Disc Contents Contents Search

ENVIRONMENTAL MAPPING IN THE JACKSON-YEGUA LIGNITE BELT, SOUTHEAST TEXAS[1]

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ABSTRACT

Environmental geologic maps of the Jackson-Yegua trend delineate important land areas and provide data useful in lignite mine planning and reclamation. Mapping was sponsored by the U. S. Geological Survey. The map area encompasses the Upper Eocene Jackson-Yegua outcrop, from Fayette County in south-central Texas to the Louisiana border in Sabine County. The sediments strike generally parallel to the coast, and dip 1 to 3 degrees to the southeast. The fluvial Yegua Formation contains interbedded sands and muds. The Jackson Group represents a regressive cycle (Fisher *et al.*, 1970). At the base of this cycle is the marine Caddell Formation. Above the Caddell lies the deltaic Wellborn Formation. Two major sands in the Wellborn form cuestas and sand hills. The deltaic Manning Formation overlies the Wellborn and exhibits a characteristic chocolate brown mud with local sands. The youngest formation in the Jackson is the Whitsett. Fisher *et al.* (1970) interpret this sand-rich formation as the fluvial counterpart of the Wellborn and Manning. At the eastern edge of the map area the Jackson and Yegua are predominantly marine mud.

Lignite occurs in the Yegua, in the Manning, and in the upper part of the Wellborn. Yegua lignites, originally deposited in an interchannel fluvial environment, are intermediate in quality among Texas lignites. Jackson lignites developed as marshes on foundering delta lobes and thus occur in high-sand areas, are relatively continuous, and are low in quality (Kaiser *et al.*, 1980).

In the mid-1970's, as increased lignite mining resulted from a search for cheaper energy sources, Federal and State laws were passed that restrict surface mining of lignite. The purpose of the surface mining laws is to ensure that reclaimed land approaches its pre-mine condition. Specifically, the laws require that native vegetation and prime farmland be restored. Mining may be restricted in flood-prone areas, ground-water quality must be monitored, and aquifer and aquifer recharge zones are expected to store the same quantity of water as they did prior to mining. Basic data are needed to plan lignite mining and reclamation in accordance with surface mining laws, and environmental geologic mapping was developed to provide much of the required data.

Environmental maps delineate flood-prone areas (P1, P2), vegetation and lithology (J1, J2), prime farmland (B1, B2), and severely eroded areas (G2) (All alpha-numeric pairs refer to Figure 1.). In addition, each map unit is described in terms of substrate, soil, geomorphology, geologic process, vegetation, and land use. Map units are divided into three major categories in accordance with a classification used in the Wilcox Group by Henry and Basciano (1979). The categories are 1) geomorphic, including floodplains and eroded uplands (P1, P2, G2), 2) substrate, including sand (H1, H2, H4), sand and mud (J1, J2), and mud, and 3) man-made, including lignite mines (M1) and gravel pits (M2).

Flood-prone units are among the most important, for not only do they delineate areas that may be flooded while mining is in progress, but they also contain prime farmland that needs to be carefully restored. Floodplain and adjacent terrace deposits (A2) store important irrigation water for which purity should be maintained.

Sand hills are important in mine planning because they may release water into the pit during mining and because they are easily eroded, contributing excess sediment to surface waters. Recharge rates in original sand hills must be approximated in reclaimed land.

A third environmental unit calling for attention in mine planning is prime farmland. By law, the A, B, and sometimes the C soil horizons are stripped and if necessary preserved during mining, and then replaced. Prime farmland is easily located on the environmental maps and can thus be avoided early in mine planning.

Gullied areas or steep vegetated hillsides are important because they may be difficult to strip, and like sand hills they are easily eroded and require prompt revegetation. These areas are also located easily on the environmental maps, and if necessary can be eliminated from consideration without costly preliminary studies.

Environmental maps delineate land areas that require special attention during mining, help in the early elimination of areas unsuitable for mining because of cost or regulation, and provide an original record of land condition as an aid to proper reclamation and as a base from which to direct more detailed site studies.

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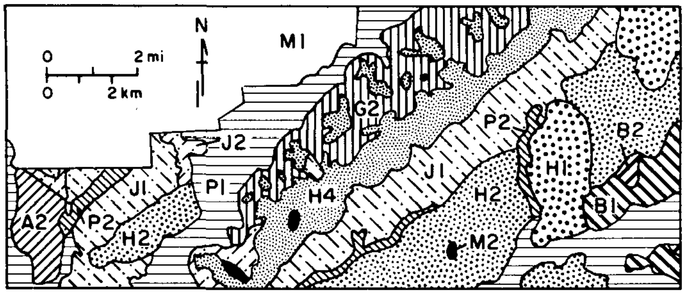

EXPLANATION

P1	Floodplain	B1	Low-relief blacksoil
P2	Tributary stream	B2	Rolling blacksoil
A2	Terrace	J1	Low-relief sand and mud
H1	Sand hill	J2	Rolling sand and mud
H2	Rolling sand	M1	Lignite mine
H4	Indurated sand	M2	Gravel pit
G2	Steep hillside		

Figure 1. Section of environmental map, Jackson-Yegua trend, 15 miles east of College Station, Texas, showing a part of the Gibbons Creek lignite mine (M1).

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DIAGENETIC INCORPORATION OF HEAVY METALS IN CLAYS: IMPORTANCE IN THE INTERPRETATION OF ENVIRONMENTAL TEST WELL MONITORING DATA

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ABSTRACT

Increased pressure from governmental agencies and environmental groups has, in recent years, required that the drilling of most test wells in closed bays and estuaries be accompanied by extensive chemical and biological monitoring programs. The procedures normally used to monitor heavy metal contamination can lead to mis-interpretation (and litigation), however, because they fail to consider the actual means by which metals are adsorbed, and incorporated, in sediments. Specifically, "whole sediment" chemical analysis does not reveal whether a metal is present in bottom clays as: (1) a structural ion in the clay lattice, (2) as one substituting for a cation in a non-indigenous material, (3) as an ion incorporated in exchangeable sites, or (4) as a metallically-chelated compound adhering to the surface of the clay platelets. Information of this type is necessary in order to determine if an observed elevated metal content, following completion of the well, is the result of the drilling operation, or some other activity that may have taken place in the area.

Data derived from an extensive monitoring program accompanying Mobil Oil's drilling of a test well in Mobile Bay, Alabama showed, for example, that increases in barium and strontium were not related to contamination of the bottom sediments by drilling muds but rather were traceable to the presence of both elements as substitutional impurities in the shell material that made up the drilling pad. Other elevated metal contents for copper, lead, zinc and chromium in the bay have subsequently been traced to dredging and construction activities which caused a release of metals from chelated sites in the bottom sediments by disruption of Eh conditions.

The acquisition of metal partitioning data, therefore, may provide critical information during monitoring studies that will help establish the true sources of anomalous metal contents in estuarine sediments (Sponsored by Mississippi-Alabama SEA GRANT Consortium).

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