I AM A POND. God Creates Me
Daily Intentions

Day	One	Two	Three	Four	Five
Theme	I Am a Pond	God Creates Me	I Am Sacred (Balanced)	I Love Myself	I Give Myself Permission to Be Responsible
First Article	I believe that God creates me and all that exists.	God has given to me and still preserves my body and soul and all their powers.	God provides me with food and clothing, home and family, daily work, and all I need from day to day.	God also protects me in time of danger and guards me from evil. All this God does out of parental and divine goodness and mercy though I do not deserve it.	Therefore, I sure ought to thank and praise, serve and obey God.
Theological/ Biblical Intentions	1. Discover how humans are described in the Bible 2. Review ways "water" is understood in the Bible	1. Learn that God continually creates me 2. Discover God's name, YHWH	1. Discuss baptism 2. Understand the body as sacred 3. Discover that the meaning of sacrilegious 4. Connect Sacred - Holy - Whole - Health	1. Distinguish between self love and egotism 2. Recognize that the love of self is for the sake of loving the neighbor	1. Learn the meaning of "responsibility" and "leisure" 2. Look at confession and affirmation of baptism as giving oneself permission 3. Reflect on the meaning of wisdom
Environmental Intentions	3. Learn the composition of an ecosystem 4. Study the properties of water 5. Examine the characteristics of a pond	3. Study the organisms in the pond 4. Discover the need for community	5. Learn the meaning of homeostasis (balance) 6. Review how pollutants disrupt the balance of a pond	3. Discuss how a pond belongs to a larger system 4. Review meaning of "niche"	4. Look at how ponds contribute to the wellness of the water system in the area (especially, wet lands)
Human Physiology Intentions	6. Investigate the role of water in the human body 7. Learn some of the "systems" in the human body 8. Compare the human body with a pond	5. Study cells in the human body and their frequency of replacement 6. Study the various microorganisms in the body	7. Learn the balancing systems in the body 8. Look at influences of alcohol, drugs and tobacco	5. Learn what the body depends upon from outside of itself 6. Discover that the care of the body is the care of the life within us	5. Define humor 6. Discover the function of the immune system 7. Find out how the body heals
Multi -Cultural -Racial -Gender -Religious Intentions	9. Reflect on how water has touched everything and every place and everyone throughout all of time.	7. Discuss human diversity 8. Examine the human need for community	9. Reflect on the sacredness of relationships	7. Examine the meaning of "children at risk"	8. Practice openness with others 9. Learn implications of living responsively and responsibly with others
Behavioral Leanings	10. Learn how the perception of oneself affects behavior	9. Delve into the impact humans have on each other	10. Discuss attitudes that promote use of alcohol, tobacco, and drugs	8. Reflect on diets, personal hygiene, and self maintenance	10. Practice giving oneself permission and taking responsibility

I AM A POND
God Creates Me

John E. (Jack) Swanson

PREFACE

One day I was sitting by Paul's Pond at LOMC. Someone had just drawn water out of the pond into a clear glass vial. Looking at it I could see many types of life teeming in that small wet space. I don't know what possessed me to say it, but out of my mouth came the words, "I am a pond." I became intrigued with the notion: I am a body of water. Like the pond, I have many types of life within me, and my body depends upon these organisms and organ systems to work.

I had hoped that I could find some publications that compared the human body with a pond. Much to my disappointment nothing has surfaced so far. Besides reflecting on God's creative activity in relation to my body, I am making a furtive effort to parallel the pond and the human body.

To begin, the stage must be set by introducing the characteristics of water, an ecosystem, the pond, and the human body.

INTRODUCTION
Water

Water is a phenomenal resource. It touches every part of the earth and appears in a variety of forms. Water sculpts the earth. We can see the etchings of the glaciers and the shaping of the landscape by rivers. Water has the capacity to create serenity and, when it rages, to terrorize.

Three fourths of the earth's surface is covered with water. Water comprises 70 - 80% of our bodies. Cells are made up of 70% water. All of life is ultimately dependent upon water, what it does, and what it contains. Water is the lifeblood of the earth.

In the human body everything that nourishes our cells - nutrients, oxygen, and organic compounds - must arrive via arteries and capillaries and returns via veins which contain blood composed mostly of water. For plants, 100 pounds of water are needed for each pound of new growth.

Water freezes, and therein lies one of its peculiar properties. As water cools, the molecules pack together more densely, like a rock. It becomes heavy and begins to sink. When water reaches 39.2°F (4°C), it attains its highest density. As water cools to the freezing point of 32°F (0°C) its molecular structure gradually expands and becomes less dense. Ice becomes slightly lighter than the warmer water beneath it, and it floats. Because of this, a pond freezes from the top down rather than the bottom up. As a result the heat transfer from the water is reduced, and the underlying water is protected from freezing. This is important for all sea, lake, and pond life. Thus, some living organisms, such as fish, can survive the winter.

Water holds heat well, so it responds slowly to the rise and fall of outside temperatures. Because of this, a body of water influences the area around it, warming and cooling it more slowly as temperatures change.

The water cycle is familiar to most people. Sunlight and wind cause water to evaporate. As a gas water rises from the surface of the earth. When water reaches the cooler air of the upper atmosphere it condenses onto fine particles in the air, e.g., dust, pollen grains, or pollutants, and forms a cloud. When air gets very moist it forms droplets and eventually falls to the earth as snow or rain. The amount of rainfall each year would cover the surface of the earth with water 3.3 feet deep.

More water evaporates from the oceans than falls there as precipitation on the oceans, but less water evaporates from the land masses than falls on it. The rivers act to balance the water between the land masses and the oceans. (Later we will see how the lymphatic system in the human body does a similar thing.)

The circulation of water vapor also serves to distribute heat from the equatorial regions to the northern and southern extremes of the earth. (This is similar to blood circulation that supplies heat to the extremities of the body.)

Another characteristic of water is that the electrically charged molecules of water make it a wide ranging solvent that facilitates many chemical reactions. (This is seen in the ability of water to dissolve many things.)

Basic Characteristics of an Ecosystem

An ecosystem is a community of plants and animals interacting with each other and the environment and sharing available resources within a defined area. Each species has its own niche (profession and place). A healthy community has a great diversity of species. The ecosystem takes into account the biotic (living) and the abiotic (non-living) components of a system and establishes a balance between them.

The ecosystem is energized by a process in plants called "photosynthesis." This process can be shown this way:

water + carbon dioxide + chlorophyl + sunlight
yields
water + oxygen + carbohydrates

Respiration is the way an organism metabolizes food molecules to get energy for growth and maintenance. Oxygen is consumed and carbon dioxide is given off. Healthy ecosystems experience a balance between the levels of activity of oxygen producers and oxygen users.

In most ecosystems there are producers, consumers, and decomposers as well as herbivores, carnivores, and omnivores.

"Food chain" describes the way the sun's energy passes from one organism to another. The food pyramid represents the energy loss. The food web shows the

many possible ways energy flows. The more complex the web, the more stable the ecosystem.

The nitrogen cycle is one of the most critical in the ecosystem. Five percent of the dry weight of every living cell is composed of nitrogen. It composes 79% of our air and is essential for plant and animal growth. Its most useful forms are ammonia and nitrate. This process yields amino acids which later are incorporated into protean and DNA molecules.

Some bacteria on legume roots and blue-green bacteria in water can change nitrogen gas into ammonia. The process is called nitrogen fixing. Lightning also fixes nitrogen for use in the soil. In gas form, nitrogen is unavailable.

Macronutrients are elements needed in an ecosystem in large amounts: phosphorous, calcium, and sodium. Micronutrient are elements needed in smaller amounts: zinc, manganese, magnesium, silicon, iron, and iodine.

All plants and animals have natural upper and lower limits of tolerance to temperatures. Warmer water increases metabolic rates and respiration rates.

Ecological pollution consists of 1) adding a substance that is not naturally occurring, 2) adding substances that increase the amount or intensity of a naturally occurring substance in an ecosystem, or 3) altering the level or concentration of a biological component of an ecosystem. Something must be detrimental to the ecosystem for it to be a pollutant.

Both inorganic matter and organic matter can act as noxious pollutants in aquatic ecosystems. Phosphates and nitrates are common inorganic nutrients that are introduced by surface runoffs from agricultural and domestic fertilizers in lakes and ponds. Organic pollution includes human sewage, waste, and manure. Organic matter contains carbon.

Toxins damage the ability of animals to carry out their life sustaining functions. Nutrient cycles and energy flows are short circuited. Plants and animals have tolerance levels for toxic elements, but if this tolerance is exceeded, stress occurs and resistance to disease and other hazards is lowered. Then there is death. Humans ingest natural toxins daily (about two grams) without harm.

In an ecosystem organisms have several types of relationships. Symbiosis occurs when two or more organisms live together. Commensalism occurs when one organism uses another, but the used one is unaffected. Mutualism is a kind of symbiosis in which both organisms benefit each other. (A good example of this is *Escherichia coli* which is a bacterium in the human intestine, which aids in digestion and is nourished by food consumed by the host.) Parasitism and predation describe relationships in which one organism uses another organism for its well being and draws nutrients away from it, even causing death. Competition is the striving of organisms for the same limited resources.

In an ecosystem one will find representatives of the five kingdoms into which all organisms fall.

Monera - bacteria - coils of DNA[1] wrapped in a bit of cytoplasm
Protista - one-celled microorganisms that have a nucleus, e.g., protozoa and algae
Fungi - molds and mushrooms
Animals - multi-celled organisms that cannot make their own food
Plants - multi-celled organisms that contain chlorophyll; that use the energy of the sun to make food by photosynthesis

Something needs to be said about the Kingdom Monera because until recently this kingdom had not been distinguished separately from the others. Furthermore, the Kingdom Monera has great significance for this theme.

Bacteria are made of living material called cytoplasm that is enclosed in a sac-like membrane. Most, but not all, membrane-bound cytoplasm, are surrounded by cell walls that give it structure. Some cell walls are coated with a layer of loose slime. The walls protect the cell's cytoplasm from drying out. (When we wash our hands, the soap and other detergents dissolve or weaken these walls so that disease-producing bacteria become harmless.)

Bacteria take a variety of forms: spheres or *cocci*, rods or *bacilli*, and helices or *spirilla*. We can see spirochetes and rod bacteria that are found in saliva and in scrapings taken from our back teeth or the bacteria in yogurt and cottage cheese.

These small forms of life are able to divide their DNA equally and pinch themselves in two.

Bacteria move in several ways. Some depend upon the currents of water. Others have flagella that spin and propel the bacteria through fluids.

In the human body and the pond (as well as throughout the whole world) bacteria are essential in the food chain. Their roles are tremendous even though their sizes are microscopic.

Pond

A pond is a body of water that has a muddy or silty bottom with a great variety of plants growing from shore to shore. It is smaller than a lake and is usually naturally or artificially confined. No two ponds are alike.

Temperatures in a pond vary throughout the day. The warmer the water, the

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[1]DNA - a nucleic acid composed of nucleotides. DNA is found in the nucleus (control center) of the cell where it constitutes the genetic material, or genes. It has two fundamental roles: it replicates (reproduces) itself before a cell divides, ensuring that the genetic information in the descendent cell is identical. And it provides instructions for building every protein in the body. By providing the information for protean synthesis DNA determines what type of organism you will be and directs growth and development

less dissolved oxygen is in the water[2], and the higher the respiration rate is.

Pond life depends upon photosynthesis. Photosynthetic plants and autotrophic bacteria are primary producers of organic matter in the pond. The major photosynthesizers are algae. Most animal life either eats it directly or feeds on smaller animals that eat it.

Pond mud is mostly saturated with water and devoid of oxygen. Few fungi and bacteria are able to survive in anaerobic (without oxygen) conditions. Thus, organic matter accumulates. Some anaerobic bacteria are chemotropic, i.e., use chemical reactions to derive organic nutrients for growth from inorganic elements. By-products are hydrogen sulfide which smells like rotten eggs, and methane a marsh gas, colorless and odorless but highly combustible. Nutrients are released through excretion and elimination by algae, microscopic animals, and the animals that feed on detritus (the waste at the bottom of the pond).

Water is liquid soil. When water is more fertile, there is a greater abundance and growth of animals and plants.

The relationship between pond water chemistry and nutrient levels is dynamic. Nutrients tend to be more available at certain acidic and dissolved oxygen levels and temperatures. Nutrients such as calcium and magnesium can moderate the acidity of water by acting as buffers that neutralize acids.

The pond is a zoo. It contains representatives of all the kingdoms.

Kingdom Monera - This is the kingdom of bacteria. Obviously, the pond is full of all types of bacteria. However, there is one type that stands out and needs further mention. This is cyanobacteria (blue-green bacteria), once called blue-green algae, one of the most valuable organisms on earth. It photosynthesizes and releases oxygen. Each of the cells looks like it has a coat of gelatin. When grouped together they look like a string of beads or a mass of tangled threads. These can be found on submerged rocks or growing as free-floating mats on the top of the pond. In polluted ponds phosphates and nitrates can be held in this material.

Kingdom Protista - There are several pond organisms in this kingdom. The first is algae. Algae are everywhere. These protista do not grow from seeds. They simply divide themselves. All algae contains chloroplasts which are containers for chlorophyll, which produces food through photosynthesis with oxygen as a by-product. What food alga does not use for itself is stored as starch (like rice and potatoes plants do). Over 6,500 types of green algae have been identified. Some algae have flagella to propel themselves and others fasten to stones.

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[2]This is true for gases in general; as the temperature of the solvent increases the solubility of the gaseous solute decreases. (This explains why warm pop goes flat. The "fizz" of the pop is due to bubbles of carbon dioxide dissolved in the liquid. As the pop warms, the dissolved carbon dioxide comes out of the solution and the pop tastes flat.)

Another member of the Protistan kingdom is the diatom. Over 5,000 types of diatoms have been identified. Each diatom lives inside a tiny crystal box made of silica. There are two types: one looks like a crystal bicycle reflector and another like a rowboat. When diatoms die they sink to the bottom of the pond and create a sediment called diatomaceous ooze. When this ooze dries up it is called diatomaceous earth which is used in pool filtering systems.

Amoebas are in the Protistan kingdom, too. The typical pond amoeba is *Amoeba proteus*. It is about the size of a pinhead. Its cell consists of liquid cytoplasm that is held together with a tough outer membrane. The material looks like tiny grains of sand. It is bound together with a jellylike layer. The amoeba moves by sending out a "foot" which looks like a finger in a rubber glove and then the body flows into the finger (or "foot"). When the amoeba finds food it releases a number of the "feet" to surround the food. The food is enclosed in a small bit of the amoeba's cell membrane, like a tiny balloon, with the food inside. There the food is digested and absorbed directly into the amoeba's body. Like protozoa the amoeba takes in carbon dioxide from the water through tiny openings in the cell membrane.

Ciliates are also in the Protistan kingdom. They are fast moving. (Note the name "cilia" is the word for hair found on and in the human body.) Cilia resemble eye lashes connected by a network of fibers that work in unison like many oars in a racing boat. Over 8,000 different ciliates have been discovered. They are found eating bacteria in decaying matter. They also eat algae and other protozoa. It has been estimated they can consume 2-5 million *Escherichia coli*, the common intestinal bacteria, every day. The most common ciliate is the *Paramecium*. It looks like a tiny gray speck in the water. One type of ciliate is the *didimiums*. It is the wolf pack of ciliates. It eats only *paramecia*. Another ciliate is the large stentor. It is shaped like a trumpet. Other ciliates are the *Vorticella* which are shaped like a bell, *Colpidium* which are shaped like a kidney bean, and *Bursaria* which look like a change purse.

<u>Animal Kingdom</u> - First are the Rotifers - the wheeled animals. Most are free-swimming. The one most commonly found is the *Rotaria rotatoria*. Its body is cylindrical, and its head bears the wheels. Rotifers have a nervous system, a brain, sense organs, muscles, organs that float within the body cavity, and fluid that acts like human blood. The Rotifer consumes bacteria, protozoa, and algae. Rotifers are mostly female. They lay eggs that hatch without male fertilization (parthenogenesis).

Tardigrad - Water bears. They move along the bottom of the pond with eight stumpy legs that end in hooks. To eat they suck out the contents of plants. They conserve energy when in a stressful situation by drying up and shriveling their body into the shape of a barrel.

Arthropods contain the most complex invertebrates (no backbone) known. In this phylum are Crustacea, Arachnida, and Insecta. The Crustacea include large crabs and lobsters, small water fleas, water hoppers, and seed shrimp. Water mites belong to the Arachnida (along with spiders).

Water fleas (daphnia) and water hoppers (copepoda) need to be highlighted because they are so common in most stands of water.

Water fleas are among the smallest members of the Crustacea. It resembles a flea only in the way it moves in the water. At the top of the daphnia's head there are what look like branching arms. These are antennae and are used for swimming. Daphnias favor algae for food. The water fleas have a visible heart which pumps blood around the interior of the body.

Water hoppers have two sets of antennae. The first antennae curve out on either side of the creature's head. The second antennae are smaller than the first and fold against the body when moving in the water. With this antennae and four pairs of legs the water hopper swims. The most common copepod is the Cyclops. Its gets its name from the single eye in the center of the head.

There are also many other animals, which are called zooplankton, that could be named, e.g., sponges, worms, etc.

When one sees with amazement the microscopic life in a pond, one begins to wonder about all the life within our own bodies.

Water in the Human Body

The human body is 70% to 80% water. Water is present in blood, lymph (a Latin word that means "water"), mucus, and saliva (needed for taste and smell).

Grey matter in the brain contains 85% water. Other tissues, such as fat layers, contain 25%. The body's major transport system is the blood which contains 80% water.

The control center for thirst is in the hypothalamus, which is deep in the brain. This organ senses the amount of water in the blood. If the amount of water in the blood compared to the amount of salts and other substances diminishes, the nerve cells in this organ are stimulated. In addition to creating the sensation of thirst, this organ guides production of hormones which make the kidneys conserve water. The kidneys manage the water balance, which must be kept within very tight limits.

The plasma in blood is a water solution of minerals, nutrients, and small amounts of essential compounds such as hormones plus one other essential component - the protein that makes up a major part of the plasma.

Mucus is an essential part of several organs. In many cases the activity of the organ involves acid which could destroy the organ. In a sense, mucus can protect the organ from itself.

Water is eliminated from the body by breathing, sweating, urinating, and defecating (as well as sneezing, spitting, and regurgitating).

In the eye the image of an object being seen passes through a watery liquid (the aqueous humor) that is inside the corneal dome. The ear uses a fluid called endolymph to maintain the body's balance.

Each and every cell in the human body contains water and is bathed in water. Water transports all the sustaining substances. Even saliva brings nutrients to the teeth so they will remain healthy and not become chalky.

Amazingly enough, the body makes water any time stored protein or carbohydrates are broken down.

In days of old the word "humor" was used for certain liquids in the body: blood, phlegm, choler, and melancholy. The latter two are types of bile. Phlegm is mucus. People's dispositions were thought to be determined by the condition of the humor; a person could be in good or bad humor.

Human Body

To best understand how the human body works we are going to look at some of its systems, in particular, the ones that closely ally themselves with a pond.

DIGESTIVE SYSTEM

When we consume food our bodies immediately begin to digest it. Meat, vegetables, fruits, and grains do not retain their original form very long. Digestion in the body is accomplished by enzymes and bacteria. They break down food into nutrients. The nutrients that result are amino acids from protein, glucose from sugar and carbohydrates, and fatty acids from other carbohydrates. They eventually become small enough to travel through the smallest of the blood vessels in our body.

How does this happen? Most food we eat we chew. We break down already small pieces into smaller pieces. Why don't we swallow the food whole like a snake swallowing a mouse and let all the enzymes, bacteria, and acids do the work? The reason is that these digestive materials only work on the outside of the particles of food. Mammals, including humans, need to transfer energy from the food to the body rapidly. Teeth break down food into smaller pieces. Snakes do not have teeth because they do not need to transfer the energy from their food as rapidly as mammals because they are cold blooded.

Saliva (mucus) then comes into play. It has three functions. First, it gives us the ability to taste what we are eating. (Taste and smell are chemical reactions created by molecules and mucus.) This is important for sorting out good food from bad. Second, enzymes in the saliva begin to digest the food. Third, saliva mixes with the food so it will be easier to swallow providing lubrication.

In swallowing, the food passes through the esophagus and on to our stomachs. There the food encounters more things that break it down: hydrochloric acid (which will eat your skin if it touches you), the enzyme pepsin that comes out of the walls of the stomach lining (the fancy word for that process is secreting), and bacteria. The mixture of all these things is called chyme. After about four hours in the stomach the chyme passes into the small intestine (where it spends another 4.5 hours).

In the small intestine food is digested by more enzymes and bacteria. In fact, the resulting particles are so small that they are absorbed into the

walls of the small intestine. (Remember how the amoeba is fed?)

The walls of the intestine are peculiar. They are not a flat surface or plane and even surface as one might think. These walls look like thousands of fingers being poked into a membrane of some kind. Thus, the wall has a very great surface area.

Not all the chyme is absorbed into the walls. The particles that are too large and have no nutritional value continue their journey into the large intestine where the water is drawn out. Water and undigested food spend 7-16 hours in the large intestine. The liquid eventually becomes urine, and the solid material eventually becomes feces.

Let's get back to the small intestine. What happens to the nutrients that pass through the walls of the small intestine? They are absorbed into the veins that pass through and around the intestine.

Eventually we will talk about the circulatory system, but suffice it to say that the blood vessels, the arteries, and capillaries that carry oxygen from the heart and deliver the oxygen throughout the body, become veins as they return the deoxygenated blood (that now carry carbon dioxide) back to the heart where it eventually will be brought to the lungs and exhaled. These are the veins that are all around the small intestine.

It is into these veins that the nutrients from the small intestines are absorbed and carried directly to the liver. In the liver the nutrients are broken down further, and any impurities are removed. The fat is metabolized in the small intestine by the bile that is produced by the liver. The hydrochloric acid from the stomach is neutralized. The end result is ammonia, which is removed from the urine by the kidneys. Vitamins A, D,, and B, and iron are also stored in the liver for use later when certain stresses are placed upon the body. The liver metabolizes drugs and alcohol, as well.

Once through the liver, the deoxygenated and nutrient-carrying plasma travels in the veins to the heart, to the right ventricle. This is then pumped through the pulmonary artery into the lung where the exchange of carbon dioxide and oxygen takes place. The blood, now saturated with oxygen, returns to the heart, the left ventricle, and is pumped into the aorta which then distributes it throughout the body.

What might confuse people is how food that enters the mouth can become so small it can pass through various membranes of the body.

We need to understand that the enzymes, acids, and bacteria in our bodies break down food to the basic substances: glucose, fatty acids, and amino acids. The amino acids are the building blocks of proteins. This process is the magnificent work of the liver.

<u>RESPIRATORY SYSTEM</u>

The lungs draw in oxygen. Oxygen is carried by the blood and is used to "burn" the sugars of our body into useful energy. When the oxygen is spent, the red blood cells absorbs the carbon dioxide in our cells, and the carbon

dioxide is taken by the veins to the lungs where it is exhaled into the air. In a plant this carbon dioxide finds its way back to a leaf where photosynthesis takes place, and carbon dioxide is converted into sugar and oxygen.

CELLS

To best understand how the body works we need to learn a little about cells. All living matter is made up of cells. The human body contains many types of cells such as: muscle, pancreas, ovum, bone, blood, liver, heart, lung, kidney, skin, nerve, and brain. There are many more.

The human body is composed of trillions of cells. WOW! All these cells have different functions, and they make up all the organs in our body. All the cells in our body have one thing in common: each cell in our body has our own personal name - a scientist would call it a code. In fact, it is our unique DNA. Whatever it is called, each cell belongs to us.

These cells are incredible. They are 70% water (sound familiar?). They have within themselves all the blueprints necessary to duplicate our complete body. How's that? By whatever process one wants to call it, each cell has taken on one particular role in our bodies.

Our cells can reproduce. They have various life expectancies. Some cells do not reproduce: heart muscle cells, egg cells, cartilage cells, and neuron cells. The cells that do reproduce vary in their duration of existence. Here are some examples:

Stomach lining	2 days
Platelets	10 days
Olfactory cells (scent)	60 days
Red blood cells	120 days
Skin cells	1-34 days
Sperm cells	2-3 days
White blood cells	Few days to several months
Liver cells	500 days (can replace itself entirely)
Bone cells	25-30 years

The surface of our skin is essentially dried-up cells. These cells flake off our bodies and are probably one of the greatest contributors to house dust.[3]

While cells are alive they need to be nurtured. That is what the blood does. It brings water, oxygen, and nutrients so the cell can live.

CIRCULATORY SYSTEM

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[3]The skin is the body's largest organ, 15% of our weight, and is the body's first defense against microbial invasion. A piece of skin the size of a dime contains two hundred nerve endings, ten hairs and muscles, one hundred sweat glands, fifteen oil glands, three blood vessels, twelve heat-sensing organs, two cold-sensing organs, and twenty-five pressure-sensing organs. The skin is composed of three layers: an outer epidermis, a lower dermis, and an underlying layer of subcutaneous tissue.

Because the organs are so integrated the circulatory system was reviewed when covering the digestive system. However, we need to go a little further. Blood, which some refer to as a separate organ, transports many things: red and white cells, platelets, dissolved nutrients, and hormones. Blood is carried through a system of blood vessels. There are 62,000 miles of blood vessels in the average human body. These blood vessels make sure that all the parts of our body are fed. Also carried in the blood vessels is the material that keeps us well through our immune system.

The red blood cells; hemoglobin, which binds up oxygen; and platelets are manufactured in bone marrow. White blood cells are generated in bone marrow and the lymph glands.

The heart pumps blood into the arteries about 70 times per minute. The pressure travels along like a wave. This wave is our pulse. The heart pumps blood around the body in just 30 seconds.

LYMPHATIC SYSTEM

One of the fascinating systems in our bodies, with which we may not be very familiar, is the lymphatic system. This system plays two roles: 1) transporting fluids that have escaped from the blood vessels back to the blood and 2) defending and resisting disease. Actually, we know something about this system because we might know about tonsils, adenoids, and lymph nodes (the ones that swell up when we have mumps). Lymph is excess water in our bodies that is produced by all the cells in our body.

Just like blood running through arteries and veins, lymph runs through a vessel system. Lymph does not flow like blood. Blood is pumped from the heart- it spurts. Lymph, on the other hand, is exercised through the lymph vessels by the movement of our muscles.

The water that passes through our bodies into the lymph vessels can be infected. Many pathogens are collected in this water. When the lymph passes through the lymph glands, the lymph is filtered and cleaned up with white blood cells. Lymph nodes swell and "get infected" when they are fighting off infections in the body with white blood cells. Once cleansed, the water is passed on to the heart where it re-enters the blood stream. The lymph system is a part of our immune system.

EXCRETORY SYSTEM

This is probably the disgusting topic. Who wants to talk about human waste? Yet, the body needs to rid itself of various things that are toxic or of organisms that are no longer useful. Cells that are replaced, for example, need to be discarded.

Humans excrete in four separate distinct ways. First, there is sweat. There are certain toxins that are detoxified in the liver, and they are expressed from the body through the pores as sweat from the sweat glands.

The second process is breathing. Remember that the lungs exchange carbon dioxide for oxygen in the blood. Carbon dioxide is a by-product created when protean, fats, and sugar are burned, and it is toxic to the human body so it

is expelled in exhalation. Water is also expelled. Breathe on a piece of glass.

The third is urea. The liver breaks down the amino acids to urea which is excreted and glycogen which is stored for later use by the blood for energy. We create about 3½ pints each day. Ammonia is also a product of breaking down food in cells (metabolism).

The fourth is feces. Various foods that the body does not break down, hormones, used-up cells of various types, and bacteria are excreted as feces.

There are five major sources of bodily waste products: toxins, internally produced chemicals, food, nitrogen, and fibers (which makes up the bulk of the feces).

The kidneys are a major participant in the blood's excretory system. There are two of them. Blood passes from the aorta through the renal artery, is filtered by the kidney, and passes out through the renal vein. The kidneys absorb useful molecules and reject unwanted waste that is expelled through urine.

In 24 hours the kidneys filter 47 gallons of blood derived fluid. Ninety-nine percent of it is returned to the system, and 1% is expelled.

<u>The Glands</u>

The glands in the body manufacture chemical substances called hormones. The word hormone comes from a Greek word meaning "to excite," and that is what hormones do. They excite or stimulate various parts of the body to function properly. Some glands send these hormones directly into the blood stream and so are called ductless or endocrine glands. The other type, like the pancreas, have little tubes or ducts through which they send out the hormones and therefore are called duct or exocrine glands.

To keep the body working normally, these glands must be regulated so that just the right number of hormones are released. The pituitary gland, located in the brain, is the most important gland.

Besides making hormones, the pituitary gland directs and controls all the other glands such as the thyroid, parathyroid, adrenal, etc.

Consider the thyroid gland. It produces thyroxin, which is needed for proper body growth and mental development. The thyroid gland sends out thyroxin to protect the body against abnormal mental and physical development.

All the hormones together regulate digestion and the changing of the food we eat into useful nourishment needed to rebuild cells - a process called metabolism. The hormones also regulate physical maturity, reproduction, and some mental ability.

Chapter 1
I AM A POND

In the Bible humans are likened to trees, grass, chickens, sheep, deer, goats, and grasshoppers. But nowhere in Scripture is the metaphor of a pond utilized. Thus, we are venturing out on our own.

The pond metaphor is intended to help us understand ourselves as an ecosystem. This particular image of an ecosystem and how it works is of recent origin in human thought.

Scripture does talk about water. The spirit broods over the water at the beginning of the first creation story in Genesis. In John Jesus is called the "living water." Water is the element in baptism. Water is a symbol of dying, drowning, cleansing, and satisfying thirst.

Water is a major subject in the environmentalists' Psalm 104. However, at no point in Scripture is water seen in the same details as we will be looking at it. Water for us will be the medium in which life takes place. Water is the place where organisms in a pond carry out life's functions. Water is the transport system for the activities of the organs of the body.

An interesting characteristic of water is that it touches all of time and space.

CELEBRATE WATER

Warm water soothes me
Yesterday touched a head in baptism.

Fresh water quenches my thirst
Tomorrow will cool a fevered child.

Soft droplets punctuate solitude, striking my umbrella
Yesterday aided spring flowers to push up and smile at the sun.

Rain water nourishes a thirsty pond
Tomorrow will keep seafaring vessels afloat.

Clear water trickles down a mountainside
Yesterday - mudpies!

What does it mean to you to look at yourself as a pond? There can be some fascinating responses.

First, both the human body and the pond depend upon the gas exchange. For humans, oxygen enters when one inhales and carbon dioxide leaves when one exhales through the lungs. Oxygen is introduced into the pond through the algae and plant life in it as well as by the wind blowing, exciting the water surface, and allowing oxygen to enter the water. In both the human body and the pond oxygen is introduced, and various organs and organisms release carbon dioxide.

In the pond oxygen is dissolved in the water. It does not create a separate chemical structure. In the human body oxygen is absorbed in the hemoglobin and becomes a part of another chemical structure.

Second, the nutrient cycle is a continuous activity in both the pond and the human body. The difference is the major players. In the body they are both the organisms and the organs, and in the pond, the organisms.

Third, throughout the human body there are enzymes, and specifically in the intestines there are bacteria. All these are necessary to break down food. The idea that there are millions of microbes in our bodies may sound unsavory to us. Nonetheless, they must be retained for our good health. Bacteria and enzymes are also a critical part of the pond system for the sake of digestion. They are free agents in the water as well as at work in the various organisms. They also play a critical role, along with fungi, in the digestion of excrement that coats the bottom of the ponds.

Fourth, the body has skin with a variety of animals living on it. Be sure to look at Knudsen's book, Furtive Fauna. The pond has skin, too. It is the surface tension of the water. Some critters such as water striders move on it. Others live under the surface of the pond, such as larvae for mosquitoes and dragonflies.

Fifth, the pond and the human body have a circulatory system which maintains appropriate temperatures throughout the system. The human body works most efficiently at 98.6° F.

Sixth, the human body and ponds age.

In making this comparison we can learn that the body is an ecosystem that has its own integrity.

There are also certain things that distinguish a pond from a human body. One stands out with great significance. In a pond, relationships between organisms can be antagonistic, i.e., the predator/prey relationship, which are part of the food chain. In the human body, continuity is the nature of the relationships of the organs, i.e., they are more symbiotic.

Chapter 2
GOD CREATES ME

Christians believe that humans are products of God's creativity. For some individuals this idea is a past tense activity. In reality we are continually being created.

God's creative act is a detailed act. In the book of Job (chapters 38-39) the Lord points this out. In I Corinthians 12 Paul mentions the interaction of organs in the human body. It is recent scientific discoveries that have made us more profoundly aware of the intricacies of the human body and with that the magnificence of God's creative work.

When we say, "God creates me," who is the "me?" There are many living things

in my body; thousands and thousands of different types of bacteria and a massive variety of cells. "Me" takes on a little different meaning.

Knowledge of microbes which began in 1678 when Antoine van Leeuwenhoek invented the microscope enabled scientists to recognize cells. (The word "cell" gets its name from the early studies of a piece of cork. The small particles in cork looked like a cell, the rooms in which a monk lived.) The ability to see life in very small forms help us understanding of the uniqueness of our physical world in general and ourselves in particular.
An article in the Science Section of the New York Times, October 15, 1996, titled, "Body Houses Microbe Zoo," shows how far scientists have come in the study of life within our bodies.

> It is a love affair that begins at birth: the human and the microbe.
>
> The human fetus, before birth, is both innocent and germ-free. Skin, mouth, and gut are all sterile. But it is a dirty world, and the adjustment to it starts as the newborn passes through the birth canal . . .
>
> This is when bacteria jump on board. They are in the air, on the hands of every person who touches the baby, all over the mother's nipples and the rubber nipple of every milk bottle. In the first few months of life, the infant is colonized by successive invasions of microbes. In fact, . . . at least 400 species begin to set up housekeeping in the baby's gut and many more reside on the skin, the mouth and elsewhere.
>
> But this is not a horror story. Only a few bacteria out of thousands of known species in the world are virulent threats to human health and welfare. The ones that colonize human bodies are, for the most part, working on the host's behalf. And in the most subtle and intriguing ways. . . .
>
> The body's bacterial colonies are among the most dense in nature. Half the contents of the colon are bacterial. Every year each person excretes his or her weight in bacteria. In fact there are very few places in nature where one can find populations as diverse and numerous as ones found in the human body . . . It is estimated that the number of microbes that colonize the body exceeds the number of cells in the body by twofold to one hundredfold.

It may be wrong to talk about "me." Rather we should say "us." Because there are all kinds of "me's" that God creates, and God creates how these "me's" live in relationship with one another. The human body is in fact a diverse community.

Also, in this diverse community there is always flux. Life is being regenerated and recreated

One of the fascinating teachings of the Hebrew Bible is the name used for God, YHWH (Exodus 3). The word can be translated "I am WHO I am," "I will be WHO I will be," "I was WHO I was." The word is grounded in the idea that God is

eternally active in all the affairs of life. One should note that it is a word the Hebrew people do not utter out loud because it is sacred. They substitute by speaking the word "Adonai" which means "Lord." Also, one should note that the second commandment instructs us not to abuse the name.

The God in whom we believe is an integral part of natural history as well as human history. God always creates.

Chapter 3
I AM SACRED (BALANCED)

We are temples, places where God dwells, sacred vessels, as Paul tells us in I Corinthians 6:9. He lays it out very distinctly in Romans 12:1-2:

> I appeal to you therefore, brothers and sisters, by the mercies of God, to present your bodies as a living sacrifice, holy and acceptable to God, which is your spiritual worship. Do not be conformed to this world, but be transformed by the renewing of your minds, so that you may discern what is the will of God--what is good and acceptable and perfect.

What is good, acceptable, and perfect can also be defined as balanced. Other words used to describe a body in balance are sacred - holy - whole - healthy. We can choose behaviors to live with our bodies like we can choose to live with the whole environment.

On the other hand, we can choose to be destructive and live against our bodies. Using the word sacrilegious we can explore how our behaviors are characteristic of temple robbing (the meaning of sacrilegious) where un-balanced behaviors can lead one to dis-ease.

In the introduction there is a discussion of how a pond can become imbalanced. This is through no fault of the pond. A pond has to live with what it is given. But think for a moment how humans can disrupt the balance of the body with the use of alcohol, drugs, tobacco, and poor diets and what Paul calls "the works of the flesh" (Galatians 5). These actions and product consumption are voluntary acts on the part of humans. Not only does it challenge the body's ability to repair itself both mentally and physically, but it can also destroy body parts affected by misuse. Possible mental and physical complications are:

lack of self-esteem - one only sees one's place in society as a conformist.
brain damage - affected areas of the brain are dead, shutting down cognitive capabilities.
intensive lung inflammation - white blood cells work overtime to stimulate production of antibodies to bring it back to health. If the problem persists, the white blood cells cannot do any other job.
chronic bronchitis - air tubes are infected robbing one of needed oxygen upon which the body depends.
weakened immune system - white blood cells are too busy to work throughout the body.
lack of energy - body systems denied proper nutrients

In Galatians 5 "the works of the flesh" are fornication, impurity, licentiousness, idolatry, sorcery, enmities, strife, jealousy, anger, quarrels, dissensions, factions, envy, drunkenness, carousing, and other such behaviors. The word, flesh, for such behaviors is a result of one not seeing oneself as a vessel of the Spirit of God, a temple, a place where Christ dwells. Ironically, humans have a natural tendency to be sinners whom God continually revitalizes. This does not give humans the right to choose sinful behaviors, but to create healthy strategies to "present our bodies as living sacrifices, holy and acceptable to God." As Paul writes in Romans 6 we are to "consider ourselves dead to sin and alive to God in Christ Jesus."

Christianity has to do with our attitudes, our love of others, our faith in Christ. It also includes our physical selves.

The way we look at ourselves begins with our baptism, the water sacrament of rebirth that makes us new people, new creations, new beings. Our whole selves belong to the order of God's plan of salvation, God's plan that humans be balanced, that our bodies be sacred vessels of God's presence in the world.

Chapter 4
I LOVE MYSELF

You shall love your neighbor as you love yourself, Scripture teaches. This means we should extend to our neighbors the way we treat ourselves.

It might be that you have a little different appreciation of this concept having reflected a little on the self as an ecosystem. When we love ourselves we are loving the sum of many parts, organs, and organisms. Self love is seeing to it that each part of the self is doing what it is supposed to do. It is a community affair.

The opposite of self love is egoism or egotism or egocentrism. We put ourselves at the center of the orbit as though we are the sun.

The love of self is an altruistic and mutualistic act, not only for the community within us but the community outside of ourselves. If we do not care for ourselves we put others at risk.

My wife shared an example from her work place. People throughout the office had colds and spread germs every time they sneezed, passed a piece of paper, or touched community property. Rather than staying home and nursing themselves back to health, they were at work. It was a contagious environment. Everyone was affected.

Another example of this insight is the spread of the HIV and AIDS. Because people have been careless about themselves and how they interact with others, it has become necessary to treat as though each person is HIV positive. A person doing simple first aid must wear gloves when treating a victim lest they come in contact with body fluids. No one knows if another is infected.

A way to understand the self in this context is to understand the pond as a

system that is part of a larger system. The trees that grow on its edge are nourished by the water from the pond. The water that flows from it goes to other water courses. Animals which live near or above the pond will use the pond for water and food. Certain bugs develop in their larval stage in the water before they exit the pond water (e.g., mosquitoes).

The boundaries of a pond are beyond its watery limits, just as our boundaries ripple beyond our bodies.

The fact that our bodies are part of a larger system is probably not as apparent. One example is that, like the pond, the human body evaporates and dispels water beyond itself. By this we affect the temperature and humidity of the area around us. We make a physical impact.

What are some of the ways we can care for our physical selves?

a. Correct bad habits
b. Have regular medical checkups
c. Modify behavior that risks our bodies as well as the bodies of others.
d. Control our diet
e. Exercise

Personal hygiene can be practiced. Of all the parts of the body that need cleaning, two of the most important are the hands. We carry more germs to others with our hands than we do breathing or touching objects with our lips.

The physical self must be loved for the care of the community around us.

Chapter 5
I GIVE MYSELF PERMISSION TO BE RESPONSIBLE

If we love ourselves it follows that we would take responsibility for the care of ourselves. I want to look into responsibility in more detail and, as the chapter title states, explore responsibility as something I give myself permission to do. It is a willful act that requires an educated response. I want to demonstrate this with the engaging story of vaccines.

Most everyone has been vaccinated. It is usually a major childhood trauma. Vaccinations are given for smallpox, diphtheria, polio, etc. Do you know why we are vaccinated? Do you know what happens in our bodies?

In the late 1700's Edward Jenner had patients ailing from smallpox. Like a good physician he sought a cure. During his research he discovered that the population of people who did not suffer from smallpox were those who worked with cows.

What did these people have that made them immune to smallpox? They had cows and, more specifically, these cows were diseased with cow pox. They had blisters. Pus, that awful stuff that oozes out of blisters, contained the germ of the cow pox. As the people worked among the cows and rubbed against their bodies, the pus would get on their hands and eventually into their open cuts and bruises. It was this pus from cows that made these people immune to

smallpox.

It sounds awful, but do you know that because of this discovery smallpox has been eradicated throughout the world? From the time of Jenner scientists have been learning how our bodies fight invading germs and have developed a variety of vaccines.

Oh, yes, the word "vaccine" comes from the Latin word for "cow."

How does a vaccination work? Our bodies have bacteria and white cells that are always fighting all kinds of infections.[4] The struggle goes on every moment of our existence without our knowledge. When we eat, drink and breathe we take in all types of pathogens that can make us sick. Viruses and bacteria in our bodies are always attempting to perform this dangerous act.

In addition to the white blood cells and bacterium there are also "B" cells and "T" cells. These are unique. "B" cells are created in the bone marrow. "T" cells are produced in the Thymus (thus the "T").

What happens is that when an invader enters the body which the present immune system cannot fight the "B" cell creates an antibody that specifically identifies (i.e., tags) the antigen. It is then that the "T" cells come along to destroy the antigen. This antibody now exists for this specific antigen and travels throughout the body looking for this antigen to appear again so it can "tag" it and thereby alert the "T" cells to destroy it. Thus, our bodies are immune to that particular antigen.

Vaccines are used to make us immune to specific antigens. When we are vaccinated smallpox, an antigen from cows, is put into our bodies. The "B" cells in our bodies recognize the enemy and begin to manufacture antibodies to destroy it.

Vaccines are used to make the human body immune as a preventive maneuver. An antibody "learns" about a specific antigen and fights it off. It "remembers" this antigen. The next time that particular antigen enters the body the specifically designed antibody chases it down and summons "T" cells to destroy it.

The fact that the body has the capacity to heal is taken for granted when we get a cut on the skin or break a bone or develop a cold. This is when we notice the healing process taking place. Our antibodies, the bacteria that line our bodies inside and out, and our white blood cells are always fighting disease. This is the immune system at work.

When one studies an ecosystem it is apparent that all of the natural world have the built-in capacity of responding, making whole, and nurturing, if for no other reason than for the selfish benefit of the organism. Creation is always being restored. This restoration is the work of the system and not

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[4]Imagine how long raw beef takes to rot. This is what would happen to us if our bodies did not fight back.

simply the activity of an individual organ or organism.

Restoration can be observed over long periods of time in a pond. Ponds that have been degenerated have the ability to return to their original state if given a chance. This is called resilience. Also, a pond does have resistance to invaders much like the human immune system. A key to this is the pond's biodiversity.

Now I want to shift gears. When we talk about ecosystems we need to also address the human influence on the environment. Unlike other organisms humans have impacted the nonhuman world to alter its destiny. When it comes to our bodies the situation is no different.

I want to contrast the human act of responsibility with the way an antibody responds. Like the antibodies in our systems humans may know intuitively or may have learned how to be responsible. But being responsible is not always an automatic response. We need to be told, or reminded, or reprimanded.

What is the source of the problem? Some would say that humans have free will and have the capacity to make choices. In a sense this makes humans unique from other organisms. Humans are more complex and have a variety of choices, attitudes, moods, and interest with which to deal. We are not fixed on one task or limited with our talents. We can alter our environment dramatically.

One could say that we are the opposite of antibodies. Each antibody has a specific task, however, there are so many of them, and they are so diverse that by working in community they are able to accomplish the larger task.

The contrast between the human and the antibody should be obvious. For the human diversity is often seen as a bane rather than seen as a blessing. We do not have singleness of purpose within ourselves. The options in our environment are many.

In most cases antibodies are self-tolerant and not destructive to good tissues. But there are some incidents when this is not true. There are autoimmune diseases that occur because killer cells identify body organs as invaders. These "T" cells attack good tissues and cause such diseases as diabetes, lupus, and arthritis.

Humans can be indifferent to or ignorant of the extent to which we go beyond the limits of our bodies. We will willingly destroy the tissues of our very own bodies.

Our memory tends to disappear or become sullied. We may have learned what we are to learn, but it has remained on the surface. It does not become ingested into our response mechanism.

What do we mean by human responsibility?

The concept of responsibility presupposes at least three things. First, the human being is responsive. We can react. A stimulus has a response. Second, the human has an intellect. Information can be sorted out and interpreted in

our minds. Third, the human being can take action.

I think responsibility is defined in five different ways, and each of these are facets of a larger definition: recognition, knowledge, timeliness, the welfare of self and others, and judgment.

First, being responsible means we are able to recognize something. We are alert. We notice. There is a consciousness of something outside of ourselves. Once in a while a small group leader will say to a child, "Why aren't you responsible? Don't you see your underwear on the floor?" The child might respond by asking, "What floor?"

Second, responsibility is defined as having knowledge. The small group leader says to the camper,"Why can't you be responsible? I showed you how to set up the tent so it wouldn't blow away." Sometimes we are irresponsible because we don't really know what to do, even when we recognize a problem.

Third, responsibility involves a time factor. When someone does not jump to address an urgent need someone might say they are being irresponsible.

Fourth, responsibility takes into account the well being of the people and the environment. If a person acts in a disruptive manner that person is accused of being irresponsible. On the other hand, if care and concern are demonstrated the action is interpreted as appropriate.

Fifth, being responsible means to use "good" discernment. One must decide then act.

My intention here is not to present a treatise on responsibility. I feel we need to understand that responsibility involves a variety of definitions, and they all fit together. Also, we need to understand that responsibility involves the managing of ourselves, our bodies, our very beings. We have authority over ourselves.

I am encouraging the reader to think in new terms, and I put it this way: I give myself permission to be responsible. The Latin word for "giving permission" is "leisure." We have so abused the original meaning of the word leisure that we might not be able to redefine it. In common parlance leisure is treated as recreation. time not working, or lounging around and sloughing off. We need to shake off that usage.

We give ourselves permission to do a lot of things. In some instances, which tend to be dramatic, they are negative behaviors. But there are positive ones, too. We permit ourselves to work and to play. There are times we will say we deserve something because we have done something to earn it. We really mean we are giving ourselves permission.

Giving permission is an effort, an intentional act. It is an independent act. It can certainly be encouraged by peer pressure. But what it ultimately boils down to is that the granting of permission is something I do on my own and for myself.

To give myself permission to be responsible cuts to the chase, and we are freed to act, not just to decide.

The focus of this paper has been on God continually creating our bodies to make us whole and the plan is that we participate in our own health maintenance.

Let me summarize how I think a Christian person should be grounded when making decisions regarding their well being.

1. What is the image of our physical self? I have suggested the pond metaphor. Do we see ourselves as individuals or as communities?
2. How do we understand God's continual creative process in ourselves? Or do we think we have been made and thrown out to fend for ourselves?
3. What message(s) do we convey with our bodies in the world? Are we temples of the Holy Spirit or examples of sacrilege?
4. Do we love ourselves for the sake of the well being of the community or for the sake of ourselves?

Ownership of responsibility and giving oneself permission to be responsible are highlighted in two events of our religious life: confession of sins and confirming our faith (affirmation of baptism).

In confession we acknowledge our sin, and we own it. We ask God for a renewal of ourselves so that we can find ourselves doing that which is right. Note Psalm 51.

In the Affirmation of Baptism we are asked to respond positively to this question:

> You have made public profession of your faith. Do you intend to continue in the covenant God made with you in Holy Baptism:
> to live among God's faithful people,
> to hear his Word and share in his supper,
> to proclaim the good news of God in Christ through word and deed,
> to serve all people, following the example of our Lord Jesus,
> and to strive for justice and peace in all the earth?

Maybe we should substitute the phrase "give yourself permission" for the word "intend?"

One final note. In the book of Proverbs wisdom is discussed as a way of life. In chapters 7 and 8 wisdom, a female, is compared with another woman, an adulteress. The distinction between the two is that the adulteress seduces, appealing to our prurient interest, and wisdom calls for obedience. In both cases one can give oneself permission to act. In one case, the action is in response to seduction, and in the other the action is done on one's own authority.

Conclusion

The human body is an ecosystem created by God. There is every reason to treat all ecosystems, like ponds and human bodies, with the same dignity and respect

we treat the whole of God's handiwork.

Both ponds and the human body age, but the time frame is different. Ponds can live longer. Ponds can outgrow various disruptions, and there is time for adaptation to occur. The human body outgrows some of its ailments, too. But it also begins to fall apart as it gets older. How shall we look at time? Both ponds and the human body require care.

Another distinction between a pond and the human body is that a pond cannot be anything other than an ecosystem. For the human, one can become an egosystem.

As an ecosystem the human body is very complex. Like any ecosystem the greater the diversity the more successful it will function. Knowledge of details of the human body may not necessarily affect our attitudes. However, the marvel of it all may give us pause when we decide to endanger its complexity.

The human body is the dwelling place of God, the temple of the Holy Spirit, according to Paul, and the place where Christ resides. The body is a vessel that God uses to encounter others. This should also have some implications for our behavior.

I AM A POND

Sit beside me
and reflect

Walk beside me
and listen

Breathe deeply,
inhale my scents

Reach out and touch me,
I am warm

Care for me,
I am vulnerable

Abuse me not,
I am filled with life

Celebrate me,
I am God's creation!

I am a Pond!

we treat the whole of God's handiwork.

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DAY ONE

I. Theme: I Am a Pond

II. First Article: I believe that God creates me and all that exists.

III. Intentions
- A. Theological/Biblical
  1. Discover how humans are described in the Bible
  2. Review ways "water" is understood in the Bible
- B. Environmental
  3. Learn the composition of an ecosystem
  4. Study the properties of water
  5. Examine the characteristics of a pond
- C. Human Physiology
  6. Investigate the role of water in the human body
  7. Learn some of the "systems" in the human body
  8. Compare the human body with a pond
- D. Multi-Cultural/Racial/Gender/Religious
  9. Reflect on how water has touched everything and every place and everyone throughout all of time.

IV. Behavioral Learnings
Learn how the perception of oneself affects behavior

V. Bible Passages

Genesis 6:5-8	Isaiah 40:6-8, 12	Matthew 25:31-33
Exodus 17:1-6	53:4-6	John 4:1-15
Psalm 1	Jeremiah 17:13b	Romans 6
23		
41:17-20		
65:9-13		
78:52-53		
104		

B. WORSHIP AND DEVOTIONAL EXPERIENCES

1. Group Prayer - Day 1
   - I. Description: This is the first of a day by day process to engage participants in corporate prayer. A different suggestion is given for each day.
   - II. Appropriate for: All Ages
   - III. Materials: Paper and pencils
   - IV. Process:
     - A. Participants write something for which they are thankful.
     - B. Participants read aloud what they have written.
     - C. Leader closes with a prayer (called a "collect") that collects all the hopes and expectations mentioned. The leader could also begin each section of the prayer using the name of the person who expressed the idea(s), "Jean prays that . . ."

2. Special Spots
   - I. Description: Participants find a special space for devotion and meditation.
   - II. Appropriate for: All Ages
   - III. Materials: 12" of surveyor's tape for each participant.
   - IV. Process:
     - A. Find a natural area that will not be disturbed by other individuals and groups. (The area can be used several times during the week for devotional purposes and for environmental awareness activities.)
     - B. Begin this activity by telling the participants that they are going to a spot that will become very special to them.
     - C. Upon arriving at the area instruct the participants to find a place within sight of the leader that they like and sit down. The closest person should be 30 feet away. There is to be no talking. They are to stay in the spot for 10 minutes observing what they see in the area. Tell the participants to use their eyes, ears, and sense of touch to become familiar with the place.
     - D. Near the end of the quiet time the leader distributes surveyor's tape and instructs the participants to put their names on it and tie it in their area.
     - E. Gather the participants after the 10 minutes and ask them to describe their areas.

3. God's Running Water - a programmed devotion
   - I. Description: Participants move from one location to another on a water course.
   - II. Appropriate for: All
   - III. Biblical Texts: Exodus 17:1-6, Psalms 1, 41:17-20, 65:9-13
   - IV. Materials: Bibles, song sheets, printed description of activities of each station.
   - V. Process:
     - A. Create Stations with written instructions
     - B. Stations Description/Activity
       1. A spring, seepage point, or small drainage flow; identify water coming from the Earth with the life-giving power of God; touch, smell, hear the water. (Exodus 17:1-6)
       2. Water moving over rocks, sticks, gravel, and barriers; it is moving toward a larger body (implications for Christian life and community); try to block the flow of water (be careful not to do environmental harm) and watch what happens; God's continuous flow of power and care. (Psalm 65:9-13)
       3. A large tree; the power of God; the mighty oak from the small

acorn; growth is nurtured by God's continuous life-giving power. (Psalm 1)

4. Follow the stream or drainage to a collection point, e.g., a pond. Recognize God's use of water. (Psalm 41:17-20)

C. Gather at worship site
   1. Pray
   2. Sing
   3. Use one of the following:
      a. Brief Meditation by leader
      b. Process experience with passage

4. Containers of Water

I. Description: An introductory drama for the theme

II. Biblical Text: John 4:1-15

III. Materials: Amplification equipment, robe for Jesus character

IV. Process:

A. A couple of people are discussing all the ways water is contained.
   1. "Do you know how many types of containers hold water?"
   2. The audience can participate.
   3. List the obvious: bottles, cans, cars, refrigerators, lakes, rivers, ponds, etc.
   4. List the least obvious:
      a. Plants - if it was not for water they would not stand.
      b. Trees
      c. Some plants have little ponds in them, e.g., cup plant, bamboo, and many of the rain forest trees that frogs use for their young.
   5. "Did you know that humans are water containers as well?"
      a. An interesting dialogue can be developed.
      b. Remember that the human body is 70 to 80% water.

B. One of the speaks says, looking at the audience, "Look at all the water containers. I wonder how much water is there?"
   1. The speakers can estimate the average weight and the number of people, multiply these two figures. Then multiply the results by 75% and divide by 8 (8 pounds is the weight of a gallon of water). This will giver the size in gallons of the pond.
   2. Try to make a comparison with an existing body of water.

C. Speaker says, "You know in a way, we are like a pond because we are not only containers, we have all kinds of life in our bodies. Water most often has many types of organisms in it."

D. A voice comes from a distant point (possibly amplified and with a gurgling sound), "I am a pond!"

E. There is a conversation between the voice and the speakers.
   1. The voice describes what makes a pond different from a human, "I have fish, plants, fungi, bacteria, etc.
   2. The speaks begin to describe how humans are like ponds, e.g., skin, bacteria, algae (in back of mouth), etc. (See background paper for more details.)
   3. The conversation goes on as long as it can stay exciting.

F. Then a person appears wearing a robe, giving the aura of being Jesus.
   1. The person approaches the group and says, "I am a pond, a pond that has living water."
   2. The others respond using various types of knowing and amazing expressions.
      a. They say, "Our water is alive, too. It has all kinds of life in it."
      b. The pond says, "Living water, hah! I am really alive compared to

you. Not only do I have life in me, I provide all kinds of water for animals that come to me and plants that live near me."

3. The Jesus character says, "My living water lasts for ever. It gives life to people. In fact, this living water is me."
4. The speakers say, "Can you give us this water so that we can have forever?
   a. The Jesus character says, "Yes, if you believe in me I will fill you with myself and you will have eternal water within you.
   b. "Trust me."
5. Jesus says, "You realize that because you have many things living in you along with me you have to love and take care of yourself and be responsible with your life."
6. The pond says, "I wish I could control what happens to me entirely. However, people have ways of polluting me and causing my destruction. I wish I was a human pond, and could have better control of my situation.
7. The human speakers respond:
   a. "We never thought of this before.
   b. "We are each a pond.
   c. "We can make decisions about what happens to our pond.
   d. "We are filled with more than living creatures.
   e. "We are filled with God!
   f. "WOW!"

G. A leader can summarize the theme for the week with a brief message.

C. BIBLE STUDIES

1. Psalm 104
   I. Description: Explore the nature of interdependence, habitats, and niches environmentally and Biblically.
   II. Appropriate for: Grade 7 and up
   III. Biblical Text: Psalm 104
   IV. Materials: Bibles, Song sheet, paper, pencil
   V. Process:
      A. Do an environmental activity
         1. Natural Process (Cf. I E 6)
         2. Habitat (CF. I E 7)
         3. Energy Pyramid (Cf. I E 9)
         4. Habitats of the Pond (Cf. I E 14)
      B. Review some basic concepts with the participants.
         Interdependence
         Interaction
         Ecosystems
         Habitat
         Worship (Worthyship) and valuing
         Food Chain and Food Web
      C. Read Psalm 104 out loud. (Can sing the song)
      D. The leader then presents the following: This Psalm can be divided into two general parts 1) vss. 1-26, a description of God's creative work, and 2) vss. 27-35, an enthusiastic description of God's constant care of Creation with an emphasis upon the dependency of creatures upon God. The central theme is the Lord's glory and wisdom are manifested in the created world. The Psalmist's philosophy is that nothing is made for itself alone, but each is made for another. The parallel is Genesis 1:1-2:4.
      E. Divide the group according the passages below.
         1. vss. 1-4 - The first stage of creation.
         2. vss. 5-13 - Springs of water.
         3. vss. 14-18 - Vegetation.
         4. vss. 19-23 - The moon and the sun.
         5. vss. 24-26 - The sea and its animals.
         6. vss. 27-30 - All life looks to God.
         7. vss. 31-35 - Doxology. The psalmist expresses the hope that God will find joy in all of God's Creation.
      F. Ask each group to rewrite the assigned text and report back to the large group. Below are comments the leader can make after each presentation.
         1. vss. 1-4 The parallel is Genesis 1:1-8. God is not fully revealed; God is hidden. The Creation is the mask of God (Luther). The light is God's robe, heaven is the shelter that contains life. Clouds, wind and fire are God's messengers and servants. All that is, is in God's hands and for God's purposes
         2. vss. 5-13 The "stuff" of God's Creation has its limits, like the water in vs. 9. But God has also created the "stuff" of Creation to inter-act. Thus, the water serves the animals. Though partially implied, the Psalmist indicates how one system serves another and then a third. The water serves the trees, the trees give birds a place to nest, and the birds sing.
         3. vss. 14-18 The parallel is Genesis 1:11-13. Here is amplified the Psalmist's image of an interdependent ecosystem which God creates.
         4. vss. 19-23 God gives everything its own opportunity. The darkness, which God creates, is the time for animals to stalk their

prey and be fed by God. The daylight is when a human can earn one's living. It is all God's ordering.

5. vss. 24-26 The parallel is Genesis 1:20-23. The Psalmist acknowledges God's wisdom as the heart of God's shaping of the world. Even the Psalmist realizes the multitude of things God has made. The Psalmist also realizes that God has made things for their own value. As the NEB translates, "... and in it plays Leviathan, that sea monster which you (God) made." God makes something with which to sport, God enjoys something in and of itself! You might indicate that one of the things which God does on the seventh day is to behold what God has made - a way to give and recognize value in something. You might take an object in which the participants can see "value" (costing something) and then ask them if it has value other than when it is being used ("celebrated") for the purpose it was designed.
6. vss. 27-30 The parallel is Genesis 1:29-30. God provides, and God takes away. All things are dependent on God. The word for "breath" and "spirit" in Hebrew is the same. God uses part of God's Creation to serve another part.

G. Discuss: What is the function of water in the Psalm?
   1. What is the role of water in the pond?
   2. What is the role of water in the human body?

2. Introduce the Meaning of Metaphor - I Am a Pond

I. Description: Introduce the meaning of metaphor as a description, look at some metaphors of humans in Scripture, and study the metaphor of the "pond."
II. Appropriate for: All ages (some adaption necessary for younger youth)
III. Biblical Texts: Genesis 6:5-8, Psalm 1:1-3, 23, 78:52-53, Isaiah 40:6-8, 40:22, 53:4-6, 104, Jeremiah 17:13b, Matthew 25:31-33, John 4:7-15, and Romans 6
IV. Gallon jugs and water
V. Process:
   A. Invite the participants to identify themselves with a particular animal.
      1. Participants can use some source from which to select animals:
         a. A nook with various critters
         b. A hunt in the out-of-doors with a box for carrying the critters
         c. After a study of specific creatures that live in a pond, see Pond Water Zoo by Peter Loewer.
      2. As the participants share their stories encourage them to explain how their animal describes something very special about themselves.
   B. Discuss how humans use words to describe other people, in some instances these are not complimentary: cuddly bear, turkey, etc.
   C. Look at how the Bible uses metaphors to describe human beings.
      1. Look up each passage listed below and ask the participants two questions:
         a. What do they know about the particular word being used as a metaphor (description)?
         b. Why is that metaphor (description) being used in this passage?
      2. Bible passages:
         a. Grass - Isaiah 40:6-8
         b. Grasshoppers - Isaiah 40:22
         c. Sheep and goats - Matthew 25:31-33
         d. Sheep - Isaiah 53:4-6, Psalm 23, Psalm 78:52-53
         e. Trees - Psalm 1:1-3
   D. Introduce the idea that we are going to describe the human being as a

pond.

1. Ask the participants to play with this idea in their minds.
2. Then ask them to share their thoughts, especially their first thoughts.

E. Talk about water - which is common to the pond and the human being.
   1. How much of the earth's surface is covered with water?
   2. How much water is in the human body?
   3. As an experiment use gallon jugs to demonstrate. A gallon of water weighs 8 pounds. E.g., if a person weighs 100 pounds, that person is 70 pounds of water - close to 9 gallons. Stack up 9 gallons in some way.
   4. Discuss the properties of water.

F. An option here is to look at passages of the Bible that discuss water. (These are just a few of the possibilities.)
   1. The Noah Story - Genesis 6:5-8
   2. Water in the ecosystem - Psalm 104. (Look at how water functions in this Psalm).
   3. Baptism - Romans 6
   4. Living Water - Jeremiah 17:13b and John 4:7-15 (who is the "Living Water" describing?)

G. Do a pond study.

H. Study how water functions in the human body.

I. Ask participants if they can make any comparisons and/or connections.

D. GROUP LIFE EXPERIENCES

"FIRST DAY AT CAMP"

There are several important steps that must be followed on the first day. If participants cannot create a sense of confidence in themselves and in the group, group life will not be successful.

The three essential steps are: Get Acquainted
Community Building ("bonding")
Contracting

I. Get Acquainted

1. Name Train
   I. Description: Get Acquainted - Learn names
   II. Appropriate for: All
   III. Materials: None
   IV. Process:
      A. The participants stand in a circle. One participant volunteers to be the locomotive, choo-chooing and piston-driving her/his arms.
      B. The locomotive stops and exchanges introductions with another: "Hi, I'm Bob. Hello, I'm Mary." Upon hearing the other's name, Bob, the locomotive, alternately raises his arms and extends his legs while chanting the person's name: "Mary, Mary, Mary, Mary, etc.!"
      C. Once Bob is finished with his chant, Mary puts her hands on Bob's hips or shoulders - like a caboose attached to the end of a train - and the enlarged train choo-choos around the circle and makes another stop at a third person, Jim.
      D. Bob and Jim then exchange introductions and Bob chants Jim's name as he did Mary's. Then Mary does the same chant again.
      E. When Mary is finished with the chant, Jim hooks up to Mary as Mary has hooked up to Bob and the sequence continues until all the campers are in the train.
   V. Source: More New Games, p. 75.

2. Name Tag Mixer
   I. Description: Get Acquainted. Learning names in large unacquainted group.
   II. Appropriate for: All.
   III. Materials: Name tags or shoes for each person.
   IV. Process:
      A single circle of players face the center of the circle. Each person takes off his/her name tag and places it on the ground in front of him-/her. On the signal to begin, everyone begins walking single file in one direction around the circle. On the signal to stop, all stop by someone else's name tag. The tag is then to be returned to its owner. The same play is repeated about half the number of times that there are people in the group.
   V. Source: Guide for Recreation Leaders, p. 33.

3. Moving Name Game
   I. Description: Get-Acquainted
   II. Appropriate for: Grades 4-7, 10-12, Families (intergenerational)
   III. Materials: None
   IV. Process:
      A. The participants place the syllables of their name to a rhythm and

create a series of movements so that there is one distinct and easily repeatable movement for each beat in their name.

B. The first person does his/her name and movement. The second person repeats the first person's name and movement, and does his/her own.

C. The third person does the first two, and then his/her own.

V. Source: Playfair, p. 65.

II. Building Community

4. Water Cup Pass

I. Description: Group building - Cooperative exercise.

II. Appropriate for: All ages, Families (intergenerational), Adults, Seniors

III. Materials: Water cups for all, 1 quart of water

IV. Process:
Everyone stands in a circle with a paper cup under his/her arm. One person's cup is filled with water. That person begins by pouring the water into the next person's cup without hands, and so on around the circle. Only use the extra water if the first water poured is spilled.

V. Source: Adapted from For the Fun of it!, p. G-14.

E. ENVIRONMENTAL LEARNING EXPERIENCES

General

1. What Good Is It?
   I. Description: A valuing activity.
   II. Appropriate for: All ages, Families (intergenerational), Adults, Seniors
   III. Materials: Paper and pencil for leader
   IV. Process:
      A. Find a natural area without disruptions from other people.
      B. This game is played like "Twenty Questions". One of the participants is "it" and is sent out of hearing range from the group. The group then picks a natural object which will be the subject to be guessed by "it".
      C. "It" is then called to return and tries to guess the object by asking questions that can be answered "yes" or "no". The group tells "it" if the object is animal, vegetable, or mineral. "It" must begin each question with the words, "Is it good for...?" The question must be directed to a specific person in the group.
      D. If "it" has been successful in guessing the object he/she can sit own, and the person who answered the last question becomes "it". The game begins again.
      E. If "it" doesn't correctly guess the object within 20 questions, "it" sits down, is told the answer, and the last person to receive a question then becomes it, and the game starts again.

2. Box Concentration
   I. Description: Give participants further exposure to natural items, reinforcing their present knowledge.
   II. Appropriate for: All ages.
   III. Materials: Large empty box, four to ten natural objects, paper, pencils
   IV. Process:
      A. Make sure participants know the names of every item in the box.
      B. Distribute paper. Participants fold paper into quarters.
      C. Place objects on a sheet of paper that has been divided into sections by folding.
      D. Direct the participants to concentrate on the objects for one minute. Then cover the whole thing with the box. Participants try to remember the objects and where they were located. For further rounds change sections around.
   V. Variation: Follow the same procedure as above, but rather than naming the item the participants are sent outside to find the duplicates.
   VI. Source: The Nature Specialist, Miller, pp. 36-37.

3. The Wonder of Nature
   I. Description: Participants participate in a guided scavenger hunt without a sheet of instructions.
   II. Appropriate for: Youth
   III. Source: Clouds on the Clothesline, Pearce, p. 30f.

4. How Wet Is Our Planet?
   I. Description: Participants can describe the amount and distribution of water on the earth in oceans, rivers, lakes, groundwater, icecaps, and the atmosphere and make inferences about the importance of responsible use of water.
   II. Appropriate for: Grades 4-12

III. Materials: large map of the world, a five or ten gallon aquarium or container, writing materials, calculators, measuring cup, one quart container for every three participants, one measuring tablespoon for every three participants.

IV. Preparations:

V. Commentary:

VI. Process:

A. Using a map of the earth, begin to discuss how much water is present. Ask the participants to comment on why the earth is called "the water planet." Call their attention to the statistic that between two-thirds and three-fourths of the surface is covered with water. After general discussion, provide the participants with the following statistics.

Oceans	97.2% of total
All icecaps/glaciers	2.0%
Groundwater	.62%
Freshwater lakes	.009%
Inland seas/salt lakes	.008%
Atmosphere	.001%
All rivers	.0001%
Total	99.831%

B. Discuss the relative percentage. Do the calculations for them, or ask the participants to calculate the estimated amount of fresh water potentially available for human use:

Groundwater	
Groundwater	.62%
Freshwater lakes	.009%
All rivers	.0001%
	.6291%
All icecaps/glaciers	2.0%
	2.6291%

C. In discussing these figures, emphasize that the usable percentages of existing fresh water is reduced by pollution and contamination. Also, all the groundwater is not available and icecaps certainly are not readily available. Discuss the needs of humans for usable fresh water. Ask the participants to consider what other life forms need both fresh and saline (salt) water.

D. Now shoe the participants five gallons of water in an aquarium. Tell them how much is there. Provide the students with the following quantity: 5 gallons = 1280 tablespoons.

E. Have the participants assume that the five gallons represent all the water on earth. Do the calculations for them, or ask the participants to calculate the volume of all the other quantities on the water percentage list. This will require the use of decimals. Show the number of tablespoons in each category:

Oceans	1244.16
All icecaps/glaciers	25.24
Groundwater	7.93
Freshwater lakes	.11
Inland seas/salt lakes	.1
Atmosphere	.0128
All rivers	.0012
Total	1280

F. Once the values are obtained, ask the participants to calculate the volume of the water other than ocean water. It is approximately 34

tablespoons.) Ask them to divide up in teams of three and put 34 tablespoons of water in a container and take it to their workplaces.

G. At the workplaces, ask the participants to remove the amount of water presented by all freshwater lakes and rivers. (It is .111 tablespoons, approximately one tent of a tablespoon.) Then ask the students to extract the amount represented by rivers. (It is one-thousandth of a tablespoon.) This is less than a drop. Discus the relative proportions with the participants.

H. Consider the fragile nature of the freshwater, wetlands, and oceans of our planet. Discuss how all species depend upon this minute percentage of water for their survival. Summarize the activity by using an earth globe to illustrate that if the earth were this size (12 inches in diameter, e.g.) less that one-half cup (eight tablespoons) of water would fill al the oceans, rivers, lakes, and icecaps. Close by emphasizing the importance of keeping the earth's waters clean and healthy and - when we do use waters - using them wisely and responsibly.

5. I'm Related to the Mosquito.

I. Description: To whom are we related? How?

II. Appropriate for: All ages; Families; Seniors

III. Process:

Campers can think about all the people with whom they are related. What makes them "related"? What does "related" mean? In families, the issue of relatedness is often that of birth and/or marriage. But families also can be thought of as units of people that have things in common. They share the same house. They often eat the same foods together. They are a financial unit. Often you go to a trusted family member when you are in trouble.

But what are the other non-human "families" with which we are related? Help the campers think of all the things in nature with which they need to share.

One example would be water. What depends on water? For what do various entities depend on water? Among other things, mosquitoes. Without the mosquito people wouldn't have fish to catch or songbirds to enjoy. The participants can make connections with other animals and plants that they "share" with nature. Lead discussion in the direction that it is God who gives birth to all creation. That is a common bond for all of God's creatures.

6. Natural Process

I. Description: Learn environmental concepts

II. Appropriate for: Grade 2 and older

III. Preparations: Group size of 12-18. Props can be used.

IV. Commentary: In this game, the group acts out a natural process such as plant succession, water cycle, the food chain, or even glaciation and photosynthesis

V. Process:

A. Each group selects a natural process

B. Each group prepares a skit that demonstrates one of the concepts.

7. Habitat
   I. Description: "Create" a natural environment
  II. Appropriate for: Grades 2 and older
 III. Preparations: Each player chooses one of the environment's components
  IV. Process:
      A. Group leader secretly tells the group the environment they will play. Without prior discuss, have the players choose their component of the environment and immediately begin playing their roles. While each group performs, the people in the larger group watch, refraining from guessing the environment until the performers have finished their "act."
      B. After the players have performed for a while, ask the audience which environment was being portrayed.

8. I Am a Camera
   I. Description: Players act as cameras.
  II. Appropriate for: All ages.
 III. Materials: Index cards and pencils or charcoal
  IV. Process:
      A. One player takes the role of a photographer, and the other plays the camera. the photographer guides the camera, who keeps her/his eyes closed. When the photographer sees something sh/he likes the camera's lens are pointed at it.
      B. The photographer pulls on one of the camera's ear lobes so the camera lens will open and then pulls on the other ear lobe to close the lens.
      C. The camera takes several pictures, and then the camera draws only one of the pictures (develops).
      D. Pictures are shared. Sometimes it is fun for the leader to collect all the pictures and let the participants guess who did which developed photo.

9. Energy Pyramids
   I. Description: Demonstrate how energy flows through a food web using a pyramid model
  II. Appropriate for: All ages.
 III. Materials: Large index cards
  IV. Preparations: Divide group into groups of six (or into numbers that can form a three or four tiered pyramid)
   V. Commentary: Pyramid models are one of the best ways to demonstrate how energy flows through a complex food web or a whole ecosystem. Energy Pyramids combines this lesson along with the fun and teamwork of building a human pyramid.
  VI. Process:
      A. The leader shows participants a diagram of a food pyramid depicting the various trophic levels (levels of nourishment). Green plants are on the bottom at trophic level one because their energy has been transferred once from the sun to plants. Herbivores (plant eaters) are at trophic level two because their energy has been transferred twice: from sun to plants and plants to herbivores. Carnivores (meat eaters) that herbivores are at trophic level three because their energy has been transferred three times: from sun to plants, plants to herbivores, herbivores to carnivores. High-level carnivores (those that eat other carnivores) are trophic level four because their energy has been transferred four times.

B. Once the participants understand the principle, explain that it is possible to have many more levels of a pyramid, but that you will be looking at three or four levels of energy transfer.

C. Each team is now presented with a set or large index cards with animals or plants showing a particular energy flow printed on each. The object of the games is to see which team can build their pyramid and label each level first. Only correct labeling counts, so careful thought is as important to success as speed.

D. Some examples:

orca
sea lion
salmon
herring

gull
starfish
blue mussel
plankton

bear
rock crab
periwinkle
young seaweeds

fox
grass snake
common shrew
ground beetle

hawk
great tit
oak-leaf aphid
oak leaf

Cf. Pond Water Zoo

E. The index cards can be strung to hang behind the neck of one player at each level, or, alternatively, they can simply be held in the mouth. The two teams build their pyramids directly facing one another so they are constantly aware of the other's progress as well as any errors in their logic.

F. The first team to have all their members in position with the correct labeling wins the set. Following the inevitable collapse of the pyramid it is time to start over, with each team given a new set of cards. Five to six sets are usually sufficient to exhaust most everyone.

G. A short discussion should follow each pyramid-building session, to be certain all players understood why the energy transfer worked the way it did. An interesting addition to this game is to give four colored tennis balls to the four bottom players in each pyramid. "These balls," the leader points out. "You must pass them up to each level above you, and the top-level predator must hold all four because that's where they end up in the real food pyramid. In a real world three-level food chain, the predator would get 111 "balls" because each lower trophic level is ten times larger than the one above." Try another pyramid where the leader says, " I wonder what would happen if we pulled out part of a level?" and proceeds to do so. "So what happens if when the herring or shrimp get overfished? if oil spills kill the plankton or too many high-level carnivores are exterminated?"

H. SAFETY WARNING: be sure to choose a good location for this activity and monitor the event carefully to prevent injuries. Be sure that the smallest players end up on top.

10. Phenomenal Photosynthesis Puzzles

I. Description: Assemble two leaf-shaped puzzles, one puzzle that shows the essential elements needed for photosynthesis and a second puzzle that

shows the products and byproducts of photosynthesis. Discuss photosynthesis and its vital role in supporting life on Earth through the food energy and oxygen it produces. Discover the gas cycle between plants and animals.

II. Appropriate for: All ages.

III. Materials: Copy of addendum (figure 5-8), pencils, crayons, posterboard or light card stock, scissors, large envelopes, large yellow ball or balloon for sun, string

IV. Preparations: Make an enlarged copy of Figure 5-8 to use as a master. Copy this master onto posterboard or lightcard stock and then cut each of the two illustrations of a leaf into puzzle pieces. Make the puzzles more or less complicated to suit the age of the children. Younger children will be challenged by a 4 to 6 piece puzzle, while older children will need, for example, a 12 piece puzzle. Label the backs of the pieces of each puzzle with all A's, B's, etc., and put them into similarly labeled envelopes to keep matching puzzle pieces together. Make a set of puzzles for each pair of children: one puzzle showing the ingredients for photosynthesis and one showing the products. Have one group triple-up if you have an odd number of children. Obtain a large yellow ball or balloon to represent the sun.

V. Commentary: Understand the basic formula for photosynthesis. Realize that photosynthesis is the life-giving process that captures the sun's energy and transforms it into a form that is usable by life on Earth. Understand the gas cycle between animals and green plants.

VI. Process:

A. Have participants work in pairs to assemble the first puzzles (Figure 5-8a), one puzzle to each pair. Once the puzzles are put together, ask the children what they see. Tell them that they are looking at the ingredients for photosynthesis, the life-giving process by which green plants change the sun's energy into the things people and all animal life need to live. Ask the children what they think are the essential things we need to live. Describe the ingredients of photosynthesis, and the need for sunlight to make it work, but *do not tell the children the products of photosynthesis yet.*

B. Now hold up the yellow sphere to represent the sun and hang it in a prominent place. Hand out the second puzzles (Figure 5-8b) and have the children assemble them. Once the puzzles are assembled, review with the children the products of photosynthesis shown on the puzzles as well as the formula for photosynthesis. Ask the children to think of specific foods and useful things plants produce via photosynthesis.

C. Point out that in the puzzle a someone is exhaling carbon dioxide, which the plant uses during photosynthesis, and that in puzzle b someone is inhaling oxygen, which plants give off during photosynthesis. Describe how these gases pass back and forth between plants and animals in a *gas cycle*. Ask: "Have you breathed on a plant today to thank it?"

D. Have young children color their puzzles.

VII. Source: Keepers of Life, p. 69

POND

14. Pond or Lake Study

I. Description: Expose participants to the diversity of aquatic life, introduce them to the water as an important habitat, point up the differences between land and a pond, and observe the different types of

life.
II. Appropriate for: All ages.
III. Materials: Dip nets, insect nets, white plastic and enamel pans, strainers, spoons, lenses, small paint brush, small portable microscope, pond or water life guide for both plants and animals, plankton net, water scopes (homemade from a large plastic container with both ends cut open. At one end heavy duty clear plastic is held on with a rubber band.)
IV. Process:
A. Background: A pond or a lake, if it is healthy, teams with life. The organisms that live in a water habitat will differ depending on many variables: water depth, pH, pollutants, temperature, source of the water, etc.
B. On the way to the lake or pond talk about water, clear water, water conservation, breathing through gills, how some insects and all amphibians spend the early stages of their lives in water, aquatic food chains and webs, etc.
C. At the water's edge have the participants spread out and with dip nets, strainers, etc., carefully search the plants and the detritus (mushy bottom) for organisms. The items can be seen better when placed against a white background, e.g., an enamel pan. Use bug boxes or lenses to get close-up looks. Identify the items.
V. Follow-up Activities from OBIS:
A. Animal Movement in the Water
B. Attract a Fish
C. Habitats of the Pond
D. Too Many Mosquitoes
E. Water Breathers
F. Water Holes to Mini-Ponds
G. What Lives Here?
VI. Source: The Nature Specialist, Miller, pp. 54-55.

15. Habitats of the Pond
I. Description: Locate plants and animals in each of the 5 habitats of a pond or lake, and record where they live.
II. Appropriate for: Youth
III. Source: OBIS

16. What Lives Here?
I. Description: Discuss and investigate some of the plants and animals that live in an aquatic site.
II. Appropriate for: Youth
III. Source: OBIS

17. Can Fishing
I. Description: Discover what kinds of aquatic organisms live on or in submerged cans.
II. Appropriate for: Youth
III. Source: OBIS

18. A Better Fly Trap
I. Description: Make a device that attracts and traps flies.
II. Appropriate for: Youth
III. Source: OBIS

19. Water Snails
   I. Description: Mark and recapture water snails to discover their preferred habitat.
  II. Appropriate for: Youth
 III. Source: OBIS

20. Water Striders
   I. Description: Explore the movement and feeding behavior of water striders.
  II. Appropriate for: Youth
 III. Source: OBIS

21. Animal Movement in Water
   I. Description: Discover how some aquatic animals move through water.
  II. Appropriate for: Youth
 III. Source: OBIS

22. Water Breathers
   I. Description: Investigate currents that aquatic animals create.
  II. Appropriate for: Youth
 III. Source: OBIS

23. Swamp
   I. Description: Word descriptions of nature.
  II. Appropriate for: Youth
 III. Source: Clouds on the Clothesline, Pearce, p. 20.

24. Bottle Biology
   I. Description: Develop various ecosystems using soda bottles
  II. Appropriate for: All ages.
 III. See Bottle Biology

25. Life in a Body of Water
   I. Description: Every body of water contains a variety of forms of aquatic life which may be collected, observed, and studies in detail.
  II. Appropriate for: All ages.
 III. Materials: dip net, seines, old nylon stocking, jar, and microscope
  IV. Commentary: All forms of life shall be returned unharmed to where it was found.
  VI. Process:
      A. Use a dip net to collect many organisms that live in the sediments on the bottom of the water. Place all items that are collected in an enamel pan containing a small amount of water, and sort them according to kinds and sizes. If possible, identify the organisms, and ascertain through further study, their physical structures and life habits
      B. Use seines to collect samples of fish life found near the shore. Identify the various types, and study their form and structure. Further investigation will reveal much about them.
      C. Gather plankton by seining with an old nylon stocking. Place the material that remains after the water is strained through the stocking in a jar. Use a microscope, and carefully examine the plankton.
      D. Search for amphibians which can be found "in" and "out" of the water. Identify the kinds found, and ascertain the environmental factors

which contribute to their presence at this particular location.

E. Many kinds of insects live "in," "on," or "above" the water. Collect samples of the "scum," and examine it for insects. Identify the kinds of crawling or flying insects, and find out what they eat and how long they live.

F. Carefully examine submerged rocks and logs for the organisms that are attached.

G. Classify the organisms that were found according to their place in the food chain, their habitat, or their needs. Try to establish a niche or place for each form.

26. Life in a Pond Puppet Show

I. Description: Introduce the idea that pond creatures must have special adaptations to survive in the pond.

II. Appropriate for: All ages.

III. Materials: Puppets and Scripts

IV. Source: Hands-on Nature, pp. 133, 115-117.

27. Picture a Pond with Your Ears

I. Description: Become aware of the variety of sounds around a pond.

II. Appropriate for: All ages.

III. Process:

Upon arrival at the pond, all should sit quietly together, close their eyes, and concentrate on listening. Hold up one finger for each different sound heard. When most participants have five fingers up, tell them to open their eyes. Discuss the sounds, identify them if you wish, and why they were or were not typical pond sounds. Which sounds did they like the most? the least?

28. Operation: Water

I. Description: Awareness of various elements of an aquatic environment and comparison to another aquatic environment

II. Appropriate for: All ages.

III. Materials: two small, clear pill bottles

IV. Preparations:

V. Commentary: Become familiar with a water resource through use of the senses.

VI. Process:

Invite the participants to imagine that they have landed on Earth from another planet. The planet they come from only has minerals and air. They had received word that a substance had been found on a green plant (Earth) that could move or hold its shape. They are here to see if the report is true and discover for themselves what this "water" is like. They are equipped with finely tuned instruments for sound, feel, sight, smell, and taste. They are to split into two search parties, one going into the pond area, one to the stream. They have 15 minutes to gather sounds, smells, signs of animal and plant life, observe water clarity, composition of the bottom and materials on top, feel mud around the water and on the bottom, and bring back a sample of water in the pill bottle. The groups then discuss and compare the two water sightings and make speculations about the role of water on this green plant.

VII. Source: Eco Acts, p. 164

29. Ponds and Stream Information - Gerald Durrell, A Practical Guide for the Amateur Naturalist, 165ff.

30. Hay Infusion
   I. Description: Making a hay infusion results in a very fascinating effect.
  II. Appropriate for: All ages.
 III. Materials: microscope, dried grasses, container with lid (with one or two holes), water.
  IV. Preparations: This activity must be done in two session; getting started may be short or more complex. Get some dried grasses and place them in a container. Add water and cover with lid that has one or two holes punched in it.
   V. Commentary:
  VI. Process:
      A. Set container aside in a dimly lit corner for two to four days.
      B. For greater interest, set up several different containers.
         1. Dried grass with cold tap water
         2. Dried grass with tap water that has been standing for a day or so (to let chlorine out)
         3. Dried grass with pond water
         4. Dried grass with lake water
         5. Other plants with any of the above
      C. In two days examine the hay infusions. Check for color, cloudiness, odor, etc. Examine with a hand lens. Then, get a few drops on a slide (with a well), and look at it under the scope. Try all powers.

31. Common Pond Insects
   I. Source: The Nature Specialist p. 107
  II. See Addendum

32. Creepy Crawler Guide
   I. Source: The Nature Specialist p. 108
  II. See Addendum

HUMAN PHYSIOLOGY

40. Population of Water
   I. Description: Weight of Water
  II. Appropriate for: All ages.
 III. Materials: Gallon Jugs and Water
  IV. Process:
      Learn the estimated number of humans in the world. How much water is contained. Include in the equation. A gallon of water weighs 8 pounds.

   I. Description:
  II. Appropriate for: All ages.
 III. Materials:
  IV. Preparations:
   V. Commentary:
  VI. Process:

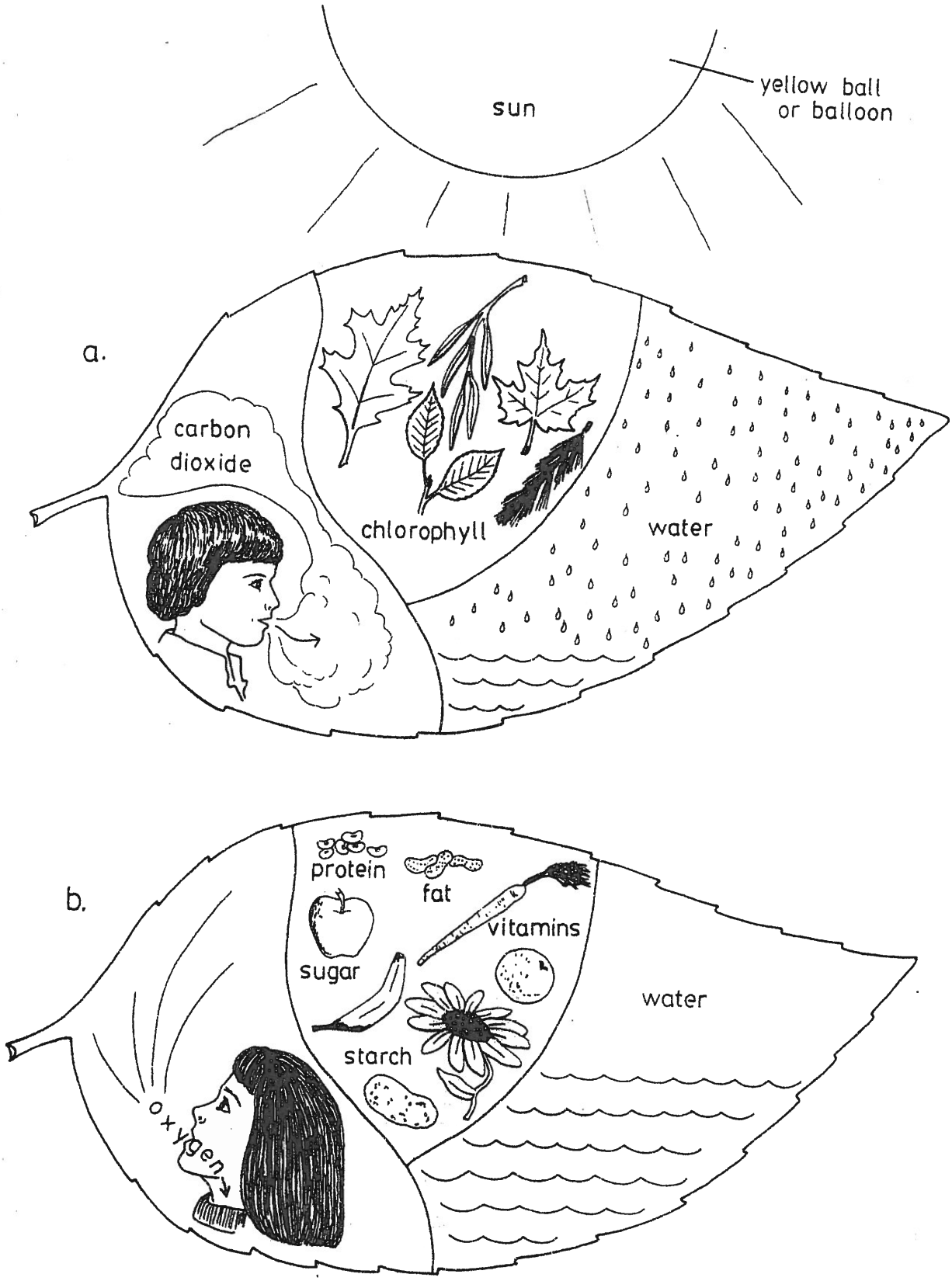
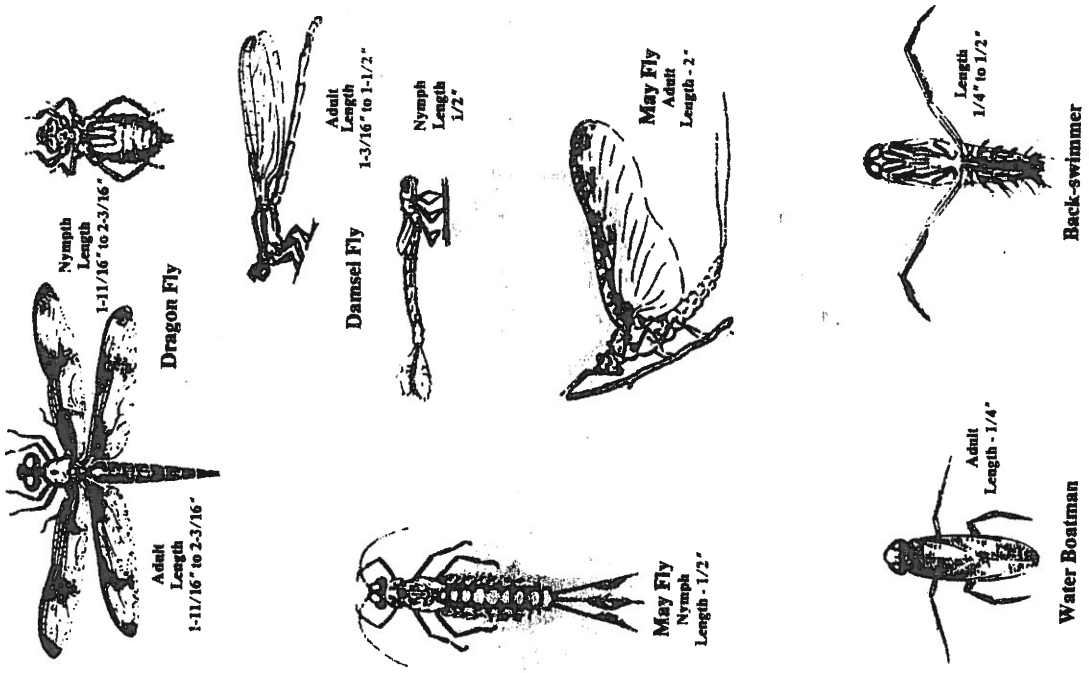


Figure 5-8. Puzzle masters for use in "Phenomenal Photosynthesis Puzzles": *a. the ingredients for photosynthesis, and b. the products of photosynthesis.*

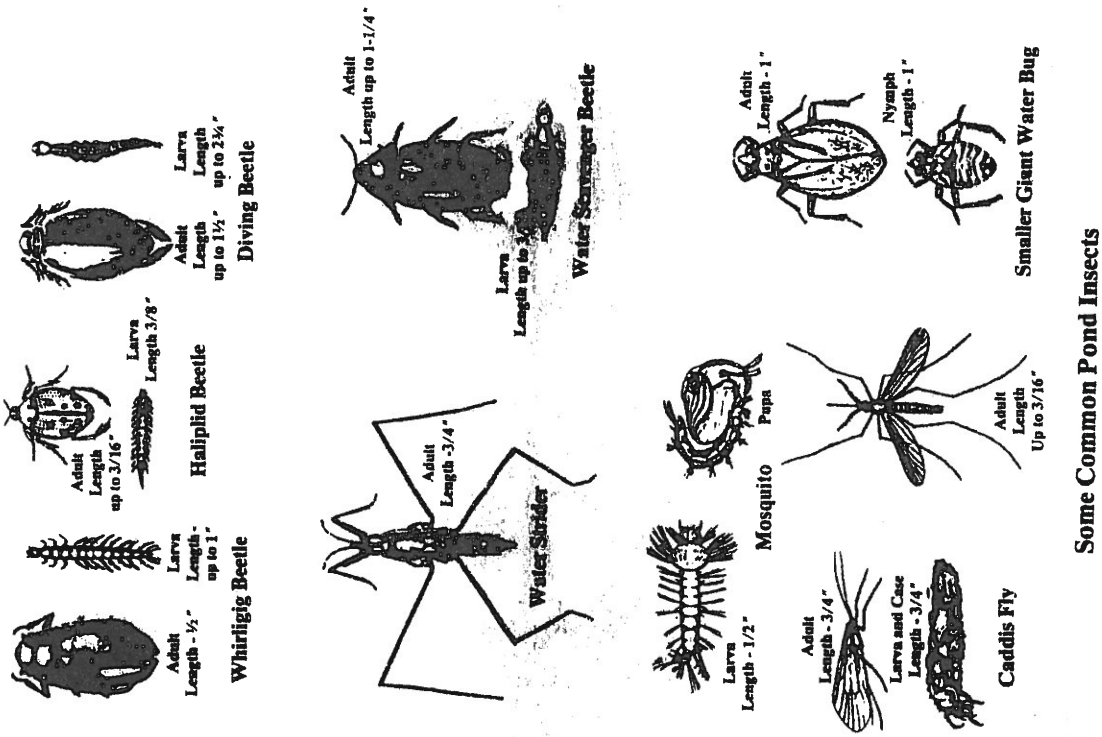
APPENDIX B

Field Guides and Keys

Insects: Common Pond Insects



COMMON POND INSECTS



Some Common Pond Insects

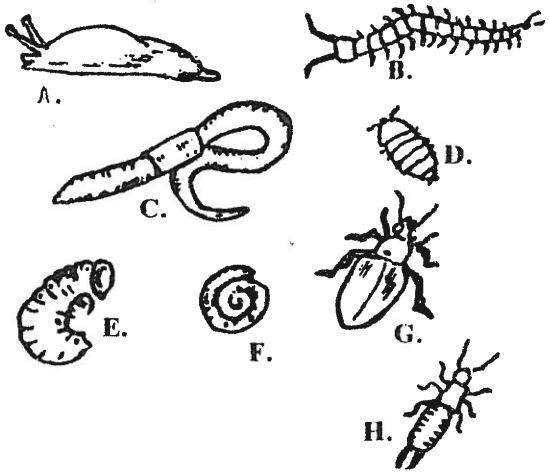
(Used by permission of Verne N. Rockcastle, Cornell Science Leaflet, Volume 60, No. 2.)

APPENDIX B

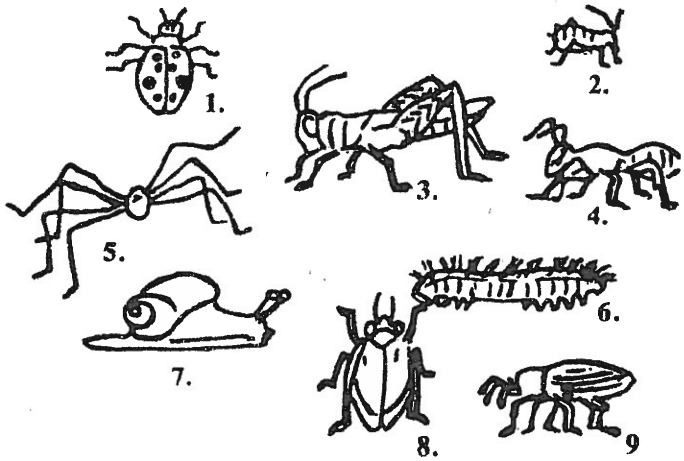
Field Guides and Keys

Insects: Creepy Crawler Guide

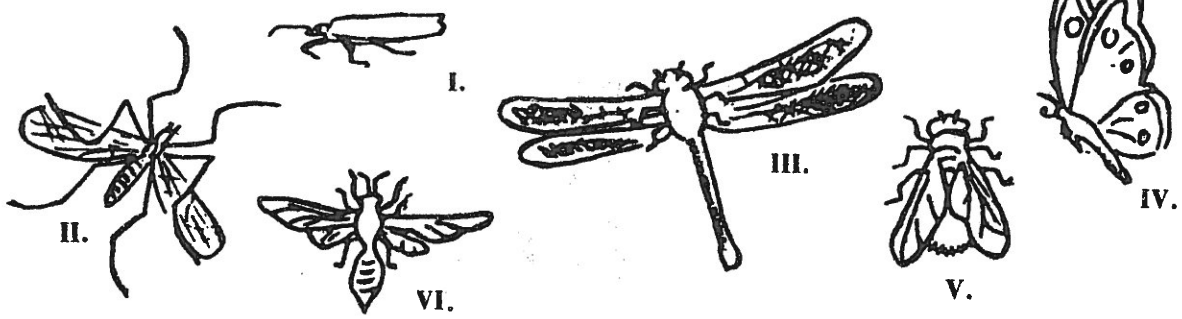
CREEPY CRAWLER GUIDE



Critters Found Under Rocks



Critters Found on Plants



Critters Found in the Air

KEY

Critters Under rocks:

A. Slug
B. Centipede
C. Earthworm
D. Isopod
E. Beetle larva (grub)
F. Millipede
G. Ground Beetle
H. Earwigs

Critters on Plants:

1. Lady Bug
2. Aphid
3. Grasshopper
4. Ant
5. Daddy-long-legs (spider)
6. Caterpillar
7. Land Snail
8. Leaf Hopper
9. Weevil

Critters in the Air:

I. Lawn Moth
II. Crane Fly
III. Dragonfly
IV. Butterfly
V. Housefly or Horsefly
VI. Wasp or Hornet

From a Guide created by Mary Vorndan for use at the Helmer Nature Center. Used by permission.

F. MULTI-CULTURAL/RACIAL/GENDER/RELIGIOUS

1. Water, Water Everywhere
   I. Description: Reflection on where water has been
   II. Appropriate for: All ages.
   III. Materials: Globe, paper, pencils
   IV. Process:
      A. Discuss how water has moved over and within the earth over the centuries. (A globe might be helpful.)
      B. Take a portion of water into your hand (a drop, a cup, etc.) And think about:
         1. Where has this water been?
         2. For what has it been used?
         3. What people has it touched?
      C. Read aloud the poem in Chapter I of the background paper.
      D. Ask the participants to write their own poem.
      E. How does it make one feel to be connected to centuries of people in this way?

G. SPORTS AND GAMES

A Note about Games and Sports

Games and sports in this Program Resource serve two functions:

1) the activity serves the intentions of the day and is used in a Bible study/learning experience, and
2) the activity serves the purpose of group-building and communication. This includes some activities that are done just "for fun" and are experienced by the small group.

In Day I be sure to first begin with games that are fairly easy, of low personal risk, and introductory (names, hometown, etc.). Then continue with games that are group-building activities (beginning of trust bonds, opening of communication lines, development of group spirit, etc.).

The "Group-Building" games listed below are noted specifically in Day I so that the sequencing of get-acquainted and group-building activities can be kept in the proper order. Many of the games in Days II, III, IV, and V are g-roup-building in nature but are not listed as such since they often serve multiple purposes.

1. Swamp Chute
   - I. Description: Play on a lawn or carpet. Do this one for fun. A good large group activity.
   - II. Appropriate for: All ages, Families (intergenerational), Adults
   - III. Materials: Parachute
   - IV. Process:
     - A. The participants hold the edge of the parachute and sit with their legs under the chute.
     - B. "It", the alligator, crawls around under the chute and pulls legs.
     - C. Once under the chute the person becomes another alligator.
   - V. Source: More New Games, p. 171.

2. Blob Tag (Group-Building)
   - I. Description:
   - II. Appropriate for: All ages; Families (intergenerational)
   - III. Materials: Large open area with clearly defined boundaries
   - IV. Process:
     The campers are involved in an activity that includes (rather than excludes, like traditional tag games) others. One person is "it" and tags another. The two of them are then it and must hold hands, elbows, etc. with each other at all times. They go for a third. When "it" has 6 or more people, then the campers may sub-divide into smaller "its" of no less than 3 people each.
   - V. Variations:
   - VI. Source: New Games Book, p. 107.

H. ARTS AND CRAFTS

1. Water scope
   I. Description: A device for underwater observation.
   II. Appropriate for: All ages
   III. Materials: plastic bucket, clear plastic wrap, elastic or rubber band, penknife, ballpoint pen
   IV. Process:
      A. Remove the big circle from the bottom of the bucket.
      B. Cut a piece of clear plastic wrap large enough to cover the top of the bucket.
      C. Secure the plastic in place with elastic or a rubber band.
   V. Source: Toy Book

2. Sealed World
   I. Description: A simple aquarium
   II. Appropriate for: All ages
   III. Materials: one gallon wide-mouth jar with lid, small amount of sandy soil, pond water, four or five water plants, one snail, two minnows, paraffin.
   IV. Process:
      Put sandy soil in bottom of jar. Push plant roots into it. Fill with pond water to within two inches of top. Allow one week for soil, water and plants to settle. Then add snail and minnows. Be sure to screw lid on jar, then pour melted paraffin all around lid to seal it. Use a cardboard collar to keep paraffin above the water level so the light can get through and people can observe. Put the jar in good light, but not direct sunlight.
   V. Variations:
      The number of plants, fish and snails can be different.
         1 minnow - 5 plants - 1 snail
         3 minnows - 2 plants - 1 snail
         4 minnows - 2 plants - 2 snails
         2 minnows - 1 plant - 1 snail
   VI. Source: The Nature Specialist, Miller, pp. 59-60.

3. Litmus Paper
   I. Description: Home made litmus paper.
   II. Appropriate for: All ages.
   III. Materials: Red cabbage, paper toweling, vinegar, baking soda.
   IV. Preparations: Chop up and boil a few of the most purple leaves of a red cabbage. Boil for about twenty minutes in a small amount of water, but do not let the water boil off. Allow to cool.
   V. Commentary:
   VI. Process:
      A. Bottle some red cabbage liquid for future use. Dip some paper towels in the solution and hang up to dry. You now have an indicator that will show acids (turn it from purple to red) and bases (turn it from purple to blue). (You could do this alone or with children.)
      B. Participants can use this just as regular litmus paper. Let them each have one sheet of toweling they can use for testing. First, let them use vinegar, then baking soda mixed with water. Tell them that these are test substances: the vinegar is an acid, the soda is a base, the cabbage juice was neutral. They can then test a variety of substances: water, milk, rainfall, lake, pond, stream, soda, choco-

late milk, apples, bananas, oranges, lemons, onions, laundry water, whatever is around.

C. Discuss acid rain with them.

4. How to Make a Plankton Net

I. Description: Make a net for catching small creatures in the water

II. Appropriate for: All ages.

III. Materials: Small jar, auto hose clamp, shirt sleeve or nylon stocking, wire coat hanger, nylon fishing line, swivel to prevent lines from tangling, tow rope - 20 feet

IV. Preparations:

V. Commentary:

VI. Process:

A. Cut off shirt sleeve evenly at shoulder.

B. Sew ½ inch hem.

C. Cut small hole ½ inch in length in one side of hem. Run straightened hanger through hem to form circular opening and twist ends together. Cut off any excess wire.

D. Puncture cloth just below hanger at three even points around the circumference. Attach three 12" lengths of fishing line at holes. Join free ends a swivel.

E. Cut off cuff of sleeve leaving one inch of doubled material.

F. Attach jar using auto hose clamp.

G. Drag through water and examine what collects in jar.

VII. Source: The Nature Specialist, p. 132

DAY TWO

I. Theme: God Creates Me

II. First Article: God has given to me and still preserves my body and soul and all their powers.

III. Intentions
- A. Theological/Biblical
  - 1. Learn that God continually creates me
  - 2. Discover God's name, YHWH
- B. Environmental
  - 3. Study the organisms in the pond
  - 4. Discover the need for community
- C. Human Physiology
  - 5. Study cells in the human body and their frequency of replacement
  - 6. Study the various microorganisms in the body
- D. Multi-Cultural/Racial/Gender/Religious
  - 7. Discuss human diversity
  - 8. Examine the human need for community

IV. Behavioral Learnings
Delve into the impact humans have on each other

V. Bible Passages

Genesis 1:1-2:7
3:1-9
Exodus 3:1-15
Deuteronomy
8:1-20
32:4, 6, 18
I Chronicles
29:10-19
Job 10:8-12

Psalm 23
46
92:1-8
93
95
96
97
98
99
103
110
111
136
Isaiah 40:10-28
49:15

I Corinthians
12:12-31
Philippians
2:5-11

B. WORSHIP AND DEVOTIONAL EXPERIENCES

The suggestions made in this section can be used in and/or adapted for other sessions.

1. Group Prayer - Day 2
   - I. Description: Write something about which participants are thankful in a person who cares for them (parent, teacher, friend, etc.).
   - II. Appropriate for: All ages
   - III. Materials: Scrap paper, pencils
   - IV. Process:
     - A. Participants write prayer sentences.
     - B. Then read them aloud to the group at prayer time.
   - V. Variations: This may be done for several days.

2. A Creation Antiphonal Reading
   - I. Description: A reading to be done between two locations where people are in earshot of one another.
   - II. Appropriate for: All Ages
   - III. Biblical Texts: Genesis 1:1-2:4 and Psalm 104
   - IV. Materials: Bibles or printed sheets
   - V. Process:

Description	Psalm 104	Genesis 1:1-2:4
The First State of Creation	vss. 1-4	vss. 1-5
Foundation of the Earth and Spring of Water	vss. 5-13	vss. 6-10
Vegetation	vss. 14-18	vss. 11-13
Moon and Sun	vss. 19-23	vss. 14-19
Sea and Its Animals	vss. 24-26	vss. 20-28
All Life Looks to God	vss. 27-30	vss. 29-31
Doxology	vss. 31-35	vss. 2:1-4

3. Movie Screen the Genesis First Creation Account
   - I. Description: Participants experience the activities of each day of creation.
   - II. Appropriate for: Small groups. All ages.
   - III. Biblical Text: Genesis 1:1-2:4
   - IV. Materials: Bible for the leader
   - V. Process:
     - A. Participants sit in a circle on the ground and are told what to expect. They will be closing their eyes and listening to the reading of the first Genesis account of creation and imagining they are sitting inside a big movie theater.
     - B. To prepare the group to sit quietly with eyes closed the leader asks the participants to sit in a relaxed fashion. Feel comfortable. Suggest they relax their bodies from their toes to their heads. When instructing the participants to close their eyes the leader may need to allow a few moments for the participants to express themselves orally to relax their discomfort. There is no need to rush.
     - C. Before beginning be sure that everyone understands and agrees.
     - D. Instruct the participants to close their eyes and to imagine a huge movie screen on their foreheads.
       1. Tell them to watch the screen for colors and shapes, to listen for sounds, and to notice where they are in the "movie" as the script is read.
       2. Read Genesis 1:1-2:4 slowly.
          - a. Pause between each day.
          - b. Allow time for the participants' imaginations to work.

3. When the reading is complete instruct the participants to open their eyes slowly when they are ready.

E. When everyone's eyes are open encourage the participants to talk to each other.
1. The leader should listen carefully and try to pick up what the participants are sharing and ask that the persons share with the entire group.
2. Try to get the participants to freely state their feelings.
3. If it is necessary these questions can be asked:
a. What was the high point for you?
b. What was the low point?
c. Which day was your favorite?
d. Where were you? Watching the screen? Involved in the process?

VI. Variations: If this is done with a large group, follow the steps above and then add:
A. Ask participants to subgroup according to their favorite day. (If a small group is too large split it up. Make sure there is a leader, a guide, in each group.)
B. The leader guides the small group to:
1. Talk about what caused the group members to choose this particular day.
2. Prepare a statement, a prayer, or a sketch to present to/share with the larger group.
C. Gather the group together with group sharing and appropriate songs.

4. "Creation" from <u>God's Trombones</u>"
I. Description: This sermon/poem is a part of the Black heritage. Many children were reared on it.
II. Appropriate for: All ages.
III. Materials: The book <u>God's Trombones</u>, Johnson
IV. Process:
A. Read
B. Dramatize

5. Sauntering Service
I. Description: Using senses participants find an item of creation with/for which to praise God.
II. Appropriate for: All ages
III. Biblical Text: Psalm 19:1-6
IV. Materials: Blindfolds
V. Process:
A. Bring the group to the center of an area. Blindfold everyone.
B. Say the Invocation: "In the Name of the Father, and of the Son, and of the Holy Spirit. Amen."
C. The group stands in a small circle. The leader spins each person around several times so he/she looses his/her orientation.
D. Instruct the participants to remain silent, and on the leader's cue they are to walk until the leader says, "Stop." (Let the group go no more than 20' from the center of the area.) Instruct individuals to sit down.
E. While blindfolded, instruct the participants to individually find "something" for which they can praise God. They will need to do this by discovering by touching what is in the area.
F. Once they have found something, they are to return to the center of the area by following the leader's voice. Ask the participants to hold hands and walk in a circle for at least two revolutions.

G. The participants sit down and remove their blindfolds.
   1. Share the "something" each person found and explain reasons for praising God.
   2. Read aloud together Psalm 19:1-6
   3. Offer a prayer.

H. For the scattering ask the participants to find the spot where they sat when blindfolded. When each person locates his/her spot he/she is to shout "Alleluia!"

6. A Celebration of Birth
   I. Description: A dramatic celebration of birth
   II. Appropriate for: All Ages
   III. Biblical Texts: Deuteronomy 32:4, 6, 18
   IV. Materials: torches or candles, floral bouquets
   V. Process:
      A. Preparation
         1. For groups -
            a. Assign each group an organism whose birth they are to celebrate. Give them specific items, e.g. a cat fish, not just a fish. Be as creative with the assignments as possible. Assign the "universe" and "humanity" and then any types of fish, insects, snakes, fungi, tree, herb, etc.
            b. The group is to prepare a report of the day of birth to present to the large group. The presentation can take the form of a drama, a mime, a poem, etc. The report should include answers to these questions:
               + What was it like the day of birth? Weather? Time of year?
               + Where was the organism born? Water? Earth? Specific location?
               + What was the birthing experience like? Sounds? Colors? Sensations? Feelings? Pain?
               + Where were the parents?
            c. The group then decides how the birthday will be celebrated. The song "Happy Birthday" cannot be used nor can there be a cake.
            d. Each group gathers a bouquet of flowers to be used in the celebration.
         2. Worship Site -
            a. Prepare a place for the participants to gather. Can be a campfire site, but that is not necessary.
            b. Erect torches/candles for each group making a presentation. There may need to be kerosene wicked torches with wind protection.
         3. Leader -
            a. Select some appropriate songs. The ones listed below are found in <u>Lift Up Your Voice</u>, Youth Songbook, Fortress Press, Philadelphia:
               "Born of the Father"
               "God Made the World"
               "Let All Things Now Living"
               "For the Beauty of the Earth"
               "Praise and Thanksgiving"
            b. Prepare a litany.
               + Create a petition for each of the organisms given to the groups. Prepare the petitions in a sequence so that the last two in the order are "universe" and "humanity."
               + Each petition should be shaped so that it addresses the

particular organism. The petition should include:
- A statement acknowledging God's providence in creating the organism.
- A line about what the organism provided for others.
- A sentence that describes what would happen if the organism lived solely for itself.
- An ending that clues the assembly they are to respond with the following:

+ Prepare a copy of the response to be recited in unison after each petition.

"In His perfect work God is always just.
He is a God of faithfulness and goodness.
Did He not create you?
Be not unmindful of the Father who begot you,
And forget not the God who gave you birth."

B. A Tentative Order
1. Gathering Song(s)
2. Introductory Comments:
   a. We worship God and celebrate the Birth of the Earth. We will think specifically about particular aspects of God's creation. This will be done when groups make their presentations. The candle signifies our memory of the particular organism that is presented.
   b. We shall also share in a litany. When the group's organism is mentioned a representative from the group places the bouquet at the base of the torch recognizing our celebration of God.
3. Each group makes a presentation. These presentations can be interspersed with songs.
4. Light one of the torches at the conclusion of each presentation.
5. The leader presents the litany before the appropriate torch. At the end of the assembly's response the group assigned to the organism mentioned places a bouquet of flowers at the foot of the torch.
6. Closing Song
7. Prayer
8. Scattering

7. Texts for Creating Services of Praise to God
Use I Chronicles 29:10-19 and/or Psalm 92:1-8

8. The Present Saving Parent
I. Description: An experience that celebrates God as the Loving Parent
II. Appropriate for: All ages
III. Biblical Text: Psalm 103
IV. Materials: Eggs, (fruit, though less dramatic)
V. Process:
A. Preparation
1. Rewrite Psalm 103 using images of parental care.
2. E.g.,
God is like the parent who -
Stays with us when we are sick
Crowns us with love when we don't deserve it
Overcomes holding our sinfulness against us
Encourages us to be vigorous
Does not always criticize us
Slowly gets angry

G. The participants sit down and remove their blindfolds.
   1. Share the "something" each person found and explain reasons for praising God.
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               + Where were the parents?
            c. The group then decides how the birthday will be celebrated. The song "Happy Birthday" cannot be used nor can there be a cake.
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               "God Made the World"
               "Let All Things Now Living"
               "For the Beauty of the Earth"
               "Praise and Thanksgiving"
            b. Prepare a litany.
               + Create a petition for each of the organisms given to the groups. Prepare the petitions in a sequence so that the last two in the order are "universe" and "humanity."
               + Each petition should be shaped so that it addresses the

particular organism. The petition should include:
- A statement acknowledging God's providence in creating the organism.
- A line about what the organism provided for others.
- A sentence that describes what would happen if the organism lived solely for itself.
- An ending that clues the assembly they are to respond with the following:

+ Prepare a copy of the response to be recited in unison after each petition.

"In His perfect work God is always just.
He is a God of faithfulness and goodness.
Did He not create you?
Be not unmindful of the Father who begot you,
And forget not the God who gave you birth."

B. A Tentative Order
1. Gathering Song(s)
2. Introductory Comments:
   a. We worship God and celebrate the Birth of the Earth. We will think specifically about particular aspects of God's creation. This will be done when groups make their presentations. The candle signifies our memory of the particular organism that is presented.
   b. We shall also share in a litany. When the group's organism is mentioned a representative from the group places the bouquet at the base of the torch recognizing our celebration of God.
3. Each group makes a presentation. These presentations can be interspersed with songs.
4. Light one of the torches at the conclusion of each presentation.
5. The leader presents the litany before the appropriate torch. At the end of the assembly's response the group assigned to the organism mentioned places a bouquet of flowers at the foot of the torch.
6. Closing Song
7. Prayer
8. Scattering

7. Texts for Creating Services of Praise to God
   Use I Chronicles 29:10-19 and/or Psalm 92:1-8

8. The Present Saving Parent
   I. Description: An experience that celebrates God as the Loving Parent
   II. Appropriate for: All ages
   III. Biblical Text: Psalm 103
   IV. Materials: Eggs, (fruit, though less dramatic)
   V. Process:
      A. Preparation
         1. Rewrite Psalm 103 using images of parental care.
         2. E.g.,
            God is like the parent who -
            Stays with us when we are sick
            Crowns us with love when we don't deserve it
            Overcomes holding our sinfulness against us
            Encourages us to be vigorous
            Does not always criticize us
            Slowly gets angry

Does not stay angry
Shares our feelings
Other images can be added.

B. The Service
1. Introductory song(s)
2. Introductory comments:
a. We look to God as a Parent. There are many characteristics we might call motherly and fatherly. You may want to make some observations at this point.
b. Tell the participants you are going to give each of them an egg to treat as though it was their child. They will be responsible for the egg for(you fill in the period of time). They can name it, mark it for identification, care for it, make a place for it to reside.
3. Sing "Children of the Heavenly Father"
4. Read Psalm 103 as you have rewritten it and make appropriate comments.
5. Prayer
6. Closing Song
7. Benediction

VI. Comment:
Make plans for participants to share their egg-parenting experience at some time.

9. Celebrating the Enduring Love of God
I. Description: A worship design that lifts up God's abiding presence in the creation and the history of the people of Israel.
II. Appropriate for: Older youth and adults
III. Biblical Text: Psalm 136
IV. Materials: None
V. Process:
A. Review the text:
1. Vss. 1-9 - Creation
2. Vss. 10-15 - Experiences in Egypt and the Exodus
3. Vss. 16-22 - The wandering in the wilderness
4. Vss. 23-25 - Summary of God's action
5. Vs. 26 - Conclusion
B. Design a liturgy celebrating each of the facets of the text.

10. God Is the Wholly Other
I. Description: A worship that looks at the meaning of "the fear of the Lord" from the perspective of real fear and not awe. Introduce the word YHWH.
II. Appropriate for: Older youth and adults
III. Biblical Text: Exodus 3:13-15 and Psalm 111
IV. Materials: None
V. Process:
A. Create a situation in which fear can be remembered and possibly relived.
1. Tell true stories (not ghost stories) that are adventurous, e.g., being involved with a bear in the campsite.
2. Discuss any feelings of fear during the camping experience.
3. Pantomime a prey that is under siege by a predator.
4. (Warning: Do not create a fearful situation.)
B. Focus on what fear causes us to feel. Be as dramatic as possible.
C. When we fear -
1. We sense another who is beyond us, over whom we have no control (the thief lurking around the house).

2. We sense ourselves being aware of every nerve ending in our bodies (it tingles).
3. Our attitudes are impacted (we are intimidated by every noise we hear).
4. Our behavior is changed (we can feel frozen or desire to run).
5. We may question our sense of worth, our very being.
6. Our perceptions change.
7. Sometimes we become remorseful.

D. Read Psalm 111
   1. Note that "fear" is used in this Psalm.
      a. People often translate "fear" as "awe" or "respect."
      b. "Fear" in this text is not intended to mean to be afraid.
      c. In this text "fear" means to realize that God is "wholly other" than ourselves.
         + God is not someone we create.
         + God is not someone who lets us get by without being critical.
   2. Ask the assembly to listen to the text read a second time thinking of God as someone "wholly other" than we are. To fear God is to sense God's otherliness and our very being. From this point we see God reaching out to us. God bridges the gap.

E. Look up Exodus 3:15-16 and discuss the name YHWH and how it is treated as sacred.

C. BIBLE STUDIES

1. Write Your Own Creation Story
   I. Description: Write a creation account based on own understanding of the origin of the world.
   II. Appropriate for: Grades 7 and older
   III. Biblical Text: Genesis 1:1-2:4
   IV. Materials: Bibles, pencils, paper
   V. Process:
      A. Talk a few minutes about the various hypotheses of "how the world was made."
         1. Big Bang - (Cf. II E 1)
         2. Creationism
         3. Other?
      B. Ask participants to write their own creation stories. They can work individually or in groups of two.
      C. Have the participants read their stories.
         1. The leader listens for three things:
            a. Who creates?
            b. How is the world created? What "powers" are used?
            c. What value is there in creation? Is there any "worth" given?
         2. Chances are, the above information is missing.
      D. Ask participants to read Genesis 1:1-2:4.
      E. Remind the participants that the authors of the first creation story used an existing hypothesis of that day. Read the Genesis account and note the following:
         1. God is proclaimed the Creator. How does the Genesis writer show this?
         2. God creates by speaking. Words are used. Cite examples from the Genesis text.
         3. God calls creation "good" and spends one day celebrating creation's value. How does God do this? (He does it by calling creation "good" and resting on the Seventh Day.
      F. The First Creation Story talks about the creation of things.
         1. Does it also talk about the creation of relationships?
         2. Is there any orderliness in the process? (Note the sequence of the days.)
         3. Does one thing build upon another as far as the writer of this account is concerned? As far as you are concerned?
      G. It may happen that the participants raise some questions how the contemporary hypotheses might negate the Biblical account of creation. The important factor is not that the Biblical account is received literally by the participants. Emphasize why God did what was done and how it was done. This is a statement of faith about God, not to be accepted as a scientific description.

2. Movie Screen the Genesis First Creation Account (Cf. II B 3)

3. The Good, the Bad, and the Footprint - Part I
   I. Description: This is part one of a three part Bible Study to be used on continuous days.
      Part 1: The Good - How good is God's complete and whole Creation? What are the signs of a good ruler? How is God a good ruler?
      Part 2: The Bad - How do we humans mess up God's Creation and subsequently human life? Humankind has been given the authority "to have dominion" over the Earth. What are the signs of our "bad dominion" over people? Over the natural environment?
      Part 3: The Footprint - We can be caring and sensitive to all of God's

Creation. How can Christians show God's mark ("logo") and "walk softly" in the world while working for God's good? How can we take part in God's "good ruling"?

II. Appropriate for: Grades 7 & older

III. Biblical Text: Psalm 72:1-14

IV. Materials: Bibles, paper and marking pens

V. Process:

A. Have the participants quickly brainstorm the characteristics of a good ruler/leader. The leader can organize the characteristics into the categories so that sub-groups of 3-4 participants can work on a brief skit or role-play of a good leader. They may need to be reminded of authority figures in their lives (teacher, pastor, parent, etc.) that can provide good role models for a positive ruler/leader.

B. Presentation on a "Good Ruler"

1. The participants perform a skit or role-play of a good ruler.
2. After each presentation the group lists what the presenters identified as characteristics of a good rule/leader

C. Review the list

1. Would participants add more characteristics than what was presented in the skits?
2. Direct their responses to how God has shown God's "powerful establishing, wise shaping, and joyful valuing".

D. Bring out both human and environmental concerns. As the participants state these ideas, write them down on the right of the corresponding ideas in the first column.

E. Read Psalm 72:1-14, a prayer for God's blessing on a kind (It shows good characteristics of a king.)

1. Ask participants to watch for characteristics mentioned in the Psalm that were written on the newsprint. Check the items off on the newsprint.
2. Now look in the Psalm for characteristics not mentioned on the newsprint. Add them to the list.
3. Do participants understand what these characteristics mean? Discuss.

F. Have the participants find evidence in the natural world how God has been a good ruler of nature.

1. How do things care for each other?
2. How does God provide for them?
3. Have the participants give examples from the pond.

G. Close with a prayer giving thanks to God for His good ruling.

VI. Source: Stewardship of Creation, pp. 27-28.

4. The Saving Present Parent

I. Description: Develop an understanding of God as one who is involved with creation to make it complete.

II. Appropriate for: Various ages. Plenty of opportunity for adapting.

III. Biblical Texts: Genesis 3:1-9; Job 10:8-12; Psalms 23, 46, 93, 95, 96, 97, 98, 99, 110, 136; Isaiah 40:10-11, 49:15, Philippians 2:5-11

IV. Materials: Bibles, newsprint, markers, and pencils

V. Process:

A. How do you describe God? One or more of the following procedures can be used.

1. Participants compose a list of occupations which depend upon hands, e.g., artist, carpenter, mechanic, etc.
   a. Review the list and ask each participant to select one to three occupations he/she thinks best describes God for him/her.
   b. If more than one is selected prioritize the choice.

c. Share ideas and reasons.

2. What dimension is your God?
   a. J. B. Phillips suggests these descriptions of God. The leader can write them down on newsprint.
      + Resident Policeman - tells you right from wrong, conscience, sets limit.
      + Parental Hangover - parent tapes, God is a mother or father image, the voice one hears.
      + Grand Old Man - God just watches, cares, acts benevolently, but not necessarily involved.
      + Meek and Mild - God is not punitive, adapts to the situation, kind person.
      + Absolutely Perfect - a circle, no beginning or ending, all is beautiful, nothing wrong, almost no fun, a philosophical being.
      + Heavenly Bosom - God hides the faithful in Godself, no fears.
      + God-in-a-Box - God and Church are synonymous, a building is pictured when the word "God" is said.
      + Managing Director - God choreographs everything, beings might even be puppets.
   b. Ask each participant to choose one of the above that is closest to their idea of God or is the opposite.
   c. If they do not like these images have them make up their own.
   d. Ask the participants to draw a picture of the one image they chose. Hold up the pictures and have the participants gather with others who have similar pictures. Groups can talk about why they picked this particular image. Share with large group.
   e. A variation: participants choose the image they would have selected at a younger age and the image they would select now. Share comparisons.
3. Ask participants to find a natural object that symbolizes God for them. Share thoughts with group.
4. Participants select one person they identify with God. Share person and reason.
5. Participants select one animal they would identify with God. Share animal and reason.

B. Activities to explore the parental/nurturing role.
   1. Adaptation Experiences. There are various ways that animals adapt to their environment. Adaptation is any feature of an organism to improve its choices of survival and reproduction.
      a. What Lives Here? (Cf. II E 5)
      b.
   2. Caring for the young
      a. Find a critter, often times a bird or mouse, that is no longer in its nest, and care for it.
      b. Pretend you have a baby. How would you care for it? Act out/Discuss.

C. When one or more of these activities are completed discuss briefly the images of God and/or the place of God in the situation.
   1. In the environmental activities one can note how God works in the created order to assure survival. Adaptation is in the plan of God to nurture a species.
   2. In other activities the image of God may be more symbolic.

D. Bible Study
   Select several passages that work in the situation you find yourself. It is too much to use all the texts. Read the texts and discuss how the author is describing God.

1. Genesis 3:1-9. This is the story of the Fall. God appears seeking out Adam and Eve in spite of their disobedience. God holds them accountable and removes them from the Garden, but God seeks them out and keeps them in communion with Godself.
2. Job 10:8-12. The passage appears amid a section where Job is bemoaning his fate and how God has made life miserable for him. However, Job presents a God who creates and nurtures.
3. Psalm 23. God is the Good Shepherd. This can be compared to John 10:11-18. A pastoral setting where life appears pleasant and easy. However, note that the Shepherd is with us as we walk through the Valley of the Shadow of Death and as we sit at a table in the presence of our enemies. The opponent may be powerless, but it is not destroyed. We are able to live with the situation.
4. Psalm 46. Luther was inspired by this Psalm to write "A Mighty Fortress Is Our God." These powerful images of God portray a safe island, the power to make something desolate, and the end of war.
5. Psalms 93, 95, 96, 97, 98, 99, 110. God is a majestic ruler.
6. Psalm 136. This is an outline of the history of Israel. The repetition reminds us of the depth of God's compassion.
7. Isaiah 40:10-11. God is depicted as a ruler who comes in power, a good shepherd, and a mother.
8. Isaiah 49:15. This is a positive statement about God stated in the negative. The words "compassion" and "womb" have the same Hebrew root word.
9. Philippians 2:5-11. Paul describes God who comes in Jesus Christ.

E. Care of the young.
1. What do participants know about how various animals care for their young?
2. Here are a few details:
   a. Blue Gill, Sun Fish, and Bull Heads. Fish build nests in a bowl shaped depression in the gravel. Very territorial. Males guard the nest jealously.
   b. Catfish. After fertilizing the eggs the male picks up 40-55 eggs in his mouth and carries them for a month until hatched. The male then holds them for another two weeks. He does not eat during this time. If a young catfish is threatened it will return to the father's mouth for sanctuary.
   c. Trout and Salmon. These fish bury their eggs. Because they are safer from predators, fewer eggs are produced.
   d. Turtles. Once they have laid their eggs motherhood ceases. This is generally true of snakes. Bull snakes are an exception.
   e. Finches. Mothers and fathers regurgitate seeds for their new offspring. It is the original pre-chewed meal. Insects are fed the young when they get older.
3. Participants may want to research various traits of animals and play charades with the group.

F. The parental character of God.
1. List all the positive characteristics of a parent. Write on newsprint
2. Next to it list all the characteristics of God that have been developed during this study. Write on newsprint.
3. Help the participants see that God is the SAVING PRESENT PARENT.

G. Luther's Explanation to the First Article of the Apostles' Creed.
1. Recite with the group the whole explanation.
2. Focus on the words, "All this God does out of fatherly and divine goodness and mercy . . ."
3. How do participants understand this phrase?

H. Summarize: What was learned?

5. The Earth Is the Lords

I. Description: A study focusing on letting the world be left natural.

II. Appropriate for: Older youth/adults

III. Biblical Texts: Psalm 24, Deuteronomy 8:1-20

IV. Materials: Bibles

V. Process:

A. Find a quiet spot in the out-of-doors and ask the participants to close their eyes and listen to the reading of Psalm 24.
   1. Read the passage slowly several times.
   2. Instruct participants in advance to listen carefully and let whatever images appear in their minds develop.

B. Participants share what they saw in their minds.
   1. Did they have any images at all, or was it a blank?
   2. What verse or images stood out for them?
   3. Was there anything exciting?
   4. Where were you in the images?

C. Review the text. Participants open their Bibles and reread the text.
   1. To whom does the earth belong?
   2. Who is this "good" person?
   3. What shall God give that person?
   4. What event is being expected?

D. Help participants understand that the imagery is the ascending of the mountain in Jerusalem where the Temple is located. The people are bringing the Ark of the Covenant. The Ark contains the Torah. It is also the symbol of the presence of God, the King of glory.

E. Using the ideas from this Psalm when we look at our world what does it mean to:
   1. Recognize the earth belongs to God and not to us?
   2. We are to have clean hands and pure hearts?

F. Does this have anything to do with how we treat our fellow creatures in this world?

G. Do one or more of the activities that engage the participants in looking carefully at this world.
   1. Alluring Algae (Cf. II E 3)
   2.

H. A question to be raised with the participants is: How important to the ecosystem/habitat being observed is the human being?
   1. What effect do humans have on these systems?
   2. How would the participants define the humans' role?

I. Read Deuteronomy 8:1-20
   1. This passage talks about the people of Israel entering the Promised Land.
   2. Can this text say anything to us about how we should treat our land?
      a. How does our land compare to the Promised Land?
      b. To whom does it belong?
   3. The object of this study is that we do not need to destroy and conquer our world. It can be natural. It is sufficient unto itself. Nature has its own integrity.

6. Creator Spirit

I. Description: Discover how God, described as Spirit and breath, gives life.

II. Appropriate for: All ages

III. Biblical Texts: Genesis 1:1-2, 2:4b-7, Psalm 104:27-30

IV. Process:

A. Study the nature of oxygen
   1. Study the oxygen - carbon dioxide cycle.
   3. Study how oxygen is dissolved in water and makes possible water creatures to breathe
      a. Plant life
      b. Wind
   4 Study how oxygen enters the human body and how the pulmonary and circulatory system works.
   5. When discussing how integral oxygen is to life note:
      a. There are some types of life that do not need oxygen (anaer-obic).
      b. The word used for oxygen is "burning." Why use that word.
      c. What happens when oxygen is absent.

B. Bible Study
   1. Read Genesis 1:1-2
      a. Ask participants to imagine what is being described and tell their thoughts
      b. What is the most important part of the two verses?
      c. At some point there could be a discussion of wind
      d. What in fact does oxygen make possible?
      e. Note that the word *reach* means wind, breath, and Spirit.
      f. What is this passage saying to the participants? Who gives the natural world the life-giving oxygen?
   2. Read Genesis 2:4b-7
      a. Ask participants to image what is being described and share their thoughts. (It may be good to use "Creation" by Johnson.)
      b. What does God do? What is the anthropomorphic images?
      c. Older youth may talk about CPR.
   3. Read Psalm 1014:27-30
      a. How do participants understand this passage?
      b. Is God's breathing a past tense or present tense activity?

C. Discuss how God is continuing to create
   1. Oxygen is supplied
   2. Good -nourishment
   3. Various parts of body replaced.

7. How YHWH Got YHWH's Name

I. Description: Learn the meaning of YHWH as the name for God who is involved in all of history

II. Appropriate for: Older Youth

III. Biblical Texts: Exodus 3:1-15, Isaiah 40:12-28 (omit vss. 15-17), and I Corinthians 12:12-31

IV. Process:

A. What niches can be identified?
   1. Looking in a pond, what are the roles so the various organisms?
   2. In the human body, what are some of the tasks of some of the organs?

B. Note that each entity has a name and at least one function/role.

C. Optional: Read I Corinthians 12:12-31.
   1. Paul discusses various parts of the body.
   2. Would the participants substitute some new parts given what they know about the human body? (This can be playful.)
   3. Pay some attention to why Paul is using the metaphor of the body. (Describing the church as the work of the Spirit with people fulfilling a variety of roles.)

D. The leader should pause to give a brief presentation on two kinds of history: human history and natural history.
   1. What is human history?

a. Can participants name some historical events?
b. Howe are they recorded?

2. What is natural history?
   a. Describe how the activities of nature are just as historical as human events.
   b. How are these recorded?
3. Of what type of history is the event of Jesus (life, death, and resurrection)?

E. The leader informs the participants that they are going to read a story about an event in human history from the Bible, but they are to think in terms of natural history.
   1. Read the story of Moses and the burning bush in Exodus 3:1-15.
   2. Are the participants familiar with this story? (For fun, asking if there was any smoke at this fire.)
   3. What is God asking Moses to do?
   4. Look carefully at vss. 7-12 and discuss the problem God is dealing with.
   5. In vss. 13-15 what is Moses' dilemma?
   6. What is the word God uses for God's name?

F. The leader may want to comment on this: The name YHWH has at the root of its meaning the idea that God is interacting with all of history, all the events that have ever gone on and will go on. Thus the interesting way of siting the word with past, present, and future tenses.

G. Using their imagination ask the participants to present that Moses is one of the organs or organisms in the human body or one of the organisms in the pond.
   1. The name of the entity is "Moses."
   2. What does Gods do with "Moses?"
      a. Encounters him.
      b. Gives him a task (a niche).
      c. Empowers him to do his task within the ecosystem.
   3. And God is called _____ because God is also (involved) in the event.

H. As a summary read Isaiah 40:12-28 (omit vss. 15-17) and ask the participants to put it in their own words.

I. How would they understand
   1. That God continues to create all the time?
   2. That God is called YHWH?

8. A Celebration of Birth (Cf. II B 6)

E. ENVIRONMENTAL LEARNING EXPERIENCES

GENERAL

1. The Big Bang Theory
   The Universe, 14.5 Billion Years Ago

   The universe - the only one we have evidence of, though it may have existed in previous incarnations and may one day die and be reborn - was created 14.5 billion years ago, when a superdense ball of primordial matter, drifting through a black, formless void, suddenly exploded. This was the "big bang."

   The scientific reason for that shattering cataclysm remains a mystery. The searing heat of those first few moments of creation forever evaporated the fingerprints of the Prime Mover - whether they were the familiar forces of physics or a spiritual force in the form of a personal God.

   We do know that in the ensuing chaos matter vigorously fought antimatter for eternal dominance. When particles of opposite dispositions approached each other too closely, both were instantaneously annihilated, producing radiant bursts of pure energy. The battle for what would become the essence of galaxies, stars, and of life itself raged on for millions of years.

   The victor, of course, was matter. The legions of antimatter, what few survived, were banished to remote islands in space, and others were imprisoned, it's believed, in gravitational traps at the centers of numerous present-day galaxies, including our Milky Way.

   As the universe expanded, rushing outward to fill the void, it also began to cool. By the time of its one-billionth birthday, it was sufficiently cool to start condensing into galaxies, swirling masses of primal mist.

   Matter, now having few foes, was under rule of the god gravity, which gathered together inside each galaxy gases and dust, and fashioned stars. Some blazed in isolation, others in great constellations that human beings eons later on a planet that had yet to be formed would imagine resembled dippers, bears, horses, and crabs.

   Stars continued to form as the universe aged, cooled, and further expanded. Gravity, in its all-pervasive reach, eventually served as a brake to slow the expansion, limiting physical reality to a bubble-like shell whose dimensions one day would be daringly estimated by a great physicist, Albert Einstein.

   Populated now with clusters of matter, the universe was a few billion years old. There were countless galaxies, but only an amorphous hint of our own Milky Way; numerous stars, but not our sun; many planets, but not the Earth.

   At a later point in cosmological time, either accident or the hand of God, depending on one's personal belief, began to erect a state of high order at one infinitesimally small place in the swirling Milky Way. It was to become our solar system.

POND

4. Pond Pantomime

I. Description: Learn through close observation and translate that observation into personal experience.

II. Appropriate for: All ages.

III. Materials: Collected animals

IV. Process:

The participants should look closely at their specimens to see what parts of the animals bodies are moving and why? to propel themselves? to eat? to breathe? The each participants chooses an animal and imitates its motions. The others guess what it is by name or by pointing to the correct one in the dish pan. Which pond habitat does each pantomimed animals spend most of its time? Why? End the activity with a special release ceremony so all animals are returned safely to the water.

5. Alluring Algae

I. Description: (A)Visit, observe and experience algae in the natural environments that are available to you: freshwater, ocean and estuary. collect a few samples for close examination and for later use in an "Algae Mobile." (B) Closely observe the samples of microscopic algae collected earlier. Grow and observe microscopic algae from a small sample of pond water.

II. Appropriate for: Younger and older children

III. Materials:

(A) Field guides to algae and various aquatic habitats, large jar with holes punched in the lid for use in "B," plankton net (see I H number 4) small bottles for plankton samples, hand lenses, scissors to cleanly snip off algae samples in the field, small cooler with ice in it.
(B) Bottle(s) containing plankton samples gathered in "A," microscope and microscope slides, eye dropper, small shallow plate, guide to using microscopes, guides to algae, paper, pencils, crayons, jar of hay, jar of sterile water, sample of pond water gathered in "A," large jar and lid with air holes (made in "A")

IV. Commentary: Understand algae and appreciate the diversity among algae. Realize that algae live in many different aquatic environments. Experience the sight, smell, feel and taste of algae. Practice growing these fascinating organisms.

V. Process:

A. Algae Afield

Bring the participants to one or more sites and take samples of the algae living there. Describe the kind of algae it is and all you have learned about it. Pass the samples around and assign someone to collect each sample when all have seen it and place it in the cooler. Encourage the children to feel, smell and, if (and on if) you have instructed them to do so, to taste a tiny piece of those algae you have stated are safe to eat. Immerse the children as much as possible in the sensory experience of the pond or other body of water. Encourage them to use their hand lenses. Use the plankton net to gather a bottle of sample at each site: first, fill the plankton bottle halfway with water from the environment you are studying. Gently pull the plankton net through he water to gather plankton, then invert the net over the bottle and use a little water to back-flush the plankton free of the tip of the net into the bottle. Swish the inverted net around a little to free the plankton.

Take an extra plankton sample at the pond.

B. Algae Alive

1. Gently swirl the water in the bottle containing the plankton sample so the plankton are well interspersed and not settled on the bottom. Place a bit of the water from the plankton sample onto a small glass plate and use the eye dropper to put a few drops onto a microscope slide. Focus the microscope on some algae. Have the participants take turns looking at the algae and using the guides to identify and read about each kind of algae. Pass out paper, pencils and crayons for the children to draw the algae they see as best they can, in detail, to create notebooks that record algae discoveries.
2. Ask the participants to fill a large jar halfway with hay, and then nearly to the top with sterile water. tell them they are going to "grow" a jar of algae, bacteria, and microscopic animals (protozoans) by using the hay as a culture and a sample of the pond water to "seed" the jar. Have them add a few drops of pond water. Cap the jar using the lid with holes in it. Keep the jar in a bright spot and expose it to a few hours of direct sunlight each day, but do not let the water get too hot. Every day, over the course of the next few weeks. place a small sample of the culture under the microscope and observe it with the children. They will see the development of bacteria, flagellates, paramecia, and, finally, a community of green algae, amoebas, rotifers, crustaceans and other pond organisms. Have the participants illustrate each new algae as it appears.

6. Flagellum Flail

I. Description: Use a piece of string to mimic the two basic kinds of flagellum movements used by *Euglena*, dinoflagellates and other tiny swimmers.
II. Appropriate for: All ages.
III. Materials: Piece of string
IV. Process: Cut a piece of string roughly 3 feet long, hold it hand hanging down and make small, easy circular motions with the hand to create the "propeller". Mimic the flexible oar by gently moving the hand back and forth in one plane to send ripples of waves down the string. How do these motions help a tiny organism to swim.

7. What Lives Here?

I. Description: Discover and investigate some of the plants and animals that live in the pond.
II. Appropriate for: All ages.
III. Materials: Dip nets, hand lens for each student, jars or plastic collecting cups or milk carton cut in half lengthwise (milk cartons work best), chart of aquatic life, medicine droppers, diluted droppers, diluted food coloring (1 part food coloring to 8 parts water), spoons, aquarium
IV. Preparations:
V. Commentary:
VI. Process:
A. Collect a clean water sample. Collect a sample with silt.
B. Ask, "If you took a water animal from the pond, which sample do you think it would live best in?"
C. Demonstrate collecting methods. Turn rock over slowly. Replace rock (back on its original side) after searching for animals.
D. Review procedures: Divide group into buddy teams. Explain the import-

ance of staying together. Announce boundaries. Instruct participants to catch only ONE animal at a time. Stress to BRING 'EM BACK ALIVE! Announce that each animal must be returned to its habitat (home) before another is caught.

E. Pass out dip nets and jars.

F. Student Activity:
   1. Catch an animal/plant.
   2. Look at it through hand lenses. Mark on master chart.
   3. Put in aquarium.
   4. Participants may use charts to identify the name of any plant or animal.

G. The next activity is another OBIS activity called Water Breathers. The participants will investigate currents that aquatic animals create when they breathe, feed, and propel themselves through water. Use one of the aquatic animals collected in the previous activity. Also collect some plants and non-living objects from the animal's environment. Keep the animals fresh and lively in uncovered containers with lots of water. Dilute the food coloring beforehand. Mix one part food coloring with eight parts water from the collection site. Mix up enough for the entire group.
   1. Tell the participants that many aquatic animals create a variety of water currents when they breathe, feed, and swim, and that these currents are usually difficult to observe because of the lack of color contrast to make animal currents visible.
   2. You can solve the "invisible current" problem by using diluted food coloring, which safely passes through animals that actively pump water through their bodies. This technique provides enough color contrast to make animal currents visible.
   3. Introduce the medicine dropper and diluted food coloring as told for observing aquatic animal currents.
   4. Place an active aquatic animal (fish, tadpole, shrimp, etc.) in a container filled with clear water and demonstrate the tracing technique. Emphasize the fact that only one carefully place drop at a time is needed. Place the tip of the medicine dropper underwater and close to the area (mouth, tail, side, etc.) of the animal being investigated before squeezing the bulb.
   5. Hand out the materials and let the participants choose an aquatic animal to investigate. Challenge the group to use the medicine dropper technique to search for currents caused by breathing, feeding, and swimming movements of aquatic animals.
   6. Grab a medicine dropper and some "mystery" solution and investigate some currents for yourself. Help refill the viewing containers with clear water when used. (Be careful not to lose the aquatic animals during the refilling.) Some children do not administer the dye to any body part other than the head. Encourage the kids to apply the dye near other parts of the animal.
   7. If time allows, challenge the students to investigate their animals; reaction to other organisms and non-living objects take from the same environments. Encourage them to investigate several aquatic animals.

H. Discuss for the group:
   1. Which animals seem to breath water, i.e., pump water in and out of their bodies?
   2. Do any other animals take in or expel water from areas other then their mouth? Which animals? Where do these intakes and exhausts occur?

3. How do the animals circulate water? How might movement help an animal survive? (food, oxygen, warmth, protection, etc.) Tell the participants that special features of an organism (such as gills for breathing or a powerful tail for fast swimming) that improve its chances for survival and reproduction are called ADAPTATIONS. What adaptations would you need to live underwater? (Mechanical devices such as SCUBA gear are not allowed.)

8. Aquatic Insects

I. Description: Descriptions of various aquatic animals.

II. Appropriate for: All ages.

III. Materials: Photocopy the pictures (See II E Page 7)

VI. Commentary

A. <u>May Flies</u> (Ephemerotera)
May flies are abundant in streams and lakes and can be found in practically all fresh water through the state. The nymphs are found on the undersides of rocks or other underwater objects. They have two or three tails. The wings of the adult are held in an up-right position while resting.

B. <u>Dragonfly</u> (Odonata)
They are found in all types of fresh-water areas; ponds, lakes, streams, and swampy areas. The nymphs can be found crawling about on the bottom, on aquatic plants, or other underwater objects. They are one of the largest aquatic insects; most of them are dark brown to greenish as juveniles, change to brighter colors as adults. When resting, their four wings are held outstretched.

C. <u>Stone Fly</u> (Plecoptera)
Stone flies seem to require running water in which to live. They are never found in lakes except in the inlets and outlets. When the adult is resting its wings lie lengthwise upon the back. Nymphs are found in abundance only among the rocks in streams. Stone fly nymphs have two long and stiff tails.

D. <u>Water Boatman</u> (Hemiptera)
Boatmen are found in nearly all waters. They swim in an erratic patterns underwater, and are usually found in slow moving waters. Boatmen are normally brownish in color and equipped with leathery wings.

E. <u>Water Strider</u> (Hemiptera)
Water striders are a familiar sight on the surface of slow moving waters, ponds, and lakes. They resemble long legged spiders. although equipped with wings, they are rarely observed in flight. Their color is usually brown to gray. Many persons call them "water skippers."

F. <u>Caddis Fly</u> (Trichoptera)
Caddis flies are found in nearly all lakes, streams, and ponds. During their underwater life, they live in cases made from sticks and small particles of rock. These can usually be seen moving about on the bottom. When the adults are at rest the wings are held roof-like over the body and sloping down at the sides. The adults are generally dull brown or black in color. Sometimes the larvae are called "penny winkles" by fishermen. Periwinkle" is another common name.

G. <u>Whirligig Beetle</u> (Coleoptera)
These are found on the surface of slow moving waters, taking advantage of the surface tension. The Whirligig beetles, true to

their name, whirl or swim on the water's surface. When disturbed they dive under the water, frequently. Their bodies are dark colored, robust, and the front legs are long and slender.

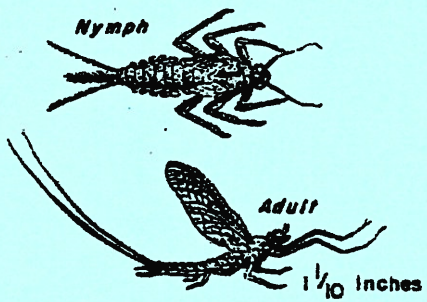
H. Crane Fly (Diptera)
The larvae of the Crane fly are found in scum of shallow waters, in the damp soil along streams or lake shores, and marshy areas. The adults are never truly aquatic and may be found great distances from water. The adults look much like giant mosquitos without a beak.

I. Mosquitos (Diptera)
Mosquito larvae are usually found in stagnant slow moving water. Most people are familiar with the appearance of adults and know that they are more abundant around marshy, damp areas. The young are often called "wigglers" and can usually be found wiggling about just under the water's surface. Contrary to popular belief, not all mosquitos bite, the males just buzz and are not equipped for biting.

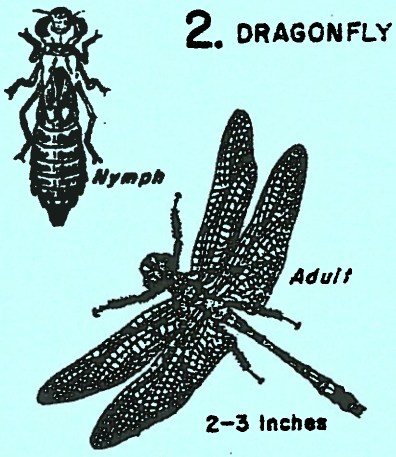
J. Black Fly (Diptera)
The larvae are found in flowing water (only) on stones, vegetation, or other objects, usually in the swiftest part of the stream. in many cases, the larvae are so numerous they appear moss-like over the surface of the attached object. Later on in life, they live in a cocoon which is customarily a boot-shaped structure. The Black fly as the name implies, are usually dark compactly built flies, with rounded black and short broad wings. The adults may be found great distances from water.

K. Midges (Diptera)
Larvae are most abundant in the shallow water areas of lakes, ponds, and streams favored by a heavy growth of aquatic plants. They prefer soft mucky bottoms, ans they are a bottom-dwelling species, and need this type of environment for constructing their tube-like homes. Larvae live in soft tubes, however, during later stages of life they are found living in silken cocoons or gelatinous cases. The adult Midges look much the same as mosquitoes. Their antennae look like two feathers on the front of their head, and they don't have a beak.

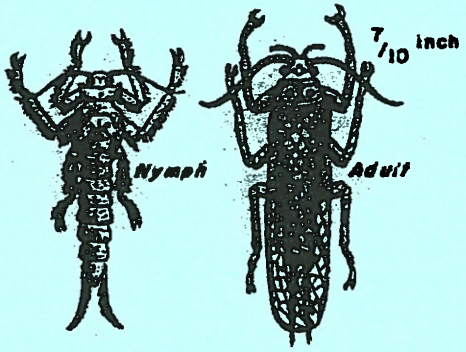
AQUATIC INSECTS



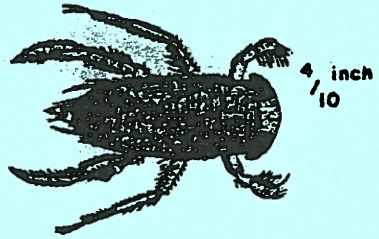
1. MAYFLY



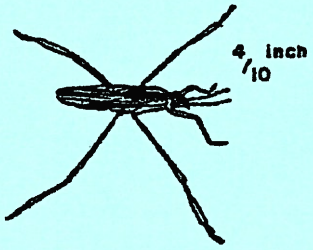
2. DRAGONFLY



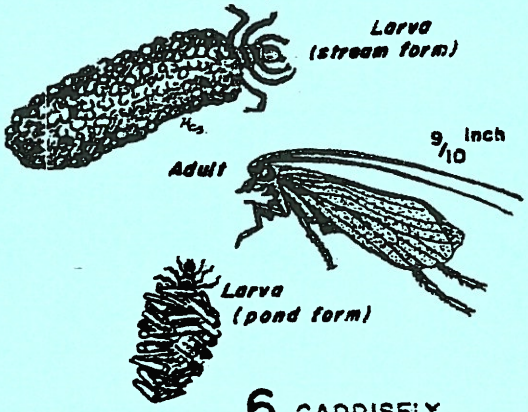
3. STONEFLY



4. WATER BOATMAN



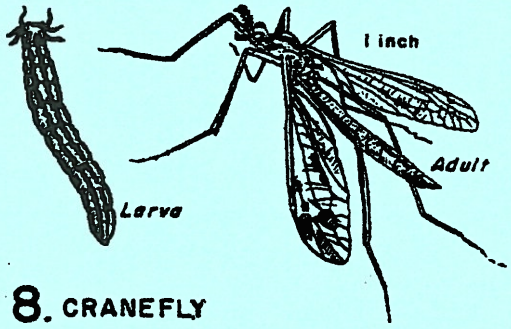
5. WATER STRIDER



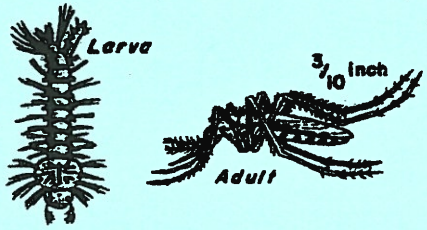
6. CADDISFLY

AQUATIC INSECTS

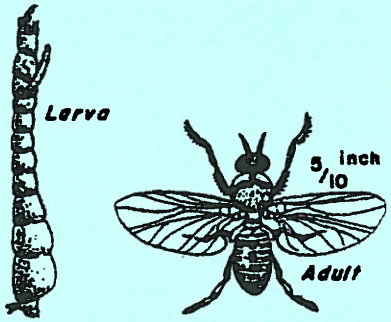
7. WHIRLIGIG BEETLE



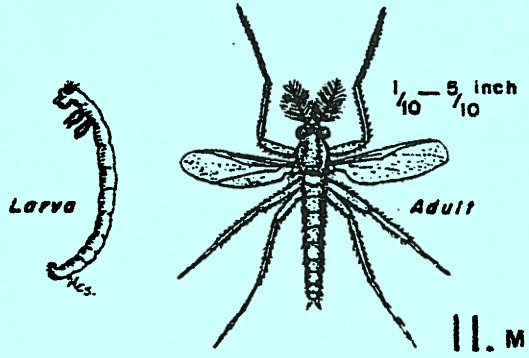
8. CRANEFLY



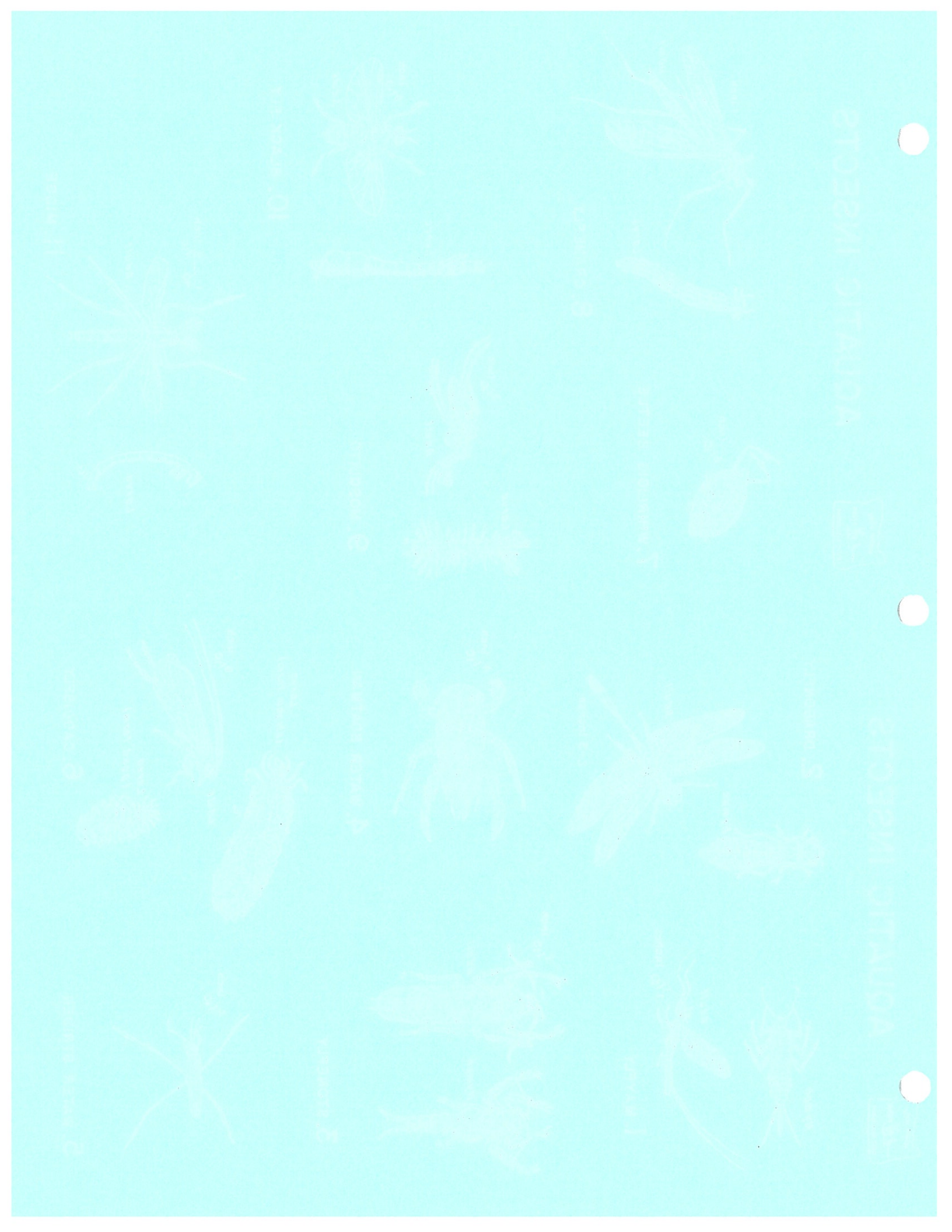
9. MOSQUITO



10. BLACK FLY



11. MIDGE



F. MULTI-CULTURAL/RACIAL/GENDER/RELIGIOUS

1. The Commonality of Birth
   I. Description: Discussions and activities that help participants understand that they all at least one thing in common - birth.
   II. Appropriate for: All ages
   III. Materials: Newsprint and marker (or paper and pencil), Bibles
   IV. Process: Discuss any or all of the following as appropriate.
      A. The Day You Were Born
         Participants relate the story of the day they were born. Do they know any of the details?
      B. Birth - we have it in common with all humans, all species, and God?
      C. Is anyone in the group adopted - what does it mean? Note that they still have a birth to celebrate. (A more important discussion of adoption could come up in Day II)
      D. What Comes with Birth? (physical/social/etc.)
         1. List all the things that come with birth.
         2. Identify the things that can be changed and how.

List of Things That Come with Birth	Check Here the Things that Can Be Changed	Tell how the things Can Be Changed

         3. Discuss items that cannot be changed.
            a. What does one do to live with them?
            b. Give examples: handicap, parents, siblings, body structure, etc.
         4. Birth Right
            a. Define a birth right
            b. Review the story of Esau and Jacob (Genesis 25:19 ff)
      F. Are all people born equal?
      G. Discuss: Is birth sacred? What makes it sacred?

G. SPORTS AND GAMES

1. Blind Group Together
   I. Description: Acting out the role of King/Queen
   II. Appropriate for: Grades 7-12; Families (intergenerational); Adults
   III. Materials: Blindfolds, Long rope
   IV. Process:
   Each group member is tied to a long rope, blindfolded, and then the whole group is tangled up. The group must untangle itself.
   V. Variations:
   Before the group is tangled up, pull one participant aside and announce to the group he/she is the King/Queen of Untangled Knots. After the group is tangled, the King/Queen alone is to untangle them all. When the group is untangled, talk about how the King/Queen did the job.
   VI. Source: Source: Initiative Games, p. 24.

2. Light - No Light
   I. Description: The temptation to cheat.
   II. Appropriate for: Grades 4-12; Families (intergenerational)
   III. Materials: Flashlight(s) for "it(s)", safety flashlight for leader
   IV. Process:
   This activity is played much like flashlight tag as "it" tries to catch the others sneaking up behind her/him. See source for directions.
   V. Variation: With this activity the participants can talk about the temptation to cheat in one way or the other.
   VI. Source: Clouds on the Clothesline, p. 69.

3. Inflictions
   I. Description: Persons become handicapped and depend upon one another.
   II. Appropriate for: Youth
   III. Materials: As needed
   IV. Process:
   A. The group takes a hike.
   B. Along the way the leader announces that one or more of the participants has developed a handicap. Handicaps include: Blindness, deafness, broken leg, broken arm, other.
   C. The leader can decide that eventually all the members of the group have one handicap. The level of dependency increases.

4. Handicapped Lunch
   I. Description: Participants are "handicapped" to make and eat lunch together.
   II. Appropriate for: Youth
   III. Materials: A picnic lunch that requires some assembly.
   IV. Process:
   A. Participants pair up. One member of each pair is blindfolded. The other member cannot use his/her hand.
   B. The task is for the team members help each other make and eat lunch.

H. ARTS AND CRAFTS

1. Algae Art Keepers of Life

I. Description: (A) Create two mobiles, one featuring microscopic algae and one presenting pieces of the large algae gathered outdoors during "Algae Field." (B) Make giant replicas of diatoms using old boxes.

II. Appropriate for: All ages.

III. Materials:

A. Illustrations of microscopic algae from "Algae Alive", newspaper strips, wheat paste, water, bucket for paste, strong thread, crayons, tempera paint, paint brushes, water, paint containers, pipe cleaners, and buttons, plus other materials for crafting the "algae." Pieces of algae gathered during "Algae Afield," strong thread, models of microscopic algae, at least one dozen pieces of very thick doweling 1.5 ft long, pieces of string, screw hook.

B. One box for each child (shoebox, small gift box etc.), white nontoxic glue and paste, scissors, tape, construction paper, crayons, paints and supplies as in "A," stapler and staples, guides to algae.

IV. Goals: (A) Recognize some common algae, both larger species and microscopic species. (B) Understand the basic structure of diatoms as well as the specific design of several species.

V. Process:

A. Algae Mobile

1. Have participants use their illustrations of microscopic algae from "Algae Alive" as models to create small (hand-sized) papier mache models of those species. These ought to be as "realistic" as possible, including shape, color, and markings. For hanging, be certain that the participants attach a loop of thread to the top of the loop. Allow these to dry.
2. Share with the participants the algae that were gathered outdoor during "Alluring Algae" and that have been stored in the refrigerator. Through questions and answers, review and discuss each kind and its natural history.
3. While the algae are still soft and pliable, work with the group to trim pieces of the algae to a reasonable size for hanging on a mobile. Make a small hole in each piece and tie a loop of thread through the hole for hanging. Carefully spread these our onto newspaper and allow to dry for several days while the papier-mache projects are drying.
4. Once the drying is complete, use the dowels and threat to make two separate mobiles: one of the microscopic "algae" and one of the pieces of real algae. Use the string to hang the first dowel from something within the children's reach. Tie the algae onto the ends of the dowels using the thread - this allows them to dance and spin more easily. Use the string to tie the dowels to each other. Stagger the points of attachment and balance along the dowels to make the mobiles lively and interesting. Hang the mobile up high when it is completed.

B. Diatom Designs

1. Have each participant choose a box-shaped species of a diatom to create from guides used in "Algae Afield." Help the participants to fashion their boxes into a diatom shape with rounded ends. The lid should fit snugly. Now have the participant glue the lid on and decorate her or his diatom. When these are completed have each child read (or read to young children about his or her

diatom. Participants will then take turns sharing their diatoms with the rest of the group and reporting on what that diatom is called, how it lives, etc. Take time to share pictues and ilustrations of other diatoms from among the incredible diversity of those that exist.

VI. Source: Keepers of Life pgs. 68-69.