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ABSTRACT

These materials are the result of a summer curriculum development workshop during the summer of 1973. The participants purposely represented several subject disciplines and grade levels to give credence to the philosophy of environmental education as an interdisciplinary study that permeates all areas of the curriculum, kindergarten to grade twelve and beyond. The publication includes a definition and a philosophy of environmental education. The remaining pages contain the conceptual framework developed by the workshop participants. Four major areas are covered: the geosphere, the energysphere, the sociosphere, and the biosphere. The statements following each of these are divided into conceptual schemes, concepts, subconcepts, and principles. These are meant to be used as a guideline to the development of an environmental education curriculum and can be used by teachers to fit their needs. (MA)

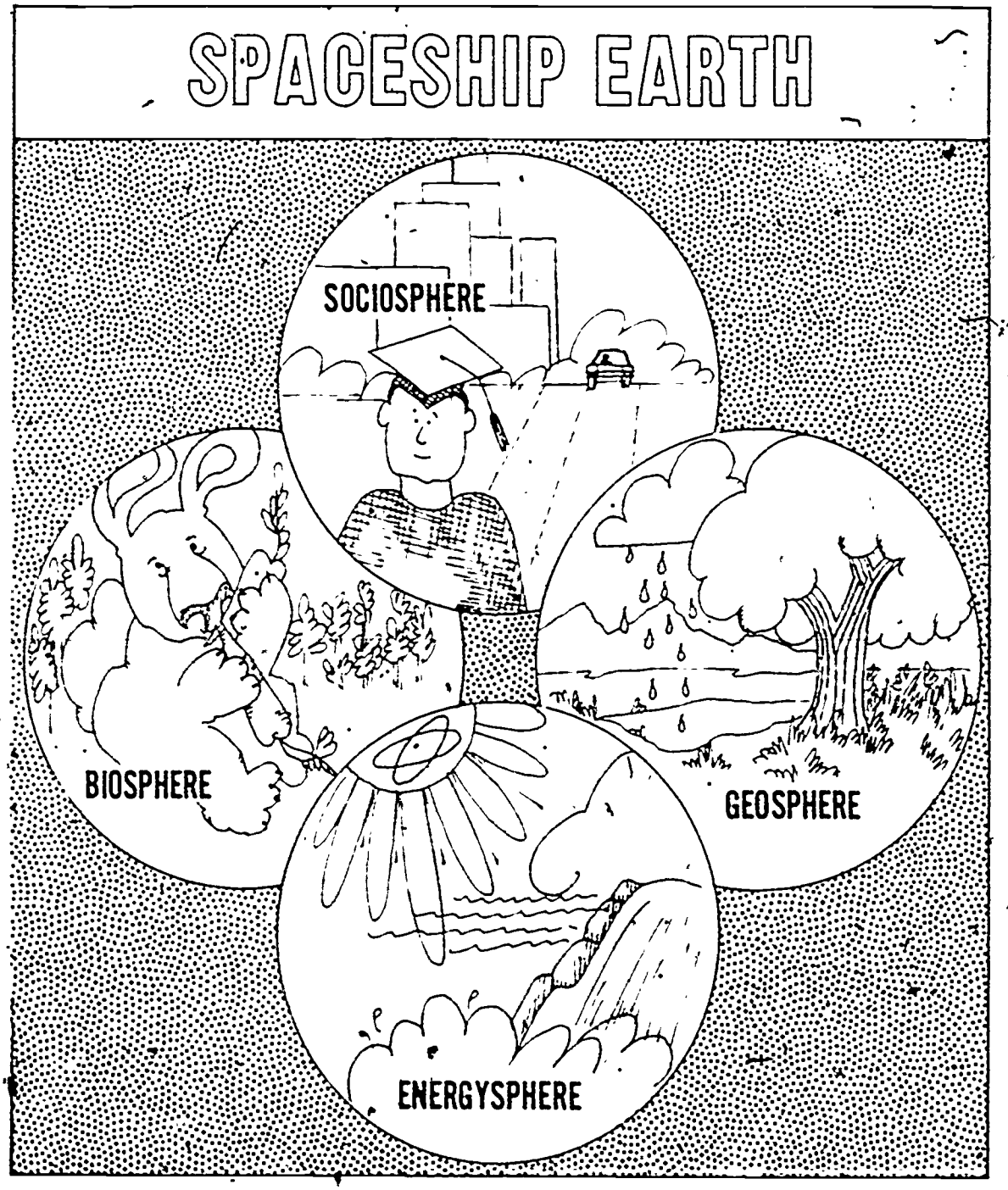
# Environmental Education

## Conceptual Curriculum Framework

## (Tentative)








Utah State Board of Education 1973

# ENVIRONMENTAL EDUCATION

## Foreword

Environmental education has come upon the scene of American education with such an onrush and with so many differing views regarding its scope, that most educators have been unprepared, both in understanding and implementation.

The following materials are designed to give some dimension to the discipline yet not be restrictive. It should be recognized that this initial effort may have many deficiences and inaccuracies common to a first endeavor, but the desire to "get something down on paper" for trial, reaction, and revision prompted this early reproduction.

These materials are the result of a summer curriculum development workshop during the summer of 1973. The participants purposely represented several subject disciplines and grade levels to give credence to our philosophy of environmental education as an inter-disciplinary study which should permeate all areas of the curriculum, kindergarten to grade twelve and beyond.

The workshop participants included the following:

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There is still much to be done. It is hoped that each individual who has opportunity to peruse or use these materials will forward to me any suggestions, comments, and/or materials to assist in refinement of this program. Also feel free to make contact with me or any member of the workshop committee for assistance in your implementation of these materials.

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Specialist in Science and
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# WHAT IS ENVIRONMENTAL EDUCATION?

Not all educators and planners agree on a definition of environmental education, but they know what environmental education is and what it is not.

*Environmental education is---*

A new approach to teaching about man's relationship to his environment--how he affects and is affected by the world around him;

An integrated process dealing with man's natural and man-made surroundings;

Experience-based learning, using the total human, natural, and physical resources of the school and surrounding community as an educational laboratory.

An interdisciplinary approach that relates all subjects to a whole-earth "oneness of purpose";

Directed toward survival in an urban society;

Life-centered and oriented toward community development;

An approach for developing self-reliance in responsible, motivated members of society;

A rational process to improve the quality of life;

Geared toward developing behavior patterns that will endure throughout life.

*The consensus is that environmental education is not---*

Conservation, outdoor resource management, or nature study (although these may be included in an environmental-education program);

A cumbersome new program requiring vast outlays of capital and operating funds;

A self-contained course to be added to the already over-crowded curriculum.

Merely getting out of the classroom.

--*Places for Environmental Education, a report issued by Educational Facilities Laboratories.*

## DEFINITION OF ENVIRONMENTAL EDUCATION

Environmental education is the art of making enlightened decisions about the quality of life.

In practice, environmental education is a life long, inter-disciplinary process furthering a respect for life and promoting individual responsibility, having as its objectives a vital awareness of the interrelationships of living and non-living surroundings and development of problem-solving skills to prevent and solve environmental problems.

## ENVIRONMENTAL EDUCATION PHILOSOPHY

Man, in common with all living things, is part of the ecosystem. To avoid harmful reaction to environmental problems man must understand his place in the system. Therefore, environmental education is of paramount importance in today's world. This education should instill in man a respect for self, respect for others, and a desire to use technical assistance to solve environmental problems. Man has the technical capability, but through apathy, misunderstanding and financial indifference this capability has not been fully applied.

There are two small but powerful extremes of the spectrum concerning the use of man's environment. Preservationists often state that man should preserve all natural resources while some other groups urge man to consider only man and his wants and needs in the use of natural resources.

The most tenable position, one in which man wisely uses natural resources, is a middle ground between the two extremes. There are many actions individuals can take to improve and maintain the environment; however, some situations require group action. An informed citizenry through example, forum, private and public organizations and the legislative process can collectively accomplish many desired objectives.

Man's environmental education has as its objectives the focusing of the individual's attention on environmental problems, on the scope of differing positions and the development of an individual environmental ethic. This education should make him aware of possible solutions, their implications and infuse him with concern and a life long commitment to make enlightened decisions about the environment for present and future generations.


ENVIRONMENTAL EDUCATION
CONCEPTUAL CURRICULUM FRAMEWORK
August 1973

GEOSPHERE

(Conceptual Scheme) I. *The GEOSPHERE includes all nonliving components of the earth and its atmosphere.*

(Concept) A. The earth is in constant change.

(Subconcepts)

1. Physical, chemical, and nuclear changes are constantly taking place in the interior as well as on the surface of the earth, producing both cataclysmic and gradual transformations.

2. In chemical or in physical changes the total amount of matter remains constant.

B. All natural resources are limited.

1. Earth's resources and natural recycling systems can support a finite number of people.

2. Every country has some resources, but no country has all the natural resources a modern civilization needs.

3. In nature there is a continuous recycling of many elements.

(Principles)

a. Some resources do not renew themselves because they are the result of a process which has ceased to function.

4. The nonrenewable resource base is considered finite.

C. Pollution is a disturbance of normal cycling.

1. We are discovering that the earth is a "closed system"; large quantities of wastes dumped almost anywhere are likely to have far-reaching consequences.

D. Conservation is using natural resources wisely and providing for future use.

1. Whenever possible, man should use renewable instead of nonrenewable resources.

II. *The solid part of the earth is the LITHOSPHERE which is in constant change and consists of the crust, mantle and core.*

A. Soil is a basic resource.

1. Soils are formed from different types of rocks.

a. The soil is partially composed of weathered rocks, minerals and organic matter.

b. Plant and animal life exist in the soil, help form it and change the structure and nature of the soil.

c. Most soils have three layers - topsoil, subsoil and parent material.

(1) Soils are formed in layers that differ in texture, organic matter, structure, water holding capacity and fertility.

(2) The thin mantle of topsoil is very important.

2. All living things depend on soil directly or indirectly.

a. Soils used according to the capability and treated in relation to their needs will provide food, water, recreation, wildlife and timber for all generations.

b. Soil is a reservoir that holds water.

c. Soil is the home of many things.

3. Man can improve the soil.

a. Irrigation, drainage and vegetation bring lands into useful production.

(1) People use plants to prevent or correct damage to the soil.

b. Soil productivity can be maintained by utilizing known organic, mechanical and chemical processes.

c. Maintaining, improving and restoring soil productivity is important to the welfare of people.

(1) Productive soil is capital wealth on which the agricultural industry depends.

4. Man can impair the soil.

a. The depletion of the organic matter in the soil is the first step to soil erosion.

(1) Soil depletion affects the economic well-being as well as the health of the farmer, the community and our country.

(2) Soil depletion affects the nutritional value and growth of plants in the soil.

b. Deterioration of soil is the same, in effect, as a reduction in the amount of land.

c. Plowing of dry grasslands and overgrazing augments destructive forces e.g., dust, storms, erosion

5. Soil can be saved by proper use and management.

   a. Soil conservation is everyone's responsibility.

   b. Government agencies and private landowners are working to conserve our soils.

B. A mineral is an element or compound found in the earth.

1. Minerals include everything from the ground except plants and animals.

   a. The three general classes of mineral deposits are: metallic, nonmetallic and fuels.

   b. Rocks are made of minerals.

      (1) Rocks are divided into three major groups: igneous, sedimentary and metamorphic.

   c. Useful minerals are distributed unevenly throughout the world and vary greatly in quantity and quality.

      (1) No one industrial country is completely self-sufficient as to mineral resources.

         (a) Our state has some principal commercial minerals and rocks.

2. Minerals are useful to man.

   a. Many things we eat, wear or use have minerals in them.

   b. New mineral uses often bring about cultural changes.

3. Mineral conservation involves the utilization of all known methods of using minerals to serve more people for a longer time.

   a. Technologically and ecologically sound ways of mining and recycling can conserve our mineral resources.

      (1) Scientific advancement through research is an important conservation technique in mineral conservation.

         (a) Continued research is finding new sources of minerals, more efficient extraction methods and developing mineral substitues.

b. Mineral deposits are continuously being formed, but the rate is so slow that man can count only on those already deposited.

c. Depletion of some of our mineral resources is accelerated because of waste and huge demand.

(1) Wasting minerals increases the cost of obtaining them at a later time.

d. Some practices for mineral conservation must be imposed through law.

C. Land is a natural resource.

1. Land is classified according to its capability for cultivated crops and suitability for timber, recreation, water, wildlife and forage.

2. A landscape develops through the interaction of all factors that make up the environment.

a. Some good agricultural land is taken out of production for man's other needs.

b. Geographical factors initiate settlement of a region.

c. Many landscape features can be classified and their extent and location mapped.

III. *The HYDROSPHERE is the total amount of water existing around, on and in our planet.*

A. The total amount of water has never changed nor will it ever, as far as we can foresee.

1. Water has several forms: (solid - ice), (gas - steam and water vapor) and (liquid - water).

a. Water is renewable.

(1). Water moves from clouds to earth and back again as the hydrologic cycle.

(a) The water cycle produces a continuous supply of water (97% in oceans and only 3% in fresh water, including glaciers, streams, lakes and ground water).

(b) The water we use is tapped at various points of the watercycle, but is not permanently removed from the cycle.

B. Water is essential for all living things.

1. Water is used in a wide variety of human activities (e.g., drinking, food preparation, manufacturing, farming, recreation, cleaning, cooling, heating).

2. The availability of water is probably the most important of all factors which determine the distribution of plants over the surface of the earth.

3. The ocean community provides sustenance for living organisms.

   a. Food from the sea affords a high quality protein for the diet of man.

   b. Ocean plants supply 70% to 80% of our oxygen.

   c. The ocean is a storehouse of minerals.

C. The amount of usable water available on the planet earth is reduced by pollution.

1. Pollution is the principle way by which our water resource is wasted or made unfit for use.

   a. Floods cause damage to natural resources and property.

   b. Water is a transporter and carrier of disease and other impurities.

2. Many sources of water pollution are a result of man's technology and careless, thoughtless activities.

   a. Polluted water affects the economy, man's safety and health and total ecology.

      (1) Adding large quantities of hot water to a river or lake, through nuclear energy and industrial plants, is a form of pollution.

      (2) Chemicals, raw sewage, oil and agricultural wastes are polluting lakes, rivers and seashores.

         (a) Lakes and ponds are threatened most by eutrophication, but parts of rivers having still water may also be endangered.

   b. The ocean is the final dumping place for many pollutants.

      (1) Most ocean dumping is done close to shore, where most large schools of fish are caught.

      (2) The consequences of dumping wastes into the ocean depend on the kind and amount of waste and where it is dumped.

(3) The immensity of an ocean makes it seem like an ideal place to dump wastes: however, we are discovering that even the ocean cannot be treated as a limitless dumping grounds.

c. Living organisms in the water adapt to their environment but can withstand only a certain amount of chemical and physical change.

(1) Wastes absorbed by microscopic plants and animals are transferred to small marine animals and the contamination is passed along the ocean food chains, eventually reaching fish that people eat.

d. Water pollution affects cities and towns far from its source.

e. Water pollution is not just a big-city problem, but stems also from inadequate or nonexistant rural sewage treatment facilities and pesticides.

D. Water management and conservation is necessary to insure the water needs of present and future generations.

1. As populations increase, competition for the use of water increases, resulting in a need for establishing water use priorities.

a. Man must be aware of the social, political and economic factors influencing management of the water system.

(1) There is often a conflict of interest in the way water is managed.

b. There are national, state and local conservation agencies concerned with water resource problems.

2. Watersheds make possible a gradual release of the water stored in them.

a. Improved research develops watershed techniques which protects the land and provides more water for use by individuals.

(1) It is less costly to reduce run off through good watershed management.

(2) Expected benefits from dam construction have to be analyzed in regard to potential losses of wildlife, habitat and aesthetic values.

3. Communities have the responsibility to protect waters from contamination.

4. Desalination of sea water may become economically feasible for urban use, but will probably be impractical for irrigation use.

IV. *The ATMOSPHERE is the entire mass of air surrounding the earth.*

A. Air is an essential natural resource.

1. The composition of air is mainly nitrogen and oxygen with small amounts of carbon dioxide.

a. The atmosphere consists of two large zones: the homosphere and the heterosphere.

b. The atmosphere acts like glass in a greenhouse, allowing the light to pass through it but holding back the re-radiated heat.

2. All living things require a constant supply of oxygen, varying in amounts according to body size, physical activity and the basic rate of metabolism.

a. We have no choice but to breathe the air around us, whatever its quality.

B. Air pollution is the presence in the atmosphere of foreign substances put there by activities of man or nature in concentrations sufficient to interfere with comfort, safety or health.

1. Air pollution covers the entire scale of contaminants - smoke, dust, fumes, mists, radioactive wastes, gases and combinations of these items.

a. Air pollution contributes to deterioration of inanimate objects and has a negative effect upon animals and plants.

(1) Air pollution effects the life span of an organism.

(a) Air pollution affects some plants and animals before man.

2. There are many sources of man-made air pollution - industrial processes, heating of buildings, electric generation and automobiles.

a. In spite of the numerous ways that the air gets cleaned, man has been able to introduce pollutants faster than cleansing activities have been able to remove them.

b. Most of the gases and particulates that man puts into the atmosphere are the result of combustion.

(1) Air pollution from automobiles can be decreased by better engine maintenance, special devices to recycle by-products of incomplete burning, totally new engine design and the development of efficient mass transit.

(2) Smog is characterized by a thick haze; it produces eye irritation and can aggravate asthma.

(a) Dense layers of smoke and haze over a city may absorb as much as 90% of the sunlight and are a frequent cause of traffic accidents.

(b) An atmosphere filled with pollutants can prevent warming sunlight from reaching the earth and eventually change the climate.

(c) The accumulation of smog is particularly noticeable when a climatic condition called a thermal inversion prevents air and pollutants from rising.

c. Air pollution cannot be treated as a local problem - pollutants are carried with the wind and cannot be held within boundaries.

d. Air pollution has always existed, but has become a serious problem as a result of industrialization and increased population.

(1) The increase in population, which results in increased human activities, is a leading cause of air pollution.

3. Some air pollution is caused naturally (e.g., volcanic eruptions, forest fires, decaying vegetation, dust storms).

C. Four factors in the atmosphere give rise to weather: heat, wind, moisture and air pressure.

1. The movement of air masses has an important influence on weather.

a. The general circulation of the atmosphere influences weather.

b. Conditions that produce changes in the speed and direction of the wind indirectly affect the dispersal of pollutants in the air.

c. Air can transport pollutants across the length and breadth of the landscape, as well as vertically.

2. Weather affects soil formation, plant and animal adaptations and management of the environment.

D. Conservation of the purity of air is necessary.

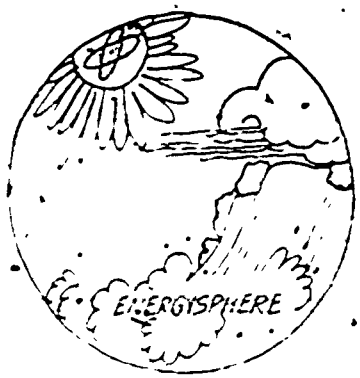
1. The two major ways of reducing air pollution are prevention and control.

a. Man is attempting to prevent and control air pollution by enforcing laws and enacting legislation.

(1) Standards must be set to define what is an "acceptable" level of emissions as eliminating pollutants entirely is impractical and unnecessary.

(2) Local, state and national legislation should be a unified cooperative effort to effectively reduce air pollution.

b. Air is considered free but man must make personal and financial commitments to have pollutants removed so that he can breathe clean air.




ENERGYSPHERE

(Conceptual Scheme) I. *ENERGY interchanges accompany every natural occurrence.*

(Concept) A. Energy can do work, but may exist without doing work.

B. Energy cannot be created nor destroyed, but can be changed from one form to another.

(Subconcepts) 1. Some forms of energy must be transformed to become useful for man's needs.

2. All forms of energy can be classified as either energy of motion or stored energy.

(Principles) a. Running water, winds, earthquakes, and volcanic eruptions are forms of the earth's kinetic energy.

b. Potential (stored) energy, which came originally from the sun, is stored in plant and animal matter as chemical energy.

(1) Fossil fuels (derived from ancient plants and animals) are a valuable source of energy, chemicals and synthetic fibers.

(2) Fossil fuels often cause environmental problems and additional alternative energy sources should be developed.

(3) Other forms of stored energy from organic sources are wood, dung and peat.

3. The earth has a limited number of energy sources that man knows how to use.

II. *SOLAR ENERGY is produced by the sun.*

A. The sun is the ultimate source of energy for all living things, including man and his culture.

1. The most important function of the sun's energy is in the life processes.

a. Some of the sun's energy is converted to chemical energy that flows from one level to another in a food web, losing energy at each level.

2. The energy of moving water is directly due to solar energy which causes the evaporation of water; the water vapor later provides rain to fill streams and rivers.

3. Solar fuel cells are gaining use as a source of stored energy.

III. *GEOTHERMAL ENERGY is energy derived from the heat of the earth's interior.*

A. Geothermal energy is now being utilized in a few sites around the world.

B. Research is being done to expand the possible uses of geothermal energy.

IV. *HYDROELECTRIC ENERGY is derived from moving water.*

A. Man harnesses the force of water to create power, e.g., water wheels, tides, hydroelectric generators.

B. The energy of moving water is tremendous and renewable.

C. Available water power is not equally distributed over the earth.

V. *NUCLEAR ENERGY results from changes in the nucleus of an atom. Nuclear fission is the splitting of an atom. Nuclear fusion is the combining of atoms of a low atomic number to form atoms of a slightly higher number.*

A. Nuclear energy can become a vast source of economical energy.

B. Nuclear energy has provided us with medical tools and diagnostic aids, e.g., tracer elements, radiation services, etc.

C. Isotopes from nuclear reactions have provided us with research aid which have revealed vast amounts of knowledge.

D. Some nuclear by-products are a concern to man and a potential threat to the environment.

1. Radiation hazards include the possibility of birth defects and susceptibility to some diseases.

2. Radiation concentrates in food webs in proportion to the number of organisms in the food chain.

3. Radiation exposure from man-made sources can be reduced by sufficiently strict controls and reasonable care during use.

4. Thermal pollution from atomic power production is the unwanted heat energy accumulating in water ways.

VI. *WIND is moving air that produces energy.*

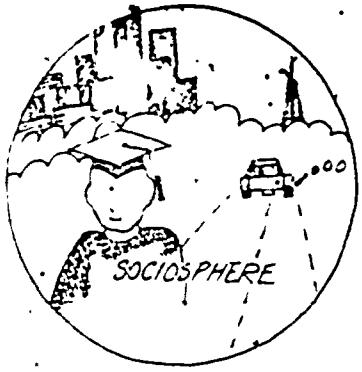
A. Wind has served man's energy needs in the past and offers some potential solutions for the future.

B. There is a tremendous amount of wind power available.

1. Large scale utilization of wind power has not been put into effect.

2. Wind is not a constant or a reliable source of power.

*ELECTROCHEMICAL ENERGY is energy derived from chemical reactions, e.g., fuel cells, batteries.*




# SOCIOSPHERE

(Conceptual Scheme)

I. *Each individual must ultimately bear most of the RESPONSIBILITY, both moral and financial, for improving the environment and protecting natural resources.*

(Concepts)

A. Individuals must learn to make decisions which reflect or represent collective interests.

B. It is the responsibility of each individual to become aware of governmental regulations intended to protect the environment.

C. Individuals perceive different self-roles in the social and environmental context dependent on their internal values.

(Subconcepts)

1. The behavior of an individual stems from an interaction of heredity and the physical, social and cultural environment.

2. Within limits of acceptable rules individuals develop self-respect, responsibility for others, and responsibility for property.

3. The concepts and values man accepts as guides to his future behavior determines the quality of his life, if not his survival.

D. Man has physical, psycho-social and intellectual needs which are enhanced by a clean environment.

E. Man is continually developing an ethical base for making value judgements.

F. Man interacts mentally and emotionally to the physical objects, geometric forms and events in his environment.

1. The arts aid man in feeling a oneness with nature and fellowmen.

(Principles)

(a) Man creates objects, events and behaviors which satisfy his images of beauty and order.

2. The need of man to turn inward for self-renewal can be stimulated by his external aesthetic experiences.

3. An interest in and appreciation of the environment should be reflected in desirable attitudes toward our country's natural beauty.

4. A person's aesthetic values are reflected in the internal and external condition of his home and its immediate environment.

G. The importance of animals to humans involves their usefulness as well as their contributions to the richness of our lives, e.g., pets, wildlife.

II. *The individual is affected by EXTERNAL INFLUENCES which cause an individual reaction.*

A. Education generally improves the quality of one's life.

1. Individual citizens should be stimulated to become well informed about resources, political issues, problems management procedures and ecological principles.

B. Natural resources may be enjoyed through recreation.

1. Some parks and recreational areas are left in their natural state for our spiritual, aesthetic, physical and emotional enjoyment.

a. Crowding makes it difficult to experience the outdoors fully, as the special quality of a place is lost.

2. Wildlife enchances our lives because of the recreational pursuits, e.g., hunting, photography.

C. Various forms of wildlife perform functional services for mankind.

III. *The interaction of individuals, groups, cultures, and events through time comprise a nation's HISTORY.*

A. The social development of a nation's people are part of its historical development.

B. Technological advances frequently occur far more rapidly than the rate of philosophical, social, economical and behavioral changes which must accommodate these advances.

1. Management is technical and scientific knowledge applied in a rational direction to achieve a particular objective.

2. The incidence of diseases related to ecological factors is increasing.

3. Moral responsibility has not always accompanied industrial growth.

C. The culture of a group is learned behavior in the form of customs, habits, attitudes, institutions, and lifeways that are transmitted to its progeny.

1. The family is the early and continuing environment for establishing behavior.

2. Man creates a cultural environment in interaction with his natural environment, regional behavior and ethnic groups.

   a. The interaction of the culture with available technology determines those facets of the environment which are planned and developed.

3. Man's cultural changes tend to be rapid and cumulative in contrast to the relatively slow process of natural environmental change.

4. Industrialization develops a community of life style regardless of nation or location.

IV. *Man is in constant interaction with his NATURAL ENVIRONMENT in order to utilize the world's available resources.*

A. The distribution or location of resources in relation to population, technology and economic factors are critical to problems of resource conservation and use.

B. A knowledge of the social, physical and biological sciences, and humanities is important for environmental understanding.

   1. Societies perceive and react to environmental issues of their time on the basis of social values and past experiences.

C. Human resources include the physical and mental abilities with which man is endowed and the knowledge which he has generated.

D. Natural resources are essential for meeting man's needs for food, clothing, shelter, tools, room for living, and recreation.

   1. Man's technological ability to change or control the environment to meet his needs is increasing.

   2. Man's alteration of his environment changes his specific needs and wants.

      a. Man adjusts differently in different environments.

   3. Survival of man depends upon his ability to adjust to his environment and make adjustments through use of his intelligence.

   4. Heredity and environment help determine how an individual develops and contributes to society.

   5. Nations develop economic systems in relation to the availability of resources.

      a. Nations decline or prosper in relation to their ability to adjust to new events or conditions.

E. Man's demands upon natural resources increase as populations grow.

1. As population increases, competition increases for use of natural resources, resulting in a need for establishing priorities.

a. Given sufficient natural resources, a population will continue to increase in size, unless some limiting factor is imposed, e.g., space, water, food.

2. Increased population mobility is changing the nature of demands upon some resources.

3. Some predicted effects of a continued population increase are a drain on natural resources, a danger of famine, an increase in all kinds of pollution and lower overall quality of life.

a. As populations increase or as resources decrease, freedom of the individual to use the resources as he wishes decreases.

V. *People live in COMMUNITIES out of necessity and preference.*

A. Urbanization affects organism behavior patterns.

1. Congestion of people may create pockets of problems relating to litter, pollution, safety, and health.

a. Group living requires cooperation within and between individuals and groups in order to create and maintain optimum physical, social and cultural environments for all.

(1) Life within a group imposes duties and responsibilities as well as entailing rights and privileges.

(a) Local and national units of government function to provide rules and protection for the rights of individuals and groups.

(2) Environmental responsibilities should be shared by individuals, businesses, industries, special interest groups, all levels of government and education.

(a) The quality of life can be enhanced by improving neighborhoods and by applying knowledge acquired from past mistakes to the planning of new communities.

(3) Community spirit may be created through public awareness of problems and alternate solutions.

(4) The individual's or group's capability for interacting with his government directly affects his success in dealing with environmental problems.

B. Urban sprawl is uncontrolled growth outward from a metroplitan area, usually resulting in a ring of low rent housing surrounding the inner city.

1. Industrialization and centralization may destroy urban areas through crowding, pollution, crime and unhealthy living conditions.

C. Prolonged exposure to the tension and frustrations of city living without self-renewal can affect one's health.

1. Parks provide urban dwellers a change of pace and scenery, a chance to observe seasonal changes, a place to escape from crowds, noise and traffic, and relief from the city's heat.

a. Areas of urban renewal should include parks and greenbelt areas to serve citizens.

2. Trees, plants, and flowers are important in cities for their cooling effect, aesthetic values, fragrance, and as absorbers of sound.

a. We can improve the beauty of our home and schoolyard by taking care of our trees, shrubs and grounds.

(1) A school aboretum can help us learn and appreciate the different trees and add beauty to our school.

D. Dealing with urban problems requires the cooperation of social institutions.

VI. *Present and future GENERATIONS depend on the planning and wise use of natural resources.*

A. Long range planning must be applied to the use of human and natural resources.

1. Man is the important factor in determining environmental quality.

a. As many factors as possible should be considered before nature's pattern is altered.

(1) There are certain risks, limitations, and benefits experienced when manipulating the natural environment.

b. Vandalism and carelessness are harmful to the environment and lead to much destruction of property.

c. Advertising media have contributed greatly to aesthetic pollution of the environment.

d. Irrigation, drainage, and vegetation can bring some additional lands into production.

e. Dam projects may aid in making arid lands productive, yet pose special environmental problems.

f. There are three major dangers associated with the use of pesticides, namely: 1) the possibility of polluting water supplies, 2) combining with plant and animal sources, 3) ecological imbalance may result.

2. Natural resource policies came about as the result of interacting social processes, science and technology, government operations, private interests, and public attitudes.

a. A sound natural resources policy is dependent upon a flexible political system which reflects society's ability to affect that system and its processes.

b. Correcting man-made ugliness is difficult because subjective aesthetic values are involved.

(1) Architecture can be one of the positive persuasive influences in developing a congenial environment.

B. A variety of <u>institutional structures</u> are involved in planning and managing the environment.

1. Government is interaction of custom, rule, and law.

2. Governmental policies and social aims determine the utilization of resources.

a. Governmental services should maintain and support the type of environment which will provide maximum benefits to individuals and community groups.

(1) Laws are sometimes necessary to ensure equal opportunity for the use of natural resources.

(2) Governmental laws, such as zoning and quality standards, have an effect on the quality of the environment.

3. Governments can conserve natural resources to a degree that individuals cannot.

a. Governmental agencies direct the management of publicly owned resources and help private landowners manage their resources.

4. Value dilemmas often develop related to government action on environmental problems.

C. Management has the responsibility for maintaining a quality environment and is the result of cooperative interaction between national and local units of government.

D. Conservation is recognizing the need to develop, to maintain and to use resources wisely.

1. Conservation policy is determined by the interaction of science and technology, social and political factors, aesthetics, ethical, and economic considerations.

2. Decisions concerning land use projects should be based on the ecological suitability and long term environmental benefits.

a. There are no limits to man's wants, but natural resources are limited in quality, quantity, and location.

b. People of a given nation desire the resources of other nations so they purchase, trade, or wage war to obtain these resources.

c. Conflicts emerge between private land use rights and maintenance of environmental quality for the general public.

E. Economic systems evolve through interaction of individuals, groups, culture, events, and availability of resources.

1. Aesthetic resources and recreational facilities are important factors in man's leisure time activities.

a. There are many recreational areas constructed and managed by man on private, state, and federal lands.

(1) Recreation affords a wide variety of outdoor experiences.

(a) Good habits and attitudes concerning courtesy, safety, and sanitation are important in the use of outdoor areas.

(b) The use of forests and outdoor schools is an important part of our educational program.

(c) A nature trail is an educational device which can be used to teach the balance and interrelationships of nature.

(2) Recreation uses are causing great impact on land management problems.

b. Wildlife is important for food and recretional activities.

(1) There are federal and state laws pertaining to conservation of wildlife, e.g., hunting regulations.

(2) Multiple use is a practice in which land areas function in two or more compatible ways.

(3) Natural lands, if preserved, have an intrinsic worth far beyond any measurable economic value.

2. Goods and services are produced by the interaction of labor, capital, natural resources, and technology.

a. Money alone will not solve environmental problems without modifying the values and attitudes of people.

b. Outdoor recreation is an increasingly important part of our economy and culture.

(1) Ready transportation, growing interest, money surpluses, and increased leisure time combine to create heavy pressures on existing recreation facilities and demands for new ones.

c. Recreational activities and business create employment for many people.

d. A leading cause of urbanization is the greater opportunity for employment offered by the city.

(1) A number of economic factors lead to the creation of poverty levels within society.

(2) Urban renewal plans attempt to rebuild, restore or revitalize existing land and buildings in the inner city.

(3) Improved public transportation can relieve congested inner city areas.

F. Innovative new ways of dealing with the waste disposal problem are needed; the answer lies in developing better methods of waste treatment and in discovering ways of putting our waste to practical use.

1. Safe waste disposal and treatment, including the reduction of harmful and accumulative effects of various solids, liquids, gases, radioactive wastes and heat, is important if the well-being of man and environment is to be preserved.

2. Each of the widely used methods for waste disposal has some shortcomings, i.e., open dumps and litter are ugly and unsanitary, landfills limit land use and bury resources.

a. Landfill and burning garbage create environmental and air pollution problems.

b. Materials that neither burn nor decompose present the greatest disposal problems, e.g., metal, plastic.

G. Unnecessary and excessive noise contribute to environmental pollution.

1. Unwanted sound is called noise and is a serious problem in some areas and occupations.

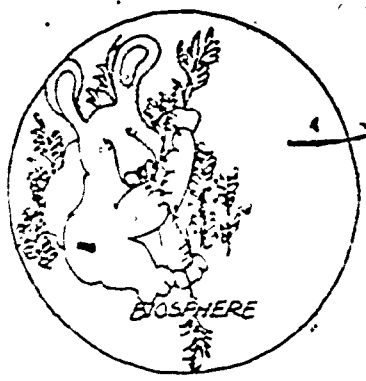
a. Sounds may promote or hinder learning ability and other mental processes, as well as influence the way we feel.

b. Technological advances, although increasing noise pollution, offer potential solutions.

c. The most annoying sounds are irregular, intermittent, monotonous and generally of high frequency and high intensity.

d. Sounds under certain conditions may be both physically and psychologically harmful, particularly when exposure is continuous.

e. Noise pollution bears a direct relationship to industrialization and technological advancement.




# BIOSPHERE

I. There are certain general BIOLOGICAL PRINCIPLES which govern all organisms.

A. The <u>form of life</u> present depends upon the coincidence of the life needs and their availability in the environment.

1. There are many habitat arrangements and all must satisfy the fundamental needs - food, shelter, water and living space.

a. The sun is the ultimate source of energy for all living things.

(1) The food web can be thought of as a way of passing along energy from the sun.

(2) All animal life is dependent upon the existence of plants.

(3) Food provides animals with a source of energy and materials needed for building cell tissues.

(a) Water is necessary to all forms of life.

(b) Shelter offers animals a necessary protection and a safe place to reproduce.

(c) Adequate living space is essential for living organisms.

(d) Food pyramids are a result of food requirements.

2. All things have a place in the environment since everything in the environment is interrelated.

a. Living organisms and nonliving parts of their particular environment interact to form a "balance of nature".

(1) The "balance in nature" may become upset when a species is destroyed, thus creating the possibility of another species becoming too numerous.

3. All ecosystems require the same basic nutrients - oxygen, carbon dioxide and water - which are recycled.

4. Living things interchange matter and energy with the environment.

   a. Living things convert matter and energy into characteristic forms.

   b. Living beings, limited by excesses and deficiencies, react to all factors of the environment.

B. Adaptation is the adjustment of living things to the conditions brought about by environmental modification in order to continue their existence.

   1. An organism is the product of its heredity and environment.

      a. All living things, including man, are constantly changing.

      b. The characteristics of a living thing are laid down in a genetic code which is passed from one generation to another (e.g., a living thing can only reproduce another living thing that is like itself).

      c. Man is influenced by many of the same hereditary and environmental factors that affect other organisms.

   2. Environmental change often occurs more rapidly than organic biological evolution.

   3. Special environments require special adaptive behaviors.

      a. The more specialized an organism becomes the less adaptable it is and the less able to survive environmental change.

      b. Each kind of organism represents a collection of adaptations which fit it for survival under a given set of conditions.

   4. Succession is the gradual and continuous replacement of one kind of plant or animal complex by another and is characterized by gradual changes in species composition.

   5. A species is geographically limited by the extremes of environmental adversities it can withstand.

      a. Wildlife is found everywhere (e.g., schoolgrounds, yards, parks, farms, fields, forests, arid lands, swamps, streams, lakes, oceans).

   6. Some forms of living things have become extinct or are in danger of extinction.

      a. Extinction of a species can result from natural causes or from man's interference.

      b. Man can protect endangered species to some extent.

7. Diversity is a key factor in the survival of an ecosystem.

II. *PLANTS, including trees, purify the air, provide a cover to hold soil in place, protect the water supply, shelter wildlife, supply basic economic materials and add aesthetic values to man's environment.*

A. Green plants are the ultimate source of food, clothing, shelter, energy and recreation in most societies.

1. Cultures throughout the world are influenced by the kinds of plants an area can grow.

2. Plants are a renewable resource.

a. Forests can be managed to produce a continuous supply of wood and wood products, wildlife, water and recreational opportunities.

(1) Harvest of timber on forest lands must be planned so that other renewable resources present are not impaired.

b. With proper management, the productiveness and value of plant crops can be increased.

c. Tree planting, adjusted to a given site and to the stage of ecological succession at the site, increases successful growth.

d. Areas of different plant and vegetative types are managed as natural areas without man caused disturbances for scientific research and study.

e. New uses for plants are being discovered.

3. Vegetation is destroyed by overgrazing, insects, forest fires and improper forestry methods.

a. Leaving enough vegetation to protect the range against erosion by winter rains increases carrying capacity.

b. Overgrazing and improper utilization by domestic livestock tend to cause packing of soil, destruction of organic matter and soil cover, and facilitate erosion.

4. Plants have different needs and habits of growth which determine where they live.

a. The character of the soil and climate helps determine the kinds of plants which will grow.

b. Plants influence each other and their environment by competition for light, minerals and moisture.

c. Many organisms that are harmful to man are useful in maintaining a balance between living things.

d. Plants furnish a variety of micro-habitats important to animal life.

3. Green plants produce simple sugar from carbon dioxide and water in the presence of sunlight to form plant tissue (i.e., photosynthesis).

a. Green plants get matter from the environment for growth.

B. Plants provide many benefits for man.

1. Plants provide natural pollution controls.

a. Growing plants filter both particulate and gaseous pollutants out of the air and play a leading role in keeping down the concentration of $CO_2$ in the air.

b. Vegetation can absorb some noise.

c. Plants improve the quality of water from a watershed, stabilize underground water level and maintain a more even flow.

d. Micro-organisms are nature's decomposers of natural and man-made litter.

2. Grasslands provide food for livestock, safeguard water resources, wildlife and enrich soil.

3. Plant litter, humus and roots give soils an exceptional ability to absorb moisture and resist erosion.

4. Plants make streams and lakes more attractive and useful for recreational purposes.

5. Plants carry on transpiration and tend to reduce direct evaporation from the soil.

6. Domestic plants originate from natural species by selection and experimentation.

III. *ANIMAL POPULATIONS are important biologically, economically and aesthetically.*

A. The interaction of environmental and biological factors determines the size and range of a species.

1. Animals have different needs and habits which determine the place where they live.

a. Some animals are domesticated while others are wild.

b. Animals are often incapable of adapting to changes in their habitat.

(1) A wildlife species will disappear if a suitable habitat of sufficient size is not available.

(2) Loss of habitat; pollution of air, water and land have resulted in over 100 species of wildlife being endangered in the United States.

(3) Wildlife populations are limited by suitable habitat, disease, predation, accidents, hunting and fishing.

c. Some animals can tolerate a wide range of environmental conditions and may thrive as a result of change.

d. A suitable environment is vital to the reproduction of animals.

(1) Marsh and lake restoration programs contribute to the welfare and population of waterfowl and other animals.

B. Animals are important to man.

1. It is necessary to control insects and rodents as they are an annoyance to comfortable living and may transmit disease.

2. The damage done by insects runs into the billions of dollars each year in the United States alone.

3. Domestic animals are a source of labor, food, clothing, fertilizer products and enjoyment.

4. Game animals provide a source of food and recreation.

5. Animals contribute aesthetically to the environment.

6. Human encroachments upon the habitat of wild animals and plants often cause their depletion or disappearance.

C. Managing an ecosystem involves managing populations.

1. Wildlife management is an attempt to bring about a balance between the numbers of animals and the amount of food, water and shelter.

a. Wildlife conservation is the application of basic principles and practices of management so that annual crops of wildlife surpluses can be harvested by man.

b. Wildlife management policies should be developed through reliable ecological studies and not influenced by political pressures.

c. Legislation has protected some wildlife through establishment of game preserves, wildlife refuges and hunting laws.

2. Pesticides have provided a means for man to produce food for a rapidly increasing population at a reasonable cost.

   a. Pesticides must be used carefully as they are destructive to many unintended species when used improperly.

   b. Pesticides last for years and can be stored in living tissue, becoming a definite risk to plant and animal life.

   c. Pesticides serve a definite purpose by killing plant-damaging and disease-bearing insects.

   d. One alternative to pesticides is to import an insect's natural enemies.