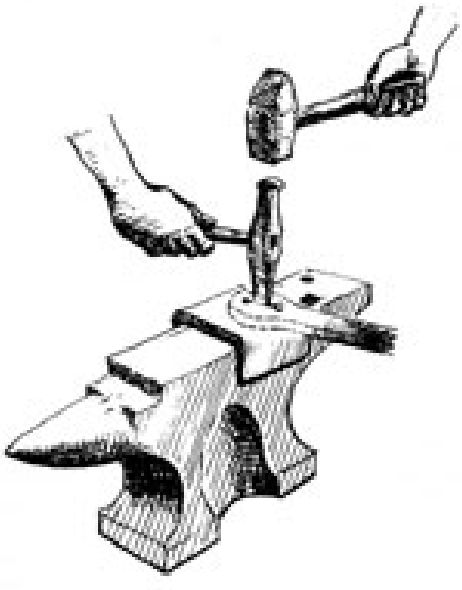
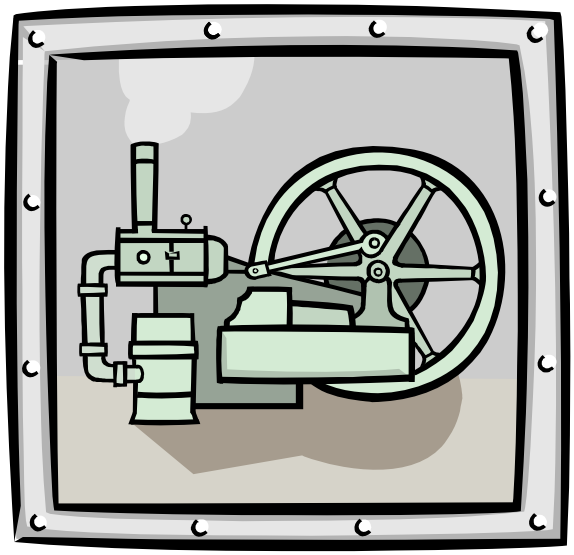
History Curriculum and Programs for the National Mississippi River Museum & Aquarium

- *Boat Building, Steam Power, and Rivet Toss*
- *Old Bones on the Sandbar*
- *Native American Tales*
- *American Indians of the Upper Mississippi River*
- *Steam Power and Steamboats*
- *Furs and Lead: The Life of a Voyageur Along the Mississippi River*
- *All Hands on Deck! Exploring the William M. Black*
- *From Frontier to Community*
- *Treasures of the Mississippi*

Boat Building, Steam Power, and Rivet Toss





National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	4th grade - high school
Key Words:	Boat Building, Riveting
Subject Areas:	History, Industrial Technology
Duration:	45 minutes - 1 hour

Title: ***Boat Building, Steam Power, and Rivet Toss***

Summary:

Participants will tour the boat building shop at the National Mississippi River Museum & Aquarium to see wooden boat building demonstrations and blacksmithing demonstrations (not usually with a hot forge unless it is a more in depth program). Students will be able to handle and try their skill by working with several of the hand tools in the shop. They will also see a model steam engine operate and have a chance to test their skill at tossing rivets the way boat builders did prior to gas and arc welders.

Objectives:

To learn about the boat building industry along the Mississippi River, and about the various techniques employed to construct both large and small watercraft. Construction techniques for both wood and metal boats will be discussed.

Group Size: 10- 25 people

Background for Educators:

During most of human history boats, canoes, and other watercraft were made of wood, and usually of hand collected natural materials. Some people used bark or hides covering a wooden frame to construct watercraft. Eventually wooden planks were used for boat construction and eventually metals such as copper and steel were used on boat hulls. In the twentieth century fiberglass plastic also became a very important boat building material.

Birch bark canoes are built from white cedar wood, spruce or pine roots, and the bark of the birch tree. This canoe was the sealed at the seams with pine tar mixed with charcoal and animal fat to waterproof the canoe.

Prior to the use of electric welders, most steel hulled boats were built of steel plates joined by rivets. Tossing red hot metal rivets was a very important skill in assembling steel plates used in the boat building industry. One man would heat the rivet in a forge and then this hot rivet would have to instantly be removed from the forge fire and be

hammered into place in holes joining the steel plates. To speed the process of getting the hot rivet to the riveter, the rivet was often tossed from the forge to the riveter who would catch this hot rivet in a metal cone. This hot rivet was then instantly fitted into the hole and the rivet fitter would hold the hot rivet in place while someone on the other side of the steel plate would hammer the hot rivet to form a head to hold the rivet in place, before it cooled.

Steam power became the most important means of powering large boats until the development of the internal combustion engine that used petroleum based fuels such as gas and diesel. A model steam engine will be used to demonstrate the workings of a simple steam engine and show the students how power can be used from heated water.

National Mississippi River and Aquarium Boat Shop Information

Purpose of the boat shop: to demonstrate boat building, historic artisan work, and the use of hand tools.

Boats displayed on top platform (from left as you are facing it):

1. Scull boat – powered by a sculling oar which is one oar located on the back of the boat. Used for duck hunting; made of wood and canvas. People would hide down in the boat. They would use the sculling oar to propel the boat forward to sneak up on ducks and then stand up and shoot them. The people who did this were market hunters: people who hunted as much as they could to sell them to meat markets, before they had limits on the number of ducks that could be taken.

2. Bull boat --- made of buffalo hides and willow branches. Mandan Indians of North Dakota built bull boats when they hunted and killed buffaloes. They would take the hide and stretch it over a round willow frame (like a big basket) and let it dry in the sun. They would then use these boats to cross back and forth across the Missouri River. Sometimes they also used these boats to carry their dried buffalo meat across, after having hunted on the other side of the river. There is a paddle inside of it. Usually one person would paddle in the front, alternating from side to side to keep it going forward.

3. "Grumman Sport Boat" – made of aluminum; it was used on the upper Mississippi Fish and Wildlife Refuge for banding ducks and wildlife census in the 1960's until about 1980.

4. Unfinished wood strip motor or fishing boat – never finished – older boat from an old boat shop.

5. Birch bark canoe built in about 1987 by Jack Minehart of cedar Falls, Iowa with help from museum staff.

Boats displayed on the ground floor:

1. Big boat in the back is called a bateau – was used by loggers when putting together log rafts, in maneuvering log rafts down the river, and to travel from the log raft to the shore and back.

2. Row boat under construction – made of pine – called a "wet boat." There are gaps in it when it is out of water. When it is put in water, the wood will swell. After the wood swells, it will stop any leaks.

3. A wood-strip frame that looks like half of a canoe – this is a bending form for canoe ribs that will be used to build canoes in the boat shop, such as birch bark or canvas-covered canoes. (The ribs will be steamed and then bent around this bending form.) The ribs and planking for birch bark canoes (some of which have already been made) are made from a white cedar log. The birch bark is the covering, with the inside of the bark on the outside of the canoe. The entire canoe is stitched together with roots from the black spruce tree, and all the materials come from the north woods (Minnesota, Wisconsin, Michigan and Canada). The hardest thing about building the canoe is harvesting the natural

materials. A "tar" or "caulk" to seal the seams is made of pine pitch, animal fat and charcoal. Some or all of this "caulking" may need to be renewed a couple of times a year, depending upon the amount of usage of the canoe.

4. Plywood sailboat under construction, in corner of the boat shop.

Tools in the boat shop:

As stated above, the purpose of the boat shop is to demonstrate boat building and the use of hand tools. We only have one electric grinding tool for sharpening the other tools.

1. Tools displayed on the east brick wall include:
   Saws and equipment used for logging on the right. On the left are tongs, hook, pike pole, and saws for ice harvesting.

2. Blacksmithing equipment:
   Forge and anvil that are used to make hardware for the log cabin on the museum grounds, for various tools, and for iron boat parts. The forge is a portable one so all blacksmithing is done outside (so wood chips from shaving don't catch on fire.)

3. Shaving bench – an important tool for making canoe ribs, spokes for wheels, new handles for tools, shingles. It is
   used with a draw knife or with a spoke shave. (If allowing kids to try something on the shaving bench, have them use the spoke shave as it is safer.)

4. Froe and wooden mallet – used to split log for shingles, or planking and ribs for canoes.

5. Tools used in building a birch bark canoe: froe and mallet for splitting logs; shaving bench and draw knife for
   making ribs and planking; steamer for bending ribs (this equipment will be set up just temporarily when needed); bone and steel awls for stitching canoe together.

Materials Needed:

Hand tools in the boat building shop such as planes, draw knives, spoke shave, drills, forge, tongs, hammers, clamps, and measuring devices, aprons, safety goggles or glasses, model steam engine.

Setup:

Prior to this session beginning the facilitator must open up all of the tool cases and entry gate, it is also important to get out the tools to be demonstrated and used by students, and make sure everything is set up for the steam engine (please refer to separate instructions below).

- Set out the rivet cup and tongs along with the wooden rivets
- clamp a board to be planed into the wood vise on the side of the workbench
- put a piece of wood to be shaved into the shaving bench for use with the spoke shave
- set up the brace and bit for students to try drilling into a wood scrap
- set out the three caulking chisels, oakum caulking fiber, wooden mallets, and caulking board on the work table
- set up and fill the steam engine with water, get out a fuel tablet to be lit for the demonstration
- set up the sailboat troughs and model sailboats

Procedure:

- Boatyard Plaza

Meet the students outside of the boat shop and take them down the steps near the Logsdon to look at the wooden hull. Ask them if they think the Logsdon would float if it was to be launched into the water. Point out all of the cracks and gaps in the wooden hull and explain how the wood would swell if it were to be but into water. Further explain how important it was to pack caulking into the cracks so that when the wood did expand it would seal the leak. There may be old caulking rags hanging from the bottom side of the Logsdon. While the students are in the Boatyard Plaza some of the boat building machinery can be pointed out as well as the boat launch.

- Woodward

Lead the student group to the Woodward Museum wing, just outside of the boat shop to view the diorama of the Ice Harbor showing the Sprague being launched. Show them some of the objects from the Sprague. Take a tour through the Woodward to view various wooden boats.

As you pass the steamboat area, a mention of wooden hulled steamboats can be made. Look at the clamming boat and the Rosalie pleasure boat. Mention how these wooden hulled boats would have to be hand caulked and sealed between the wooden seams on almost n annual basis, and often had to be bailed or pumped out regularly.

Stop at the metal plate just outside of the boat shop and discuss how metal hulled boats were built before welders were used. Point out the rivets and the plate of steel covering and riveted over the metal seam. Explain that metal hulled boats, ships, and barges used to be put together from large metal plates that were overlapped and hot riveted together through pre-drilled or punched holes. The *Titanic* was constructed in this fashion.

- Boat Shop

Upon entering the boat shop point out the various boats displayed and being constructed in the shop. Demonstrate and interpret the boat building process for canoes, bull boat, wooden boats, and metal hulled boats.

Light the fuel in the steam engine and let it begin heating the boiler in a safe place. Remind the students that there is a flame in the engine and not to touch it while it is heating. Put the toy firemen next to the steam engine as a reminder.

Allow students to handle and use some of the hand tools on scrap logs or wood, being careful to point out the sharp blades and discuss safety issues. Show the students the method of using the shaving bench with spoke shave, wood plane at the workbench, brace and bit at the workbench or short table, caulking mallets and chisels, and rivet toss. Allow each student to rotate individually or in small groups so that they can try all of these stations.

Show how tools are cared for and sharpened.

Show the forge, metal rivet, and rivet cup to catch red hot rivets. Allow the students to try their hand at throwing and catching a “hot” rivet (made of wood). The throwing can either be with a blacksmith tongs or a leather glove (originally asbestos). The hot rivet can be caught in a metal rivet cup and picked out of the cup with a blacksmith tongs.

Note: During special or extended programs students may be able to make a small project at the boat shop, such as a small wooden sail boat, bird house kit, or wooden toy.

When the steam engine is ready to operate call the students together at the workbench and demonstrate the steam engine. After the demonstration put the steam engine back in a safe place and allow the students to continue there hands-on activities in the boat shop.

Steam Engine instructions:

The model steam engine is made by Wilsco which is a German company. It actually operates by heating water in a small boiler to produce steam that can be used to turn a flywheel, operate a steam whistle, or power other model equipment. The fuel for the steam engine are called esbit tablets. One tablet should be sufficient for a short run of the engine, and two tablets will make the engine run for a fairly long time.

The steam engine should be set up and a fuel tablet made ready. It is very important to make sure all moving parts are oiled and that the water level in the boiler can be seen in the glass water level window. It is best to have the water level at least half way up on the window. If more water is required use distilled water if there is some available in the tool room.

When the students arrive in the boat shop, and after the initial explanation of the shop, the fuel tablet can be lit to heat the steam boiler. The steam engine is then put out of the way, in a safe place, until it is ready to run.

Note: The boat shop educator should be the only one to operate the steam engine as parts of it can be very hot and may cause a severe burn.

Additional equipment may be attached by pulley belts to the steam engine. Two possibilities are a man with a table saw that can be run by the steam, or a metal shear machine. Either one of these pieces of equipment may have been run by steam and later electricity in the Dubuque Boat and Boiler Works. Point out the large metal shears outside in the boatyard plaza that was used for cutting large metal plates for boat building.

The steam whistle should only be demonstrated after the engine has run for awhile and there is ample steam pressure built up. The use of the whistle will take away steam power and the engine will slow or stop. After the whistle is closed steam power will quickly build again. It is best to demonstrate the whistle with short bursts.

After the steam engine has been used allow the fuel capsule to burn out on its own, either under the boiler or taken out of the steam engine. The steam engine should be put into the back tool room to allow to cool and dry out before it is put away. It is best to remove the smoke stack to allow the inside to dry out.

All water should be dumped out of the boiler so that it does not leave a permanent residue on the water level glass. Wipe down the engine with a towel or rag to dry off the excess water.

Evaluation:

Evaluation sheet provided to the teacher, feedback from the teacher to the educator.

Additional resources:

Mississippi River Museum archives, copies of boat building plans or *WoodenBoat* magazine.

Extensions:

Build small sailboats out of supplied small wooden boat hulls, masts, and paper to cut out a sail for the student boats. The boats are then “sailed” in water-filled “canal” and powered by wind from the student. The boats can be timed to determine the boat race winner. Discussion can be done later on why some boats worked better than others (ie:

too large of sail, too small of sail, too much side wind, top heavy, mast mounted crooked, not heavy enough keel, etc. etc.)

Tour boats (*Logsdon* and *William M. Black*) that have been made from wood, steel, or fiberglass, and study the construction process.

Launch the museum boat into the Ice Harbor to experience what a n actual boat launch would have been like.

Watch some of the short movie segments in the second floor steamboat salon. This talks about the development of the steam boat and steamboating on the Mississippi River.

Watch for the hot rivet being tossed in the *River of Dreams* movie when the locks and dams are being built.

Credits:

Mark D. Wagner, Iowa State University Extension, Director of Education for the National Mississippi River Museum & Aquarium; Dubuque, Iowa

Old Bones on the Sandbar

(Not currently offered)

National Mississippi River Museum and Aquarium
History Education Curriculum

Target Grades:	3 - 8
Key Words:	archeology, paleontology,
Subject Areas:	science, archeology, and mapping
Duration:	45 minutes -1 hour

Title: ***Old Bones on the Sandbar***

Summary:

The students will excavate a buried bison skeleton from a sand pit. They will learn about archeological techniques, skeletal articulation, and skeletal anatomy. They will also learn more about the bison that inhabited Iowa's prairies. Upper grade classes may choose to measure bone locations while excavating. Archaeozoology is the study of animals in an archeological context.

Objectives:

Students will learn about bison through the use of correct procedures for performing an archeological dig. Students will identify the various bones of a large herbivore, and will note the function of some of these bones. Students will use measuring skills for locating and mapping bones in an excavation site.

Group Size: 5 - 25

Background for Educators:

During the Pleistocene period, a wide variety of large mammals roamed North America. Much of what is known about these animals and the time in which they lived comes from studying remains which would have been buried under just the right conditions and thus became preserved over thousands of years. In some remote areas such as Siberia, whole animals have been found washing out of the banks of the permafrost with skin and muscle tissue intact, and partially digested food still in the stomach. Many examples like these have contributed immensely to our knowledge about the diet of the animals and plants of that time. Although rare, there are remote instances when animal remains are found associated with Native Americans in ways such as kill or butcher sites where bones are unearthed with butcher marks and/or found with Paleo-Indian artifacts such

as that which occurred at the Cherokee Sewer Site near Cherokee, IA. These are exciting instances where the sciences of paleontology and archaeology become intermixed.

For thousands of years the American Bison lived and died along the rivers where they went to drink and graze or in the tall grass prairies on the river uplands. They died of disease, drowning, poisoning, and by being hunted by animal predators and humans. When a bison died on a riverbank or sandbar, scavengers would pick at the carcass until only bones were left remaining. These bones would be chewed on by small rodents like mice and gophers, and be weathered by the sun and rain. Eventually even the bones would decompose, unless they were buried and protected from the elements in nature.

Some of the bison that died near a stream or river got caught in quicksand or mud at a buffalo wallow or backwater marsh, were buried under water and mud. This would preserve the skeleton for a long time. If the bones were left undisturbed for thousands of years they would eventually be replaced by minerals in the process of fossilization. Along many river banks and gravel pits in the Mississippi River Valley bones of bison, mammoth, elk, giant beaver, and many other ice age animals are found each year. Some of these bones are partly mineralized, on their way to becoming fossils. Others are from more recent animals of only a few hundred years ago.

Native American men did most of the hunting. They made the stone spear points and other tools needed for a successful hunt. Some rocks were easier to use than others, and the men quickly learned which kinds were best. For example, if they first heated quartz or chert in a campfire, then it was easier to chip the spear points out of those rocks. Hunters used this method for thousands of years.

Many kinds of tools were used. Hunters chipped tiny notches into the wide end of their spear points so they could tie the points tightly to the spear shaft. A short weighted stick called a spear thrower, or atlatl, helped the hunters hurl their spears farther.

Thin bone tools with sharp points (called *awls)* were used to punch holes in animal skins. Then the skins were sewn together into clothing. Bones were also used for making needles, fish hooks, farming tools, spoons, and weapons.

The hunters and gatherers lived together in small bands. Children, parents, aunts, uncles, and grandparents traveled together from one campsite to another, looking for wild plants, berries, bison, deer, and many other wild foods. Their houses were probably skin tents that could be moved easily, or made of bark or reeds that could be made quickly. As the seasons changed, the bands moved to hickory or oak groves to gather nuts or to the open prairie to hunt bison.

Sometimes several bands might cooperate in hunting bison. Sometimes when a large bison herd was spotted near a river cliff or the steep bank of a creek, everyone lined up in a big "V." The people shouted and waved, scaring the herd into a stampede. The bison ran wild, over the edge of the cliff. The fall would kill them or injure them so they could not escape. By working together, the bands could butcher and skin many animals. Some of the meat was dried and saved for the winter, when it was harder to hunt in the cold.

The way of life of the hunters and gatherers along the Mississippi River lasted for more than 8,000 years. The people were very skillful in finding and using a rich variety of wild food. The flood plains along the rivers and the sheltered valleys in the prairie and

wooded hills were good places for small villages of about 50 people. The soil was fertile. There was plenty of water. Many trees grew along the river for firewood and building materials.

Women did the farming while the men hunted nearby. Small plots of sunflowers, beans, squash, and corn were planted. Hoes were made by tying bison shoulder blade bones to sticks or handles.

In the later period of Native Americans, people hunted with bows and arrows, the men hunted elk, deer, and bison. They fished with hooks made of bone and lures made of clamshells. Meat and vegetables were dried for winter.

Bones of bison and elk have been uncovered from some of the hunting and butchering sites below cliffs and high stream banks.

When an archeologist or archeozoologist excavates a buried site, they use special techniques and keep special records of their find. Depending on the age and ability of the class, the teacher may wish to use simple techniques for excavation, or detailed measuring, mapping, and archeological techniques of uncovering, removing, and re-articulating the bones from the site.

Materials Needed:

- Complete and cleaned bison skeleton.
- Sand pit about 8' to 10' in diameter and from 2' to 3' deep.
- small shovels, cement trowels, whisk brooms, spoons
- identification guide for bison or bovine bones
- metal tubs or wooden boxes for removing sand while digging
- plastic or canvass tarpaulin on which to re-articulate the bison skeleton

Procedure:

Divide the students into groups depending on the detail the class wishes to pursue. One group could begin the excavation, another group could be in charge of measuring, another group could map the site (including location and depth of each bone uncovered), and another group could clean and articulate the skeleton on a tarpaulin. At specified time intervals these groups could change roles to vary their experience.

The excavating crew should begin by carefully digging sand away from the excavation site and putting the loose sand into large containers that can be placed on the outside edge of the sand pit. When a bone is found it should be excavated very carefully with trowels, spoons, and whisk broom to fully uncover the bone in situ (where it is sitting). This activity will work best if the sand is a bit moist. If measuring and mapping are to be a part of this activity, the excavating team should move to another area within the site and dig for a new artifact (there may be several excavating teams working at the same time). The measuring crew can than measure the location and placement of the artifact from the edges of the sand pit. They can also hold a cord across the pit at grade level and measure from this cord to the artifact to get a depth location measurement. This

information can be given to the mapping crew who could plot the bone location on graph paper. The bone would then be removed and given to the re-assembly crew to be identified and re-articulated on the tarpaulin.

With younger classes perhaps only digging and re-articulation would be done. Other artifacts could be added like artificial spear, arrow, or knife projectile points.

After the skeleton has been somewhat put back together, the class can study the function of various bones, and learn a few simple names for some of the bones in the skeleton. This would also be a good time to discuss the adaptations of the bison for life on the prairie, or how Native Americans could use the meat, hide, and bones of a bison in their daily lives. If tool artifacts are a part of the site, the class can try to reconstruct the event that may have taken place at this site, such as hunting or butchering.

When the activity is completely finished, the students can re-bury the bones for another class. All of the containers of sand should also be put back into the excavation pit

Evaluation:

- teacher observation and interaction
- ability to articulate the excavated bison skeleton
- measuring and mapping results

Additional resources:

Brennan, Louis A.
1973 *Beginner's Guide to Archeology.* Dell Publishing Company, Inc. New York.

Morrison, Velma F.
1981 *Going on a Dig.* Dodd Mead and Company, New York. (for elementary students)

Extensions:

- map the location (depth and position) of each bone as it is excavated
- Try to figure out why certain bison bones are the shape they are, e.g., vertebrae with long dorsal extensions, two toes, no teeth on upper lip, short bone in part of the leg (canon bone).
- research and report on the bison or another prairie animal
- Bury an artifact used by Native Americans to hunt or butcher bison along with the bison skeleton. Reproduction projectile points can be obtained through various sources. One source is the University of Iowa Natural History Museum.

Credits:

Iowa Archeological Society
Dave Carlisle, Naturalist, Montgomery, Mills, Page, and Fremont County Conservation Boards.

Mark D. Wagner, Iowa State University Extension, Director of Education for the National Mississippi River Museum & Aquarium; Dubuque, Iowa

Native American Tales

National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	4th – 6th grade
Key Words:	Native Americans
Subject Areas:	Native Americans, storytelling
Duration:	45 minutes - 1 hour

Title: ***Native American Tales***

Summary:

Have you ever wondered why the fawn has spots or why some trees are always green? Native American cultures provide a treasure of stories of plants and animals, and the earth on which they thrive. Let's gather together to enjoy some of these traditional tales and create new ones along the way.

Objectives:

To explore the Native American storytelling culture and prompt the students to use language skills and creativity to write their own short stories.

Group Size: from 5 to roughly 30 maximum students

Background for Educators:

See *Keepers of the Night*, by Michael J. Caduto and Joseph Bruchac for background discussion:
Very few Native American tribes had written history. Instead, they had oral history told as stories. Stories were/are powerful tools used to teach and discipline in Native American cultures. Among many Native American cultures there were certain stories that were usually told at specific times of the year.

The way one would learn the stories was by listening to them over and over. For this activity you should try to practice the stories so you can tell them from memory to help bring the story to life. Do not to change the ending or combine stories together. The elements of a story create a whole, living being unto itself. Stories to many Native Americans are life; they help maintain the cultural integrity of the people and to keep the world in balance.

Once a storyteller is able to "see" a story and feel comfortable with its telling, you may find it helpful to have a way of recalling the story. The Haudenosaunee (Iroquois) storyteller or Hage'ota carried a bag of items that acted as mnemonic devices-each represented a story. The Hage'ota or perhaps a child for the audience would pull an item out of the bag, the item would be shown to the people and the story would begin.

In many Native American cultures, everyone was allowed to have a say and people listened with patience. People would sit in a circle during the time of storytelling because in a circle no person is at the head.

A good story cannot exist without a good listener. There are certain things which you, as a reader or teller, can do to help your listeners be more effective and involved. One devise is the use of "response words." Tell the listeners that whenever you say "Ho?" they are to respond with "Hey!" can also be used as pacing elements in the story or to make the listeners feel themselves entering the tale.

Materials Needed:

-Native American stories found in books, or photocopies, or potentially from memory
-Paper
-Pencils
-Mammal Furs, including but not limited to: beaver, deer, red fox, raccoon, coyote, skunk, otter, etc.
-turtle shells

Procedure:

Read and/or tell Native American stories intermingled with passing around visual aids. Successful pairing of stories with animal furs, turtle shells, teeth, claws, etc. brings the stories to life.

For students to have a part in telling the story, use the following approach: type up the story in a large, readable font, and in numbered fragments, such as sentence by sentence, to reach the desired number of students (give or take a few, as you can always help tell the tale and/or put teachers and chaperones to work too!). Cut the fragmented story into slips and distribute the slips in some way to the students, challenging them to arrange themselves in the proper order to them tell the story successfully. It works well to have this done with students in a circle, them scatter the slips on the floor in the middle of the circle and have each student grab one and use the numbered fragments to rearrange the circle for the story. When it is time for each student to contribute to the story's development, they should step into the middle of the circle, read his/her fragment, and then return to the circle to be active listeners.

If time allows, have students create their own Native American tales. This can be done individually or in pairs, and with their own story ideas or by developing themes/titles you provide. This activity can also be a take-home or often one to take back to the classroom. If time does not allow, this creative portion can be done as a group brainstorm with some impromptu storytelling on the student's behalf. In some cases, even getting up front and acting out a theme was a very successful part of this program.

Stories most often utilized include:
How the Fawn got its Spots
Turtle Races with Beaver
How Turtle Flew South for the Winter
Otter Gets Tricked
Why Some Trees are Always Green
The Coming of Corn

Evaluation:

Stories the students write on their own are collected and sent back to school with the teachers, who often read them and discuss as a follow-up to the program.

Additional resources:

Stories can be obtained from many sources, but the 'Keepers' series of books, by Michael J. Caduto and Joseph Bruchac, are excellent sources.

Extensions:

American Indians of the Upper Mississippi River

Credits:

Amber Majerus, National Mississippi River Museum & Aquarium; Dubuque, Iowa.
This curriculum segment was written through a Resource Enhancement and Protection Conservation Education Program Grant (REAP CEP), December 2007

American Indians of the Upper Mississippi River

National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	3rd - 8th
Key Words:	American Indians, Native Americans,
Subject Areas:	History and time periods of American Indians
Duration:	45 minutes

Title: ***American Indians of the Upper Mississippi River***

Summary:

Imagine a time before European settlers arrived when American Indian villages dotted the riverbanks and ceremonial and burial mounds could be seen on the river bluffs. During this presentation students will learn about the various time periods of the American Indians who lived along the Upper Mississippi River Valley. Various tools, foods, and life ways of the Upper Mississippi River American Indians will be discussed and some of the tools will be demonstrated to the students.

The various characteristics that anthropologists and archaeologists use to determine these various time periods will be highlighted.

Objectives:

To get an understanding of the people who first arrived in America, what brought them here, and how they lived from the resources that they found in the Mississippi River watershed and beyond.. Also to follow the progression of how American Indians adapted to the land they lived in, developed new tools and techniques, and lived off of the land where they lived.

Group Size: Any sized group, but ideally less than 40 students

Background for Educators:

American Indians or "Native Americans" were the first people to arrive in the Mississippi River watershed. Nothing is known about the names of various tribal

groups since there were no written histories, and only sketchy information is known about early cultures from tools and artifacts that have been found or excavated along the rivers and streams of the watershed.

Native Americans of the Upper Mississippi River Valley

Native Americans arrived along the Mississippi River between 10,000 and 12,000 years ago, as the last glacier melted. The first people to arrive probably hunted some of the ice age animals such as mammoths, bears, musk ox, giant bison and elk, and many animals that are now extinct or gone (extirpated) from this area. Many of the early hunters were nomadic and traveled to follow wild game and to find plants for food. These early people are known as Paleo Indians.

Eventually some of the Native Americans began farming crops such as corn, squash, pumpkins, and beans and since they tended their fields along with hunting game, they established more permanent villages. They also buried their dead near their villages, often in mounds. Some of the ceremonial mounds were built in the shapes of animals, with some the most famous being found at the Effigy Mounds National Monument near McGregor, Iowa..

As Settlers moved closer to the Mississippi River some of the Native American tribes moved in from other areas and pushed out people who were living there. When the explorers and settlers came they pushed out some of the Native Americans that had moved in to the area. When Julien Dubuque arrived in 1788, he made friends with the Native Americans living along the Mississippi as they were the people he traded with for furs that they trapped and lead that they mined. The Mesquaki (also known as Fox) were the people living in the Mississippi River Valley at that time and many names of streams, rivers, and local areas bear names from that time period. Names such as Sinsinawa, Maquoketa, Muscatine, Potosi, Peosta, Winona, Kickapoo, Wyalusing, Wisconsin, Illinois, and Iowa are only a few Native American names heard along the river.

Materials Needed:

American Indian study trunk at the National Mississippi River Museum & Aquarium including the following:

- Time line
- Pump drill
- Bone awl
- Corn grinding mortar and pestle
- Foods of corn, dried pumpkin, beans, and dried meat
- Projectile points
- atlatl
- Bow and arrows
- Flint knapping tools
- Red ochre (for paint)
- Feathers

- Birch bark
- Deer hide
-

Procedure:

Have the students sit in a comfortable area outside or in a quiet area (Otter Overlook or log cabin) away from distractions of other visitors, classes, moving animals, or noise from the river or railroad. Introduce the topic of American Indians discussing the various "correct" terminology used to label this ethnic group, such as Indians, Native Americans, First Americans, American Indians, or their various known tribal names such as Mesquaki, Ojibway, Winnebago (Ho-Chunk), Mandan, Ioway, Sioux, or other known names.

Try and dispel any myths such as: All Indians live in tepees, all projectile points are "arrow heads", American Indians hunted for all of their food, all were buffalo hunters, all wore buckskin clothing, all Native Americans were "savage" or warlike.

A potential outline for a program on American Indians could be like the following:

- Introduce the various names and terminology used to talk about American Indians (ie. Indians, savages, Native Americans, American Indians, first Americans)
- Talk about some of the concepts, myths, and mis-information that people have about American Indians (all live in tepees and rode horses)
- Use the time line to discuss various periods of American Indians and how these periods are determined by certain criteria and characteristics
- Discuss differences between the atlatl and bow and arrow, demonstrate how the atlatl would have been used
- Artifact recognition as to how it is used to determine age or time periods of various periods (replica or original projectile points and other tools)
- Various dwellings wickiup, tipi, earth lodge, bark long house, N.W. Coast cedar house, cliff dwellings, kiva
- Traditional American crops: corn, beans, wild rice, squash, pumpkins, peppers, melons, tomatoes, tobacco, potatoes, gourds
- Types of animals hunted in various parts of the country and during various time periods
- Burial types:
  - flatland burials
  - conical mounds or effigy mounds (bird=sky, bear=land, lizard=water)
- leatherwork and textiles
- fire starting fireboard and bow drill vs. flint and steel in later years
- flint knapping to produce tools
- hand drills - dowel drill and pump drill
- paints and dyes natural ochre colors and dyes from plants
- use of various tools - scrapers, knives, projectile points, grinding stone,
- rope making
- use of bone and antler (awls, hoes, fish hooks, needles, porcupine quill flattener)

American Indians
of the Upper Mississippi River Valley

Paleo Indians 10,000 or 12,000 B.C. ---- 6,000 B.C

Hunters and gatherers of the late Pleistocene (Ice Age), probably hunted mammoths, mastodons, giant ground sloths, bison, elk, musk ox, camels, and other large animals. Clovis and Folsom projectile points

Clovis projectile points

Archaic Indians 6,000 B.C. ---- 500 B.C.

Hunters of large prehistoric bison and elk Extensive use of atlatl spear thrower for hunting and warfare flexed burials Perhaps the beginning of agriculture in the late Archaic period

St. Charles "Dovetail" point

Woodland Indians 500 B.C. ----1000 A.D.

Conical burial mounds with burial offerings signifying organized religion. Grit tempered and cord impressed pottery. Small villages. Hunting with some agriculture.

1) Early Woodland Period 500 B.C. ------ 200 A.D.
agriculture introduced, first known use of pottery, burial mounds, use of atlatl spear thrower for hunting and warfare

2) Middle Woodland Period 200 A.D. ------ 500 A.D.
burial mounds, broad trading network, extensive use of pottery, use of atlatl spear thrower for hunting and warfare

3) Late Woodland Period 500 A.D. ------- 1000 A.D.
true arrow heads and use of bow, burial mounds and effigy ceremonial mounds

Post Woodland or Mississippian Indians 1000A.D. -------1600 A.D

Agriculture supplemented by hunting, small to medium sized villages, flatland burials (not mounds), elaborate shell tempered pottery

1) Nebraska Culture - Central Plains Tradition
2) Mill Creek Culture – Middle Missouri Tradition
3) Great Oasis Culture – Middle Missouri Tradition? Oneota Tradition

Cahokia Fish hook and true arrowhead from Cahokia

Ethno historic Indians 1600 A.D. -----1800 A.D

Siouan speakers west of the Mississippi River; influx of Algonquian speakers from east of the Mississippi River. Tribes are fairly well known from this period

Omaha, Oto, Ioway, (from Oneota) Mesquaki (Sac and Fox), Illinois, Ho-Chunk (Winnebago), Miami, Menominee from Wisconsin

Evaluation:

From comments and questions from students.

Additional resources:

Handbook of Native American Games, Allan and Paulette Macfarlan, Dover Press 1985.

Native American Crafts:

Schneider, Richard C., **Crafts of The North American Indians**, Van Nostrand Reinhold Company N.Y. 1972, 325 pages. (Excellent step by step instructions and illustrations on various Indian crafts such as tools, skin and leather work, beadwork, basketry and pottery.)

Hunt, Ben W., **The Complete How To Book of Indian Craft**, Collier Books - Macmillan Publishing Co., Inc. New York, 1973, 187 pages (This book shows a great variety of Indian crafts and contains excellent illustrations.)

Native American use of plants:

Densmore, Frances, **How Indians Use Wild Plants for Food, Medicine, and Crafts**, Dover Publications, Inc. New York, 1974, 118 pages.

Gilmore, Melvin R., **Uses of Plants by the Indians of the Missouri River Region**, University of Nebraska Press, 1977, 109 pages. (Interesting references to uses of wild and cultivated plants)

Native American artifacts:

Morrow, Toby, **Iowa Projectile Points**, University of Iowa Press, Special publication of the Office of the State Archeologist, 111 illustrations covering 100 projectile points.

Anthropology:

Kroeber, Theodora, **Ishi inTwo Worlds** (a biography of the last wild Indian in North America, University of California Press, Berkley, California, 1961, 255 pages. (Very interesting account of the last remaining Indian of a now extinct West Coast tribe)

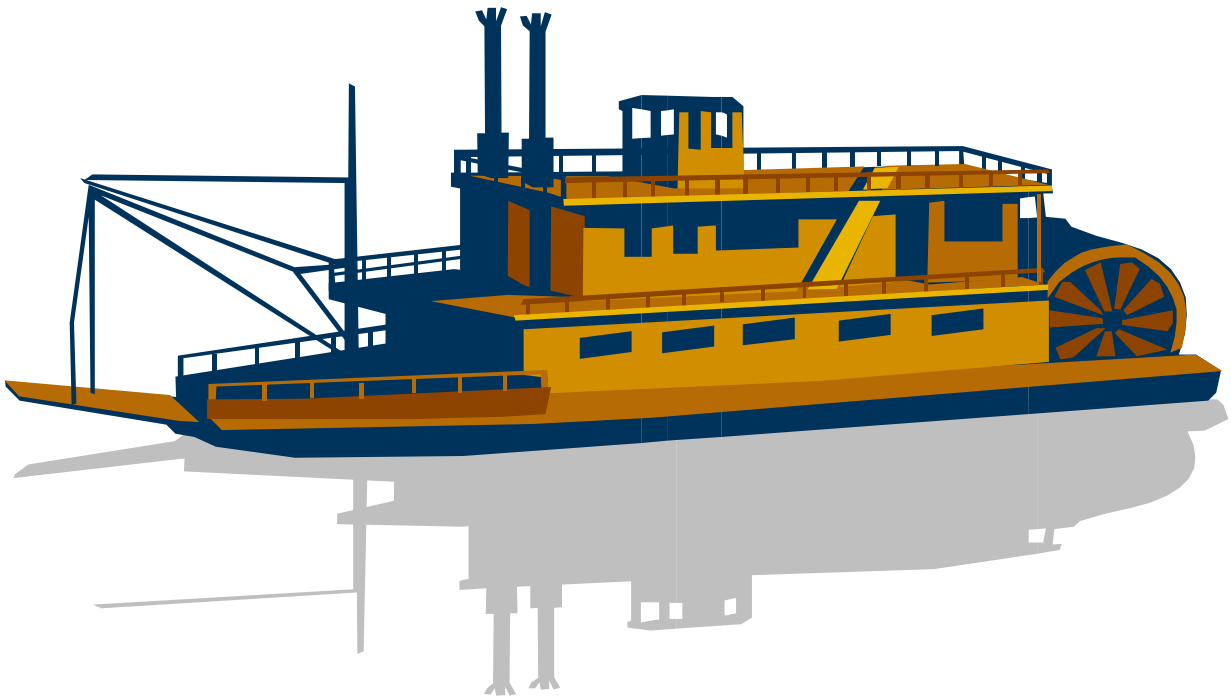
Hartman, Sheryl, **Indian Clothing of the Great Lakes: 1740 -1840**, Eagle's View Publishing.

Extensions:

Visit the Old Jail Museum in Dubuque to see the artifacts from the Hermann Collection.
Visit the wickiup in the wetland area of the National Mississippi River Museum & Aquarium, and perhaps help with the sewing of cattail mats if in the early fall of the year.
Visit the Effigy Mounds National Monument near McGregor, Iowa or other mounds located along the Upper Mississippi River such as Gramercy Park in East Dubuque, Ill., Bellevue State Park in Iowa, Little Maquoketa River Mounds near Dubuque**,**

Credits:
Mark D. Wagner, Director of Visitor Experience, Dubuque County Historical Society
Iowa Resource Enhancement and Protection, Conservation Education Program (REAP CEP) Grant
Iowa State Archaeological Society

Steam Power and Steamboats



National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	4th grade - adult
Key Words:	Steam Power, Steamboats
Subject Areas:	Steam power,
Duration:	45 minutes - 1 hour

Title: ***Steam Power and Steamboats***

Summary: Participants will study how steam power was used to propel steamboats and steam locomotives. A working model of a steam engine will be demonstrated and various steam boilers will be studied and interpreted. A tour of the William M. Black will be part of the program so that the parts of a full sized steam engine can be observed.

Objectives: To learn about steam engines and how steam engines were used in industry, railroads and steam boats.

Group Size: 15 - 25

Background for Educators:

Steam power was very important during the Industrial Revolution, and in fact helped to create the Industrial Revolution. Steam power could operate machinery and transportation equipment so effectively that it revolutionized the way people could travel and manufacture tools to change the way things had been done for millennium. Steam engines were used to power boats, trains, machine shops, blacksmith shops, water and oil pumps, and even some of the first automobiles.

Materials Needed:

Wilsco model steam engine, steam engine lubricant, distilled water, 2 Esbit fuel tablets all found in the boat shop storage area.

Procedure:

Steam Engine instructions:

The model steam engine is made by Wilsco which is a German company. It actually operates by heating water in a small boiler to produce steam that can be used to turn a flywheel, operate a steam whistle, or power other model equipment. The fuel for the steam engine are called esbit tablets. One tablet should be sufficient for a short run of the engine, and two tablets will make the engine run for a fairly long time.

The steam engine should be set up and a fuel tablet made ready. It is very important to make sure all moving parts are oiled and that the water level in the boiler can be seen in the glass water level window. It is best to have the water level at least half way up on the window. If more water is required use distilled water if there is some available in the tool room.

When the students arrive in the boat shop, and after the initial explanation of the shop, the fuel tablet can be lit to heat the steam boiler. The steam engine is then put out of the way, in a safe place, until it is ready to run.

Note: The demonstrating educator should be the only one to operate the steam engine as parts of it can be very hot and may cause a severe burn.

Additional equipment may be attached by pulley belts to the steam engine. Two possibilities are a man with a table saw that can be run by the steam, or a metal shear machine. Either one of these pieces of equipment may have been run by steam and later electricity in the Dubuque Boat and Boiler Works. Point out the large metal shears outside in the boatyard plaza that was used for cutting large metal plates for boat building.

The steam whistle should only be demonstrated after the engine has run for awhile and there is ample steam pressure built up. The use of the whistle will diminish steam power and the engine will slow or stop. After the whistle is closed steam power will quickly build again, as long as there is adequate fuel still burning. It is best to demonstrate the whistle with short bursts.

After the steam engine has been used allow the fuel capsule to burn out on its own, either under the boiler or taken out of the steam engine. The steam engine should be put into the back tool room to allow to cool and dry out before it is put away. It is best to remove the smoke stack to allow the inside to dry out.

All water should be dumped out of the boiler so that it does not leave a permanent residue on the water level glass. Wipe down the engine with a towel or rag to dry off the excess water.

Evaluation:

Additional resources:

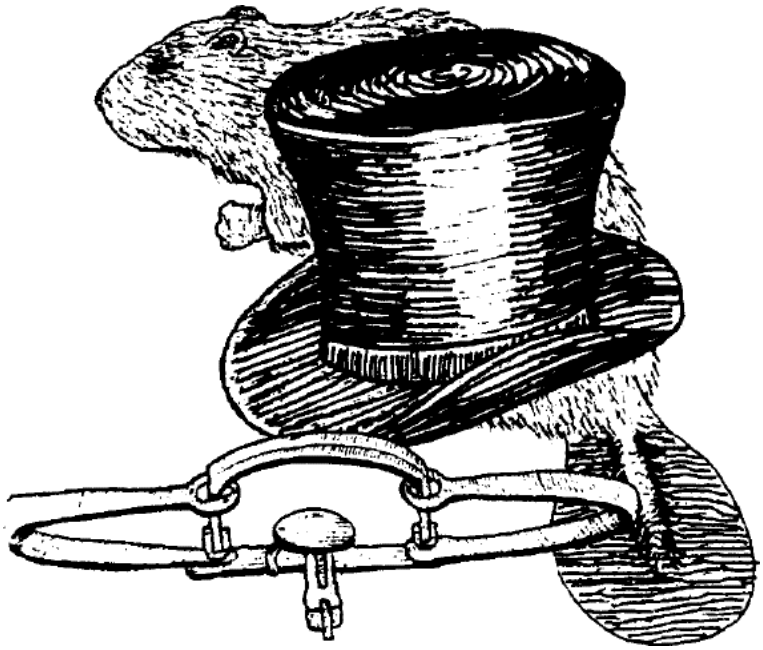
Extensions:

Credits:

Mark D. Wagner, Iowa State University Extension, Director of Education for the National Mississippi River Museum & Aquarium; Dubuque, Iowa.

This curriculum segment was written through a Resource Enhancement and Protection Conservation Education Program Grant (REAP CEP), December 2007

Furs and Lead:
The Life of a Voyageur Along the Mississippi River



National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	2nd grade - adult
Key Words:	fur trade, fur bearer, trade goods, voyageur, American Indians, birch bark canoe, tump Line, flintlock trade gun
Subject Areas:	history, social studies
Duration:	45 minutes – 1 hour

Title: ***Furs and Lead: The Life of a Voyageur Along the Mississippi River***

Summary:

This program concentrates on exploration along the upper Mississippi River Valley by Europeans and later Americans, in their search for a water route across the continent and the riches that may by found along their search. Early explorers were hoping to find gold, but what they did find was an abundance of animal furs and lead ore. There was also competition between the great European powers of England, France, and Spain, and later America to control this great waterway and the wealth it held.

This program highlights the French fur trade period around the time of Julien Dubuque, for whom the City of Dubuque is named. Julien Dubuque arrived in the present day Dubuque area in 1788 to trade furs and lead with the local Mesquakie Indian tribe. He died in 1810 and is buried in a grave prominently seen downriver from Dubuque, on a bluff top overlooking the Mississippi River.

Objectives:

The objectives of this program is to give the participants a background in the exploration, control of trade, relationships between American Indian tribes and European descended traders and voyageurs. This program gives the students an introduction to the clothing, food, river transportation, furs, beaver felt hats, and way of life of the voyageurs and traders.

Group Size: Any sized group

Background for Educators:
The French fur trading period is very important along the Mississippi River Valley. Marquette and Joliet were two French Canadians who were sent by France to search for the great river that was known only from accounts told by the American Indians who visited and traded in the Green Bay area. In the search for a water route from the Atlantic to the pacific, Marquette and Joliet encountered the Mississippi River in 1673 with the guidance from American Indian guides. Later in the 1680's, LaSalle claimed

the entire Mississippi River and its watershed for France, by planting a flag at the mouth of the Mississippi River in or near the Gulf of Mexico.

This claim became known as New France until the time of the French and Indian Wars, when England won the war. Rather than give up its claim of New France to England, France ceded the land to Spain. When Julien Dubuque arrived to trade furs and mine lead in 1788, Spain was in possession of the land on the west side of the river, around Dubuque. Julien Dubuque wrote a letter to the Spanish governor requesting an easement to mine the lead in Spanish claimed territory. He called his lead claim the Mines of Spain, which is now the name given to an Iowa State recreation area and park by that name.

The fur trade period along the Mississippi River started in the late 1600's and continued for the next 150 years until around 1840. The primary furs were that of beaver and otter, but also sought after were furs of marten, muskrat, fox, raccoon, bear, and deer hides. After trapping the beaver, the fur was skinned off of the animal and all meat and fat was scraped off. The raw fur was then stretched onto a willow sapling hoop until it was dried into a "blanket" or oval shaped pelt, called a pleut in French. The finished fur or "made beaver" was the exchange value during the fur trade period.
The fur trade blanket has four lines woven into one corner which represents the trade price of four beaver pelts.

The main use for the beaver pelt was to use the fur for making beaver felt that was then shaped into hats that were very much in style in Europe and the colonies. These hats were very expensive and took a lot of work to make. Many of the hat makers, termed hatters, went crazy due to the use of mercury in the process. Hatters absorbed mercury through their skin and often died early and were termed "mad hatters" as it destroyed their brains.

Beaver pelts were traded by the American Indians for things that they could not make themselves from materials such as metal and glass that they did not yet know how to manufacture into items. Examples of sought after trade goods were brass buckets, tomahawks, guns, traps, beads, blankets, knives, arrowheads, tools, gunpowder, alcoholic drinks, bottles, metal jewelry, cloth, needles, fish hooks, and a large variety of other items that were common in Europe and early settlements of America. Most of these trade goods arrived in large birch bark canoes, and the furs were taken to the factory or trading house in these canoes.

The fur trade was strictly controlled by governments and fur trading companies. Fur trading companies were organized and fur trade posts, called factories, were established at Mackinac and Green Bay on the Great Lakes and Prairie Du Chien on the Mississippi River. The men who worked for the fur trading companies were predominantly French or French Indian mix. Head traders were known as bourgeois (boosh-wa, a French word meaning "boss"), assistant traders were called "commis" (kom-mi), and the skilled canoe men were called "voyageurs" (voy-a-jers). The voyageurs ate very simple meals of dried peas, corn, pemmican (dried and pounded meat), salt pork,(fat or lard), and hard crackers or biscuits.

For over q hundred years these fur companies were operated by French (1680-1761). Later the English established companies (1763-1816) and after the Louisiana Purchase of 1803 the Americans established fur trading companies along the Mississippi River. Following the War of 1812, the United States government established control over the Mississippi River trade, and St. Louis became the leading fur trade center. French fur traders continued to be employed by AMERICAN COMPANIES. (1816-1850).

Trade Values

Trade Item	Beaver Skins
1 trade gun	10 – 12 beaver pelts
1 trap	5
1 Ax	2
12 rings	1
1 small tin kettle	3
1 large brass kettle	7
18 flints	1
1 pound of musket balls (14)	1
1 carrot of tobacco	5
1 two gallons of cheap (diluted) rum	5
1 medium sized silver Cross of Lorraine (two cross arms)	1
25 needles	1
12 awls	1
12 fire steels	2
4 large knives	1
1 package white beads	4
1 four point blanket	4
1 yard of Calico cloth	1
2 yards of scarlet cloth	6
1 yard of ribbon	½
1 iron spear head	½
1 fifteen foot birch bark canoe	10

Materials Needed:

- Fur trade trunk (containing trade goods, tanned beaver pelt, iron trap, brass kettle, glass beads, tomahawk, trade jewelry, leather tump line, and other props)
- Stretched beaver pelt
- Canoe paddle
- Flintlock trade gun and shooting pouch with powder horn
- Costumes of the French fur trade period
- Beaver felt hat

Procedure:

Set up all of the props for the fur trade program prior to the class arrival. Items should be taken from the trunk and set up on a cart or table using the fur trade blanket as a base cover on which to set up all of the other fur trade artifacts.

If possible dress in costume of the period and set the stage for the program by speaking some French or speaking in first person about the fur trade of the 1780's period. If not in costume perhaps have some of the students model some of the period clothing during the presentation.

Talk about the clothing of the period including straight last buckle shoes, breeches, men's stockings, long linen shirt, vest over the shirt, and most importantly the beaver hat. Originally three cornered and eventually top hat or "stove pipe" design.

Show trade goods and tell how the beaver was trapped and the hide dressed to be traded. Show some of the trade items and mention the value equivalents from trade goods to furs.

Talk about the transportation of both furs and trade goods by birch bark canoe and the leather tump line. Demonstrate the tump line, or portaging harness, with the help of a student volunteer.

Demonstrate the flintlock trade gun being sure to stress gun safety and safe handling of guns and gunpowder.

Sing a French voyageur song with the class if possible. The song Alouette is below.

The following song is a French song sung by voyageurs while paddling their canoes and is probably over 300 years old.

Alouette

CHORUS- Alouette, gentille alouette, Alouette, je t'y plumerai

1. Je t'y plumerai la tête (2times)
   Et la tête, *Et la tête* Alouette, *Alouette* CHORUS

2. Je t'y plumerai les yeux (2 times)
   Et les yeux, *Et les yeux,* Et la tête, *Et la tête* , Alouette, *Alouette* CHORUS

3. Je t'y plumerai le bec (2 times)
   Et le bec, *Et le bec,* Et les yeux, *Et les yeux,* Et la tête, *Et la tête* ,
   Alouette, *Alouette* CHORUS

4. Je t'y plumerai le dos (2 times)
   Et le dos, *Et le dos,* Et le bec, *Et le bec,* Et les yeux, *Et les yeux,*
   Et la tête, *Et la tête* , Alouette, *Alouette* CHORUS

5. Je t'y plumerai le cou (2 times)
   Et la cou, *Et la cou,* Et le dos, *Et le dos,* Et le bec, *Et le bec,*
   Et les yeux, *Et les yeux,* Et la tête, *Et la tête* , Alouette, *Alouette* CHORUS

Oh--Alouette, gentille alouette, Alouette, je t'y plumerai

(translation : CHORUS - Alouette, gentle Alouette Allouette, I'm going to pluck your feathers out

tete - head, les yeux – eyes, le bec – beak, le dos – back, la cou – neck)

Evaluation:

Additional resources: ***Where Two Worlds Meet,*** Minnesota Historical Society

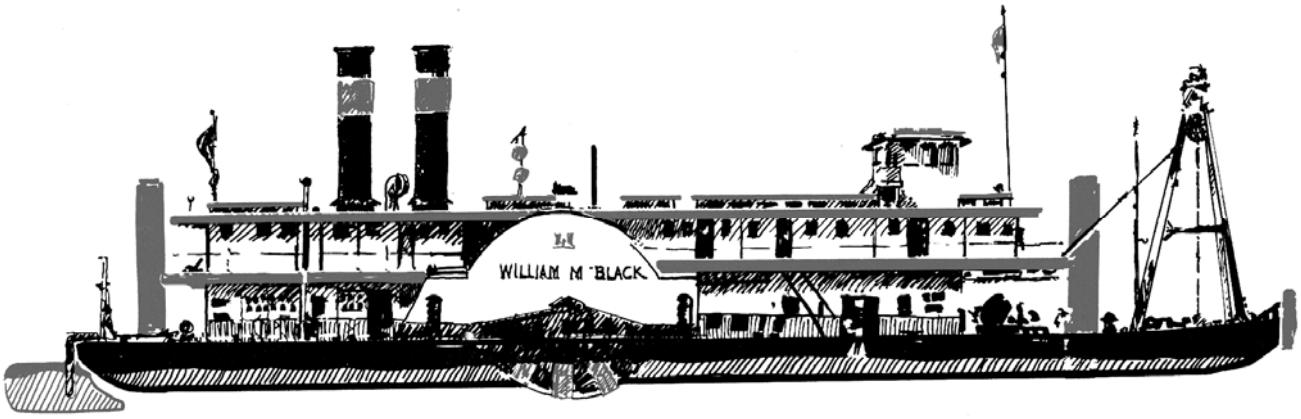
Extensions:

- *Mammals of the Mississippi*
-

Credits:

Mark D. Wagner, Director of Visitor Experience for the National Mississippi River Museum & Aquarium
This curriculum segment was written through a Resource Enhancement and Protection Conservation Education Program Grant (REAP CEP), December 2007

All Hands on Deck!
Exploring the
William M. Black



National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	3rd – 7th grade
Key Words:	U.S. Army Corps of Engineers, dredgeboat, river navigation
Subject Areas:	Dredging, steam power, river depth, river transportation, river channelization
Duration:	45 minutes

Title: ***All Hands On Deck! Exploring the William M. Black***

Summary:

This hands-on program gives students a look at the life of a river boatman working on a steam dredgeboat. Students will learn a few important skills of boatmen such as taking river depth soundings, knot tying, duties of the crew and officers, and how steam powered the boat.

Objectives:

To learn about river life from hands-on experiences shared by boatmen working on a United States Army Corps of Engineers dredge boat.

Group Size: 15 – 20 students

Background for Educators:

Dredging is an important occupation on navigable river. As we read stories from Mark Twain or other writings from a time before locks and dams on the Mississippi and Missouri Rivers, we learn about boats getting stuck on sandbars, getting caught on submerged logs and snags, and encountering rocky rapids or falls that made boat travel dangerous and sometimes impossible.

To alleviate some of the navigational hazards on river the U.S. Army Corps of Engineers has been charged with making the Mississippi and Missouri rivers more navigable to large boats and barges. The building of locks & dams, construction of wing dams to channel the water flow, and dredging of the river bottom to maintain a nine foot navigation channel have all helped to make boat travel safe and possible even during low water levels.

The William M. Black dredgeboat, located in the Ice Harbor at the National Mississippi River Museum & Aquarium, is a National Landmark.

Background information and history on the William M. Black

(This material gleaned from archival material and interviews with former officers and crew from the William M. Black and the Meriwether Lewis by former museum educator, Roger Thiede. Original written April, 2002; revised and updated - October, 2002; post script added June 12, 2003; reviewed, corrected and updated January, 2006. All the material is or can be documented with the exception of any reference to the 21 day work shift that may have been followed in the 1930's.)

The boat

When built – The WMB was built in 1934 and was commissioned in November, 1934, following Coast Guard inspection and licensing. Construction took 210 days from laying the keel to commissioning. She began dredging the next year, 1935. The WMB operated from the spring of 1935 until the fall of 1973, 39 seasons in all.

Where built – The WMB was built at ship yards at Point Pleasant, West Virginia by the Marietta Mfg Co. Today little remains of what was, for many years, a very active ship building industry at Point Pleasant. Point Pleasant is on the Ohio River at the confluence of the Kanawha River, about 40 miles north of Huntington, WV.

Boat data – The WMB is 277 feet from headlong to stern and 85 feet abeam at the wheel boxes. The hull is 8.5 feet deep, 50 foot wide and was originally made from hot riveted steel plate 5/8ths of an inch thick. The original hull was replaced by a welded steel hull in the 1960's. The boat has a displacement of about 1700 tons (3,400,000 pounds), dry and draws between 4.5 and 5 feet of depth when working. From the waterline to the top of the stacks is about 70 feet. The stacks are hinged and will tip so she could get under some of the bridges on the Missouri river. 15 feet is gained by tipping the stacks, giving her clearance for all the bridges from St. Charles, MO to Sioux City, IA.

Engines – Like most boats of that period almost everything was steam powered and there were more than 50 steam engines and steam turbines on board, most operating at 120 psi steam pressure. All of the engines were condensing engines. Several of the engines and turbines were removed when the boat was decommissioned in 1973.

The engines range in size from the 1300 HP triple expansion dredge pump engine to the two 600 HP tandem compound propelling engines to some of the small reciprocating piston engines and turbines used on oil pumps and oil injectors.

The triple expansion engine, the propelling engines, the jet pump and fire pump turbines and generator turbines operated at a working pressure of 220 psi. The triple expansion dredge pump engine is similar to the engines used to propel ocean going steamboats, such as ocean liners like the Titanic (although the Titanic was propelled by quad expansion engines), the Liberty ships of WW II and various cargo ships. The

pistons vary in size from the small, high pressure piston with a diameter of 18" to the middle piston with a diameter of 29" to the low pressure piston with a diameter of 47.5 inches. Even though steam pressure drops from 220 psi at the small piston intake to atmospheric pressure at the large piston discharge because of the increasing piston surface area the total force per piston remains about the same. The triple expansion engine was capable of rotating the dredge pump turbine at 160 rpm. The stroke is 20 inches. There is no clutching system to connect the triple expansion engine to the dredge pump so when the engine is running the pump is turning. The triple expansion engine was built by the American Shipbuilding Company.

There are two identical propelling engines, one for each of the paddlewheels. These are tandem compound (compound engines have steam pressure driving the pistons in each direction) reversing engines with a 20" diameter and a 40" diameter piston that share a common connecting rod and have a stroke of 84 inches. These engines are attached to the paddlewheel cranks by the 29 foot long pitman arms. These engines operated at 220 psi on the high pressure piston and were rated at 600 HP each. The propelling engines could turn the paddlewheels at a maximum rate of 17 rpm which would drive the boat at about 10 mph on the water. The two propelling engines were not linked and each was operated by a leverman when the boat was underway on orders from the pilot through the speaking tubes and the mechanical telegraphs.

Steam turbines operated the jet pump, sea water pumps and electric generators. These large turbines operated at 220 psi. The jet pump is located on the starboard side of the triple expansion engine and it pumped hundreds of gallons per minute of water at 60 psi pressure through the hydraulic jets at the bottom of the dustpan. The jet pump turbine is rated at 275 HP. The water jets cut and suspended the sand and silt in front of the lowered dustpan at the river bottom. Water from the jet pump was also used to jet in the pilings used to anchor the boat during dredging, and to remove them at the end of a dredge cut.

Reversing reciprocating (piston) steam engines were used to operate many machines on the WMB. These small engines resemble the engines used on railroad locomotives, except for the difference in size. A pair of these engines was used as the power source for the gypsy winches on the fore deck as well as the dustpan hoist and the forward and aft spud hoists. Single reciprocating engines were used to operate the capstans and were used to operate the various low pressure water and fuel pumps. Several of these engines operated fuel pumps to move the bunker oil among the bunkers and to the pre-heater for use in the boilers. These small engines operated at a pressure of 120 psi.

Condensers

Aft of the triple expansion engine is a large Ingersoll Rand condenser that converted steam from the triple expansion engine, the propelling engines and the jet pump back into water. It used water from the river as the cooling agent. You can see the cooling water intake pipe on the starboard side at the front of the condenser. It is made of copper, which does not rust or corrode as does iron pipe. Since some oil would be scavenged as the steam passed through the engines it was necessary to remove that oil before the water was reused in the boilers. This is done in the rectangular tank

called a hot well aft of the I-R condenser. A material called "monkey wool" was used to absorb the oil that floated to the top of the hot well. Monkey wool was actually made from the fibers of the flax plant and was akin to the fibers used to make linen cloth. Once it was oil saturated it was disposed of, although we don't know just what was done with it. I doubt it was pitched over the side although that may have been an option. When we got the boat in 1979 the hold immediately forward of the hot well was packed with oil soaked "monkey wool."

Electrical System

The boat was originally equipped with two 20 KW DC generators, each operated by a steam turbine. The electricity was used to power the floodlights used for nighttime dredging operations as well as running lights and compartment lights on the boat and motors in the shop. The generators were replaced with two 40 KW DC generators when the boat was in for its winter overhaul in the early 1950s. Each of the 40 KW generators could produce 325 amps of current. All electrical power was hand switched through the switching panel at the back of the engine room. Note that there is a wooden "bumper bar" in front of the panel to protect the operators from being accidentally thrown into the panel by pitches and rolls of the boat. All voltage was 120 V DC. Two AC current alternators were installed sometime in the late 1960s or early 1970s and may have been used in some applications before the boat was decommissioned in 1973.

Water System

Besides the jet pump and the fire pumps, which used river water that had been screened but not filtered, there was a treatment process to create pure water for the boilers and for drinking and cooking. There are four "sea chests", covered with brass plates with half inch holes to screen the incoming river water. The sea chests, two on each side of the hull forward of the paddlewheels and about two feet below the water line, are small tanks inside the hull that measured about 2' by 5' by 1' deep. Depending on where it was to be used the incoming water either went to the jet pump or fire pumps or to the vertical sand filters that were located to the starboard side of the rear part of the engine room. Today this would be considered "grey" water and it is not potable. This filtered water was used for most other applications on the boat from flushing toilets to showers to the laundry. If the water were going to be used for boiler water replenishment or for cooking and drinking then it was distilled to make it very pure. The capacity of the distilling condensers was 325 gallons per hour.

Waste Water

Until environmental regulations forced changes in the way that waste water was handled in the mid-1960s, all waste water including sewage was discharged into the river. A waste water holding tank was then installed in the middle hold with a capacity of several thousand gallons and it was pumped out at dumping stations at ports on the river. There were problems, especially with odor, from the stored waste water and a power venting system had to be installed to discharge the gases into the air high enough so that they did not stink up the boat too much. You can see this vent stack on the starboard deck ahead of the wheel box and back of the ladder.

Boiler Room

The WMB is equipped with two Babcock and Wilcox water tube marine boilers, each capable of producing 22,500 pounds of steam per hour at a pressure of 250 psi. Each boiler had a heat exchange surface area of over 4600 square feet. The boilers are oil fired and when dredging the WMB could burn up to 7000 gallons of #6 bunker oil every 24 hours making steam. Number six bunker oil is sometimes called “black oil”, or “bunker C”. There are four fuel oil injectors on each boiler and they could be controlled individually to match the amount of heat needed to make steam, depending on what the boat was doing. There are four fuel bunkers, two on each side, of the boiler room. Each bunker can hold up to 12,000 gallons of oil. Because the oil is too viscous at room temperature to be pumped through the burner injectors the fuel is preheated to at least 140 degrees F to make it fluid enough to go through the injectors. Normally the bunkers were only filled from 20,000 to 25,000 gallons to keep the boat drafting a little higher in the water. There were two fuel barges assigned to the WMB that could each hold 75,000 gallons of fuel. These were shuttled back and forth from fueling ports to the WMB. When not dredging the boilers are kept on standby and one or the other had steam pressure up. Steam pressure was necessary to operate the electrical generators, pump water and do other tasks. Even on standby the boat burned 1200 gallons of fuel in 24 hours. All the engines and turbines on the WMB are condensing, meaning that the steam is recovered and condensed back to water for reuse in the boilers, but a certain amount of the boiler water is lost in the cycle so the water levels in the boilers were constantly monitored by the striker or boilerman on duty to be sure that there was plenty of water available in each boiler. Even though the boiler water feed was automatic I doubt that there was ever a fireman or striker living that did not check the boiler water sight gauges regularly. Even in the winter when the boat was in for its annual overhaul steam pressure would be maintained, either by operating one or both of the boilers or by bringing in a steam line from a stationery plant at the boat yard. If the boat was completely cold it could not be started without bringing in steam from an outside source, such as another steamboat or from a stationery plant on shore, so that oil could be pumped and preheated, water pumped into the boilers and so forth. Once one of the injectors was going and there was some pressure being generated then the rest of the injectors would be hand lit by using a long wire with cotton waste at the end that was oil soaked, lit, then extended into the boiler as successive injectors were brought online. The lighting devise was called a q-tip and there is one located in a pipe on the starboard front corner of the aft boiler.

There is a large air compressor located on the starboard bulkhead at the back of the boiler room, just to the left of the door into the shop. It is black and looks like the air compressors used on railroad steam locomotives (and, in fact, is made by the same company that made compressors for locomotives). Compressed air lines run throughout the boat and the compressed air was used for air powered tools, among other things.

Shop

Because the boat was away from its winter quarters at the USACE boatyard at Gasconade, MO for most or all of the dredging season it was necessary to have the tools and the skilled operators on board to facilitate repairs on most of the systems on the boat. There are grinders, vises, anvils, welders, pipe cutters, threading machines, radial drills, an eight foot lathe that had a compound bed that could be extended to 12 feet, a shaper, a forge and many hand tools. Besides the metal working shop there was a carpenter's work area on the aft deck where wood could be worked to build or repair sounding poles, furniture, paddle wheel buckets, or whatever was in need of repair or rebuilding. There is a hold compartment outside of the starboard shop doors that contained storage space for hardware used to repair the paddlewheels.

Forward deck

The dredge pick-up unit, called the dustpan, was raised and lowered by a leverman operating the dustpan hoist. The dustpan could be lowered to a depth of 20 feet at the front. It hinges at the forward bulkhead with a swivel joint for the high pressure water line in the center and a ball and socket type slip joint for the two intakes. The port and starboard gypsy winches were used to pull the boat forward when dredging. The winches are two speed winches and each has a pulling force of 120,000 pounds. They are wrapped with 3600 feet of 1-1/8 inch wire rope that would be tied to pilings that had been jetted into the river as anchors to pull against. A piling or anchor that was used to pull against was called a "deadman". In the 1950's the USACE purchased navy surplus anchors left over from WW II and then used these anchors instead of the pilings to pull against when dredging. It was easier and much quicker to set and move anchors than it was to jet in and then jet out pilings. The anchors weigh about 8000 pounds each and are made of cast iron. The half round loops welded to the bottoms of the anchors were necessary to hook onto when lifting the anchors as this type of anchor will dig in deeper and deeper the harder you pull against them.

The forward spud is used to anchor the boat. The spud is hollow steel, 20 inches square and 40 feet long and is raised and lowered by the steam powered spud winch. The fore and aft spuds remain set on the river bottom while the boat floats up or down according to the river stage. In the Ice Harbor they anchor the boat so well that we never feel wave or wind action aboard the WMB.

The port and starboard "A" frames were used to raise and lower the pilings used when dredging. Note that the high pressure water lines run part way up the A frame structures.

The head log is the 36 inch square steel bumper, of sorts, at the very front of the boat. It has two towing knees attached that were faced with 10" X 11" oak beams to prevent barges that were being pushed from damaging the boat. It also has several pulleys that were used to cross the gypsy winch cables in front of the boat.

There are two capstans on the fore deck that were used to tighten the ropes to barges that were tied along side the WMB, or to snug the lines when the WMB was docked at

a pier. They are operated by small reciprocating steam engines in the holds below the capstans.

The pick up unit, or dust pan, is 36 feet wide and has 38 water jets across the lower face of the pan. Dredging was normally done at a depth of 18 feet. The high pressure water from the jets breaks up and suspends the sand and the silt at the river bottom. Heavier material, such as rock or water soaked logs usually will not be picked up in the suspension, however the jet pipes form a bar grate that keeps anything larger than about 10 inches from entering the intakes. The dredge pump could handle most materials that would pass through the bar grates into the intakes. When the dredge was doing bank dredging them often encountered tree roots and it would be necessary to raise the dustpan periodically to clean it by hand and with high pressure water. Working in dense clay could also cause problems that could usually be flushed out with high pressure water. Sometime when raising the dustpan it come out of the water with a snake or two in it! A former deckhand from the Dredge Lewis told me that he saw his first cottonmouth water moccasin when they were doing some bank dredging below Brownvil1e, NE back around 1955. Although that is too far north for the normal range of the cottonmouth he was sure that's what it was. Sometimes when cutting a new channel the dredge would work across what had been a strip of dry land, usually flood plain, to make the new channel. At times the dredges worked in conjunction with bulldozers that stripped off as much vegetation as possible before it could be sucked up by the dredge pumps.

Rear or aft deck

There is an aft spud, similar to the forward spud that was used as an anchor. It was also possible to set one or the other of the spuds and use them as pivots to turn the boat in tight quarters.

There are four rudders, two starboard, two port. The rudders were operated from the pilot house and were steam activated.

There is a single capstan on the rear deck. It was also used for securing lines to barges or to piers. It’s operated by a small reciprocating steam engine below the capstan.

The dredge spoil discharge line comes out in a goose neck and is attached to a floating pipeline of 14 fifty foot sections of dredge line discharge pipe floating on pontoons. The discharge pipe was able to be steered from the "doghouse" which was located on the final pontoon. The discharge pipe was 34 inches inside diameter and made of cast iron. It was rotated 90 degrees every few years to insure that it would wear uniformly.

The doghouse contained a movable vane or baffle that could deflect the discharge spoil to drive the whole pipeline to the port or to the starboard side of the boat during dredging. There was an actual shack, complete with a small stove, to warm the operator in cold weather. This was a dangerous job because of the distance from the dredge, usually 700 feet, and the fact that when the dredge was not pumping there was no way to control the position of the pipeline. There was a telephone that connected to the pilot house on the WMB but at night, especially, it was a risky place

to have to work. This was definitely not a job that was much sought after. The discharge pipe was sometimes called the "stinger"" because the pipeline would undulate in the river current until pumping was started again. Also, because tow boats continued using the river during dredging operations, there was the danger of being run over by a down-bound tow if the dredge's master did not get the pipeline out of the way in time. It was necessary to stop the dredging operation and pull out of the channel to let down-bound and up-bound tows pass at times when there was not enough water or enough room to accommodate both the dredge and the tow in the channel. The *William M. Black's* tender, the *Tavern*, could also be used to help position the discharge pipeline.

Below Decks

There are 25 separate compartments, or holds below the main deck. At least six of these holds were used for parts storage. Several are equipped with shelving and bins for parts and all are lit so they can be worked in. When the boat was in operation the holds were kept clean and were painted every few years. They are isolated one from the other to prevent flooding of the boat if a leak were to develop in any one of the holds. Each hold had a siphoning system, or pumping system to remove any water that might leak in.

Second Deck or boiler deck

The forward area, forward of the galley, is "officer country" and that is where the officer's staterooms are located. There are 12 staterooms, six on a side, with the master or captain and the chief engineer having their own quarters and their own heads (bathrooms). Between the captain's quarters and the chief engineer's quarters is the office with a desk for the captain and one for the chief engineer. The chart table is at the back of the office and the map trays contained river charts from the lower Missouri river. There could be two officers assigned to each stateroom and, if there were dignitaries on board, they were usually assigned to the staterooms immediately aft to the captain's or the chief engineer's staterooms. That way they could share the heads between the staterooms and had a bit more privacy than was afforded for the officers, other than the master or captain and the chief engineer. The WMB was by no stretch a pleasure boat but politicians and Corps of Engineers dignitaries occasionally came on board to "check up" on the dredging operations. The other officers shared a common head, or bathroom, that was located on the starboard side at the back of the dayroom, or lounge off the officer's mess.

The galley was located amidships and was divided into three areas. The forward area was the officer's mess, the aft area on the starboard side was the crew's mess and between them is the galley. The original galley had two oil fired cook stoves and food was served family style to both officers and crew by mess boys. In the 1950s the boat's electrical system was upgraded and some time in the 1960s the electric stove replaced the oil fired stoves and the steam table was added. After that people went through the line to get their food. The cook's quarters were on the port side just behind the galley. The only pieces of original equipment in the galley are the work table on the starboard side, just forward of the crew's mess, and the Hobart electric mixer attached to that same wall. Refrigerators were located in the pantry at the back of the galley. These

refrigerators were open and crew members could raid them if they so desired. There was always coffee available in the galley for the crew. There is a large walk-in freezer on the main deck to the port side of the shop. Next to that freezer is a walk-in refrigerator. Both of the walk-in units were locked and not accessible to the crew. There is an ice maker next to the walk-in refrigerator that was installed when the boat was built. It appears in the original blueprints for the boat.

Aft of the galley was the laundry room. In the early days of operation, through the 1930s, 1940s and into the 1950s there was a crewman assigned as a laundryman and it was his job to wash sheets, towels and he would wash clothes for the officers and crew. It was normal for the officers and the crew to tip the laundryman for doing their personal laundry. A pair of socks, for instance, would be $0.02; a shirt may cost a nickel. There were ironing boards and mangles so that if something needed pressing, it could be done on board. Later, starting sometime in the early 1960s, the boat's laundry, including towels, sheets and other flat ware was sent to commercial laundry facilities in nearby river towns. Officers and crew could, if they chose, do their own personal laundry on board or send it out. The drying_room on the port side was located above the boiler room and heat rising from the boilers would be used to dry the clothes as they hung on lines in the drying room.

There is an alleyway between the laundry room and the aft section of the boiler deck. On the forward bulkhead (wall) on the starboard side of the alleyway is a wood slat bin that was used to store potatoes for the galley.

The crew’s quarters are in the aft compartment of the second deck. There are two heads, or bathrooms, one on each side of the compartment. Normally there would be six to ten people sleeping in the crew’s quarters on any given shift. The others would either be on their work shift, between shifts or on their days off. There are 32 bunks and lockers for the crew.

Also on the boiler deck were a number of Adirondack style deck chairs. Some of them were located in front of the staterooms and office under the canopy, and others were located on either side of the starboard and port wheel boxes. Among the crew's favorite activities when they were not working was to sit and lounge on the deck in those chairs when the weather was fit.

The pilot house was located on the top deck. It was from this position that the pilot guided the boat when it was underway on the river. Normally there would not be anyone in the pilot house, other than the pilot. When the boat was dredging it was controlled from either the office below the pilot house or from the main deck. The only controls that the pilot had direct handling of were the rudders which were controlled by the twin sticks. The WMB (and the Mitchell) was never steered by a wheel, such as the dredges Clark and Lewis were originally. The paddle wheels were operated from the main deck according to directions from the pilot, given through the mechanical telegraph system and the speaking tubes. The pilot also had control of the whistles and the boat's bell.

Dredging History

The United States Army Corps of Engineers was and is in charge of maintaining the navigability of the inland waterways, including the Mississippi, the Missouri, the Illinois, the Ohio, the Tennessee, the Arkansas and the other navigable inland waterways. There are over 25,000 miles of navigable rivers in the lower 48 states. In the mid 1800s the US Congress authorized the Corps of Engineers to maintain a minimum channel depth of 3 feet in these rivers but as railroads began to take away much of the transportation of goods and freight from the steamboats an effort was made to keep the steamboat industry competitive so Congress authorized the 6 foot channel in the very early 1900s so steamboats could be larger and more heavily loaded than those that were limited by the 3 foot channels that existed in places on some of the rivers. But the die was cast and the movement of freight and goods continued to move to the railroads, which were not limited by winter or the location of rivers and river ports, such as Dubuque or St. Louis or St. Paul.

The steamboat industry was forced to change due to the loss of freight hauling and in the early 1900s many of the steamboats were either scrapped or converted from packets into excursion boats, used for special outings. My father used to tell of taking a steamboat from Dubuque to Potosi for a day outing in the summertime during the 'teens. It would cost a $1.00 for the round trip. The steamboats did continue to haul some goods and freight, though. The Potosi Brewing Company used to ship kegs of beer aboard some of the boats and, so the story goes, when they could not pull in to a dock to unload a keg or two they would simply push the correct number of kegs over the side and the purchaser would pick them up in a small boat.

The barge industry began to emerge as a new force on the rivers in the 1920s and with it came the need for larger and more powerful towboats and a deeper navigable channel. In 1930 Congress authorized the Corps of Engineers to maintain all of the inland waterways at the new depth of 9 feet. At first the towboats were pushing a few barges but as the towboats became more powerful the number of barges they could push was increasing so that down bound tows could push dozens of barges if the water was high enough.

As a point of information a single barge is called a "load" and the assembly of anywhere from two to 15 or 16 barges and the towboat is called a "tow." So a down bound of up bound "tow" may contain anywhere from one or two to 15 or 16 loads" plus the towboat, which is actually pushing the barges. And the towboats are designated as motor vessels, or MV's. Empty barges as "MT's." A "light" boat is a towboat without barges. Steam powered boats are designated Str.

And that brings up the reason that the USACE had four steam powered side-wheel hydraulic dustpan dredges built in the early 1930s for service on the Missouri river.

One of the rivers that has been navigated by steamboats from the early 1800s on was the Missouri river. The Missouri river presents a much different problem in channel management than does the Upper Mississippi or the Ohio or Illinois. It carries and through history has carried a much larger bed load of what a geologist would call "fines" – mostly very fine silt and sand – than some of the other river systems. Some of

the old timers described the river as being “too thin to plant corn on and too thick to steamboat on." Because of the volume of the bed load the sand and silt would shift around with the current and it was not uncommon for sand bars and shoals to build then degrade all within a few hours or days. The early steamboats would try to limit their trips upriver to the army forts to high water in the spring of the year but more than a few of them were left stuck on sand bars over the winter months when they were caught by low water on their return trips to St. Louis. On their up bound trips if they got stuck on a sandbar it was sometimes necessary to unload the boat in an effort to free it. Sometimes just waiting a few hours or even a few days was long enough for the river channel to change sufficiently to allow movement again. There was a saying among the Missouri river pilots that the men were separated from the boys at the mouth of the Missouri. The “boys” continued up the Mississippi and the “men” turned up the Missouri.

The Missouri also carries a large volume of water. As much as 60% of the volume of the Mississippi river between St. Charles, MO, where the Missouri flows into the Mississippi, to Cairo, IL, where the Ohio River enters the flowage, is made up of water that flows out of the Missouri River.

The upper Mississippi flows through a lot of limestone rock and in general the river bed is not as soft and movable as the sand and silt in the Missouri so the frequency of dredging on the Missouri was greater than on the Upper Mississippi. To handle the type and volume of materials effectively huge dredges were needed. The Corps ordered four dredges, all very similar, in the early 1930s. The William Clark and the Meriwether Lewis were built and commissioned in 1932, and the William M. Black and the William Mitchell were built and commissioned in 1934. The Clark and the Lewis worked out of the Omaha, NE division of the USACE and the Black and the Mitchell worked out of the Kansas City division.

Each of these dredges was capable of moving from 80,000 to 100,000 cubic yards of spoil every 24 hours and in the 1930s and 1940s they worked most of the time during the shipping season to keep the Missouri navigable between St. Charles and Sioux City, IA. The dredging season usually began when the spring rise was dropping in late April or early May and would continue through October and even into late November some years. 100,000 cubic yards of material is about the amount of material it would take to fill 10,000 of today's tandem axle dump trucks. If stacked on a football field by the end of a 24-hour day there would be a stack of sand and silt that would be about 40 feet high, reaching to the top of the fourth floor of most buildings. Another way to look at that amount of dredge spoil is that the dredges could pump the equivalent of almost seven dump truck loads of material per minute!

In the 1940s the first of the five flood control dams was completed on the Missouri River at Pickstown, South Dakota. Others followed in the 1950s and 1960s. The dredging mission was also changing from channelizing to channel maintenance because the water level of the navigable river could be controlled by holding back or releasing more water from the dams. Dredging the river to provide a navigable channel provided a narrower, deeper, and straighter river and also increased the velocity of the flow which made it partially self-scouring. In the 1950s the dredge Clark was first moved to the USACE Memphis district and then later sold to a private operator and

moved to Texas, where it still dredging in the Houston ship canal in the late 1990's. The Clark was converted from a hydraulic dustpan to a cutter head and the intake was lengthened so that it could dredge to a depth of 45 feet. The headlog was moved to allow this. The Meriwether Lewis was decommissioned in 1969, the William M. Black in 1973, and the last of those four dredges, the William Mitchell, was decommissioned in 1981.

Port and starboard paddlewheels

The paddlewheels are 25 feet in diameter, 15 feet wide, weigh about 45,000 to 50,000 lbs each. Buckets and framing are made of white oak which resists water togging and rotting. The paddlewheels are out of round slightly because by being slightly oval shaped they "bite" the water better when underway. Some of the paddle buckets have two planks, some have three.

The Crew

The full crew aboard the WMB was 63 men. No women ever worked aboard the four Missouri river dredges. No blacks ever worked on the WMB, either, according to a mate that worked on the WMB from the spring of 1940 until the boat was taken out of service in 1973. He did say, however, that blacks were hired as cooks aboard some of the USACE boats in the St. Louis area after the 1950s. Some of the crew and officers were from the south; states like Louisiana, Arkansas, Mississippi, Tennessee. They would work for the USACE during the dredging season, usually May through October, and then work on the southern rivers during the winter months. But most of the crew and officers were hired from the areas where the dredges worked. Many of the crew on the WMB, for instance, were from the Gasconade, MO area and other Missouri River towns nearby. Crewmen were considered temporary employees and were hired by the season. Officers, which included anyone licensed by the US Coast Guard, such as the captain, engineers, pilots, mates, and so forth, were considered to be federal government employees and were assigned GS ratings and were afforded benefits according to their ratings. It's interesting to note that the crew received room and board as part of their compensation but officers had to pay for their own room and board. The Corps of Engineers, like many government organizations, kept volumes of records in quadruplicate documenting the average costs of meals and the cost of each "man night" of boarding.

It took a minimum crew of about 12 people to operate the dredge but there were usually about 15 to 16 officers and crew working on any given eight hour shift. The day shift was usually staffed with the most people. It was normal to have about 48 people aboard when the boat was dredging. Because dredging was a 24 - 7 operation time off for crew and officers was staggered to assure that there were enough people aboard to staff the three shifts.

When the boat was standing by waiting for a call the crew had to be available to be on board within a few hours. The boat usually tied up in Kansas City when it was standing by.

Some Frequently Asked Questions

How much did they get paid?

In 1935, the first dredging season on the WMB, a deckhand was paid every two weeks. He was paid $27.50 each pay period and also received room and board. In 1946 a cook's helper would be paid $0.75 per hour. Their wages still included room and board. Prior to the work rule changes the deckhands and officers worked a twenty-one day period and were then given 32 hours off the boat. Shifts were changed every week so that during any three week period a deckhand would work at least three different eight hour shifts. The shifts were broken down into 8 AM to 4 PM, 4 PM to midnight, and midnight to 8 AM - so when you received your day off, 24 hours, you were given an additional eight hours and then started back to work on the next shift instead of the one you were working before your 32 hours off. By 1964 a deckhand was earning a minimum of $1.25 per hour and by 1967 that minimum had increased to $1.40 per hour. Shifts were still changed weekly. A differential was paid for working second shift, an extra $0.10 per hour; or for third shift, and extra $0.15 per hour. In 1967 the wages ranged from the minimum of $1.40 per hour to as much as $3.19 per hour, depending on your job and your years of service. These jobs were considered to be good jobs and many of the deckhands and officers came back season after season to work for the Corps of Engineers on the dredges.

What did they do when they were not working?

When the boat was on the river and not close to any of the river towns on the Missouri men stayed aboard most of the time between their work shifts. There was not much to do, other than to talk, play cards, read, or write letters. There was a radio in the day room, or lounge, off the officers' mess and in the late 1950s a TV was added in the laundry room but reception was limited by the location of the boat. One of the deckhands that I talked with in 2001 said that he really would have liked to have worked more hours as it got too boring between shifts with 16 hours off. If the boat was near a landing or in an area near one of the ports, such as Kansas City, the men could leave the boat with the only requirement being that they be back on board in time for their next shift and be sober enough to work it safely.

How did they dredge? How fast did the dredge go? What did they do with all that dredge spoil?

The usual procedure was to use a motor launch to survey where dredging was needed, then to map it out and establish the cuts needed to accomplish the job. A surveyor went out with a poleman in the launch and they crisscrossed the river, sounding every 25 feet to determine what the bottom looked like. After the area was mapped the dredge would pull up to the top of the cut to be made – the dredge always worked heading into the current and moved upstream during the cut – and at the top of the cut two pilings (or later, the two anchors would be placed) would be set into the river, one on the port and one on the starboard side. The gypsy winch lines would be crossed in front of the headlog and attached to the pilings. Then, using the paddlewheels, the boat would reverse to the bottom of the cut, usually a distance of from a few hundred feet to as much as 1200 to 1400 feet. Then the triple expansion engine would be

turned on and the dredge pump would be primed and would start turning, the jet pump would be activated and the dustpan would be lowered into the river and dredging would commence. When it was at depth, usually 18 feet, the levermen would start the gypsy winches and the boat would be pulled forward at about 150 to 200 feet an hour. Because the lines were crossed in front of the boat by operating the winches at different speeds it was possible to sweep sideways as the boat moved forward. It would take about fifty feet per cut doing the sweep as the boat dredged. Normally the channel was supposed to be 300 feet wide. When the boat reached the top of the cut one of the pilings would be pulled and reset to the port or starboard, depending, and the process would be repeated until the cut was wide enough and long enough to meet standards.

The dredge spoil would be piped from the pump through the boat in a 34 inch diameter pipe that ran the length of the hull. At the back of the boat the discharge line was attached to the 14 pontoon pipes and doghouse and the spoil was usually discharged along the shoreline, if possible. Sometimes it was discharged behind wing dams or on islands. Since the dredge was moving forward as it dredged it was necessary to continually reposition the end of the line with the baffle in the doghouse section at the end of the line.

Did they really put men down inside that pipe in front of the pump?

According to deckhands and officers I've talked with men were not put into the pipe to clean it out. If the turbine blades on the pump were damaged or blocked, however, it was always easier to try to fix it by going into the man hole than to disassemble the pump housing. But down in the pipe? Probably not. When there were problems with blockages it was usual1y at the dustpan and it was cleared with high pressure water hoses. Man in the pipeline does, however, make a good story for 4th graders.

Why was the boat made with steam power instead of diesel engines?

One probable answer is that a huge amount of power was needed to operate the dredge pumps and diesel technology was just beginning to develop whereas steam technology was highly developed and there was experience with these boats that showed that they could do the job they were constructed to do, move extremely large amounts of silt and sand from the Missouri River. Also, fuel was cheap so the fact that the WMB could burn up to 7000 gallons of fuel a day was not considered a problem.

Why side paddles instead of propellers or a stern paddle?

Again it was probably experience that decided that the dredges should be side paddle boats. Side paddle boats are very maneuverable because the paddles can be operated independently one from the other. That way if the boat did get up on a sand bar it could usually be "walked" off by using the paddles. It's interesting to note that the USACE Dredge Thompson was built only three years after the WMB, in 1937, and is powered by diesels and propelled by propellers and also has about half the dredging capacity that the WMB had because its pipeline is only 24 inches in diameter. It is also a "cutter head" dredge instead of a hydraulic suction head dredge. Hydraulic suction

dredges require very large engines to operate the dredge pump that creates the suction to do the dredging.

So the era of the WMB is now "history." Dustpan dredges are few and far between these days as modern technology has replaced steam with diesel power and cutter heads have replaced the hydraulic dustpan pick up units. The Corps of Engineers are still operating a few much newer hydraulic dustpan dredges on the lower Mississippi. In their time, these old dredges did what they were intended to do. They "tamed" the Missouri River by converting it from a meandering prairie river into a navigable channelized river so that it would be a reliable waterway for barge traffic. And, some would add, at the expense of the natural flora and fauna of the lower Missouri River system.

Post Script: On Thursday, June 12, 2003, I had an interesting visit with Bunny (Buena) Ryan, widow of the late Ed Ryan. Ed was instrumental in obtaining the William M. Black for Dubuque in 1979 with the aid of Senator John Culver. The boat was obtained from the General Services Administration and there was a keen competition between Kansas City and Dubuque as to who would be awarded the boat. It also helped that Dubuque had a protected harbor for the boat and would be able to incorporate the boat into the Dubuque County Historical Society exhibits as part, of the Mississippi River Museum.

Some of the things I learned during our visit was that the Black was tied up at the USACE boatyard in Gasconade, not Kansas City as I had previously thought. Newt Marine Services of Dubuque towed the Black to Clinton, where the starboard overhang deck was cut off and the paddlewheel removed. There was some difficulty in finding a crane at Clinton that could lift the paddlewheel and place it on a deck barge but eventually the lift was done by two cranes working together. The boat arrived in the Ice Harbor sometime during the summer of 1979.

Materials Needed:

- River depth sounding pole (located on rack on the port side of the boat)
- Activity tub with knot tying supplies (located in the laundry room closet)
- Model steam engine (in boat building shop)
- Role playing assignments for students

Role Playing Assignments:

Captain
Chief Engineer
1st Assistant Engineer
2nd Assistant Engineer
Clerk
Carpenter - stationed on the stern of the first deck
Machinist - stationed in the machine shop
Dog-House Man - stationed at the stern
1st Mate - stationed in the pilothouse
Fireman-watertender -stationed at the steam boilers
Tender Operator - stationed on or near the *Tavern* tender

Marine Oiler - stationed near the steam pistons of main engine and pump engine.
Cook-Steward - stationed in the galley
Cook - stationed in the galley
Cook - stationed in the galley
Laundry -
Mess Attendant - stationed in the officer's mess
Mess Attendant - stationed in the crew's mess
Cabin boy - stationed in the crew cabin
Leverman - stationed on the fore deck
Deckhand
Deckhand
Deckhand
Deckhand
Deckhand
Deckhand
Deckhand
Deckhand

Procedure:

Assign each student a role that they will be responsible for while on the *William M. Black* (This may be done in the classroom prior to your visit). Students may want to wear period clothing from the 1930's or 40's, such as bib overalls, jeans, "newsboy hat" , flannel shirt, leather shoes, etc.

This will be a training cruise to learn about the *William M. Black* operations and to practice some of the operating and safety procedures.

A tour will be given of the William M. Black dredgeboat with all assigned roles taking their positions as the class progresses through the boat. Nautical terminology will be used while on the Black and demerits will be handed out to any student, teacher, chaperone, or educator who used a non nautical term.

The knot tying tub will be gotten from the laundry and can be used on the deck, in the crew's quarters, or in the crew mess room. Some basic knots to be learned include a square knot, half-hitches, taught-line hitch, sheet bend, bowline, clove hitch, and timber hitch.

Optional- Set up steam engine (located in the boat shop) in the galley of the *William M. Black*, make sure there is water and fuel in place to be able to light the engine fuel.

Evaluation:

Additional resources:

- *William M. Black* brochure
- *"Bread and Quicksilver"* overnight role playing activity

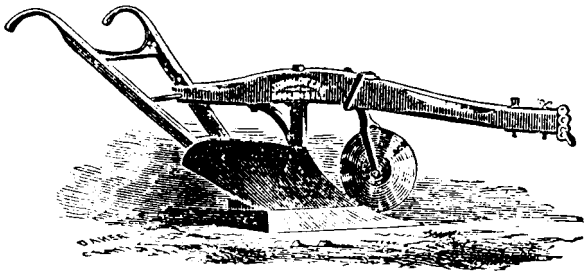
Extensions:

- *Boat Building, Steam Power, and Rivet Toss*
- *Steam Power and Steamboats*

Credits:

Mark D. Wagner, Director of Visitor Experience for the National Mississippi River Museum & Aquarium, *William M. Black* education staff and docents.
Dubuque County Historical Society Archives
Boy Scout Handbook (knot tying)
This curriculum segment was written through a Resource Enhancement and Protection Conservation Education Program Grant (REAP CEP), December 2007

From Frontier to Community



National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	1st-3rd grade
Key Words:	frontier, community, natural resources, transportation, Mississippi River, Native Americans, fur trade, lead mining, steamboating
Subject Areas:	history, social studies
Duration:	30-45 minutes

Title: ***From Frontier to Community***

Summary:

The rich heritage of the Upper Mississippi River Valley is full of tales of Native Americans and fur traders, lead miners and steamboat captains. Let's explore the settlement of communities such as Dubuque and identify how and why they developed and prospered along this great river.

Objectives:

The objectives of this program is to give the participants a background in the settlement of the Upper Mississippi River Valley, specifically river towns such as Dubuque, and to identify the natural resources unique to this area and discover how they contributed to our shared history.

Group Size: Ideal size is 15 students, 30 students maximum

Background for Educators:

Rivers have long been ideal locations for settlements for many reasons, including transportation, safety, availability of food and water, and opportunities for earning a living. Throughout history these themes have played a part in the evolution of many communities, from small river towns to some of the larger, key cities in our nation. The abundant natural resources in our nation have influenced where people can not only survive, but thrive. The settlement of this region is very clearly related to the Mississippi River and one cannot appreciate the history of the area without considering this waterway as the key element in the transition from frontier to community.

Materials Needed:

- Bulletin board
- pushpins
- collage items – pictures, words, images
- Frontier to Community word scramble

Three dimensional artifacts/reproductions, including any/all of the following:

- Beaver fur, other furs optional
- Beaver felt hat
- Chunk of galena
- Lead shot
- Wood – tree trunk slice for example
- Wooden canoe paddle

Procedure:

-Set up a blank bulletin board, pushpins, and a variety of pictures, key words, and other printed items relating to the history of the Upper Mississippi River. Pass out the items to the students and invite them to help you create a collage that will bring to life the transition from Frontier to Community.

-Discuss these terms and this transition by communicating the following:

- **Example Outline**

What is the difference between these two words? What do they mean? Let's define them!
Frontier – unsettled wilderness with plants, animals, natural resources, etc.
Community – city/town, a settled environment with people, homes, businesses, transportation resources, etc.

Ask the kids to think about Community:
What **community** are you kids from? Well, let's think back to a time before your community was settled…when it was still part of the **frontier**!
What was there? Who? What did it look like? What resources were there that men and women would want to take advantage of and use to their benefit?

What was there?
Natural Resources- Forests, Lead (mineral nicknamed 'grey gold'), Animals (furs, food…deer, beaver, coyote, raccoon, muskrat, skunk, fox, etc.)
Mississippi River- waterways were essential systems of transportation, sources for food and water, ice in winter, etc.

Who?
Native Americans- Sauk, Fox, Ioway, Sioux, Mesquakie, Potawatomi, Oto, Missouri, Winnebago, Ojibwe

Now let's travel through history and find out why this frontier developed into a community!

What Natural Resource brought the early explorers and voyageurs here?

- The Animals of the Fur Trade (people came to make $$, trade goods, set up trade posts and forts, ended up forming communities)
- Beaver furs = hats (connect to world economy, hat making 'mad hatters', set standard of trade)

What pursuit of another Natural Resource brought the early miners and settlers here?

-Lead Mining (a heavy grayish metallic mineral found underground, variety of uses including lead shot, bullets, paint, etc. – but not in pencils today, that's graphite! – lead to formation of settlements with smelters, shot towers, etc. and thus communities!

Some very important characters from this era of history:

Julien Dubuque
-Mines of Spain, lead mining with Mesquakie, traded and shipped lead up and down river system, community namesake
Mathias Ham
-made a fortune as early entrepreneur, including lead mining, and then built the beautiful Ham House, Italianate Villa c. 1856, also invested in the railroad but lost money in the end

Once Dubuque had developed as a community along the river, another important connection to the region's natural resources developed. As technology and populations increased, our canoes were definitely not big enough and fast enough…so Steamboating was the next important theme in our community's settlement.

Evaluation:

Students are given a word scramble utilizing the key terms discussed in the program – often the teachers take this back to the classroom as a follow-up activity.

Additional resources:

Key Terms in varied fonts for the collage:

Natural Resources *The Mississippi River*

Native Americans **Fur Trade** Lead Mining *Steamboating* ***Frontier***

Community ***Animals*** **Transportation** **Food** **Water**
Forests **Ice** **Businesses** **Homes**

Extensions:

- *Furs & Lead: Life of a Voyageur along the Mississippi River*
- *Native American Tales*

Credits:

Amber Majerus, National Mississippi River Museum & Aquarium, Dubuque, Iowa. This curriculum segment was written through a Resource Enhancement and Protection Conservation Education Program Grant (REAP CEP), December 2007

Treasures of the Mississippi

National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:	4th – 6th grade
Key Words:	
Subject Areas:	History, Social Studies
Duration:	45 minutes

Title: Treasures of the Mississippi

Summary: From the muddy depths to the shallow streams, from the wooded shores to the high bluffs, the Mississippi River holds many treasures. Join us in exploring the world of fur traders and lead miners, lumberjacks, and ice men, steamboat captains and clammers. We will learn how humans have used the river through seasons of prosperity and seasons of change. All these treasures await you, and more!!

Objectives: Students will learn that the resources of the Mississippi River and its watershed were the treasures that attracted people to settle this region for over ten thousand years.

Group Size:

60 students maximum

Background for Educators:

There is no doubt that the Mississippi River is America's river. This river has made major contributions to the physical and economic growth of the nation. It is a navigation artery of great importance to the nation's transportation system, carrying an ever-growing commerce. Coursing through the heart of America, it supplies water for the cities and industries that have located along its banks. This great river is, truly, one of the Nation's outstanding treasures.

Not only is the river itself considered a great treasure, but resources that have come from the river have always been very important to this country. In this program some of these "treasures" like logging, pearl buttons, lead, and transportation of goods will be discussed in detail.

This program can be used either as a museum program or as an outreach program. Under each topic you will find a list of materials. These materials are broken into two parts, what can be taken to the school and what needs to be used at the museum.

The following topics can be discussed in any order

1. Native Americans

Outreach Program

a. Bone Awl
b. Steel Awl
c. Picture of Wickiup
d. Wild Rice
e. Native American Corn
f. Picture of Mesquaki
g. Small canoe model

Museum program

h. Corn Grinder
i. Atlatl

Native Americans (picture of Mesquaki)**:**
-last Native American inhabitants of upper Mississippi River region in eastern Iowa
-native groups referred to Mississippi River in various ways as big water, great water, big river, etc. and the Ojibway term was *mesi sipi*

A. Bone Awl
-Sharp pointed tools used to create clothing, moccasins and bags. The awl would be used to punch holes in animal skin, sinew from the animal was then used to thread the skins together.
-made using bone or wood for a handle and bone or horn for the point. Often handle made from part of a deer leg bone.

B. Steel Awl
-When Europeans came to North America they introduced steel, which replaced the horn/bone awls.

C. Wikiup or wigwam

- wickiup was used in this area (Dubuque/ upper Mississippi Valley Region) by several different groups including Mesquaki, Sauk, Sioux, and Ioway
- generally was used in winter months (roughly October to April) as temporary hunting lodge; would have been built in fall; built in area that would serve as hunting and trapping region for winter months away from "summer camp" or village, and sometimes a good distance away.
- fire inside for cooking and warmth, and hole in top of wickiup allowing smoke to escape.
- Sometimes constructed using Silver Maple as frame or skeleton; poles for frame were harvested and then bent into place within 48 hours of being

cut assuring green saplings (Silver Maple) would not dry out resulting in cracking and splitting; poles placed in holes 1 ½ to 2 feet deep; once in the ground, poles bent into shape and lashed together; frame lashed together with wet Basswood bark which then dried and harden; basswood bark called lashing material

- frame covered with cattail reed mats sewn together; several mat layers were applied; mats fulfills several functions including weather protection, insulation, and water repelling; mats sewn together with different cordage ranging from stripped bark and dried grasses.
- insulation properties of cattail mats are interesting: each individual reed contains hundreds or thousands of little air pockets that act as insulation, another material used to cover wickiups was elm bark, which has a very water resistant quality and usually covered the larger, more permanent structures of these Native American groups.

D. Wild Rice

Wild rice was harvested by some Native American tribes including the Ojibway, who called it menomen. Wild rice grows in very wet areas and was typically harvested from boat. The rice was harvested by threshing the stalks to dislodge the kernels, commonly called "knocking". The rice would then be parched or dried over a fire and was a very important food source. Wild rice is actually more closely related to oats than to rice.

E. Mesquakie

The most recent Native American inhabitants of the Mines of Spain were the Mesquakie (Fox) Indians. It is estimated that the Mesquakie Indians settled in the Dubuque area in the 1700's. In 1764 they began mining lead and the process of log furnace smelting at the Mines of Spain. In 1780 the Mesquakie established the village of Kettle Chief near the mouth of Catfish Creek. The Natives were successful in this area until 1830 when they abandoned their village at Kettle Chief. They would return periodically to hunt and mine, but never reestablished.

F. Canoes

Dugout Canoe:

-burning and scraping (wood, fire, clam shells/ rock scrapers) process used to construct the canoe out of one large piece of tree trunk

Birchbark Canoe:

-process of steaming white cedar to make it pliable to form boat frame
- lashed together with the roots from black spruce or tamarack trees
- covered with the white bark from the paper birch tree
-extremely lightweight
-no nails, screws, all natural materials
-seams sealed with tar made from pine pitch, charcoal, and animal fat to help waterproof

G. Indian Corn
Maize, known as corn in some countries, is a cereal grain domesticated in Mesoamerica and subsequently spread throughout the American continents. After European contact with the Americas in the late 15th and early 16th century, maize spread to the rest of the world.

H. Corn Grinder
Dried corn could be ground into a fine powder or cornmeal and stored. The powder could be made into bread. Some grinders were nothing more than a curved smooth rock for the base and a smaller handheld rock for the grinding.

I. Atlatl
An atlatl is a tool that uses leverage to achieve greater velocity in throwing spears, and was used by some Native American tribes. It consists of a shaft with a handle on one end and a spur or cup on the other, against which the butt of the spear rests. The spear is thrown by the action of the upper arm and wrist in conjunction with a shift of balance of the body. An atlatl can readily cast a well made spear to ranges greater than 100 meters.

2. Fur Trading

Outreach or Museum program

a. Beaver Fur
b. Beads
c. Trade Silver
d. Picture of beaver skin hat

Museum Program only

e. Trade Blanket
f. Musket
g. Brass Bucket

Trade:
-the beaver pelt was the standard unit of value
-Native Americans were interested in metal tools (verses rock and bone tools), decorative beads, shells, jewelry, silver and pipes.
-furs traded for other goods like wool blankets, muskets, etc.
-value of a trade blanket marked by the four blue lines on the edge, 4 lines = 4 beaver pelts
-value of a musket was also priced in beaver pelts. On average a musket could be purchased for 12 beaver pelts.

Beaver Pelts:
-extremely valued by the French Voyageurs and early European explorers.
-primarily used to make **beaver felt hats**
-to make a beaver felt hat you had to remove the thick top layer of fur

-mercury metal was used in the process
-Interesting Note: *Mad Hatters*? Yes, unfortunately, the men who worked in these hat shops began to act very strangely, some became very physically and mentally ill, and some even died. This is how the phrase "mad hatter" came into being. The men were constantly inhaling and exposed to mercury, which is highly toxic to humans, this was causing them to become ill.

Trade Silver and Glass Beads
These two items were very important in the fur trade. Native Americans did not have access to silver; trade silver were usually crosses or other decorative pieces that could be worn around the neck.
Glass Beads, again very popular. They came from Italy and something Native Americans weren't able to make.

3. Lead Mining

Outreach or Museum program

a. Chunk of lead ore called galena
b. Lead shot
c. Shot tower picture
d. Pigtail
e. Sticking tommy with candle
f. Image of mine shaft and workers

Julien Dubuque:
-Julien Dubuque is considered the founder of Dubuque
-he arrived in 1788 and died in 1810
-Dubuque was a fur trader and lead miner
-befriended the Mesquakie and was able to mine some of their land
-his land was called "The Mines of Spain" is now a recreational/nature preservation area

Lead Mining:
-provided great wealth for some, but was dangerous work
-Native Americans would mine lead in the ground and natural caves
-the Europeans made lead mines that went down directly into the ground anywhere from 25-100 feet deep
-lead is a mineral actually called "galena" or lead sulphide in its natural state
-lead sulphide must be smelted, or melted down to extract the sulpher and other waste material to get pure lead
-lead was formed into shot through use of a shot tower
-replica lead mine shaft with windlass used to raise and lower buckets with supplies, lead, rock, and even miners themselves

Pigtail
Was literally a "pig tailed" shaped piece of metal used to hold the bucket to the rope during lead mining. When the bucket was pulled up to the surface it could slide right off the pigtail instead of having to untie and tie it again to be lowered down. It was a time saver.

Sticking tommy with candle
A metal mount with a candle. This was an early way to see down in the lead mines. The metal could be hammered right into the wall or twisted around and worn from a hat.

4. Logging

Outreach or Museum program

a. Picture of logging
b. Picture of raft
c. Picture of people running on logs or spikes from shoes
d. Sawdust
e. Logging chain and eyes for tying together rafts

Lumber:
-The second largest industry in this area (lead mining first)
-rafts were extremely large, letting the water do the work of moving heavy logs
-lumber from Minnesota and Wisconsin sent downriver to sawmills

5. Steamboating

Outreach or Museum program

a. Recording of salon music
b. Advertisements
c. Images
d. Menus
e. Bill of passage

History
-Steam power was very important during the Industrial Revolution, and in fact helped to create the Industrial Revolution. Steam power could operate machinery and transportation equipment so effectively that it revolutionized the way people could travel and manufacture tools to change the way things had been done for millennium. Steam engines were used to power boats, trains, machine shops, blacksmith shops, water and oil pumps, and even some of the first automobiles.
-The age of steamboats began in the early 1800's. It can be dated from 1712, nearly a century before the first successful boat. Tomas Newcommen tried without success to install a steam engine to pump water from a coal mine. In 1769, James Watt made improvements on the engine, but it was still too large to power boats or trains.
-The first American steamboat was built by John Fitch in 1787. The 45 foot long experimental vessel crossed the Delaware River powered by oarlike paddles. Public never thought of the boats as more than just a novelty and Fitch gave up and shut down the operation.
-Robert Fulton became generally known as the "father of steamboating." He figured out how to make steamboating economical and kicked off a long running of paddle wheelers on the Hudson River.

-Steamboating on the Mississippi dates back to 1811 and the pioneering *New Orleans,* a 116 foot long side-wheel steamer. The first steamboat to travel the lengths of the Ohio and Lower Mississippi.
-The Delta Queen was built in 1927 and is still paddling the Western Rivers. Has been serving the Mississippi since WWII
-Mark Twain (Samuel Lanhorne Clemens) was a steamboat captain for two years before the Civil War caused the suspension of civilian river traffic on the Mississippi.

Traveling Public
-Passenger revenue amounted to only a small portion of total earning. They would also transport many goods including; cotton, livestock, salt, and grain.
- Fares fluctuated from season to season and stage of river. At one time in mid-century passage from St. Louis to New Orleans fell to $12 one way. This included a cabin and meals
-Deck passage was about half price and one rode on the deck along side the freight, life stock, and machinery. These passengers had to provide their own bedding and food and required to assist in wooding and firing.
-It would be remiss to suggest that the early immigrants did, in fact, travel in luxury on the first steamboats. Such was not often the case. Many immigrant families traveled in virtual squalor and suffered great hardship as deck passengers on board the early packets. Poorer immigrants were forced to travel in cramped conditions, often among cattle and pigs. They were exposed to dreadful diseases and enjoyed few, if any, measures of comfort. The point is that steamboat travel opened immigration to settlers and their children. Travel with children was now safer and easier than it was when only treacherous overland routes existed. The speed and relative safety the steamboat could afford now made it feasible for families to move together, rather than for a father to have to leave loved ones behind while he arduously ventured ahead through wilderness with the hopes of returning for them much later. This fact is what accounted for the tremendous surge in growth.

6. Boatbuilding

Outreach or Museum

a. Picture of Dubuque Boat and Boiler works
b. Rivet

Boatbuilding
-Iowa Iron Works began in 1870 and was reorganized in 1904 as the Dubuque Boat and Boiler Works, which built boats until 1972

Rivets
-Prior to the use of electric welders, most steel hulled boats were built of steel plates joined by rivets. Tossing red hot metal rivets was a very important skill in assembling steel plates used in the boat building industry. One man would heat the rivet in a forge and then this hot rivet would have to instantly be removed from the forge fire and be hammered into place in holes joining the steel plates. To speed the process of getting the hot rivet to the riveter, the rivet was often

tossed from the forge to the riveter who would catch this hot rivet in a metal cone. This hot rivet was then instantly fitted into the hole and the rivet fitter would hold the hot rivet in place while someone on the other side of the steel plate would hammer the hot rivet to form a head to hold the rivet in place, before it cooled.
-The *Titanic* was constructed in this fashion.

7. Clamming

Outreach or Museum program

a. Mussel shells
b. Brail hooks
c. Buttons
d. Blanks
e. Freshwater seed pearl

Clamming:
-Mussel shells where used years ago, up and down the river, for buttons. John Boepple, a German immigrant, came to the Muscatine area and was amazed by the large population of mussels – he started the button industry here. He actually died on a mussel survey in Indiana – he stepped on a mussel and cut his foot. He got a blood infection and died.
-clams, or mussels, face upstream, get hooks caught in their shells
-clams were gathered, boiled (which killed the living clam inside) then shucked
-clam meat was usually discarded, perhaps given to dogs or used in hog slop
-clam shells were used for buttons (1890s-1930s) then, plastics were invented and ended need for shells
-clamming ended just as some clam species were becoming scarce
-in the last ten years, they have started clamming again (much smaller quantities)
-now shells are crushed into little pieces and shipped to Japan where they are inserted into oysters as seed pearls to make cultured pearls

8. Ice Harvesting

Outreach or Museum program

a. Picture of an ice box
b. Picture of people harvesting ice
c. Fake ice cube
d. Ice tongs

History of Ice Harvesting
Before the arrival of modern refrigeration, people had to depend on ice boxes to keep food cool. These ice boxes were designed to hold both food and large blocks of ice. Providing these blocks of ice was an important industry in Iowa during the 19th and early 20th centuries.

Usually around the first of January local and “seasonal” ice harvesting crews began working rivers and lakes. Various tools and methods were used for cutting and removing the ice, including large saws and horse drawn cutters. By the 1900s workers used motor driven saws. Ice was then taken to the ice house to be stored until summer. The ice house was a double walled brick or wood building where the ice was covered with layers of hay or sawdust to keep it from melting.
When the weather turned warm, the demand for ice began. The ice wagon, delivering ice door to door, was a common sight in Iowa towns. The large demand for ice made it one of the top commodities handled by the shipping industry.

The ice wagon was a familiar site on urban streets. It became an American institution, delivering ice as needed when consumers posted the “Ice Today” sign in their windows. Iceboxes were typically made of wood, lined with tin or zinc and insulated with sawdust or seaweed. Water pans had to be emptied daily.

For centuries, people preserved and stored their food — especially milk and butter — in cellars, outdoor window boxes or even underwater in nearby lakes, streams or wells. Or perhaps they stored food in a springhouse, where cool running water from a stream trickled under or between shelved pans and crocks. But even these methods could not prevent rapid spoilage, since pasteurization was not yet known and bacterial infestation was rampant. It was not unusual in colonial days to die of “summer complaint” due to spoiled food during warm weather.

Before 1830, food preservation used time-tested methods: salting, spicing, smoking, pickling and drying. There was little use for refrigeration since the foods it primarily preserved — fresh meat, fish, milk, fruits, and vegetables — did not play as important a role in the North American diet as they do today. In fact, the diet consisted mainly of bread and salted meats.

Consumer demand for fresh food, especially produce, led to diet reform between 1830 and the Civil War, fueled by the dramatic growth of cities and the improvement in economic status of the general populace. And as cities grew, so did the distance between the consumer and the source of the food.

9. Upper Mississippi Wildlife Refuge

Outreach or In house

a. Feather
b. Bird leg band
c. Certificate
d. Otolith bone

Upper Mississippi River National Wildlife and Fish Refuge

The Upper Mississippi River National Wildlife and Fish Refuge is 261 miles long from Wabasha, Minnesota to Savannah, Illinois and encompassing about

200,000 acres. This is the longest refuge in the nation and the only refuge to have commercial water traffic. Generally the refuge goes from railroad tracks on one side of the river to railroad tracks on the opposite side. The Refuge was established by congress in 1924, thanks to the urging of many conservationists, especially Will Dilg who was the founder of the Izaak Walton League. One important mission of the Upper Mississippi River Refuge biologists is to band and research waterfowl species. An important part of the research includes banding of migratory waterfowl (see aluminum bands and banding return certificates).

Otolith Bone:
Otolith ("earstones") are small, white structures found in the head of all fishes other than sharks, rays and lampreys. Otoliths provide a sense of balance to fish in much the same way that the inner ear provides balance in humans. Otoliths have growth rings or annuli, not unlike those of a tree, that record the age and growth of a fish from the date of hatch to the time of death.

Materials Needed:

-Treasure of the Mississippi Treasure Chest
-Supplies listed under each topic, most will be found inside treasure chest

Procedure:

Place the trunk where people can see it. Open it up and pull the items out one at a time to talk about. If the group is small enough, pass certain items around so that students can touch and observe them.

Another option would be for you or a student to pull out certain items and see if the students could tell you what that item is or what it was used for. Then you could discus and pass the item.

Evaluation:

Students will be evaluated using questions throughout the entire program.

Additional resources:

1. National Mississippi River Museum & Aquarium tour guide packet.
2. National Mississippi River Museum & Aquarium Eco tour packet.
3. Museum curriculum
    a. Boat Building, Steam Power, and Rivet Toss
    b. Steam power and Steamboats
4. Steamboats The Story of Lakers, Ferries, and Majestic Paddle-Wheelers By Karl Zimmermann
5. Come Hell or High Water: A lively history of steamboating on the Mississippi and Ohio Rivers
6. http://www.iptv.org/iowapathways/mypath.cfm?ounid=ob_000023
7. http://www.history-magazine.com/refrig.html
8. http://www.winona.edu/historicalsociety/sesqui/steam/
9. http://en.wikipedia.org/wiki/Maize

Extensions:

*The National Mississippi River Museum & Aquarium is full of historic items and information. The upstairs has many displays to teach about history.

Credits:

Amber Majerus- National Mississippi River Museum & Aquarium: Dubuque, IA
Kristi Karwal-Clark - National Mississippi River Museum & Aquarium: Dubuque, IA
Mark D. Wagner - National Mississippi River Museum & Aquarium: Dubuque, IA

National Mississippi River Museum & Aquarium
History Education Curriculum

Target Grades:

Key Words:

Subject Areas:

Duration:

Title:

Summary:

Objectives:

Group Size:

Background for Educators:

Materials Needed:

Procedure:

Evaluation:

Additional resources:

Extensions:

Credits: