



Field Tour Descriptions

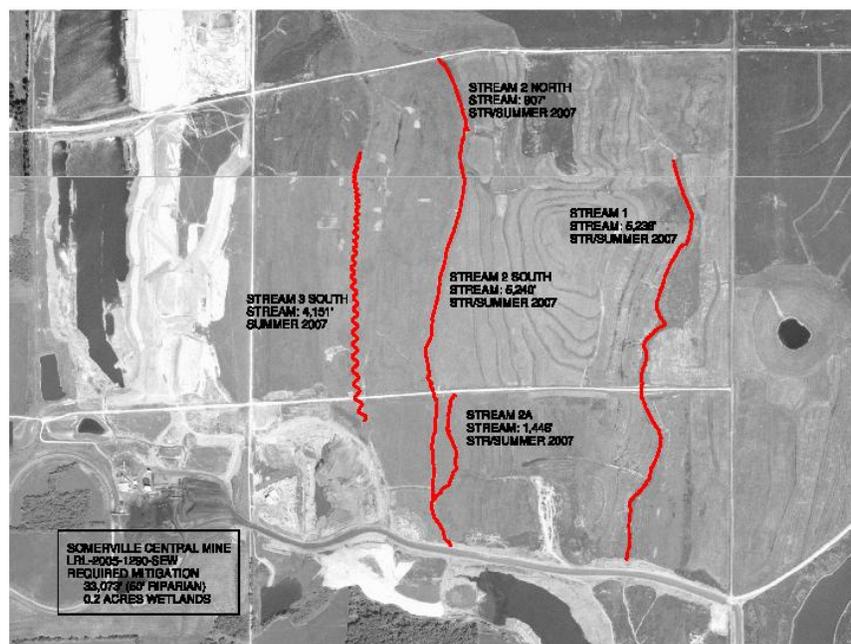
Both the Illinois and Indiana field tours will examine natural stream design approaches to reconstructing streams on surface mined lands. However, the tours differ substantially in both the scale and age of the sites to be visited. The Indiana tour will stop at six moderately sized sites featuring reclamation to ephemeral and smaller sized intermittent streams. All sites were reclaimed within the previous six years or are currently undergoing stream reconstruction. The Indiana Tour will also provide a balance of both regulatory and AML projects. The Illinois Tour will visit some of the largest full-scale stream reconstruction projects ever completed in the US. The tour will explore just two reclaimed surface mines but will feature multiple stops along over 11 miles of reconstructed perennial stream. The streams on the Illinois tour are more mature than those of the Indiana tour, up to 20 years since reconnection. Combined, the two tours will provide participants a unique opportunity to explore these unique sites and discuss the design and monitoring practices utilized with personnel directly involved with restoration efforts.

Indiana Field Tour

May 17th, 2011

Somerville Central Mine

Peabody Energy's Somerville Central Mine includes 44,186 linear feet of ephemeral stream and 7,051 linear feet of intermittent stream impacts. USACE approved mitigation includes the replacement of 33,073 linear feet of stream with no distinction between ephemeral and intermittent stream regime required, but with a 50 foot riparian buffer zone along the entire length. Beginning in 2007, mitigation has consisted of 16,980 linear feet of stream being replaced which include log vanes, j-hooks, root wads, and down-cut protection structures.



Hedges Highwall, AML Site 2082

This AML reclamation project consisted of 4,500 linear feet of dangerous highwall along a county road and was completed in October 2010. Most of the area is owned and managed by the Sugar Ridge State Fish and Wildlife Area, while a portion is owned and managed by the Patoka River National Fish and Wildlife Refuge. In order to eliminate the danger posed to local motorists and visitors of the fish and wildlife areas, the highwall was backfilled. During the backfilling process, several open water pits and wetland areas were impacted, requiring compensatory mitigation, which consisted of avoidance, enhancement and the replacement of 3,770 linear feet of natural stream design channel.



	DATE MADE 1/24/2011	2082 HEDGES HIGHWALL	DESIGNED BY DRH	SCALE NTS	SHEET
	DATE REVISED 1/24/2011 6:58:16 AM	STATE OF INDIANA DEPARTMENT OF NATURAL RESOURCES BUREAU OF RECLAMATION	DRAWN BY DRH	PROJECT	SITE 2082

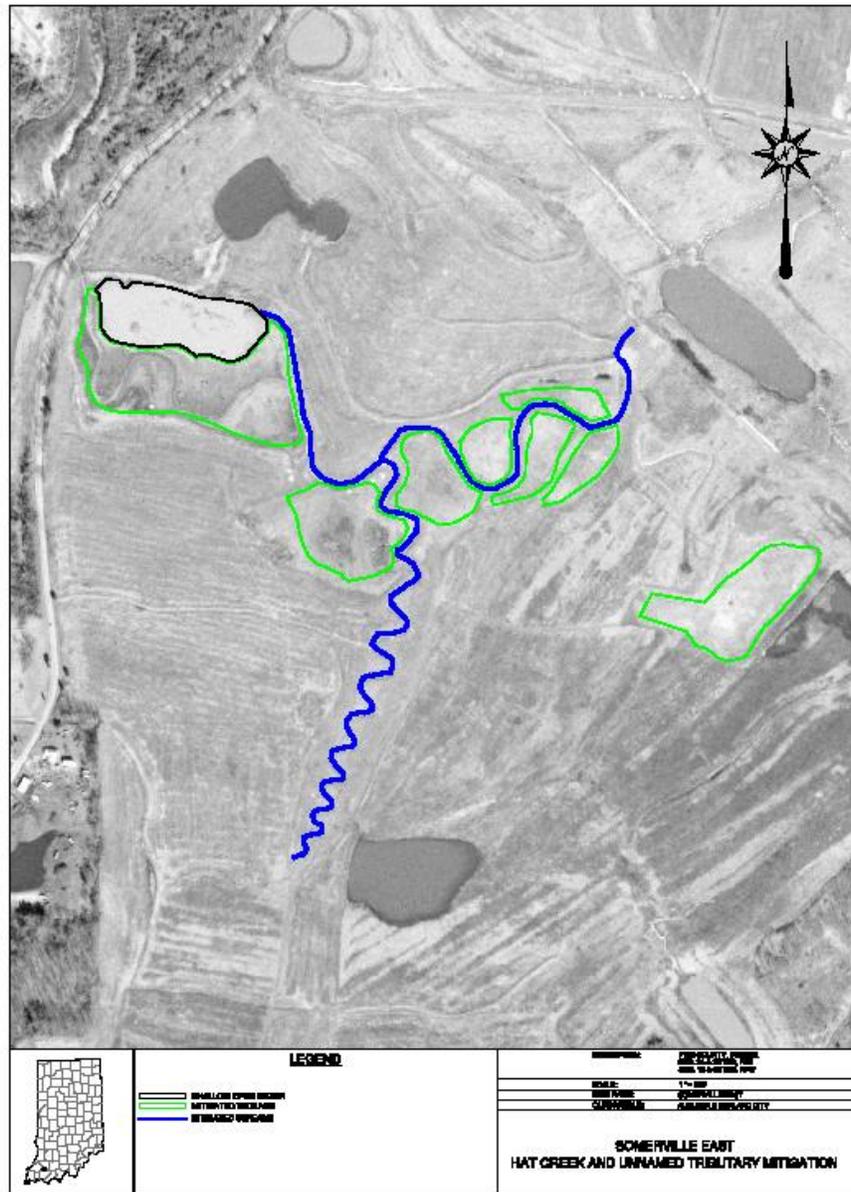
Augusta South Mine

Since the Augusta South mine opened in January 2005, Triad Mining has affected approximately 562 acres, including 15,735 linear feet of stream and 2.53 acres of wetlands. Stream and wetland restoration has been an ongoing project since the spring of 2005. Approximately 15,517 linear feet of stream and 13 acres of forested wetland have been restored. Most of the restored streams have forested riparian buffers around them. Triad Mining has made extensive use of native rock and brush from the mine in the restoration process.



Somerville East Mine

Black Beauty Coal Company, now Peabody Midwest Mining, permitted the Somerville East Mine in February 2005 with United Minerals Company as the subcontractor. During mining operations, 20,298 linear feet of streams and 9.6 acres of forested wetlands were impacted. Original stream reconstruction was completed in 2008, with improvements/repairs being made in 2009 and 2010. At this point, 2,640 linear feet of Hat Creek and 2,720 linear feet of an unnamed tributary to Hat Creek have been replaced.



Augusta North Mine/AML Site 309

This joint reclamation project was also conducted to eliminate 3,781 linear feet of dangerous highwall along a county road. Although this was an AML eligible site, Triad Mining was conducting operations directly across the street, and therefore agreed to enter into a cooperative agreement with the AML Program to reclaim the adjacent highwall as part of their mining operations. Several impoundments at the base of the highwall were filled as part of the backfill operation. As of July 2010, 3,500 linear feet of a natural stream design channel was replaced as compensatory mitigation.



Log Creek Church, AML Site 900

As with the previous AML sites, this reclamation project, completed in November 2006, consisted of 1,900 linear feet of dangerous highwall along a county road and is owned and managed by the Sugar Ridge State Fish and Wildlife Area. This highwall was backfilled to eliminate the danger to local motorists and property visitors. Although wetland mitigation was not an issue at this particular highwall, it was still reclaimed using natural stream design, creating 2,600 linear feet of channel. Being the first time the Indiana AML Program used this design technique, a cost comparison between natural stream design and typical reclamation techniques was conducted as part of the bid process.



Illinois Field Tour

May 19th, 2011

CONSOL Burning Star 4

Consolidation Coal Company engineers and reclamation staff designed and planned the nation's largest stream restoration effort to reconstruct more than 7 miles of meander channels through reclaimed mine soils at the Burning Star No 4 Mine (Anderson 1987). CONSOL's 4.3-mile Galum Creek restoration and 3.7-mile Bonnie Creek restoration were constructed through replaced mine soils in the approximate location of the pre-mine riparian corridor. The complexity of integrating the restoration of two streams into the planning, mining, and reclamation process required 20 years from initial design to channel reconnection for Galum Creek (Table 4). The CONSOL Galum and Bonnie creek restorations clearly illustrated that stream restoration is a complex, long term hydrogeomorphic process.

The U.S. Office of Surface Mining National Award for innovative reclamation practices recognized the significance of the CONSOL Burning Star 4 stream restorations in September 2002. OSM noted that this was ...

".....the first time in Illinois that two major streams in a minefield were diverted during mining and then restored to their original locations.reclaimed as a habitat for wildlife and waterfowl....."

The CONSOL Burning Star 4 award-winning stream restoration practices implemented at both Galum and Bonnie Creek enhanced wildlife habitat within the stream channel and the floodplain corridor. The restoration practices included construction of meander channels, riffles, pools, and deep water habitat.



CONSOL Burning Star 4. Galum Creek 4.3-mile restoration relocated through reclaimed soils in the approximate pre-mine riparian corridor.



CONSOL Burning Star 4. Bonnie Creek 3.7- mile restoration relocated through reclaimed mine soils in the approximate pre-mine riparian corridor.

BEFORE - CONSOL
Burning Star 4 Mine.
Galum Creek
restoration
integrating meander
channel construction
with active mining.
(Photo Date 1985)



AFTER - CONSOL
Burning Star 4 Mine.
Galum Creek
restoration
incorporating diverse
reclaimed land use
(row crop, forest,
wetlands) with
channel relocation
(Photo Date 2005)



AMAX Leahy Pipestone Creek

The ~ 4.6-mile reconstruction of meander channels and riparian corridor of Pipestone Creek at the AMAX Leahy Mine in Perry County was the longest single stream restoration project on a reclaimed surface mine in Southern Illinois. Similar to other (Galum and Bonnie Creek) post-law stream restorations, the Pipestone restoration followed the approximate original pre-mine floodplain location. Construction of the Pipestone Creek meander channels began in ~ 1979 with a small dragline, following grade and centerline profiles established by standard engineering practices of the 1970-80s. Meander channel segments of the Pipestone Creek restoration were constructed between 4 incline haulroads and vegetated as the active pit advanced beyond the future riparian corridor.

Stream restoration plans often identify the construction of a “stable” channel as a design feature. Ironically, channel stability conflicts with the true hydrogeomorphic definition of “meander” as a verb rather than a noun. If the restored stream is truly “restored”, meandering of the channel within the floodplain should be expected to occur. A restored stream that meanders within its reclaimed floodplain is demonstrating the dynamic equilibrium that we expect to occur in natural streams. The lower reach of the Pipestone Creek restoration “meandered” within the floodplain, when storm flows rerouted the channel across the floodplain prior to reconnecting with an existing “meander”. This natural abandonment of a constructed meander channel provides a desirable succession from a lotic to lentic stream channel environment that diversifies wetland habitats within a functionally restored floodplain.

Similar to the CONSOL Galum Creek restoration, the restored Pipestone Creek channel was designed to enhance deep water habitat connectivity provided by 3 incline lake basins. During the construction (ca 1980 – 1990) of more than 24,200 feet of meander channel stream restoration segments within the active mining complex, the main channel of Pipestone Creek was rerouted through a 22,700-foot straight-line temporary diversion that was constructed around the northern and eastern perimeter of the active surface mine. When all segments of the permanent restoration channel were completed (fall 1991) Pipestone Creek was reconnected to the 4.6- mile restored channel; and, inactive reaches of the temporary diversion were backfilled and reclaimed. Backfill conversion of portions of the temporary diversion channel to palustrine emergent season wetlands provided habitat for Illinois threatened and unique species such as the rice rat (*Oryzomys palustris*) and least bittern (*Ixobrychus exilis*).

Water quality and stream biota in the temporary diversion; and, eventually in the restoration channel were monitored semi-annually (spring and fall) by CWRL staff and the coal operator from 1983- 1995. Unique species of aquatic invertebrates and fish more commonly associated with clear and cool flowing streams were recorded during monitoring of the channel reaches immediately below the incline basin sampling points; and, in the clear water below the last restoration channel segment. Reductions of stream water turbidity values from 36 NTU (upstream) to 8 NTU (below incline basin) were noted in those reaches of Pipestone Creek in which brook silverside (*Labidesthes sicculus*) minnows and stonefly (Perlidae) larvae were sampled during the semi-annual monitoring program.

The occurrence of aquatic species indicative of high quality streams in a relatively short time following stream restoration suggests that physical features of stream restoration practices associated with deep water reconnection can provide immediate in-stream habitat improvement prior to longer term plant community development in the adjacent riparian corridor.

The streams, floodplain forested habitats, emergent wetlands, and row crop reclamation associated with the Pipestone Creek restoration corridor can now be viewed, 20 years post-construction, by visitors to the 16,000-acre IDNR Pyramid State Park (Denmark Unit). The AMAX Pipestone Creek restoration demonstrates the success of the Illinois stream restoration / reclamation program.



AMAX Leahy Mine. Pipestone Creek 4.6- mile meander channel restoration relocated in approximate pre-mine riparian corridor.



Pipestone Creek restoration. Channel “meander” (dashed black line).