On T.R.A.C.K.S.

Teaching Resource Activities and Conservation to Kansas Students

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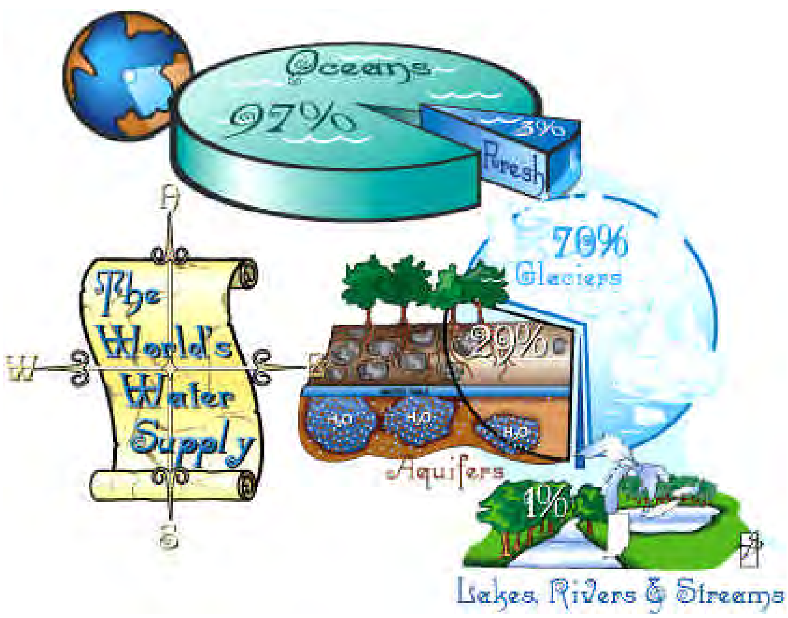


Water: Our Most Precious Resource Part II

In Water: Our Most Precious Resource Part I, we discussed the following: the water cycle, ground water, surface water, our usage of water, irrigation, and the problems Kansas is facing with its water availability under its present usage level. We discovered the outlook is not very encouraging, especially in western Kansas.

In this, the second part, we will explore the health of our aquatic systems, indicators of water quality, riparian areas and their importance to water quality and wildlife, and wetlands--their value to us and wildlife and why we need to protect them. As in issue one, we are only providing a brief presentation of the above areas.

In some situations, the clock is rapidly ticking regarding the usage of our local water supplies. Responsible action will be required in the immediate future to avoid more serious consequences. Our intent is to bring these areas to you and your student's attention to help all gain a greater awareness and understanding of the water situation in Kansas.

Inside...

We experienced some difficulty in obtaining state bids to reproduce the ON T.R.A.C.K.S. newsletter onto a CD rom format. Because of the delay, you will receive the Fall and Winter issues on the same disk. The first issue explores the quality, quantity, utilization, and depletion of water sources in Kansas. Our winter issue will touch upon the conservation measures needed to be employed to reduce water consumption and restore the quality of our water supplies. As a bonus, we are also including the Life in a Pond, Winter issue from 1996. Some of our older issues, produced on newsprint, may no longer be available. Therefore, we will try to include past, related issues with our current newsletter.

Chemical Water Quality

There are many ways to monitor the health of aquatic systems. Although the presence of certain plants and animal species may be used as a barometer of aquatic health,the most fundamental approach to the study of aquatic systems is to look at the chemical and physical properties of the water, also called water-quality. When the results of water-quality parameters are documented, the data can be compared to data from other wetlands or data from the same body of water over time. The results can be correlated with other factors such as weather, watershed dynamics, and human activity.

The kinds of tests used to determine water-quality are many and varied. Some of the basic tests a researcher may wish to perform include: temperature, flow rate, dissolved oxygen (DO), pH, turbidity, hardness, and nitrates. Other tests such as BOD (Biological Oxygen Demand), COD (Chemical Oxygen Demand) and fecal coliforms may be routine only in certain situations i.e. testing the outflow of a sewage treatment station.

Temperature

Temperature directly and indirectly effects many things in the aquatic system. The stability of a lake (i.e. lake turnover), the amount of gases dissolved in the water (particularly oxygen), and the rate at which biological processes take place all may be affected by temperature. Temperature should be taken at several places i.e. the surface, near the middle, and at the bottom of the body of water or in moving vs. still water. For an accurate reading, keep the thermometer at the same level in the water for a minute or more.

Dissolved Oxygen

Dissolved oxygen is vital to the health of aquatic habitats.A low amount of oxygen in the water is a sign that the habitat is stressed. Water must contain around five parts per million (ppm) to sustain life. Less than 2 ppm is considered anoxic or not suitable for life.

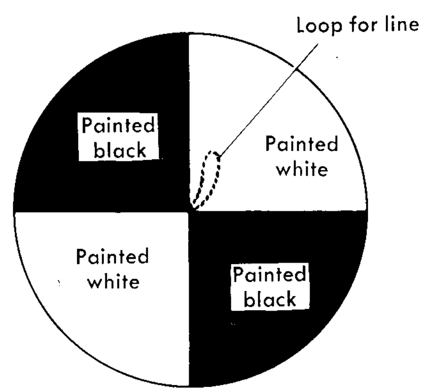
Oxygen from the air is mixed into water with the help of rain, wind, waves, and currents. The amount of oxygen dissolved in the water is affected by weather, temperature (cold water can hold more oxygen than warm water), salinity (fresh water holds more oxygen than salt water), and time of day (DO levels rise as plants produce oxygen during the morning and afternoon, but fall in the evening as animal respiration consumes oxygen.)

pH

The measure of hydrogen ions in a solution is called the pH.A solution is more acidic when it contains more hydrogen ions. pH is measured on a scale of 0-14 where 0 is extremely acidic, 7 is neutral, and 14 is extremely basic. The pH range of natural systems under normal circumstances is typically between 6.0 and 8.0. This is the most favorable range for life, although some organisms can tolerate harsher conditions.

Turbidity

When water is cloudy, it is said to be turbid. Turbidity is caused when sediment like soil and other particles are stirred up in the water. Rain, wind, waves, tides, animals and various human activities can all stir up suspended particles and increase turbidity.



Secchi disc

Increased turbidity can keep sunlight from reaching underwater plants and it can also clog the gills of fish, mussels, and other gilled creatures. A Secchi disc is used to measure the depth of light penetration, or turbidity.

Biological Monitoring

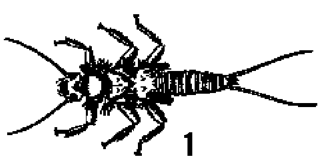
Biological monitoring is the systematic use of living organisms to determine the quality of the aquatic environment. It differs from the traditional physical and chemical approaches mentioned previously. Physical and chemical measurements give us a "snapshot" at just the time of collection. Biomonitoring is more like a time-lapse video since the organisms present are exposed to past conditions as well. Physical/chemical measurements and biomonitoring are not mutually exclusive; most water quality monitoring programs use both approaches together.

Fish, algae, protozoans, and other groups of organisms have been recommended for use in biomonitoring but macroinvertebrates, which are dominated by aquatic insects, are the group most frequently used. The first approach adopted , using macroinvertebrate monitoring, was to develop a list of indicator organisms based on organisms responses to environmental conditions. For example, tubifex worms are considered to be pollution tolerant, whereas caddisflies are considered to be pollution intolerant. While this concept still remains the basis for some indices, others have been developed as well.

A diversity index assesses water quality by describing the macroinvertebrate communities according to their species diversity. This type of index is based on the idea that the greater the diversity of species present, the healthier the site.

Provided on the next few pages is a key to stream macroinvertebrates based on their pollution tolerance. This key was developed by the Izaak Walton League of America, 1401 Wilson Blvd., Level B,Arlington, VA 22209.

Stream Macroinvertebrates



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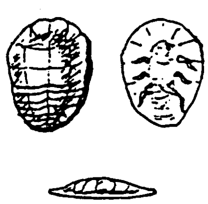

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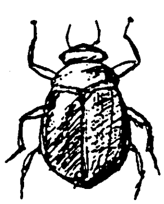

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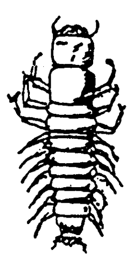

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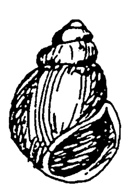

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GROUP ONE TAXA

Pollution sensitive organisms found in good water quality.

1. Stonefly: Order Plecoptera 1/2"-11/2", 6 legs with hooked tips, long antennae, 2 hair-like tails. Three examples.

2. Caddisfly: Order Trichoptera Up to 1/2", 6 hooked legs on upper third of body, 2 hooks at back end. May be in a stick, rock, or leaf case with its head sticking out.

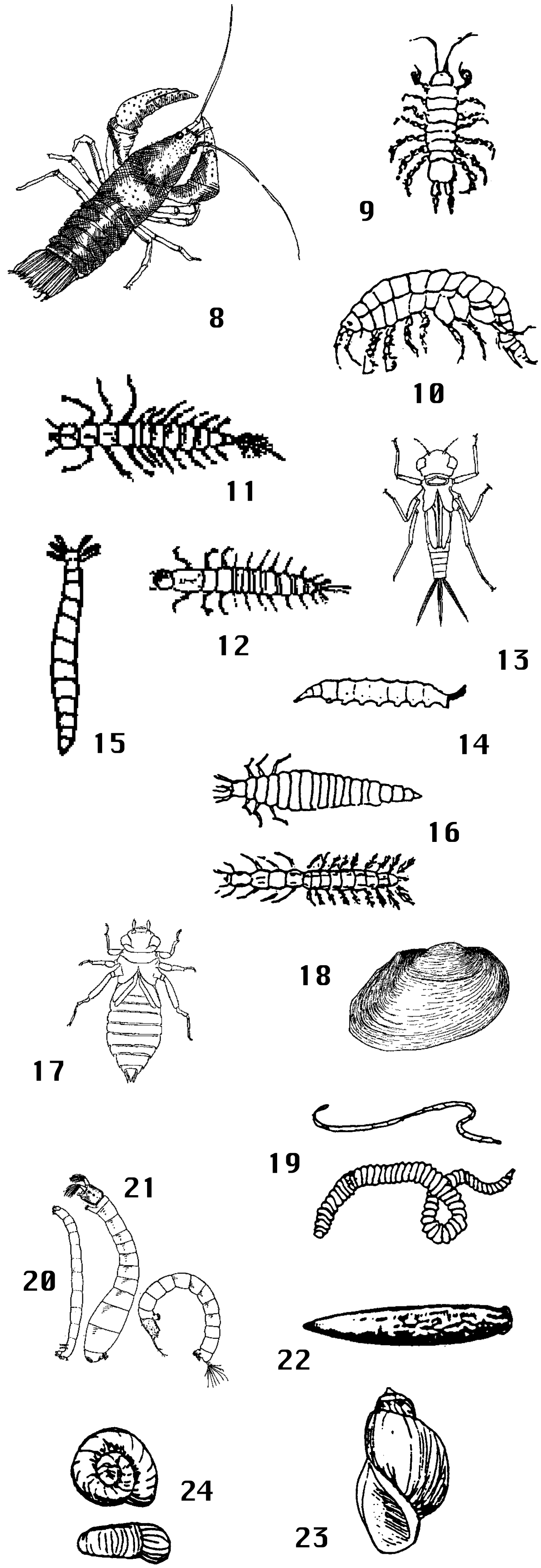
3. Water Penny: Order Coleoptera 1/4", flat saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side. Immature riffle beetle. Three examples.

4. Riffle Beetle: Order Coleoptera 1/4", oval body covered with tiny hairs, 6 legs, antennae. Adult form of water penny.

5. Mayfly: Order Ephemeroptera 1/4"-1", brown, moving, plate-like gills on sides of body, 6 large hooked legs, many long feelers on lower half of body, antennae, 2 or 3 long, hair-like tails.

6. Gilled Snail: Phylum Mollusca Shell opens on right, opening covered by thin plate called operculum.

7. Dobsonfly (Hellgrammite): Suborder Megaloptera 3/4"-4", dark-colored, 6 legs, many long feelers on lower half of body, short antennae, 4 hooks at back 0 end.



GROUP TWO TAXA

Somewhat pollution tolerant organisms can be in fair quality water.

8. Crayfish: Order Crustacea 1/2"-6", 2 large claws, 8 legs, resembles small lobster.

9. Sowbug: Order Crustacea 1/4"-3/4", gray oblong body wider than it is high, more than 6 legs, antennae.

10. Scud: Order Crustacea 1/4", fat body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp.

11. Alderfly larva: Suborder Megaloptera 1" long. Looks like small hellgrammite but has 1 long, thin, branched tail at back end.

12. Fishfly larva: Suborder Megaloptera 1"-11/2" long. Looks like small hellgrammite but lighter reddish-tan color, often with yellowish streaks.

13. Damselfly: Order Odonata 1/2"-1", large eyes, 6 thin hooked legs, 3 broad oar-shaped tails. Two views

14. Watersnipe Fly Larvae: Order Diptera(Atherix) 1/4"-3/4", green, tapered body, many cater pillar-like legs, conical head, feathery "horn" at back end.

15. Crane Fly: Order Diptera 1/3"-2", green or brown, plump caterpillar-like segmented body, finger-like lobes at back end.

16. Beetle Larva: Order Coleoptera 1/4"-1", light-colored, 6 legs on upper half of body, feelers, antennae. Two examples.

17. Dragonfly: Order Odonata 1/2"-2", large eyes, 6 hooked legs.

18. Clam: Phylum Mollusca

GROUP THREE TAXA

Pollution tolerant organisms can be in poor quality water.

19. Aquatic Worm: Order Oligochaeta 1/4"-1", can be very tiny, thin worm-like body.

20. Midge Fly Larva: Order Diptera Up to 1/4", worm-like segmented body, 2 legs on each side.

21. Blackfly Larva: Order Diptera Up to 1/4", one end of body wider. Black head, suction pad on end.

22. Leech: Order Hirudinea 1/4"-2", brown, slimy body, ends with suction pads.

23. Pouch Snail: Phylum Mollusca shell opens on left. No operculum. Breath air.

24. Other snails.

What is a MACROINVERTEBRATE, anyway?

Macroinvertebrates are defined as organisms that lack an internal skeleton and are large enough to be seen with the naked eye. They are an integral part of wetland and stream ecosystems. Examples of macroinvertebrates include mayflies, stoneflies, dragonflies, rat-tailed maggots, scuds, snails, and leeches. These organisms may spend all or part of their lives in water; usually their immature phases (larvae and nymphs) are spent entirely in water. [Larvae do not show wing buds and are usually very different in appearance from the adult version of the insects. Nymphs generally resembles adults, but have no developed wings and are usually smaller.]

A variety of environmental stressors can impact macroinvertebrate populations. Urban and/or agricultural runoff can produce conditions that some macroinvertebrates cannot tolerate. Sewage and fertilizers added to streams induce the growth of algae and bacteria that consume oxygen and make it unavailable for macroinvertebrates. Changes in land use from natural vegetation to a construction site or to poorly protected cropland may add sediment to the water.Sedimentation destroys habitats by smothering the rocky areas of the stream where macroinvertebrates live. Removal of trees along the bank of a river and alteration of stream velocity can both alter normal water temperature patterns in the stream. Some organisms depend on certain temperature patterns to regulate changes in their life cycle. Other stressors include the introduction of alien species and stream channelization.

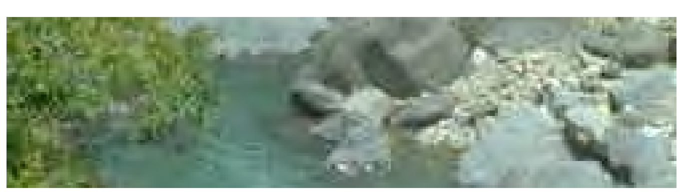
Water quality researchers often sample macroinvertebrate populations to monitor changes in stream conditions over time and to assess the cumulative effects of environmental stressors. Environmental degradation will likely decrease the diversity of a community by eliminating intolerant organisms and increasing the number of tolerant organisms. If the environmental stress is severe enough, species of intolerant macroinvertebrates may disappear altogether. If a sample of macroinvertebrates contains a diversity of organisms, the stream conditions are likely good.

Excerpt from the Project WET activity“Macroinvertebrate Mayhem”,1995, The Watercourse and the Council for Environmental Education.

Stream Link

Teachers in the counties of Riley, Geary, Morris, Wabaunsee, Pottawatomie, Jackson, Shawnee, Jefferson, Leavenworth, Douglas, Johnson, & Wyandotte can become involved in a unique water education program called StreamLink.. This K-12 cross-curricular program is designed to build student water literacy through water quality assessment and general watershed education. Offered through the Kaw Valley Heritage Alliance (KVHA), StreamLink is specifically designed to facilitate students' personal, life-long relationships with water resources. KVHA provides StreamLink participants the training and materials necessary for sucessfully taking part in the program. Great latitude is given to teachers to focus the program components as necessary based on their curriculum needs, however, participation in StreamLink requires a commitment to each program component and to protocol compliance. Participants must plan a minimum of two stream visits per academic year.

Anyone interested can check out KVHA's website at www.kvha.org or contact Alison Reber at (785) 842-2205 or email her at areber4369@aol.com



KS Water Quality: How Are We Doing?

How does the quality of Kansas water compare with the national norm? In most studies, Kansas surface water quality is ranked in the lower half when compared to other states. Around 80% of our surface water is restricted for one reason or another. In fact, a study in 1996-97 indicated 60% of our public lakes are impaired for fishing, supporting aquatic life, or providing quality drinking water. Of the public wetlands assessed in Kansas, 29% support aquatic life, but are considered threatened ecosystems.

To better understand this, we must realize that surface water is a complex ecosystem in which many biological, physical, and chemical processes interact. Biological variables such as reproduction rates, competition, and food sources are intertwined with chemical variables such as oxygen, pH levels, temperature, and turbidity. Physical variables such as sunlight, stream cover, and riparian borders must also be included in the mix. In many streams, these various factors are in a delicate balance and the alteration of one affects many others. To illustrate this, let's use the example of one common factor found in many Kansas streams-- turbidiity.

Turbidity describes the clarity of the stream's water. Sediment (particles of soil material transported by water) can greatly decrease the clarity of the water which, in turn, decreases the amount of sunlight that penetrates the water. This often starts a domino effect within the stream. A reduction in sunlight reduces the plant life in the stream. The lack of plant life reduces the oxygen concentration in the stream and, hence, the number of aerobic organisms (those which live only in the presence of oxygen). Without an adequate supply of oxygen, aerobic organisms die. Now we have dramatic changes occurring in the stream. Not only is the stream's food web disrupted by the lack of oxygen, but the stream's oxygen supply is further depleted by the increase in decomposition brought forth by the dying organisms. This is not a complete senerio of the "cause and effect" aftermaths brought about by sedimentation, but it does give one an idea of the chain reactions which can come about.

Sediment reduction in major public water supplies is an on-going concern. Large sums of money are being spent for erosion and sediment control. One program devoted to this cause is the Water Resource Cost-Share Program (WRCSP). This program provides financial incentives to landowners for establishing conservation practices to reduce soil erosion and enhance water supplies. In 1999, this program reduced sediments for the following reservoirs: Cheney - 15,700 tons; Hillsdale - 4,390 tons; Melvern - 1,200 tons; Perry - 24,058 tons; and Tuttle Creek - 85,690 tons. Modern farmers and ranchers are doing a better job of reducing soil erosion on agricultural lands, but erosion and sedimentation are still a serious problem along rivers and streams where the natural vegetation has been reduced or removed.

Fecal coliform bacteria from animal waste is another common impairment found in many Kansas streams and rivers. This is not surprising considering Kansas has over two million head of cattle on over 32,000 farms.

Kansas surface water often contains high level of nitrates. Most of the nitrates comes from chemicals being applied to agricultural land, however, an increasing source for these nitrates is the runoff from urban areas. Farmers must abide by an intensive recording and reporting program when applying chemicals to their land. The same is not true with an urban homeowner. The average urban homeowner uses ten times more pesticides and commercial fertilizer per acre than a farmer. In essence, a two-acre lawn is producing the same amount of chemical runoff as twenty acres of farm land. Both sources, farms and urban lawns, are often classified as non-point pollution sources (sources which can't be easily identified as coming from one specific location).

The situation will not change for the better by itself. Kansas' surface water is in need of care through conservation programs and public awareness, hence the purpose of this issue of On TRACKS.

Kansas Groundwater Quality

What about the quality of groundwater? Until recently, most people thought groundwater was immune to the problems facing surface water. This belief was due, in part, to the lack of good data and monitoring studies on groundwater. Overall, it appears groundwater quality is good in Kansas. Locally, however, groundwater quality may be threatened by a variety of land uses. Agricultural, industrial, commercial, waste disposal, and residential practices are known to contaminate groundwater. Over-pumping of groundwater can induce saltwater intrusion into freshwater aquifers. Underground storage tanks of gasoline and fuel oil can leak, contaminating the groundwater. Old landfills and abandoned wells can act as direct conduits for the entrance of contaminants into the ground water. The occurrence of chemicals, such as solvents and cleaners, in our groundwater suggest a need for a more coordinated groundwater protection effort.

Our information about the extent and condition of our groundwater quality is limited when compared to our understanding of surface water quality. Groundwater quality monitoring is more expensive, more time consuming, and more difficult to characterize beyond the local level. Clean up efforts can be very expensive and groundwater protection regulations are difficult to enforce. Like many states, Kansas is working toward a more comprehensive resource-base approach to protect our groundwater supplies, but much remains to be done.

Non-Point Source Pollution

What is non-point pollution? Simply put, it is pollution which enters the water from diffused sources as opposed to a single “point” (a discharge pipe from a particular factory). Obviously, the sources of non-point pollutants are often difficult to identify. Chemicals from fertilizers may come from the farm, urban land owners, or a public golf course. Or, it could be coming from all three. Chemicals and waste from many small non-point sources can combine to make a very serious environmental problem.

What are some of the more common non-point pollutants? Silt, from farmlands, construction sites, and exposed areas is a common problem in Kansas. Waste materials from feedlots, improperly maintained septic tanks, and landfills are often found in our streams and are a serious health problem. Motor oil and household chemicals are certainly hazardous to our drinking water.

What can we do about non-point pollution? The most effective and easiest cure is prevention. Here are some preventive measures we all can employ.

1. Proper disposal of chemicals and petroleum products. Learn where your local, approved hazardous substance disposal center is located.
2. Apply only the recommended amounts of fertilizer and pesticide and purchase only as much as you will be using of the product.
3. Don’t dispose of chemicals or petroleum products down your storm water collection sys tem.
4. Find out about water quality problems in your area and determine if you are contributing to the problem. Take the necessary action to correct your actions.
5. Support programs and legislation to control non-point pollutant sources.
6. Join or support groups working on local water quality projects and programs.

Habitat: Riparian Areas

A riparian area is the thin strip of land bordering a stream or river. Most people think riparian areas are dominated by trees but grasses, forbs, and shrubs also create riparian habitat. The common factor for riparian areas is that the dominant vegetation often consists of phreato - phytes or water-loving plants.

The following information about natural riparian areas was complied from the “Kansas River

and Stream Corridor Management Guide” produced by the Kansas State Conservation Commission, an excellent source for good definitions and interesting state facts (www.ink.org/public/ksce). The guide lists four different types of natural riparian areas:

Riparian Meadows, Riparian Shrublands, Riparian Woodlands, and Riparian Forests.

Vegetation, soils and/or topography distinguish these four different areas from themselves and from upland areas.

Another factor used to distinguish riparian areas is the stream type which they border. Kansas hosts three different stream types: ephemeral streams (which flow only during or after rainfall or snowmelt and are dry otherwise), intermittent streams (which flow most of the year but may dry during the dryer months of the year), and perennial streams (which flow most of the year but may dry during extended droughts.)

Riparian Meadows are found throughout Kansas but are more common in western Kansas. These meadows typically border small, headwater streams in upper portions of watersheds. Common water-tolerant vegetation includes sedges, prairie cord grass, and switch grass with cattails, bulrushes, smartweed, and sprikerush often found in extremely wet areas.

Riparian Shrublands typically border intermittent streams and consist of sandbar willow, false indigo, roughleaf dogwood, and/or buttonbush. Unfortunately, many riparian shrublands have been invaded by salt cedar (tamarisk) which is not native and is considered undesirable vegetation.

Riparian Woodlands are most common in central and eastern Kansas bordering perennial streams. Cottonwood, black willow, ash, elm, and/or box elder are dominant trees with grasses and shrubs found in the understory.

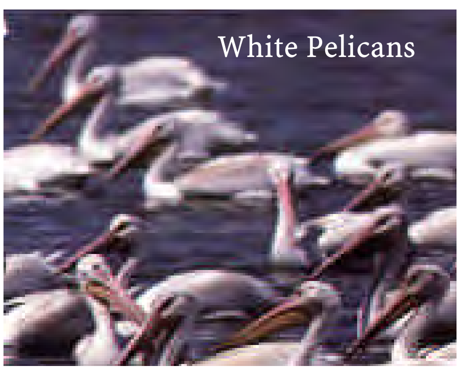
Riparian Forests are predominatley located in the eastern one third of the Kansas, claiming 83% of the 1.5 million acres of forests occurring in the state. Silver maple, cottonwood, black walnut, green ash, red oak, bur oak, elms, box elder, hickories, hackberry, and sycamore can be found along these streams depending on the location in the state. The dense canopy creates an understory of small trees, shrubs, and vines.

Riparian areas are vital to maintaining the health of our water systems in Kansas. Riparian vegetation acts as a filtration system, trapping sediment and certain chemicals that would otherwise make it into the water. They are also essential for maintaining wildlife diversity in

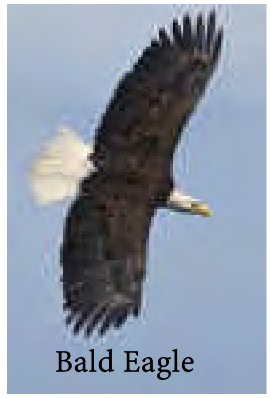
Kansas by providing nesting grounds, food, shelter, and, of course, clean water. Riparian areas also provide other critical components for wildlife.

Riparian areas are often used by wildlife, such as deer, bobcat, fox, raccoon, opossum, and skunks, as travel corridors, providing safe passage under roads and through highly developed areas. Just within Kansas, there has been a westward expansion of woodland species made possible by woodland riparian corridors. The opossum is a South American mammal that naturally migrated northward along riparian corridors hundreds of years ago. The armadillo is a more current example of a mammal using these riparian highways for northward expansion.

Riparian areas provide wildlife with migration routes by linking otherwise geographically isolated areas. These migration routes may correspond to air or water corridors. The Central Flyway with its routes through Kansas wetlands is a good example of this. Waterfowl and shorebirds like the Snowy Plover (threatened), Piping Plover (threatened), Least Tern (endangered) and others depend on these water stops. In fact, Cheyenne Bottoms is considered to be one of the most important migration stops for these birds in the United States. Species like the chestnut lamprey (threatened) and the American eel are examples of species migrating through water, using Kansas waterways. In the case of the eel, they make a migration of thousands of miles over many years to finally arrive in Kansas from the Atlantic Ocean!


White Pelicans

Most of the wildlife listed in Kansas as endangered, threatened or as a “species in need of conservation” are linked to riparian areas and/or water. Some wildlife like the Lake Scott riffle beetle, the cave salamander, and the Neosho madtom have specific needs that are only met in special habitats in Kansas. For these animals, it may be easy to understand that habitat is critical. However, wildlife with greater territory ranges like the flat floater mussel (endangered), the Arkansas darter (threatened), and birds such as the White-faced Ibis (threatened) and Whopping Cranes (endangered) are facing problems in Kansas. Even the Bald Eagle, our national symbol, is teetering on the edge of slipping backwards as riparian habitats are destroyed.


Bald Eagle


Arkansas Darter

In the book, An Illustrated Guide to Endangered or Threatened Species in Kansas, one can find several reoccurring themes that leads to population decline-- habitat alterations, draining of streams, rivers and wetlands, channelization and/or damming of streams and rivers and water pollution. It is not surprising that three of the four reasons are directly related to water and water quality. When riparian areas are altered or destroyed, water purifying capabilities are diminished and siltation and chemical pollution have no real barriers before reaching the stream.

Recent studies have been conducted in cooperation with many state agencies and private organizations such as The Wetland and Riparian Alliance. You may want to check out recent studies performed by Kansas Department of Health and Environment on their web site: www.kdhe.state.ks.us The Kansas Water Office also has information on Wetland and Riparian Management at www.kwo.org.

With water being an essential need of all life and vegetated areas (riparian) along waterways acting as filtration systems, travel corridors, nesting grounds, foraging areas and shelter for wildlife, it is not hard to understand that the decline of riparian areas also means a decline in wildlife diversity. Steps must be taken to insure the health of riparian areas so we all can enjoy wildlife diversity in Kansas, for all times.

Habitat: Wetlands

Water creates wetlands but a wetland is more than just an image of cattails and red-winged blackbirds! There are many different types of wetlands; some wetlands are wet meadows, forested wetlands, deep marshes or shrub wetlands, while others may be spring seeps, stock ponds or riparian areas along a stream. Wetlands may stay wet all year long or dry up during certain times of the year.

The presence of water produces particular types of soils, called hydric soils, and the specially adapted plants, called hydrophytes, that are used to identify a wetland. Hydric soils tend to hold and retain water during at least part of the growing season during normal or wet years. The lack of oxygen in saturated soil creates the special chemistry of hydric soils. Some wetlands, such as man-made wetlands, spring seeps, gravel beds, sandbars, and other areas with well-oxygenated water, are exceptions and do not have hydric soils.

Plants in a wetland have a special capability to tolerate saturated soils and/or standing water for extended periods. There are literally hundreds of types of hydrophytes. Examples are slough sedges, whitetop, smartweed, rushes, marsh marigolds, burreed, and willows. Many of these plants have special adaptations like hollow stems for air passage) that enable them to live in these conditions that would be too stressful for upland plants.

Whether water is present or not, the definition of a wetland usually requires evidence of all three attributes of a wetland: hydrophytes, hydric soils, and hydrology(water).All areas considered to be wetlands must have enough water during some part of the year to stress plants and animals that are not adapted to life in water or saturated soils.

WETLAND VALUES

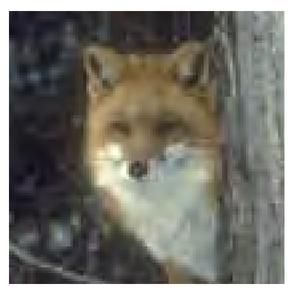
While only about 5% of the U.S. land area is in wetlands, about 31% of all known plants in the U.S. are wetland plants! This illustrates the fact that wetlands are the most productive ecosystems in the world in terms of the amount of plant and animal tissue and energy produced. Wetlands are the breeding, resting, and wintering habitats for thousands of migratory birds, including ducks, geese, swans, shorebirds, herons, and other wading birds. Between 12-20 million ducks nest and breed annually in the pothole wetlands of North America.

Cottonwood and willow communities along streams provide habitat for most of our migratory nongame birds such as Swainson's thrush, northern waterthrush, belted kingfisher, and yellow warbler. Such birds are of increasing international concern because of their declining populations.

A wide variety of reptiles, amphibians, insects, fish, and crustaceans breed and live in wetlands. Roughly two-thirds of our shellfish and commercial and/or sport species of marine fish rely on coastal marshes for spawning and nursery grounds.

Many species of flowers, including endangered orchids, depend on wetlands. It is estimated that one-third of the nation's threatened or endangered species live in wetland areas.

Many mammals depend on wetlands for food, shelter, and water.We know that wetlands provide cover for deer and rabbits and many other small mammals; fawning habitat for deer; and hunting territory for red fox. A study in North Dakota reported that more than half the diet of the great horned owl, Swainson's hawk, red-tailed hawk, and short-eared owl was made up of wetland species.



Along with their great diversity, plants in a wetland perform vital functions. They absorb nutrients and help cycle them through the food chain; they provide an important food source for other life forms; they keep the water's nutrient concentration from reaching toxic levels; and they providing oxygen through photosynthesis.

Wetlands have a unique ability to purify the environment. They can trap and neutralize sewage waste, allow silt to settle, and promote the decomposition of many toxic substances. They also lessen the effects of sudden and seasonal rainfall or spring thaw by retaining excess water and allowing it to drain into streams and rivers gradually. Healthy wetlands are buffer zones that prevent flooding and erosion.

LOSS OF WETLANDS

Attitudes towards wetlands have changed over the years. Once viewed only as "wastelands"-- sources of mosquitoes, flies, unpleasant odors, and disease-- some universities recommended draining wetlands, and some government agencies even paid landowners to drain them. Because of this desire to eliminate wetlands, more than one half (54%) of America's original wetlands have been destroyed.

The lower 48 states contained an estimated 103.3 million acres of wetlands in the mid-1980s (an area about the size of California). This compares to 220 million acres found in the same area in the 1600s. Six states (IN, IL, MO, KY, IA,CA, and OH) lost 85% or more of their original wetland acreage, and 22 lost 50% or more. Kansas has lost about one-half its wetlands in the last 200 years.

Wetland loss did not happen all at once, however, the period between the mid-1950s to mid-1970s saw a major loss of wetland habitat. Fortunately, new facts about our land and water resources have changed our understanding of the value of wetlands. Public understanding of the values and functions of wetlands became an emerging trend in Kansas and elsewhere in the mid-1980s. Increased appreciation and concern has made wetlands protection a natural resource management priority. Many wetlands are now protected by federal and state laws but there is still a need to create a greater awareness of the importance of wetlands.

Making History With Wetlands

Never in Kansas history have so many acres of wetlands been restored to their natural state. Tens of thousands of acres of privately owned wet Kansas croplands are being restored to wetlands or managed floodplains. Landowners have voluntarily entered these lands into the U.S. Department of Agriculture's Wetlands Reserve Program (WRP) and Emergency Wetlands Reserve Program (EWRP) and other programs such as Partners for Wildlife and the state Wetland and Riparian Area Protection Program.

The Wetlands Reserve Program is a voluntary program to restore and protect wetlands on private property. It is an opportunity for landowners to receive financial incentives to enhance wetlands in exchange for retiring marginal agricultural land. Congress authorized WRP under the Food Security Act of 1985, as amended by the 1990 and 1996 Farm Bills. The Natural Resources Conservation Service (NRCS) of the USDA administers the program with the Farm Service Agency (FSA) and other Federal agencies. Funding for WRP comes from the Commodity Credit Corporation. The NRCS has enlisted the support of numerous national and state level conservation entities to assist with program delivery (e.g. Ducks Unlimited, The Nature Conservancy, Mississippi Fish & Wildlife Foundation, etc.) This partnership approach ensures that the finest technical expertise is available to assist private landowners in achieving optimum wetland restoration results. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10 year duration.

For more information about this program in Kansas contact Rod Egbarts rod.egbarts@ks.nrcs.usda.gov

Species Spotlight: Cheyenne Bottoms: T

Kansas is home to more wetlands than you might imagine but Cheyenne Bottoms, located six miles northeast of Great Bend in Barton County, is the largest. The Bottoms is a 41,000-acre elliptical-shaped basin-like lowlands of which 19, 857 acres are managed as a wildlife area by Kansas Wildlife & Parks.

Without a doubt, Cheyenne Bottoms is the most important ecosystem in Kansas and the most important migration point for shorebirds in North America and perhaps in this hemisphere. The International Shorebird Survey, based at Manomet bird Observatory, in Manomet, MA, rated Cheyenne Bottoms as the top shorebird staging area in the 48 contiguous states during migration.Studying more than 200 known stopover sites, the survey discovered that Cheyenne Bottoms attracted almost half (45%) of the entire northward migrating populations of North American shorebirds.

More than 90% of the population of five species pass through the Bottoms:

- White-rumped sandpiper
- Baird's sandpiper
- Stilt sandpiper
- Long-billed dowitcher
- Wilson's phalarope

In addition, 74% of all pectoral sandpipers, 73% of all marbled godwits, and 59% of all Hudsonian godwits pass through the Bottoms. One waterfowl count on the Bottoms put the number of ducks at 225,000 and geese at 25,000. The Bottoms is federally designated critical habitat for the endangered whooping crane. Other threatened and endangered species such as the least tern, peregrine falcon, and bald eagle use the Bottoms as well. Because of these important wildlife values, Cheyenne Bottoms is the first non-federal area in North America to be designated as a "Wetland of International Importance."

Historically, Cheyenne Bottoms was recognized by Native Americans and early settlers as a unique and important area. The area is named after the Cheyenne Indians who fought to keep the area as their hunting grounds. One such battle was said to be against the Kiowas or Pawnees; history is unclear. The particularly bloody battle took place around 1825 and one of the streams running into the Bottoms was said to have run red with blood, hence the name Blood Creek.

Cheyenne Bottoms has never had a reliable water source. During dry periods, the area would be but a shadow of its former image. Flood conditions in the late 1800s and early 1900s created a huge lake. White men controlled the area by then, or at least tried to control it. In 1896, the Grand Lake Reservoir Company was formed to divert water from the Arkansas River into the Bottoms to form a great recreation and irrigation lake. This canal only lasted 100 days until flood waters washed out the diversion dam.

In 1925, the Forestry, Fish & Game Commission was created and the agency assumed the responsibility of developing the Bottoms. In 1930, it seemed a certainty that Congress would create a national wildlife refuge out of the Bottoms, however, funding never came through. The Pittman-Robertson Act in 1937 finally created some funding that could be used to develop dikes and roads in the area.

Long-billed dowitcher

Pectoral Sandpiper

Blue-winged teal are the most common nesting duck on Cheyenne Bottoms

Managing a marsh is more than just manipulating water levels. Cheyenne Bottoms continues to be a challenge for wildlife managers but many steps have been taken in the last 15 years to improve the area. Current management practices, scientific investigations, and maintenance schedules at the Bottoms are all directed toward one goal: to provide a diverse marsh habitat for migrating waterfowl and shorebirds.

The future of Cheyenne Bottoms is very promising. Protecting and managing the Bottoms is essential for a healthy environment, both today and tommorrow. Education and better public understanding of wetlands will help preserve the Bottoms in ways that dollars cannot. Marshes such as Cheyenne Bottoms are priceless.

Information compiled from a special report "Cheyenne Bottoms: Jewel of the Prairie" by Kansas Department of Wildlife & Parks. Authors include W. Alan Wentz, Mike Miller, Karl Grover, and Joe Kramer.

Wildlife and Moisture

Remember the hot days of July and August and you are outside working on that summer project with the sun beating down upon you and the wind is so still the area around you feels like a blast furnace? Wouldn't a nice tall glass of water just be the thing to bring some relief to your dry, parched body? Now what if you were a deer, pheasant, or sandhill plum tree? You don't have a faucet from which to draw water.You depend upon whatever sources of moisture are available in your environment. If you are a plant, the moisture has to come to you; animals can travel to water sources providing they are available.

In one year, we can have periods of excess moisture or the lack of it. Both situations can affect wildlife. Last spring we had a wet May. The moisture was indeed welcome after the rather dry winter. It just happened that some of the heavy rain fell upon areas where young quail were hatching. Wet, cold, baby quail chicks can't survive when rained upon shortly after hatching. For many quail in the south-central region of Kansas, the first hatch was not a successful one because of the heavy rain storms around hatching time. This heavy rain, followed by warm, sunny days, was just what the winter wheat required for a strong growth spurt. The wheat harvest came early, too early for the hen pheasants nesting in the wheat fields!

When it comes to moisture, wildlife often has a

rather narrow window of opportunity. Too much or not enough moisture can be very critical at key intervals in their daily struggles.A late summer drought is yet another example of the way moisture or the lack thereof affects wildlife. When moisture is scarce, plants produce fewer leaves and twigs and these leaves and twigs contain less sugar and protein.Animals eating them can't store enough body fat. This can reduce the number of young for the next year and the availability of their food supply. The insect population is also reduced in drought conditions. Insects are the chief food source for young game birds and other ground-dwelling birds. Without insects, young birds can't grow strong and healthy and are more likely to be victimized by predators.

A lack of moisture starts a chain-reaction with

each segment of the wildlife population affecting others. Without relief, the binding blocks of moisture start to disappear and soon the whole structure of the living community starts to weaken and may even collapse.

We must always remember all living things depend on water. Plants, animals, even tiny, invisible organisms, must have water to live and grow. No wonder scientists become so excited in their search for life when they come upon a planet which may have a water source. We are lucky organisms; our planet-- Earth-- is called the water planet. If only we can all learn to use and share it wisely for the benefit of all living things.

Here are some additional sources of information which one can request.

"Water Celebration! A Handbook", A complete guide to planning and implementing a school or community water celebration to make people aware of the importance of water. Write or call:

The Watercourse
201 Culbertson Hall
Montana State University
Bozeman, MT 59717
409-994-5392

"State Conservation Commission Annual Report", Reports on non-point source pollution, riparian and wetlands, and other water related topics. Write or call:

State Conservation Commission Office
109 SW 9th, Suite 500
Topeka, KS 66612
785-296-3600

"Kansas Water Quality Buffer Initative" Discover what is the buffer initiative and why it is needed.

State Conservation Commission Office
109 SW 9th, Suite 500
Topeka, KS 66612
785-296-3600

"Trees for Clean Water" Promotes the re-establishment and protection of riparian forest buffers in Kansas by education and informing landowners about the tree planting programs available to protect the water quality in Kansas' waterways. Write or call:

Kansas Water Office
109 SW 9th St., Suite 300
Topeka, KS 66612-1249
785-296-3185

"The Kansas Governor's Water Quality Initiative" - Working Together for Clean Water. A brief summary of the Governor's Water Quality Initiative to improve water quality in the Kansas-Lower Republican River basin, through research, education, and action programs, planned and implemented collaboratively by state agencies in partnership with the private sector. Write or call:

Kansas State University
44 Waters Hall
KCARE
Manhattan, KS 66502
785-532-7103

THE WILD EXCHANGE

Your Source for Project WILD Information in Kansas

Outdoor Wildlife Learning Sites-OWLS

Stafford - Students listened as water trickled across the rock wall, flowing into a shallow pool. "Isn't that relaxing?" fifth-grade teacher Martha Hilley asked her students.

The moment of silence ended, and the Stafford Elementary students resumed their excitement as they explained the school's newest project - an Outdoor Wildlife Learning Site.

OWLS projects have been popping up at Kansas schools over the past decade, thanks to the Kansas Department of Wildlife and Parks. The outdoor science labs teach children about the environment and nature, said Shelby Stevens at KDWP headquarters in Pratt.

"Schools contact us and I send a grant application and guidelines," Stevens said. "Then I set them up with a biologist."

The Stafford OWLS project involves all of the city's students, from kindergarten through high school, Hilley said. Seventh-graders will take care of water filtration system. Fifth-graders are in charge of the birdbath.

Students have been working on the OWLS site since last spring, when they planted trees, sunflowers and butterfly bushes. This fall, they released butterflies outside Stafford Elementary.

On Monday and Tuesday, the water attraction was installed at no cost to the school, thanks to donations from Western Resources, KPL and KGE.

Each class spent some time at the learning site, which is just outside the school library's east window.

Hilley's students discussed why the OWLS site is important.

"I think its going to improve our school by helping us learn more about nature and maybe the wildlife," Sarah Bottcher said.

"I like the waterfall and stream," said Lauren Volker.

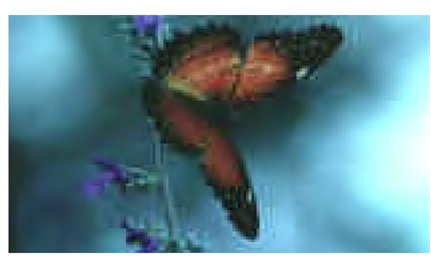
A pump continuously recycles the same 500 gallons of water. Anthony Pence said he's excited because birds will have a resting place at the school.

"I think it will be good for our environment because birds will come here and be safe," Cody Bravo said.

As the students talked, a flock of ring-billed gulls flew overhead. Eventually, the pond will have fish and frogs.

Other schools that built OWLS sites have found that they provide a variety of learning opportunities. In Great Bend, Jill Vseteca said students have planted trees at the site outside the USD 438 district office. Special education students in vocational classes help maintain the site, and the high school horticulture class uses it.

Hutchinson News
November 2, 2000



DID YOU KNOW: WATER FACTS

The steel in one car took over 39,000 gallons of water to produce.

The average cost of water in North America is $1.27 for each 1,000 gallons; one penny would buy you 160 eight-ounce glasses of water.

A leaking (running toilet) could waste as much as 60 gallons a day.

Until the Clean Water Act of 1972, the Ohio River, at times, would literally catch on fire.

Our nation's water supply is the cleanest since written records of water quality started around 1910.

Project Aquatic WILD and Project WET are two great environmental programs to help young people increase their knowledge, understanding, and appreciation for water.

The average person would only live 5-7 days without water, less under stress conditions.

A person should consume eight glasses of water a day to maintain good health.

97% of the earth's water by volume can't be used by humans under normal means because of the salt content.

It takes 2,607 gallons of water to produce one serving of steak and 408 gallons to produce one serving of chicken.

In the United States, only 1% of the total water treated for drinking is actually consumed. The rest is used on lawns, in washing machines, and removing water produces.

Kansas Wetlands and Riparian Areas Alliance

The mission of the Kansas Wetlands and Riparian Areas Alliance (KWRAA) is a public that is well-informed and involved in activities that foster the protection, enhancement, and establishment of wetland and riparian areas in Kansas.

The Kansas Wetlands and Riparian Areas Alliance was formed in 1996 in recognition of the urgent need to promote wetland and riparian area conservation throughout Kansas. The ultimate goal of KWRAA is an increase in the quantity and quality of wetland and riparian area resources in the state. To acheive this goal, KWRAA uses a voluntary education approach focusing on three areas: education, communication, and research and data collection.

Educational and promotional activities sponsored by KWRAA are funded through state and federal environmental protection grants, and the support and cooperation of several private conservation and agricultural production groups.

For more information, visit their website at www.kwraa.org

Wetland Definitions

Lacustrine system: Wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent are coverage; (3) total area exceeds 20 acres.

Palustrine system: All non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 percent.

Riverine system: All wetland and deepwater habitats contained within a channel, with two exceptions: (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens; and (2) habitats with water containing ocean derived salts.

Wetland: Areas that have a predominance of hydric soils and that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions.

Wetlands: Complex of wetland habitats that share the influence of similar hydrologic, geomorphic, chemical, or biological factors.