



Field Guide- North Mississippi Regional Park to the East River Flats Route

Welcome to the Mississippi National River and Recreation Area!

This field trip focuses on the student's connections to the Mississippi River. The river provides the water they drink, it has shaped events that built the city of Minneapolis, and it is home to a variety of wildlife. During the trip, please ask questions and encourage the students to make their own connections to the Mississippi River.

The following sights of interest are listed in the order of the paddle route:

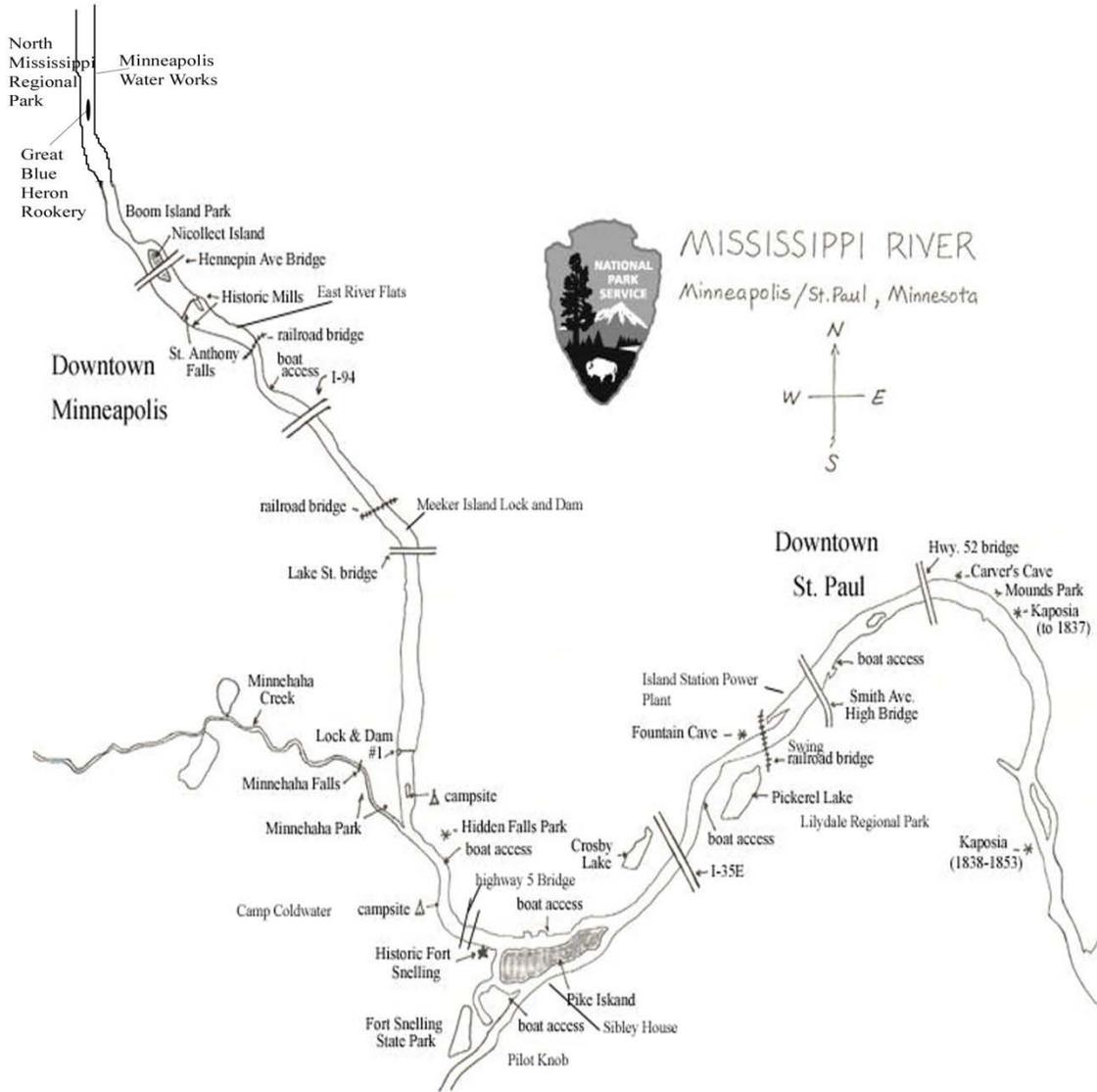
- ✂ Minneapolis Water Works
- ✂ Great Blue Heron Rookery
- ✂ Shingle Creek Mouth
- ✂ Upper Harbor Terminal
- ✂ Riverside Power Plant
- ✂ Northern Metal Recycling
- ✂ Old Grain Belt Brewery
- ✂ River Booms
- ✂ Storm Sewers
- ✂ Basset Creek Mouth
- ✂ Nicollet Island
- ✂ Hennepin Avenue Bridge
- ✂ Federal Reserve Bank Square
- ✂ Mill City Museum and the Milling District
- ✂ Saint Anthony Locks and Dams
- ✂ Stone Arch Bridge
- ✂ Bohemian Flats

The sight's locations are described based on the river mile markers (see picture on the right), which are found along the banks of the Mississippi River. The Army Corp of Engineers uses the markers as navigational tools. They measure the distance upstream from Cairo, Illinois.



Urban Wilderness Canoe Adventures (UWCA) Paddle Route Map

*note scale is not perfect and not all sites are listed!



Minneapolis Water Works

Location: River Mile 858.70 — Left Descending Bank (left bank, as you head downstream).

Description: Immediately across the river from North Mississippi Regional Park, you will see the large brick building with an intake area at the shoreline. This is the City of Minneapolis Water Works.



Facts: Here at the City of Minneapolis Water Works, about 28 billion gallons of water are pumped from the Mississippi River per year. The water is then treated through a disinfection, filtration, and sedimentation process. The clean water is delivered to Minneapolis and some surrounding cities for drinking water, sanitation, irrigation, and industrial purposes. Minneapolis consistently provides public water that meets higher standards than those set by local, state, and federal regulatory agencies.

Approximately one million people in the Twin Cities metro get their drinking water from the Mississippi River. Minneapolis Water Treatment & Distribution Services produces an average of 57 million gallons of clean water per day. That's enough water to fill Lake of the Isles in about four days.

If you live in any of these areas, then you can see exactly where your water is coming from at this site.

Source: http://fieldguide.fmr.org/site_detail.php?site_id=40, and City of Minneapolis water works page (<http://www.ci.minneapolis.mn.us/water/waterfacts.asp>)

Questions:

- ✂ How does the water works connect you to the Mississippi River?
- ✂ What are some ways we can protect our source of drinking water?

Great Blue Heron Rookery

Location: Island in the River at far end of the Park, less than .5 miles from the starting point.

Description: Look for Great Blue Herons flying to and from the rookery. They are large, blue-grey colored birds with long legs and necks. As you paddle by, you will see many heron nests in the trees, and hear sounds of their calls. NOTE: The rookery was destroyed in the May 2011 tornado. The herons will find new locations to build nests. The island downstream at the Riverside power plant has seen nest building activity.



Great Blue Herons nest in rookeries. These groupings of nests are built atop trees on islands, which helps the birds to avoid predators. Great Blue Herons nest in groups because there is security in having several pairs of sharp eyes and pointy bills available for defense.

Facts: The Great Blue Heron is among the tallest herons in North America. Its wingspan can be up to 6 feet wide. Because of its long legs and neck and its sharp, serrated beak, the Great Blue Heron is well suited for catching fish. A patient hunter, the

heron wades slowly in shallow water, where it finds crayfish, fish, small turtles, and frogs. The heron may also hunt for small animals and large insects on land.

Fun Fact: Many fish, such as perch and bluegills, are armed with sharp spines. To eat fish, blue herons turn their prey so it is swallowed head first. This depresses spines, usually located in the fins, against the fish's body and makes it less likely that the bird will be injured.

Source: NPS/miss site: <http://www.nps.gov/miss/naturescience/birdsgrea.htm>

Questions:

- ✂ How do birds connect you to the river?
- ✂ How does seeing birds make you feel?
- ✂ What can you do to help these birds?

Shingle Creek Mouth

Location: River Mile 857.90 — Right Descending Bank

Facts: Shingle Creek runs through the Camden Neighborhood in North Minneapolis. In 1910, Shingle Creek was straightened and classified as ditch #13. By 2004, the creek had lost almost all of its natural meandering quality. It is now classified as an impaired stream, which means that it does not meet state and federal standards for water quality.



The Shingle Creek Watershed Management Commission is now required to find out why and how the stream is so polluted. The watershed management district has been conducting studies and trying solutions. Salinification and run-off from city streets are some of the problems they have addressed. So far, the commission has held a conference and workshop about using less salt on the roads in the winter. They are experimenting with porous pavers, which drain rainwater to the river more

gradually. Source: http://henry.mpls.k12.mn.us/A_Political_and_Environmental_Study_of_Shingle_Creek.html

Questions:

- ✘ Has anyone ever played or hung out in a creek or stream? How did you feel?
- ✘ What do you think about streams becoming polluted/impaired?
- ✘ How can you help to improve the water in places like Shingle Creek?



Wilderness
Inquiry



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Upper Harbor Terminal

Location: River Mile 857.50-857.10 — Right Descending Bank

Facts: The Upper Harbor Terminal is the Port of Minneapolis. It is the northernmost point that the Army Corp of Engineers keeps open for navigation. The Army Corps of Engineers maintains at least a nine-foot channel in the river to this point. Many commodities may be present at this terminal, including grain, lumber, phosphate fertilizer, seed oil, steel, twine, paper, pipes, and salt. The igloo-shaped storage tanks are used for solids, and some tanks are insulated to keep products from freezing. The Upper Harbor Terminal is one of only four active barge facilities above the confluence of the Mississippi and Minnesota Rivers.



According to its “Above the Falls Master Plan” Minneapolis’ long-term plans for the property include converting the riverfront portion of the land to a new park, and redeveloping a portion of the land further from the river as housing.

Source: FMR Field Guide: http://fieldguide.fmr.org/site_detail.php?site_id=60

Questions:

- ✂ How are barges and other boat traffic connected to you? (You eat some of the food they carry, or live in buildings made from materials they carry.)
- ✂ How do you think the river has changed to allow navigation and boat travel?



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Riverside Power Plant

Location: River Mile 856.90 — Left Descending Bank

Facts: The Riverside Power Plant was originally built in 1911 and operated as a coal plant, by the Minneapolis General Electric Company. In 1916, Northern States Power Company took over ownership. Xcel energy now owns the plant, and in 2009, they switched from coal burning to natural gas energy. In the process, Xcel created a more efficient plant and reduced their emissions. This project reduced annual emissions from the site by around 99% of sulfur dioxide, 96% of nitric oxide and nitrogen dioxide, 86% of particulates, and 100% of mercury. Xcel changed their facility after legislation created incentives for conversion in 2001. This plant now produces about 439 megawatts of power, which is sufficient to power about 400,000 homes.

Source: FMR and Power Technology: http://www.power-technology.com/projects/riverside_chp/



Questions:

- ✂ How are you connected to the plant, and how is the plant connected to the river?
- ✂ Do you know anyone with asthma? (Discuss air quality issues, particularly from coal-powered plants and how this would make asthma worse.)
- ✂ What human actions affect what kind of power we use and how it is produced? (we were able to get clearer air quality largely due to political action---resulting from local activism)

Northern Metal Recycling

Location: River Mile 856.3 --- Right Descending Bank

Facts: This is usually a very noisy facility on a noisy stretch of river making a good site to know about. The Northern Metal Recycling Company owns and operates the site as a metal recycling plant, where scrap metal is broken down into smaller pieces and then shipped down river to metal re-furbishing plant. On this site they handle most grades of bulk quantity commercial, industrial and demolition metal scrap.



According to Northern Metal's website their "fully-enclosed metal shredder installation here is the environmentally cleanest in North America; adjoining barge loading facilities enable direct access to global commerce via the Mississippi River. The 11-acre paved yard surface is sloped away from the river and all stormwater is diverted into a network of catch basins. Collected water is stored in large underground tanks for treatment and eventual use by ongoing operations. There is no groundwater infiltration or run-off into the Mississippi." (<http://www.northernmetalrecycling.com/AmericanIronPage.html>)

There was significant controversy over installation of a giant scrap-iron grinding machine from Germany called the "Kondirator." The city council issued a special use permit for the Kondirator in 1990 but then the city ordered a halt to the shredder in 1991. Nine years of litigation followed, ending with a permit for the shredder and a city payment of \$8.75 million to the company (http://fieldguide.fmr.org/site_detail.php?site_id=71). Now the technology has changed and the Kondirator is no longer necessary but the cleaner environmental technology mentioned above resulted in part from the litigation.

Questions:

- ✂ Do any of the students recycle anything made of metal?
- ✂ What do they think about seeing a part of the metal recycling cycle?
- ✂ What do they think about the company's work to divert storm-water and groundwater from the Mississippi River?
- ✂ How is this different from what happens to most storm-water?
- ✂ Could the city, other companies, or their families could learn to deal with their storm-water better?

Old Grain Belt Brewery (Currently houses offices and the Pierre Bottineau branch of the Minneapolis Public Library)

Location: River Mile 855.50 — Left Descending Bank

Facts: The Gain Belt Brewery was built between 1891 and 1892. By 1890, there were over 100 breweries in the state. Beer brewing took off in the area because of the abundance of barley, and the traditions of the German settlers. The barrels used in the brewery were made from logs sent down the river.

*Fun Fact: The people who made the barrels were called Coopers. Are any of the student's last names Cooper?

The library here is named for Pierre Bottineau, who was a Métis (pronounced "may-tee"). Bottineau was a fur company scout, messenger, settler, and land speculator. He was also a translator between English, French, Dakota, Cree, Ojibwa, Mandan, and Winnebago languages. He knew the land very well. In fact, it was once said that, "The vast Northwest lay like a map in his brain."



The Métis people were a mix of French Canadian and Native American, usually Ojibway or Cree. They often served as go-betweens between Europeans and Native Americans. Further down the river is the vintage sign for Grain Belt Beer, a Minneapolis icon, which is clearly visible from the river.

Questions:

- ✂ How many languages can you speak?
- ✂ Can anyone speak more than one, two, or three languages? Bottineau could speak seven different languages, which gave him an advantage in his travels.

River Booms

Location: Historically, booms were located all along the upper river, particularly for the purposes of lumber transport. Today, they are most often found near construction sites.

Description: River booms are used to contain or direct anything that floats in water. Historically, they were used in the logging industry to direct logs into the proper lumber mill. Booms are now primarily used to direct or contain sediment and/or pollution.

Looking up the west bank of the Mississippi River, ca. 1890, MHS



Historical Facts: About a hundred years ago, logs were floated from Northern Minnesota to these booms near downtown Minneapolis, which directed the logs to the company that owned them. Each log was branded by company name. Men known as “log drivers”, walked out onto the logs, separated the logs into the correct boom, and kept them moving downriver. This was a very dangerous profession, as log drivers could easily become caught under the logs. The area we are

paddling through today would have been covered with logs during the 1890s. Lumbering was a significant part of the Minnesota economy and workforce from 1860-1910. In 1899, Minneapolis was the number one lumber-milling city in the nation.

Source: Anginson Historical Study, Ch. 7

Current Use: Booms are used during construction, particularly bridge construction. This is why we see yellow booms by the Lowery Avenue Bridge construction site. Recently, booms have also been used to contain the oil spill in the Gulf of Mexico.

Questions:

- ✂ How does logging on the river connect to your life?
- ✂ How and where do you see booms used today?



Storm Sewers

Location: Throughout the Park

Facts: Storm sewers bring water, and anything contained in the water, from our city streets into the river. Anything dropped on the street, yards, or parks of Minneapolis may end up in the river without any treatment. Much of the pollution in the river results from this non-point source pollution. Some examples of the pollutants which end up in the river are oil and grease, construction site sediment, bacteria from animal waste, excess lawn fertilizer and pesticides, and toxic metals (such as mercury and lead). A typical downtown city block produces about nine times more runoff than a wooded area of the same size, because of all of the hard (impervious) surfaces. Runoff from the streets is particularly noticeable after a rainstorm, when there is visible refuse in the river.

Questions:



- ✕ How do storm drains/sewers connect your life to the river?
- ✕ What can you do to help keep the river clean?

Basset Creek



Location: River Mile 854.60 — Left Descending Bank

Description: The second creek outlet into the river is found on your left, immediately after we pass the Plymouth Avenue Bridge. The creek is slightly upriver from Nicollet Island.

Facts: This creek travels above ground through Crystal, Golden Valley, and the Harrison and Bryn Mawr neighborhoods of Minneapolis. It also runs underground through most of the Downtown Minneapolis area. Over the last 150 years, Basset Creek has been used for industrial purposes such as logging, automotive fabrication, and machining. Today, there are new plans to restore and redevelop parts of Basset Creek.

Questions:

- ✂ How does this creek connect the people who live near it to the Mississippi?
- ✂ How does it smell around the creek?
- ✂ What can we do to help improve the water quality of streams like this one?

***Side note:** Many of the storm drains that direct water into the Mississippi are actually streams, which would have flown above ground before humans developed this area into a city. Storm water management was developed in urban areas to remove water from streets during flooding. Streams were sometimes put underground and straightened to drain water quickly into the river. Today, these old methods of water management are being replaced with solutions such as rain gardens and porous pavers which lead to better river-water quality. Some of the streams can be restored to their natural, above ground path. This can create a beautiful park area and improve water quality, but it is an expensive process.

On the next leg of our trip, we will enter the Saint Anthony Falls (SAF) historic district. This area is the former milling district, around which the city of Minneapolis grew up. Hydropower from the falls has created tremendous opportunity for wealth and many jobs here. In addition to this field trip, there are other wonderful learning activities to explore in this area. You and your class may enjoy taking a tour of the Mill City Museum, taking a walking tour across the Stone Arch Bridge, or doing “The Quest” (a scavenger hunt, information is available at www.nps.gov/miss)

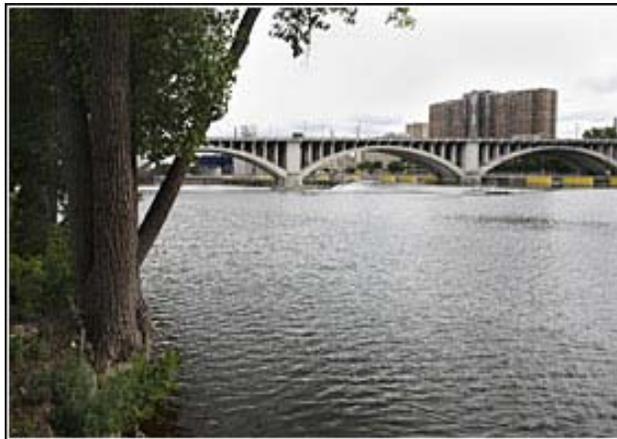
Nicollet Island

Location: River Mile 854.60-854.00

Facts: Nicollet Island is named for an explorer and scientist, who in 1838 saw the falls in their natural state. The falls would have been wild because the river originally contained many whitewater rapids. Chunks of fallen limestone in the river are evidence of the fall's geological recession upstream. The overall drop from the top of the falls to the end of the rapids (near the end of our trip) was around 75 feet. In 1848, Franklin Steele constructed the first dam in this area to power his sawmill on Nicollet Island.

Story of the Eastman Tunnel

Collapse: In 1865, William Eastman and John Merriam bought Nicollet Island and began construction of an ill-fated water race to power a sawmill, which was located on the island. They attempted to tunnel from Hennepin Island to



Nicollet Island, through soft sandstone. The sandstone tunnel eventually collapsed, and created a giant whirlpool (90 feet wide and 16.5 feet deep). The collapse of the tunnel threatened the integrity of the entire falls, and the milling industry around it because of the erosion it caused. The entire city of Minneapolis is said to have run out to look at the whirlpool. Many objects, including huge trees, were tossed into the whirlpool in an attempt to stop it. Nothing worked until the Army Corps of Engineers constructed an apron (covering) over the falls, which protected the sandstone from further erosion. Some of the sandstone rocks and evidence of the erosion can be seen at the edge of Hennepin Island. Source: http://www.nps.gov/miss/planyourvisit/nicollet_island.htm

Questions:

- ✂ Ask the students to imagine a giant whirlpool right near the island. What would the falls look like before the city was here?
- ✂ How does that compare to the way that it looks now?
- ✂ Has hydropower from the falls had an influence on where Downtown Minneapolis is located, and where you live now?

Hennepin Avenue Bridge

Location: River Mile 854.30 — Spans across the river.

Facts: The original Hennepin Avenue Bridge was the first bridge to span the Mississippi River. It was built in 1855 to carry passenger and cart traffic. Franklin Steele led the group of speculators who helped fund the bridge. It was first operated as a private toll bridge until it was purchased by Hennepin County in 1869. Throughout the history of Minneapolis, four different bridges have spanned the river here. The current bridge was built in 1990.

Source: FRM, www.nps.gov/miss

Questions:



- ✂ How do bridges connect you to the Mississippi River?
- ✂ How often do you cross the Mississippi on a bridge?
- ✂ What do you think life would have been like on the Mississippi before there were bridges?

Federal Reserve Bank Square (Former location of Union Railroad Depot and Gateway District)

Location: Right after Hennepin Bridge, River Mile 854.30 — Right Descending Bank

Facts: This area was once considered the “Gateway” into Minneapolis. Many people entered the city through train stations that were located nearby (Milwaukee Road at 3rd Ave and Washington and the Great Northern at West River Parkway and Hennepin Ave). Downtown Minneapolis was thriving and important aspects of city-life operated here. In addition to railroad stations, there were food markets, shops of all types, restaurants, offices, and government buildings. The area also housed a great number of saloons, brothels, and around the turn of the 20th century, the area developed a reputation as being wild and risqué.



The Great Northern Railroad Station was originally located where the U.S. Post Office stands today. In 1914 it was rebuilt on the west side of Hennepin Ave. (where the

Federal Reserve Bank is now located). Gateway Park and Pavilion and the U.S. Post Office were built in 1915. At the turn of the 20th century, the Gateway area had 109 liquor bars and saloons, 130 flophouses and hotels, and approximately 3,000 residents. Many residents were loggers from the north woods, gandy-dancers (railroad workers), and harvest hands. In the 1920s, thirty brothels and 300 prostitutes were tallied within 600 feet of 1st Avenue and Marquette. There were, however, many reputable businesses in the area and many beautiful buildings. Between 1957 and 1965, the City of Minneapolis leveled 17 blocks around the Gateway District, displacing 450 businesses and 3,000 residents. The Great Northern Depot was torn down in 1978, and the Federal Reserve Bank built in its place in the late 1990s. In the front walk area of the Federal Reserve Bank note the bronze medallions, inlaid bronze, and cut stone scenes of the history of this area.

Questions:

- ✂ What do students think about our changing attitudes towards this area?
- ✂ How has the use of land changed over time?

The Minneapolis Milling District and Mill City Museum

Location: River miles 854.5-853. The milling district was once located on both sides of the river. The Mill City Museum is on the right descending bank.



Facts: The availability of hydropower from Saint Anthony Falls is what enabled Minneapolis to grow and become a city. Before electricity, hydropower was used to run milling machinery, such as saws for lumber-milling and grinding wheels for flour milling. These industries grew larger, and by 1880, Minneapolis had become the flour milling capital of the country. Minneapolis remained the number one flour-milling city in the nation until 1930. Minneapolis was the lumber milling capital of the country from 1899-1905. Eventually, lumber moved towards steam-powered mills, creating energy by burning excess wood scraps, allowing this industry to move away from the falls. Earlier on this trip, we passed through the historic lumber milling district.

The flour milling technology developed in the Saint Anthony Falls mills changed the way the world ate by creating cheap, abundant, and high-quality wheat flour. This allowed food to be mass-produced, which resulted in products such as breakfast cereal. Today, Pillsbury and General Mills are giants in the world of processed foods, and they owe their early success to their mills here at St. Anthony Falls. The lower levels of many of the early mills are exposed at Mill Ruins Park.

Source: River of History, Anfinson, John.



Questions:

- ✂ How does the power of Saint Anthony Falls connect you to Minneapolis?
- ✂ Do you ever eat products that contain milled wheat, such as bread, cereal, or pasta?
- ✂ Do you recognize some of the names of the companies on the mills?

Mill Ruins Park

The Mississippi River Gorge Bluffs, Rock Layers, and Ravines

Location: Throughout river miles 854- 840 on the water



The Mississippi River Gorge

The Mississippi River Gorge in the Twin Cities area is the only true gorge along the entire Mississippi River. The gorge was formed as historic River Warren Falls migrated slowly upriver. Over thousands of years the falls receded upstream from downtown St. Paul to their current location where they became known as St. Anthony Falls. This was caused in part by the geological formations of the gorge; there are three distinct layers, sandstone on bottom, then shale, and limestone. The soft sandstone erodes faster than the limestone and shale. As the sandstone was eroded by the glacial waterfall, the support of the upper two layers eroded as well, eventually leading to the limestone and shale falling and crashing into the river. This created the gorge we see today. In some places you can see the different layers clearly and chunks of limestone that fell into the river.

Questions:

- ✂ What happened to rocks that broke off? Prior to the creation of locks and dams, would it have been easier for a boat to land in Minneapolis or St. Paul?
- ✂ How did Minneapolis businesses use St. Anthony Falls to their advantage beginning in the 1850's?
- ✂ Why are there the "Twin Cities" of Minneapolis and St. Paul?



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Facts:

(<http://www.fromsitetostory.org/sources/papers/mnarch48/48hist.asp>).

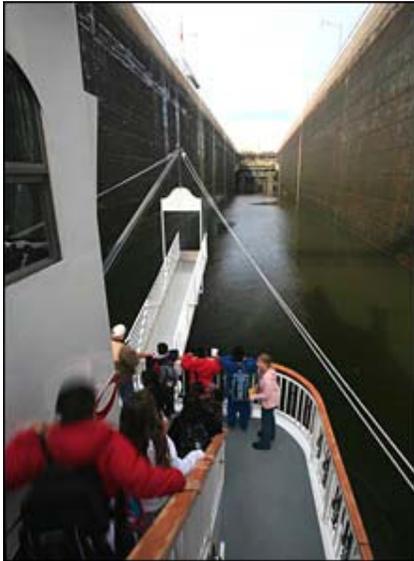
The twin cities are located in an area characterized by a depression filled with a series of sedimentary rocks overlain by a cap of recently deposited glacial drift. The upper three bedrock layers were deposited during the Ordovician period by a sea which covered most of the midwest about 500 million years ago. The lowest of these layers is the St. Peter sandstone, a very soft, white rock that is up to 155 feet thick. Above this is the Glenwood shale, a soft, grey layer which reaches depths of 16 feet southeast of Minneapolis, but is only a few feet thick in the vicinity of St. Anthony Falls. The uppermost rock layer is the Platteville limestone, a relatively hard formation that is 35 feet thick beneath much of Minneapolis, but rapidly thins and bevels upward to the north in the central riverfront area.

Melt-water from Lake Agassiz drained down the River Warren into the Mississippi River valley. Above St. Paul the river flowed on top of the Platteville Limestone, which resisted the river's erosive force. Below St. Paul, the River Warren intercepted a pre-glacial bedrock valley filled with outwash. The river's force was easily enough to erode this outwash. Once the outwash was eroded away, a giant falls plunged over the edge of the Platteville Limestone into the pre-glaciated valley, forming a giant falls, named River Warren Falls. The falls formed around 12,000 years ago and was larger than Niagara Falls. The retreat of the River Warren Falls was relatively rapid due to the immense volumes of water involved. When the waterfall reached the junction of the Mississippi and Minnesota Rivers at Fort Snelling about 10,000 years ago, the falls split and a waterfall went up each river. The Minnesota/Warren Falls proceeded another two miles upstream to Nine Mile Creek where the river once again flowed through an earlier channel so the limestone and, hence, the falls disappeared. The Mississippi River falls, St. Anthony Falls, continued to work its way upriver and had gone about eight miles when it was seen by Father Hennepin in 1680.

The Falls of St. Anthony were the reason Minneapolis was located where it is (water-power for milling) and those Falls were close to extinction when white settlement began. Over most of its retreat from Ft. Snelling, the Falls moved about four to five feet a year, but because the limestone cap thins in downtown Minneapolis and industrial activity increased the destruction of the cap, the rate rapidly accelerated there. The Mississippi Valley Lumberman (10/24/1876) estimated the Falls receded about 640 feet from 1852 to 1869, for an overall average of about 35.5 feet per year. The Falls actually receded over 100 feet per year just before the apron was erected in the 1860s. Since the limestone layer rises above the water level at the southern end of Nicollet Island, the Falls would be gone by now had it not been covered with a protective apron. This protective apron, is what gives the Falls the appearance they now have.

Saint Anthony Locks and Dams

Location: River Mile 854.1, right descending bank.



Facts: The dream of traveling north of St. Anthony Falls on the Mississippi River was made possible when Congress approved the Upper Minneapolis Harbor Development Project in 1937. This project included the construction of the Upper St. Anthony Falls Lock and Dam, and was completed in 1963.

With a lift of 49 feet, the lock at St. Anthony Falls accounts for more than 10% of height change on the river between the Twin Cities and St. Louis, MO. This is the largest drop on the Mississippi River. The Army Corps of Engineers operates an observatory on this site.

The Upper St. Anthony Falls Lock and Dam, along with the Lower St. Anthony Falls Lock and Dam (with a drop of 24 feet), allow navigation upstream four miles to the head of the Mississippi River's 9-foot channel. The system contains the remnants of the Mississippi River's only waterfall. There are 27 locks on the Mississippi River, all located between Minneapolis and Granite City, IL. The locks allow economical transportation of heavy materials. There is a clear economic advantage to transporting heavy items by barge vs. by truck. However, the environmental costs of the locks and dams Mississippi River are harder to quantify. Varying seasonal changes in water levels, once an important part of surrounding ecosystems, are now restricted by humans. Hundreds of islands that once populated the river are gone. As a result of these dramatic changes in habitat, some species of fish, mussels, plants and aquatic life, once common on the river, are now just a memory.

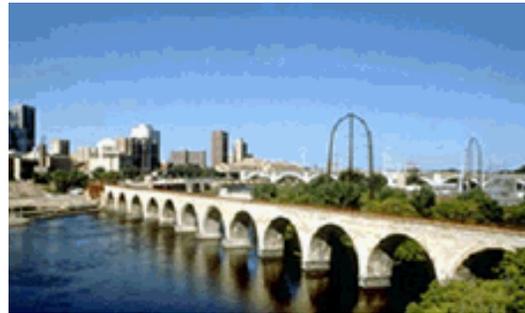
Questions:

- ✂ What do you think are the advantages of locks and dams like these? Who benefits from them?
- ✂ How do these benefits connect you to the river? What might be the disadvantages of locks and dams?

Stone Arch Bridge

Location: River mile 853.9, spans the river.

Facts: The Stone Arch Bridge was built in 1883. The construction workers who built this great structure were paid \$1.25 a day. The railroad baron James J Hill financed the project. Hill made his money transporting materials on rail routes, bringing wheat from the rural fields to the urban flour mills. The new bridge allowed for increased railroad traffic across the Mississippi. This one-of-a-kind landmark is made of native granite and limestone. It measures 2,176 feet by 28 feet, with 23 arches. It is the only stone arch bridge constructed over the Mississippi River.



The Stone Arch Bridge now serves as a pedestrian and bicycle bridge, connecting both sides of the historic Saint Anthony Falls district. It serves as a reminder of the past prevalence of railroads in the Minneapolis-Saint Paul area. It also serves as a reminder of the competition between two important modes of transportation: railroads and barge traffic. When the Upper St. Anthony Falls lock was built in the early 1960s, two of the arches were removed to make room for barges that use the lock.

Source: River of History, and Minneapolis City webpage, <http://www.ci.minneapolis.mn.us/about/stonearch.asp>

Questions:

- ✂ Has anyone walked or ridden a bicycle across the stone arch bridge?
- ✂ Can you imagine railroads crossing it?

Bohemian Flats (Former location of Cheever’s Ferry and Brewery Flats)

Location: River Mile 852.70-852.30 — Right Descending Bank

Facts: This area demonstrates changing land use and popular attitudes about riverfront property. Bohemian Flats has had many transformations over the years—as a settlement for poor immigrants, as an industrial area, and a park. Currently, the park stores the remains of the I-35W Bridge. The parts are being kept as evidence in case of a legal battle.

Historically, this area has been valued for its flat landing surface. The rocky rapids below St. Anthony Falls were once the northern-most navigable point for steamboats and shallow-draft vessels in high water. A ferry was located in this spot, near the Washington Avenue Bridge. A man named William Cheever ran the ferry across the river, starting in 1847. Breweries, and early immigrants used a terrace along the right descending bank. Terrace was known as Cheever's Landing, and later as Murphy's Landing. It also was known as "Brewery Flats", since two breweries were built into the cliffs at both ends.



Between the breweries, a community of poor immigrants, many of whom were from Bohemia, had settled on the floodplain; thus, the neighborhood was called "Bohemian Flats". By 1930, the city evicted the residents and turned the area into a barge terminal. Oil tankers and coal storage moved in.

In the Great Depression of the 1930s and 40s, the federal government funded the Works Progress Administration (WPA) to construct West River Parkway and retaining walls. Since this time, the Minneapolis

Park and Recreation Board have controlled the Bohemian Flats area. Debris from the collapsed 35W bridge was temporarily stored at this site through 2010.

Source: Anfinson, Scott 1989-90, FMR field guide, <http://www.tc.umn.edu/~buel0028/bohemianflats/eviction.html>

Questions:

- ✂ Are any students from families that are new to this area?
- ✂ Do they live in communities with others from their country or region of origin?
- ✂ Can you think of any current news events or situations in your own life that relate to what has happened in this area?

Field Guide- East River Flats to Hidden Falls Route Mississippi River Gorge Trip

Welcome to the Mississippi National River and Recreation Area!

This route travels through the Mississippi River Gorge, which was carved out by the recession of what were once giant waterfalls. The waterfall actually traveled from downtown St. Paul to modern day St. Anthony Falls. The recession of these falls are one of the natural features and forces we encounter. In addition to natural forces, we will also discuss the various ways that humans have impacted the river; for example, the storm sewers, the navigational channel and buoys, dams, bridges, and buildings along the gorge.

The following sights of interest are listed in order of the paddle route:

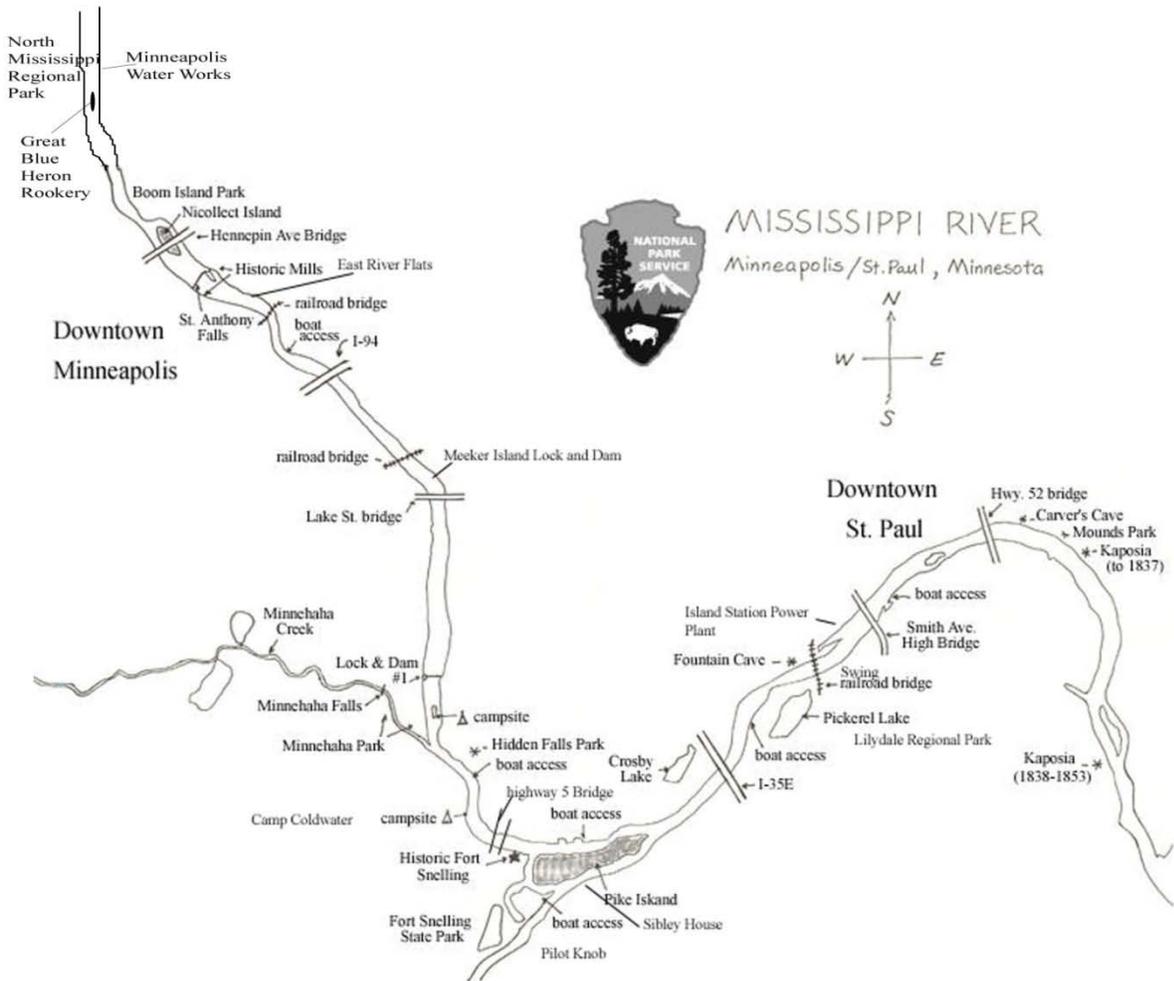
- ✂ Navigational Aids: Buoys and Day-markers
- ✂ East River Flats Catwalk
- ✂ Bluffs, Rock Layers, and Waterfalls
- ✂ Dartmouth Bridge (I-94)
- ✂ Cappelén Memorial (Franklin Avenue) Bridge
- ✂ Short Line Railroad Bridge
- ✂ Sand Flats and Dredged Sands
- ✂ Meeker Island Lock and Dam
- ✂ Storm Water Drain Outfalls
- ✂ Under-river Pipes
- ✂ Floodplain Forest
- ✂ Beaver-gnawed Trees
- ✂ Lock and Dam # 1
- ✂ Minnehaha Creek and Park
- ✂ Hidden Falls



Paddlers entering Hidden Falls Park

Urban Wilderness Canoe Adventures (UWCA) Paddle Route Map

*note scale is not perfect and not all sites are listed!



Navigational Aids: Buoys and Day-markers

Location: Found throughout the river

Buoys and Day-markers:

Buoys and day-markers act as traffic signals that guide watercraft operators safely along waterways. They also identify dangerous or controlled areas and give directions and information. These navigational aides are used in the U.S. Aids to Navigation System (ATON). The Mississippi River and its tributaries above Baton Rouge use a variation of ATON, called the Western Rivers Marking System.



Figure 1: A green "can" buoy

Colors and numbers on these navigational aides have the same meaning, regardless of the kind of buoy or marker on which they appear. Buoy shapes include "nun" (cone shaped, red, and with even numbers) and "can" (green, cylindrical, and with odd numbers). Red buoys mark

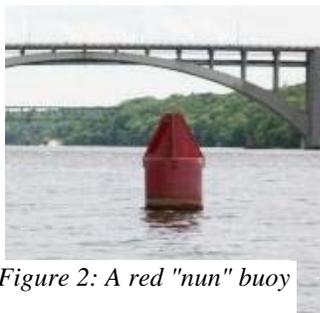


Figure 2: A red "nun" buoy

the edge of the channel on the starboard (right) side as you enter from open sea or head upstream. Green buoys mark the edge of the channel on your port (left) side as you enter from open sea or head upstream. Green buoys have odd numbers and red buoys have even numbers, which increase consecutively as you head upstream.

Day-marks have the same role as buoys. They are permanent signs attached to posts or other structures. Common day-

marks are red triangles (equivalent to nuns) and green squares (equivalent to cans). On the Mississippi River, day-marks are not numbered, but they have an attached mile marker board that indicates the river mileage upstream from Cairo, Illinois (the mouth of the Ohio River). When using these navigational aids on the Mississippi, remember this phrase as a reminder of the correct course when returning from open waters or heading downstream: "Red Right Returning."

(source: <http://www.takemefishing.org/boating/boating-basics/navigation/buoys-markers>,

http://files.dnr.state.mn.us/education_safety/safety/boatwater/miss_river_guide/mrg_boating_big_river.pdf).

Figure 3: A "day-marker"



Questions

- ✂ How did people navigate the river prior to buoys and daymarks?
- ✂ How did the invention of navigational aides assist in improving river commerce and recreation?

East River Flats Catwalk

Location: River Mile 851.6 to 852, left descending bank

The Catwalk:

East River Flats Park is part of the Minneapolis Park and Recreation Board. This park offers one of few opportunities within the urban portion of the Mississippi River Gorge to access and view the river from below the bluff line. The park is situated below 25-foot limestone bluffs, and lies upon relatively flat deposits on the inner side of a large bend in the river set just below the University of Minnesota. The catwalk was constructed to allow visitors to safely traverse a section of the river where erosion and rock slides made an older path unusable.



East River Flats Catwalk. Image from <http://www.johnweeks.net/bridges/pages/b18.html>

Questions:

- ✂ How does a catwalk or other similarly engineered structure provide easy access for visitors?
- ✂ What are some other methods for providing access to otherwise inaccessible areas?
- ✂ Do you think the construction of a catwalk or other engineered structure harms or minimizes human impact on an environment?

Facts:

The undeveloped areas of the Mississippi River Gorge have a number of trails running through them. The area under the Dartmouth Bridge is very narrow, and is prone to rock slides. When the Dartmouth Bridge was rebuilt, a rock slide made the existing path unusable. To fix the problem, the Minneapolis Parks Department had a prefabricated bridge installed to run along the river shore in 2008. This allows the trail to safely traverse the unstable area, and it makes the trail safe at high water (when there is almost no space between the rock face and the river). The catwalk, as it is called, runs from the East River Flats Park south to near the Cappelen Memorial Bridge at Franklin Avenue. It is accessible to both bikes and pedestrians.

(Source: <http://www.johnweeks.com/bridges/pages/b18.html>).

The Mississippi River Gorge: Bluffs, Rock Layers, and Waterfalls

Location: Throughout river miles 854-840, on the water

The Mississippi River Gorge:

The Mississippi River Gorge in the Twin Cities area is the only true gorge on the Mississippi River. The gorge was formed as historic River Warren Falls migrated slowly upriver. Over thousands of years, the falls receded upstream from what is now downtown St. Paul to their current location, where they became known as St. Anthony Falls.



This recession of the falls was caused in part by the geological formation of the gorge. There are three distinct layers of rock found around the river: sandstone on bottom, then shale, and limestone on top. Over time, the soft sandstone erodes faster than the limestone and shale. As the sandstone erodes, the support of the upper two layers breaks down, and eventually the limestone falls into the river. This collapse of rock created the gorge we see today. Along some of the bluffs you can see the different layers of sedimentary bedrock clearly. You might also spot boulders of limestone that fell into the river.

Questions:

- ✘ What happened to rocks that broke off?
- ✘ Prior to the creation of locks and dams, would it have been easier for a boat to land in Minneapolis or St. Paul?
- ✘ How did Minneapolis businesses use St. Anthony Falls to their advantage beginning in the 1850's?
- ✘ Why do we call Minneapolis and St. Paul the Twin Cities?

Facts: The Twin Cities are located in an area characterized by a depression filled with a series of sedimentary rocks, which is overlain by a cap of recently deposited glacial drift. The upper three bedrock layers were deposited during the Ordovician period by a sea which covered most of the Midwest about 500 million years ago. The lowest of these layers is St. Peter sandstone, a very soft, white rock that is up to 155 feet thick. Above this is Glenwood shale, a soft, gray layer which reaches depths of 16 feet southeast of Minneapolis, but is only a few feet thick in the vicinity of St. Anthony Falls. The uppermost rock layer is the Platteville limestone, a relatively hard formation that is 35

feet thick beneath much of Minneapolis, but it rapidly thins and bevels upward to the north in the central riverfront area.



Melt water from the glacial Lake Agassiz drained down the River Warren into the Mississippi River Valley. Above St. Paul, the river flowed on top of the Platteville Limestone, which resisted the river's erosive force. Below St. Paul, the River Warren intercepted a pre-glacial bedrock valley filled with outwash. The river's force was easily enough to erode this outwash. Once the outwash was eroded away, a giant falls plunged over the edge of the Platteville Limestone into the pre-glaciated valley, forming a giant falls called River Warren Falls. The falls formed around 12,000 years ago, and they were larger than Niagara Falls.

The retreat of the River Warren Falls was relatively rapid, which was due to the immense quantity of water that passed through. When the waterfall reached the junction of the Mississippi and Minnesota Rivers at Fort Snelling about 10,000 years ago, the falls split into two. The Minnesota Falls and Warren Falls proceeded another two miles upstream to Nine Mile Creek. Eventually, the limestone was eroded, and the falls continued to move upriver as they collapsed. The falls had shifted about eight miles when Father Hennepin saw them in 1680.

These falls were the reason the cities of Minneapolis and St. Paul were build in their current locations. St. Paul was located below the rapids created by the retreat of the waterfall, making it the head of navigation. Minneapolis began next to St. Anthony Falls in order to utilize the water power for milling. However, the falls were nearly depleted when European settlement began because of natural erosion. As the falls receded from the Fort Snelling Area to St. Anthony, they were decaying and becoming less powerful. *The Mississippi Valley Lumberman* (10/24/1876) estimated the Falls receded about 640 feet from 1852 to 1869, an overall average of about 35.5 feet per year. When the rate increased to 100 feet per year in 1860, businesses and residents in Minneapolis decided it would be best to preserve the remaining falls by reinforcing it with a concrete "apron." Had it not been reinforced, the St. Anthony Falls would not exist today. This protective apron is what gives the falls its uniform appearance.

(Source: <http://www.fromsitetostory.org/sources/papers/mnarch48/48hist.asp>)

Dartmouth Bridge (I-94 Mississippi River Crossing)

Location: River Mile 852.70, both sides

Dartmouth Bridge:

The Dartmouth Bridge (I94) is a box girder bridge that spans the Mississippi River in Minneapolis between the Cedar-Riverside area and the University of Minnesota Campus area. It was built in 1964. The bridge has a basic design when compared to other Mississippi River bridges in the vicinity, but it is very functional.



The Dartmouth Bridge carries more vehicles than any other bridge in the state (167,000 vehicles daily) on I-94 between downtown Minneapolis and Saint Paul. It was reconstructed in the mid-90s to add lanes and increase traffic capacity. This reconstruction was done without shutting the bridge down. This is quite a feat of engineering when you consider that this is the busiest highway bridge in the state of Minnesota, and the busiest highway bridge anywhere on the Mississippi River.

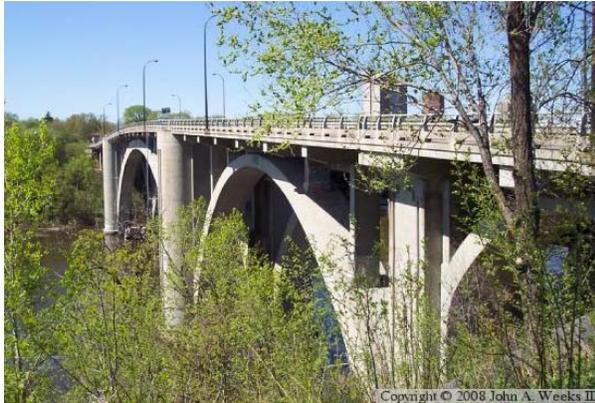
(From <http://www.johnweeks.com/bridges/pages/ms13.html>).

Questions:

Notice the different bridges we pass under today and think about the following questions:

- ✂ Which bridge do you like best?
- ✂ Which aspect of architecture is most important (structure, function, appearance, etc.), and why?
- ✂ What causes bridges to collapse?
- ✂ How do bridge designers design bridges to address traffic needs?

Cappelen Memorial (Franklin Avenue) Bridge



Franklin Bridge. From <http://www.johnweeks.com/bridges/pages/ms12.html>

Location: River Mile 851.50, both sides

Facts: The original Franklin Avenue Bridge was constructed in 1889 for pedestrians and wagons. The bridge was rebuilt between 1919 and 1923. When the bridge was completed in 1923, it featured the single longest concrete arch span in the world at 400 feet. It was refurbished and modernized between 1971 and 1973. The Cappelen Bridge was added to the National Register of Historic Places in 1989.

Frederick W. Cappelen is one of the great names from the golden age of bridge

building. As an engineer for the City of Minneapolis, Cappelen designed many of the monumental bridges from the early 20th century. He passed away during the construction of the Franklin Avenue Bridge, so it is named in his honor as a tribute.

The Cappelen Bridge saw little maintenance during its early life. But by 1970, the Cappelen Bridge was in such poor shape that it had to be closed down. The bridge was stripped down to its main arches and rebuilt from 1971 to 1973. Two pier remnants from the original 1889 bridge remain. Engineers calculated that the original bridge was overbuilt, and needed only half as many vertical supports. The horizontal stringers were built wider, and a 4-lane deck with wide sidewalks was installed. The bridge now looks more streamlined as a result.



Pier from original 1889 Franklin Ave. Bridge

Questions:

- ✘ Again, how do you feel passing under this bridge?
- ✘ What do you think of the design?
- ✘ In your opinion, which aspect of architecture is most important (structure, function, appearance, etc.) and why?
- ✘ How long should a bridge last?

Short Line Railroad Bridge



Location: River Mile 850.70, on both banks

Short Line Railroad Bridge:

This railroad bridge was built during a time of major railroad expansion (1879-1880). Instead of using rivers

for transportation, railroads were becoming the dominant method for moving people and goods. Railroads could be built virtually anywhere, and they were a fast mode of transport. Railroads were versatile serving both long and short distance transportation needs.

The bridge is located at the eastern end of the Midtown Greenway. Some people hope the bridge could someday serve as the river crossing for this route, but today it is still used for only for rail traffic.

Questions:

- ✂ What are some modes of transport that have replaced railroads?
- ✂ What advantages do railroads have over rivers when travelling? What about rivers over railroads?

Facts:

By the late 1870s, there was the need to make a shorter rail connection between Minneapolis and Saint Paul. Thus, the so-called "Short Line" was created. The Chicago, Milwaukee, and Saint Paul Railroad laid track for the Short Line to the river (roughly parallel to 27th Street) in the late 1870s, and the Short Line Bridge was completed in 1880. Fourteen stories tall and 1,000 feet long, it was one of the first bridges to span the river south of downtown. In 1901, the bridge was widened and rebuilt to accommodate 3 tracks. It carried both freight and passenger trains, such as the famous Olympian passenger train. Passenger rail service stopped in 1971, but several freight trains still use the bridge to service to the grain elevators on Hiawatha Avenue, their primary customers. The Canadian Pacific Railroad currently owns the bridge and rail corridor and leases it to the Minnesota Commercial Railroad.

(From FMR- http://fieldguide.fmr.org/site_detail.php?site_id=161)

Sand Flats and Dredged Sand

Location: River Mile 850.30, left descending bank, and 851.50, both sides

Facts: Sedimentation in the Mississippi River channel is caused by the normal cycle of silt movement, erosion from high water or heavy rains, and changes in river currents. This natural cycle of sedimentation has been altered by human activities. Agricultural and home fertilizers, urbanization, and the redirection of streams that feed into the river have added to the sediment and turbidity of the waters.



To maintain the 9-foot navigation channel for boats, excess material that settles in river bottom must be removed. Mechanical or hydraulic dredging are methods used for removal. The navigation channel is kept up for 243.6 miles on the Mississippi, and also on the St. Croix River, the Minnesota River, and Black River tributaries.

Dredged material is removed by the Army Corps of Engineers, and it is placed in designated areas

along the river. Some of these areas are “beneficial use” placement areas. Common beneficial uses of dredged material in the St. Paul District are upland habitat development, wetland creation, aquatic habitat enhancement, creation of areas for bird nesting, beach nourishment, winter road maintenance, levee repair and improvement, aggregate for concrete, lining fly ash pits, bank protection, and general purpose fill.

The navigation project is achieved primarily by a series of locks and dams. Channel maintenance consists of dredging, the use of channel control structures (wing dams, closing dams, and bank revetment), snag removal, accurate channel marking, and close monitoring of river conditions. Since 1985, 840,000 cubic yards are dredged annually (an Olympic sized swimming pool holds around 3,000 cubic yards) from 28 locations around St. Paul.

Questions:

- ✘ Does removing sand from the river pose environmental issues?
- ✘ How often does the river navigation channel need to be dredged?
- ✘ Are there locations on the river than need dredging more frequently than others?

Meeker Island Lock and Dam

Location: River Mile 850.30, left descending bank

Facts: By the early 1890s, the Army Corps of Engineers had devised a plan to build two low dams with locks, which would raise the level of the river sufficiently enough to make navigation to St. Anthony Falls possible. One dam would be near Meeker Island (just south of the Short Line railroad bridge), and the other was built near the mouth of Minnehaha Creek, which is known as Lock and Dam #1.

Construction on the Meeker Island Lock and Dam started in 1898, and took nearly a decade to finish. It was completed in 1907. This lock and dam operated for only 5 years before it was partially demolished. A new, high dam was completed to the south, and the the Meeker Dam was destroyed to regulate water levels. The old lock is still visible during low water on the St. Paul side, but the bear trap gates on the Minneapolis side of the River (once used to send logs down the river), have disappeared under the white sand dredge spoils that are deposited there.



Meeker Dam.

From <http://www.johnweeks.com/bridges/pages/meeker.html>

To avoid confusion with the current Lock & Dam #2 near Hastings, MN, the old Lock & Dam #2 is now generally called the Meeker Island Lock & Dam. Every so often, low water on the Mississippi River exposes part of the old lock structure. One such occasion was in August, 2007, following the I-35W bridge collapse, when the US Army Corps of Engineers drew down the Ford Dam pool by 2 feet to aid in the search and recovery operation.

(Source: <http://www.johnweeks.com/bridges/pages/meeker.html>).

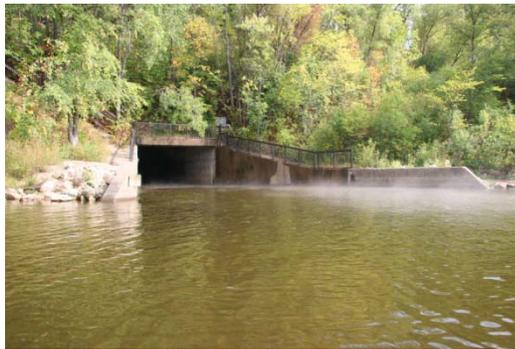
Questions

- ✂ How do locks and dams enable river traffic to navigate the river?
- ✂ What are some of the impacts a lock and dam system can have on a river's environment?
- ✂ Why are dams sometimes necessary?

Storm Water Drain Outfalls

Location: Throughout the gorge

Facts: Storm water originates from precipitation, snowmelt, or agricultural and home runoff. Storm water that does not soak into the ground becomes surface runoff, which flows directly into surface waterways or is channeled into storm sewers. This water eventually ends up in the rivers and lakes. Storm water is of concern for two main issues: volume and timing of runoff water, and water pollution. Storm water runoff flows



into storm drains through catch basins (storm drain inlets), which are located in city streets. Collected storm water runs through a series of tunnels that lead to the Mississippi River. The catch basins are critical to controlling runoff, so they should not be clogged, and nothing but storm water should be put into them. In Minneapolis, there are over 509 miles of storm drains and 12 miles of deep storm tunnels under the streets. In St. Paul, the city storm water system includes 450 miles of sewers.

Storm water runoff flows off hard surfaces such as roofs, driveways, parking lots, and streets and moves into storm drains. Examples of pollutants that collect on hard surfaces are oil and grease, construction site sediment, bacteria from animal waste, excess lawn fertilizer and pesticides, and toxic metals (such as mercury and lead). A typical downtown city block produces about nine times more runoff than a wooded area of the same size, because of all of the hard (impervious) surfaces. Rainwater washes the hard surfaces, and the runoff carries these pollutants directly to nearby streams, rivers, and lakes.



To prevent runoff, replace lawns with long grasses, shrubs, and trees. These plants absorb and filter water better than regular grass. Using porous pavers for streets and sidewalks also reduces the problem of runoff. Rain barrels are another method for catching runoff; the barrels save extra storm water for use in a garden.

Questions:

What do you think/feel when you see the storm sewer?

Do you care if the river becomes polluted, and why would you?

What are some easy steps to prevent pollution from entering the river?

How does pollution affect river life?

Once a river is contaminated, how can it be cleaned up?

Think back to our last big storm, did you see any streets that were flooded?

(Source: <http://www.ci.minneapolis.mn.us/stormwater/>, <http://www.stpaul.gov/index.aspx?nid=2686>).

Under-river Pipes and Pump Station

Location: River Mile 850.30, right descending bank, before the boathouse and after the sand flats



Facts: Around 1870, the earliest known sewers in the City of Minneapolis were constructed. Today, there are over 830 miles of sanitary sewers and 31 miles of sanitary main and interceptor tunnels under Minneapolis streets.

Over 100,000 buildings in Minneapolis create about 60 million gallons of wastewater per day. The water runs through the sewer system to the Metropolitan Council Environmental

Services (MCES) Pig's Eye sewage treatment plant in St. Paul. Fees paid to MCES go towards maintaining its regional collection system and the costs of wastewater treatment.

Sewers usually flow downhill, using gravity to move the wastewater along. Sewer mains often follow streams, which also flow downhill. The main tunnel from Minneapolis to MCES follows the Mississippi River. When gravity doesn't work, pump stations force the wastewater to a higher level, where gravity is able to take over again.

When the wastewater reaches MCES, several steps are taken to treat it. First, wastewater passes through a large iron grate to remove large items. After that, the solids are settled out, collected, and incinerated. Bacteria are used to remove organic materials and nutrients, after which the bacteria are settled out. Finally, phosphorus and nitrogen are removed, and a small amount of chlorine is added. After all of these steps, this water is safe for us to drink and use.



(source: <http://www.ci.minneapolis.mn.us/stormwater/>, <http://www2.metrocouncil.org/environment/WastewaterTreatment/Metro.htm>)

Pump Station just past the first sand flats on the route

Questions

- ✂ How does it smell around the sewer area?
- ✂ How does wastewater from my house get to the treatment plant?
- ✂ What other methods are available for treating wastewater?
- ✂ How does wastewater that enters the river affect the ecosystem?

Floodplain Forest

Location: Throughout the river

Facts: Floodplain forestland is valuable to the river. The vegetation and microorganisms that live in these forests serve as water absorbing and filtering systems. Instead of flowing directly to the river, the water is able to infiltrate into the soil. Infiltration is



improved because of the large root systems the vegetation provides. Most of the vegetation along the river has been lost, but the remaining floodplain forest continues to fulfill an important role in improving water quality. Water which enters the river from a floodplain forest is much cleaner than water from storm sewers because it has gone through this filtering process.

The ability of forests to produce clean water declines as they are depleted or reduced in size. Thus, the loss of forestland seriously impairs water flow and quality, ecological health and diversity, and some economic and recreational water use. The Upper Mississippi River watershed experienced rapid loss of forestland in the late 1800s through the early 1900s. Since then, deforestation is most common in high-growth areas. Trends in forest ownership show a continuing trend towards smaller tracts, which will likely have a negative impact on water quality.

Lowland deciduous forest habitats occur within floodplains like this one. Floodplain forests are seasonally wet forests; they flood in the spring after the snowmelt or after a heavy rain. These forests are found on sandy or silt-laden alluvium (fertile soil deposited by flowing water). These forested areas are an interface between terrestrial and aquatic ecosystems.

The canopy of floodplain forests are dominated by deciduous trees that are tolerant of saturated soils, prolonged inundation, frequent erosion, and sediment deposition. Less tolerant plants will grow on terraces, which flood only occasionally. In this area, silver maple, black willow, and cottonwood trees are the most dominant.

Source: <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/habitats/03.pdf>

Questions:

- ✂ Do you think there was more forest land before humans arrived?
- ✂ How do you think modern human land-uses, such as sewers and concrete have affected water quality?
- ✂ How can we work to improve water quality within the modern context?
- ✂ How does a forest “clean up” water and improve watershed health?
- ✂ Can a habitat be “restored” to its original condition?
- ✂ Why does the destruction of floodplain forest have an impact on birds?
- ✂ What are some ways to prevent destruction of floodplain forests?

Beaver-gnawed Trees

Location: Throughout the river

Facts: The Mississippi River Valley provides habitat for both aquatic and terrestrial animals. Mammals (including river otter, beaver and fox) are found in within the area. Evidence of the beaver (gnawed trees) can be seen throughout the river. Although humans have developed much of their natural habitat, beavers have adapted to change.



Beaver gnawed trees. From http://en.wikipedia.org/wiki/File:Beaver_signs.JPG

Beavers use their powerful front teeth to cut trees and plants for building and food. They are known for their “lodges,” their wooden homes found in rivers, ponds, and streams. They also build canals to float building materials that are difficult to haul over land. In the absence of ponds, beavers must construct dams before building their lodges. First they secure vertical poles. The beavers then fill the open spaces with horizontally placed branches. They close the gaps with weeds and mud until the dam impounds sufficient water to surround the lodge.

Beaver Life in The Winter

Beavers do not hibernate in winter. Instead, they store sticks and logs in a pile in their ponds. They eat the under-bark of the sticks until spring comes. Some of the pile stays above water and accumulates snow in the winter. This insulation often keeps the water from freezing around the food pile, which provides a location for beavers to breathe when outside of their lodge.

The beaver works as a keystone species in an ecosystem by creating wetlands that are used by many other species. Under their direction, a small stream flowing through a wooded valley will become a pond edged with second-growth forest. Eventually, if the beavers live there long enough, the pond will fill in with detritus and soil, becoming a fertile meadow. This activity is a direct consequence of the ecological niche that beavers occupy.

When startled or frightened, a swimming beaver will dive and slap the water with its broad tail. This sound is audible over great distances, and it serves as a warning to other beavers. Once a beaver has sounded the alarm, nearby beavers dive and may not reemerge for some time. Beavers are slow on land, but are good swimmers that can stay under water for as long as 15 minutes.

(Source: <http://www.gpnc.org/beaver.htm>, <http://en.wikipedia.org/wiki/Beaver>).

Questions

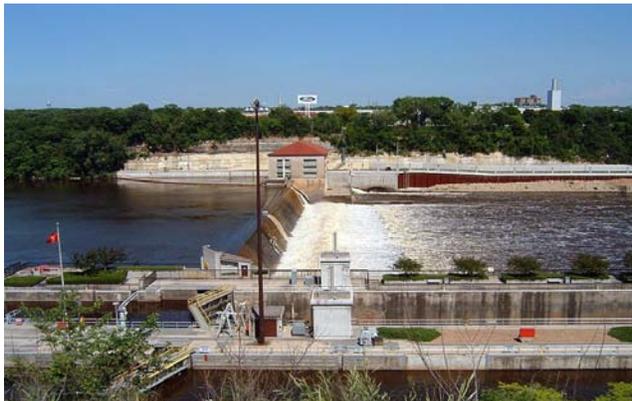
- ✘ Are there animals besides humans and beavers that modify the environment for their own purposes?
- ✘ What is a “keystone species?”
- ✘ Since beavers are so adapted to an aquatic lifestyle, are they able to climb trees to get their food? If not, how do they get it?
- ✘ Have people altered the population of beavers?



Lock and Dam #1

Location: River Mile 847.50, on the river

Facts: A 15-ton, iron turbine at the Ford Dam generated electricity from 1924 to 1994. Today, the dam continues to transform water power into electricity. Lock and Dam #1 was started in 1903. In 1910, Congress approved a new strategy, abandoning the low dams in favor of a high dam that would create electricity (a hydroelectric dam) and support navigation (a lock). Lock and Dam #1 was chosen as the spot for the high dam. When Lock and Dam #1 was completed in 1917, it was only used for navigation.



*Ford Lock and Dam. From
http://commons.wikimedia.org/wiki/File:Ford_lock_and_dam.jpg*

Congress did not fund a hydroelectric plant at the lock and dam, but they directed that some other entity develop the hydroelectric feature at some point. After Congress finally agreed on how these entities would operate hydroelectric dams, a user for the hydroelectric dam was sought. In the early 1920s, partially due to the prospect of cheap hydropower, St. Paul

successfully wooed the Ford Motor Company to open a new assembly plant near the lock and dam. Ford completed

the hydroelectric plant at the dam in 1924. The assembly plant opened in 1925. Originally constructed with only one lock, the facility was rebuilt in 1930-32 to include two 440-foot locks (although only one is in use today). The hydroelectric plant currently creates about 250,000 kilowatt hours per day of energy, about half of which goes to the Ford plant, and the rest is sold to Xcel Energy (Source: From FMR-
http://fieldguide.fmr.org/site_detail.php?site_id=173)

Questions

- ✘ How do locks and dams enable river traffic to navigate the river?
- ✘ What are some of the effects of a lock and dam system on a river's environment?
- ✘ Why are dams sometimes necessary?



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Minnehaha Creek and Park

Location: River Mile 847.10, right descending bank

Facts: Overlooking the Mississippi River, Minnehaha Park is one of Minneapolis' oldest and most popular parks. It attracts over 850,000 visitors annually. The park is located at the intersection of Hiawatha Avenue and Minnehaha Parkway. The 193-acre park features a 53-foot waterfall, limestone bluffs, and river overlooks. It contains oak, elm, silver maple, basswood, hackberry, and cottonwood trees, as well as native and prairie woodland wild flowers.

The park's location has been important to humans for centuries. The glen below the falls was said to echo with Dakota flute music as a favorite romantic courting ground. The romantic notion of the falls was popularized in 1855 by Henry Longfellow's poem "The Song of Hiawatha" (Longfellow never actually visited the site).



"The Song of Hiawatha" inspired thousands of tourists from the eastern US to visit the site. In 1889, the area was transformed into parkland. By 1912, the Longfellow Zoological Gardens on the west side of the park had 1,000 birds and animals, including baboons, bears, lions, camels, monkeys, mountain lions, ostriches, peacocks, porcupines, possums, sea lions, and wolves ("1912." p. 23). The zoo was run by Robert "Fish" Jones, a seafood dealer, who lived in a house he built to resemble the home of Henry W. Longfellow. The odors and noises of the zoo were unpopular with neighbors, but the zoo was a popular picnic destination. The house later contained a branch of the public library. From the river dogs and their humans can be seen enjoying the Minneapolis Parks dog park.

Questions:

- ✂ Have you ever visited Minnehaha Falls? Did you have fun?
- ✂ What do you think about the fact that people have been enjoying themselves at this place for hundreds of years?



Wilderness
Inquiry



MISSISSIPPI
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Hidden Falls Regional Park

Location: River Mile 845.4 to 847.6, Left Descending Bank

Facts: In Hidden Falls park, the disappearance of the river gorge is apparent in the evidence of the floodplain forest which is more common below the gorge. The river gorge starts to disappear as the Mississippi approaches its confluence with the Minnesota river. This park features tall cottonwoods in a floodplain forest, which is common below the gorge.

There is a good paved bike trail through the park, which connects up to the trails within Croby Farm Regional Park. There also are several hiking trails, one of which does go up to the 'hidden' falls. The falls are found in the North section of the park, and descend down the bluff face. They descend via a series of limestone steps. They are best viewed in the spring when there is more water flowing. The park is operated by St. Paul Parks and Recreation and includes a picnic pavilion, boat launch, and bathrooms.

Questions:

- ✂ Have you ever found the hidden falls here?
- ✂ Ask the students to look at the elevated tree roots of the cottonwood trees. Why are we able to see the roots above ground?
- ✂ Do you know how to get this park and other access points to the river? Try to let the students know that the river and the associated parkland runs through their city and belongs to them. It is open, free, and available to the public.