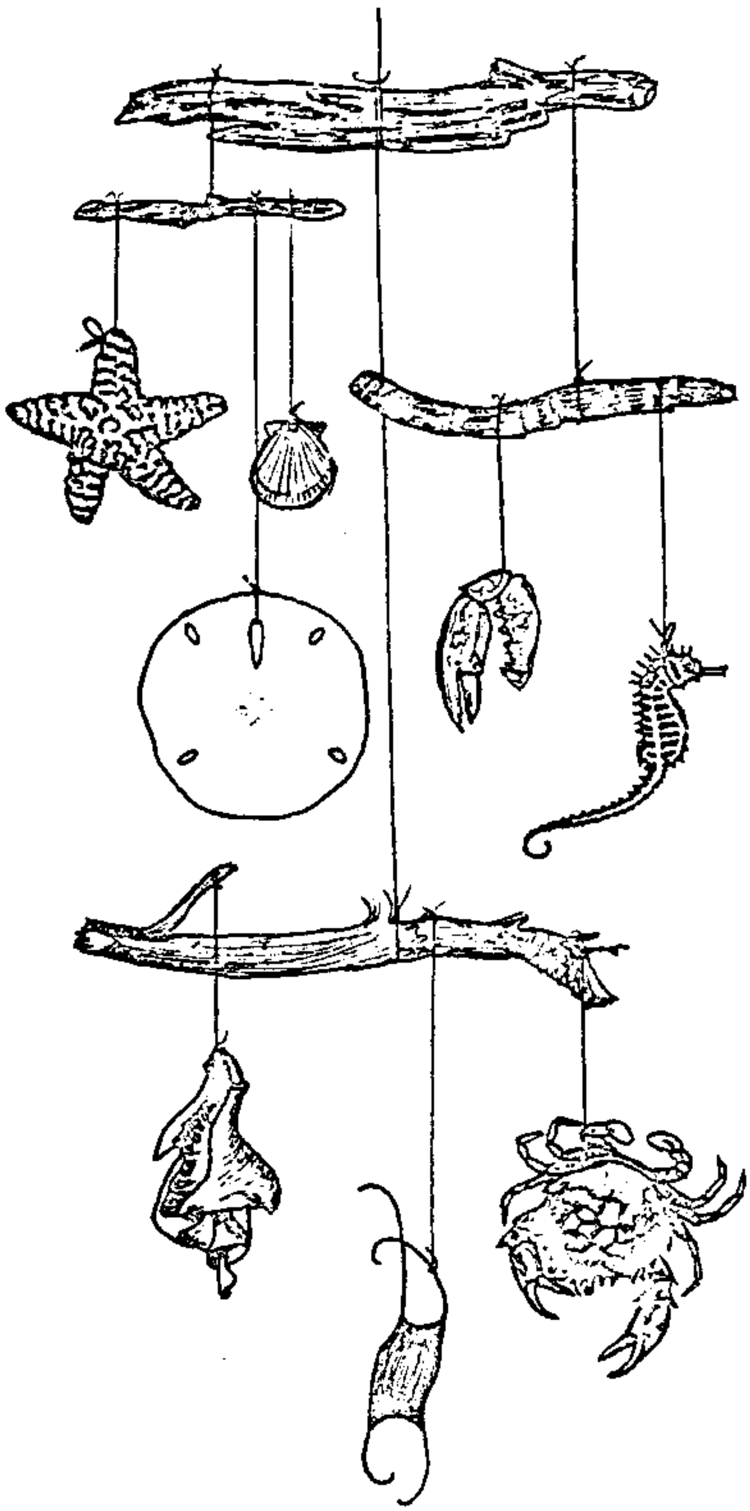


12. Tuck bottom point of upper layer into bottom opening and fold. Repeat on other side.



Now you are ready to have a sailboat race in your nearest swollen creek. In the creek, release boats at the same time at different distances from the bank. As the boats go, draw a map of the creek to locate rapids, quiet pools, deep holes, and so forth, noting for each section the effect it has on the sailboats. You may wish to time the boats from point to point, measure the distance travelled, and calculate the current speed (Rate = Distance ÷ Time).

A Marine Mobile



To display your beachcombing treasures this summer, try building a mobile. A mobile can be made of almost anything. Since its secret is balance, the objects you decide to use should be fairly light and of nearly the same weight.

Begin by selecting a supporting bar. Pieces of driftwood are ideal, but balsa-wood strips or a sturdy piece of wire, such as a coat hanger will work as well. This bar will be suspended from the ceiling by fine string, fishing line, or wire. Tie the string or wire firmly to the supporting bar, but loosely enough so it can be moved back and forth to balance the mobile objects. Bend the ends of the wire or notch the wood so the string won't slide off as you attach the objects.

Now you're ready to hang your objects. There are many things that can be chosen, but remember, they need to be fairly ligh[t]. A trip to the beach might provide shells, sea stars, bits of driftwood or feathers. The sea animals you made from hexagomi circles (Middle Sea, Vol. 2, #1) might also be used.

To attach the objects to the supporting bar, tie strings to each end of the bar. Then tie the other ends of the strings to the objects.

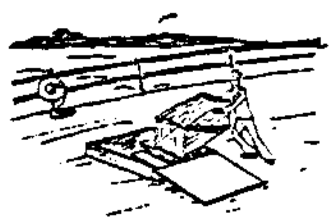
Move the strings back and forth along the bar until the mobile balances. If you want to have more "levels," add more wire bars and repeat the balancing procedure.

Knowing the Ropes

Ropes, ships and sailors have had a significant influence on the language we use every day. The language arts activities that follow are part of the coming OEAGLS investigation called "Knowing the Ropes." The entire activity will be ready for distribution by January 1.

A. Listed below are some common expressions that had their beginnings at sea. Think about what each one might have referred to on an early sailing ship. Then try to match the saying with the picture that shows its meaning. Write sentences to tell what each saying means in our modern language.

1. stand by
2. making ends meet
3. skyscraper
4. down the hatch

B. Read the following paragraphs about the original meanings of some other common expressions. On a separate sheet of paper, draw a picture that shows the original meaning for at least one of the sayings.

1. A person who "knows the ropes" today is an expert who knows what to do. In early sailing days the new sailor usually did not know much about the ship's rigging. By the time his training voyage was over, though, his discharge papers could be marked "knows the ropes."

3. Today, if someone calls you an "old stick in the mud," it means simply that you're not progressive, or that you're being grouchy. But its origins were gruesome. When English pirates were hanged, their bodies were buried in the mud of the Thames River so that no one might ever again find them.

C. The language of sailors on the Great Lakes is different from that of "salty" sailors. All vessels on the lakes are called <u>boats</u> regardless of their size. The Captain is not said to be "in command." He "sails the boat," while the Chief Engineer "runs the boat." Speed is measured in miles per hour, never in knots. A boat that can go more than about 12 mph is a "slippery" boat that can pass up all the others.

In going through the lakes, cargo boats are "downbound" if heading toward the sea, and "upbound" if heading inland. In most lakes this is easy to remember, but in Lake Michigan, a steamer going to Chicago is upbound even though it is sailing to the south! In each lake at right, can you draw arrows that point in the upbound direction?

Wetlands Activity

from Bowman, M. L. and J. F. Disinger, Land Use Activities for the Classroom, ERIC/SMEAC, 1977.

PURPOSE: To understand how development of wetlands increases probability of flooding downstream.

LEVEL: 10-12

SUBJECT: Science
Mathematics
Social Studies

CONCEPT: Natural resources are unequally distributed with respect to land areas and political boundaries thus, conflicts emerge between private land use rights and the maintenance of environmental quality for the general public.

REFERENCE: Inland Wetlands, Area Cooperative Educational Services, New Haven, CT, Environmental Education Center. ED 133 219.

ACTIVITY: When wetlands are used for the development of industrial sites or shopping centers, arrangements must be made to handle the run off that occurs during rain storms. Wetlands have the ability to store large quantities of water, on the other hand, impervious surfaces generate large quantities of storm water run off. To illustrate this point, study the following problem.

SCENARIO: You have a parcel of marginal wetland that has 800 feet of frontage on a major highway and is 1,099 feet deep. A development group has made an attractive offer for the pro perty, with the intent of filling the area and building a shopping center on the site.

Neighbors downstream for the site have expressed concern about the flooding of a small stream that runs across the back of the property.

TASK: Calculate the gallons of run off created during a two-inch rainfall if the parcel is covered by an impervious surface (i.e., parking lot and buildings).

PROCEDURE: (To calculate cubic feet of water we must multiply length of site in feet X width of site in feet X depth of water in feet).

1. Calculate the square footage of the area:
   1,009 feet X 800 feet = 871,200 sq. ft.

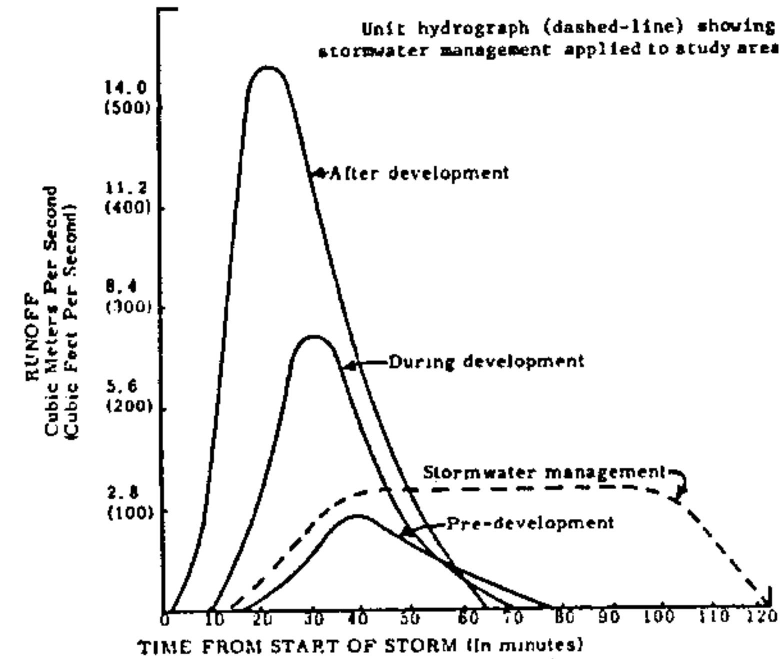
2. Convert 2 inches of rainfall to a fraction of one foot:
   2 inches/12 inches = 1/6 of a foot of rain.

3. To calculate the number of cubic feet of run off from this area, multiply:
   871,200 sq. ft. X 1/6 ft. of rain = 145,200 cu. ft. of run off.

4. One cubic foot of water = 7.48 gallons, so to convert 145,200 cu. ft. to gallons we must multiply by 7.48 gallons per cubic foot. 145,200 cu. ft. x 7.48 gallons per cu. ft = 1,086,096 gallons.

If this quantity of water drains into the stream as direct run runoff, it will raise the height of the stream significantly. Frequently, improper planning for runoff from these kinds of developments have led to serious downstream flooding.

Although the case you have just studied is hypothetical, the problem of increased runoff from development and subsequent pollution does exist. There are many cases of once natural streams becoming severely eroded or flooding because of construction activity in their watersheds. By instituting a sound program of stormwater management, runoff can be retained temporarily and the degree of discharge can be effectively maintained in a range that existed prior to development. The following graph compares the quantity of runoff from a site before, during and after development. The dashed line indicates the way in which potentically damaging runoff can be controlled through a stormwater management program.



Source: Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity, EPA Bulletin 430/9-73-007, p. 109.

As you study the graph, there are several important factors which you should observe. In the predevelopment state the peak runoff period occurred about 40 minutes after the start of the storm at a level of about 80 cubic feet per second. During development, runoff peaked at about 30 minutes after the start of the storm of a rate of about 270 cubic feet per second. After development runoff peaked at about 25 minutes after the start of the storm at about 540 cubic feet per second. With a stormwater management program the runoff peak was reached at about 45 minutes at 110 cubic feet per second and stayed at the level until approximately 90 minutes after the start of the storm.

Rhymes with a Reason

There are ten minutes left in the period, and you've stretched the lesson as far as you can. How can you contain this writhing mass of humanity until the bell rings?

Write a poem! Some very simple non-rhyming verse forms can serve to crystallize the feelings or summarize the ideas from the lesson that has just been completed. Once the verse forms have been mastered, the "concluding poem" activity can become an expected and easily implemented method of summary. (Some students write memorable verses and use them as study aids for tests!)

HAIKU

This ancient Japanese verse form has three lines with a total of 17 syllables:

five in the first line
seven in the second line
five in the third line

The subject always concerns nature, and frequently the poem is used to focus on the poet's feelings about the natural world.

Try haiku yourself to describe your view of something you love in nature. Here's mine:

Marshes are wonders,
Teeming with fresh-blossomed life,
Vibrant and fragile.
RWF, 1981

It may be hard at first to write haiku, but the most important thing is to get the feeling. Good form can come later, so keep trying.

CINQUAIN

Rather than concentrating only on feelings, cinquain (sank-an) is a more direct discription of one thing. It has five lines (cinq is French for five) and is structured as follows:

Line 1 - a single noun, the name of what will be described.
Line 2 - two words describing the noun
Line 3 - three words, an action phrase about Line 1
Line 4 - four words, the poet's feeling about the subject
Line 5 - one word that renames the subject. (Some say Line 5 should be 5 words that complete a sentence begun in Line 1.)

Participants in our recent workshop at Ottawa Wildlife Refuge came up with these cinquain verses:

Zooplankton
Important, microscopic
Flows with waves
Lifeline to ocean life
Animals
Reed M. Oestreich
Woodville, Ohio

Oceans
Choppy, blue
Rolling toward land
Makes man feel small
Seas
Rose M. Jones
Pemberville, Ohio

SYNTU

This is the easiest of the verse forms to work with, because it is less demanding in the number of words or syllables required. It goes like this:

Line 1 - one word, the name of something
Line 2 - an observation of thing named using one of the senses
Line 3 - a feeling about the subject
Line 4 - another observation of Line 1 using a different one of the senses
Line 5 - a one-word synonym for Line 1

My first efforts at syntu produced this one:

Sand
Gleaming white along the shore
Threshold of my mind's wanderings
Warm beneath my feet
Beach
RWF, 1981

Spotlight on OEAGLS

The original mission of Middle Sea was to inform teachers about the development of Oceanic Education Activities for Great Lakes Schools (OEAGLS). There are now 23 OEAGLS available for use by middle schools. Here are some segments of one of the newest activities.

PCBs IN FISH: A PROBLEM?

During the summer of 1978, New York State closed down many of the fishing areas on Lake Ontario. This was done to reduce the chance that people would catch fish containing PCBs and eat them.

The PCB story is a classic one on how we have knowingly created a threat to our health and that of animals that share our planet. This happened while providing something that improved our living standard. PCB is produced from petroleum. It is very useful as insulating material. It will not burst into flame at high temperatures, and so is used in electrical transformers and capacitors. It has also been used in a variety of consumer products. These latter uses have been banned since 1971.

Are PCBs found in fish from Lake Erie? In 1979, the Ohio Department of Natural Resources measured the PCB concentration in white bass, collected at six different places on Lake Erie. The chart below has the data that were obtained.

Size	Bono	Port Clinton	Sandusky Bay	East Harbor	Cedar Point	Lorain
8-8.9"	0.72	0.78	1.4	0.68	0.37	0.46
9-9.9"	0.56	2.0	0.61	0.46	0.84	0.80
10-10.9"	0.96	2.3	0.42	0.93	0.88	1.0
11-11.9"	1.4	0.97	1.2	1.0	1.3	1.0
12-12.9"	1.9	1.6	1.2	1.5	1.0	1.4
13-13.9"	1.7	——	1.8	2.6	2.4	——

Concentration of PCBs in White Bass taken from Lake Erie in 1979.

On a piece of graph paper, construct a bar graph of the data from East Harbor and answer the following questions:

1. How is fish size related to PCB content?
2. What could cause this relationship?

Construct another graph with the data from Bono.

3. Do you see the same relationship?
4. Does the relationship seem to hold for fish taken at each of the sites?

Locate each of the sites on a map of Ohio.

5. Is the concentration of PCB in the fish related to the site at which they are obtained?
6. Which site seems to have fish with the highest concentration?

PCBs are found in Lake Erie fish—but are they dangerous? The Food and Drug Administration, using information from the occurrence of PCB poisoning in Japan and from studies of laboratory animals, has established a standard of 5 ppm of PCBs. This standard remained in effect in 1981. The FDA has proposed lowering it to 2 ppm as the maximum allowable concentration in fish used for human consumption. The white bass is an important food and sports fish.

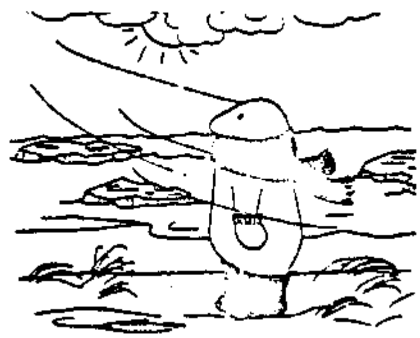
7. What would you recommend to a fellow sportsfisher about eating white bass caught on a fishing trip to Lake Erie?

(Note: These data, though sketchy, do suggest that there should not be any problems in consuming white bass that have been taken from Lake Erie, since even the recommended standards were only slightly exceeded in two locations.)

In the OEAGLS investigation, this activity is preceded by a demonstration of the dilution factor indicated by "parts per million". It is followed by a role-play simulation in which students are provided with role descriptions that will enable them to represent various experts from governments and interest groups. They attempt to determine a policy regulating the use of contaminated fish from Lake Ontario.

To order a copy of the student workbook and teacher guide for PCBs in Fish: A Problem?, send $1 plus $1 for postage and handling to Ohio Sea Grant Education Program, 283 Arps Hall, 1945 N. High Street, Columbus, Ohio, 43210. A free catalog of other OEAGLS materials is available from the same address.

WINTER WATER STUDY



Since the winter issue of Middle Sea comes fairly late in that season, we thought you might appreciate having this activity now so you can make plans for using it later. The activity was developed by Ned A. Mosher, Supervisor of Outdoor Education and Science for Westerville Schools, as an assignment for last year's inservice course in Marine and Aquatic Education.

Rationale

There are good reasons why ecology field work should be pursued in winter. For one reason, the winter season is entirely included within the academic school year. For another, winter is the time of greatest stress for most forms of life and thus a critical stage in the life cycle. In this regard, aquatic life faces a special complex of problems that do no affect terrestrial organisms. Winter field work in aquatic ecology reveals unfamiliar situations that should be understood to fill out knowledge of the yearly cycle of life.

The Old One-Two

The freezing of the surface of bodies of water is the first of a one-two winter death blow. Ice prevents the surface exchange of gases with the atmosphere. Aquatic life then depends upon photosynthesis by water plants to furnish life-sustaining oxygen and a rationed food web for weeks or months until there is a thaw.

All life clings to this photosynthetic thread that is at the mercy of the first snowfall--the second blow. Whether measured in inches or feet, for all practical purposes snow shuts off light, and competition for the limited supply of oxygen begins. The plants, no longer photosynthesizing, compete with animals for the oxygen the plants themselves once released. Decay of bottom material also consumes oxygen, a factor greatly increased in eutrophic lakes and polluted water. Studies indicate that under these conditions, the consumption of oxygen by decomposing bacteria is greater than all other factors combined.

As anaerobic conditions develop, the less tolerant vertebrate species begin to die off (we are not considering animals that hibernate in the bottom mud). Their decomposition starts a geometric progression of dissolved oxygen consumption by micro-organisms, while the concentration of carbon dioxide increases. Anaerobic bacteria also produce measurable quantities of methane, hydrogen sulfide, ammonia, nitrogen, and carbon monoxide. A hole in the ice will release these gases, giving off a sewer-like stench of putrefaction, a clue to conditions below the surface. Shallow lakes are most likely to reach this extreme.

If a thaw does not release the stranglehold, a near total collapse of the ecosystem will result. Near total, because even in the worst cases there are usually enough survivors to restore the species balance, a further significance of the great reproductive potential of most aquatic organisms.

Finding Out For Yourself

Winter thus provides ecological conditions unlike those at any other time of the year, offering opportunities for field work of unusual interest. Of course, the regular organizational and safety rules for field trips apply, while in addition students should be cautioned to wear adequate cold weather clothing, including headgear, footwear, and gloves, items seldom associated with youth. The trip should be conducted when a deep freeze has produced a thick ice cover strong enough to bear the weight of the class safely but not after a heavy snowfall. Areas extensively used for ice fishing are places where greatest abundance of winter aquatic life may be found. If safe and satisfactory ice-covered areas are not available, many of the procedures described below can be conducted to some extent from shore, or better, from a bridge or dock.

EQUIPMENT:

Ice auger or spud bar	Secchi disk
pH paper, testing kit	Plankton net
Plant grappling hook	Water samplers
Small jars for plankton	Dissolved CO_2 testing kit
Masking tape for labels	Plastic bags for plant material
Dissolved oxygen testing kit	Fishing line, hooks, bait, etc.
Thermometer	Ruler
Food color	Sounding weight and line

-continued-

Winter (continued)

PROCEDURES:

Divide the class into groups, assigning collecting stations and specific activities to each group. The collecting stations should be arranged so that shallow and deep areas are sampled for contrast. If there are enough students, a line of stations could be set up across the lake from near shore to the deepest area. If time allows, students should take samples at more than one station, also switching jobs to become familiar with all collecting procedures. The appropriate data should be recorded on the spot, using a data card form that can be drawn up for the desired information as described below.

1. Ice depth - The ice auger or spud bar is the most effective way to get through the ice. There are a number of different types and all are easy to operate. The safety of blue lake ice is 2" safe for man on foot, 3" for groups single file, 7½" for light auto and 12" for 2 ton truck. Slush or "snow" ice is only half as strong and new ice is stronger than old ice.
2. Light penetration - A secchi disk is the most effective means of measuring light depth or the photic zone. The black and white disk is lowered into the water and the depth at which the disk goes out of sight is recorded. The disk is raised and the depth at which it reappears is recorded. The average of the two is taken as the reading for light penetration. Doubling that depth gives you the photic zone.
3. Water currents - To test for water currents, release some food color into the water at an ice hole and observe the rate and direction of its movement. The ice thickness and snow cover can be measured the same time.
4. Plankton collecting - Lower the plankton net through the ice hole to within a few feet from the bottom and then raise it. Repeat this several times and plankton will collect in the jar at the end of the net.
5. Bottom vegetation - A grappling hook is lowered through the ice hole and used to snag the vegetation, which should be placed in the plastic bags. Examination may take place back inside the lab. Do not allow the plankton or vegetation to freeze while in the field.
6. Water sampling - Temperature, pH tests, O_2, CO_2, and color observing or any other tests can be obtained quickly as soon as the sample has been collected.
7. Water depth - A sounding weight may be lowered into the ice hole to determine the depth of water. A line or cord marked in one foot intervals makes it easy.
8. Ice fishing - If success comes, each fish should be identified, measured, weighed, and cleaned along with its stomach contents checked for dietary information.

Later Activities and Discussion

Draw a cross-sectional profile of the pond or lake studied, using contour lines to show the thermal gradient, O_2, CO_2 concentrations, pH levels, ice and water depths. Include some ideas of bottom plants.

1. Relate these physical factors to the size, depth, water circulation, and other features of the body of water studied.
2. What source of error exists in collecting the information outlined above and how could these errors be resolved?
3. What are some specific difficulties related to collecting data in winter as opposed to summer? Are there any advantages to winter work over summer work?
4. Construct a food web or pyramid based on the information gathered; draw a food chain for the area studied.
5. Assign a role of producer, decomposer, herbivore, primary or secondary carnivore to each organism collected.
6. Based on previous work or research, compare the physical information gained in this field work with that typical of a summer aquatic study and explain the difference.
7. Do the same for the biological information gathered.
8. Is the body of water studied subject to winter kill?
9. If winter kills are possible in the study area, suggest some measures that might prevent them.
10. Compare how winter might affect succession and long term development of a lake in an area where lakes freeze in winter compared to an area where freezing weather is uncommon.

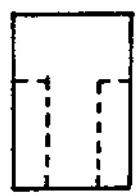
ORGANISMS IN A BOTTLE

One of the learning centers we use in the introductory session of our workshops was developed by Texas A&M Sea Grant's Education Program. This makes an ideal rainy recess or "finished early" activity for elementary schools, especially if several are available and have different kinds of pictures: marine mammals, coastal invertebrates, Lake Erie fish, shore birds, and even historic ships (if you want to start some non-organism bottles).

Preparation:

(1) Cut a slit 1½ inches wide by 2½ inches long in the edge of a plastic 1-gallon milk jug.

(2) Cut 5 x 8 note cards into a T-shape, thus:

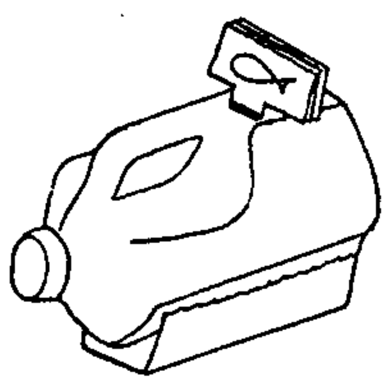


(3) On the wide top of each T, place a picture of an aquatic animal or plant. We used some stamps from a Golden Book and others from the National Wildlife Federation. For pictures of Lake Erie fish, order our "Getting to Know Your Local Fish" activity. Ordering instructions are on page 2.

(4) Across the narrow stem of each T, write the name of the organism pictured.

(5) Place the cards in the milk jug slit so that the names of the organisms can be seen when you look into the neck of the bottle.

(6) Make a wavy frame from corrugated cardboard to hold the milk jug in the position shown.



Directions:

Look at the picture on the front card. Do you know the name of the sea animal shown? Check your answer by looking in the neck of the bottle.

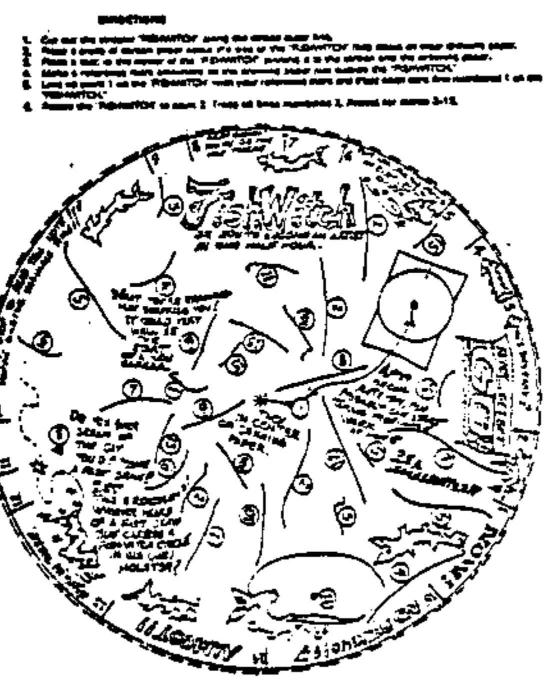
Move the front card to the back of the set and try to name the rest of the animals.

WORKSHOP SPINOFFS

Barry Moore teaches math and algebra at Kennedy Junior High in Newark. As his project for one of last year's marine and aquatic education workshops, he developed the following ideas for his math classes.

Applications of mathematics can be found in many different fields of study. For example, one can find examples of mathematics being used in art, geography, history, music, social studies, science, etc. The study of Marine and Aquatic Education is no exception. Here one can find examples of applications of mathematics also.

In teaching algebra, Barry makes up his own word problems which relate to marine and aquatic education. For example, in rate-time-distance problems, problems can deal with traveling from one point to another by means of water, as in OEAGLS "Geography of the Great Lakes." This type of problem can also help in the teaching of vector-addition and vector-subtraction. In most mathematics textbooks, word problems involving airplanes are used to teach working with vectors. The same concept can be taught using a person swimming in the water, or a boat in the water, because the student must be aware of the differences in traveling with or against the stream to solve the problems. Another example is to consider crossing a fast moving stream. Here, one might aim the boat upstream to land at a point exactly across the stream. Here the student would be relating mathematics to a marine or aquatic situation.



Barry also recommends use of the "Fishwitch" art activity (Middle Sea, January 1979) in teaching. This can be set up at an extra desk in the classroom. After students have finished classroom work, then they can on a voluntary basis do the fishwitch. This activity gives practice in following directions in a numerical sequence. Barry plans to make up different pictures of fish, ships, etc., that give a result similar to the fishwitch. Instead of just going in a numerical sequence, he would make up problems involving addition, subtraction, multiplication and division. The only lines to be traced would be the ones representing the answer of the mathematical problem.

Kennedy Junior High has a resource and study lab for students working on special projects. "To Harvest A Walleye" would be a good game to put into the lab to help students practicing their addition, subtraction, multiplication and division. The students would become acquainted with a biomass pyramid and gain a better understanding of how the different organisms are related to each other in a food web, all while practicing their mathematics. "Yellow Perch In Lake Erie" is another game that involves the students in practicing their basic math processes. While using this game, a student can become familiar with the life cycle of the yellow perch, and with the factors that affect the perch population during its life cycle.

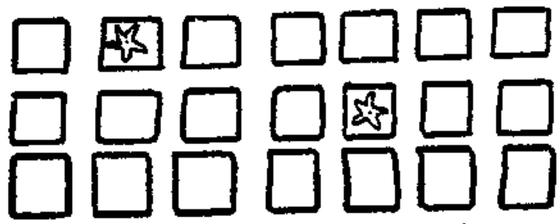
As a group project, the students who have played the games can do more research on the main topics and give an oral report to the class. Hopefully, this will stimulate more interest in other students to become involved in the game projects.

Finally, using OEAGLS "Erosion Along Lake Erie," students find distances, average distances, recession rates, surface areas, cliff heights, volume, and losses due to erosion along the lake. In Barry's own words, "There seems to always be room for new ways of teaching mathematics. The marine and aquatic approach may be an interesting one for the students." Our thanks to Barry Moore for sharing his ideas with us.

Try These:

Below are some of the activities assembled by Ramona Mercer, Betty Minneman and Michele Henson as a part of a workshop project. These teachers are with the Maumee City Schools' GATE Program (Gifted And Talented Education). The activities should be useful for elementary classrooms.

CONCENTRATION GAME. Have each child in your class draw two of the same aquatic objects on two 3 x 5 cards. This can be part of an art activity. When the children have completed this task you have a perfect concentration game. The object of which is to remember where cards are in order to make pairs.



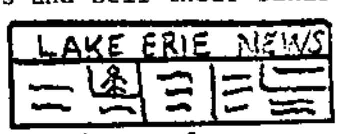
MYSTERY BOX. Take an old shoe box. You may wish to cover it with contact paper. Cut a hole large enough for a student's hand to fit in. Place an object in the box. Can the children guess what is in the box? (Suggestions: shells, sand, coral)

CREATURE FILE. Provide each child with a 5 x 7 note card. On the blank side the child is to draw or paste a picture of a favorite water creature. Underneath print the creature's proper name. On the other side the child should research the following information and print it out.

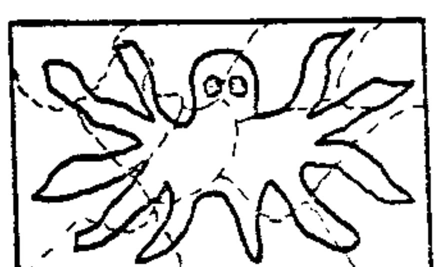
Name:
Environment:
Eats:
Moves by:
Color:
Size:
Other Information:

Place these in a file box in alphabetical order.

NEWSPAPER. Have your class put together a Lake Erie News. Each child is responsible for one article. Cartoons and games relating to lake life may be included. Your class may wish to make copies and sell their finished product.

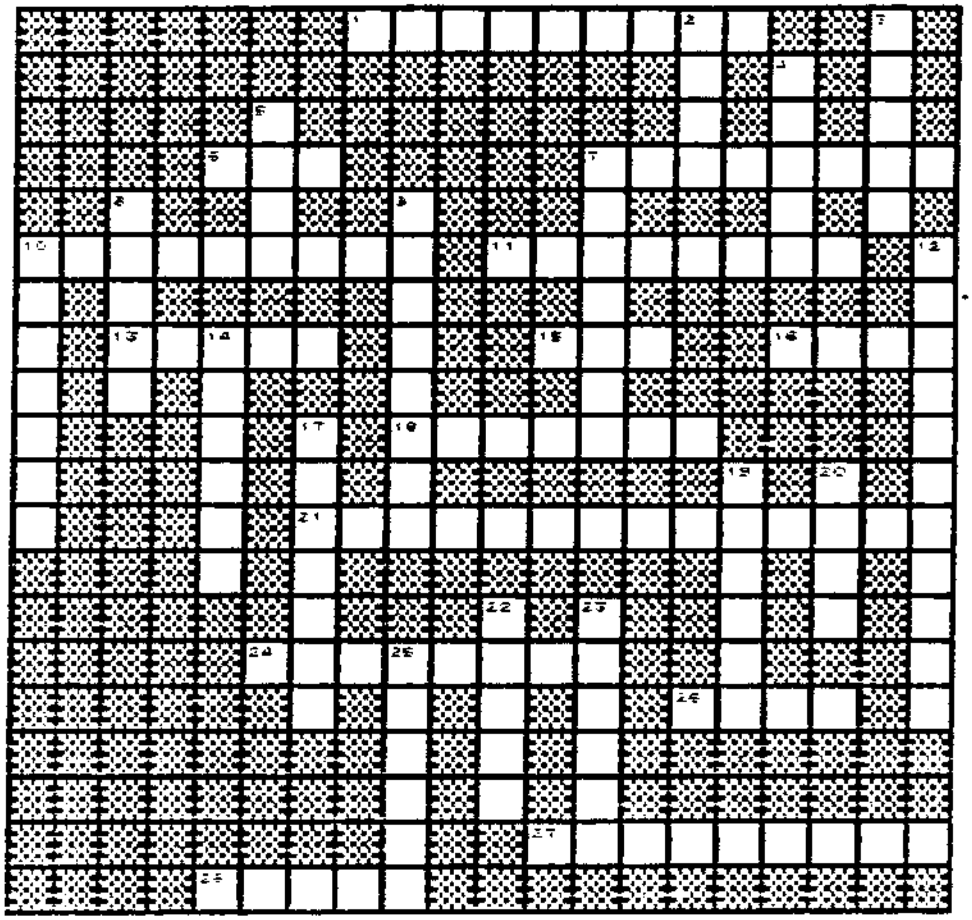


CREATURE PUZZLES. Draw or cut a picture from a magazine. Place it on card board. Laminate or contact paper your picture. Cut the picture into 8 pieces, less if it is a small picture. Place your puzzle in an envelope to share with others. Make up a title for your puzzle.



STATE OF LAKE ERIE CROSSWORD

In the Autumn issue of Middle Sea, we published "State of the Lake" by Linda Schein. As part of a workshop assignment, Karen J. Schunk, a teacher at Northwest High School in Cincinnati, developed this crossword on the same topic. Your junior high or high school students may enjoy this learning experience.



ACROSS

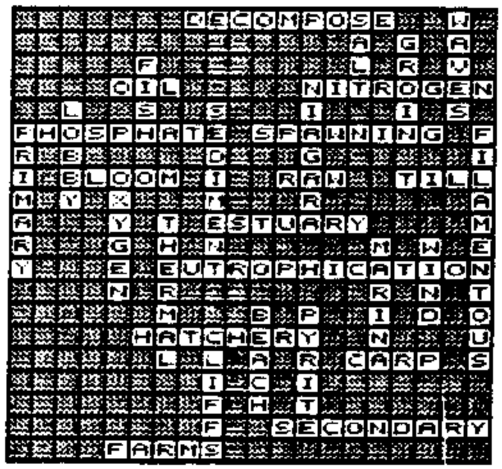
1. Bacteria and fungi do this to dead plant and animal bodies.
6. Canada drills in lake for this product.
7. Fertilizers often contain this element.
10. Used in detergents; a nutrient in Lake Erie
11. Fish breeding
13. Large seasonal increase in algae
15. Untreated, as in sewage
16. Glacial material in cliffs along eastern basin
18. Drowned river mouth rich in plant and animal life
21. Aging process in a Lake
24. Place where stock fish are raised
26. Rough fish that tolerates pollution
27. Sewage treatment to get rid of phosphates and other minerals
28. Source of silt, nitrogen and phosphates in Lake

DOWN

2. Mined in central basin area
3. Cause erosion along unprotected cliffs
4. Barrier perpendicular to shore; traps sand
5. Finned lake vertebrates
7. River that carries water from Lake Erie
8. Pressure brought upon lawmakers
9. Soil particles that settle from water
10. Sewage treatment that eliminates biological contaminants only
12. Long, threadlike form of algae
14. Death of green plants results in lack of this gas
17. Pollution by heated water
19. Boat docking area
20. Creates waves
22. Natural shore protective feature
23. Weathers to produce sulfate
25. Undergo serious erosion in central and eastern basin

(Solution on back)

Crossword Answers:

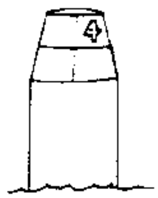


Street Signs for Sailors

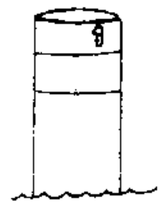
Do sailors have "street signs" to guide their travels? Yes, they do, but in the form of a buoyage system. Grove City teacher Marc Chesser compiled the following information to teach these "street signs" for sailors.

Most buoys are positioned so that they mark the best channel for boats to navigate in a river, lake, or harbor. These buoys are painted red or green. Buoys float in a fixed position because they are attached to a concrete block which rests on the floor of the channel. In order to be sure that they are noticed, buoys sometimes carry lights, bells, whistles, or horns. All black buoys are now being changed to green.

Buoys that have different shapes have different names. Buoys that have a conical outline are referred to as nuns. Cans are buoys that have a cylindrical outline.



Nun Buoy



Can Buoy

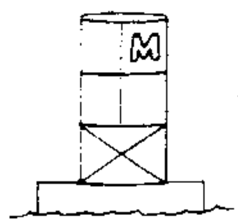
The most common buoyage system has one basic rule. When returning to the land from the sea, a boat must leave all red marks to starboard (right) and all green marks to port (left).

"Red, Right, Returning"

When going out to sea, the markers should be treated in the opposite manner: red to port (left), green to starboard (right).

Daymarks are navigation markers that are used in shallow water. Both the color and the shape of the daymark is important. When returning to the land, triangular daymarks are kept to starboard and square daymarks are kept to port. When going seaward, triangular daymarks are kept to port and square daymarks are kept to starboard.

Daymarks



Junction Buoy

The numbers that appear on buoys and daymarks help identify them. Red markers will have even numbers and green markers will have odd numbers.

Junction buoys mark the junction of two channels. These buoys can be passed on either side. When a green band is on top, however, the best channel is to starboard. A red band on top means the best channel is to port. The letters on junction buoys are for identification.

ACTIVITY:

On a piece of poster board, each student should draw a harbor with one or two rivers running into it. The water and land should be colored in.

Each student should cut out shapes of buoys, cans, and nuns. These shapes should then be colored to convey navigational messages. Triangular and square daymarks should also be cut out and colored. These markers should then be placed on the pictured harbor.

For a final evaluation, students should be paired up and take turns navigating each other's harbor.

Middle Sea, Vol. 6, No.1,
Ohio Sea Grant

Abstracted by Sarah [illegible]

Perils Of The Perch

An innovative way to introduce students to the effects of harvesting a natural population is by playing a simple game entitled "Perils of the Perch." It was adapted by Melissa Conrath from the Carolina Biological Supply "Predator-Prey BioKit," 1976. In this activity, people are harvesting a population of yellow perch.

A freshwater lake (represented by a pan of water) is stocked with small numbers of yellow perch (represented by styrofoam packing beads). The human population fishing in the lake is initially small and represented by a small aquarium net.

The instructor must make twelve playing cards for this activity. Eight cards should say "Take Your Normal Turn." There should be one card each with the following instructions:

- Sonar instruments designed to locate fish double fishing efficiency. Take two scoops for each fisherman during this generation.
- Taconite tailings dumped into the lake by area industry. This increases turbidity and kills 1/3 of the perch population. Remove 1/3 before starting this generation.
- Rainy weather for two weeks discourages some fishermen and they go home. Remove 1/3 of your fishermen before starting this generation.
- Use this card only if fish population is below 20. If above 20, take your normal turn. Fisheries manager sets a limit on yellow perch catch for the next two generations. Fishermen must throw back 1/2 of their catch.

Certain guidelines must be followed for a successful game:

1. The first three generations must start with at least 10 fish.
2. The surviving number of fish in one generation doubles before the start of the next generation.
3. The maximum number of fish the lake can support is 100.
4. In order for a fisherman to continue fishing on the lake he must catch at least four fish, or else he will get discouraged and fish somewhere else.
5. For every seven fish a fisherman catches, word gets around that this is a good place to fish and a new fisherman comes to the lake.

Now the game can begin. Divide the class into groups of two, each group with its own lake. Start with 20 fish and 1 fisherman at the lake. Have the students draw a card at the beginning of each generation and do what it says. If it says take your normal turn, one student scoops the net through the pan without looking, one time for each fisherman present. This simulates fishing by the fishermen. The second student records the number of fish caught, the remaining number of fish, and whether or not the fisherman left because he caught too few (less than 4) or if new fishermen came to the lake for the next generation because he caught a large number (more than 7). The next generation begins by drawing a card. If the next generation has 2 fishermen, scoop through the pan twice, once for each fisherman. Repeat this procedure for 12 generations.

After the groups have completed 12 generations, have them graph their results (fish as well as fishermen, population size versus time in generations). Each group will have different results because of the variety of factors acting on the populations. Groups can then discuss with the rest of the class what happened to their populations and what factors influenced these changes.

— abstracted by Sarah Schult

Middle Sea, Vol. 6, No. 2
Ohio Sea Grant

Using Postage Stamps for Teaching

Commemorative postage stamps can serve as an excellent teaching aid for many subjects in the curriculum. The waterworks page tells where to find some ideas for math, social studies, and science, and some information about U.S. stamps in general. Watch how many water-related commemoratives appear, and take advantage of this innovative teaching aid. Here's an example of what a stamp collection could accomplish:

CAMOUFLAGE IN THE SEA

Some aquatic animals have protective coloration just as terrestrial ones do. They may be colored to match their surroundings, or have markings that confuse predators.

1. Many fish are dark on their dorsal surface (back or top and light on the ventral surface. Look at the stamps below illustrating fish of this type.

2. How does this type of coloration serve to protect the fish?

3. The bright colors of coral reef fish match the array of colors in the coral itself. Colored markings may resemble a sea grass habitat, a sandy sea bottom, or the light and dark shadows of a kelp "forest", or the markings way mimic larger fish.

Choose one of the fish below and make a drawing or watercolor picture of a likely habitat for the fish based on its markings.

Middle Sea, Vol. 7, No. 1
Ohio Sea Grant

A Do-it-yourself Legend

Loggers have Paul Bunyan; cowboys have Pecos Bill; the Ohio River has Mike Fink; but what of the inland seas? Have we no hero to call our own? No larger-than-life maker of magic? We could borrow the salt water sailors' Captain Alfred Bulltop Stormalong. Or, as teacher Vera Darmafall suggests, your students could create their own Great Lakes legends.

Legends are an effort to deal with or explain nature; an effort to deal with strange phenomena; an attempt to understand and interpret the ways of humans; and an attempt to express the universal emotions of joy, grief, fear, jealousy, and triumph.

Students should begin this activity by creating a character or hero. They will need to give a physical description of their hero, his super characteristics, his super power, and of course, his name!

What do heroes do to make them heroes? Paul Bunyan's footsteps made the Great Lakes. Pecos Bill rode a whirlwind. Mike Fink could out fight, out drink, and out shoot any man alive or dead. Old Stormy sailed on a ship so big you needed to ride horseback from fore to aft. If you walked, you needed a compass. This ship made all the bays and inlets along the American coast as she bumped them while turning.

Your students' characters may be responsible for some feature of Lake Erie. Provide students with a map of the lake. What on the map could be the cause for a legend? Reefs, shoals, islands, basins, waterspouts, marshes, swamps, and the weather are all possibilities.

Students can also consider other phenomena as the basis of their legend. How could a hero tame a storm or ride a waterspout? Mystery ships, fog horn sounds, or lighthouses could help create an exciting tale. The shallowness of Lake Erie and island names may be other inspirations for a legend.

Using these suggestions students should be able to construct a fascinating folktale for the Great Lakes.

--Vera Darmafall and
Sarah Schulz

Demonstrating Lake Stratification

Some of Lake Erie's water quality problems have been related to the stratification of the Central Basin in the summer months. During that period warm surface water does not mix with the cold bottom waters. If there has been a large growth of algae earlier in the season, decomposition of the dead algae on the lake bottom will use up the oxygen dissolved in the cold water. A period of anoxia may occur, when there is no oxygen in the bottom waters. Cooling surface temperatures in the fall eventually eliminate the density barriers between the layers of water, and mixing replenishes the oxygen through the fall overturn process.

Arlene F. Foley of Wright State University developed a demonstration of "Summer Stratification and Fall Overturn — In a Jar," for the Journal of College Science Teaching, Sept. - Oct. 1984. The following is a summary of her technique:

MATERIALS: large wide-mouth jar, food coloring, ice, water, 300 ml beaker, 300 ml flask, separatory funnel

PROCEDURE:

1. Demonstrate that cold water is more dense than warm by filling a 300 ml flask to the brim with water at 4°C and weighing it, then comparing the weight of the same flask full of 30°C water.

2. Fill a large wide-mouth jar just less than 1/2 full of water at about 35°C.

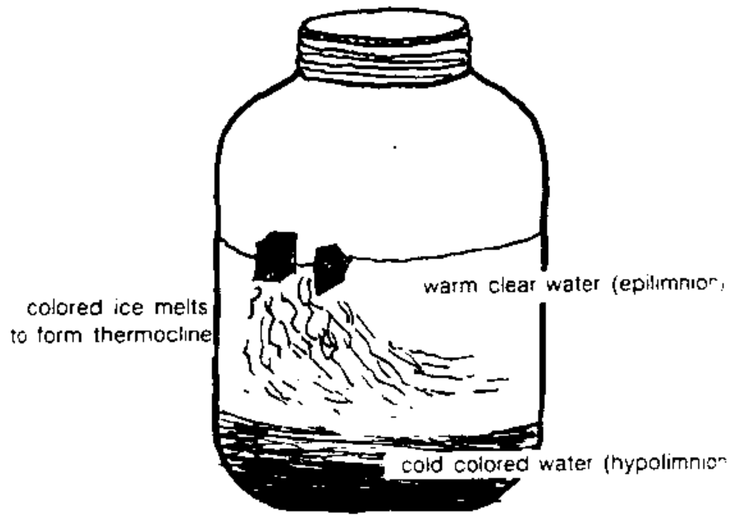
3. In a beaker melt crushed ice in cold tap water to get water at 4°C. Add 8 drops of food coloring.

4. Put the cold colored water into a separatory funnel and lower the funnel into the wide-mouth jar until it touches the bottom.

5. Open the stopcock and let the colored water slowly run out. Close the stopcock and remove the funnel without stirring the water. The colored layer will not mix rapidly with the clear water.

6. Measure the temperatures of the two layers carefully if you wish. They will change slowly but should remain separated for well over 1/2 hour.

7. To illustrate the thermocline between the two layers, float an ice cube that has been frozen with another food color added to it. As the ice melts its colored water will sink because it is colder than the surface. It warms on the way down, however, so it remains less dense than the bottom layer and settles into a layer of its own near the middle. The jar now illustrates the stratification that is common in Temperate Zone lakes of 40 foot depth or greater.



8. To demonstrate fall overturn and the effects of cooler surface temperatures in that season, gently float clear crushed ice on the top of the clear layer. As the ice melts, its water sinks. Soon the temperature is the same throughout and the layers have mixed completely. In this way oxygen and nutrients are cycled into the entire lake system again.

Middle Sea, vol 7 #?