Exploring the Field of Zoology

High School Self-directed Tour

Students will explore the field of zoology by studying animals at the Milwaukee County Zoo (MCZ) and the careers of people who work with animals at the **Zoo** and in the **wild**. Students also will look at some of the challenges faced by modern zoologists.

Objectives:
Students will:

Define zoology as a science and as a career option.
Explore the zoological collection of the MCZ.
Examine examples of how the MCZ is working on some wildlife conservation issues.
Choose an animal and observe that animal at the MCZ, observe its zoo enclosure and public education signs. Research the management of wild and captive animals, and develop a proposal to protect your focal animal from extinction.

Table of Contents

This curriculum packet is provided by
the Zoological Society of Milwaukee County and the Ladish Company Foundation.

Prior to your Zoo visit go over the following information with your students

1. What is **Zoology?**

Definition: The science or study of animal life. Together with *botany*, the study of plant life, it forms the science of *biology*. Zoology is such a vast subject that most zoologists specialize or focus on the study of particular organisms or taxonomic groups. Many branches of zoology have been established. *Entomology*, for example, deals with insects. *Ornithology* deals with birds. *Morphology* deals with animal form and structure. *Taxonomy* deals with the naming and classification of animals.

Branches of Zoology

Anatomy	Entomology	Ichthyology
Biochemistry	Ethology	Morphology
Bionics	Evolution	Ornithology
Cytology	Helminthology	Pathology
Ecology	Herpetology	Physiology
Embryology	Histology	Protozoology

Activity:

Have the students look up these branches of zoology and biology as well as any others they can come up with.

Assignment:

A remote area of the Amazon is about to be set aside as an animal reserve or protected area. This reserve may contain animals never before seen or classified. Your assignment is to put together a complete team of zoologists to survey animal life within the reserve. List the branches of zoology that would useful to you and what they study.

2. **Review the taxonomic classes of animals represented at the MCZ**

Birds

Definition: Birds are warmblooded, egg-laying animals with a feather-covered body and forelimbs modified as wings. Birds at the MCZ can be found in and around the Herb and Nada Mahler Family Aviary.

Mammals

Definition: Mammals are warmblooded animals. They also have hair on their bodies, breathe air, and generally give birth to live young, which are initially nourished by milk produced by the mother. Example: carnivores, primates, ungulates and bats. Mammals at the MCZ can be found in the Primates of the World building, Feline Building, Small Mammals Building, and Australia Building. Ungulates (hoofed animals) can be found in the open yard exhibits.

Amphibians

Definition: Amphibians are animals that change during their lives from gill-breathing animals that take oxygen from the water into lung-breathing animals that remove oxygen from the atmosphere. Amphibians at the MCZ can be found in the Aquatic & Reptile Center.

Reptiles

Reptiles are animals that have dry, rough scaly skin. They are ectothermic, or coldblooded, and have a backbone. Most reptiles hatch from eggs. The reptiles include turtles, snakes and lizards, and crocodilians and tuataras. Reptiles at the MCZ can be found in the Aquatic & Reptile Center.

Fish

Fish are coldblooded animals. Most live in the water; they are vertebrates. They breathe through gills and have wet, slimy, and scaly skin. Most fish at the MCZ can be found in the Aquatic & Reptile Center. Some are in a Great Barrier Reef exhibit in the Australia Building.

Invertebrates

Invertebrates are animals that do not have backbones. Examples: octopus, jellyfish, sea anemones. The invertebrates at the MCZ can be found in the Aquatic & Reptile Center.

Animal Classification

Most animals at a zoo are vertebrate animals (animals with backbones). A few zoos exhibit invertebrate animals (animals without backbones). Since most of the animals in Wisconsin zoos are vertebrate, this self-directed tour will focus on this group.

The students will be looking for mammals, reptiles, birds, amphibians and fish -- the vertebrate groups. This tour also will allow the student to identify some of the mammals that fit into the major mammal orders.

Order Carnivora includes many familiar animals: cats, canine family (wolf, dog, coyote, fox, etc.), bears, raccoons, weasel family (mink, martens, wolverines, otters, badgers, etc.), skunks, mongoose and hyenas. Most carnivores have powerful, agile bodies and strong bones. Many carnivores are either carnivorous (meat eaters) or omnivorous (eat vegetation and meat).

Order Cetacea includes dolphins and whales. **Order Pinnipedia** includes walrus, seals, and sea lions.

Order Sirena includes manatees. This order is easier for the student to identify. Just be careful to remind them that not everything in the sea that swims is a mammal. Can they think of some non-mammals? (Examples: penguins, sea turtles, sea snakes, and, of course many, many fish).

Order Primates includes monkeys, apes and prosimians. Students may have a little difficulty identifying the prosimians, which include lemurs, lorises, bushbabies, and tarsiers. Prosimians are the more "primitive" members of the primate order; so you may wish to focus on monkeys and apes. Apes (the tail-less group) include gorillas, bonobos, chimpanzees, orangutans, siamangs, and gibbons.

Order Perissodactyla - the odd-toed ungulates (hoofed mammals) This order includes horses, zebras, tapirs, and rhinos.

Order Artiodactyla - the even-toed ungulates (hoofed mammals) This order includes camels, pigs, hippos, deer, giraffes, cattle, antelope, sheep, and goats. This is a common order. You should be able to find more than one of these animals at the Zoo (either in the farm exhibit or within the general exhibits).

Order Rodentia - the rodents This order includes beavers, rats, cavies, porcupines, gophers, capybara and woodchucks. You may not find many rodents on exhibit, but you should see them on the Zoo grounds (squirrels, chipmunks, woodchucks and mice). On the Zoo grounds you also might see the **Order Lagomorpha - the rabbit group.**

Order Marsupialia - the marsupials (pouched mammals) This order is probably familiar to most students and includes opossums, kangaroos, wallabies, koalas, and wombats.

These are the more common orders of mammals found in zoos. Have the students discuss each order. Talk about the common factors or adaptations of the animals in each order. List the similarities of the animals in each order.

Each copycat page contains some items that need to be completed before your Zoo visit. Watch for this symbol: 🕮 and complete these sections before your trip.

Class Act - Self-directed Tour - copycat page

📖 Name(s) of the person or team completing this report: _____, _____, _____, _____

📖 What characteristic defines a vertebrate animal?

_____

📖 What characteristics or adaptations make an animal a mammal?

_____

📖 What characteristics make an animal a bird?

_____

📖 What characteristics make an animal a fish?

_____

📖 What characteristics make an animal a reptile?

_____

📖 What characteristics make an animal an amphibian?

As you tour the Zoo, find three vertebrate animals and place them in the correct category.
Do not just list *turtle* under reptile. List the scientific name followed by the common name

BIRD

_____

_____

_____

REPTILE

_____

_____

_____

AMPHIBIAN

_____

_____

_____

MAMMAL

_____

_____

_____

FISH

_____

_____

_____

Class Act - Self-directed Tour - copycat page

Place the Zoo's mammals into their proper taxonomic orders. This may be a difficult task, since many orders are large and varied. Good luck! List the common name followed by the scientific name.

Order Carnivora includes many familiar animals: cats, dogs, bears, raccoons, weasels, mongoose, and hyena families.

Find three: _____ _____

_____

Order Cetacea includes dolphins and whales. The **Order Pinnipedia** includes: walruses, seals, and sea lions. The **Order Sirena** includes manatees.

Find one: _____

Order Primates includes monkeys, apes, and prosimians.

Find two apes: _____ _____

and two monkeys: _____ _____

Order Perissodactyla - the odd-toed ungulates (hoofed mammals) This order includes horses, zebras, tapirs, and rhinos.

Find three: _____ _____

_____

Order Artiodactyla - the even-toed ungulates (hoofed mammals) This order includes camels, pigs, hippos, deer, giraffes, cattle, antelope, sheep, and goats.

Find four: _____ _____

_____ _____

Order Rodentia - the rodents, or the Order Lagomorpha - the rabbit group.

Find two: _____ _____

Order Marsupialia - the marsupials (pouched mammals)

Find one: _____

Can you name the one marsupial found in Wisconsin?_____

Trumpeter Swans:
a threatened existence

North America's largest waterfowl, the trumpeter swan, was once a prominent feature in Wisconsin's lakes and marshes.

In 1805, when explorers Lewis and Clark first encountered these snowy-white birds, the swans were common throughout the northern United States and Canada. By the early 1930s only 69 trumpeter swans were known to remain in the entire continental United States south of Canada.

Market hunting for skins, down quills, and the fashionable millinery trade of the 1800s brought the trumpeter swan to near extinction.

The last known breeding trumpeter swans vanished from Wisconsin in the late 1800s.

Bringing the trumpeter swan back again

A growing interest in preserving the trumpeter swan has led to full-scale efforts to restore this species to native habitats in the Midwest.

Because Wisconsin still has suitable wetland habitats for trumpeter swans, the Wisconsin Department of Natural Resources implemented a recovery program to reintroduce this native species. The goal of establishing a migratory and breeding population of at least 20 trumpeter swan pairs by the year 2000 was met and surpassed. However, the species remains vulnerable to illegal hunting in Wisconsin.

Trumpeter swan habits and habitat

Trumpeter swans establish nesting territories in the spring as soon as frozen lakes and wetlands thaw. They prefer large shallow lakes and marshes with both open water and emergent vegetation. In most cases, only one pair will nest on a lake or marsh. Trumpeter pairs build their nests on muskrat houses in shallow water, or on vegetation they have pulled up and piled into mounds up to 6 feet across and 18 inches high.

Most trumpeters do not start nesting until they are 4 to 6 years old. Typically, trumpeters form mating bonds that may last for life. A female trumpeter swan, called a pen, lays from 4 to 6 eggs, but she may lay as many as 9 eggs. The female incubates the eggs for about 33 days. Both adults vigorously defend the nest territory from intrusion by other swans (and predators such as snapping turtles) during breeding season.

When the eggs hatch, the young swans, or cygnets, weigh only 7 ounces, but they begin to grow rapidly. During their first days, the cygnets eat insects, crustaceans and duckweed. By 3 weeks of age, they feed mostly on tubers, leaves and stems from a variety of aquatic plants -- just like their parents.

When fully grown, trumpeters weigh 20 to 30 pounds and have a 7-foot wingspan. Trumpeters can live for 30 or more years, but the average lifespan in the wild is about 15 years.

In the late fall, trumpeters gather into small family groups and migrate south. Midwestern swans migrate down the Mississippi River Valley to suitable wintering sites. When the swans return to their breeding grounds in early spring, the family units break up and juvenile swans venture out on their own.

Egg Laying

Female trumpeter swans incubate their eggs only until a few cygnets hatch. This fact allowed researchers to remove some eggs for captive hatching without hurting the trumpeter population.

The recovery plan called for collecting 30 to 40 trumpeter eggs from Alaska. The eggs then were flown to the Milwaukee County Zoo for incubation and hatching. After hatching, the chicks were raised by keepers who were disguised as trumpeter swans. This was done to avoid imprinting (a phenomenon in which recently hatched birds identify the first moving object they see as their mother) and so that the birds did not associate too closely with humans. In fact, whenever a keeper in regular clothes was in sight of a chick, the sounds of an adult trumpeter making alarm calls would be played on a tape recorder. The chicks thus learned to avoid humans.

As the cygnets matured, they were transferred to a small lake where they could further mature in a semi-captive enclosure that excluded predators. Some cygnets got additional survival training from people disguised as adult trumpeters. The people were partly submerged in water (a dedicated lot indeed). From this enclosure, birds were released into suitable habitat areas when they reached adulthood.

The Black Rhino

Several hundred thousand black rhinos used to roam the scrubland and open woodlands throughout most of Africa. With the invention of the high-powered rifle and the ever-increasing demand for rhino horn, rhino populations have plummeted. In 1960 about 100,000 were left; by 1970, only 60,000; 1980, 15,000; by 1990, 3,000; and by the year 2000, there were only 2,400, with numbers continuing to fall. Horns are desired for their beauty when carved and polished and for their supposed medicinal qualities (relating to beliefs about gaining the power or stamina of an animal by touching or eating its body parts -- rhino horn actually consists of the same material as your fingernails). The only scientifically proven medicinal value is that of an equivalent to aspirin. Nonetheless, in Southeast Asia, powdered rhino horn is sold for more than its weight in gold.

Desperate anti-poaching measures by African countries have not stopped the slaughter. In Zimbabwe, there is a shoot-to-kill policy against poachers, armed guards are posted to watch over the rhinos, and intensely protected sanctuaries have been created. This poaching war has reached new levels of ferocity. Some dealers want the rhino to become extinct to drive up the value of the rhino horns they already have stockpiled. The Zimbabwe rhino population of 1,700 animals a few years ago had fallen to less than 300 by 2002. To thwart poachers, Zimbabwe has sent rhinos to the U.S. and Australia as safe havens for the species.

In accordance with Rhino Specialist Group and Rhino Species Survival Plan recommendations, the Milwaukee County Zoo received a pair a black rhinoceroses directly from Zimbabwe. The expensive transport of the two animals to Milwaukee was funded entirely by donations from employees of the Miller Brewing Company and the Zoological Society. The long-term goal is to breed these rhinos and send some of the offspring to Zimbabwe when protected areas have been established. Since 1992, three offspring have been born from this pairing.

The Milwaukee County Zoo, the Zoological Society, and concerned staff members are involved directly with the conservation of rhinos. The Milwaukee County Zoo is participating in the Black Rhino Species Survival Plan, a volunteer organization of black rhino conservation centers dedicated to preserving the genetic diversity of captive black rhinos for the next 200 years.

The Zoological Society has sponsored numerous natural history safaris to Africa, including excursions to Kenya and Zimbabwe. The majority of the money paid for such safaris contributes directly to the economy of these African nations. Tourism therefore provides a major economic incentive (and funding) for the conservation of rhinos and other wildlife in these impoverished nations.

At-the-Zoo Student Activities

Tour the Zoo and locate one endangered species. An endangered species may be listed as endangered or may be listed as a Vanishing animal. Both terms are used at the Zoo. All the animal buildings at the Zoo have endangered species.

Scientific Investigation

After selecting an animal, complete the following:

Endangered species scientific name: _____
common name: _____

Area of the world: _____

Habitat: _____

What information can you gather from the signs about your species status or threats to its existence:

Now conduct some observations of the animal. Take notes on:

A. Its general appearance

B. Types of behavior that you observe: feeding, fighting, play, etc.

Conserving an animal's habitat or other preservation steps often relies on public relations. How a species is perceived, or even if the public is aware of the animal, directly affects the prospects for conserving that animal. Whether legislation is passed to provide money for research and preserving habitat, as well as stopping harmful human practices, depends on the public's awareness of the animal and its problems.

One of the main purposes of zoos is to provide people with the chance to experience and learn about the diversity and uniqueness of animals.

Back at school complete the following information:

Research your animal.

A. Find out the extent of its past or historic home range versus its present range and other environmental facts that impact your animal.

B. Find out about past and current research on this animal.

C. Who are the researchers and where are they working?

D. What laws and regulations protect the species or its habitat?

E. Are any conservation projects underway to help these animals?

Now form a plan to save these animals.

A. List of individuals and/or groups who would need to be involved.

B. Public relations campaign ideas, education that would be necessary

C. Conservation measures that could be taken

D. Needed research

What animal careers are there at the Milwaukee County Zoo and elsewhere?

Zoos: Keeper, Curator, Director, Veterinarian, etc.
State: (DNR) Forester, Wildlife Manager, and Biologist.
Federal: US Fish and Wildlife Service, US Forest Service, National Park Service,
Private (Sea World): animal trainers

ZOO & AQUARIUM CAREERS

The American Zoo and Aquarium Association (AZA) is the largest professional organization representing zoological parks, aquariums, wildlife parks, and virtually all professional management persons employed in such institutions. Also, the association is often called upon to advocate wildlife conservation on behalf of the more than three million individuals who support zoological parks and aquariums at the local level.

ZOO AND AQUARIUM CAREER OPPORTUNITIES

With more than 110 million people visiting zoological institutions in North America annually, zoo and aquarium employees have the opportunity to educate the public about the critical need for wildlife conservation. This responsibility assures a prospective employee an interesting and rewarding career, but the profession dictates more than a commitment to conservation; it requires hard work. Not all zoo and aquarium employment is glamorous. It takes a special kind of individual to give total dedication to the care of captive animals. They require attention 24 hours a day, seven days a week. When weather conditions seem worst, zoo employees work their hardest. Still, the rewards for such efforts are great, and employees share in the knowledge they are providing the best care to treasures of the wild kingdom.

Learning there are generally more candidates than positions can be frustrating for serious applicants; those who persevere find it is well worth their effort. There are fewer than 200 professionally operated zoos, aquariums, wildlife parks and oceanariums in North America. Their 12,000 full-time employees include directors, curators, educators, public relations professionals, scientists, keepers, gardeners, laborers, tradesmen, secretaries, accountants and clerks. Fewer than 5,000 individuals have an opportunity to work directly with the institutions' animal collections. The rewards for such efforts are great. Zoo and aquarium employees share in the knowledge that they are providing the best care for the creatures in their facility, as well as developing a forum for others to learn how they, too, can participate in the conservation of our planet's natural resources.

REQUIREMENTS

The conservation and scientific programs in zoos and aquariums have become highly technical and specialized. Although practical experience with animals may sometimes be substituted for academic training, most entry-level keeper positions now require a four-year college degree. (At the Milwaukee County Zoo, a degree is not required for the keeper position, but many keepers do have college degrees.) Training in animal science, zoology, marine biology, conservation biology, wildlife management and animal behavior is preferred. Curatorial, research, and conservation positions typically require advanced academic degrees. However, advanced academic training by itself is insufficient, and it may take years of on-the-job training for someone to learn the practical aspects of exotic animal care. A few institutions offer curatorial internships that are designed to provide practical experience.

Students wishing to pursue animal-related careers are encouraged to do a careful review of the curriculum of the schools they wish to attend, as some programs focus more on a zoological application than others.

Students who are interested in the business side of zoo and aquarium operations should concentrate on skills related to a particular area of expertise, such as accounting, public relations marketing, personnel management, etc. Whatever your career goals, guidance counselors can offer assistance in deciding the most appropriate course of study.

SALARIES

Salaries for zoo and aquarium employees vary depending on the institution and its location. They are generally higher in metropolitan areas. A keeper's salary can range from slightly above minimum wage to more than $30,000 a year, depending on tenure. Pay for other zoo and aquarium employees compares favorably with salaries prevailing in the region.

POSITIONS

Listed below are some positions in zoological parks and aquariums and a brief description of responsibilities. Not all positions listed are available in all zoological institutions, and responsibilities often vary.

DIRECTOR - Chief Operating Officer - Executes policy as directed by the governing authority. Responsible for the institution's operation and plans its future development.

FINANCE MANAGER/DIRECTOR - Manages the institution's finances, including payment of bills, purchasing, investments, and the preparation of financial statements.

GENERAL CURATOR - Responsible for the management of the entire animal collection and animal management staff. Responsible for strategic collection planning.

CURATOR OF (Mammals, Birds, Reptiles, Fish, etc.) - Manages a certain portion of the institution's animal collection and that section's animal care staff.

VETERINARIAN - Responsible for the health of the animal collection and the maintenance of all animal health records.

VETERINARY TECHNICIAN - Assists the veterinarian and provides care to animals under the supervision of the veterinarian.

REGISTRAR - Maintains computer records on the animal collection and applies for permits and licenses to hold or transport animals.

CONSERVATION/BIOLOGIST/ZOOLOGIST - Provides scientific and technical assistance in the management of the animal collection and assists in conducting various research or field conservation projects.

COORDINATOR/DIRECTOR OF RESEARCH - Supervises research projects, serves as liaison between the institution and the academic community, publishes articles in scientific journals.

COORDINATOR/DIRECTOR OF CONSERVATION - Oversees the institution's conservation activities, including field projects. Serves as liaison with government wildlife agencies and other conservation organizations.

HEAD KEEPER/AQUARIST - Supervises a section or department of the institution and provides training and scheduling.

KEEPER/AQUARIST - Provides daily care to the institution's animals, including diet preparation, cleaning, general exhibit maintenance, and record keeping.

OPERATIONS MANAGER - Responsible for the daily operation of the institution's physical plant and equipment.

CURATOR OF EXHIBITS - Creates exhibits and assists in the design of graphics.

HORTICULTURIST - Responsible for the institution's botanical collection and its application to the animal collection, as well as daily maintenance of the institution's grounds.

CURATOR/DIRECTOR OF EDUCATION - Plans and implements the institution's educational programs.

PUBLIC RELATIONS MANAGER - Promotes the institution, its mission, and its programs to the public via the media.

GIFT SHOP MANAGER - Manages staff and all phases of gift shop operation, from buying the products to designing shops.

VISITOR-SERVICES MANAGER - Manages the staff and facilities that cater to the visiting public including concessions and restrooms.

PERSONNEL MANAGER - Responsible for all personnel matters, including payroll, insurance and tax matters.

DEVELOPMENT DIRECTOR/OFFICER - Develops and manages fund-raising activities, which can include writing grant proposals and attracting corporate sponsors, as well as soliciting private donations.

MARKETING DIRECTOR/MANAGER - Creates advertising campaigns and other activities to increase public awareness of the institution.

SPECIAL EVENTS MANAGER/COORDINATOR - Develops and implements events to attract visitors throughout the year.

MEMBERSHIP DIRECTOR/MANAGER - Responsible for maintaining and increasing institution memberships for families and individuals and designing special events for members only.

VOLUNTEER COORDINATOR - Responsible for recruiting and maintaining a staff of volunteers/docents. Duties include scheduling docents for on- and off-grounds activities and keeping docents abreast of new developments to relate to the public.

DOCENT/VOLUNTEER - Duties may include diet preparation, small animal care, teaching educational programs, leading group tours, and staffing special events.

JUNIOR KEEPER - Some institutions offer a summer program for high school students who wish to volunteer in a zoo or aquarium setting. Duties are often similar to those of other volunteers, but they are supervised much more closely.

OTHER ORGANIZATIONS PROVIDING CAREER INFORMATION

The American Association of Zoo Veterinarians (AAZV) is a professional organization dedicated to the science of animal medicine, especially that of wild animals in captivity. Those pursuing a career in zoo or aquarium animal medicine should contact the AAZV, http://aazv.org/aazv_001.htm.

The American Association of Zoo Keepers (AAZK) is dedicated to the important role zookeepers play in providing professional care to captive wild animals. Those interested in pursuing careers as zookeepers should contact the AAZK, http://www.aazk.org/aazknew/.

Wisconsin DNR

Primarily because of its abundant natural resources, Wisconsin is recognized as one of the nation's best states in which to live and work. A commitment to protect and enhance these resources for everyone's use drives the environmental programs of Wisconsin's Department of Natural Resources.

A career with the DNR's Division for Environmental Quality offers a direct means for you to make a difference in the preservation and protection of environmental quality today and in the future.

The wide variety of responsibilities in the department's environmental protection programs allows you to focus on your areas of interest and apply your skills and knowledge to address complex environmental issues.

You'll receive on-the-job training from staff members experienced in the newest environmental technologies and have the opportunity to continue your learning through seminars and training in technical subject areas, data management, and communication skills.

Solid and Hazardous Waste Program

Reducing the volume of waste we produce, managing wastes to protect the environment and public health, ensuring that spills and contaminated sites are cleaned up -- these are the difficult challenges confronting the people who work in the Solid and Hazardous Waste Management Program.

The program works with the public, industry and other government agencies to reduce the volume of waste we produce in Wisconsin, and makes sure that the waste we do generate is handled, stored, treated, recycled and disposed of in ways that protect the environment.

Hydrogeologist
- Investigate groundwater contamination sites and set up groundwater monitoring systems.
- Assess the feasibility of constructing new or expanding existing waste management facilities.
- Develop and direct clean-up operations at contaminated waste sites.

Waste Management Specialist
- Work with public and private facilities to ensure compliance with state and federal regulations for waste disposal, storage and transportation.
- Inspect facilities and investigate waste handling and contamination problems.
- Review plans for hazardous waste storage, treatment, and disposal facilities.
- Provide hazardous waste recycling and minimization technical assistance.

Source Reduction/Recycling Specialist
- Help communities design and operate source reduction and recycling programs and assist them in getting grants to support their recycling operations.
- Help develop markets for recyclable products.
- Inspect recycling facilities.
- Consult on composting and yard waste.

Waste Management Engineer

- Review and approve waste disposal plans to ensure that landfills and other waste disposal facilities are properly designed, constructed, operated and closed.
- Inspect waste disposal sites to prevent contamination and check for compliance with regulations.
- Investigate spills and contaminated sites.

Water Resources Management Program

If you value clean water and want to help protect streams, lakes and groundwater, the DNR's Water Resources Management Program may be for you. The Bureau of Water Resources Management develops approaches for water resources protection. You could be part of the team that fights water pollution, solves complex pollution problems through computer modeling, identifies toxic pollutants in fish, and much more. Emphasis is now on Great Lakes protection, wetlands preservation, cleaning up contaminated sediments, and storm-water control.

Water Resources Engineer

- Evaluate pollution-control requirements and design permit requirements.
- Provide technical support for lake watershed management.
- Develop strategies to reduce pollution from construction sites, urban storm water, agricultural runoff and erosion, and from sediment clean-up projects.

Water Resources Management Specialist

- Conduct studies and develop policies to ensure the protection and improvement of water quality in lakes, streams and groundwater.
- Evaluate and review scientific information in the areas of biology, toxicology, water chemistry and ecology.
- Work with professionals from other agencies, environmental groups, industries and the U.S. EPA to develop protective measures.

Aquatic Biologist/Chemist

- Participate in ecosystem surveys of inland and Great Lakes waters.
- Evaluate aquatic environments and make recommendations to protect and restore water quality.
- Collect and interpret chemical and biological data.

Water Quality Modeler

- Develop computer-based simulations to evaluate and predict environmental impacts from water pollutants.
- Develop long-range projections of the impacts of various types of pollution sources.

Hydrogeologist/Soil Scientist

- Oversee groundwater monitoring projects and develop groundwater quality standards.
- Provide technical assistance in areas where runoff pollution impacts groundwater.
- Evaluate agricultural practices for their effects on water resources and work with county agricultural experts and landowners to reduce runoff pollution.

Choosing a Job That's Right for You:

An Important First Step by Anne White

"The more I see of people, the less I want to." As always, Donna Dennett was close to tears as she finished her shift behind the counter at Friendly Jack's, the big restaurant near the expressway. She, herself, was feeling anything but friendly.

Donna's job that summer required an early starting time, a fast pace, and lots of hard work. But these weren't the things that were bothering her. She was never late, didn't mind the rush, and never made mistakes on the orders or checks.

It was the customers who were driving her crazy!

The travelers were bad enough. The ones who chose the counter were always in a hurry.
After long hours on the road, the adults were often irritable; the children, restless and demanding.

But the regular customers were even harder to take.

The men who stopped in for coffee loved to tease and joke. Her shift-mates, Linda and Mary, handled the teasing with no trouble. Both were quick with a funny comeback, and, when it was needed, a clever put-down. But Donna could never think of a fast answer. She'd stammer, blush, and get really flustered. Then, of course, they'd tease her even more.

"Loosen up," Linda told her. "Things will get better."

Linda was wrong. They didn't.

Luckily for Donna, after a few weeks on the job she learned of an opening in the business office of the restaurant-motel complex. On her break, she hurried over to inquire about it. Because she had proved herself accurate and dependable, Jack agreed to give her a try.

By the time the day was over, Donna felt for the first time that summer as if she could breathe freely. Tallying the checks from the restaurant, typing purchase orders, and learning the billing procedures might be a bit difficult at first, but she knew she could handle it. And she knew she would enjoy it.

Donna had learned an important lesson about herself. She was happier working with figures than with people.

Data, People, Things

Most people, like Donna, find themselves happiest in a job that suits their preference for work with data (ideas and figures), people, or things. Although every occupation requires some ability to deal with all three, the job description usually emphasizes one more than the others. If you can, like Donna, use a part-time or summer job as a testing ground to find out what your preference is, so much the better.

See how much you already know about your own preference by answering the following questions.

Take Stock of Yourself

Through a stroke of unbelievable luck, you can have your choice of any part-time job you want in one of these businesses. You will be shown just how to do the job and all jobs will pay the same. All you have to do is decide which job in each place you think you would like best.

RESTAURANT

_____ a) Taking inventory of stock, checking in orders, tallying receipts and checks
_____ b) Waiting on customers
_____ c) Preparing salads, shrimp cocktails, and relish trays

HOSPITAL

_____ a) Gathering information for business office, helping prepare reports
_____ b) Working as a sunshine aide, chatting with patients, reading to children
_____ c) Washing test tubes and cleaning up the hospital lab

FLORIST SHOP

_____ a) Keeping the books and doing the billing
_____ b) Selling in the shop
_____ c) Making the floral arrangements

COMMUNITY THEATER

_____ a) Writing press releases and advertising copy
_____ b) Ushering and giving out programs
_____ c) Building and painting scenery

STATE PARK

_____ a) Handling reservations for campsites
_____ b) Helping park rangers enforce park regulations and handle complaints
_____ c) Cutting brush and maintaining park grounds

BUSINESS

_____ a) Bookkeeping in an office
_____ b) Taking telephone orders
_____ c) Operating a machine on the production line

Total score _____ a's _____ b's _____ c's

If you checked 5 to 6 a's, you show all the signs of being a data person. You are interested in jobs that require you to use your mind to write, report, investigate, compute, and categorize.

Future career fields of interest to you may be accounting, writing, record keeping, or computer programming.

If you selected a large number of b answers, you are probably a people person, comfortable working with others.

You may enjoy helping occupations: nursing and other health-care jobs, teaching, social work, other jobs where you provide a service to others.

Another type of people-job centers around leading, persuading, or influencing others. These jobs include careers in sales, management, and politics.

Scoring highest in the c, or the "things," category indicates that you like to see concrete results of what you do. Building and making things and working out of doors are apt to be most satisfying to you. Jobs in this category include machine operator, farmer, carpenter, cook, and craft person.

If your answers don't show a clear-cut preference, you may be open to many different kinds of jobs -- or perhaps you need more time and experience to decide what you like best.

Examine your summer or part-time jobs, along with your school activities, in terms of data-people-things. You will be taking an important first step in your search for a career that will be right for you.

"TEN WAYS"

Complete these "fun fill-ins" honestly and thoughtfully, and you'll have a superior supply of career clues.

1. The class I enjoy going to most is _____
   because _____

2. If I didn't have to worry about earning a living, I'd _____
_____ instead.

3. I feel really great when someone compliments me for _____
_____

4. Sometimes I daydream that I'm the best _____
_____ in the world.

5. It's easy to motivate myself to _____.

6. I feel terrific after I finish _____.

7. Ever since I was a little kid, I've always wanted to _____
_____

8. Before I die, I'd like to accomplish three things _____,
_____ and _____

9. The one activity I've always wanted to participate in at school but haven't had the confidence to try is
_____

10. If I were a guest on a talk show, my area of expertise would be _____

FINAL PROJECT: FUTURE PLAN

1. What job/career are you presently considering?

2. What training/education do you plan on pursuing after graduation from high school?

3. List any high school courses you should take to better prepare for this career?

4. What school activities should you participate in to be better prepared for the career you selected?

5. What activities <u>in school</u> would help you prepare for your future career?

6. What activities outside of school would help you prepare for your future career?

Share this plan with your teacher, so that she/he can discuss this plan with you and help you to modify, if appropriate.

Zoo Conversations and Careers - copycat page

📖 Name(s) of the person or team completing this report: _____, _____, _____, _____,

📖 Why do you think zoos exist? _____

What type of jobs (duties) do you think workers at a zoo do?

_____

_____

Now on to the Zoo...

See how many jobs you can find at the Zoo and complete the chart below. Find as many duties as you can.

Example A. feed animals, by zookeeper or B. plant flowers, by gardeners

A. _____ by _____

B. _____ by _____

C. _____ by _____

D. _____ by _____

E. _____ by _____

F. _____ by _____

Remember, there are lots of duties that need to be done at a zoo. Many zoos have volunteers. These volunteers are just as important as the paid staff. So don't forget to list what they do for the zoo. Some staff have lots of different duties. For example, a zookeeper may feed the animals, clean the enclosure, look for animal health problems, etc. List the various duties you observe. Watch other staff or volunteers and observe what they are doing (e.g., custodial, maintenance person, zoologist, veterinarian, office staff, gift or food sales staff, marketing person, and educator).

When you return to school, complete the following: Do you think you would like to work at a zoo? If yes, what would you like you like to do and why?

_____

_____

If you said no, why would you not want to work at a zoo?

_____

Zoo Conversations and Careers - copycat page

All zoos have a basic plan or layout. After walking around the Zoo, what do you think is the basic plan or the various themes of the Zoo (e.g., North American animals, predator vs. prey, small animals, farm animals, etc.)? Some zoos have more than one theme. List all that you found:

_____

_____

_____

If you see a volunteer, staff person or sign that explains what the purpose of a zoo is, or what the purpose of this zoo is, summarize here:

_____

_____

Look for a map or a person to find out the size of the Zoo. (Most zoos have non-exhibit land. You just want to find out the size of the land used for animal exhibits and zoo-visitor areas of the Zoo).

What size is the zoo you are visiting and how much of that space is allocated to animal exhibits (give a %)

size _____ allocated to animal space:_____%, helpful hint: if a zoo has a map, it might be easier to determine the percentage.

When you return home, do you still feel that your - "why zoos exist statement" is accurate? Make any changes to your original statement here:

_____

_____

Re-build a Zoo - Activity

1. Divide your students into teams and hand out the Plan copycat pages.

2. Read the following to your students:

In 1950, the city of Dontcare closed its zoo because not enough people went to visit it. The new Mayor, Carry Moore, decided to hire you to develop a zoo renovation plan on the same site as the old zoo (150 acres). She wants you to develop a plan and submit a basic sketch of how the zoo should be laid out. She also wants you to complete a preliminary general operating budget to determine if the city can afford the annual operating costs. Be aware she is accepting a number of different plans. The mayor will be judging the plans based on these points:

- Is the plan well-thought-out, practical, and complete?
- Is the plan creative and exciting?
- Does this new zoo sound like a place people would want to visit?
- Is the admission fee realistic?

3. Give the students some time to complete the plan. Then you or another person from the school should serve as mayor. The students then present the plan to the class and the mayor.

4. It is then your choice. The mayor can decide which plan to go with, or you can call for a vote from the citizens of Dontcare.

You can take this concept even farther by having the students create the zoo layout as a diorama.

Re-build a Zoo - copycat page

Give your company a name and list the people working on the plan.

Company name_____

Personnel _____ _____ _____

1. Suggest a name for the new zoo

_____

2. What will be the overall theme or themes?

3. What type of habitats will you feature?

4. What types of animals and how many of each animal will the zoo have?

5. What types of exciting things does your plan include that will ensure that people will want to visit and then re-visit your zoo?

Re-build a Zoo - copycat page

Prepare a preliminary budget sheet:

1. How many people do you think will visit the zoo each year?_____

2. How much will you charge for zoo admission? _____, this will mean a revenue of admission charged $_____ times number of visitors _____ = $ _____

3. How many people and what type of people will you need to operate the zoo? Remember you are open all year, seven days a week)?

   Number of people _____ times an average salary of $22,000 each = _____ in labor costs.

   Types of positions you will need:

4. How much will it cost, per year, to feed the animals? (Helpful hint: it costs around $200 per "general feeder" animal. If you have a specialized feeder (an animal that eats only one or two things, such as the koala, panda, etc.), it costs $25,000 per animal.

A. Number of general feeder animals _____ times $200 each = _____

B. Number of specialized feeder animals _____ times $25,000 each = _____
   (you do not have to have specialized feeders if you do not want)

   Total animal food costs: _____

5. Signs - average cost of a sign is $500 each. How many signs will you need _____

   number of signs_____ times $500 = _____

TOTAL PRELIMINARY COST _____

Remember, this is just a preliminary budget, and so it does not have to include the costs of purchasing animals, shipping animals, building the zoo, landscaping, utilities, uniforms, restaurant or gift shop supplies, staff training -- just to name a few other items needed to run a zoo. A full budget detail would be needed only if your business received the contract to do the zoo renovation job. When the Milwaukee County Zoo was renovated in the late 1980s and early 1990s, it cost $26 million. The annual operating budget of the Milwaukee County Zoo is $15.5 million. A capital campaign begun jointly by the Zoo and the Zoological Society in 2001 aims to raise nearly $30 million over several years to improve and update the Zoo.

Re-build a Zoo - copycat page

Draw the basic zoo layout, including buildings, animal enclosures, entrances, parking, gift shops, etc. This zoo is around 80 acres. To help guide you; every inch = about 10 acres.

Things to remember when visiting the Milwaukee County Zoo…

1. One chaperone is required for every 10 students.

2. Teachers and chaperones must accompany their students at all times and monitor their behavior.

3. The animals are on special diets to promote good health and prevent disease. Please do not feed them.

4. Please do not enter “restricted areas”.

5. Treat the animals with respect. Don’t harass or mistreat them.