

Conceptual Framework

This framework serves as the conceptual basis for activities in the *Project WILD* and *Project WILD Aquatic K–12 Curriculum and Activity Guides*. Every concept statement in a topic area is directly addressed by the activities listed for that topic. Activities under other topics may also support the concepts directly or indirectly.

Ecological Knowledge

Wildlife Populations (WP)

I. Characteristics

- A. Wildlife comprises all nonhuman and nondomesticated animals. Wildlife includes but is not limited to insects, spiders, birds, reptiles, fish, amphibians, and mammals.
 - 1. Wildlife is all around, although it may not be seen or heard or its presence otherwise sensed.
 - 2. Wildlife varies from forms that are microscopic to those more than 100 feet in length, and it occurs in a variety of forms, colors, and shapes.
- B. All living things go through a series of orderly changes in life cycles. Some species have distinct changes; the young of other species resemble their parents.
- C. Living things all need food, water, shelter, and a suitable place to live.
- D. Animals can be classified according to life needs, behavior, and physical characteristics, including body appearance, movement, habitat type, and relationship to humans (wild/domesticated).

II. Population Dynamics

- A. Wildlife numbers and species compositions are not static but are constantly changing.
 - 1. Systematic inventory of wildlife populations did not become a common practice until the 1930s, although journals of early explorers reflect considerable variation in historic population levels.
 - 2. Some wildlife populations exhibit cyclic patterns over time.
 - a. Living things tend to reproduce in numbers greater than their habitat can support.
 - (1) Carrying capacity is the dynamic equilibrium expressed by the availability of habitat components and the number of animals the habitat can support.
 - (2) Each area of land or water, and ultimately the planet, has a carrying capacity of plants and animals.
 - (a) Carrying capacity is determined by climatic, geological, biological, or behavioral factors, along with human activities.
 - (b) Carrying capacity may fluctuate from season to season and year to year.
 - (c) Carrying capacity affects and is affected by wildlife behavior.

- i. The numbers, health, and distribution of wildlife are related to carrying capacity.
 - ii. Carrying capacity limitations can result in competition between and among domestic animals, wildlife, and humans.
- b. A population tends to increase in size until limited by one or more factors.
 - (1) When one or more limiting factors exceed the tolerance range for an animal, population, or species, it directly affects the well-being of the animal(s) and may result in death or extinction.
 - (2) Limiting factors include life history parameters such as food, water, shelter, space, disease, predation, and climatic conditions, as well as human activities such as development, pollution, and hunting.
 - B. Natural laws are ultimately as binding on human populations as on wildlife.

Habitats, Ecosystems, and Niches (HN)

I. Distribution

- A. Wildlife is present in nearly all areas of the Earth.
- B. Each environment has characteristic life forms.
 1. The environment—created and shaped by natural forces or modified by humans—shapes life forms that occupy it.
 2. Each species occupies a niche within the range of environments in which it is found.

II. Importance

- A. Good habitat is the key to the survival of humans and wildlife.
 1. Habitat is composed of many integrated components including food, water, shelter or cover, space, and the suitable arrangement of these in relation to each other.
 2. In addition to supporting wildlife, ecosystems must furnish the products humans need to survive.
- B. Wildlife may be used as an indicator of the environmental health of an ecosystem.

Interdependence (ID)

I. Commonalities

- A. All living elements of an ecological system are interdependent.
 1. All forms of life depend on food, water, shelter, and space in a suitable arrangement.
 2. Humans and wildlife have similar basic needs.
 - a. Humans and wildlife share environments and are subject to essentially the same environmental conditions.
 - b. The health and well-being of humans and wildlife depend on the quality of the natural environment.
- B. Plants and animals in ecological systems live in a web of interdependence, in which each species contributes to the functioning of the overall system.

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II. Interactions

- A. All living things are affected by and interact with their environments.
- B. In a naturally functioning ecosystem, life forms and environmental factors interact to keep wildlife populations in long-term dynamic equilibrium with each other and with their habitats.
 - 1. Many interactions result in a flow of energy and matter throughout the system.
 - a. Energy takes a one-way course through an ecosystem and dissipates at every trophic level.
 - b. Material substances, such as water, nitrogen, carbon, and phosphorus, cycle through ecosystems.
 - 2. Food webs illustrate the interrelationships of all living things.
 - a. Either directly or indirectly, plants support nearly all forms of animal life, including humans.
 - (1) Energy from the sun and organic matter enters the animal world through herbivores, those animals that eat plants.
 - (2) A relatively large quantity of plant material is required to support herbivores (primary consumers), and herbivores can support only a smaller number of carnivores (secondary consumers).
 - (3) Decomposers complete the cycle by breaking down organic matter formed by photosynthesis.
 - b. Trophic relationships in an ecosystem may be complex and may vary depending on environmental conditions.
- C. Wildlife interacts with other wildlife and thereby affects the functioning of the ecological system.
 - 1. Interactions exist between different populations.
 - a. Competition is a major determinant of community structure.
 - b. Predation can be beneficial or harmful to a population as a whole.
 - c. Symbiotic relationships may benefit or harm one or both of the partners.
 - 2. Interactions exist among members within a population, including competition and cooperation.

Changes and Adaptations (CA)

I. Environmental Changes

- A. Variation and change occur in all ecological systems.
- B. Succession is an orderly, gradual, and continuous replacement of one natural community of life by another.
 - 1. Succession influences what kinds of plants and animals live in an area.
 - a. New communities arise when ecosystems change through succession.
 - b. Newer communities may have less diversity.
 - c. Species present in new communities will have traits that allow them to survive in the new environment.
 - d. Over time, species diversity may increase in a new community.
 - 2. Natural events and human activities affect the rate and direction of succession.
- C. All forms of life are affected by changes in the quality, quantity, and distribution of their habitats.

II. Organism Adaptations

- A. All life forms exhibit adaptations to the environments in which they live.
 - 1. Fish and wildlife are adapted to their environment in ways that enable them to survive and maintain their populations.
 - a. Many physical and behavioral adaptations, such as body coverings, hibernation, and migration, are associated with climatic conditions.
 - b. Adaptations to predator and prey relationships may include behavioral (e.g., signaling, flight, freezing) as well as physical (e.g., camouflage, mimicry) variations.
 - c. Reproductive strategies are adaptations that maximize species survival.
 - 2. Fish and wildlife species differ in their ability to adapt to changes in their habitats.
- B. Each habitat is suitable only to those life forms that are adapted to its ecological conditions.
- C. Isolated ecosystems are more vulnerable to environmental change.

Biodiversity (BD)

I. Types

Biodiversity can refer to a variety of natural systems, a variety of species in an area, or a genetic diversity within a species.

A. Ecosystem Diversity

- 1. Ecosystem diversity is affected by many influences, such as climate and level of disturbance.
- 2. Ecosystems undergo successional changes that are usually gradual.
- 3. Species that are not able to adapt to ecosystem change may become extinct.
- 4. A biologically healthy ecosystem is diverse over the range of the ecosystem, not necessarily within each community.

B. Species Diversity

- 1. Climate and habitats influence species diversity.
- 2. Organisms that are not able to adjust to ecosystem changes will die.
- 3. New ecosystems and ecosystems that are harsh tend to have relatively few species.
- 4. Species diversity tends to be higher in the transition zone between ecosystems.

C. Genetic Diversity

- 1. Genetic variability is important to health within a species.
- 2. Diversity facilitates adaptation to change and provides sources of new genetic material.

II. Human Influence

- A. Some wildlife species are not native but have been introduced to the area they presently occupy. Such introductions can be beneficial, harmful, or both to other species in the ecosystem.
- B. Adding or subtracting members from a community affects other members of the community.
- C. Human activities can affect the rate at which wildlife becomes threatened, endangered, or extinct.

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III. The Importance of Habitat

- A. Habitat is the key to wildlife survival.
- B. Improving habitat improves wildlife populations.
- C. Reintroduction of wildlife into its former range may be possible if suitable habitat and suitable wild stock are available, and if such other conditions as weather and predator levels do not substantially interfere.
- D. Management of one species will affect other species in a community.
- E. For a wildlife population to sustain itself, there must be suitable habitat to support a viable breeding population, not just a few individuals.

Social and Political Knowledge

Cultural Perspectives (CP)

I. Cultural Development

- A. Human cultures and societies, past and present, affect and are affected by wildlife and its habitat.
- B. Values, ethics, and historical traditions of cultures and societies are reflected in their treatment of wildlife and other resources.
 - 1. Human and wildlife relationships are expressed through legends, myths, religious teachings and writings, symbols, protocols, ceremonies, and other cultural and societal activities.
 - 2. Appreciation of wildlife is often portrayed through creative expression of human relationships with wildlife in historic and contemporary times.

II. Appreciation

Societies and cultures within societies may have different attitudes toward wildlife and its uses, formed and transmitted by family, community, and other social groups in a variety of ways.

- A. The aesthetic and spiritual values that humans place on wildlife vary from person to person and culture to culture.
- B. Different cultures may disagree over certain uses of and rights to wildlife and its habitat.
- C. Wildlife and its habitat are interpreted and treated differently by people viewing them from various cultural perspectives and frames of reference.
 - 1. Increasing separation of people from direct contact with the natural world has influenced human actions and attitudes toward wildlife. Therefore, actions and attitudes toward wildlife may be positive, negative, naïve, or misguided.
 - 2. Formal and nonformal education and the media shape the attitude of people toward wildlife and its habitat.

Economic, Commercial, and Recreational Considerations (EC)

I. Economic Considerations

- A. Natural resources include water, air, minerals, soil, fossil fuels, and plant life, as well as aquatic and terrestrial wildlife.
 - 1. Nonrenewable natural resources are those available on a finite basis.
 - 2. Renewable natural resources, including wildlife, can replenish themselves independently or with human assistance.

- B. The distribution and abundance of wildlife can affect the economy of an area.
 - 1. Some wildlife provides products of commercial value or subsistence needs to humans.
 - 2. Members of some cultures still depend on wildlife to supply a portion of their requirements for food, shelter, and clothing.
 - 3. Human use of wildlife directly and indirectly creates job opportunities for people.
 - C. Economic trends, in addition to increased human population and mobility, have important influences on wildlife and its habitat.
 - D. The human culture and economic condition of an area affect and are affected by the available resources, including wildlife and its habitat.
- II. Commercial, Recreational, and Other Economic Considerations
- A. Historically, when conflict between recreational and commercial harvest of a wildlife species became severe, the commercial use had been eliminated.
 - B. Recreational trends affect wildlife and its habitat.
 - 1. Wildlife-based recreation is of major importance to many millions of North Americans.
 - a. Consumptive wildlife-based activities, such as hunting and fishing, provide U.S. and Canadian citizens with millions of days of outdoor recreation each year.
 - b. Nonconsumptive activities, such as wildlife photography, painting, feeding, and observation, also provide millions of days of recreation annually.
 - 2. More leisure time and the growing popularity of outdoor activities are increasing the pressures on wildlife and habitat.
 - C. Funds provided by consumptive users, not general tax dollars, historically have been the primary source of income for most state wildlife management programs and some federal programs.
 - 1. Charging an access fee to hunt, fish, camp, play, or trap on private land is common.
 - 2. Reductions in income from direct consumptive uses of wildlife (hunting, fishing, etc.) and nonconsumptive uses (camping, bird watching, etc.) have resulted in a loss of revenue for natural resource agencies.

Historical and Geographic Development (HG)

I. Development of Society

Historically, wildlife affected the development, movement, and size of human societies.

- A. Human societies and cultures developed in various ways, partly because environmental factors produced different types of plants and animals in different places.
- B. Wildlife has played a significant role in the development of human culture through its influence on art, religion, and commerce.
- C. Wildlife questions and issues have influenced alliances and conflicts between and within communities, societies, states, and nations.

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II. Development of Commerce

Throughout history humans have used wildlife for food, shelter, clothing, and other products.

- A. All livestock and pet animals were domesticated and developed from wildlife species as humans sought to provide themselves with food, shelter, medicines, and companionship, and to satisfy other needs or wants.
- B. The ways in which humans value wildlife and natural resources have changed over time.
- C. As human populations have grown and pressures on wildlife populations have increased, people have developed systems to study wildlife and to regulate human impact on wildlife and habitats.

Political and Legislative Frameworks (PL)

I. United States

- A. Political trends affect wildlife and other natural resources.
- B. In the United States, wildlife is considered to be a public resource. Ownership of land or water alone does not secure ownership of wildlife on that land or in that water as it does in some other countries.
 1. Public decisions that affect wildlife and the environment are made through social and political processes designed to represent the wishes of the society.
 2. Primary responsibility for most wildlife conservation programs in the United States is delegated to governmental agencies.
 - a. States are considered to have a greater responsibility for wildlife conservation programs than does the federal government. State wildlife agencies are legally responsible for managing most wildlife on public and private lands within their geographic jurisdictions.
 - b. Federal agencies, in cooperation with state agencies, are legally responsible for managing wildlife affecting national interest, such as most threatened and endangered species and migratory wildlife.
 3. Nongovernmental institutions play significant roles in influencing environmental policy and direction.
 - a. Wildlife interest groups use judicial, legislative, and regulatory systems in reaching their objectives.
 - b. Private organizations, industrial interests, and individual citizens also conduct wildlife conservation activities.
- C. Societies develop programs and policies relating to wildlife and its habitat through a variety of social mechanisms.

II. International

- A. Other nations and governments have different policies and philosophies relating to wildlife ownership and protection and to habitat management.
- B. Many wildlife species regularly move across national boundaries, necessitating the adoption of international agreements and the formation of international agencies and organizations to ensure protection and management of these species.

Sustaining Fish and Wildlife Resources

Attitudes and Awareness (AA)

I. Awareness

- A. Humans may find peace and inspiration through study and observation of wildlife, or simply through knowledge of its existence.
- B. Citizens benefit from experiencing and enjoying their natural resources.

II. Values

- A. Wildlife has intrinsic value, although humans often recognize only values based upon human wants and needs.
 1. The value placed on wildlife is commonly an issue in resource management decisions because value is often intangible and varies from person to person.
 2. Various groups interested in wildlife represent a wide range of philosophies and ethics concerning wildlife and how best to ensure its long range health and viability.
- B. Ecosystems have a finite capacity to provide for wildlife and human needs and wants. Sustainable living requires humans to live within the limits of the ecosystem capacity.

Human Impacts (HI)

I. The Importance of Impacts

- A. Human effects on fish and wildlife and their habitats are a driving force affecting environmental quality worldwide.
- B. The presence of people affects wildlife in positive and negative ways.

II. Impacts

- A. Humans have the capacity to sustain themselves and wildlife.
 1. Although all organisms affect their environment, only humans have the capacity to consider the effects of their actions and to develop a community that is sustainable into the future.
 2. A sustainable community is one that is in balance with a healthy environment and perpetuates a healthy environment for future generations.
 3. The development and adoption of sustainable human lifestyles and social decisions can change the negative effects of human activity on wildlife.
 - a. Individual lifestyle decisions including recreational choices, transportation options, housing selections, vocation, food, clothing, and energy use affect wildlife directly and indirectly.
 - b. Community conservation practices, plus social, cultural, and economic values affect environmental programs and activities.
- B. Human populations and technologies often require space and activities that are detrimental to wildlife and its habitat.
 1. Human development encroaches on wildlife habitat, decreasing the amount of available habitat.
 2. Wildlife habitats are being fragmented by urban sprawl, resulting in restricted wildlife movement.
 3. Some habitats are being altered by human development activities such as water storage and landscaping.

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4. Contaminants and their bio-accumulative risks to both wildlife and humans threaten sustainable environments.
 5. Pollutants fall into a number of categories including acid rain, terrestrial runoff, biological (exotics, disease, waste), industrial waste and spills, post-consumer petroleum products, sewage, silt or sediment, thermal pollution, and radioactive and solid waste. Each of these pollutants creates particular effects on habitats and, if severe enough, may cause habitat loss.
- C. Loss and degradation of habitat are considered the greatest problems facing wildlife today.
1. Wildlife habitat loss because of natural trends or human activities is a condition common in nearly all nations.
 2. One specific cause of habitat degradation is pollutants, which can negatively affect environmental quality.
 3. Many critical habitats have been, and are, under pressure from historic and current development. Many have been damaged or lost.
 4. Remaining critical habitats can be, and in some cases are being, protected and maintained; damaged habitats can be, and in some cases are being, rehabilitated.

Issues and Trends (IT)

I. Global Perspectives

- A. Current wildlife issues and trends are complex, involve alternatives, and affect the environment.
- B. Many problems, issues, and trends involving wildlife in other parts of the world are similar to those in this country.
 1. Wildlife issues can affect global and international as well as national, regional, and local political activities—particularly regarding human harvesting practices, transmission of pollutants and their secondary impacts, migratory species, and aquatic habitats.
 2. Consumptive uses of wildlife have been excessive in some settings and continue as a persistent problem in other parts of the world.
 3. Commercial sale of wildlife and wildlife products is controversial and has worldwide implications.

II. Wildlife Populations

- A. Human activities increasingly determine which species of plants and animals will flourish and which will decline or disappear.
 1. Most species that are endangered or threatened became so from natural or human-caused changes in their habitat and their inability to adapt or adjust to such changes.
 2. Exotic species introduced into a community can change the functioning of that system.
 - a. Evaluation of the impact of non-native plants and animals on ecosystems is important to the management and conservation of those ecosystems.
 - b. Citizens must be aware of their potential role in the dispersal of non-native species and the transmission of disease, and must take steps to avoid contributing to these problems.
- B. Private landowners play an important role in sustaining and improving wildlife habitat.

III. Land Use

- A. As human populations increase and become significantly urban, land usage is altered dramatically.
 - 1. Individual transportation systems that allow increased accessibility spearhead development and drive land-use changes.
 - 2. Natural areas are being converted to agricultural, recreational, residential, and commercial purposes.
 - 3. Fragmentation of biological communities, caused by human activities, affects wildlife diversity and populations.
- B. Consumer changes lead to agricultural production changes.

IV. Human Perspectives

- A. Wildlife issues involve conflicts between different interest groups.
- B. Issues involving wildlife and its habitat are often products of cultural differences and priorities.
- C. Well-informed individuals can assist resource management through increased involvement.

V. Consumptive and Nonconsumptive Uses

- A. Conflicts exist within and between consumptive and nonconsumptive resource users. Any resolution must consider the needs of all groups and the sustainability of the resource.
 - 1. Whether uses of wildlife should be consumptive or nonconsumptive is of concern to many people.
 - 2. Among consumptive groups, conflicts often involve how, when, and how much wildlife populations are used.
- B. Nongame species have begun to receive greater and more specific management attention.

Wildlife Management (WM)

I. Basic Concepts

- A. For management purposes, wildlife often has been divided into categories, including game, nongame, endangered, and threatened.
 - 1. Game species are those that are hunted, fished, or trapped for recreational or economic purposes by humans.
 - 2. Nongame species are those that are not hunted, fished, or trapped for either recreational or economic purposes by humans.
 - 3. Endangered species are those in danger of extinction throughout all or a significant portion of their ranges.
 - 4. Threatened species are those likely to become endangered.
- B. Wildlife management is the application of scientific knowledge and technical skills to the protection, preservation, conservation, limitation, or enhancement of wildlife and its habitat.
- C. Conservation is the use of natural resources in a way that assumes their continuing availability to future generations through the wise use or protection of natural resources.

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II. Management Considerations

- A. Wildlife resources can be managed and conserved.
- B. Wildlife species are important components of a larger ecosystem and should be managed within the context of that ecosystem.
 - 1. Management of one species of wildlife may have positive or negative consequences for other species within the same ecosystem.
 - 2. Management of aquatic wildlife and its habitat is directly influenced by land-based activities in the surrounding watershed.
- C. Wildlife management considers the needs and desires of people as well as wildlife.
 - 1. Humans differ in how they value wildlife and its habitat, and the total demand on each may exceed the supply.
 - 2. Wildlife management decisions must consider political, social, economic, and biological concerns; such decisions should involve all interested or potentially affected constituencies.
 - 3. These same factors may limit the scope and effectiveness of wildlife management activities.
- D. Philosophies and practices in wildlife management have been both supported and criticized by individuals, as well as by public and private organizations.
- E. Most wildlife exists on land or in waters that are not directly controlled by state or federal wildlife management agencies.

III. Management Practices

Wildlife managers combine an understanding of species biology and of ecosystem structure and function with population- and land-manipulation techniques to accomplish management goals.

- A. Wildlife management is based on natural sciences such as biology, ecology, geography, and soil science, as well as on many other disciplines.
 - 1. Wildlife management practices have been developed through extensive research on ecosystems, through both observation and experimentation.
 - 2. Habitat management practices are often intended to mimic the effects of natural ecosystem processes, especially disturbance.
- B. Wildlife management practices involve population and habitat inventory and monitoring, direct management of wildlife species through manipulation of populations, indirect management of wildlife species through protection and manipulation of habitat, and public regulation and education.
 - 1. Surveys of wildlife populations and their habitat provide important baseline information to guide management decisions.
 - 2. Wildlife populations are manipulated through practices such as artificial propagation, stocking, transplanting, predator and damage control, and regulated harvest.
 - 3. Acquisition, protection, improvement, and restoration of habitat are considered to be the most successful and cost-effective long-range techniques for managing wildlife species.

4. Regulations are necessary for wildlife conservation, but they cannot substitute for the availability of suitable habitat, nor can they maintain the population of a species whose habitat has been depleted or destroyed.
 5. A public that is well educated about wildlife management issues is critical to the long-term success of wildlife management programs.
- C. Scientific knowledge of all aspects of wildlife, including biological and social, is growing.
1. Technology changes affect environmental management decisions by allowing more sophisticated science-based analysis.
 2. Wildlife agencies employ persons with a variety of scientific training and vocational skills.

Responsible Action (RA)

- I. All plants and animals (human and wildlife) must live within the limits of their natural resources.
 - A. Both consumptive and nonconsumptive resource uses by people can strengthen their sense of responsibility toward the environment and encourage ethical actions.
 - B. It is the responsibility of citizens, government, and industry to avoid waste and destructive exploitation of natural resources, including wildlife.
 - C. Communities can learn to live in a sustainable manner by understanding the effects of their actions on the long-term health of the environment.
 1. Citizens must understand their rights, privileges, and responsibilities, plus the consequences of their actions. That is, they should be aware of methods to help protect and improve the resource and should have the opportunity to practice and apply them.
 2. Private decisions that affect wildlife and the environment are made through personal judgments. Each person makes such decisions each day, including use of time and energy, consumer choices, and vocational and leisure time activities.
 3. Citizens can become involved in the management of wildlife, habitat, and the environment by direct participation in the political process or through local, state, national, or international organizations.
 4. Individuals can influence public processes by voting, demonstrating, lobbying, seeking office, and supporting compatible interest groups.
 5. All users of wildlife must respect the rights and property of others, consider effects on the habitat, and observe rules and regulations relating to wildlife.
 6. Communities can learn to live in a sustainable manner by understanding the effects of their actions on the long-term health of the environment.
 7. Education can help landowners so that they can prosper while maintaining environmental quality and integrity into the future.
 - D. Each individual has a responsibility to act in ways that can directly or indirectly reduce the impact of the pollutants on the environment.
- II. Conservation, restoration, and enhancement of natural resource habitats benefit humans.