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# Role of Federal Agencies in Large-Scale Mapping

It is hoped that production can be accomplished primarily  
by contracting for commercial mapping services.

## INTRODUCTION

THE FIRST TOPOGRAPHIC maps published by the Geological Survey were at a scale of 1:250,000. In the relatively short period from 1879 to the present, the topographic mapping program has evolved from the 1:250,000-scale product through a series of continuously increasing scales to the present 1:24,000-scale national series. Increasing requirements for more detail for a variety of

National Topographic Program is to provide 1:24,000-scale coverage for the conterminous United States, Hawaii, and outlying areas, and 1:63,360 coverage for Alaska. This program is over 60 percent complete for 1:24,000 coverage and about 80 percent complete for Alaska. If present output and funding levels are maintained, this program should be completed by 1983. At the present time, considering available coverage at scales of 1:24,000,

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*ABSTRACT: In recent years, we have witnessed new Federal, public and private dedication to understanding and control better the factors that influence the ecology of our country. Pollution control, environment management, metropolitan and regional planning all are elements of those factors.*

*Inevitably, as Federal, State, county, or regional planning groups initiate plans or consider new programs, requirements develop for larger scale maps in addition to the standard 1:24,000-scale series and smaller scale maps. All too often, however, it is determined that the largest scale national map series available (National Topographic Map Series, 1:24,000 scale) is inadequate for detailed planning. Accordingly, it is our belief that a larger scale map product is required at an as yet undetermined scale and format, and that it should be part of the national map series to assure uniformity of scale, content, and accuracy to best serve the national interest. Such mapping could be produced primarily by extensive use of contractual services supported by Federal funding in accordance with Federal specifications, inspection, and acceptance.*

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uses directly contributed to the adoption of today's 1:24,000-scale topographic maps for general-purpose use. Today, with a new awareness of land use, as it relates to our Nation's population growth, urban planning, and environmental quality, a requirement for mapping that is substantially larger in scale than the present 1:24,000-scale product is clearly indicated for certain areas and for particular uses. The primary objective of the

1:62,500, or 1:63,360, the United States is approximately 84 percent covered.

By 1976 all of the remaining unmapped areas in the United States will have been programmed into the production cycle. It is the sincere conviction of the Geological Survey that completion of the 1:24,000-scale topographic mapping program at the earliest possible date is in the best national interest. Dedication to that purpose and a limited budget have prevented the Survey from responding to a growing need for a larger-scale map series. It is time now to consider and plan for new programs to meet new needs.

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### REBIRTH OF A NATION

Historically, man has assumed that the land, water, and air around him would absorb his waste products, would accommodate ever increasing expansion of urban growth with its attendant socio-economic requirements, and that natural resources necessary to support his demands would be ample. Now, Americans are beginning to measure the impact of increased population and its distribution on their environment and are realizing that new planning concepts are a necessity. The Nation's response to these problems has taken many forms, such as Federal urban assistance programs that have encouraged the formation of hundreds of State, regional, and local planning organizations; the creation of a Council on Environmental Quality; and study of the impact and meaning of a National Land Use Policy. In all of these new planning concepts the requirement for larger-scale map products to support the objectives of these areas of national concern has been demonstrated. It is the purpose of this paper to discuss these requirements and develop the rationale for adopting a larger-scale national map series.

### URBAN MAPPING NEEDS

State, county, and city planning organizations are aware of and give voice to their need for adequate maps for planning. In 1965, the Geological Survey joined with other Federal agencies in forming an Urban Mapping Coordination Group to consider urban mapping and geodetic control problems on a coordinated basis. A few highlights of the information developed by the Urban Mapping Coordination Group follow:

- The Department of Housing and Urban Development (HUD) annually expends considerable funds for large-scale urban mapping. This mapping, procured for one purpose and rarely satisfying another, is done by private mapping contractors and usually funded through HUD's comprehensive Planning Assistance Program.
- The Federal Highway Administration (FHWA) encourages State highway departments to prepare larger-scale maps in metropolitan areas. This special-purpose mapping is supported by the FHWA Highway Planning and Research Program and is done by State highway departments and/or by private mapping contract.
- The National Ocean Survey is becoming increasingly involved in establishing geodetic control for urban areas.
- A comprehensive review of urban mapping needs indicates that scale requirements for comprehensive urban planning vary from 1 inch = 2,000 feet to 1 inch = 400 feet with a developing need for a planimetric map series, utilizing a computer-receptive coordinate system to facilitate digitized recording and storage of selected map data.

There is every reason to believe that the general-purpose 1:24,000 and 1:62,500-scale series maps will always be highly useful for urban planning purposes, but it is becoming abundantly clear that a need already exists for larger-scale mapping for particular urban planning uses. The necessity for a national map series in which common scale, format, content, and accuracy can be achieved is evident. The urban problems that have emphasized the need for larger scale maps are not limited by jurisdictional boundaries. Urban sprawl caused by increasing concentration of population is not confined by a State boundary, county lines, or city limits. Until a larger-scale national map series suitable for most urban planning purposes is adopted, the various urban planning organizations will continue to seek independent solutions to their larger scale mapping problems.

### ENVIRONMENTAL MAPPING NEEDS

The need for larger scale maps to support certain environmental control programs has recently been identified by the Council on Environmental Quality (CEQ). One such program currently under study is associated with protection of wetlands—those land areas that border the bays and estuaries and that are affected by the rise and fall of tidal water. In September 1970, the Governor of New Jersey estimated that approximately 70 percent of all fish caught for sport or food depend at one time or another in their life-span on the natural qualities of wetlands and estuary waters. Shellfish depend almost totally on the natural qualities of wetlands and estuary waters. Estuarine waterways also provide transportation routes for commerce, provide barriers against wind and water erosion, act as water purifiers, and provide recreational opportunities.

Significantly, the quality of human life depends to a large extent on the preservation and natural health of wetland areas. Unfortunately, the destruction or elimination of wetlands has been taking place at an alarming rate and almost exclusively in the proclaimed interest of land development. Now, it has been determined to be in the best national interest to survey and measure all wetland areas and then proclaim some sort of legislative protection. Governor Cahill of New Jersey on November 5, 1970, signed into State law the "Wetlands Act of 1970" which directs in part "map and inventory the wetlands (State) before adopting orders controlling those lands."

Representatives of CEQ and the Depart-

ment of Environmental Protection, State of New Jersey, have stated requirements for maps to carry out the wetland studies with scales varying from 1 inch=200 feet to 2 inch=400 feet. Here again, the wetland protection considerations that have highlighted the need for larger scale maps are not limited by jurisdictional boundaries. As the impetus for protection of wetlands grows, the adjoining States having such interests will undoubtedly require large-scale mapping and will seek independent solutions to those problems. A larger-scale national map series, suitable for most of the wetland studies would be highly useful in providing conformity of scale, accuracy, and data presentation on a continuous basis.

#### LAND-USE MAPPING FOR FLOOD PLAINS

The demand for larger-scale mapping to define and study flood-plain areas is especially evident and is constantly increasing as new concepts of land-use policies are promulgated at the Federal, State, and local level. The Geological Survey, through activities of the Water Resources Division, is engaged in a program of preparing general outline maps of flood-prone areas. The purpose of the maps is to alert State and local planners to areas that are subject to periodic flooding. There is a growing demand, however, for larger-scale maps, such as 1 inch=200 feet with 2-foot contours, for metropolitan areas where the loss of life, property, revenue, and the cost of emergency relief would be predicably high. The requirement for such maps is particularly identified with urbanizing areas to support land-use management programs and to establish ordinances for flood insurance programs administered by the Department of Housing and Urban Development, but flood-plain areas and planning problems associated with them are not limited by jurisdictional boundaries, State boundaries, county lines, or city limits. A larger-scale national map series suitable for most flood-plain studies will be required to provide conformity of scale, accuracy, and data presentation on a continuous basis.

#### WHAT KIND OF LARGER-SCALE MAP PRODUCT?

Discussions held with potential users of larger scale maps clearly indicate that a wide variation of map products are desired. Some of the basic considerations are: (1) the variety of map scale requirements ranging from 1 inch=2,000 feet to 1 inch=400 feet indicates the desirability of a map scale that would be

flexible and yet retain inherent accuracies basic to its original form; (2) for urban planning purposes and flood-plain studies of populated areas, the product should yield to rapid revision techniques with minimum cartographic assists; (3) relative horizontal accuracy and minimum cartographic displacement of map features is more important than absolute geodetic accuracy; (4) the basic map product should yield to graphic flexibility—that is, permit the application of overlays by separation of data categories; (5) contour information, where required, must be accurate and relatable to actual ground features; (6) a computer-receptive coordinate or grid system should be used to facilitate digitized recording or storage for rapid retrieval of selected categorized data.

With these basic factors being considered the Geological Survey is now investigating the type of map product that would most nearly meet the needs of users of larger scale maps. The investigation is presently oriented toward orthophoto products at sufficiently large scales to yield flexibility and permit the preparation by photographic enlargement of other highly useful products for special needs.

#### THE FEDERAL ROLE

In July 1969, Robert H. Lyddan, Chief Topographic Engineer, U. S. Geological Survey, reported on "National Mapping for Urban Areas" and discussed future programs. Since that time, and as presented in this paper continuing investigations and interviews and indeed entirely new requirements have identified the need for a larger-scale national map series. However, with emphasis on completing the 1:24,000-scale topographic map series and the maintenance of that series, the Geological Survey does not expect to expand production sufficiently to accomplish the required larger-scale mapping entirely with its own forces. Rather it is hoped that production can be accomplished primarily by contracting for commercial mapping services with Federal influence exercised through negotiation, product specification, inspection, and acceptance. Federal influence is considered mandatory to achieve conformity of scale, format, and accuracy, thereby producing a map product that will offer maximum utility for continuous areas extending beyond independent jurisdictional boundaries.

Considering urban planning needs, environmental control studies, and support of land-use policies the total area involved in larger scale map needs could equal one-fifth of the land area of the United States. Al-

though further studies to identify specific requirements must be made, we are convinced that the needs are there for a new national program involving larger scale maps for specific areas. Implementation of the new program should begin as soon as the needs are adequately identified and catalogued. Ob-

viously, a new program of this magnitude cannot be accomplished within the level of funding currently provided for the National Mapping Program. But, as with any new program, if the need is justified and a national interest is served, full support and funding can be anticipated.

### Articles for Next Month

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