Exploring New Possibilities:

Working and Natural Lands at the Cherokee County Superfund Site

www.epa.gov/region7

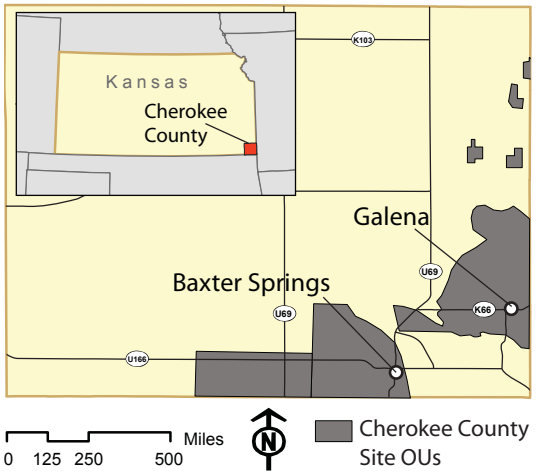
Cherokee County's mining history is familiar ground. So too is the legacy of contamination left behind at the Cherokee County Superfund site. As cleanup continues, however, it may be less well-known that former mine lands like the site can be restored and reused, most commonly for agriculture and wildlife habitat.

For landowners, economic benefits from these land uses include financial returns, increased property values and improved soil health. Other benefits include restored ecosystems and ecosystem services, enhanced biodiversity, and increased tax revenues and quality of life.

This handout explores several of these land uses – haying, grazing and habitat – that are compatible with the site's remedy and also discusses several potential longer-term opportunities: renewable energy, carbon trading and land conservation.

Quick Site Facts

Location:	EPA Region 7, Cherokee County, Kansas
Size:	approximately 115 square miles; 7 operable units (OUs)
History:	former lead and zinc mining area; part of larger Tri-State Mining District
Contaminants:	heavy metals (lead, cadmium, zinc)
Cleanup:	grading and containment of waste rock; excavation and disposal of contaminated soil; revegetation
Cleanup Status:	alternate water supply provided to 500+ homes; 800+ residential properties and 1,500+ acres of mining wastes remediated; soil cover and vegetation in place at several OUs



GETTING STARTED: COORDINATION WITH EPA AND KDHE

- Working with EPA and the Kansas Department of Health and Environment (KDHE) will ensure that your reuse plans are compatible with the site's remedy.
- KDHE is responsible for the operation and maintenance of the remedy in most areas and has Environmental Use Controls in place that may restrict some activities.
- Where engineered caps are in place, disturbance of the area for soil amendment or grazing may be restricted. Other areas may be suited for these activities.
- Potentially Responsible Parties have performed the remedy in some areas and may have agreements in place with the land owners that limit certain activities.

GROWING YOUR SOIL

Revitalization of soil health is critical following substantial disturbance of a site through activities like mining. Investing in healthy soil can prepare former mine lands for agriculture and wildlife habitat.

Soils: A pH of 6-7, adequate nitrogen, and phosphorus and potassium levels of 15-25 parts per million (ppm) and 80-130 ppm, respectively, provide good local growing conditions.

Amendments: Soil amendments rebuild and revitalize soil by increasing water holding capacity, re-establishing microbial communities and alleviating compaction. Local soil amendments include commercial fertilizers, poultry compost and other manures. Poultry compost provides organic matter to rebuild soils and is a cost-effective source of nutrients. Lime products may also be needed.

Tailored Plans: The type, mix and amounts of soil amendments can vary based on local remedy characteristics, soil conditions and the type of desired vegetation. Soil tests and coordination with the Cherokee County Extension Office will provide the information needed to develop an effective soil improvement plan for your property.

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PLANTING A PRODUCTIVE FUTURE

Haying, grazing and habitat are each well-suited to Cherokee County's economy and landscape. Because these land uses are not expected to accumulate heavy metals from former mining activities, they are also compatible with the site's remedy. Healthy grass stands can be established at the site following soil improvement.

HAYING

Maintaining a hay meadow is a low-cost diversification strategy. Hay can be used as forage for a farm's own livestock or as a cash crop sold to other livestock owners. Haying also provides insurance against drought or harsh winter weather. In eastern Kansas, the market for hay is strong from several quarters, including horse breeders, dairies and feedlots, according to the Kansas Biological Survey. With proper management, native prairies can be harvested for haying while also providing a tremendous variety of ecological services.

RECLAMATION IN ACTION

In the eastern part of the county, 96 acres of a former lead and zinc mine have been reclaimed for haying and grazing. Reclamation activities included backfilling of mining pits and rebuilding site subsoil and surface soil. Bermuda grass sprigs were planted in May 2010, enabling harvest of the first grass stand in September 2010.

GRAZING

Cherokee County includes 97,000 acres of grassland, with tall fescue the main pasture grass. With appropriate management practices, grazing can also be compatible with good wildlife habitat (see next section). When planting, using cool and warm season grasses in combination can significantly extend the grazing season.

WILDLIFE HABITAT

Landowners can conserve existing natural resources, restore native prairie and support local ecosystems common to the county's two ecoregions, the Springfield Plateau and the Cherokee Lowlands. Area ecosystems support a variety of fish, birds and other wildlife, including 51 species that are on threatened and endangered species lists or are otherwise of special concern. Habitat could be established for species like the bobwhite quail and eastern turkey, for example, while also helping to restore the region's tallgrass prairie, one of the most endangered ecosystems in the world. Interested landowners can incorporate wildlife habitat as part of their haying and grazing plans or can pursue habitat restoration independently.

COMMON GRASSES PLANTED IN CHEROKEE COUNTY

Grasses	Uses	Seeding Seasons*
WARM SEASON GRASSES		
bermuda grass (sprigs)	haying; grazing	Apr. 1 – Jun. 1
bermuda grass (seed)	haying; grazing	Nov. 15 – May 15
switchgrass, indiangrass, big and little bluestem, side-oats grama, western wheatgrass	prairie restoration; haying; wildlife habitat	Nov. 15 – May 15
COOL SEASON GRASSES		
fescue, ryegrass (annual)	haying; grazing	Sept. 1 – Oct. 1 (optimal) Dec. 15 – Apr. 15

* A two-week extension to the cutoff seeding date may be possible, based on favorable moisture and temperature conditions. (Information provided by the Cherokee County Extension Office.)

MAINTAINING YOUR INVESTMENT

Following soil improvement and planting, good land management practices will provide additional benefits, including erosion prevention, water filtration, invasive species control and improved drainage. To ensure the protectiveness of the site's remedy, it is important to minimize soil disturbance over time, particularly in areas with minimal soil cover. To the extent possible, no-till or conservation tillage approaches should be used.

- For grassland restoration, cool season grasses like fescue take 90-120 days to establish following planting. These grasses require regular fertilization. Reseeding with legumes every few years helps maintain forage quality.
- For prairie restoration, blended native grass species take about three years to establish following planting. Maintenance involves occasional mowing or burning, usually every three-to-five years. Regular fertilization is not required.
- To establish grasslands that also support wildlife habitat, best management practices include using rotational and light grazing; maintaining a combination of cool and warm season grasses; fencing livestock from water resources and wildlife areas; and coordinating grazing areas to avoid nesting locations.
- Harvesting hay meadows in late June provides the best compromise between quality and yield. Haying should take place in early July for hay meadows that are also managed for wildlife habitat, when ground-nesting birds like quail and turkey will have fledged. Unharvested hay meadows can also be managed to convert to prairie over time, providing additional habitat opportunities.
- Prairie management: ecologists recommend that 10-30 percent of a prairie should be left untouched each year, to serve as wildlife refuges and allow for continued seed production. Native prairies should not be cut twice in one season; a second cutting will reduce yield the following year.

THE BOTTOM LINE:
SEEDING AND MANAGEMENT COSTS

According to the 2008 *Cherokee County Restoration Plan / Environmental Assessment*, **estimated costs to establish haying, grazing and wildlife habitat at the site are approximately the same**: $2,700 in seeding costs per acre and $3,100 in long-term management costs – $150 per acre per year, over a 30-year period in present-value terms.

Looking to the Future

These land uses are also compatible with several developing trends that may offer new opportunities for landowners over the longer term. Look for more information on these subjects in the years ahead.

- ***Renewable Energy:*** A 2009 EPA *Renewable Energy Assessment* found that, at the utility scale, biomass is the resource likely most-suited to the site in the future. Perennial grasses like switchgrass are showing long-term promise for ethanol production. And, while solar and wind resources may not be feasible at the utility scale due to resource and/or transmission limitations, they will provide an increasingly cost-competitive power source for individual homes and farms in the future. (See the **Resources** section.)
- ***Carbon Storage and Trading:*** Parties seeking to offset their carbon emissions can invest in "carbon credits" – stored carbon – through voluntary markets like the Chicago Climate Exchange. Carbon credits are supplied through the carbon sequestration efforts of farmers and other landowners. Future regulatory measures and new incentives could create new markets and increase the value of carbon stored by agricultural land uses and wildlife habitat in Kansas. (See the **Resources** section.)

- ***Land Conservation:*** Restored lands at the site include ecologically important resources that merit protection. For landowners interested in ensuring their long-term stewardship, conservation easements are a well-established option that provides tax benefits. While resources to purchase easements are currently limited in Kansas, this may change in the future. The Kansas Department of Wildlife and Parks provides conservation-related assistance to landowners. (See the **Resources** section.)

FOR MORE INFORMATION

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Additional Resources

Information

SOIL AMENDMENTS

- The Use of Soil Amendments for Remediation, Revitalization and Reuse (EPA, 2007): www.clu-in.org/download/remed/epa-542-r-07-013.pdf

HAYING AND PRAIRIE MANAGEMENT

- Native Prairie Hay Meadows: A Landowner's Management Guide (KBS, 2009): www.kbs.ku.edu/people/staff_www/kindscher/Kindscher%20publicaitons/PrairieHayMeadows-web.pdf

WILDLIFE HABITAT AND ECOLOGICAL REUSE

- EPA CLU-IN website, Tools for Ecological Land Reuse section: www.clu-in.org/ecotools
- Ecological Revitalization: Turning Contaminated Properties Into Community Assets (EPA, 2009): www.epa.gov/superfund/accomp/news/ecological_revitalization.htm

RENEWABLE ENERGY

- Biomass fact sheet (AgMRC, 2009): www.agmrc.org/commodities_products/biomass/index.cfm

CARBON STORAGE

- U.S. Department of Energy Carbon Sequestration Program: fossil.energy.gov/sequestration/index.html

LAND CONSERVATION

- USDA Farm and Ranch Land Protection Program: www.nrcs.usda.gov/programs/frpp
- Kansas Department of Wildlife and Parks, private landowner assistance: www.kdwp.state.ks.us/news/Other-Services/Private-Landowner-Assistance

OTHER

- Cherokee County Restoration Plan / Environmental Assessment (U.S. DOI and U.S. FWS, 2008): www.fws.gov/mountain-prairie/nrda/CherCO_KS/EA/Final_RP_December%202008.pdf

Organizations

LOCAL, STATE AND FEDERAL RESOURCES

- Cherokee County Extension Office: www.cherokee.ksu.edu/DesktopDefault.aspx
- Kansas Biological Survey: www.kbs.ku.edu
- Kansas Center for Agricultural Resources and the Environment: www.kcare.ksu.edu/DesktopDefault.aspx
- Kansas Department of Health and Environment: www.kdheks.gov
- USDA Natural Resources Conservation Service, Kansas Office: Supervisory District Conservationist Scott Williams (620) 429-3360; scott.williams@ks.usda.gov) | www.ks.nrcs.usda.gov
- U.S. Fish and Wildlife Service, Manhattan, Kansas Office: www.fws.gov/mountain-prairie/contaminants/ecstaff.htm

EPA RESOURCES

- EPA Region 7 and EPA Western Ecology Division, Kansas Ecoregion: www.epa.gov/Region7/index.htm | www.epa.gov/wed/pages/ecoregions/ksne_eco.htm
- EPA Superfund Redevelopment Initiative: www.epa.gov/superfund/programs/recycle
- EPA Abandoned Mine Lands Team: www.epa.gov/aml/revital/index.htm