WATERSHED WONDERS

THE LOS ANGELES RIVER AND THE ADVENTURES OF THE COLA KAYAK TEACHER RESOURCE GUIDE

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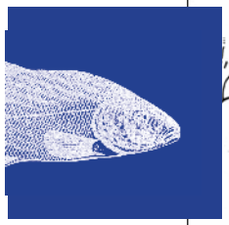
THE LOS ANGELES RIVER AND THE ADVENTURES OF THE COLA KAYAK

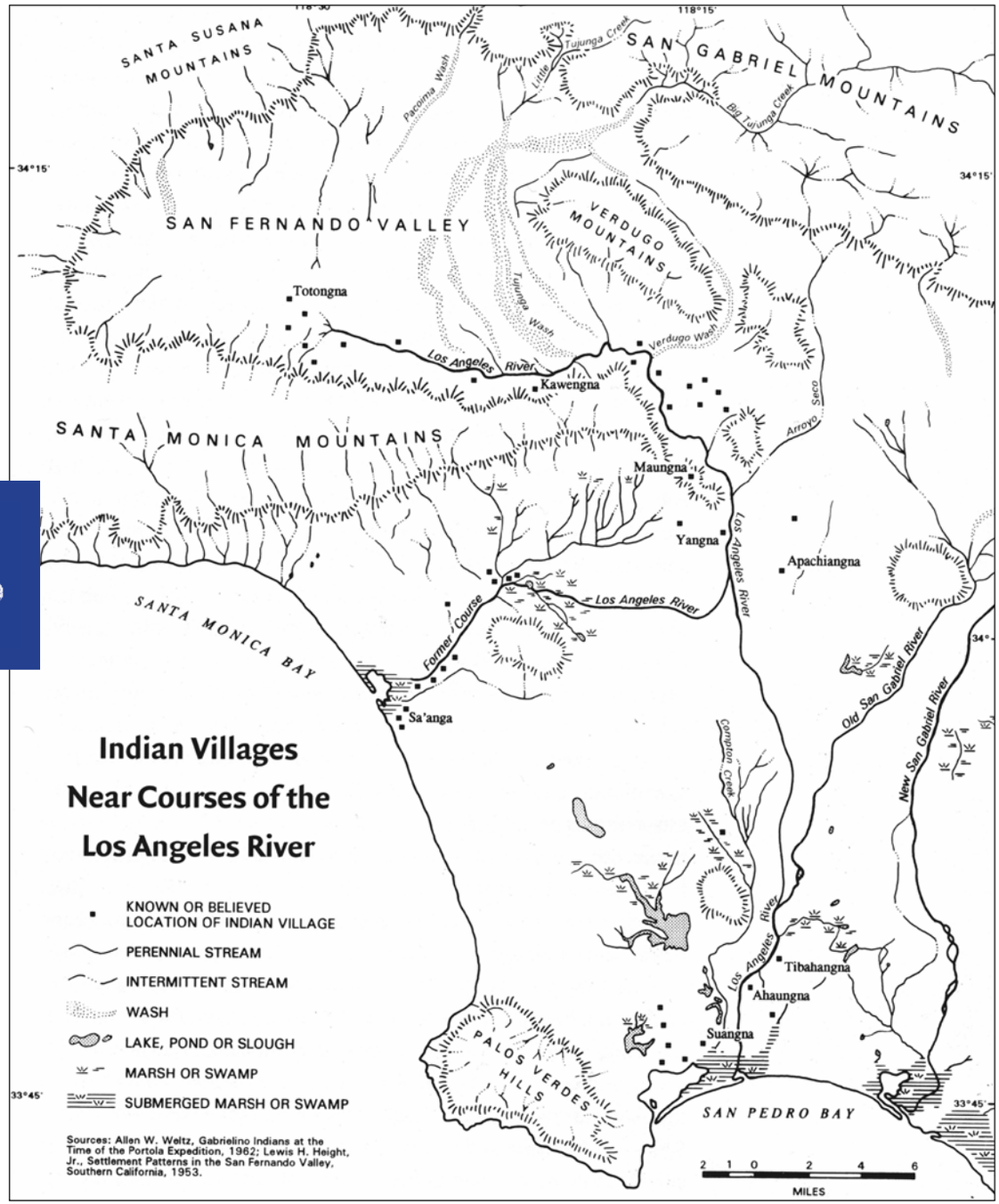
CHAPTER 1 CULTURAL HISTORY OF THE LOS ANGELES RIVER





1000 + YEARS AGO The Tongva people were the original settlers along the Los Angeles River and they developed a way of life uniquely suited to this area. The lush environment provided them with food, water, clothing and tools. The Tongva acknowledged and respected their environment and the natural climate cycles of flooding and drought and built their settlements accordingly. Their dwellings were made out of willow and tule and located on higher ground well outside the floodplain.





Map by Blake Gumprecht, from *The Los Angeles River: Its life, Death and Possible Rebirth*. Johns Hopkins University Press. 1999 pg. 30

1771 When Spanish explorers first arrived in California, the Tongva had established over 40 villages throughout the area from Topanga Canyon to Laguna Niguel. The Yangna village was believed to be located on the hills near downtown Los Angeles. With the founding of the San Gabriel Mission in 1771, the Tongva were identified by the Spanish as the "Gabrielino" because of their association with the mission.

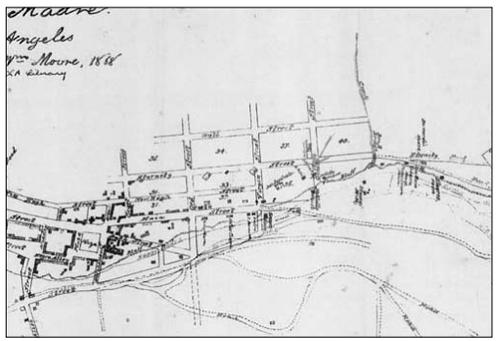
1769 Don Gaspar de Portola led an expedition that brought the first European explorers to California. The Spanish, having claimed California in 1542, sent Portola into California in search of sites for presidios and missions. Portola's group made their way into the basin, by way of the Arroyo Seco, and came upon the Los Angeles River. A member of the party, Spanish priest Father Juan Crespi, described what he saw:

"*…through a pass between low hills, we entered a very spacious valley, well grown with cottonwoods and alders, among which ran a beautiful River from the north-northwest.*"

1781 The Spanish colonists founded El Pueblo de la Reina de Los Angeles near the River. The River was given the name Nuestra Senora de los Angeles de la Porciúncula (Our Lady of the Angels of Porciúncula) in commemoration of St.Francis of Assisi's Church in Italy. Eventually the name of the River was shortened to Rio de Porciúncula (porciúncula means "little portion").

Within the first two years the Spanish dug the Zanja Madre (mother ditch), Los Angeles' first public works project. This open ditch brought water from the Los Angeles River to the pueblo for domestic and irrigational purposes. A seasonal dam was also constructed. As the pueblo grew, the Zanja system grew. Farming fields were located to the east of the ditch, between it and the River, in a swampy area subject to floods. With ample grazing lands and water, the Pueblo produced an abundance of wine grapes, corn and cattle.

Ancient Ditch Found! In March 2000, Melody Carver and Craig Howell, a couple amateur archaeologists, took it upon themselves to locate and excavate a segment of the original Zanja Madre, the "mother ditch," that first carried water from the L.A. River to the pueblo. The vaulted, brick-covered ditch, about three feet wide, runs along the bottom of the slope below Spring Street, next to the Metro Gold Line Train. This fragment of the Zanja Madre is a crucial part of L.A. history. Not only does this discovery provide a rare glimpse of how Latinos built the foundation for present-day Los Angeles, but helped an alliance of community activists led by FOLAR to stop an industrial development from being built on the site. Now, instead, the State Department of Parks and built the Los Angeles State Historic Park on the site and you can see a portion of the Zanja Madre they uncovered at the west end of the park.



Map of the Zanja Madre 1888.
Courtesy of the Los Angeles Public Library Photo Collections.

Zanja Madre in the Los Angeles State Historic Park 2009.

For field trip opportunities about Southern California Spanish History, El Pueblo de Los Angeles Historic Monument, and the Zanja Madre system for students (grades 4-12) please call 213-217-6926 or visit the Metropolitan Water District of Southern California website at http://www.mwdh2o.com/mwdh2o/pages/education/sc_teacher/teach04_03.html

1930s The Los Angeles River often flooded and shifted its course across the Los Angeles Basin. The most dramatic shift in course occurred in 1825 when the River broke through its banks near the pueblo and cut a second channel south that emptied into the Santa Monica Bay

1833 After the Spanish, more and more people came to the area and the city continued to grow. Between 1833 and 1846, the 1796 land grants were increased and 500 more grants were awarded. The first settlers were lured from Mexico by wages, farming and residential land, animals, common privileges of water, pasturage, firewood and timber. A pueblo was four square leagues of land which could be divided into house lots, farm lots, rental land and commons.

Agricultural development of the area led to the clearing of the lush plain. The wetlands dried up as the water was diverted to irrigation channels. The willows, cottonwoods and oaks were removed to provide farm and grazing land. The lush alluvial plain was transformed into an agricultural center as Los Angeles prospered. As a result, over-cultivation reduced much of the coastal plain to wash and gravel. The watershed began to change.

1849 Los Angeles experienced one of its first economic booms after the 1848 Gold Rush brought Mexican and American prospectors through the area.

1850 California became a state and migration increased.

1862 A three year drought began. As a result, cattle ranchers went into debt, and the cattle industry was destroyed. Spanish ranchers were forced to sell their large land grant ranches. This still did not deter the numbers of people coming to the area.

1858 With the growing need for domestic water distribution, William Dryden created the Los Angeles Water Works Company and erected a water wheel at the Zanja Madre and a distribution system of wooden pipes. Four years later the system was washed out in heavy rains. Winter rains washed away dams, footbridges, and acres of farmland. Urban development increased the flood problems as buildings went up in the floodplain, and removed vegetation needed to slow the floodwaters.

Water wheel built in the 1850s to draw water from the L.A. River. Los Angeles Public Library/Security Pacific Collections.

1863-4 Several droughts kill most of the livestock in the region. Rancheros face financial and legal pressures to give up their extensive land holdings.

1876 The transcontinental railroad reached Los Angeles and the city grew again, as settlers from all over the country were drawn by the promise of agricultural success.

Farms along the L.A. River in Elysian valley circa 1900. Department of Special collections, University of Southern California Library/Title Insurance & Trust Company Collections.

1899 A Supreme Court ruling in 1899, established Los Angeles' claim to the local water as a public commodity. William Mulholland took over as head of the once private Los Angeles City Water Company.

He soon expanded the Buena Vista pumping plant, built the Elysian Reservoir, and bought out the Los Angeles City Water Company. In 1903, he began digging a tunnel with the plan that the city would then sink wells into this tunnel and pump off the ground water that percolated into it.

1904 The pueblo had become a city of over 100,000 people. Water supply again became a major concern, as the Los Angeles River and local aquifers could no longer sustain the needs of the growing population. William Mullholland, Superintendent of the Los Angeles City Water Company, announces Los Angeles will need new water sources.

1913 The Owens Valley Aqueduct was built to bring water from the Owens Valley, east of the Sierra Nevada, into the city. The Owens Valley Aqueduct permanently changed the role of the Los Angeles River. Though it was no longer the sole source of water for the city, it was still a known force.

1922 The California grizzly bear (or brown bear) thrived in the valleys and low mountains of Southern California. However, as settlers began to populate the area they were hunted down and killed as they fed on livestock. The last one was killed in Tulare County in August of 1922 and the species became extirpated in this area. Cousins of the California Grizzly live in other states and are now protected.

1930 Landscape architects Frederick Law Olmstead Jr. and Harland Bartholomew presented their plan, “Parks, Playgrounds and Beaches for the Los Angeles Region,” to the Chamber of Commerce. This plan recommended that the then natural Los Angeles River, and its tributary creeks and streams, be utilized as a system of Parkways, connecting the mountains to the sea. Had their plan been adopted, the River would have been left with room to spread, its wide floodplain undeveloped, and LA would have had a great park like New York’s Central Park (designed by Olmstead Sr.) Instead, the River was rendered useless as a viable public space when it was paved.

The River park would have served as a gathering place and respite for Los Angelenos. Unfortunately the Chamber of Commerce shelved the plan, and less than a decade later, after the flood of 1938, the River was subject, to engineers who narrowed and deepened its course, fixing it in concrete. While Los Angeles has been developed far beyond the point where the original plan could ever be fully realized, the plan still guides those working to resurrect the River’s potential. The county’s current Los Angeles River Master Plan is an initial attempt to resurrect and translate some of the Olmstead plan’s original vision.

Groundwater levels drop by 2 to 20 feet per year and the first spreading grounds are constructed.

1934 More floods came and devastated the foothill communities killing 40 people in the La Crescenta area and costing $100 million in damages.

1935 Congress appropriates $19 million under the Emergency Relief Act for the construction of storm drains and catch basins.

1936 The Flood Control Act of 1936 authorizes $70 million for improvements and changes the role of the U.S. Army Corps of Engineers from providing emergency relief to supervising permanent future flood control plans for the Los Angeles, Rio Hondo and San Gabriel Rivers.

1938 The most damaging flood in the history of Los Angeles struck in 1938 and caused $62 million in damages and 85 people died. Where channelization had been implemented, the engineers were able to see which of their control measures worked and which measures did not. Areas of reinforced concrete had withstood the flood, and so, a plan to increase the amount of channelization was proposed and approved.

1938 flood near Griffith Park. Photograph by F.H. Baalbergen, G.C. Loomer and A.M. Reece of the Photo Taskforce, 1938. The County of Los Angeles Department of Public Works.

Southern Pacific line damaged in 1938 flood near Figueroa Street in Cypress Park.

The concrete channeling of the River took 20 years to complete the effort required three million barrels of concrete and over 10,000 workers. Over 400 miles of the River and its tributaries were narrowed, straightened, deepened, encased in concrete and connected to underground storm drains to create a 5,000 mile storm drain network running through the Los Angeles River watershed.

Top: Construction of channel walls at Laurel Canyon in Studio City in the L.A. River by the U.S. Army Corps of Engineers. Courtesy of the Los Angeles Public Library.
Bottom: U.S. Army Corps of Engineers. Department of Special Collections, Charles E. Young Research Library, UCLA. circa 1938.

1939 14 dams are completed in mountain canyons to control flooding and debris in downstream areas.

The 110 freeway is constructed on a narrow strip of land which parallels the Arroyo Seco eliminating most adjacent parklands.

1940 Population of Los Angeles County reaches 2.7 million.

The last record of a steelhead trout caught in the Los Angeles River. Steelhead trout are the only native California species that travel from the mountains to the sea and back. Recently, steelhead have been seen as nearby as Malibu and San Mateo Creek. It is believed that when the steelhead return to the Los Angeles River, the ecological health of the River will have been achieved.

1941 Sepulveda and Hansen Dams completed by the U.S. Army Corps of Engineers.

Sepulveda Dam 2008

1950 Population of Los Angeles County reaches 4.1 million

L.A. River Cat in the Glendale Narrows

The LA River Cats have been around since the 1950's. No one knows who started it, but it must have been irresistible. Storm drain covers are in the form of cat faces. They are round with two small triangular hinge covers at the top. In the beginning, it was a few simple strokes with white paint, denoting eyes, nose, mouth & whiskers like Felix the Cat. In later years, local artist Leo Limon picked up the brush and began to create the multi colored, psychedelic cat faces we see today.

Social and Public Art Resource Center (SPARC) Great Wall of Los Angeles mural in the Tujunga Wash near Valley College.

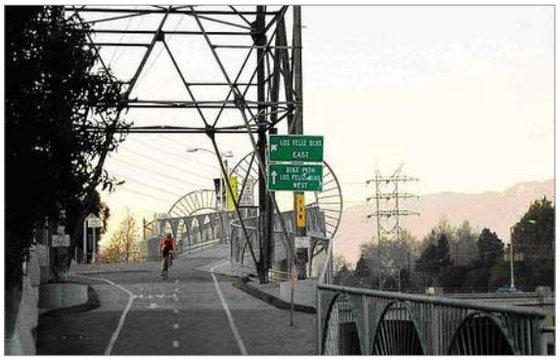
1976-1984 Arts activist, community leader and visual arts professor Judy Baca begins constructing the Great Wall of Los Angeles, the first large scale public mural in the Los Angeles River (Tujunga Wash tributary). This half mile mural depicts the ethnic history of Los Angeles from prehistoric times to the 1950s. This 8 year project involved 35 artists working with over 400 youth. For a full history of the project please visit http://www.sparcmurals.org.

1977 The Los Angeles River/Rio Hondo Channel (LARIO) trail opens and over 21 miles of bike and equestrian trails are built. http://www.labikepaths.com/Lario.html

1986 The Friends of the Los Angeles River (FoLAR) is founded by Lewis MacAdams, Pat Patterson, and Roger Wong.

1988 FoLAR holds the first La Gran Limpieza, the Great Los Angeles River Clean Up.

1991 The Los Angeles County Department of Public Works is directed by the Board of Supervisors to develop the Los Angeles River Master Plan. The goal of this plan is to identify and coordinate regional and local projects along the 51 miles of the Los Angeles River and 9 miles of the Tujunga Wash. http://ladpw.org/wmd/Watershed/LA/Larmp/



Los Angeles bike path and bridge over Los Feliz Blvd. in Atwater

1994 The Algalita Marine Research Foundation was founded by Captain Charles Moore after discovering themassive accumulation of plastic waste in the middle of the North Pacific Gyre.

1996 The City of Los Angeles constructs a 3.2 mile bike path, from Riverside Dr. (at Victory) down to Los Feliz Blvd. The next mile and a half to Fletcher Drive, opens in 2000 with the completion of the Los Feliz overpass and lighting. http://www.labikepaths.com/Lario.html

1999 The Algalita Marine Research Foundation first collected data showing plastic marine debris in the North Pacific Gyre at a rate of 6:1 when comparing the dry weight of plastic to zooplankton.

1999 Great Heron Gates dedicated at the Earth Day Celebration of FoLARs 10th La Gran Limpieza. FoLAR commissioned this gate with funding from the MRCA. One of the first gateways to welcome visitors to the Los Angeles River, it was constructed by sculptor Brett Goldstone. Goldstone went on to create the Rocks and Water gate at Fletcher Drive commissioned by North East Trees and Acrecite Water Willow Gate in 2006 commissioned by the Friends of Atwater Village with funding from the City of Los Angeles Board of Public Works.

Great Heron Gates at Fletcher Drive in the Glendale Narrows. FOLAR

Acresite Gate in Atwater Village. Friends of Atwater Village

2001 After battles with developers, FoLAR along with a coalition of community organizations join forces to stop further urban development along the banks of the L.A. River in park poor and under represented communities in Elysian Valley and downtown Los Angeles. CA State Parks steps in and purchases over 74-acres and to create the Los Angeles State Historic Park and El Rio de Los Angeles State Park which convey a new approach to land use downtown and on the River.

2006 SEPTEMBER Los Angeles State Historic Park (formerly the Cornfields) opens to the public. This 32 acre park is dedicated to public open space

MAY The Mountains Recreation and Conservation Authority (MRCA) completes Marsh Street Park along the Los Angeles River in Elysian Valley.

The City of Maywood completes Maywood River Front Park. The first and only park in Maywood.

Population of Los Angeles County 9,948,081.

2007 MAY The Los Angeles City Bureau of Engineering complete the Los Angeles River Revitalization Master Plan that outlines over 200 greening projects along 36 miles of the Los Angeles River. www.lariver.org

Cornfields opportunity site. © City of Los Angeles. 2007 Los Angeles River Revitalization Master Plan

APRIL CA State Parks and the City of Los Angeles Department of Parks and Recreation open El Rio de Los Angeles State Park (formerly Taylor Yards). This 42-acre park is dedicated to passive and active recreation. Located at 1900 San Fernando Road in Los Angeles.

Taylor Yard before 2007. The City Project.

El Rio de Los Angeles Stte Park, 2008. The City Project.

CHAPTER 2 NATURAL HISTORY OF THE LOS ANGELES RIVER

Much of what the River looked like hundreds of years ago exits only in tiny fragments along our mostly channelized River of today. The history of the River has been ever changing as topography; weather and human settlement have all had their influence.

Thousands of years ago, the LA Basin was largely grassland with the Los Angeles River meadnering its way through basin to the ocean. Naturally shallow, the River flooded and changed course throughout the year. Before it was channelized, the L.A. River shifted course several times across the coastal plain. (see Gumprecht map on facing page). Flooding deposited rich soil and created marshes and small ponds throughout the LA Basin turning it into a rich alluvial plain that in turn created ecologically diverse habitats for wildlife.

"NOT A DESERT!"

Southern California falls within a Mediterranean biome. Only 5% of the world's biomes are Mediterranean, including Central Chile, Cape of South Africa, Mediterranean Sea borderlands, and southwest Australia. Located on the western coasts of continents and influenced by cold offshore ocean currents, the climate of a Mediterranean biome is characterized by 6 months of cool, wet winters and 6 months of hot, dry summers. This type of climate makes for an incredible biodiversity. It was this biodiversity that provided the Native Americans with everything that they needed to survive for hundreds of years. The Los Angeles River was a vital resource, providing much of the needed plants and animals for every day aspects of their lives, including a waterway for travel.

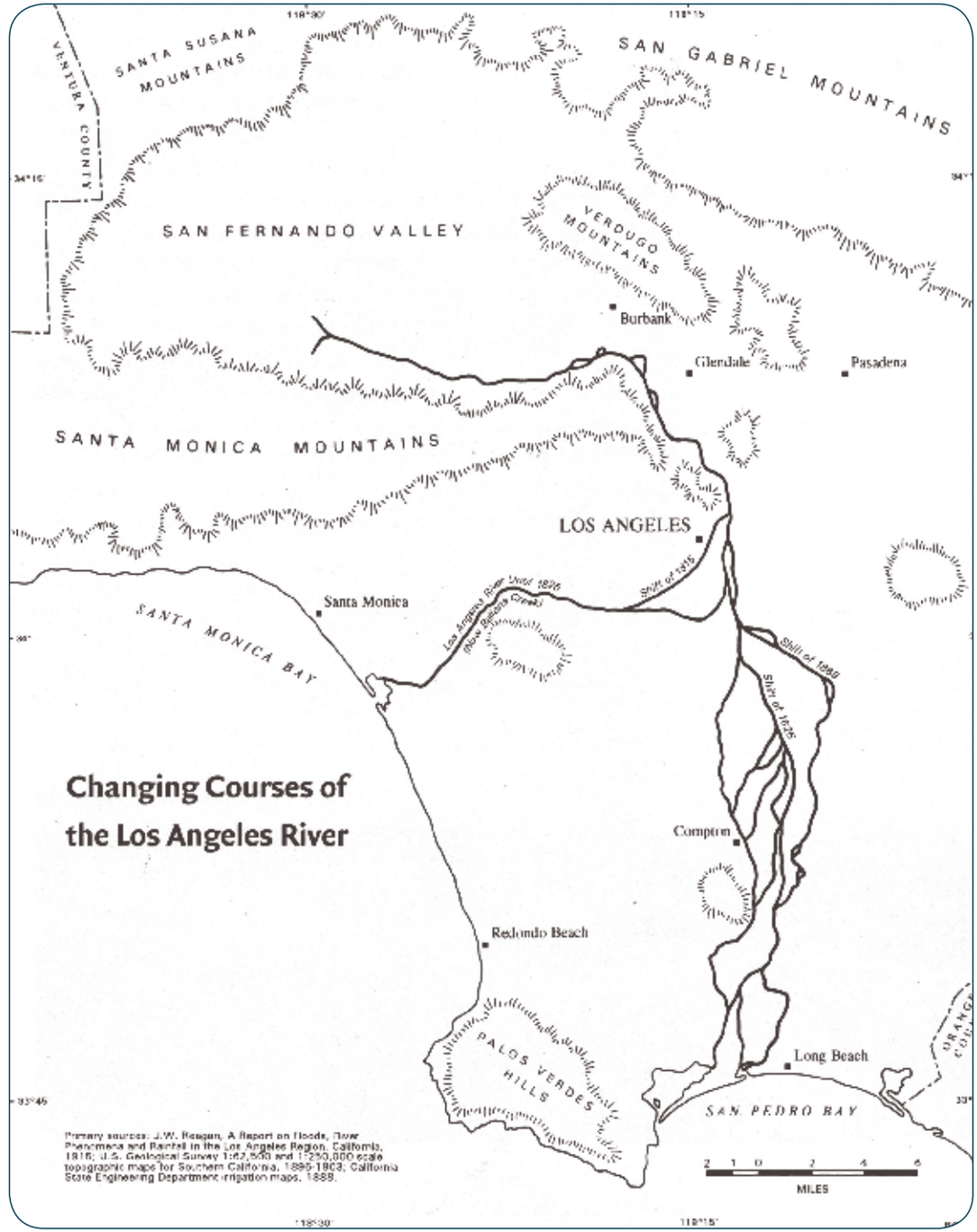
A HISTORY OF FLOODS

The first major flood to affect the city occurred in 1815. The pueblo was washed away, and a new one was built. Since that time the River changed its course several times and ran into what is now Ballona Creek. In 1825, another flood caused the River to change its course again. This time it flowed south to Long Beach. The River was known to flow gently for many years of low rainfall, and then rage wildly during occasional years of flooding. Because of the ever-changing nature of the River, settlements could be safe for years, then be washed away overnight. During the recorded history of Los Angeles, the River changed course at least nine times.

A UNIQUE TYPOGRAHY

The topography of the Los Angeles River watershed is highly unusual. It ranges from 3,000 feet in the San Gabriel Mountains to sea level in a very short distance. The average grade of the mountain slopes is 65-70%. As an example, the Los Angeles River is 51 miles long and drops 30’ per mile. The Mississippi is 2,348 miles long and drops about 1’ per mile.

It is this topography that created to the once, rich alluvial soils that attracted farmers in the first place. The San Gabriel Mountains are young mountains, geologically speaking, and are still rising at a rate of about 3/4” per year. This means they are also eroding rapidly, and would naturally be depositing rich soils in the valleys and replenishing our beaches with sand via the natural transportation of the River systems. With channelization, these processes have been impaired.



Map by Blake Gumprecht, from *The Los Angeles River: Its life, Death and Possible Rebirth.* Johns Hopkins University Press, 1999. pg. 140

WILDLIFE

The Los Angeles River was once a prime habitat for Mountain Lions and grizzly bears. The grizzly was once more prevalent in California than in any other state – it is our state symbol. The California grizzly bear (or brown bear) thrived in the valleys and low mountains of Southern California. As settlers began to populate the area they were hunted down and killed because they fed on the livestock of settlers. The last one was killed in Tulare County in August of 1922. The California Grizzly became extirpated in this area. Cousins of the California Grizzly live in other states and are now protected.

Steelhead Trout are one of the few species of trout that can survive in both warm and cool temperature climates. Steelhead Trout are the only native Southern California species that travel the waters from the mountains to the sea and back. Over time their habitat slowly began to disappear. The last Los Angeles River Steelhead was caught in the late 1940's. Recently, steelhead have been seen as nearby as Malibu Creek and San Mateo Creek. It is believed that when the steelhead return to the Los Angeles River, the ecological health of the River will have been achieved.

HABITATS OF THE LOS ANGELES RIVER

Willow trees growing in the natural bottom portion of the Los Angeles River in the Glendale Narrows. Photo by Peter Bennett.

FLOODPLAIN WILLOW FORESTS

In the days before channelization, the Los Angeles River was known to flood its banks periodically, meander along, and shift its course to the ocean. The resulting erosion and widespread deposit of sediments created flat strips of land called floodplains. These deposits resulted in the growth of willows, cottonwoods, and other aquatic and semi-aquatic plants. At one time these lowland forests formed one of the most biologically rich habitats of the River watershed. Since channelization, these areas are harder to find, but reestablished areas and remnants still exist. The best examples are behind damns including Hansen, Sepulveda, well as in the Glendale Narrows.

While there are numerous species of willow trees and shrubs in Southern California, the White Willow (*Salix alba*) and Arroyo Willow (*Salix lasiolepis*) are often found in the natural bottom portions of the River and its tributaries. Their leaves are almost four-times as long as they are wide, and have a pale underside. Willows are deciduous, shallow-rooting plants that favor moist soils typical of

riverbanks. Floodplain plants and trees also have a natural ability to clean pollutants through the process of biofiltration and phytoremediation. In these processes, pollutants from urban run off found within the water and soil, are captured, broken down, and treated. Other important functions of these floodplain forests include stream bank stabilization (bioengineering), slope stabilization, soil erosion control, soil building, and wildlife habitat.

In addition, flood plain willow forests serve as a vital habitat for urban wildlife. These forests support a rich and diverse population of birds and migrating birds that nest in and under its lush canopy. The willow gold finch, willow flycatcher, yellow warbler, western wood pee wee, herons, egrets, cormorants, ducks, redtail hawks and osprey are a few of the species that can be seen in natural bottom portions of the Los Angeles River. In addition, these forests also provide shade required by a diversity of fish, aquatic insects and plants in the River's ecosystem.

The Ballona Wetlands, once a 2,200 acre coastal estuary is now less than 200 degraded acres today. The Santa Monica Bay Restoration Commission.

FRESH WATER MARSH

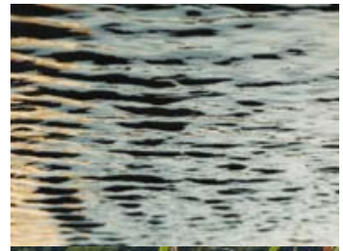
Thousands of years ago the Los Angeles River created and flowed through several fresh water marshes. Marshes can form in almost any shallow depression that is kept wet by streams or ground water. Along the Los Angeles River, these marshes formed in places where the water table was high year round. Fresh water marshes contain layers of low, non-woody vegetation in soil saturated with moisture. These wetlands serve important hydrolic, biological, and habitat functions. Hydrologic functions include long term and short term water storage, subsurface water storage for ground water recharge, energy dissipation, and moderation of groundwater flow or discharge. Fresh water marshes also convert water, sunlight and minerals to biomass at rates much higher than in dry ecosystems. They also provide a lush and safe environment for a wide range of life, from planktonic and filamentous algae to animals such as frogs and water fowl. Cattails are often a symbol for these wetland habitats and found with other plants such as duckweed that float along the surface and sedges and grasses that are found around the edges of the marsh. These plants stabilize sediments and add organic matter.

While many of these original wetlands along the Los Angeles River have disappeared as a result of changing typography and human development and growth, efforts are underway to restore portions of important wetland habitats along the Los Angeles River.

For more information please visit the Los Angeles River Revitalization Master Plan at www.lariver.org.

There are however a few coastal wetlands remaining in Southern California that are being protected and preserved through the efforts of the Friends of the Ballona Wetlands and Los Cerritos Wetlands.

For more information please visit http://www.ballonafriends.org/ and http://www.lcwlandtrust.org/index.htm.



LAKES & PONDS

These fresh water ecosystems are non-moving water habitats and contain several important functions; they capture and hold natural rain water and help replenish ground water sources in addition to serving as an important habitat for migrating birds and waterfowl that include herons, American coots, mallards, pie-billed grebes, and Canadian geese. Ponds are shallow enough to support aquatic vegetation whereas such vegetation is often found along the edges of lakes. Because of limited water volume in shallow ponds, water temperature varies greatly and parallels that of the air and this intern impacts the amount of dissolved oxygen in the water. Cooler waters produce more oxygen than warmer waters. Aquatic insects and organisms adapt to a certain temperature ranges. Dissolved oxygen levels also vary with daily and seasonally in both lakes and ponds and this can also impact fish and other aquatic species that need dissolved oxygen to breath. Living within the vegetation you will find a number of insects and their larvae such as dragon flies, water boatmen, and diving beetles, that are well adapted to the water temperature and dissolved oxygen levels within these habitats.

While human development and growth within the Los Angeles River Watershed has decreased the amount of significant wetlands, natural lakes and ponds, recent conservation efforts have resulted in the development of River side parks containing man-made lakes and seasonal settling ponds along the Los Angeles River. These parks serve multiple benefits. They create habitat for many species of migrating birds, water fowl, aquatic insects and plants; they restore open green space in park-starved cities where the public can relax, slow down and engage in outdoor recreational activities.

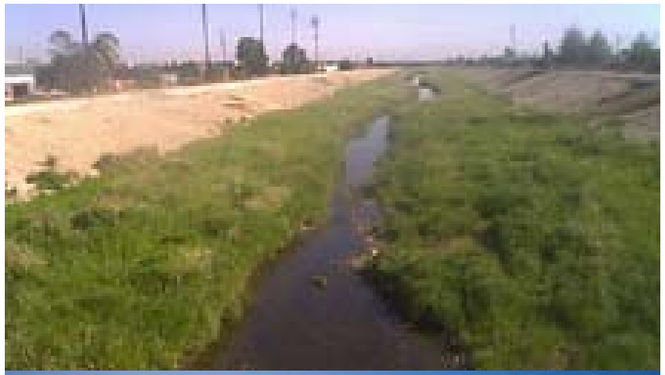
Above photo: Sepulveda Basin Wildlife Reserve. Photo by Al Pavangkanan.

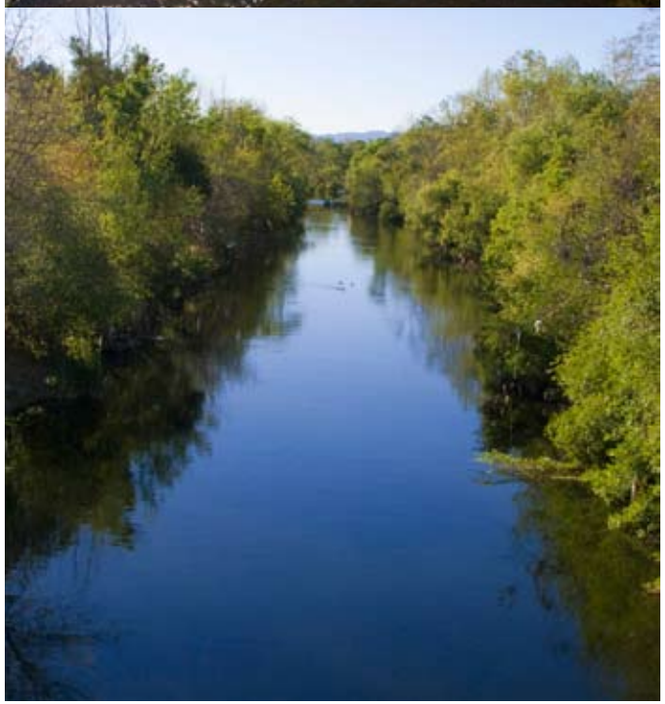
Sepulveda Basin Wildlife Reserve is a 225 acre park completed by the City of Los Angeles Department of Parks and Recreation with funding from the U.S. Army Corps of Engineers. In the 1960s and 1970s forward thinking citizens and city planners saw the need to limit development into the lower flood-prone basin areas and “re-create” a natural habitat for birds and small animals with native vegetation where people would be welcome as visitors. This reserve contains trails that will lead you to a man made lake that serves as a refuge for many migrating bird and water fowl, a 3-mile natural bottom portion of the Los Angeles River between the Sepulveda Dam and Balboa, and Haskell Creek that runs from the Tillman Water Reclamation Plant to the Los Angeles River.

SOFT BOTTOM RIPARIAN

In four stretches along the course of the Los Angeles River you will find soft-bottom portions where the natural river bed has not been lined with concrete; north or upstream of the Sepulveda Dam, the Glendale Narrows, Compton Creek, and the Estuary downstream from Willow Street in Long Beach. Instead, the riverbed is lined with sediment and boulders and offers a glimpse of the River as it once was. Fortunately, the high water table in these areas made it impossible for the River bottom in these areas to be sealed in concrete, and the River’s natural bed have been preserved along with a diversity of plants and wildlife. Today, approximately 13 miles of the present day 51 mile River is natural bottom. For more information about these areas please see ***Down by the Los Angeles River*** by Joe Linton.

Islands of willow trees, sycamores spring up in the middle and long the sides of the River in the Glendale Narrows while thick layers of sedges and grasses line the bed of Compton Creek and both trees, shrubs and grasses line the banks of the River upstream from the Sepulveda Dam to Balboa Blvd. Oxygen content is high in





Photos top to bottom: Compton Creek. LASGWC
Glendale Narrows. Photo by Peter Bennett.
North of Sepulveda Dam. Photo by Peter Bennett.

moving parts of the River for several reasons; the agitated shallow water exposes a large surface to the air, oxygen consuming debris is washed away, and the water is often cooler in water that is constantly moving. As a result, these areas are rich with animal, plant, and macro-invertebrate life and are excellent places to conduct biotic surveys when it is not raining.

ESTUARY

Estuary at Willow Street, Long Beach, CA.
Photo by Tom Andrews. www.Laist.com

According to the Environmental Protection Agency, estuaries are places where rivers meet the sea. They are highly productive ecosystems and distinct from all other places on earth. The tidal, sheltered waters of estuaries also support an assortment of specialized plants, animals, and micro organisms especially adapted for life in unique waters. Estuaries are among the most productive ecosystems on earth, creating more organic matter each year. Thousands of species of birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce. They are called the nurseries of the seas as many species of fish spawn in their sheltered and protected waters. In addition, estuaries also filter out sediments and pollutants before it reaches the ocean. The plants and soils can act as a natural buffer between the land and ocean. However, most estuaries are at risk due to human activities, both past and present.

The Los Angeles River estuary is a 2.6 mile, soft bottom stretch of the river between the Willow Street Bridge to Queensway Bay in Long Beach.Year-round flow is maintained by urban and agricultural run-off, and discharges of treated wastewater. During the drier months up to 80 million gallons per day enter Queensway Bay. In an 100 year flood the U.S. Army Corps of Engineers has calculated a discharge of 175,000 cfs (cubic feet per second) from the river where it enters Queensway Bay.

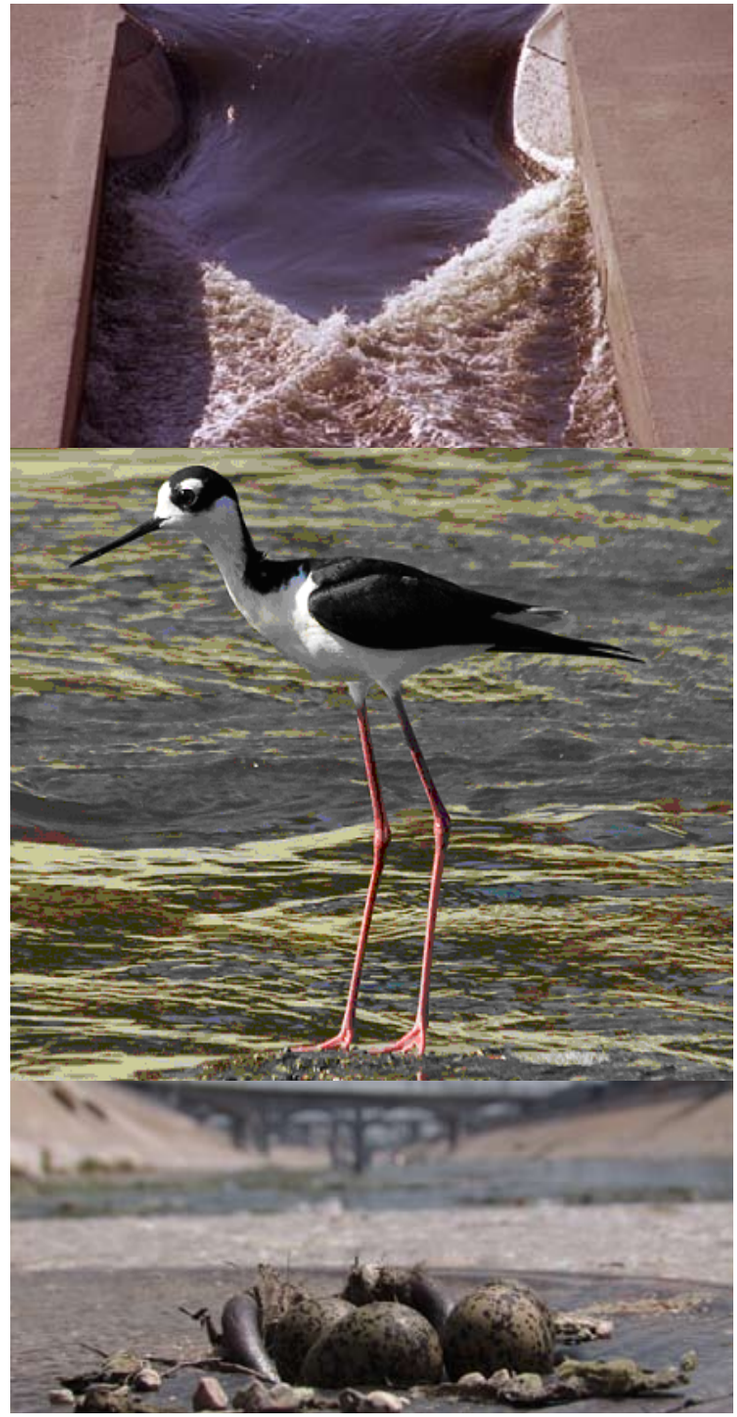
WET CONCRETE CHANNEL

When the U.S. Army Corps of Engineers paved the Los Angeles River they straightened and thus shortened the River from 52 to 51 miles. Today, over 80% of the River is channelized and completely encased in concrete. While these areas may not appear to provide much habitat, nature has managed to survive amidst concrete walls.

During the warmer months of the year, the concrete channel bottom is covered by a shallow flow of water and there is extensive algal growth. Algae is an ideal habitat for many invertebrates which attract a variety of birds. From July through October, southbound migrating shorebirds can be found in the wet concrete channel areas of the Los Angeles River in Long Beach feeding in the shallow water. The most abundant species is the Western Sandpiper, a sparrow-sized bird with a long, narrow bill that easily pikes into the algae in search of food.

During low flow months (August-October), the black necked stilts not only feed but build their nests in the concrete portions of the Los Angeles River. These birds can be identified by their long red legs, black and white plumage, and long narrow beak. Shallow, slow moving waters and abundance of aquatic insects in these concrete portions of the River resemble wetland habitats in which these types of birds live.

Photos, top to bottom: Low flow channel. Photo by Mark Lamonica.
Black necked stilt.Photo by Peter Bennett. 2008
Black necked stilt nest and eggs found in concrete channel of the L.A. River.
Photo by Marcus Ericsen. 2008



WHILE MANY OF THESE ORIGINAL WETLANDS ALONG THE LOS ANGELES RIVER HAVE DISAPPEARED AS A RESULT OF CHANGING TYPOGRAPHY AND **HUMAN DEVELOPMENT** AND GROWTH, EFFORTS ARE UNDERWAY TO **RESTORE** PORTIONS OF IMPORTANT WETLAND HABITATS ALONG THE LOS ANGELES RIVER.

CHAPTER 3 ADVENTURES OF THE COLA KAYAK

To know the Los Angeles River you've got to get in it, get your feet wet, and discover what an amazing resource we have flowing through our city. The river is nearly navigable all the way down thanks to water from underground springs, treatment plants, and urban runoff. It flows year round, 51.5 miles, from the football field of Canoga High School to the Queen Mary Ocean Liner docked in the Los Angeles Harbor. It meanders through quiet neighborhoods in the valley, wetlands in Balboa Park, rapids in Glendale Narrows, concrete canyons of downtown, and opens to the Pacific Ocean 51.5 miles from where it began. As it flows, its history unfolds, both cultural and natural. Like I said, you've got to get into it, so I built a boat and dropped it in the river where it began, high in the San Fernando Valley.

It took six days to see the whole thing. And each day was a completely different experience. The Los Angeles River drains the Los Angeles Watershed, which is like a 834 square mile bowl surrounded by mountains, with one side pouring into the ocean. It's a long way from the top of the watershed to the bottom. I needed a boat.

My friends, the "Green Ambassadors" at the Environmental Charter High School in Lawndale, suggested plastic bottles. "All you need is 150 plastic bottles, duct tape, and a pair of crutches for oars," one student said. It didn't take long to transform trash into a seaworthy vessel, complete with a broken classroom chair to sit on too. There might be a few shallow spots, so we added a pair of junk wheels from baby stroller. We called it the "Cola Kayak."

The Los Angeles River Watershed

SECTION 1
7.5 MILES

SECTION 2
11 MILES

SECTION 3
8 MILES

SECTION 4
3 MILES

SECTION 5
19 MILES

SECTION 6
3 MILES

Simi Valley
Burbank
Glendale
Pasadena
Calabasas
Santa Monica
Los Angeles
Long Beach
Torrance
Carson
Compton
Lakewood
Whittier
Huntington Beach
PACIFIC OCEAN
PALOS VERDES HILLS

ADVENTURES OF THE COLA KAYAK•DAY 1 CANOGA HIGH SCHOOL TO THE SEPULVEDA DAM

The air is crisp at the 50-yard line on the football field of Canoga High School. The Cola Kayak is flipped upside-down so that it rolls on the junk stroller wheels. The school building supervisor guides me over to a gate on the far end of the field.

"Past this gate is where the two streams come together," he says. Calabasas Creek and Bell Creek drain the upper regions of the Los Angeles Watershed. Both creeks are concrete lined, and where they meet is the official beginning of the Los Angeles River. A century ago, before the high school was here, and before orange groves spread across the valley, this spot was a dry streambed pebbled with granite boulders and lined with scrub oak. Today the two creeks meet where two 15-foot walls come to a point.

It is impossible to descend into the river here, but I can see a bridge and a path leading to the river's edge ahead. There's enough water to float the raft alone, as I slosh along by its side. The sloped walls are concrete, as is the floor of the river. Green algae flows in the slow moving current like waves of spaghetti. I can see the tops of homes, and windows of businesses facing the river. Cars are stuck in traffic on bridges I walk under.

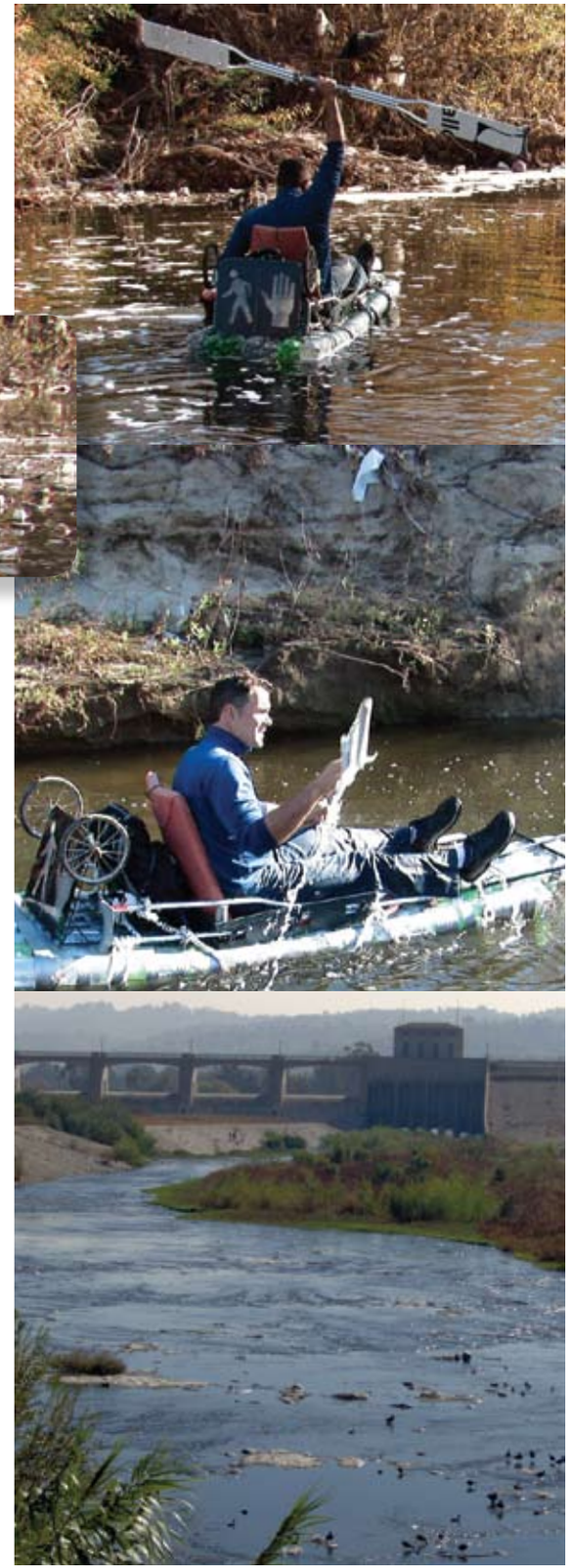
Sore feet and six miles later, the river changes abruptly. I can see trees ahead. The concrete disappears. What was a concrete corridor barricaded by high chainlink fences has evaporated into quite pools, like a necklace of natural pearls surrounded by a garden of grasses and willow trees. The distant hum of car horns blends with varied birdcalls, tweets, screeches and quacks., I recognize Burbank Blvd. ahead. I gently paddle in the shadow of the bridge. Looking up I see branches. Wedged in the crevices of the concrete pillars of the bridge there are branches and boughs of grasses. A piece of wood from the trunk of a tree, with roots sticking out, is dangling high above the water. "How did all of this get up there?" I wonder.

NEED IMAGE OF CREEK CONFLUENCE

Il realize that this is the Sepulveda Basin. The Corps of Engineers, determined to keep the Los Angeles River from flooding the city and risking lives and property, have designed this basin to hold water, and lots of it. This basin is basically a manmade bowl with a 57-foot tall dam on one end. The last six miles of concrete walls transport rainwater quickly from the streets of neighborhoods to this basin and holds it here. The natural debris stuck under the bridge high above me was lodged there when the last big rainstorm threatened to flood the city. The gates of the dam closed as millions of gallons of water filled the basin and covered Burbank Blvd. Where I'm sitting now was once covered with 20 ft. of water. This is why there are fences along the river. It's not always as quiet as it is today, with a light breeze blowing in the trees, and hundreds of white snowy egrets roosting on branches.

"Wait, that's not an egret," I say to myself. What I thought was an egret, a tall slender bird with a thin bill, thin black legs, and snow white feathers, is actually a plastic bag. Thousands of plastic bags hang high in the trees. Storm drains filled with plastic bags, plastic bottles, straws and cup lids, all flush into the Sepulveda Basin. What goes down the street, will go down the Los Angeles River. And then there are the pollutants I can't see, like oil drops from cars, pet waste, detergents from washing cars and fertilizers and pesticides from manicured lawns.

I continue paddling through a maze of boulders and trees hanging over a slow moving river. Balboa Park is nearby, occupying open fields within the basin. I can hear people cheering, as if a soccer game is in progress. A blue heron leaps out of the water ahead of me. There is wildlife here. Suddenly, a giant splash ahead, but it's not a bird. Then something big swims beneath the Cola Kayak. "What's that," I yell to myself, as the large form disappears. I look ahead. A concrete wall stands in front of me, with four large metal doors, as if I'm approaching the entrance of a grand palace. I paddle in awe to the Sepulveda Dam.



Top and middle: The Cola Kayak paddles through a plasticized Sepulveda Basin.
Inset: Detail of the plastic debris.
Bottom: A natural stream precedes the Sepulveda dam ahead.

ADVENTURES OF THE COLA KAYAK SEPULVEDA DAM TO THE BEGINNING OF GLENDALE NARROWS

The dam towers over me as I enter the gates. I can feel the metal framework under my feet as I drag the Cola Kayak through. I stop in the middle. These giant metal doors, designed to hold back the weight of millions of pounds of water, they could crush anything that got in their way. Like a concrete hallway, I walk through the thickness of the dam. It opens into sunlight, a flat concrete expanse, like a small parking lot, with giant walls on both sides. The dam is behind me now, as is the natural beauty of the Sepulveda Basin. Similar to the first six miles, there's concrete all around with tall fences on top. This time I understand why.

It's another day and I've returned to the same place where I left off from the first day. There's no place to camp along the way, so I travel the river by daylight only. The river is shallow. It's late spring, so the dry season is just beginning. It will not rain for another five months, yet the river will flow continuously thanks to the Donald C. Tillman Water Reclamation Plant sewage treatment plant located in the Sepulveda Basin, which pumps a steady 20 million gallons per day into the Los Angeles River. Add to this urban runoff from people washing cars and watering lawns, and you
get a navigable river year round.

The concrete walls are steep on both sides, and are roughly 50 feet apart. The river sloshes from side to side depending on which way the winding channel turns. For miles I meander slowly below quiet neighborhoods.

There's a long straight stretch through Studio City. Strangely, it looks dry ahead, as though the river narrows till it disappears. When I get closer I see white froth boiling in the middle of the river, and soon discover that the once wide river, as wide as the concrete walls, instantly becomes an 8-foot wide, deep channel in the middle.

Left: Exiting Sepulveda Dam.
Right: The bank of the Los Angeles River is a canvas for graffiti artists.

“Here I go,” I say to myself as the white water grabs the plastic bottles at the front of the Cola Kayak. Like the moment at the top of a rollercoaster, the river hesitates briefly, then rolls over and plummets downstream, more than tripling it’s speed. I must be moving 6-8 miles per hour. “Yaahh!” I yell as the river carries me through Burbank and into Glendale. Movie studios are on the left. Hollywood hills are on the right. A canvas of graffiti covers the walls on both sides of the channel.

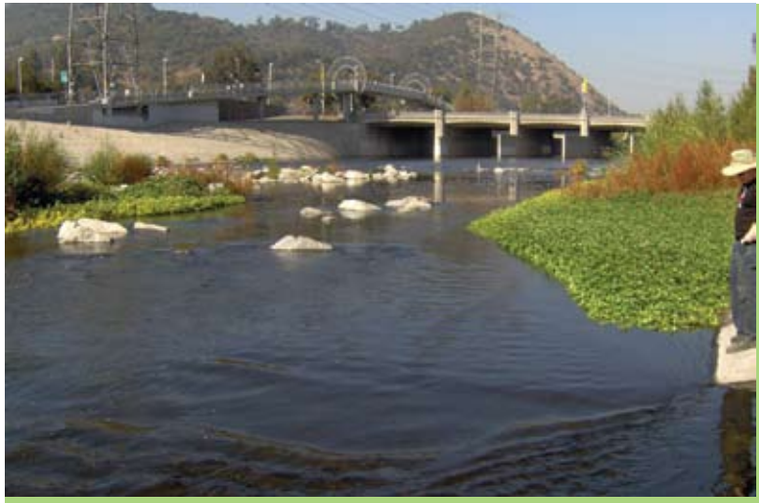
The hills of Griffith Park tower above on the right side of the river. The 134 freeway roars on the left, and crosses the river ahead. Far ahead I can see giant boulders and trees in the distance. The Sepulveda Dam is 11 miles behind me. Soon, the Los Angeles River is going to change again into something different, unpredictable.

ADVENTURES OF THE COLA KAYAK• DAY 3 GLENDALE NARROWS

Another tributary, the Western Burbank Channel, joins the Los Angeles River just before the dark underbelly of the 134 freeway bridge. Beneath the highway, pigeons roost, graffiti marks territory, and the refuse of emptied storm drains litters the flat, flooded expanse of concrete, like a six-inch layer of water sitting over the runway at LAX. Here, the river is noisy. Traffic bustles above, while below everything changes. Giant granite boulders burst from the riverbed midstream, like breaching whales with salt and pepper skin. Willow trees stretch to the sky, their lower branches capturing more plastic bags, no longer imitating egrets in my mind.

There is more water, but not because of anything humans have created or controlled. Underground reservoirs percolate to the surface here. The water table emerges with little springs that bubble out of the concrete bank, like an overflowing kitchen sink spilling onto the floor. These little springs have kept the Corps of Engineers from pouring concrete over the river bottom here. So there's sand, rocks, mud, deep pools and falling water, and in every crack and crevice something grows, from renegade tomato bushes to willow trees. A bicycle path parallels the river. People walk along the high ground, or just sit, peering into the river, watching it flow, or bearing witness to the dance of mallard ducks, herons, stilts and egrets.

The Cola Kayak meanders over boulders into deep black pools. Something splashes in front of me, something big. It disappears below and surfaces ahead. Another splashes behind me. I paddle downstream quickly, and notice I'm not alone. I hop off and drag the boat over a swath of granite rocks, rounded by miles and centuries of tumbling down the Los Angeles River. The river becomes a thousand little streams fingering their way to the next pool. "There's another one," I say. There are fish here, big fish, with large round, bronze scales, like a coat made from pennies. These are the Asian Carp I've heard about. They're not from here, otherwise they might naturally be called California carp. It is an invasive species that has settled down in this habitat, and is likely here to stay.

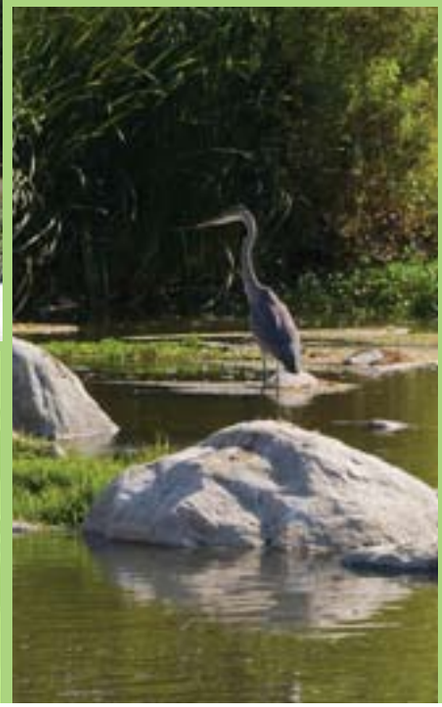












The hills of Griffith Park come close to the river's edge, with the 5 freeway sandwiched in between. But at the bottom of the concrete slope, hidden in the trees, behind little islands in the river, and the occasional shopping cart filled with rocks and straw, it is easy to imagine a wild California mountain stream, and ignore the 10 million other people surrounding you in Los Angeles County. The Cola Kayak drifts gently under the Los Feliz bridge and Fletcher Drive, where a family sits along the water's edge.

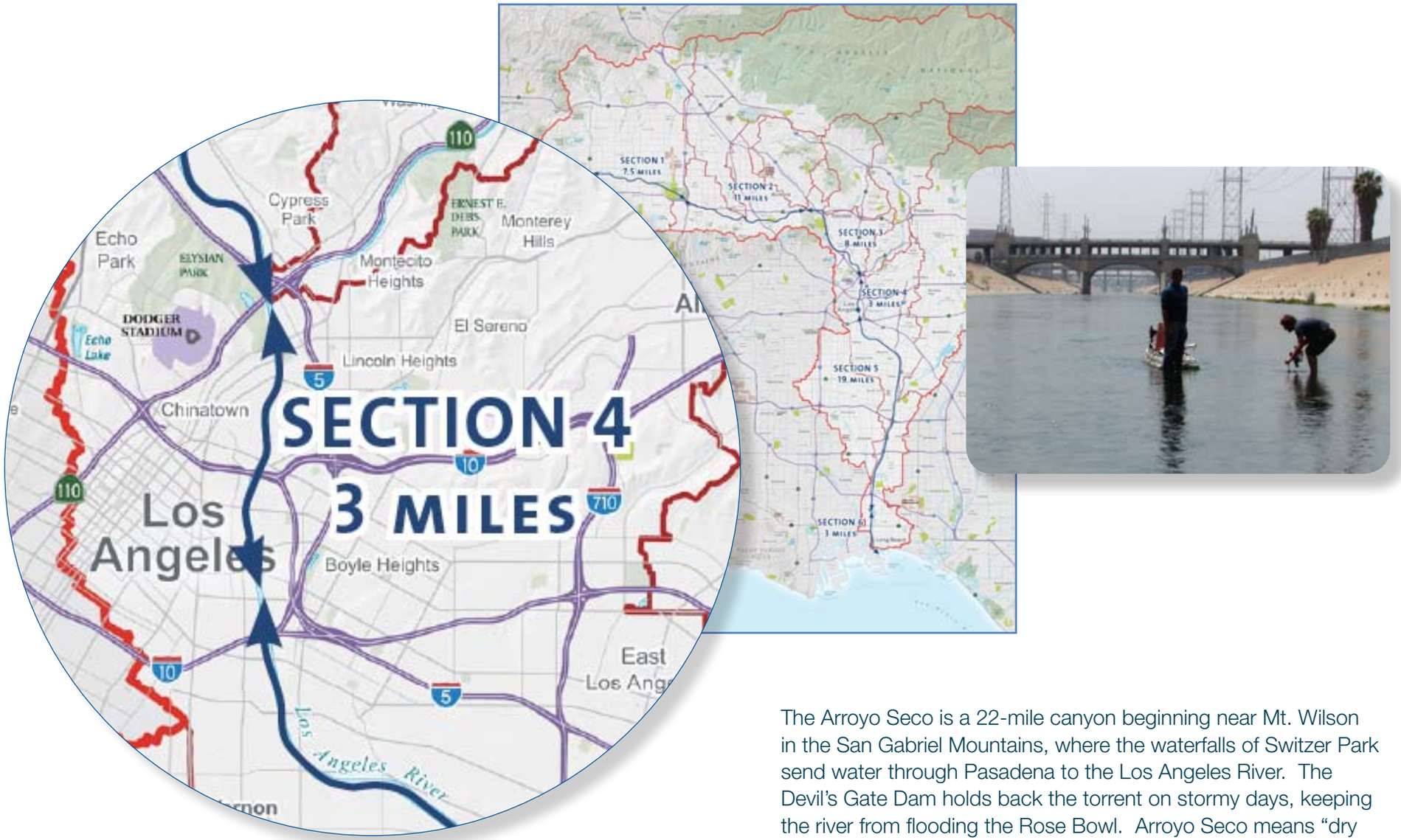
"What kind of a boat is that?" the father asks, holding a fishing pole in one hand."It's called the Cola Kayak," I reply, explaining how the Green Ambassadors from ECHS built it. "I've got one," his daughter exclaims, leaping to her feet as her fishing pole bends in her hands due to the size and strength of whatever is on the other end. She's a 10 yr. old urban angler reeling in her catch of the day. It's an Asian Carp. "And it's good to eat," she explains.Though others might be hesitant to serve up LA River Fish, the Friends of the Los Angeles River recently tested Asian Carp for pollutants and found their tissues to be surprisingly clean, but still recommended not eating them. I examine the wriggling fish close up, then hand it back to her. "What do you use as bait?" I ask."Tortillas," she replies.

Ahead, the dangling trees, decorated with mud-colored plastics bags, create a corridor of white water. I realize this after it's too late. These are the waterfalls on the Los Angeles River, where elevation drops 10 feet in only fifty feet of the river's length. Raising my oars high above my head, I race the rapids and barely keep my head above water. When it ends I want to do it again. Below I can see that I'm not alone. Dozens of Asian Carp race around the Cola Kayak, wriggling about in the shallow pools.

Soon, the 110 freeway bridge soars high above the river. Trees and granite disappear, giving way to a concrete channel again. Another tributary, the Arroyo Seco, joins the Los Angeles River, making it stronger and faster as it rushes by.

Left to right: The Asian Carp, an invasive species, thrives in the shallow pools of Glendale Narrows. Rapids on the Los Angeles River provide recreational variety for the urban canoeist. Los Feliz bridge over the Los Angeles River as it snakes around Griffith Park. The 110 freeway and Figueroa Avenue Bridge soar high above the river. Notice the fast moving water in the

ADVENTURES OF THE COLA KAYAK • DAY 4 ARROYO SECO TO DOWNTOWN 6TH ST. BRIDGE



The Arroyo Seco is a 22-mile canyon beginning near Mt. Wilson in the San Gabriel Mountains, where the waterfalls of Switzer Park send water through Pasadena to the Los Angeles River. The Devil's Gate Dam holds back the torrent on stormy days, keeping the river from flooding the Rose Bowl. Arroyo Seco means "dry streambed," which it was when it was explored during the late 1700's, but now treated water and urban runoff feed the concrete channel, much like the continuous flow of the Los Angeles River.

I drag the Cola Kayak to the edge of the 10-foot wide, low-flow channel, which is designed to keep water in the center of the Los Angeles River. The river is high today, spilling over the edge of the channel, creating a flat, inch-deep, reflecting pool over the rest of the concrete floor. Beautiful shore birds, called stilts, with long black legs and thin bills, create gentle ripples as they slowly stride across the surface, while in the low-flow channel, the river rushes by.

There are a few high spots where mixtures of sand, glass, and metal have created tiny islands. Standing on one, I look down and see why the stilts are squawking. Three green eggs, peppered with black freckles, are neatly arranged in a nest made from algae. I carefully look downriver again. With new eyes I notice dozens of stilts on or around little island nests as far as I can see.

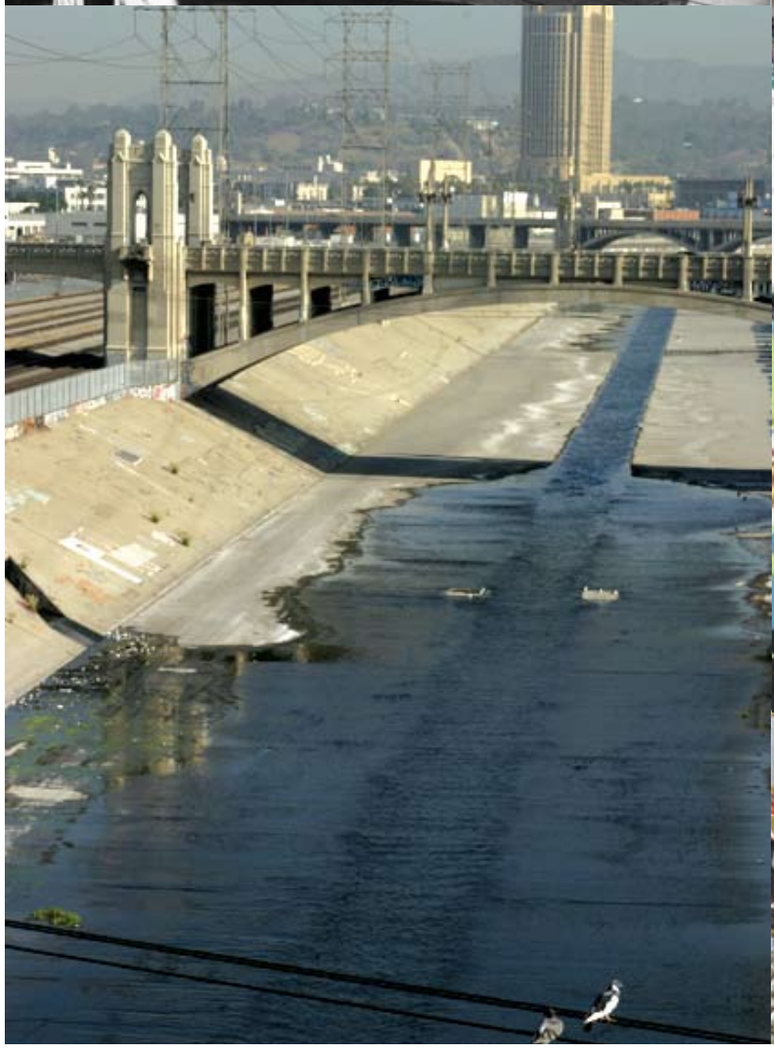
In the seat of the Cola Kayak, bottles creak as the river carries it downstream. The walls of the river seem higher. Tall barbed fences dress the top of the bank. Bridges, adorned with beautiful arches, columns and light poles, tower high above, so I can't see cars, only hear them. Trains hurtle passengers too and from opposite ends of the city. The familiar "clack, clack" of railcars hopping over joints in the track echoes through the deep canyons of the river bed. The riverbank is sometimes slanted, sometimes vertical, yet always spraypainted. Beautiful murals of mythic figures, fanciful fonts of illegible form identifying their artist more by style than name, graphic gestures of urban tragedy or humor, all together offer a kaleidoscope of color and culture.

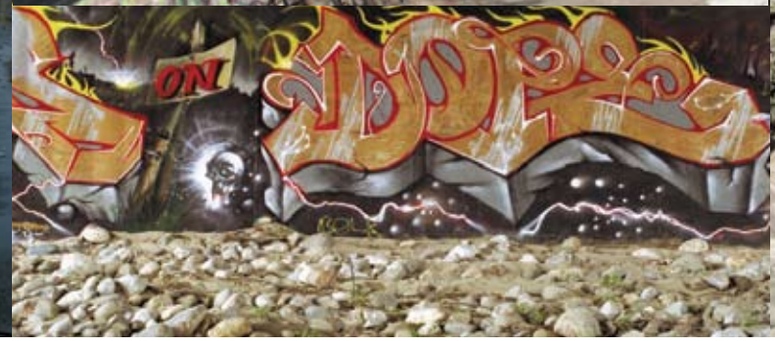
The 6th Street Bridge arches high above the river. On the west bank there is a tunnel, large enough to drive a car through. John is sitting there on a sofa. It's his sofa. It's his living room. Shirtless, with blue jeans and a chain around his neck, he offers me a cigarette, like the one dangling from his lip. He lives here, in the river, away from the streets.

"I've been here for two years," he says, adding, "It's peaceful here. Nobody bothers me." The diversity of Los Angeles exposes our greatest feats and failures, and the end of road for choices made long ago. John laughs at the design of the Cola Kayak as I haul it out of the water and march to the mouth of the tunnel.

The people that visit the river, those that live here, the graffiti artwork, the engineered concrete channel, and the natural beauty finding its niche, defines the Los Angeles River. The character of this city is reflected by these waters, and shows how wonderfully diverse we truly are. I'm beginning to understand that this river slices through our home, revealing everyone inside, our troubles and triumphs, our wild nature, and the powerful and powerless attempts to control it.


STILL
IN
PROGRESS





ADVENTURES OF THE COLA KAYAK•DAY 5 6TH STREET TO WILLOW STREET

Returning days later through the tunnel, the river opens to a brightly lit concrete corridor, with fast moving water running down the center as far as I can see. This is the long haul to Long Beach, a gauntlet of urban sprawl till the ocean. Beginning in 1938, the Corps of Engineers transformed a meandering river on a flat floodplain, where high water could break a levee and go wherever it wanted, to a straight, deep canal designed to get millions of gallons off the streets and into the ocean as quickly as possible.

The Cola Kayak dips into the river. The current grabs the bottles on the bow with a jolt, as if it is warning me to hold on. When I let go of the edge of the bank, the raft zooms downstream. There are 19 miles to Willow St., where the concrete bottom ends. It's eight miles to the Florence Avenue Bridge in the city of Bell. I make it in less than three hours. It's smooth sailing until I see flashing lights.

"What on earth to you think you're doing?" the police officer says, stepping out of the squad car that came to a screeching halt in the riverbed ahead of me. They wait for me to float to them. I use my oars to come to a grinding halt as well, and then drag the Cola Kayak up the bank.

"You know you really shouldn't be here," he says, scratching his head, adding, "This river can be dangerous." We look at each other. He and I both know that there are 5 months of the dry season ahead, so the chance of a flash flood is rather slim. I whip out my Permit to Film, which I acquired from the city, allowing me to be here and document the journey on film.

"How many bottles you got there? That contraption's not gonna fall apart is it? Why are you doing this again?" He and his partner ask dozens of questions about the raft, the reason, and the route. They know this section of the river better than I do. He's got a digital camera in his patrol car. We pose for a couple of shots. "My wife's never gonna believe this." I put the Cola Kayak back in the water, wave and paddle away as if nothing ever happened.

Top to bottom: sbridge, Cola Kayak, 6th st bridge

Willow Street Bridge

Another 9 miles and three hours later, the river has remained unchanged. Yet drop by drop the current is stronger as other streams and canals drain the watershed into the Los Angeles River. Rio Hondo appears on my left. Compton Creek appears on my right, draining approximately 42 square miles of the roughly 834 square miles of the entire Los Angeles watershed. Water from washing cars and watering lawns flows down the streets of Compton to the creek, feeding the wild patches of wetlands under the Artesia Blvd. Bridge, where herons and egrets watch turtles chase minnows. Though most, but not all, of Compton Creek is a concrete channel, it is refreshing to know that nature is resilient wherever it finds a hospitable place to grow.

Continuing down the Los Angeles River, the 405 freeway soars overhead and the low-flow channel disappears.Thick concrete walls, the size of several refrigerators placed end to end, appear in rows across the river. I slosh around the barricades dragging the raft. Sand, glass, metal and plastic are piled in front of them. Quickly, I pick up recognizable debris: a shoe, bottle cap, bullet, key still inside of a lock, two plastic CD's made from heavy polycarbonate, an arm from a doll, and a remote control car. Collectively they tell who we are, what we do value, and what we don't.

These sturdy concrete walls are designed to slow the raging torrent on those few rainy days throughout the year. Between two of the walls I recognize a granite boulder, twice the size of a basketball, like the ones I saw far upstream in Glendale Narrows. I realize that it was carried here by water, tumbling downstream, powerless to the force of water pushing it along. This is no place to be when clouds are swirling above. A light drizzle at the top of the watershed can sweep away anyone wandering in the waters below. I realize why the police officers came to talk to me. My worst fears have been a tragedy for others, and those officers have seen it before. Wet and tired, I drag the Cola Kayak out of the river, and onto the Willow St. Bridge.

Above left: Concrete barricades before the Willow Street Bridge slow rushing water.
Above right: A heron taking flight.
Bottom left: Debris, carried by wind, water or wheels, flows down storm drains and into the river.
Bottom right:

ADVENTURES OF THE COLA KAYAK • DAY 6 WILLOW ST. BRIDGE TO THE PACIFIC OCEAN

From the top of the bridge I can see the concrete barricades and the channeled river to the north. On the south side there are wetlands, boulders, trees, and wildlife leaps into the air on wings or dives below with fins. I drag the Cola Kayak below the bridge and sit mid-stream in the shallow waterfall and slowly accelerate, sliding gracefully into a dark pool below. This is where the concrete floor gives way to a natural river bed.

The river meanders through a wide basin, with wetlands emerging on both sides. The slope on each side is covered with large irregular shaped rocks directing the river out to sea. There is open sky beyond the last bridge. Soon the grasses and quiet ducks and egrets disappear, giving way to open water, waves, and the effect of tides.

Near the mouth of the river, a giant net hangs beneath large floating pontoons, designed to catch trash before it floats out to sea. There are thousands of plastic bottles, bags, cup lids, and straws, and surprisingly there are hundreds of tennis balls. Beyond this net, the water of the Los Angeles River begins to blend with seawater in giant swirls of brown and green. Algae blossom in the nutrient-rich waters washing the land into the Los Angeles Harbor.

Three miles beyond the Willow St. Bridge, giant smokestacks, banded red and black, rising from the deck of the Queen Mary, tower over the harbor, a monument to the ocean liners that once shuttled thousands of people from continent to continent. In the shadow of this steel behemoth the Los Angeles River comes to
an end.

52 miles from the football field of Canoga High School, and 780 feet lower in elevation, everything that washes down our streets flows into the Pacific Ocean, including the Cola Kayak.

CHAPTER 6 ACTIVITIES

Pre and Post lesson survey

Pre-visit activities:

Gifts from the River
The Los Angeles Water Cycle
Water Audit

Field Labs:

Water Quality Testing
Plant survey
Bird survey 6 need drawings
Macro invertebrate survey
Plastic debris survey

Post-visit activities:

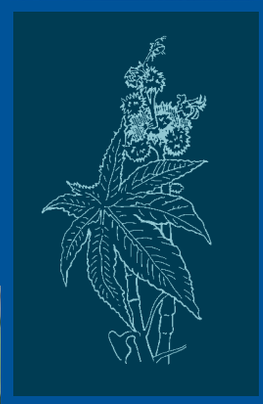
Classroom trash/plastic audit and awareness campaign
Designing Your L.A. River



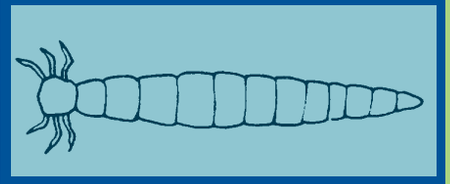
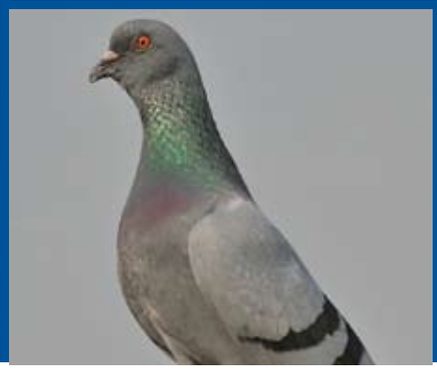
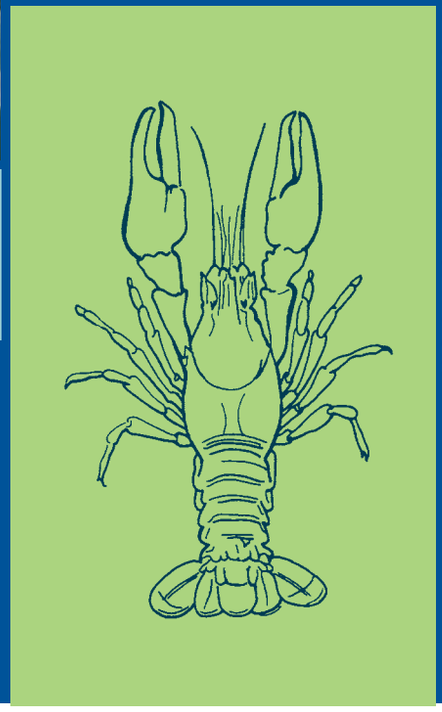










PRE AND POST STUDENT SURVEY

Please photocopy and have students complete and return these pre and post tests for each chapter before and after you complete an activity.
Please return surveys to Alicia Katano at the Friends of the Los Angeles River, 570 West Avenue 26, Ste. 250, Los Angeles, CA 90065

PRE-TEST

Student Name: **Grade:**
School: **Teacher:**
Lesson: **Chapter:**

1. I have
- **a.** ____ rode my bike along the L.A. River
- **b.** ____ walked along along the L.A. River
- **c.** _____
- **d.** ____ only seen the River from the freeway or street.
- **e.** ____ only heard of the L.A. River.
- **f.** ____ never heard of the L.A. River.

2. I think the L.A. River is a _____ place where you will see _____
_____
_____.

3. I think it is River is ____ important ____ not important to protect the Los Angeles River.

Use the back of this form for additional comments.

POST-TEST

Student Name: **Grade:**
School: **Teacher:**
Lesson: **Chapter:**

1. List 5 new things you have learned about the Los Angeles River:
1.
2.
3.
4.
5.

2. What is the most important thing you have learned about the L.A. River _____
_____
_____

3. I think it is ____ important ____ not important to protect the Los Angeles River because _____
_____
_____
_____
_____
_____

4. List 2 things you can do to help protect the Los Angeles River.
1.
2.

Use the back of this form for additional comments.

ACTIVITY 1 GIFTS FROM THE RIVER

BACKGROUND

Thousands of years ago, the Tongva (Gabrielino) Indians built their villages throughout the Los Angeles basin. They built their villages near the River because of the many resources the River had to offer. They were also aware of the frequent natural flooding of the shallow Los Angeles River and built their villages in the adjacent hillsides. The River had a rich and biologically diverse ecosystem that supported many daily needs such as drinking and bathing not only for the Tongva peoples but it also supported a diversity of animals that depended on the water, fish, birds, and plants growing and living by the River as well. Many plants and trees that grew by the River providing shade for fish, aquatic insects, and places to nest for birds but they also were used by the Tongva as food, medicine, tools, baskets and building materials. This biodiversity of plants, insects, fish, and animals made the River an ideal place to hunt, fish, and gather food and supplies needed for daily life for many life forms. The Tongva had respect for nature and the River and had a symbiotic relationship with their environment in which nothing was wasted. They new maintaining balance and biodiversity within the environment was needed to survive because all the living things of the River were connected and dependent upon each other to survive. The Tongva did not have supermarkets, hospitals, and stores like we have today. Instead, they relied on and used a variety of the plants and animals that lived near the Los Angeles River.

OBJECTIVE

- Students learn the many ways the River functioned as a resource to people in the past.
- Students understand the interconnected relationships between living organisms within the River's ecosystem.
- Students understand how loosing one part of the ecosystem weakens the whole system.

CALIFORNIA SCIENCE STANDARDS

K Earth sciences 3c
Grade 1 Life sciences 2 a-e
Grade 2 Earth sciences 3e
Grade 3 Life sciences 3a-d
Grade 4 Life sciences 2a-c, 3a-c
Grade 6 Ecology 5a-e
Grade 7 Life science 3e
Grades 9-12 Ecology 6a,b,c

MATERIALS

Bio-diversity cards template
Ball of yarn
Los Angeles River Timeline
Gumprecht map pg. 30

PROCEDURE

1. Photocopy the biodiversity card template and cut them into cards. Be sure to make copies double sided so that the object is on the front and the use is on the back. Hole punch cards and string them up to allow students to wear around their necks.

2. Have students sit in a circle and then read activity background. When you are done explain each student is going to represents a resource that lived near the Los Angeles River.

3. Pass out one biodiversity card to each student. Have each student introduce themselves by reading the front and back of their cards. Then have students identify if they are one or more of the following:

a. Producer – organisms that capture energy from the sun to produce food and then passes that energy and nutrients on to consumers (example: plants)

b. Consumer—organisms that can not make its own food and must obtain it from their environment (examples: herbivores, carnivores, omnivores, and bacteria and fungi)

c. Decomposer—organisms that breaks down the remains of dead animals and plants recycling valuable nutrients into the environment to be used by other members of the ecosystem. (example: bacteria and fungi)

4. Starting with your picture (example: sun), read your description and holding on to the end of the yarn toss the ball to a resource you depend on or that depends on you (could be anyone since all forms of life depend on the sun).

5. Explain to the student who catches the ball of yarn they must now toss the ball of yarn to a resource they need or that needs them. Have students give an explanation for their choices.

6. Continue until each student is holding a piece of the yarn (one person may get tossed to more than once if needed).

7. Point out they have created a “web of life” that existed in the Los Angeles River thousands of years ago and that the elements they represent are all connected to one another in terms of what they needed to survive and what they provided in terms of survival for others.

8. To show this connection have them hold on to the string as you explain that you are now traveling through time. Using the timeline state it is now.

a. 1800s and the Spanish and new settlers are diverting some of the water from the Los Angeles River. Have the student representing water tug on the string and ask students who feel a tug to raise their hand. Call on these students and have them identify themselves and discuss as a group how they would be affected by less water.

b. 1938 and people have started to pave the Los Angeles River with concrete to prevent floods. Have the student representing soil tug on the string and ask students who feel a tug to raise their hand. Call on these students and have them identify themselves and explain how they would be affected by less soil. Take it a step further and ask those two students to tug and reveal other resources. Have students identify themselves and discuss as a group how they are affected by less soil. You can continue the tugging until everyone has spoke and this will show how everything in an ecosystem is connected.

c. Continue this to discuss other events on the L.A. River timeline in terms of their impact on water quality, supply, river habitat, wildlife, and changes in the Los Angeles River through time.

9. WRAP UP QUESTIONS

a. What materials were used by the Tongva to build homes/as medicines/for clothing/for food?

b. What parts of the web of life in the Los Angeles River still exist today? What parts are missing?

c. How does this affect the Los Angeles River?

d. What would help the web today?

SUN	AIR
WATER	TULE REEDS/GRASSES
WILLOW TREE	ELDERBERRY
WILD RABBITS	PEOPLE
FROG	SQUIRREL

• Air is necessary for all forms of life—insects, algae, fish, plants, trees, mammals. • Plants release oxygen through the process of photosynthesis.	• Sun is a form of energy necessary for all life. • It provides algae, plants, grasses, and trees with the energy to produce food and oxygen. • The sun also helps humans produce vitamin D.
• The Tongva used its leaves were for the walls homes and for weaving mats, its roots were ground into flour, and its seeds were eaten raw or ground into mush • Birds, lizards, frogs, and small animals hide or build their nests and use as a source of food • Fish and aquatic life depend on them for shade • They require water, soil, and sunlight.	• Water is necessary for all forms of life. • It is habitat for fish, frogs, and aquatic insects and plants. • Animals and plants need water to survive. • People use water to drink, bath, and cook.
• The Tongva ate their berries, used their blossoms for medicine, and made bows and musical instruments from its branches. • Also a source of food for mammals and birds.	• Leaves were used for medicine and branches for building homes. • A place birds could build their nests. • Provided shade needed for survival by fish and aquatic insects if growing by water.
• The Tongva depended on many things from their environment to survive.	• Was a source of food for Tongva and carnivorous mammals. • The Tongva used its fur for clothing and blankets and bones were used for tools
• Eaten as food by the Tongva and other mammals • Require water and plants for food and shelter.	• Eaten as food by the Tongva and other mammals. • Require water and plants for food and shelter.

RIVER STONES	SOIL
MULE DEER	BLACK BIRD
STEELHEAD TROUT/FISH	GRASSHOPPERS/INSECTS
LIZARD	BLACK WALNUT
WILD ROSE	SNAKE

• Lined the River bottom and prevented soil from eroding.	• Were used by the Tongva for grinding acorns.
• A source of food for the Tongva and other mammals. • Feathers were used as decoration by the Tongva. • Birds also ate insects and were important in keeping populations in balance in the ecosytem.	• A source of food for the Tongva who also used their skin was for clothing and blankets and bones to make tools.
• A source of food for the Tongva and other mammals. • Fish ate aquatic insects and helped maintain balance in their populations in the ecosystem.	• A source of food for the Tongva and other mammals. • Require water and plants to survive.
• A source of food for people, mammals and large birds. • Lizards ate insects and help keep a balance in the ecosystem.	• A source of food for people, mammals, birds, and fish. • Tongva used hulls for dying and half shells for games.
• A food source. • Maintained populations of insects, mice, and other rodents.	• A source of vitamin C and food for Tongva. • Buds were eaten, blossoms were made into a tea that relieved stomach aches.

ACTIVITY 3 THE L.A. WATER CYCLE

BACKGROUND

Urban Run Off

When it rains, most water flows across concrete ad asphalt covered ground and is directed into storm drains that empty the water into the Los Angeles River where it travels to the ocean at incredibly high speeds. Along the way this rain water picks up several pollutants as it washes over our streets, parking lots, and freeways.

Ground Water

In areas along the Los Angeles River, despite the concrete, you can find bubbling springs of water. This ground water comes from subsurface reservoirs of fresh water that generally follow the path of the Los Angeles River. Beneath the land's surface, water percolates down into two general zones. The unsaturated zone is directly beneath the soil surface where air and water fill the space between soil and rock. The saturated zone is beneath the unsaturated zone and is also know as ground water or aquifer. Rain water reaches the aquifer as it percolates through soil layers until it reaches layers of clay or compact shale that prevent further movement. As water percolates through layers of soil and sedimentary rock, it becomes purified. Like water in rivers, gravity directs the flow of ground water to the ocean.

Imported water

Today, most of the water that we use to drink, cook, bath, laundry, and water our lawns is piped into our homes from other watershed resources. 35% comes from Mono Lake in Northern California via the Los Angeles Aqueduct and 53% comes from the Eastern Sierra Nevada watershed (via the Los Angeles Aqueduct); the Colorado River (via the Colorado River Aqueduct) and the Sacramento-San Joaquin Delta (via the State Water Project / California Aqueduct).

CALIFORNIA STATE SCIENCE STANDARDS

Grade 5 Earth Sciences 3a-e
Grades 9-12 Ecology 6b, California Geology 9c

MATERIALS

Paper cups
Bucket
Confetti or hole punches
Coffee beans
Food coloring
Water

PROCEDURE

1. Prepare or collect the following for you begin this activity.

Environmental Pollutants

trash – (plastic bags, bottles, wrappers, cigarette butts, etc.)
confetti
pet waste – coffee beans
pesticides from lawns –green food coloring
oils & copper from cars—orange food coloring
household detergents and cleaners—blue food coloring

2. Review the cycle of natural rain and purchased water in Los Angeles discussed in chapter 3 using the cards below.

3. Hand out cards and discuss how natural and purchased water travel through the Los Angeles River watershed.

4. Hand out cards to students and have them create three lines outlined below. Walk them through the three cycles of water through Los Angeles using information from Chapter 3.

CLOUDS = sponge soaked in water

↓

RAIN WATER

Line 1	Line 2	Line 3
Street, parking lot	Park or open green space	Mono lake or Colorado River
Catch basin	absorbs through soil	L.A. Aquaduct (purchased water)
Storm drain	waters trees/plants	Water treatment
The Los Angeles River	replenishes underground	home faucets/showers/lawns
	water supply	sewer system
		Water treatment plant

LOS ANGELES RIVER

↓

OCEAN = bucket

5. Then review forms of non-point source pollution that comes from our streets and assign to remaining students.

motor oil = drop of blue food coloring

pet waste = coffee bean

plastic bag cigarette buts, food wrappers = confetti,

soap from people washing their cars=red dye.

pesticides from lawns/gardens = green dye

6. Once you have gone through the list explain how water cycles through Los Angeles via the storm and sewer drain systems and how these systems connects our homes, businesses, parking lots to our waterways.

7. IT'S RAINING. Then have students explore the path of rain through your community. work with students and investigate each place and consider if they have the potential to help or harm the Los Angeles River. Investigate non-point pollutants that these places may produce and release into the L.A. River through run off after a rain.

RAIN WATER / 11% of our water	GROUND WATER / 8% of our water	IMPORTED WATER / 80% of our water
CLOUDS	RAIN WATER	MONO LAKE
EASTER SIERRA NEVADA WATERSHED (owens valley)	COLORADO RIVER	SACRAMENTO/SAN JOAQUIN WATERSHED
CATCH BASIN	CITY PARK	LOS ANGELES AQUADUCT

STORM DRIAN	TREES AND PLANTS	HOME (faucet)
LOS ANGELES RIVER	UNDERGROUND AQUIFERS	WATER TREATMENT PLANT
MONO LAKE	RAIN WATER	CLOUDS

COMMON BIRDS OF THE LOS ANGELES RIVER

SPECIES HERONS

Great Egret

Great Blue Heron

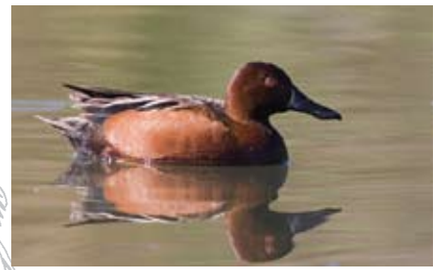
Green Heron

SPECIES DUCKS

Mallard male (left), female (right)

Bufflehead male

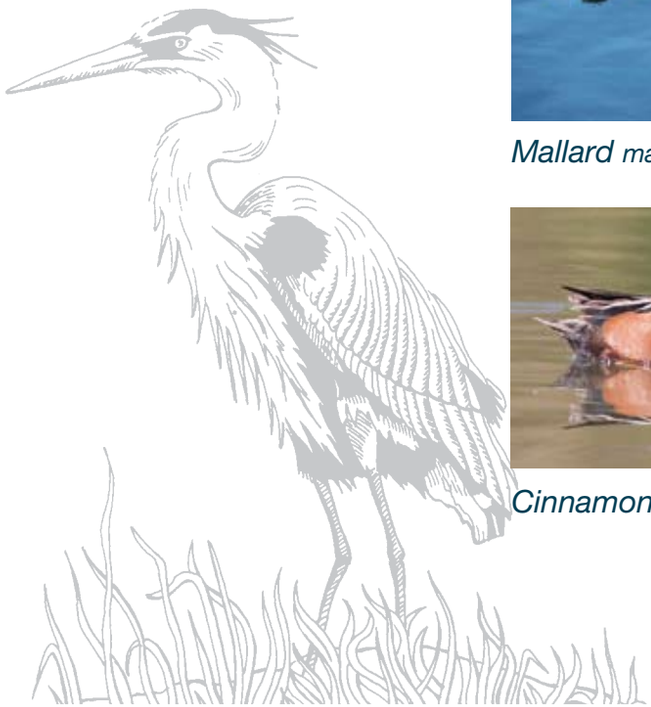
Bufflehead female



Cinnamon Teal

Green-winged Teal
male (left), female (right)

Muscovy male (left), female (right)

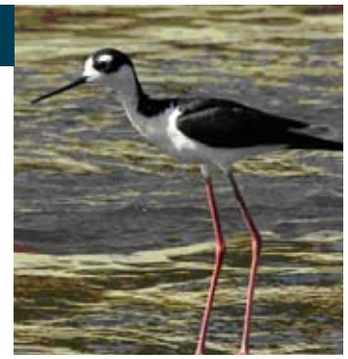


SPECIES SANDPIPERS

Greater Yellowlegs

Long-billed curlew
Photo by Alan D. Wilson, www.naturespics.

SPECIES STILTS

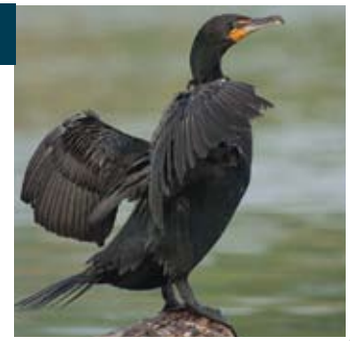


Black-necked stilt

SPECIES MERGANSER

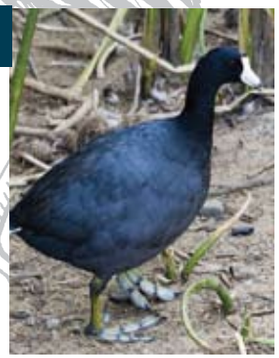
Hooded merganser

SPECIES CORMORANT



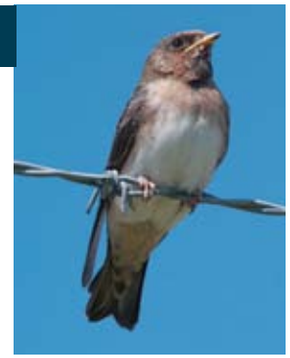
Double breasted cormorant

SPECIES COOTS



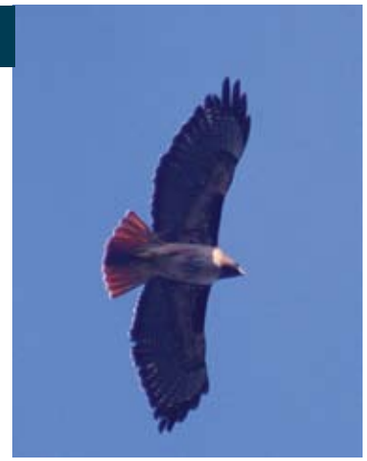
American Coot

SPECIES SWALLOW



Cliff Swallow

SPECIES HAWKS



Red-tail Hawk

Osprey

SPECIES PIGEON

Rock dove

BIRD SURVEY DATA SHEET

Name: _____

School: _____

Date: _____ **Location:** _____

Cloud cover: ◯ clear ◯ scattered ◯ overcast

Observations:

Species: Herons **Count** _____

- Great Blue Heron _____
- Green Heron _____
- Great Egret _____

Species: Ducks **Count** _____

- Mallard _____
- Green-winged Teal _____
- Cinnamon Teal _____
- Bufflehead _____

Species: Sandpiper **Count** _____

- Greater yellowlegs _____
- Long-billed curlew _____

Species: Stilt **Count** _____

- Black-necked stilt _____

Species: Merganser **Count** _____

- Hooded merganser _____

Species: Coot **Count** _____

- American Coot _____

Species: Dove **Count** _____

- Rock Dove _____

Species: Sparrow **Count** _____

- Song Sparrow _____

Species: Hawks **Count** _____

- Red-tailed hawk _____
- Osprey (fish hawk) _____

Total # of birds observed = _____

Total # of species observed = _____

Five minute observation

Type of bird: _____

Feet: ◯ webbed ◯ clawed Beak: ◯ flat ◯ pointed

Sketch

NATIVE AND INVASIVE PLANTS OF THE LOS ANGELES RIVER **IDENTIFICATION** GUIDE

Prepared by Ellen Mackey and Barbara Eisenstein for the Friends of the Los Angeles River with funding from the Los Angeles Regional Water Quality Control Board and the Los Angeles Turf Club. May 2002

This activity is meant to pique students interest in the rich diversity of the riparian community in the Los Angeles River. You will learn to recognize both native and invasive plant species.

A number of native trees and shrubs create the green ribbon we associate with the River. These common or native species have evolved in the bioregion and adapted to the area. They also provide valuable habitat for birds, insects, lizards and other plants and animals. These include:

Arroyo Willow
California Sycamore
Freemont Cottonwood
Black Walnut
Alder
Elderberry
Mulefat
Mugwort

Invasive species are now recognized as a major threat to the biological integrity of our remaining native habitat. Riparian ecosystems are especially vulnerable, as river habitats are rapidly disappearing and severely impacted in Southern California. Most of the sensitive species are dependent on the ribbons of vegetation associated with available water. Many exotic species do not provide for the habitat requirements of sensitive species; hence the sensitive species become further compromised.

We have chosen five species of invasive exotic plants to identify and sample. These include:

Castor bean
Tree-of-Heaven
Arundo
Fan Palm

We hope this introduction to riparian plants will spark your interest and that you will continue to research and visit the Los Angeles River.

California Science Content Standards
Kindergarten Physical Sciences 2c,
Investigation and experimentation 4d,e
Grade 1 Life sciences 2a-3,
Investigation and experimentation 4e
Grade 2 Earth sciences 3e,
Investigation and experimentation 4c,g
Grade 3 Life sciences 3b,d
Investigation and experimentation 5c
Grade 4 Life sciences 3a,b
Investigation and experimentation 6f
Grade 5 Investigation and experimentation 6a,g
Grade 6 Ecology 5c,e Investigation and experimentation 7b
Grade 7 Investigation and experimentation 7a
Grades 9-12 Ecology 6a,b,e

NATIVE PLANTS SPECIES

Coastal Live Oak, *Quercus agrifolia*


California Live Oaks are an evergreen live oak with dark green, oval leaves often convex in shape. Coast Live Oak is the only California native oak that actually thrives in the coastal environment, although it is rare on the immediate shore; it enjoys the mild winter and summer climate afforded by ocean proximity, and it is somewhat tolerant of aerosol-borne sea salt. The coastal fog supplies further buffering from the rainless California summer heat. Normally the tree is found on well drained soils of coastal hills and plains, often near year round or perennial streams. The name Quercus agrifolia literally means “sharp-leaved oak.”

California Sycamore, *Platanus racemosa*



The California Sycamore is a deciduous tree that stands up to 80’ tall. Its leaves are arranged in an alternate phyllotaxy. Small hairs on the underside of the leaf help capture evaporating water. The smooth top side of the leaf keeps moisture from evaporating back into the atmosphere.

Freemont Cottonwood, *Populus fremontii.* A riparian zone tree.


Arroyo Willow, *Salix lasiolepis*


There are over 300 species of willow trees. The Arroyo willow is native to western and southwestern North America and is deciduous large shrub or tree measuring 60’ tall. Its leaves are simple, lanceolate to olanceolate and pale on the underside. It has an alternate phyllotaxy. It was used for basket making by Native Americans and contains salicin which is used in asprin.

Black Walnut, *Juglans californica*

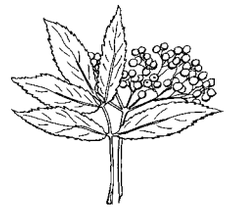

Black Walnuts are deciduous shrubs and trees that stand up to 30’ tall. Their leaves are an odd-pinnatedly compound and their phyllotaxy is an alternate leaf with a leaflet opposite to alternate. Its nut has been used in cooking for flavor and for dying.

White Alder, *Alnus rhombifolia*

White alder is a fast growing deciduous tree that can reach up to 70’ tall and is native to western North America. It is also monoecious and with male flowers appearing on twig ends and female cones appearing further back. Its leaves are alternate, simple oval serrate leaves. The seeds are small compressed winged nuts and it has smooth gray bark.

Elderberry, *Sambucus mexicana*

Elderberry is a large deciduous shrub that can stand 20’ tall. Its



leaves are odd-pinnately compound with 3-9 serrate leaflets. It has an opposity phyllotaxy with hollow, spongy stems. It produces lacy white flower clusters in spring followed by clusters of black or blue berries which have been used by Native Americans for its medicinal properties.

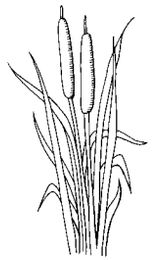
Mule fat, *Baccharis salicifolia*

Mule fat is a tall herb or shrub that stands up to 12’tall with simple, lanceolate (long and wider in the middle), entire-toothed leaves and an alternate phyllotaxy. Whitish flowers appear on tips of branches and have a musty odor. It is commonly found near creek beds.

Mugwort. *ArtemisiaVulgaris*

While native to many parts of Europe, Asia, and North Africa, Mugwort is also found in North America where it is considered an invasive weed. It is a very common plant growing on nitrogenous soils, like weedy and uncultivated areas, such as waste places and roadsides. It stands up to 6’ tall with a red-purplish stem.
The leaves are dark green, pinnate, with dense white hairs on the underside.

Cattails, *Typha latifolia*



Cattails are wetland plants that stand up to 20’ tall. The plant’s root systems help prevent erosion, and the plants themselves are often home to many insects, birds and amphibians. Many of its parts are edible by humans and considered a nutritious, energy rich food source high in starch. Hairs from the cattail have been used in nest building by birds and in moccasins and papoose boards by Native Americans.

INVASIVE PLANT SPECIES

Castor Bean

Despite its name, the seeds on this plant are not a true bean. The seed coat is also highly poisonous and ingesting as few as 1 seed can kill a human. The seed itself is the source of castor oil which has various medicinal and cultural uses. The glossy leaves are 15–45 cm long, long-stalked, alternate and palmate with 5–12 deep lobes with coarsely toothed segments. Their colour varies from dark green, sometimes with a reddish tinge, to dark reddish purple or bronze. the male flowers are yellowish-green with prominent creamy stamens and are carried in ovoid spikes up to 15 cm long; the female flowers, borne at the tips of the spikes, have prominent red stigmas). [3]

Brickell, Christopher (ed) The Royal Horticultural Society A-Z Encyclopedia of Garden Plants (1996) pp884–5, Dorling Kindersley, London, ISBN 0 7513 0303 8

Tree of Heaven *(Ailanthus altissima)*

The tree was first brought from China to the United States in 1784. It is a fast growing, deciduous tree that has become an invasive species due to its ability to quickly colonize disturbed areas and suppress other plants with chemicals that inhibits growth of other plant species. Its root system can spread up to 50 feet from the parent tree. It has an alternate leaf phyllotaxy with odd-pinnately compound leaves. The Tree of Heaven is considered a noxious weed in several countries. This tree also re-sprouts vigorously when cut, making its eradication difficult and time consuming.

Arundo *(Arundo donax)*

Arundo donax was introduced from the Mediterranean to California in the 1820s and it has become naturalized throughout warm coastal freshwaters of North America, and its range continues to

spread. It uses large amounts of water from its wet habitat to supply the rapid rate of growth, up to 5 cm per day in spring. It is capable of growing in dense stands, which may crowd out other plants and prevent their recruitment. It is among the fastest growing terrestrial plants in the world (nearly 10 cm/ day). To present knowledge Arundo does not provide any food sources or nesting habitats for wildlife. This results in resources provided by the crowded-out native plants not being replaced by the Arundo. For example, it damages California's riparian ecosystems by out competing native species, such as willows, for water. A. donax stems and leaves contain a variety of harmful chemicals, including silica and various alkaloids, which protect it from most insect herbivores and deter wildlife from feeding on it. A waterside plant community dominated by A. donax may also have reduced canopy shading of the in-stream habitat, which may result in increased water temperatures. This may lead to decreased oxygen concentrations and lower diversity of aquatic animals.

Mexican Fan Palm, *Washingtonia robusta*

While the fan palms are native to the desserts of the southwestern United States it is considered an invasive plant by the California Invasive Plant Council because they invade wetland areas and crowd out many native species.

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www.calepa.org

geogweb.berkeley.edu/GeoImages/QTVR/Berkeley/EucalyptusWrinkleL.html

www.calflora.org
http://en.wikipedia.org/wiki/Arundo_donax

California Invasive Plant Council
http://www.cal-ipc.org/landscaping/dpp/plantpage.php?region=socal&type=Palms

PLANT SURVEY

Name: _____

School: _____

River location: _____

OBSERVATIONS:

Native Plants:

	#	Edge type	Vein type	Composition	Phyllotaxy
White Alder					
California Sycamore					
Freemont Cottonwood					
Black Walnut					
Arroyo Willow					
Elderberry					
Mule Fat					
Mugwort					
Cattail					

Invasive/exotic Plants:

	#	Edge type	Vein type	Composition	Phyllotaxy
Tree-of-heaven					
Arrundo donax					
Mexican Fan Palm					
Castor bean					

Total # of plants observed _____

Total # of native plants observed _____

Total # of invasive/exotic plants observed _____

LEAF PROFILE

Leaf Edges

Entire-smooth | Serrate | Dentate or toothed | Scalloped or lobbed

Leaf Veins

Pinnate | Palmate | Parallel

Leaf Composition

Simple | Compound

Leaf Phyllotaxy

Alternate | Opposite

Leaf sketch

SYNTHETIC SAND

INTRODUCTION:
We are a culture immortalized by plastic. Average Americans consume 63 pounds of plastic each year. Multiply that by 300 million U.S. citizens and you get a picture of how much plastic we produce. Industry estimates of plastic production are more than 120 billion pounds annually in the U.S. alone. Only 3.5% of these plastics are recycled in any way. Much of this plastic enters the Pacific Ocean from our rivers, streams and beaches. On the eastern edge of the North Pacific Gyre, 1000 miles off the California coast, broken, degraded pieces of plastic outweigh surface zooplankton by a ratio of 6 to 1. That only represents what floats.

Roughly half of all plastics produced are negatively buoyant. They sink. Photodegradation, exposure to heat and UV light, doesn't work on plastics that have sunk or are buried in rivers, lakes wetlands or the ocean. There is a tremendous amount of plastic in our coastal sediments. There's also plenty of positively buoyant plastic sitting on our beaches and coastline waiting to be carried out to sea if it doesn't get collected.

One important way to change our culture of consumption is to monitor our trash and bring the issue to the attention of the public and politicians. Many environmental scientists working privately or for government agencies monitor the land and sea for debris and other pollutants. This data is used to regulate the sources of those pollutants. In this activity you will be able to collect real data which can be used to begin local change.

CALIFORNIA SCIENCE STANDARD:
3rd Grade, Life Sciences (3d) When the environment changes, some plants and animals survive and reproduce; others die or move to new locations.
4th Grade, Life Sciences (3b) In any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
5th Grade, Earth Sciences (3a,b,c,d,e)
Water on Earth moves between the oceans and land through the processes of evaporation and condensation.

OBJECTIVES:
1. Students will understand that collecting data is an important component of scientific research.
2. Students will recognize that human behavior impacts natural spaces.
3. Students will recognize that collecting data in the same location at different times will yield information that cannot be gathered by a single sample.

MATERIALS:

- One five-gallon bucket
- 2 metal scoops
- 1 colander with 1mm sieve
- 1 loop of rope with a 4-meter circumference
- Box or bag to hold sample

PROCEDURE:

1. In student groups of 3-4 students, gather all materials and travel to beach.

2. Select a beach sand collection site at the high tide debris deposit line, also known as the “wrack-line”. Make a detailed map of the site with the exact location identified. This is just in case you come back later for more data.

3.Take the 4-meter rope grid and stretch the loop to make a perfect square 1m x 1m over the high tide wrack-line. Use pencils or sticks as stakes to hold down the corners.

4. Remove big pieces of natural debris, like seaweed, leaves and wood. Brush them off and throw them away. We don’t need them in this study.

5. Measure the 10-liter mark, or halfway point, on the large plastic bucket. Mark this point with a line around the bucket using a permanent marker.

6. Using the small shovel, scoop an inch of the surface of the grid into the 5-gallon bucket. Scrape the surface EVENLY! Do not dig a hole in the sand. We are measuring the quantity of plastic over a square meter of area. This is the total amount of sand that you will collect.

7. Use the colander to sieve the 10 liters of sand in the bucket.

8. Transfer the contents of the colander to the collection bag or box.

3

6

7

8

9. Fill out the label below and place it with the sample.

SYNTHETIC SEDIMENT SAMPLE
Detailed Location of sample collection site
Date:
Collected by:

10. Sort the sample back in your classroom. Empty the bag of plastic debris into a pan and sort items into the seven categories listed on the data sheet titled “Data Sheet: Sorting for Size Class and Type of Plastic.”

11. Prepare a final report. Include a bar graph of your data.

ANSWER THE QUESTIONS BELOW.

1. How does your research build on information already known about plastic debris in the marine environment or the watershed?

2. How is your data similar or different from other student groups?

3. Do you think it would be better to combine all of the data from the entire class? Why do you think this?

4. What are the most common types of plastic in your sample?

5. Create a public awareness campaign to reduce the kind of pollution you collected.

DATA SHEET

SORTING BY TYPE OF PLASTIC

Type of Plastic Debris	#	Description
Pellets Pre-production plastic pellets, also known as “nurdles.”		
Fragment Pieces of hard plastic debris that is unrecognizable.		
Film Flat and flexible plastic debris, such as pieces of bags or wrappers.		
Foam Expanded polystyrene used for insulation or packaging,		
Filament Fishing line, rope, synthetic cloth.		
Cigarette butts		
Other Glass, rubber, metal or tar		
Date:		
Collected by:		

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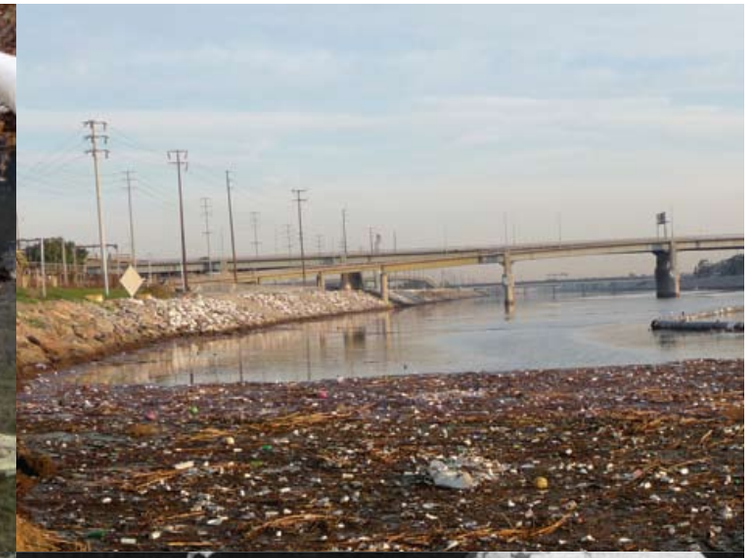
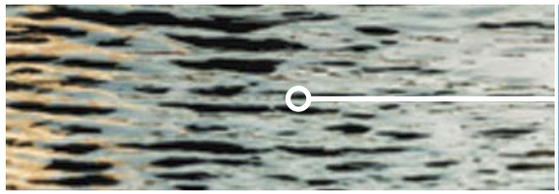
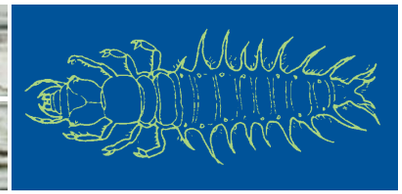


MACRO-INVERTEBRATE SURVEY





One method for measuring the health of the River is to monitor the types of macro-invertebrates that live there. Macro-invertebrates are small insect larvae and organisms that lack an internal skeleton and are large enough to be seen by the naked eye. These organisms spend all or most of their life in water and can indicate the health of a water body. A variety of environmental stressors impact macro-invertebrate populations .

• **Water temperatures**. Removal of trees along the banks of the River along with changes in water velocity alter water temperature and some organisms depend on certain temperatures to regulate life cycles.

• **Levels of dissolved oxygen**. Urban run-off such as oils, fertilizers, pet waste, etc. can induce the growth of algae and bacteria that consume oxygen within river environments.

• **Sedimentation**. An increase in sediment due to run off from construction sites or poorly protected farmland can add sediment to the water. These sediments get caught and build up in rocky areas of the water body and can smother habitat used by macro-invertebrates.

Some macro-invertebrates are sensitive to changes in a river body brought about these environmental stressors. As a result, their presence can indicate a healthy environment. Other macro-invertebrates are tolerant of altered water conditions and can live in stagnant or polluted water bodies as well as in areas with good to fair water quality.

EQUIPMENT

• Kick net • Rubber gloves • Field magnifying glass
Shallow container • Eye dropper • Identification chart
• Waders gloves

SAFETY RULES

1. NEVER go to the River during or after a rain event. Water can reach up to 35 mile velocities and the River is UNSAFE. You must wait 24 hours after rain ends before visiting the River to do a survey.
2. ADULT SUPERVISION is required for this activity.
3. PARTNERS are required for this activity. Do not conduct survey alone always go with another student.

INSTRUCTIONS

In the Classroom:

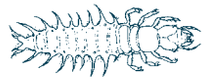
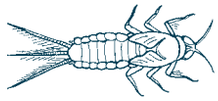
1. Go over different types of macro-invertebrates.
2. Go safety rules and assign teams.

On the River

1. Find two areas of the River where the water is shallow (1-2 feet) and slow moving. Areas with a rocky bottom and overhanging vegetation are optimal habitat. Your first sample site should be down stream and the second upstream.

Resources
Insects of the Los Angeles Basin. Charles L. Hogue. Natural History Museum of Los Angeles County. 1974

MACRO INVERTEBRATE DATA SHEET **NAME:** _____ **DATE:** _____

SENSITIVE (group 1 taxa): macro-invertebrate species	**SOMEWHAT SENSITIVE** (group 2 taxa): macro-invertebrates	**TOLERANT** (group 3 taxa): macro-invertebrates
Caddisfly larvae 	black fly larvae 	snails 
Dobson fly larvae 	clams 	leeches 
Mayfly larvae 	cranefly larvae 	midge larvae 
Rifle beetle adult 	damselfly nymphs 	aquatic earthworms 
Stonefly nymphs 	dragonfly nymphs 	blackfly larvae 
Water penny larvae 	scuds 	water boatman 
	aquatic sowbugs 	
_____ x 3 = ____ TOTAL	_____ x 2 = _____TOTAL	_____ x 1 = _____ TOTAL

POLLUTION TOLERANCE INDEX

•Take the totals for each group and multiply them by the given point value • Add the TOTALs together to determine the river's health using the Pollution Tolerance Index using the chart on the right•

_____ **TOTAL** SENSITIVE +
_____ **TOTAL** SOMEWHAT SENSITIVE+
_____ **TOTAL** TOLERANT
_____ = **RIVER HEALTH**

POLLUTION TOLERANCE INDEX	
> 23	EXCELLENT
17-22	GOOD
11 – 16	FAIR
< 10	POOR