Meandering Again!

**Grade Level:** adaptable for all grades

**Time:** 1-2 weeks

**Concept:** Human-Environmental Interaction

**Objectives:** Students will:
1. describe the historic condition of the Kissimmee River.
2. describe the Kissimmee River Waterway Project in the 1960’s.
3. debate pros and cons of the Kissimmee River and floodplain restoration.
4. draw and label a map of the Kissimmee River restoration.
5. create a HyperStudio or PowerPoint presentation to present information.

**Materials:**
The Kissimmee River Restoration Map from the *Water Resources Atlas of Florida.*
8 ½ x 11 white paper
crayons, pencils, colored pencils,
SFWMD website: Kissimmee River and other websites
Photos of the Kissimmee River
“Song of the Kissimmee”
chart paper, markers
computer, Internet connection

**Background Information:** Narrow channels and wetlands of the Kissimmee River Basin caused the water to flow slowly towards Lake Okeechobee. During the rainy season, this slowness of the water movement caused the water to back up. This occasionally caused extensive flooding as far north as Orlando. Then in the 1960’s Congress authorized the Kissimmee River Waterway Project to help with the flooding. Now, the Kissimmee River Restoration is being done to restore the integrity of the ecosystem and hydrologic conditions that are like a natural river’s flow.

**Procedures:**
**Initiating Activity:** Ask students if the flow of a river is changed by human intervention, can humans intervene again and restore the flow so that any environmental damage can be corrected?

**Strategies:**
1. Locate the Kissimmee River on a map of Florida. Discuss the absolute and relative location of it.
2. Read the “Kissimmee River Song”. Discuss what the students think it means in relation to what has happened to the Kissimmee River.
3. Read the article on the Kissimmee River. Discuss why it was channelized and why it is being restored.
4. List on chart paper the historical conditions of the river. On another chart paper list the changes
from the channelization, and then on another chart paper list the restoration information. Compare and contrast the charts.

5. Search the web using the sites listed. Find pictures of the Kissimmee River before, during, and after the River Waterway project. Print up a different picture for each student. Have the students write a description of their picture.

6. Have students research the Kissimmee River projects by internet, library and South Florida Water Management District. Using the information they gather and what they have learned in class, have them write an acrostic poem or a feeling poem form to explain what they have learned, illustrate, and share with the class.

7. Role-play the pros and cons of channelizing the Kissimmee River and then restoring the Kissimmee River.

8. Draw a map of the Kissimmee River showing the restoration.

**Culminating Activity:**
Have students create HyperStudio or PowerPoint presentations to present their information on the Kissimmee River. Include sections on the historical conditions, channelizing, restoration, pros and cons, pictures, and poetry. Present to class.

**Evaluation:**
1. Observation
2. Writings: description of picture, poetry
3. Map
4. HyperStudio or PowerPoint presentations

**National Geography Standards:**
Standard 1: How to use maps and other geographic representations, tools, and technologies to acquire, process, and report geographic information.
Standard 4: The physical and human characteristics of places.
Standard 8: The characteristics and spatial distribution of ecosystems on Earth’s surface.
Standard 14: How human actions modify the physical environment.
Standard 15: How physical systems affect human systems.
Standard 17: How to apply geography to interpret the past.
Standard 18: How to apply geography to interpret the present and plan for the future.

**Sunshine State Standards:**
LA.A.1.3: uses the reading process effectively.
LA.A.2.3.5: locates, organizes, and interprets written information for a variety of purposes, including classroom research, collaborative decision making, and performing a school or real-world task.
LA.B.1.3.1: organizes information before writing according to the type and purpose of writing.
LA.B.1.3.2: drafts and revises writing.
LA.B.1.3.3: produces final documents that have been edited.
LA.B.2.3: writes to communicate ideas and information effectively.
LA.C.1.3: uses listening strategies effectively.
LA.C.2.3: uses viewing strategies effectively.
LA.C.3.5: uses speaking strategies effectively.
SC.D.2.3: understands the need for protection of the natural systems on Earth.
SC.D.2.3.2: knows the positive and negative consequences of human action on the Earth’s systems.
SS.B.1.1.1: determines the absolute and relative location of people, places, and things.
SS.B.1.3.1: uses various map forms and other geographic representation, tools and technologies to acquire, process, and report geographic information.
SS.B.2.1.1: identifies some physical and human characteristics of places.
SS.B.2.3: understands the interactions of people and the physical environment.
SS.B.2.3.9: understands how the interaction between physical and human systems affects current conditions on Earth.

Web Sites:
Kissimmee River restoration:
www.sfwmd.gov/org/erd/krr/pastpres/3_krrpp.html
http://www.sfwmd.gov/org/erd/krr/events/3_krrce.html
http://www.sfwmd.gov/org/erd/krr/events/3_krrpe.html
http://www.state.fl.us/eog/govdocs/openv/saveglades/everglades/html/kissimee.htm

news articles:
http://www.sfwmd.gov/newsr/2_newsrel.html

These photos were taken on October 24-25, 1996 during a field investigation by U.S. Army Corps of Engineers and South Florida Water Management District personnel involved in the Kissimmee River Restoration Project:
http://www.saj.usace.army.mil/h2o/lib/graphics/kss96oct/

Kissimmee River Restoration:
http://www.eng.fiu.edu/evrglads/engineer/kissimme.htm

Story/Song of the Kissimmee River:
http://riverwoods.ces.fau.edu/kiss/storyk.html
http://riverwoods.ces.fau.edu/kiss/songk.html

demolition photos of the S65B Lock and Dam Structure on the Kissimmee River in June 2000:
http://www.sfwmd.gov/org/erd/krr/photo/s65b/4_s65bpix.html

http://www.google.com
http://www.northernlight.com
http://www.dogpile.com
http://www.askjeeves.com
good geography and science search sites

South Florida Water Management
http://www.sfwmd.gov
student corner, free materials, great environmental information, great pictures of Kissimmee River
Examples Of Poetry Forms

Acrostic poetry form
Can
Really
Open
Students’ minds
To
Imaginative ways that they
Can present their new knowledge.

I feel the warm humid breeze.
I see the returning of the birds and fish.
I hear the noises of the floodplains.
I taste the fish I now can catch.
I smell the fresh air.
I touch the mud in the restored floodplain.

River
Slow, meandering
Birds, fish, floodplains
KISSIMMEE
The Legend lives on
From the Seminole on down
Of the river they call the
Kissimmee

The river they say
Did meander her way
To big waters they named
Okeechobee

When summer rains arrived
The river would rise
The land was flooded by water

All nature rejoiced
With a singular voice –
The birds, the fishes and otters

The white man came
To the land he laid claim
For his cities, his farms and his ranches

Crops and cattle he grew
But if only he knew
Just how much he was taking his chances

When the summer floods
Arrived
There were many lost lives
Many dreams were shattered and broken

The water was viewed
As a force to subdue
Many words about this were spoken

A plan was applied
To the river and tides
She no longer flowed and meandered

Life’s cycle was changed
It no longer remained
The goddess of nature seemed angered

Where were the birds?
Songs were no longer heard
Where were the fishes and otters?

The river was now pooled
Had man been such a fool
To believe he could rule mother nature?

How can we reverse?
We must open our purse
And pay for mistakes thought improvements

The scientists were called
Engineers were enrolled
To restore the river’s proud movements

Some day we will find
If we caught it in time
To revive the Kissimmee’s life systems

The earth, it will tell
If we’ll only be still
Pay attention to nature and listen

We must live by her rules
Be wise with our tools
And the world we will leave to our children

Captain Robert K. Turpin
May 1999

Song of the Kissimmee River
http://riverwoods.ces.fau.edu/kiss/songk.html
The Kissimmee River

Historical Conditions

The Kissimmee watershed is comprised of areas drained by the Kissimmee chain of lakes and the Kissimmee River valley. Water from the chain of lakes flowed into Lake Kissimmee and out to the Kissimmee River. The river channel was generally 10 feet deep or less and meandered for approximately 103 miles over a 1-to-2 mile wide floodplain to Lake Okeechobee. During wet periods, water overflowed the river banks and covered the floodplain. The surface of the river and floodplain sloped a vertical distance of approximately 36 feet, from 52 feet above sea level at Lake Kissimmee to 16 feet near Lake Okeechobee. The floodplain contained extensive and diverse wetland habitats that supported at least 320 species of fish, birds, mammals, and other animals. Upland vegetation occurred along ridges, islands, and at the floodplain boundary.

Slow movement of water through the narrow channels and wetlands caused water to back up in the rainy season. Occasional but extensive flooding occurred in the river valley, lakes, and watersheds as far north as Orlando. Maximum discharges occurred in October and minimum discharges occurred in May. Water flowed through the Kissimmee valley more than 90 percent of the time - ceasing to flow only during severe droughts. Sediments continually migrated within the basin, forming new channels, ridges, islands, and ponded areas as the river meandered across the floodplain.

Present Conditions

The river channel and channels between lakes were dredged, beginning in the 1880s. When the Central and Southern Florida project was formed in 1947, these channels were further modified to improve flood control and navigation. Regulation schedules were established for the major lakes to provide high water levels for irrigation during the dry season, enough water for navigation, and low lake levels for flood protection during the wet season.

The Kissimmee River Waterway Project was authorized by Congress in the 1960s. A 60-mile long, 33 feet deep, channel (C-38 Canal) was dredged through the floodplain. Water control structures and tieback levees were built to create five impoundments. Floodplain boundaries were still distinct, but 54 square miles of wetlands were lost. With the establishment of regulation schedules in the upper chain of lakes, the valley receives flow from the lakes about 10 percent of the time. Most of this flow occurs within the C-38 Canal. The remaining river channels have no flow and are clogged with silt and vegetation.

At the north end of each impoundment, wetlands are drained and replaced by terrestrial vegetation, farmland, and pasture. At the south end, wetlands are permanently flooded and have changed to ponds or sloughs. Impacts on wildlife were substantial and populations of many desirable species, especially birds and fishes, declined dramatically. Various management methods for impounded wetlands were studied and evaluated during the 1970s and 1980s before it was concluded that the only means to regain lost ecosystem values of the river and floodplain was to restore their physical form and hydrology.

The SFWMD and other agencies have initiated studies to address environmental problems of the Kissimmee system. Water quality and limnological investigations indicate that the productivity of lakes in the Kissimmee chain increased due to the influx of nutrients from adjacent agricultural and urban areas. Many symptoms of eutrophication can be alleviated by controlling the inflow of nutrients from wastewater and stormwater and by periodic drawdowns to consolidate and oxidize accumulated organic materials. Elimination of wastewater discharges and the use of improved farming practices and
Upland detention/retention systems to manage flows from tributary watersheds have reduced the influx of nutrients to the Kissimmee lakes and river.

Large-scale efforts are presently underway, by the Army Corps of Engineers, SFWMD, and state agencies to restore the Kissimmee River and floodplain. Success of restoration will be determined by an extensive evaluation program to analyze ecosystem response. Results from this evaluation will be used to determine whether hydrologic and biological attributes have been restored. An adaptive management approach is used so that restoration activities can be modified, in response to data collected, to avoid adverse effects or enhance system performance.

Mathematical models and a physical model of the Kissimmee River were developed during 1986-1989 to simulate flow characteristics of the system, evaluate different backfilling operations, and select the most feasible restoration methods. These models indicated that the restored system could provide adequate water movement during flood periods without causing excessive sediment deposition downstream.

**Future Conditions**

The area around Orlando is rapidly developing. Urban and agricultural water use are expected to increase significantly during the next 20 years. Restoration activities in the upper basin lakes will add 10,000 acre-feet of seasonal water storage by raising lake levels. This additional water will provide additional flow to simulate historic discharges to the valley. In addition, increased water level fluctuations in the lakes will more closely resemble historic conditions.

Kissimmee River and floodplain restoration involves management of two primary features – form and hydrology – to restore ecosystem integrity. Changes in form are required to restore natural river/floodplain interactions, including connectivity, continuity, and water level recession rates. A 22-mile segment of the channel will be filled, and 43 miles of river and 26,500 acres of floodplain will be restored during the next 10 years. These changes to the form of the river and floodplain will create conditions that are suitable for repopulation by native plant and animal communities, reestablishment of benthic invertebrates, improved distribution of fishes and enhanced use by birds.

The second aspect of restoration is to create hydrologic conditions that simulate the flow of a natural river. Filling of the dredged channel will increase flow and improve oxygen levels in the remaining oxbows. More water will be forced to flow across the floodplain, establish higher water levels, and ultimately support a natural river/floodplain ecosystem.

Finally, ongoing evaluation efforts will be used to demonstrate that observed responses are due to restoration efforts, document that these efforts are fiscally responsible, and determine better ways to manage the system. In addition, the evaluation program provides a basis to justify future construction and funding and to ensure that the people of South Florida receive the benefits they expect.