1-1972

Texas Forestry Paper No. 11

J. Robert Singer
Stephen F. Austin State University

William T. Miller
Stephen F. Austin State University

TEXAS FORESTRY PAPER NO. 11 – JANUARY 1972

SCHOOL OF FORESTRY

STEPHEN F. AUSTIN STATE UNIVERSITY

Nacogdoches, Texas

A RECONNAISSANCE LEVEL SYSTEM FOR PLANNING AND ENVIRONMENTAL IMPACT ANALYSIS

J. Robert Singer

and

William T. Miller[1]

Planning for extensive land use changes and appraisal of environmental impacts require systematic analysis of multiple aspects of the environment over large areas. Such analyses require assembly of basic data of many kinds related to specific land units.

A system for presentation of data for such reconnaissance surveys is presented here. It is flexible, permitting the incorporation of data from numerous disciplines, is compatible with major existing sources of mapped data, and permits analysis of data from all sources applicable to standard land units. It is adaptable to either hand or computer compilation. Essentially a stratification of data on transparent grids, it provides ready access to data on soils, geology, vegetation, and all other pertinent information in a form that facilitates comparison and analysis.

Stratification approaches have been used successfully by regional planning commissions as early as 1964 (Anon., 1964). Amidon (1964) developed an early computer-oriented system for assembling and displaying land management information using watershed examples as case studies. In 1965, a partial stratification approach was used in a multi-state regional economic study (Anon., 1965). A refined computer technique was defined by Amidon (1966) and

[1] Assistant Professor and Graduate Assistant, respectively, School of Forestry, Stephen F. Austin State University, Nacogdoches, Texas.

applied to East Texas conditions in 1967 (Anon., 1967). Storey *et al.* (1969) applied a similar technique to analyze the variables that influence wildfires. McHarg (1969) developed a stratification technique during the 1960's and applied it in a study seeking to identify the corridor of least environmental impact of highway construction. An important feature is the gradation he recognizes within each environmental stratum. Amidon's method, with the grid system, was applied by Dissmeyer[2] at the reconnaissance level in watershed analysis, and Wiksten (1970) used a stratification technique to identify lands providing greatest economic returns for the management monies invested.

Most recently, Leopold *et al.* (1971) included man's activities in a stratification of the natural environment. His matrix is a guide to be used by an administrator in determining the impact of a cultural activity on nature.

The key to the system presented here is a 5-minute quadrangle map, with mylar overlays. Ruled grids on the overlays divide this 5-minute quadrangle into 14 columns and 14 rows, (Fig. 1) thus forming 196 plots, each extending 21.43 seconds in latitude and longitude. At the latitude of Nacogdoches, Texas, each plot is a rectangle, 1,847 feet by 2,187 feet, and contains 92.72 acres - - very close to the 100 acre plot size considered optimum for a reconnaissance study by Dissmeyer (1969).

Quadrangle maps and overlay grids are prepared on the scale of available mapping, usually the 1:24,000, 1:62,500, or 1:125,000 scales of the U. S. Geological Survey maps. The larger scales facilitate detailed determinations and are preferable for preliminary mapping. Consideration of multiple factors over large areas, however, requires reduction of the maps and overlays of the resultant data; a scale of 1:125,000 is convenient and is compatible with computer outputs.

Unit maps and grids are identified by 3-digit numbers reflecting geographic position. Plots are identified by letters, A through P (I and O are not used) designating rows and columns (Fig. 1). Thus the plot in the upper left is designated "AA"; that in the first row of the fifth column is "AE", and that in the fourth row of the fifth column is "DE".

Data reflecting pertinent environmental factors are transferred to the transparent overlays. One or more overlays are used for each category of information, such as soils, topography, geology, and plant associations; each overlay presents data for a single stratum of information. Thus biological information might be mapped as plant associations on a single overlay or could be expanded to additional overlays classifying forest types, understory types, wildlife habitats, or other biological strata. Any type data which can be associated with specific areas reflecting the atmosphere, hydrosphere, lithosphere, or biosphere, as well as cultural works of man, can be recorded on such overlays. Analysis of data and planning for manage-

[2] Dissmeyer, G. E. 1969. Cookbook approach to MIADS-2 for watershed analysis. Division of Flood Prevention and River Basin Programs. Southeastern Area, USDA Forest Service. Unpublished Manuscript. 8 pp.

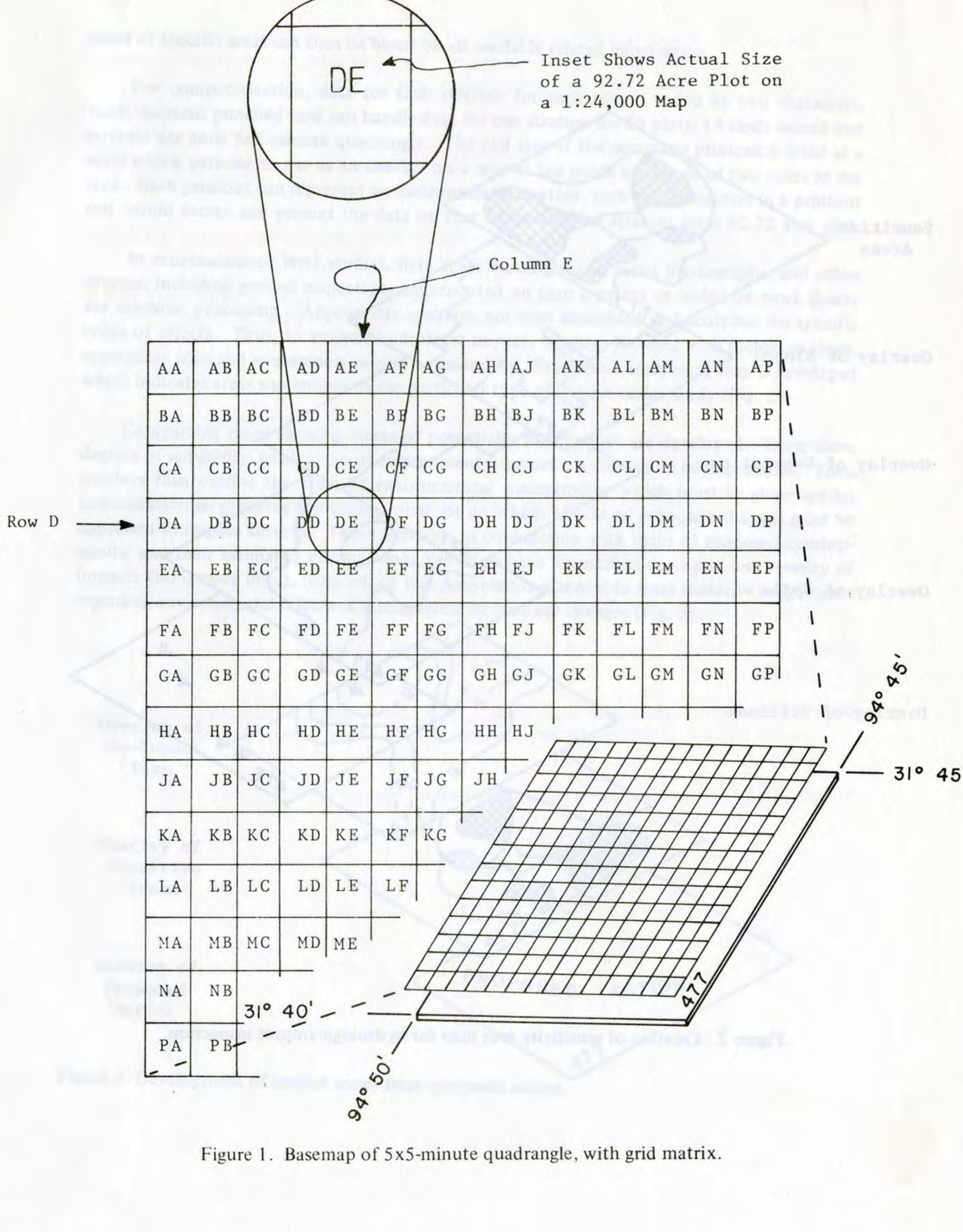

Figure 1. Basemap of 5x5-minute quadrangle, with grid matrix.

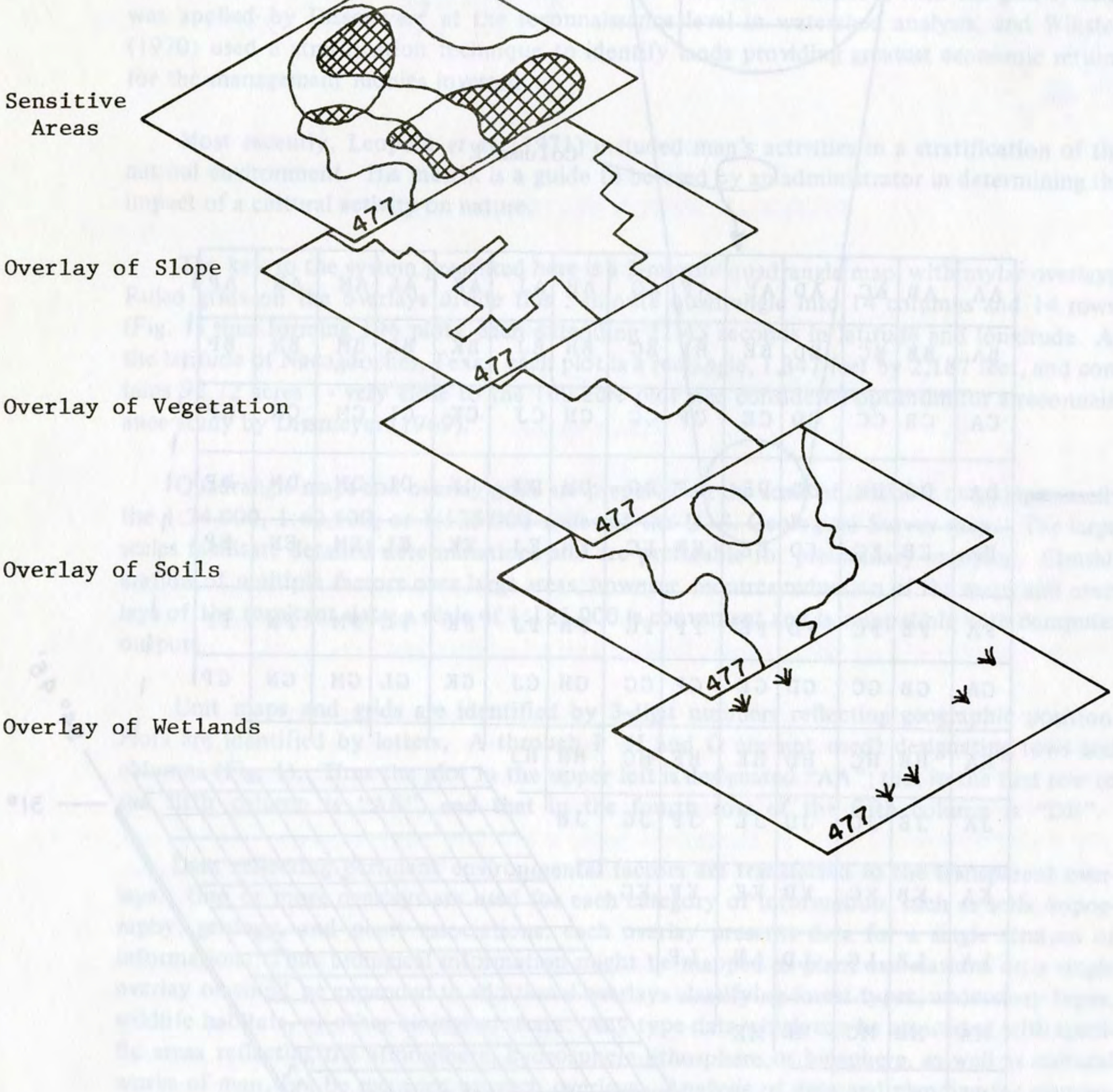

Figure 2. Creation of sensitivity area map for hydrologic impact inspection.

ment of specific areas can thus be based on all available related information.

For computerization, data for each stratum for each plot is coded by two characters. Each standard punched card can handle data for one stratum for 14 plots; 14 cards record one stratum for each 5x5-minute quadrangle. The cell size of the computer printout is fixed at a scale which permits its use as an overlay on a map at the much used scale of two miles to the inch. Each printout can represent an environmental stratum; each two characters in a printout cell would locate and present the data on that environmental stratum for a 92.72 acre plot.

In reconnaissance level studies, data from existing maps, aerial photographs, and other sources, including ground inspection, are recorded on map overlays or coded on work sheets for machine processing. Appropriate overlays are then assembled and analyzed for specific types of effects. Thus, to analyze hydrologic impact, overlays showing such factors as slope, vegetation, soils and swampiness, would be assembled. From such analyses, a map is developed which indicates areas susceptible to the particular type of impact under study (Fig. 2).

Comparable maps showing zones of potentially high impact are developed. These show degrees of sensitivity to all types of environmental impact which may be of importance. These overlays thus outline the areas of environmental susceptibility which must be given special consideration in planning for management, or on which effects of proposed changes must be appraised in impact surveys. These overlays, in conjunction with maps of proposed developments, and their estimated impact zones, provide a basis for establishing zones and severity of impacts (iso-impact lines), from which it is possible for planners to form tentative judgements regarding environmental effects of management or land use changes (Fig. 3).

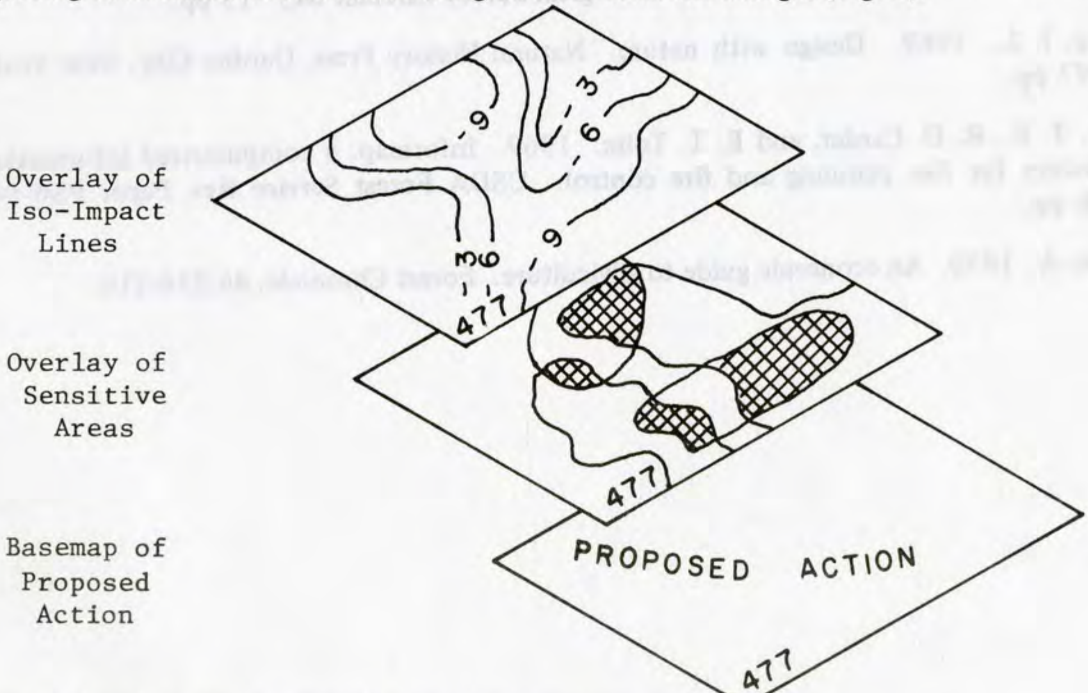

Figure 3. Development of impact zones from proposed action.

Detailed field inspection of impact sites can now proceed as a basis for completing the impact statements for each environmental sphere. These, in turn, provide the environmental impact data which are basic to decisions on proposed actions.

LITERATURE CITED

Amidon, E. L. 1964. A computer-oriented system for assembling and displaying land management information. USDA Forest Service Res. Paper PSW-17. 34 pp.

______________. 1966. MIADS-2, An alphanumeric map information assembly and display system for a large computer. USDA Forest Service Res. Paper PSW-38. 12 pp.

Anon. 1964. Data bank report. Misc. Rep. Joint Planning Commission, Lehigh Valley, Pa. 20 pp.

______________. 1965. Preliminary analysis for economic development plan for the Appalachian Region. Litton Industries for the Appalachian Regional Commission, Washington, D.C. 290 pp.

______________. 1967. A long-range plan for forestry education in Texas - -1967-1987. Prepared for Coordination Board, Texas College and University System by School of Forestry, SFASU, Nacogdoches, Tex. 179 pp.

Leopold, L. B., F. E. Clarke, B. B. Hanshaw, and J. R. Balsley. 1971. A procedure for evaluating environmental impact. U. S. Geological Survey Circular 645. 13 pp.

McHarg, I. L. 1969. Design with nature. Natural History Press, Garden City, New York. 197 pp.

Storey, T. E., R. D. Carder, and E. T. Tolin. 1969. Informap: a computerized information system for fire planning and fire control. USDA Forest Service Res. Paper PSW-54. 16 pp.

Wiksten, A. 1970. An economic guide to silviculture. Forest Chronicle, 46:214-216.