

FRONTENAC RECLAMATION PROJECT

Section 5, T30S, R25E, Crawford County

Located within the city limits

of Frontenac, Kansas

Submitted by:

The Kansas Department of Health and Environment,

Surface Mining Section

(620) 231-8540

Designed by:

Boyd, Brown, Stude, & Cambern

Kansas City, Missouri

for

The Kansas Department of Health and Environment,

Surface Mining Section

Construction by:

Thomas Construction

Fort Scott, Kansas

Started : April 1997

Completed: September 1998

Cost: \$238,773.50

March 2002

Frontenac Reclamation Project, Frontenac, Kansas
Completed by the Kansas Department of Health & Environment
Surface Mining Section

The Frontenac Reclamation Project is located in Section 5, Twp. 30S, Rge. 24E, in Crawford County Kansas. The project site is in the city limits of Frontenac; within one mile of the city of Pittsburg; and within 500 feet of US Highway 160. The project was developed from the Kansas Department of Health and Environment (KDHE), Surface Mining Section's (SMS), Abandoned Mine Land (AML) inventory list. Historically, the project area was first underground mined for the Weir-Pittsburg coal, and then strip mined, possibly for the Croweburg seam, with the Mineral coal being the lowest seam mined. After removal of the coal, the mining company abandoned the area. The area was left not only with the typical ridges and valleys of abandoned strip mines, but also with numerous haul roads adjacent to strip pit lakes. The ridges and valleys were overgrown with trees, shrubs, honeysuckle and briars.

The Frontenac Abandoned Mine Land Reclamation project was initiated to eliminate hazards left from past mining. The total area within the project is approximately 129 acres, most of which is owned by the City of Frontenac. The part owned by the city was called the City Park because many residents of Frontenac and surrounding areas used the numerous strip pit lakes for fishing. The network of unimproved dirt roads (haul roads) made the area very accessible. Hazards at the site included approximately 1800 feet of Priority 2 Dangerous Highwalls associated with the strip pit lakes, one acre of Industrial and residential waste, and 0.5 miles of Clogged Stream. The project site is in close proximity to residences to the south and east sides, an auto salvage business to the north side, and privately owned pasture and dumps to the west. Within the project boundary on the east side is an access road to a cable receiving station and fishing pits. Besides the whole project area being used for fishing activities, there was evidence of people using the site for off road vehicle travel. Illegal dumping of residential trash was evident at several places along the highwalls and along the road shoulders. Close to the east access road, there existed a spoil pile with a 20 foot high, steep embankment. Local youth had dug a cave five to six feet tall, two to three feet wide and about seven feet long into the unstable spoil which could have collapsed and caused a serious accident. Additionally, nearby residents often complained that a stream on the site had not drained properly since being mined through (in the 1940's). After heavy rains, water would leave the stream causing water to stand between the spoil ridges. The water often became stagnant and was a breeding place for mosquitos during warm weather. The stream was aptly called stinky ditch by the local inhabitants.

Much of the 1800 feet of Dangerous Highwall was adjacent to the dirt roads. Most of these highwalls were only a few feet from the road's edge with a drop to the water between 8 and 20 feet. The steepness of the highwalls and the close proximity of the highwalls to the roads, made the roads unstable and actively eroding. If a person fell into the strip pit lakes, they would have a hard time getting out because of the steep highwalls.

Routine preliminary consultation with appropriate state agencies revealed the following:

- * □ The Kansas Geological Survey determined that, having three coal seams already removed the project area had little potential of being remined.
- * □ The Kansas Historical Society determined there were no historical sites on the project.
- * □ The Corp of Engineers determined that even though the majority of the site is in a floodplain, there were no substantial wetlands to be protected.
- * □ The Kansas Department of Wildlife and Parks, along with the United States Department of Fish and Game, determined that the strip pit lakes on site were a possible foraging habitat for the threatened and endangered species *Myotis grisescens* (Gray bat).

The Gray bat, like other species of bats, consume hundreds of insects nightly. Bats are the most important natural controller of night-flying insects, consuming mosquitoes, moths, beetles, crickets, leafhoppers, chinch bugs, and a variety of aquatic insects. Because bats consume so many insects they greatly reduce our reliance on chemical pesticide use (Tuttle, 1998).

A nursery colony of Gray bats was found to exist in the City of Pittsburg storm sewers in 1961(Choate, 1990). Since that time, studies have produced data showing that the Gray bats use the linear shaped, tree lined strip pit lakes, left from past mining, for cover and forage. The bats feed primarily on mayflies and other aquatic insects over the water, while the tree canopy protects the bats from predators, such as owls. Later studies defined the foraging range to be an area approximately seven miles in diameter from the storm sewer openings, a perfect manmade habitat, providing shelter, water, food, and space. The SMS consulted for several months, with the Kansas Department of Wildlife and Parks. Subsequently, the determination was made that the project was not likely to jeopardize the continued existence of the gray bat if, as required by Kansas Statue and Administrative Regulation, the SMS obtained and implemented a Threatened and Endangered Species Action Permit from the Kansas Department of Wildlife and Parks (KDWP).

Stipulations of the T&E permit were:

1. All clearing and grubbing activities were limited to a period between October 1 and April 30, when the bats were hibernating outside of Kansas.
2. A 30 foot woody buffer would be established around the edge of each disturbed aquatic area, to protect the bats from Raptors and other predators.
3. Tree species replaced would be selected to match the species identified prior to construction.
4. At least 80% of the trees planted should survive after three growing seasons.
5. Trees would be spaced as approved by the Kansas forestry guidelines and any permit

conditions imposed by the KDWP.

The firm of Boyd, Brown, Stude, and Cambern, Inc. provided engineering designs for the reclamation plans. The plans showed that out of the 129 acres in the project boundaries, only a total of 29 acres would be cleared and grubbed. Trash and debris were to be removed. Strip pits would be end-filled and/or sloped to eliminate dangerous highwalls. Since past mining of the area had disturbed a tributary to First Cow Creek, channel work was required to establish adequate drainage. Therefore, it was determined that a permit for the stream channel and floodplain modifications was needed from the Kansas Department of Agriculture, Division of Water Resources.

The channel and floodplain modifications were difficult to design. By regulation, there could be no significant change in the course of water flow or base flood elevations, which would cause adverse impacts above or below the project area. In addition to elimination of dangerous highwalls, the plans included designs for eight riprap channels, seven spillways, and two vegetated channels. All were designed to handle the large amount of water that flows through the estimated 1100 acre watershed. To stabilize channels and control erosion, approximately 5950 tons of conventional riprap, along with 301 tons of grouted riprap, were used on the project.

The construction phase of the project was awarded to Thomas Construction. One of the first items on the reclamation agenda was the removal of the cave dug out by the children living in the area. Everyone agreed that the cave was the most dangerous item on the project site. Neighborhood children had dug into a loose spoil pile, making a dangerous, unstable tunnel just large enough for a child to enter. If for any reason the unconsolidated material would have collapsed, severe injury or even death could have resulted. The material from the elimination of the cave was then used as end fill material to remediate some of the dangerous highwalls at the project site.

Most of the 29 acres cleared and grubbed at the site were in one continuous plot. In addition, there were seven other small areas of highwalls to be addressed. The clearing and grubbing of the large area eliminated a number of small strip pit lakes, valleys and hills, putting the contour of the land back to a near pre-mine state. The two most dangerous highwalls were eliminated in this effort. One highwall was right next to the south entrance access road and was actually eroding into the road. The strip pit lake associated with the highwall was approximately 30 feet deep. The City of Frontenac was trying to curtail the erosion by dumping construction waste at the edge of the highwall. This was also the sight of most of the residential dumping. The reclamation first removed the trash and debris and then backfilled the pit, moving the edge of the water 60 feet from the road. Additionally, a more gentle slope to the water's edge and two vegetated channels were installed to prevent future erosion. The pre-reclamation access road turned into a winding network of dirt roads. An existing culvert connected two large strip pit lakes and was part of the road network. A concrete slab above the culvert was being used as a bridge for vehicle traffic. The slab-culvert combination was dangerous and in dire need of repair or elimination. A vehicle driving over the concrete slab could have collapsed the culvert and ended up in the pit lake. The winding dirt roads encouraged not only fishing, but other activities as well, such as impromptu parties, off road driving, etc. After reclamation the road ended in a

cul-de-sac that gives access to many fishing points, but eliminated the structurally unsound bridge. The cul-de-sac road is 40 feet from the edge of the strip pit lakes and a cable guard rail was added for extra safety. To mitigate for the Gray bat, a new pond was excavated creating shoreline to replace the strip pits that were filled in. In essence this is better habitat as the new shoreline is long and linear in shape, whereas the eliminated strip pit shoreline was short and circular in shape. Eight other highwalls were resloped to the water's edge, making them safe for visitors and stopping further erosion. All of the areas that were cleared were planted to native grasses and forbs. On all shorelines of strip pit lakes that were cleared and resloped, trees were planted as stipulated in the T&E permit, to form a 30 foot woody buffer zone.

As recommended by KDWP, trees were planted in 10 by 10 foot rows to a density of 430 trees per acre. Approximately 2,315 native trees were planted to mitigate for disturbed Gray bat habitat. Trees planted were comparable to what had been cleared and were chosen through previous experience for survival, desirability and compatibility. Species chosen were: Sycamore, Bur Oak, Pin Oak, Redbud, Choke Cherry, and Green Ash. First the contractor ripped rows for the trees in the abandoned spoil material, then went back over the ripped rows with a tree planter to plant 12" bare root seedlings, one to two years old. Ripping the rows first helped insure that the seedlings would be planted at the proper depth in the clayey, shaley soil. The seedlings were dipped in a root gel containing mycorrhizal inoculants. Mycorrhizal fungus occurs naturally in soil, but in the abandoned spoil the extra inoculants made sure the seedling roots came in contact with this beneficial fungus. Mycorrhizal fungus helps tree roots take up water, improves mineral nutrient assimilation, and accelerates root and shoot growth. Root gel keeps the roots from drying out, and the inoculants speed up the beneficial association between the tree's roots and the mycorrhizae. Additionally, trees were fertilized with slow release fertilizer packets. After the trees were planted and the soil around them slightly tamped, a 36" mulch mat was placed around the trees to choke out incoming grass that might compete for moisture and nutrients. In addition, the mulch mats help moderate the soil temperature around each seedling.

The reclamation project was completed in September of 1998. Stinky ditch was replaced with a rip rap channel that directs water into a strip pit lake, eliminating stagnated water and mosquito traps. The highwalls were replaced with gentle slopes to the water's edge eliminating erosion into the roads. This also made access into and out of the area easier in case of accidents and placed the hazardous water body farther from the road. The cave, along with the dangerous embankment was removed. The summer of 2001 was the third growing season for the trees. Although the native grasses are reestablished and doing well, in the spring of 2001, the SMS had to replace approximately 400 trees at the Frontenac project in order to meet the 80% survival as required by the T&E permit. As part of an outreach program, a presentation was given to the Frontenac High School Field Biology class about the endangered Gray bat, their benefit to the ecology of the area, and the need to plant trees for mitigation. The students were given the opportunity to participate in replanting the trees at the City Park. As a result, about 20 students assisted in planting trees in April, 2001. When these trees were planted, they were dipped in root gel, fertilized, furnished with a mulch mat, and a tree protector. Since the SMS's first tree planting experience back in 1995, it has been concluded that tree protectors increase the survival rate of the trees. Tree protectors are translucent plastic tubes, two foot high and three inches in diameter. They protect the seedlings from browsers and gnawers, and provide a green house like

environment around the seedlings trapping moisture during dry periods. The protectors stay on the tree for at least two years (sometimes three), and gradually photo degrade after about 36 months.

Although Black Locust trees were not planted, they were naturally occurring on the site prior to reclamation. Since reclamation the Black Locust have become weed like. A management plan is in place that includes mowing in summer and fall to control the Black Locust. Through proper management, the SMS believes these trees will be eradicated from the site over time. The native grasses are well established and provide ample ground cover. It is anticipated that the tree survival rate will be sufficient to release the project from the T&E permit by the 2003, growing season.

What started out to be an AML project was completed in partnership by the City of Frontenac, the Frontenac High School staff and Field Biology students, and the SMS. The City of Frontenac is pleased with the outcome of the project. What once was a hazardous area associated with past mining, has become an asset. The area is presently an attractive place to spend an afternoon fishing and picnicking, without the danger of steep highwalls, or the unsightliness of trash or debris. To boost the fishing activity of the newly reclaimed lakes, the Kansas Department of Wildlife and Parks stocked the lakes with several species of fish. Moreover, the city is exploring the possibilities for adding an open air pavilion and other recreational equipment. The SMS will continue to monitor the successful mitigation of the Gray bat habitat. This will insure the continued ability of the species to thrive in the Pittsburg-Frontenac area. In addition to people and bats using the area, the Frontenac High School Biology teacher has obtained an Outdoor Wildlife Learning Center (OWL) grant from the Kansas Department of Wildlife and Parks. In cooperation with the City of Frontenac, part of the City Park will be developed for this center. The field biology students will plant native wild flowers to attract butterflies and hummingbirds. Small trees and bushes will be planted to supply winter food for birds, and trails will be developed for viewing wildlife using these areas. This will be a great benefit and educational opportunity for students of every grade level and the entire community. The partnership of all involved has brought successful completion to this not so ordinary project.

INSERT PHOTO 1 HERE

Located within the city limits of Frontenac, Kansas, the site was an attractive place to dump trash, drive off-road vehicles, and have parties. The network of dirt roads made it hard to police and left the City of Frontenac with a hazardous area. This photo was taken at the south entrance to the project.

INSERT PHOTO 2 HERE

This photo taken at the same place as the above picture, shows that reclamation has given the site a new look. The stip pit lake was end filled and now the edge of the water is about 60 feet from the road.

INSERT PHOTO 3 HERE

The network of roads have been eliminated and reclaimed. Now, one road ends in an attractive cul-de-sac where cable guard rail adds protection, while providing access for people to walk to the water s edge to fish.

INSERT PHOTO 4 HERE

In addition to eliminating over 1800 feet of dangerous highwall, numerous rock channels were installed to interconnect the remaining pits onsite, to control erosion, and to eliminate flooding of the surrounding area.. Native grasses were planted to enhance wildlife habitat. Wetlands were both created and preserved. Trees were planted around all bodies of water for Gray bat habitat enhancement.

INSERT SITE MAP HERE

LITERATURE CITED

Choate, J.R.. 1990. Critical Habitat of the Gray Bat (*Myotis Grisescens*) In Kansas, Fort Hays State University, Hays, Kansas.

Tuttle, Merlin, & Daniel Taylor. 1998. Bats and Mines, Bat Conservation International, Inc, Austin, Texas.