APPLICATION OF THE TEXAS LAND RESOURCES MAP[1]

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SHORT NOTE

Texas is endowed with an enormous variety of natural land resources. Almost 270,000 square miles of plains, plateaus, mountains, hill country, beaches, river valleys, badlands, and many other land types comprise the natural land wealth of the State. Because of this great diversity, Texas exhibits a natural variability in energy and mineral resources, agricultural capacity, environmental sensitivity, and recreational potential that promotes industrial and cultural attraction. The desire to maintain the natural attractiveness of Texas has led to considerable interest in understanding the basic components of the States land resources. Production of oil and gas and development of lignite and uranium resources are prime examples of resource utilization that can exist in harmony with the natural characteristics of the land.

Essential to achieving balanced use of the environment is a comprehensive knowledge of physical, chemical, and biological characteristics limiting conditions and interrelationships of the varied land and water areas in Texas. Because no environment or group of environments is isolated, a regional perspective is necessary to ascertain the diversity of land and water resources, to assess their natural suitability, and to identify areas where more detailed studies are needed.

Land Resources of Texas, an inventory of Texas lands, has recently been published by the Bureau of Economic Geology. Seventy-one land resource units are depicted on a map at a scale of 1:500,000. The basis for mapping followed the concept of land and water resources, ". . . . mappable entities, either natural or man-made, that are defined by the physical, chemical, and biological characteristics or processes which govern the type or degree of use that is consistent with both their natural quality and productive utilization" (St. Clair and others, 1975). Each land resource unit displays a limited and predictable range of relatively unique properties that determine its attributes for varied activities.

Names and classification of the land resource units are based on properties subjectively judged to be the most significant in their potential use. For example, "ceramic clay and lignite/coal" is a land resource unit recognized by its importance as a potential source of ceramic materials and energy. Some of the physical characteristics of the ceramic clays present limitations for construction purposes, but the resource potential of the land is deemed to be of greater importance, and the unit is categorized as a mineral land unit with other units of similar potential. Eight major categories of land resources are defined: geohydrologic units, mineral land units, physical properties units, geomorphic units and structural features, process units, biologic units, estuary/lagoon/open-gulf units, and man-made units or features.

Land resource units are recognized principally by unique combinations of substrate materials, soils, vegetation, topographic configurations, and active processes (Fig. 1). Field investigations provide the basis for discriminating and mapping land resource types and determining their interrelationships. Interpretation of aerial photographs and existing maps of soils and rock types greatly facilitates the mapping program. The *Geologic Atlas of Texas* provided much of the areal and descriptive data needed to prepare the *Land Resources* map. Land resource mapping of the Texas Coastal Zone was based on maps prepared for the *Environmental Geologic Atlas of the Texas Coastal Zone.* Predictable associations and relationships within and among geohydrologic systems, dynamic processes, biologic communities, and others also aided in determining factors that are impor-

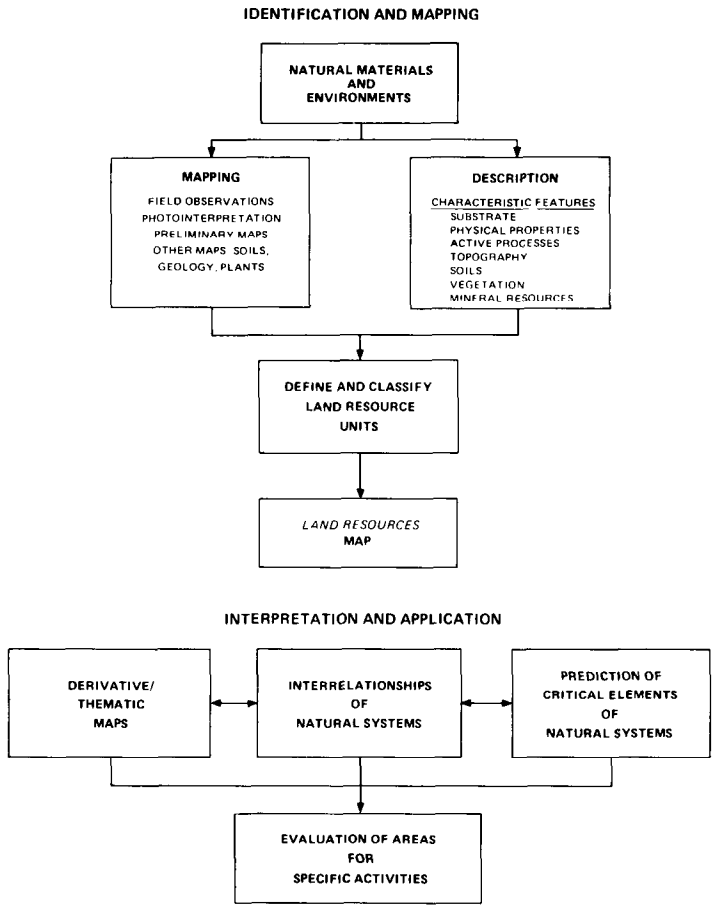

FIGURE 1. Flow diagram illustrating the process of land resource analysis.

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tant in evaluating the natural capacity of a land area for specific activities.

The 71 land resource units are shown on the map with distinct colors or patterns and letter-number symbols. A brief explanation on the map describes the characteristics of each unit: substrate material, topography, vegetation types, active processes, and known or potential resources. A table on the map presents natural suitability and recommended use considerations. Additional tables in the text provide more specific information about physical properties, distribution, substrate composition, plants and animals, economic resources, and current land use of the resource units. There are 11 small auxiliary maps (Table 1) that summarize aspects of land resources in Texas that could not be shown on the large map.

The *Land Resources of Texas* map was designed to provide a regional perspective of Texas lands that should be useful to planning authorities, educators, individuals, residential and industrial developers, and government agencies. The map provides the means to appraise the kind and level of technology required to use Texas lands in a manner that is economically prudent and environmentally compatible with natural conditions (Fig. 2). Use of the *Land Resources* map to select potential sites for a particular activity provides an opportunity to consider economic trade-offs and to perform preliminary cost/benefit analyses prior to detailed site evaluation. Derivative or thematic maps can be prepared that focus on particular aspects of the State's natural resources (Table 2).

The *Land Resources* map is intended to serve as the basis for regional land analysis and as a basis for delineating areas suitable for more detailed site- and area-specific studies. By using the descriptive and interpretive tables and by compiling derivative maps, the user can evaluate the potential of a land area for a variety of activities on a regional or statewide basis. The approach emphasizes the positive aspects of natural capability as well as natural constraints on land and water use.

Table 1. Auxiliary maps to the *Land Resources* map.

PHYSIOGRAPHY
Twenty physiographic provinces of Texas depicted by line drawing and colors.

SURFACE GEOLOGY
Generalized surface geology of the State depicted according to age and type of rocks.

SOILS MAP
Sixteen general kinds of soil grouped by such factors as color, texture, and soil chemistry.

VEGETATION REGIONS
General vegetation regions of the State grouped according to principal plant associations.

STRUCTURAL GEOLOGY
General structural framework of the State depicted by the locations of uplifts, basins, and basin margins. In addition, the area of active or potentially active faulting in the Coastal Zone is shown.

RIVER AND COASTAL BASINS
Fifteen major river basins and eight major coastal basins statutorially defined in Texas.

CLIMATE
General climatic conditions of the State depicted by mean annual temperature, precipitation, and evaporation over approximately a 30-year period. In addition, the maps shows the area of the coast flooded by surge and tides associated with Hurricanes Carla and Beulah.

MAJOR FRESH-WATER AQUIFERS
Recharge areas and downdip limits of major fresh-water aquifers in Texas.

MINERAL RESOURCES
Known and potential resources of the State. The map also shows locations of active or recently active surface mines or quarries, groups of mines or quarries, or wells for many of the resources.

ENERGY RESOURCES
Active and potentially active sources of energy resources in the State.

AGRICULTURAL PRODUCTS
Seventeen areas of different kinds of agricultural production in the State.

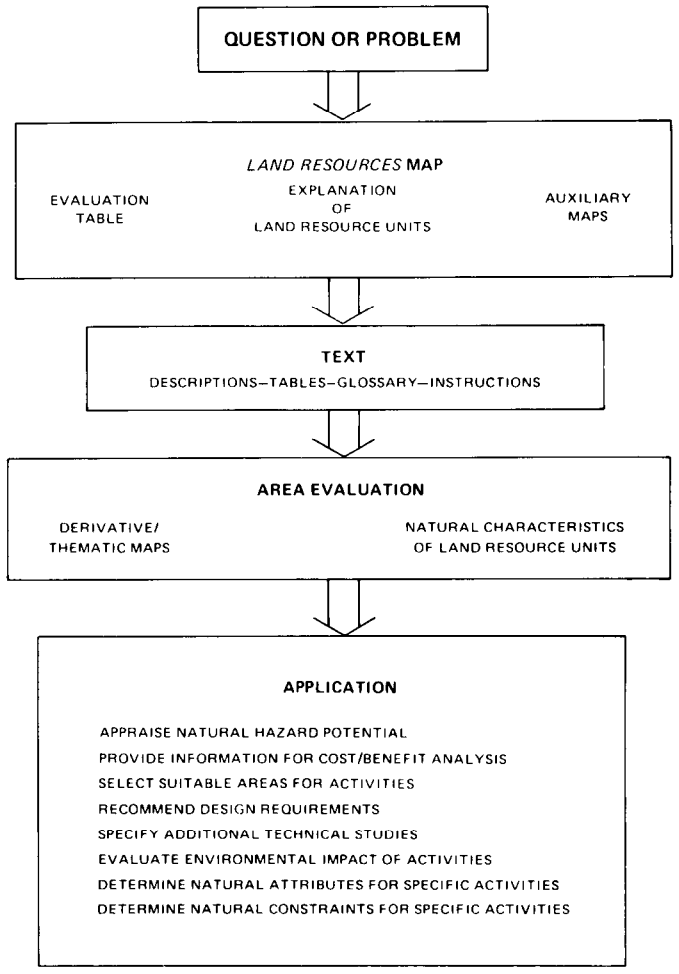

FIGURE 2. Flow diagram illustrating use of Land Resources of Texas map.

REFERENCES

St. Clair, A.E., Proctor, C.V., Jr., Fisher, W.L., Kreitler, C.W., and Mc Gowen, J.H., 1975, Land and water resources—Houston-Galveston Area Council: Univ. Texas, Austin, Bur. Econ. Geology, 25 pp.

CRITICAL BIOLOGIC AREAS	Delineate areas of high biologic productivity which should be undisturbed. 1. Fresh-water areas 2. Salt-water areas
LIQUID-WASTE DISPOSAL	Rate units according to permeability, flood potential, topography, and erosion. 1. Suitable: low permeability, low flood potential, gentle slopes 2. Marginal: moderate or variable permeability, moderate slopes 3. Unsuitable: high permeability, high flood potential, steep slopes
RIPABILITY	Rate units according to hardness 1. Ripable: excavation by conventional equipment 2. Marginal: excavation may require blasting locally 3. Nonripable: excavation requires blasting
RELIEF	Rate areas according to topographic character or shade contour intervals to emphasize elevation variations
PHYSICAL PROPERTIES	Group units according to similar physical properties such as shrink-swell potential, permeability, corrosion potential, or slope stability
FLOOD-PRONE AREAS	Outline areas described as being susceptible to flooding
CONSTRUCTION SUITABILITY	Rate units according to foundation strength, slope stability, shrink-swell potential, and flood potential
SOLID-WASTE DISPOSAL	Rate units according to permeability, flood potential, topography, etc.
RECHARGE AREAS	Group units according to aquifer characteristics
GREENBELT ZONES	Outline areas which should remain undeveloped based on hazards, biologic productivity, or unique features

TABLE 2. Types of derivative maps that can be constructed from the Land Rdsources of Texas map.