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A GIS-based comparison of Pre- and Post-
Lignite Strip Mining Waters in East Texas

Strip-mine operations in Texas are of ecological concern due to the phenomenon of "acid mine drainage." In strip mining, overburden —unconsolidated and loosely-consolidated sediments overlying the targeted geologic formation or seam— is desaturated, removed, and stacked into piles arranged by depth (e.g. top soil, middle-depth sediments, and deepest sediments). Once the target layer is exposed at the surface of the open pit or rolling line, it is removed and transported to nearby power plants to generate electricity. Finally, the overburden is returned to its original location and vertically stacked into groups that approximate the pre-mining order of the sediments. Native vegetation is planted and the disturbed ground resaturates. Once EPA regulations regarding key hydrochemical and geochemical variables (including a stable pH between 6-8.5) are satisfied, the reclaimed land is released from bond and free to be sold by the relevant mining company.

However, in the lignite mining industry in east Texas, the presence of low pH seeps has delayed the release of some post-mining lands from bond. The lignite seams are associated with the Carrizo-Wilcox Formations, and are overlain by the pyrite-rich Reklaw Formation. My hypothesis is that the process of removing and replacing the overburden alters the redox conditions of the overburden, resulting in the oxidation of pyrite and a drop in pH.

I will use ArcGIS to investigate the spatial and temporal relations between the presence of the Reklaw Formation in the overburden and lignite strip-mining in east Texas. I will look at spatial relations by mapping:

> (1) the outcrop and near-surface geology of central and east Texas,
> (2) the location of lignite strip mines owned by Luminant Energy and other companies,
> (3) multi-year ground and surface water sampling locations used by the USGS and TWDB,
> (4) stream locations and flow direction (including watershed boundary delineation), and
> (5) the groundwater availability model (GAM) for Texas (for ground water flow and direction).

I will look at temporal relations by linking water sampling locations with multi-year water chemistry data collected by the USGS and TWDB (with a focus on pH and $[SO_4^{2-}]$) and linking strip mining operations with years of operation. I will use publically available data on USGS and TWDB website to gather most of this information. I will also use internet searches (and follow-up inquiries over mail or the telephone, if necessary) to research the location and years of operation of lignite strip mines in east Texas. There are two objectives for this project. The first is to establish a link between the presence of the Reklaw Formation in lignite strip-mining overburden and low pH seeps. The second is to determine whether the low pH seeps are temporally correlated with lignite strip mining operations, or whether low pH waters are present even before mining operations disturb the sediments.